RF & MICROWAVE COMPONENTS

RF & Microwave
Coaxial switching products
2011

RADIALL
The next conneXion

COMPANY PROFILE

*Technical information and sales contacts are available at : **www.radiall.com***

Simply Your Best Connection

Radiall is a global leader in the design, development and manufacturing of leading edge interconnect solutions. Dedicated to understanding its customers' needs since 1952, Radiall has earned the reputation of being "the best of the best" in engineering ingenuity by providing a constant flow of creative system solutions serving the telecommunications, aerospace, defense, instrumentation, automotive, industrial, medical and broadcast markets.

The Best End-to-End Interconnect Solutions

We offer an extensive range of solutions that supports the most demanding signal transmission applications. 4G wireless infrastructure, active array radars, IED's detection, electrical wiring in aircrafts, soldier tactical radios, in-vehicle communications networks, and magnetic resonance imaging systems are just a few of the complex applications that we support.

- RF coaxial connectors
- Fiber optic connectors and transceivers
- Coaxial and fiber optic cable assemblies and harnesses
- High frequency microwave components
- Coaxial switches, including the smallest and most reliable SPDT relay
- Multipin rectangular connectors
- Rack and panel connectors
- Antennas for tactical networks, aerospace and instrumentation

Best Value-added Services

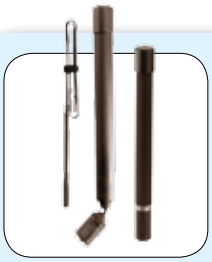
- **Collaboration**: We work closely with your engineers to understand your business, your technical needs, and your budgetary issues;
- **Wide Product Range**: We manage our product lines thru the entire lifecycle in order to offer you a wide selection of standard products at an affordable cost;
- **Custom Products**: We can tailor products to specific equipment and application needs;
- **Global Presence**: We're everywhere you need us, with worldwide sales, engineering support, R&D in North America, Europe, and Asia, and manufacturing facilities strategically located in the United States, Mexico, France, India, and China;
- **Responsive Support and Service**: From the design stage, planning to post-installation support, we're with you at every step, whether you need sales support or engineering expertise;
- **On-time Delivery**: We support your logistical needs so you get the products when and where you need them;
- **Warranty**: We proudly stand behind our products.

ISO 9001 Certified
AS/EN/JISQ9100-ISOTS 16949-ISO-14001

Certifications and Environmental

Radiall is ISO 9001: 2008 certified and dedicated to continuous improvement programs that have resulted in also being AS9100, TS16949 and ISO 14001 certified. In addition, Radiall is committed to investing in its people, future technologies and the environment, such as being RoHS (Restriction of Hazardous Substances) and REACH (Registration, Evaluation, Authorization and Restriction of Chemical substances) compliant.

A GLOBAL RANGE - TO MEET YOUR NEEDS

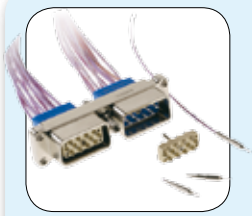


ANTENNAS

RADIALL specializes in antennas from 27 MHz to 6 GHz for military applications.
- Technologies used: wire, patch, printed, wire-plate, PIFA
- Numerous types of antennas: single pole, dipole, network, passive or active (with LNA), adaptable and intelligent, outdoor or integrated.

AEP CONNECTORS

AEP RF connectors are designed and manufactured in USA for the demanding requirements of military field radio and avionics systems:
- Coaxial waterproof connectors with a unique system of sealing.
- MIL-PRF-39012 QPL connectors
- SSMB and SSMC superior connectors
- SLB Self Aligning connector system.



FIBER OPTIC CONNECTORS

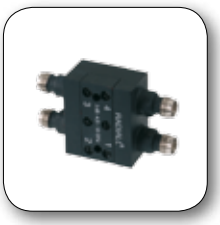
Wide range of interconnect solutions, including standard connector interfaces for multimode and singlemode fiber (LC, SC, FC, ST...) as well as connectors and termini contacts (MIL-T-29504, ARINC 801) for harsh environment applications (aeronautic, military, naval, medical, railway...). Great flexibility for custom design.

HARNESSES

The combination of design and manufacturing of RF and microwave cables as well as multipin connectors (EPX, ARINC 404 and 600) allows Radiall to be a specialist of harnesses for onboard (aeronautic, navy...) or land (railways, remote antenna...) equipment or communications systems.
All types of contacts can be used and mixed such as signal, power, RF, quadrax, fiber optic...

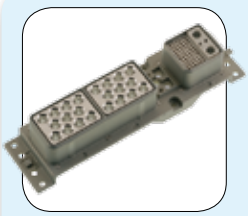
RF & MICROWAVE SWITCHES

Wide range of coaxial switching products for commercial, military and instrumentation applications. Available with a large choice of interfaces (SMA, QMA, N, ...), from DC to 40 GHz. Main products :
- Standard RAMSES series.
- PLATINUM series with high repeatability (0.03dB) on insertion loss during 10 million actuations.
- Subminiature SPnT up to 26.5 GHz.
- SMT high power micro-SPDT.



MICROWAVE COMPONENTS

Wide range of coaxial terminations and attenuators using standard interfaces (SMA, QMA, N, QN...) from low (1W) to high power (100W). Cable load solution, chip terminations up to 18 GHz, hybrid or directional SMT couplers, connectorized couplers, lightning protectors, detectors, rotary joints, phase shifters, DCBlocks...



MULTIPIN CONNECTORS

The range includes rack and panel connectors (Arinc 404 & MIL-C-81659B DSX, Arinc 600 NSX & SW280WS1 BPX, EN3682/ MIL-C-83527 MPX JN1123 TCX), modular connector (EPX A & B), compatible with a large variety of contacts : signal, power, RF, data bus, fiber optic, quadrax and twinax.
A range of wire to wire and wire to board is also available: B & MCSR duty connectors, M, MM, MB, MBC rectangular miniature series, MMC.

FIBER OPTIC TRANSCEIVERS

Our multi-channel transceiver modules in smallest available packages are fully qualified for harsh environments and avionics applications.
- Bit rate up to 10 Gbps
- Up to 12 channels per module
- Various packages with footprint as small as 12x13mm^2

RF & MICROWAVE CABLE ASSEMBLIES

Wide range of cable assemblies using all types of coaxial connectors and cables.
- RG, LMR, conformable, semi-rigid, corrugated, etc.
- Cable diameter 0.8mm up to 1 5/8"
- SHF wrapped cable manufactured in house for appplications at 40GHz and above
- TestPro range dedicated to test benches
- Lightweight range designed for airframe installation
- Phase matching available for radar and other applications

RF COAXIAL CONNECTORS

The widest range of coaxial connectors in the world from microminiature (UMP) to standard connectors (7/16) covering the frequency range of DC to 65 GHz mixing standardized and custom interfaces (UMP, IMP, MMS, MMT, QMA, QN, MMBX).

CONTENTS

Head office - Rosny sous Bois France

A WIDE FIELD OF ACTIVITY

Specialized in passive microwave components, the RADIALL's engineering staff designs and manufactures a wide range of standard coaxial devices including terminations, attenuators, couplers, coaxial detectors, coaxial and waveguide switches, covering a wide frequency spectrum from DC to 50 GHz.

EXPERIENCE

With over 60 years of experience and continuous efforts in R&D, Radiall has become Europe's number one source for coaxial connectors.

RADIALL's position as a market leader has enabled the company to excel in the passive microwave component field for more than 50 years.

RADIALL's competence in design, development and manufacturing of passive microwave components is widely acknowledged in the in today's industry.

CAPACITIES AND FACILITIES

The association inside the same plant of all the technical skills: marketing, R&D, industrialization, manufacturing and quality control enable RADIALL to produce a range of high performance and low cost devices for industrial applications as well as high reliability components for severe requirements in military and space fields.

RESEARCH AND DEVELOPMENT

The increasing complexity of microwave systems requires more and more high performance components.

To meet these requirements, the R&D department is constantly engaged in the development of new products as well as improvement on present products.

Equipped with with microwave and mechanical CAD and with the latest generation of microwave test equipment up to 60 GHz, RADIALL uses the state-of-the-art technology to optimize its products and to give the fastest response to specific customer requirements.

For more technical information, consult us.

PRODUCTION

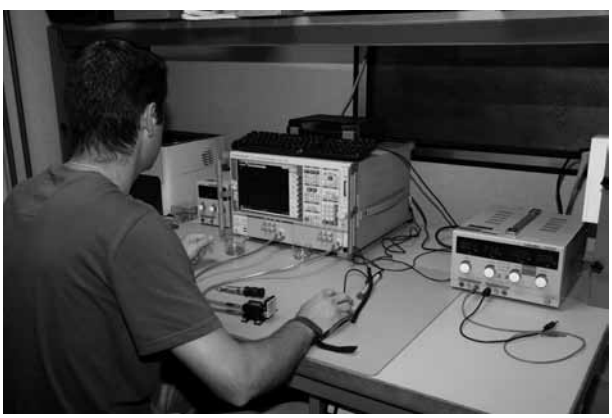
Electrical performances of microwave products are closely dependent upon machining quality of individual piece parts and associated plating.

The latest computer-controlled machinery, and an in-house plating department allow RADIALL to manufacture high quality piece parts compatible with the requirement of our components.

Owing to its thick film and thin film etching equipments, our production department warrants the quality and the reproducibility of our resistive cells used in most of our terminated switching products.

A “prototype” workshop enables RADIALL to give a fast answer to special customer requirements.

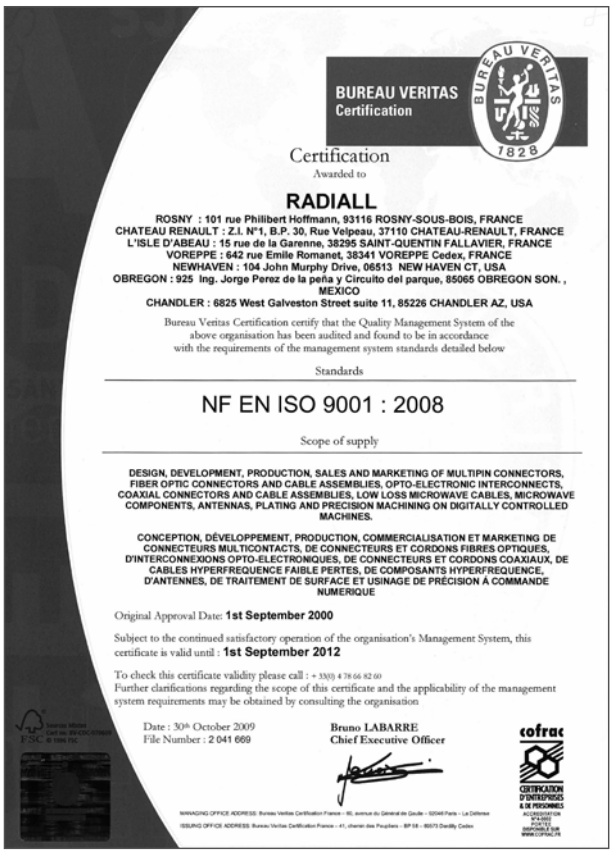
All the phases of manufacturing and test are strictly inspected by our quality department, so as to warrant the constancy of our products and to achieve general and specific requirements.



QUALITY AND RELIABILITY AND PATENTS

Quality and reliability: Two major requirements of passive microwave components that RADIALL has been taking into account for years. ISO 9001 V2008 label is the best evidence of quality assurance interfaces at every stage of a product from designing to manufacturing.

All new products are subjected to rigid qualification programs before mass production. In the same way, every element which could affect product quality is tested periodically.



BUREAU VERITAS
Certification

Certification
Awarded to

RADIALL

ROSNY : 101 rue Philibert Hoffmann, 93116 ROSNY-SOUS-BOIS, FRANCE
CHATEAU RENAULT : Z.I. N°1, B.P. 30, Rue Velpeau, 37110 CHATEAU-RENAULT, FRANCE
L'ISLE D'ABEAU : 15 rue de la Garenne, 38295 SAINT-QUENTIN FALLAVIER, FRANCE
VOREPPE : 642 rue Emile Romanet, 38341 VOREPPE Cedex, FRANCE
NEWHAVEN : 104 John Murphy Drive, 06513 NEW HAVEN CT, USA
OBREGON : 925 Ing. Jorge Perez de la peña y Circuito del parque, 85065 OBREGON SON., MEXICO
CHANDLER : 6825 West Galveston Street suite 11, 85226 CHANDLER AZ, USA

Bureau Veritas Certification certify that the Quality Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standards detailed below

Standards

NF EN ISO 9001 : 2008

Scope of supply

DESIGN, DEVELOPMENT, PRODUCTION, SALES AND MARKETING OF MULTIPIN CONNECTORS, FIBER OPTIC CONNECTORS AND CABLE ASSEMBLIES, OPTO-ELECTRONIC INTERCONNECTS, COAXIAL CONNECTORS AND CABLE ASSEMBLIES, LOW LOSS MICROWAVE CABLES, MICROWAVE COMPONENTS, ANTENNAS, PLATING AND PRECISION MACHINING ON DIGITALLY CONTROLLED MACHINES.

CONCEPTION, DÉVELOPPEMENT, PRODUCTION, COMMERCIALISATION ET MARKETING DE CONNECTEURS MULTICONTACTS, DE CONNECTEURS ET CORDONS FIBRES OPTIQUES, D'INTERCONNEXIONS OPTO-ELECTRONIQUES, DE CONNECTEURS ET CORDONS COAXIAUX, DE CABLES HYPERFREQUENCE FAIBLE PERTES, DE COMPOSANTS HYPERFREQUENCE, D'ANTENNES, DE TRAITEMENT DE SURFACE ET USINAGE DE PRÉCISION À COMMANDE NUMERIQUE

Original Approval Date: **1st September 2000**

Subject to the continued satisfactory operation of the organisation's Management System, this certificate is valid until : **1st September 2012**

To check this certificate validity please call : + 33(0) 4 78 66 82 60
Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organisation

Date : 30th October 2009
File Number : 2 041 669

Bruno LABARRE
Chief Executive Officer

cofrac

Also, RADIALL switches are patent protected products.

NATO CODE

RADIALL is a qualified microwave components manufacturer under military label (manufacturer code F0503 and F6507) Its products quality assurance has been developed in accordance with N.A.T.O. standards.

For more technical information, consult us.

1) A TESTING LABORATORY

As an illutration of RADIALL's commitment to quality and reliability, RADIALL has an in-house test laboratory qualified by CECC which permits RADIALL to carry out most of tests required by its customers.

2) PARTIAL LIST OF TEST MEANS

→ ELECTRICALS

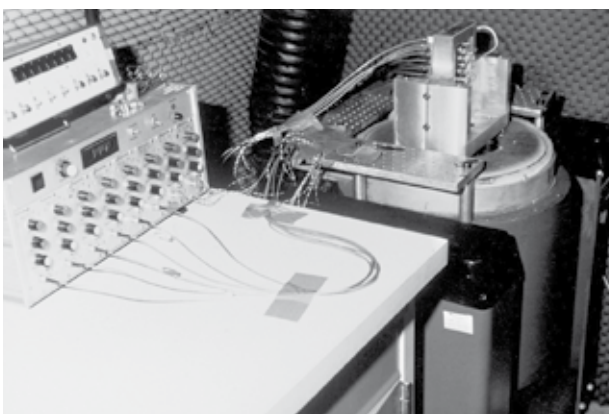
Breakdown voltage	12 KVolts
Insulation resistance	40.10^3 MOhms
Contact resistance	1µOhms

→ MICROWAVE

V.S.W.R. insertion loss Isolation	Vector Network Analyzer From 0.04 up to 60 GHz TDR 150ps
RF Leakage/EMC	Reverberation chamber method 0.5 to 20 GHz / Noise 100 dB
Power Handling	400 W CW at 936 MHz 400 W CW at 17.8 GHz 20 W CW 8 up to 18 GHz 100 W CW at 420 MHz 20 W CW 8 up to 18 GHz

→ ENVIRONMENTAL

Vibrations : Sine random	0 - 120 g 5 to 4000 Hz
Shocks	30 to 1000g
Shakes	25 to 40g 6 ms
Thermal vacuum	10^{-5} TORR -45 to +100°C
Thermal shock	-70°C +200°C / transfert 20s
Storage temperature	-70°C to +200°C
Humidity	20 to 98 % HR
Salt spray	-35°C to +55°C
Hermeticity	Helium 10^{-5} to 10^{-8} atm cm^3/s



For more technical information, consult us.

3) CAPABILITIES

RADIALL offers coaxial switches in four major markets: Telecom, Instrumentation, Military and Hi-Rel Space.

RADIALL products are currently used in military airborne, earth stations, Automatic Test Equipment, Instrumentation systems, wireless base stations and space applications including ground segments.

This catalog is intended to be used as a guide in selecting the right type of switch for a given application.

It is important to note that RADIALL doesn't limit itself to catalog products and has the flexibility to design a specific product on a tight schedule at a reasonable cost.

RADIALL welcomes discussions of each customer's unique requirements.

4) RELIABILITY

All RADIALL coaxial switches offer exceptional reliability and performance. A unique patented design of the actuator and transmission link enables RADIALL to guarantee operation up to 10 million cycle for Terminated SPnT, others series as well, with excellent repeatability.

5) LIST OF APPLICABLE DOCUMENTS

List of related covering the general mechanical and environmental tests applicable to the devices decribed in this catalogue.

AIR 7304	NFC 93563	MIL C 39012
DIN 47295	NFC 93564	MIL E 5400
NFC 93561	NFC 96317	MIL STD 202
NFC 93562	MIL DTL 3928	154 IEC

For more technical information, consult us.

6) GENERAL SPECIFICATIONS DESIGNED TO MEET MIL DTL 3928 AND MIL STD 202

→ ENVIRONMENTAL CHARACTERISTICS

These requirements are guaranteed according to MIL standard, see applicable product section to get more accurate and detailed information.

Vibrations Method 204	10 - 2000 Hz 10g	Operating
Shocks Method 213	50g, 1/2 sinus	Non-operating

→ MECHANICAL CHARACTERISTICS, MATERIAL AND FINISHED

All materials and finishes are in accordance with applicable MIL and NF specifications.

All connectors are in accordance with applicable MIL, DIN, NF and CEI specifications.

All dimensions in this catalog are given in millimeters. The non specified dimensions are given within +/- 0.5 mm.

RF body	Aluminium, Gold plated Aluminium, Nickel plated Aluminium with Cr3 passivation
Contacts	Beryllium Copper, Gold plated
Insulator	PTFE, ULTEM 1000
Connectors	Stainless stess, passivated brass, Nickel plated
Construction	Splash proof
Cover	Aluminium, blue anodized

7) MANUFACTURING AND QUALITY ASSURANCE

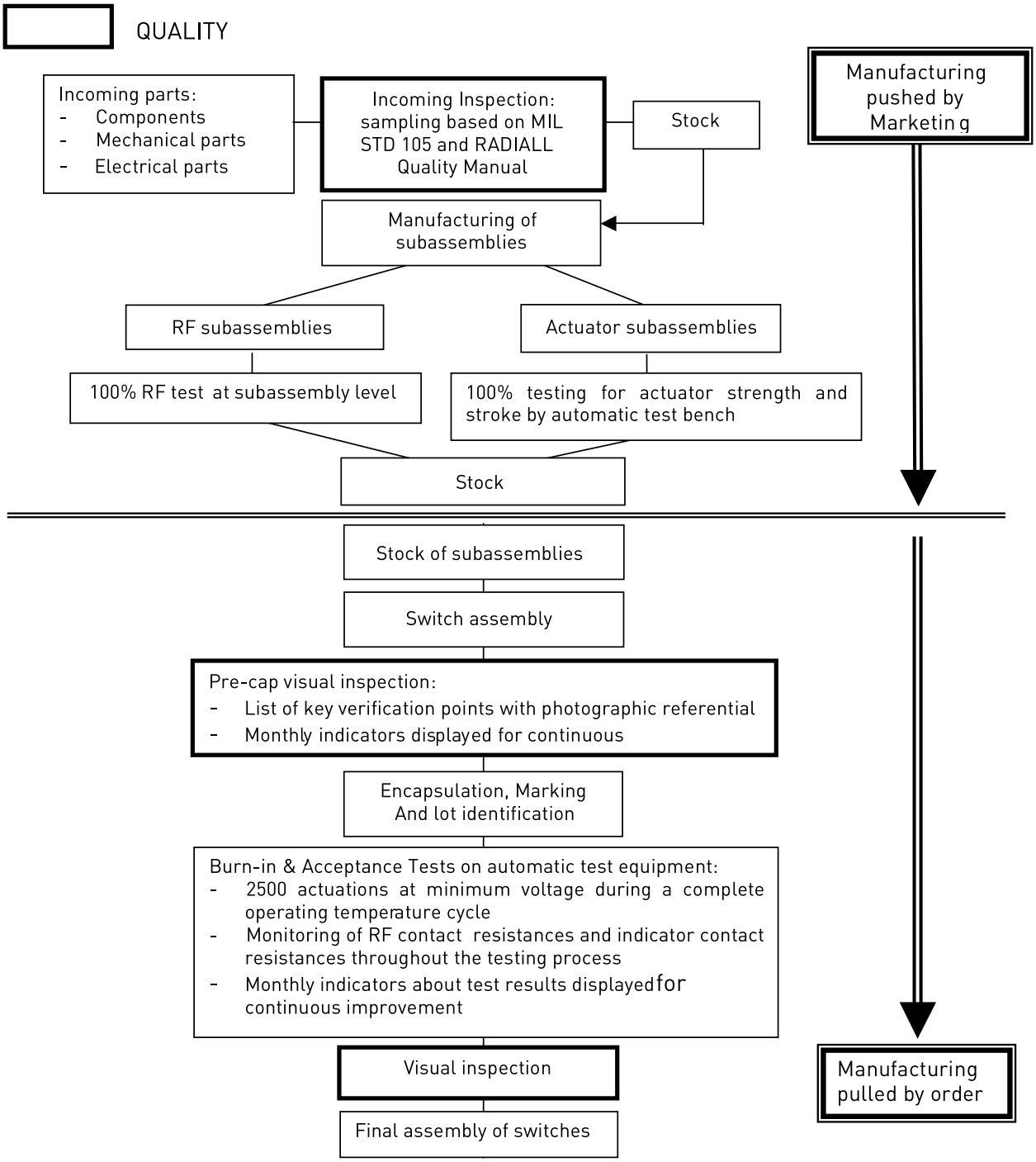
RADIALL's RF switches product line is made of approximately 20 series of switches, with each series divided into a large number of configurations. Part Numbers consist of 9 digits, each digit designating a portion of the part actual identity (such as series, frequency, actuator voltage, etc...). For each digit, 2 to 10 options are available. A complete Part Number represents a unique configuration. Overall, there are more than 80,000 different configurations available with very few subassemblies due to the modularity of the RAMSES switching line (less than 300 different subassemblies).

A PUSH-PULL manufacturing process has been implemented to reduce both lead time and inventory. Based upon marketing forecast and monthly updates, various subassemblies are manufactured.

When an order is received, an automated MRP system selects the appropriate subassemblies from stock to manufacture the requested products within a short time frame (a few days to a few weeks) depending on the complexity of the product.

RADIALL has adopted the process management philosophy of "LEAN MANUFACTURING". This process enables the assurance of the best pricing and lead times on our coaxial products by eleminating all stages without added value of our adminitrative processes and production. This organization was first applied to our RAMSES SPDT and SP6T non terminated coaxial products and is being expended to all over coaxial switches.

8) MANUFACTURING AND QUALITY ASSURANCE FLOW



For more technical information, consult us.

9) RAMSES CONCEPT

An innovative new system has been designed for constructing electromechanical coaxial RF switches with increased long-term reliability. The **RA**diall **M**odular **S**ystem for **E**lectromechanical **S**witches (RAMSES) is a patented concept that enables microwave coaxial switches to be produced with a typical operating life of 10 million cycles while suffering no decrease in contact resistance reliability over time. In addition, the unique internal construction makes the switches cost-competitive with traditional switches.

• Friction Effects

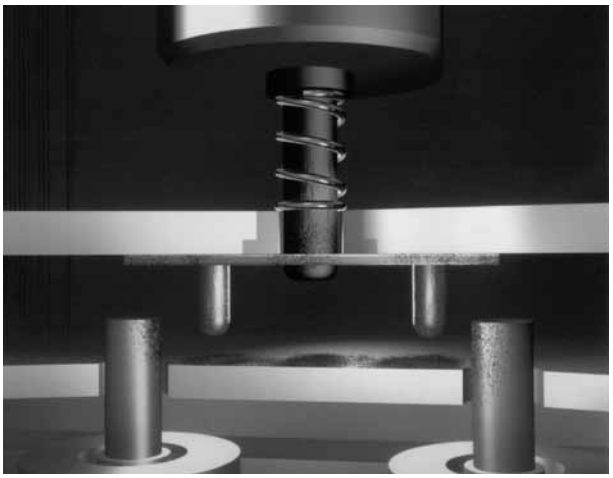
The unique design of RAMSES is based on the reduction of friction, which minimizes particle deposits that can interfere with the transmission of lower frequency signals (up to 3 GHz). This particle elimination effect is particularly important for telecommunications applications that are currently in the 900 MHz and 2 GHz regions. In addition, the design involves fewer components than other microwave switches, making it easier and quicker to assemble. These savings directly relate to lower cost for improved performance.

Many of the existing coaxial electromechanical switches also are able to function mechanically for 10 million operations. But the reliability and quality of the electrical contact can seriously degrade during that lifetime. In general, these traditional switches operate by moving a rectangular switching blade section inside a rectangular cavity. The blades are linked with pushers constructed of dielectric material that travel inside an access hole between the RF cavity and switch actuator. The pushers are directed by dielectric material guides. These dielectric parts rub on the blades and inside the access hole and generate isolating particles in the RF cavity that pollute the electrical contacts and ultimately cause running defects.

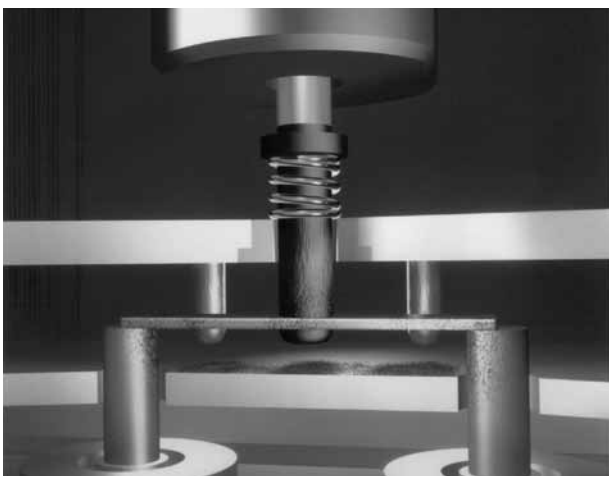
Figure 1 shows the build-up of minute dielectric particles on a set of conventional switch contacts after one million cycles. These defects are not particularly noticeable at very high frequencies since the contact is established by a capacitive effect.However the insertion loss of the contacts increases considerably at lower frequencies (3 GHz below).

• A new actuator Configuration

To eliminate this problem of increased insertion loss in the contacts, RAMSES devices incorporate a patented system compressing two parallel blades suspended from a bearer, which enables the guiding and positioning of the commutation blades to be accomplished entirely outside the RF cavity. These blades impose a rectilinear motion on the switching pusher, suppressing both friction and the production of particles inside the RF cavity. The unique system is extremely small and can be used in all of RAMSES series switches.



(a) RF line open



(b) RF line closed

Figure 1: conventional switch contacts after one million cycles

Figure 2 shows a cutaway view of a RAMSES coaxial switch displaying the actuator mechanism.

A second improvement involves a new rectilinear actuator design using high energy magnets and a switching performance in relation to its size. The system is used in the production of both failsafe and latching actuators, depending on how it is applied in the switch. The actuator system also produces sticking forces that far exceed those of traditional actuators; that is, either 500g locking forces or 300 to 800g current forces for a power consumption of 100mA at 28V. The new actuator has the added advantage of very low magnetic leakage, allowing actuators to be used in close proximity to one another without performance degradation. Finally, the use of a dry, solid lubricant and the control of friction areas produce an actuators life expectancy of over 50 million operations without defect over a -55° to +85°C temperature range.

For more technical information, consult us.

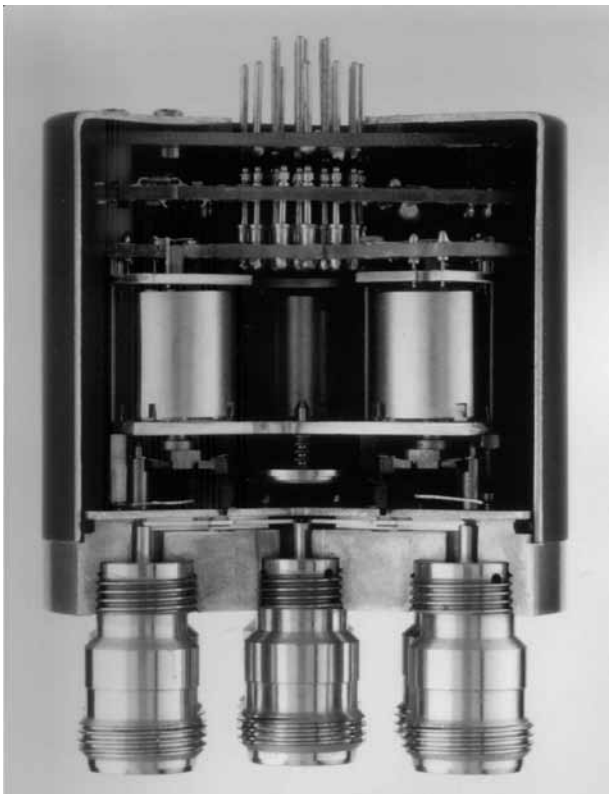
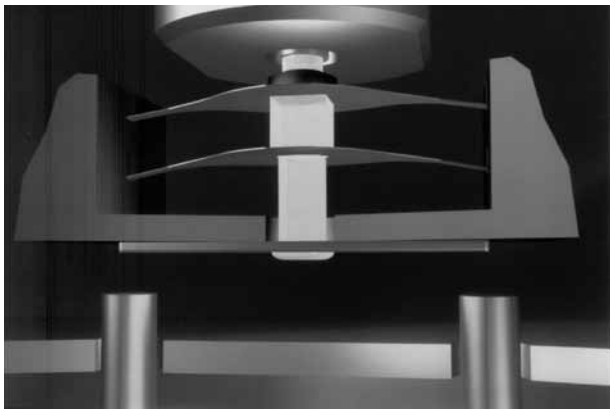
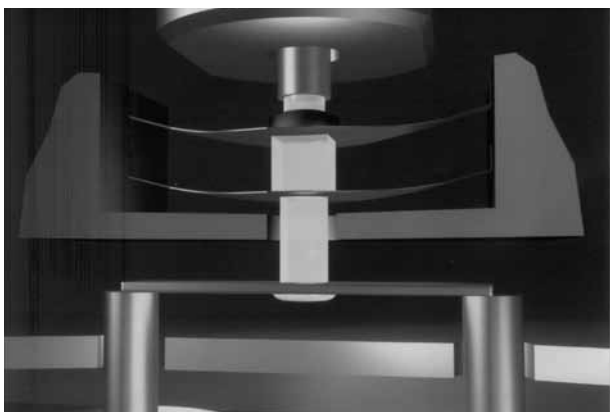


Figure 2: a cutaway view of RAMSES coaxial switch



(a) RF line open



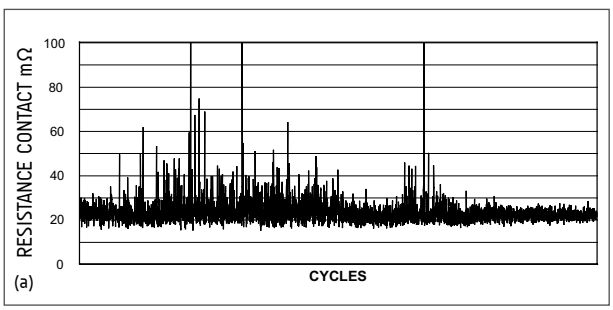
(b) RF line closed

Figure 3: a RAMSES set of contacts

• Switch performances

RAMSES series switches have successfully survived tests of 10 million switching temperature cycles from -55° to + 85°C while demonstrating good contact resistance stability. Visual inspection of these switches after testing has indicated that the RF lines were free of much of the contamination found during similar tests on traditional switches. A comparison of the actual measured contact resistance obtained from monitoring both conventional and RAMSES switches using several parts that have already been actuated one million cycles is shown in **figure 4.**

Although the conventional switch may not be considered failure, its contact resistance has become unstable, thus degrading its reliability.



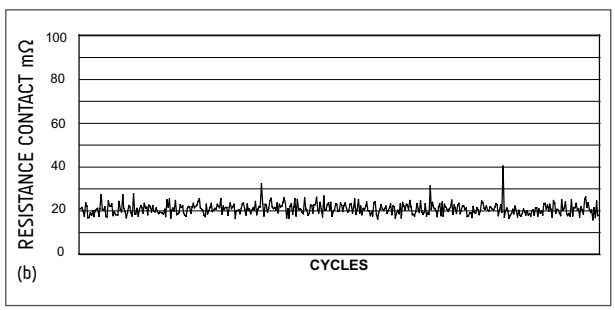
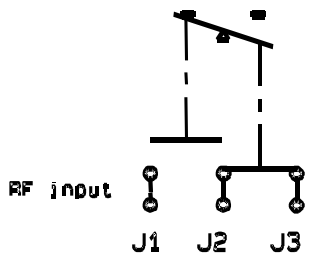


Figure 4: a comparison of (a) conventional and (b) RAMSES switch design contact resistance during one million cycles

For more technical information, consult us.

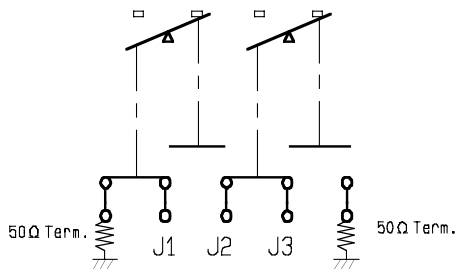
10) RF ARRANGEMENT

COAXIAL SPDT SWITCH
(Single Pole Double Throw)



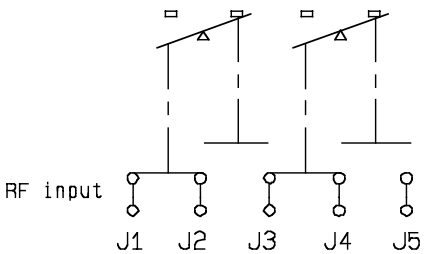
Single pole Double Throw Switch
A switch with one input port and two selectable output ports

COAXIAL SPDT TERMINATED SWITCH
(Single Pole Double Throwh terminated)



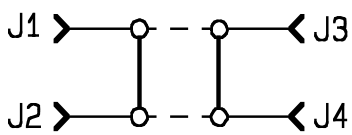
Single Pole Double Throw, Terminated switch
Same as SPDT, but the unused output port is automatically terminated by a 50 Ohm resistive load.

COAXIAL DP3T SWITCH
(Double Pole Three Throw)



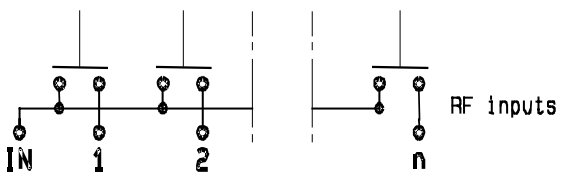
Double Pole Three Throw switch
A switch with two input ports and three output ports.
Each input (J2 - J4) can be switched between two adjacent outputs with one output being common to both inputs

COAXIAL DPDT SWITCH
(Double Pole Double Throw)



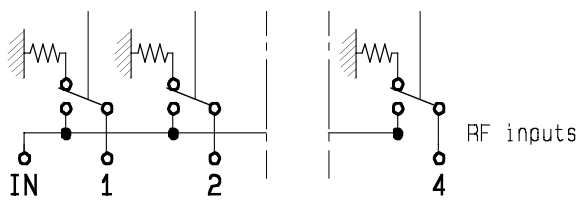
Double Pole Double Throw Switch
A four port switch with two independent paths that operate simultaneously in one of two selected positions..
In a DPDT / Transfer switch, the two transmission paths are provided as shown above

COAXIAL MULTIPOSITION SWITCH
(Single Pole n Throw)



Single Pole n Throw Switch (n<13)
A switch with one input port and more than two output ports. The multiposition switch allows direct access to any individual output port by energizing the respective actuator.
RADIALL SPnT switches provide up to 12 Output ports

COAXIAL MULTIPOSITION TERMINATED SWITCH
(Single Pole n Throw Terminated)



Single Pole n Throw Terminated Switch (n<13)
Same as SPnT, but each unused output port is automatically terminated in a internal 50 Ohm resistive load

For more technical information, consult us.

11) GLOSSARY

→ ACTUATOR VOLTAGE

All RAMSES series relays are either 12 or 28 Vdc nominal voltage over the entire temperature range. The switches can be operated with a voltage between -15 % and +10 % of the nominal value. Other voltage as 5, 15 or 24 Volts can be supplied at the customer's request.

→ AUTOMATIC "RESET"

All Latching version multiposition switches (or SPnT) cause the following scenario:

When a RF path is closed, it remains in the closed position after the voltage is cut-off (latching function). To switch to another path, the first path must be opened via a "RESET" driver, followed by the closing of the second RF path. Without the "RESET" driver, both paths would remain in the ON position at the same time.

To simplify the use of latching products, an "automatic RESET" is recommended. The auto reset feature is accomplished by an electronic circuit which brings about the automatic opening of a previously closed path during changes of position of the switches.

Note: *This option produces a higher current consumption during a few milliseconds (see voltage & current values listed on the product's individual Technical Data Sheet).*

→ BCD (Binary Code Digital) DRIVER INTERFACE

BCD logic coding				RF & Microwave ways position
E1	**E2**	**E3**	**E4**	
0	0	0	0	Latching models: all ways in "OFF" position
0	0	0	0	Normally Open models: memory of last position
0	0	0	1	Way IN - 1 in "ON" position
0	0	1	0	Way IN - 2 in "ON" position
0	0	1	1	Way IN - 3 in "ON" position
0	1	0	0	Way IN - 4 in "ON" position
0	1	0	1	Way IN - 5 in "ON" position
0	1	1	0	Way IN - 6 in "ON" position
1	1	1	1	Way IN - 7 in "ON" position
1	0	0	0	Way IN - 8 in "ON" position
1	0	0	1	Way IN - 9 in "ON" position
1	0	1	0	Way IN - 10 in "ON" position
1	0	1	1	Way IN - 11 in "ON" position
1	1	0	0	Way IN - 12 in "ON" position
1	1	1	1	Latching models: memory of last position
1	1	1	1	Normally Open models: all ways are in "OFF" position

Nota: E1, E2, E3, E4 are BCD driver pins of the product. E4 applies only with 8 positions or more.
E3 applies only 4 positions or more.

GLOSSARY (CONTINUED)

→ BREAK BEFORE MAKE

RADIALL coaxial relays are considered “break before make”. In a break before make product the contact of the first path leaves its state before the final contact has been established.

→ FAILSAFE

A switch with an actuator that contains a return mechanism, either mechanical or magnetic, that provides RF connection to one selected position when no voltage is applied to the power terminals. This type of switch requires continuous voltage to maintain RF connection to any other position.

→ FREQUENCY RANGE

The frequency range indicated for each device indicates the maximum frequency RADIALL will guarantee the product’s performance.

→ INDICATORS CONTACTS

Electrical contacts of “open circuit, short-circuit” type, mechanically linked to the actuator and synchronized with switched RF paths, ensure the recopy of positions of RF transmission paths. When a microwave path is switched, the corresponding indicator contact is closed. It is generally used with pilot lamps to indicate position of RF contacts (characteristics are given for a resistive load).

→ INTERMODULATION

Intermodulation (PIM), or intermod for short, is a form of signal distortion that occurs whenever signals of two or more frequencies are produced in a passive device which contains some linear response. This interference phenomenon is attributable to many sources such a low contact pressure, dirty interconnects, magnetic materials or other anodic effect. The typical value for RADIALL switches is around 120 dBc (with 2 carriers at +43 dBm), however products can be designed for a better performances upon request.

→ ISOLATION

The RF leakage from a connected path to any connector outside that path. Isolation is measured in decibels below the input power.

→ LATCHING

A switch with an actuator that contains a mechanism, either mechanical or magnetic, that will maintain a chosen RF contact path whether voltage is maintained or not after switching is accomplished. A pulse length of a duration equal to the maximum switching time is enough to change the switch position.

→ LIFE

Number of toggles a product is able to carry out. Relays and switches of RAMSES, PLATINUM and TITANIUM ranges have a life duration from 2 to 10 million cycles.

→ NORMALY OPEN

Normaly open is a mode of operation in which all output ports of the switch are disconnected from the input port until a voltage is applied to a selected position.

For more technical information, consult us.

GLOSSARY (CONTINUED)

→ MULTIPIN CONNECTORS

Switches family	Type of		Pins Number	Comments
	Series	Connector		
RAMSES SPDT	**SPDT => R570**	D-Sub (male)	9 pins	Available only on products described on **page 2-20**
	SPDT => R572	Not Available		Only solder pins
PLATINUM SPDT	**SPDT => R595**	D-Sub (male)	9 pins	Non terminated models
RAMSES DPDT	**DPDT => R577**	D-Sub (male)	9 pins	Available only on products described on **page 4-6**
TITANIUM DPDT	**DPDT => R513**	HE10 ribbon receptacle (male)	10 pins	Delivered with ribbon cable 750 mm (30 inches) + HE10 connector (female)
PLATINUM DPDT	**DPDT => R593**			
RAMSES DP3T **(1)**	**DP3T => R585**	Not Available		Only solder pins
PLATINUM DP3T **(1)**	**DP3T => R595**	D-Sub (male)	9 pins	--
RAMSES & Subminiature SPnT	**SPnT => R573/R574** 3 to 10 positions 11 and 12 positions	--	--	--
		D-Sub (male)	25 pins 44 pins	-- High density
	SPnT => R591 4 and 6 positions	Micro-D receptacle (female)	9 pins	--
TITANIUM SPnT	**SPnT => R514** 4 and 6 positions	--	--	--
		HE10 ribbon receptacle (male)	16 pins	Delivered with ribbon cable 750 mm (30 inches) + HE10 connector (female)
PLATINUM SPnT	**SPnT => R594** 4 and 6 positions	--	--	--
		HE10 ribbon receptacle (male)	16 pins	Delivered with ribbon cable 750 mm (30 inches) + HE10 connector (female)

Note (1) : RAMSES & PLATINUM SPDT terminated SPDT are included R585 & R595

→ PLATINUM and TITANIUM series

By adapting our RAMSES concept (without friction) and our knowledge of manufacturing coaxial switches for more than 40 years, RADIALL introduced a new range of high coaxial performance coaxial switches to the market place: PLATINUM Series.

Following an increasing need of the instrumentation market, our PLATINUM coaxial switches are optimized for use in automatic test benches or measureament equipment. With a guarantee insertion loss repeatability of 0.03 dB over the life of the product (10 million), PLATINUM Series switches are perfectly suited for applications requiring excellent RF performance. Radiall offers a full range of coaxial switches such as SPDT-DP3T (R595 series), transfer relay DPDT (R593 series) and multithrow switches SPnT (R594 series), with the same level of RF performance, for use in the most stringent environments.

TITANIUM series offers the same RF performance as PLATINUM series. TITANIUM products are more economically priced due to the reduced number of life cycles guaranteed (2.5M vs 10M for PLATINUM). This product line is ideal for the Instrumentation market, where RF performance is more critical than the number of actuations guaranteed.

→ POLARITY

Common minus polarity potential is chosen by RADIALL for its standards products. An inverted polarity (common plus) is available on RAMSES range, ask RADIALL for availability.

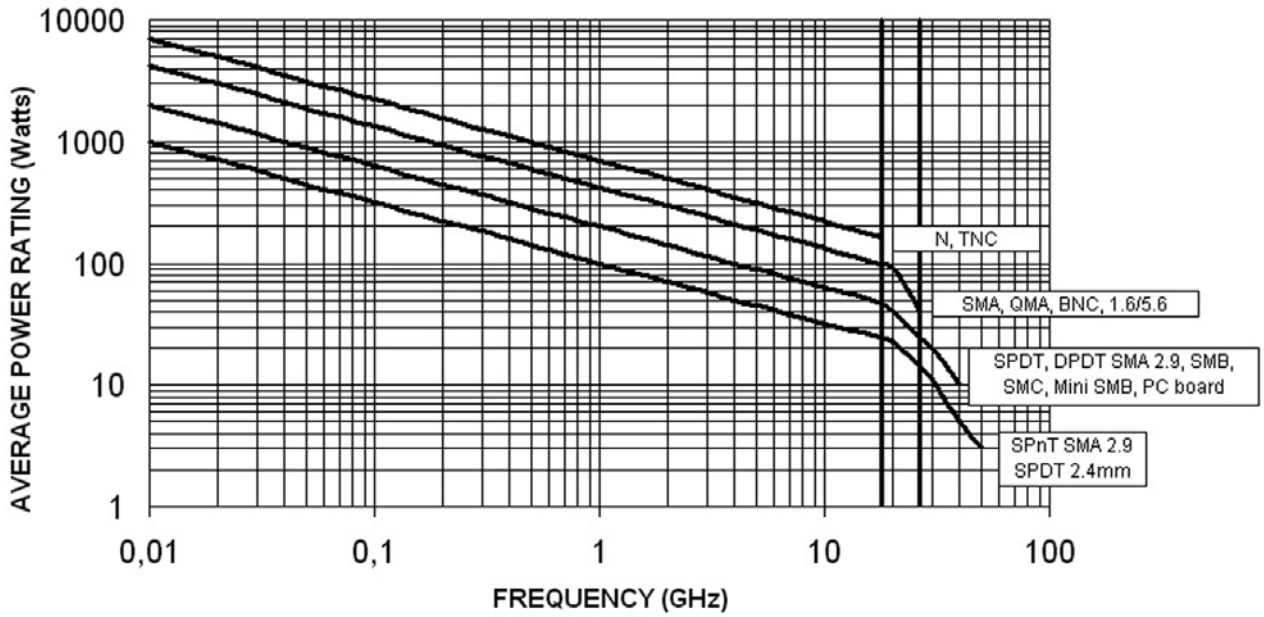
Note: *For PLATINUM and TITANIUM series, Common plus polarity potential is chosen for its standard products.*

GLOSSARY (CONTINUED)

→ RF POWER CHART

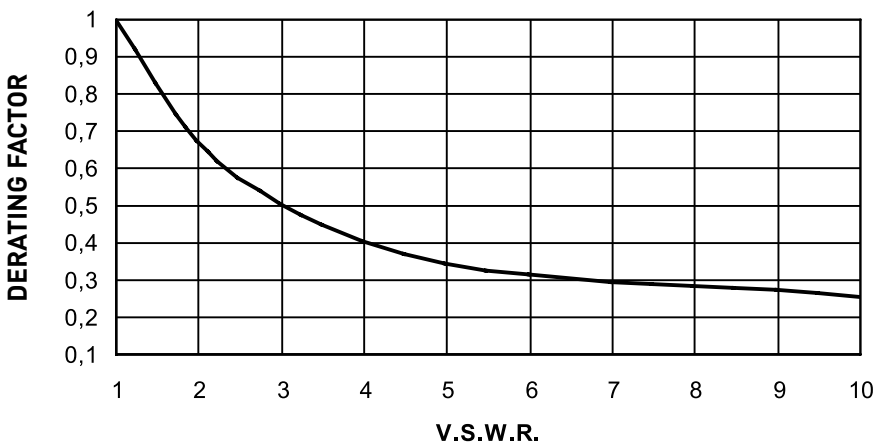
The RF power rating is the capability of handling RF power (CW power) through closed contacts. The RF power should be removed during switching. Power ratings assume unity V.S.W.R. (matched load) at room temperature (25°C), sea level pressure (14.7 p.s.i.) and cold switching. See below the CW power capability Vs. Frequency Chart. Changes in these specifications require power derating (see derating factor versus V.S.W.R.).

This graph is based on the following conditions:
- Ambient temperature: +25°C
- Sea Level
- V.S.W.R.: 1:1 and cold switching



→ DERATING FACTOR

The average power input must be reduced for load V.S.W.R. above 1:1.



For more technical information, consult us.

GLOSSARY (CONTINUED)

→ PEAK POWER HANDLING

The maximun peack power which, when applied at room temperature under a pulse of one microsecond every millisecond, will not permanently change the specifications of the switch. Power applied over this limit will alter the RF performance of the switch.

→ REPEATABILITY

The maximun standard deviation in insertion loss specifications on each path over the life of the product. Insertion loss repeatability is specified for all PLATINUM series (0.03dB over 10 million) and all TITANIUM series (0.03dB over 2.5 million).

→ RF CONNECTORS

RF connectors are 50 or 75 Ohm female, unless otherwise specified. The applicable mating dimensions, materials and finish are in accordance with applicable sections of international standard (MIL C 39012, DIN 47295).

NB RADIALL 75 Ohm coaxial switches are only available with only DIN 1.6/5.6 (srew, snap and slide connector) and mini SMB RF connectors.

→ SELF CUT OFF

This term refers to the ability of a switch to disconnect the actuator voltage as soon as the switching of the position is carried out. The system applies to latching relays and is achieved with solid state circuitry. Self Cut-Off time for our RAMSES coaxial switches is from 40ms to 120ms.

→ SOLDER PIN

RAMSES relays are equiped with solder pins for the control and indicator contacts. The maximum temperature during soldering should not exceed 250°C for 30 seconds or 300°C for 10 seconds for leadfee soldering process.

→ SUPPRESSION DIODES

Diode connected in parallel with the coil of a switch to suppress transient voltage generated by the self inductance of the coil during the driver signal cut-off. This option is systematically enclosed in all TTL, SELF CUT-OFF and all electronic interfaces.

→ SWITCHING TIME

The total amount of time between application of voltage to the actuator terminals and completion of switching including all contact bounces, if any. Total switching time consists of three parts, namely inductive delay in the actuator coil, transfer time of the RF contacts, and bounce time of the RF contacts.

→ TTL DRIVER INTERFACE

This term points out an interface realized thanks to an electronic circuit which enables driving either relays or switches by TTL logic signals. Products equipped with such an option have therefore a pin for the voltage of the actuator (12 V or 28 V) as well as a TTL driver pin shared per position. The polarity is not relevant to applications for switches for applications with this option.The logic used is a positive one, that is to say high level nominal +5V (2.2 to 5.5 V) of TTL signal means logic "1" enabling to close the corresponding microwave way. Low level i.e logic contacts 0, voltage is 0-0.8 V.

