Electronic Components



Relays Microelectronic

OMRON®
ELECTRONIC COMPONENTS

Omron Electronic Components LLC

Stability and Experience

With over 75 years experience, Omron continues to apply the latest technologies providing you with innovative efficient control component solutions. Our wide range of relays, switches, sensors, and connectors allows our customers to streamline vendor lists and reduce the cost of procurement.

Quality First

Our commitment, your benefit

Omron makes a conscious choice to relentlessly pursue quality. Our quality engineers are part of the design and manufacturing process from the start. We design and evaluate at the component level, test and adjust during manufacturing, and examine every physical, mechanical, and electrical aspect of each final product before it leaves the factory.

Customer Support

Omron's sales engineers, inside sales representatives, and customer service staff have experience with all types of electronic applications. No matter what the application or volume, we will find just the right component for your project.

Broad Product Offering

Relays:
- MOS FET
- Low Signal
- RF/HF
- RF MEMS
- Power PCB
- Automotive
- General-Purpose
- Solid State

Switches:
- Snap Action
- Tactile
- DIP
- Dome Array
- Thumbwheel
- Rocker

Sensors:
- Flow
- Pressure
- Tilt
- Vibration
- NIBP Module

Connectors:
- FPC
- Industrial
- PCB

Fiber Optic:
- Tosa/Rosa
- Tx/Rx Module
- Splitters
- MLA

Additional information can be found at www.components.omrom.com, or by calling us at: 847.882.2288 Monday through Friday 8:30 AM until 5:00 PM CST. Our inside sales staff will be ready to provide you with detailed product information, technical design support, or the location of your local Omron sales office or authorized distributor.



RoHS COMPLIANT



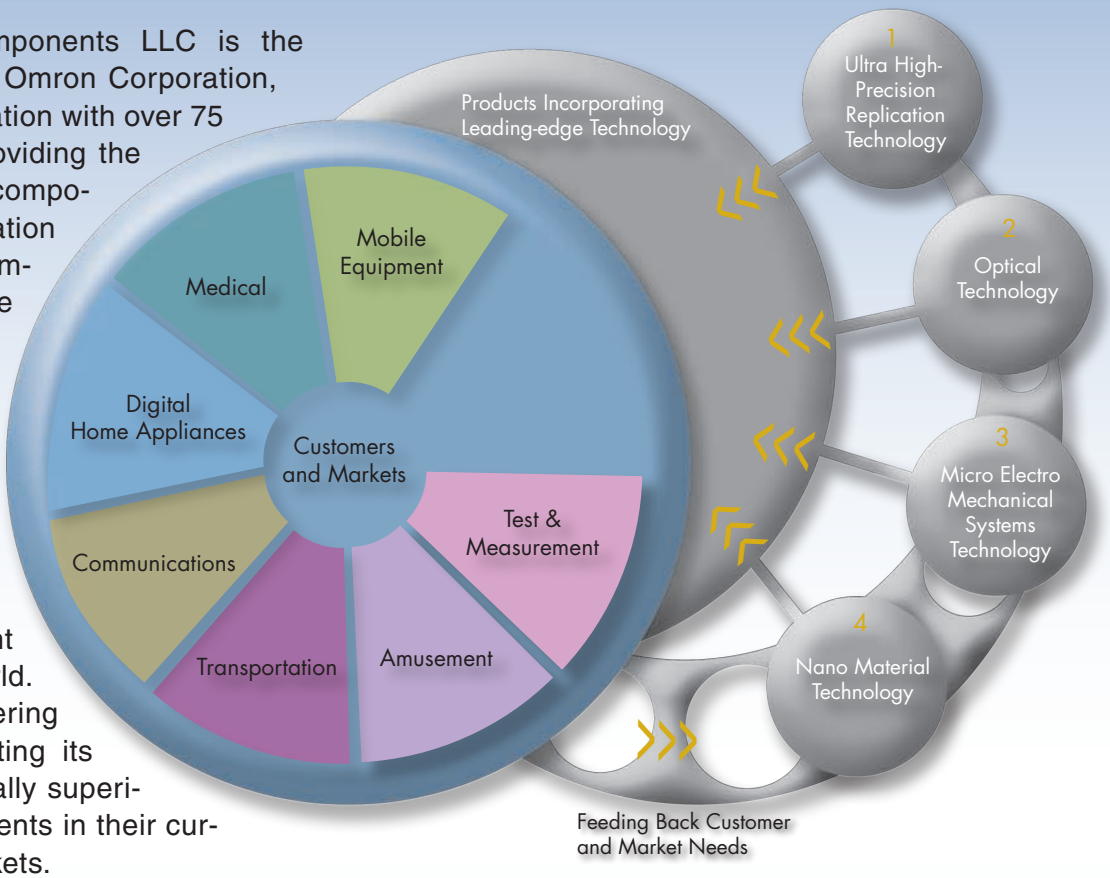
OMRON ELECTRONIC COMPONENTS

At work for a better life... a better world for all!

Focus Markets

Omron Electronic Components LLC is the Americas subsidiary of Omron Corporation, a leading global corporation with over 75 years experience of providing the market with electronic components, industrial automation controls, automotive components, and healthcare products. Our broad product offering can be found in applications for the communications, transportation, medical, HVAC, appliance, industrial automation, consumer electronics, and test & measurement markets around the world. Omron has an unfaltering commitment to supporting its customers with technically superior, high quality components in their current and emerging markets.

OMRON Responds to IT Evolution with Four Advanced Technologies.



Core Technologies

In order to provide more value to customers, OMRON has worked to further strengthen our four leading-edge technologies in the electronic components business.

Ultra High-Precision Replication

The first is an ultra-precise replication technology that is accurate down to a single micrometer. This technology is indispensable to optical communications, optical displays, illumination, high-frequency devices and subminiature mechanical devices.

Optical / Fiber

The second is optical control technology, which uses the wave nature of light to efficiently control the direction of light movement. Omron's technology supports the continuing evolution of Passive Optical Networks (PON), Video Over Fiber devices and IT devices used for data communication.

Micro Electro Mechanical Systems

The third is micro-electro-mechanical systems (MEMS) technology, which helps support the Digital Age by allowing materials to be processed with micrometer- to nanometer-level precision. This contributes to the micro-miniaturization of mobile devices, biotechnology products, consumer, industrial, and automobile applications.

Nano Materials

The fourth is nano-material technology, which is used to develop materials at the molecular level. Omron continues to incorporate nano-materials in to its new, state-of-the-art components.

RELAYS

Omron is one of the most recognized world leaders in relay design and manufacturing. Omron delivers innovative control components that allow customers to reduce product size, add more functional capability, and assemble products more cost effectively. As a world class manufacturer, the company provides local technical support and global logistics coordination to expertly facilitate design in one country, fabrication in another, and on-time delivery wherever product is needed. Omron's comprehensive quality commitment means improved manufacturing yields, reduced field failures, on-time product launches, and a reputation for product reliability.

High Frequency Relays

Omron's high frequency relays are available with a broad variety of features offering low power consumption solutions for applications requiring frequency bandwidths from 1 to 26.5 GHz.

Applications

- Test & Measurement Equipment
- Mobile Communication Infrastructure
- Broadcast Equipment

Low Signal Relays

Omron supplies one of the widest ranges of signal relays and is at the forefront of development in specialty products and surface mount technology.

Applications

- Telecom, ADSL, Test Line Access
- Automotive, Audio, Satellite Navigation
- Security, Alarm Systems
- Test & Measurement Equipment

MOS FET Relays

Providing Solid State performance and reliability, Omron's MOS FET Relay offering includes 1 & 2-Pole configurations in Thru-Hole, Surface Mount, SOP and SSOP packages.

Options

- Current Limiting
- High Current Load Handling
- High Dielectric Withstand Voltage
- High Switching Speed
- Low Leakage, Low LED Trigger, Low On Resistance and Low Capacitance

Applications

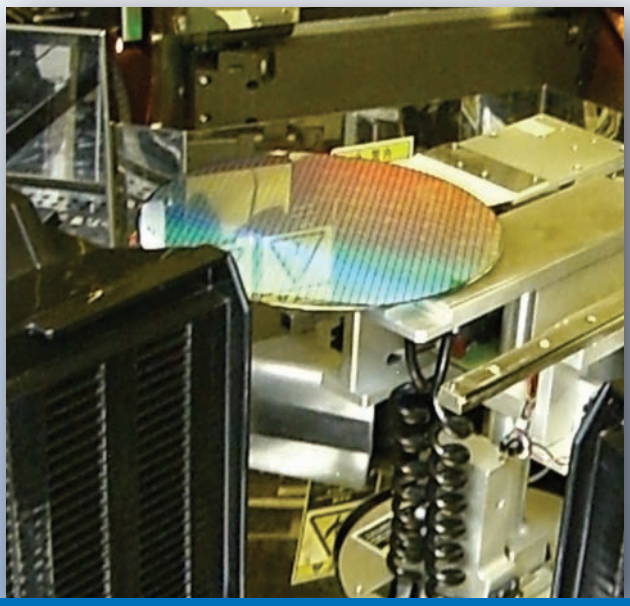
- Test & Measurement Equipment
- Mobile Communication Infrastructure
- Broadcast Equipment

RF MEMS Switch

Omron's new 2SMES MEMS Switch provides the superb RF Characteristics of an electromechanical relay with a life expectancy generally only found in solid state products, of 100 Million Operations with ultra-low power consumption.

Applications

- Automated Test Equipment
- RF Communication Equipment





Omron's MEMS wafer fab facility produces 4", 5"& 8" wafers for variety of sensing and switching products.

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Omron Electronic Components, LLC

Terms and Conditions of Sales

I. GENERAL

1. Definitions: The words used herein are defined as follows.
   (a) Terms: These terms and conditions
   (b) Seller: Omron Electronic Components LLC and its subsidiaries
   (c) Buyer: The buyer of Products, including any end user in section III through VI
   (d) Products: Products and/or services of Seller
   (e) Including: Including without limitation
2. Offer: Acceptance: These Terms are deemed part of all quotations, acknowledgments, invoices, purchase orders and other documents, whether electronic or in writing, relating to the sale of Products by Seller. Seller hereby objects to any Terms proposed in Buyer's purchase order or other documents which are inconsistent with, or in addition to, these Terms.
3. Distributor: Any distributor shall inform its customer of the contents after and including section III of these Terms.

II. SALES

1. Prices; Payment: All prices stated are current, subject to change without notice by Seller. Buyer agrees to pay the price in effect at the time the purchase order is accepted by Seller. Payments for Products received are due net 30 days unless otherwise stated in the invoice. Buyer shall have no right to set off any amounts against the amount owing in respect of this invoice.
2. Discounts: Cash discounts, if any, will apply only on the net amount of invoices sent to Buyer after deducting transportation charges, taxes and duties, and will be allowed only if (a) the invoice is paid according to Seller's payment terms and (b) Buyer has no past due amounts owing to Seller.
3. Interest: Seller, at its option, may charge Buyer 1.5% interest per month or the maximum legal rate, whichever is less, on any balance not paid within the stated terms.
4. Orders: Seller will accept no order less than 200 U.S. dollars net billing.
5. Currencies: If the prices quoted herein are in a currency other than U.S. dollars, Buyer shall make remittance to Seller at the then current exchange rate most favorable to Seller; provided that if remittance is not made when due, Buyer will convert the amount to U.S. dollars at the then current exchange rate most favorable to Seller available during the period between the due date and the date remittance is actually made.
6. Governmental Approvals: Buyer shall be responsible for all costs involved in obtaining any government approvals regarding the importation or sale of the Products.
7. Taxes: All taxes, duties and other governmental charges (other than general real property and income taxes), including any interest or penalties thereon, imposed directly or indirectly on Seller or required to be collected directly or indirectly by Seller for the manufacture, production, sale, delivery, importation, consumption or use of the Products sold hereunder (including customs duties and sales, excise, use, turnover and license taxes) shall be charged to and remitted by Buyer to Seller.
8. Financial: If the financial position of Buyer at any time becomes unsatisfactory to Seller, Seller reserves the right to stop shipments or require satisfactory security or payment in advance. If Buyer fails to make payment or otherwise comply with these Terms or any related agreement, Seller may (without liability and in addition to other remedies) cancel any unshipped portion of Products sold hereunder and stop any Products in transit until Buyer pays all amounts, including amounts payable hereunder, whether or not then due, which are owing to it by Buyer. Buyer shall in any event remain liable for all unpaid accounts.
9. Cancellation; Etc: Orders are not subject to rescheduling or cancellation unless Buyer indemnifies Seller fully against all costs or expenses arising in connection therewith.
10. Force Majeure: Seller shall not be liable for any delay or failure in delivery resulting from causes beyond its control, including earthquakes, fires, floods, strikes or other labor disputes, shortage of labor or materials, accidents to machinery, acts of sabotage, riots, delay in or lack of transportation or the requirements of any government authority.
11. Shipping; Delivery: Unless otherwise expressly agreed in writing by Seller:
    (a) All sales and shipments of Products shall be FOB shipping point (unless otherwise stated in writing by Seller), at which point title to and all risk of loss of the Products shall pass from Seller to Buyer, provided that Seller shall retain a security interest in the Products until the full purchase price is paid by Buyer;
    (b) Delivery and shipping dates are estimates only; and
    (c) Seller will package Products as it deems proper for protection against normal handling and extra charges apply to special conditions.
12. Claims: Any claim by Buyer against Seller for shortage or damage to the Products occurring before delivery to the carrier or any claim related to pricing or other charges must be presented in detail in writing to Seller within 30 days of receipt of shipment.

III. PRECAUTIONS

1. Suitability: IT IS THE BUYER'S SOLE RESPOINSIBILITY TO ENSURE THAT ANY OMRON PRODUCT IS FIT AND SUFFICIENT FOR USE IN A MOTORIZED VEHICLE APPLICATION. BUYER SHALL BE SOLELY RESPONSIBLE FOR DETERMINING APPROPRIATENESS OF THE PARTICULAR PRODUCT WITH RESPECT TO THE BUYER'S APPLICATION INCLUDING (A) ELECTRICAL OR ELECTRONIC COMPONENTS, (B) CIRCUITS, (C) SYSTEM ASSEMBLIES, (D) END PRODUCT, (E) SYSTEM, (F) MATERIALS OR SUBSTANCES OR (G) OPERATING ENVIRONMENT. Buyer acknowledges that it alone has determined that the Products will meet their requirements of the intended use in all cases. Buyer must know and observe all prohibitions of use applicable to the Product/s.
2. Use with Attention: The followings are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible use of any Product, nor to imply that any use listed may be suitable for any Product:
   (a) Outdoor use, use involving potential chemical contamination or electrical interference.
   (b) Use in consumer Products or any use in significant quantities.
   (c) Energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
   (d) Systems, machines, and equipment that could present a risk to life or property.
3. Prohibited Use: NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.
4. Motorized Vehicle Application: USE OF ANY PRODUCT/S FOR A MOTORIZED VEHICLE APPLICATION MUST BE EXPRESSLY STATED IN THE SPECIFICATION BY SELLER.
5. Programmable Products: Seller shall not be responsible for the Buyer's programming of a programmable Product.

IV. WARRANTY AND LIMITATION

1. Warranty: Seller's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Seller (or such other period expressed in writing by Seller). SELLER MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT ALL OTHER WARRANTIES, NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS.
2. Buyer Remedy: Seller's sole obligation hereunder shall be to replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product or, at Seller's election, to repay or credit Buyer an amount equal to the purchase price of the Product; provided that there shall be no liability for Seller or its affiliates unless Seller's analysis confirms that the Products were correctly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Seller before shipment.
3. Limitation on Liability: SELLER AND ITS AFFILIATES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY. FURTHER, IN NO EVENT SHALL LIABILITY OF SELLER OR ITS AFFILITATES EXCEED THE INDIVIDUAL PRICE OF THE PRODUCT ON WHICH LIABILITY IS ASSERTED.
4. Indemnities: Buyer shall indemnify and hold harmless Seller, its affiliates and its employees from and against all liabilities, losses, claims, costs and expenses (including attorney's fees and expenses) related to any claim, investigation, litigation or proceeding (whether or not Seller is a party) which arises or is alleged to arise from Buyer's acts or omissions under these Terms or in any way with respect to the Products.

V. INFORMATION; ETC.

1. Intellectual Property: The intellectual property embodied in the Products is the exclusive property of Seller and its affiliates and Buyer shall not attempt to duplicate it in any way without the written permission of Seller. Buyer (at its own expense) shall indemnify and hold harmless Seller and defend or settle any action brought against Seller to the extent that it is based on a claim that any Product made to Buyer specifications infringed intellectual property rights of another party.
2. Property; Confidentiality: Notwithstanding any charges to Buyer for engineering or tooling, all engineering and tooling shall remain the exclusive property of Seller. All information and materials supplied by Seller to Buyer relating to the Products are confidential and proprietary, and Buyer shall limit distribution thereof to its trusted employees and strictly prevent disclosure to any third party.
3. Performance Data: Performance data is provided as a guide in determining suitability and does not constitute a warranty. It may represent the result of Seller's test conditions, and the users must correlate it to actual application requirements.
4. Change In Specifications: Product specifications and descriptions may be changed at any time based on improvements or other reasons. It is Seller's practice to change part numbers when published ratings or features are changed, or when significant engineering changes are made. However, some specifications of the Product may be changed without any notice.
5. Errors And Omissions: The information on Seller's website or in other documentation has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.
6. Export Controls: Buyer shall comply with all applicable laws, regulations and licenses regarding (a) export of the Products or information provided by Seller; (b) sale of Products to forbidden or other proscribed persons or organizations; (c) disclosure to non-citizens of regulated technology or information.

VI. MISCELLANEOUS

1. Waiver: No failure or delay by Seller in exercising any right and no course of dealing between Buyer and Seller shall operate as a waiver of rights by Seller.
2. Assignment: Buyer may not assign its rights hereunder without Seller's written consent.
3. Law: These Terms are governed by Illinois law (without regard to conflict of laws). Federal and state courts in Cook County, Illinois have exclusive jurisdiction for any dispute hereunder.
4. Amendment: These Terms constitute the entire agreement between Buyer and Seller relating to the Products, and no provision may be changed or waived unless in writing signed by the parties.
5. Severability: If any provision hereof is rendered ineffective or invalid, such provision shall not invalidate any other provision.

Certain Precautions on Specifications and Use

1. Suitability for Use. Seller shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in Buyer's application or use of the Product. At Buyer's request, Seller will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases but the following is a non-exhaustive list of applications for which particular attention must be given:
   (i) Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
   (ii) Energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
   (iii) Use in consumer products or any use in significant quantities.
   (iv) Systems, machines and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to this product.

   NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.
2. Programmable Products. Seller shall not be responsible for the user's programming of a programmable product, or any consequence thereof.
3. Performance Data. Performance data given in this publication is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Seller's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to Seller's Warranty and Limitations of Liability.
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5. Errors and Omissions. The information in this publication has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors, or omissions.
6. RoHS Compliance. Where indicated, our products currently comply, to the best of our knowledge as of the date of this publication, with the requirements of the European Union's Directive on the Restriction of certain Hazardous Substances ("RoHS"), although the requirements of RoHS do not take effect until July 2006. These requirements may be subject to change. Please consult our website for current information.

MEMO

MOS FET Relays

Technical Information

Introduction

New models with a wider range of characteristics provide an array of solutions, meeting the needs of today's high performance applications.

Our expanded range of MOS FET relays, Type G3VM, sets the benchmark in Solid State Relays (SSRs). Products are manufactured using the latest advances in automated production and include a variety of improved construction technologies within the areas of the input LED, PDA (Photo Diode Array used as a photocoupler) and MOS FET chips used in the load switching circuit. As a result, further reductions in package size and power requirements have been achieved.

Combining the advantages of mechanical and solid state technology, the new G3VM range gives you unprecedented capability to design. All models featured include a double MOS FET load circuit, enabling the designer complete versatility since it makes no difference whether an AC or DC load in either direction is connected (Connection A). Thus, the MOS FET relay is a fully functional alternative to an electromechanical relay with minimal additional drive circuitry.

The built-in Current Limit Function (CLR models) has many uses. Traditionally used to clamp excessive over current fault conditions in telecom equipment, this feature can also be used to good effect to resist transient and short circuit conditions.

MOS FET relays are the ideal data and telecommunication solution for line seizing, line switching, hook switching, Data Access Arrangement (DAA) function, line transformer circuit control and other feature phone functions. Central office applications require high reliability and long life. Here the G3VM is ideal for use in the areas of Subscriber Line Interfaces (SLICs) Multiplexers and Routers. In addition, Local Area Networks (LANs) and Network Termination Units (NTUs) including Set-Top Boxes (STBs) and Remote Metering Systems (RMS) can take advantage of the G3VMs' small size and low ON resistance.

Advances in performance and cost reduction enable MOS FET relays to be considered as good alternatives to Reed Relays in application areas such as security motion detectors (standard and anti-mask PIRs), and Automated Test Equipment (ATE) probe cards.

Glossary

Term	Symbol	Description
LED forward current	I_F	Rated current that can flow continuously in the forward direction of the LED
Repetitive peak LED forward current	I_{FP}	Rated current that can flow momentarily in the forward direction of the LED
LED forward current reduction rate	$<I_F/°C$	Rated change of forward current flowing through the LED relative to ambient temperature above 25°C
LED reverse voltage	V_R	Rated reverse voltage that can be applied between the anode and the cathode
Connection temperature	T_J	Rated temperature that can be allowed in the junction of the LED, Photodetector or MOS FET(s)
Load voltage (AC peak / DC)	V_{OFF}	Rated voltage that can be applied between the MOS FET's output terminals in the OFF state
Continuous load current	I_O	Rated current that can flow between the MOS FET's output terminals in the ON state
ON current reduction rate	$<I_{ON}/°C$	Rated change of load current flowing between MOS FET(s) output terminals relative to ambient temperature above 25°C
Dielectric strength between input and output	V_{I-O}	Isolation voltage between input and output terminals for a specified time
Operating temperature	T_a	Ambient temperature range in which the relay may be operated without impairment
Storage temperature	T_{stg}	Ambient temperature range in which the relay may be stored while not operating
LED forward voltage	V_F	Voltage drop between the LED's anode and cathode at a certain forward current
LED reverse current	I_R	Leakage current flowing in the LED's reverse direction (between cathode and anode)
Capacity between (LED) terminals	C_T	Electrostatic capacitance between the anode and the cathode terminals of the LED
Trigger LED forward current	I_{FT}	Minimum value of input current necessary to put the output MOS FET(s) in to the ON state
Maximum resistance with output ON	R_{ON}	Resistance between the MOS FET's output terminals specified with reference to ON state current
Current leakage when the relay is open	I_{LEAK}	Leakage current flowing between the MOS FET's output terminals in the OFF state
Output Capacitance	C_{off}	Electrostatic capacitance between the output terminals in the OFF state
Capacity between I/O terminals	C_{I-O}	Electrostatic capacitance between the input and output terminals of the relay
Insulation resistance	R_{I-O}	Resistance between the input and output terminals at the specified voltage value
Turn-ON time	t_{ON}	Time required for the output waveform to change from 0 (100%) to 90 (10%) after input goes from OFF to ON state
Turn-OFF time	t_{OFF}	Time required for the output waveform to change from 0 (100%) to 90 (10%) after input goes from ON to OFF state
Recommended Load Voltage (AC peak / DC)	V_{DD}	Rated load voltage that can be applied between the MOS FET's output terminals

Precautions

⚠ WARNING

Be sure to turn OFF the power when wiring the Relay, otherwise an electric shock may be received.

⚠ WARNING

Do not touch the charged terminals of the SSR, otherwise an electric shock may be received.

⚠ CAUTION

Do not apply overvoltage or overcurrent to the I/O circuits of the SSR, otherwise the SSR may malfunction or burn.

⚠ CAUTION

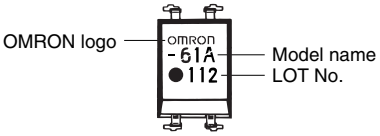
Be sure to wire and solder the Relay under the proper soldering conditions, otherwise the Relay in operation may generate excessive heat and the Relay may burn.

⚠ CAUTION

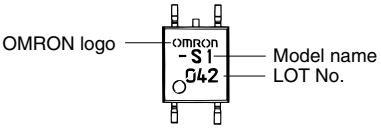
Electrostatic sensitive devices. Keep in original packaging until required to use. Avoid touching device terminals. Take static handling precautions during processing.

Appearance Examples

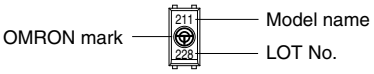
DIP (Dual Inline Package)



SOP (Small Outline Package)



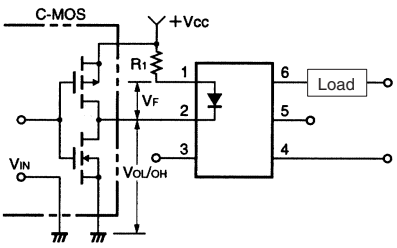
SSOP (Shrink Small Outline Package)



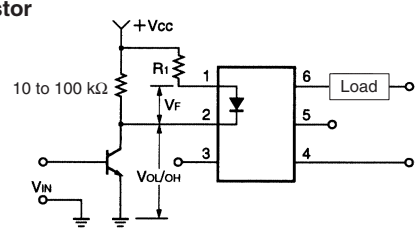
Note: "G3VM" is not printed on the actual product.

Typical Relay Driving Circuit Examples

C-MOS



Transistor



Use the following formula to obtain the LED current limiting resistance value to assure that the relay operates accurately.

$$R_1 = \frac{V_{CC} - V_{OL} - V_F\ (ON)}{5 \text{ to } 20 \text{ mA}}$$

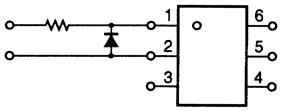
Use the following formula to obtain the LED forward voltage value to assure that the relay releases accurately.

$$V_{F\ (OFF)} = V_{CC} - V_{OH} < 0.8 \text{ V}$$

■ Protection from Surge Voltage on the Input Terminals

If any reversed surge voltage is imposed on the input terminals, insert a diode in parallel to the input terminals as shown in the following circuit diagram and do not impose a reversed voltage value of 3 V or more.

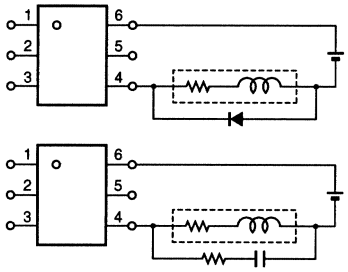
Surge Voltage Protection Circuit Example



■ Protection from Spike Voltage on the Output Terminals

If a spike voltage exceeding the absolute maximum rated value is generated between the output terminals, insert a C-R snubber or clamping diode in parallel to the load as shown in the following circuit diagram to limit the spike voltage.

Spike Voltage Protection Circuit Example

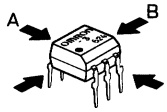


■ Unused Terminals (6-pin models only)

Terminal 3 is connected to the internal circuit. Do not connect anything to terminal 3 externally.

■ Pin Strength for Automatic Mounting

In order to maintain the characteristics of the relay, the force imposed on any pin of the relay for automatic mounting must not exceed the following.

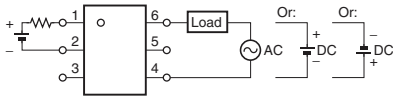


In direction A: 1.96 N
In direction B: 1.96 N

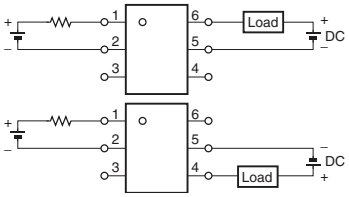
■ Load Connection

Do not short-circuit the input and output terminals while the relay is operating or the relay may malfunction.

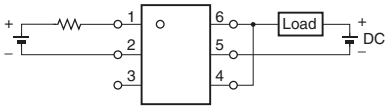
AC Connection



DC Single Connection



DC Parallel Connection



Guidelines for Mounting Devices on PCBs

■ Cleaning

When ions in the flux enter into the product during soldering, fluctuation in device performance or corrosion may occur. Be sure to wash away any flux residue which contains Cl or Na ions.

The following types of solvents are recommended for cleaning the flux:

- Asahi Clean AK-225AES
- Kao Cleanthru 750H
- Pine-Alpha ST-100S

Cleaning Conditions

Cleaning conditions and precautions may vary according to product specifications.

General precautions for dip cleaning

Dipping time varies according to the solvent used.

However, as a general guideline, it is recommended that the dip time be limited to three minutes.

General precautions for ultrasonic cleaning

When ultrasonic cleaning is conducted for an excessively long time, contact between the product resin and the metal leads may lessen. Also, excessive ultrasonic stress may cause cracks in the pellet.

It is recommended that the applied stress be minimized.

Recommended conditions for standard ultrasonic cleaning

Frequency:	27kHz to 29kHz
Output:	0.25 W/cm^2 or less
Time:	30 seconds or less

Temperature: 50°C (may vary according to the type of solvent used)

Cleaning must be conducted with the printed circuit board or device floating on the solvent, so as to avoid direct contact between the PCB or device and the ultrasonic vibrator.

Handling Precautions

Do not touch the device's mark-bearing surface with your hand or with a brush while cleaning or applying cleaning liquid to the device. This may erase device markings. It is important to confirm that neither the solvent used for cleaning nor the cleaning conditions will damage the device package.

■ Solder Mounting

Perform solder mounting under the following recommended conditions to prevent the temperature of the relays from rising, causing possible damage to the relays.

Flow Soldering

Through Hole Packages (Once only)

Solder type	Preheating Temperature	Solder Temperature
Lead solder (SnPb)	150°C, 60 to 120s	260°C, 10s max.
Lead-free solder (SnAgCu)	150°C, 60 to 120s	260°C, 10s max.

Note: It is recommended that the suitability of solder mounting be verified under actual conditions

Reflow Soldering

Surface Mount Packages (Twice max.)

Solder type	Preheating Temperature*	Soldering Temperature*	
Lead solder (SnPb)	140 to 160°C, 60 to 120s	210°C, 30s max.	Peak, 240°C max.
Lead-free solder (SnAgCu)	180 to 190°C, 60 to 120s	230°C, 30 to 50s	Peak, 260°C max.

*Measured from the top surface of the relay package

Note: 1. It is recommended that the suitability of solder mounting be verified under actual conditions

2. Tape cut SSOP's are packaged without humidity resistance. Use manual soldering to mount them.

Manual Soldering (Once only)

Manually solder at 350°C for 3s or less or at 260°C for 10s or less.

SSOP Handling Precautions

Humidity-resistant Packaging

Component cases can crack if surface-mounted components that have absorbed moisture are subjected to thermal stress when mounting. To prevent this, observe the following precautions.

1. Unopened components can be stored in the packaging at 5 to 30°C and a humidity of 90% max. However, they should be used within 12 months.

2. After the packaging has been opened, components can be stored at 5 to 30°C and a humidity of 70% max. However, they should be mounted within 168 hours.

3. If, after opening the packaging, the humidity indicator turns pink to the 30% mark or the expiration date is exceeded, then bake the components while they are still on the taping reel and use them within 72 hours. Do not bake the same components more than once.

Baking conditions: 60 5°C, 64 to 72 hours

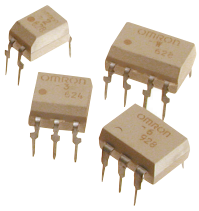
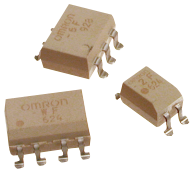
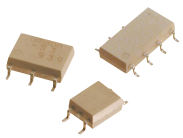
4. If the same components are baked repeatedly, then the tape detachment strength will change, causing potential problems when mounting. Use caution when mounting under these conditions.

5. When mounting using dehumidifying measures, always take countermeasures against component damage from static electricity.

6. Do not throw or drop the components. If the laminated packaging material is damaged, airtightness will be lost.

7. Tape cut SSOP's are packaged without humidity resistance. Use manual soldering to mount them.

MOS FET Relay Selection Guide

General Attributes	 G3VM PCB	 G3VM SMT	 G3VM SOP	 G3VM SSOP
Dimensions mm (in)	Please refer to data sheets for all dimension information	Please refer to data sheets for all dimension information	Please refer to data sheets for all dimension information	4 pin: 3.8 L x 2.04 W x 1.8 H (0.15 x 0.08 x 0.07)
Features	• Solid-state relay with MOS FET output and photo-LED input • Ideal for communication equipment, medical devices, computer peripheral, office automation, security, and control applications	• Solid-state relay with MOS FET output and photo-LED input • Ideal for communication equipment, medical devices, computer peripheral, office automation, security, and control applications	• Solid-state relay with MOS FET output and photo-LED input • Ideal for communication equipment, medical devices, computer peripheral, office automation, security, and control applications • Low ON resistance and low output capacitance versions ideal for ATE and Instrumentation	• Solid-state relay with MOS FET output and photo-LED input • Ideal for communication equipment, medical devices, computer peripheral, office automation, security, and control applications • Low ON resistance and low output capacitance versions ideal for ATE and Instrumentation
Load voltage	60 – 600 V	60 – 600 V	20 – 600 V	20 – 100 V
Contact form	1 Form A, 2 Form A, 1 Form B, 2 Form B, 1 Form A+1 Form B	1 Form A, 2 Form A, 1 Form B, 2 Form B, 1 Form A+1 Form B	1 Form A, 2 Form A, 1 Form B, 2 Form B, 1 Form A+1 Form B	1 Form A
Load current	100 – 2,500 mA	100 – 2,500 mA	80 – 1,250 mA	80 – 900 mA
Dielectric strength (50/60 Hz for 1 minute)	2,500 VAC, 5,000 VAC	1,500 VAC, 2,500 VAC, 5,000 VAC	1,500 VAC	1,500 VAC
ON resistance	0.065 – 40 Ω (typical)	0.065 – 40 Ω (typical)	0.02 – 40 Ω (typical)	0.18 – 25 Ω (typical)
Output capacitance	30 – 400 pF (typical)	30 – 400 pF (typical)	0.6 – 1,000 pF (typical)	0.45 – 40 pF (typical)
Packaging	Tube	Tube or tape-and-reel	Tube or tape-and-reel	Tape-and-reel or cut tape
Additional features	Low ON resistance, Current limiting, High I/O isolation, High Current	Low ON resistance, Current limiting, High I/O isolation, High Current	Low ON resistance, Low output capacitance, Current limiting, High Current, Low LED Trigger	Low ON resistance, Low output capacitance, Low Leakage

■ Normally Open Relays

Load voltage		20 V		40 V	60 V		80 V		100 V
Number of terminals		4	6	4	4	6	4	6	4
SPST-NO	Through hole				G3VM-61A1	G3VM-61B1 G3VM-61BR			
	SMT				G3VM-61D1	G3VM-61E1 G3VM-61ER			
	SOP	G3VM-21GR G3VM-21GR1	G3VM-21HR	G3VM-41GR3 G3VM-41GR4 G3VM-41GR5 G3VM-41GR6 G3VM-41GR7 G3VM-41GR8	G3VM-61G1 G3VM-61G2 G3VM-61GR1	G3VM-61H1	G3VM-81G1 G3VM-81GR G3VM-81GR1	G3VM-81HR	
	SSOP	G3VM-21LR G3VM-21LR1 G3VM-21LR10 G3VM-21LR11		G3VM-41LR3 G3VM-41LR4 G3VM-41LR5 G3VM-41LR6 G3VM-41LR10 G3VM-41LR11	G3VM-61LR		G3VM-81LR		G3VM-101LR

Load voltage		200 V		350V		400 V		600 V	
Number of terminals		4	6	4	6	4	6	4	6
SPST-NO	Through hole			G3VM-351A	G3VM-351B	G3VM-401A	G3VM-401B G3VM-401BY		G3VM-601BY
	SMT			G3VM-351D	G3VM-351E	G3VM-401D	G3VM-401E G3VM-401EY		G3VM-601EY
	SOP	G3VM-S5 G3VM-201G G3VM-201G1	G3VM-201H1	G3VM-351G G3VM-351G1	G3VM-351H	G3VM-401G	G3VM-401H	G3VM-601G	

Load voltage		60 V	200 V	350 V	400 V
Number of terminals		8	8	8	8
DPST-NO	Through hole	G3VM-62C1		G3VM-352C	G3VM-402C
	SMT	G3VM-62F1		G3VM-352F	G3VM-402F
	SOP	G3VM-62J1	G3VM-202J1	G3VM-352J	G3VM-402J

■ Normally Open Current-limiting Relays

Load voltage		350 V
Number of terminals		4
SPST-NO	Through hole	G3VM-2L
	SMT	G3VM-2FL
	SOP	G3VM-351GL

Load voltage		350 V
Number of terminals		8
DPST-NO	Through hole	G3VM-WL
	SMT	G3VM-WFL

■ Normally Closed Relays

Load voltage		350 V	
Number of terminals		4	6
SPST-NC	Through hole	G3VM-353A G3VM-353A1	G3VM-353B G3VM-353B1
	SMT	G3VM-353D G3VM-353D1	G3VM-353E G3VM-353E1
	SOP	G3VM-353G G3VM-353G1	G3VM-353H G3VM-353H1

Load voltage		350 V
Number of terminals		8
DPST-NC	Through hole	G3VM-354C G3VM-354C1
	SMT	G3VM-354F G3VM-354F1
	SOP	G3VM-354J G3VM-354J1

■ SPST-NO/SPST-NC Relays

Load voltage		350 V
Number of terminals		8
SPST-NO/ SPST-NC	Through hole	G3VM-355C G3VM-355CR
	SMT	G3VM-355F G3VM-355FR
	SOP	G3VM-355J G3VM-355JR

Model Number Structure

■ G3VM Model Number Legend

G3VM-□□ □ □ □ □
1 2 3 4 5

Note: Some products may have a different model number structure.

1. Load Voltage

2:	20 V
4:	40 V
6:	60 V
8:	80 V
10:	100 V
20:	200 V
25:	250 V
35:	350 V
40:	400 V
60:	600 V

2. Contact Form

1:	SPST-NO
2:	DPST-NO
3:	SPST-NC
4:	DPST-NC
5:	SPST-NO/SPST-NC
6:	Other form

3. Package Type

A:	4-pin DIP
B:	6-pin DIP
C:	8-pin DIP
D:	4-pin SMD
E:	6-pin SMD
F:	8-pin SMD
G:	4-pin SOP
H:	6-pin SOP
J:	8-pin SOP
K:	18-pin SOP
L:	4-pin SSOP

4. Additional Functions

L:	Current limit
M:	Basic multifunction
N:	Multifunction without diode
O:	Single input LED
P:	Special pin arrangement
Q:	Multfunction with current limiter
R:	Low ON-resistance
S:	Slow ON/OFF
T:	Multifunction with current limiter and without diode
Y:	Dielectric strength between I/O above 2.5 kV

5. Other Information

When specifications overlap, serial code is added in the recorded order.

Note: 1. The letter "I" is not used because it may be confused with the number "1."

2. For 4-pin SOP models, where the available marking space is insufficient to clearly differentiate model numbers with 6 or more suffix digits, the package type code (3) is omitted.

G3VM Series

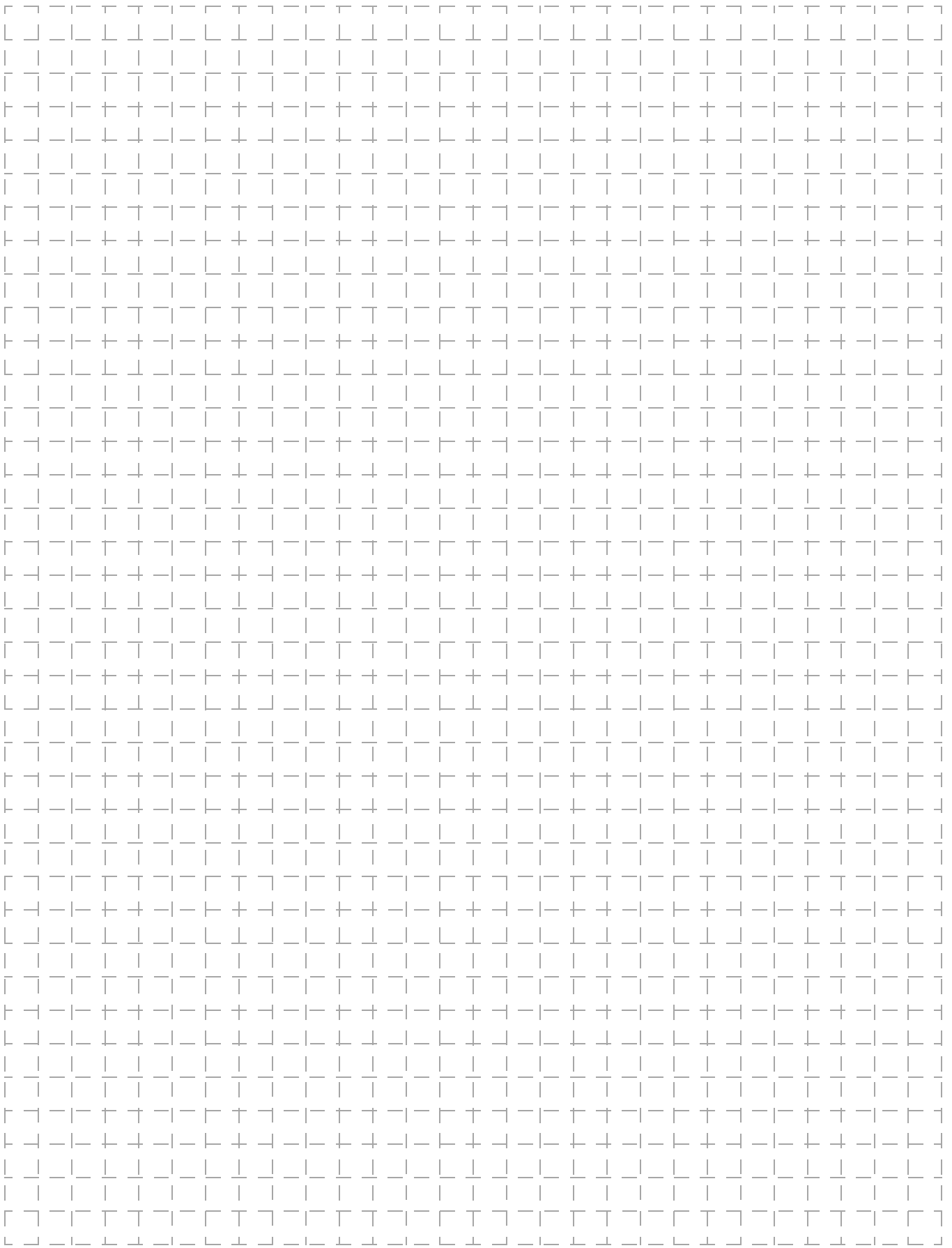
Load Voltage (VAC/VDC)	Contact Form	Package Type	No. of Terminals	Part #	Load Current mA	Voltage Withstand (1 min) VAC	On Resistance (typ.) Ω	Output Offstate capacitance (typ.) pF	Leakage Current (typ.) nA	Key Features	Page Number
20	1 Form A	SOP	4	G3VM-21GR	160	1,500	5	1	0.2	Low CxR	*89*
				G3VM-21GR1	300	1,500	1	5	0.2	Low CxR	*93*
			6	G3VM-21HR	2,500	1,500	0.02	1000	2	High Current	*85*
		SSOP	4	G3VM-21LR	160	1,500	5	1	0.2	Low CxR	*231*
				G3VM-21LR1	450	1,500	0.8	5	0.2	Low CxR	*235*
				G3VM-21LR10	200	1,500	3	0.8	0.01	Low CxR, Low Leak, Fast On/Off	*239*
				G3VM-21LR11	900	1,500	0.18	40	0.2	Low CxR, High Current	*243*
40	1 Form A	SOP	4	G3VM-41GR3	80	1,500	25	0.6	0.01	Low CxR, Low Leak	*97*
				G3VM-41GR4	250	1,500	2.0	5.0	0.009	Low CxR, Low Leak	*101*
				G3VM-41GR5	300	1,500	1	10	0.2	Low CxR	*105*
				G3VM-41GR6	120	1,500	10	1	0.2	Low CxR	*109*
				G3VM-41GR7	120	1,500	6.5	1.65	0.2	Low CxR	*113*
				G3VM-41GR8	1,000	1,500	0.1	300	0.2	High Current	*117*
		SSOP	4	G3VM-41LR3	80	1,500	25	0.6	0.2	Low CxR	*247*
				G3VM-41LR4	250	1,500	2	5	0.2	Low CxR	*251*
				G3VM-41LR5	300	1,500	1	10	0.2	Low CxR	*255*
				G3VM-41LR6	120	1,500	10	1	0.2	Low CxR	*259*
				G3VM-41LR10	120	1,500	12	0.45	0.01	Low CxR, Low Leak, Fast On/Off	*263*
				G3VM-41LR11	140	1,500	7	0.7	0.01	Low CxR, Low Leak, Fast On/Off	*267*
60	1 Form A	DIP	4	G3VM-61A1	500	2,500	1	130	1		*11*
			6	G3VM-61B1	500	2,500	1	130	1		*15*
				G3VM-61BR	2,500	2,500	0.065	400	1	High Current	*19*
		SMT	4	G3VM-61D1	500	2,500	1	130	1		*11*
			6	G3VM-61E1	500	2,500	1	130	1		*15*
				G3VM-61ER	2,500	2,500	0.065	400	1	High Current	*19*
		SOP	4	G3VM-61G1	400	1,500	1	130	1		*121*
				G3VM-61G2	400	1,500	1	130	1	Low LED Trigger	*125*
				G3VM-61GR1	1,000	1,500	0.25	90	0.2	High Current	*129*
			6	G3VM-61H1	400	1,500	1	130	1		*133*
		SSOP	4	G3VM-61LR	400	1,500	1	20	0.04	Low CxR, Low Leak	*271*
	2 Form A	DIP	8	G3VM-62C1	500	2,500	1	130	1		*23*
		SMT	8	G3VM-62F1	500	2,500	1	130	1		*23*
		SOP	8	G3VM-62J1	400	1,500	1	130	1		*137*
80	1 Form A	SOP	4	G3VM-81G1	350	1,500	1	30	0.2	Low CxR	*141*
				G3VM-81GR	40	1,500	16	2.5	0.5		*145*
				G3VM-81GR1	200	1,500	5	6.5	0.5	Low CxR	*149*
			6	G3VM-81HR	1,250	1,500	0.11	460	1.2	High Current	*153*
		SSOP	4	G3VM-81LR	120	1,500	7.5	5	0.1	Fast On/Off	*275*
100	1 Form A	SSOP	4	G3VM-101LR	80	1,500	8	6	0.1	Fast On/Off	*279*
200	1 Form A	SOP	4	G3VM-201G	50	1,500	40	15	0.07		*161*
				G3VM-201G1	200	1,500	5	90	1	Low LED Trigger	*165*
				G3VM-S5	150	1,500	5	100	0.45		*157*
			6	G3VM-201H1	200	1,500	5	100	0.35		*169*
	2 Form A	SOP	8	G3VM-202J1	200	1,500	5	100	3.1		*173*

(continued from previous page)

Load Voltage (VAC/VDC)	Contact Form	Package Type	No. of Terminals	Part #	Load Current mA	Voltage Withstand (1 min.) VAC	On Resistance (typ.) Ω	Output Offstate Capacitance (typ.) pF	Leakage Current (typ.) nA	Additional Features	Page Number
350	1 Form A	DIP	4	G3VM-2L	120	2,500	22	40	0.5	Current Limiting *	31
				G3VM-351A	120	2,500	35	30	1.5		27
			6	G3VM-351B	120	2,500	35	30	1.5		39
		SMT	4	G3VM-2FL	120	2,500	22	40	0.5	Current Limiting *	31
				G3VM-351D	120	2,500	35	30	1.5		27
			6	G3VM-351E	120	2,500	35	30	1.5		39
		SOP	4	G3VM-351G	110	1,500	35	30	1.5		177
				G3VM-351G1	100	1,500	35	35	1	Low LED Trigger	181
				G3VM-351GL	120	1,500	15	70	0.5	Current Limiting*	185
			6	G3VM-351H	110	1,500	35	30	1.8		193
	2 Form A	DIP	8	G3VM-352C	120	2,500	35	30	1.5		47
				G3VM-WL	120	2,500	22	40	0.5	Current Limiting*	51
		SMT	8	G3VM-352F	120	2,500	35	30	1.5		47
				G3VM-WFL	120	2,500	22	40	0.5	Current Limiting*	51
		SOP	8	G3VM-352J	110	1,500	35	30	1.5		201
	1 Form B	DIP	4	G3VM-353A	150	2,500	15	85	10.5		35
				G3VM-353A1	100	2,500	30	30	3		35
			6	G3VM-353B	150	2,500	15	85	10.5		43
				G3VM-353B1	100	2,500	27	30	3		43
		SMT	4	G3VM-353D	150	2,500	15	85	10.5		35
				G3VM-353D1	100	2,500	30	30	3		35
		SMT	6	G3VM-353E	150	2,500	15	85	10.5		43
				G3VM-353E1	100	2,500	27	30	3		43
		SOP	4	G3VM-353G	120	1,500	15	65	10.5		189
				G3VM-353G1	90	1,500	30	30	3		189
			6	G3VM-353H	120	1,500	15	65	10.5		197
				G3VM-353H1	90	1,500	27	30	3		197
	2 Form B	DIP	8	G3VM-354C	150	2,500	15	85	10.5		55
				G3VM-354C1	100	2,500	30	30	3		55
		SMT	8	G3VM-354F	150	2,500	15	85	10.5		55
				G3VM-354F1	100	2,500	30	30	3		55
		SOP	8	G3VM-354J	120	1,500	15	65	10.5		211
				G3VM-354J1	90	1,500	30	30	3		211
	1 A + 1 B	DIP	8	G3VM-355C	100	2,500	40	30	6 NO, 3 NC		59
				G3VM-355CR	120	2,500	15	65	1.5 NO, 10.5 NC		59
		SMT	8	G3VM-355F	100	2,500	40	30	6 NO, 3 NC		59
				G3VM-355FR	120	2,500	15	65	1.5 NO, 10.5 NC		59
		SOP	8	G3VM-355J	90	1,500	40	30	6 NO, 3 NC		205
				G3VM-355JR	120	1,500	15	65	1.5 NO, 10.5 NC		205
400	1 Form A	DIP	4	G3VM-401A	120	2,500	18	40	0.8		65
			6	G3VM-401B	120	2,500	17	40	0.8		69
				G3VM-401BY	120	5,000	17	40	0.4	High Dielectric	73
		SMT	4	G3VM-401D	120	2,500	18	40	0.8		65
			6	G3VM-401E	120	2,500	17	40	0.8		69
				G3VM-401EY	120	5,000	17	40	0.4	High Dielectric	73
		SOP	4	G3VM-401G	120	1,500	17	70	3		215
			6	G3VM-401H	120	1,500	17	70	3		219
	2 Form A	DIP	8	G3VM-402C	120	2,500	18	40	0.8		81
		SMT	8	G3VM-402F	120	2,500	18	40	0.8		81
		SOP	8	G3VM-402J	120	1,500	17	70	3		223
600	1 Form A	DIP	6	G3VM-601BY	100	5,000	30	120	0.5	High Dielectric	77
		SMT	6	G3VM-601EY	100	5,000	30	120	0.5	High Dielectric	77
		SOP	4	G3VM-601G	90	1,500	45	75	1	Low LED Trigger	227

*Current Limiting Range = 150 to 300 mA

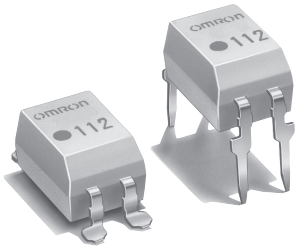
MEMO



MOS FET Relays
G3VM-61A1/D1

Compact, General-purpose, Analog-switching MOS FET Relay, with Dielectric Strength of 2.5 kVAC between I/O Using Optical Isolation

- Upgraded G3VM-61 A/D Series.
- Switches minute analog signals.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Measurement devices
- Security systems
- Amusement machines

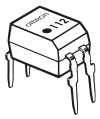
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	60 VAC	**G3VM-61A1**	100	---
	Surface-mounting terminals		**G3VM-61D1**		
			G3VM-61D1(TR)	---	1,500

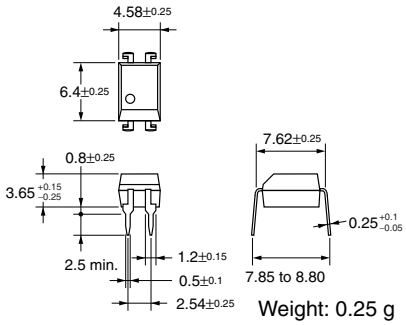
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-61A1



Note: The actual product is marked differently from the image shown here.

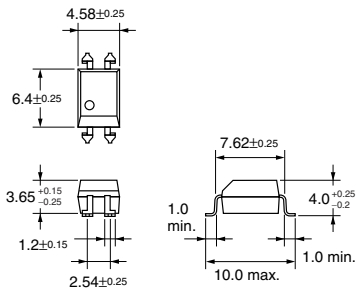


Weight: 0.25 g

G3VM-61D1



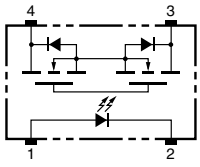
Note: The actual product is marked differently from the image shown here.



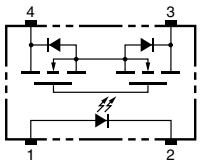
Weight: 0.25 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-61A1

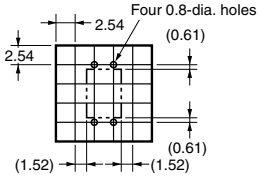


G3VM-61D1



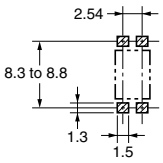
■ PCB Dimensions (Bottom View)

G3VM-61A1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-61D1



■ Absolute Maximum Ratings (Ta = 25°C)

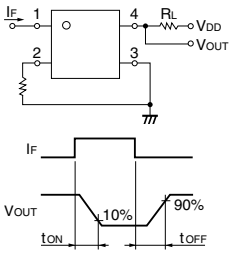
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	60	V	
	Continuous load current	I_O	500	mA	
	ON current reduction rate	ΔI_{ON}/°C	–5.0	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1.6	3	mA	I_O = 500 mA
Output	Maximum resistance with output ON	R_{ON}	---	1	2	Ω	I_F = 5 mA, I_O = 500 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.001	1.0	μA	V_{OFF} = 60 V
	Capacity between terminals	C_{OFF}	---	130	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, R_{oH} ≤ 60%
Turn-ON time		t_{ON}	---	0.8	2.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.1	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

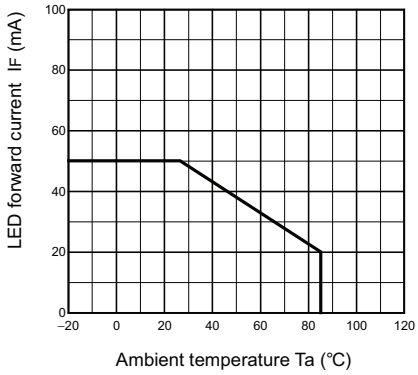
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	48	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	500	mA
Operating temperature	T_a	– 20	---	65	°C

■ Engineering Data

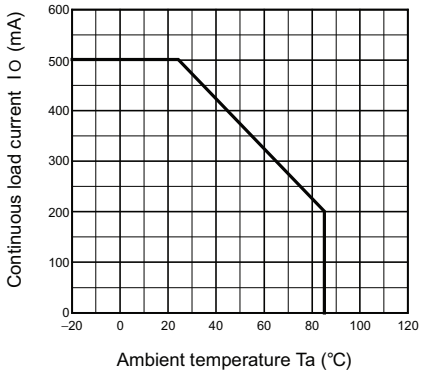
LED forward current vs. Ambient temperature

I_F - Ta



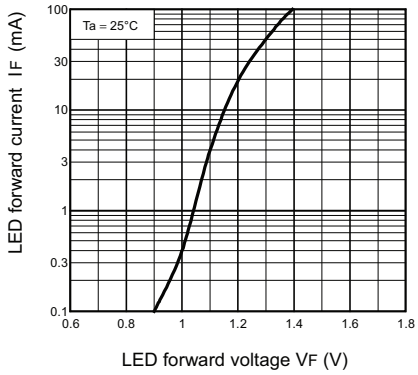
Continuous load current vs. Ambient temperature

I_O - Ta



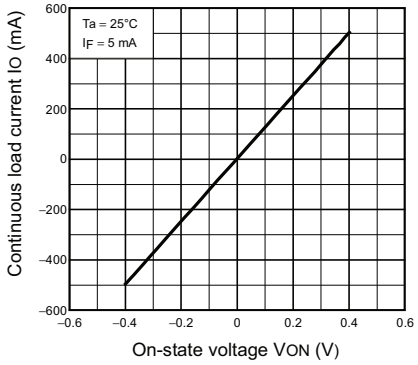
LED forward current vs. LED forward voltage

I_F - V_F



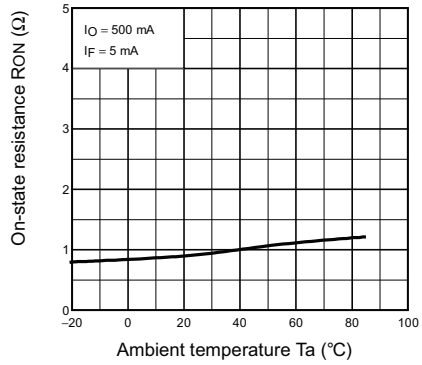
Continuous load current vs. On-state voltage

I_O - V_{ON}



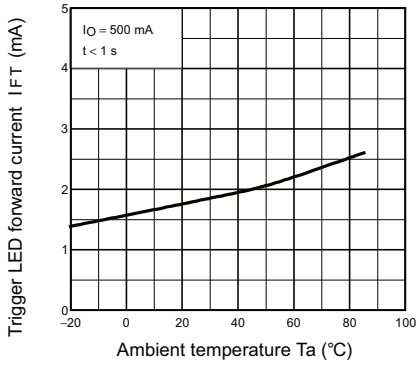
On-state resistance vs. Ambient temperature

R_{ON} - Ta



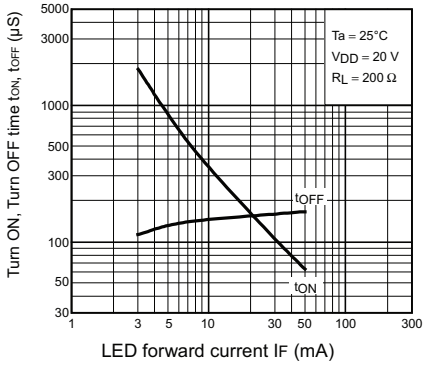
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



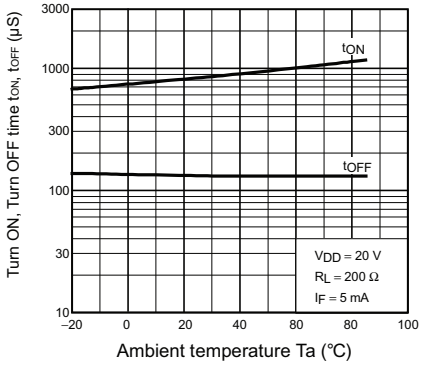
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



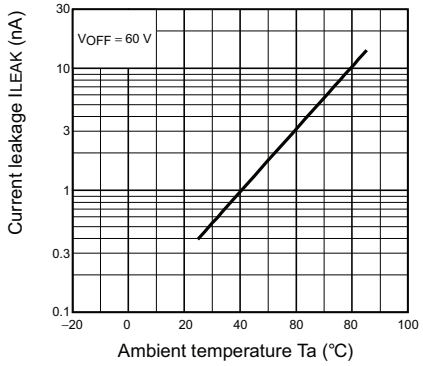
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

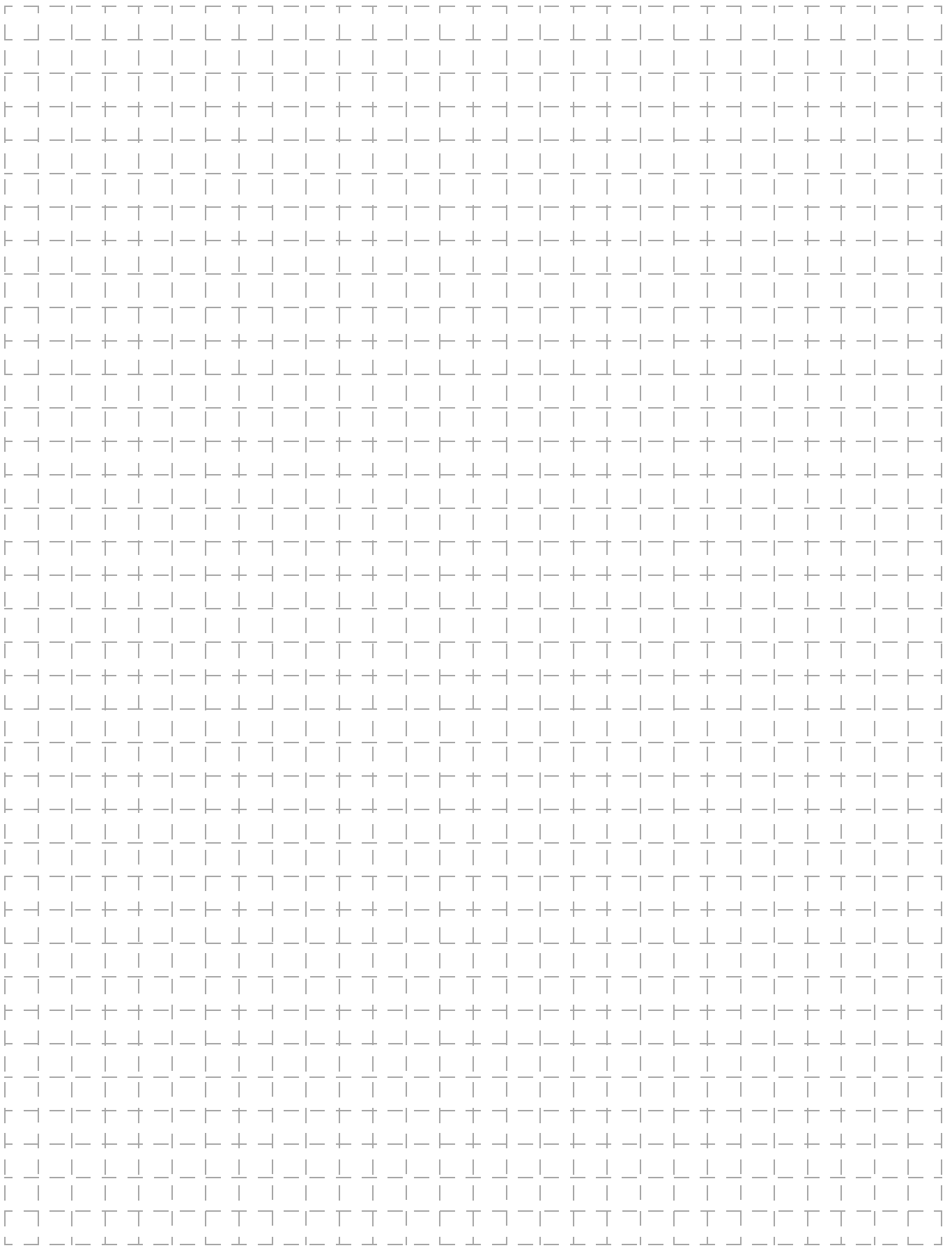


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



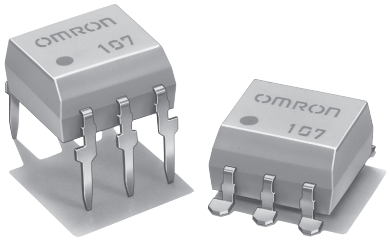
MEMO



MOS FET Relays
G3VM-61B1/E1

Analog-switching MOS FET Relay for High Switching Currents, with Dielectric Strength of 2.5 kVAC between I/O.

- Upgraded G3VM-61 B/E Series.
- 500 mA continuous load current.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Measurement devices
- Security systems
- Amusement machines

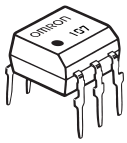
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	60 VAC	**G3VM-61B1**	50	---
	Surface-mounting terminals		**G3VM-61E1**		
			G3VM-61E1(TR)	---	1,500

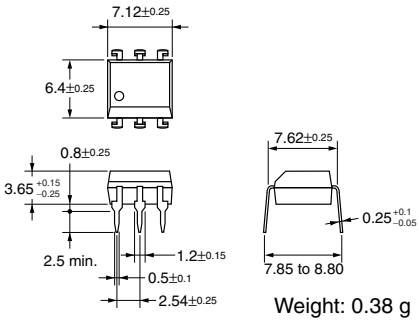
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-61B1

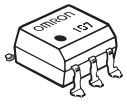


Note: The actual product is marked differently from the image shown here.

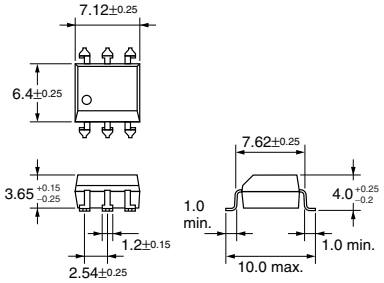


Weight: 0.38 g

G3VM-61E1



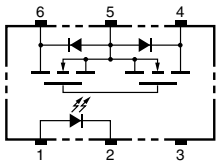
Note: The actual product is marked differently from the image shown here.



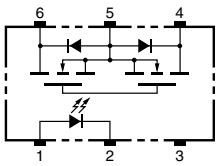
Weight: 0.38 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-61B1

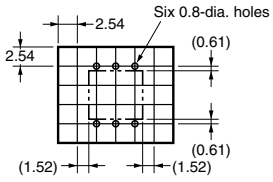


G3VM-61E1



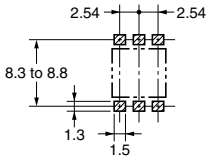
■ PCB Dimensions (Bottom View)

G3VM-61B1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-61E1

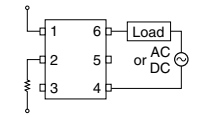
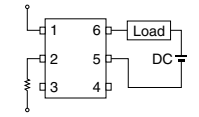
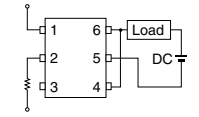


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		ΔI_F/°C	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Load voltage (AC peak/DC)		V_{OFF}	60	V	
	Continuous load current	Connection A	I_O	500	mA	
		Connection B		500		
		Connection C		1,000		
	ON current reduction rate	Connection A	ΔI_{ON}/°C	−0.5	mA/°C	Ta ≥ 25°C
		Connection B		−0.5		
		Connection C		−10.0		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature			T_a	−40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

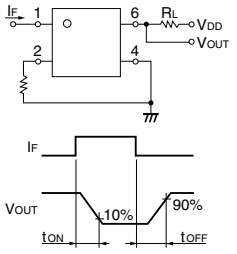
Connection Diagram

Connection A	
Connection B	
Connection C	

■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1.6	3	mA	I_O = 500 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	1	2	Ω	I_F = 5 mA, I_O = 500 mA
		Connection B		---	0.5	1	Ω	I_F = 5 mA, I_O = 500 mA
		Connection C		---	0.25	---	Ω	I_F = 5 mA, I_O = 1,000 mA
	Current leakage when the relay is open		I_{LEAK}	---	0.001	1.0	μA	V_{OFF} = 60 V
	Capacity between terminals A Connection		C_{OFF}	---	130	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, R_{oH} ≤ 60%
Turn-ON time			t_{ON}	---	0.8	2.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			t_{OFF}	---	0.1	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

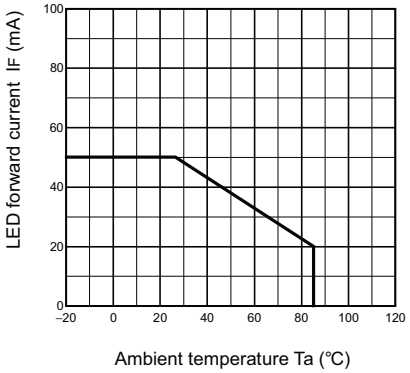
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	48	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	500	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

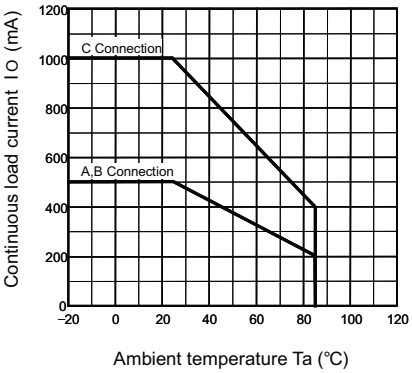
LED forward current vs. Ambient temperature

I_F - Ta



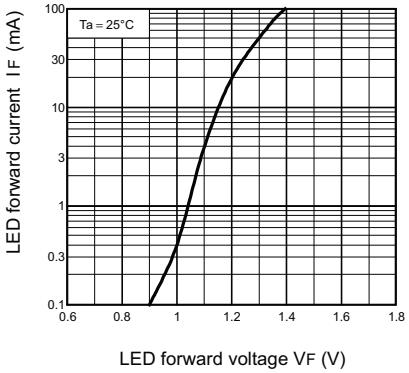
Continuous load current vs. Ambient temperature

I_O - Ta



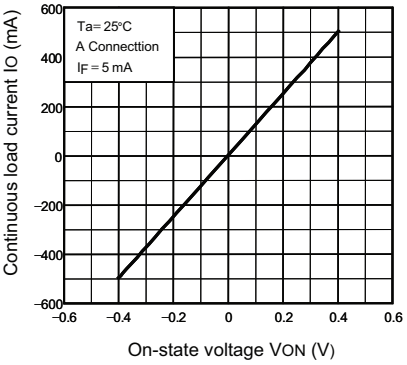
LED forward current vs. LED forward voltage

I_F - V_F



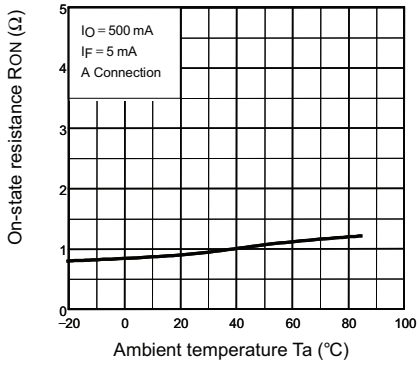
Continuous load current vs. On-state voltage

I_O - V_{ON}



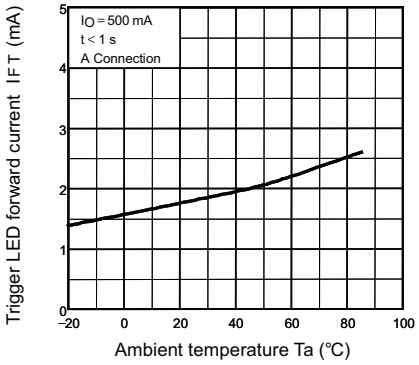
On-state resistance vs. Ambient temperature

R_{ON} - Ta



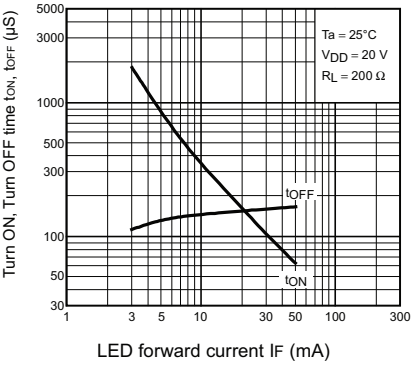
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



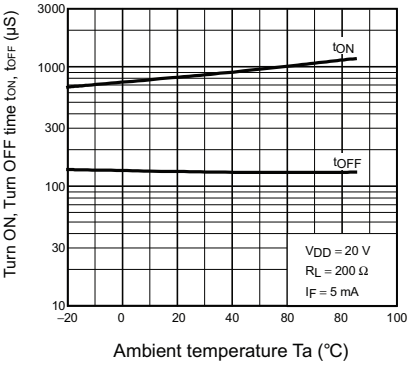
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



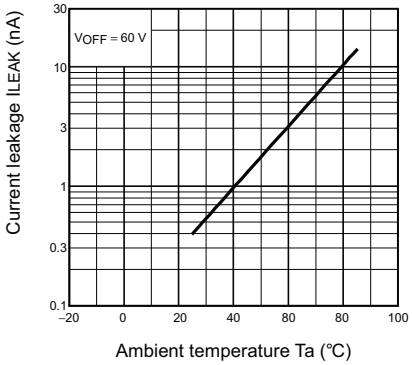
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

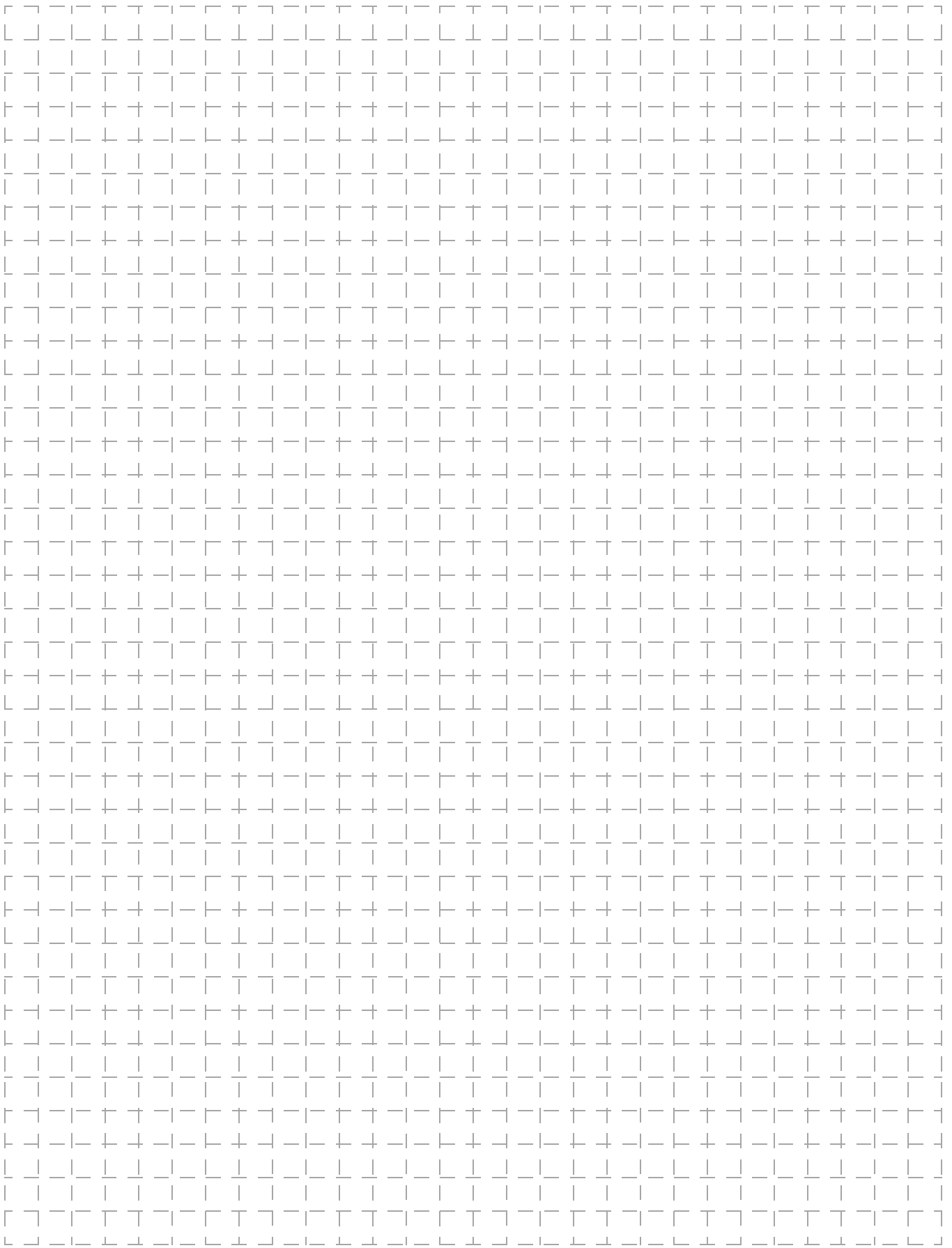


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



MEMO



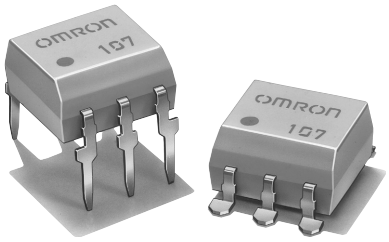
MOS FET Relays
G3VM-61BR/ER

New Analog-switching MOS FET Relays Featuring a High Capacity of 2.5 A.

- Switches minute analog signals.
- Low ON-resistance of 0.1 Ω max.
- Continuous load current of 2.5 A.
- RoHS compliant

■ Application Examples

- Measurement devices
- Security systems



Note: The actual product is marked differently from the image shown here.

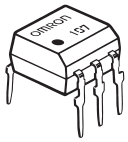
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	60 VAC	**G3VM-61BR**	50	---
	Surface-mounting terminals		**G3VM-61ER**		
			G3VM-61ER(TR)	---	1,500

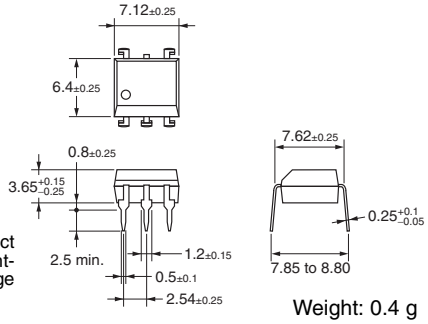
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-61BR

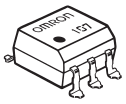


Note: The actual product is marked differently from the image shown here.

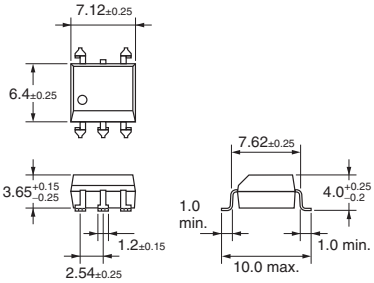


Weight: 0.4 g

G3VM-61ER



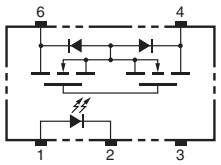
Note: The actual product is marked differently from the image shown here.



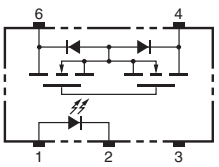
Weight: 0.4 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-61BR

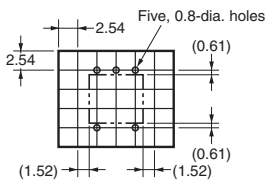


G3VM-61ER



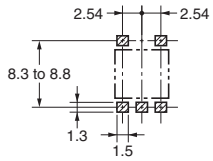
■ PCB Dimensions (Bottom View)

G3VM-61BR



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-61ER



■ Absolute Maximum Ratings (Ta = 25°C)

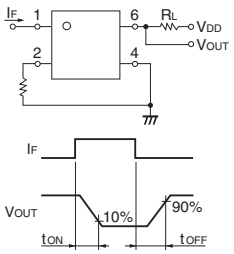
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	30	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.3	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	60	V	
	Continuous load current	I_O	2,500	mA	
	ON current reduction rate	ΔI_{ON}/°C	−22	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.18	1.33	1.48	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	70	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1.0	3	mA	I_O = 1 A
Output	Maximum resistance with output ON	R_{ON}	---	0.065	0.1	Ω	I_F = 10 mA, I_O = 2 A
	Current leakage when the relay is open	I_{LEAK}	---	1.0	10	nA	V_{OFF} = 60 V
	Capacity between terminals	C_{OFF}	---	400	600	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	1.0	1.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.2	0.4	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

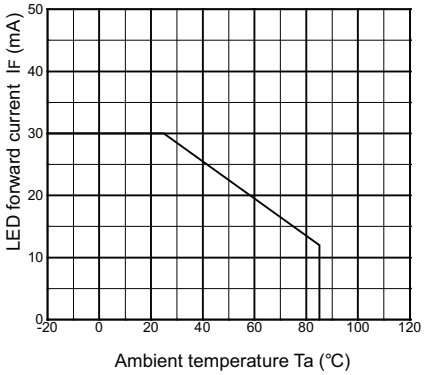
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	48	V
Operating LED forward current	I_F	10	---	20	mA
Continuous load current (AC peak/DC)	I_O	---	---	2,500	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

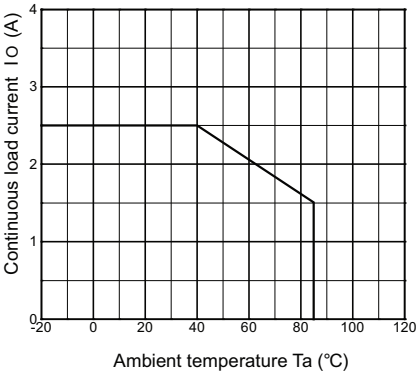
LED forward current vs. Ambient temperature

I_F - Ta



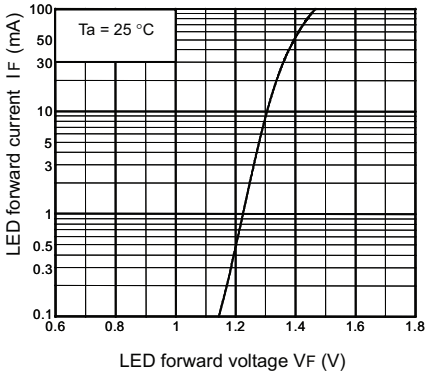
Continuous load current vs. Ambient temperature

I_O - Ta



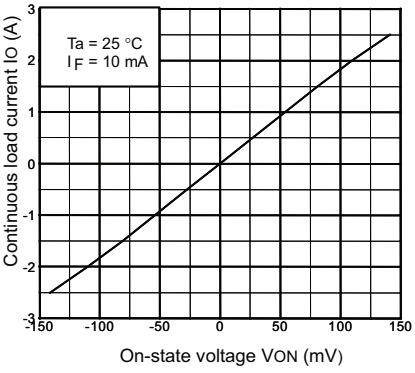
LED forward current vs. LED forward voltage

I_F - V_F



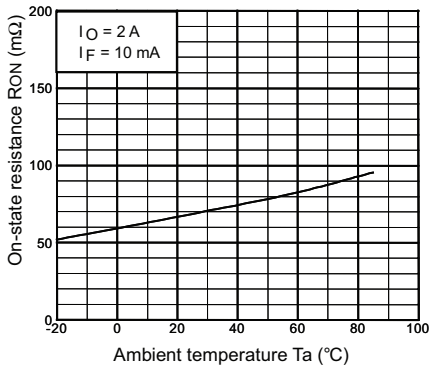
Continuous load current vs. On-state voltage

I_O - V_{ON}



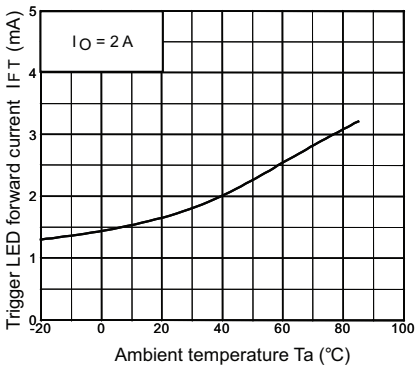
On-state resistance vs. Ambient temperature

R_{ON} - Ta



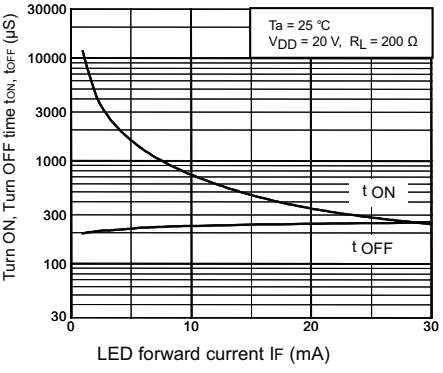
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



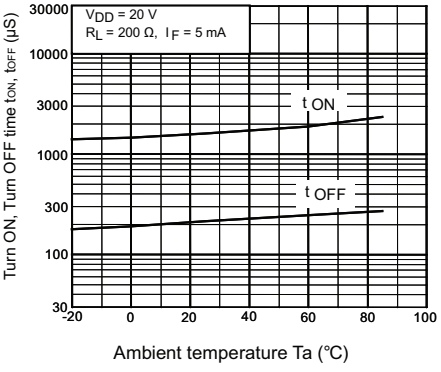
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



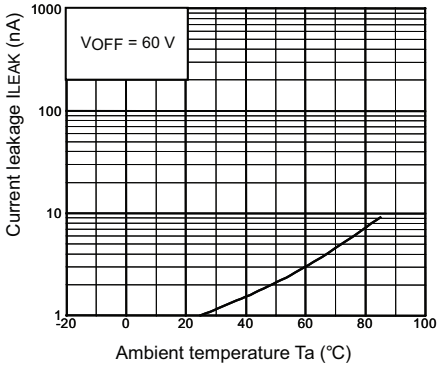
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

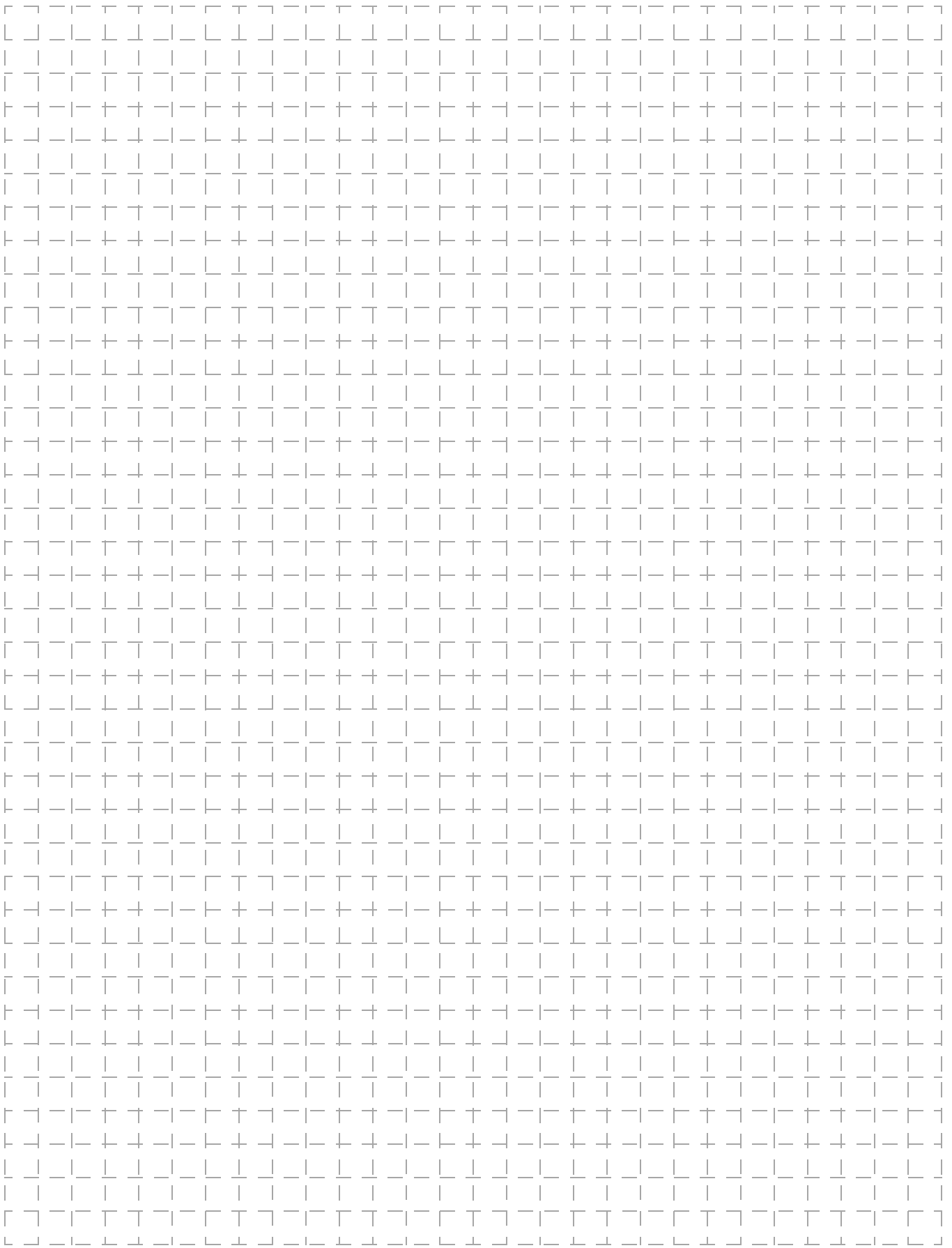


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



MEMO



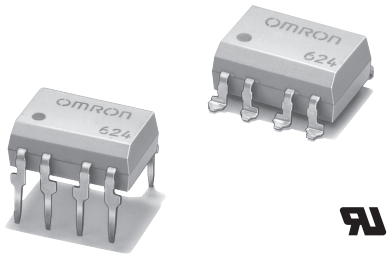
MOS FET Relays
G3VM-62C1/F1

Analog-switching MOS FET Relays with 2 Output channels. Dielectric Strength of 2.5 kVAC between I/O.

- Switches minute analog signals.
- Dielectric strength of 2,500 Vrms between I/O.
- RoHS Compliant.

■ Application Examples

- Measurement devices
- Security systems



Note: The actual product is marked differently from the image shown here.

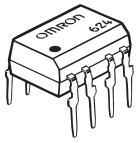
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NO	PCB terminals	60 VAC	**G3VM-62C1**	50	---
	Surface-mounting terminals		**G3VM-62F1**		
			G3VM-62F1(TR)	---	1,500

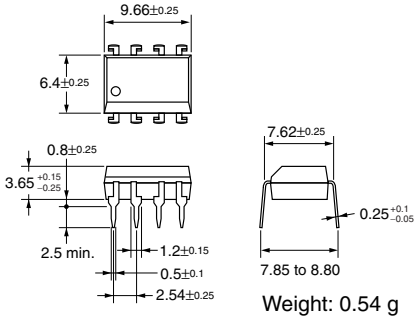
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-62C1

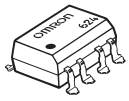


Note: The actual product is marked differently from the image shown here.

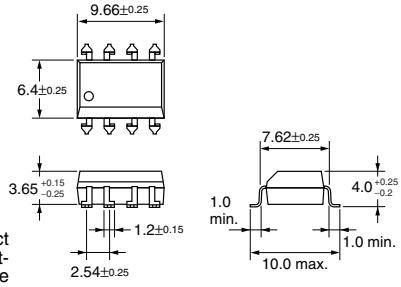


Weight: 0.54 g

G3VM-62F1



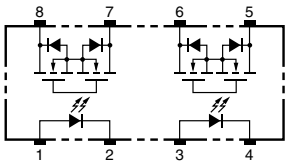
Note: The actual product is marked differently from the image shown here.



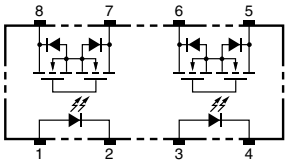
Weight: 0.54 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-62C1

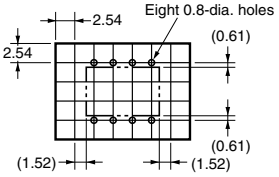


G3VM-62F1



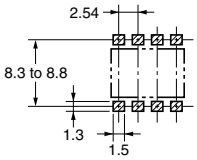
■ PCB Dimensions (Bottom View)

G3VM-62C1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-62F1



■ Absolute Maximum Ratings (Ta = 25°C)

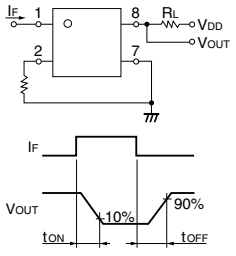
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	60	V	
	Continuous load current	I_O	500	mA	
	ON current reduction rate	ΔI_{ON}/°C	−5.0	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: 1. The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1.6	3	mA	I_O = 500 mA
Output	Maximum resistance with output ON	R_{ON}	---	1.0	2.0	Ω	I_F = 5 mA, I_O = 500 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.001	1.0	μA	V_{OFF} = 60 V
	Capacity between terminals	C_{OFF}	---	130	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, R_{oH} ≤ 60%
Turn-ON time		t_{ON}	---	0.8	2.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.1	0.5	ms	

Note: 2. Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

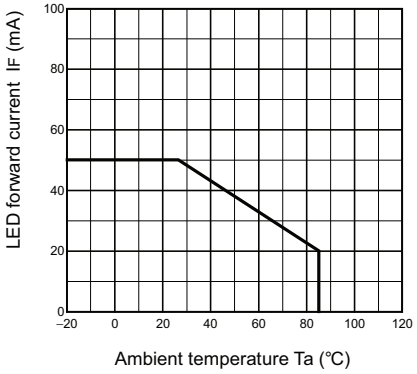
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	48	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	500	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

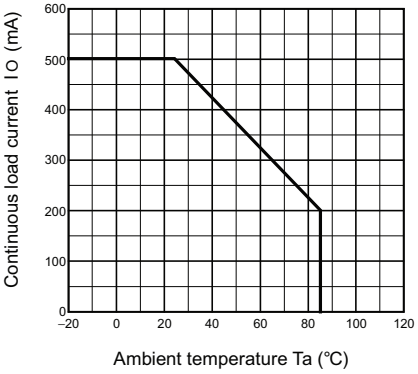
LED forward current vs. Ambient temperature

I_F - Ta



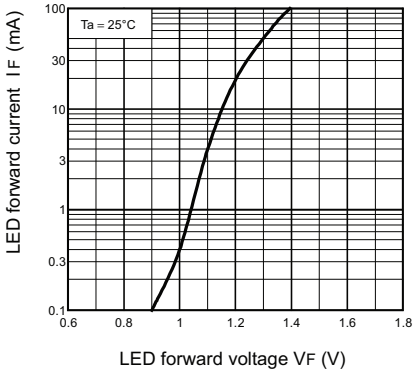
Continuous load current vs. Ambient temperature

I_O - Ta



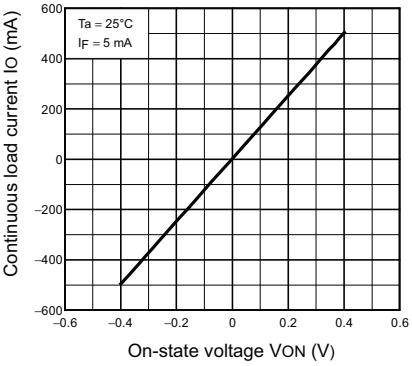
LED forward current vs. LED forward voltage

I_F - V_F



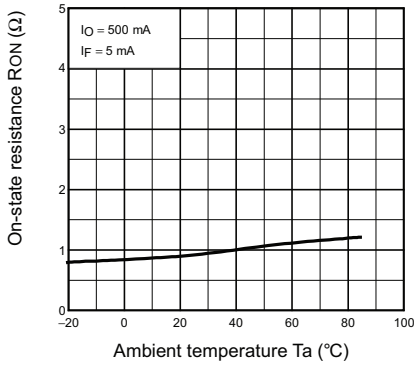
Continuous load current vs. On-state voltage

I_O - V_{ON}



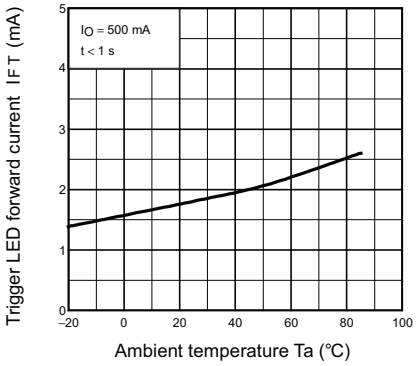
On-state resistance vs. Ambient temperature

R_{ON} - Ta



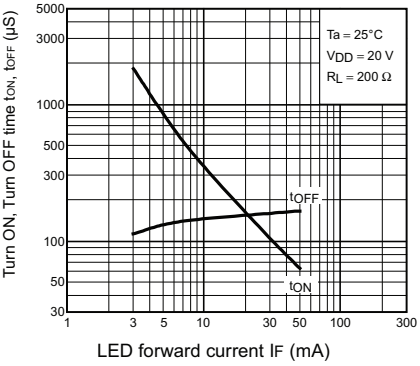
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



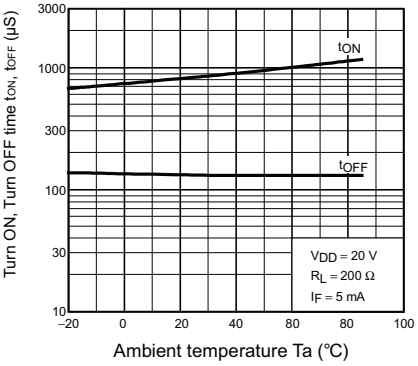
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



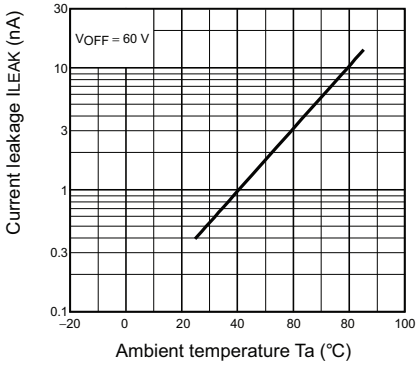
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

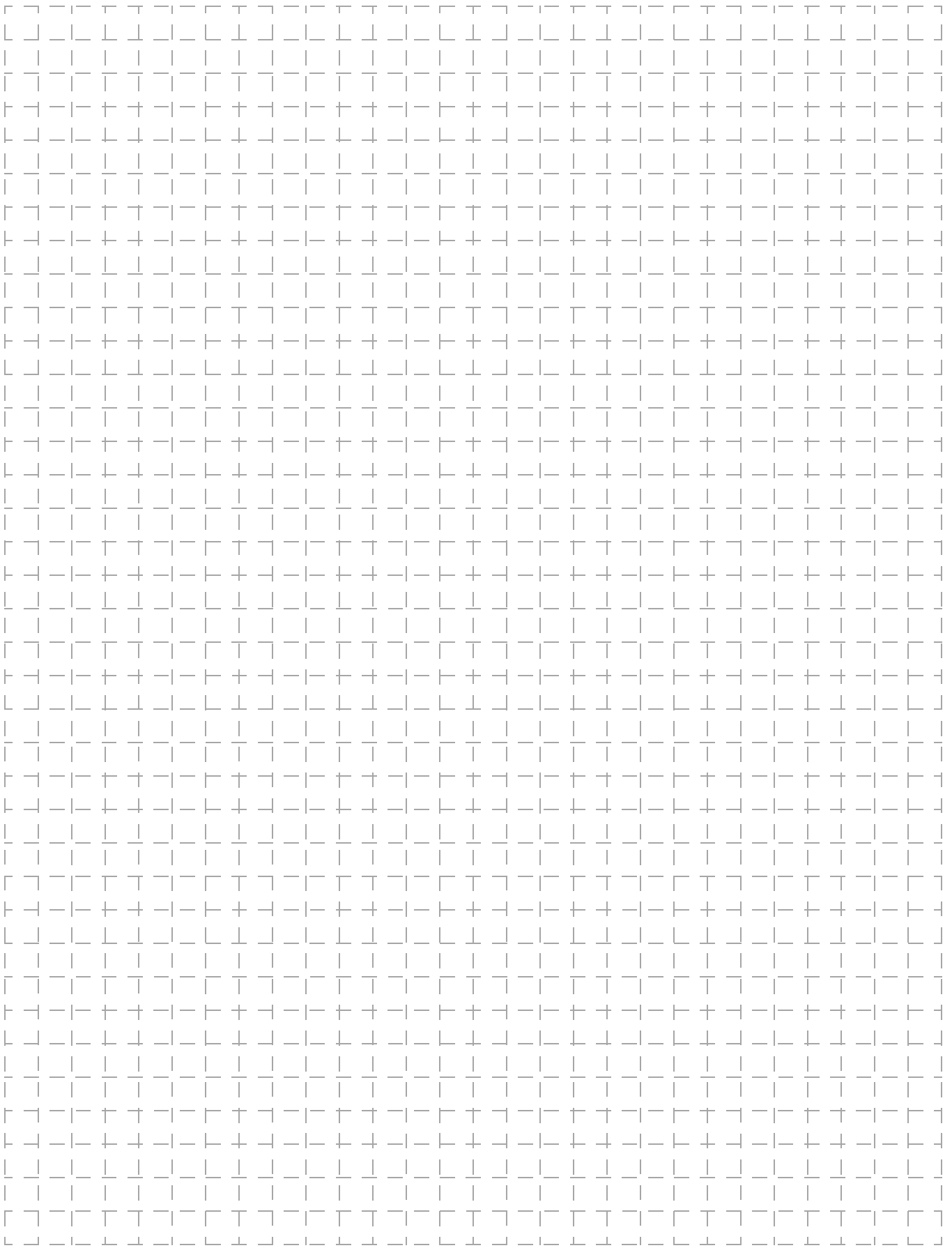


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



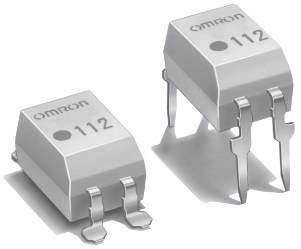
MEMO



MOS FET Relays
G3VM-351A/D

MOS FET Relay Series with 350-V Load Voltage

- Upgraded G3VM-2 Series.
- Continuous load current of 120 mA.
- Dielectric strength of 2,500 Vrms between I/O.
- Operating time of 0.3 ms (typical).
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Measurement devices
- Security systems
- Amusement machines

■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	350 VAC	**G3VM-351A**	100	---
	Surface-mounting terminals		**G3VM-351D**		
			G3VM-351D(TR)	---	1,500

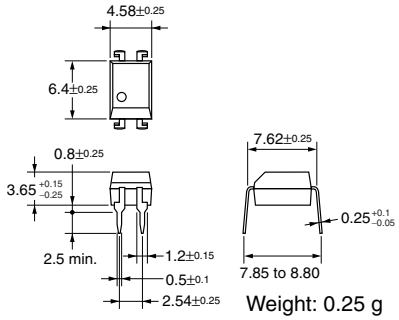
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-351A



Note: The actual product is marked differently from the image shown here.

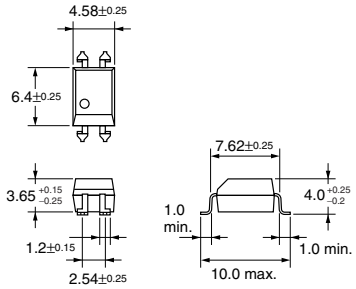


Weight: 0.25 g

G3VM-351D



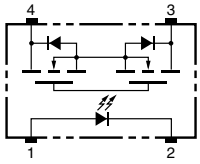
Note: The actual product is marked differently from the image shown here.



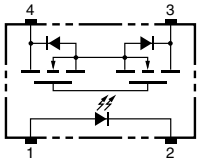
Weight: 0.25 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-351A

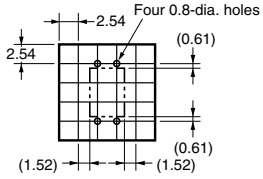


G3VM-351D



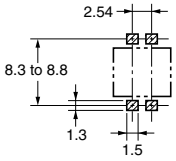
■ PCB Dimensions (Bottom View)

G3VM-351A



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-351D



■ Absolute Maximum Ratings (Ta = 25°C)

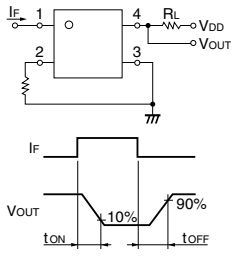
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	350	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	–1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	25	35	Ω	I_F = 5 mA, I_O = 120 mA, t < 1 s
			---	35	50	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.0015	1.0	μA	V_{OFF} = 350 V
	Capacity between terminals	C_{OFF}	---	30	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, R_{oH} ≤ 60%
Turn-ON time		t_{ON}	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.1	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

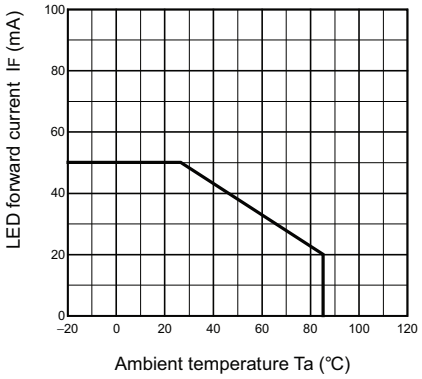
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	100	mA
Operating temperature	T_a	– 20	---	65	°C

■ Engineering Data

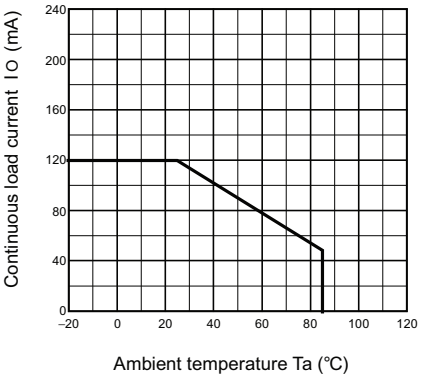
LED forward current vs. Ambient temperature

I_F - Ta



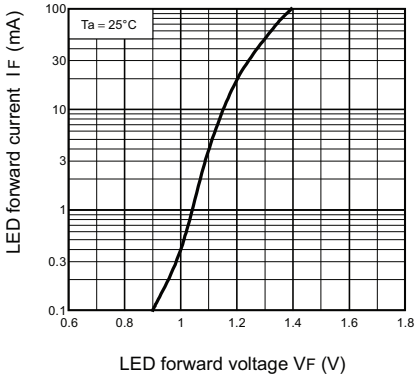
Continuous load current vs. Ambient temperature

I_O - Ta



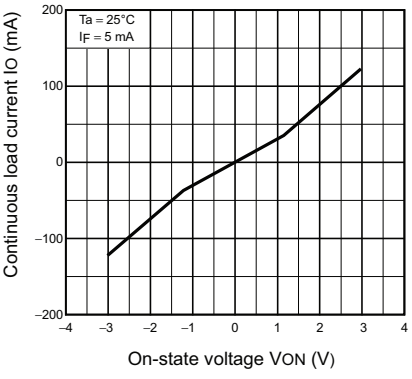
LED forward current vs. LED forward voltage

I_F - V_F



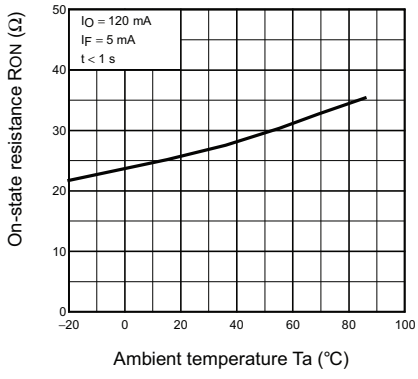
Continuous load current vs. On-state voltage

I_O - V_{ON}



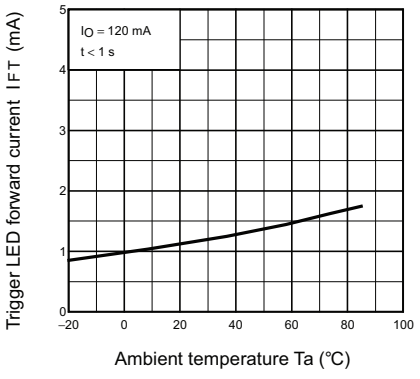
On-state resistance vs. Ambient temperature

R_{ON} - Ta



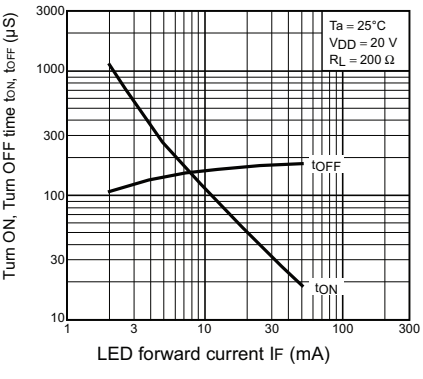
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



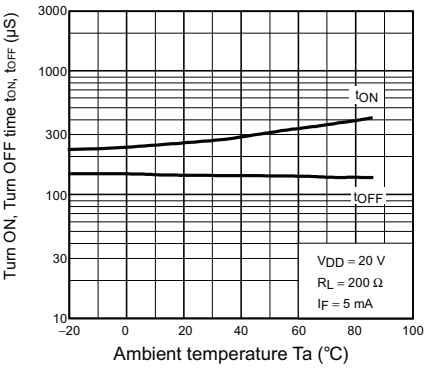
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



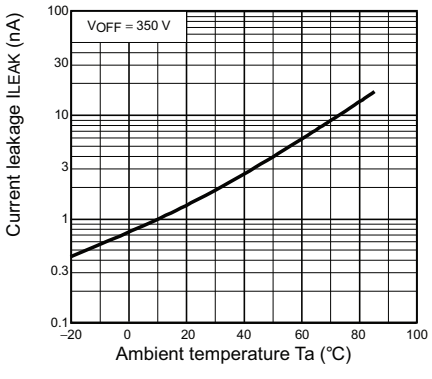
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

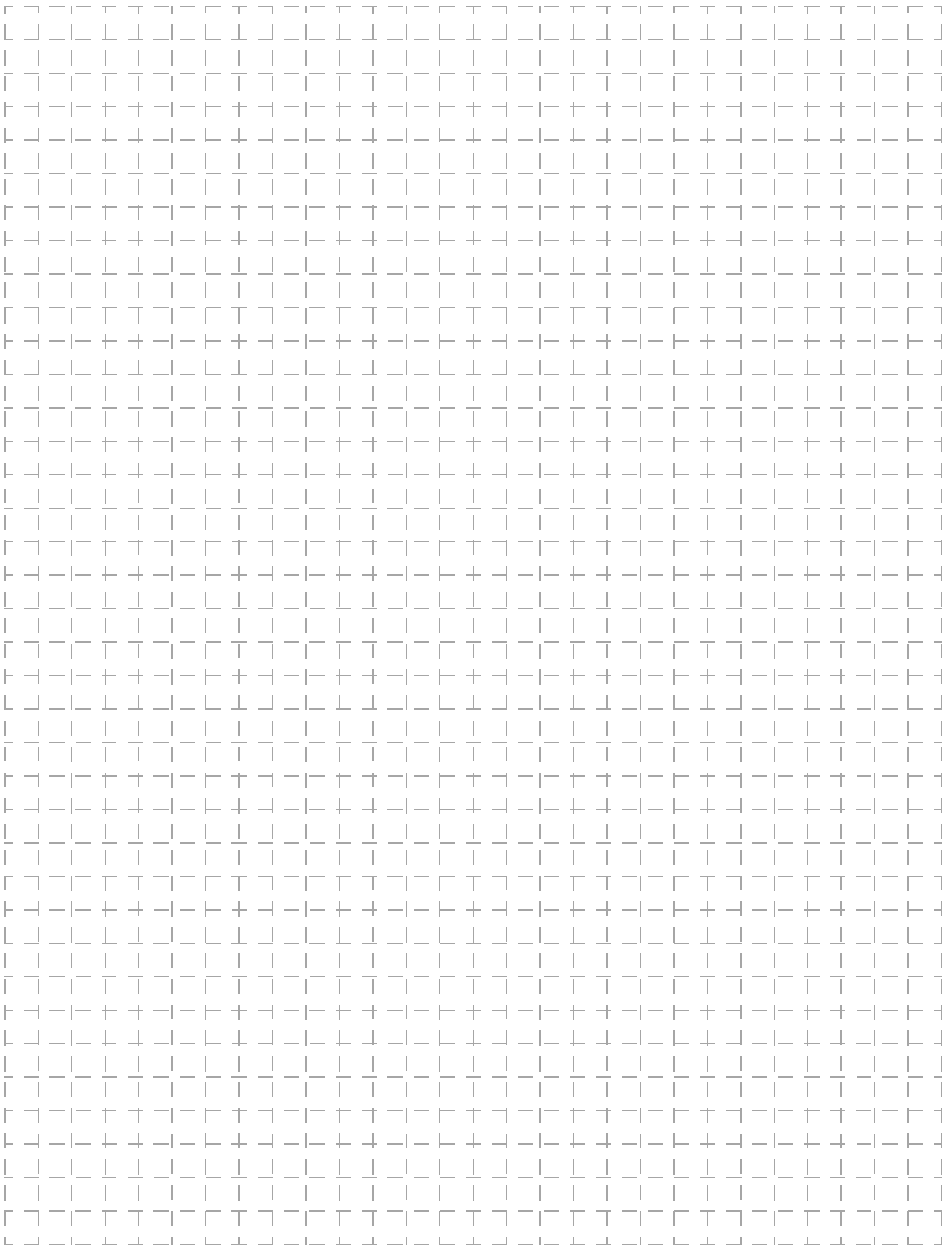


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



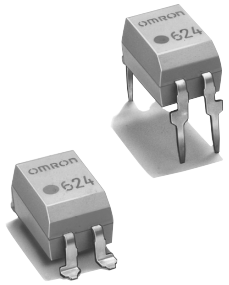
MEMO



MOS FET Relays
G3VM-2(F)L

Analog-switching MOS FET Relays with 350-V Load Voltage and Current Limit.

- A 4-pin Relay available with the same terminal-pin position as 4-pin photocouplers.
- Approved standards: UL1577 (File No. E80555)
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Electronic automatic exchange systems
- Cordless telephones
- Multi-functional telephones
- Measurement devices

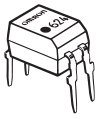
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Current limit	Number per stick	Number per tape
SPST-NO	PCB terminals	350 VAC	**G3VM-2L**	Yes	100	---
	Surface-mounting terminals		**G3VM-2FL**			
			G3VM-2FL(TR)		---	1,500

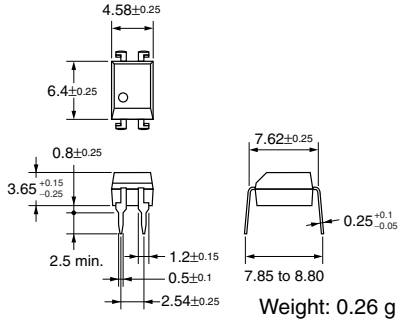
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-2L



Note: The actual product is marked differently from the image shown here.

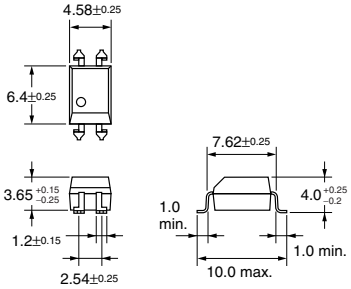


Weight: 0.26 g

G3VM-2FL



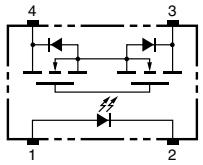
Note: The actual product is marked differently from the image shown here.



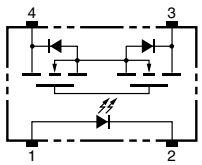
Weight: 0.26 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-2L

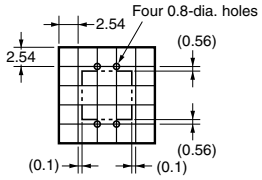


G3VM-2FL



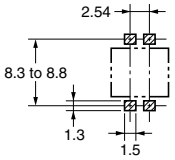
■ PCB Dimensions (Bottom View)

G3VM-2L



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-2FL



■ Absolute Maximum Ratings (Ta = 25°C)

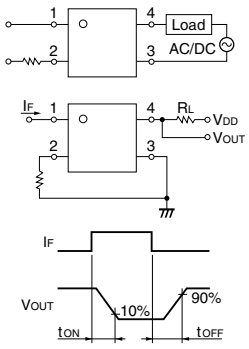
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	6	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	350	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 6 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	22	35	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.0005	1.0	μA	V_{OFF} = 350 V
	Capacity between terminals	C_{OFF}	---	40	---	pF	V = 0, f = 1MHz
Limit current		I_{LIM}	150	---	300	mA	I_F = 5 mA, V_{DD} = 5 V, t = 5 ms
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, R_{oH} ≤ 60%
Turn-ON time		t_{ON}	---	0.25	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.15	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

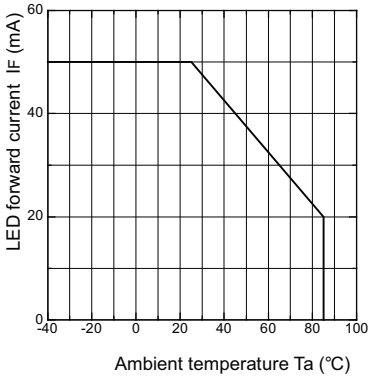
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

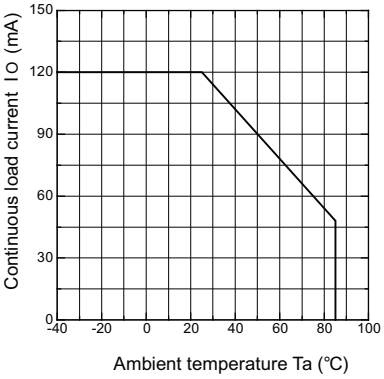
LED forward current vs. Ambient temperature

IF - Ta



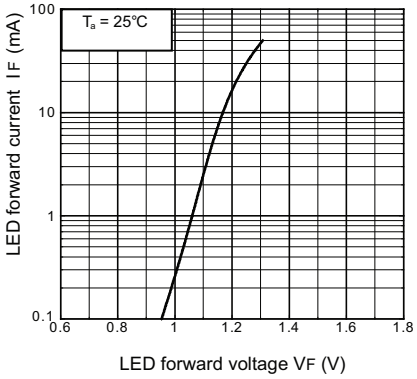
Continuous load current vs. Ambient temperature

IO - Ta



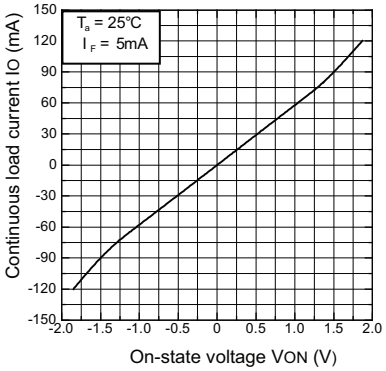
LED forward current vs. LED forward voltage

IF - VF



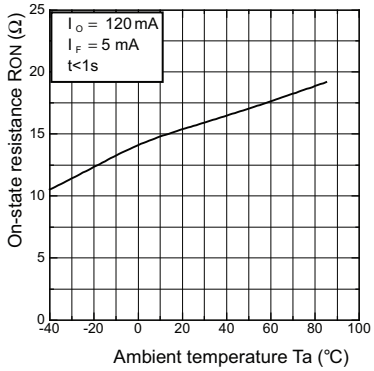
Continuous load current vs. On-state voltage

IO - VON



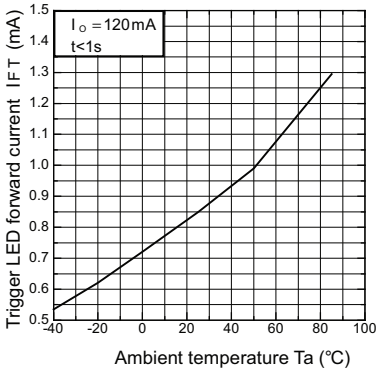
On-state resistance vs. Ambient temperature

RON - Ta



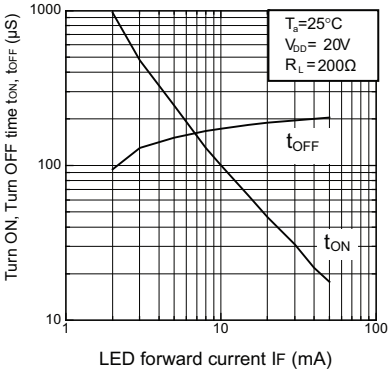
Trigger LED forward current vs. Ambient temperature

IFT - Ta



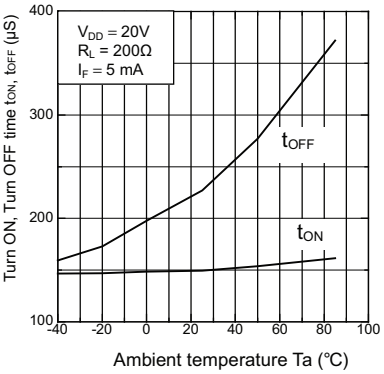
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



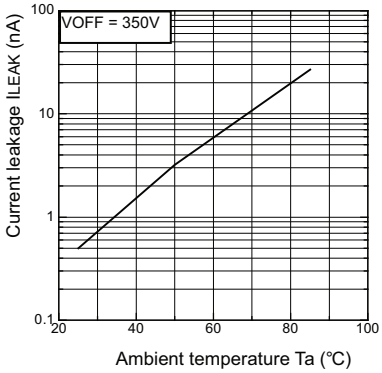
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta

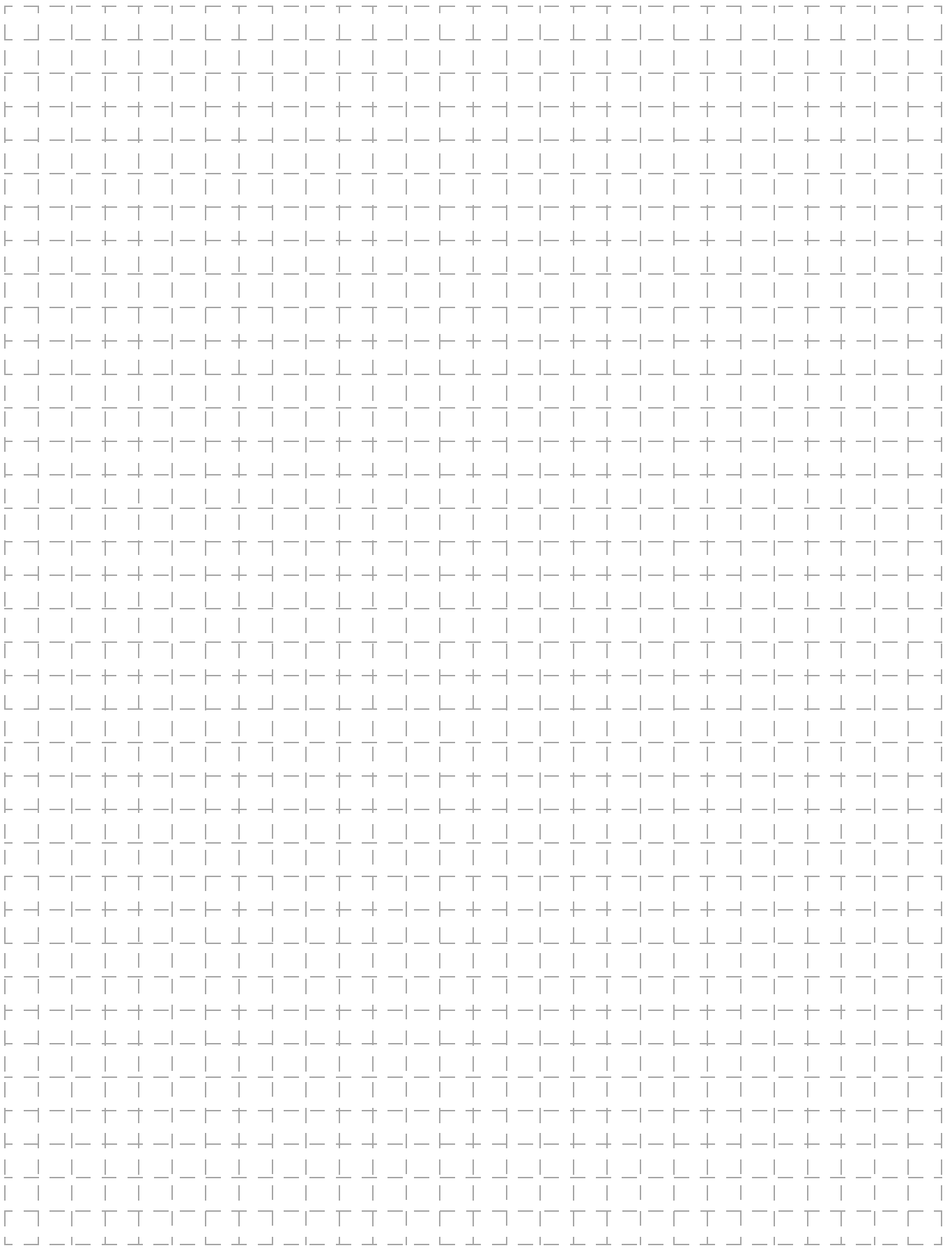


Current leakage vs. Ambient temperature

I LEAK - Ta



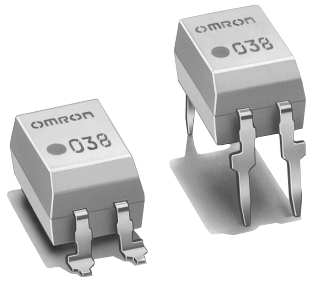
MEMO



MOS FET Relays
G3VM-353A/A1/D/D1

Analog-switching MOS FET Relays with SPST-NC Contact. General-purpose Models Added.

- Switches AC and DC minute analog signals.
- General-purpose models (high ON resistance) added.
- RoHS compliant



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Electronic automatic exchange systems
- Security systems
- Datacom (modem) systems
- FA systems and Measurement devices

■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NC	PCB terminals	350 VAC	**G3VM-353A**	100	---
			G3VM-353A1		
	Surface-mounting terminals		**G3VM-353D**		
			G3VM-353D1		
			G3VM-353D(TR)	---	1,500
			G3VM-353D1(TR)		

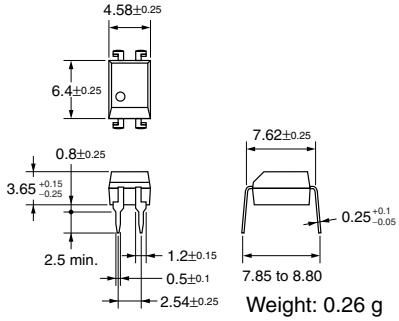
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-353A/A1



Note: The actual product is marked differently from the image shown here.

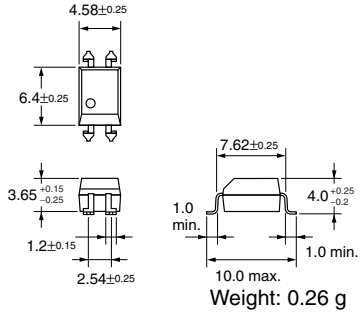


Weight: 0.26 g

G3VM-353D/D1



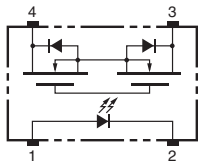
Note: The actual product is marked differently from the image shown here.



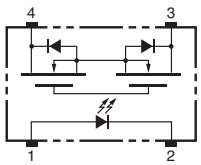
Weight: 0.26 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-353A/A1

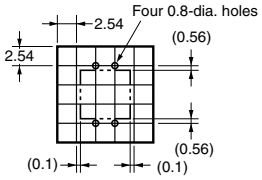


G3VM-353D/D1



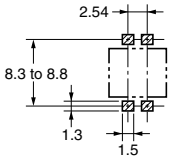
■ PCB Dimensions (Bottom View)

G3VM-353A/A1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-353D/D1



■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	350	V	
	Continuous load current (AC peak/DC)	I_O	150 (100)	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.5 (−1)	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Values in parentheses are for the G3VM-353A1/D1.

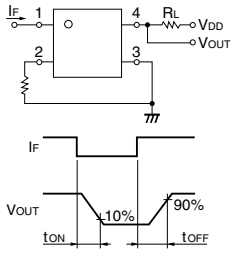
Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_{OFF} = 10 μA
Output	Maximum resistance with output ON	R_{ON}	---	15 (30)	25 (50)	Ω	I_O = 150 mA (100 mA)
	Current leakage when the relay is open	I_{LEAK}	---	0.0105 (0.003)	1.0	μA	I_F = 5 mA, V_{OFF} = 350 V
	Capacity between terminals	C_{OFF}	---	85 (30)	---	pF	V = 0, f = 1MHz, I_F = 5 mA
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.1 (0.25)	1.0 (0.5)	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	1.0 (0.5)	3.0 (1)	ms	

Values in parentheses are for the G3VM-353A1/D1.

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	---	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	150 (100)	mA
Operating temperature	T_a	− 20	---	65	°C

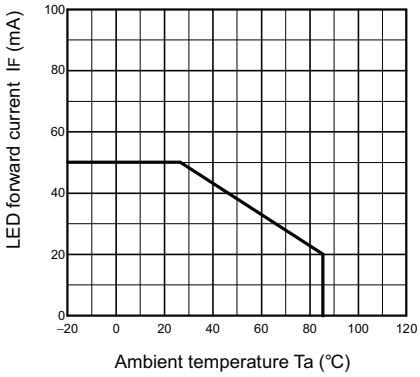
Values in parentheses are for the G3VM-353A1/D1.

■ Engineering Data

G3VM-353A/D

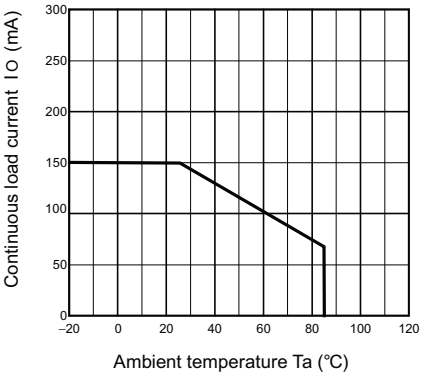
LED forward current vs. Ambient temperature

IF - Ta



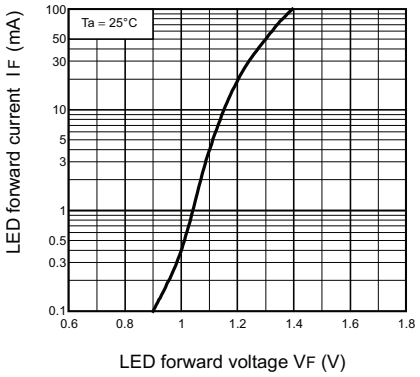
Continuous load current vs. Ambient temperature

IO - Ta



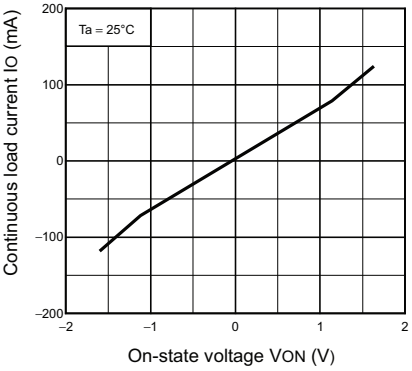
LED forward current vs. LED forward voltage

IF - VF



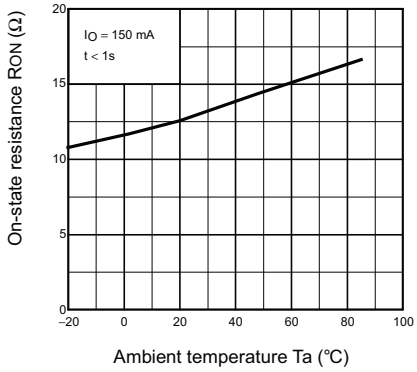
Continuous load current vs. On-state voltage

IO - VON



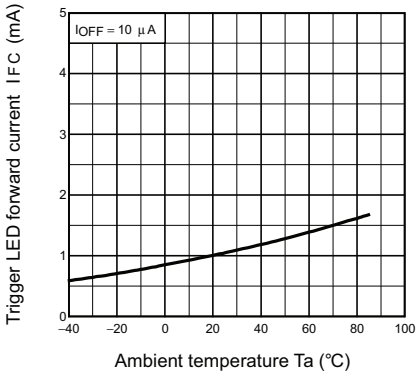
On-state resistance vs. Ambient temperature

RON - Ta



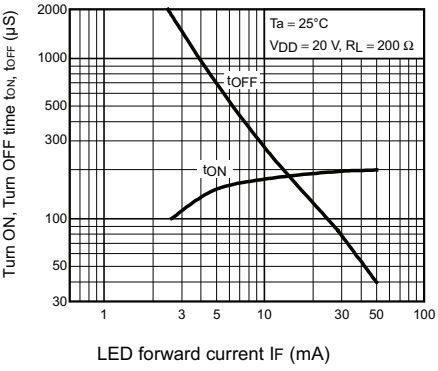
Trigger LED forward current vs. Ambient temperature

IFC - Ta



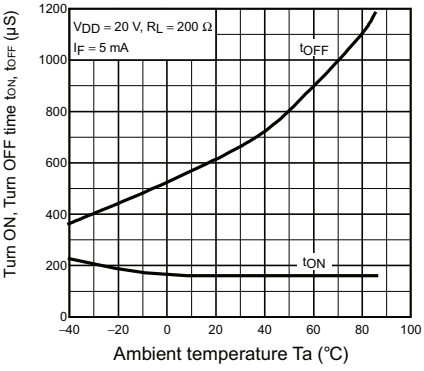
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



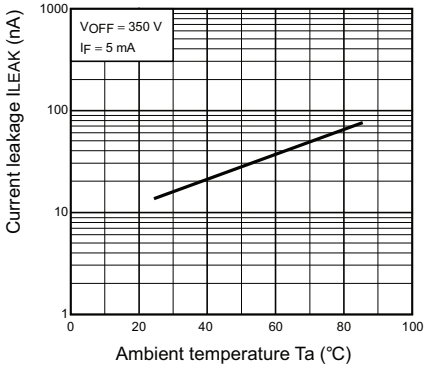
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



Current leakage vs. Ambient temperature

I LEAK - Ta

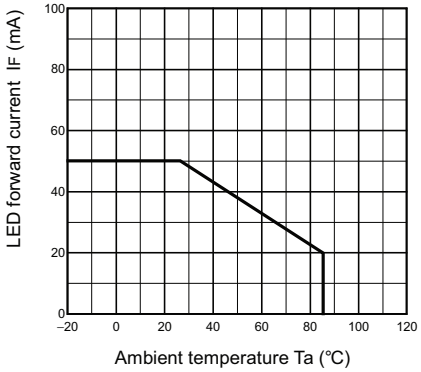


■ Engineering Data

G3VM-353A1/D1

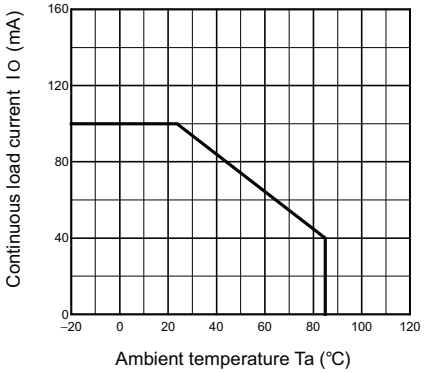
LED forward current vs. Ambient temperature

I_F - Ta



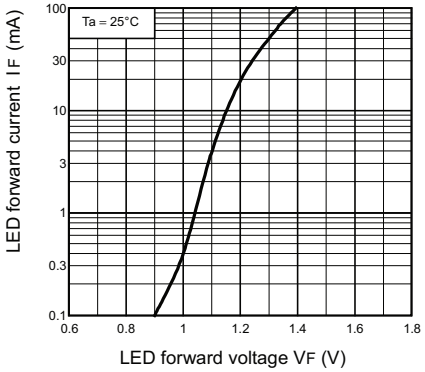
Continuous load current vs. Ambient temperature

I_O - Ta



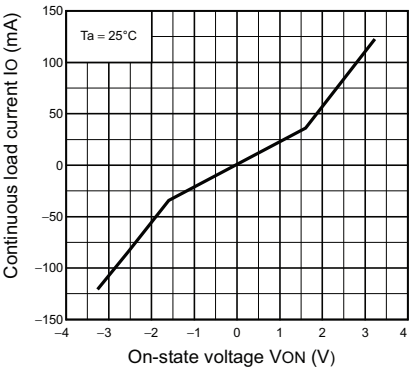
LED forward current vs. LED forward voltage

I_F - V_F



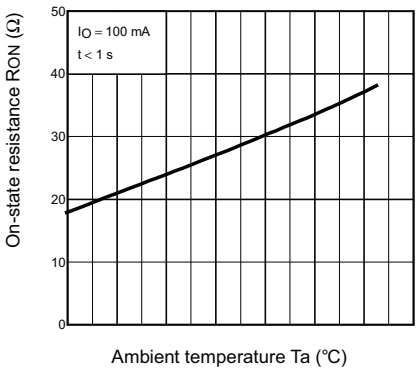
Continuous load current vs. On-state voltage

I_O - V_{ON}



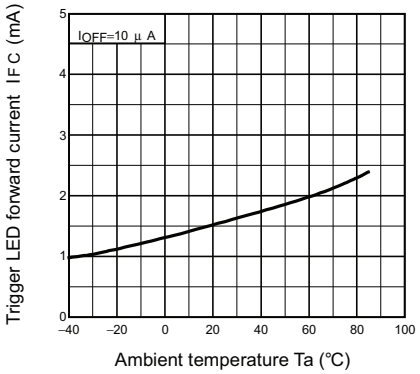
On-state resistance vs. Ambient temperature

R_{ON} - Ta



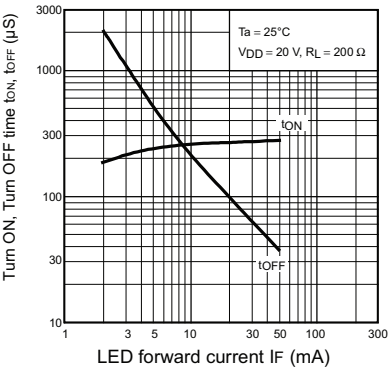
Trigger LED forward current vs. Ambient temperature

I_{FC} - Ta



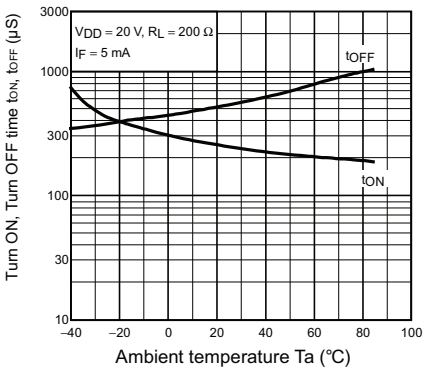
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



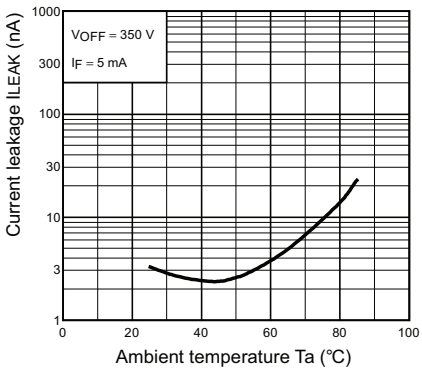
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



Current leakage vs. Ambient temperature

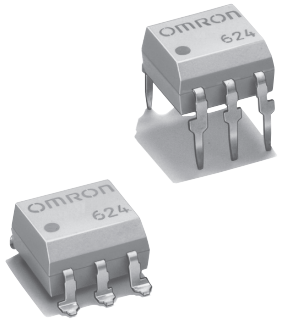
I_{LEAK} - Ta



MOS FET Relays
G3VM-351B/E

MOS FET Relay Series with 350-V Load Voltage

- Upgraded G3VM-3 Series.
- Continuous load current of 120 mA.
- Dielectric strength of 2,500 Vrms between I/O.
- Operating time of 0.3 ms (typical).
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Measurement devices
- Security systems
- Amusement machines

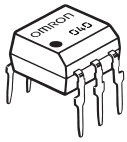
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	350 VAC	**G3VM-351B**	50	---
	Surface-mounting terminals		**G3VM-351E**		
			G3VM-351E(TR)	---	1,500

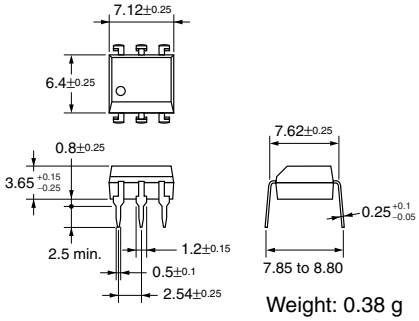
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-351B



Note: The actual product is marked differently from the image shown here.

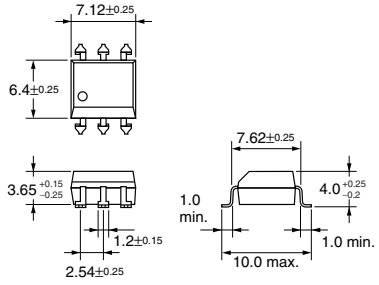


Weight: 0.38 g

G3VM-351E



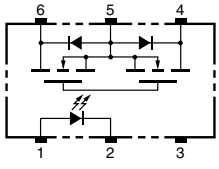
Note: The actual product is marked differently from the image shown here.



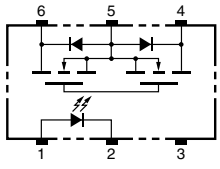
Weight: 0.38 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-351B

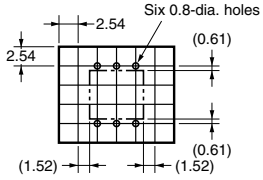


G3VM-351E



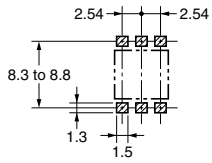
■ PCB Dimensions (Bottom View)

G3VM-351B



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-351E

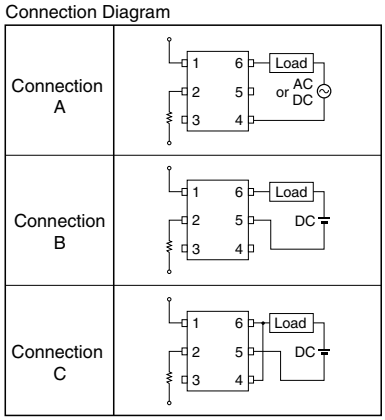


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		ΔI_F/°C	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Load voltage (AC peak/DC)		V_{OFF}	350	V	
	Continuous load current	Connection A	I_O	120	mA	
		Connection B		120		
		Connection C		240		
	ON current reduction rate	Connection A	ΔI_{ON}/°C	−1.2	mA/°C	Ta ≥ 25°C
		Connection B		−1.2		
		Connection C		−2.4		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature			T_a	−40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

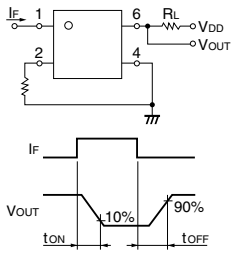
Connection Diagram



■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	25	35	Ω	I_F = 5 mA, I_O = 120 mA, t < 1 s
				---	35	50	Ω	I_F = 5 mA, I_O = 120 mA
		Connection B		---	28	40	Ω	I_F = 5 mA, I_O = 120 mA
		Connection C		---	14	20	Ω	I_F = 5 mA, I_O = 240 mA
	Current leakage when the relay is open		I_{LEAK}	---	0.0015	1.0	μA	V_{OFF} = 350 V
	Capacity between terminals A Connection		C_{OFF}	---	30	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, R_{oH} ≤ 60%
Turn-ON time			t_{ON}	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			t_{OFF}	---	0.1	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

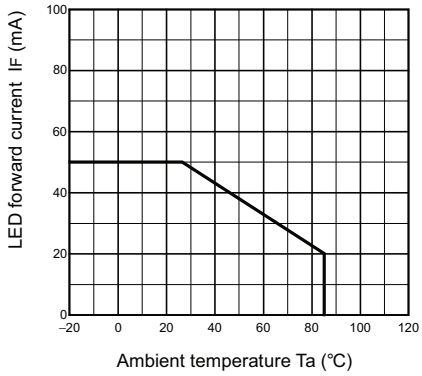
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	10	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

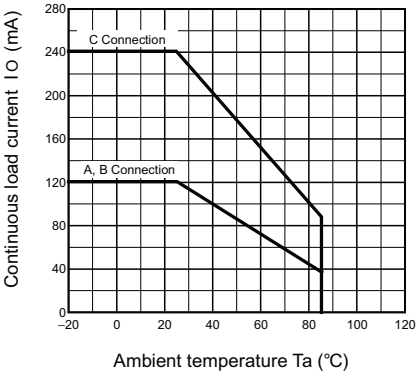
LED forward current vs. Ambient temperature

I_F - Ta



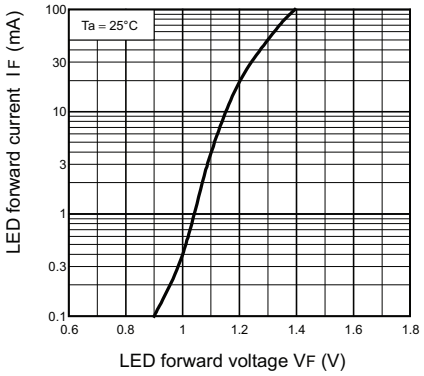
Continuous load current vs. Ambient temperature

I_O - Ta



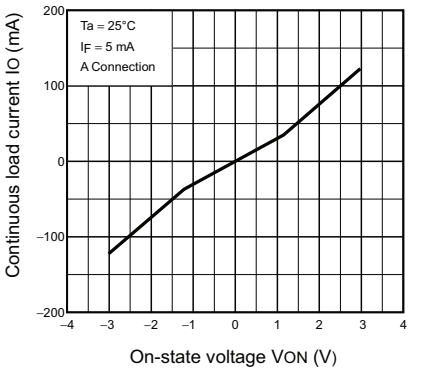
LED forward current vs. LED forward voltage

I_F - V_F



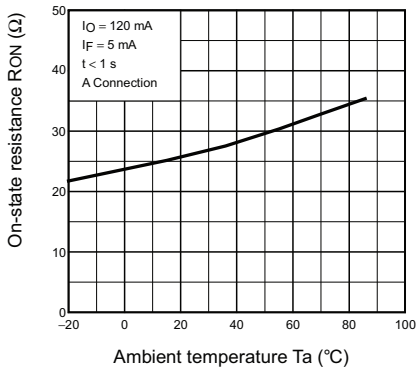
Continuous load current vs. On-state voltage

I_O - V_{ON}



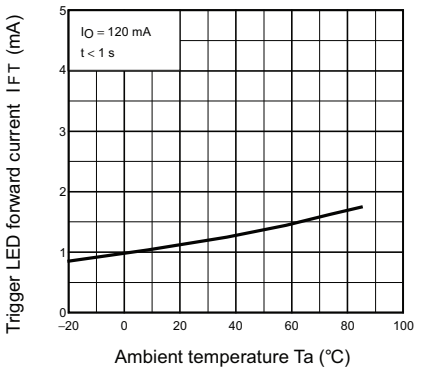
On-state resistance vs. Ambient temperature

R_{ON} - Ta



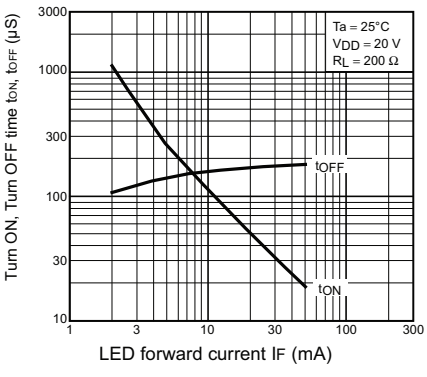
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



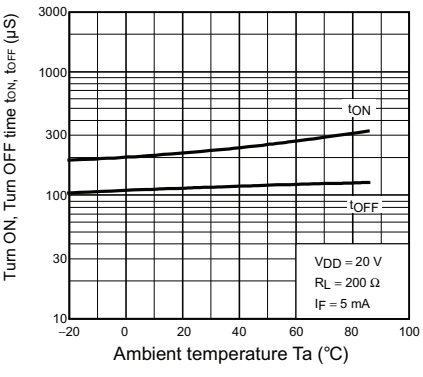
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



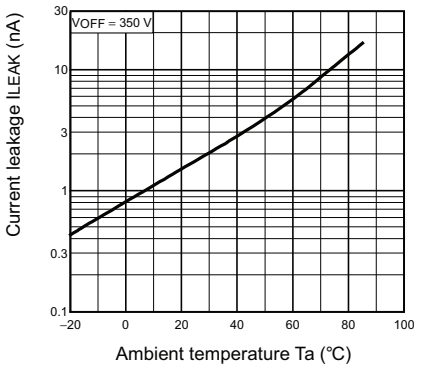
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

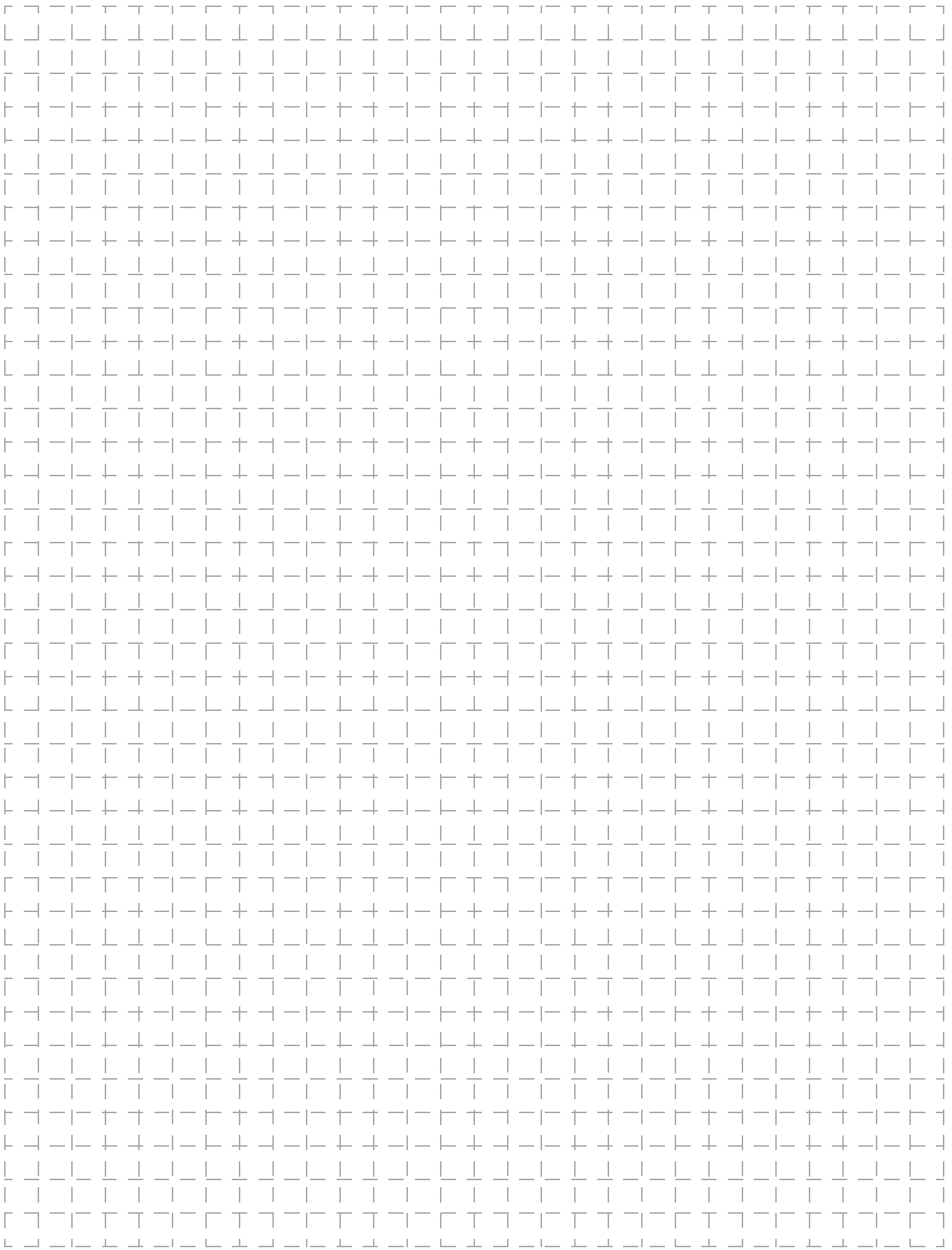


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



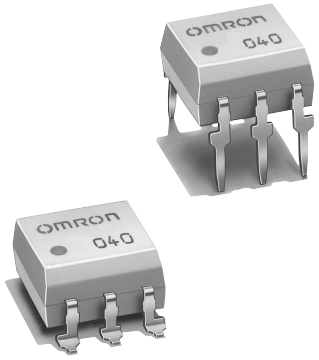
MEMO



MOS FET Relays
G3VM-353B/B1/E/E1

Analog-switching MOS FET Relay with SPST-NC Contact. General-purpose Models Added.

- Switches minute AC and DC analog signals.
- General-purpose models (with high ON resistance) added.
- RoHS compliant



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Electronic automatic exchange systems
- Security systems
- Datacom (modem) systems
- FA systems and Measurement devices

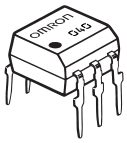
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NC	PCB terminals	350 VAC	**G3VM-353B**	50	---
			G3VM-353B1		
	Surface-mounting terminals		**G3VM-353E**		
			G3VM-353E1		
			G3VM-353E(TR)	---	1,500
			G3VM-353E1(TR)		

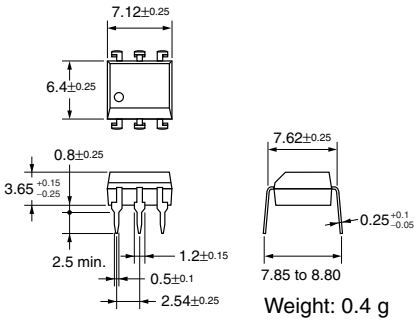
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-353B/B1

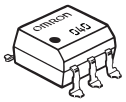


Note: The actual product is marked differently from the image shown here.

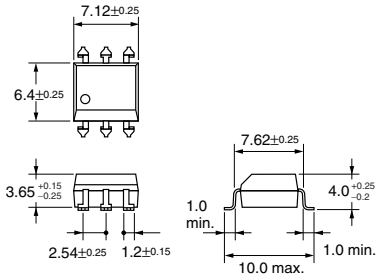


Weight: 0.4 g

G3VM-353E/E1



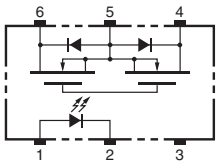
Note: The actual product is marked differently from the image shown here.



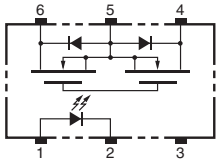
Weight: 0.4 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-353B/B1

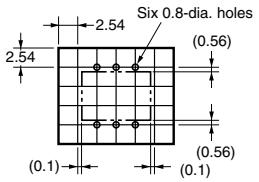


G3VM-353E/E1



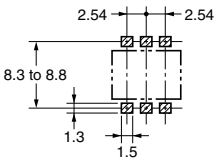
■ PCB Dimensions (Bottom View)

G3VM-353B/B1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-353E/E1



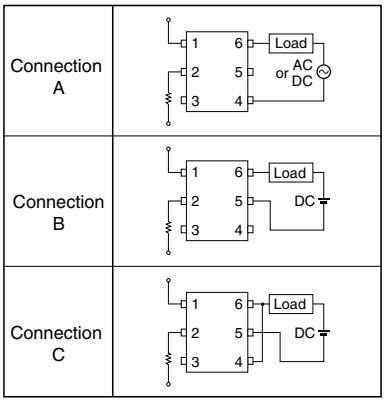
■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Load voltage (AC peak/DC)		V_{OFF}	350	V	
	Continuous load current (AC peak/DC)	Connection A	I_O	150 (100)	mA	
		Connection B		150 (100)		
		Connection C		300 (200)		
	ON current reduction rate	Connection A	ΔI_{ON}/°C	–1.5 (–1)	mA/°C	$T_a \geq 25$°C
		Connection B		–1.5 (–1)		
		Connection C		–3.0 (–2)		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature			T_a	–40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Values in parentheses are for the G3VM-353B1/E1.

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

Connection Diagram

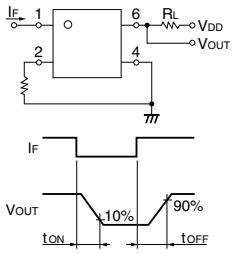


■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1	3	mA	I_{OFF} = 10 μA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	15 (27)	25 (50)	Ω	I_O = 150 mA (100 mA)
		Connection B		---	8 (20)	14 (43)	Ω	I_O = 150 mA (100 mA)
		Connection C		---	4 (10)	7 (---)	Ω	I_O = 300 mA (200 mA)
	Current leakage when the relay is open		I_{LEAK}	---	0.0105 (0.003)	1.0	μA	I_F = 5 mA, V_{OFF} = 350 V
	Capacity between terminals A Connection		C_{OFF}	---	85 (30)	---	pF	V = 0, f = 1MHz, I_F = 5 mA
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time			t_{ON}	---	0.1 (0.25)	1.0 (0.5)	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			t_{OFF}	---	1.0 (0.5)	3.0 (1)	ms	

Values in parentheses are for the G3VM-353B1/E1.

