Omron Electronic Components: The Quality, Flexibility and Global Support You Need

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OMRON® Electronic Components LLC

Sensors

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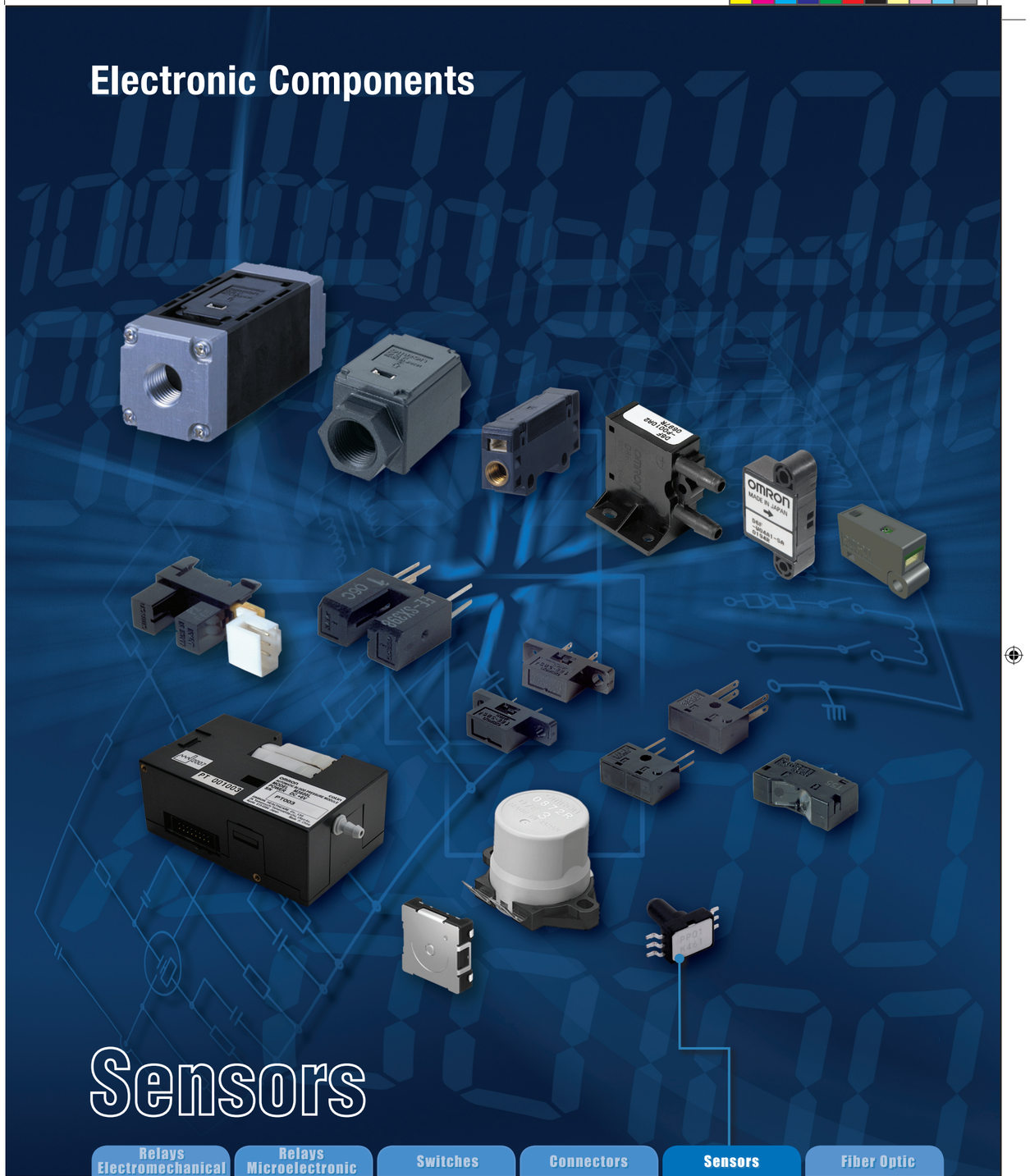

Sensors

Relays Electromechanical | Relays Microelectronic | Switches | Connectors | **Sensors** | Fiber Optic

OMRON® ELECTRONIC COMPONENTS

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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!

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.

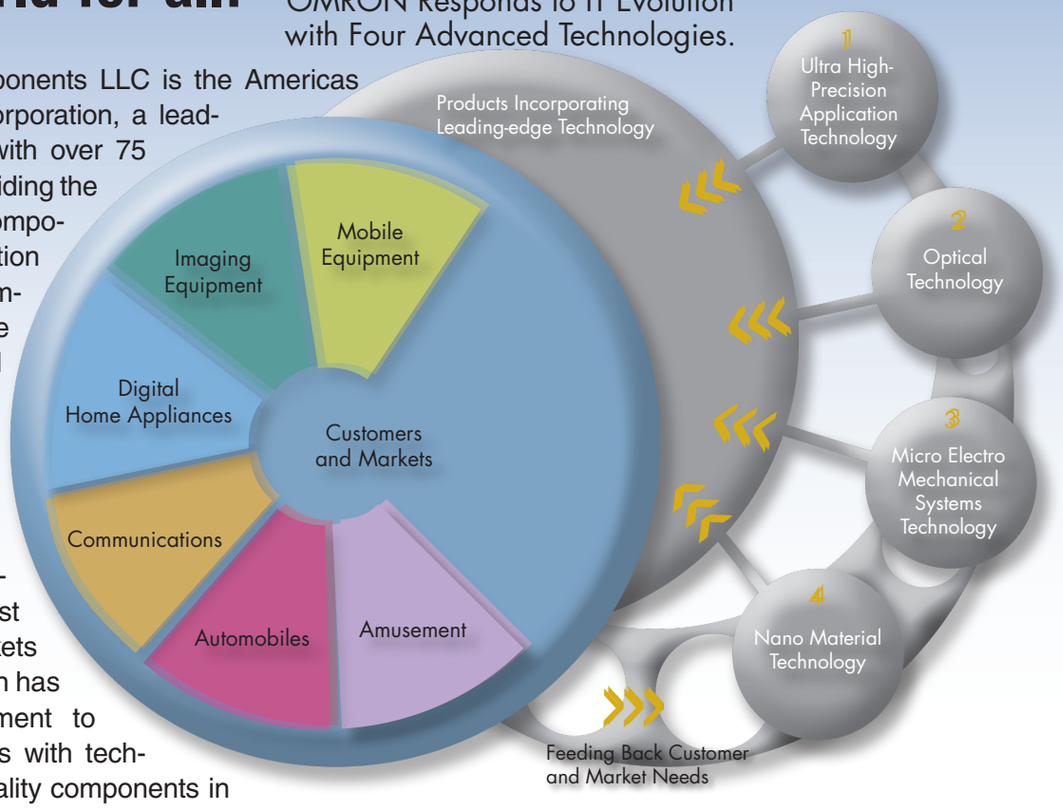
OMRON ELECTRONIC COMPONENTS

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

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.

CORE TECHNOLOGIES:

OMRON Responds to IT Evolution with Four Advanced 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 Application Technology

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 Technology

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 Technology

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, consumer applications, industrial
applications, automobile applications and biotechnology-related products. Omron's state-of-the-art chip foundry includes 8" MEMS wafer fabrication.

Nano Material Technology

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.

OMRON®
ELECTRONIC COMPONENTS

SENSORS:

Omron's experience in MEMS technology has enabled it to greatly expand its component level sensor offering. Advanced micro component sensors are ideal for a wide variety of consumer, commercial and industrial applications. The micro-sensor product line includes MEMS mass flow and velocity/clogged filter sensors, MEMS piezo resistive pressure sensors, micro-tilt sensors, and photomicrosensors. Target applications include medical, HVAC, consumer electronics, networking infrastructure, fuel cells and test equipment.

MEMS Mass Flow Sensors

Gas flow sensors are available for 0.1 LPM to 50 LPM flow rates. High sensitivity is achieved with Omron's MEMS mass flow chip. Each sensor is individually calibrated on the production line for superb accuracy and product consistency. Omron's factory will consider requests for custom solutions and also provides calibration for a wide range of gases. The D6F-P economic bypass style flow sensor series features an integrated dust segregation system to keep debris away from the sensing element. Used in a bypass design, it can measure beyond 200 LPM.

MEMS Velocity Sensors

Compact sensors available to detect air flows from 1 to 10 m/sec. These sensors are often employed for clogged filter monitoring, providing feedback as to when the filter requires cleaning/replacing or if it is missing. Internal Dust Segregation Systems keeps the sensors' elements free of debris for long life.

MEMS Pressure Sensors

Omron has been producing MEMS Pressure Sensors for over 15 years. The latest ultra-compact piezo resistive type offers excellent characteristics in a 0-280 mmHG measurement range.

NiBP Blood Pressure Module

Omron's highly regarded professional blood pressure technology is available as an OEM Module to simplify the process of adding blood pressure measurement to a variety of medical devices. The Omron M3600 is a self contained Non-Invasive Blood Pressure (NiBP) module that combines the hardware and software necessary to complete blood pressure measurements utilizing the oscillometric method.

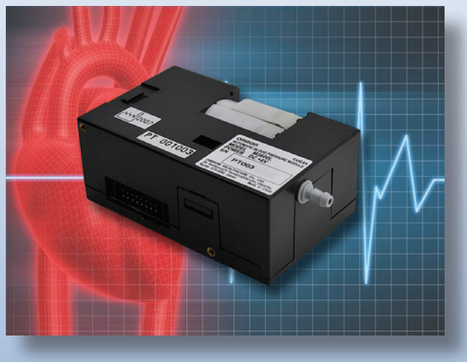
Tilt and Vibration Sensors

The D6BN micro-tilt sensor is ideal for consumer electronic applications in which portrait or landscape orientation needs to be detected. The D7E series tilt/shock/vibration sensors can be used in a wide variety of consumer and industrial applications to detect movement for power-off signaling during high vibration/earthquake or incorrect product orientation conditions.

Non-Amplified Photomicrosensors

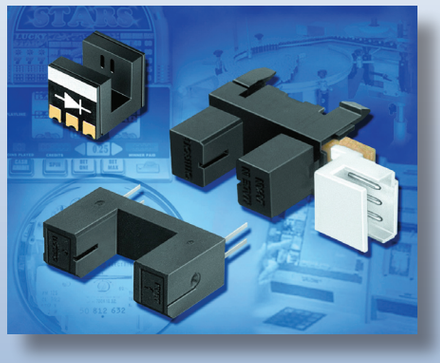
The large product offering of non-amplified photomicrosensors by Omron includes Photo IC as well as Photo-transistor types with slotted or reflective configurations in a wide variety of slot widths sensing distances and terminal arrangements.

NiBP Module



Flow Sensors

Photomicrosensors



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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 are due net 30 days from invoice date 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.

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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.
4. Change in Specifications. Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Seller representative at any time to confirm actual specifications of purchased Product.
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.

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MEMS Sensors Selection Guide

Mass Flow Sensors

General Attributes	D6F-P	D6F-01A1/02A1	D6F-01N/02L/05N	D6F-03A3
	 Page 7	 Page 11	 Page 15	 Page 19
Dimensions mm (in)	27.2H x 17.2D x 35W (1.07 x 0.68 x 1.38) (D6F-P□A1 / A2)	15 H x 20 D x 66 L (0.60 x 0.79 x 2.60)	22 H x 22 D x 62 L (0.87 x 0.87 x 2.4)	16.8 H x 8 D x 36.6 L (0.66 x 0.32 x 1.44)
Features	• Improved performance & low flow resolution compared to differential pressure sensors • Precision mass airflow up to 1 LPM inline • Use in Bypass Configuration for higher flow rates • Bidirectional models available • PCB Terminals or Connector Type • Internal passive Dust Segregation System (DSS) • Cost competitive	• Excellent low flow resolution down to 0.01% full scale range • Precision unidirectional mass airflow up to 2 LPM • Stable output • Low power consumption • High accuracy and repeatability	• Precision unidirectional mass airflow up to 5 LPM • Stable output • Low power consumption • High accuracy and repeatability • Aluminum Alloy Body	• Precision unidirectional mass airflow up to 3 LPM • Fast Response, (<5 msec typical, for reference only) • Low power consumption • High accuracy and repeatability • Perfect for tight space requirements such as pick & place equipment
Specifications				
Applicable Gases (See note 1)	Air	Air	Natural gas, Propane gas	Air
Supply Voltage	4.75 to 9.45VDC	10.8 to 26.4VDC	10.8 to 26.4VDC	10.8 to 26.4VDC
Output Voltage	0.5 to 2.5VDC	1 to 5VDC	1 to 5VDC	1 to 5VDC
Operating Temp. Range	-10°C to +60°C (1 LPM version) -33°C to +75°C (0.1 LPM version)	-10°C to +60°C	-10°C to +60°C	0°C to +50°C
Calibration Gas (See note 1)	Air	Air	Natural gas (D6F-□N2-□) Propane gas (D2F-□L2-□)	Air
Port style	Barbed (D6F-P□A1 / A2) Manifold (D6F-P□AM2)	Barbed fitting, 5/16" ID Tube	1/4" BSPT	M5 threaded tube
Mounting/ Termination	Flange Mount w/PCB Terminals (D6F-P□A1) Flange Mount w/Plug-In Connector (D6F-P□A2) Manifold Mount w/Plug-In Connector (D2F-P□AM2)	Flange Mount w/Plug-In Connector	Panel Mount / In-line tube w/Plug-In Connector	Panel Mount / In-line tube w/Plug-In Connector
Flow Range	0-0.1 LPM (D6F-P0001A□) 0-1 LPM (D6F-P0010A□)	0-1 LPM (D6F-01A1-110) 0-2 LPM (D6F-02A1-110)	0-1 LPM (D6F-01N2-000) 0-2 LPM (D6F-02L2-000) 0-5 LPM (D6F-05N2-000)	0-3 LPM

Note: 1. Contact Omron for other calibration gases. Omron mass flow sensors are compatible with a wide variety of noncorrosive gases including nitrogen, oxygen carbon dioxide, argon, heliox, nitrogen oxides.

2. Be sure to read the precautions and information common to all D6F MEMS Sensors, contained in the Technical User's Guide, "D6F Flow Sensors - Technical Information", for correct use.

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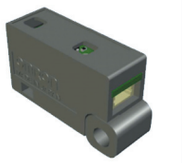
	Mass Flow Sensors	Velocity Sensors	
	 Page 23	 Page 27	 Page 31
General Attributes	**D6F-10/20/50**	**D6F-V**	**D6F-W**
Dimensions mm (in)	30 H x 30 D x 78 L (1.18 x 1.18 x 3.07)	14H x 8D x 24L (0.55 x 0.32 x 0.94)	9H x 20Dx 39L (0.35 x 0.79 x 1.53)
Features	• Precision unidirectional mass airflow up to 50LPM • Stable output • Alternate manifold mount with NBR 'O'ring (A5 version) • Low power consumption • High accuracy and repeatability	• Value engineered version of D6F-W • Smaller package • Lower Supply Voltage • Built for OEM designs • Internal passive Dust Segregation System (DSS)	• Compact size • Integral passive Dust Segregation System (DSS) • Fast fit for easy installation • High accuracy • Amplified & temperature compen-sated output signal
Specifications			
Applicable Gases (See note 1)	Air	Air	Air
Supply Voltage	10.8 to 26.4VDC	3.15 to 9.45VDC	10.8 to 26.4VDC
Output Voltage	1 to 5VDC	0.5 to 2VDC	1 to 5VDC
Operating Temp. Range	-10°C to +60°C	-10°C to +60°C	-10°C to +60°C
Calibration Gas (See note 1)	Air	Air	Air
Port style (See note 3)	1/4" BSPT (D6F-□A6-000) Manifold (D6F-□A5-000)	- - -	- - -
Mounting/ Termination	Panel Mount / In-line tube w/Plug-In Connector	Panel Mount w/Plug-In Connector	Panel Mount w/Plug-In Connector
Flow Range	0-10 LPM (D6F-10□-000) 0-20 LPM (D6F-20□-000) 0-50 LPM (D6F-50□-000)	0-3 m/sec	0-1 m/sec (D6F-W01A1) 0-4 m/sec (D6F-W04A1) 0-10 m/sec (D6F-W10A1)

Note: 1. Contact Omron for other calibration gases. Omron mass flow sensors and velocity sensors are compatible with a wide variety of noncorrosive gases including nitrogen, oxygen carbon dioxide, argon, heliox, nitrogen oxides.

2. Be sure to read the precautions and information common to all D6F MEMS Sensors, contained in the Technical User's Guide, "D6F Flow Sensors - Technical Information", for correct use.

3. Contact Omron for additional port thread options.

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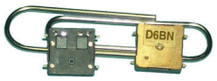
Micro Tilt Sensor



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General Attributes	D6BN
Dimensions mm (in)	2 H x 7 D x 7 W (0.08 x 0.28 x 0.28)
Features	• Utilizes Hall Effect technology • Low profile • Surface mount • No EMC bounce • Requires only 2 micro processor ports and no additional circuitry
Specifications	
Operating Angle	40 – 80° (left to right)
Return Angle	50 – 10° (left to right)
Supply Voltage (V_{dd})	2.4 to 3.6 VDC
Output Voltage Low	0.4VDC, max.
Output Voltage High	V_{dd} - 0.4VDC, min.
Current Consumption	10 μA max.
Operating Temp. Range	-10°C to +60°C

Tilt Sensor

Page 51

General Attributes	D7E-3
Dimensions mm (in)	23.1 H x 23.6 D x 36.4 W (0.91 x 0.93 x 1.43)
Features	• Pure Mechanical Detector • Self Resetting • Quick Connect Terminals • Great option for space heaters or other tilt-sensitive equipment
Specifications	
Operating Angle	50 – 80° (from horizontal)
Return Angle	>25° (from the horizontal)
Contact Capacity	0.1mA at 5VDC to 100mA at 30VDC (resistive load)
Contact Form	SPST-NC
Operating Temp. Range	-25° to +60°C
Service Life	5000 operations min.

Pressure Sensor

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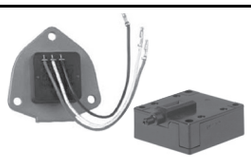

Page 41

General Attributes	2SMPP	D8M
Dimensions mm (in)	8.2H x 6.1L x 4.7W (0.32 x 0.24 x 0.19)	30H x 25.8D x 30W (D8M-R1) (1.18 x 1.02 x 1.19)
Features	• Piezo Resistive MEMS Gauge Sensor	• Frequency output (D8M-R1) • Pulse count output (D8M-D82)
Specifications		
Applicable Gases	Air	Air (others available)
Pressure Range	0-37 kPa	0-196.13 Pa (D8M-R1) 0-4.9 kPa (D8M-D81)
Output	-2.5 to 31 mV	1 kHz/9.81 Pa w/80-300 kHz (D8M-R1) 1 pulse / 9.81 Pa (D8M-D82)
Supply Requirments	100 μADC	4.2 - 5.5 VDC (D8M-R1) 2.2 - 3.4 VDC (D8M-D82)
Current Consumption	130 μADC max.	10 mA, max. (D8M-R1)
Operating Temp. Range	0°C to +50°C	-20°C to +70°C (D8M-R1)

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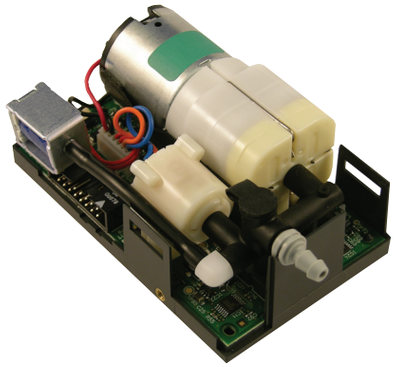
NiBP Module



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M3600

Omron's Self contained Non-invasive Blood Pressure (NiBP) module combines the hardware and software necessary to perform complete blood pressure measurements utilizing a non-invasive oscillometric method. The module includes our proprietary Smart Inflation™ and Dynamic Linear Deflation for added comfort and speed.

Features

- Adult/Pediatric/Neonatal
- Pulse Rates: 40 to 240bpm
- Pulse Rate Accuracy: ±2bpm or 2% reading, whichever is greater
- Blood Pressure complies with ANSI/AAMI SP10:2002
- Power Supply: 12VDC @ 680mA, 2.0A inrush current
- Dimensions (in): 2.36 x 1.57 x 3.78
- Weight: 0.44 lbs.

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D6F Flow Sensors

Technical Information

■ Precautions for Correct Use

All D6F Models

D6F- is a precision component. Keep in the original packaging and remove only when ready for installation. Damage may occur if subjected to excessive force (e.g. dropped or kicked). Any item suspected to be damaged should be discarded. Immediately following installation, a qualified person should perform checks to ensure safe, satisfactory operation.

Operating Environment

Do not use the Sensor in the following locations:

- Locations subject to direct radiant heat from heating equipment
- Locations subject to water or oil
- Locations subject to direct sunlight
- Locations subject to dust and dirt, or to corrosive or combustible gas
- Locations subject to sudden temperature changes
- Locations where there is a possibility of icing or condensation
- Locations subject to strong vibration or shock

Countermeasures Against Noise

Noise may make it impossible to obtain correct measurements. Consider the following countermeasures.

- Install the Sensor as far as possible from devices that generate surges or strong high frequencies (such as high-frequency welders and machines).
- Attach surge absorbers or noise filters to noise-generating devices that are near the Sensor (in particular, equipment with inductance, such as motors, transformers, solenoids, and magnetic coils). (It also helps to separate pipes and ducts, and to use shielded cables.)

Power Supply

Use the applicable connectors. Directly soldering the connection terminals will cause product failure.

Check the terminal names and polarity and wire the power supply correctly. Incorrect wiring will cause failure of internal components.

When using a commercially available switching regulator, ground the FG (frame ground) and G (ground) terminals.

■ RoHS Compliant

The "RoHS Compliant" designation indicates that the listed models do not contain the six hazardous substances covered by the RoHS Directive.

Reference:

The following standards are used to determine compliance for the six substances.

Lead:	1,000 ppm max.
Mercury:	1,000 ppm max.
Cadmium:	100 ppm max.
Hexavalent chromium:	1,000 ppm max.
PBB:	1,000 ppm max.
PBDE:	1,000 ppm max.

■ Precautions for Safe Use

⚠ CAUTION

The D6F is built for use with general-purpose devices. When using the D6F for applications with the safety requirements described below, take steps to ensure system and device safety through measures such as fail-safe designs, redundant designs, and regular inspections.

- Safety devices for ensuring safety for persons
- Transportation equipment control (such as applications to stop operation)
- Aviation and space equipment
- Nuclear power equipment

Do not use the D6F for applications in which D6F operation would directly affect human life.

All D6F Models

1. Use clean fluids. Install a filter or mist separator on the inflow pipe. Failure to do so may result in malfunction or changes in characteristics due to dust or mist. This does not apply to the D6F-W□A1.
2. The specified performance may not be obtained if the D6F is used for fluids other than the specified applicable fluids.
3. Do not use corrosive gases (such as chlorine, sulfur, acid, or alkali). Doing so may cause product failure.
4. After removing the Sensor from the package, do not allow foreign particles to enter the piping. Foreign particles in the piping may cause product failure.
5. Install the Sensor so that the fluid flows in the direction indicated by the arrow on the Sensor. Correct measurements cannot be obtained if the fluid flows in the wrong direction.
6. It is recommended that the Sensor (except for the D6F-03A3) be mounted horizontally. If it is not mounted horizontally, an error of ±1% FS or higher may result.
7. Always check operation after installation.
8. Do not drop the Sensor or disassemble the cover.

D6F-01A1/02A1

1. Use dry air for the fluid. Condensation and icing can change characteristics and cause product failure. Take measures such as installing an air dryer on the inflow pipe to remove moisture.
2. Do not use combustible gas (such as hydrogen, methane, ethane, or propane). Doing so may cause product failure.
3. Make sure that pipes with barb joints are airtight. Correct measurements cannot be obtained if there is leakage from joints.
4. Mount the Sensor to a flat surface, use M3 panhead screws, and tighten the screws to a torque of 0.59 N·m maximum. Incorrect mounting may cause product failure and make it impossible to obtain correct measurements.

D6F-01N2/05N2/02L2

1. Confirm that the specified applicable fluid (combustible gas) is used.
2. Do not use combustible gas (such as hydrogen) or corrosive gas (such as chlorine, sulfur, acid, or alkali) other than the specified applicable fluids. Doing so may cause product failure.
3. Use Rc1/4 taper pipe thread for the piping to the hexagonal section.Tighten to a torque of 5 N·m maximum. Tightening to a torque higher than this may cause cracking and possible leakage.
4. Mount the Sensor to a flat surface, use M3 panhead screws, and tighten the screws to a torque of 0.59 N·m maximum. Incorrect mounting may cause product failure and make it impossible to obtain correct measurements.

D6F-03A3 and D6F-10A□ /-20A□ /- 50A□

1. When installing the pipes to the D6F-03A3, use M5 screws for the joints and tighten to a torque of 1.5 N·m maximum.
2. Connect D6F-□A6-000 sensors using 1/4" British Standard Pipes, Threaded.
3. Use sealing tape on pipes to make the joints airtight. Incorrect installation may make it impossible to obtain correct measurements.
4. Use 'O' Rings to seal the Inlet and Outlet of D6F-□A5-000 right-angle manifold mount sensors.
5. It is recommended that the D6F-03A3 Sensor be mounted either horizontally or vertically. Mounting the Sensor at an angle may make it impossible to obtain correct measurements.
6. Mount the Sensor to a flat surface, use M3 panhead screws, and tighten the screws to a torque of 0.59 N·m maximum. Incorrect mounting may cause product failure and make it impossible to obtain correct measurements.
7. Do not use in the presence of flammable gases (e.g. hydrogen, methane, ethane) and liquefied petroleum gas.
8. Ensure good grounding is achieved by grounding the GND terminal to the peripheral equipment's main ground frame connection and its associated regulated power supply.
9. Do not make a direct solder connection to the integral terminals. It is recommended you use the appropriate cable, for attachment to ensure correct connection.

D6F-W01A1/W04A1

1. Depending on the ambient temperature and the mounting position, foreign objects, such as dust or dirt, may enter into the Sensor and partially or completely block the flow path. If this occurs, the Sensor may not be able to sufficiently perform as described above. Make sure that you understand how to use the Sensor, and test it in advance with the actual equipment with which it is to be used.
2. Installation
   - Turn OFF the power to the equipment before installing the Sensor. Leaving the power ON during installation may cause electric shock and malfunctioning.
   - Mount the Sensor to a flat surface, use M3 panhead screws, and tighten the screws to a torque of 0.59 N·m maximum. Incorrect mounting may cause product failure and make it impossible to obtain correct measurements.
   - Always check operation after installation.
3. Do not use combustible gas (such as hydrogen), other than the specified applicable fluids. Doing so may cause product failure.

D6F-P0010A1/P0010A2

1. Depending on the environment and the mounting position, foreign objects, such as dust or dirt, may enter into the Sensor and partially or completely block the flow path. If this occurs, the Sensor may not be able to sufficiently perform as described above. Make sure that you understand how to use the Sensor and test it in advance with the actual equipment with which it is to be used.
2. For fluids other than the specified applicable fluids, it is the user's responsibility to confirm performance and safety. In any case, do not use combustible gas, such as hydrogen, methane, ethane, or propane, and do not use corrosive gases, such as chlorine, sulfurized gas, or ammonia gas.
3. Installation
   - Turn OFF the power to the equipment before installing the Sensor. Leaving the power ON during installation may cause electric shock and malfunctioning.
   - Use M2.6 panhead screws or tapping screws of the same diameter, and tighten them to a torque of 0.59 N·m maximum.
   - Mount the Sensor on a flat surface. If the surface is uneven, the Sensor will be affected and will not be able to obtain correct measurements.
   - Set up the piping so that the fluid flows in the direction from plus (+) to minus (-).
   - Always check operation after installation.

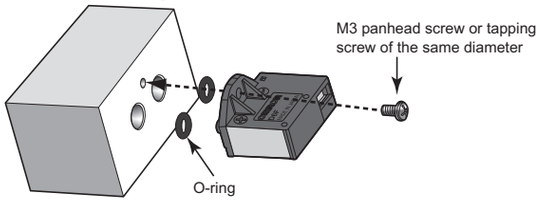
D6F-P0010A1

Solder the terminals after securing the Sensor to the PCB.

D6F-0010AM2

1. Mount the Sensor to a flat surface. Use M3 panhead screws or tapping screws of the same diameter, and tighten the screws to a torque of 0.59 N·m maximum. Incorrect mounting may cause product failure and make it impossible to obtain correct measurements.
2. Use O-rings to seal the fluid inlet and outlet sections. (Recommended O-ring: JIS B2401 bearing number P4 or ISO 3601-1 Designation: A0037G. O-rings are not included and must be purchased separately.)

   Installation Example



D6F-05N7/02L7

Use male P10 quick couplings for the piping, and secure them with the applicable quick fasteners. Do not apply excessive force to the adapter section when connecting the pipes. If strong force is applied to the connected pipes, or if strong force is applied directly to the adapter section while holding the Sensor, it may damage the Sensor or cause leakage.

Note: With the pipes connected, applying a static load of 40 N or greater at a point 300 mm from the center of the Sensor with the Sensor as the fulcrum may cause damage or leakage.

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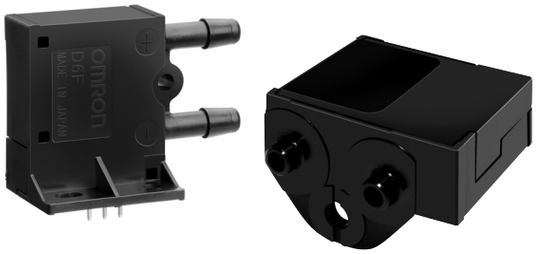
MEMS Mass Flow Sensor
D6F-P

A Compact, High-performance Flow Sensor with Dust Segregation Structure.

- Built in Dust Segregation System (DSS) with cyclone flow structure, diverts particulates from sensor element.
- High resolution and repeatability, even at low flow rates.
- Barbed ports with connector or PCB terminals, or manifold mount with connector versions.
- Built in voltage regulator, temperature compensation and amplified output. Measure up to 200 LPM with a bypass setup.
- Alternative to differential pressure sensing.
- RoHS Compliant



Ordering Information

Description	Case	Calibration Gas (See note 1.)	Flow Range	Mounting Method	Connection	Model
Flow Sensor	PBT	Air (See note 2.)	0-0.1 LPM	Flange mount	PCB terminals	**D6F-P0001A1**
			0-1 LPM			**D6F-P0010A1**
					Connector	**D6F-P0010A2**
				Manifold mount	Connector	**D6F-P0010AM2**
Cable Connector Assembly	- - -	- - -	- - -	- - -	- - -	**D6F-CABLE2**

Note: 1. Can be calibrated for different gas types. Consult your Omron representative.
2. Dry gas must not contain large particles, eg dust, oil, mist.
3. Cable Assembly "D6F-CABLE2", used with D6F-P0010A2 and D6F-P0010AM2, is sold separately.

Specifications

■ Characteristics

Models	D6F-P0001A1	D6F-P0010A1	D6F-P0010A2	D6F-P0010AM2
Flow Range (See note 1.)	0 to 0.1 L/min.	0 to 1 L/min.		
Calibration Gas (See note 2.)	Air			
Flow Port Type	barbed fitting maximum outside dia. 4.9 mm			manifold mount
Electrical Connection	Lead terminal		Connector (3 wire)	
Power Supply	4.75 to 9.45 VDC			
Current Consumption	Max. 15 mA (no load, Vcc = 5 VDC)			
Operating Output Voltage	0.5 to 2.5 VDC			
Output Voltage Limits (Min and Max.)	0 VDC min. and 3.1 VDC max. (Lead resistance 10 kΩ)			
Accuracy and Temperature Characteristics	± 5% F.S. max. of detected characteristics at 25 °C, within -10 to 60 °C (typical test results within ±2% F.S.)			
Repeatability (Reference (typical))	± 1.0% F.S.	± 0.4% F.S.		
Case Material	PBT			
Degree of Protection	IP40			
Withstand Pressure	50 kPa (7 psi)			
Pressure Drop (Reference (typical))	0.19 kPa			0.48 kPa
Operating Temperature	-10 to 60°C (1 LPM versions) and -33 to 75°C (0.1 LPM version) with no icing or condensation (Storage: -40 to 80°C with no icing or condensation)			
Operating Humidity	35 to 85% RH with no icing or condensation (Storage: 35 to 85% RH with no icing or condensation)			
Insulation Resistance	20 MΩ (500 VDC between lead terminal and the case)			
Dielectric Strength	500 VAC, 50/60 Hz for 1 minute. (Leakage current typ. Max. 1mA) between lead terminals and case.			
Weight	8.5 g			8.0 g
Response Time (Reference (typical))	150 msec			

Note: 1. Mass flow converted into volumetric flow rate, SLM (standard liters per minute) at 0°C, 1 atmosphere.
2. Dry gas. (must not contain large particles, dust, oil, mist)

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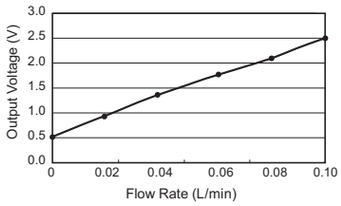
■ Absolute Maximum Rating

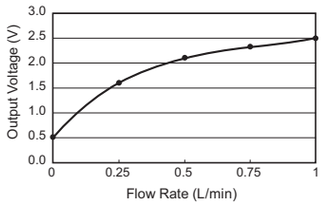
Item	Symbol	Rating	Unit
Power supply voltage	Vcc	10	VDC
Output voltage	Vout	4.0	VDC

■ Output Voltage Characteristics

D6F-P0001A□



D6F-P0010A□



D6F-P0001A□

Flow Rate (LPM)	0.00	0.02	0.04	0.06	0.08	0.10
Output Voltage (VDC)	0.50 ± 0.10	0.90 ± 0.10	1.30 ± 0.10	1.70 ± 0.10	2.10 ± 0.10	2.50 ± 0.10

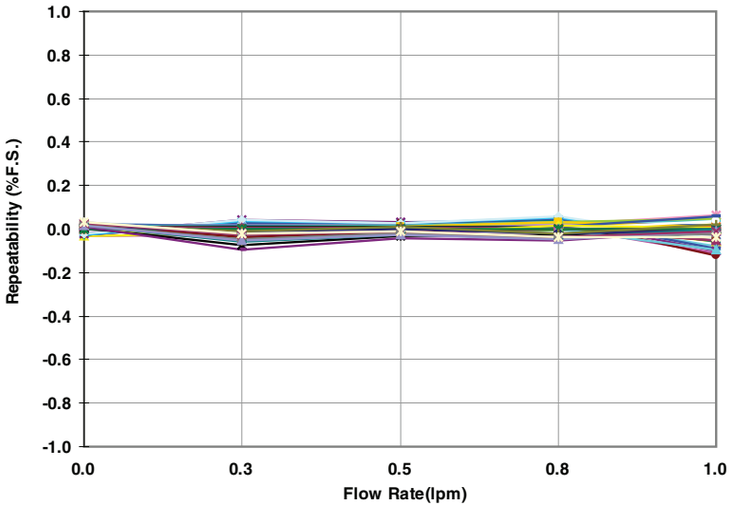
D6F-P0010A□

Flow Rate (LPM)	0.00	0.25	0.50	0.75	1.00
Output Voltage (VDC)	0.50 ± 0.10	1.60 ± 0.10	2.10 ± 0.10	2.31 ± 0.10	2.50 ± 0.10

Note: 1. Mass flow converted into volumetric flow rate, SLM (standard liters per minute) at 0°C, 1 atmosphere.
2. 0 to 0.5 VDC output indicates a negative flow direction.
3. Measurement condition: Power supply voltage 5 ± 0.1VDC, ambient temperature 25 ± 5 °C and ambient humidity 25 to 75% RH.

■ Repeatability. (Typical test results)

(5 Samples, D6F-P0010A□, repeated 10 times each)



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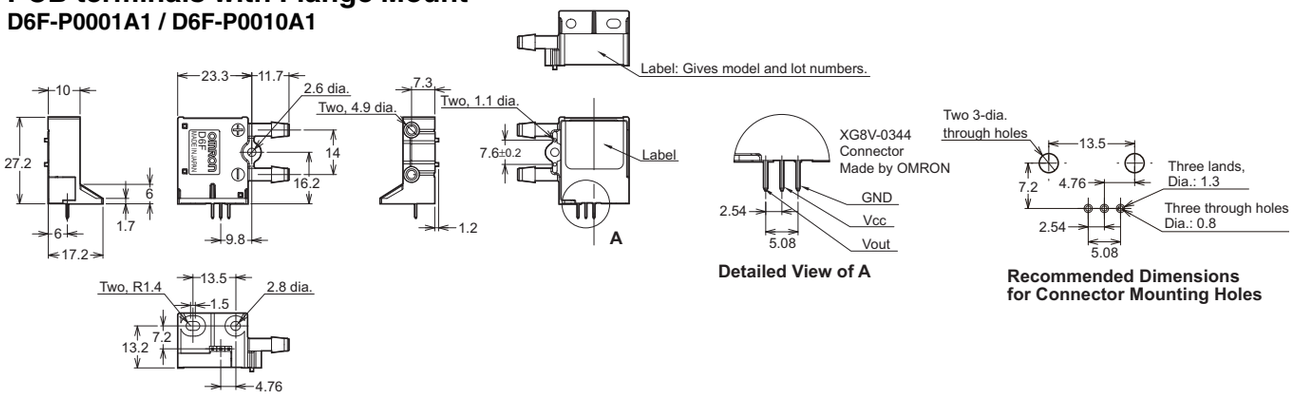
Dimensions

Note: All units are in millimeters unless otherwise indicated.

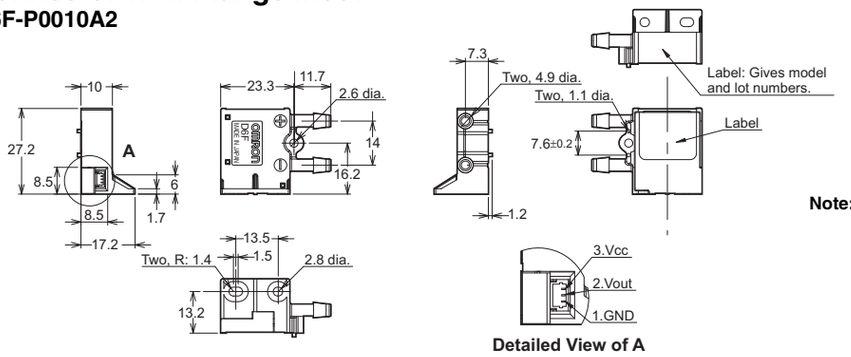
PCB terminals with Flange Mount

D6F-P0001A1 / D6F-P0010A1



Connector with Flange Mount

D6F-P0010A2



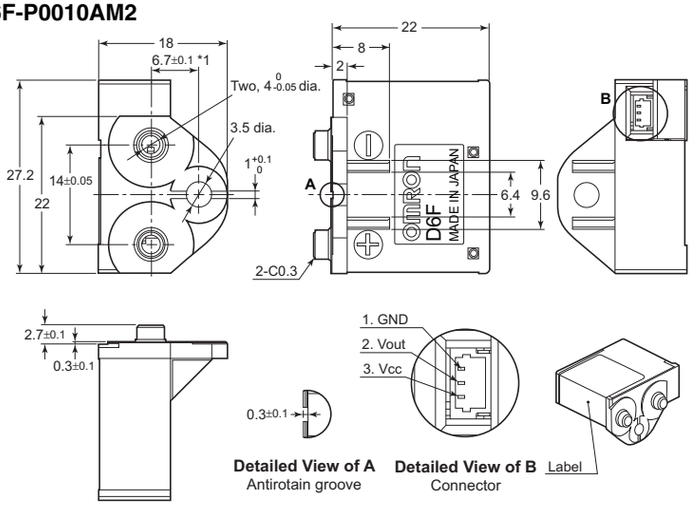
Note: 1. Use M3 or M2.6 pan screw or tapping screw with an equal diameter for installation. And bind tight with 0.59N·m or less torque.

2. Use an attached connector. Manufactured by JST Mfg Co., Ltd. (Japan) for A2 and AM2 types.
   - Pressure welding connector
     Socket: 03SR-3S
     Wire: AWG#30
   - Crimp type connector
     Contact: SSH-003T-P0.2|
     Wire: AWG#32 to #28
   - Housing: SHR-03V-S

3. O-rings are not attached. 4mm ID tube recommended for D6F-P0010A1 and D6F-P0010A2 types.

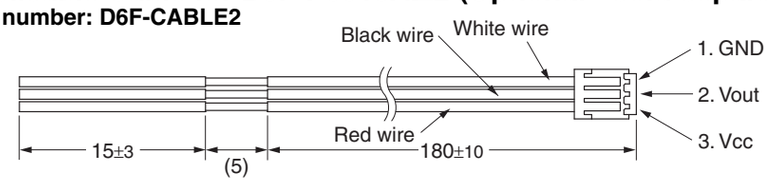
Connector with Manifold Mount

D6F-P0010AM2



Applicable Cable for D6F-P0010A□2 (Optional - sold separately)

part number: D6F-CABLE2



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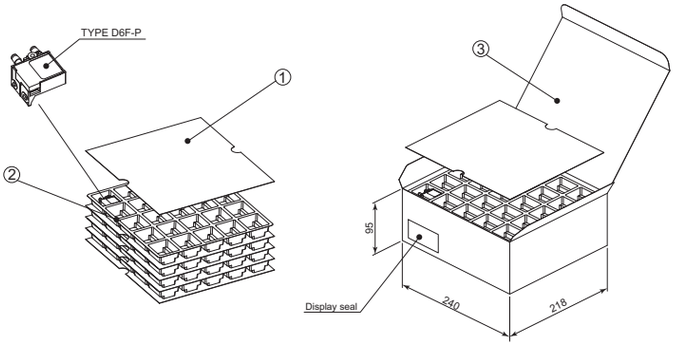
Packaging

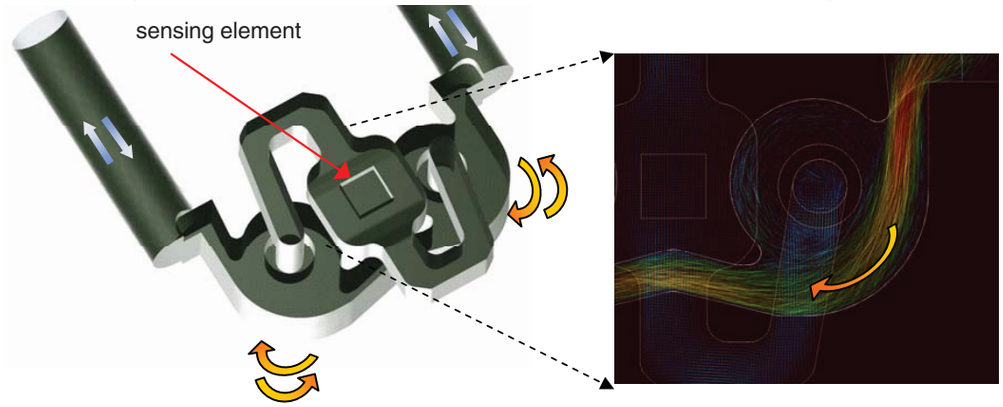


No.	Item	Material
1	Sock liner	CCNB
2	Tray (25pcs)	Polyethylene
3	Box (100 pcs)	CCNB

Application Information and Examples

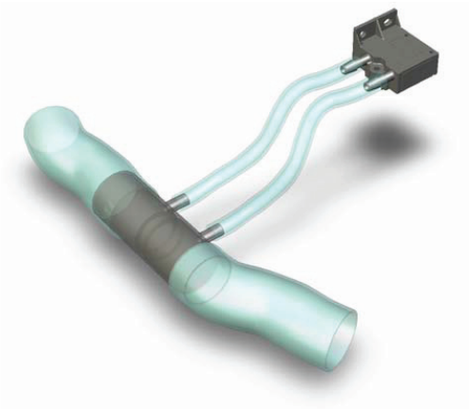
■ Bidirectional Dust Segregation System

The D6F-P series has a patented dust segregation design. The flow path incorporates dual centrifugal chambers, in which particulate matter follows in the outer path, away from the MEMS sensor chip regardless of the flow direction. Note, standard products are calibrated for unidirectional flow, as indicated in note 3 of the “Output Characteristics” table, above. Contact Omron for bidirectional calibration options.



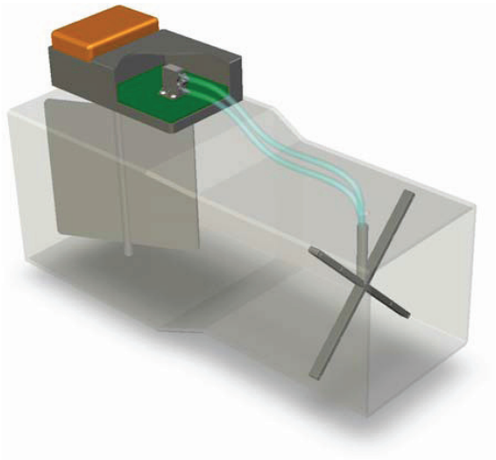
Bypass Setup

When used in a bypass set-up, as illustrated below, the D6F-P mass flow sensors can measure flow rates far beyond the 1 LPM in-line rating. The pressure differential required to pull airflow through the sensor can be accomplished by installing a flow restrictor between the two ports or through the use of a flow cross in large ducts, as shown in the HVAC application.



HVAC Application

The D6F-P mass flow sensor is ideal for damper control in variable air volume systems, where low flow rates are difficult to measure with differential pressure sensors.



Note: Be sure to read the precautions and information common to all D6F sensors, contained in the Technical User’s Guide, “D6F Technical Information” for correct use.

OMRON

MEMS Flow Sensor

D6F-01A1, -02A1

High Accuracy Mass Flow Sensing

- Small size
- Fast response
- Applicable to air, non-corrosive gas
- Applications include: medical respiratory equipment, analysis apparatus, pick and place systems, spectroscopy, leak detection, environmental comfort controls and mass flow controllers.
- RoHS Compliant

Ordering Information

Case	Gas	Flow range**	Notes	Model
PPS	Air*	0-1L/min	Integral orifice	**D6F-01A1-110**
		0-2L/min		**D6F-02A1-110**

* Contact Omron for other gases.

**Mass flow converted to volumetric flow (standard liters per minute) at 0°C and 1 atm.

Ratings

■ Absolute Maximum Rating

Item	Symbol	Rating	Unit
Power supply	V_{CC}	26.4	VDC
Output voltage	V_{OUT}	6	VDC

■ Electrical Performance

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power supply	V_{CC}	—	10.8	—	26.4	VDC
Operating temperature	T_{OPR}	No condensation or icing	-10	—	60	°C
Output voltage (max.)	V_{OH}	V_{CC} = 12 to 24 VDC I_{OH} = 5 mA	5	—	5.7	VDC
Output voltage (min.)	V_{OL}	V_{CC} = 12 to 24 VDC I_{OH} = 5mA	0	—	1	VDC

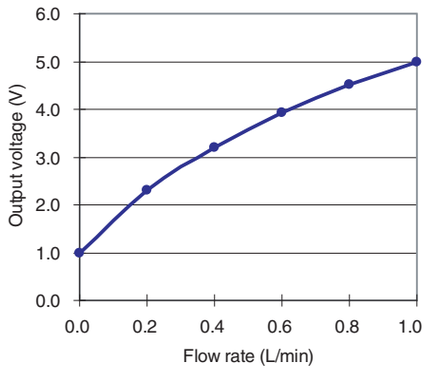
Characteristics

Model	D6F-01A1-110	D6F-02A1-110
Flow rate @ 0°C and 101.3 kPa	0-1L/min	0-2L/min
Joint type	Press-fit type (External diameter: 7.4 mm to 8.6 mm. Passage diameter: 4 mm)	
Case material	PPS	
Applicable gas	Air*	
Withstand pressure (max.)	200kPa (about 30 psi)	
Accuracy	±3% F.S. max	
Operating temperature	-10 to 60°C (with no icing or condensation)	
Storage temperature	-40 to 80°C (with no icing or condensation)	
Operating and Storage humidity	85% RH max. (with no icing or condensation)	
Output signal	1 to 5 VDC, Analog Output	
Current consumption	15 mA max. (No-Load with V_{CC} = 12 to 24 VDC, V_{SS} = 0V and 25°C)	
Insulation resistance	20MΩ min. at 500 VDC, between lead terminal and case	
Dielectric strength	500 VAC, 50/60 Hz, for 1 minute (Leakage current typ <1 mA.), between the lead terminals and the base	
Orifice	Integral	
Response Time (reference)	150 mS, typical	

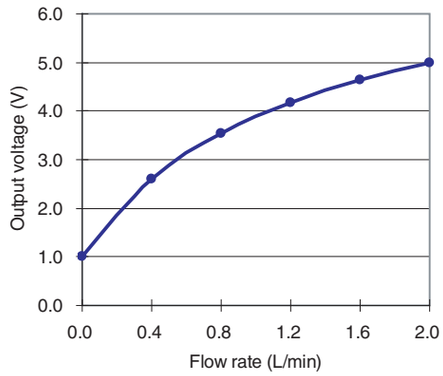
* Contact Omron for other gases.

Operating Characteristics

D6F-01A1-110



D6F-02A1-110



D6F-01A1-110

Flow Rate (LPM)	0	0.2	0.4	0.6	0.8	1.0
Output Voltage (VDC)	1.00 ± 0.12	2.31 ± 0.12	3.21 ± 0.12	3.93 ± 0.12	4.51 ± 0.12	5.00 ± 0.12

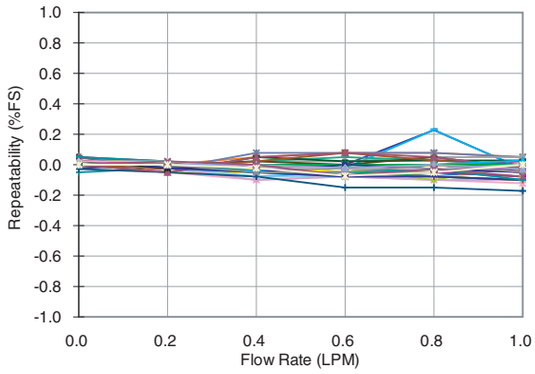
D6F-02A1-110

Flow Rate (LPM)	0	0.4	0.8	1.2	1.6	2.0
Output Voltage (VDC)	1.00 ± 0.12	2.59 ± 0.12	3.53 ± 0.12	4.18 ± 0.12	4.65 ± 0.12	5.00 ± 0.12

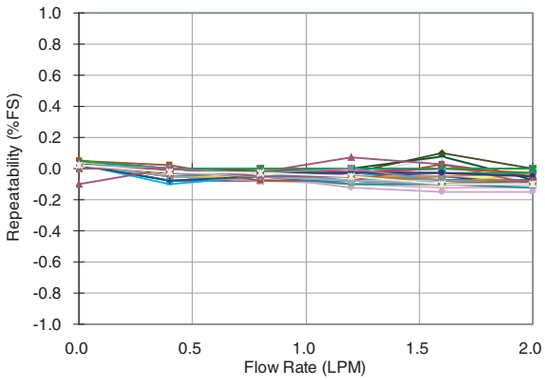
OMRON

Test Results (typical performance)

D6F-01A1 Repeatability
(5 samples, repeated 10 times each)



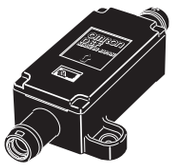
D6F-02A1 Repeatability
(5 samples, repeated 10 times each)

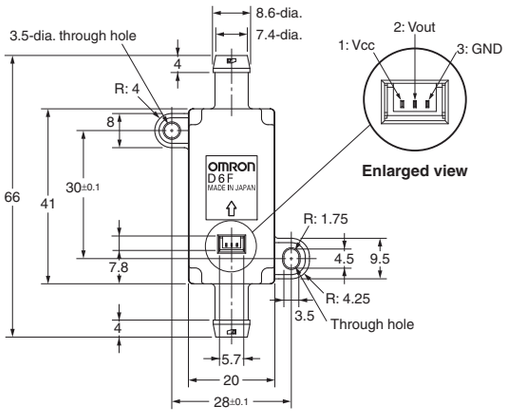


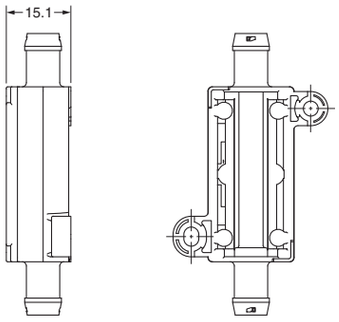
Dimensions

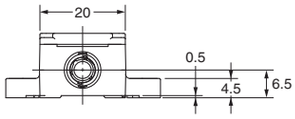
Unit: mm

D6F-01A1-110
D6F-02A1-110

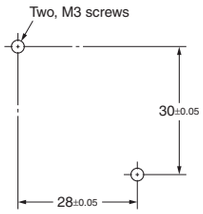








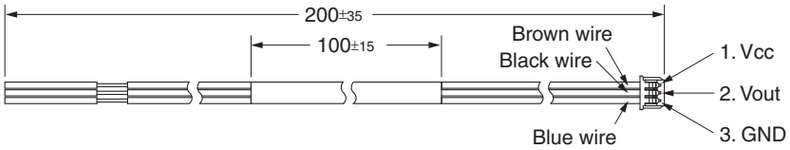
Mounting Hole Dimensions



Note: 1. Mount using an M3 pan head screw, tightened to 0.59 N•m max. torque.

2. Install tubes made of materials such as rubber or urethane so that they will not disconnect. For urethane tubes, tubes with an outer diameter of 12 mm and an inner diameter of 8 mm are recommended.

Applicable Cable for D6F (included)
part number: D6F-CABLE1 (for replacement cables)



Housing: Molex - 51021
Terminal: Molex - 50079
Wire: 26-28 AWG

Note: Be sure to read the precautions and information common to all D6F sensors, contained in the Technical User's Guide, "D6F Technical Information" for correct use.

MEMO

OMRON

MEMS Flow Sensor

D6F-01N, -02L, -05N

High Accuracy Mass Flow Sensing for Natural Gas and Propane Applications

- Small size
- Fast response
- Applicable to air, non-corrosive gas, natural gas and propane
- Applications include: analysis apparatus, combustion control
- RoHS Compliant

Ordering Information

Case	Calibration gas	Flow range**	Model
Aluminum	Natural Gas*	0-1L/min	**D6F-01N2-000**
	Propane Gas*	0-2L/min	**D6F-02L2-000**
	Natural Gas*	0-5L/min	**D6F-05N2-000**

* Contact Omron for other gases.

**Mass flow converted to volumetric flow (standard liters per minute) at 0°C and 1 atm.

Ratings

■ Absolute Maximum Rating

Item	Symbol	Rating	Unit
Power supply	V_{CC}	26.4	VDC
Output voltage	V_{OUT}	6	VDC

■ Electrical Performance

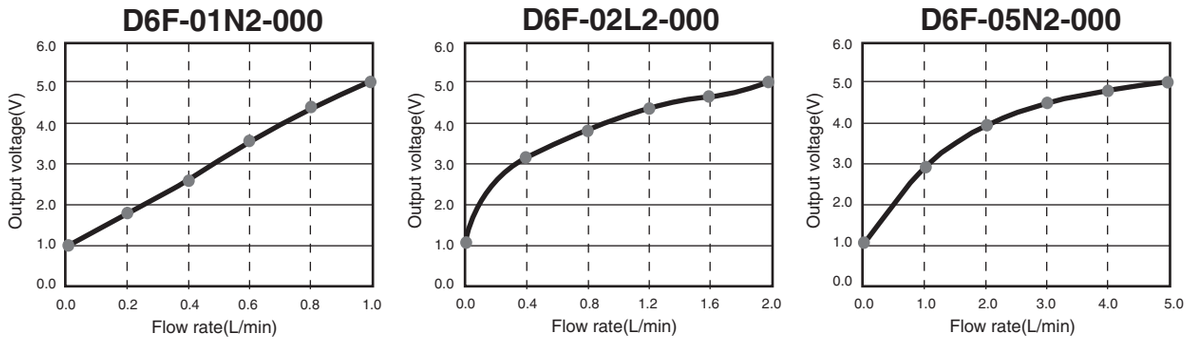
Item	Symbol	Condition	Min.	Max.	Unit
Power supply	V_{CC}	—	10.8	26.4	VDC
Operating temperature	T_{OPR}	No condensation or icing	-10	60	°C
Output voltage (max.)	V_{OH}	V_{CC} = 12 to 24 VDC I_{OH} = 5 mA	5	5.7	VDC
Output voltage (min.)	V_{OL}	V_{CC} = 12 to 24 VDC I_{OH} = 5mA	0	1	VDC

Characteristics

Model	D6F-01N2-000	D6F-02L2-000	D6F-05N2-000
Flow rate @ 0°C and 101.3 kPa	0-1L/min	0-2L/min	0-5L/min
Joint type	Rc 1/4 screw (1/4" BSPT)		
Case material	Aluminum		
Applicable gas*	Natural Gas	Propane	Natural Gas
Withstand pressure (max.)	200kPa (about 30 psi)		
Accuracy	±3% F.S. max		
Operating temperature	-10 to 60°C (with no icing or condensation)		
Storage temperature	-40 to 80°C (with no icing or condensation)		
Operating and Storage humidity	85% RH max (with no icing or condensation)		
Output signal	1 to 5 VDC, Analog Output		
Current consumption	15 mA max. (No-Load with V_{CC} = 12 to 24 VDC, V_{SS} = 0V and 25°C)		
Insulation resistance	20MΩ min. at 500 VDC, between lead terminal and case		
Dielectric strength	500 VAC, 50/60 Hz, for 1 minute. (Leakage current typ <1 mA.), between the lead terminals and the base		
Response Time (reference)	150 mS, typical		

* Contact Omron for other gases.

Operating Characteristics



D6F-01N2-000

Flow Rate (LPM)	0	0.2	0.4	0.6	0.8	1.0
Output Voltage (VDC)	1.00 ± 0.12	1.90 ± 0.12	2.81 ± 0.12	3.64 ± 0.12	4.37 ± 0.12	5.00 ± 0.12

D6F-02L2-000

Flow Rate (LPM)	0	0.4	0.8	1.2	1.6	2.0
Output Voltage (VDC)	1.00 ± 0.30	3.02 ± 0.08	3.95 ± 0.08	4.47 ± 0.08	4.79 ± 0.08	5.00 ± 0.12

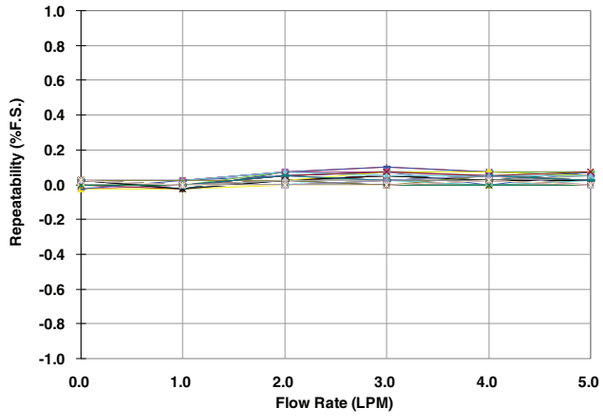
D6F-05N2-000

Flow Rate (LPM)	0	1.0	2.0	3.0	4.0	5.0
Output Voltage (VDC)	1.00 ± 0.12	2.91 ± 0.12	3.92 ± 0.12	4.47 ± 0.12	4.79 ± 0.12	5.00 ± 0.12

OMRON

Test Results (typical performance)

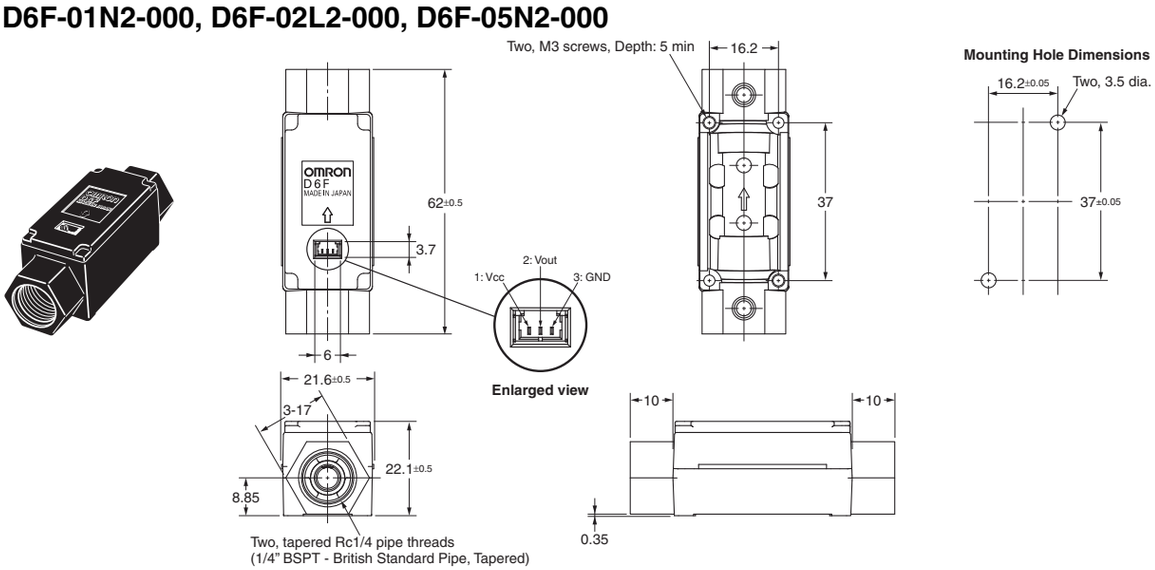
D6F-05N2
(5 samples, repeated 10 times each)



Dimensions

Unit: mm

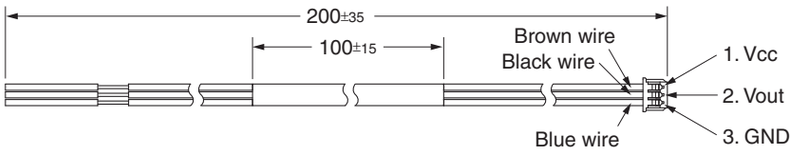
D6F-01N2-000, D6F-02L2-000, D6F-05N2-000



Note: Mount using an M3 pan head screw, tightened to 0.59 N•m max. torque.

Applicable Cable for D6F (included)

part number: D6F-CABLE1 (for replacement cables)



Housing: Molex - 51021
Terminal: Molex - 50079
Wire: 26-28 AWG

Note: Be sure to read the precautions and information common to all D6F sensors, contained in the Technical User's Guide, "D6F Technical Information" for correct use.

MEMO

OMRON

MEMS Mass Flow Sensor

D6F-03A3-000

Compact, sensors featuring MEMS technology for precision mass airflow measurement.

- Precision unidirectional mass airflow up to 3 LPM
- Fast Response (< 5 msec, typical)
- Ultra-compact size 36.6 (L) x 8 (W) x 16.8 (H) mm
- Low power consumption
- RoHS Compliant

Ordering Information

Description	Case	Applicable gas	Flow range**	Model
Mass Flow Sensor	Thermoplastic resin / Aluminum Alloy	Air*	0-3L/min	**D6F-03A3-000**
Cable Connector Assembly	- - -	- - -	- - -	**D6F-CABLE2**

Note: Cable Assembly is sold separately.

* Contact Omron for other gases.

**Mass flow converted to volumetric flow (standard liters per minute) at 0°C and 1 atm.

■ Application examples

- Pick and place systems
- Industrial processes
- Leak detection
- Spectroscopy
- Mass flow controllers
- Scientific / test equipment
- Environmental comfort controls
- Fuel cell controls

Ratings

■ Absolute Maximum Rating

Item	Symbol	Rating	Unit
Power supply	V_{CC}	26.4	VDC
Output voltage	V_{OUT}	6	VDC

■ Electrical Performance

Item	Symbol	Condition	Min.	Max.	Unit
Power supply	V_{CC}	—	10.8	26.4	VDC
Operating temperature	T_{OPR}	No condensation or icing	0	50	°C
Output voltage (max.)	V_{OH}	Load resistance: 10kΩ	5	5.7	VDC
Output voltage (min.)	V_{OL}	Load resistance: 10kΩ	0	1	VDC

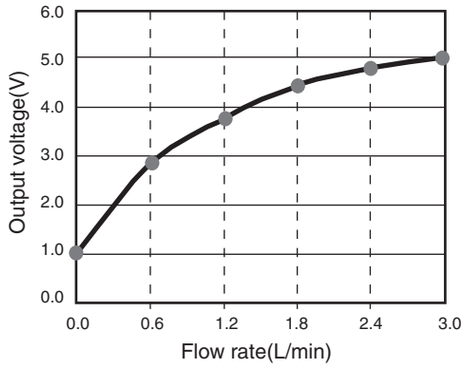
Characteristics

Model	D6F-03A3-000
Flow rate @ 0°C and 101.3 kPa	0-3L/min
Case material	Thermoplastic resin
Applicable gas*	Air
Electrical connection	Connector (3 wire)
Withstand pressure (max.)	200kPa (about 30 psi)
Accuracy	±5% F.S. max of detected characteristics at 25°C
Operating temperature	0 to 50°C (with no icing or condensation)
Storage temperature	-10 to 60°C (with no icing or condensation)
Operating and Storage humidity	85% RH max (with no icing or condensation)
Power supply voltage	10.8 to 26.4 VDC
Output signal	1 to 5 VDC, Analog Output (Load resistance: 10kΩ)
Current consumption	15 mA max. (No-Load with V_{CC} = 12 to 24 VDC, V_{SS} = 0V and 25°C)
Insulation resistance	20MΩ min. at 500 VDC, between lead terminal and case
Dielectric strength	500 VAC, 50/60 Hz, for 1 minute. (Leakage current typ <1 mA.), between the lead terminals and case

* Contact Omron for other gases.

Operating Characteristics

D6F-03A3-000



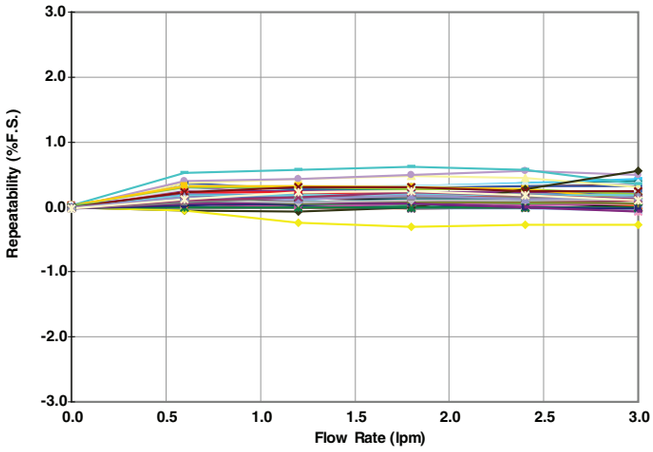
D6F-03A3-000

Flow Rate (LPM)	0	0.6	1.2	1.8	2.4	3.0
Output Voltage (VDC)	1.00 ± 0.2	2.83 ± 0.2	3.77 ± 0.2	4.34 ± 0.2	4.72 ± 0.2	5.00 ± 0.2

OMRON

Test Results (typical performance)

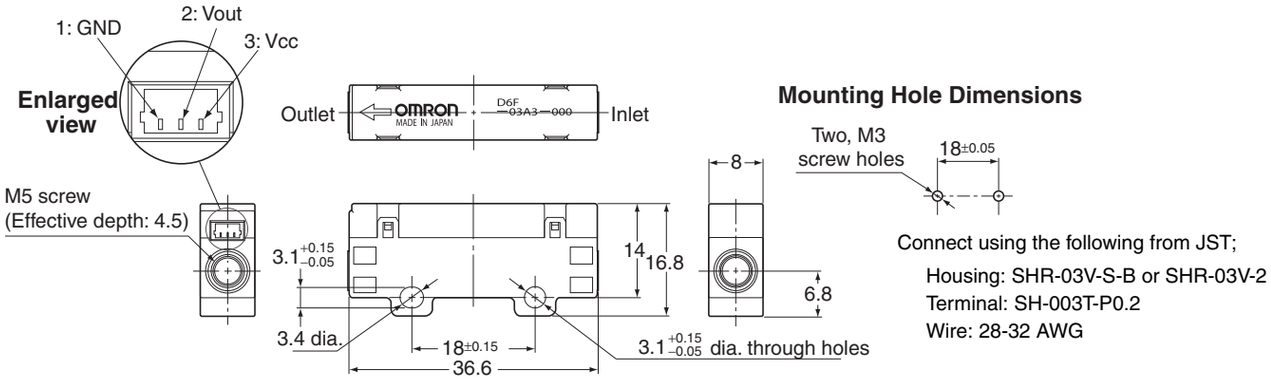
(5 samples, repeated 10 times each)



Dimensions

Unit: mm

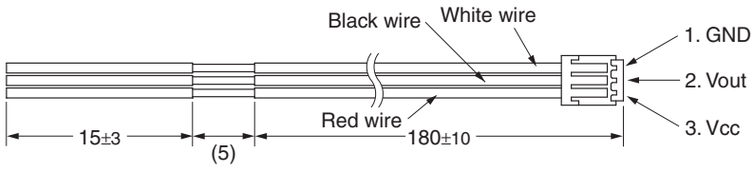
D6F-03A3-000



Note: 1. When installing the pipes, use M5 screws for the joints and tighten to a torque of 1.5 N•m max. Use sealing tape to make the joints airtight.
2. Mount to a flat surface using an M3 pan head screw, tightened to 0.59 N•m max. torque.

Applicable Cable for D6F-03A3-000 (Optional - sold separately)

part number: D6F-CABLE2



Note: Be sure to read the precautions and information common to all D6F sensors, contained in the Technical User's Guide, "D6F Technical Information" for correct use.

MEMO

OMRON

MEMS Airflow Sensor

D6F-10A, -20A, -50A

Compact, intelligent sensor featuring MEMS technology for precision mass airflow measurement

- Precision mass airflow up to 50 LPM
- Stable output across full scale
- Manifold mounting feature with NBR 'O' ring option
- Compact size 78 (L) x 30 (W) x 30 (H) mm
- Low power consumption
- RoHS Compliant

Ordering Information

Description	Case	Applicable Gas	Flow Range**	Connection Type	Model
Mass Flow Sensor	Thermoplastic resin / Aluminum alloy	Air*	0 – 10 LPM	Right-angle manifold mount connection	**D6F-10A5-000**
			0 – 20 LPM		**D6F-20A5-000**
			0 – 50 LPM		**D6F-50A5-000**
			0 – 10 LPM	Straight RC1/4 (1/4" BSPT) threaded pipe*	**D6F-10A6-000**
			0 – 20 LPM		**D6F-20A6-000**
			0 – 50 LPM		**D6F-50A6-000**
Cable Connector Assembly	- - -	- - -	- - -	- - -	**D6F-CABLE1**

Note: Cable Assembly is sold separately.

* Contact Omron for other gases or thread types.

**Mass flow converted to volumetric flow (standard liters per minute) at 0°C and 1 atm.

■ Application Examples

- Industrial processes
- Medical Respirators and Ventilators
- MiG and TiG welding systems
- Anesthesia Delivery
- Mass flow controllers
- Scientific / test equipment
- Fuel cell controls

Rating

■ Absolute maximum rating

Item	Symbol	Ratings	Unit
Power supply	V_{CC}	26.4	VDC
Output voltage	V_{OUT}	6	VDC

■ Electrical Performance

Item	Term	Condition	MIN	MAX	Unit
Power supply	V_{CC}	—	10.8	26.4	VDC
Operating temperature	T_{OPR}	No condensation or icing	-10	60	°C
Output voltage (max.)	V_{OH}	V_{CC} = 12 to 24VDC I_{OH} = 0.5mA	5	5.7	VDC
Output voltage (min.)	V_{OL}	V_{CC} = 12 to 24VDC I_{OL} = -0.5mA	0	1	VDC

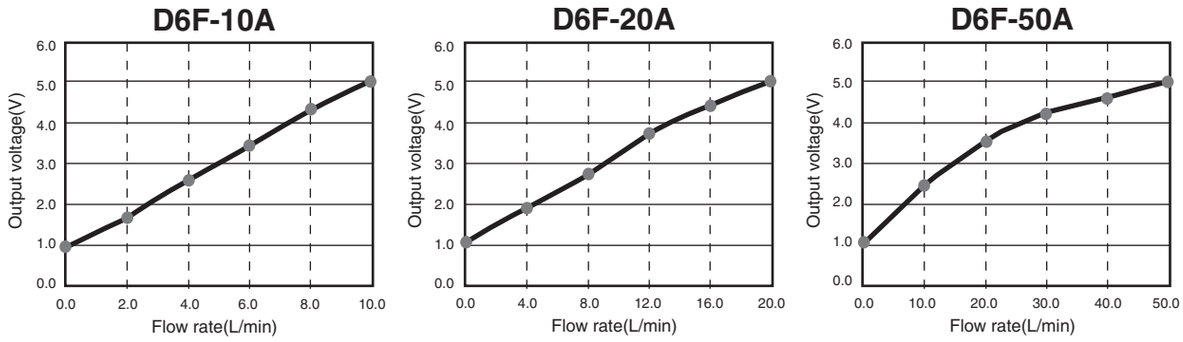
OMRON

Characteristics

Model	D6F-10A□-000	D6F-20A□-000	D6F-50A□-000
Flow rate @ 0°C and 101.3 kPa	0-10 L/min	0-20 L/min	0-50 L/min
Joint type*	Manifold mount with 'O' Ring (A5 type) or Rc 1/4 (1/4" BSPT threaded)(A6 type)**		
Case material	Thermoplastic resin		
Applicable Gas**	Air		
Electrical Connection	Connector (3 wire)		
Withstand Pressure (max.)	500 kPa (about 72.5 psi)		
Accuracy	±3% F.S. max, 25°C		
Operating Temperature	-10 to +60°C (with no icing or condensation)		
Storage Temperature	-30 to +80°C (with no icing or condensation)		
Operating Humidity	85%RH max. (with no icing or condensation)		
Output Signal	1 to 5 VDC, Analog Output (non-linear output)		
Current Consumption	15 mA max. (No-Load with V_{CC} = 12 to 24 VDC, V_{SS} = 0V and 25°C)		
Insulation Resistance	20MΩ min. at 500 VDC, between lead terminal and case		
Dielectric Strength	500 VAC, 50/60 Hz, for 1 minute. (Leakage current typ <1 mA.), between the lead terminals and the base		
Response Time (reference)	150 mS, typical		

* Contact Omron for other thread types (A6)
** Contact Omron for other gases.

Operating Characteristics



D6F-10A

Flow Rate L/min (normal)	0	2	4	6	8	10
Output Voltage (VDC)	1.00 ±0.12	1.75 ±0.12	2.60 ±0.12	3.45 ±0.12	4.25 ±0.12	5.00 ±0.12

D6F-20A

Flow Rate L/min (normal)	0	4	8	12	16	20
Output Voltage (VDC)	1.00 ±0.12	1.93 ±0.12	2.87 ±0.12	3.70 ±0.12	4.41 ±0.12	5.00 ±0.12

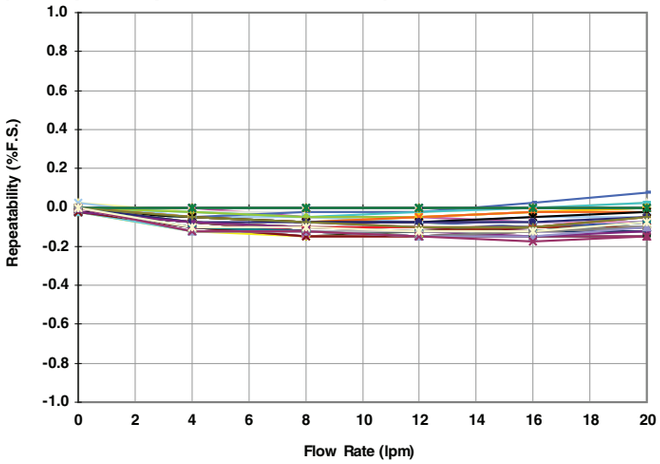
D6F-50A

Flow Rate L/min (normal)	0	10	20	30	40	50
Output Voltage (VDC)	1.00 ±0.12	2.45 ±0.12	3.51 ±0.12	4.20 ±0.12	4.66 ±0.12	5.00 ±0.12

OMRON

Test Results (typical performance)

D6F-20A□
(5 samples, repeated 10 times each)



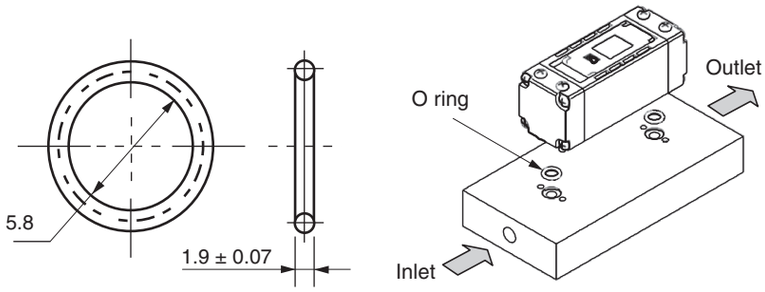
Installation: D6F-□A5-000

Recommendation for right-angle, manifold mount connection;

Use M3 panhead screws for mounting, and tighten them to a maximum torque of 0.59 N•m. Please seal INLET and OUTLET with 'O' rings. Please install the product as shown below. Incorrect mounting may cause product failure and make it impossible to obtain correct measurements.

Recommended 'O' ring for sealing inlet and outlet orifice;

- Material: NBR70 (recommended for all applications including medical and food processing.)
- Example part number: JASO part number: CO 0003
- Alternative manufacturers with similar DO and W dimensions may be used



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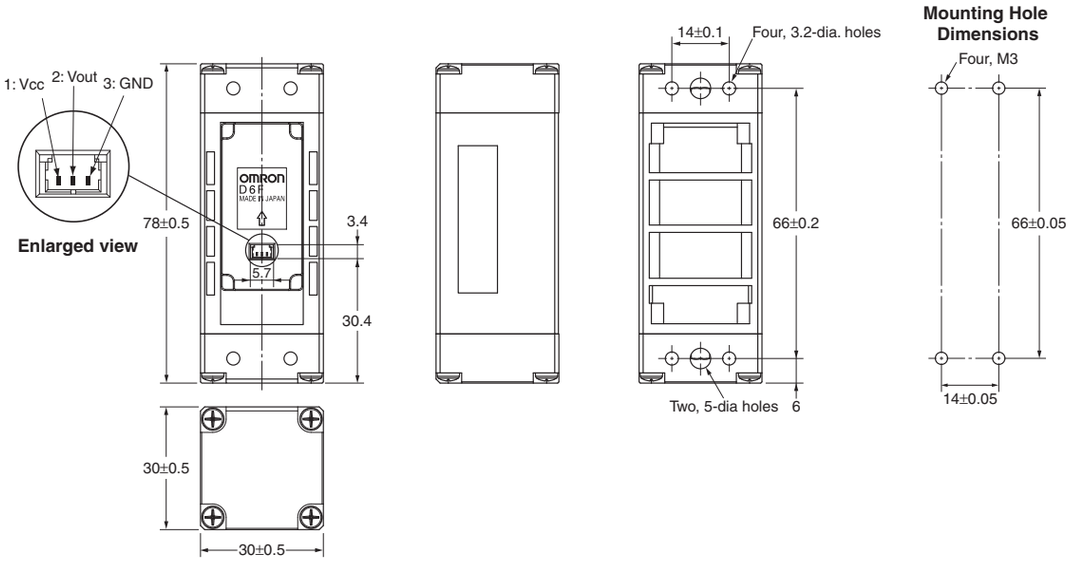
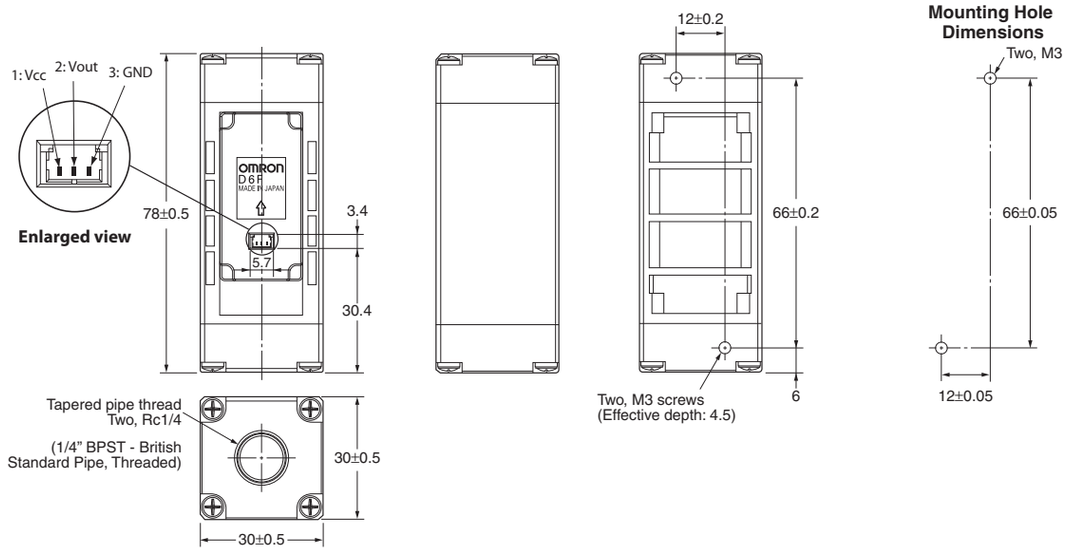
Dimensions

Unit: mm

D6F-10A5-000, D6F-20A5-000, D6F-50A5-000

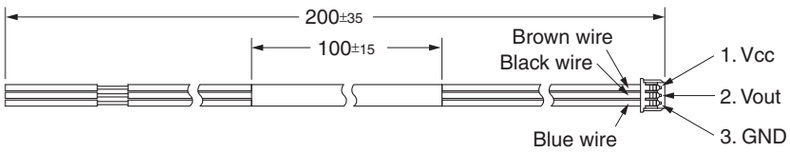


D6F-10A6-000, D6F-20A6-000, and D6F-50A6-000



Applicable Cable for D6F-□A□-000 (Optional - sold separately)

part number: D6F-CABLE1



Housing: Molex - 51021
Terminal: Molex - 50079
Wire: 26-28 AWG

Note: Be sure to read the precautions and information common to all D6F sensors, contained in the Technical User's Guide, "D6F Technical Information" for correct use.

OMRON

MEMS Air Velocity Sensor

D6F-V03A1

Unique dust separating structure, developed by OMRON, in a compact and highly efficient FLOW-SENSOR.

- Unique dust segregation structure.
- +/-10% Full-Scale repeatable accuracy achieves consistent air velocity measurement, in a cost efficient package.
- Applications include clogged-filter detection and air velocity.
- RoHS Compliant

Ordering Information

Description	Case	Applicable Gas	Flow Range	Model
Velocity Sensor	PBT	Air (See note 1.)	0-3 m/sec	**D6F-V03A1**
Cable Connector Assembly	- - -	- - -	- - -	**D6F-CABLE2**

Note: 1. Dry gas must not contain large particles, eg dust, oil, mist.
2. Cable Assembly is sold separately.

■ Application examples

- Cassette (ceiling / suspended), multi-modular air conditioners
- Duct connected heating and air conditioning systems
- Alternative for thermal dispersion measurement
- Air & water cooled chillers, indoor packaged AC systems
- Window / split, multi-split residential AC coolers
- Air purifiers, dehumidifiers
- Fan assisted space heaters
- Air cooled, high power indoor lighting
- Mission critical PC, Workstation ventilation
- Watchdog ventilation systems

Ratings

■ Absolute maximum rating

Item	Symbol	Rating	Unit
Power supply	V_{CC}	12.0	VDC
Output voltage	V_{OUT}	3.0	VDC

■ Electrical Performance

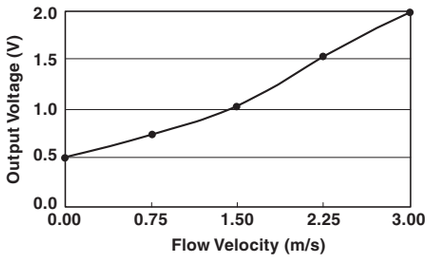
Item	Symbol	Condition	Min.	Max.	Unit
Power supply	V_{CC}	—	3.15	9.45	VDC
Operating temperature	T_{OPR}	No condensation or icing	-10	60	°C
Output voltage (max.)	V_{OH}	Load resistance: 10kΩ	- - -	2.7	VDC
Output voltage (min.)	V_{OL}	Load resistance: 10kΩ	0	- - -	VDC

Characteristics

Model	D6F-V03A1
Flow Range	0 – 3 m/s @ 25°C, 1 atmosphere
Case Material	Thermoplastic resin
Applicable Gas	Air
Operating Temperature	-10 to 60°C (with no icing or condensation)
Storage Temperature	-40 to 80°C (with no icing or condensation)
Operating and Storage Humidity	85% RH max. (with no icing or condensation)
Power Supply Voltage	3.15 to 9.45 VDC
Output Signal	0.5 to 2 VDC, Analog output (non-linear output) (Load resistance: 10kΩ min.)
Current Consumption	15mA max. (No-Load with V_{CC} = 3.3 VDC and 25°C)
Insulation Resistance	20MΩ min. at 500 VDC, between lead terminal and case
Dielectric Strength	500VAC, 50/60Hz, for 1 minute. (Leakage current typ < 1mA), between the lead terminals and case

Operating Characteristics

D6F-V03A1



D6F-V03A1

Flow Velocity (m/sec)	0	0.75	1.50	2.25	3.00
Output Voltage (VDC)	0.50±0.15	0.70±0.15	1.11±0.15	1.58±0.15	2.00±0.15

Measurement condition: Power-supply voltage 3.3VDC, ambient temperature 25°C and dry air.

Note: 1. Air velocity is the value converted from the mass-flow in OMRON regulation wind tunnel phi48mm.

2. The air velocity, set to the Measurement Law, is not shown. Please confirm in a real use environment in use.

3. Temperature characteristics:
Over ambient temperature range -10 to +60°C: within ±20% F.S. of detected characteristics
Of at +25°C.

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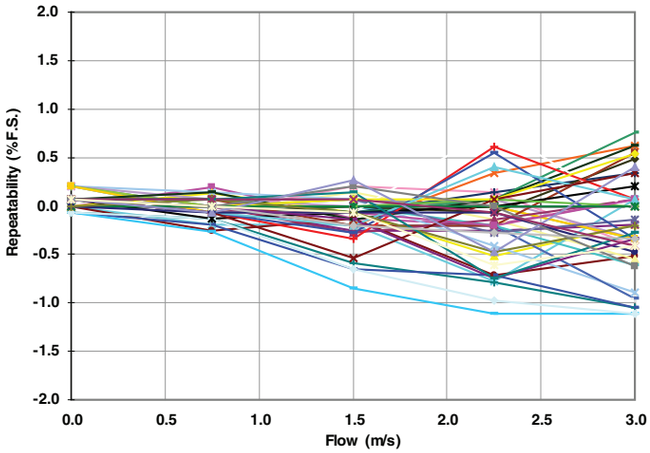
Test Results (typical performance)

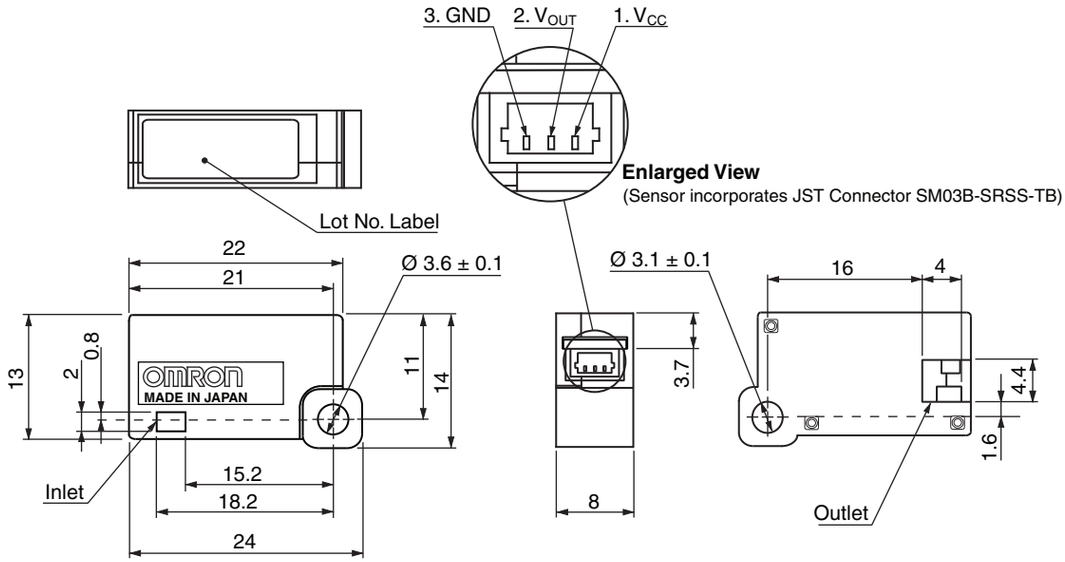
(5 samples, repeated 10 times each)



Dimensions

Unit: mm

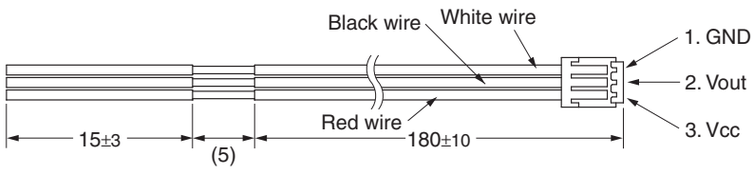
D6F-V03A1



Note: Mount using M3 panhead screws, tightened to 0.59 N•m max. torque

Applicable Cable for D6F-V03A1 (Optional - sold separately)

part number: D6F-CABLE2



JST Connector;
Housing: SHR-03V-S-B or SHR-03V-2
Terminal: SH-003T-P0.2
Wire: 28-32 AWG

Note: Be sure to read the precautions and information common to all D6F sensors, contained in the Technical User's Guide, "D6F Technical Information" for correct use.

MEMO

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MEMS Air Velocity Sensor
D6F-W

MEMS precision technology for repeatable airflow velocity detection.

- Precision uni-directional air velocity detection with ±5% full-scale repeatable accuracy.
- Integral passive Dust Segregation System (DSS) prevents contamination of sensor element.
- Compact size: 39 (L) x 20 (W) x 9 (H) mm
- Output signal amplified & temperature compensated.
- User friendly - no adjustment necessary.
- RoHS Compliant

Ordering Information

Description	Case	Applicable Gas	Flow Range	Model
Velocity Sensor	PPS	Air (See note 1.)	0-1 m/sec	**D6F-W01A1**
			0-4 m/sec	**D6F-W04A1**
			0-10 m/sec	**D6F-W10A1**
Cable Connector Assembly	- - -	- - -	- - -	**D6F-W CABLE**

Note: 1. Dry gas must not contain large particles, eg dust, oil, mist.
2. Cable Assembly is sold separately.

Specifications

■ Characteristics

Models	D6F-W01A1	D6F-W04A1	D6F-W10A1
Flow Range (See note 1.)	0 to 1 m/s	0 to 4 m/s	0 to 10 m/s
Applicable Gas (See note 2.)	Air		
Electrical Connection	Connector (3 wire)		
Power Supply	10.8 to 26.4 VDC		
Current Consumption	Max. 15 mA (no load, Vcc = 12 to 24VDC, 25°C)		
Operating Output Voltage (VDC)	1 to 5 VDC		
Output Voltage (Max.)	5.7 VDC (Lead resistance 10kΩ)		
Output Voltage (Min.)	0 VDC (Lead resistance 10kΩ)		
Accuracy	± 5% F.S. max. of detected characteristics at 25 °C		
Repeatability (See note 3.)	± 0.4% F.S.		
Case Material	PPS		
Degree of Protection	IP40		
Operating Temperature	-10 to 60°C (with no icing or condensation)		
Operating Humidity	35 to 85% RH (with no icing or condensation)		
Storage Temperature	-40 to 80°C (with no icing or condensation)		
Storage Humidity	35 to 85% RH (with no icing or condensation)		
Temperature Characteristics	± 5% F.S. max. of detected characteristics at 25 °C (within -10 to 60°C)		
Insulation Resistance	20 MΩ (500 VDC between lead terminal and the case)		
Dielectric Strength	500 VAC, 50/60 Hz for 1 minute. (Leakage current typ. Max. 1 mA) between lead terminals and case.		
Weight	6.3 g		

Note: 1. Flow range at 0°C, 101.3kPa.
2. Dry gas. (must not contain large particles, dust, oil, mist)
3. Reference (typical)

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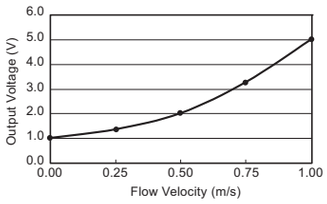
■ Absolute Maximum Rating

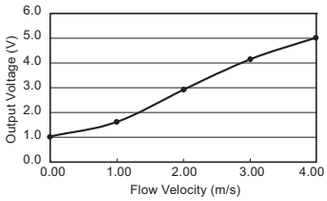
Item	Symbol	Rating	Unit
Power supply voltage	Vcc	26.4	VDC
Output voltage	Vout	6.0	VDC

■ Output Voltage Characteristics

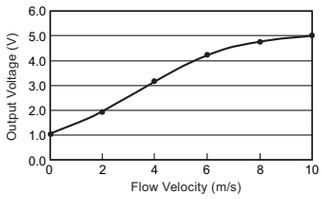
D6F-W01A1



D6F-W04A1



D6F-W10A1



D6F-W01A1

Flow Velocity (m/s)	0.00	0.25	0.50	0.75	1.00
Output Voltage (VDC)	1.00±0.2	1.35±0.2	2.01±0.2	3.27±0.2	5.00±0.2

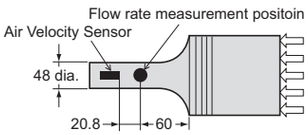
D6F-W04A1

Flow Velocity (m/s)	0	1	2	3	4
Output Voltage (VDC)	1.00±0.2	1.58±0.2	2.88±0.2	4.11±0.2	5.00±0.2

Note: 1. Air velocity. D6F-W is optimally adjusted for air velocity detection, derived from mass air-flow measurement according to our in-house test method using a wind tunnel ϕ 48 mm as shown in Fig. 1.

2. Measurement condition: Power supply voltage 12±0.1 VDC, ambient temperature 25±5°C. and dry air.

Fig. 1.



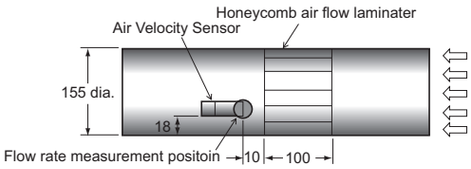
D6F-W10A1

Flow Velocity (m/s)	0	2	4	6	8	10
Output Voltage (VDC)	1.00±0.24	1.94±0.24	3.23±0.24	4.25±0.24	4.73±0.24	5.00±0.24

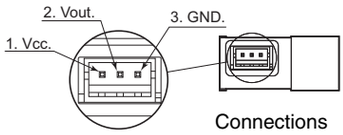
Note: 1. Air velocity. D6F-W is optimally adjusted for air velocity detection, derived from mass air-flow measurement according to our in-house test method using a wind tunnel ϕ 155 mm as shown in Fig. 2.

2. Measurement condition: Power supply voltage 12±0.1 VDC, ambient temperature 25±5 °C. and dry air.

Fig. 2.



Connections



Enlarged view

Connections

Pin No.	1: Vcc 2: Vout 3: GND
Connector	S3B-ZR-SM2-TF (Made by JST Mfg. Co.,Ltd.)