→ V.S.W.R.

The Voltage Standing Wave Ratio is a measure of the return loss or level of the reflected signal of a device connected on a transmission line. V.S.W.R. is linked to the coefficient of reflection (r) by the equation:

$$V.S.W.R = \frac{1+|r|}{1-|r|} \qquad r = \frac{Z-Zo}{Z+Zo}$$

with: "r" is the coefficient of reflection
"Zo" is the characteristic impedance of the line
"Z": the impedance of the line

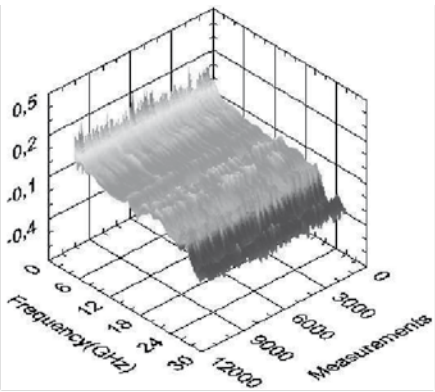
V.S.W.R. varies from 1 to ∞, a value equal to 1 represents a perfect matching

For more technical information, consult us.

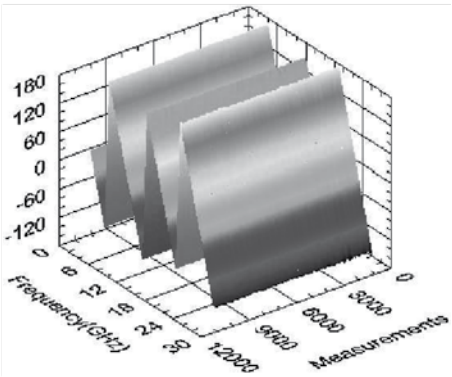
12) RF REPEATABILITY AND LIFE TEST PARAMETERS

Our approach is to work by qualification over the complete life of the switch (2.5 million to 10 million cycles depending on switch models). Radiall has built an Automatic Test Bench composed by a Vector Network Analyzer (VNA), Digital Multi-Meters (DMM), a PC and a switch driver. This ATE extracts and stores the RF parameters or contacts resistances of the switch according to our own internal procedure. For each frequency point a calculation of V.S.W.R., Insertion loss standard deviation are computed. All measurements are performed at room temperature. RF switch is toggled at 3 Hz.

→ The curves in 3D illustrate the RF characteristics over 10 million switching cycles on SP6T-26.5 GHz RAMSES.



Insertion loss over 10 million cycles



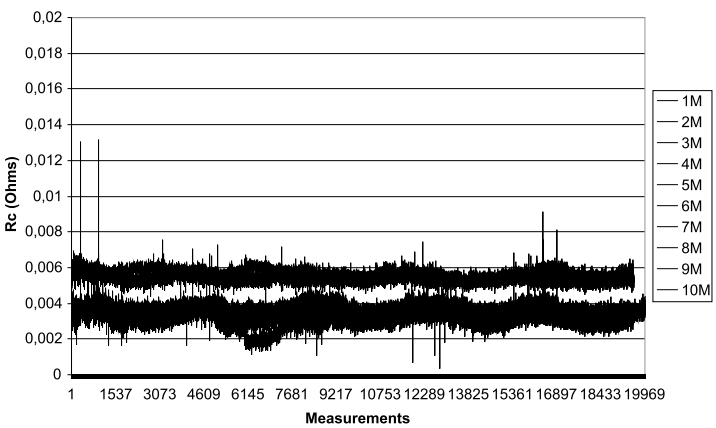
Phase over 10 million cycles

The contribution due to only Rc can be calculated as follows:

$$RL = 20 \log_{10} |\Gamma| = 20 \log_{10} \frac{Rc}{2Ro + Rc}$$

$$VSWR = 1 + \frac{Rc}{Ro}$$

$$IL = 10 \log_{10} \frac{Ro}{Ro + Rc}$$



The following curve shows RF contact resistance up to 10 million. Switch was toggled at 3 Hz with Rc recorded every 50 cycles.

For more technical information, consult us.

13) CONVERSION MEASUREMENT UNIT

→ Convert Inch to millimeters: 1 Inch=25.4mm / 1 meter=39.3 Inches.

→ Convert centimeters to feet: 1 foot=30.40 cm / 1 meter=3.28 feet.

→ Convert kilogram to pounds: 1 kg=2.20 Lb / 1 pound=0.45 kg.

14) POWER CONVERSION

Power (dBm) / Power (W)

dBm	Power	dBm	Power	dBm	Power	dBm	Power
-49	0.01 µW	-24	3.98 µW	1	1.26 mW	26	398.11 mW
-48	0.02 µW	-23	5.01 µW	2	1.58 mW	27	501.19 mW
-47	0.02 µW	-22	6.31 µW	3	2.00 mW	28	630.96 mW
-46	0.03 µW	-21	7.94 µW	4	2.51 mW	29	794.33 mW
-45	0.03 µW	**-20**	**10 µW**	5	3.16 mW	**30**	**1 W**
-44	0.04 µW	-19	12.59 µW	6	3.98 mW	31	1.26 W
-43	0.05 µW	-18	15.85 µW	7	5.01 mW	32	1.58 W
-42	0.06 µW	-17	19.95 µW	8	6.31 mW	**33**	**2 W**
-41	0.08 µW	-16	25.12 µW	9	7.94 mW	37	5.01 W
-40	0.10 µW	-15	31.62 µW	**10**	**10 mW**	35	3.16 W
-39	0.13 µW	-14	39.81 µW	11	12.59 mW	36	3.98 W
-38	0.16 µW	-13	50.12 µW	12	15.85 mW	37	5.01 W
-37	0.20 µW	-12	63.10 µW	13	19.95 mW	38	6.31 W
-36	0.25 µW	-11	79.43 µW	14	25.12 mW	39	7.94 W
-35	0.32 µW	-10	100.00 µW	15	31.62 mW	**40**	**10 W**
-34	0.40 µW	-9	125.89 µW	16	39.81 mW	41	12.59 W
-33	0.50 µW	-8	158.49 µW	17	50.12 mW	42	15.85 W
-32	0.63 µW	-7	199.53 µW	18	63.10 mW	43	19.95 W
-31	0.79 µW	-6	251.19 µw	19	79.43 mW	44	25.12 W
-30	**1 µW**	-5	316.23 µW	**20**	**100 mW**	45	31.62 W
-29	1.26 µW	-4	398.11 µW	21	125.89 mW	46	39.81 W
-28	1.58 µW	-3	501.19 µW	22	158.49 mW	47	50.12 W
-27	**2 µW**	-2	630.96 µW	23	199.53 mW	48	63.10 W
-26	2.51 µW	-1	794.33 µW	24	251.19 mW	49	79.43 W
-25	3.16 µW	0	1 mW	25	316.23 mW	**50**	**100 W**

dBm = 10 x Log_{10} P (milliwatts)

P (milliwatts) = 10^ (dBm/10)

For more technical information, consult us.

15) REFLECTION COEFFICIENT / RETURN LOSS CONVERSION

Reflection Coefficient	V.S.W.R.	Return Loss (dB)	Reflection Coefficient	V.S.W.R.	Return Loss (dB)	Reflection Coefficient	V.S.W.R.	Return Loss (dB)
0	1.00	∞	0.13	1.30	17.7	0.26	1.7	11.7
0.01	1.02	40.0	0.135	1.31	17.4	0.265	1.72	11.5
0.015	1.03	36.0	0.14	1.33	17.1	0.27	1,74	11.4
0.02	1.04	34.0	0.145	1.34	16.8	0.275	1.76	11.2
0.025	1.05	32.0	0.15	**1.35**	**16.5**	0.28	1,78	11,1
0.03	1.06	30.5	0,155	1.37	16.2	0.285	**1.80**	**10.9**
0.035	1.07	29.1	0.16	1.38	15.9	0.29	1.82	10.8
0.04	1.08	28.0	0.165	**1.4**	**15.7**	0.295	1.83	10.7
0.045	1.09	26.9	0.17	1.41	15.4	0.3	1.85	10.5
0.046	**1.09**	26.7	0.175	1.42	15.1	0.305	1.86	10.3
0.05	1.10	26.0	0.18	1.44	14.9	0.31	**1.90**	**10.2**
0.055	1.11	25.2	0.185	**1.45**	**14.7**	0.32	1.94	9.8
0.06	1.12	24.4	0.19	1.47	14.4	0.33	1.98	9.7
0.065	1.13	23.7	0.195	1.48	14.2	0.34	2.04	9.4
0.07	**1.15**	23.1	0.2	**1.5**	**14.0**	0.35	2.08	9.2
0.075	1.16	22.5	0.205	1.52	13.8	0.36	2.13	8.9
0.08	1.17	21.9	0.21	1.53	13.6	0.37	2.18	8.7
0.085	1.18	21.4	0.215	**1.55**	**13.4**	0.38	2.23	8.4
0.09	**1.19**	20.9	0.22	1.56	13.2	0.39	2,.8	8.2
0.095	1.20	20.4	0.225	1.58	13.0	0.4	2.34	7.9
0.1	1.22	20.0	0.23	1.6	12.8	0.41	2.40	7.7
0.105	1.23	19.6	0.235	1.61	12.6	0.42	2.45	7.6
0.11	**1.24**	19.2	0.24	1.63	12.4	0.43	2.51	7.3
0.115	1.25	18.8	0.245	1.65	12.2	0.44	2.57	7.1
0.12	1.27	18.4	0.25	1.67	12.0	0.45	2.63	6.9
0.125	1.28	18.1	0.255	1.68	11.9	0.5	**3.00**	**6.0**

Reflection coefficient (ρ)

Standard Wave Ratio $(1 + \rho) / (1 - \rho)$

Return Loss (dB) $(-20 \log_{10} (1- \rho^2))$

For more technical information, consult us.

16) TEMPERATURE EQUIVALENCE

Centigrade / Fahrenheit

°C	°F	°C	°F	°C	°F	°C	°F
-80	-112.0	9	48.2	47	116.6	85	185.0
-70	-94.0	10	50.0	48	118.4	86	186.6
-60	-76.0	11	51.8	49	120.2	87	188.8
-50	-58.0	12	53.6	50	122.0	88	190.4
-45	-49.1	13	55.4	51	123.8	89	192.2
-40	-40.0	14	57.2	52	125.6	90	194.0
-35	-31.0	15	59.0	53	127.4	91	195.8
-30	-22.0	16	60.8	54	129.2	92	197.6
-25	-13.0	17	62.6	55	131.0	93	199.4
-20	-4.0	18	64.4	56	132.8	94	201.2
-19	-2.2	19	66.2	57	134.6	95	203.0
-18	-0.4	20	68.0	58	136.4	96	204.8
-17	1.4	21	69.8	59	138.2	97	206.6
-16	3.2	22	71.6	60	140.0	98	208.4
-15	5.0	23	73.4	61	141.8	99	210.2
-14	6.8	24	75.2	62	143.6	100	212.0
-13	8.6	25	77.0	63	145.4	105	221.0
-12	10.4	26	78.8	64	147.2	110	230.0
-11	12.2	27	80.6	65	149.0	115	239.0
-10	14.0	28	82.4	66	150.8	120	248.0
-9	15.8	29	84.2	67	152.6	130	266.0
-8	17.6	30	86.0	68	154.4	140	284.0
-7	19.4	31	87.8	69	156.2	150	302.0
-6	21.2	32	89.6	70	158.0	160	320.0
-5	23.0	33	91.4	71	159.8	170	338.0
-4	24.8	34	93.2	72	161.6	180	356.0
-3	26.6	35	95.0	73	163.4	190	374.0
-2	28.4	36	96.8	74	165.2	200	392.0
-1	30.2	37	98.6	75	167.0	250	482.0
0	32.0	38	100.4	76	168.8	300	572.0
1	33.8	39	102.2	77	170.6	350	662.0
2	35.6	40	104.0	78	172.4	400	752.0
3	37.4	41	105.8	79	174.2	500	932.0
4	39.2	42	107.6	80	176.0	600	1112.0
5	41.0	43	109.4	81	177.8	700	1292.0
6	42.8	44	111.2	82	179.6	800	1472.0
7	44.6	45	113.0	83	181.4	900	1652.0
8	46.4	46	144.8	84	183.2	1000	1832.0

Temp (°C) = ((°F - 32) x 5)) / 9

Temp (°F) = ((9 x °C) / 5) + 32

For more technical information, consult us.

17) DERATING TEMPERATURE INFORMATION

The temperature at which the switches are used has an effect on the coil resistance. This is due to the variation of the resistivity of copper with respect to temperature. The pick up voltage also varies with respect to temperature.

Mathematical formula of the variation of coil resistance versus to the temperature is as follows:

$$R' = R\,(1 + K\,(t' - t))$$

K = Temperature coefficient (0,0038 for copper)
R = Coil resistance (ohms) at temperature t (°C)
R' = Coil resistance (ohms) at temperature t' (°C)

→ Example of calculation:

Device: SPDT Failsafe R570413000. How to calculate current at 70°C with this relay ?

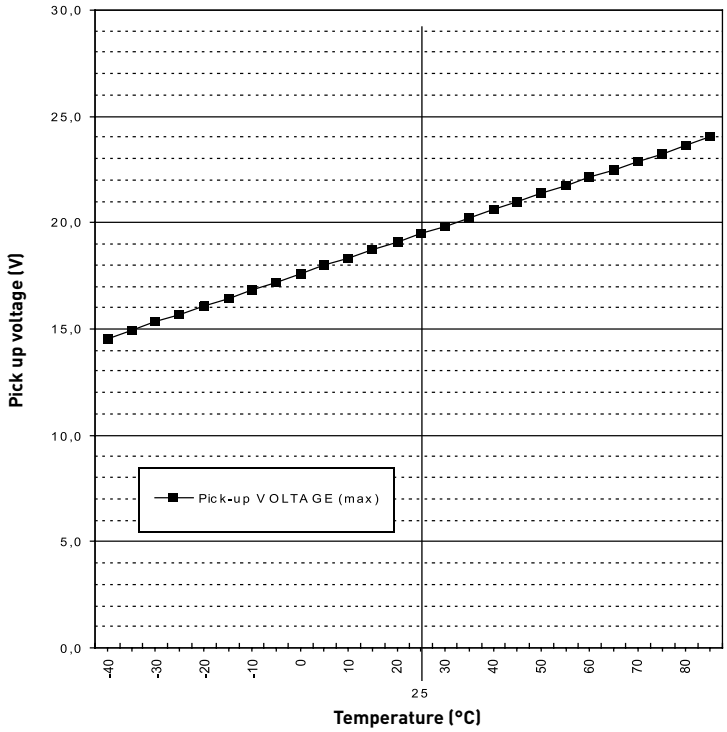
In reference with specifications as specified in the technical data sheet:
Coil resistance 275 Ohms at 25°C (R = 275, t = 25, t' = 70)
Nominal current = 102 mA at 25°C
Nominal voltage = 28 volts

New coil resistance at 70°C will be:
R' = 275 (1 + 0.0038 (70 – 25))
R' = 275 x 2,71
R' = 323 Ohms

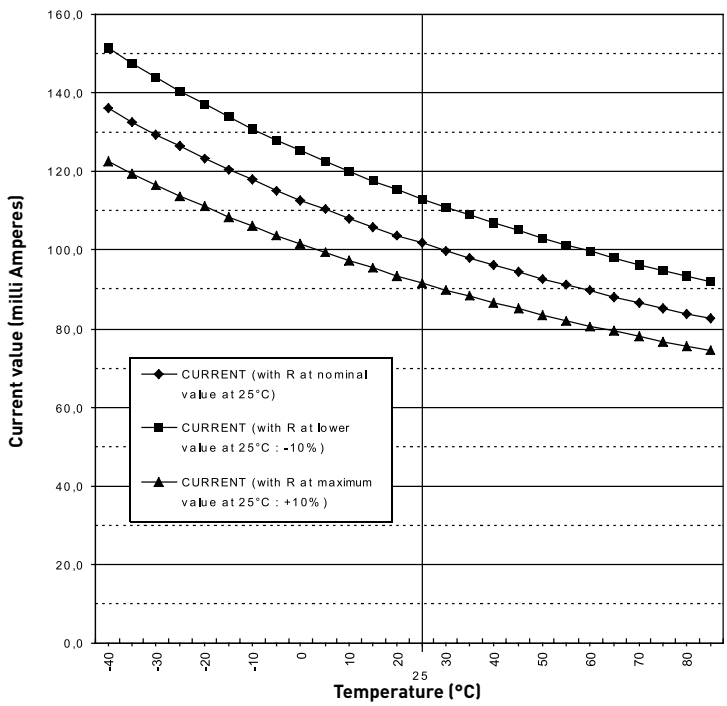
According to the Ohm law (U = R I), at 70°C:
U = R x I
I = 87 mA

The following graphs are examples of calculation for the same product R570413000 (SPDT SMA)

→ Maximum pick up voltage versus temperature



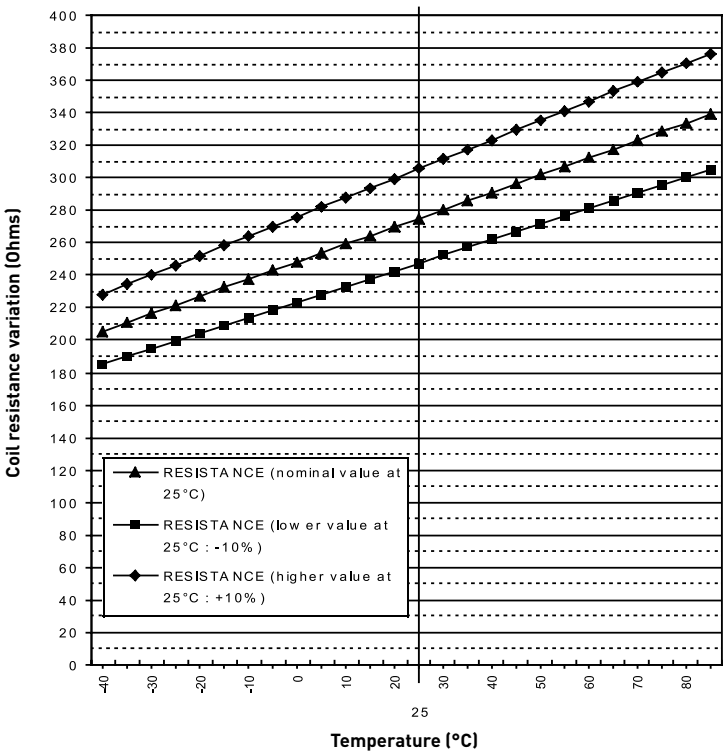
→ Current value versus voltage over temperature range



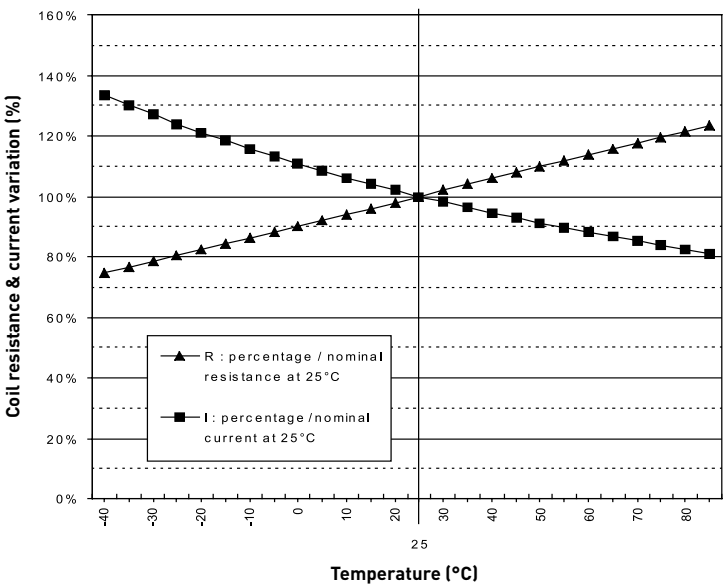
For more technical information, consult us.

TECHNICAL INFORMATION

→ Coil resistance value versus temperature



→ Maximum pick up voltage variation versus temperature



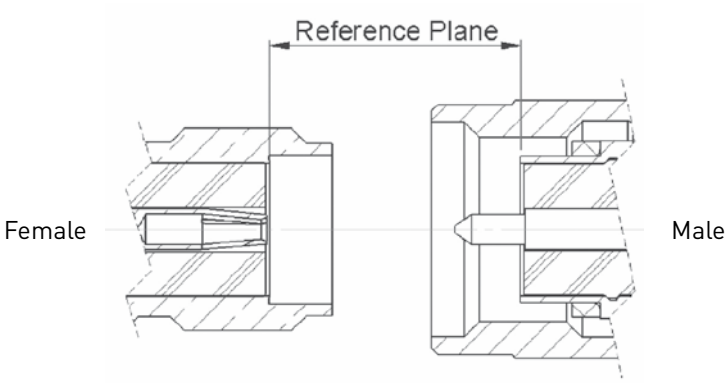
For more technical information, consult us.

18) USER HANDBOOK FOR CONNECTOR ASSEMBLY ON COAXIAL SWITCHES

How to connect RF coaxial connectors to RADIALL switches ?

To avoid irreversible damage on RF switches some precautions should be followed

A) Use only connectors with the correct interface dimensions



Appropriate torque on the connector to avoid damage on the contacts. The use of a specific tool with calibrated torque Apply the recommended torque as defined below

SMA Connectors	from 80 to 120 cm
TNC Connectors	390 N.cm

B) Connection of semi rigid cable using the center contact of the cables as pin for connecting the female connector

If the center contact is not in alignment with the female socket, the switch RF connector could be damaged.

RF connector with removable nut can assure by visual control that the center contact is correctly positioned.

Cable	Connector
.085"	**R125 052 500**
.141"	**R125 055 500**

Female contact slots

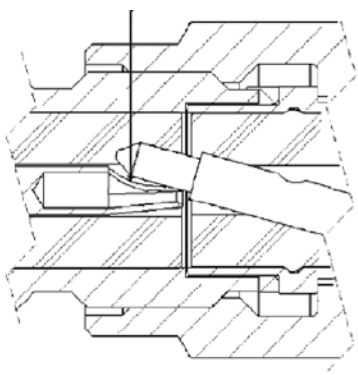


Fig A: Misaligned pin between insulator and female contacts slots

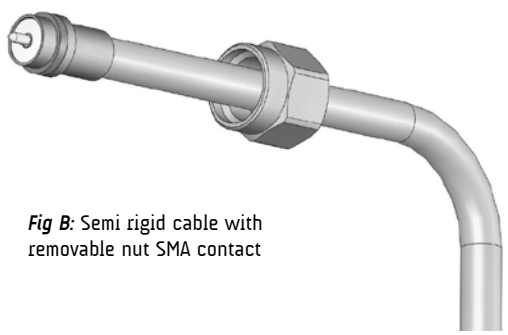


Fig B: Semi rigid cable with removable nut SMA contact

For more technical information, consult us.

SWITCHING PRODUCTS SELECTION GUIDE

How to find the right product for your application ?

Family	Type	Serie	Page	Connectors	2.5 GHz	3 GHz	6 GHz	8 GHz	12.4 GHz	18 GHz	26.5 GHz	40 GHz	50 GHz
SPDT / DP3T / DPDT	Micro relay SMT	R596	*2-2*	None	Surface Mount Technology								
	SPDT & DPDT	R570, R572 & R577	*2-12 / 2-16 / 4-2*	DIN 1.6/5.6	NEW								
		R570, R572 & R577	*2-12 / 2-16 / 4-2*	BNC									
		R570 & R572	*2-12 / 2-16*	SMB / SMC									
				Pc Board/ mini SMB									
		R570, R572 & R577	*2-12 / 2-16 / 4-2*	QMA									
				N									
				TNC	RAMSES Series								
				SMA									
				SMA 2.9									
		R570	*2-12*	2.4 mm									NEW
	SPDT Term. & DP3T	R585 serie	*3-2*	SMA	RAMSES Series							NEW	
	SPDT & SPDT Term.	R595	*2-28 / 3-12*	SMA	High performance and 0.03 dB on the insertion loss/ **PLATINIUM Series**								
	DPDT	R513 serie	*4-14*	SMA/SMA 2.9	High performance and 0.03 dB on the insertion loss/ **TITANIUM Series**								NEW
	DPDT	R593 serie	*4-23*	SMA/SMA 2.9	High performance and 0.03 dB on the insertion loss/ **PLATINIUM Series**								
SPnT	SPnT 3 to 6 ways												
		R573	*5-8*	DIN 1.6/5.6									
		R573	*5-22*	BNC									
		R573	*5-22*	TNC									
		R573	*5-8*	QMA									
		R573 & R574	*5-22*	N	RAMSES Series								
		R573 & R574	*5-8*	SMA									
		R573 & R574	*5-8*	SMA 2.9									
	SP4T & SP6T	R513 & R514	*5-38*	SMA/SMA 2.9	High performance and 0.03 dB on the insertion loss/ **TITANIUM Series**								
	SP4T & SP6T	R594	*5-46*	SMA/SMA 2.9	High performance and 0.03 dB on the insertion loss/ **PLATINIUM Series**								
	SP4T & SP6T	R591	*5-2*	QMA	Small size								
			5-2	SMA	and long life/Subminiature RAMSES serie							NEW	
	SPnT 7 to 8 ways	R573 & R574	*5-22*	N	RAMSES Series								
		R573 & R574	*5-8*	SMA									
	SPnT 9 to 10 ways	R573 & R574	*5-22*	N	RAMSES Series								
		R573 & R574	*5-8*	SMA									
	SPnT 11 to 12 ways		*5-22*	N	RAMSES Series								
			5-8	SMA									
					2.5 GHz	3 GHz	6 GHz	8 GHz	12.4 GHz	18 GHz	26.5 GHz	40 GHz	50 GHz

For more technical information, consult us.

SPDT SECTION

SECTION 2

Pages

SPDT PRODUCTS SELECTION GUIDE

Quick access to the right page:

	Frequency								
Connector	DC - 2.5	DC - 3	DC - 6	DC - 8	DC - 12.4	DC - 18	DC - 26.5	DC - 40	DC - 50
DIN1.6/5.6	2-12 / 2-16								
SMB/SMC		2-12 / 2-16							
Mini SMB		2-12 / 2-16							
BNC		2-20							
QMA			2-12 / 2-16						
SMT			2-20						
PC Board				2-12					
N					2-20				
TNC						2-20			
SMA							2-12 / 2-16		
SMA2.9								2-12 / 2-16	
2.4mm									2-12 / 2-16

For more detailed technical information please consult Radiall customer support.

SMT POWER MICRO SPDT with 10 GHz capabilities

SURFACE MOUNT TECHNOLOGY

Patent pending

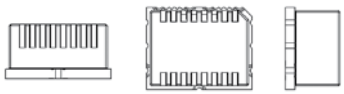
RoHS • WEEE • COMPLIANT

An innovative and original «micro-mechanical» design allows the R596 SMT micro-relay to bring together the excellent reliability, RF and repeatability characteristics of coaxial switches with the miniature size and low cost implementation of surface mount components.

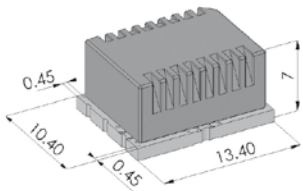
Very low return loss and insertion loss allow this relay to be used in power applications, as well as in typical SMT relay applications such as RF attenuators, RF matrices, spectrum analysers, and telecommunications.

Failsafe models are offered in two RF configurations (direct and inverted): The association of these two products on the same PC board enables the product to perform the «BYPASS» function. (For Bypass mounting, further information is available on page 2-8).

ACTUAL SIZE



TYPICAL OUTLINE DRAWING
(All dimensions in mm)



Example of P/N:
R596813100 is a SPDT SMT 8 GHz, 24 Vdc, failsafe, standard packaging.

PART NUMBER SELECTION

R 596 . . . 10 .

Frequency range:
3: DC – 3 GHz
8: DC – 8 GHz

Type:
1: Failsafe
3: Latching, 2 coils
9: Failsafe, inverted RF path (1)

Actuator Voltage:
2: 12 Vdc
3: 24 Vdc

Packaging style (2):
0: Standard packaging
2: Tape and reel of 200 relays (2)
5: Tape and reel of 500 relays (2)
9: Tape without reel (2) (4)
T: Soldered on a connectorized test fixture (2) (3)

(1): To be associated with a failsafe model, so as to achieve the "BYPASS" function (see application details on page 2-8)
(2): Non standard packaging symbols (2, 5, 9 or T) are not marked on the relay
(3): See details about test fixture dimensions on page 2-4
(4): Tape delivered without reel, available for all specific quantities up to 200 pieces

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

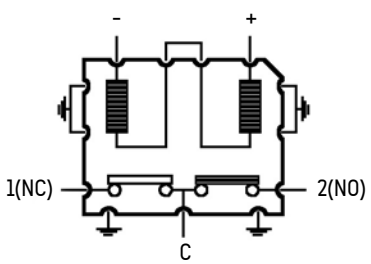
SMT POWER MICRO SPDT with 10 GHz capabilities

GENERAL SPECIFICATIONS

Operating mode			Failsafe (types 1 and 9)		Latching (type 3)	
Nominal operating voltage (across temperature range)		Vdc	12 (10.2 to 13)	24 (20.5 to 30)	12 (10.2 to 13)	24 (20.5 to 30)
Coil resistance at 23°C (+/-10%)		Ohms	330	1130	205	865
Operating current at 23°C		mA	36	25	58	32
RF and command ports			½ hole gold plated, Infrared reflow, forced air oven or hand soldering (Compatible with "lead free" soldering processes)			
Switching time at nominal voltage	Making contacts		Max 4ms (typical 1.8ms), including contact bounce time			
	Breaking contacts		Max 1ms (typical 0.5ms)			
Life	- Cold switching (max 120 cycles/min)		2 million cycles			
	- Hot switching (max 20 cycles/min)		500.000 cycles (1W, impedance 50Ω, V.S.W.R. < 1.25)			
Insulation			Dielectric test voltage		300 Vrms	
			Insulation resistance at 500Vdc		> 100 MOhms	
Environmental protection			"LEAD FREE" construction – Waterproof (acc. To IEC 60529 / IP67)			
Mass			< 2g			
Operating temperature range (with no icing nor condensation)		°C	Failsafe		Latching	
			-25 to +85 (5)		-40 to +85	
Storage temperature range		°C	-55 to +85			
Sine vibration (MIL STD 202, Method 204D)			- Condition D: 10-2000 Hz, 20g		operating	
			- Condition G: 10-2000 Hz, 30g		non operating	
Random vibration (MIL STD 202, Method 214A, Profile I)			- Condition F: 50-2000 Hz, 20.71g		operating	
			- Condition H: 50-2000 Hz, 29.28g		non operating	
Shocks (According to MIL STD 202, Method 213B, Cond. C)			100g / 6 ms, ½ sine		operating	

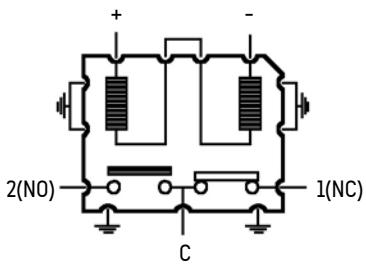
(5): Failsafe models may be used down to -40°C, but if coil remains permanently supplied at nominal voltage, the holding current value must be reduced by 45% to 55% so as to avoid internal condensation. (for more details, see RADIALL application note AN-R596-51 on page 2-10).

PIN IDENTIFICATION (TOP VIEW)



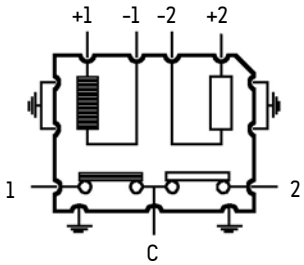
Failsafe model (type 1)

Voltage	RF continuity
De-energized	C <--> 1(NC)
Energized	C <--> 2(NO)



Inverted failsafe model for bypass applications (type 9)

Voltage	RF continuity
De-energized	C <--> 1(NC)
Energized	C <--> 2(NO)



Latching model (type 3)

Voltage	RF continuity
-1 +1	C <--> 1
-2 +2	C <--> 2

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

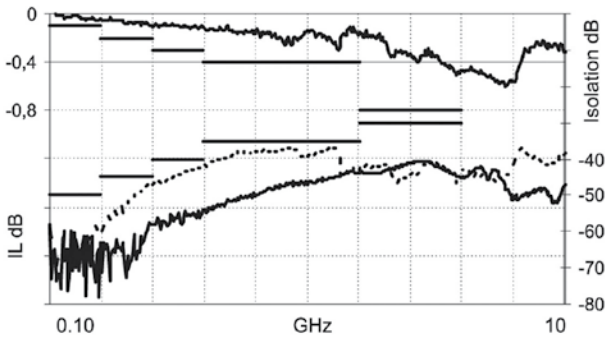
SMT POWER MICRO SPDT with 10 GHz capabilities

RF PERFORMANCES (S parameters available on request)

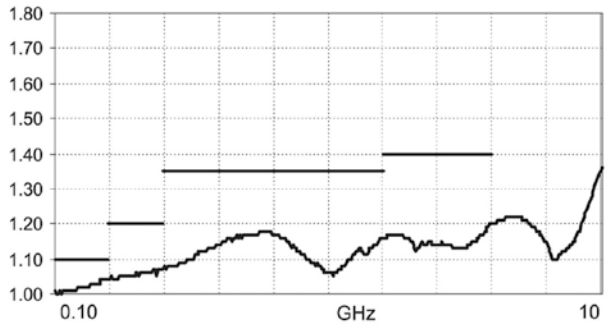
Frequency Range GHz		V.S.W.R. (max)	Insertion Loss (max) dB	Isolation (min) dB		Average power W (see page 2-5)		Third order Inter modulation	Impedance Ohms
				switch alone	switch + board layout (6)	cold switching	hot switching		
DC – 3 DC – 8	DC - 1	1.10	0.10	50	50	400	50	-120 dBc typical (2 carriers 20W)	50
	1 - 2	1.20	0.20	45	40	280	50		
	2 - 3	1.35	0.30	40	30	175	40		
	3 - 6	1.35	0.40	35	30	50	25		
	6 - 8	1.40	0.80	30	30	35	5		

TYPICAL RF PERFORMANCE

Insertion Loss and Isolation



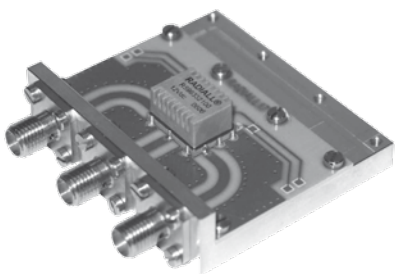
V.S.W.R.

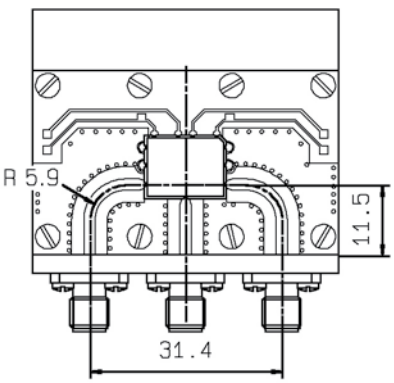


(6): taking account of the reduction of isolation due to coupling between PCB microstrip lines (see isolation dotted curve above and measurement method below)

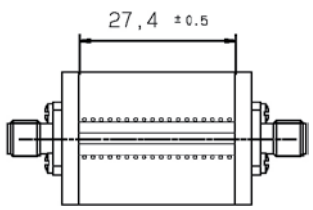
MEASUREMENT METHOD

Relay soldered on text fixture (7)





Calibration board



Inputs/Outputs of the calibration board and test fixture are equipped with SMA type receptacle connectors, RADIALL part number R125 510 000. The length of the RF tracks are the same on the calibration board and the test fixture circuits. The insertion loss of the relay itself is calculated by subtracting the insertion loss of the "calibration board" to the insertion loss of the "relay welded on the test fixture".

(7): Relay soldered on Test Fixture available. To order, please use the suffix « T » (part number R596 - - - - - T), as explained in page 2-2.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

www.radiall.com

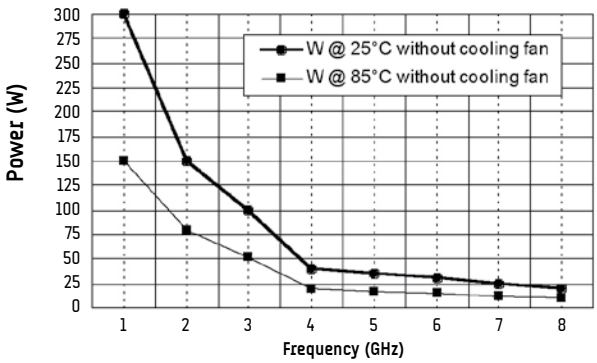
RF POWER RATING For COLD SWITCHING USE

(Impedance 50 Ohms, V.S.W.R. < 1.25)

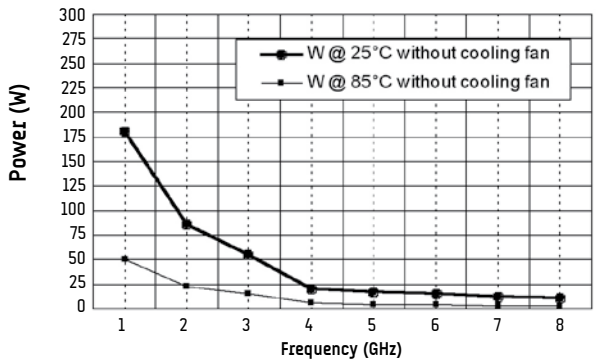
Power level depends on environmental conditions:

- R596 series have been designed to be used without a cooling fan even for high power applications. However, the power capability may be still improved by using the appropriate cooling fan.
- For failsafe models used with coil permanently supplied (N/O position), the same power level as latching models may be applied: see on application note N° AN-R596-51 on page 2-10, how to implement a "low holding current" function on your PC board, so as to avoid internal overheating and increase the RF power level.

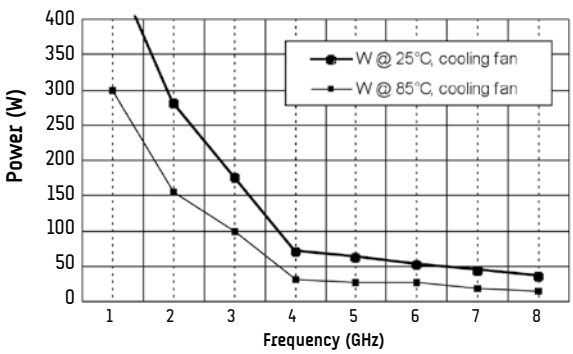
NO COOLING FAN - LATCHING (all models)
FAILSAFE: NC pos. & NO with low holding voltage



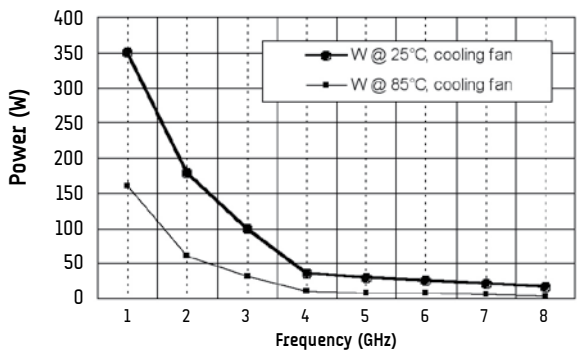
NO COOLING FAN
FAILSAFE: NO pos. Supplied at nominal voltage



WITH COOLING FAN - LATCHING (all models)
FAILSAFE: NC pos. & NO with low holding voltage



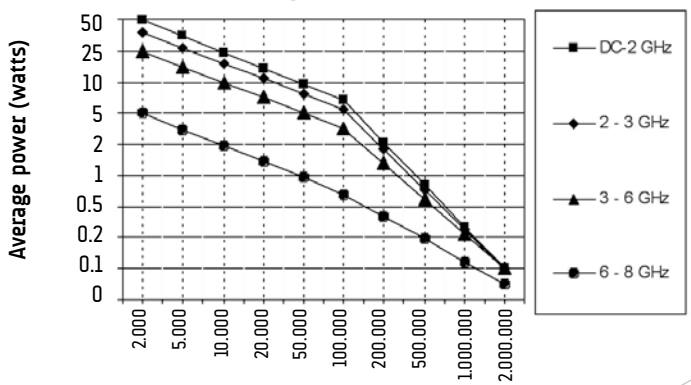
WITH COOLING FAN
FAILSAFE: NO pos. Supplied at nominal voltage



LIFE DERATING CURVE FOR HOT SWITCHING USE

(Impedance 50 Ohms, V.S.W.R. < 1.25) General Specifications

Impedance 50Ω
V.S.W.R. < 1.25
max switching frequency:
30 cycles per mn

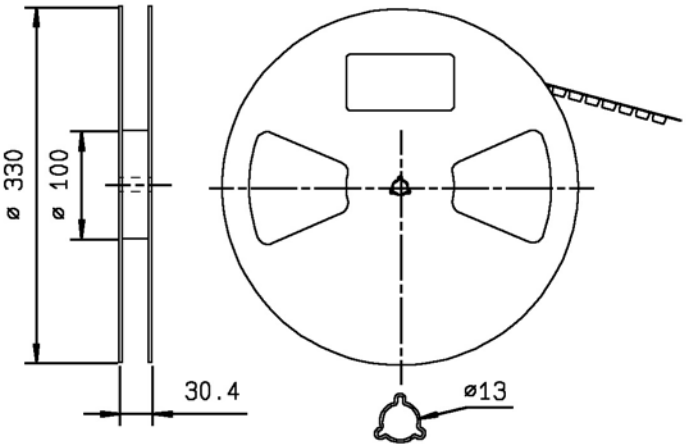


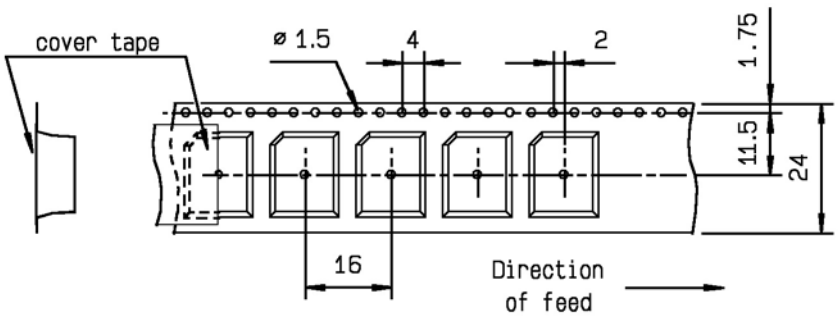
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

RELAY PACKAGING

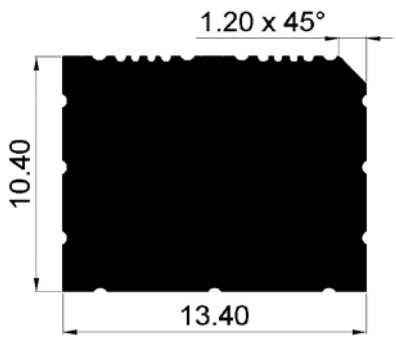
ACCORDING TO IEC 286-3 STANDARD

MATERIALS:
Reel: polyester
Carrier tape: antistatic PETG (polyester)
Cover tape: polyester

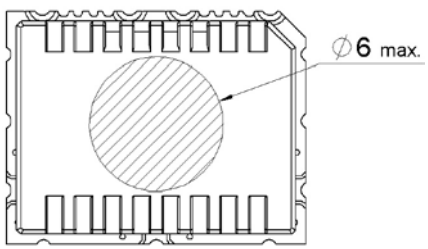




Video shadow of the relay



Aspiration Aera



To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

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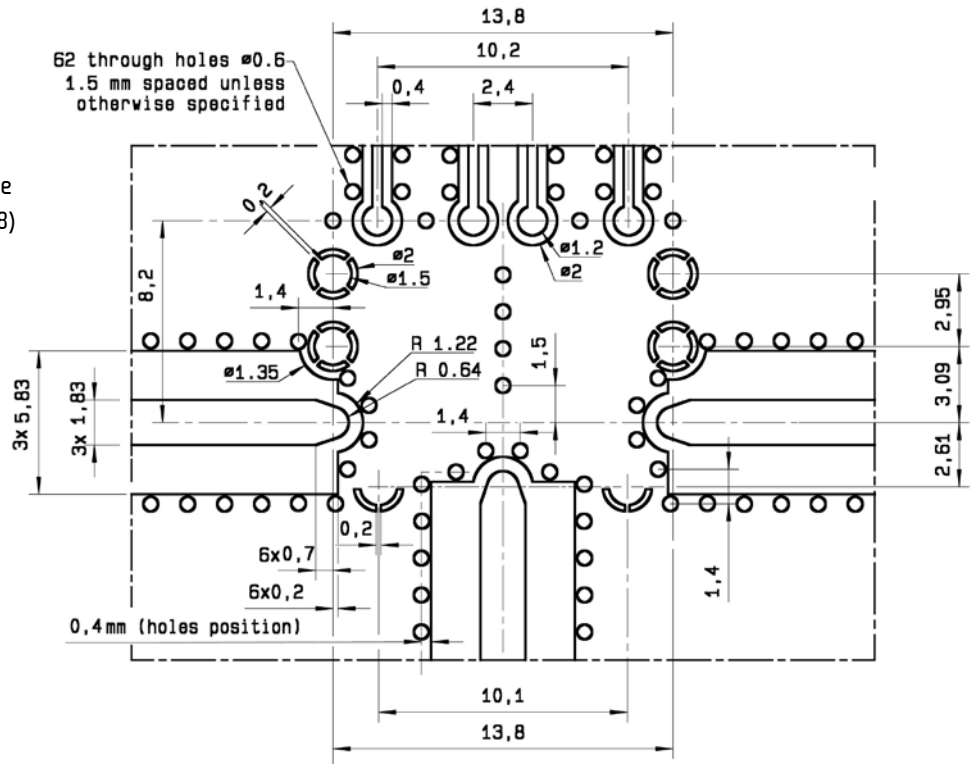
PC BOARD MOUNTING

Board layout

DXF or GERBER format file available upon request (8)



Subtrate Types

Recommended substrates are **ROGERS RO4003** or **ARLON 25N**,

- **Mounting face**: Thickness 0.813 mm Cu double side 17.5µm. Width of track 1.83 mm
  Others substrates: **RO4350**, thickness 0.813 mm Cu double side 17.5µm. Width of track 1.80 mm
  25FR, thickness 0.813 mm Cu double side 17.5µm. Width of track 1.76 mm
- **Opposite face**: Plating all over the face.

Total thickness of the tracks (copper over thickness + plating): 40µm.

Other substrates may be used (for instance standard FR4), if provided with adequate modification of the tracks width.

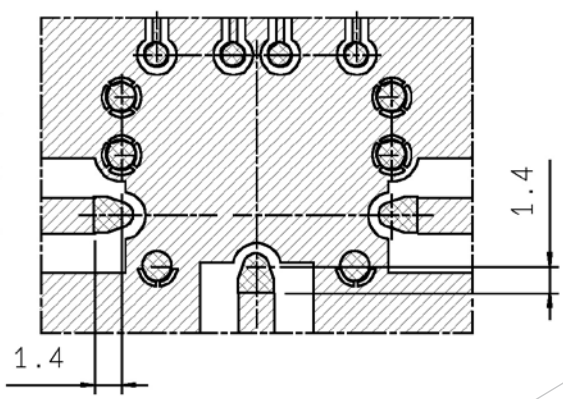
Relay soldering pattern

DXF format file available upon request (8)

(8): Please visit our customer support and / or contact us by e-mail.

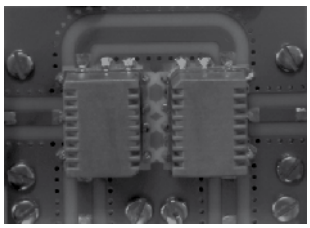
Pattern

Area for solder paste



To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

BYPASS APPLICATION: FAILSAFE MICRO-RELAY TYPICAL IMPLANTATION

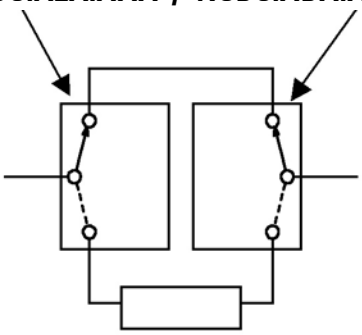


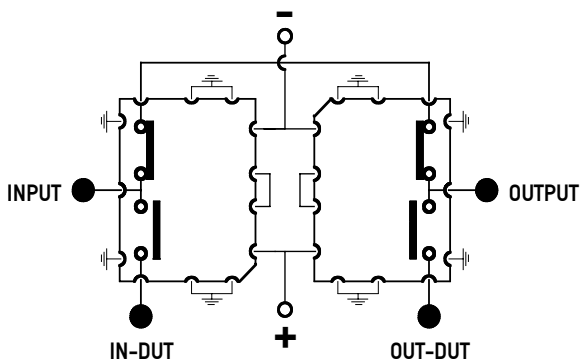
ACTUAL SIZE

SPDT relays (Single Pole Double Throw) can be used to achieve a Bypass switch function. For SMT applications, R596 series, relays are available in two failsafe versions, standard and inverted, to provide symmetric RF ports implantation possibility. The "side by side" implementation of these two versions on a PCB effectively produces the «BYPASS» function: the package size is reduced and interconnecting tracks are shortened. As required to protect the receiver for transmit/receive applications, and depending on the distance between the two relays, this configuration can achieve high isolation levels, up to 80 dB @1GHz, 70 dB @ 2 GHz, and 60 dB @ 6GHz.

BYPASS TYPICAL IMPLANTATION & PIN IDENTIFICATION (TOP VIEW)

R596.X1X.XXX / R596.X9X.XXX

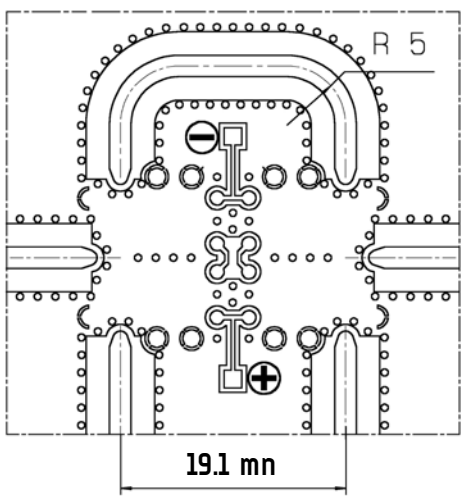




Voltage	RF continuity
De-energized	INPUT <--> OUTPUT (direct line)
Energized	INPUT <--> IN-DUT / OUT-DUT <--> OUTPUT

BYPASS PC BOARD MOUNTING

Example of Board layout for BYPASS application.