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	---	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	150 (100)	mA
Operating temperature	T_a	– 20	---	65	°C

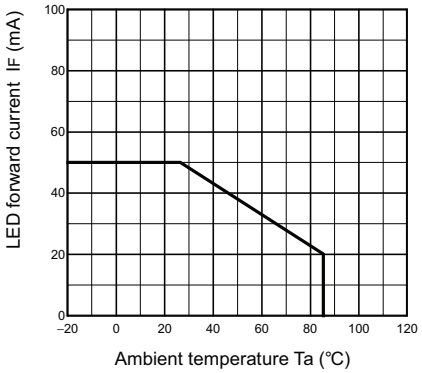
Values in parentheses are for the G3VM-353B1/E1

■ Engineering Data

G3VM-353B/E

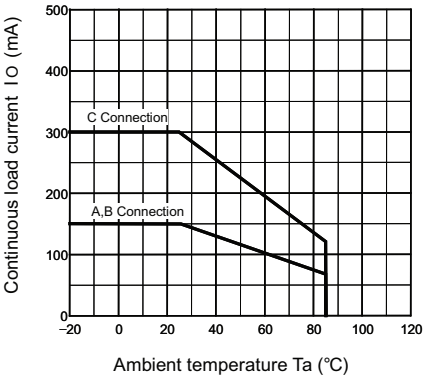
LED forward current vs. Ambient temperature

IF - Ta



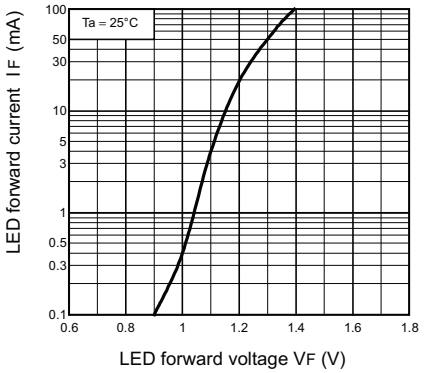
Continuous load current vs. Ambient temperature

IO - Ta



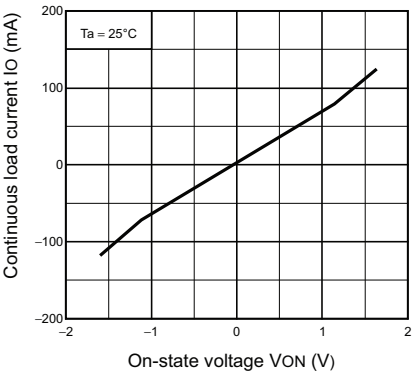
LED forward current vs. LED forward voltage

IF - VF



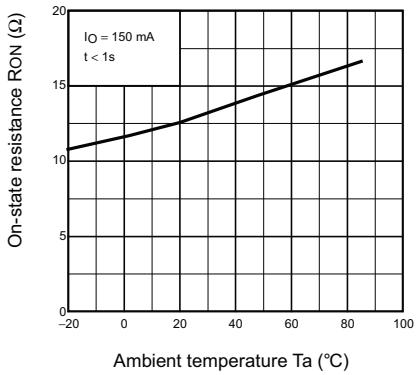
Continuous load current vs. On-state voltage

IO - VON



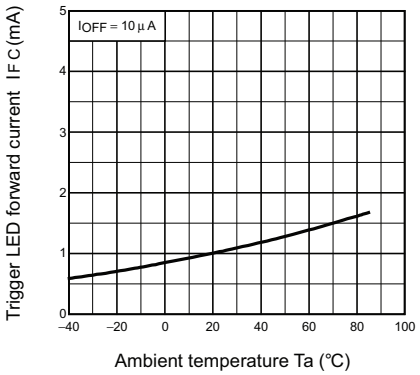
On-state resistance vs. Ambient temperature

RON - Ta



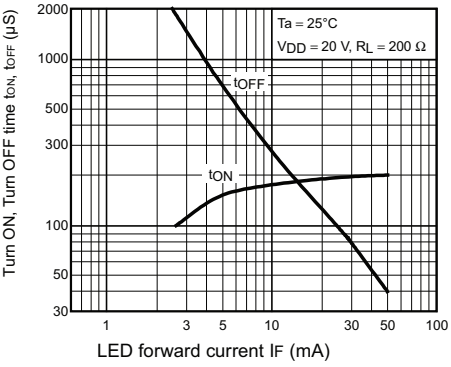
Trigger LED forward current vs. Ambient temperature

IFC - Ta



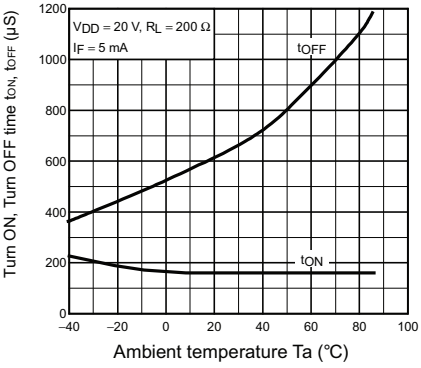
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



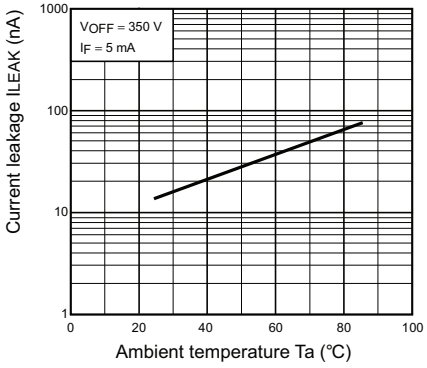
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



Current leakage vs. Ambient temperature

I LEAK - Ta

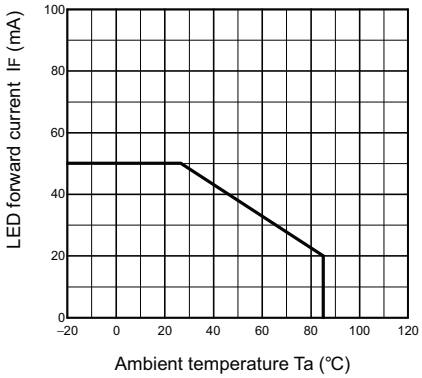


■ Engineering Data

G3VM-353B1/E1

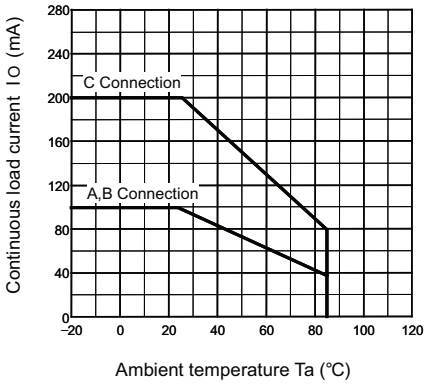
LED forward current vs. Ambient temperature

I_F - Ta



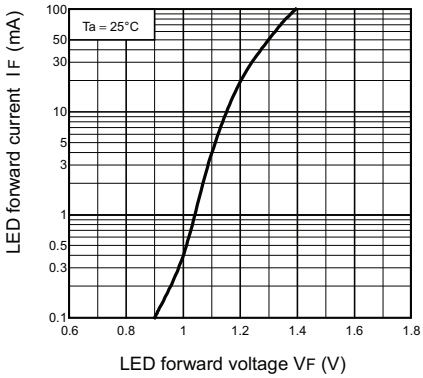
Continuous load current vs. Ambient temperature

I_O - Ta



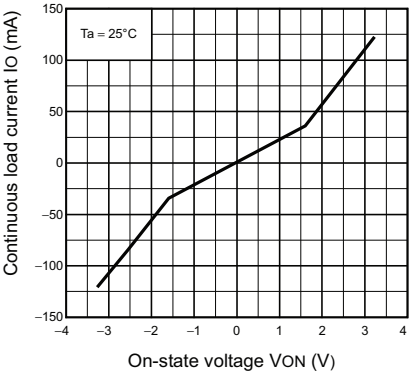
LED forward current vs. LED forward voltage

I_F - V_F



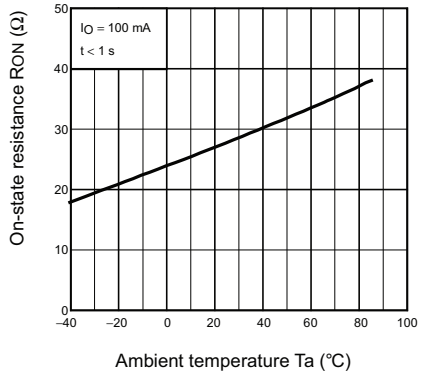
Continuous load current vs. On-state voltage

I_O - V_{ON}



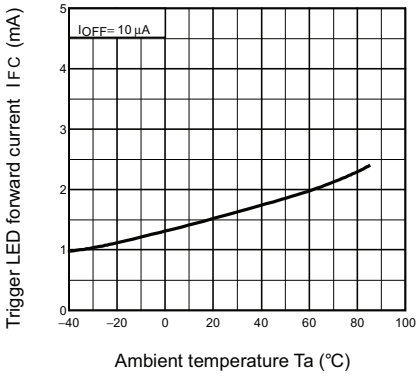
On-state resistance vs. Ambient temperature

R_{ON} - Ta



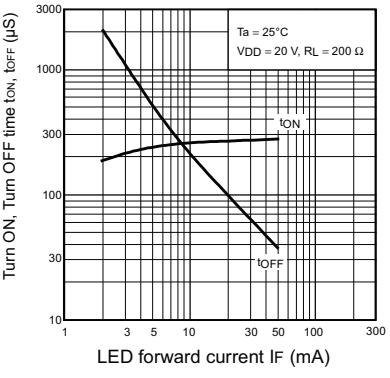
Trigger LED forward current vs. Ambient temperature

I_{FC} - Ta



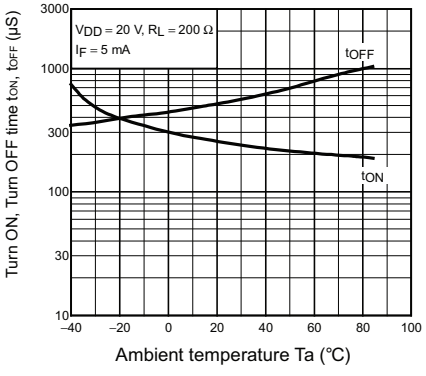
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



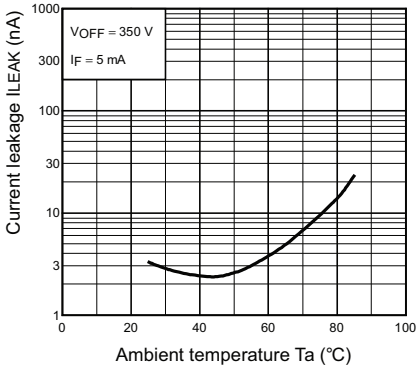
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



Current leakage vs. Ambient temperature

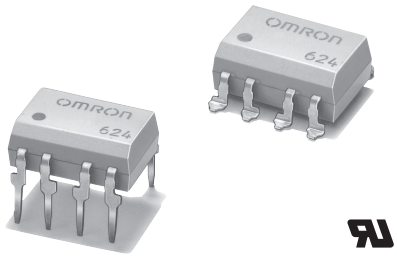
I_{LEAK} - Ta



MOS FET Relays
G3VM-352C/F

MOS FET Relay Series with 350-V Load Voltage Including Models with 2 Outputs.

- Upgraded G3VM-W Series.
- Continuous load current of 120 mA.
- Dielectric strength of 2,500 Vrms between I/O.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Measurement devices
- Security systems
- Amusement machines

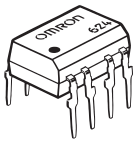
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NO	PCB terminals	350 VAC	**G3VM-352C**	50	---
	Surface-mounting terminals		**G3VM-352F**		
			G3VM-352F(TR)	---	1,500

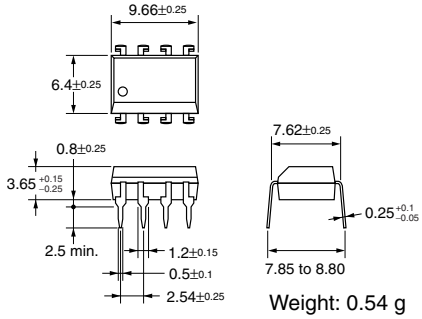
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-352C

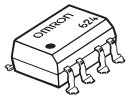


Note: The actual product is marked differently from the image shown here.

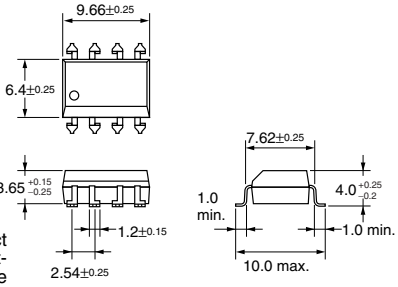


Weight: 0.54 g

G3VM-352F



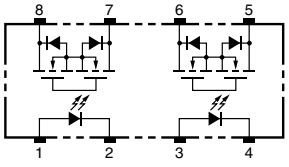
Note: The actual product is marked differently from the image shown here.



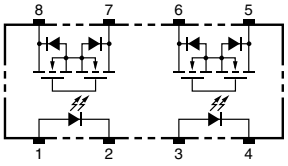
Weight: 0.54 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-352C

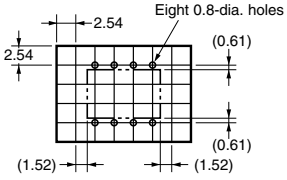


G3VM-352F



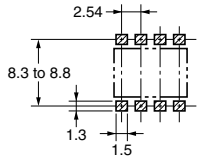
■ PCB Dimensions (Bottom View)

G3VM-352C



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-352F



■ Absolute Maximum Ratings (Ta = 25°C)

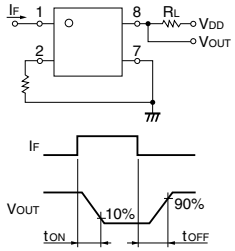
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	350	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	25	35	Ω	I_F = 5 mA, I_O = 120 mA, t < 1 s
			---	35	50	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.0015	1.0	μA	V_{OFF} = 350 V
	Capacity between terminals	C_{OFF}	---	30	---	pF	V = 0, f = 1MHz,
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, R_{oH} ≤ 60%
Turn-ON time		t_{ON}	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.1	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

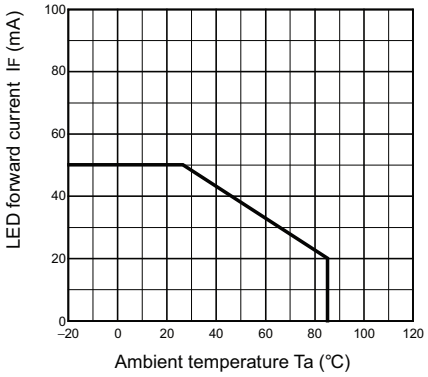
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

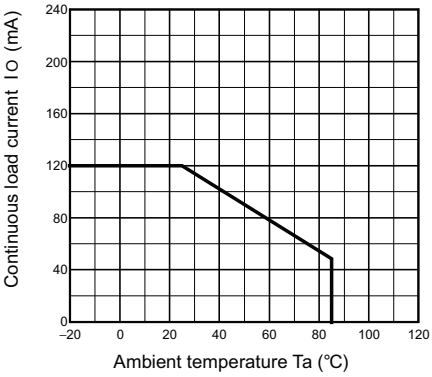
LED forward current vs. Ambient temperature

I_F - Ta



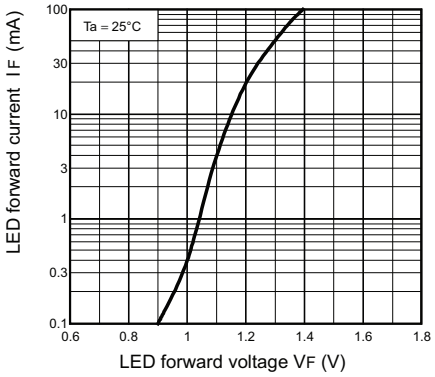
Continuous load current vs. Ambient temperature

I_O - Ta



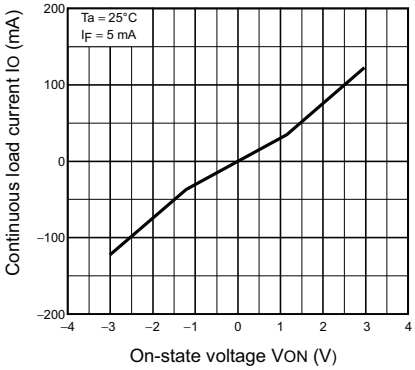
LED forward current vs. LED forward voltage

I_F - V_F



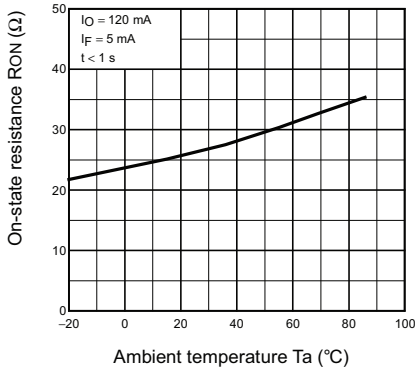
Continuous load current vs. On-state voltage

I_O - V_{ON}



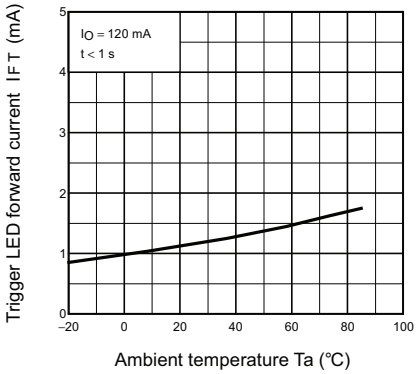
On-state resistance vs. Ambient temperature

R_{ON} - Ta



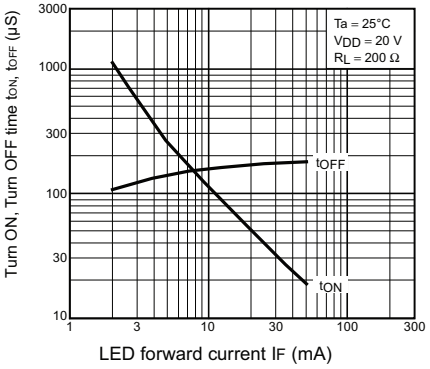
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



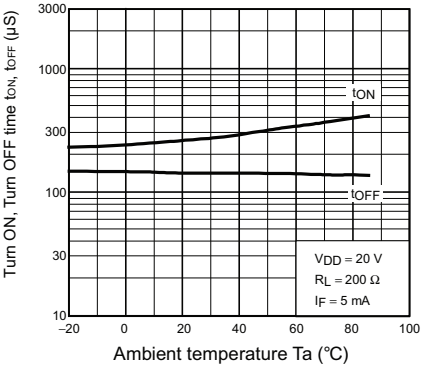
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



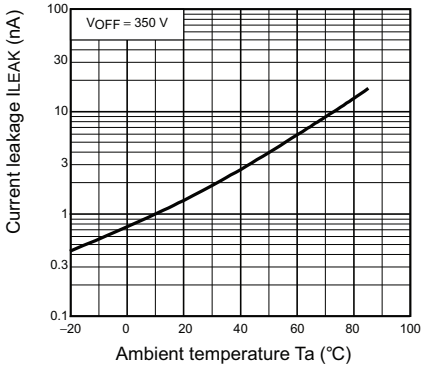
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

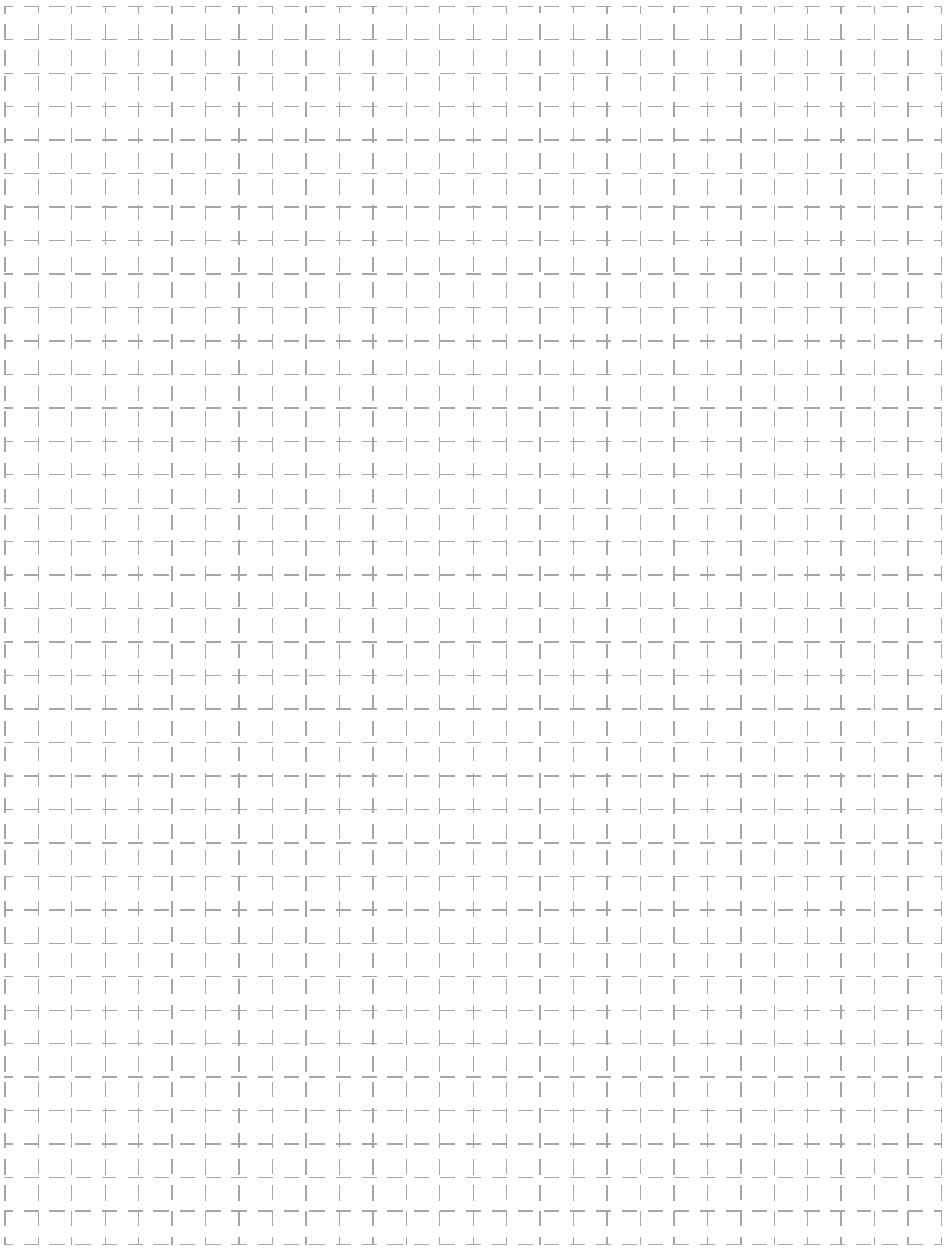


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



MEMO



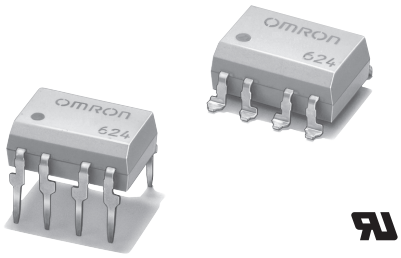
MOS FET Relays
G3VM-W(F)L

MOS FET Relay Series with 350-V Load Voltage Current-limiting Models with 2 Outputs.

- Current Limit: 100 to 300 mA
- RoHS Compliant.

■ Application Examples

- Electronic automatic exchange systems
- Multi-functional telephones
- Cordless telephones
- Measurement devices



Note: The actual product is marked differently from the image shown here.

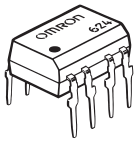
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Current limit	Number per stick	Number per tape
DPST-NO	PCB terminals	350 VAC	**G3VM-WL**	Yes	50	---
	Surface-mounting terminals		**G3VM-WFL**			
			G3VM-WFL(TR)		---	1,500

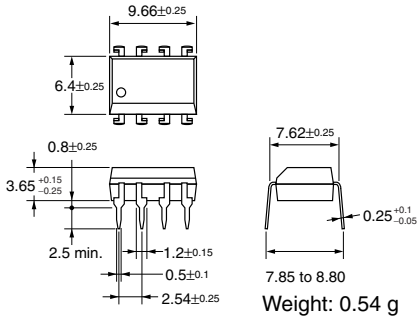
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-WL

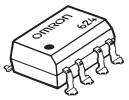


Note: The actual product is marked differently from the image shown here.

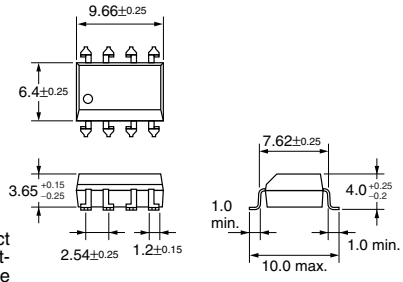


Weight: 0.54 g

G3VM-WFL



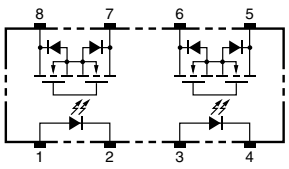
Note: The actual product is marked differently from the image shown here.



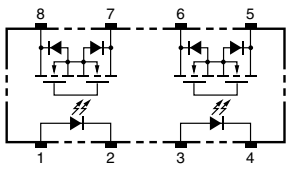
Weight: 0.54 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-WL

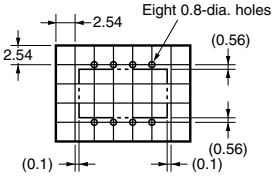


G3VM-WFL



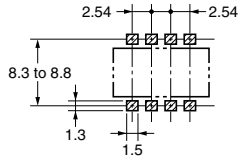
■ PCB Dimensions (Bottom View)

G3VM-WL



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-WFL



■ Absolute Maximum Ratings (Ta = 25°C)

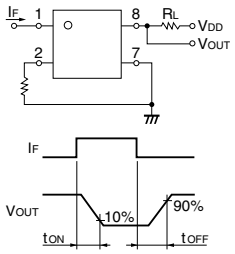
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	6	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	350	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	22	35	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.0005	1.0	μA	V_{OFF} = 350 V
	Capacity between terminals	C_{OFF}	---	40	---	pF	V = 0, f = 1MHz
Limit current		I_{LIM}	150	---	300	mA	I_F = 5 mA, V_{DD} = 5 V, t = 5 ms
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, R_{oH} ≤ 60%
Turn-ON time		t_{ON}	---	0.25	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.15	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

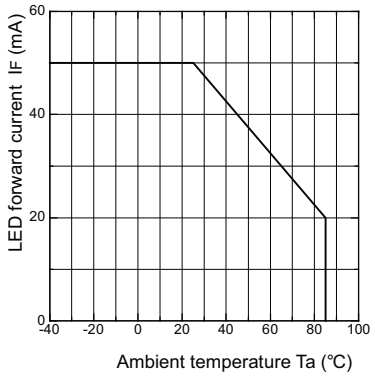
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

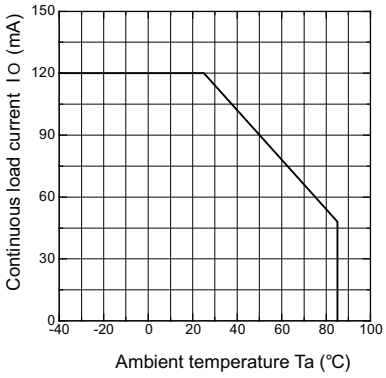
LED forward current vs. Ambient temperature

IF - Ta



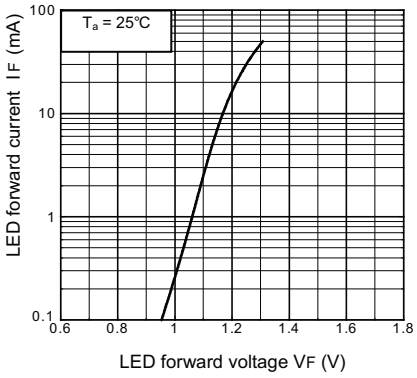
Continuous load current vs. Ambient temperature

IO - Ta



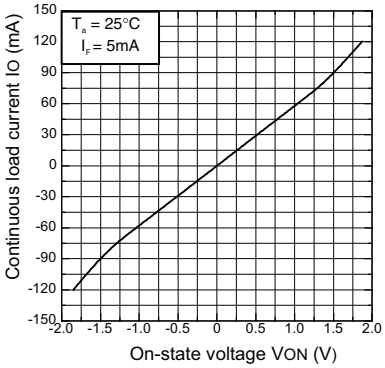
LED forward current vs. LED forward voltage

IF - VF



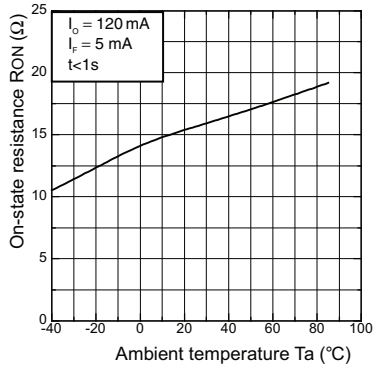
Continuous load current vs. On-state voltage

IO - VON



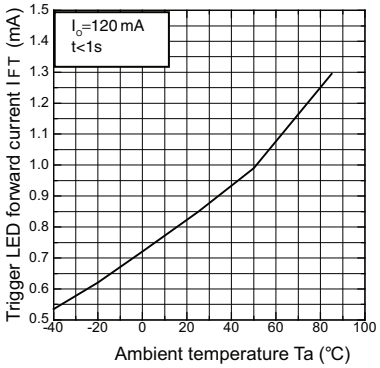
On-state resistance vs. Ambient temperature

RON - Ta



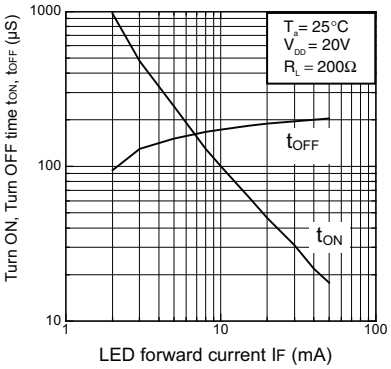
Trigger LED forward current vs. Ambient temperature

IFT - Ta



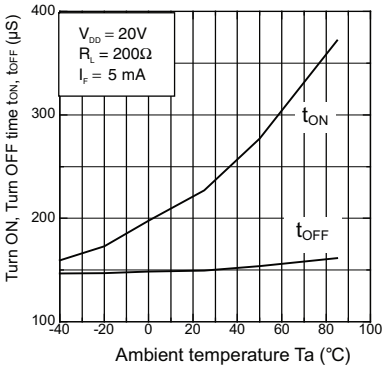
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



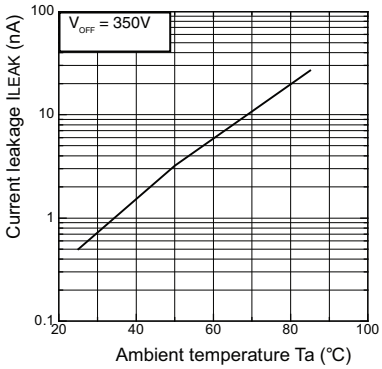
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta

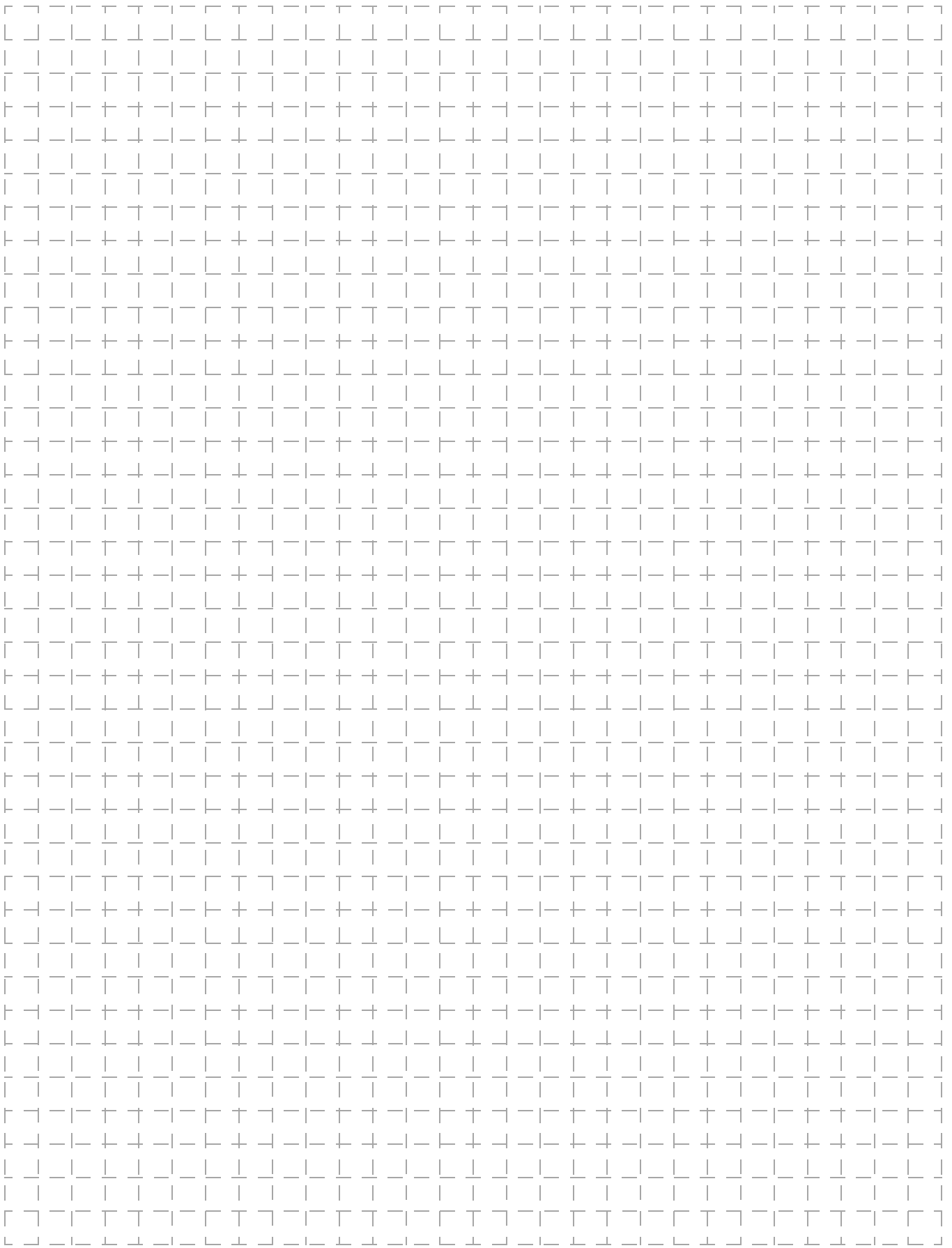


Current leakage vs. Ambient temperature

I LEAK - Ta



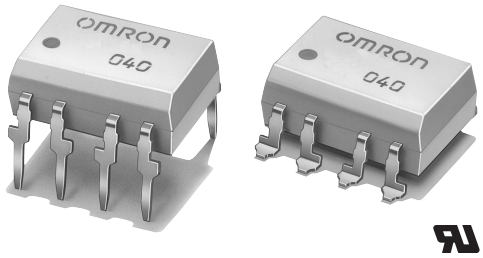
MEMO



MOS FET Relays
G3VM-354C/C1/F/F1

Analog-switching MOS FET Relay with DPST-NC Contacts. General-purpose models added.

- Switches minute analog signals.
- Switching AC and DC.
- General-purpose models (high ON resistance) added.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Electronic automatic exchange systems
- Security systems
- Datacom (modem) systems
- FA systems and Measurement devices

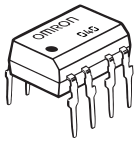
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NC	PCB terminals	350 VAC	**G3VM-354C**	50	---
			G3VM-354C1		
	Surface-mounting terminals		**G3VM-354F**		
			G3VM-354F1		
			G3VM-354F(TR)	---	1,500
			G3VM-354F1(TR)		

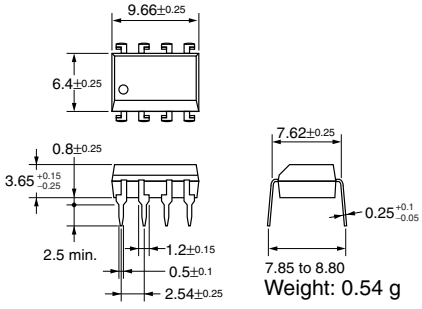
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-354C/C1

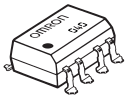


Note: The actual product is marked differently from the image shown here.

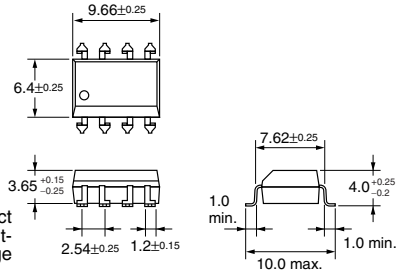


Weight: 0.54 g

G3VM-354F/F1



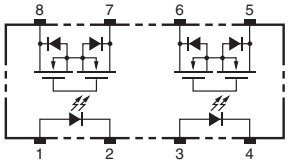
Note: The actual product is marked differently from the image shown here.



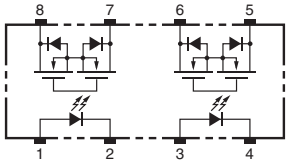
Weight: 0.54 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-354C/C1

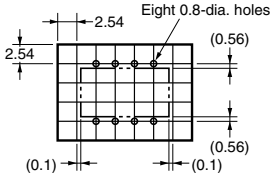


G3VM-354F/F1



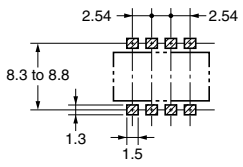
■ PCB Dimensions (Bottom View)

G3VM-354C/C1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-354F/F1



■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	350	V	
	Continuous load current (AC peak/DC)	I_O	150 (100)	mA	
	ON current reduction rate	ΔI_{ON}/°C	–1.5 (–1)	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Values in parentheses are for the G3VM-354C1/F1

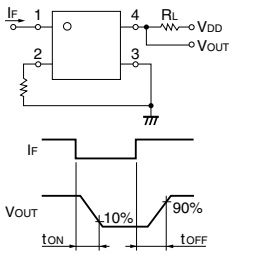
Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_{OFF} = 10 μA
Output	Maximum resistance with output ON	R_{ON}	---	15 (30)	25 (50)	Ω	I_O = 150 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.0105 (0.003)	1.0	μA	I_F = 5 mA, V_{OFF} = 350 V
	Capacity between terminals	C_{OFF}	---	85 (30)	---	pF	V = 0, f = 1MHz, I_F = 5 mA
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, R_{oH} ≤ 60%
Turn-ON time		t_{ON}	---	0.1 (0.25)	1.0 (0.5)	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	1.0 (0.5)	3.0(0.1)	ms	

Values in parentheses are for the G3VM-354C1/F1

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	---	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	150 (100)	mA
Operating temperature	T_a	– 20	---	65	°C

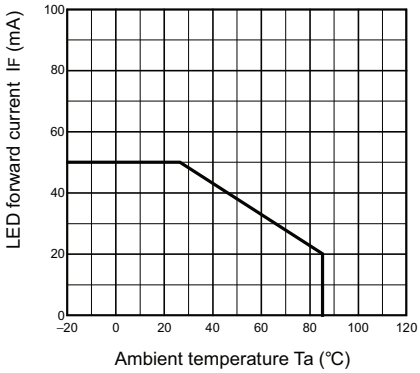
Values in parentheses are for the G3VM-354C1/F1

■ Engineering Data

G3VM-354C/F

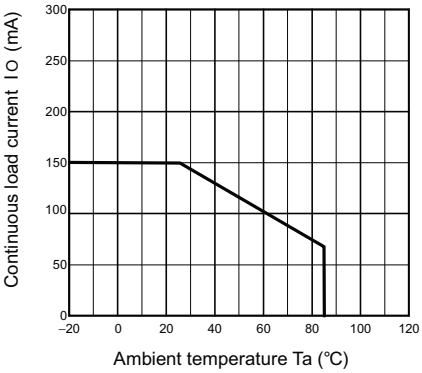
LED forward current vs. Ambient temperature

IF - Ta



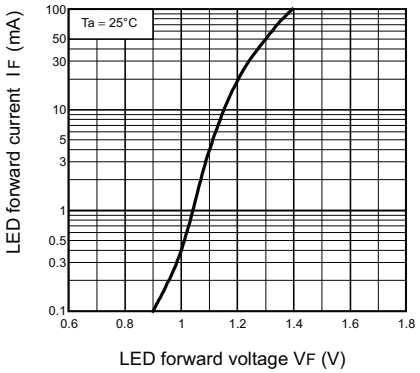
Continuous load current vs. Ambient temperature

IO - Ta



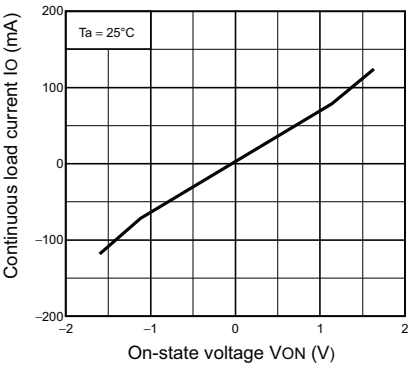
LED forward current vs. LED forward voltage

IF - VF



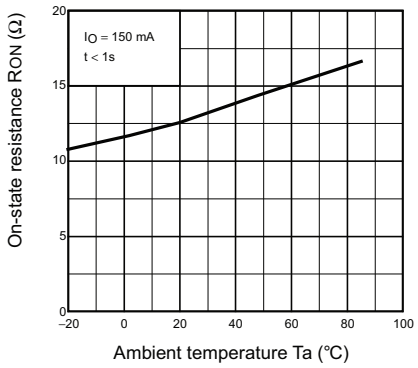
Continuous load current vs. On-state voltage

IO - VON



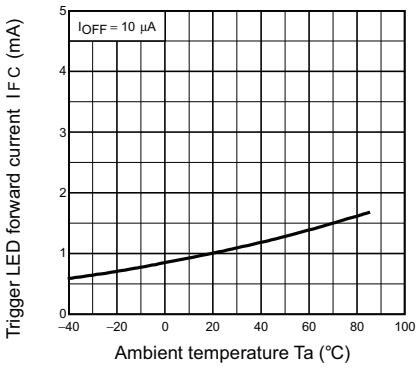
On-state resistance vs. Ambient temperature

RON - Ta



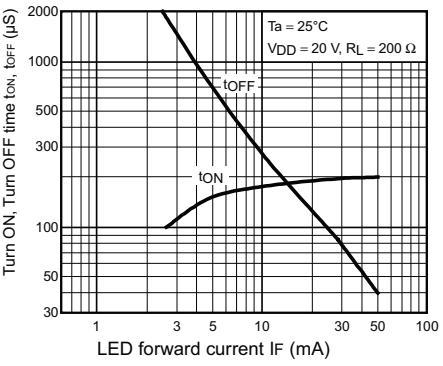
Trigger LED forward current vs. Ambient temperature

IFC - Ta



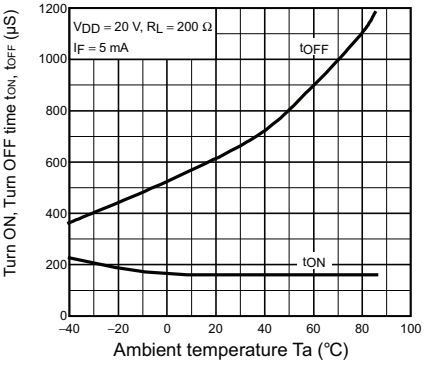
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



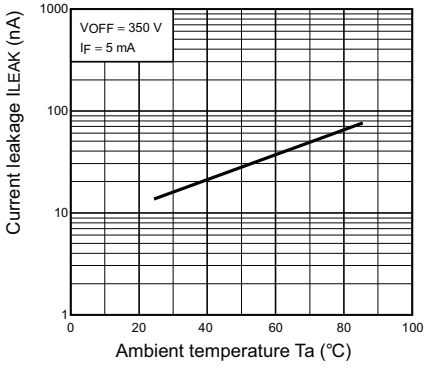
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



Current leakage vs. Ambient temperature

I LEAK - Ta

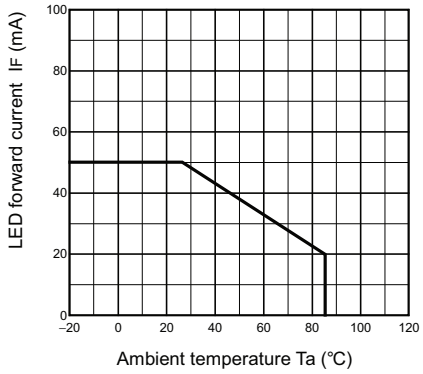


■ Engineering Data

G3VM-354C1/F1

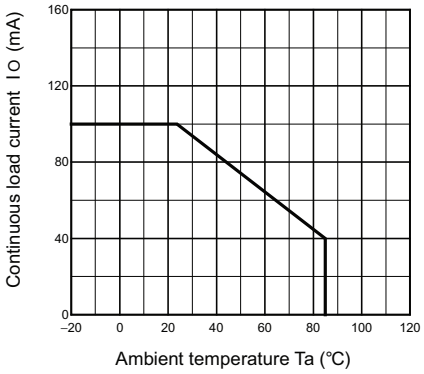
LED forward current vs. Ambient temperature

IF - Ta



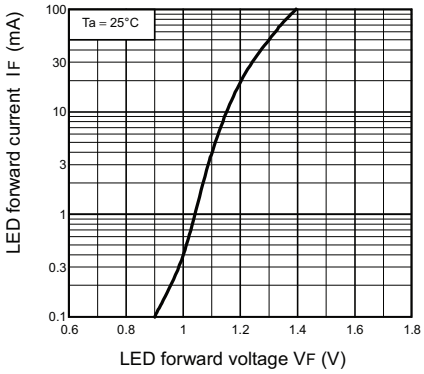
Continuous load current vs. Ambient temperature

IO - Ta



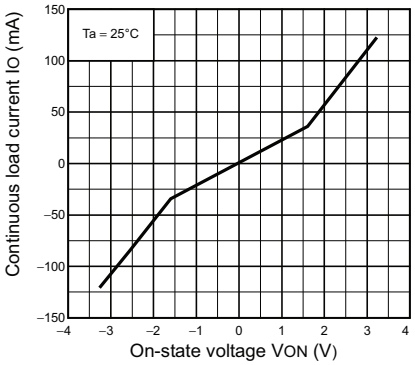
LED forward current vs. LED forward voltage

IF - VF



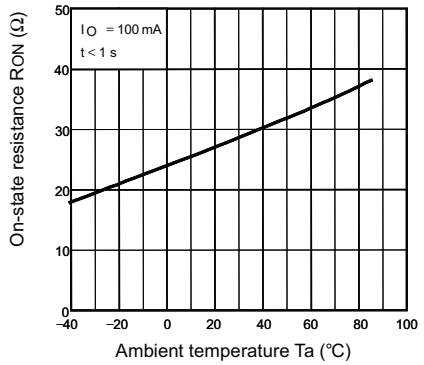
Continuous load current vs. On-state voltage

IO - VON



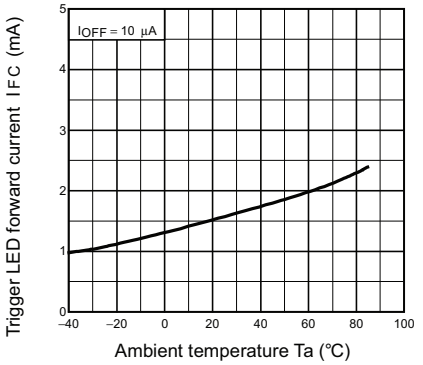
On-state resistance vs. Ambient temperature

RON - Ta



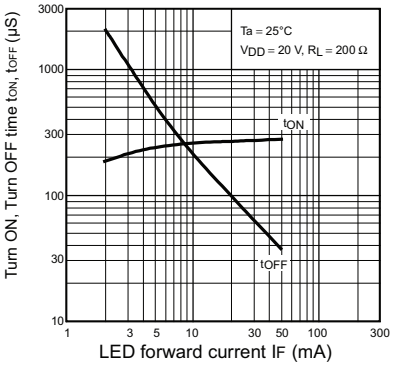
Trigger LED forward current vs. Ambient temperature

IFC - Ta



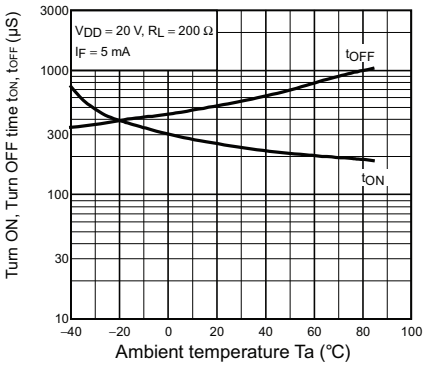
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



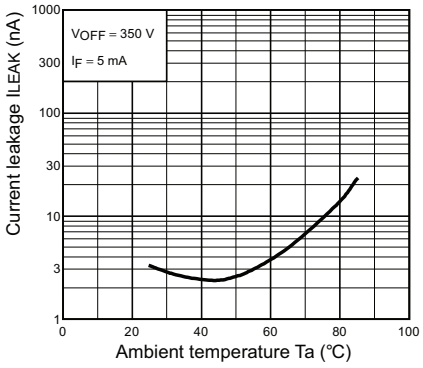
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



Current leakage vs. Ambient temperature

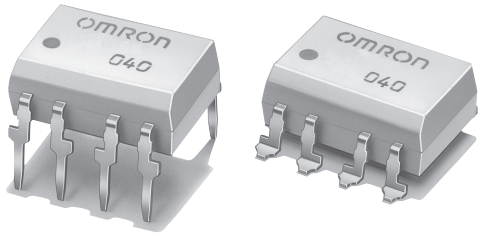
I LEAK - Ta



MOS FET Relays
G3VM-355C/CR/F/FR

MOS FET Relay with Both SPST-NO and SPST-NC Contacts Incorporated in a Single DIP Package. General-purpose Models Added.

- SPST-NO/SPST-NC models included in the 350-V load series.
- Continuous load current of 120 mA.
- Dielectric strength of 2,500 Vrms between I/O.
- General-purpose models (high ON resistance) added.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Measurement devices
- Security systems
- Amusement machines

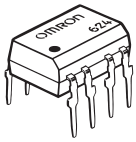
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO/ SPST-NC	PCB terminals	350 VAC	**G3VM-355CR**	50	---
			G3VM-355C		
	Surface-mounting terminals		**G3VM-355FR**		
			G3VM-355F		
			G3VM-355FR(TR)	---	1,500
			G3VM-355F(TR)		

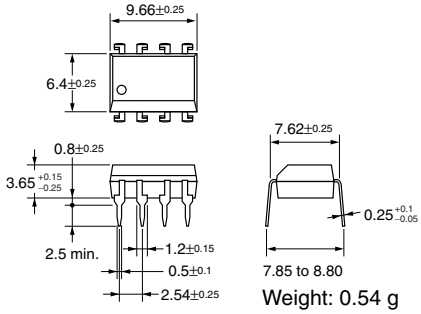
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-355C/CR

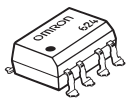


Note: The actual product is marked differently from the image shown here.

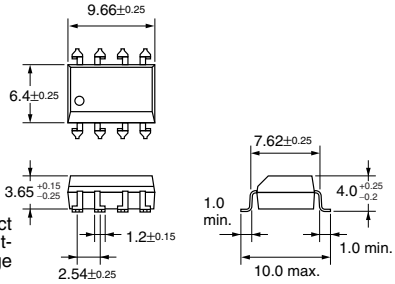


Weight: 0.54 g

G3VM-355F/FR



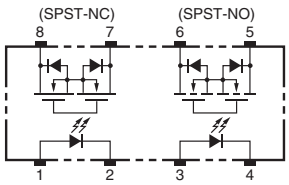
Note: The actual product is marked differently from the image shown here.



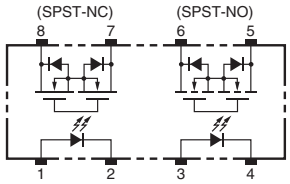
Weight: 0.54 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-355C/CR

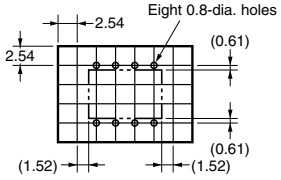


G3VM-355F/FR



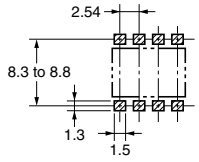
■ PCB Dimensions (Bottom View)

G3VM-355C/CR



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-355F/FR



■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	350	V	
	Continuous load current (AC peak/DC)	I_O	120 (100)	mA	
	ON current reduction rate	ΔI_{ON}/°C	–1.2 (–1)	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Values in parentheses are for the G3VM-355C/F

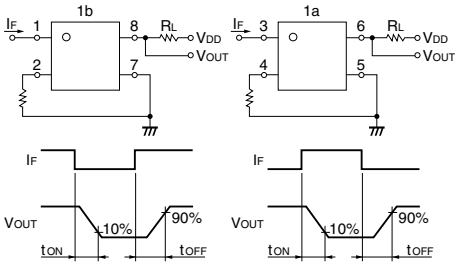
Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1	3	mA	SPST-NO: I_O = 120 mA (100 mA)
								SPST-NC: I_{OFF} = 10 μA
Output	Maximum resistance with output ON		R_{ON}	---	15 (40)	25 (50)	Ω	SPST-NO: I_F = 5 mA, I_O = 120 mA (100 mA)
								SPST-NC: I_F = 0 mA, I_O = 120 mA (100 mA)
	Current leakage when the relay is open		I_{LEAK}	---	0.0015 NO (0.006) 0.0105 NC (0.003)	1.0	μA	V_{OFF} = 350 V
	Capacity between terminals		C_{OFF}	---	65 (30)	---	pF	V = 0, f = 1MHz (NO) V = 0, f = 1MHz, I_F = 5 mA (NC)
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, R_{oH} ≤ 60%
Turn-ON time		SPST-NO	t_{ON}	---	0.18 (0.3)	1.0 (1.0)	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
		SPST-NC		---	0.15 (0.25)	1.0 (1.0)	ms	
Turn-OFF time		SPST-NO	t_{OFF}	---	0.11 (0.15)	1.0 (1.0)	ms	
		SPST-NC		---	0.7 (0.5)	3.0 (1.0)	ms	

Values in parentheses are for the G3VM-355C/F

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	---	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	120 (100)	mA
Operating temperature	T_a	– 20	---	65	°C

Values in parentheses are for the G3VM-355C/F

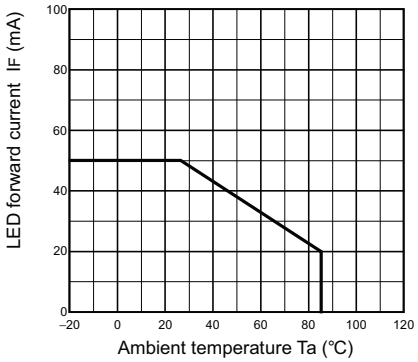
■ Engineering Data

G3VM-355C/F

Common Characteristics; SPST-NO / SPST-NC

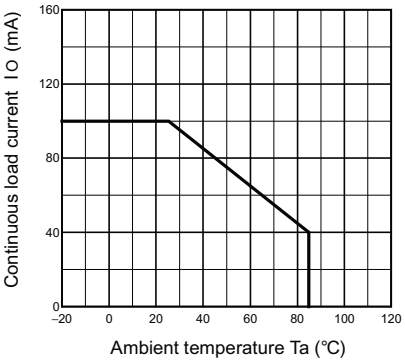
LED forward current vs. Ambient temperature

I_F - Ta



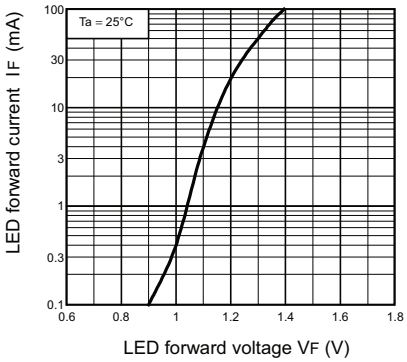
Continuous load current vs. Ambient temperature

I_O - Ta



LED forward current vs. LED forward voltage

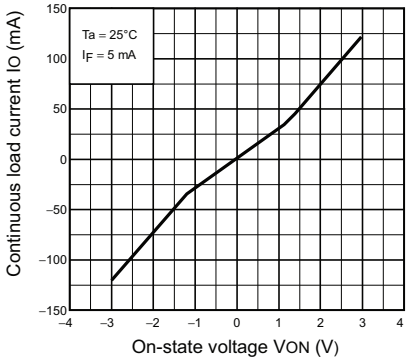
I_F - V_F



Characteristics; SPST-NO

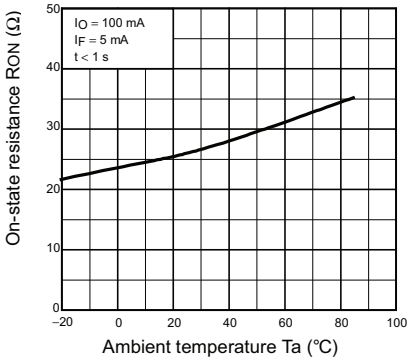
Continuous load current vs. On-state voltage

I_O - V_{ON}



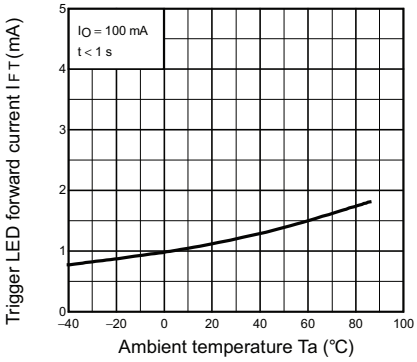
On-state resistance vs. Ambient temperature

R_{ON} - Ta



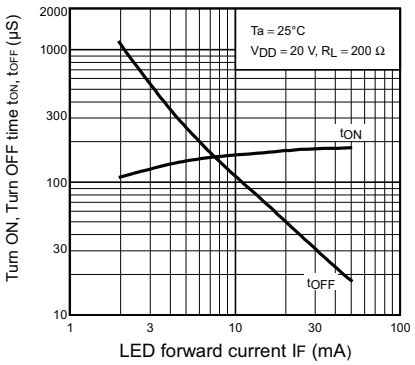
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



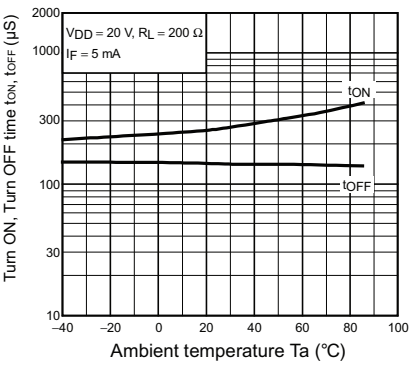
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



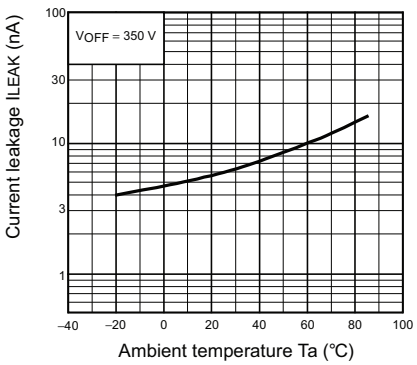
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



Current leakage vs. Ambient temperature

I_{LEAK} – Ta



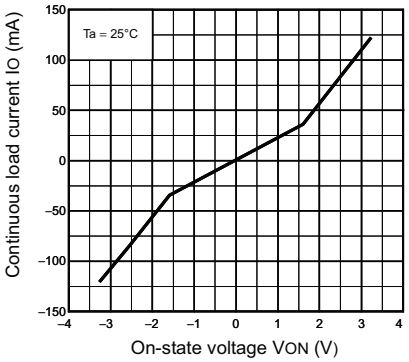
■ Engineering Data

G3VM-355C/F (continued)

Characteristics; SPST-NC

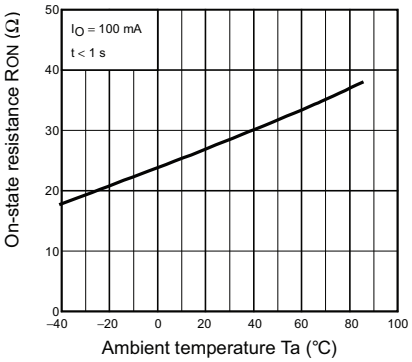
Continuous load current vs. On-state voltage

I_O - V_{ON}



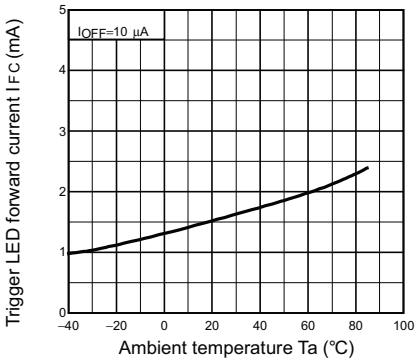
On-state resistance vs. Ambient temperature

R_{ON} - Ta



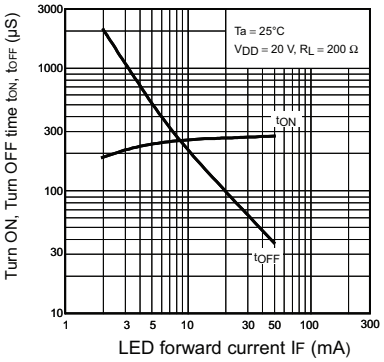
Trigger LED forward current vs. Ambient temperature

I_{FC} - Ta



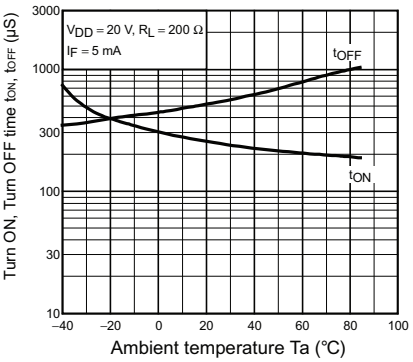
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



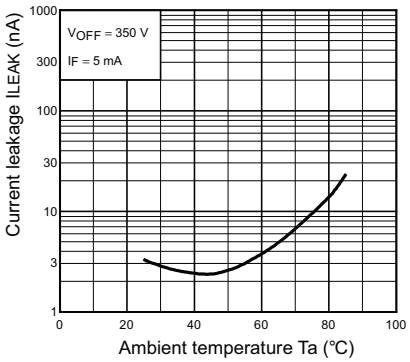
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



Current leakage vs. Ambient temperature

I_{LEAK} – Ta



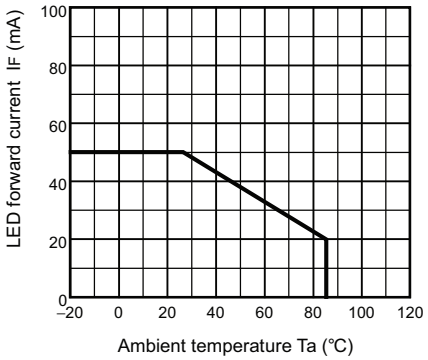
■ Engineering Data

G3VM-355CR/FR

Common Characteristics; SPST-NO / SPST-NC

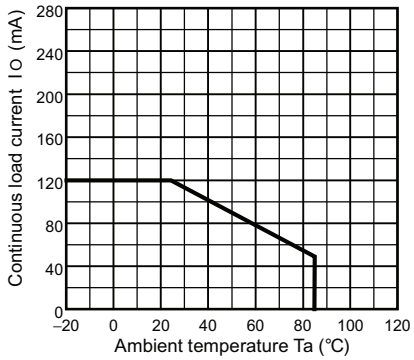
LED forward current vs. Ambient temperature

I_F - Ta



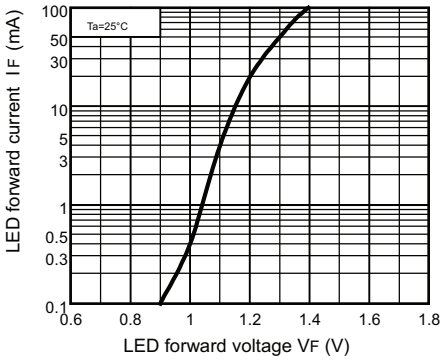
Continuous load current vs. Ambient temperature

I_O - Ta



LED forward current vs. LED forward voltage

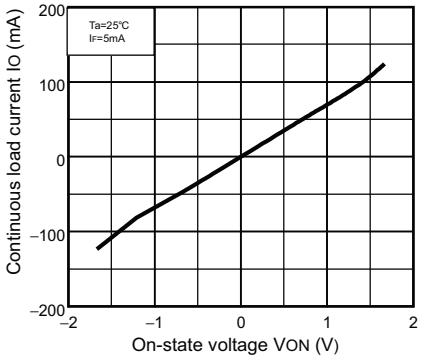
I_F - V_F



Characteristics; SPST-NO

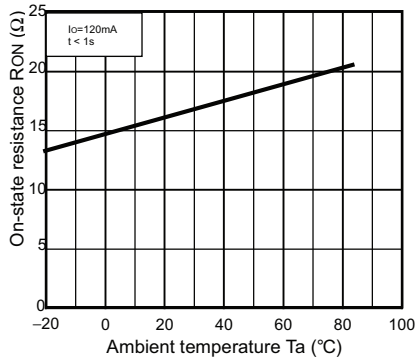
Continuous load current vs. On-state voltage

I_O - V_{ON}



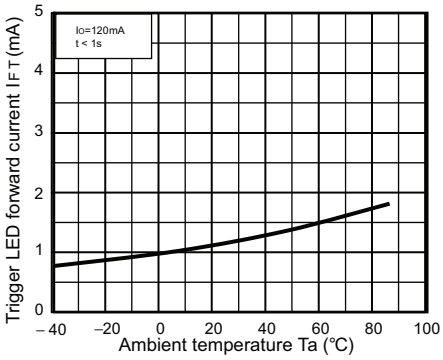
On-state resistance vs. Ambient temperature

R_{ON} - Ta



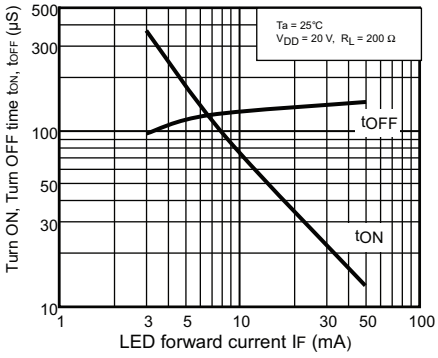
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



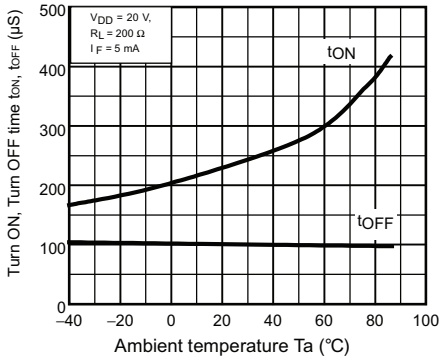
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



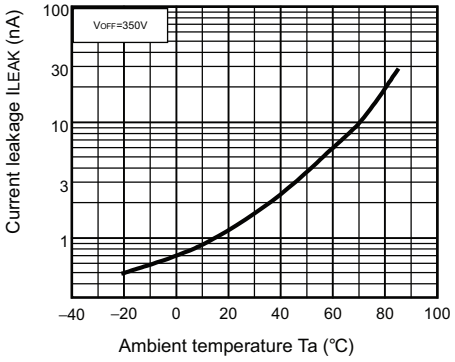
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



Current leakage vs. Ambient temperature

I_{LEAK} – Ta



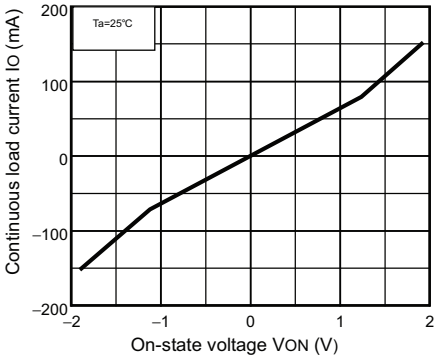
■ Engineering Data

G3VM-355CR/FR (continued)

Characteristics; SPST-NC

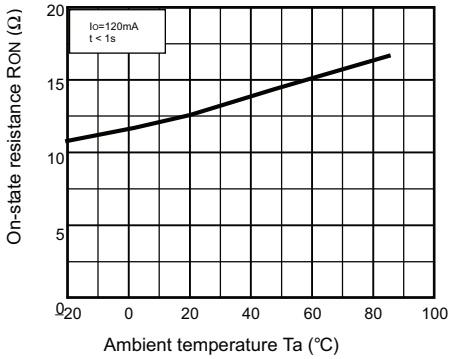
Continuous load current vs. On-state voltage

I_O - V_{ON}



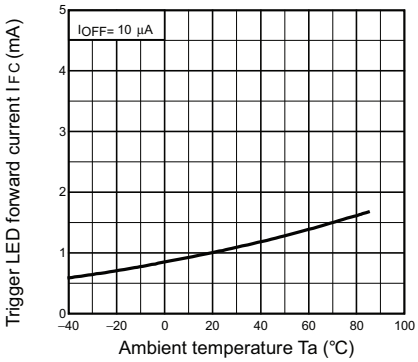
On-state resistance vs. Ambient temperature

R_{ON} - Ta



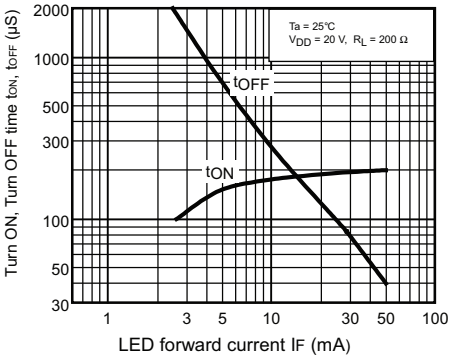
Trigger LED forward current vs. Ambient temperature

I_{FC} - Ta



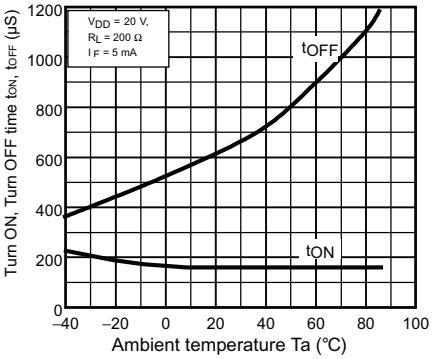
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



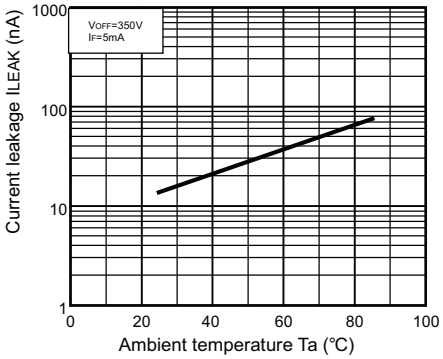
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



Current leakage vs. Ambient temperature

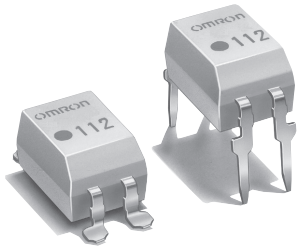
I_{LEAK} – Ta



MOS FET Relays
G3VM-401A/D

Analog-switching MOS FET Relays with 400-V Load Voltage

- A 4-pin Relay in the 400-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 2,500 Vrms between I/O.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Measurement devices
- Security systems
- Amusement machines

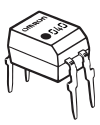
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	400 VAC	**G3VM-401A**	100	---
	Surface-mounting terminals		**G3VM-401D**		
			G3VM-401D(TR)	---	1,500

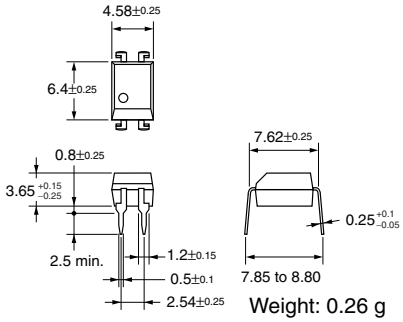
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-401A



Note: The actual product is marked differently from the image shown here.

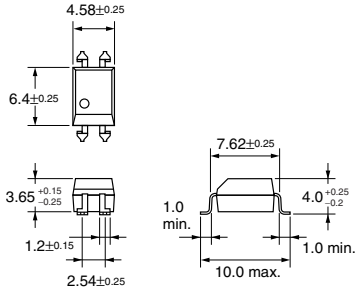


Weight: 0.26 g

G3VM-401D



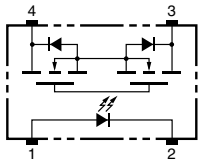
Note: The actual product is marked differently from the image shown here.



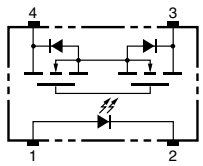
Weight: 0.26 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-401A

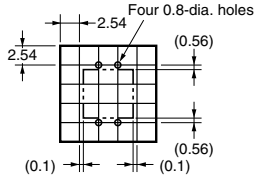


G3VM-401D



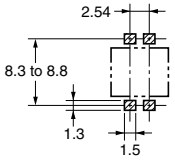
■ PCB Dimensions (Bottom View)

G3VM-401A



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-401D



■ Absolute Maximum Ratings (Ta = 25°C)

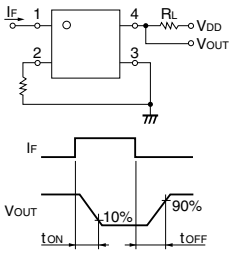
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	400	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.2	mA/°C	Ta ≥ 25°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	18	35	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.0008	1.0	μA	V_{OFF} = 400 V
	Capacity between terminals	C_{OFF}	---	40	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, R_{oH} ≤ 60%
Turn-ON time		t_{ON}	---	0.4	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.09	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

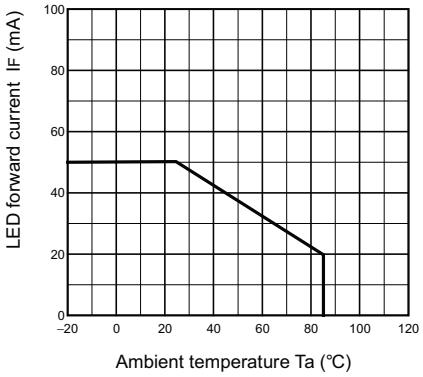
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	320	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

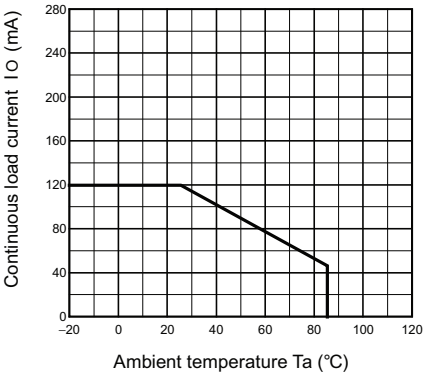
LED forward current vs. Ambient temperature

I_F - Ta



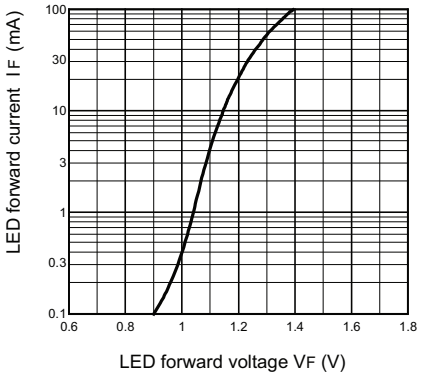
Continuous load current vs. Ambient temperature

I_O - Ta



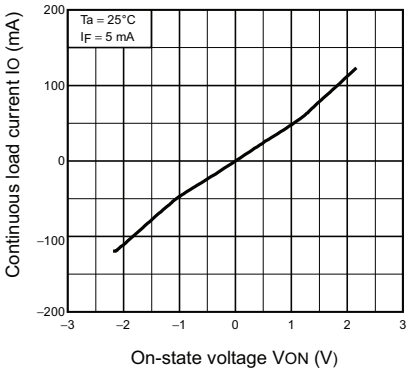
LED forward current vs. LED forward voltage

I_F - V_F



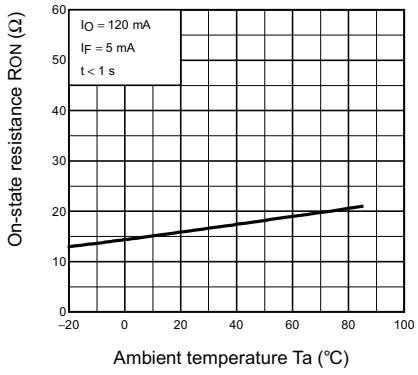
Continuous load current vs. On-state voltage

I_O - V_{ON}



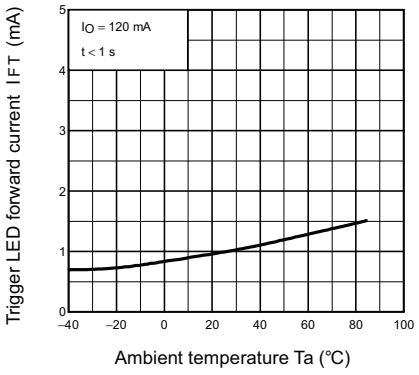
On-state resistance vs. Ambient temperature

R_{ON} - Ta



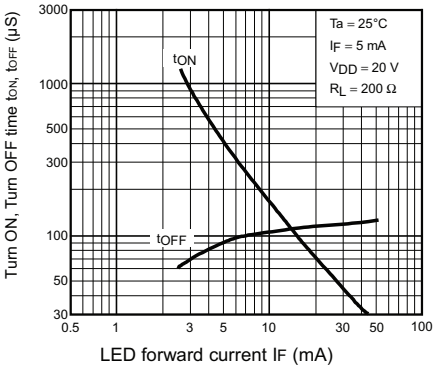
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



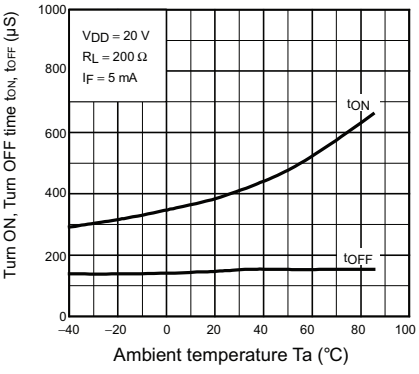
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



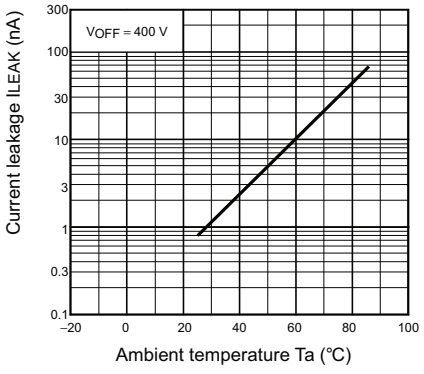
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

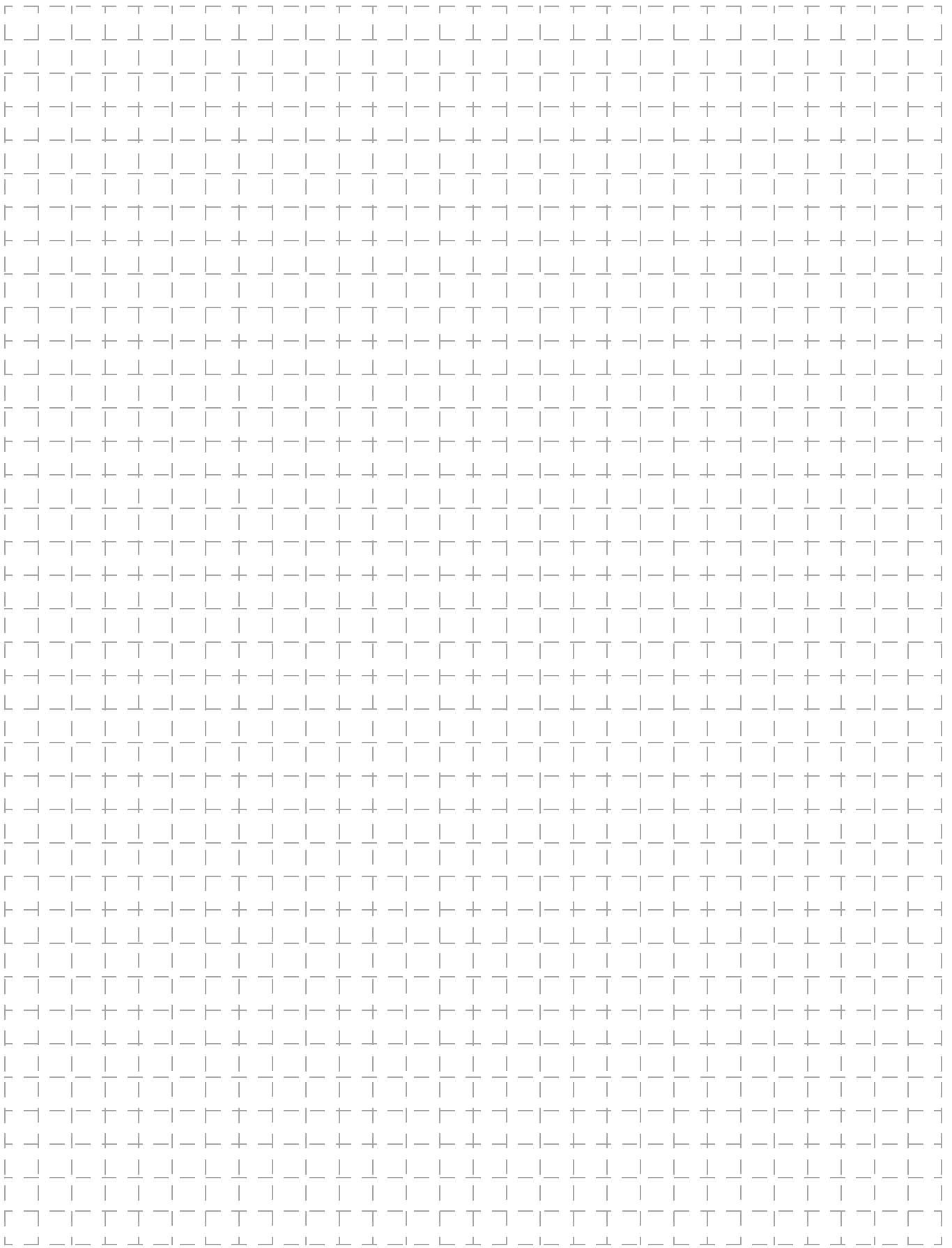


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



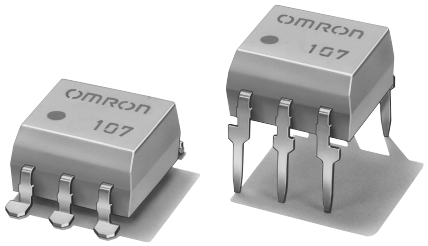
MEMO



MOS FET Relays
G3VM-401B/E

Analog-switching MOS FET Relays with Dielectric Strength of 2.5 kVAC between I/O Using Optical Isolation

- Switches minute analog signals.
- Leakage current of 1 μA max. (0.8 nA typ.) when relay is open.
- Upgraded G3VM-4N Series.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Electronic automatic exchange systems
- Measurement devices
- FA systems

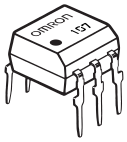
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	400 VAC	**G3VM-401B**	50	---
	Surface-mounting terminals		**G3VM-401E**		
			G3VM-401E(TR)	---	1,500

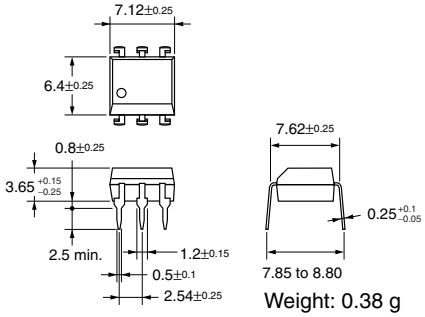
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-401B



Note: The actual product is marked differently from the image shown here.

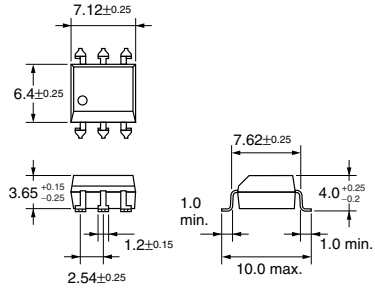


Weight: 0.38 g

G3VM-401E



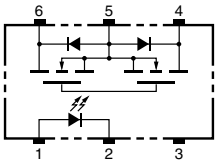
Note: The actual product is marked differently from the image shown here.



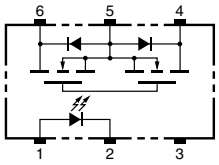
Weight: 0.38 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-401B

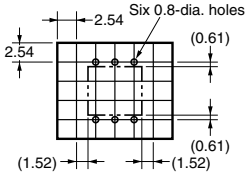


G3VM-401E



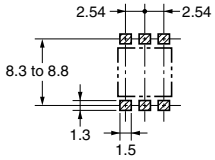
■ PCB Dimensions (Bottom View)

G3VM-401B



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-401E

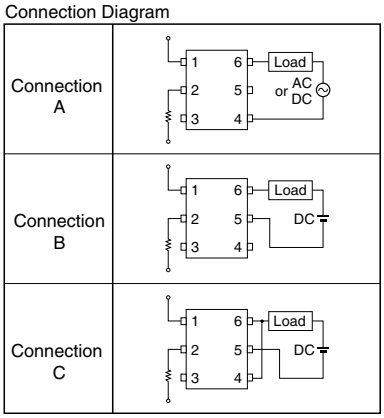


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		ΔI_F/°C	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Load voltage (AC peak/DC)		V_{OFF}	400	V	
	Continuous load current	Connection A	I_O	120	mA	
		Connection B		120		
		Connection C		240		
	ON current reduction rate	Connection A	ΔI_{ON}/°C	−1.2	mA/°C	Ta ≥ 25°C
		Connection B		−1.2		
		Connection C		−2.4		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature			T_a	−40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

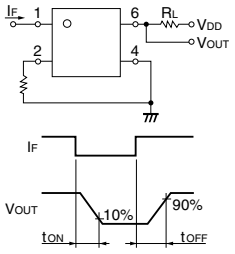
Connection Diagram



■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	17	35	Ω	I_F = 5 mA, I_O = 120 mA
		Connection B		---	11	20	Ω	I_F = 5 mA, I_O = 120 mA
		Connection C		---	6	10	Ω	I_F = 5 mA, I_O = 240 mA
	Current leakage when the relay is open		I_{LEAK}	---	0.0008	1.0	μA	V_{OFF} = 350 V
	Capacity between terminals A Connection		C_{OFF}	---	40	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, R_{oH} ≤ 60%
Turn-ON time			t_{ON}	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			t_{OFF}	---	0.1	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

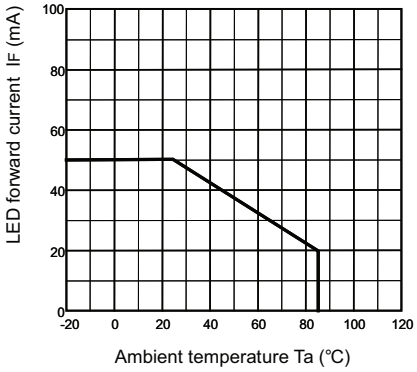
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	320	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	120	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

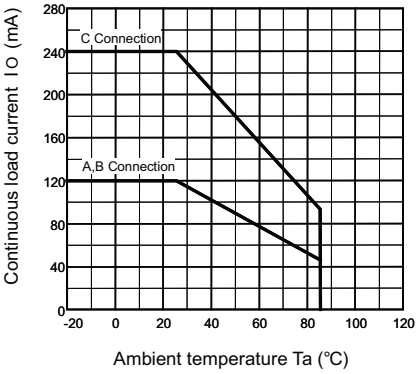
LED forward current vs. Ambient temperature

I_F - Ta



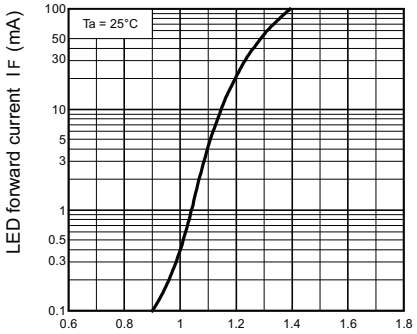
Continuous load current vs. Ambient temperature

I_O - Ta



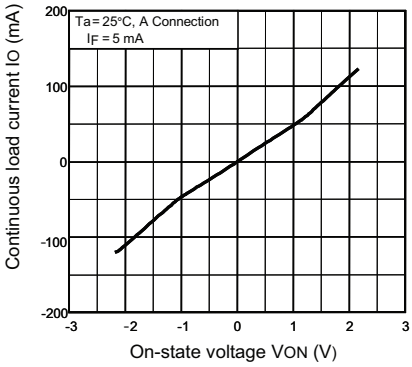
LED forward current vs. LED forward voltage

I_F - V_F



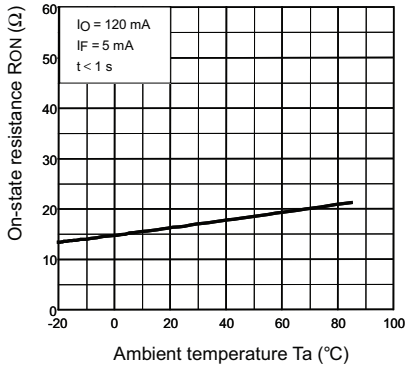
Continuous load current vs. On-state voltage

I_O - V_{ON}



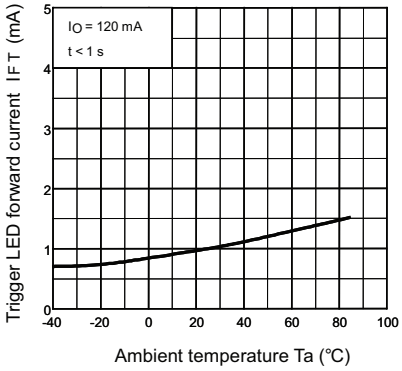
On-state resistance vs. Ambient temperature

R_{ON} - Ta



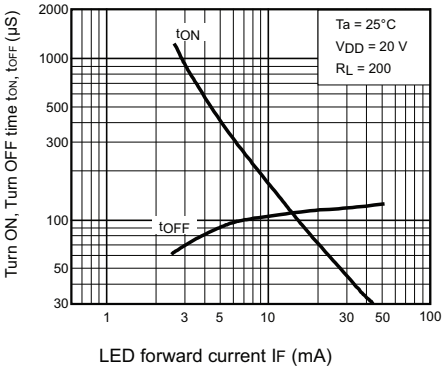
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



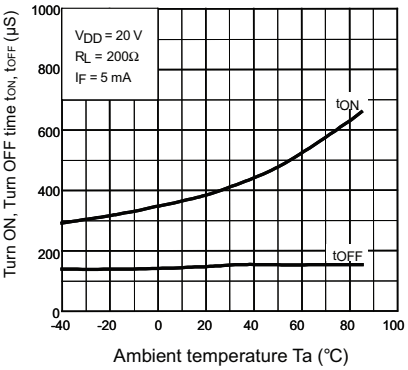
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



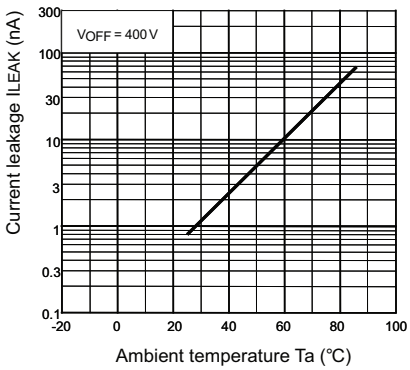
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

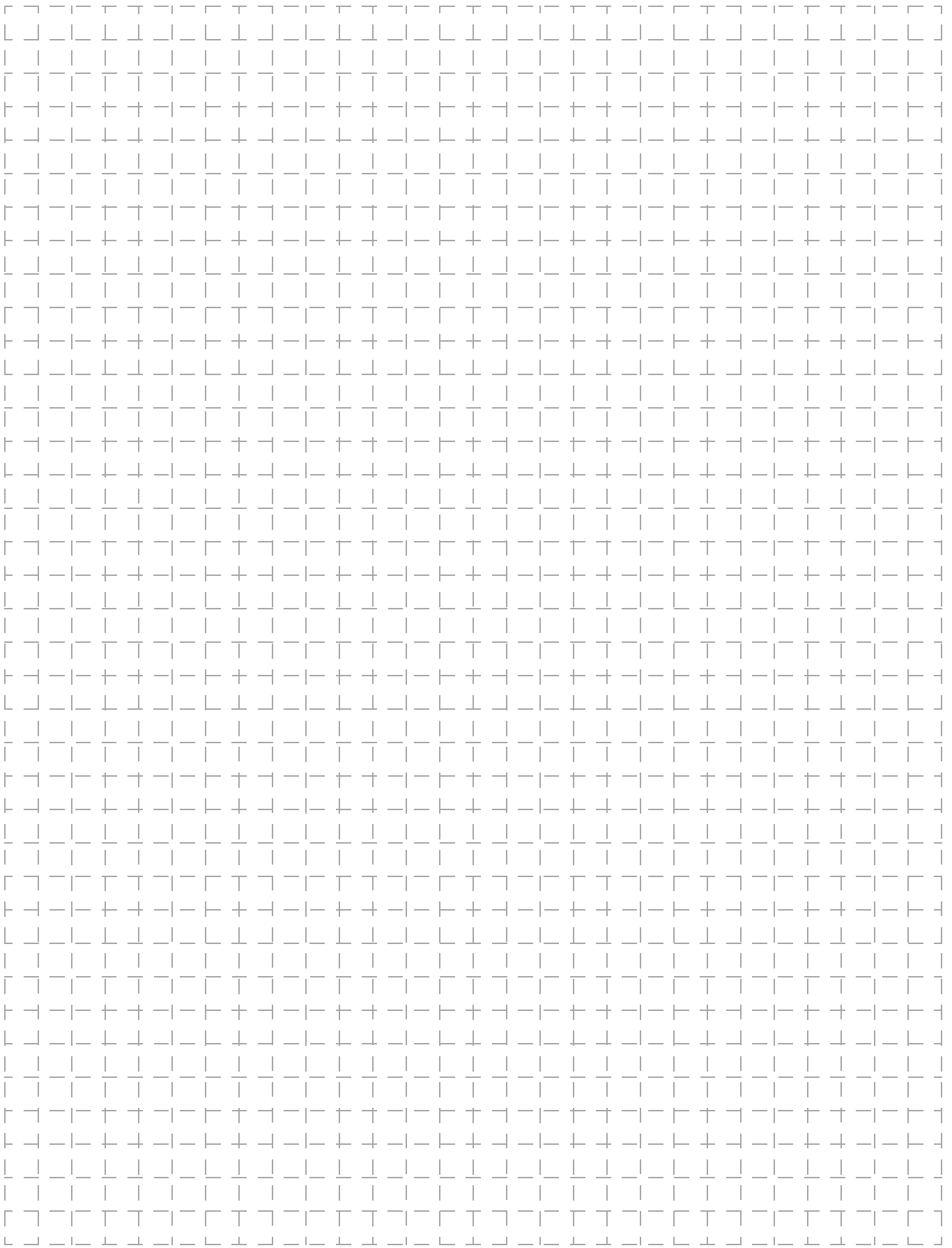


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



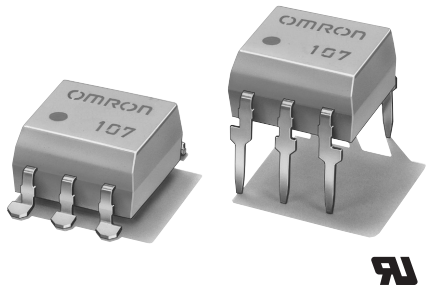
MEMO



MOS FET Relays
G3VM-401BY/EY

Analog-switching MOS FET Relay with Dielectric Strength of 5 kVAC between I/O Using Optical Isolation.

- Switches minute analog signals.
- Leakage current of 1 μA max. when output relay is open.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Electronic automatic exchange systems
- Measurement devices
- FA systems

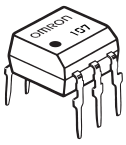
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	400 VAC	**G3VM-401BY**	50	---
	Surface-mounting terminals		**G3VM-401EY**		
			G3VM-401EY(TR)	---	1,500

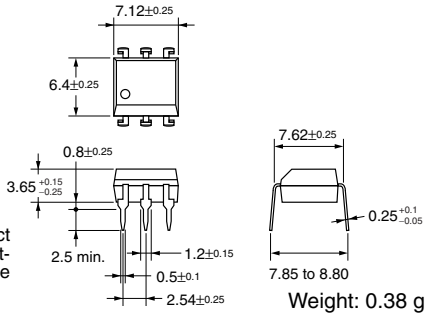
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-401BY

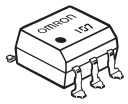


Note: The actual product is marked differently from the image shown here.

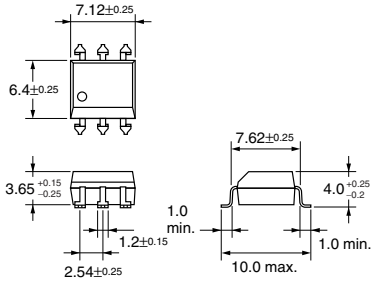


Weight: 0.38 g

G3VM-401EY



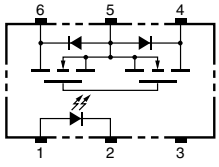
Note: The actual product is marked differently from the image shown here.



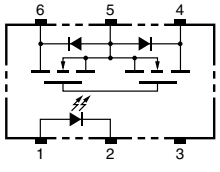
Weight: 0.38 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-401BY

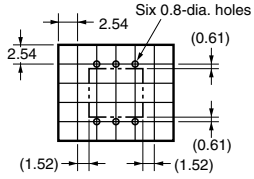


G3VM-401EY



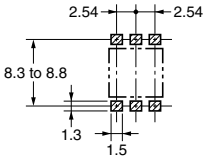
■ PCB Dimensions (Bottom View)

G3VM-401BY



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-401EY

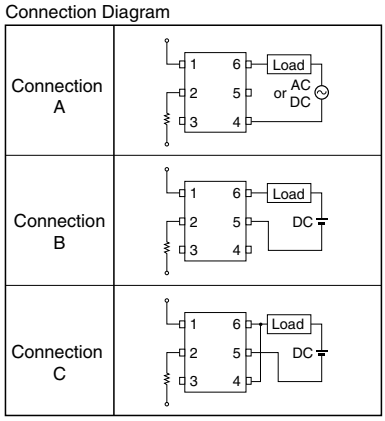


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		ΔI_F/°C	–0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Load voltage (AC peak/DC)		V_{OFF}	400	V	
	Continuous load current	Connection A	I_O	120	mA	
		Connection B		120		
		Connection C		240		
	ON current reduction rate	Connection A	ΔI_{ON}/°C	–1.2	mA/°C	Ta ≥ 25°C
		Connection B		–1.2		
		Connection C		–2.4		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	5,000	V_{rms}	AC for 1 min
Operating temperature			T_α	–40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

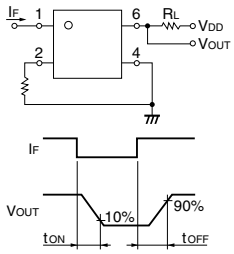
Connection Diagram



■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	---	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	17	35	Ω	I_F = 5 mA, I_O = 120 mA
		Connection B		---	11	20	Ω	I_F = 5 mA, I_O = 120 mA
		Connection C		---	6	10	Ω	I_F = 5 mA, I_O = 240 mA
	Current leakage when the relay is open		I_{LEAK}	---	0.0004	1.0	μA	V_{OFF} = 400 V
	Capacity between terminals A Connection		C_{OFF}	---	40	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, R_{oH} ≤ 60%
Turn-ON time			t_{ON}	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			t_{OFF}	---	0.1	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

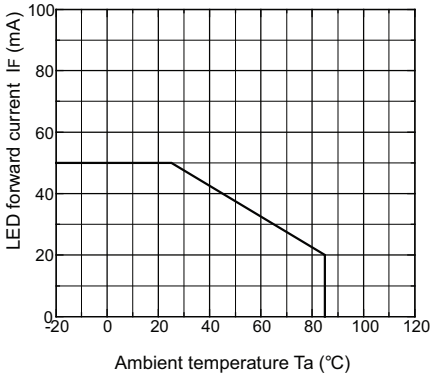
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	$V_{\Delta\Delta}$	---	---	320	V
Operating LED forward current	I_Φ	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	120	mA
Operating temperature	T_α	– 20	---	65	°C

■ Engineering Data

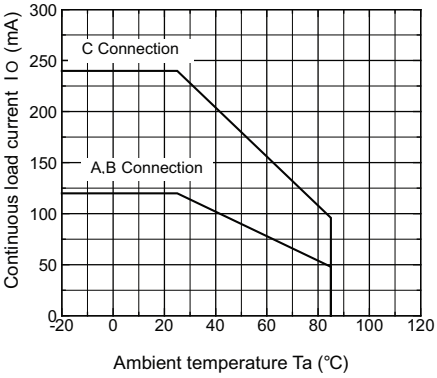
LED forward current vs. Ambient temperature

IF - Ta



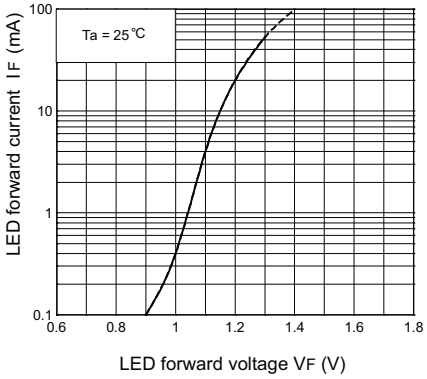
Continuous load current vs. Ambient temperature

IO - Ta



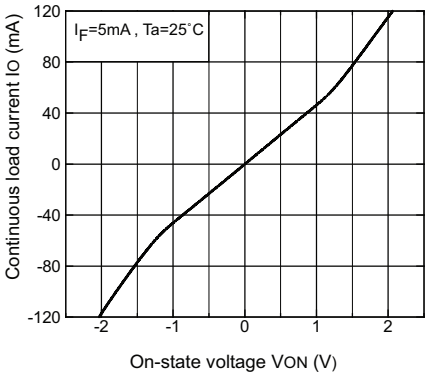
LED forward current vs. LED forward voltage

IF - VF



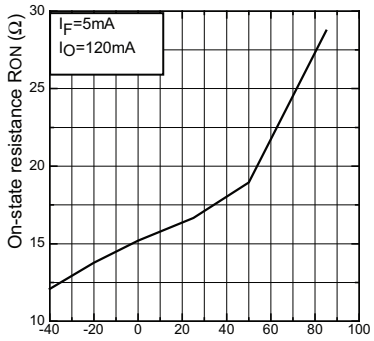
Continuous load current vs. On-state voltage

IO - VON



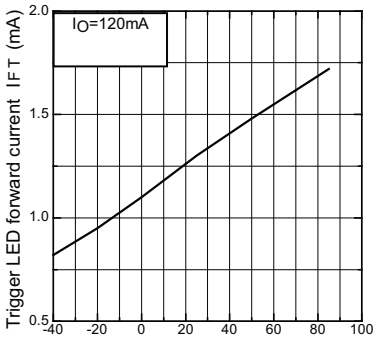
On-state resistance vs. Ambient temperature

RON - Ta



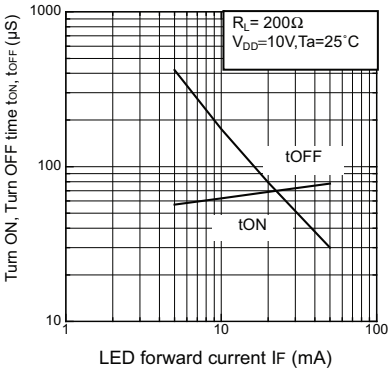
Trigger LED forward current vs. Ambient temperature

IFT - Ta



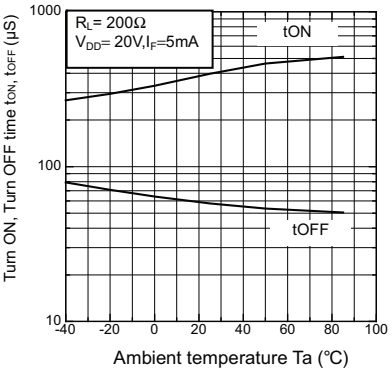
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



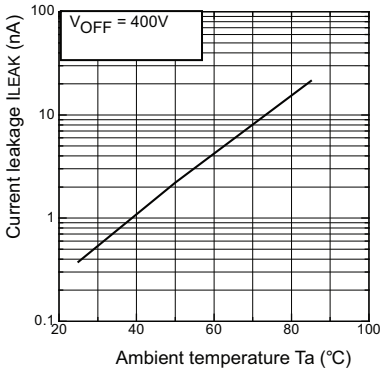
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta

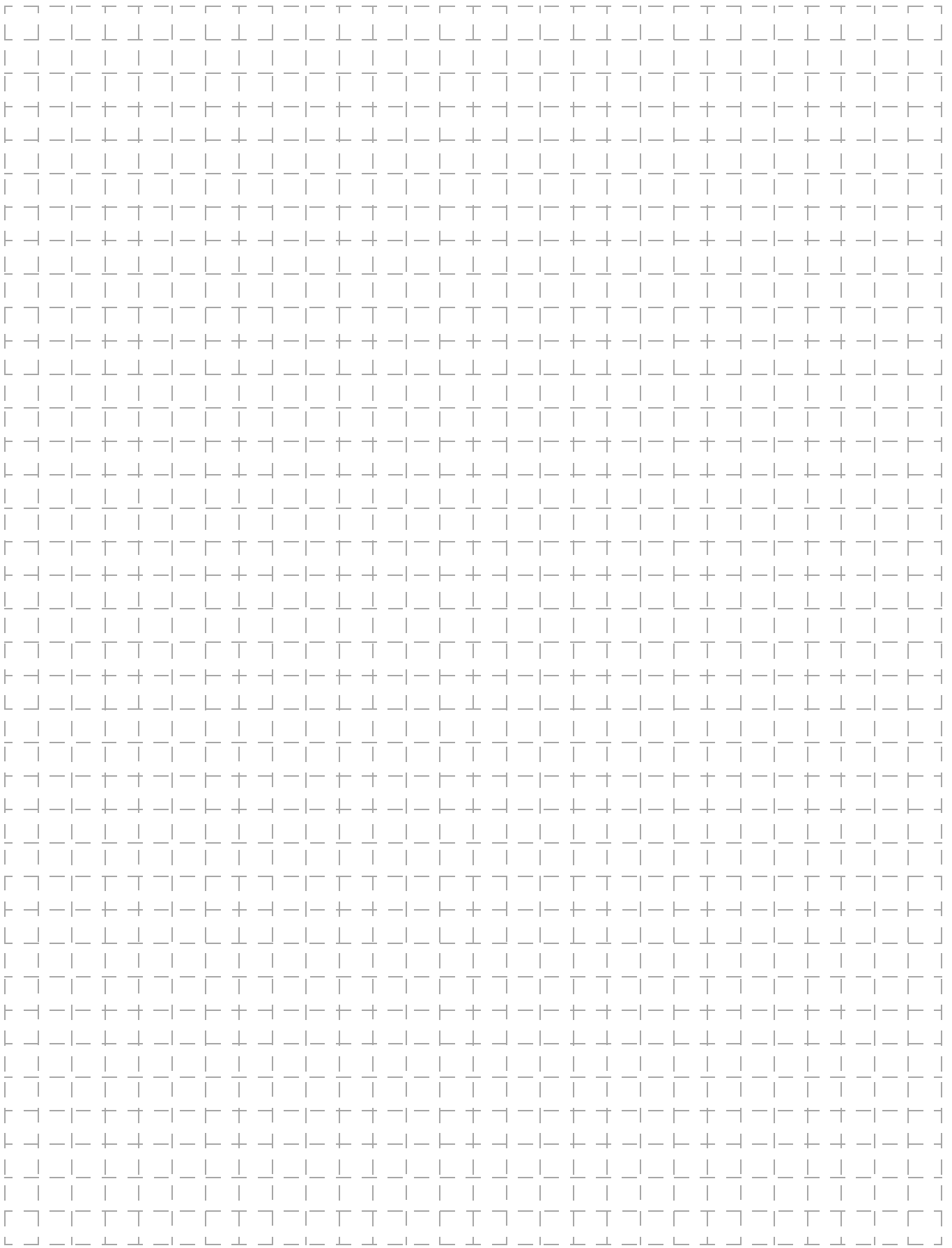


Current leakage vs. Ambient temperature

I LEAK - Ta



MEMO



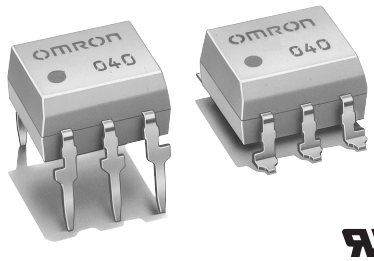
MOS FET Relays
G3VM-601BY/EY

Analog-switching MOS FET Relay with a Dielectric Strength of 5 kVAC between I/O Using Optical Isolation

- Switches minute AC and DC analog signals.
- Peak load voltage of 600 V.
- Dielectric strength of 5 kVAC between I/O.
- RoHS Compliant.

■ Application Examples

- Electronic automatic exchange systems
- FA systems
- Measurement devices
- Security systems



Note: The actual product is marked differently from the image shown here.

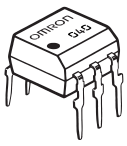
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	PCB terminals	600 VAC	**G3VM-601BY**	50	---
	Surface-mounting terminals		**G3VM-601EY**		
			G3VM-601EY(TR)	---	1,500

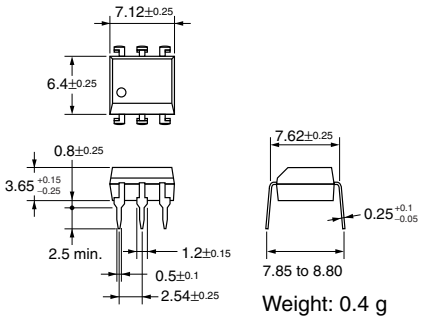
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-601BY

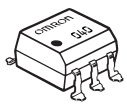


Note: The actual product is marked differently from the image shown here.

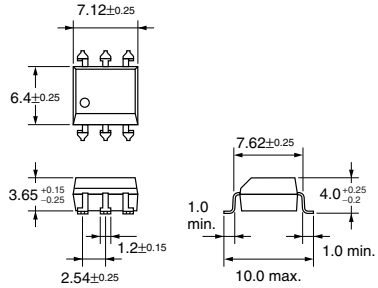


Weight: 0.4 g

G3VM-601EY



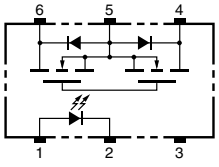
Note: The actual product is marked differently from the image shown here.



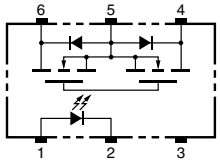
Weight: 0.4 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-601BY

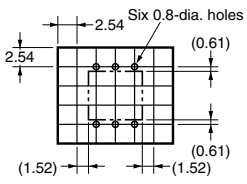


G3VM-601EY



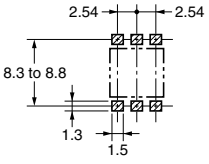
■ PCB Dimensions (Bottom View)

G3VM-601BY



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-601EY

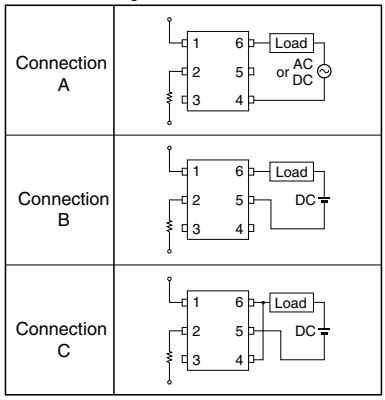


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		ΔI_F/°C	−0.5	mA/°C	Ta ≥ 25°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Load voltage (AC peak/DC)		V_{OFF}	600	V	
	Continuous load current	Connection A	I_O	100	mA	
		Connection B		100		
		Connection C		200		
	ON current reduction rate	Connection A	ΔI_{ON}/°C	−1.0	mA/°C	Ta ≥ 25°C
		Connection B		−1.0		
		Connection C		−2.0		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	5,000	V_{rms}	AC for 1 min
Operating temperature			T_a	−40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

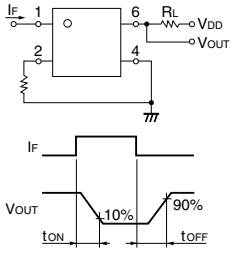
Connection Diagram



■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1.6	5	mA	I_O = 100 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	25	35	Ω	I_F = 10 mA, I_O = 100 mA, t < 1 s
				---	30	45	Ω	I_F = 10 mA, I_O = 100 mA
		Connection B		---	23	35	Ω	I_F = 10 mA, I_O = 100 mA
		Connection C		---	12	18	Ω	I_F = 10 mA, I_O = 200 mA
	Current leakage when the relay is open		I_{LEAK}	---	0.0005	1.0	μA	V_{OFF} = 600 V
	Capacity between terminals A Connection		C_{OFF}	---	120	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, R_{oH} ≤ 60%
Turn-ON time			t_{ON}	---	0.2	1.5	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			t_{OFF}	---	0.2	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

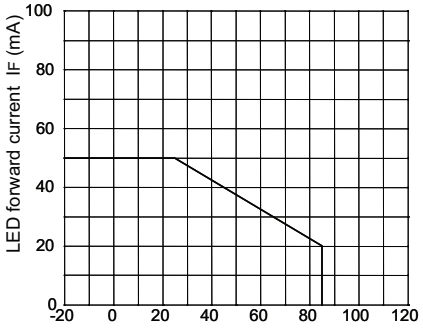
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	480	V
Operating LED forward current	I_F	7.5	15	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

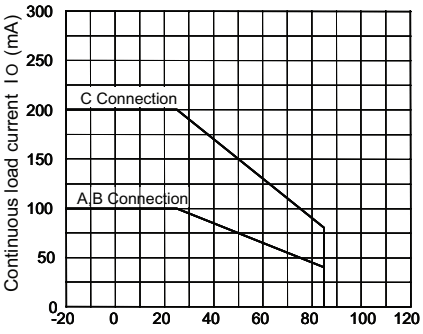
LED forward current vs. Ambient temperature

IF - Ta



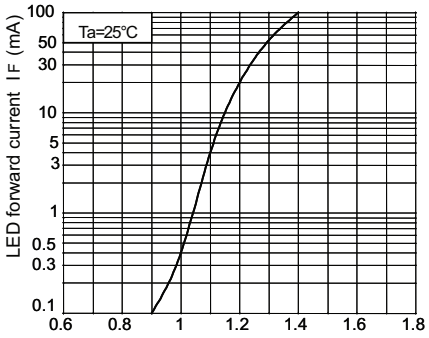
Continuous load current vs. Ambient temperature

IO - Ta



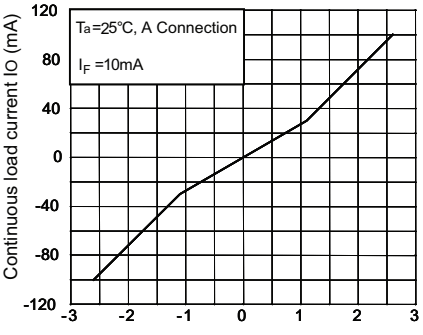
LED forward current vs. LED forward voltage

IF - VF



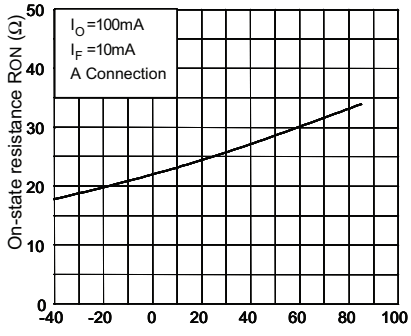
Continuous load current vs. On-state voltage

IO - VON



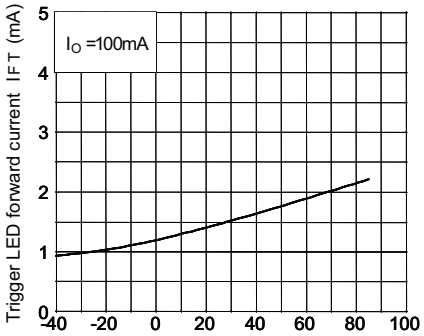
On-state resistance vs. Ambient temperature

RON - Ta



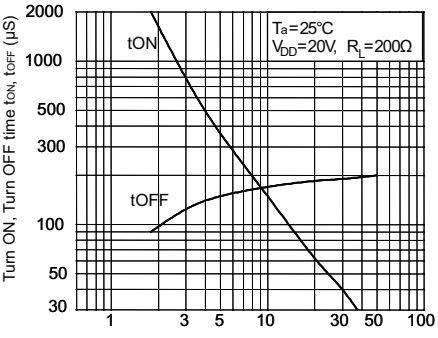
Trigger LED forward current vs. Ambient temperature

IFT - Ta



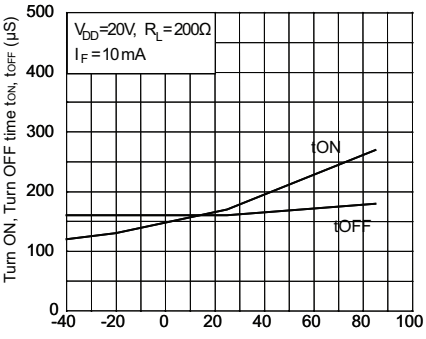
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



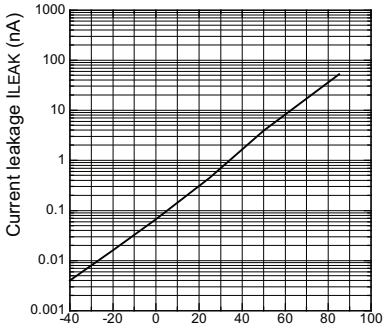
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



Current leakage vs. Ambient temperature

I LEAK - Ta



MEMO

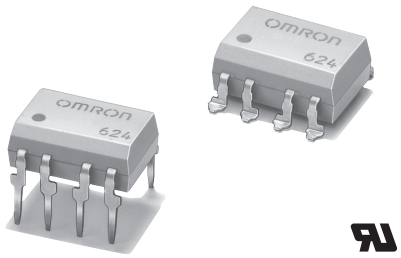
MOS FET Relays
G3VM-402C/F

Analog-switching MOS FET Relays with 400-V Load Voltage with 2 Output Channels.

- A 2-channel Relay in the 400-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 2,500 Vrms between I/O.
- RoHS Compliant.

■ Application Examples

- Measurement devices
- Security systems
- Amusement machines



Note: The actual product is marked differently from the image shown here.

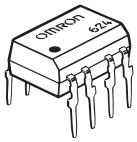
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NO	PCB terminals	400 VAC	**G3VM-402C**	50	---
	Surface-mounting terminals		**G3VM-402F**		
			G3VM-402F(TR)	---	1,500

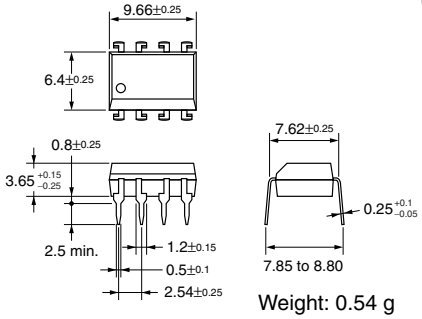
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-402C

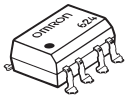


Note: The actual product is marked differently from the image shown here.

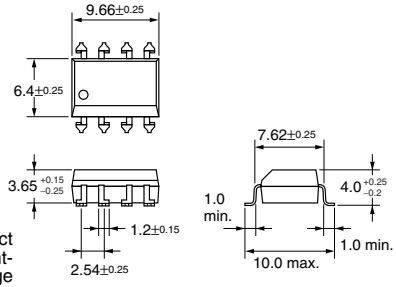


Weight: 0.54 g

G3VM-402F



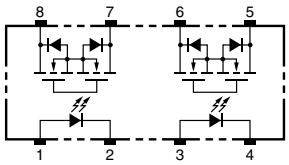
Note: The actual product is marked differently from the image shown here.



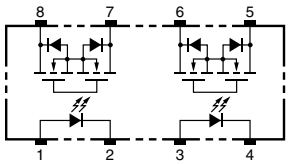
Weight: 0.54 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-402C

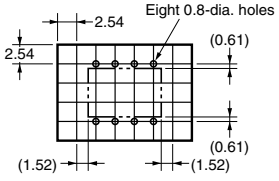


G3VM-402F



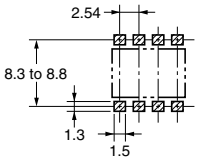
■ PCB Dimensions (Bottom View)

G3VM-402C



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-402F



■ Absolute Maximum Ratings (Ta = 25°C)

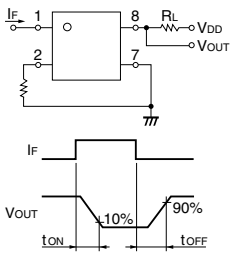
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	400	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	–1.2	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	2,500	V_{rms}	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	18	35	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.0008	1.0	μA	V_{OFF} = 400 V
	Capacity between terminals	C_{OFF}	---	40	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.4	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.09	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

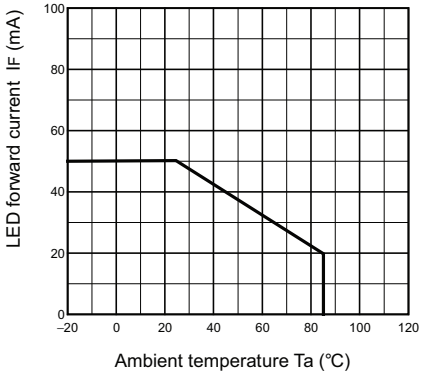
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	320	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	100	mA
Operating temperature	T_a	– 20	---	65	°C

■ Engineering Data

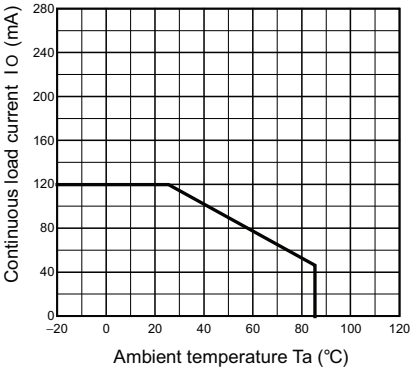
LED forward current vs. Ambient temperature

I_F - Ta



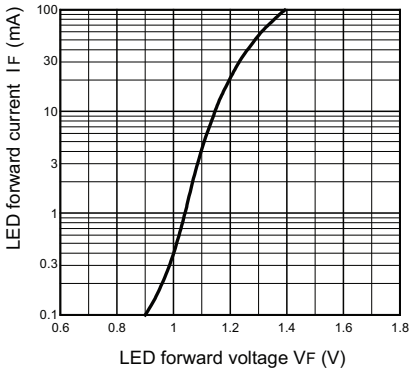
Continuous load current vs. Ambient temperature

I_O - Ta



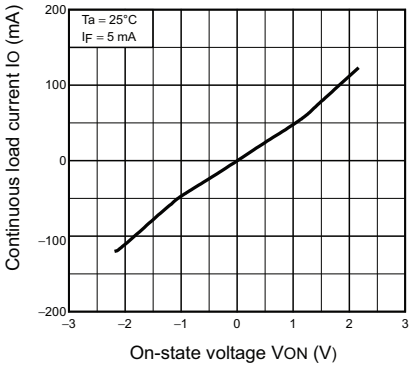
LED forward current vs. LED forward voltage

I_F - V_F



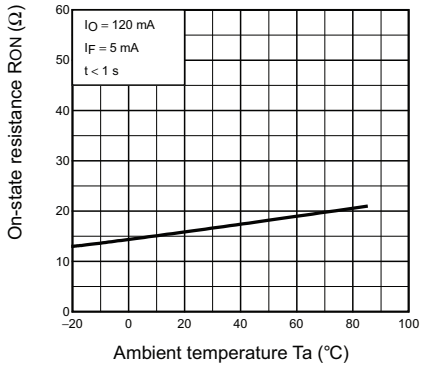
Continuous load current vs. On-state voltage

I_O - V_{ON}



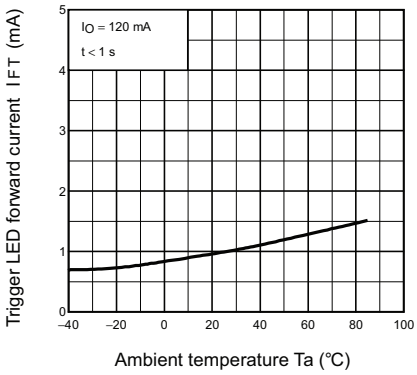
On-state resistance vs. Ambient temperature

R_{ON} - Ta



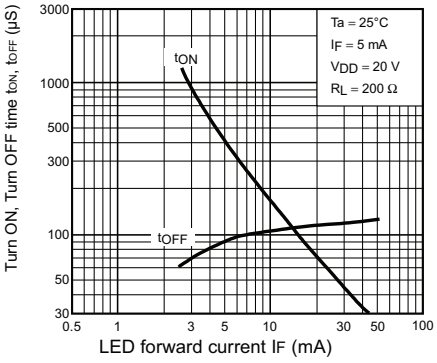
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



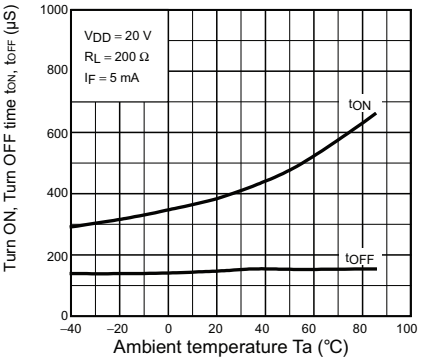
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



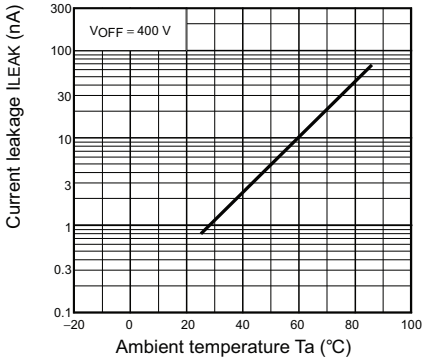
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

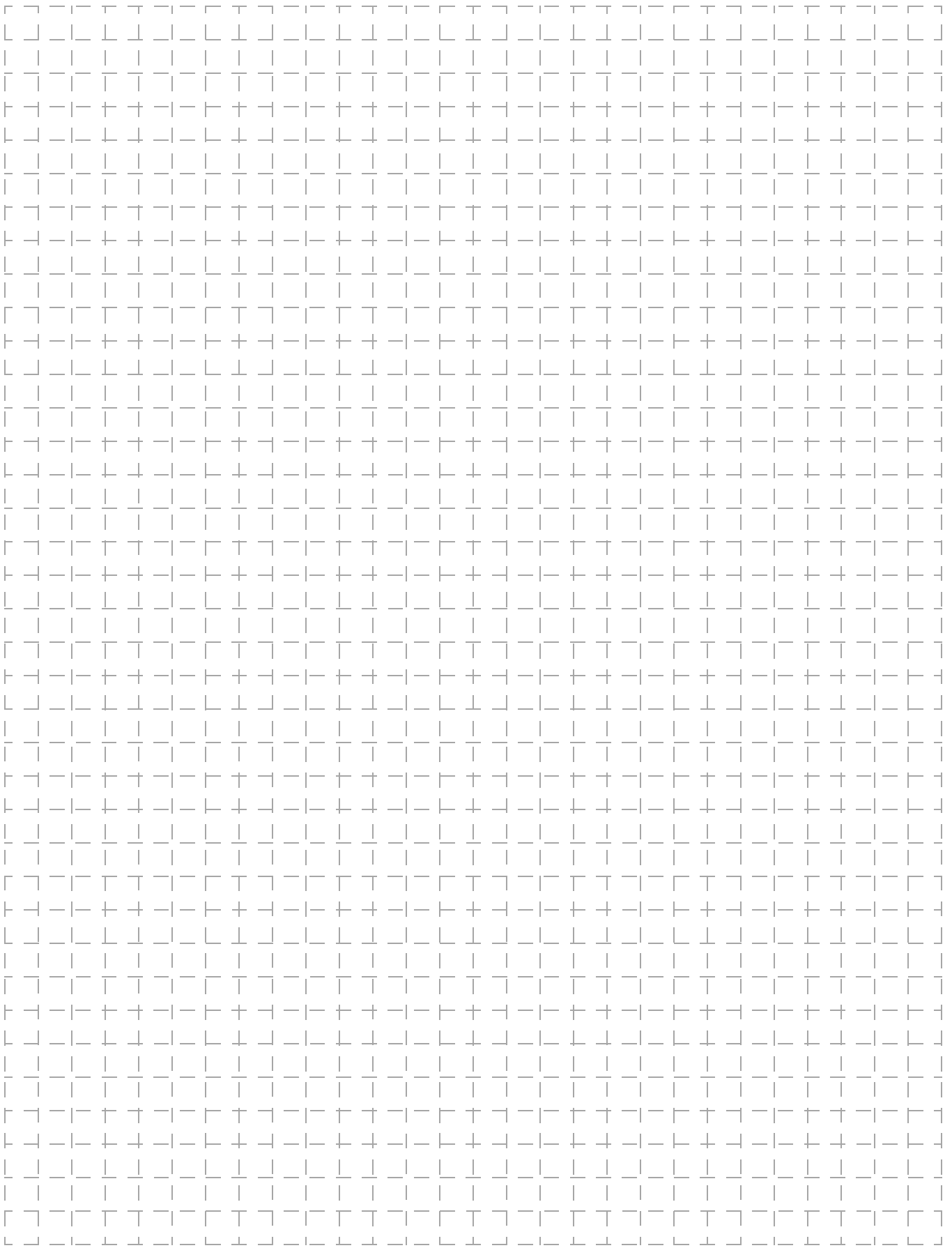


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



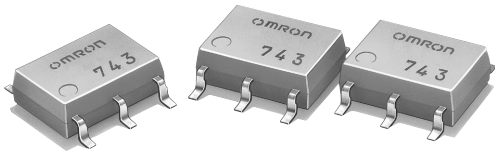
MEMO



MOS FET Relays
G3VM-21HR

Low 20-mΩ ON Resistance.
High-power, 2.5-A Switching with SOP Package.

- Continuous load current of 2.5 A (connection C = 5 A).
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant



NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Industrial equipment

■ List of Models

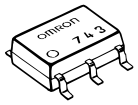
Contact form	Terminals	Load voltage (peak value) (See note.)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	20 V	**G3VM-21HR**	75	---
			G3VM-21HR(TR)	---	2,500

Note: The AC peak and DC value is given for the load voltage.

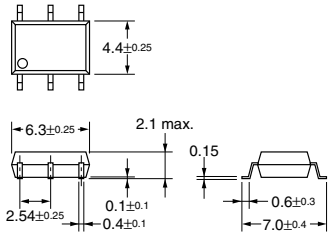
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-21HR



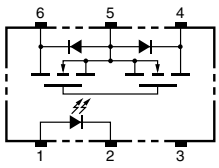
Note: The actual product is marked differently from the image shown here.



Weight: 0.13 g

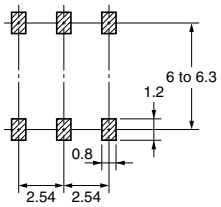
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-21HR



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-81HR

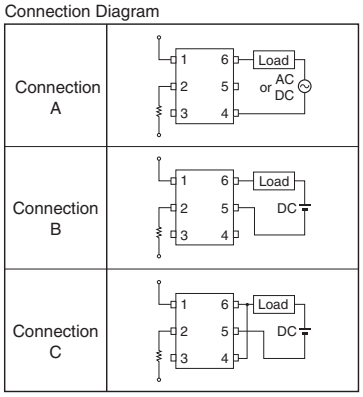


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current		I_F	30	mA	
	LED forward current reduction rate		ΔI_F/°C	–0.3	mA/°C	$T_a \geq 25$°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Load voltage (AC peak/DC)		V_{OFF}	20	V	
	Continuous load current	Connection A	I_O	2.5	A	Connection A: AC peak/DC Connection B and C: DC
		Connection B		2.5		
		Connection C		5		
	ON current reduction rate	Connection A	ΔI_O/°C	–33.3	mA/°C	$T_a \geq 50$°C
		Connection B		–33.3		
		Connection C		–66.6		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature			T_a	–40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

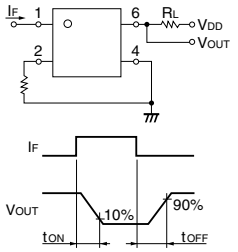
Connection Diagram



■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.18	1.33	1.48	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	70	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	---	3	mA	I_O = 100 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	0.02	0.05	Ω	I_F = 5 mA, I_O = 2 A, t < 1s
		Connection B		---	0.01	0.025	Ω	I_F = 5 mA, I_O = 2 A, t < 1s
		Connection C		---	0.005	---	Ω	I_F = 5 mA, I_O = 4 A, t < 1s
	Current leakage when the relay is open		I_{LEAK}	---	2	10	nA	V_{OFF} = 20 V
	Capacity between terminals A Connection		C_{OFF}	---	1,000	1,500	pF	V = 0, f = 1MHz
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time			t_{ON}	---	1.5	5.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 10 V (See note 2.)
Turn-OFF time			t_{OFF}	---	0.1	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

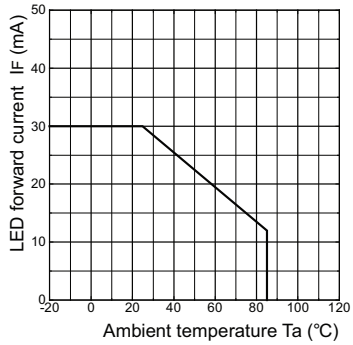
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	20	V
Operating LED forward current	I_F	5	10	20	mA
Continuous load current (AC peak/DC)	I_O	---	---	2	A
Operating temperature	T_a	–20	---	65	°C

■ Engineering Data

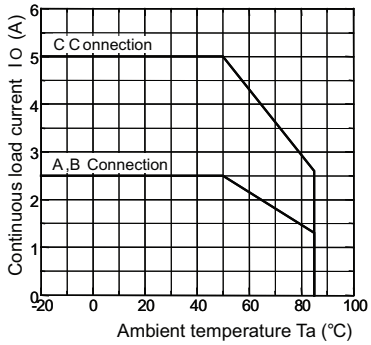
LED forward current vs. Ambient temperature

IF - Ta



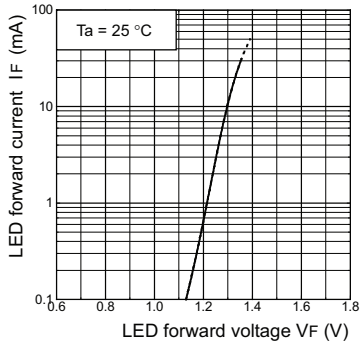
Continuous load current vs. Ambient temperature

IO - Ta



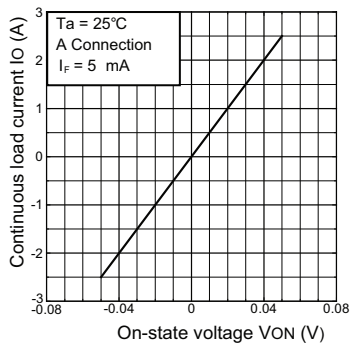
LED forward current vs. LED forward voltage

IF - VF



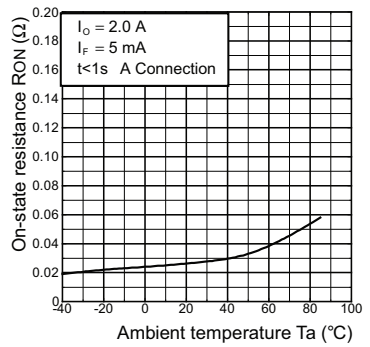
Continuous load current vs. On-state voltage

IO - VON



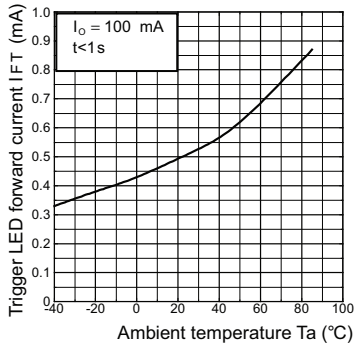
On-state resistance vs. Ambient temperature

RON - Ta



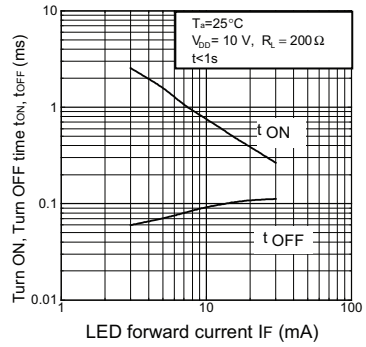
Trigger LED forward current vs. Ambient temperature

IFT - Ta



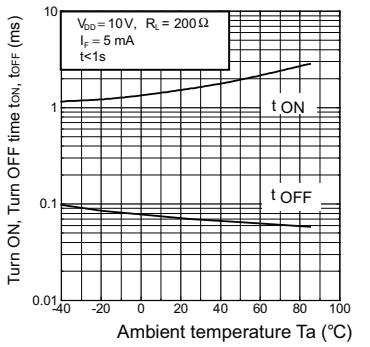
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



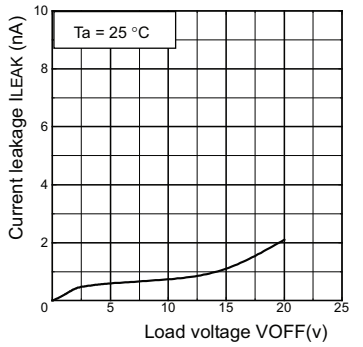
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



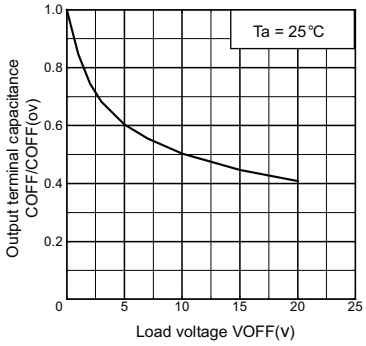
Current leakage vs. Load voltage

I LEAK – VOFF

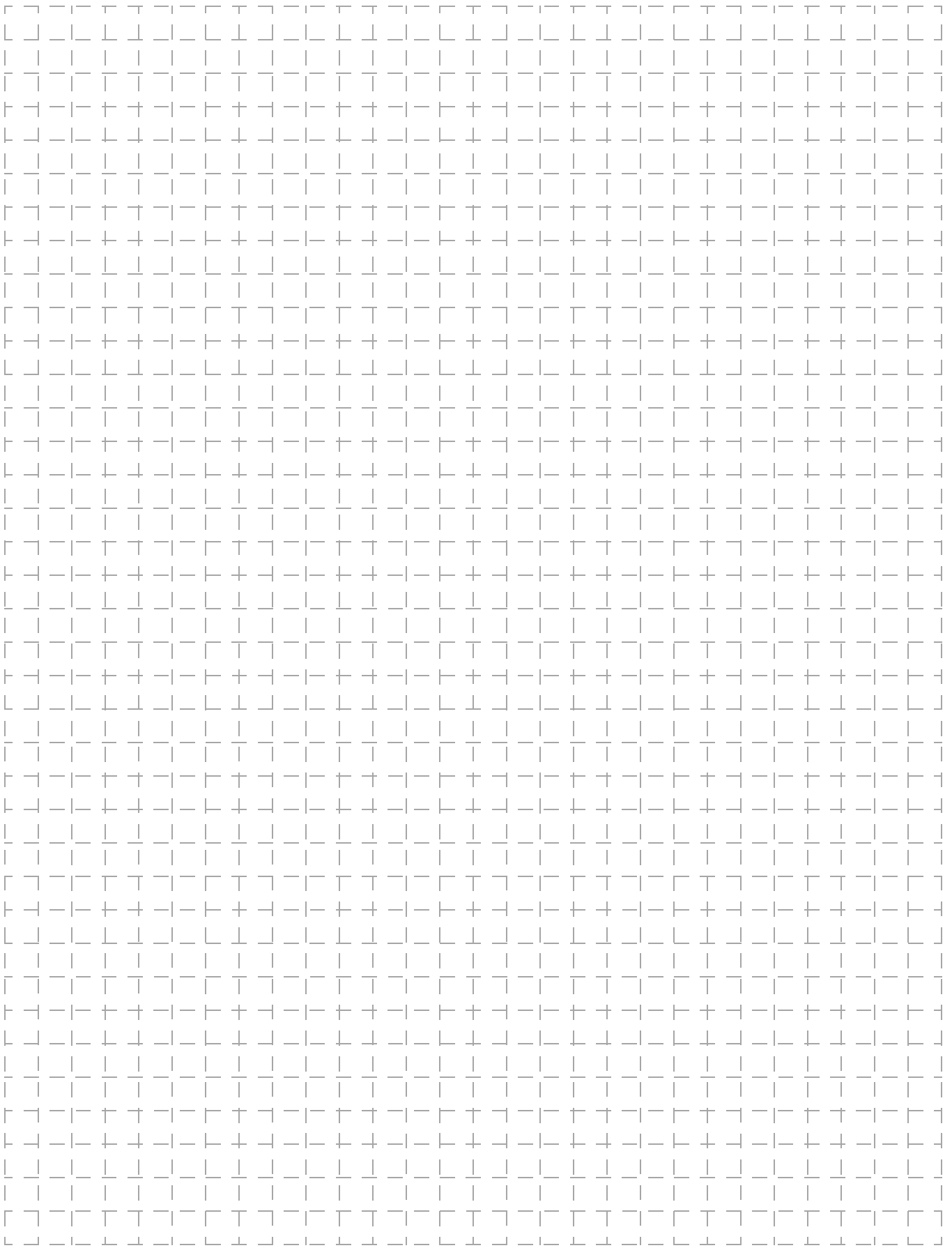


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

COFF - VOFF



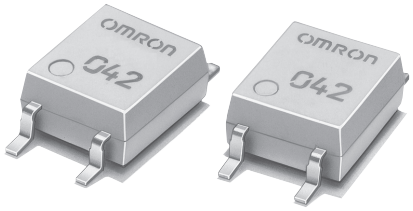
MEMO



MOS FET Relays
G3VM-21GR

MOS FET Relay with Low Output Capacitance and ON Resistance (C×R = 5pF• Ω) in a 20-V Load Voltage, SOP Package.

- Output capacitance of 1 pF (typical) allows high-frequency applications.
- Leakage current of 1.0 nA max. (0.2 nA typ.) when relay is open.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices
- Broadband systems
- Data loggers

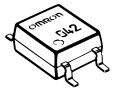
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	20 VAC	**G3VM-21GR**	100	
			G3VM-21GR(TR)	---	2,500

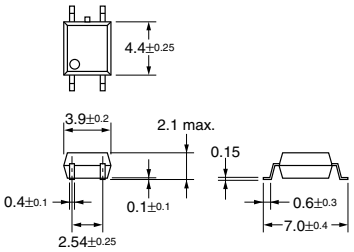
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-21GR



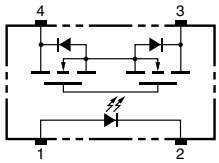
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

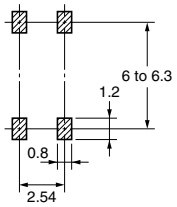
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-21GR



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-21GR



■ Absolute Maximum Ratings (Ta = 25°C)

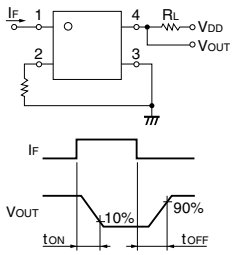
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	20	V	
	Continuous load current	I_O	160	mA	
	ON current reduction rate	ΔI_{ON}/°C	–1.6	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	5	8	Ω	I_F = 5 mA, I_O = 160 mA, t < 1 s
	Current leakage when the relay is open	I_{LEAK}	---	0.2	1.0	nA	V_{OFF} = 20 V, T_a = 50°C
	Capacity between terminals	C_{OFF}	---	1.0	2.5	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.025	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.11	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

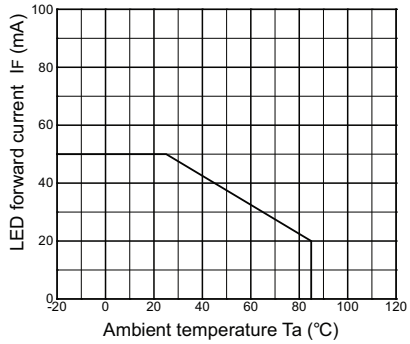
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	20	V
Operating LED forward current	I_F	7	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	160	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

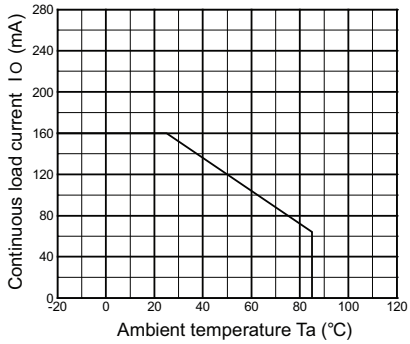
LED forward current vs. Ambient temperature

I_F - Ta



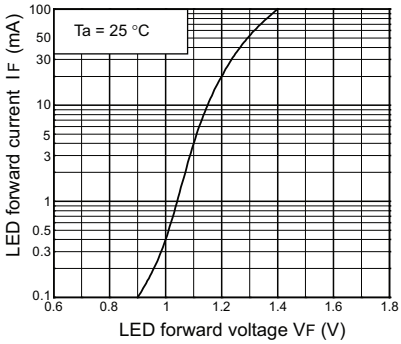
Continuous load current vs. Ambient temperature

I_O - Ta



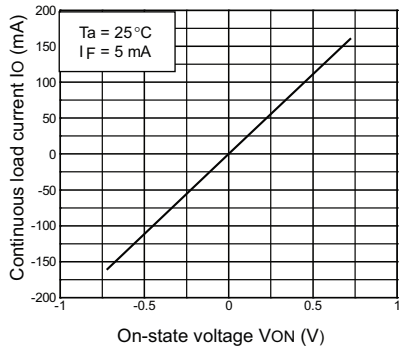
LED forward current vs. LED forward voltage

I_F - V_F



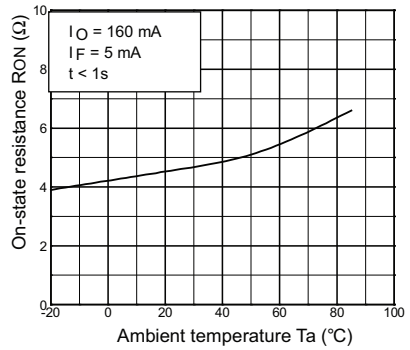
Continuous load current vs. On-state voltage

I_O - V_{ON}



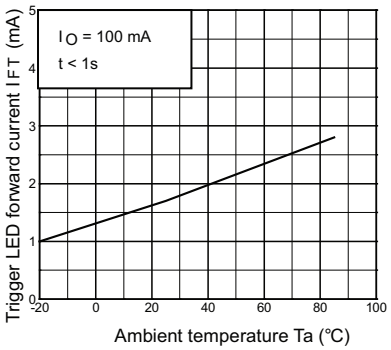
On-state resistance vs. Ambient temperature

R_{ON} - Ta



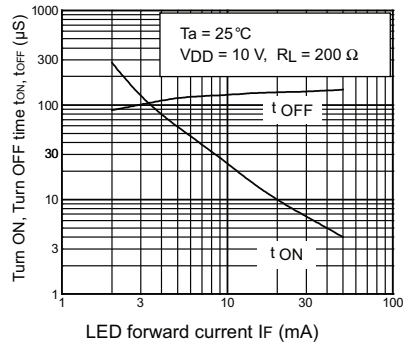
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



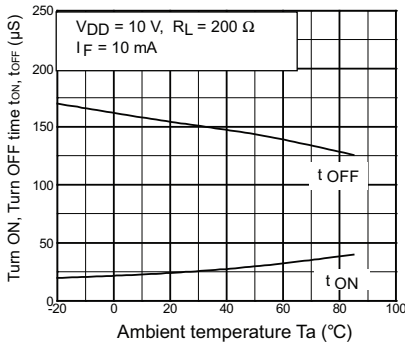
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



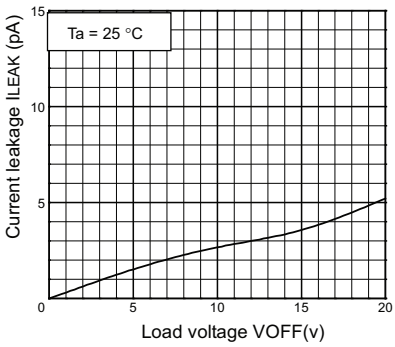
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



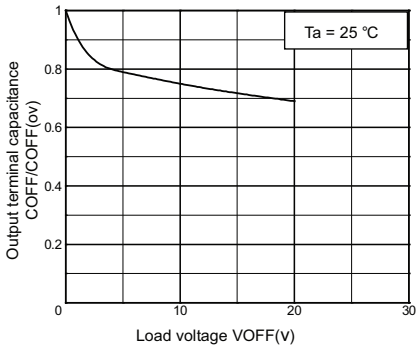
Current leakage vs. Load voltage

I_{LEAK} – V_{OFF}

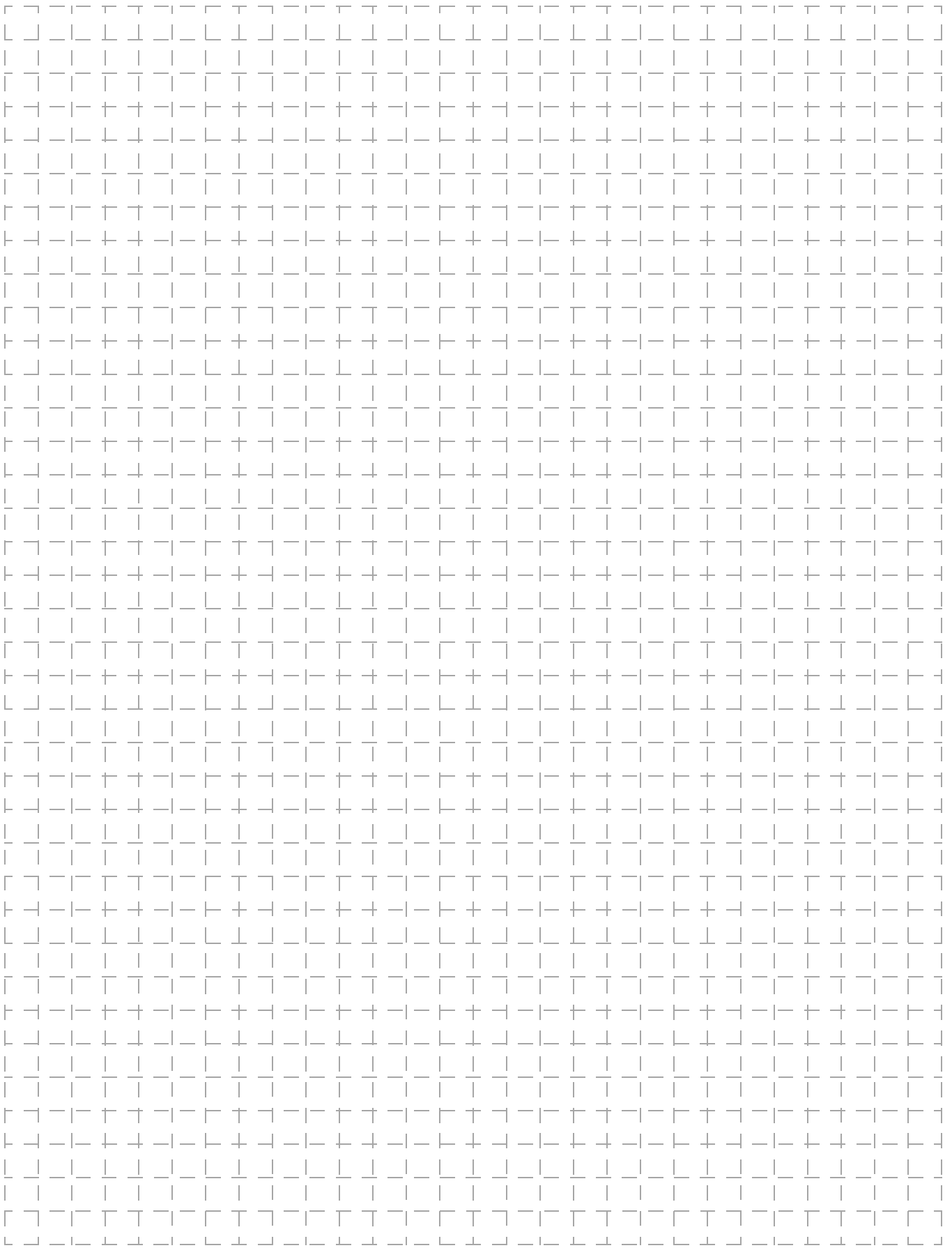


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

C_{OFF} - V_{OFF}



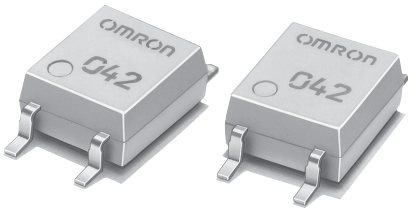
MEMO



MOS FET Relays
G3VM-21GR1

MOS FET Relay with Low Output Capacitance and ON Resistance (C×R = 5pF• Ω) in a 20-V Load Voltage, SOP Package.