The connector linked to this product should use the following JST Mfg.Co.,Ltd. housing, contacts and electrical wire

1) Contact: SZH-002T-P0.5
Wire: AWG#28 to #26
OR
2) Contact: SZH-003T-P0.5
Wire: AWG#32 to #28

Housing: ZHR-3

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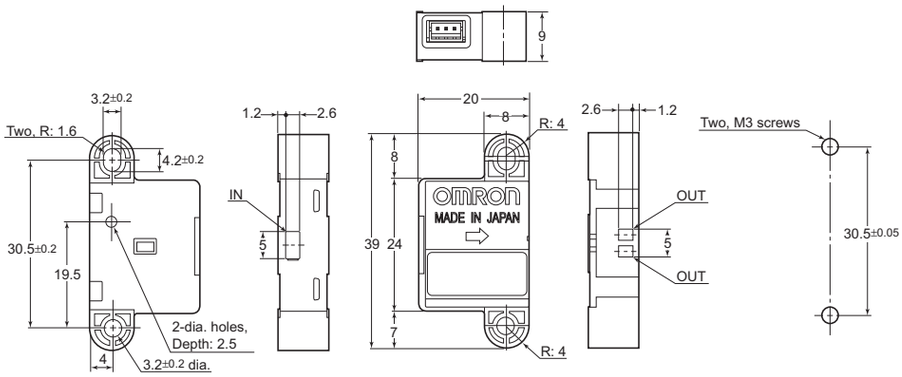
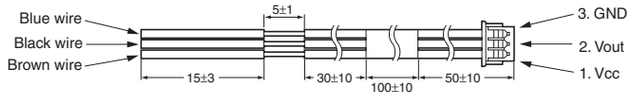
Dimensions

Note: All units are in millimeters unless otherwise indicated.

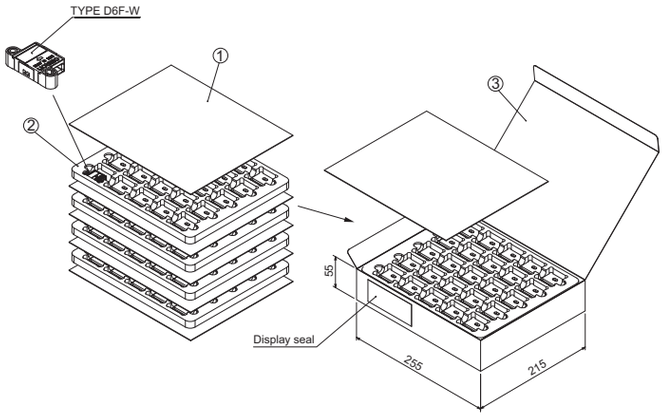
D6F-W01A1
D6F-W04A1
D6F-W10A1



D6F-W CABLE
(Sold separately)



Packaging

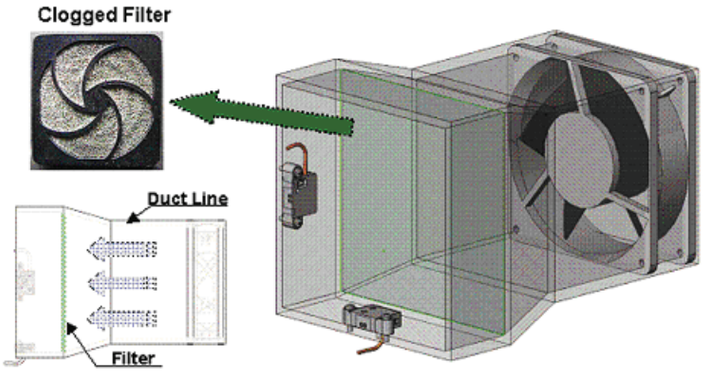


No.	Item	Material
1	Sock liner	CCNB
2	Tray (25pcs)	Polyethylene
3	Box (100 pcs)	CCNB

Application Example

Clogged Filter Detection

The D6F-W air flow sensor detects the decrease in air velocity through the filter as it becomes more contaminated with particles. The moment the velocity drops below a certain threshold, a warning signal is sent out, indicating the need for filter replacement.



Note: Be sure to read the precautions and information common to all D6F sensors, contained in the Technical User's Guide, "D6F Technical Information" for correct use.

MEMO

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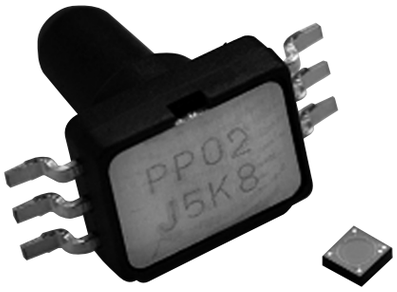
MEMS Gauge Pressure Sensor
2SMPP

MEMS Gauge Pressure Sensor Featuring Small Size and Low Power Consumption

- Ultra-miniature 6.1 × 4.7 × 8.2 mm (L × W × H).
- Piezo Resistive element provides electrical characteristics that are superior to capacitive type pressure sensors.
- 0 to 37 kPa pressure range.
- Low Power consumption of 0.2 mW
- Low Temperature Influence
- RoHS Compliant

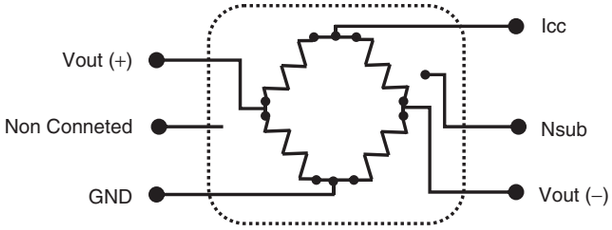


Ordering Information

Standard Models with Surface mount package

Classification	Structure	Packaging	Model
Bottom Port Type	SOP	Plastic sleeve	**2SMPP-02**

Terminal Arrangement



Application Examples

- Medical equipment
- Home appliance
- Air movement control
- Level indicators
- Leak detection
- Pressure controller

Specifications

■ Ratings

Item		2SMPP-02
Pressure type		Gauge Pressure
Sensing type		Piezo Resistive
Applicable gases		Air (Non-corrosive, dust free)
Ratings	Pressure range	0 to 37 kPa
	Withstand pressure	Max. 53 kPa
	Supply current	100 μADC
	Current consumption	Max. 130 μADC
	Ambient operating temperature	0 to 50°C (with no icing or condensation)
	Ambient operating humidity	15 to 90%RH (with no icing or condensation)
	Ambient storage temperature	–30 to 85°C (with no icing or condensation)
	Ambient storage humidity	10 to 95%RH (with no icing or condensation)

Note: 1. The above values are initial values measured at ambient temperature condition of 23°C.
2. Please avoid caustic gases.
3. Standard product is not calibrated for negative pressures.

■ Electrical Characteristics

Item	2SMPP-02
Bridge resistance	20 ± 2 kΩ
Offset voltage (See note 2.)	–2.5 ± 4.0 mV
Span voltage (See note 2.)	31.0 ± 3.1 mV (at 37 kPa)
Non-Linearity (See note 2.)	0 ± 0.8%FS (0 to 37 kPa)
Hysteresis (See note 2.)	0 ± 0.5%FS (0 to 37 kPa)
Temperature influence of Span	0.5 ± 1.0%FS (at 0°C)
	0.3 ± 1.0%FS (at 50°C)
Temperature influence of Offset	0 ± 3.0%FS (0 to 25°C)
	0 ± 3.0%FS (25 to 50°C)

Note: 1. The above values are initial values measured at ambient temperature condition of 23°C.
2. Not including temperature influence.

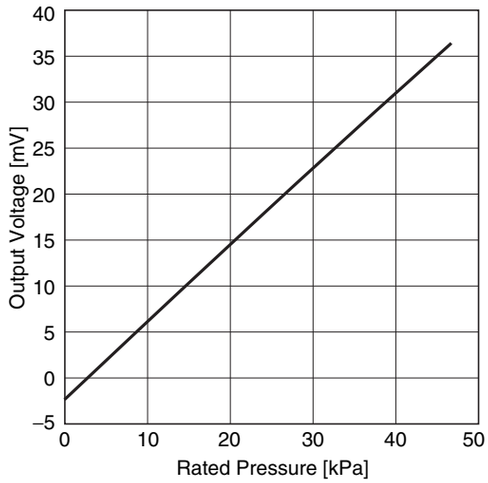
■ Environment Characteristics

Item		2SMPP-02
Vibration resistance	Destruction	10 Hz to 500 Hz 10 G
	Malfunction	10 Hz to 500 Hz 10 G
Shock resistance	Destruction	15 G
	Malfunction	15 G
Life Expectancy		300,000 Operations min. (0 to 39 kPa)
ESD		1000 V (Human body model)
Weight		0.17 g
Package Material		PPS (Polyphenylenesulfide)

Engineering Data (for reference)

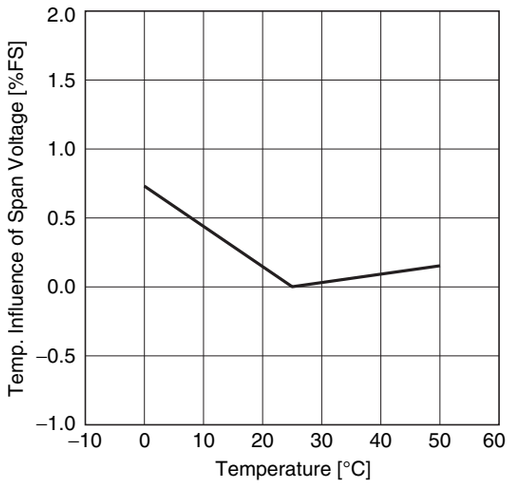
■ Output Characteristics

Rated Pressure vs. Output Voltage

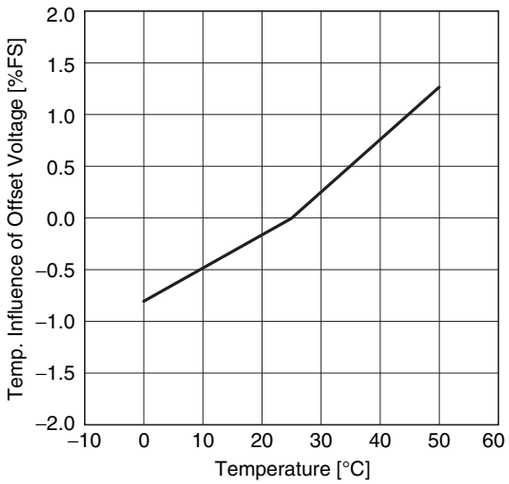


Note: 1. Ambient temperature condition: 25°C
2. Drive current: 100 μA
3. These output voltage characteristics are measured with tester without a mounting board.
4. The output voltage characteristics may be influenced by the mounting board. Be sure to check operation including durability in actual equipment before use.

Temperature influence of Span voltage

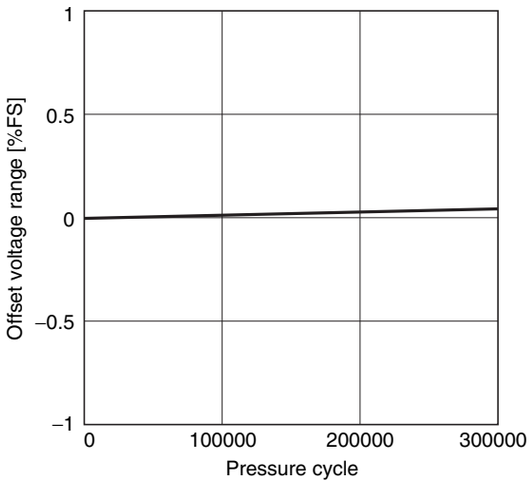


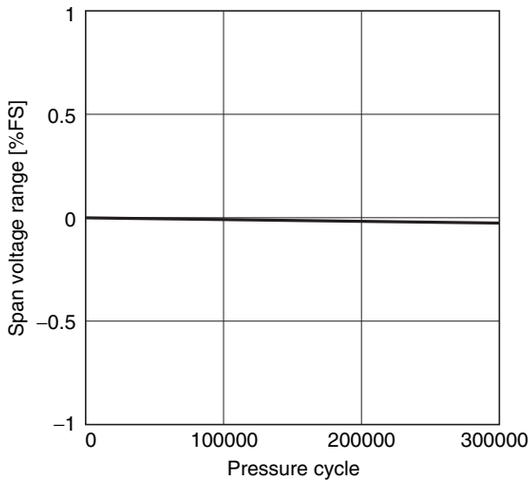
Temperature influence of Offset voltage



Note: 1. Measured points are 0°C and 25°C, 50°C
2. Drive current: 100 μA
3. These output voltage characteristics are measured with tester without a mounting board.
4. The output voltage characteristics may be influenced by the mounting board. Be sure to check operation including durability in actual equipment before use.

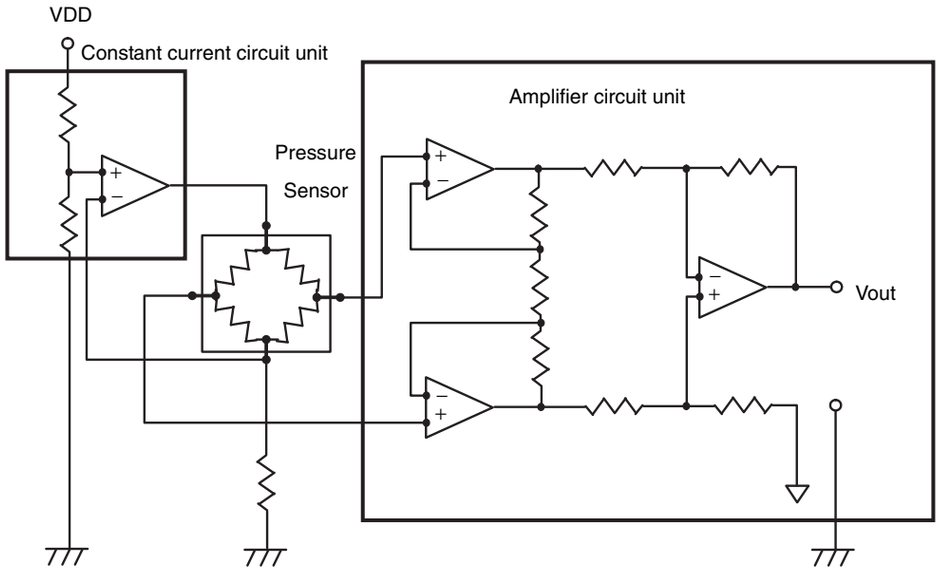
Pressure cycle range (0 to 40 kPa)





Note: 1. Tested temperature condition: 25°C
2. Number of pressure cycle time: 3 x 10^5
3. Rated cycle pressure: 0 to 40 kPa
4. These output voltage characteristics are measured with tester without a mounting board.

Example of application circuit for MEMS Pressure Sensor



1. The pressure sensor is designed to convert a voltage by means of constant current drive.
2. Please amplify the output voltage of the pressure sensor by using the amplifying circuit if necessary.

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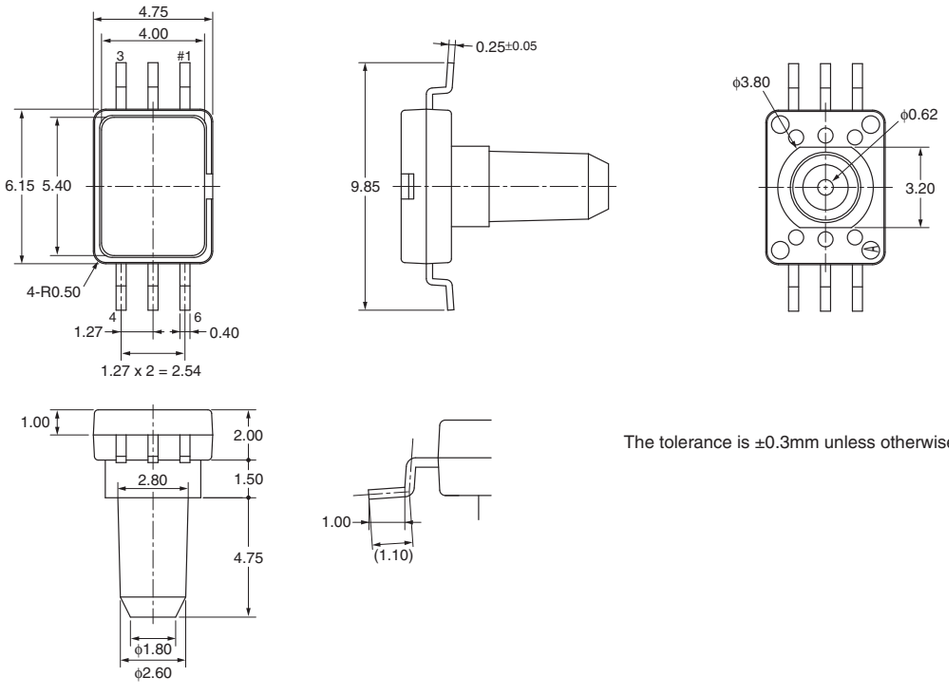
Dimensions

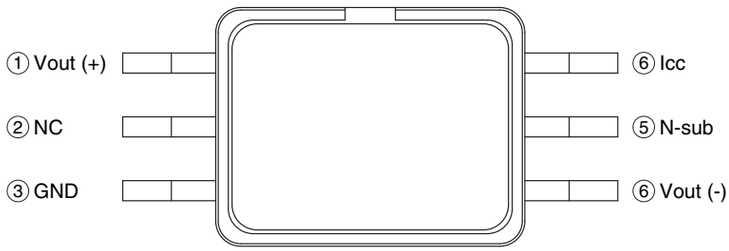
Note: All units are in millimeters unless otherwise indicated.

2SMPP-02

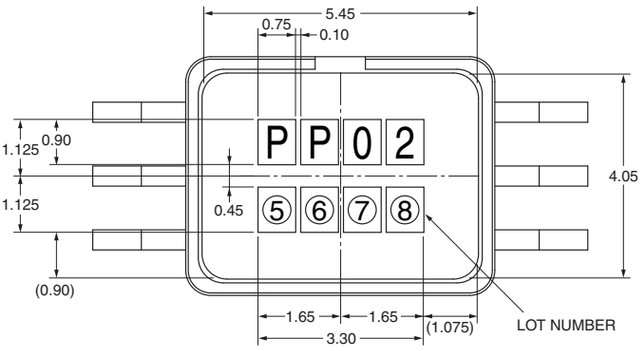


The tolerance is ±0.3mm unless otherwise specified.

Top view



Marking



Precautions

■ Precautions for Correct Use

Handling

- Only air can be used as pressure media on the products directly. It is prohibited to use pressure media including corrosive gases (e.g. organic solvents gases, sulfur dioxide and hydrogen sulfide gases), fluid and any other foreign materials.
- The products are not water proof. Please keep dry in use.
- Don't use the products under dew-condensing conditions. Frozen fluid on sensor chips may also cause fluctuation of sensor output and other troubles.
- Don't put foreign materials (e.g. a wire or pin) into connecting tube. It may cause breakage of pressure sensor chips or fluctuation of sensor output caused by clogging the tube.
- Use the products within rated pressure. Usage at pressure out of the range may cause breakage.
- Don't use under high-frequency vibration including ultrasonic wave.
- The products may be broken by static electricity. Charged materials (e.g. a workbench and a floor) and workers must provide measures against static electricity, including ground connection.
- Overpowering terminals may deform them and detract their solderability. Don't drop or handle the products roughly.
- Don't use the products under humid or dusty condition.
- Terminals connection of pressure sensors must be handled as directed by a connection diagram.

Environmental Conditions for Transport and Storage

- It is prohibited to keep the products with corrosive gases (e.g. organic solvents gases, sulfur dioxide and hydrogen sulfide gases).
- The products are not water proof. Please keep dry during storage.
- An anti-static treatment has been applied to the sleeves. Please note the following points.
  1. Getting wet may remove an anti-static treatment and eliminate its effect.
  2. The sleeves may feel sticky under hot and humid condition due to the nature of the anti-static treatment.
  3. Anti-static has aging degradation. It is prohibited to keep the sleeves for more than six months. The sleeves are also non-reusable.
- Don't keep the products under humid or dusty condition.

Mounting

- Use lands on the printed-circuit boards to which the sensor can be securely fixed.
- Fix pin No.2 on the printed-circuit boards, not fixed causes fluctuation of sensor output signals.

Soldering

- Due to its small size, the thermal capacity of the pressure sensor is low. Therefore, take steps to minimize the effects of external heat.
- Dip soldering bath: Max.260°C, within 10 sec.
- Soldering iron: Max. 260°C, within 10 sec.
- Do not heat the case of sensor package, heat only terminal.
- Use a non-corrosive resin type of flux. Since the pressure sensor chip is exposed to the atmosphere, do not allow flux to enter inside.

Cleaning

- Since the pressure sensor chip is exposed to atmosphere, do not allow cleaning fluid to enter inside.
- Avoid ultrasonic cleaning since this may cause breaks or disconnections in the wiring.

Coating

- Do not coat the pressure sensor when it is mounted to the print circuit board.
- Do not wash the print circuit board after the pressure sensor is mounted using detergent containing silicone. Otherwise, the detergent may remain on the surface of the pressure sensor.

OMRON

Solid State Pressure Sensors
D8M

Solid State Pressure Sensors with Pulse or Frequency Outputs

- Compact housing measures 30L x 30W x 12.4H mm.
- Accept 4 mm OD tubing (D8M-R1); 6 mm OD tubing for D8M-D82.
- Chemical-resistant plastic (PBT) body.
- Metal shield mounted version (D8M-D82) available.
- IP40 enclosure rating for embedded applications.

Ordering Information

Operating pressure range	Output signal	Output frequency	Power supply voltage	Withstand pressure	Model
0 to 4.9 kPa (0 to 0.71 psi)	Pulse count, 1 pulse/9.81 Pa (1/0.0014 psi)	—	2.2 to 3.4 VDC with regulator	19.6 kPa (2.84 psi) for 5 minutes	**D8M-D82**
0 to 196.13 Pa (0 to 0.028 psi)	Frequency, 1 kHz/9.81 Pa (1 kHz/0.0014 psi)	80 to 300 kHz	4.2 to 5.5 VDC with regulator	3 kPa (0.435 psi) for 10 seconds	**D8M-R1**

Specifications

■ Electrical Ratings

Item	D8M-D82	D8M-R1
Power supply voltage	2.2 to 3.4 VDC with regulator	4.2 to 5.5 VDC with regulator
Current consumption	100 mA ± 5% at 3 VDC	10 mA max.
Leakage current	1 mA or less	1 mA or less
Output pulses	—	80 to 300 kHz
Output resolution	1 pulse/9.81 Pa	1 kHz/9.81 Pa
Operating characteristics	0 kPa = 30 pulses 0.15 kPa = 45 ± 30 pulses 2 kPa = 204 ± 15 pulses 4 kPa = 438 ± 46 pulses	0 Pa = 180 ± 100 kHz; Incremental change from 0 value: 49.03 Pa = 5 ± 0.9 kHz 73.55 Pa = 7.5 ± 1.0 kHz 147.10 Pa = 15 ± 0.8 kHz 196.13 Pa = 20 ± 1.4 kHz (Note)

Note: Values measured during and after testing.

■ Operating Characteristics

Item	D8M-D82	D8M-R1
Pressure range	0 to 4.9 kPa (0 to 0.71 psi)	0 to 196.13 Pa (0 to 0.028 psi)
Withstand pressure	19.6 kPa for 5 minutes	3 kPa for 10 seconds
Repeatability/hysteresis	±0.5% FS	±0.5% FS
Non-linearity characteristics	±2% FS max.	±2% FS max.
Response time	1.5 ms (pressure) 30 ms max. (switch) 45 ms (discharge)	3 seconds max.
Operating temperature (Note)	-10 to 60 °C	-20 to 70 °C
Storage temperature (Note)	-20 to 70 °C	-30 to 80 °C
Operating humidity	25 to 95%	25 to 95%

Note: With no icing or condensation.

■ Environmental Characteristics

Item	D8M-D82	D8M-R1
Insulation resistance	100 MΩ min., 250 VDC between lead terminals and the base	
Dielectric strength	250 VAC, 50/60 Hz for 1 minute between lead terminals and the base	500 VAC, 50/60 Hz for 1 minute between terminals and the base
Degree of protection	IP40	IP40
Pressure port	6 mm OD	4 mm OD
Connection method	Three AWG26 wires, 115 mm long	Wiring connector on bottom
Material	PBT (polybutylene terephthalate)	

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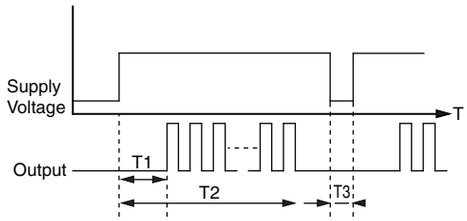
Operation

■ Response Timing Charts

D8M-D82



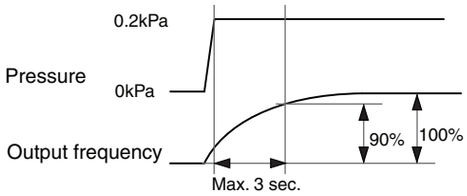
Model	T1	T2	T3
D8M-D82	1.5 ms min.	30 ms max.	45 ms max.

Legend: T1, Pressure measurement time
T2, Response time
T3, Electrical discharge time

D8M-R1

Response time to 90% of 0.2kPa

Max. 3 seconds (excluding time for pressure change)

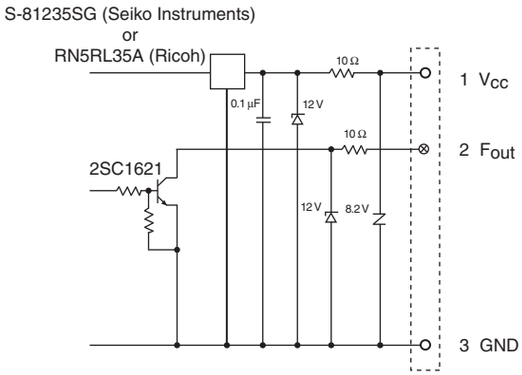


■ Interface Circuit Diagram

D8M-R1

Response time to 90% of 0.2kPa

Max. 3 seconds (excluding time for pressure change)



Application Examples

Compact D8M solid state pressure sensors provide reliable detection for gas and air inflow for burner controls in water heaters, furnaces and other gas-fired devices. They can also be used in gas usage meters.

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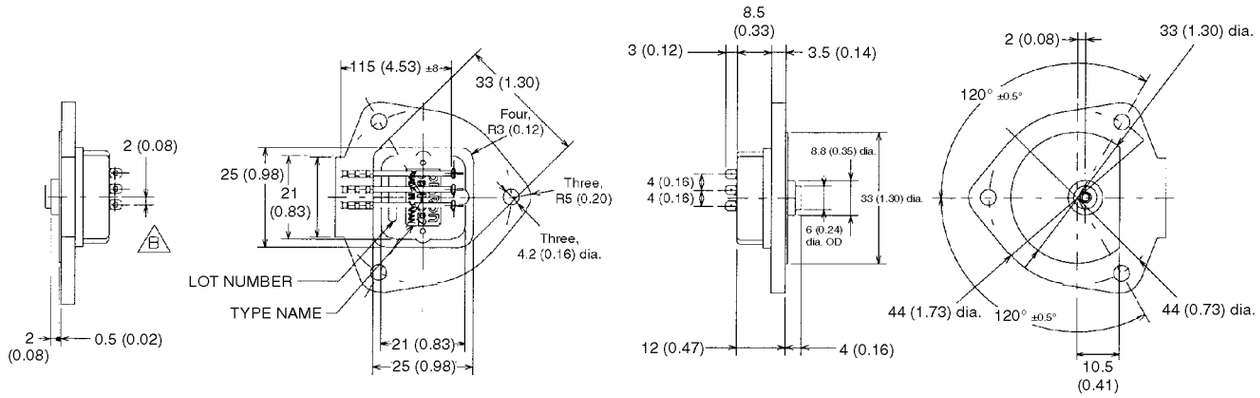
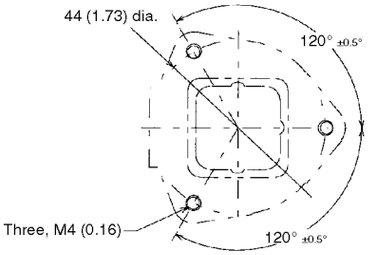
Dimensions

Unit: mm (inch)

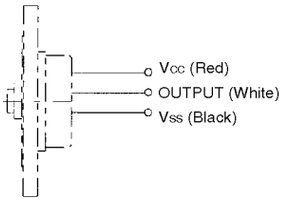
■ D8M-D82



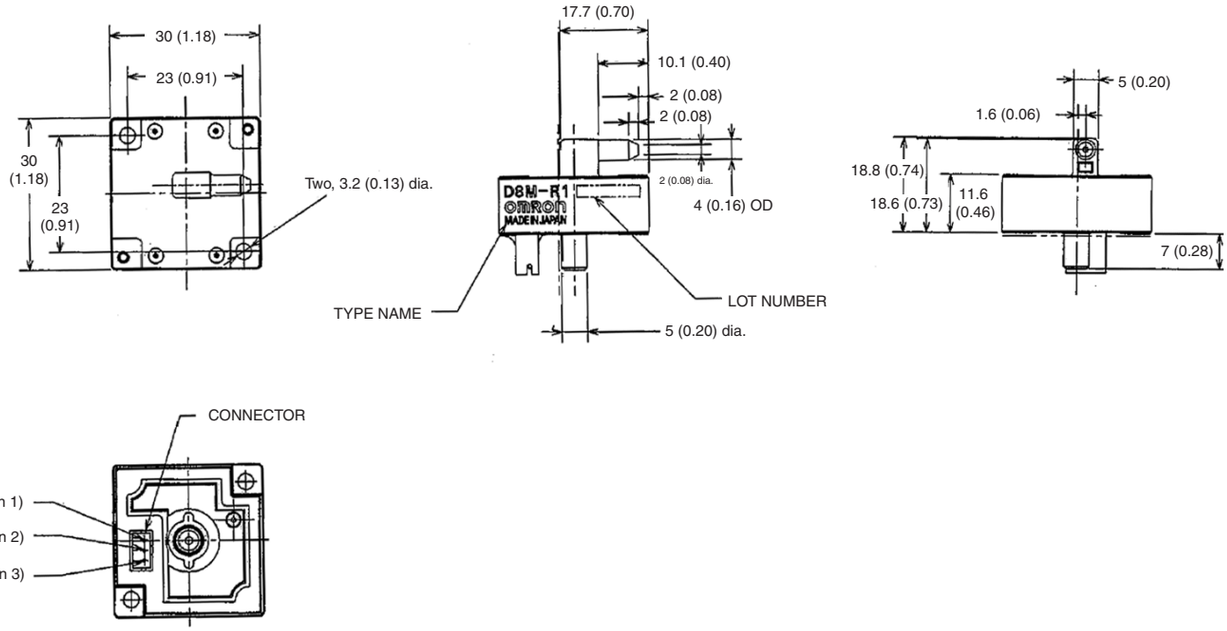
Mounting Hole



Lead Arrangement (Left Side View)



■ D8M-R1



Precautions

Be sure to abide by the following precautions for the safe operation of the Sensor.

Mounting

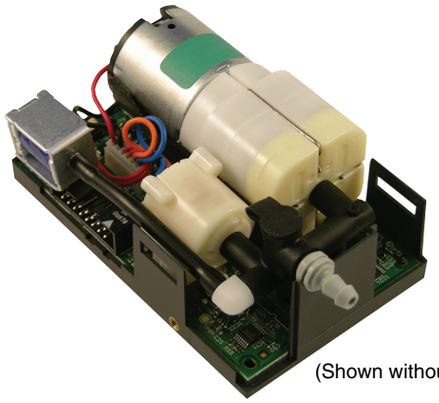
For proper operation, mount the sensor within ±10 degrees of level.

OMRON

NIBP Module
M3600

Self-contained Non-Invasive Blood Pressure (NIBP) module combines the hardware and software needed to perform complete blood pressure measurements.

- Takes measurements from Adults, Children or Neotatals.
- Utilizes the non-invasive oscillometric method.
- Smart Inflation™ automatically determines patient-specific inflation pressures and controls the inflation rate.
- Dual transducers and CPU processors.
- Dynamic Linear Deflation for faster measurement.



(Shown without cover)

Ordering Information

Description	Items included	Model
NIBP Module	Module only	**M3600**
Developers Kit	Module, power supply, RS-232 cable, documentation, adult cuff, terminal emulator and sample scripts	**M3600DEVKIT**

Note: Blood Pressure Cuffs are sold separately. Contact Omron for availability.

Characteristics

Model		M3600	
		Adult/Pediatric	**Neonate**
Dimensions		60mm (H) x 96mm (L) x 40mm (W)	
Measurement Ranges	**Pulse Rate**	40 - 200 bpm	40 - 240 bpm
	Systolic Pressure	60 - 250 mmHg	40 - 120 mmHg
	Diastolic Pressure	40 - 200 mmHg	20 - 90 mmHg
	Mean Arterial Pressure	45 - 235 mmHg	30 - 100 mmHg
Measurement Accuracy	**Pulse Rate**	±2 pbm or 2% of reading, whichever is greater	
	Blood Pressure	Complies with ANSI / AAMI SP10:2002	
Number of Pressure Transducers		Two independent solid-state	
Deflation Method		Dynamic Linear Deflation, rate specific to pulse rate	
Modes of Measurement		Manual Long-term automatic Short-term automatic Smart Inflation™ Smart measurement High Speed measurement	
Power Supply Requirements		+12 VDC @ 680mA; Inrush current = 2.0A	
Atmospheric Pressure		700 - 1060 hPa	
Ambient Operating Temperature		0 - 50°C	
Ambient Operating Humidity		30 - 85% RH (non-condensing)	
Asynchronous Serial Communications		TTL Levels, 1200, 4800, 9600 and 19200 baud rate (See note 1)	
Weight		200g	

Note: 1. 4800 is the default baud rate. Contact Omron regarding other rates.
2. Specifications and appearance are subject to change without notice for purposes of improvement.
3. Smart Inflation™ is a trademark of Omron Healthcare Co., LTD.

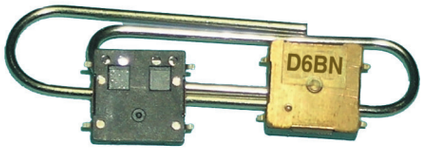
MEMO

OMRON

Micro Tilt Sensor
D6BN

Surface Mounting Tilt Sensor Fits Space-Confined Installations

- Low profile 2mm with Gull wing surface mount terminals
- Detect tilting over a range of 40 to 80 degrees in right-and-left inclination
- Wide operating temperature range: -10° to 60°C
- Ideal for PDAs, cell phones and test equipment; digital cameras and video cameras to change aspect ratio automatically
- Replaces mercury switches in portable space heaters and gaming machines, such as pinball games, and slot machines
- RoHS Compliant



Ordering Information

Operation angle	Return angle	Output rating	Operating voltage	Model
40° to 80°	50° to 10°	0.4 VDC	2.4 to 3.6 VDC	**D6BN-1P**

Specifications

■ Absolute Maximum Ratings

Supply voltage range (V_{dd})	-0.1 to 5.0 VDC
Output current (I_{out})	±1 mA
Operating temperature range	-10° to 60°C with no icing
Storage temperature range	-25° to 70°C
Operating/storage humidity range	25% to 85% RH with no icing or condensation

■ Electrical Characteristics

Power supply voltage range	2.4 to 3.6 VDC
Output high voltage	V_{dd} – 0.4 V min.
Output low voltage	0.4 V max.
Current consumption	10 μA max.; 10 μA typical (V_{dd} = 3)

Note: Measured under standard conditions of ambient temperature ≈ 5°C to 35°C.

■ Performance

Refer to the drawing on the following page for an operational diagram showing operation and return angles.

Operation angle	40° to 80° (when output goes from High to Low)
Return angle	50° to 10° (when output goes from Low to High)
Vibration resistance	Malfunction: 10-55-10 Hz 1.5 mm single amplitude (3.0 mm double amplitude) for 2 hours, 3-Axis
Shock resistance	Malfunction: 735 m/s^2 (approx. 75G)
Electrical life expectancy	100,000 operations min. (15-20 operations/minute)

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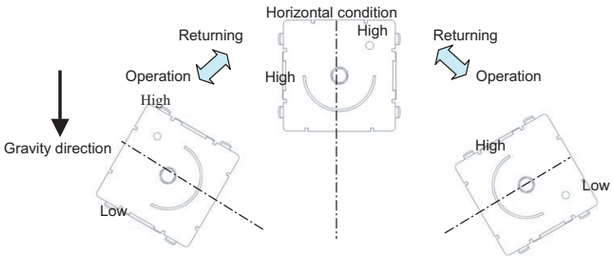
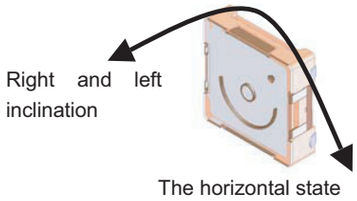
Operation

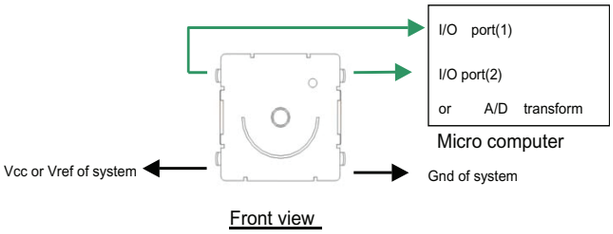




Note: 1. Operation angle: Output goes from High to Low.
2. Return angle: Output goes from Low to HIgh.
3. Characteristic values are provided on condition that there is no tilt back and forth while the operation speed is 10° per second.

Installation

■ Terminal Arrangement



■ Solder Conditions

In the case of Sn-Pb eutectic solder

Temperature [°C]		Time[s]
Preheat area	140	90±30
Reflow area	230±5	≤ 20
Peak temperature	max. 240	≤ 5

In the case of Pb-free solder

Temperature [°C]		Time[s]
Preheat area	160 ~ 180	90±30
Reflow area	230±5	≤ 40
Peak temperature	max. 250	≤ 10

Reflow times: 2 times max.

Desoldering Conditions with Blower Employed

Desolder the Sensor at a temperature of 240°C within five seconds.

If a soldering iron is applied manually, desolder the Sensor within 10 seconds at an iron tip temperature of 260°C or within three seconds at an iron tip temperature of 350°C.

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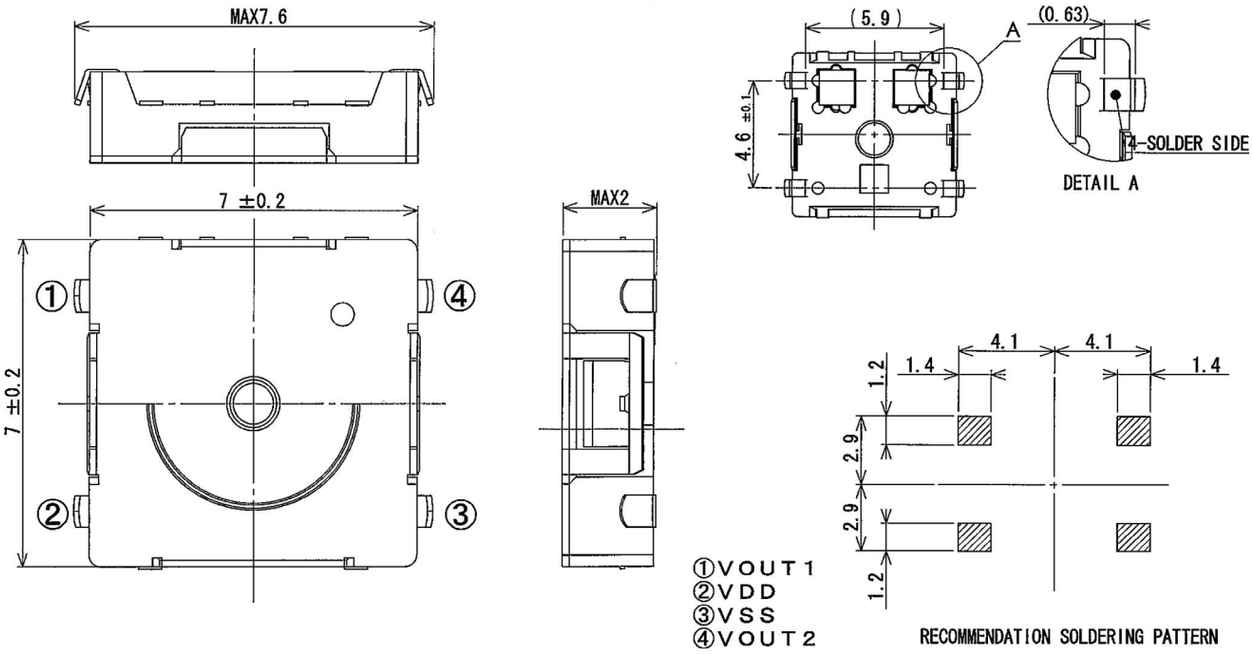
Dimensions



Precautions

- The Sensor does not use any materials detrimental to the ozone layer.
- Specifications other than the electrical or mechanical characteristics, external dimensions, or mounting dimensions of the Sensor are subject to change without notice.

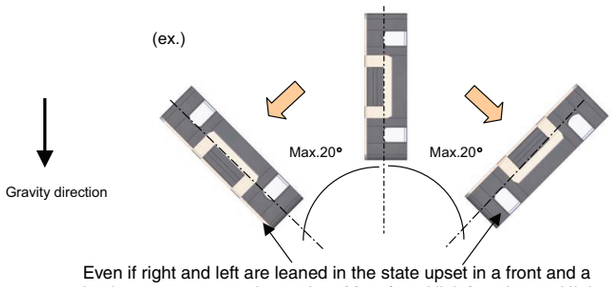
■ Handling Precautions

Operating Environment

- The Sensor consists of a Hall IC and a magnet. Check that the Sensor in operation will not be influenced by any external magnetic fields.
- Do not install any magnetic materials within 2 mm of the Sensor, else the performance characteristics of the Sensor may not be guaranteeable. If there are any objects (e.g. motors and solenoids) generating magnetic fields near the Sensor, operate and test the Sensor before the Sensor comes into actual use.
- Do not apply any voltage exceeding 5V to the Sensor, else the IC may be damaged.
- Do not wash the Sensor after the Sensor is soldered.
- Do not mount or dismount the Sensor while power if flowing to the Sensor.
- The Sensor may generate error signals if impacted at a minimum acceleration of 294 m/s^2.
- The Sensor may generate error signals if a vibration at a minimum frequency of 15 Hz and a minimum acceleration of 15m/s^2 is applied to the Sensor.
- Confirm that no static electricity at a maximum voltage of 5kV is applied to the pins, else the IC may be damaged.

Operating Characteristics

The present output may stay unchanged if the inclination of the Sensor back and forth is 20° or more. Under that condition, the output might not change even when the Sensor is leaned left or right.



Even if right and left are leaned in the state upset in a front and a back, output may not change Low Mata from High from Low to HIgh.

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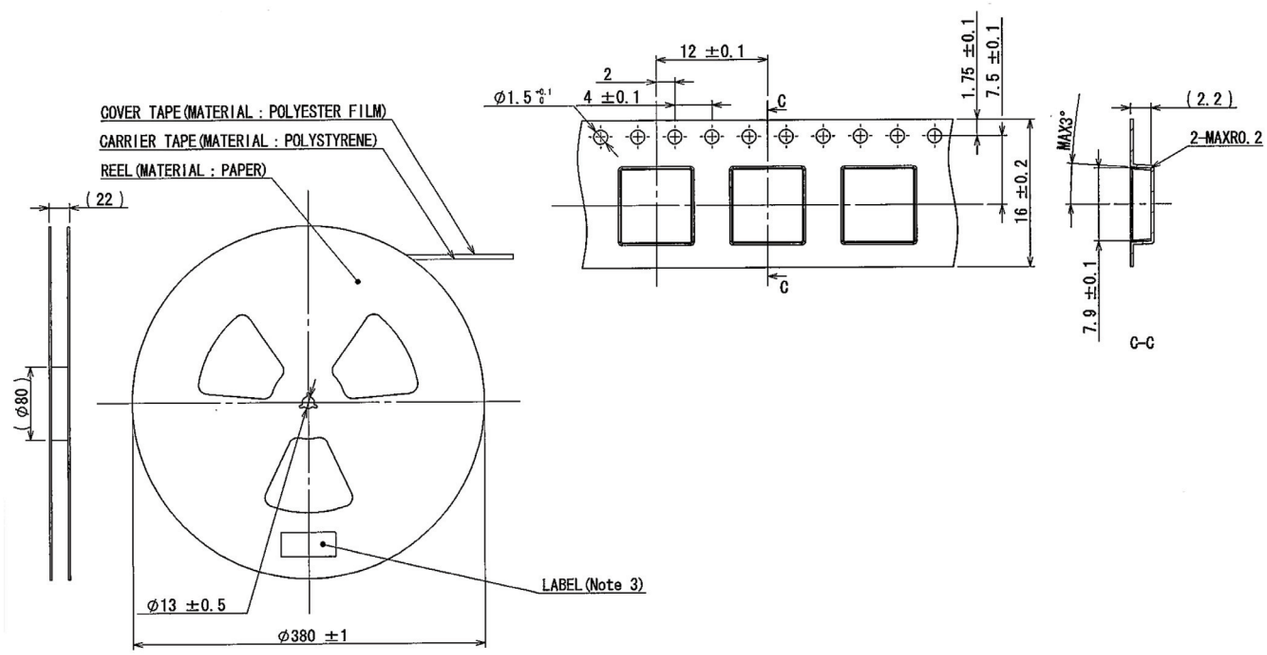
Tape Packing

■ Reel Dimensions



Note: 1. This Packing conforms EIAJ standard.

2. This Packing packs up D6BN-□ 2,500 pieces.

3. Expression of label as follows;

- TYPE NAME
- LOT No.
- NAME OF A COMPANY
- THE COUNTRY OF ORIGIN

OMRON

Sealed Tilt Switch
D7E

- Pure mechanical tilt detector
- Sealed enclosure
- Output capacity from 0.1 mA at 5 VDC to 100 mA at 30 VDC
- RoHS Compliant

Ordering Information

Operating Angle	Model
50 to 80 degrees	D7E-3

Characteristics

Operating angle	Tilt of 50 to 80 degrees, when the switch is tilted gradually (approx. 1 degree/s) from the horizontal
Returning angle	Tilt of more than 25 degrees, when the switch is tilted gradually (approx. 1 degree/s) from the horizontal
Permissible mounting level	1 degree max. from the horizontal
Contact form	Single pole single throw (NC contact / slow action)
Mounting	Pitch: 30 mm 2 screws (M3)
	Height: 5.3 mm
Soldering	Soldering iron: temperature 350 ±10°, 3 sec. max
Ratings	5 VDC, 0.1 mA to 30 VDC, 100 mA (resistive load)
Insulation resistance	100 MΩ min. (250 VDC, between each terminal of the same polarity) To measure off condition
Contact resistance	300 m Ohm max. (Initial value)
Vibration during transportation	Condition: Vibration: 200 gal (1 cycle: 0.5 sec.) Vibration direction: 2 axial directions Time: Total 50 hours
Shock	Condition: Acceleration: 980 m/s^2 3 times Shock direction: 3 axial directions
Operating temperature and humidity	Temperature: -25° to +60° (with no icing and condensation) Humidity: 45 to 95% RH
Storage temperature and humidity	Temperature: -25° to +60° (with no icing and condensation) Humidity: 45 to 95% RH protection
Protection	IP67

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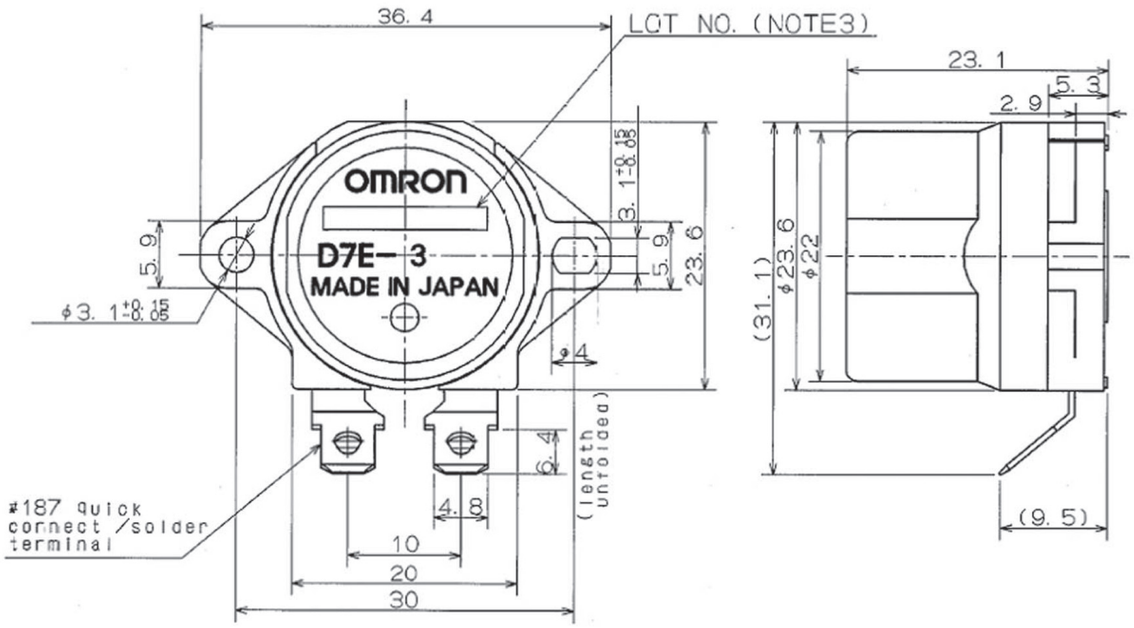
Dimensions

Unit: mm



OMRON

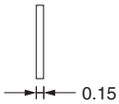
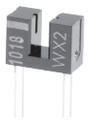
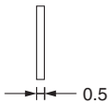
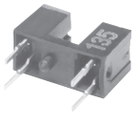
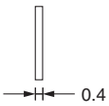
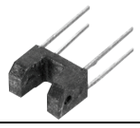
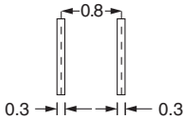
Non-Amplified Photomicrosensors

Selection Guide

Microphotonic Devices

Sensing Distance	Sensing Method	Appearance	Model	Output	Optical Modulation	Features	Page Number
50 mm	Multi-beam		EY3A-1051	Photo-IC	Non-modulated	1 beam high sensitivity and resistivity to light interference	*91*
80 mm			EY3A-1081				*93*

Transmissive

Slot Width	Appearance	Model	Output	Aperature width (mm) and orientation	Terminals	Page Number
1.0 mm		EE-SX1107	Phototransistor		Surface Mount	*131*
2.0 mm		EE-SX1018			Through-hole PCB	*95*
		EE-SX1049				*107*
		EE-SX1103				*125*
		EE-SX1105				*127*
		EE-SX1108			Surface Mount	*135*
		EE-SX1131				*147*
		EE-SX4134	Photo IC (Light-ON)			*201*

Continued on next page.

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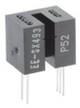
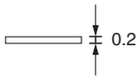
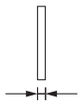
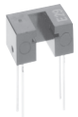
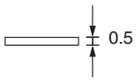
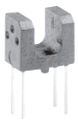
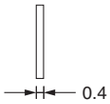
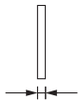
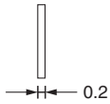
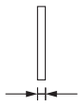
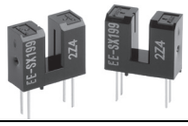
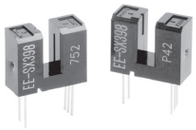
Transmissive

Slot Width	Appearance	Model	Output	Aperature width (mm) and orientation	Terminals	Page Number
2.0 mm		EE-SX493	Photo IC (Light-ON)	 0.2	Through-hole PCB	*193*
2.8 mm		EE-SX1055	Phototransistor	 0.5		*109*
3.0 mm		EE-SX1046		 0.5		*105*
		EE-SX1106		 0.4		*129*
		EE-SX1109		 0.5	Surface Mount	*139*
		EE-SX129		 0.2	Through-hole PCB	*157*
		EE-SX198		 0.5		*163*
		EE-SX199				*165*
		EE-SX298	Photodarlington transistor			*177*
		EE-SX398	Photo IC (Dark-ON)			*195*
		EE-SX498	Photo IC (Light-ON)			

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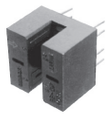
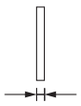
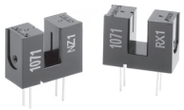
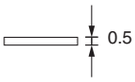
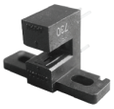
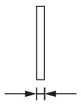
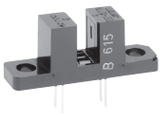
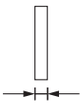
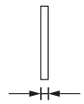
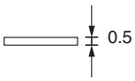
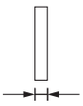
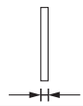
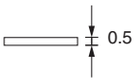
Transmissive

Slot Width	Appearance	Model	Output	Aperature width (mm) and orientation	Terminals	Page Number
3.4 mm		EE-SX1031	Phototransistor (dual channel)	 0.5	Through-hole PCB	*97*
		EE-SX1071	Phototransistor			*117*
		EE-SX1088				*121*
		EE-SX1096		 0.5		*123*
		EE-SX138				*159*
		EE-SX153		 0.5		*161*
		EE-SH3			Solder	*169*
		EE-SH3-B			Through-hole PCB	
		EE-SH3-CS		 1.0	Solder	
		EE-SH3-C			Through-hole PCB	
		EE-SH3-DS		 0.2	Solder	
		EE-SH3-D			Through-hole PCB	
		EE-SH3-GS		 0.5	Solder	
		EE-SH3-G			Through-hole PCB	
		EE-SJ3-C		 1.0		*171*
		EE-SJ3-D		 0.2		
		EE-SJ3-G		 0.5		

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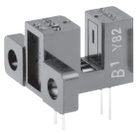
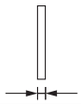
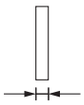
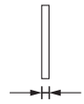
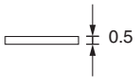
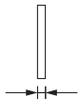
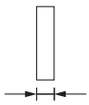
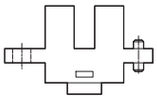
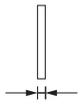
Transmissive

Slot Width	Appearance	Model	Output	Aperature width (mm) and orientation	Terminals	Page Number
3.4 mm		EE-SV3	Phototransistor	 0.5	Solder	175
		EE-SV3-B			Through-hole PCB	
		EE-SV3-CS		 1.0	Solder	
		EE-SV3-C			Through-hole PCB	
		EE-SV3-DS		 0.2	Solder	
		EE-SV3-D			Through-hole PCB	
		EE-SV3-GS		 0.5	Solder	
		EE-SV3-G			Through-hole PCB	
		EE-SX301	Photo IC (Dark-ON)	 0.5	Through-hole PCB	179
		EE-SX401	Photo IC (Light-ON)			
		EE-SX305	Photo IC (Dark-ON)			181
		EE-SX405	Photo IC (Light-ON)			
		EE-SX3088	Photo IC (Dark-ON)			187
		EE-SX4088	Photo IC (Light-ON)			
3.5 mm		EE-SX384	Photo IC (Dark-ON)			191
		EE-SX484	Photo IC (Light-ON)			
3.6 mm		EE-SG3	Phototransistor	 2.0	Solder	167
		EE-SG3-B			Through-hole PCB	
		EE-SX1057				111
		EE-SX3148-P1	Photo IC (Dark-ON)	 0.5	Connector	189
4.2 mm		EE-SX1128	Phototransistor	 0.5	Through-hole PCB	145
4.6 mm		EE-SX1061		 2.0		113

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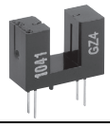
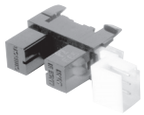
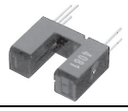
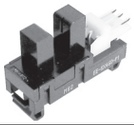
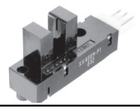
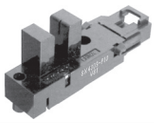
Transmissive

Slot Width	Appearance	Model	Output	Aperature width (mm) and orientation	Terminals	Page Number
5.0 mm		EE-SJ5-B	Phototransistor	0.5	Through-hole PCB	*173*
		EE-SX1041				*101*
		EE-SX1042				*103*
		EE-SX1081				*119*
		EE-SX1115				*143*
		EE-SX1137				*151*
		EE-SX1235A-P2			Connector	*155*
		EE-SX3081	Photo IC (Dark-ON)		Through-hole PCB	*185*
		EE-SX4081	Photo IC (Light-ON)			
		EE-SX460-P1			Connector	*209*
		EE-SX3009-P1	Photo IC (Dark-ON)			*197*
		EE-SX4009-P1	Photo IC (Light-ON)			
		EE-SX4009-P10				*199*

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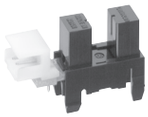
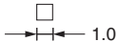
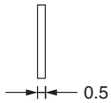
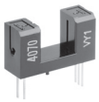
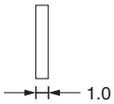
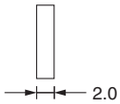
Transmissive

Slot Width	Appearance	Model	Output	Aperature width (mm) and orientation	Terminals	Page Number
5.0 mm		EE-SX4235A-P2	Photo IC (Light-ON)		Connector	*205*
		EE-SX3239-P2	Photo IC (Dark-ON)			*207*
5.2 mm		EE-SX1035	Phototransistor		Through-hole PCB	*99*
8.0 mm		EE-SX1070				*115*
		EE-SX3070	Photo IC (Dark-ON)			*183*
		EE-SX4070	Photo IC (Light-ON)			
14.0 mm		EE-SX1140	Phototransistor			*153*
15.0 mm		EE-SX461-P11	Photo IC (Light-ON)		Connector	*211*

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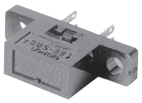
Reflective

Sensing Distance	Appearance	Model	Output	Terminals	Page Number
1.0 mm		EE-SY193	Phototransistor	Surface Mount	*225*
		EE-SY199			*229*
3.5 mm		EE-SY171		Through-hole PCB	*223*
4.0 mm		EE-SY169			*217*
		EE-SY169A			*219*
		EE-SY169B			*221*
4.4 mm		EE-SY113			*215*
		EE-SY313	Photo IC (Dark-ON)		*239*
		EE-SY413	Photo IC (Light-ON)		
5.0 mm		EE-SB5	Phototransistor	Solder	*233*
		EE-SB5-B		Through-hole PCB	
		EE-SF5		Solder	*235*
		EE-SF5-B		Through-hole PCB	
		EE-SY110			*213*
		EE-SY310	Photo IC (Dark-ON)		*237*
		EE-SY410	Photo IC (Light-ON)		

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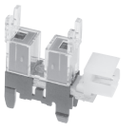
Actuator

Appearance	Model	Output	Terminals	Page Number
	EE-SA102	Phototransistor	Through-hole PCB	*241*
	EE-SA104			*243*
	EE-SA105			*245*
	EE-SA113			*247*
	EE-SA407-P2	Photo IC (Light-ON)	Connector	*249*

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Photomicrosensors

Technical Information

Features of Photomicrosensors

The Photomicrosensor is a compact optical sensor that senses objects or object positions with an optical beam. The transmissive Photomicrosensor and reflective Photomicrosensor are typical Photomicrosensors.

The transmissive Photomicrosensor incorporates an emitter and a transmissive that face each other as shown in Figure 1. When an object is located in the sensing position between the emitter and the detector, the object intercepts the optical beam of the emitter, thus reducing the amount of optical energy reaching the detector.

The reflective Photomicrosensor incorporates an emitter and a detector as shown in Figure 2. When an object is located in the sensing area of the reflective Photomicrosensor, the object reflects the optical beam of the emitter, thus changing the amount of optical energy reaching the detector.

"Photomicrosensor" is an OMRON product name. Generally, the Photomicrosensor is called a photointerrupter.

Figure 1 Transmissive Photomicrosensor

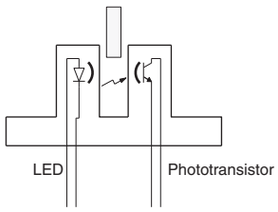
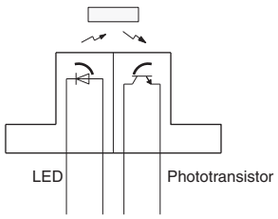


Figure 2 Reflective Photomicrosensor



Datasheet

■ Absolute Maximum Ratings and Electrical and Optical Characteristics

The datasheets of Photomicrosensors include the absolute maximum ratings and electrical and optical characteristics of the Photomicrosensors as well as the datasheets of transistors and ICs. It is necessary to understand the difference between the absolute maximum ratings and electrical and optical characteristics of various Photomicrosensors.

Absolute Maximum Ratings

The absolute maximum ratings of Photomicrosensors and other products with semiconductors specify the permissible operating voltage, current, temperature, and power limits of these products. The products must be operated absolutely within these limits.

Therefore, when using any Photomicrosensor, do not ignore the absolute maximum ratings of the Photomicrosensor, otherwise the Photomicrosensor will not operate precisely. Furthermore, the Photomicrosensor may deteriorate or become damaged, in which case OMRON will not be responsible.

Practically, Photomicrosensors should be used so that there will be some margin between their absolute maximum ratings and actual operating conditions.

Electrical and Optical Characteristics

The electrical and optical characteristics of Photomicrosensors indicate the performance of Photomicrosensors under certain conditions.

Most items of the electrical and optical characteristics are indicated by maximum or minimum values. OMRON usually sells Photomicrosensors with standard electrical and optical characteristics.

The electrical and optical characteristics of Photomicrosensors sold to customers may be changed upon request. All electrical and optical characteristic items of Photomicrosensors indicated by maximum or minimum values are checked and those of the Photomicrosensors indicated by typical values are regularly checked before shipping so that OMRON can guarantee the performance of the Photomicrosensors.

In short, the absolute maximum ratings indicate the permissible operating limits of the Photomicrosensors and the electrical and optical characteristics indicate the maximum performance of the Photomicrosensors.

Terminology

The terms used in the datasheet of each Photomicrosensor with a phototransistor output circuit or a photo IC output circuit are explained below.

■ Phototransistor Output Photomicrosensor

Symbol	Item	Definition
I_{FP}	**Pulse forward current**	The maximum pulse current that is allowed to flow continuously from the anode to cathode of an LED under a specified temperature, a repetition period, and a pulse width condition.
I_C	**Collector current**	The current that flows to the collector junction of a phototransistor.
P_C	**Collector dissipation**	The maximum power that is consumed by the collector junction of a phototransistor.
I_D	**Dark current**	The current leakage of the phototransistor when a specified bias voltage is imposed on the phototransistor so that the polarity of the collector is positive and that of the emitter is negative on condition that the illumination of the Photomicrosensor is 0 ℓx.
I_L	**Light current**	The collector current of a phototransistor under a specified input current condition and at a specified bias voltage.
$V_{CE\ (sat)}$	**Collector-emitter saturated voltage**	The ON-state voltage between the collector and emitter of a phototransistor under a specified bias current condition.
I_{LEAK}	**Leakage current**	The collector current of a phototransistor under a specified input current condition and at a specified bias voltage when the phototransistor is not exposed to light.
tr	**Rising time**	The time required for the leading edge of an output waveform of a phototransistor to rise from 10% to 90% of its final value when a specified input current and bias condition is given to the phototransistor.
tf	**Falling time**	The time required for the trailing edge of an output waveform of a phototransistor to decrease from 90% to 10% of its final value when a specified input current and bias condition is given to the phototransistor.
V_{CEO}	**Collector-emitter voltage**	The maximum positive voltage that can be applied to the collector of a phototransistor with the emitter at reference potential.
V_{ECO}	**Emitter-collector voltage**	The maximum positive voltage that can be applied to the emitter of a phototransistor with the collector at reference potential.

■ Phototransistor/Photo IC Output Photomicrosensor

Symbol	Item	Definition
I_F	**Forward current**	The maximum DC current that is allowed to flow continuously from the anode of the LED to the cathode of the LED under a specified temperature condition.
V_R	**Reverse voltage**	The maximum negative voltage that can be applied to the anode of the LED with the cathode at reference potential.
V_{CC}	**Supply voltage**	The maximum positive voltage that can be applied to the voltage terminals of the photo IC with the ground terminal at reference potential.
V_{OUT}	**Output voltage**	The maximum positive voltage that can be applied to the output terminal with the ground terminal of the photo IC at reference potential.
I_{OUT}	**Output current**	The maximum current that is allowed to flow in the collector junction of the output transistor of the photo IC.
P_{OUT}	**Output permissible dissipation**	The maximum power that is consumed by the collector junction of the output transistor of the photo IC.
V_F	**Forward voltage**	The voltage drop across the LED in the forward direction when a specified bias current is applied to the photo IC.
I_R	**Reverse current**	The reverse leakage current across the LED when a specified negative bias is applied to the anode with the cathode at reference potential.
V_{OL}	**Output low voltage**	The voltage drop in the output of the photo IC when the IC output is turned ON under a specified voltage and output current applied to the photo IC.
V_{OH}	**Output high voltage**	The voltage output by the photo IC when the IC output is turned OFF under a specified supply voltage and bias condition given to the photo IC.
I_{CC}	**Current consumption**	The current that will flow into the sensor when a specified positive bias voltage is applied from the power source with the ground of the photo IC at reference potential.
I_{FT} ($I_{FT\ OFF}$)	**LED current when output is turned OFF**	The forward LED current value that turns OFF the output of the photo IC when the forward current to the LED is increased under a specified voltage applied to the photo IC.
I_{FT} ($I_{FT\ ON}$)	**LED current when output is turned ON**	The forward LED current value that turns ON the output of the photo IC when the forward current to the LED is increased under a specified voltage applied to the photo IC.
ΔH	**Hysteresis**	The difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC is turned ON and when the photo IC is turned OFF.
f	**Response frequency**	The number of revolutions of a disk with a specified shape rotating in the light path, expressed by the number of pulse strings during which the output logic of the photo IC can be obtained under a specified bias condition given to the LED and photo IC (the number of pulse strings to which the photo IC can respond in a second).

Design

The following explains how systems using Photomicrosensors must be designed.

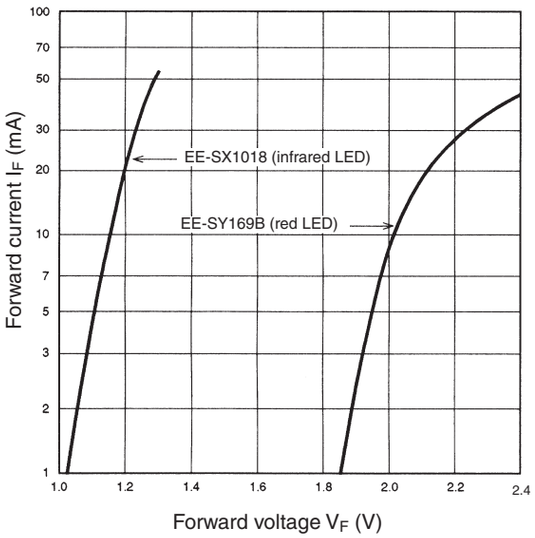
■ Emitter

Characteristics of Emitter

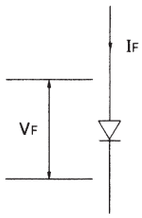
The emitter of each Photomicrosensor has an infrared LED or red LED. Figure 3 shows how the LED forward current characteristics of the EE-SX1018, which has an emitter with an infrared LED, and those of the EE-SY169B, which has an emitter with a red LED, are changed by the voltages imposed on the EE-SX1018 and EE-SY169B. As shown in this figure, the LED forward current characteristics of the EE-SX1018 greatly differ from those of the EE-SY169B. The LED forward current characteristics of any Photomicrosensor indicate how the voltage drop of the LED incorporated by the emitter of the Photomicrosensor is changed by the LED's forward current (I_F) flowing from the anode to cathode. Figure 3 shows that the forward voltage (V_F) of the red LED is higher than that of the infrared LED.

The forward voltage (V_F) of the infrared LED is approximately 1.2 V and that of the red LED is approximately 2 V provided that the practical current required by the infrared LED and that required by the red LED flow into these LEDs respectively.

Figure 3 LED Forward Current vs. Forward Voltage Characteristics (Typical)



Forward Voltage VF



Driving Current Level

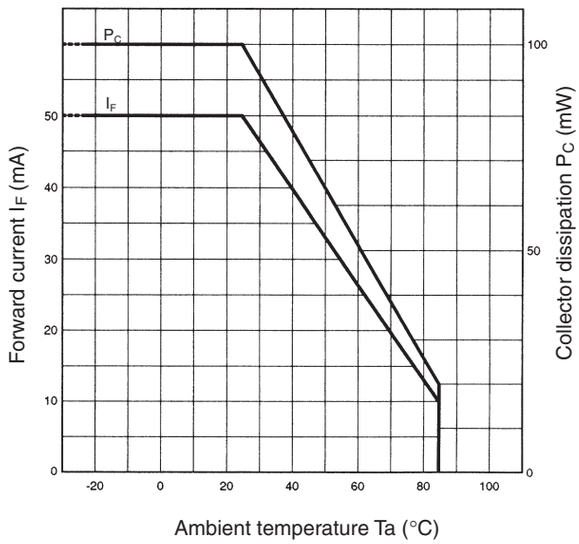
It is especially important to decide the level of the forward current (I_F) of the emitter incorporated by any Photomicrosensor. The forward current must not be too large or too small.

Before using any Photomicrosensor, refer to the absolute maximum ratings in the datasheet of the Photomicrosensor to find the emitter's forward current upper limit. For example, the first item in the absolute maximum ratings in the datasheet of the EE-SX1018 shows that the forward current (I_F) of its emitter is 50 mA at a Ta (ambient temperature) of 25°C. This means the forward current (I_F) of the emitter is 50 mA maximum at a Ta of 25°C. As shown in Figure 4 the forward current must be reduced according to changes in the ambient temperature.

Figure 4 indicates that the forward current (I_F) is approximately 27 mA maximum if the EE-SX1018 is used at a Ta of 60°C. This means that a current exceeding 27 mA must not flow into the emitter incorporated by the EE-SX1018 at a Ta of 60°C.

As for the lower limit, a small amount of forward current will be required because the LED will not give any output if the forward current I_F is zero.

Figure 4 Temperature Characteristics (EE-SX1018)



In short, the forward current lower limit of the emitter of any Photomicrosensor must be 5 mA minimum if the emitter has an infrared LED and 2 mA minimum if the emitter has a red LED. If the forward current of the emitter is too low, the optical output of the emitter will not be stable. To find the ideal forward current value of the Photomicrosensor, refer to the light current (I_L) shown in the datasheet of the Photomicrosensor. The light current (I_L) indicates the relationship between the forward current (I_F) of the LED incorporated by the Photomicrosensor and the output of the LED. The light current (I_L) is one of the most important characteristics. If the forward current specified by the light current (I_L) flows into the emitter, even though there is no theoretical ground, the output of the emitter will be stable. This characteristic makes it possible to design the output circuits of the Photomicrosensor with ease. For example, the datasheet of EE-SX1018 indicates that a forward current (I_F) of 20 mA is required.

Design Method

The following explains how the constants of a Photomicrosensor must be determined. Figure 5 shows a basic circuit that drives the LED incorporated by a Photomicrosensor.

The basic circuit absolutely requires a limiting resistor (R). If the LED is imposed with a forward bias voltage without the limiting resistor, the current of the LED is theoretically limitless because the forward impedance of the LED is low. As a result the LED will burn out. Users often ask OMRON about the appropriate forward voltage to be imposed on the LED incorporated by each Photomicrosensor model that they use. There is no upper limit of the forward voltage imposed on the LED provided that an appropriate limiting resistor is connected to the LED. There is, however, the lower limit of the forward voltage imposed on the LED. As shown in Figure 3, the lower limit of the forward voltage imposed on the LED must be at least 1.2 to 2 V, otherwise no forward current will flow into the LED. The supply voltage of a standard electronic circuit is 5 V minimum. Therefore, a minimum of 5 V should be imposed on the LED. A system incorporating any Photomicrosensor must be designed by considering the following.

- Forward current (I_F)
- Limiting resistor (R) (refer to Figure 5)

As explained above, determine the optimum level of the forward current (I_F) of the LED. The forward current (I_F) of the EE-SX1018, for example, is 20 mA. Therefore, the resistance of the limiting resistor connected to the LED must be decided so that the forward current of the LED will be approximately 20 mA. The resistance of the limiting resistor is obtained from the following.

$$R = \frac{V_{CC} - V_F}{I_F}$$

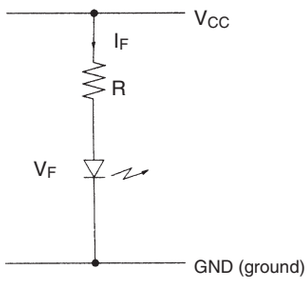
In this case 5 V must be substituted for the supply voltage (V_{CC}). The forward voltage (V_F) obtained from Figure 3 is approximately 1.2 V when the forward current (I_F) of the LED is 20 mA. Therefore, the following resistance is obtained.

$$R = \frac{V_{CC} - V_F}{I_F} = \frac{5 - 1.2\ \text{V}}{20\ \text{mA}} = 190\ \Omega$$

$$= \text{approx. } 180 \text{ to } 220\ \Omega$$

The forward current (I_F) varies with changes in the supply voltage (V_{CC}), forward voltage (V_F), or resistance. Therefore, make sure that there is some margin between the absolute maximum ratings and the actual operating conditions of the Photomicrosensor.

Figure 5 Basic Circuit



The positions of the limiting resistor (R) and the LED in Figure 5 are interchangeable. If the LED is imposed with reverse voltages including noise and surge voltages, add a rectifier diode to the circuit as shown in Figure 6. LEDs can be driven by pulse voltages, the method of which is, however, rarely applied to Photomicrosensors.

In short, the following are important points required to operate any Photomicrosensor.

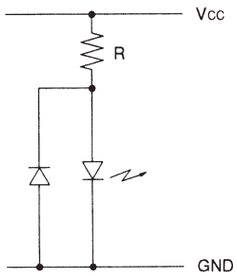
A forward voltage (V_F) of approximately 1.2 V is required if the Photomicrosensor has an infrared LED and a forward voltage (V_F) of approximately 2 V is required if the Photomicrosensor has a red LED.

The most ideal level of the forward current (I_F) must flow into the LED incorporated by the Photomicrosensor.

Decide the resistance of the limiting resistor connected to the LED after deciding the value of the forward current (I_F).

If the LED is imposed with a reverse voltage, connect a rectifier diode to the LED in parallel with and in the direction opposite to the direction of the LED.

Figure 6 Reverse Voltage Protection Circuit



■ Design of Systems Incorporating Photomicrosensors (1)

Phototransistor Output

Characteristics of Detector Element

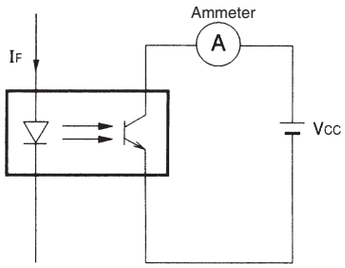
The changes in the current flow of the detector element with and without an optical input are important characteristics of a detector element. Figure 7 shows a circuit used to check how the current flow of the phototransistor incorporated by a Photomicrosensor is changed by the LED with or without an appropriate forward current (I_F) flow, provided that the ambient illumination of the Photomicrosensor is ideal (i.e., 0 ℓx). When there is no forward current (I_F) flowing into the LED or the optical beam emitted from the LED is intercepted by an opaque object, the ammeter indicates several nanoamperes due to a current leaking from the phototransistor. This current is called the dark current (I_D). When the forward current (I_F) flows into the LED with no object intercepting the optical beam emitted from the LED, the ammeter indicates several milliamperes. This current is called the light current (I_L).

The difference between the dark current and light current is 10^6 times larger as shown below.

- When optical beam to the phototransistor is interrupted
  Dark current I_D: 10^{-9} A
- When optical beam to the phototransistor is not interrupted
  Light current I_L: 10^{-3} A

The standard light current of a phototransistor is 10^6 times as large as the dark current of the phototransistor. This difference in current can be applied to the sensing of a variety of objects.

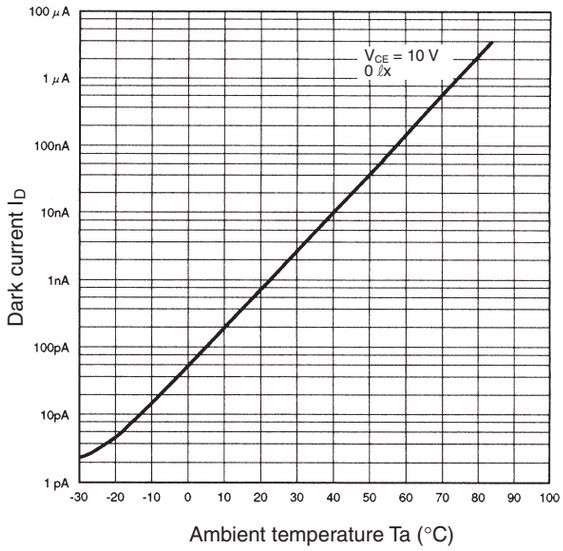
Figure 7 Measuring Circuit



The ambient illumination of the LED and phototransistor incorporated by the Photomicrosensor in actual operation is not 0 ℓx. Therefore, a current larger than the dark current of the phototransistor will flow into the phototransistor when the optical beam emitted from the LED is interrupted. This current is rather large and must not be ignored if the Photomicrosensor has a photoelectric Darlington transistor, which is highly sensitive, as the detector element of the Photomicrosensor. The dark current of the phototransistor incorporated by any reflective Photomicrosensor flows if there is no reflective object in the sensing area of the reflective Photomicrosensor. Furthermore, due to the structure of the reflective Photomicrosensor, a small portion of the optical beam emitted from the LED reaches the phototransistor after it is reflected inside the reflective Photomicrosensor. Therefore, the dark current and an additional current will flow into the phototransistor if there is no sensing object in the sensing area. This additional current is called leakage current (I_{LEAK}). The leakage current of the phototransistor is several hundred nanoamperes and the dark current of the phototransistor is several nanoamperes.

The dark current temperature and light current temperature dependencies of the phototransistor incorporated by any Photomicrosensor must not be ignored. The dark current temperature dependency of the phototransistor increases when the ambient temperature of the Photomicrosensor in operation is high or the Photomicrosensor has a photoelectric Darlington transistor as the detector element of the Photomicrosensor. Figure 8 shows the dark current temperature dependency of the phototransistor incorporated by the EE-SX1018.

Figure 8 Dark Current vs. Ambient Temperature Characteristics (Typical) (EE-SX1018)



Due to the temperature dependency of the phototransistor, the light current (I_L) of the phototransistor as the detector element of the Photomicrosensor increases according to a rise in the ambient temperature. As shown in Figure 9, however, the output of the LED decreases according to a rise in the ambient temperature due to the temperature dependency of the LED. An increase in the light current of the phototransistor is set off against a decrease in the output of the LED and consequently the change of the output of the Photomicrosensor according to the ambient temperature is comparatively small. Refer to Figure 10 for the light current temperature dependency of the phototransistor incorporated by the EE-SX1018.

The light current temperature dependency shown in Figure 10 is, however, a typical example. The tendency of the light current temperature dependency of each phototransistor is indefinite. This means the temperature compensation of any Photomicrosensor is difficult.

Figure 9 LED and Phototransistor Temperature Characteristics (Typical)

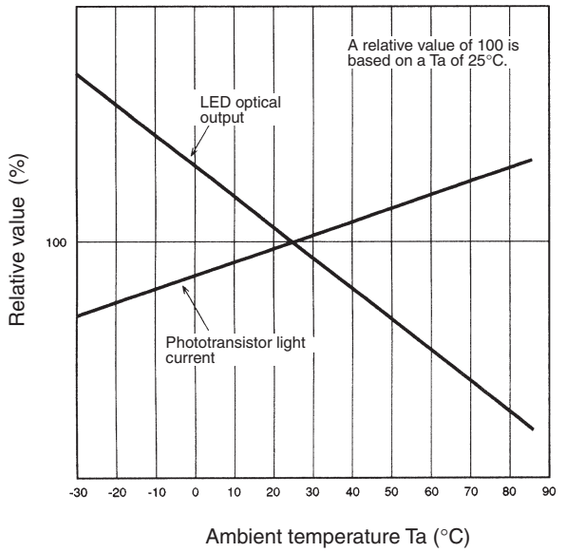
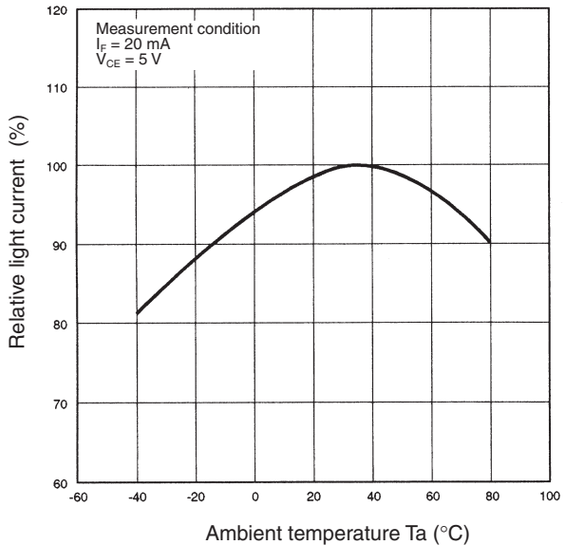


Figure 10 Relative Light Current vs. Ambient Temperature Characteristics (EE-SX1018)



Changes in Characteristics

The following explains the important points required for the designing of systems incorporating Photomicrosensors by considering worst case design technique. Worst case design technique is a method to design systems so that the Photomicrosensors will operate normally even if the characteristics of the Photomicrosensors are at their worst. A system incorporating any Photomicrosensor must be designed so that they will operate even if the light current (I_L) of the phototransistor is minimal and the dark current (I_D) and leakage current of the phototransistor are maximal. This means that the system must be designed so that it will operate even if the difference in the current flow of the phototransistor between the time that the Photomicrosensor senses an object and the time that the Photomicrosensor does not sense the object is minimal.

The worst light current (I_L) and dark current (I_D) values of the phototransistor incorporated by any Photomicrosensor is specified in the datasheet of the Photomicrosensor. (These values are specified in the specifications either as the minimum value or maximum value.)

Table 1 shows the dark current (I_D) upper limit and light current (I_L) lower limit values of the phototransistors incorporated by a variety of Photomicrosensors.

Systems must be designed by considering the dark current (I_D) upper limit and light current (I_L) lower limit values of the phototransistors. Not only these values but also the following factors must be taken into calculation to determine the upper limit of the dark current (I_D) of each of the phototransistors.

- External light interference
- Temperature rise
- Power supply voltage
- Leakage current caused by internal light reflection if the systems use reflective Photomicrosensors.

The above factors increase the dark current (I_D) of each phototransistor.

As for the light current (I_L) lower limit of each phototransistor, the following factors must be taken into calculation.

- Temperature change
- Secular change

The above factors decrease the light current (I_L) of each phototransistor.

Table 2 shows the increments of the dark current (I_D) and the decrements of the light current (I_D) of the phototransistors.

Therefore, if the EE-SX1018 is operated at a Ta of 60°C maximum and a V_{CC} of 10 V for approximately 50,000 hours, for example, the dark current (I_D) of the phototransistor incorporated by the EE-SX1018 will be approximately 4 μA and the light current (I_L) of the phototransistor will be approximately 0.25 mA because the dark current (I_D) of the phototransistor at a Ta of 25°C is 200 nanoamperes maximum and the light current (I_L) of the phototransistor at a Ta of 25°C is 0.50 mA minimum.

Table 3 shows the estimated worst values of a variety of Photomicrosensors, which must be considered when designing systems using these Photomicrosensors.

The dispersion of the characteristics of the Photomicrosensors must be also considered, which is explained in detail later. The light current (I_L) of the phototransistor incorporated by each reflective Photomicrosensor shown in its datasheet was measured under the standard conditions specified by OMRON for its reflective Photomicrosensors. The light current (I_L) of any reflective Photomicrosensor greatly varies with its sensing object and sensing distance.

Table 1. Rated Dark Current (I_D) and Light Current (I_L) Values

Model	Upper limit (I_D)	Lower limit (I_L)	Condition
EE-SG3(-B)	200 nA	2 mA	I_F = 15 mA
EE-SX1018, -SX1055 EE-SX1041, -SX1042 EE-SX1070, -SX1071 EE-SX198, -SX199	200 nA	0.5 mA	I_F = 20 mA
EE-SB5(-B) EE-SF5(-B) EE-SY110	200 nA	0.2 mA	I_F = 20 mA (see note)
Condition	V_{CE} = 10 V, 0 ℓx Ta = 25°C	V_{CE} = 10 V Ta = 25°C	---

Note: These values were measured under the standard conditions specified by OMRON for the corresponding Photomicrosensors.

Table 2. Dependency of Detector Elements on Various Factors

Elements		Phototransistor	Photo-Darlington transistor
Dark current I_D	**External light interference**	To be checked using experiment	To be checked using experiment
	Temperature rise	Increased by approximately 10 times with a temperature rise of 25°C.	Increased by approximately 28 times with a temperature rise of 25°C.
	Supply voltage	See Figure 11.	See Figure 12.
Light current I_L	**Temperature change**	Approximately –20% to 10%	Approximately –20% to 10%
	Secular change (20,000 to 50,000 hours) Note: For an Infrared LED.	Decreased to approximately one-half of the initial value considering the temperature changes of the element.	Decreased to approximately one-half of the initial value considering the temperature changes of the element.

Figure 11 Dark Current Imposed Voltage Dependency (Typical) (EE-SX1018)

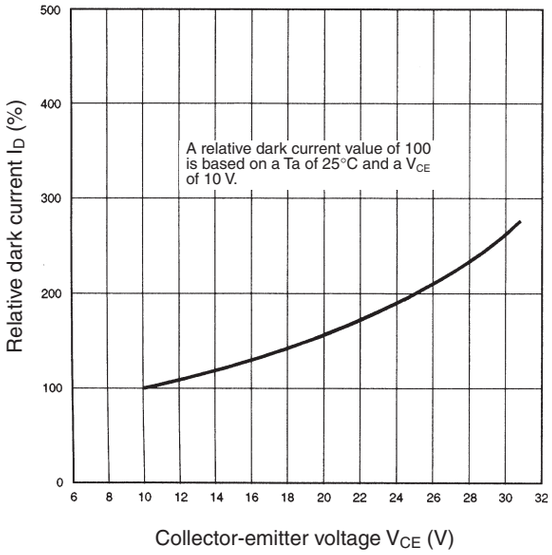


Figure 12 Dark Current Imposed Voltage Dependency (Typical - Photodarlington. Consult specific datasheets)

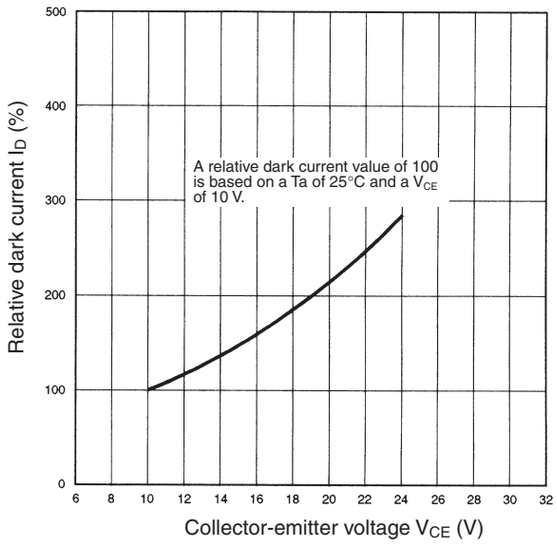


Table 3. Estimated Worst Values of a Variety of Photomicrosensors

Model	Estimated worst value (I_D)	Estimated worst value (I_L)	Condition
EE-SG3(-B)	4 μA	1 mA	I_F = 15 mA
EE-SX1018, -SX1055 EE-SX1041, -SX1042 EE-SX1070, -SX1071 EE-SX198, -SX199	4 μA	0.25 mA	I_F = 20 mA
EE-SB5(-B) EE-SF5(-B) EE-SY110	4 μA	0.1 mA	I_F = 20 mA (see note)
Condition	V_{CE} = 10 V, 0 ℓx Ta = 60°C	V_{CE} = 10 V, Operating hours = 50,000 to 100,000 hrs Ta = T_{opr}	---

Note: These values were measured under the standard conditions specified by OMRON for the corresponding Photomicrosensors with an Infrared LED.

Design of Basic Circuitry

The following explains the basic circuit incorporated by a typical Photomicrosensor and the important points required for the basic circuit.

The flowing currents (i.e., I_L and I_D) of the phototransistor incorporated by the Photomicrosensor must be processed to obtain the output of the Photomicrosensor. Refer to Figure 13 for the basic circuit. The light current (I_L) of the phototransistor will flow into the resistor (R_L) if the phototransistor receives an optical input and the dark current (I_D) and leakage current of the phototransistor will flow into the resistor (R_L) if the phototransistor does not receive any optical input. Therefore, if the phototransistor receives an optical input, the output voltage imposed on the resistor (R_L) will be obtained from the following.

$I_L \times R_L$

If the phototransistor does not receive any optical input, the output voltage imposed on the resistor (R_L) will be obtained from the following.

(I_D + leakage current) x R_L

The output voltage of the phototransistor is obtained by simply connecting the resistor (R_L) to the phototransistor. For example, to obtain an output of 4 V minimum from the phototransistor when it is ON and an output of 1 V maximum when the phototransistor is OFF on condition that the light current (I_L) of the phototransistor is 1 mA and the leakage current of the phototransistor is 0.1 mA, and these are the worst light current and leakage current values of the phototransistor, the resistance of the resistor (R_L) must be approximately 4.7 kΩ. Then, an output of 4.7 V (i.e., 1 mA x 4.7 kΩ) will be obtained when the phototransistor is ON and an output of 0.47 V (i.e., 0.1 mA x 4.7 kΩ) will be obtained when the phototransistor is OFF. Practically, the output voltage of the phototransistor will be more than 4.7 V when the phototransistor is ON and less than 0.47 V when the phototransistor is OFF because the above voltage values are based on the worst light current and leakage current values of the phototransistor. The outputs obtained from the phototransistor are amplified and input to ICs to make practical use of the Photomicrosensor.

Figure 13 Basic Circuit

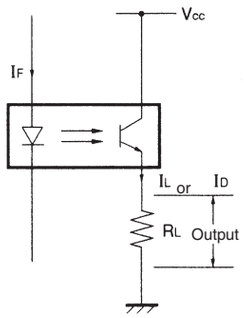
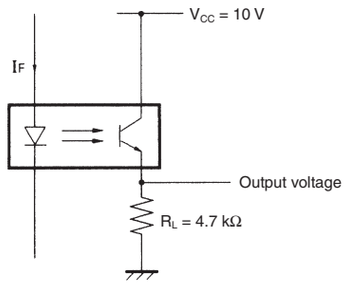


Figure 14 Output Example



EE-SX1018

Design of Applied Circuit

The following explains the designing of the applied circuit shown in Figure 15.

The light current (I_L) of the phototransistor flows into R_1 and R_2 when the phototransistor receives the optical beam emitted from the LED. Part of the light current (I_L) will flow into the base and emitter of Q_1 when the voltage imposed on R_2 exceeds the bias voltage (i.e., approximately 0.6 to 0.9 V) imposed between the base and emitter of the transistor (Q_1). The light current flowing into the base turns Q_1 ON. A current will flow into the collector of Q_1 through R_3 when Q_1 is ON. Then, the electric potential of the collector will drop to a low logic level. The dark current and leakage current of the phototransistor flow when the optical beam emitted from the LED is intercepted. The electric potential of the output of the phototransistor (i.e., (I_D + leakage current) x R_2) is, however, lower than the bias voltage between the base and emitter of Q_1. Therefore, no current will flow into the base of Q_1 and Q_1 will be OFF. The output of Q_1 will be at a high level. As shown in Figure 16, when the phototransistor is ON, the phototransistor will be seemingly short-circuited through the base and emitter of the Q_1, which is equivalent to a diode, and if the light current (I_L) of the phototransistor is large and R_1 is not connected to the phototransistor, the light current (I_L) will flow into Q_1 and the collector dissipation of the phototransistor will be excessively large.

The following items are important when designing the above applied circuit:

- The voltage output (i.e., I_L x R_2) of the phototransistor receiving the optical beam emitted from the LED must be much higher than the bias voltage between the base and emitter of Q_1.
- The voltage output (i.e., (I_D + leakage current) x R_2) of the phototransistor not receiving the optical beam emitted from the LED must be much lower than the bias voltage between the base and emitter of Q_1.

Therefore, it is important to determine the resistance of R_2. Figure 17 shows a practical applied circuit example using the EE-SX1018 Photomicrosensor at a supply voltage (V_{CC}) of 5V to drive a 74-series TTL IC. This applied circuit example uses R_1 and R_2 with appropriate resistance values.

Figure 15 Applied Circuit

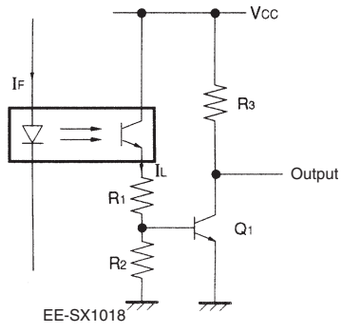


Figure 16 Equivalent Circuit

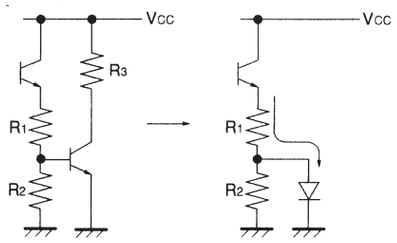
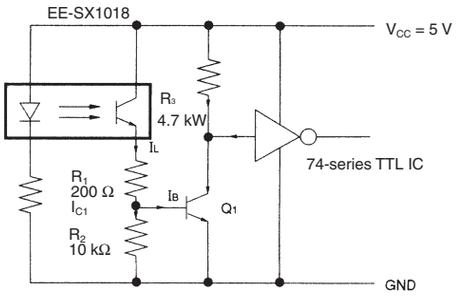


Figure 17 Applied Circuit Example



Calculation of R_2

The resistance of R_2 should be decided using the following so that the appropriate bias voltage ($V_{BE(ON)}$) between the base and emitter of the transistor (Q_1) to turn Q_1 ON will be obtained.

$$I_{C1} \times R_2 > V_{BE(ON)}$$
$$I_{C1} = I_L - I_B$$

Equation 1 $\therefore (I_L - I_B) \times R_2 > V_{BE(ON)}$

Equation 2 $\therefore R_2 > \dfrac{V_{BE(ON)}}{I_L - I_B}$

The bias voltage ($V_{BE(ON)}$) between the base and emitter of Q_1 is approximately 0.8 V and the base current (I_B) of Q_1 is approximately 20 μA if Q_1 is a standard transistor controlling small signals. The estimated worst value of the light current (I_L) of the phototransistor is 0.25 mA according to Table 3.

Therefore, the following is obtained.

$$R_2 > \frac{0.8\ \text{V}}{0.25\ \text{mA} - 20\ \mu\text{A}} = \text{approx. } 3.48\ \text{k}\Omega$$

R_2 must be larger than the above result. Therefore, the actual resistance of R_2 must be two to three times as large as the above result. In the above applied circuit example, the resistance of R_2 is 10 kΩ.

Verification of R_2 Value

The resistance of R_2 obtained from the above turns Q_1 ON. The following explains the way to confirm whether the resistance of R_2 obtained from the above can turn Q_1 OFF as well. The condition required to turn Q_1 OFF is obtained from the following.

$(I_D + \alpha) \times R_2 < V_{BE(OFF)}$

Substitute 10 kΩ for R_2, 4 μA for the dark current (I_D) according to Table 3, and 10 μA for the leakage current on the assumption that the leakage current is 10 μA in Equation 3. The following is obtained.

Equation 3 $(I_D + \alpha) \times R_2 < V_{BE(OFF)}$

$(4\ \mu\text{A} + 10\ \mu\text{A}) \times 10\ \text{k}\Omega = 0.140\ \text{V}$

$V_{BE(OFF)} = 0.4\ \text{V}$

$\therefore 0.140\ \text{V} < 0.4\ \text{V}$

The above result verifies that the resistance of R_2 satisfies the condition required to turn Q_1 OFF.

If the appropriateness of the resistance of R_2 has been verified, the design of the circuit is almost complete.