(See detailed board layout on page 2-7)

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

www.radiall.com

RECOMMENDED SOLDERING PROCEDURE

A-Soldering procedure using automatic pick and place equipment

1-Solder paste:

R596 series are « Lead Free », and Lead Free Sn-Ag3.5-Cu0.7 solder cream may be used as well as standard Sn63-Pb35-Ag2. RADIALL recommends using a « no clean - low residue » solder cream (5% solid residue of flux quantity) that will permit the elimination of the cleaning operation step after soldering. Note: Due to the gold plating of the switch PCB interface, it is important to use a paste made with silver. This will help in avoiding formation of intermetallics as part of the solder joint.

2-Solder paste deposition:

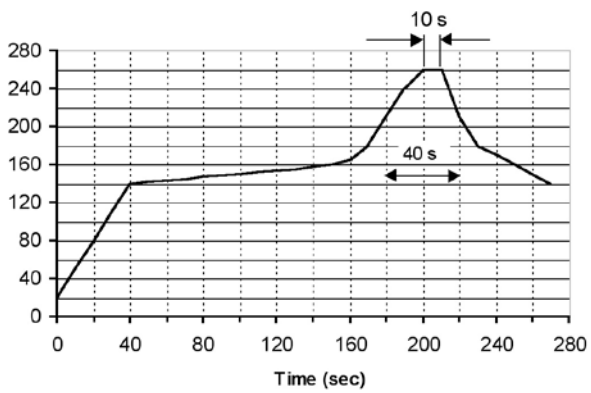
Solder cream may be applied on the board with screen printing or dispenser technologies. For either method, the solder paste must be coated to appropriate thickness and shapes to achieve good solder wetting. Please optically verify that the edges of the zone are clean and without contaminates, and that the PCB zoned areas have not oxydated. The design of the mounting pads and the stenciling area are given on page 2-7, for a thickness of the silk-screen printing of 0.15 mm (0.006 ").

3-Placement of the component:

For small lightweight components such as chip components, a self-alignment effect can be expected if small placement errors exist. However, this effect is not as expected for relays components and they require a accurate positioning on their soldering pads, typically +/- 0.1mm (+/-0.004"). Place the relay onto the PCB with automatic pick and place equipment. Various types of suction can be used. RADIALL does not recommend using adhesive agents on the component or on the PCB.

4-Soldering: infra-red process:

Please follow the RADIALL recommended temperature profile for infra-red reflow or forced air convection:



Higher temperature (>260°C) and longer process duration would damage permanently the switches.

5-Cleaning procedure:

On miniature relays, high frequency cleaning may cause the contacts to stick. If cleaning is needed, please avoid ultrasonic cleaning and use alcohol based cleaning solutions.

In-line cleaning process, spraying, immersion, especially under temperature, may cause a risk of degradation of internal contacts.

6-Quality check:

Verify by visual inspection that the component is centered on the mounting pads. Solder joints: verify by visual inspection that the formation of meniscus on the pads are proper, and have a capilarity amount upper the third of the height.

B–Soldering procedure by manual operation

1-Solder paste and flux deposition:

Refer to procedure A – 1

Deposite a thin layer of flux on mounting zone. Allow the flux to evaporate a few seconds before applying the solder paste, in order to avoid dilution of the paste.

2-Solder paste deposition:

RADIALL recommends depositing a small amount of solder paste on the mounting zone area by syringe. Be careful, not to apply solder paste outside of the zone area.

3-Placement of the component:

During manipulation, avoid contaminating the lead surfaces by contact with fingers. Place the component on the mounting zone by pressing on the top of the relay lid.

4-Hand soldering:

Iron wattage 30 to 60 W. Tip temperature 280 to 300°C for max. 5 seconds To keep good RF characteristics above 3GHz, it is important to solder RF ports first, and apply pressure on the relay lid during all the soldering stage, so as to reduce the air gap between the PC board and the relay.

5-Cleaning procedure:

Refer to procedure A – 5.

6-Quality check:

Verify by visual inspection that component is centred on the mounting pads.

Solder joints: verify by visual inspection that the formation of meniscus on the RF pads are proper, and have a capillarity amount higher than one third of the height.

APPLICATION NOTE AN-R596-051

Subject: How to use failsafe R596 micro-relays over all the guaranteed temperature range, in icing or condensation environmental conditions.

RF and electrical characteristics are guaranteed on all failsafe R596 switches over their operating temperature range (-25°C to +85°C), and under "no icing nor condensation" conditions.

In extreme applications, with failsafe models used at low temperature, continuously in the N/O position (coil permanently supplied), N/C contact failures may occur, due to the high gradient of temperature between the coil (heated by the permanent power 500mW) and the RF paths.

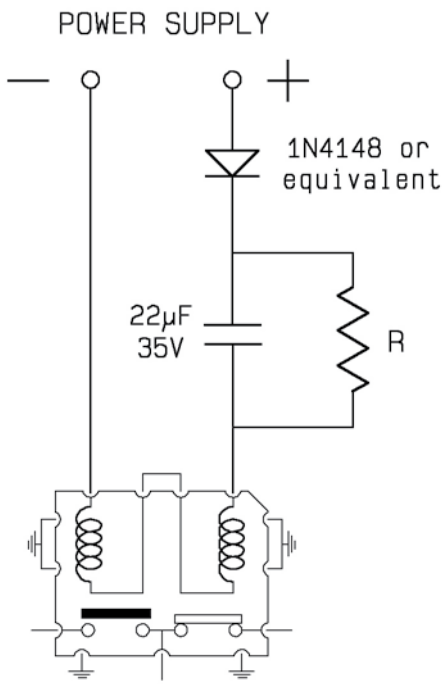
N/O contact resistance remains satisfactory, but condensation deposits ice on the open contact N/C, and when power is cut, the N/C position is not correctly established.

Failsafe models can be driven continuously energized from -40°C, if the coil is not permanently supplied at nominal voltage, to avoid heating and internal condensation: once the relay has switched, the operating voltage must be reduced by 50% +/-5%. This low holding voltage is possible on R596 series, as it is enough to maintain the switch in "energized" position (for instance 5.4V to 6.6V for a 12V model). Furthermore it allows the user to save energy, by combining the advantages of latching and failsafe models.

This "holding current" function can be achieved by the implementation of a simple electronic drive on the command PC Board (1 resistor, 1 diode and 1 capacitor), for 12V and 24V models. A typical circuit design is shown on the schematic below. A few milliseconds after switching, the current is divided by two, and the absorbed power is divided by four (i.e. 6V and 110mW for a 12V model).

To reduce the voltage by 50%,
the value of resistance R must be equal
to the total resistance of the switch coil:

- 12V models: 330 Ohms 1/4W
- 24V models: 1200 Ohms 1/4W



R596 FAILSAFE RELAY

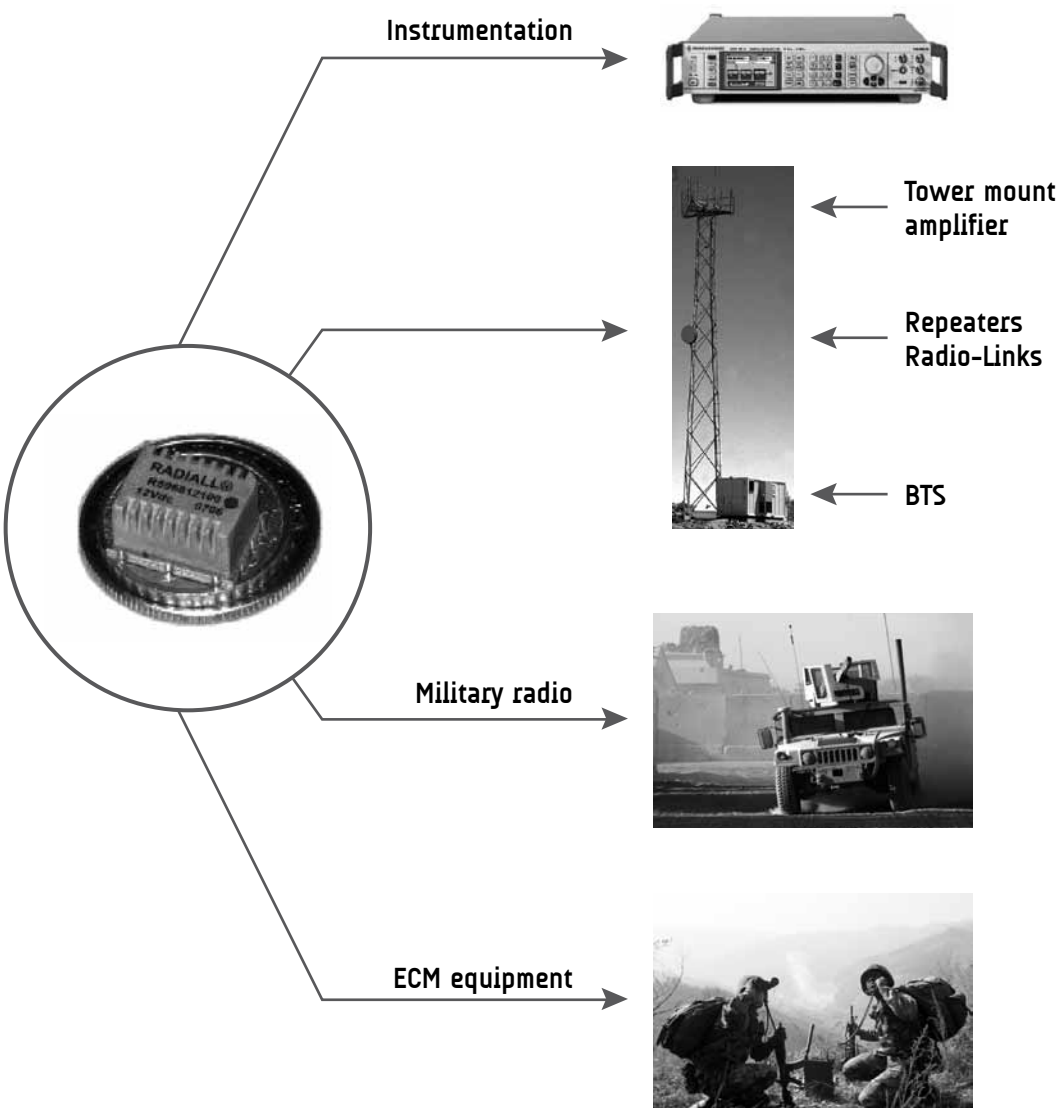
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

www.radiall.com

EXAMPLE OF SMT APPLICATIONS

The SMT Series offers a large range of products which can be used in many applications such as:
- Tower mount amplifiers
- Instrumentation
- Military radios
- ECM equipment
- BTS
- Radio-Links
- Repeaters

These products offer the same RF Board and soldering process as all RF components but with a reduced weight and size. They are also specified for all market specifications.



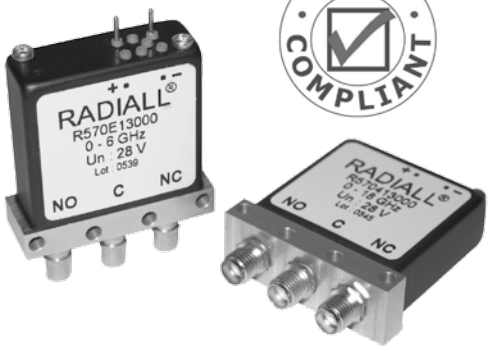
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

www.radiall.com

SPDT up to 50 GHz

Pc Board - SMA - SMA2.9 - 2.4mm - QMA - SMC - SMB - mini SMB - DIN 1.6/5.6

COAXIAL SPDT RELAYS



Radiall's RAMSES SPDT switches offer excellent reliability, high performance and operating frequencies from DC to 50 GHz. With RADIALL's RAMSES Concept (which provides for a life span of 10 million cycles) all options are available to respond to customer needs.

These relays are dedicated to all market applications including: Military, Instrumentation and Telecommunications.

Example of P/N:
R570413100 is a SPDT SMA 18 GHz, failsafe, 28 Vdc, with TTL driver, without option, solder pins.

PART NUMBER SELECTION

R 570 . . . . . .

Frequency range:
3: SMA up to 3 GHz
B: SMB up to 3 GHz
C: SMC up to 3 GHz
E: QMA up to 6 GHz (4)
4: SMA up to 18 GHz
F: SMA up to 26.5 GHz
8: SMA2.9 up to 40 GHz (5)
J: 2.4mm up to 50 GHz
9: DIN 1.6/5.6 up to 2.5 GHz
H: mini SMB up to 3 GHz (6)
A: Pc board mount up to 3 GHz (6)

Type:
1: Failsafe
2: Failsafe + I.C.
3: Latching
4: Latching + I.C.
5: Latching + S.C.O. (1)
6: Latching + S.C.O. + I.C. (1)

Actuator Voltage:
2: 12 Vdc
3: 28 Vdc

TTL Option:
0: Without TTL driver
1: With TTL driver (high level) (1) (2)

Options:
0: Without option
1: Positive common (2) (3)
3: With suppression diodes (1)
4: With suppression diodes and positive common (2) (3)

Actuator voltage:
0: Solder pins

I.C.: Indicator contact - S.C.O.: Self Cut-Off
(1): Suppression diodes are already included in Self Cut-OFF & TTL option
(2): Polarity is not relevant to application for switches with TTL driver
(3): Positive common shall be specified only with type 3, 4, 5 & 6 because failsafe switches can be used with both polarities
(6): Available only upon request

(4): The QLF tradermark (Quick Lock Formula®) standard applies to QMA and QN series and guaranties the full intermateability between suppliers using this tradermark. Using QLF certified connectors also guarantees the specified level of RF performances.
(5): Connector SMA2.9 is equivalent to "K connector®", registered trademark of Anritsu.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SPDT up to 50 GHz

Pc Board - SMA - SMA2.9 - 2.4mm - QMA - SMC - SMB - mini SMB - DIN 1.6/5.6

GENERAL SPECIFICATIONS

Operating mode			Failsafe		Latching	
Nominal operating voltage (across temperature range)		Vdc	12 (10.2 to 13)	28 (24 to 30)	12 (10.2 to 13)	28 (24 to 30)
Coil resistance at 23°C (+/-10%)		Ω	47.5	275	58	350
Operating current at 23°C		mA	250	102	210	80
Average power			See Power Rating Chart **page 1-16**			
TTL Input	High level		2.5 to 5.5 Volts		800µA max 5.5 Volts	
	Low level		0 to 0.8 Volts		20µA max 0.8 Volts	
Indicator rating			1 W / 30 V / 100mA			
Switching time		ms	10			
Life	SMA - SMA2.9 - QMA		10 million cycles			
	DIN 1.6/5.6 - Pc Board		5 million cycles			
	SMB - SMC - mini SMB		2.5 million cycles			
	2.4mm		2 million cycles			
Connectors			SMA - SMA2.9 - QMA - DIN 1.6/5.6 - SMB - SMC Mini SMB - Pc Board - 2.4 mm			
Operating temperature range	DIN 1.6/5.6 - SMB - SMC - mini SMB - 2.4mm		-25°C to +70°C			
	SMA - SMA2.9 - QMA - Pc Board		-40°C to +85°C			
Storage temperature range	DIN 1.6/5.6 - SMB - SMC - mini SMB - 2.4mm		-40°C to +85°C			
	SMA - SMA2.9 - QMA - Pc Board		-55°C to +85°C			
Vibration (MIL STD 202, Method 204D, cond.D)			10-2000 Hz, 20g		Operating	
Shock (MIL STD 202, Method 213B, cond.C)			100g / 6ms, ½ sine		Operating	

RF PERFORMANCES

Connectors	Frequency Range GHz		V.S.W.R. (max)	Insertion Loss (max) dB	Isolation (min) dB	Impedance Ohms
DIN 1.6/5.6	DC - 2.5	DC - 1	1.20	0.20	80	75
		1 - 2.5	1.30	0.30	70	
Mini SMB	DC - 3	DC - 1	1.20	0.20	80	
		1 - 3	1.30	0.30	70	
SMB - SMC	DC - 3	DC - 3	1.20	0.20	80	50
QMA	DC - 6	DC - 3	1.20	0.20	80	50
		3 - 6	1.30	0.30	70	
SMA	DC - 3 DC - 18 DC - 26.5	DC - 3	1.20	0.20	80	50
		3 - 8	1.30	0.30	70	
		8 - 12.4	1.40	0.40	60	
		12.4 - 18	1.50	0.50	60	
		18 - 26.5	1.70	0.70	55	
SMA 2.9	DC - 40	DC - 6	1.30	0.30	70	50
		6 - 12.4	1.40	0.40	60	
		12.4 - 18	1.50	0.50	60	
		18 - 26.5	1.70	0.70	55	
		26.5 - 40	1.90	0.80	50	
PC Board	DC - 3	DC - 3	1.20	0.20	80	50
2.4mm	DC - 50	DC - 6	1.30	0.30	70	50
		6 - 12.4	1.40	0.40	60	
		12.4 - 18	1.50	0.50	60	
		18 - 26.5	1.70	0.70	55	
		26.5 - 40	1.90	0.80	50	
		40 - 50	1.90	1.10	50	

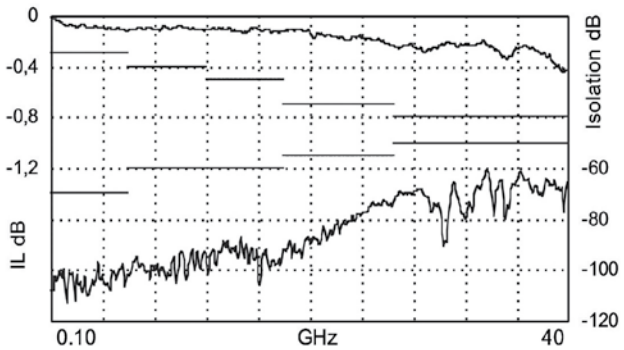
See page 2-14, 2-18 and 2-19 for typical RF performances

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

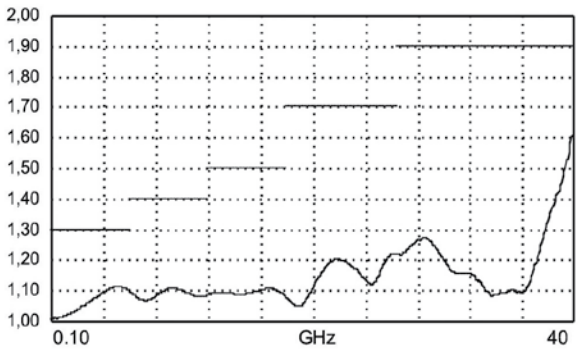
R570 AND R572 TYPICAL RF PERFORMANCES

Example: SPDT SMA2.9 up to 40 GHz

Insertion Loss and Isolation

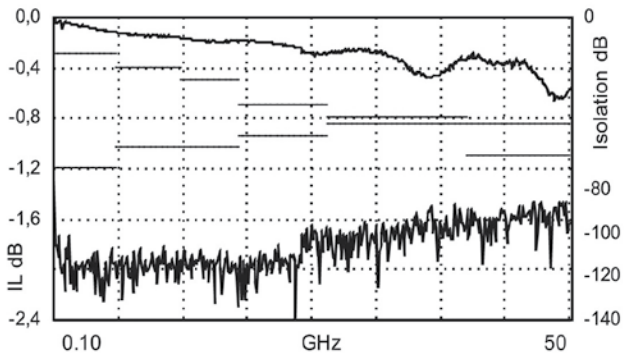


V.S.W.R.

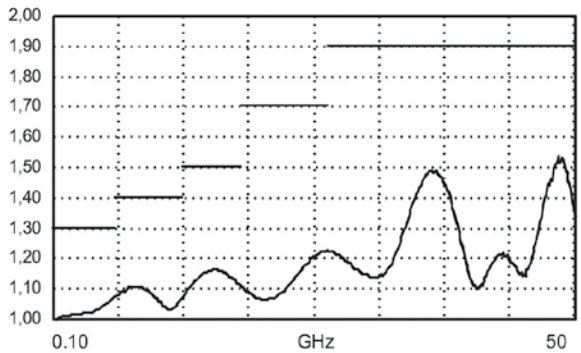


Example: SPDT 2.4mm up to 50 GHz

Insertion Loss and Isolation

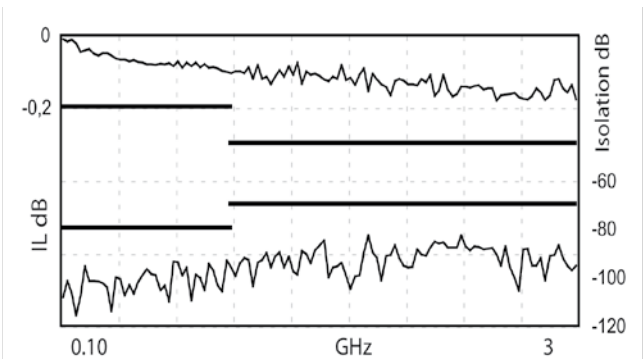


V.S.W.R.

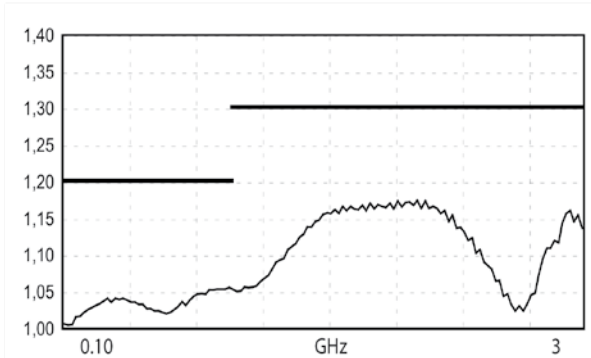


Example: SPDT mini SMB up to 3 GHz

Insertion Loss and Isolation



V.S.W.R.



Note: see page 2-18 for other connectors.

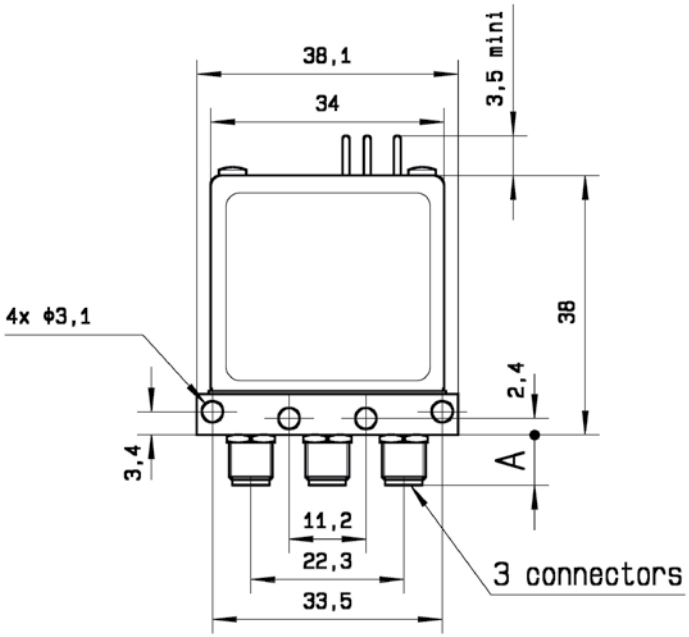
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

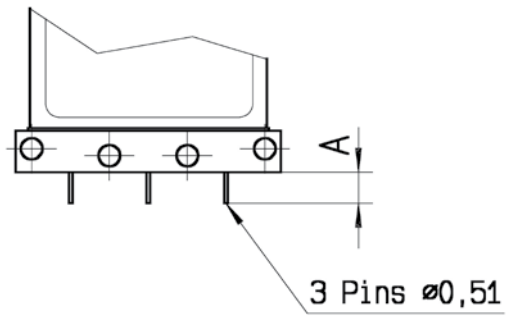
SPDT up to 50 GHz

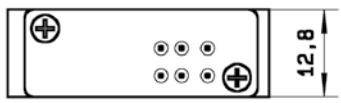
Pc Board - SMA - SMA2.9 - 2.4mm - QMA - SMC - SMB - mini SMB - DIN 1.6/5.6

TYPICAL OUTLINE DRAWING

Connectors	A max (mm)
SMA	7.4
SMA2.9 & 2.4mm	6.3
SMB - SMC	9.3
QMA	10.8
Mini SMB	7.5
DIN 1.6/5.6	11.5
Pc Board	4.5





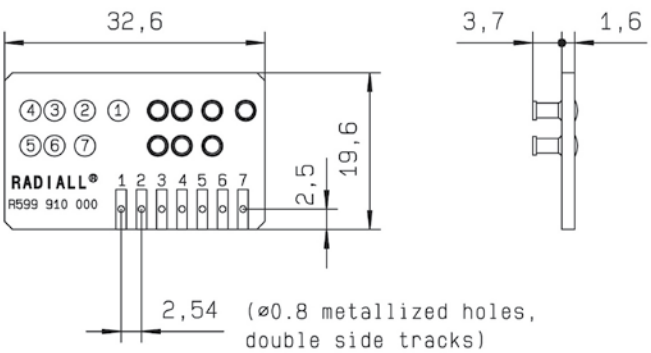


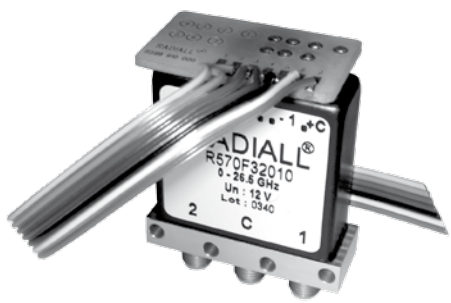
See page 2-27 for pin identification.

ACCESSORIES

A printed circuit board interface connector (ordered separately) has been designed for easy mounting on terminals.

For SPDT model R570 series => Radiall part number: **R599 910 000**





To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SPDT up to 50 GHz: Low Consumption & Reduced Size

SMA - SMA2.9 - 2.4mm - QMA - SMC - SMB - mini SMB - DIN 1.6/5.6

RADIALL's RAMSES R572 SERIES are ideal for RF & Microwaves systems where low current consumption, reduced size, high performance and high reliability are required. Other options are also available as shown on this page.

These relays are perfect for all market applications including: Industrial, Instrumentation, Defense and Telecommunications as well.

Example of P/N:
R572432010 is a SPDT SMA 18 GHz, latching, 12 Vdc, positive common, solder pins.

PART NUMBER SELECTION

R 572 . . . 0 . 0

Frequency range:
3: SMA up to 3 GHz
B: SMB up to 3 GHz
C: SMC up to 3 GHz
E: QMA up to 6 GHz (3)
4: SMA up to 18 GHz
F: SMA up to 26.5 GHz
8: SMA2.9 up to 40 GHz (4)
J: 2.4mm up to 50 GHz
9: DIN 1.6/5.6 up to 2.5 GHz
H: mini SMB up to 3 GHz (2)

Type:
1: Failsafe
3: Latching

Options:
0: Without option
1: Positive common (1)

Actuator Voltage:
2: 12 Vdc
3: 28 Vdc

(1): Positive common shall be specified only with type 3 because failsafe switches can be used with both polarities.
(2): Available only upon request

(3): The QLF tradermark (Quick Lock Formula®) standard applies to QMA and QN series and guaranties the full intermateability between suppliers using this tradermark. Using QLF certified connectors also guarantees the specified level of RF performances
(4): Connector SMA2.9 is equivalent to "K connector®", registered trademark of Anritsu.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SPDT up to 50 GHz: Low Consumption & Reduced Size
SMA - SMA2.9 - 2.4mm - QMA - SMC - SMB - mini SMB - DIN 1.6/5.6

GENERAL SPECIFICATIONS

Operating mode			Failsafe		Latching	
Nominal operating voltage (across temperature range)		Vdc	12 (10.2 to 13)	28 (24 to 30)	12 (10.2 to 13)	28 (24 to 30)
Coil resistance at 23°C (+/-10%)		Ω	75	450	58	350
Operating current at 23°C		mA	160	62	210	80
Average power			See Power Rating Chart **page 1-16**			
Switching time		ms	10			
Life			2.5 million cycles (2 million cycles for connectors 2.4 mm)			
Connectors			SMA - SMA2.9 - QMA - DIN 1.6/5.6 - SMB - SMC - 2.4 mm			
Operating temperature range	DIN 1.6/5.6 - SMB - SMC - mini SMB - 2.4mm		-25°C to +70°C			
	SMA - SMA2.9 - QMA - Pc Board		-40°C to +85°C			
Storage temperature range	DIN 1.6/5.6 - SMB - SMC - mini SMB - 2.4mm		-40°C to +85°C			
	SMA - SMA2.9 - QMA - Pc Board		-55°C to +85°C			
Vibration (MIL STD 202, Method 204D, cond.C)			10-2000 Hz, 20g		Operating	
Shock (MIL STD 202, Method 213B, cond.G)			50g, 11ms, ½ sine		Operating	

RF PERFORMANCES

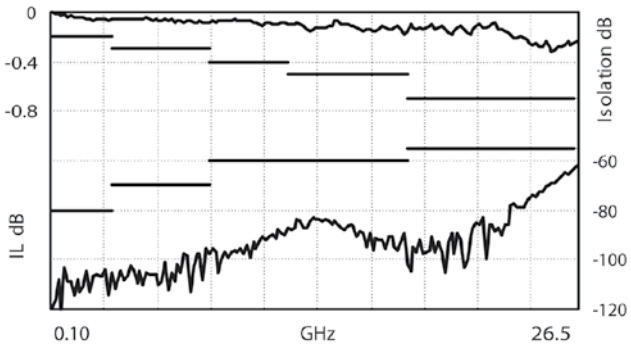
Connectors	Frequency Range GHz		V.S.W.R. (max)	Insertion Loss (max) dB	Isolation (min) dB	Impedance Ohms
DIN 1.6/5.6	DC - 2.5	DC - 1	1.20	0.20	80	75
		1 - 2.5	1.30	0.30	70	
Mini SMB	DC - 3	DC - 1	1.20	0.20	80	
		1 - 3	1.30	0.30	70	
SMB - SMC	DC - 3	DC - 3	1.20	0.20	80	50
QMA	DC - 6	DC - 3	1.20	0.20	80	50
		3 - 6	1.30	0.30	70	
SMA	DC - 3 DC - 18 DC - 26.5	DC - 3	1.20	0.20	80	50
		3 - 8	1.30	0.30	70	
		8 - 12.4	1.40	0.40	60	
		12.4 - 18	1.50	0.50	60	
		18 - 26.5	1.70	0.70	55	
SMA2.9	DC - 40	DC - 6	1.30	0.30	70	50
		6 - 12.4	1.40	0.40	60	
		12.4 - 18	1.50	0.50	60	
		18 - 26.5	1.70	0.70	55	
		26.5 - 40	1.90	0.80	50	
2.4mm	DC - 50	DC - 6	1.30	0.30	70	50
		6 - 12.4	1.40	0.40	60	
		12.4 - 18	1.50	0.50	60	
		18 - 26.5	1.70	0.70	55	
		26.5 - 40	1.90	0.80	50	
		40 - 50	1.90	1.10	50	

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

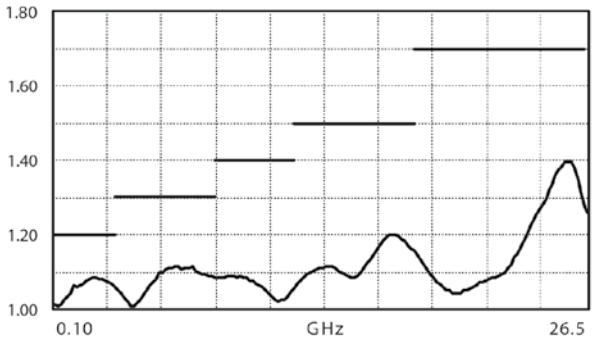
R570 AND R572 TYPICAL RF PERFORMANCES

Example: SPDT SMA up to 26.5 GHz

Insertion Loss and Isolation

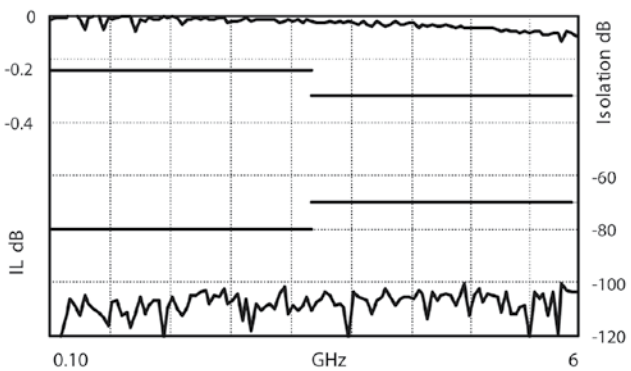


V.S.W.R.

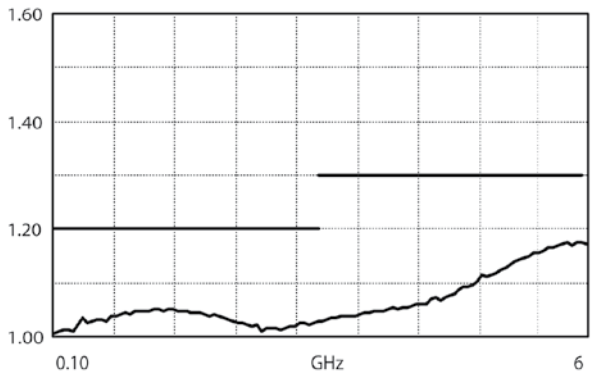


Example: SPDT QMA up to 6 GHz

Insertion Loss and Isolation



V.S.W.R.



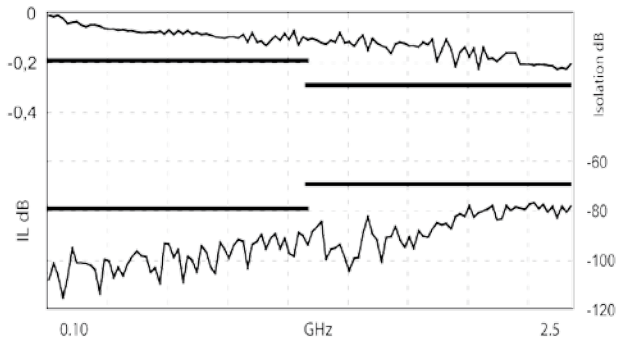
Note: see page 2-14 for other connectors.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

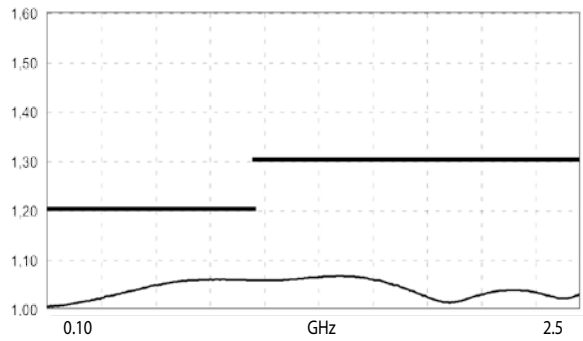
R570 AND R572 TYPICAL RF PERFORMANCES

Example: SPDT DIN 1.6/5.6 up to 2.5 GHz

Insertion Loss and Isolation

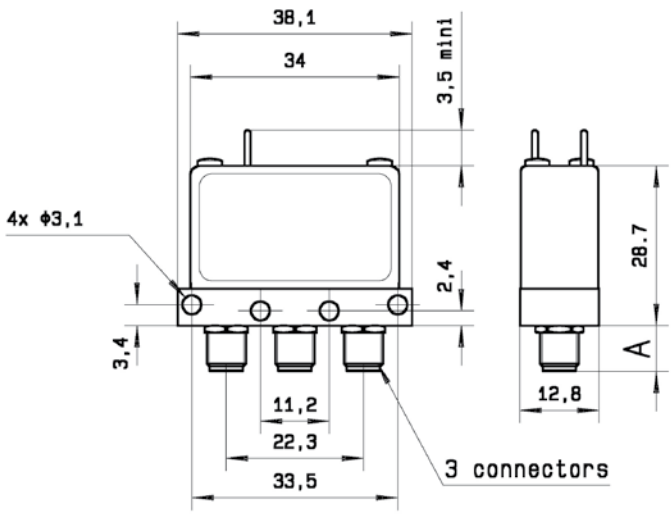


V.S.W.R.



TYPICAL OUTLINE DRAWING

Connectors	A max (mm)
SMA	7.4
SMA2.9 & 2.4mm	6.3
SMB - SMC	9.3
QMA	10.8
Mini SMB	7.5
DIN 1.6/5.6	11.5



See page 2-27 for pin identification

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SPDT up to 18 GHz
N - TNC - BNC

RADIALL's RAMSES SPDT N, BNC & TNC switches are designed for high performance in RF & Microwave systems up to 18 GHz. With RADIALL's RAMSES concept (modular concept) a full range of configurations are available. They are commonly used for applications where high power handling capability is required.

These relays are dedicated to all market applications including: Defense, Instrumentation and Telecommunications.

Example of P/N:
R570113035 is a SPDT N 12.4 GHz, failsafe, 28 Vdc, with supression diodes, without option, D-Sub connector.

PART NUMBER SELECTION

R 570 . . . . . .

Frequency range:
0: N up to 3 GHz
1: N up to 12.4 GHz
2: BNC up to 3 GHz
5: TNC up to 3 GHz
6: TNC up to 12.4 GHz
D: TNC up to 18 GHz

Type:
1: Failsafe
2: Failsafe + I.C.
3: Latching
4: Latching + I.C.
5: Latching + S.C.O. (1)
6: Latching + S.C.O. + I.C. (1)

Actuator Voltage:
2: 12 Vdc
3: 28 Vdc

TTL Option:
0: Without TTL driver
1: With TTL driver (high level) (1) (2)

Options:
0: Without option
1: Positive common (2) (3)
3: With suppression diodes (1)
4: With suppression diodes and positive common (2) (3)

Actuator Voltage:
0: Solder pins
5: D-Sub connector

I.C.: Indicator contact - S.C.O.: Self Cut-Off
(1): Suppression diodes are already included in Self Cut-OFF & TTL option
(2): Polarity is not relevant to application for switches with TTL driver
(3): Positive common shall be specified only with type 3, 4, 5 & 6 because failsafe switches can be used with both polarities

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SPDT UP TO 18 GHz
N - TNC - BNC

GENERAL SPECIFICATIONS

Operating mode			Failsafe		Latching	
Nominal operating voltage (across temperature range)		Vdc	12	28	12	28
			(10.2 to 13)	(24 to 30)	(10.2 to 13)	(24 to 30)
Coil resistance at 23°C (+/-10%)		Ω	47.5	275	38	225
Operating current at 23°C		mA	250	102	320	125
Average power			See Power Rating Chart **page 1-16**			
TTL input	High level		2.2 to 5.5 Volts		800µA max 5.5 Volts	
	Low level		0 to 0.8 Volts		20µA max 0.8 Volts	
Switching time		ms	15			
Life			2.5 million cycles			
Connectors			N - TNC - BNC			
Actuator terminals			Solders pins or 9 pin D-Sub connector			
Operating temperature range			-40°C to +85°C			
Storage temperatur erange			-55°C to +85°C			
Vibration (MIL STD 202, Method 204D, cond.D)			10-2000 Hz, 20g		Operating	
Shock (MIL STD 202, Method 213B, cond.C)			100g / 6 ms, ½ sine		Non operating	

RF PERFORMANCES

Connectors	Frequency Range GHz		V.S.W.R. (max)	Insertion Loss (max) dB	Isolation (min) dB	Impedance Ohms
N / TNC	DC - 3 DC - 12.4	DC - 1	1.15	0.15	85	50
		1 - 2	1.20	0.20	80	
		2 - 3	1.25	0.25	75	
		3 - 8	1.35	0.35	70	
		8 - 12.4	1.50	0.50	60	
TNC 18GHz	DC - 18	DC - 6	1.30	0.30	70	50
		6 - 12.4	1.50	0.50	60	
		12.4 - 18	1.60	0.70	60	
BNC	DC - 3	DC - 1	1.15	0.15	85	50
		1 - 2	1.20	0.20	80	
		2 - 3	1.25	0.25	75	

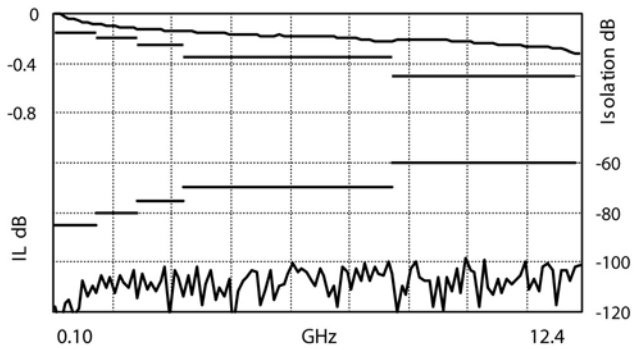
See page 2-22 for typical RF performances

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

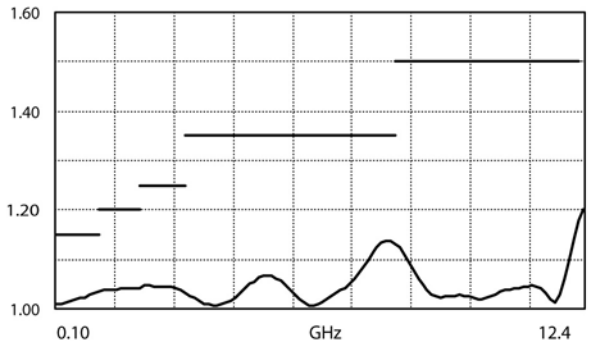
R570 TYPICAL RF PERFORMANCES

Example: SPDT N and TNC up to 12.4 GHz

Insertion Loss and Isolation

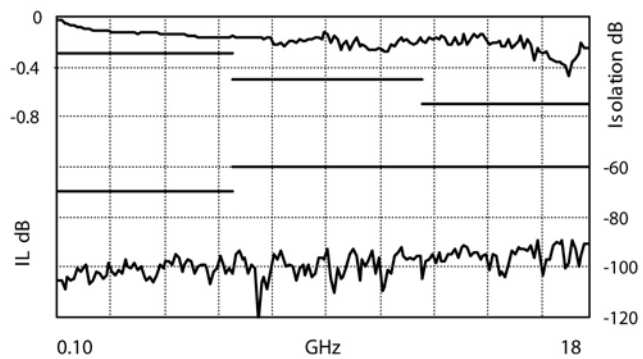


V.S.W.R.

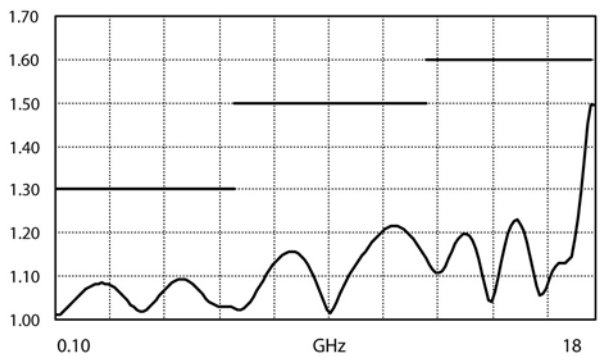


Example: SPDT TNC up to 18 GHz

Insertion Loss and Isolation



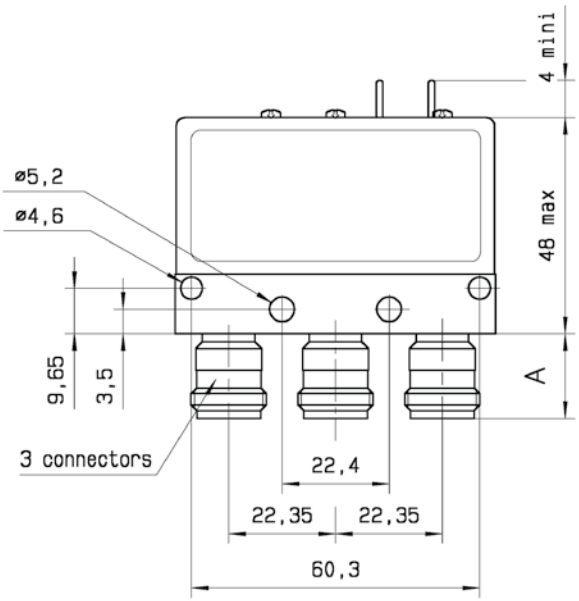
V.S.W.R.

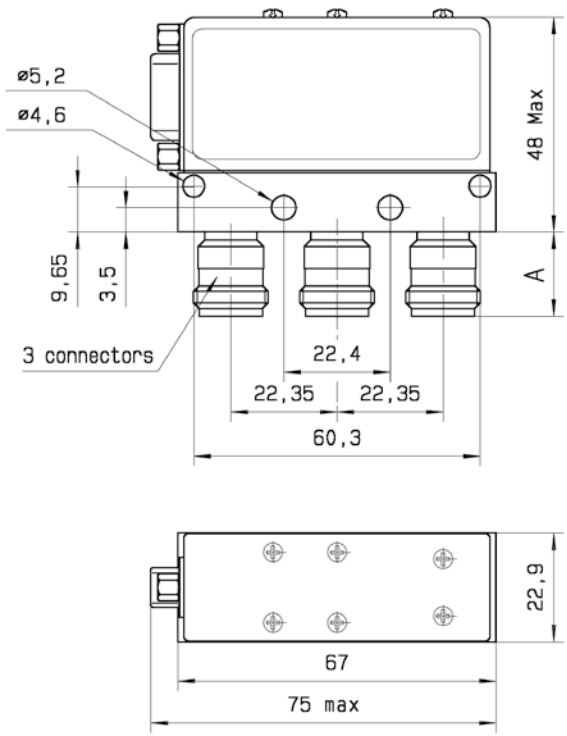


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

TYPICAL OUTLINE DRAWING

Example: SPDT N up to 12.4 GHz





See page 2-27 for pin allocation

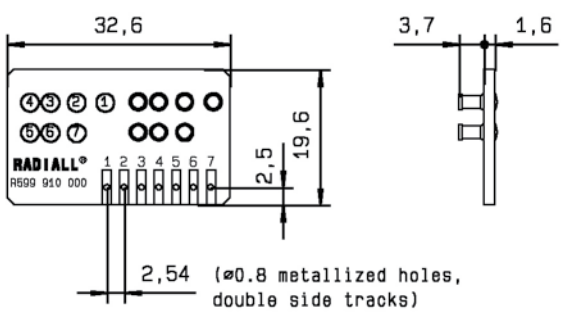
See page 2-27 for D-Sub pin allocation

Connectors	N	TNC	BNC
A max (mm)	17.7	11.3	11.3

ACCESSORIES

A printed circuit board interface connector (ordered separately) has been designed for easy mounting on terminals.