- ON resistance of 1 Ω (typical) suppresses output signal attenuation.
- Leakage current of 1.0 nA max. (0.2 nA typ.) when relay is open.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices
- Broadband systems
- Data loggers

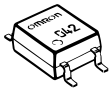
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	20 VAC	**G3VM-21GR1**	100	
			G3VM-21GR1(TR)	---	2,500

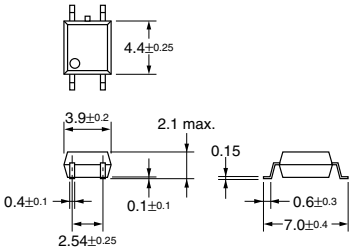
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-21GR1



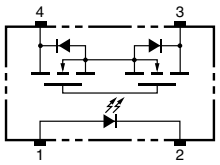
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

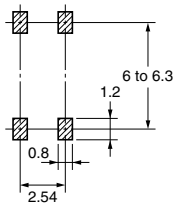
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-21GR1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-21GR1



■ Absolute Maximum Ratings (Ta = 25°C)

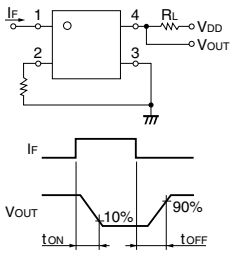
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	20	V	
	Continuous load current	I_O	300	mA	
	ON current reduction rate	ΔI_{ON}/°C	–3.0	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	1	1.5	Ω	I_F = 5 mA, I_O = 300 mA, t < 1 s
	Current leakage when the relay is open	I_{LEAK}	---	0.2	1.0	nA	V_{OFF} = 20 V, T_a = 50°C
	Capacity between terminals	C_{OFF}	---	5.0	12.0	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.09	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.2	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

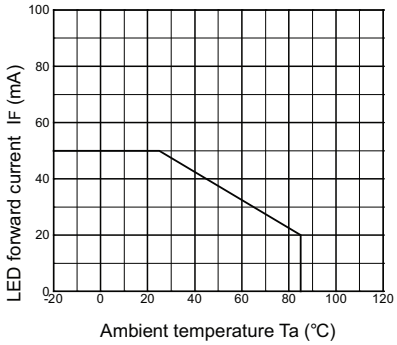
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	20	V
Operating LED forward current	I_F	7	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	300	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

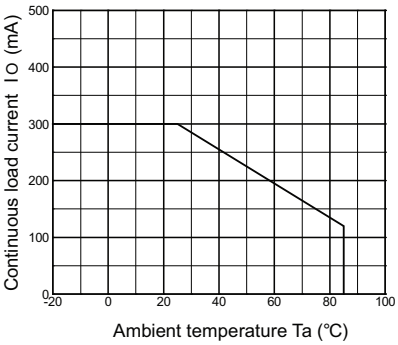
LED forward current vs. Ambient temperature

I_F - Ta



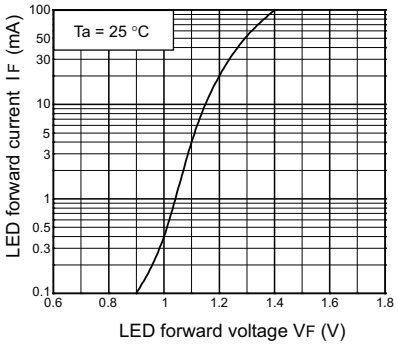
Continuous load current vs. Ambient temperature

I_O - Ta



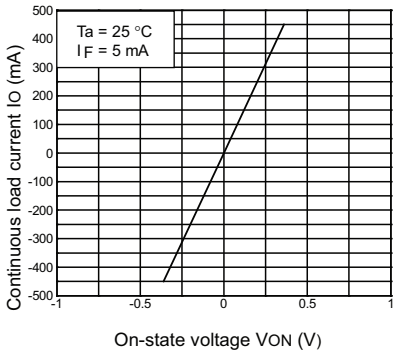
LED forward current vs. LED forward voltage

I_F - V_F



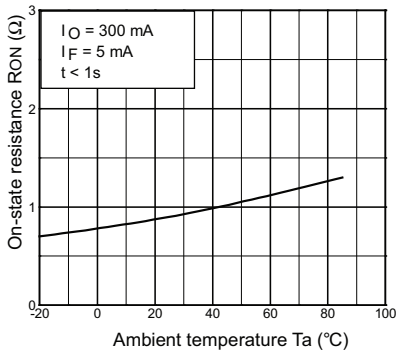
Continuous load current vs. On-state voltage

I_O - V_{ON}



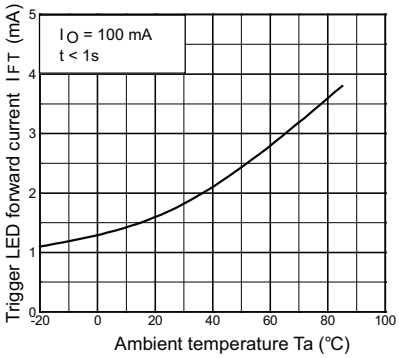
On-state resistance vs. Ambient temperature

R_{ON} - Ta



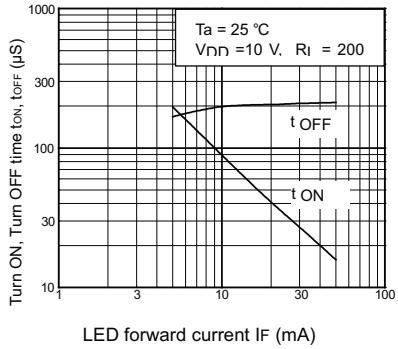
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



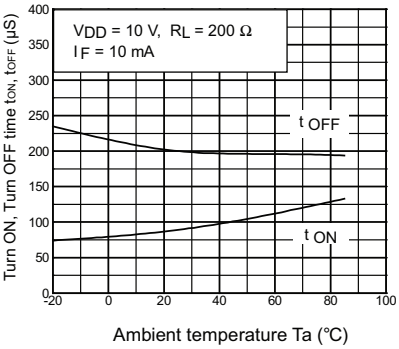
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



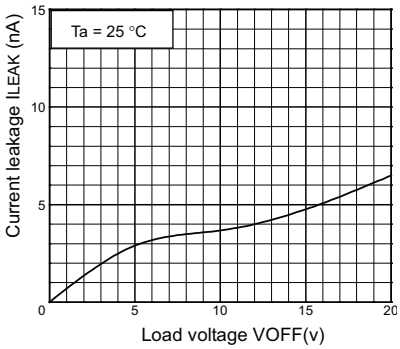
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



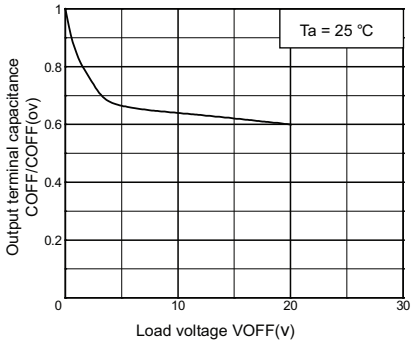
Current leakage vs. Load voltage

I_{LEAK} – V_{OFF}

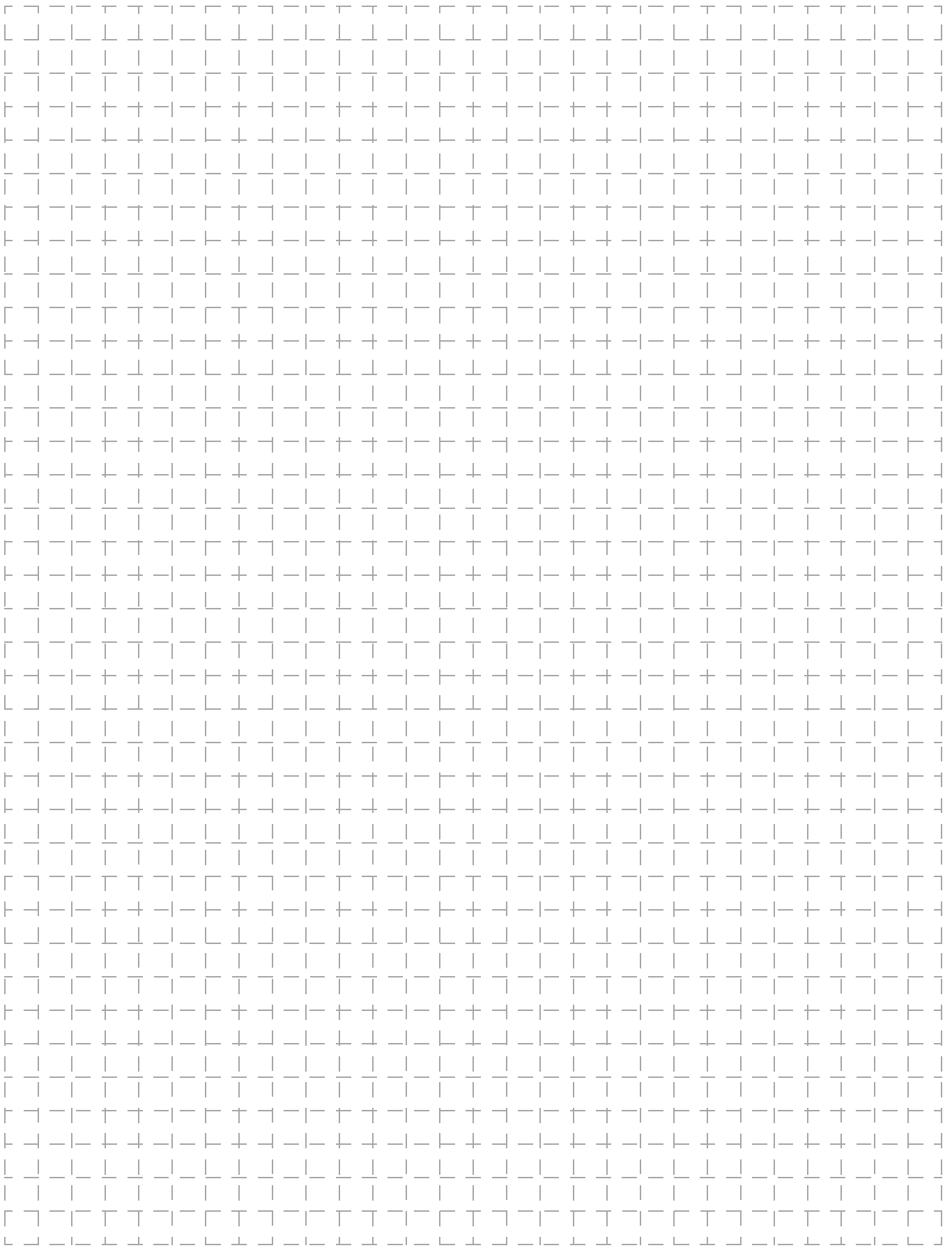


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

C_{OFF} - V_{OFF}



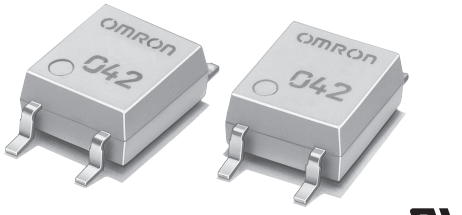
MEMO



MOS FET Relays
G3VM-41GR3

New MOS FET Relays with Low Output Capacitance and ON Resistance (C×R = 15pF•Ω) in a 40-V Load Voltage, SOP Package.

- Output capacitance of 0.6 pF (typical) allows high-frequency applications.
- Leakage current of 1.0 nA max. (0.01 nA typ.) when relay is open.
- RoHS compliant



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices and Data loggers
- Broadband systems

■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	**G3VM-41GR3**	100	
			G3VM-41GR3(TR)	---	2,500

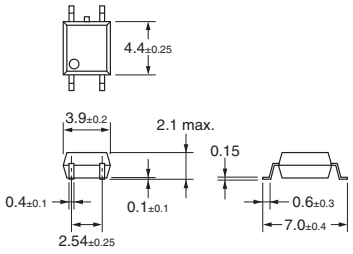
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-41GR3



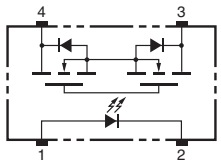
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

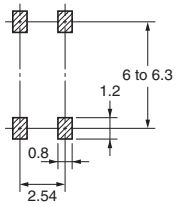
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-41GR3



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41GR3



■ Absolute Maximum Ratings (Ta = 25°C)

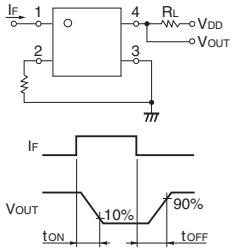
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	40	V	
	Continuous load current	I_O	80	mA	
	ON current reduction rate	ΔI_{ON}/°C	−0.8	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	25	35	Ω	I_F = 5 mA, I_O = 80 mA, t < 1 s
	Current leakage when the relay is open	I_{LEAK}	---	0.01	1.0	nA	V_{OFF} = 20 V, T_a = 50°C
	Capacity between terminals	C_{OFF}	---	0.6	1.4	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.025	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.11	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

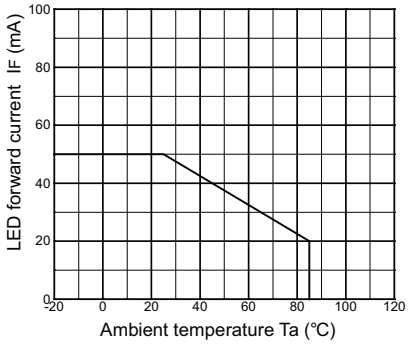
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	32	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	80	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

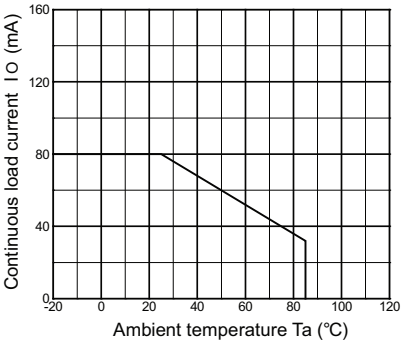
LED forward current vs. Ambient temperature

I_F - Ta



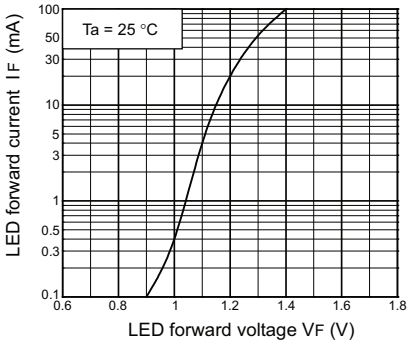
Continuous load current vs. Ambient temperature

I_O - Ta



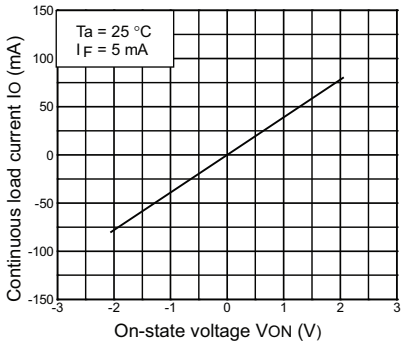
LED forward current vs. LED forward voltage

I_F - V_F



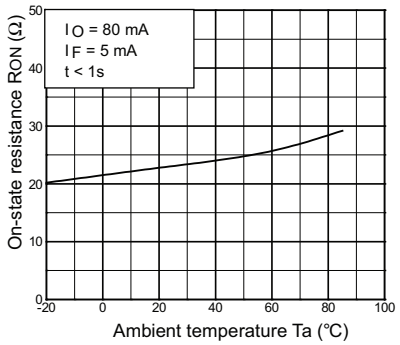
Continuous load current vs. On-state voltage

I_O - V_{ON}



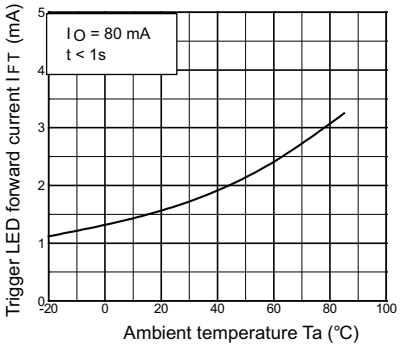
On-state resistance vs. Ambient temperature

R_{ON} - Ta



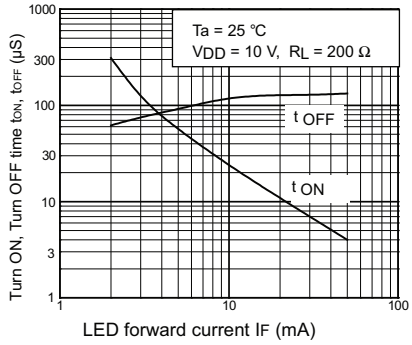
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



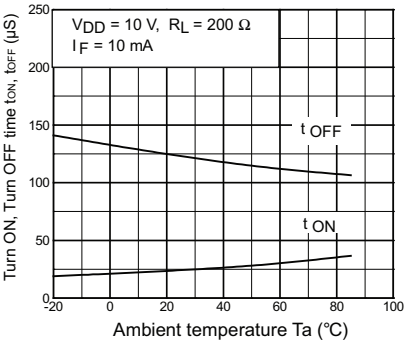
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



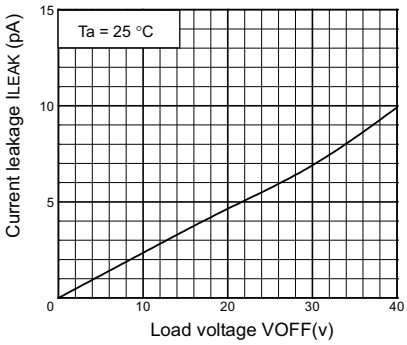
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



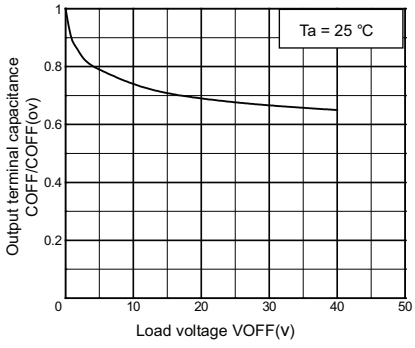
Current leakage vs. Load voltage

I_{LEAK} – V_{OFF}

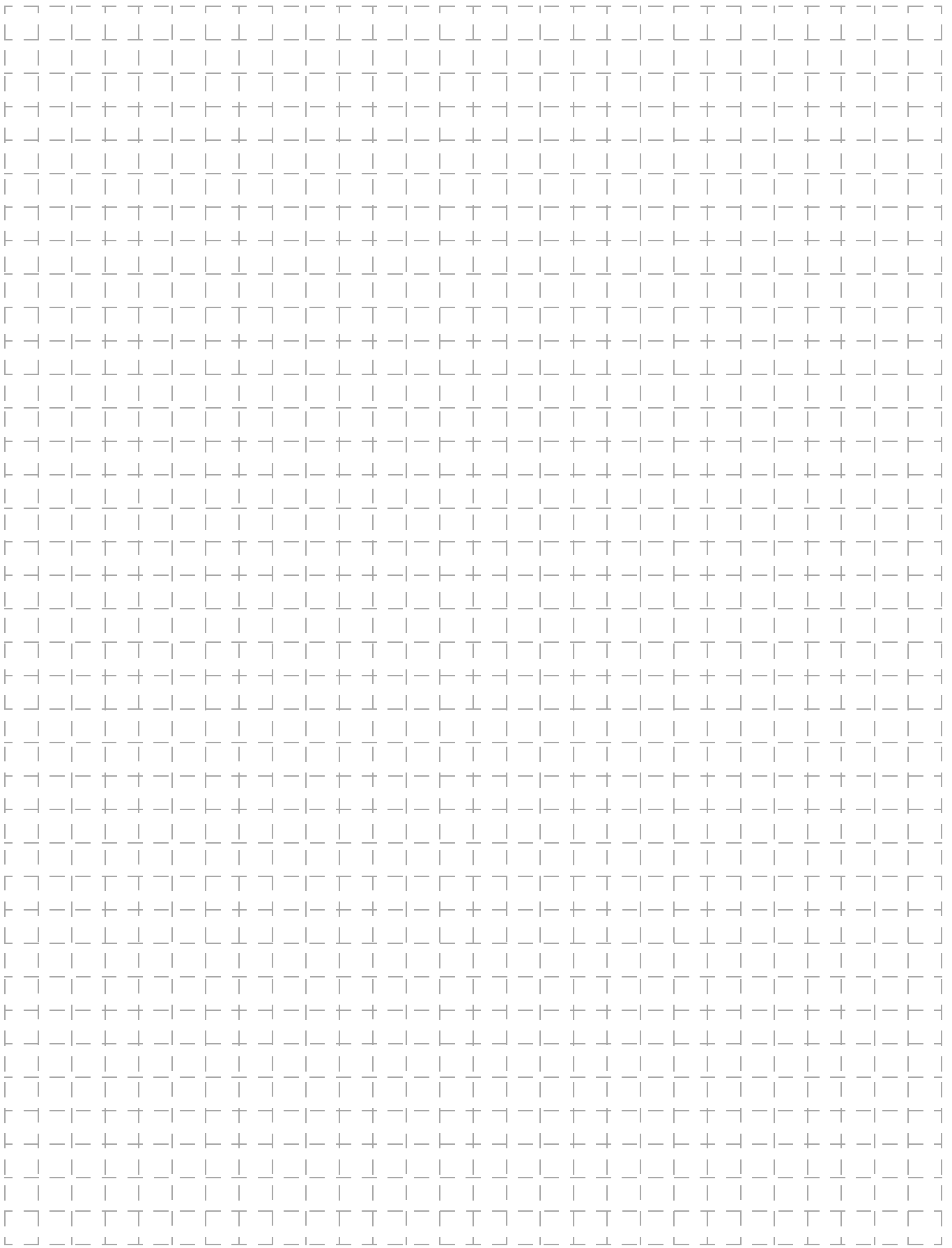


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

C_{OFF} - V_{OFF}



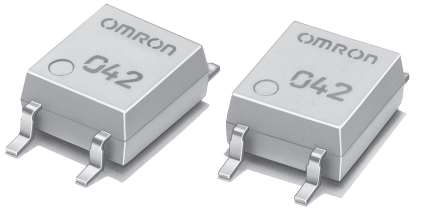
MEMO



MOS FET Relays
G3VM-41GR4

New MOS FET Relays with Low Output Capacitance and ON Resistance (C×R = 10pF•Ω) in a 40-V Load Voltage, SOP Package.

- ON resistance of 2 Ω (typical) suppresses output signal attenuation.
- Leakage current of 1.0 nA max. (0.009 nA typ.) when relay is open.
- RoHS compliant



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices and Data loggers
- Broadband systems

■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	**G3VM-41GR4**	100	
			G3VM-41GR4(TR)	---	2,500

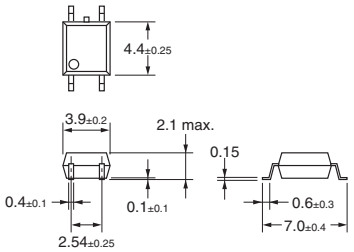
■ Dimensions

Note: All units are in millimeters unless otherwise indicated

G3VM-41GR4



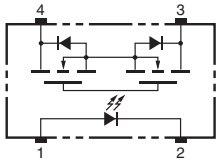
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

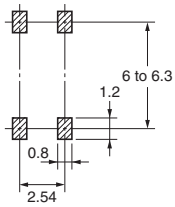
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-41GR4



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41GR4



■ Absolute Maximum Ratings (Ta = 25°C)

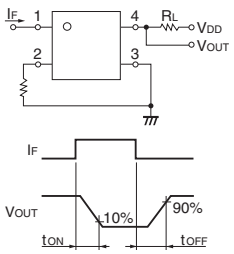
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	40	V	
	Continuous load current	I_O	250	mA	
	ON current reduction rate	ΔI_{ON}/°C	–2.5	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	2.0	3.0	Ω	I_F = 5 mA, I_O = 250 mA, t < 1 s
	Current leakage when the relay is open	I_{LEAK}	---	0.009	1.0	nA	V_{OFF} = 30 V, T_a = 50°C
	Capacity between terminals	C_{OFF}	---	5.0	7.0	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.055	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.19	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

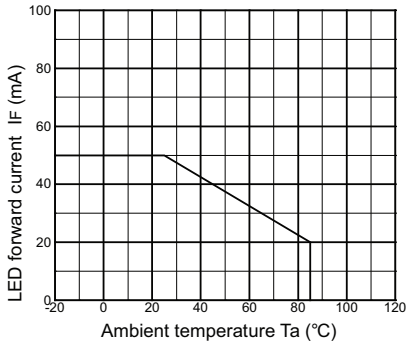
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	32	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	250	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

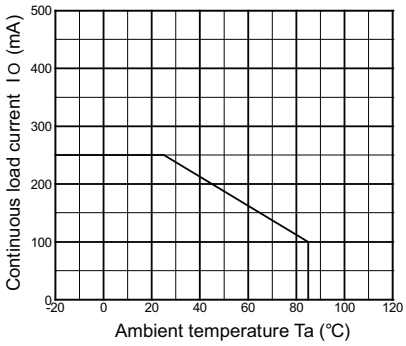
LED forward current vs. Ambient temperature

I_F - Ta



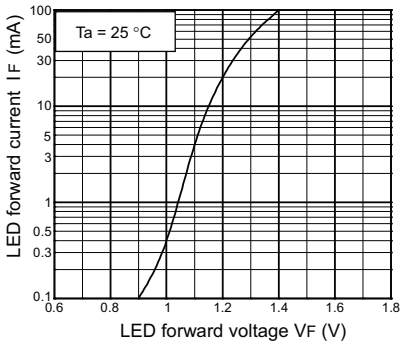
Continuous load current vs. Ambient temperature

I_O - Ta



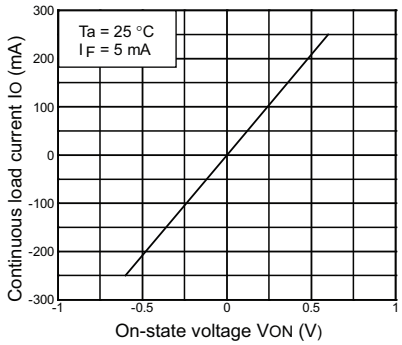
LED forward current vs. LED forward voltage

I_F - V_F



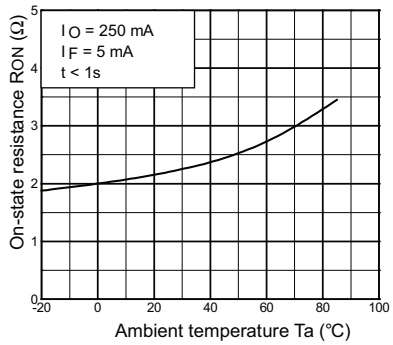
Continuous load current vs. On-state voltage

I_O - V_{ON}



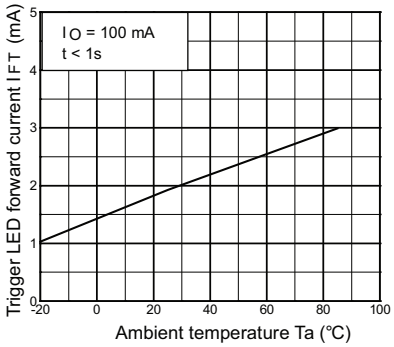
On-state resistance vs. Ambient temperature

R_{ON} - Ta



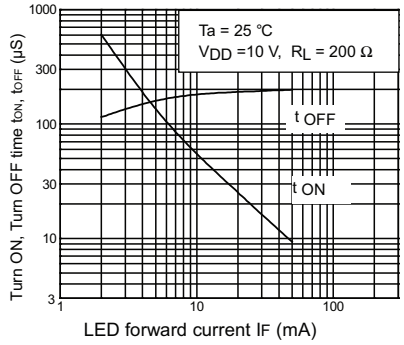
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



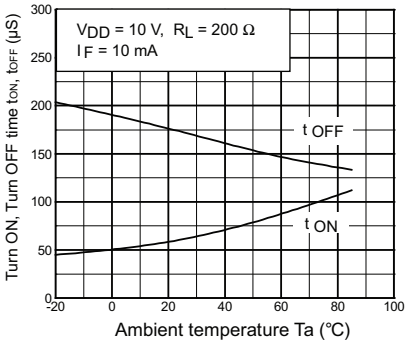
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



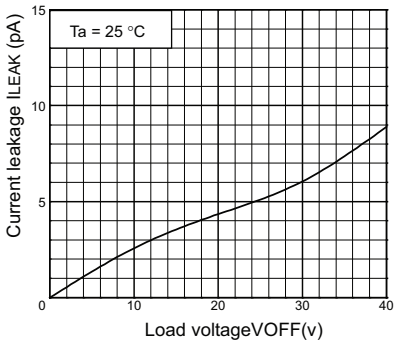
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



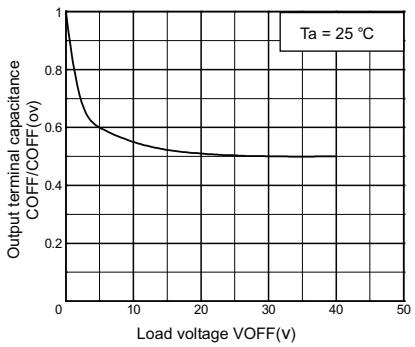
Current leakage vs. Load voltage

I_{LEAK} – V_{OFF}

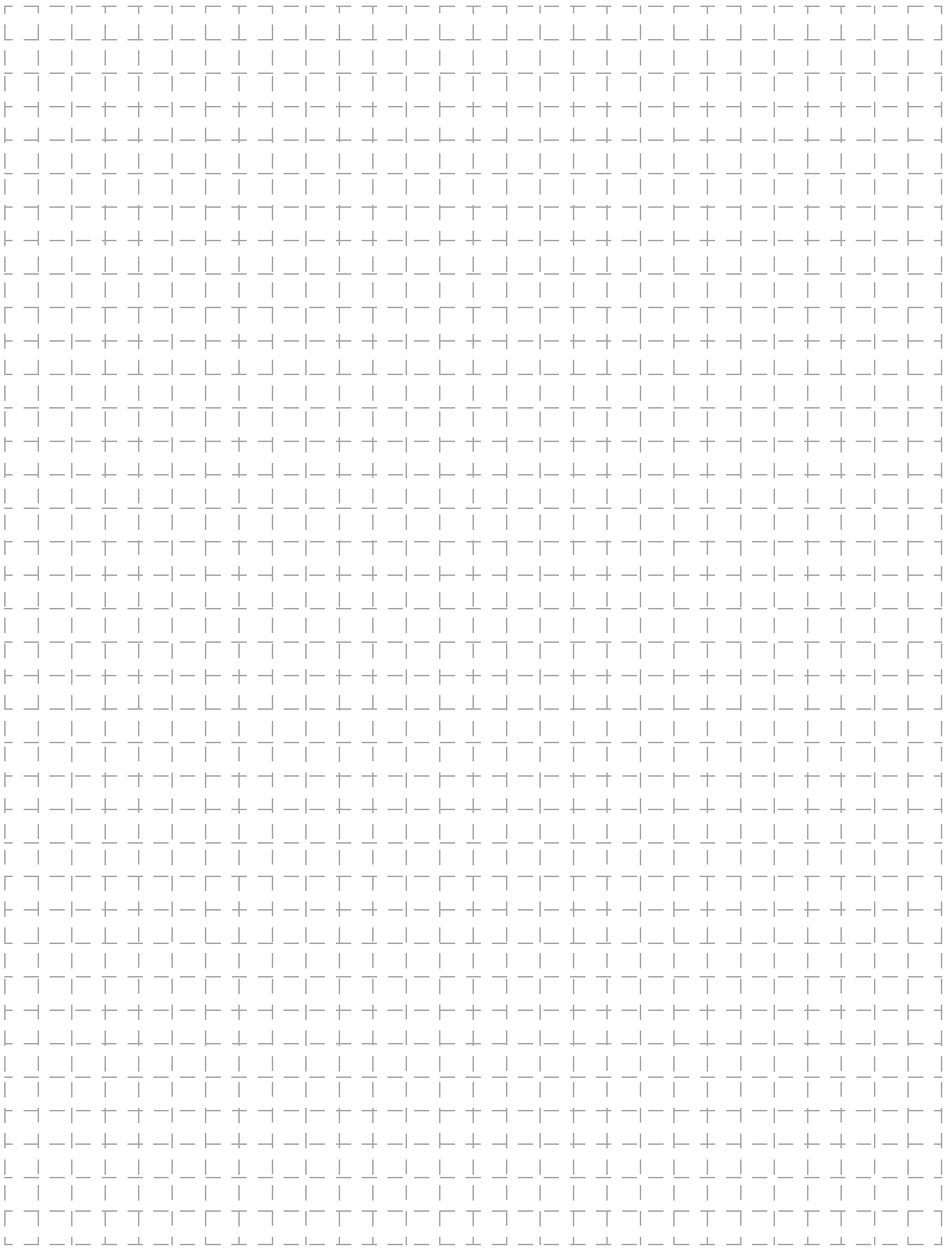


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

C_{OFF} - V_{OFF}



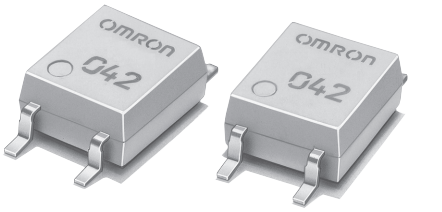
MEMO



MOS FET Relays
G3VM-41GR5

MOS FET Relay with Low Output Capacitance and ON Resistance (C×R = 10pF• Ω) in a 40-V Load Voltage, SOP Package.

- ON resistance of 1 Ω (typical) suppresses output signal attenuation.
- Leakage current of 1.0 nA max. (0.2 nA typ.) when relay is open.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices
- Broadband systems
- Data loggers

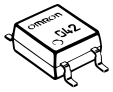
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	**G3VM-41GR5**	100	---
			G3VM-41GR5(TR)	---	2,500

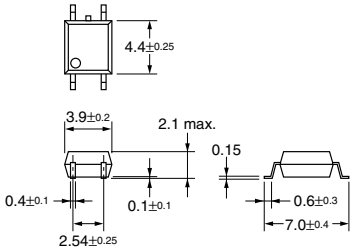
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-41GR5



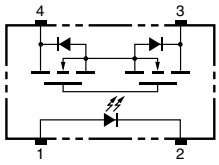
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

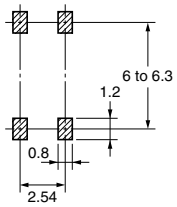
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-41GR5



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41GR5



■ Absolute Maximum Ratings (Ta = 25°C)

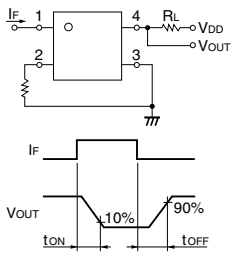
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	40	V	
	Continuous load current	I_O	300	mA	
	ON current reduction rate	ΔI_{ON}/°C	−3.0	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	1.0	1.5	Ω	I_F = 5 mA, I_O = 300 mA, t < 1 s
	Current leakage when the relay is open	I_{LEAK}	---	0.2	1.0	nA	V_{OFF} = 30 V, T_a = 50°C
	Capacity between terminals	C_{OFF}	---	10.0	14.0	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.09	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.21	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

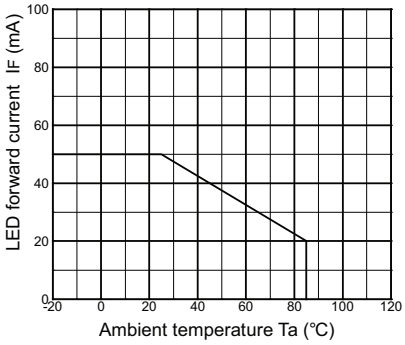
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	32	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	300	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

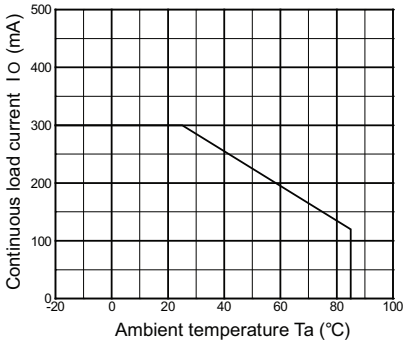
LED forward current vs. Ambient temperature

I_F - Ta



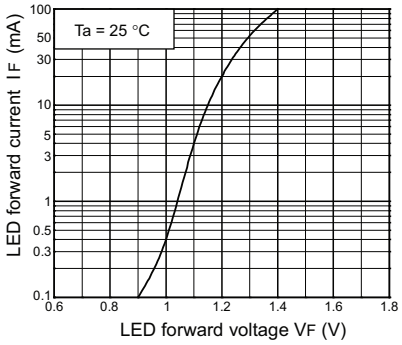
Continuous load current vs. Ambient temperature

I_O - Ta



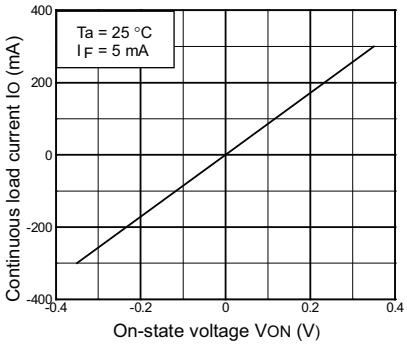
LED forward current vs. LED forward voltage

I_F - V_F



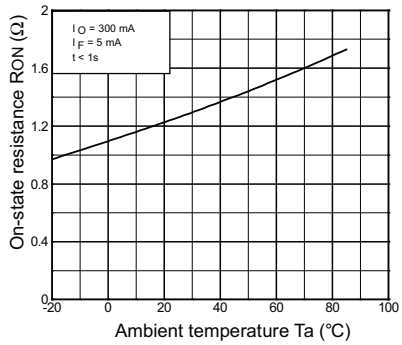
Continuous load current vs. On-state voltage

I_O - V_{ON}



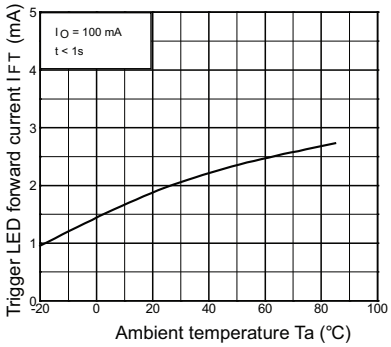
On-state resistance vs. Ambient temperature

R_{ON} - Ta



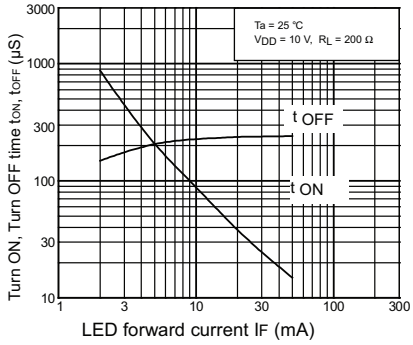
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



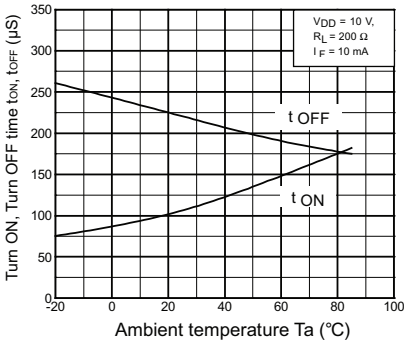
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



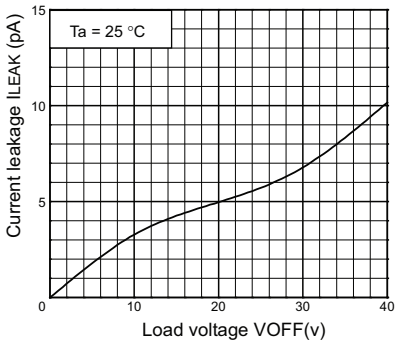
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



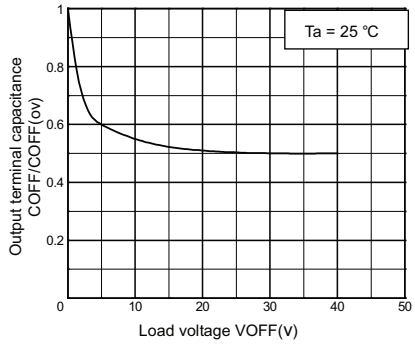
Current leakage vs. Load voltage

I_{LEAK} – V_{OFF}



Output terminal capacitance COFF/COFF(ov) vs. Load voltage

C_{OFF} - V_{OFF}

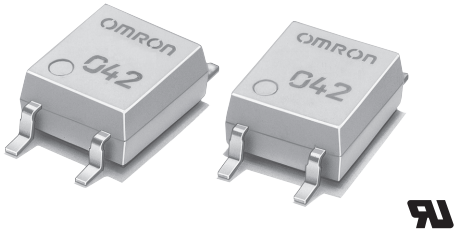


MEMO

MOS FET Relays
G3VM-41GR6

MOS FET Relay with Low Output Capacitance and ON Resistance (C×R = 10pF• Ω) in a 40-V Load Voltage, SOP Package.

- Output capacitance of 1 pF (typical) allows high-frequency applications.
- Leakage current of 1.0 nA max. (0.2 nA typ.) when relay is open.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices
- Broadband systems
- Data loggers

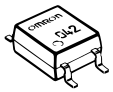
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	**G3VM-41GR6**	100	---
			G3VM-41GR6(TR)	---	2,500

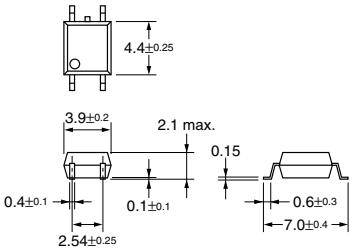
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-41GR6



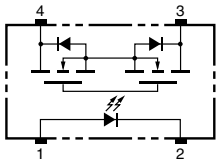
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

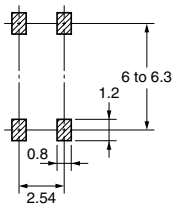
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-41GR6



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41GR6



■ Absolute Maximum Ratings (Ta = 25°C)

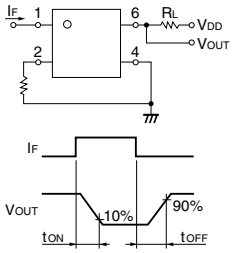
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	40	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.2	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	10	15	Ω	I_F = 5 mA, I_O = 120 mA, t < 1 s
	Current leakage when the relay is open	I_{LEAK}	---	0.2	1.0	nA	V_{OFF} = 30 V, T_a = 50°C
	Capacity between terminals	C_{OFF}	---	1.0	2.0	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.025	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.15	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

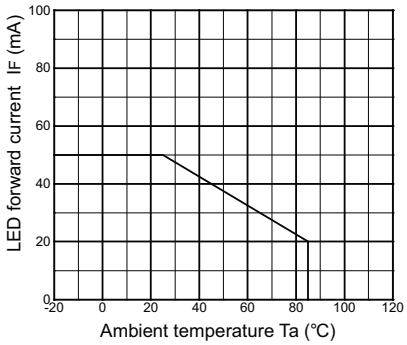
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	32	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	120	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

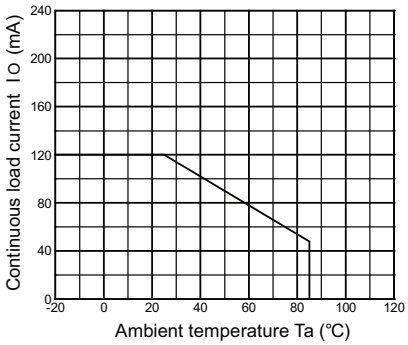
LED forward current vs. Ambient temperature

IF - Ta



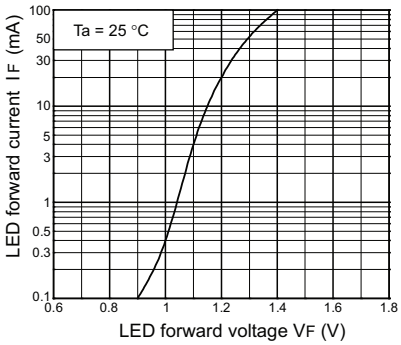
Continuous load current vs. Ambient temperature

IO - Ta



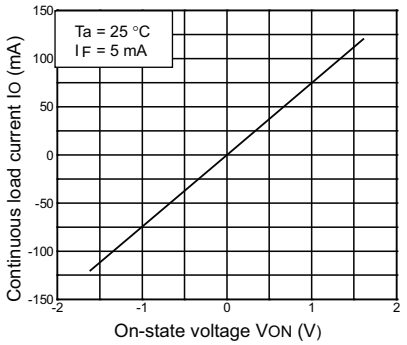
LED forward current vs. LED forward voltage

IF - VF



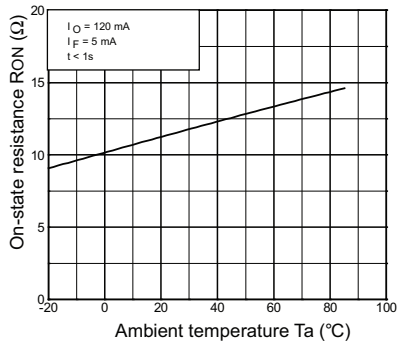
Continuous load current vs. On-state voltage

IO - VON



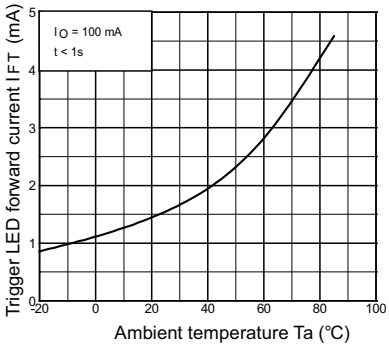
On-state resistance vs. Ambient temperature

RON - Ta



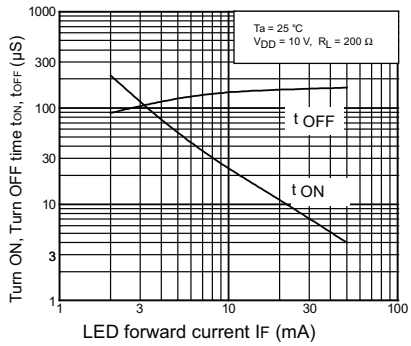
Trigger LED forward current vs. Ambient temperature

IFT - Ta



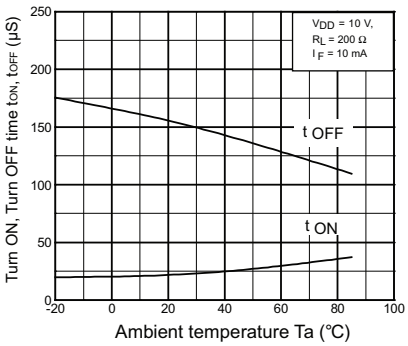
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



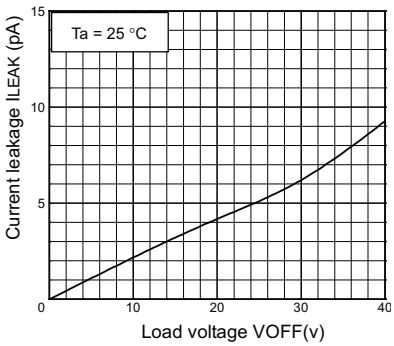
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



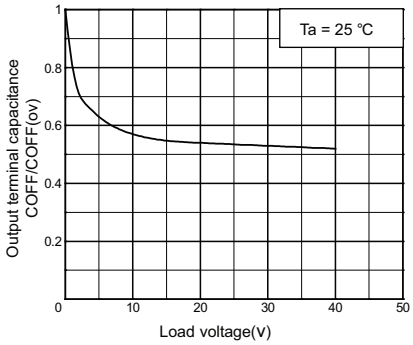
Current leakage vs. Load voltage

I LEAK – VOFF

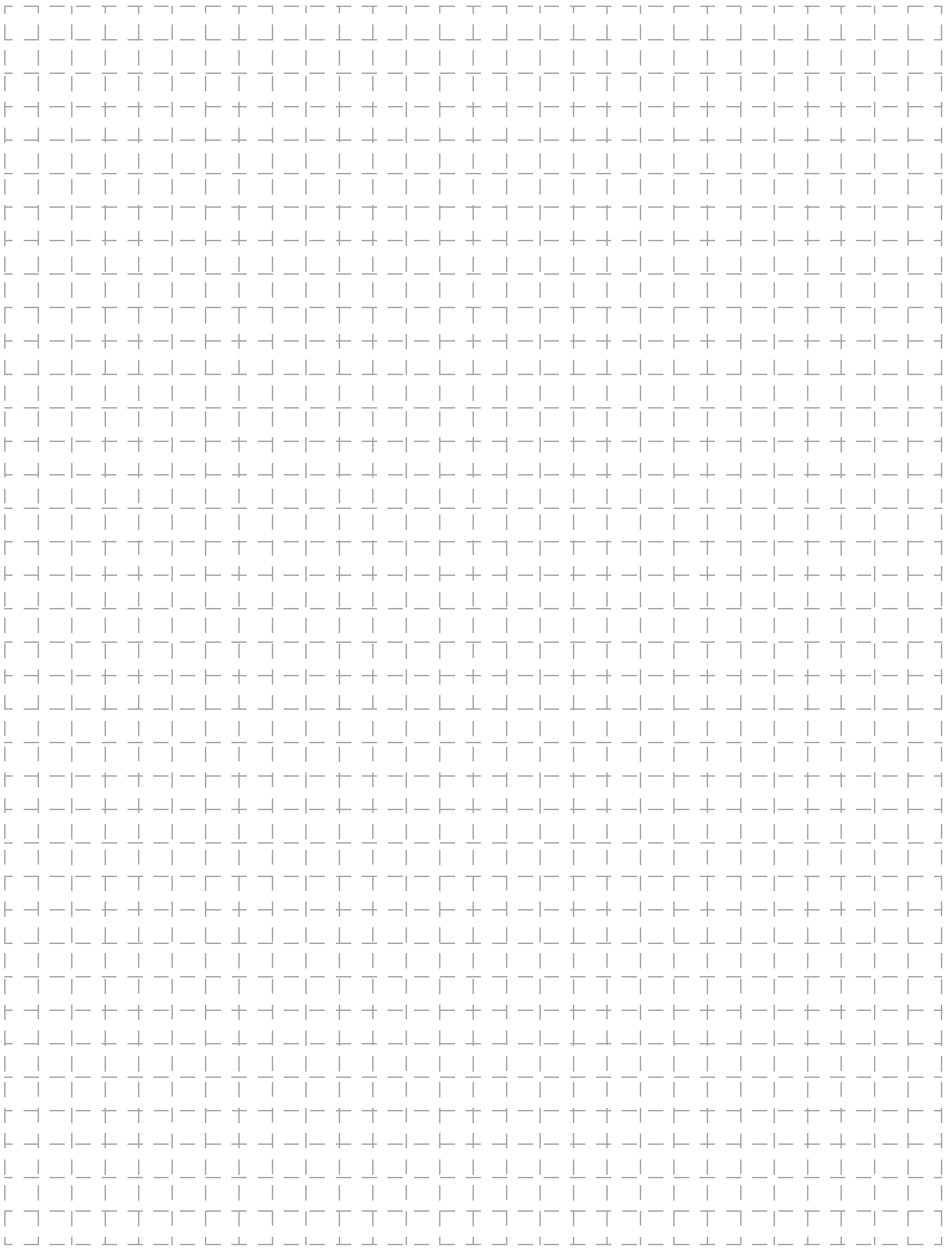


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

COFF - VOFF



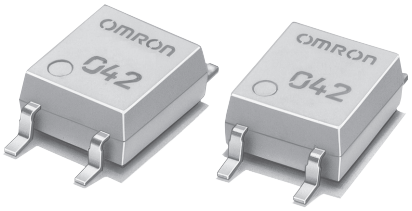
MEMO



MOS FET Relays
G3VM-41GR7

New MOS FET Relays with Low Output Capacitance and ON Resistance (C×R = 10.7pF•Ω) in a 40-V Load Voltage, SOP Package.

- C_{OFF} = 1.65 pF (typical), R_{ON} = 6.5 Ω (typical)
- Leakage current of 1.0 nA max. (0.2 nA typ.) when relay is open.
- RoHS compliant



NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices
- Broadband systems
- Data loggers

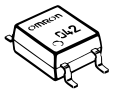
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	**G3VM-41GR7**	100	---
			G3VM-41GR7(TR)	---	2,500

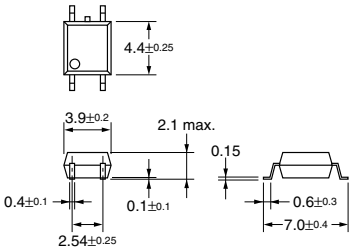
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-41GR7



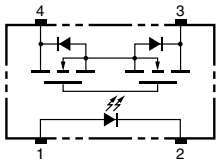
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

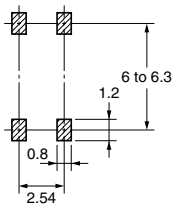
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-41GR7



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41GR7



■ Absolute Maximum Ratings (Ta = 25°C)

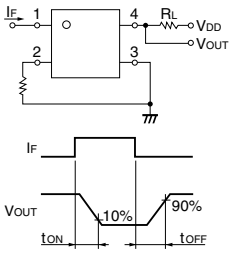
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	40	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_O/°C	−1.2	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	6.5	9.5	Ω	I_F = 5 mA, I_O = 120 mA, t = 10 ms
	Current leakage when the relay is open	I_{LEAK}	---	0.2	1.0	nA	V_{OFF} = 30 V, T_a = 50°C
	Capacity between terminals	C_{OFF}	---	1.65	3.0	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance between I/O terminals		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.03	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 10 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.15	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

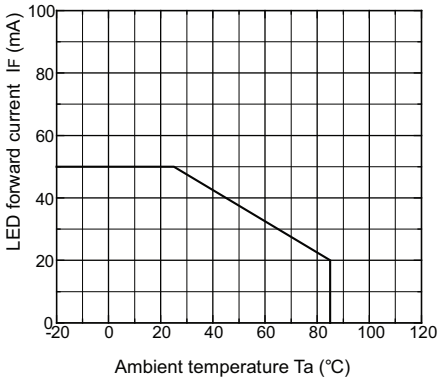
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	32	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	120	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

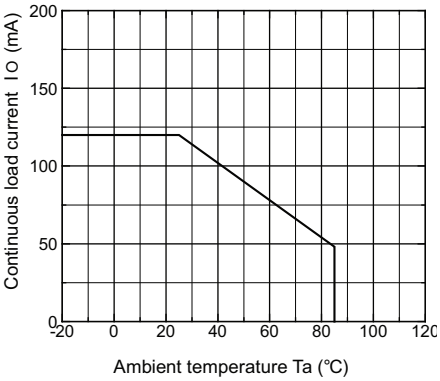
LED forward current vs. Ambient temperature

I_F - Ta



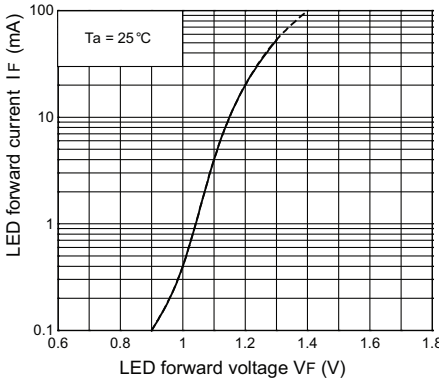
Continuous load current vs. Ambient temperature

I_O - Ta



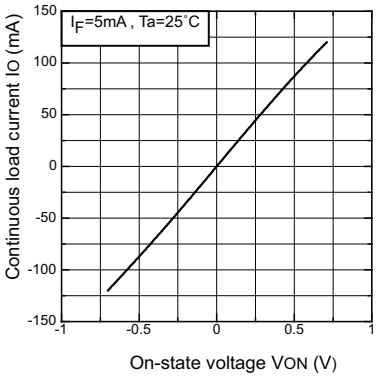
LED forward current vs. LED forward voltage

I_F - V_F



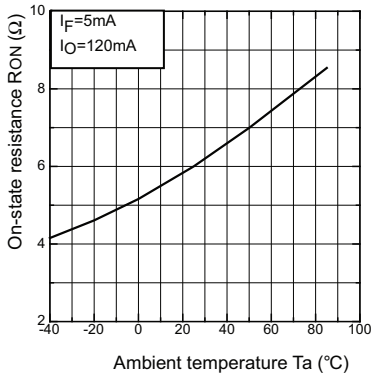
Continuous load current vs. On-state voltage

I_O - V_{ON}



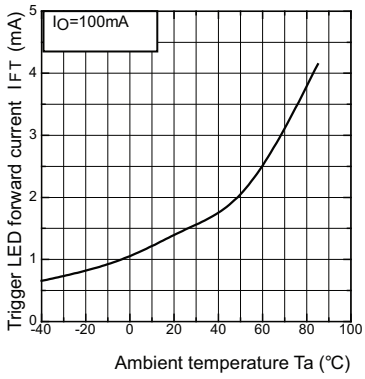
On-state resistance vs. Ambient temperature

R_{ON} - Ta



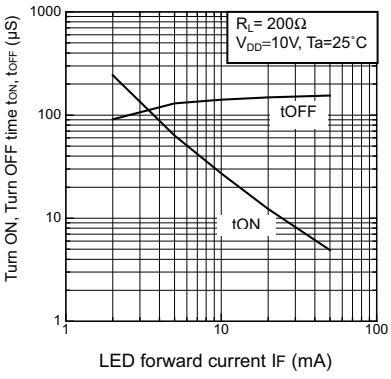
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



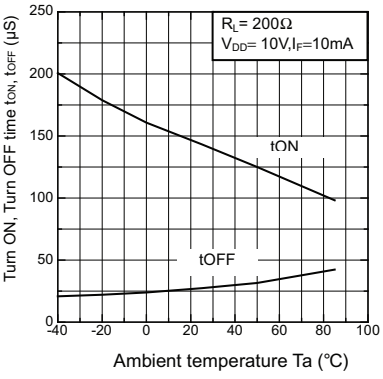
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



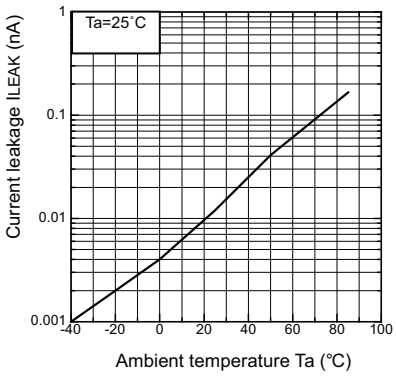
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

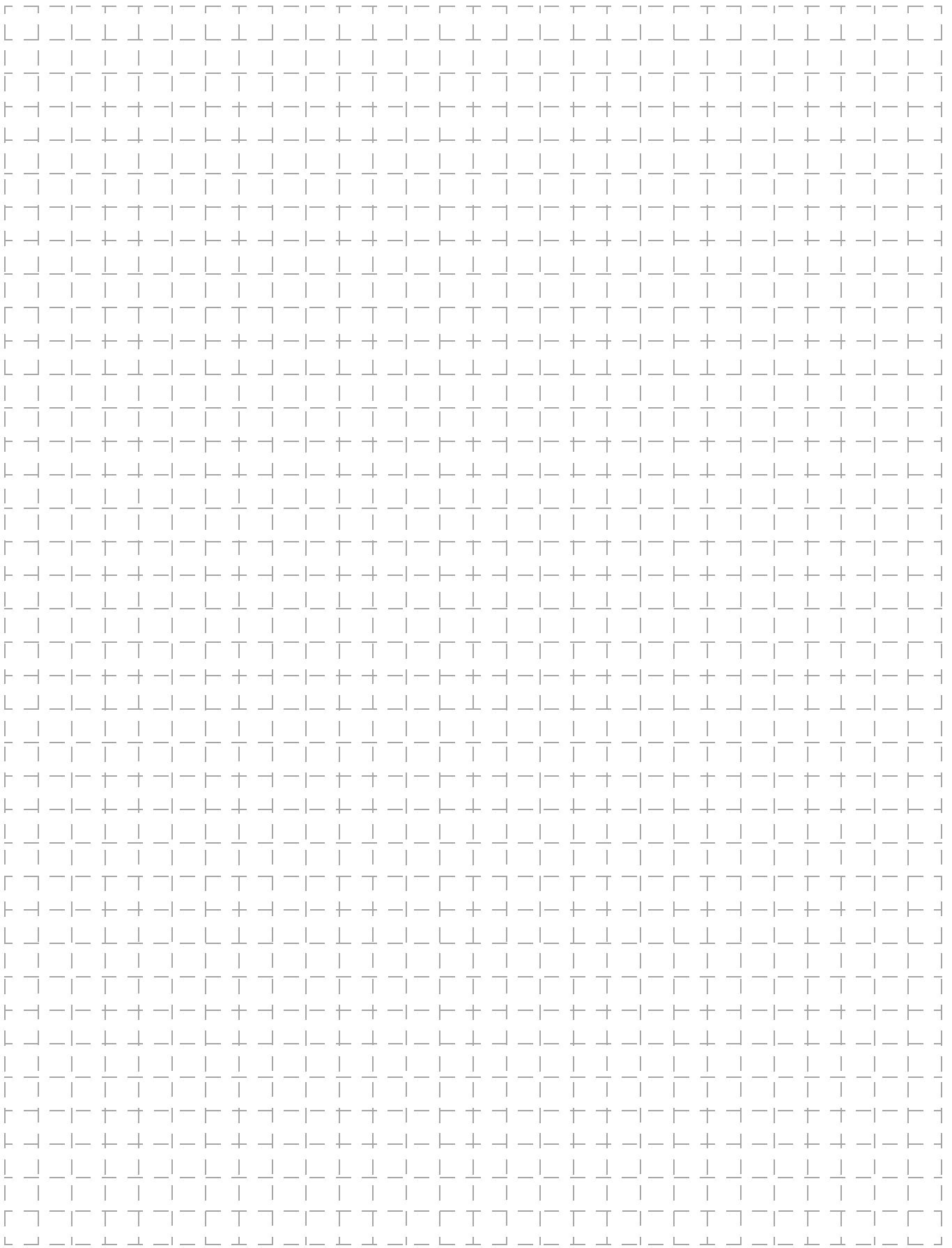


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



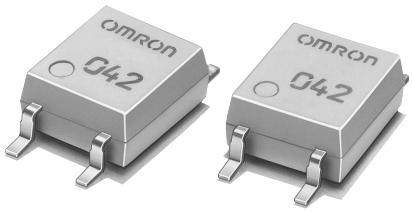
MEMO



MOS FET Relays
G3VM-41GR8

Low 100-mΩ ON Resistance.
High-power, 1-A Switching with SOP Package.

- Continuous load current of 1 A.
- ON resistance of 0.1 Ω (typical) suppresses output signal attenuation.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS compliant



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	**G3VM-41GR8**	100	---
			G3VM-41GR8(TR)	---	2,500

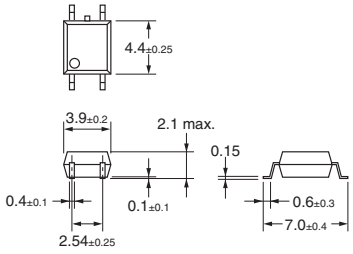
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-41GR8



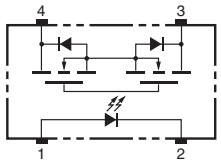
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

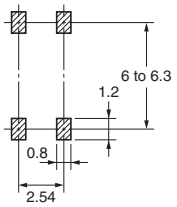
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-41GR8



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41GR8



■ Absolute Maximum Ratings (Ta = 25°C)

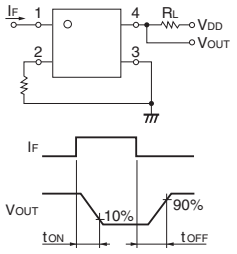
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	30	mA	
	LED forward current reduction rate	ΔI_F/°C	–0.3	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	40	V	
	Continuous load current	I_O	1,000	mA	
	ON current reduction rate	ΔI_O/°C	–13.3	mA/°C	$T_a \geq 50$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.18	1.33	1.48	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	70	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1.0	3	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	0.1	0.13	Ω	I_F = 5 mA, I_O = 1 A
	Current leakage when the relay is open	I_{LEAK}	---	0.2	1	nA	V_{OFF} = 30 V
	Capacity between terminals	C_{OFF}	---	300	500	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance between I/O terminals		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	1.2	3.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.2	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

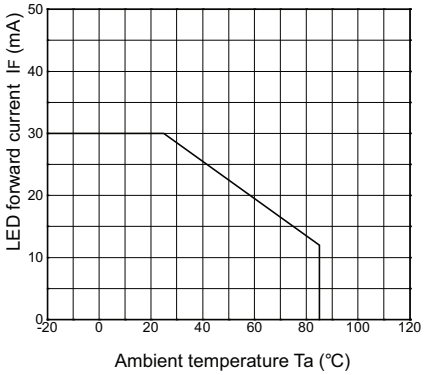
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	32	V
Operating LED forward current	I_F	5	10	20	mA
Continuous load current (AC peak/DC)	I_O	---	---	1,000	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

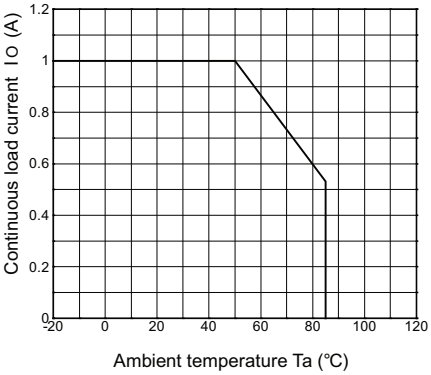
LED forward current vs. Ambient temperature

IF - Ta



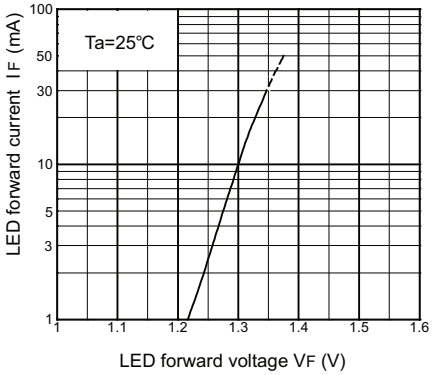
Continuous load current vs. Ambient temperature

IO - Ta



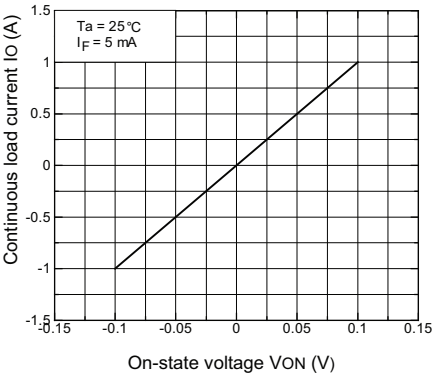
LED forward current vs. LED forward voltage

IF - VF



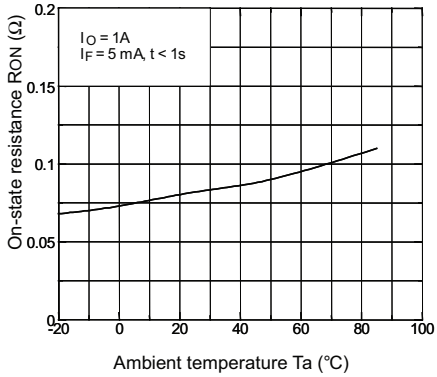
Continuous load current vs. On-state voltage

IO - VON



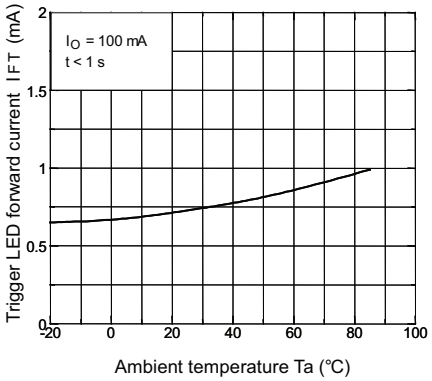
On-state resistance vs. Ambient temperature

RON - Ta



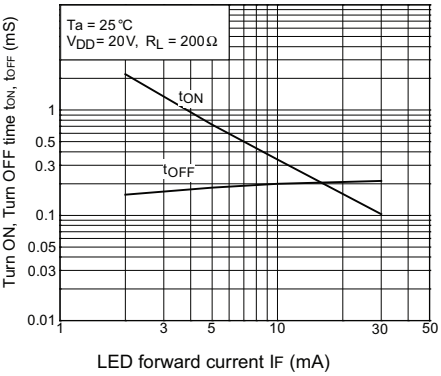
Trigger LED forward current vs. Ambient temperature

IFT - Ta



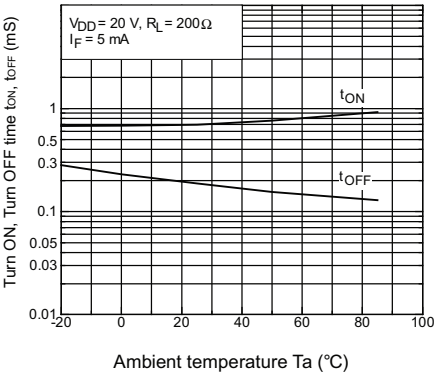
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



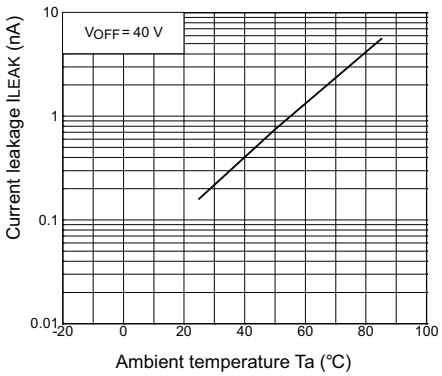
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta

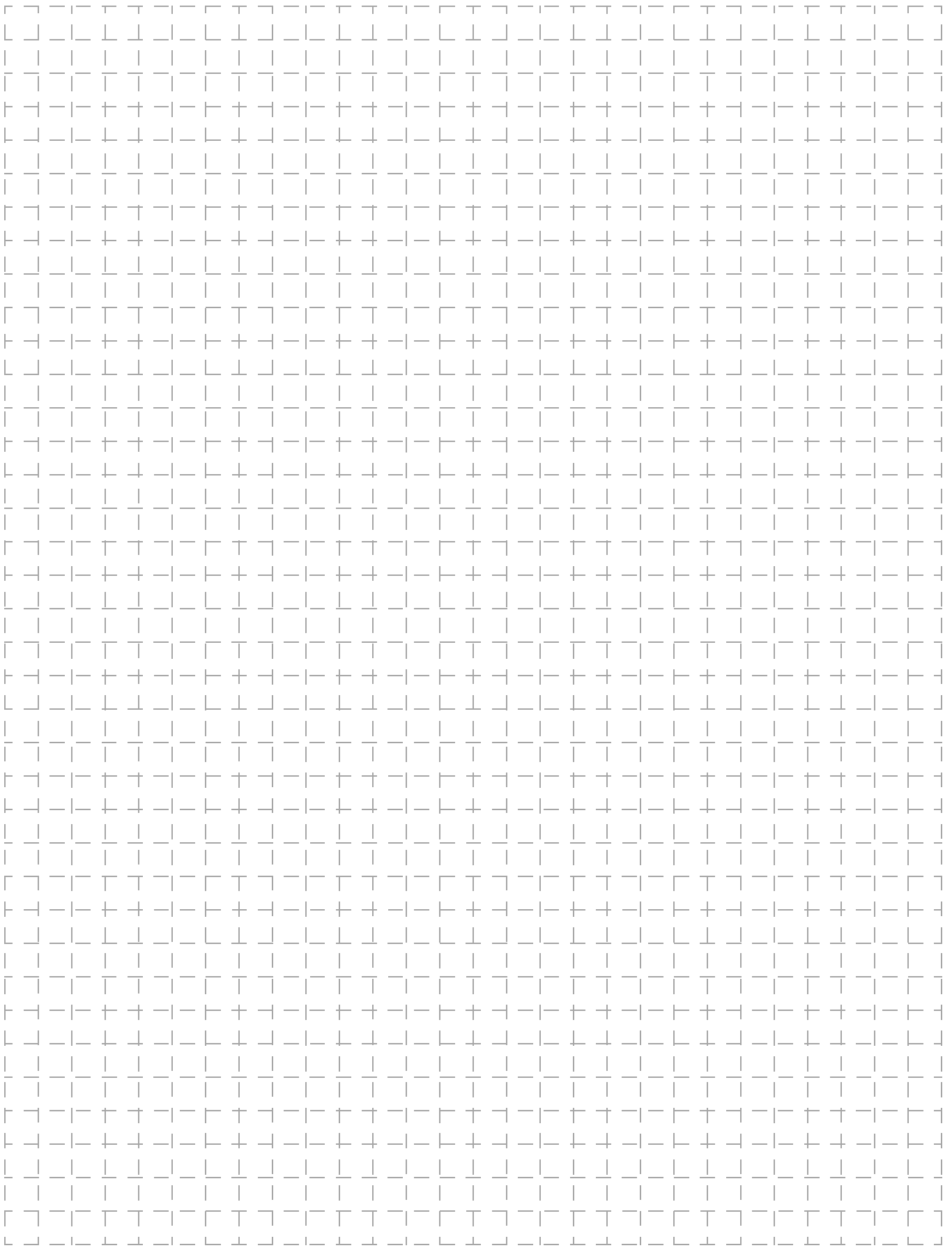


Current leakage vs. Ambient temperature

I LEAK - Ta



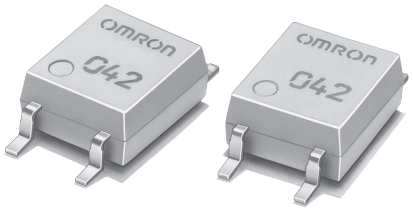
MEMO



MOS FET Relays
G3VM-61G1

MOS FET Relay Designed for Switching Minute and Analog Signals, SOP Package.

- Upgraded G3VM-S1 Series.
- Continuous load current of 400 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

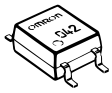
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	60 VAC	**G3VM-61G1**	100	---
			G3VM-61G1(TR)	---	2,500

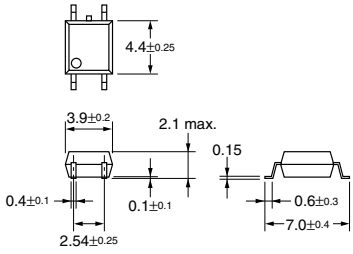
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-61G1



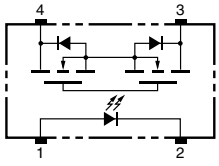
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

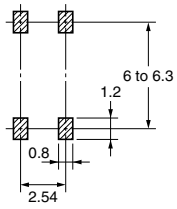
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-61G1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-61G1



■ Absolute Maximum Ratings (Ta = 25°C)

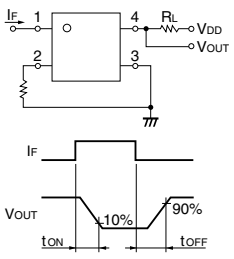
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	60	V	
	Continuous load current	I_O	400	mA	
	ON current reduction rate	ΔI_{ON}/°C	–4.0	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1.6	3	mA	I_O = 400 mA
Output	Maximum resistance with output ON	R_{ON}	---	1	2	Ω	I_F = 5 mA, I_O = 400 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.001	1.0	μA	V_{OFF} = 60 V
	Capacity between terminals	C_{OFF}	---	130	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.8	2.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.1	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

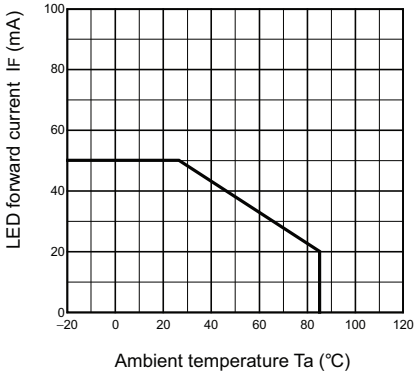
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	48	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	400	mA
Operating temperature	T_a	– 20	---	65	°C

■ Engineering Data

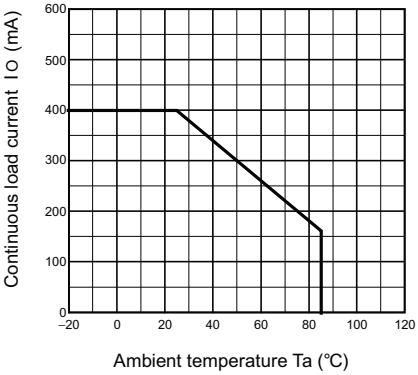
LED forward current vs. Ambient temperature

I_F - Ta



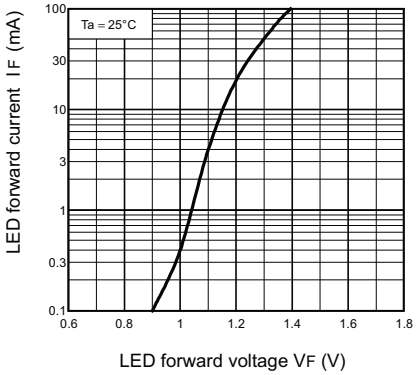
Continuous load current vs. Ambient temperature

I_O - Ta



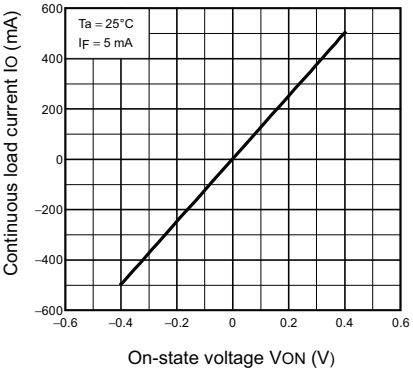
LED forward current vs. LED forward voltage

I_F - V_F



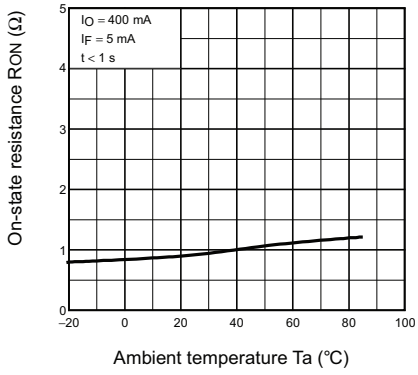
Continuous load current vs. On-state voltage

I_O - V_{ON}



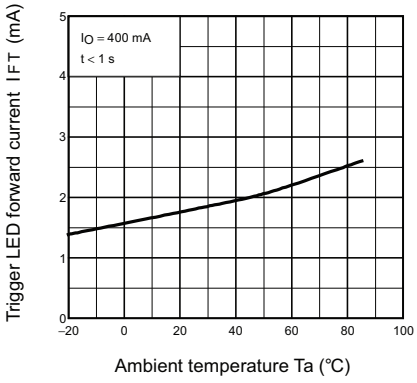
On-state resistance vs. Ambient temperature

R_{ON} - Ta



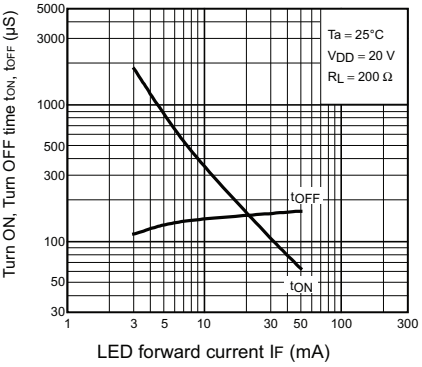
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



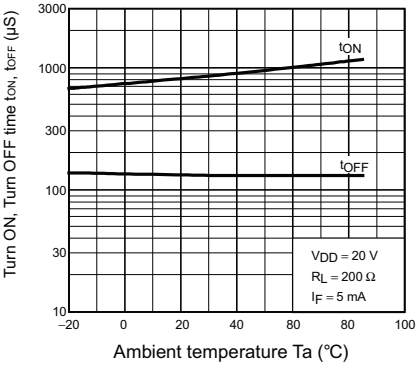
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



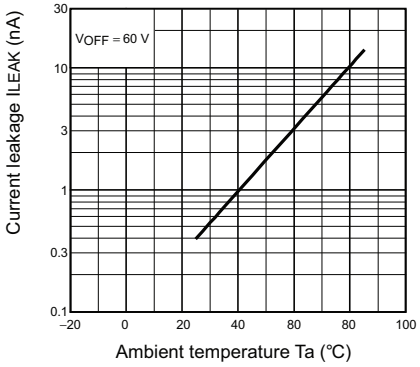
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

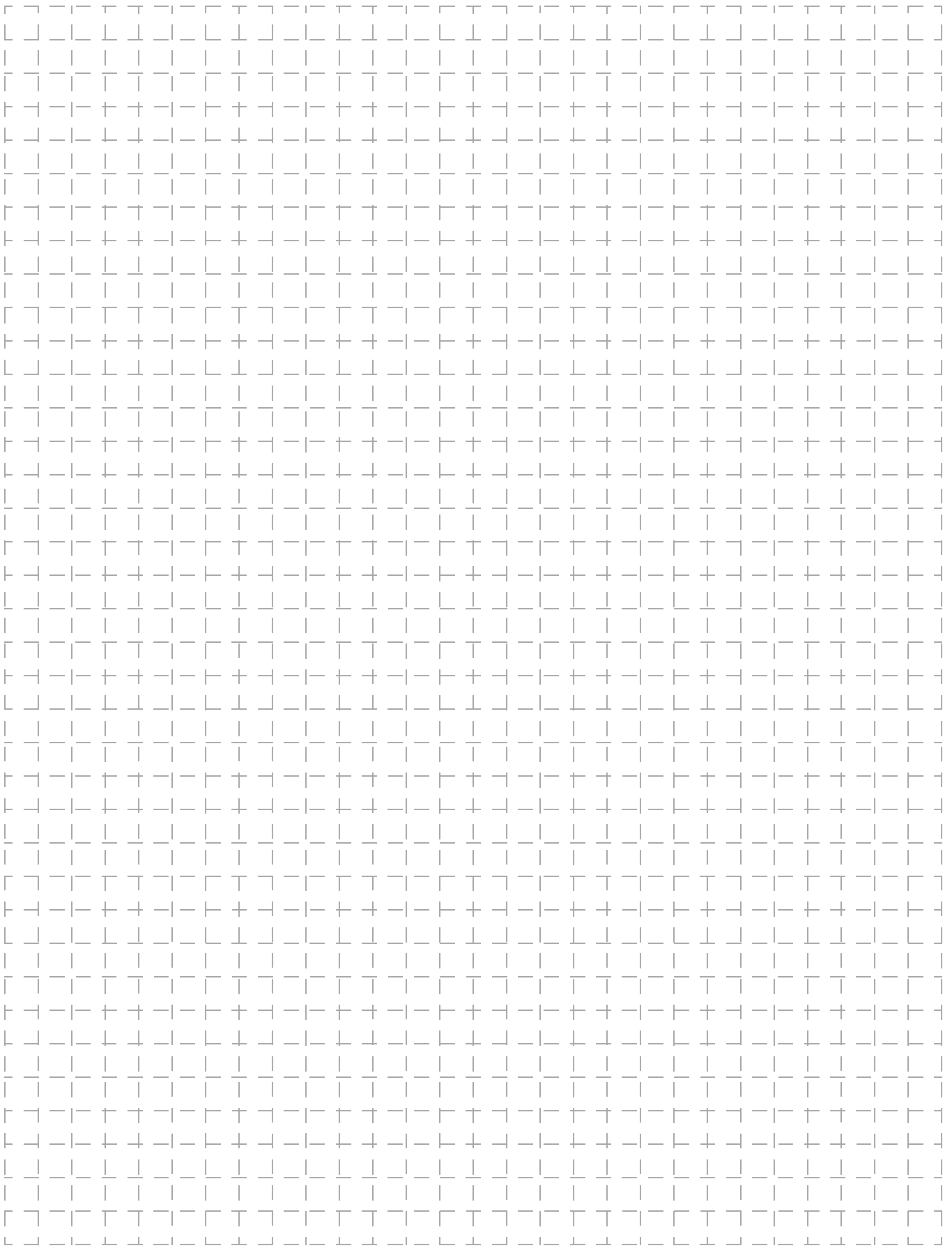


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



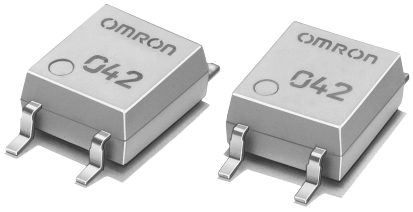
MEMO



MOS FET Relays
G3VM-61G2

Ultrasensitive MOS FET Relays in 60 V Load series for power savings, SOP Package.

- Trigger LED forward current of 1 mA (maximum) facilitates power saving designs and prolonged battery life.
- Continuous load current of 400 mA.
- RoHS Compliant



NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems and Measurement devices
- Security systems
- Industrial equipment
- Battery powered equipment and Amusement machines

■ List of Models

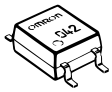
Contact form	Terminals	Load voltage (peak value) (See the note.)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	60 V	**G3VM-61G2**	100	---
			G3VM-61G2(TR)	---	2,500

Note: The AC peak and DC value are given for the load voltage.

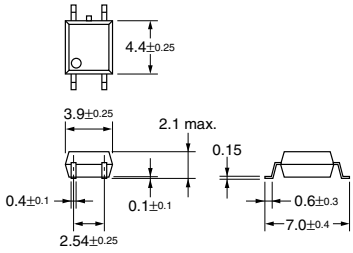
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-61G2



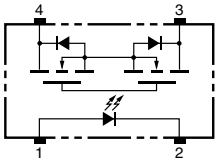
Note: The actual product is marked differently from the image shown here.

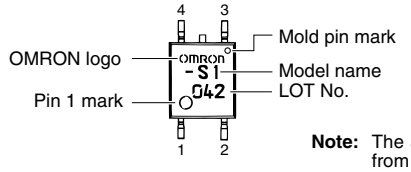


Weight: 0.1 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-61G2

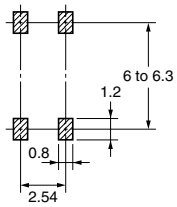




Note: The actual product is marked differently from the image shown here.

■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-61G2



■ Absolute Maximum Ratings (T_a = 25°C)

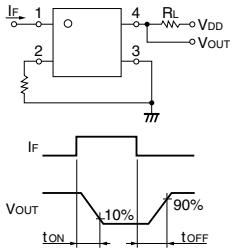
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	60	V	
	Continuous load current (AC peak/DC)	I_O	400	mA	
	ON current reduction rate	ΔI_O/°C	–4.0	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (T_a = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	0.4	1	mA	I_O = 400 mA
Output	Maximum resistance with output ON	R_{ON}	---	1	2	Ω	I_F = 2 mA, I_O = 400 mA
	Current leakage when the relay is open	I_{LEAK}	---	1	1000	nA	V_{OFF} = 60 V
	Capacity between terminals	C_{OFF}	---	130	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq$ 60%
Turn-ON time		t_{ON}	---	3	8	ms	I_F = 2 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	1	3	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

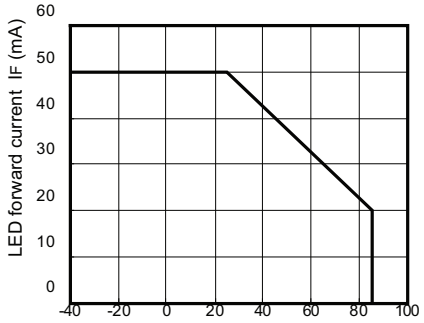
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	48	V
Operating LED forward current	I_F	---	2	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	320	mA
Operating temperature	T_a	– 20	---	65	°C

■ Engineering Data

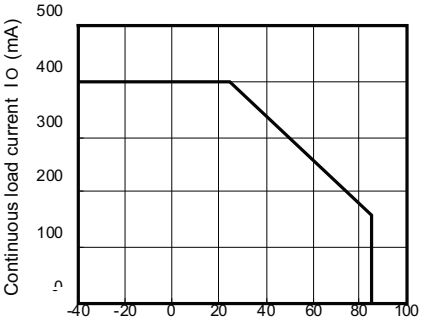
LED forward current vs. Ambient temperature

IF - Ta



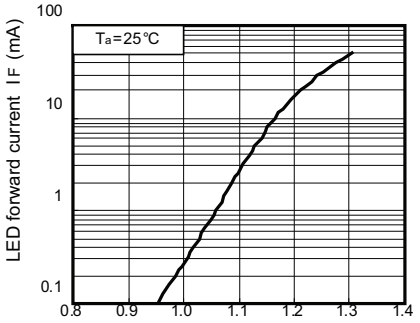
Continuous load current vs. Ambient temperature

IO - Ta



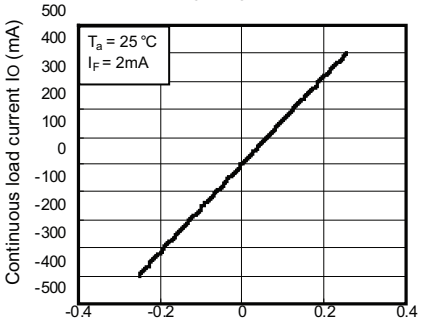
LED forward current vs. LED forward voltage

IF - VF



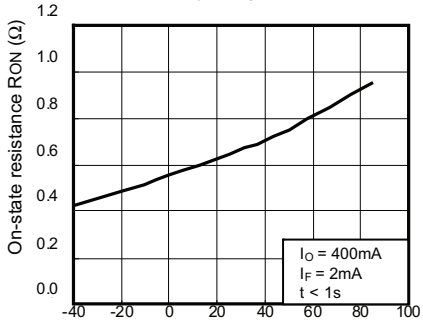
Continuous load current vs. On-state voltage

IO - VON



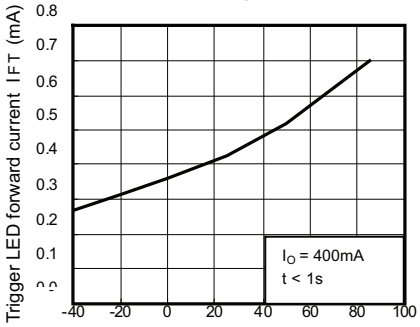
On-state resistance vs. Ambient temperature

RON - Ta



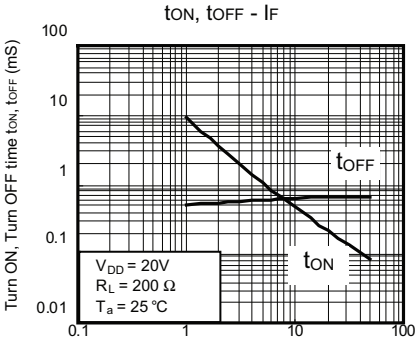
Trigger LED forward current vs. Ambient temperature

IFT - Ta



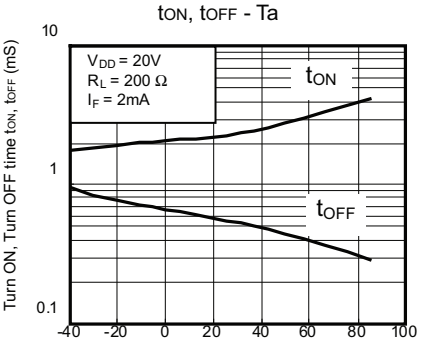
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



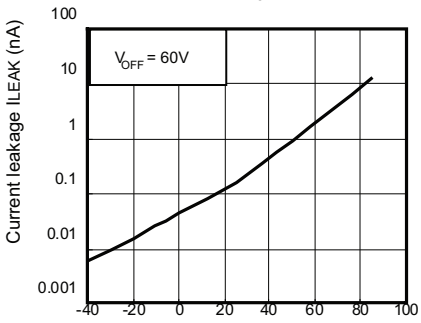
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta

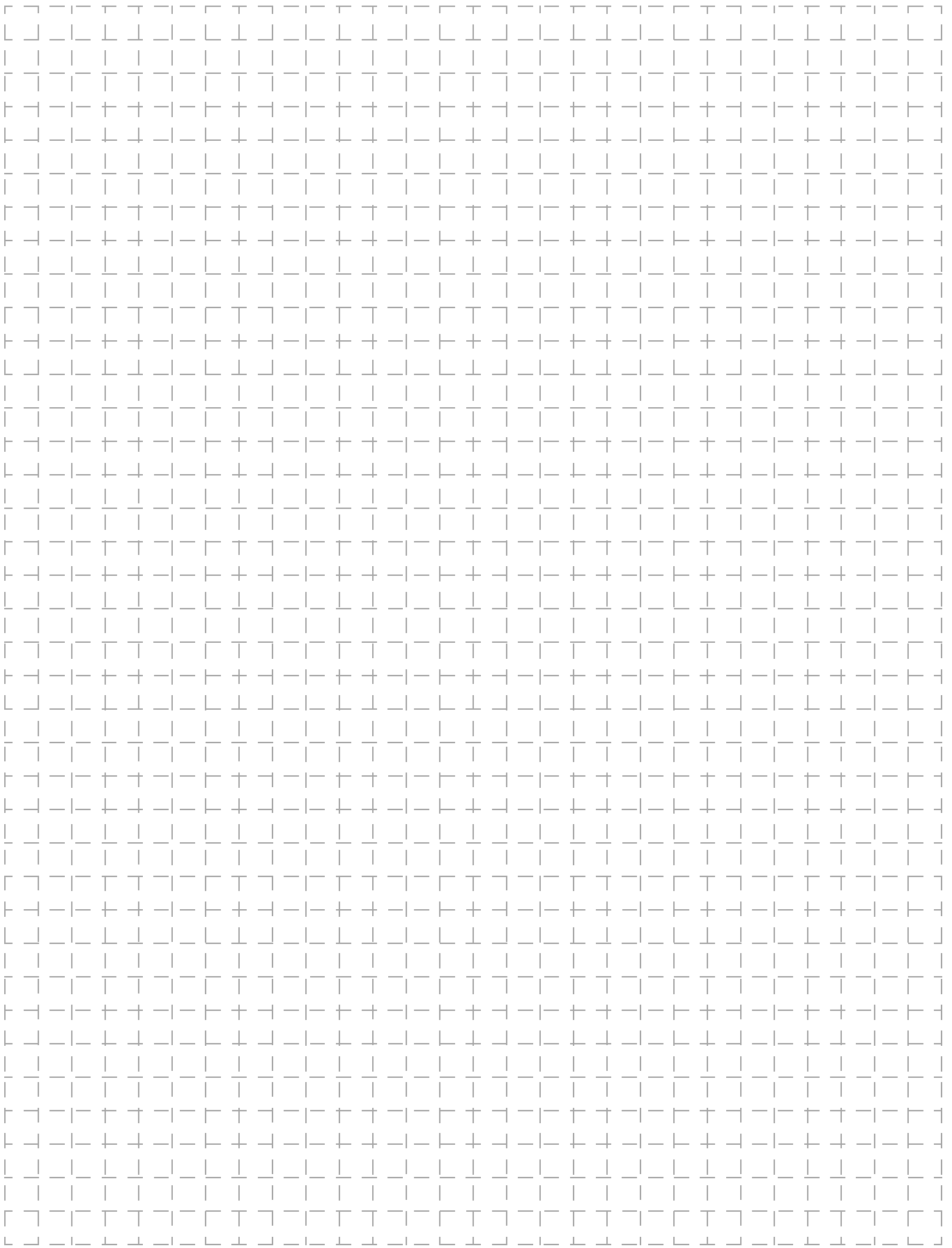


Current leakage vs. Ambient temperature

I LEAK - Ta



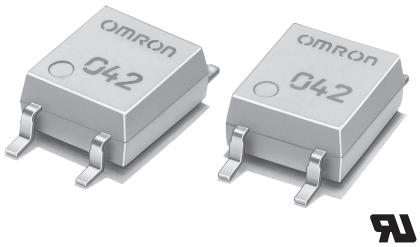
MEMO



MOS FET Relays
G3VM-61GR1

New MOS FET Relays with 1 Amp Switching Designed for Switching Minute and Analog Signals, SOP Package

- Upgraded G3VM-S1 Series.
- Continuous load current of 1 A.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS compliant



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	60 VAC	**G3VM-61GR1**	100	---
			G3VM-61GR1(TR)	---	2,500

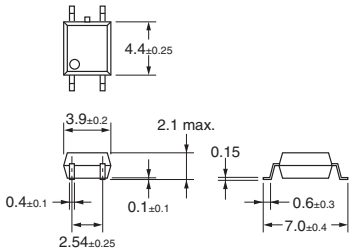
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-61GR1



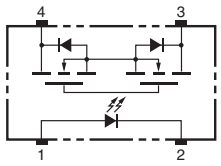
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

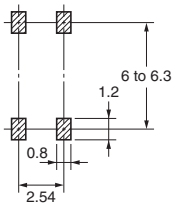
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-61GR1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-61GR1



■ Absolute Maximum Ratings (Ta = 25°C)

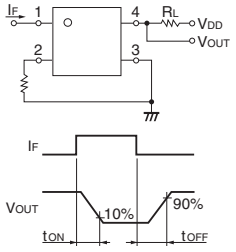
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	60	V	
	Continuous load current	I_O	1,000	mA	
	ON current reduction rate	ΔI_{ON}/°C	−13.3	mA/°C	$T_a \geq 50$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1.0	3	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	0.25	0.7	Ω	I_F = 5 mA, I_O = 1 A
	Current leakage when the relay is open	I_{LEAK}	---	0.2	100	nA	V_{OFF} = 60 V
	Capacity between terminals	C_{OFF}	---	90	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	1.4	3.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.6	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

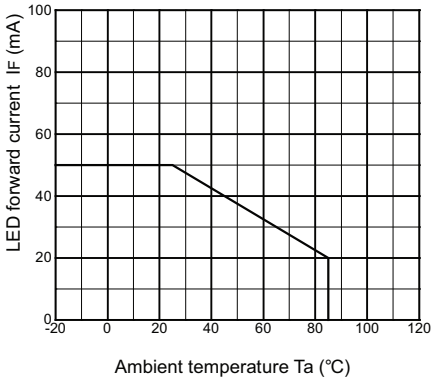
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	48	V
Operating LED forward current	I_F	5	10	20	mA
Continuous load current (AC peak/DC)	I_O	---	---	1,000	mA
Operating temperature	T_a	25	---	65	°C

■ Engineering Data

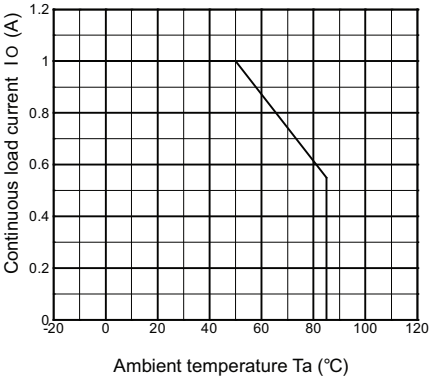
LED forward current vs. Ambient temperature

IF - Ta



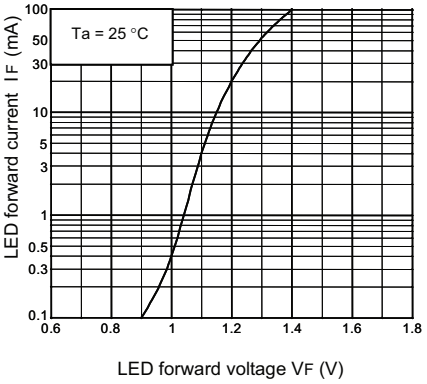
Continuous load current vs. Ambient temperature

IO - Ta



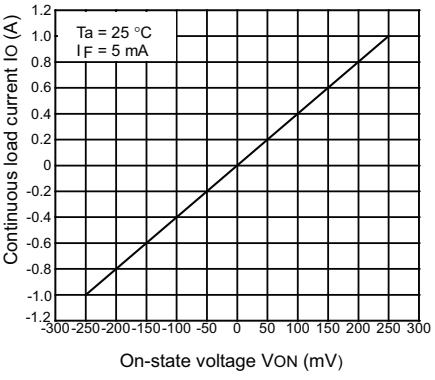
LED forward current vs. LED forward voltage

IF - VF



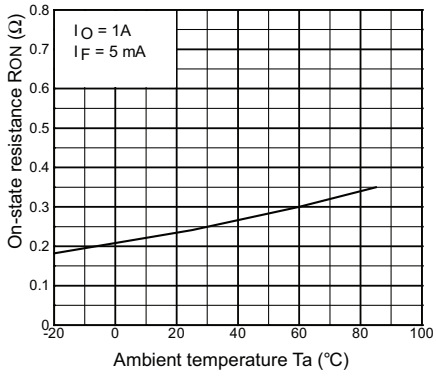
Continuous load current vs. On-state voltage

IO - VON



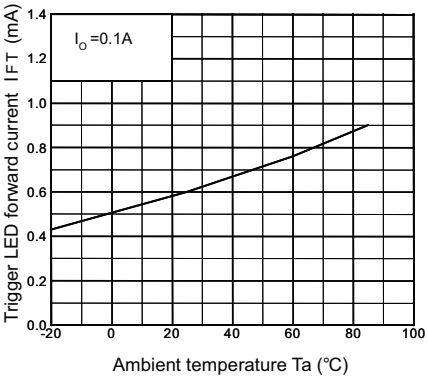
On-state resistance vs. Ambient temperature

RON - Ta



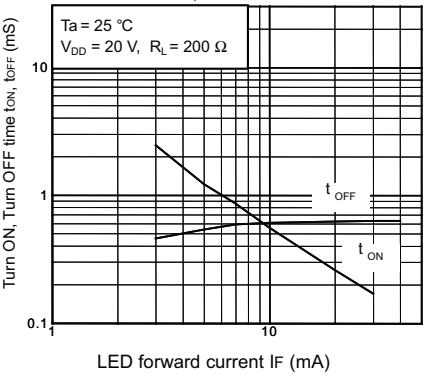
Trigger LED forward current vs. Ambient temperature

IFT - Ta



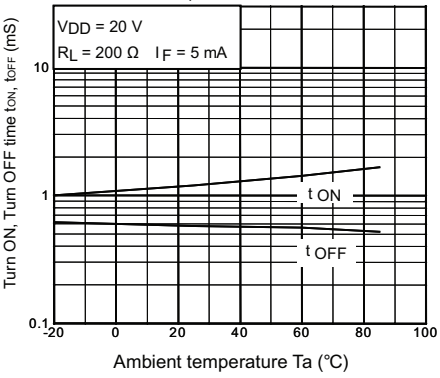
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



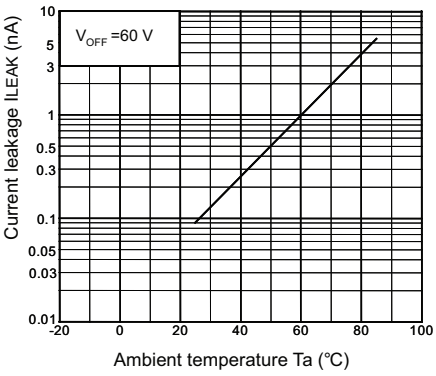
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta

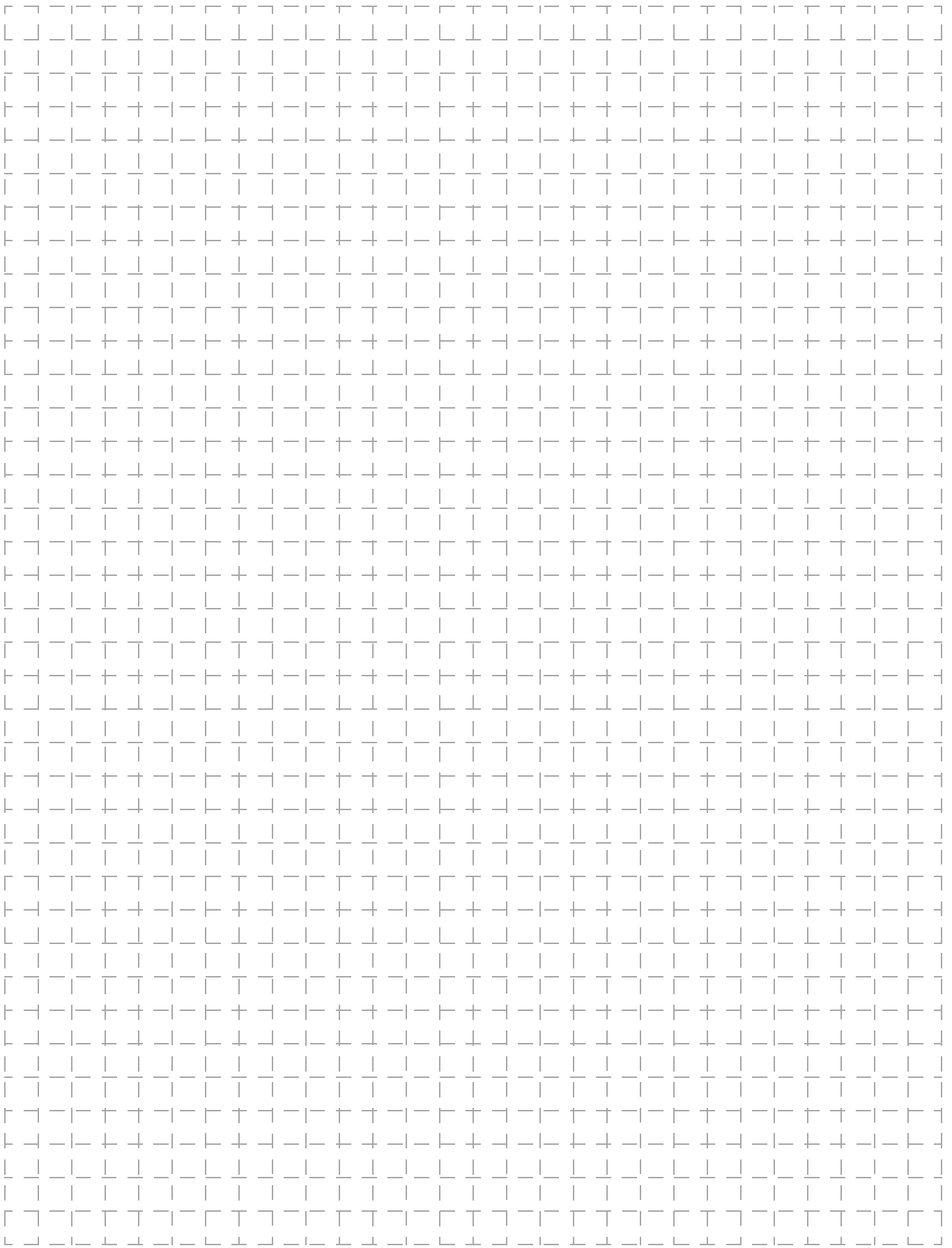


Current leakage vs. Ambient temperature

I LEAK - Ta



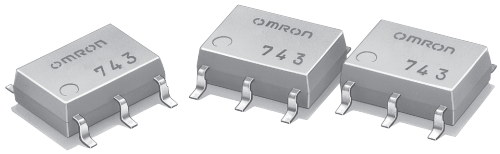
MEMO



MOS FET Relays
G3VM-61H1

MOS FET Relay Designed for Switching Minute and Analog Signals has a 6-pin SOP Package and 60-V Load Voltage

- Continuous load current of 400 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

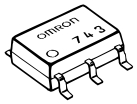
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	60 VAC	**G3VM-61H1**	75	---
			G3VM-61H1(TR)	---	2,500

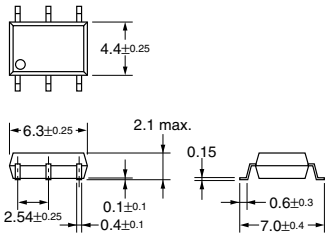
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-61H1



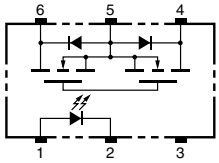
Note: The actual product is marked differently from the image shown here.



Weight: 0.13 g

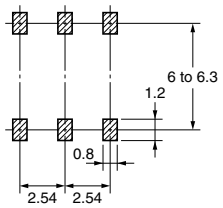
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-61H1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-61H1

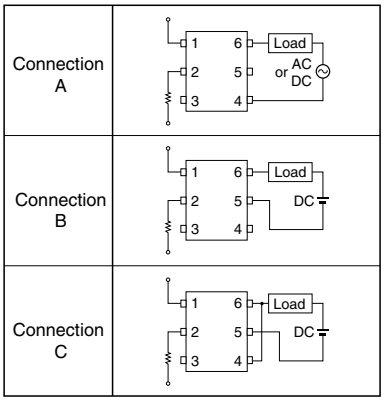


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		Δ I_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Load voltage (AC peak/DC)		V_{OFF}	60	V	
	Continuous load current	Connection A	I_O	400	mA	
		Connection B		400		
		Connection C		800		
	ON current reduction rate	Connection A	Δ I_{ON}/°C	–4.0	mA/°C	$T_a \geq 25$°C
		Connection B		–4.0		
		Connection C		–8.0		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature			T_a	–40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

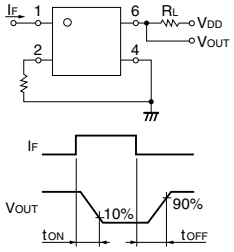
Connection Diagram



■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1.6	3	mA	I_O = 400 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	1	2	Ω	I_F = 5 mA, I_O = 400 mA
		Connection B		---	0.5	1	Ω	I_F = 5 mA, I_O = 400 mA
		Connection C		---	0.25	---	Ω	I_F = 5 mA, I_O = 800 mA
	Current leakage when the relay is open		I_{LEAK}	---	0.001	1.0	μA	V_{OFF} = 60 V
	Capacity between terminals A Connection		C_{OFF}	---	130	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time			t_{ON}	---	0.8	2.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			t_{OFF}	---	0.1	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

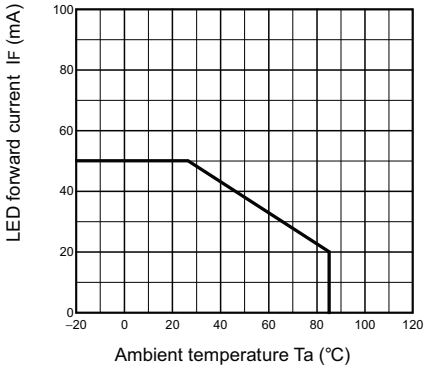
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	48	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	400	mA
Operating temperature	T_a	– 20	---	65	°C

■ Engineering Data

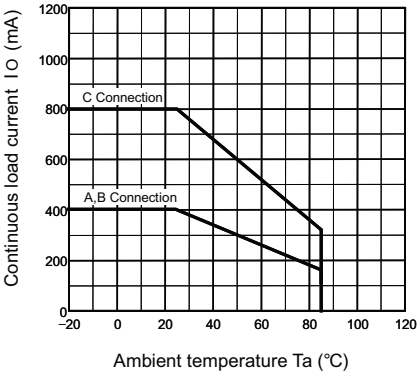
LED forward current vs. Ambient temperature

I_F - Ta



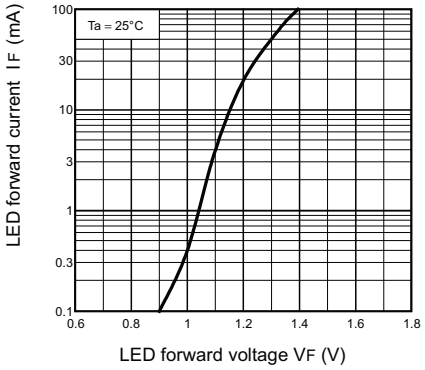
Continuous load current vs. Ambient temperature

I_O - Ta



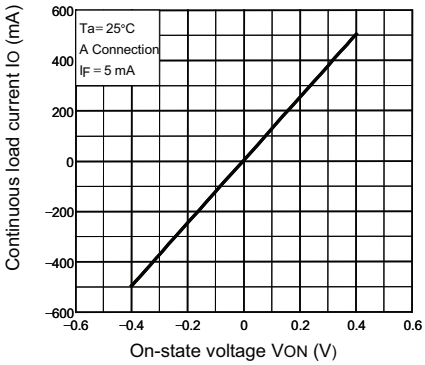
LED forward current vs. LED forward voltage

I_F - V_F



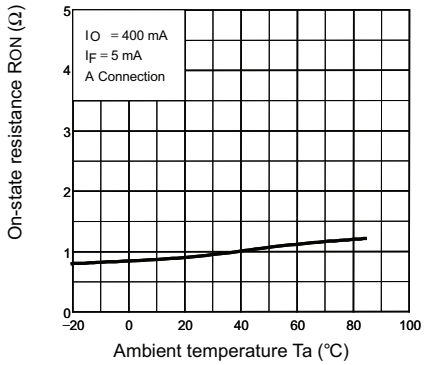
Continuous load current vs. On-state voltage

I_O - V_{ON}



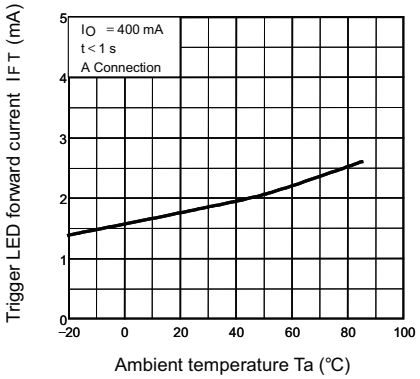
On-state resistance vs. Ambient temperature

R_{ON} - Ta



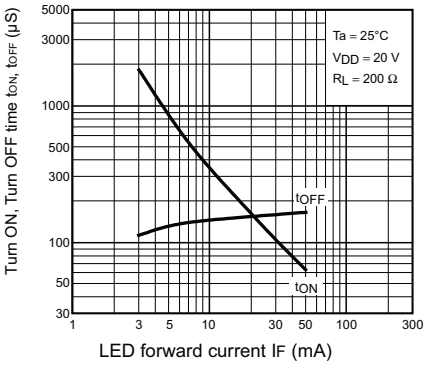
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



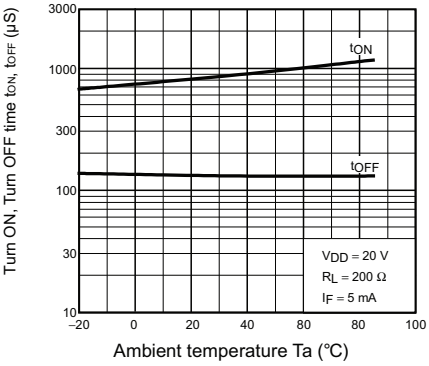
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



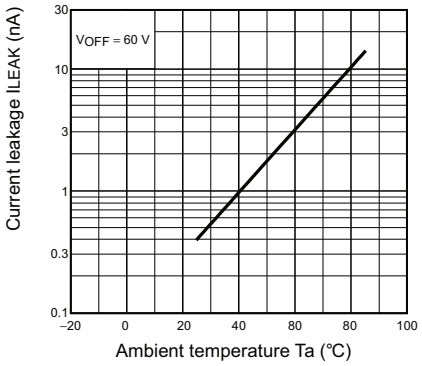
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

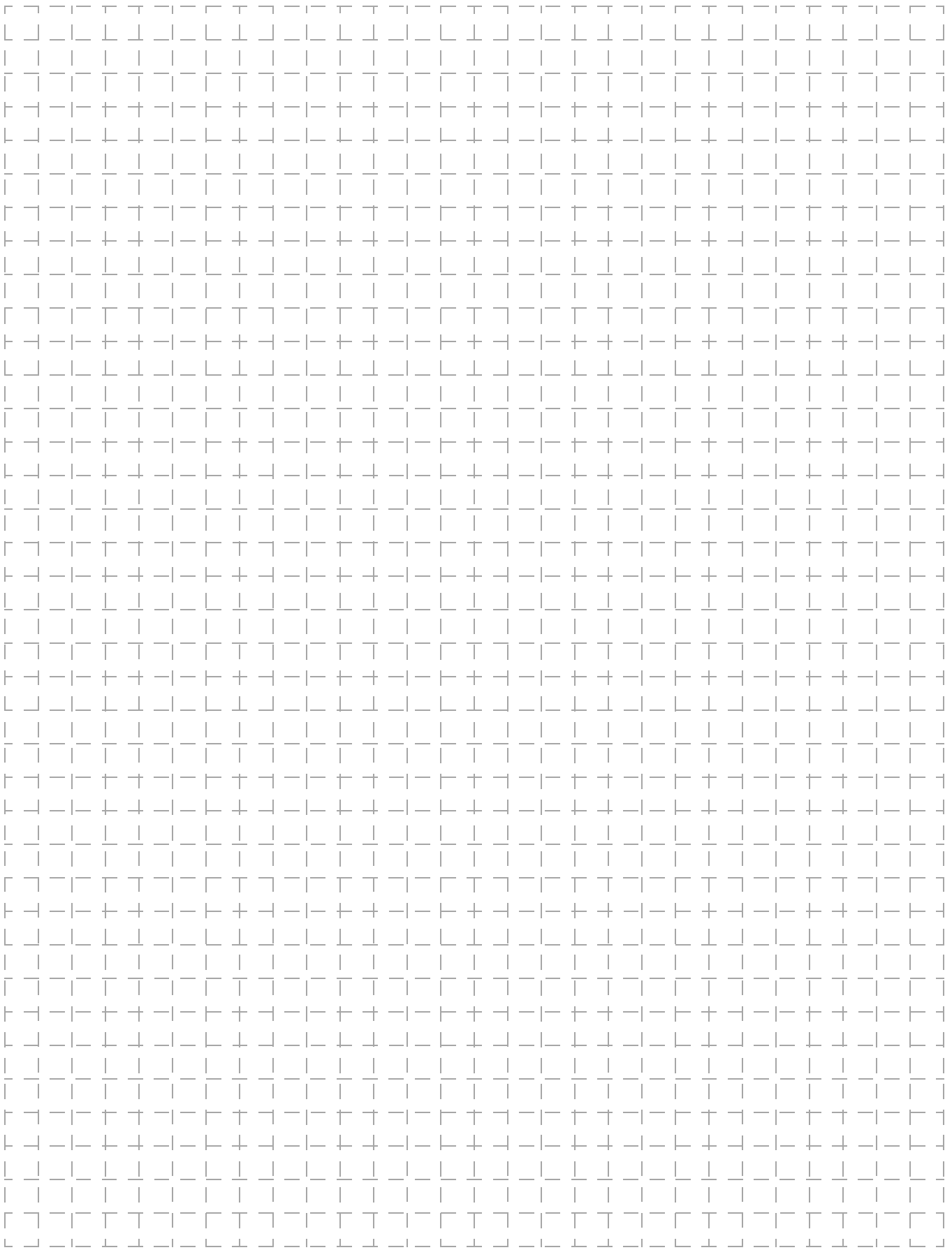


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



MEMO



MOS FET Relays
G3VM-62J1

MOS FET Relay Designed for Switching Minute and Analog Signals has 2 Channels and a 60-V Load Voltage, 8-pin SOP Package.

- Continuous load current of 400 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices
- Data Loggers
- Amusement machines

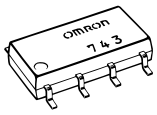
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NO	Surface-mounting terminals	60 VAC	**G3VM-62J1**	50	---
			G3VM-62J1(TR)	---	2,500

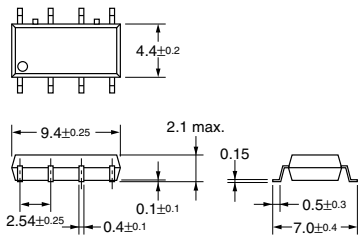
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-62J1



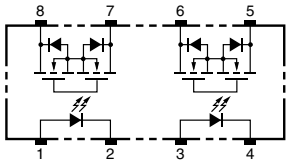
Note: The actual product is marked differently from the image shown here.



Weight: 0.2 g

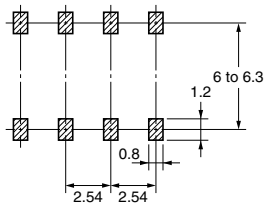
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-62J1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-62J1



■ Absolute Maximum Ratings (Ta = 25°C)

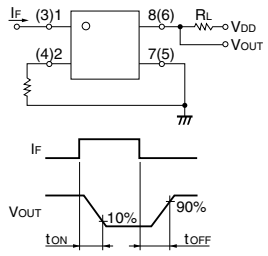
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	60	V	
	Continuous load current	I_O	400	mA	
	ON current reduction rate	ΔI_{ON}/°C	−4.0	mA/°C	$T_a \geq 25$°C
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1.6	3	mA	I_O = 400 mA
Output	Maximum resistance with output ON	R_{ON}	---	1.0	2.0	Ω	I_F = 5 mA, I_O = 400 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.001	1.0	μA	V_{OFF} = 60 V
	Capacity between terminals	C_{OFF}	---	130	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.8	2.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.1	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

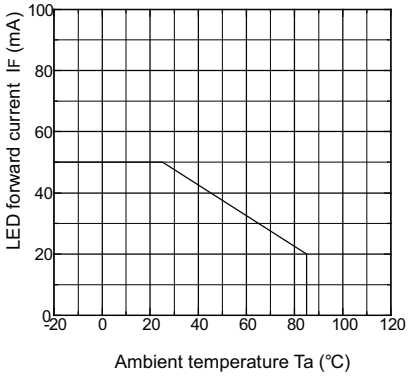
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	48	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	400	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

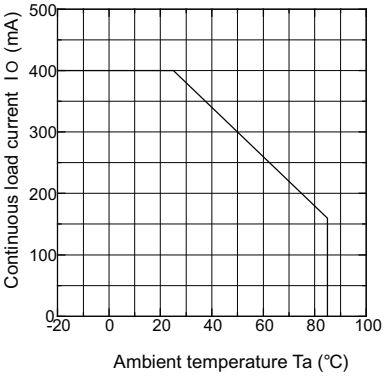
LED forward current vs. Ambient temperature

I_F - Ta



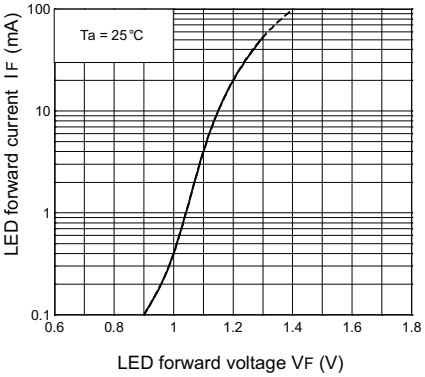
Continuous load current vs. Ambient temperature

I_O - Ta



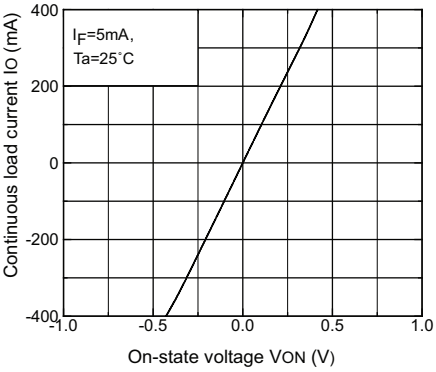
LED forward current vs. LED forward voltage

I_F - V_F



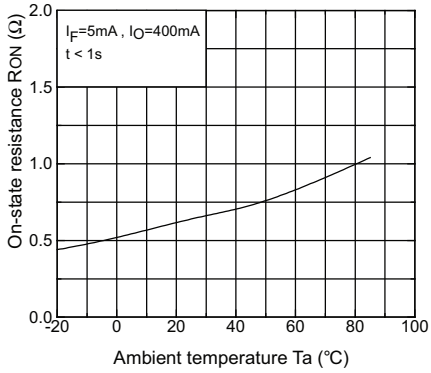
Continuous load current vs. On-state voltage

I_O - V_{ON}



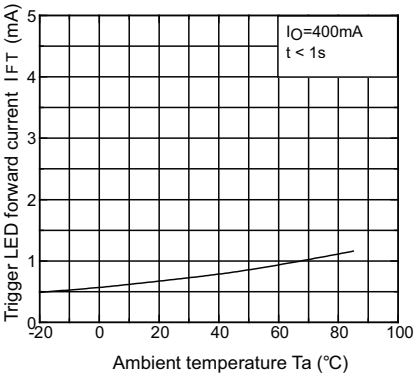
On-state resistance vs. Ambient temperature

R_{ON} - Ta



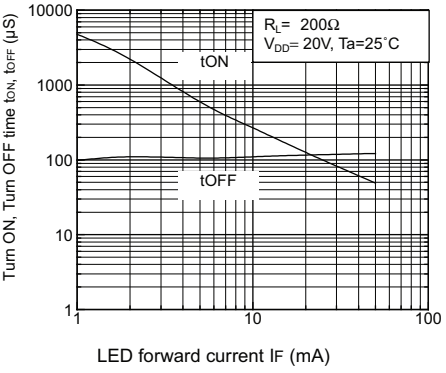
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



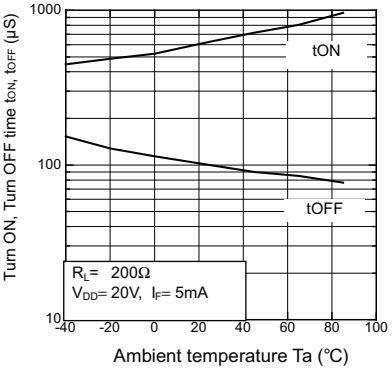
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



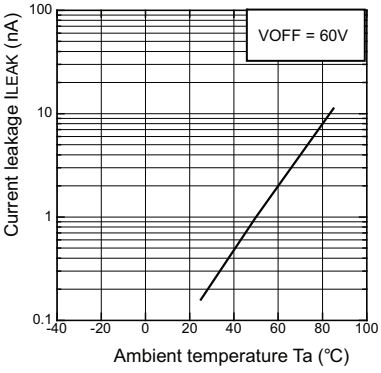
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

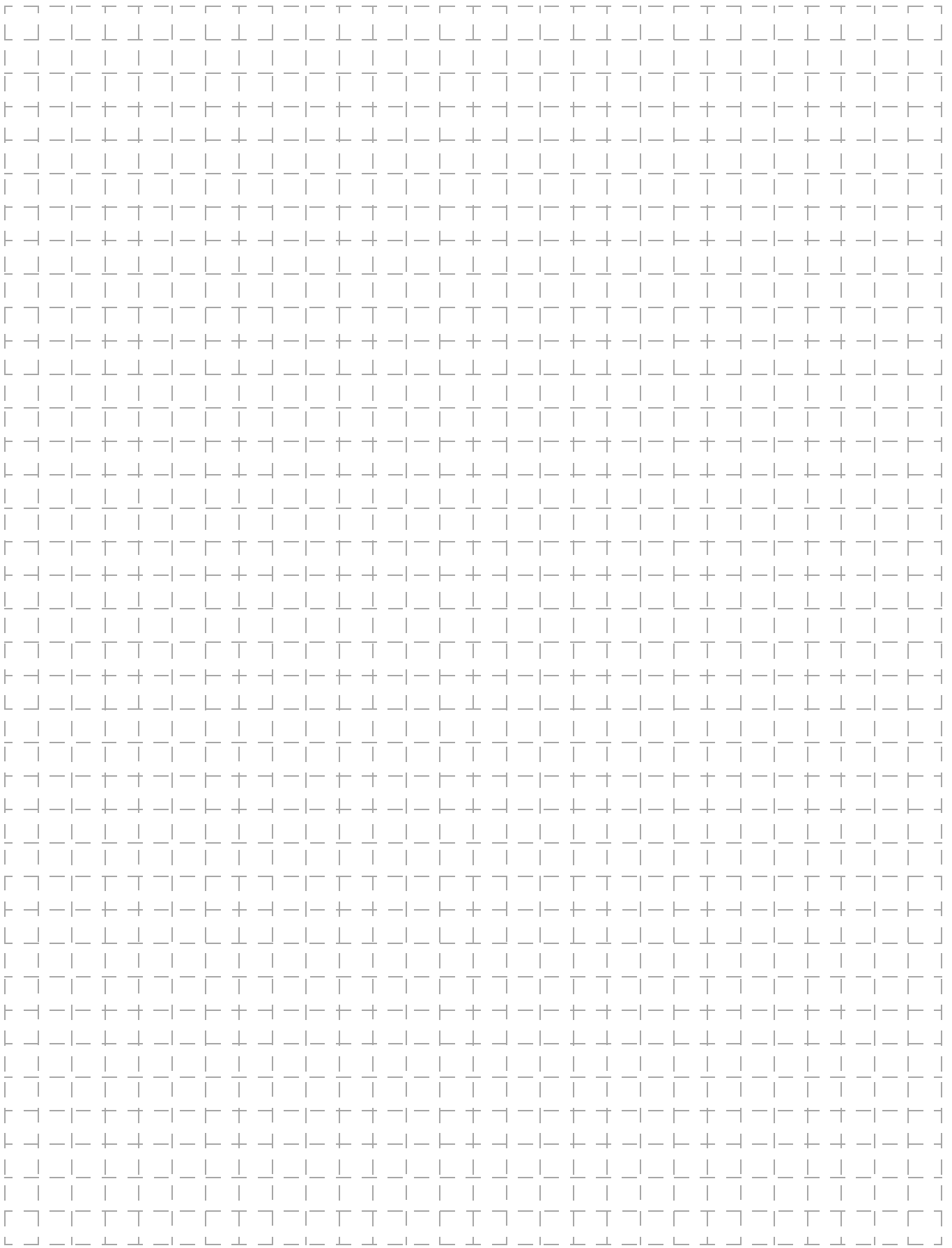


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



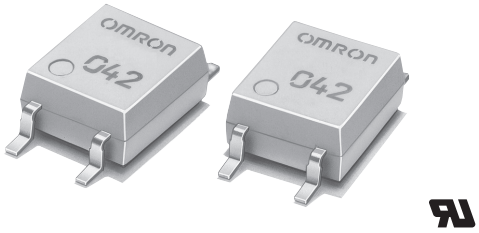
MEMO



MOS FET Relays
G3VM-81G1

Relay Incorporating a MOS FET Optically Coupled with an Infrared LED has a 4-pin SOP Package and 80-V Load Voltage

- Continuous load current of 350 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

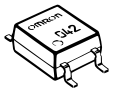
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	80 VAC	**G3VM-81G1**	100	---
			G3VM-81G1(TR)	---	2,500

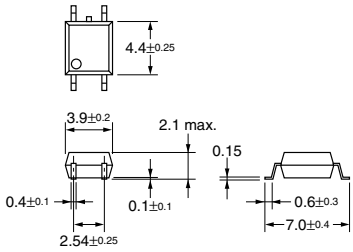
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-81G1



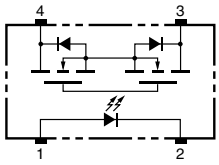
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

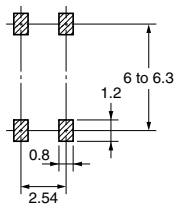
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-81G1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-81G1



■ Absolute Maximum Ratings (Ta = 25°C)

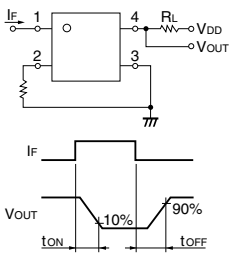
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	80	V	
	Continuous load current	I_O	350	mA	
	ON current reduction rate	ΔI_{ON}/°C	−3.5	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	Vrms	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1.0	4.0	mA	I_O = 350 mA
Output	Maximum resistance with output ON	R_{ON}	---	1.0	1.2	Ω	I_F = 5 mA, I_O = 350 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.2	1.0	nA	V_{OFF} = 30 V, Ta = 50°C
	Capacity between terminals	C_{OFF}	---	30	40	pF	V = 0, f = 100 MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.3	0.5	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.3	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

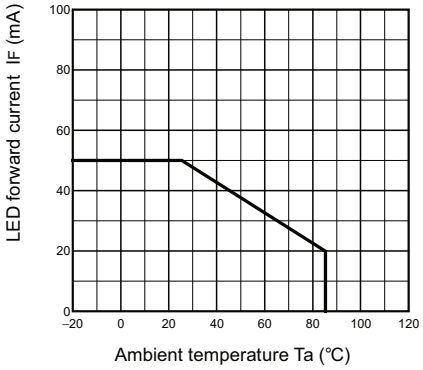
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	64	V
Operating LED forward current	I_F	5	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	350	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

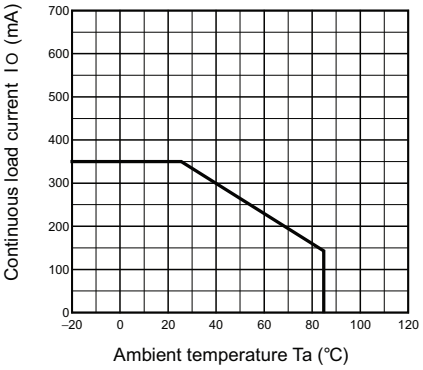
LED forward current vs. Ambient temperature

I_F - Ta



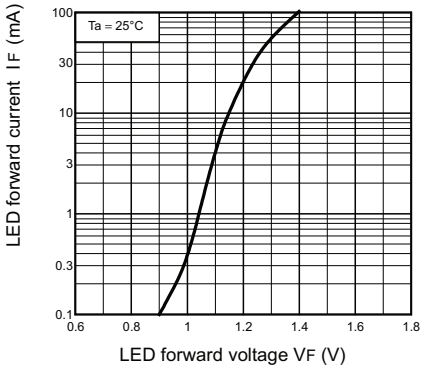
Continuous load current vs. Ambient temperature

I_O - Ta



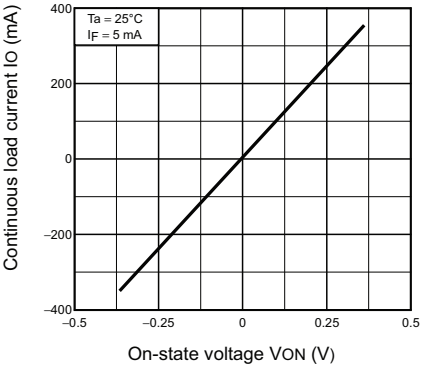
LED forward current vs. LED forward voltage

I_F - V_F



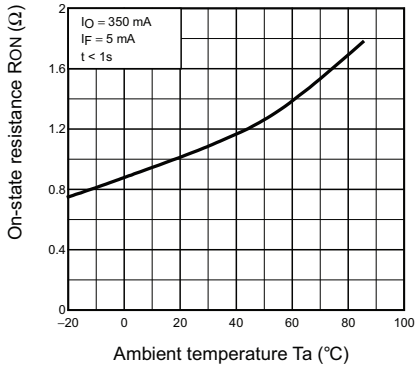
Continuous load current vs. On-state voltage

I_O - V_{ON}



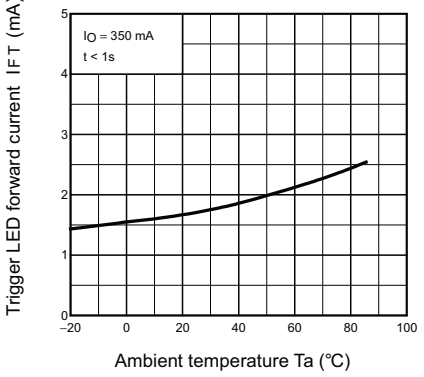
On-state resistance vs. Ambient temperature

R_{ON} - Ta



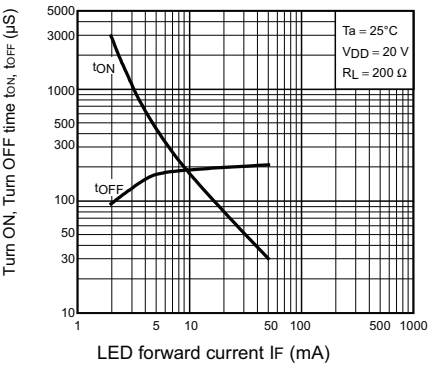
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



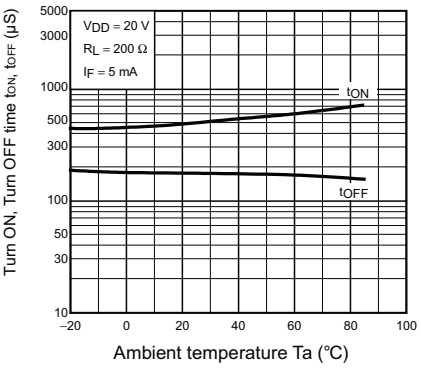
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



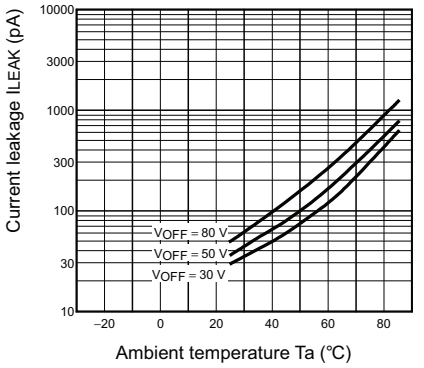
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

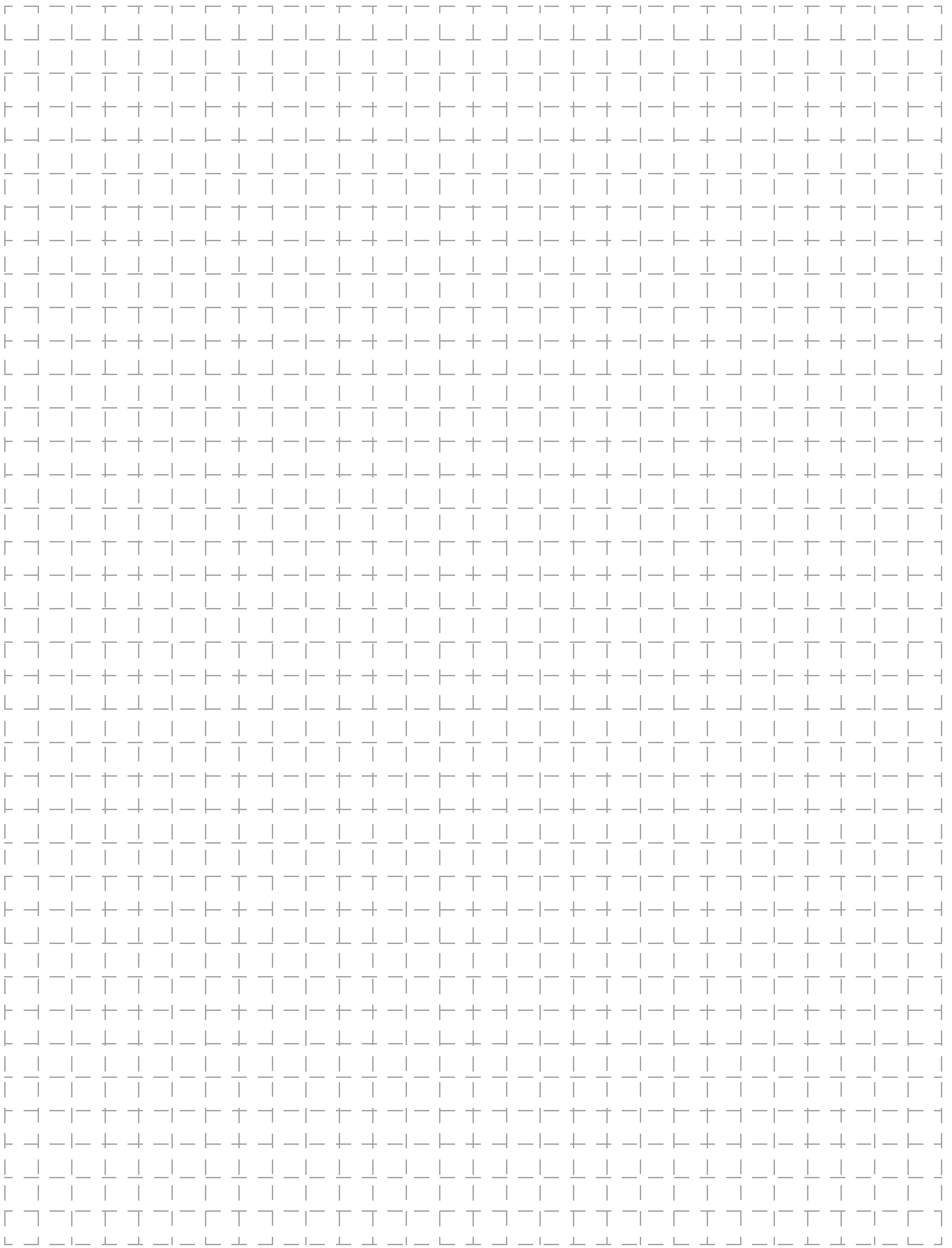


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



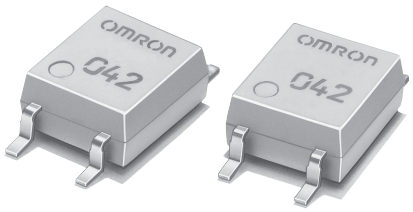
MEMO



MOS FET Relays
G3VM-81GR

New MOS FET Relay Designed for Switching Minute and Analog Signals, SOP Package.

- New model for 80-V loads.
- Turn-ON/turn-OFF times of 0.07 ms (typical).
- Capacity between output terminals of 2.5 pF (typical).
- RoHS compliant



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

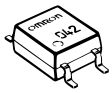
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	80 VAC	**G3VM-81GR**	100	---
			G3VM-81GR(TR)	---	2,500

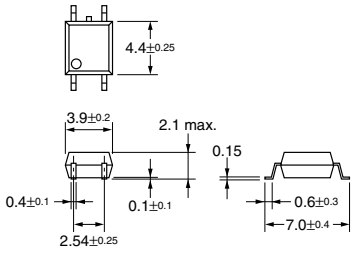
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-81GR



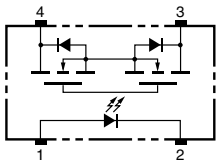
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

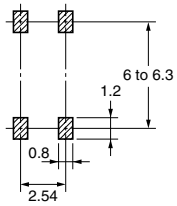
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-81GR



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-81GR



■ Absolute Maximum Ratings (Ta = 25°C)

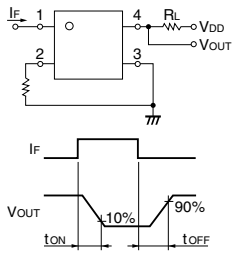
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	80	V	
	Continuous load current	I_O	40	mA	
	ON current reduction rate	ΔI_O/°C	−0.4	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Ambient operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−40 to +125	°C	With no icing or condensation
Soldering temperature		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	3	mA	I_O = 40 mA
Output	Maximum resistance with output ON	R_{ON}	---	16	25	Ω	I_F = 5 mA, I_O = 40 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.5	1	nA	V_{OFF} = 80 V, T_a = 60°C
	Capacity between terminals	C_{OFF}	---	2.5	3.5	pF	V = 0, f = 100 MHz, t < 10 s
Capacity between I/O terminals		C_{I-O}	---	0.7	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance between I/O terminals		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.07	0.5	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 10 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.07	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

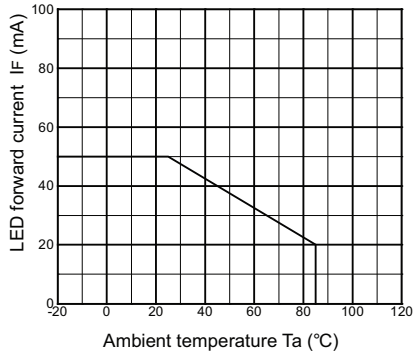
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	64	V
Operating LED forward current	I_F	5	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	40	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

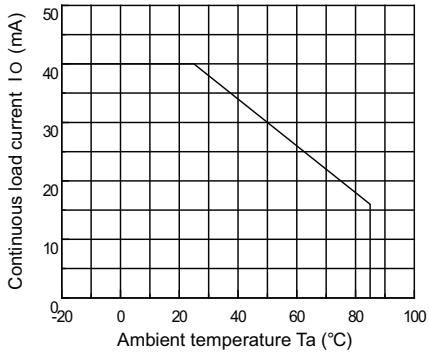
LED forward current vs. Ambient temperature

IF - Ta



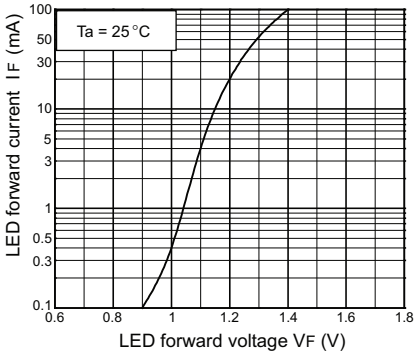
Continuous load current vs. Ambient temperature

IO - Ta



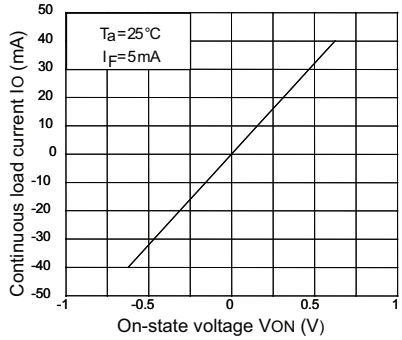
LED forward current vs. LED forward voltage

IF - VF



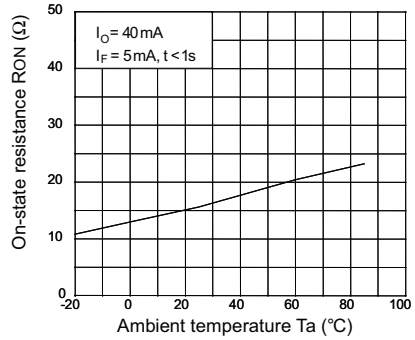
Continuous load current vs. On-state voltage

IO - VON



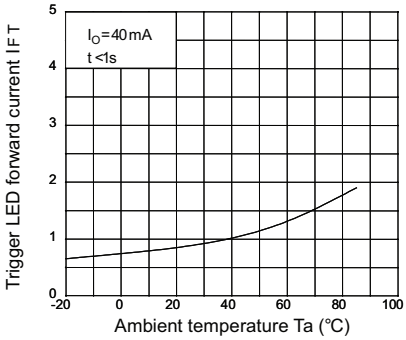
On-state resistance vs. Ambient temperature

RON - Ta



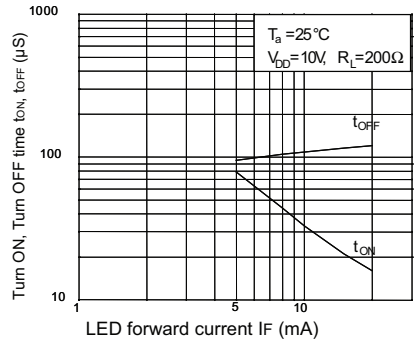
Trigger LED forward current vs. Ambient temperature

IFT - Ta



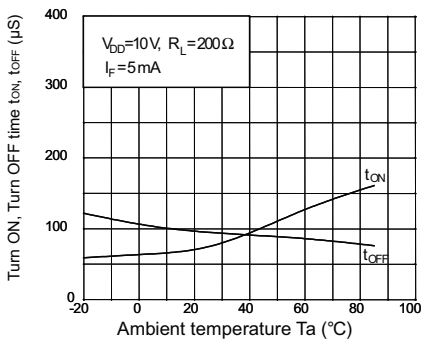
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



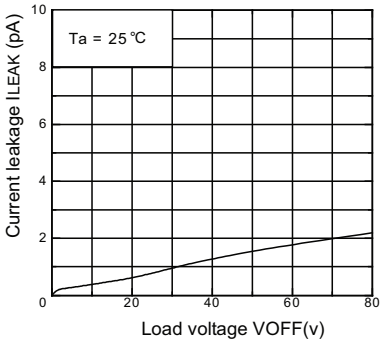
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



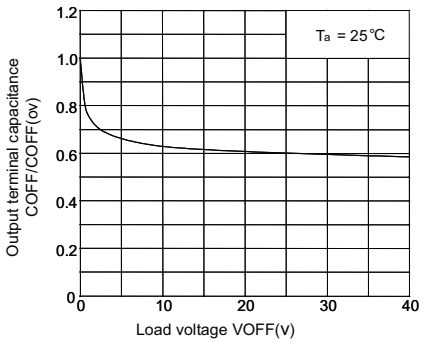
Current leakage vs. Load voltage

I LEAK – VOFF

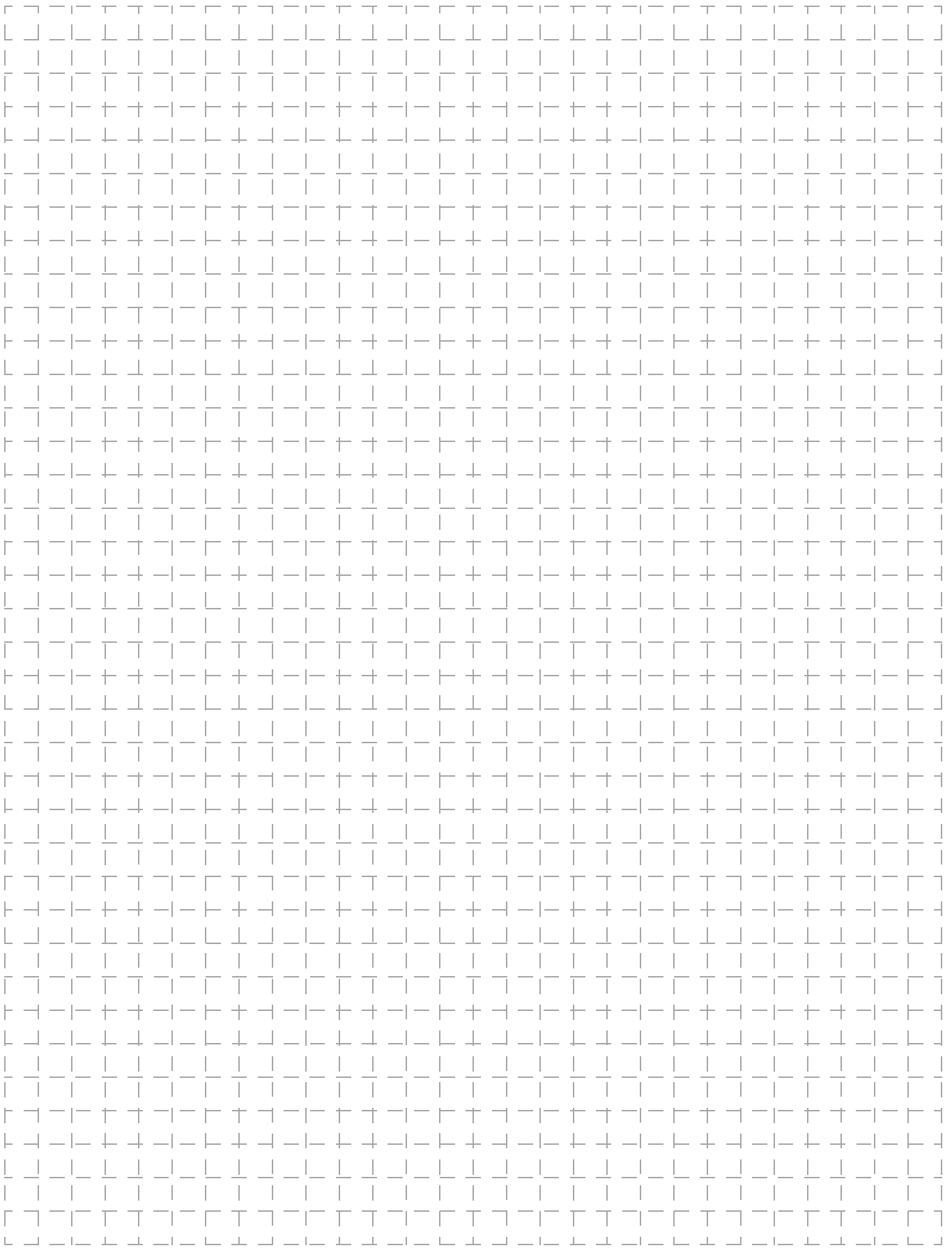


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

COFF - VOFF



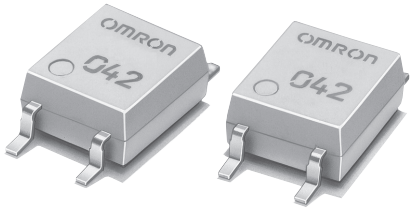
MEMO



MOS FET Relays
G3VM-81GR1

New MOS FET Relay Designed for Switching Minute and Analog Signals, SOP Package.

- New model for 80-V loads.
- Low C × R of 32.5 pF•Ω.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS compliant



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

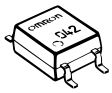
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	80 VAC	**G3VM-81GR1**	100	---
			G3VM-81GR1(TR)	---	2,500

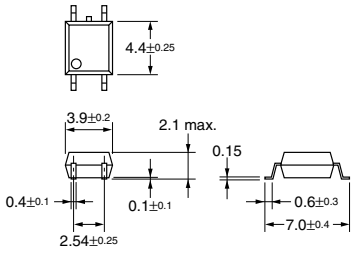
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-81GR1



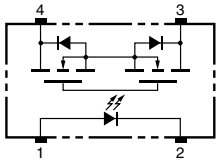
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

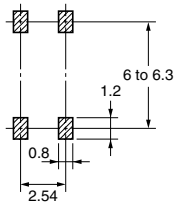
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-81GR1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-81GR1



■ Absolute Maximum Ratings (Ta = 25°C)

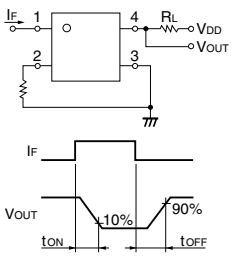
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	80	V	
	Continuous load current	I_O	200	mA	
	ON current reduction rate	ΔI_O/°C	–2.0	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Ambient operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–40 to +125	°C	With no icing or condensation
Soldering temperature		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	3	mA	I_O = 200 mA
Output	Maximum resistance with output ON	R_{ON}	---	5	8	Ω	I_F = 5 mA, I_O = 200 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.5	1	nA	V_{OFF} = 80 V, T_a = 50°C
	Capacity between terminals	C_{OFF}	---	6.5	11	pF	V = 0, f = 100 MHz, t < 10 s
Capacity between I/O terminals		C_{I-O}	---	0.7	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance between I/O terminals		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.13	0.5	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 10 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.17	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

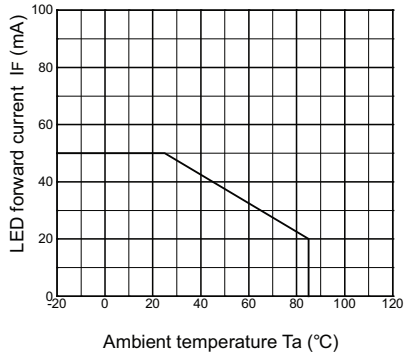
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	64	V
Operating LED forward current	I_F	5	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	200	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

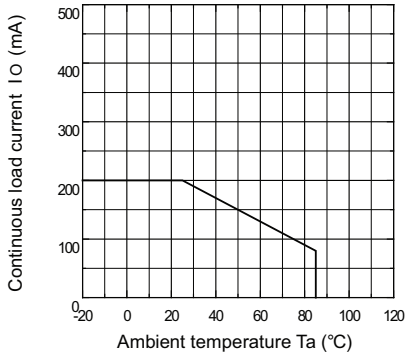
LED forward current vs. Ambient temperature

I_F - Ta



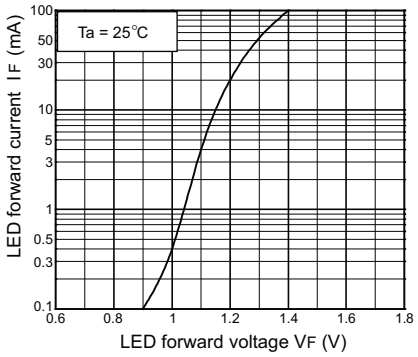
Continuous load current vs. Ambient temperature

I_O - Ta



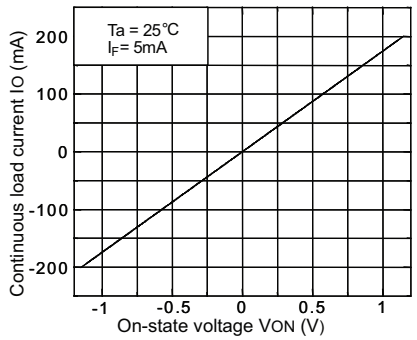
LED forward current vs. LED forward voltage

I_F - V_F



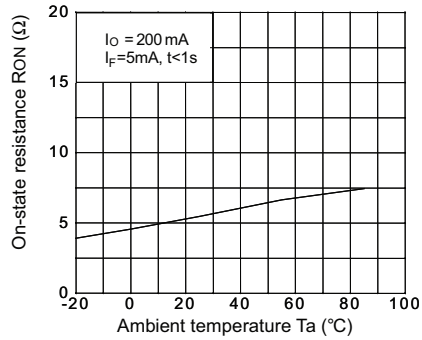
Continuous load current vs. On-state voltage

I_O - V_{ON}



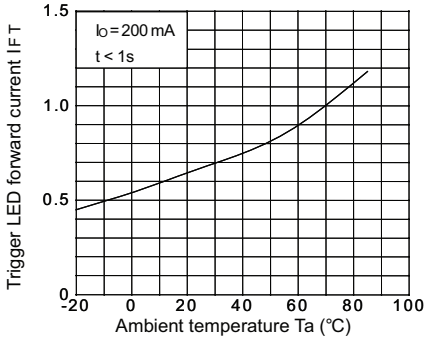
On-state resistance vs. Ambient temperature

R_{ON} - Ta



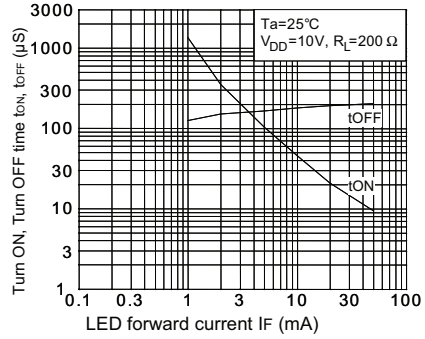
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



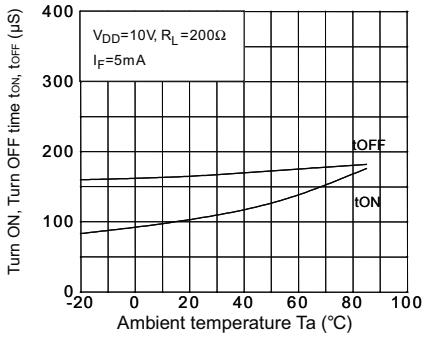
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



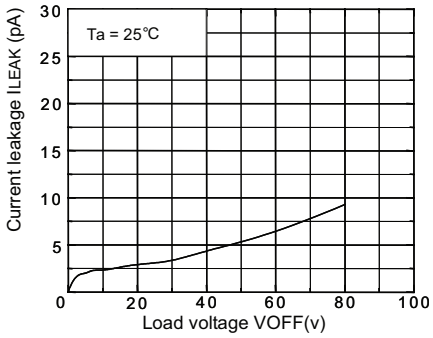
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



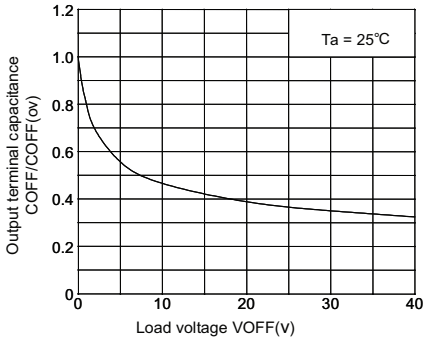
Current leakage vs. Load voltage

I_{LEAK} – V_{OFF}

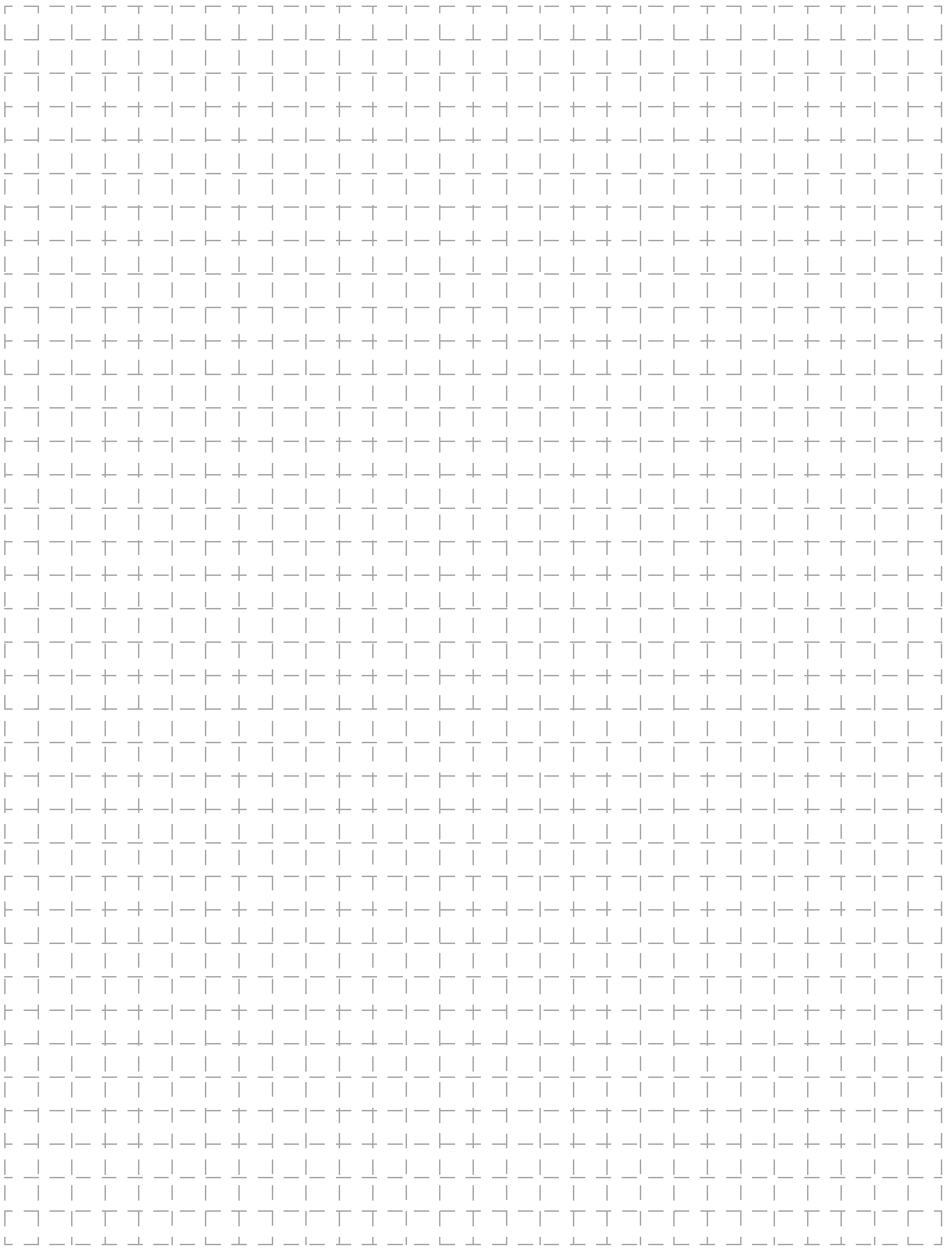


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

C_{OFF} - V_{OFF}



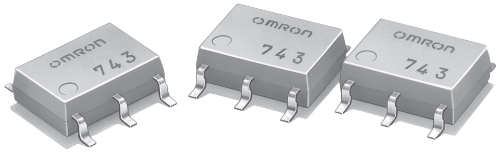
MEMO



MOS FET Relays
G3VM-81HR

High-capacity MOS FET Relay Allowing Switching of a 1.25-A Continuous Load Current with a 80-V Load Voltage, 6-pin SOP Package.