R_1

As shown in Figure 16, when the phototransistor is ON, the phototransistor will be seemingly short-circuited through the base and emitter of the Q_1, and if the light current (I_L) of the phototransistor is large and R_1 is not connected to the phototransistor, the light current will flow into Q_1 and the collector dissipation of the phototransistor will be excessively large. The resistance of R_1 depends on the maximum permissible collector dissipation (P_C) of the phototransistor, which can be obtained from the datasheet of the Photomicrosensor. The resistance of R_1 of a phototransistor is several hundred ohms. In the above applied circuit example, the resistance of R_1 is 200 Ω.

If the resistance of R_1 is determined, the design of the circuit is complete.

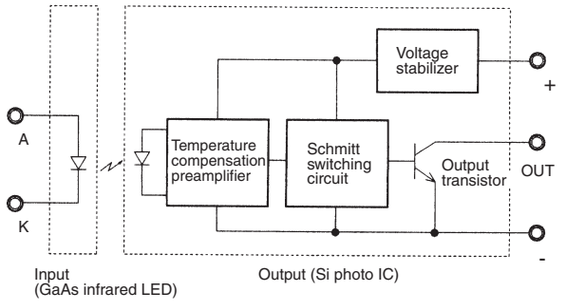
It is important to connect a transistor to the phototransistor incorporated by the Photomicrosensor to amplify the output of the phototransistor, which increases the reliability and stability of the Photomicrosensor. Such reliability and stability of the Photomicrosensor cannot be achieved if the output of the phototransistor is not amplified. The response speed and other performance characteristics of the circuit shown in Figure 15 are far superior to those of the circuit shown in Figure 13 because the apparent impedance (i.e., load resistance) of the Photomicrosensor is determined by R_1, the resistance of which is comparatively small. Recently, Photomicrosensors that have photo IC amplifier circuits are increasing in number because they are easy to use and make it possible to design systems using Photomicrosensors without problem.

■ Design of Systems Incorporating Photomicrosensors (2)

Photo IC Output

Figure 18 shows the circuit configuration of the EE-SX301 or EE-SX401 Photomicrosensor incorporating a photo IC output circuit. The following explains the structure of a typical Photomicrosensor with a photo IC output circuit.

Figure 18 Circuit Configuration



LED Forward Current (I_F) Supply Circuit

The LED in the above circuitry is an independent component, to which an appropriate current must be supplied from an external power supply. This is the most important item required by the Photomicrosensor.

It is necessary to determine the appropriate forward current (I_F) of the LED that turns the photo IC ON. If the appropriate forward current is determined, the Photomicrosensor can be easily used by simply supplying power to the detector circuitry (i.e., the photo IC). Refer to the datasheet of the Photomicrosensor to find the current of the LED turning the photo IC ON. Table 4 is an extract of the datasheet of the EE-SX301/EE-SX401.

Table 4. Abstract of Characteristics

Item	Symbol	EE-SX301, -SX401	
		Value	Condition
LED current when output is turned OFF (EE-SX301)	I_{FTOFF}	8 mA max.	V_{CC} = 4.5 to 16 V Ta = 25°C
LED current when output is turned ON (EE-SX401)	I_{FTON}		

To design systems incorporating EE-SX301 or EE-SX401 Photomicrosensors, the following are important points.

- A forward current equivalent to or exceeding the I_{FTOFF} value must flow into the LED incorporated by each EE-SX301 Photomicrosensors.
- A forward current equivalent to or exceeding the I_{FTON} value must flow into the LED incorporated by the EE-SX401 Photomicrosensors.

The I_{FTON} value of the EE-SX301 is 8 mA maximum and so is the I_{FON} value of the EE-SX401. The forward current (I_F) of LED incorporated by the EE-SX301 in actual operation must be 8 mA or more and so must the actual forward current of (I_F) the LED incorporated by the EE-SX401 in actual operation. The actual forward currents of the LEDs incorporated by the EE-SX301 and EE-SX401 are limited by their absolute maximum forward currents respectively. The upper limit of the actual forward current of the LED incorporated by the EE-SX301 and that of the LED incorporated by the EE-SX401 must be decided according Figure 19, which shows the temperature characteristics of the EE-SX301 and EE-SX401. The forward current (I_F) of the EE-SX301 must be as large as possible within the absolute maximum forward current and maximum ambient temperature shown in Figure 19 and so must be the forward current (I_F) of the EE-SX401. The forward current (I_F) of the EE-SX301 or that of the EE-SX401 must not be close to 8 mA, otherwise the photo IC of the EE-SX301 or that of the EE-SX401 may not operate if there is any ambient temperature change, secular change that reduces the optical output of the LED, or dust sticking to the LED. The forward current (I_F) values of the EE-SX301 and the EE-SX401 in actual operation must be twice as large as the I_{FOFF} values of the EE-SX301 and EE-SX401 respectively. Figure 20 shows the basic circuit of a typical Photomicrosensor with a photo IC output circuit.

If the Photomicrosensor with a photo IC output circuit is used to drive a relay, be sure to connect a reverse voltage absorption diode (D) to the relay in parallel as shown in Figure 21.

Detector Circuit

Supply a voltage within the absolute maximum supply voltage to the positive and negative terminals of the photo IC circuit shown in Figure 18 and obtain a current within the I_{OUT} value of the output transistor incorporated by the photo IC circuit.

Figure 19 Forward Current vs. Ambient Temperature Characteristics (EE-SX301/-SX401)

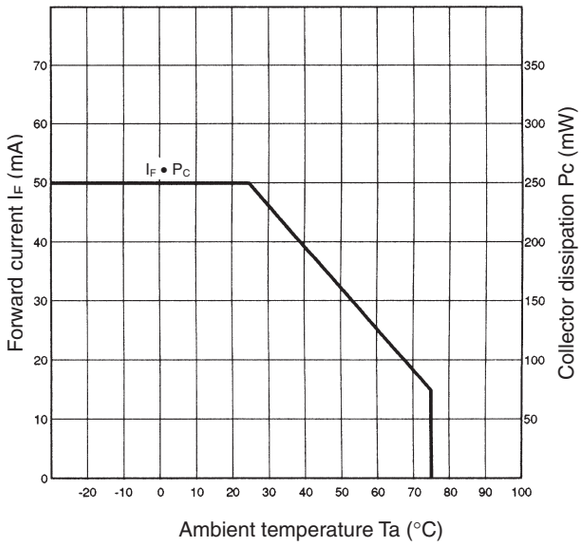


Figure 20 Basic Circuit

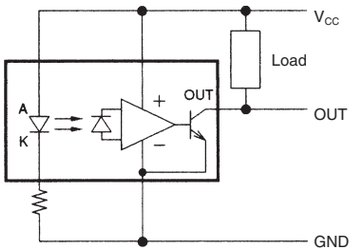
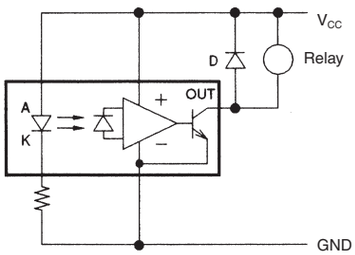


Figure 21 Connected to Inductive Load



Precautions

The following provides the instructions required for the operation of Photomicrosensors.

■ Transmissive Photomicrosensor Incorporating Phototransistor Output Circuit

When using a transmissive Photomicrosensor to sense the following objects, make sure that the transmissive Photomicrosensor operates properly.

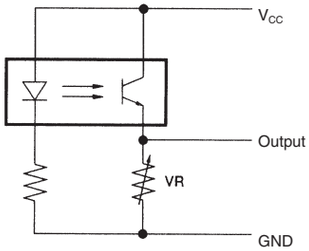
- Highly permeable objects such as paper, film, and plastic
- Objects smaller than the size of the optical beam emitted by the LED or the size of the aperture of the detector.

The above objects do not fully intercept the optical beam emitted by the LED. Therefore, some part of the optical beam, which is considered noise, reaches the detector and a current flows from the phototransistor incorporated by the detector. Before sensing such type of objects, it is necessary to measure the light currents of the phototransistor with and without an object to make sure that the transmissive Photomicrosensor can sense objects without being interfered by noise. If the light current of the phototransistor sensing any one of the objects is $I_L(N)$ and that of the phototransistor sensing none of the objects is $I_L(S)$, the signal-noise ratio of the phototransistor due to the object is obtained from the following.

$$S/N = I_L(S)/I_L(N)$$

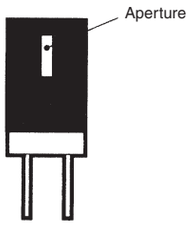
The light current (I_L) of the phototransistor varies with the ambient temperature and secular changes. Therefore, if the signal-noise ratio of the phototransistor is 4 maximum, it is necessary to pay utmost attention to the circuit connected to the transmissive Photomicrosensor so that the transmissive Photomicrosensor can sense the object without problem. The light currents of phototransistors are different to one another. Therefore, when multiple transmissive Photomicrosensors are required, a variable resistor must be connected to each transmissive Photomicrosensor as shown in Figure 22 if the light currents of the phototransistors greatly differ from one another.

Figure 22 Sensitivity Adjustment



The optical beam of the emitter and the aperture of the detector must be as narrow as possible. An aperture each can be attached to the emitter and detector to make the optical beam of the emitter and the aperture of the detector narrower. If apertures are attached to both the emitter and detector, however, the light current (I_L) of the phototransistor incorporated by the detector will decrease. It is desirable to attach apertures to both the emitter and detector. If an aperture is attached to the detector only, the transmissive Photomicrosensor will have trouble sensing the above objects when they pass near the emitter.

Figure 23 Aperture Example



When using the transmissive Photomicrosensor to sense any object that vibrates, moves slowly, or has highly reflective edges, make sure to connect a proper circuit which processes the output of the transmissive Photomicrosensor so that the transmissive Photomicrosensor can operate properly, otherwise the transmissive Photomicrosensor may have a chattering output signal as shown in Figure 24. If this signal is input to a counter, the counter will have a counting error or operate improperly. To protect against this, connect a 0.01- to 0.02-μF capacitor to the circuit as shown in Figure 25 or connect a Schmitt trigger circuit to the circuit as shown in Figure 26.

Figure 24 Chattering Output Signal

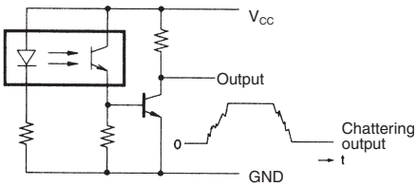


Figure 25 Chattering Prevention (1)

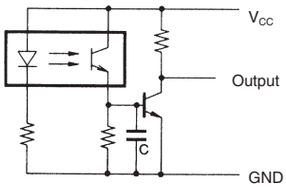
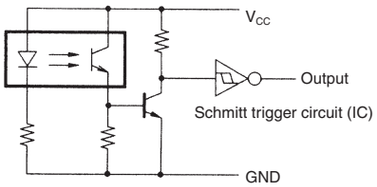


Figure 26 Chattering Prevention (2)



■ Reflective Photomicrosensor Incorporating Phototransistor Output Circuit

When using a reflective Photomicrosensor to sense objects, pay attention to the following so that the reflective Photomicrosensor operates properly.

- External light interference
- Background condition of sensing objects
- Output level of the LED

The reflective Photomicrosensor incorporates a detector element in the direction shown in Figure 27. Therefore, it is apt to be affected by external light interference. The reflective Photomicrosensor, therefore, incorporates a filter to intercept any light, the wavelength of which is shorter than a certain wavelength, to prevent external light interference. The filter does not, however, perfectly intercept the light. Refer to Figure 28 for the light interception characteristics of filters. A location with minimal external light interference is best suited for the reflective Photomicrosensor.

Figure 27 Configuration of Reflective Photomicrosensor

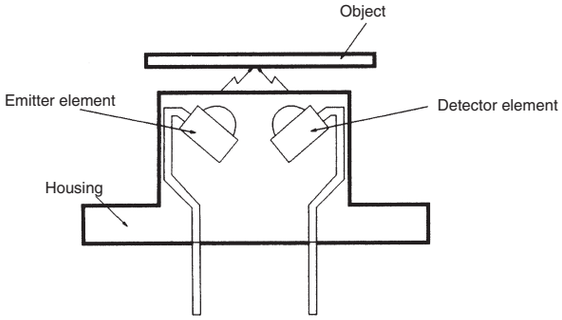


Figure 28 Light Interception Characteristics of Filters

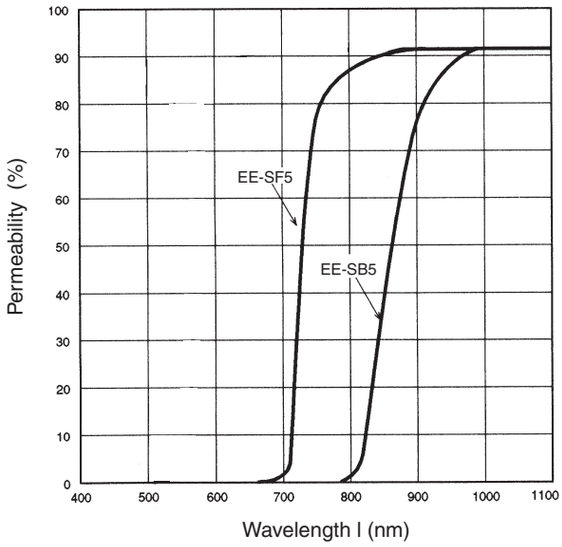
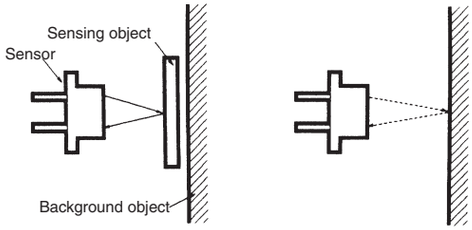


Figure 29 Influence of Background Object



With regard to the background conditions, the following description is based on the assumption that the background is totally dark.

Figure 29 shows that the optical beam emitted from the LED incorporated by a reflective Photomicrosensor is reflected by a sensing object and background object. The optical beam reflected by the background object and received by the phototransistor incorporated by the detector is considered noise that lowers the signal-noise ratio of the phototransistor. If any reflective Photomicrosensor is used to sense paper passing through the sensing area of the reflective Photomicrosensor on condition that there is a stainless steel or zinc-plated object behind the paper, the light current ($I_L(N)$) of the phototransistor not sensing the paper may be larger than the light current ($I_L(S)$) of phototransistor sensing the paper, in which case remove the background object, make a hole larger than the area of the sensor surface in the background object as shown in Figure 30, coat the surface of the background object with black lusterless paint, or roughen the surface of the background. Most malfunctions of a reflective Photomicrosensor are caused by an object located behind the sensing objects of the reflective Photomicrosensor.

Unlike the output (i.e., I_L) of any transmissive Photomicrosensor, the light current (I_L) of a reflective Photomicrosensor greatly varies according to sensing object type, sensing distance, and sensing object size.

Figure 30 Example of Countermeasure

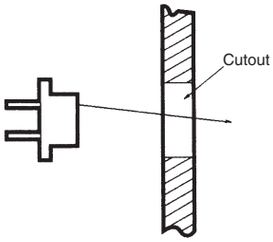
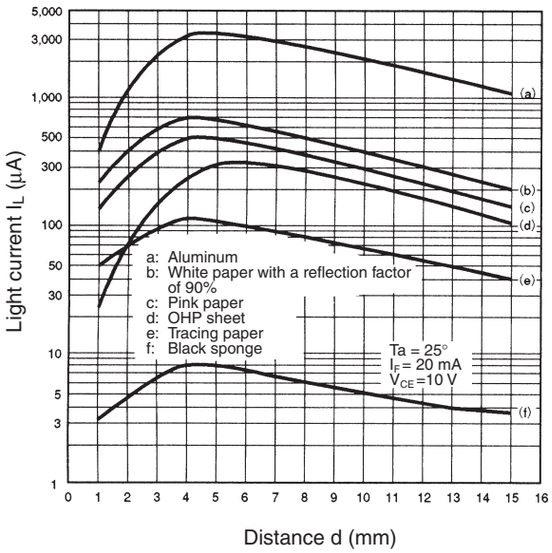


Figure 31 Sensing Distance Characteristics (EE-SF5)



The light current (I_L) of the phototransistor incorporated by the transmissive Photomicrosensor is output when there is no sensing object in the sensing groove of the transmissive Photomicrosensor. On the other hand, the light current (I_L) of the phototransistor incorporated by the reflective Photomicrosensor is output when there is a standard object specified by OMRON located in the standard sensing distance of the reflective Photomicrosensor. The light current (I_L) of the phototransistor incorporated by the reflective Photomicrosensor varies when the reflective Photomicrosensor senses any other type of sensing object located at a sensing distance other than the standard sensing distance. Figure 31 shows how the output of the phototransistor incorporated by the EE-SF5(-B) varies according to varieties of sensing objects and sensing distances. Before using the EE-SF5(-B) to sense any other type of sensing objects, measure the light currents of the phototransistor in actual operation with and without one of the sensing objects as shown in Figure 32. After measuring the light currents, calculate the signal-noise ratio of the EE-SF5(-B) due to the sensing object to make sure if the sensing objects can be sensed smoothly. The light current of the reflective Photomicrosensor is, however, several tens to hundreds of microamperes. This means that the absolute signal levels of the reflective Photomicrosensor are low. Even if the reflective Photomicrosensor in operation is not interfered by external light, the dark current (I_D) and leakage current (I_{LEAK}) of the reflective Photomicrosensor, which are considered noise, may amount to several to ten-odd microamperes due to a rise in the ambient temperature. This noise cannot be ignored. As a result, the signal-noise ratio of the reflective Photomicrosensor will be extremely low if the reflective Photomicrosensor senses any object with a low reflection ratio.

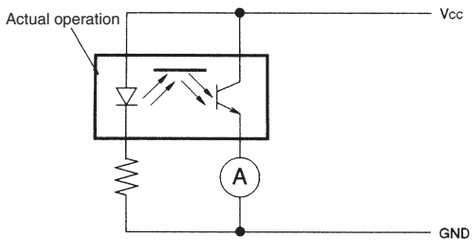
Pay utmost attention when applying the reflective Photomicrosensor to the sensing of the following.

- Marked objects (e.g., White objects with a black mark each)
- Minute objects

The above objects can be sensed if the signal-noise ratio of the reflective Photomicrosensor is not too low.

The reflective Photomicrosensor must be used with great care, otherwise it will not operate properly.

Figure 32 Output Current Measurement



Precautions

■ Correct Use

- Use the product within the rated voltage range.

  Applying voltages beyond the rated voltage ranges may result in damage or malfunction to the product.
- Wire the product correctly and be careful with the power supply polarities.

  Incorrect wiring may result in damage or malfunction to the product.
- Connect the loads to the power supply. Do not short-circuit the loads.

  Short-circuiting the loads may result in damage or malfunction to the product.

■ Structure and Materials

The emitter and detector elements of conventional Photomicrosensors are fixed with transparent epoxy resin and the main bodies are made of polycarbonate. Unlike ICs and transistors, which are covered with black epoxy resin, Photomicrosensors are subject to the following restrictions.

- Low Heat Resistivity

  The storage temperature of standard ICs and transistors is approximately 150°C. The storage temperature of highly resistant Photomicrosensors is 100°C maximum. The heat resistance of the EE-SY169 Series, which use ABS resin in the case, is particularly low (80°C maximum).
- Low Mechanical Strength

  Black epoxy resin, which is used for the main bodies of ICs and transistors, contains additive agents including glass fiber to increase the heat resistivity and mechanical strength of the main bodies. Materials with additive agents cannot be used for the bodies of Photomicrosensors because Photomicrosensors must maintain good optical permeability. Unlike ICs and transistors, Photomicrosensors must be handled with utmost care because Photomicrosensors are not as heat or mechanically resistant as ICs and transistors. No excessive force must be imposed on the lead wires of Photomicrosensors.

■ Mounting

Screw Mounting

If Photomicrosensors have screw mounting holes, the Photomicrosensors can be mounted with screws. Unless otherwise specified, refer to the following when tightening the screws

Hole diameter	Screw size	Tightening torque
1.5 dia.	M1.4	0.20 N • m
2.1 dia.	M2	0.34 N • m
3.2 dia.	M3	0.54 N • m
4.2 dia.	M4	0.54 N • m

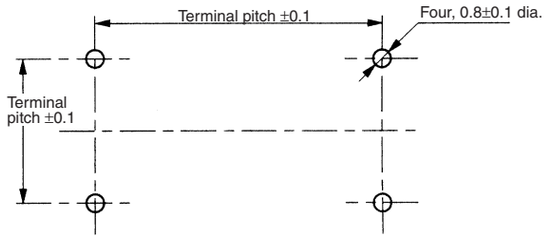
Read the following before tightening the screws.

- The use of a torque screwdriver is recommended to tighten each of the screws so that the screws can be tightened to the tightening torque required.
- The use of a screw with a spring washer and flat washer for the mounting holes of a Photomicrosensor is recommended. If a screw with a spring washer but without a flat washer is used for any mounting hole, the part around the mounting hole may crack.
- Do not mount Photomicrosensors to plates stained with machining oil, otherwise the machining oil may cause cracks on the Photomicrosensors.
- Do not impose excessive forces on Photomicrosensors mounted to PCBs. Make sure that no continuous or instantaneous external force exceeding 500 g (4.9 N) is imposed on any lead wire of the Photomicrosensors.

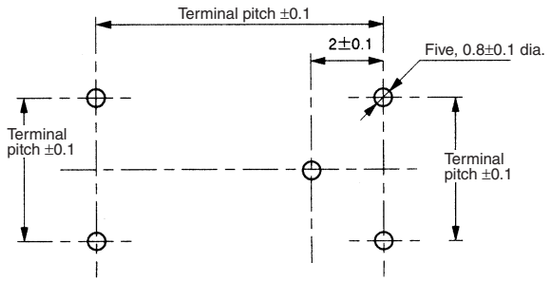
PCB Mounting Holes

Unless otherwise specified, the PCB to which a Photomicrosensor is mounted must have the following mounting holes.

Four Terminals



Five Terminals



■ Soldering

Lead Wires

Make sure to solder the lead wires of Photomicrosensors so that no excessive force will be imposed on the lead wires. If an excessive forces is likely to be imposed on the lead wires, hold the bases of the lead wires.

Soldering Temperature

Regardless of the device being soldered, soldering should be completed quickly so that the devices are not subjected to thermal stress. Care is also required in the processing environment for processes other than soldering so that the devices are not subject to thermal stress or other external force.

Manual Soldering

Unless otherwise specified, the lead wires of Photomicrosensors can be soldered manually under the following conditions.
These conditions must also be maintained when using lead-free solder, i.e., soldering with lead-free solder is possible as long as the following conditions are maintained.

Soldering temperature:	350°C max. (The temperature of the tip of a 30-W soldering iron is approximately 320°C when the soldering iron is heated up.)
Soldering time:	3 s max.
Soldering position:	At least 1.5 mm away from the bases of the lead wires.

The temperature of the tip of any soldering iron depends on the shape of the tip. Check the temperature with a thermometer before soldering the lead wires. A highly resistive soldering iron incorporating a ceramic heater is recommended for soldering the lead wires.

Dip Soldering

The lead wires of Photomicrosensors can be dip-soldered under the following conditions unless otherwise specified.

Preheating temperature:	Must not exceed the storage temperature of the Photomicrosensors.
Soldering temperature:	260°C max. (the lead wires)
Soldering time:	10 s max.
Soldering position:	At least 0.3 mm away from the bases of the housing.

The soldering temperature is specified as the temperature applied to the lead terminals. Do not subject the cases to temperatures higher than the maximum storage temperature. It is also possible for the sensor case to melt due to residual heat of the PCB. When using a PCB with a high thermal capacity (e.g., those using fiber-glass reinforced epoxy substrates), confirm that the case is not deformed and install cooling devices as required to prevent distortion. Particular care is required for the EE-SY169 Series, which use ABS resin in the case.

Do not use non-washable flux when soldering EE-SA-series Photomicrosensors, otherwise the Photomicrosensors will have operational problems. For other Photomicrosensors, check the case materials and optical characteristics carefully to be sure that residual flux does not adversely affect them.

Reflow Soldering

The reflow soldering of Photomicrosensors is not possible except for the EE-SX1107, -SX1108, -SX1109, -SX1131, -SX4134, and EE-SY193. The reflow soldering of these products must be performed carefully under the conditions specified in the datasheets of these products, respectively. Before performing the reflow soldering of these products, make sure that the reflow soldering equipment satisfies the conditions.

Compared to general ICs, optical devices have a lower resistance to heat. This means the reflow temperature must be set to a lower temperature. Observe the temperature provided in the specifications when mounting optical devices.

External Forces Immediately Following Soldering

The heat resistance and mechanical strength of Photomicrosensors are lower than those of ICs or transistors due to their physical properties. Care must thus be exercised immediately after soldering (particularly for dip soldering) so that external forces are not applied to the Photomicrosensors.

External Forces

The heat resistivity and mechanical strength of Photomicrosensors are lower than those of ICs or transistors. Do not to impose external force on Photomicrosensors immediately after the Photomicrosensors are soldered. Especially, do not impose external force on Photomicrosensors immediately after the Photomicrosensors are dip-soldered.

■ Cleaning Precautions

Cleaning

Photomicrosensors except the EE-SA105 and EE-SA113 can be cleaned subject to the following restrictions.

Types of Detergent

Polycarbonate is used for the bodies of most Photomicrosensors. Some types of detergent dissolve or crack polycarbonate. Before cleaning Photomicrosensors, refer to the following results of experiments, which indicate what types of detergent are suitable for cleaning Photomicrosensors other than the EE-SA105 and EE-SA113.

Observe the law and prevent against any environmental damage when using any detergent.

Results of Experiments

Ethyl alcohol:	OK
Methyl alcohol:	OK
Isopropyl alcohol:	OK
Trichlene:	NG
Acetone:	NG
Methylbenzene:	NG
Water (hot water):	The lead wires corrode depending on the conditions

Cleaning Method

Unless otherwise specified, Photomicrosensors other than the EE-SA105 and EE-SA113 can be cleaned under the following conditions. Do not apply an unclean detergent to the Photomicrosensors.

DIP cleaning:	OK
Ultrasonic cleaning:	Depends on the equipment and the PCB size. Before cleaning Photomicrosensors, conduct a cleaning test with a single Photomicrosensor and make sure that the Photomicrosensor has no broken lead wires after the Photomicrosensor is cleaned.
Brushing:	The marks on Photomicrosensors may be brushed off. The emitters and detectors of reflective Photomicrosensors may have scratches and deteriorate when they are brushed. Before brushing Photomicrosensors, conduct a brushing test with a single Photomicrosensor and make sure that the Photomicrosensor is not damaged after it is brushed.

■ Operating and Storage Temperatures

Observe the upper and lower limits of the operating and storage temperature ranges for all devices and do not allow excessive changes in temperature. As explained in the restrictions given in *Structure and Materials*, elements use clear epoxy resin, giving them less resistance to thermal stress than normal ICs or transistors (which are sealed with black epoxy resin). Refer to reliability test results and design PCBs so that the devices are not subjected to excessive thermal stress.

Even for applications within the operating temperature range, care must also be taken to control the humidity. As explained in the restrictions given in *Structure and Materials*, elements use clear epoxy resin, giving them less resistance to humidity than normal ICs or transistors (which are sealed with black epoxy resin). Refer to reliability test results and design PCBs so that the devices are not subjected to excessive thermal stress. Photomicrosensors are designed for application under normal humidities. When using them in humidified or dehumidified, high-humidity or low-humidity, environments, test performance sufficiently for the application.

■ LED Drive Currents

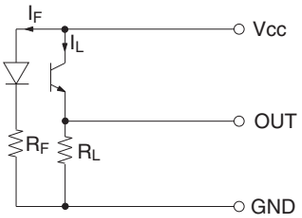
Photomicrosensors consist of LEDs and light detectors. Generally speaking, temporal changes occur to LEDs when power is supplied to them (i.e., the amount of light emitted diminishes). With less light, the photoelectric current is reduced for a sensor with a phototransistor output or the threshold current is increased for a sensor with a photo-IC output. Design circuits with sufficient consideration to the decline in the emitted light level. The reduction in emitted light is far greater for red LEDs than for infrared LEDs. Also, with red LEDs that contain aluminum, aluminum oxide will form if they are powered under high humidities, calling for a greater need for consideration of the decline in the emitted light level.

■ Light Interceptors

Select a material for the light interceptor with superior interception properties. If a material with inferior light interception properties, such as a plastic that is not black, is used, light may penetrate the interceptor and cause malfunction. With Photomicrosensors, most of which use infrared LEDs, a material that appears black to the human eye (i.e., in the visible light range) may be transparent to infrared light. Select materials carefully.

Guideline for Light Interceptors

When measuring the light interception properties of the light interceptor, use 0.1% maximum light transmission as a guideline.



Criteria

Where,

I_{L1} is the I_L for light reception
I_{L2} is the I_L for light interception by the intercepter
V_{TH} is the threshold voltage
I_{F1} is the I_F for measurement of I_L given in product specifications
I_{F2} is the I_F in actual application (= $(V_{CC} - V_F)/R_F = (V_{CC} - 1.2)/R_F$)
I_{LMAX} is the standard upper limit of the optical current I_L

Then,

Light transmission = $I_{L2}/I_{L1} = \alpha$

Here there should be no problems if the following equation is satisfied.

$V_{TH} \geq (I_{F2}/I_{F1}) \times I_{LMAX} \times R_L \times \alpha$

Caution is required, however, because there are inconsistencies in light transmission.

■ Reflectors

The reflectors for most Photomicrosensors are standardized to white paper with a reflection ratio of 90%. Design the system to allow for any differences in the reflection ratio of the detection object. With Photomicrosensors, most of which use infrared LEDs, a material that appears black to the human eye (i.e., in the visible light range) may have a higher reflection ratio. Select materials carefully. Concretely, marks made with dye-based inks or marks made with petroleum-based magic markers (felt pens) can have the same reflection ratio for infrared light as white paper.

The reflectors for most Photomicrosensors are standardized to white paper with a reflection ratio of 90%. Paper, however, disperses light relatively easily, reducing the effect of the detection angle. Materials with mirrored surfaces, on the other hand, show abrupt changes in angle characteristics. Check the reflection ratio and angles sufficiently for the application.

The output from most Photomicrosensors is determined at a specified distance. Characteristics will vary with the distance. Carefully check characteristics at the specific distance for the application.

■ Output Stabilization Time

Photomicrosensors with photo-IC outputs require 100 ms for the internal IC to stabilize. Set the system so that the output is not read for 100 ms after the power supply is turned ON. Also be careful if the power supply is turned OFF in the application to save energy when the Photomicrosensor is not used.

When using a Photomicrosensor with a phototransistor output outside of the saturation region, stabilization time is required to achieve thermal balance. Care is required when using a variable resistor or other adjustment.

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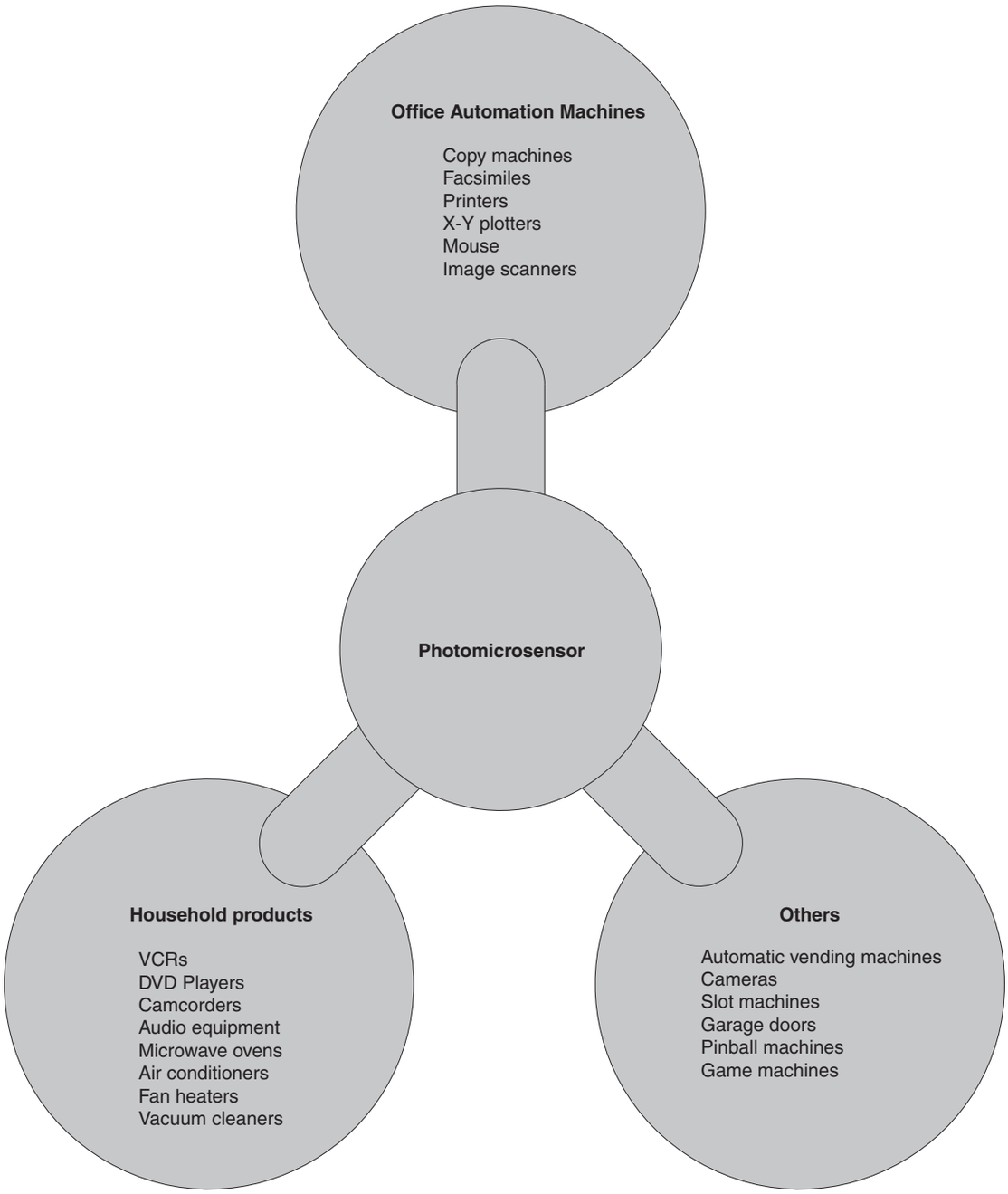
Application Examples

Most People May Not Realize the Fact that Photomicrosensors are Built Into Machines and Equipment that are Used Everyday



■ Application Examples

Classification	Products	Sensing example
Household products	VCRs	Rotating reel sensing and tape sensing
	Camcorders	Lens origin sensing and lens control
	Laserdisc players	Rotation sensing and disk size sensing
	Air conditioners/Fan heaters	Louver direction sensing and fan motor rotation sensing
	Microwave ovens	Turntable sensing
	Vacuum cleaners	Carpet and floor discrimination
Office automation machines	Printers/Typewriters	Origin sensing, paper sensing, paper size sensing, and ink ribbon end sensing
	Copy machines	Paper sensing, cassette sensing, and toner sensing
	Facsimiles	Paper sensing, black end mark sensing, paper size sensing
	Floppy disk drives	Disk sensing, origin sensing, and write protect sensing
	Optical disk drives	Disk sensing, disk type sensing, and write protection sensing
	Image scanners	Origin sensing and movement value sensing
	Mouse	Movement direction sensing and movement value sensing
	X-Y plotters	Paper sensing, origin sensing, pen sensing, and movement value sensing
Others	Automatic vending machines/Ticket machines	Coin sensing, coin discrimination, and ticket sensing
	Cameras	Film forwarding, lens control, and motor control
	Cash dispensers	Card sensing, bill sensing, mechanical control
	Robot/Machine tools	Mechanical control
	Sewing machines	Motor rotation sensing and needle position sensing
	Pinball machines	Ball sensing, mechanical control, and sensing of remaining balls
	Slot machines	Coil sensing and lever sensing
	Game machines	Prize sensing, coil sensing, and mechanical control
	Garage doors	Door opening and closing sensing

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Product Quality Control and Reliability

■ Product Quality Control

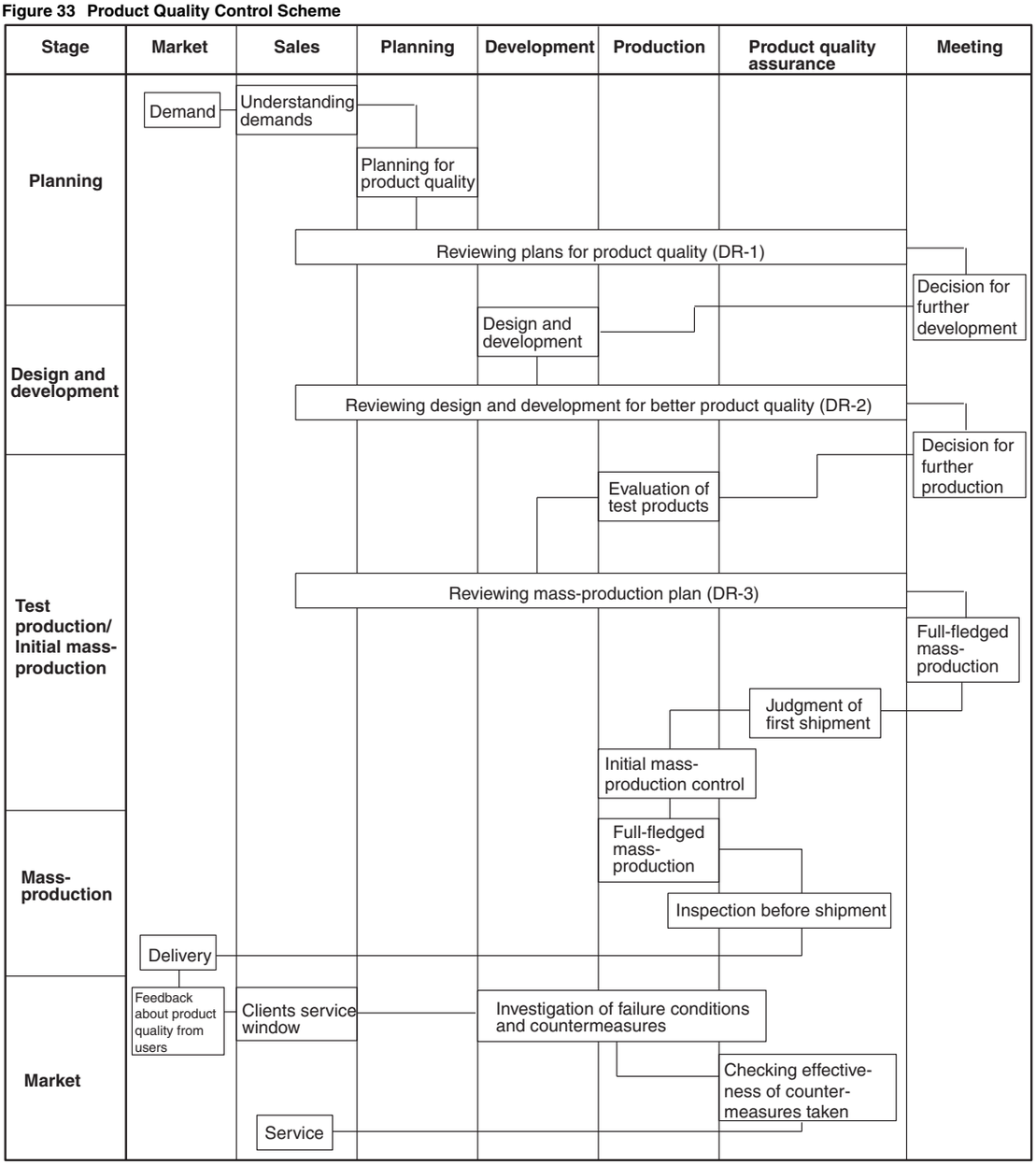
Basic Policy of Product Quality Control

OMRON has been attaching great importance to quality control of its products, with the view of making a contribution to society by producing high-quality products. The table below shows the contents of OMRON's quality control system including marketing surveys and quality control activities conducted by OMRON's various departments so that the products can be shipped in good condition.

The first step to product quality control is to reflect in the development of OMRON's products the users' demands for product quality. After setting the target, we aim at producing the products that are consistently high in quality and can meet the standards that we set. OMRON's basic concept is that each process of production is equally important as it plays an important role in product quality control.

To ensure the quality of OMRON's products in the product quality control system, we carry out various tests such as design check, process control, pre-shipment, and reliability tests.

Figure 33 Product Quality Control Scheme



Quality Control of Products Being Developed

The first step to product quality control is to reflect in the development of OMRON's products the users' demands for product quality. OMRON's DR (design review) system was made to achieve this before OMRON starts the mass production of any product. The DR system enables OMRON's engineers to review the quality of products during the planning, design and development, and initial mass-production stages to solve any quality problems and to maintain excellent product quality. Refer to the following for the steps of the DR system and the purposes of the steps.

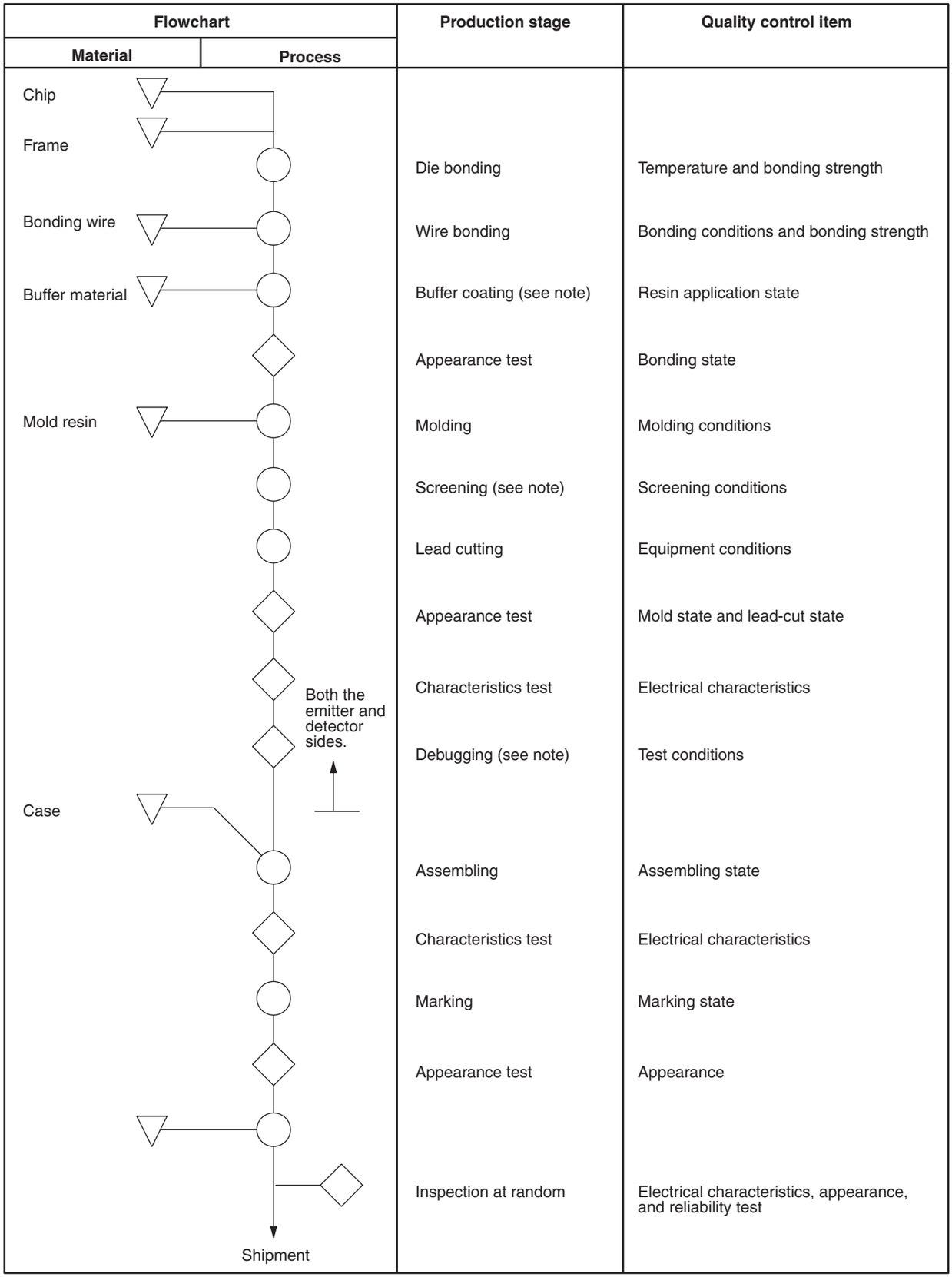
Figure 34

Reviewing plans for product quality (DR-1)	Reviewing design and development for better product quality (DR-2)	Reviewing mass-production plans (DR-3)
Evaluating the specifications of the products by considering the use, purposes, operating conditions, and target reliability of the products in the planning stages.	Evaluating the design, drawings, trial models, and test results of the products by considering not only the functions but also the productivity, safety, reliability, and production costs of the products.	Evaluating the arrangements required for the mass-production of the products in the test production or initial mass-production stages.

Product Quality Control in Mass-production Stage

To improve the quality of the products in the mass-production stages of OMRON's products, OMRON attaches importance to its staff supervision, the equipment and machines used for the manufacture of the products, the materials of the products, and the manufacturing methods of the products. There are rules for the changes in the design and manufacturing methods of the products and the steps to deal with any abnormality in the mass-production stages to conduct the quality control of the products. Figure 35 shows the flowchart used for the quality control in all the production stages of the EE-SX1041 Transmissive Photomicrosensor.

Figure 35 Quality Control in EESX1041 Photomicrosensor Production Stages



Note: Applied to the LED only.

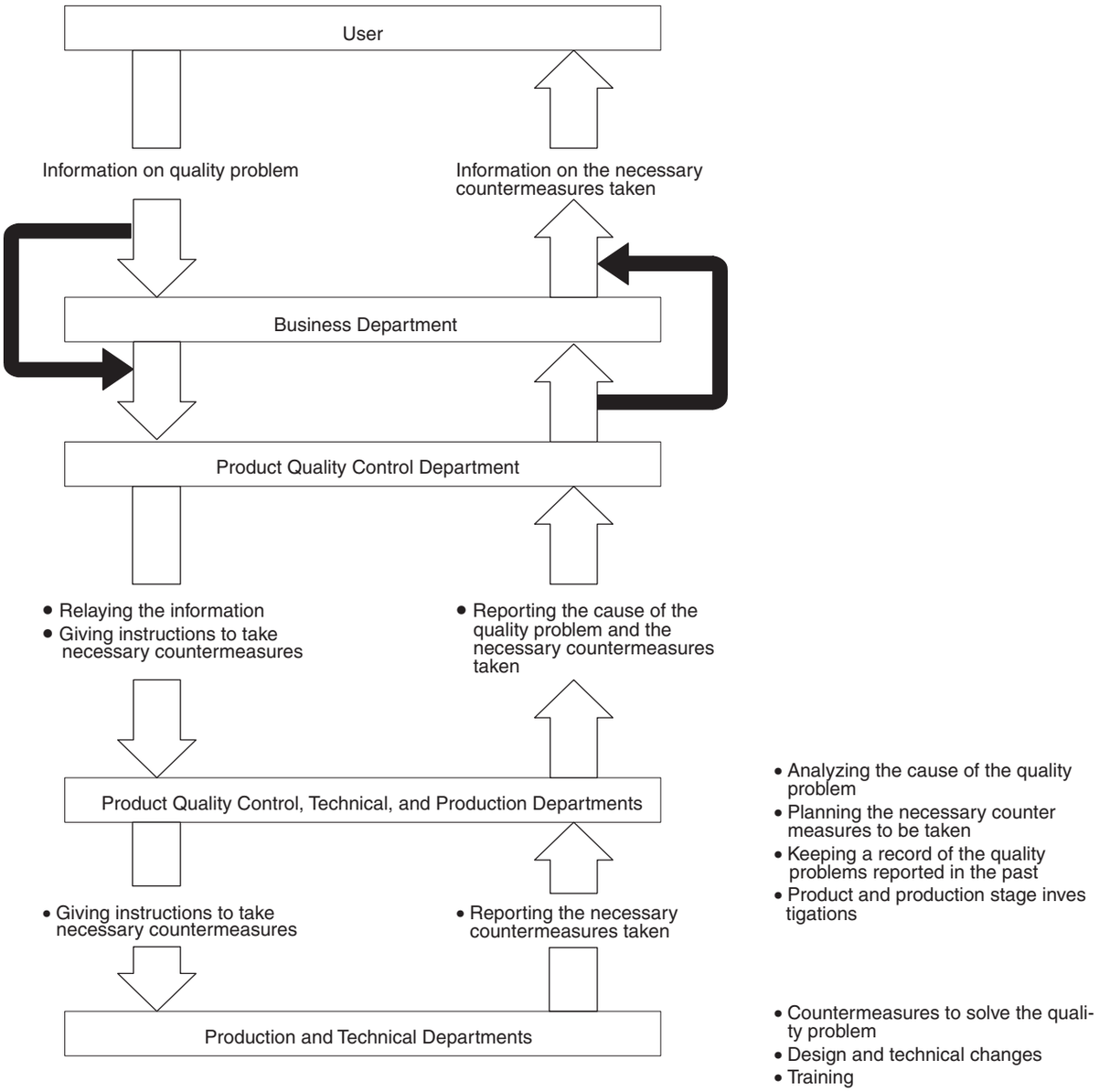
Shipment Product Quality Control

OMRON is conducting product quality control activities in the design and production stages of all OMRON's products. Recently, the failure rate tolerated by users has been less than 10 ppm, which cannot be achieved by any conventional product quality control system. OMRON is complying with OMRON product users' demand by not only conducting the above-mentioned product control activities but also properly managing its design and production stages, conducting tests of OMRON's products to ensure the reliability of the products, and strengthening its troubleshooting technology.

Market Product Quality Control

OMRON is actively collecting comments on the quality of OMRON's products on the market to reflect the results toward the improvement in the quality and reliability of OMRON's all products including any product to be released by OMRON in the future.
The comments include complaints about the quality of OMRON products. If any OMRON product on the market has a quality problem, OMRON's Product Quality Control Department, in cooperation with the departments concerned, promptly finds the cause of the problem, takes necessary countermeasures to solve the problem, and prevents the recurrence of the problem by taking the steps shown in Figure 36.

Figure 36 Treatment of Complaint about Market Product Quality



■ Reliability

Market Product Quality

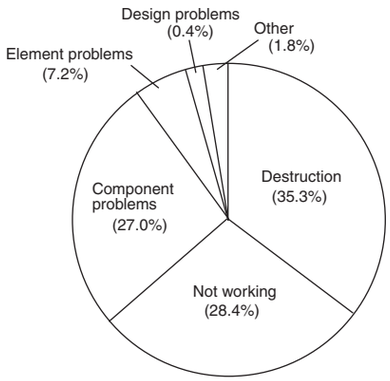
OMRON is making efforts so that OMRON's products can achieve a failure rate of only 10^{-7}/h.

OMRON will continue improving the quality of its products to comply with OMRON product users' demand for product quality while actively providing good after-sales service.

OMRON's products achieved a failure rate of 10 ppm. Figure 37 shows the reasons for the return of OMRON products.

The reasons for approximately two-thirds of the products sent back were that they were not working or they were destroyed. It is possible that they were not working or they were destroyed because excessive voltages were imposed on them or they were not operated properly according to their specifications. To solve such problems, OMRON actively holds preliminary meetings with customers who will use OMRON products and advises them of the operating conditions required by the products while actively providing them with after-sales service.

Figure 37 Reasons for Products Sent Back



The life of any Photomicrosensor depends on the secular changes of the optical output of the LED built into the Photomicrosensor. The following are the output characteristics of the Photomicrosensor, all of which depend on the optical output of the LED.

Phototransistor output	Light current (I_L)
Photo IC output	LED current I_{FT} with the photo IC output ON and OFF
Amplifier output (reflective sensor)	Sensing distance d

OMRON has been conducting reliability tests of each type of Photomicrosensor to check the secular changes of the optical output of the LED built into the Photomicrosensor.

Reliability Tests

In principle, Photomicrosensors conform to JEITA standards. The following table shows the details of the reliability tests of Photomicrosensors conducted by OMRON.

Details of Reliability Tests

Classification	Test	Detail	Conforming standard	
Thermal condition test	Soldering heat resistivity	Evaluates the soldering heat resistivity of products. Usually, this test is conducted under the following conditions. Soldering temperature: 260±5°C Soldering time:10±1 s	JEITA ED-4701/300 ED-8121 JIS C7021: A1 IEC Pub68-2-20	
	Thermal shock	Evaluates the resistivity of products to radical temperature changes. Usually, this test is conducted under the following conditions. Ta: 0°C to 100°C (liquid bath) or TstgMIN to TstgMAX (liquid bath)	JEITA ED-4701/300 JIS C7021: A3 IEC Pub68-2-14	
	Temperature cycle	Evaluates the low- and high-temperature resistivity of products. Tstg min. (30 min) — 25°C (5 min) — Tstg max. (30 min) — 25°C (5 min) 1 cycle	JEITA ED-4701/100 JIS C7021: A4 IEC Pub68-2-14	The five-minute storage periods at a temperature of 25°C in the test may be omitted.
	Temperature and humidity cycle	Evaluates the high-temperature and high-humidity resistivity of products. 65°C, 25°C, 90% to 95%, 10 cycles, −10°C 24 h, 1 cycle	JEITA ED-4701/200 JIS C7021: A5 IEC Pub68-2-4	
Mechanical test	Soldering ease	Evaluates the terminal soldering ease of the products. Usually, this test is conducted under the following conditions. Soldering temperature: 230±5°C Soldering time: 5±0.5 s	JEITA ED-4701/300 ED-8121 JIS C7021: A2 IEC Pub68-2-20	
	Terminal strength	Evaluates the resistivity of the terminals of products to the force imposed on the terminals while the products are mounted, wired, or operated. **Tension test** On each terminal of products, a specified load is imposed for 10±1 s in the direction of the terminal. **Bending test** On the tip of each terminal of products, a specified load is imposed to bend the terminal by 90° and to change it back.	JEITA ED-4701/400 ED-8121 JIS C7021: A11 IEC Pub68-2-21	
	Shock resistance	Judges the structural resistivity and mechanical resistivity of products. The conditions of this test vary with the product structure. Usually, this test is conducted under the following conditions. Impact acceleration:14,700 m/s^2 Pulse width: 0.5 ms	JEITA ED-4701/400 ED-8121 JIS C7021: A7 IEC Pub68-2-27	A product may be subjected to this test after it is packed up.
	Vibration resistance	Evaluates the vibration resistivity of products while they are transported or operated. Usually, this test is conducted under the following conditions. Frequency: 100 to 2000 Hz/4 min 200 m/s^2	JEITA ED-4701/400 ED-8121 JIS C7021: A10 IEC Pub68-2-21	A product may be subjected to this test after it is packed up.
	Natural drop	Evaluates the irregular shock resistivity of products while they are handled, transported, or operated. Usually, this test is conducted under the following conditions. Height: 75 cm No. of times: 3	JEITA EIAJ-8121 JIS C7021: A8 IEC Pub68-2-32	A product may be subjected to this test after it is packed up.

Classification	Test	Detail	Conforming standard	
Life expectancy test	Continuous operation	Evaluates the resistivity of products to a continuous, long-time electrical stress and temperature stress. Usually, this test is conducted under the following conditions. Ta: 25±5°C Bias: I_{FMAX} or P_{CMAX}	EIAJ-EDX-8121 EIAJ-SD-121: 201 JIS C7021: B4	A product may be subjected to this test at a high temperature, low temperature, or high temperature and humidity.
	High-temperature storage	Evaluates the resistivity of products to a high-storage temperature for a long time. Usually, this test is conducted under the following conditions. Ta: TstgMAX Time: 1,000 hrs	EIAJ-EDX-8121 EIAJ-SD-121: 115 JIS C7021: B10 IEC Pub68-2-2	
	Low-temperature storage	Evaluates the resistivity of products to a low-storage temperature for a long time. Usually, this test is conducted under the following conditions. Ta: TstgMIN Time: 1,000 hrs	EIAJ-EDX-8121 EIAJ-SD-121: 116 JIS C7021: B12 IEC Pub68-2-1	
	High-temperature and high-humidity storage	Evaluates the resistivity of products to a high-storage temperature and high storage humidity for a long time. Usually, this test is conducted under the following conditions. Ta: 60°C Humidity: 90% Time: 1,000 hrs	EIAJ-EDX-8121 EIAJ-SD-121: 117 JIS C7021: B11 IEC Pub68-2-3	
	High-temperature reverse bias	Evaluates the resistivity of products to a continuous electrical stress and temperature stress.	EIAJ-SD-121: 203 JIS C7021: B8	A product may be subjected to this test at a low temperature, high temperature, or high humidity.

Note: The above testing conditions and testing times depend on the features of each product.

Data from Reliability Tests

The following tables show the results of the reliability tests of typical Transmissive Photomicrosensors with an Infrared LED conducted by OMRON.

Providing this data does not imply that OMRON guarantees the specified reliability level.

Typical Failure Rates (MTTF Data)

EE-SX1041 (Transmissive Phototransistor Output)

Failure Criteria

Item	Symbol	Measuring conditions	Failure criteria	
			General test (see note)	Life test
Forward voltage	V_F	I_F = 30 mA	1.5 V max.	1.8 V max.
Reverse current	I_R	V_R = 4 V	10 μA max.	20 μA max.
Dark current	I_D	V_{CE} = 10 V 0ℓx	200 nA max.	400 nA max.
Light current	I_L	I_F = 20 mA V_{CE} = 10 V	0.5 mA min. 14 mA max.	Initial value × 0.7 min.

Note: Except life test.

Test Results

Test item	Test conditions (see note 1)	Number of samples	Component hours (h)	Number of failures	Failure rate (1/h) (see note 2)
Continuous operation	Ta = 25°C, I_F = 50 mA 2000 h	22 pcs	4.4×10^4	0	5.22×10^{-5}
High-temperature storage	Ta = 100°C 2000 h	22 pcs	4.4×10^4	0	5.22×10^{-5}
Low-temperature storage	Ta = –30°C 2000 h	22 pcs	4.4×10^4	0	5.22×10^{-5}
High-temperature and high-humidity storage	Ta = 60°C, 90% 2000 h	22 pcs	4.4×10^4	0	5.22×10^{-5}
High-temperature reverse bias	Ta = 85°C, V_{CE} = 30 V 2000 h	22 pcs	4.4×10^4	0	5.22×10^{-5}
Temperature cycle	–30°C (30 min) to 100°C (30 min) 10 times	22 pcs	---	0	---
Shock resistance	14,700 m/s², 0.5 ms, 3 times each in ±X, ±Y, and ±Z directions	11 pcs	---	0	---
Vibration resistance	20 to 2,000 Hz, 1.5 mm or 98 m/s² each in X, Y, and Z directions	11 pcs	---	0	---

Note: 1. The tests after 1001 hours are for reference only.
2. Confidence level of 90%.

EE-SX1235A-P2 (Transmissive Phototransistor Output)

Failure Criteria

Item	Symbol	Measuring conditions	Failure criteria	
			General test (see note)	Life test
Forward voltage	V_F	I_F = 30 mA	1.5 V max.	1.8 V max.
Reverse current	I_R	V_R = 4 V	10 μA max.	20 μA max.
Dark current	I_D	V_{CE} = 10 V 0*lx*	200 nA max.	400 nA max.
Light current	I_L	I_F = 20 mA V_{CE} = 5 V	0.5 mA min. 14 mA max.	Initial value × 0.7 min.

Note: Except life test.

Test Results

Test item	Test conditions (see note 1)	Number of samples	Component hours (h)	Number of failures	Failure rate (1/h) (see note 2)
Continuous operation	Ta = 25°C, I_F = 50 mA 2000 h	22 pcs	4.4×10^4	0	5.22×10^{-5}
High-temperature storage	Ta = 100°C 2000 h	22 pcs	4.4×10^4	0	5.22×10^{-5}
Low-temperature storage	Ta = –40°C 2000 h	22 pcs	4.4×10^4	0	5.22×10^{-5}
High-temperature and high-humidity storage	Ta = 60°C, 90% 2000 h	22 pcs	4.4×10^4	0	5.22×10^{-5}
High-temperature reverse bias	Ta = 85°C, V_{CE} = 30 V 2000 h	22 pcs	4.4×10^4	0	5.22×10^{-5}
Temperature cycle	–40°C (30 min) to 100°C (30 min) 10 times	22 pcs	---	0	---
Shock resistance	294 m/s^2, 0.5 ms, 3 times each in ±X, ±Y, and ±Z directions	11 pcs	---	0	---
Vibration resistance	5 to 50 Hz, 1.5 mm or 9.8 m/s^2 each in X, Y, and Z directions	11 pcs	---	0	---

Note: 1. The tests after 1001 hours are for reference only.
2. Confidence level of 90%.

EE-SX398 (Transmissive Photo-IC Output)

Failure Criteria

Item	Symbol	Measuring conditions	Failure criteria	
			General test (see note)	Life test
Forward voltage	V_F	I_F = 20 mA	1.5 V max.	1.8 V max.
Reverse current	I_R	V_R = 4 V	10 μA max.	20 μA max.
Low-level output voltage	V_{OL}	V_{CC} = 16 V I_{OL} = 16 mA I_F = 0 mA	0.4 V max.	0.48 V max.
High-level output current	I_{OH}	V_{CC} = 16 V V_{OUT} = 28 V I_F = 5 mA	100 μA max.	200 μA max.
Current consumption	I_{CC}	V_{CC} = 16 V	10 mA max.	12 mA max.
LED current when output is OFF	I_{FT}	V_{CC} = 16 V I_{OL} = 16 mA	5 mA max.	Initial value × 1.3 max.

Note: Except life test.

Test Results

Test item	Test conditions (see note 1)	Number of samples	Component hours (h)	Number of failures	Failure rate (1/h) (see note 2)
Continuous operation	Ta = 25°C, I_F = 20 mA, V_{CC} = 5 V 1500 h	22 pcs	3.3×10^4	0	6.96×10^{-5}
High-temperature storage	Ta = 100°C 2000 h	22 pcs	3.3×10^4	0	6.96×10^{-5}
Low-temperature storage	Ta = –40°C 2000 h	22 pcs	3.3×10^4	0	6.96×10^{-5}
High-temperature and high-humidity storage	Ta = 60°C, 90% 2000 h	22 pcs	3.3×10^4	0	6.96×10^{-5}
High-temperature reverse bias	Ta = 85°C, V_{CE} = 30 V 2000 h	22 pcs	3.3×10^4	0	6.96×10^{-5}
Temperature cycle	–40°C (30 min) to 100°C (30 min) 10 times	22 pcs	---	0	---
Shock resistance	14,700 m/s², 0.5 ms, 3 times each in ±X, ±Y, and ±Z directions	11 pcs	---	0	---
Vibration resistance	20 to 2,000 Hz, 1.5 mm or 98 m/s² each in X, Y, and Z directions	11 pcs	---	0	---

Note: 1. The tests after 1001 hours are for reference only.
2. Confidence level of 90%.

EE-SX4235A-P2 (Transmissive Photo-IC Output)

Failure Criteria

Item	Symbol	Measuring conditions	Failure criteria	
			General test (see note)	Life test
Current consumption	I_{CC}	V_{CC} = 5.5 V	16.5 mA max.	19.8 mA max.
Low-level output voltage	V_{OL}	V_{CC} = 4.5 V I_{OUT} = 16 mA with incident	0.35 V max.	0.42 V max.
High-level output voltage	I_{OH}	V_{CC} = 5.5 V V_{OUT} = V_{CC} with incident R_L = 47 kΩ	4.95 V max.	3.96 V max.

Note: Except life test.

Test Results

Test item	Test conditions (see note 1)	Number of samples	Component hours (h)	Number of failures	Failure rate (1/h) (see note 2)
Continuous operation	Ta = 25°C, V_{CC} = 5 V 1000 h	22 pcs	2.2×10^4	0	1.05×10^{-4}
High-temperature storage	Ta = 85°C 1000 h	22 pcs	2.2×10^4	0	1.05×10^{-4}
Low-temperature storage	Ta = –40°C 1000 h	22 pcs	2.2×10^4	0	1.05×10^{-4}
High-temperature and high-humidity storage	Ta = 60°C, 90% 1000 h	22 pcs	2.2×10^4	0	1.05×10^{-4}
Temperature cycle	–40°C (30 min) to 85°C (30 min) 10 times	22 pcs	---	0	---
Shock resistance	294 m/s², 0.5 ms, 3 times each in ±X, ±Y, and ±Z directions	11 pcs	---	0	---
Vibration resistance	5 to 50 Hz, 1.5 mm or 9.8 m/s² each in X, Y, and Z directions	11 pcs	---	0	---

Note: 1. The tests after 1001 hours are for reference only.
2. Confidence level of 90%.

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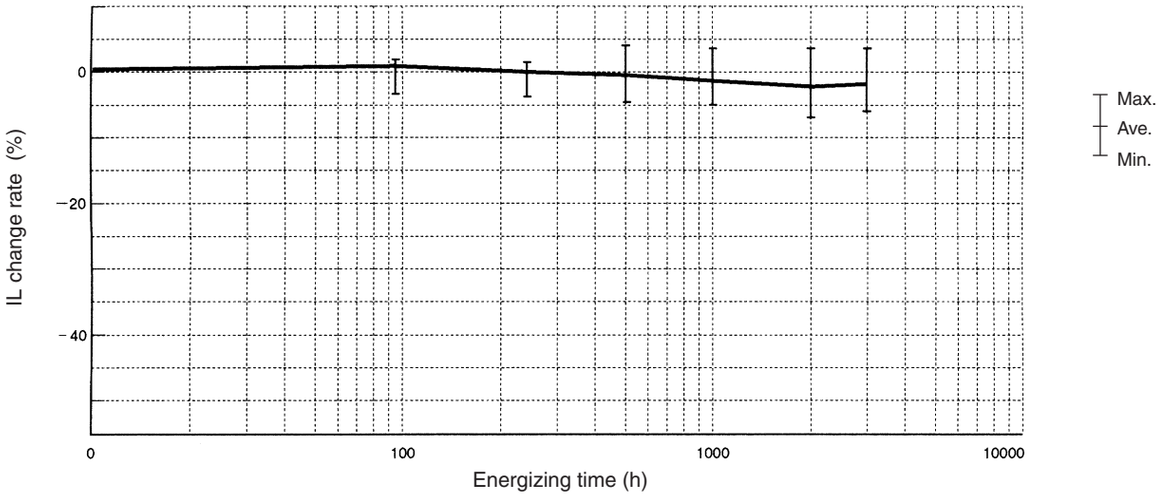
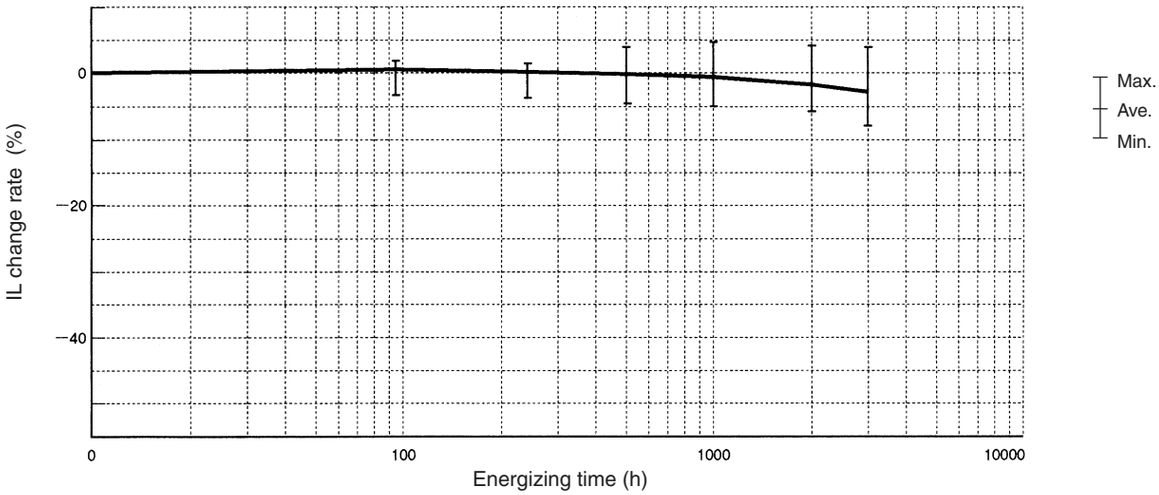
Light Current (I_L) Secular Changes of Phototransistor Output Photomicrosensor

Note: These graphs show the results of reliability testing conducted by OMRON for typical transmissive photomicrosensors (e.g., the EE-SX1041, EE-SX1081, and EE-SX1235A-P2) with an Infrared LED. For the reliability of the Photomicrosensor with a Red LED, please contact your nearest OMRON representative.

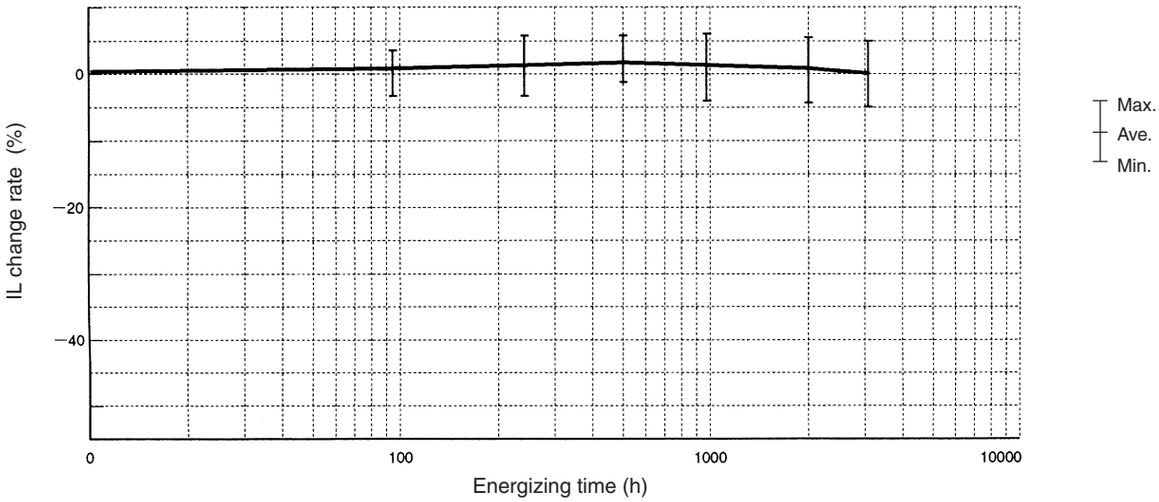
Ta = 25°C, I_F = 20 mA, n = 22



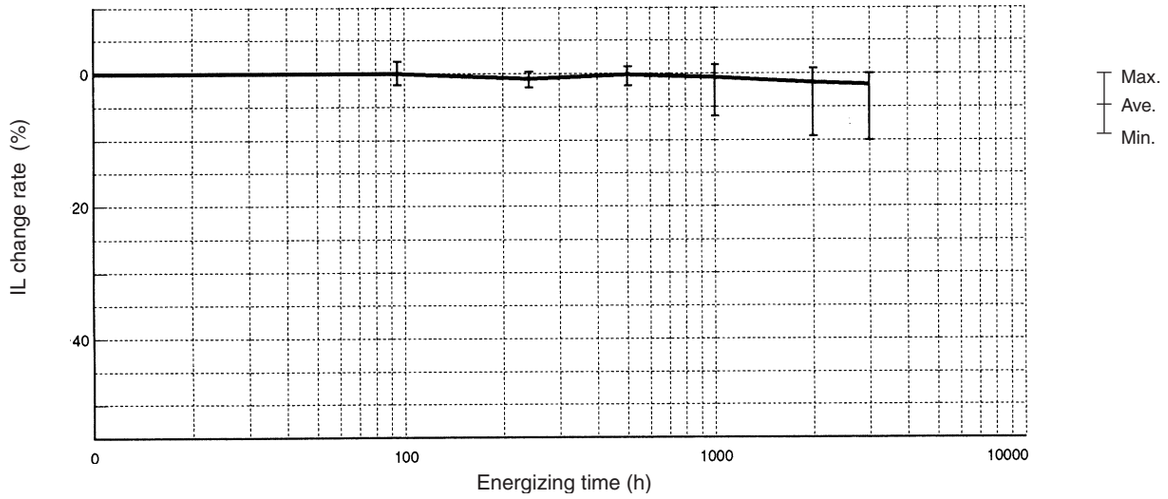
Ta = 25°C, I_F = 50 mA, n = 22



Ta = 85°C, I_F = 10 mA, n = 22



Ta = –25°C, I_F = 50 mA, n = 22

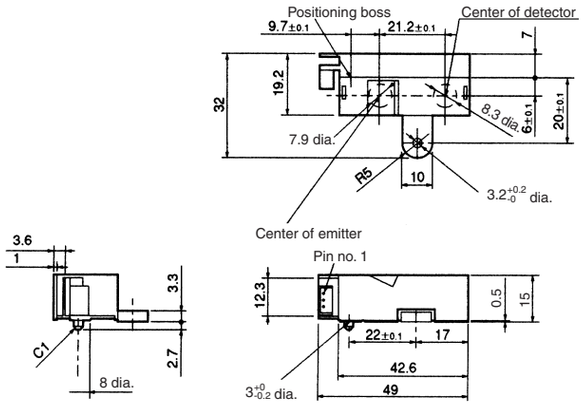


OMRON

Multi-beam Sensor (1 Beam: 50 mm)
EY3A-1051

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Pin no.	Remarks	Name
1	O	Output (OUT)
2	V	Power supply (Vcc)
3	G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65
30 < mm ≤ 50	±0.8

Recommended Mating Connectors:
Japan Molex 51090-0300 (crimp connector)
52484-0310 (press-fit connector)

■ Features

- Ensures higher sensitivity and external light interference resistivity than any other photomicrosensor.
- Narrow sensing range ensures stable sensing of a variety of sensing objects.
- Designed to detect manuscript paper on a glass platen.
- RoHS Compliant

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Load voltage		V_{OUT}	7 V
Load current		I_{OUT}	10 mA
Ambient temperature	Operating	T_{opr}	0°C to 60°C
	Storage	T_{stg}	–15°C to 70°C

Note: Make sure there is no icing or condensation when operating the Sensor.

■ Ordering Information

Description	Model
Multi-beam sensor	**EY3A-1051**

■ Electrical and Optical Characteristics (Ta = 0°C to 60°C)

Item	Value	Condition
Power supply voltage	5 V ±5%	---
Current consumption	50 mA max.	V_{CC} = 5 V, R_L = ∞
Peak current consumption	200 mA max.	V_{CC} = 5 V, R_L = ∞
Low-level output voltage	0.6 V max.	V_{CC} = 5 V, I_{OL} = 4 mA (see note 1)
High-level output voltage	3.5 V min.	V_{CC} = 5 V, R_L = 4.7 kΩ (see note 2)
Response delay time (High to Low)	1.5 ms max.	The time required for the output to become “Lo” after placing sensing object.
Response delay time (Low to High)	1.5 ms max.	The time required for the output to become “Hi” after removing sensing object.

Note: 1. These conditions are for the sensing of lusterless paper with an OD of 0.9 maximum located at the correct sensing position of the Sensor as shown in the optical path arrangement on the next page.

2. These conditions are for the sensing of the paper supporting plate with an OD of 0.05 located using the glass plate without paper as shown in the optical path arrangement on the next page.

■ Characteristics (Paper Table Glass: t = 6 mm max., Transparency Rate: 90% min.) (Ta =0°C to 60°C)

Item	Characteristic value
Sensing density	Lusterless paper with an OD of 0.9 max. (sensing distance: 50 mm) (see note)
Non-sensing distance	85 mm (from the top of the sensor), OD: 0.05
Paper sensing distance	50 mm (from the top of the sensor)
Ambient illumination	Sunlight: 3,000 ℓx max., fluorescent light: 2,000 ℓx max.

Note: 1. The data shown are initial data.

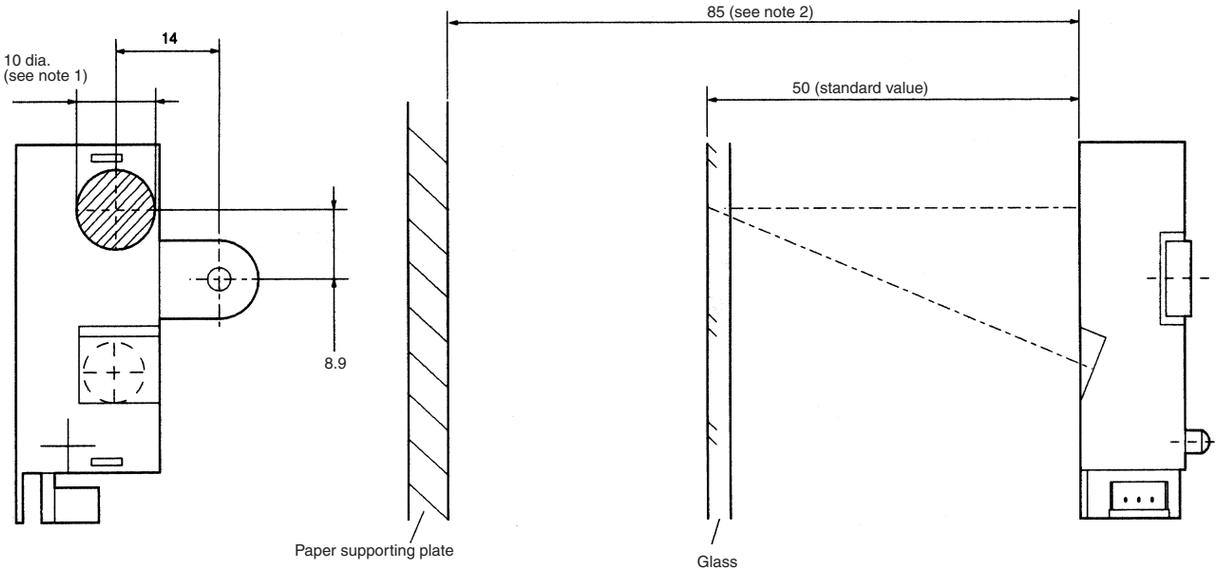
2. Optical darkness (OD) is defined by the following formula:

$$OD = -\log_{10}\left(\frac{P_{OUT}}{P_{IN}}\right)$$

P_{IN} (mW): Light power incident upon the document

P_{OUT} (mW):Reflected light power from the document

■ Optical Path Arrangement

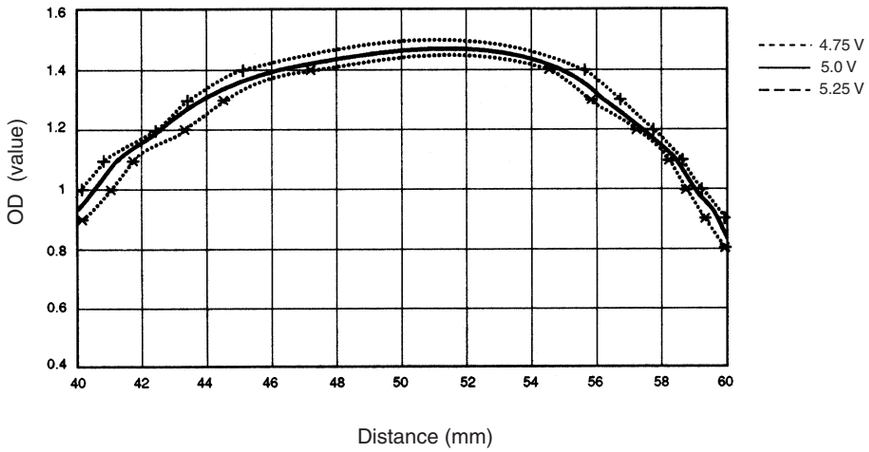


Note: 1. The part with oblique lines indicates the paper sensing area of the EY3A-1051, which is practically determined by the diameter of the beam and its tolerance.

2. The non-sensing distance of the EY3A-1051 is determined using a paper with an OD of 0.05.

■ Engineering Data

Distance Characteristics (Typical)

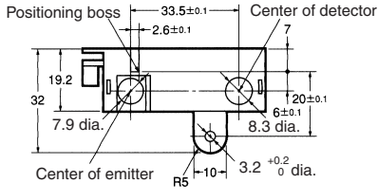


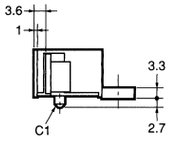
OMRON

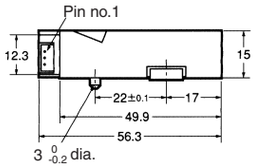
Multi-beam Sensor (1 Beam: 80 mm)
EY3A-1081

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.







Pin no.	Remarks	Name
1	O	Output (OUT)
2	V	Power supply (Vcc)
3	G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65
30 < mm ≤ 50	±0.8
50 < mm ≤ 80	±0.95

Recommended Mating Connectors:
Japan Molex 51090-0300 (crimp connector)
52484-0310 (press-fit connector)

■ Features

- Ensures higher sensitivity and external light interference resistivity than any other photomicrosensor.
- Narrow sensing range ensures stable sensing of a variety of sensing objects.
- Designed to detect manuscript paper on a glass platen.
- RoHS Compliant

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Load voltage		V_{OUT}	7 V
Load current		I_{OUT}	10 mA
Ambient temperature	Operating	T_{opr}	0°C to 60°C
	Storage	T_{stg}	–15°C to 70°C

Note: Make sure there is no icing or condensation when operating the Sensor.

■ Ordering Information

Description	Model
Multi-beam sensor	**EY3A-1081**

■ Electrical and Optical Characteristics (Ta = 0°C to 60°C)

Item	Value	Condition
Power supply voltage	5 V ±5%	---
Current consumption	50 mA max.	V_{CC} = 5 V, R_L = ∞
Peak current consumption	200 mA max.	V_{CC} = 5 V, R_L = ∞
Low-level output voltage	0.6 V max.	V_{CC} = 5 V, I_{OL} = 4 mA (see note 1)
High-level output voltage	3.5 V min.	V_{CC} = 5 V, R_L = 4.7 kΩ (see note 2)
Response delay time (High toLow)	1.5 ms max.	The time required for the output to become “Lo” after placing sensing object.
Response delay time Low to High)	1.5 ms max.	The time required for the output to become “Hi” after removing sensing object.

Note: 1. These conditions are for the sensing of lusterless paper with an OD of 0.7 maximum located at the correct sensing position of the Sensor as shown in the optical path arrangement on the next page.

2. These conditions are for the sensing of the paper supporting plate with an OD of 0.05 located using the glass plate without paper as shown in the optical path arrangement on the next page.

■ Characteristics (Paper Table Glass: t = 6 mm max., Transparency Rate: 90% min.) (Ta =0°C to 60°C)

Item	Characteristic value
Sensing density	Lusterless paper with an OD of 0.7 max. (sensing distance: 80 mm) (see note)
Non-sensing distance	120 mm (from the top of the sensor), OD: 0.05
Paper sensing distance	80 mm (from the top of the sensor)
Ambient illumination	Sunlight: 3,000 ℓx max., fluorescent light: 2,000 ℓx max.

Note: 1. The data shown are initial data.

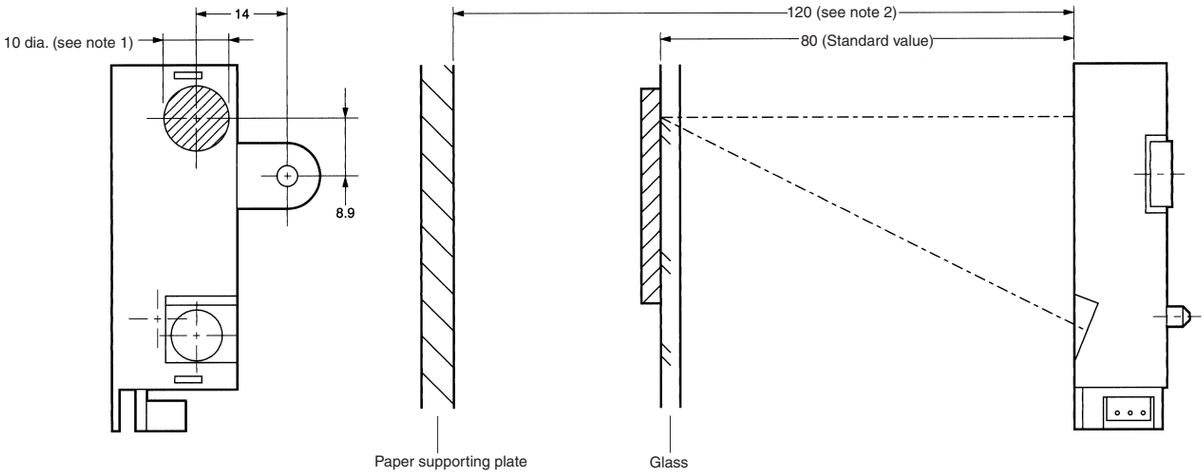
2. Optical darkness (OD) is defined by the following formula:

$$OD = -\log_{10}\left(\frac{P_{OUT}}{P_{IN}}\right)$$

P_{IN} (mW): Light power incident upon the document

P_{OUT} (mW):Reflected light power from the document

■ Optical Path Arrangement

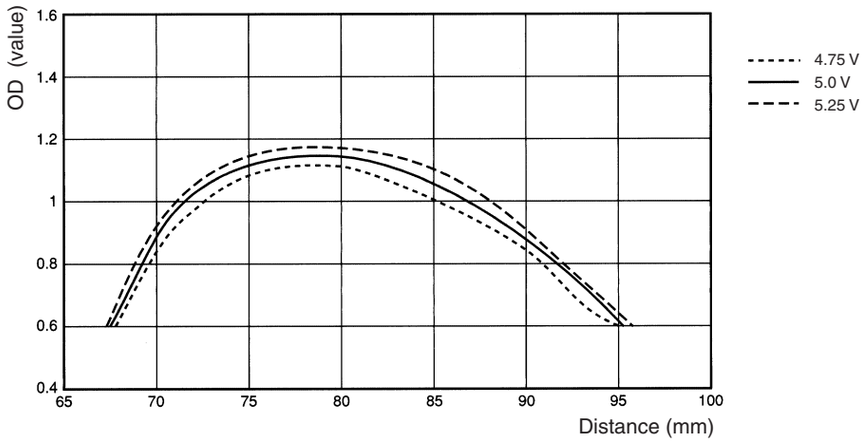


Note: 1. The part with oblique lines indicates the paper sensing area of the EY3A-1081, which is practically determined by the diameter of the beam and its tolerance.

2. The non-sensing distance of the EY3A-1081 is determined using a paper with an OD of 0.05.

■ Engineering Data

Distance Characteristics (Typical)

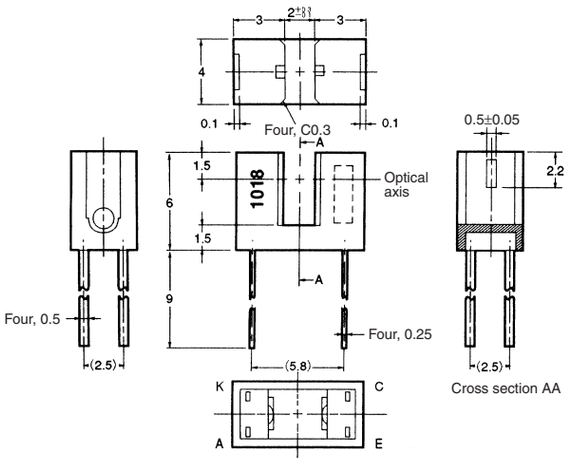


OMRON

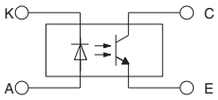
Photomicrosensor (Transmissive)
EE-SX1018

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Compact model with a 2-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1018**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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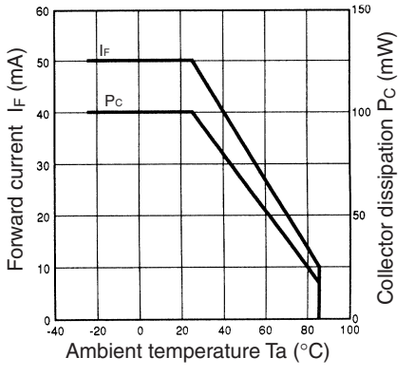
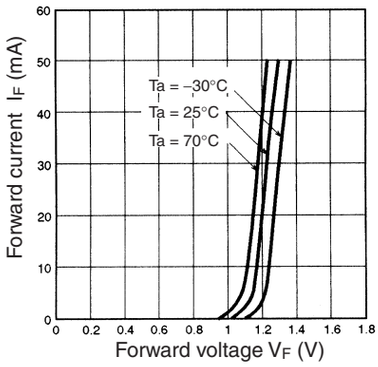
■ Engineering Data

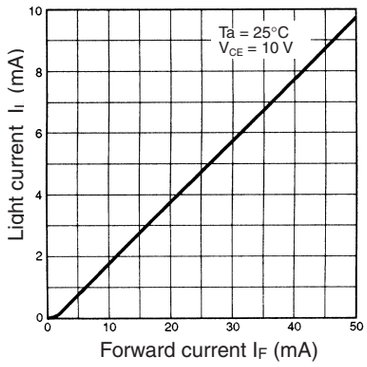
Forward Current vs. Collector Dissipation Temperature Rating



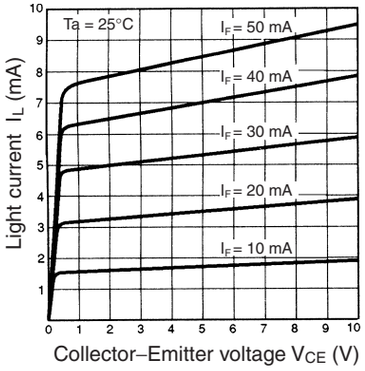
Forward Current vs. Forward Voltage Characteristics (Typical)



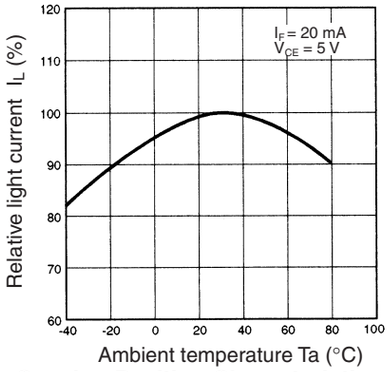
Light Current vs. Forward Current Characteristics (Typical)



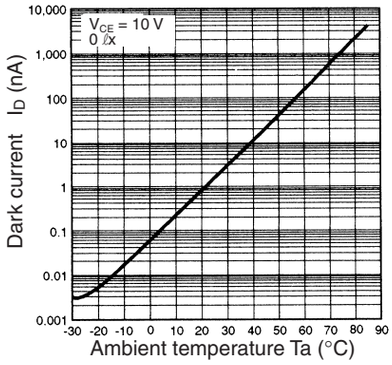
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



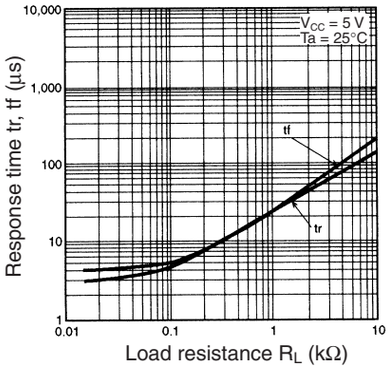
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



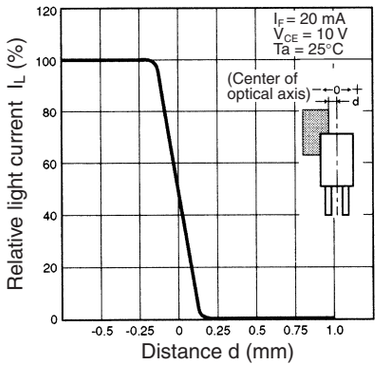
Dark Current vs. Ambient Temperature Characteristics (Typical)



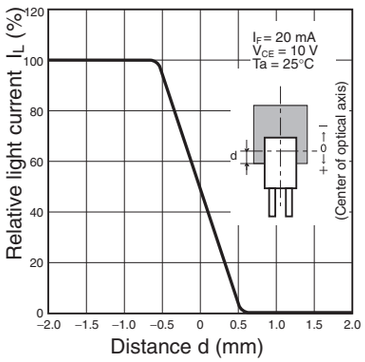
Response Time vs. Load Resistance Characteristics (Typical)



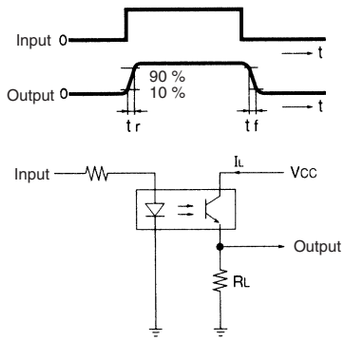
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

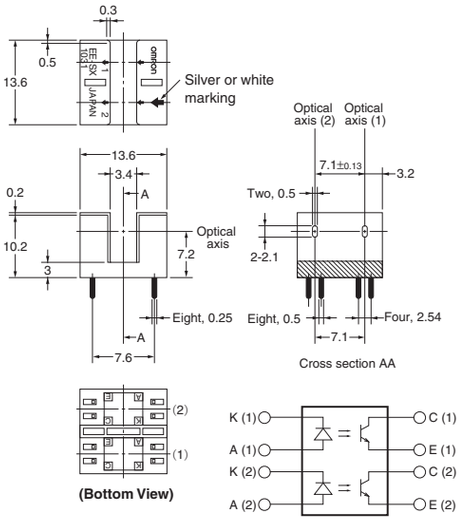


OMRON

Photomicrosensor (Transmissive)
EE-SX1031

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



■ Features

- High resolution with a 0.5-mm-wide aperture.
- Separate LED/Phototransistor combinations within a single housing.
- PCB mounting type.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1031**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 to 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.15 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time (see note)		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

Note: Refer to *Response Time Measurement Circuit.*

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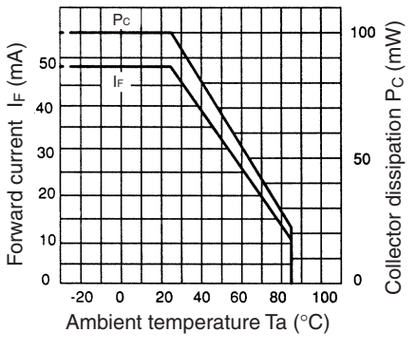
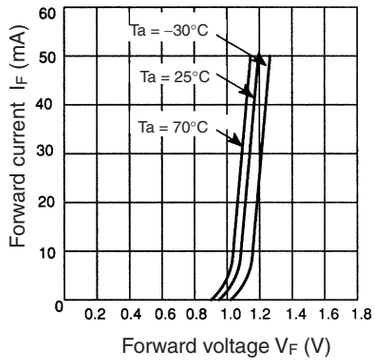
■ Engineering Data

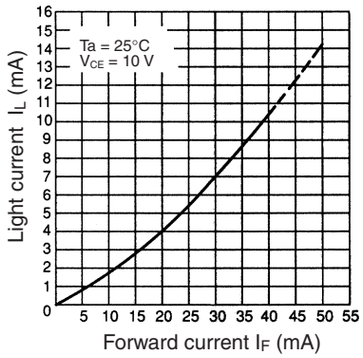
Forward Current vs. Collector Dissipation Temperature Rating



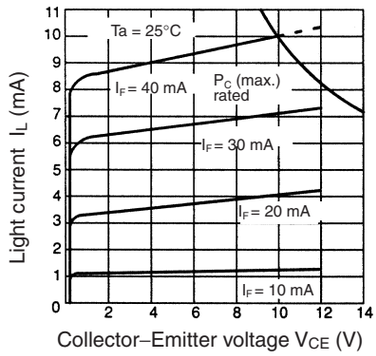
Forward Current vs. Forward Voltage Characteristics (Typical)



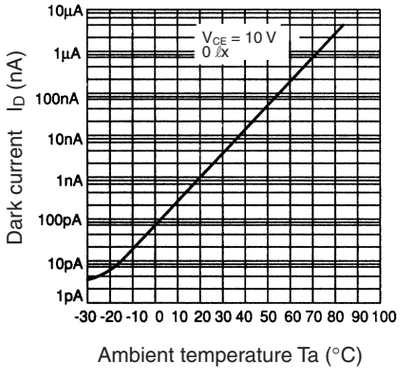
Light Current vs. Forward Current Characteristics (Typical)



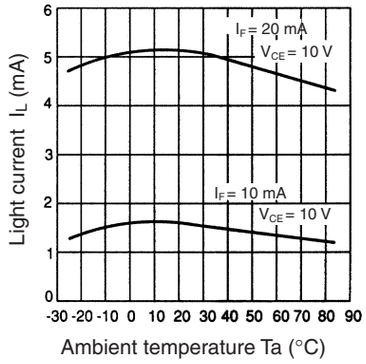
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



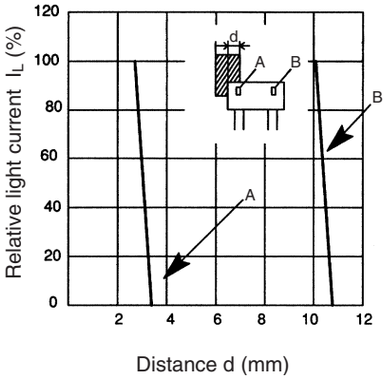
Dark Current vs. Ambient Temperature Characteristics (Typical)



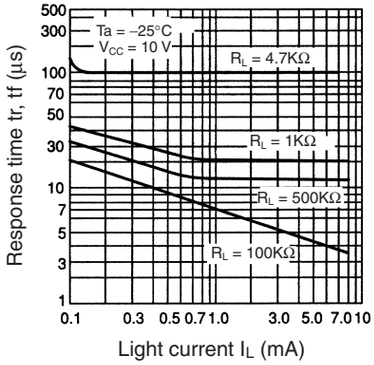
Light Current vs. Ambient Temperature Characteristics (Typical)



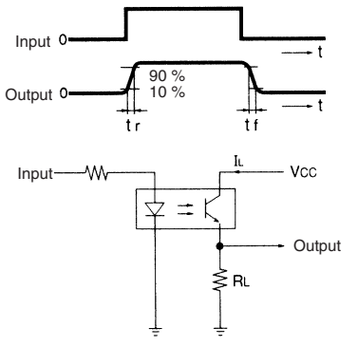
Sensing Position Characteristics (Typical)



Response Time vs. Load Resistance Characteristics (Typical)



Response Time Measurement Circuit



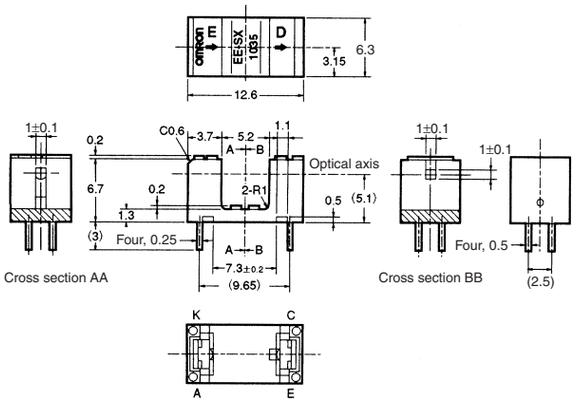
Note: The operating conditions of the Photomicrosensor must be within the absolute maximum rating ranges.