For SPDT model R570 series => Radiall part number: **R599 910 000**

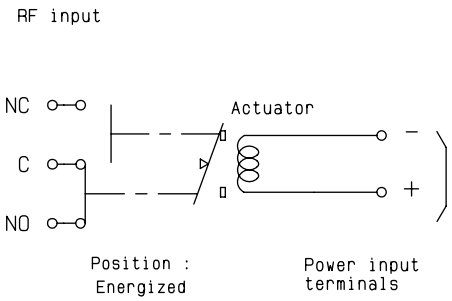


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

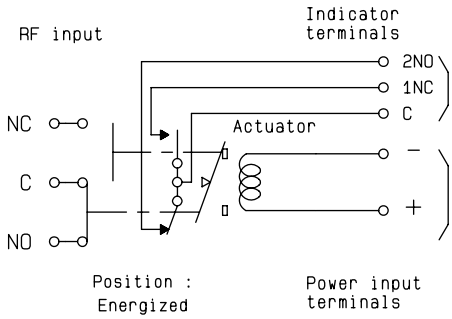
COAXIAL SPDT - Electrical Schematics
R570/R572 Series

FAILSAFE

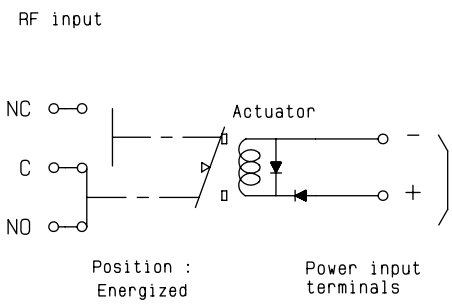
WITHOUT OPTION
R570 -1- 000 / R572 -1- 000



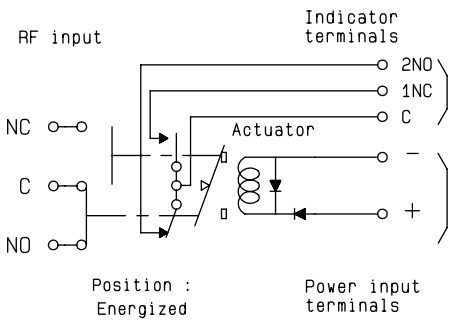
WITH INDICATOR CONTACT
R570 -2- 000



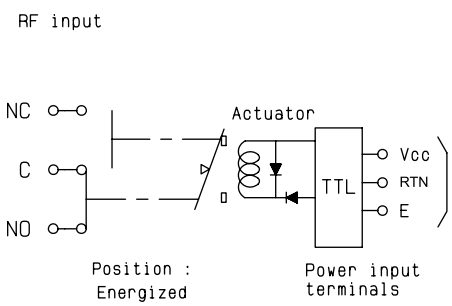
WITH SUPPRESSION DIODES
R570 -1- 030



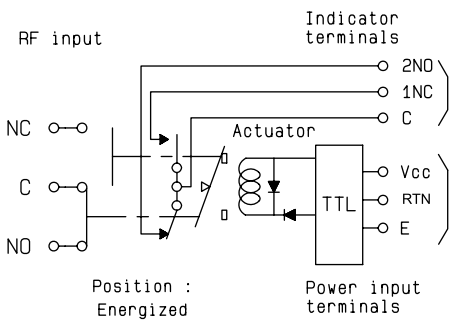
WITH SUPPRESSION DIODES AND INDICATOR CONTACT
R570 -2- 030



WITH TTL DRIVER
(suppression diodes are included)
R570 -1- 100



WITH TTL DRIVER AND INDICATOR CONTACT
(suppression diodes are included)
R570 -2- 100

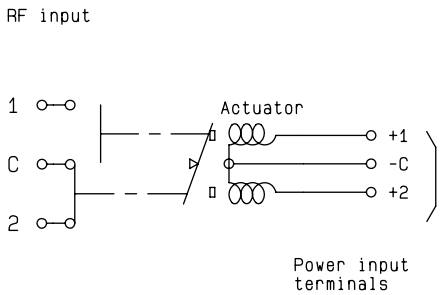


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

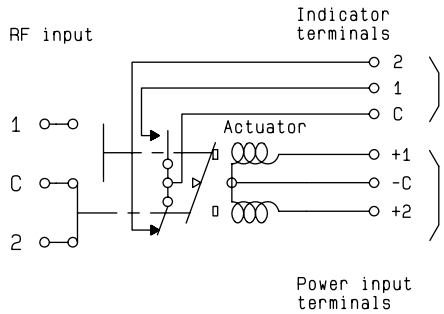
COAXIAL SPDT - Electrical Schematics
R570/R572 Series

LATCHING

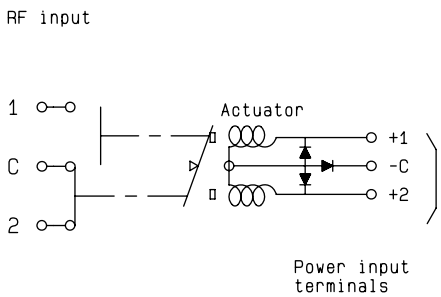
WITHOUT OPTION
R570 -3- 000 and R572 -3- 000



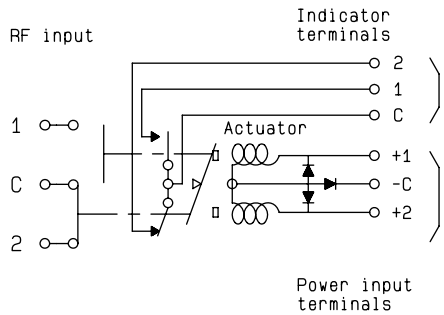
WITH INDICATOR CONTACT
R570 -4- 000



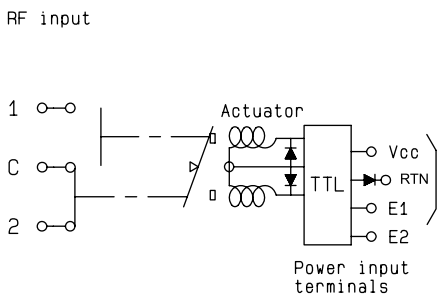
WITH SUPPRESSION DIODES
R570 -3- 030



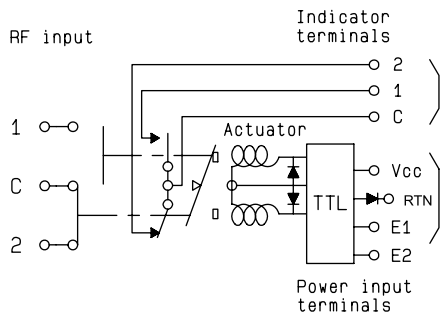
WITH SUPPRESSION DIODES AND INDICATOR CONTACT
R570 -4- 030



WITH TTL DRIVER
(suppression diodes are included)
R570 -3- 100



WITH TTL DRIVER AND INDICATOR CONTACT
(suppression diodes are included)
R570 -4- 100

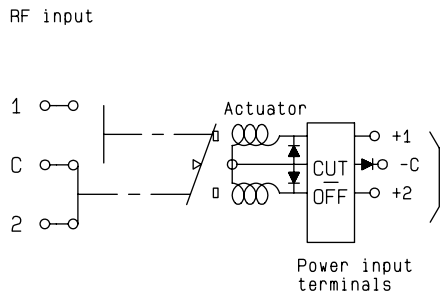


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

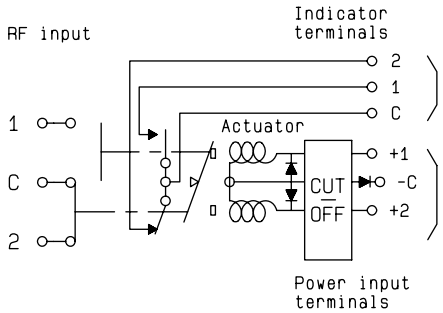
COAXIAL SPDT - Electrical Schematics
R570/R572 Series

LATCHING

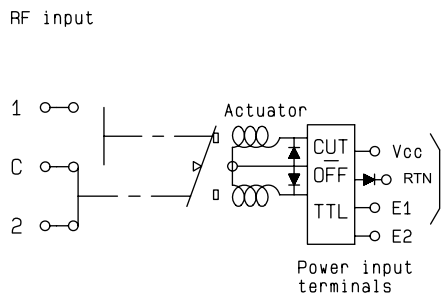
WITH CUT-OFF
(suppression diodes are included)
R570 -5- 000



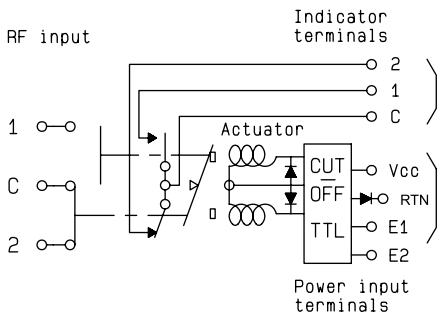
WITH CUT-OFF AND INDICATOR CONTACT
(suppression diodes are included)
R570 -6- 000



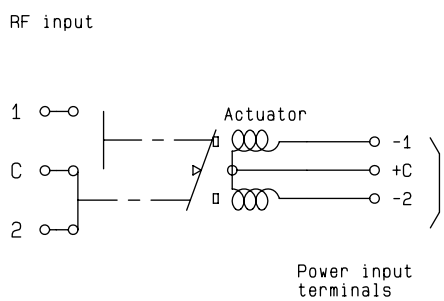
WITH CUT-OFF AND TTL DRIVER
(suppression diodes are included)
R570 -5- 100



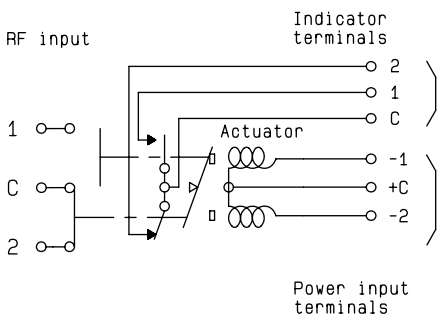
WITH CUT-OFF, TTL AND INDICATOR CONTACT
(suppression diodes are included)
R570 -6- 100



WITH POSITIVE COMMON, NO OPTION
R570 -3- 010 / R572 -3- 010



WITH POSITIVE COMMON AND INDICATOR CONTACT
R570 -4- 010

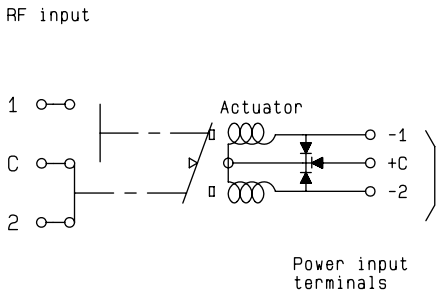


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

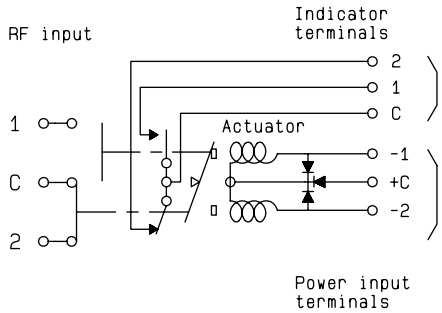
COAXIAL SPDT - Electrical Schematics
R570/R572 Series

LATCHING

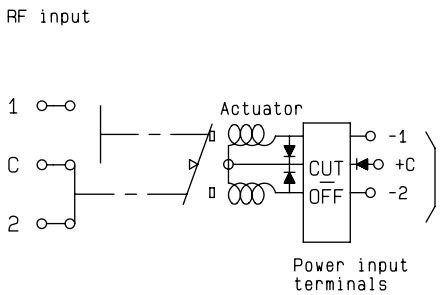
WITH POSITIVE COMMON AND SUPPRESSION DIODES
R570 -3- 040



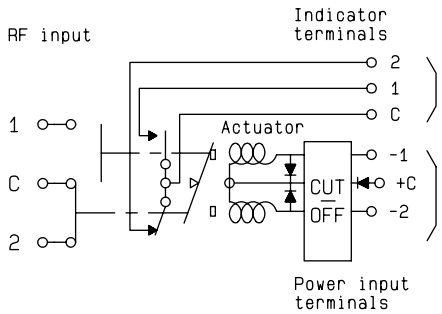
WITH POSITIVE COMMON, SUPRESSION DIODES AND INDICATOR CONTACT
R570 -4- 040



WITH POSITIVE COMMON AND CUT-OFF
(suppression diodes are included)
R570 -5- 010



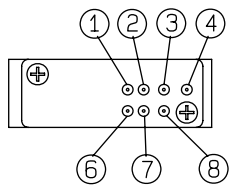
WITH POSITIVE COMMON, CUT-OFF AND INDICATOR CONTACT
(suppression diodes are included)
R570 -6- 010



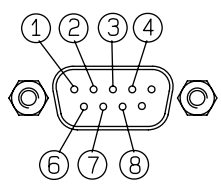
PIN IDENTIFICATION

Type	PIN						
	1	2	3	4	6	7	8
Failsafe	+		-				
Failsafe + I.C.	+		-		2NO	1NC	C
Failsafe + TTL	E		RTN	VCC			
Failsafe + I.C. + TTL	E		RTN	VCC	2NO	1NC	C
Latching Latching + Cut-off	-2 or +2	-1 or +1	+C or -C				
Latching + I.C. Latching + I.C. + Cut-off	-2 or +2	-1 or +1	+C or -C		2	1	C
Latching + TTL Latching + TTL + Cut-off	E2	E1	RTN	VCC			
Latching + TTL + I.C. Latching + TTL + I.C. + Cut-off	E2	E1	RTN	VCC	2	1	C

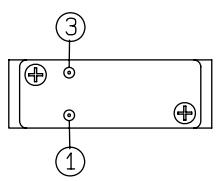
Bottom view



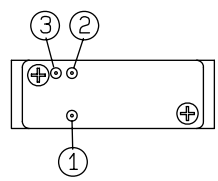
Solder pins : R570



D-Sub 9 pins : R570



Solder pins : failsafe R572



Latching R572

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

High performance SPDT up to 26.5 GHz
SMA

RoHS COMPLIANT

Radiall's PLATINUM SERIES switches are optimised to perform at a high level over an extended life span, with outstanding RF performances, and a guaranteed insertion loss repeatability of 0.03 dB over a life span of 10 million switching cycles. PLATINUM SERIES switches are perfect for automated test and measurement equipment, as well as signal monitoring devices.

Example of P/N:
R595443125 is a SPDT SMA 20 GHz, latching, 24Vdc, with TTL driver, Indicators, D-Sub connector.

PART NUMBER SELECTION

R 595 . . . 1 . . .

Frequency range:
3: SMA up to 6 GHz
4: SMA up to 20 GHz
F: SMA up to 26.5 GHz

Type:
3: Latching
4: Latching + I.C.
5: Latching + S.C.O.
6: Latching + S.C.O. + I.C.

Actuator Voltage:
3: 24 Vdc
7: 15 Vdc

I.C.: Indicator contact - S.C.O.: Self Cut-Off

Documentation:
-: Certificate of conformity
C: Calibration certificate
R: Calibration certificate + RF curves

Actuator terminals:
0: Solder pins
5: D-Sub connector

Options:
1: Without option (positive common)
2: Compatible TTL driver (high level)

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

High performance SPDT up to 26.5 GHz
SMA

GENERAL SPECIFICATIONS

Operating mode			Latching	
Nominal operating voltage (across temperature range)		Vdc	24 (20 to 32)	15 (12 to 20)
Coil resistance (+/-10%)		Ω	350	120
Operating current at 23°C		mA	68	125
Average Power			RF Path	Cold switching: see Power Rating Chart on **page 2-33** Hot switching: 1 Watt CW
TTL input	High level		3 to 7 Volts: 800µA max at 7 Volts	
	Low level		0 to 0.8 Volts: 20µA max at 0.8 Volts	
Switching time		ms	15	
Life (min)			10 million cycles	
Connectors			SMA	
Actuator terminal			D-Sub 9 pin female Solder pins	
Weight (max)		g	60	

ENVIRONMENTAL SPECIFICATIONS

Operating temperature range	-25°C to +75°C
Storage temperature range	-55°C to +85°C
Temperature cycling (MIL STD 202F, Method 107D, Cond.A)	-55°C to +85°C (10 cycles)
Sine vibration operating (MIL STD 202, Method 204D, Cond.D)	20-2000 Hz, 20g
Random vibration operating	16.91g (rms) 50-2000 Hz 3min/axis
Shock operating (MIL STD 202, Method 213B, Cond.G)	50g / 11ms, sawtooth
Humidity operating	15 to 95% relative humidity
Humidity storage (MIL STD 202, Method 106E, Cond.E)	65°C, 95% RH, 10 days
Altitude operating	15.000 feet (4.600 meters)
Altitude storage (MIL STD 202, Method 105C, Cond.B)	50.000 feet (15.240 meters)

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

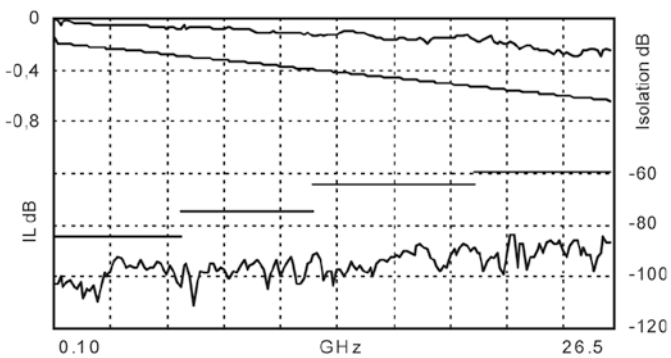
High performance SPDT up to 26.5 GHz
SMA

RF PERFORMANCES

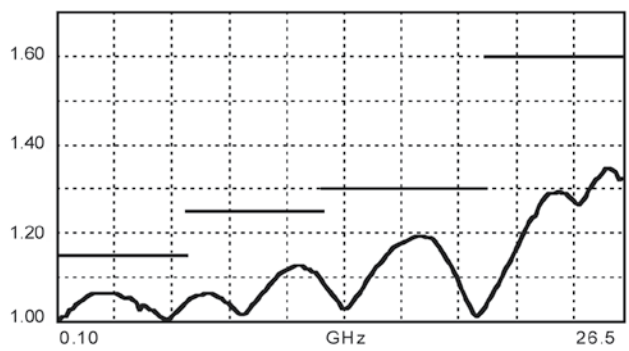
Part Number		R5953--1--	R5954--1--		R595F--1--	
Frequency range	GHz	DC to 6	DC to 20		DC to 26.5	
Impedance	Ω	50				
Insertion Loss (max)	dB	0.20 + (0.45 / 26.5) x frequency (GHz)				
Isolation (min)	dB	85	DC to 6 GHz	85	DC to 6 GHz	85
			6 to 12.4 GHz	75	6 to 12.4 GHz	75
			12.4 to 20 GHz	65	12.4 to 20 GHz	65
					20 to 26.5 GHz	60
V.S.W.R. (max)		1.15	DC to 6 GHz	1.15	DC to 6 GHz	1.15
			6 to 12.4 GHz	1.25	6 to 12.4 GHz	1.25
			12.4 to 18 GHz	1.30	12.4 to 18 GHz	1.30
			18 to 20 GHz	1.60	20 to 26.5 GHz	1.60
Repeatability (up to 10 million cycles mesured at 25°C)	dB	0.03 dB maximun				

TYPICAL RF PERFORMANCES

Insertion Loss and Isolation



V.S.W.R.

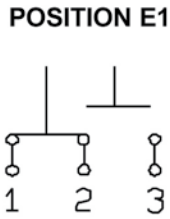


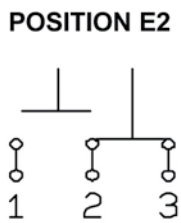
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SWITCH MODEL: NON TERMINATED SPDT SWITCH

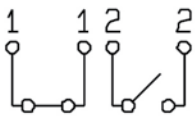
The non terminated SPDT switch is a single pole double throw switch. This switch is “break before make”.

RF SCHEMATIC DIAGRAM

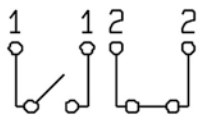




POSITION INDICATOR



STATE “11”



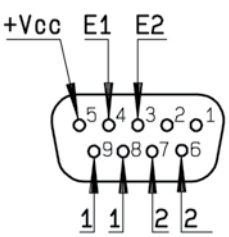
STATE “22”

Standard drive option “1” (Positive common):

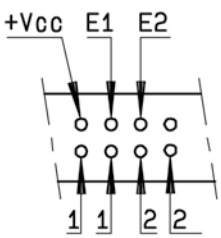
- Connect pin +Vcc to supply (+20 Vdc to +32 Vdc).
- Select desired RF path by applying ground to the corresponding "close" pin (Ex: ground pin E1 to switch to position E1. RF path 1-2 closed and RF path 2-3 open).
- To open desired path and close the new RF path, connect ground to the corresponding "close" pin (Ex: ground pin E2 to open RF path 1-2 and close RF path 2-3).

TTL drive option “2”

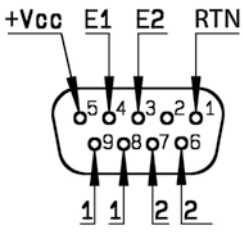
- Connect pin RTN to ground.
- Connect pin +Vcc to supply (+20 Vdc to +32 Vdc).
- Select (close) desired RF path by applying TTL "High" to the corresponding "drive" pin (Ex: apply TTL "High" to pin E1 to switch to position E1. RF path 1-2 closed and RF path 2-3 open).
- To open desired path and close the new RF path, apply TTL "High" to the "drive" pin which corresponds to the desired RF path. (Ex: apply TTL “High” to pin E2 to open RF path 1-2 and close RF path 2-3).



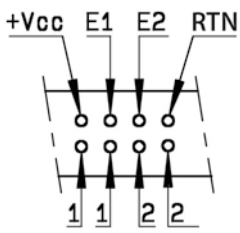
D-Sub connector



Solder pins



D-Sub connector

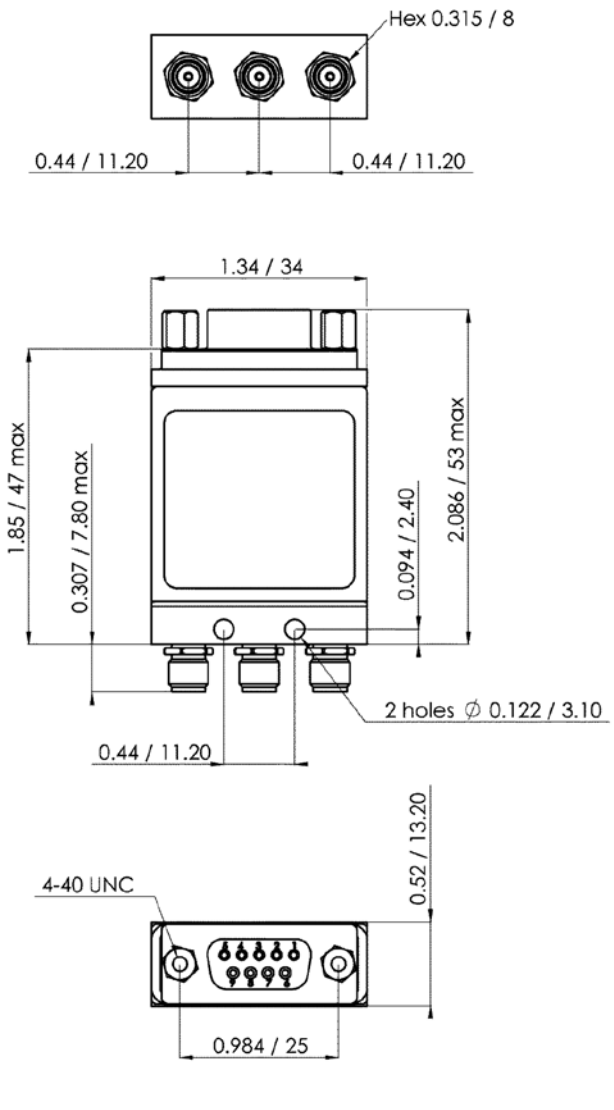


Solder pins

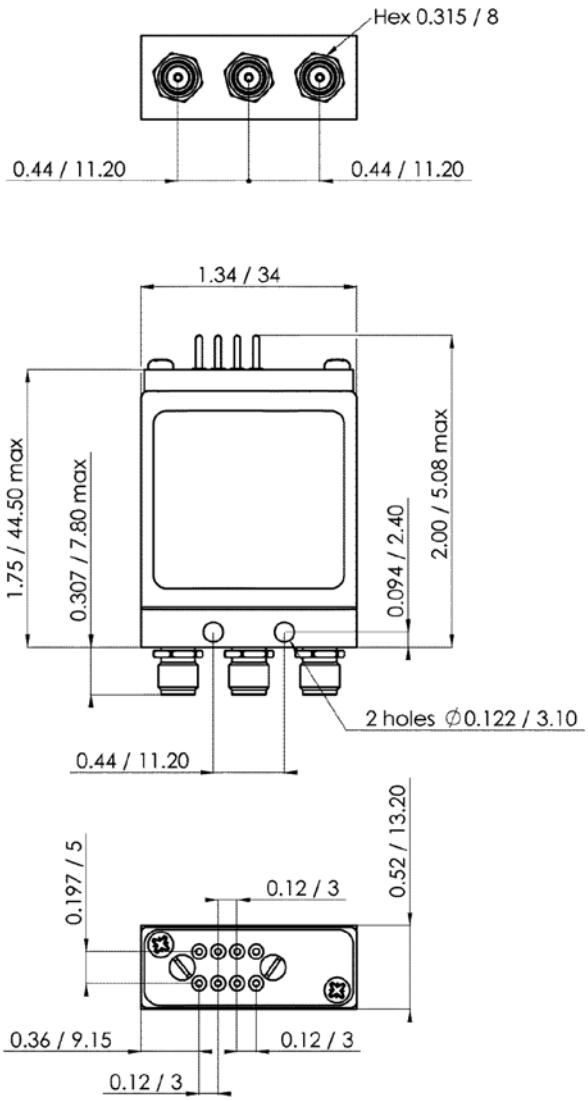
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

TYPICAL OUTLINE DRAWING

With D-Sub connector



With solder pins



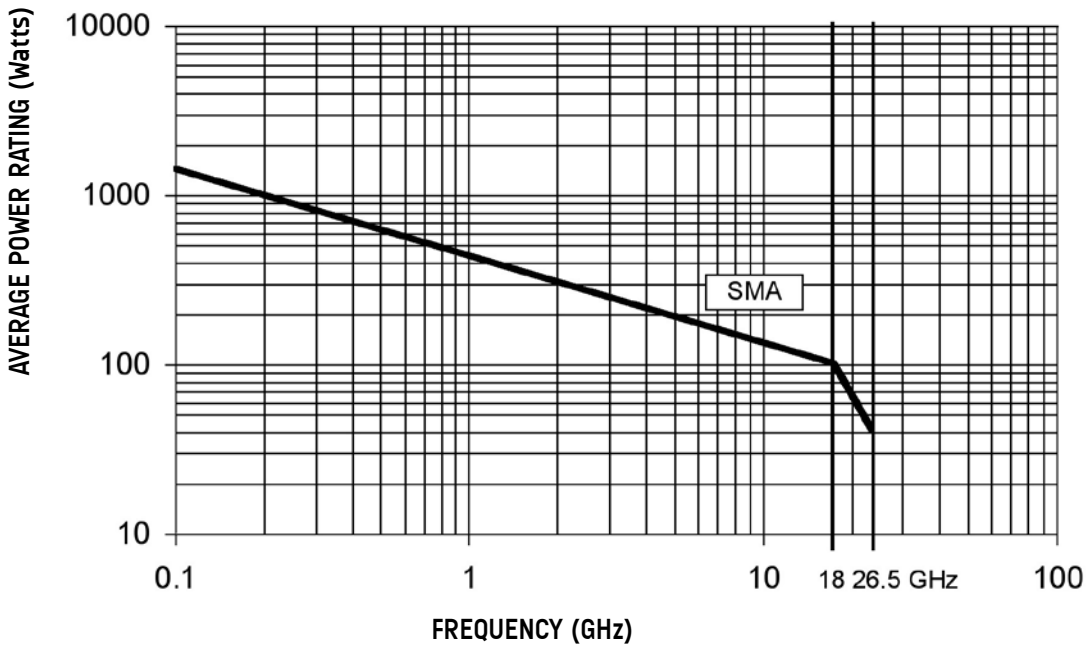
All dimensions are in inches/millimeters

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

RF POWER RATING CHART

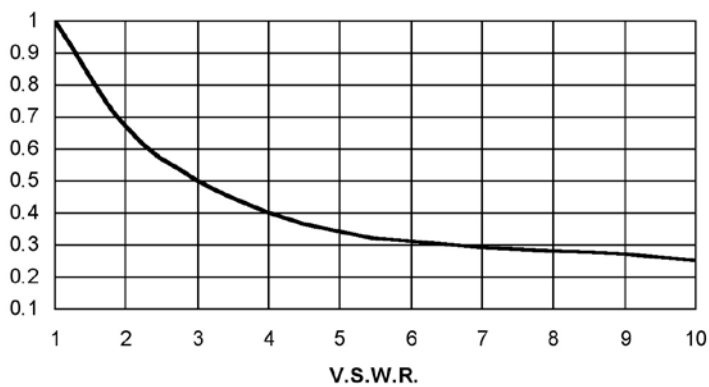
This graph is based on the following conditions:

- Ambient temperature: + 25°C
- Sea level
- V.S.W.R.: 1 and cold switching



DERATING FACTOR VERSUS VSWR

The average power input must be reduced for load V.S.W.R. above 1:1



To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

Optional Features for SPDT

GENERAL

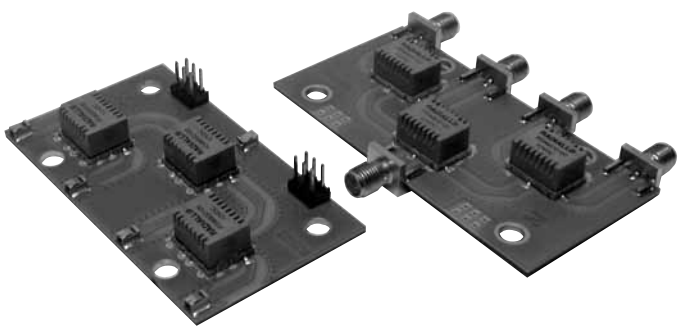
All miniature SPDT switches fitted with SMA, QMA, SMC, SMB or SMA2.9 connectors can be delivered with 34 mm narrow width RF body. Ask RADIALL for availability.

Examples of dedicated application options:

SMA SPDT with SINGLE input TTL driver. This option is available in latching configuration upon special request. Key advantages:
Less wires, easier connection.

SPDT with HN coaxial connectors and MILC38999 circular connector for L band airbone applications.

SPDT models available for high power military applications (up to 100 watts CW from DC to 18 GHz).



A SP4T design up to 8 GHz with SMT relays mounted on a PCB fitted with UMP (Ultra Miniature Pressure) contact. Various switching configurations can be designed according to your specific requests.

A SMA SPDT with a specific RF body (with mounting leg) for easy mounting on front panel of switching matrix.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

www.radiall.com

DP3T SECTION

SECTION 3

Pages

DP3T PRODUCTS SELECTION GUIDE

Quick access to the right page:

	Frequency				
Connector	DC - 3	DC - 6	DC - 18	DC - 26.5	DC - 40
SMA				3-2 / 3-12	
SMA2.9					3-2

For more detailed technical information please consult Radiall customer support.

DP3T and Terminated SPDT up to 40 GHz
SMA - SMA2.9

Radiall's RAMSES DP3T and Terminated SPDT switches offer excellent reliability, high performance and operating frequencies from DC to 40 GHz. A full range of options are available with RADIALL RAMSES concept to offer customers complete solutions.

These relays are dedicated to market applications including: Defense Instrumentation and Telecommunications.

Example of P/N:
R585423300 is a SPDT terminated SMA 18GHz, failsafe, 28Vdc, indicator contacts, internal terminations without TTL drivers and solder pins.

PART NUMBER SELECTION

R 585 . . . . . .

RF Connectors:
3: SMA up to 3 GHz
4: SMA up to 18 GHz
F: SMA up to 26.5 GHz
8: SMA2.9 up to 40 GHz (4) (5)

Type:
1: Failsafe
2: Failsafe + I.C.
3: Latching
4: Latching + I.C.
5: Latching + S.C.O. (1)
6: Latching + S.C.O + I.C. (1)
7: Normally open
8: Normally open + I.C.

Actuator Voltage:
2: 12 Vdc
3: 28 Vdc

Actuator Terminals:
0: Solder pins

Options:
0: Without option
1: Positive common (2) (3)
3: With suppression diodes (1)
4: With suppression diodes and positive common (2) (3)

Switch Model:
0: DP3T without TTL Driver (DP3T)
1: DP3T with TTL Driver (DP3T) (high level) (1) (2)
2: SPDT terminated without TTL Driver / (internal termination)
3: SPDT terminated without TTL Driver / (high level) (1) (2) / (internal termination)
4: SPDT terminated without TTL Driver / (external termination)
5: SPDT terminated with TTL Driver / (high level) (1) (2) / (external termination)
6: Terminated 4 ports bypass no option (external terminations)
7: Terminated 4 ports bypass with TTL (external termination)

I.C.: Indicator contact - S.C.O.: Self Cut-Off
(1): Suppression diodes are already included in Self Cut-OFF & TTL option
(2): Polarity is not relevant to application for switches with TTL driver
(3): Positive common shall be specified only with type 3, 4, 5, 6, 7 & 8 because failsafe switches can be used with both polarities
(4): Not available with switch model "2" & "3"

(5): Connector SMA2.9 is equivalent to "K connector©", registered trademark of Anritsu.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

DP3T and Terminated SPDT up to 40 GHz
SMA - SMA2.9

GENERAL SPECIFICATIONS

Operating mode			Failsafe		Latching		Normally open	
Nominal operating voltage (across operating temperature)		Vdc	12 (10.2 to 13)	28 (24 to 30)	12 (10.2 to 13)	28 (24 to 30)	12 (10.2 to 13)	28 (24 to 32)
Coil resistance (+/-10%)		Ω	24	138	29	175	47.5	275
Nominal operating current at 23°C		mA	500	205	420	160	250	102
Average power			RF path: see power rating chart **page 1-16** Internal terminations: 1 Watt CW into 50 Ohms					
TTL Input	High level		2.5 to 5.5 Volts			800µA max 5.5 Volts		
	Low level		0 to 0.8 Volts			20µA max 0.8 Volts		
Switching time (max)		ms	10					
Life (min)			2 million cycles for products with internal terminations and 40 GHz models 10 million cycles for all other products					
Connectors			SMA - SMA2.9					
Actuator terminals			Solder pins					
Operating temperature range		SMA SMA2.9	-40°C, +85°C					
Storage temperature range		SMA SMA2.9	-55°C, +85°C					
Vibration (MIL STD 202, Method 204D, cond.D)			10-2000 Hz, 20g			Operating		
Shock (MIL STD 202, Method 213B, cond.C)			100g / 6ms, ½ sine			Operating		

RF PERFORMANCES

Connectors	Frequency Range GHz		V.S.W.R. (max)	Insertion Loss (max) dB	Isolation (min) dB	Impedance Ohms
SMA	DC - 3 DC - 18 DC - 26.5	DC - 3	1.20	0.20	80	50
		3 - 8	1.30	0.30	70	
		8 - 12.4	1.40	0.40	60	
		12.4 - 18	1.50	0.50	60	
		18 - 26.5	1.80	0.70	50	
SMA2.9	DC - 40	DC - 6	1.30	0.30	70	50
		6 - 12.4	1.40	0.40	60	
		12.4 - 18	1.50	0.50	60	
		18 - 26.5	1.70	0.70	55	
		26.5 - 40	1.90	0.80	50	

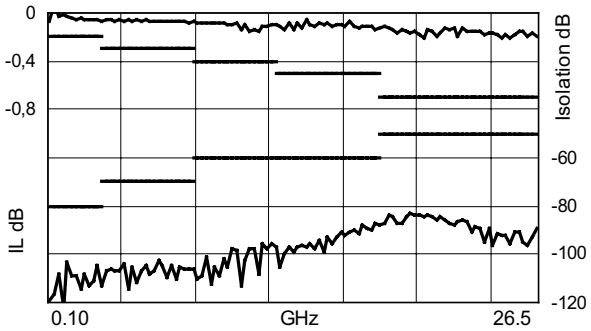
See page 3-4 for typical RF performances

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

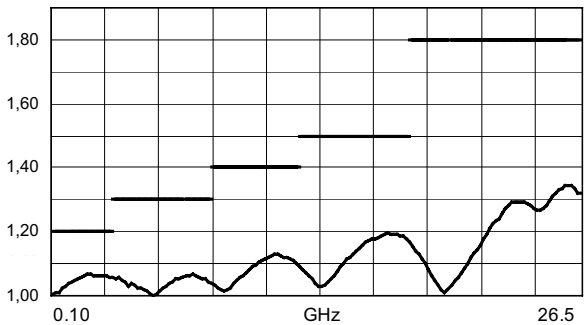
R585 TYPICAL RF PERFORMANCES

Example: DP3T SMA up to 26.5 GHz

Insertion Loss and Isolation

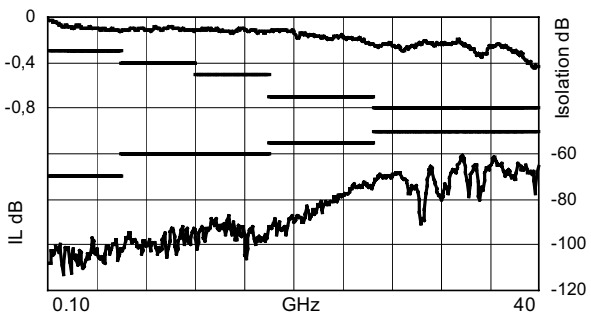


V.S.W.R.

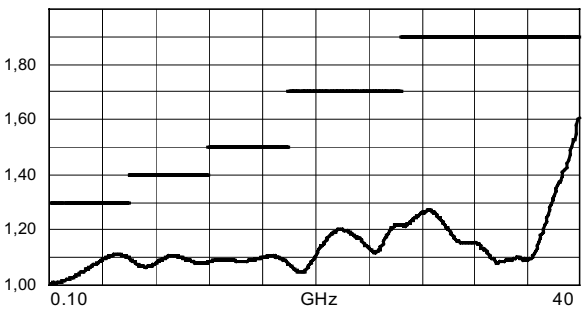


Example: DP3T SMA2.9 up to 40 GHz

Insertion Loss and Isolation



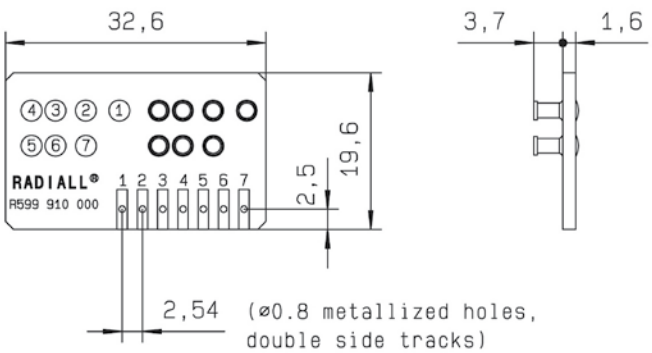
V.S.W.R.



ACCESSORIES

A printed circuit board interface connector (ordered separately) has been designed for easy mounting on terminals.

For DP3T model R585 series => Radiall part number: **R599910000**

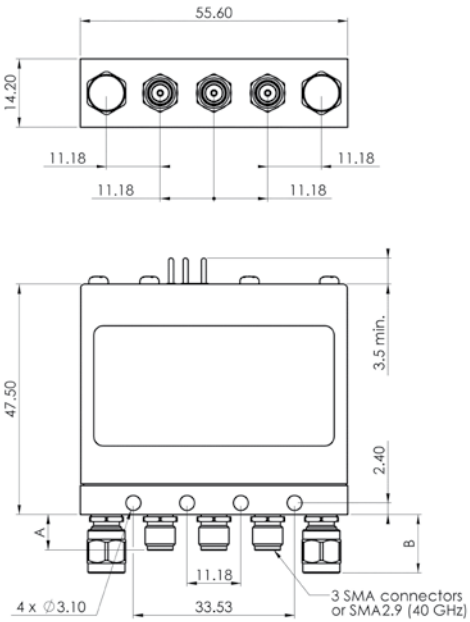


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

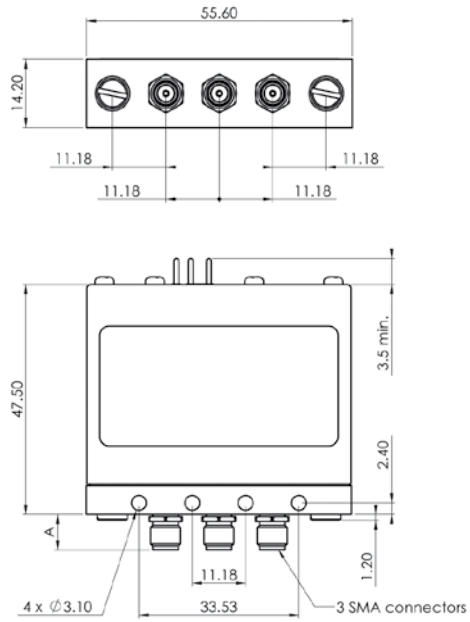
www.radiall.com

DP3T and Terminated SPDT up to 40 GHz
SMA - SMA2.9

TYPICAL OUTLINE DRAWING

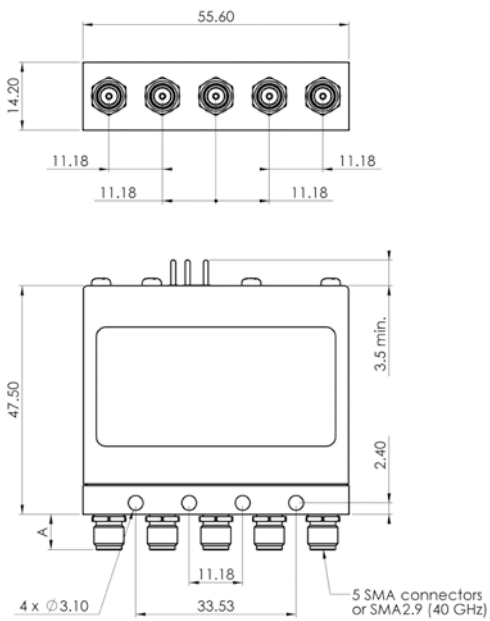


SPDT with **external** terminations
R585 --- 4--
R585 --- 5--

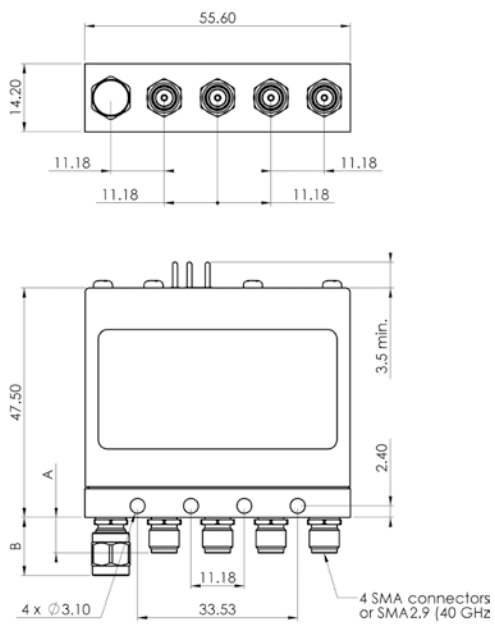


SPDT with **internal** terminations
R585 --- 2--
R585 --- 3--

See page 3-11 for pin indentification



DP3T
R585---0--
R585---1--



Terminated 4 ports **BYPASS** relay
R585 --- 6--
R585 --- 7--

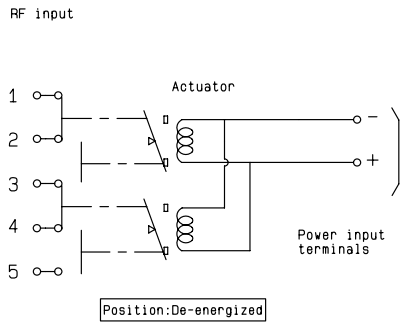
Connectors	A (mm)	B max (mm) If applicable
SMA up to 18 GHz	7.4	13.5
SMA up to 26.5 GHz	7.4	21
SMA 2.9 up to 40 GHz	6.3	21

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

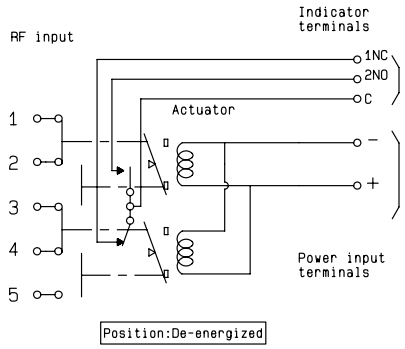
COAXIAL DP3T & Terminated SPDT - ELECTRICAL SCHEMATICS
R585 Series

FAILSAFE

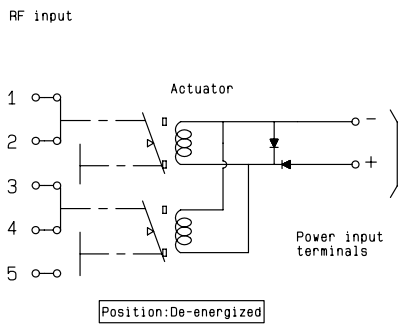
WITHOUT OPTION
R585 -1- 000 / R585 -1- 200 / R585 -1- 400



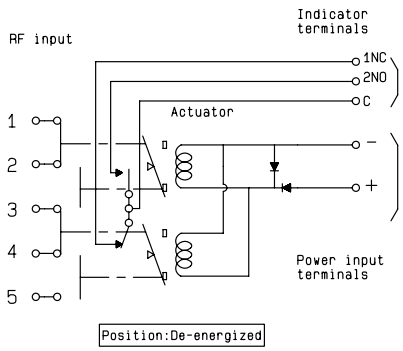
WITH INDICATOR CONTACT
R585 -2- 000 / R585 -2- 200 / R585 -2- 400



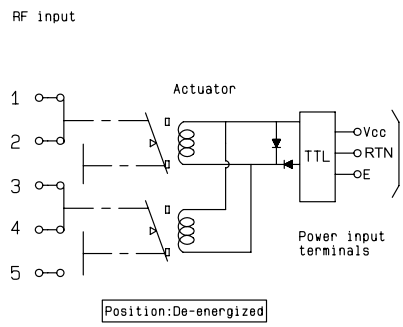
WITH SUPPRESSION DIODES
R585 -1- 030 / R585 -1- 230 / R585 -1- 430



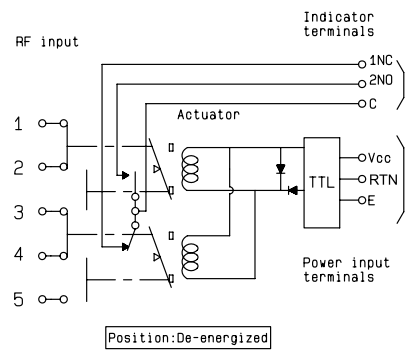
WITH SUPPRESSION DIODES AND INDICATOR CONTACT
R585 -2- 030 / R585 -2- 230 / R585 -2- 430



WITH TTL DRIVER
(suppression diodes are included)
R585 -1- 100 / R585 -1- 300 / R585 -1- 500



WITH TTL DRIVER AND INDICATOR CONTACT
(suppression diodes are included)
R585 -2- 100 / R585 -2- 300 / R585 -2- 500

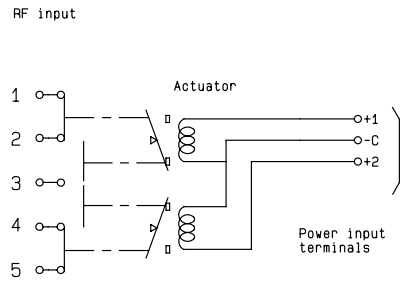


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

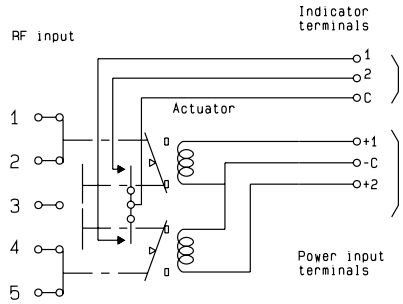
COAXIAL DP3T & Terminated SPDT - ELECTRICAL SCHEMATICS
R585 Series

NORMALLY OPEN

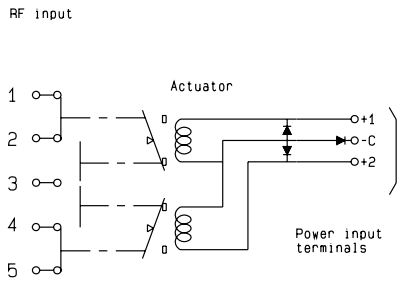
WITHOUT OPTION
R585 -7- 000 / R585 -7- 200 / R585 -7- 400



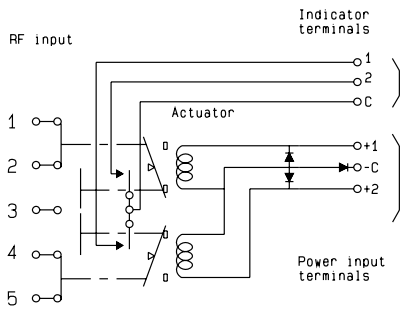
WITH INDICATOR CONTACT
R585 -8- 000 / R585 -8- 200 / R585 -8- 400



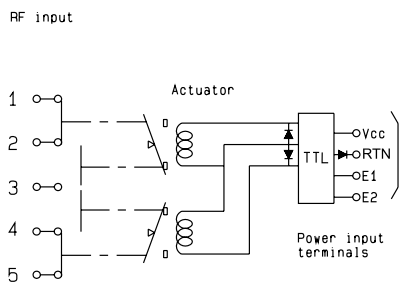
WITH SUPPRESSION DIODES
R585 -7- 030 / R585 -7- 230 / R585 -7- 430



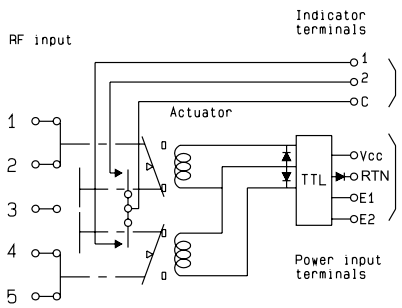
WITH SUPPRESSION DIODES AND INDICATOR CONTACT
R585 -8- 030 / R585 -8- 230 / R585 -8- 430



WITH TTL DRIVER
(suppression diodes are included)
R585 -7- 100 / R585 -7- 300 / R585 -7- 500



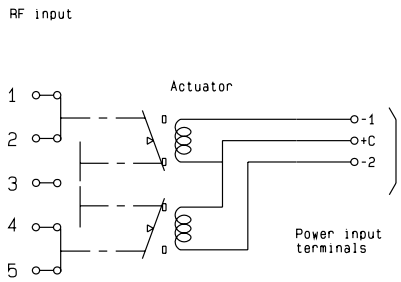
WITH TTL DRIVER AND INDICATOR CONTACT
(suppression diodes are included)
R585 -8- 100 / R585 -8- 300 / R585 -8- 500



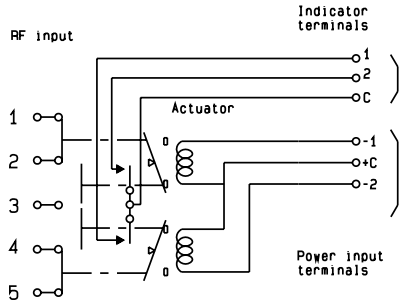
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

NORMALLY OPEN

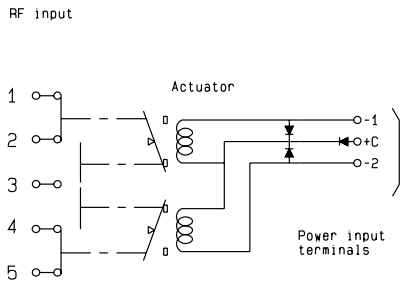
WITH POSITIVE COMMON, NO OPTION
R585 -7- 010 / R585 -7- 210 / R585 -7- 410



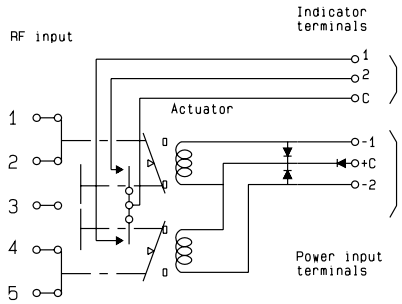
WITH POSITIVE COMMON AND INDICATOR CONTACT
R585 -8- 010 / R585 -8- 210 / R585 -8- 410



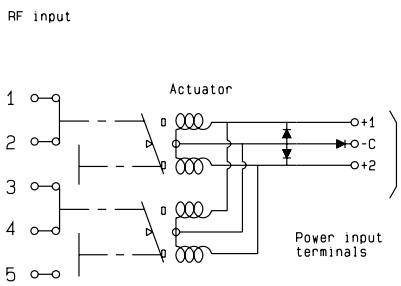
WITH POSITIVE COMMON AND SUPPRESSION DIODES
R585 -7- 040 / R585 -7- 240 / R585 -7- 440



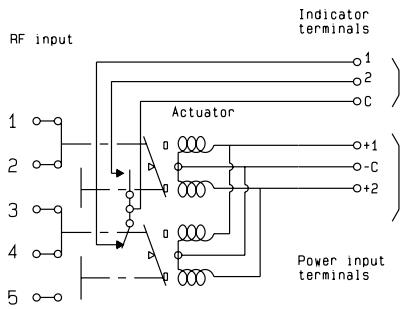
WITH POSITIVE COMMON, INDICATOR CONTACT AND SUPPRESSION DIODES
R585 -8- 040 / R585 -8- 240 / R585 -8- 440