- Continuous load current of 1,250 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.



■ Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

Note: The actual product is marked differently from the image shown here.

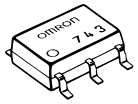
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	80 VAC	**G3VM-81HR**	75	---
			G3VM-81HR(TR)	---	2,500

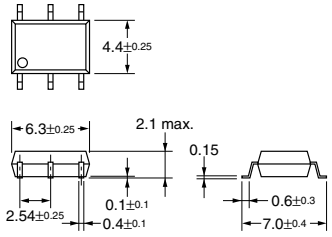
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-81HR



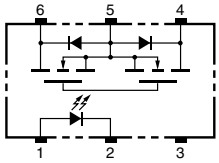
Note: The actual product is marked differently from the image shown here.



Weight: 0.13 g

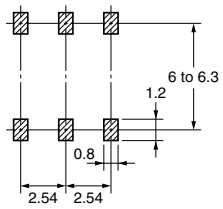
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-81HR



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-81HR



■ Absolute Maximum Ratings (Ta = 25°C)

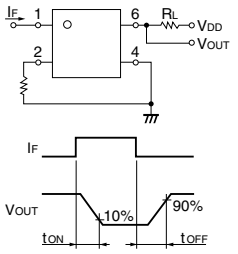
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	80	V	
	Continuous load current	I_O	1,250	mA	
	ON current reduction rate	ΔI_{ON}/°C	−12.5	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	2	5	mA	I_O = 1,250 mA
Output	Maximum resistance with output ON	R_{ON}	---	0.11	0.15	Ω	I_F = 5 mA, I_O = 1,250 mA
	Current leakage when the relay is open	I_{LEAK}	---	1.2	1.5	nA	V_{OFF} = 20 V, T_a = 50°C
	Capacity between terminals	C_{OFF}	---	460	1,000	pF	V = 0, f = 100 MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	2.0	3.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.7	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

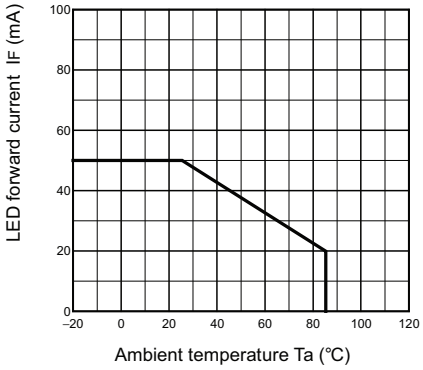
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	64	V
Operating LED forward current	I_F	5	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	1,250	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

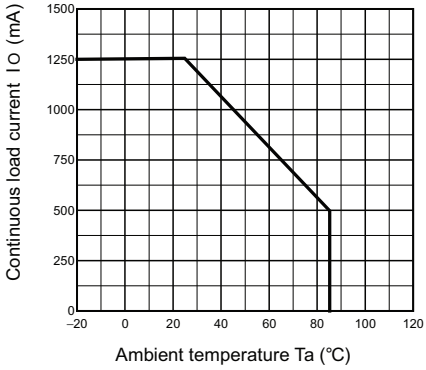
LED forward current vs. Ambient temperature

I_F - Ta



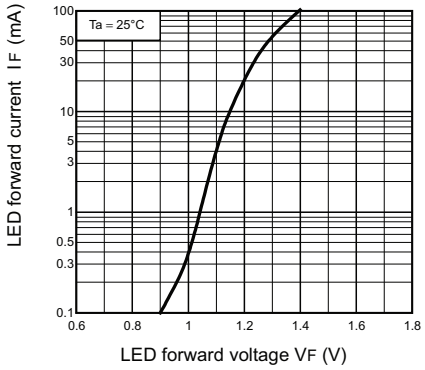
Continuous load current vs. Ambient temperature

I_O - Ta



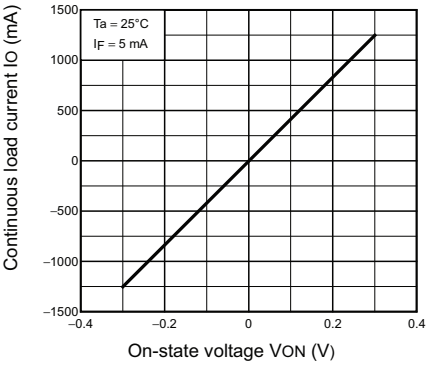
LED forward current vs. LED forward voltage

I_F - V_F



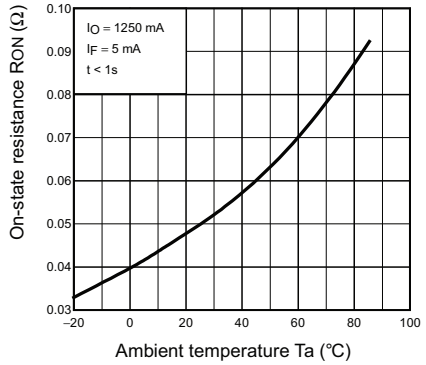
Continuous load current vs. On-state voltage

I_O - V_{ON}



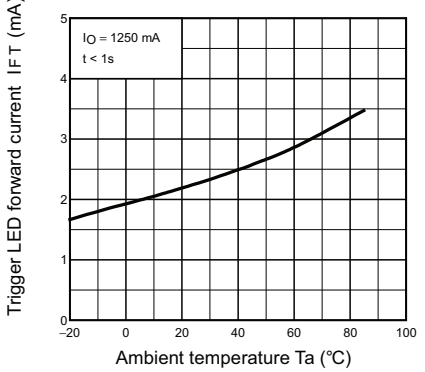
On-state resistance vs. Ambient temperature

R_{ON} - Ta



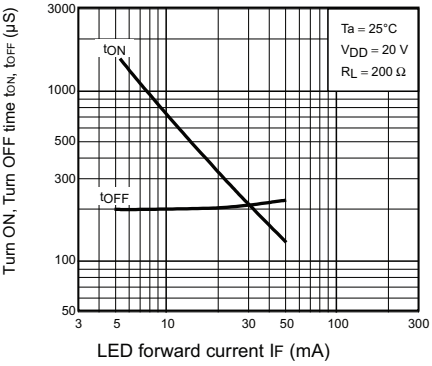
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



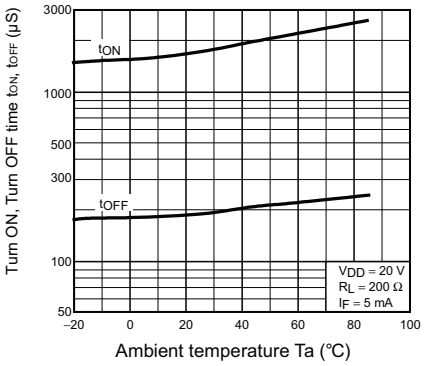
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



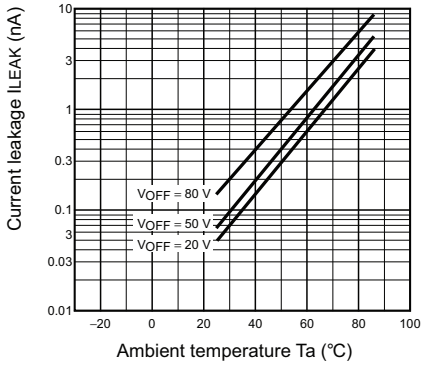
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

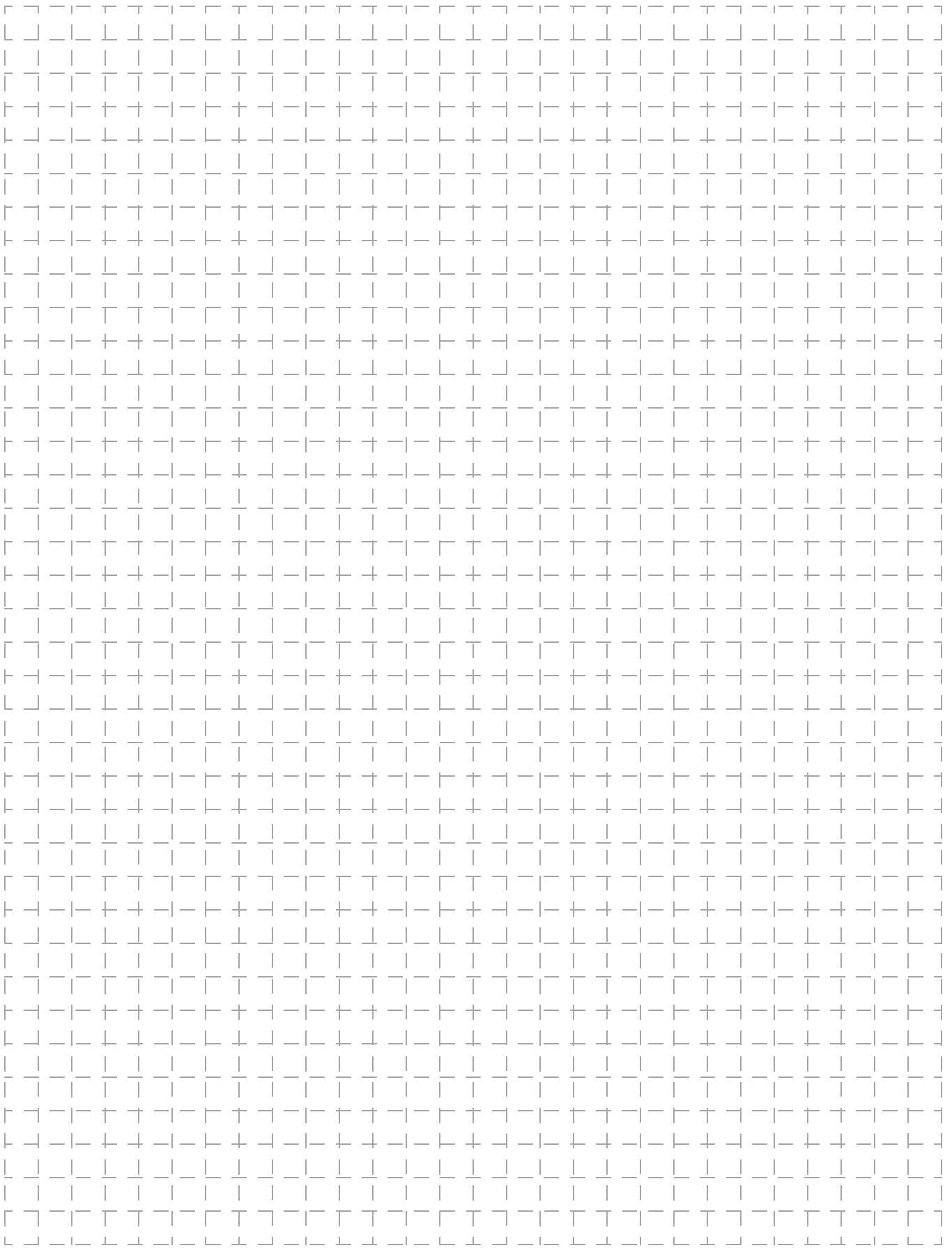


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



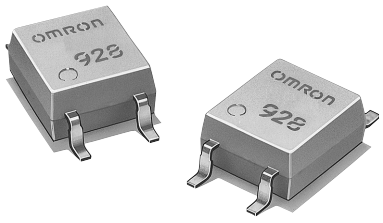
MEMO



MOS FET Relays
G3VM-S5

Analog-Switching MOS FET Relay in 200-V Load Voltage Series, SOP Package.

- Ideal replacement for the dial-pulse relay or hook relay for modems and facsimile machines.
- Ideal for application to the line interface blocks of PBX and telephone exchange systems.
- Can be applied to hybrid IC circuits and card-type modems conforming to PCMCIA standards.
- Peak load voltage of 200 V.
- Approved standards: UL1577 (File No. E80555)
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- PBX subscriber interfaces
- Multi-functional telephones
- Card-type modems and fax modems
- Built-in modems in personal computers

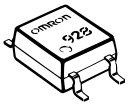
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	200 VAC	**G3VM-S5**	100	---
			G3VM-S5(TR)	---	2,500

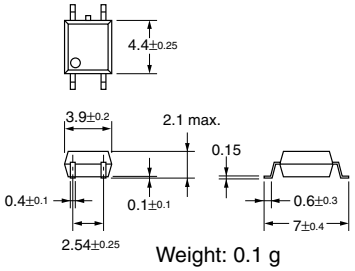
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-S5



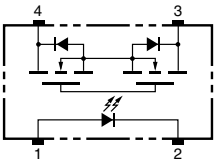
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

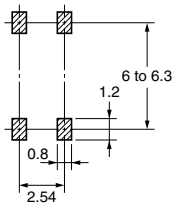
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-S5



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-S5



■ Absolute Maximum Ratings (Ta = 25°C)

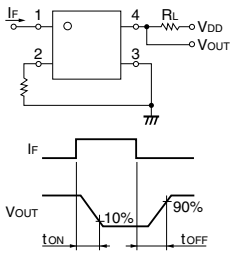
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	200	V	
	Continuous load current	I_O	150	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.5	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +100	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 150 mA
Output	Maximum resistance with output ON	R_{ON}	---	5	8	Ω	I_F = 5 mA, I_O = 500 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.00045	1.0	μA	V_{OFF} = 200 V
	Capacity between terminals	C_{OFF}	---	100	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.6	1.5	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.1	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

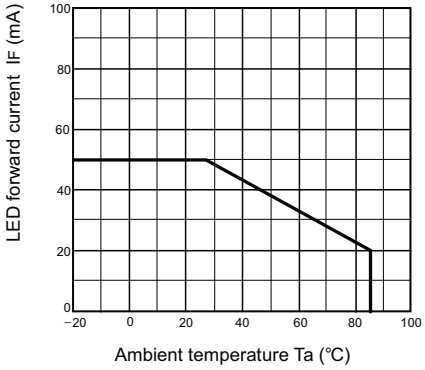
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	150	200	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	120	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

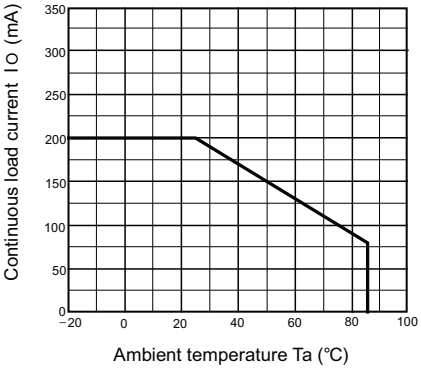
LED forward current vs. Ambient temperature

I_F - Ta



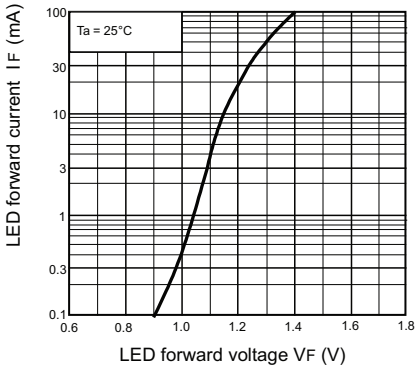
Continuous load current vs. Ambient temperature

I_O - Ta



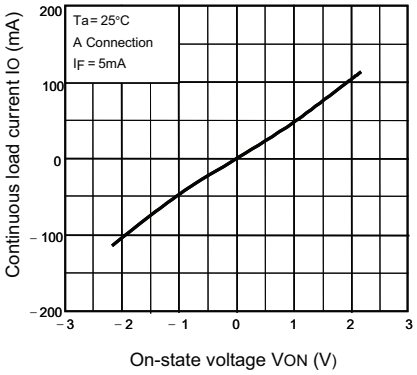
LED forward current vs. LED forward voltage

I_F - V_F



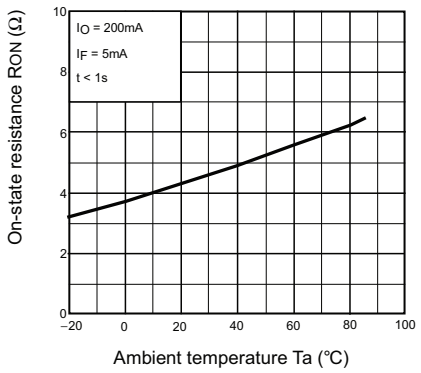
Continuous load current vs. On-state voltage

I_O - V_{ON}



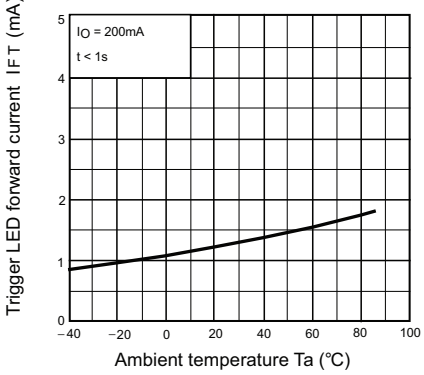
On-state resistance vs. Ambient temperature

R_{ON} - Ta



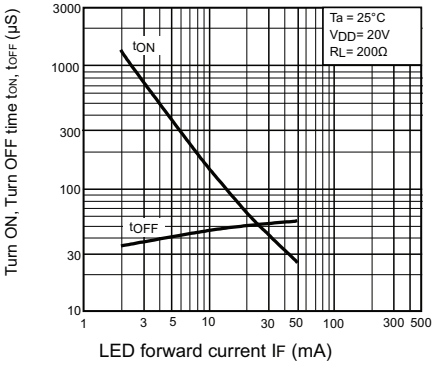
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



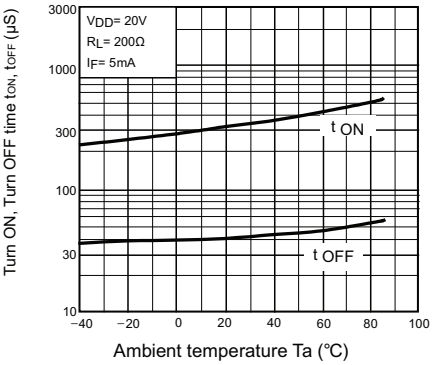
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



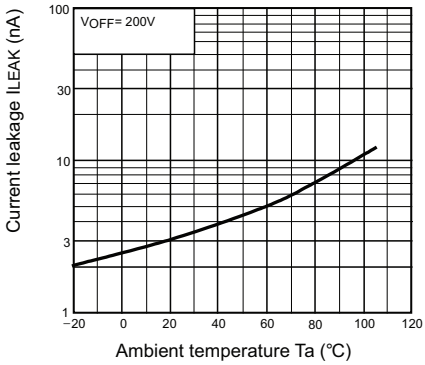
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

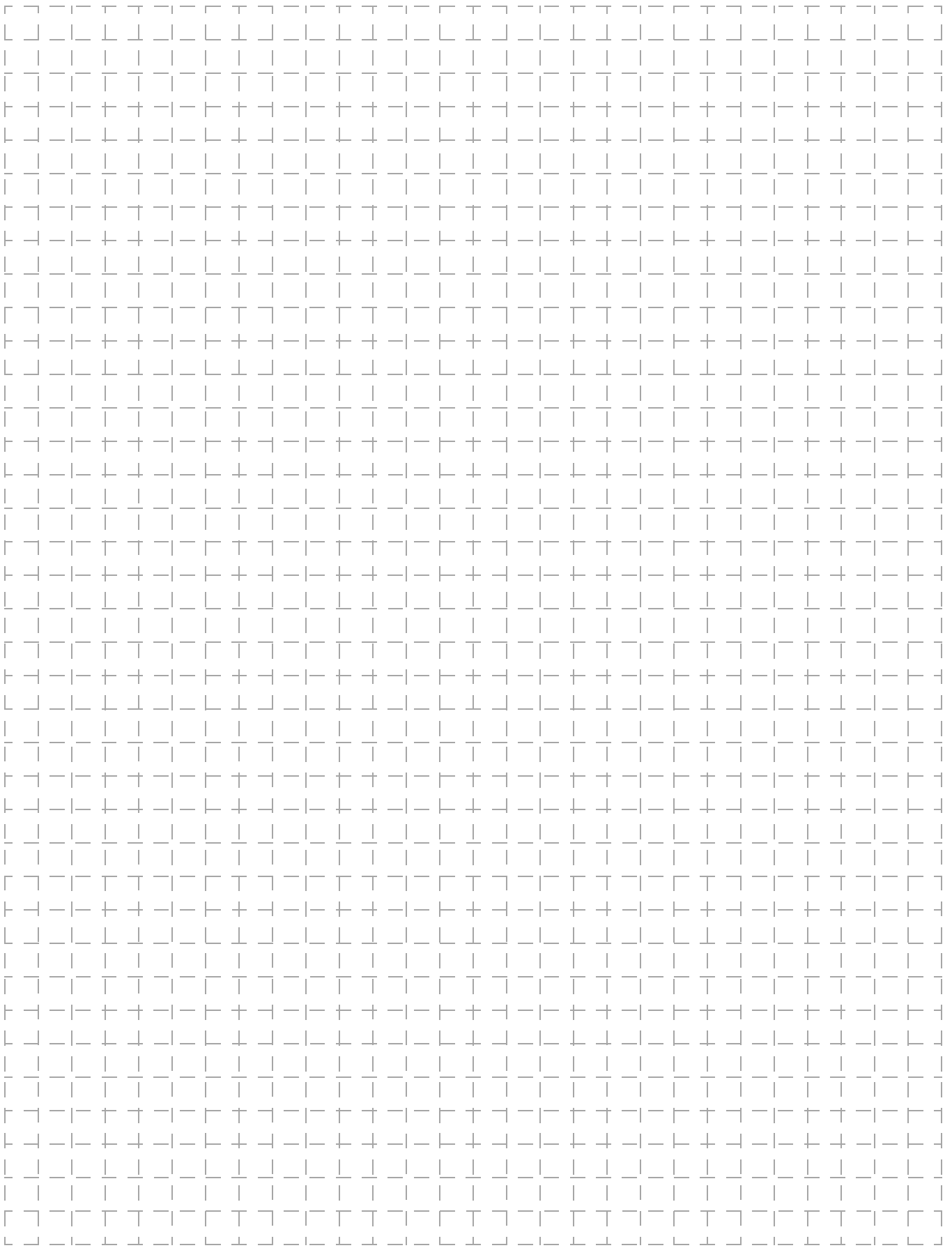


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



MEMO



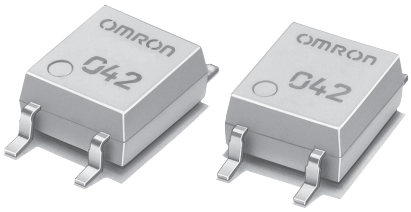
MOS FET Relays
G3VM-201G

Slim, 2.1-mm High MOS FET Relay with 4-pin SOP Package

- Leakage current of 1 nA max. (0.07 nA typ.) when relay is open.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.

■ Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines



Note: The actual product is marked differently from the image shown here.

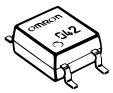
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	200 VAC	**G3VM-201G**	100	---
			G3VM-201G(TR)	---	2,500

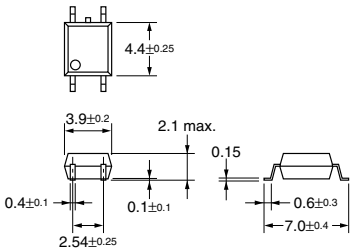
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-201G



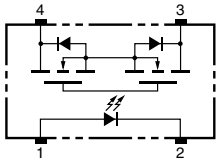
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

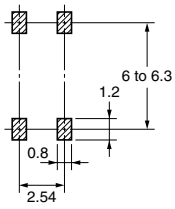
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-201G



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-201G



■ Absolute Maximum Ratings (Ta = 25°C)

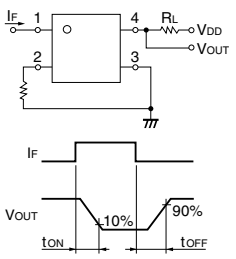
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	200	V	
	Continuous load current	I_O	50	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.2	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +100	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 50 mA
Output	Maximum resistance with output ON	R_{ON}	---	40	50	Ω	I_F = 5 mA, I_O = 50 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.07	1.0	nA	V_{OFF} = 200 V, T_a = 25°C
	Capacity between terminals	C_{OFF}	---	15	20	pF	V = 0, f = 100 MHz, t < 10 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.03	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 10 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.07	0.2	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

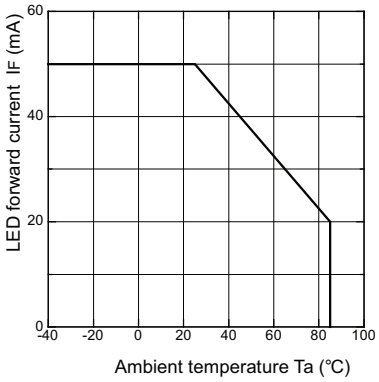
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	160	V
Operating LED forward current	I_F	5	7.5	15	mA
Continuous load current (AC peak/DC)	I_O	---	---	40	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

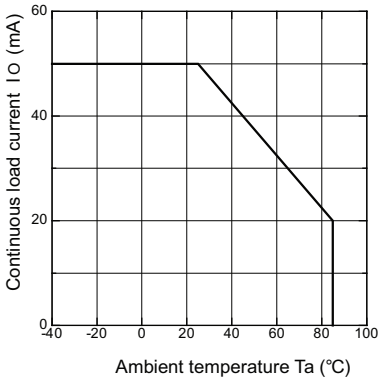
LED forward current vs. Ambient temperature

IF - Ta



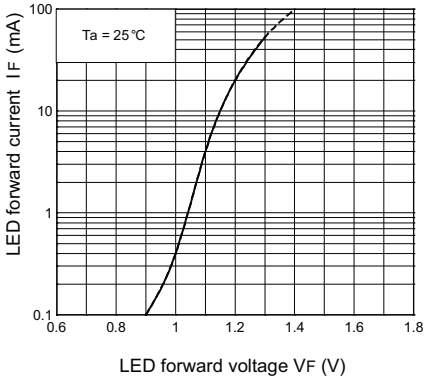
Continuous load current vs. Ambient temperature

IO - Ta



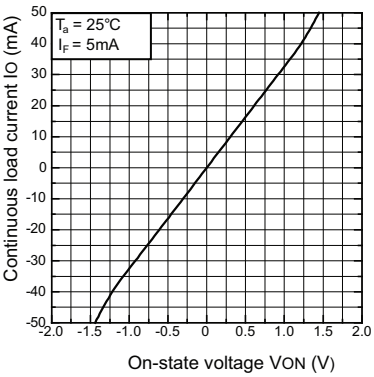
LED forward current vs. LED forward voltage

IF - VF



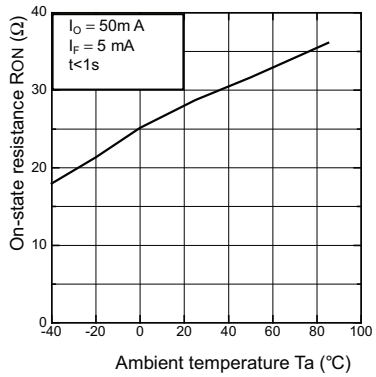
Continuous load current vs. On-state voltage

IO - VON



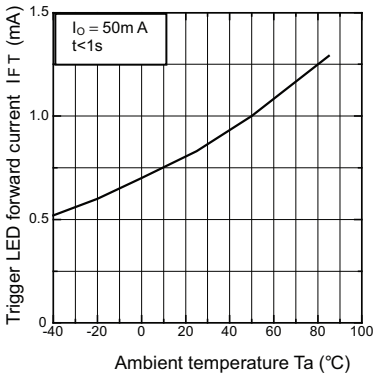
On-state resistance vs. Ambient temperature

RON - Ta



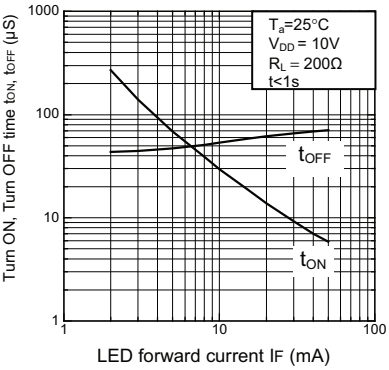
Trigger LED forward current vs. Ambient temperature

IFT - Ta



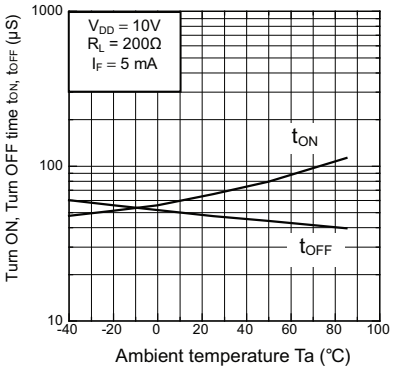
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



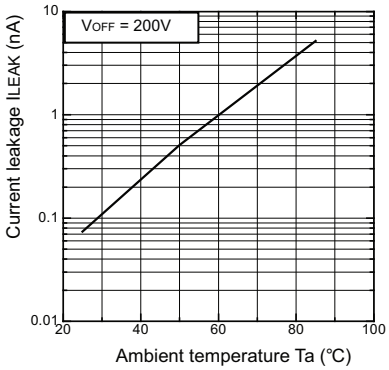
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta

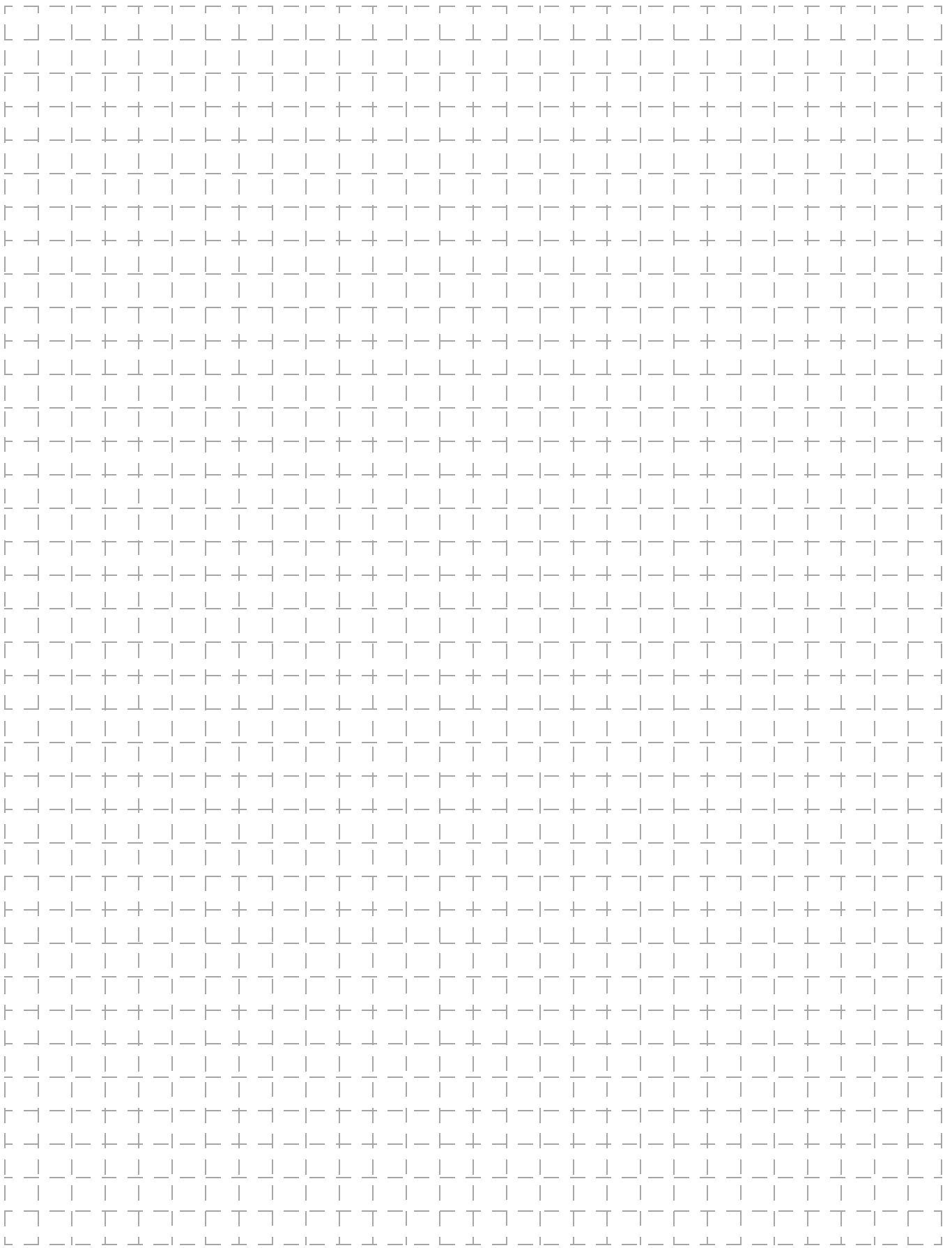


Current leakage vs. Ambient temperature

I LEAK - Ta



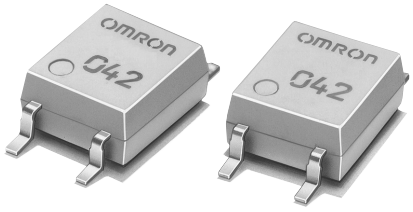
MEMO



MOS FET Relays
G3VM-201G1

Ultrasensitive MOS FET Relay in 200 V Load series for power savings, SOP Package.

- Trigger LED forward current of 1 mA (maximum) facilitates power saving designs and prolonged battery life.
- Continuous load current of 200 mA.
- RoHS Compliant



NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems and Measurement devices
- Security systems
- Industrial equipment
- Battery powered equipment and Amusement machines

■ List of Models

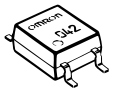
Contact form	Terminals	Load voltage (peak value) (See the note.)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	200 V	**G3VM-201G1**	100	---
			G3VM-201G1(TR)	---	2,500

Note: The AC peak and DC value are given for the load voltage.

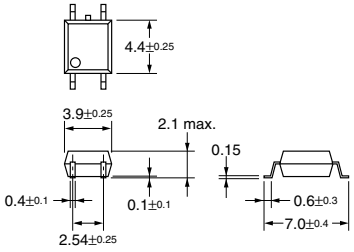
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-201G1



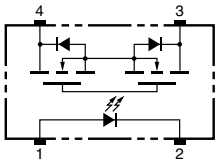
Note: The actual product is marked differently from the image shown here.

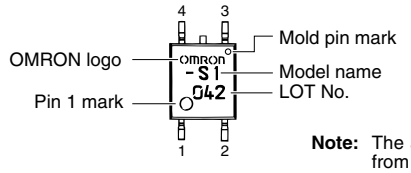


Weight: 0.1 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-201G1

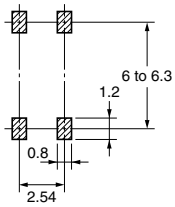




Note: The actual product is marked differently from the image shown here.

■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-201G1



■ Absolute Maximum Ratings (T_a = 25°C)

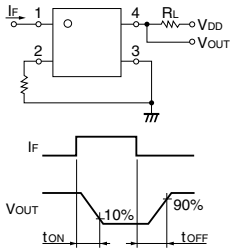
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	200	V	
	Continuous load current (AC peak/DC)	I_O	200	mA	
	ON current reduction rate	ΔI_O/°C	–2.0	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +100	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (T_a = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	0.4	1	mA	I_O = 200 mA
Output	Maximum resistance with output ON	R_{ON}	---	5	8	Ω	I_F = 2 mA, I_O = 200 mA
	Current leakage when the relay is open	I_{LEAK}	---	1	1000	nA	V_{OFF} = 200 V, T_a = 25°C
	Capacity between terminals	C_{OFF}	---	90	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	3	8	ms	I_F = 2 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.6	3	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

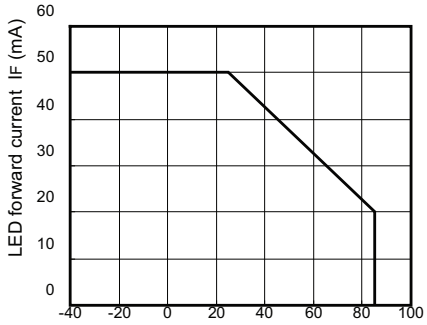
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	160	V
Operating LED forward current	I_F	---	2	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	160	mA
Operating temperature	T_a	–20	---	65	°C

■ Engineering Data

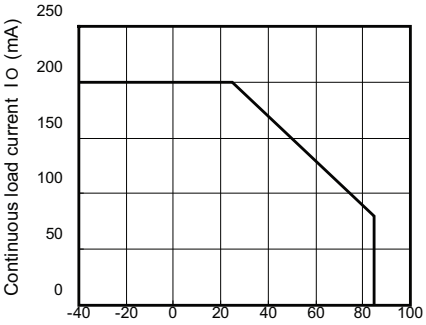
LED forward current vs. Ambient temperature

IF - Ta



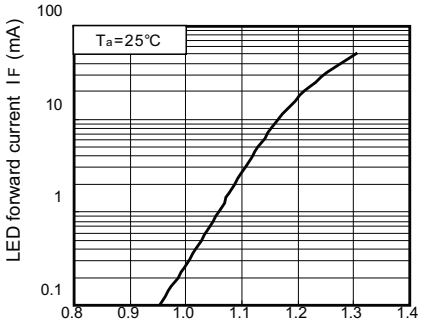
Continuous load current vs. Ambient temperature

IO - Ta



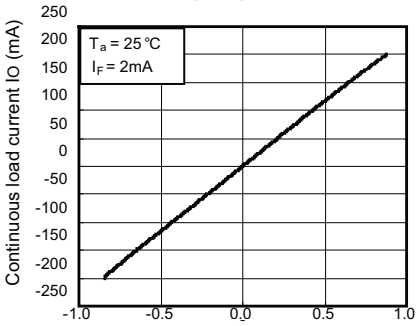
LED forward current vs. LED forward voltage

IF - VF



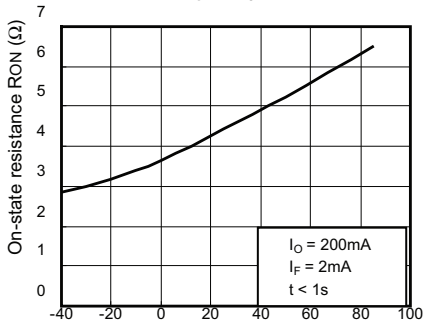
Continuous load current vs. On-state voltage

IO - VON



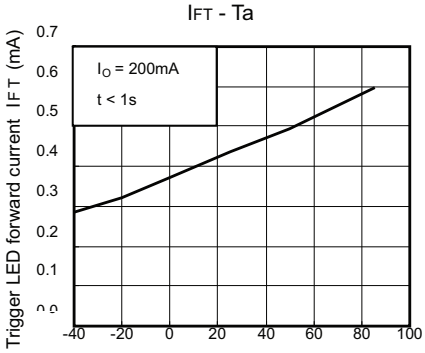
On-state resistance vs. Ambient temperature

RON - Ta



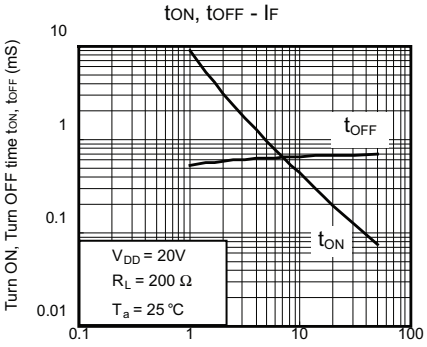
Trigger LED forward current vs. Ambient temperature

IFT - Ta



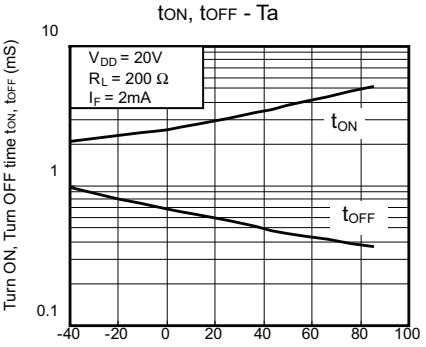
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



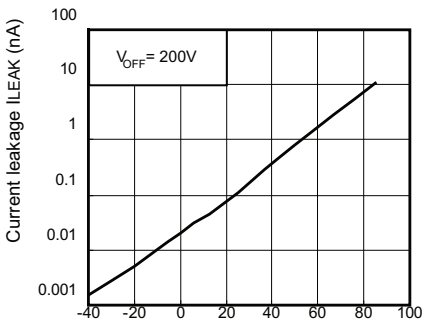
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



Current leakage vs. Ambient temperature

I LEAK - Ta

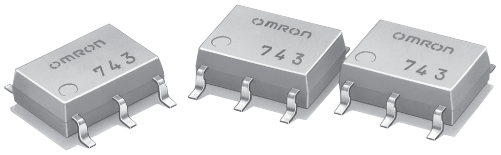


MEMO

MOS FET Relays
G3VM-201H1

Slim, 2.1-mm High, MOS FET Relay with Miniature, Flat, 6-pin SOP Package

- 6-pin SOP package in the 200-V load voltage series.
- Continuous load current of 200 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.



■ Application Examples

- Broadband systems
- Measurement devices
- Data loggers
- Amusement machines

Note: The actual product is marked differently from the image shown here.

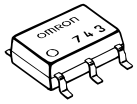
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	200 VAC	**G3VM-201H1**	75	---
			G3VM-201H1(TR)	---	2,500

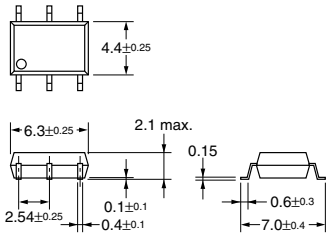
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-201H1



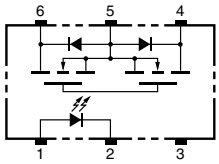
Note: The actual product is marked differently from the image shown here.



Weight: 0.13 g

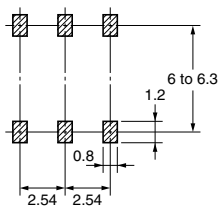
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-201H1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-201H1

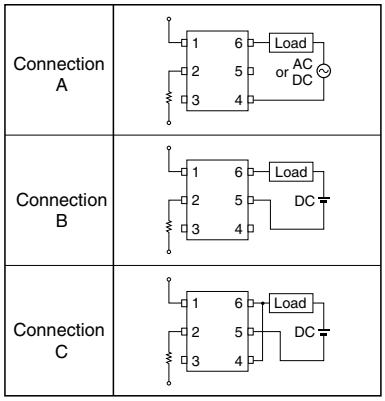


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Load voltage (AC peak/DC)		V_{OFF}	200	V	
	Continuous load current	Connection A	I_O	200	mA	
		Connection B		200		
		Connection C		400		
	ON current reduction rate	Connection A	ΔI_{ON}/°C	–2.0	mA/°C	$T_a \geq 25$°C
		Connection B		–2.0		
		Connection C		–4.0		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature			T_a	–40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

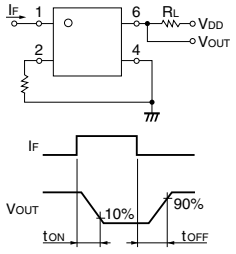
Connection Diagram



■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1	3	mA	I_O = 200 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	5	8	Ω	I_F = 5 mA, I_O = 200 mA
		Connection B		---	3	5	Ω	I_F = 5 mA, I_O = 200 mA
		Connection C		---	1.5	---	Ω	I_F = 5 mA, I_O = 400 mA
	Current leakage when the relay is open		I_{LEAK}	---	0.00035	1.0	μA	V_{OFF} = 200 V
	Capacity between terminals A Connection		C_{OFF}	---	100	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time			t_{ON}	---	0.6	1.5	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			t_{OFF}	---	0.1	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

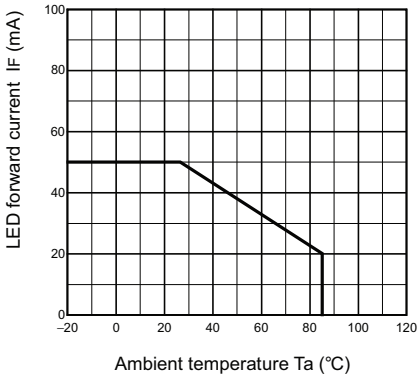
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	160	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	130	mA
Operating temperature	T_a	– 20	---	60	°C

■ Engineering Data

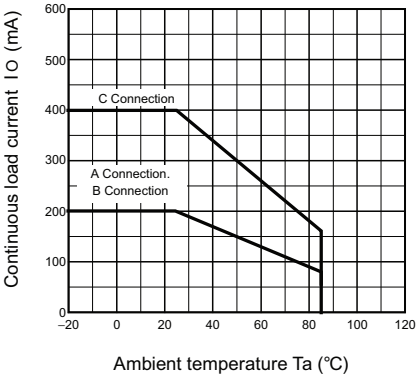
LED forward current vs. Ambient temperature

I_F - Ta



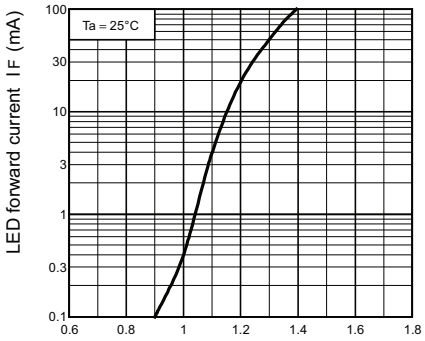
Continuous load current vs. Ambient temperature

I_O - Ta



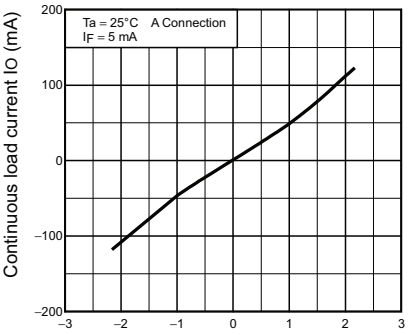
LED forward current vs. LED forward voltage

I_F - V_F



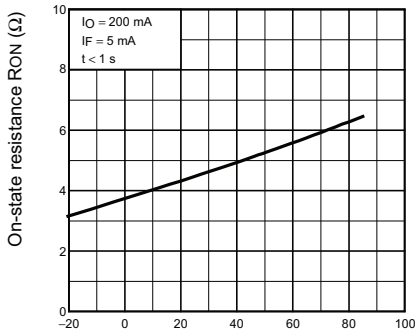
Continuous load current vs. On-state voltage

I_O - V_{ON}



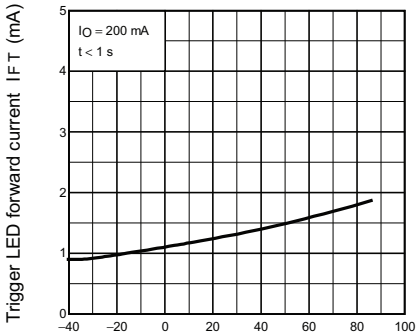
On-state resistance vs. Ambient temperature

R_{ON} - Ta



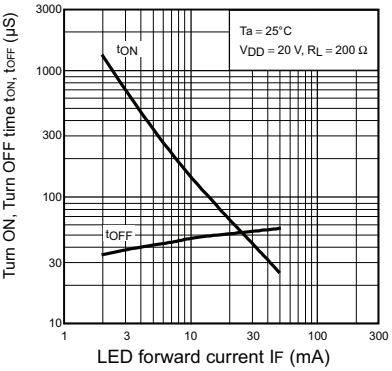
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



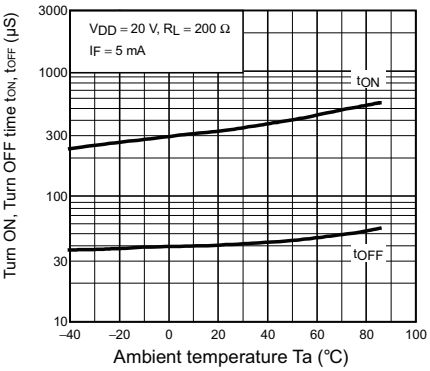
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



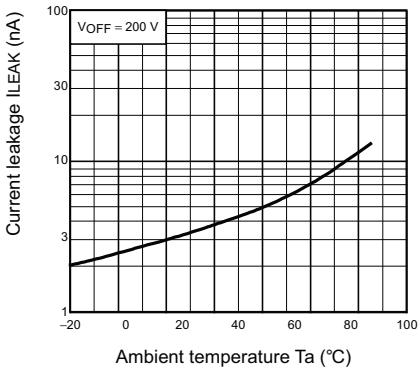
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

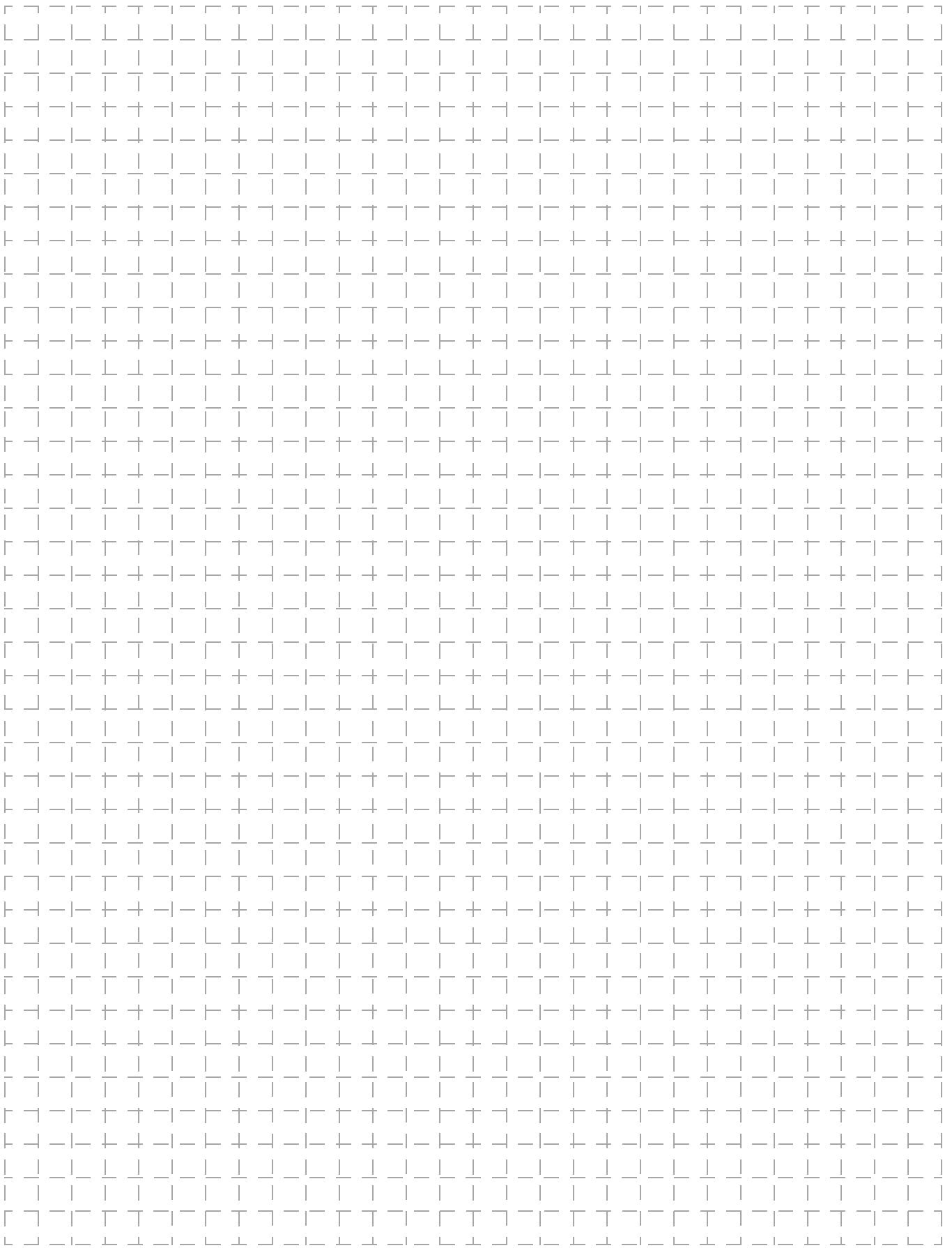


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



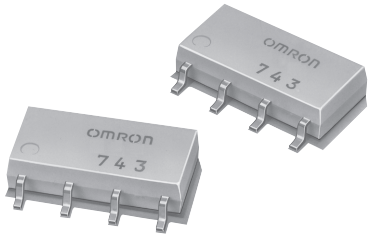
MEMO



MOS FET Relays
G3VM-202J1

Slim, 2.1-mm High MOS FET Relay with Miniature, Flat, 8-pin SOP Package

- 2 channels and an 8-pin SOP package in the 200-V load voltage series.
- Continuous load current of 200 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

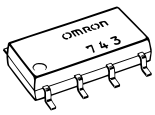
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NO	Surface-mounting terminals	200 VAC	**G3VM-202J1**	50	---
			G3VM-202J1(TR)	---	2,500

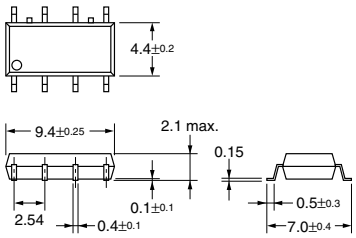
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-202J1



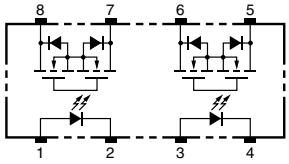
Note: The actual product is marked differently from the image shown here.



Weight: 0.2 g

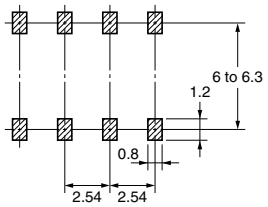
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-202J1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-202J1



■ Absolute Maximum Ratings (Ta = 25°C)

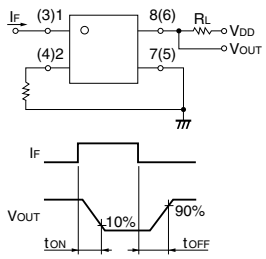
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	200	V	
	Continuous load current	I_O	200	mA	
	ON current reduction rate	ΔI_{ON}/°C	−2.0	mA/°C	$T_a \geq 25$°C
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 200 mA
Output	Maximum resistance with output ON	R_{ON}	---	5	8	Ω	I_F = 5 mA, I_O = 200 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.0031	1.0	μA	V_{OFF} = 200 V
	Capacity between terminals	C_{OFF}	---	100	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.6	1.5	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.1	1	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

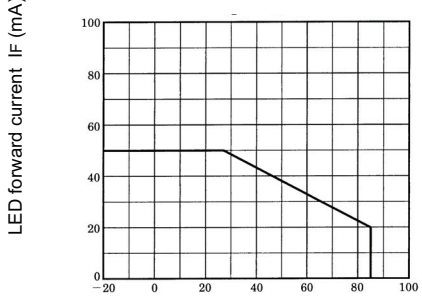
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	150	200	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	130	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

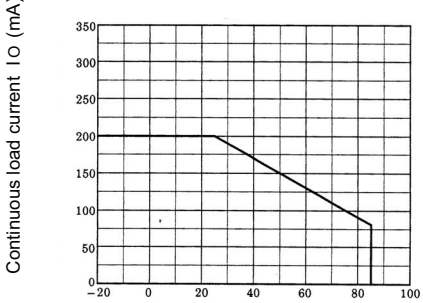
LED forward current vs. Ambient temperature

IF - Ta



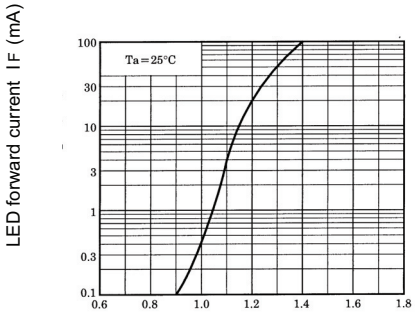
Continuous load current vs. Ambient temperature

IO - Ta



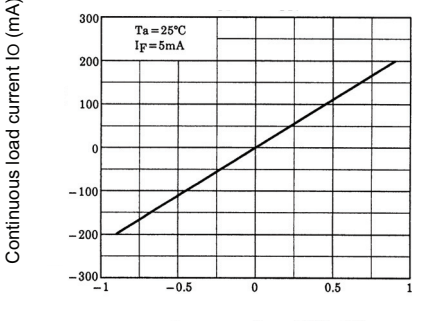
LED forward current vs. LED forward voltage

IF - VF



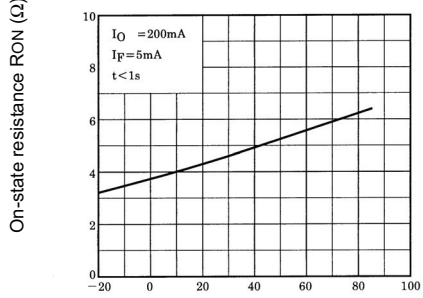
Continuous load current vs. On-state voltage

IO - VON



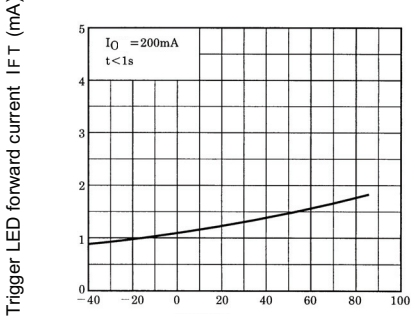
On-state resistance vs. Ambient temperature

RON - Ta



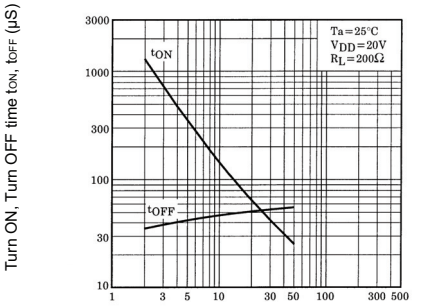
Trigger LED forward current vs. Ambient temperature

IFT - Ta



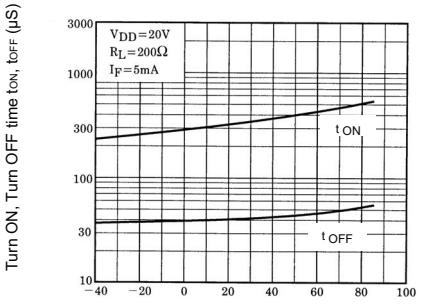
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



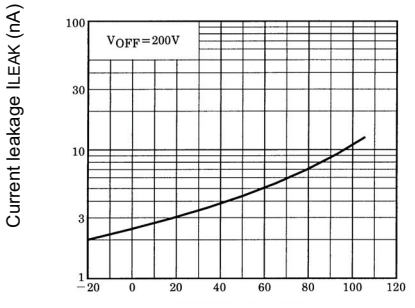
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta

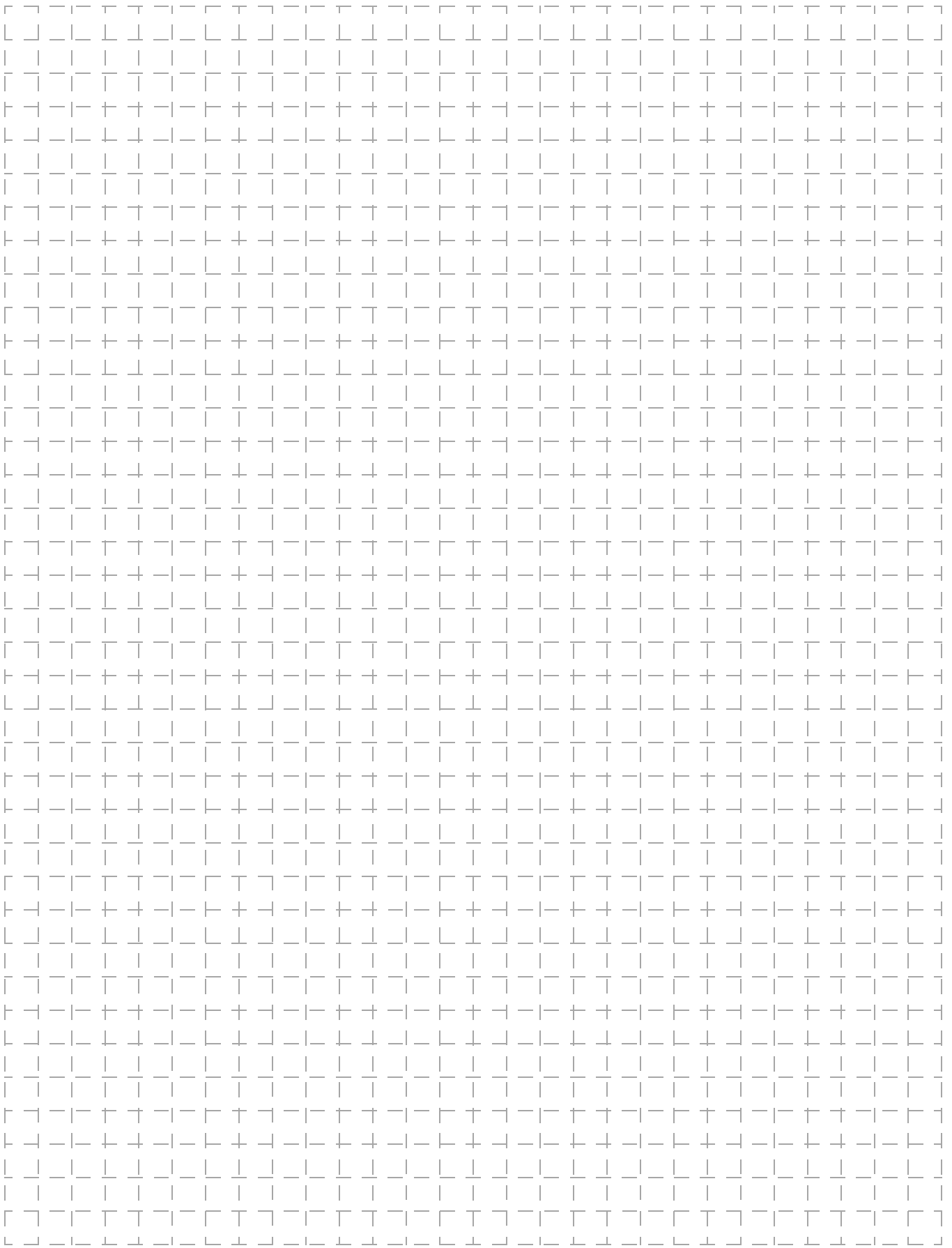


Current leakage vs. Ambient temperature

I LEAK - Ta



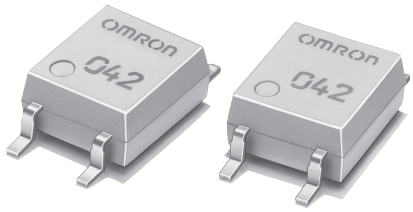
MEMO



MOS FET Relays
G3VM-351G

Slim, 2.1-mm High Relay Incorporating a MOS FET Optically Coupled with an Infrared LED in a Miniature, Flat SOP Package

- Upgraded G3VM-S2 Series.
- Continuous load current of 110 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.



■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

Note: The actual product is marked differently from the image shown here.

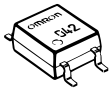
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	350 VAC	**G3VM-351G**	100	---
			G3VM-351G(TR)	---	2,500

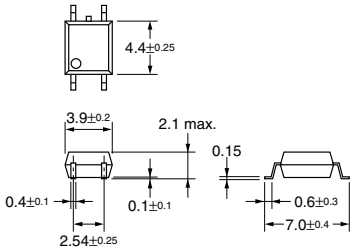
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-351G



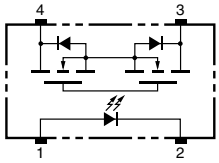
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

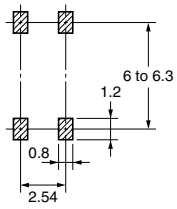
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-351G



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-351G



■ Absolute Maximum Ratings (Ta = 25°C)

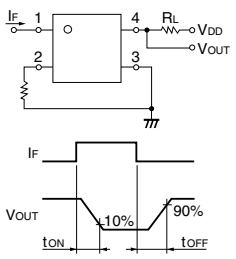
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	Δ I_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	350	V	
	Continuous load current	I_O	110	mA	
	ON current reduction rate	Δ I_{ON}/°C	−1.1	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	25	35	Ω	I_F = 5 mA, I_O = 110 mA, t < 1 s
			---	35	50	Ω	I_F = 5 mA, I_O = 110 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.0015	1.0	μA	V_{OFF} = 350 V
	Capacity between terminals	C_{OFF}	---	30	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.1	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

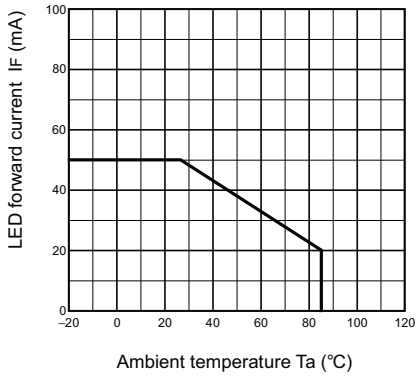
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

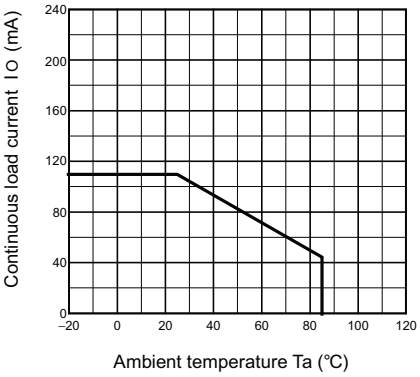
LED forward current vs. Ambient temperature

I_F - Ta



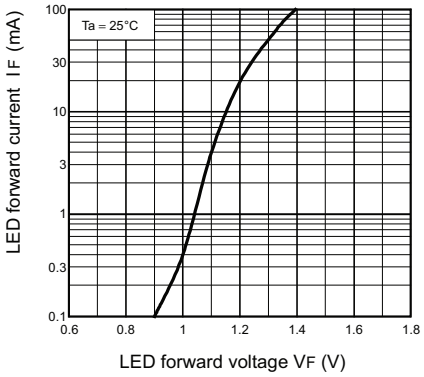
Continuous load current vs. Ambient temperature

I_O - Ta



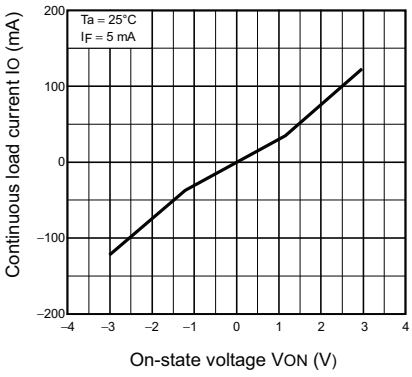
LED forward current vs. LED forward voltage

I_F - V_F



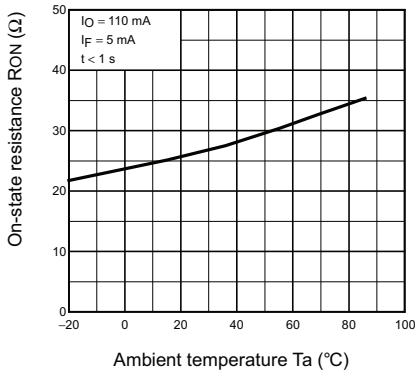
Continuous load current vs. On-state voltage

I_O - V_{ON}



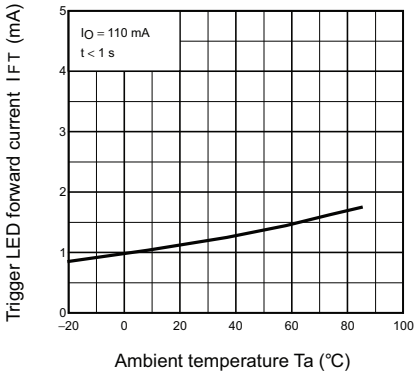
On-state resistance vs. Ambient temperature

R_{ON} - Ta



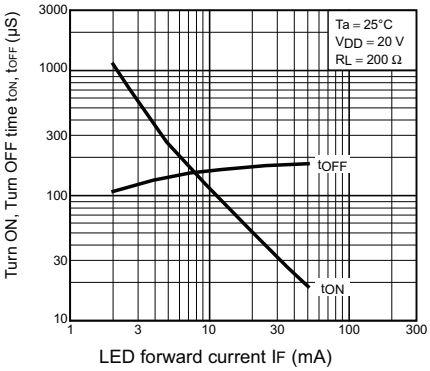
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



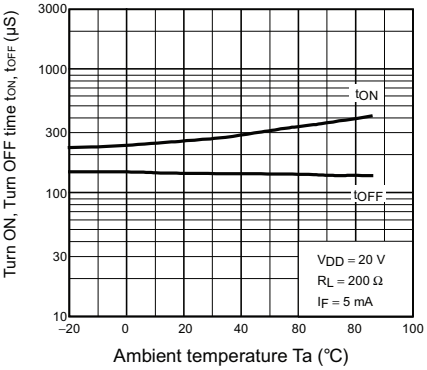
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



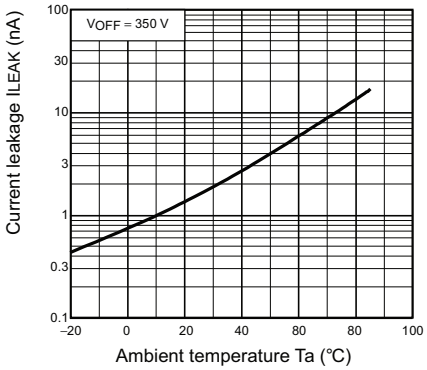
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

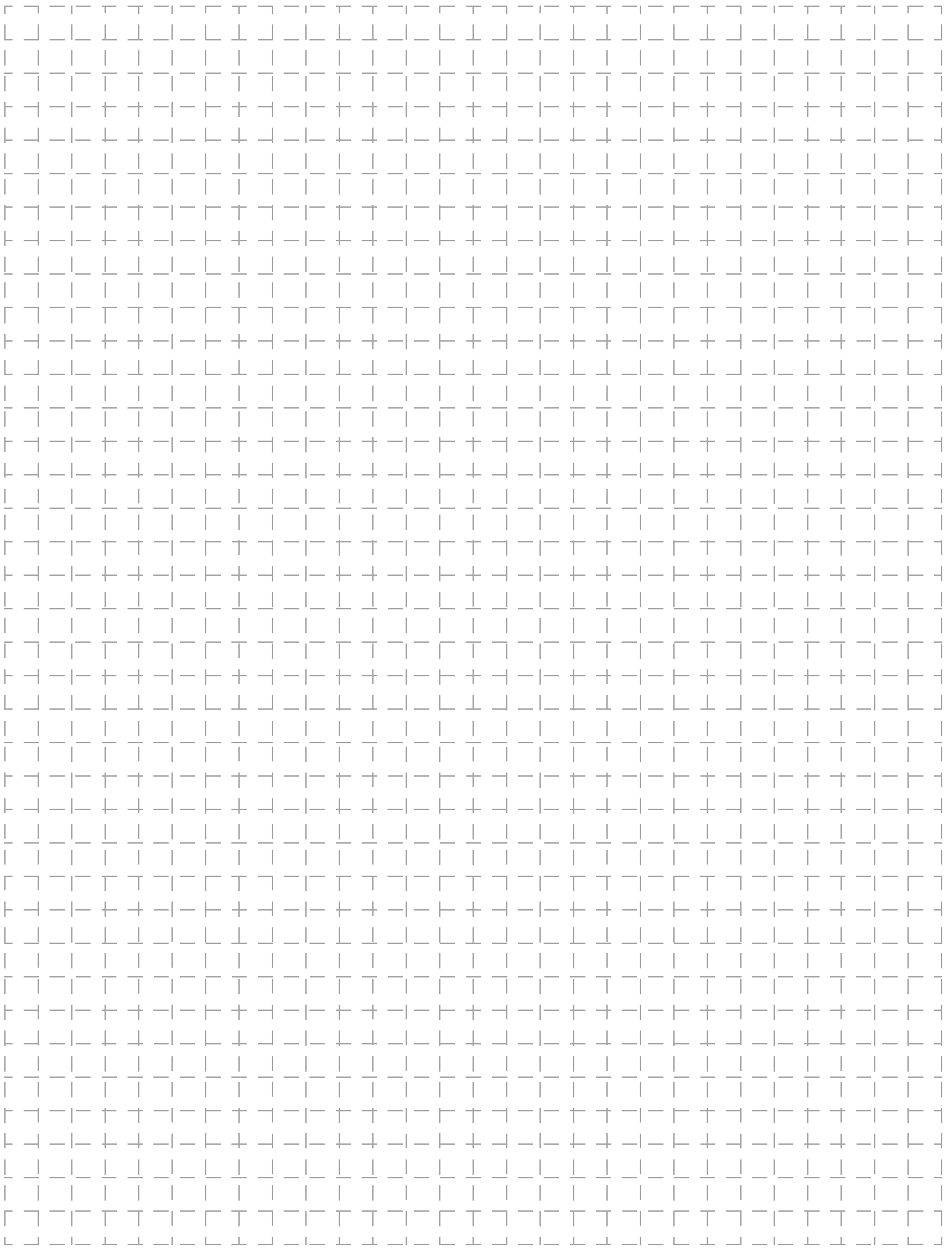


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



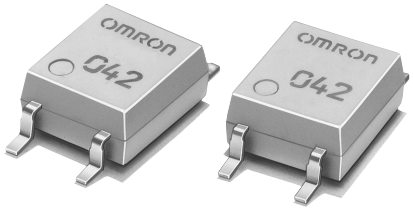
MEMO



MOS FET Relays
G3VM-351G1

Ultrasensitive MOS FET Relays in 350 V Load series for power savings, SOP Package.

- Trigger LED forward current of 1 mA (maximum) facilitates power saving designs and prolonged battery life.
- Continuous load current of 100 mA.
- RoHS Compliant



NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems and Measurement devices
- Security systems
- Industrial equipment
- Battery powered equipment and Amusement machines

■ List of Models

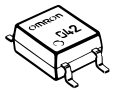
Contact form	Terminals	Load voltage (peak value) (See the note.)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	350 V	**G3VM-351G1**	100	---
			G3VM-351G1(TR)	---	2,500

Note: The AC peak and DC value are given for the load voltage.

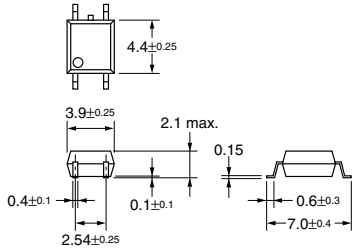
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-351G1



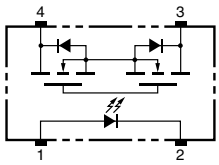
Note: The actual product is marked differently from the image shown here.

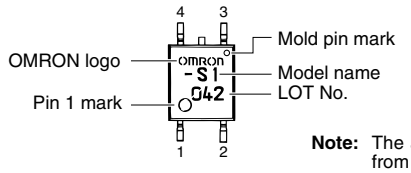


Weight: 0.1 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-351G1

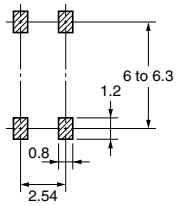




Note: The actual product is marked differently from the image shown here.

■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-351G1



■ Absolute Maximum Ratings (T_a = 25°C)

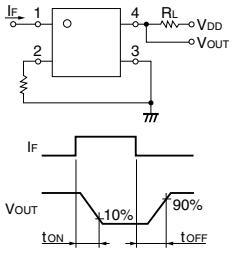
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	350	V	
	Continuous load current (AC peak/DC)	I_O	100	mA	
	ON current reduction rate	ΔI_O/°C	−1.0	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_φ	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (T_a = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	0.4	1	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	25	35	Ω	I_F = 2 mA, I_O = 100 mA, t < 1 s
			---	35	50	Ω	I_F = 2 mA, I_O = 100 mA
	Current leakage when the relay is open	I_{LEAK}	---	1	1000	nA	V_{OFF} = 350 V
	Capacity between terminals	C_{OFF}	---	35	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	1	5	ms	I_F = 2 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	1	3	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

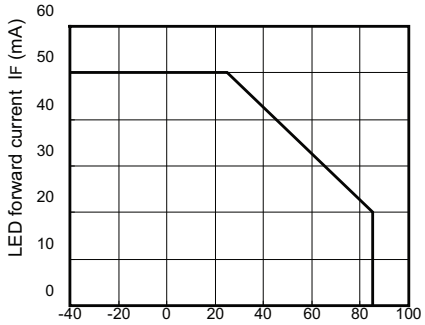
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	---	2	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	80	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

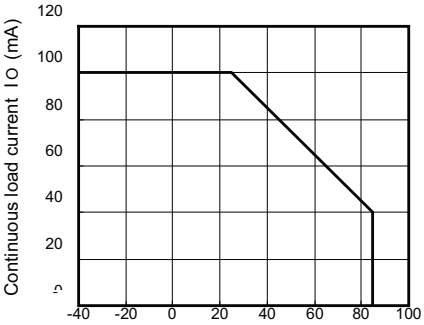
LED forward current vs. Ambient temperature

IF - Ta



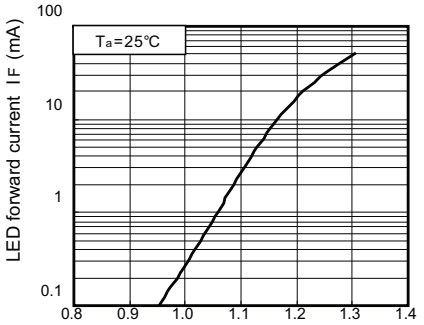
Continuous load current vs. Ambient temperature

IO - Ta



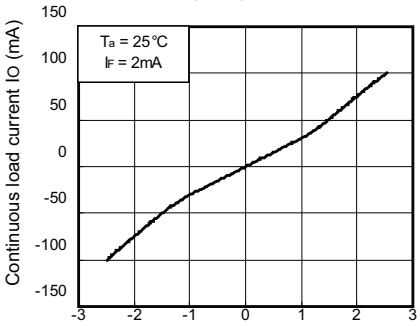
LED forward current vs. LED forward voltage

IF - VF



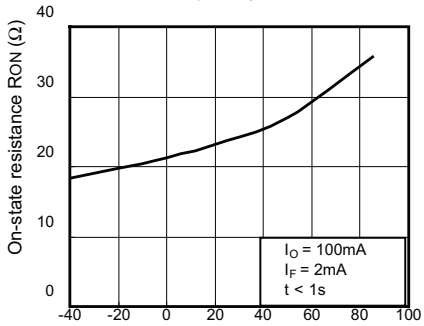
Continuous load current vs. On-state voltage

IO - VON



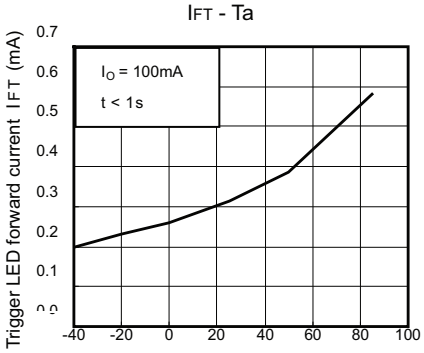
On-state resistance vs. Ambient temperature

RON - Ta



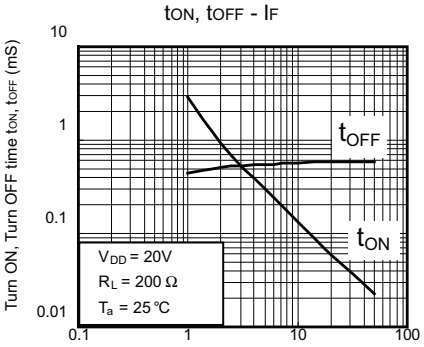
Trigger LED forward current vs. Ambient temperature

IFT - Ta



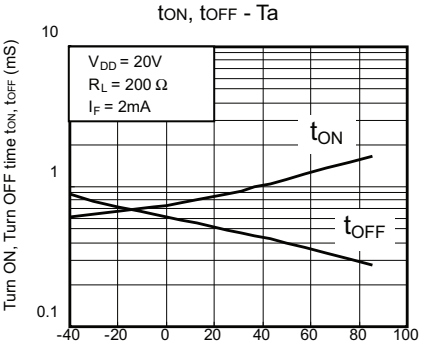
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



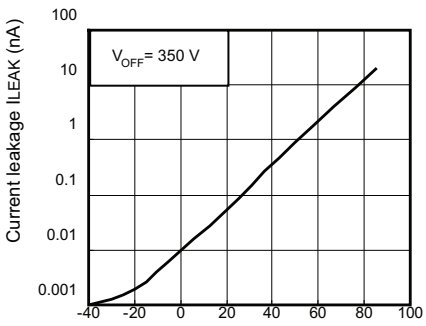
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta

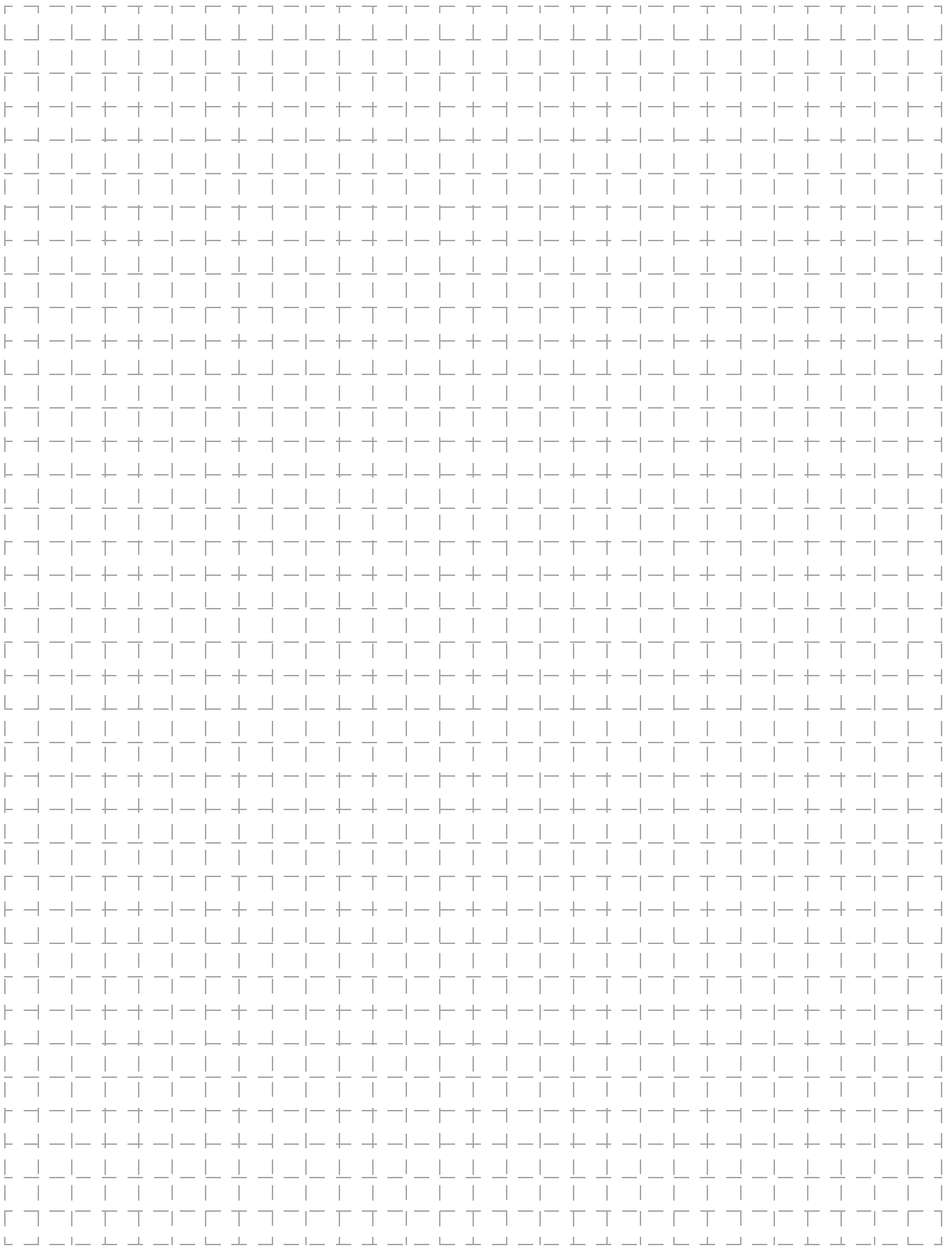


Current leakage vs. Ambient temperature

I LEAK - Ta



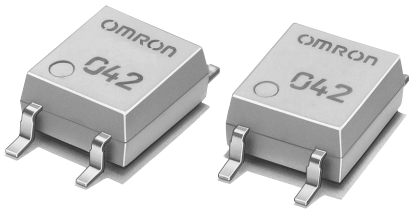
MEMO



MOS FET Relays
G3VM-351GL

SOP Current-limiting Relays in 350-V Load Voltage Series.

- G3VM-351G with current limiting.
- Current limit: 150 to 300 mA
- RoHS compliant



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Electronic automatic exchange systems
- Cordless telephones
- Multi-functional telephones
- Measurement devices

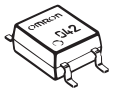
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Current limit	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	350 VAC	**G3VM-351GL**	Yes	100	---
			G3VM-351GL(TR)		---	2,500

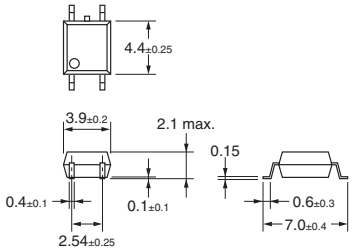
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-351GL



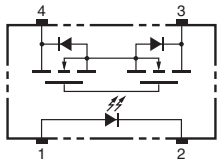
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

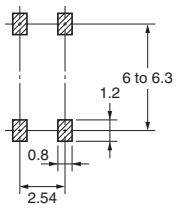
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-351GL



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-351GL



■ Absolute Maximum Ratings (Ta = 25°C)

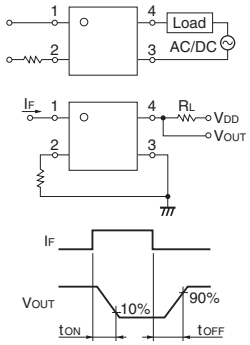
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	6	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	350	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	–1.2	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 6 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	15	35	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.0005	1.0	μA	V_{OFF} = 350 V
	Capacity between terminals	C_{OFF}	---	70	---	pF	V = 0, f = 1MHz
Limit current		I_{LIM}	150	---	300	mA	I_F = 5 mA, V_{DD} = 5 V, t = 5 ms
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.1	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

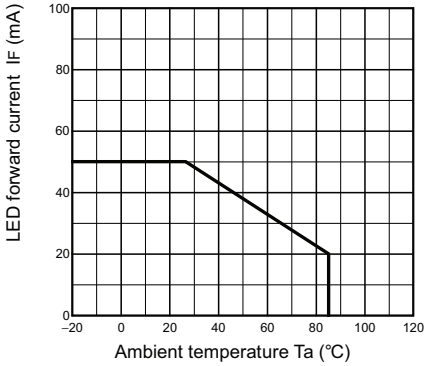
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	100	mA
Operating temperature	T_a	– 20	---	65	°C

■ Engineering Data

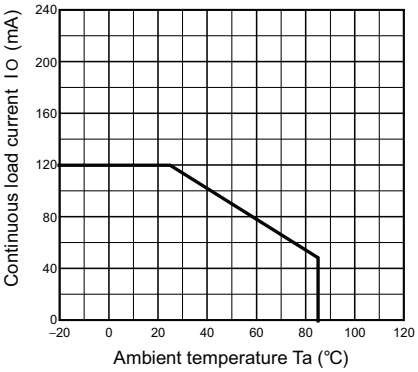
LED forward current vs. Ambient temperature

I_F - Ta



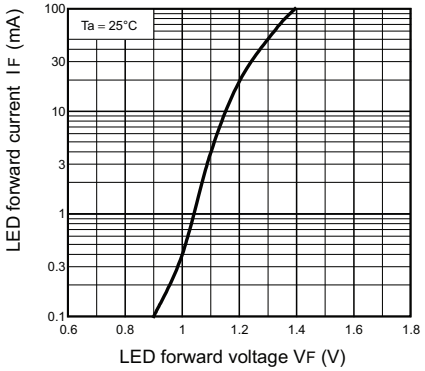
Continuous load current vs. Ambient temperature

I_O - Ta



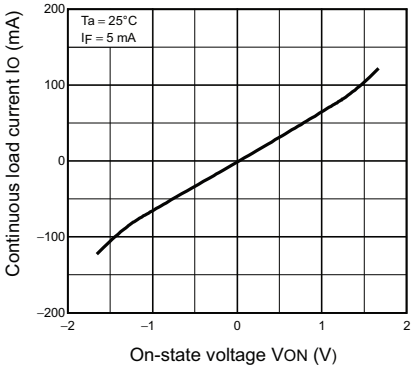
LED forward current vs. LED forward voltage

I_F - V_F



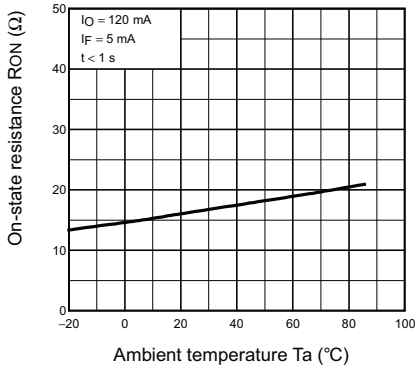
Continuous load current vs. On-state voltage

I_O - V_{ON}



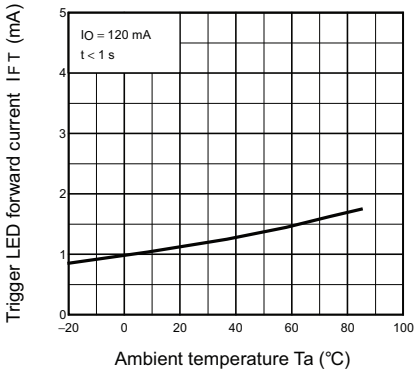
On-state resistance vs. Ambient temperature

R_{ON} - Ta



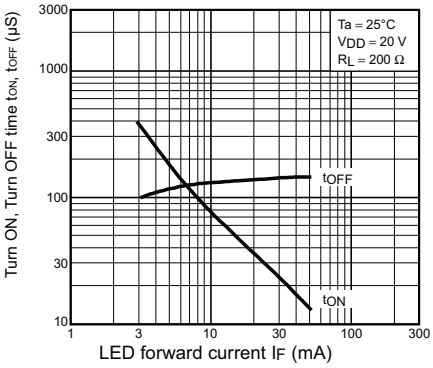
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



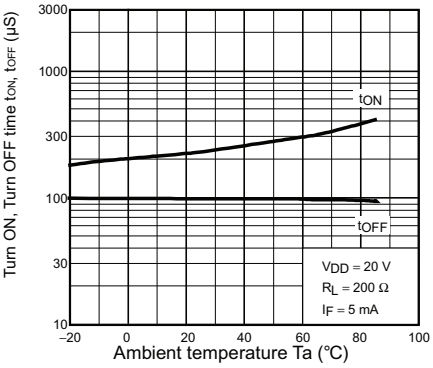
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



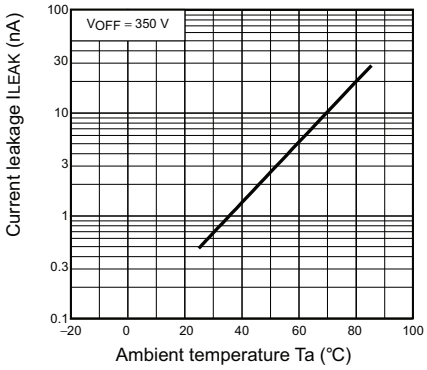
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

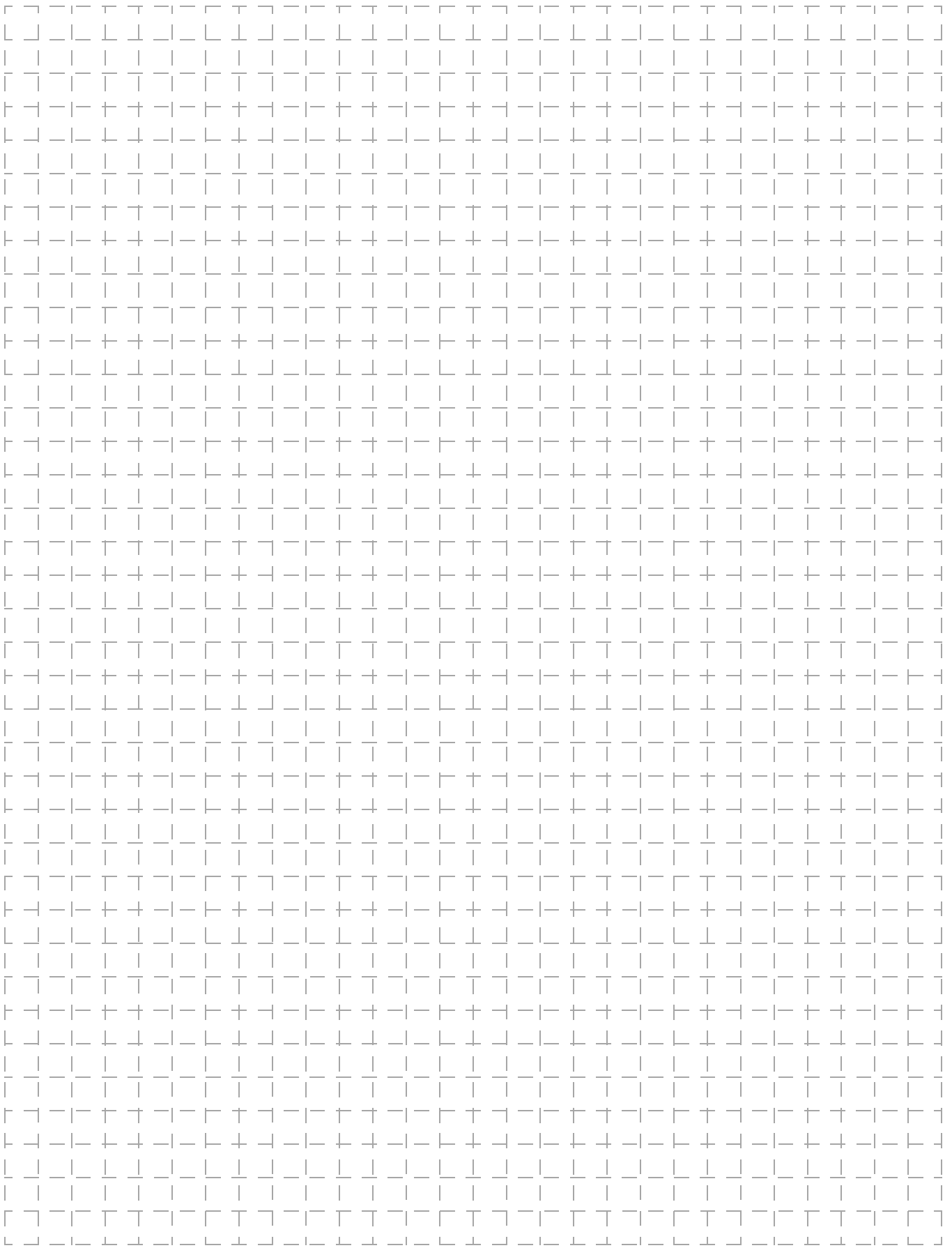


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



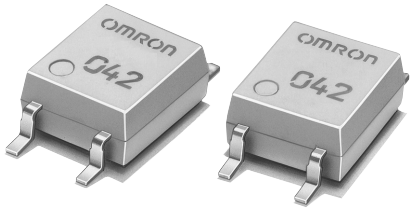
MEMO



MOS FET Relays
G3VM-353G/G1

Analog-switching MOS FET Relay with SPST-NC Contacts. General Purpose version added.

- New models with SPST-NC contacts and a 4-pin SOP package included in 350-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- General-purpose series (with high ON resistance) added.
- RoHS Compliant.



NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

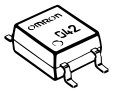
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NC	Surface-mounting terminals	350 VAC	**G3VM-353G**	100	---
			G3VM-353G1		
			G3VM-353G(TR)	---	2,500
			G3VM-353G1(TR)		

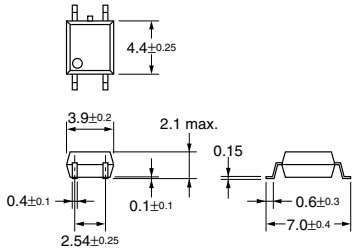
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-353G/G1



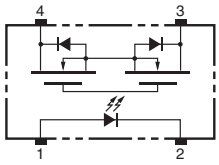
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

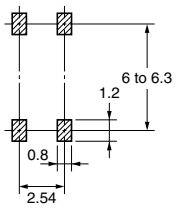
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-353G/G1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-353G/G1



■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	350	V	
	Continuous load current (AC peak/DC)	I_O	120 (90)	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.2 (−0.9)	mA/°C	$T_a \geq 25$°C
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Values in parentheses are for the G3VM-353G1

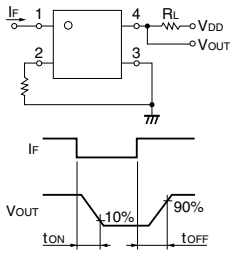
Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_{OFF} = 10 μA
Output	Maximum resistance with output ON	R_{ON}	---	15 (30)	25 (50)	Ω	I_O = 120 mA (90 mA)
	Current leakage when the relay is open	I_{LEAK}	---	0.0105 (0.003)	1.0	μA	V_{OFF} = 350 V, I_F = 5 mA
	Capacity between terminals	C_{OFF}	---	65 (30)	---	pF	V = 0, f = 1MHz, I_F = 5 mA
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{OH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.15 (0.25)	1.0 (1)	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.7 (0.5)	3.0 (1)	ms	

Values in parentheses are for the G3VM-353G1

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	---	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	120 (90)	mA
Operating temperature	T_a	− 20	---	65	°C

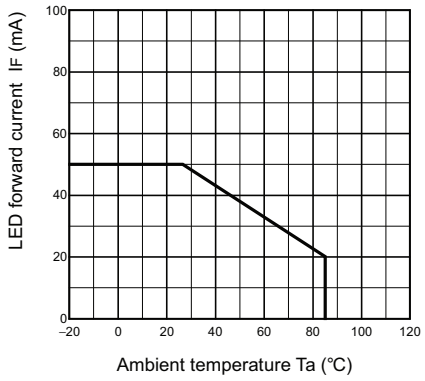
Values in parentheses are for the G3VM-353G1

■ Engineering Data

G3VM-353G

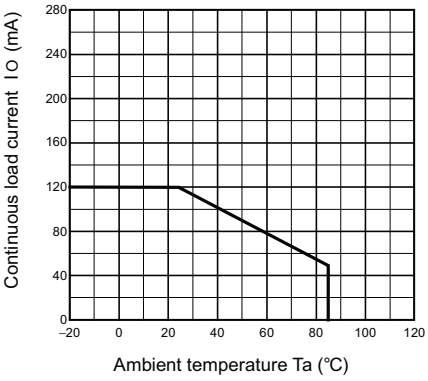
LED forward current vs. Ambient temperature

I_F - Ta



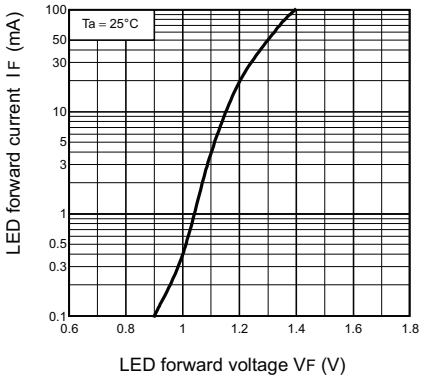
Continuous load current vs. Ambient temperature

I_O - Ta



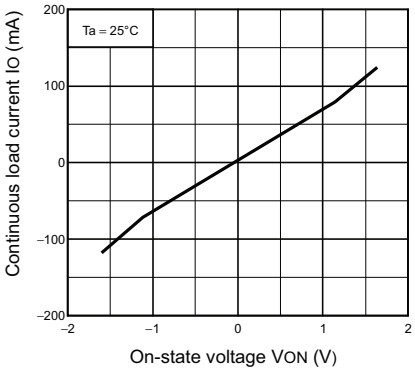
LED forward current vs. LED forward voltage

I_F - V_F



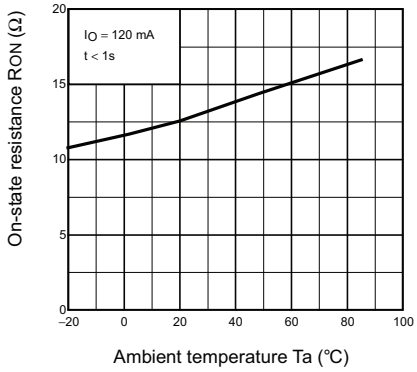
Continuous load current vs. On-state voltage

I_O - V_{ON}



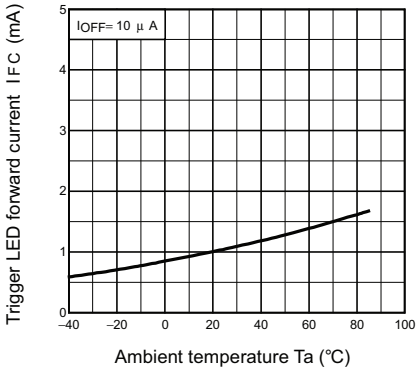
On-state resistance vs. Ambient temperature

R_{ON} - Ta



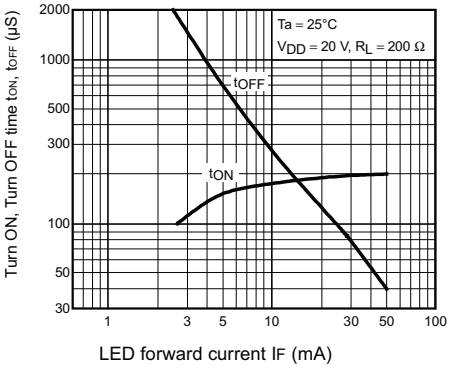
Trigger LED forward current vs. Ambient temperature

I_{FC} - Ta



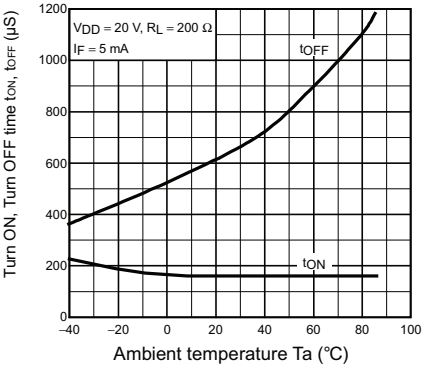
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



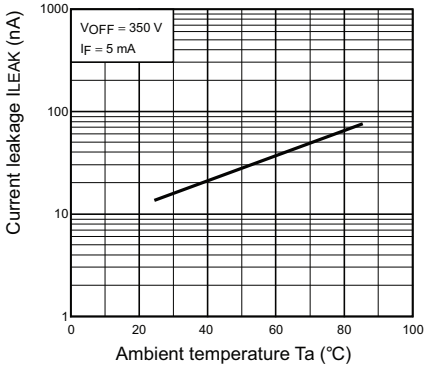
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



Current leakage vs. Ambient temperature

I_{LEAK} - Ta

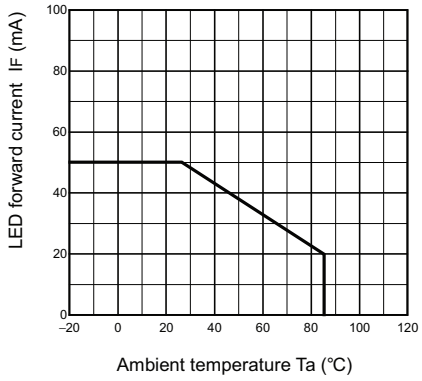


■ Engineering Data

G3VM-353G1

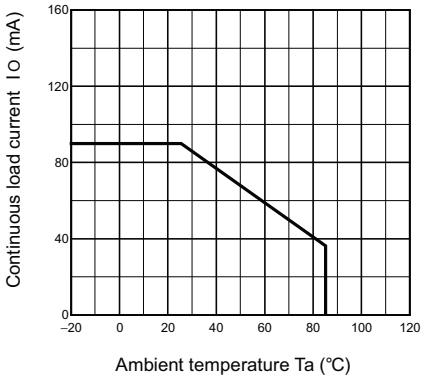
LED forward current vs. Ambient temperature

I_F - Ta



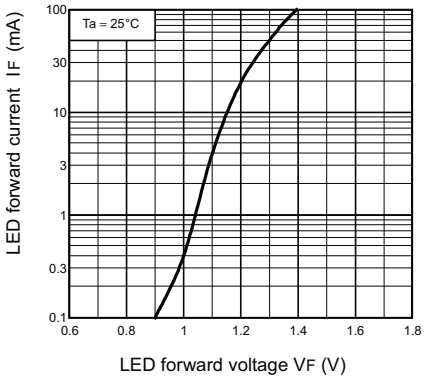
Continuous load current vs. Ambient temperature

I_O - Ta



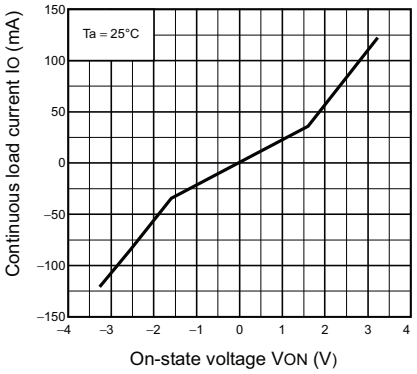
LED forward current vs. LED forward voltage

I_F - V_F



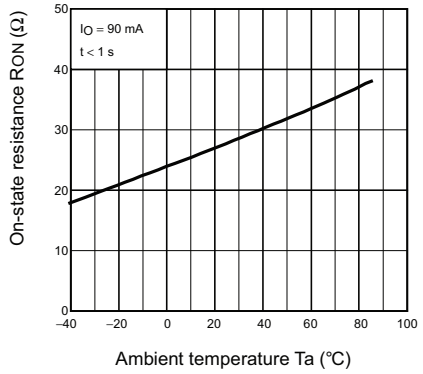
Continuous load current vs. On-state voltage

I_O - V_{ON}



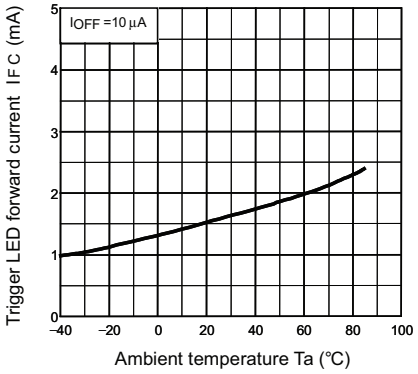
On-state resistance vs. Ambient temperature

R_{ON} - Ta



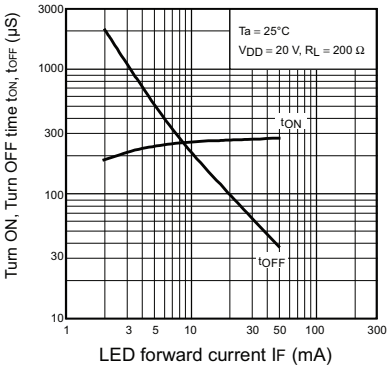
Trigger LED forward current vs. Ambient temperature

I_{FC} - Ta



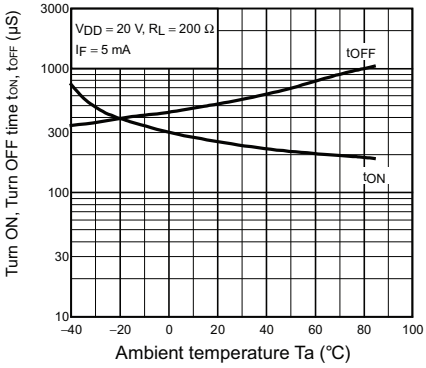
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



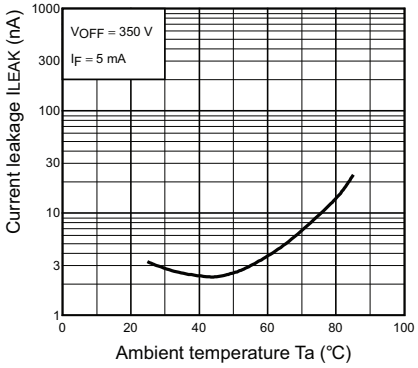
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



Current leakage vs. Ambient temperature

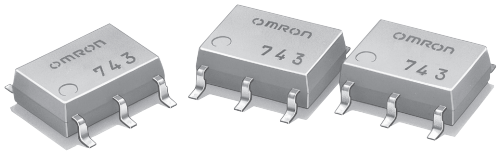
I_{LEAK} - Ta



MOS FET Relays
G3VM-351H

Slim, 2.1-mm High Relay Incorporating a MOS FET Optically Coupled with an Infrared LED in a Miniature, Flat SOP Package

- Upgraded G3VM-S3 Series.
- Continuous load current of 110 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.



■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

Note: The actual product is marked differently from the image shown here.

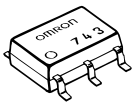
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	350 VAC	**G3VM-351H**	75	---
			G3VM-351H(TR)	---	2,500

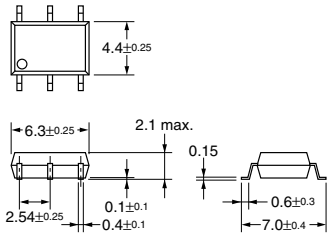
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-351H



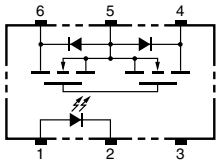
Note: The actual product is marked differently from the image shown here.



Weight: 0.13 g

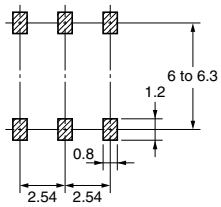
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-351H



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-351H

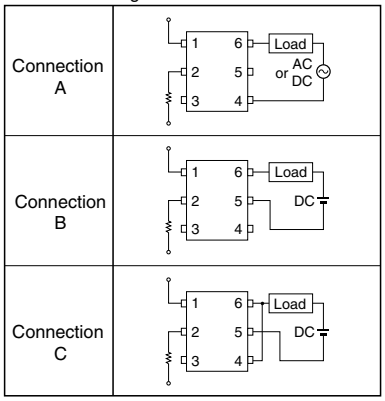


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Load voltage (AC peak/DC)		V_{OFF}	350	V	
	Continuous load current	Connection A	I_O	110	mA	
		Connection B		110		
		Connection C		220		
	ON current reduction rate	Connection A	ΔI_{ON}/°C	−1.1	mA/°C	$T_a \geq 25$°C
		Connection B		−1.1		
		Connection C		−2.2		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature			T_a	−40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

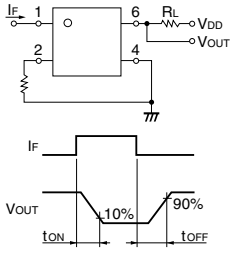
Connection Diagram



■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1	3	mA	I_O = 110 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	25	35	Ω	I_F = 5 mA, I_O = 110 mA, t < 1 s
				---	35	50	Ω	I_F = 5 mA, I_O = 110 mA
		Connection B		---	28	40	Ω	I_F = 5 mA, I_O = 110 mA
		Connection C		---	14	20	Ω	I_F = 5 mA, I_O = 220 mA
	Current leakage when the relay is open		I_{LEAK}	---	0.0018	1.0	μA	V_{OFF} = 350 V
	Capacity between terminals A Connection		C_{OFF}	---	30	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{OH} \leq 60\%$
Turn-ON time			t_{ON}	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			t_{OFF}	---	0.1	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

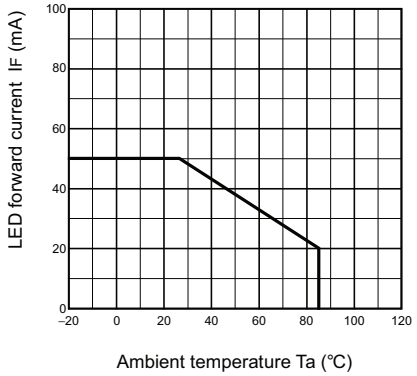
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	10	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

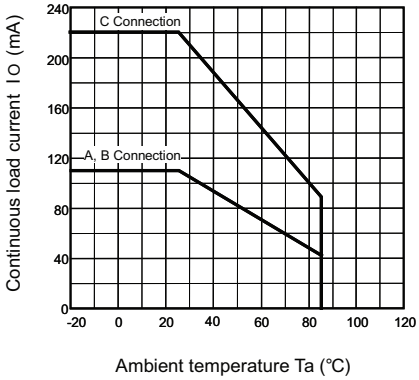
LED forward current vs. Ambient temperature

IF - Ta



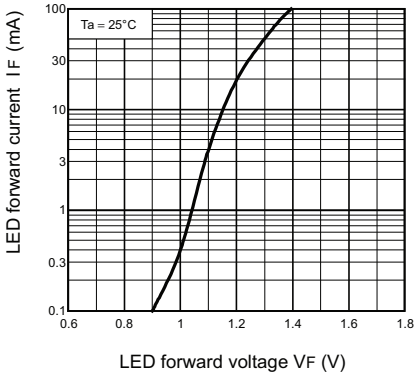
Continuous load current vs. Ambient temperature

IO - Ta



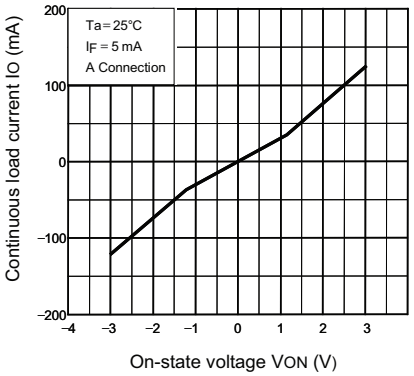
LED forward current vs. LED forward voltage

IF - VF



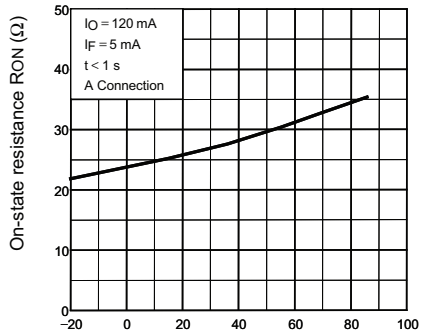
Continuous load current vs. On-state voltage

IO - VON



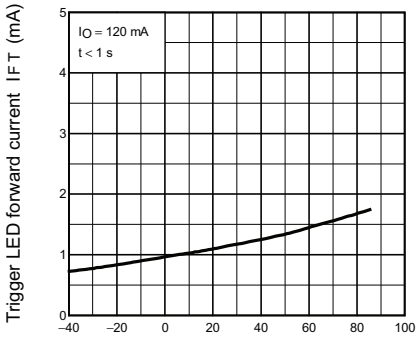
On-state resistance vs. Ambient temperature

RON - Ta



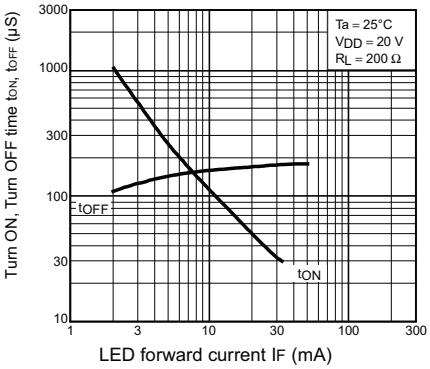
Trigger LED forward current vs. Ambient temperature

IFT - Ta



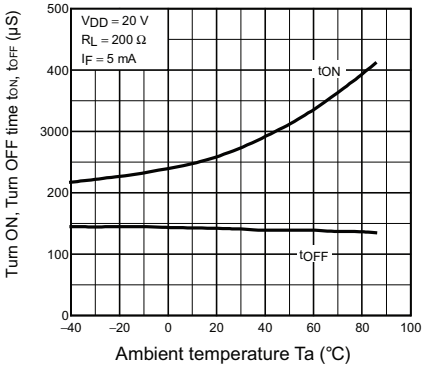
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



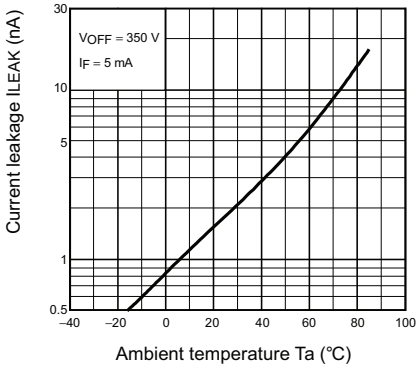
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta

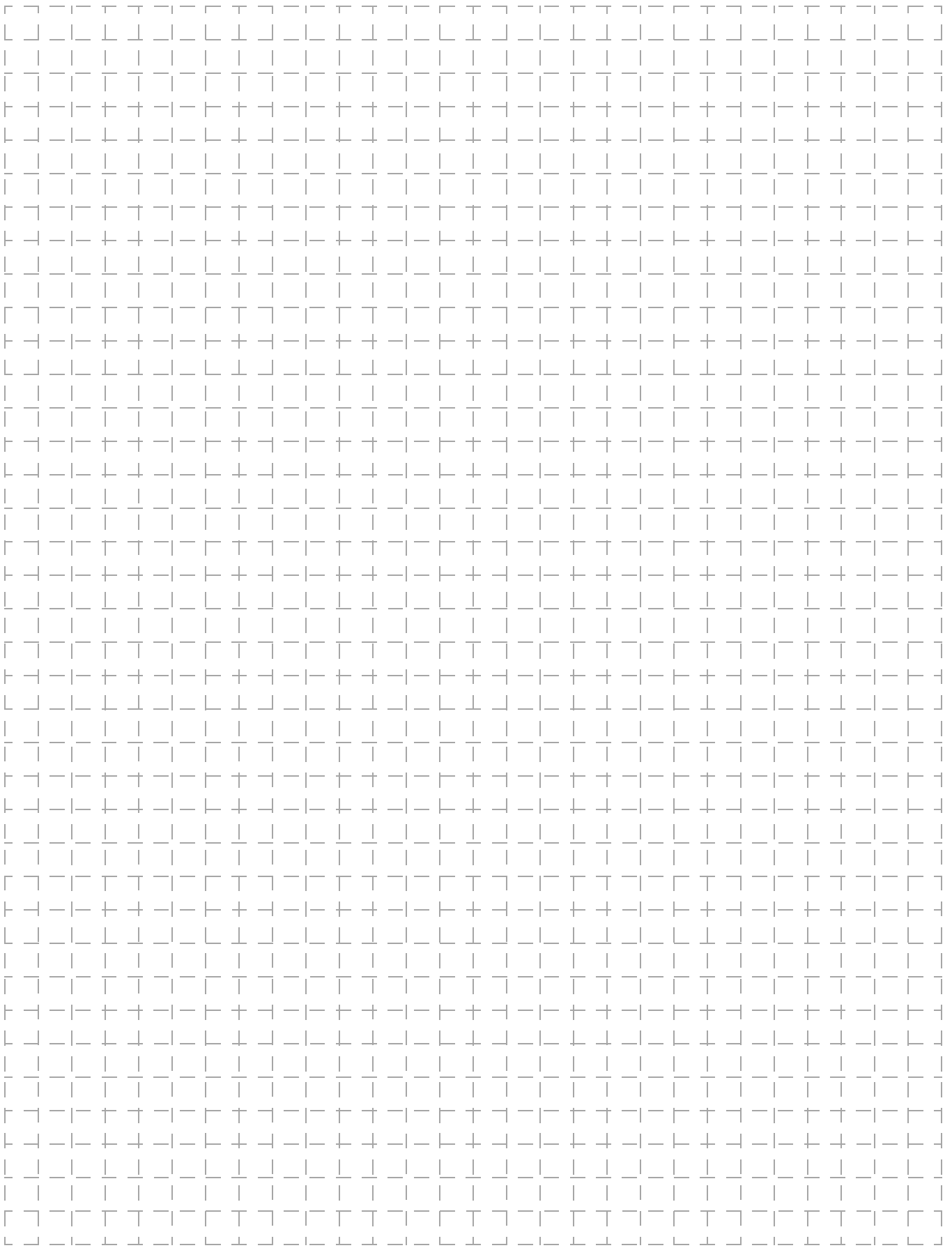


Current leakage vs. Ambient temperature

I LEAK - Ta



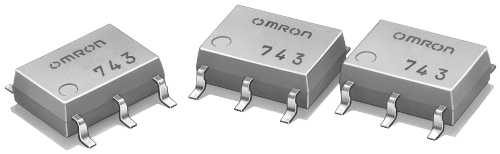
MEMO



MOS FET Relays
G3VM-353H/H1

Analog-switching MOS FET Relay with SPST-NC (Single-pole, Single-throw, Normally Closed) Contacts. General-purpose Series Added.

- New models in 350 load voltage with SPST-NC contacts and a 6-pin SOP package. General-purpose (high On-Resistance) series added.
- Continuous load current of 120 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.



NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

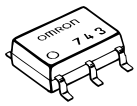
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NC	Surface-mounting terminals	350 VAC	**G3VM-353H**	75	---
			G3VM-353H1		
			G3VM-353H(TR)	---	2,500
			G3VM-353H1(TR)		

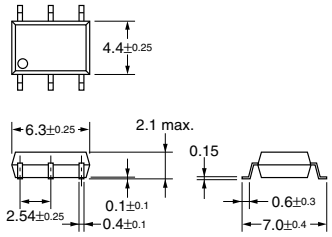
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-353H/H1



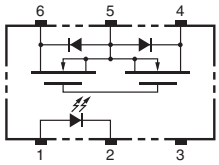
Note: The actual product is marked differently from the image shown here.



Weight: 0.13 g

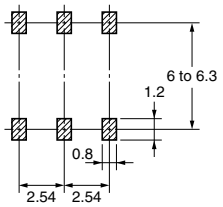
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-353H/H1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-353H/H1



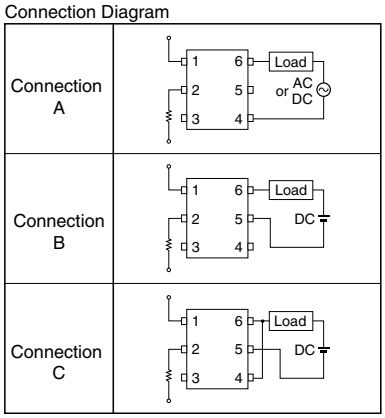
■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Load voltage (AC peak/DC)		V_{OFF}	350	V	
	Continuous load current	Connection A	I_O	120 (90)	mA	
		Connection B		120 (90)		
		Connection C		240 (180)		
	ON current reduction rate	Connection A	ΔI_{ON}/°C	−1.2 (-0.9)	mA/°C	$T_a \geq 25$°C
		Connection B		−1.2 (-0.9)		
		Connection C		−2.4 (-1.8)		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature			T_a	−40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Values inside parentheses ( ) are for G3VM-353H1

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

Connection Diagram

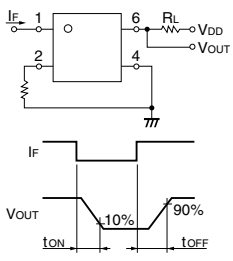


■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1.0	3.0	mA	I_{OFF} = 10 μA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	15 (27)	25 (50)	Ω	I_O = 120 mA
		Connection B		---	8 (20)	14 (43)	Ω	I_O = 120 mA
		Connection C		---	4 (10)	---	Ω	I_O = 240 mA
	Current leakage when the relay is open		I_{LEAK}	---	0.0105 (0.003)	1.0	μA	V_{OFF} = 350 V, I_F = 5 mA
	Capacity between terminals A Connection		C_{OFF}	---	65 (30)	---	pF	V = 0, f = 1(100) MHz, I_F = 5 mA
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time			t_{ON}	---	0.15 (0.25)	1.0 (0.5)	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			t_{OFF}	---	0.7 (0.5)	3.0 (1)	ms	

Values inside parentheses ( ) are for G3VM-353H1

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	---	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	120 (90)	mA
Operating temperature	T_a	− 20	---	65	°C

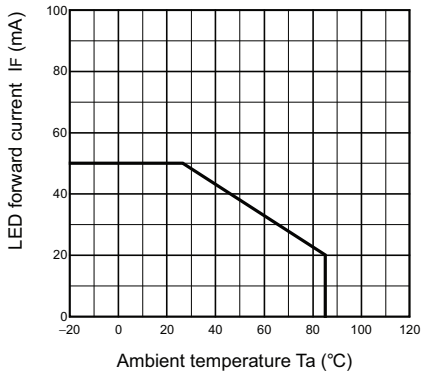
Values inside parentheses ( ) are for G3VM-353H1

■ Engineering Data

G3VM-353H

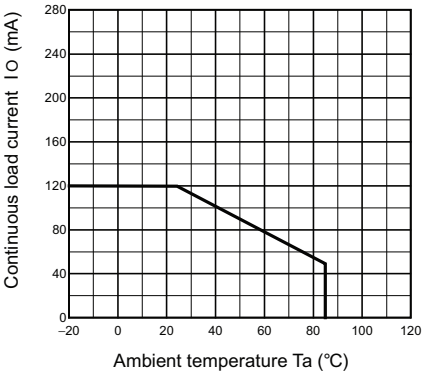
LED forward current vs. Ambient temperature

IF - Ta



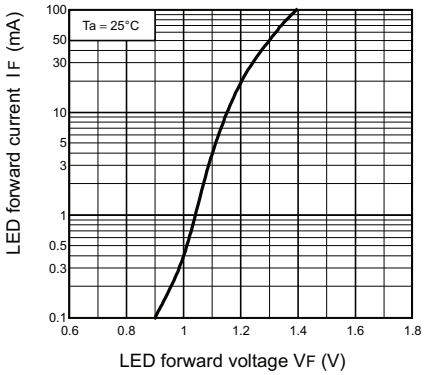
Continuous load current vs. Ambient temperature

IO - Ta



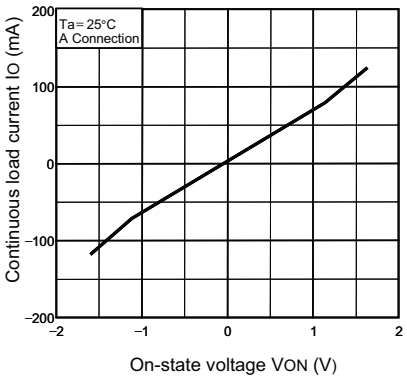
LED forward current vs. LED forward voltage

IF - VF



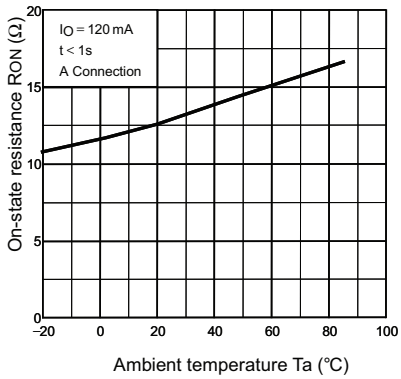
Continuous load current vs. On-state voltage

IO - VON



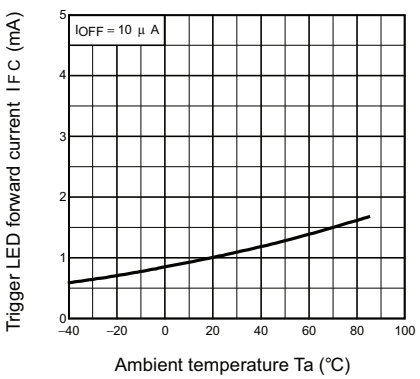
On-state resistance vs. Ambient temperature

RON - Ta



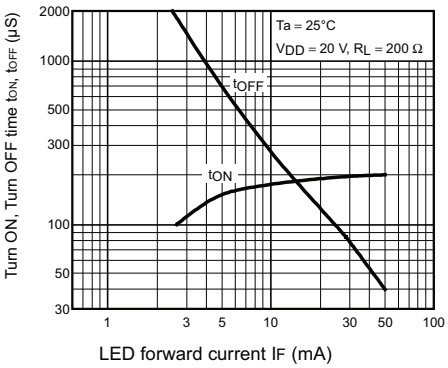
Trigger LED forward current vs. Ambient temperature

IFC - Ta



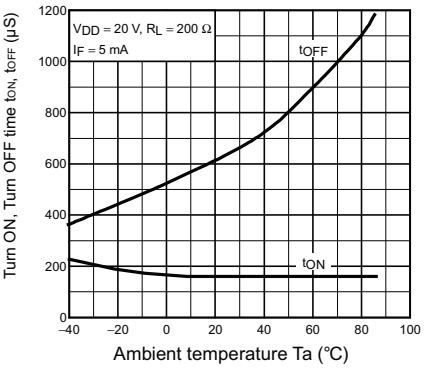
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



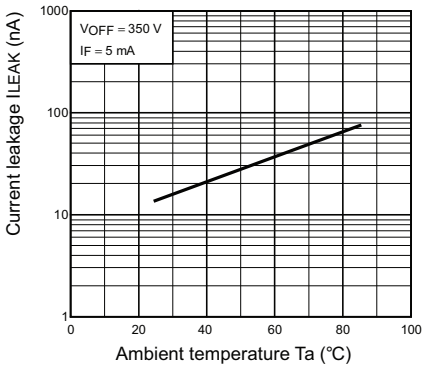
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



Current leakage vs. Ambient temperature

I LEAK - Ta

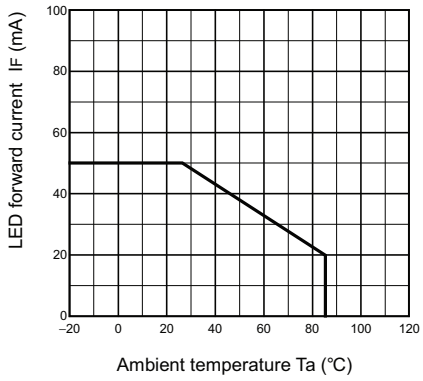


■ Engineering Data

G3VM-353H1

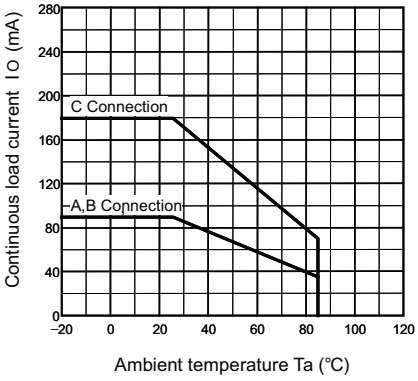
LED forward current vs. Ambient temperature

I_F - Ta



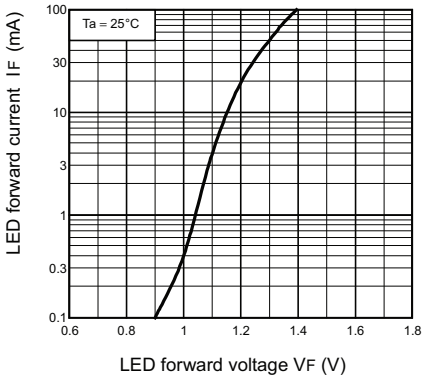
Continuous load current vs. Ambient temperature

I_O - Ta



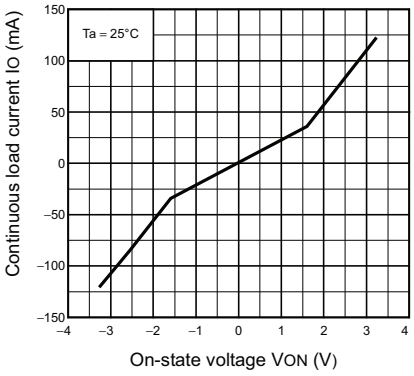
LED forward current vs. LED forward voltage

I_F - V_F



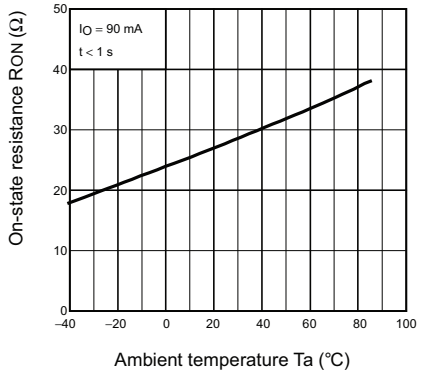
Continuous load current vs. On-state voltage

I_O - V_{ON}



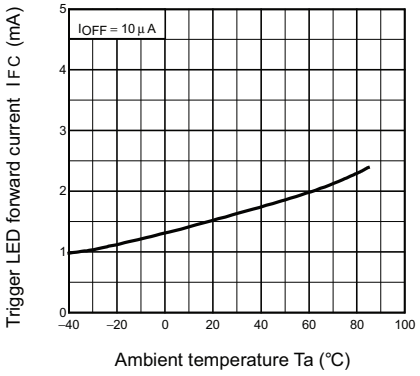
On-state resistance vs. Ambient temperature

R_{ON} - Ta



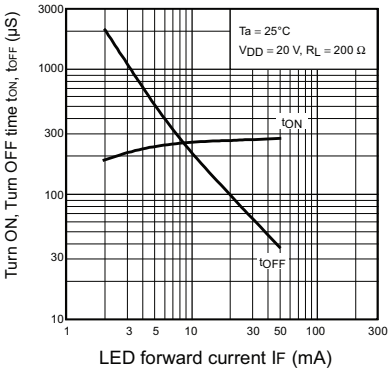
Trigger LED forward current vs. Ambient temperature

I_{FC} - Ta



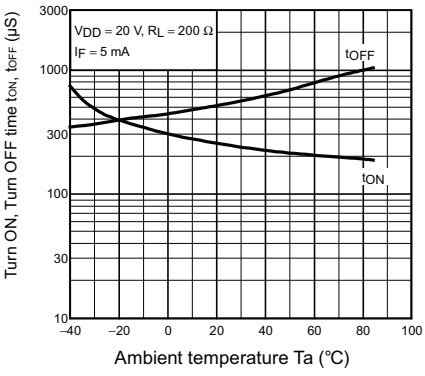
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



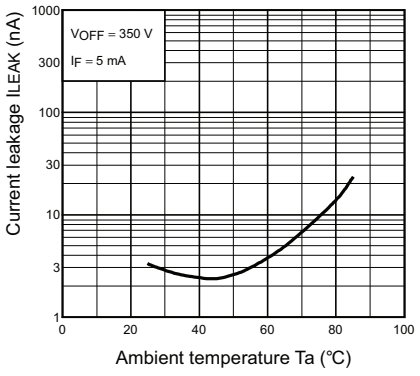
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



Current leakage vs. Ambient temperature

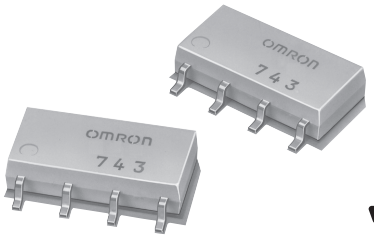
I_{LEAK} - Ta



MOS FET Relays
G3VM-352J

Slim, 2.1-mm High Relay Incorporating a MOS FET Optically Coupled with an Infrared LED in a Miniature, Flat SOP Package

- 2 channels and an 8-pin SOP packageincluded in 350-V load voltage series.
- Continuous load current of 110 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

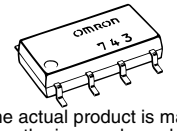
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NO	Surface-mounting terminals	350 VAC	**G3VM-352J**	50	---
			G3VM-352J(TR)	---	2,500

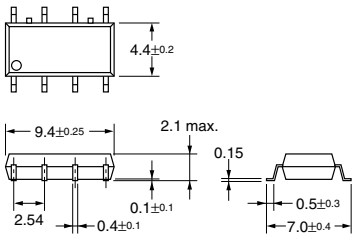
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-352J



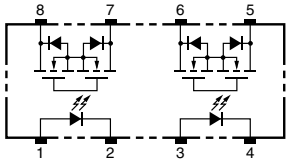
Note: The actual product is marked differently from the image shown here.



Weight: 0.2 g

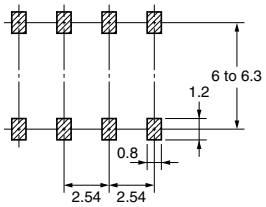
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-352J



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-352J



■ Absolute Maximum Ratings (Ta = 25°C)

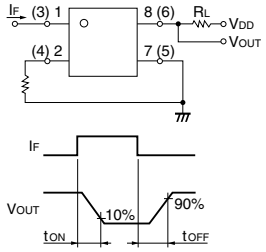
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	350	V	
	Continuous load current	I_O	110	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.1	mA/°C	$T_a \geq 25$°C
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 110 mA
Output	Maximum resistance with output ON	R_{ON}	---	25	35	Ω	I_F = 5 mA, I_O = 110 mA, t < 1 s
			---	35	50	Ω	I_F = 5 mA, I_O = 110 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.0015	1.0	μA	V_{OFF} = 350 V
	Capacity between terminals	C_{OFF}	---	30	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.3	1	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.1	1	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

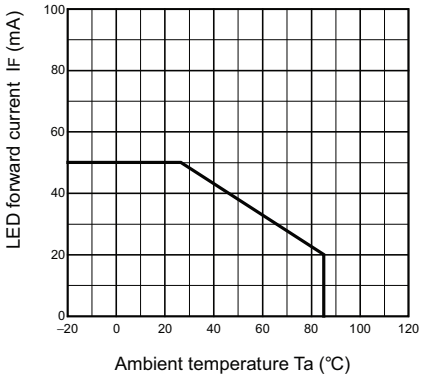
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	10	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	100	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

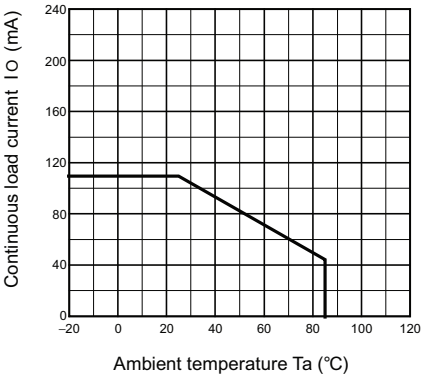
LED forward current vs. Ambient temperature

I_F - Ta



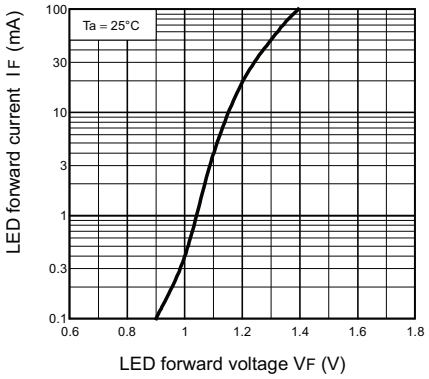
Continuous load current vs. Ambient temperature

I_O - Ta



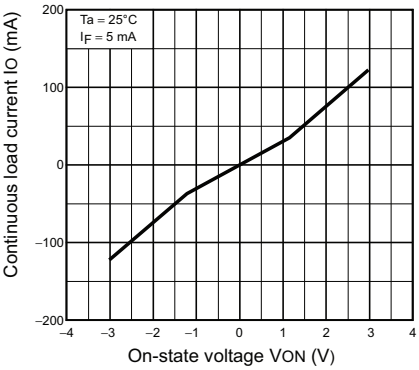
LED forward current vs. LED forward voltage

I_F - V_F



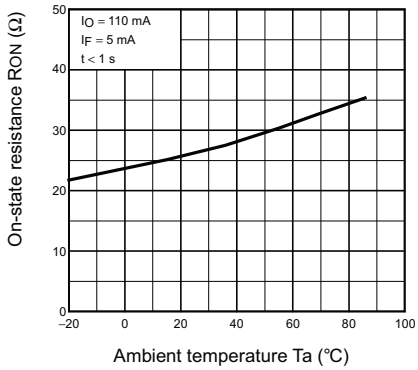
Continuous load current vs. On-state voltage

I_O - V_{ON}



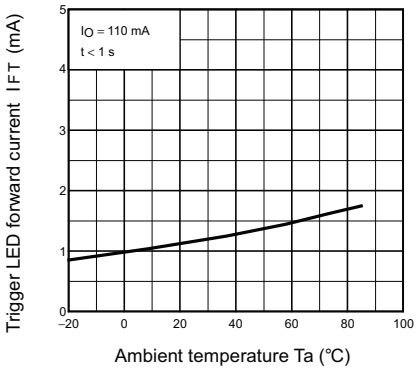
On-state resistance vs. Ambient temperature

R_{ON} - Ta



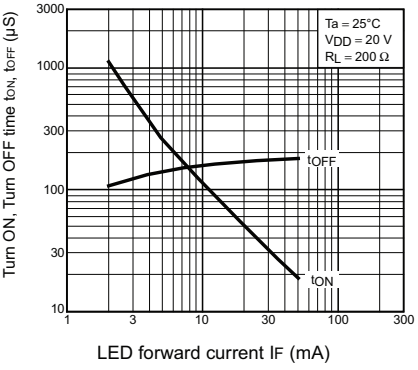
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



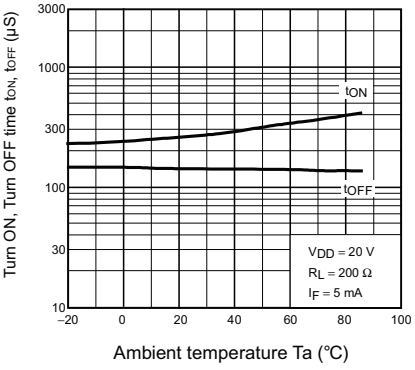
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



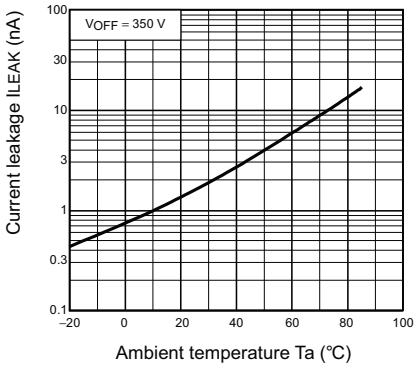
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

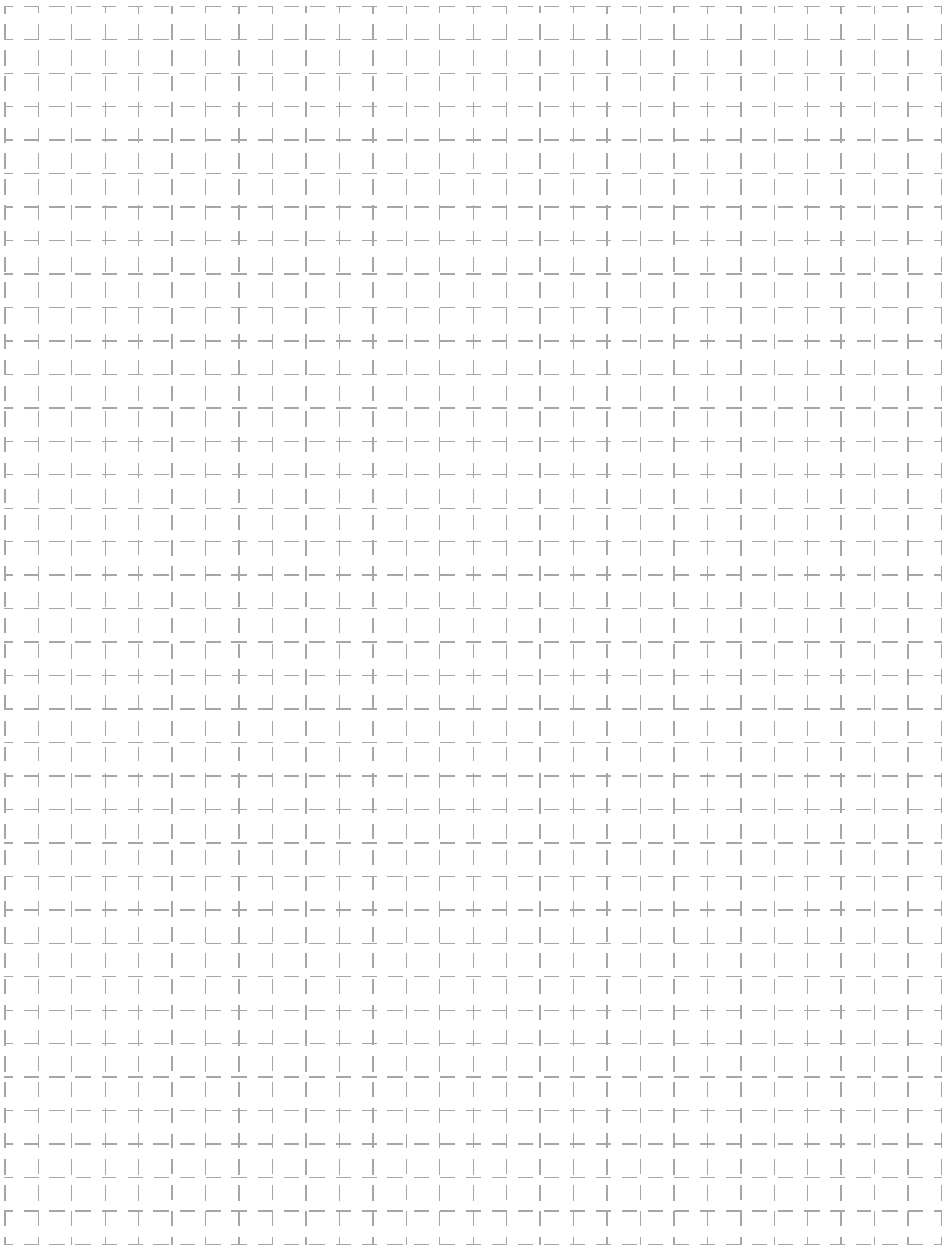


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



MEMO



MOS FET Relays
G3VM-355J/JR

MOS FET Relay with Both SPST-NO and SPST-NC Contacts Incorporated in a Single SOP Package. General-purpose (high On-resistance) Series Added.

- SPST-NO/SPST-NC models with an 8-pin SOP package in the 350-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

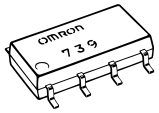
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO/ SPST-NC	Surface-mounting terminals	350 VAC	**G3VM-355JR**	50	---
			G3VM-355J		
			G3VM-355JR(TR)	---	2,500
			G3VM-355J(TR)		

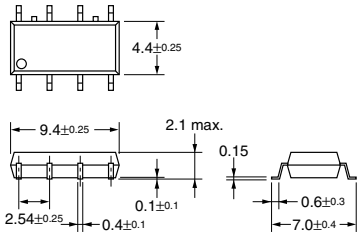
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-355J/JR



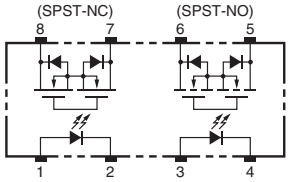
Note: The actual product is marked differently from the image shown here.