OMRON

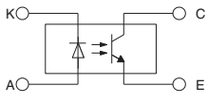
Photomicrosensor (Transmissive)
EE-SX1035

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

■ Features

- Compact model with a 5.2-mm-wide slot.
- PCB mounting type.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1035**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.15 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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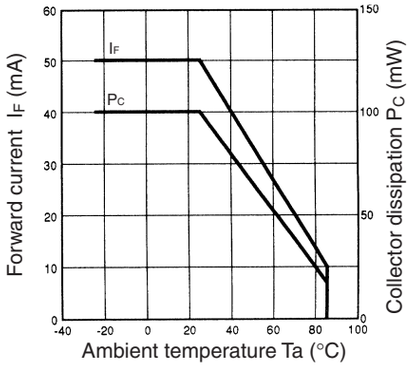
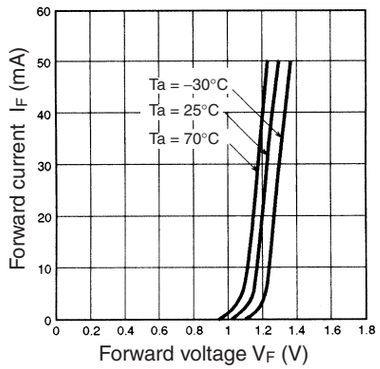
■ Engineering Data

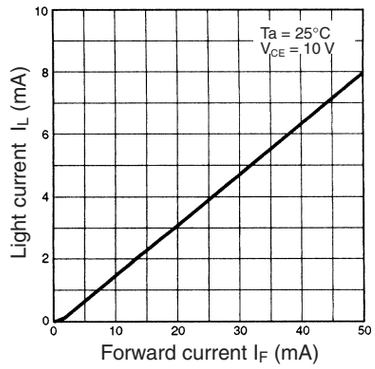
Forward Current vs. Collector Dissipation Temperature Rating



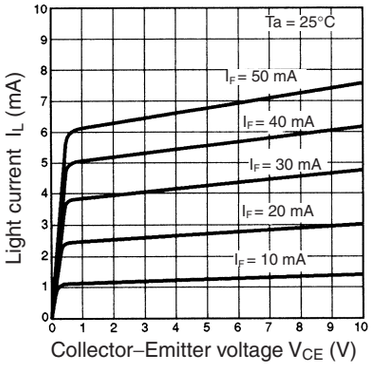
Forward Current vs. Forward Voltage Characteristics (Typical)



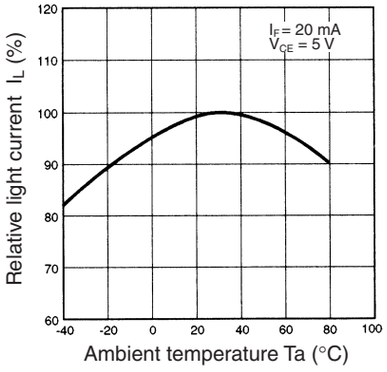
Light Current vs. Forward Current Characteristics (Typical)



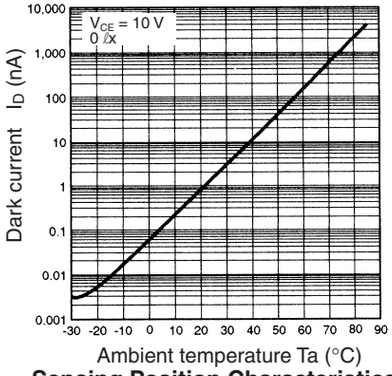
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



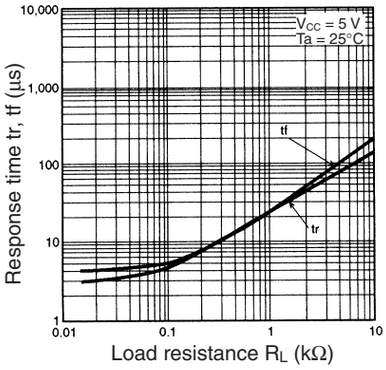
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



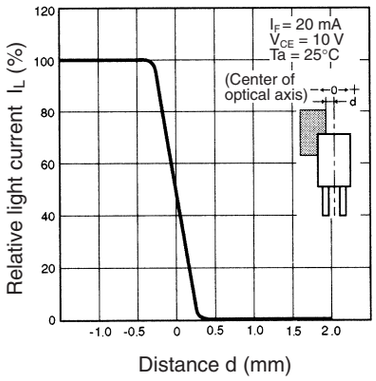
Dark Current vs. Ambient Temperature Characteristics (Typical)



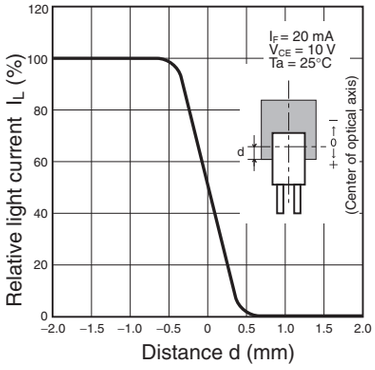
Response Time vs. Load Resistance Characteristics (Typical)



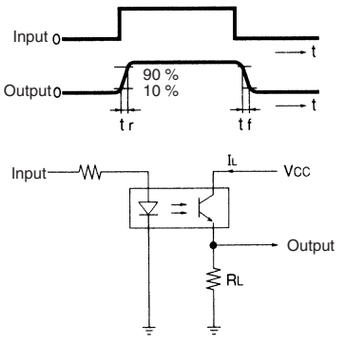
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



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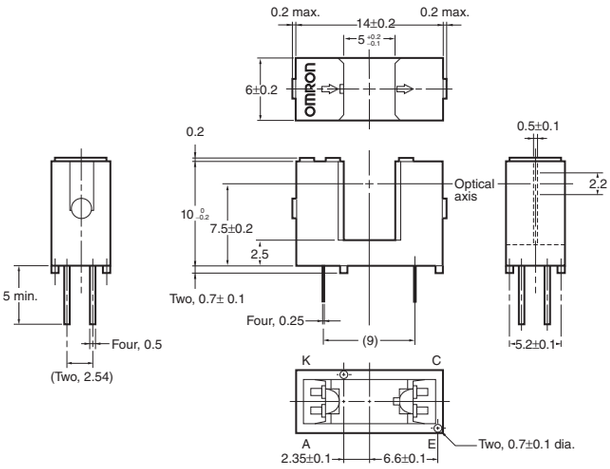
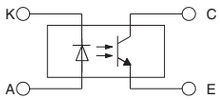
Photomicrosensor (Transmissive)
EE-SX1041

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- General-purpose model with a 5-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 95°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1041**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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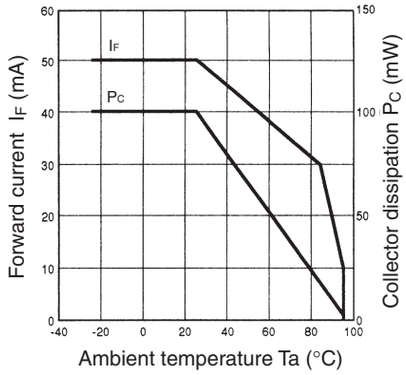
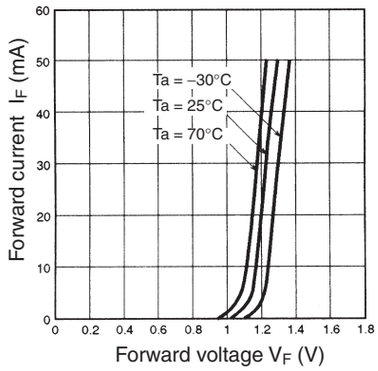
■ Engineering Data

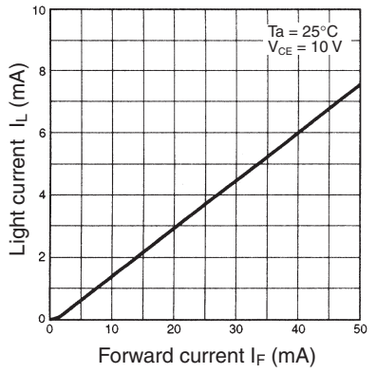
Forward Current vs. Collector Dissipation Temperature Rating



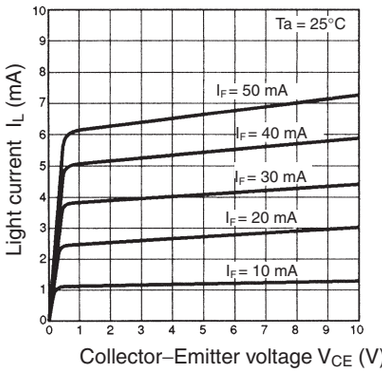
Forward Current vs. Forward Voltage Characteristics (Typical)



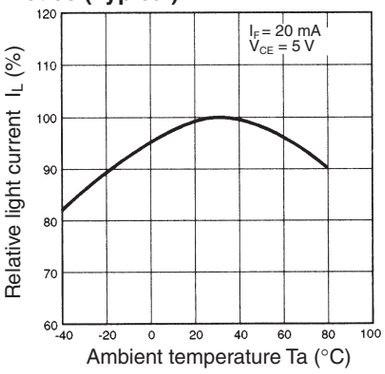
Light Current vs. Forward Current Characteristics (Typical)



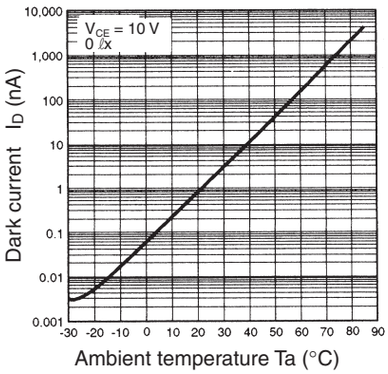
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



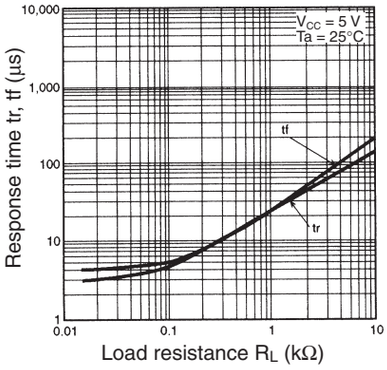
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



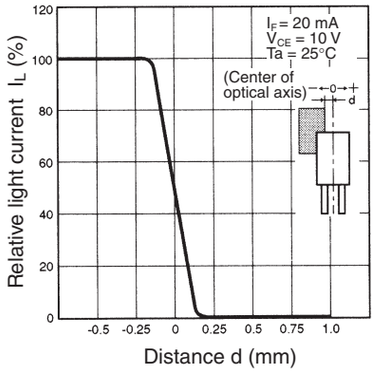
Dark Current vs. Ambient Temperature Characteristics (Typical)



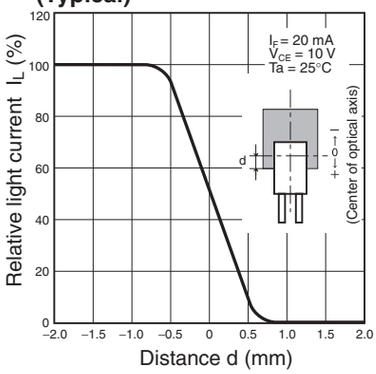
Response Time vs. Load Resistance Characteristics (Typical)



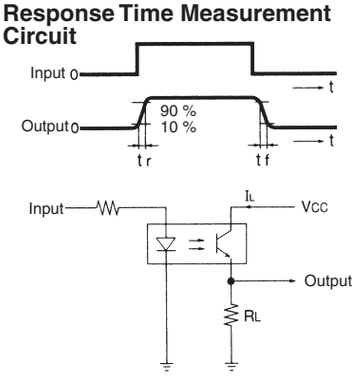
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

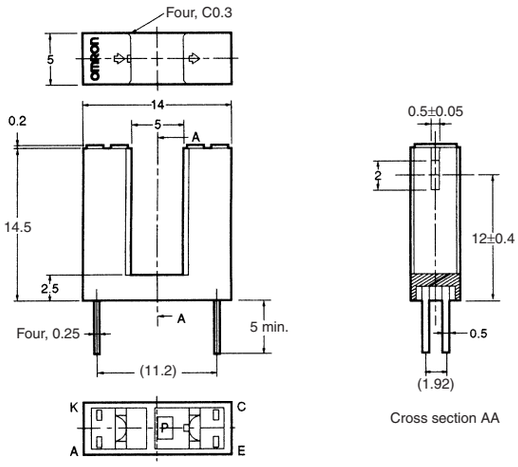


OMRON

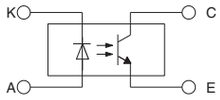
Photomicrosensor (Transmissive)
EE-SX1042

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- 14.5-mm-tall model with a deep slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1042**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 10 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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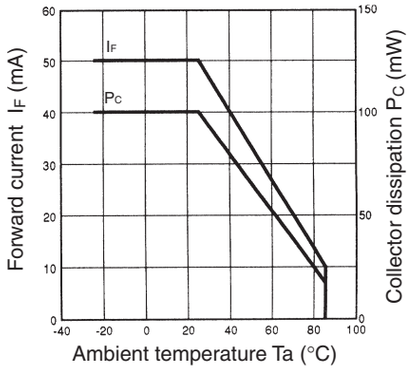
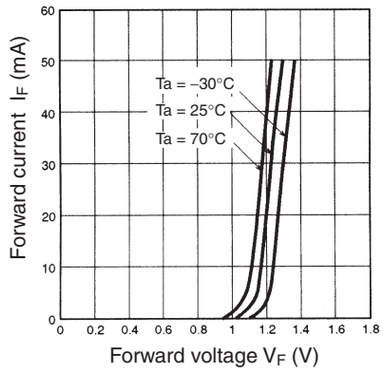
■ Engineering Data

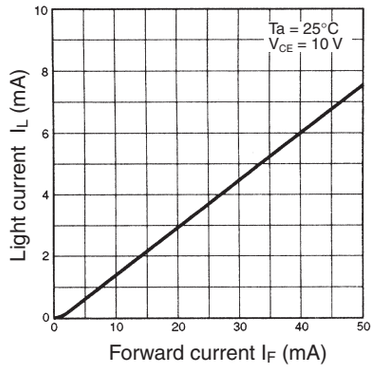
Forward Current vs. Collector Dissipation Temperature Rating



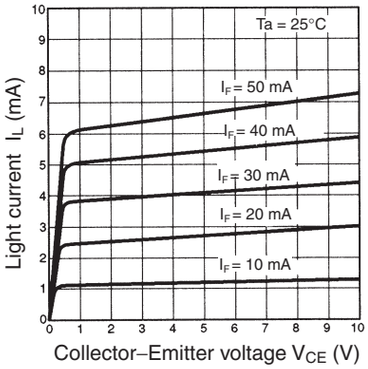
Forward Current vs. Forward Voltage Characteristics (Typical)



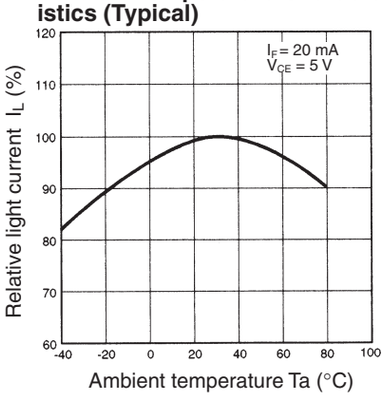
Light Current vs. Forward Current Characteristics (Typical)



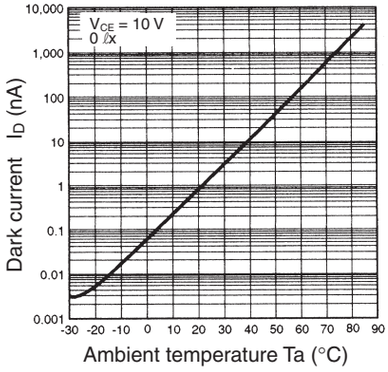
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



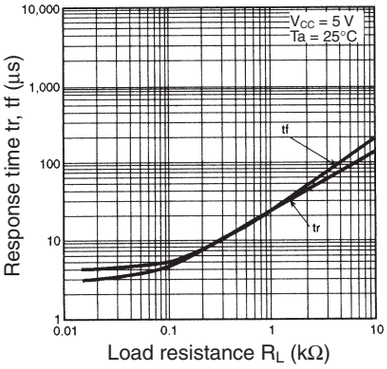
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



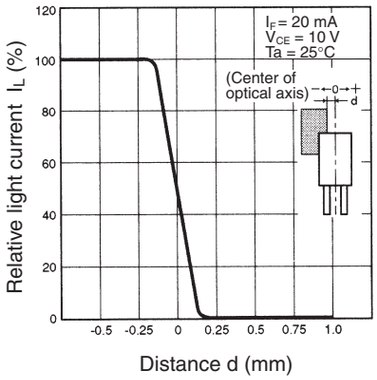
Dark Current vs. Ambient Temperature Characteristics (Typical)



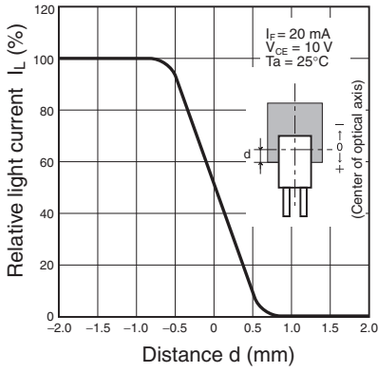
Response Time vs. Load Resistance Characteristics (Typical)



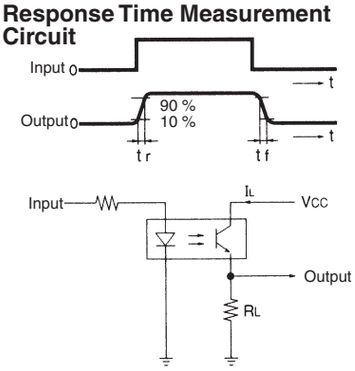
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

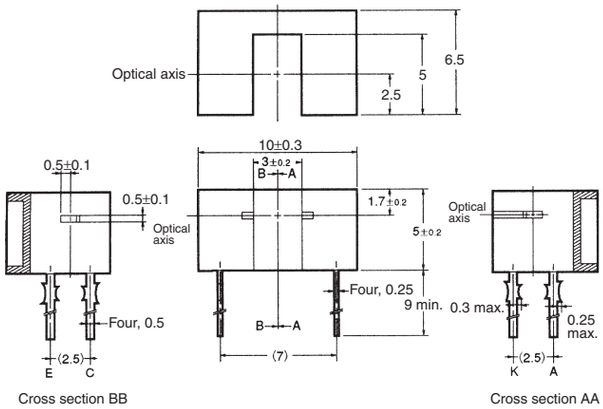


OMRON

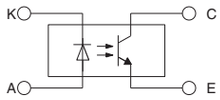
Photomicrosensor (Transmissive)
EE-SX1046

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm 6	±0.375
6 < mm 10	±0.45
10 < mm 18	±0.55
18 < mm 30	±0.65

■ Features

- With a horizontal sensing aperture.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1046**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	920 nm typ.	I_F = 20 mA
Detector	Light current	I_L	1.2 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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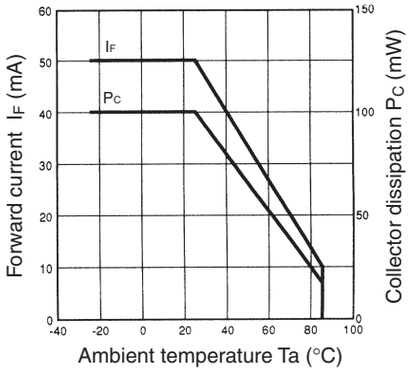
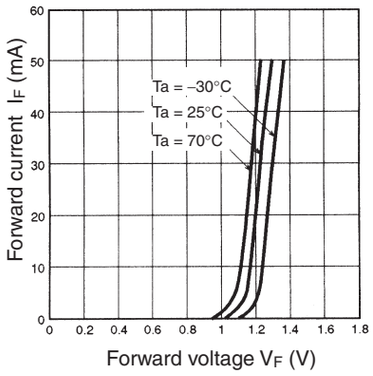
■ Engineering Data

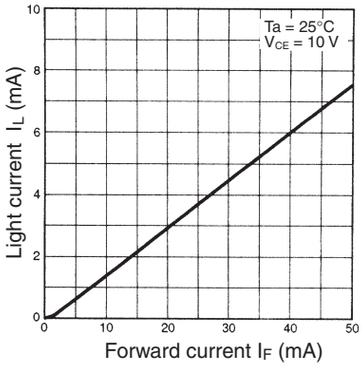
Forward Current vs. Collector Dissipation Temperature Rating



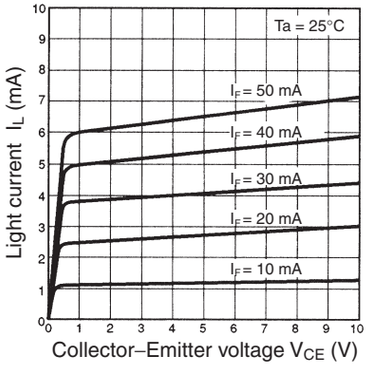
Forward Current vs. Forward Voltage Characteristics (Typical)



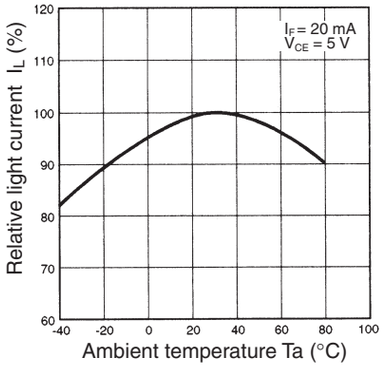
Light Current vs. Forward Current Characteristics (Typical)



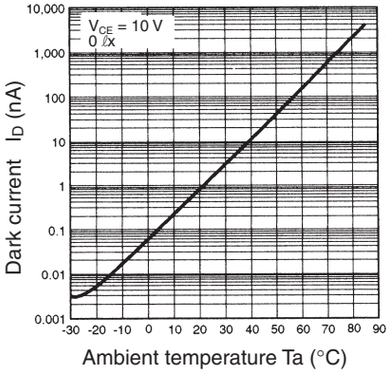
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



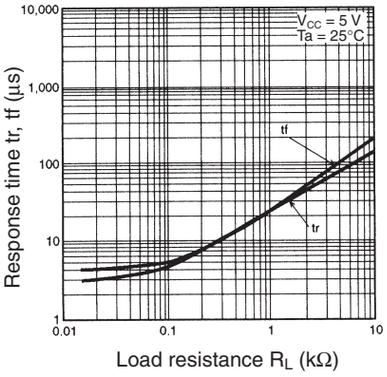
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



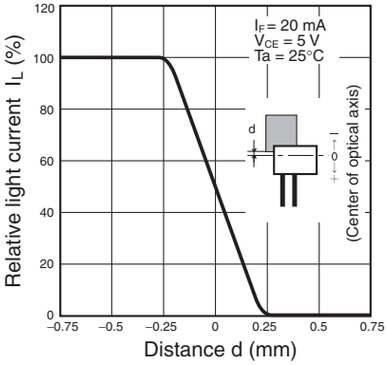
Dark Current vs. Ambient Temperature Characteristics (Typical)



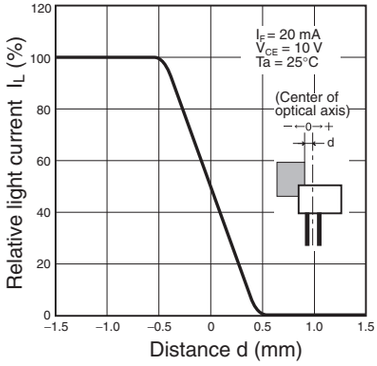
Response Time vs. Load Resistance Characteristics (Typical)



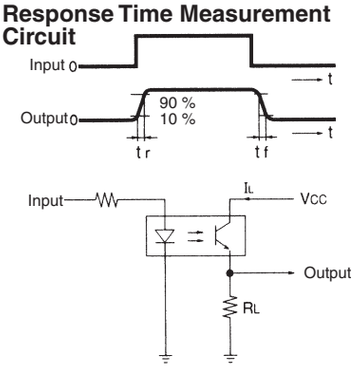
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

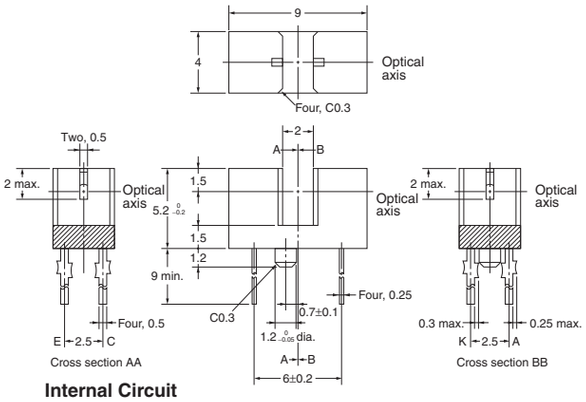


OMRON

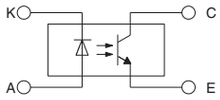
Photomicrosensor (Transmissive)
EE-SX1049

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Compact with a slot width of 2 mm.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- RoHS Compliant

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1049**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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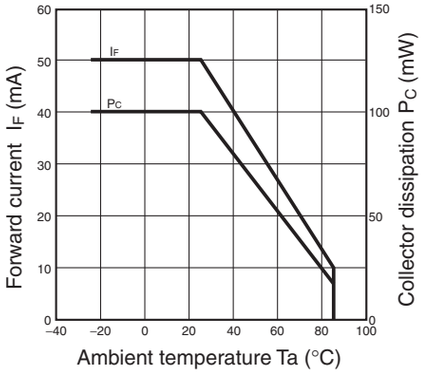
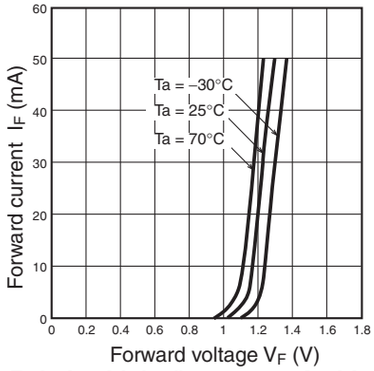
■ Engineering Data

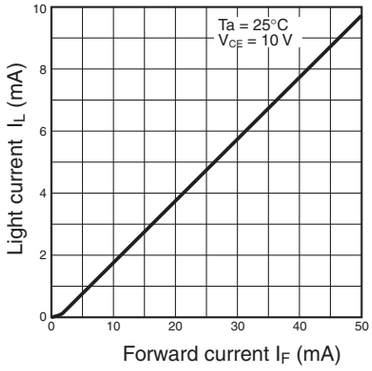
Forward Current vs. Collector Dissipation Temperature Rating



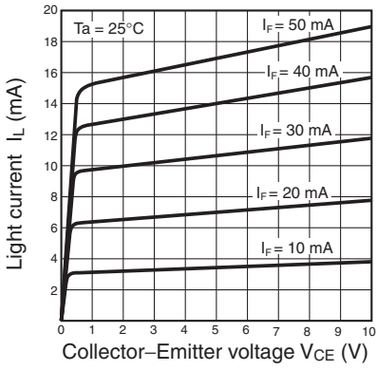
Forward Current vs. Forward Voltage Characteristics (Typical)



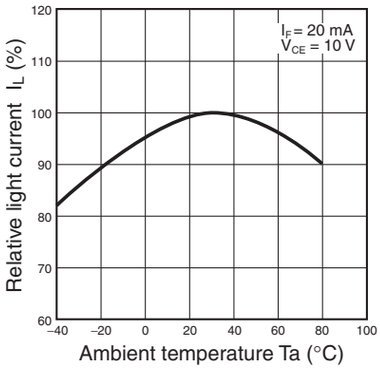
Light Current vs. Forward Current Characteristics (Typical)



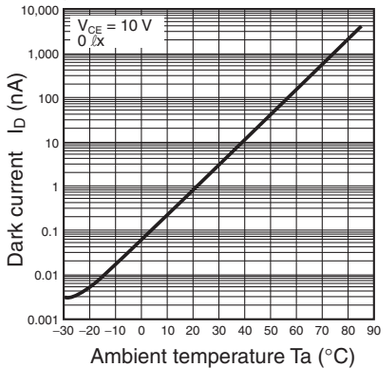
Light Current vs. Collector−Emitter Voltage Characteristics (Typical)



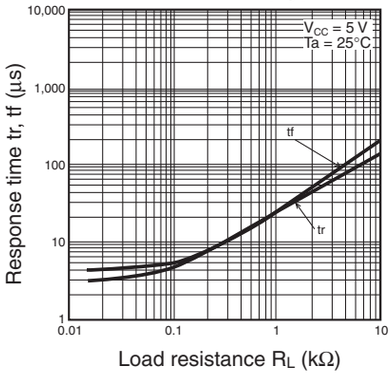
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



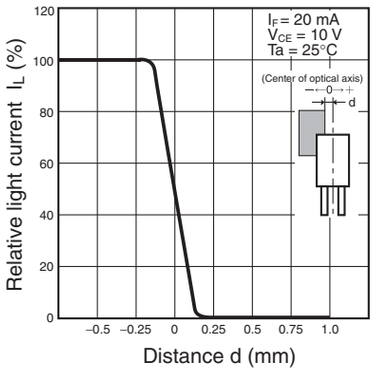
Dark Current vs. Ambient Temperature Characteristics (Typical)



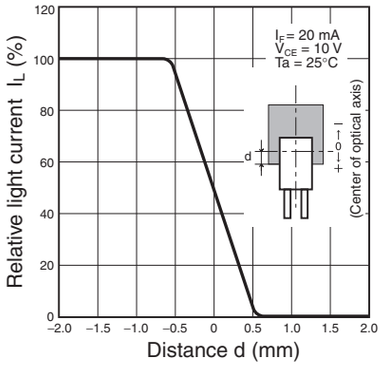
Response Time vs. Load Resistance Characteristics (Typical)



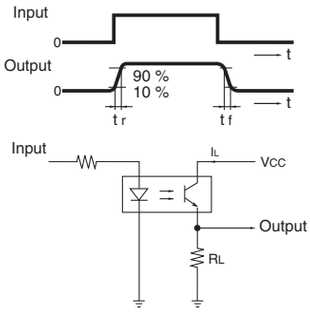
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

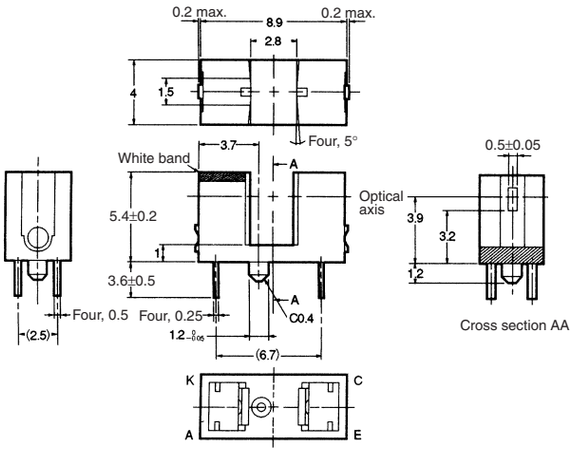


OMRON

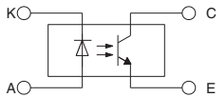
Photomicrosensor (Transmissive)
EE-SX1055

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Longer leads allow the sensor to be mounted to a 1.6-mm thick board.
- 5.4-mm-tall compact model.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1055**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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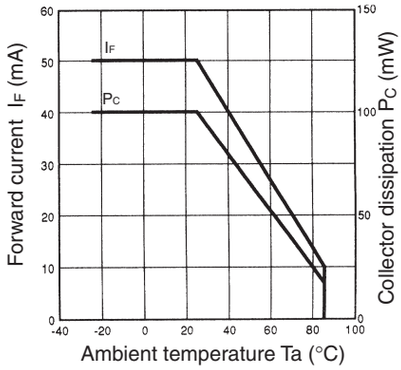
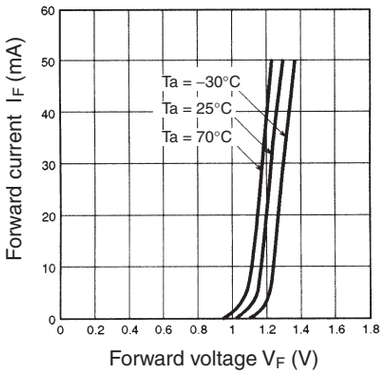
■ Engineering Data

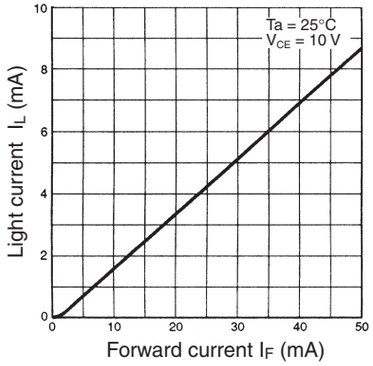
Forward Current vs. Collector Dissipation Temperature Rating



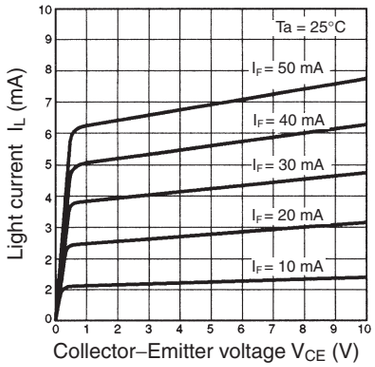
Forward Current vs. Forward Voltage Characteristics (Typical)



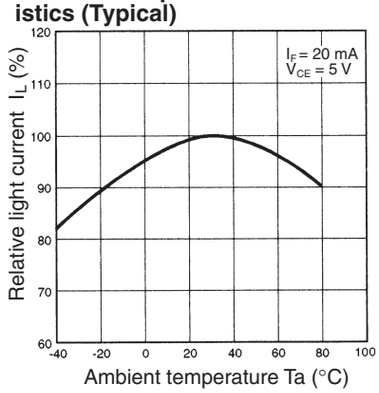
Light Current vs. Forward Current Characteristics (Typical)



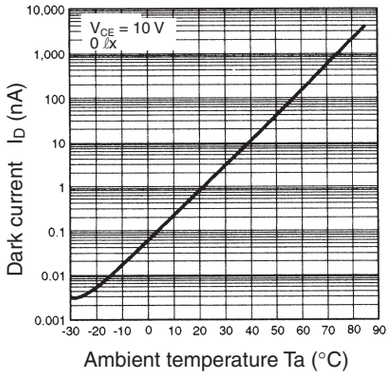
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



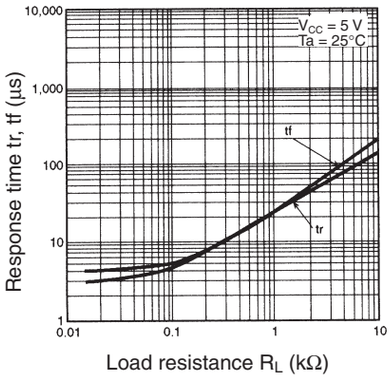
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



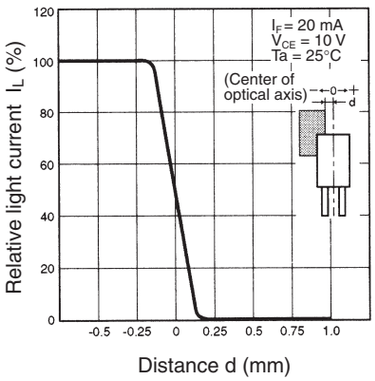
Dark Current vs. Ambient Temperature Characteristics (Typical)



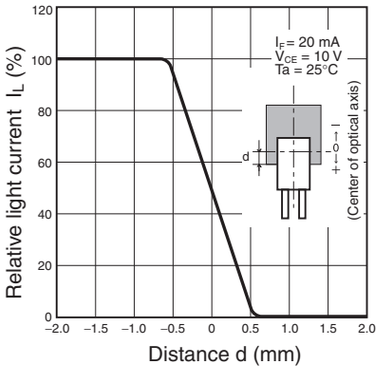
Response Time vs. Load Resistance Characteristics (Typical)



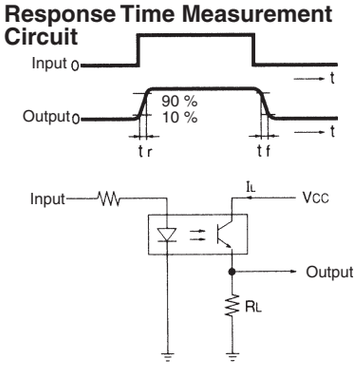
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

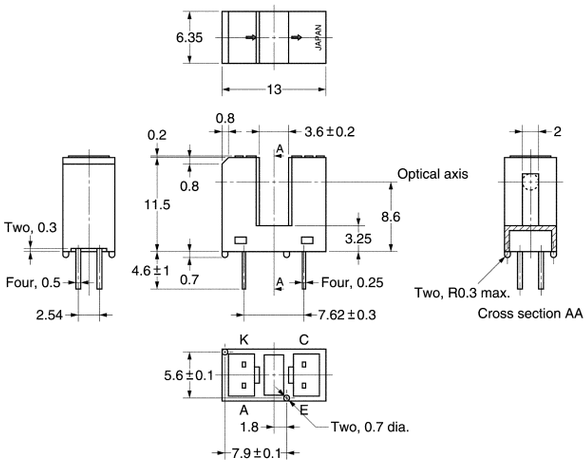


OMRON

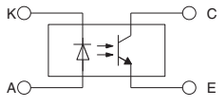
Photomicrosensor (Transmissive)
EE-SX1057

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

■ Features

- Compact model with a 3.6-mm-wide slot.
- PCB mounting type.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1057**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.15 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	1.5 mA min., 8 mA typ., 30 mA max.	I_F = 15 mA, V_{CE} = 2 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.4 V max.	I_F = 30 mA, I_L = 1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ., 20 μA max.	V_{CC} = 10 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ., 20 μA max.	V_{CC} = 10 V, R_L = 100 Ω, I_L = 5 mA

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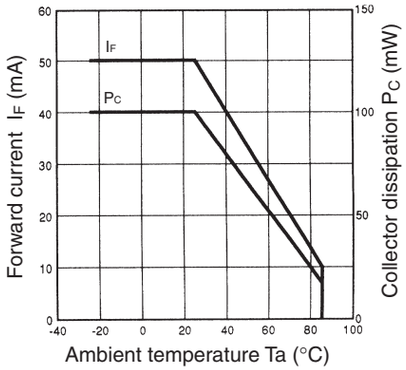
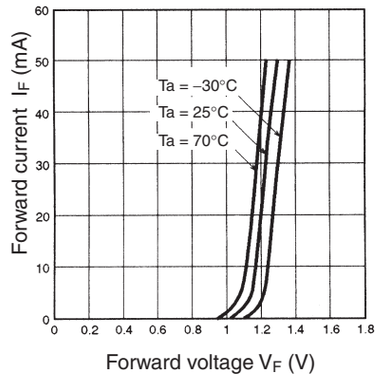
■ Engineering Data

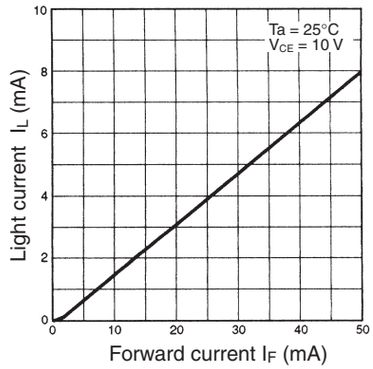
Forward Current vs. Collector Dissipation Temperature Rating



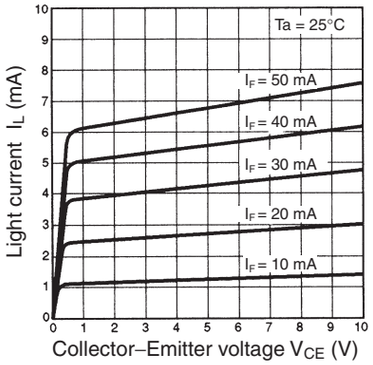
Forward Current vs. Forward Voltage Characteristics (Typical)



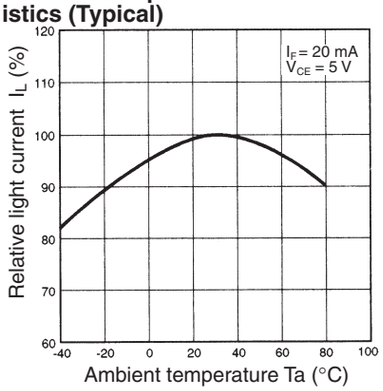
Light Current vs. Forward Current Characteristics (Typical)



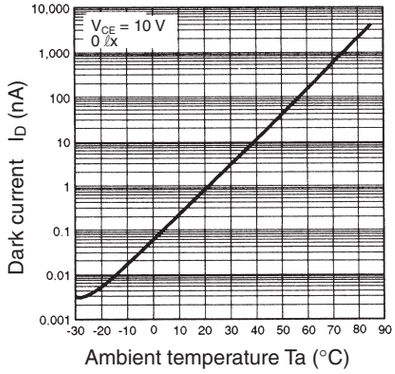
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



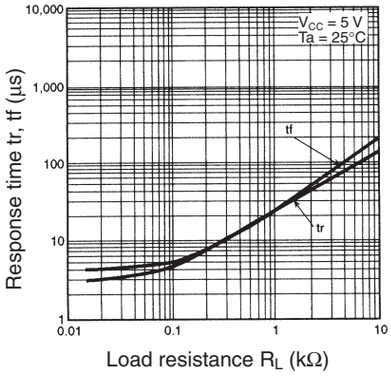
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



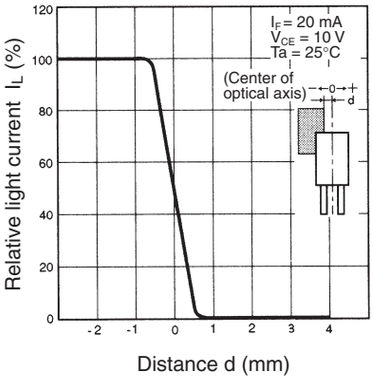
Dark Current vs. Ambient Temperature Characteristics (Typical)



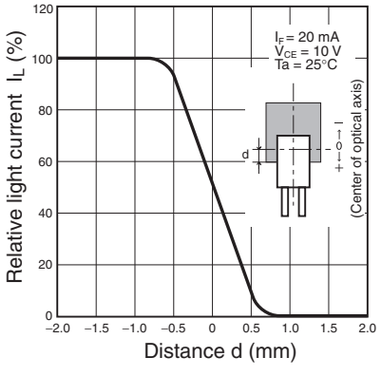
Response Time vs. Load Resistance Characteristics (Typical)



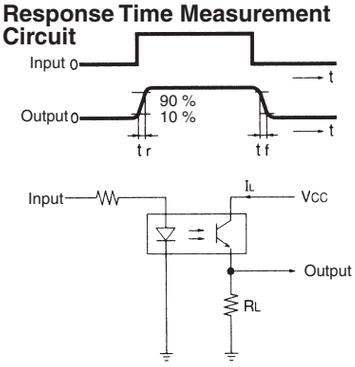
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

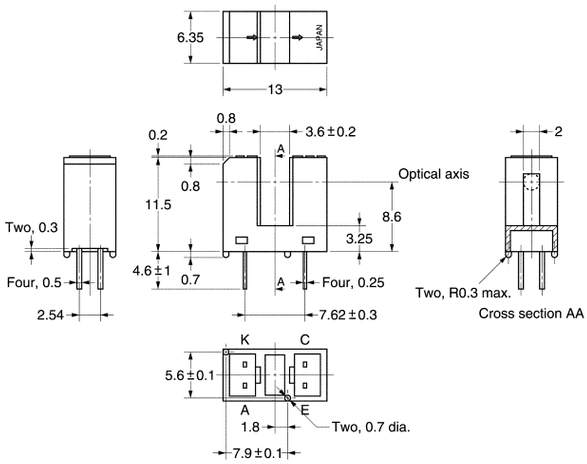


OMRON

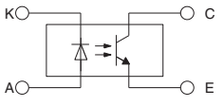
Photomicrosensor (Transmissive)
EE-SX1061

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

■ Features

- General-purpose model with a 4.6-mm-wide slot.
- PCB mounting type.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	---
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–40°C to 85°C
	Storage	T_{stg}	–40°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1061**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	1.3 mA min., 26 mA max.	I_F = 20 mA, V_{CE} = 12 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.8 V max.	I_F = 10 mA, V_{CC} = 12 V, R_L = 22k Ω
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	1,000 μs max.	V_{CC} = 12 V, R_L = 22k Ω, I_L = 10 mA
Falling time		tf	1,000 μs max.	V_{CC} = 12 V, R_L = 22k Ω, I_L = 10 mA

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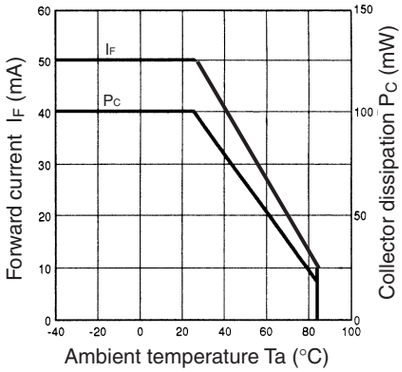
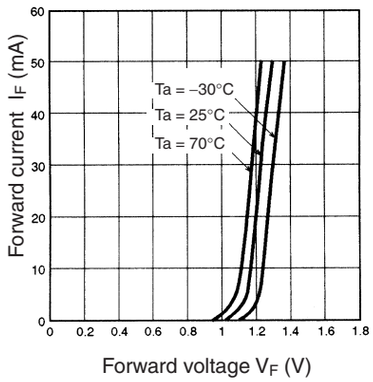
■ Engineering Data

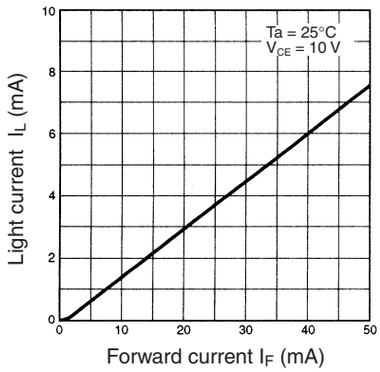
Forward Current vs. Collector Dissipation Temperature Rating



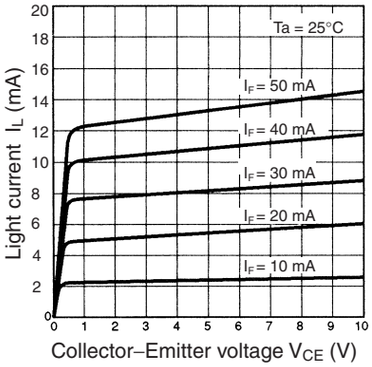
Forward Current vs. Forward Voltage Characteristics (Typical)



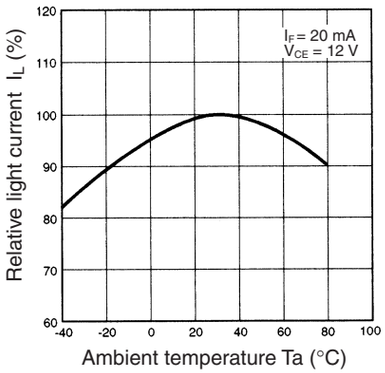
Light Current vs. Forward Current Characteristics (Typical)



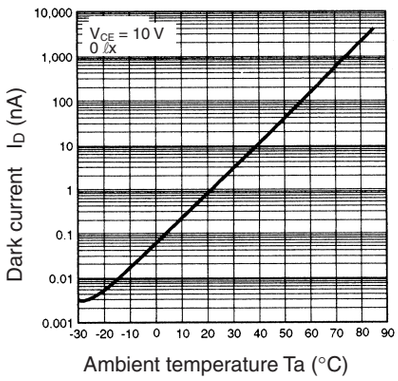
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



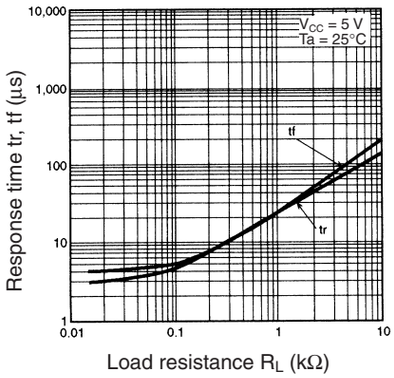
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



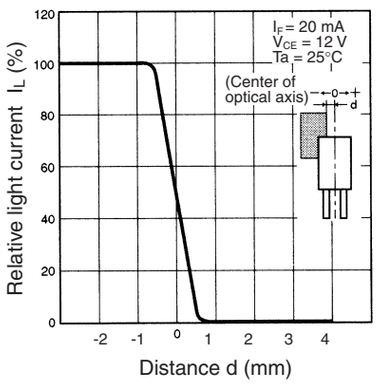
Dark Current vs. Ambient Temperature Characteristics (Typical)



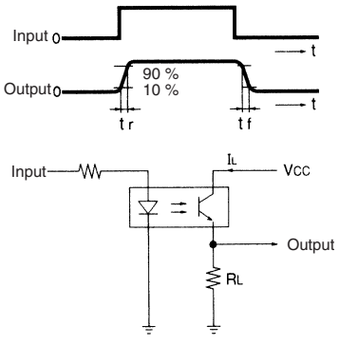
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

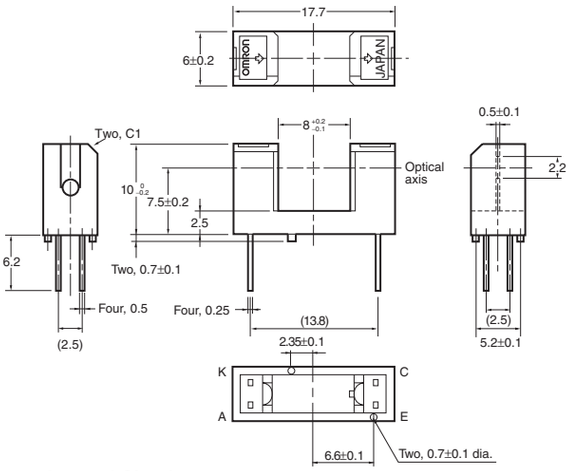


OMRON

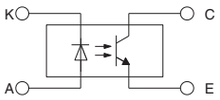
Photomicrosensor (Transmissive)
EE-SX1070

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Wide model with a 8-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 95°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1070**

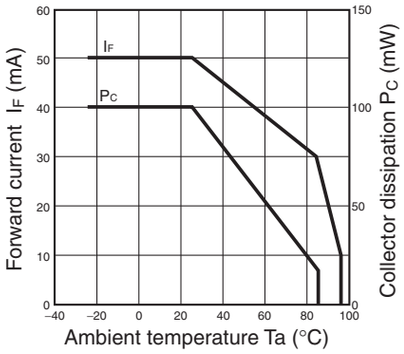
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

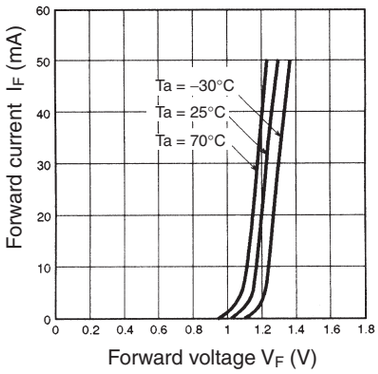
OMRON

■ Engineering Data

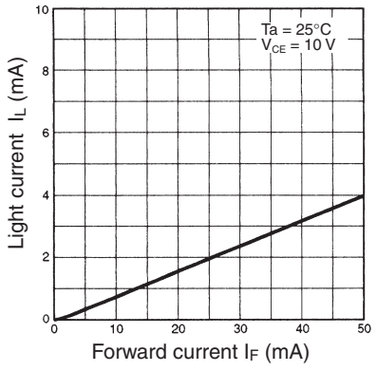
Forward Current vs. Collector Dissipation Temperature Rating



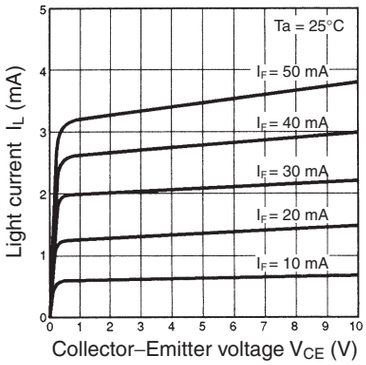
Forward Current vs. Forward Voltage Characteristics (Typical)



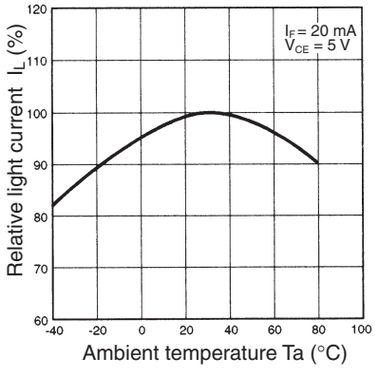
Light Current vs. Forward Current Characteristics (Typical)



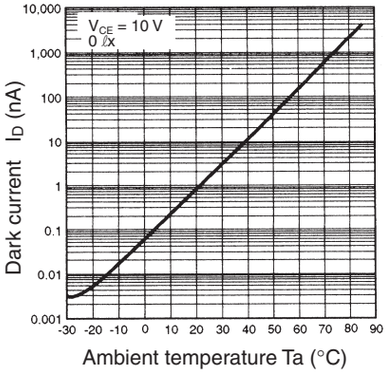
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



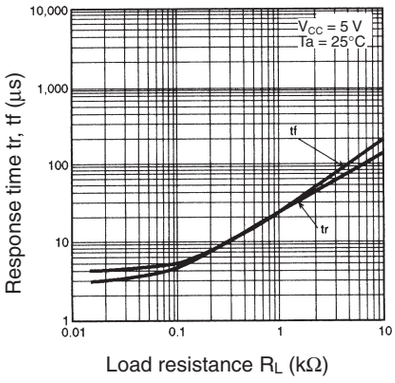
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



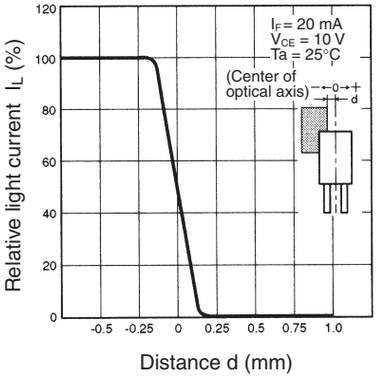
Dark Current vs. Ambient Temperature Characteristics (Typical)



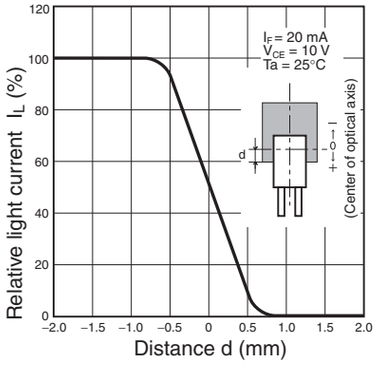
Response Time vs. Load Resistance Characteristics (Typical)



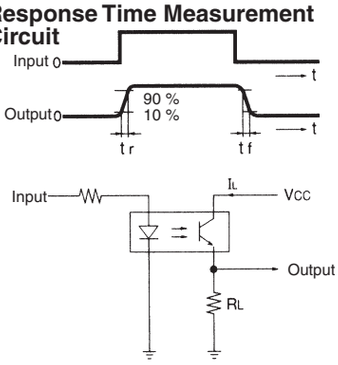
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

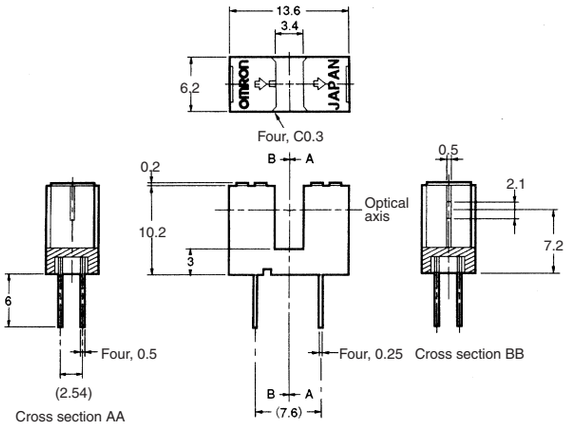


OMRON

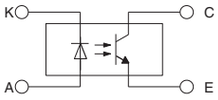
Photomicrosensor (Transmissive)
EE-SX1071

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- General-purpose model with a 3.4-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1071**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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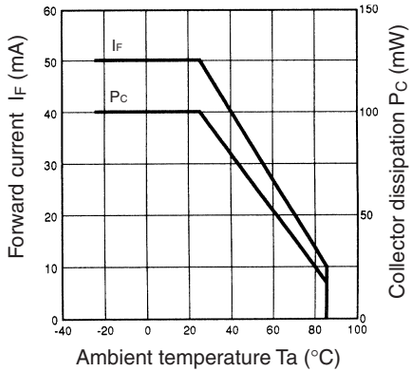
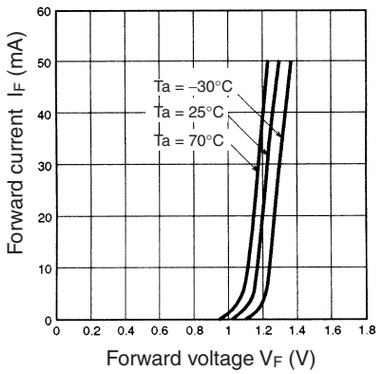
■ Engineering Data

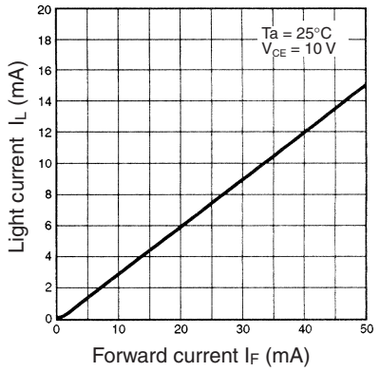
Forward Current vs. Collector Dissipation Temperature Rating



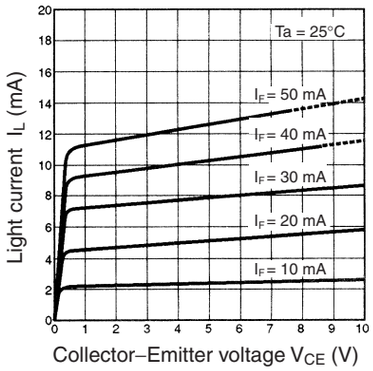
Forward Current vs. Forward Voltage Characteristics (Typical)



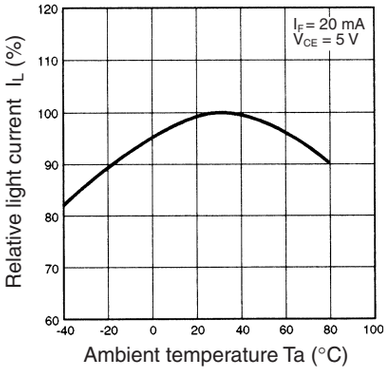
Light Current vs. Forward Current Characteristics (Typical)



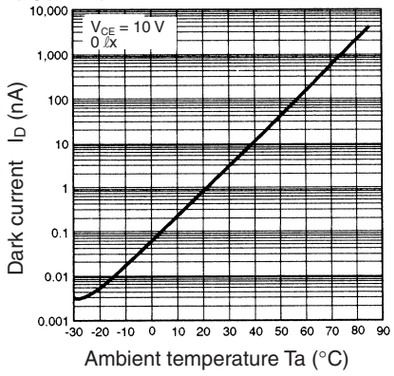
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



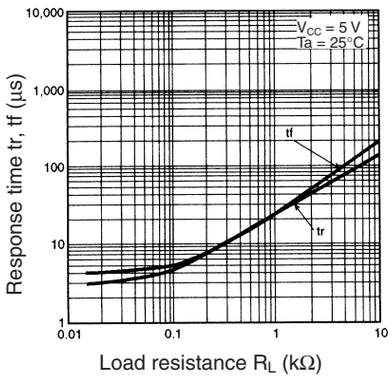
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



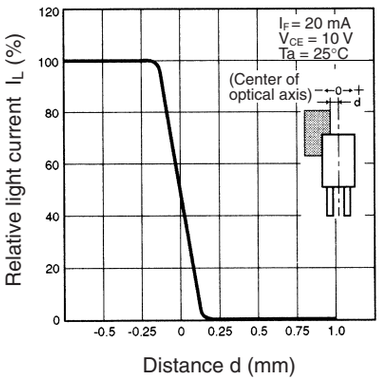
Dark Current vs. Ambient Temperature Characteristics (Typical)



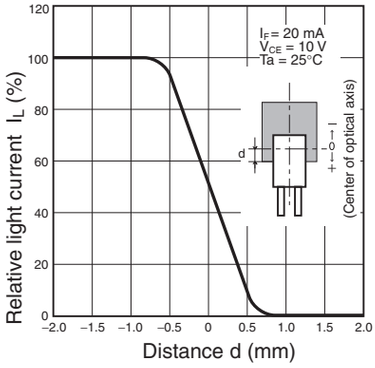
Response Time vs. Load Resistance Characteristics (Typical)



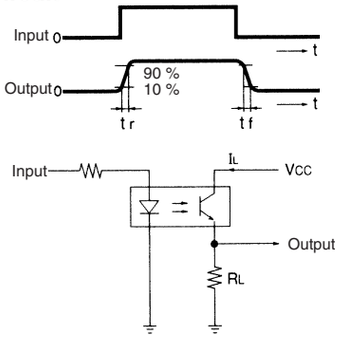
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

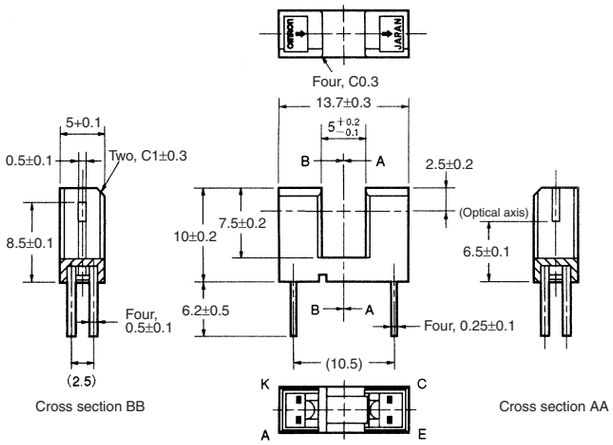


OMRON

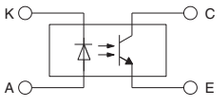
Photomicrosensor (Transmissive)
EE-SX1081

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- General-purpose model with a 5-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1081**

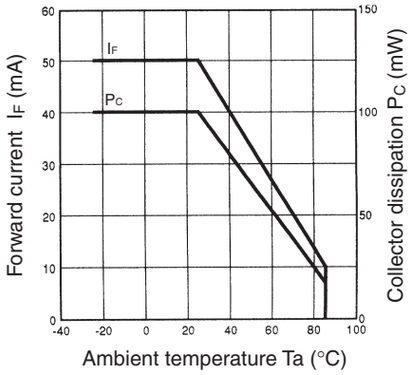
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

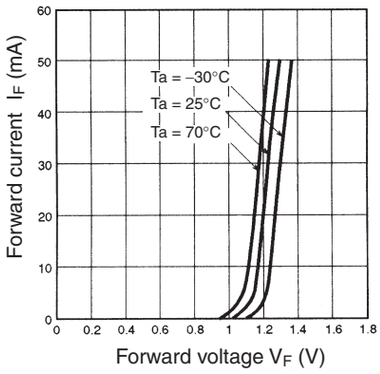
OMRON

■ Engineering Data

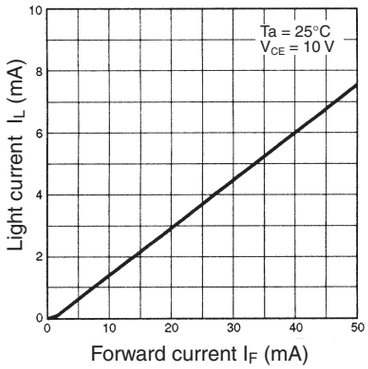
Forward Current vs. Collector Dissipation Temperature Rating



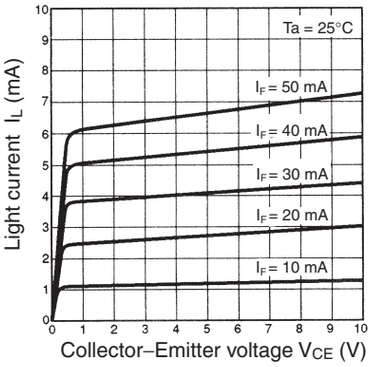
Forward Current vs. Forward Voltage Characteristics (Typical)



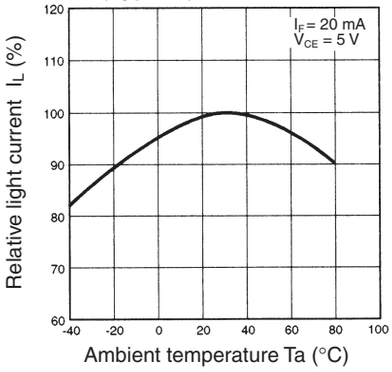
Light Current vs. Forward Current Characteristics (Typical)



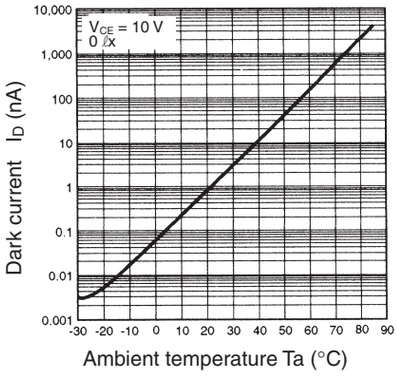
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



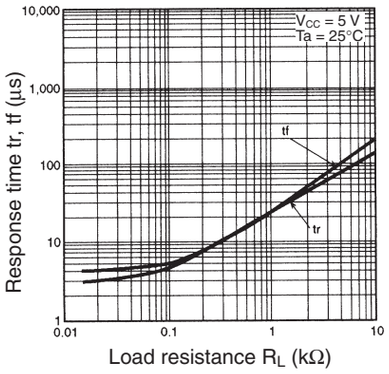
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



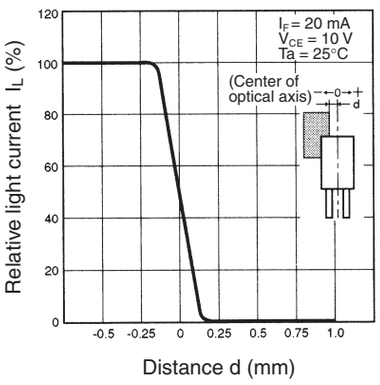
Dark Current vs. Ambient Temperature Characteristics (Typical)



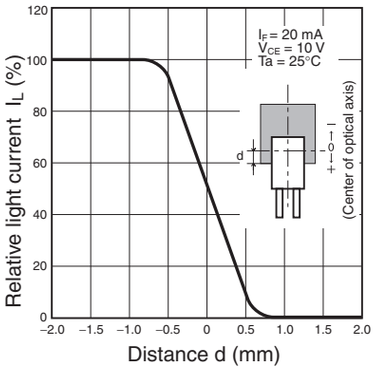
Response Time vs. Load Resistance Characteristics (Typical)



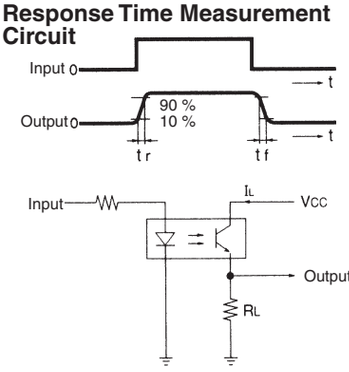
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

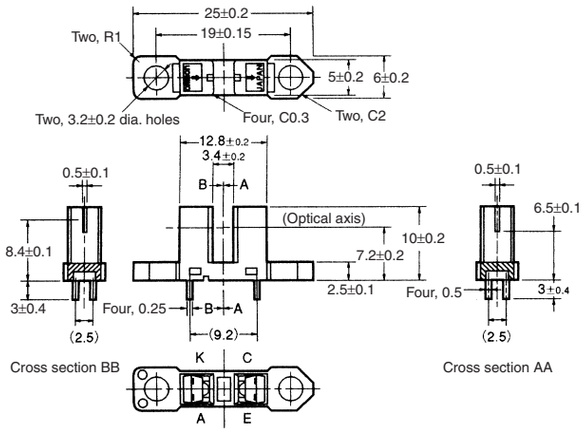


OMRON

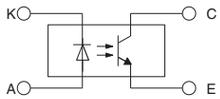
Photomicrosensor (Transmissive)
EE-SX1088

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- General-purpose model with a 3.4-mm-wide slot.
- Mounts to PCBs or connects to connectors.
- High resolution with a 0.5-mm-wide aperture.
- OMRON's XK8-series Connectors can be connected without soldering. Contact your OMRON representative for information on obtaining XK8-series Connectors.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1088**

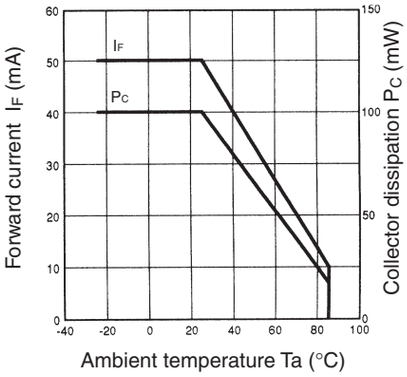
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.15 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

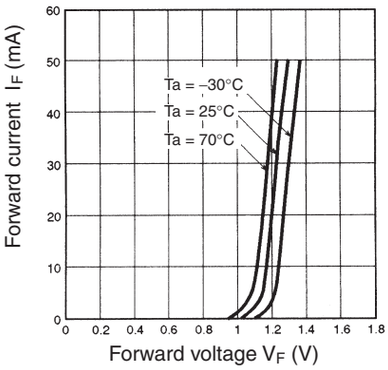
OMRON

■ Engineering Data

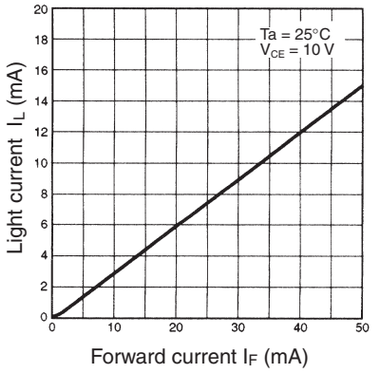
Forward Current vs. Collector Dissipation Temperature Rating



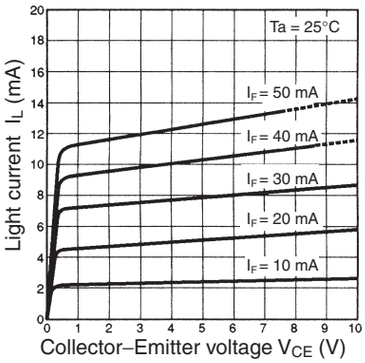
Forward Current vs. Forward Voltage Characteristics (Typical)



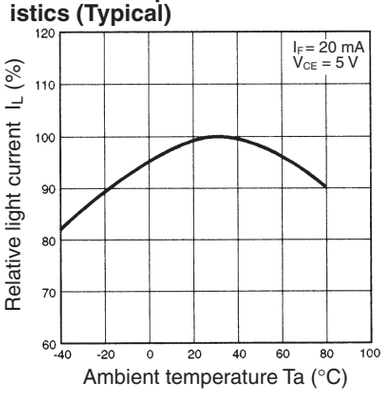
Light Current vs. Forward Current Characteristics (Typical)



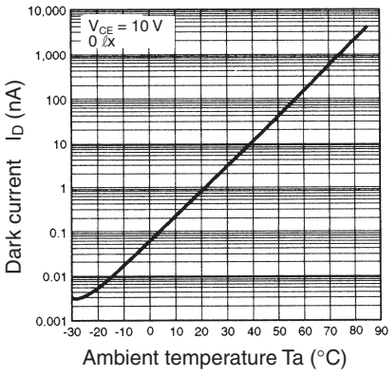
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



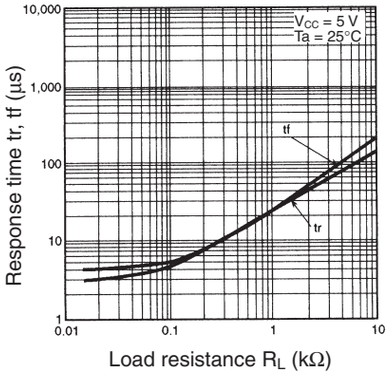
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



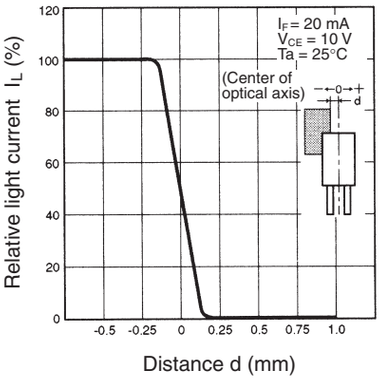
Dark Current vs. Ambient Temperature Characteristics (Typical)



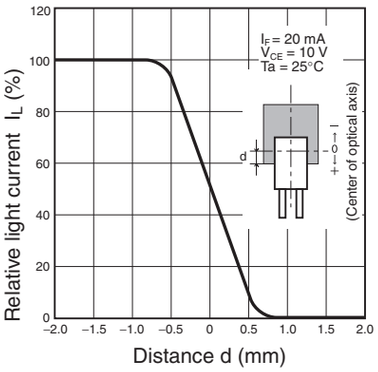
Response Time vs. Load Resistance Characteristics (Typical)



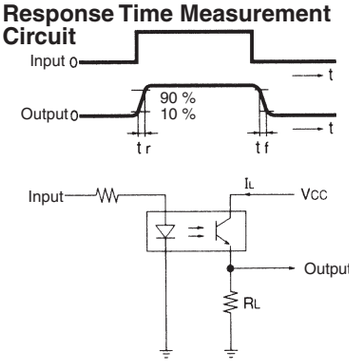
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

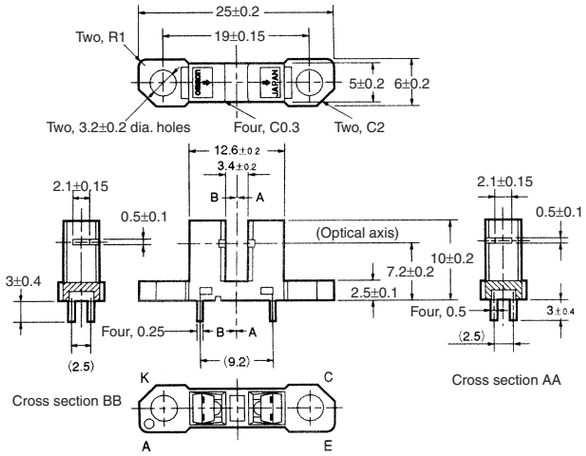


OMRON

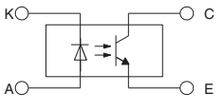
Photomicrosensor (Transmissive)
EE-SX1096

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- General-purpose model with a 3.4-mm-wide slot.
- Mounts to PCBs or connects to connectors.
- High resolution with a 0.5-mm-wide aperture.
- With a horizontal sensing slot.
- OMRON's XK8-series Connectors can be connected without soldering. Contact your OMRON representative for information on obtaining XK8-series Connectors.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1096**

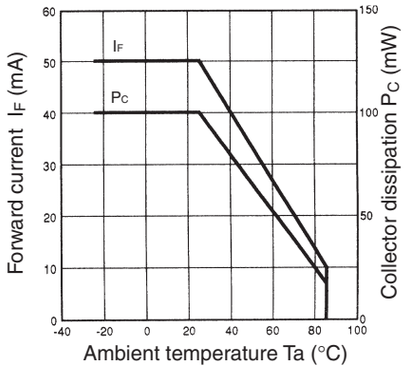
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

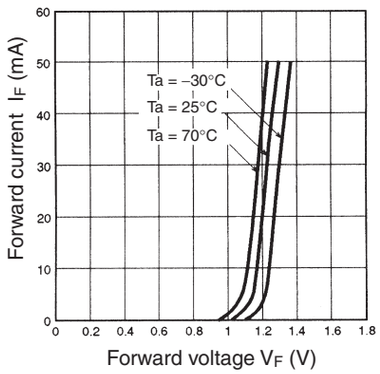
OMRON

■ Engineering Data

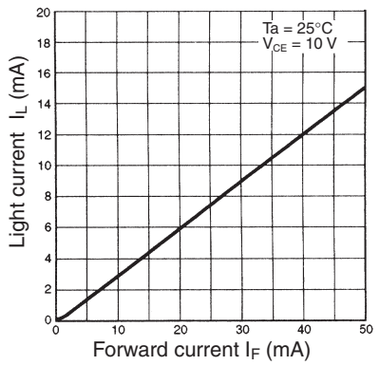
Forward Current vs. Collector Dissipation Temperature Rating



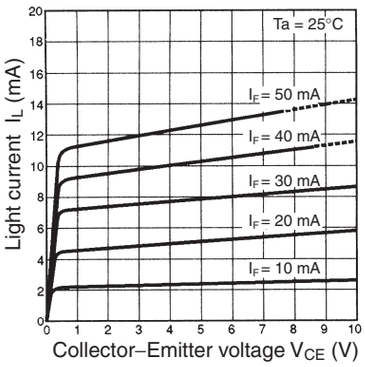
Forward Current vs. Forward Voltage Characteristics (Typical)



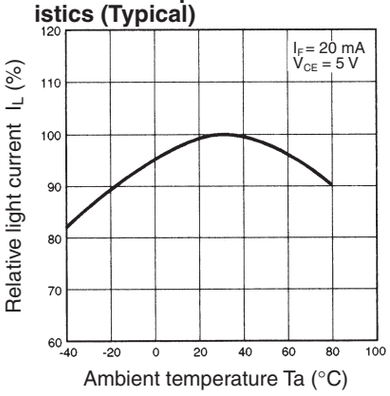
Light Current vs. Forward Current Characteristics (Typical)



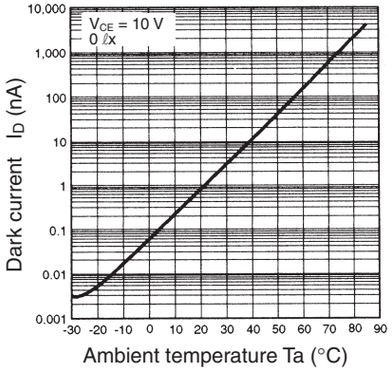
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



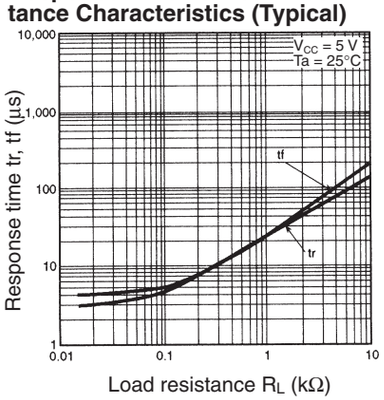
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



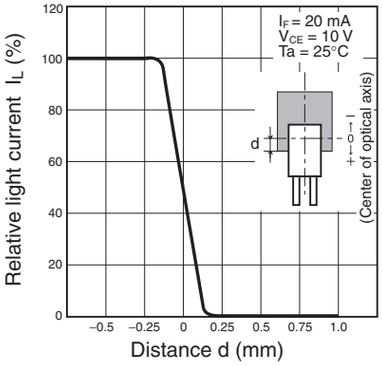
Dark Current vs. Ambient Temperature Characteristics (Typical)



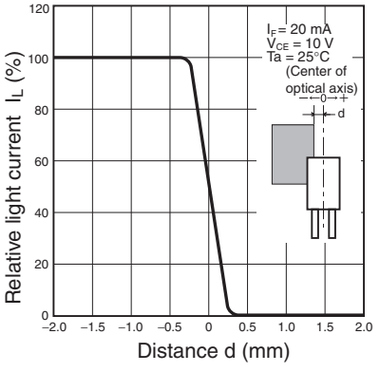
Response Time vs. Load Resistance Characteristics (Typical)



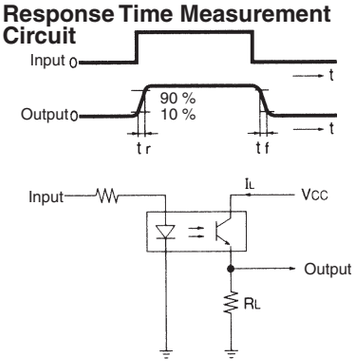
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

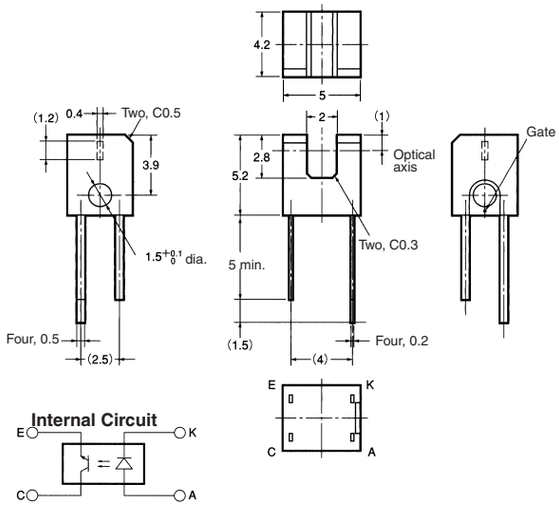


OMRON

Photomicrosensor (Transmissive)
EE-SX1103

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are ±0.2 mm.

■ Features

- Ultra-compact with a sensor width of 5 mm and a slot width of 2 mm.
- PCB mounting type.
- High resolution with a 0.4-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	---
	Reverse voltage	V_R	5 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	4.5 V
	Collector current	I_C	30 mA
	Collector dissipation	P_C	80 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 3 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1103**

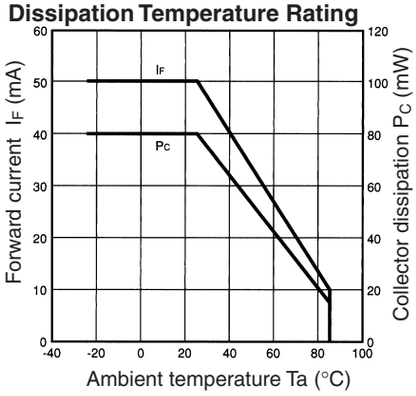
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.3 V typ., 1.6 V max.	I_F = 50 mA
	Reverse current	I_R	10 μA max.	V_R = 5 V
	Peak emission wavelength	λ_P	950 nm typ.	I_F = 50 mA
Detector	Light current	I_L	0.5 mA min.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	500 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.4 V max.	I_F = 20 mA, I_L = 0.3 mA
	Peak spectral sensitivity wavelength	λ_P	800 nm typ.	V_{CE} = 5 V
Rising time		tr	10 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_F = 20 mA
Falling time		tf	10 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_F = 20 mA

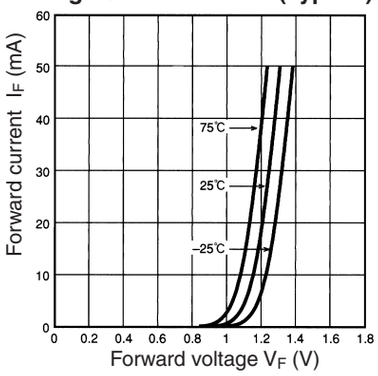
OMRON

■ Engineering Data

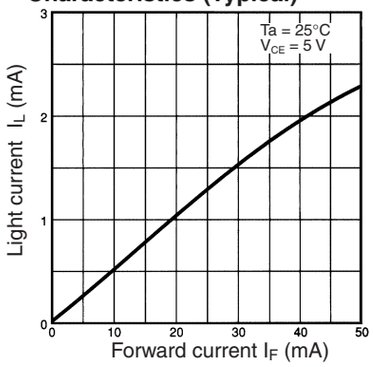
Forward Current vs. Collector Dissipation Temperature Rating



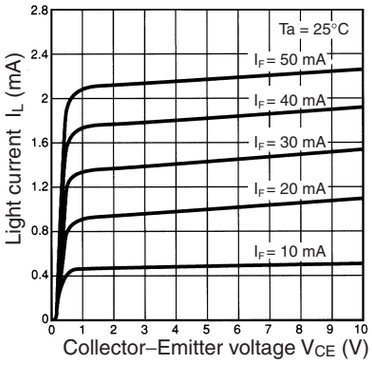
Forward Current vs. Forward Voltage Characteristics (Typical)



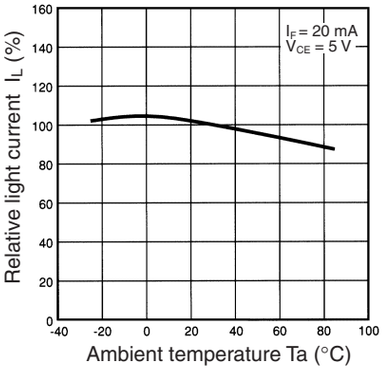
Light Current vs. Forward Current Characteristics (Typical)



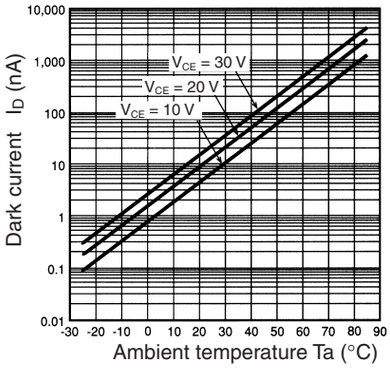
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



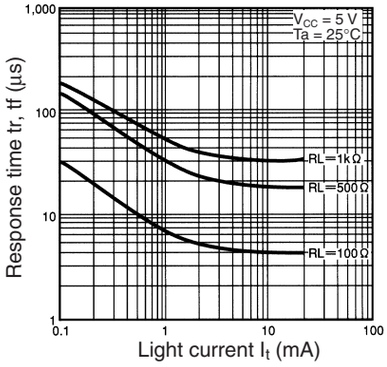
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



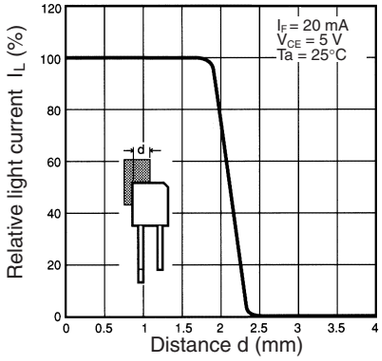
Dark Current vs. Ambient Temperature Characteristics (Typical)



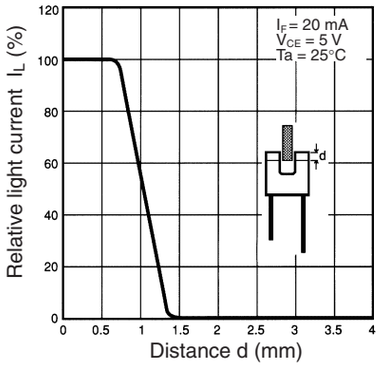
Response Time vs. Light Current Characteristics (Typical)



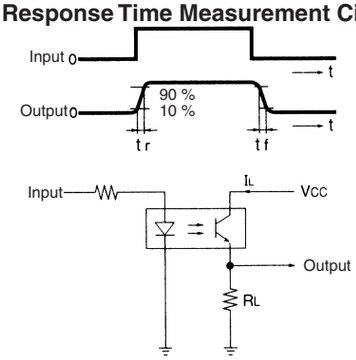
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

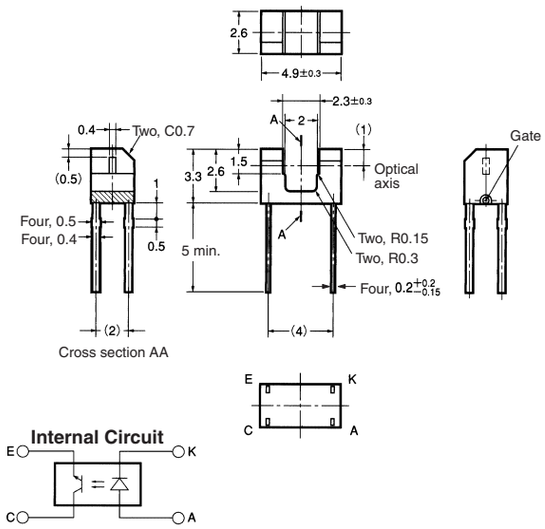


OMRON

Photomicrosensor (Transmissive)
EE-SX1105

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are ±0.2 mm.

■ Features

- Ultra-compact with a sensor width of 4.9 mm and a slot width of 2 mm.
- Low-height of 3.3 mm.
- PCB mounting type.
- High resolution with a 0.4-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	---
	Reverse voltage	V_R	5 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	4.5 V
	Collector current	I_C	30 mA
	Collector dissipation	P_C	80 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 3 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1105**

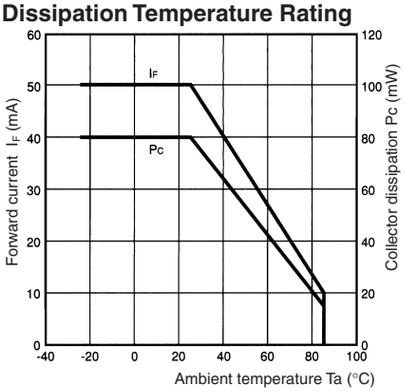
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.3 V typ., 1.6 V max.	I_F = 50 mA
	Reverse current	I_R	10 μA max.	V_R = 5 V
	Peak emission wavelength	λ_P	950 nm typ.	I_F = 50 mA
Detector	Light current	I_L	0.2 mA min.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	500 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	800 nm typ.	V_{CE} = 5 V
Rising time		tr	10 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_F = 20 mA
Falling time		tf	10 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_F = 20 mA

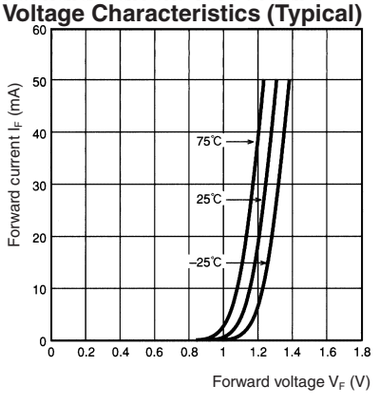
OMRON

■ Engineering Data

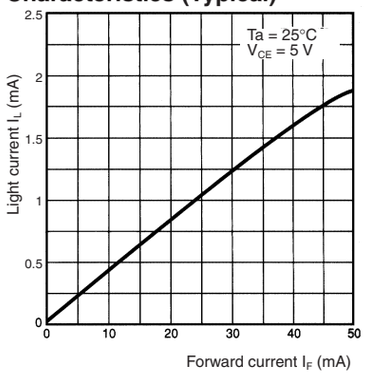
Forward Current vs. Collector Dissipation Temperature Rating



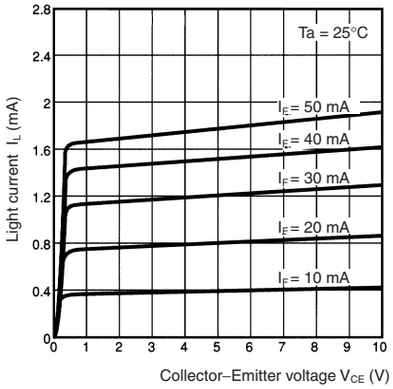
Forward Current vs. Forward Voltage Characteristics (Typical)



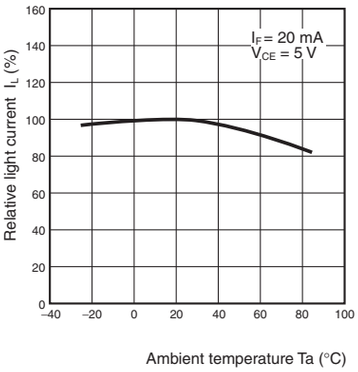
Light Current vs. Forward Current Characteristics (Typical)



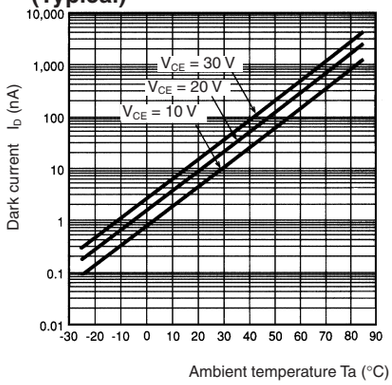
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



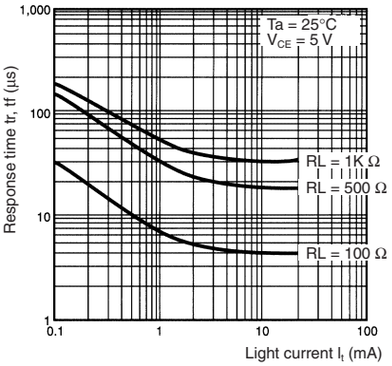
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



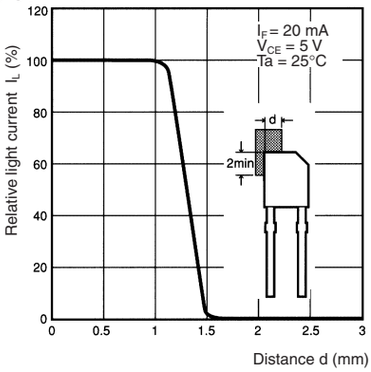
Dark Current vs. Ambient Temperature Characteristics (Typical)



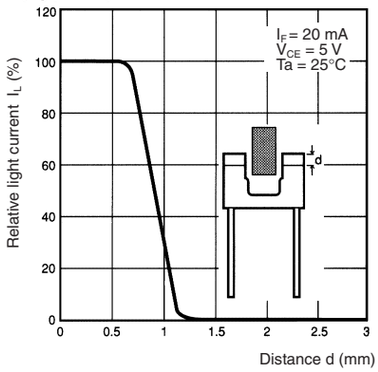
Response Time vs. Light Current Characteristics (Typical)



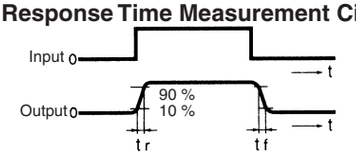
Sensing Position Characteristics (Typical)

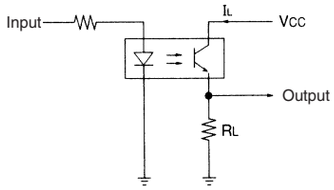


Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



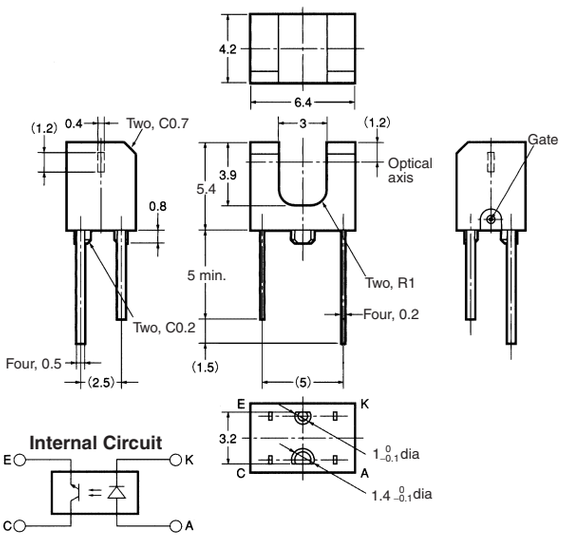


OMRON

Photomicrosensor (Transmissive)
EE-SX1106

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are ±0.2 mm.