WITHOUT OPTION
R585 -3- 000 / R585 -3- 200 / R585 -3- 400



WITH INDICATOR CONTACT
R585 -4- 000 / R585 -4- 200 / R585 -4- 400



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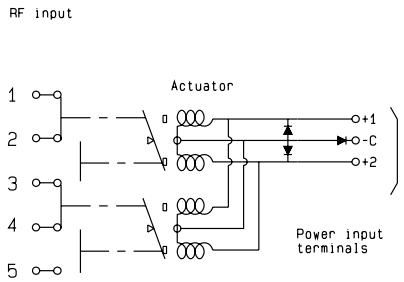
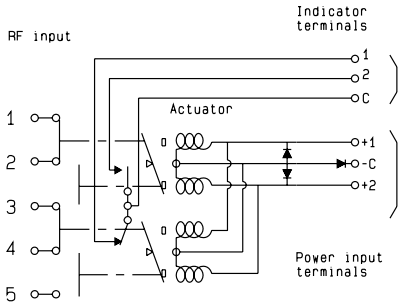
COAXIAL DP3T & Terminated SPDT - ELECTRICAL SCHEMATICS
R585 Series

LATCHING

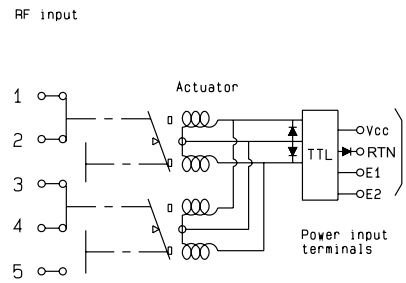
WITH SUPPRESSION DIODES
R585 -3- 030 / R585 -3- 230 / R585 -3- 430



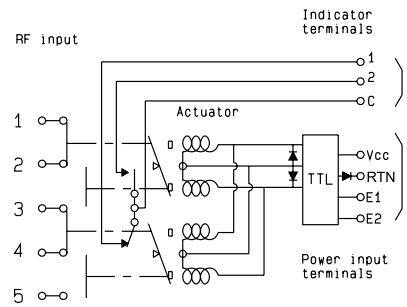
WITH SUPPRESSION DIODES AND INDICATOR CONTACT
R585 -4- 030 / R585 -4- 230 / R585 -4- 430



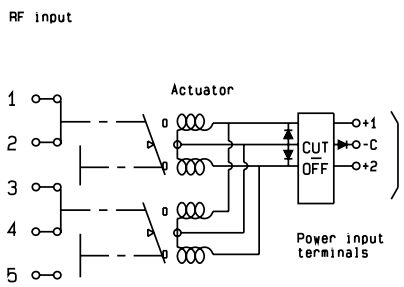
WITH TTL DRIVER
(suppression diodes are included)
R585 -3- 100 / R585 -3- 300 / R585 -3- 500



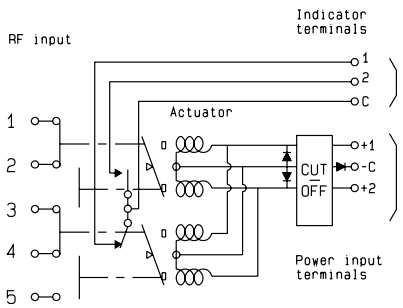
WITH TTL DRIVER AND INDICATOR CONTACT
(suppression diodes are included)
R585 -4- 100 / R585 -4- 300 / R585 -4- 500



WITH CUT-OFF
(suppression diodes are included)
R585 -5- 000 / R585 -5- 200 / R585 -5- 400



WITH CUT-OFF AND INDICATOR CONTACT
(suppression diodes are included)
R585 -6- 000 / R585 -6- 200 / R585 -6- 400



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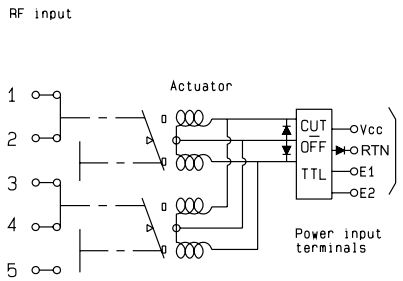
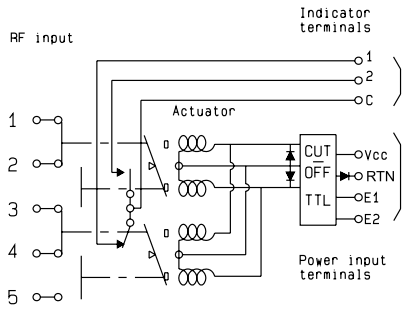
LATCHING

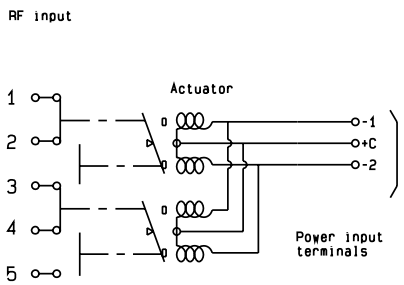
WITH CUT-OFF AND TTL DRIVER
(suppression diodes are included)
R585 -5- 100 / R585 -5- 300 / R585 -5- 500



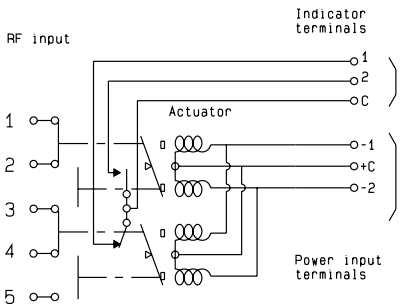
WITH CUT-OFF, TTL DRIVER AND INDICATOR CONTACT
(suppression diodes are included)
R585 -6- 100 / R585 -6- 300 / R585 -6- 500



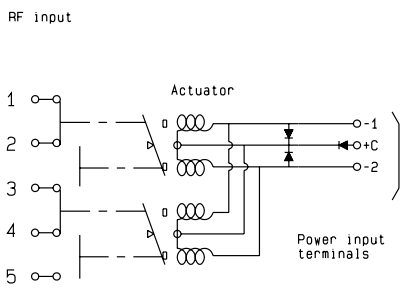
WITH POSITIVE COMMON, NO OPTION
R585 -3- 010 / R585 -3- 210 / R585 -3- 410



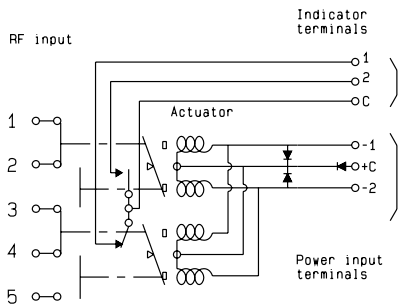
WITH POSITIVE COMMON AND INDICATOR CONTACT
R585 -4- 010 / R585 -4- 210 / R585 -4- 410



WITH POSITIVE COMMON AND SUPPRESSION DIODES
R585 -3- 040 / R585 -3- 240 / R585 -3- 440



WITH POSITIVE COMMON, SUPPRESSION DIODES AND INDICATOR CONTACT
R585 -4- 040 / R585 -4- 240 / R585 -4- 440



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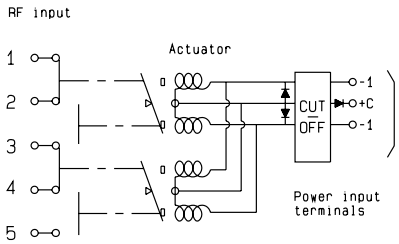
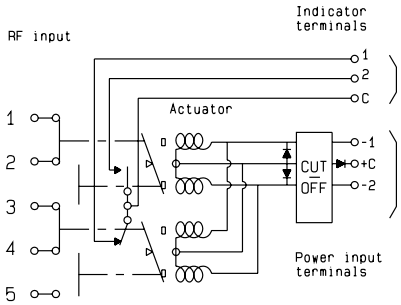
COAXIAL DP3T & Terminated SPDT - ELECTRICAL SCHEMATICS
R585 Series

LATCHING

WITH POSITIVE COMMON AND CUT-OFF
(suppression diodes are included)
R585 -5- 010 / R585 -5- 210 / R585 -5- 410



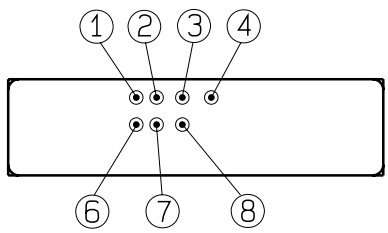
WITH POSITIVE COMMON, CUT-OFF AND INDICATOR CONTACT
(suppression diodes are included)
R585 -6- 010 / R585 -6- 210 / R585 -6- 410



PIN IDENTIFICATION

Type	PIN						
	1	2	3	4	6	7	8
Failsafe	+		-				
Failsafe + I.C.	+		-		2NO	1NC	C
Failsafe + TTL	E		RTN	VCC			
Failsafe + I.C. + TTL	E		RTN	VCC	2NO	1NC	C
Latching Latching + Cut-off	-2 or +2	-1 or +1	+C or -C				
Latching + I.C. Latching + I.C. + Cut-off	-2 or +2	-1 or +1	+C or -C		2	1	C
Latching + TTL Latching + TTL + Cut-off	E2	E1	RTN	VCC			
Latching + TTL + I.C. Latching + TTL + I.C. + Cut-off	E2	E1	RTN	VCC	2	1	C
Normally open	-2	-1	+C				
Normally open + I.C.	-2	-1	+C				
Normally open + TTL	E2	E1	RTN	VCC			
Normally open + TTL + I.C.	E2	E1	RTN	VCC	2	1	C

Bottom view



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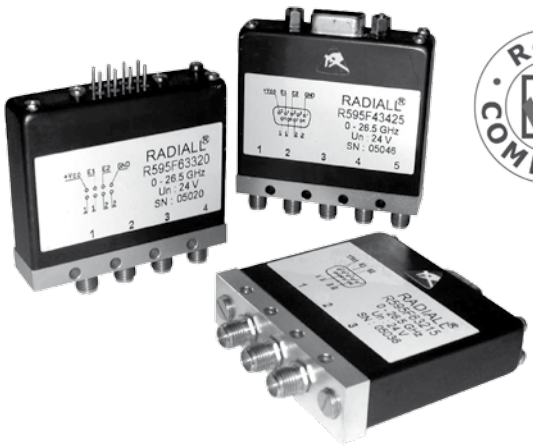
High performance DP3T & Terminated SPDT up to 26.5 GHz
SMA



RoHS COMPLIANT

Radiall's PLATINUM series switches are optimised to perform at a high level over an extended life span. With outstanding RF performances, and a guaranteed Insertion Loss repeatability of 0.03 dB over a life span of 10 million switching cycles. PLATINUM SERIES switches are perfect for automated test and measurement equipment, as well as signal monitoring devices.

Example of P/N:
R595F63215 is a Terminated SPDT SMA 26.5 GHz, latching with Self Cut-Off, 24Vdc, Indicators, D-Sub connector.

PART NUMBER SELECTION

R 595 . . . . . .

RF Connectors:
3: SMA up to 6 GHz
4: SMA up to 20 GHz
F: SMA up to 26.5 GHz

Type:
3: Latching
4: Latching + I.C.
5: Latching + S.C.O.
6: Latching + S.C.O. + I.C.

Actuator Voltage:
3: 24 Vdc
7: 15 Vdc

Switch Model:
2: Terminated SPDT switch
3: Terminated 4 ports bypass switch
4: Non terminated 5 ports DP3T switch

Documentation:
-: Certificate of conformity
C: Calibration certificate
R: Calibration certificate + RF curves

Actuator Termination:
0: Solder pins
5: D-Sub connector

Options:
1: Without option (positive common)
2: Compatible TTL driver (high level)

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

High performance DP3T & Terminated SPDT up to 26.5 GHz
SMA

GENERAL SPECIFICATIONS

Operating mode			Latching	
Nominal operating voltage (across operating temperature)		Vdc	24 (20 to 32)	15 (12 to 20)
Coil resistance (+/-10%)		Ω	175	60
Operating current at 23°C		mA	140	250
Average Power			RF Path: Cold switching: see Power Chart on **page 3-21** Hot switching: 1 Watt CW	
			Internal terminations	1 Watt average into 50 Ohms
TTL input	High level		3 to 7 Volts: 800µA max at 7 Volts	
	Low level		0 to 0.8 Volts: 20µA max at 0.8 Volts	
Switching time (max)		ms	15	
Life (min)			10 million cycles	
Connectors			SMA	
Actuator terminal			D-Sub 9 pin female Solder pins	
Weight		g	100	

ENVIRONMENTAL SPECIFICATIONS

Operating temperature range	-25°C to +75°C
Storage temperature range	-55°C to +85°C
Temperature cycling (MIL STD 202F, Method 107D, Cond.A)	-55°C to +85°C (10 cycles)
Sine vibration operating (MIL STD 202, Method 204D, Cond.D)	10-2000 Hz, 20g
Random vibration operating	16.91g (rms) 50-2000 Hz 3min/axis
Shock operating (MIL STD 202, Method 213B, Cond.G)	50g / 11ms, sawtooth
Humidity operating	15 to 95% relative humidity
Humidity storage (MIL STD 202, Method 106E, Cond.E)	65°C, 95% RH, 10 days
Altitude operating	15,000 feet (4,600 meters)
Altitude storage (MIL STD 202, Method 105C, Cond.B)	50,000 feet (15,240 meters)

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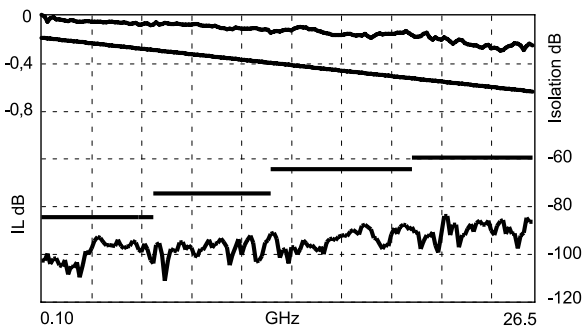
High performance DP3T & Terminated SPDT up to 26.5 GHz
SMA

RF PERFORMANCES

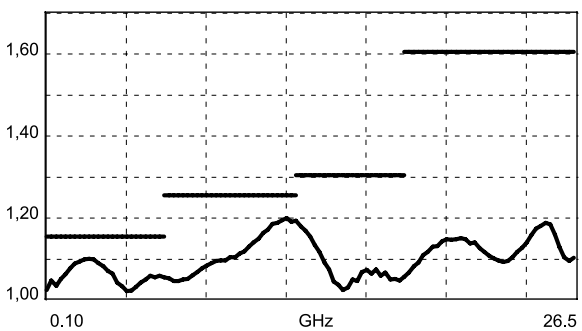
Part Number		R5953-----	R5954-----		R595F-----	
Frequency range	GHz	DC to 6	DC to 20		DC to 26.5	
Impedance	Ω	50				
Insertion Loss (max)	dB	0.20 + (0.45 / 26.5) x frequency (GHz)				
Isolation (min)		85	DC to 6 GHz	85	DC to 6 GHz	85
			6 to 12.4 GHz	75	6 to 12.4 GHz	75
			12.4 to 20 GHz	65	12.4 to 20 GHz	65
					20 to 26.5 GHz	60
V.S.W.R. (max)		1.15	DC to 6 GHz	1.15	DC to 6 GHz	1.15
			6 to 12.4 GHz	1.25	6 to 12.4 GHz	1.25
			12.4 to 18 GHz	1.30	12.4 to 18 GHz	1.30
			18 to 20 GHz	1.60	18 to 26.5 GHz	1.60
Repeatability (up to 10 million cycles mesured at 25°C)		0.03 dB maximun				

TYPICAL RF PERFORMANCES

Insertion Loss and Isolation



V.S.W.R.



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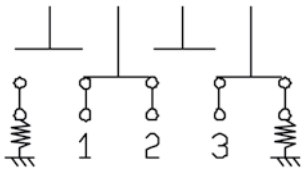
SWITCH MODEL: TERMINATED SPDT SWITCH

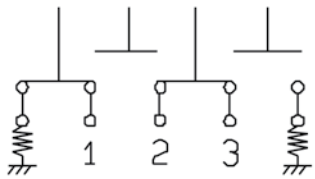
The terminated SPDT switch is a single pole double throw switch. The unused ports are terminated into 50 ohms. This switch is “break before make”.

RF SCHEMATIC DIAGRAM

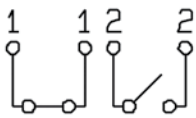
POSITION E1



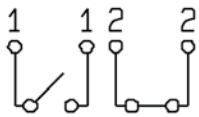
POSITION E2



POSITION INDICATORS



STATE “11”



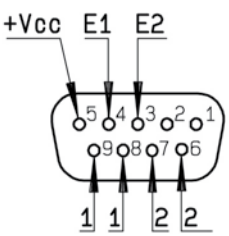
STATE “22”

Standard drive option “1” (Positive common):

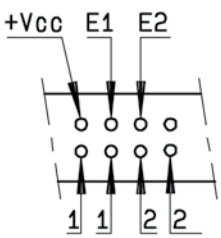
- Connect pin +Vcc to supply (+20 Vdc to +32 Vdc).
- Select desired RF path by applying ground to the corresponding "close" pin (Ex: ground pin E1 to switch to position E1. RF path 1-2 closed and RF path 2-3 open).
- To open desired path and close the new RF path, connect ground to the corresponding "close" pin (Ex: ground pin E2 to open RF path 1-2 and close RF path 2-3).

TTL drive option “2”

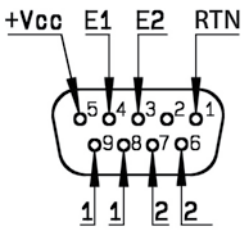
- Connect pin RTN to ground.
- Connect pin +Vcc to supply (+20 Vdc to +32 Vdc)
- Select (close) desired RF path by applying TTL "High" to the corresponding "drive" pin. (Ex: apply TTL "High" to pin E1 to switch to position E1. RF path 1-2 closed and RF path 2-3 open).
- To open desired path and close the new RF path, apply TTL "High" to the "drive" pin which corresponds to the desired RF path. (Ex: apply TTL “High” to pin E2 to open RF path 1-2 and close RF path 2-3).



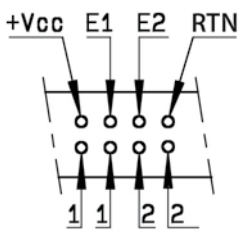
D-Sub connector



Solder pins



D-Sub connector



Solder pins

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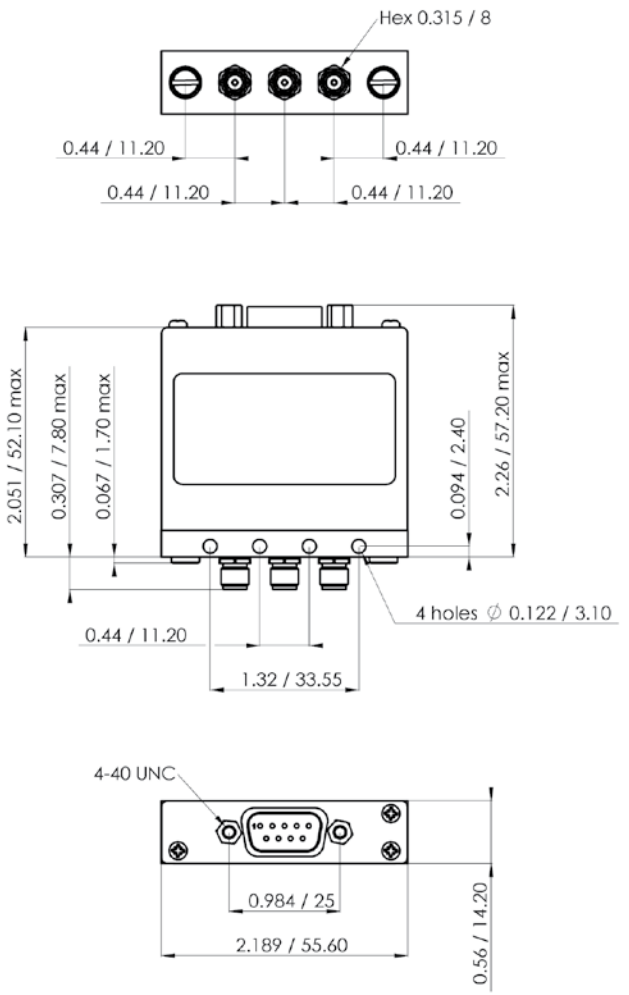
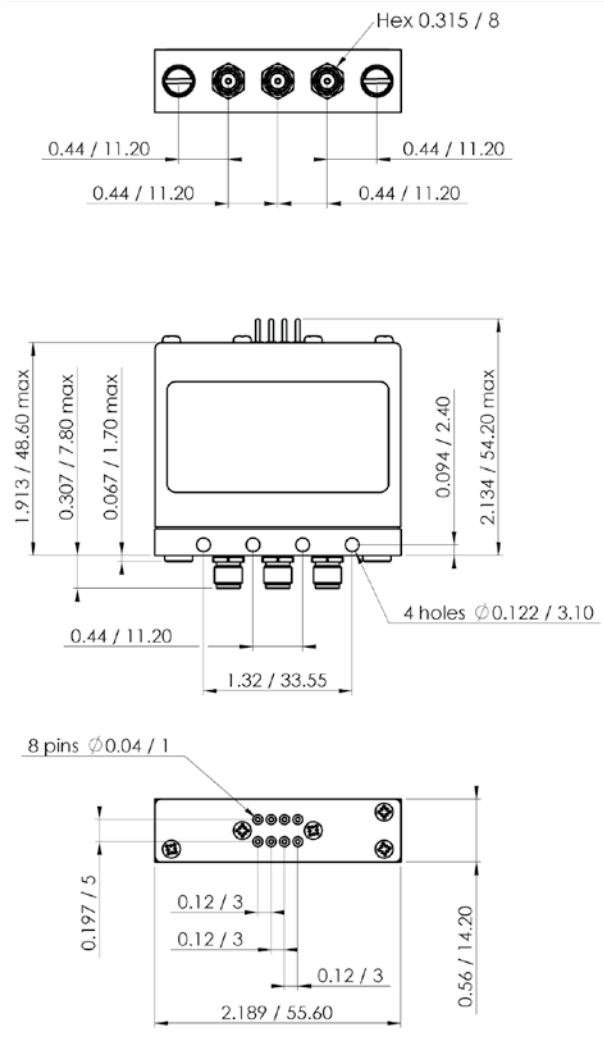
SWITCH MODEL: TERMINATED SPDT SWITCH

With D-Sub connector



With solder pins



All dimensions are in inches/millimeters

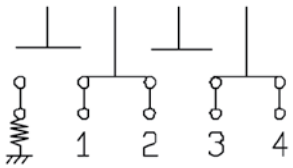
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SWITCH MODEL: TERMINATED 4 PORT BYPASS SWITCH

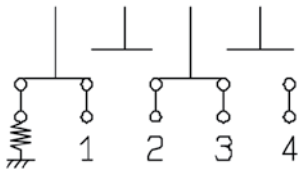
The terminated 4 port bypass switch can terminate into the 50 ohms device under test.
These switches are “break before make”.

RF SCHEMATIC DIAGRAM

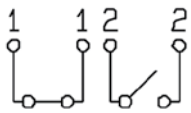
POSITION E1



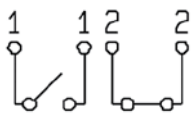
POSITION E2



POSITION INDICATORS



STATE “11”



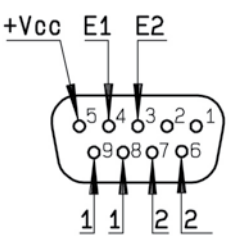
STATE “22”

Standard drive option “1” (Positive common):

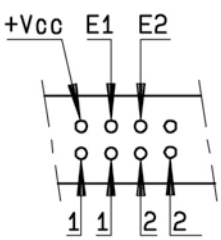
- Connect pin +Vcc to supply (+20 Vdc to +32 Vdc).
- Select desired RF path by applying ground to the corresponding "close" pin (Ex: ground pin E1 to switch to position E1. RF path 1-2 and RF path 3-4 closed and RF path 2-3 open).
- To open desired path and close the new RF path, connect ground to the corresponding "close" pin (Ex: ground pin E2 to open RF path 1-2 and 3-4 and close RF path 2-3).

TTL drive option “2”:

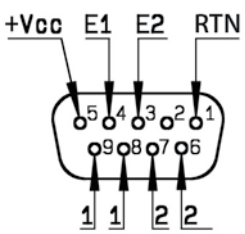
- Connect pin RTN to ground.
- Connect pin +Vcc to supply (+20 Vdc to +32 Vdc).
- Select (close) desired RF path by applying TTL "High" to the corresponding "drive" pin (Ex: apply TTL "High" to pin E1 to switch to position E1. RF path 1-2 and 3-4 closed and RF path 2-3 open).
- To open desired path and close the new RF path, apply TTL "High" to the "drive" pin which corresponds to the desired RF path. (Ex: apply TTL “High” to pin E2 to open RF path 1-2 and 3-4 and close RF path 2-3).



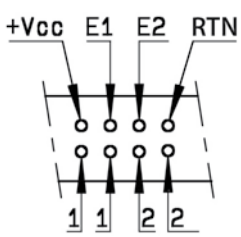
D-Sub connector



Solder pins



D-Sub connector

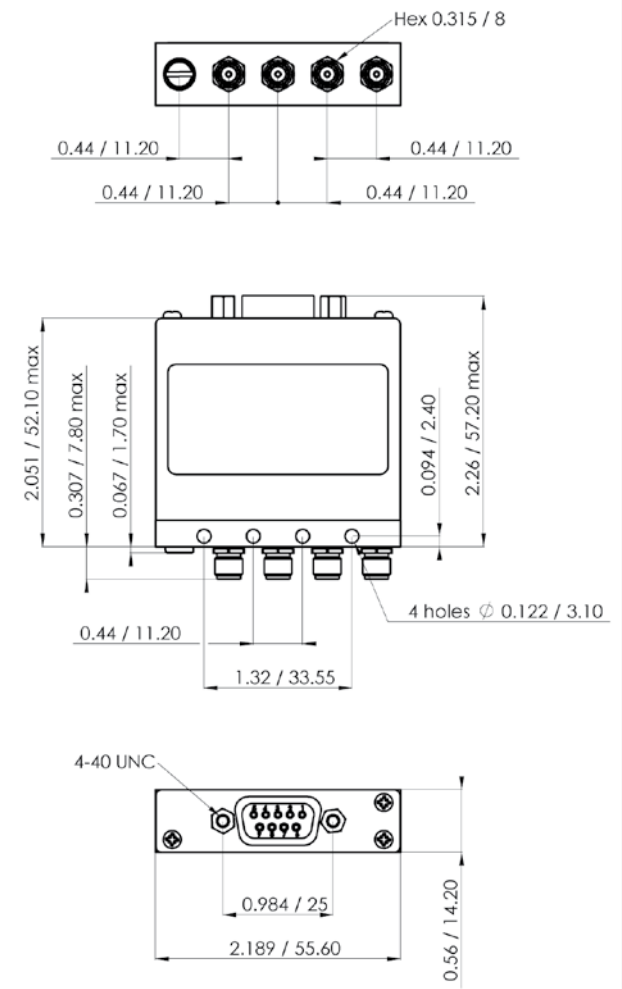


Solder pins

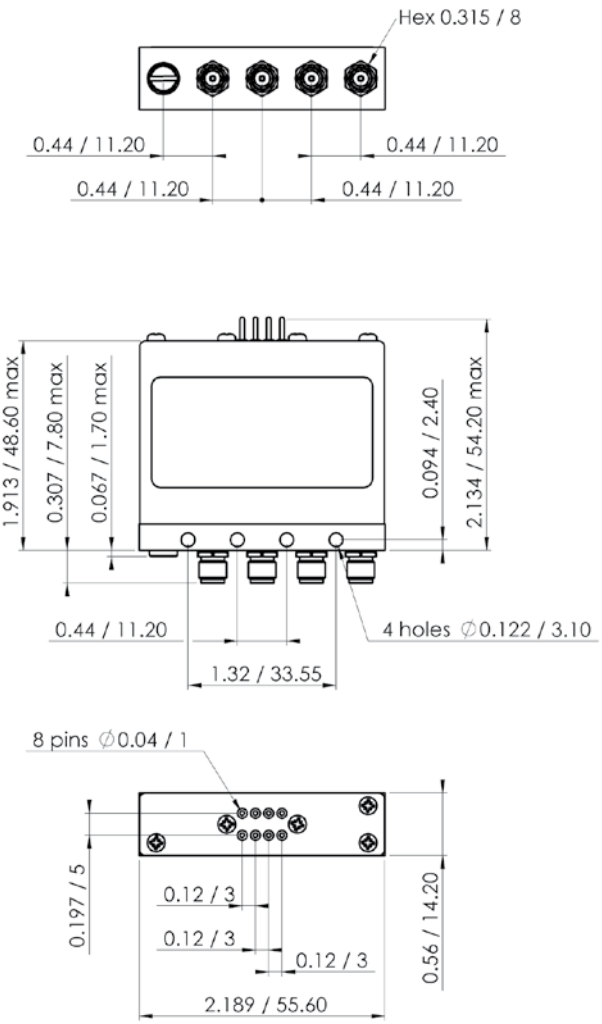
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SWITCH MODEL: TERMINATED 4 PORT BYPASS SWITCH

With D-Sub connector



With solder pins



All dimensions are in inches/millimeters

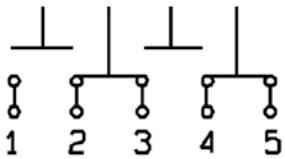
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SWITCH MODEL: 5 PORT DP3T SWITCH

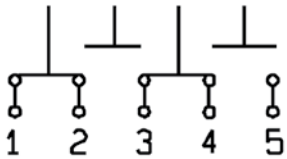
The non terminated 5 port DP3T switch can be used as SPDT with high power terminations, as a bypass switch.
In this application, the fifth port can be terminated externally with a high power termination.
These switches are “break before make”.

RF SCHEMATIC DIAGRAM

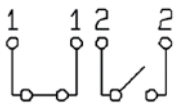
POSITION E1



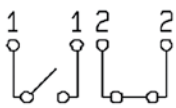
POSITION E2



POSITION INDICATORS



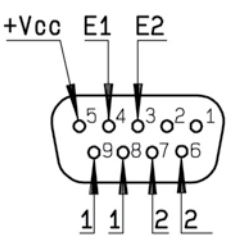
STATE “11”



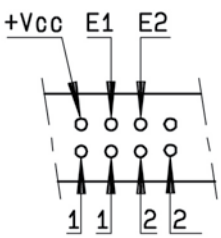
STATE “22”

Standard drive option “1” (Positive common):

- Connect pin +Vcc to supply (+20 Vdc to +32 Vdc).
- Select desired RF path by applying ground to the corresponding "close" pin (Ex: ground pin E1 to switch to position E1. RF path 2-3 and RF path 4-5 closed and RF path 1-2 and RF path 3-4 open).
- To open desired path and close the new RF path, connect ground to the corresponding "close" pin (Ex: ground pin E2 to open RF path 2-3 and 4-5 and close RF path 1-2 and 3-4).



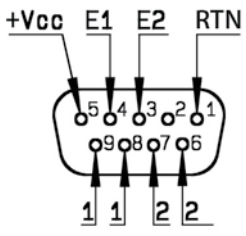
D-Sub connector



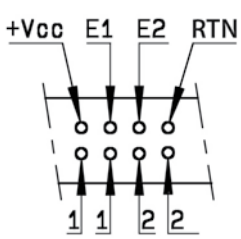
Solder pins

TTL drive option “2”:

- Connect pin RTN to ground.
- Connect pin +Vcc to supply (+20 Vdc to +32 Vdc)
- Select (close) desired RF path by applying TTL "High" to the corresponding "drive" pin (Ex: apply TTL "High" to pin E1 to switch to position E1. RF path 2-3 and RF path 4-5 closed and RF path 1-2 and 3-4 open).
- To open desired path and close the new RF path, apply TTL "High" to the "drive" pin which corresponds to the desired RF path. (Ex: apply TTL “High” to pin E2 to open RF path 2-3 and 4-5 and close RF path 1-2 and 3-4).



D-Sub connector

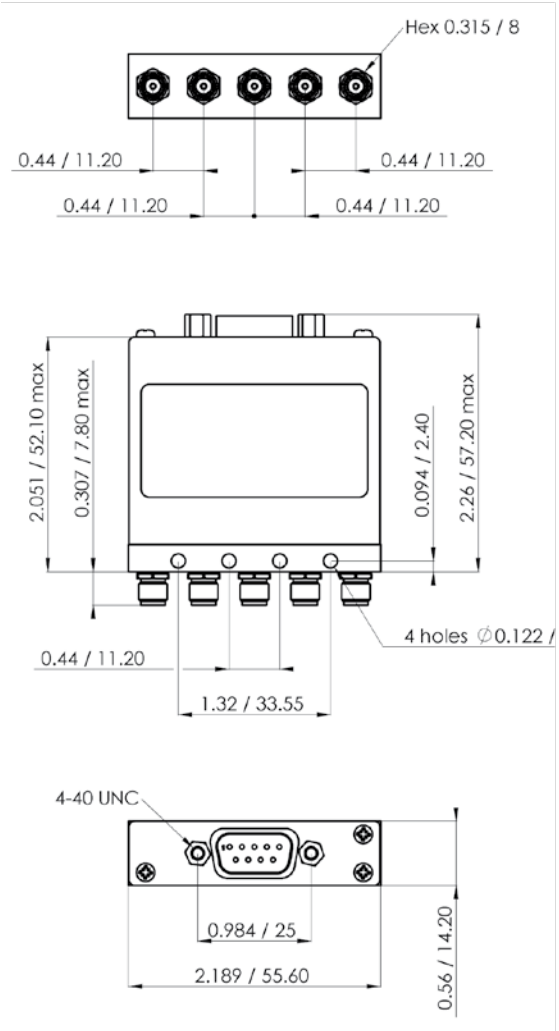


Solder pins

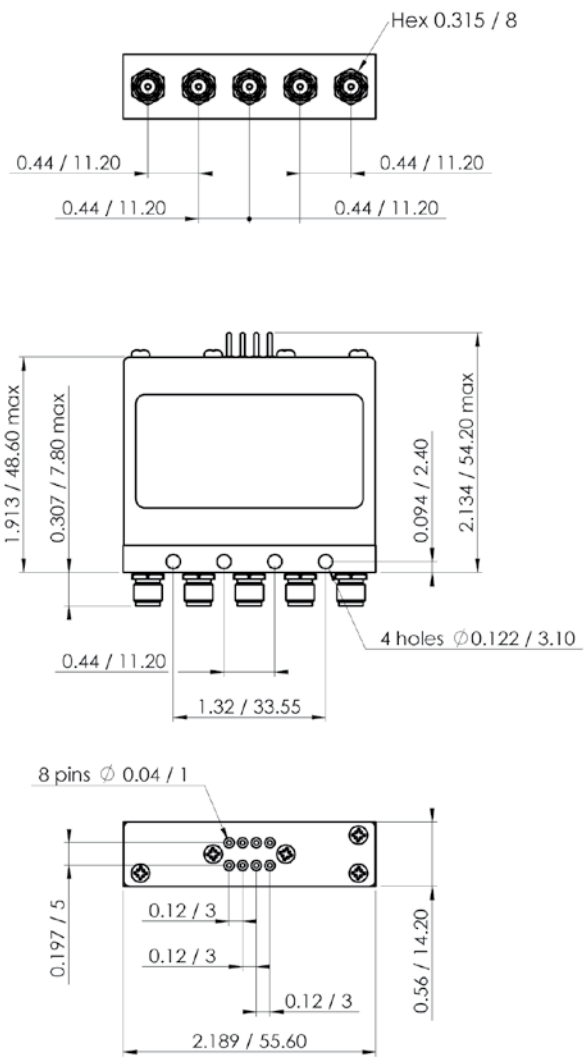
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SWITCH MODEL: 5 PORT DP3T SWITCH

With D-Sub connector



With solder pins



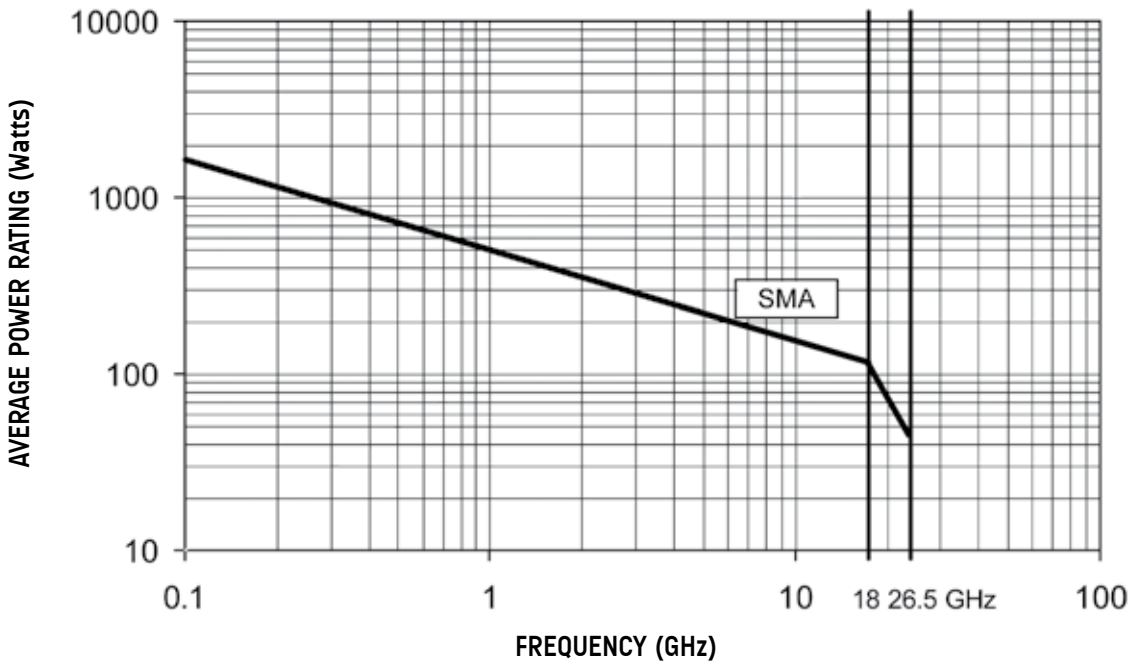
All dimensions are in inches/millimeters

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

POWER RATING CHART

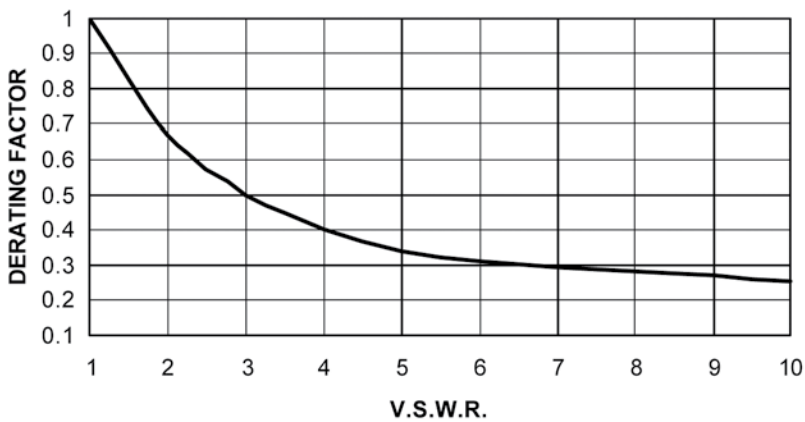
This graph is based on the following conditions:

- Ambient temperature: + 25°C
- Sea level
- V.S.W.R.: 1 and cold switching



DERATING FACTOR VERSUS V.S.W.R.

The average power input must be reduced for load V.S.W.R. above 1.1



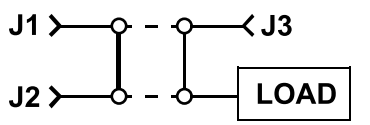
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

Optional features for DP3T switches

GENERAL

RADIALL DP3T / SPDT terminated are designed only with SMA connectors.

For all other connectors (N, BNC etc ..), the same function as SPDT Terminated can be easily performed with a standard DPDT and an external load.



POS 1 : J1 to J2 / J3 to load

Examples of dedicated applications

This SPDT Teminated is composed of a DP3T with SMA connectors and 2 RADIALL cable loads used as medium power terminations. The Key advantage of this solution is the ability to mount the switch with external terminations at power level desired.

This is an example of an SPDT terminated switch that was designed with 2 separate coils for a specific test network application.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

DPDT SECTION

SECTION 4

Pages

DPDT PRODUCTS SELECTION GUIDE

Quick access to the right page:

	Frequency					
Connector	DC - 2.5	DC - 3	DC - 6	DC - 12.4	DC - 26.5	DC - 40
DIN1.6/5.6	4-2					
SMB/SMC		4-2				
BNC		4-6				
QMA			4-2			
N				4-6		
TNC				4-6		
SMA					4-2, 4-14 & 4-20	
SMA2.9						4-2, 4-14 & 4-20

For more detailed technical information please consult Radiall customer support

DPDT up to 40 GHz
SMA - SMA2.9 - QMA - SMB - SMC - DIN 1.6/5.6

Radiall's DPDT switches offer excellent reliability, high performance and operating frequencies from DC to 40 GHz. Radiall's RAMSES concept guarantees a life span of 2.5 million cycles and provides a full array of options to respond to the needs of our customers.

These relays are well suited to applications across all markets including: Defense, Instrumentation, and Telecom.

Example of P/N:
R577F63105 is a DPDT SMA 26.5 GHz latching with Indicators, Self Cut-Off, 28 Vdc, TTL driver, D-Sub connector.

PART NUMBER SELECTION

R 577 . . . . . .

RF Connectors:
3: SMA up to 3 GHz
E: QMA up to 6 GHz
4: SMA up to 18 GHz (4)
F: SMA up to 26.5 GHz
8: SMA2.9 up to 40 GHz (5)
9: DIN 1.6/5.6 up to 2.5 GHz

Type:
1: Failsafe
2: Failsafe + I.C.
3: Latching
4: Latching + I.C.
5: Latching + S.C.O. (1)
6: Latching + S.C.O. + I.C. (1)

Actuator Voltage:
2: 12 Vdc
3: 28 Vdc

Actuator Terminals and fixing:
0: Solder pins with bracket
2: Solder pins without bracket
5: D-Sub connector with bracket
7: D-Sub connector without bracket

Options:
0: Without option
1: Positive common (2) (3)
3: With suppression diodes (1)
4: With suppression diodes and positive common (2) (3)

TTL Option:
0: without TTL Driver
1: with TTL Driver (high level) (1) (2)

I.C.: Indicator contact - S.C.O.: Self Cut-Off
1: Suppression diodes are already included in self cut-off & TTL option
2: Polarity is not relevant to application for switches with TTL driver
3: Positive common shall be specified only with type 3,4,5 & 6 because failsafe switches can be used with both polarities

(4): The QLF tradermark (Quick Lock Formula®) standard applies to QMA and QN series and guaranties the full intermateability between suppliers using this tradermark. Using QLF certified connectors also guarantees the specified level of RF performances.
(5): Connector SMA2.9 is equivalent to "K connector®", registered trademark of Anritsu.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

DPDT up to 40 GHz
SMA - SMA2.9 - QMA - SMB - SMC - DIN 1.6/5.6

GENERAL SPECIFICATIONS

Operating mode			Failsafe		Latching	
Nominal operating voltage (across operating temperature)		Vdc	12 (10.2 / 13)	28 (24 / 30)	12 (10.2 / 13)	28 (24 / 30)
Coil resistance (+/-10%)		Ω	35	200	38	225
Nominal operating current at 23°C		mA	340	140	320	125
Average power			See Power Rating Chart **page 1-16**			
TTL Input	High level		2.5 to 5.5 Volts		800µA max 5.5 Volts	
	Low level		0 to 0.8 Volts		20µA max 0.8 Volts	
Switching time (max)		ms	15			
Life (min)			2.5 million cycles			
Connectors			SMA - SMA2.9 - QMA - DIN 1.6/5.6			
Actuator terminals			Solder pins or male 9 pin D-Sub connector			
Operating temperature range	DIN 1.6/5.6		-25°C to +70°C			
	SMA - SMA2.9 - QMA		-40°C to +85°C			
Storage temperature range	DIN 1.6/5.6		-40°C to +85°C			
	SMA - SMA2.9 - QMA		-55°C to +85°C			
Vibration (MIL STD 202, Method 204D, cond.C)			10-2000 Hz, 10g			Operating
Shock (MIL STD 202, Method 213B, cond.G)			50g / 11ms, ½ sine			Operating

RF PERFORMANCES

Connectors	Frequency Range GHz		V.S.W.R. (max)	Insertion Loss (max) dB	Isolation (min) dB	Impedance Ohms
DIN 1.6/5.6	DC - 2.5	DC - 1	1.20	0.20	80	75
		1 - 2.5	1.30	0.30	70	
QMA	DC - 6	DC - 3	1.20	0.20	80	50
		3 - 6	1.30	0.30	70	
SMA	DC - 3 DC - 18 DC - 26.5	DC - 3	1.20	0.20	80	50
		3 - 8	1.30	0.30	70	
		8 - 12.4	1.40	0.40	65	
		12.4 - 18	1.50	0.50	60	
		18 - 26.5	1.70	0.70	50	
SMA2.9	DC - 40	DC - 6	1.30	0.30	70	50
		6 - 12.4	1.40	0.40	60	
		12.4 - 18	1.50	0.50	60	
		18 - 26.5	1.70	0.80	55	
		26.5 - 40	1.90	1.00	50	

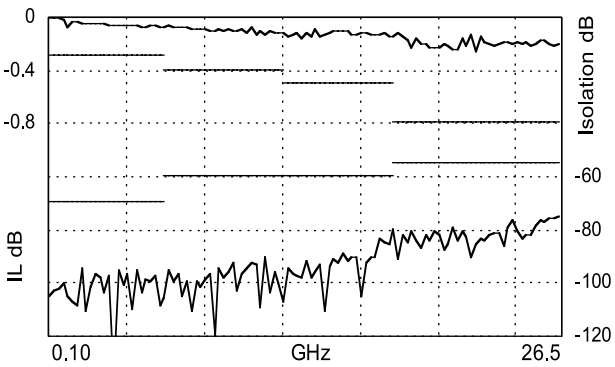
See page 4-4 for typical RF performances

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

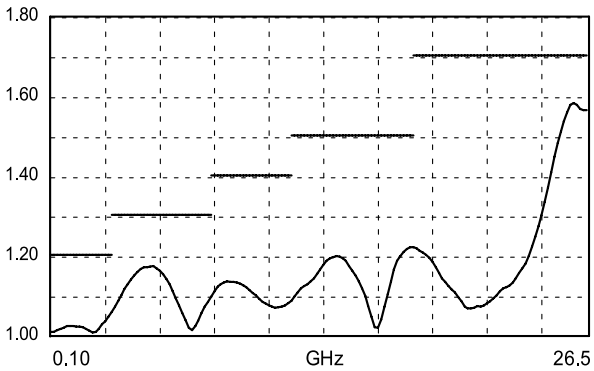
R577 TYPICAL RF PERFORMANCES

Example: DPDT SMA up to 26.5 GHz

Insertion Loss and Isolation

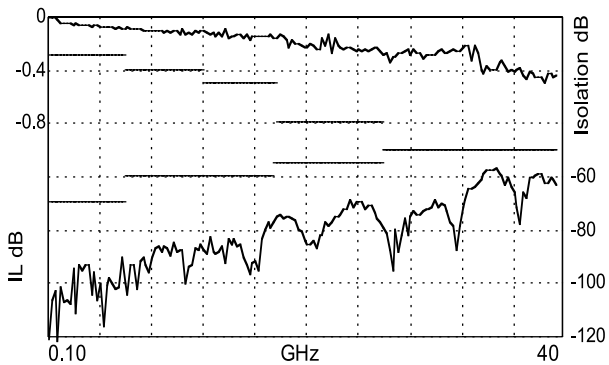


V.S.W.R.

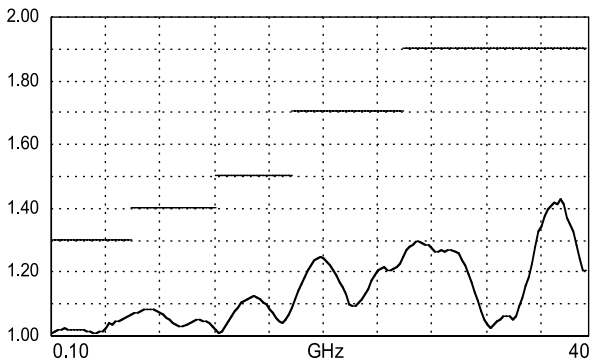


Example: DPDT SMA2.9 up to 40 GHz

Insertion Loss and Isolation



V.S.W.R.

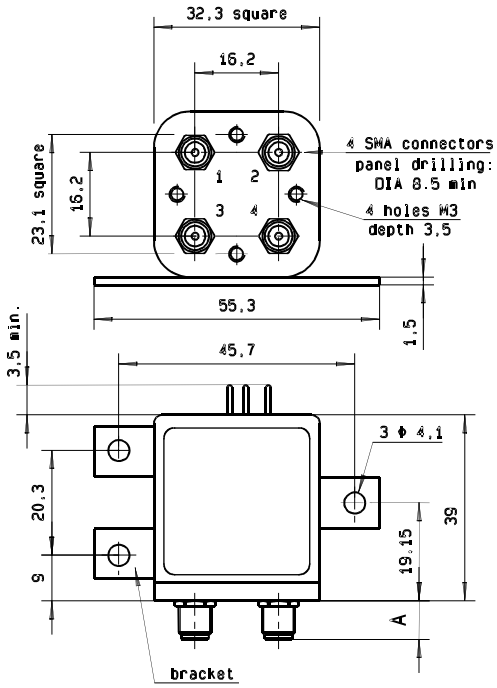


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

DPDT up to 40 GHz
SMA - SMA2.9 - QMA - SMB - SMC - DIN 1.6/5.6

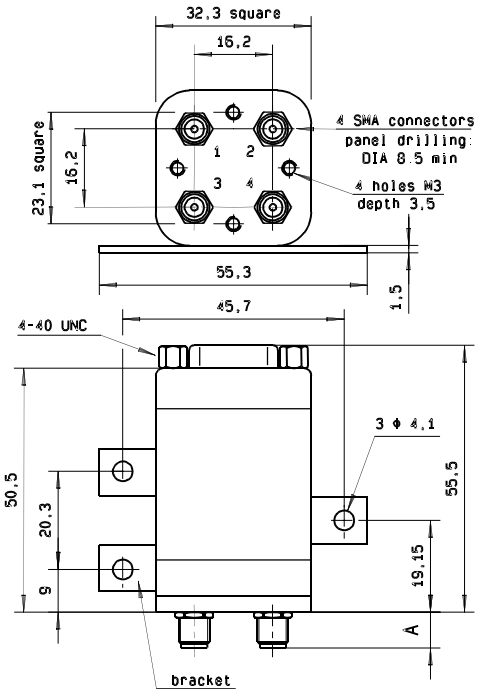
TYPICAL OUTLINE DRAWING

With solder pins and bracket



See page 4-13 for pin allocation

With D-Sub connector and bracket

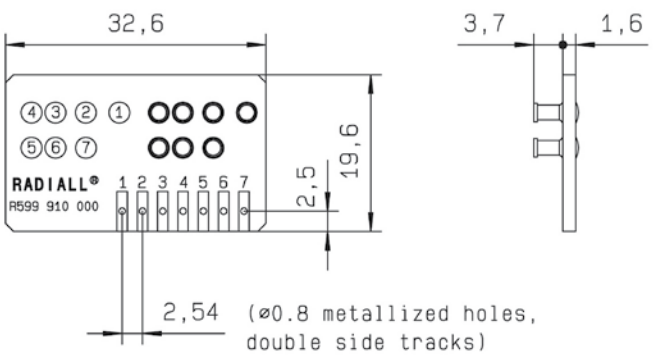


Connectors	SMA	SMA2.9	QMA	DIN 1.6/5.6
A max (mm)	7.4	6.3	10.8	11.5

ACCESSORIES

A printed circuit board interface connector (ordered separately) has been designed for easy mounting on terminals.