Weight: 0.2 g

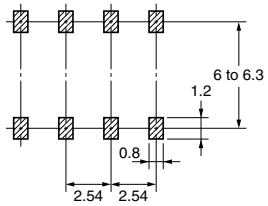
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-355J/JR



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-355J/JR



■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	350	V	
	Continuous load current	I_O	120 (90)	mA	
	ON current reduction rate	ΔI_{ON}/°C	-1.2 (-0.9)	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

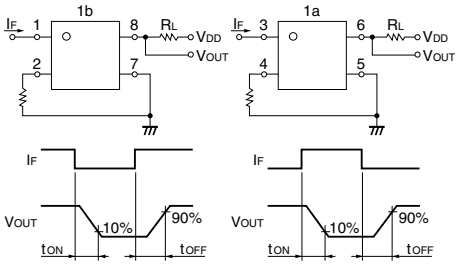
Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

Values inside parenthesis ( ) are for G3VM-355J

■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1	3	mA	SPST-NO: I_O = 120 mA
			I_{FC}					SPST-NC: I_{OFF} = 10 μA
Output	Maximum resistance with output ON		R_{ON}	---	15 (40)	25 (50)	Ω	SPST-NO: I_F = 5 mA, I_O = 120 mA
								SPST-NC: I_F = 0 mA, I_O = 120 mA
	Current leakage when the relay is open		I_{LEAK}	---	0.0015 NO (0.006) 0.0105 NC (0.003)	1.0	μA	V_{OFF} = 350 V
	Capacity between terminals		C_{OFF}	---	65 (30)	---	pF	V = 0, f = 1MHz (NO) V = 0, f = 1MHz, I_F = 5 mA (NC)
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, Vs = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		SPST-NO	t_{ON}	---	0.18 (0.3)	1.0 (1.0)	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
		SPST-NC		---	0.15 (0.25)	1.0 (1.0)	ms	
Turn-OFF time		SPST-NO	t_{OFF}	---	0.11 (0.15)	1.0 (1.0)	ms	
		SPST-NC		---	0.7 (0.5)	3.0 (1.0)	ms	

Note: **2.** Turn-ON and Turn-OFF Times



Values inside parenthesis ( ) are for G3VM-355J

■ Recommended Operating Conditions

Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	10	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	120 (90)	mA
Operating temperature	T_a	- 20	---	65	°C

Values inside parenthesis ( ) are for G3VM-355J

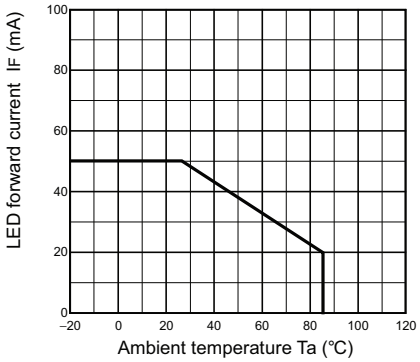
■ Engineering Data

G3VM-355J

Common Characteristics; SPST-NO / SPST-NC

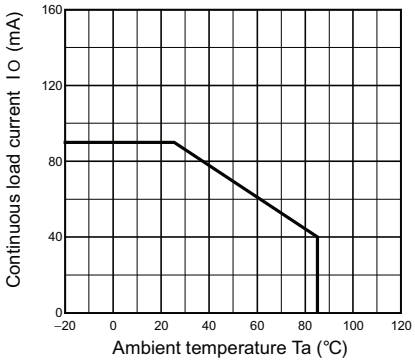
LED forward current vs. Ambient temperature

IF - Ta



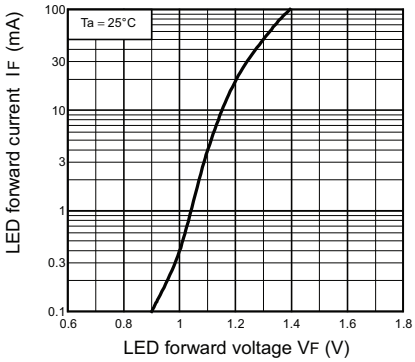
Continuous load current vs. Ambient temperature

IO - Ta



LED forward current vs. LED forward voltage

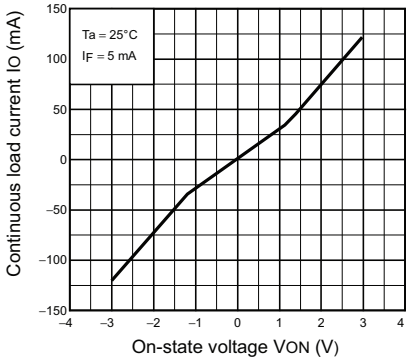
IF - VF



Characteristics; SPST-NO

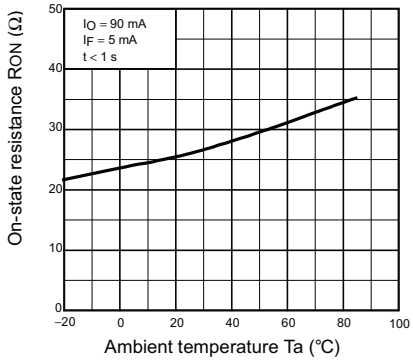
Continuous load current vs. On-state voltage

IO - VON



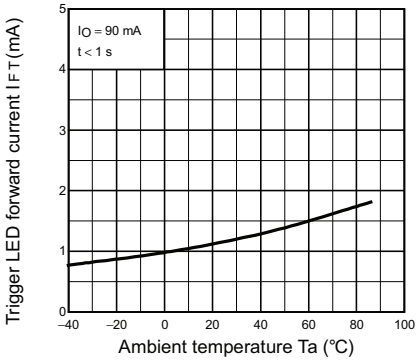
On-state resistance vs. Ambient temperature

RON - Ta



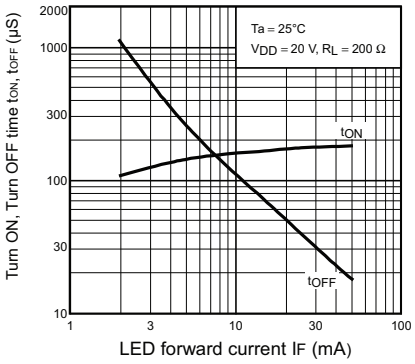
Trigger LED forward current vs. Ambient temperature

IFT - Ta



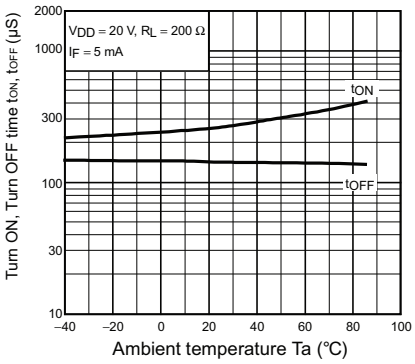
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



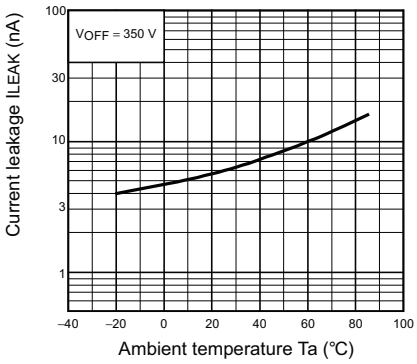
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



Current leakage vs. Ambient temperature

I LEAK – Ta



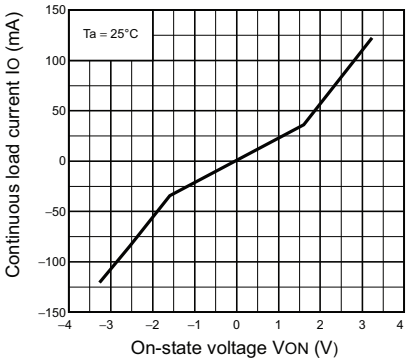
■ Engineering Data

G3VM-355J (continued)

Characteristics; SPST-NC

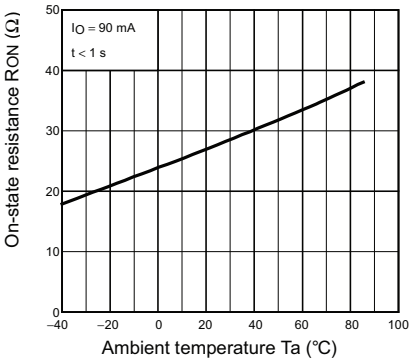
Continuous load current vs. On-state voltage

I_O - V_{ON}



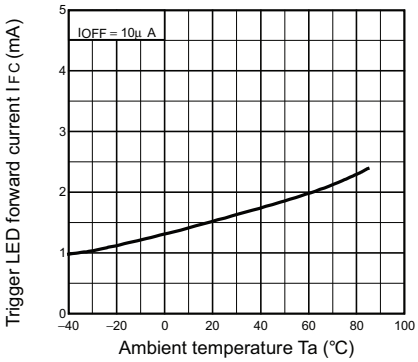
On-state resistance vs. Ambient temperature

R_{ON} - Ta



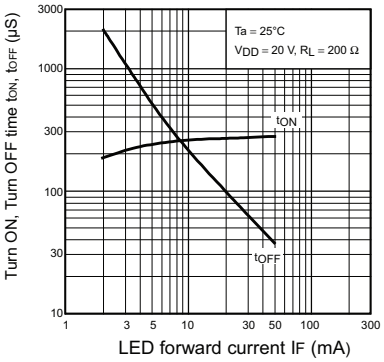
Trigger LED forward current vs. Ambient temperature

I_{FC} - Ta



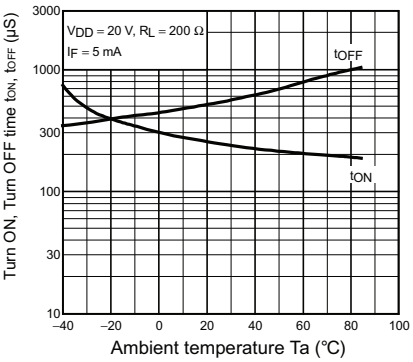
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



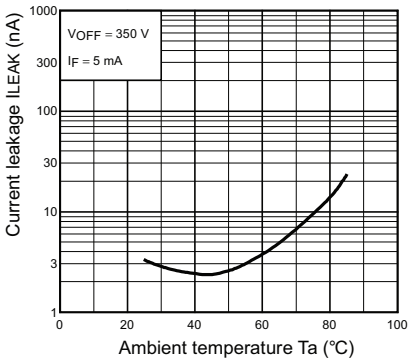
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



Current leakage vs. Ambient temperature

I_{LEAK} – Ta



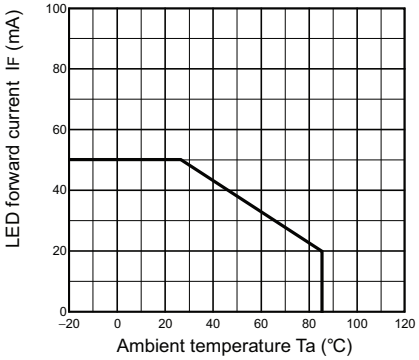
■ Engineering Data

G3VM-355JR

Common Characteristics; SPST-NO / SPST-NC

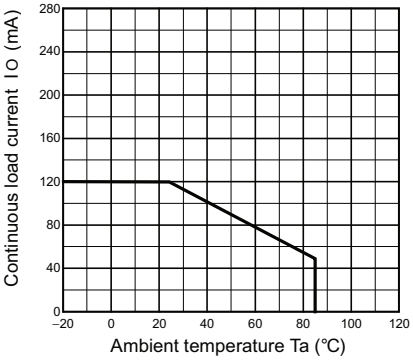
LED forward current vs. Ambient temperature

IF - Ta



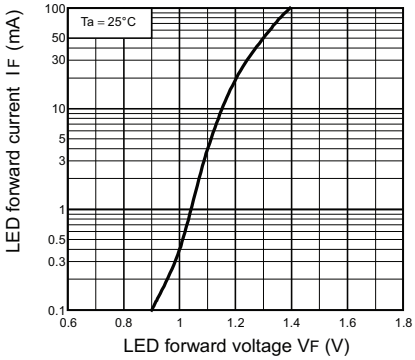
Continuous load current vs. Ambient temperature

IO - Ta



LED forward current vs. LED forward voltage

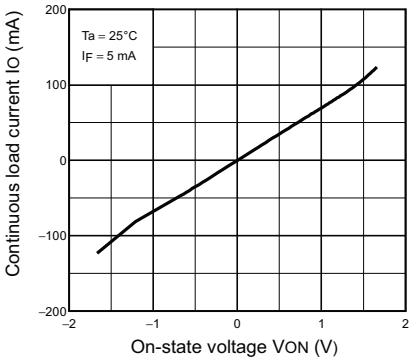
IF - VF



Characteristics; SPST-NO

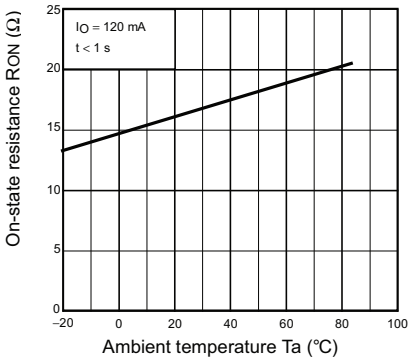
Continuous load current vs. On-state voltage

IO - VON



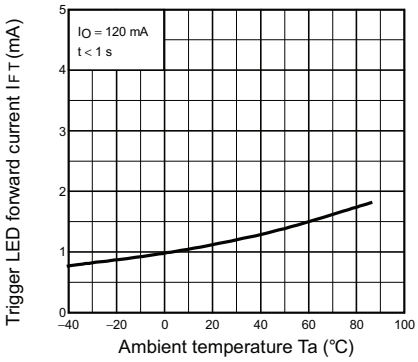
On-state resistance vs. Ambient temperature

RON - Ta



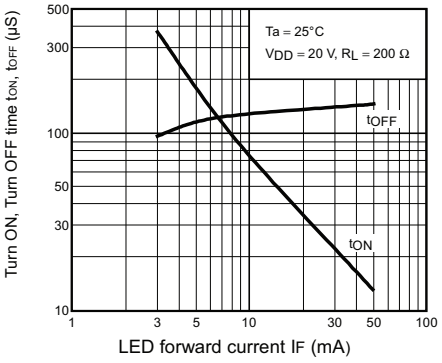
Trigger LED forward current vs. Ambient temperature

IFT - Ta



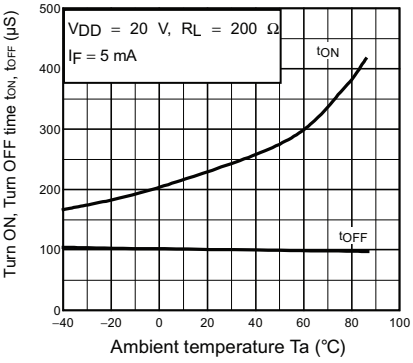
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



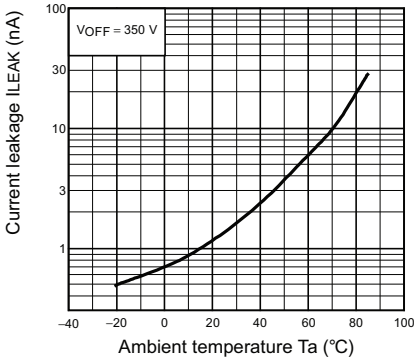
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



Current leakage vs. Ambient temperature

I LEAK – VOFF



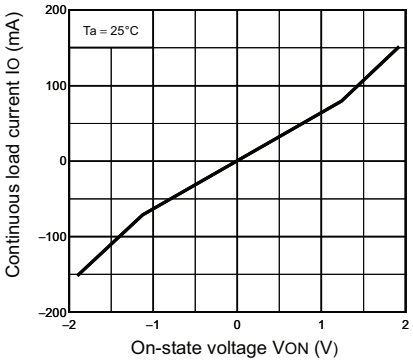
■ Engineering Data

G3VM-355JR (continued)

Characteristics; SPST-NC

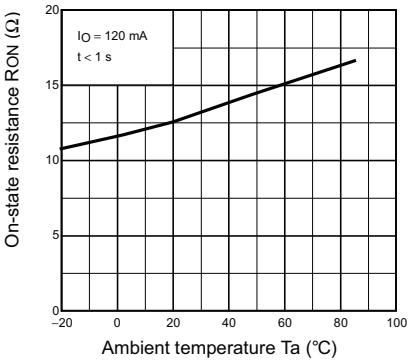
Continuous load current vs. On-state voltage

I_O - V_{ON}



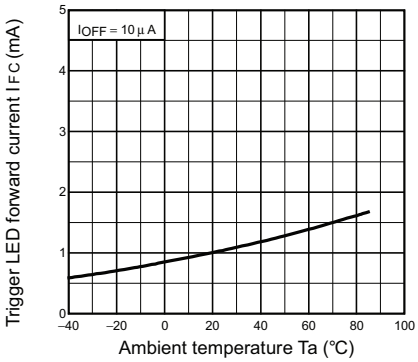
On-state resistance vs. Ambient temperature

R_{ON} - Ta



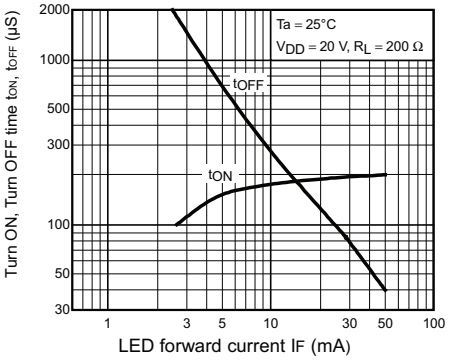
Trigger LED forward current vs. Ambient temperature

I_{FC} - Ta



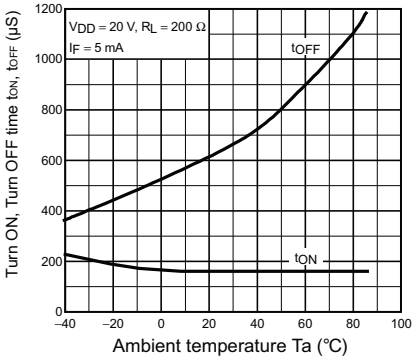
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



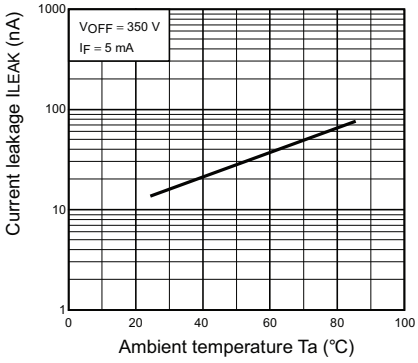
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



Current leakage vs. Ambient temperature

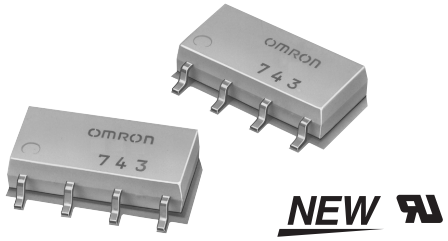
I_{LEAK} – Ta



MOS FET Relays
G3VM-354J/J1

Analog-switching MOS FET Relay with DPST-NC Contacts. General-purpose Models Added.

- New models with SPST-NC contacts and an 8-pin SOP package now included in 350-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- General-purpose models (with high ON resistance) added.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

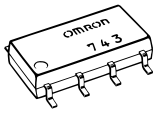
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NC	Surface-mounting terminals	350 VAC	**G3VM-354J**	50	---
			G3VM-354J1		
			G3VM-354J(TR)	---	2,500
			G3VM-354J1(TR)		

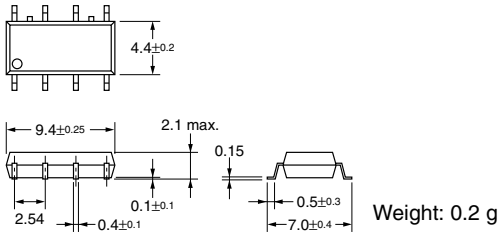
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-354J/J1



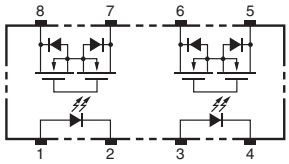
Note: The actual product is marked differently from the image shown here.



Weight: 0.2 g

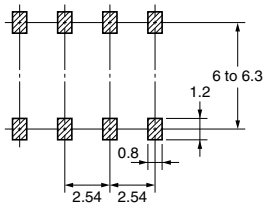
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-354J/J1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-354J/J1



■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	350	V	
	Continuous load current (AC peak/DC)	I_O	120 (90)	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.2 (−0.9)	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Values in parentheses are for the G3VM-354J1.

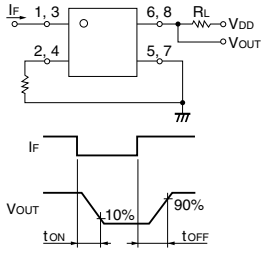
Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_{OFF} = 10 μA
Output	Maximum resistance with output ON	R_{ON}	---	15 (30)	25 (50)	Ω	I_O = 120 mA (90 mA)
	Current leakage when the relay is open	I_{LEAK}	---	0.0105 (0.003)	1.0	μA	V_{OFF} = 350 V, I_F = 5 mA
	Capacity between terminals	C_{OFF}	---	65 (30)	---	pF	V = 0, f = 1MHz, I_F = 5 mA
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.15 (0.25)	1.0 (0.5)	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.7 (0.5)	3.0 (1)	ms	

Values in parentheses are for the G3VM-354J1.

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	280	V
Operating LED forward current	I_F	5	---	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	120 (90)	mA
Operating temperature	T_a	− 20	---	65	°C

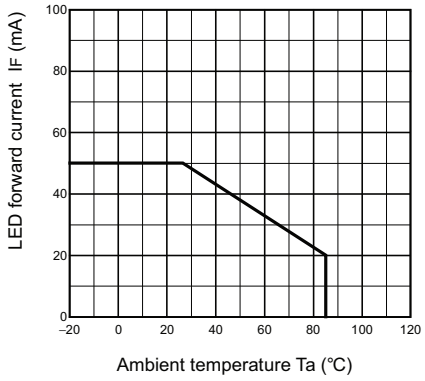
Values in parentheses are for the G3VM-354J1.

■ Engineering Data

G3VM-354J

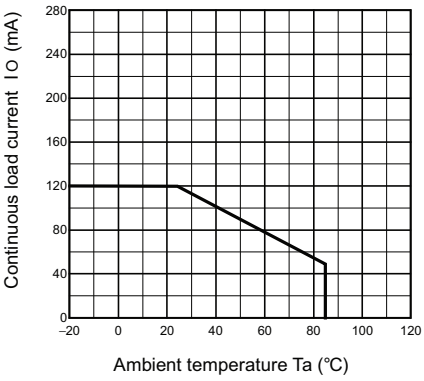
LED forward current vs. Ambient temperature

I_F - Ta



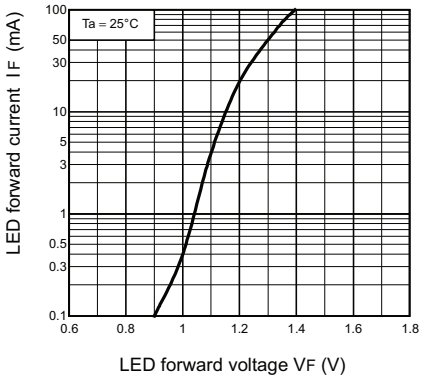
Continuous load current vs. Ambient temperature

I_O - Ta



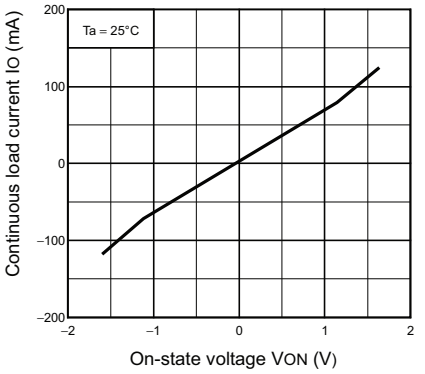
LED forward current vs. LED forward voltage

I_F - V_F



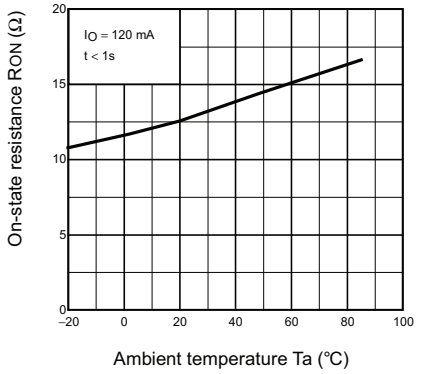
Continuous load current vs. On-state voltage

I_O - V_{ON}



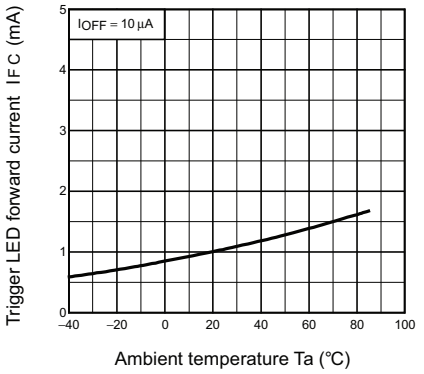
On-state resistance vs. Ambient temperature

R_{ON} - Ta



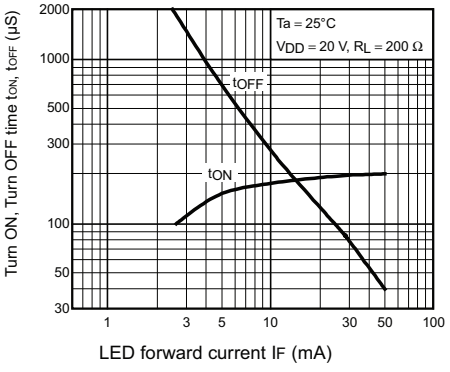
Trigger LED forward current vs. Ambient temperature

I_{FC} - Ta



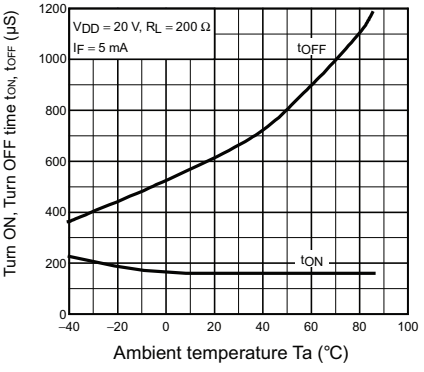
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



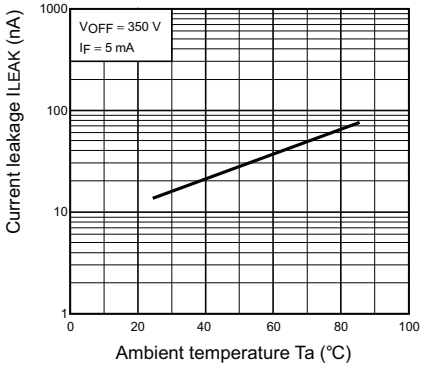
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



Current leakage vs. Ambient temperature

I_{LEAK} - Ta

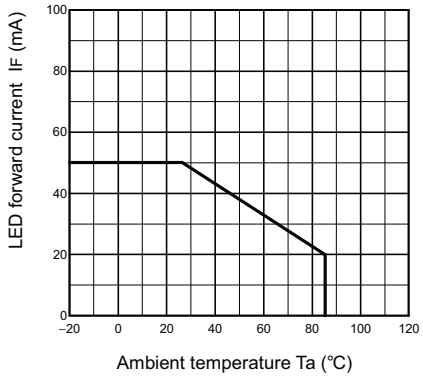


■ Engineering Data

G3VM-354J1

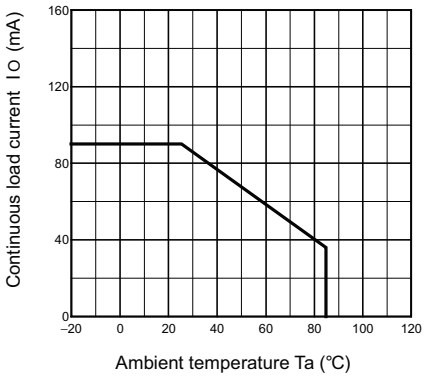
LED forward current vs. Ambient temperature

I_F - Ta



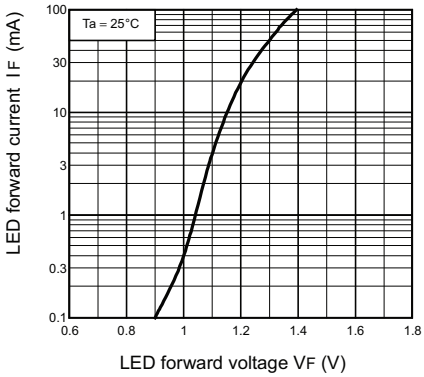
Continuous load current vs. Ambient temperature

I_O - Ta



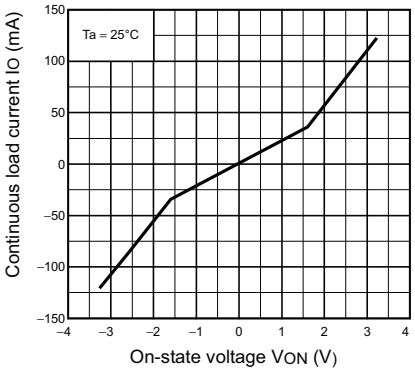
LED forward current vs. LED forward voltage

I_F - V_F



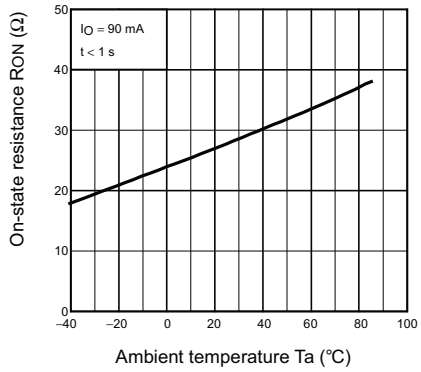
Continuous load current vs. On-state voltage

I_O - V_{ON}



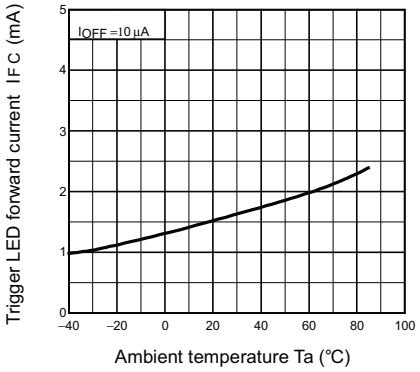
On-state resistance vs. Ambient temperature

R_{ON} - Ta



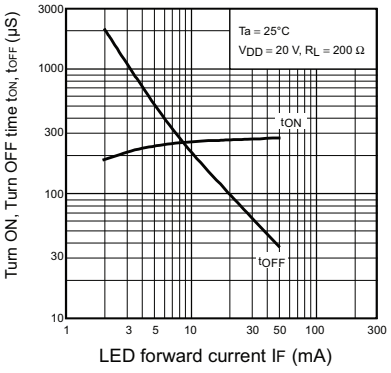
Trigger LED forward current vs. Ambient temperature

I_{FC} - Ta



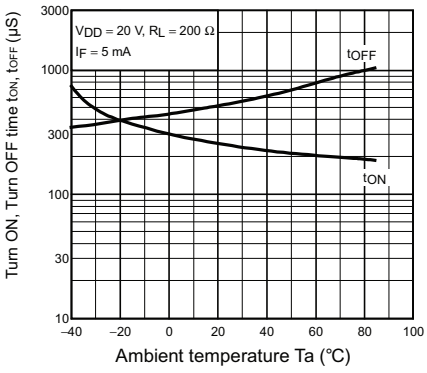
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



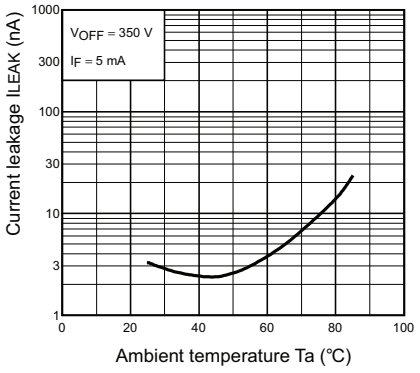
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



Current leakage vs. Ambient temperature

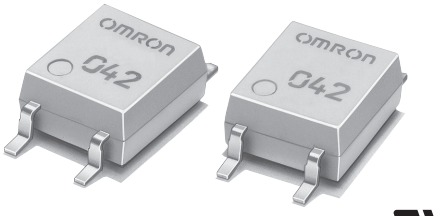
I_{LEAK} - Ta



MOS FET Relays
G3VM-401G

Analog-Switching MOS FET Relays in 400-V Load Voltage Series

- 4-pin SOP package in the 400-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

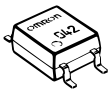
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	400 VAC	**G3VM-401G**	100	---
			G3VM-401G(TR)	---	2,500

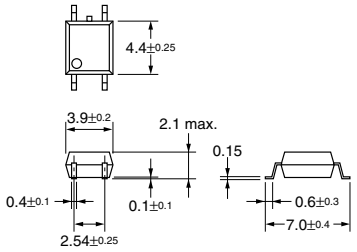
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-401G



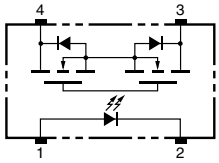
Note: The actual product is marked differently from the image shown here.



Weight: 0.1 g

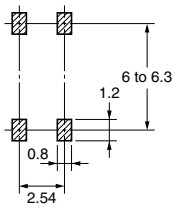
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-401G



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-401G



■ Absolute Maximum Ratings (Ta = 25°C)

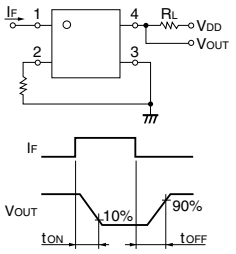
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	400	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.2	mA/°C	$T_a \geq 25$°C
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	17	35	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.003	1.0	μA	V_{OFF} = 400 V
	Capacity between terminals	C_{OFF}	---	70	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.3	1	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.1	1	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

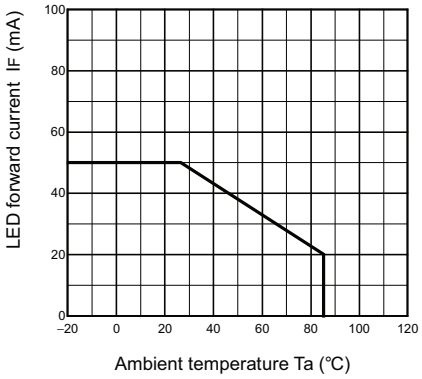
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	320	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	120	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

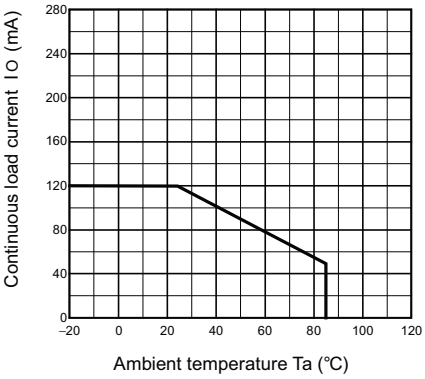
LED forward current vs. Ambient temperature

I_F - Ta



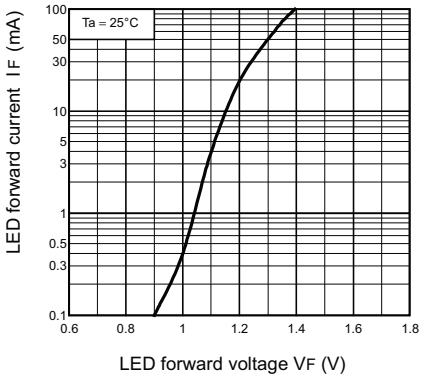
Continuous load current vs. Ambient temperature

I_O - Ta



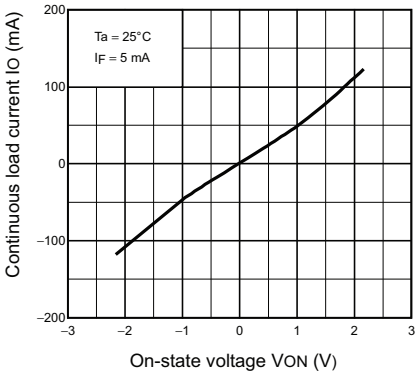
LED forward current vs. LED forward voltage

I_F - V_F



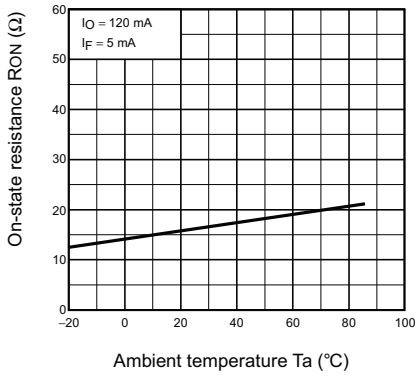
Continuous load current vs. On-state voltage

I_O - V_{ON}



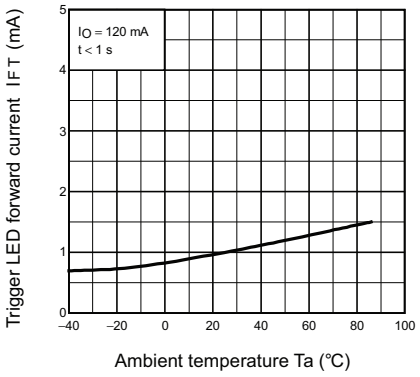
On-state resistance vs. Ambient temperature

R_{ON} - Ta



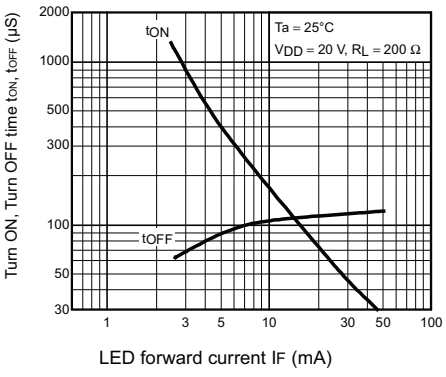
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



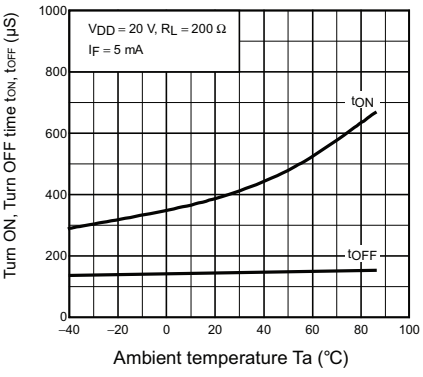
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



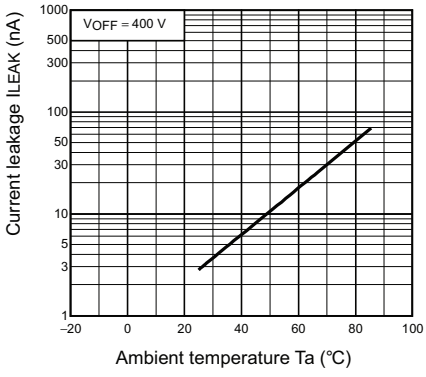
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

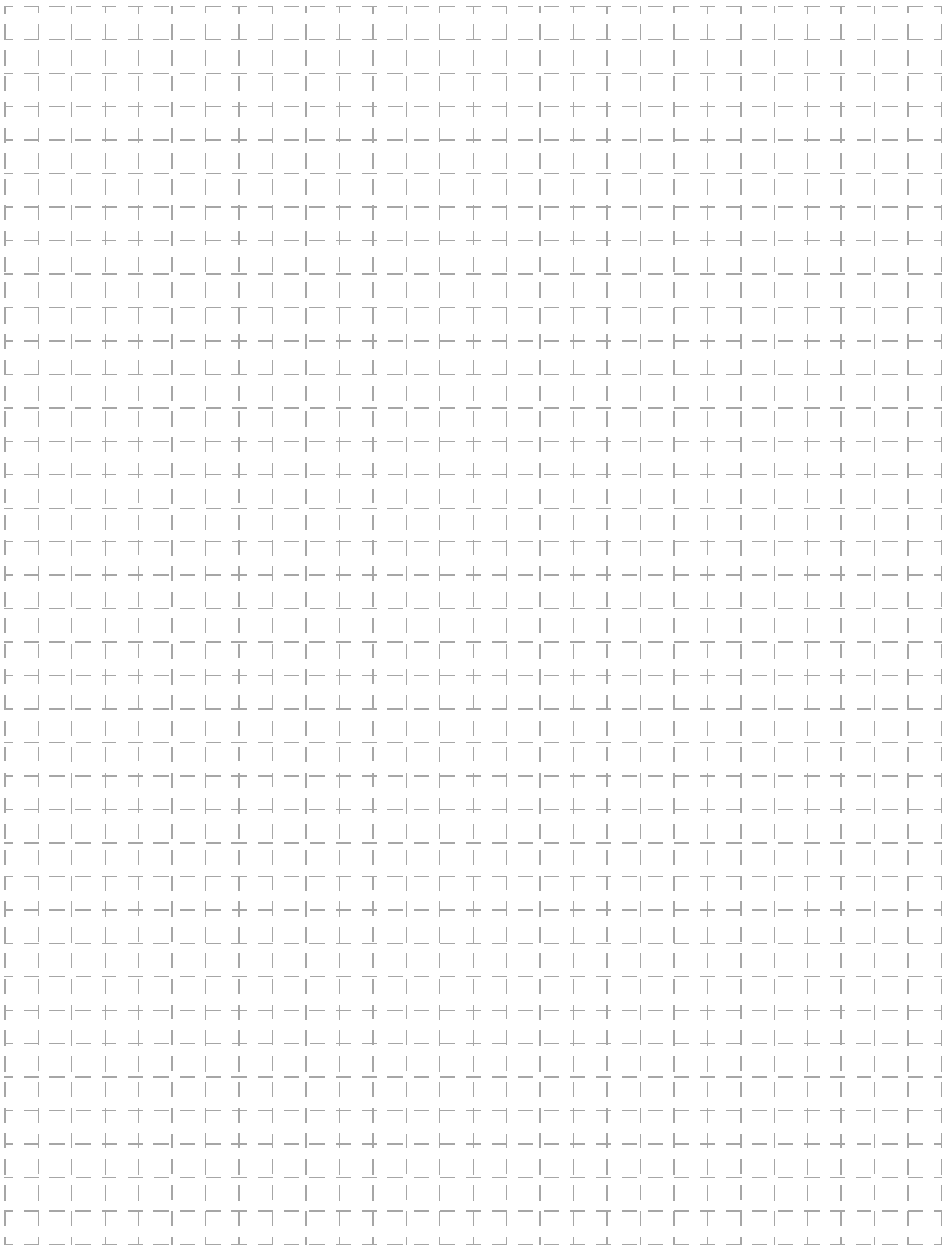


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



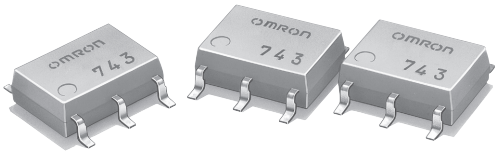
MEMO



MOS FET Relays
G3VM-401H

Analog-Switching MOS FET Relays with 400-V Load Voltage

- New models with a 6-pin SOP package in a 400-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.



■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

Note: The actual product is marked differently from the image shown here.

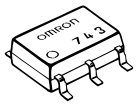
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	400 VAC	**G3VM-401H**	75	---
			G3VM-401H(TR)	---	2,500

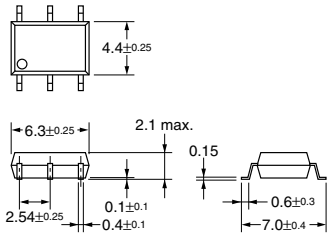
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-401H



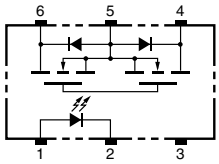
Note: The actual product is marked differently from the image shown here.



Weight: 0.13 g

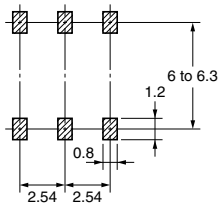
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-401H



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-401H

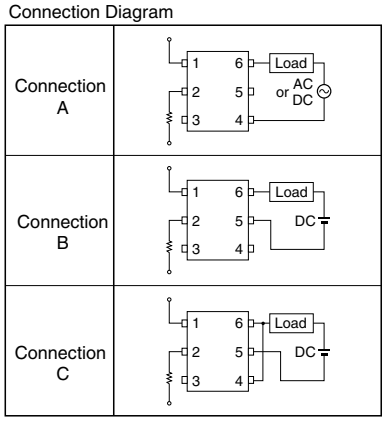


■ Absolute Maximum Ratings (Ta = 25°C)

Item			Symbol	Rating	Unit	Measurement conditions
Input	LED forward current		I_F	50	mA	
	Repetitive peak LED forward current		I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate		ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage		V_R	5	V	
	Connection temperature		T_j	125	°C	
Output	Load voltage (AC peak/DC)		V_{OFF}	400	V	
	Continuous load current	Connection A	I_O	120	mA	
		Connection B		120		
		Connection C		240		
	ON current reduction rate	Connection A	ΔI_{ON}/°C	–1.2	mA/°C	$T_a \geq 25$°C
		Connection B		–1.2		
		Connection C		–2.4		
	Connection temperature		T_j	125	°C	
Dielectric strength between input and output (See note 1.)			V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature			T_a	–40 to +85	°C	With no icing or condensation
Storage temperature			T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)			---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

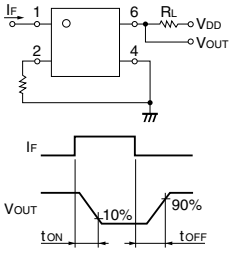
Connection Diagram



■ Electrical Characteristics (Ta = 25°C)

Item			Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage		V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current		I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals		C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current		I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	Connection A	R_{ON}	---	17	35	Ω	I_F = 5 mA, I_O = 120 mA
		Connection B		---	11	20	Ω	I_F = 5 mA, I_O = 120 mA
		Connection C		---	6	---	Ω	I_F = 5 mA, I_O = 240 mA
	Current leakage when the relay is open		I_{LEAK}	---	0.003	1.0	μA	V_{OFF} = 400 V
	Capacity between terminals A Connection		C_{OFF}	---	70	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals			C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance			R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time			t_{ON}	---	0.3	1.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time			t_{OFF}	---	0.1	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

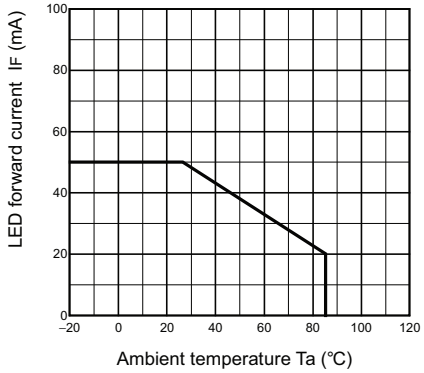
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	320	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	120	mA
Operating temperature	T_a	– 20	---	65	°C

■ Engineering Data

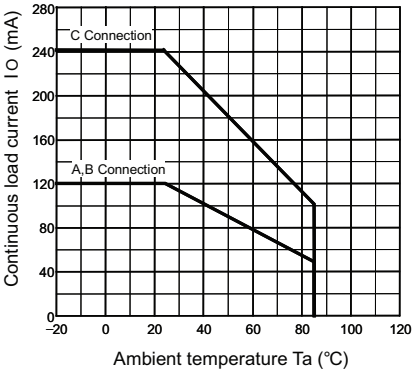
LED forward current vs. Ambient temperature

I_F - Ta



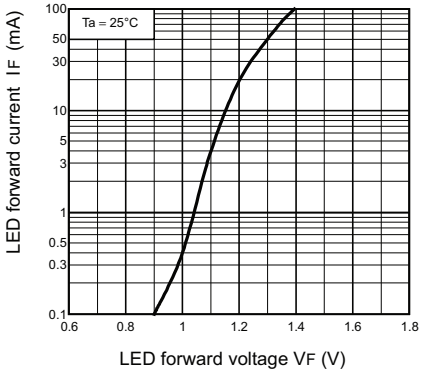
Continuous load current vs. Ambient temperature

I_O - Ta



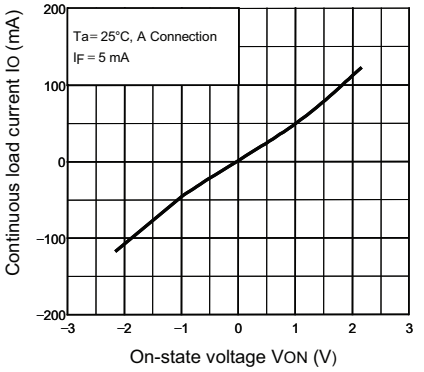
LED forward current vs. LED forward voltage

I_F - V_F



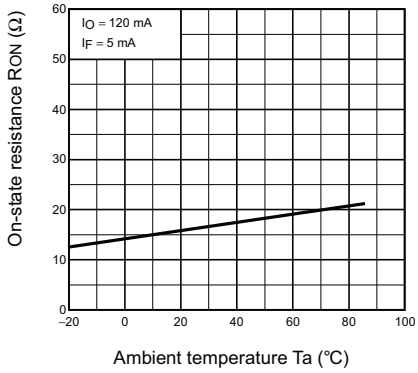
Continuous load current vs. On-state voltage

I_O - V_{ON}



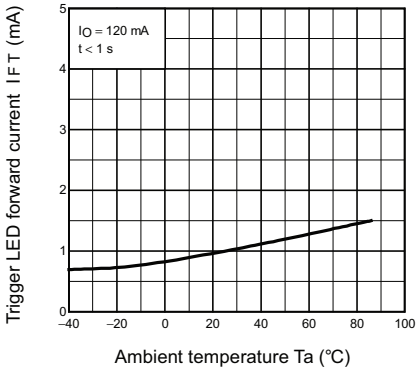
On-state resistance vs. Ambient temperature

R_{ON} - Ta



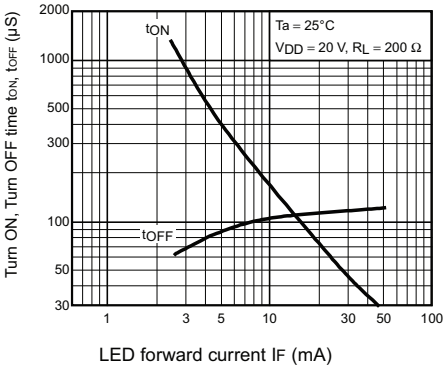
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



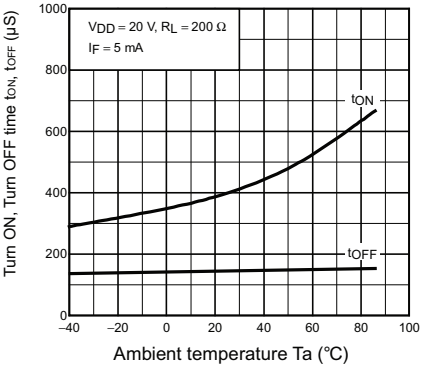
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



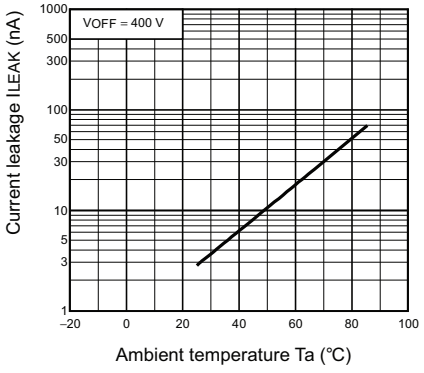
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

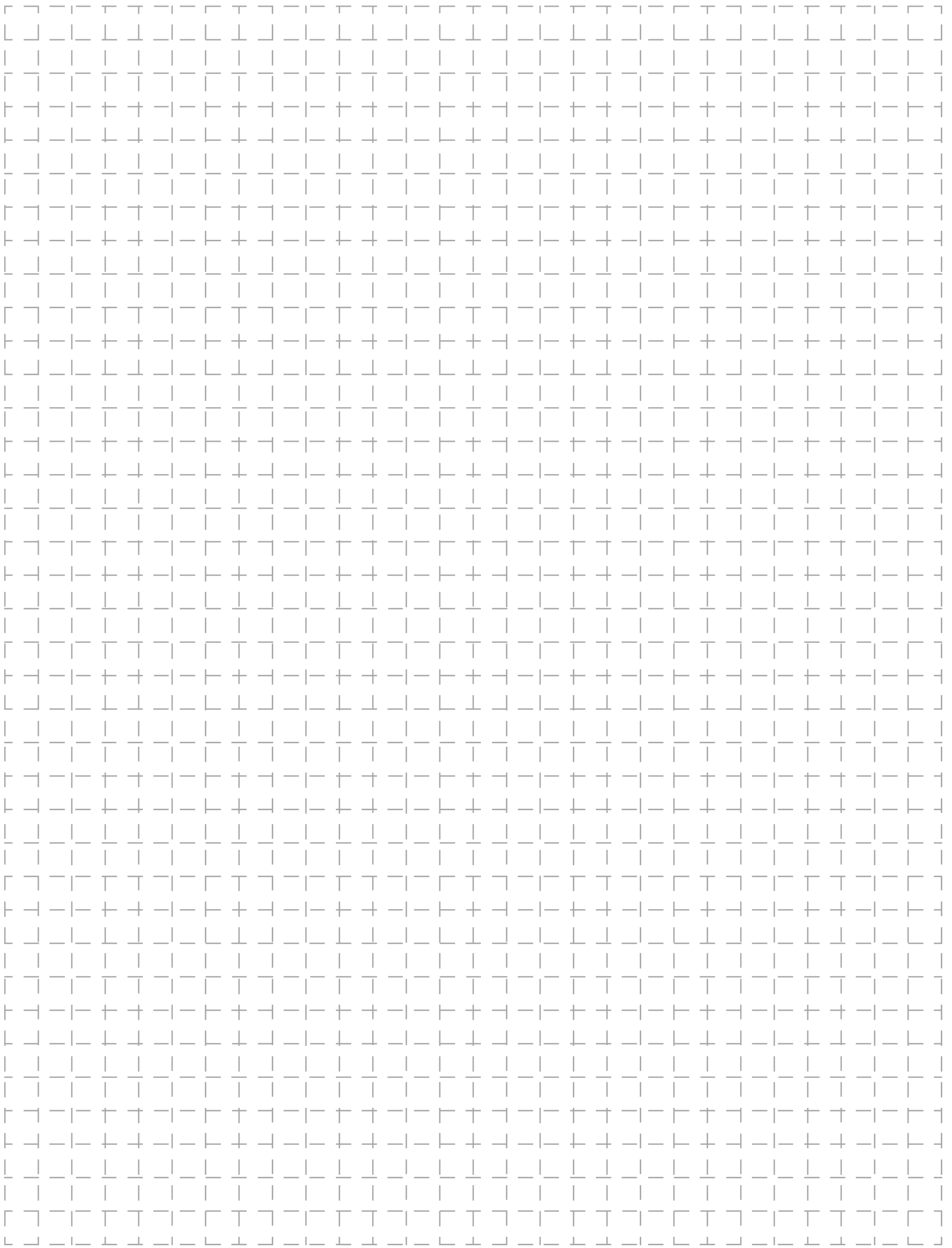


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



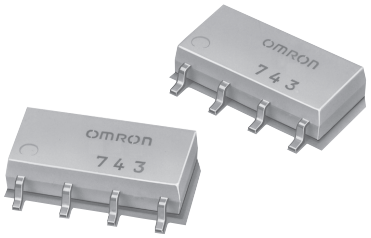
MEMO



MOS FET Relays
G3VM-402J

Analog-Switching MOS FET Relays with 400-V Load Voltage

- Two channels and an 8-pin SOP package included in a 400-V load voltage series.
- Continuous load current of 120 mA.
- Dielectric strength of 1,500 Vrms between I/O.
- RoHS Compliant.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems
- Measurement devices and Data loggers
- Amusement machines

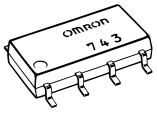
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per stick	Number per tape
DPST-NO	Surface-mounting terminals	400 VAC	**G3VM-402J**	50	---
			G3VM-402J(TR)	---	2,500

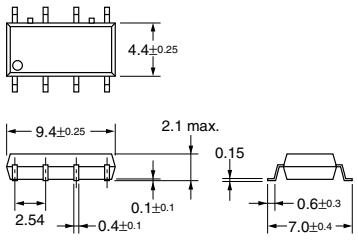
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-402J



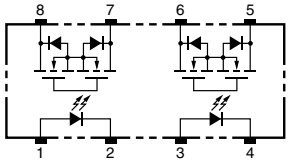
Note: The actual product is marked differently from the image shown here.



Weight: 0.2 g

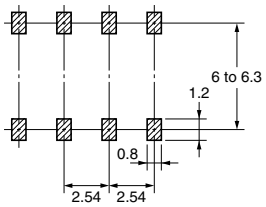
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-402J



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-402J



■ Absolute Maximum Ratings (Ta = 25°C)

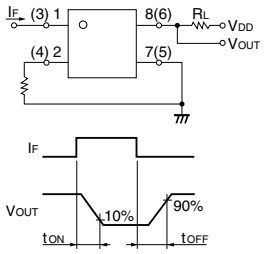
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	400	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.2	mA/°C	$T_a \geq 25$°C
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	3	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	17	35	Ω	I_F = 5 mA, I_O = 120 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.003	1.0	μA	V_{OFF} = 400 V
	Capacity between terminals	C_{OFF}	---	70	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.3	1	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.1	1	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

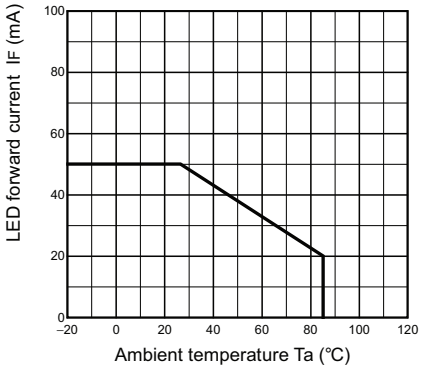
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	320	V
Operating LED forward current	I_F	5	7.5	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	120	mA
Operating temperature	T_a	− 20	---	65	°C

■ Engineering Data

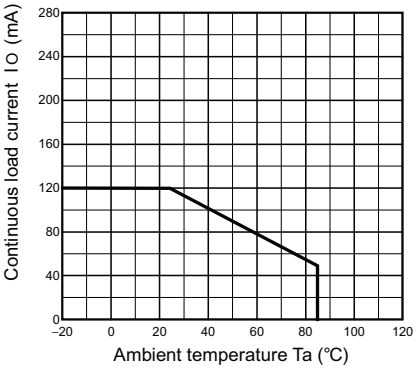
LED forward current vs. Ambient temperature

I_F - Ta



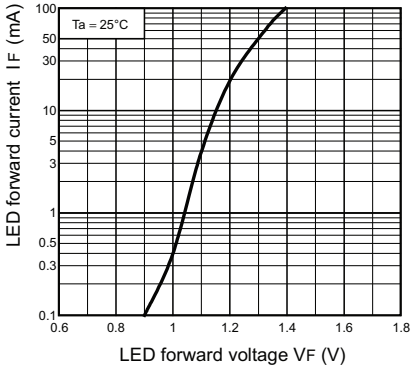
Continuous load current vs. Ambient temperature

I_O - Ta



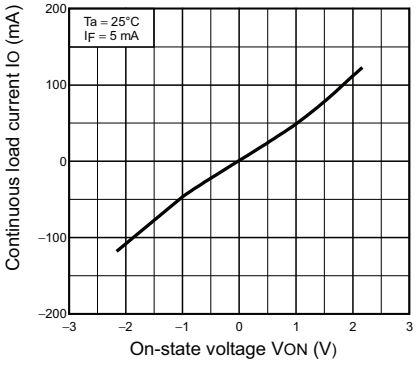
LED forward current vs. LED forward voltage

I_F - V_F



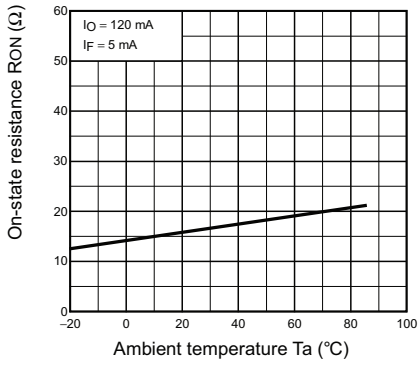
Continuous load current vs. On-state voltage

I_O - V_{ON}



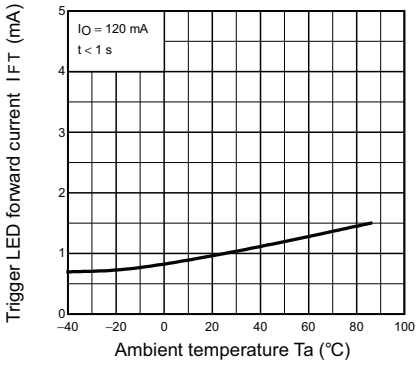
On-state resistance vs. Ambient temperature

R_{ON} - Ta



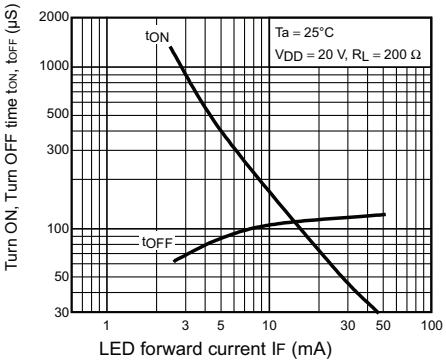
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



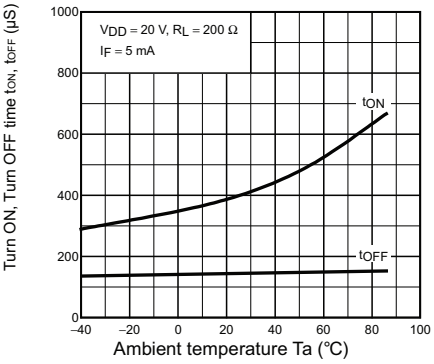
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



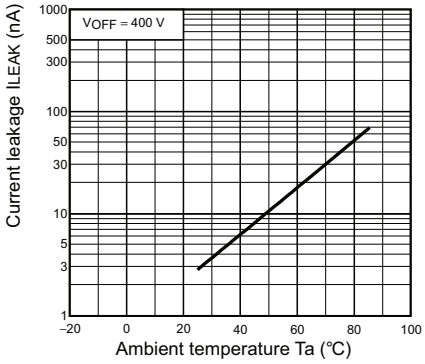
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

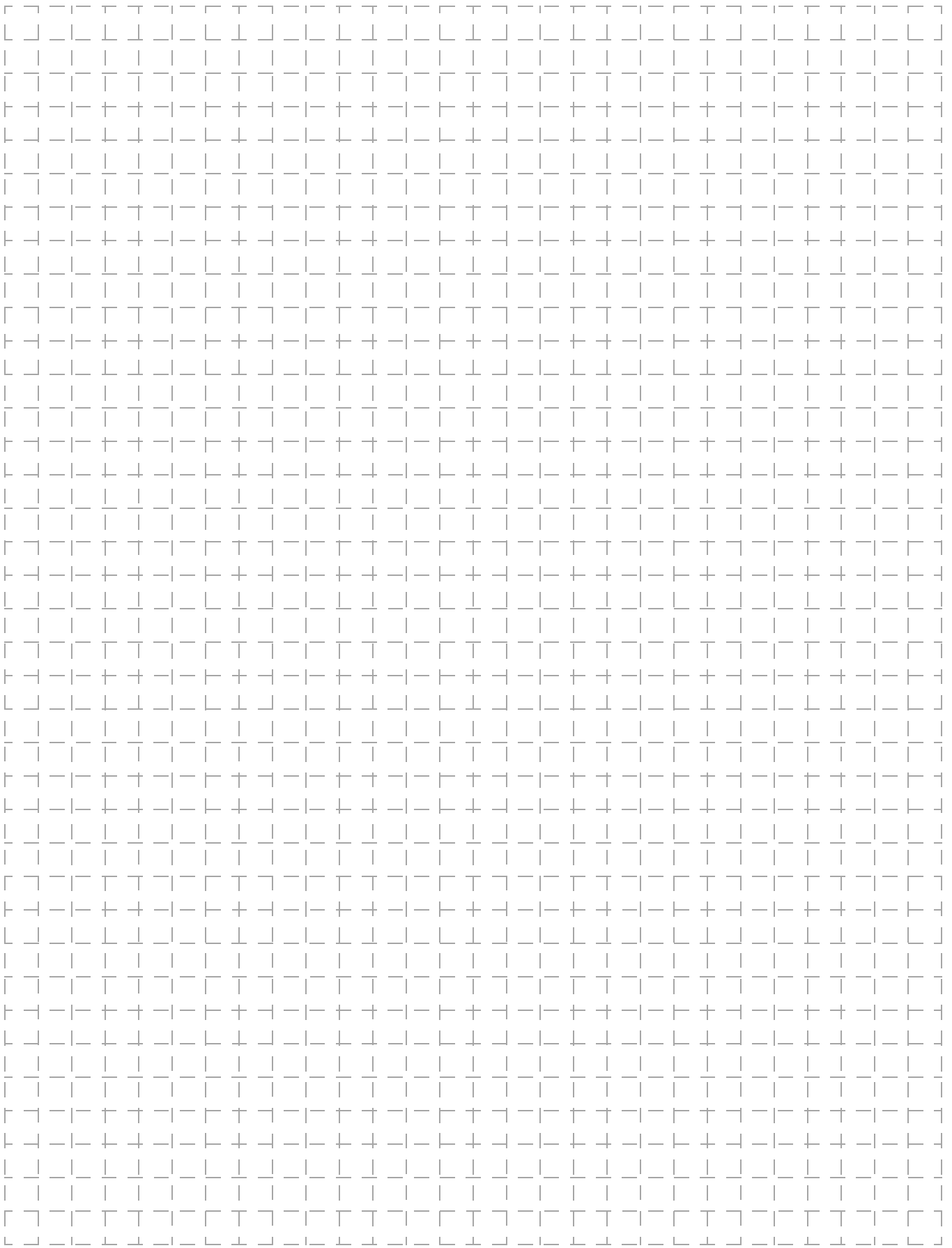


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



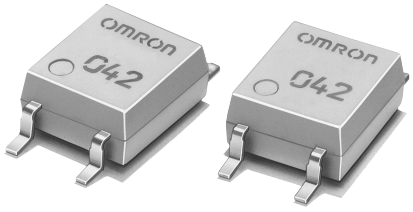
MEMO



MOS FET Relays
G3VM-601G

Ultrasensitive MOS FET Relays in 600 V Load series for electric power saving.

- 4-pin SOP package now included in the 600 V load series.
- Trigger LED forward current of 1 mA (maximum) facilitates power saving designs and prolonged battery life.
- Continuous load current of 90 mA.
- RoHS Compliant



NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Broadband systems and Measurement devices
- Security systems and Industrial equipment
- Battery powered equipment and Amusement machines

■ List of Models

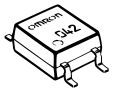
Contact form	Terminals	Load voltage (peak value) (See the note.)	Model	Number per stick	Number per tape
SPST-NO	Surface-mounting terminals	600 V	**G3VM-601G**	100	---
			G3VM-601G(TR)	---	2,500

Note: The AC peak and DC value are given for the load voltage.

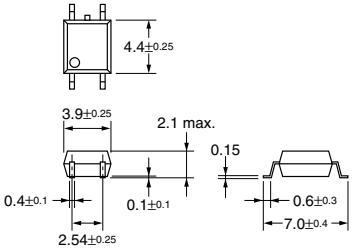
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-601G



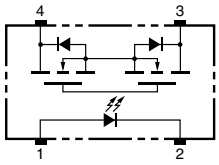
Note: The actual product is marked differently from the image shown here.

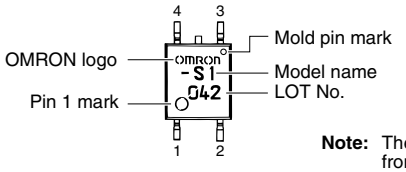


Weight: 0.1 g

■ Terminal Arrangement/Internal Connections (Top View)

G3VM-601G

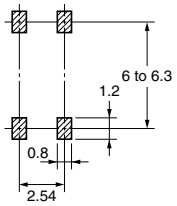




Note: The actual product is marked differently from the image shown here.

■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-601G



■ Absolute Maximum Ratings (T_a = 25°C)

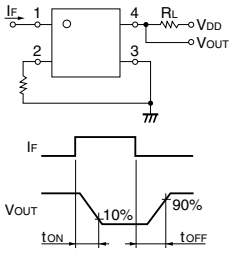
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	600	V	
	Continuous load current (AC peak/DC)	I_O	90	mA	
	ON current reduction rate	ΔI_O/°C	–0.9	mA/°C	$T_a \geq 25$°C
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	–40 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–55 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (T_a = 25°C)

Item		Symbol	Mini-mum	Typical	Maxi-mum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	30	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	0.4	1	mA	I_O = 90 mA
Output	Maximum resistance with output ON	R_{ON}	---	45	60	Ω	I_F = 2 mA, I_O = 90 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.001	1.0	μA	V_{OFF} = 600 V
	Capacity between terminals	C_{OFF}	---	75	---	pF	V = 0, f = 1MHz
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq$ 60%
Turn-ON time		t_{ON}	---	2	8	ms	I_F = 2 mA, R_L = 200 Ω, V_{DD} = 10 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.5	3	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

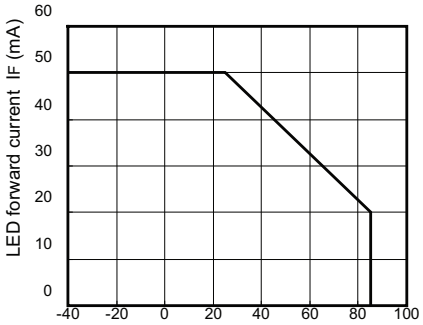
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	480	V
Operating LED forward current	I_F	---	2	25	mA
Continuous load current (AC peak/DC)	I_O	---	---	70	mA
Operating temperature	T_a	– 20	---	65	°C

■ Engineering Data

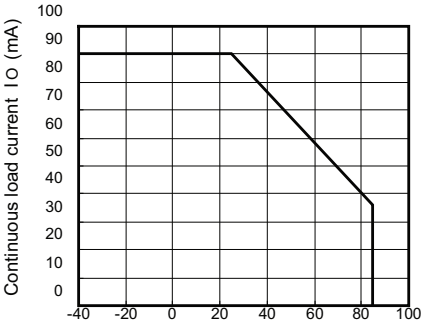
LED forward current vs. Ambient temperature

IF - Ta



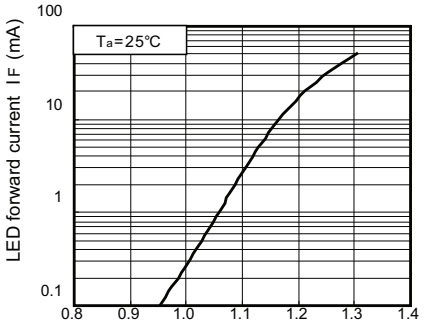
Continuous load current vs. Ambient temperature

IO - Ta



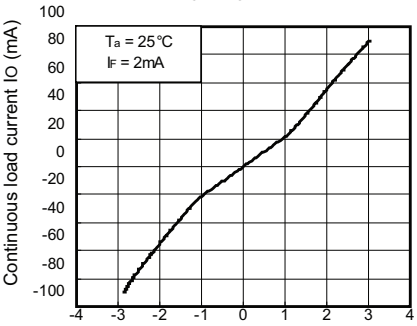
LED forward current vs. LED forward voltage

IF - VF



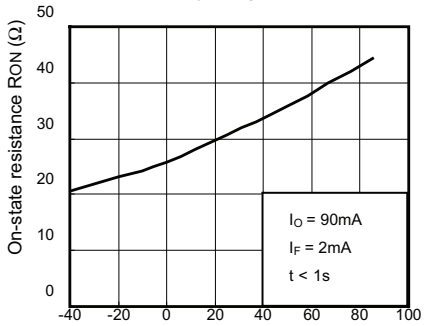
Continuous load current vs. On-state voltage

IO - VON



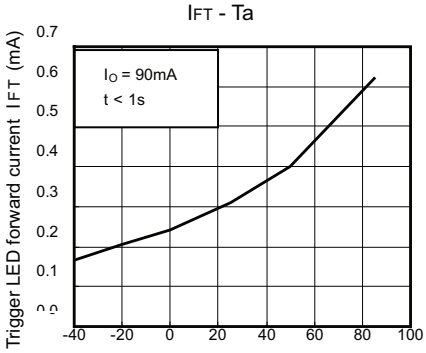
On-state resistance vs. Ambient temperature

RON - Ta



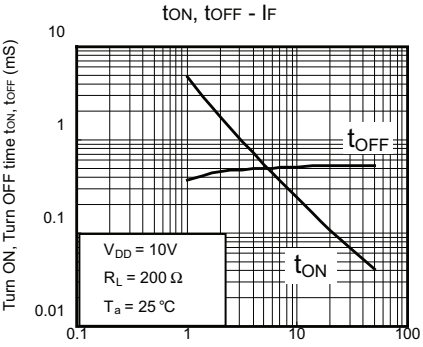
Trigger LED forward current vs. Ambient temperature

IFT - Ta



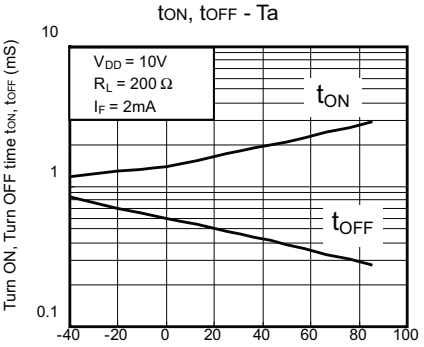
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



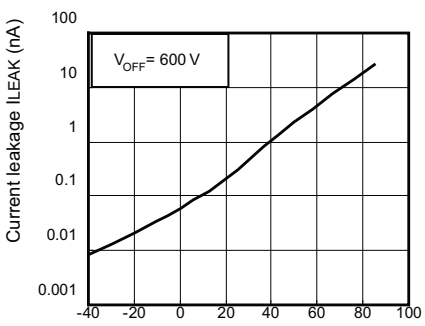
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta

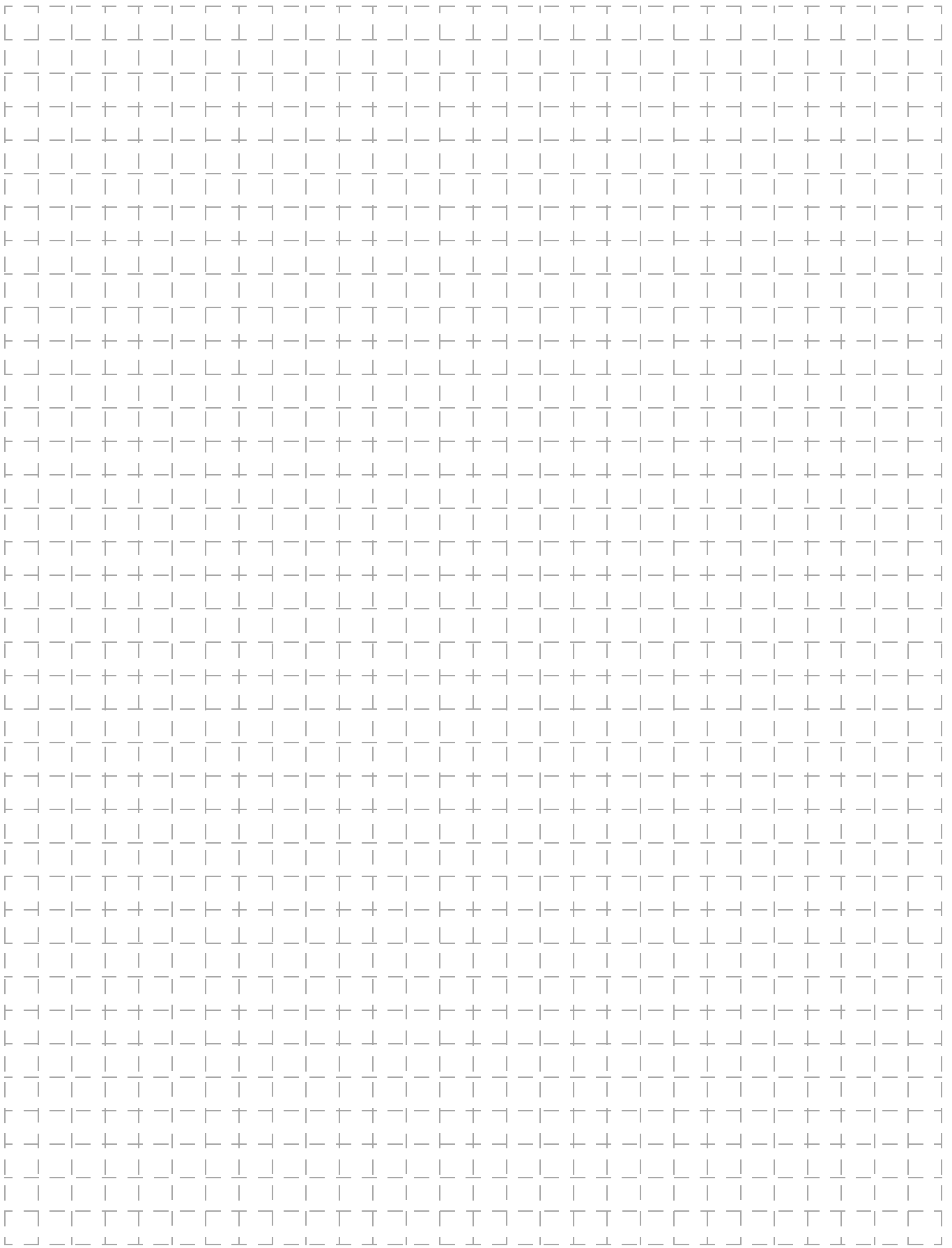


Current leakage vs. Ambient temperature

I LEAK - Ta



MEMO



MOS FET Relays
G3VM-21LR

World's Smallest SSOP Package MOS FET Relay* with Low Output Capacitance and ON Resistance (C×R = 5pF• Ω) in a 20-V Load Voltage Model

- Output capacitance of 1 pF (typical) allows high frequency applications.
- RoHS Compliant.

*Information correct as of May, 2007, according to data obtained by OMRON.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices and Data loggers
- Broadband systems

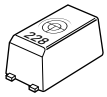
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	20 VAC	**G3VM-21LR**	---
			G3VM-21LR(TR)	1,500
			G3VM-21LR(TR05)	500
			G3VM-21LR(TR10)	1,000

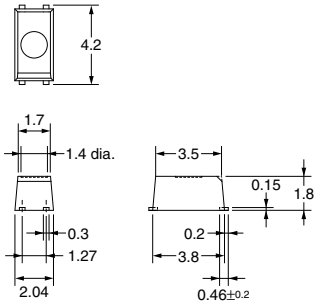
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-21LR



Note: The actual product is marked differently from the image shown here.

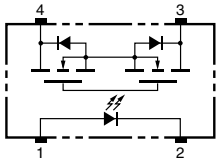


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

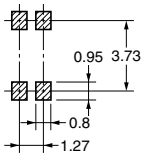
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-21LR



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-21LR



■ Absolute Maximum Ratings (Ta = 25°C)

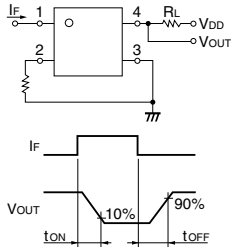
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	20	V	
	Continuous load current	I_O	160	mA	
	ON current reduction rate	ΔI_{ON}/°C	–1.6	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	5	8	Ω	I_F = 5 mA, I_O = 160 mA, t = 10 ms
	Current leakage when the relay is open	I_{LEAK}	---	0.2	1.0	nA	V_{OFF} = 20 V, Ta = 50°C
	Capacity between terminals	C_{OFF}	---	1.0	2.5	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, RoH ≤ 60%
Turn-ON time		t_{ON}	---	0.06	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.12	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

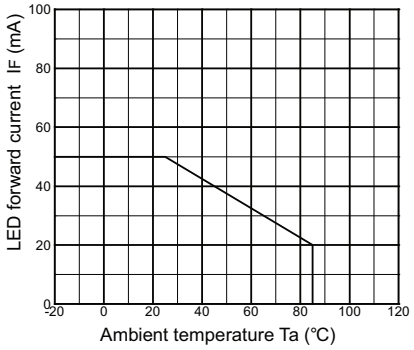
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	20	V
Operating LED forward current	I_F	7	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	160	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

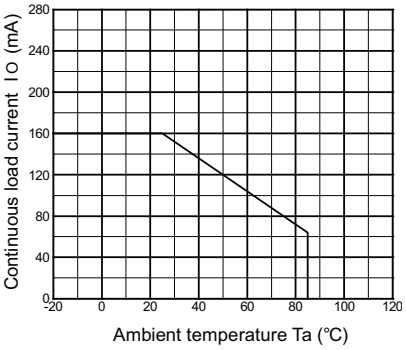
LED forward current vs. Ambient temperature

I_F - Ta



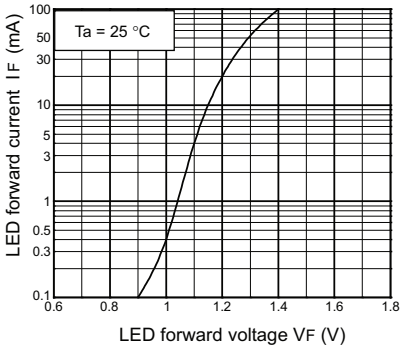
Continuous load current vs. Ambient temperature

I_O - Ta



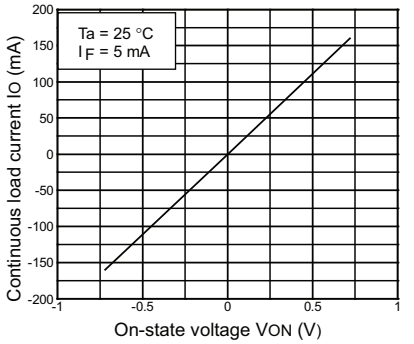
LED forward current vs. LED forward voltage

I_F - V_F



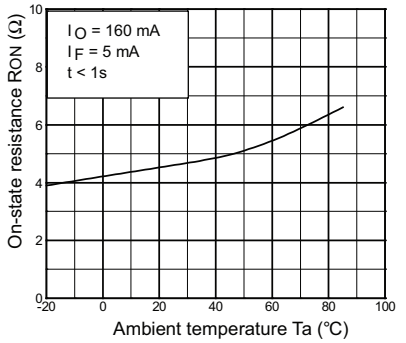
Continuous load current vs. On-state voltage

I_O - V_{ON}



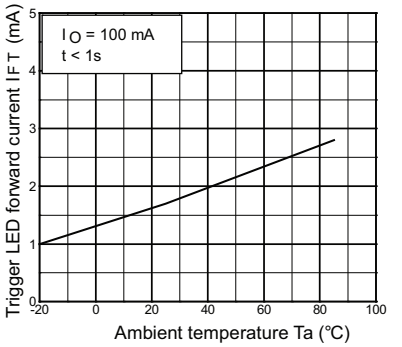
On-state resistance vs. Ambient temperature

R_{ON} - Ta



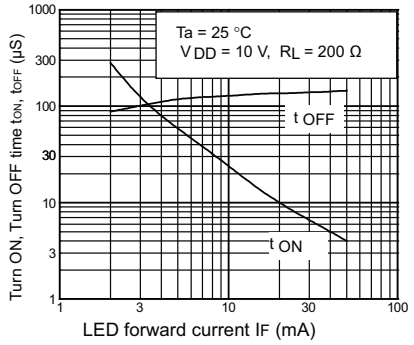
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



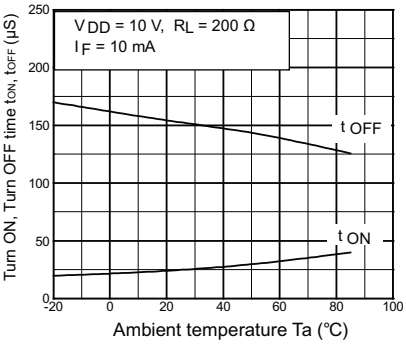
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



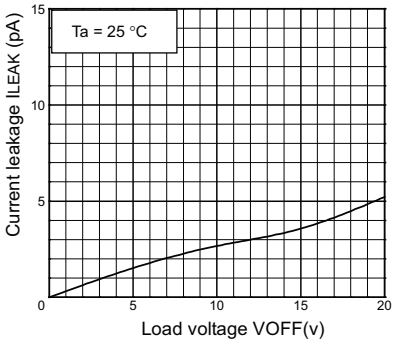
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



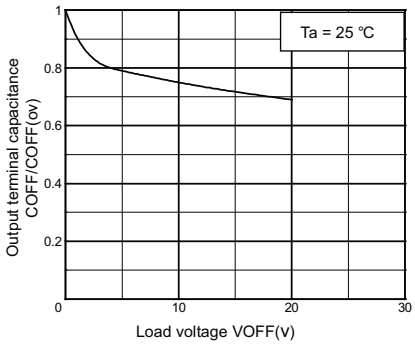
Current leakage vs. Load voltage

I_{LEAK} – V_{OFF}

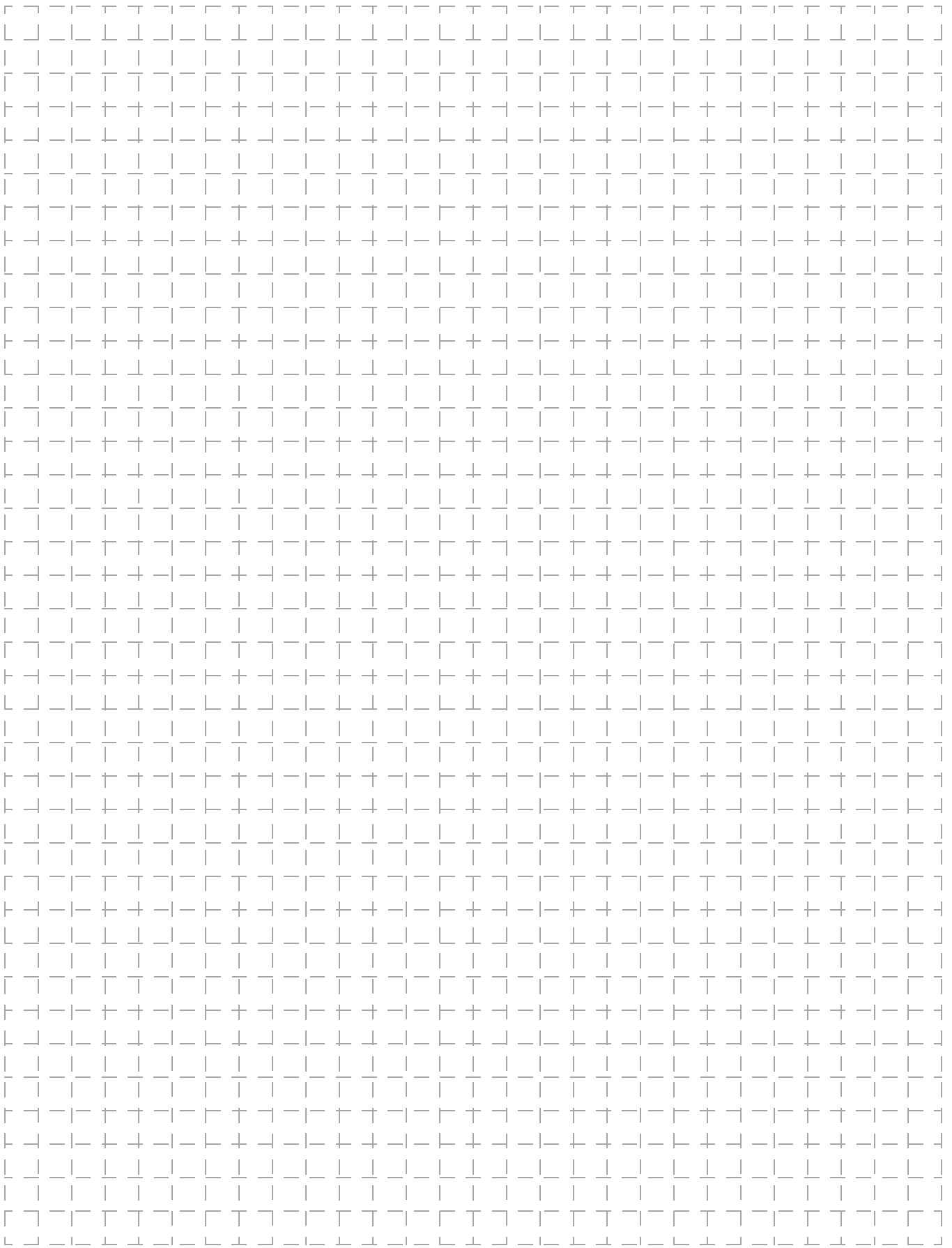


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

C_{OFF} - V_{OFF}



MEMO



MOS FET Relays
G3VM-21LR1

World's Smallest SSOP Package MOS FET Relay* with Low Output Capacitance and ON Resistance (C×R = 4pF• Ω) in a 20-V Load Voltage Model

- ON resistance of 0.8 Ω (typical) suppresses output signal attenuation.
- RoHS Compliant.

*Information correct as of May, 2007, according to data obtained by OMRON.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices and Data loggers
- Broadband systems

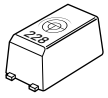
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	20 VAC	**G3VM-21LR1**	---
			G3VM-21LR1(TR)	1,500
			G3VM-21LR1(TR05)	500
			G3VM-21LR1(TR10)	1,000

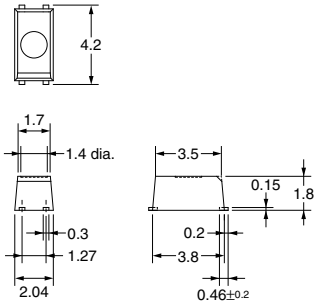
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-21LR1



Note: The actual product is marked differently from the image shown here.

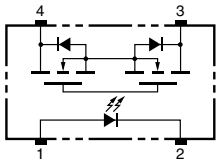


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

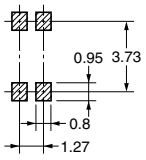
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-21LR1



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-21LR1



■ Absolute Maximum Ratings (Ta = 25°C)

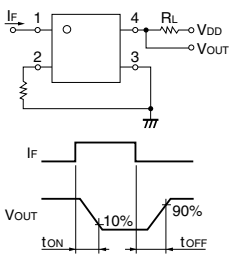
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	20	V	
	Continuous load current	I_O	450	mA	
	ON current reduction rate	ΔI_{ON}/°C	−4.5	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	0.8	1.2	Ω	I_F = 5 mA, I_O = 450 mA, t = 10 ms
	Current leakage when the relay is open	I_{LEAK}	---	0.2	1.0	nA	V_{OFF} = 20 V, T_a = 50°C
	Capacity between terminals	C_{OFF}	---	5.0	12.0	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.2	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.2	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

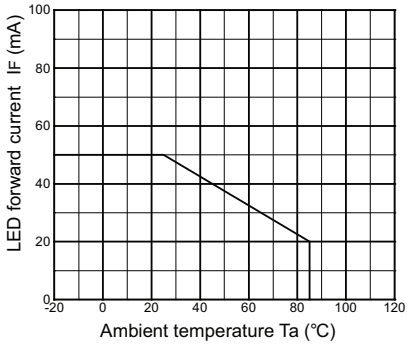
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	20	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	450	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

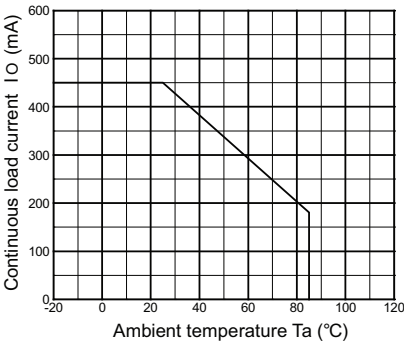
LED forward current vs. Ambient temperature

I_F - Ta



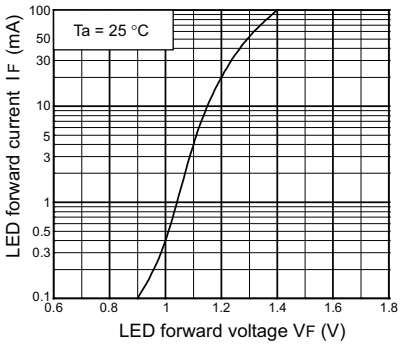
Continuous load current vs. Ambient temperature

I_O - Ta



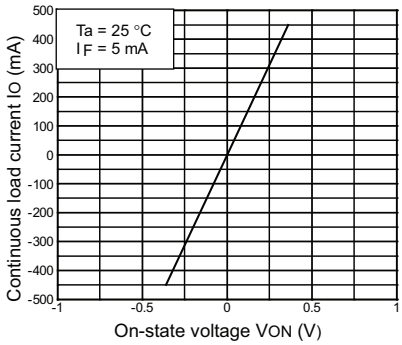
LED forward current vs. LED forward voltage

I_F - V_F



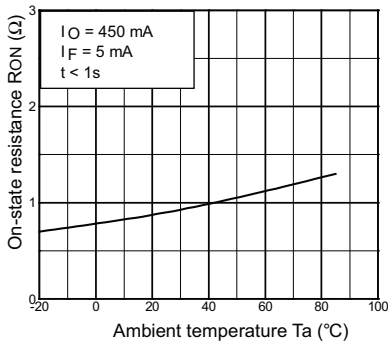
Continuous load current vs. On-state voltage

I_O - V_{ON}



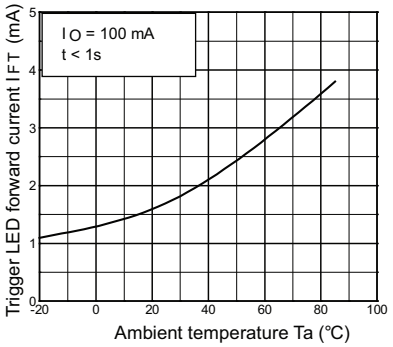
On-state resistance vs. Ambient temperature

R_{ON} - Ta



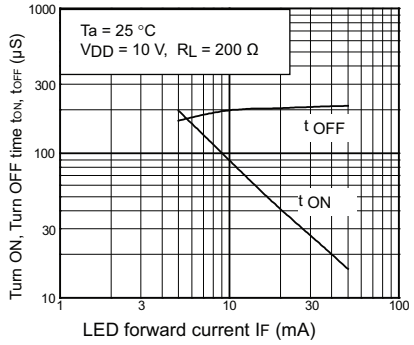
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



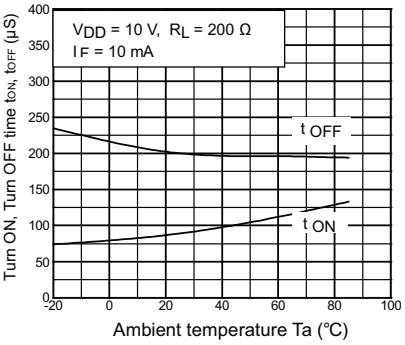
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



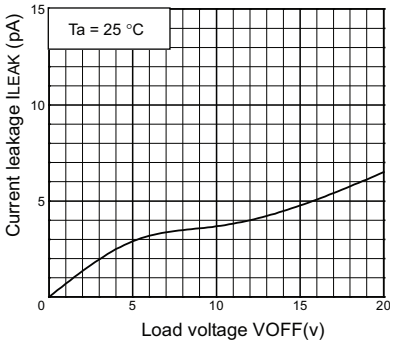
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



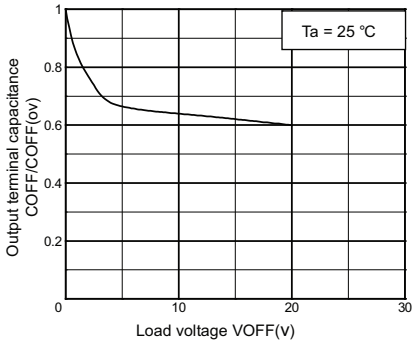
Current leakage vs. Load voltage

I_{LEAK} – V_{OFF}

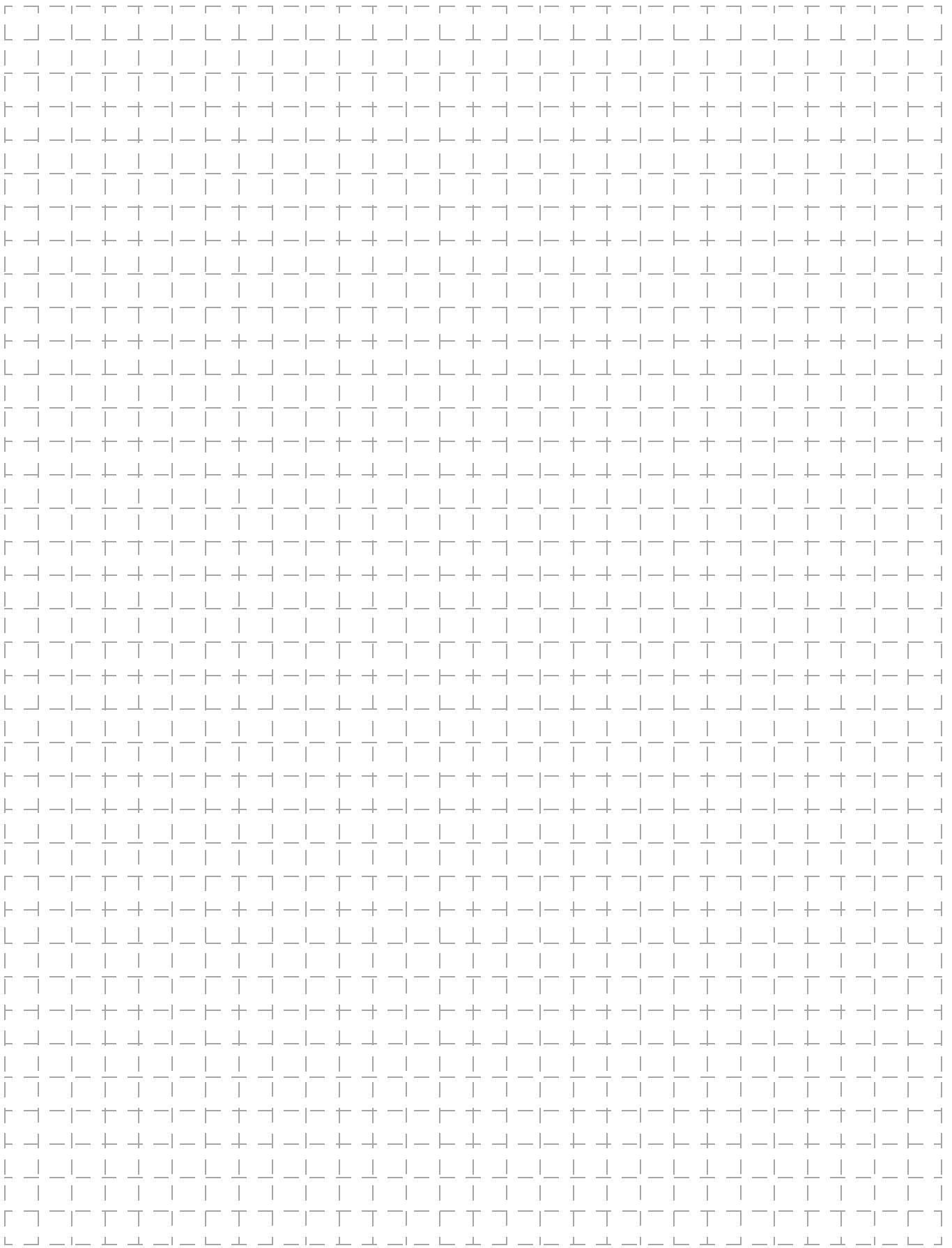


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

C_{OFF} - V_{OFF}



MEMO



MOS FET RELAYS
G3VM-21LR10

SSOP Package MOS FET Relay with Low Leakage Current, Output Capacitance and ON Resistance (C × R = 2.4 pF•Ω) in a 20-V Load Voltage Model.

- Output capacitance of 0.8 pF (typical) allows high frequency applications.
- Leakage current of 0.2 nA max. (10 pA typ.) when relay is open
- Turn-on time = 0.026 ms (typ.), turn-off time = 0.045 ms (typ.)
- RoHS compliant



NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices and Data loggers
- Broadband systems

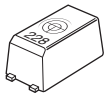
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	20 VAC	**G3VM-21LR10**	---
			G3VM-21LR10(TR05)	500
			G3VM-21LR10(TR)	1,500

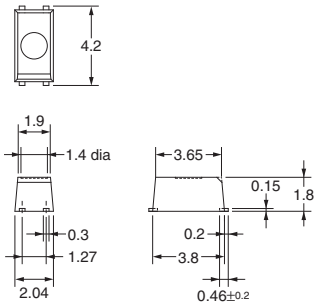
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-21LR10



Note: The actual product is marked differently from the image shown here.

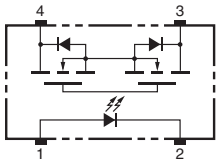


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

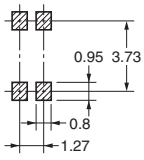
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-21LR10



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-21LR10



■ Absolute Maximum Ratings (Ta = 25°C)

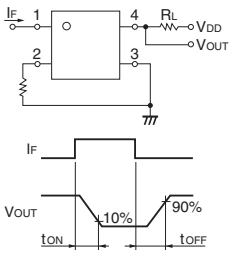
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	30	mA	
	LED forward current reduction rate	ΔI_F/°C	–0.3	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	20	V	
	Continuous load current	I_O	200	mA	
	ON current reduction rate	ΔI_{ON}/°C	–2.0	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Ambient operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–40 to +125	°C	With no icing or condensation
Soldering temperature		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.15	1.35	1.45	V	I_F = 5 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	70	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	3	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	3	5	Ω	I_F = 5 mA, I_O = 200 mA, t < 1 s
	Current leakage when the relay is open	I_{LEAK}	---	10	200	pA	V_{OFF} = 20 V, T_a = 25°C
	Capacity between terminals	C_{OFF}	---	0.8	1.1	pF	V = 0, f = 100 MHz
Capacity between I/O terminals		C_{I-O}	---	0.3	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance between I/O terminals		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.026	0.2	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 10 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.045	0.2	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

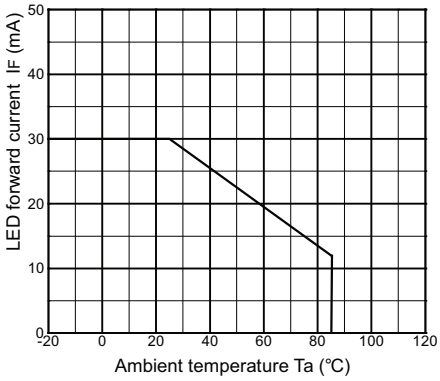
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	20	V
Operating LED forward current	I_F	---	---	20	mA
Continuous load current (AC peak/DC)	I_O	---	---	200	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

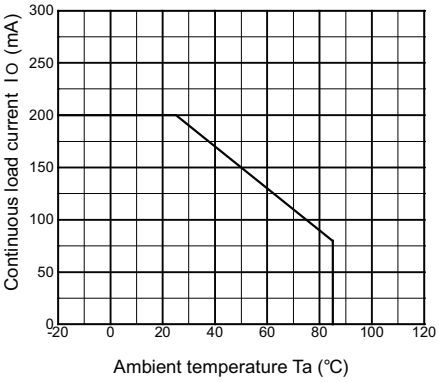
LED forward current vs. Ambient temperature

IF - Ta



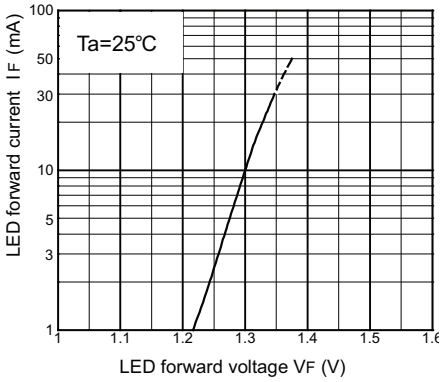
Continuous load current vs. Ambient temperature

IO - Ta



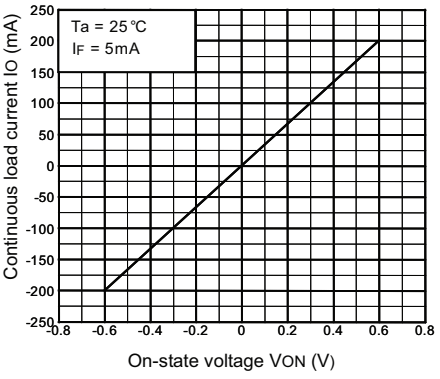
LED forward current vs. LED forward voltage

IF - VF



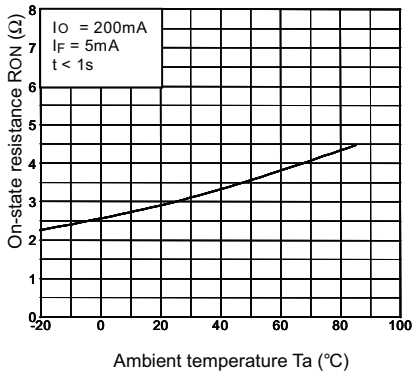
Continuous load current vs. On-state voltage

IO - VON



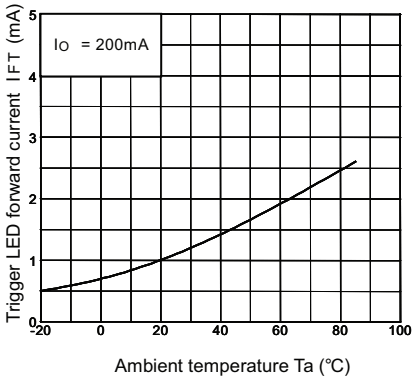
On-state resistance vs. Ambient temperature

RON - Ta



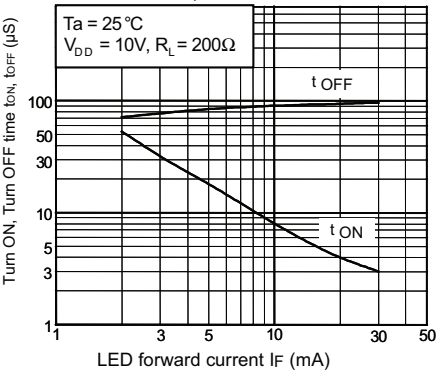
Trigger LED forward current vs. Ambient temperature

IFT - Ta



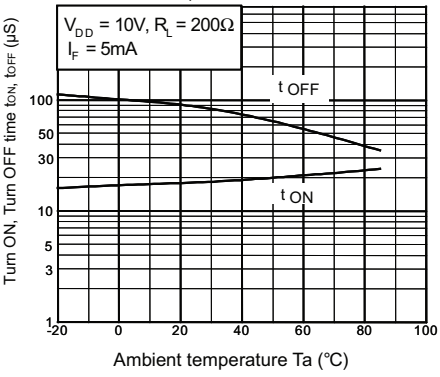
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



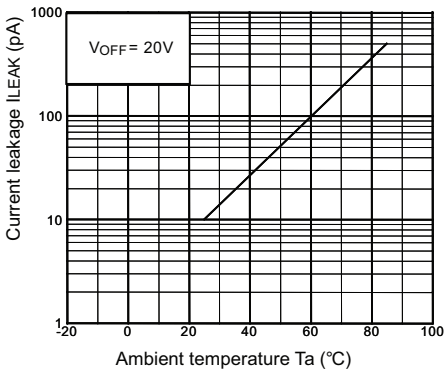
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



Current leakage vs. Ambient temperature

I LEAK - Ta



MEMO

MOS FET Relays
G3VM-21LR11

High-power, 0.9-A Switching with SSOP Package in a 20-V Load Voltage Model.

- RoHS compliant



NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices
- Broadband systems
- Data loggers

■ List of Models

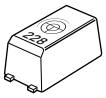
Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	20 V	**G3VM-21LR11**	---
			G3VM-21LR11(TR05)	500
			G3VM-21LR11(TR)	1,500

Note: Use "TR05" instead of "TR" in the part number, to obtain reels with 500 pc/reel. (e.g., G3VM-21LR11(*TR05*))

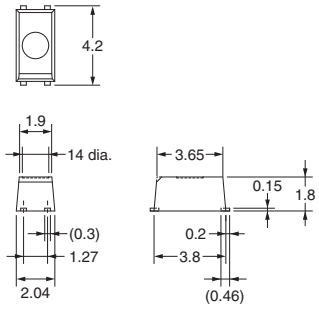
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-21LR11



Note: The actual product is marked differently from the image shown here.

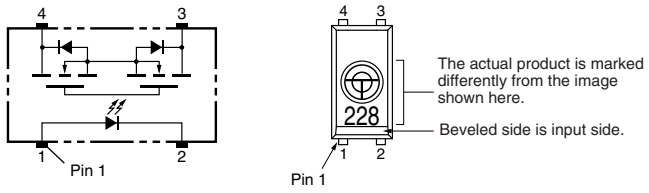


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

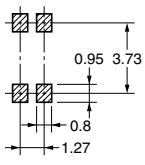
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-21LR11



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-21LR11



■ Absolute Maximum Ratings (Ta = 25°C)

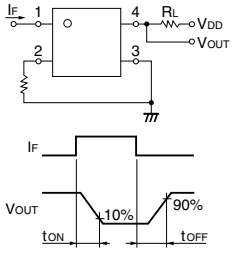
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	20	V	
	Continuous load current (AC peak/DC)	I_O	900	mA	
	ON current reduction rate	ΔI_O/°C	–12	mA/°C	$T_a \geq 50$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Ambient operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–40 to +125	°C	With no icing or condensation
Soldering temperature		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	3.0	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	0.18	0.22	Ω	I_F = 5 mA, I_O = 900 mA, t < 1 s
	Current leakage when the relay is open	I_{LEAK}	---	0.2	1.0	nA	V_{OFF} = 20 V
	Capacity between terminals	C_{OFF}	---	40	80	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.3	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance between I/O terminals		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{OH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.3	2.0	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 10 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.2	1.0	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

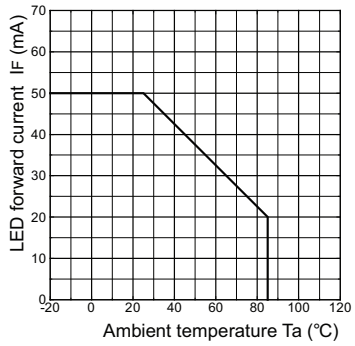
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	20	V
Operating LED forward current	I_F	---	---	20	mA
Continuous load current (AC peak/DC)	I_O	---	---	900	mA
Operating temperature	T_a	–20	---	65	°C

■ Engineering Data

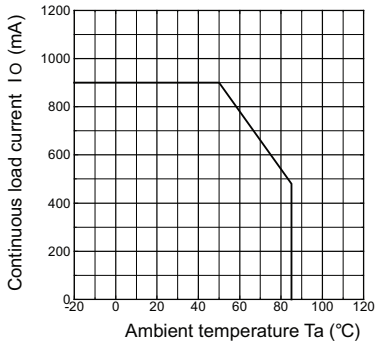
LED forward current vs. Ambient temperature

IF - Ta



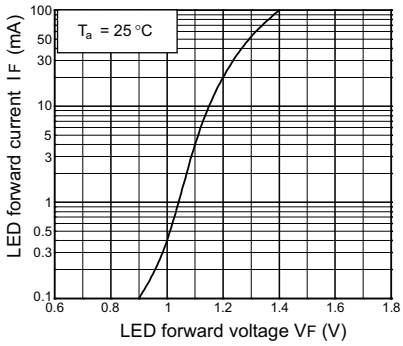
Continuous load current vs. Ambient temperature

IO - Ta



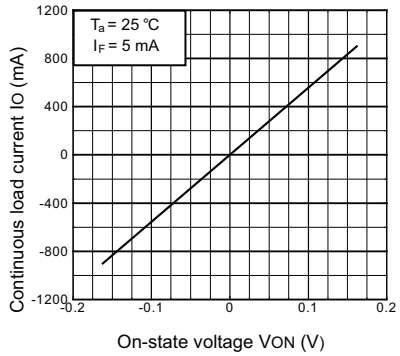
LED forward current vs. LED forward voltage

IF - VF



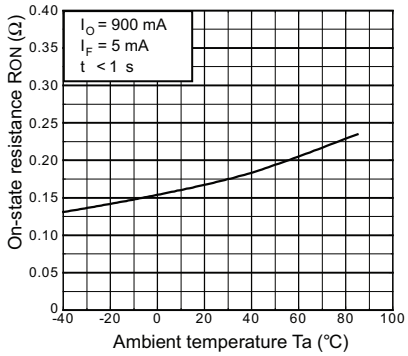
Continuous load current vs. On-state voltage

IO - VON



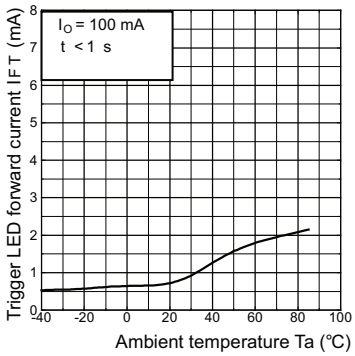
On-state resistance vs. Ambient temperature

RON - Ta



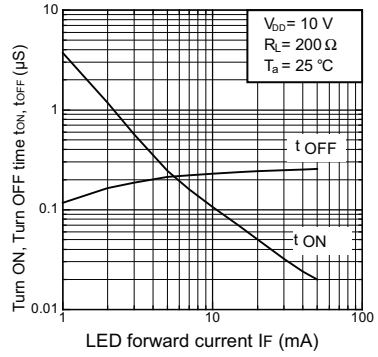
Trigger LED forward current vs. Ambient temperature

IFT - Ta



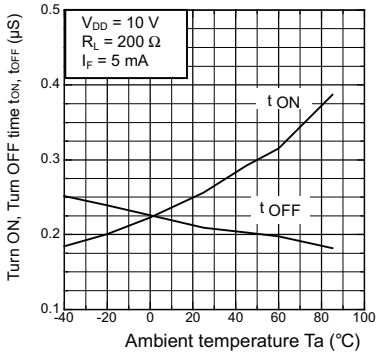
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



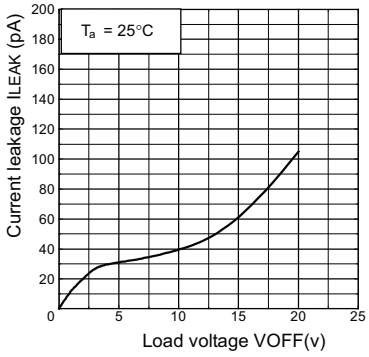
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



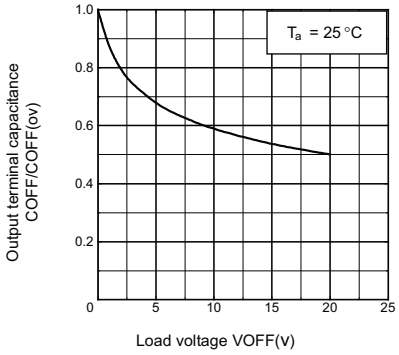
Current leakage vs. Load voltage

I LEAK – VOFF

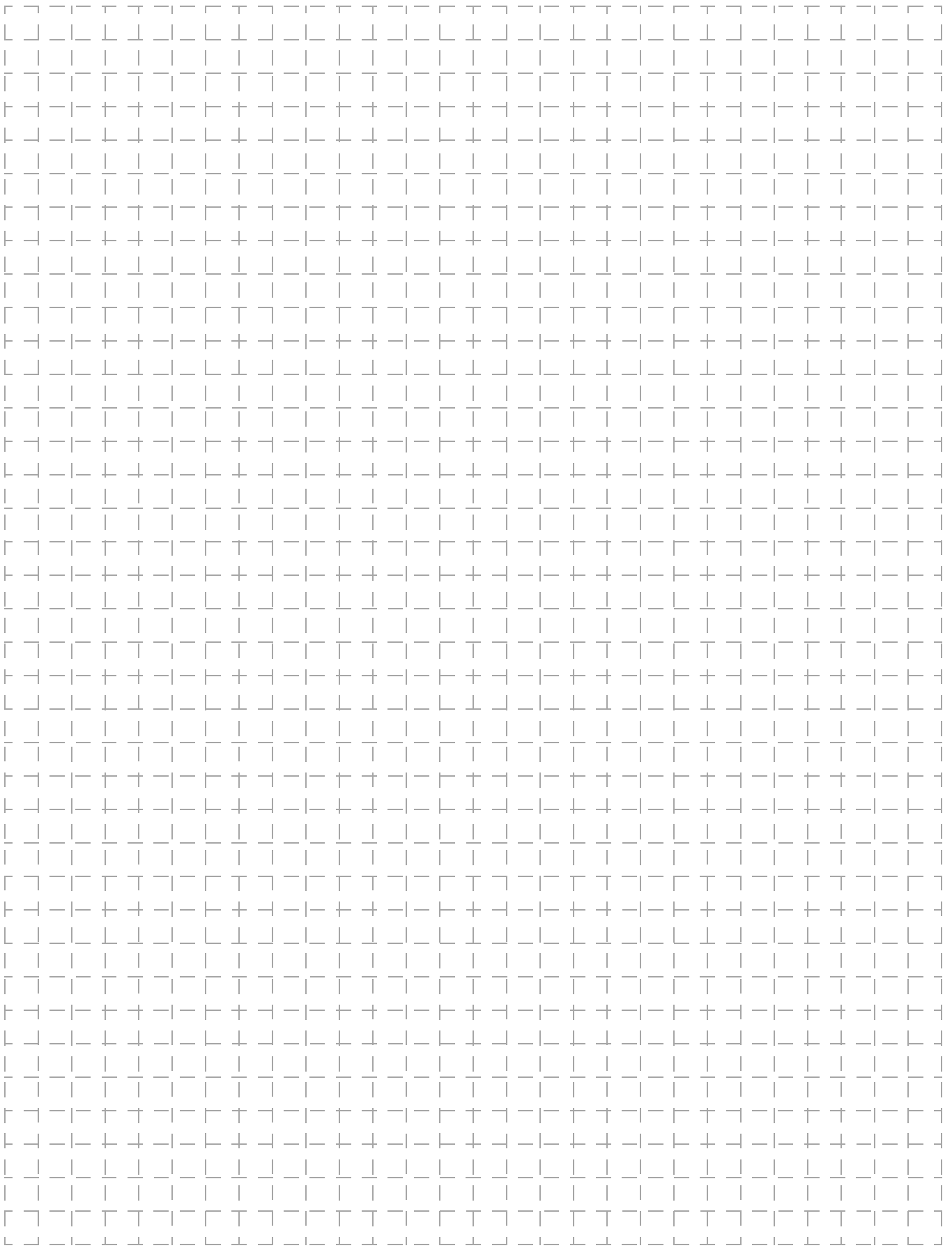


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

COFF - VOFF



MEMO



MOS FET Relays
G3VM-41LR3

World's Smallest SSOP Package MOS FET Relay* with Low Output Capacitance and ON Resistance (C×R = 15pF•Ω) in a 40-V Load Voltage Model.

- Output capacitance of 0.6 pF (typical) allows high frequency applications.
- RoHS compliant

*Information correct as of May, 2007, according to data obtained by OMRON.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices and Data loggers
- Broadband systems

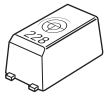
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	**G3VM-41LR3**	---
			G3VM-41LR3(TR)	1,500

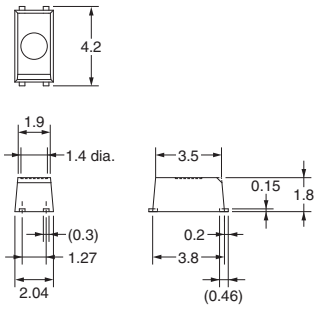
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-41LR3



Note: The actual product is marked differently from the image shown here.

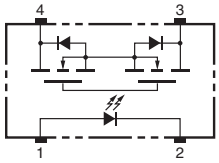


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

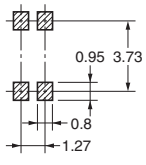
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-41LR3



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41LR3



■ Absolute Maximum Ratings (Ta = 25°C)

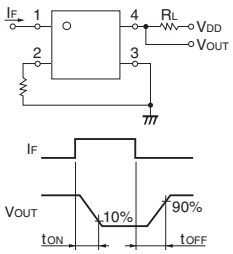
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs plus, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	40	V	
	Continuous load current	I_O	80	mA	
	ON current reduction rate	ΔI_{ON}/°C	–0.8	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Ambient operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–40 to +125	°C	With no icing or condensation
Soldering temperature		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 80 mA
Output	Maximum resistance with output ON	R_{ON}	---	25	35	Ω	I_F = 5 mA, I_O = 80 mA, t = 10 ms
	Current leakage when the relay is open	I_{LEAK}	---	0.2	1.0	nA	V_{OFF} = 30 V, T_a = 50°C
	Capacity between terminals	C_{OFF}	---	0.6	1.4	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance between I/O terminals		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.03	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.12	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

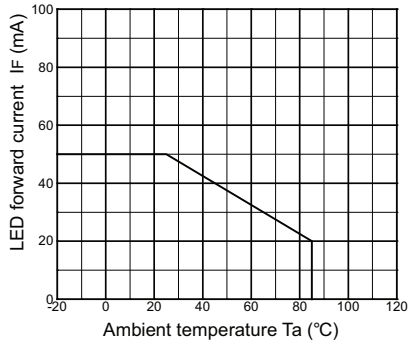
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	32	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	80	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

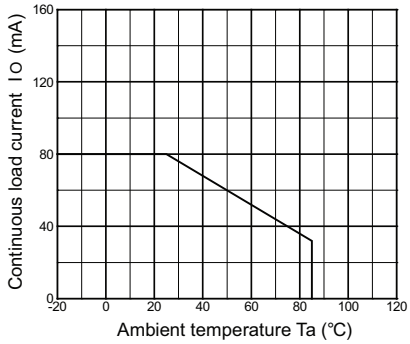
LED forward current vs. Ambient temperature

I_F - Ta



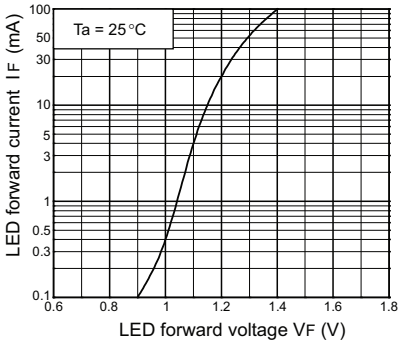
Continuous load current vs. Ambient temperature

I_O - Ta



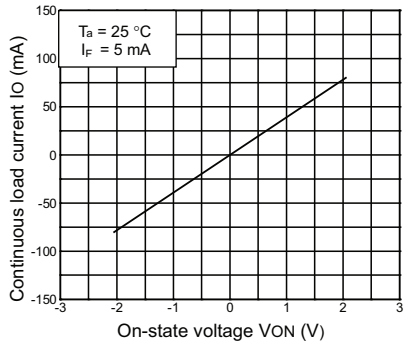
LED forward current vs. LED forward voltage

I_F - V_F



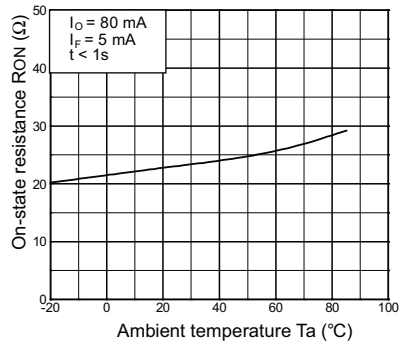
Continuous load current vs. On-state voltage

I_O - V_{ON}



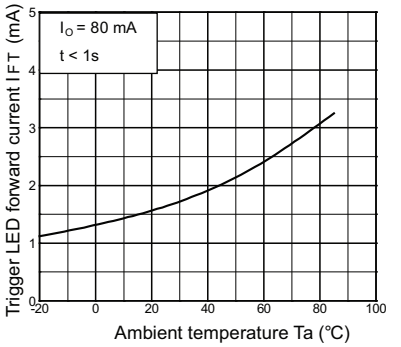
On-state resistance vs. Ambient temperature

R_{ON} - Ta



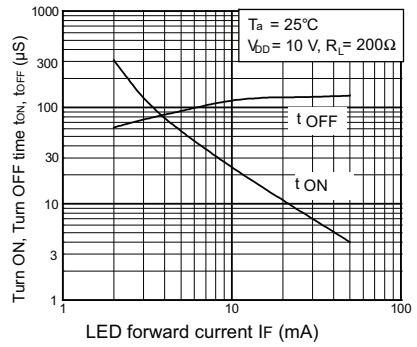
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



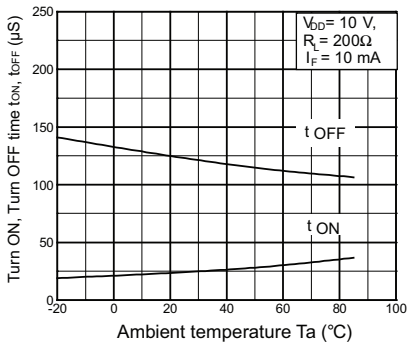
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



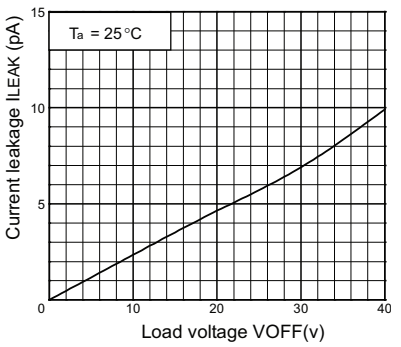
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



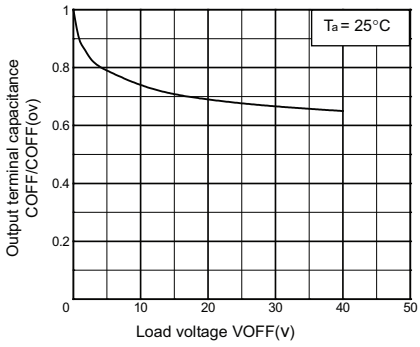
Current leakage vs. Load voltage

I_{LEAK} – V_{OFF}

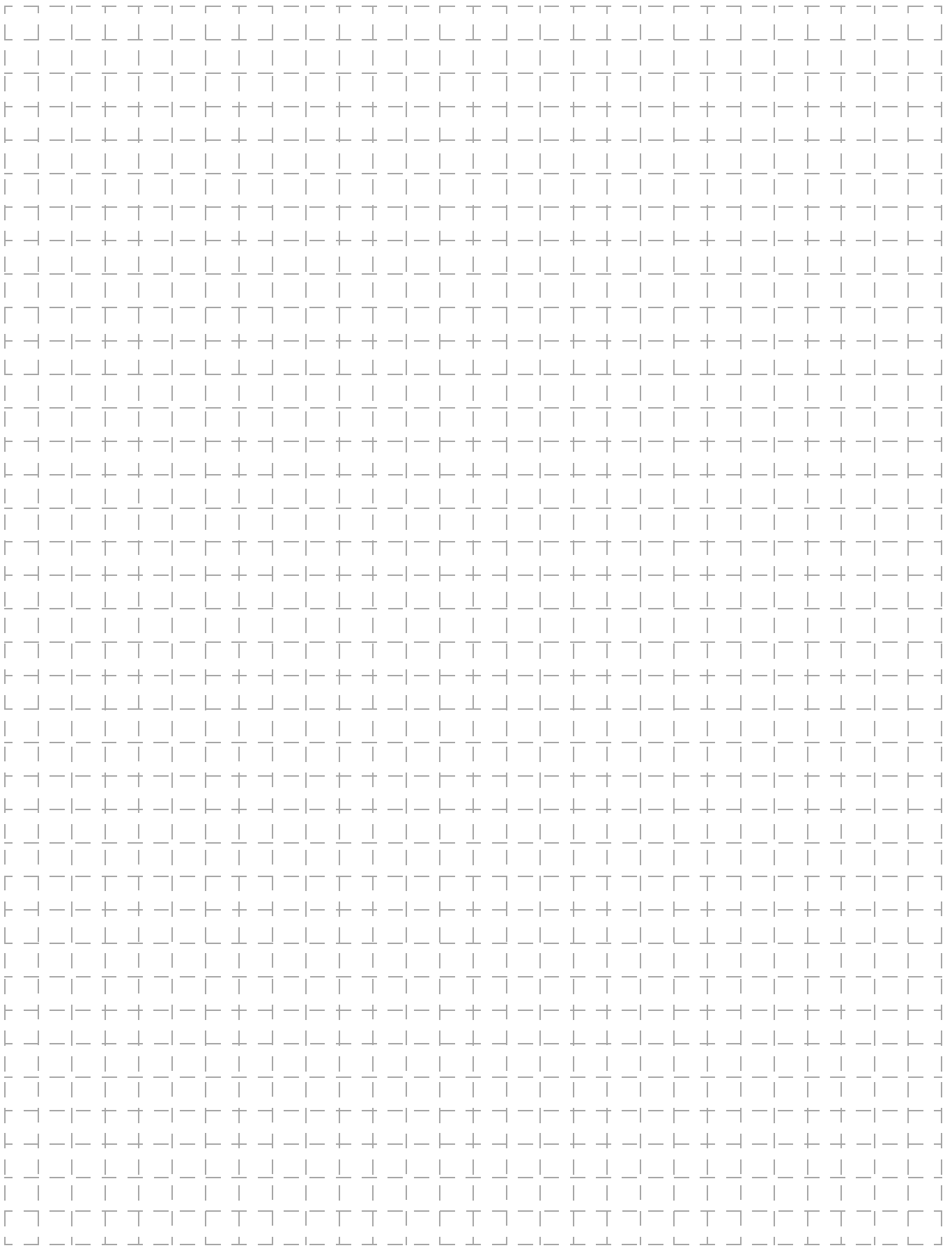


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

C_{OFF} - V_{OFF}



MEMO



MOS FET Relays
G3VM-41LR4

World's Smallest SSOP Package MOS FET Relay* with Low Output Capacitance and ON Resistance (C×R = 10pF•Ω) in a 40-V Load Voltage Model.

- ON resistance of 2 Ω (typical) suppresses output signal attenuation.
- RoHS compliant

*Information correct as of May 2007, according to data obtained by OMRON.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices and Data loggers
- Broadband systems

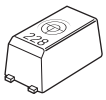
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	**G3VM-41LR4**	---
			G3VM-41LR4(TR)	1,500

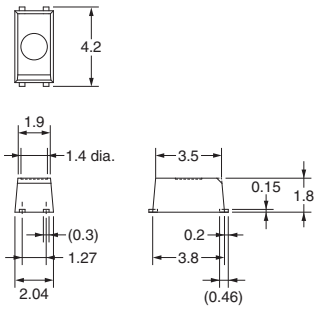
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-41LR4



Note: The actual product is marked differently from the image shown here.

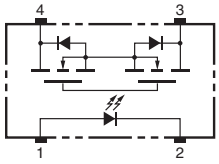


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

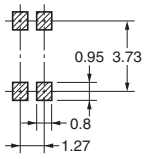
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-41LR4



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41LR4



■ Absolute Maximum Ratings (Ta = 25°C)

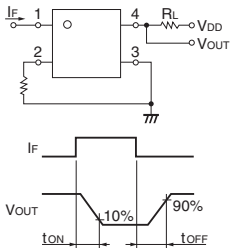
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load Voltage (AC peak/DC)	V_{OFF}	40	V	
	Continuous load current	I_O	250	mA	
	ON current reduction rate	ΔI_{ON}/°C	–2.5	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Ambient operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–40 to +125	°C	With no icing or condensation
Soldering temperature		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	2	3	Ω	I_F = 5 mA, I_O = 250 mA, t = 10 ms
	Current leakage when the relay is open	I_{LEAK}	---	0.2	1.0	nA	V_{OFF} = 30 V, T_a = 50°C
	Capacity between terminals	C_{OFF}	---	5	7	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance between I/O terminals		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.12	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.14	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

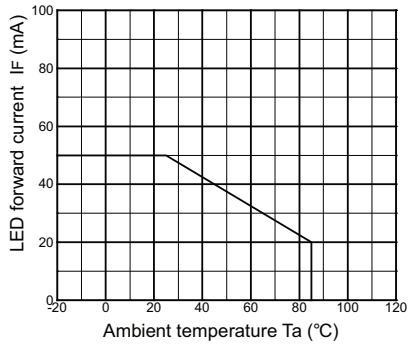
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	32	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	250	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

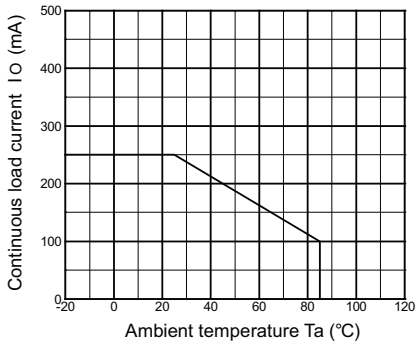
LED forward current vs. Ambient temperature

I_F - Ta



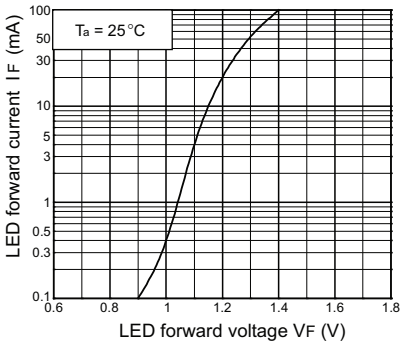
Continuous load current vs. Ambient temperature

I_O - Ta



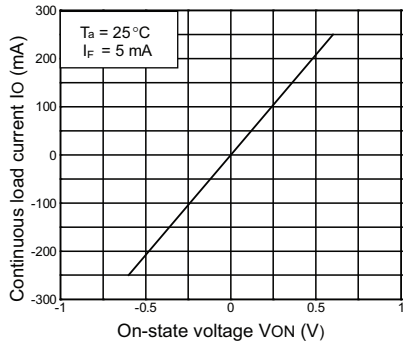
LED forward current vs. LED forward voltage

I_F - V_F



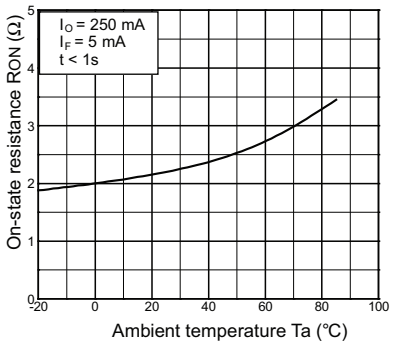
Continuous load current vs. On-state voltage

I_O - V_{ON}



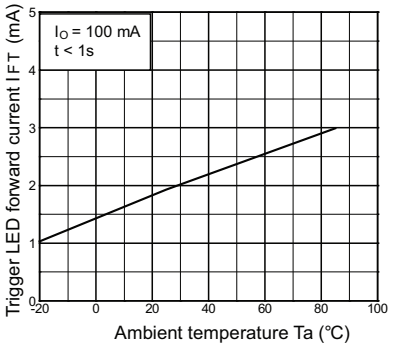
On-state resistance vs. Ambient temperature

R_{ON} - Ta



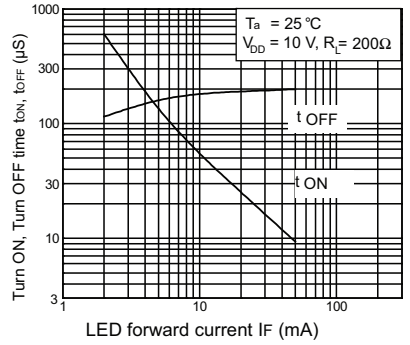
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



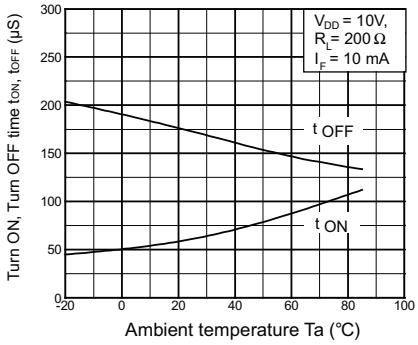
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



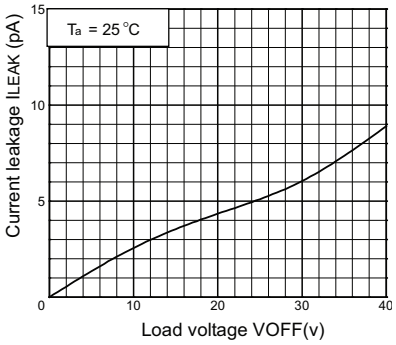
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta



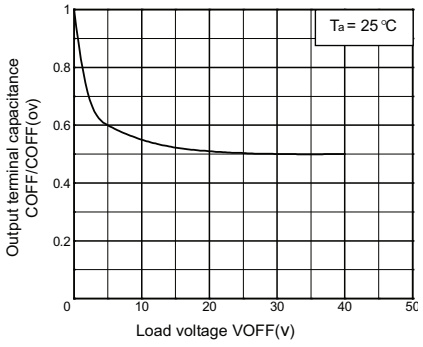
Current leakage vs. Load voltage

I_{LEAK} – V_{OFF}

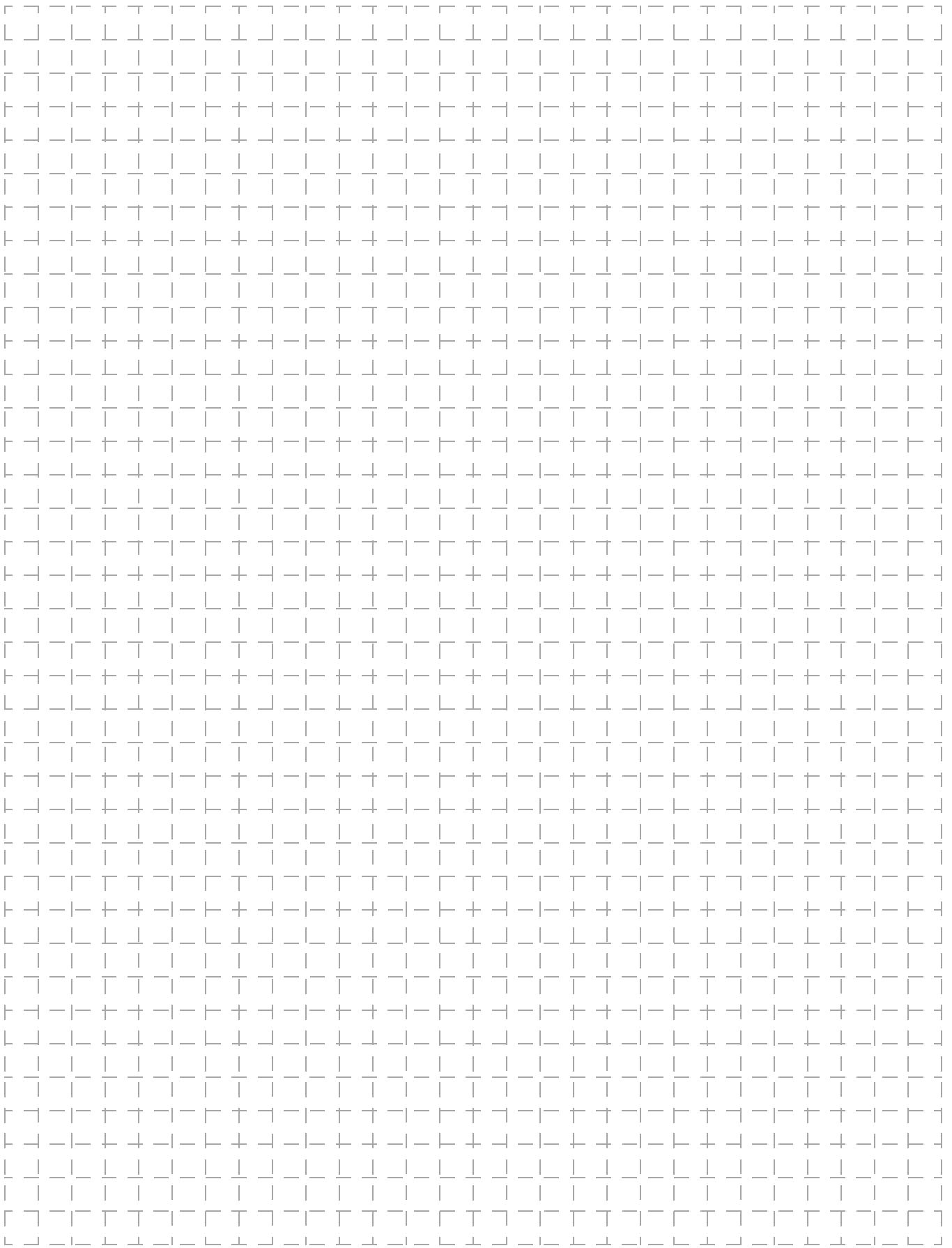


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

C_{OFF} - V_{OFF}



MEMO



MOS FET Relays
G3VM-41LR5

World's Smallest SSOP Package MOS FET Relay* with Low Output Capacitance and ON Resistance (C×R = 10pF• Ω) in a 40-V Load Voltage Model

- ON resistance of 1 Ω (typical) suppresses output signal attenuation.
- RoHS Compliant.

*Information correct as of May 2007, according to data obtained by OMRON.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices and Data loggers
- Broadband systems

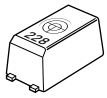
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	**G3VM-41LR5**	---
			G3VM-41LR5(TR)	1,500
			G3VM-41LR5(TR05)	500
			G3VM-41LR5(TR10)	1,000

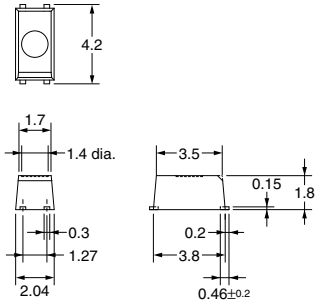
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-41LR5



Note: The actual product is marked differently from the image shown here.

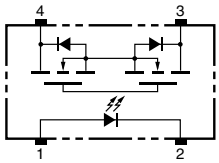


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

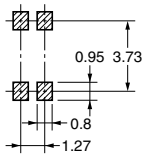
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-41LR5



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41LR5



■ Absolute Maximum Ratings (Ta = 25°C)

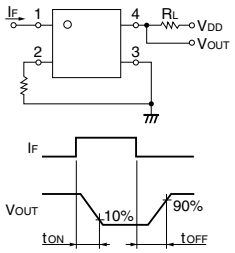
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	40	V	
	Continuous load current	I_O	300	mA	
	ON current reduction rate	ΔI_{ON}/°C	–3.0	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	1.0	1.5	Ω	I_F = 5 mA, I_O = 300 mA, t = 10 ms
	Current leakage when the relay is open	I_{LEAK}	---	0.2	1.0	nA	V_{OFF} = 30 V, T_a = 50°C
	Capacity between terminals	C_{OFF}	---	10	14	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq$ 60%
Turn-ON time		t_{ON}	---	0.2	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.2	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

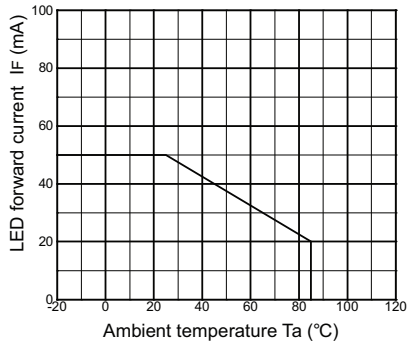
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	32	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	300	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

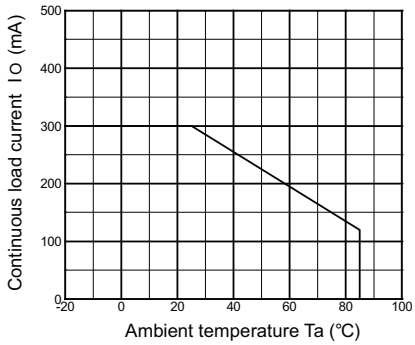
LED forward current vs. Ambient temperature

IF - Ta



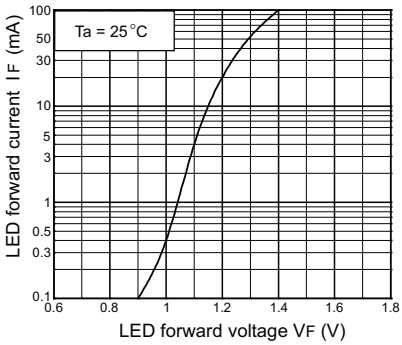
Continuous load current vs. Ambient temperature

IO - Ta



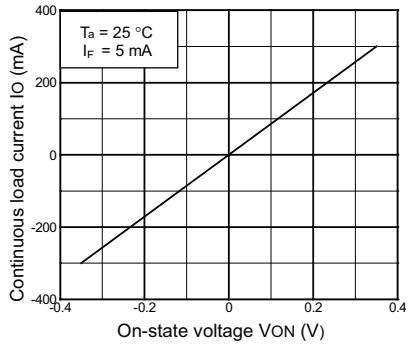
LED forward current vs. LED forward voltage

IF - VF



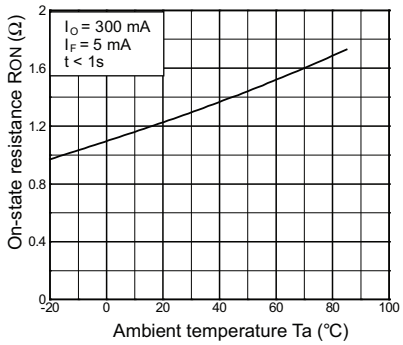
Continuous load current vs. On-state voltage

IO - VON



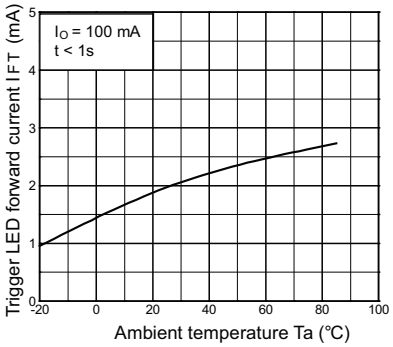
On-state resistance vs. Ambient temperature

RON - Ta



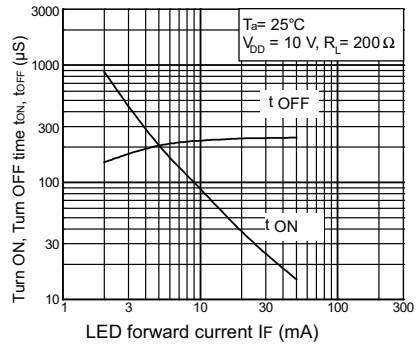
Trigger LED forward current vs. Ambient temperature

IFT - Ta



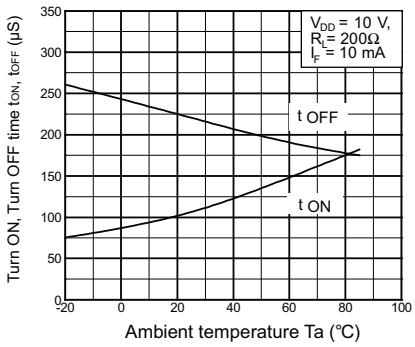
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



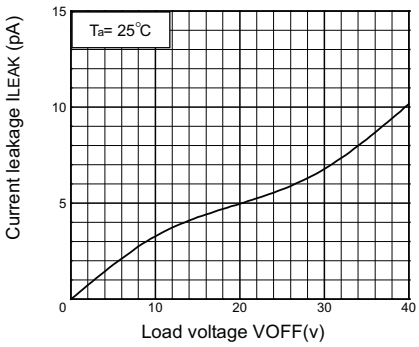
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



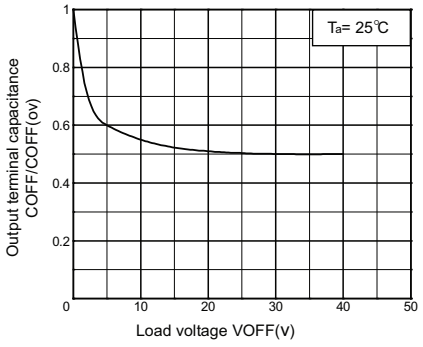
Current leakage vs. Load voltage

I LEAK – VOFF

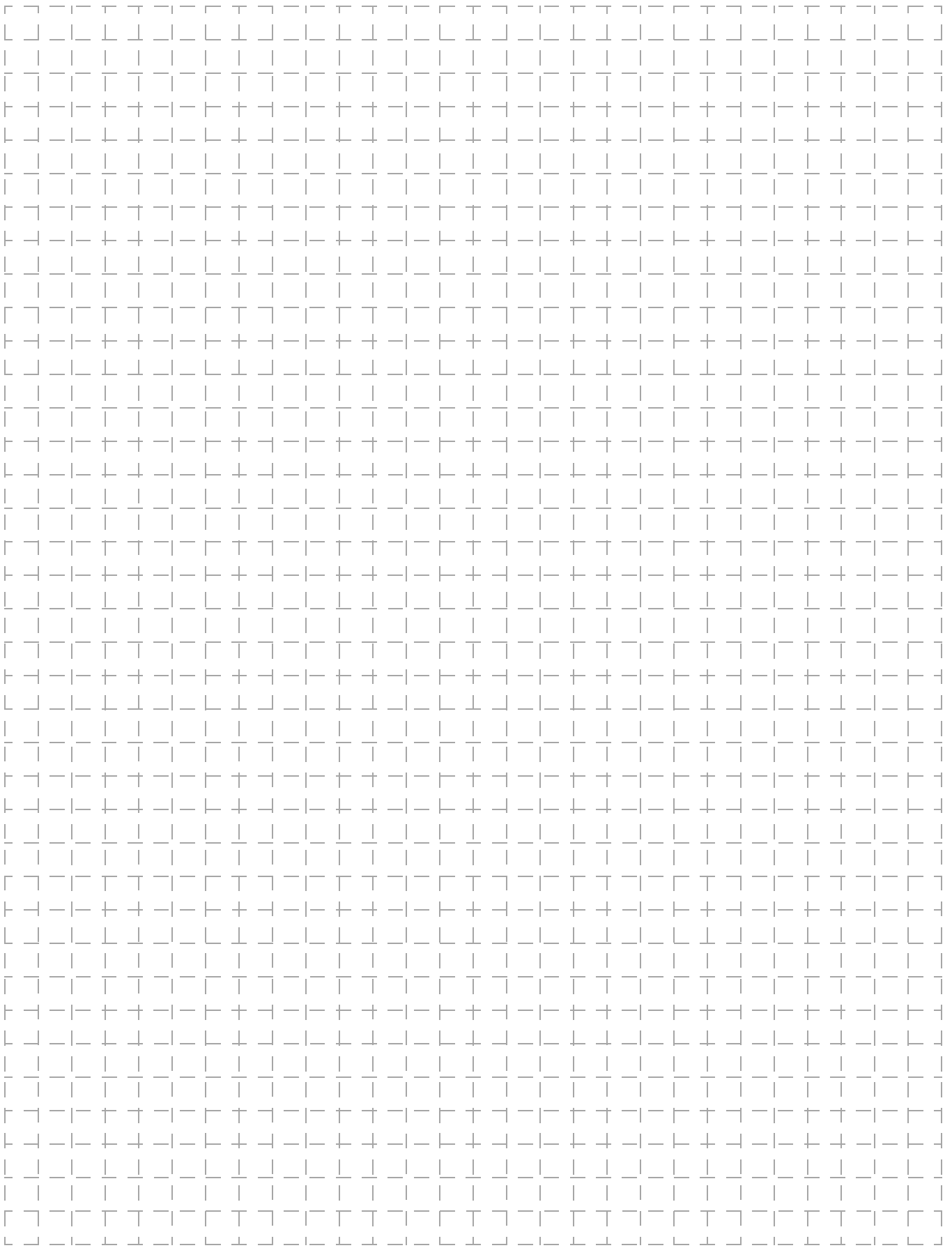


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

COFF - VOFF



MEMO



MOS FET Relays
G3VM-41LR6

World's Smallest SSOP Package MOS FET Relay* with Low Output Capacitance and ON Resistance (C×R = 10pF• Ω) in a 40-V Load Voltage Model

- Output capacitance of 1 pF (typical) allows high-frequency applications.
- RoHS Compliant.

*Information correct as of May 2007, according to data obtained by OMRON.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices and Data loggers
- Broadband systems

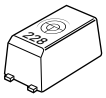
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	**G3VM-41LR6**	---
			G3VM-41LR6(TR)	1,500
			G3VM-41LR6(TR05)	500
			G3VM-41LR6(TR10)	1,000

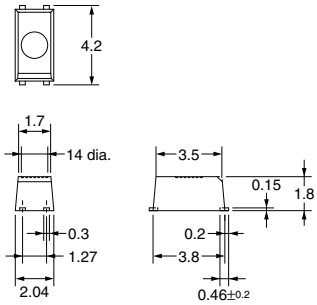
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-41LR6



Note: The actual product is marked differently from the image shown here.

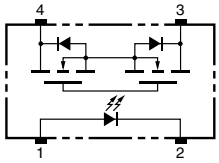


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

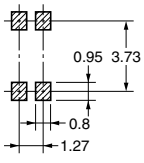
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-41LR6



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41LR6



■ Absolute Maximum Ratings (Ta = 25°C)

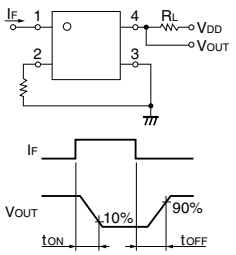
Item		Symbol	Rating	Unit	Measurement conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	1	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	−0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	40	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.2	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−40 to +125	°C	With no icing or condensation
Soldering temperature (10 s)		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	4	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	10	15	Ω	I_F = 5 mA, I_O = 120 mA, t = 10 ms
	Current leakage when the relay is open	I_{LEAK}	---	0.2	1.0	nA	V_{OFF} = 30 V, Ta = 50°C
	Capacity between terminals	C_{OFF}	---	1.0	2.0	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.05	0.5	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.12	0.5	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

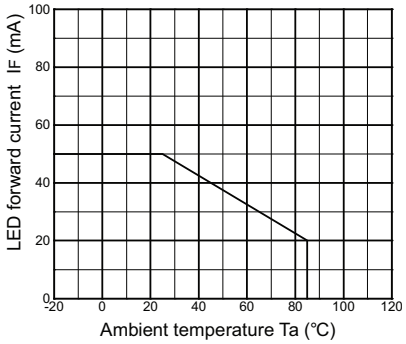
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	32	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	120	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

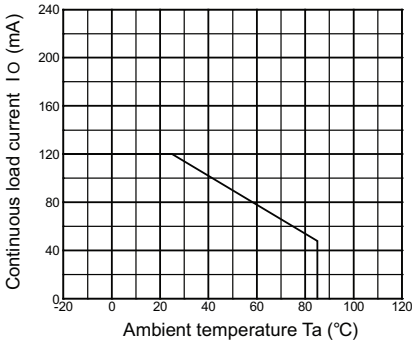
LED forward current vs. Ambient temperature

IF - Ta



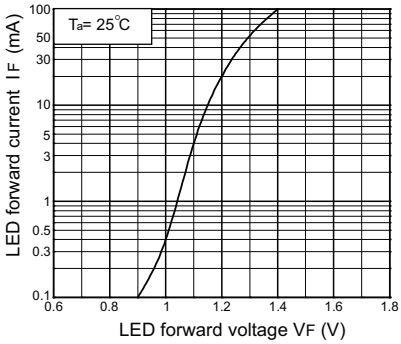
Continuous load current vs. Ambient temperature

IO - Ta



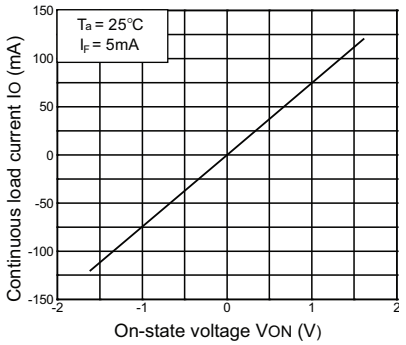
LED forward current vs. LED forward voltage

IF - VF



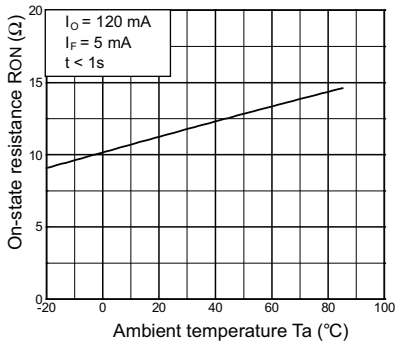
Continuous load current vs. On-state voltage

IO - VON



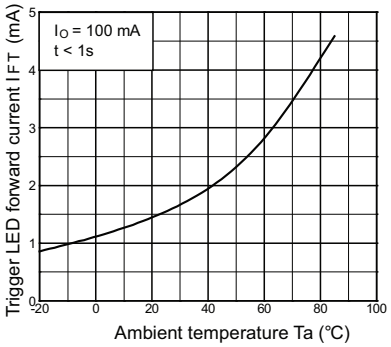
On-state resistance vs. Ambient temperature

RON - Ta



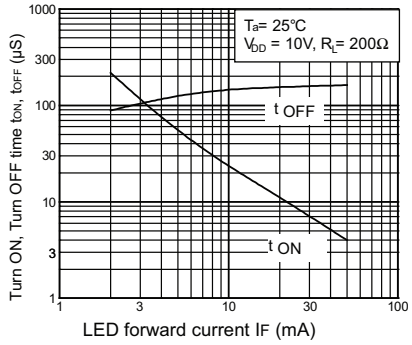
Trigger LED forward current vs. Ambient temperature

IFT - Ta



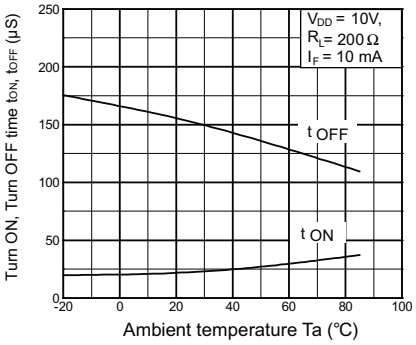
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



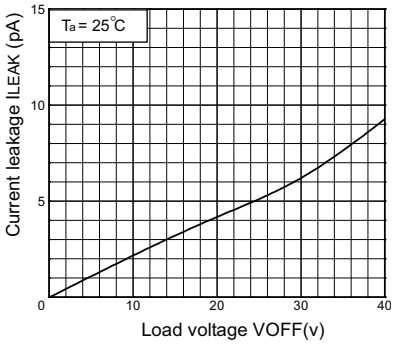
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



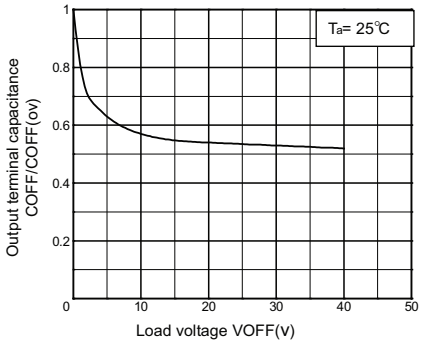
Current leakage vs. Load voltage

I LEAK – VOFF

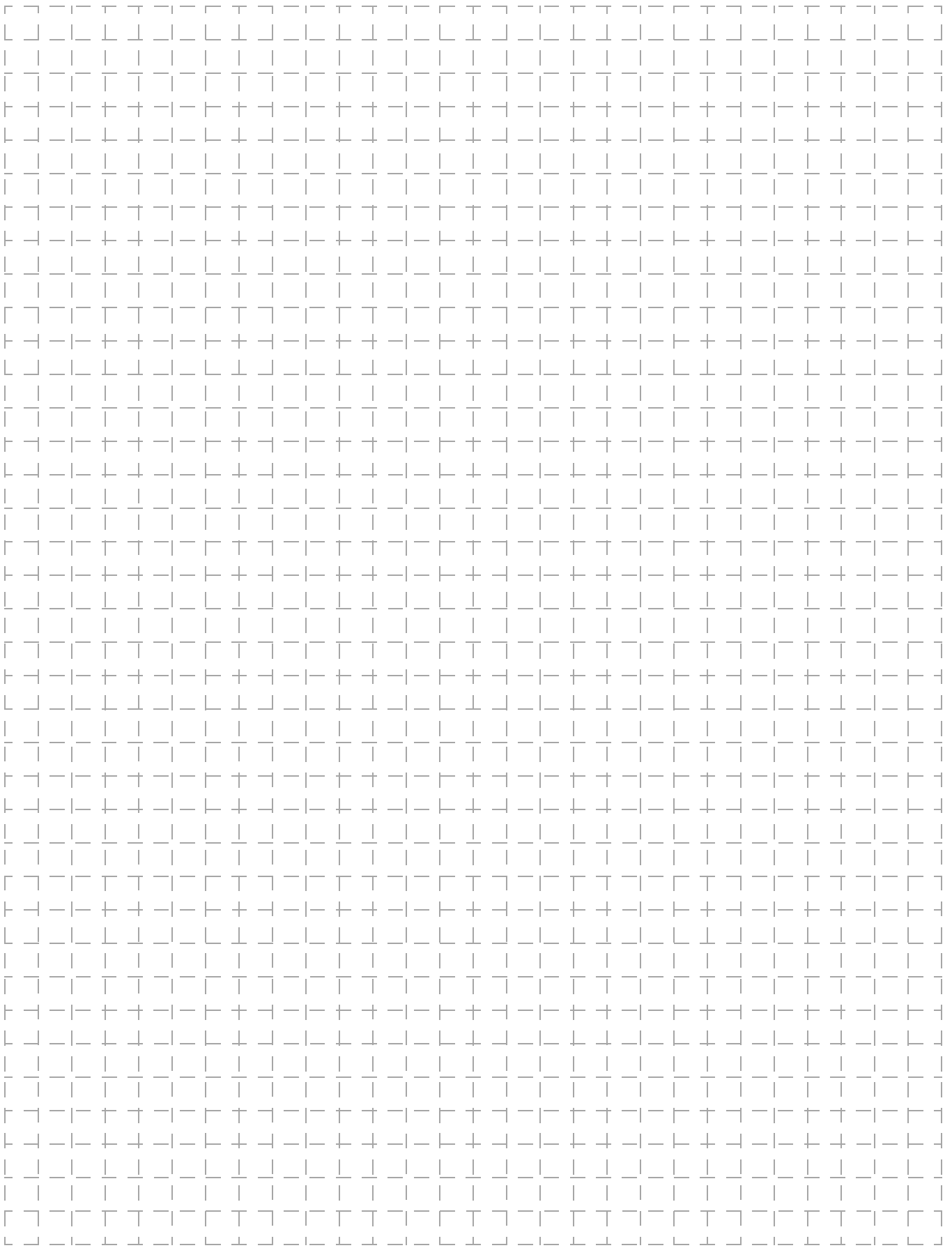


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

COFF - VOFF



MEMO



MOS FET Relays
G3VM-41LR10

SSOP Package MOS FET Relays with Low Leakage Current, Output Capacitance and ON Resistance ($C \times R = 5.4$ pF•Ω) in a 40-V Load Voltage Model.