■ Features

- Ultra-compact with a slot width of 3 mm.
- PCB mounting type.
- High resolution with a 0.4-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	---
	Reverse voltage	V_R	5 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	4.5 V
	Collector current	I_C	30 mA
	Collector dissipation	P_C	80 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 3 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1106**

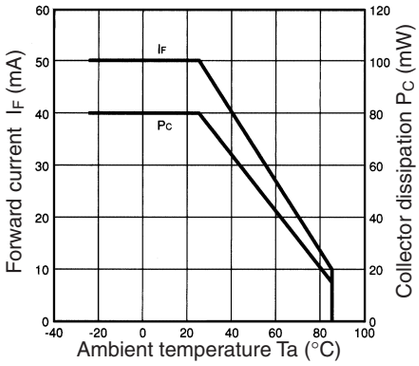
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.3 V typ., 1.6 V max.	I_F = 50 mA
	Reverse current	I_R	10 μA max.	V_R = 5 V
	Peak emission wavelength	λ_P	950 nm typ.	I_F = 50 mA
Detector	Light current	I_L	0.2 mA min.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	500 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	800 nm typ.	V_{CE} = 5 V
Rising time		tr	10 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_F = 20 mA
Falling time		tf	10 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_F = 20 mA

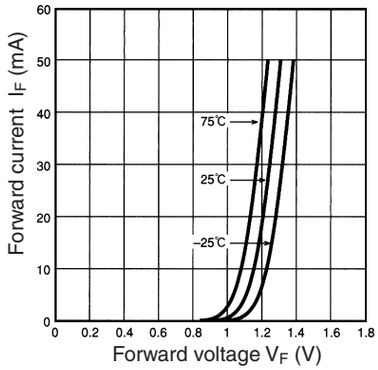
OMRON

■ Engineering Data

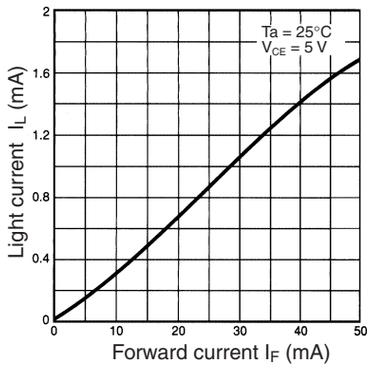
Forward Current vs. Collector Dissipation Temperature Rating



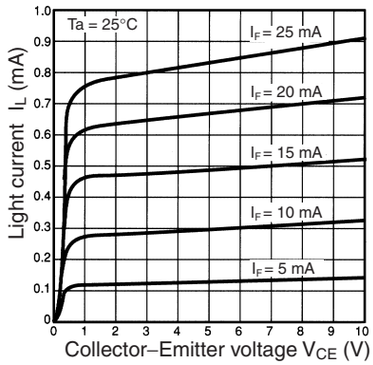
Forward Current vs. Forward Voltage Characteristics (Typical)



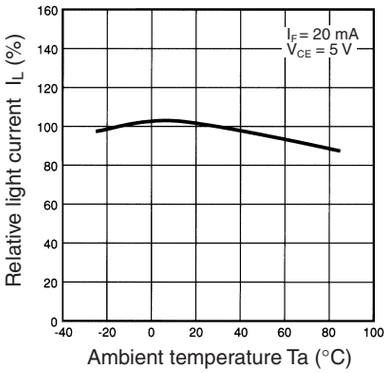
Light Current vs. Forward Current Characteristics (Typical)



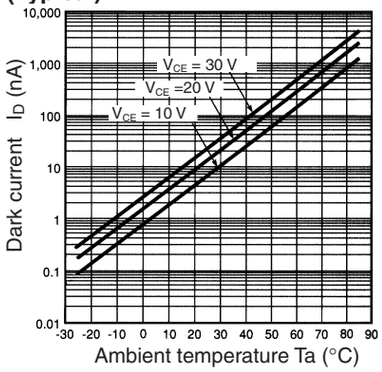
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



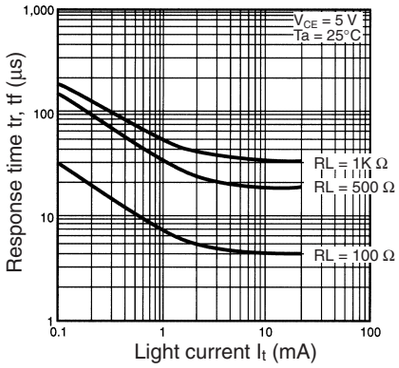
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



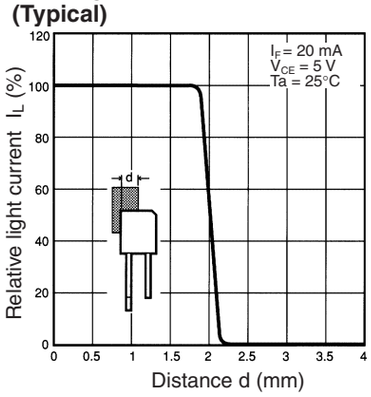
Dark Current vs. Ambient Temperature Characteristics (Typical)



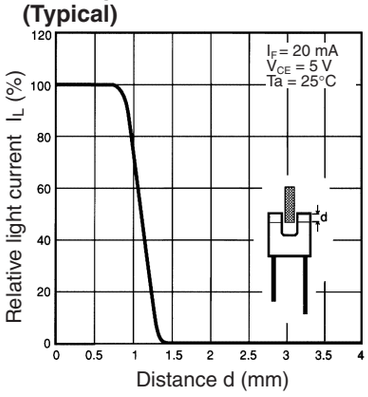
Response Time vs. Light Current Characteristics (Typical)



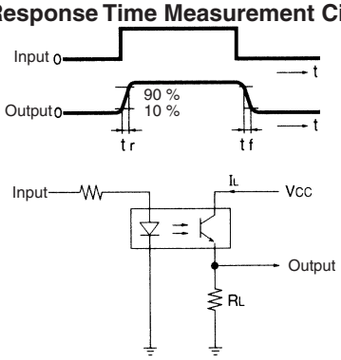
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

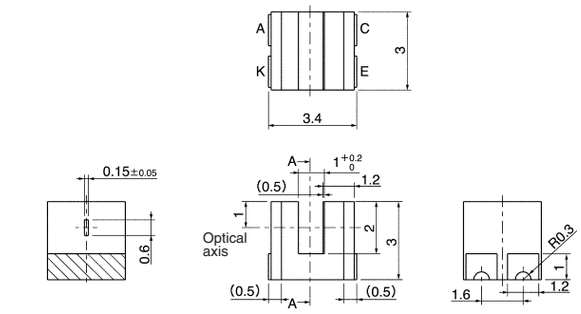


OMRON

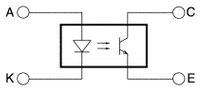
Photomicrosensor (Transmissive)
EE-SX1107

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

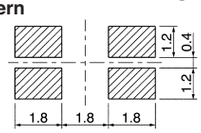


Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Recommended Soldering Pattern



Unless otherwise specified, the tolerances are ±0.15 mm.

■ Features

- Ultra-compact with a 3.4-mm-wide sensor and a 1-mm-wide slot.
- PCB surface mounting type.
- High resolution with a 0.15-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	25 mA (see note 1)
	Pulse forward current	I_{FP}	100 mA (see note 2)
	Reverse voltage	V_R	5 V
Detector	Collector–Emitter voltage	V_{CEO}	20 V
	Emitter–Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–30°C to 85°C
	Storage	T_{stg}	–40°C to 90°C
	Reflow soldering	T_{sol}	255°C (see note 3)
	Manual soldering	T_{sol}	350°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Duty: 1/100; Pulse width: 0.1 ms
3. Complete soldering within 10 seconds for reflow soldering and within 3 seconds for manual soldering.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1107**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.1 V typ., 1.3 V max.	I_F = 5 mA
	Reverse current	I_R	10 μA max.	V_R = 5 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	50 μA min., 150 μA typ., 500 μA max.	I_F = 5 mA, V_{CE} = 5 V
	Dark current	I_D	100 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 50 μA
	Peak spectral sensitivity wavelength	λ_P	900 nm typ.	---
Rising time		tr	10 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 μA
Falling time		tf	10 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 μA

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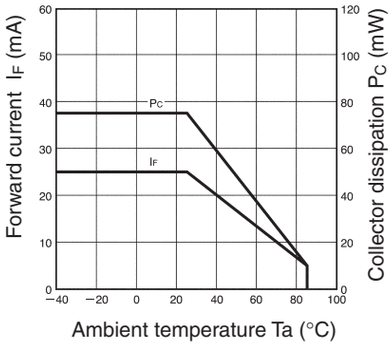
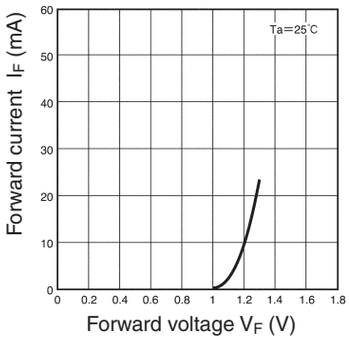
■ Engineering Data

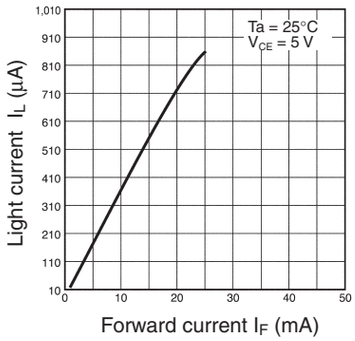
Forward Current vs. Collector Dissipation Temperature Rating



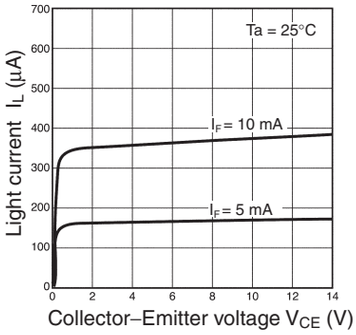
Forward Current vs. Forward Voltage Characteristics (Typical)



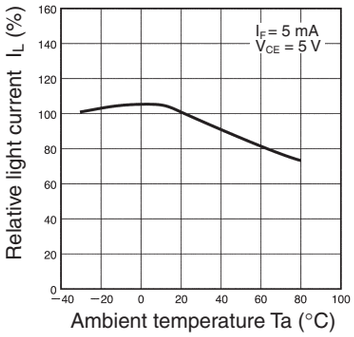
Light Current vs. Forward Current Characteristics (Typical)



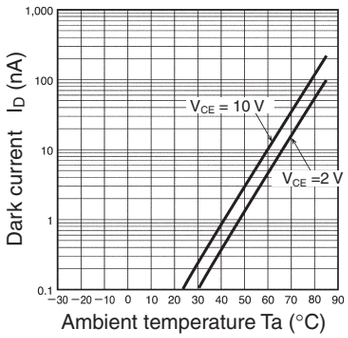
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



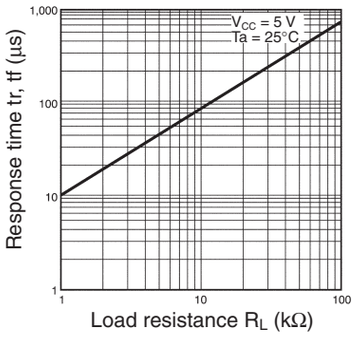
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



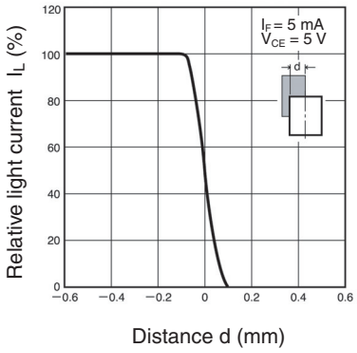
Dark Current vs. Ambient Temperature Characteristics (Typical)



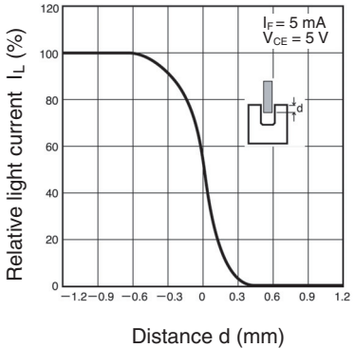
Response Time vs. Load Resistance Characteristics (Typical)



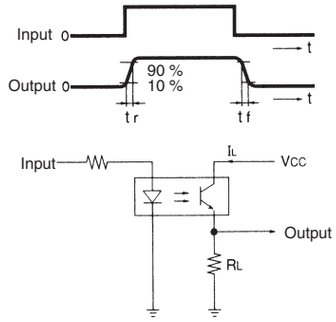
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



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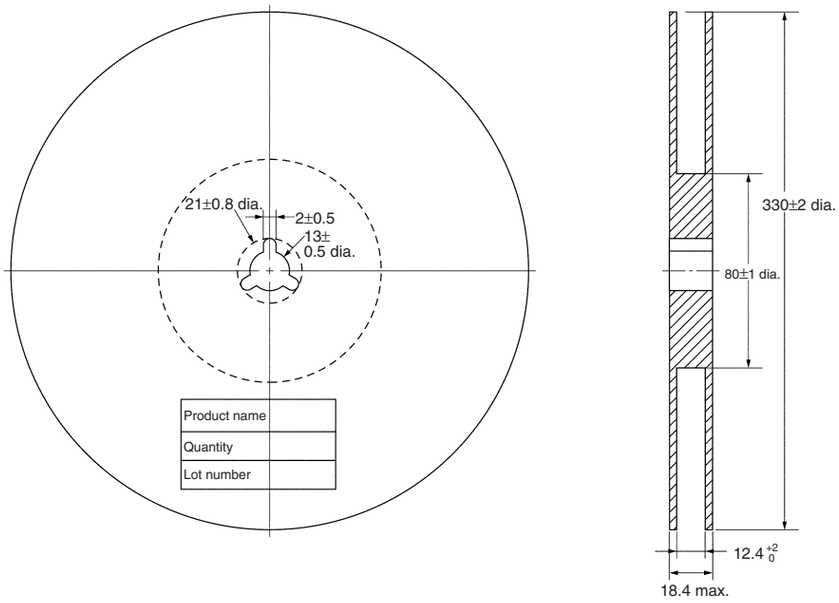
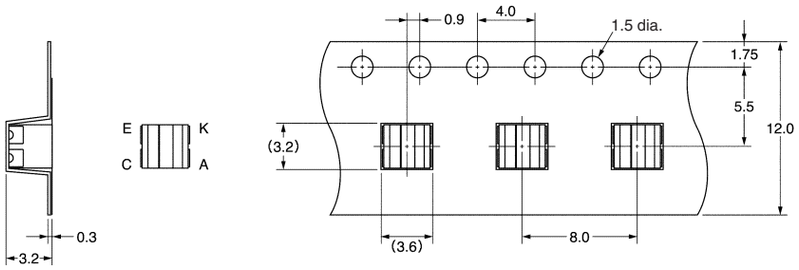
Unit: mm (inch)

■ Tape and Reel

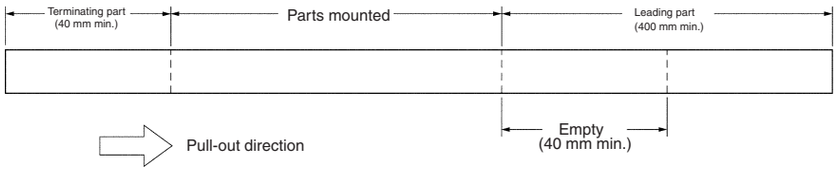
Reel



Tape



Tape configuration



Tape quantity

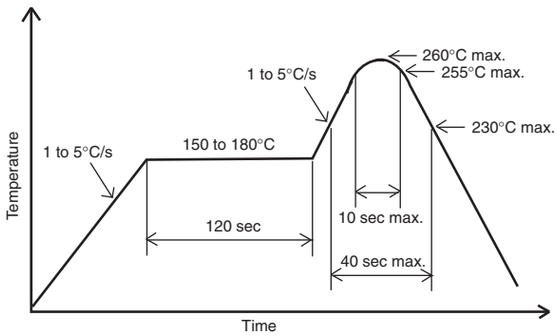
2,500 pcs./reel

Precautions

■ Soldering Information

Reflow soldering

- The following soldering paste is recommended:
  Melting temperature: 216 to 220°C
  Composition: Sn 3.5 Ag 0.75 Cu
- The recommended thickness of the metal mask for screen printing is between 0.2 and 0.25 mm.
- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



Manual soldering

- Use “Sn 60” (60% tin and 40% lead) or solder with silver content.
- Use a soldering iron of less than 25 W, and keep the temperature of the iron tip at 350°C or below.
- Solder each point for a maximum of three seconds.
- After soldering, allow the product to return to room temperature before handling it.

Storage

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended. If this is not possible, store the product under the following conditions:

Temperature: 10 to 30°C
Humidity: 60% max.

The product is packed in a humidity-proof envelope. Reflow soldering must be done within 48 hours after opening the envelope, during which time the product must be stored under 30°C at 80% maximum humidity.

If it is necessary to store the product after opening the envelope, use dry-box storage or reseal the envelope.

Baking

If a product has remained packed in a humidity-proof envelope for six months or more, or if more than 48 hours have lapsed since the envelope was opened, bake the product under the following conditions before use:

Reel: 60°C for 24 hours or more
Bulk: 80°C for 4 hours or more

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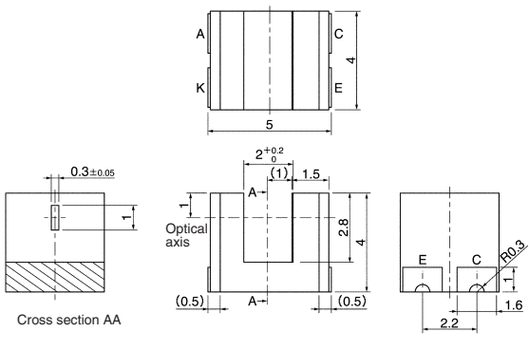
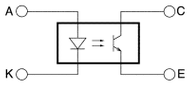
Photomicrosensor (Transmissive)
EE-SX1108

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

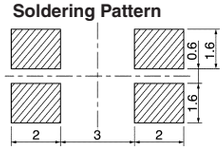


Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Recommended Soldering Pattern



Unless otherwise specified, the tolerances are ±0.15 mm.

■ Features

- Ultra-compact with a 5-mm-wide sensor and a 2-mm-wide slot.
- PCB surface mounting type.
- High resolution with a 0.3-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	25 mA (see note 1)
	Pulse forward current	I_{FP}	100 mA (see note 2)
	Reverse voltage	V_R	5 V
Detector	Collector–Emitter voltage	V_{CEO}	20 V
	Emitter–Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–30°C to 85°C
	Storage	T_{stg}	–40°C to 90°C
	Reflow soldering	T_{sol}	255°C (see note 3)
	Manual soldering	T_{sol}	350°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Duty: 1/100; Pulse width: 0.1 ms
3. Complete soldering within 10 seconds for reflow soldering and within 3 seconds for manual soldering.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1108**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.1 V typ., 1.3 V max.	I_F = 5 mA
	Reverse current	I_R	10 μA max.	V_R = 5 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	50 μA min., 150 μA typ., 500 μA max.	I_F = 5 mA, V_{CE} = 5 V
	Dark current	I_D	100 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 50 μA
	Peak spectral sensitivity wavelength	λ_P	900 nm typ.	---
Rising time		tr	10 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 μA
Falling time		tf	10 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 μA

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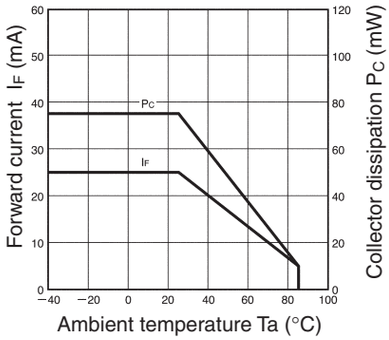
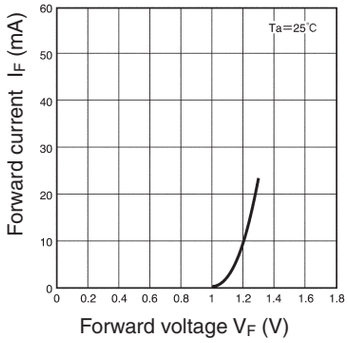
■ Engineering Data

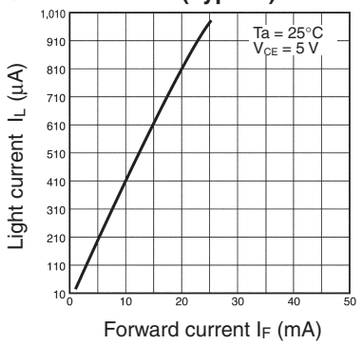
Forward Current vs. Collector Dissipation Temperature Rating



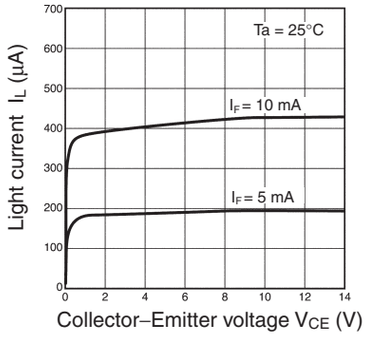
Forward Current vs. Forward Voltage Characteristics (Typical)



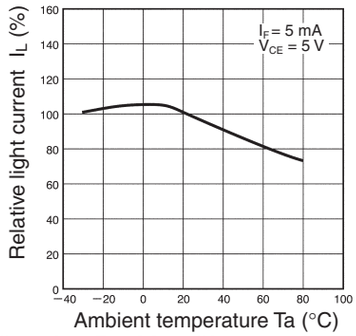
Light Current vs. Forward Current Characteristics (Typical)



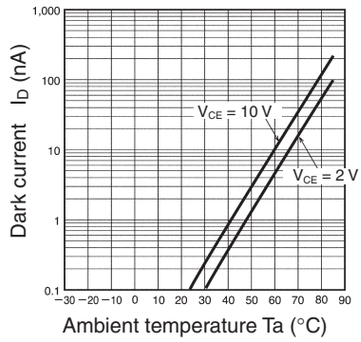
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



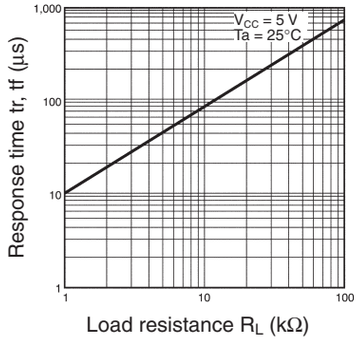
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



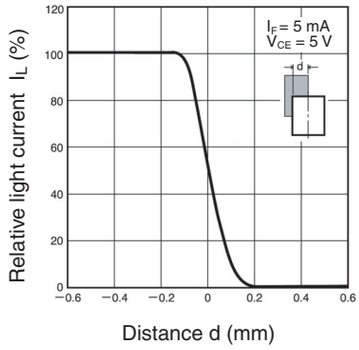
Dark Current vs. Ambient Temperature Characteristics (Typical)



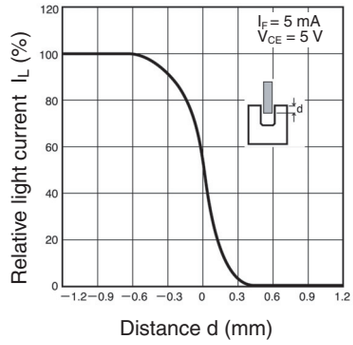
Response Time vs. Load Resistance Characteristics



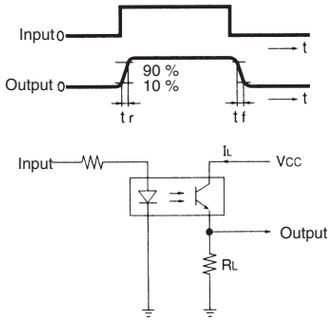
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



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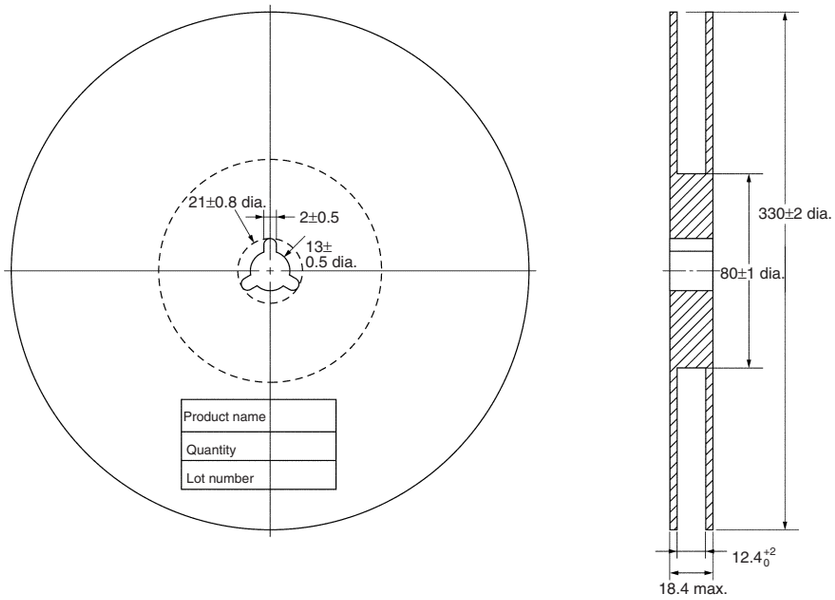
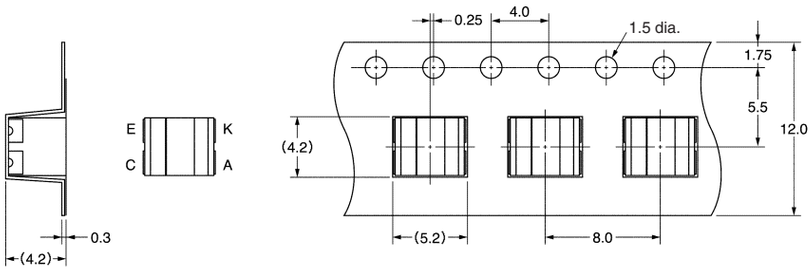
Unit: mm (inch)

■ Tape and Reel

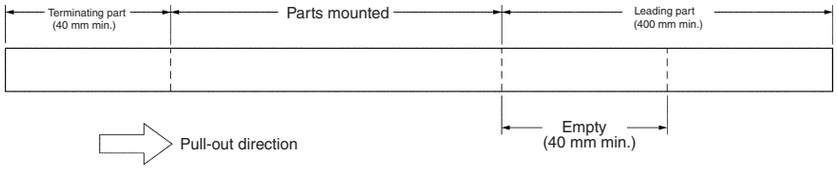
Reel



Tape



Tape configuration



Tape quantity

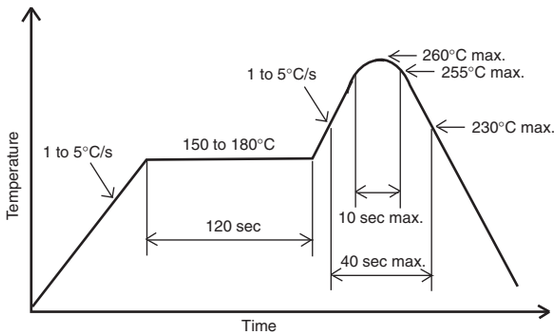
2,000 pcs./reel

Precautions

■ Soldering Information

Reflow soldering

- The following soldering paste is recommended:
  Melting temperature: 216 to 220°C
  Composition: Sn 3.5 Ag 0.75 Cu
- The recommended thickness of the metal mask for screen printing is between 0.2 and 0.25 mm.
- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



Manual soldering

- Use “Sn 60” (60% tin and 40% lead) or solder with silver content.
- Use a soldering iron of less than 25 W, and keep the temperature of the iron tip at 300°C or below.
- Solder each point for a maximum of three seconds.
- After soldering, allow the product to return to room temperature before handling it.

Storage

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended. If this is not possible, store the product under the following conditions:

Temperature: 10 to 30°C
Humidity: 60% max.

The product is packed in a humidity-proof envelope. Reflow soldering must be done within 48 hours after opening the envelope, during which time the product must be stored under 30°C at 80% maximum humidity.

If it is necessary to store the product after opening the envelope, use dry-box storage or reseal the envelope.

Baking

If a product has remained packed in a humidity-proof envelope for six months or more, or if more than 48 hours have lapsed since the envelope was opened, bake the product under the following conditions before use:

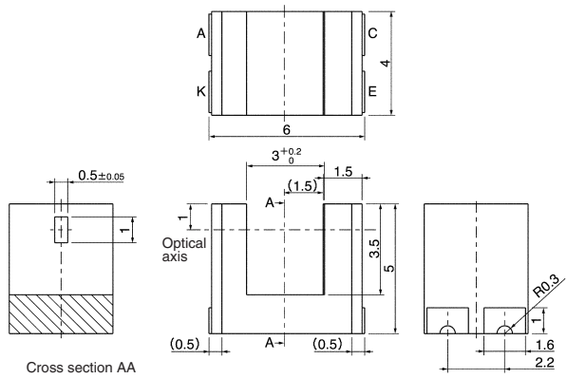
Reel: 60°C for 24 hours or more
Bulk: 80°C for 4 hours or more

OMRON

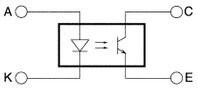
Photomicrosensor (Transmissive)
EE-SX1109

■ Dimensions

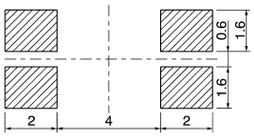
Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Recommended Soldering Pattern



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are ±0.15 mm.

■ Features

- Ultra-compact with a 6-mm-wide sensor and a 3-mm-wide slot.
- PCB surface mounting type.
- High resolution with a 0.5-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	25 mA (see note 1)
	Pulse forward current	I_{FP}	100 mA (see note 2)
	Reverse voltage	V_R	5 V
Detector	Collector–Emitter voltage	V_{CEO}	20 V
	Emitter–Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–30°C to 85°C
	Storage	T_{stg}	–40°C to 90°C
	Reflow soldering	T_{sol}	255°C (see note 3)
	Manual soldering	T_{sol}	350°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Duty: 1/100; Pulse width: 0.1 ms
3. Complete soldering within 10 seconds for reflow soldering and within 3 seconds for manual soldering.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1109**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.1 V typ., 1.3 V max.	I_F = 5 mA
	Reverse current	I_R	10 μA max.	V_R = 5 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	50 μA min., 150 μA typ., 500 μA max.	I_F = 5 mA, V_{CE} = 5 V
	Dark current	I_D	100 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 50 μA
	Peak spectral sensitivity wavelength	λ_P	900 nm typ.	---
Rising time		tr	10 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 μA
Falling time		tf	10 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 μA

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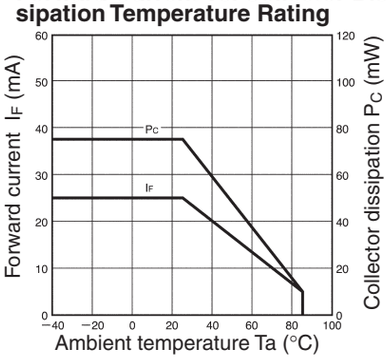
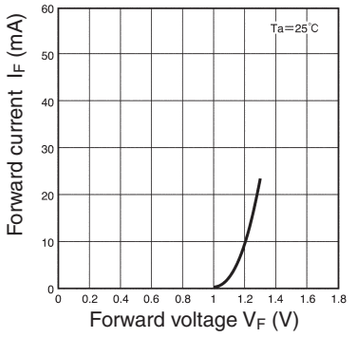
■ Engineering Data

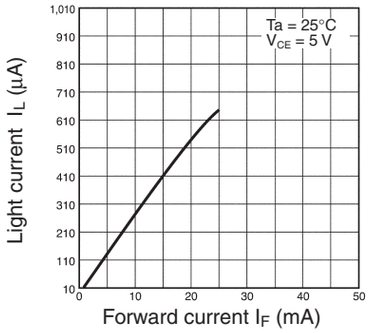
Forward Current vs. Collector Dissipation Temperature Rating



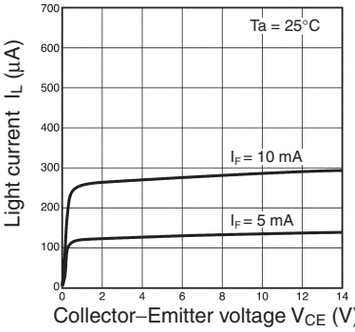
Forward Current vs. Forward Voltage Characteristics (Typical)



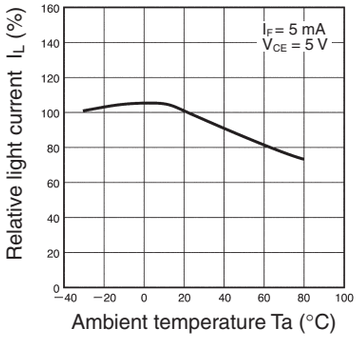
Light Current vs. Forward Current Characteristics (Typical)



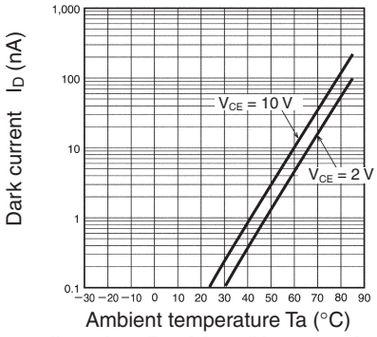
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



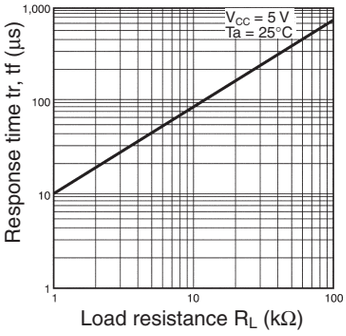
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



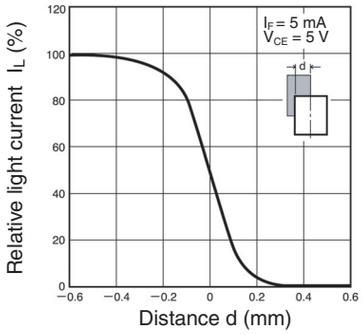
Dark Current vs. Ambient Temperature Characteristics



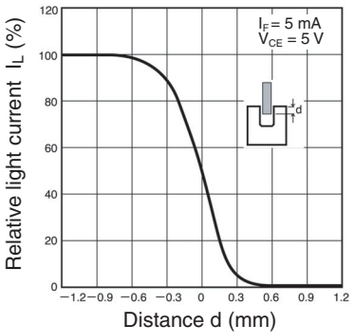
Response Time vs. Load Resistance Characteristics



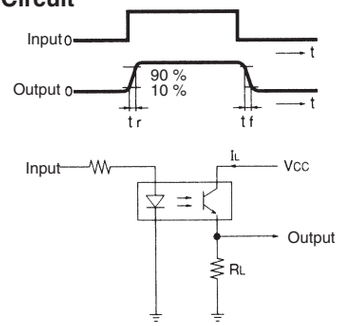
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



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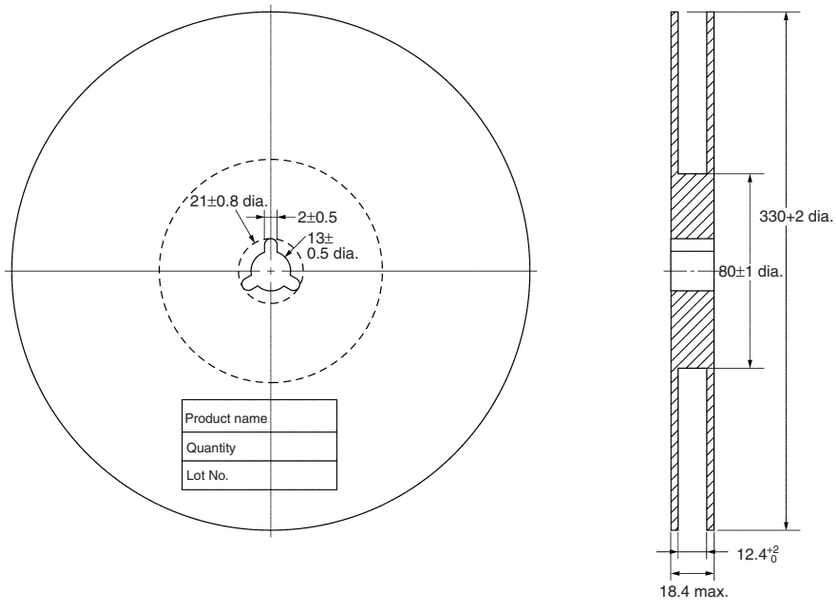
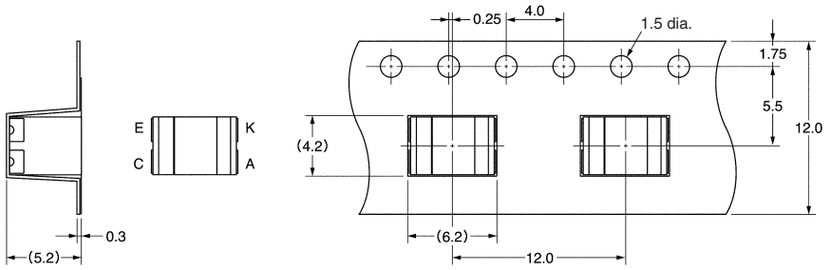
Unit: mm (inch)

■ Tape and Reel

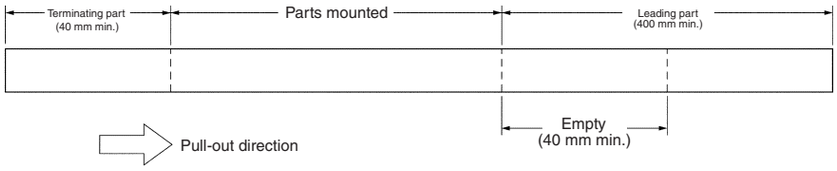
Reel



Tape



Tape configuration



Tape quantity

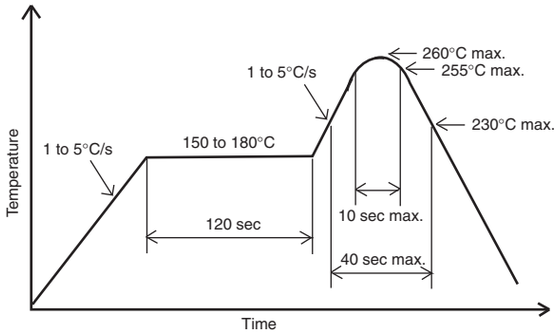
1,000 pcs./reel

Precautions

■ Soldering Information

Reflow soldering

- The following soldering paste is recommended:
  Melting temperature: 216 to 220°C
  Composition: Sn 3.5 Ag 0.75 Cu
- The recommended thickness of the metal mask for screen printing is between 0.2 and 0.25 mm.
- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



Manual soldering

- Use “Sn 60” (60% tin and 40% lead) or solder with silver content.
- Use a soldering iron of less than 25 W, and keep the temperature of the iron tip at 300°C or below.
- Solder each point for a maximum of three seconds.
- After soldering, allow the product to return to room temperature before handling it.

Storage

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended. If this is not possible, store the product under the following conditions:

Temperature: 10 to 30°C
Humidity: 60% max.

The product is packed in a humidity-proof envelope. Reflow soldering must be done within 48 hours after opening the envelope, during which time the product must be stored under 30°C at 80% maximum humidity.

If it is necessary to store the product after opening the envelope, use dry-box storage or reseal the envelope.

Baking

If a product has remained packed in a humidity-proof envelope for six months or more, or if more than 48 hours have lapsed since the envelope was opened, bake the product under the following conditions before use:

Reel: 60°C for 24 hours or more
Bulk: 80°C for 4 hours or more

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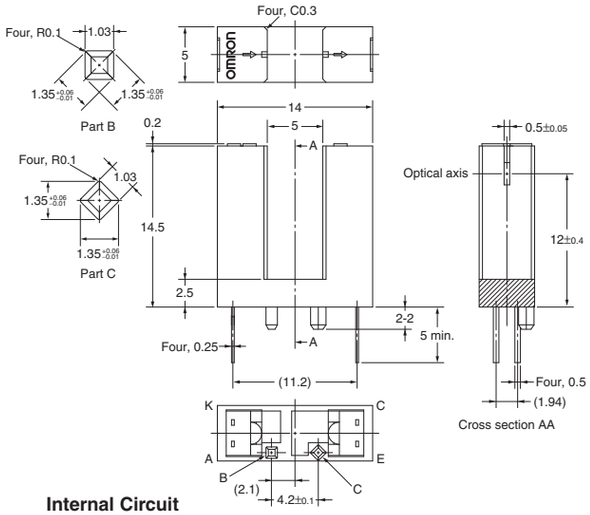
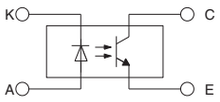
Photomicrosensor (Transmissive)
EE-SX1115

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- 14.5-mm-tall model with a deep slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1115**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 lx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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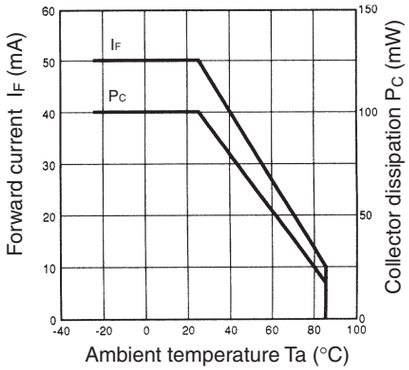
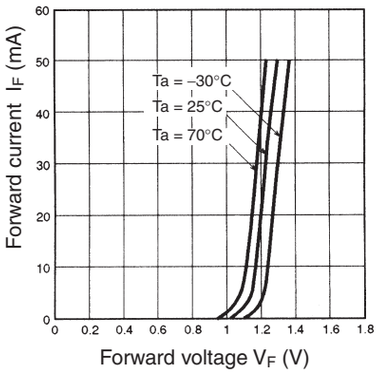
■ Engineering Data

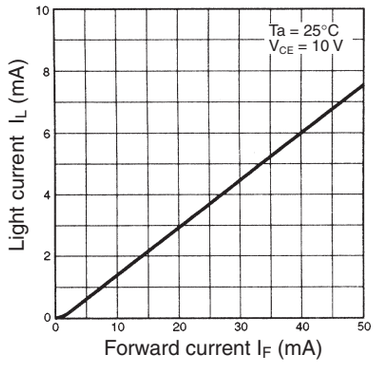
Forward Current vs. Collector Dissipation Temperature Rating



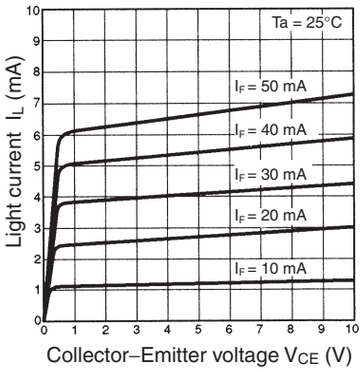
Forward Current vs. Forward Voltage Characteristics (Typical)



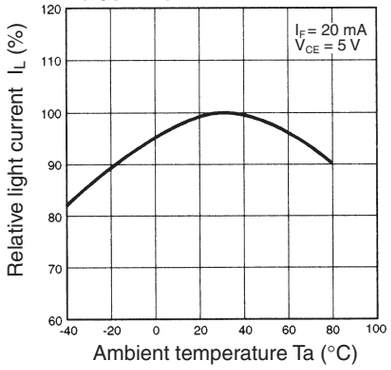
Light Current vs. Forward Current Characteristics (Typical)



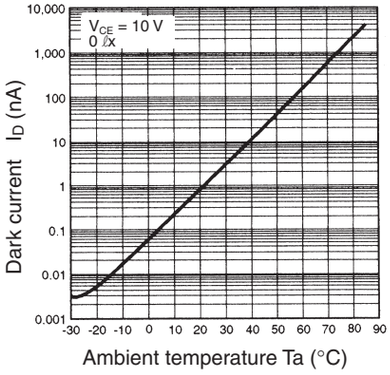
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



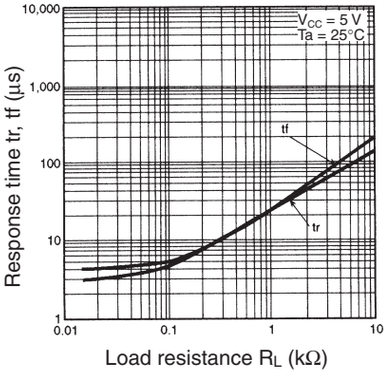
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



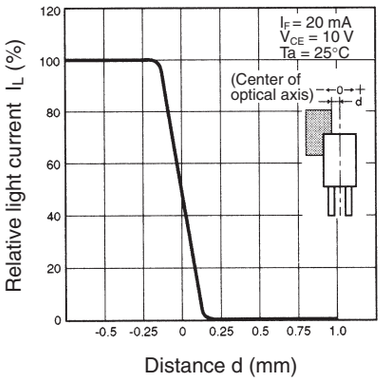
Dark Current vs. Ambient Temperature Characteristics (Typical)



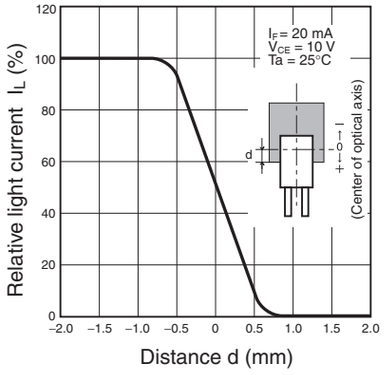
Response Time vs. Load Resistance Characteristics (Typical)



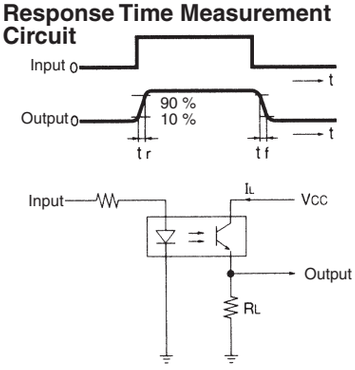
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



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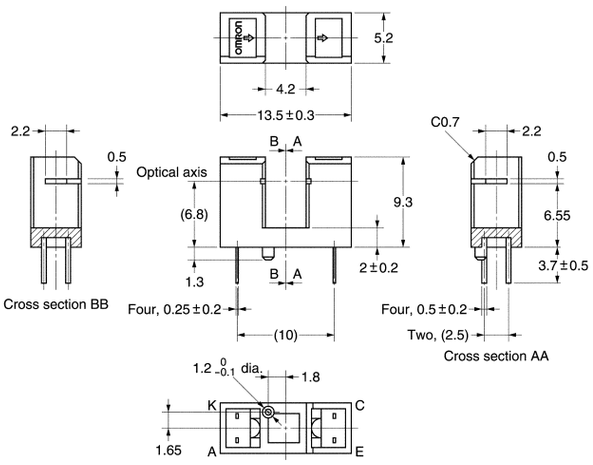
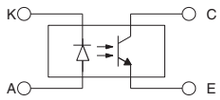
Photomicrosensor (Transmissive)
EE-SX1128

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
0 < × ≤ 4	±0.100
4 < × ≤ 18	±0.200

■ Features

- General-purpose model with a 4.2-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- Horizontal sensing aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1128**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 10 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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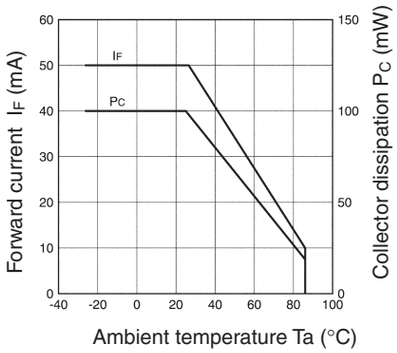
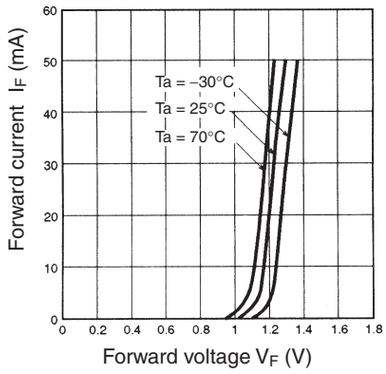
■ Engineering Data

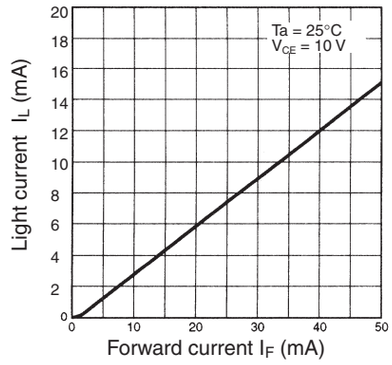
Forward Current vs. Collector Dissipation Temperature Rating



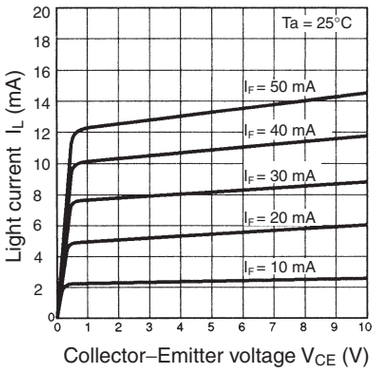
Forward Current vs. Forward Voltage Characteristics (Typical)



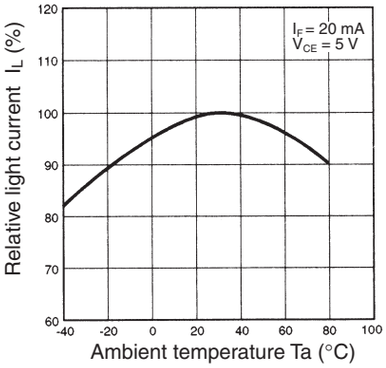
Light Current vs. Forward Current Characteristics (Typical)



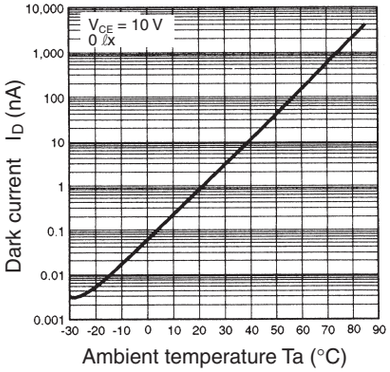
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



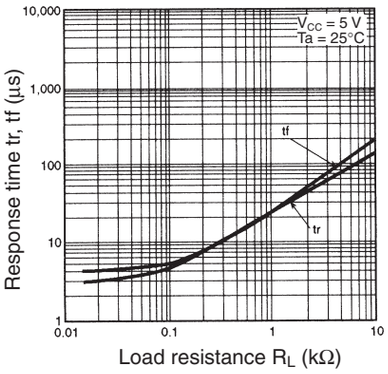
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



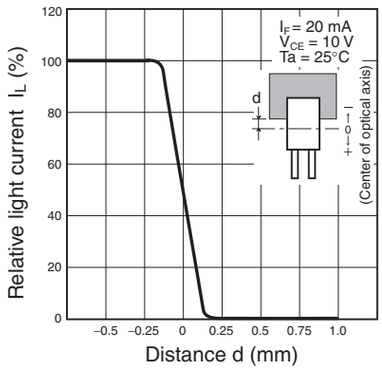
Dark Current vs. Ambient Temperature Characteristics (Typical)



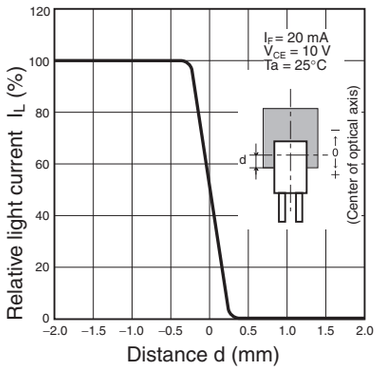
Response Time vs. Load Resistance Characteristics (Typical)



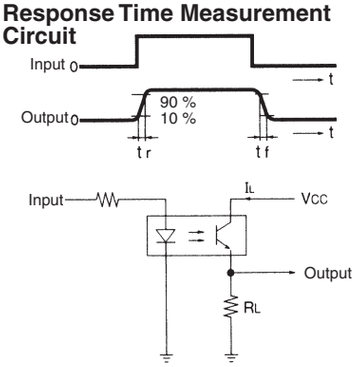
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



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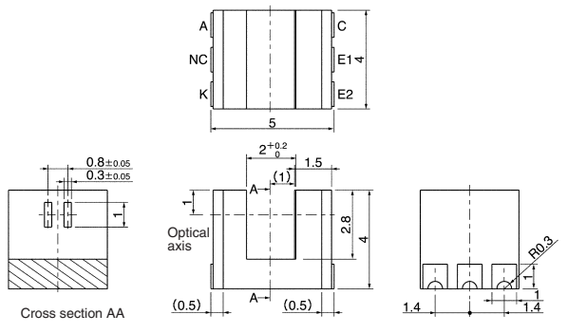
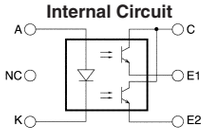
Photomicrosensor (Transmissive)
EE-SX1131

■ Dimensions

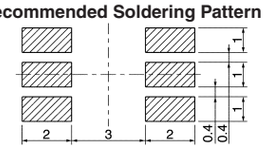
Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Recommended Soldering Pattern



Terminal No.	Name
A	Anode
NC	Not connected.
K	Cathode
C	Collector
E1	Emitter 1
E2	Emitter 2

Unless otherwise specified, the tolerances are ±0.15 mm.

■ Features

- Ultra-compact with a 5-mm-wide sensor and a 2-mm-wide slot.
- PCB surface mounting type.
- High resolution with a 0.3-mm-wide aperture.
- Dual-channel output.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	25 mA (see note 1)
	Pulse forward current	I_{FP}	100 mA (see note 2)
	Reverse voltage	V_R	5 V
Detector	Collector–Emitter voltage	V_{CEO}	20 V
	Emitter–Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–30°C to 85°C
	Storage	T_{stg}	–40°C to 90°C
	Reflow soldering	T_{sol}	255°C (see note 3)
	Manual soldering	T_{sol}	350°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Duty: 1/100; Pulse width: 0.1 ms
3. Complete soldering within 10 seconds for reflow soldering and within 3 seconds for manual soldering.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1131**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.1 V typ., 1.3 V max.	I_F = 5 mA
	Reverse current	I_R	10 μA max.	V_R = 5 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_{L1}/I_{L2}	50 μA min., 150 μA typ., 500 μA max.	I_F = 5 mA, V_{CE} = 5 V
	Dark current	I_D	100 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 50 μA
	Peak spectral sensitivity wavelength	λ_P	900 nm typ.	---
Rising time		tr	10 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 μA
Falling time		tf	10 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 μA

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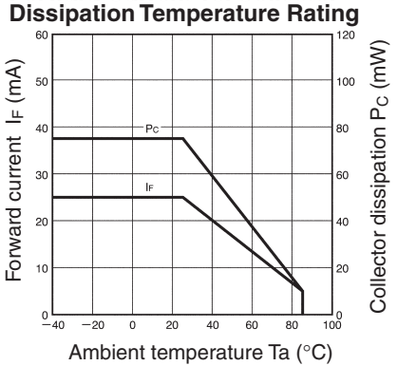
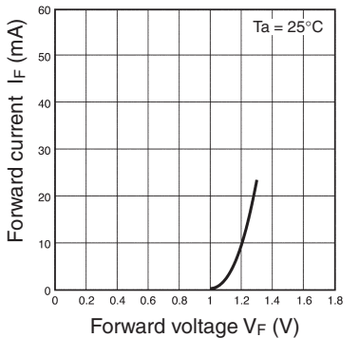
■ Engineering Data

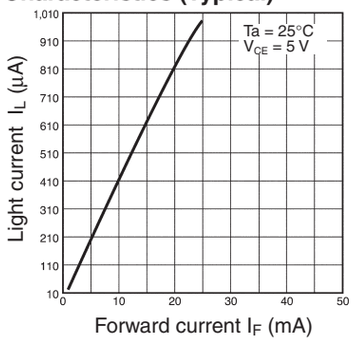
Forward Current vs. Collector Dissipation Temperature Rating



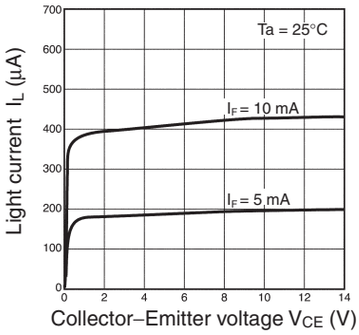
Forward Current vs. Forward Voltage Characteristics (Typical)



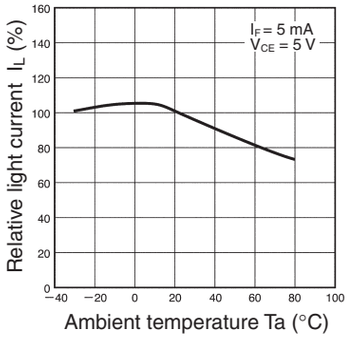
Light Current vs. Forward Current Characteristics (Typical)



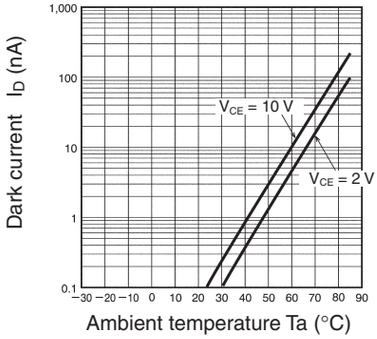
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



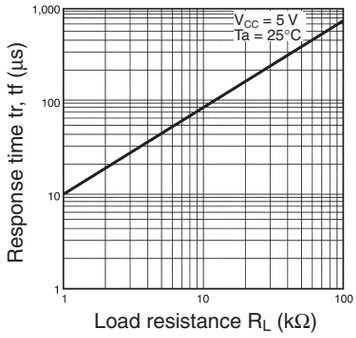
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



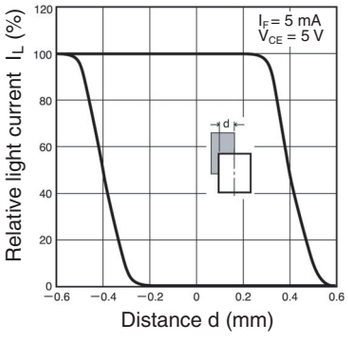
Dark Current vs. Ambient Temperature Characteristics



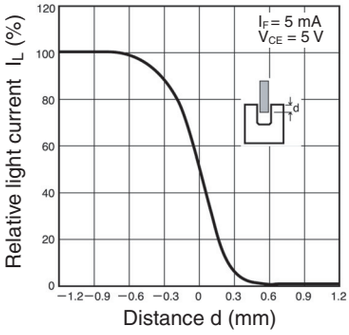
Response Time vs. Load Resistance Characteristics (Typical)



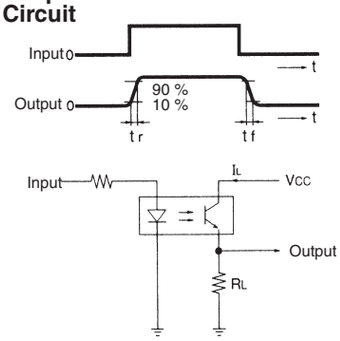
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



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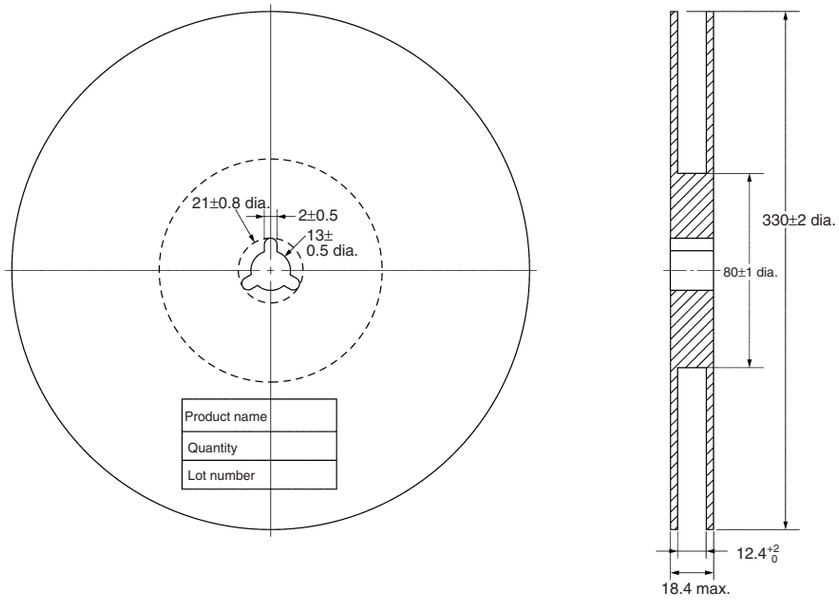
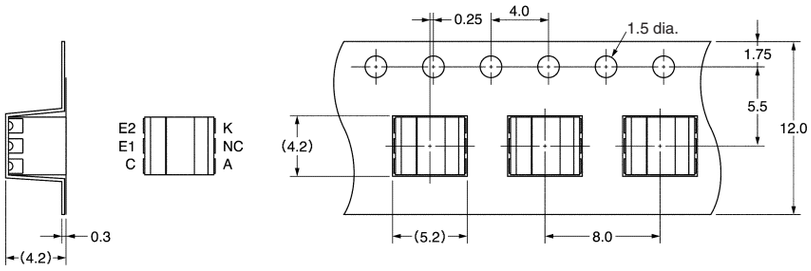
Unit: mm (inch)

■ Tape and Reel

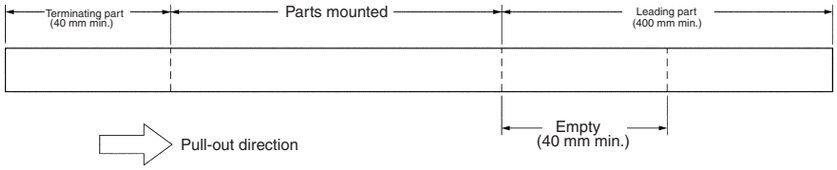
Reel



Tape



Tape configuration



Tape quantity

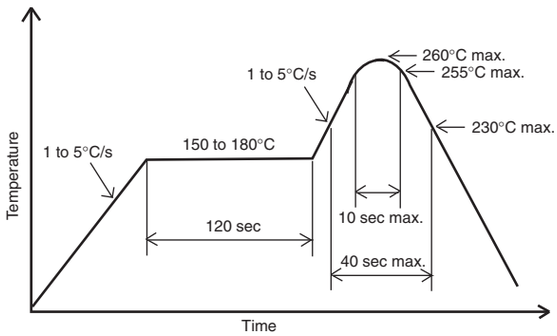
2,000 pcs./reel

Precautions

■ Soldering Information

Reflow soldering

- The following soldering paste is recommended:
  Melting temperature: 216 to 220°C
  Composition: Sn 3.5 Ag 0.75 Cu
- The recommended thickness of the metal mask for screen printing is between 0.2 and 0.25 mm.
- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



Manual soldering

- Use “Sn 60” (60% tin and 40% lead) or solder with silver content.
- Use a soldering iron of less than 25 W, and keep the temperature of the iron tip at 300°C or below.
- Solder each point for a maximum of three seconds.
- After soldering, allow the product to return to room temperature before handling it.

Storage

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended. If this is not possible, store the product under the following conditions:

Temperature: 10 to 30°C
Humidity: 60% max.

The product is packed in a humidity-proof envelope. Reflow soldering must be done within 48 hours after opening the envelope, during which time the product must be stored under 30°C at 80% maximum humidity.

If it is necessary to store the product after opening the envelope, use dry-box storage or reseal the envelope.

Baking

If a product has remained packed in a humidity-proof envelope for six months or more, or if more than 48 hours have lapsed since the envelope was opened, bake the product under the following conditions before use:

Reel: 60°C for 24 hours or more
Bulk: 80°C for 4 hours or more

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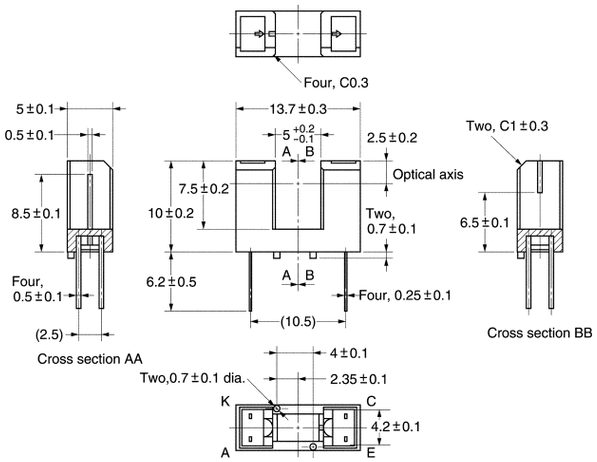
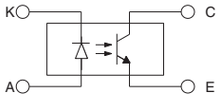
Photomicrosensor (Transmissive)
EE-SX1137

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- General-purpose model with a 5-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1137**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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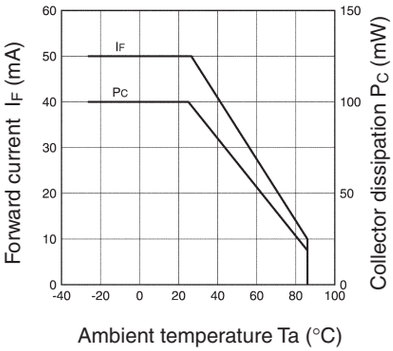
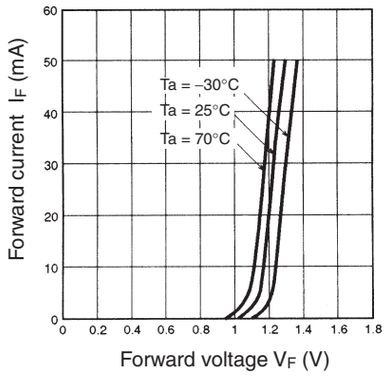
■ Engineering Data

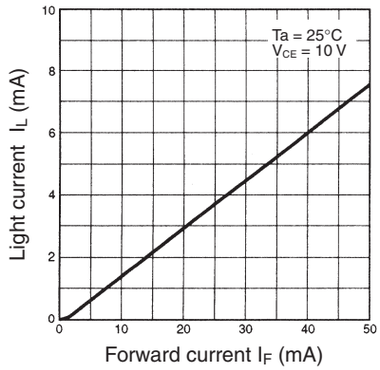
Forward Current vs. Collector Dissipation Temperature Rating



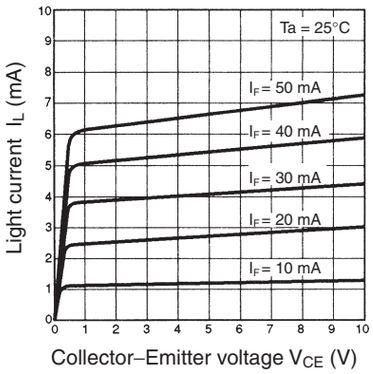
Forward Current vs. Forward Voltage Characteristics (Typical)



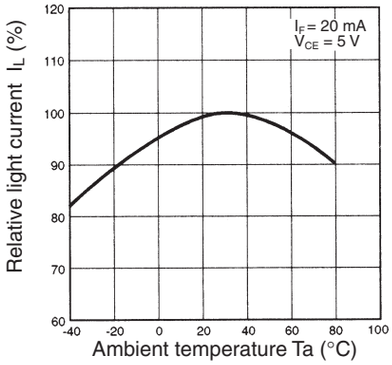
Light Current vs. Forward Current Characteristics (Typical)



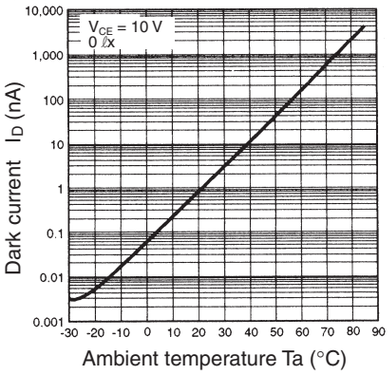
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



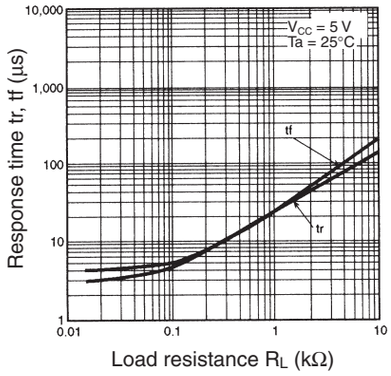
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



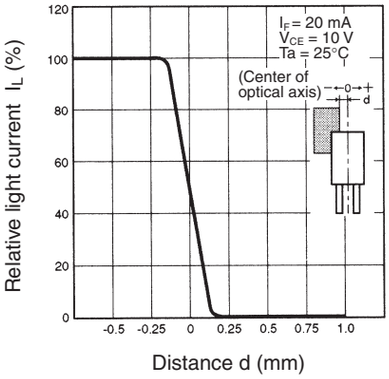
Dark Current vs. Ambient Temperature Characteristics (Typical)



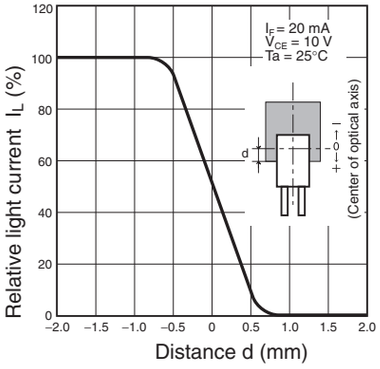
Response Time vs. Load Resistance Characteristics (Typical)



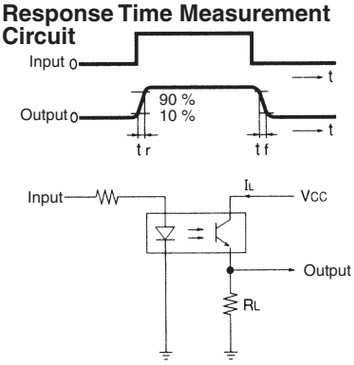
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



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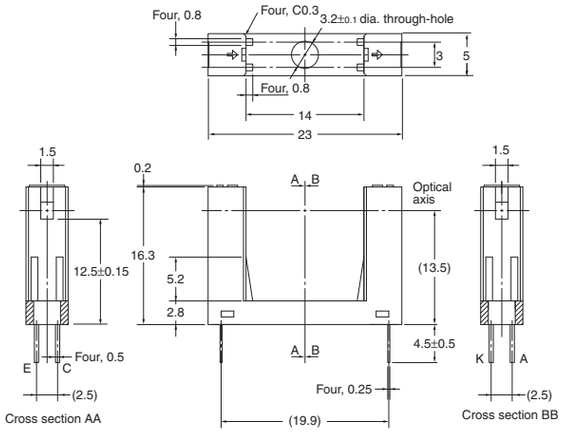
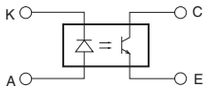
Photomicrosensor (Transmissive)
EE-SX1140

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- General-purpose model with a 14-mm-wide slot.
- 16.3-mm-tall model with a deep slot.
- PCB mounting type.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1140**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.4 mA min.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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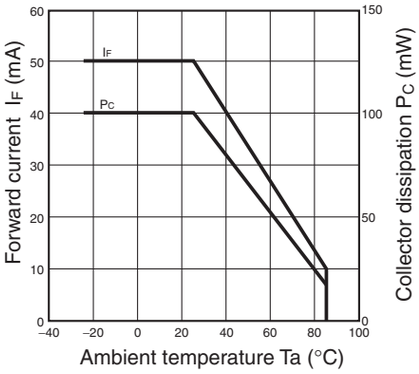
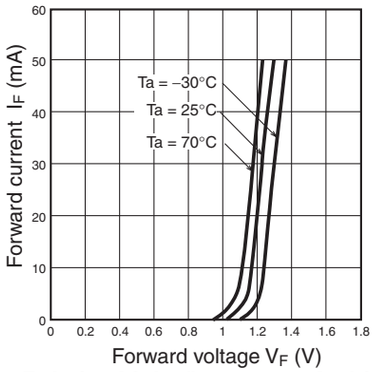
■ Engineering Data

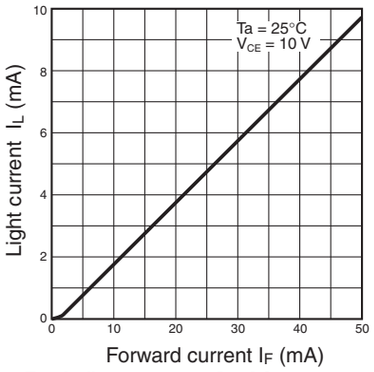
Forward Current vs. Collector Dissipation Temperature Rating



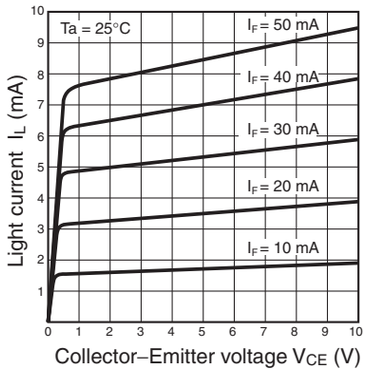
Forward Current vs. Forward Voltage Characteristics (Typical)



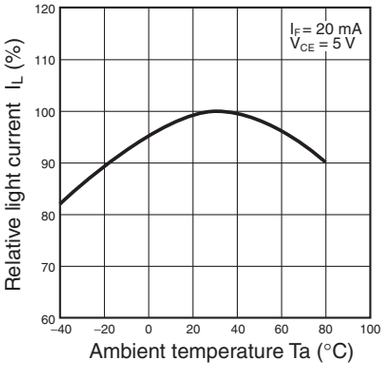
Light Current vs. Forward Current Characteristics (Typical)



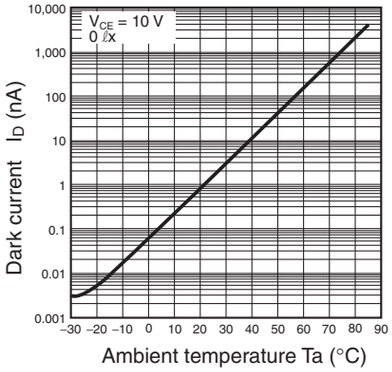
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



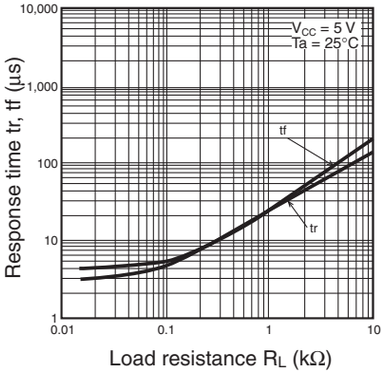
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



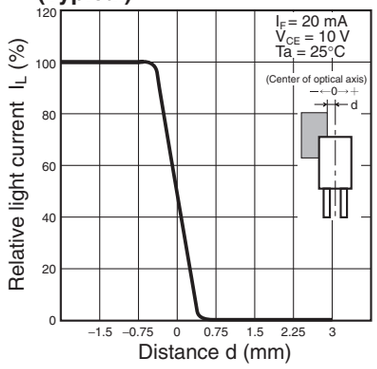
Dark Current vs. Ambient Temperature Characteristics (Typical)



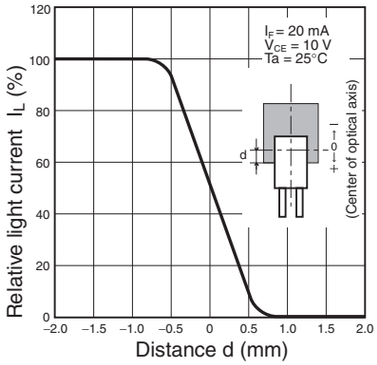
Response Time vs. Load Resistance Characteristics (Typical)



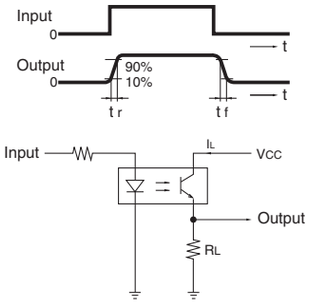
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



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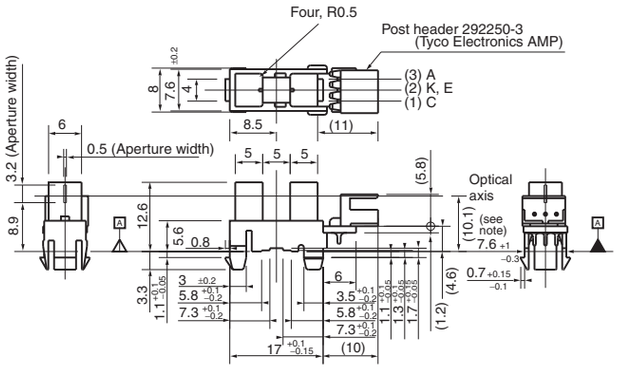
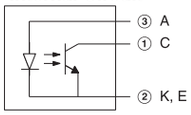
Photomicrosensor (Transmissive)
EE-SX1235A-P2

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
C	Collector
K, E	Cathode, Emitter

Note: The asterisked dimension is specified by datum A only.

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Recommended Mating Connectors:
Tyco Electronics AMP 173977-3 (press-fit connector)
175778-3 (crimp connector)
179228-3 (crimp connector)

■ Features

- Snap-in mounting model.
- Mounts to 1.0-, 1.2- and 1.6-mm-thick PCBs.
- High resolution with a 0.5-mm-wide aperture.
- 5-mm-wide slot.
- Connects to Tyco Electronics AMP's CT-series connectors.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note)
	Pulse forward current	I_{FP}	---
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note)
Ambient temperature	Operating	T_{opr}	–25°C to 95°C
	Storage	T_{stg}	–40°C to 100°C
Soldering temperature		T_{sol}	---

Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX1235A-P2**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 30 mA
Detector	Light current	I_L	0.6 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.3 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 5 V
Rising time		tr	8 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 1 mA
Falling time		tf	8 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 1 mA

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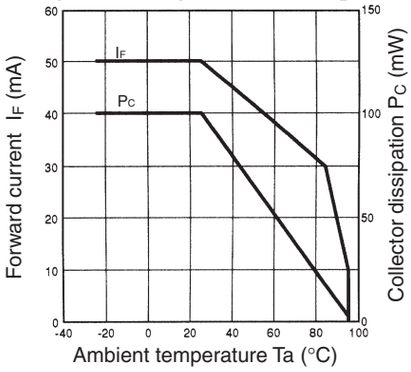
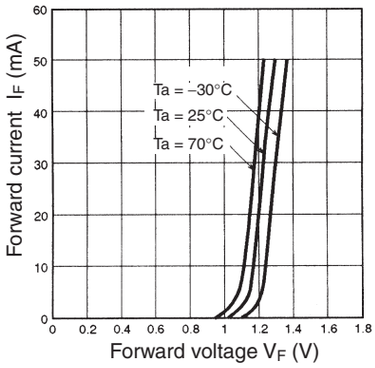
■ Engineering Data

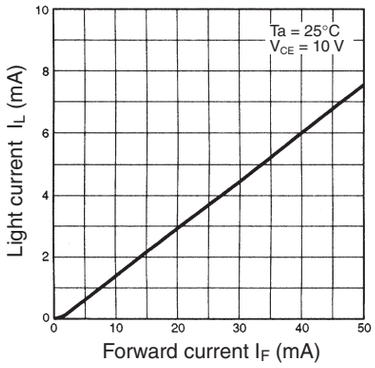
Forward Current vs. Collector Dissipation Temperature Rating



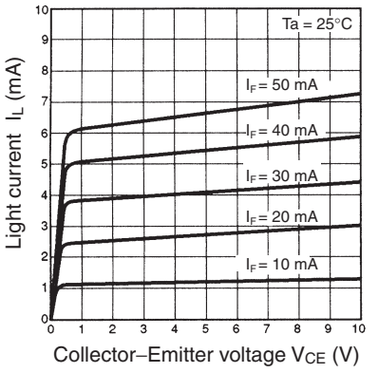
Forward Current vs. Forward Voltage Characteristics (Typical)



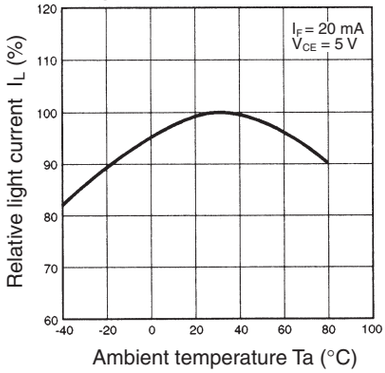
Light Current vs. Forward Current Characteristics (Typical)



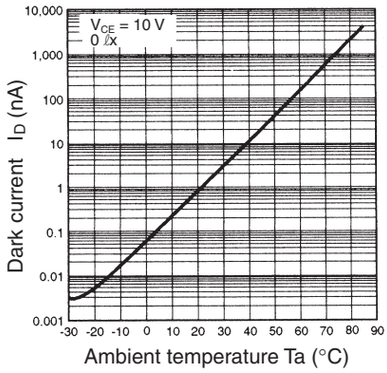
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



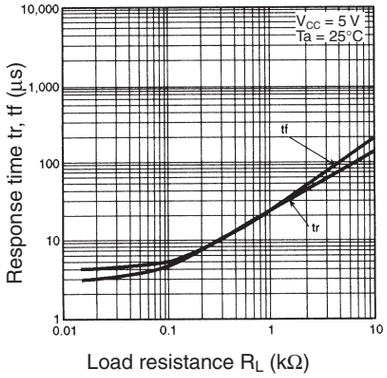
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



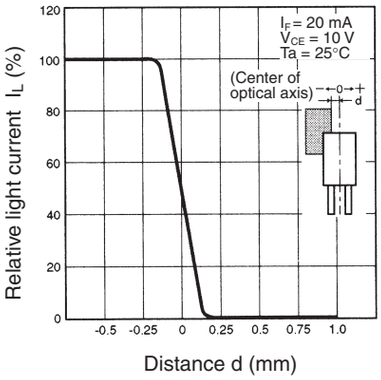
Dark Current vs. Ambient Temperature Characteristics (Typical)



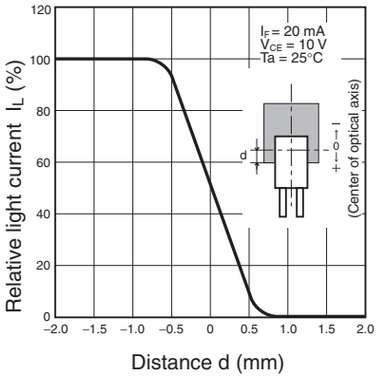
Response Time vs. Load Resistance Characteristics (Typical)



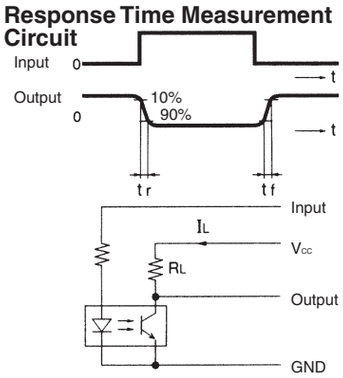
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



See also *EE-SX4235A-P2* datasheet.

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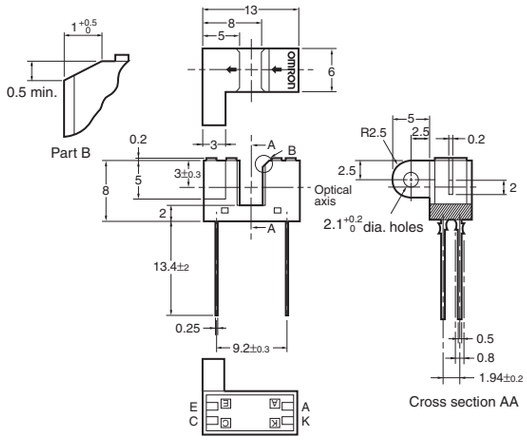
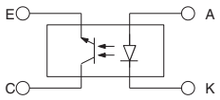
Photomicrosensor (Transmissive)
EE-SX129

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- High-resolution model with a 0.2-mm-wide sensing aperture.
- PCB mounting type.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–40°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX129**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	920 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.2 mA min.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	---	---
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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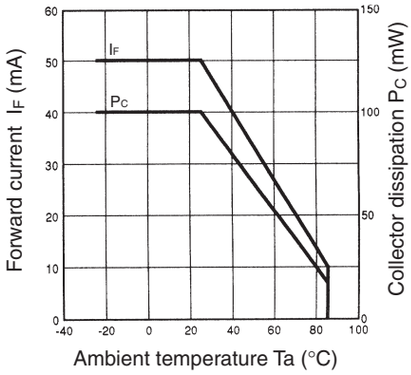
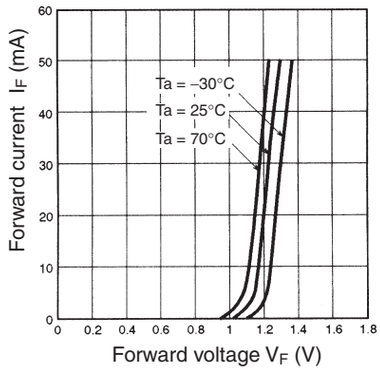
■ Engineering Data

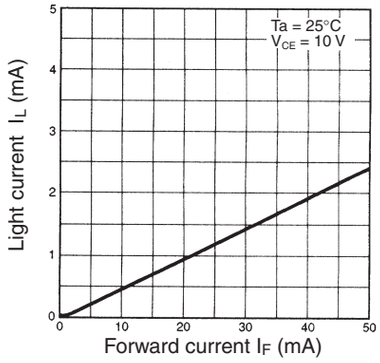
Forward Current vs. Collector Dissipation Temperature Rating



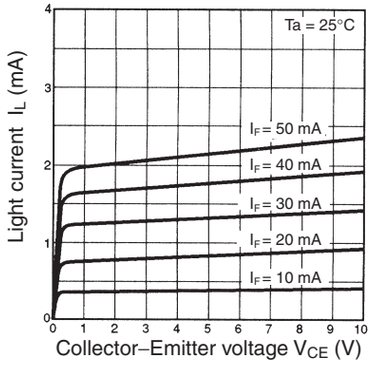
Forward Current vs. Forward Voltage Characteristics (Typical)



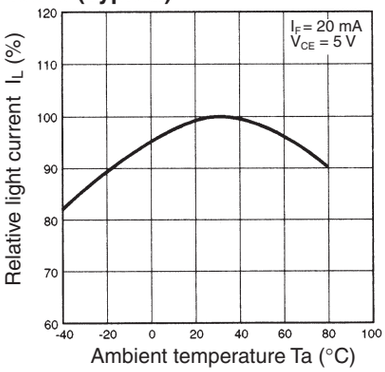
Light Current vs. Forward Current Characteristics (Typical)



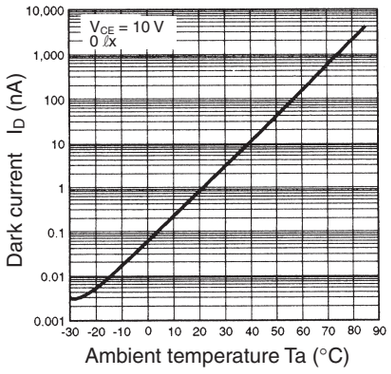
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



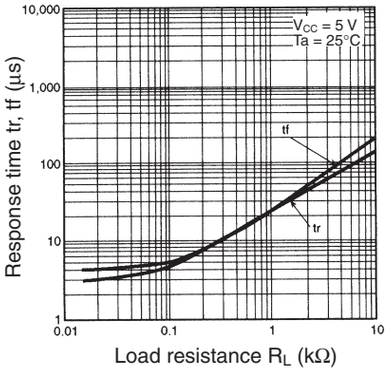
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



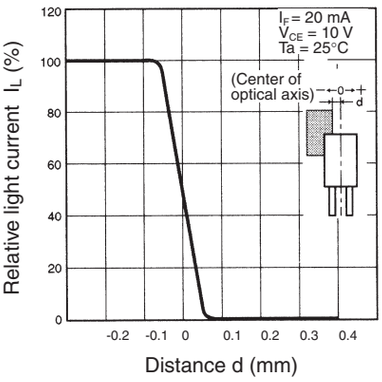
Dark Current vs. Ambient Temperature Characteristics (Typical)



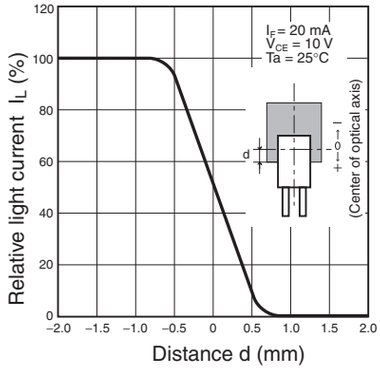
Response Time vs. Load Resistance Characteristics (Typical)



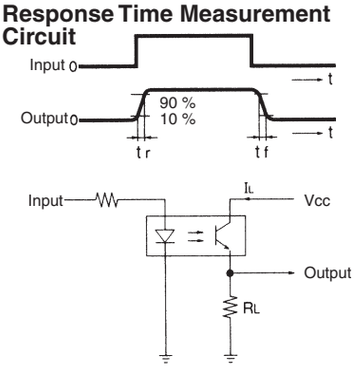
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



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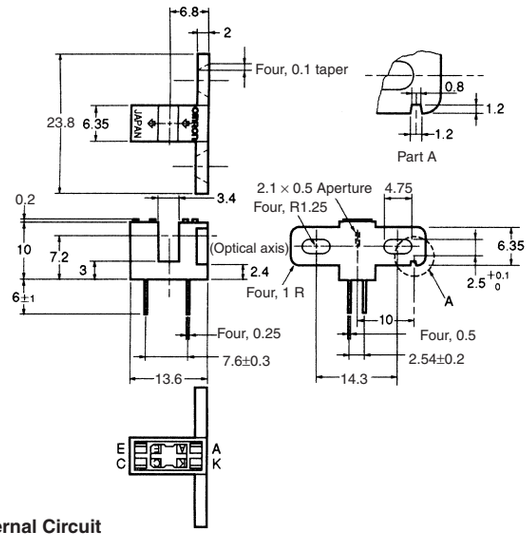
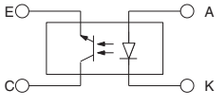
Photomicrosensor (Transmissive)
EE-SX138

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

■ Features

- General-purpose model with a 3.4-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- Screw-mounting possible.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–40°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX138**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	1.9 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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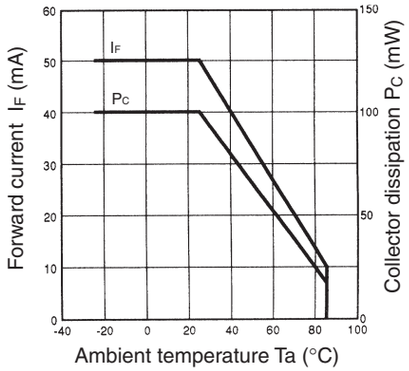
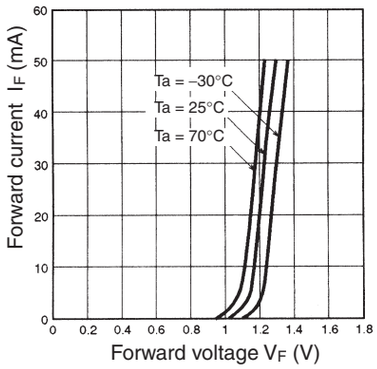
■ Engineering Data

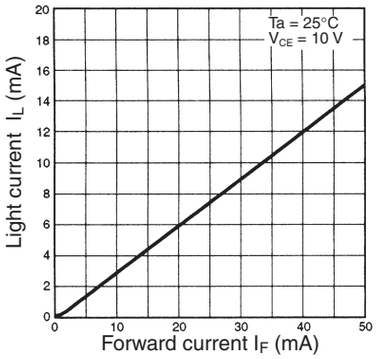
Forward Current vs. Collector Dissipation Temperature Rating



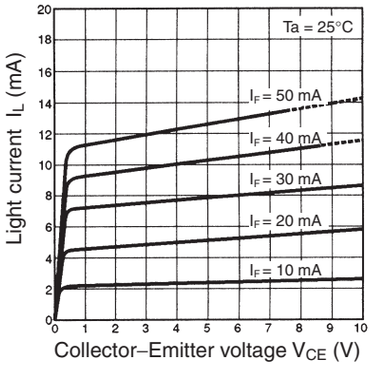
Forward Current vs. Forward Voltage Characteristics (Typical)



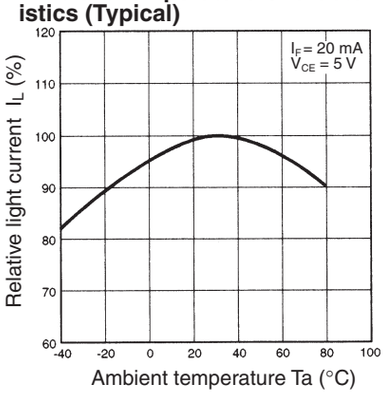
Light Current vs. Forward Current Characteristics (Typical)



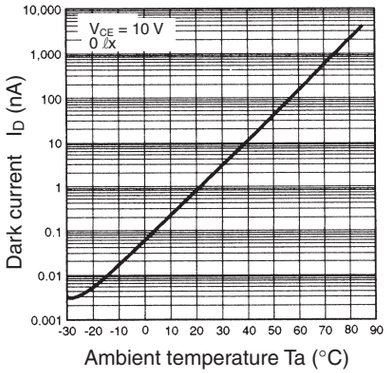
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



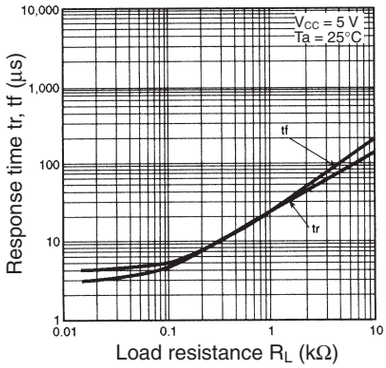
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



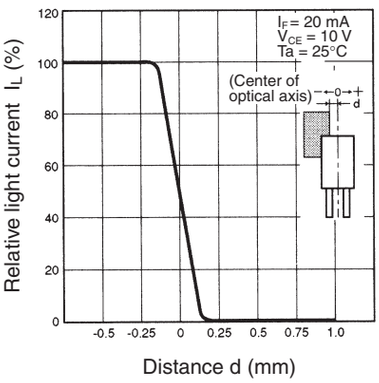
Dark Current vs. Ambient Temperature Characteristics (Typical)



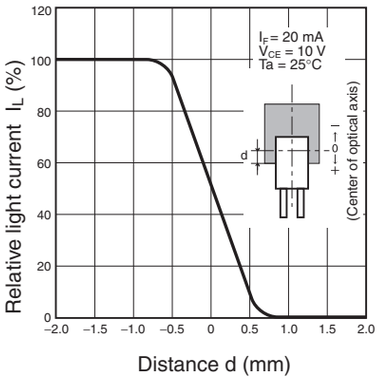
Response Time vs. Load Resistance Characteristics (Typical)



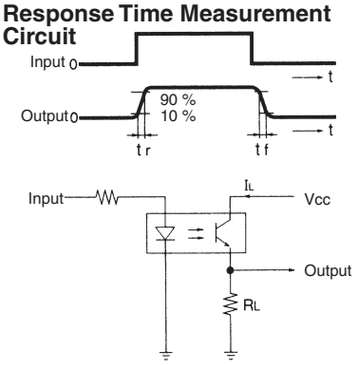
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

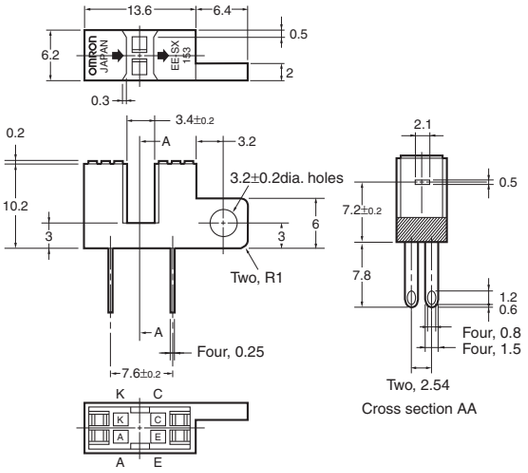


OMRON

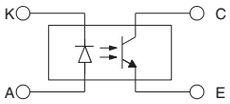
Photomicrosensor (Transmissive)
EE-SX153

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- General-purpose model with a 3.4-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- With a horizontal sensing aperture.
- Screw-mounting possible.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–40°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX153**

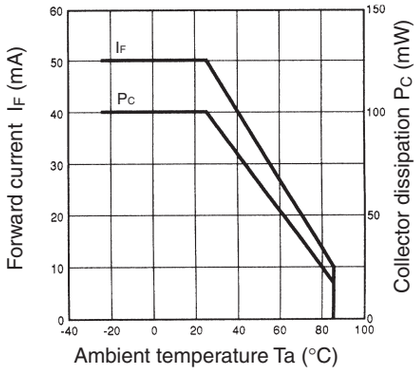
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

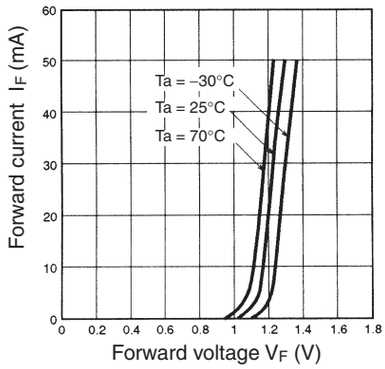
OMRON

■ Engineering Data

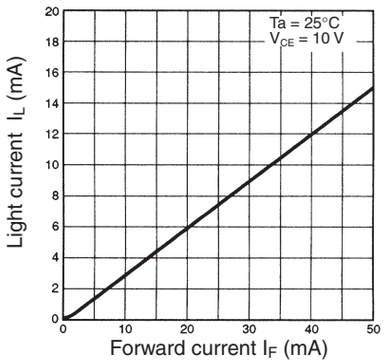
Forward Current vs. Collector Dissipation Temperature Rating



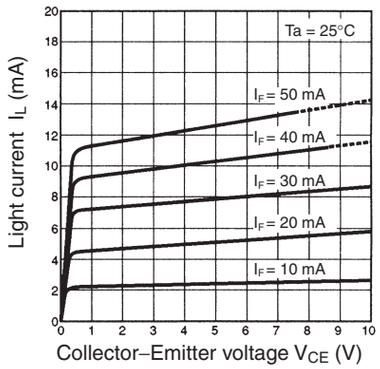
Forward Current vs. Forward Voltage Characteristics (Typical)



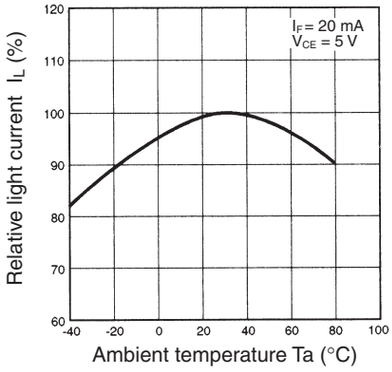
Light Current vs. Forward Current Characteristics (Typical)



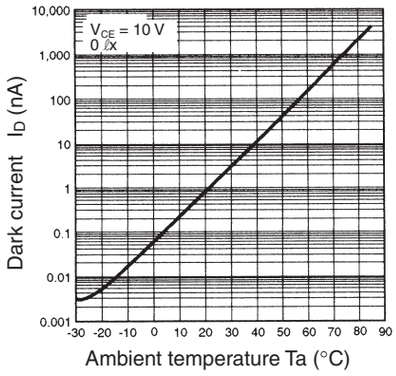
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



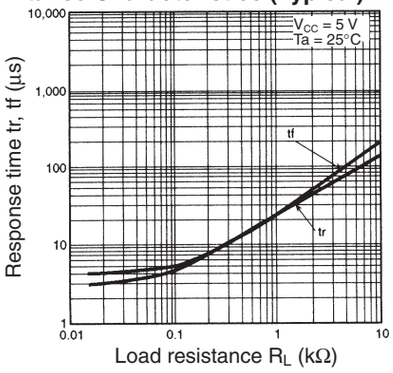
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



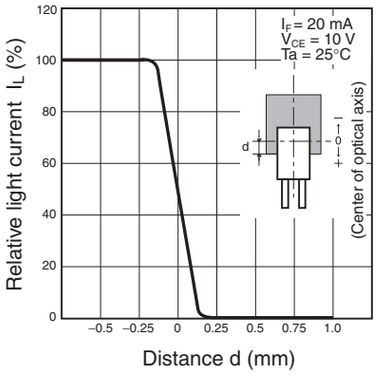
Dark Current vs. Ambient Temperature Characteristics (Typical)



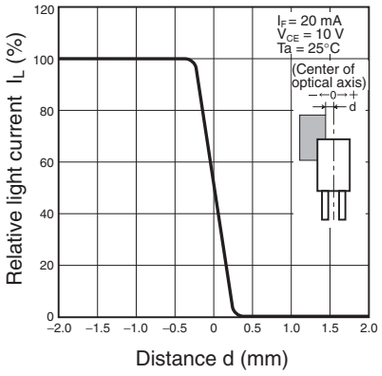
Response Time vs. Load Resistance Characteristics (Typical)



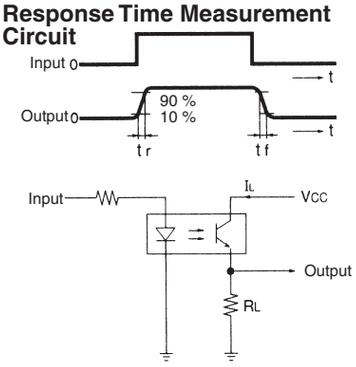
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

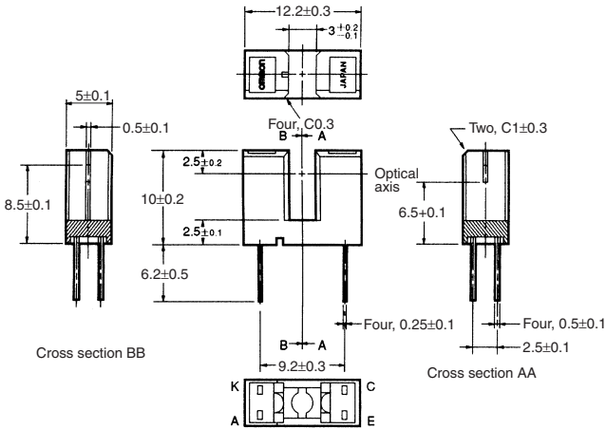


OMRON

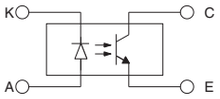
Photomicrosensor (Transmissive)
EE-SX198

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are ±0.2 mm.