For DPDT model R577 series => Radiall part number: **R599 910 000**



To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

DPDT up to 12.4 GHz – RAMSES CONCEPT
N - BNC - TNC

RoHS COMPLIANT

Radiall's DPDT switches offer excellent reliability, high performance and operating frequencies from DC to 12.4 GHz. Radiall's RAMSES concept guarantees a life span of 2.5 million cycles and provides a full array of options to respond to the needs of our customers.

These relays are well suited to applications across all markets including: Defense, Instrumentation, and Telecom.

Example of P/N:
R577122030 is a DPDT N 12.4 GHz, failsafe with Indicators, 12 Vdc, suppression diodes, solder pins with bracket.

PART NUMBER SELECTION

R 577 . . . . . .

RF Connectors:
0: N up to 3 GHz
1: N up to 12.4 GHz
2: BNC up to 3 GHz
5: TNC up to 3 GHz
6: TNC up to 12.4 GHz

Type:
1: Failsafe
2: Failsafe + I.C.
3: Latching
4: Latching + I.C.
5: Latching + S.C.O. (1)
6: Latching + S.C.O. + I.C. (1)

Actuator Voltage:
2: 12 Vdc
3: 28 Vdc

Actuator Terminals and fixing:
0: Solder pins with bracket
2: Solder pins without bracket
5: D-Sub connector with bracket
7: D-Sub connector without bracket

Options:
0: Without option
1: Positive common (2) (3)
3: With suppression diodes (1)
4: With suppression diodes and positive common (2) (3)

TTL Option:
0: without TTL Driver
1: with TTL Driver (high level) (1) (2)

I.C.: Indicator contact - S.C.O.: Self Cut-Off
1: Suppression diodes are already included in self cut-off & TTL option
2: Polarity is not relevant to application for switches with TTL driver
3: Positive common shall be specified only with type 3,4,5 & 6 because failsafe switches can be used with both polarities

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

DPDT up to 12.4 GHz – RAMSES CONCEPT
N - BNC - TNC

GENERAL SPECIFICATIONS

Operating mode			Failsafe		Latching	
Nominal operating voltage (across operating temperature)		Vdc	12 (10.2 / 13)	28 (24 / 30)	12 (10.2 / 13)	28 (24 / 30)
Coil resistance (+/-10%)		Ω	35	200	38	225
Nominal operating current at 23°C		mA	340	140	320	125
Average power			See Power Rating Chart **page 1-16**			
TTL Input	High level		2.5 to 5.5 Volts		800µA max 5.5 Volts	
	Low level		0 to 0.8 Volts		20µA max 0.8 Volts	
Switching time (max)		ms	15			
Life (min)			2.5 million cycles			
Connectors			N - BNC - TNC			
Actuator terminals			Solder pins or male 9 pin D-Sub connector			
Operating temperature range			-40°C, +85°C			
Storage temperature range			-55°C, +85°C			
Vibration (MIL STD 202, Method 204D, cond.C)			10-2000 Hz, 10g			Operating
Shock (MIL STD 202, Method 213B, cond.G)			50g / 11ms, ½ sine			Operating

RF PERFORMANCES

Connectors	Frequency Range GHz		V.S.W.R. (max)	Insertion Loss (max) dB	Isolation (min) dB	Impedance Ohms
BNC	DC - 3	DC - 1	1.15	0.15	85	50
		1 - 2	1.20	0.20	80	
		2 - 3	1.25	0.25	75	
N - TNC	DC - 3 DC - 12.4	DC - 1	1.15	0.15	85	50
		1 - 2	1.20	0.20	80	
		2 - 3	1.25	0.25	75	
		3 - 8	1.35	0.35	70	
		8 - 12.4	1.50	0.50	60	

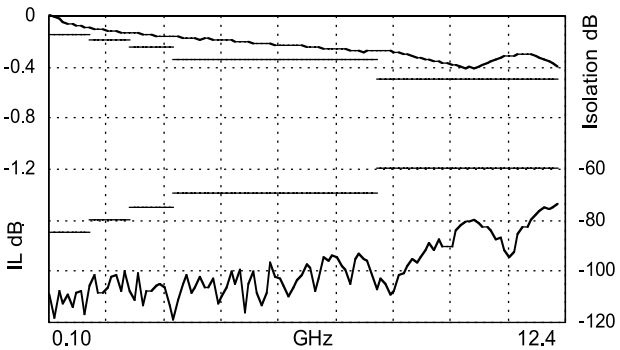
See page 4-8 for typical RF performances

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

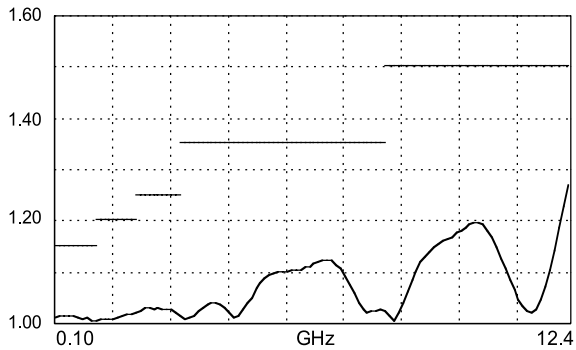
R577 TYPICAL RF PERFORMANCES

Example: DPDT N/TNC 12.4 GHz

Insertion Loss and Isolation

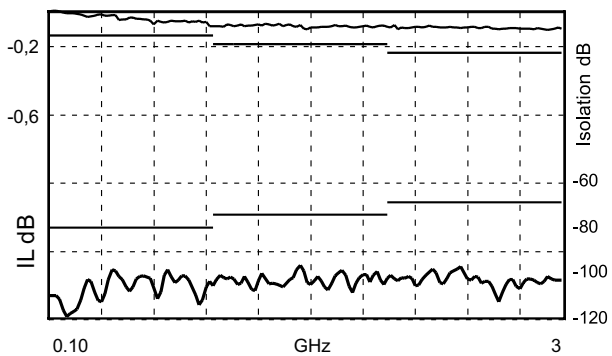


V.S.W.R.

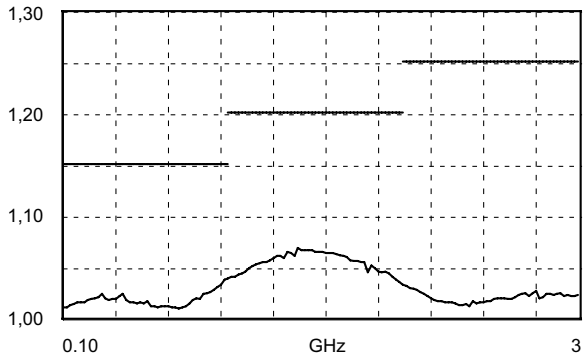


Example: DPDT BNC up to 3 GHz

Insertion Loss and Isolation



V.S.W.R.

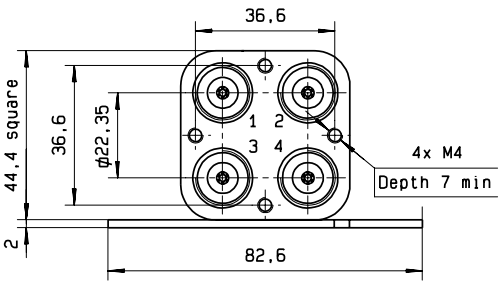


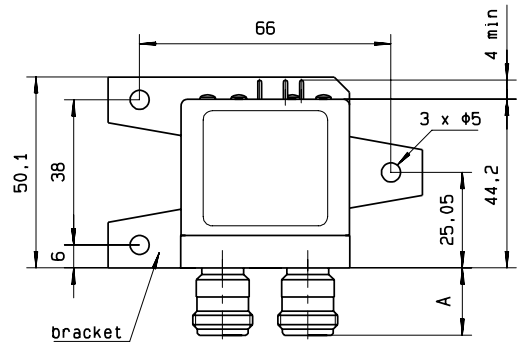
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

DPDT up to 12.4 GHz – RAMSES CONCEPT
N - BNC - TNC

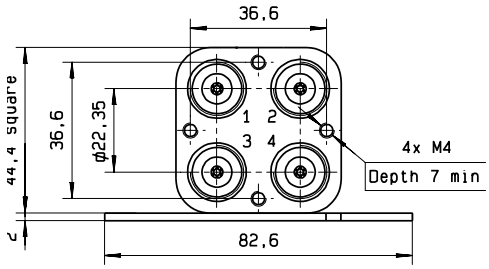
TYPICAL OUTLINE DRAWING

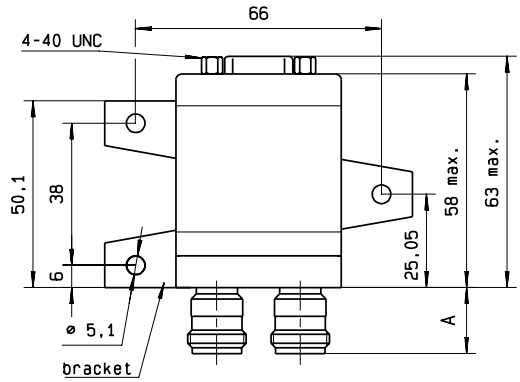
With solder pins and bracket





With D-Sub connector and bracket





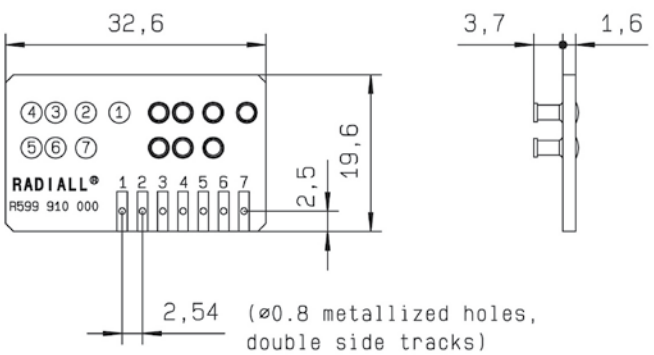
See page 4-13 for pin allocation

Connectors	N	BNC	TNC
A max (mm)	17.7	11.3	11.3

ACCESSORIES

A printed circuit board interface connector (ordered separately) has been designed for easy mounting on terminals.

For DPDT model R577 series => Radiall part number: **R599 910 000**

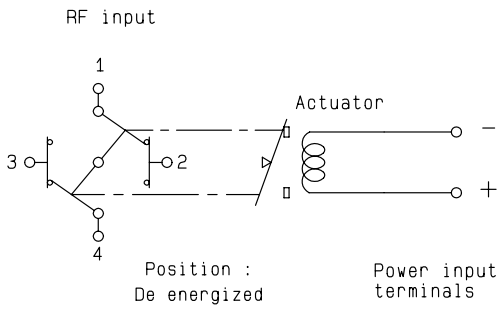


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

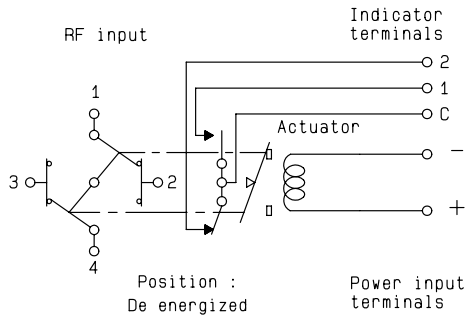
COAXIAL DPDT - ELECTRICAL SCHEMATICS
R577 series

FAILSAFE

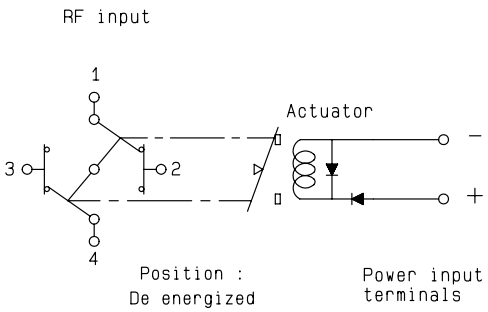
WITHOUT OPTION
R577 -1- 000



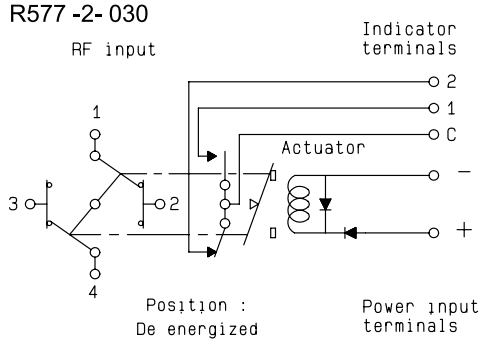
WITH INDICATOR CONTACT
R577 -2- 000



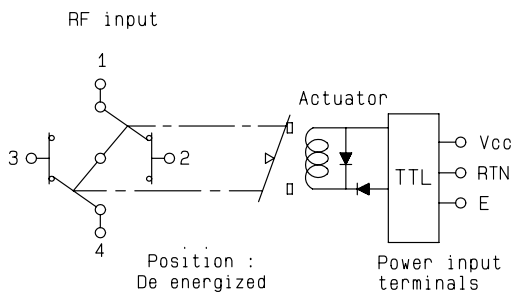
WITH SUPPRESSION DIODES
R577 -1- 030



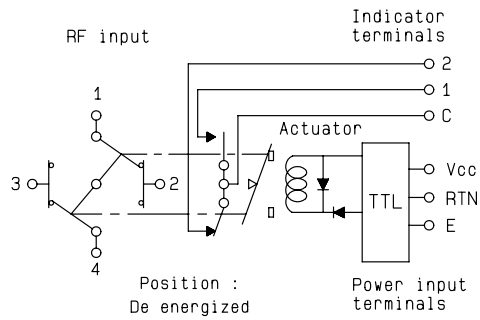
WITH SUPPRESSION DIODES AND INDICATOR CONTACT
R577 -2- 030



WITH TTL DRIVER
(suppression diodes are included)
R577 -1- 100



WITH TTL DRIVER AND INDICATOR CONTACT
(suppression diodes are included)
R577 -2- 100

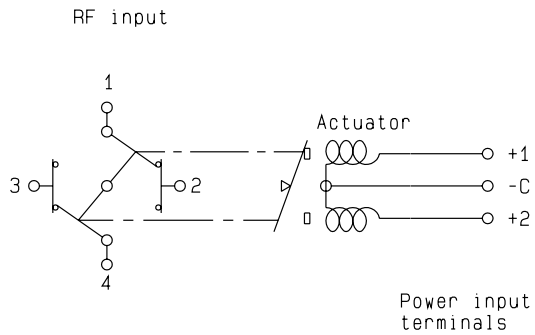


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

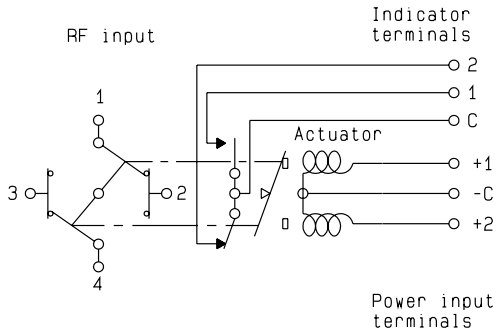
COAXIAL DPDT - ELECTRICAL SCHEMATICS
R577 series

LATCHING

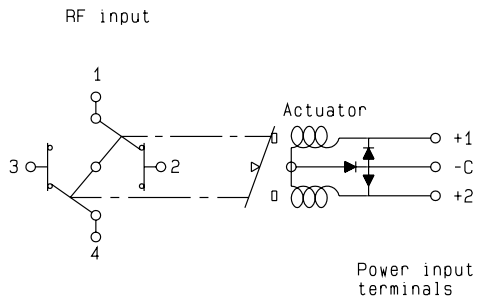
WITHOUT OPTION
R577 -3- 000



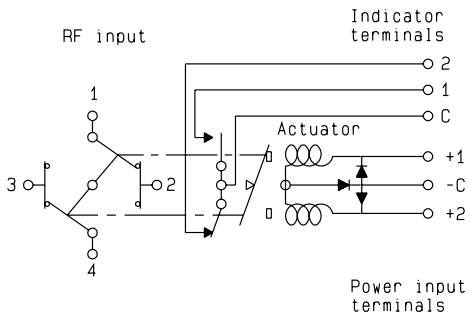
WITH INDICATOR CONTACT
R577 -4- 0000



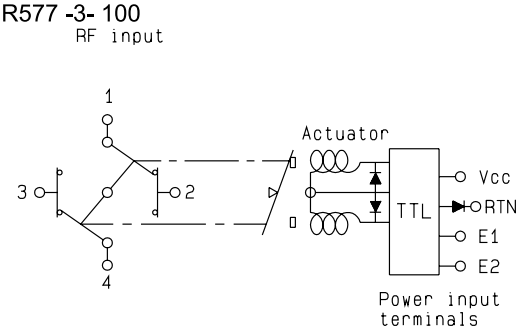
WITH SUPPRESSION DIODES
R577 -3- 030



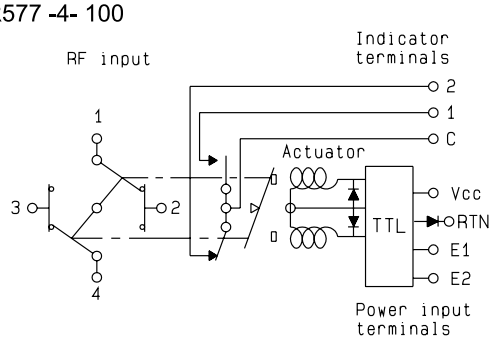
WITH SUPPRESSION DIODES AND INDICATOR CONTACT
R577 -4- 030



WITH TTL DRIVER
(suppression diodes are included)
R577 -3- 100



WITH TTL DRIVER AND INDICATOR CONTACT
(suppression diodes are included)
R577 -4- 100



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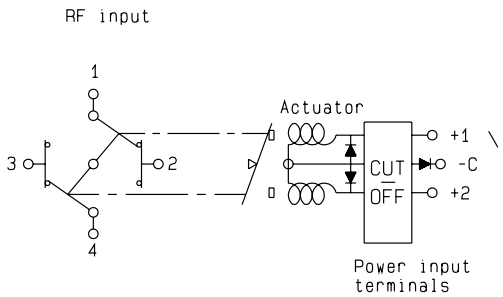
For more detailed technical information please consult Radiall customer support.

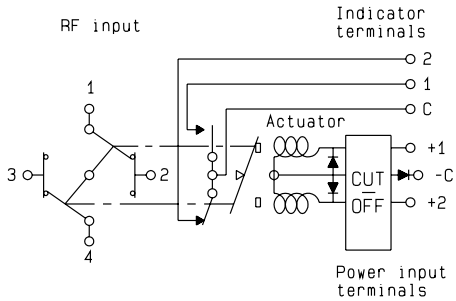
COAXIAL DPDT - ELECTRICAL SCHEMATICS
R577 series

LATCHING

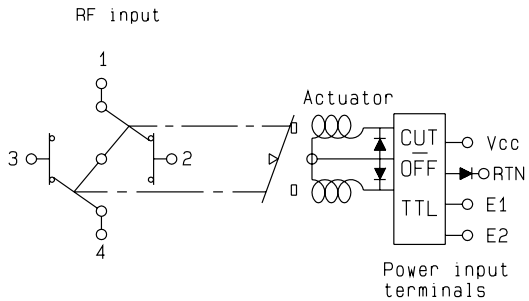
WITH CUT-OFF
(suppression diodes are included)
R577 -5- 000



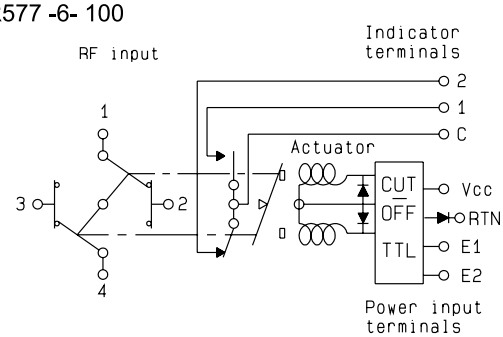
WITH CUT-OFF AND INDICATOR CONTACT
(suppression diodes are included)
R577 -6- 000



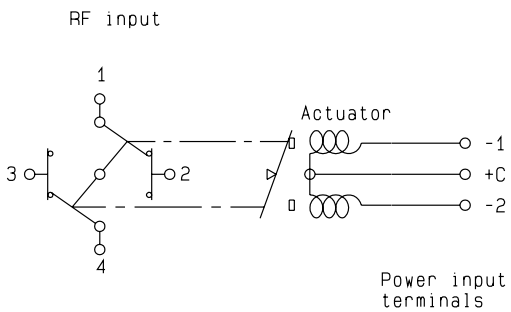
WITH CUT-OFF AND TTL DRIVER
(suppression diodes are included)
R577 -5- 100



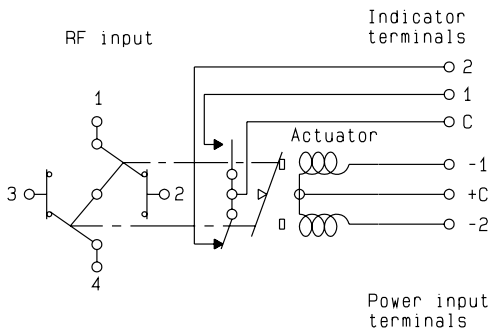
WITH CUT-OFF, TTL AND INDICATOR CONTACT
(suppression diodes are included)
R577 -6- 100



WITH POSITIVE COMMON, NO OPTION
R577 -3- 010



WITH POSITIVE COMMON AND INDICATOR CONTACT
R577 -4- 010

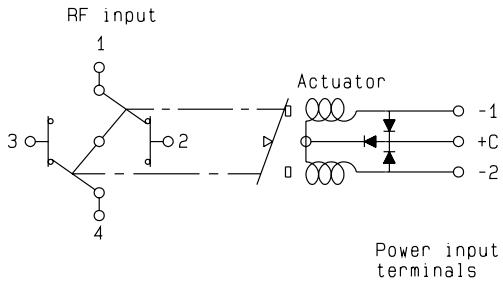


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

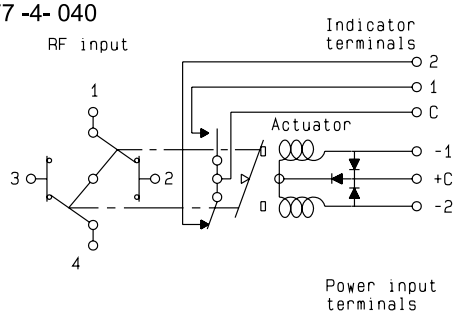
COAXIAL DPDT - ELECTRICAL SCHEMATICS
R577 series

LATCHING

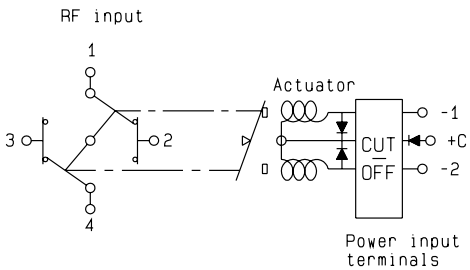
WITH POSITIVE COMMON AND SUPPRESSION DIODES
R577 -3- 040



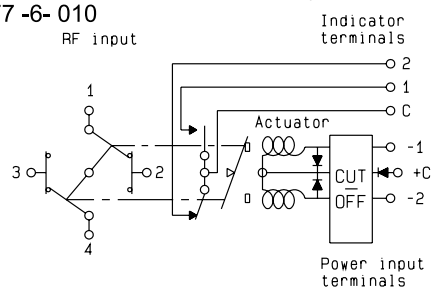
WITH POSITIVE COMMON, SUPPRESSION DIODES AND INDICATOR CONTACT
R577 -4- 040



WITH POSITIVE COMMON AND CUT-OFF
(suppression diodes are included)
R577 -5- 010



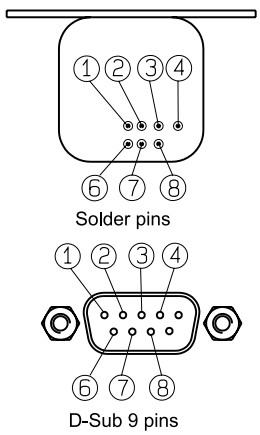
WITH POSITIVE COMMON, CUT-OFF AND INDICATOR CONTACT
(suppression diodes are included)
R577 -6- 010



PIN IDENTIFICATION

Type	PIN							
	1	2	3	4	5	6	7	8
Failsafe	+		-					
Failsafe + I.C.	+		-			1	2	C
Failsafe + TTL	E		RTN	VCC				
Failsafe + I.C. + TTL	E		RTN	VCC		1	2	C
Latching Latching + Cut-off	-1 or +1	-2 or +2	+C or -C					
Latching + I.C. Latching + I.C. + Cut-off	-1 or +1	-2 or +2	+C or -C			1	2	C
Latching + Cut-off Latching + Cut-off + I.C.	E2	E1	RTN	VCC				
Latching + TTL + I.C.	E2	E1	RTN	VCC		1	2	C

Bottom view



To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

HIGH PERFORMANCE DPDT
TITANIUM SERIES / DPDT up to 40 GHz

RoHS COMPLIANT

Radiall's TITANIUM SERIES switches are optimised to perform at a high level over an extended life span. With outstanding RF performances, and a guaranteed Insertion Loss repeatability of 0.03 dB over a life span of 2.5 million switching cycles. RADIALL TITANIUM switches are perfect for automated test and measurement equipment, as well as signal monitoring devices.

Example of P/N:
R513473148 is a DPDT SMA 20 GHz, latching, Self Cut-Off, diodes, positive common, TTL driver, Indicators, HE10 receptacle with bracket.

PART NUMBER SELECTION

R 513 . . . . . .

RF Connectors:
3: SMA up to 6 GHz
4: SMA up to 20 GHz
F: SMA up to 26.5 GHz
8: SMA2.9 up to 40 GHz (2)

Type:
7: Latching + Self cut-off + Indicators

Actuator Voltage:
3: 24 Vdc

TTL Option:
1: With TTL driver (high level)

Documentation:
-: Certificate Of conformity
C: Calibration certificate
R: Calibration certificate + RF curves

Actuator Terminals and Fixing:
8: HE 10 receptacle with bracket (1)
9: HE 10 receptacle without bracket (1)

Option:
4: With suppression diodes and positive common

(1): Delivered with 750 mm (30 inches) ribbon cable + HE10 connector

(2): Connector SMA2.9 is equivalent to "K connector®", registered trademark of Anritsu.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

www.radiall.com

HIGH PERFORMANCE DPDT
TITANIUM SERIES / DPDT up to 40 GHz

GENERAL SPECIFICATIONS

Operating mode			Latching	
Nominal operating voltage (across operating temperature)		Vdc	24 (20 / 32)	
Coil resistance (+/-10%)		Ohms	120	
Nominal operating current at 23°C		mA	200	
Maximum stand-by current		mA	50	
Average power			RF path Cold switching: see Power Rating Chart on **page 4-19** Hot switching : 1 Watt CW	
TTL input	High Level		3 to 7 V	1.4 mA max at 7 V
	Low Level		0 to 0.8 V	-
Indicator specifications			Maximum withstanding voltage 60V Maximum current capacity 150 mA Maximum « ON » resistance 2.5 Ω Minimum « OFF » resistance 100 MΩ	
Switching time (max)		ms	15	
Life (min)	SMA - SMA2.9		2.5 million cycles	
Connectors			SMA - SMA2.9	
Actuator terminal			HE10 ribbon receptacle	
Weight (max)		g	110	

ENVIRONMENTAL SPECIFICATIONS

Operating temperature range	-25°C to +75°C
Storage temperature range	-55°C to +85°C
Temperature cycling (MIL-STD-202, Method 107D, Cond.A)	-55°C to +85°C (10 cycles)
Vibration (MIL STD 202, Method 204D, Cond.D)	10-2000 Hz , 10g operating
Shock (MIL STD 202, Method 213B , Cond.C)	50g / 6 ms,½ sine operating
Moisture resistance (MIL STD 202, Method 106E, Cond.E)	65°C, 95% RH, 10 days
Altitude storage (MIL STD 202, Method 105C, Cond.B)	50,000 feet (15,240 meters)
RFI (MIL STD 1344, Method 3008 or IEC 61726)	40dB at 20GHz

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

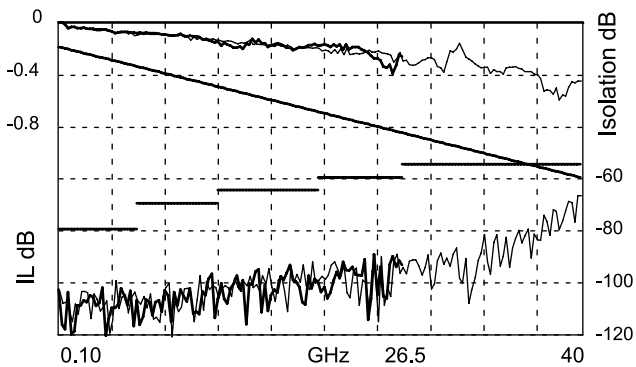
HIGH PERFORMANCE DPDT
TITANIUM SERIES / DPDT up to 40 GHz

RF PERFORMANCES

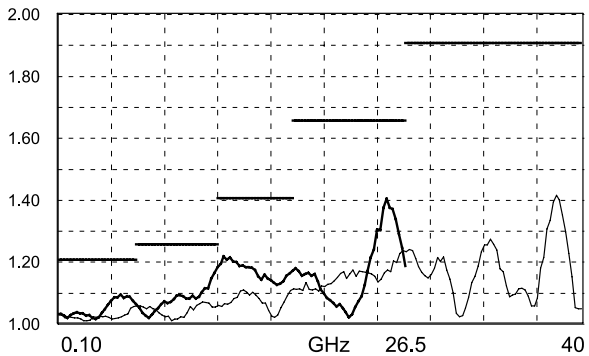
Part Number		R51337314-	R51347314-		R513F7314-		R51387314-	
Frequency range	GHz	DC to 6	DC to 20		DC to 26.5		DC to 40	
Impedance	Ω	50						
Insertion Loss (max)	dB	0.2 + 0.025 x frequency (GHz)						
Isolation dB (min)		100	DC to 6 GHz	80	DC to 6 GHz	80	DC to 6 GHz	80
			6 to 12.4 GHz	70	6 to 12.4 GHz	70	6 to 12.4 GHz	70
			12.4 to 20 GHz	65	12.4 to 20 GHz	65	12.4 to 20 GHz	65
					20 to 26.5 GHz	60	20 to 26.5 GHz	60
							26.5 to 40 GHz	55
V.S.W.R. (max)		1.20	DC to 6 GHz	1.20	DC to 6 GHz	1.20	DC to 6 GHz	1.20
			6 to 12.4 GHz	1.25	6 to 12.4 GHz	1.25	6 to 12.4 GHz	1.25
			12.4 to 18 GHz	1.40	12.4 to 18 GHz	1.40	12.4 to 18 GHz	1.40
			18 to 20 GHz	1.65	18 to 26.5 GHz	1.65	18 to 26.5 GHz	1.65
							26.5 to 40 GHz	1.70
Repeatability (mesured at 25°C)		0.03 dB maximun					0.05 dB	

TYPICAL RF PERFORMANCES

Insertion Loss and Isolation



V.S.W.R.



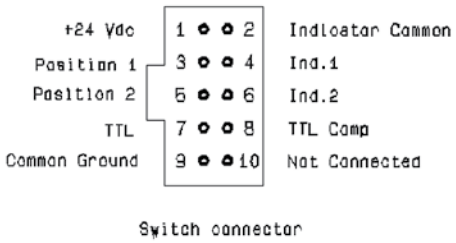
—— 26.5 GHz model with **SMA** / —— 40 GHz model with **SMA2.9**

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

www.radiall.com

DRIVING THE SWITCH

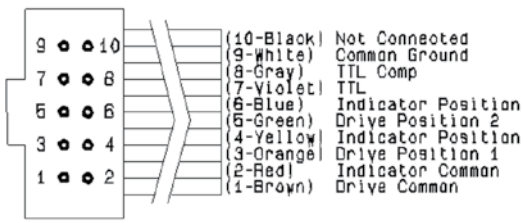
Transfer switches are configured with two positions. Each RF path can be closed by applying Ground or TTL "High" to the corresponding "drive" pin.



Switch connector

Standard drive

- Connect pin 9 to ground (See note 1).
- Connect pin 1 to supply (+20 VDC to +32 VDC).
- Select (close) desired RF paths by applying Ground to the corresponding "drive" pin (Ex: apply Ground to pin 3 to close RF path 1-2 and 3-4).
- To select the second path, ensure that unwanted RF path "drive" pin are disconnected from Ground. Apply Ground to the "drive" pin which corresponds to the desired RF paths (Ex: apply Ground to pin 5 to close RF path 1-3 and 2-4).

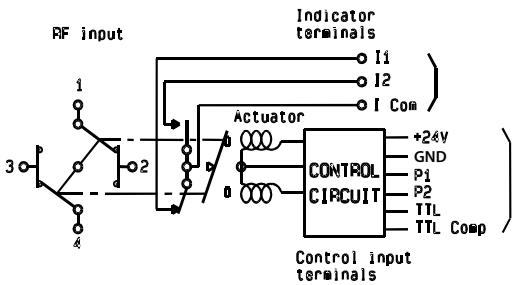


Mating cable connector

TTL drive (Dual line)

- Connect pin 9 to ground.
- Connect pin 1 to supply (+20 VDC to +32 VDC).
- Select (close) desired RF path by applying TTL "High" to the corresponding "drive" pin (Ex: apply TTL "High" to pin 7 and TTL "Low" to pin 8 to close RF paths position 1).
- To select the second path, ensure that unwanted RF path "drive" pins are in TTL "Low" position. Apply TTL "High" to the "drive" pin which correspond to the desired RF path and TTL "low" to the undesired. (Ex: apply TTL "High" to pin 8 and TTL "Low" to pin 7 to close RF paths position 2).

RF SCHEMATIC DIAGRAM



TTL drive (Single line)

- Connect pin 9 to ground.
- Connect pin 1 to supply (+20 VDC to +32 VDC)
- Connect pin 8 to TTL "High".
- Select (close) position 1 by applying TTL "High" to pin 7 (Ex: apply TTL "High" to pin 7 to close RF paths 1-2 and 3-4).
- Select position 2 by applying TTL "Low" to pin 7 (Ex: apply TTL "Low" to pin 7 to close RF paths 1-3 and 2-4).

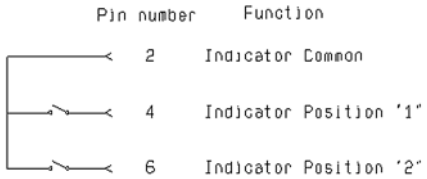
	RF continuity	Indicator
Position 1	1-2 / 3-4	ICom - I1
Position 2	1-3 / 2-4	ICom - I2

Note 1

Pin 9 does not need to be grounded for the switch to operate in standard drive. If pin 9 is not grounded, the position indicators will only function while the appropriate drive is applied. Therefore, if a pulse drive is used and continuous indicator operation is required, pin 9 must be grounded.

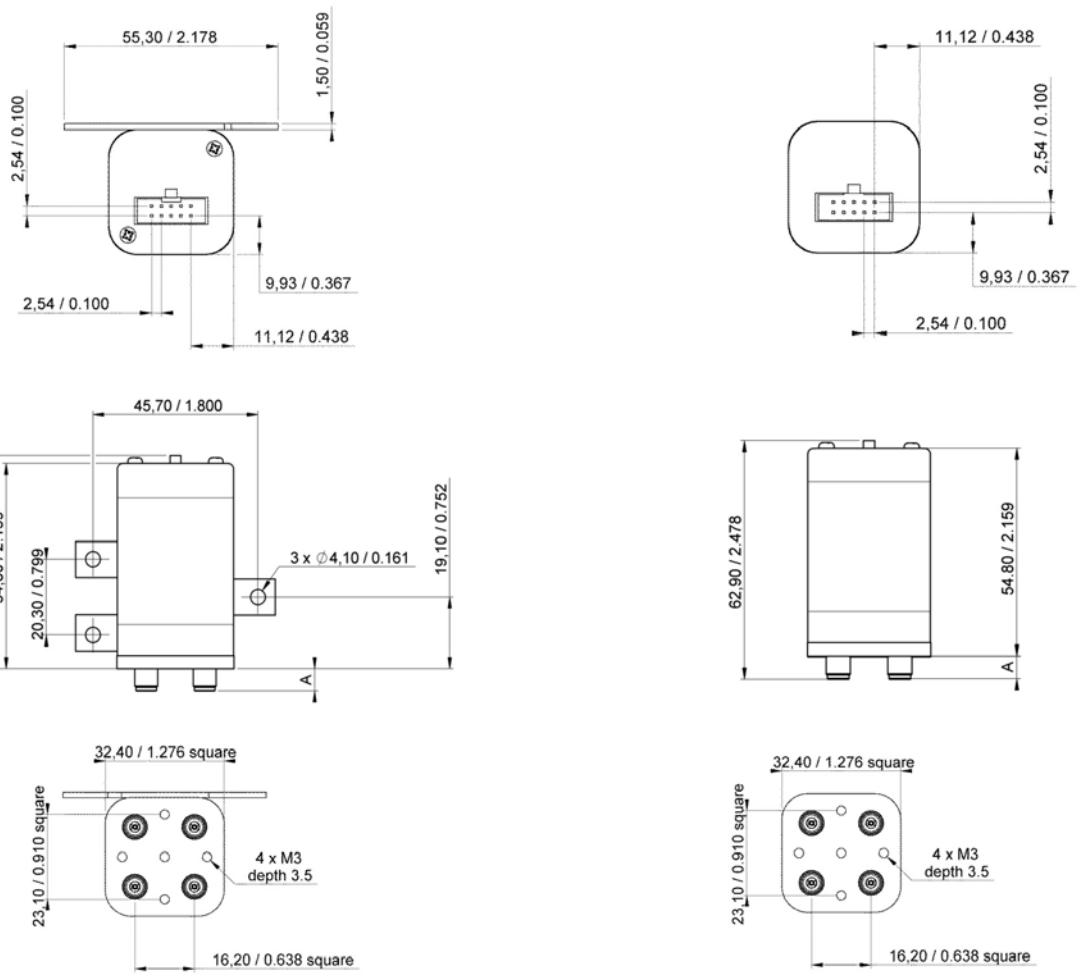
HIGH PERFORMANCE DPDT
TITANIUM SERIES / DPDT up to 40 GHz

RF PERFORMANCES



The electronic position indicators use photo-MOS transistors which are driven by the mechanical position of the RF paths moving elements. The circuitry consists of a common which can be connected to an output corresponding to selected RF path. The photo-MOS transistors are configured for AC and/or DC operation. The electronic position indicators require the supply (20 to 32 VDC) to be connected to pin 1 and ground connected to pin 9.

TYPICAL OUTLINE DRAWING



All dimensions are in millimeters / inches

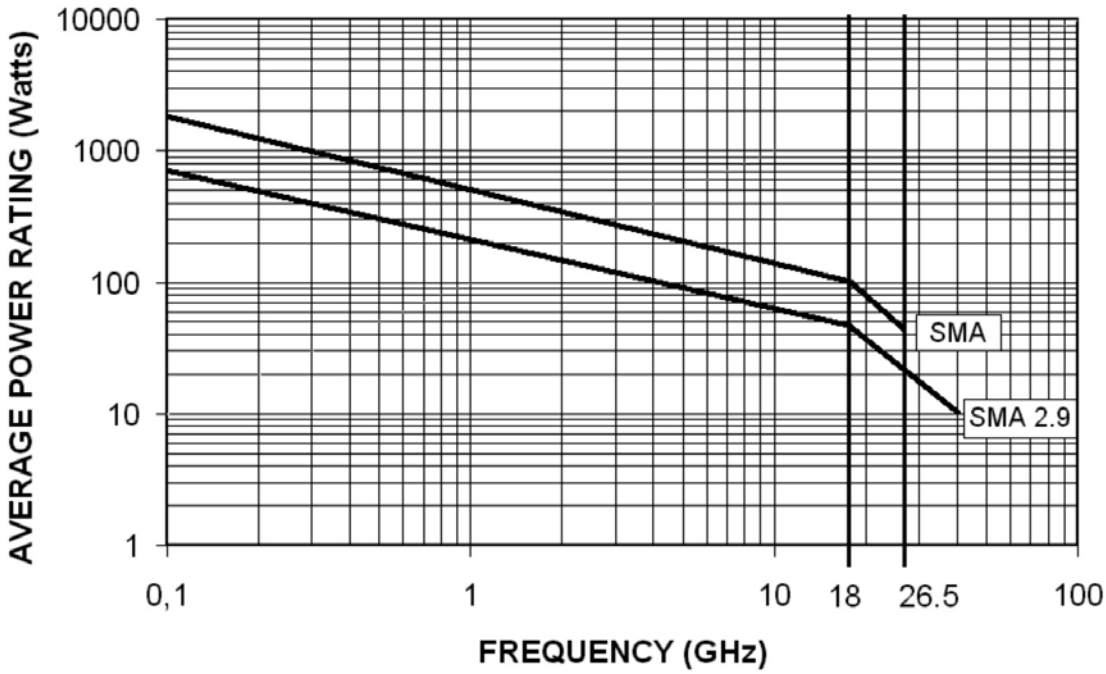
Connectors	SMA	SMA2.9
A max (mm)	7.4	6.3

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

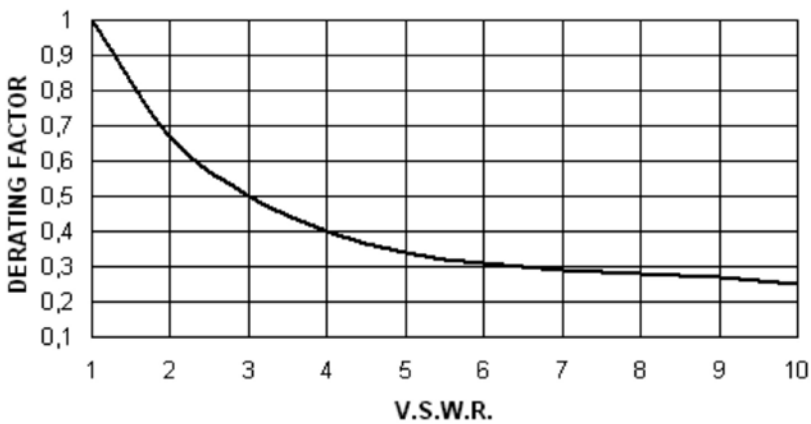
www.radiall.com

POWER RATING CHART

This graph is based on the following conditions:
- Ambient temperature: + 25°C
- Sea level
- V.S.W.R.: 1 and cold switching

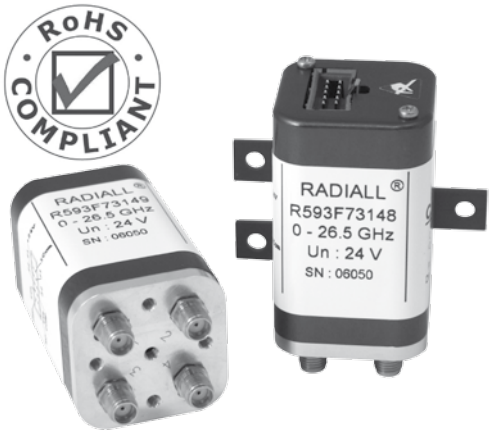


DERATING FACTOR VERSUS V.S.W.R.



To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

HIGH PERFORMANCE DPDT
PLATINUM SERIES / DPDT up to 40 GHz



Radiall's PLATINUM SERIES switches are optimised to perform at a high level over an extended life span. With outstanding RF performances, and a guaranteed Insertion Loss repeatability of 0.03 dB over a life span of 10 million switching cycles. PLATINUM SERIES switches are perfect for automated test and measurement equipment, as well as signal monitoring devices.

Example of P/N:
R593F73148 is a DPDT SMA 26.5 GHz, latching, Self Cut-Off, diodes, positive common, TTL driver, Indicators, HE10 receptacle with bracket.

PART NUMBER SELECTION

R 593 . . . . . .

RF Connectors:
3: SMA up to 6 GHz
4: SMA up to 20 GHz
F: SMA up to 26.5 GHz
8: SMA2.9 up to 40 GHz (2)

Type:
7: Latching + Self cut-off + Indicators

Actuator Voltage:
3: 24 Vdc

TTL Option:
1: With TTL driver (high level)

Documentation:
-: Certificate Of conformity
C: Calibration certificate
R: Calibration certificate + RF curves

Actuator Terminals and Fixing:
8: HE 10 receptacle with bracket (1)
9: HE 10 receptacle without bracket (1)

Option:
4: With suppression diodes and positive common

(1): Delivered with 750 mm (30 inches) ribbon cable + HE10 connector

(2): Connector SMA2.9 is equivalent to "K connector®", registered trademark of Anritsu.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

www.radiall.com

HIGH PERFORMANCE DPDT
PLATINUM SERIES / DPDT up to 40 GHz

GENERAL SPECIFICATIONS

Operating mode			Latching	
Nominal operating voltage (across operating temperature)		Vdc	24 (20 / 32)	
Coil resistance (+/-10%)		Ohms	120	
Nominal operating current at 23°C		mA	200	
Maximum stand-by current		mA	50	
Average power			RF path Cold switching: see Power Rating Chart on **page 4-25** Hot switching: 1 Watt CW	
TTL input	High Level		3 to 7 V	1.4 mA max at 7 V
	Low Level		0 to 0.8 V	-
Indicator specifications			Maximum withstanding voltage 60V Maximum current capacity 150 mA Maximum « ON » resistance 2.5 Ω Minimum « OFF » resistance 100 MΩ	
Switching time (max)		ms	15	
Life (min)	SMA		10 million cycles	
	SMA2.9		5 million cycles	
Connectors			SMA - SMA2.9	
Actuator terminal			HE10 ribbon receptacle	
Weight (max)		g	110	

ENVIRONMENTAL SPECIFICATIONS

Operating temperature range	-25°C to +75°C
Storage temperature range	-55°C to +85°C
Temperature cycling (MIL-STD-202, Method 107D, Cond.A)	-55°C to +85°C (10 cycles)
Vibration (MIL STD 202, Method 204D, Cond.D)	10-2000 Hz , 10g operating
Shock (MIL STD 202, Method 213B, Cond.C)	50g / 6 ms,½ sine operating
Moisture resistance (MIL STD 202, Method 106E, Cond.E)	65°C, 95% RH, 10 days
Altitude storage (MIL STD 202, Method 105C, Cond.B)	50,000 feet (15,240 meters)
RFI (MIL STD 1344, Method 3008 or IEC 61726)	40dB at 20GHz

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

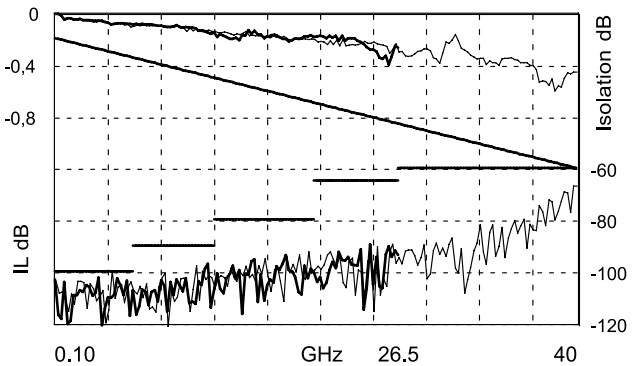
HIGH PERFORMANCE DPDT
PLATINUM SERIES / DPDT up to 40 GHz

RF PERFORMANCES

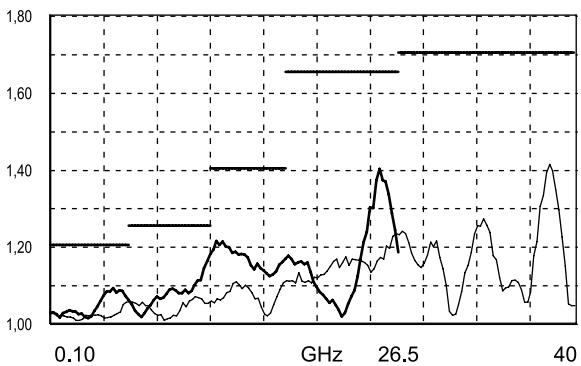
Part Number		R59337314-	R59347314-		R593F7314-		R59387314-	
Frequency range	GHz	DC to 6	DC to 20		DC to 26.5		DC to 40	
Impedance	Ω	50						
Insertion Loss (max)	dB	0.2 + 0.025 x frequency (GHz)						
Isolation dB (min)		100	DC to 6 GHz	100	DC to 6 GHz	100	DC to 6 GHz	100
			6 to 12.4 GHz	90	6 to 12.4 GHz	90	6 to 12.4 GHz	90
			12.4 to 20 GHz	80	12.4 to 20 GHz	80	12.4 to 20 GHz	80
					20 to 26.5 GHz	65	20 to 26.5 GHz	65
							26.5 to 40 GHz	60
V.S.W.R. (max)		1.20	DC to 6 GHz	1.20	DC to 6 GHz	1.20	DC to 6 GHz	1.20
			6 to 12.4 GHz	1.25	6 to 12.4 GHz	1.25	6 to 12.4 GHz	1.25
			12.4 to 18 GHz	1.40	12.4 to 18 GHz	1.40	12.4 to 18 GHz	1.40
			18 to 20 GHz	1.65	18 to 26.5 GHz	1.65	18 to 26.5 GHz	1.65
							26.5 to 40 GHz	1.70
Repeatability (mesured at 25°C)		0.03 dB maximun					0.05 dB	

TYPICAL RF PERFORMANCES

Insertion Loss and Isolation



V.S.W.R.