- Output capacitance of 0.45 pF (typical) allows high frequency applications.
- Leakage current of 0.2 nA max. (10 pA typ.) when relay is open
- Turn-on time = 0.026 ms (typ.)
- RoHS compliant



NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices and Data loggers
- Broadband systems

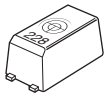
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	**G3VM-41LR10**	---
			G3VM-41LR10(TR05)	500
			G3VM-41LR10(TR)	1,500

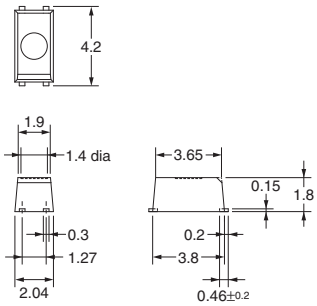
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-41LR10



Note: The actual product is marked differently from the image shown here.

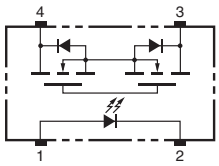


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

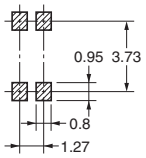
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-41LR10



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41LR10



■ Absolute Maximum Ratings (Ta = 25°C)

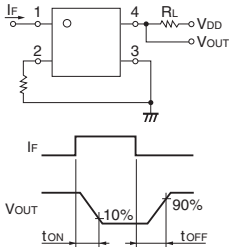
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	30	mA	
	LED forward current reduction rate	ΔI_F/°C	–0.3	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	40	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_{ON}/°C	–1.2	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Ambient operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–40 to +125	°C	With no icing or condensation
Soldering temperature		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.15	1.35	1.45	V	I_F = 5 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	70	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	3	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	12	14	Ω	I_F = 5 mA, I_O = 120 mA, t < 1 s
	Current leakage when the relay is open	I_{LEAK}	---	10	200	pA	V_{OFF} = 35 V, T_a = 25°C
	Capacity between terminals	C_{OFF}	---	0.45	0.8	pF	V = 0, f = 100 MHz, t = < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.3	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance between I/O terminals		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.026	0.2	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 10 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.14	0.3	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

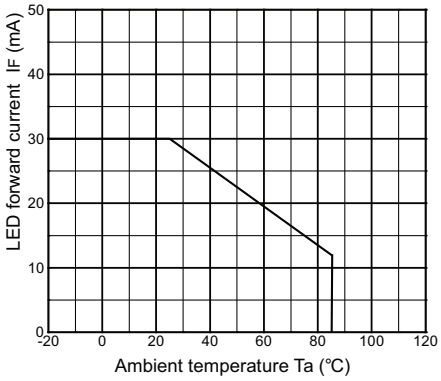
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	32	V
Operating LED forward current	I_F	---	---	20	mA
Continuous load current (AC peak/DC)	I_O	---	---	120	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

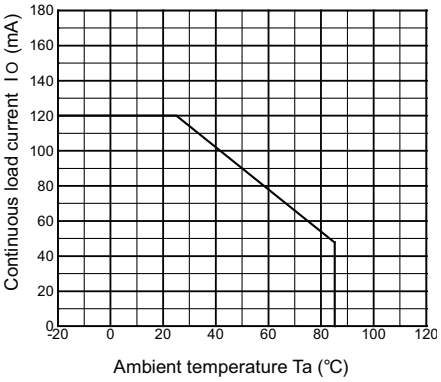
LED forward current vs. Ambient temperature

IF - Ta



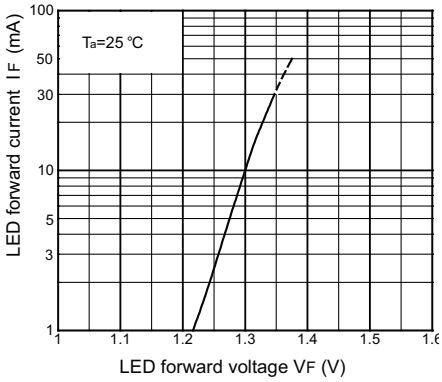
Continuous load current vs. Ambient temperature

IO - Ta



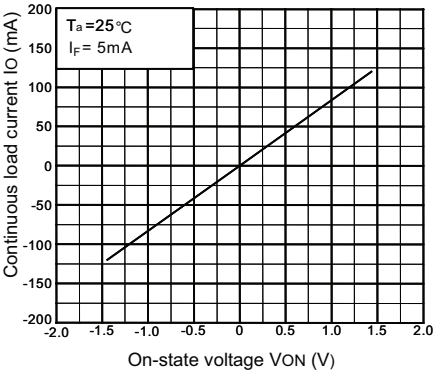
LED forward current vs. LED forward voltage

IF - VF



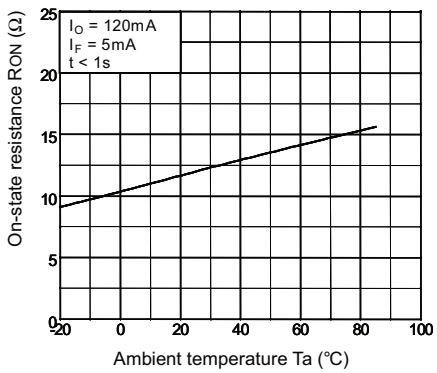
Continuous load current vs. On-state voltage

IO - VON



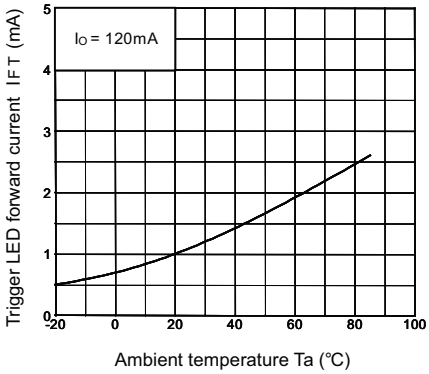
On-state resistance vs. Ambient temperature

RON - Ta



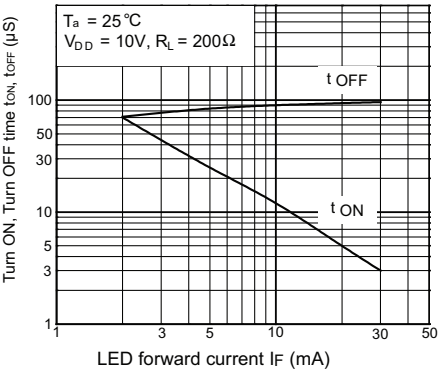
Trigger LED forward current vs. Ambient temperature

IFT - Ta



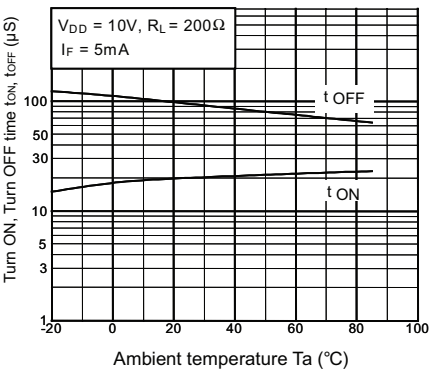
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



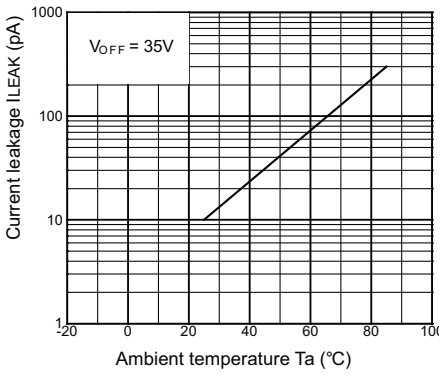
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta

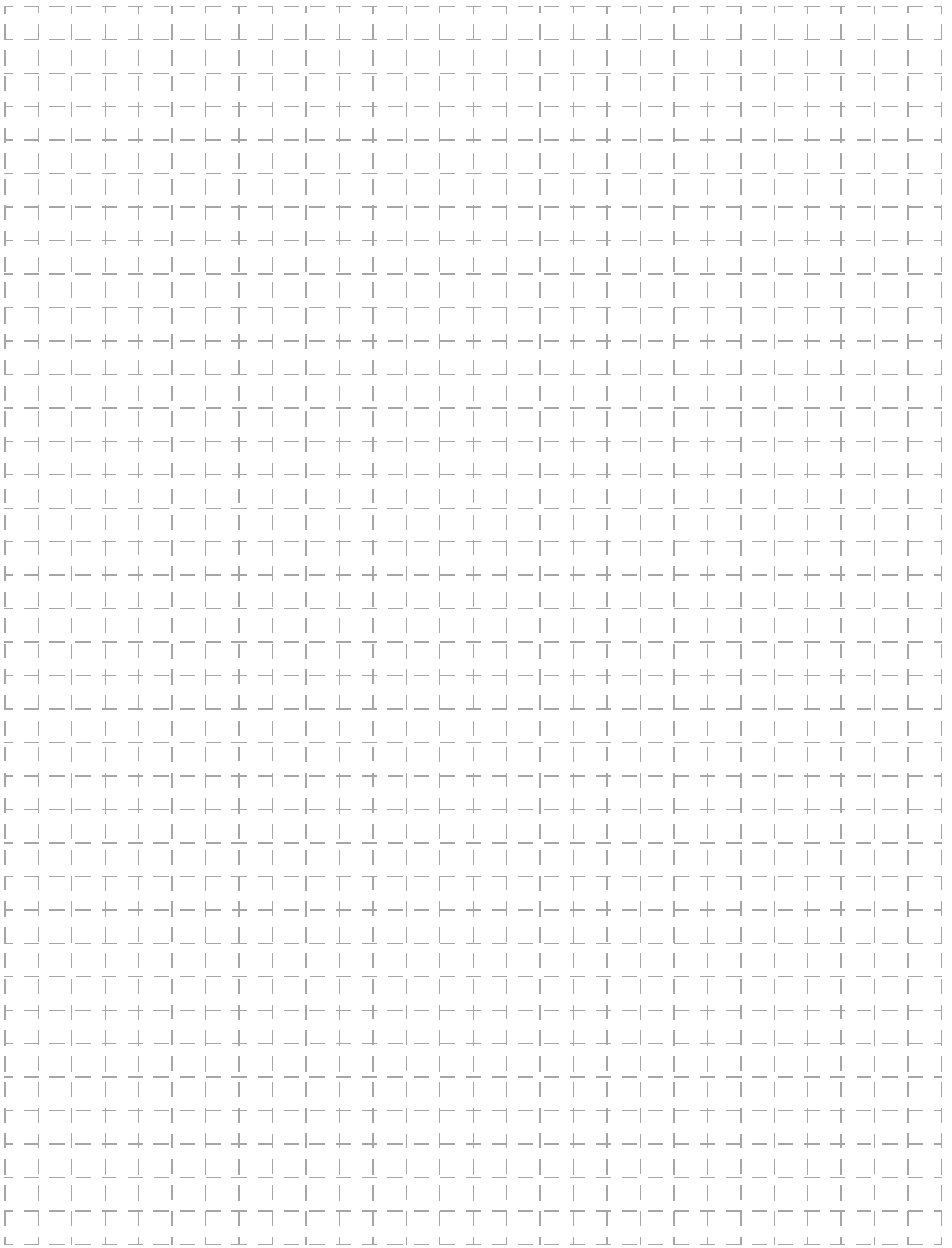


Current leakage vs. Ambient temperature

I LEAK - Ta



MEMO



MOS FET Relays
G3VM-41LR11

SSOP Package MOS FET Relay with Low Output Capacitance and ON Resistance (C × R = 4.9 pF•Ω) in a 40-V Load Voltage Model.

- ON resistance of 7 Ω (typical) suppresses output signal attenuation.
- Leakage current of 0.2 nA max. (10 pA typ.) when relay is open
- Turn-on time = 0.026 ms (typ.), Turn-off time = 0.045 ms (typ.)
- RoHS compliant



NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices and Data loggers
- Broadband systems

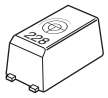
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	40 VAC	**G3VM-41LR11**	---
			G3VM-41LR11(TR)	1,500

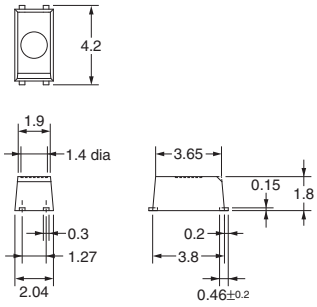
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-41LR11



Note: The actual product is marked differently from the image shown here.

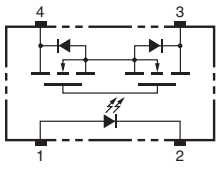


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

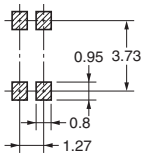
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-41LR11



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-41LR11



■ Absolute Maximum Ratings (Ta = 25°C)

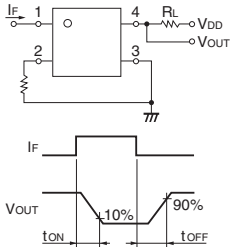
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	30	mA	
	LED forward current reduction rate	ΔI_F/°C	−0.3	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	40	V	
	Continuous load current	I_O	140	mA	
	ON current reduction rate	ΔI_{ON}/°C	−1.4	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Ambient operating temperature		T_a	−20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	−40 to +125	°C	With no icing or condensation
Soldering temperature		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.15	1.30	1.45	V	I_F = 5 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	70	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	---	3	mA	I_O = 100 mA
Output	Maximum resistance with output ON	R_{ON}	---	7	10	Ω	I_F = 5 mA, I_O = 140 mA, t < 1 s
	Current leakage when the relay is open	I_{LEAK}	---	10	200	pA	V_{OFF} = 35 V, Ta = 25°C
	Capacity between terminals	C_{OFF}	---	0.7	1.3	pF	V = 0, f = 100 MHz, t = < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.3	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance between I/O terminals		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.026	0.2	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 10 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.045	0.2	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

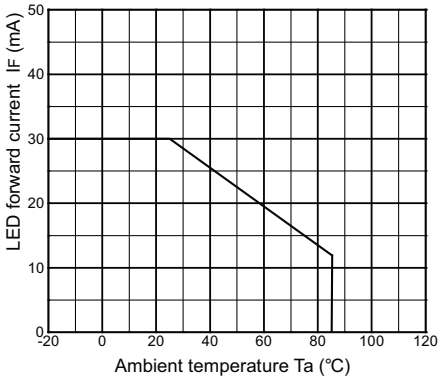
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	32	V
Operating LED forward current	I_F	---	---	20	mA
Continuous load current (AC peak/DC)	I_O	---	---	140	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

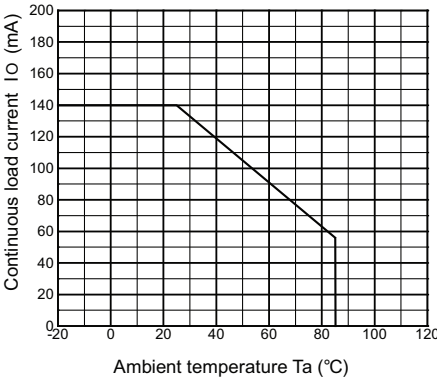
LED forward current vs. Ambient temperature

I_F - Ta



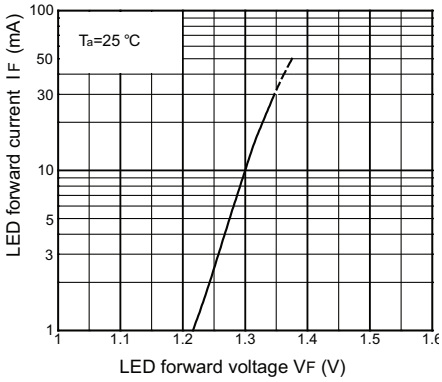
Continuous load current vs. Ambient temperature

I_O - Ta



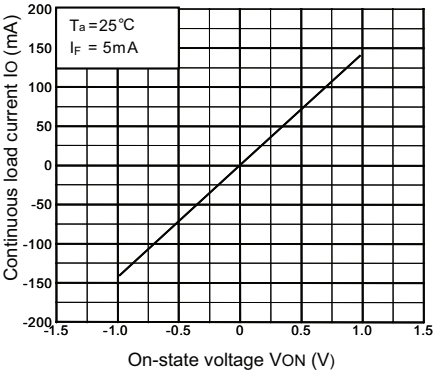
LED forward current vs. LED forward voltage

I_F - V_F



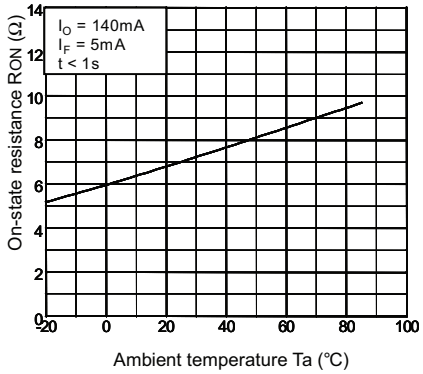
Continuous load current vs. On-state voltage

I_O - V_{ON}



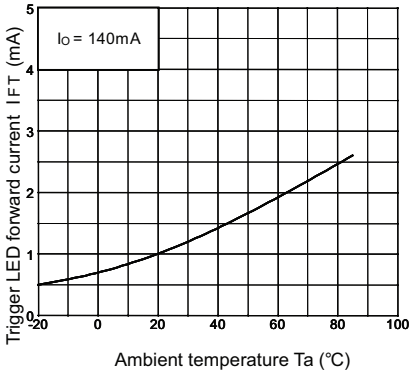
On-state resistance vs. Ambient temperature

R_{ON} - Ta



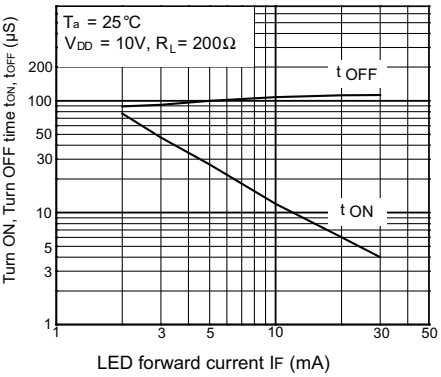
Trigger LED forward current vs. Ambient temperature

I_{FT} - Ta



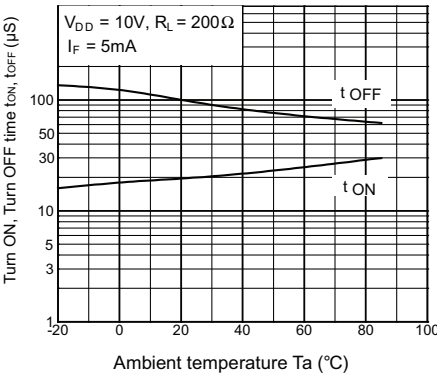
Turn ON, Turn OFF time vs. LED forward current

t_{ON}, t_{OFF} - I_F



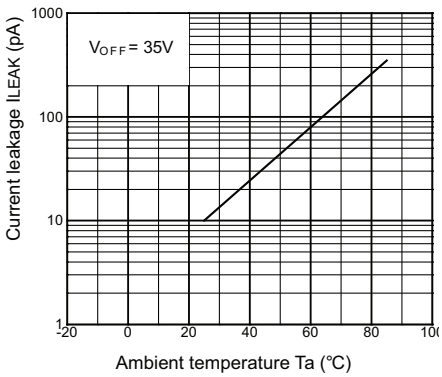
Turn ON, Turn OFF time vs. Ambient temperature

t_{ON}, t_{OFF} - Ta

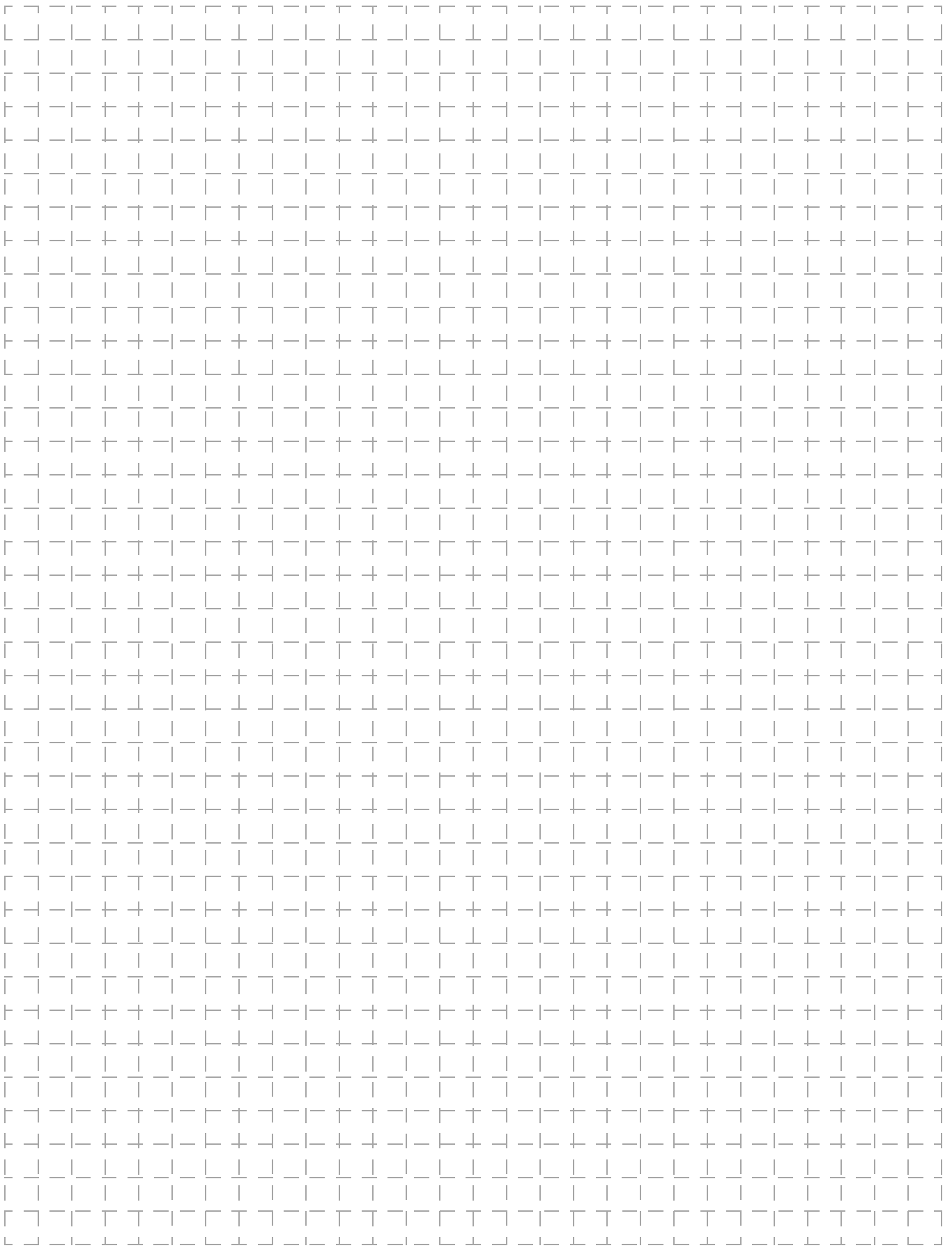


Current leakage vs. Ambient temperature

I_{LEAK} - Ta



MEMO



MOS FET Relays
G3VM-61LR

SSOP Package MOS FET Relay with Low Leakage Current, Output Capacitance and ON Resistance ($C \times R = 20$ pF•Ω) in a 60-V Load Voltage Model.

- ON resistance of 1 Ω (typical) suppresses output signal attenuation.
- Leakage current of 0.04 nA (typ.) when relay is open
- RoHS compliant



NEW

Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices and Data loggers
- Broadband systems

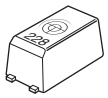
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	60 VAC	**G3VM-61LR**	---
			G3VM-61LR(TR05)	500
			G3VM-61LR(TR)	1,500

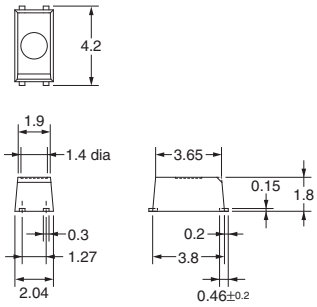
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-61LR



Note: The actual product is marked differently from the image shown here.

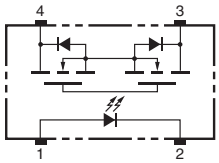


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

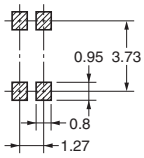
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-61LR



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-61LR



■ Absolute Maximum Ratings (Ta = 25°C)

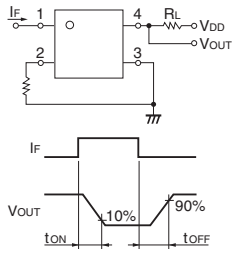
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	60	V	
	Continuous load current	I_O	400	mA	
	ON current reduction rate	ΔI_{ON}/°C	–4.0	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Ambient operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–40 to +125	°C	With no icing or condensation
Soldering temperature		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	2	5	mA	I_O = 100 mA, R_{ON} < 1.5 Ω
Output	Maximum resistance with output ON	R_{ON}	---	1.0	1.5	Ω	I_F = 5 mA, I_O = 400 mA
	Current leakage when the relay is open	I_{LEAK}	---	0.04	1,000	nA	V_{OFF} = 60 V, T_a = 25°C
	Capacity between terminals	C_{OFF}	---	20	---	pF	V = 0, f = 100 MHz, t = < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.3	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance between I/O terminals		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.3	1	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.2	1	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

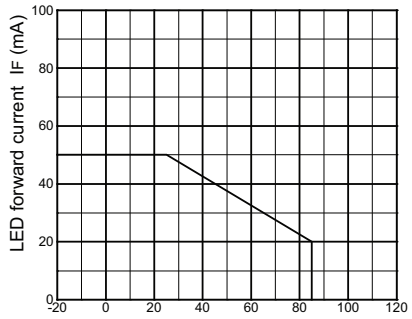
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	48	V
Operating LED forward current	I_F	10	---	20	mA
Continuous load current (AC peak/DC)	I_O	---	---	400	mA
Operating temperature	T_a	–20	---	70	°C

■ Engineering Data

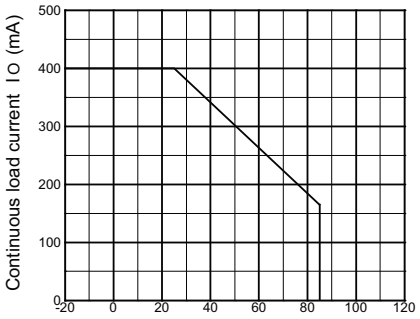
LED forward current vs. Ambient temperature

IF - Ta



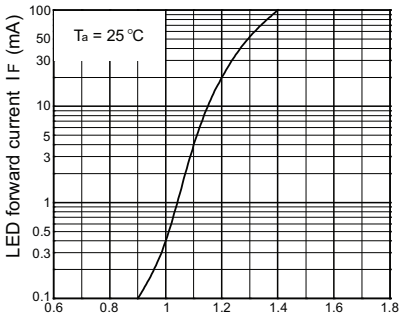
Continuous load current vs. Ambient temperature

IO - Ta



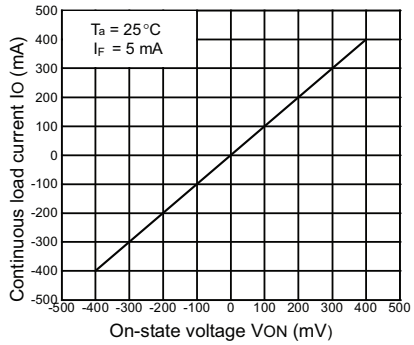
LED forward current vs. LED forward voltage

IF - VF



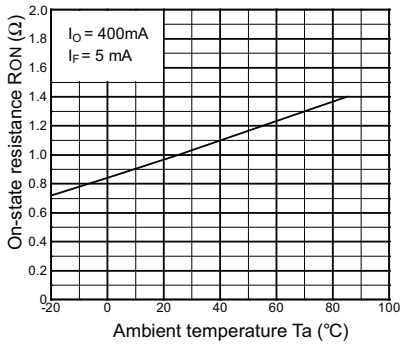
Continuous load current vs. On-state voltage

IO - VON



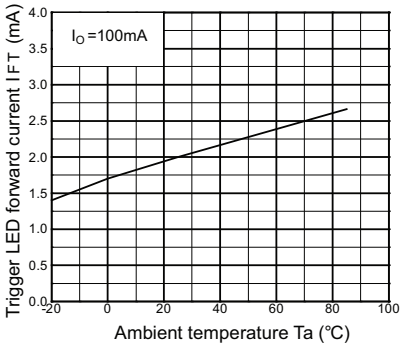
On-state resistance vs. Ambient temperature

RON - Ta



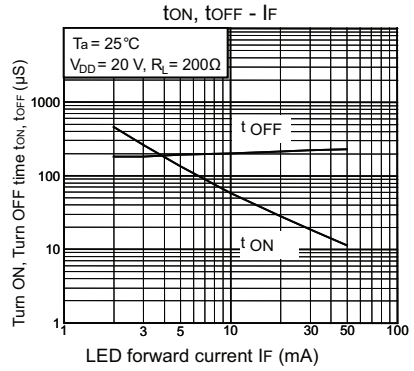
Trigger LED forward current vs. Ambient temperature

IFT - Ta



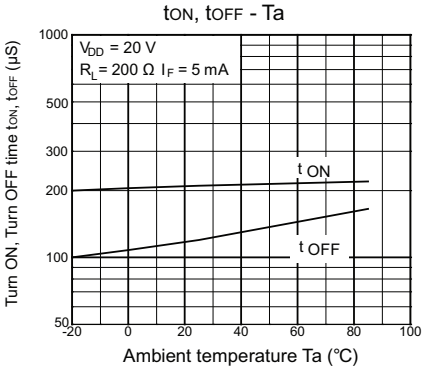
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



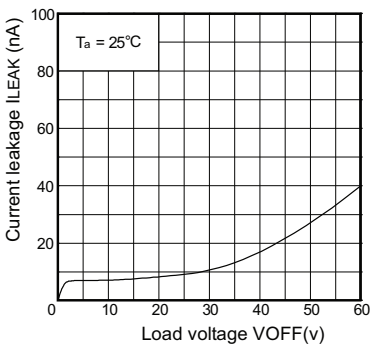
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



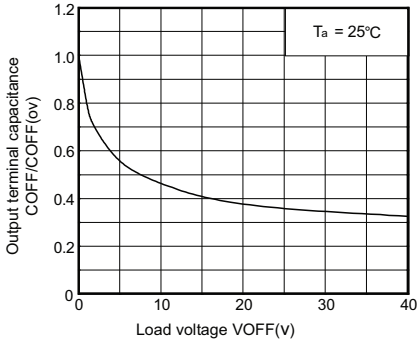
Current leakage vs. Load voltage

I LEAK – VOFF

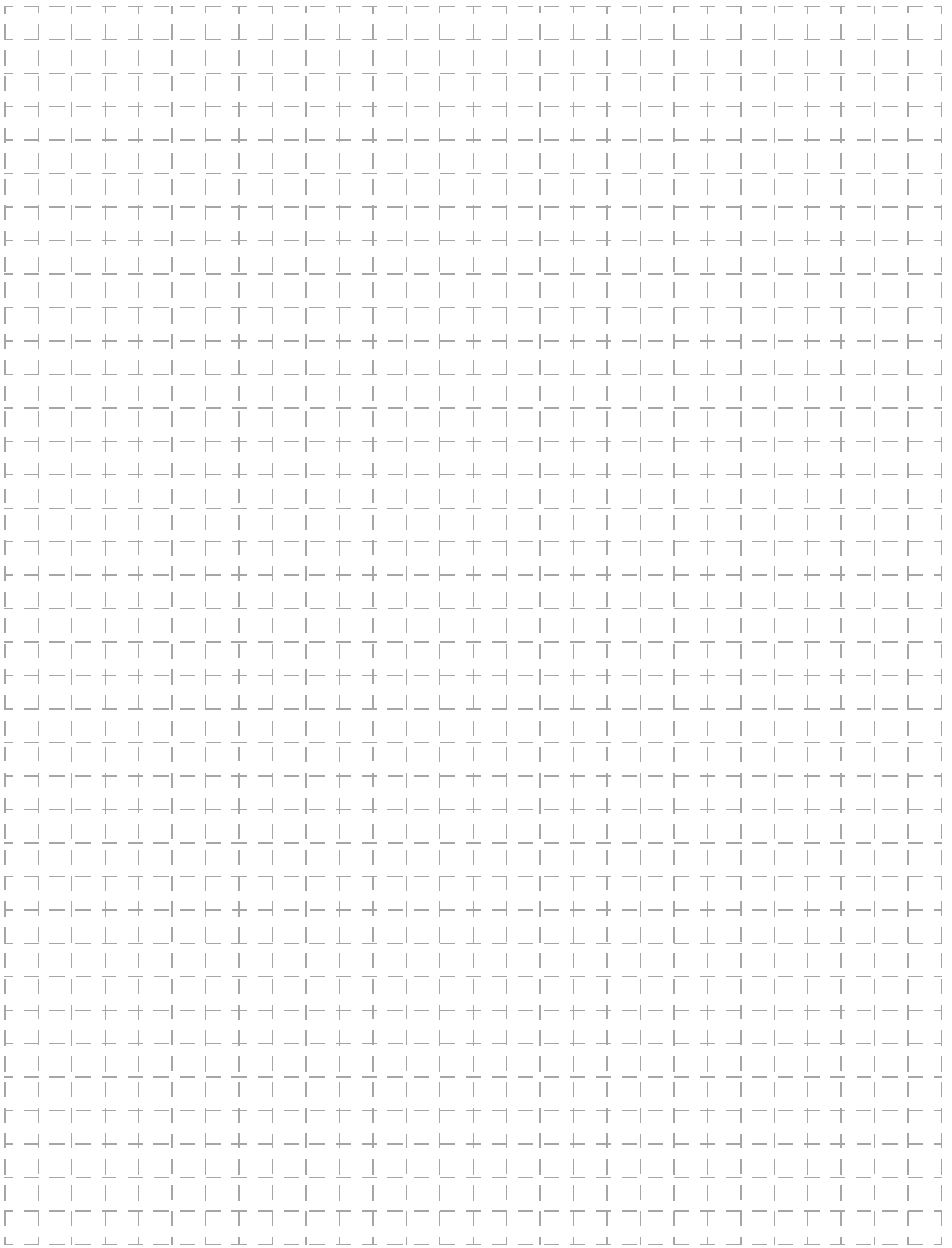


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

COFF - VOFF



MEMO



MOS FET Relays
G3VM-81LR

World's Smallest SSOP Package MOS FET Relay* with Low Output Capacitance and ON Resistance (C×R = 37.5pF•Ω) in a 80-V Load Voltage Model.

- Turn-on time = 0.1 ms (typ.), Turn-off time = 0.15 ms (typ.)
- RoHS compliant

*Information correct as of May 2007, according to data obtained by OMRON.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices
- Broadband systems
- Data loggers

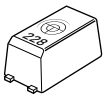
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	80 VAC	**G3VM-81LR**	---
			G3VM-81LR(TR05)	500
			G3VM-81LR(TR)	1,500

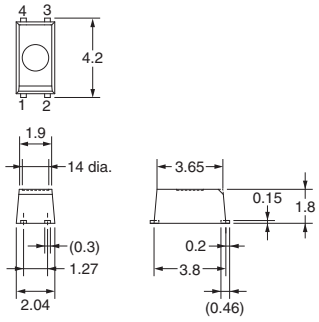
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-81LR



Note: The actual product is marked differently from the image shown here.

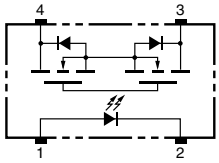


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

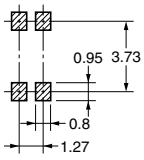
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-81LR



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-81LR



■ Absolute Maximum Ratings (Ta = 25°C)

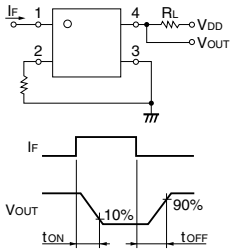
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	Repetitive peak LED forward current	I_{FP}	---	A	100 μs pulses, 100 pps
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	80	V	
	Continuous load current	I_O	120	mA	
	ON current reduction rate	ΔI_O/°C	–1.2	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Ambient operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–40 to +125	°C	With no icing or condensation
Soldering temperature		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	2	5	mA	I_O = 120 mA
Output	Maximum resistance with output ON	R_{ON}	---	7.5	12	Ω	I_F = 10 mA, I_O = 120 mA, t = 10 ms
	Current leakage when the relay is open	I_{LEAK}	---	100	200	pA	V_{OFF} = 80 V, T_a = 60°C
	Capacity between terminals	C_{OFF}	---	5	7	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.8	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance between I/O terminals		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{oH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.1	0.25	ms	I_F = 10 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.15	0.2	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

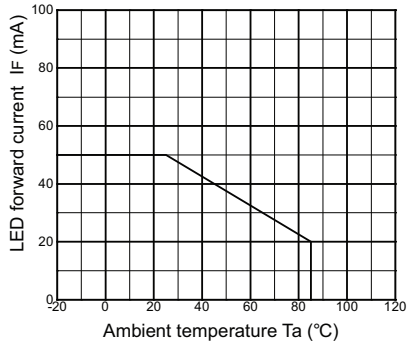
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	64	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	120	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

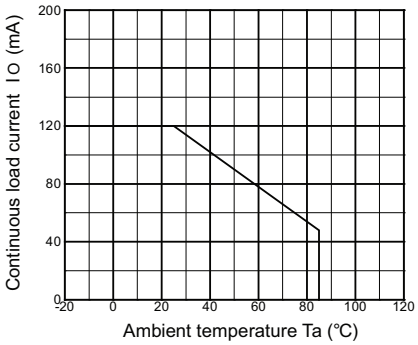
LED forward current vs. Ambient temperature

IF - Ta



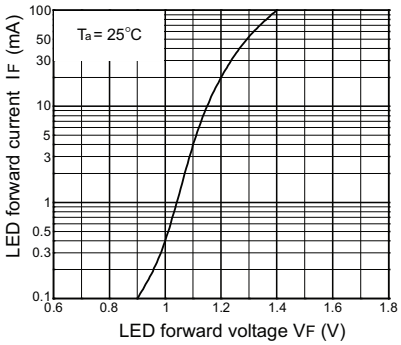
Continuous load current vs. Ambient temperature

IO - Ta



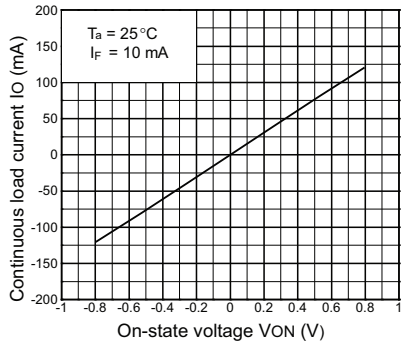
LED forward current vs. LED forward voltage

IF - VF



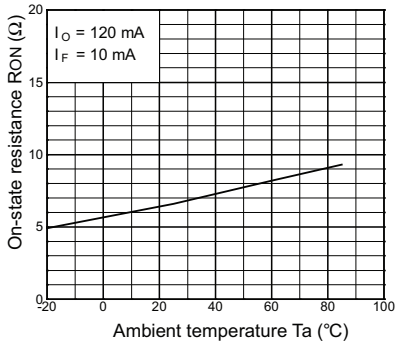
Continuous load current vs. On-state voltage

IO - VON



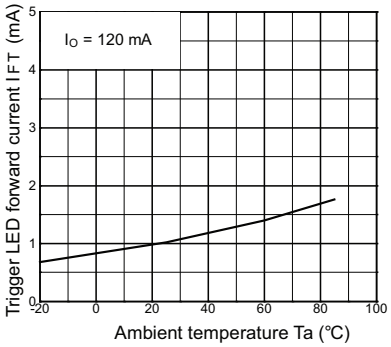
On-state resistance vs. Ambient temperature

RON - Ta



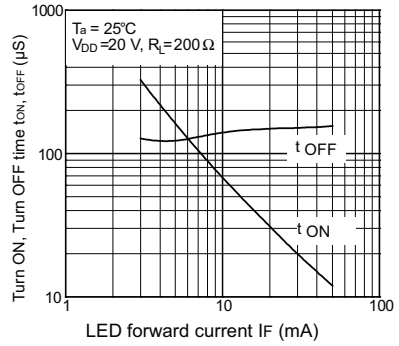
Trigger LED forward current vs. Ambient temperature

IFT - Ta



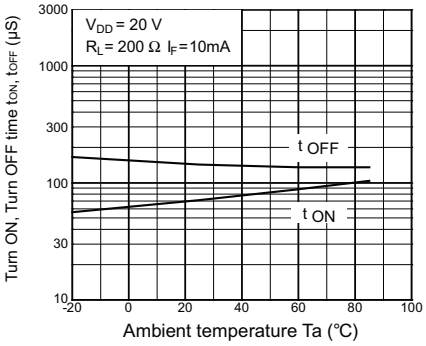
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



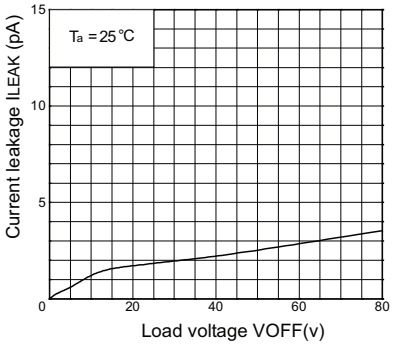
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



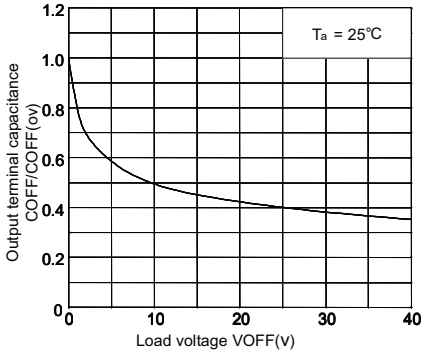
Current leakage vs. Load voltage

I LEAK – VOFF

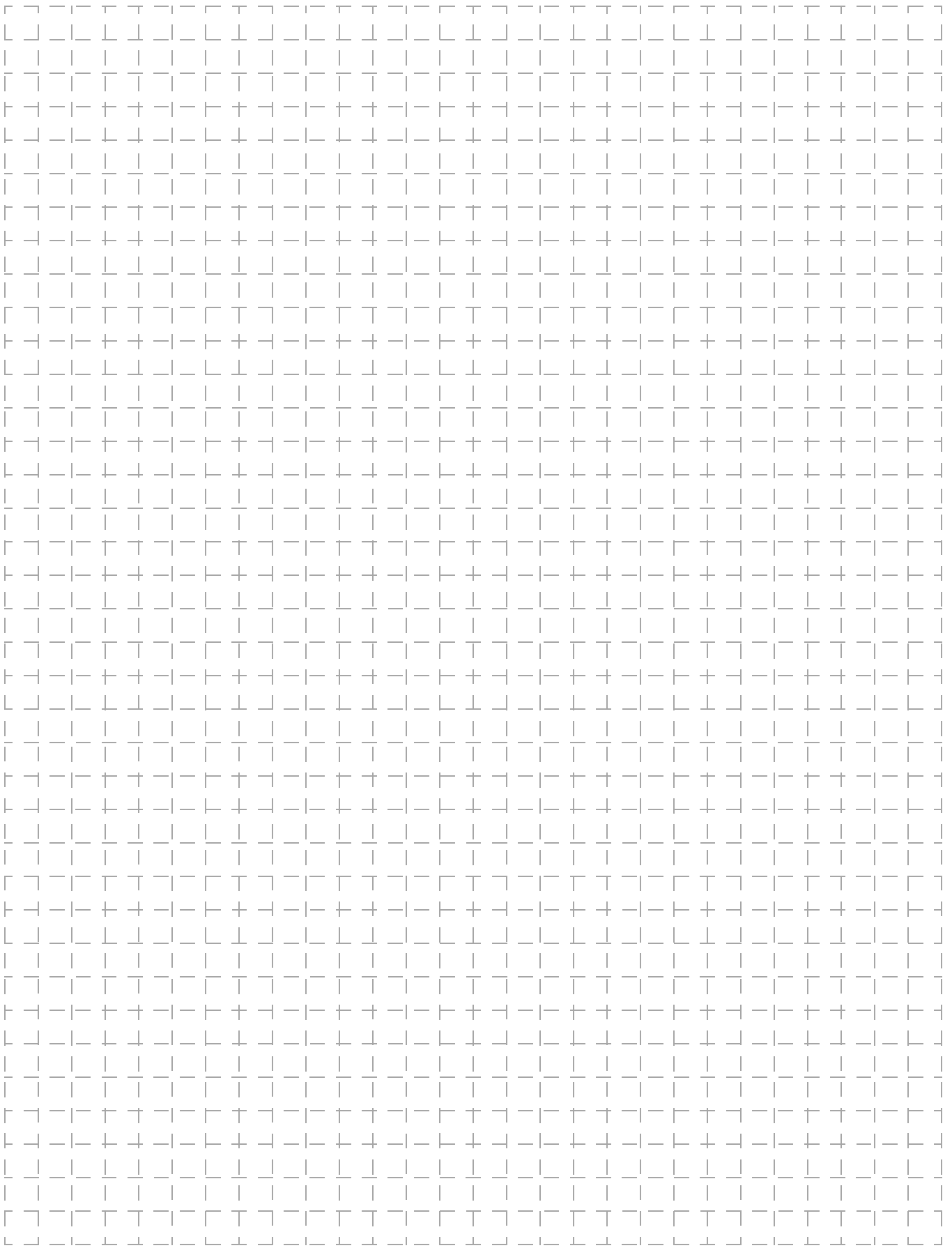


Output terminal capacitance COFF/COFF(ov) vs. Load voltage

COFF - VOFF



MEMO



MOS FET Relays
G3VM-101LR

World's Smallest SSOP Package MOS FET Relay* with High Load Voltage of 100 V.

- Leakage current of 200 pA max. (100 pA typ.) when relay is open.
- Turn-on time = 0.1 ms (typ.), Turn-off time = 0.1 ms (typ.)
- RoHS compliant

*Information correct as of May 2007, according to dataobtained by OMRON.



Note: The actual product is marked differently from the image shown here.

■ Application Examples

- Semiconductor inspection tools
- Measurement devices and Data loggers
- Broadband systems

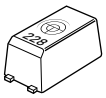
■ List of Models

Contact form	Terminals	Load voltage (peak value)	Model	Number per tape
SPST-NO	Surface-mounting terminals	100 VAC	**G3VM-101LR**	---
			G3VM-101LR(TR05)	500
			G3VM-101LR(TR)	1,500

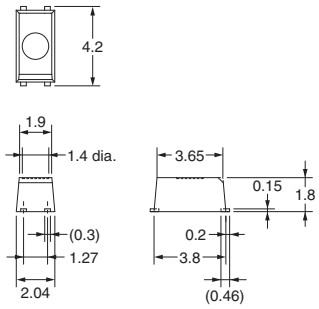
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

G3VM-101LR



Note: The actual product is marked differently from the image shown here.

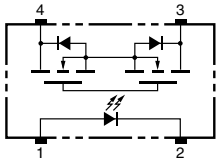


Note: A tolerance of ±0.1 mm applies to all dimensions unless otherwise specified.

Weight: 0.03 g

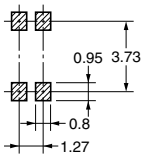
■ Terminal Arrangement/Internal Connections (Top View)

G3VM-101LR



■ Actual Mounting Pad Dimensions (Recommended Value, Top View)

G3VM-101LR



■ Absolute Maximum Ratings (Ta = 25°C)

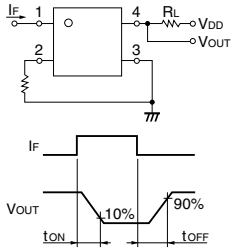
Item		Symbol	Rating	Unit	Measurement Conditions
Input	LED forward current	I_F	50	mA	
	LED forward current reduction rate	ΔI_F/°C	–0.5	mA/°C	$T_a \geq 25$°C
	LED reverse voltage	V_R	5	V	
	Connection temperature	T_j	125	°C	
Output	Load voltage (AC peak/DC)	V_{OFF}	100	V	
	Continuous load current	I_O	80	mA	
	ON current reduction rate	ΔI_O/°C	–0.8	mA/°C	$T_a \geq 25$°C
	Connection temperature	T_j	125	°C	
Dielectric strength between input and output (See note 1.)		V_{I-O}	1,500	V_{rms}	AC for 1 min
Ambient operating temperature		T_a	–20 to +85	°C	With no icing or condensation
Storage temperature		T_{stg}	–40 to +125	°C	With no icing or condensation
Soldering temperature		---	260	°C	10 s

Note: **1.** The dielectric strength between the input and output was checked by applying voltage between all pins as a group on the LED side and all pins as a group on the light-receiving side.

■ Electrical Characteristics (Ta = 25°C)

Item		Symbol	Minimum	Typical	Maximum	Unit	Measurement conditions
Input	LED forward voltage	V_F	1.0	1.15	1.3	V	I_F = 10 mA
	Reverse current	I_R	---	---	10	μA	V_R = 5 V
	Capacity between terminals	C_T	---	15	---	pF	V = 0, f = 1 MHz
	Trigger LED forward current	I_{FT}	---	1	5	mA	I_O = 80 mA
Output	Maximum resistance with output ON	R_{ON}	---	8	14	Ω	I_F = 10 mA, I_O = 80 mA, t = 10 ms
	Current leakage when the relay is open	I_{LEAK}	---	100	200	pA	V_{OFF} = 80 V
	Capacity between terminals	C_{OFF}	---	6	8	pF	V = 0, f = 100 MHz, t < 1 s
Capacity between I/O terminals		C_{I-O}	---	0.6	---	pF	f = 1 MHz, V_s = 0 V
Insulation resistance between I/O terminals		R_{I-O}	1,000	---	---	MΩ	V_{I-O} = 500 VDC, $R_{OH} \leq 60\%$
Turn-ON time		t_{ON}	---	0.1	0.3	ms	I_F = 5 mA, R_L = 200 Ω, V_{DD} = 20 V (See note 2.)
Turn-OFF time		t_{OFF}	---	0.1	0.3	ms	

Note: **2.** Turn-ON and Turn-OFF Times



■ Recommended Operating Conditions

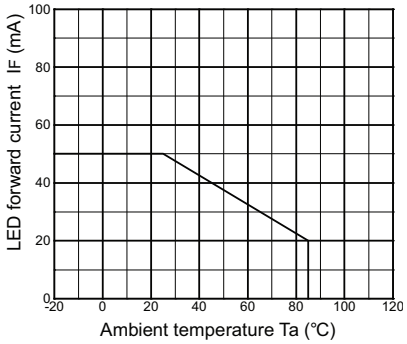
Use the G3VM under the following conditions so that the Relay will operate properly.

Item	Symbol	Minimum	Typical	Maximum	Unit
Load voltage (AC peak/DC)	V_{DD}	---	---	80	V
Operating LED forward current	I_F	10	---	30	mA
Continuous load current (AC peak/DC)	I_O	---	---	80	mA
Operating temperature	T_a	25	---	60	°C

■ Engineering Data

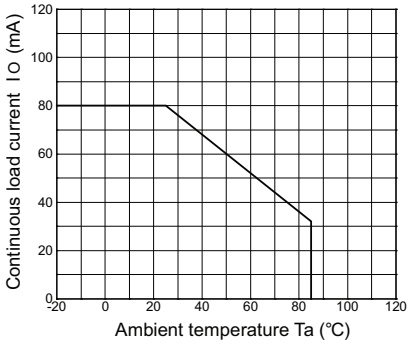
LED forward current vs. Ambient temperature

IF - Ta



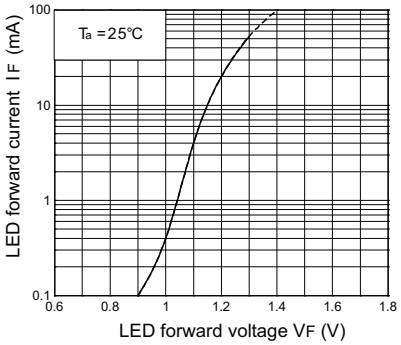
Continuous load current vs. Ambient temperature

IO - Ta



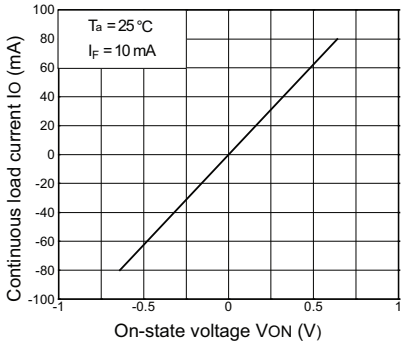
LED forward current vs. LED forward voltage

IF - VF



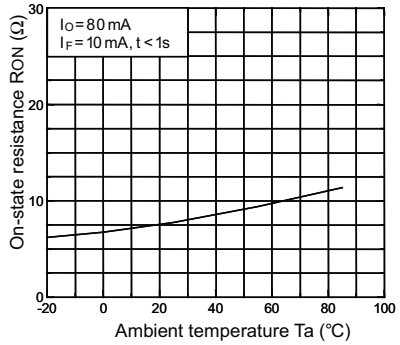
Continuous load current vs. On-state voltage

IO - VON



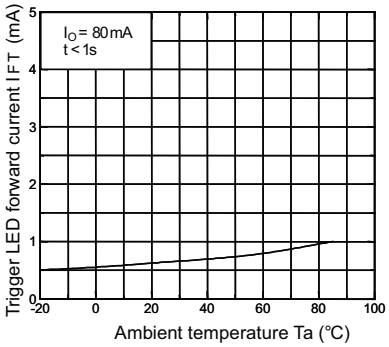
On-state resistance vs. Ambient temperature

RON - Ta



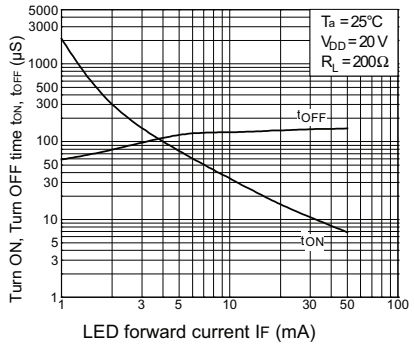
Trigger LED forward current vs. Ambient temperature

IFT - Ta



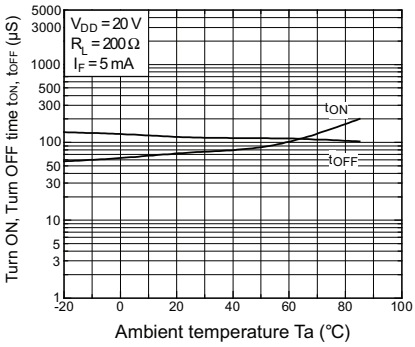
Turn ON, Turn OFF time vs. LED forward current

tON, tOFF - IF



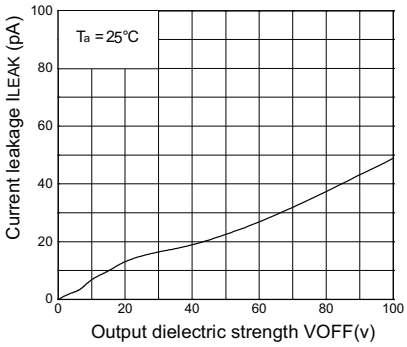
Turn ON, Turn OFF time vs. Ambient temperature

tON, tOFF - Ta



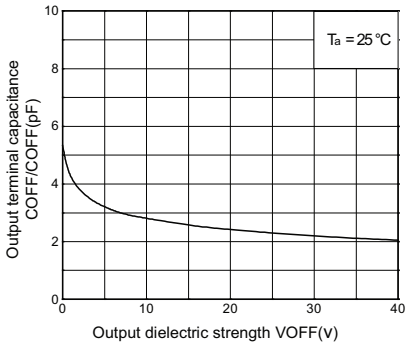
Current leakage vs. Output dielectric strength

I LEAK – VOFF

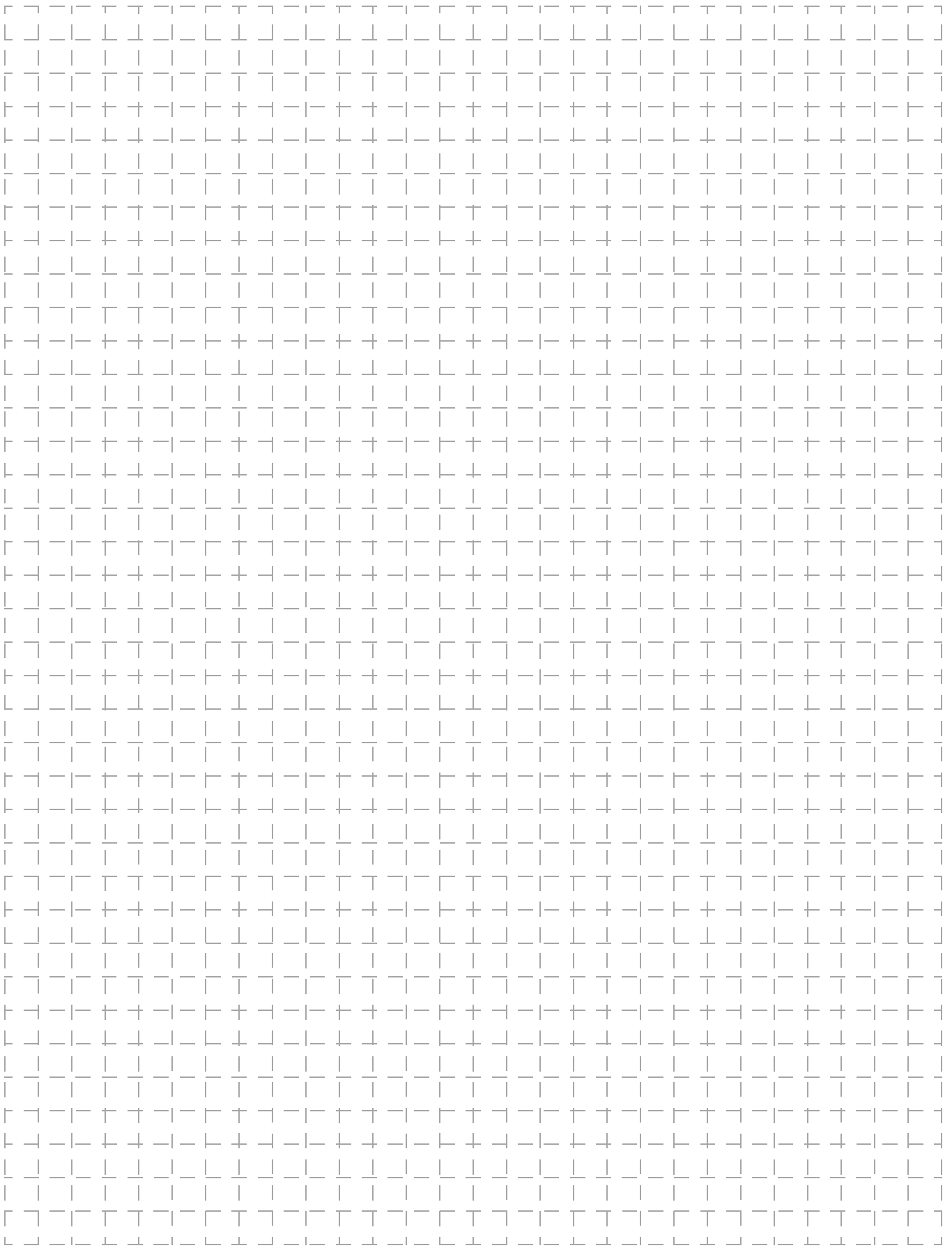


Output terminal capacitance COFF/COFF(ov) vs. LED forward current

COFF - VOFF



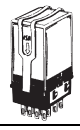
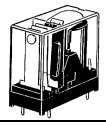
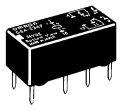
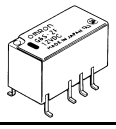
MEMO



HF/RF and Low Signal Relays

Technical Information

Relay Classification

Model	Mounting	Enclosure Ratings	Features
LY 	Discrete	Unsealed	Designed for manual soldering
G2R 		Semi-sealed	Design inhibits flux intrusion into the casing at the terminals during soldering.
G6A 		Fully sealed	Sealed resin casings and covers, limiting damage from corrosive atmospheres.
G6S 	Surface mounting		Surface mounting relays permit automatic reflow soldering.

Construction

■ SEALING

Unsealed

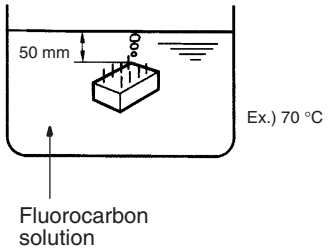
Relays of this type are intended for manual soldering. No measures are taken against penetration of flux and cleaning solvent into the relay. This type of relay cannot be immersion-cleaned.

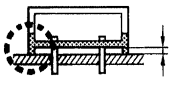
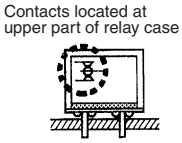
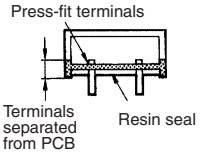
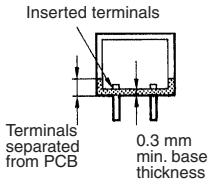
Semi-Sealed

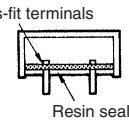
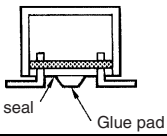
Special design construction prevents flux from penetrating into the relay housing, for example, due to capillary action up the terminals when the relay is soldered onto a PCB. This type of relay also cannot be immersion-cleaned.

Fully Sealed

Fully sealing prevents not only flux, but also cleaning solvent from penetrating into the relay housing. Therefore, this type of relay can be immersion-cleaned. Relays are each tested before being shipped. The relay is immersed in fluorocarbon solution for 1 minute, at a temperature of 70°C +5°C/-0°C, to see if gases escape from the relay. The following figure illustrates the test conditions.



Classification	Unsealed		Semi-Sealed	
Construction				
Features	Terminals are separated from PCB surface when relay is mounted.	Contacts are positioned away from base.	Terminals are pressed into base.	Terminals are inserted into base 0.3 mm min. thick.
Automatic flux application	Poor	Poor	Good	Good
Automatic soldering	Poor	Poor	Good	Good
Automatic cleaning	Poor	Poor	Poor	Poor
Manual soldering	Good	Good	Good	Good
Penetration of dust	Fair		Fair	
Penetration of corrosive gas	Poor		Poor	

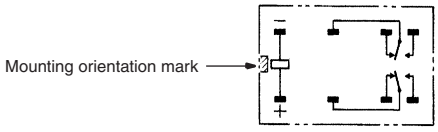
Classification	Fully Sealed	Surface Mounting
Construction		
Features	Terminals, base, and case are sealed.	Terminal and base, as well as the base and casing, are sealed.
Automatic flux application	Good	Good
Automatic soldering	Good	Good
Automatic cleaning	Good	Good
Manual soldering	Good	Good
Penetration of dust	Good	Good
Penetration of corrosive gas	Fair	Fair

Operation

■ Single-side Stable Relays (Standard/Non-latching)

The contacts of this simple type of relay momentarily turn ON and OFF, depending on the energized state of the coil.

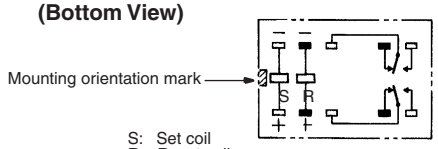
Terminal Arrangement/ Internal Connections (Bottom View)



■ Dual Coil, Latching Relays

This latching relay has two coils: set and reset. It can retain the ON or OFF states even when a pulsating voltage is supplied, or when the voltage is removed.

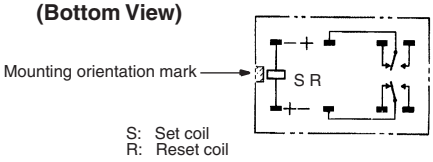
Terminal Arrangement/ Internal Connections (Bottom View)



■ Single Coil, Latching Relays

Unlike the dual coil latching relay, the single-winding latching relay has only one coil. This coil, however, serves as both the set and reset coils, depending on the polarity (direction) of current flow. When current flows through the coil in the forward direction, it functions as a set coil; when current flows through the coil in the reverse direction, it functions as a reset coil.

Terminal Arrangement/ Internal Connections (Bottom View)



■ Built-in Diode

A diode is built into some relays, wired in parallel with the coil to absorb the counterelectromotive force (counter emf) generated by the coil.

■ Built-in Operation Indicator

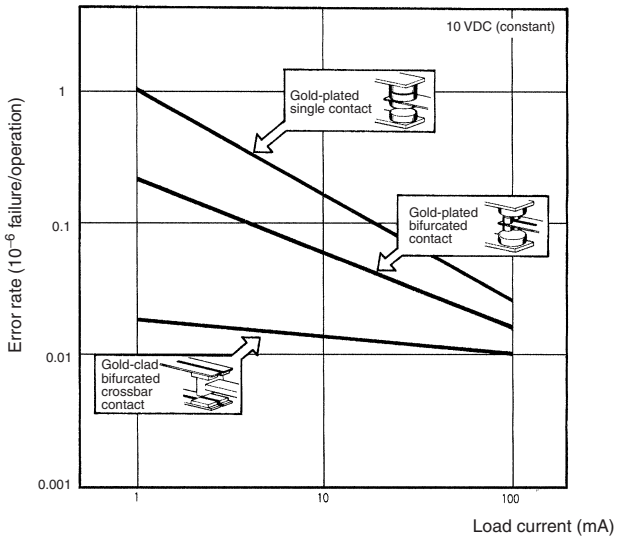
Some relays are provided with a light-emitting diode (LED), wired in parallel with the coil. This permits a fast-check of the relay's operating status.

Contact Styles

Contact ratings are generally indicated according to resistive loads and inductive loads (cosϕ = 0.4 or L/R = 7 ms). Contact shape and material are also shown to guide the customer in selection of a model suitable for the intended load and required service life.

When used at extremely low loads, the failure rate differs according to the contact material and contact method, as shown in the figure. For example, in comparing a single contact point with a bifurcated contact point, the bifurcated contact model has higher parallel redundancy and will therefore exhibit a lower failure rate.

Example



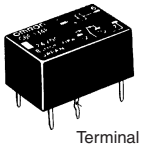
Terminals

■ Straight PCB Terminals

PCB terminals are normally straight.

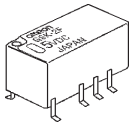
Self-clinching (S-shaped) PCB Terminals

Some relays have terminals that are bent into an “S” shape. This secures the PCB relay to the PCB prior to soldering, helping the terminals stay in their holes and keeping the relay level.

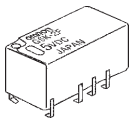


Terminal

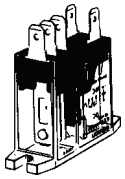
Gull-wing SMT terminal



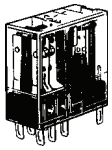
"Inside L" SMT terminal



Quick-connect terminal

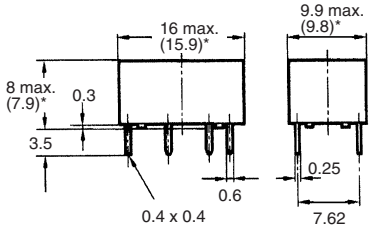


Plug-in terminal



Dimensions

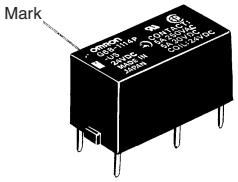
For miniature relays, the maximum dimensions and the average values ( ) marked with an asterisk are provided to aid the customer in designing.



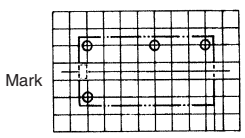
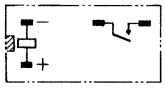
*Average value

■ Mounting Orientation Mark

On the top of all OMRON relays is a mark indicating where the relay coil is located. Knowing the coil location aids in designing PCBs when spacing components. Also, pin orientation is easy to discern when automatic or hand-mounting relays.



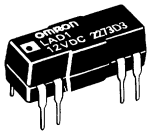
On dimensional drawings in all OMRON literature this mark is left-oriented. Mounting holes, terminal arrangements, and internal connections follow this alignment. The following two symbols are used to represent the orientation mark.

Drawing view	Bottom	Top
Detail	Mounting holes	Terminal arrangement/ internal connections
Symbol		
Example	 (Bottom view)	 (Bottom view)

■ Terminal Arrangement/Internal Connections

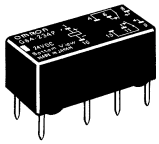
Top View

If the terminal arrangement of a relay can be seen from above the PCB, the top view of the relay is provided in the Dimensions section of the catalog or data sheet.



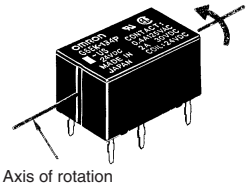
Bottom View

If the relay’s terminals cannot be seen from above the PC board, as in this example, a bottom view is shown.



Rotation Direction to Bottom View

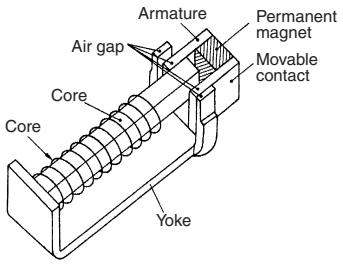
The bottom view shown in the catalog or data sheet is rotated in the direction indicated by the arrow, with the coil always on the left.



Moving Loop System

In the U.S.A., the National Association of Relay Manufactures (NARM) in April 1984, awarded OMRON for monumental advances in relay technology, as embodied in the Moving Loop System.

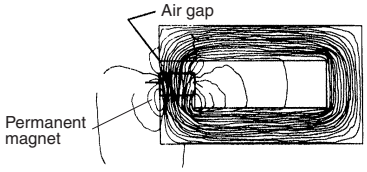
This unique relay construction maximizes electrical and permanent magnet energy. A high-efficiency magnet adds to the magnetic flux of the relay coil, which also allows for tighter packing of relay parts. Relays having such a coil are known as “polarized relays.” Details of construction are shown below.



The moving loop design has similarities with polarized relays; however, the following two features make for a large performance distinction.

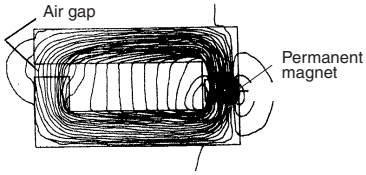
A permanent magnet is placed in the vicinity of the “working gaps.” The flux energy of this permanent magnet complements that of the electrical coil. This increased efficiency enables the mechanism holding the contacts closed to ultimately switch larger loads, and at the same time reduces the power consumed by the coil.

The following diagram shows concentric lines of magnetic flux when the permanent magnet is placed near the working gap.



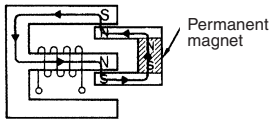
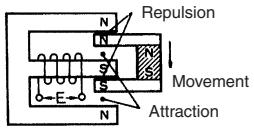
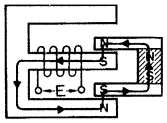
Conventional Relay Coil

The following diagram shows the lines of magnetic flux when the permanent magnet is placed away from the working gap. These lines of flux detract from the total strength of the coil.



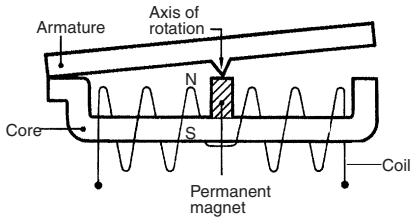
When the switching voltage is removed from the coil, the collapse of the magnetic flux created by the permanent magnet and the electrical coil provides the force to return the relay contacts to the reset position. Note the flux path and magnet polarity in the illustration overleaf.

Operating Principle, Moving Loop

Release	
Transition from release to operation (operating voltage supplied)	
Operation	

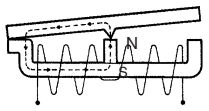
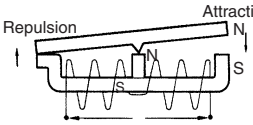
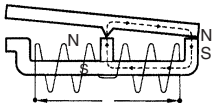
Super Moving Loop System

A very small high-sensitivity magnetic circuit is incorporated to further minimize the conventional moving loop system.



This magnetic circuit has the following features:

- High-efficiency polarized magnetic circuit utilizes power of both attraction and repulsion.
- Balanced armature system improves resistance to both vibration and impacts.
- Ideal mechanism for a low-profile relay.

Release	 Released status is maintained by per manent magnet.
Transition from release to operation (operating voltage supplied)	 The armature see saws due to the at traction and repul sion torque exerted on the armature by the coil voltage and the permanent magnet.
Operation	 Energized status is maintained by the coil voltage and permanent magnet.

Note: The above applies to a latching relay.

Glossary

■ Terms Related to Contacts

Carry Current

The value of the current which can be continuously applied to the relay contacts without opening or closing them, and which allows the relay to stay within the permissible temperature rise.

Maximum Switching Current

A current which serves as a reference in determining the performance of the relay contacts. This value will never exceed the current flow. When using a relay, do not exceed this value.

Contact Form

OMRON uses the following relay terminology for the various polarity and switch configurations.

1 FORM A: SPST-NO

1 FORM B: SPST-NC

1 FORM C: SPDT

2 FORM C: DPDT

Contact symbols

NO	NC	DT
		
Double-break		NC
		
Make-before-break		Latching relays
		

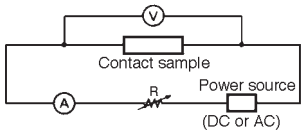
Make-before-break (MBB) Contact

A contact arrangement in which part of the switching section is shared between both an NO and NC contact. When the relay operates or releases, the contact that closes the circuit operates before the contact that opens the circuit releases. Thus both contacts are closed momentarily at the same time.

Contact Resistance

The total resistance of the conductor, as well as specific resistivities such as of the armature and terminal, and the resistance of the contacts. Contact resistance values given in this catalog are initial values. These values are not intended to indicate suitability or unsuitability in actual use. The contact resistance values given are measurement values for a stable contact circuit at a stable contact resistance. This value is determined by measuring the voltage drop across the contacts by applying test currents as shown in the table below.

Rated current (A)	Test current (mA)
Under 0.01	1
0.01 to 0.1	10
0.1 to 1	100
Over 1	1000



A: Ammeter V: Voltmeter R: Variable resistor

For most applications, use at least 1 A, 5 VDC for contact resistance measurements.

Maximum Switching Capacity

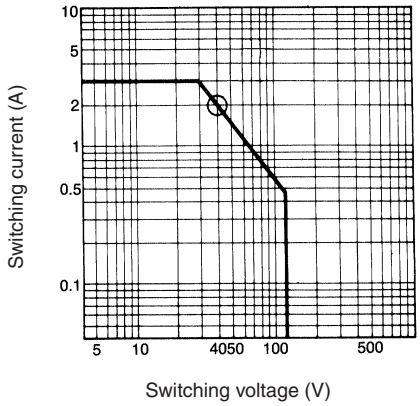
The maximum value of the load capacity which can be switched without problem. When using a relay, do not exceed this value.

For example, when maximum switching voltage V_1 is known, maximum switching current I_1 can be obtained at the point of intersection on the characteristic curve “Maximum Switching Capacity” shown below. Conversely, maximum switching voltage V_1 can be obtained if I_1 is known.

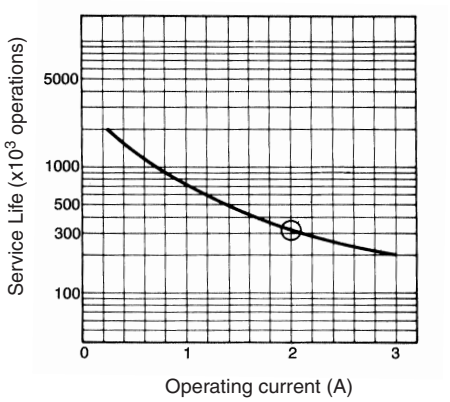
$$\text{Maximum switching current } (I_1) = \frac{\text{Max. switching power [W(VA)]}}{\text{Max. switching voltage (V1)}}$$

$$\text{Maximum switching voltage } (V_1) = \frac{\text{Max. switching power [W(VA)]}}{\text{Max. switching current (I1)}}$$

For instance, if the maximum switching voltage = 40 V
Maximum switching current = 2 A (see circled point on graph below.)

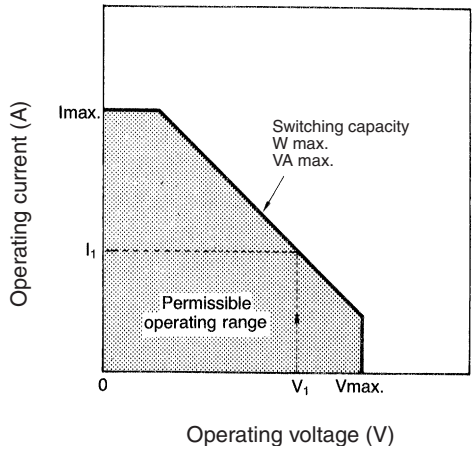


The life expectancy of the relay can be determined from the electrical service life curve shown below, based on the rated switching current (I_1) obtained above. For instance, the electrical service life at the obtained maximum switching current of 2 A is slightly over 300,000 operations (see circled point on graph below).



However, with a DC load, it may become difficult to break the circuit of 48 V or more due to arcing. Determine the suitability of the relay in actual usage testing.

The correlation between the contact ratings is shown in the following figure:



Minimum Permissible Load

The minimum permissible load indicates the lower limit of switching capability of a relay as the reference value. Such minute load levels are found in microelectronic circuits. This value may vary, depending on operating frequency, operating conditions, expected reliability level of the relay, etc. It is always recommended to double-check relay suitability under actual load conditions.

In Omron catalogs, the minimum permissible load of each relay is indicated as a reference value. It indicates failure level at a reliability level of 60% (λ_{60}). λ_{60}=0.1x 10^{-6}/operation means that one failure is presumed to occur per 10,000,000 (ten million) operations at a reliability level of 60%.

Number of Poles

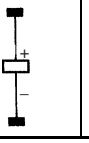
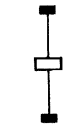
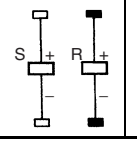
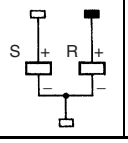
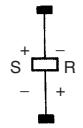
The number of contact circuits. See *Contact Form* for reference.

■ Terms Related to Coils

Rated Coil Voltage

A reference voltage applied to the coil when the relay is used under normal operating conditions.

Coil Symbols

Single-sided stable (Non-latching)		Dual Coil Latching		Single Coil Latching
Polarized	Non-polarized	w/4 terminals	w/3 terminals	
				

Coil Resistance (Applicable to DC-switching Relays only)

The resistance of the coil is measured at a temperature of 23°C with a tolerance of ±10% unless otherwise specified. (The coil resistance of an AC-switching type relay may be given for reference when the coil inductance is specified.)

Cold Start

The ratings set forth in the catalog or data sheet are measured at a coil temperature of 23°C unless otherwise specified.

Maximum Voltage

The maximum value of permissible over voltage or pulsating voltage fluctuations in the operating power supply to the relay coil.

Minimum Pulse Width

The minimum value of the pulse voltage required to set and reset a latching relay at a temperature of 23°C.

Must Operate (Must Set) Voltage

The threshold value of a voltage at which a relay operates when the input voltage applied to the relay coil in the reset state is increased gradually.

Must Release (Must Reset) Voltage

The threshold value of a voltage at which a relay releases when the rated input voltage applied to the relay coil in the operating state is decreased gradually.

Power Consumption

The power (= rated voltage x rated current) consumed by the coil when the rated voltage is applied to it. A frequency of 60 Hz is assumed if the relay is intended for AC operation. The current flows through the coil when the rated voltage is applied to the coil at a temperature of 23°C. The tolerance is +15%/-20% unless otherwise specified.

■ Terms Related to Electrical Characteristics

Dielectric Strength

The critical value which a dielectric can withstand without rupturing when a high-tension voltage is applied for 1 minute between the following points:

- Between coil and contact
- Between contacts of different poles
- Between contacts of same poles
- Between set coil and reset coil
- Between current-carrying metal parts and ground terminal

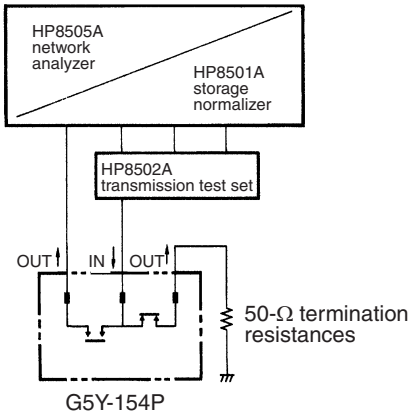
Note that normally a leakage current of 3 mA is detected; however, a leakage current of 1 mA to 10 mA may be detected on occasion.

Electrical Service Life

The life of a relay when it is switched at the rated operating frequency with the rated load applied to its contacts. Also known as Electrical Endurance.

High-frequency Isolation (Applicable to High-frequency Relay only)

The degree of isolation of a high-frequency signal, which is equivalent to the insulation resistance of ordinary relays.



The following characteristics are measured with contacts unrelated to the measurement terminated at 50Ω, when a signal is applied from input terminal 11 to output terminal 8 or from input terminal 11 to output terminal 14 of the sample.

- Isolation characteristics
- Insertion loss characteristics
- Return loss

The following conversion formula converts from return loss to VSWR.

$$VSWR = \frac{1 + 10^{-\frac{x}{20}}}{1 - 10^{-\frac{x}{20}}}$$

where,
x = return loss

High-frequency Switching Power (Applicable to High-frequency Relays Only)

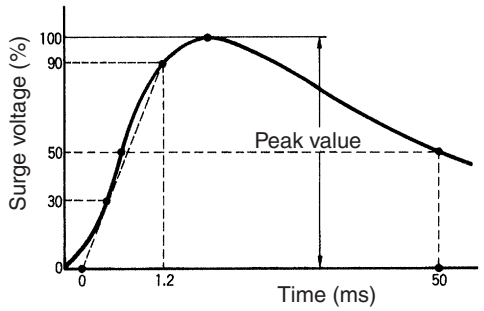
The power of a high-frequency signal that can be switched.

High-frequency Transmitted Power (Applicable to High-frequency Relays Only)

The transmission capacity of a high-frequency signal.

Impulse Withstand Voltage

The critical value which the relay can withstand when the voltage surges momentarily due to lightning, switching an inductive load, etc. The surge waveform which has a pulse width of ±1.2 x 50 μs is shown below:



Insertion Loss (Applicable to High-frequency Relays Only)

The attenuation of a high-frequency signal in a transmission line and is equivalent to the contact resistance of ordinary relays.

Insulation Resistance

The resistance between an electric circuit such as the contacts and coil, and grounded, non-conductive metal parts such as the core, or the resistance between the contacts. The measured values are as follows:

Rated insulation voltage	Measured value
60 V max.	250 V
61 V min.	500 V

Maximum Operating Frequency

The frequency or intervals at which the relay continuously operates and releases, satisfying the rated mechanical and electrical service life.

Mechanical Service Life

The life of a relay when it is switched at the rated operating frequency without the rated load. Also known as Mechanical Endurance.

Operate Bounce Time

The bounce time of the normally open (NO) contact of a relay when the rated coil voltage is applied to the relay coil at an ambient temperature of 23°C.

Operate Time

The time that elapses after power is applied to a relay coil until the NO contacts have closed, at an ambient temperature of 23°C. Bounce time is not included. For the relays having an operate time of less than 10 ms, the mean (reference) value of its operate time is specified as follows:

Operate time	5 ms max. (mean value: approx. 2.3 ms)

Release Bounce Time

The bounce time of the normally closed (NC) contact of a relay when the coil is de-energized at an ambient temperature of 23°C.

Release Time

The time that elapses between the moment a relay coil is de-energized until the NC contacts have closed, at an ambient temperature of 23°C. (With a relay having SPST-NO or DPST-NO contacts, this is the time that elapses until the NO contacts have operated under the same condition.) Bounce time is not included. For the relays having an operate time of less than 10 ms, the mean (reference) value of its operate time is specified as follows:

Release time	5 ms max. (mean value: approx. 2.3 ms)

Reset Time (Applicable to Latching Relays Only)

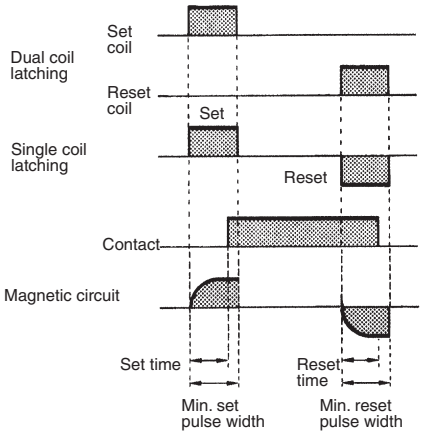
The time that elapses from the moment a relay coil is de-energized until the NC contacts have closed, at an ambient temperature of 23°C. (With a relay having SPST-NO contacts, this is the time that elapses until the NO contacts have operated under the same condition.) Bounce time is not included. For the relays having a reset time of less than 10 ms, the mean (reference) value of its reset time is specified as follows:

Reset time	5 ms max. (mean value: approx. 2.3 ms)

Set Time

The time that elapses after power is applied to a relay coil until the NO contacts have closed, at an ambient temperature of 23°C. Bounce time is not included. For the relays having a set time of less than 10 ms, the mean (reference) value of its set time is specified as follows:

Reset time	5 ms max. (mean value: approx. 2.3 ms)



Shock Resistance

The shock resistance of a relay is divided into two categories: “Mechanical Durability” (“Destruction”) which quantifies the characteristic change of, or damage to, the relay due to considerably large shocks which may develop during the transportation or mounting of the relay, and “Malfunction Durability” which quantifies the malfunction of the relay while it is in operation.

Stray Capacitance

The capacitance measured between terminals at an ambient temperature of 23°C and a frequency of 1 kHz.

VSWR (Applicable to High-frequency Relays Only)

Stands for voltage standing-wave ratio. The degree of reflected wave that is generated in the transmission line.

Vibration Resistance

The vibration resistance of a relay is divided into two categories: “Mechanical Durability” (“Destruction”) which quantifies the characteristic changes of, or damage to, the relay due to considerably large vibrations which may develop during the transportation or mounting of the relay, and “Malfunction Durability” which quantifies the malfunction of the relay due to vibrations while it is in operation.

$a = 0.002f^2A$

where,

a: Acceleration of vibration (G-force equivalence)

f: Frequency (Hz)

A: Double amplitude

Precautions

■ Basic Information

Before actually committing any component to a mass-production situation, OMRON strongly recommends situational testing, in as close to actual production situations as possible. One reason is to confirm that the product will still perform as expected after surviving the many handling and mounting processes that are involved in mass production. Also, even though OMRON relays are individually tested a number of times, and each meets strict requirements, a certain testing tolerance is permissible. When a high-precision product uses many components, each depends upon the rated performance thresholds of the other components. Thus, the overall performance tolerance may accumulate into undesirable levels. To avoid problems, always conduct tests under the actual application conditions.

General

To maintain the initial characteristics of a relay, exercise care that it is not dropped or mishandled. For the same reason, do not remove the case of the relay; otherwise, the characteristics may degrade. Avoid using the relay in an atmosphere containing chemicals such as sulfuric acid (SO_2), hydrogen sulfide (H_2S), or other corrosive gases. Do not continuously apply a voltage higher than the rated maximum voltage to the relay. Never try to operate the relay at a voltage and a current other than those rated.

If the relay is intended for DC operation, the coil may have a polarity. Pay particular attention to this polarity. Connect the power source to the coil in the correct direction. Do not use the relay at temperatures higher than that specified in the catalog or data sheet.

The storage for the relay should be in room temperature and humidity.

Coil

AC-switching Relays

Generally, the coil temperature of the AC-switching relay rises higher than that of the DC-switching relay. This is because of resistance losses in the shading coil, eddy current losses in the magnetic circuit, and hysteresis losses. Moreover, a phenomenon known as “chatter” may take place when the AC-switching relay operates on a voltage lower than that rated. For example, chatter may occur if the relay’s supply voltage drops. This often happens when a motor (which is to be controlled by the relay) is activated. This results in damage to the relay contacts by burning, contact weld, or disconnection of the self-holding circuit. Therefore, countermeasures must be taken to prevent fluctuation in the supply voltage.

One other point that requires attention is the “inrush current.” When the relay operates, and the armature of the relay is released from the magnet, the impedance drops. As a result, a current much higher than that rated flows through the coil. This current is known as the inrush current. (When the armature is attracted to the magnet, however, the impedance rises, decreasing the inrush current to the rated level.) Adequate consideration must be given to the inrush current, along with the power consumption, especially when connecting several relays in parallel.

DC-switching Relays

This type of relay is often used as a so-called “marginal” relay that turns ON or OFF when the voltage or current reaches a critical value, as a substitute for a meter. However, if the relay is used in this way, its control output may fail to satisfy the ratings because the current applied to the coil gradually increases or decreases, slowing down the speed at which the contacts move. The coil resistance of the DC-switching relay changes by about 0.4% per degree C change in the ambient temperature. It also changes when the relay generates heat. This means that the pickup and dropout voltages may increase as the temperature rises.

Coil Operating Voltage Source

If the supply voltage fluctuates, the relay will malfunction regardless of whether the fluctuation lasts for a long time or only for a moment.

For example, assume that a large-capacity solenoid, relay, motor, or heater is connected to the same power source as the relay, or that many relays are used at the same time. If the capacity of the power source is insufficient to operate these devices at the same time, the relay may not operate, because the supply voltage has dropped. Conversely, if a high voltage is applied to the relay (even after taking voltage drop into account), chances are that the full voltage will be applied to the relay. As a consequence, the relay’s coil will generate heat. Therefore, be sure 1) to use a power source with sufficient capacity and 2) that the supply voltage to the relay is within the rated must operate voltage range of the relay.

Lower Limit Pickup Voltage

When a relay is used at high temperatures, or when the relay coil is continuously energized, the coil temperature rises and coil resistance increases. Consequently, the pickup voltage increases. This increase in the pickup voltage requires attention when determining the lower-limit pickup value of the pickup voltage. An example and outline for determining this lower-limit pickup voltage is given below for reference when designing a power source appropriate for the relay.

Assuming a coil temperature rise of 10°C, the coil resistance will increase about 4%. The pickup voltage increases as follows:

Rated values of Model G5LE are taken from catalog or data sheet.

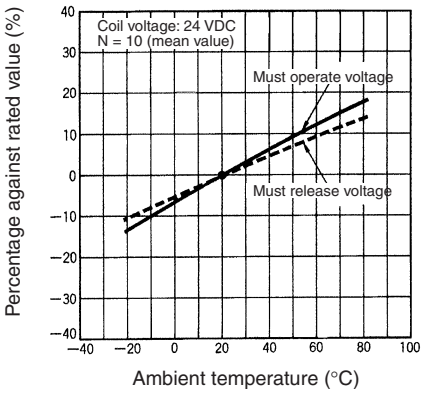
Rated voltage: 12 VDC
Coil resistance: 360Ω
Pickup voltage: 75% max. of rated voltage at 23°C coil temperature

The rated current that flows through this relay can be obtained by dividing the rated voltage by the coil resistance. Hence,

12 VDC ÷ 360Ω = 33.3 mA

However, the relay operates at 75% maximum of this rated current, i.e., 25mA (= 33 mA x 0.75). Assuming that the coil temperature rises by 10°C, the coil resistance increases 4% to 374Ω (= 360Ω x 1.04). The voltage that must be applied to the relay to flow an operating current of 25 mA through the relay under this condition is 25 mA x 374Ω = 9.35 V.

Coil Temperature vs.
Must Operate/release Voltage



The minimum must operate voltage can be determined by this expression.

$$E_T > E \times \frac{Epv + 5}{100} \times \left(\frac{T - Ta}{234.5 + Ta} + 1 \right) [V]$$

where,

E (V): Rated coil voltage
Epv (%): Must operate voltage
Ta: Coil temperature for determining Epv (20°C, unless otherwise specified)
T (°C): Ambient operating temperature
ET (V): Minimum must operate voltage

Note: In the above expression, T is taken to be the result of energization of the coil, when the coil temperature is the same as the ambient temperature.

■ Coil Input

To guarantee accurate and stable relay operation, the first and foremost condition to be satisfied is the application of the rated voltage to the relay. Additionally, details concerning the type of the power source, voltage fluctuation, changes in coil resistance due to temperature rise and the rated voltage must also be considered. If a voltage higher than the rated maximum voltage is applied to the coil for a long time, layer short-circuiting and damage to the coil by burning may take place.

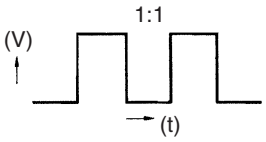
Coil Temperature Rise

When a current flows through the coil, the coil's temperature rises to a measurable level, because of copper loss. If an alternating current flows, the temperature rises even more, due not only to the copper loss, but additionally to the iron loss of the magnetic materials, such as the core. Moreover, when a current is applied to the contact, heat is generated on the contacts, raising the coil temperature even higher (however, with relays whose switching current is rated at 2 A or lower, this rise is insignificant).

Temperature Rise by Pulsating Voltage

When a pulsating voltage having an ON time of less than 2 minutes is applied to the relay, the coil temperature rise varies, and is independent of the duration of the ON time, depending only on the ratio of the ON time to the OFF time. The coil temperature in this case does not rise as high as when a voltage is continuously applied to the relay.

Energization time	Release temperature rise
Continuous energization	100%
ON:OFF = 3:1 approx.	80%
ON:OFF = 1:1 approx.	50%
ON:OFF = 1:3 approx.	35%



Changes in Must Operate Voltage by Coil Temperature Rise (Hot Start)

The coil resistance of a DC-switching relay increases (as the coil temperature rises) when the coil has been continuously energized, de-energized once, and then immediately energized again. This increase in the coil resistance raises the voltage value at which the relay operates. Additionally, the coil resistance rises when the relay is used at a high ambient temperature.

Maximum Must Operate Voltage

The maximum voltage applicable to a relay is determined in accordance with the coil temperature rise and the coil insulation materials' heat resistivity, electrical as well as mechanical life, general characteristics, and other factors.

If a voltage exceeding the maximum voltage is applied to the relay, it may cause the insulation materials to degrade, the coil to be burnt, and the relay to malfunction at normal levels.

The coil temperature must not exceed the temperature that the coil can withstand.

How to Calculate Coil Temperature

$$t = \frac{R2 - R1}{R1}(234.5+T1) + T1\ [°C]$$

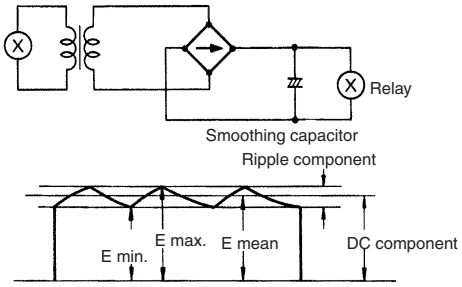
where,

R1 Ω:	coil resistance before energization
R2 Ω:	coil resistance after energization
T1 (°C):	coil temperature (ambient) before energization
t (°C):	coil temperature after energization

Before using the relay confirm no problems occur.

DC Input Power Source

Pay attention to the coil polarity of the DC-switching relay. Power sources for DC-operated relays are usually a battery or a DC power supply, **either with a maximum ripple of 5%**. If power is supplied to the relay via a rectifier, the pickup and dropout voltages vary with the ripple percentage. Therefore, check the voltages before actually using the relay. If the ripple component is extremely large, chatter may occur. If this happens, it is recommended that a smoothing capacitor be inserted as shown in the following diagram.



$$Ripple\ percentage = \frac{Emax. - Emin.}{Emean} \times 100$$

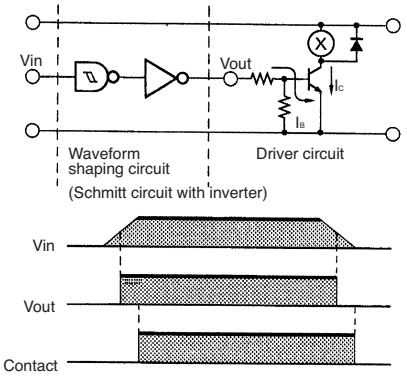
where,
E max.: maximum value of ripple component
E min.: minimum value of ripple component
E mean: mean value of DC component

The use of a regulated, filtered power supply is preferred for DC coils.

If the voltage applied to the DC-operated coil increases or decreases slowly, each contact of a multi-pole contact relay may not operate at the same time. It is also possible for this situation to result in the must operate voltage varying each time the relay operates. Either way, circuit sequencing will not be correct. In critical applications, the use of a Schmitt circuit is recommended to reshape the DC waveform to trigger all contacts of the relay at the same time.

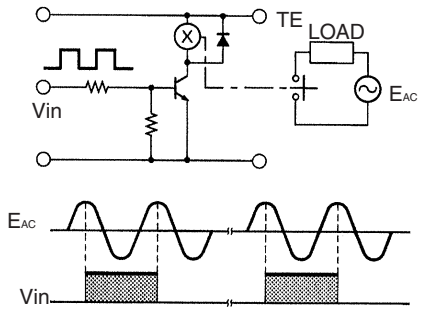
Relay Driving Signal Waveform

A long rise time and/or fall time of the signal driving the relay may prolong the operate time and/or release time of the relay. This situation may shorten the life expectancy of the contacts. If this situation cannot be avoided, providing a Schmitt trigger circuit at the circuit stage preceding the relay circuit will shape a waveform with sharp transitions, as shown in the following diagram:



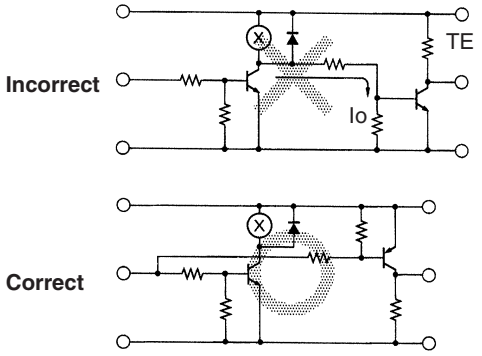
If the Schmitt trigger circuit is configured of transistors, a residual voltage may exist in the output of the circuit. Therefore, confirm that the rated voltage is present across the relay coil, or that the residual voltage drops to zero when the relay releases.

Cyclic Switching of AC Load



If the relay operates in synchronization with the supply voltage, the life of the relay may be shortened. When designing the control system in which the relay is used, estimate the life of the relay and thus the reliability of the overall system under actual operating conditions. Moreover, construct the circuit so that the relay operates in a random phase or in the vicinity of the zero point.

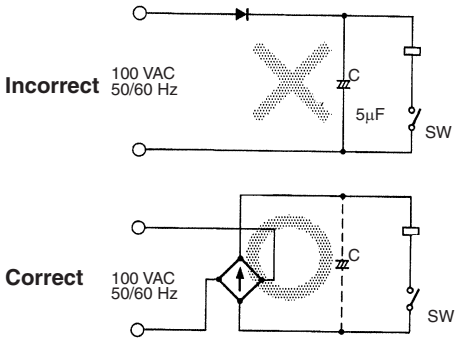
Dark Current in OFF Time



A circuit that produces a control output as soon as the relay operates must be carefully designed. In the first example, electrode dark current flows as shown when the relay operates. When dark current flows into the relay coil, the relay's resistivity to shock and vibration may degrade.

Overcoming Chatter in DC Relays

Use a full wave rectified signal that is filtered and regulated to control the coil of a DC relay. Ensure that the maximum ripple is 5%.

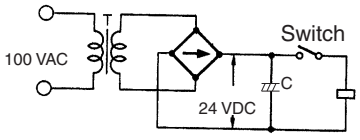


Voltage Considerations for AC Relays

The voltage applied to the relay must be a sine wave. When a commercial power source is used, there should be no problem. However, if an AC stabilized power source is used, either chatter or abnormal heating may occur, depending on the wave distortion of the power source. A shading coil is used to suppress beat (chatter) in an AC current coil, but wave distortion defeats this function.

When a motor, solenoid, transformer, or other device is connected to the same power line source as the relay controller, and any of these devices causes a drop in the line voltage, the relay may chatter, damaging the contact. This commonly occurs when a small transformer is added to the line, when the transformer is too small, when long wiring is used, or when thin wiring is used in the customer's premises. Be aware of this phenomenon, as well as normal voltage fluctuations. Should this problem occur, check the change in voltage with a synchroscope or the like, and take appropriate countermeasures. Effective countermeasures include replacing the relay with a special relay suited to the circumstances, or use of a DC circuit and inclusion of a capacitor to compensate for the voltage change, as shown in the following circuit diagram.

Voltage change compensation circuit incorporating a capacitor



■ Contacts

The contacts are the most important constituent of a relay. Their characteristics are significantly affected by factors such as the material of the contacts, voltage and current values applied to them (especially, the voltage and current waveforms when energizing and de-energizing the contacts), the type of load, operating frequency, atmosphere, contact arrangement, and bounce. If any of these factors fail to satisfy predetermined values, problems such as metal deposition between contacts, contact welding, wear, or rapid increase in the contact resistance may occur.

Switching voltage (AC, DC)

When a relay breaks an inductive load, a fairly high counterelectromotive force (counter emf) is generated in the relay's contact circuit. The higher the counter emf, the greater the damage to the contacts. This may result in a significant decrease in the switching capacity of DC-switching relays. This is because, unlike the AC-switching relay, the DC-switching relay does not have a zero-cross point. Once arc has been generated, it does not easily diminish, prolonging the arc time. Moreover, the unidirectional flow of the current in a DC circuit may cause metal degradation to occur between contacts and the contacts to wear rapidly (this is discussed later).

Despite the information a catalog or data sheet sets forth as the approximate switching power of the relay, always confirm the actual switching power by performing a test with the actual load.

Switching Current

The quantity of electrical current which flows through the contact directly influences the contact' characteristics. For example, when the relay is used to control an inductive load such as a motor or a lamp, the contacts will wear faster, and metal decomposition between the mating contacts will occur more often as the inrush current to the contacts increases. Consequently, at some point the contacts may weld.

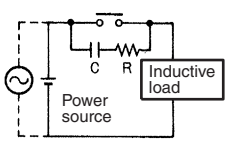
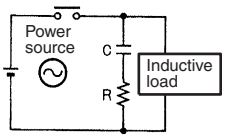
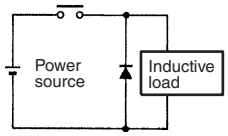
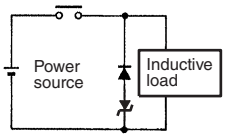
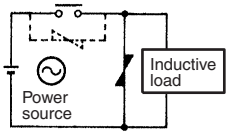
Contact Materials

Selection of an appropriate contact material according to the load to be opened or closed is important. Several contact materials and their properties are listed below.

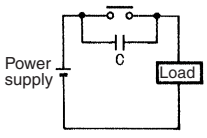
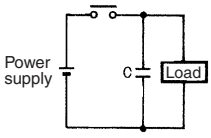
Examples of Contact Materials	
P. G. S. Alloy	This material has excellent corrosion resistance and is suitable for very small current circuits. (Au : Ag : Pt = 69 : 25 : 6)
AgPd	This material exhibits good corrosion and sulphur resistance. In a dry circuit, it attracts organic gas to generate a polymer, therefore it is usually plated with gold or other material.
Ag	This material has the highest electric and heat conductivities among all metals. It exhibits low contact resistance, but easily forms sulfide film in a sulfide gas environment. This may result in defective contact performance at a low-voltage small-current operation.
AgNi	This material exhibits the same high electric conductivity as silver and excellent arc resistance.
AgSnIn	This material exhibits excellent deposition resistance and exhaustion resistance.
$AgSnO_2$	This material exhibits excellent deposition resistance. It easily forms sulfide film in a sulfide gas environment, same as Ag contact material
AgW	This material exhibits a high hardness and melting point. It also exhibits excellent arc resistance and superior resistance to deposition and transfer. However, it shows high contact resistance and inferior environmental resistance.

Contact Protection Circuit

A contact protection circuit, designed to prolong the life of the relay, is recommended. This protection will have the additional advantages of suppressing noise, as well as preventing the generation of carbide and nitric acid, which otherwise would be generated at the contact surface when the relay contact is opened. However, unless designed correctly, the protection circuit may produce adverse effects, such as prolonging the release time of the relay. The following table lists examples of contact protection circuits.

Circuit example		Applicability		Features and remarks	Element selection
		AC	DC		
CR		Fair	Good	Load impedance must be much smaller than the RC circuit when the relay operates on an AC voltage.	Optimum C and R values are: C: 1 to 0.5 μF for 1–A switching current R: 0.5 to 1Ω for 1–V switching voltage These values do not always agree with the optimum values due to the nature of the load and the dispersion in the relay characteristics. Confirm optimum values experimentally. Capacitor C suppresses discharge when the contacts are opened, while resistor R limits the current applied when the contacts are closed the next time. Generally, employ a capacitor C whose dielectric strength is 200 to 300 V, or more than double the switching voltage. If the circuit is powered by an AC power source, employ an AC capacitor (non-polarized).
		Good	Good	This circuit is effective if connected across the load when the supply voltage is 24 to 48 V. When the supply voltage is 100 to 240 V, connect the circuit across the contacts.	
Diode		N/A	Good	The diode protects the coil and driver circuit from inductive kickback. Relays with a diode connected in parallel with the relay coil tend to experience increased release times.	Employ a diode having a reverse breakdown voltage of more than 10 times the circuit voltage and a forward current rating greater than the load current. A diode having a reverse breakdown voltage two to three times that of the supply voltage can be used in an electronic circuit where the circuit voltage is not particularly high.
Diode + Zener Diode		N/A	Good	This circuit effectively shortens release time in applications where the release time of a diode protection circuit proves to be too slow.	The zener diode breakdown voltage should be about the same as the supply voltage.
Varistor		Good	Good	By utilizing the constant-voltage characteristic of a varistor, this circuit prevents high voltages from being applied across the contacts. This circuit also somewhat delays the release time. This circuit, if connected across the load, is effective when the supply voltage is 24 to 48 V. If the supply voltage is 100 to 240 V, connect the circuit across the contacts.	—

Avoid use of a surge suppressor in the manner shown below.

	
This circuit arrangement is very effective for diminishing sparking (arcing) at the contacts, when breaking the circuit. However, since electrical energy is stored in C (capacitor) when the contacts are open, the current from C flows into the contacts when they close. Therefore, metal degradation is likely to occur between mating contacts due to capacitive current inrush.	This circuit arrangement is very useful for diminishing sparking (arcing) at the contacts when breaking the circuit. However, since the charging current to C flows into the contacts when they are closed, metal degradation is likely to occur between the mating contacts due to capacitive current inrush.

Although it is considered that switching a DC inductive load is more difficult than a resistive load, an appropriate contact protection circuit can achieve almost the same characteristics.

■ Latching Relays

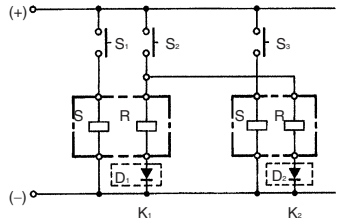
- Avoid use in locations subject to excessive magnetic particles or dust.
- Avoid use in magnetic fields (over 8,000 A•m).
- Take measures to preventing problems caused by vibration or shock. Problems may originate from other relay(s) operating or releasing on the same panel.
- Avoid simultaneous energization of the set and reset coils, even though both coils can be continuously energized.
- Avoid use under conditions where excessive surge-generating sources exist in the coil power source.
- When planning to mount multiple relays side-by-side, observe the minimum mounting interval of each type of relay.

Drive Circuit (Dual Coil Latching Relays G5AK, G6AK, G6BK, etc.)

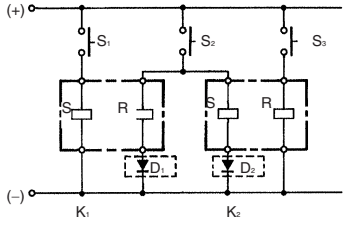
When a DC-switching latching relay is used in one of the circuits shown in the following diagram, the relay contacts may be released from the locked state unless a diode (enclosed in the dotted box in the circuit diagram) is connected to the circuit.

Circuits

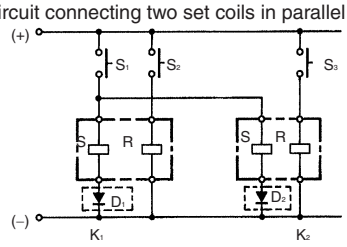
Circuit connecting two reset coils in parallel.



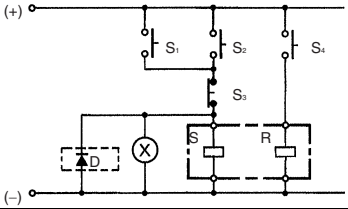
Circuit connecting set coil to reset coil.



Circuit connecting two set coils in parallel



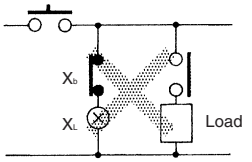
Circuit connecting set coil of latching relay in parallel with another relay coil.



When connecting a diode to the relay circuit, be sure to use a diode with a repetitive peak-inverse voltage, and a DC reverse voltage sufficient to withstand external noise or surge. Also be sure that the diode has an average rectified current greater than the coil current.

If the contact of the relay is used to de-energize the relay, the relay may not operate normally. Avoid using the relay in a circuit like the one shown below:

Incorrect Use:



X_L: Latching relay
X_b: NC contact of relay

PCB Design

■ Soldering

As demands for more compact electronic devices have grown, so have demands declined for the plug-in relays that requires a bulky socket for connection. This trend has lead to the development of relays that can be soldered directly onto the PCB. Smaller relays have made possible great density increases on the PCB, which in turn reduces the size of the product or device. However, unless the relay is fully sealed, when soldered onto a PCB, flux may penetrate into the housing, adversely affecting the internal circuitry.

The following points will help when designing a product which uses relays. This section points out details to be noted when soldering a relay to a PCB.

■ PCB Selection

In general, relays are directly mounted and soldered onto a PCB. Although seemingly an uninvolved process, soldering and its related processes of flux application, relay mounting, heat application, and washing can be detrimental to a relay's performance. For example, if the PCB were to warp, the internal mechanism of the relay could become distorted, degrading the performance characteristics. Thus it could be said that the relay's characteristics are also affected by the size, thickness, and material of the PCB. Therefore, carefully select a PCB that will not jeopardize the performance of the relay.

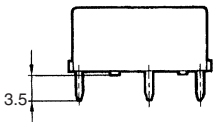
■ PCB Materials

Generally, the substrate of a PCB is made of glass epoxy (GE), paper epoxy (PE), or paper phenol (PP). Of these, the glass-epoxy or paper-epoxy PCB is recommended for mounting relays. See the following table

Item	Epoxy Based		Phenol-based
	Glass Epoxy (GE)	Paper Epoxy (PE)	Paper Phenol (PP)
Electrical characteristics	High insulation resistance. Insulation resistance hardly affected by humidity.	Fair	Insulation resistance degraded by humidity.
Mechanical characteristics	Little expansions/shrinkage caused by change in temperature or humidity. Suitable for through-hole PCBs and multi-layered PCBs.	Fair	Much expansion/shrinkage caused by changes in temperature or humidity. Not suitable for through-hole PCB.
Cost Effectiveness	Expensive	Fair	Fair

■ PCB Thickness

PCBs having a thickness of 0.8, 1.2, 1.6, or 2.0 mm are generally used. A PCB that is 1.6 mm thick is best for mounting a PCB relay, considering the weight of the relay and the length of the terminals. (The terminal length of OMRON relays is 3, 3.5, or 4.0 to 5.0 mm.)



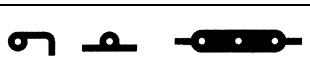
■ Terminal Hole Diameter and Land Diameter

Select the appropriate terminal hole and land diameters from the following table, based on the PCB mounting hole drawing. Land diameters may be reduced to less than those listed below if the through-hole connection process is to be employed.

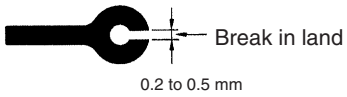
Terminal Hole and Land Diameters		
Terminal Hole Diameter		Minimum Land Diameter
Normal	Tolerance	
0.6 mm	±0.1 mm	1.5 mm
0.8 mm		1.8mm
1.0 mm		2.0mm
1.2 mm		2.5mm
1.3 mm		2.5mm
1.5 mm		3.0mm
1.6 mm		3.0mm
2.0 mm		3.0mm

■ Shape of Lands

The land section should be on the center line of the copper-foil pattern, so that the soldered fillets become uniform.

Correct	
Incorrect	

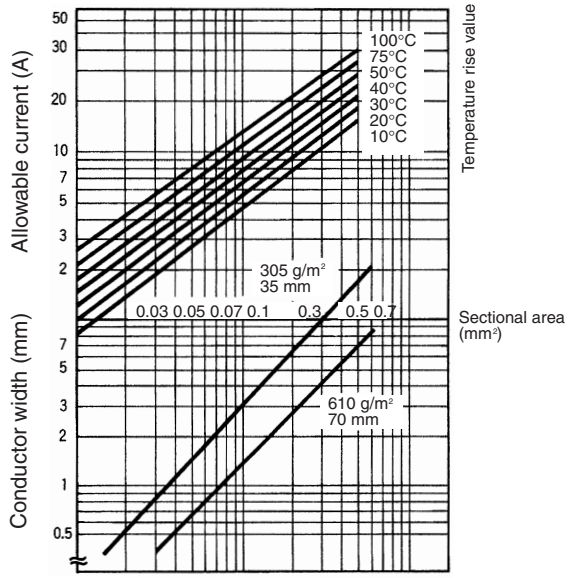
A break in the circular land area will prevent molten solder from filling holes reserved for components which must be soldered manually after the automatic soldering of the PCB is complete.



■ Conductor Width and Thickness

The following thickness of copper foil are standard: 35 μm and 70 μm. The conductor width is determined by the current flow and allowable temperature rise. Refer to the chart below.

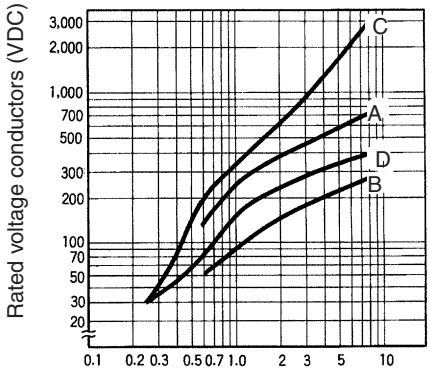
Conductor Width and Carry Current
(according to IEC Pub326-3)



■ Conductor Pitch

The conductor pitch on a PCB is determined according to the insulation resistance between conductors and the environmental conditions under which the PCB is to be placed. The following graph shows the general relationship between the voltage between conductors and the conductor pitch on a PCB. However, if the PCB must conform to safety organization standards (such as UL, CSA, VDE, etc.), priority must be given to fulfilling their requirements.

Voltage between Conductors vs. Conductor Pitch



A = w/o coating at altitude of 3,000 m max.
B = w/o coating at altitude of 3,000 m or higher but lower than 15,000 m
C = w/coating at altitude of 3,000 m max.
D = w/coating at altitude of 3,000 m or higher

■ Temperature and Humidity

PCBs expand or contract with changes in temperature. Should expansion occur with a relay mounted on the PCB, the internal components of the relay may be shifted out of operational tolerance. As a result, the relay may not be able to operate with its normal characteristics.

PCB materials have "directionality," which means that a PCB generally has expansion and contraction coefficients 1/10 to 1/2 higher in the vertical direction than in the horizontal direction. Conversely, its warp in the vertical direction is 1/10 to 1/2 less than in the horizontal direction. Therefore, take adequate counter-measures against humidity by coating the PCB. Should heat or humidity be entirely too high, the relay's physical characteristics will likewise be affected. For example, as the heat rises the PCB's insulation resistance degrades. Mechanically, PCB parts will continue to expand as heat is applied, eventually passing the elastic limit, which will permanently warp components.

Moreover, if the relay is used in an extremely humid environment, silver migration may take place.

■ Gas

Exposure to gases containing substances such as sulfuric acid, nitric acid, or ammonia can cause malfunctions such as faulty contacting in relays. They can also cause the copper film of a PCB to corrode, or prevent positive contacts between the PCB's connectors. Of the gases mentioned, nitric acid is particularly damaging as it tends to accelerate the silver migration. As a counter-measure against gas exposure damage, the following processes on the relay and PCB have proved useful.

Item	Process
Outer Casing, housing	Sealed construction by using packing, etc.
Relay	Use of simplified hermetically sealed type relay, DIP relay
PCB, Copper Film	Coating
Connector	Gold-plating, rhodium-plating process

■ Vibration and Shock

Although the PCB itself is not usually a source of vibration or shock, it may simplify or prolong the vibration by sympathetically vibrating with external vibrations or shocks. Securely fix the PCB, paying attention to the following points.

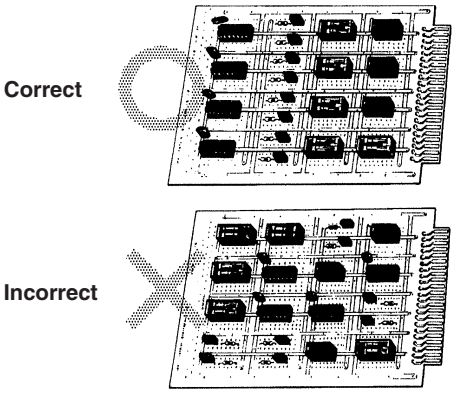
Mounting Method	Remarks
Rack Mounting	No gap between rack's guide & PCB
Screw Mounting	Securely tighten screw. Place heavy components such as relays on part of PCB near screws. Attach rubber washers to screws when mounting components that are affected by shock (such as audio devices.)

■ Mounting Position

Depending on where the relay is mounted, the function of the relay (and the performance of the circuit which includes the relay) may be adversely affected.

The relay may malfunction if it is mounted near a transformer or other device that generates a large magnetic field, or much heat. Provide an adequate distance between the relay and such devices.

Also, keep the relay away from semiconductor devices, if they are to be mounted on the same PCB.



■ Mounting Direction

To allow a relay to operate to its full capability, adequate consideration must be given to the mounting direction of the relay. Relay characteristics that are considerably influenced by mounting direction are shock resistance, life expectancy, and contact reliability.

■ Shock Resistance

Ideally, the relay must be mounted so that any shock or vibration is applied to the relay at right angles to the operating direction of the armature of the relay. Especially when a relay's coil is not energized, the shock resistance and noise immunity are significantly affected by the mounting direction of the relay.

■ Life Expectancy

When switching a heavy load that generates arc (generally, a load having a greater impedance than that of the relay coil), substances spattered from the contact may accumulate in the vicinity, resulting in degradation of the insulation resistance of the circuit. Mounting the relay in the correct direction is also important in preventing this kind of degradation of the insulation resistance.

■ Contact Reliability

Switching both a heavy and a minute load with a single relay contact is not recommended. The reason for this is that the substances scattered from the contact when the heavy load is switched degrade the contact when switching the minute load. For example, when using a multi-pole contact relay, avoid the mounting direction or terminal connections in which the minute load switching contact is located below the heavy load switching contact.

■ Mounting Interval

When mounting multiple relays side by side on a PCB, pay attention to the following points:

When many relays are mounted side by side, they may generate an abnormally high heat due to the thermal interference between the relays. Therefore, provide an adequate distance between the relays to dissipate the heat. When using a relay, be sure to check the minimum mounting interval.

Also, if multiple PCBs with relays are mounted to a rack, the temperature may rise. In this case, preventive measures must be taken so that the ambient temperature falls within the rated value.

Pattern Layout

Countermeasures Against Noise

The relay can be a noise source when viewed from a semiconductor circuit. This must be taken into consideration when designing the layout positioning of the relay and other semiconductor components on the PCB.

- Keep the relay away from semiconductor components as far away as possible.
- Locate the surge suppressor for the relay coil as close to the relay as possible.
- Do not route wiring for signals such as audio signals that are likely to be affected by noise below the relay.
- Design the shortest possible pattern.
- One method for separating the power source and relay from other electronic components is to use shielded patterns.

■ Conformal Coating

Coating the PCB is recommended to prevent the circuitry from being degraded by harmful gases. When coating the PCB, care should be taken to avoid relay contamination. Otherwise, faulty contact of the relay may occur due to sticking or coating. Some coating agents may degrade or adversely affect the relay. Select the coating agent carefully.

Type of Coating		
Item	**Applicability to PCB with relays mounted**	**Feature**
Epoxy	Good	Good insulation. Applying this coating is a little difficult, but has no effect on relay contact.
Urethane	Good	Good insulation and easy to coat. Be careful not to allow the coating on the relay itself, as thinner-based solvents are often used with this coating.
Silicon	Poor *	Good insulation and easy to coat. However, silicon gas may cause contact contamination and misoperation.

* Satisfactory for sealed, but totally unsatisfactory for unsealed relays.

Automatic Mounting of Relay on PCB

■ Through-hole Mounting

The following tables list the processes required for mounting a relay onto a PCB and the points to be noted in each process.

Process 1: Placement

Do not bend any terminal of the relay to use it as a self-clinching relay or the relay may malfunction.

It is recommended to use magazine-packaged self-clinching relays for placement onto the PCB.

Possibility of Automatic Placement			
Construction	**Unsealed**	**Flux protection**	**Fully sealed**
Magazine-packaged relay	NO	YES	YES
Self-clinching relays			

Process 2: Flux Application

To apply flux to a flux protection or fully sealed relay, a sponge soaked with flux can be used. Place the relay in the holes drilled in the PCB and press the PCB (with the relay still mounted) firmly against the sponge. The flux will be pushed up the relay's contact legs, and through the PCB holes. This method must never be applied with an unsealed relay because the flux will penetrate into the relay.

Use a non-corrosive rosin-type flux or water washable organic flux.

For the flux solvent, use an alcohol-based solvent, which tends to be less chemically reactive.

Apply the flux sparingly and evenly to prevent penetration into the relay. When dipping the relay terminals into liquid flux, be sure to adjust the flux level, so that the upper surface of the PCB is not flooded with flux.

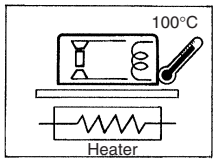
Possibility of Dipping Method		
Unsealed	**Flux protection**	**Fully sealed**
NO	YES	YES

Process 3: Transportation

When the PCB is transported, the relay mounted on the PCB may be lifted from the board surface due to vibration. This can be prevented if the relay mounted on the PCB has self-clinching terminals.

Process 4: Preheating

Preheat the PCB at a temperature of 110°C maximum within a period of approximately 40 seconds for smooth soldering. The characteristics of the relay may change if it is heated at a high temperature for a long time.



Possibility of Preheating		
Unsealed	**Flux protection**	**Fully sealed**
NO	YES	YES

Process 5: Soldering

Flow soldering is recommended to assure a uniform solder joint.

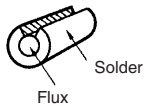
- Solder temperature and soldering time: 260°C, 5 s max.
- Adjust the level of the molten solder so that the PCB is not flooded with solder.

Possibility of Automatic Soldering		
Unsealed	**Flux protection**	**Fully sealed**
NO	YES	YES

Manual Soldering

Complete the soldering operation quickly. Use the correct wattage of soldering iron. Do not overheat while smoothing the applied solder with the tip of the iron.

- Soldering iron: rated at 30 to 60 W
- Tip temperature: 280°C to 300°C
- Soldering time: 3 s max.
- The following table contains recommended solders:



Type	Sparkle solder
Applicable solder diameter	**0.8 to 1.6 mm**
Spread rate	**90%**
Storage	**3 months max.**

The solder in the illustration shown above is provided with a cut section to prevent the flux from splattering.

Possibility of Manual Soldering

Unsealed	Flux protection	Fully sealed
YES	YES	YES

Process 6: Cooling

Upon completion of automatic soldering, use a fan or other device to forcibly cool the PCB. This helps prevent the relay and other components from deteriorating due to the inertial heat of soldering.

Fully sealed relays are washable. Do not, however, put fully sealed relays in a cold cleaning solvent immediately after soldering or the seals may be damaged.

Flux protection	Fully sealed
Necessary	Necessary

Process 7: Cleaning

Avoid cleaning the soldered terminals whenever possible. When a resin-type flux is used, no cleaning is necessary. If cleaning cannot be avoided, exercise care in selecting an appropriate cleaning solvent.

Cleansing Method		
Unsealed	**Flux protection**	**Fully sealed**
Boiling cleaning and immersion cleaning are not possible. Clean only the back of the PCB with a brush.		Boiling cleaning and immersion cleaning are possible. Ultrasonic cleaning will have an adverse effect on the performance of relays not specifically manufactured for ultrasonic cleaning. The washing temperature is 40°C max.

List of Cleaning Solvents		
Solvent		**Fully Seated**
Chlorine-based	Perochlene Chlorosolder Trichloroethylene	Yes
Water-based	Indusco Holys	Yes
Alcohol-based	IPA Ethanol	Yes
Others	Thinner Gasoline	No
Cleaning method		Automatic cleaning Ultrasonic cleaning (see note 4)

Note: 1. Consult your OMRON representative before using any other cleaning solvent. Do not use Freon-TMC-based, thinner-based, or gasoline-based cleaning solvents.

2. Worldwide efforts are being made at discontinuing the use of CFC-113-based (fluorochlorocarbon-based) and trichloroethylene-based cleaning solvents. The user is requested to refrain from using these cleaning solvents

3. It may be difficult to clean the space between the relay and PCB using hydrogen-based or alcohol-based cleaning solvent. It is recommended the stand-off-type be used, such as G6A-□-*ST*, when using hydrogen-based or alcohol-based cleaning solvents.

4. Ultrasonic cleaning may have an adverse effect on the performance of relays not specifically manufactured for ultrasonic cleaning. Please refer to the model number to determine if your relay is intended to be cleaned ultrasonically.

5. Contact Omron representative for recommended cleaning procedures of specific relays.

Process 8: Coating

Do not apply a coating agent to any flux-resistant relay or relay with a case because the coating agent will penetrate into the relay and the contacts may be damaged.

Some coating agents may damage the case of the relay. Be sure to use a proper coating agent.

Do not fix the position of relay with resin or the characteristics of the relay will change.

Resin	Fully Sealed
Epoxy	YES
Urethane	YES
Silicone	NO
Fluorine	YES

■ Surface Mounting

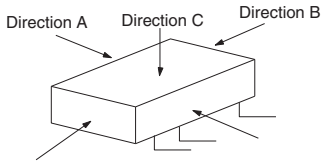
The following tables list the processes required for mounting a relay onto a PCB and the points to be noted in each process.

Process 1: Cream Solder Printing

Do not use a cream solder that contains a flux with a large amount of chlorine or the terminals of the relay may be corroded.

Process 2: Relay Mounting

The holding force of the relay holder must be the same as or more than the minimum holding force value required by the relay.



Direction	G6H	G6S
A	200 g max.	200 g max.
B	500 g max.	500 g max.
C	200 g max.	200 g max.

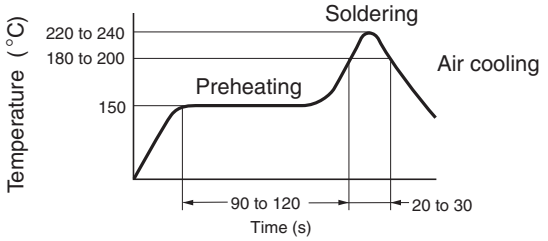
Process 3: Transportation

The relay may be dismounted by vibration during transportation. To prevent this, it is recommended an adhesive agent be applied to the relay's gluing part (protruding part) to tack the relay.

Adhesive Agent Application Methods	
Dispenser Method	**Screen-printing Method**
NO	YES

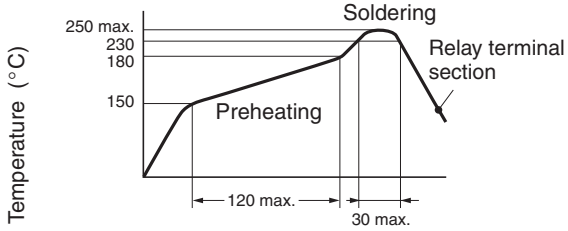
Process 4: Soldering Reflow

Mounting with lead solder	Mounting with lead-free solder
The recommended soldering conditions show the temperature changes of the PCB surface. The conditions, however, vary with the relay model. Check the relay specifications before soldering. (For details refer to the precautions for each model.) Do not put the relay in a cleaning solvent or other cold liquid immediately after soldering or the seal of the relay may be damaged.	The recommended soldering conditions show the temperature changes of the relay terminal section. The conditions, however, vary with the relay model. Check the relay specifications before soldering. (For details refer to the precautions for each model.) Do not put the relay in a cleaning solvent or other cold liquid immediately after soldering or the seal of the relay may be damaged.



Recommended IRS Conditions (G6H-2F)

Top surface of case (peak): 255˚C max.



Recommended IRS Conditions (G6H-2F)

Note: Do not submerse the relay in a solder bath. Doing so will deform the resin, causing faulty operation.

Process 5: Cleaning

Boiling cleaning and immersion cleaning are recommended. When washing the product after soldering the relay to a PCB, use a water-based solvent or alcohol-based solvent, and keep the solvent temperature to less than 40°C

Ultrasonic cleaning will have an adverse effect on the performance of relays not specifically manufactured for ultrasonic cleaning.

List of Cleaning Solvents		
Solvent		**Fully Sealed**
Chlorine-based	Perochlene Chlorosolder Trichloroethylene	Yes
Water-based	Indusco Holys	Yes
Alcohol-based	IPA Ethanol	Yes
Others	Thinner Gasoline	No
Cleaning method		Automatic cleaning Ultrasonic cleaning (see note 4)

Note: 1. Consult your OMRON representative before using any other cleaning solvent. Do not use Freon-TMC-based, thinner-based, or gasoline-based cleaning solvents.

2. Worldwide efforts are being made at discontinuing the use of CFC-113-based (fluorochlorocarbon-based) and trichloroethylene-based cleaning solvents. The user is requested to refrain from using these cleaning solvents

3. It may be difficult to clean the space between the relay and PCB using hydrogen-based or alcohol–based cleaning solvent. It is recommended the stand-off-type be used, such as G6A-□-*ST*, when using hydrogen-based or alcohol-based cleaning solvents.

4. Ultrasonic cleaning may have an adverse effect on the performance of relays not specifically manufactured for ultrasonic cleaning. Please refer to the model number to determine if your relay is intended to be cleaned ultrasonically.

5. Contact Omron representative for recommended cleaning procedures of specific relays.

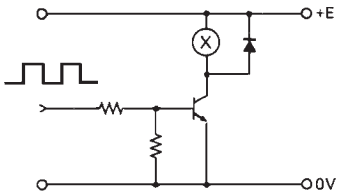
Notes on Correct Use

■ Driving by Transistor

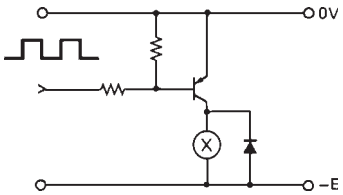
When a transistor is used to drive the relay, be sure to ground the emitter of the transistor.

When the transistor is used in emitter-follower configuration (i.e., the collector is grounded), give adequate consideration to the voltage across the collector and emitter. The required voltage must be applied to the relay.

NPN transistor



PNP transistor



Advice on selecting a transistor for driving the relay

1. From the relay catalog or data sheet, ascertain the following coil characteristics:

Rated voltage _____ VDC

Rated current _____ mA

Coil resistance _____ Ω

2. Determine the lower- and upper-limit values of the pickup voltage from the rated voltage.

Lower-limit pickup voltage _____V

Upper-limit pickup voltage _____V

(If surge is contained in the rated voltage, obtain the maximum value including the surge.)

3. By determining the component for suppressing surge, obtain the dielectric strength of the transistor for driving the relay.

In the case of diode

(Upper-limit of pickup voltage + 0.6) x 2* ≅ V_{CEO} ≅ V_{CBO} = ___V

In the case of diode and zener diode

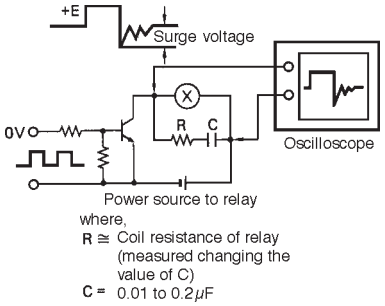
(Upper-limit of pickup voltage + 0.6 + breakdown voltage**) x 2* ≅ V_{CEO} ≅ V_{CBO} = ___V

In the case of varistor

(Upper-limit pickup voltage + varistor voltage***) x 2* ≅ V_{CEO} ≅ V_{CBO} = ___V

In the case of RC

(Upper-limit pickup voltage + surge voltage****) x 2* ≅ V_{CEO} ≅ V_{CBO} = ___V



4. Determine collector current I_C.

I_C = Upper-limit pickup voltage/Coil resistance x 2*

5. Select the transistor that satisfies the conditions determined in steps 3 and 4.

6. After selecting the transistor, observe the I_C vs. V_{CE} characteristics of the transistor indicated in its ratings.

The characteristic curve illustrates the relation between collector current I_C and collector-emitter voltage V_{CE} at base current I_B. From this graph, obtain collector-emitter voltage V_{CE} where,

I_C = Maximum value of must operate voltage/Coil resistance

I_B = Base current of the switching transistor which is determined by the driver stage.

Thus, Collector-emitter voltage V_{CE} = V

Use the transistor in its switching (saturation) area. An adequate base current is required.

Note:

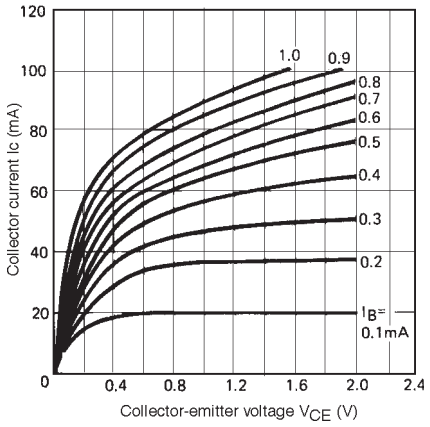
* This safety factor must be determined by the user.

** The breakdown voltage differs depending on the component. If multiple zener diodes are to be used, use their maximum breakdown voltage.

*** The varistor voltage differs depending on the component. In addition, the varistor voltage of a single varistor may vary depending on the current. Consult the manufacturer of the varistor to be used to determine the varistor voltage.

****The surge voltage differs depending on the type and rating of the relay, and the constants of C and R of the circuit in which the relay is used. Positively determine the surge voltage by experiment.

I_C vs. V_{CE} characteristics (Example)



7. Using the following formula, calculate the power dissipated by the transistor to confirm that it is within the range of permissible power dissipation of the transistor.

Total power dissipation P_T = Collector dissipation P_C + Base dissipation P_B where,

P_C= Maximum value of pickup voltage/ Coil resistance x V_{CE}

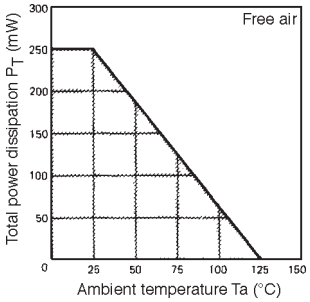
(V_{CE} is determined in step 6.)

$P_B = I_B$ x 0.6 to 1

(For details on I_B, refer to step 6.)

Confirm that P_T obtained by the above formula is within the curve representing the total power dissipation vs. ambient temperature characteristics.

Total power dissipation vs. ambient temperature



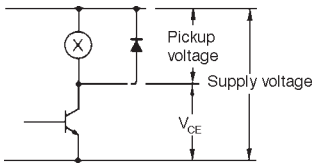
In case the total dissipation exceeds the permissible power dissipation, either attach a radiator plate to the transistor, or replace the transistor.

8. Determine the supply voltage to the relay.

The maximum and minimum values of the supply voltage to the relay are determined by the following expressions using the upper- and lower-limit values of the pickup voltage V_{CE} obtained in step 6.

Maximum supply voltage ≤ Upperlimit pickup voltage + V_{CE}

Minimum supply voltage ≥ Lowerlimit pickup voltage + V_{CE}



9. Verify that the following conditions are satisfied.

V_{CEO} > (Maximum supply voltage + surge voltage) x safety factor*

V_{CBO} > (Maximum supply voltage + surge voltage) x safety factor*

* Determine the safety factor giving consideration to external surge (such as lightning and surge from other devices).

10. Check the following items during actual use of the relay.

- Is the upper-limit value of the pickup voltage equal to or less than the rated value when the maximum supply voltage is applied?
- Is the lower-limit value of the pickup voltage equal to or more than the rated value when the minimum supply voltage is applied?
- Are the above conditions satisfied within the operating temperature range?
- Is there any abnormality found in a test run?

In addition to checking the above items, take into consideration the items listed in this table.

Rated voltage of relay	Low	High
Coil current*	High	Low
I_C of switching transistor	High	Low
V_{ECO}, V_{CEO} of switching transistor**	Low	High
Driving current of transistor	High	Low
Voltage drop V_{CE} in transistor	High	Low
Voltage dropV_{BE} in transistor	High	Low
Total power dissipation P_T of transistor	High	Low

* Inversely proportional to voltage

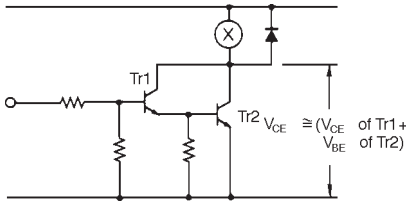
** Often used V_{CEO}: 35 to 60 V

From the above discussion, the best relay coil should be rated at 12 VDC or 24 VDC when the relay is driven by a transistor.

■ Driving by Darlington-Connected Transistors

To reduce the current of the transistor to drive the relay (i.e., base current of the transistor), two transistors may be used, via Darlington connection. Darlington connected transistors are available enclosed in a single package.

NPN-NPN Darlington Connection

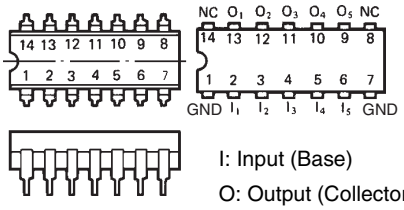


When the Darlington-connected transistors are used, the required value of V_{CE} is higher than when using a single transistor. For this reason, consideration must be given to designing the total power dissipation and supply voltage for the second transistor, Tr2.

■ Driving by IC

An IC on which multiple driving transistors are integrated is available. The designing of the circuit or PCB to drive multiple relays, a small-size solenoid, or a small-size lamp can be simplified by using this IC. Consult the manufacturer of the IC for details. For V_{CE}, refer to the description of the related voltage and surge suppressor.

Dimensions Connection (Top view)

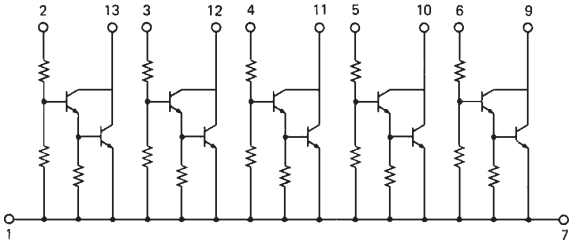


I: Input (Base)

O: Output (Collector)

GND: (Common Emitter)

Equivalent circuit



■ Driving by TTL

TTLs can be divided into two types by classification of the output: totem-pole and open-collector outputs. Connection of each type of TTL is described below.

Use a diode as surge suppressor.

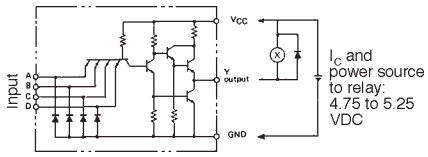
In the specifications of some ICs, such a phrase as “fan-out 10” may be used in place of the legend I_{OL}. This denotes that 10 standard TTLs can be connected in parallel. In terms of current, fan-out 1 equals 1.6 mA. Hence,

Fan-out n = 1.6 x n (mA)

1. To drive a relay by the totem-pole output of a TTL, these conditions must be satisfied:

- I_{OL} (low-level output current) > Maximum supply voltage/Coil resistance.
- I_{OH} (high-level output current) < Rated current x pickup voltage (%)/Coil resistance
- Minimum supply voltage (4.75 V) – Maximum V_{OL} (low-level output voltage) > Lower-limit value of pickup voltage (Refer to *Driving by Transistor*)

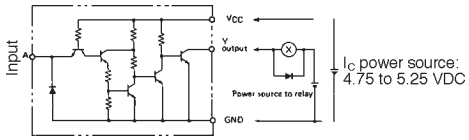
Totem-pole output



2. To drive a relay with open-collector output type TTL, a degree of freedom is allowed in the ratings of the relay coil. However, these, conditions must be satisfied:

- I_{OL} > Maximum supply voltage to the relay coil/Coil resistance
- I_{OH} < Rated current x pickup voltage (%)/200
- V_O = Dielectric strength of the output transistor (Refer to *Driving by Transistor*.)
- V_{OL} = Collector emitter voltage V_{CE} of the output transistor (Refer to *Driving by Transistor*.)

Open-collector output

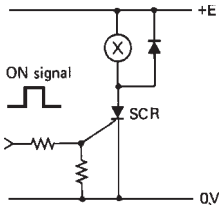


The above description of the standard TTL is applicable when using S, H, and LS type TTLs.

■ Driving by Other Switching Devices

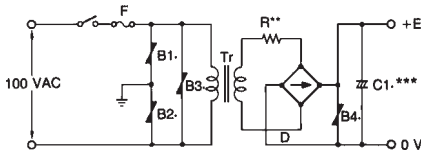
Consult the manufacturer of the switching device. The upper- and lower-limit values of the pickup voltage can be determined in the same manner as described in Upper-limit Pickup Voltage and Lower-limit Pickup Voltage.

Example of Driving by SCR



■ Designing Power Circuit

Since many documents and reference books on the power circuit are available, a detailed description is omitted here.

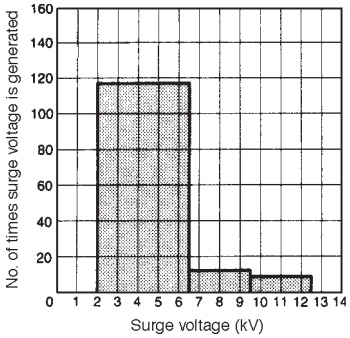


* In the circuit above, varistors B_1 to B_4 are used to protect the power circuit elements, as well as elements related to the power circuit, in case the voltage on the power line experiences surges (due to lightning or the surge voltage generated in other devices connected to the power circuit). Connect an appropriate surge suppressor across the output terminals of the power circuit to prevent a surge voltage from being generated. The surge suppressor must keep the surge voltage, if generated, from exceeding the breakdown voltage of each element in the power circuit.

** Resistor R protects diode bridge D from the inrush current that flows through the power circuit upon power application. Although the resistance of R is determined according to the resistance of the load coil and the ratings of the diodes, the use of a resistor having a resistance of 0.1 to 100Ω is recommended.

*** C_1 is a smoothing capacitor. Its capacitance must be as large as possible to reduce the ripple percentage.

■ Connection of Surge Suppressor



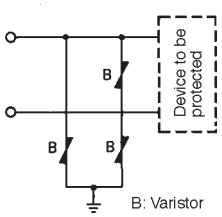
Note: This graph is plotted by measuring the surge voltage in the line of low-tension overhead wiring (cable length: 200 to 500 m).

When connecting a surge suppressor, pay attention to the following points:

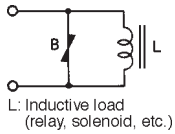
1. Place the surge suppressor near the device to be protected. For example, to protect a device from external surge, set the surge suppressor at the inlet of the device's power cable.

   To suppress an internal surge, the suppressor must be placed near the surge generating source.

External surge



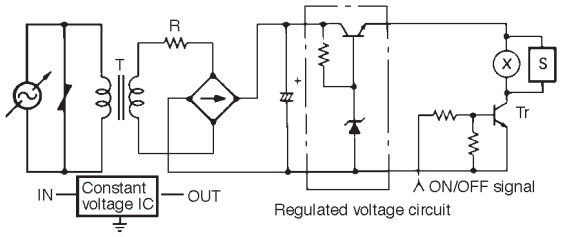
Internal surge



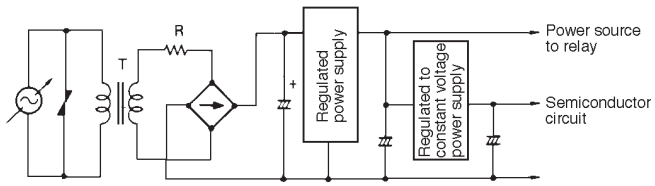
2. The cable for connecting the surge suppressor must be as short as possible in length, and thick enough in diameter so that it can sufficiently withstand the surge current. The short length and thick diameter are important to reduce the inductance and generated voltage, and to protect the device from heat damage.
3. When using a surge suppressor between cable and ground, the lower the ground resistance of the surge suppressor, the better the protective effect of the surge suppressor. Perform grounding at a ground resistance of 10Ω or less.

■ Countermeasures Against Supply Voltage Fluctuation

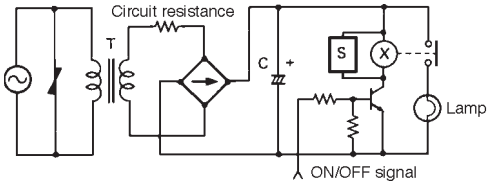
In case the supply voltage fluctuates heavily, insert a regulated voltage circuit or constant-voltage circuit in the application circuit as shown below.



Relays consume more power than semiconductor elements. The following circuit configuration is recommended to improve the characteristics.

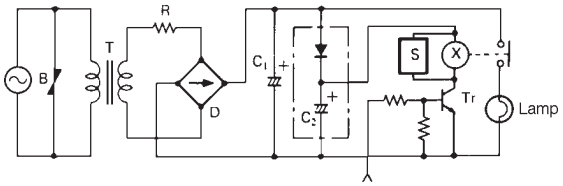


■ Countermeasures Against Inrush Current

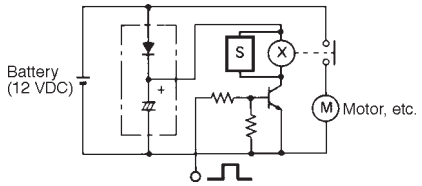


If a load such as a capacitor or lamp through which an inrush current flows is connected to the power source and contact of the relay, the supply voltage may drop when the contact is closed, causing the relay to abnormally release.

Increasing the capacity of the transformer or providing an additional control circuit can be used to prevent this drop in the supply voltage. On some occasions, use of the following circuit may prevent voltage drop.



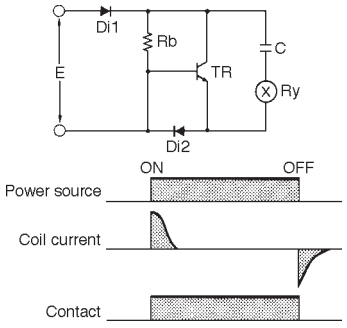
The same circuit also applies when the relay is driven by a battery.



■ Designing Power-Conserving Driver Circuit with Single-Winding Latching Relay (Pat. 1239293)

This section introduces a patented drive circuit for the single-winding latching relay that can be driven on several milliwatts. This drive circuit not only allows the relay to be used in the same manner as semiconductor devices but also offers a wide range of applications.

Operating principle



Set

When a specified voltage is applied across E, the current flows through the circuit in the sequence of diode Di1, capacitor C, relay Ry, and diode Di2. C is then charged, setting the relay.

Energization

When C has been fully charged, the relay is biased by the current flowing from Di1 to Rb. C does not discharge. The power consumption at this time is very small, several milliwatts at best, and its value can be calculated as follows:

$$P = \frac{(E - V_F)2}{Rb}$$

where,

P: power consumption

V_F: voltage drop across diode Di1

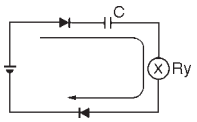
The current that is to flow through Rb at this time is dependent on the transfer ratio h_{fe} of transistor TR which is required for TR to turn ON.

Reset

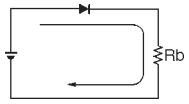
When the voltage placed across E is removed, the electricity charged in C is discharged, causing the current to flow through the circuit in the sequence of Rb, the base, and the emitter of TR. In this way, the relay is reset by the current flowing in the direction opposite to when the relay is set.

The following equivalent circuits respectively illustrate the current flows when the relay is set, energized, and reset.

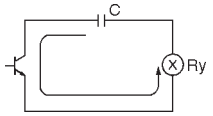
Set



Energization



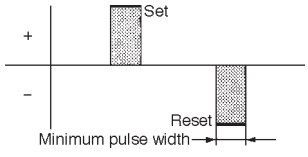
Reset



Circuit design

Fundamental

Generally, the latching relay is set and reset when a pulse having a square waveform is applied to it for a short time. The minimum pulse width required to set and reset the relay is predetermined.

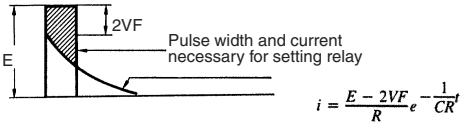


The charging current shown in the above equivalent circuit diagrams, has a sawtooth waveform that can be expressed by the following formula, because it is the primary circuit of C and R.

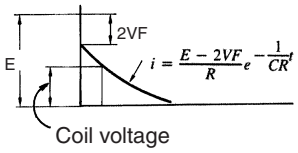
$$i = \frac{E - 2VF}{R} e^{-\frac{1}{CR}t}$$

(2 Forward voltage diode drops)

If applied voltage E and the rated coil voltage of the relay are the same, the current to the relay falls short by the quantity indicated by the shaded portion in the following figure.

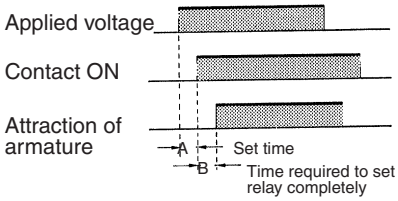


Therefore, the current must be applied to the relay as follows when designing this driver circuit.



Time constant

When the rated voltage is applied to the relay, time A in the timing chart below is required to turn ON the contacts. After this time has elapsed, time B is required until the armature attraction to the magnet is complete.

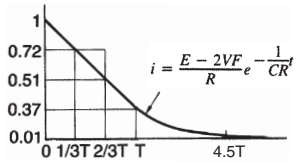


Therefore, it is apparent that time constant T obtained as the product of C and R must be equal to or longer than the sum of A and B. Actually, however, T should not be equal to the sum of A and B but must be longer than that to ensure the stable operation of the circuit. Thus,

T = A + B + X

where X is the time margin.

The set time A of OMRON's moving-loop relays (with a pickup power of 200 mW) is rated at about 3 milliseconds. Time constant T for them should be about three times that of A. The following graph illustrates this. This graph indicates that, if C is completely charged (I_{PEAK}), it takes 4.6T to discharge I to 1%. Note that time constant T is broken down into three segments. The first 1/3T equals A, the second 1/3T, B. The remaining 1/3T is the time margin expressed as X in the above equation. T is three times A.



Voltage drop E1 across the total resistance of the capacitance C's resistance and relay coil's internal resistance is the difference between the supply voltage E and voltage drops across two diodes: Di1 and Di2. Hence,

E1 = E – 2VF

Assuming the supply voltage to be 5 V and VF to be 0.6 V,

E1 = 5 – 2 x 0.6 = 3.8 V

From E1 and the above graph, the required coil voltage of a relay can be obtained. Again assuming the E, i.e., the supply voltage of a single-winding latching relay is 5 V, the coil voltage is:

3.8 x 0.72 = 2.7 V

At this time, the capacitance of C is 246.9 μF, according to the equation shown in the above graph.

Coil ratings and capacitance of C

In the example, the coil voltage obtained by calculation is 2.7 V, which is 0.3 V less than the value at which the coil voltage of commercially available standard latching relay is rated. The standard coil voltages of relays at a supply voltage of 6, 9, 12, and 24 V can be respectively calculated in the same way. Table 1 compares the results of the calculation and the coil voltages of standard relays.

Table 1

Supply voltage	Coil voltage (calculated)	Standard voltage	Coil resistance
5 V	2.7 V	3 V	45Ω
6 V	3.5 V	3 V	45Ω
9 V	5.6 V	5 V	125Ω
12 V	7.8 V	6 V	405Ω
24 V	16.4 V	12 V	720Ω

Table 2

Supply voltage	Coil voltage (calculated)	Coil resistance	Capacitance of C
5 V	2.7 V	45Ω	280 μF
6 V	3.5 V	45Ω	142 μF
9 V	5.6 V	125Ω	54 μF
12 V	7.8 V	405Ω	40 μF
24 V	16.4 V	720Ω	6.5 μF

The calculated coil voltages significantly deviates from the standard values. It is therefore necessary to determine the time constant of the relay by adjusting the capacitance of C when the relay coil is to operate on the standard voltage.

As an example, calculate the capacitance of C and time constant T of a relay with a rated supply voltage of 5 V. The coil voltage E_1 has been calculated above (3.8 V). To determine how much current I flows through the coil at 3.8 V, from Table 1, note that the coil resistance is 45Ω. So,

I = 3.8/45 = 84.4 mA

Therefore, the peak current of capacitor C to be used must be 84.4 mA.

Remember, that time A of an OMRON relay is 3 ms. Capacitance C must be a value that allows 66.6 mA to flow through 3 ms after 5 V is applied to the relay.

Thus,

$$66.6 = 84.4e^{-\frac{3\times10^{-3}}{c\times45}}$$

From this,

C = 280 μF

At this time, time constant T is:

280 x 10^{-6} x 45 = 12.6 ms

By calculating the C of each of the relays listed in Table 1, the values in Table 2 are obtained.