■ Features

- General-purpose model with a 3-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX198**

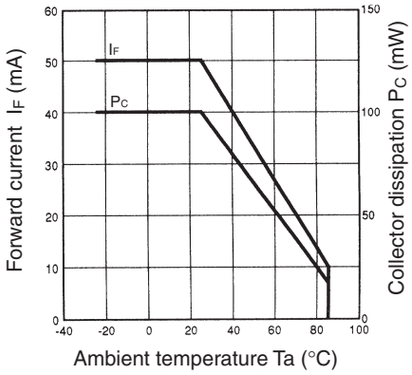
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.4 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 20 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 40 mA, I_L = 0.5 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

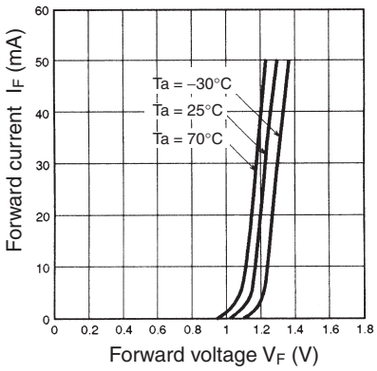
OMRON

■ Engineering Data

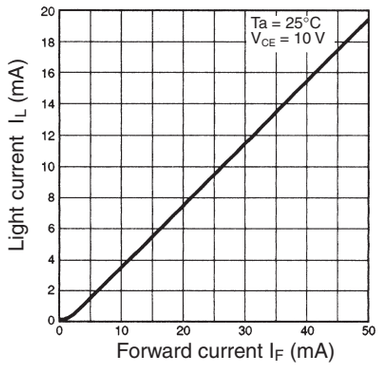
Forward Current vs. Collector Dissipation Temperature Rating



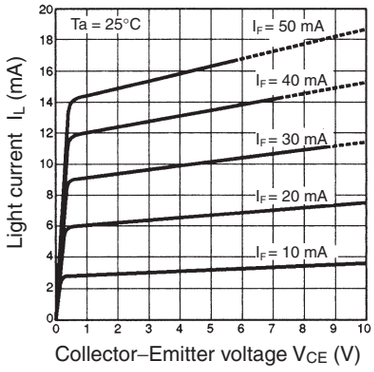
Forward Current vs. Forward Voltage Characteristics (Typical)



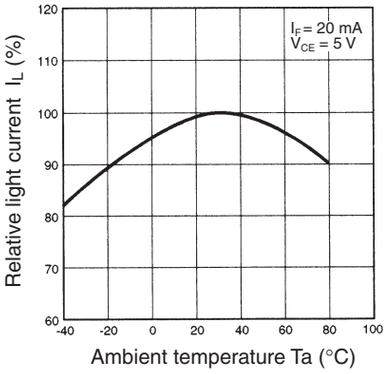
Light Current vs. Forward Current Characteristics (Typical)



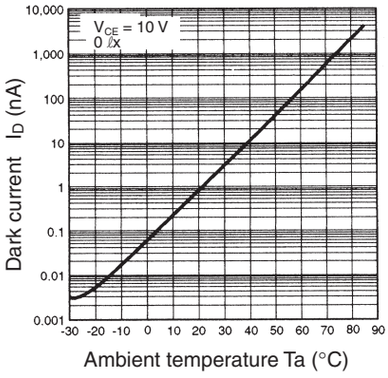
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



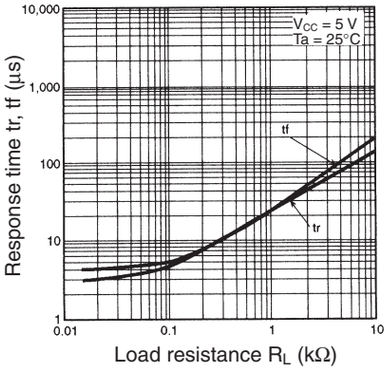
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



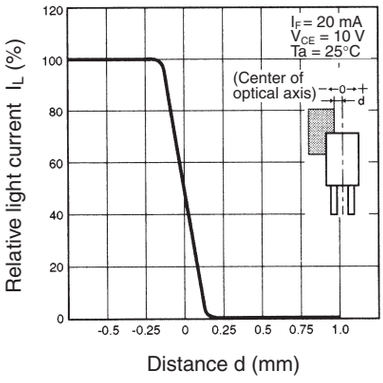
Dark Current vs. Ambient Temperature Characteristics (Typical)



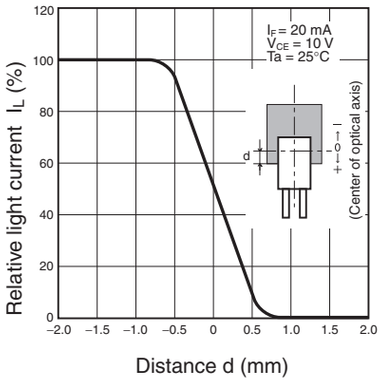
Response Time vs. Load Resistance Characteristics (Typical)



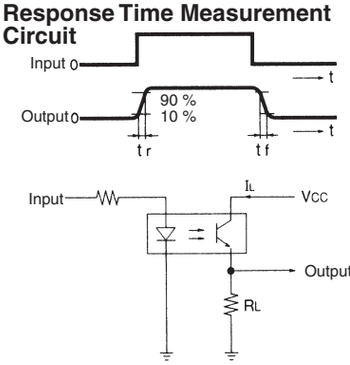
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

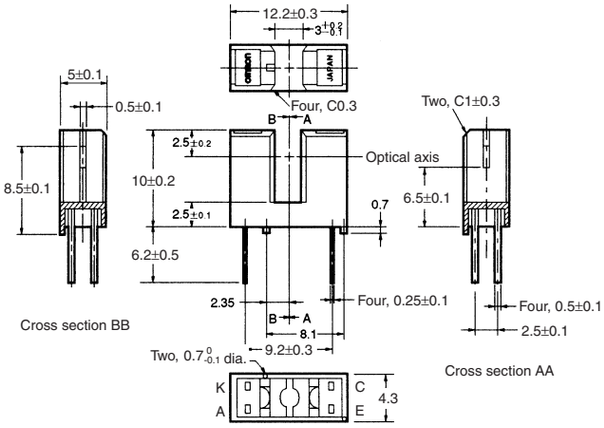


OMRON

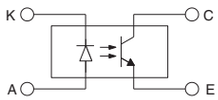
Photomicrosensor (Transmissive)
EE-SX199

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are ±0.2 mm.

■ Features

- General-purpose model with a 3-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- With a positioning boss.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–40°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX199**

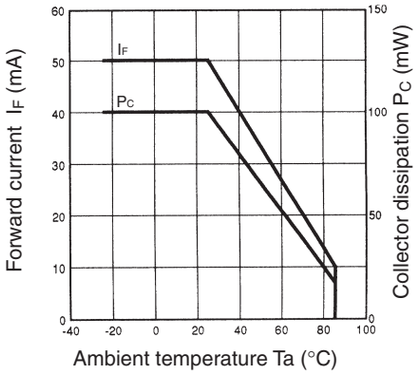
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.4 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 20 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 40 mA, I_L = 0.5 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

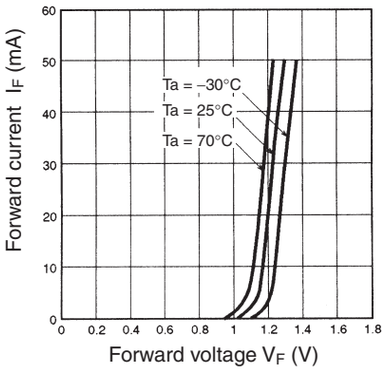
OMRON

■ Engineering Data

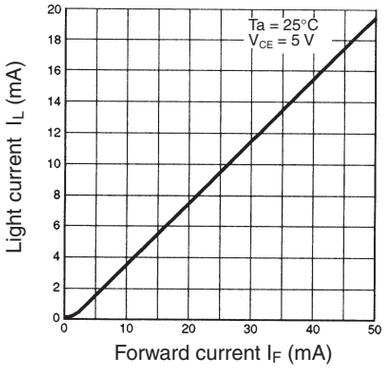
Forward Current vs. Collector Dissipation Temperature Rating



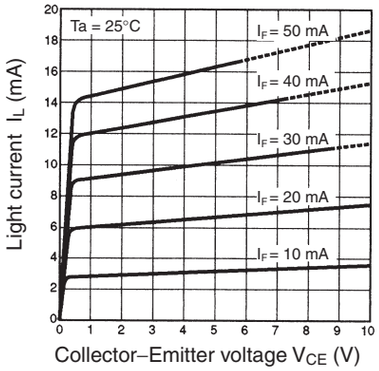
Forward Current vs. Forward Voltage Characteristics (Typical)



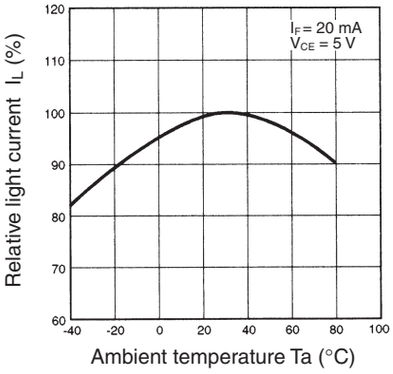
Light Current vs. Forward Current Characteristics (Typical)



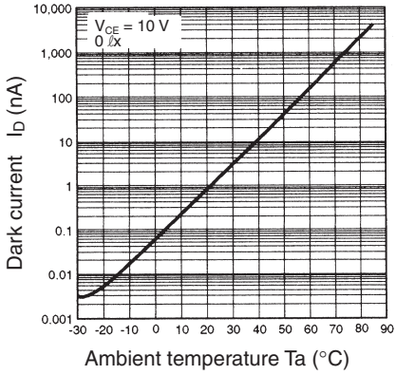
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



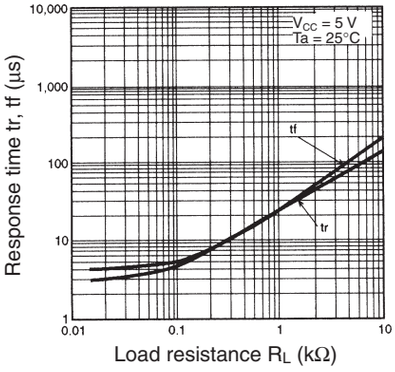
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



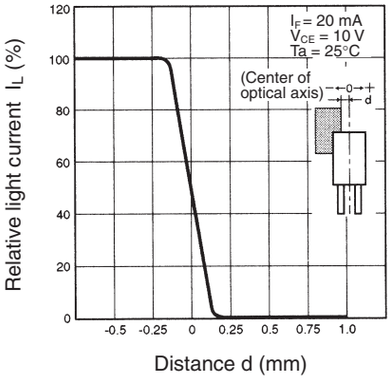
Dark Current vs. Ambient Temperature Characteristics (Typical)



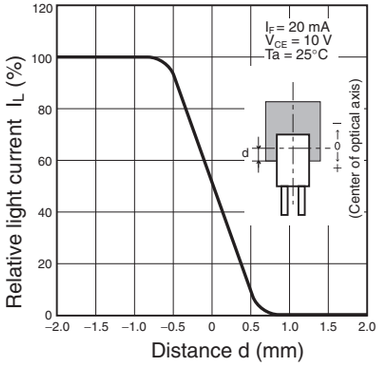
Response Time vs. Load Resistance Characteristics (Typical)



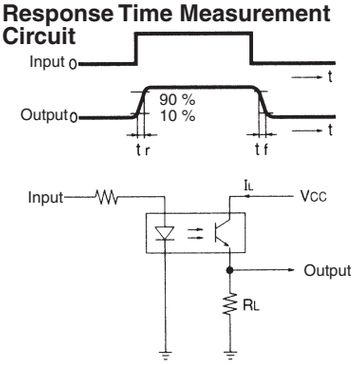
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

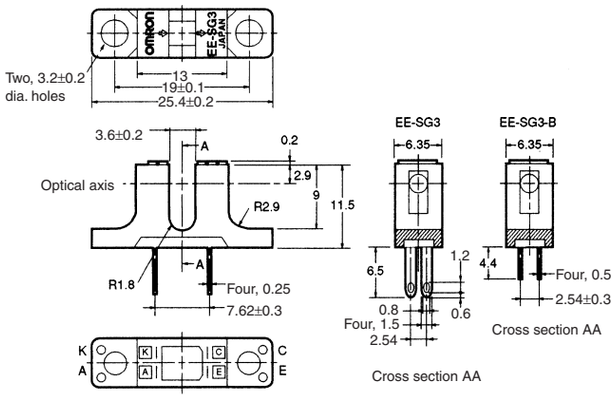


OMRON

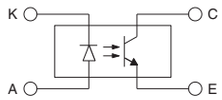
Photomicrosensor (Transmissive)
EE-SG3/EE-SG3-B

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Dust-proof model.
- Solder terminal model (EE-SG3).
- PCB terminal model (EE-SG3-B).
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description		Model
Photomicrosensor (transmissive)	Solder terminal	**EE-SG3**
	PCB terminal	**EE-SG3-B**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	2 mA min., 40 mA max.	I_F = 15 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 30 mA, I_L = 1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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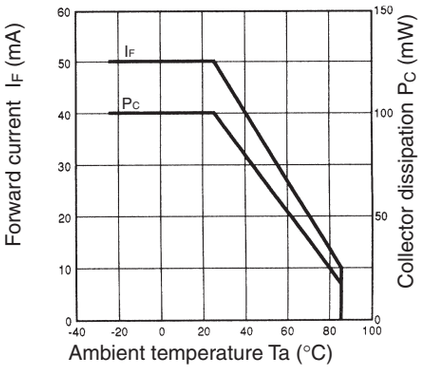
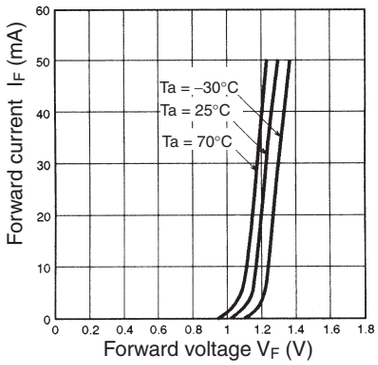
■ Engineering Data

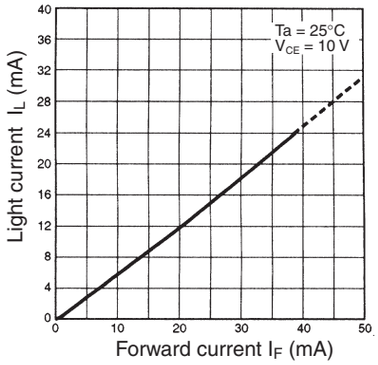
Forward Current vs. Collector Dissipation Temperature Rating



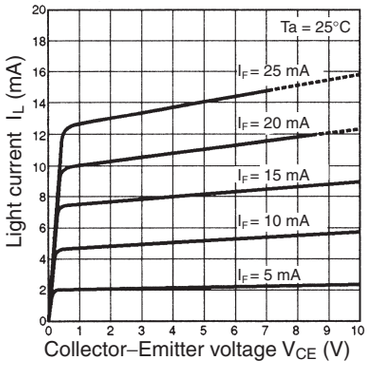
Forward Current vs. Forward Voltage Characteristics (Typical)



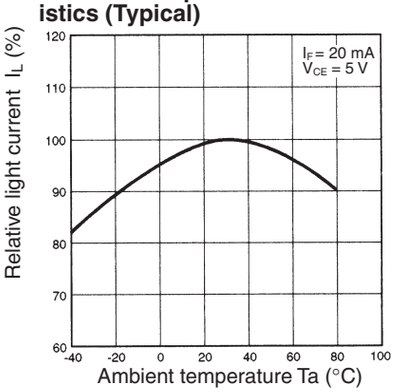
Light Current vs. Forward Current Characteristics (Typical)



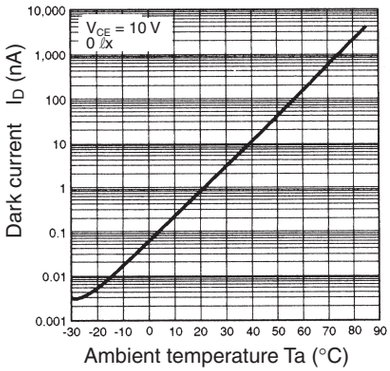
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



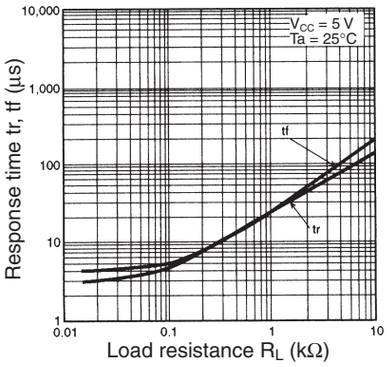
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



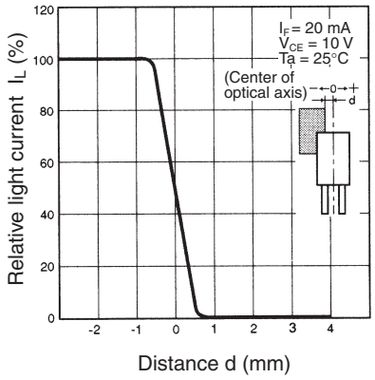
Dark Current vs. Ambient Temperature Characteristics (Typical)



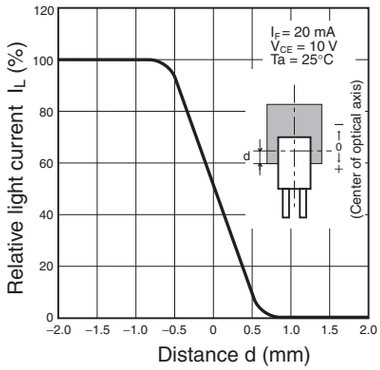
Response Time vs. Load Resistance Characteristics (Typical)



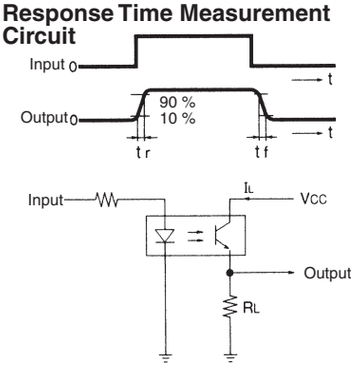
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



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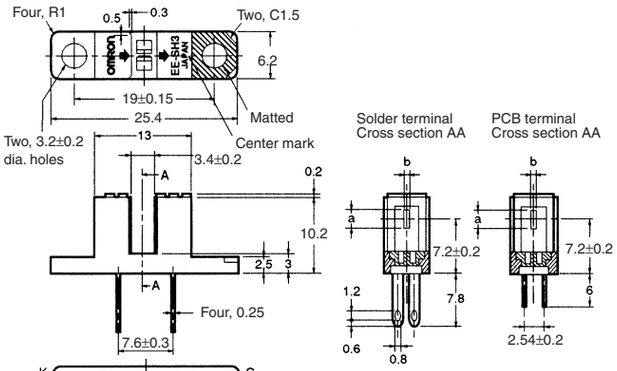
Photomicrosensor (Transmissive)
EE-SH3 Series

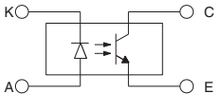
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Model	Aperture (a x b)
EE-SH3(-B)	2.1 x 0.5
EE-SH3-C(S)	2.1 x 1.0
EE-SH3-D(S)	2.1 x 0.2
EE-SH3-G(S)	0.5 x 2.1

Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

■ Features

- High-resolution model with a 0.2-mm-wide or 0.5-mm-wide sensing aperture, high-sensitivity model with a 1-mm-wide sensing aperture, and model with a horizontal sensing aperture are available.
- Solder terminal models: EE-SH3/-SH3-CS/-SH3-DS/-SH3-GS
- PCB terminal models: EE-SH3-B/-SH3-C/-SH3-D/-SH3-G
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Aperture (a x b)	Model
Photomicrosensor (transmissive)	2.1 x 0.5	**EE-SH3(-B)**
	2.1 x 1.0	**EE-SH3-C(S)**
	2.1 x 0.2	**EE-SH3-D(S)**
	0.5 x 2.1	**EE-SH3-G(S)**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value				Condition
			EE-SH3(-B)	EE-SH3-C(S)	EE-SH3-D(S)	EE-SH3-G(S)	
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.				I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.				V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.				I_F = 20 mA
Detector	Light current	I_L	0.5 to 14 mA typ.	1 to 28 mA typ.	0.1 mA min.	0.5 to 14 mA	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.				V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---				---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.		---	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.				V_{CE} = 10 V
Rising time		tr	4 μs typ.				V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.				

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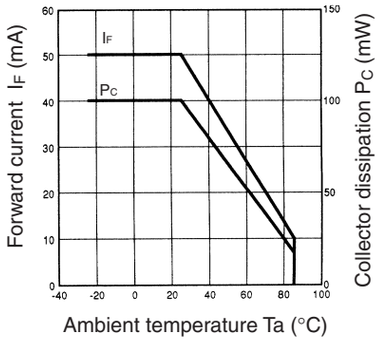
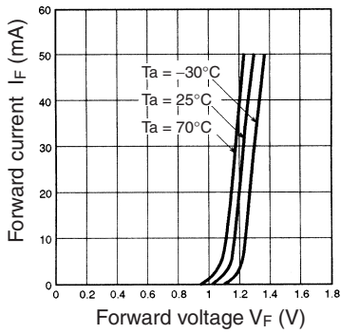
■ Engineering Data

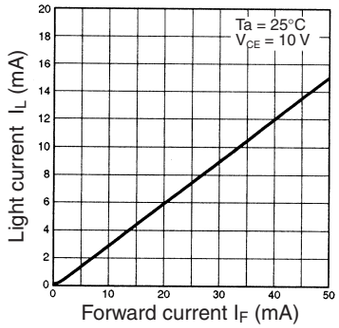
Forward Current vs. Collector Dissipation Temperature Rating



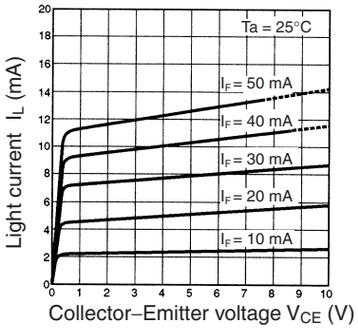
Forward Current vs. Forward Voltage Characteristics (Typical)



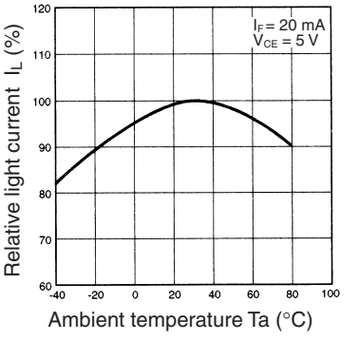
Light Current vs. Forward Current Characteristics (Typical)



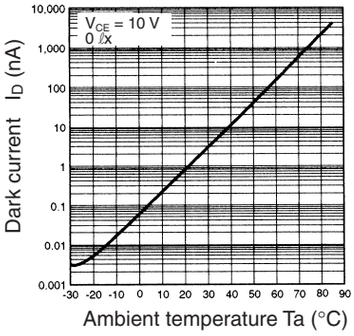
Light Current vs. Collector–Emitter Voltage Characteristics (EE-SH3(-B))



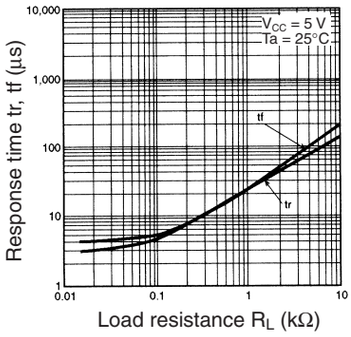
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



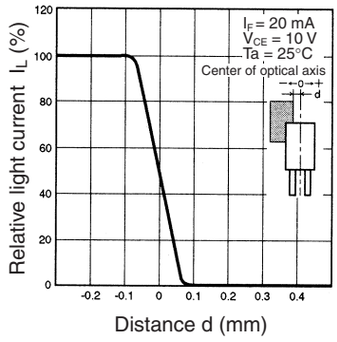
Dark Current vs. Ambient Temperature Characteristics (Typical)



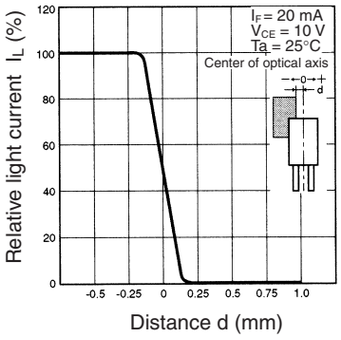
Response Time vs. Load Resistance Characteristics (Typical)



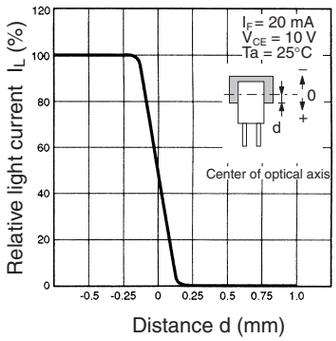
Sensing Position Characteristics (EE-SH3-D(S))



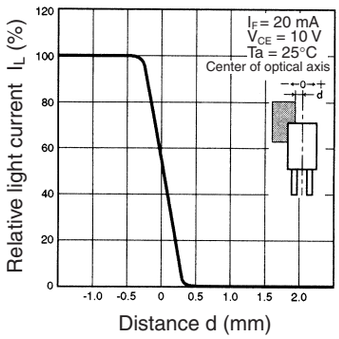
Sensing Position Characteristics (EE-SH3(-B))



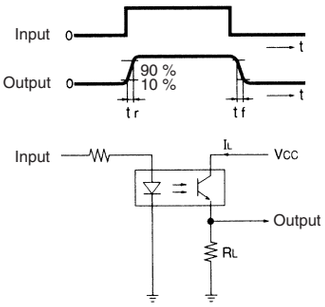
Sensing Position Characteristics (EE-SH3-G(S))



Sensing Position Characteristics (EE-SH3-C(S))



Response Time Measurement Circuit



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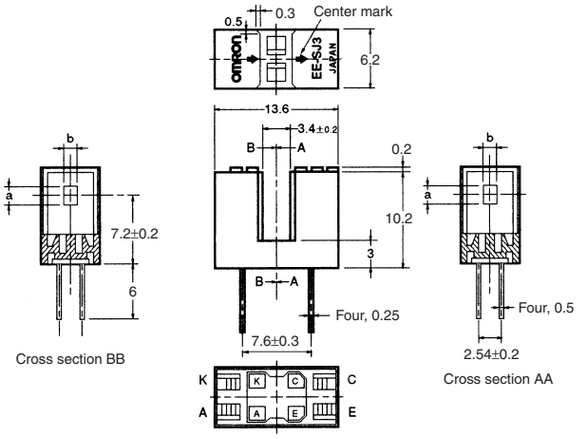
Photomicrosensor (Transmissive)
EE-SJ3 Series

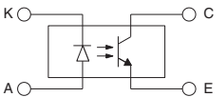
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Model	Aperture (a x b)
EE-SJ3-C	2.1 x 1.0
EE-SJ3-D	2.1 x 0.2
EE-SJ3-G	0.5 x 2.1

Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- High-resolution model with a 0.2-mm-wide sensing aperture, high-sensitivity model with a 1-mm-wide sensing aperture, and model with a horizontal sensing aperture are available.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Aperture (a x b)	Model
Photomicrosensor (transmissive)	2.1 x 1.0	**EE-SJ3-C**
	2.1 x 0.2	**EE-SJ3-D**
	0.5 x 2.1	**EE-SJ3-G**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value			Condition
			EE-SJ3-C	EE-SJ3-D	EE-SJ3-G	
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.			I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.			V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.			I_F = 20 mA
Detector	Light current	I_L	1 to 28 mA typ.	0.1 mA min.	0.5 to 14 mA	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.			V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---			---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	---	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.			V_{CE} = 10 V
Rising time		tr	4 μs typ.			V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.			

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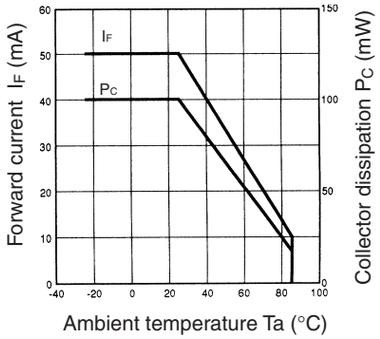
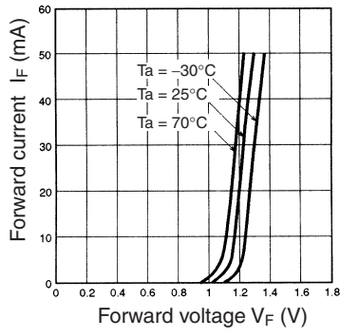
■ Engineering Data

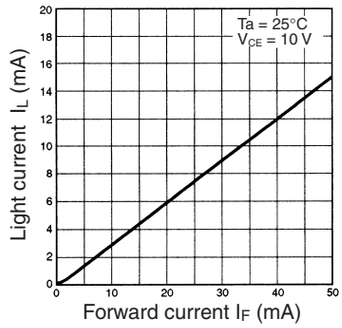
Forward Current vs. Collector Dissipation Temperature Rating



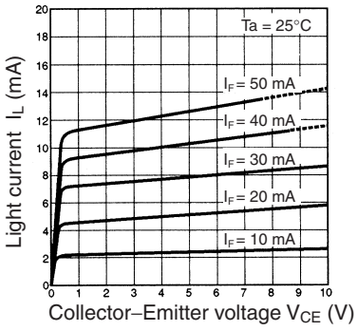
Forward Current vs. Forward Voltage Characteristics (Typical)



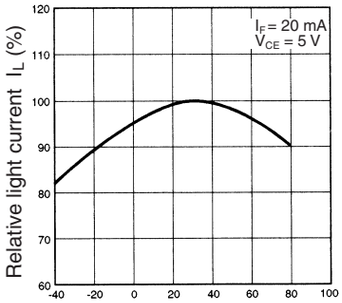
Light Current vs. Forward Current Characteristics (Typical)



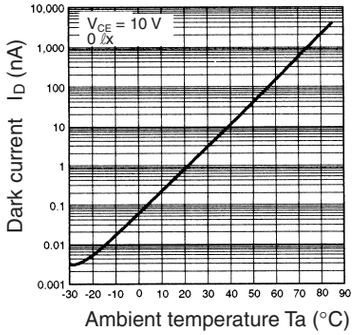
Light Current vs. Collector–Emitter Voltage Characteristics (EE-SJ3-G)



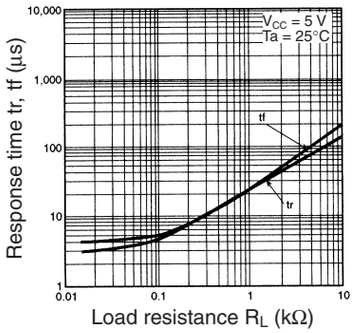
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



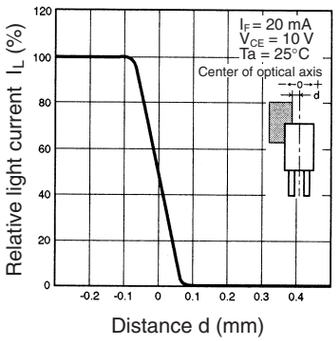
Dark Current vs. Ambient Temperature Characteristics (Typical)



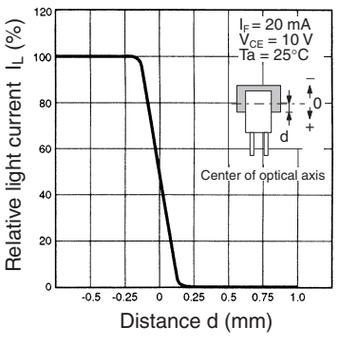
Response Time vs. Load Resistance Characteristics (Typical)



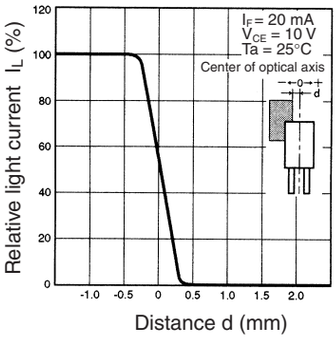
Sensing Position Characteristics (EE-SJ3-D)



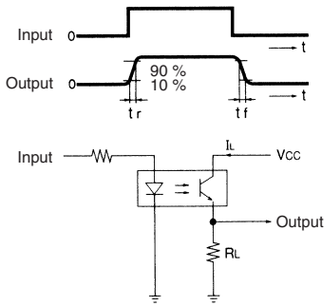
Sensing Position Characteristics (EE-SJ3-G)



Sensing Position Characteristics (EE-SJ3-C)



Response Time Measurement Circuit

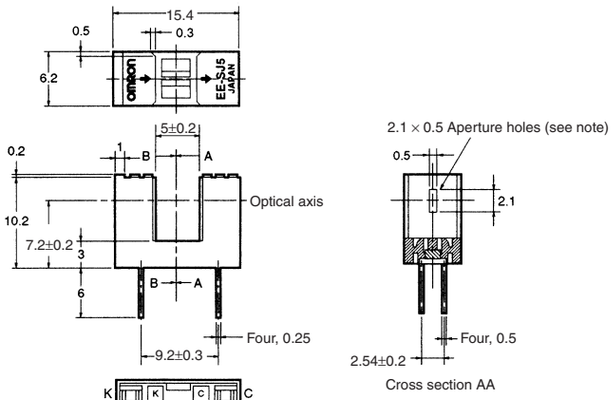


OMRON

Photomicrosensor (Transmissive)
EE-SJ5-B

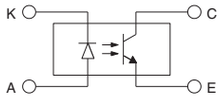
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Note: There is no difference in size between the slot on the emitter and that on the detector.

Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- General-purpose model with a 5-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SJ5-B**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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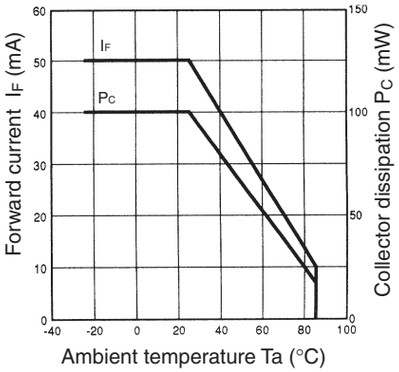
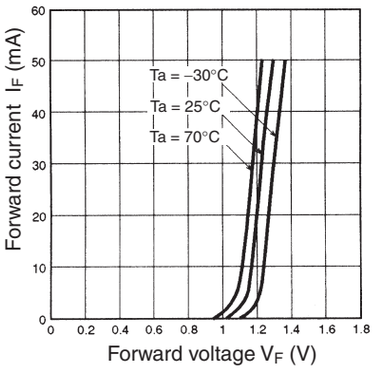
■ Engineering Data

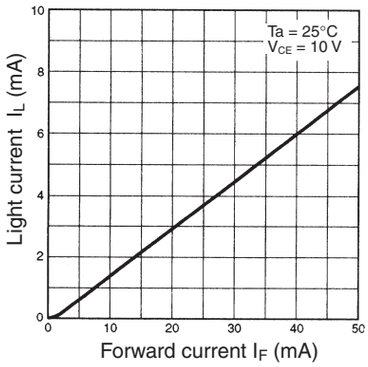
Forward Current vs. Collector Dissipation Temperature Rating



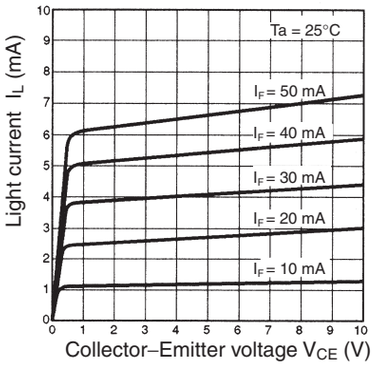
Forward Current vs. Forward Voltage Characteristics (Typical)



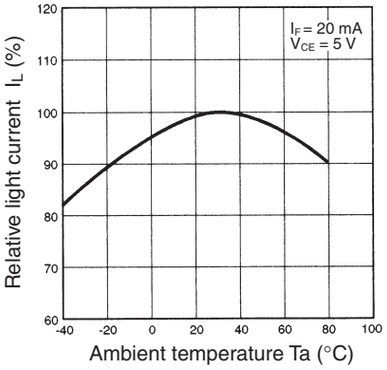
Light Current vs. Forward Current Characteristics (Typical)



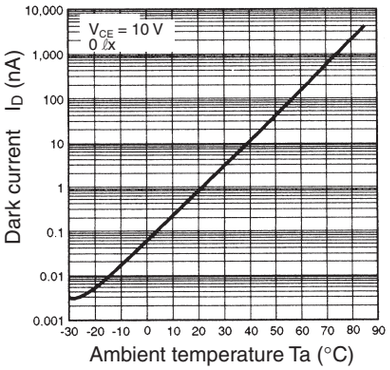
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



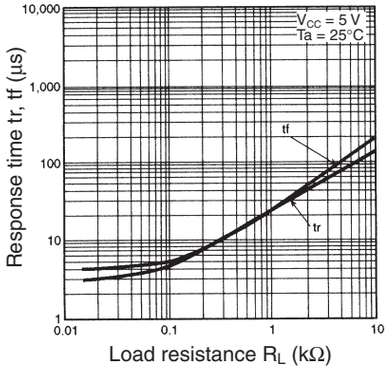
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



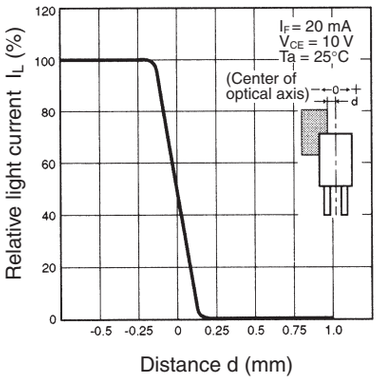
Dark Current vs. Ambient Temperature Characteristics (Typical)



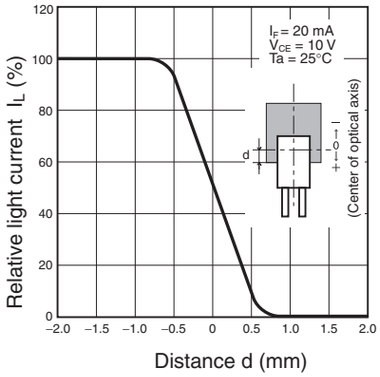
Response Time vs. Load Resistance Characteristics (Typical)



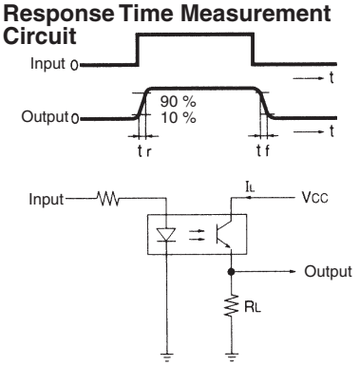
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

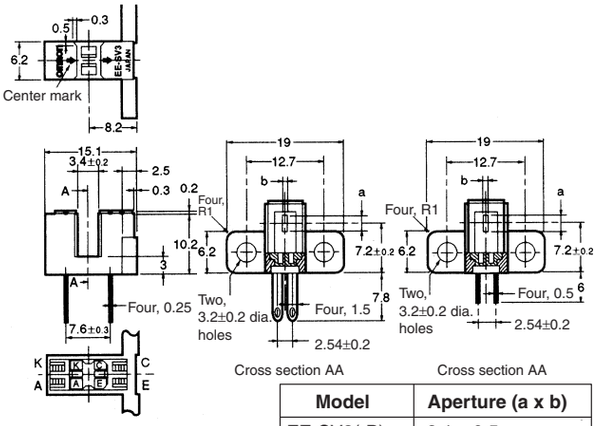


OMRON

Photomicrosensor (Transmissive)
EE-SV3 Series

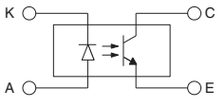
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Model	Aperture (a x b)
EE-SV3(-B)	2.1 x 0.5
EE-SV3-C(S)	2.1 x 1.0
EE-SV3-D(S)	2.1 x 0.2
EE-SV3-G(S)	0.5 x 2.1

Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

■ Features

- High-resolution model with a 0.2-mm-wide or 0.5-mm-wide sensing aperture, high-sensitivity model with a 1-mm-wide sensing aperture, and model with a horizontal sensing aperture are available.
- Solder terminal models EE-SV3/-SV3-CS/-SV3-DS/-SV3-GS
- PCB terminal models EE-SV3-B/-SV3-C/-SV3-D/-SV3-G
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Aperture (a x b)	Model
Photomicrosensor (transmissive)	2.1 x 0.5	**EE-SV3(-B)**
	2.1 x 1.0	**EE-SV3-C(S)**
	2.1 x 0.2	**EE-SV3-D(S)**
	0.5 x 2.1	**EE-SV3-G(S)**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value				Condition
			EE-SV3(-B)	EE-SV3-C(S)	EE-SV3-D(S)	EE-SV3-G(S)	
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.				I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.				V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.				I_F = 20 mA
Detector	Light current	I_L	0.5 to 14 mA	1 to 28 mA	0.1 mA min.	0.5 to 14 mA	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.				V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---				---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.		---	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.				V_{CE} = 10 V
Rising time		tr	4 μs typ.				V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.				

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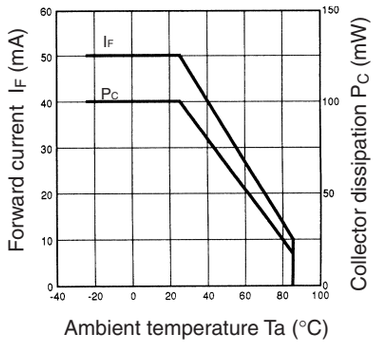
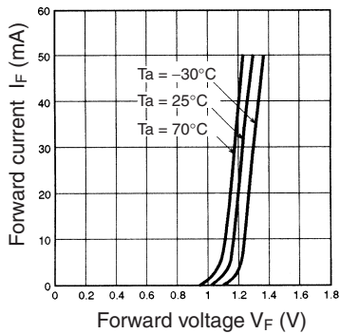
■ Engineering Data

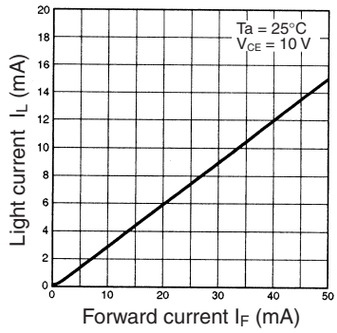
Forward Current vs. Collector Dissipation Temperature Rating



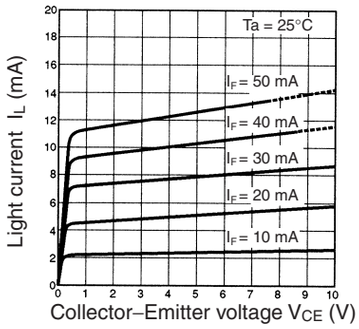
Forward Current vs. Forward Voltage Characteristics (Typical)



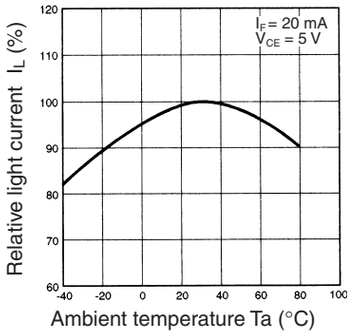
Light Current vs. Forward Current Characteristics (Typical)



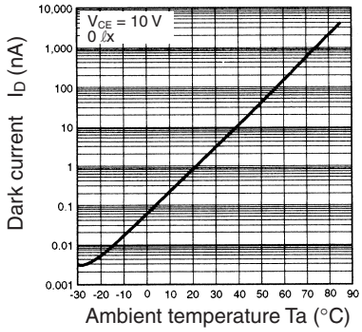
Light Current vs. Collector–Emitter Voltage Characteristics (EE-SV3(-B))



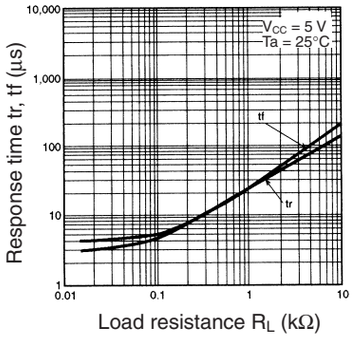
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



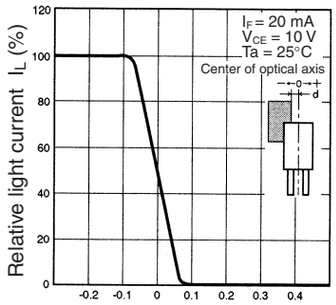
Dark Current vs. Ambient Temperature Characteristics (Typical)



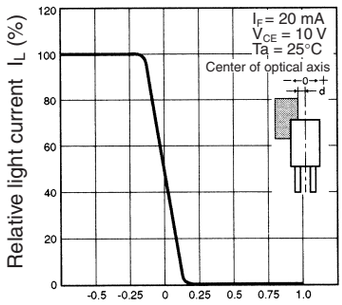
Response Time vs. Load Resistance Characteristics (Typical)



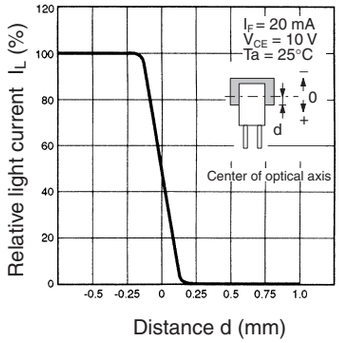
Sensing Position Characteristics (EE-SV3-D(S))



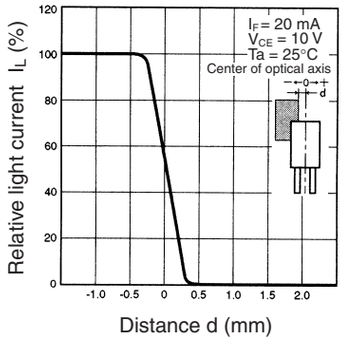
Sensing Position Characteristics (EE-SV3(-B))



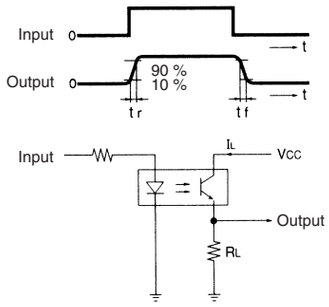
Sensing Position Characteristics (EE-SV3-G(S))



Sensing Position Characteristics (EE-SV3-C(S))



Response Time Measurement Circuit

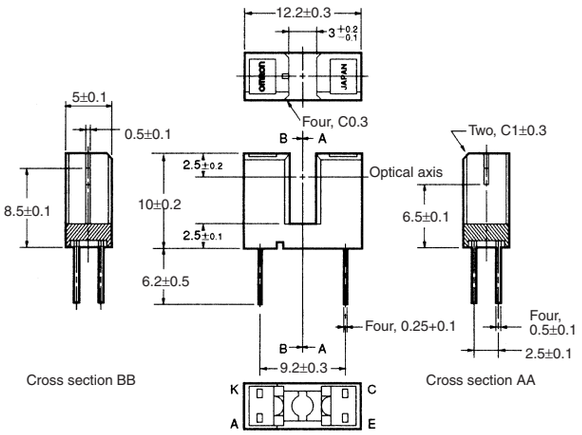


OMRON

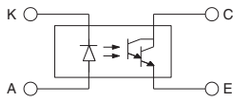
Photomicrosensor (Transmissive)
EE-SX298

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are ±0.2 mm.

■ Features

- General-purpose model with a 3-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- With a Photo-Darlington transistor as a detector element.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	35 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX298**

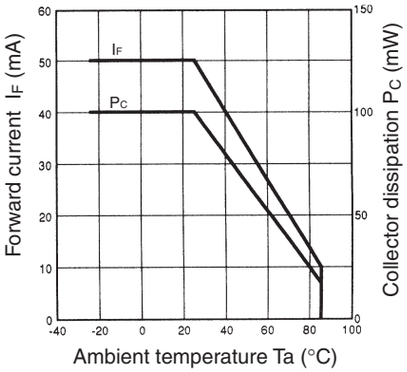
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.4 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 20 mA max.	I_F = 1 mA, V_{CE} = 2 V
	Dark current	I_D	2 nA typ., 1,000 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.75 V typ., 1.0 V max.	I_F = 2 mA, I_L = 0.5 mA
	Peak spectral sensitivity wavelength	λ_P	780 nm typ.	V_{CE} = 5 V
Rising time		tr	70 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 10 mA
Falling time		tf	70 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 10 mA

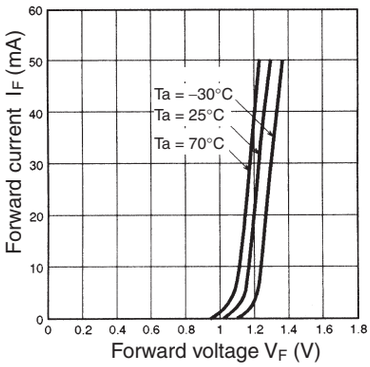
OMRON

■ Engineering Data

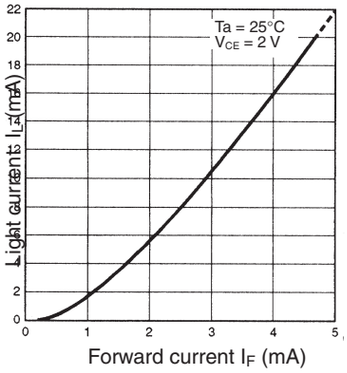
Forward Current vs. Collector Dissipation Temperature Rating



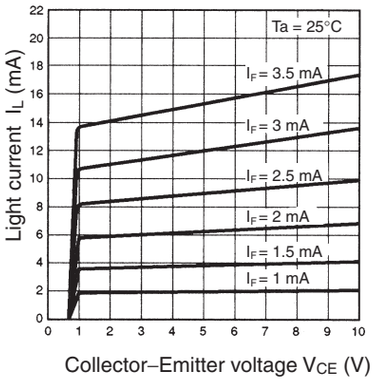
Forward Current vs. Forward Voltage Characteristics (Typical)



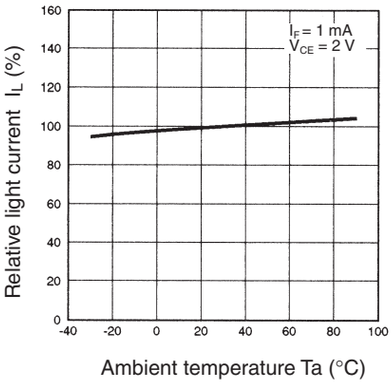
Light Current vs. Forward Current Characteristics (Typical)



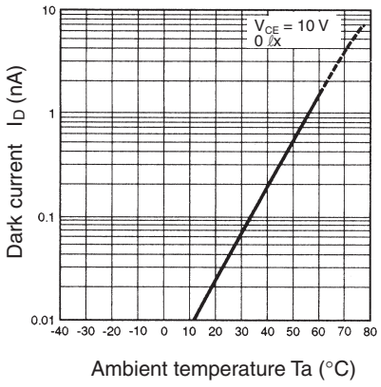
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



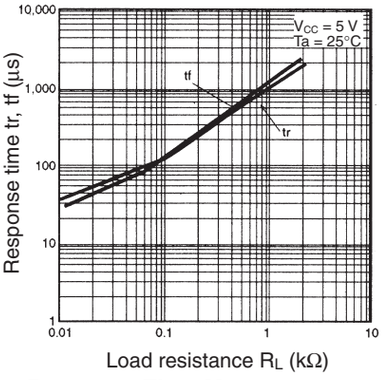
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



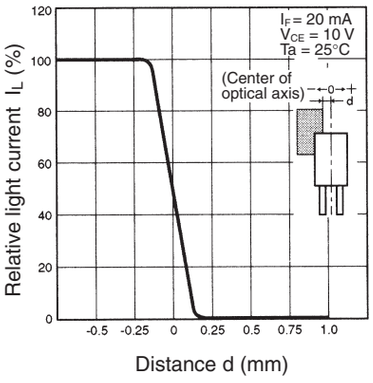
Dark Current vs. Ambient Temperature Characteristics (Typical)



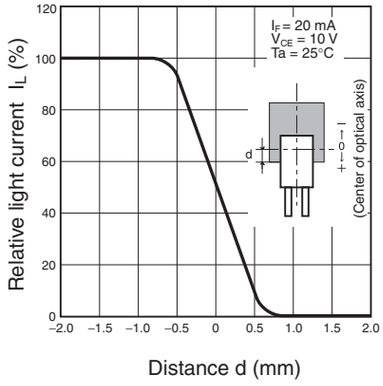
Response Time vs. Load Resistance Characteristics (Typical)



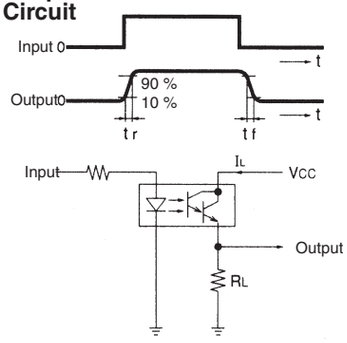
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit

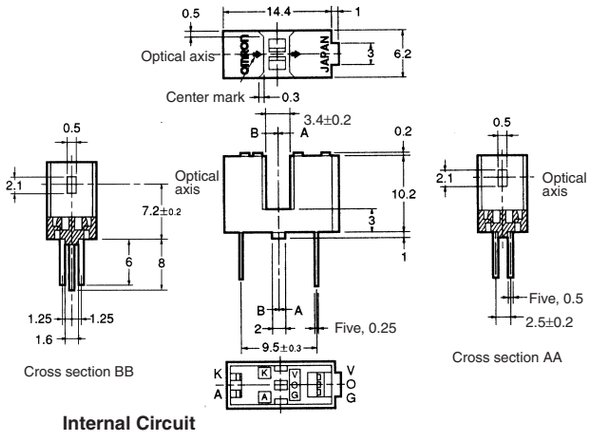


OMRON

Photomicrosensor (Transmissive)
EE-SX301/-SX401

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with a built-in temperature compensation circuit.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- High resolution with a 0.5-mm-wide sensing aperture.
- Dark ON model (EE-SX301); Light ON model (EE-SX401)
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Reverse voltage	V_R	4 V
Detector	Power supply voltage	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–40°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

■ Ordering Information

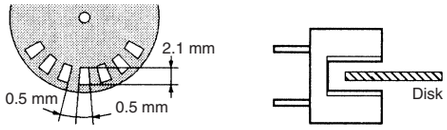
Description		Model
Photomicrosensor (transmissive)	Dark ON	**EE-SX301**
	Light ON	**EE-SX401**

■ Electrical and Optical Characteristics (Ta = 25°C)

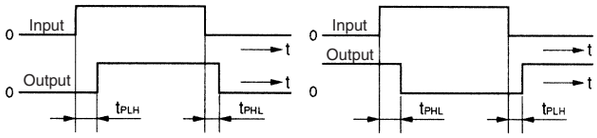
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, I_F = 0 mA (EE-SX301), I_F = 8 mA (EE-SX401)
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, I_F = 8 mA (EE-SX301), I_F = 0 mA (EE-SX401)
	Current consumption	I_{CC}	3.2 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	3 mA typ., 8 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		ΔH	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 2)
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

2. The value of the response frequency is measured by rotating the disk as shown below.



3. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EE-SX401.

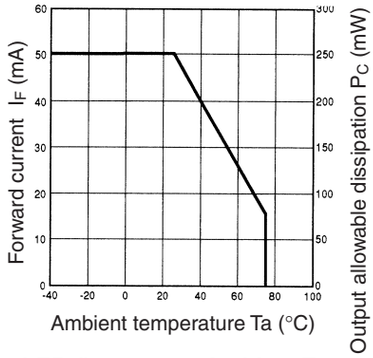


EE-SX301 EE-SX401

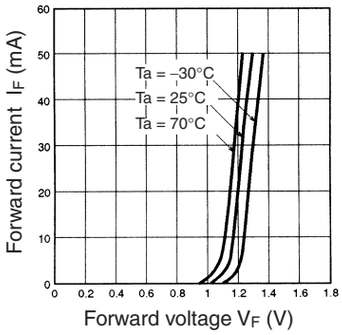
■ Engineering Data

Note: The values in the parentheses apply to the EE-SX401.

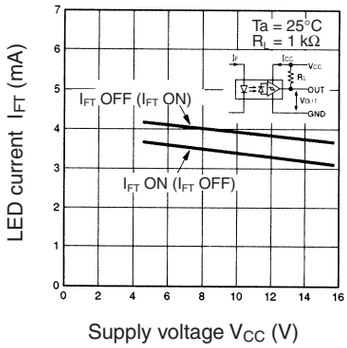
Forward Current vs. Collector Dissipation Temperature Rating



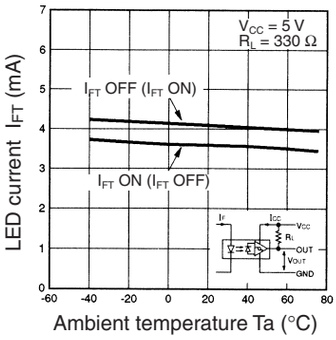
Forward Current vs. Forward Voltage Characteristics (Typical)



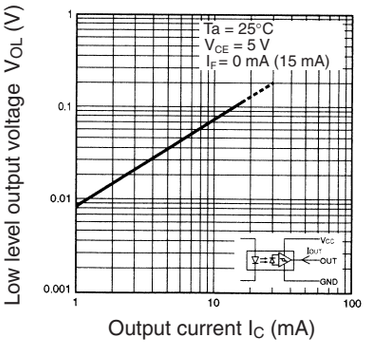
LED Current vs. Supply Voltage (Typical)



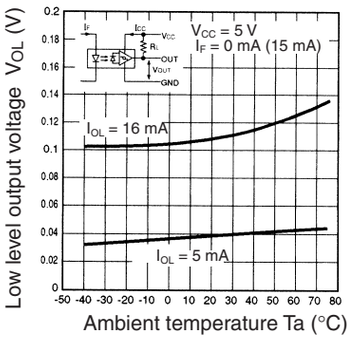
LED Current vs. Ambient Temperature Characteristics (Typical)



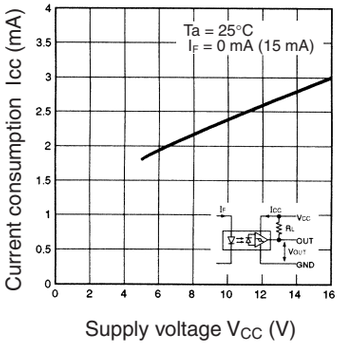
Low-level Output Voltage vs. Output Current (Typical)



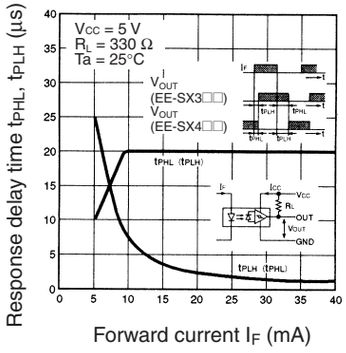
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



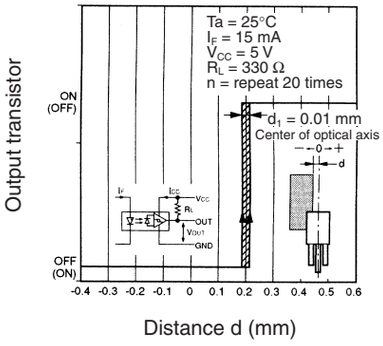
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Position Characteristics (Typical)

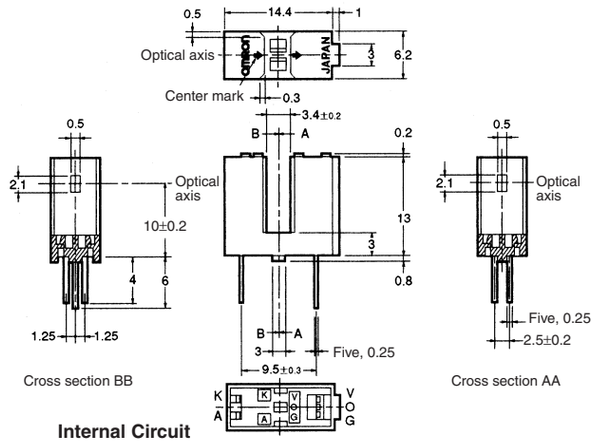


OMRON

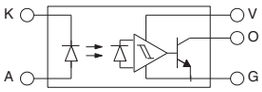
Photomicrosensor (Transmissive)
EE-SX305/-SX405

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with a built-in temperature compensation circuit.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- High resolution with a 0.5-mm-wide sensing aperture.
- Dark ON model (EE-SX305); Light ON model (EE-SX405)
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Reverse voltage	V_R	4 V
Detector	Power supply voltage	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–40°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

■ Ordering Information

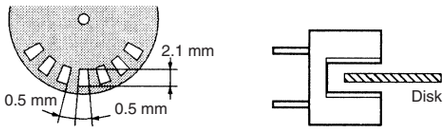
Description		Model
Photomicrosensor (transmissive)	Dark ON	**EE-SX305**
	Light ON	**EE-SX405**

■ Electrical and Optical Characteristics (Ta = 25°C)

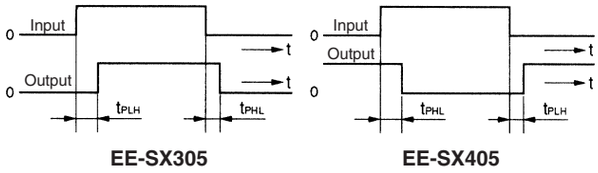
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, I_F = 0 mA (EE-SX305), I_F = 8 mA (EE-SX405)
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, I_F = 8 mA (EE-SX305), I_F = 0 mA (EE-SX405)
	Current consumption	I_{CC}	3.2 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	3 mA typ., 8 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		ΔH	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 2)
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

2. The value of the response frequency is measured by rotating the disk as shown below.



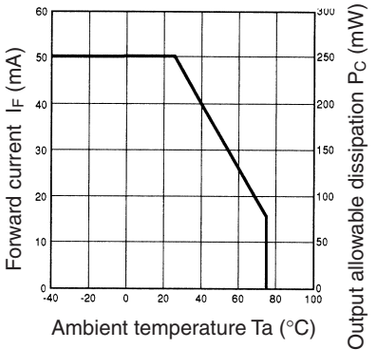
3. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EE-SX405.



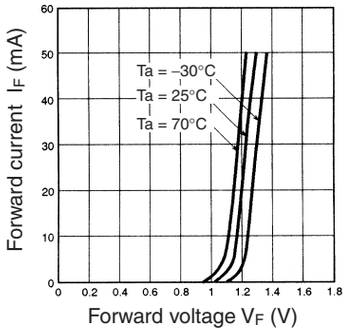
■ Engineering Data

Note: The values in the parentheses apply to the EE-SX405.

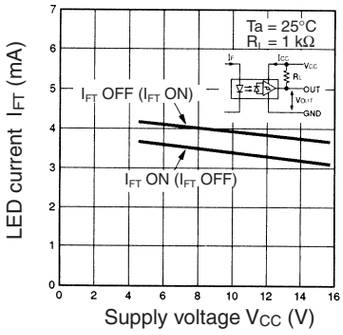
Forward Current vs. Collector Dissipation Temperature Rating



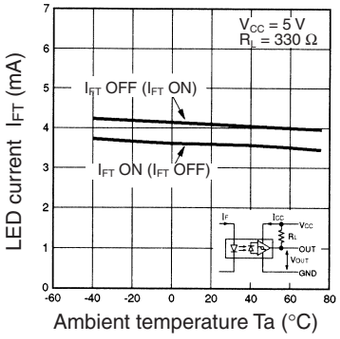
Forward Current vs. Forward Voltage Characteristics (Typical)



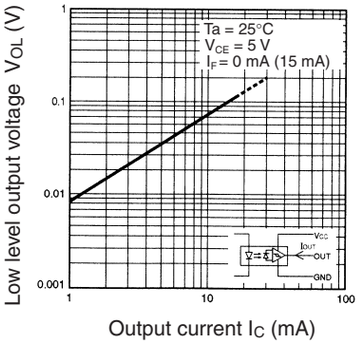
LED Current vs. Supply Voltage (Typical)



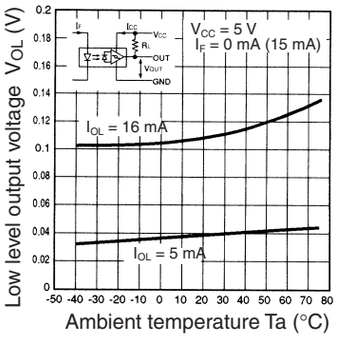
LED Current vs. Ambient Temperature Characteristics (Typical)



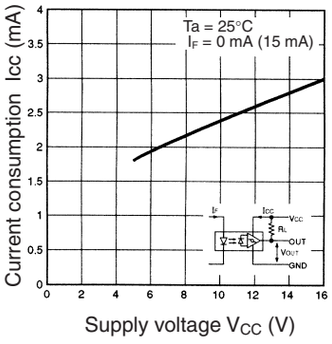
Low-level Output Voltage vs. Output Current (Typical)



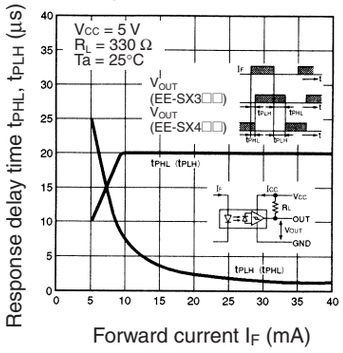
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



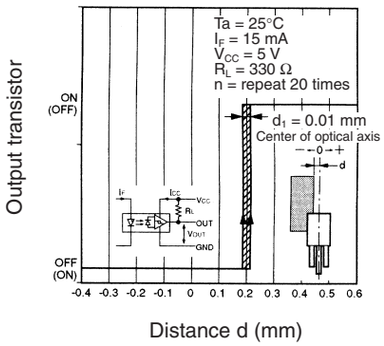
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Position Characteristics (Typical)

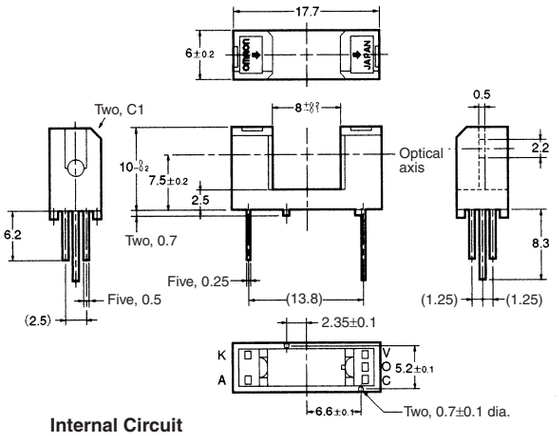


OMRON

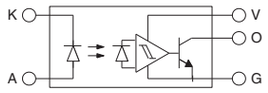
Photomicrosensor (Transmissive)
EE-SX3070/-SX4070

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with a built-in temperature compensation circuit.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- High resolution with a 0.5-mm-wide sensing aperture.
- Dark ON model (EE-SX3070); Light ON model (EE-SX4070)
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Reverse voltage	V_R	4 V
Detector	Power supply voltage	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–40°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

■ Ordering Information

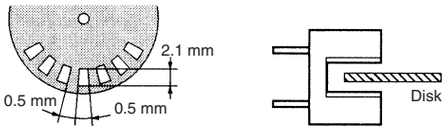
Description		Model
Photomicrosensor (transmissive)	Dark ON	**EE-SX3070**
	Light ON	**EE-SX4070**

■ Electrical and Optical Characteristics (Ta = 25°C)

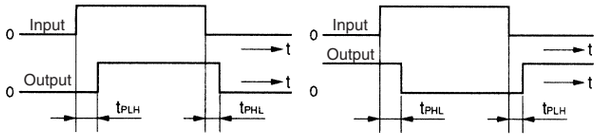
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, I_F = 0 mA (EE-SX3070), I_F = 10 mA (EE-SX4070)
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, I_F = 10 mA (EE-SX3070), I_F = 0 mA (EE-SX4070)
	Current consumption	I_{CC}	3.2 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	10 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		ΔH	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA (see note 2)
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA (see note 3)

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

2. The value of the response frequency is measured by rotating the disk as shown below.



3. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EE-SX4070.

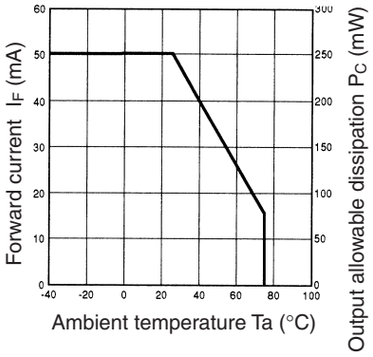


EE-SX3070 EE-SX4070

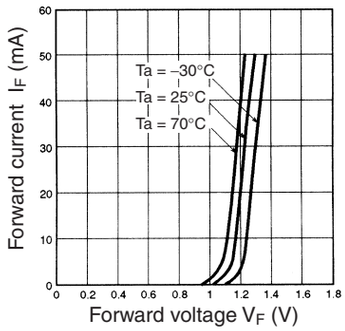
■ Engineering Data

Note: The values in the parentheses apply to the EE-SX4070.

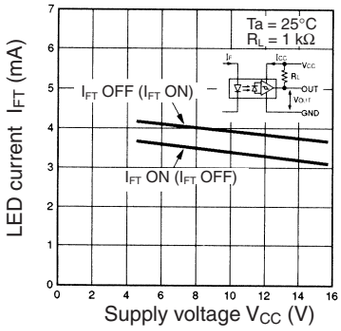
Forward Current vs. Collector Dissipation Temperature Rating



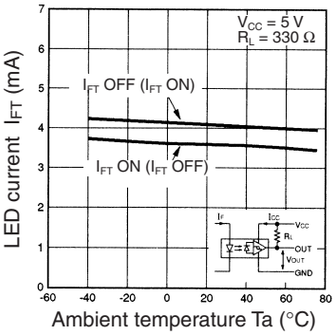
Forward Current vs. Forward Voltage Characteristics (Typical)



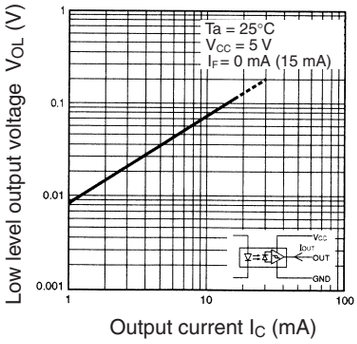
LED Current vs. Supply Voltage (Typical)



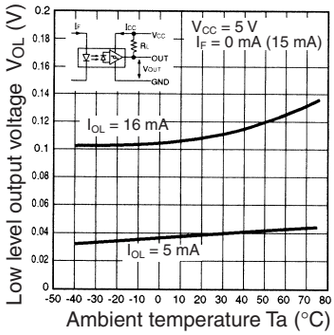
LED Current vs. Ambient Temperature Characteristics (Typical)



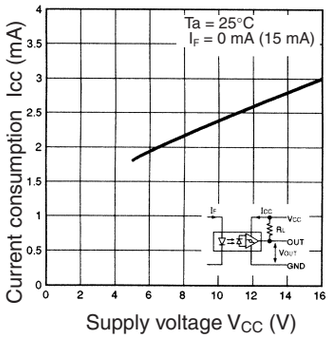
Low-level Output Voltage vs. Output Current (Typical)



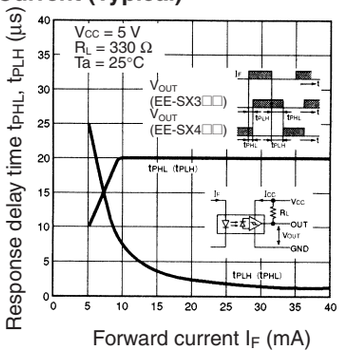
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



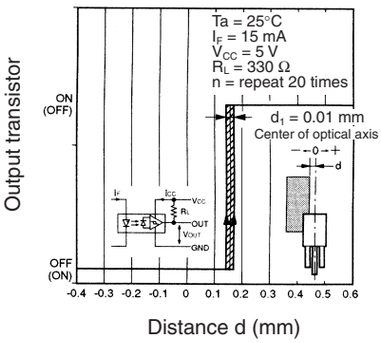
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Position Characteristics (Typical)

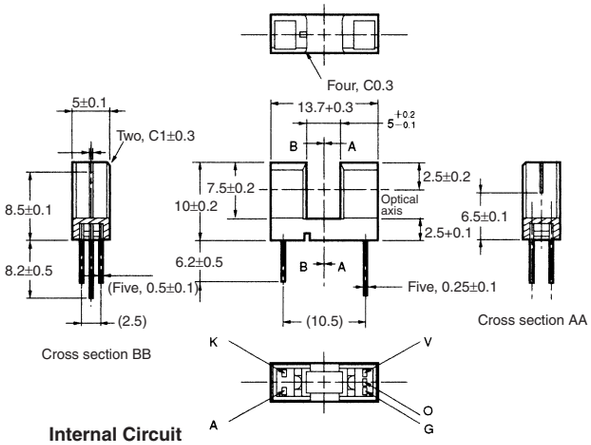


OMRON

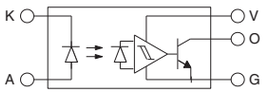
Photomicrosensor (Transmissive)
EE-SX3081/-SX4081

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with a built-in temperature compensation circuit.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- High resolution with a 0.5-mm-wide sensing aperture.
- Dark ON model (EE-SX3081); Light ON model (EE-SX4081)
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Reverse voltage	V_R	4 V
Detector	Power supply voltage	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–40°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

■ Ordering Information

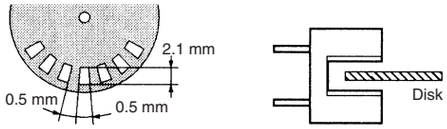
Description		Model
Photomicrosensor (transmissive)	Dark ON	**EE-SX3081**
	Light ON	**EE-SX4081**

■ Electrical and Optical Characteristics (Ta = 25°C)

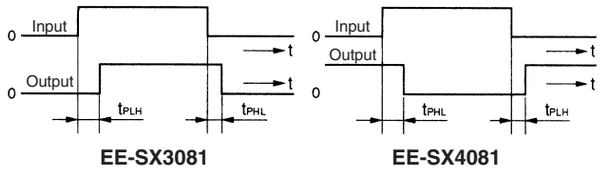
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, I_F = 0 mA (EE-SX3081), I_F = 8 mA (EE-SX4081)
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, I_F = 8 mA (EE-SX3081), I_F = 0 mA (EE-SX4081)
	Current consumption	I_{CC}	3.2 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	8 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		ΔH	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA (see note 2)
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA (see note 3)

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

2. The value of the response frequency is measured by rotating the disk as shown below.



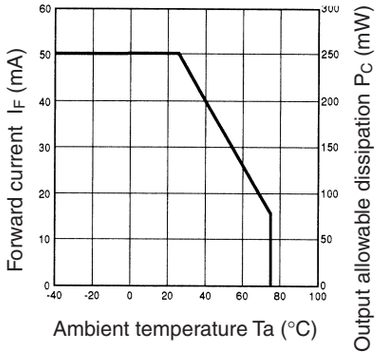
3. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EE-SX4081.



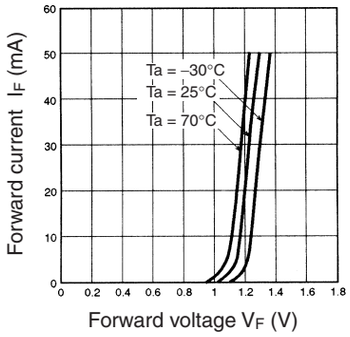
■ Engineering Data

Note: The values in the parentheses apply to the EE-SX4081.

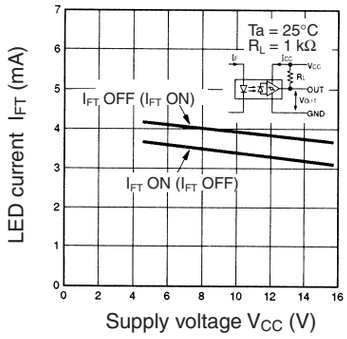
Forward Current vs. Collector Dissipation Temperature Rating



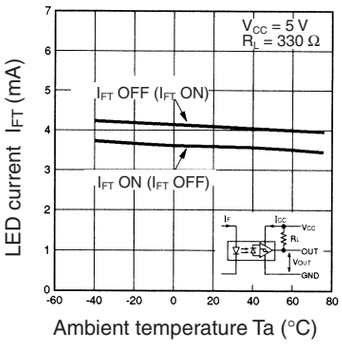
Forward Current vs. Forward Voltage Characteristics (Typical)



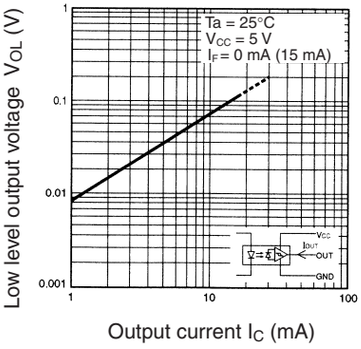
LED Current vs. Supply Voltage (Typical)



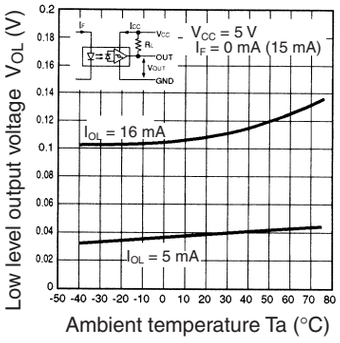
LED Current vs. Ambient Temperature Characteristics (Typical)



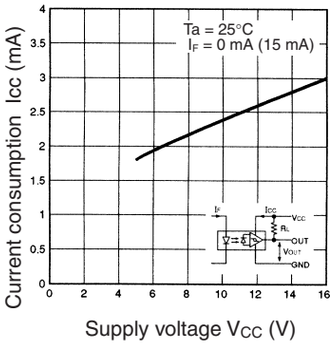
Low-level Output Voltage vs. Output Current (Typical)



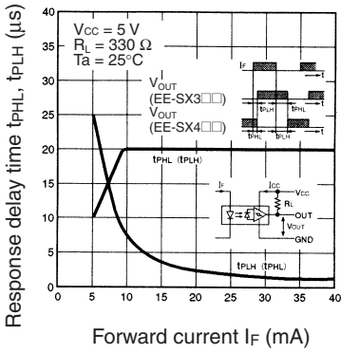
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



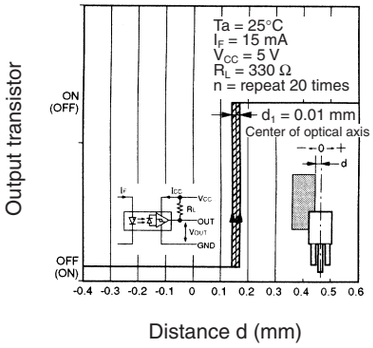
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Position Characteristics (Typical)

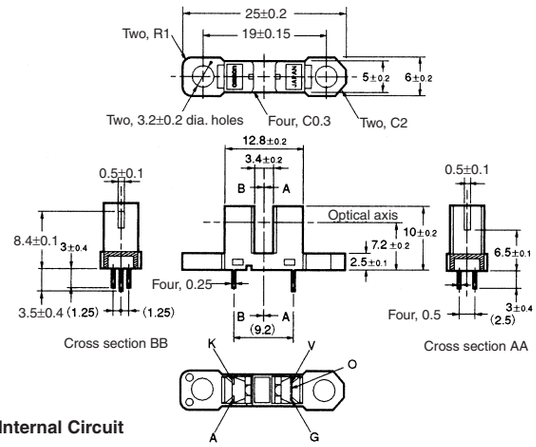


OMRON

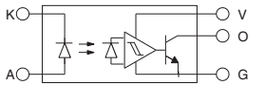
Photomicrosensor (Transmissive)
EE-SX3088/-SX4088

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- High resolution with a 0.5-mm-wide sensing aperture.
- Dark ON model (EE-SX3088); Light ON model (EE-SX4088)
- OMRON's XK8-series Connectors can be connected to the lead wires without a PCB. Contact your OMRON representative for information on obtaining XK8-series Connectors.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Reverse voltage	V_R	4 V
Detector	Power supply voltage	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–40°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

■ Ordering Information

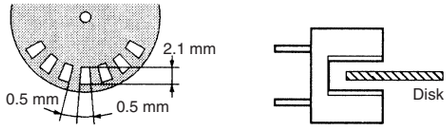
Description		Model
Photomicrosensor (transmissive)	Dark ON	**EE-SX3088**
	Light ON	**EE-SX4088**

■ Electrical and Optical Characteristics (Ta = 25°C)

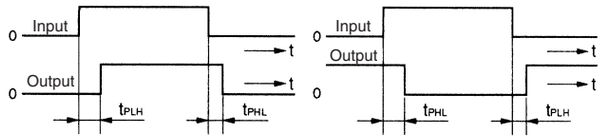
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm	I_F = 20 mA
Detector	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, I_F = 0 mA (EE-SX3088), I_F = 5 mA (EE-SX4088)
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, I_F = 5 mA (EE-SX3088), I_F = 0 mA (EE-SX4088)
	Current consumption	I_{CC}	3.2 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	2 mA typ., 5 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		ΔH	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3kHz min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 2)
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

2. The value of the response frequency is measured by rotating the disk as shown below.



3. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EE-SX4088.

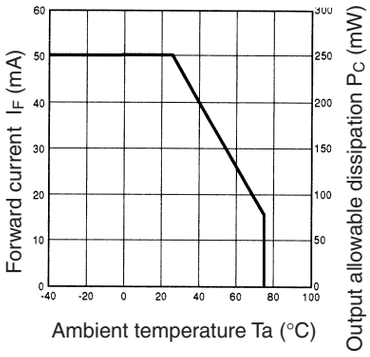


EE-SX3088 EE-SX4088

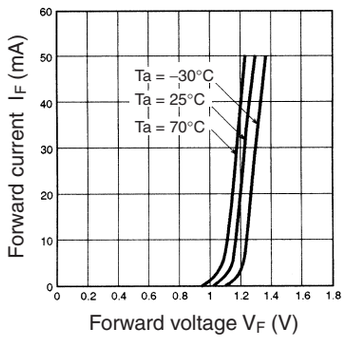
■ Engineering Data

Note: The values in the parentheses apply to the EE-SX4088.

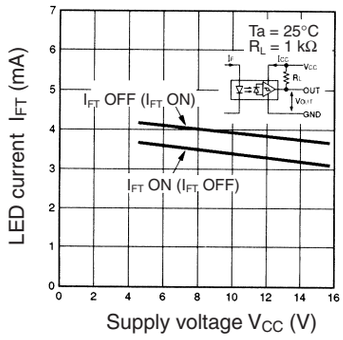
Forward Current vs. Collector Dissipation Temperature Rating



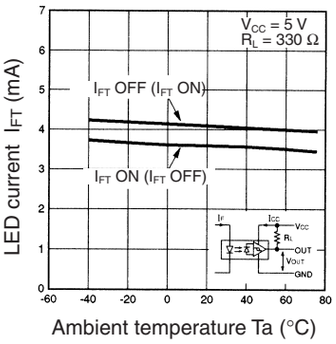
Forward Current vs. Forward Voltage Characteristics (Typical)



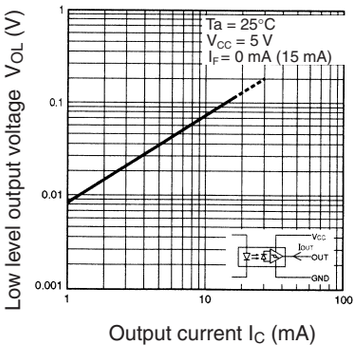
LED Current vs. Supply Voltage (Typical)



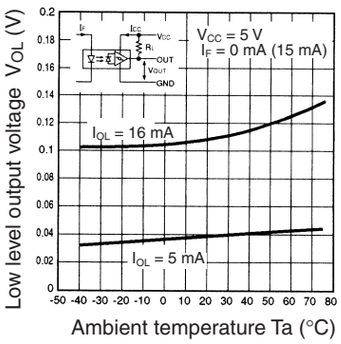
LED Current vs. Ambient Temperature Characteristics (Typical)



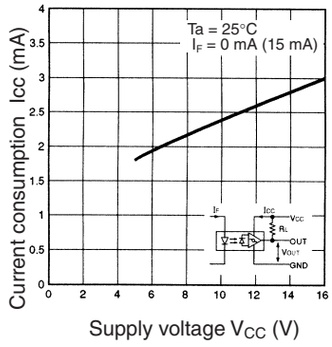
Low-level Output Voltage vs. Output Current (Typical)



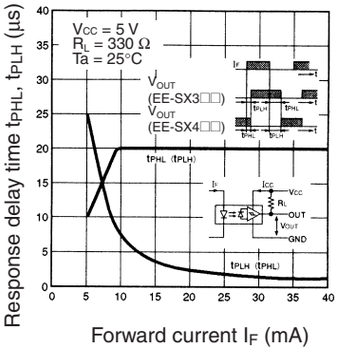
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



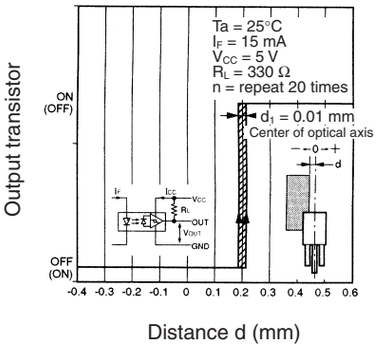
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Position Characteristics (Typical)

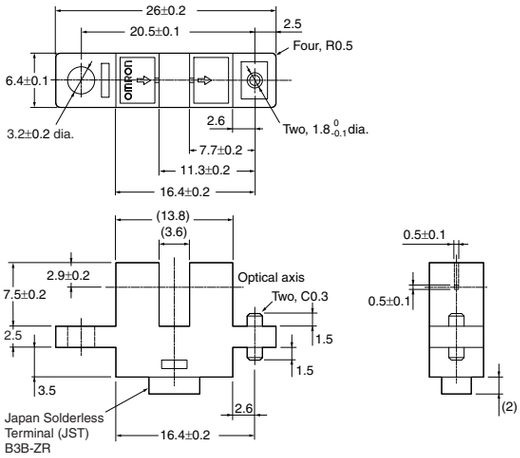


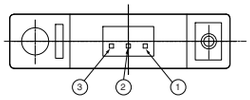
OMRON

Photomicrosensor (Transmissive)
EE-SX3148-P1

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.





Terminal No.	Name
1	Power supply (Vcc)
2	Output (OUT)
3	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.200
3 < mm ≤ 6	±0.240
6 < mm ≤ 10	±0.290
10 < mm ≤ 18	±0.350
18 < mm ≤ 30	±0.420

Recommended Mating Connectors:
JST (Japan Solderless Terminal) ZHR-3 Series (crimp connector)
03ZR Series (press-fit connector)

■ Features

- A boss on one side enables securing the Sensor with one M2 or M3 screw.
- Sensor can be installed from either top of bottom of mounting plate.
- High resolution both vertically and horizontally. (aperture dimensions: 0.5 x 0.5 mm)
- 3.6-mm-wide slot.
- Photo-IC output connects directly to CMOS and TTL devices.
- Applicable to the ZH and ZR Connector Series from JST.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Power supply voltage		V_{CC}	6 VDC
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	Operating	T_{opr}	–20°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	---

Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

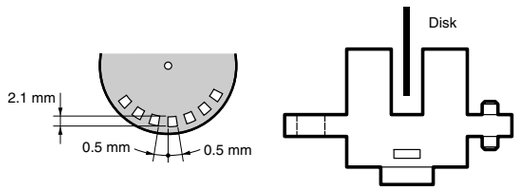
■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX3148-P1**

■ Electrical and Optical Characteristics (Ta = 25°C, V_{CC} = 5 V ±10%)

Item	Symbol	Value	Condition
Current consumption	I_{CC}	30 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.3 V max.	I_{OUT} = 16 mA without incident
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	V_{OUT} = V_{CC} with incident R_L = 47 kΩ
Response frequency	f	3 kHz min.	V_{OUT} = V_{CC}, R_L = 47 kΩ (see note)

Note: The value of the response frequency is measured by rotating the disk as shown below.