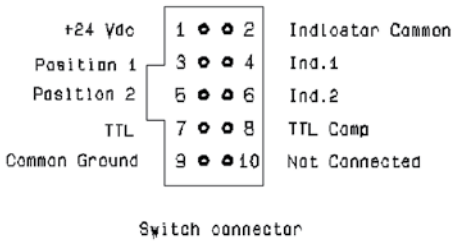
—— 26.5 GHz model with **SMA** / —— 40 GHz model with **SMA2.9**

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

www.radiall.com

DRIVING THE SWITCH

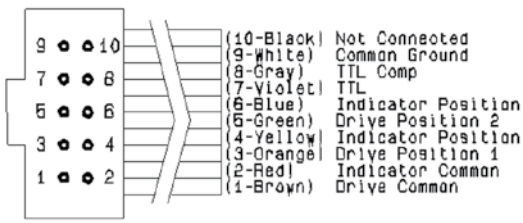
Transfer switches are configured with two positions. Each RF path can be closed by applying Ground or TTL "High" to the corresponding "drive" pin.



Switch connector

Standard drive

- Connect pin 9 to ground (See note 1).
- Connect pin 1 to supply (+20 VDC to +32 VDC).
- Select (close) desired RF paths by applying Ground to the corresponding "drive" pin (Ex: apply Ground to pin 3 to close RF path 1-2 and 3-4).
- To select the second path, ensure that unwanted RF path "drive" pin are disconnected from Ground. Apply Ground to the "drive" pin which corresponds to the desired RF paths (Ex: apply Ground to pin 5 to close RF path 1-3 and 2-4).

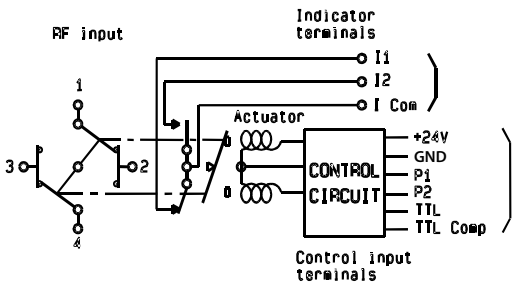


Mating cable connector

TTL drive (Dual line)

- Connect pin 9 to ground.
- Connect pin 1 to supply (+20 VDC to +32 VDC).
- Select (close) desired RF path by applying TTL "High" to the corresponding "drive" pin (Ex: apply TTL "High" to pin 7 and TTL "Low" to pin 8 to close RF paths position 1).
- To select the second path, ensure that unwanted RF path "drive" pins are in TTL "Low" position. Apply TTL "High" to the "drive" pin which correspond to the desired RF path and TTL "low" to the undesired. (Ex: apply TTL "High" to pin 8 and TTL "Low" to pin 7 to close RF paths position 2).

RF SCHEMATIC DIAGRAM



TTL drive (Single line)

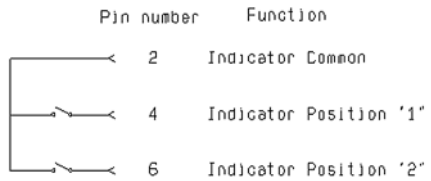
- Connect pin 9 to ground.
- Connect pin 1 to supply (+20 VDC to +32 VDC).
- Connect pin 8 to TTL "High".
- Select (close) position 1 by applying TTL "High" to pin 7 (Ex: apply TTL "High" to pin 7 to close RF paths 1-2 and 3-4).
- Select position 2 by applying TTL "Low" to pin 7 (Ex: apply TTL "Low" to pin 7 to close RF paths 1-3 and 2-4).

	RF continuity	Indicator
Position 1	1-2 / 3-4	ICom - I1
Position 2	1-3 / 2-4	ICom - I2

Note 1

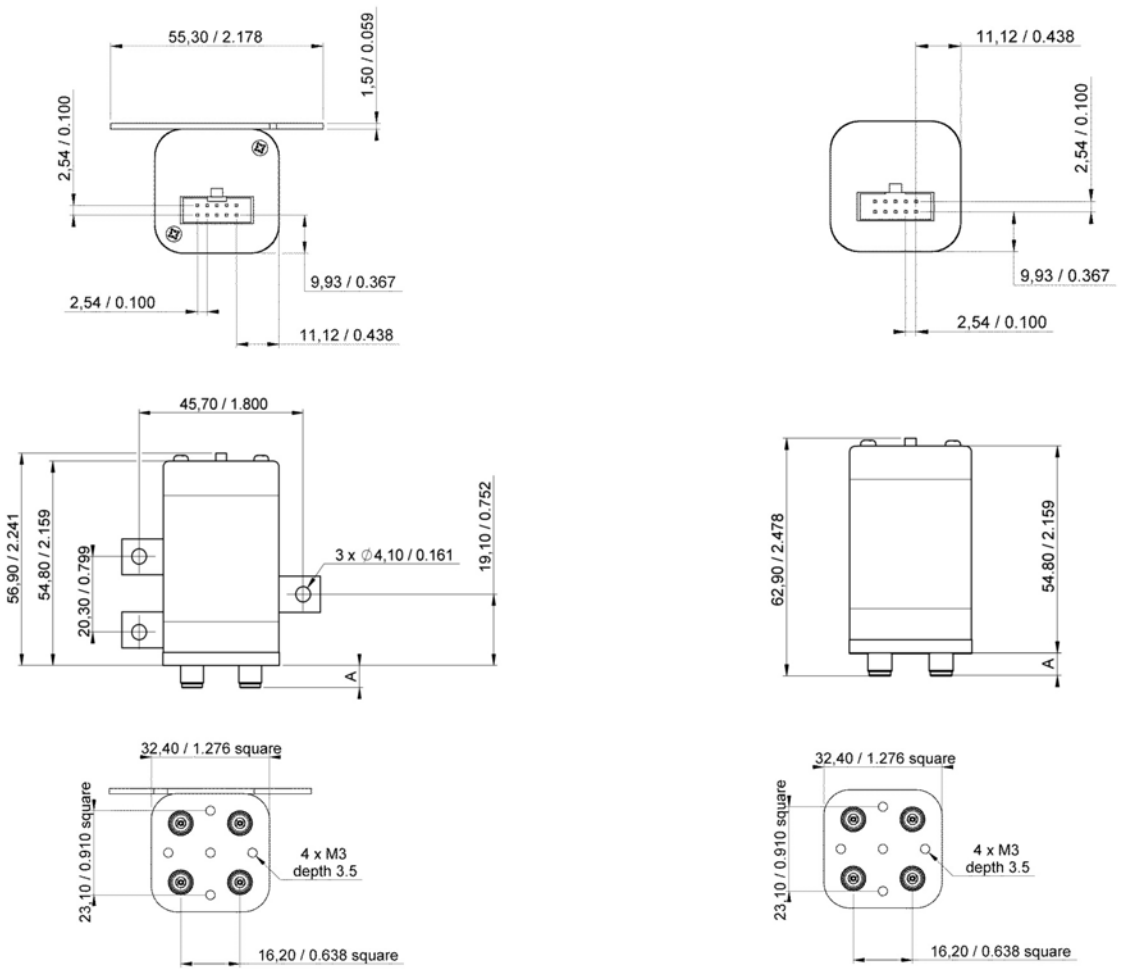
Pin 9 does not need to be grounded for the switch to operate in standard drive. If pin 9 is not grounded, the position indicators will only function while the appropriate drive is applied. Therefore, if a pulse drive is used and continuous indicator operation is required, pin 9 must be grounded.

RF PERFORMANCES



The electronic position indicators use photo-MOS transistors which are driven by the mechanical position of the RF paths moving elements. The circuitry consists of a common which can be connected to an output corresponding to selected RF path. The photo-MOS transistors are configured for AC and/or DC operation. The electronic position indicators require the supply (20 to 32 VDC) to be connected to pin 1 and ground connected to pin 9.

TYPICAL OUTLINE DRAWING



All dimensions are in millimeters / inches

Connectors	SMA	SMA2.9
A max (mm)	7.4	6.3

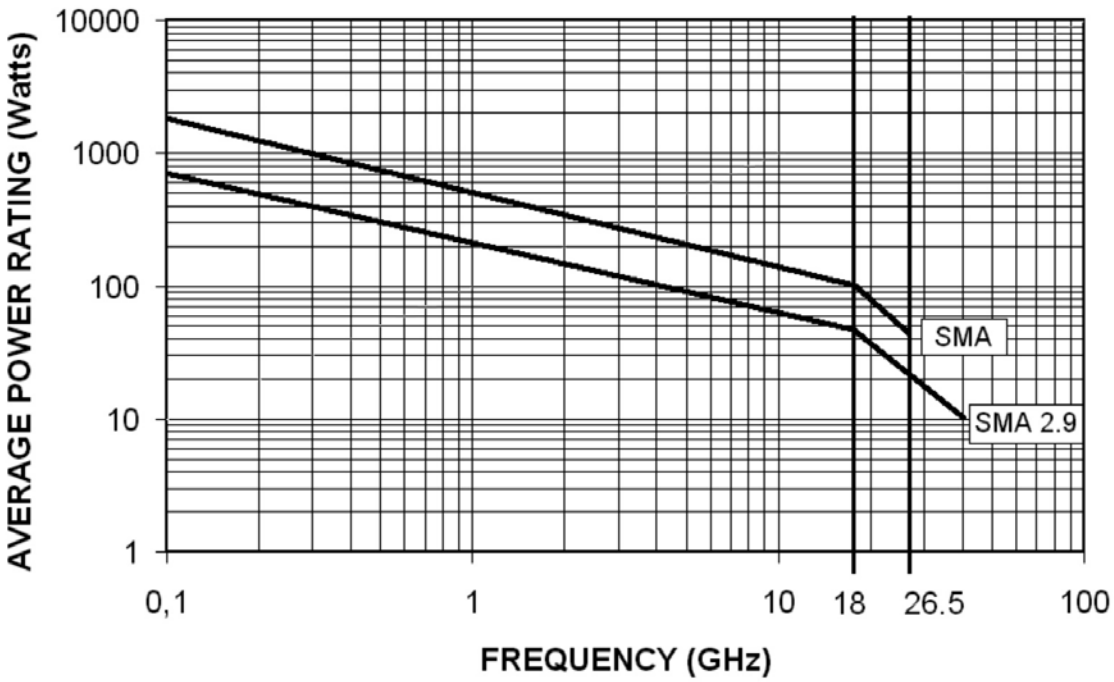
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

www.radiall.com

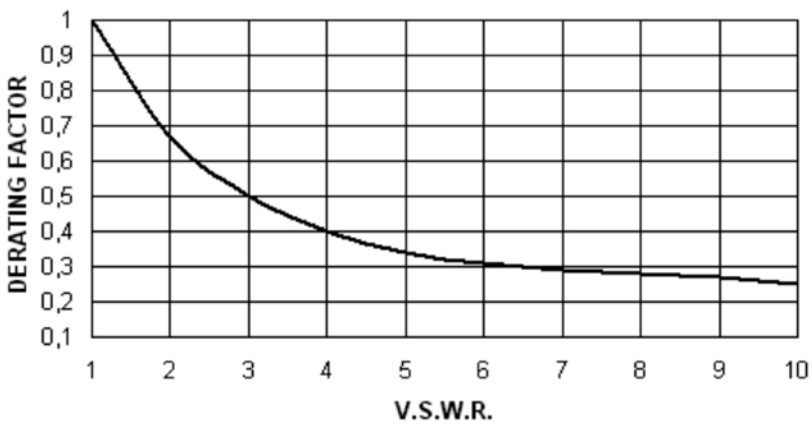
HIGH PERFORMANCE DPDT
PLATINUM SERIES / DPDT up to 40 GHz

POWER RATING CHART

This graph is based on the following conditions:
- Ambient temperature: + 25°C
- Sea level
- V.S.W.R.: 1 and cold switching



DERATING FACTOR VERSUS V.S.W.R.

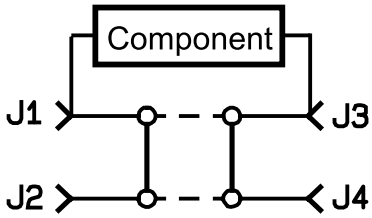


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

OPTIONAL FEATURES FOR DPDT SWITCHES

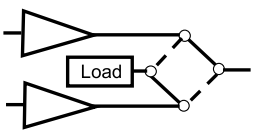
GENERAL

A microwave circuit or component can be inserted into a transmission line by using a DPDT switch as a by-pass product. In event that the short-circuit of the microwave circuit or component is undesirable, the J1/J3 path can be left out (see application option below).



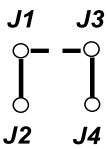
Component inserted in J1 / J3
POS 1: J2 to J4: Direct line
POS 2: J2 to J4: Component line

Examples of dedicated application options:



This DPDT with a cable load is used for redundancy purposes for 2 amplifiers, one working, the other one in stand-by.

This true By-pass Switch is based on a DPDT with only 3 RF ways instead of 4.



Component inserted in J2/J4
POS 1: J1 to J3: Direct line
POS 2: J1 to J3: Component line

This DPDT has been fitted with a specific bracket to meet a customer's requirement

This DPDT switch with SMA2.9 connectors is guaranteed up to 41 GHz, waterproof and fitted with lightning suppression components for use in a military application.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SPnT SECTION

SECTION 5

Pages

SPnT PRODUCTS SELECTION GUIDE

Quick access to the right page:

Connector		Frequency							
		DC - 2.5	DC - 3	DC - 6	DC - 12.4	DC - 18	DC - 20	DC - 26.5	DC - 40
DIN 1.6 / 5.6	No Zc	5-8							
BNC	Zc		5-22						
	No Zc		5-22						
QMA	Zc			5-8					
	No Zc			5-8 / 5-2					
N	Zc				5-22				
	No Zc				5-22				
TNC	Zc				5-22				
	No Zc				5-22				
SMA	Zc					5-8	5-34 / 5-42	5-8 / 5-38 & 5-46	
	No Zc					5-8	5-38	5-2	
SMA2.9	Zc								5-8 / 5-38 & 5-46
	No Zc								5-8 / 5-38

For more detailed technical information please consult Radiall customer support.

SUBMINIATURE SPnT up to 40 GHz
SMA – SMA2.9 – QMA

R591 RADIALL coaxial subminiature switches have a typical operating life exceeding 25 million cycles. Excellent RF & repeatability characteristics along with a guaranteed life of 10 million cycles make these switches ideal for Automated Test Equipment (ATE) and other measurement applications. These miniature switches are also an excellent choice for Mil/Aero applications due to their small size, light weight, as well as outstanding shock and vibration handling capabilities.

Example of P/N :
R591302420 is a SP4T SMA up to 6 GHz, normally open, 12 Vdc with TTL driver

PART NUMBER SELECTION

R 591 . . . . .

RF connectors:
3: SMA up to 6 GHz
7: SMA up to 26.5 GHz
8: SMA2.9 up to 40 GHz (6)
E: QMA up to 6 GHz (5)

Type:
0: Normally open
2: Latching, global reset
6: Latching, separated reset (1)

Actuator Voltage:
2: 12 Vdc
3: 28 Vdc

Actuator Terminals:
0: Solder pins
5: Micro-D connector

Options:
0: Without option
1: Positive common (1)
2: With TTL driver (2) (3) (4)
3: With suppression diodes
4: With suppression diodes and positive common

Number of positions:
4: 4 positions
6: 6 positions

(1): Available with “solder pins“ models only
(2): Polarity is not relevant to application for switches with TTL driver
(3): Suppression diodes are already included with TTL option
(4): Available with “normaly open” models only

(5): The QLF tradermark (Quick Lock Formula®) standard applies to QMA and QN series and guaranties the full intermateability between suppliers using this tradermark. Using QLF certified connectors also guarantees the specified level of RF performances.
(6): Connector SMA2.9 is equivalent to "K connector®", registered trademark of Anritsu.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SUBMINIATURE SPnT up to 40 GHz
SMA – SMA2.9 – QMA

GENERAL SPECIFICATIONS

Operating mode			Normally open		Latching	
Nominal operating voltage (across operating temperature)		Vdc	12 (10.2 / 13)	28 (21 / 30)	12 (10.2 / 13)	28 (21 / 30)
Coil resistance (+/-10%)		Ohms	48	250	60	285
Operating current at 23°C		mA	250	110	200	98
Average power			See RF Power Rating Chart **page 1-16**			
TTL input	High Level		2.2 to 5.5 Volts		800µA max 5.5 Volts	
	Low Level		0 to 0.8 Volts		20µA max 0.8 Volts	
Switching time (max)		ms	10			
Life			10 million cycles (SMA, QMA) / 2 million cycles (SMA2.9)			
Connectors			SMA - QMA - SMA2.9			
Actuator terminals			Solder Pins: double row connector for wrapping, soldering (250°C max / 30 sec), or connecting to 2.54 mm pitch female connector. 9 pin micro-D receptacle M83513/07-A according to MIL-C-85513.			
Operating temperature range			-40°C to +85°C			
Storage temperature range			-55°C to +85°C			
Sine vibration (According to MIL STD 202, Method 204D, Cond. D)			10-2000 Hz, 20g operating			
Random vibration (According to MIL STD 202, Method 214A, Profile I, Cond. F)			50-2000 Hz, 20.71grms operating			
Shock (According to MIL STD 202, Method 213B, Cond. C)			100g / 6 ms, ½ sine operating			

RF PERFORMANCES

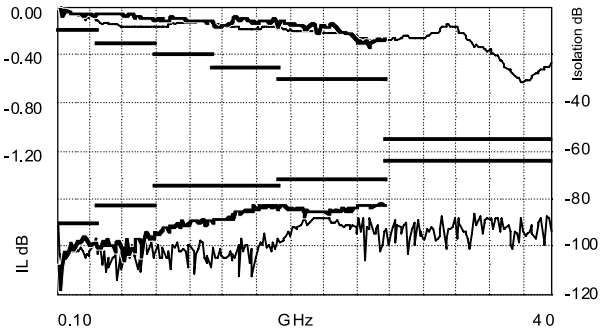
Connectors	Frequency Range GHz		V.S.W.R. (max)	Insertion Loss (max) dB	Isolation (min) dB	Impedance Ohms
QMA / SMA	DC - 6	DC – 3	1.20	0.20	80	50
		3 – 6	1.30	0.30	70	
SMA	DC – 26.5	DC – 3	1.20	0.20	80	50
		3 – 8	1.30	0.30	70	
		8 – 12.4	1.40	0.40	60	
		12.4 – 18	1.50	0.50	60	
		18 – 26.5	1.60	0.60	55	
SMA2.9	DC – 40	DC – 3	1.20	0.20	80	50
		3 – 8	1.30	0.30	70	
		8 – 12.4	1.40	0.40	60	
		12.4 – 18	1.50	0.50	60	
		18 – 26.5	1.70	0.70	55	
		26.5 – 40	2.20	1.10	45	

See page 5-4 for typical RF performances

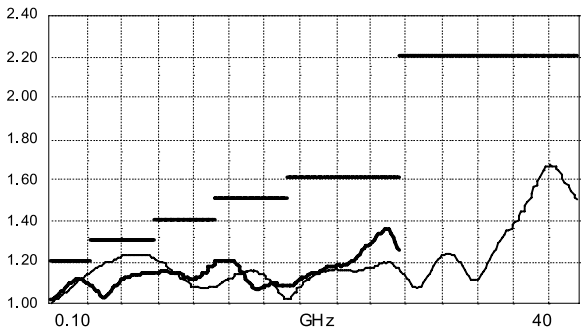
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

TYPICAL RF PERFORMANCES

Insertion Loss and Isolation

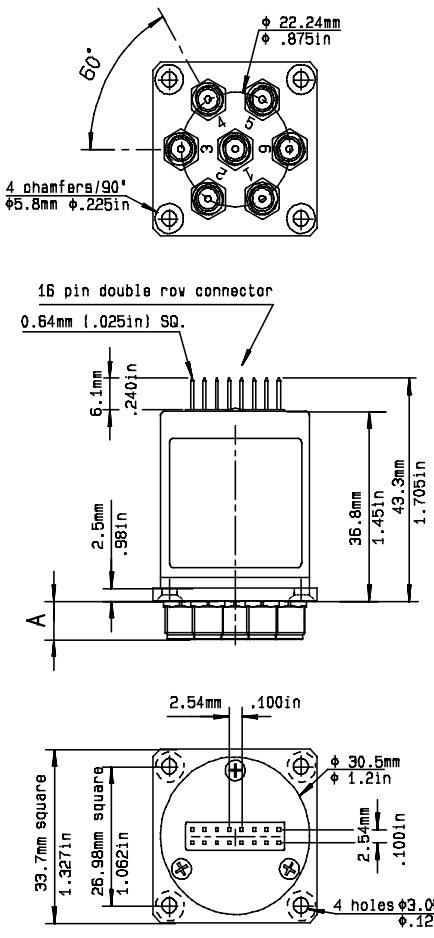


V.S.W.R.

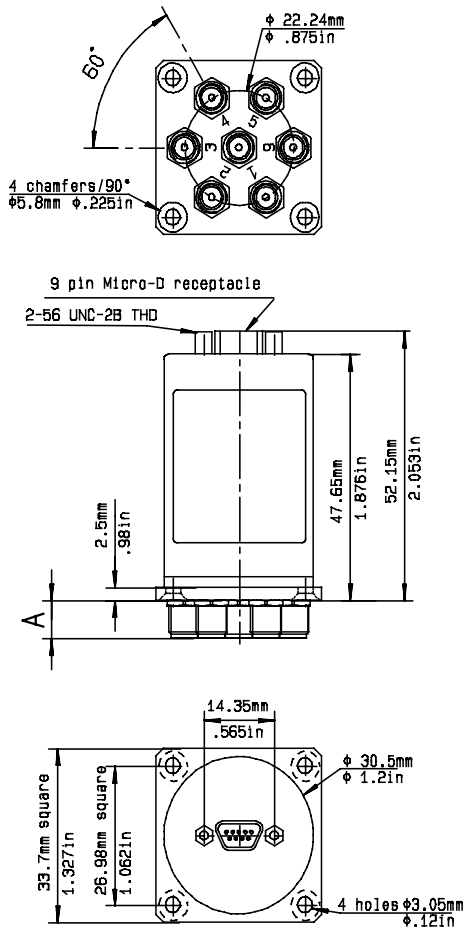


TYPICAL OUTLINE DRAWING (1)

Solder pin Model



Micro-D Model



(1) : For SP4T, ways 3 and 6 not connected

all dimensions are in mm/inches

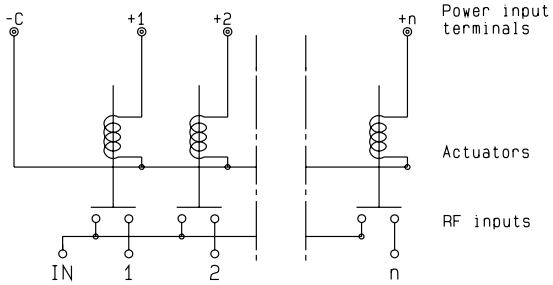
Connectors	SMA	SMA2.9	QMA
A (mm/in.)	7.4/0.291	6.5/0.26	10.8/0.425

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

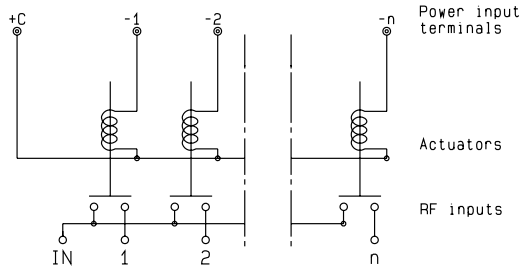
www.radiall.com

R591 SERIES ELECTRICAL SCHEMATICS

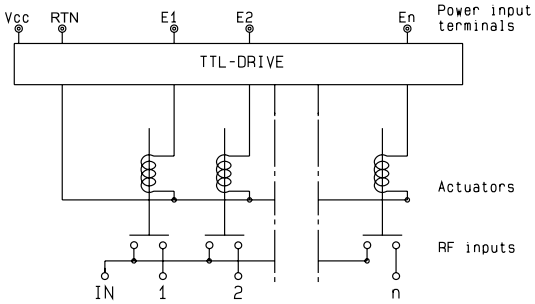
NORMALLY OPEN WITHOUT OPTION
R591 -0- -0-



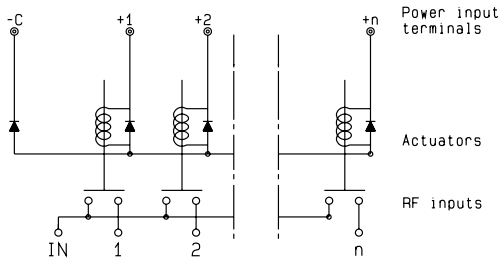
NORMALLY OPEN WITH POSITIVE COMMON
R591 -0- -1-



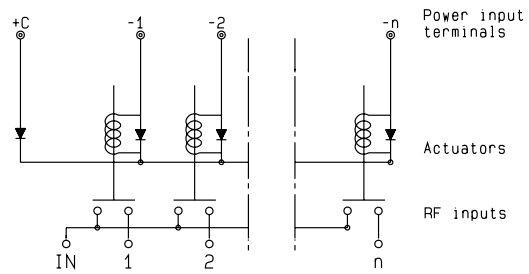
NORMALLY OPEN WITH TTL DRIVE
R591 -0- -2-



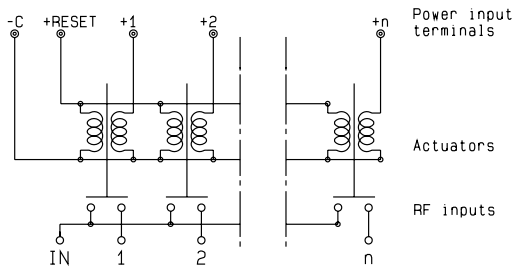
NORMALLY OPEN WITH SUPPRESSION DIODES
R591 -0- -3-



NORMALLY OPEN WITH POSITIVE COMMON AND SUPPRESSION DIODES
R591 -0- -4-



LATCHING GLOBAL RESET WITHOUT OPTION
R591 -2- -0-



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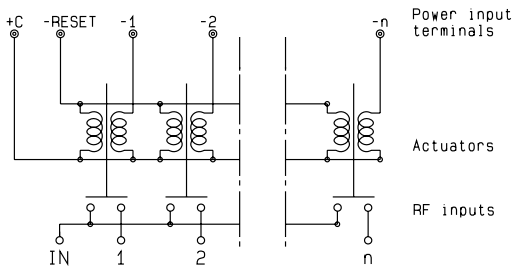
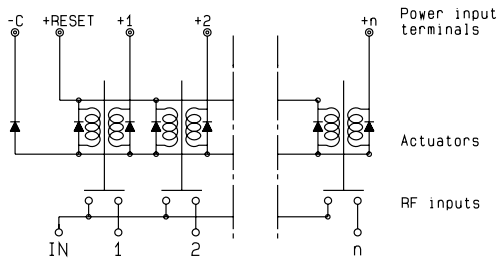
R591 SERIES ELECTRICAL SCHEMATICS

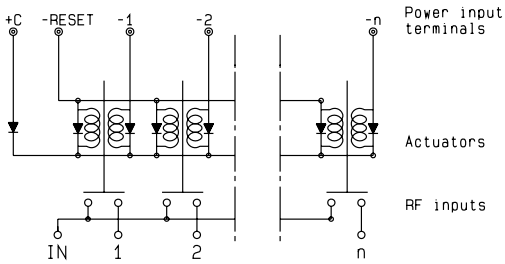
LATCHING GLOBAL RESET WITH POSITIVE COMMON
R591 -2- -1-



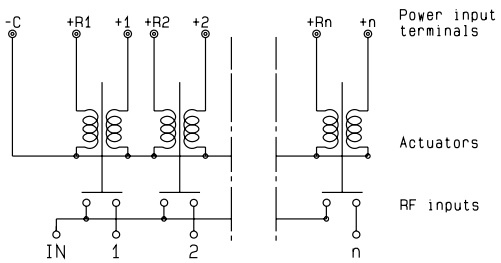
LATCHING GLOBAL RESET WITH SUPPRESSION DIODES
R591 -2- -3-



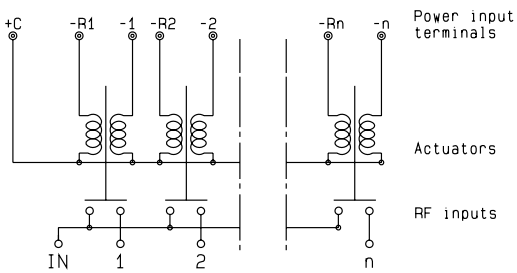
LATCHING GLOBAL RESET WITH POSITIVE COMMON AND SUPPRESSION DIODES
R591 -2- -4-



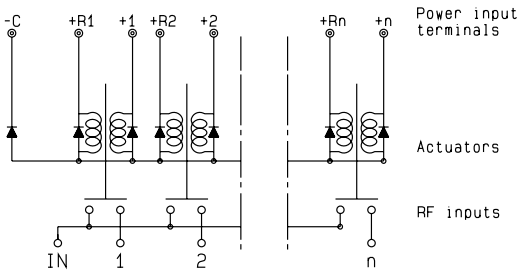
LATCHING SEPARATED RESET WITHOUT OPTION
R591 -6- -0-



LATCHING SEPARATED RESET WITH POSITIVE COMMON
R591 -6- -1-



LATCHING SEPARATED RESET WITH SUPPRESSION DIODES
R591 -6- -3-



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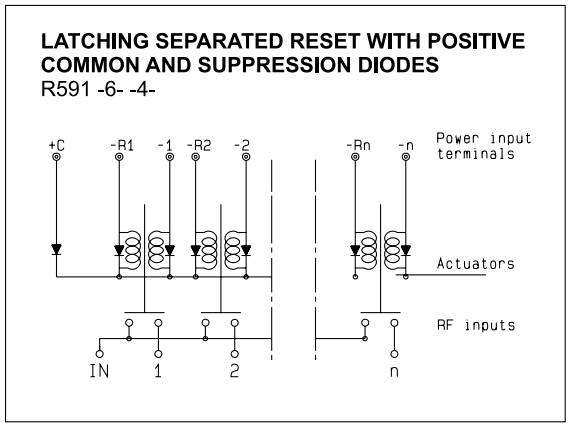
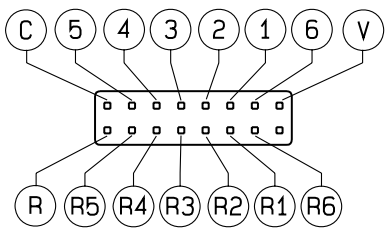
R591 SERIES ELECTRICAL SCHEMATICS

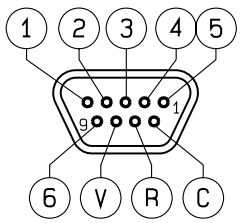


PIN IDENTIFICATION

Solder pins (top view)*



9 pin Micro-D (top view)



*: Compatible with 2.54 mm pitch double row 16 contact female connector

NC: not connected
For SP4T, ways 3 and 6 not connected
Pin R = reset of all paths

Type		C	V	1	2	3	4	5	6	R	R1	R2	R3	R4	R5	R6
Normally Open	Negative common	-C	NC	+1	+1	+3	+4	+5	+6	NC	NC	NC	NC	NC	NC	NC
	Positive common	+C	NC	-1	-1	-3	-4	-5	-6	NC	NC	NC	NC	NC	NC	NC
Latching global reset	Negative common	-C	NC	+1	+1	+3	+4	+5	+6	+reset	NC	NC	NC	NC	NC	NC
	Positive common	+C	NC	-1	-1	-3	-4	-5	-6	-reset	NC	NC	NC	NC	NC	NC
Latching individual reset	Negative common	-C	NC	+1	+1	+3	+4	+5	+6	NC	+res.1	+res.2	+res.3	+res.4	+res.5	+res.6
	Positive common	+C	NC	-1	-1	-3	-4	-5	-6	NC	-reset	-res.2	-res.3	-res.4	-res.5	-res.6
Normally open with TTL drive		RTN	VCC	E1	E2	E3	E4	E5	E6	NC	NC	NC	NC	NC	NC	NC

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
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SPnT Terminated and non Terminated up to 40 GHz

SMA - SMA2.9 - QMA - DIN 1.6 / 5.6

RADIALL R573 & R574 multithrow coaxial switches are offered in many configurations (over 40,000 possible possible combinations) including Terminated and non Terminated options. RADIALL offers reliability, reduced deliveries and competitive pricing. Excellent typical RF performances make RAMSES switches (40 GHz) ideal for Automated Test Equipment (ATE) and other measurement applications. These switches are also an excellent choice for defense, industrial, instrusmentation applications and telecommunications as well.

Example of P/N:
R574463605 is a SP6T SMA up to 18 GHz, Latching, Self Cut-Off, 28 Vdc, Indicators & male 25 pin D-Sub connector.

PART NUMBER SELECTION

R 57. . . . . .

Model:
3: Without 50 Ω termination
4: With 50 Ω termination

RF Connectors:
3: SMA up to 3 GHz
E: QMA up to 6 GHz (4) (5) (10)
4: SMA up to 18 GHz
7: SMA 2.9 up to 26.5 GHz (4) (5)
F: SMA up to 26.5 GHz (4) (6)
8: SMA 2.9 up to 40 GHz (4) (5) (11)
9: DIN 1.6/5.6 up to 2.5 GHz (4) (5)

Type:
0: Normally open
1: Normally open + I.C.
2: Latching
3: Latching + I.C.
4: Latching + S.C.O. (1) (4)
5: Latching + S.C.O. + I.C. (1) (4)
8: Latching + S.C.O. + A.R. (1)
9: Latching + S.C.O. + I.C. + A.R. (1)

Actuator Voltage:
2: 12 Vdc
3: 28 Vdc

Actuator Terminals:
0: Solder pins
5: D-Sub connector

Options:
0: Without option
1: Positive common (2) (7)
2: Compatible TTL driver (high level) (1) (9)
3: With suppression diodes
4: With suppression diodes and positive common (2) (7)
8: BCD TTL driver compatible (1) (3) (8) (9)

Number of positions:

3: 3 Positions	8: 8 Positions
4: 4 Positions	9: 9 Positions
5: 5 Positions	0: 10 Positions
6: 6 Positions	1: 11 Positions
7: 7 Positions	2: 12 Positions

I.C.: Indicator contact / S.C.O. : Self Cut-Off / A.R. : Auto Reset
(1): These models are already equiped with suppression diodes.
(2): Standard products are equiped with negative common.
(3): Latching BCD driver enables also a global reset through driver code 0000 (see BCD logic coding page 1-13).
(4): Available only up 6 positions.
(5): Model "3" only.
(6): Model "4" only .
(7): Option not available for type 4,5,8 & 9.
(8): Option available only with type 0,1,8 & 9.
(9): Polarity is not relevant to application for switches with TTL driver.

(10) : The QLF tradermark (quick lock formula®) standard applies to QMA and QN series and guaranties the full intermateability between suppliers using this tradermark. Using QLF certificied connectors also guarantees the specified level of RF performance.

(11) connector SMA 2.9 is equivalent to "K connector®", registered trademark of Anritsu.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

www.radiall.com

GENERAL SPECIFICATIONS

Type 2, 3, 4 & 5:

Latching models have a RESET pin which commands the reset of all positions. This command should be used before switching from one position to another. If not, two positions will be set at the same time.
Note: During the RESET operation the current is: Nominal operating current is multiplied by the number of positions.

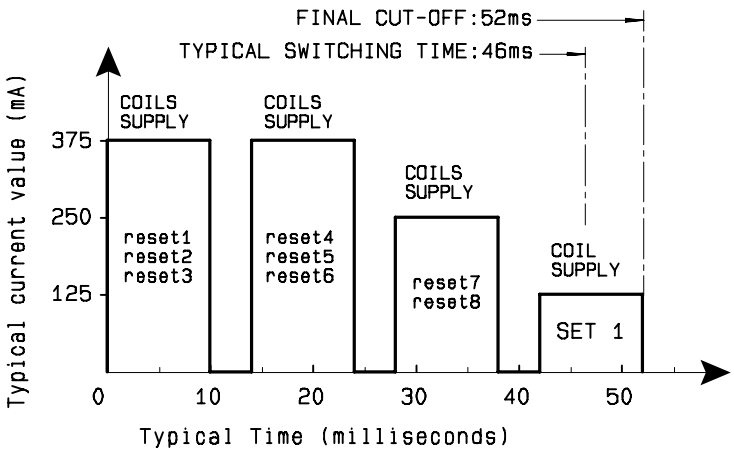
Type 8, 9:

Latching models with AUTOMATIC RESET are available; these products have an internal SET/RESET circuit which automatically resets all the non-selected positions and sets the desired position. This option simplifies the use of latching switches by suppressing the RESET command in switching sequence.

An electronic circuit supplies successively groups of 2 or 3 actuators, in order to limit the maximun current.
The current with this option is the total current of 2 or 3 reset coils in the same time (see table below).

Example: During the AUTOMATIC RESET operation, at 28 Vdc, 4 position switch has a temporary consumption of only 250 mA, during 40 ms maximum.

SWITCHING SEQUENCE



n = number of positions

Operating Total current at 23 ° C (mA) SPnT LATCHING				
Number of positions	12 Volts		28 Volts	
	Manual Reset	Automatic Reset	Manual Reset	Automatic Reset
3 to 4	320 x n	640	125 x n	250
5 to 8	320 x n	960	125 x n	375
9 to 12	320 x n	1280	125 x n	500

Availability of options according to both type and number of positions

Type	Numbers of positions	Available Options
0 or 1	3 to 12	0 - 1 - 2 - 3 - 4 - 8
2 or 3	3 to 6	0 - 1 - 2 - 3 - 4
	7 to 12	0 - 1 - 3 - 4
4 or 5	3 to 6	0 - 2
	7 to 12	Not available
8 or 9	3 to 12	0 - 2 - 8

SPnT Terminated and non Terminated up to 40 GHz
SMA - SMA2.9 - QMA - DIN 1.6 / 5.6

GENERAL SPECIFICATIONS

Operating mode			Normally open		Latching	
Nominal operating voltage (across operating temperature)		Vdc	12 (10.2 / 13)	28 (24 / 30)	12 (10.2 / 13)	28 (24 / 30)
Coil resistance (+/-10%)		Ohms	47.5	275	See table on previous page	
Nominal operating current at 23°C		mA	250	102		
Average power			See Power Rating Chart **page 1-16**			
TTL input	High Level		2.2 to 5.5 V (TTL Option) / 3.5 to 5.5 V (BCD Option)		800µA max 5.5 volts	
	Low Level		0 to 0.8 V (TTL Option) / 0 to 1.5 V (BCD Option)		20µA max 0.8 Volts	
Indicator rating			1 Watt / 30 Volts / 100 mA			
Switching time (max)		ms	15 ms For automatic reset models: SP3T to SP6T => 40 ms SP7T to SP12T => 50 ms			
Life (min)	Non terminated SP3 to 6T (R573 serie)		SMA - QMA		SMA 2.9 - 1.6/5.6	
			5 million cycles		2 million cycles	
	Terminated SP3 to 6T (R574 serie)		2 million cycles			
	SP7 to 12T (all models)					
Connectors			SMA - SMA2.9 - QMA - DIN 1.6/5.6			
Actuator terminals			Solder pins or male 25 pin D-Sub connector			
Operating temperature range	DIN 1.6/5.6		-25°C to +70°C			
	SMA - SMA2.9 - QMA		-40°C to +85°C			
Storage temperature range	DIN 1.6/5.6		-40°C to +85°C			
	SMA - SMA2.9 - QMA		-55°C to +85°C			
Vibration (MIL STD 202, method 204D, cond.D)			10-2000 Hz , 20g operating for SP3 to 6T, survival for SP7 to 12T			
Shock (MIL STD 202, method 213B, cond.C)			100g / 6 ms, ½ sine operating for SP3 to 6T, survival for SP7 to 12T			

RF PERFORMANCES

SMA Connector						
Number of positions	Frequency Range GHz		V.S.W.R. (max)	Insertion Loss (max) dB	Isolation (min) dB	Impedance Ohms
3 to 6	DC - 3 DC - 18 DC - 26.5	DC - 3	1.20	0.20	80	50
		3 - 8	1.30	0.30	70	
		8 - 12.4	1.40	0.40	60	
		12.4 - 18	1.50	0.50	60	
		18 - 26.5	1.70	0.70	50	
7 to 8	DC - 3 DC - 18	DC - 3	1.20	0.20	80	50
		3 - 8	1.30	0.30	70	
		8 - 12.4	1.40	0.40	60	
		12.4 - 16	1.50	0.55	60	
		16 - 18	1.60	0.60	60	
9 to 10	DC - 3 DC - 18	DC - 3	1.20	0.20	80	50
		3 - 8	1.30	0.30	70	
		8 - 12.4	1.40	0.40	60	
		12.4 - 15.5	1.50	0.50	60	
		15.5 - 18	1.70	0.70	55	
11 to 12	DC - 3 DC - 12.4	DC - 3	1.20	0.20	80	50
		3 - 8	1.40	0.35	70	
		8 - 12.4	1.80	0.70	60	

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RF PERFORMANCES

SMA2.9 Connector						
Number of positions	Frequency Range GHz		V.S.W.R. (max)	Insertion Loss (max) dB	Isolation (min) dB	Impedance Ohms
3 to 6	DC - 26.5 DC - 40	6 - 12.4	1.40	0.40	60	50
		12.4 - 18	1.50	0.50	60	
		18 - 26.5	1.70	0.70	55	
		26.5 - 40	2.20	1.10	50	

1.6/5.6 Connector						
Number of positions	Frequency Range GHz		V.S.W.R. (max)	Insertion Loss (max) dB	Isolation (min) dB	Impedance Ohms
3 to 6	DC - 2.5	DC - 1	1.30	0.20	80	75
		1 - 2.5	1.40	0.30	70	

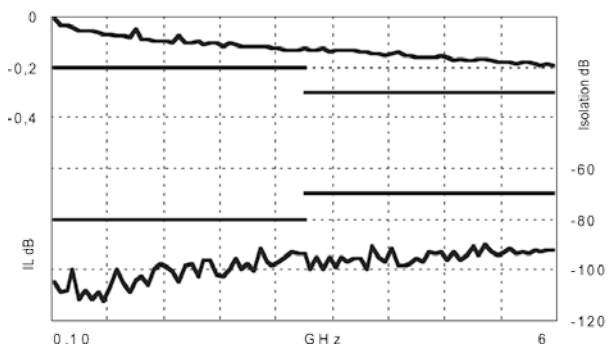
QMA Connector						
Number of positions	Frequency Range GHz		V.S.W.R. (max)	Insertion Loss (max) dB	Isolation (min) dB	Impedance Ohms
3 to 6	DC - 6	DC - 3	1.20	0.20	80	50
		3 - 6	1.30	0.30	70	

See page 5-12, 5-13, 5-14 and 5-15 for typical RF performances

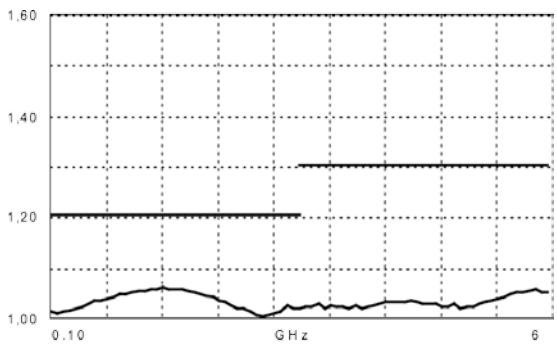
R573 AND R574 TYPICAL RF PERFORMANCES

Example: SP6T QMA up to 6 GHz

Insertion Loss and Isolation



V.S.W.R.



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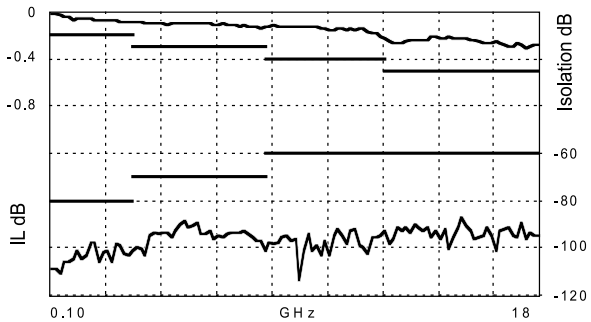
SPnT Terminated and non Terminated up to 40 GHz

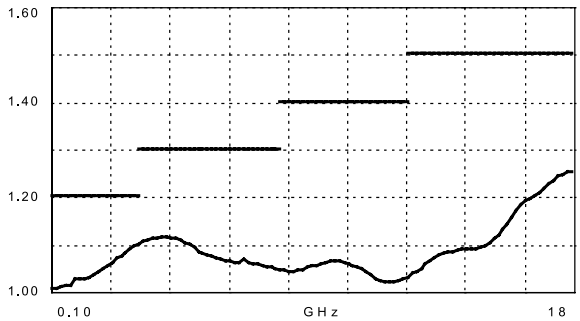
SMA - SMA2.9 - QMA - DIN 1.6 / 5.6

Example: Non terminated SP6T SMA up to 18 GHz

Insertion Loss and Isolation

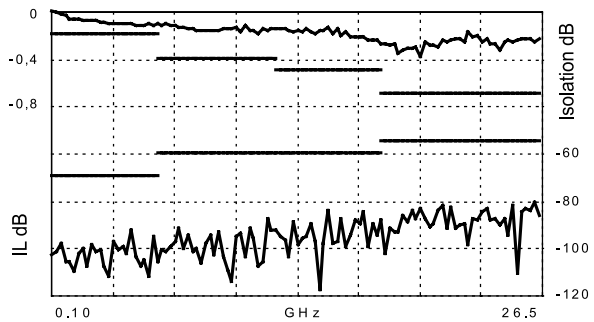


V.S.W.R.

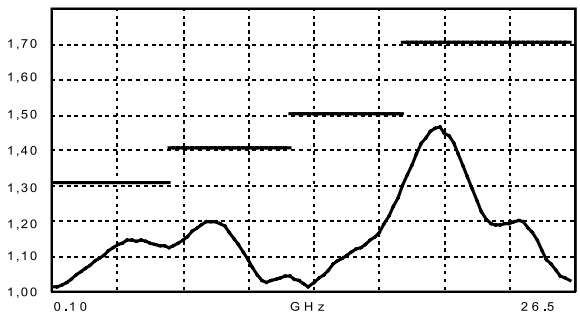


Example: Non terminated SP6T SMA2.9 up to 26.5 GHz

Insertion Loss and Isolation



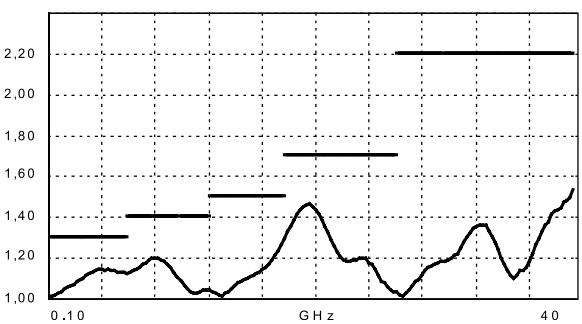
V.S.W.R.



Example: Non terminated SP6T SMA2.9 up to 40 GHz

Insertion Loss and Isolation

V.S.W.R.



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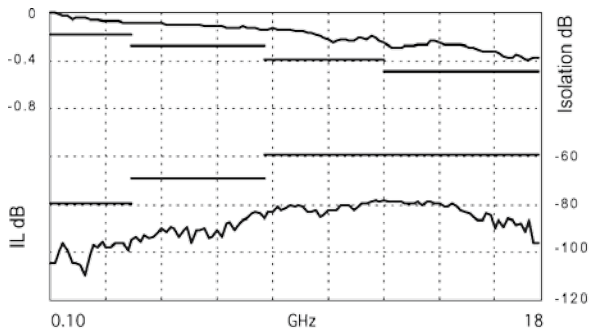
SPnT Terminated and non Terminated up to 40 GHz

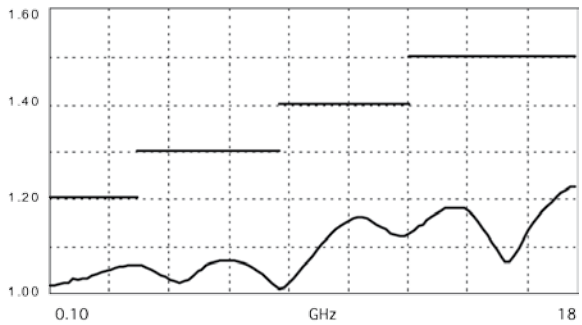
SMA - SMA2.9 - QMA - DIN 1.6 / 5.6

Example: Terminated SP6T SMA up to 18 GHz

Insertion Loss and Isolation

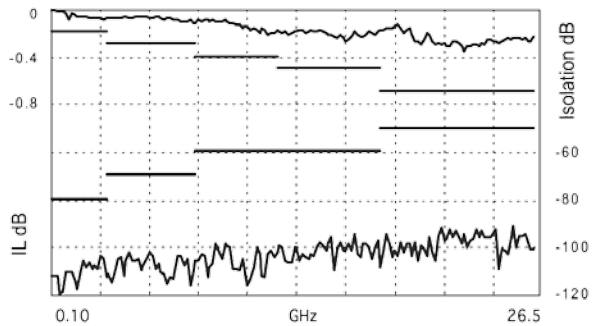


V.S.W.R.

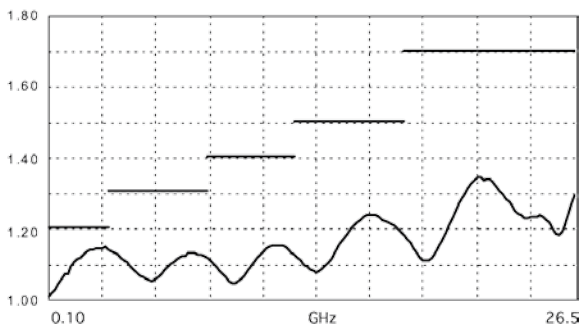


Example: Terminated SP6T SMA up to 26.5 GHz

Insertion Loss and Isolation

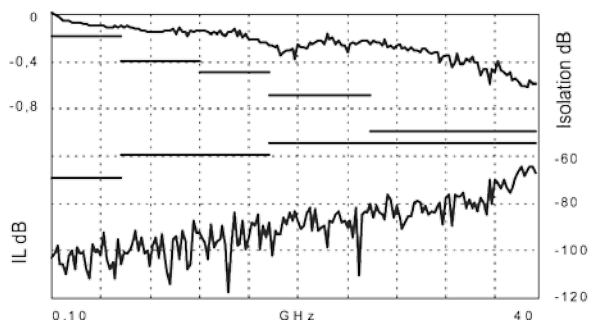


V.S.W.R.