Again, these calculated capacitances deviate from the commercially available standard capacitors. There is no problem in using standard capacitors but, if the cost and circuit space permit, it is recommended to use two or more capacitors so that a capacitance as close to the calculated value as possible is obtained. At this time, pay attention to the following points:

- Confirm that the relay operates normally even when the supply voltage is brought to 80%-120% of the rated value.
- Even if a voltage of two or three times the rated voltage is applied to this driver circuit, the coil wire will not sever. That is why, for example, when the driver circuit is mounted in an automobile where a supply voltage of 12 VDC is available from the battery, it is recommended to use a relay whose coil voltage is rated at 6 VDC, taking a voltage fluctuation of 8 to 16 VDC into consideration.

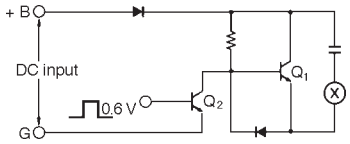
Determining Rb

The current flows into Rb should be enough to turn ON TR when the relay is reset. When determining value of Rb, the following points must be noted:

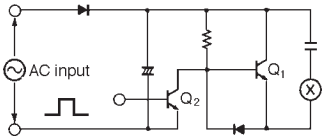
- TR must be sufficiently turned ON even when T equals the time constant.
- Give adequate consideration to changes in the due to changes in ambient temperature. Simple as it is, the driver circuit introduced here can efficiently control the relay, consuming a tiny amount of power.

An experiment reveals that the relay sufficiently operates with a capacitance of 100 μF + 47 μF where the relay is rated at a supply voltage of 5 VDC and a coil voltage of 3 VDC. It can therefore be said that the capacitance can be lower than the calculated value. This is because the time constant is determined with a relatively wide margin. So it is recommended to perform experiments to determine the time constant.

Application circuit example



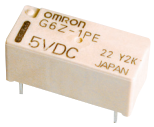
The TTL output of a solid-state switch can be used as Q_2.



Half-wave rectified AC power is applied to the circuit. Q_1 is the output of a TTL, and drives the relay.

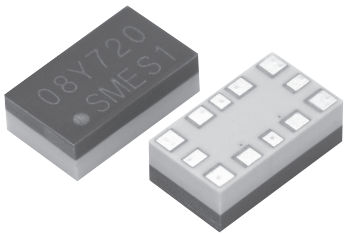
MEMS and HF/RF Relay Selection Guide

	 Page 313	 Page 321	 Page 327
General Attributes	**2SMES-01**	**G6K-RF**	**G6W**
Dimensions mm(in)	1.8 H x 5.2 L x 3.0 W (0.07 x 0.20 x 0.12)	5.4 H x 10.3 L x 6.9 W (0.21 x 0.41 x 0.27)	8.9 H x 20 L x 9.4 W (0.35 x 0.79 x 0.37)
Switching	> 0.5 mA@0.5 VDC	1 A max.	0.5 A max.
Features	• Superior high-frequency characteristics at 10 GHz typical / 8 GHz rated (50 Ω) • Contact Reliability 100million operations • Rated power consumption of 10 μW	• Smallest 2 Form C on the market • Ideal for Test & Measurement, CATV, Digital TV tuners • New ground terminal arrangement of "-S" part facilitates end-to-end PCB layout.	• Tri-plate micro strip line technology • Latching & non-latching models • SMT and PCB versions • Ideal for Base Station LNA & TMA switching, Test & Measurement, Broadcast, FWA
HF Characteristics			
Impedance	50 Ω	50 Ω	50 Ω
Frequency bandwidth	~10 GHz typ. / 8 GHz rated	~1 GHz	~5 GHz
Isolation (min.)	30 dB (10 GHz typical/8 GHz rated)	20 dB at 1 GHz	65 dB (2 GHz), 60 dB (2.5 GHz), 35 dB (5.0 GHz)
Insertion Loss (max.)	1 dB (10 GHz typical/8 GHz rated)	0.2 dB at 1 GHz	0.2 dB (2 GHz), 0.2 dB (2.5 GHz), 0.5 dB (5.0 GHz)
V.S.W.R. (max.)	1.2 at rated load	1.2 at 1 GHz	1.2 (2 GHz), 1.2 (2.5 GHz), 1.7 (5.0 GHz)
Max. Carry Power	1 W, 30 dBm (at 2 GHz and max. V.S.W.R. of 1.2)	3 W, 35 dBm	20 W, 43 dBm
Contact Information			
Contact form	SPDT (transfer contacts)	2 Form C	1 Form C
Contact type(s)	Single-side stable	Bifurcated crossbar	Twin crossbar
Contact Material	Proprietary	Au alloy on Ag base	Au clad Cu alloy
Rated load (under resistive load)	100 mA @ 10 VDC (carry) RF: 30 dB	0.3 A @ 125 VAC; 1 A @ 30 VDC	10 mA @ 30 VAC 10 mA @ 30 VDC 2.5 GHz, 10 W
Max. switching voltage	0.5 VDC	60 VDC, 125 VAC	30 VDC, 30 VAC
Max. switching capacity under resistive load	0.25 mW	37.5 VA, 30 W	10 VA, 10 W
Min. electrical service life (operations at rated load)	100 Million	100,000	300,000
Coil Information			
Coil voltage	No Coil, 34 VDC +/-5% MEMS Electrostatic Drive	3, 4.5, 5, 6, 9, 12, 24 VDC	3, 4.5, 9, 12, 24 VDC
Power consumption	10 μW	100 mW (standard) 100 mW (single coil latching)	200 mW (standard) 200 mW (single coil latching) 360 mW (dual coil latching)
Characteristics			
Dielectric strength between coil & contacts (50/60 Hz for 1 minute)	No Dielectric rating ESD 100 V (Human Body Model)	750 VAC	1,000 VAC
Terminal choices	LGA12	SMT Gullwing	PCB, SMT Gullwing
Packaging / Options	50 pc IC pack & 200 pc JEDEC tray	300 pc tray, 300 / 900 pc Tape & reel	50 pc tube

	 Page 335	 Page 341	 Page 357
General Attributes	**G6Y**	**G6Z**	**G9YA**
Dimensions mm(in)	9.20 H x 20.70 L x 11.70 W (0.36 x 0.81 x 0.46)	8.9 H x 20 L x 8.6 W (0.35 x 0.79 x 0.34)	39.0 H x 34.0 L x 13.2 W (1.54 x 1.34 x 0.52)
Switching	1 A max.	0.5 A max.	100 mA max.
Features	• Micro strip line technology • Ideal for CATV, Digital TV tuners, Test & Measurement	• Micro strip line technology • Y & E and Reverse terminal configurations • SMT and PCB versions • Ideal for Base Station LNA & TMA switching, CATV, Digital TV tuners, Test & Measurement, Broadcast, FWA	• Coaxial HF relay • Available in failsafe & TTL-driven models • Also available in non-latching and dual latching • Ideal for Mobile Communications Infrastructure Equipment, Broadcast Equipment, Test and Measurement Equipment, Wireless LAN
HF Characteristics			
Impedance	50 Ω	50 Ω / 75 Ω	50 Ω
Frequency bandwidth	~900 MHz	~2.6 GHz / ~900 GHz	~26.5 GHz / ~18 GHz / ~12.4 GHz / ~8 GHz
Isolation (min.)	65 dB at 900 MHz	60 - 65 dB (900 MHz) - varies by structure 30 - 45 dB (2.6 GHz) - varies by structure	60 dB / 65 dB / 70 dB
Insertion Loss (max.)	0.5 dB at 900 MHz	0.1 dB (900 MHz) 0.3 dB (2.6 GHz) / 0.2 dB (900 MHz) 0.5 dB (2.6 GHz)	0.8 dB / 0.5 dB / 0.4 dB / 0.3 dB
V.S.W.R. (max.)	1.5 at 900 MHz	1.1 (900 MHz) 1.3 (2.6 GHz) / 1.2 (900 MHz) 1.5 (2.6 GHz)	1.7 / 1.5 / 1.35 / 1.25
Max. Carry Power	10 W, 40 dBm	10 W, 40 dBm	120 W, 51 dBm (at 3 GHz and V.S.W.R. ≤ 1.15)
Contact Information			
Contact form	1 Form C	1 Form C	1 Form C
Contact type(s)	Twin crossbar	Twin crossbar	Twin crossbar
Contact Material	Au clad Cu alloy	Au clad Cu alloy	Au clad Cu alloy
Rated load (under resistive load)	10 mA @ 30 VAC; 10 mA @ 30 VAC; 900 MHz, 1 W	10 mA @ 30 VAC; 10 mA @ 30 VDC; 900 MHz, 10 W	100 mA @ 30 VDC
Max. switching voltage	30 VDC, 30 VAC	30 VDC, 30 VAC	30 VDC
Max. switching capacity under resistive load	10 VA, 10 W	10 VA, 10 W	120 W (3 GHz)
Min. electrical service life (operations at rated load)	300,000	300,000	5,000,000
Coil Information			
Coil voltage	3, 4.5, 5, 6, 9, 12, 24 VDC	3, 4.5, 5, 9, 12, 24 VDC	4.5, 5, 12, 15, 24, 28 VDC
Power consumption	200 mW	200 mW (standard) 200 mW (single coil latching) 360 mW (dual coil latching)	500 mW (dual coil latching) 700 mW (failsafe)
Characteristics			
Dielectric strength between coil & contacts (50/60 Hz for 1 minute)	1,000 VAC	1,000 VAC	500 VAC
Terminal choices	PCB	PCB, SMT Gullwing	SMA Terminals, Solder Terminals, Pin Terminals, Connector Cables
Packaging / Options	—	Tape & reel available	—

RF MEMS Switch
2SMES-01

Miniature, 10 GHz Band (typical)
SPDT (transfer contacts) RF MEMS Switch



- Superior high-frequency characteristics at 10 GHz typical/8 GHz rated (50 Ω)
  - ➜ Isolation of 30 dB
  - ➜ Insertion loss of 1 dB
- Ultra-miniature 5.2 x 3.0 x 1.8 mm (L x W x H).
- Contact Reliability 100 million operations (0.5 mA at 0.5 VDC resistive load)
- Rated power consumption of 10 μW
- RoHS Compliant

Application Examples

- Automatic test equipment
- RF measurement instrument
- RF component

Ordering Information

Standard Models with Surface-mounting Terminals

Classification	Structure	Packaging	Package quantity	Model
Single-side stable	Plastic sealed	JEDEC Tray	200	**2SMES-01**
		IC Pack	50	**2SMES-01CT**

Note: 1. This RF MEMS Switch was developed on the assumption of cold switching. Do not exceed ratings by hot switching (greater than 0.5 mA at 0.5 VDC resistive load).

2. This RF MEMS Switch is easily damaged by static electricity. When handling the RF MEMS Switch, take countermeasures against static electricity. Contact OMRON for handling guidelines.

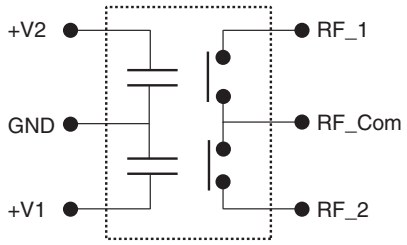
Specifications

■ Contact Ratings

Load	Resistive load
Rated load	0.5 mA at 0.5 VDC
Rated carry current	100 mA at 10 VDC RF: 30 dBm
Maximum switching voltage	0.5 VDC
Maximum switching current	0.5 mADC
Maximum switching capacity	0.25 mW

Note: The ratings are for a V.S.W.R of 1.2 max. at the load.

■ Terminal Arrangement



■ Actuator Ratings

Rated voltage (VDC)		Rated current (mA)	Must operate voltage (V)	Must release voltage (V)	Absolute maximum voltage (V)	Rated power consumption (μW)
DC	34±5%	---	90% max. of rated voltage	10% min. of rated voltage	40	10

■ High Frequency Characteristics

Item	2 GHz	8 GHz	10 GHz	12 GHz
Isolation	---	30 dB		---
Insertion Loss	---	1 dB	1 dB (Typ.)	3 dB
Return Loss	---	10 dB		---
Maximum peak power	36 dBm	---		---
Maximum carry power	30 dBm	---		---

Note: 1. The impedance of the measurement system is 50 Ω.
2. The above values are initial values.
3. These values are for a V.S.W.R. of 1.2 max. at the load.

■ Characteristics

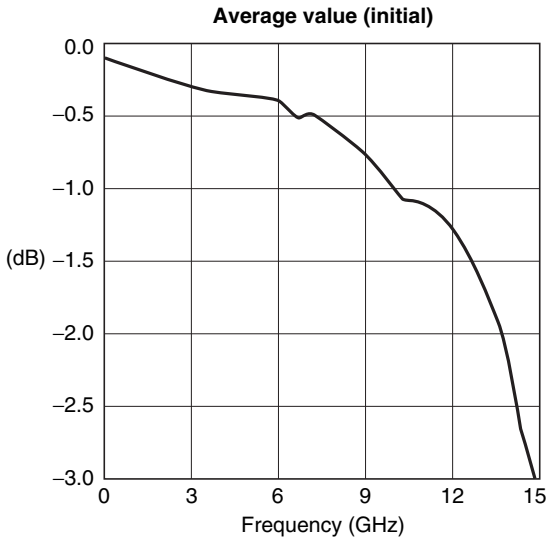
Item		Single-side stable model
		2SMES-01
Contact resistance		1500 mΩ max.
Operating time		100 μs max.
Release time		100 μs max.
Insulation resistance	**V-GND**	100 MΩ (at 40 VDC)
	others	100 MΩ (at 100 VDC)
Vibration resistance	**Destruction**	10 Hz to 500 Hz 10 G
	Malfunction	10 Hz to 500 Hz 10 G
Shock resistance	**Destruction**	100 G
	Malfunction	100 G
Life expectancy	**Mechanical**	100,000,000 Operations min.
	Electrical	100,000,000 Operations min.
ESD		100 V (Human body model)
Ambient temperature		Operating: −20°C to 85°C (with no icing or condensation)
Ambient humidity		Operating: 5% to 85%
Weight		Approx. 0.1 g

Note: 1. The above values are initial values.
2. The contact resistance was measured with 10 mA at 1 VDC with a voltage drop method.

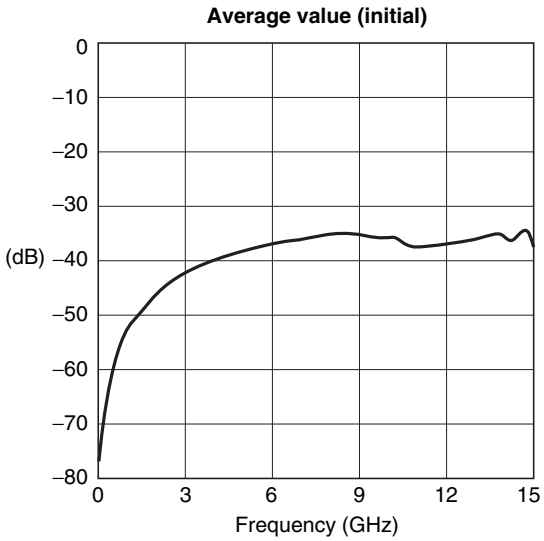
Engineering Data (for reference)

■ High Frequency Characteristics

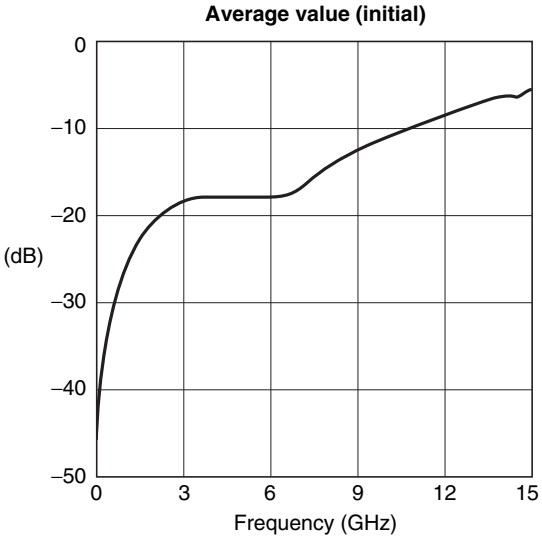
Insertion Loss



Isolation



Return Loss

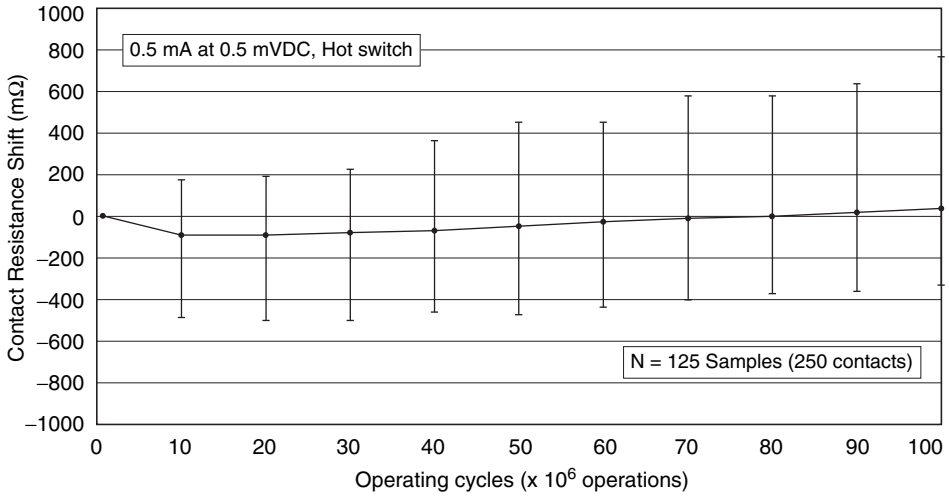


Note: 1. Ambient temperature condition: 23°C

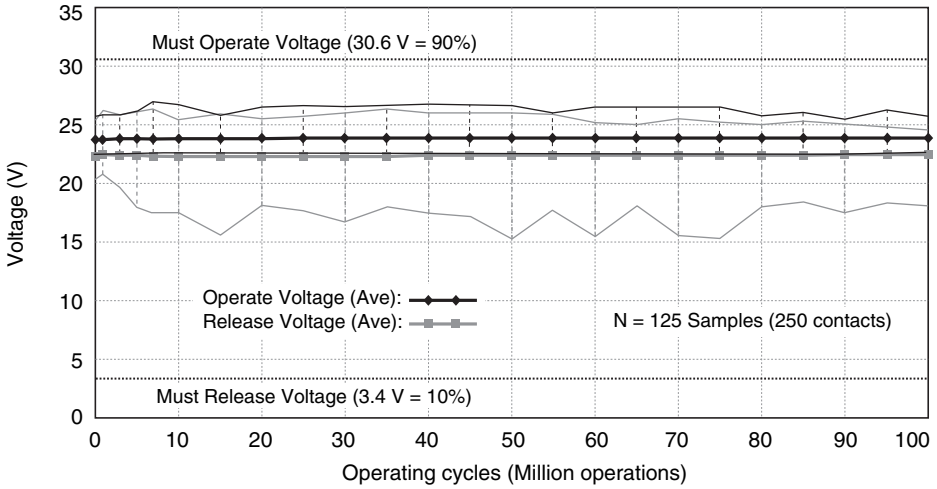
2. These high-frequency characteristics are measured with RF probe (without a mounting board).

3. The high-frequency characteristics depend on the mounting board. Be sure to check operation including durability in actual equipment before use.

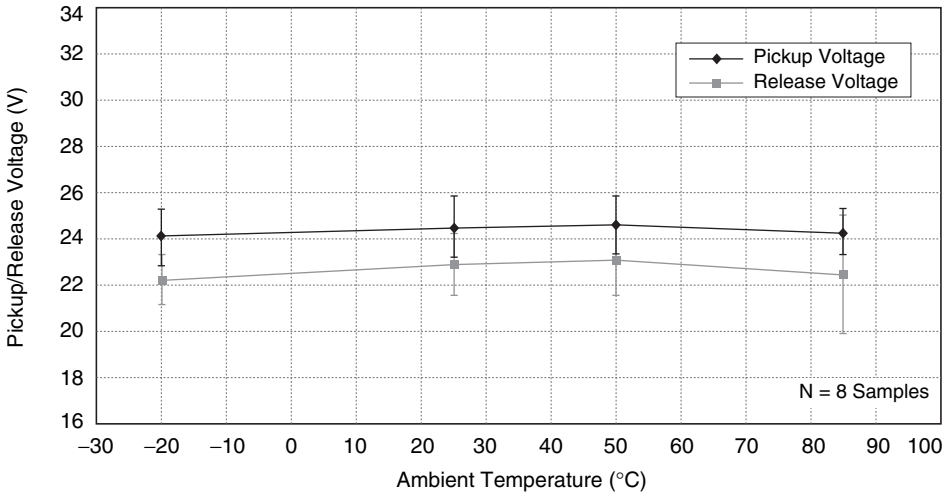
Electrical Endurance (Contact Resistance Shift)



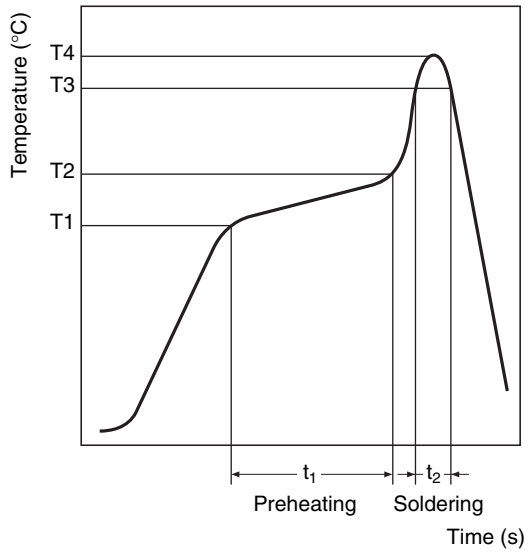
Electrical Endurance (Pickup Voltage/Release Voltage)



Ambient Temperature vs. Pickup voltage/Release Voltage



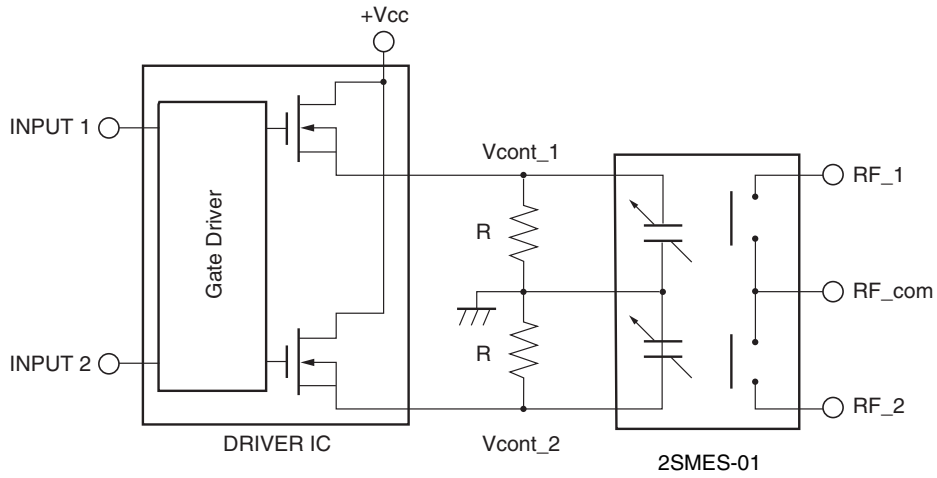
Recommended Soldering Method



- The thickness of the solder paste is to be applied between 150 and 200 μm and the land pattern should be based on OMRON's recommended PCB pattern.
- To maintain the correct soldering joint shown in the following diagram, we recommend applying solder with the soldering conditions shown on the left.
- Check the soldering in the actual mounting conditions before use.
- When washing the product after soldering the RF MEMS Switch to a print circuit board, use a water-based solvent or alcohol-based solvent and keep the solvent temperature to less than 40°C.
- Do not put the RF MEMS Switch in a cold cleaning bath immediately after soldering.

Measuring position/Item	Preheating (T1 to T2, t_1)	Soldering (T3, t_2)	Peak value (T4)
Terminal	150°C to 180°C 120 s max.	230°C min. 30 s max.	250°C max.
Upper surface of case	---	---	255°C max.

Example of Drive Circuit for RF MEMS Switch

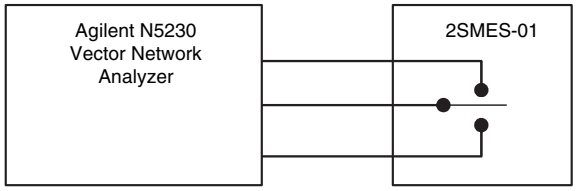


Note: 1. Operate the driving voltage with the high-side switch (Vcont_1 & Vcont_2, not ground).

2. It is necessary to discharge the charge that accumulates in the electrostatic actuator to turn off the RF MEMS Switch because this product is a MEMS Switch of an electrostatic drive type. Install the electrical discharge circuit in the drive circuit of the RF MEMS Switch with a resistance of 1 MΩ or less. Without an electrical discharge circuit, the RF MEMS Switch might not turn off, and the contacts could stick.

For Reference Only

High frequency characteristics - method and substrate for measurement

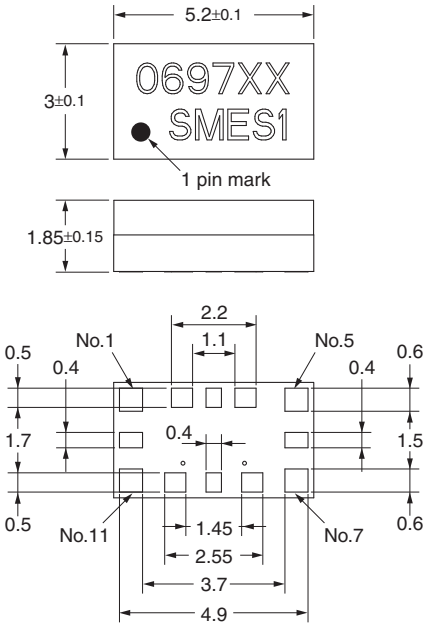


Note: Substrate: t = 1.6 mm Rogers 4350B (Dielectric constant at 10 GHz: 3.48)

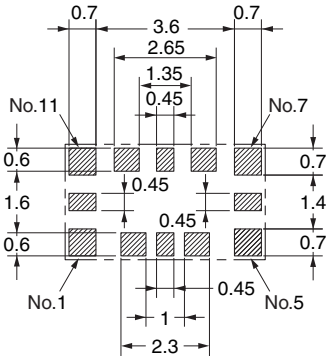
Dimensions

Note: All units are in millimeters unless otherwise indicated.

2SMES-01

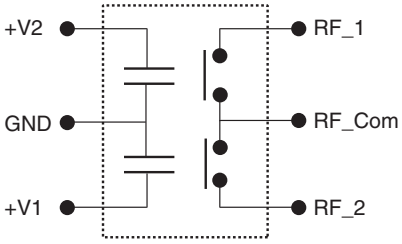


Mounting PAD Dimensions
12-Terminal Land Grid Array (LGA)
(Top View)

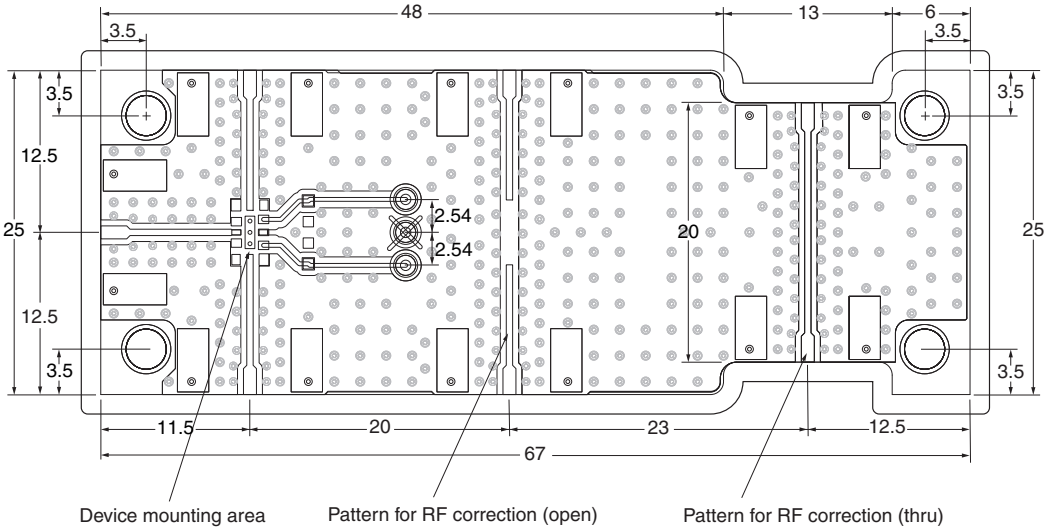


No.	Pin Arrangement
1	GND
2	GND
3	RF_com
4	GND
5	GND
6	RF_2
7	GND
8	Vcont_2
9	GND
10	Vcont_1
11	GND
12	RF_1

Terminal Arrangement

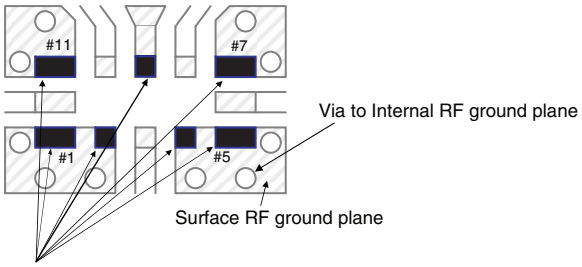


Evaluation Board Model: 2SMES-01-EVBA



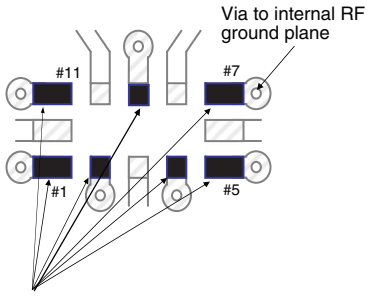
Ground Plane Connections

In case of Coplanar Waveguide



Connect **ALL** RF ground pads to the surface RF ground plane directly.

In case of Microstrip Line



Connect **EACH** RF ground pad to the internal RF ground plane through the via placed to the RF ground pad.

*RF Ground Pad is designated as ■

Safety Precautions

■ Precautions for Correct Use

- Turn off power when doing the exchange and the wiring work of the RF MEMS Switch.
- Do not touch the terminal of the RF MEMS Switch when energized.

RF MEMS Switch Handling

- Use the RF MEMS Switch as soon as possible after opening the moisture-proof package (within one week). If the RF MEMS Switch is left for a long time after opening the moisture-proof package, the appearance may suffer and seal failure may occur after the solder mounting process. To store the RF MEMS Switch after opening the moisture-proof package, place it into the original package and seal the package with adhesive tape.
- When washing the product after soldering the RF MEMS Switch to a print circuit board, use a water-based solvent or alcohol-based solvent and keep the solvent temperature to less than 40°C. Do not put the RF MEMS Switch in a cold cleaning bath immediately after soldering.
- Do not use an Ultrasonic wash.
- This RF MEMS Switch is easily damaged by static electricity. When handling the RF MEMS Switch, take countermeasure against static electricity (100 V or less). Contact OMRON for additional guidelines.
- When handling the RF MEMS Switch, do not drop.
- Do not apply force resulting in the product to transform and change in quality.

Environmental Conditions for Usage, Storage, and Transport

- Avoid direct sunlight when using, storing, or transporting the RF MEMS Switch and maintain normal temperature, humidity, and pressure conditions.
- Avoid caustic gases when using, storing, or transporting the RF MEMS Switch.

Coating

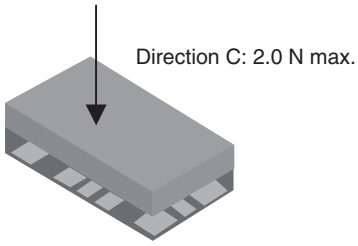
- Do not coat the RF MEMS Switch when it is mounted to the print circuit board. Do not wash the print circuit board after the RF MEMS Switch is mounted using detergent containing silicone. Otherwise, the detergent may remain on the surface of the RF MEMS Switch.

Long-term, Continuous ON Contacts

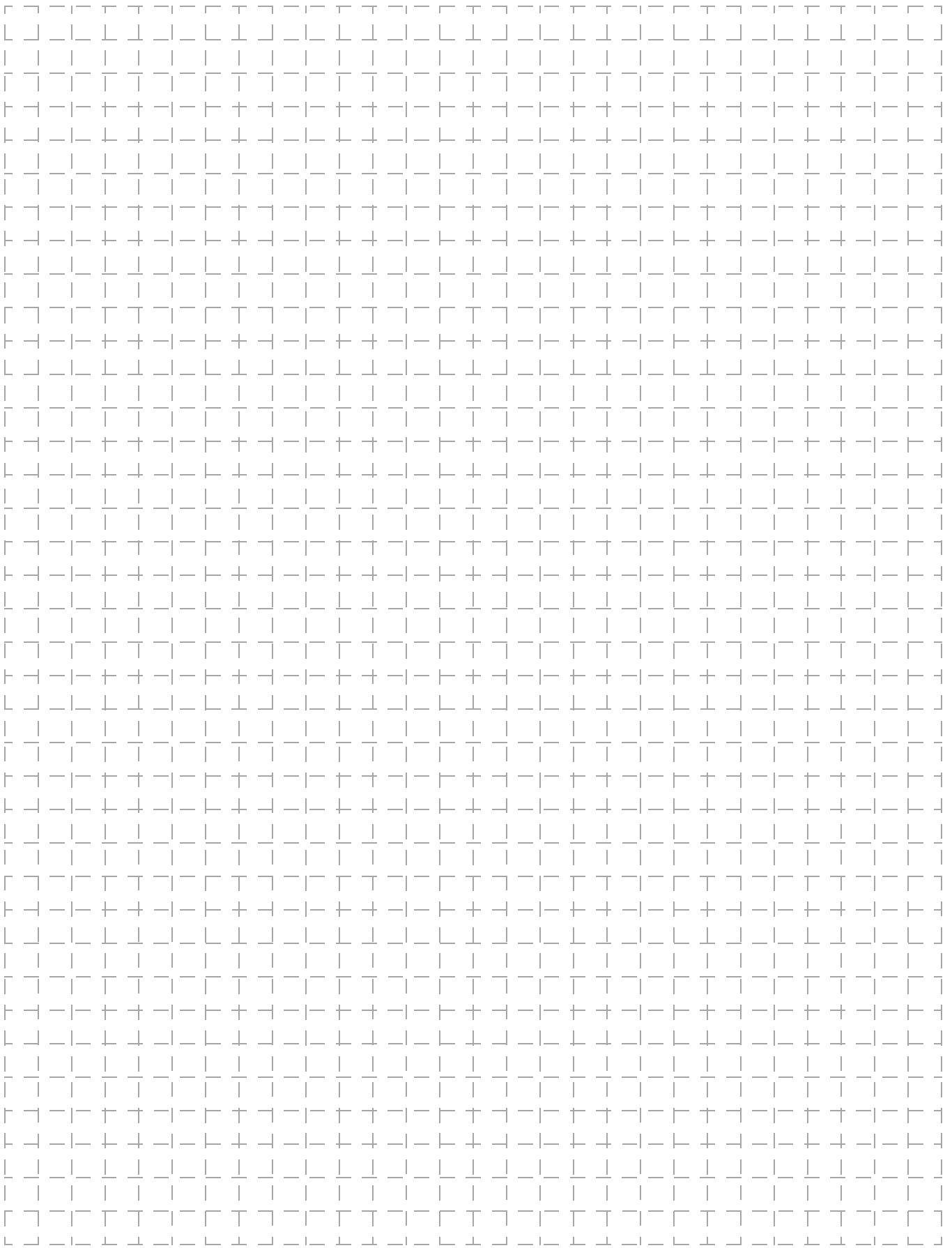
- Using the RF MEMS Switch in a circuit where the RF MEMS Switch will be ON continuously for long periods (more than 24 hours) (rather than switching) can lead to unstable contacts. If a single-side stable model must be used in this kind of circuit, we recommend adding fail-safe circuits in case the contact fails.

Claw Securing Force During Automatic Mounting

- During automatic insertion of RF MEMS Switches, be sure to set the securing force of each claw to the following so that the RF MEMS Switch's characteristics will be maintained.



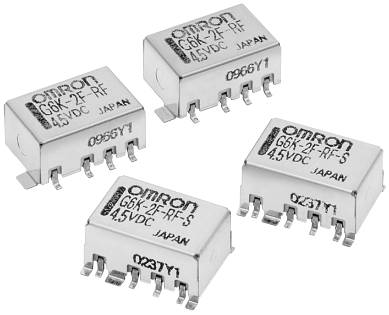
MEMO



High Frequency Relay
G6K-RF

Compact High Frequency Relays with 2 Form C (DPDT) Contacts

- **New** Space-saving version with smaller ground terminal footprint is available. ("-S" versions)
- Handles 1 A, 30 VDC discrete load and 1 W at 1GHz.
- Single-coil latching models available.
- Ambient temperature range: -40° to 70°C
- Low coil power consumption: 100 mW.
- Ideal for instrumentation and high-speed LAN network equipment.
- RoHS Compliant



NEW

Ordering Information

PCB Footprint	Max.Load	Coil Voltage	Non-Latching part number	Single-coil latching part number
Standard ground terminal	1 A at 30 VDC, 0.3 A at 125 VDC	3 VDC	**G6K-2F-RF DC3**	**G6KU-2F-RF DC3**
		4.5 VDC	**G6K-2F-RF DC4.5**	**G6KU-2F-RF DC4.5**
		5 VDC	**G6K-2F-RF DC5**	**G6KU-2F-RF DC5**
		6 VDC	**G6K-2F-RF DC6**	**G6KU-2F-RF DC6**
		9 VDC	**G6K-2F-RF DC9**	**G6KU-2F-RF DC9**
		12 VDC	**G6K-2F-RF DC12**	**G6KU-2F-RF DC12**
		24 VDC	**G6K-2F-RF DC24**	**G6KU-2F-RF DC24**
Space-saving ground terminal		3 VDC	**G6K-2F-RF-S DC3**	**G6KU-2F-RF-S DC3**
		4.5 VDC	**G6K-2F-RF-S DC4.5**	**G6KU-2F-RF-S DC4.5**
		5 VDC	**G6K-2F-RF-S DC5**	**G6KU-2F-RF-S DC5**
		6 VDC	**G6K-2F-RF-S DC6**	**G6KU-2F-RF-S DC6**
		9 VDC	**G6K-2F-RF-S DC9**	**G6KU-2F-RF-S DC9**
		12 VDC	**G6K-2F-RF-S DC12**	**G6KU-2F-RF-S DC12**
		24 VDC	**G6K-2F-RF-S DC24**	**G6KU-2F-RF-S DC24**

Note: The above listed models are packaged in trays of 300. They are also available in Tape and Reel packaging.

1. Place "-TR03" before the coil voltage to obtain Tape and Reel packaging, in quantities of 300 pieces per reel.
2. Place "-TR09" before the coil voltage to obtain Tape and Reel packaging, in quantities of 900 pieces per reel.
   Examples: G6K-2F-RF-S-TR09 DC5
   G6KU-2F-RF-TR03 DC12
3. "-TR03" and "-TR09" is only used to identify the tape quantity when ordering and is not marked on the product, itself.

Specifications

■ Contact Ratings

Load	Resistive load
Contact Material	Au alloy on Ag base
Rated load	0.3 A at 125 VAC; 1 A at 30 VDC 1 W at 1 GHz (See note.)
Rated carry current	1 A
Max. switching voltage	125 VAC, 60 VDC
Max. switching current	1 A
Max. switching capacity	37.5 VA (AC); 30 W (DC)

Note: This value is for a load with V.S.W.R. ≤ 1.2

■ Coil Ratings

Rated voltage	Rated current	Coil resistance	Must operate voltage	Must release voltage	Maximum voltage	Rated power consumption
3 VDC	33.0 mA	91 Ω	80% max. of rated voltage (75% max. of rated set voltage for latching models)	10% min. of rated voltage (75% max. of rated reset voltage for latching models)	150% of rated voltage	Approx. 100 mW
4.5 VDC	23.2 mA	194 Ω				
5 VDC	21.1 mA	237 Ω				
6 VDC	17.6 mA	341 Ω				
9 VDC	11.3 mA	795 Ω				
12 VDC	9.1 mA	1,315 Ω				
24 VDC	4.6 mA	5,220 Ω				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. The operating characteristics are measured at a coil temperature of 23°C.
3. The maximum voltage is the highest voltage that can be imposed on the Relay coil instantaneously.

■ High Frequency Characteristics at 1 GHz

Isolation	20 dB min. between contacts of the same pole 30 dB min. between contacts of different poles
Insertion loss	0.2 dB max.
V.S.W.R.	1.2 max.
Maximum transmission capacity	3 W (See note 3)
Maximum switching capacity	1 W (See note 3)

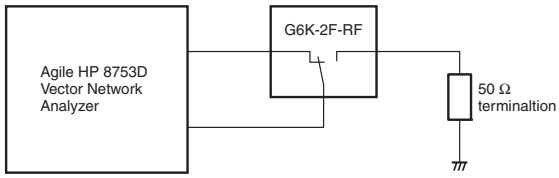
Note: 1. The impedance of the measurement system is 50 Ω.
2. The above values are initial
3. These values are for a load with V.S.W.R. ≤ 1.2

■ Characteristics

Item		Single-side stable models	Single-winding latching models
		G6K-2F-RF(-S)	G6KU-2F-RF(-S)
Contact resistance (See note 2.)		100 mΩ max.	
Operating (set) time (See note 3.)		3 ms max. (approx. 1.4 ms)	3 ms max. (approx. 1.2 ms)
Release (reset) time (See note 3.)		3 ms max. (approx. 1.3 ms)	3 ms max. (approx. 1.2 ms)
Minimum set/reset pulse time		---	10 ms
Insulation resistance (See note 4.)		1,000 MΩ min. (at 500 VDC)	
Dielectric strength	**Between coil and contacts**	750 VAC, 50/60 Hz for 1 min	
	Between contacts of different poles	750 VAC, 50/60 Hz for 1 min	
	Between contacts of the same pole	750 VAC, 50/60 Hz for 1 min	
	Between ground and coil/contacts	500 VAC, 50/60 Hz for 1 min	
Vibration resistance	**Destruction**	10 to 55 Hz, 5-mm double amplitude and 55 to 500 to 55 Hz, 300 m/s^2	
	Malfunction	10 to 55 Hz, 3.3-mm double amplitude and 55 to 500 to 55 Hz, 200 m/s^2	
Shock resistance	**Destruction**	1,000 m/s^2	
	Malfunction	750 m/s^2	
Endurance	**Mechanical**	50,000,000 operations min. (at a switching frequency of 36,000 operations/hour)	
	Electrical	100,000 operations min. (at a switching frequency of 1,800 operations/hour)	
Ambient temperature		Operating: −40°C to 70°C (with no icing or condensation)	
Ambient humidity		Operating: 5% to 85%	
Weight		Approx. 0.95 g	

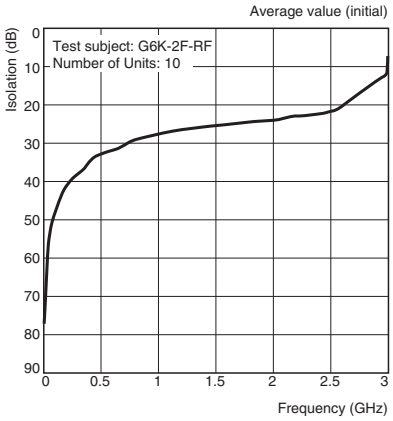
Note: 1. The above values are initial values.
2. The contact resistance was measured with 10 mA at 1 VDC with a voltage drop method.
3. Values in parentheses are typical values.
4. The insulation resistance was measured with a 500-VDC megohmmeter applied to the same parts as those used for checking the dielectric strength.

Engineering Data

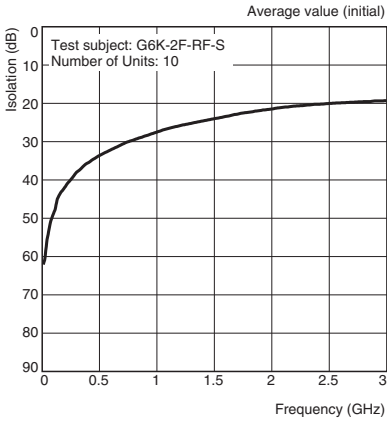


High-Frequency Characteristics (Isolation)

G6K-2F-RF

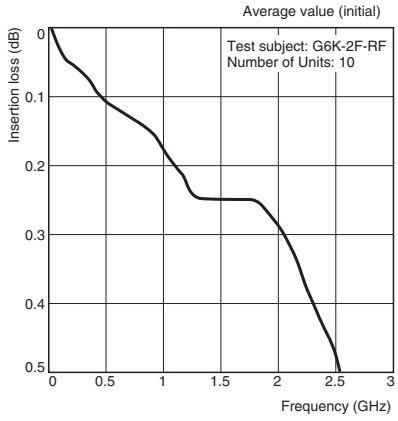


G6K-2F-RF-S

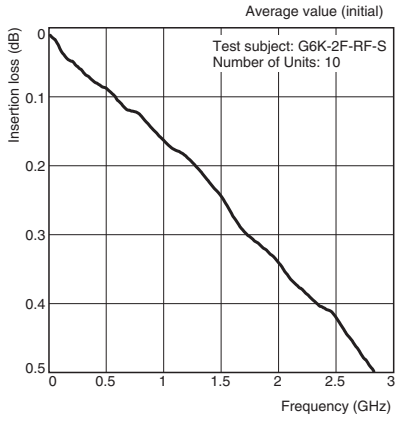


High-frequency Characteristics (Insertion Loss)

G6K-2F-RF

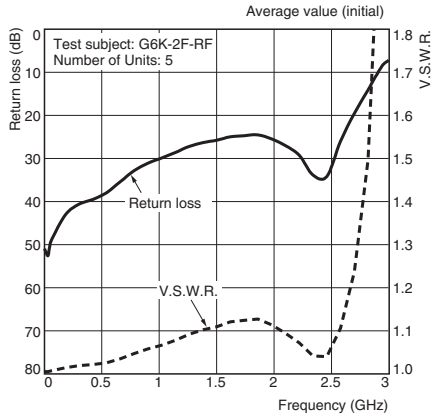


G6K-2F-RF-S

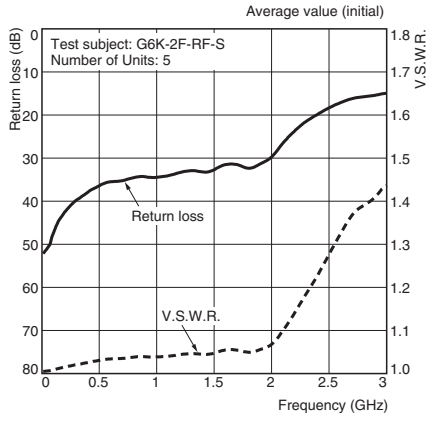


High-frequency Characteristics (Return Loss, V.S.W.R.)

G6K-2F-RF



G6K-2F-RF-S



Note: 1. Refer to the G6K specification for basic specifications and characteristics not shown above

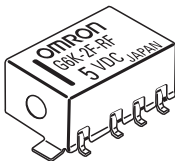
2. Ambient temperature condition: 23°C

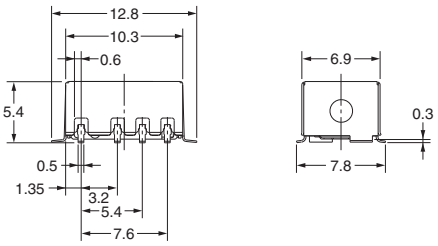
3. The high-frequency characteristics depend on the mounting board. Be sure to check actual operation, including durability, in actual equipment before use.

Dimensions

Note: All dimensions are in millimeters unless otherwise indicated

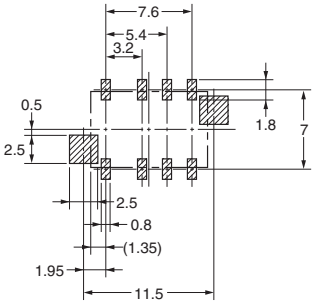
G6K-2F-RF
G6KU-2F-RF



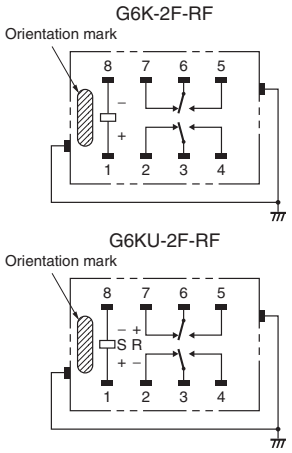


Mounting Dimensions (Top View)

Tolerance ±0.1 mm

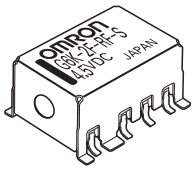


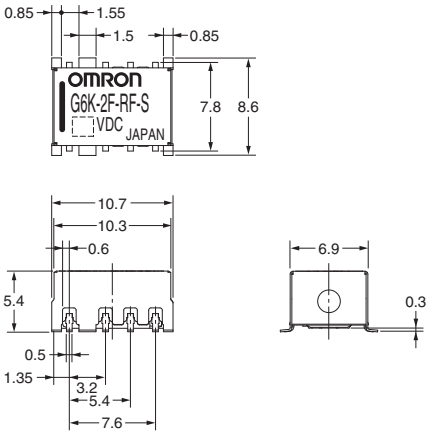
Terminal Arrangement and Internal Connections (Top View)



Note: 1. Each value has a tolerance of ±0.3 mm
2. The coplanarity of the terminals is 0.15 mm max.

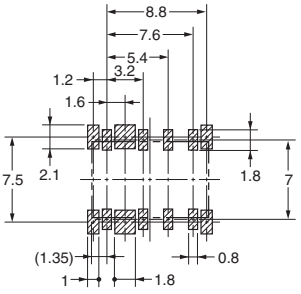
G6K-2F-RF-S
G6KU-2F-RF-S



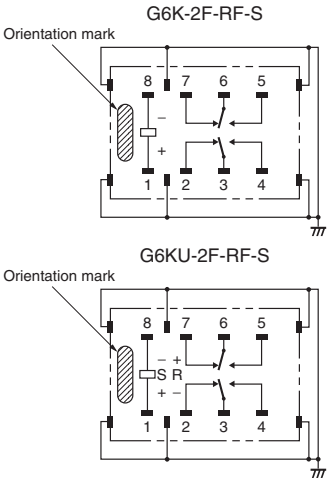


Mounting Dimensions (Top View)

Tolerance ±0.1 mm



Terminal Arrangement and Internal Connections (Top View)

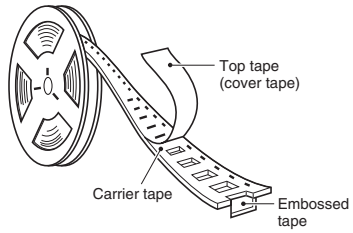


Note: 1. Each value has a tolerance of ±0.3 mm
2. The coplanarity of the terminals is 0.15 mm max.

Tape Packaging Specifications

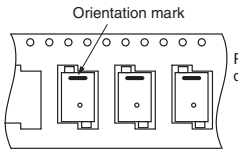
- Add “-TR03” or “-TR09” before the coil voltage to order relays in Tape and Reel packaging. If “-TR03” or “-TR09” is not included, then the relays will be provided in trays of 300 relays per tray.
  - - Add “-TR03” to obtain 300 relays per reel
  - - Add “-TR09” to obtain 900 relays per reel

1. Direction of Relay insertion

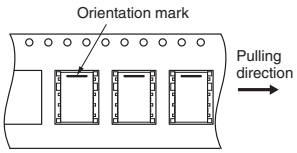


Pulling Direction

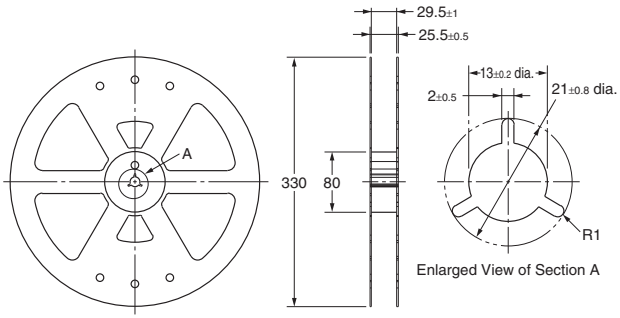
G6K(U)-2F-RF



G6K(U)-2F-RF-S

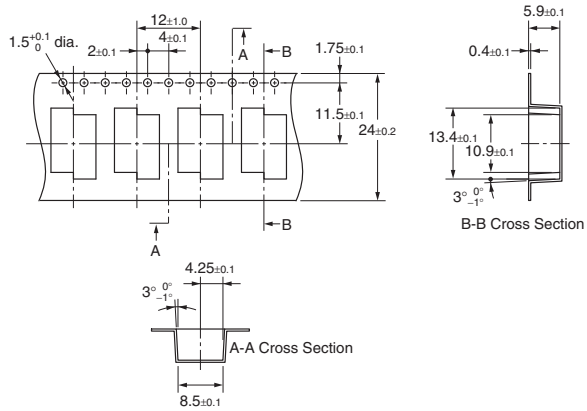


2. Reel Dimensions

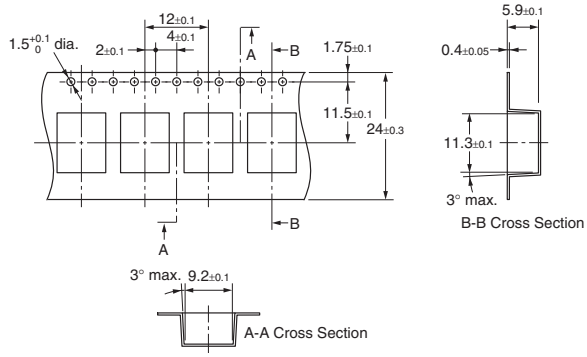


3. Carrier Tape Dimensions

G6K(U)-2F-RF



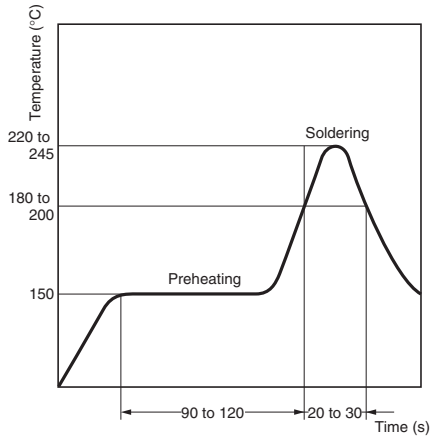
G6K(U)-2F-RF-S



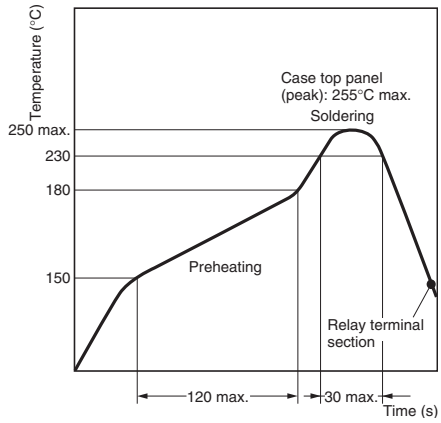
Precautions

■ Recommended Soldering Method

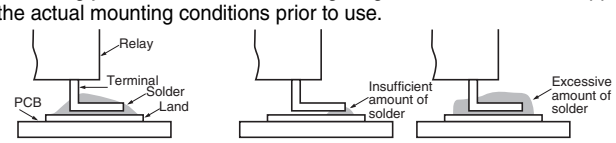
1. Temperature Profile for Lead Solder (Measured at the PCB)



2. Temperature Profile for Lead-free Solder (Measured at the PCB)



3. The thickness of cream solder to be applied should be between 200 and 250 μm and the land pattern should be based on Omron's recommended PCB pattern. To maintain the correct soldering joint shown in the following diagram, we recommend applying solder using the soldering conditions shown above. Check the soldering in the actual mounting conditions prior to use.



■ Precautions for correct use

For general precautions, refer to Omron's Relay Technical guidelines, contained in Omron's relay catalog.

Relay Handling

Do not unpack the relay until ready to mount it. Use the relay as soon as possible after opening the moisture-proof bag. Otherwise, the terminals may tarnish and seal failure may occur after the solder process.

When washing the product after soldering, use a water-based or alcohol-based solvent. Keep the solvent temperature below 40°C. Do not put the relay in a cold cleaning bath immediately after soldering.

Operating, Storage Environment

If the relay is stored for a long time in an adverse environment with high temperature, high humidity, organic or sulfide gases, then sulfide or oxide films will form on the contact surfaces. These films may result in unstable contact, contact problems or function problems. Therefore, operate, store or transport the product under specified environmental conditions.

1. Use in locations where the relay is not exposed to corrosive gas such as hydrogen sulfide gas or salty air.
2. Use in locations where no visible dust exists.
3. Use in locations where the product is not exposed to direct sunlight, rain or snow.
4. Do not apply force to the product which may result in deformation or change in quality of the product.

Coating

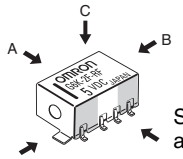
The relay mounted on the PCB may be coated or washed, but do not apply silicone coating or detergent containing silicone, otherwise, the silicone coating or detergent may remain on the surface of the relay.

Latching Relay Mounting

Make sure that excess vibration or shock doesn't set or reset the relay during normal operation. The relay is shipped in the 'reset' position. Shock or vibration during shipping may require the application of a reset signal, prior to operation.

Claw Securing Force During Automatic Mounting

During automatic insertion of relays, make sure to set the securing force of each claw to the following so that the relay's characteristics will be maintained.



Direction A: 1.96 N max.
Direction B: 4.90 N max.
Direction C: 1.96 N max.

Secure the claws to the shaded area. Do not attach them to the center of the relay or just one part of the relay.

Maximum Allowable Voltage

The maximum allowable voltage of the coil can be obtained from the coil temperature increase and the heat-resisting temperature of the coil insulating sheath material. (Exceeding the heat-resisting temperature may result in burning or short-circuiting.) The maximum allowable voltage also involves important restrictions which include the following;

- Must not cause thermal changes in or deterioration of the insulating material, which may result in films developing on the contacts.
- Must not cause damage to other control devices.
- Must not cause any harmful effect on people.
- Must not cause fire.

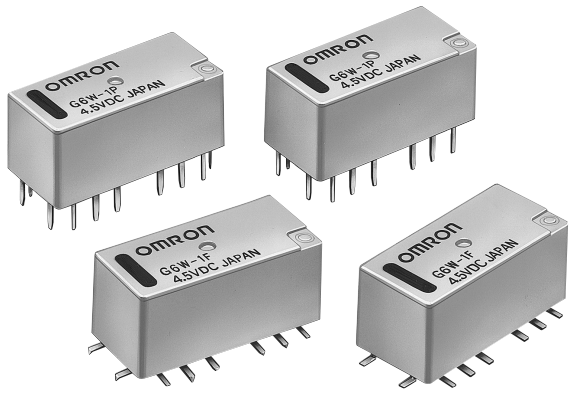
Therefore, be sure to use the maximum allowable voltage as specified in the catalog. As a rule, the rated voltage must be applied to the coil. A voltage exceeding the rated value, however, can be applied to the coil providing that the voltage is less than or equal to the maximum allowable voltage. It must be noted that continuous voltage application to the coil will cause a coil temperature increase which may affect characteristics such as electrical life and coil insulation.

Consider using a latching relay instead of a non-latching relay with a continuous voltage applied to the coil.

High-frequency Relay
G6W

Surface-mountable 5 GHz Band Miniature SPDT High-frequency Relay

- Superior high-frequency characteristics, such as an isolation of 35 dB min., insertion loss of 0.5 dB max., and V.S.W.R. of 1.7 max. at 5 GHz (50 Ω).
- High-frequency characteristics obtained by adopting tri-plate micro strip line design.
- Small size at 20 x 9.4 x 8.9 mm (L x W x H).
- Y-shape terminal structure and reverse contact option simplifies wiring to PCBs.
- RoHS Compliant.



Ordering Information

Classification				Non latching	Single-coil latching	Dual-coil latching
SPDT	Fully sealed	Through-hole terminal	Y-shape terminal	**G6W-1P**	**G6WU-1P**	**G6WK-1P**
		Surface-mount terminal	Y-shape terminal	**G6W-1F**	**G6WU-1F**	**G6WK-1F**

Note: When ordering, add the rated coil voltage to the model number.
Example: G6W-1P DC12
Rated coil voltage

Model Number Legend:

G6W□ - □ □ □ - □
1 2 3 4 5

1. **Relay function**
   None: Non-latching
   U: Single-coil latching
   K: Dual-coil latching
2. **Contact form**
   1: SPDT
3. **Terminal shape**
   F: Surface-mount terminals
   P: PCB through-hole terminals
4. **Terminal Structure**
   None: Y-shape terminal (standard)
5. **Contact Arrangement**
   None: Standard contact arrangement
   R: Reverse contact arrangement (Available only for Non-Latching versions)

■ Typical Applications

- Mobile phone base station (W-CDMA, UMTS, CDMA-2000, PCS)
- Wireless LAN and TV transmitters
- Test and Measurement devices
- Signal Generators

Specifications

■ Contact Ratings

Load type	Resistive load
Contact material	Au clad Cu alloy
Rated load	10 mA at 30 VAC; 10 mA at 30 VDC 2.5 GHz, 50 Ω, 10 W (See note 2)
Rated carry current	0.5 A
Max. switching voltage	30 VDC, 30 VAC
Max. switching current	0.5 A

■ High-frequency Characteristics

Frequency	**2.0 GHz**	**2.5 GHz**	**5.0 GHz**
Isolation	65 dB min.	60 dB min.	35 dB min.
Insertion loss	0.2 dB max.		0.5 dB max.
V.S.W.R.	1.2 max.		1.7 max.
Max. carry power	20 W (See note 2)		
Max. switching power	10 W (See note 2)		

Note: 1. The above values are initial values.

2. These values are for a load with V.S.W.R. ≤1.2 at an impedance of 50 Ω.

■ Coil Ratings

Non-latching Relays (G6W-1F, G6W-1P)

Rated voltage	3 VDC	4.5 VDC	9 VDC	12 VDC	24 VDC
Rated current	66.7 mA	44.4 mA	22.2 mA	16.7 mA	8.3 mA
Coil resistance	45 Ω	101 Ω	405 Ω	720 Ω	2,880 Ω
Must operate voltage	80% of max. of rated voltage				
Must release voltage	10% min. of rated voltage				
Maximum voltage	150% of rated voltage				
Power consumption	Approx. 200 mW				

Single-coil Latching Relays (G6WU-1F, G6WU-1P)

Rated voltage	9 VDC	12 VDC
Rated current	22.2 mA	16.7 mA
Coil resistance	405 Ω	720 Ω
Must set voltage	80% max. of rated voltage	
Must reset voltage	80% max of rated voltage	
Maximum voltage	150% of rated voltage	
Power consumption	Approx. 200 mW	

Dual-coil Latching Relays (G6WK-1F, G6WK-1P)

Rated voltage	3 VDC	4.5 VDC	9 VDC	12 VDC	24 VDC
Rated current	120 mA	80 mA	40 mA	30 mA	15 mA
Coil resistance	25 Ω	56 Ω	225 Ω	400 Ω	1,600 Ω
Must set voltage	80% max. of rated voltage				
Must reset voltage	80% max. of rated voltage				
Maximum voltage	150% of rated voltage				
Power consumption	Approx. 360 mW				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ± 10%.

2. The operating characteristics are measured at a coil temperature of 23°C.

3. The maximum voltage is the highest voltage that can be imposed on the relay coil.

4. The voltage measurements for operate/release and set/reset are the values obtained for instantaneous changes in the voltage. (Rectangular wave).

■ Characteristics

Item		Non-latching	Single-coil latching	Dual-coil latching
		G6W-1F, G6W-1P	G6WU-1F, G6WU-1P	G6WK-1F, G6WK-1P
Contact resistance (See note 2)		100 mΩ max.		
Operate (set) time (See note 3)		10 ms max. (Approx. 3.5 ms)	10 ms max. (Approx. 2.5 ms)	
Release (reset) time (See note 3)		10 ms max. (Approx. 2.5 ms)		
Minimum set/reset signal width		-----	12 ms	
Insulation resistance (See note 4)		1,000 MΩ min. (at 500 VDC)		
Dielectric strength	Coil and contacts	1,000 VAC, 50/60 Hz for 1 min		
	Coil and ground, contacts and ground	500 VAC, 50/60 Hz for 1 min		
	Contact of same polarity	500 VAC, 50/60 Hz for 1 min		
Vibration resistance	Destruction	10 to 55 Hz, 1.5-mm double amplitude		
	Malfunction	10 to 55 Hz, 2-mm double amplitude		
Shock resistance	Destruction	1,000 m/s^2		
	Malfunction	500 m/s^2		
Endurance	Mechanical	1,000,000 operations min. (at 36,000 operations/hour)		
	Electrical	300,000 operations min. (with a rated load at 1,800 operations/hour) 100,000 operations min. (2.5GHz, 50 Ω, 10 W)		
Ambient temperature		Operating: -40°C to 70°C (with no icing or condensation)		
Ambient humidity		Operating: 5% to 85%		
Weight		Approx. 3 g		

Note: 1. The above values are initial values.

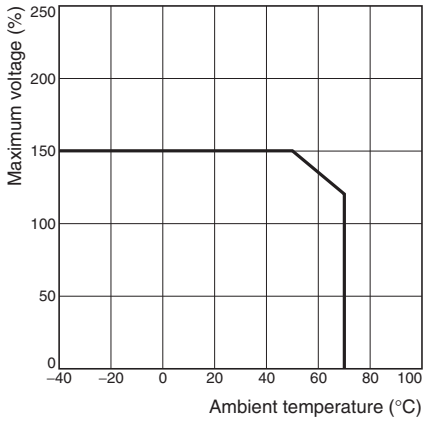
2. The contact resistance was measured with 10 mA at 1 VDC with a fall-of-potential method.

3. Values in parentheses are typical values.

4. The insulation resistance was measured with a 500-VDC Megger Tester applied to the same parts as those used for checking the dielectric strength.

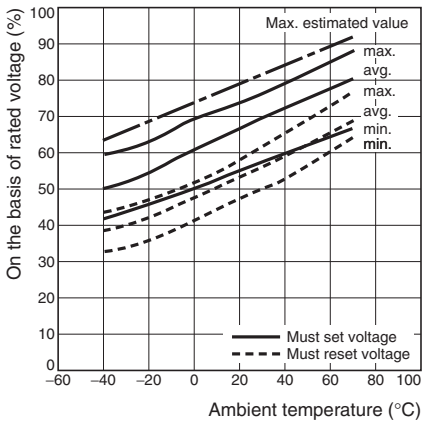
Engineering Data

Ambient Temperature vs. Maximum Voltage

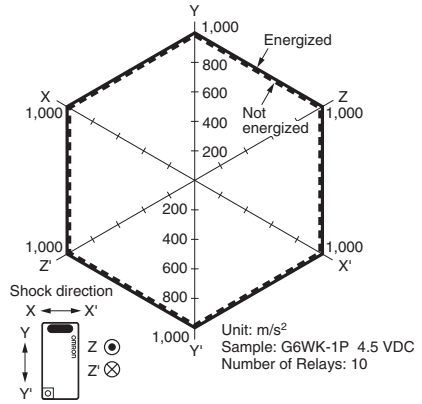


Note: "Maximum voltage" is the maximum voltage that can be applied to the relay coil.

Ambient Temperature vs. Must Set or Must Reset Voltage

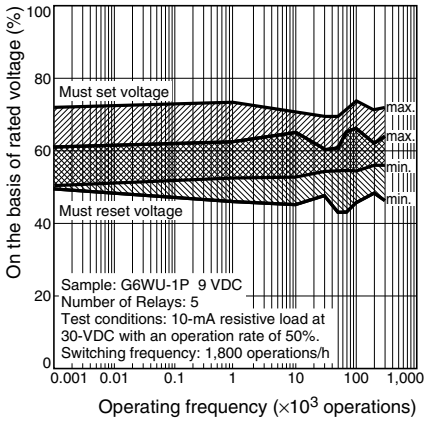


Shock Malfunction

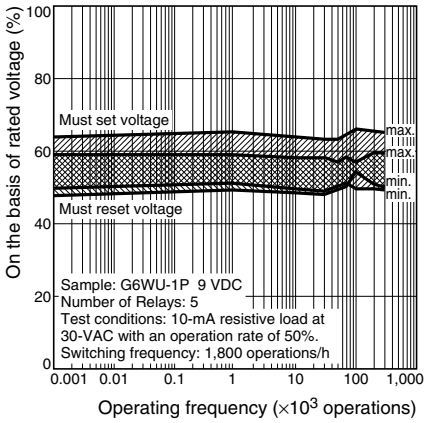


Conditions: Shock is applied in ±X, ±Y, and ±Z directions three times each with and without energizing the relays to check the number of contact malfunctions.

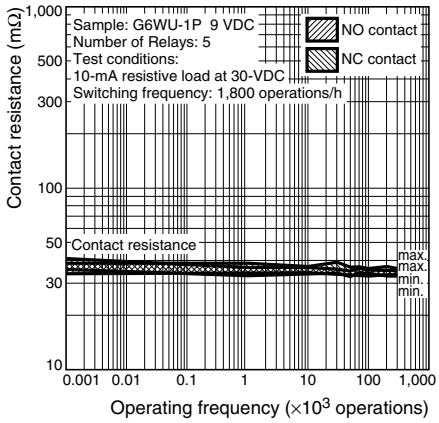
Electrical Endurance, DC Load: Must Set and Must Reset Voltage (See notes 1 and 2)



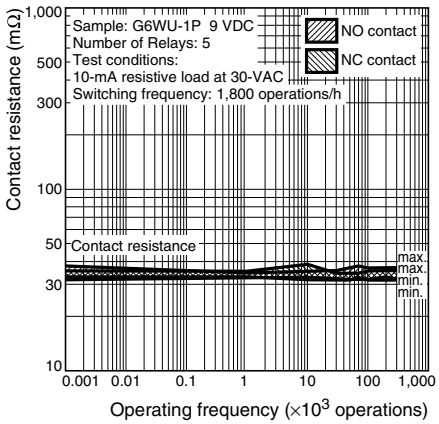
Electrical Endurance, AC Load: Must Set and Must ResetVoltage (See notes 1 and 2)



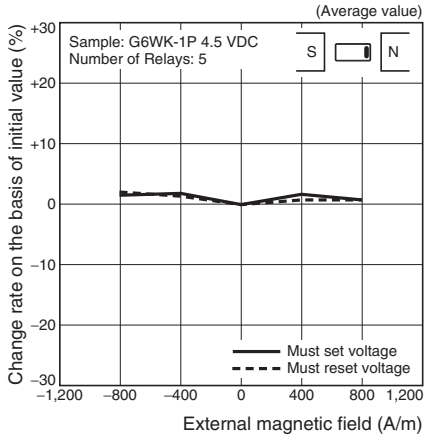
Electrical Endurance, DC Load: Contact Resistance (See notes 1 and 2)

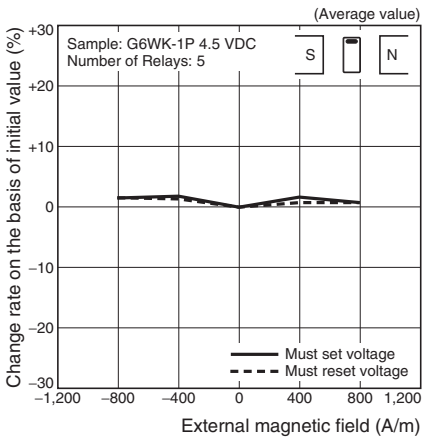


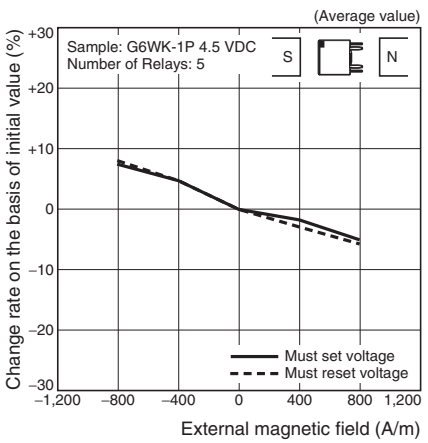
Electrical Endurance, AC Load: Contact Resistance (See notes 1 and 2)



External Magnetic Interference



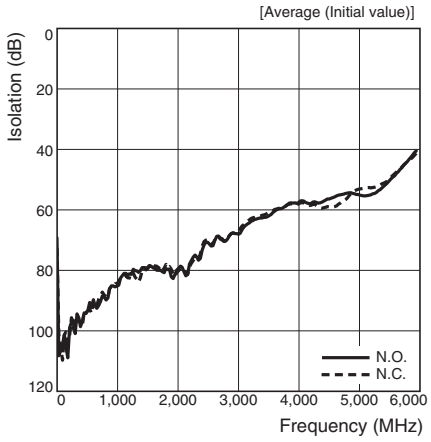




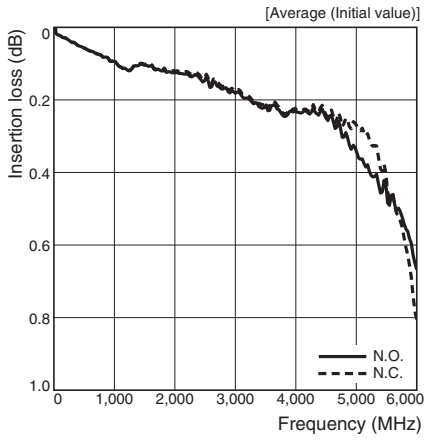
Note: 1. The tests were conducted at an ambient temperature of 23°C

2. The contact resistance data are periodically measured reference values and are not values from monitoring each operation. Contact resistance values will vary according to the switching frequency and operating environment. Therefore, be sure to check the operation under the actual operating conditions before use.

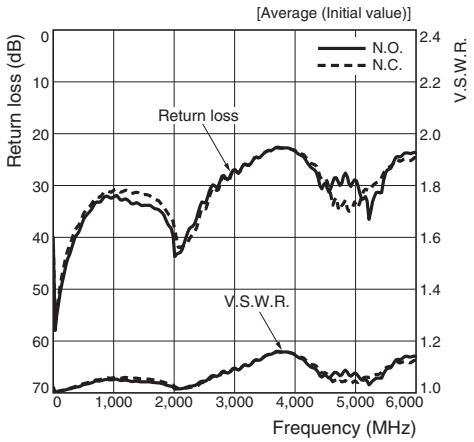
Isolation
(See notes 1 and 2)



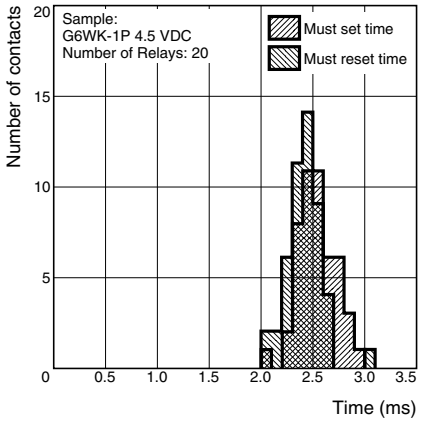
Insertion Loss
(See notes 1 and 2)



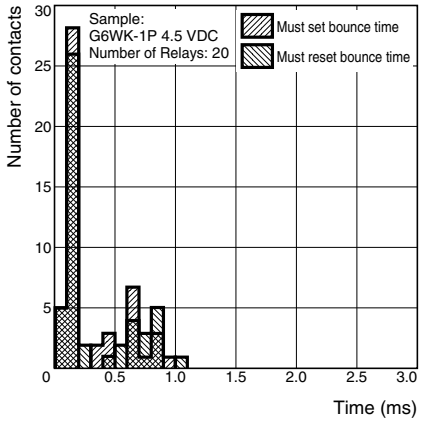
V.S.W.R. / Return Loss
(See notes 1 and 2)



Must Set and Must Reset
Time Distribution (see note 1).



Must Set and Must Reset
Bounce Time Distribution (see note 1).



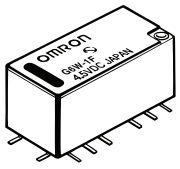
Note: 1. The tests were conducted at an ambient temperature of 23°C.

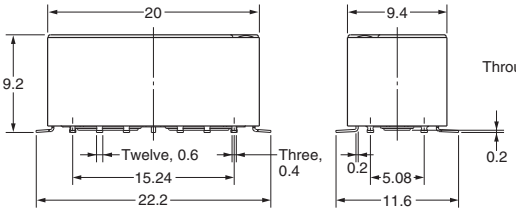
2. High-frequency characteristics depend upon the PCB to which the relay is mounted. Always check these characteristics, including endurance (life expectancy) in the actual application before use.

Dimensions

Note: All units are in millimeters unless otherwise indicated.

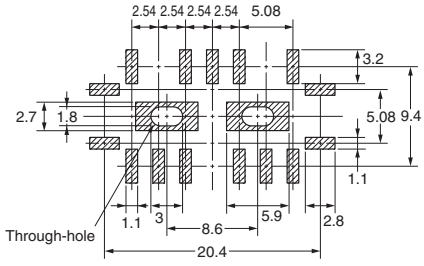
G6W-1F
G6WU-1F



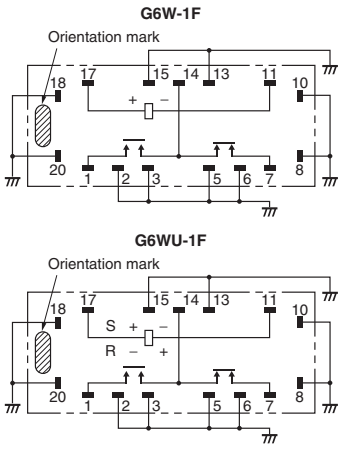


Mounting Pads
(Top View)

Tolerance: ±0.1 mm



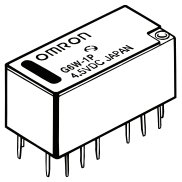
Terminal Arrangement/
Internal Connections
(Top View)

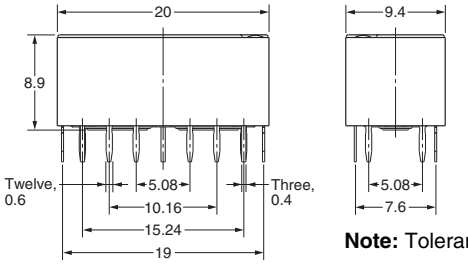


Note: 1. Tolerance: ±0.3 mm unless specified.

2. The coplanarity of the terminals is 0.1 mm max.

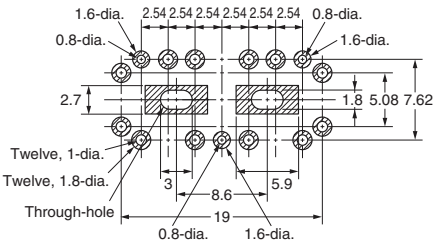
G6W-1P
G6WU-1P



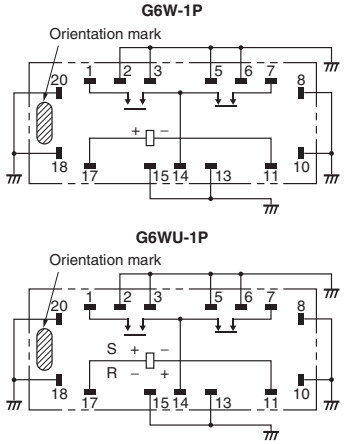


Mounting Holes (Bottom View)

Tolerance: ±0.1 mm

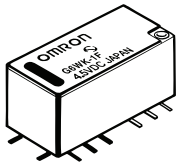


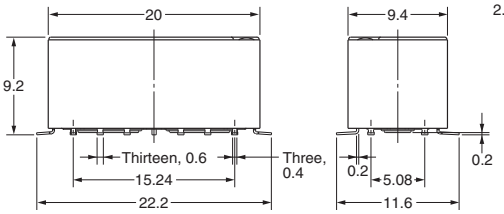
Terminal Arrangement/ Internal Connections (Bottom View)



Note: Tolerance: ±0.3 mm unless specified.

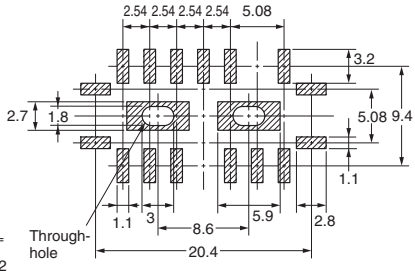
G6WK-1F



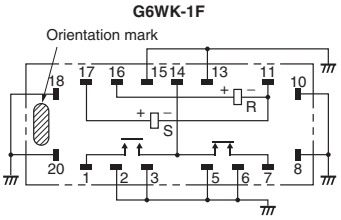


Mounting Pads (Top View)

Tolerance: ±0.1 mm

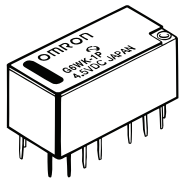


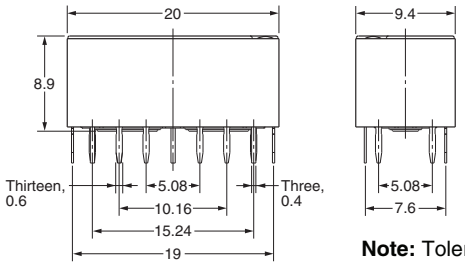
Terminal Arrangement/ Internal Connections (Top View)



Note: 1. Tolerance: ±0.3 mm unless specified.
2. The coplanarity of the terminals is 0.1 mm max.

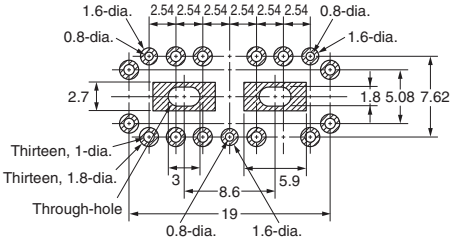
G6WK-1P



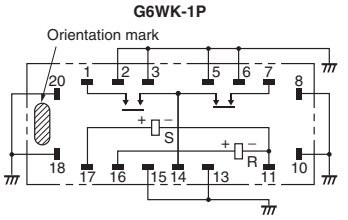


Mounting Holes (Bottom View)

Tolerance: ±0.1 mm



Terminal Arrangement/ Internal Connections (Bottom View)

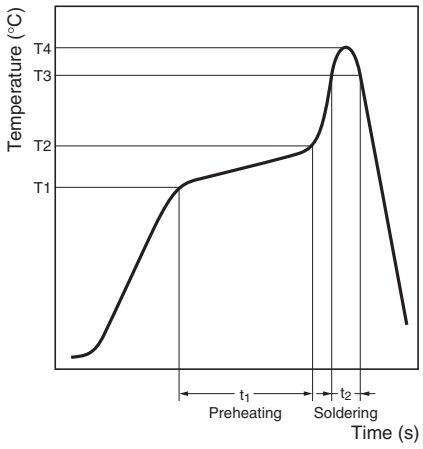


Note: Tolerance: ±0.3 mm unless specified.

Recommended Soldering Method

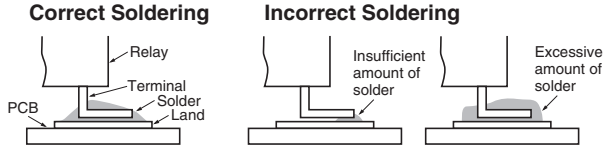
■ Temperature Profile According to IRS Method

When performing reflow-soldering, check the profile on an actual device after setting the temperature condition so that the temperatures at the relay terminals and the upper surface of the case do not exceed the limits specified in the following table.



Item / Measuring position	Preheating (T1 to T2, t_1)	Soldering (T3, t_2)	Peak value (T4)
Terminal	150°C to 180°C, 120 s max.	230°C min., 30 s max.	250°C max.
Upper surface of case	---	---	255°C max.

The thickness of cream solder to be applied should be within a range between 150 and 200 μm on OMRON's recommended PCB pattern.



Visually check that the Relay is properly soldered.

Bottom Ground Soldering Conditions

To solder the bottom ground, manually solder separately from the terminals according to the following conditions.

- Soldering iron: 50 W
- Iron temperature: 380°C to 400°C
- Soldering time: 10 s max.

Note: The above conditions are for a PCB with OMRON's recommended patterns and hole perforations. The conditions will depend on the PCB being used. Therefore, it is recommended to double-check the suitability under actual PCB conditions.

Soldering

Soldering temperature: Approx. 250°C (At 260°C if the DWS method is used.)

Soldering time: Approx. 5 s max. (approx. 2 s for the first time and approx. 3 s for the second time if the DWS method is used.)

Be sure to adjust the level of the molten solder so that the solder will not overflow onto the PCB.

Precautions

■ Correct Use

Handling

Use the Relay as soon as possible after opening the moisture-proof package. If the Relay is left for a long time after opening the moisture-proof package, the appearance may suffer and seal failure may occur after the solder mounting process. To store the Relay after opening the moisture-proof package, place it into the original package and sealed the package with adhesive tape.

When washing the product after soldering the Relay to a PCB, use a water-based solvent or alcohol-based solvent, and keep the solvent temperature to less than 40°C. Do not put the Relay in a cold cleaning bath immediately after soldering.

Dropping the Relay may cause damage to its functional capability. Never use the Relay if it is dropped.

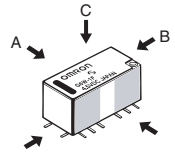
Protect the Relays from direct sunlight during operation, storage, and transportation and keep the relays under normal temperature, humidity, and pressure.

Coating

Do not use silicone coating to coat the Relay when it is mounted to the PCB. Do not wash the PCB after the Relay is mounted using detergent containing silicone. Otherwise, the detergent may remain on the surface of the Relay.

Claw Securing Force During Automatic Insertion

During automatic insertion of Relays, make sure to set the securing force of the claws to the following values so that the Relay characteristics will be maintained.



Direction A: 4.90 N max.
Direction B: 9.80 N max.
Direction C: 9.80 N max.

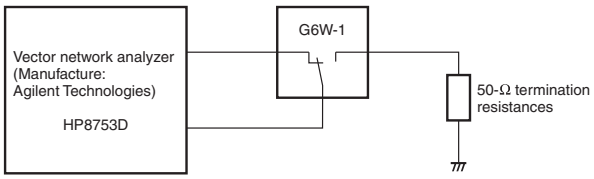
Secure the claws to the area indicated by shading.
Do not attach them to the center area or to only part of the Relay.

Latching Relay Mounting

Make sure that the vibration or shock that is generated from other devices, such as relays in operation, on the same panel and imposed on the Latching Relay does not exceed the rated value, otherwise the Latching Relay that has been set may be reset or vice versa. The Latching Relay is reset before shipping. If excessive vibration or shock is imposed, however, the Latching Relay may be set accidentally. Be sure to apply a reset signal before use.

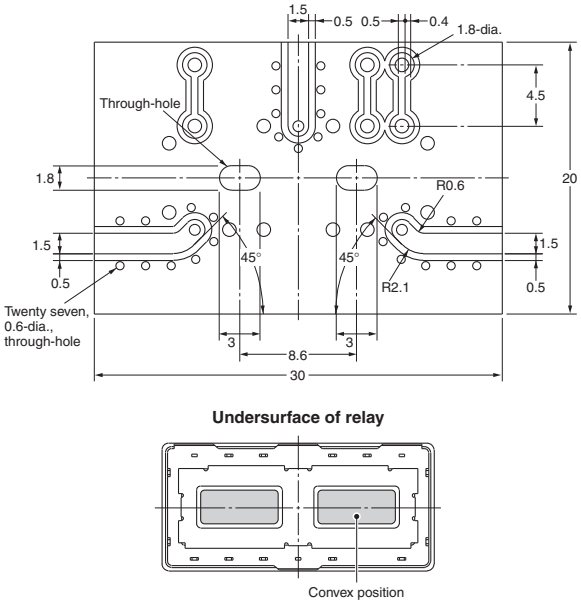
■ High-frequency Characteristics Measurement Method and Substrate to be Measured

High-frequency Characteristics for G6W are measured as shown below.



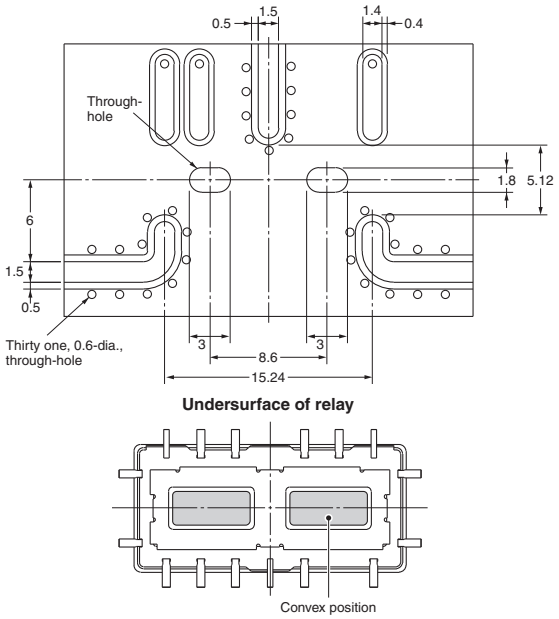
Through-hole substrate

Substrate: t-0.8 BT resin (Dielectric constant at 2 GHz: 3.37)



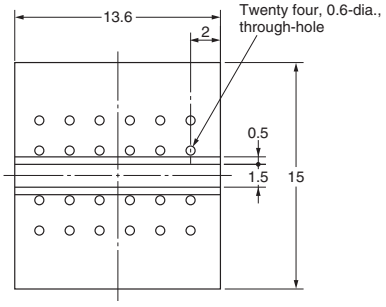
SMD-type substrate

Substrate: t-0.8 BT resin (Dielectric constant at 2 GHz: 3.37)



Note: To obtain high-frequency characteristics close to those specified in this datasheet, solder the convex point on the undersurface of the relay to the ground pattern of the substrate.

Base plate for high-frequency characteristic compensation

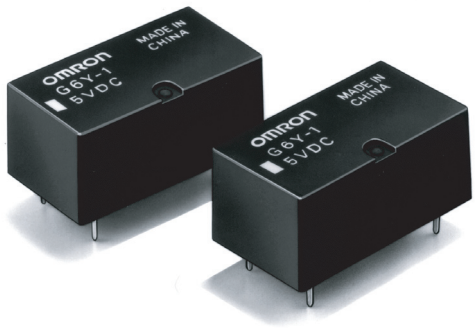


Note: The above compensation plate is used to measure the loss by the relay.
The relay loss is determined by subtracting the data measured for a compensation base plate from those for a high-frequency characteristics measuring substrate mounted with a relay.

High Frequency Relay
G6Y

Economical HF Relay Design Based on Micro Strip Line Technology

- Isolation characteristics of 65 dB or better at 900 MHz.
- Effective insertion loss of 0.2 dB (typical) at 900 MHz.
- Fully sealed construction.
- Improved shock-resistance.
- Form, fit and function replacement to G5Y relay with improved characteristics
- RoHS Compliant



Ordering Information

To order: Select the part number and add the desired coil voltage rating (e.g. G6Y-1-DC12).

Type	Contact Form	Construction	Part Number
Standard	SPDT	Fully-sealed	**G6Y-1**

Model Number Legend

G6Y - □ - DC□
1 2

1. **Contact Form**
   1: SPDT

2. **Rated Coil Voltage**
   4.5, 5, 9, 12, 24

Application Examples

- **Wired Communications:** Cable TV, captain systems, and video response systems
- **Wireless Communications:** Transceivers, ham radio, fax machines, satellite broadcasting, text multiplex broadcasting
- **Entertainment Equipment:** TVs, DVD players, and video games
- **Industrial Equipment:** Measuring equipment, test equipment, and multiplex transmission devices

Specifications

■ Contact Ratings

Load type	Resistive load
Contact Material	Au clad Cu alloy
Rated load	0.01 A at 30 VAC 0.01 A at 30 VDC 900 MHz, 1 W (See note.)
Rated carry current	0.5 A
Max. switching voltage	30 VAC 30 VDC
Max. switching current	0.5 A
Max. switching capacity (reference value)	AC10VA DC10W

Note: This value is for a load with V.S.W.R. of 1.2 max.

■ High-frequency Characteristics

Item	250 MHz	900 MHz	2.5 GHz
Isolation	80 db min.	65 dB min.	30 dB min.
Insertion loss	0.5 dB max.	0.5 dB max.	---
V.S.W.R.	1.5 max.	1.5 max.	---
Max. carry power	10 W		---
Max. switching power	10 W (See note 3.)		---

Note: 1. The impedance of the measuring system is 50 Ω.
2. The table above shows preliminary values.
3. This value is for a load with V.S.W.R. of 1.2 max.

■ Coil Ratings

Rated voltage (VDC)	Rated current (mA)	Coil resistance (Ω)	Operating voltage (V)	Release voltage (V)	Maximum voltage (V)	Power consumption (mW)
4.5	44.4	101	75% max. of rated voltage	10% min. of rated voltage	150% of rated voltage at 23°C	Approx. 200
5	40.0	125				
9	22.2	405				
12	16.7	720				
24	8.3	2,880				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

2. The operating characteristics are measured at a coil temperature of 23°C.

3. The maximum voltage is the highest voltage that can be imposed on the relay coil instantaneously. It is not the maximum voltage that can be applied continuously.

■ Characteristics

Contact resistance (See note 2.)	100 mΩ max.
Operating time	10 ms max. (approx. 5 ms, typ.)
Release time	5 ms max. (approx. 1 ms, typ.)
Insulation resistance (See note 3.)	100 MΩ min.
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between coil and contacts
	500 VAC, 50/60 Hz for 1 min between contacts of same polarity
	500 VAC, 50/60 Hz for 1 min between coil and ground and between contacts and ground
Vibration resistance	Destruction: 10 to 55 Hz, 1.5 mm double amplitude Malfunction: 10 to 55 Hz, 1.5 mm double amplitude
Shock resistance	Destruction: 1,000 m/s² (approx. 100G) Malfunction: 500 m/s² (approx. 50G)
Life expectancy	Mechanical: 1,000,000 operations min. (at 1,800 operations/hr) Electrical: 300,000 operations min. (under rated load at 1,800 operations/hr)
Ambient temperature	Operating: −40°C to 70°C (with no icing)
Ambient humidity	Operating: 5 to 85%
Weight	Approx. 5 g

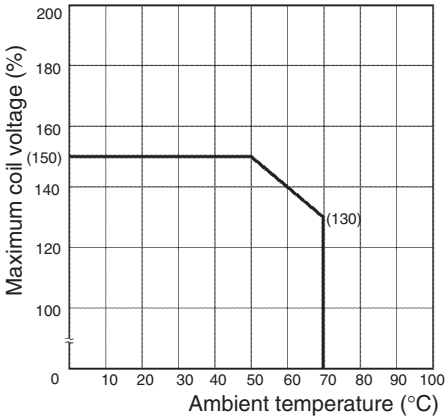
Note: 1. The table above shows preliminary values.

2. The contact resistance was measured with 100mA at 5VDC with a voltage drop method.

3. The insulation resistance was measured with a 500-VDC megohmeter applied to the same points as those used for checking the dielectric strength.

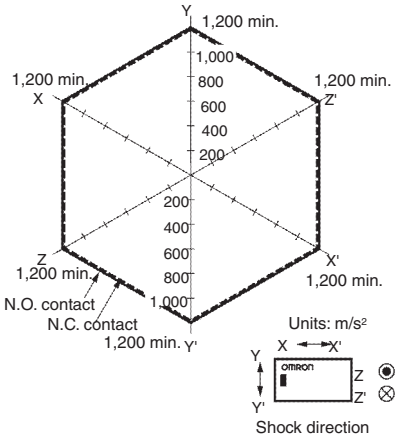
Engineering Data

■ Ambient Temperature vs. Maximum Coil Voltage



Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

■ Resistance to Shock

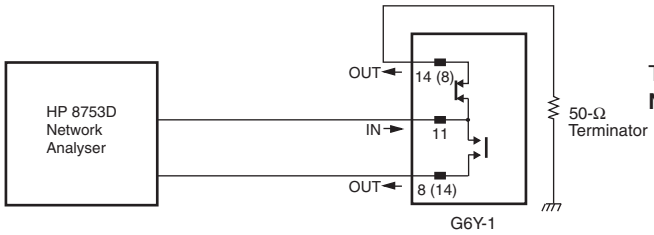


Quantity Tested: 10 Units Rating: 500 m/s²

Test Method: Shock was applied 3 times in each direction with and without excitation and the level at which the shock caused malfunction was measured.

■ High-frequency Characteristics

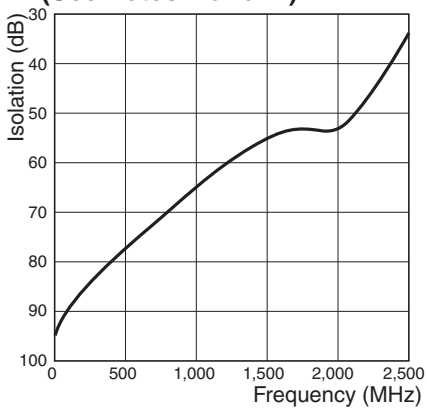
Measurement Conditions



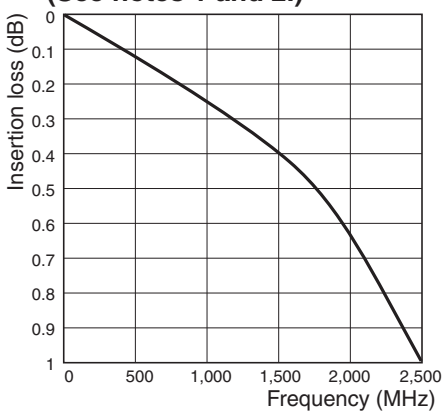
Terminals which were not being measured were terminated with 50 Ω.

Note: The high-frequency characteristics data were measured using a dedicated circuit board and actual values will vary depending on the usage conditions. Check the characteristics of the actual equipment being used.

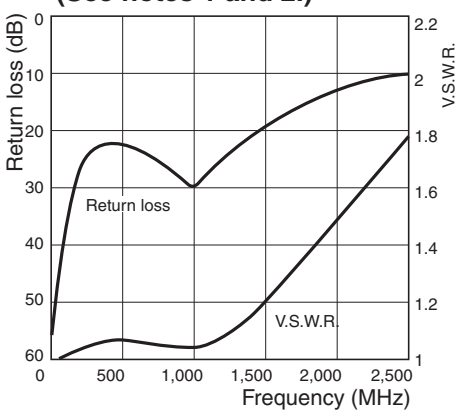
■ Isolation, Average Values (See notes 1 and 2.)



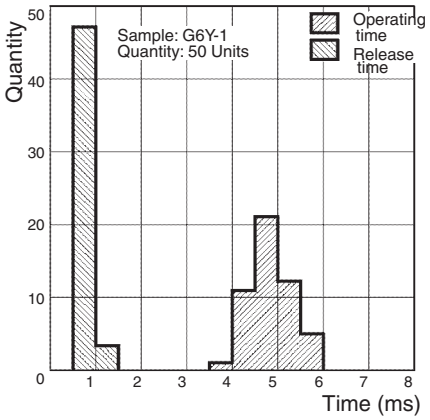
■ Insertion Loss, Average Values (See notes 1 and 2.)



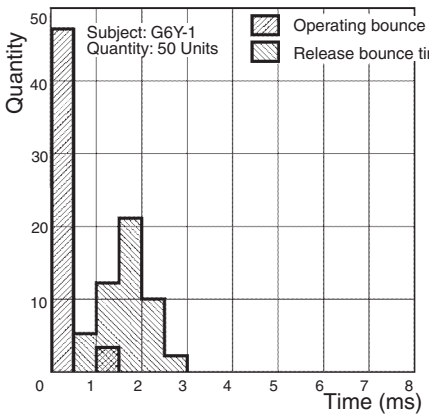
■ V.S.W.R. / Return Loss, Average Values (See notes 1 and 2.)



■ Operating/Release Time Distribution (See note 1.)



■ Bounce Time Distribution (See note 1.)



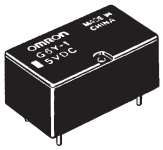
Note: 1. The tests were conducted at an ambient temperature of 23°C.

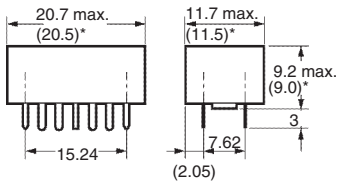
2. High-frequency characteristics depend on the PCB to which the Relay is mounted. Always check these characteristics, including endurance (life expectancy), in the actual machine before use.

Dimensions

Note: All units are in millimeters unless otherwise indicated.

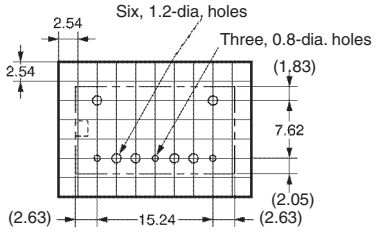
G6Y-1





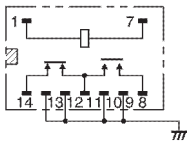
* Average value

PCB Dimensions (Bottom View)



(Holes for the coil terminals may also be 1.0.)
Tolerances: ±0.1 mm.

Terminal Arrangement/ Internal Connections (Bottom View)



(There is no polarity to the coil.)

Note: The shaded and unshaded parts indicate the product's directional marks.

Precautions

■ Correct Use

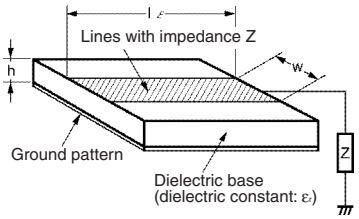
Long-term Continuously ON Contacts

Using the Relay in a circuit where the Relay will be ON continuously for long periods (without switching) can lead to unstable contacts because the heat generated by the coil itself will affect the insulation, causing a film to develop on the contact surfaces. Be sure to use a fail-safe circuit design that provides protection against contact failure or coil burnout.

Seal integrity during cleaning will last 1 minute at 70°C. Complete cleaning within these conditions.

Micro Strip Line Design

- It is advantageous to use the Micro Strip Line in high–frequency transmission circuits because a low-loss transmission can be constructed with this method. By etching the dielectric base which has copper foil attached to both sides, the Micro Strip Line will have a concentrated electric field between the lines and ground as shown in the following diagram.



- The characteristic impedance of the lines Z_O is determined by the kind of base (dielectric constant), the base's thickness, and the width of the lines, as expressed in the following equation.

$$Z_O = \frac{377}{\sqrt{\varepsilon_r}\,\frac{W}{H}\left\{1+\frac{2H}{\pi W}\left[1+\ln\frac{\pi W}{H}\right]\right\}}$$

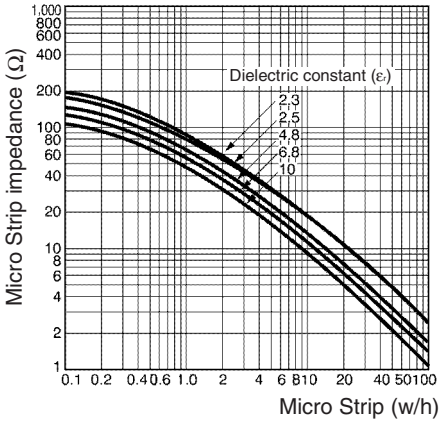
W: Line width

εr: Effective dielectric constant

H: Dielectric base thickness

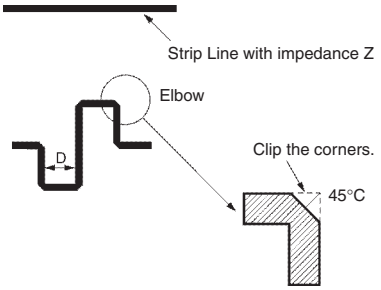
The copper foil thickness must be less than H.

- The following graph shows this relationship.



- For example, when creating 50-Ω lines using a glass epoxy base with a thickness of 1.6 mm, the above graph will yield a w/h ratio of 1.7 for a dielectric constant of 4.8. Since the base thickness is 1.6 mm, the width will be h × 1.7 ≈ 2.7 mm.
  The thickness of the copper foil "t" is ignored in this design method, but it must be considered because large errors will occur in extreme cases such as a foil thickness of t ≈ w.
  Furthermore, with the Micro Strip Line design, the lines are too short for the G6Y's intended frequency bandwidths, so we can ignore conductive losses and the line's attenuation constant.
- The spacing of the Strip Lines and ground pattern should be comparable to the width of the Strip Lines.
- Design the pattern with the shortest possible distances. Excessive distances will adversely effect the high-frequency characteristics.
- Spread the ground patterns as widely as possible so that potential differences are unlikely to develop between the ground patterns.
- To avoid potential short-circuits, do not place the pattern's leads near the point where the bottom of the Relay attaches to the board.

Bending the Micro Strip Line



When the lines must curve, an elbow can be used as shown in the diagram. A distance (D) between the lines of approximately twice the line width is sufficient.

Relay Handling

When washing the product after soldering the Relay to a PCB, use a water-based solvent or alcohol-based solvent, and keep the solvent temperature to less than 40°C. Do not put the Relay in a cold cleaning bath immediately after soldering.

Examples of Mounting Designs

Since this example emphasizes reducing mounting costs, expensive mounting methods such as through-hole boards are not shown. If such methods are to be used, the characteristics must be studied carefully using the actual board configuration.

Using a Double-sided Paper Epoxy Board

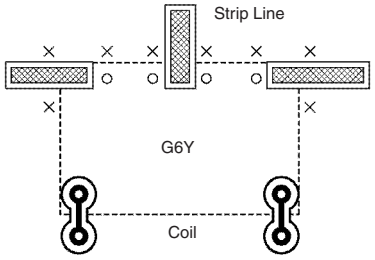
When double-sided paper epoxy boards are used, the dielectric constant will be approximately the same as that of glass epoxy boards (ε_r=4.8).

The width of the Strip Lines for a board with t=1.6 mm is 2.7 mm for 50 Ω and 1.3 mm for 75 Ω. For a board with t=1.0 mm the width is 1.7 mm for 50 Ω and 0.8 mm for 75 Ω.

The following diagram shows an example pattern and the Micro Strip Lines connected to the contact terminals are formed with pattern widths derived from the description above. The width between the Micro Strip Lines and ground patterns are comparable to the Micro Strip Line width.

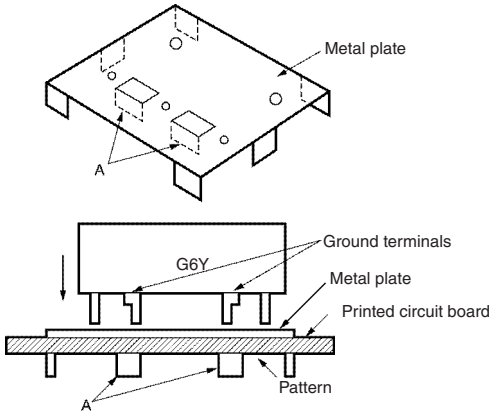
There are jumpers between the upper and lower patterns at the points marked with Xs in the diagram. Improved characteristics can be obtained with more jumper locations. This method yields isolation characteristics of 65 dB to 75 dB at 500 MHz and 50 dB at 900 MHz.

At this point in the diagram the component side is the entire ground pattern side, but set aside approximately 2.0 mm × 2.0 mm of the pattern for the contact terminals and coil terminals.



Using a Single-sided Board

When a single-sided board is used, isolation characteristics of only 60 dB to 70 dB at 200 MHz can be obtained. When high frequency bands are to be used with a single-sided board, a metal plate can be placed between the base and Relay and connected to the ground pattern.



With this method a metal plate is placed between the Relay and base and connected to the pattern, as shown in the above diagram. The important point here is that 3 locations (the G6Y's ground terminal, the metal plate's bent tabs (A), and the ground pattern) are soldered together at the same time. This method combines an inexpensive single-sided board and inexpensive metal plate to yield the same characteristics as a double-sided board. Good characteristics are obtained by grounding the G6Y's ground terminal and metal plate in the same place.

The metal plate must be attached to the base as described here. From this point, the methods used for Strip Line design are the same as for the double-sided board.

Mounting Precautions

Be sure to securely attach the Relay's base surface to the board during installation. The isolation characteristics will be affected if the Relay lifts off the board.

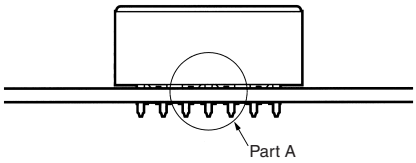
As shown in the enlarged illustration of the cross-section of part A, the G6Y is designed to ensure better high-frequency characteristics if the stand-off part of the G6Y is in contact with the ground pattern of the PCB. Therefore, the ground terminal and stand-off part are electrically connected internally.

Should the through hole electrically connected to the contact terminal come in contact with the stand-off part, the contact will be short-circuited with the ground, which may cause an accident.

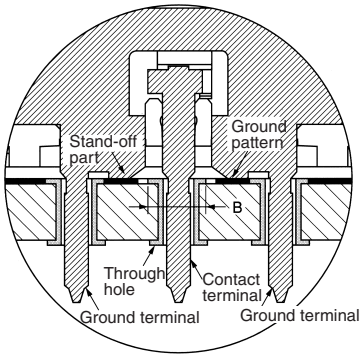
As a preventive measure, keep at least a distance of 0.3 mm between the stand-off part and the through hole or land.

For example, if the terminal hole on the PCB is 1 mm in diameter and the length B shown in the illustration is 1.4 mm, a distance of 0.3 mm or more will be provided between the through hole and stand-off part.

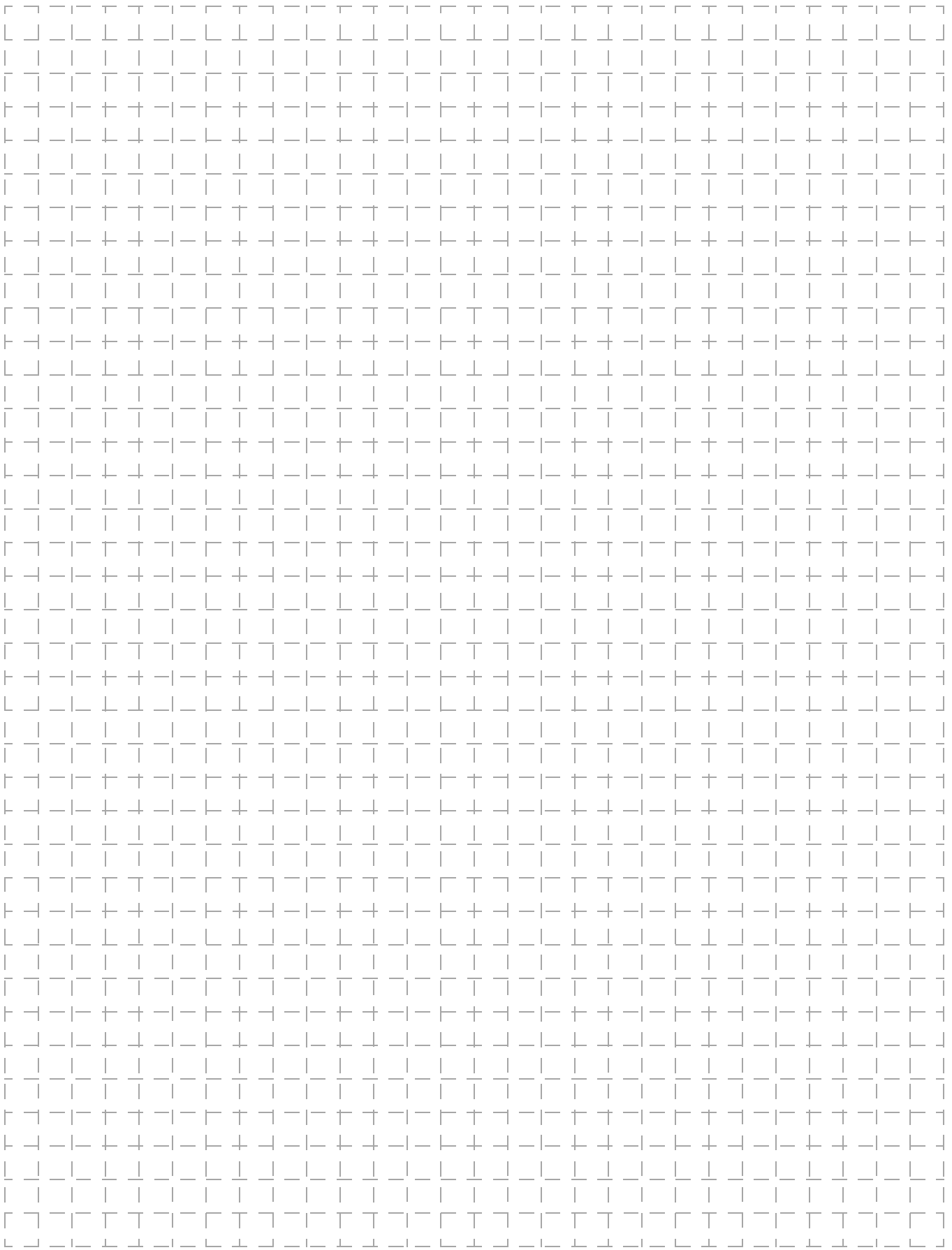
PCB Mounting



Cross-section of Part A



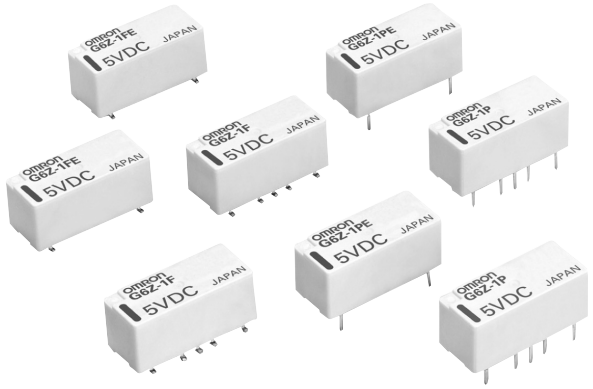
MEMO



High-frequency Relay
G6Z

Miniature 2.6-GHz-Band, SPDT, High-frequency Relay

- Superior high-frequency characteristics include an isolation of 30 dB min., insertion loss of 0.5 dB max., and V.S.W.R. of 1.5 max. at 2.6 GHz.
- Triplate micro stripline technology assures superior high-frequency characteristics.
- Miniature dimensions of 20 x 8.6 x 8.9 mm (L x W x H).
- E-shape or Y-shape terminal options with reverse contact arrangements available, allows greater freedom with PCB design.
- Choose between 75-Ω or 50-Ω impedance models
- RoHS Compliant.



Ordering Information

Classification	Structure	Contact form	Terminal arrangement	Characteristic impedance	Rated coil voltage	Model	
						Through-hole	Surface Mount
Non-latching	Fully sealed	SPDT	E-shape	75 Ω	3, 4.5, 5, 9, 12, and 24 VDC	**G6Z-1PE**	**G6Z-1FE**
				50 Ω		**G6Z-1PE-A**	**G6Z-1FE-A**
			Y-shape	75 Ω		**G6Z-1P**	**G6Z-1F**
				50 Ω		**G6Z-1P-A**	**G6Z-1F-A**
Single coil latching			E-shape	75 Ω		**G6ZU-1PE**	**G6ZU-1FE**
				50 Ω		**G6ZU-1PE-A**	**G6ZU-1FE-A**
			Y-shape	75 Ω		**G6ZU-1P**	**G6ZU-1F**
				50 Ω		**G6ZU-1P-A**	**G6ZU-1F-A**
Dual coil latching			E-shape	75 Ω		**G6ZK-1PE**	**G6ZK-1FE**
				50 Ω		**G6ZK-1PE-A**	**G6ZK-1FE-A**
			Y-shape	75 Ω		**G6ZK-1P**	**G6ZK-1F**
				50 Ω		**G6ZK-1P-A**	**G6ZK-1F-A**

Notes: 1. When ordering, add the rated coil voltage to the model number.
Example: G6Z-1PE-A-DC12
Rated coil voltage

2. When ordering tape packing (surface mount models), add "-TR" to the model number.
Example: G6ZU-1FE-TR-DC12
Tape packing
"-TR" is not part of the relay model number. Therefore, it is not marked on the relay case.

Model Number Legend:

G6Z □ - □ □ □ - □ □ - DC □
1 2 3 4 5 6 7

1. Relay Function
None: Non-latching
U: Single coil latching
K: Dual coil latching

2. Contact Form
1: SPDT

3. Terminal Shape
F: Surface mount terminals
P: PCB through-hole terminals

4. Terminal Structure
None: Y-shape terminal
E: E-shape terminal

5. Characteristic Impedance
None: 75 Ω
A: 50 Ω

6. Contact arrangement
None: Standard contact arrangement
R: Reverse contact arrangement

7. Rated Coil Voltage
3, 4.5, 5, 9, 12, 24

Application Examples

These Relays can be used for switching signals in media equipment.

- **Wire communications:**
  Cable TV (STB and broadcasting infrastructure), cable modems, and VRS (video response systems)
- **Wireless communications:**
  Transceivers, ham radios, ETC, ITS, high-level TV, satellite broadcasting, text multiplex broadcasting, mobile phone stations, TV broadcasting facilities, community antenna systems and car navigation systems
- **Entertainment equipment:**
  TVs, video games, satellite radio units,
- **Industrial equipment:**
  Measuring equipment, test equipment, and multiplex transmission devices

Specifications

■ Contact Ratings

Load type	Resistive load
Contact Material	Au clad Cu alloy
Rated load	10 mA at 30 VAC; 10 mA at 30 VDC; 10 W at 900 MHz (See note)
Rated carry current	0.5 A
Max. switching voltage	30 VAC, 30 VDC
Max. switching current	0.5 A

Note: This value is for an impedance of 50 Ω or 75 Ω with a V.S.W.R. of 1.2 max.

■ High-frequency Characteristics

Frequency		**900 MHz**				**2.6 GHz**			
Terminal type		**Through hole**		**Surface mount**		**Through hole**		**Surface mount**	
Terminal structure		**E-shape**	**Y-shape**	**E-shape**	**Y-shape**	**E-shape**	**Y-shape**	**E-shape**	**Y-shape**
Isolation	**75** Ω	65 dB min.		60 dB min.		35 dB min.	45 dB min.	30 dB min.	40 dB min.
	50 Ω	60 dB min.							
Insertion loss (not including substrate loss)	**75** Ω	0.2 dB max.				0.5 dB max.			
	50 Ω	0.1 dB max.				0.3 dB max.			
V.S.W.R.	**75** Ω	1.2 max.				1.5 max.			
	50 Ω	1.1 max.				1.3 max.			
Return loss	**75** Ω	20.8 dB max.				14.0 dB max.			
	50 Ω	26.4 dB max.				17.7 dB max.			
Maximum carry power		10 W (See note 2)							
Maximum switching power		10 W (See note 2)							

Note: 1. The above values are initial values.
2. These values are for an impedance of 50 Ω or 75 Ω with a V.S.W.R. of 1.2 max.

■ Coil Ratings

Non-latching, Standard and Reverse-contact Models G6Z-1P(E), G6Z-1F(E)

Rated voltage (VDC)	Rated current (mA)	Coil resistance (Ω)	Must operate voltage (VDC)	Must dropout voltage (VDC)	Maximum voltage (VDC)	Power consumption (mW)
3	66.7	45	75% max. of rated voltage	10% min. of rated voltage	150% of rated voltage	Approx. 200
4.5	44.4	101				
5	40.0	125				
9	22.2	405				
12	16.7	720				
24	8.3	2,880				

Single Coil Latching Models G6ZU-1P(E), G6ZU-1F(E)

Rated voltage (VDC)	Rated current (mA)	Coil resistance (Ω)	Must set voltage (VDC)	Must reset voltage (VDC)	Maximum voltage (VDC)	Power consumption (mW)
3	66.7	45	75% max. of rated voltage	75% max. of rated voltage	150% of rated voltage	Approx. 200
4.5	44.4	101				
5	40.0	125				
9	22.2	405				
12	16.7	720				
24	8.3	2,880				

Dual Coil Latching Models G6ZK-1P(E), G6ZK-1F(E)

Rated voltage (VDC)	Rated current (mA)	Coil resistance (Ω)	Must set voltage (VDC)	Must reset voltage (VDC)	Maximum voltage (VDC)	Power consumption (mW)
3	120	25	75% max. of rated voltage	75% max. of rated voltage	150% of rated voltage	Approx. 360
4.5	80	56				
5	72	69				
9	40	225				
12	30	400				
24	15	1,600				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

2. The operating characteristics are measured at a coil temperature of 23°C.

3. The maximum voltage is the highest voltage that can be imposed on the relay coil instantaneously.

4. The voltage measurements for operate/release and set/reset are the values obtained for instantaneous changes in the voltage (rectangular wave).

Characteristics

Item		Non-latching models	Single coil latching models	Dual coil latching models
		G6Z-1P(E), G6Z-1F(E)	G6ZU-1P(E), G6ZU-1F(E)	G6ZK-1P(E), G6ZK-1F(E)
Contact resistance (See note 2)		100 mΩ max.		
Operating (set) time (See note 3)		10 ms max. (approx. 3.5 ms)	10 ms max. (approx. 2.5 ms)	
Release (reset) time (See note 3)		10 ms max. (approx 2.5 ms)		
Set/reset time		---	12 ms	
Insulation resistance (See note 4)		100 MΩ min. (at 500 VDC)		
Dielectric strength	Coil and contacts	1,000 VAC, 50/60 Hz for 1 min.		
	Coil and ground, contacts and ground	500 VAC, 50/60 Hz for 1 min.		
	Contacts of same polarity	500 VAC, 50/60 Hz for 1 min.		
Vibration resistance	Mechanical durability	10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)		
	Malfunction durability	10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)		
Shock resistance	Mechanical durability	1,000 m/s^2		
	Malfunction durability	500 m/s^2		
Service life	Mechanical	1,000,000 operations min. (at 36,000 operations/hour)		
	Electrical	300,000 operations min. (30 VAC, 10 mA/30 VDC, 10 mA), 100,000 operations min. (900 MHz, 10 W) at a switching frequency of 1,800 operations/hour		
Ambient temperature		Operating: -40°C to 70°C (with no icing or condensation)		
Ambient humidity		Operating: 5% to 85% RH		
Weight		Approx. 2.8 g		

Note: 1. The above values are initial values.

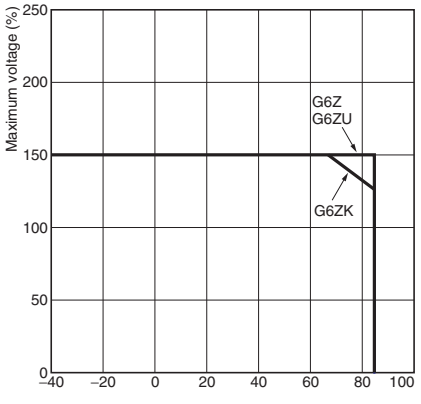
2. The contact resistance was measured with 10 mA at 1 VDC with a voltage drop method.

3. Values in parentheses are typical values.

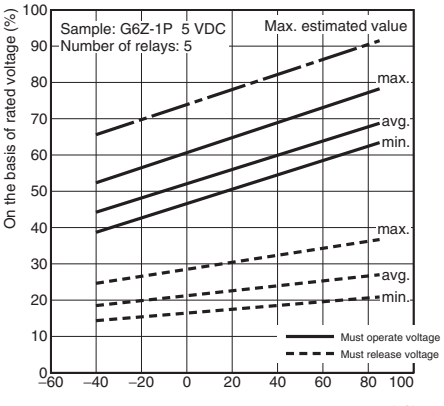
4. The insulation resistance was measured with a 500-VDC megohmmeter applied to the same parts as those used for checking the dielectric strength.

Engineering Data

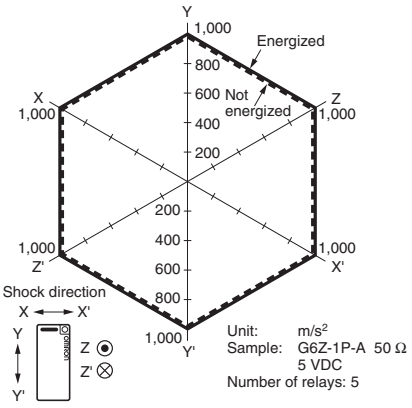
Ambient Temperature vs. Maximum Voltage



Ambient Temperature vs. Must Operate or Must Release Voltage

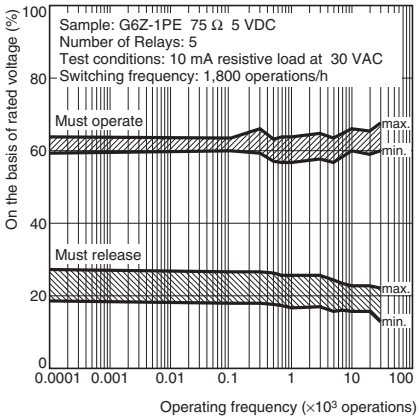


Shock Malfunction

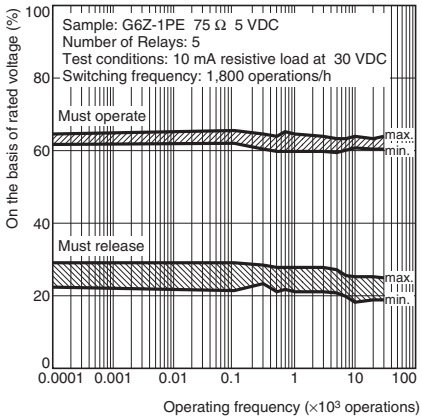


Conditions: Shock is applied in ±X, ±Y, and ±Z directions three times each with and without energizing the Relays to check for contact malfunctions.

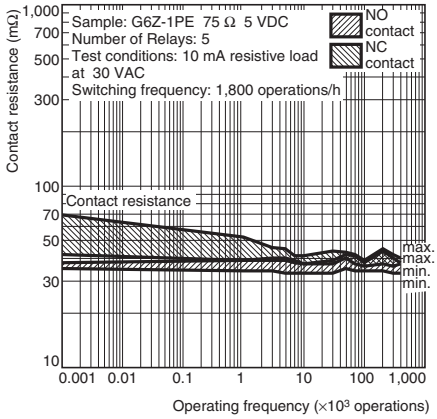
Electrical Endurance (with Must Operate and Must Release Voltage)



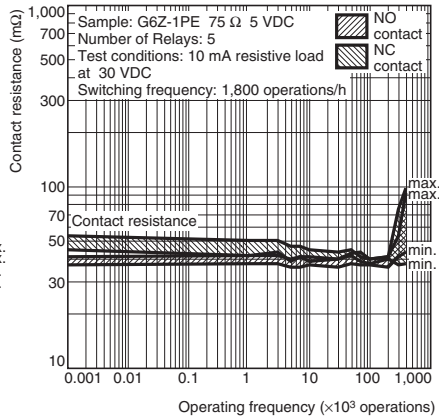
Electrical Endurance (with Must Operate and Must Release Voltage)



Electrical Endurance (Contact Resistance)

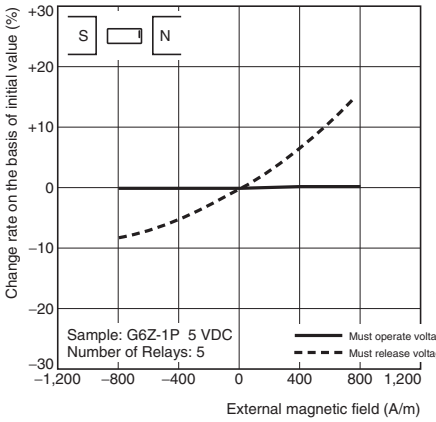


Electrical Endurance (Contact Resistance)

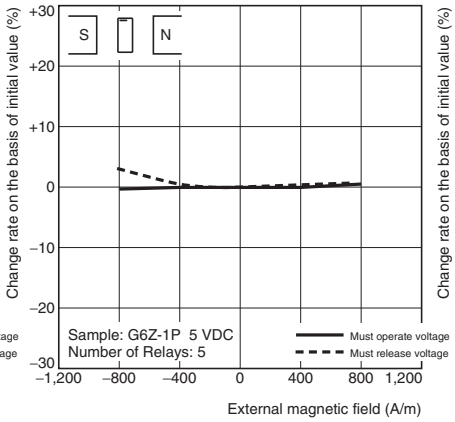


External Magnetic Interference

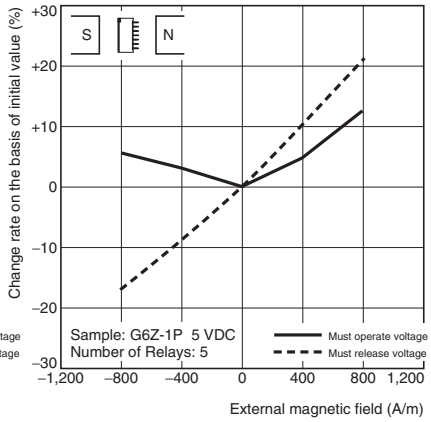
(Average value)



(Average value)



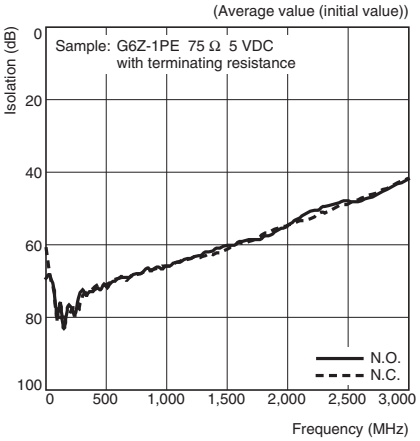
(Average value)



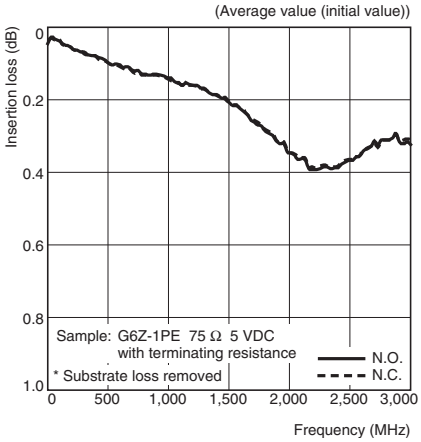
Note: 1. The tests were conducted at an ambient temperature of 23°C.

2. The contact resistance data are periodically measured reference values and are not values from monitoring each operation. Contact resistance values will vary according to the switching frequency and operating environment, so be sure to check operation under the actual operating conditions before use.

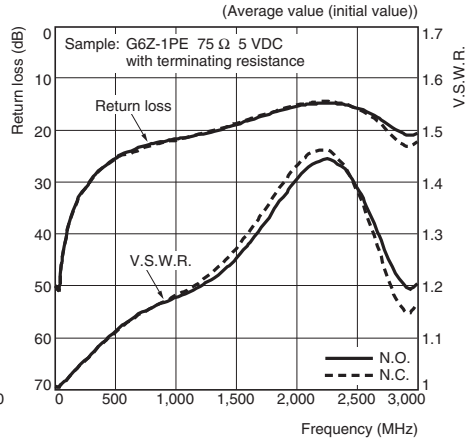
High-frequency Characteristics at 75 Ω (Isolation)



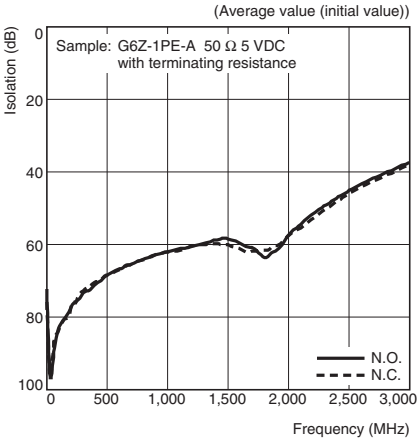
High-frequency Characteristics at 75 Ω (Insertion Loss)



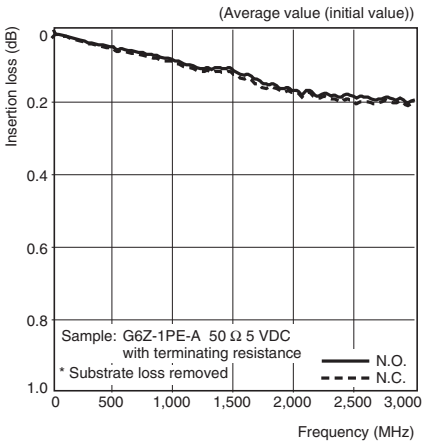
High-frequency Characteristics at 75 Ω (Return Loss, V.S.W.R.)



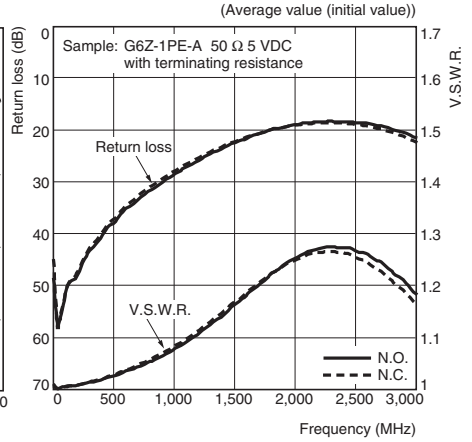
High-frequency Characteristics at 50 Ω (Isolation)



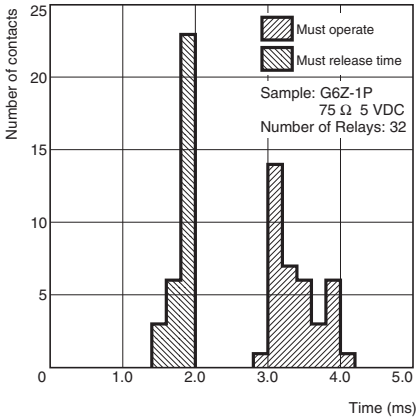
High-frequency Characteristics at 50 Ω (Insertion Loss)



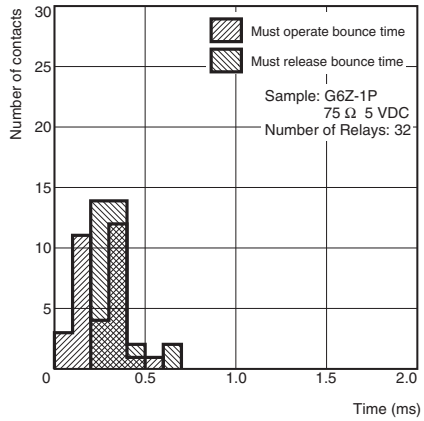
High-frequency Characteristics at 50 Ω (Return Loss, V.S.W.R.)



Must Operate and Must Release Time Distribution (See note.)



Must Operate and Must Release Bounce Time Distribution (See note.)



Note: 1. The tests were conducted at an ambient temperature of 23°C.

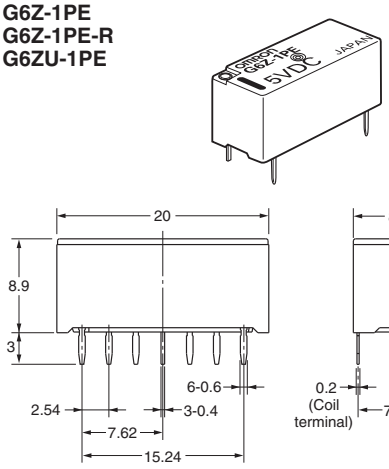
2. High-frequency characteristics depend upon the PCB to which the relay is mounted. Always check these characteristics, including endurance (service life), in the actual machine before use.

Dimensions

Note: All units are in millimeters unless otherwise indicated.

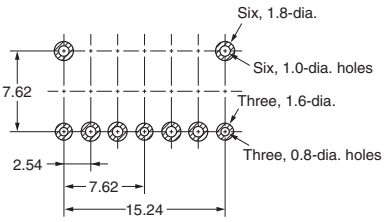
■ PCB Through-hole Terminal Types

G6Z-1PE
G6Z-1PE-R
G6ZU-1PE



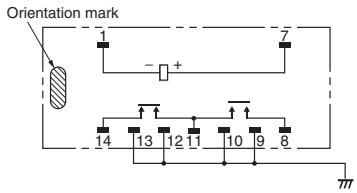
Note: Each value has a tolerance of ±0.3 mm.

Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

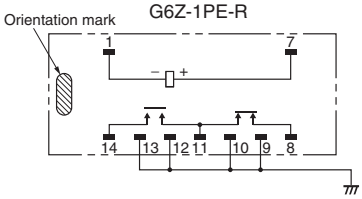


Terminal Arrangement/Internal Connections (Bottom View)

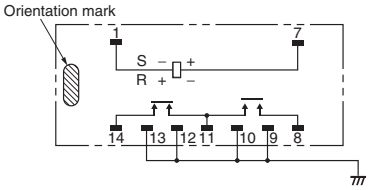
G6Z-1PE



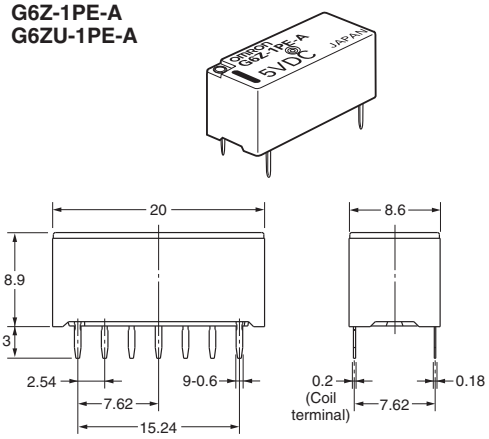
G6Z-1PE-R



G6ZU-1PE

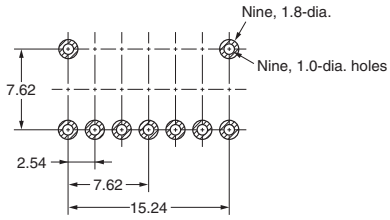


G6Z-1PE-A
G6ZU-1PE-A



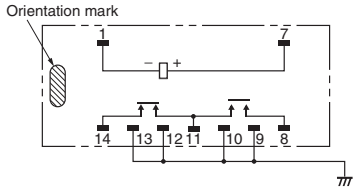
Note: Each value has a tolerance of ±0.3 mm.

Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

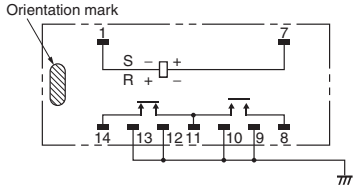


Terminal Arrangement/Internal Connections (Bottom View)

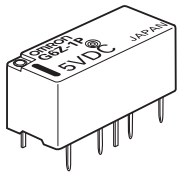
G6Z-1PE-A

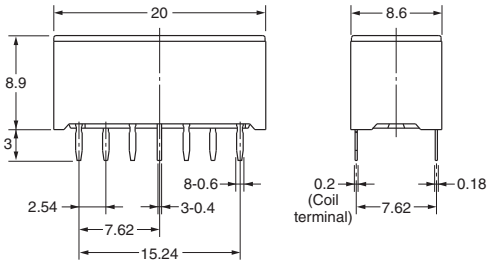


G6ZU-1PE-A



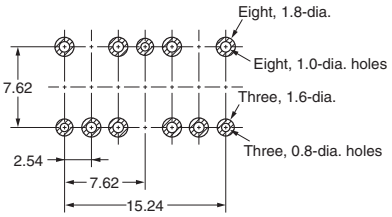
G6Z-1P
G6ZU-1P





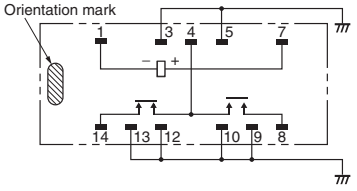
Note: Each value has a tolerance of ±0.3 mm.

Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

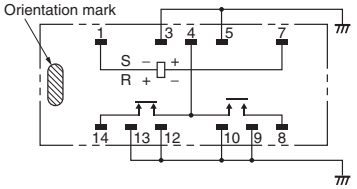


Terminal Arrangement/Internal Connections (Bottom View)

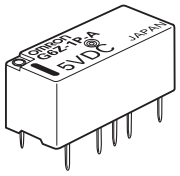
G6Z-1P

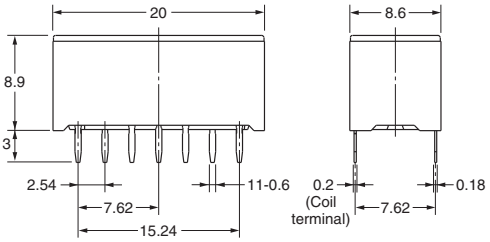


G6ZU-1P



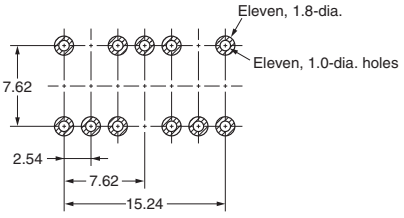
G6Z-1P-A
G6ZU-1P-A





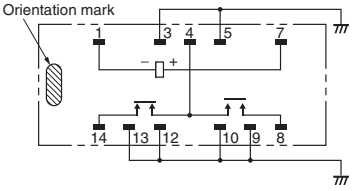
Note: Each value has a tolerance of ±0.3 mm.

Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

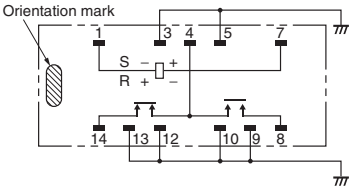


Terminal Arrangement/Internal Connections (Bottom View)

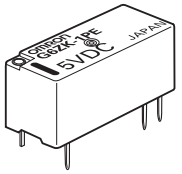
G6Z-1P-A

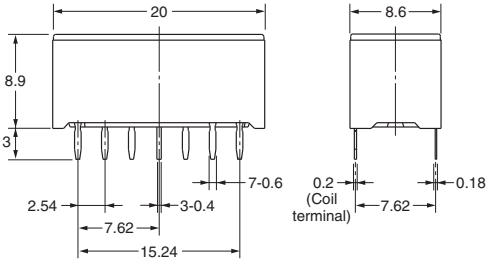


G6ZU-1P-A



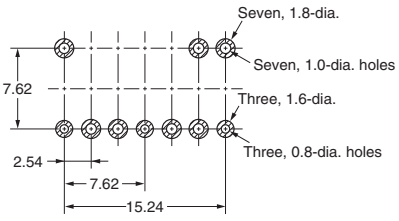
G6ZK-1PE



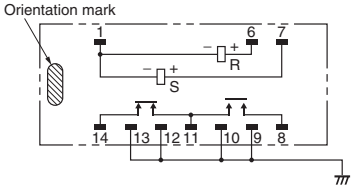


Note: Each value has a tolerance of ±0.3 mm.

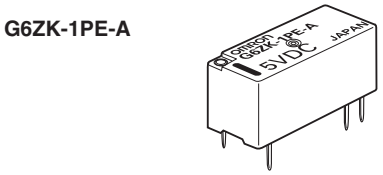
Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

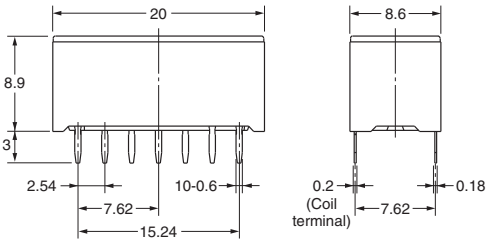


Terminal Arrangement/Internal Connections (Bottom View)



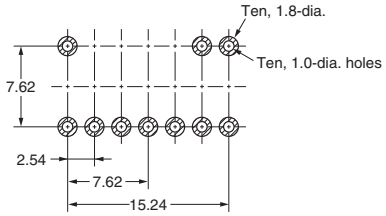
G6ZK-1PE-A



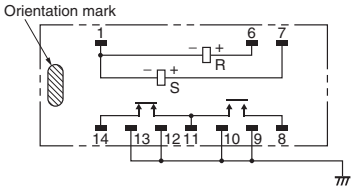


Note: Each value has a tolerance of ±0.3 mm.

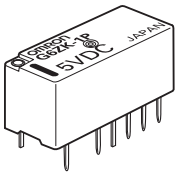
Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

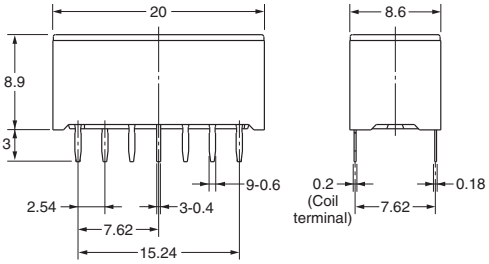


Terminal Arrangement/Internal Connections (Bottom View)



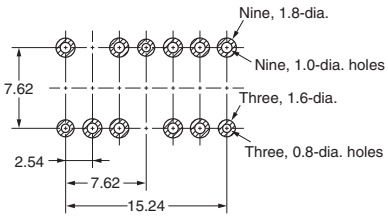
G6ZK-1P



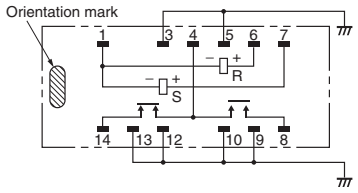


Note: Each value has a tolerance of ±0.3 mm.

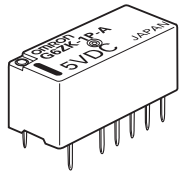
Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

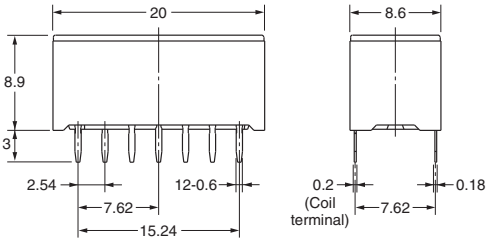


Terminal Arrangement/Internal Connections (Bottom View)



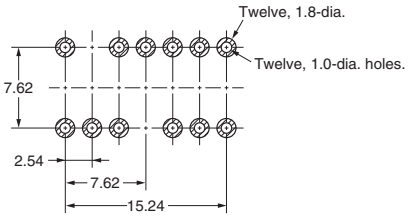
G6ZK-1P-A



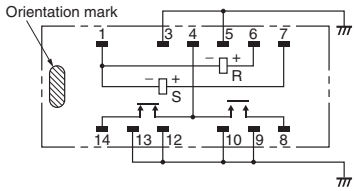


Note: Each value has a tolerance of ±0.3 mm.

Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

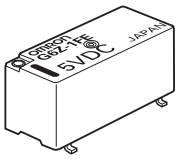


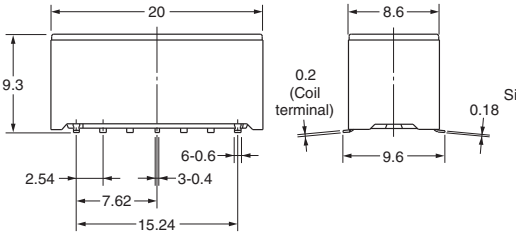
Terminal Arrangement/Internal Connections (Bottom View)



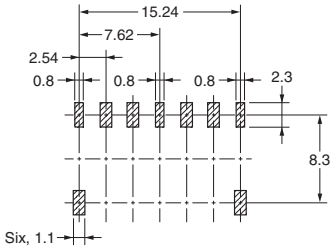
■ Surface Mount Terminal Types

G6Z-1FE
G6ZU-1FE



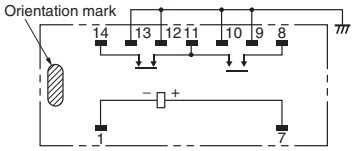


Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

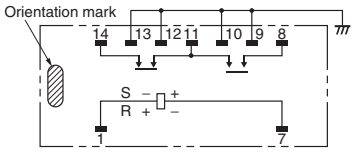


Terminal Arrangement/Internal Connections (Top View)

G6Z-1FE

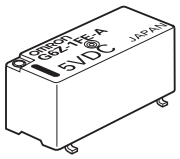


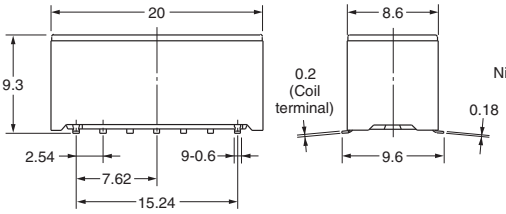
G6ZU-1FE



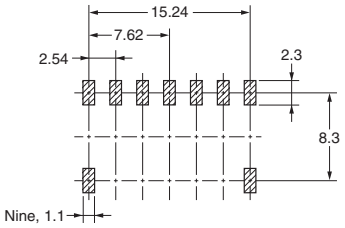
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

G6Z-1FE-A
G6ZU-1FE-A



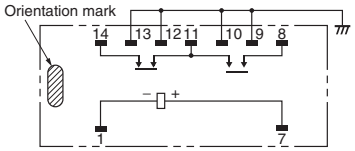


Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

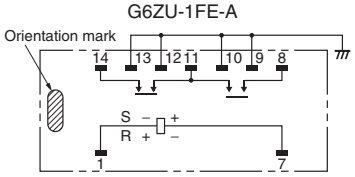


Terminal Arrangement/Internal Connections (Top View)

G6Z-1FE-A

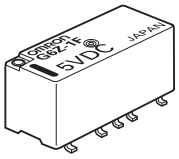


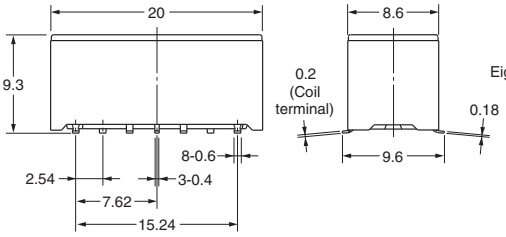
G6ZU-1FE-A



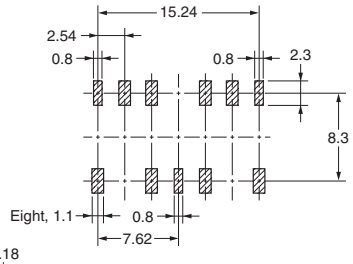
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

G6Z-1F
G6ZU-1F



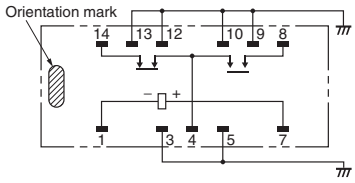


Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

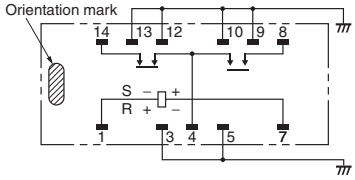


Terminal Arrangement/Internal Connections (Top View)

G6Z-1F

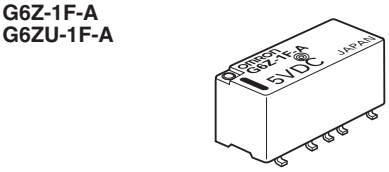


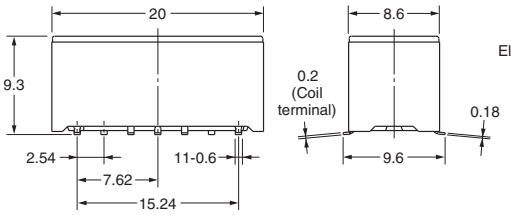
G6ZU-1F



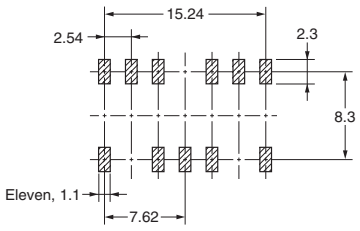
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

G6Z-1F-A
G6ZU-1F-A



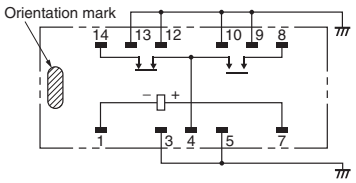


Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

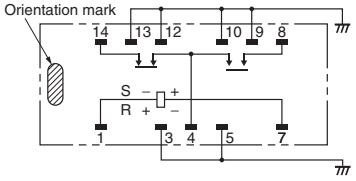


Terminal Arrangement/Internal Connections (Top View)

G6Z-1F-A

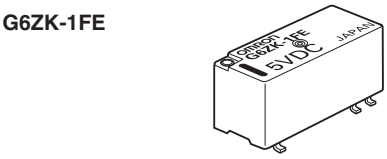


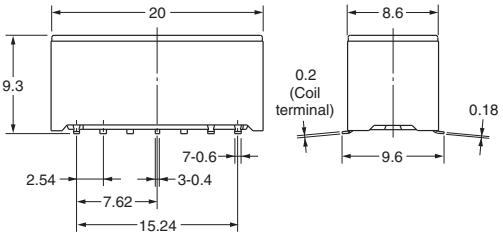
G6ZU-1F-A



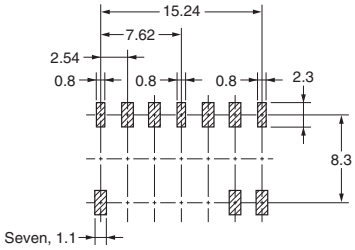
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

G6ZK-1FE

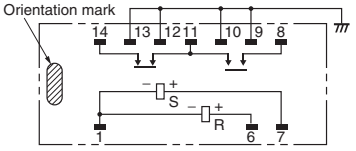




Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

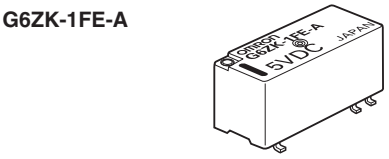


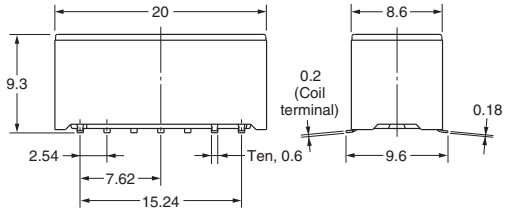
Terminal Arrangement/Internal Connections (Top View)



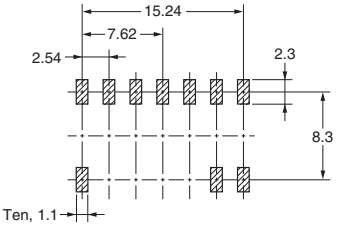
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

G6ZK-1FE-A

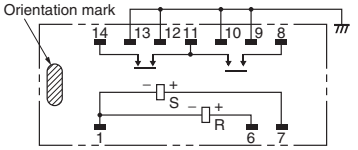




Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

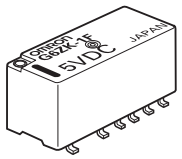


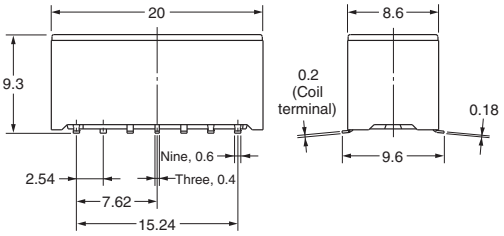
Terminal Arrangement/Internal Connections (Top View)



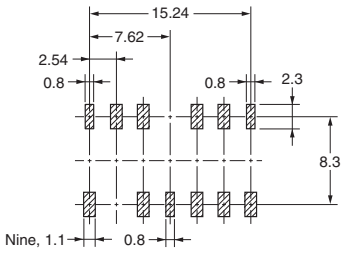
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

G6ZK-1F

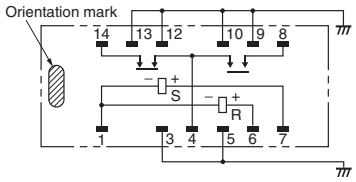




Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

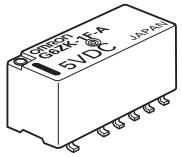


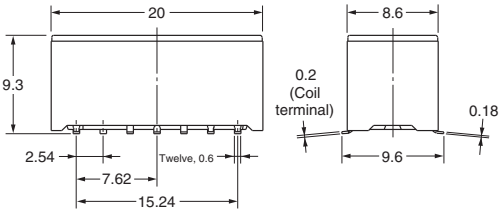
Terminal Arrangement/Internal Connections (Top View)



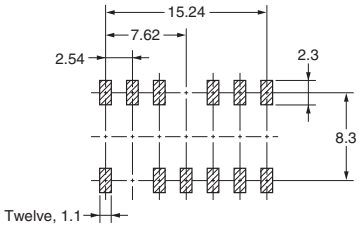
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

G6ZK-1F-A

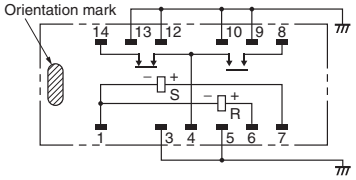




Mounting Dimensions (Top View)
Tolerance: ±0.1 mm



Terminal Arrangement/Internal Connections (Top View)



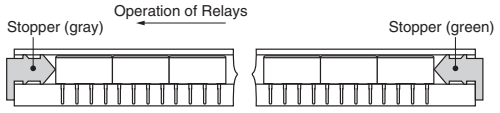
Note 1: Each value has a tolerance of ±0.3 mm.
2: The coplanarity of the terminals is 0.1 mm max.