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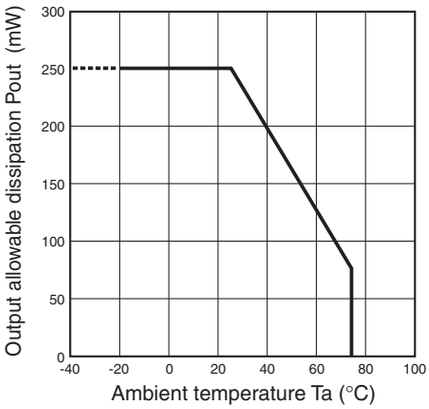
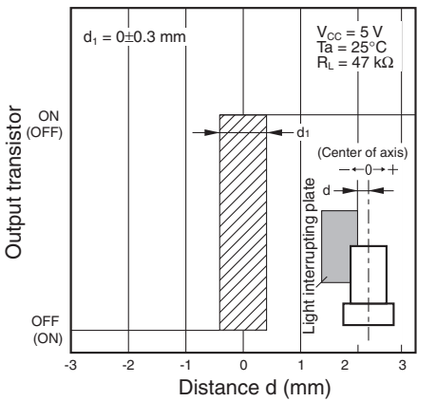
■ Engineering Data

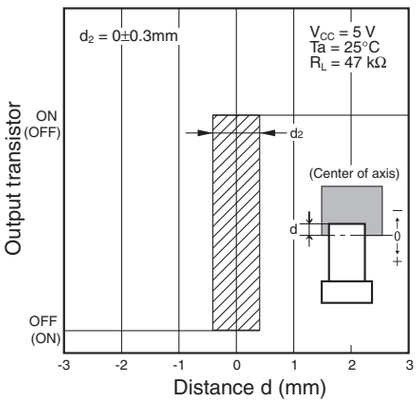
Output Allowable Dissipation vs. Ambient Temperature Characteristics



Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)

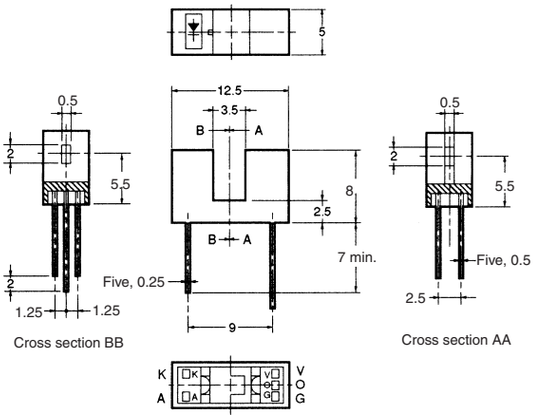


OMRON

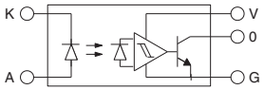
Photomicrosensor (Transmissive)
EE-SX384/-SX484

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are ±0.2 mm.

■ Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with a built-in temperature compensation circuit.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- High resolution with a 0.5-mm-wide sensing aperture.
- Dark ON model (EE-SX384); Light ON model (EE-SX484)
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Reverse voltage	V_R	4 V
Detector	Power supply voltage	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–40°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

■ Ordering Information

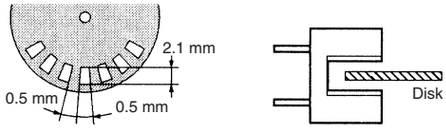
Description		Model
Photomicrosensor (transmissive)	Dark ON	**EE-SX384**
	Light ON	**EE-SX484**

■ Electrical and Optical Characteristics (Ta = 25°C)

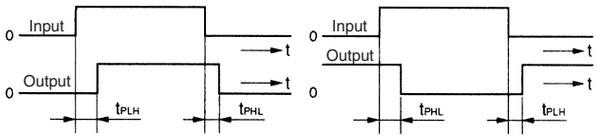
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, I_F = 0 mA (EE-SX384), I_F = 8 mA (EE-SX484)
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, I_F = 8 mA (EE-SX384), I_F = 0 mA (EE-SX484)
	Current consumption	I_{CC}	3.2 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	3 mA typ., 8 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		ΔH	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 2)
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

2. The value of the response frequency is measured by rotating the disk as shown below.



3. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EE-SX484.

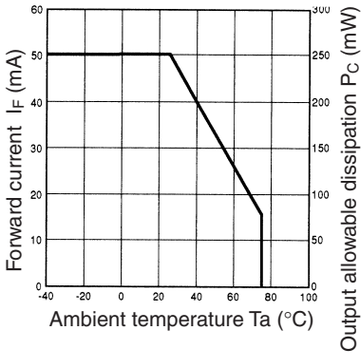


EE-SX384 EE-SX484

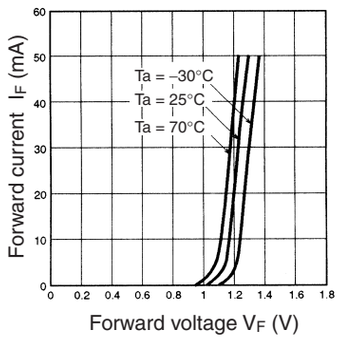
■ Engineering Data

Note: The values in the parentheses apply to the EE-SX484.

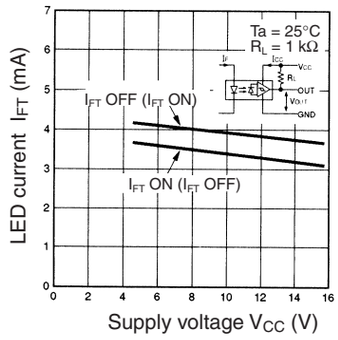
Forward Current vs. Collector Dissipation Temperature Rating



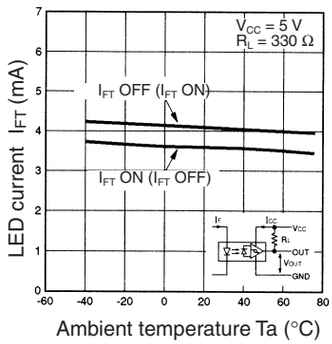
Forward Current vs. Forward Voltage Characteristics (Typical)



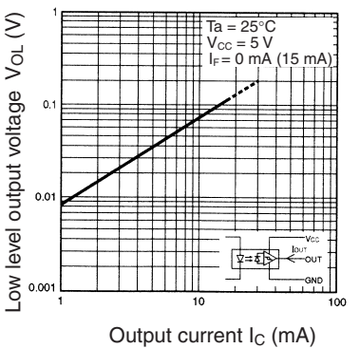
LED Current vs. Supply Voltage (Typical)



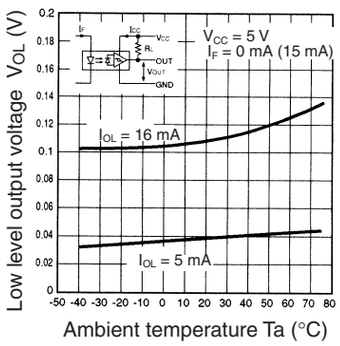
LED Current vs. Ambient Temperature Characteristics (Typical)



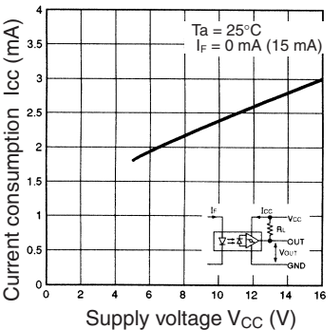
Low-level Output Voltage vs. Output Current (Typical)



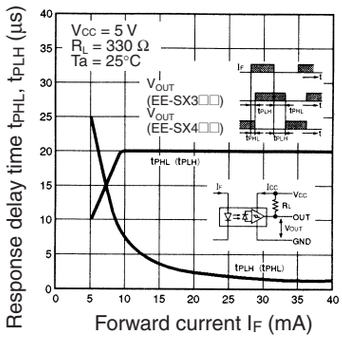
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



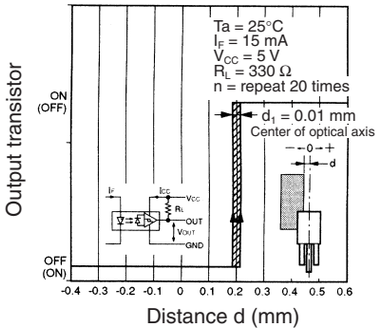
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Position Characteristics (Typical)

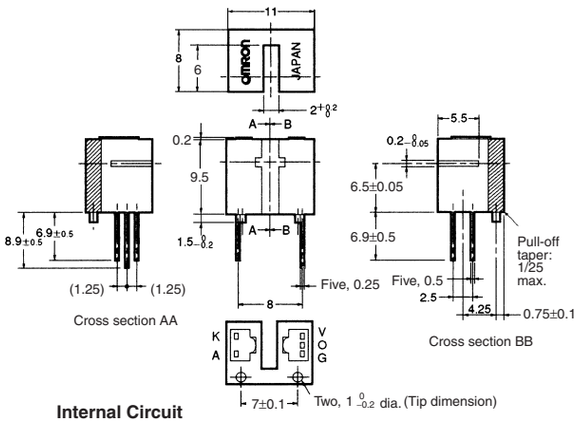


OMRON

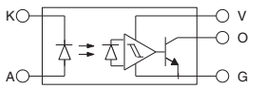
Photomicrosensor (Transmissive)
EE-SX493

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.125
3 < mm ≤ 6	±0.150
6 < mm ≤ 10	±0.180
10 < mm ≤ 18	±0.215
18 < mm ≤ 30	±0.260

■ Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with a built-in temperature compensation circuit.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- Allows highly precise sensing with a 0.2-mm-wide sensing aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Reverse voltage	V_R	4 V
Detector	Power supply voltage	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–40°C to 60°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

■ Ordering Information

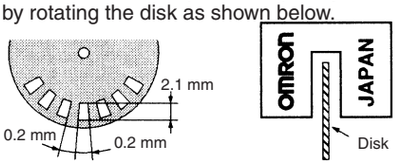
Description	Model
Photomicrosensor (transmissive)	**EE-SX493**

■ Electrical and Optical Characteristics (Ta = 25°C)

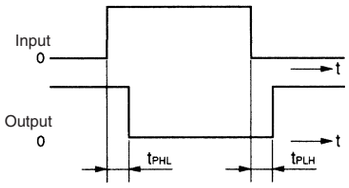
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, I_F = 15 mA
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, I_F = 0 mA
	Current consumption	I_{CC}	5 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	10 mA typ., 15 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		ΔH	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 2)
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

2. The value of the response frequency is measured by rotating the disk as shown below.

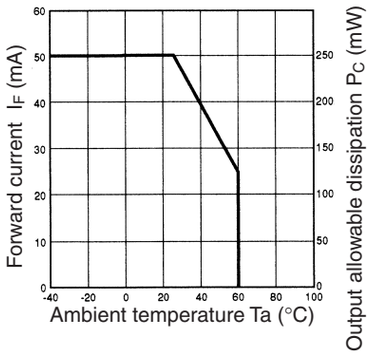


3. The following illustrations show the definition of response delay time.

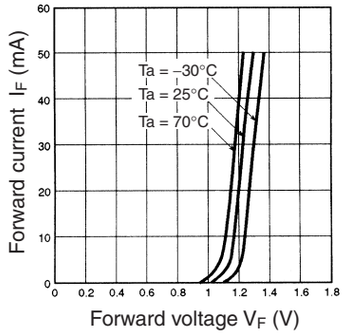


■ Engineering Data

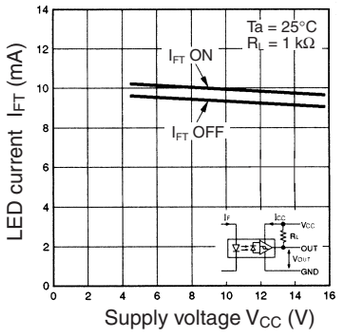
Forward Current vs. Collector Dissipation Temperature Rating



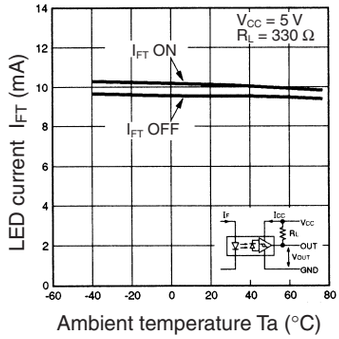
Forward Current vs. Forward Voltage Characteristics (Typical)



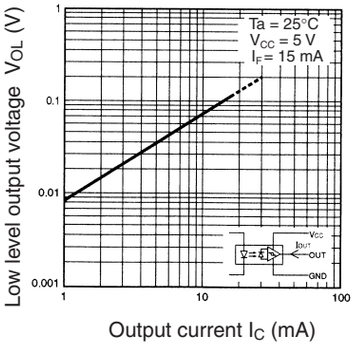
LED Current vs. Supply Voltage (Typical)



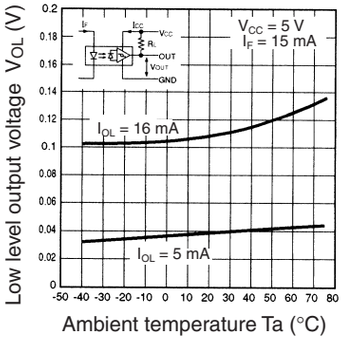
LED Current vs. Ambient Temperature Characteristics (Typical)



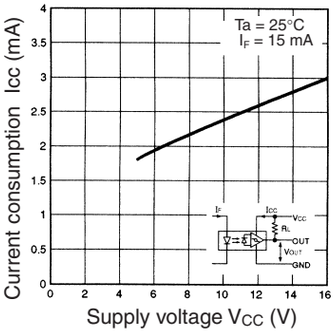
Low-level Output Voltage vs. Output Current (Typical)



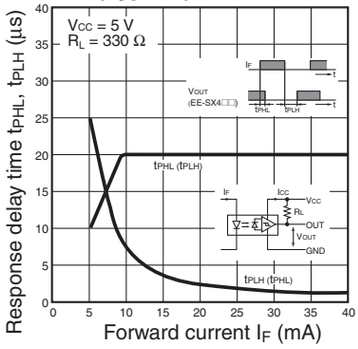
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



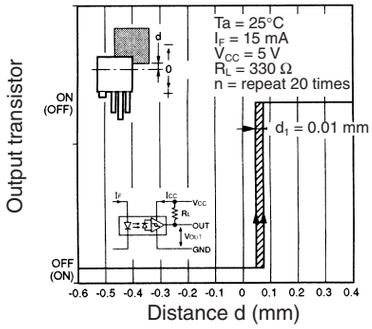
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Position Characteristics (Typical)

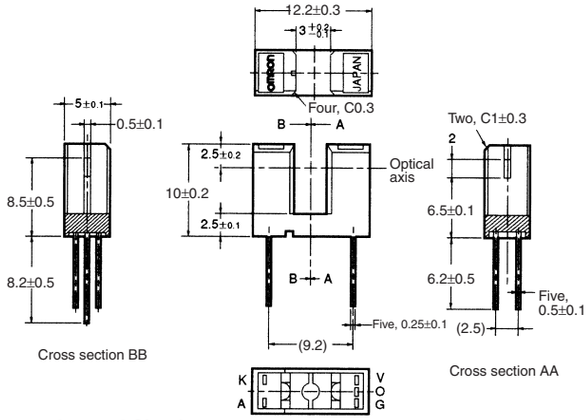


OMRON

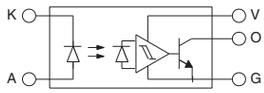
Photomicrosensor (Transmissive)
EE-SX398/498

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with a built-in temperature compensation circuit.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- High resolution with a 0.5-mm-wide sensing aperture.
- Dark ON model (EE-SX398); Light ON model (EE-SX498)
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Reverse voltage	V_R	4 V
Detector	Power supply voltage	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–40°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

■ Ordering Information

Description		Model
Photomicrosensor (transmissive)	Dark ON	**EE-SX398**
	Light ON	**EE-SX498**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, I_F = 0 mA (EE-SX398), I_F = 5 mA (EE-SX498)
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, I_F = 5 mA (EE-SX398), I_F = 0 mA (EE-SX498)
	Current consumption	I_{CC}	3.2 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	2 mA typ., 5 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		ΔH	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 2)
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)

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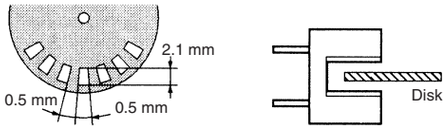
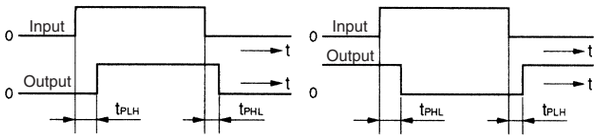
Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

2. The value of the response frequency is measured by rotating the disk as shown below.



3. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EE-SX498.

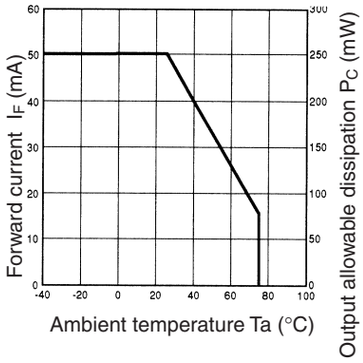


EE-SX398 EE-SX498

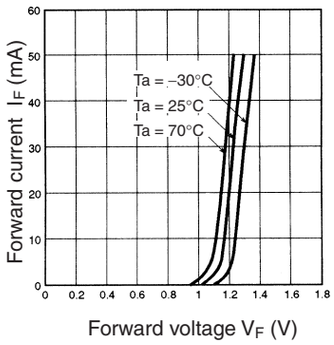
■ Engineering Data

Note: The values in the parentheses apply to the EE-SX498.

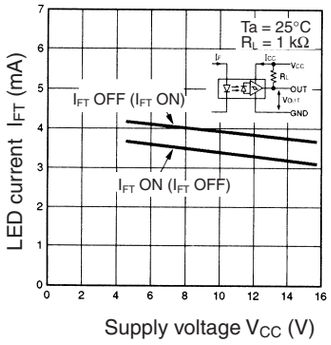
Forward Current vs. Collector Dissipation Temperature Rating



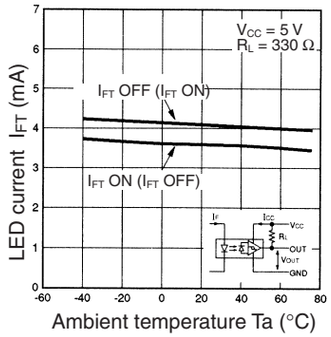
Forward Current vs. Forward Voltage Characteristics (Typical)



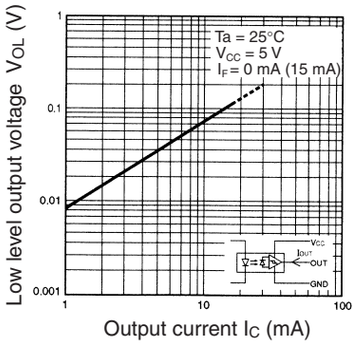
LED Current vs. Supply Voltage (Typical)



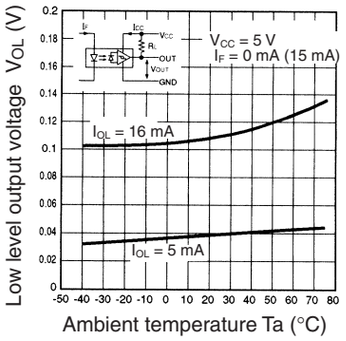
LED Current vs. Ambient Temperature Characteristics (Typical)



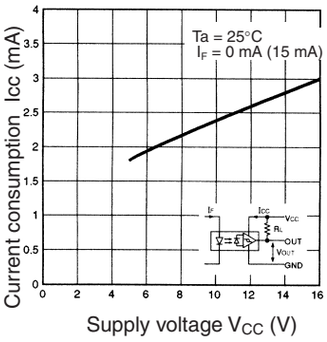
Low-level Output Voltage vs. Output Current (Typical)



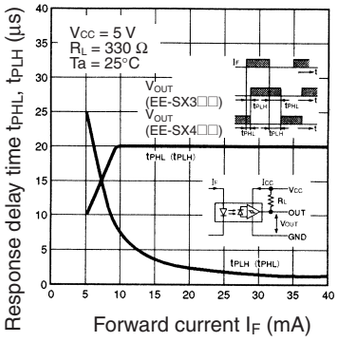
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



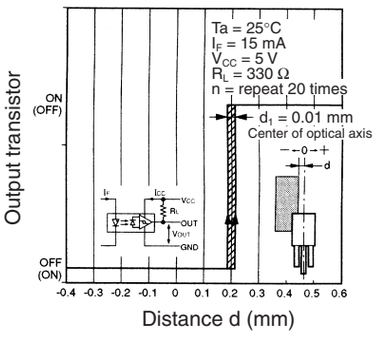
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Position Characteristics (Typical)



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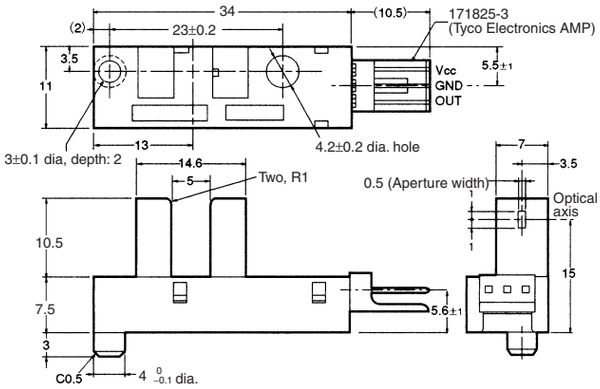
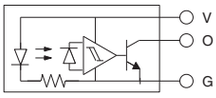
Photomicrosensor (Transmissive)
EE-SX3009-P1/-SX4009-P1

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
4 mm max.	±0.2
4 < mm ≤ 16	±0.3
16 < mm ≤ 63	±0.5

Recommended Mating Connectors:
Tyco Electronics AMP 171822-3 (crimp connector)
172142-3 (crimp connector)
OMRON EE-1005 (with harness)

■ Features

- Screw-mounting model.
- High resolution with a 0.5-mm-wide sensing aperture.
- With a 5-mm-wide groove.
- Photo IC output signals directly connect with C-MOS and TTL.
- Connects to Tyco Electronics AMP's EI-series connectors.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Power supply voltage		V_{CC}	10 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	Operating	T_{opr}	–25°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	---

Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

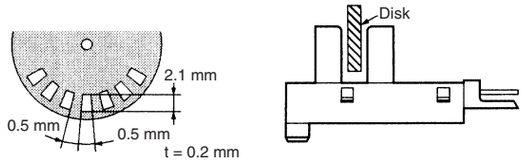
■ Ordering Information

Description		Model
Photomicrosensor (transmissive)	Dark ON	**EE-SX3009-P1**
	Light ON	**EE-SX4009-P1**

■ Electrical and Optical Characteristics (Ta = 25°C, V_{CC} = 5 V ±10%)

Item	Symbol	Value	Condition
Current consumption	I_{CC}	30 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.3 V max.	I_{OUT} = 16 mA Without incident (EE-SX3009-P1) With incident (EE-SX4009-P1)
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	V_{OUT} = V_{CC} With incident (EE-SX3009-P1) Without incident (EE-SX4009-P1), R_L = 47 kΩ
Response frequency	f	3 kHz min.	V_{OUT} = V_{CC}, R_L = 47 kΩ (see note)

Note: The value of the response frequency is measured by rotating the disk as shown below.



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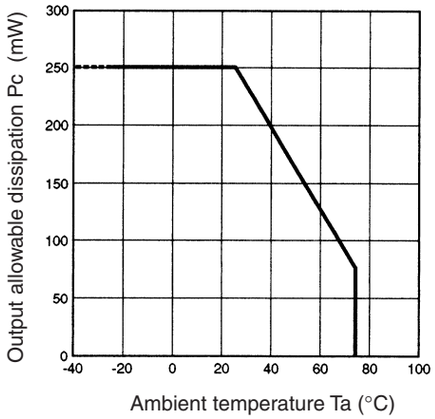
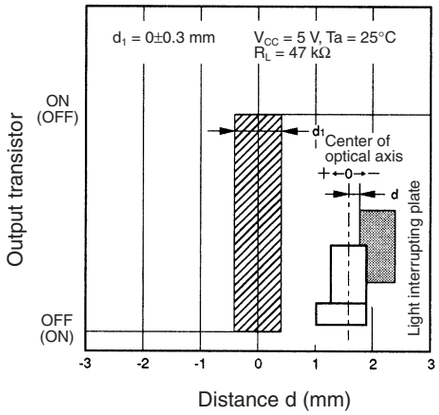
■ Engineering Data

Note: The values in the parentheses apply to the EE-SX4009-P1.

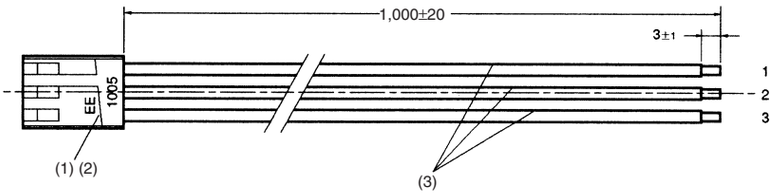
Output Allowable Dissipation vs. Ambient Temperature Characteristics



Sensing Position Characteristics (Typical)



EE-1005 Connector



No.	Name	Model	Quantity	Maker
1	Receptacle housing	171822-3	1	Tyco Electronics AMP
2	Receptacle contact	170262-1	3	Tyco Electronics AMP
3	Lead wire	UL1007 AWG24	3	---

Wiring

Connector circuit no.	Lead wire color	Output when connected to EE-SX4009-P1/EE-SX3009-P1
1	Red	V_{CC}
2	Orange	GND
3	Yellow	OUT

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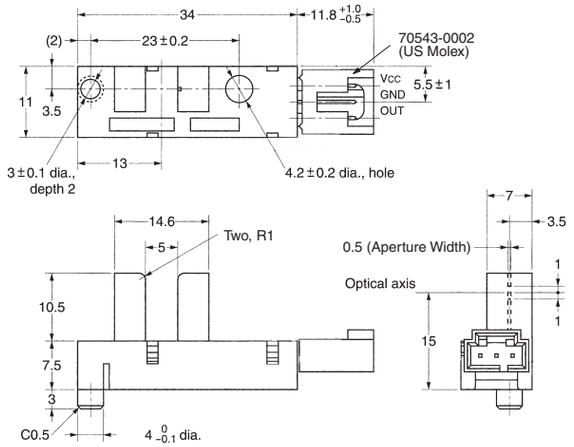
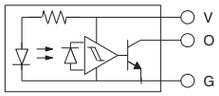
Photomicrosensor (Transmissive)
EE-SX4009-P10

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
4 mm max.	±0.2
4 < x ≤ 16 mm	±0.3
16 < x ≤ 63 mm	±0.5

Recommended Mating Connectors:
US Molex 50-57-9403
15-47-4033
14-56-2036 (AWG28)
14-56-2034 (AWG26)
14-56-2032 (AWG24)
14-56-2037 (AWG22)

■ Features

- Screw-mounting model.
- High resolution with a 0.5-mm-wide sensing aperture.
- With a 5-mm-wide groove.
- Photo IC output signals directly connect with C-MOS and TTL.
- Connects to US Molex connectors.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Power supply voltage		V_{CC}	10 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	Operating	T_{opr}	–25°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	---

Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

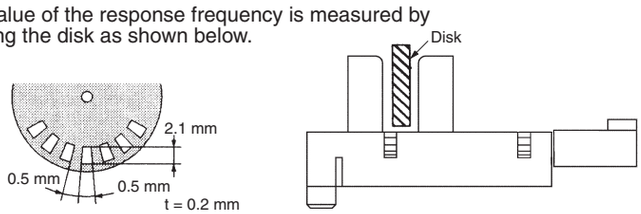
■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX4009-P10**

■ Electrical and Optical Characteristics (Ta = 25°C, Vcc = 5 V ±10%)

Item	Symbol	Value	Condition
Current consumption	I_{CC}	30 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.3 V max.	I_{OUT} = 16 mA with incident
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	V_{OUT} = V_{CC} without incident, R_L = 47 kΩ
Response frequency	f	3 kHz min.	V_{OUT} = V_{CC}, R_L = 47 kΩ (see note)

Note: The value of the response frequency is measured by rotating the disk as shown below.



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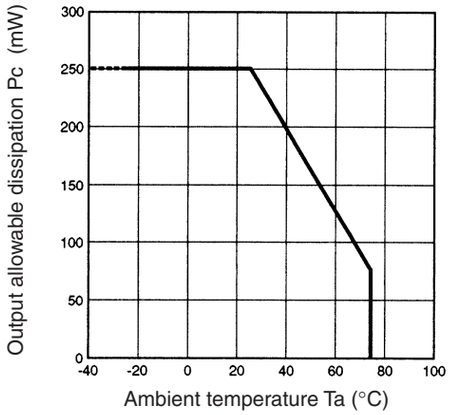
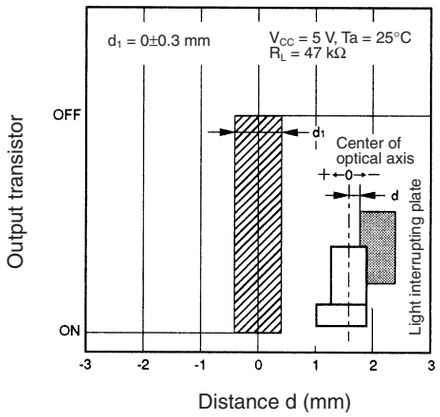
■ Engineering Data

Output Allowable Dissipation vs. Ambient Temperature Characteristics



Sensing Position Characteristics (Typical)



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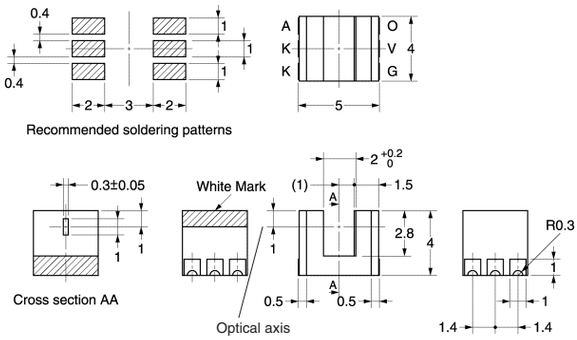
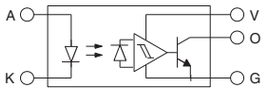
Photomicrosensor (Transmissive)
EE-SX4134

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Unless otherwise specified, the tolerances are ±0.15 mm.

Terminal No.	Name
A	Anode
K	Cathode
V	Supply voltage (Vcc)
O	Output (OUT)
G	Ground (GND)

■ Features

- Ultra-compact model.
- Photo IC output model.
- Operates at a V_{CC} of 2.2 to 7 V.
- PCB surface mounting type.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	25 mA (see note 1)
	Reverse voltage	V_R	5 V
Detector	Supply voltage	V_{CC}	9 V
	Output voltage	V_{OUT}	17 V
	Output current	I_{OUT}	8 mA
	Permissible output dissipation	P_{OUT}	80 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–40°C to 90°C
	Reflow soldering	T_{sol}	255°C (see note 2)
	Manual soldering	T_{sol}	350°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

2. Complete soldering within 10 seconds for reflow soldering and within 3 seconds for manual soldering.

■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX4134**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.4 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 5 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Power supply voltage	V_{CC}	2.2 V min., 7 V max.	---
	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 2.2 to 7 V, I_{OL} = 8 mA, I_F = 7 mA
	High-level output current	I_{OH}	10 μA max.	V_{CC} = 2.2 to 7 V, I_F = 0 mA, V_{OUT} = 17 V
	Current consumption	I_{CC}	2.8 mA typ., 4 mA max.	V_{CC} = 7 V
	Peak spectral sensitivity wavelength	λ_P	870 mm typ.	V_{CC} = 2.2 to 7 V
LED current when output is ON		I_{FT}	2.0 mA typ., 3.5 mA max.	V_{CC} = 2.2 to 7 V
Hysteresis		ΔH	21% typ.	V_{CC} = 2.2 to 7 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 2.2 to 7 V, I_F = 5 mA, I_{OL} = 8 mA (see note 2)
Response delay time		t_{PHL}	7 μs typ.	V_{CC} = 2.2 to 7 V, I_F = 5 mA, I_{OL} = 8 mA (see note 3)
Response delay time		t_{PLH}	18 μs typ.	V_{CC} = 2.2 to 7 V, I_F = 5 mA, I_{OL} = 8 mA (see note 3)

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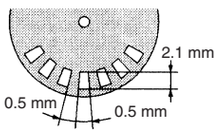
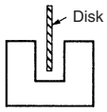
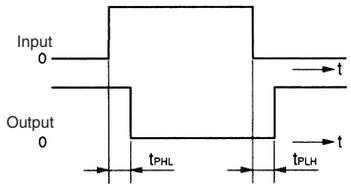
Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

2. The value of the response frequency is measured by rotating the disk as shown below.



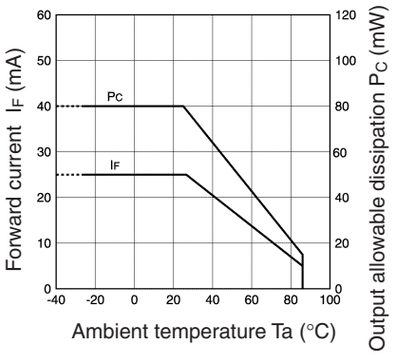


3. The following illustrations show the definition of response delay time.

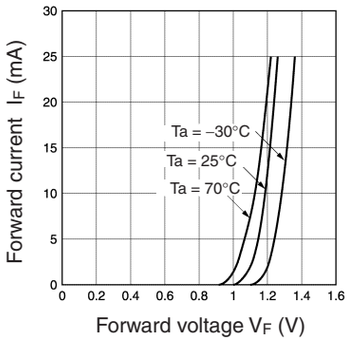


■ Engineering Data

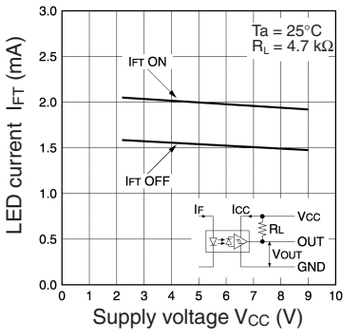
Forward Current vs. Collector Dissipation Temperature Rating



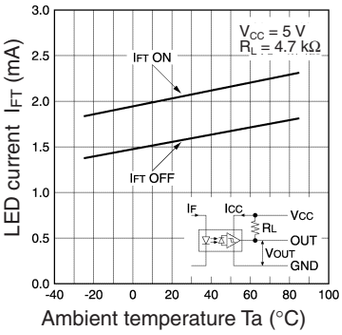
Forward Current vs. Forward Voltage Characteristics (Typical)



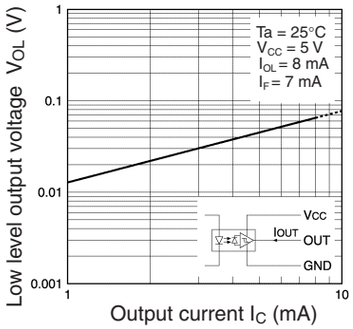
LED Current vs. Supply Voltage (Typical)



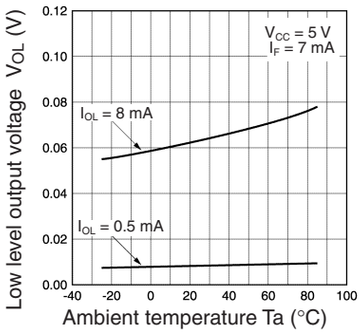
LED Current vs. Ambient Temperature Characteristics (Typical)



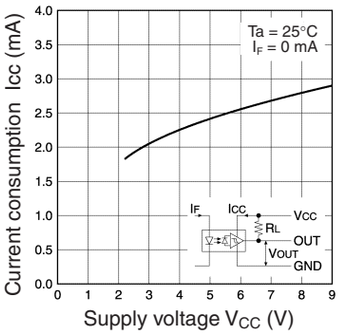
Low-level Output Voltage vs. Output Current (Typical)



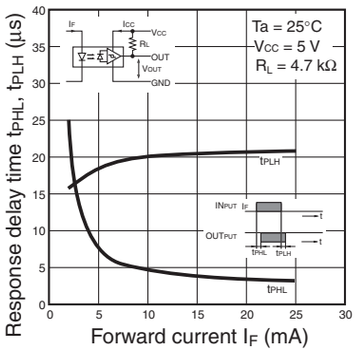
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



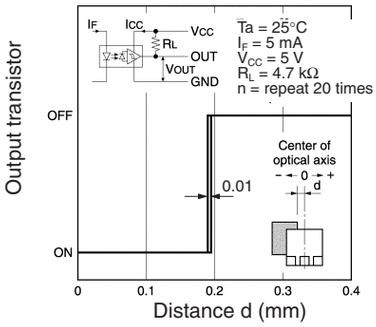
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Position Characteristics (Typical)



Unit: mm (inch)

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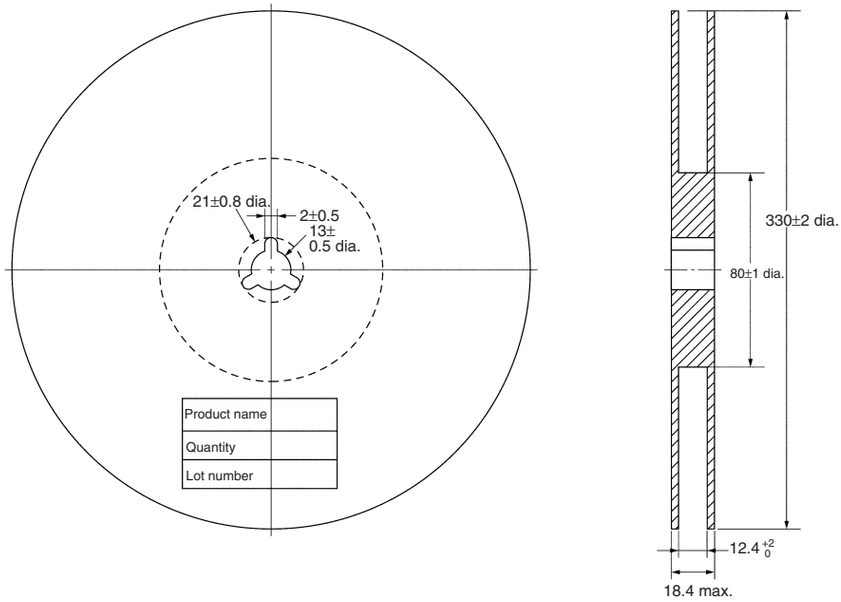
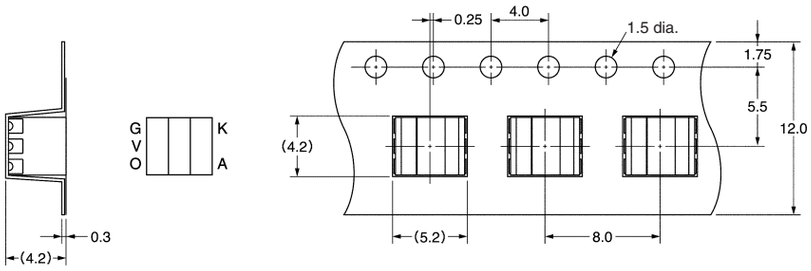
■ Tape and Reel

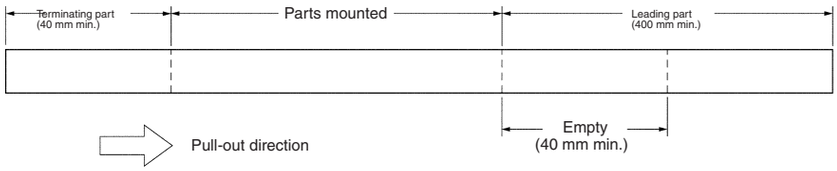
Reel



Tape



Tape configuration



Tape quantity

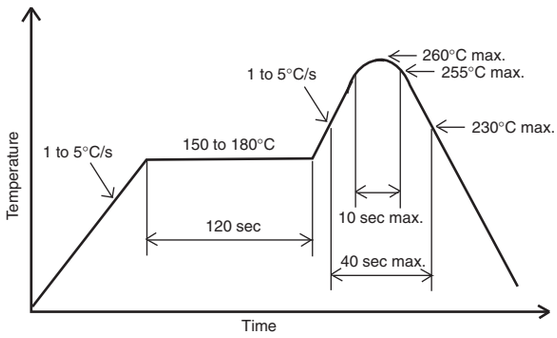
2,000 pcs./reel

Precautions

■ Soldering Information

Reflow soldering

- The following soldering paste is recommended:
  Melting temperature: 216 to 220°C
  Composition: Sn 3.5 Ag 0.75 Cu
- The recommended thickness of the metal mask for screen printing is between 0.2 and 0.25 mm.
- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



Manual soldering

- Use “Sn 60” (60% tin and 40% lead) or solder with silver content.
- Use a soldering iron of less than 25 W, and keep the temperature of the iron tip at 300°C or below.
- Solder each point for a maximum of three seconds.
- After soldering, allow the product to return to room temperature before handling it.

Storage

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended. If this is not possible, store the product under the following conditions:

Temperature: 10 to 30°C
Humidity: 60% max.

The product is packed in a humidity-proof envelope. Reflow soldering must be done within 48 hours after opening the envelope, during which time the product must be stored under 30°C at 80% maximum humidity.

If it is necessary to store the product after opening the envelope, use dry-box storage or reseal the envelope.

Baking

If a product has remained packed in a humidity-proof envelope for six months or more, or if more than 48 hours have lapsed since the envelope was opened, bake the product under the following conditions before use:

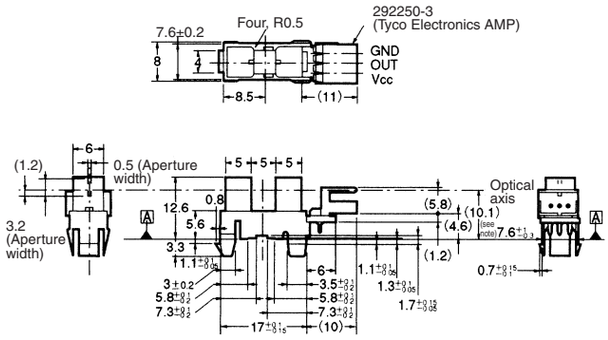
Reel: 60°C for 24 hours or more
Bulk: 80°C for 4 hours or more

OMRON

Photomicrosensor (Transmissive)
EE-SX4235A-P2

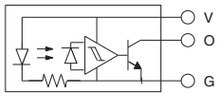
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Note: The dimension is specified by datum A only.

Internal Circuit



Terminal No.	Name
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Recommended Mating Connectors:
Tyco Electronics AMP 179228-3 (crimp connector)
175778-3 (crimp connector)
173977-3 (press-fit connector)

■ Features

- Snap-in mounting model.
- Mounts to 1.0-, 1.2- and 1.6-mm-thick panels.
- High resolution with a 0.5-mm-wide sensing aperture.
- With a 5-mm-wide slot.
- Photo IC output signals directly connect with C-MOS and TTL.
- Connects to Tyco Electronics AMP's CT-series connectors.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	Operating	T_{opr}	–25°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	---

Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

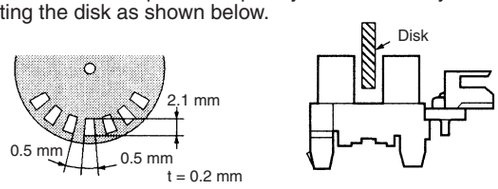
■ Ordering Information

Description	Model
Photomicrosensor (transmissive)	**EE-SX4235A-P2**

■ Electrical and Optical Characteristics (Ta = 25°C, V_{CC} = 5 V ±10%)

Item	Symbol	Value	Condition
Current consumption	I_{CC}	16.5 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.35 V max.	I_{OUT} = 16 mA with incident
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	V_{OUT} = V_{CC} without incident, R_L = 47 kΩ
Response frequency	f	3 kHz min.	V_{OUT} = V_{CC}, R_L = 47 kΩ (see note)

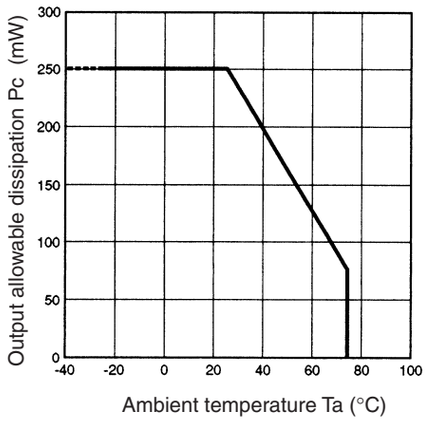
Note: The value of the response frequency is measured by rotating the disk as shown below.



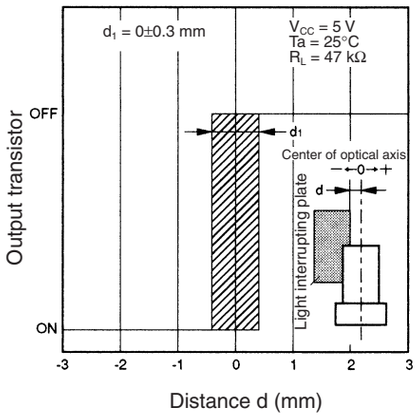
OMRON

■ Engineering Data

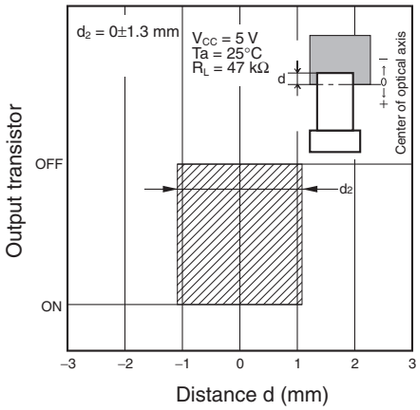
Output Allowable Dissipation vs. Ambient Temperature Characteristics



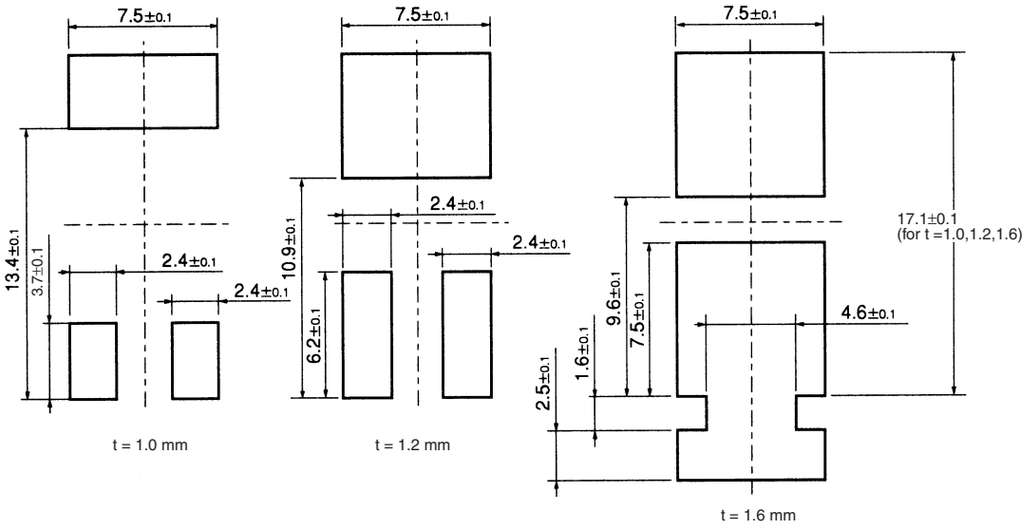
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



■ Recommended Mounting Holes



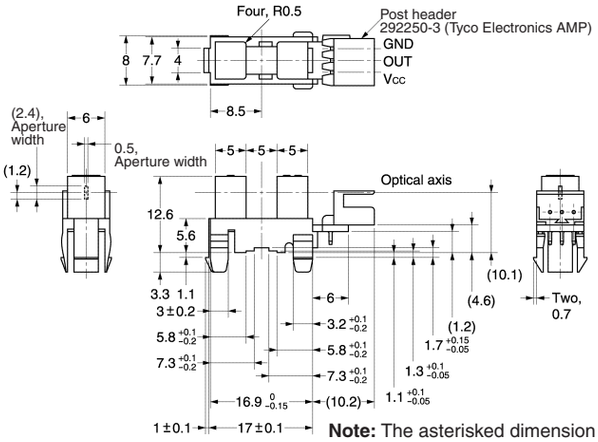
- When mounting the Photomicrosensor to a panel with a hole opened by pressing, make sure that the hole has no burrs. The mounting strength of the Photomicrosensor will decrease if the hole has burrs.
- When mounting the Photomicrosensor to a panel with a hole opened by pressing, be sure to mount the Photomicrosensor on the pressing side of the panel.
- The mounting strength of the Photomicrosensor will increase if the Photomicrosensor is mounted to a panel with a hole that is only a little larger than the size of the Photomicrosensor, in which case, however, it will be difficult to mount the Photomicrosensor to the panel. The mounting strength of the Photomicrosensor will decrease if the Photomicrosensor is mounted to a panel with a hole that is comparatively larger than the size of the Photomicrosensor, in which case, however, it will be easy to mount the Photomicrosensor to the panel. When mounting the Photomicrosensor to a panel, open an appropriate hole for the Photomicrosensor according to the application.
- After mounting the Photomicrosensor to any panel, make sure that the Photomicrosensor does not wobble.
- When mounting the Photomicrosensor to a molding with a hole, make sure that the edges of the hole are sharp enough, otherwise the Photomicrosensor may fall out.

OMRON

Photomicrosensor (Transmissive)
EE-SX3239-P2

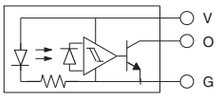
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Note: The asterisked dimension is specified by datum A only.

Internal Circuit



Terminal No.	Name
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Recommended Mating Connectors:
Tyco Electronics AMP 175778-3 (crimp connector)
173977-3 (press-fit connector)
179228-3 (crimp connector)

■ Features

- Snap-in mounting model.
- Mounts to 1.0-, 1.2- and 1.6-mm-thick panels.
- High resolution with a 0.5-mm-wide sensing aperture.
- With a 5-mm-wide slot.
- Photo IC output signals directly connect with C-MOS and TTL.
- Connects to Tyco Electronics AMP's CT-series connectors.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	Operating	T_{opr}	–20°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	---

Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

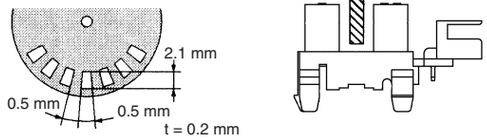
■ Ordering Information

Description		Model
Photomicrosensor (transmissive)	Dark ON	**EE-SX3239-P2**

■ Electrical and Optical Characteristics (Ta = 25°C, V_{CC} = 5 V ±10%)

Item	Symbol	Value	Condition
Current consumption	I_{CC}	16.5 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.35 V max.	I_{OUT} = 16 mA without incident (EE-SX3239-P2)
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	V_{OUT} = V_{CC} with incident (EE-SX3239-P2), R_L = 47 kΩ
Response frequency	f	3 kHz min.	V_{OUT} = V_{CC}, R_L = 47 kΩ (see note)

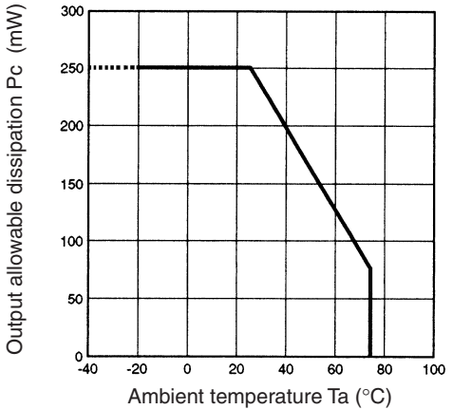
Note: The value of the response frequency is measured by rotating the disk as shown below.



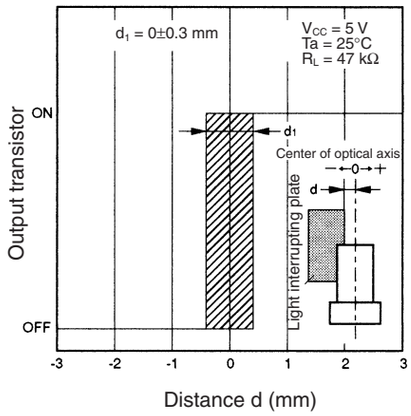
OMRON

■ Engineering Data

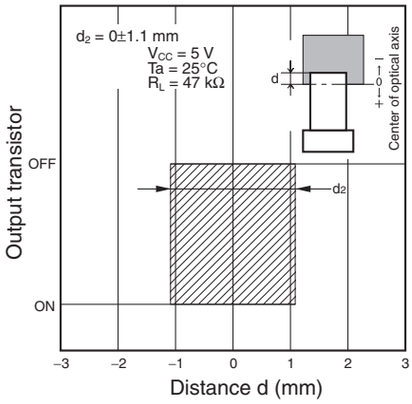
Output Allowable Dissipation vs. Ambient Temperature Characteristics



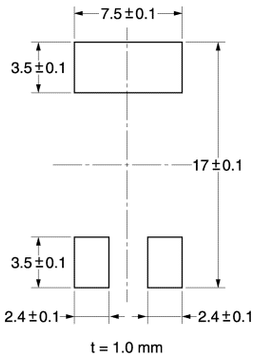
Sensing Position Characteristics (Typical)

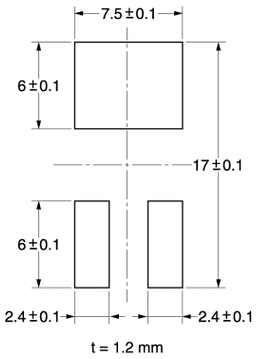


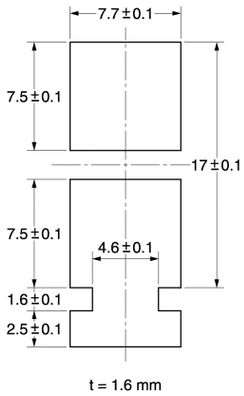
Sensing Position Characteristics (Typical)



■ Recommended Mounting Holes







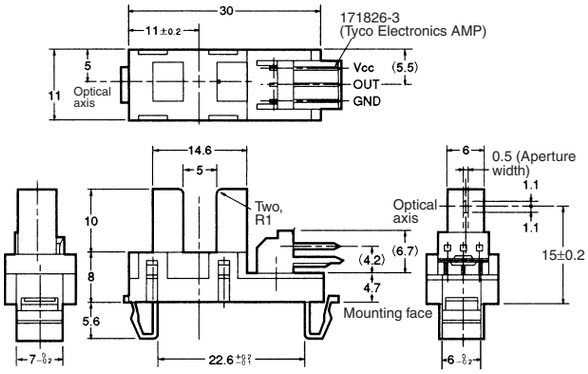
- When mounting the Photomicrosensor to a panel with a hole opened by pressing, make sure that the hole has no burrs. The mounting strength of the Photomicrosensor will decrease if the hole has burrs.
- When mounting the Photomicrosensor to a panel with a hole opened by pressing, be sure to mount the Photomicrosensor on the pressing side of the panel.
- The mounting strength of the Photomicrosensor will increase if the Photomicrosensor is mounted to a panel with a hole that is only a little larger than the size of the Photomicrosensor, in which case, however, it will be difficult to mount the Photomicrosensor to the panel. The mounting strength of the Photomicrosensor will decrease if the Photomicrosensor is mounted to a panel with a hole that is comparatively larger than the size of the Photomicrosensor, in which case, however, it will be easy to mount the Photomicrosensor to the panel. When mounting the Photomicrosensor to a panel, open an appropriate hole for the Photomicrosensor according to the application.
- After mounting the Photomicrosensor to any panel, make sure that the Photomicrosensor does not wobble.
- When mounting the Photomicrosensor to a molding with a hole, make sure that the edges of the hole are sharp enough, otherwise the Photomicrosensor may fall out.

OMRON

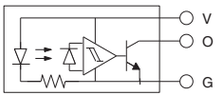
Photomicrosensor (Transmissive)
EE-SX460-P1

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Recommended Mating Connectors:
Tyco Electronics AMP 171822-3 (crimp connector)
172142-3 (crimp connector)
OMRON EE-1005 (with harness)

■ Features

- Snap-in mounting model.
- Mounts to 0.8- to 1.6-mm-thick panels.
- High resolution (aperture width of 0.5 mm)
- With a 5-mm-wide slot.
- Photo IC output signals directly connect with C-MOS and TTL.
- Connects to Tyco Electronics AMP's EI-series connectors.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Power supply voltage		V_{CC}	10 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	Operating	T_{opr}	–20°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	---

Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

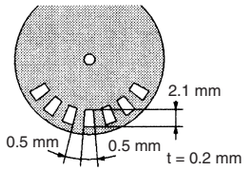
■ Ordering Information

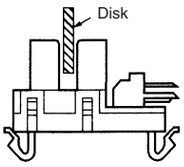
Description	Model
Photomicrosensor (transmissive)	**EE-SX460-P1**

■ Electrical and Optical Characteristics (Ta = 25°C, V_{CC} = 5 V±10%)

Item	Symbol	Value	Condition
Current consumption	I_{CC}	30 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.3 V max.	I_{OUT} = 16 mA with incident
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	V_{OUT} = V_{CC} without incident, R_L = 47 kΩ
Response frequency	f	3 kHz min.	V_{OUT} = V_{CC}, R_L = 47 kΩ (see note)

Note: The value of the response frequency is measured by rotating the disk as shown below.





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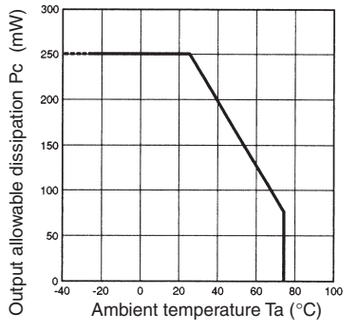
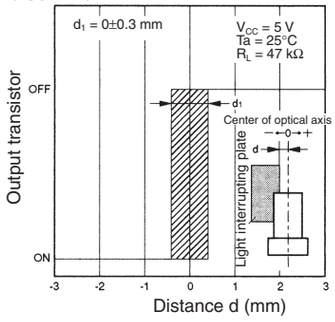
■ Engineering Data

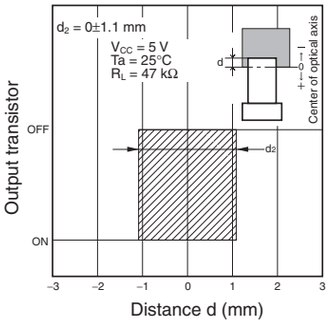
Output Allowable Dissipation vs. Ambient Temperature Characteristics



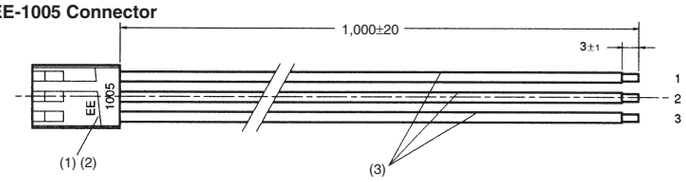
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



EE-1005 Connector

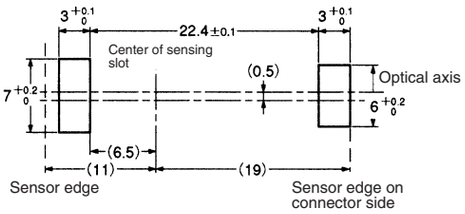


No.	Name	Model	Quantity	Maker
1	Receptacle housing	171822-3	1	Tyco Electronics AMP
2	Receptacle contact	170262-1	3	Tyco Electronics AMP
3	Lead wire	UL1007 AWG24	3	---

Wiring

Connector circuit no.	Lead wire color	Output when connected to EE-SX460-P1
1	Red	V_{CC}
2	Orange	OUT
3	Yellow	GND

■ Recommended Mounting Hole Dimensions and Mounting and Dismounting Method



The Photomicrosensor can be mounted to 0.8- to 1.6-mm-thick panels.

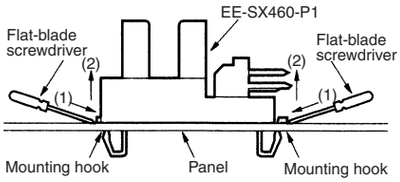
Refer to the above mounting hole dimensions and open the mounting holes in the panel to which the Photomicrosensor will be mounted.

Insert into the holes the Photomicrosensor's mounting portions with a force of three to five kilograms but do not press in the Photomicrosensor at one time. The Photomicrosensor can be easily mounted by inserting the mounting portions halfway and then slowly pressing the Photomicrosensor onto the panel.

There are two ways to dismount the Photomicrosensor. Refer to the following.

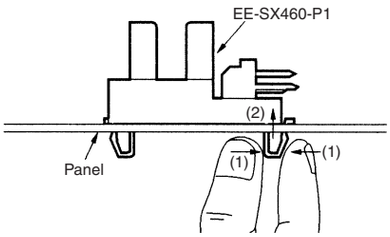
Dismounting with Screwdriver

Press the mounting hooks of the Photomicrosensor with a flat-blade screwdriver as shown in the following illustration and pull up the Photomicrosensor.



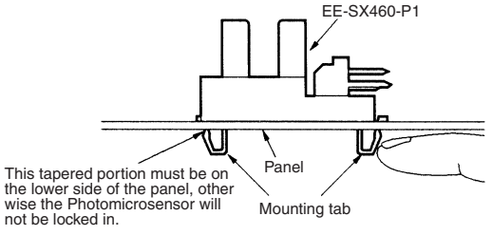
Dismounting by Hand

Squeeze the mounting tabs as shown in the following illustration and press the mounting tabs upwards.



Pressed mounting holes are ideal for mounting the Photomicrosensor. When mounting the Photomicrosensor to a panel that has pressed mounting holes for the Photomicrosensor, be sure to mount the Photomicrosensor on the pressing side of the panel, otherwise it may be difficult to mount the Photomicrosensor and an insertion force of five to six kilograms may be required.

When mounting the Photomicrosensor to a panel that has mounting holes opened by pressing, make sure that the mounting holes have no burrs, otherwise the lock mechanism of the Photomicrosensor will not work perfectly. After mounting the Photomicrosensor to a panel, be sure to check if the lock mechanism is working perfectly.

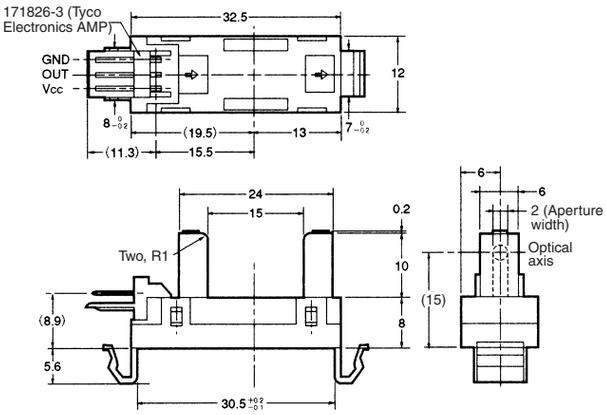


OMRON

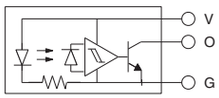
Photomicrosensor (Transmissive)
EE-SX461-P11

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Recommended Mating Connectors:
Tyco Electronics AMP 171822-3 (crimp connector)
172142-3 (crimp connector)
OMRON EE-1005 (with harness)

■ Features

- Snap-in-mounting model.
- Mounts to 0.8- to 1.6-mm-thick panels.
- With a 15-mm-wide slot.
- Photo IC output signals directly connect with C-MOS and TTL.
- Connects to Tyco Electronics AMP's EI-series connectors.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	Operating	T_{opr}	–20°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	---

Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

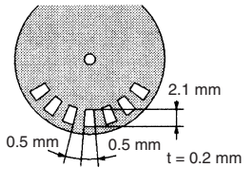
■ Ordering Information

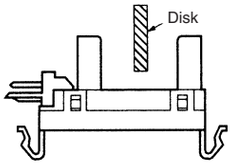
Description	Model
Photomicrosensor (transmissive)	**EE-SX461-P11**

■ Electrical and Optical Characteristics (Ta = 25°C, V_{CC} = 5 V±10%)

Item	Symbol	Value	Condition
Current consumption	I_{CC}	35 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.3 V max.	I_{OUT} = 16 mA with incident
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	V_{OUT} = V_{CC} without incident, R_L = 47 kΩ
Response frequency	f	3 kHz min.	V_{OUT} = V_{CC}, R_L = 47 kΩ (see note)

Note: The value of the response frequency is measured by rotating the disk as shown below.





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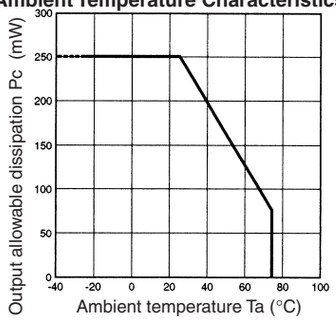
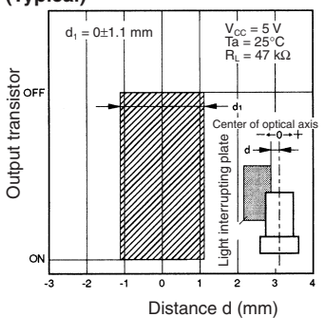
■ Engineering Data

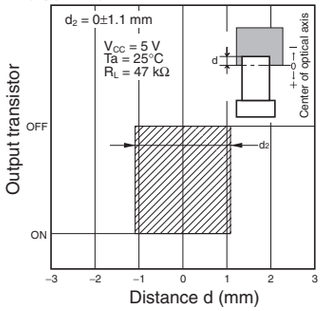
Output Allowable Dissipation vs. Ambient Temperature Characteristics



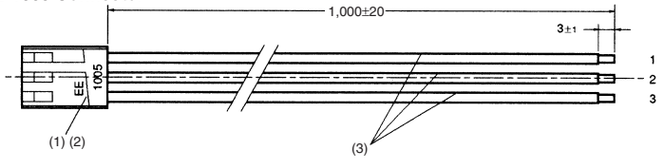
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



EE-1005 Connector

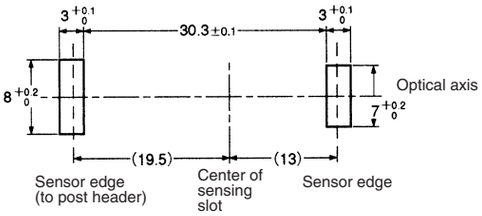


No.	Name	Model	Quantity	Maker
1	Receptacle housing	171822-3	1	Tyco Electronics AMP
2	Receptacle contact	170262-1	3	Tyco Electronics AMP
3	Lead wire	UL1007 AWG24	3	---

Wiring

Connector circuit no.	Lead wire color	Output when connected to EE-SX461-P11
1	Red	V_{CC}
2	Orange	OUT
3	Yellow	GND

■ Recommended Mounting Hole Dimensions and Mounting and Dismounting Method



The Photomicrosensor can be mounted to 0.8- to 1.6-mm-thick panels.

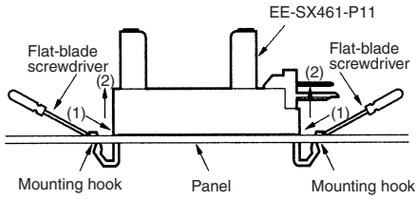
Refer to the above mounting hole dimensions and open the mounting holes in the panel to which the Photomicrosensor will be mounted.

Insert into the holes the Photomicrosensor's mounting portions with a force of three to five kilograms but do not press in the Photomicrosensor at one time. The Photomicrosensor can be easily mounted by inserting the mounting portions halfway and then slowly pressing the Photomicrosensor onto the panel.

There are two ways to dismount the Photomicrosensor. Refer to the following.

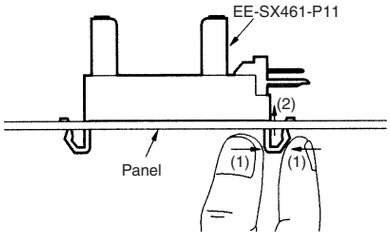
Dismounting with Screwdriver

Press the mounting hooks of the Photomicrosensor with a flat-blade screwdriver as shown in the following illustration and pull up the Photomicrosensor.



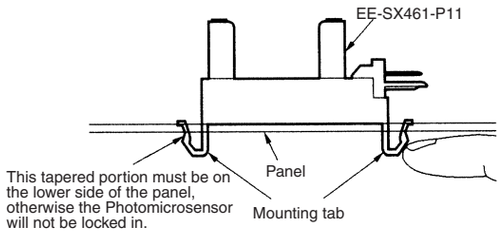
Dismounting by Hand

Squeeze the mounting tabs as shown in the following illustration and press the mounting tabs upwards.



Pressed mounting holes are ideal for mounting the Photomicrosensor. When mounting the Photomicrosensor to a panel that has pressed mounting holes for the Photomicrosensor, be sure to mount the Photomicrosensor on the pressing side of the panel, otherwise it may be difficult to mount the Photomicrosensor and an insertion force of five to six kilograms may be required.

When mounting the Photomicrosensor to a panel that has mounting holes opened by pressing, make sure that the mounting holes have no burrs, otherwise the lock mechanism of the Photomicrosensor will not work perfectly. After mounting the Photomicrosensor to a panel, be sure to check if the lock mechanism is working perfectly.

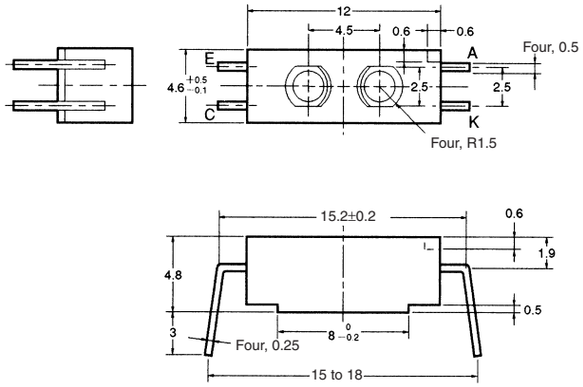


OMRON

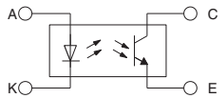
Photomicrosensor (Reflective)
EE-SY110

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

■ Features

- Compact reflective model with a molded housing.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–40°C to 85°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (reflective)	**EE-SY110**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	200 μA min., 2,000 μA max.	I_F = 20 mA, V_{CE} = 10 V White paper with a reflection ratio of 90%, d = 5 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 10 V with no reflection
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	---	---
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

Note: The letter “d” indicates the distance between the top surface of the sensor and the sensing object.

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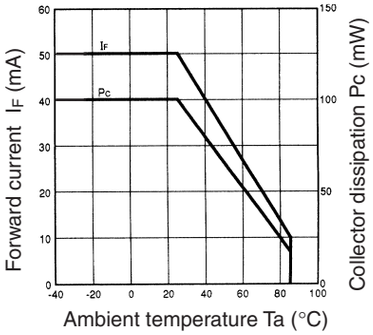
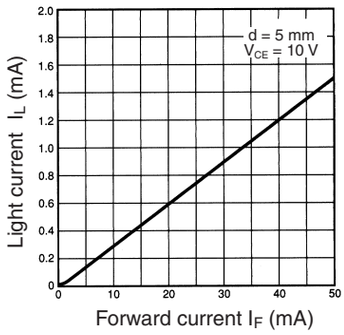
■ Engineering Data

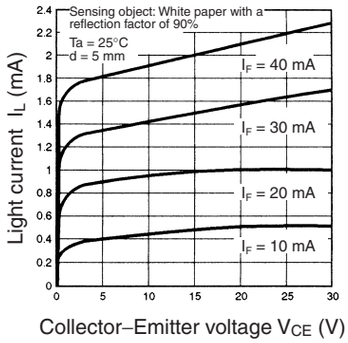
Forward Current vs. Collector Dissipation Temperature Rating



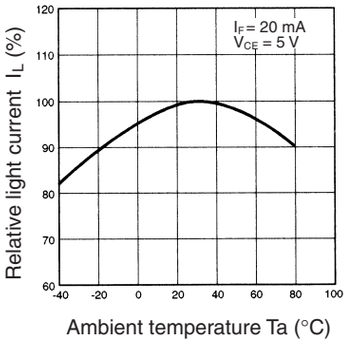
Light Current vs. Forward Current Characteristics (Typical)



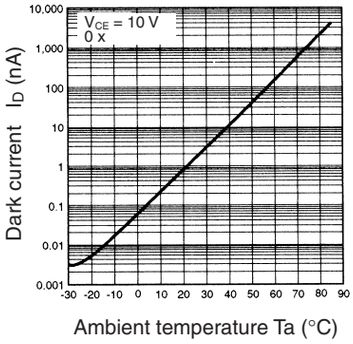
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



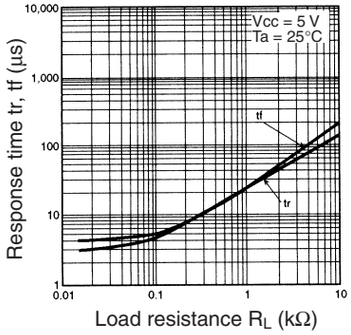
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



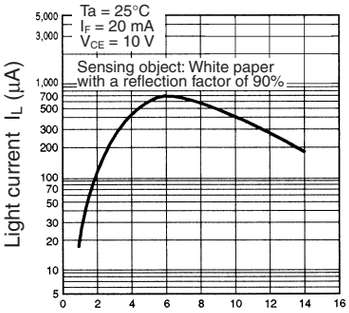
Dark Current vs. Ambient Temperature Characteristics (Typical)



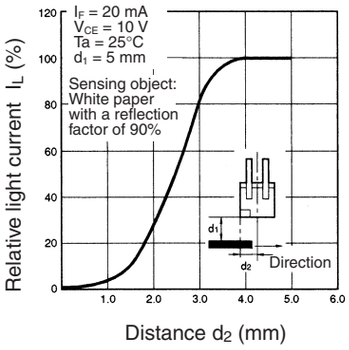
Response Time vs. Load Resistance Characteristics (Typical)



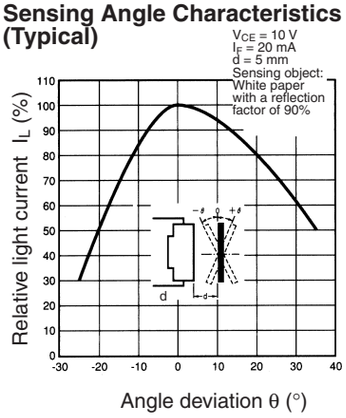
Sensing Distance Characteristics (Typical)



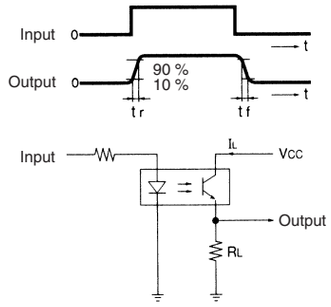
Sensing Position Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit

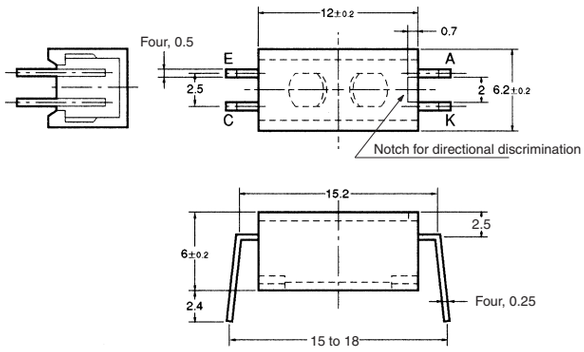


OMRON

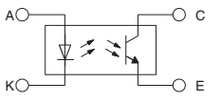
Photomicrosensor (Reflective)
EE-SY113

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Compact reflective Photomicrosensor (EE-SY110) with a molded housing and a dust-tight cover.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–40°C to 80°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (reflective)	**EE-SY113**

■ Electrical and Optical Characteristics (Ta = 25°C)

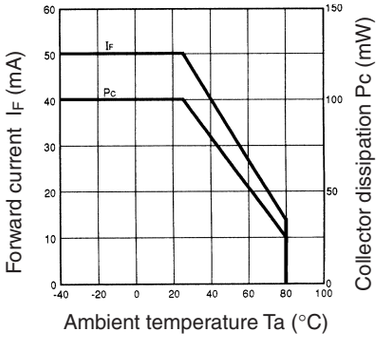
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	160 μA min., 1,600 μA max.	I_F = 20 mA, V_{CE} = 10 V White paper with a reflection ratio of 90%, d = 4.4 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 10 V with no reflection
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	---	---
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

Note: The letter “d” indicates the distance between the top surface of the sensor and the sensing object.

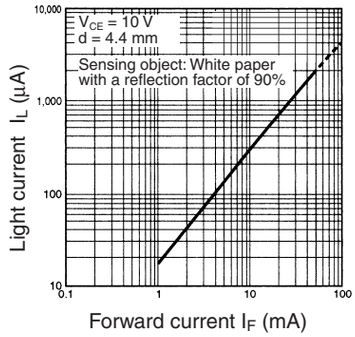
OMRON

■ Engineering Data

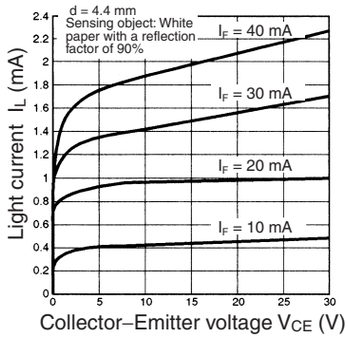
Forward Current vs. Collector Dissipation Temperature Rating



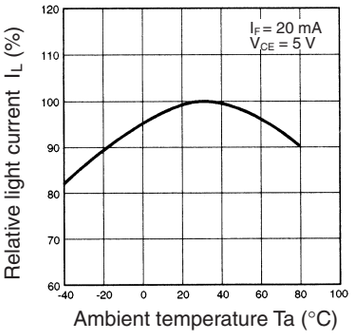
Light Current vs. Forward Current Characteristics (Typical)



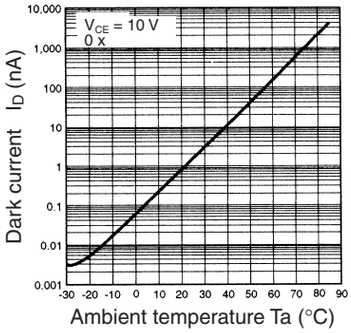
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



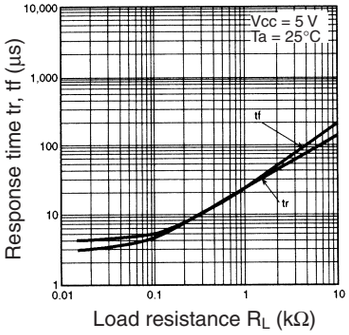
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



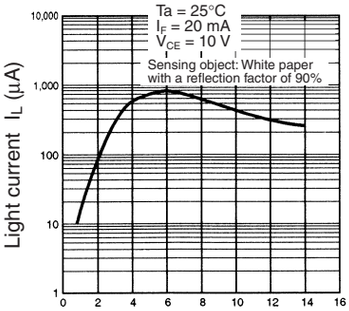
Dark Current vs. Ambient Temperature Characteristics (Typical)



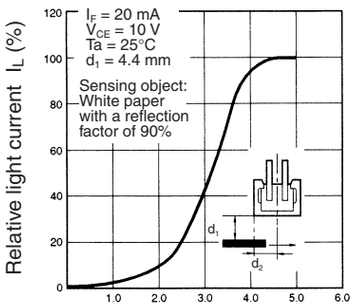
Response Time vs. Load Resistance Characteristics (Typical)



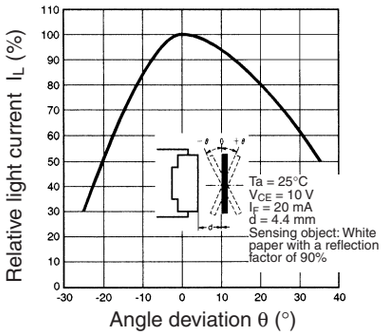
Sensing Distance Characteristics (Typical)



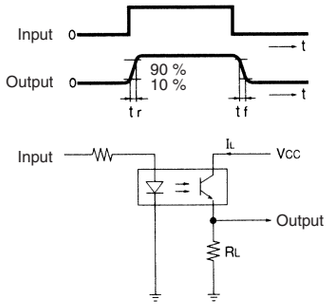
Sensing Position Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit

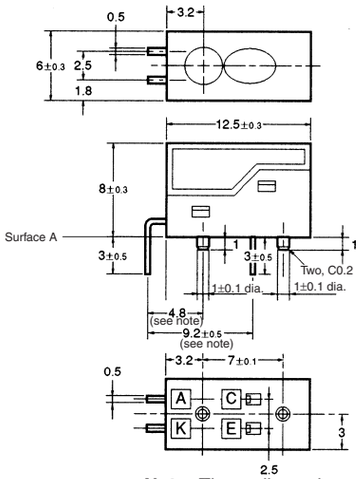


OMRON

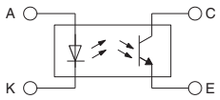
Photomicrosensor (Reflective)
EE-SY169

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Note: These dimensions are for the surface A. Other lead wire pitch dimensions are for the housing surface.

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- High-quality model with plastic lenses.
- Highly precise sensing range with a tolerance of ±0.6 mm horizontally and vertically.
- With a red LED sensing dyestuff-type inks.
- Limited reflective model.
- For lesser LED forward current, use EE-SY169B.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	40 mA (see note 1)
	Pulse forward current	I_{FP}	300 mA (see note 2)
	Reverse voltage	V_R	3 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	0°C to 70°C
	Storage	T_{stg}	–20°C to 80°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (reflective)	**EE-SY169**

■ Electrical and Optical Characteristics (Ta = 25°C)

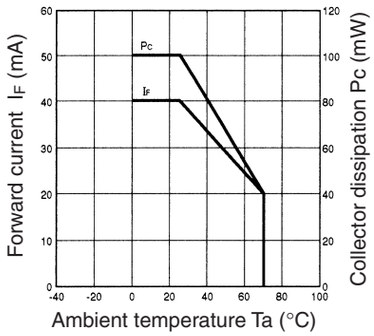
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.85 V typ., 2.3 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 3 V
	Peak emission wavelength	λ_P	660 nm typ.	I_F = 20 mA
Detector	Light current	I_L	160 μA min., 2,000 μA max.	I_F = 20 mA, V_{CE} = 5 V White paper with a reflection ratio of 90%, d = 4 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 5 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 5 V with no reflection
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	---	---
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 5 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

Note: The letter "d" indicates the distance between the top surface of the sensor and the sensing object.

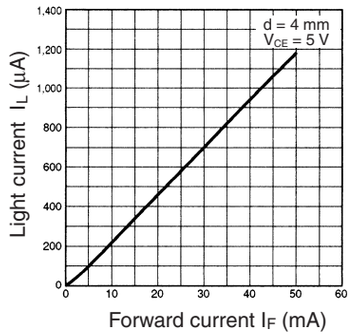
OMRON

■ Engineering Data

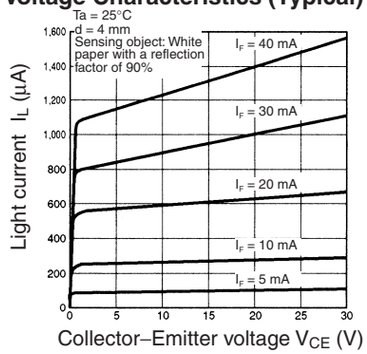
Forward Current vs. Collector Dissipation Temperature Rating



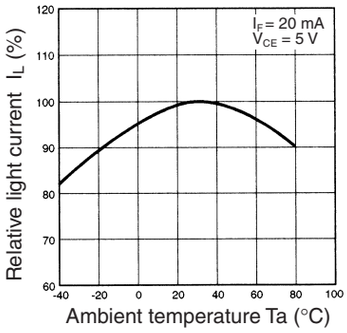
Light Current vs. Forward Current Characteristics (Typical)



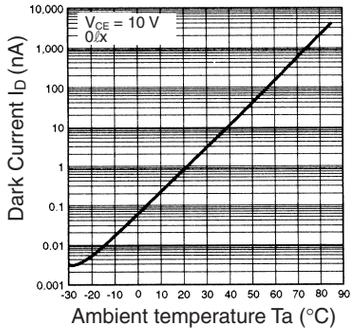
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



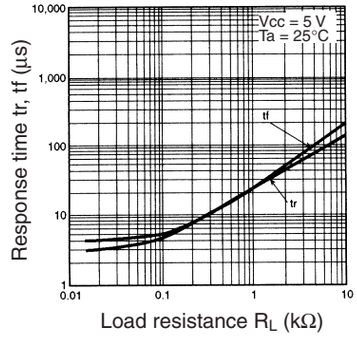
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



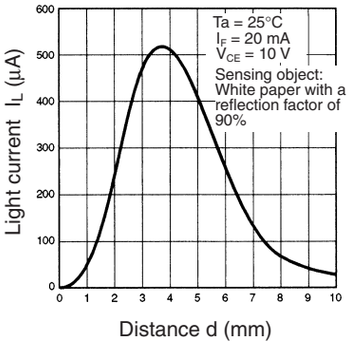
Dark Current vs. Ambient Temperature Characteristics (Typical)



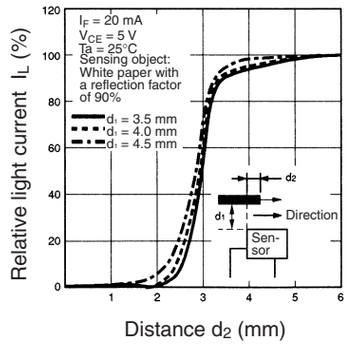
Response Time vs. Load Resistance Characteristics (Typical)



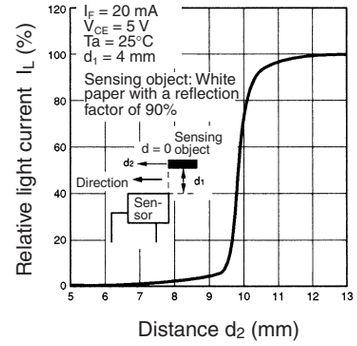
Sensing Distance Characteristics (Typical)



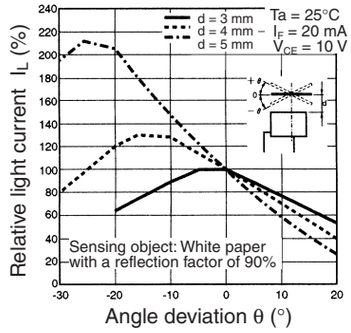
Sensing Position Characteristics (Typical)



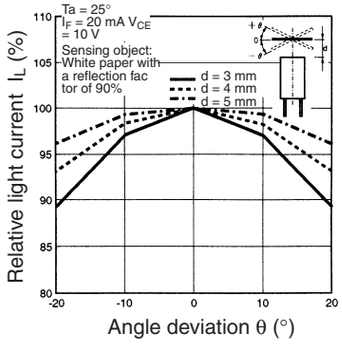
Sensing Position Characteristics (Typical)



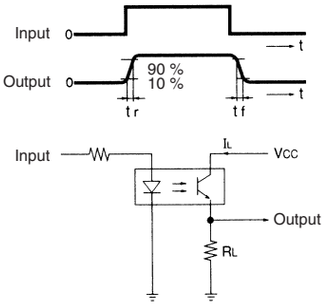
Sensing Angle Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit

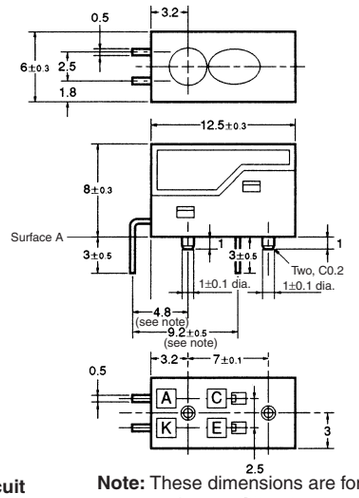


OMRON

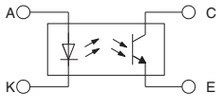
Photomicrosensor (Reflective)
EE-SY169A

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Note: These dimensions are for the surface A. Other lead wire pitch dimensions are for the housing surface.
Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- High-quality model with plastic lenses.
- Highly precise sensing range with a tolerance of ±0.6 mm horizontally and vertically.
- Convergent reflective model with infrared LED.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	3 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	0°C to 70°C
	Storage	T_{stg}	–20°C to 80°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (reflective)	**EE-SY169A**

■ Electrical and Optical Characteristics (Ta = 25°C)

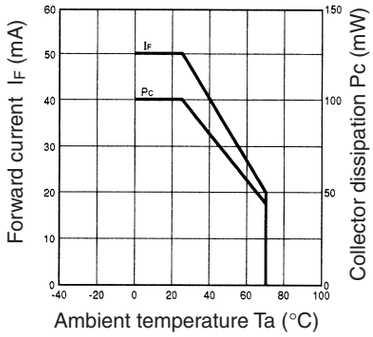
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.5 V max.	I_F = 30 mA
	Reverse current	I_R	10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	920 nm typ.	I_F = 20 mA
Detector	Light current	I_L	160 μA min., 2,000 μA max.	I_F = 20 mA, V_{CE} = 5 V White paper with a reflection ratio of 90%, d = 4 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 5 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 5 V with no reflection
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	---	---
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 5 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

Note: The letter “d” indicates the distance between the top surface of the sensor and the sensing object.

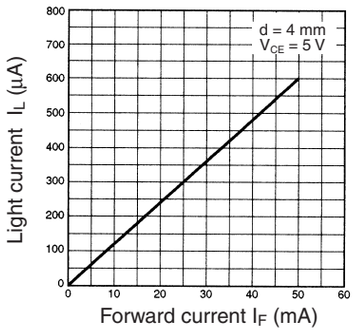
OMRON

■ Engineering Data

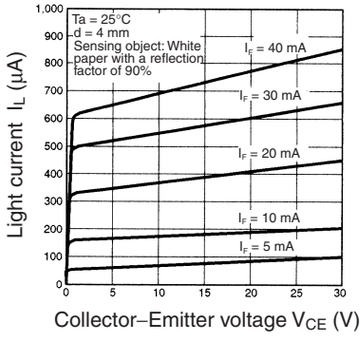
Forward Current vs. Collector Dissipation Temperature Rating



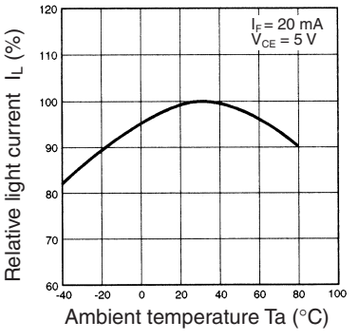
Light Current vs. Forward Current Characteristics (Typical)



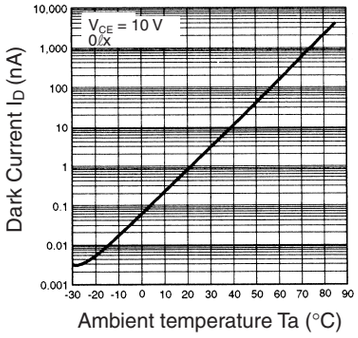
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



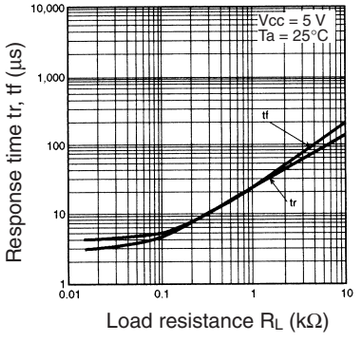
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



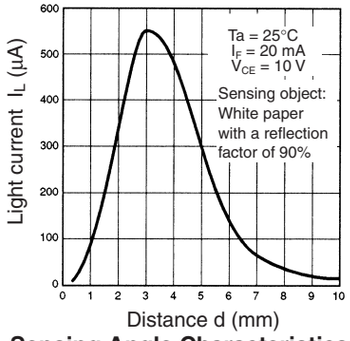
Dark Current vs. Ambient Temperature Characteristics (Typical)



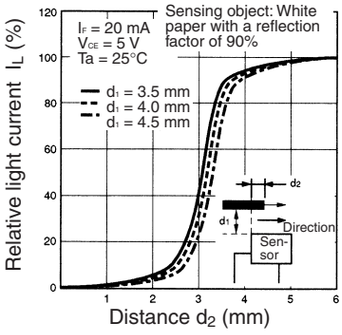
Response Time vs. Load Resistance Characteristics (Typical)



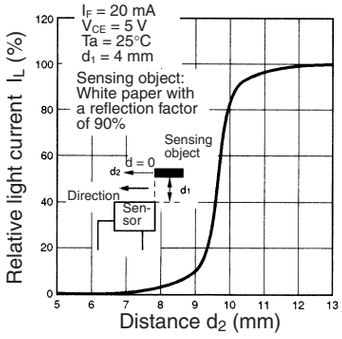
Sensing Distance Characteristics (Typical)



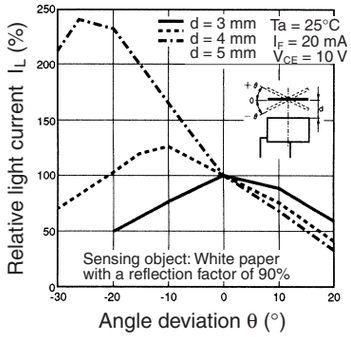
Sensing Position Characteristics (Typical)



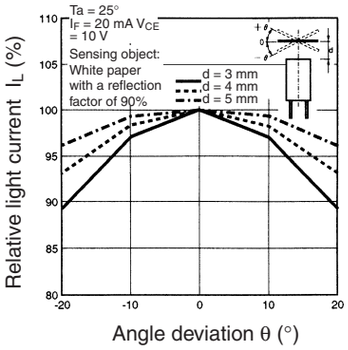
Sensing Position Characteristics (Typical)



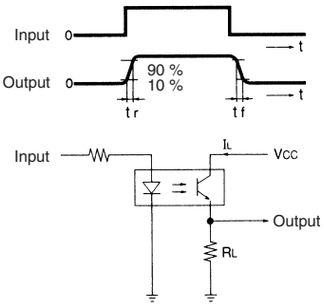
Sensing Angle Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit

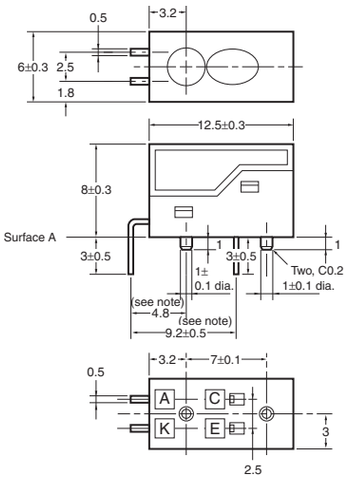


OMRON

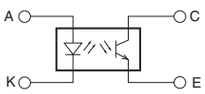
Photomicrosensor (Reflective)
EE-SY169B

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Note: These dimensions are for the surface A. Other lead wire pitch dimensions are for the housing surface.

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- High-quality model with plastic lenses.
- Highly precise sensing range with a tolerance of ±0.6 mm horizontally and vertically.
- With a red LED sensing dyestuff-type links.
- Limited reflective model
- Higher gain than EE-SY169.
- Possible to get the same I_L as EE-SY169 with I_F=10 mA. (half of EE-SY169 condition)
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	40 mA (see note 1)
	Pulse forward current	I_{FP}	300 mA (see note 2)
	Reverse voltage	V_R	3 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	0°C to 70°C
	Storage	T_{stg}	–20°C to 80°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (reflective)	**EE-SY169B**

■ Electrical and Optical Characteristics (Ta = 25°C)

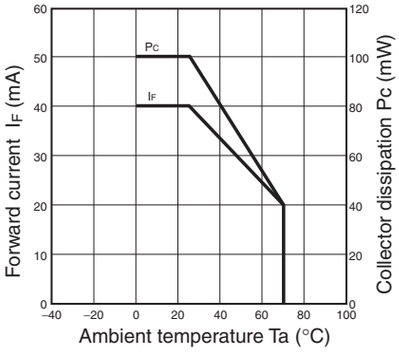
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.85 V typ., 2.3 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 3 V
	Peak emission wavelength	λ_P	660 nm typ.	I_F = 20 mA
Detector	Light current	I_L	160 μA min., 2,000 μA max.	I_F = 10 mA, V_{CE} = 5 V White paper with a reflection ratio of 90%, d = 4 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 5 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 5 V with no reflection
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	---	---
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 5 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

Note: The letter “d” indicates the distance between the top surface of the sensor and the sensing object.

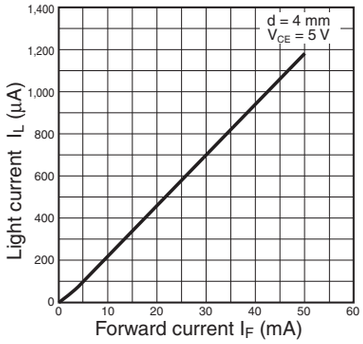
OMRON

■ Engineering Data

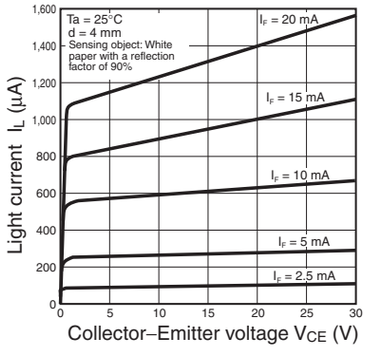
Forward Current vs. Collector Dissipation Temperature Rating



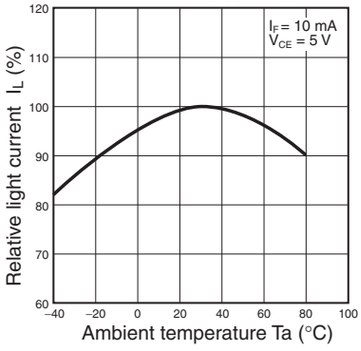
Light Current vs. Forward Current Characteristics (Typical)



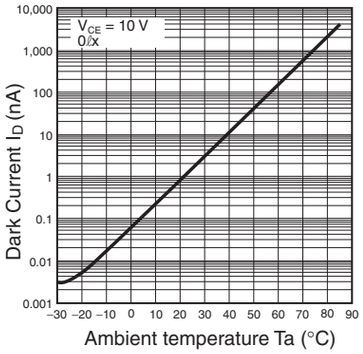
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



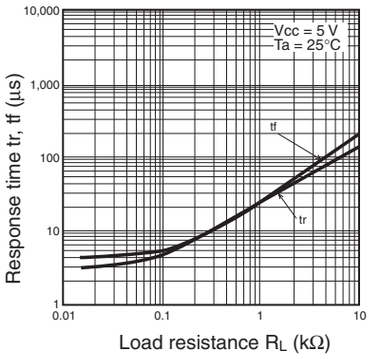
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



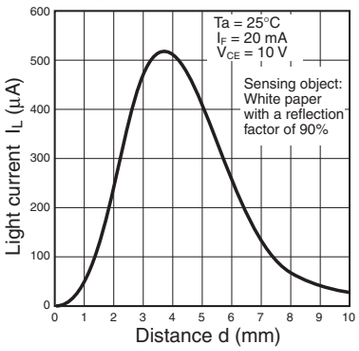
Dark Current vs. Ambient Temperature Characteristics (Typical)



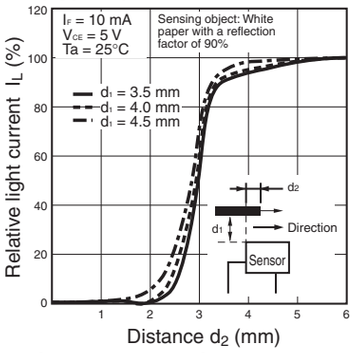
Response Time vs. Load Resistance Characteristics (Typical)



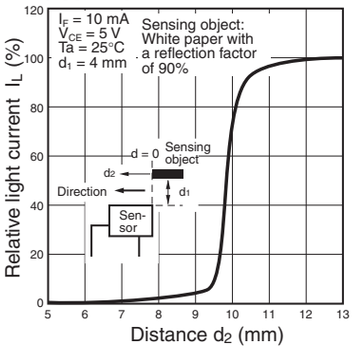
Sensing Distance Characteristics (Typical)



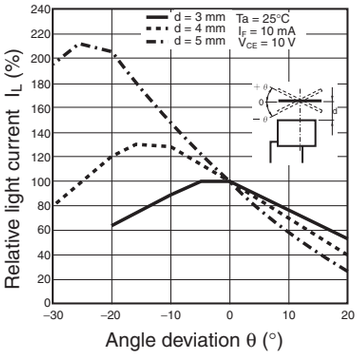
Sensing Position Characteristics (Typical)



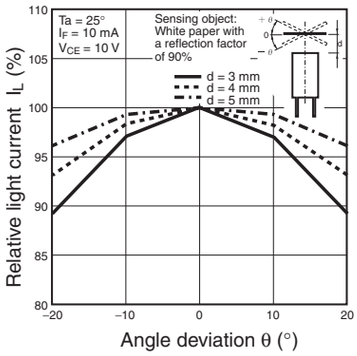
Sensing Position Characteristics (Typical)



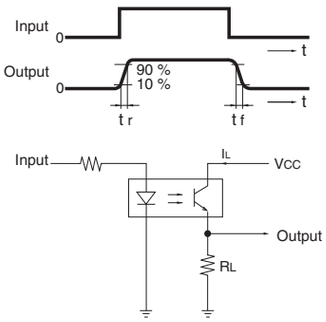
Sensing Angle Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit

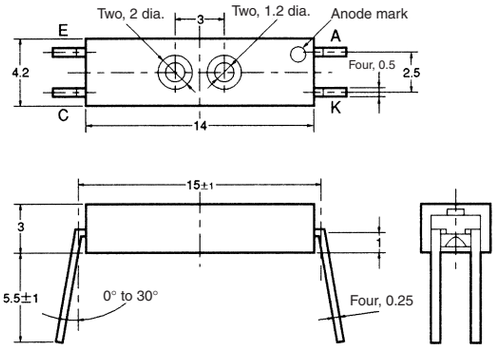


OMRON

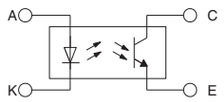
Photomicrosensor (Reflective)
EE-SY171

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- 3-mm-tall, thin model
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–40°C to 85°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (reflective)	**EE-SY171**

■ Electrical and Optical Characteristics (Ta = 25°C)

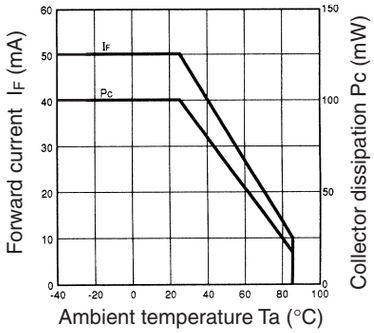
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	50 μA min., 500 μA max.	I_F = 20 mA, V_{CE} = 10 V White paper with a reflection ratio of 90%, d = 3.5 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 10 V with no reflection
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	---	---
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

Note: The letter “d” indicates the distance between the top surface of the sensor and the sensing object.

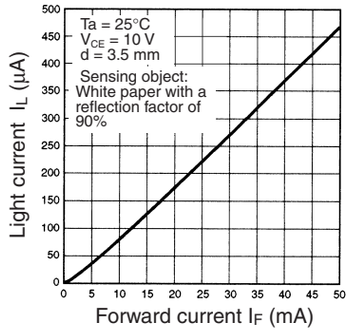
OMRON

■ Engineering Data

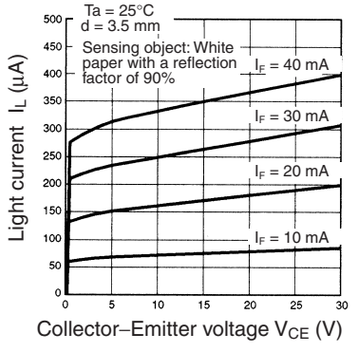
Forward Current vs. Collector Dissipation Temperature Rating



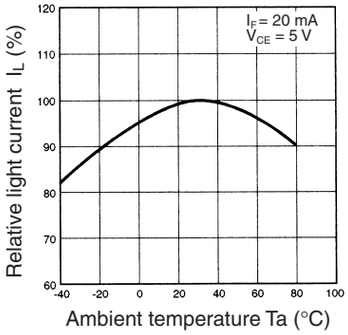
Light Current vs. Forward Current Characteristics (Typical)



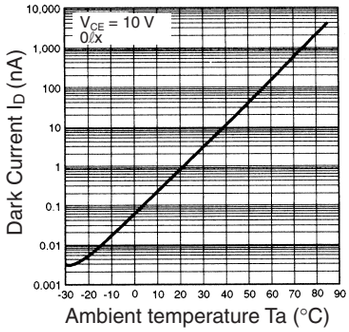
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



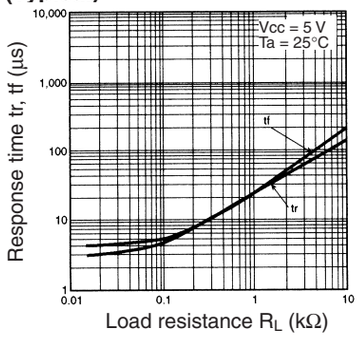
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



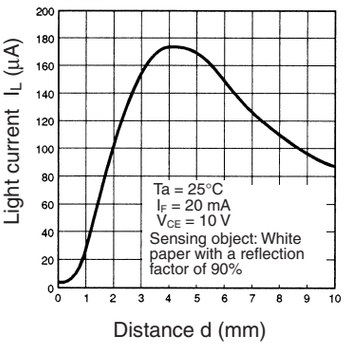
Dark Current vs. Ambient Temperature Characteristics (Typical)



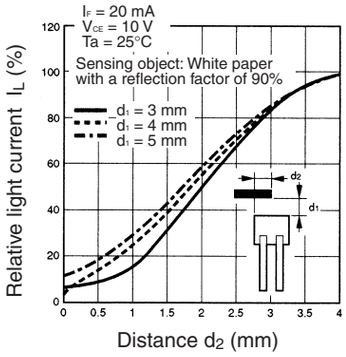
Response Time vs. Load Resistance Characteristics (Typical)



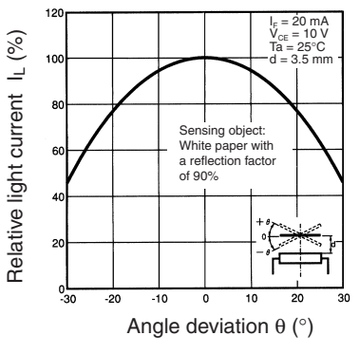
Sensing Distance Characteristics (Typical)



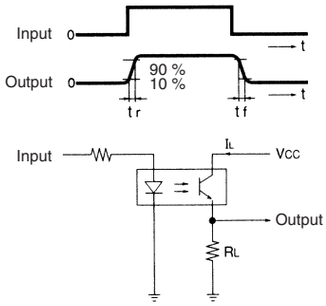
Sensing Position Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit

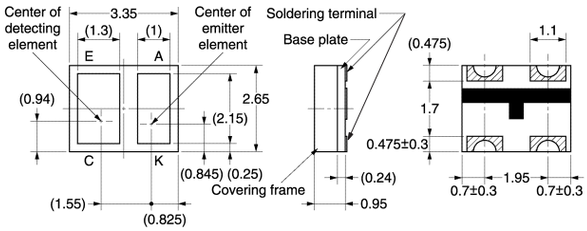


OMRON

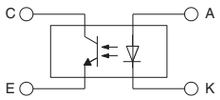
Photomicrosensor (Reflective)
EE-SY193

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

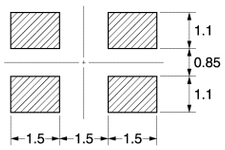


Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Recommended soldering patterns



Unless otherwise specified, the tolerances are ±0.2 mm.

■ Features

- Ultra-compact model.
- PCB surface mounting type.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	25 mA (see note 1)
	Pulse forward current	I_{FP}	100 mA (see note 2)
	Reverse voltage	V_R	6 V
Detector	Collector–Emitter voltage	V_{CEO}	18 V
	Emitter–Collector voltage	V_{ECO}	4 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–30°C to 80°C
	Storage	T_{stg}	–40°C to 85°C
	Reflow soldering	T_{sol}	220°C (see note 3)
	Manual soldering	T_{sol}	300°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Duty: 1/100; Pulse width: 0.1 ms
3. Complete soldering within 10 seconds for reflow soldering and within 3 seconds for manual soldering.

■ Ordering Information

Description	Model
Photomicrosensor (reflective)	**EE-SY193**

■ Electrical and Optical Characteristics (Ta = 25°C)

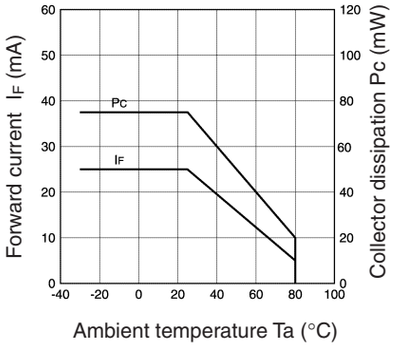
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.1 V typ., 1.3 V max.	I_F = 4 mA
	Reverse current	I_R	10 μA max.	V_R = 6 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	100 μA min., 150 μA typ., 360 μA max.	Aluminum-deposited surface, I_F = 4 mA, V_{CE} = 2 V, d = 1 mm (see note)
	Dark current	I_D	100 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	1 μA max.	I_F = 4 mA, V_{CE} = 2 V
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	---	---
	Peak spectral sensitivity wavelength	λ_P	900 nm typ.	---
Rising time		tr	25 μs typ.	V_{CC} = 2 V, R_L = 1 kΩ,
Falling time		tf	30 μs typ.	V_{CC} = 2 V, R_L = 1 kΩ,

Note: The letter “d” indicates the distance between the top surface of the sensor and the sensing object.

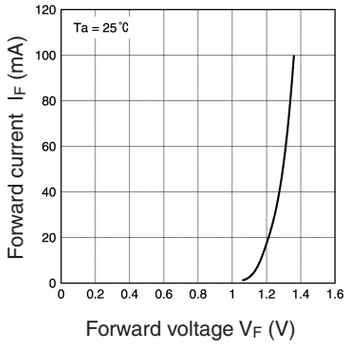
OMRON

■ Engineering Data

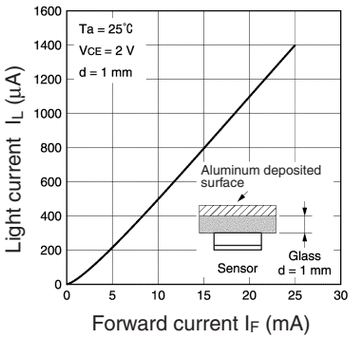
Forward Current vs. Collector Dissipation Temperature Rating



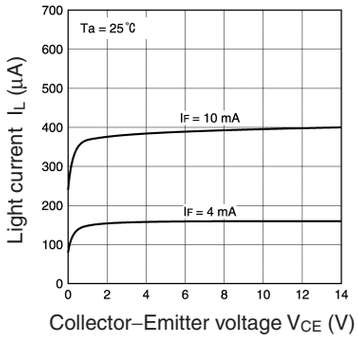
Forward Current vs. Forward Voltage Characteristics (Typical)



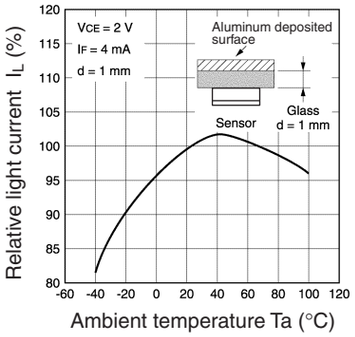
Light Current vs. Forward Current Characteristics (Typical)



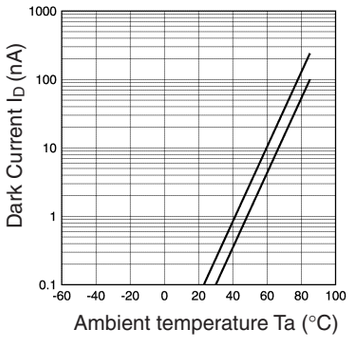
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



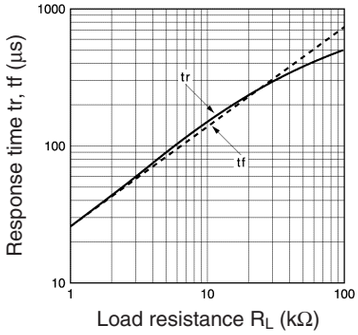
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



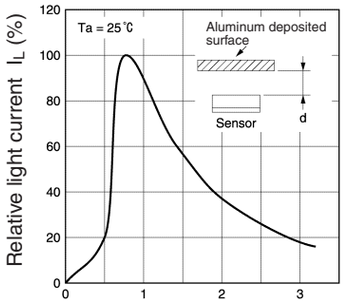
Dark Current vs. Ambient Temperature Characteristics (Typical)



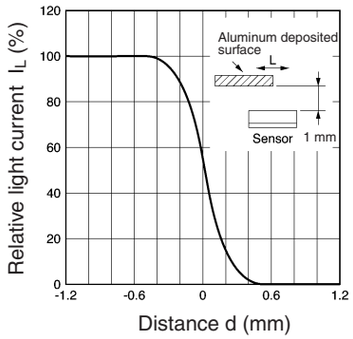
Response Time vs. Load Resistance Characteristics (Typical)



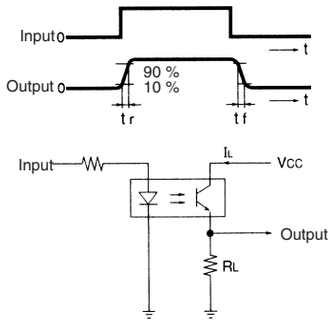
Sensing Distance Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



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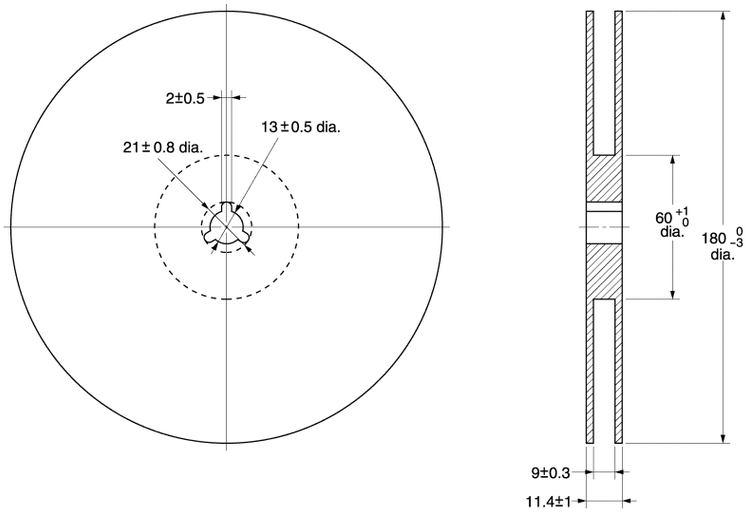
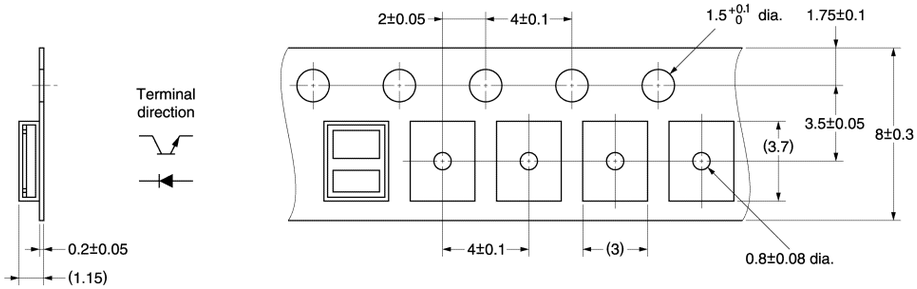
Unit: mm (inch)

■ Tape and Reel

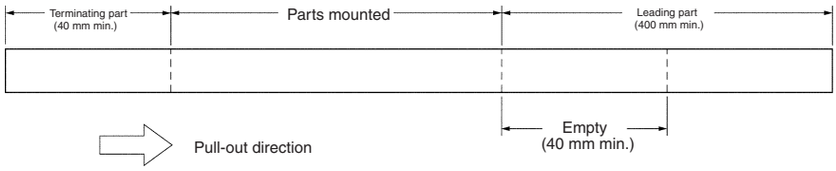
Reel



Tape



Tape configuration



Tape quantity

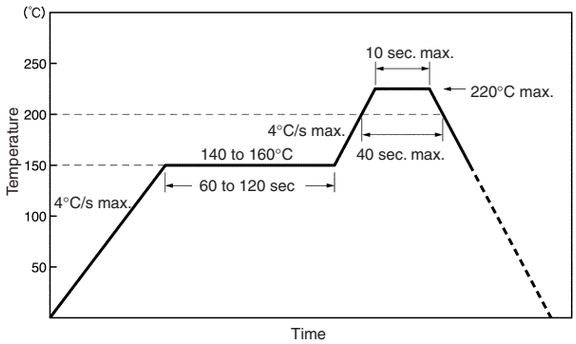
3,000 pcs./reel

Precautions

■ Soldering Information

Reflow soldering

- The following soldering paste is recommended:
  Melting temperature: 178 to 192°C
- The recommended thickness of the metal mask for screen printing is between 0.2 and 0.25 mm.
- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



Manual soldering

- Use “Sn 60” (60% tin and 40% lead) or solder with silver content.
- Use a soldering iron of less than 25 W, and keep the temperature of the iron tip at 300°C or below.
- Solder each point for a maximum of three seconds.
- After soldering, allow the product to return to room temperature before handling it.

Storage

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended. If this is not possible, store the product under the following conditions:

Temperature: 10 to 30°C
Humidity: 60% max.

The product is packed in a humidity-proof envelope. Reflow soldering must be done within 48 hours after opening the envelope, during which time the product must be stored under 30°C at 80% maximum humidity.

If it is necessary to store the product after opening the envelope, use dry-box storage or reseal the envelope.

Baking

If a product has remained packed in a humidity-proof envelope for six months or more, or if more than 48 hours have lapsed since the envelope was opened, bake the product under the following conditions before use:

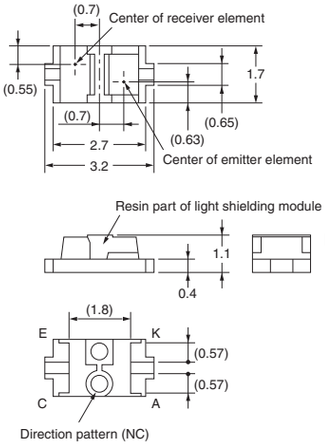
Reel:60°C for 24 hours or more
Bulk:80°C for 24 hours or more

OMRON

Photomicrosensor (Reflective)
EE-SY199

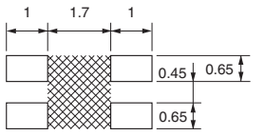
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

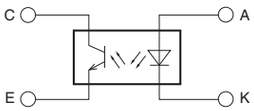
Recommended soldering pattern



Note 1. The shaded portion in the above figure may cause shorting. Do not wire in this portion.

2. The tolerance for the recommended soldering pattern is ±0.1mm

Internal Circuit



Unless otherwise specified, the tolerances are ±0.15 mm.

■ Features

- Ultra-compact model.
- PCB surface mounting type.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Reverse voltage	V_R	6 V
Detector	Collector–Emitter voltage	V_{CEO}	35 V
	Emitter–Collector voltage	V_{ECO}	6 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Total Allowable Loss		P_{TOT}	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–40°C to 100°C
	Max. Reflow soldering	T_{sol}	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

2. Complete soldering within 5 seconds. For reflow soldering, use the conditions given in the Precautions section of this datasheet.

■ Ordering Information

Description	Model
Photomicrosensor (reflective)	**EE-SY199**

■ Electrical and Optical Characteristics (Ta = 25°C)

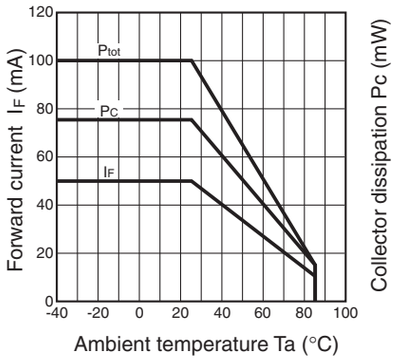
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.4 V max.	I_F = 20 mA
	Reverse current	I_R	10 μA max.	V_R = 6 V
	Peak emission wavelength	λ_P	950 nm typ.	---
Detector	Light current	I_L	40 μA min., 85 μA typ., 130 μA max.	Aluminum-deposited surface, I_F = 4 mA, V_{CE} = 2 V, d = 1 mm (see note)
	Dark current	I_D	1 nA typ., 100 nA max.	V_{CE} = 20 V, 0 ℓx
	Leakage current	I_{LEAK}	500 nA max.	I_F = 4 mA, V_{CE} = 2 V, with no reflection
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	---	---
	Peak spectral sensitivity wavelength	λ_P	930 nm typ.	---
Rising time		tr	20 μs typ., 100 μs max.	V_{CC} = 2 V, R_L = 1 kΩ, I_L = 100 μA, d = 1 mm (see note)
Falling time		tf	20 μs typ., 100 μs max.	V_{CC} = 2 V, R_L = 1 kΩ, I_L = 100 μA, d = 1 mm (see note)

Note: Refer to the “Light Current Measurement Setup Diagram” in the Engineering Data section of this datasheet, regarding distance “d”.

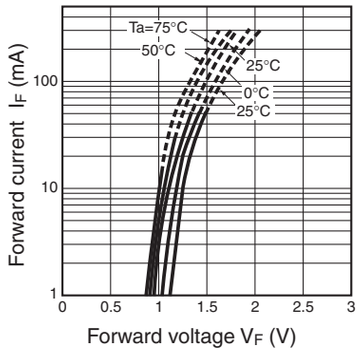
OMRON

■ Engineering Data

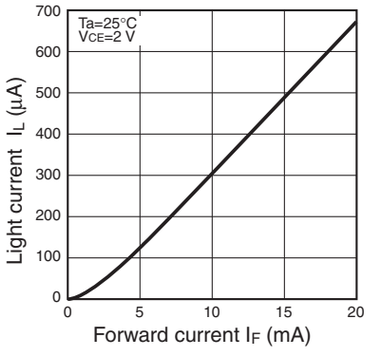
Forward Current vs. Collector Dissipation Temperature Rating



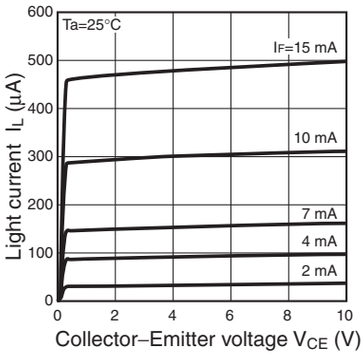
Forward Current vs. Forward Voltage Characteristics (Typical)



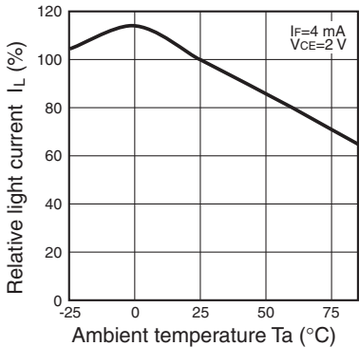
Light Current vs. Forward Current Characteristics (Typical)



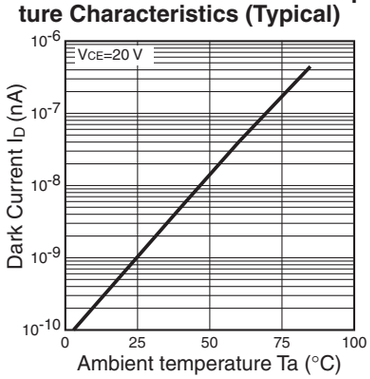
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



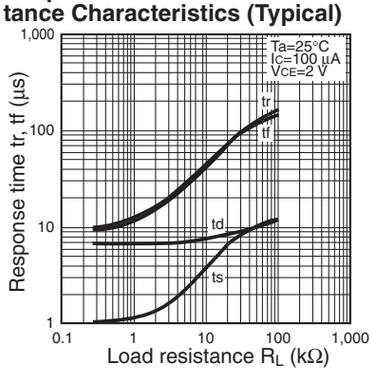
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



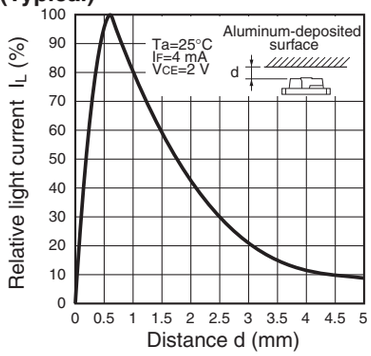
Dark Current vs. Ambient Temperature Characteristics (Typical)



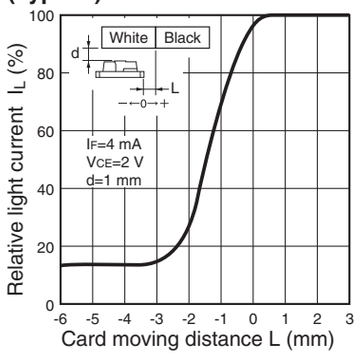
Response Time vs. Load Resistance Characteristics (Typical)



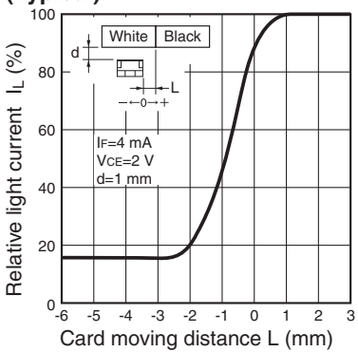
Sensing Distance Characteristics (Typical)



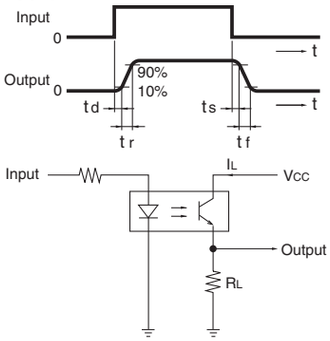
Sensing Position Characteristics (Typical)



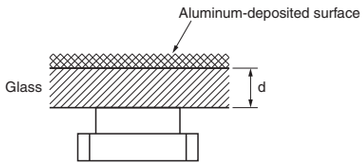
Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Light Current Measurement Setup Diagram



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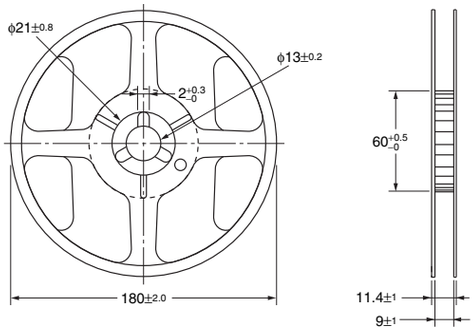
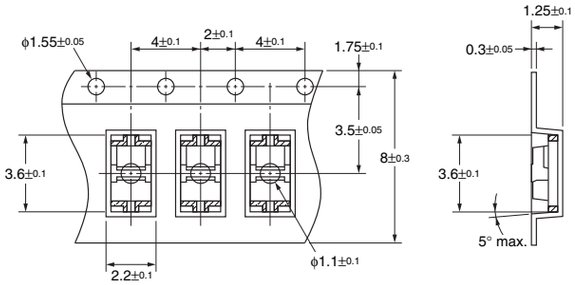
Unit: mm (inch)

■ Tape and Reel

Reel

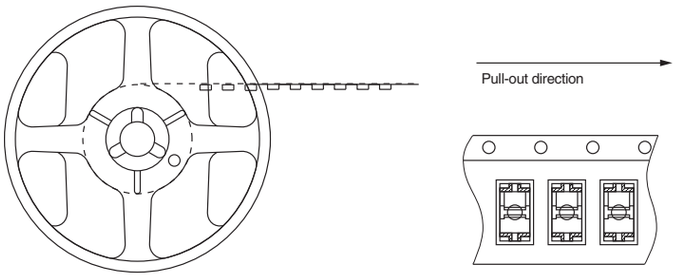


Tape



Tape configuration

The devices are oriented in the tape carrier so that the emitters are positioned closest to the carrier holes.



Tape quantity / packaging

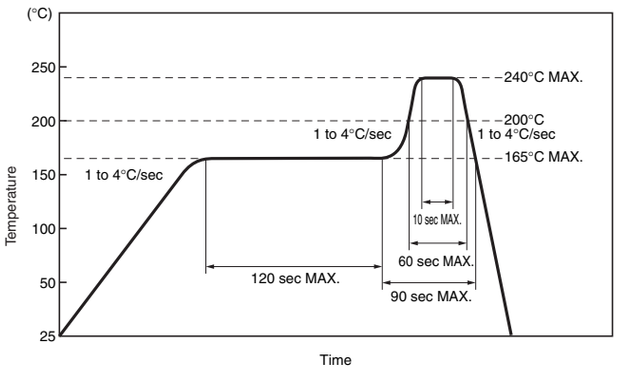
2,000 pcs./reel, with one reel sealed in an aluminum-laminated bag.

Precautions

■ Soldering Information

Reflow soldering

- Reflow no more than once.
- Adjust the amount of applied solder quantity to the product sidewall of the terminal
- When designing the pcb, avoid placing traces or other connections under the sensor, as shown in the 'Recommend Solder Pattern' diagram
- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



- Do not immerse the resin part of the sensor into the solder.
- The use of an infrared lamp can cause the temperature of the resin to rise too high. Test the soldering method under actual conditions and make sure that the process is acceptable, because the impact on the junction between the device and the PCB varies depending upon the soldering and cooling conditions.

Storage

Store the product under the following conditions:

Temperature: 5 to 30°C
Humidity: 70% max.

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended.

Reflow soldering must be done within 48 hours after opening the aluminum-laminated bag, during which time the product must be stored between 5°C and 25°C at 60% maximum humidity.

If it is necessary to store the product for more than 48 hours after opening the bag, use dry-box storage or reseal the products in the aluminum-laminated bag with a commercially available desiccant. Then, store the sensors between 5 to 30°C at 70% max. humidity, mounting them within 2 weeks.

Baking

If a product has remained packed in the aluminum-laminated bag for six months or more, or if more than 48 hours have lapsed since the bag was opened, then bake the product under the following conditions before use:

125°C for 16 to 24 hours (max.)

Note: Do not bake the sensors while they are still in their bag. Temporarily mount them to the PCB or place them in metal trays prior to baking. Subject the sensors to the baking process no more than once.

Cleaning Conditions

Recommended Solvents	Ethyl alcohol, methyl alcohol, or isopropyl alcohol
Solvent Temperature	45°C max
Immersion Time	3 hours max

Do not use ultrasonic cleaning.

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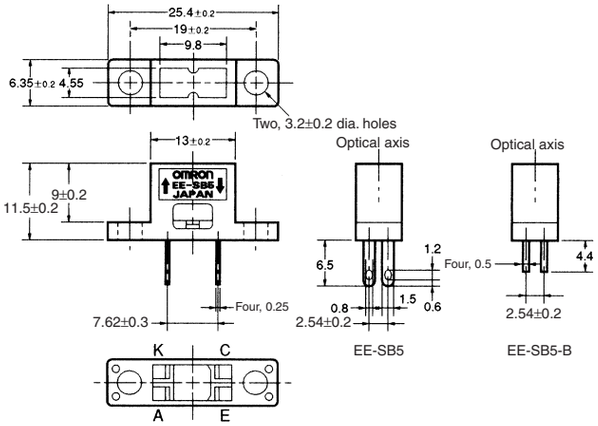
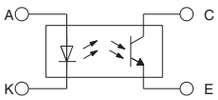
Photomicrosensor (Reflective)
EE-SB5(-B)

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Dust-tight construction.
- With a visible-light intercepting filter which allows objects to be sensed without being greatly influenced by the light radiated from fluorescent lamps.
- Mounted with M3 screws.
- Model with soldering terminals (EE-SB5).
- Model with PCB terminals (EE-SB5-B).
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 80°C
	Storage	T_{stg}	–30°C to 80°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (reflective) with soldering terminals	**EE-SB5**
Photomicrosensor (reflective) with PCB terminals	**EE-SB5-B**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	200 μA min., 2,000 μA max.	I_F = 20 mA, V_{CE} = 10 V White paper with a reflection ratio of 90%, d = 5 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 10 V with no reflection
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	---	---
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

Note: The letter "d" indicates the distance between the top surface of the sensor and the sensing object.

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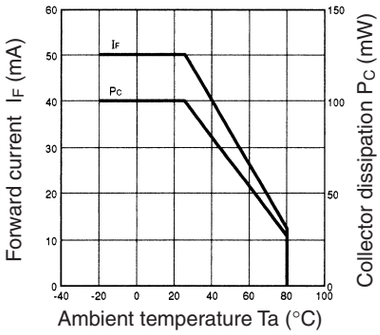
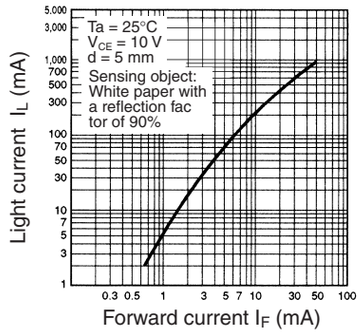
■ Engineering Data

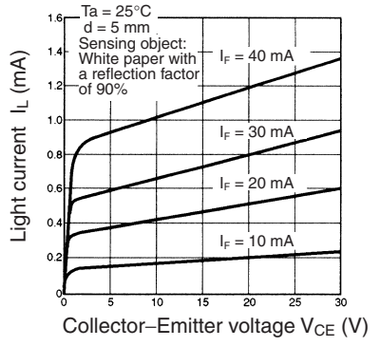
Forward Current vs. Collector Dissipation Temperature Rating



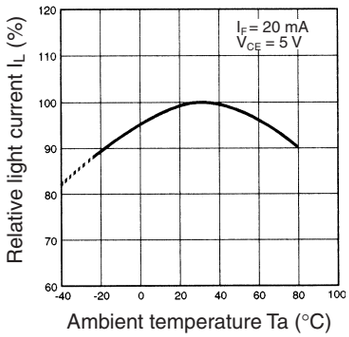
Light Current vs. Forward Current Characteristics (Typical)



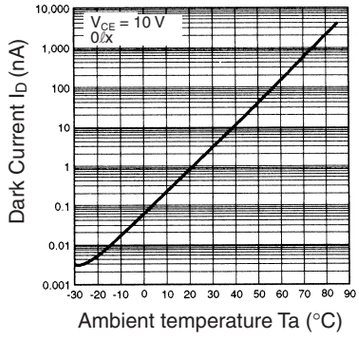
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



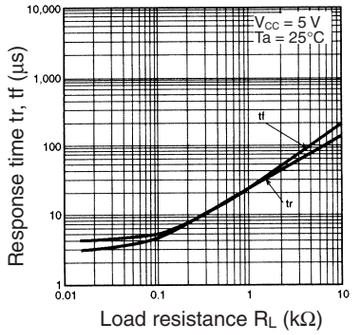
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



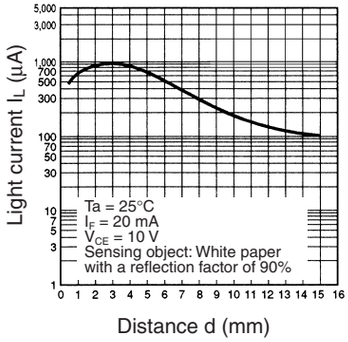
Dark Current vs. Ambient Temperature Characteristics (Typical)



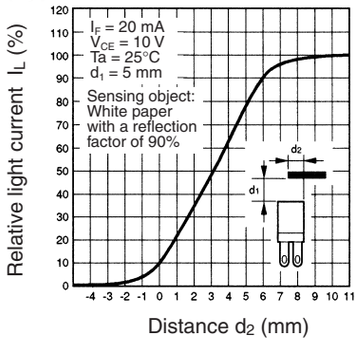
Response Time vs. Load Resistance Characteristics (Typical)



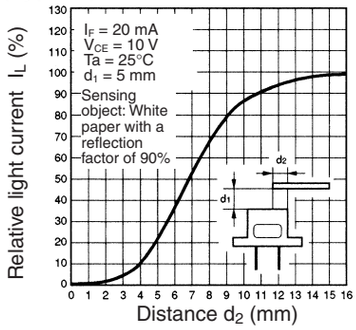
Sensing Distance Characteristics (Typical)



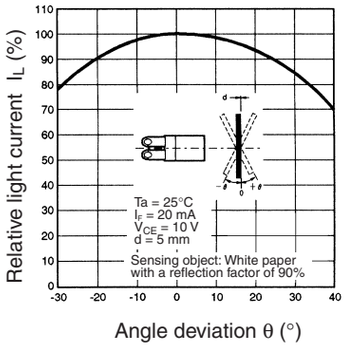
Sensing Position Characteristics (Typical)



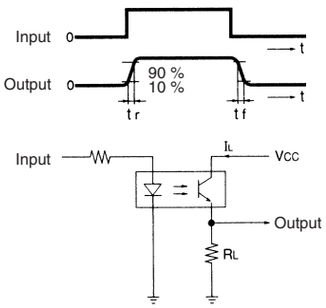
Sensing Position Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit



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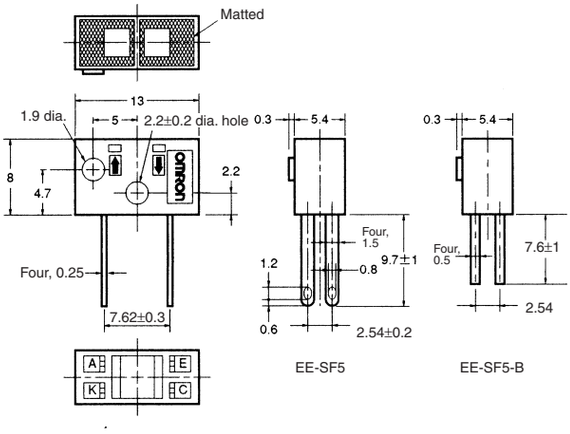
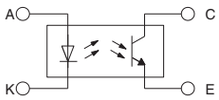
Photomicrosensor (Reflective)
EE-SF5(-B)

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Dust-tight construction.
- With a visible-light intercepting filter which allows objects to be sensed without being greatly influenced by the light radiated from fluorescent lamps.
- Mounted with M2 screws.
- Model with soldering terminals (EE-SF5).
- Model with PCB terminals (EE-SF5-B).
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 80°C
	Storage	T_{stg}	–30°C to 80°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (reflective) with soldering terminals	**EE-SF5**
Photomicrosensor (reflective) with PCB terminals	**EE-SF5-B**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	200 μA min., 2,000 μA max.	I_F = 20 mA, V_{CE} = 10 V White paper with a reflection ratio of 90%, d = 5 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 10 V with no reflection
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	---	---
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

Note: The letter “d” indicates the distance between the top surface of the sensor and the sensing object.

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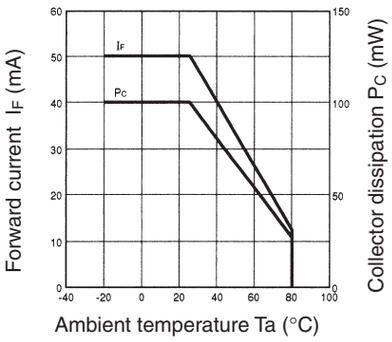
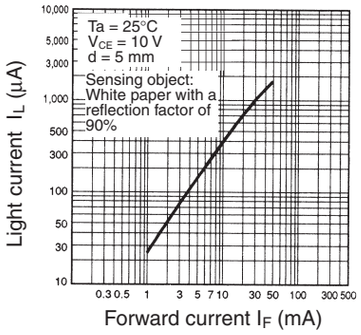
■ Engineering Data

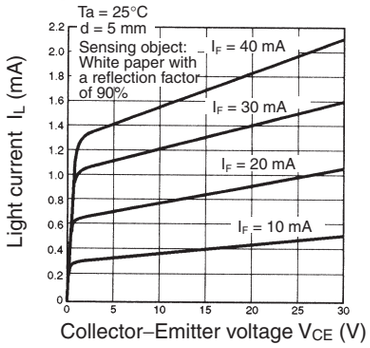
Forward Current vs. Collector Dissipation Temperature Rating



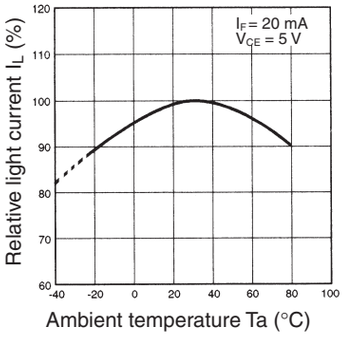
Light Current vs. Forward Current Characteristics (Typical)



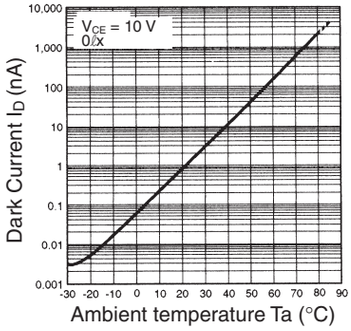
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



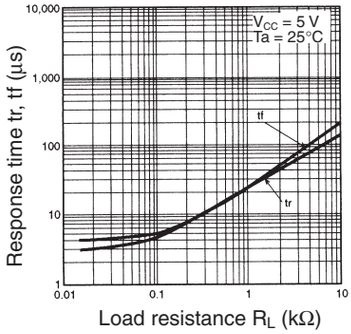
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



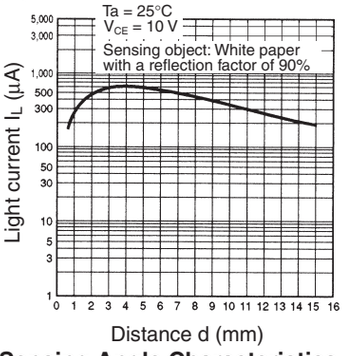
Dark Current vs. Ambient Temperature Characteristics (Typical)



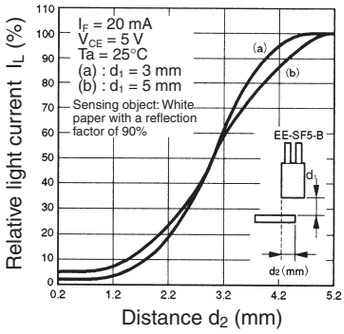
Response Time vs. Load Resistance Characteristics (Typical)



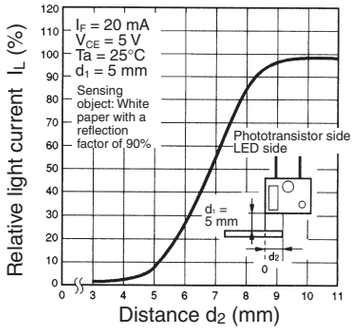
Sensing Distance Characteristics (Typical)



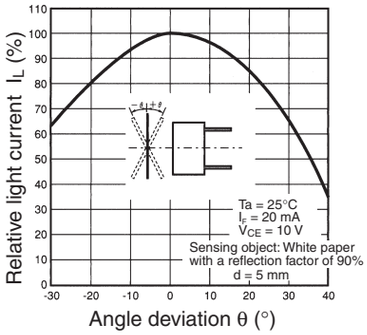
Sensing Position Characteristics (Typical)



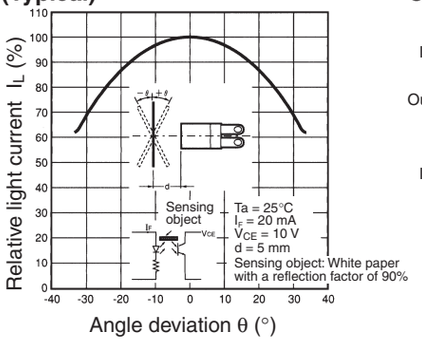
Sensing Position Characteristics (Typical)



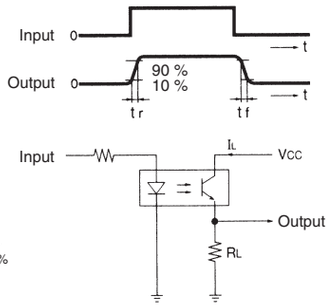
Sensing Angle Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit

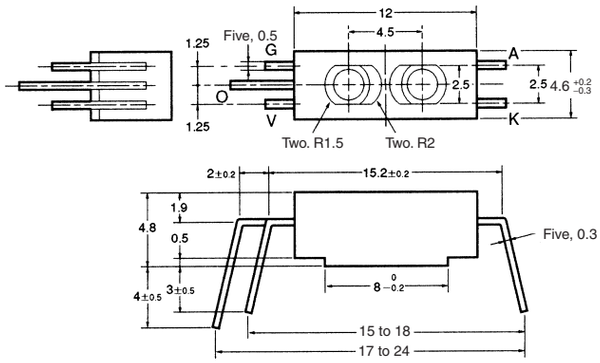


OMRON

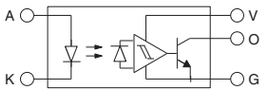
Photomicrosensor (Reflective)
EE-SY310/-SY410

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

■ Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with a built-in temperature compensation circuit.
- Compact reflective model with a molded housing.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- Dark ON model (EE-SY310) and Light ON model (EE-SY410)
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Reverse voltage	V_R	4 V
	Pulse forward current	I_{FP}	1 A (see note 2)
Detector	Power supply voltage	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–40°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description		Model
Photomicrosensor (reflective)	Dark ON	**EE-SY310**
	Light ON	**EE-SY410**

■ Electrical and Optical Characteristics (Ta = 25°C)

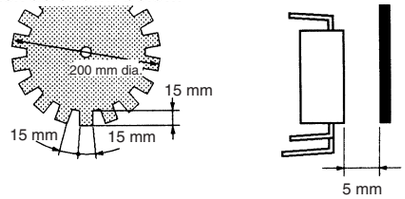
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	920 nm typ.	I_F = 20 mA
Detector	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, without incident light (EE-SY310), with incident light (EE-SY410) (see notes 1 and 2)
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, with incident light (EE-SY310), without incident light (EE-SY410) (see notes 1 and 2)
	Current consumption	I_{CC}	3.2 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	6 mA typ., 15 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		ΔH	17% typ.	V_{CC} = 4.5 to 16 V
Response frequency		f	50 Hz min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA

Note: 1. With incident light" denotes the condition whereby the light reflected by white paper with a reflection factor of 90% at a sensing distance of 5 mm is received by the photo IC when the forward current (I_F) of the LED is 20 mA.

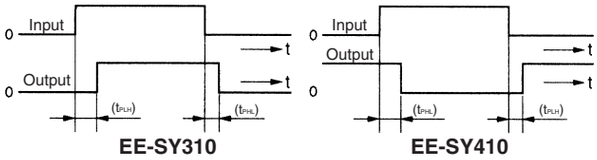
2. Sensing object: White paper with a reflection factor of 90% at a sensing distance of 5 mm.

3. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC is turned from ON to OFF and when the photo IC is turned from OFF to ON.

4. The value of the response frequency is measured by rotating the disk as shown below.



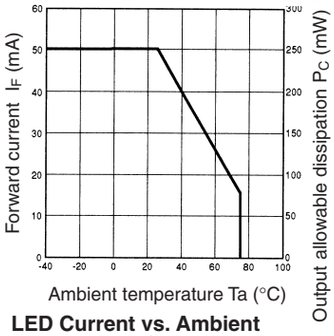
5. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EE-SY410.



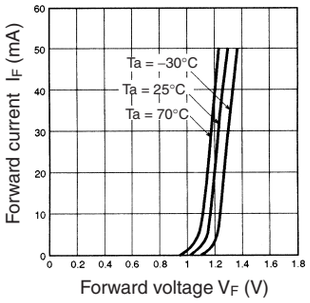
■ Engineering Data

Note: The values in the parentheses apply to the EE-SY410.

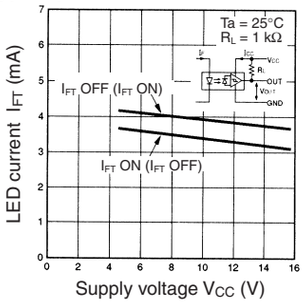
Forward Current vs. Collector Dissipation Temperature Rating



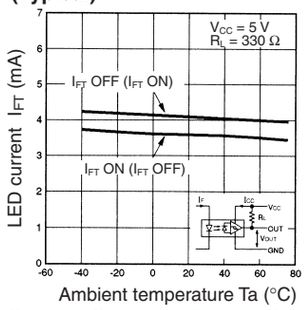
Forward Current vs. Forward Voltage Characteristics (Typical)



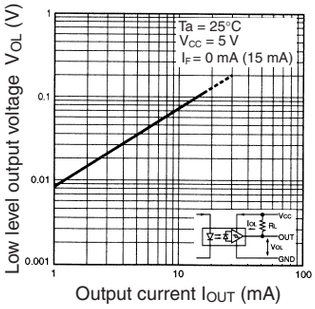
LED Current vs. Supply Voltage (Typical)



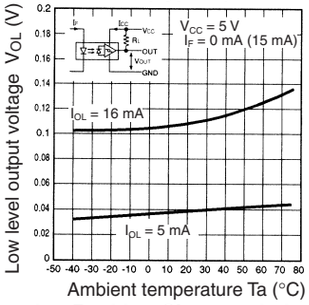
LED Current vs. Ambient Temperature Characteristics (Typical)



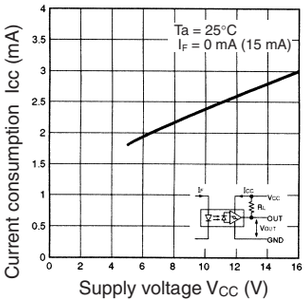
Low-level Output Voltage vs. Output Current (Typical)



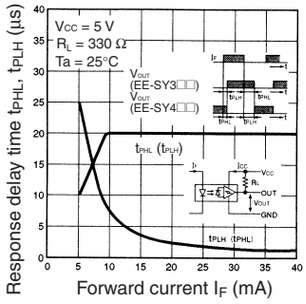
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



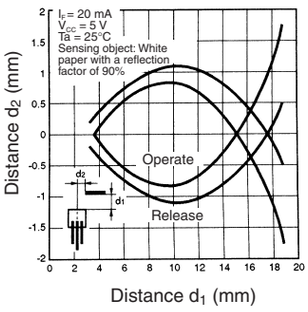
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Sensing Position Characteristics (Typical)

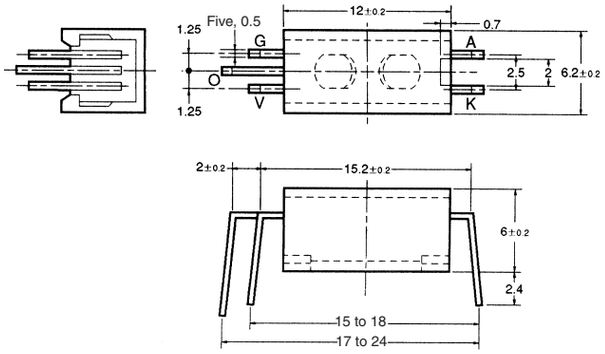


OMRON

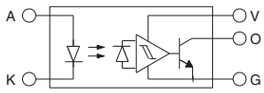
Photomicrosensor (Reflective)
EE-SY313/-SY413

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with a built-in temperature compensation circuit.
- Compact reflective Photomicrosensor (EE-SY310/-SY410) with a molded housing and a dust-tight cover.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- Dark ON model (EE-SY313) and Light ON model (EE-SY413)
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Reverse voltage	V_R	4 V
	Pulse forward current	I_{FP}	1 A (see note 2)
Detector	Power supply voltage	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–40°C to 65°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description		Model
Photomicrosensor (reflective)	Dark ON	**EE-SY313**
	Light ON	**EE-SY413**

■ Electrical and Optical Characteristics (Ta = 25°C)

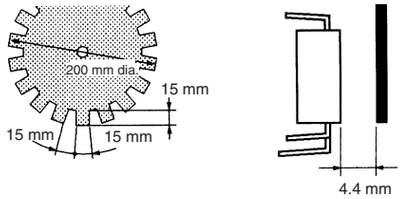
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	920 nm typ.	I_F = 20 mA
Detector	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, without incident light (EE-SY313), with incident light (EE-SY413) (see notes 1 and 2)
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, with incident light (EE-SY313), without incident light (EE-SY413) (see notes 1 and 2)
	Current consumption	I_{CC}	3.2 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	10 mA typ., 20 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		ΔH	17% typ.	V_{CC} = 4.5 to 16 V
Response frequency		f	50 pps min.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA

Note: 1. With incident light" denotes the condition whereby the light reflected by white paper with a reflection factor of 90% at a sensing distance of 4.4 mm is received by the photo IC when the forward current (I_F) of the LED is 20 mA.

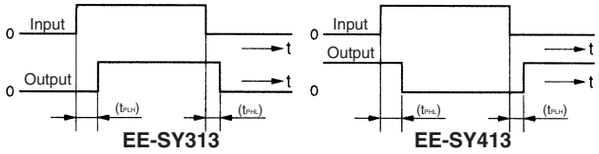
2. Sensing object: White paper with a reflection factor of 90% at a sensing distance of 4.4 mm.

3. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC is turned from ON to OFF and when the photo IC is turned from OFF to ON.

4. The value of the response frequency is measured by rotating the disk as shown below.



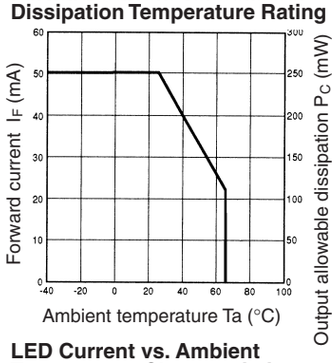
5. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EE-SY413.



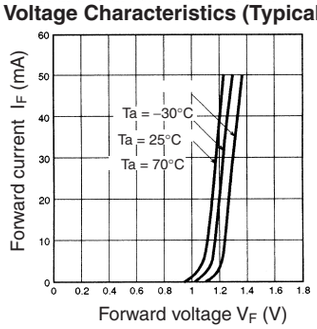
■ Engineering Data

Note: The values in the parentheses apply to the EE-SY413.

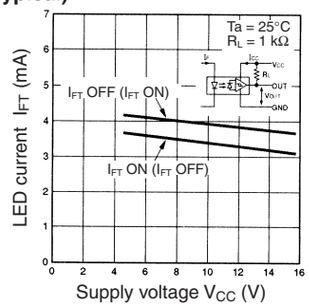
Forward Current vs. Collector Dissipation Temperature Rating



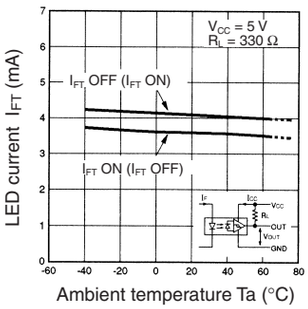
Forward Current vs. Forward Voltage Characteristics (Typical)



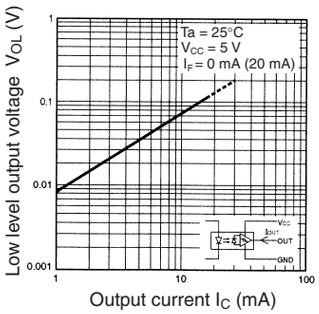
LED Current vs. Supply Voltage (Typical)



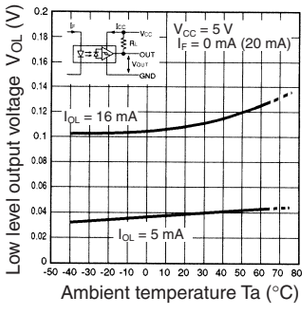
LED Current vs. Ambient Temperature Characteristics (Typical)



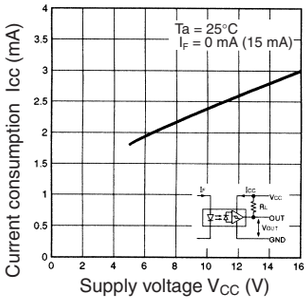
Low-level Output Voltage vs. Output Current (Typical)



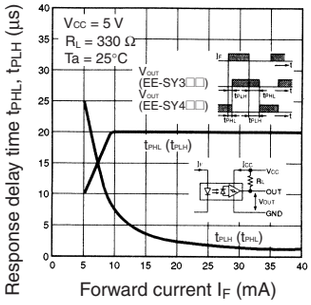
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



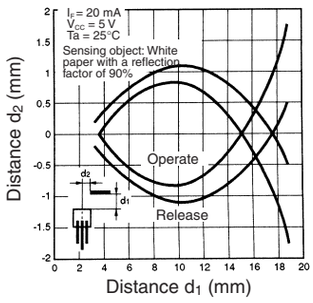
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Sensing Position Characteristics (Typical)

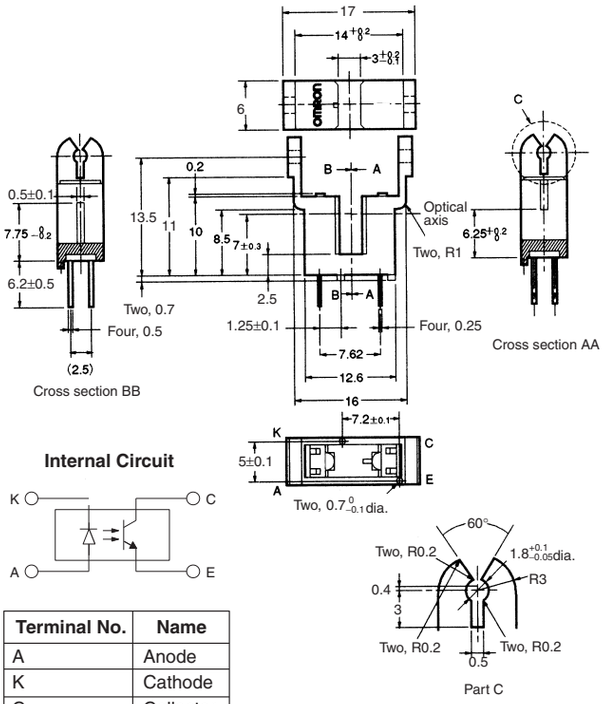


OMRON

Photomicrosensor (Actuator Mounted)
EE-SA102

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are ±0.2 mm.

■ Features

- An actuator can be attached.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (actuator mounted)	**EE-SA102**

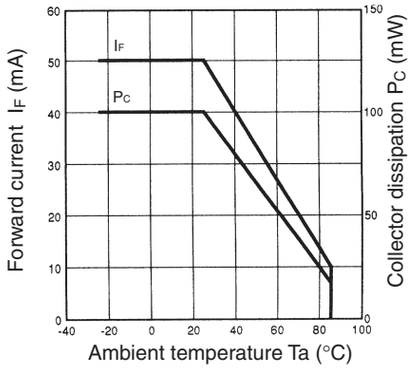
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

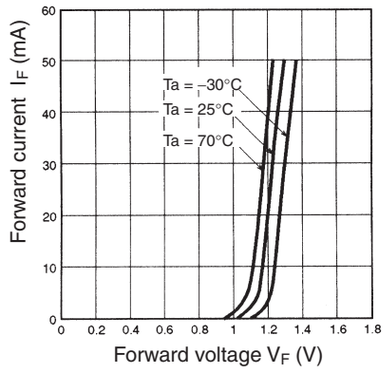
OMRON

■ Engineering Data

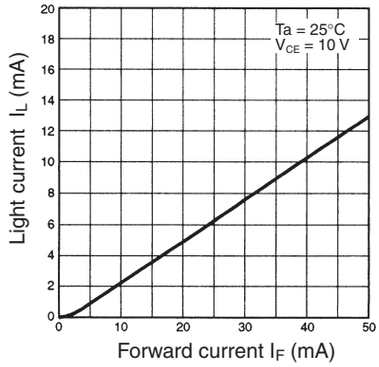
Forward Current vs. Collector Dissipation Temperature Rating



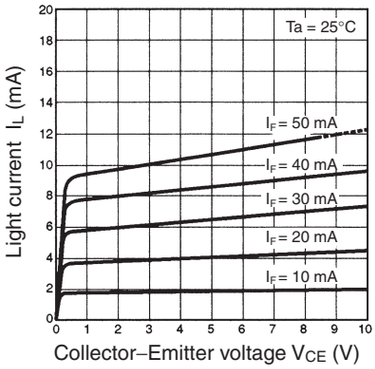
Forward Current vs. Forward Voltage Characteristics (Typical)



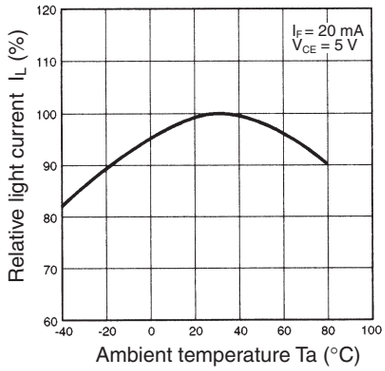
Light Current vs. Forward Current Characteristics (Typical)



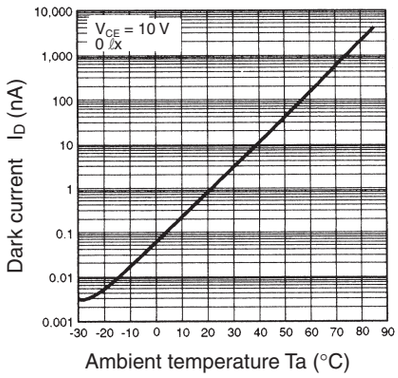
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



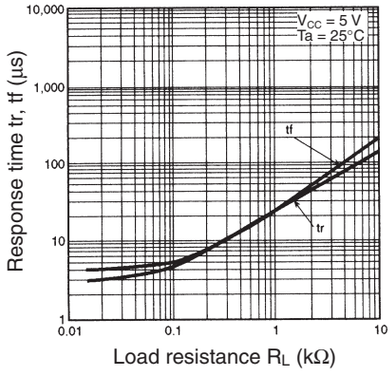
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



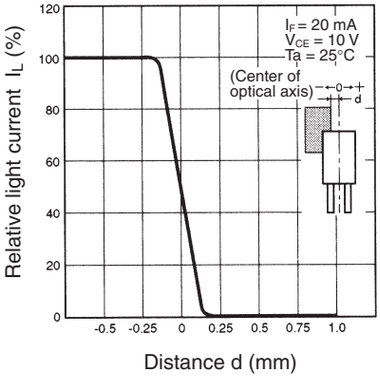
Dark Current vs. Ambient Temperature Characteristics (Typical)



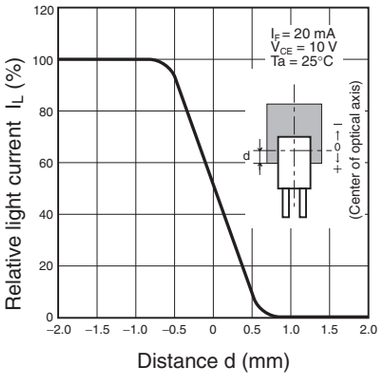
Response Time vs. Load Resistance Characteristics (Typical)



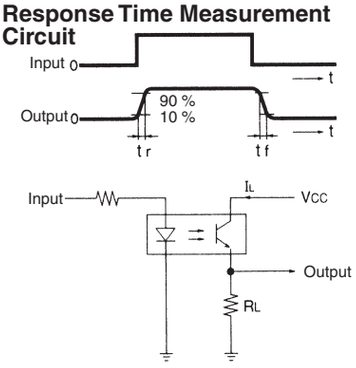
Sensing Position Characteristics (Typical)



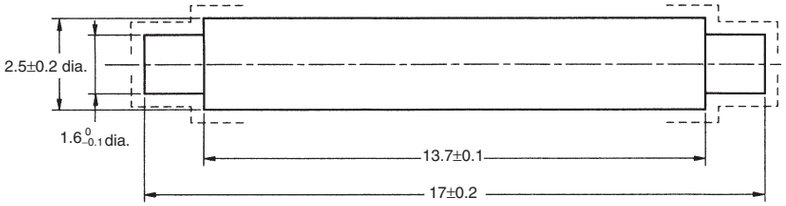
Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Actuator Dimensions



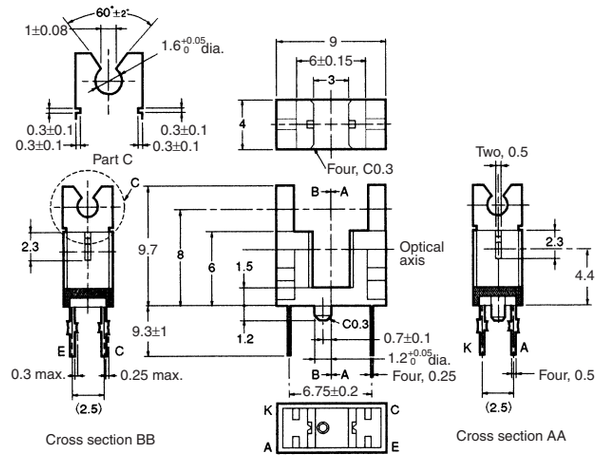
Note: 1. Make sure that the portions marked with dotted lines have no burrs.
2. The material of the actuator must be selected by considering the infrared permeability of the actuator.

OMRON

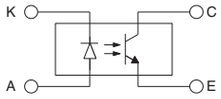
Photomicrosensor (Actuator Mounted)
EE-SA104

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- An actuator can be attached.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
Detector	Collector–Emitter voltage	V_{CEO}	30 V
	Emitter–Collector voltage	V_{ECO}	---
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 85°C
	Storage	T_{stg}	–30°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (actuator mounted)	**EE-SA104**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

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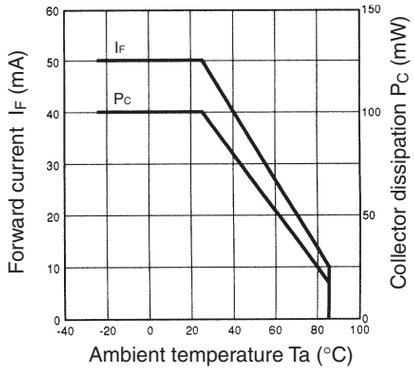
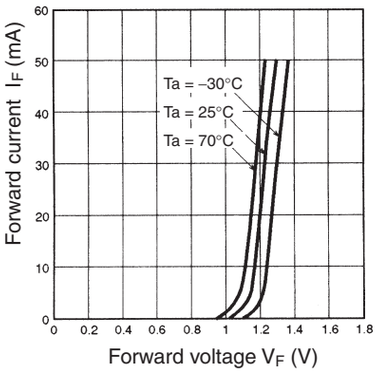
■ Engineering Data

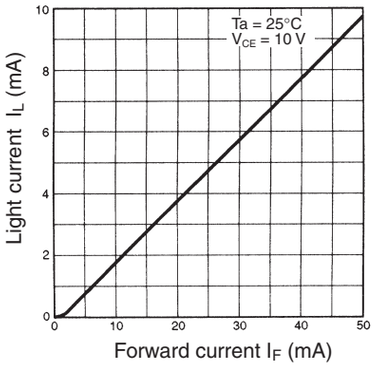
Forward Current vs. Collector Dissipation Temperature Rating



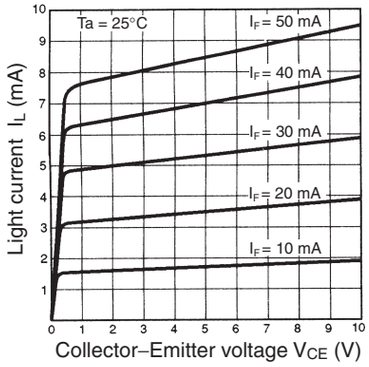
Forward Current vs. Forward Voltage Characteristics (Typical)



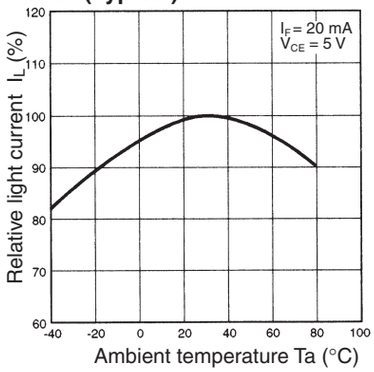
Light Current vs. Forward Current Characteristics (Typical)



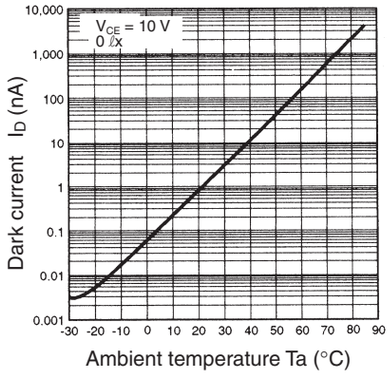
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



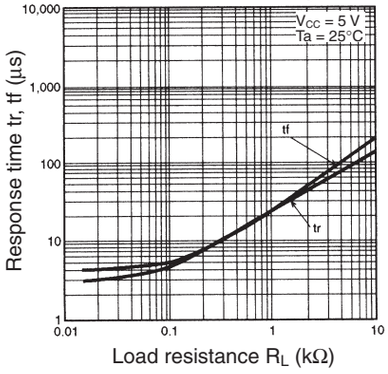
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



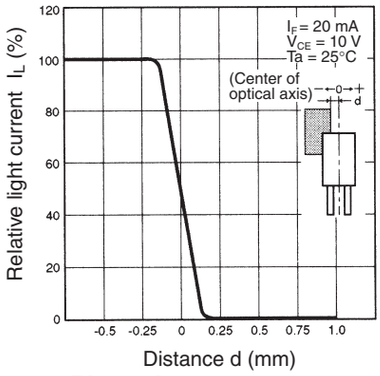
Dark Current vs. Ambient Temperature Characteristics (Typical)



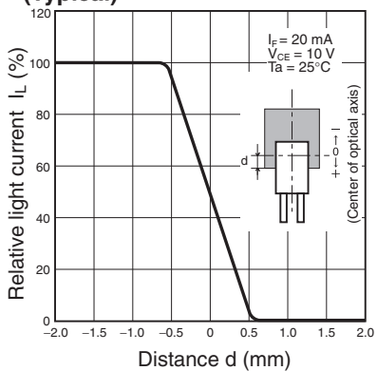
Response Time vs. Load Resistance Characteristics (Typical)



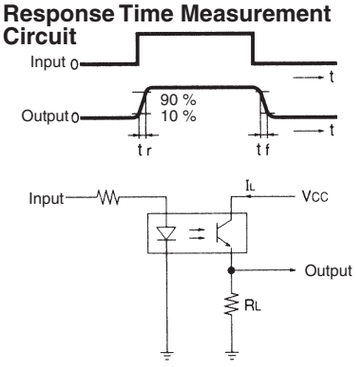
Sensing Position Characteristics (Typical)



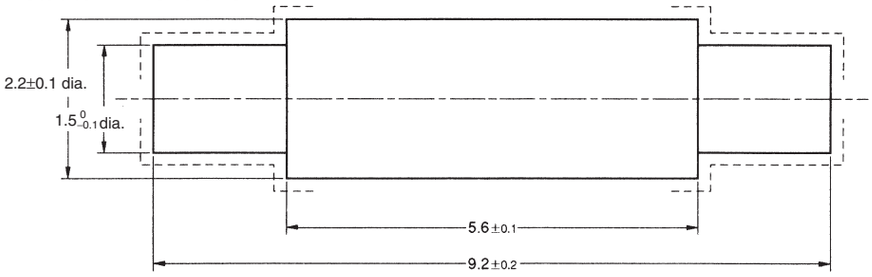
Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Actuator Dimensions



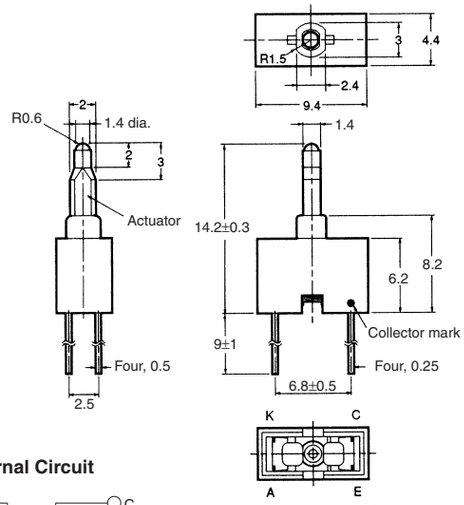
Note: 1. Make sure that the portions marked with dotted lines have no burrs.
2. The material of the actuator must be selected by considering the infrared permeability of the actuator.

OMRON

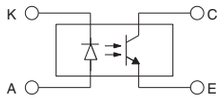
Photomicrosensor (Actuator)
EE-SA105

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Model has an actuator and low operating force (0.15 N (15 gf)).
- Connects to circuits with ease.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
	Collector–Emitter voltage	V_{CEO}	30 V
Detector	Emitter–Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 70°C
	Storage	T_{stg}	–40°C to 100°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (actuator)	**EE-SA105**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min.	I_F = 20 mA, V_{CE} = 5 V at free position (FP)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	10 μA max.	I_F = 20 mA, V_{CE} = 5 V at operating position (OP)
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.15 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	---	---
Falling time		tf	---	---

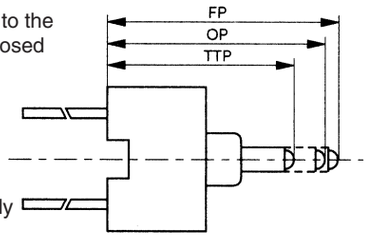
■ Mechanical Characteristics

Actuator operation (I_F = 20 mA, V_{CE} = 5 V) (see note 1)	Free position (FP): 14.2 ± 0.3 mm Operating position (OP): 13.0 mm min. Total travel position (TTP): 12.1 mm max.
Operating force (see note 2)	0.15 N (15 gf) max.
Mechanical life expectancy	500,000 operations min. (The actuator traveling from its FP to FP via TTP is regarded as one operation.)

Note: 1. Free position (FP): The distance between the bottom of the housing to the top of the actuator without any external force imposed on the actuator.

Operating position (OP): The distance between the bottom of the housing to the top of the actuator when the actuator is pressed and the I_L becomes I_{LEAK} or less.

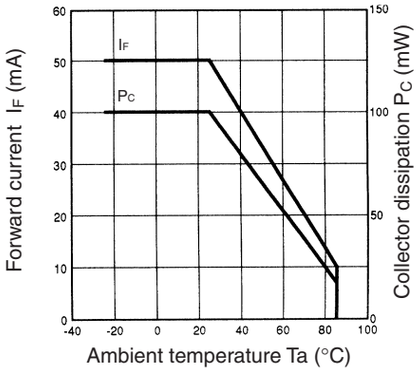
Total travel position (TTP): The distance between the bottom of the housing to the top of the actuator when the actuator is fully pressed.



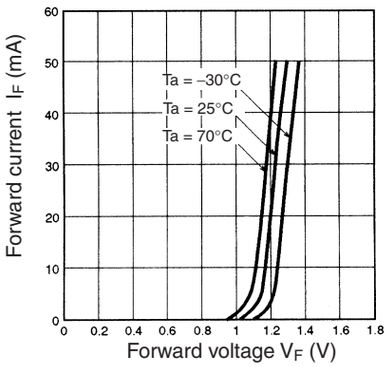
2. Operating force: The force required to press the actuator from its FP to OP.

■ Engineering Data

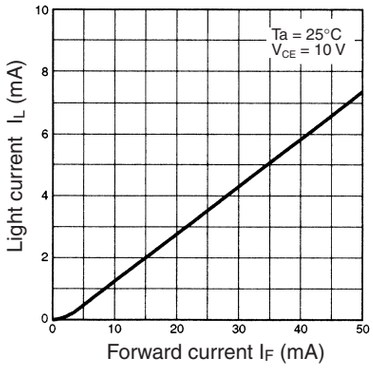
Forward Current vs. Collector Dissipation Temperature Rating



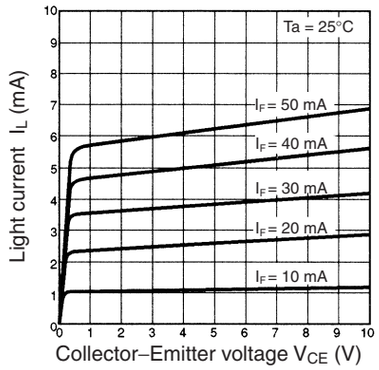
Forward Current vs. Forward Voltage Characteristics (Typical)



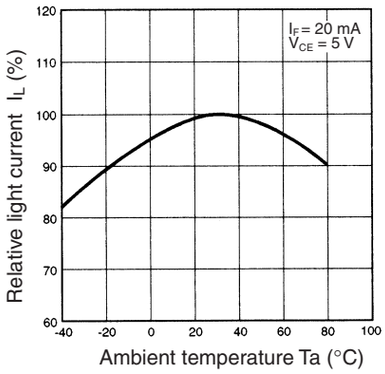
Light Current vs. Forward Current Characteristics (Typical)



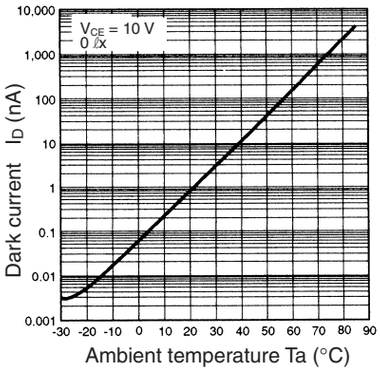
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



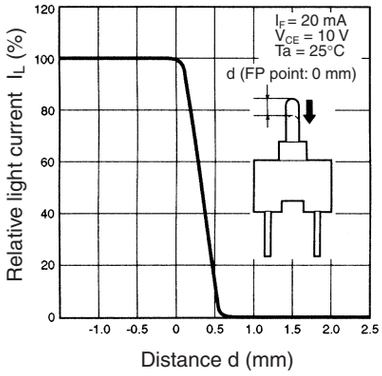
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



Dark Current vs. Ambient Temperature Characteristics (Typical)



Sensing Position Characteristics (Typical)

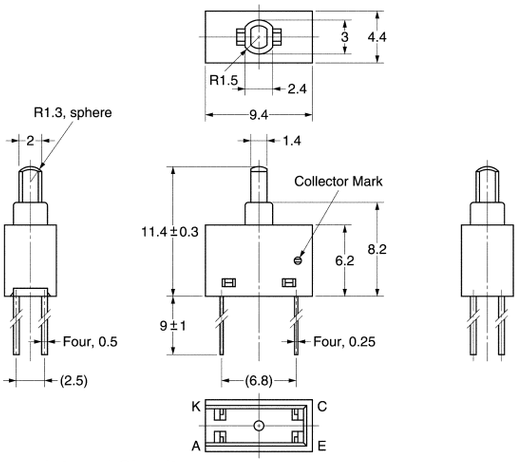


OMRON

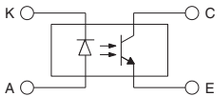
Photomicrosensor (Actuator)
EE-SA113

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Model has an actuator.
- Low operating force (0.15 N (15 gf)).
- Connects to circuits with ease.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse voltage	V_R	4 V
	Collector–Emitter voltage	V_{CEO}	30 V
Detector	Emitter–Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–25°C to 70°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ Ordering Information

Description	Model
Photomicrosensor (actuator)	**EE-SA113**

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min.	I_F = 20 mA, V_{CE} = 5 V at free position (FP)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	10 μA max.	I_F = 20 mA, V_{CE} = 5 V at operating position (OP)
	Collector–Emitter saturated voltage	$V_{CE\ (sat)}$	0.15 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	---	---
Falling time		tf	---	---

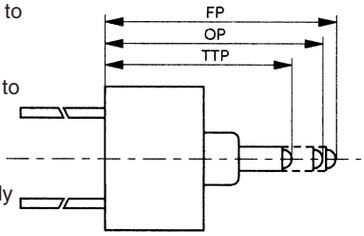
■ Mechanical Characteristics

Actuator operation (I_F = 20 mA, V_{CE} = 5 V) (see note 1)	Free position (FP): 11.4 ± 0.3 mm Operating position (OP): 10.2 mm min. Total travel position (TTP): 9.3 mm max.
Operating force (see note 2)	0.15 N (15 gf) max.
Mechanical life expectancy	500,000 operations min. (The actuator traveling from its FP to FP via TTP is regarded as one operation.)

Note: 1. Free position (FP): The distance between the bottom of the housing to the top of the actuator without any external force imposed on the actuator.

Operating position (OP): The distance between the bottom of the housing to the top of the actuator when the actuator is pressed and the I_L becomes I_{LEAK} or less.

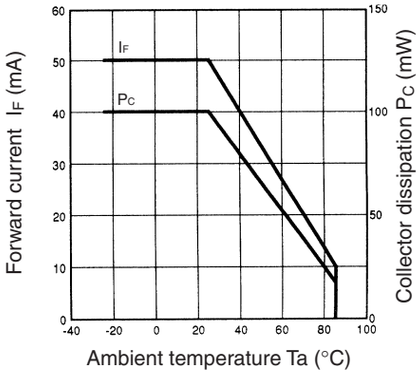
Total travel position (TTP): The distance between the bottom of the housing to the top of the actuator when the actuator is fully pressed.



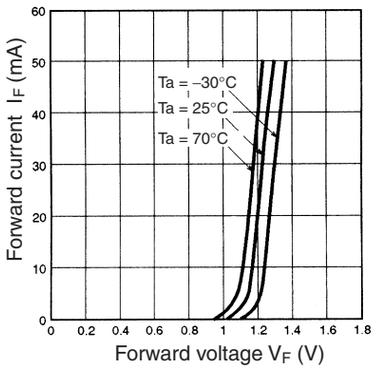
2. Operating force: The force required to press the actuator from its FP to OP.

■ Engineering Data

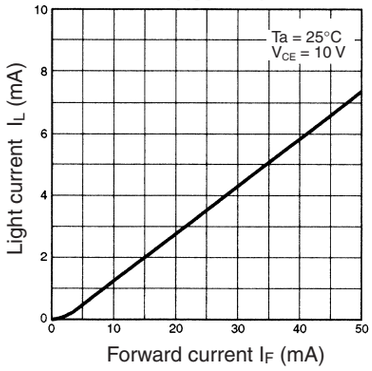
Forward Current vs. Collector Dissipation Temperature Rating



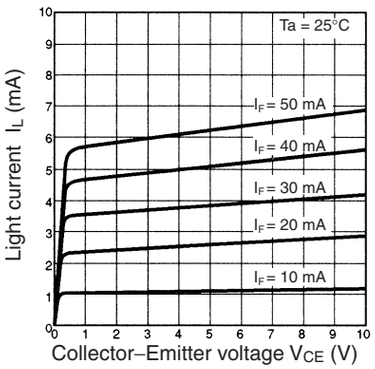
Forward Current vs. Forward Voltage Characteristics (Typical)



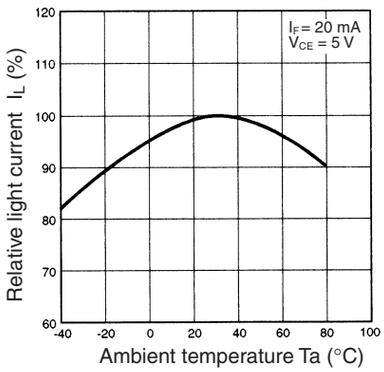
Light Current vs. Forward Current Characteristics (Typical)



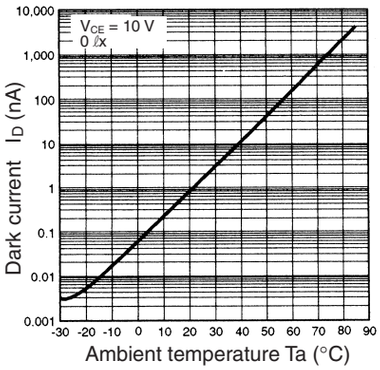
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



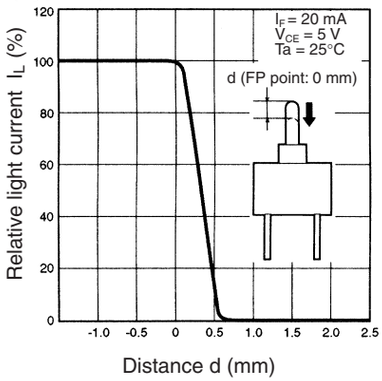
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



Dark Current vs. Ambient Temperature Characteristics (Typical)



Sensing Position Characteristics (Typical)

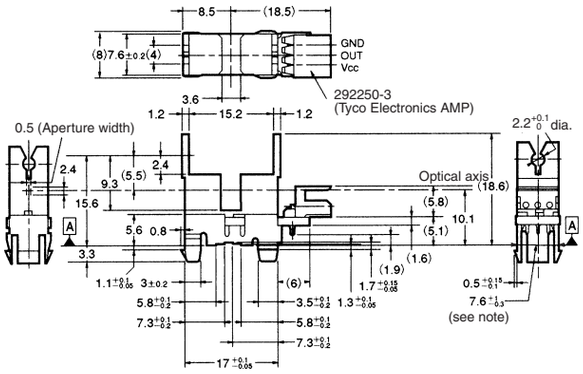


OMRON

Photomicrosensor (Actuator Mounted)
EE-SA407-P2

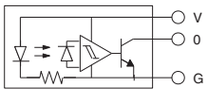
■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Note: The dimension is specified by datum A only.

Internal Circuit



Terminal No.	Name
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Recommended Mating Connectors:
Tyco Electronics AMP 179228-3 (crimp connector)
175778-3 (crimp connector)
173977-3 (press-fit connector)

■ Features

- An actuator can be attached.
- Snap-in mounting model.
- Mounts to 1.0-, 1.2- and 1.6-mm-thick panels.
- High resolution with a 0.5-mm-wide sensing aperture.
- With a 3.6-mm-wide slot.
- Photo IC output signals directly connect with logic circuit and TTL.
- Connects to Tyco Electronics AMP's CT-series connectors.
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	Operating	T_{opr}	–20°C to 75°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	---

Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

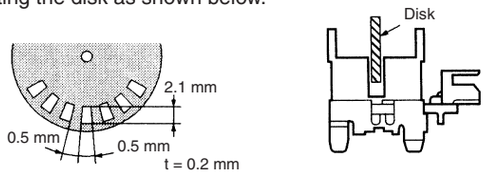
■ Ordering Information

Description	Model
Photomicrosensor (actuator mounted)	**EE-SA407-P2**

■ Electrical and Optical Characteristics (Ta = 25°C, V_{CC} = 5 V ±10%)

Item	Symbol	Value	Condition
Current consumption	I_{CC}	30 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.35 V max.	I_{OUT} = 16 mA with incident
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	V_{OUT} = V_{CC} without incident, R_L = 47 kΩ
Response frequency	f	3 kHz min.	V_{OUT} = V_{CC}, R_L = 47 kΩ (see note)

Note: The value of the response frequency is measured by rotating the disk as shown below.



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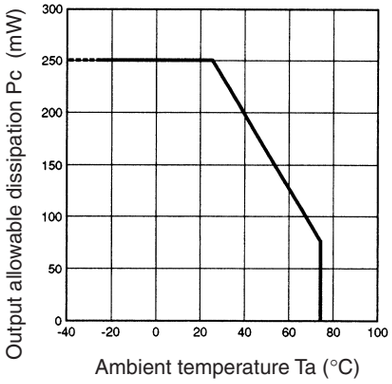
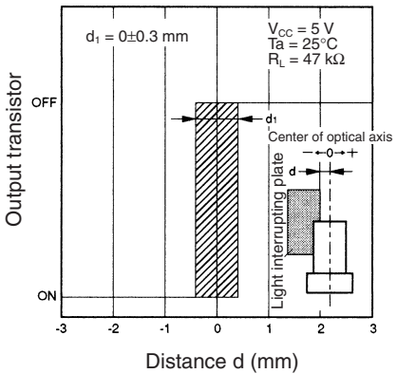
■ Engineering Data

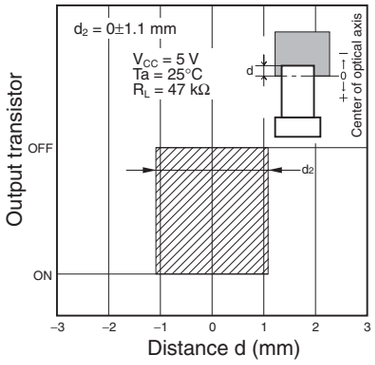
Output Allowable Dissipation vs. Ambient Temperature Characteristics



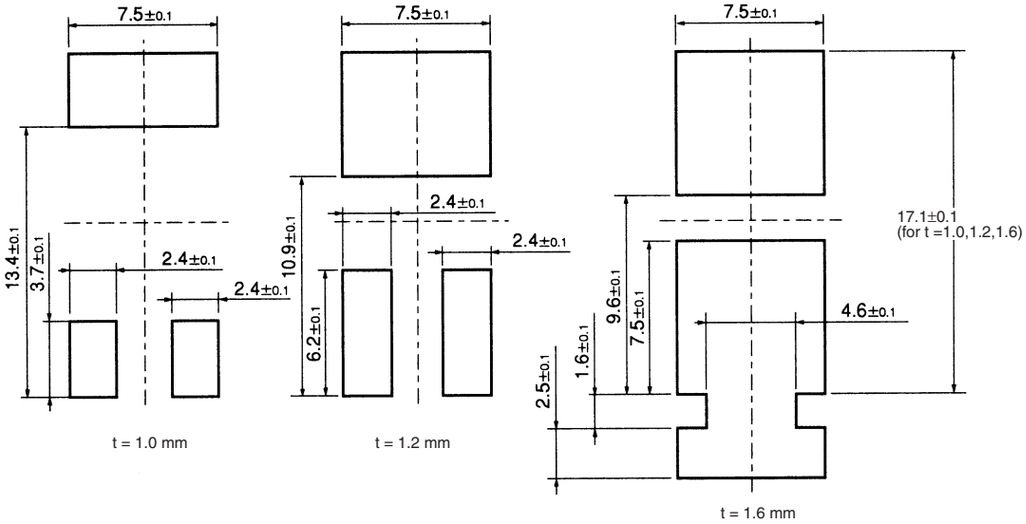
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)

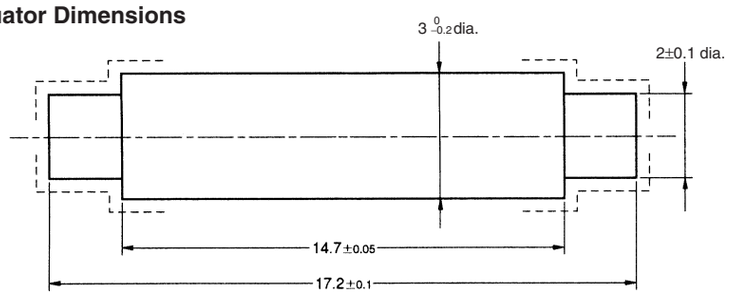


■ Recommended Mounting Holes



- When mounting the Photomicrosensor to a panel with a hole opened by pressing, make sure that the hole has no burrs. The mounting strength of the Photomicrosensor will decrease if the hole has burrs.
- When mounting the Photomicrosensor to a panel with a hole opened by pressing, be sure to mount the Photomicrosensor on the pressing side of the panel.
- The mounting strength of the Photomicrosensor will increase if the Photomicrosensor is mounted to a panel with a hole that is only a little larger than the size of the Photomicrosensor, in which case, however, it will be difficult to mount the Photomicrosensor to the panel. The mounting strength of the Photomicrosensor will decrease if the Photomicrosensor is mounted to a panel with a hole that is comparatively larger than the size of the Photomicrosensor, in which case, however, it will be easy to mount the Photomicrosensor to the panel. When mounting the Photomicrosensor to a panel, open an appropriate hole for the Photomicrosensor according to the application.
- After mounting the Photomicrosensor to any panel, make sure that the Photomicrosensor does not wobble.
- When mounting the Photomicrosensor to a molding with a hole, make sure that the edges of the hole are sharp enough, otherwise the Photomicrosensor may come fall out.

Actuator Dimensions



Note: 1. Make sure that the portions marked with dotted lines have no burrs.
2. The material of the actuator must be selected by considering the infrared permeability of the actuator.

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