Packaging

1. Tube Packaging

Relays in tube packaging are arranged so that the orientation mark of each Relay in on the left side.

Be sure not to make mistakes in Relay orientation when mounting the Relay to the PCB.



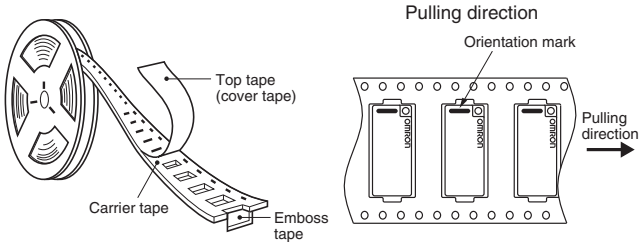
Tube length: 530 mm (stopper not included)
No. of Relays per tube: 25

2. Tape and Reel Packaging (Surface mount Terminal Models)

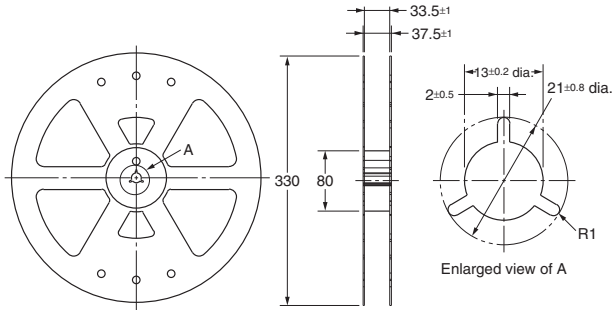
When ordering Relays in tape packing, add the prefix "-TR" to the model number, otherwise the Relays in stick packing will be provided.

Relays per Reel: 300

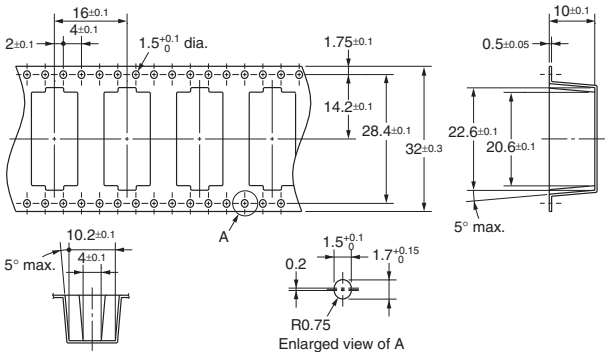
Direction of Relay Insertion



Reel Dimensions



Carrier Tape Dimensions

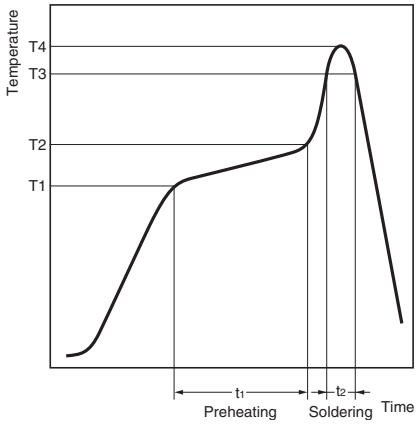


Note: The radius of the unmarked corner is 0.3 mm.

Recommended Soldering Method

■ Temperature Conditions for IRS Method

When using reflow soldering, ensure that the Relay terminals and the top of the case stay below the following curve. Check that these conditions are actually satisfied before soldering the terminals.

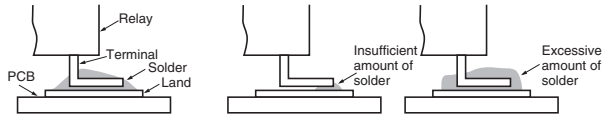


Measured part	Preheating (T1 → T2, t1)	Soldering (T3, t2)	Maximum peak (T4)
Terminals	150 → 180°C, 120 s max.	230°C min, 30 s max.	250°C max.
Top of case	---	---	255°C max.

Do not quench the terminals after mounting. Clean the Relay using alcohol or water no hotter than 40°C max.

The thickness of cream solder to be applied should be between 150 and 200 μm on OMRON's recommended PCB pattern.

Correct Soldering **Incorrect Soldering**



Check the soldering in the actual mounting conditions before use.

Safety Precautions

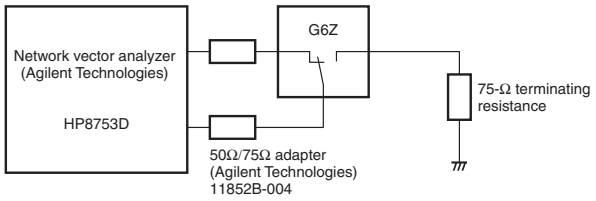
■ Precautions for Correct Use

Please observe the following precautions to prevent failure to operate, malfunction, or undesirable effect on product performance.

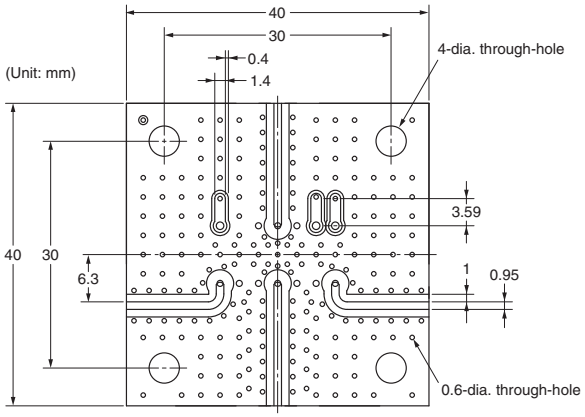
High-frequency Characteristics Measurement Method and Measurement Substrate

High-frequency characteristics for the G6Z are measured in the way shown below. Consult your OMRON representative for details on 50-Ω models.

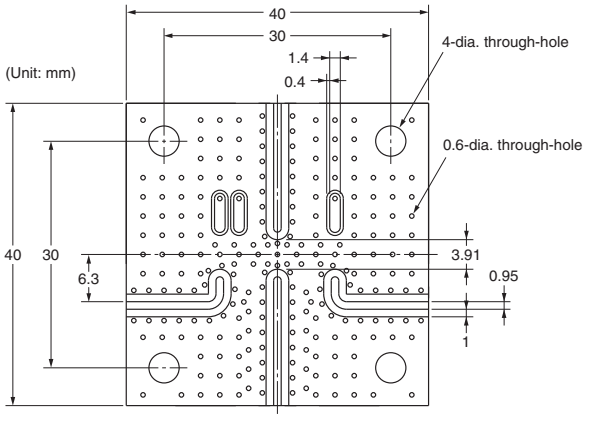
Measurement Method for 75-Ω Models



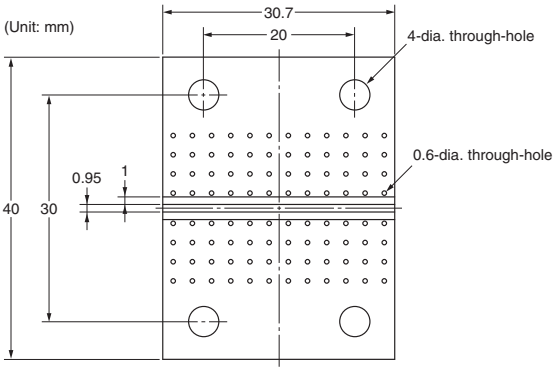
Through-hole Substrate (75-Ω Models, E-shape or Y-shape)



SMD-type Substrate (75-Ω Models, E-shape or Y-shape)



Substrate for High-frequency Characteristic Compensation (75-Ω Models, E-shape or Y-shape)



Substrate Types

Material: FR-4 glass epoxy (glass cloth impregnated with epoxy resin and copper laminated to its outer surface)

Thickness: 1.6 mm

Thickness of copper plating:18 μm

Note: 1. The compensation substrate is used when measuring the Relay's insertion loss. The insertion loss is obtained by subtracting the measured value for the compensation substrate from the measured value with the Relay mounted to the high-frequency measurement substrate.

Note: 2. For convenience, the diagrams of the high-frequency measurement substrates given here apply both to models with an E-shape terminal structure and to models with a Y-shape terminal structure.

Note: 3. Be sure to mount a standoff tightly to the through-hole substrate.

Note: 4. Use measuring devices, connectors, and substrates that are appropriate for 50 Ω and 75 Ω respectively.

Note: 5. Ensure that there is no pattern under the Relay. Otherwise, the impedance may be adversely affected and the Relay may not be able to attain its full characteristics.

Handling

Do not use the Relay if it has been dropped. Dropping the Relay may adversely affect its functionality.

Protect the Relay from direct sunlight and keep the Relay under normal temperature, humidity, and pressure.

Flow Soldering

Solder: JIS Z3282, H63A

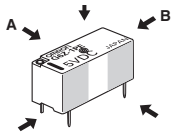
Soldering temperature: Approx. 250°C (260°C if the DWS method is used)

Soldering time: Approx. 5 s max. (approx. 2 s for the first time and approx. 3 s for the second time if the DWS method is used)

Be sure to make a molten solder level adjustment so that the solder will not overflow on the PCB.

Claw Securing Force During Automatic Mounting

During automatic insertion of Relays, be sure to set the securing force of each claw to the following so that the Relay's characteristics will be maintained.



Direction A: 4.90 N max.
Direction B: 4.90 N max.
Direction C: 4.90 N max.

Secure the claws to the shaded area.
Do not attach them to the center area
or to only part of the Relay.

Latching Relay Mounting

Make sure that the vibration or shock that is generated from other devices, such as Relays, on the same panel or substrate and imposed on the Latching Relay does not exceed the rated value, otherwise the set/reset status of the Latching Relay may be changed. The Latching Relay is reset before shipping. If excessive vibration or shock is imposed, however, the Latching Relay may be set accidentally. Be sure to apply a reset signal before use.

Coating

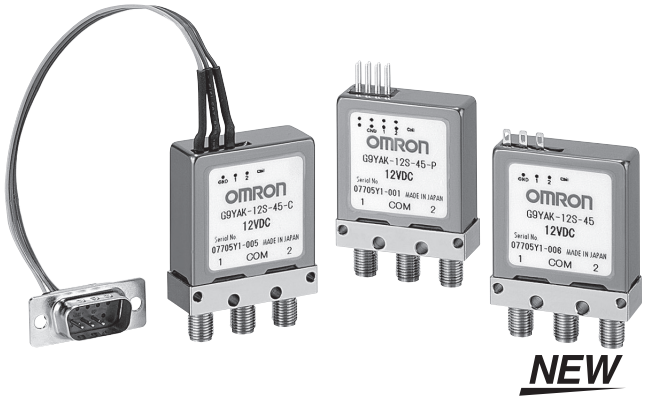
Do not use silicone coating to coat the Relay when it is mounted to the PCB. Do not wash the PCB after the Relay is mounted using detergent containing silicone. Otherwise, the detergent may remain on the surface of the Relay.

MEMO

Coaxial Switch
G9YA

High-frequency, High-capacity Coaxial Switch Supporting Bandwidths to 26.5 GHz

- Isolation of 60 dB min., insertion loss of 0.8 dB max., and V.S.W.R. of 1.7 max. at 26.5 GHz (50 Ω).
- Contact carry power of 120 W at 3 GHz.
- High sensitivity with rated power consumption of 700 mW for failsafe models and 500 mW for dual coil latching models
- Models with TTL-driven dual coil latching and indicator terminals are available
- Models available with 26.5 GHz or 18 GHz operation.
- RoHS Compliant



Ordering Information

■ Model Number Legend:

G9YA□-□□-□□-□□□
1 2 3 4 5 6 7 8

1. **Relay Function**
   None: Failsafe
   K: Dual coil latching
   T: TTL-driven dual coil latching (with self cut-off function)
2. **Contact Form**
   12: SPDT
3. **Terminal Shape**
   S: SMA
4. **Frequency**
   4: 26.5 GHz
   3: 18 GHz
5. **Characteristic Impedance**
   5: 50 Ω
6. **Operating Terminals**
   None: Soldering terminals
   P: Pin terminals (See note 1.)
   C: Connector cable
7. **Auxiliary Indicator Terminals**
   None: No indicator terminals
   N: Indicator terminals
8. **Data Package**
   None: No data package
   D: Data package

Note: 1. To order, select the part number and add the desired coil voltage rating (e.g. G9YAK-12S-45-PND *DC12*).
2. Refer to “List of Models” for available part numbers

Application Examples

- Mobile communications infrastructure equipment, mobile phone base station equipment, and antenna devices
- Wireless devices, wireless LAN, and disaster prevention wireless equipment
- Test and measurement equipment
- Broadcasting equipment (digital TV, cable TV, and satellite broadcasting)

■ List of Models

Standard SPDT Models with Soldering Terminals

Classification	Indicator terminals	Data package	Rated coil voltage	Minimum packaging unit	Model
Failsafe	No	No	4.5, 12, 15, 24, and 28 VDC	One per box	**G9YA-12S-45**
		Yes	4.5, 12, 15, 24, and 28 VDC		**G9YA-12S-45-D**
	Yes	No	4.5, 12, 15, 24, and 28 VDC		**G9YA-12S-45-N**
		Yes	4.5, 12, 15, 24, and 28 VDC		**G9YA-12S-45-ND**
Dual coil latching	No	No	4.5, 12, 15, 24, and 28 VDC	One per box	**G9YAK-12S-45**
		Yes	4.5, 12, 15, 24, and 28 VDC		**G9YAK-12S-45-D**
	Yes	No	4.5, 12, 15, 24, and 28 VDC		**G9YAK-12S-45-N**
		Yes	4.5, 12, 15, 24, and 28 VDC		**G9YAK-12S-45-ND**
TTL-driven dual coil latching (with self cut-off function)	No	No	5, 12, 15, and 24 VDC	One per box	**G9YAT-12S-45**
		Yes	5, 12, 15, and 24 VDC		**G9YAT-12S-45-D**
	Yes	No	5, 12, 15, and 24 VDC		**G9YAT-12S-45-N**
		Yes	5, 12, 15, and 24 VDC		**G9YAT-12S-45-ND**

Standard SPDT Models with Pin Terminals

Classification	Indicator terminals	Data package	Rated coil voltage	Minimum packaging unit	Model
Failsafe	No	No	4.5, 12, 15, 24, and 28 VDC	One per box	**G9YA-12S-45-P**
		Yes	4.5, 12, 15, 24, and 28 VDC		**G9YA-12S-45-PD**
	Yes	No	4.5, 12, 15, 24, and 28 VDC		**G9YA-12S-45-PN**
		Yes	4.5, 12, 15, 24, and 28 VDC		**G9YA-12S-45-PND**
Dual coil latching	No	No	4.5, 12, 15, 24, and 28 VDC	One per box	**G9YAK-12S-45-P**
		Yes	4.5, 12, 15, 24, and 28 VDC		**G9YAK-12S-45-PD**
	Yes	No	4.5, 12, 15, 24, and 28 VDC		**G9YAK-12S-45-PN**
		Yes	4.5, 12, 15, 24, and 28 VDC		**G9YAK-12S-45-PND**
TTL-driven dual coil latching (with self cut-off function)	No	No	5, 12, 15, and 24 VDC	One per box	**G9YAT-12S-45-P**
		Yes	5, 12, 15, and 24 VDC		**G9YAT-12S-45-PD**
	Yes	No	5, 12, 15, and 24 VDC		**G9YAT-12S-45-PN**
		Yes	5, 12, 15, and 24 VDC		**G9YAT-12S-45-PND**

Standard SPDT Models with Connector Cables

Classification	Indicator terminals	Data package	Rated coil voltage	Minimum packaging unit	Model
Failsafe	No	No	4.5, 12, 15, 24, and 28 VDC	One per box	**G9YA-12S-45-C**
		Yes	4.5, 12, 15, 24, and 28 VDC		**G9YA-12S-45-CD**
	Yes	No	4.5, 12, 15, 24, and 28 VDC		**G9YA-12S-45-CN**
		Yes	4.5, 12, 15, 24, and 28 VDC		**G9YA-12S-45-CND**
Dual coil latching	No	No	4.5, 12, 15, 24, and 28 VDC	One per box	**G9YAK-12S-45-C**
		Yes	4.5, 12, 15, 24, and 28 VDC		**G9YAK-12S-45-CD**
	Yes	No	4.5, 12, 15, 24, and 28 VDC		**G9YAK-12S-45-CN**
		Yes	4.5, 12, 15, 24, and 28 VDC		**G9YAK-12S-45-CND**
TTL-driven dual coil latching (with self cut-off function)	No	No	5, 12, 15, and 24 VDC	One per box	**G9YAT-12S-45-C**
		Yes	5, 12, 15, and 24 VDC		**G9YAT-12S-45-CD**
	Yes	No	5, 12, 15, and 24 VDC		**G9YAT-12S-45-CN**
		Yes	5, 12, 15, and 24 VDC		**G9YAT-12S-45-CND**

Note: Versions with 18-GHz operation are available. Replace "-45" with "-35" when ordering.
-- Example: Order G9YA-12S-*35*-PND DC12 instead of G9YA-12S-*45*-PND DC12.

Specifications

■ Indicator Ratings, SPDT Models

Rating	100 mA max. at 30 V
Contact resistance	1 Ω max. (See note 2.)

Note: 1. The above values are initial values.
2. The contact resistance was measured with 10 mA at 1 VDC with a voltage drop method.

■ High-frequency Characteristics

Frequency / Item	1 GHz max.	4 GHz max.	8 GHz max.	12.4 GHz max.	18 GHz max.	26.5 GHz max.
Insertion loss	0.2 dB max.		0.3 dB max.	0.4 dB max.	0.5 dB max.	0.8 dB max.
Isolation	85 dB min.	80 dB min.	70 dB min.	65 dB min.	60 dB min.	
V.S.W.R.	1.1 max.	1.15 max.	1.25 max.	1.35 max.	1.5 max.	1.7 max.

Note: 1. The above values are initial values.
2. Of the above values, the rated values are 18 GHz max. for the 18-GHz models and 26.5 GHz max. for the 26.5-GHz models.

■ Coil / Input Ratings

Note: An extra 140 to 300 mW of power consumption is added to models with indicator terminals, due to the operating coil and voltage specifications.

Failsafe Models (G9YA-12S-45(35))

Rated voltage (VDC)	Rated current (mA)	Coil resistance (Ω)	Must operate voltage (V)	Must release voltage (V)	Maximum voltage (V)	Power consumption (mW)
4.5	155.2	29	80% max. of rated voltage	10% min. of rated voltage	150% of rated voltage	Approx. 700
12	58.5	205				
15	46.7	321				
24	29.2	822				
28	25.0	1,118				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. The operating characteristics are measured at a coil temperature of 23°C.
3. The maximum voltage is the highest voltage that can be imposed on the relay coil instantaneously.

Dual Coil Latching Models (G9YAK-12S-45(35))

Rated voltage (VDC)	Rated current (mA)	Coil resistance (Ω)	Must operate voltage (V)	Must release voltage (V)	Maximum voltage (V)	Power consumption (mW)
4.5	109.8	41	80% max. of rated voltage	80% max. of rated voltage	150% of rated voltage	Approx. 500 mW
12	41.7	288				
15	33.3	450				
24	20.8	1,152				
28	17.9	1,568				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. The operating characteristics are measured at a coil temperature of 23°C.
3. The maximum voltage is the highest voltage that can be imposed on the relay coil instantaneously.

TTL-driven Dual Coil Latching Models (G9YAT-12S-45(35))

Rated voltage (VDC)	TTL logic level		Electronic self cut-off	Switching frequency
	ON	OFF		
5 VDC	2.4 to 5.5 V	0 to 0.5 V	Yes	180 operations per minute max. (ON time: OFF time = 1:1)
12 VDC				
15 VDC				
24 VDC				

■ Characteristics

Item \ Type		Failsafe models	Dual coil latching models	TTL-driven dual coil latching models
Item \ Model		G9YA-12S-45(35)	G9YAK-12S-45(35)	G9YAT-12S-45(35)
Contact resistance (See note 3.)		100 mΩ max.		
Operating (set) time		15 ms max.		
Release (reset) time		15 ms max.		
Minimum set/reset pulse time		---	100 ms	
Insulation resistance (See note 4.)		1,000 MΩ min. (at 500 VDC)		
Dielectric strength	Coil and contacts	500 VAC, 50/60 Hz for 1 min		
	Coil and ground, contacts and ground	500 VAC, 50/60 Hz for 1 min		
	Contacts of same polarity	500 VAC, 50/60 Hz for 1 min		
Vibration resistance	Destruction	10 to 55 Hz, 5.0-mm double amplitude		
	Malfunction	10 to 55 Hz, 3.0-mm double amplitude		
Shock resistance	Destruction	1,000 m/s^2		
	Malfunction	500 m/s^2		
Endurance	Mechanical	5,000,000 operations min. (at 36,000 operations/hour)		
	Electrical	5,000,000 operations min. (3 GHz, 5 W, 50 Ω, V.S.W.R. 1.2 max.) at a switching frequency of 1,800 operations/hour		
Contact carry power		120 W (at 3 GHz, 50 Ω, V.S.W.R. ≤ 1.15) with an ambient temperature of 40°C		
Ambient operating temperature		–55 to 85°C (with no icing or condensation)		
Ambient operating humidity		5% to 85%		
Weight		Approx. 50 g		

Note: 1. The above values are initial values.

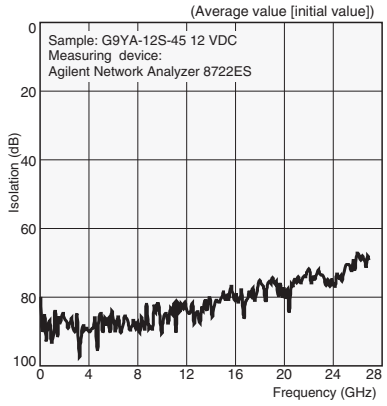
2. Rated and characteristic (initial) values are for a standard temperature of 23°C and a humidity of 65% unless otherwise indicated.

3. The contact resistance was measured with 10 mA at 1 VDC with a voltage drop method.

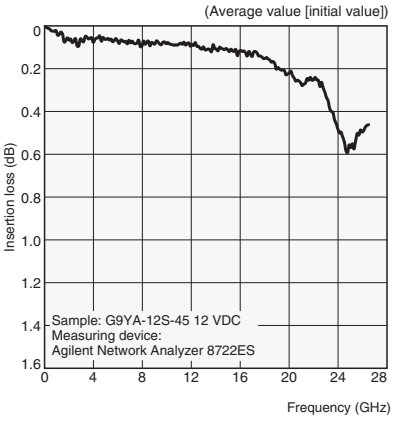
4. The insulation resistance was measured with a 500-VDC megohmmeter applied to the same parts as those used for checking the dielectric strength.

Engineering Data

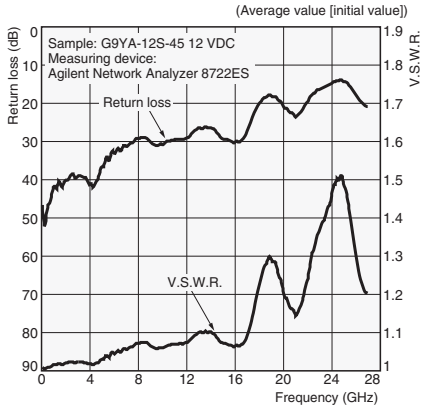
High-frequency Characteristics (Isolation)



High-frequency Characteristics (Insertion Loss)



High-frequency Characteristics (Return Loss, V.S.W.R.)



Note: 1. The tests were conducted at an ambient temperature of 23°C.

2. The high-frequency characteristics will vary according to the connectors. Be sure to check operation including durability at the actual device before use.

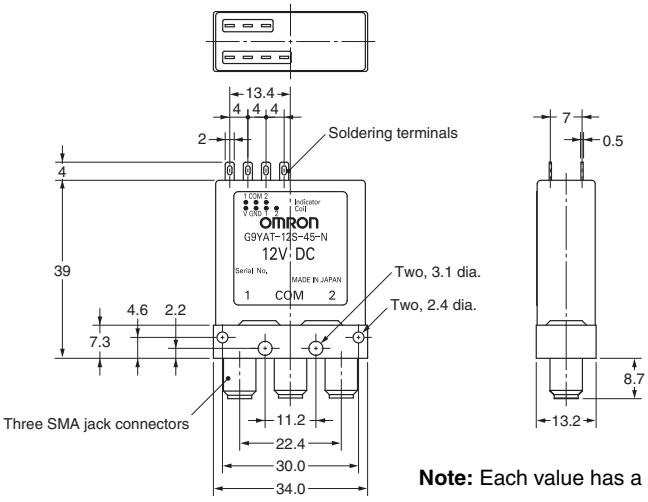
Dimensions

Note: All units are in millimeters unless otherwise indicated.

■ Models with Soldering Terminals

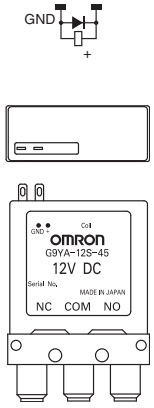
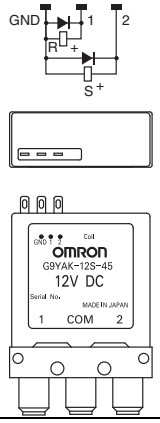
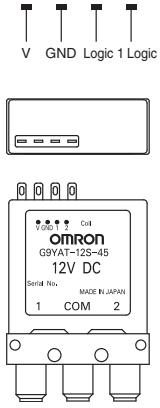
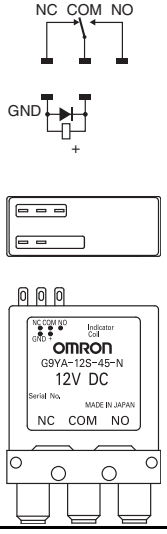
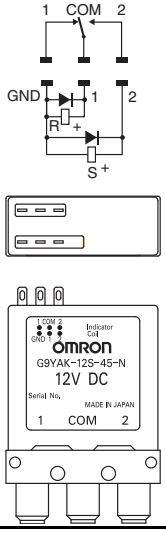
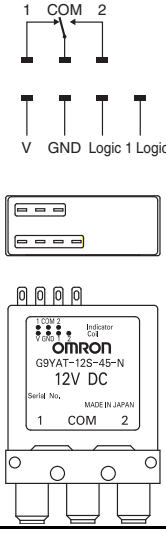
G9YA-12S-45(35)-□
G9YAK-12S-45(35)-□
G9YAT-12S-45(35)-□





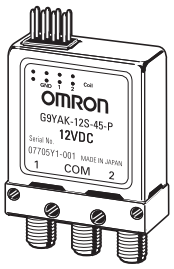
Note: Each value has a tolerance of ±0.3 mm.

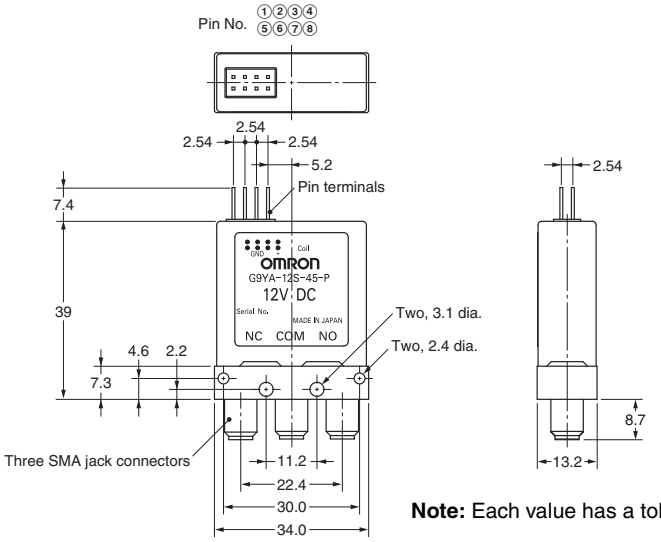
Soldering Terminal Arrangement

Model	G9YA-12S-45(35)-□	G9YAK-12S-45(35)-□	G9YAT-12S-45(35)-□
Indicator terminals Type	Failsafe	Dual coil latching	TTL-driven dual coil latching
Without indicator terminals			
With indicator terminals			

■ Models with Pin Terminals

G9YA-12S-45(35)-P□
G9YAK-12S-45(35)-P□
G9YAT-12S-45(35)-P□





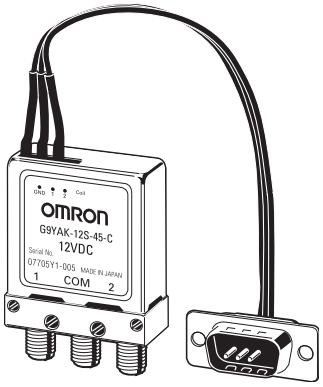
Note: Each value has a tolerance of ±0.3 mm.

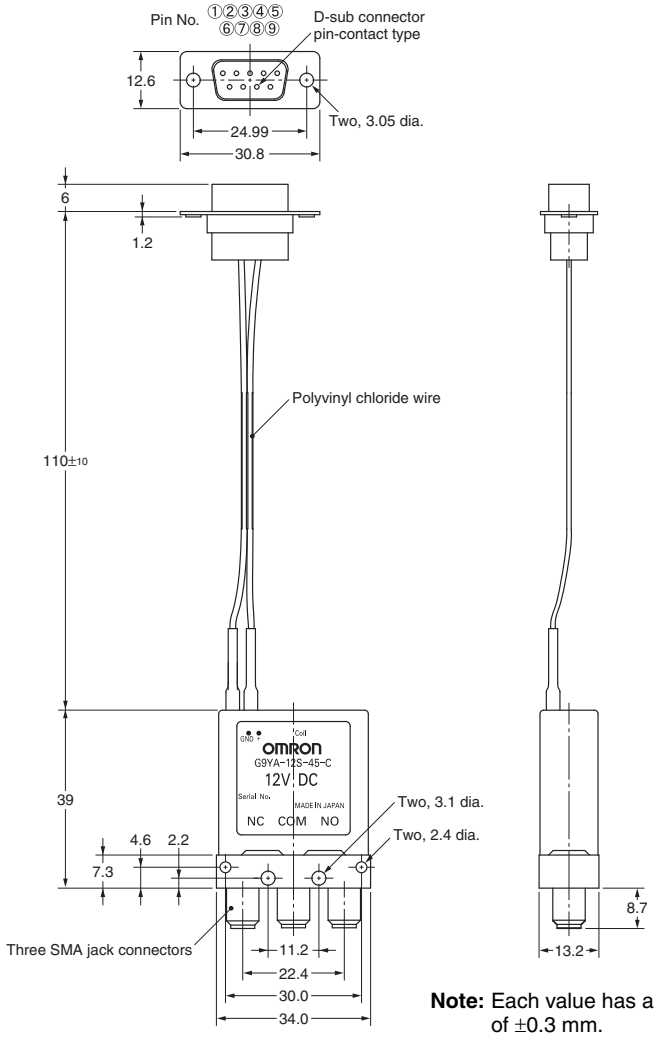
Pin Terminal Arrangement

		Indicator				Coil			
	Pin number	①	②	③	④	⑤	⑥	⑦	⑧
Without indicator terminals	**Failsafe**						GND		+
	Dual coil latching						GND	1	2
	TTL-driven dual coil latching					V	GND	Logic 1	Logic 2
With indicator terminals	**Failsafe**		NC	COM	NO		GND		+
	Dual coil latching		1	COM	2		GND	1	2
	TTL-driven dual coil latching		1	COM	2	V	GND	Logic 1	Logic 2

■ Models with Connector Cables

G9YA-12S-45(35)-C□
G9YAK-12S-45(35)-C□
G9YAT-12S-45(35)-C□





Note: Each value has a tolerance of ±0.3 mm.

Pin Terminal Arrangement

	Pin number	Indicator				Coil				
		①	②	③	④	⑤	⑥	⑦	⑧	⑨
Without indicator terminals	**Failsafe**							GND	+	
	Dual coil latching							GND	1	2
	TTL-driven dual coil latching						V	GND	Logic 1	Logic 2
With indicator terminals	**Failsafe**		NC	COM	NO			GND	+	
	Dual coil latching		1	COM	2			GND	1	2
	TTL-driven dual coil latching		1	COM	2		V	GND	Logic 1	Logic 2

Precautions

■ Precautions for Correct Use

Relay Handling

- Relays are precision components. Do not subject the Relay to vibration or shock in excess of the standard values, whether before or after mounting. The original performance cannot be maintained if the Relay is subjected to abnormal vibration or shock or dropped. Also, do not subject the Relay to vibration or shock in excess of the rated values when it is still packaged.
- Avoid subjecting the Relay to direct sunlight when it is being used, stored or transported. Keep the Relay at conditions of normal temperature, humidity, and pressure.
- The Relay is not sealed. It cannot be washed.
- Be absolutely sure not to wire the Relay incorrectly. Incorrect wiring will result in failure of Relay functions and damage or fire in the Relay, in addition to affecting external circuits.
- Recommended torque for mounting the SMA connectors is the MIL-C-39012 standard of 0.90±0.1 N·m. The conditions, however, depend on the compatibility with the material of the connectors.
- Use of two or more Relays may result in change in the Relay characteristics due to interference in the magnetic fields generated by the Relays. Be sure to check operation using the actual devices before use.
- Use a power supply for the coil operating power supply with a maximum ripple of 5%. Be sure to check operation using the actual devices before use.
- Operation in excess of the coil ratings, contact ratings, switching service life or other specifications may result in abnormal heat generation, smoke, or fire.

Latching Relay Mounting

Make sure that the vibration or shock generated from other devices (e.g., Relays) on the same panel during operation or resetting do not exceed the values provided in the catalog, otherwise the latching Relay that has been set may be reset or vice versa. The latching Relay is reset before shipping. If excessive vibration or shock is imposed, however, the latching Relay may be set accidentally. Be sure to apply a reset signal before use.

Long-term Continuously ON Contacts

Using the Relay in a circuit where the Relay will be ON continuously for long periods (without switching) can lead to unstable contacts because the heat generated by the coil itself will deteriorate the insulation, causing a film to develop on the contact surfaces. We recommend using a latching Relay (magnetic-holding Relay) in this kind of circuit. If a failsafe Relay must be used in this kind of circuit, use a full-loop circuit design to provide protection against possible poor connections and coil disconnection.

Using Relays in an Atmosphere Containing Corrosive Gas (Silicon, Sulfuric, or Organic Gas)

Do not use Relays in a location where silicon gas, sulfuric gas (SO_2, H_2S), or organic gas is present. If Relays are used for a long period in an atmosphere of sulfuric gas or organic gas, contact surfaces may become corroded and cause contact instability and obstruction, and terminal soldering characteristics may be degraded. If Relays are stored or used for a long time in an atmosphere of silicon gas, a silicon coating will be generated on contact surfaces, causing contact failure.

Connecting to Coil and Indicator Terminals

I. Models with Soldering Terminals

Perform manual soldering under the following conditions.

Soldering iron tip temperature: 280 to 300°C
Soldering time: Approx. 3 s max.

II. Models with Pin Terminals

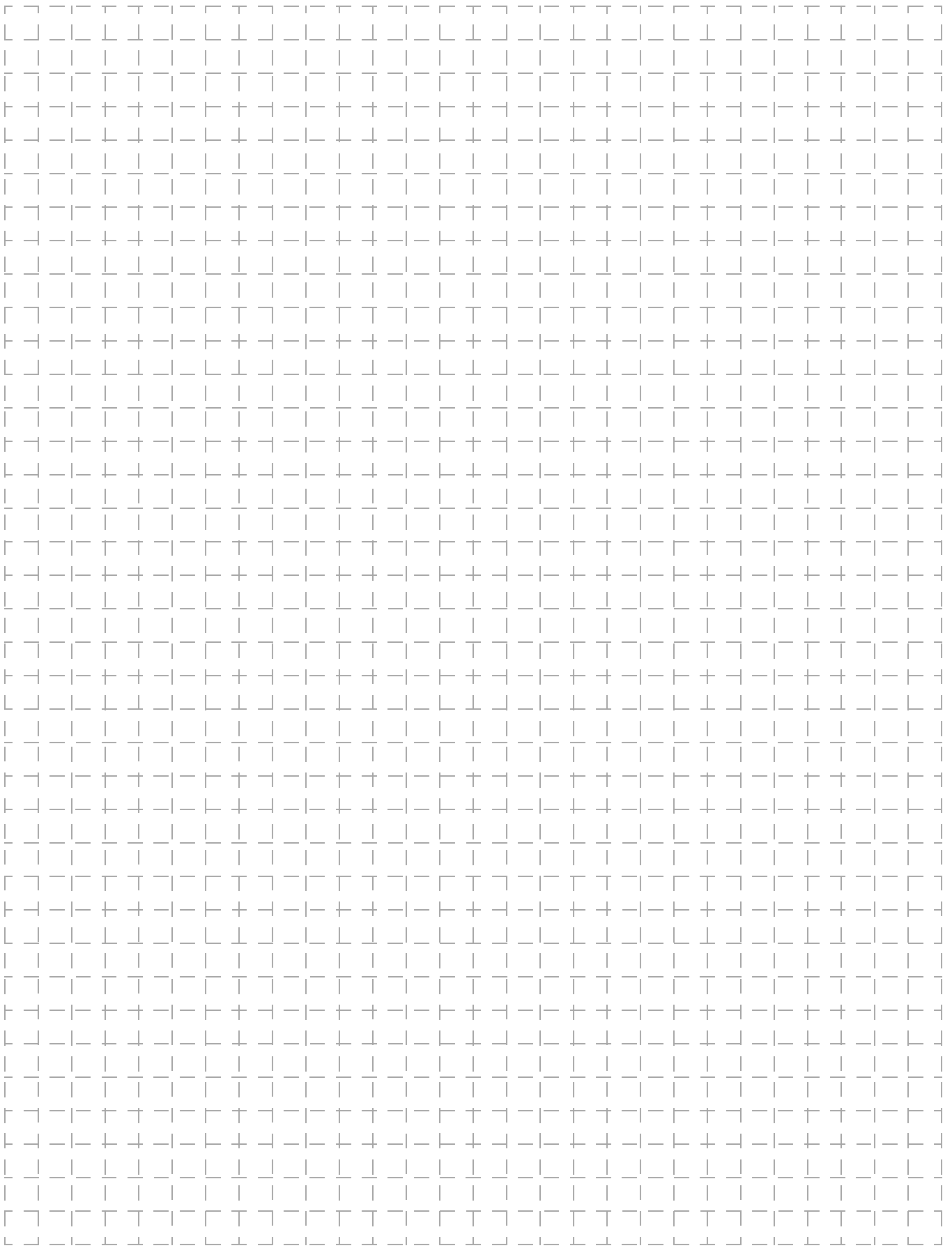
Heed the following precautions when using models with pin terminals.

1. Connectors for use: Straight dip type for panels
   Male connectors: HKP-8M29 (Honda Tsushin Kogyo)
   Refer to the general catalog of Honda Tsushin Kogyo for connector models and specifications.
2. The sockets do not have a lock mechanism. Pulling the lead wires, shock, or long-term vibration may cause the connectors to become disconnected. Heed the following precautions.
   - Securely fix the Relay and connectors and make sure that no force is pulling on the lead wires during use.
   - Fully insert the socket into the Relay connector.
3. Do not solder the lead wires directly to the pin connectors.

Low Signal Relay Selection Guide

	 Page 367	 Page 377	 Page 387
General Attributes	**G6J-Y**	**G6K**	**G6S**
Dimensions mm(in)	10.0 H x 10.6 L x 5.7 W (0.39 x 0.42 x 0.22)	5.30 H x 10.20 L x 6.70 W (0.21 x 0.40 x 0.26)	9.40 H x 15 L x 7.50 W (0.37 x 0.59 x 0.30)
Switching	1A max.	1A max.	2A max.
Features	• Slimline, 2 Form C, 1 Amp relay • SMT & PCB versions • 2.5 kV surge withstand • Available in SMT & PCB • Latching & non-latching versions • Ideal for Telecom, Test & Measurement, Medical, Security, Computer Peripheral, Office Automation	• Small real estate, 2 Form C, 1 Amp relay • 100 mW power consumption • 2.5 kV surge withstand • SMT & PCB versions • Latching & non-latching models • Ideal for Telecom, Test & Measurement, Medical, Security, Office Automation, Computer Peripheral • Conforms to FCC Part 68	•Industry standard, 2 Form C, 2 Amp relay •2.5 kV surge withstand •SMT gullwing, SMT inside-L, PCB models •Latching & non-latching versions •European version available (supplementary insulation at 250V at pollution degree 2 per EN60950/ EN41003) •Ideal for Telecom, Thermostats, Medical, Test & Measurement, Security
Contact Information			
Contact form	2 Form C	2 Form C	2 Form C
Contact type(s)	Bifurcated crossbar	Bifurcated crossbar	Bifurcated crossbar
Contact Material	Ag with Au alloy clad	Ag with Au clad	Ag with Au clad; AgPd with Au clad
Rated load (under resistive load)	0.3 A @ 125 VAC, 1 A @ 30 VDC	0.3 A @ 125 VAC, 1 A @ 30 VDC	0.5 A@ 125 VAC, 2 A @ 30 VDC
Max.operating voltage	125 VAC, 110 VDC	125 VAC, 60 VDC	250 VAC, 220 VDC
Max. switching capacity under resistive load	37.5 VA, 30 W (NO)	37.5 VA, 30 W	62.5 VA, 60 W
Min. electrical service life (operations at rated load	100,000	100,000	100,000
Min. permissible load (for reference only)	10 μA @ 10 mVDC	10 μA @ 10 mVDC	10 μA @ 10 mVDC
Coil Information			
Coil voltage	3, 4.5, 5, 12, 24 VDC	3, 4.5, 5, 6, 9, 12, 24 VDC	3, 4.5, 5, 6, 9, 12, 24 VDC
Power consumption	140 mW (230 mW for DC24)	100 mW (standard and latching)	140 mW (standard) 140 mW, 200 mW (latching)
Characteristics			
Dielectric strength between coil & contacts (50/60 Hz for 1 minute)	1,500 VAC	1,500V AC	2,000 VAC
Surge withstand	2.5 kV (2 x 10 μs)	2.5 kV (2 x 10 μs)	2.5 kV (2 x 10 μs)
Terminal choices	SMT Gullwing, PCB	SMT Gullwing, SMT Inside-L, PCB	SMT Gullwing, SMT Inside-L, PCB
Packaging	Tape & reel available	Tape & reel available	Tape & reel available
Approved standards	Bellcore 2.5kV / Telcordia GR-1089-CORE 2.5 kV between coil and contacts	UL, CSA Bellcore 2.5 kV / Telcordia GR-1089-CORE 2.5 kV between coil and contacts	UL, CSA Bellcore 2.5 kV / Telcordia GR-1089-CORE 2.5 kV (between coil and contacts)

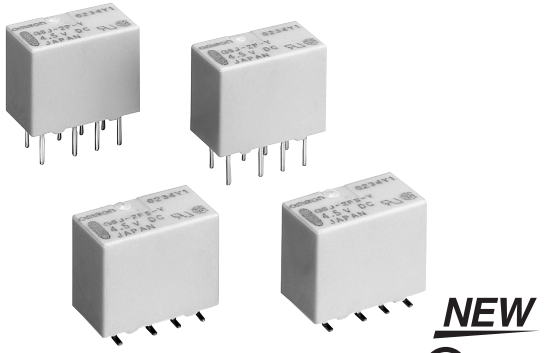
MEMO



Surface-mounting Relay
G6J-Y

Ultra-compact and Slim DPDT Relay

- Dimensions of 9H x 5.7W x 10.6L mm provide a mounting area reduction of approx. 56% when compared with the OMRON G6S.
- Dielectric strength of 1,500 VAC and an impulse withstand voltage of 2,500 V for 2 x 10 μs (conforms to Telcordia specifications (formerly Bellcore)).
- Conforms to FCC Part 68 requirments (1,500 V,10 x 160 μs).
- Single-winding latching models to save energy.
- UL recognized / CSA certified.
- RoHS Compliant.



Ordering Information

Item		Model	
Terminal	**Contact form**	**Non-latching**	**Single coil latching**
PCB through-hole	DPDT	**G6J-2P-Y**	**G6JU-2P-Y**
SMT Gull-wing		**G6J-2FL-Y**	**G6JU-2FL-Y**
SMT Shortened leads		**G6J-2FS-Y**	**G6JU-2FS-Y**

Note 1: When ordering, add the rated coil voltage to the model number.
Example: G6J-2P-Y DC12
Rated coil voltage

Note 2: When ordering tape packing, add "-TR" to the model number.
Example: G6J-2P-Y-TR DC12
Rated coil voltage

"-TR" is not part of the relay model number. Therefore it is not marked on the relay case.

Model Number Legend:

G6J □ - □ □ - Y - □ DC □
1 2 3 4 5

1. **Relay Function**
   None: Non-latching, standard
   U: Single-winding latching
2. **Contact Form**
   2: DPDT
3. **Terminal Shape**
   P: PCB through-hole terminals
   FL: SMT Gull-wing
   FS: SMT shortened leads
4. **Packaging**
   None: Tube packaging
   TR: Tape and reel packaging
9. **Rated Coil Voltage**
   3, 4.5, 5, 12, 24

Application Examples

Communications equipment, measurement devices, computer peripheral devices, office automation equipment, and audio-visual products.

Specifications

■ Contact Data

Rated load	0.3 A @ 125 VAC 1 A @ 30 VDC
Contact material	Ag (Au Clad)
Max. carry current	1 A
Max. operating voltage	125 VAC, 110 VDC
Max. operating current	1 A
Max. switching capacity	37.5 VA, 30 W
Min. permissible load (see note)	10m VDC, 10μA

Note: This value was measured at a switching frequency of 120 operations/min and the criterion of contact resistance is 5% of the load impedance. This value may vary depending on the operating frequency, operating conditions, expected reliability level of the relay, etc. Always double-check relay suitability under actual load conditions.

■ Coil Data

G6J-Y Standard, Non-latching (G6J-2P-Y, G6J-2FS-Y, G6J-2FL-Y)

Rated voltage (VDC)	Rated current (mA)	Coil resistance (Ω)	Pick-up voltage	Drop-out voltage	Max. voltage	Power consumption (mW)
			% of rated voltage			
3	48.0	62.5	75% max.	10% min.	150% max.	140
4.5	32.6	137.9				
5	28.9	173.1				
12	12.3	976.8				
24	9.2	2,600.5				230

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

2. The operating characteristics are measured at a coil temperature of 23°C.

3. The maximum voltage is the highest voltage that can be imposed on the Relay coil instantaneously.

G6JU-Y Single coil, Latching (G6JU-2P-Y, G6JU-2FL-Y, G6JU-2FS-Y)

Rated voltage (VDC)	Rated current (mA)	Coil resistance (Ω)	Set voltage	Reset voltage	Max. voltage	Power consumption (mW)
			% of rated voltage			
3	33.7	89.0	75% max.	75% max.	150% max.	100
4.5	22.0	204.3				
5	20.4	245.5				
12	9.0	1,329.2				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

2. The operating characteristics are measured at a coil temperature of 23°C.

3. The maximum voltage is the highest voltage that can be imposed on the Relay coil instantaneously.

■ Characteristics

Item		Standard non-latching relays	Single coil latching relays
		G6J-2P-Y, G6J-2FS-Y, G6J-2FL-Y	G6JU-2P-Y, G6JU-2FS-Y, G6JU-2FL-Y
Contact resistance (See note 1)		100 mΩ max.	
Operating (set) time (See note 2)		3 ms max. (approx. 1.6 ms)	
Release (reset) time (See note 2)		3 ms max. (approx. 1.0 ms)	3 ms max. (approx. 0.9 ms)
Minimum set/reset pulse width		---	10 ms min. (at 100% rated coil voltage)
Insulation resistance (See note 3)		1,000 MΩ min. (at 500 VDC)	
Dielectric strength		1,500 VAC, 50/60 Hz for 1 min. between coil and contacts 1,000 VAC, 50/60 Hz for 1 min. between contacts of different polarity 750 VAC, 50/60 Hz for 1 min. between contacts of the same polarity	
Surge withstand voltage		2,500 VAC, (2 x 10 μs) between coil and contacts	
		1,500 VAC, (10 x 160 μs) between contacts of the same and different polarity	
Vibration	Mechanical durability	10 to 55 Hz, 5-mm double amplitude	
	Malfunction durability	10 to 55 Hz, 3.3-mm double amplitude	
Shock	Mechanical durability	1,000 m/s^2 (approx. 100G)	
	Malfunction durability	750 m/s^2 (approx. 75G)	
Service life	Mechanical	50,000,000 operations min. (at 36,000 operations/hour)	
	Electrical	100,000 operations min. (with a rated load at 1,800 operations/hour)	
Ambient temperature		−40 to 85°C with no icing or condensation	
Humidity		5% to 85% RH	
Weight		Approx. 1.0 g	

Note: 1. The contact resistance was measured with 10 mA at 1 VDC with a fall-of-potential method.

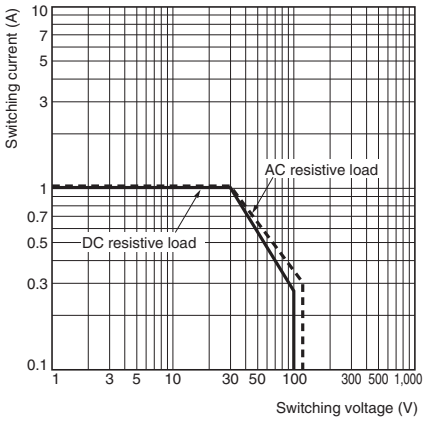
2. Values in parentheses are typical values unless otherwise stated.

3. The insulation resistance was measured with a 500-VDC Megger Tester applied to the same parts as those for checking the dielectric strength.

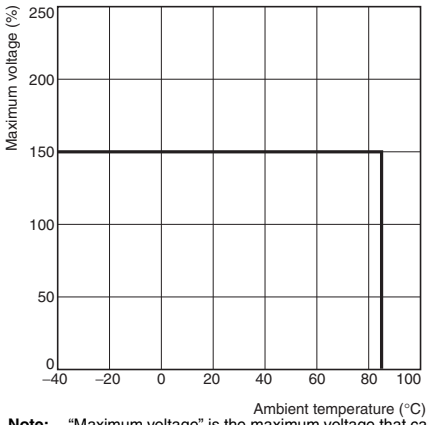
4. The above values are initial values.

Characteristic Data

Maximum Switching Capacity

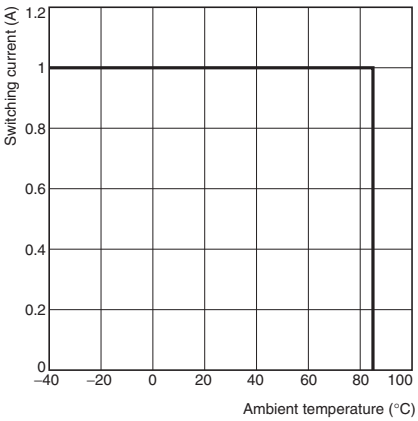


Ambient Temperature vs. Maximum Voltage

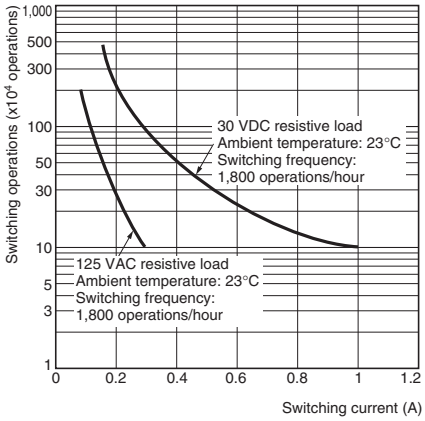


Note: "Maximum voltage" is the maximum voltage that can be applied to the Relay coil.

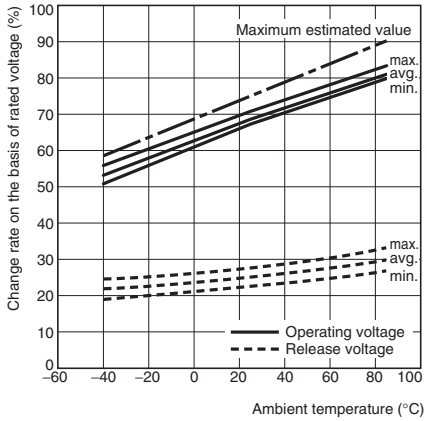
Ambient Temperature vs. Switching Current



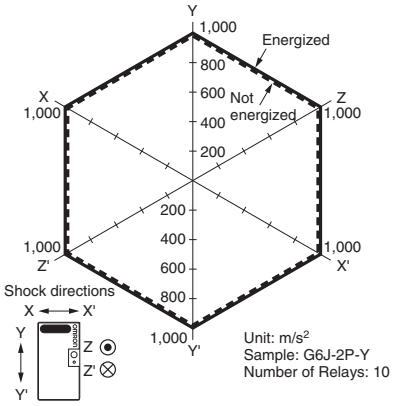
Electrical Life Expectancy



Ambient Temperature vs. Must Operate or Must Release Voltage

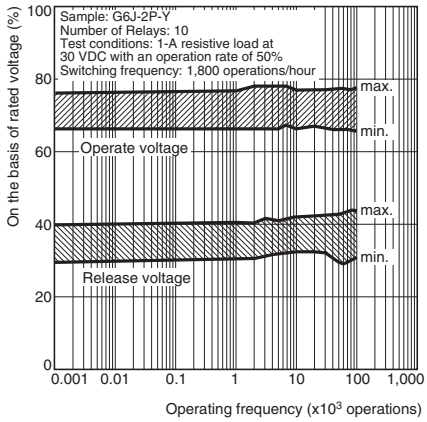


Shock Malfunction

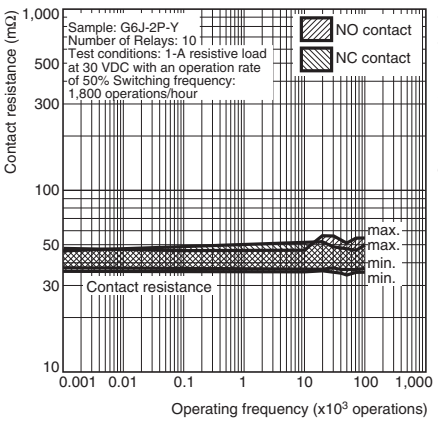


Conditions: Shock is applied in ±X, ±Y, and ±Z directions three times each with and without energizing the Relays to check the number of contact malfunctions.

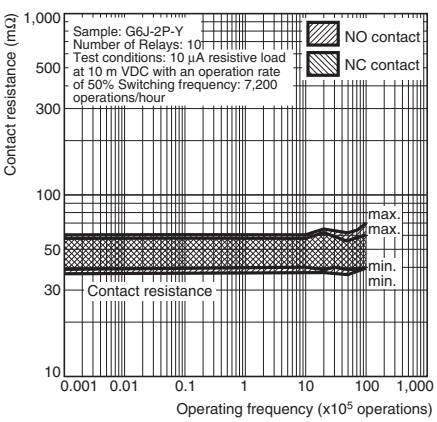
Electrical Life Expectancy (with Must Operate and Must Release Voltage) (See note.)



Electrical Life Expectancy (Contact resistance) (See note.)

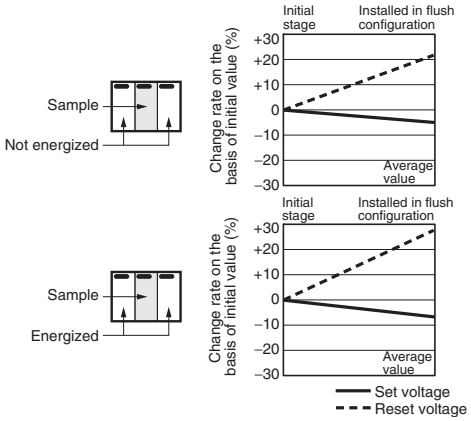


Contact Reliability Test (See note.)

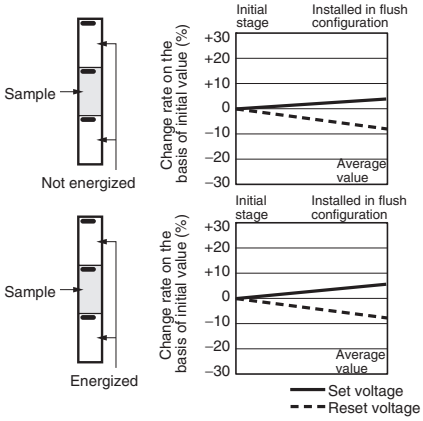


Note: **1.** The tests were conducted at an ambient temperature of 23°C.
2. The contact resistance data are periodically measured reference values and are not values from each monitoring operation. Contact resistance values will vary according to the switching frequency and operating environment, so be sure to check operation under the actual operating conditions before use

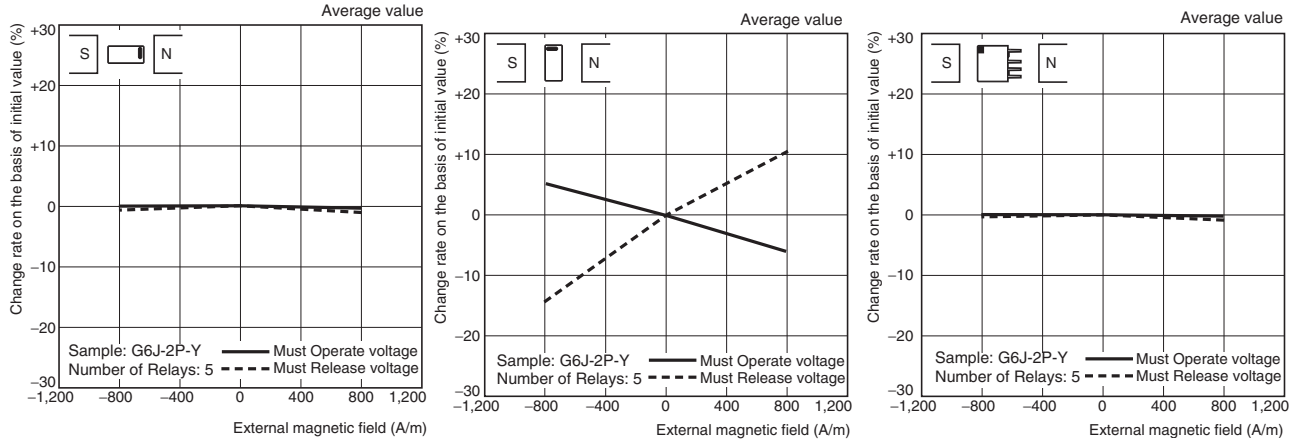
Mutual Magnetic Interference



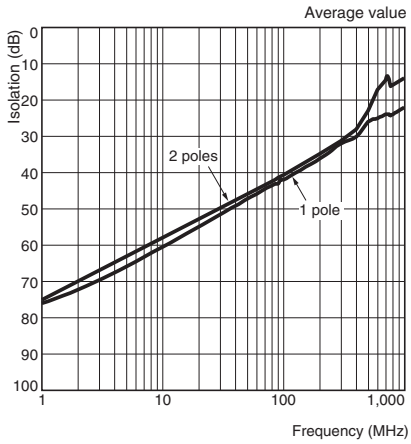
Mutual Magnetic Interference



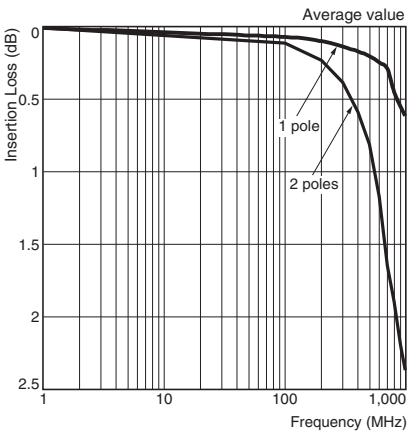
External Magnetic Interference



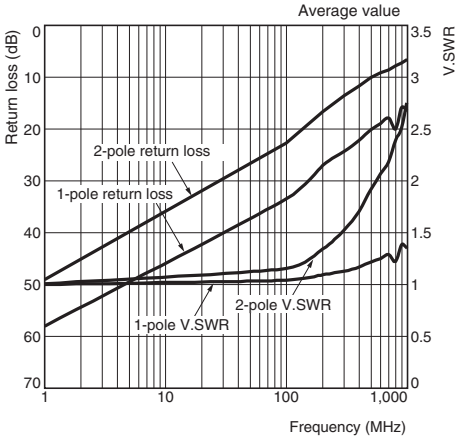
High-frequency Characteristics (Isolation)



High-frequency Characteristics (Insertion Loss)



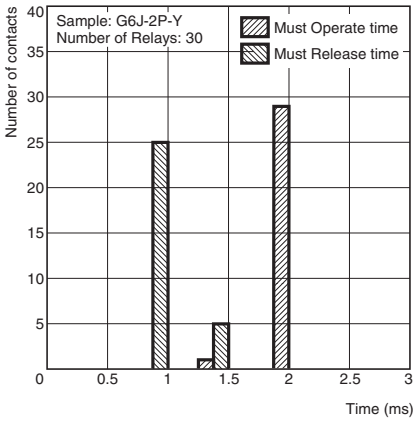
High-frequency Characteristics (Return Loss, V.SWR)



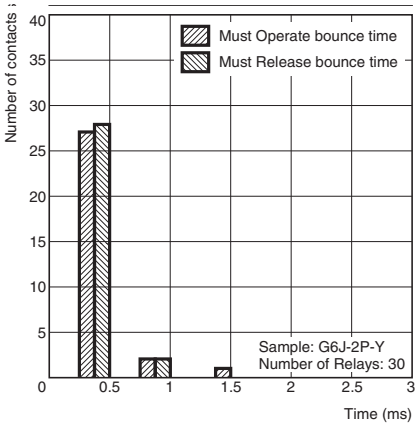
Note: 1. The tests were conducted at an ambient temperature of 23°C.

2. High-frequency characteristics depend on the PCB to which the Relay is mounted. Always check these characteristics, including endurance, in the actual machine before use.

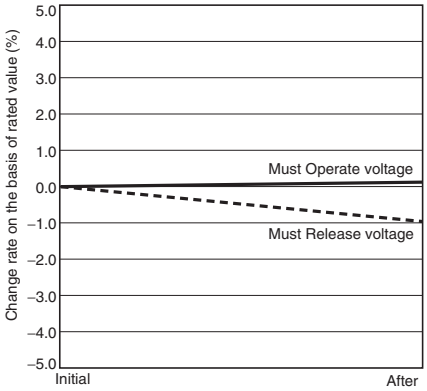
Must Operate and Must Release Time Distribution (See note.)



Must Operate and Must Release Bounce Time Distribution (See note.)



Vibration Resistance

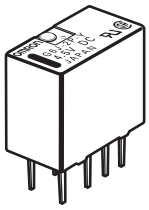


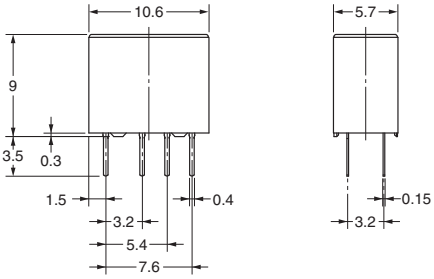
Note: The tests were conducted at an ambient temperature of 23°C.

Dimensions

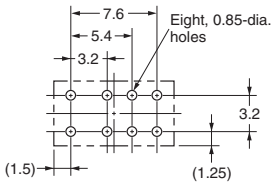
Note: All units are in millimeters unless otherwise stated.
A tolerance of ±0.3 (±0.01) applies to every dimension in the following drawings unless otherwise stated.

G6J-2P-Y
G6JU-2P-Y



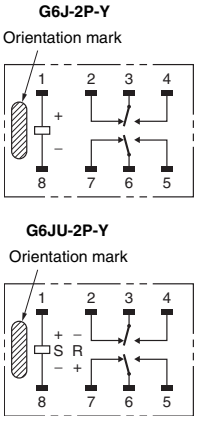


Mounting Dimensions (Bottom View)*

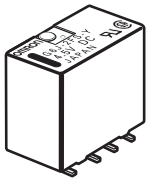


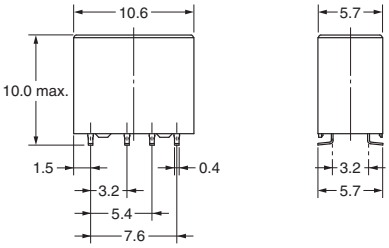
*Tolerance ±0.1 mm

Terminal Arrangement Internal Connections (Bottom View)

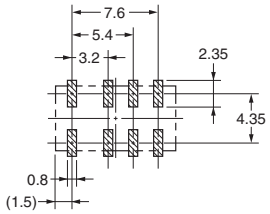


G6J-2FS-Y
G6JU-2FS-Y



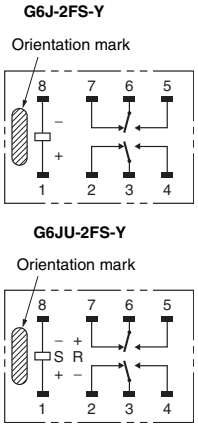


Mounting Dimensions (Top View)*

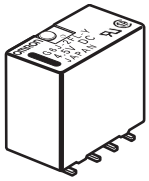


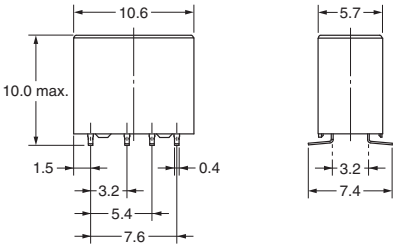
*Tolerance ±0.1 mm

Terminal Arrangement/ Internal Connections (Top View)

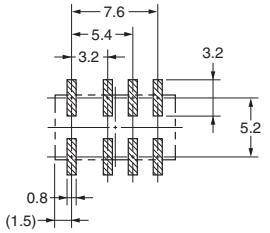


G6J-2FL-Y
G6JU-2FL-Y



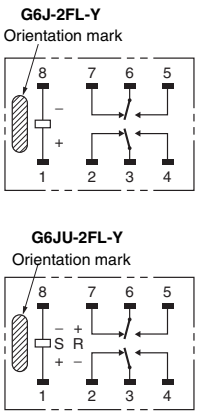


Mounting Dimensions (Top View)*



*Tolerance ±0.1 mm

Terminal Arrangement/ Internal Connections (Top View)

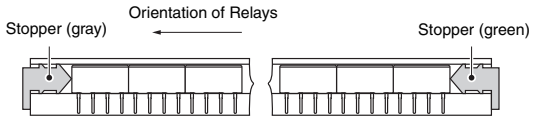


Stick Packing and Tape Packing

1. Stick Packing

Relays in stick packing are arranged so that the orientation mark of each Relay is on the left side.

Always confirm that the Relays are in the correct orientation when mounting the Relays to the PCBs.



Stick length: 555 mm (stopper not included)

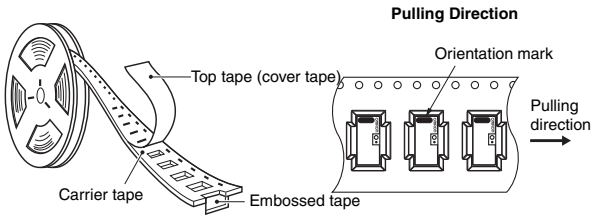
No. of Relays per stick: 50

2. Tape Packing (Surface-mounting Terminal Relays)

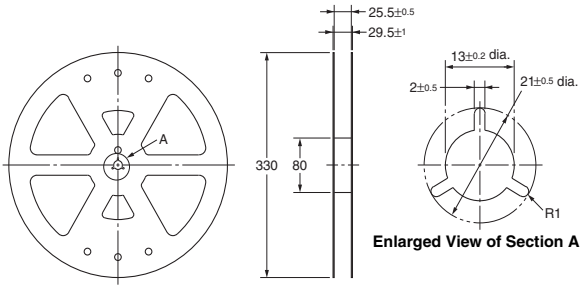
When ordering Relays in tape packing, add the prefix "-TR" to the model number, otherwise the Relays in stick packing will be provided.

Tape type:	TB2412R (EIAJ (Electronic Industrial Association of Japan))
Reel type:	R24D (EIAJ (Electronic Industrial Association of Japan))
Relays per reel:	400

Direction of Relay Insertion

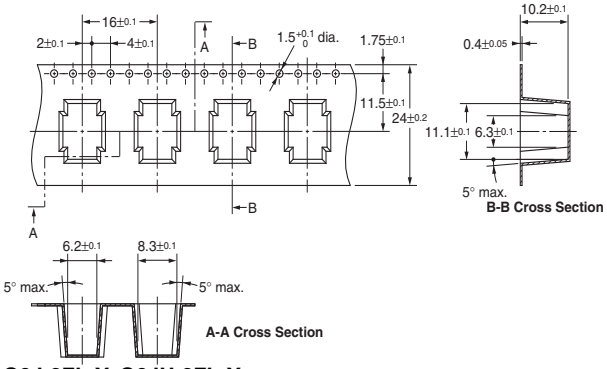


Reel Dimensions

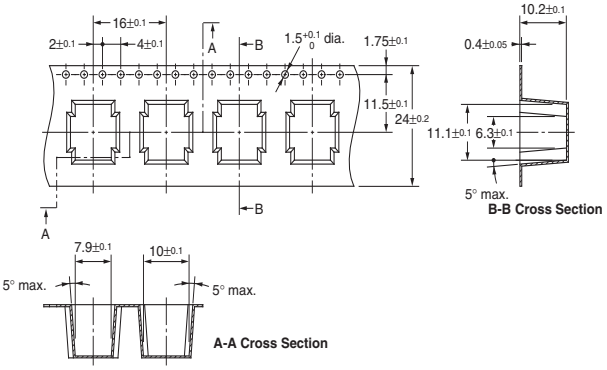


Carrier Tape Dimensions

G6J-2FS-Y, G6JU-2FS-Y

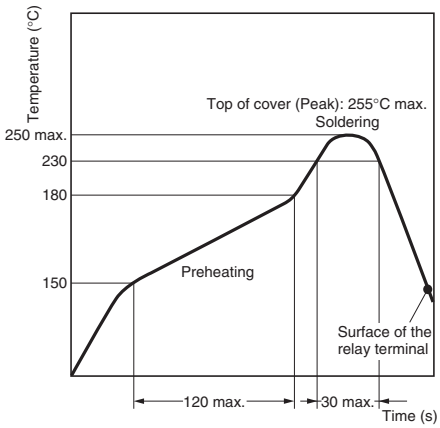


G6J-2FL-Y, G6JU-2FL-Y



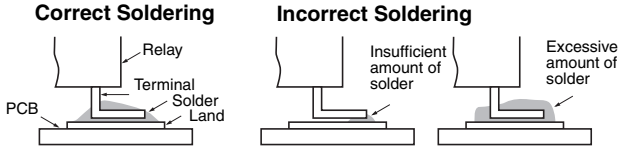
Recommended Soldering Method

IRS Method (for Surface-mounting Terminal Relays)



Note: Temperatures are given for the surface of the terminal.

- The thickness of cream solder to be applied should be between 150 and 200 μm on OMRON's recommended PCB pattern.
- In order to perform correct soldering, it is recommended that the correct soldering conditions be maintained as shown below on the left-hand side.



Visually check that the Relay is properly soldered.

■ Approved Standards

UL Recognized (File No. E41515) / CSA Certified (File No. LR31928) - - Ambient Temp. = 40°C

Contact form	Coil rating	Contact rating	Number of test operations
DPDT	G6J-2P-Y, 2FS-Y, 2FL-Y: 3 to 24 VDC G6JU-2P-Y, 2FS-Y, 2FL-Y: 3 to 24 VDC	1 A at 30 VDC (Resistive) 0.5 A at 60 VDC (Resistive) 0.3 A at 125 VAC (General purpose)	6000

Precautions

Correct Use

Long Term Current Carrying

Under a long-term current carrying without switching, the insulation resistance of the coil goes down gradually due to the heat generated by the coil itself. Furthermore, the contact resistance of the Relay will gradually become unstable due to the generation of film on the contact surfaces. A Latching Relay can be used to prevent these problems. When using a non-latching relay, the design of the fail-safe circuit provides protection against contact failure and open coils.

Handling of Surface-mounting Relays

Use the Relay as soon as possible after opening the moisture-proof package. If the Relay is left for a long time after opening the moisture-proof package, the appearance may suffer and seal failure may occur after the solder mounting process. To store the Relay after opening the moisture-proof package, place it into the original package and seal the package with adhesive tape.

When washing the product after soldering the Relay to a PCB, use a water-based solvent or alcohol-based solvent, and keep the solvent temperature at less than 40°C. Do not put the relay in a cold cleaning bath immediately after soldering.

Soldering

Solder: JIS Z3282, H63A

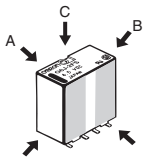
Soldering temperature: Approx. 250°C (At 260°C if the DWS method is used.)

Soldering time: Approx. 5 s max. (Approx. 2 s for the first time and approx. 3 s for the second time if the DWS method is used.)

Be sure to adjust the level of the molten solder so that the solder will not overflow onto the PCB.

Claw Securing Force During Automatic Insertion

During automatic insertion of Relays, make sure to set the securing force of the claws to the following values so that the Relay characteristics will be maintained.



Direction A: 4.90 N max.

Direction B: 9.80 N max.

Direction C: 9.80 N max.

Secure the claws to the area indicated by shading.
Do not attach them to the center area or to only part of the Relay.

Environmental Conditions During Operation, Storage, and Transportation

Protect the Relays from direct sunlight and keep the Relays under normal temperature, humidity, and pressure.

Mounting Latching Relays

The Latching Relays are reset before shipping. If excessive vibration or shock is imposed, however, the Latching Relays may be set accidentally. Be sure to apply a reset signal before use. Make sure that the vibration or shock that is generated by other devices on the same panel does not exceed the rated value of the Latching Relays.

Maximum Voltage

The maximum voltage of the coil can be obtained from the coil temperature increase and the heat-resisting temperature of coil insulating sheath material. (Exceeding the heat-resisting temperature may result in burning or short-circuiting.) The maximum voltage also involves important restrictions. Maximum voltage:

- must not cause thermal changes or deterioration of the insulating material.
- must not cause damage to other control devices.
- must not cause any harmful effect on people.
- must not cause fire.

Therefore, be sure not to exceed the maximum voltage specified in the catalog.

As a rule, the rated voltage must be applied to the coil. A voltage exceeding the rated value, however, can be applied to the coil provided that the voltage is less than the maximum voltage. It must be noted that continuous voltage application to the coil will cause a coil temperature increase which could deteriorate the coil insulation, shorten the relay's electrical life, or affect various characteristics of the relay.

Coating

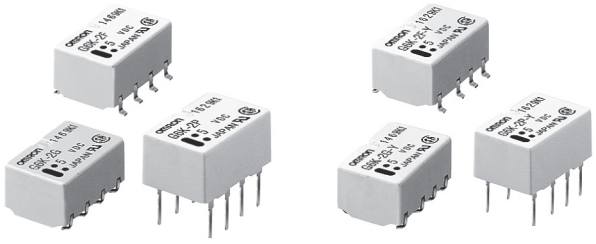
Relays mounted on PCBs may be coated or washed. Do not apply coatings or detergents containing silicone.

Other Handling

Dropping the relay may impose excess shock that exceeds the specifications. Do not use any relay that has been dropped.

Low Signal Relay
G6K

- Compact fourth generation design, offers excellent board space savings.
- Available in 2.54 and 3.2 mm coil-contact terminal spacing.
- "-Y" models meet 2.5 kV Bellcore surge requirements.
- Conforms to FCC Part 68.
- Terminal design based on Omron's successful G6S relay.
- Available in PCB through-hole, SMT gullwing and SMT "inside-L" terminals.
- UL recognized / CSA certified.
- Available in single coil latching.
- RoHS Compliant.



Ordering Information

To Order: Select the part number and add the desired coil voltage rating (e.g., G6K-2F-*DC5*).

Terminal	Contact form	Model		
		Non-latching 2.54 mm spacing	Non-latching 3.2 mm coil-contact terminal spacing	Single coil latching 3.2 mm coil-contact terminal spacing
Gullwing	DPDT	**G6K-2F**	**G6K-2F-Y**	**G6KU-2F-Y**
Inside "L"		**G6K-2G**	**G6K-2G-Y**	**G6KU-2G-Y**
PCB through-hole		**G6K-2P**	**G6K-2P-Y**	**G6KU-2P-Y**

When ordering tape packing (surface mount versions), add "-TR" to the model number (e.g., G6K-2G-*TR*-DC5)

Specifications

■ Contact Data

Load	Resistive load (cosϕ=1)
Rated load	0.3 A at 125 VAC
	1 A at 30 VDC
Contact material	Ag (Au clad)
Max. carry current	1 A
Max. operating voltage	125 VAC, 60 VDC
Max. operating current	1 A
Max. switching capacity	37.5 VA, 30W
Min. permissible load (See note)	10 μA at 10 mVDC

Note: This value was measured at a switching frequency of 120 operations/min and the criterion of contact resistance is 50 Ω. This value may vary depending on the switching frequency and operating environment. Always double-check relay suitability under actual operating conditions.

■ Coil Data

G6K- 2.5 mm coil-contact terminal spacing, standard, non-latching (G6K-2F, G6K-2G, G6K-2P)
G6K- 3.2 mm coil-contact terminal spacing, non-latching (G6K-2F-Y, G6K-2G-Y, G6K-2P-Y)

Rated voltage (VDC)	Rated current (mA)	Coil resistance (Ω)	Pick-up voltage	Dropout voltage	Maximum voltage	Power consumption (mW)
			% of rated value			
3	33.0	91	80% max.	10% min.	150% max. @ 23°C to 70°C	Approx. 100
4.5	23.2	194				
5	21.1	237				
6	17.6	341				
9	11.3	795				
12	9.1	1,315				
24	4.6	5,220				

G6KU- 3.2 mm spacing, single coil latching (G6KU-2F-Y, G6KU-2G-Y, G6KU-2P-Y)

Rated voltage (VDC)	Rated current (mA)	Coil resistance (Ω)	Set-up voltage	Reset voltage	Maximum voltage	Power consumption (mW)
			% of rated value			
3	33.0	91	75% max.	75% min.	150% max. @ 23°C to 70°C	Approx. 100
4.5	23.2	194				
5	21.1	237				
6	17.6	341				
9	11.3	795				
12	9.1	1,315				
24	4.6	5,220				

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ± 10%.
2. The operating characteristics are measured at a coil temperature of 23°C unless otherwise specified.
3. Pick-up voltage will vary with temperature
4. The maximum voltage is the highest voltage that can be imposed on the relay coil instantaneously.

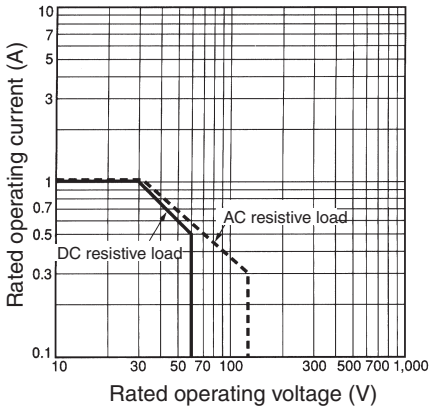
■ Characteristics

Contact resistance (See note 1)		100 mΩ max.
Operate (set) time (See note 2)		3 ms max. (Approx. 1.4 ms - standard. Approx. 1.2 ms - latching)
Release (set) time (See note 2)		3 ms max. (Approx. 1.3 ms - standard. Approx. 1.2 ms - latching)
Insulation resistance (See note 3)		1,000 MΩ min. (at 500 VDC)
Dielectric strength		1,500 VAC for 1 minute between coil contacts 1,000 VAC for 1 minute between contacts of different poles 750 VAC for 1 minute between contacts of the same pole
Surge withstand voltage	**"-Y' versions**	2,500 V, (2 x 10 μs) between coil and contacts. (Conforms to Bellcore specifications)
	Standard versions	1,500 V, (10 x 160 μs) between coil and contacts / contacts of different and same polarity. (Conforms to FCC Part 68)
Vibration	**Mechanical durability**	10 to 55 Hz; 5.0 mm double amplitude
	Malfunction durability	10 to 55 Hz; 3.3 mm double amplitude
Shock	**Mechanical durability**	1,000 m/s^2 (approx. 100G)
	Malfunction durability	750 m/s^2 (approx. 75G)
Ambient temperature		-40°C to 70°C with no icing or condensation
Humidity		5 to 85% RH
Service life	**Mechanical**	50,000,000 operations min. (at 36,000 operations per hour)
	Electrical	100,000 operations min. at rated load (at 1,800 operations per hour)
Weight		Approx. 0.7 g

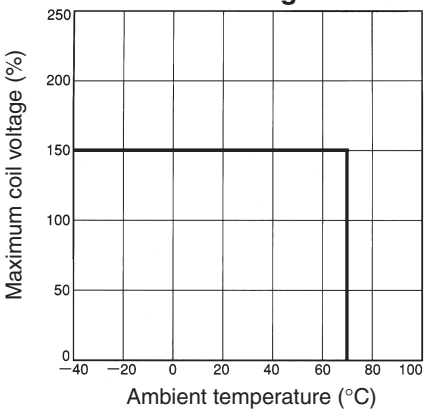
Note: 1. The contact resistance was measured with 10 mA at 1 VDC with a voltage-drop method.
2. Values in parentheses are typical values unless otherwise stated.
3. The insulation resistance was measured with a 500-VDC megohmmeter applied to the same parts as those for checking the dielectric strength.
4. Data shown are of initial value.

■ Characteristic data

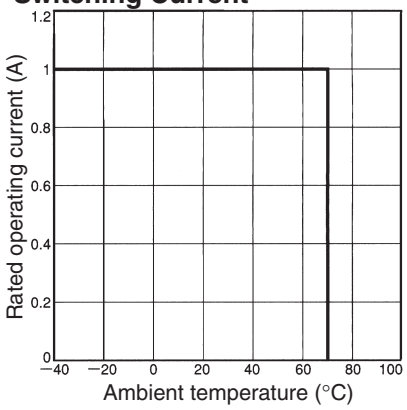
Maximum Switching Capacity



Ambient Temperature vs. Maximum Coil Voltage

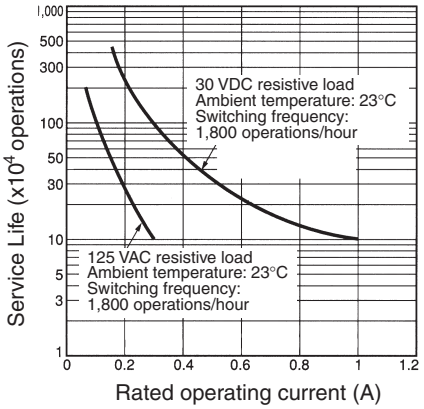


Ambient Temperature vs. Switching Current

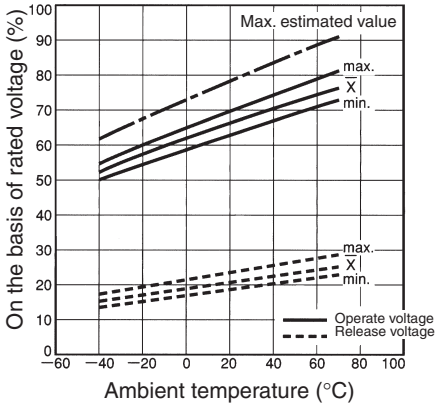


Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

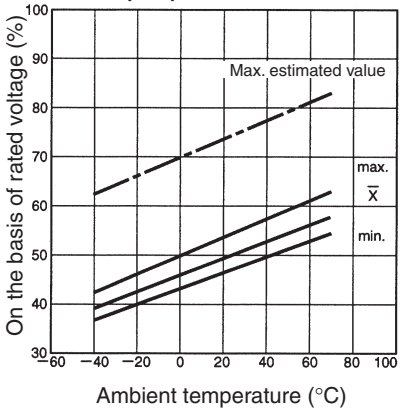
Electrical Service Life



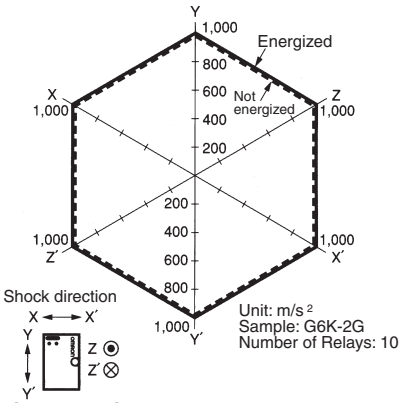
Ambient Temperature vs. Must Operate or Must Release Voltage
G6K-2G (F/P), G6K-2G (F/P)-Y



Ambient Temperature vs. Must Set or Must Reset Voltage
G6KU-2G (F/P)-Y

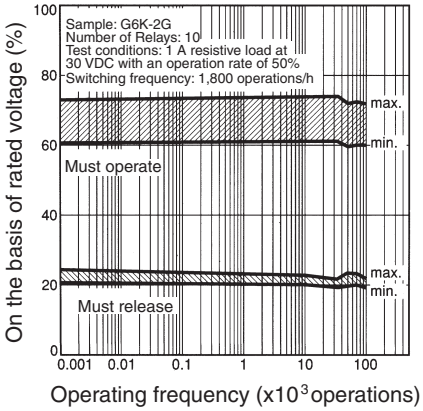


Shock Malfunction



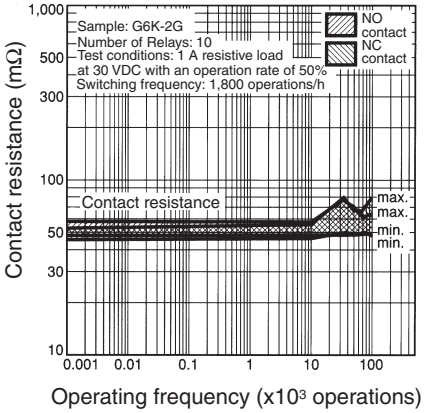
Conditions: Shock is applied in ±X, ±Y, and ±Z directions three times each with and without energizing the Relays to check the number of contact malfunctions.

Electrical Service Life (with Must Operate and Must Release Voltage) (See note.)
G6K-2G (F/P), G6K-2G (F/P)-Y



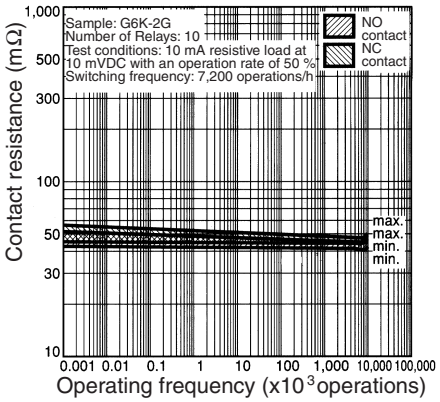
Note: The tests were conducted at an ambient temperature of 23°C.

Electrical Service Life (Contact Resistance) (See note.)
G6K-2G (F/P), G6K-2G (F/P)-Y

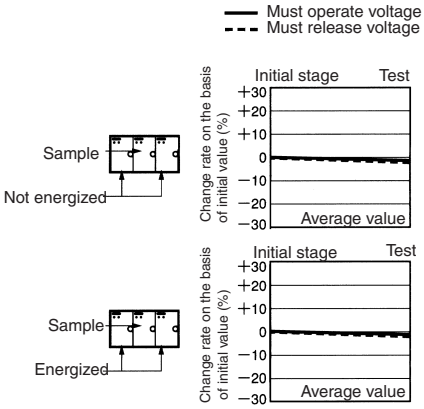


Note: The tests were conducted at an ambient temperature of 23°C.

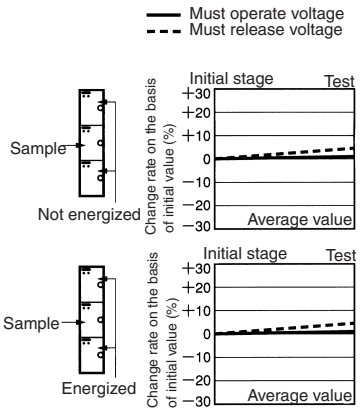
Contact Reliability Test (See note.)
G6K-2G (F/P), G6K-2G (F/P)-Y



Mutual Magnetic Interference
G6K-2G (F/P), G6K-2G (F/P)-Y



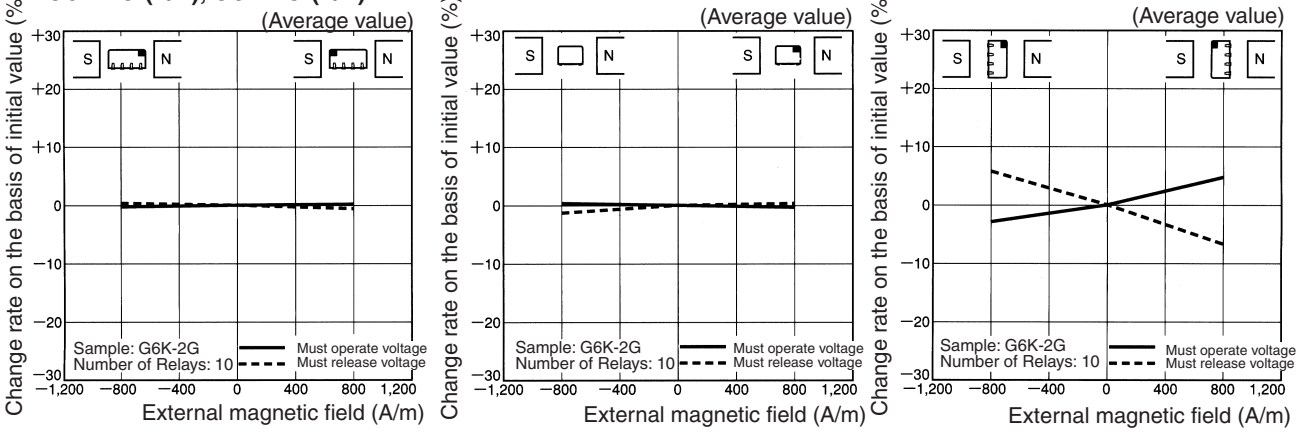
Mutual Magnetic Interference
G6K-2G (F/P), G6K-2G (F/P)-Y



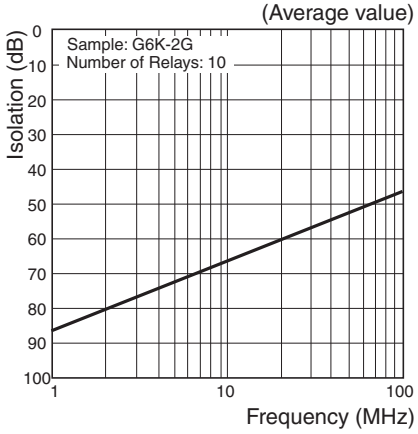
Note 1: The test was conducted at an ambient temperature of 23°C.

2: The contact resistance data are periodically measured reference values and are not values from each monitoring operation. Contact resistance values will vary according to the switching frequency and operating environment, so be sure to check operation under the actual operating conditions before use.

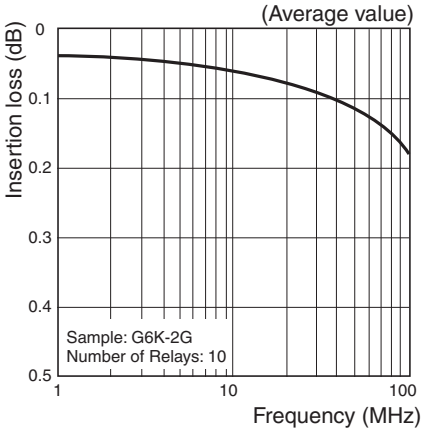
External Magnetic Interference
G6K-2G (F/P), G6K-2G (F/P)-Y



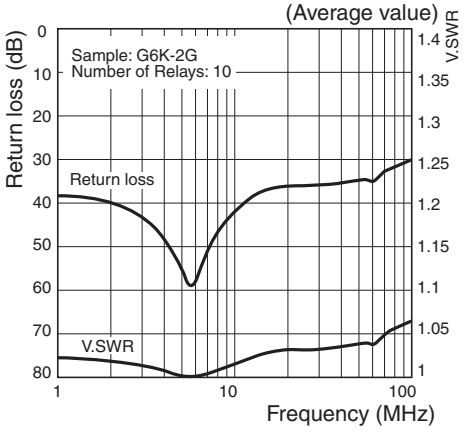
High-frequency Characteristics (Isolation)
G6K-2G (F/P), G6K-2G (F/P)-Y



High-frequency Characteristics (Insertion Loss)
G6K-2G (F/P), G6K-2G (F/P)-Y



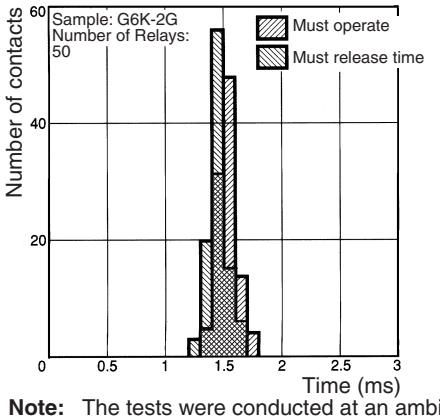
High-frequency Characteristics (Return Loss)
G6K-2G (F/P),G6K-2G (F/P)-Y



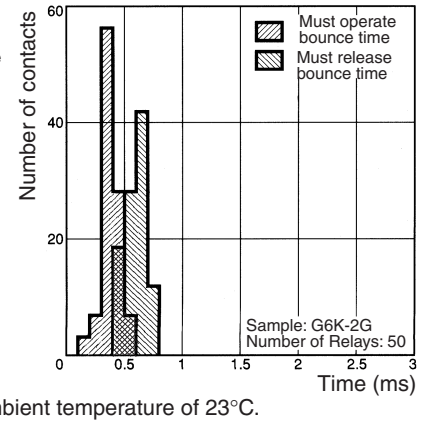
Note: 1. The tests were conducted at an ambient temperature of 23°C.

2. High-frequency characteristics depend on the PCB to which the Relay is mounted. Always check these characteristics including endurance in the actual machine before use.

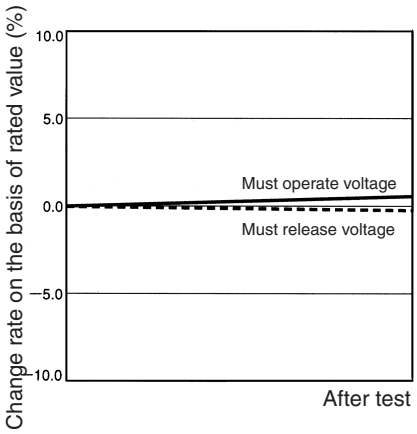
Must Operate and Must Release Time Distribution (See note.)
G6K-2G (F/P), G6K-2G (F/P)-Y



Must Operate and Must Release Bounce Time Distribution (See note.)
G6K-2G (F/P) , G6K-2G (F/P)-Y



Vibration Resistance
G6K-2G (F/P), G6K-2G (F/P)-Y



Note: The tests were conducted at an ambient temperature of 23°C.

■ Approvals

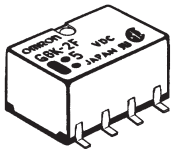
UL Recognized (File No. E41515) / CSA Certified (File No. LR31928) - - Ambient Temp. = 40°C

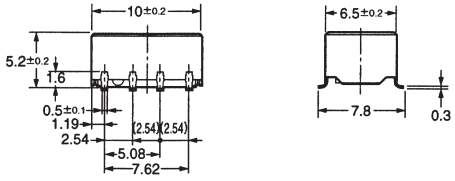
Contact form	Coil rating	Contact ratings	Number of test operations
DPDT	3 to 24 VDC	1 A at 30 VDC (Resistive) 0.5 A at 60 VDC (Resistive) 0.3 A at 125 VAC (General Use)	6,000

Dimensions

Note: All units are in millimeters unless otherwise indicated.

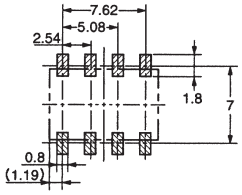
G6K-2F



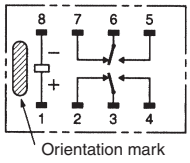


Note: Each value has a tolerance of ±0.3 mm.

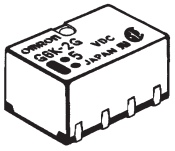
Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

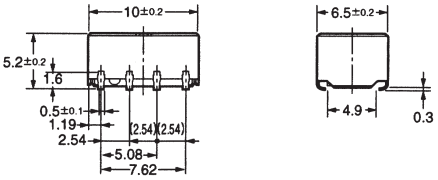


Terminal Arrangement/ Internal Connections (Top View)



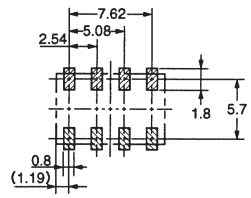
G6K-2G



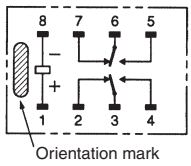


Note: Each value has a tolerance of ±0.3 mm.

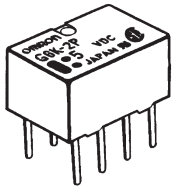
Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

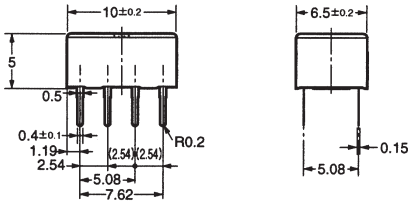


Terminal Arrangement/ Internal Connections (Top View)



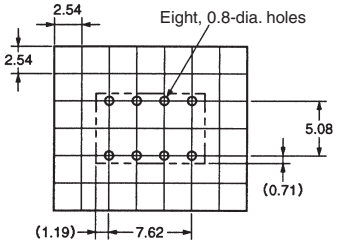
G6K-2P



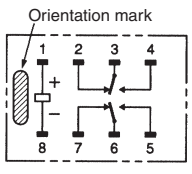


Note: Each value has a tolerance of ±0.3 mm.

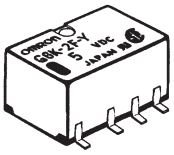
Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

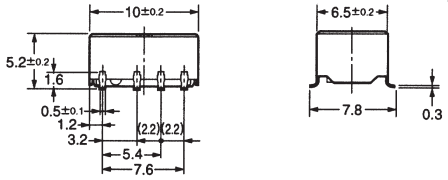


Terminal Arrangement/ Internal Connections (Bottom View)

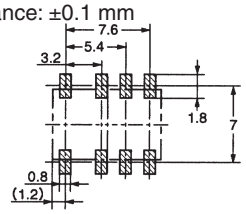


G6K-2F-Y

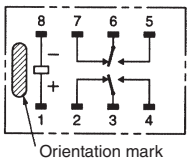




Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

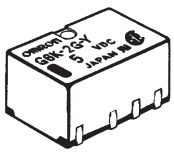


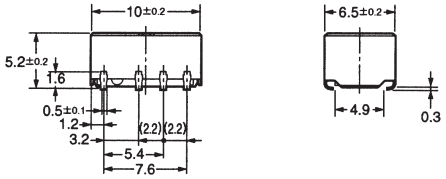
Terminal Arrangement/ Internal Connections (Top View)



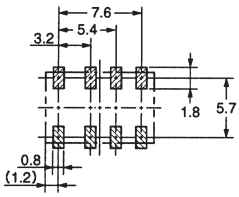
Note: Each value has a tolerance of ±0.3 mm.

G6K-2G-Y

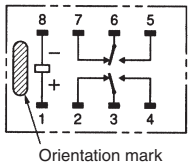




Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

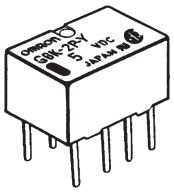


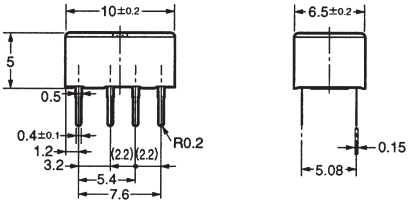
Terminal Arrangement/ Internal Connections (Top View)



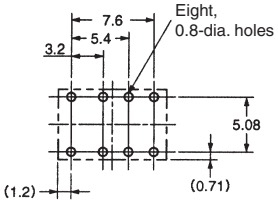
Note: Each value has a tolerance of ±0.3 mm.

G6K-2P-Y

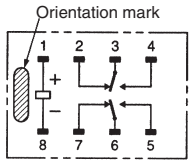




Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm

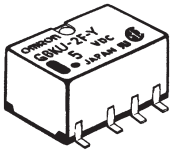


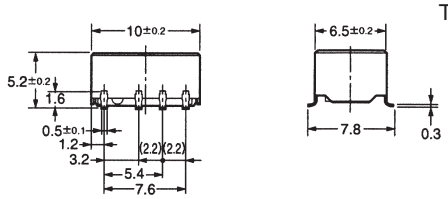
Terminal Arrangement/ Internal Connections (Bottom View)



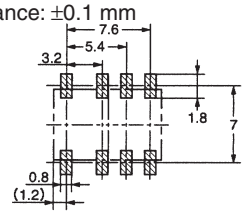
Note: Each value has a tolerance of ±0.3 mm.

G6KU-2F-Y

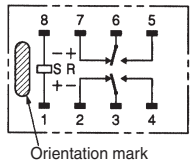




Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

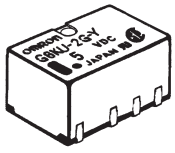


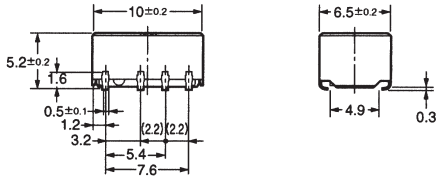
Terminal Arrangement/ Internal Connections (Top View)



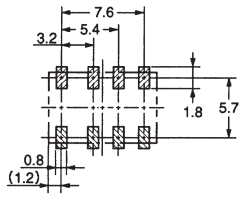
Note: Each value has a tolerance of ±0.3 mm.

G6KU-2G-Y

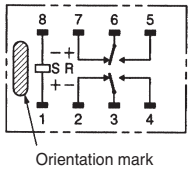




Mounting Dimensions (Top View)
Tolerance: ±0.1 mm

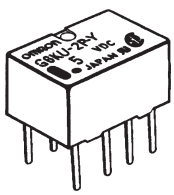


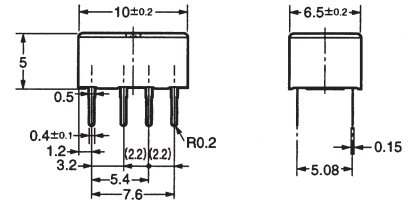
Terminal Arrangement/ Internal Connections (Top View)



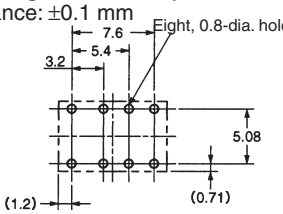
Note: Each value has a tolerance of ±0.3 mm.

G6KU-2P-Y

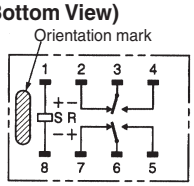




Mounting Dimensions (Bottom View)
Tolerance: ±0.1 mm



Terminal Arrangement/ Internal Connections (Bottom View)

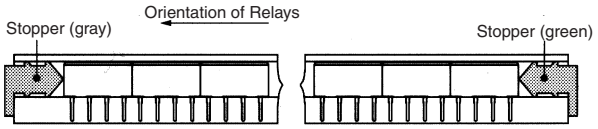


Note: Each value has a tolerance of ±0.3 mm.

■ Packaging Information

Tube packing	Standard nomenclature	50 pcs per anti-static tube
Tape packing (SMT versions, only)	When ordering, add "TR" before the rated coil voltage (e.g., G6K-2G-TR-DC5). Note: TR is not part of the relay model number and will not be marked on the relay.	900 pcs per reel 2 reels per box Order in box multiples (see details below)

Relays in tube packing are arranged so that the orientation mark of each Relay is on the left side.
Be sure to reference Relay orientation when mounting the Relay to the PCB.

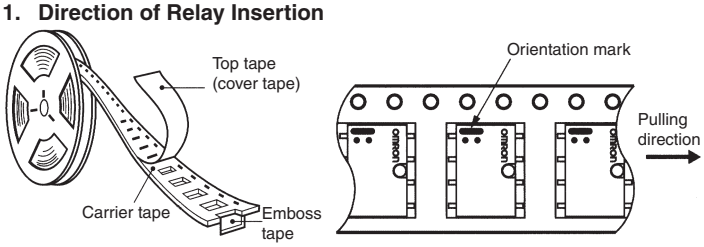


Tube length: 520 mm (stopper not included)
No. of Relays per Tube: 50

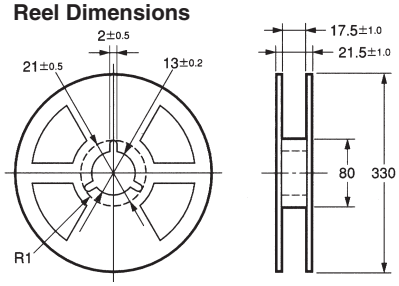
■ Tape and Reel Dimensions (Surface Mount Models)

- Tape type: ETX7200 (EIAJ - Electronic Industrial Association of Japan)
- Reel type: RPM-16D (EIAJ, 330 mm diameter)
- Relays per reel: 900

1. Direction of Relay Insertion

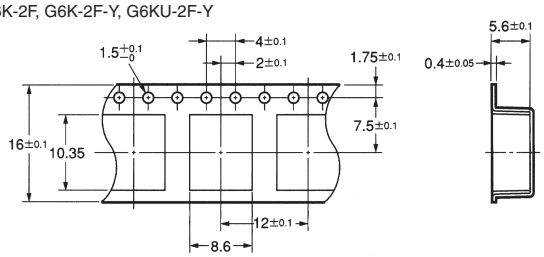


2. Reel Dimensions

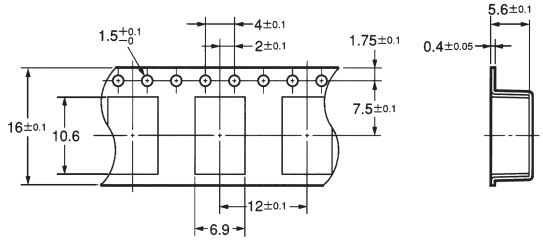


3. Carrier Tape Dimensions

G6K-2F, G6K-2F-Y, G6KU-2F-Y



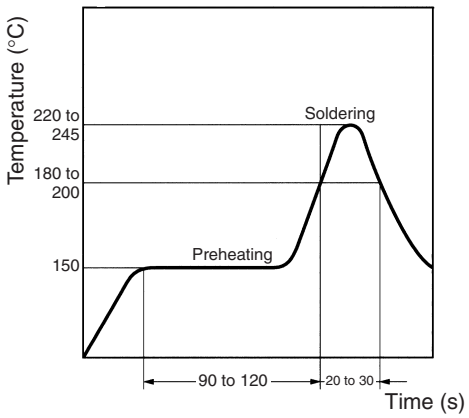
G6K-2G, G6K-2G-Y, G6KU-2G-Y



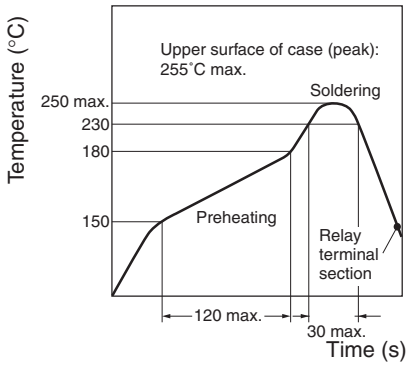
■ Recommended Soldering Method

Temperature indicates the surface temperature of the PCBs.
IRS Method (for surface mounting terminal models)

(1) IRS Method (Mounting Solder: Lead)



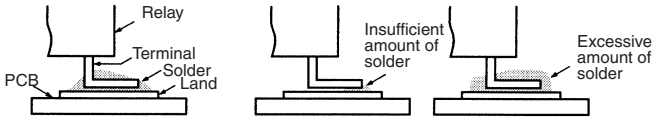
(2) IRS Method (Mounting Solder: Lead-free)



Note: The temperature profile indicates the temperature of the relay terminal section.

- The thickness of cream solder to be applied should be within a range between 150 and 200 μm on OMRON's recommended PCB pattern.
- In order to perform correct soldering, it is recommended that the correct soldering conditions be maintained as shown below on the left side.

Correct Soldering **Incorrect Soldering**



Visually check that the Relay is properly soldered.

Precautions

■ Correct Use

Handling

Do not unpack the relay until mounting it.

Soldering

Solder: JIS Z3282, H63A or equivalent

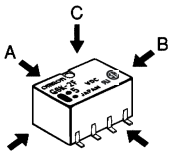
Soldering temperature: Approx. 250°C (260°C if the DWS method is used)

Soldering time: Approx. 5 s max. (approx. 2 s for the first time and approx. 3 s for the second time if the DWS method is used)

Be sure to make a molten solder level adjustment so that the solder will not overflow on the PCB.

Claw Securing Force During Automatic Mounting

During automatic insertion of Relays, make sure to set the securing force of each claw to the following so that the Relays characteristics will be maintained.



Direction A: 1.96 N
Direction B: 4.90 N
Direction C: 1.96 N

Environmental Conditions During Operation, Storage, and Transportation

It is best to keep the relay in its packaging in a controlled environment until it is ready for mounting.

If the Relay is stored for a long time in an adverse environment with high temperature, high humidity, organic gases, or sulfide gases, sulfide or oxide films will form on the contact surfaces. These films may result in unstable contact, contact problems, or functional problems. Therefore, operate, store, or transport the product under specified environmental conditions.

Latching Relay Mounting

Make sure that the vibration or shock that is generated from other devices, such as relays in operation, on the same panel and imposed on the Latching Relay does not exceed the rated value, otherwise the Latching Relay that has been set may be reset or vice versa. The Latching Relay is reset before shipping. If excessive vibration or shock is imposed, however, the Latching Relay may be set accidentally. Be sure to apply a reset signal before use.

Maximum Allowable Voltage

The maximum allowable voltage of the coil can be obtained from the coil temperature increase and the heat-resisting temperature of coil insulating sheath material. (Exceeding the heat-resisting temperature may result in burning or short-circuiting.) The maximum allowable voltage also involves important restrictions which include the following:

- Must not cause thermal changes in or deterioration of the insulating material.
- Must not cause damage to other control devices.
- Must not cause any harmful effect on people.
- Must not cause fire.

Therefore, be sure to use the maximum allowable voltage as specified in the catalog.

As a rule, the rated voltage must be applied to the coil. A voltage exceeding the rated value, however, can be applied to the coil provided that the voltage is less than or equal to the maximum allowable voltage. It must be noted that continuous voltage application to the coil will cause a coil temperature increase which may affect characteristics such as electrical life and coil insulation.

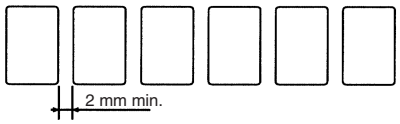
Coating

The Relay mounting on the PCB may be coated or washed but do not apply silicone coating or detergent containing silicone, otherwise the silicone coating or detergent may remain on the surface of the Relay.

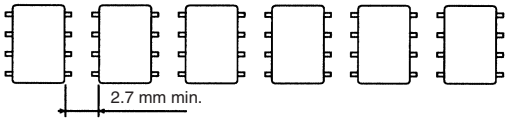
PCB Mounting

If two or more Relays are closely mounted with the long sides of the Relays facing each other and soldering is performed with infrared radiation, the solder may not be properly exposed to the infrared rays. Be sure to keep the proper distance between adjacent Relays as shown below to insure formation of good solder joints.

G6K-2G

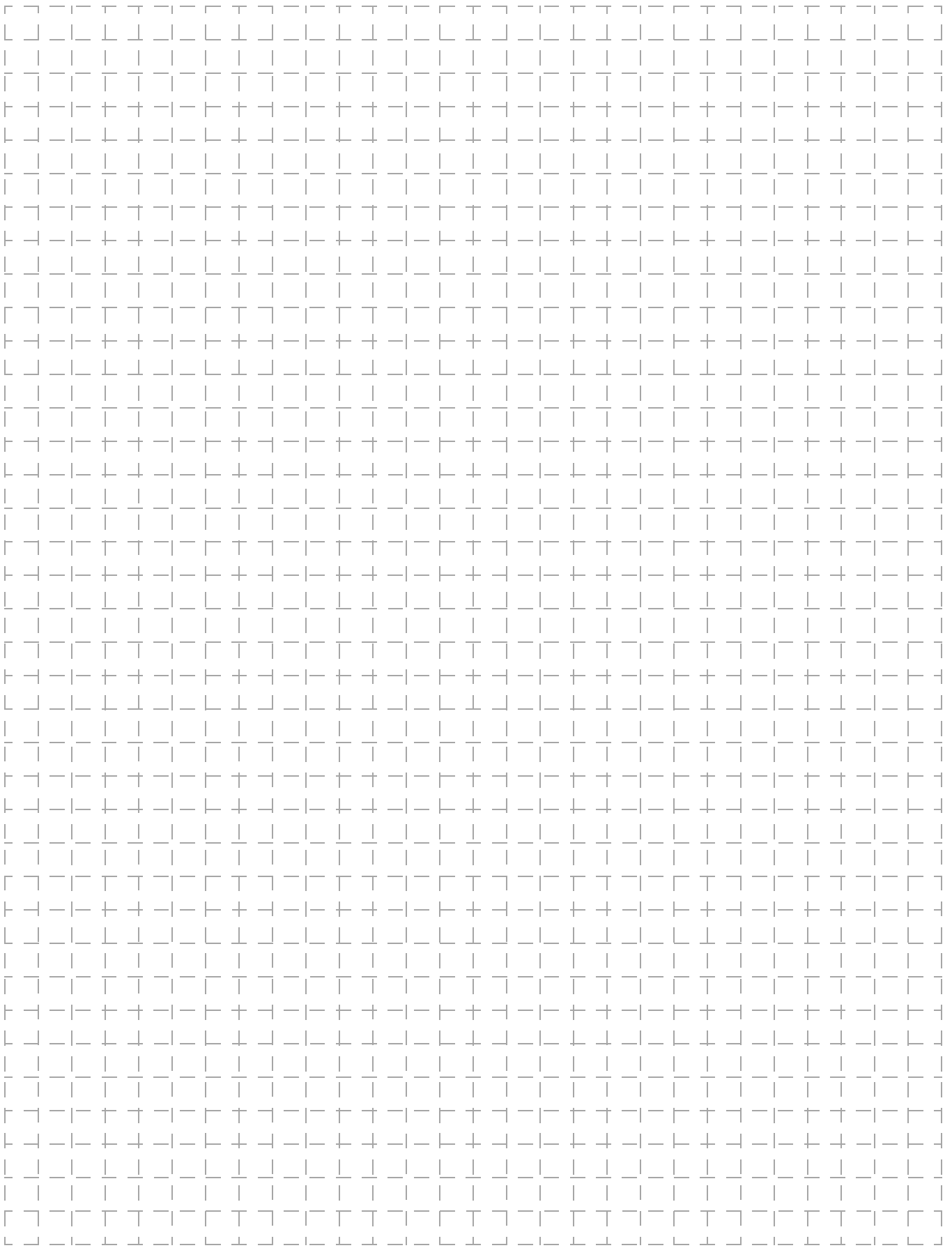


G6K-2F



Two or more Relays may be mounted as closely as desired with the short sides of the Relays facing each other.

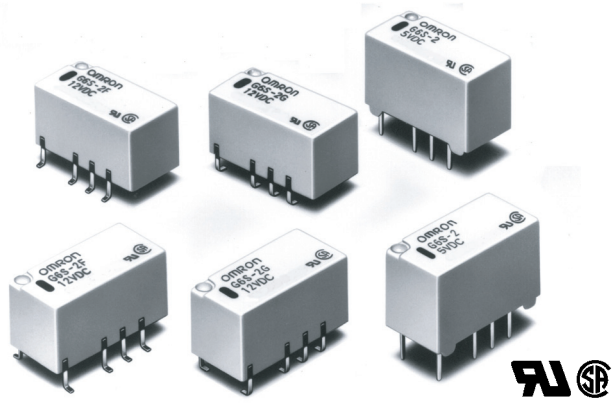
MEMO



Low Signal Relay
G6S

Suface Mount DPDT Relay

- High dielectric withstand voltage of 2,000 VAC between coil and contacts (standard type); 1,500 VAC between contacts of different polarity.
- Meets FCC Part 68 and Telcordia 2.5 kV surge withstand.
- European version certified for EN60950/EN41003 Supplementary Insulation at 250 V at Pollution Degree 2.
- Low power consumption of 140 mW (Non-latching)
- Available in through-hole and SMT terminals.
- Tape and reel or tube packaging.
- RoHS Compliant.



Ordering Information

■ Standard Version

.

Terminal	Model / Contact form	Non-latching		Single coil latching	Dual coil latching
		Standard	European Version*		
Gull-wing	DPDT	**G6S-2F**	**G6S-2F-Y**	**G6SU-2F**	**G6SK-2F**
Inside "L"		**G6S-2G**	**G6S-2G-Y**	**G6SU-2G**	**G6SK-2G**
PCB through-hole		**G6S-2**	**G6S-2-Y**	**G6SU-2**	**G6SK-2**

* Certified for EN60950/EN41003 Supplementary Insulation at 250 V (pollution degree 2)

Notes: 1. When ordering, add the rated coil voltage to the model number.
Example: G6S-2F DC12
└── Rated coil voltage

2. When ordering tape packing (surface mount models), add "-TR" to the model number.
Example: G6S-2F-TR DC12
└── Tape packing
"-TR" is not part of the relay model number. Therefore, it is not marked on the relay case.

3. Dual coil latching models are available with a High-sensitivity coil. (140 mW; 200 mW for DC24)
When ordering High-sensitivity dual coil latching models, add "-H" to the model number.
Example: G6SK-2G-H-TR DC5
└── High-sensitivity coil

Model Number Legend

G6S□ - □□ - □ - □ DC□
1 2 3 4 5 6

1. Relay Function
None: Non-latching
U: Single coil latching
K: Dual coil latching

2. Contact Form
2: DPDT

3. Terminal Shape
None: Through-hole
F: Gull-wing surface mount
G: Inside "L" surface mount

4. Approved Standards
None: UL/CSA
Y: EN60950/EN41003
(Standard coil models)

5. Packaging
None: Tube packaging
TR: Tape and reel packaging
(Surface mount models)

6. Rated Coil Voltage
4.5, 5, 12, 24

Specification

■ Contact Data

Load	Resistive load (cos ϕ = 1)
Rated load	0.5 A at 125 VAC 2 A at 30 VDC
Contact material	Ag (Au clad)
Max. carry current	2 A
Max. operating voltage	250 VAC, 220 VDC
Max. operating current	2 A
Max. switching capacity	62.5 VA, 60 W
Min. permissible load	10 μA, 10 mVDC

Note: P level: λ_{60} = 0.1 x 10^{-6}/operation
This value was measured at a switching frequency of 120 operations/min and the criterion of contact resistance is 50 Ω. This value may vary depending on the operating environment. Always double-check relay suitability under actual operating conditions.

■ Coil Data

G6S - Standard Non-latching (G6S-2F, G6S-2G, G6S-2)

Rated voltage (VDC)	Rated current (mA)	Coil resistance (Ω)	Pick-up voltage	Dropout voltage	Maximum voltage	Power consumption (mW)
			% of rated voltage			
4.5	31.0	145	75% max.	10% max.	200% max. @ 23°C	Approx. 140
5	28.1	178				
12	11.7	1,028				
24	8.3	2,880			170% max. @ 23°C	Approx. 200

G6SU - Standard Single Coil Latching (G6SU-2F, G6SU-2G, G6SU-2)

Rated voltage (VDC)	Rated current (mA)	Coil resistance (Ω)	Coil Inductance (H) (ref. value)		Set pick-up voltage	Reset pick-up voltage	Maximum voltage	Power consumption (mW)
			Armature OFF	Armature ON	% of rated voltage			
4.5	22.2	203	0.27	0.14	75% max.	75% max.	180% max. @ 23°C	Approx. 100
5	20.0	250	0.36	0.18				
12	8.3	1,440	2.12	1.14				
24	6.3	3,840	5.80	3.79				Approx. 150

G6SK - Standard Dual Coil Latching (G6SK-2F, G6SK-2G, G6SK-2)

Rated voltage (VDC)	Rated current (mA)	Coil resistance (Ω)	Coil Inductance (H) (ref. value)				Set pick-up voltage	Reset pick-up voltage	Maximum voltage	Power consumption (mW)
			Set		Reset					
			Armature OFF	Armature ON	Armature OFF	Armature ON	% of rated voltage			
4.5	44.4	101	0.12	0.074	0.082	0.14	75% max.	75% max.	170% max. @ 23°C	Approx. 200
5	40	125	0.14	0.088	0.098	0.16				
12	16.7	720	0.60	0.41	0.46	0.54				
24	12.5	1,920	1.98	1.23	1.34	2.23			140% max. @ 23°C	Approx. 300

G6S - European Version, Non-latching (G6S-2F-Y, G6S-2G-Y, G6S-2-Y)

Rated voltage (VDC)	Rated current (mA)	Coil resistance (Ω)	Pick-up voltage	Dropout voltage	Maximum voltage	Power consumption (mW)
			% of rated voltage			
5	40.0	125	75% max.	10% max.	170% max. @ 23°C	Approx. 200
12	16.7	720				
24	9.6	2,504				Approx. 230

Note: 1. The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
2. The operating characteristics are measured at a coil temperature of 23°C.
3. Pick-up voltage will vary with temperature.
4. The maximum voltage is the highest voltage that can be imposed on the relay coil.

■ Characteristics

Contact resistance (See note 1)		75 mΩ max.
Operate (set) time (See note 2)		4 ms max. (mean value approx. 2.5 ms G6S; 2.0 ms G6SU, G6SK)
Release (reset) time (See note 2)		4 ms max. (mean value approx. 1.5 ms G6S; 2.0 ms G6SU, G6SK)
Bounce time		Approx. 0.5 ms
Max. operating frequency		Mechanical: 36,000 operations/hr Electrical: 1,800 operations/hr (under rated load)
Insulation resistance (See note 3)		1,000 MΩ min. (at 500 VDC)
Dielectric strength		2,000 VAC, 50/60 Hz for 1 minute (G6S, G6SU) between coil and contacts 1,000 VAC, 50/60 Hz for 1 minute (G6SK) between coil and contacts 1,500 VAC, 50/60 Hz for 1 minute between contacts of different poles 1,000 VAC, 50/60 Hz for 1 minute between contacts of same pole 500 VAC, 50/60 Hz for 1 minute between set and reset coils (G6SK)
Surge withstand voltage	**Conforming to Telcordia specs.**	2,500 V (2 x 10 μS) between coil and contacts for G6S and G6SU 2,500 V (2 x 10 μS) between contacts of different poles
	Conforming to FCC Part 68	1,500 V (10 x 160 μS) between coil and contacts for G6SK 1,500 V (10 x 160 μS) between contacts of same pole
Vibration	**Mechanical durability**	10 to 55 Hz; 5 mm double amplitude
	Malfunction durability	10 to 55 Hz; 3.3 mm double amplitude
Shock	**Mechanical durability**	1,000 m/s^2; approx. 100 G
	Malfunction durability	750 m/s^2; approx. 75 G
Ambient temperature		-40 to +85°C with no icing; -40 to +70°C with no icing (G6SK, DC24 coil)
Ambient Humidity		5% to 85% RH
Service life	**Mechanical**	100,000,000 operations min. (at 36,000 operations/hour)
	Electrical	100,000 operations min. (2A@30VDC, resistive; 1,200 ops/hr.) 100,000 operations min. (0.5A@125VAC, resistive) See “Characteristic Data”
Weight		Approx. 2g

Note: 1. The contact resistance was measured with 10 mA at 1 VDC with a voltage drop method.

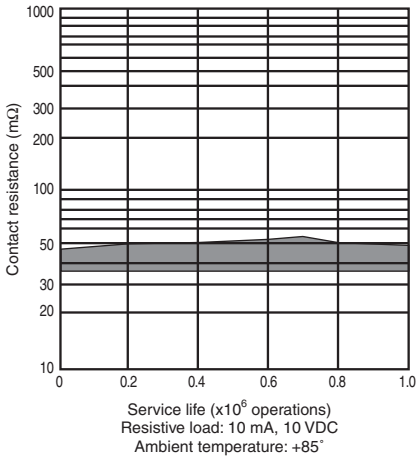
2. Values in parentheses are typical values unless otherwise stated.

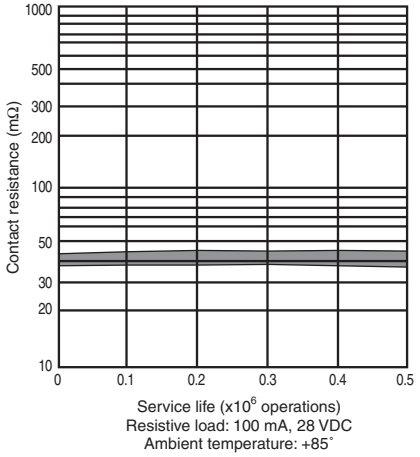
3. The insulation resistance was measured with a 500-VDC megohmmeter applied to the same parts as those used for checking the dielectric strength (except between the set and reset coil).

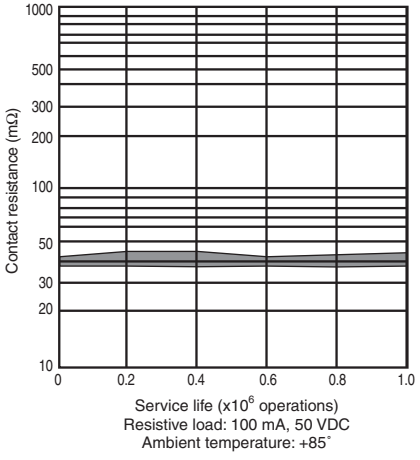
4. Data shown are of initial value.

■ Characteristic Data

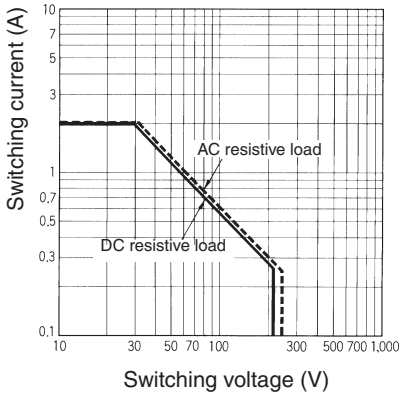
Service Life





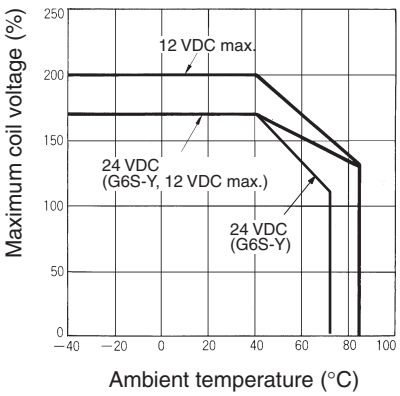


Maximum Switching Capacity

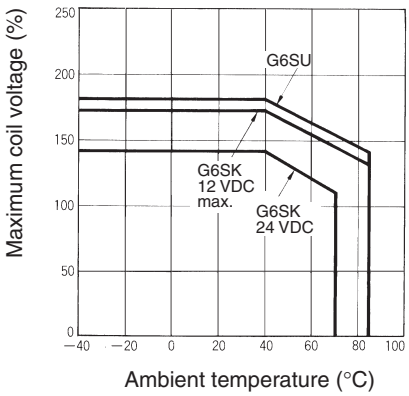


Ambient Temperature vs. Maximum Coil Voltage

Non-latching



Single Coil Latching
Dual Coil Latching

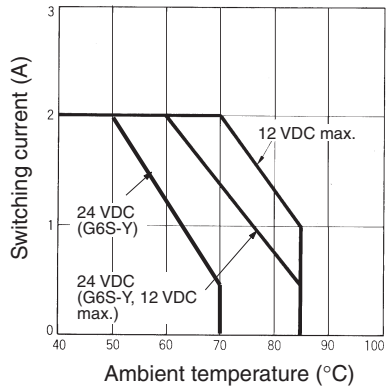


Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

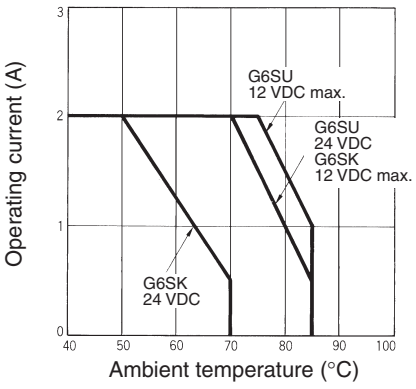
Reference Data

Ambient Temperature vs. Switching Current

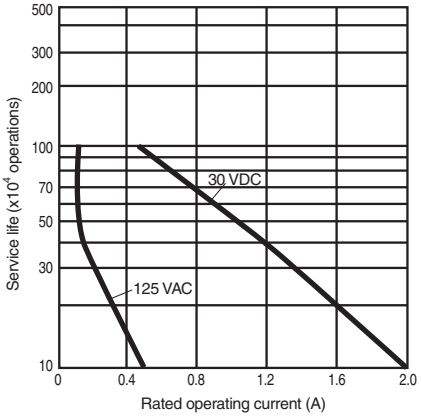
Non-latching



Single Coil Latching
Dual Coil Latching

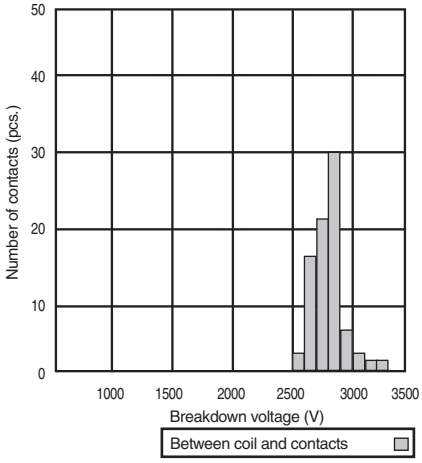


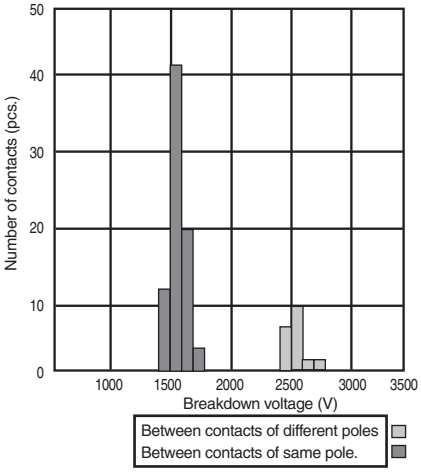
Electrical Service Life



Dielectric Strength (Standard Version, Non-latching)

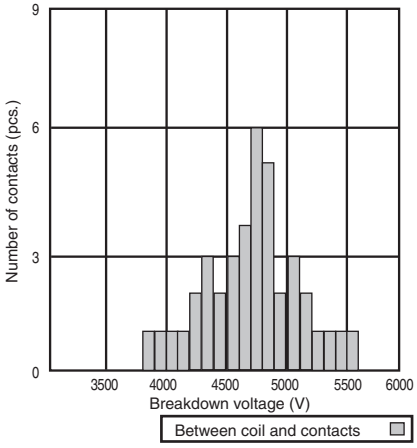
Detecting current: 1mA



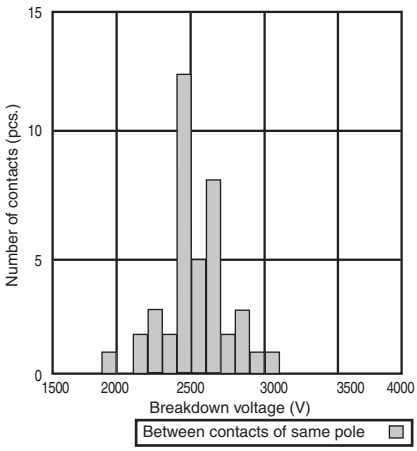


Impulse Withstand Voltage (Standard Version, Non-latching)

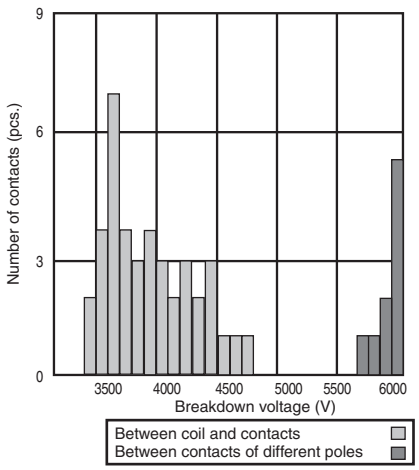
(2 x 10 ms)



(10 x 160 ms)

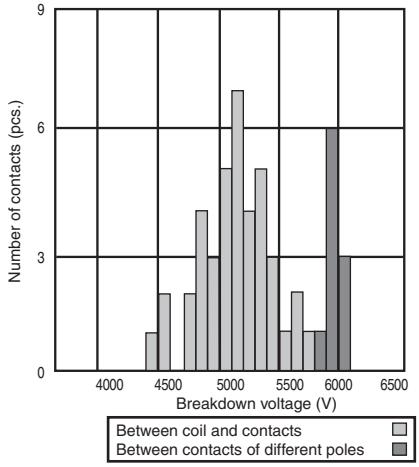


(10 x 160 ms)

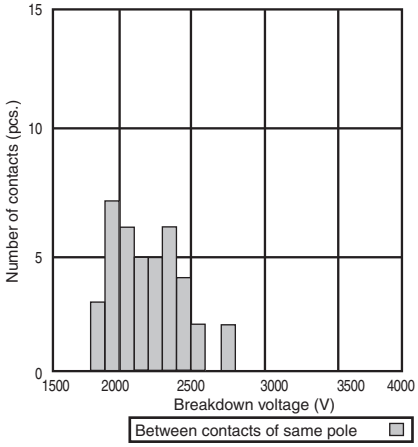


Impulse Withstand Voltage (European version)

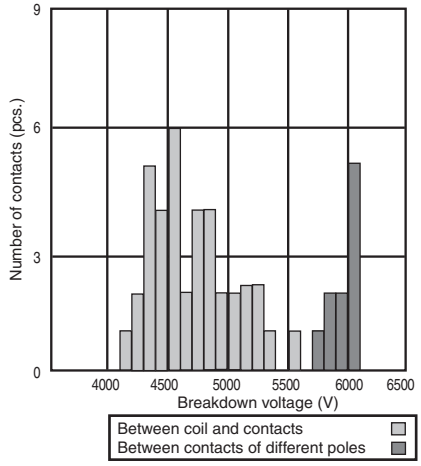
(2 x 10 ms)



(10 x 160 ms)

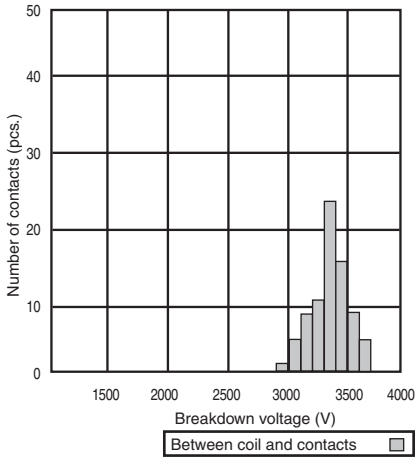


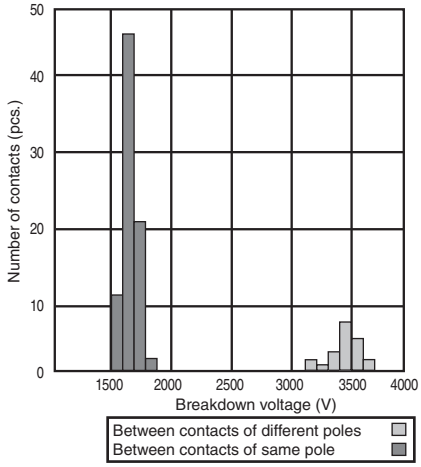
(10 x 160 ms)



Dielectric Strength (European Version, Non-latching)

Detecting current: 1mA



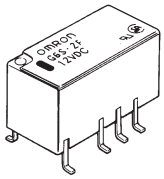


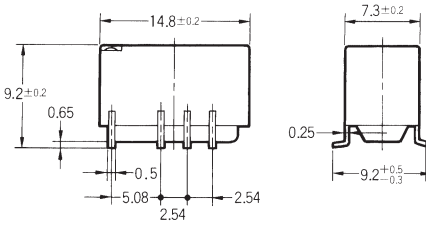
Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Coplanarity is 0.1 mm max.

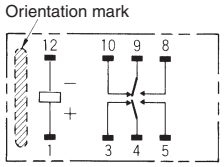
■ Standard

G6S-2F, G6S-2F-Y
Tolerance: ±0.3

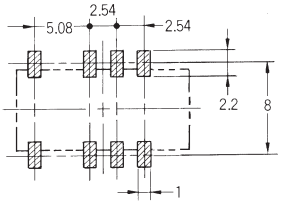




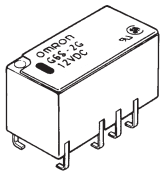
Terminal Arrangement/ Internal Connections (Top View)

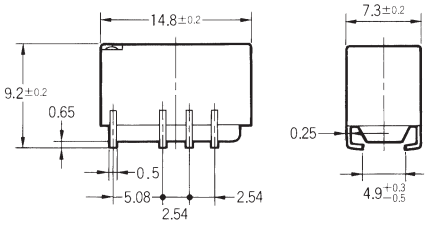


Footprint (Top View)
Tolerance: ±0.1

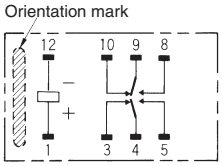


G6S-2G, G6S-2G-Y
Tolerance: ±0.3

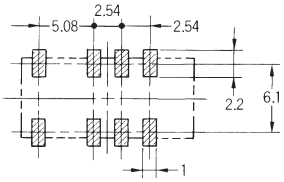




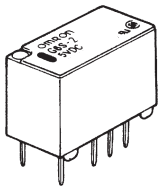
Terminal Arrangement/ Internal Connections (Top View)

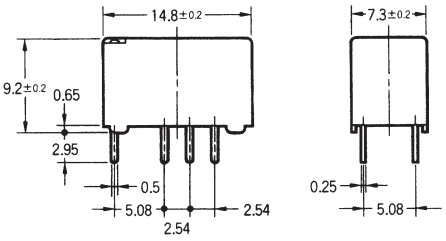


Footprint (Top View)
Tolerance: ±0.1

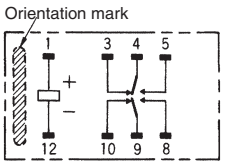


G6S-2, G6S-2-Y
Tolerance: ±0.3

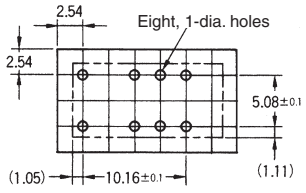




Terminal Arrangement/ Internal Connections (Bottom View)



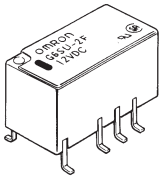
Footprint (Bottom View)
Tolerance: ±0.1

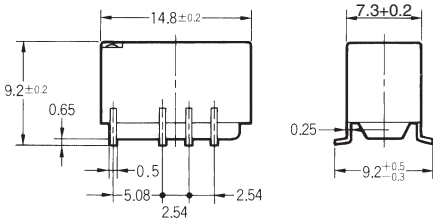


■ Single Coil Latching

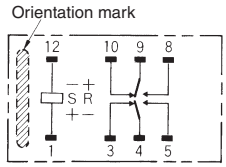
G6SU-2F

Tolerance: ±0.3



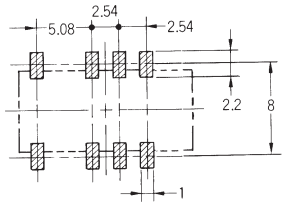


Terminal Arrangement/ Internal Connections (Top View)



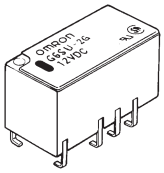
Footprint (Top View)

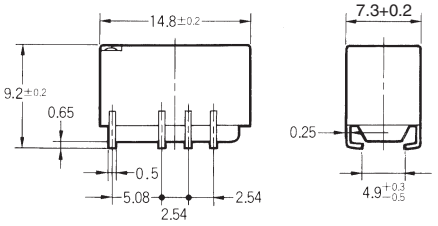
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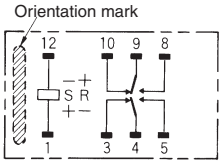
G6SU-2G

Tolerance: ±0.3



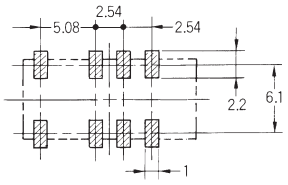


Terminal Arrangement/ Internal Connections (Top View)



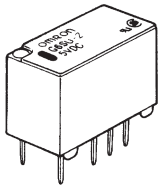
Footprint (Top View)

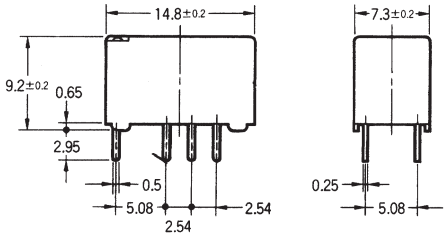
Tolerance: ±0.1



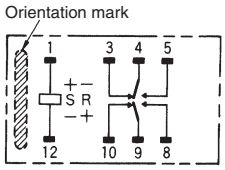
G6SU-2

Tolerance: ±0.3



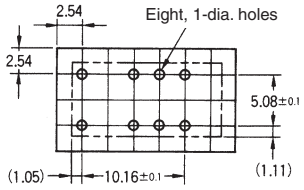


Terminal Arrangement/ Internal Connections (Bottom View)



Footprint (Bottom View)

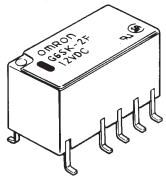
Tolerance: ±0.1

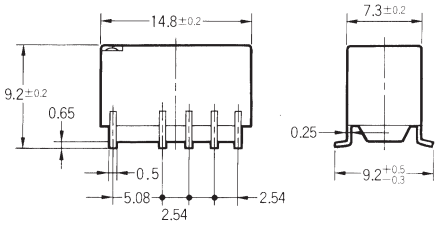


■ Dual Coil Latching

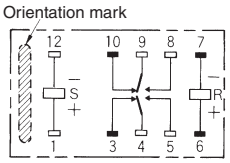
G6SK-2F

Tolerance: ±0.3



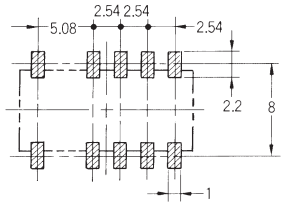


Terminal Arrangement/ Internal Connections (Top View)



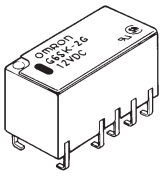
Footprint (Top View)

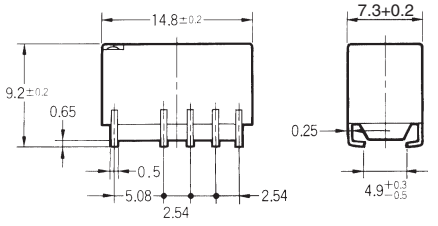
Tolerance: ±0.1



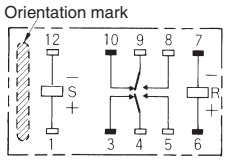
G6SK-2G

Tolerance: ±0.3



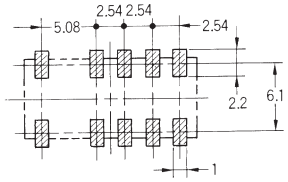


Terminal Arrangement/ Internal Connections (Top View)



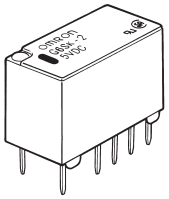
Footprint (Top View)

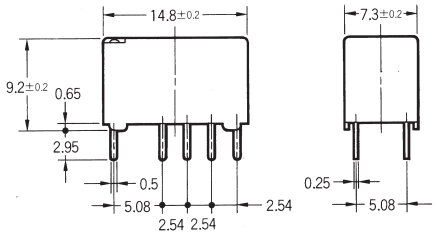
Tolerance: ±0.1



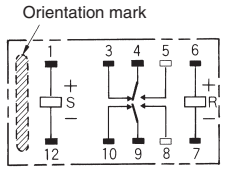
G6SK-2

Tolerance: ±0.3



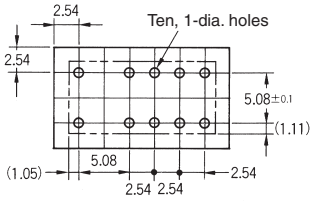


Terminal Arrangement/ Internal Connections (Bottom View)



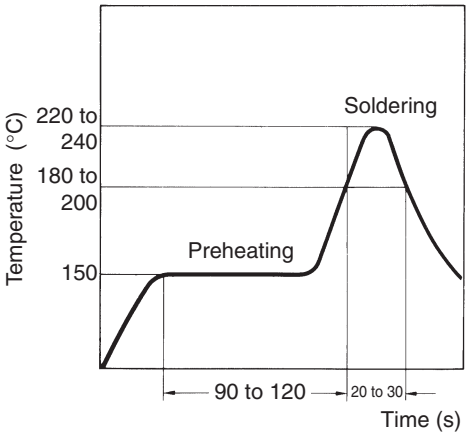
Footprint (Bottom View)

Tolerance: ±0.1

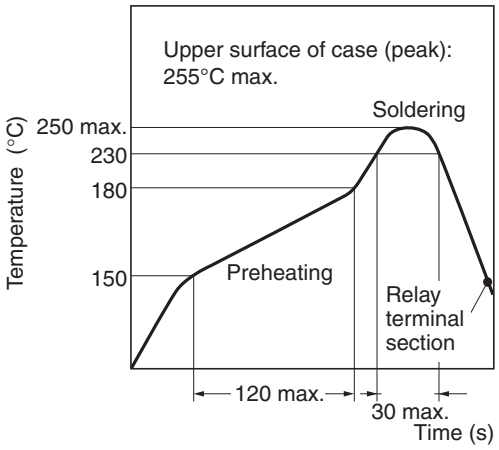


Recommended Soldering Method

(1) IRS Method (Mounting Solder: Lead)



(2) IRS Method (Mounting Solder: Lead-free)



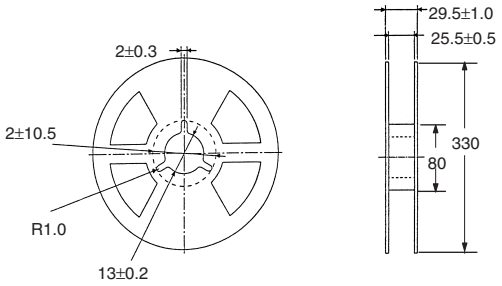
Note: The temperature profile indicates the temperature of the relay terminal section.

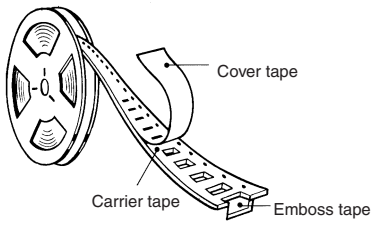
Packaging

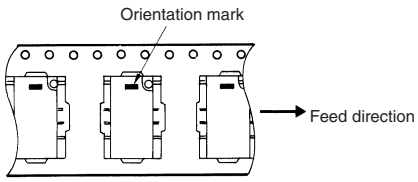
Tube packing	Standard nomenclature	50 pcs per anti-static tube
Tape packing (Surface mount versions)	When ordering, add "TR" before the rated coil voltage (e.g., G6S-2F-*TR*-DC12) Note: TR is not part of the relay model number and will not be marked on the relay.	

■ Tape and Reel Dimensions (Surface Mount Models)

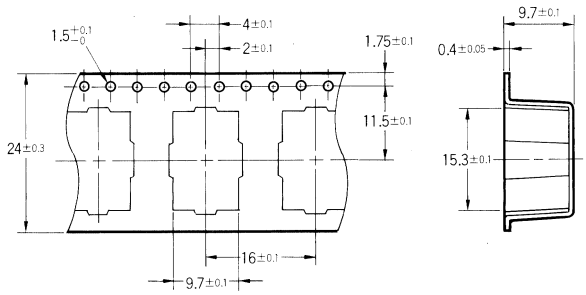
- Tape type: TE2416R (Refer to EIAJ - Electronic Industrial Association of Japan)
- Reel type: R24E (Refer to EIAJ - Electronic Industrial Association of Japan)
- Relays per reel: 400
- Reels per packing carton: 2 (800 relays)



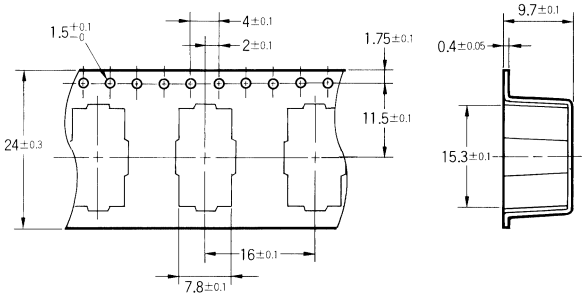




G6S-2F, G6SU-2F, G6SK-2F, G6S-2F-Y



G6S-2G, G6SU-2G, G6SK-2G, G6S-2G-Y



■ Approvals

UL Recognized (File No. E41515) / CSA Certified (File No. LR31928) - - Ambient Temp. = 40°C

Type	Contact form	Coil rating	Contact ratings	Number of test operations
G6S-2, G6S-2F, G6S-2G	DPDT	2 to 48 VDC	3 A at 30 VDC (Resistive)	6,000
G6SU-2, G6SU-2F, G6SU-2G G6SK-2, G6SK-2F, G6SK-2G G6SK-2-Y, G6SK-2F-Y, G6SK-2G-Y		2 to 24 VDC	0.3 A at 110 VDC (Resistive) 0.5 A at 125 VAC (General Use)	

EN60950 / EN41003

Type	Contact form	Isolation Category	Voltage
G6S-2-Y, G6S-2F-Y, G6S-2G-Y	DPDT	Supplementary Isolation	250 VAC

Note: 1. The rated values approved by each of the safety standards (e.g., UL and CSA) may be different from the performance characteristics individually defined in this catalog.

2. In the interest of product improvement, specifications are subject to change.

Precautions

- Use a DC power supply with 5% or less ripple factor to operate the coil.
- Do not use the G6S where subject to strong external magnetic fields.
- Do not use the G6S where subject to magnetic particles or excessive amounts of dust.
- Do not reverse the polarity of the coil (+, –).
- Latching types are delivered in the reset position. We recommend that a reset voltage be applied in advance to start operation.
- Do not drop the G6S or otherwise subject it to excessive shock.
- Remove the relay from the packing immediately prior to usage.

■ Correct use

Long-term Continuously ON Contacts

Using the Relay in a circuit where the Relay will be ON continuously for long periods (without switching) can lead to unstable contacts because the heat generated by the coil itself will affect the insulation, causing a film to develop on the contact surfaces. We recommend using a latching relay (magnetic-holding relay) in this kind of circuit. If a single-side stable model must be used in this kind of circuit, we recommend using a fail-safe circuit design that provides protection against contact failure or coil burnout.

Relay Handling

Use the Relay as soon as possible after opening the moisture-proof package. If the Relay is left for a long time after opening the moisture-proof package, the appearance may suffer and seal failure may occur after the solder mounting process. To store the Relay after opening the moisture-proof package, place it into the original package and sealed the package with adhesive tape.

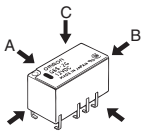
When washing the product after soldering the Relay to a PCB, use a water-based solvent or alcohol-based solvent, and keep the solvent temperature to less than 40°C. Do not put the Relay in a cold cleaning bath immediately after soldering.

G6S (K) (-U) -2 Soldering

- Soldering temperature: Approx. 250°C (At 260°C if the DWS method is used.)
- Soldering time: Approx. 5 s max. (Approx. 2 s for the first time and approx. 3 s for the second time if the DWS method is used.)
- Be sure to adjust the level of the molten solder so that the solder will not overflow onto the PCB.

Claw Securing Force During Automatic Mounting

During automatic insertion of Relays, be sure to set the securing force of each claw to the following so that the Relay's characteristics will be maintained.



Dimension A: 1.96 N max.
Dimension B: 4.90 N max.
Dimension C: 1.96 N max.

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Environmental Responsibility

Omron's commitment is to offer products that are environmentally warranted (warranted to be free from any banned substances) to customers all over the world. In accordance with this policy, Omron has taken action to completely eliminate all hazardous substances from its control devices as well. To-date, all relays fully comply with the Restriction of Hazardous Substances (RoHS) Directive for their lead and cadmium free construction. Omron strives to be an industry forerunner in regulating the use of chemical substances and working toward the goal of eliminating all hazardous substances in Omron products.

Omron considers addressing environmental issues to be its corporate responsibility and is working to reduce its negative impact on the environment by establishing an environmental action plan that designates six areas of core activities and clarifies the targets of those activities.

- Eco-Management
- Eco-Products
- Eco-Factories/Laboratories/Offices
- Eco-Logistics
- Eco-Communication
- Eco-Mind

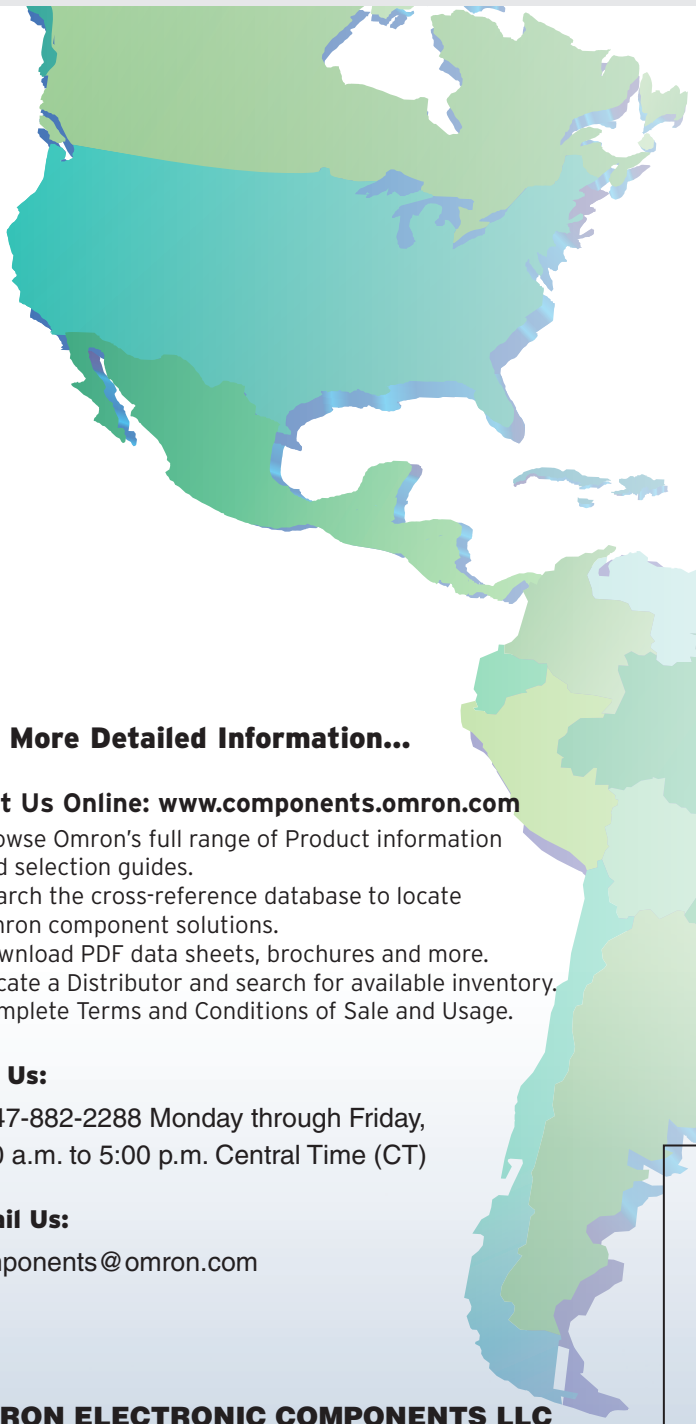
These constitute our efforts to become an environmentally advanced company that balances environmental preservation with economic development.



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