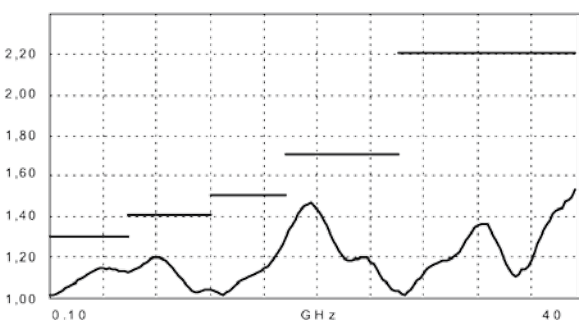


Example: Terminated SP6T SMA2.9 up to 40 GHz

Insertion Loss and Isolation



V.S.W.R.



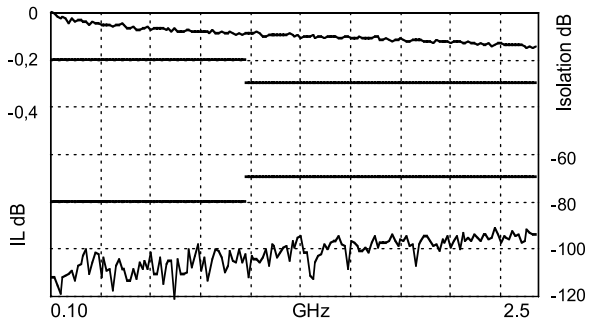
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SPnT Terminated and non Terminated up to 40 GHz

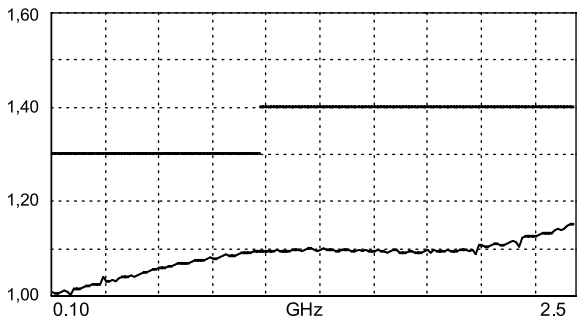
SMA - SMA2.9 - QMA - DIN 1.6 / 5.6

Example: Non terminated SP6T 1.6/5.6 up to 2.5 GHz

Insertion Loss and Isolation

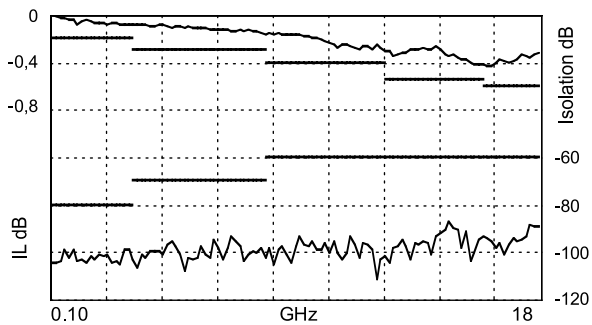


V.S.W.R.

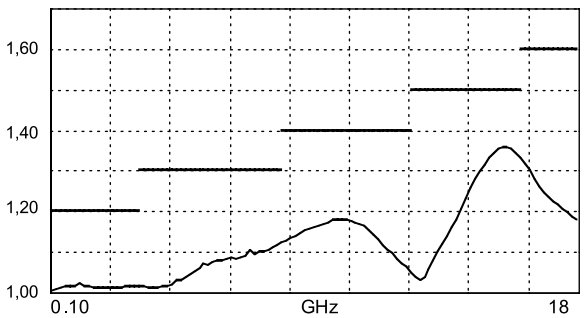


Example: SP8T SMA up to 18 GHz

Insertion Loss and Isolation

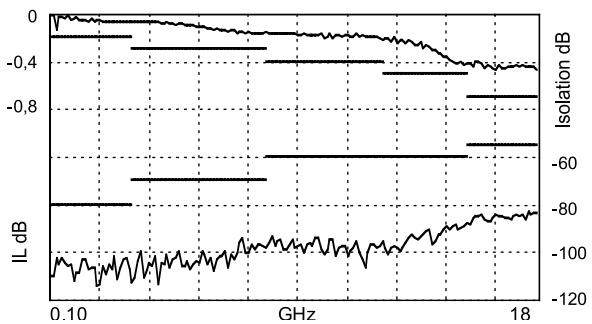


V.S.W.R.

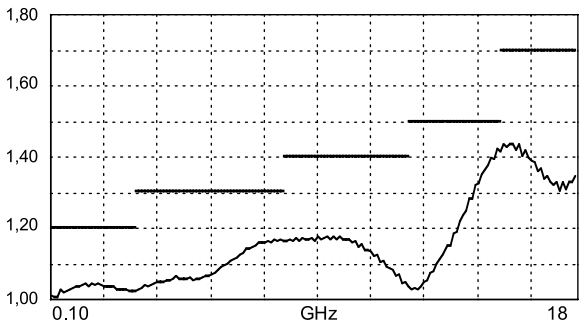


Example: SP10T SMA up to 18 GHz

Insertion Loss and Isolation



V.S.W.R.

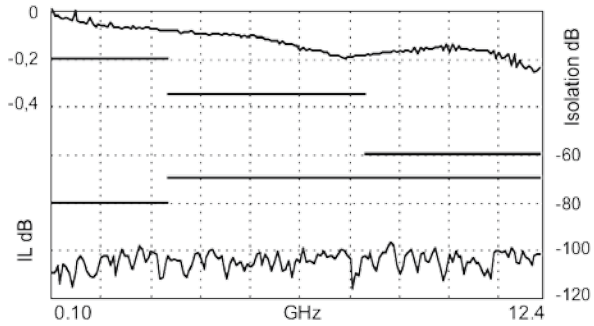


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

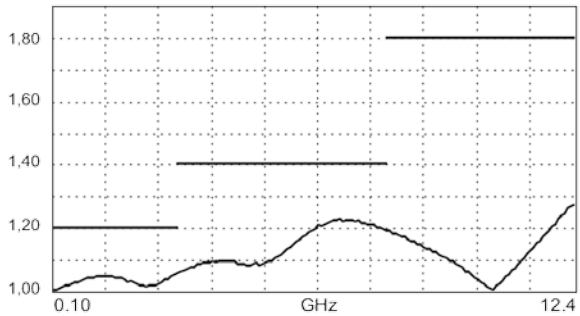
SPnT Terminated and non Terminated up to 40 GHz
SMA - SMA2.9 - QMA - DIN 1.6 / 5.6

Example: SP12T SMA up to 12.4 GHz

Insertion Loss and Isolation



V.S.W.R.

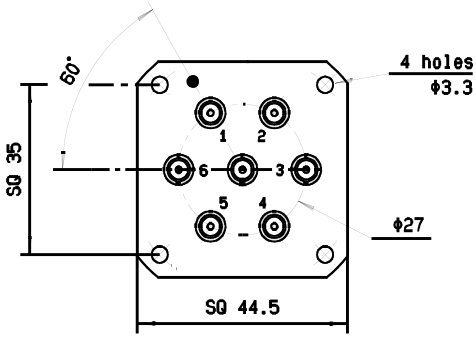


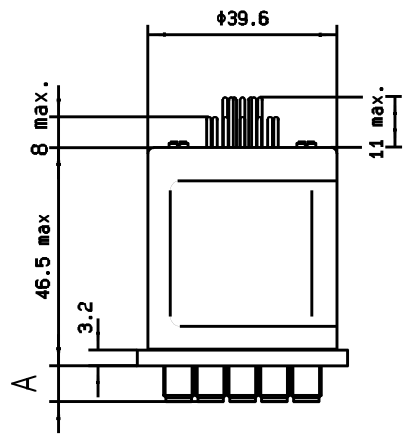
TYPICAL OUTLINE DRAWINGS

NON TERMINATED 3 to 6 positions

Connectors	A (mm)
SMA up to 26.5 GHz	7.4
SMA2.9 up to 40 GHz	6.3
QMA up to 6 GHz	10.8
DIN 1.6/5.6 up to 2.5 GHz	11.5

Solder pins	Type 0 or 1 with option 0 - 1 - 3 or 4
	Type 2 or 3 with option 0 or 1

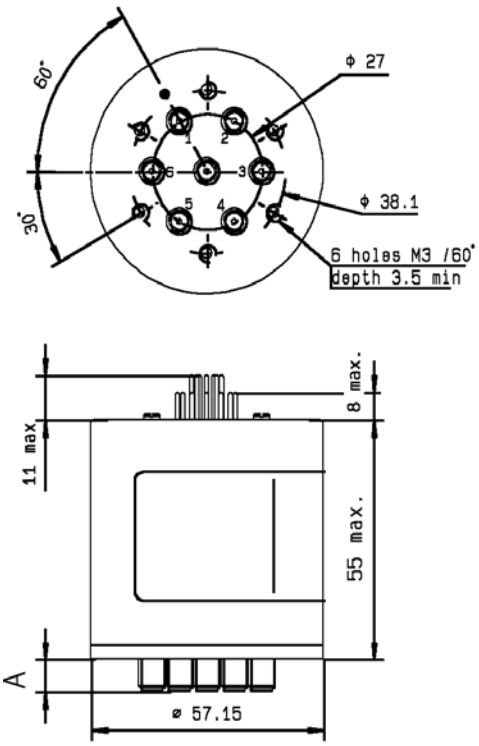


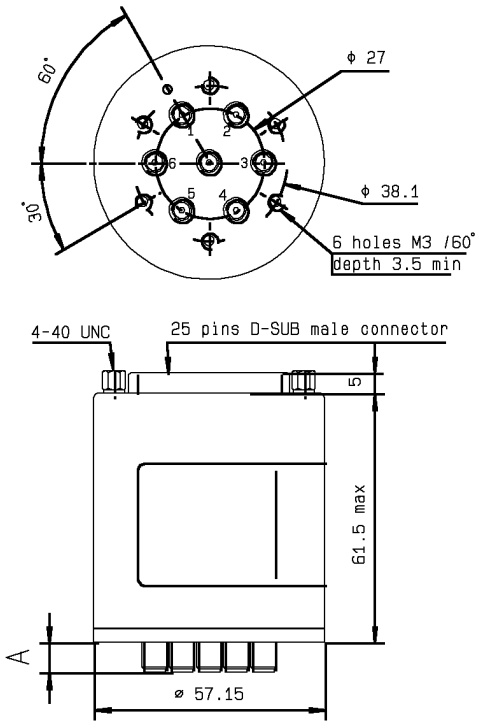


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

TYPICAL OUTLINE DRAWINGS

NON TERMINATED 3 to 6 positions (Continued)





Solder Pins	Type 0 or 1 with option 2 or 8
	Type 2 or 3 with option 2 - 3 - 4 or 8
	Type 4 - 5 - 8 or 9 with option 0 - 2 or 8

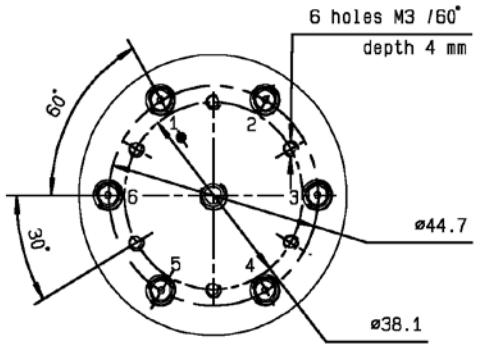
D-Sub connector	All models

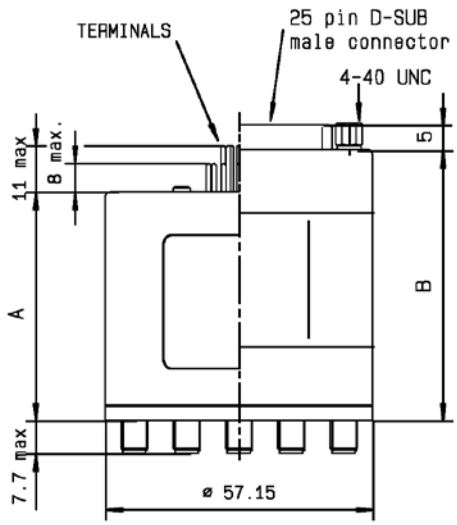
Connectors	A (mm)
SMA up to 26.5 GHz	7.4
SMA2.9 up to 40GHz	6.3
QMA up to 6 GHz	10.8
DIN 1.6/5.6 up to 2.5 GHz	11.5

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

TYPICAL OUTLINE DRAWINGS

TERMINATED 3 to 6 positions





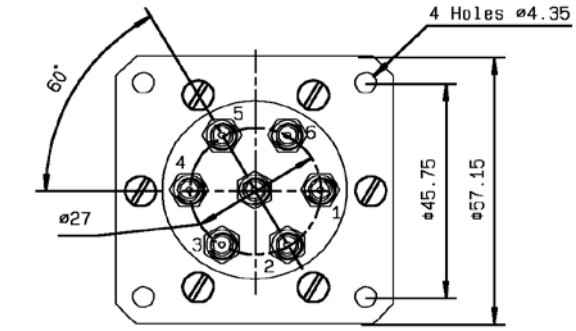
	A	B
	Solders Pins	D-Sub connector
Type 0 - 1 - 2 or 3 with option 0 - 1 - 3 or 4	46.5	61.5
Type 0 - 1 - 2 or 3 with option 2 or 8	55.5	61.5
Type 4 - 5 - 8 or 9 with option 0 - 1 - 2 or 8	55.5	61.5

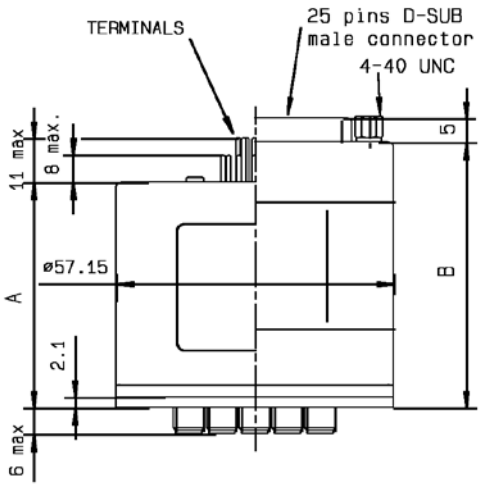
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

TYPICAL OUTLINE DRAWINGS

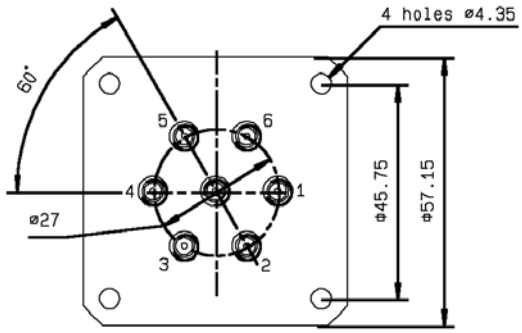
TERMINATED 3 to 6 positions 26.5 GHz & 40 GHz

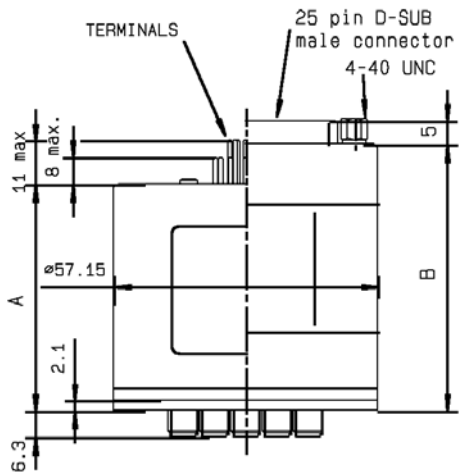
26.5 GHz model





40 GHz model





	A	B
	Solders Pins	D-Sub connector
Type 0 - 1 - 2 or 3 with option 0 - 1 - 3 or 4	48.5	63.5
Type 0 - 1 - 2 or 3 with option 2 or 8	57.5	63.5
Type 4 - 5 - 8 or 9 with option 0 - 1 - 2 or 8	57.5	63.5

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

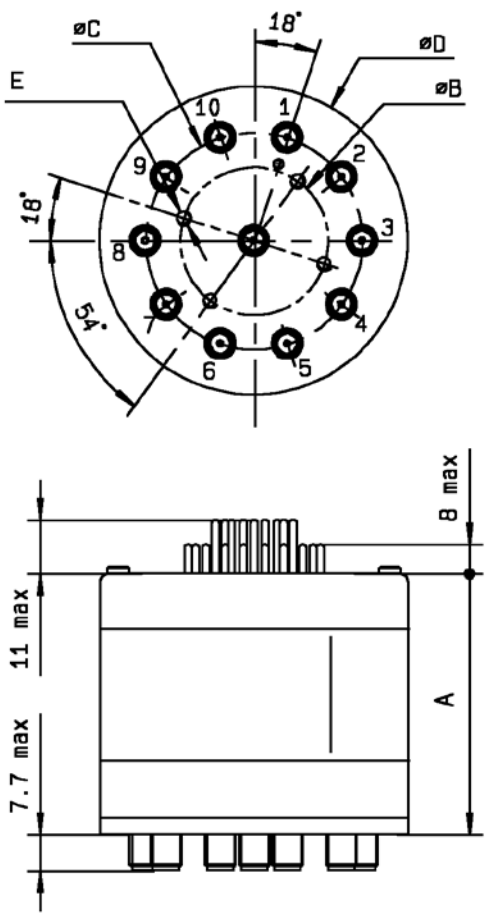
TYPICAL OUTLINE DRAWINGS

TERMINATED or NON TERMINATED 7 to 12 positions

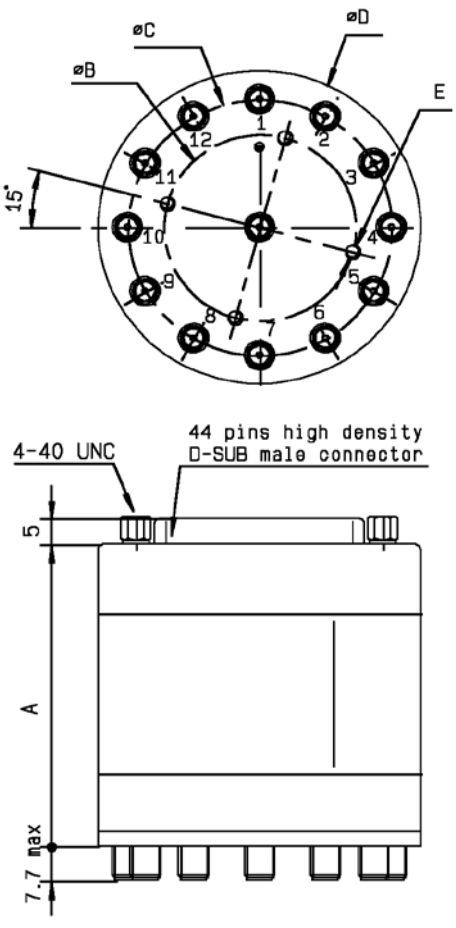
Type	A maxi (mm)	
	Solder Pins	D-Sub connector
Type 0 - 1 - 2 or 3 with option 0 - 1 - 3 or 4	50	66
Type 0 - 1 - 2 or 3 with option 2 or 8 and	61	66
Type 4 - 5 - 8 or 9 with option 0 - 1 - 2 or 8		

Number of positions	B diameter	C diameter	D diameter	E
7 - 8	49.8	44.7	56.9	4 holes M3 depth 4mm
9 - 10	30.5	44.7	63.5	
11 - 12	40.6	55.9	68.3	

10 position model
Terminated up to 18 GHz with solder pins



12 position model
Terminated up to 12.4 GHz with D-Sub



To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
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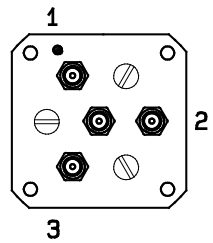
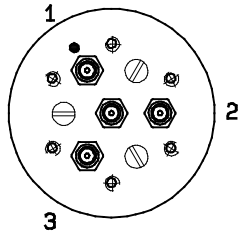
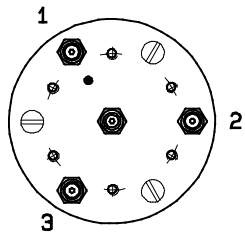
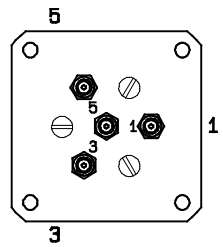
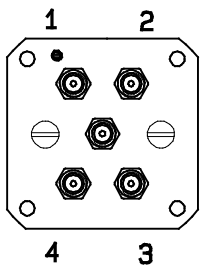
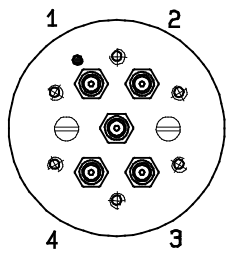
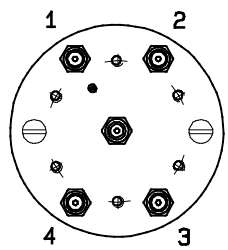
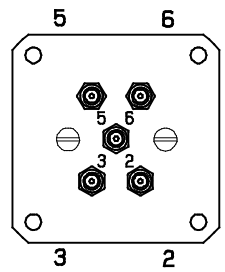
RF CONNECTORS ALLOCATION FOR SPnT SERIE

Connectors « A »: 1.6/5.6, QMA, SMA, SMA2.9
Other Connectors: N, BNC, TNC

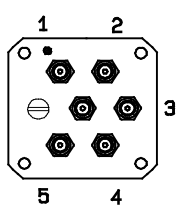
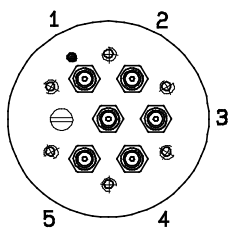
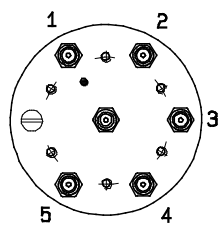
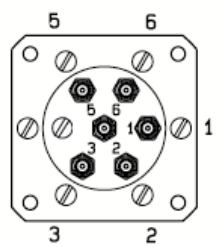
SPnT 3 ways

NON TERMINATED Version		TERMINATED Version	
Up to 18 GHz models Up to 40 GHz models Connectors « A »	Up to 18 GHz models All connectors	Up to 18 GHz models All connectors	26.5 GHz and 40 GHz models with SMA – SMA2.9
			

SPnT 4 ways

NON TERMINATED Version		TERMINATED Version	
Up to 18 GHz models Up to 40 GHz models Connectors « A »	Up to 18 GHz models All connectors	Up to 18 GHz models All connectors	26.5 GHz and 40 GHz models with SMA – SMA2.9
			

SPnT 5 ways

NON TERMINATED Version		TERMINATED Version	
Up to 18 GHz models Up to 40 GHz models Connectors « A »	Up to 18 GHz models All connectors	Up to 18 GHz models All connectors	26.5 GHz and 40 GHz models with SMA – SMA2.9
			

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
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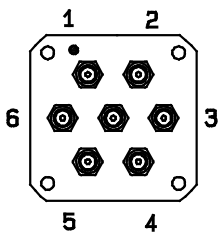
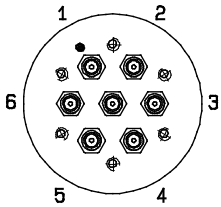
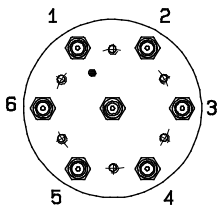
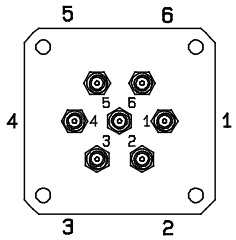
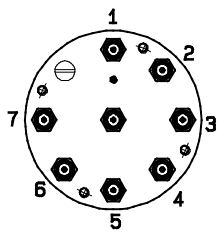
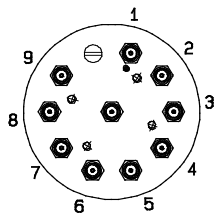
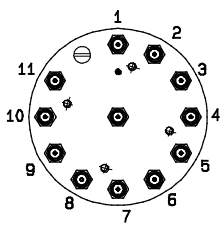
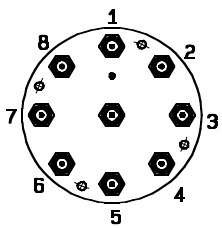
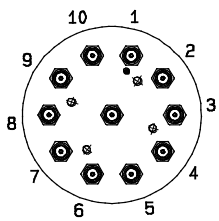
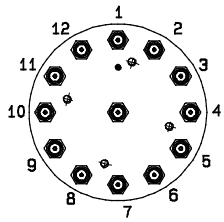
RF CONNECTORS ALLOCATION (CONTINUED)

SPnT 6 ways			
NON TERMINATED Version		TERMINATED Version	
Up to 18 GHz models Up to 40 GHz models Connectors « A »	Up to 18 GHz models All connectors	Up to 18 GHz models All connectors	26.5 GHz and 40 GHz models with SMA – SMA2.9
			

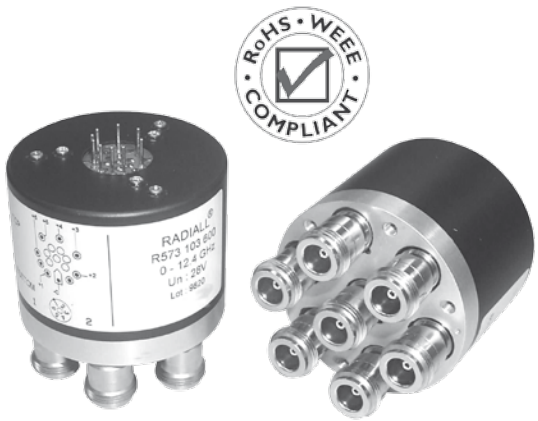
SPnT 7 and 8 ways	SPnT 9 and 10 ways	SPnT 11 and 12 ways
All connectors	All connectors	All connectors
		
		

ACCESSORIES

A printed circuit board interface connector has been designed for easy mounting on terminals :
It must be ordered separately. Refer to page **5-27** for details.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SPnT up to 12.4 GHz - RAMSES Concept
N - BNC - TNC



RADIALL R573 & R574 multithrow coaxial switches are offered in many configurations (over 40,000 possible possible combinations) including Terminated and non Terminated options. RADIALL offers reliability, reduced deliveries and competitive pricing. Excellent typical RF performances make RAMSES switches (12.4 GHz) ideal for Automated Test Equipment (ATE) and other measurement applications. These switches are also an excellent choice for defense, industrial applications and telecommunications as well.

Example of P/N:
R573123600 is a SP6T N up to 12.4 GHz, Normaly Open, 28 Vdc, Indicators and solder pins

PART NUMBER SELECTION

R 57.

Model:
3: Without 50 Ω termination
4: With 50 Ω termination

RF Connectors:
0: N up to 3 GHz
1: N up to 12.4 GHz
2: BNC up to 3 GHz (4) (5)
5: TNC up to 3 GHz (4) (5)
6: TNC up to 12.4 GHz (4) (5)

Type:
0: Normally open
1: Normally open + I.C.
2: Latching
3: Latching + I.C.
4: Latching + S.C.O. (1) (4)
5: Latching + S.C.O. + I.C. (1) (4)
8: Latching + S.C.O. + A.R. (1)
9: Latching + S.C.O. + I.C. + A.R. (1)

Actuator Voltage:
2: 12 Vdc
3: 28 Vdc

Number of positions:
3: 3 Positions
4: 4 Positions
5: 5 Positions
6: 6 Positions
7: 7 Positions
8: 8 Positions
9: 9 Positions
0: 10 Positions
1: 11 Positions
2: 12 Positions

Options:
0: Without option
1: Positive common (2) (6)
2: Compatible TTL driver (1) (8)
3: With suppression diodes
4: With suppression diodes and positive common (2) (6)
8: BCD TTL driver compatible (1) (3) (7) (8)

Actuator Terminals:
0: Solder pins
5: D-Sub connector

I.C.: Indicator contact / S.C.O.: Self Cut-Off / A.R.: Auto Reset
(1): These models are already equiped with suppression diodes.
(2): Standard products are equiped with negative common.
(3): Latching BCD driver enables also a global reset through driver code 0000 (see BCD logic coding page 1-13).
(4): Available only up 6 positions.
(5): Model "3" only.
(6): Option not available for type 4, 5, 8 & 9.
(7): Option available only with type 0, 1, 8 & 9.
(8): Polarity is not relevant to application for switches with TTL driver.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

GENERAL SPECIFICATIONS

Type 2, 3, 4 & 5:

Latching models have a RESET pin which commands the reset of all positions. This command should be used before switching from one position to another. If not, two positions will be set at the same time.
Note: During the RESET operation the current is: Nominal operating current x number of positions.

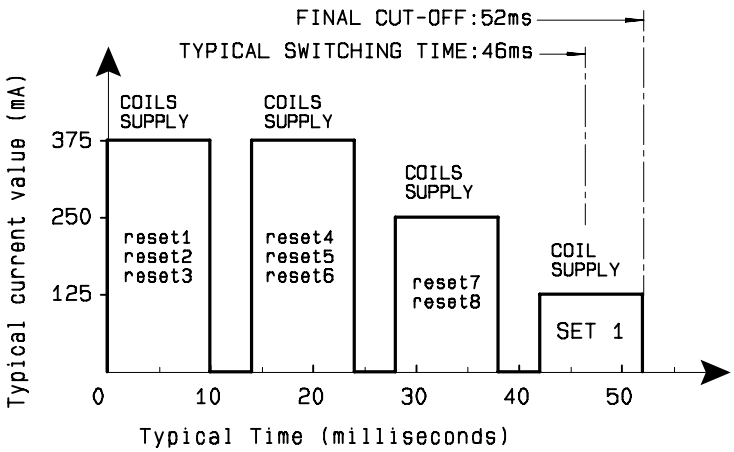
Type 8, 9:

Latching models with AUTOMATIC RESET are available; these products have an internal SET/RESET circuit which automatically resets all the non-selected positions and sets the desired position. This option simplifies the use of latching switches by suppressing the RESET command in switching sequence.

An electronic circuit supplies successively groups of 2 or 3 actuators, in order to limit the maximun current.
The current with this option is the total current of 2 or 3 reset coils in the same time (see table below).

Example: During the AUTOMATIC RESET operation, at 28 Vdc, 4 positions switch has temporarily a consumption of only 250 mA, during 40 ms maximum.

SWITCHING SEQUENCE



n = number of positions

Operating Total current at 23°C (mA) SPnT LATCHING				
Number of positions	12 Volts		28 Volts	
	Manual Reset	Automatic Reset	Manual Reset	Automatic Reset
3 to 4	320 x n	640	125 x n	250
5 to 8	320 x n	960	125 x n	375
9 to 12	320 x n	1280	125 x n	500

Availability of options according to both type and number of positions

Type	Numbers of positions	Availables Options
1 or 2	3 to 12	0 - 1 - 2 - 3 - 4 - 8
2 or 3	3 to 6	0 - 1 - 2 - 3 - 4
	7 to 12	0 - 1 - 3 - 4
4 or 5	3 to 6	0 - 2
	7 to 12	Not available
8 or 9	3 to 12	0 - 2 - 8

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SPnT up to 12.4 GHz - RAMSES Concept
N - BNC - TNC

GENERAL SPECIFICATIONS

Operating mode			Normally open		Latching	
Nominal operating voltage (across operating temperature)		Vdc	12 (10.2 / 13)	28 (24 / 30)	12 (10.2 / 13)	28 (24 / 30)
Coil resistance (+/-10%)		Ohms	47.5	275	See table on previous page	
Nominal operating current at 23°C		mA	250	102		
Average power			See Power Rating on **page 1-16**			
TTL input	High Level		2.2 to 5.5 V (TTL Option) / 3.5 to 5.5 V (BCD Option)		800µA max 5.5 Volts	
	Low Level		0 to 0.8 V (TTL Option) / 0 to 1.5 V (BCD Option)		20µA max 0.8 Volts	
Indicator rating			1 Watt / 30 Volts / 100 mA			
Switching time (max)		ms	15 ms For automatic reset models: SP3T to SP6T => 40 ms SP7T to SP12T => 50 ms			
Life (min)	Non terminated SP3 to 6T (R573 serie)		2 million cycles			
	Terminated SP3 to 6T (R574 serie)					
	SP7 to 12T (all models)					
Connectors			N - TNC - BNC			
Actuator terminals			Solder pins or male 25 pin D-Sub connector			
Operating temperature range			-40°C to +85°C			
Storage temperature range			-55°C to +85°C			
Vibration (MIL STD 202 , method 204D , cond.C)			10-2000 Hz, 10g		operating	
Shock (MIL STD 202 , method 213B , cond.C)			50g / 1 ms, ½ sine		operating	

RF PERFORMANCES

N - TNC - BNC Connector						
Number of positions	Frequency Range GHz		V.S.W.R. (max)	Insertion Loss (max) dB	Isolation (min) dB	Impedance Ohms
3 to 6	DC - 12.4	DC - 3	1.20	0.20	80	50
		3 - 8	1.35	0.35	70	
		8 - 12.4	1.50	0.50	60	
7 to 10	DC - 8	DC - 3	1.30	0.30	80	50
		3 - 8	1.50	0.50	70	
11 to 12	DC - 8	DC - 3	1.35	0.30	70	50
		3 - 8	1.70	0.50	60	

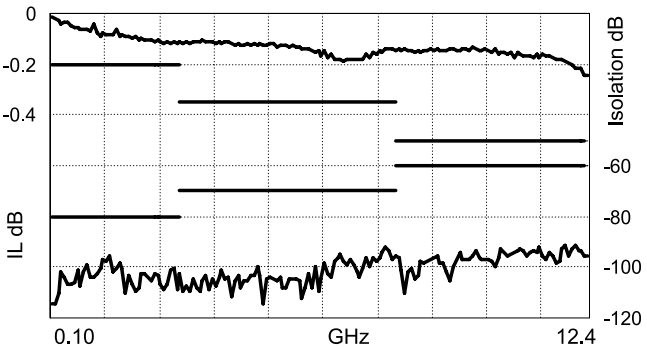
See page 5-25 for typical RF performances

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

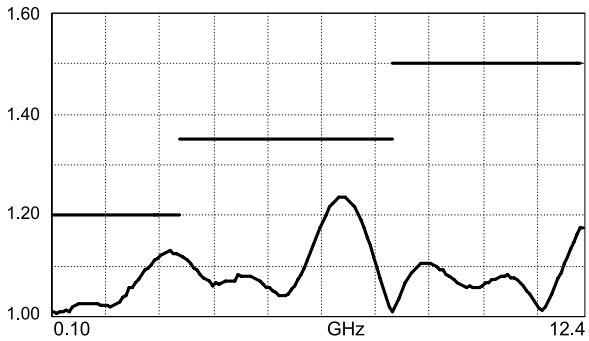
R573 AND R574 TYPICAL RF PERFORMANCES

Example: SP6T N up to 12.4 GHz

Insertion Loss and Isolation

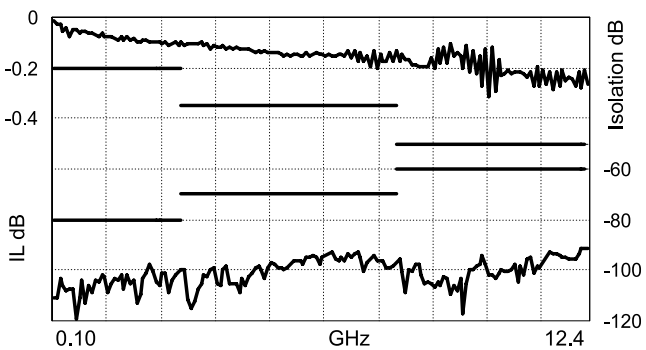


V.S.W.R.

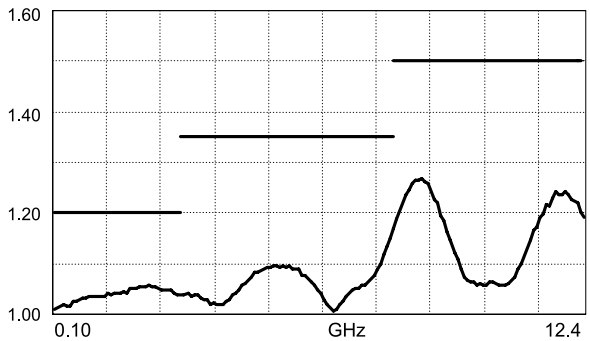


Example: SP6T TNC up to 12.4 GHz

Insertion Loss and Isolation

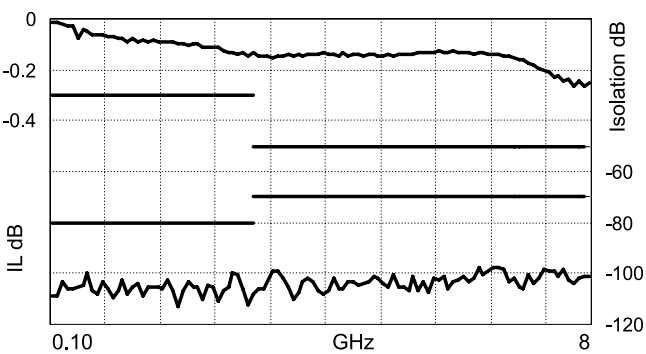


V.S.W.R.

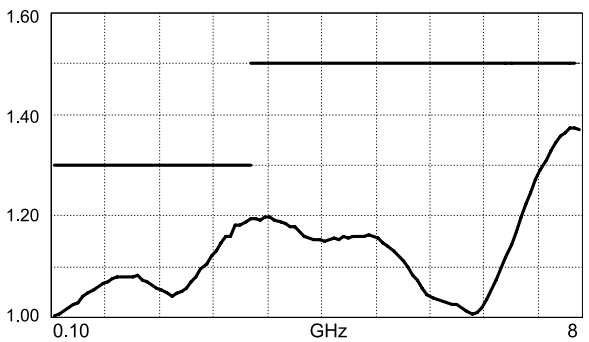


Example: SP8T up to 8 GHz

Insertion Loss and Isolation



V.S.W.R.



To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

TYPICAL OUTLINE DRAWINGS

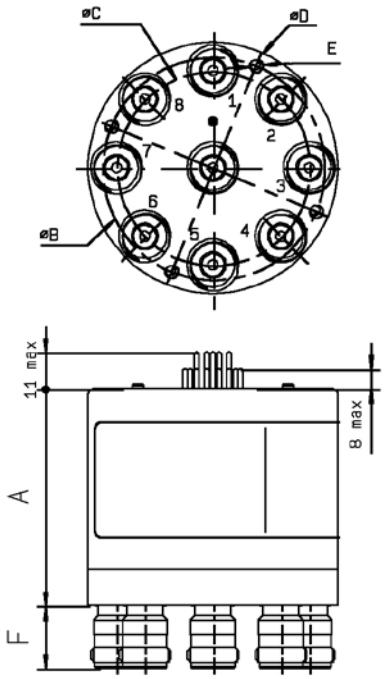
TERMINATED or NOT 3 to 12 positions

Connectors	F max (mm)
N	17.7
BNC	11.3
TNC	11.3

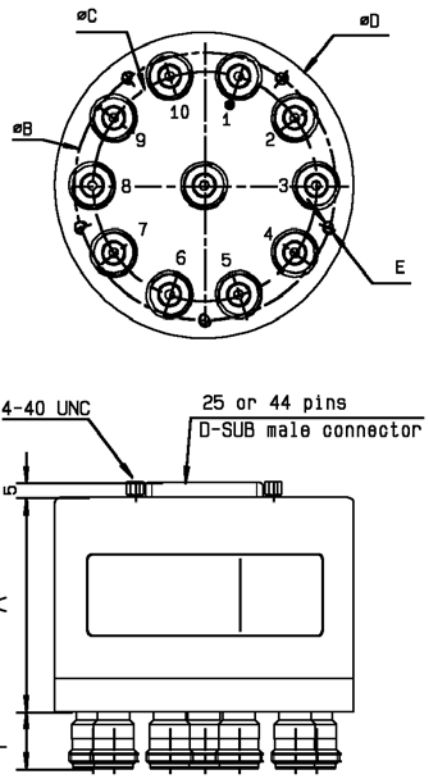
Type	A maxi (mm)	
	Solder Pins	D-Sub connector
Type 0 - 1 - 2 or 3 with option 0 - 1 - 3 or 4	56	66
Type 0 - 1 - 2 or 3 with option 2 or 8 and	71	71
Type 4 - 5 - 8 or 9 with option 0 - 1 - 2 or 8		

Number of positions	B diameter	C diameter	D diameter	E
3 - 6	54	44.7	63.5	6 holes M4/60°
7 - 8	67.7	58.9	76.2	4 holes M4/90°
9 - 10	88.9	76.2	101.6	5 holes M4/72°
11 - 12	67.7	101.6	127	6 holes M4/60°

Model SP8T positions up to 12.4 GHz
With solder pins



Model SP10T positions up to 8 GHz
D-Sub male connector



RF CONNECTORS ALLOCATION

See on page 5-20 and 5-21

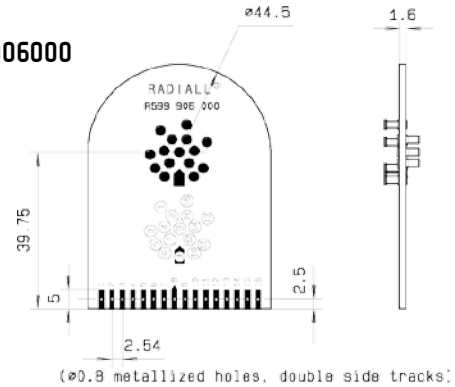
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

PRINTED CIRCUIT BOARD INTERFACE CONNECTOR

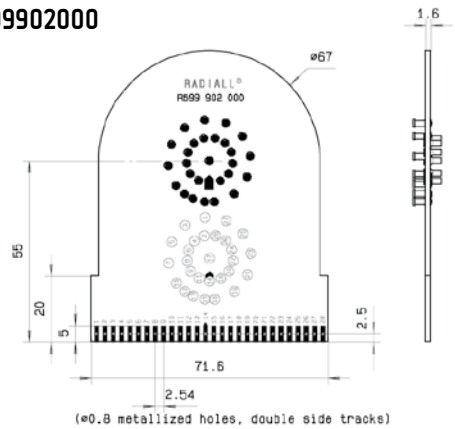
A printed circuit board interface connector (ordered separately) has been designed for easy mounting on terminals.

For SPnT model R573 and R574 series: Radiall part number: **R599 906 000 for 3 to 6 positions**
R599 908 000 for 7 to 8 positions
R599 900 000 for 9 to 10 positions
R599 902 000 for 11 to 12 positions

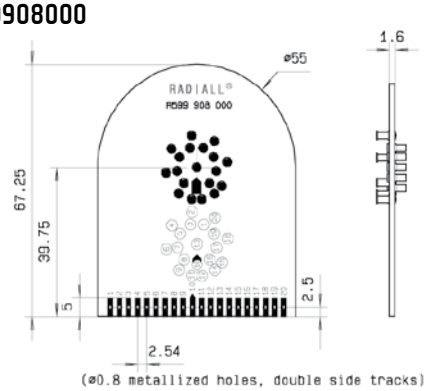
R599906000



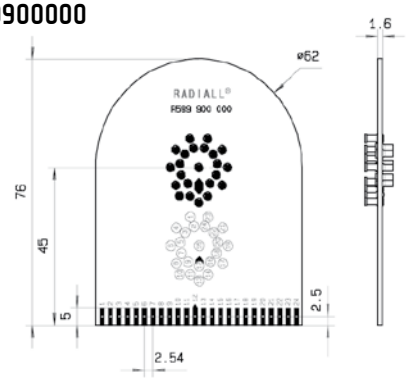
R599902000



R599908000



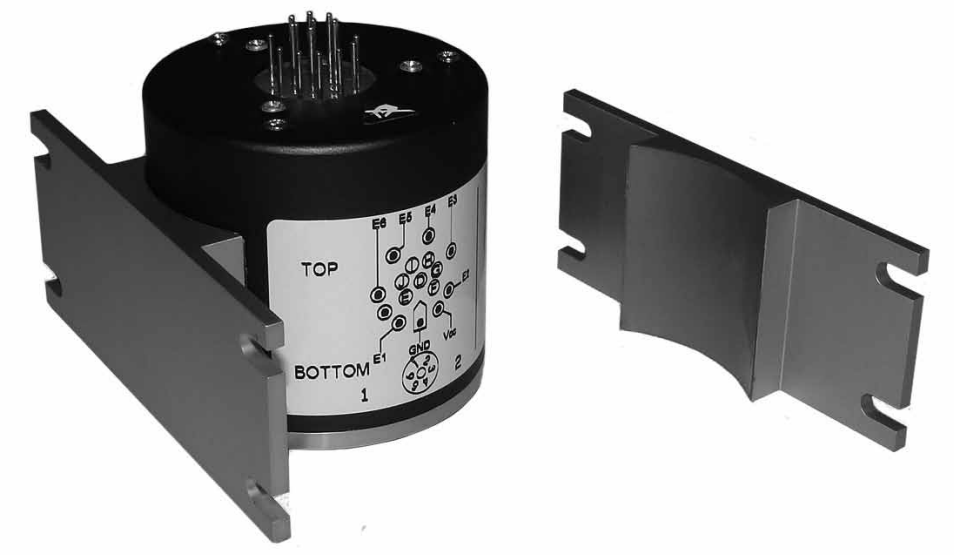
R599900000



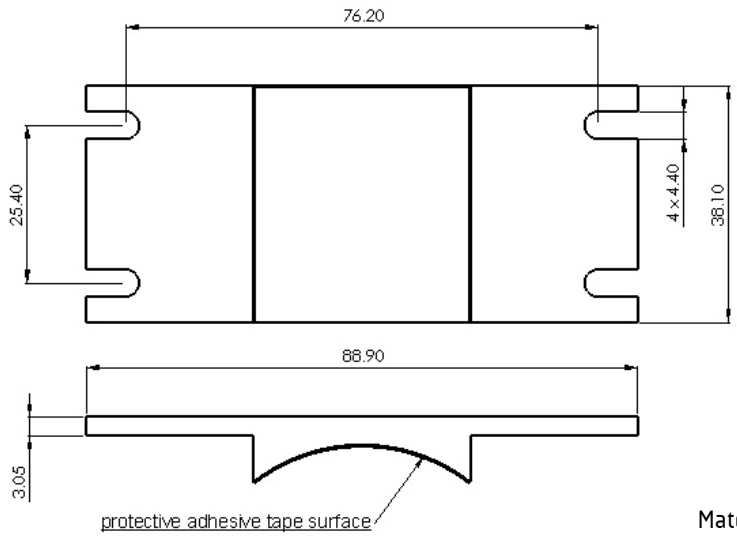
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

MOUNTING BRACKET

A metal bracket has been designed for an easy mechanical mounting of our SPnT switches for customer installation. These brackets must be ordered separately and assembled according to our recommended process on the following page.



MOUNTING BRACKET



Material: anodized aluminium

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

ACCESSORIES - RAMSES Concept
All connectors

FOR MODELS WITH CONNECTORS SMA, QMA, SMA2.9, DIN 1.6/5.6

Number of positions	Type	Options	Model	Part Number
3 to 6 positions	All	2 & 8	R573 series	**R599920000**
	4, 5, 8 & 9	All		
	All	All	R574 series	
7 & 8 positions	All		R573 series	**R599920000**
			R574 series	
9 & 10 positions	All	All	R573 series	**R599921000**
			R574 series	
11 & 12 positions	All	All	R573 series	**R599922000**
			R574 series	

FOR MODELS WITH CONNECTORS N, TNC, BNC

Number of positions	Type	Options	Model	Part Number
3 to 6 positions	All	All	R573 series	**R599921000**
			R574 series	
7 to 12 positions	All	All	R573 series	**Not Available**
			R574 series	

*For 7 to 12 positions models, bracket are not available

ADHESIVE BONDING PROCESS

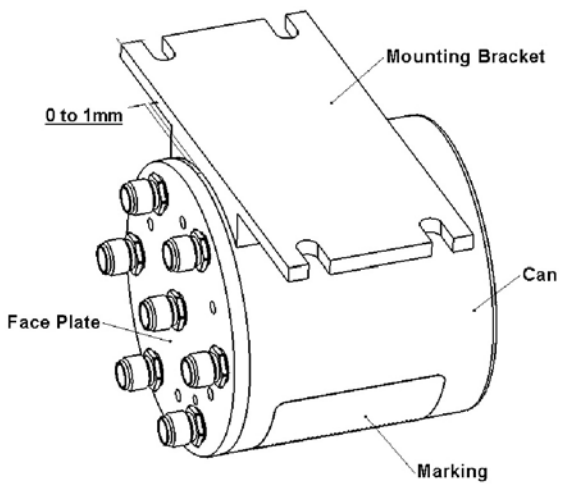
1) Clean the can with alcohol (Isopropanol or Ethanol).

2) Remove the protective adhesive tape surface.

3) Glue the mounting bracket ONLY on the blue can and NOT on the RF body.
DO NOT glue mounting bracket on the marking (See drawing).

4) Firmly press the mounting bracket against the can, and maintain pressure for several seconds (10 seconds min) to properly bond the unit (See notes 1 & 2).

5) The switch can now be installed in your equipment with 4 screws (not included).

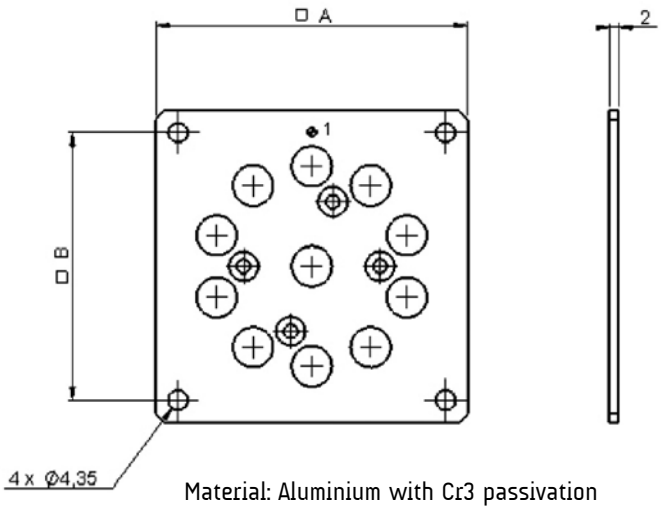


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

MOUNTING SQUARE FLANGE

A square flange has been designed for easy mechanical mounting of our SPnT switches for customer installation. These flanges must be ordered separately (like mounting bracket) and assembled according to our recommended process on the following page.

TYPICAL OUTLINE DRAWING



Material: Aluminium with Cr3 passivation

Radiall Part number	A (mm)	B (mm)
R599 310 000	63.45	53.45
R599 311 000	63.45	53.45
R599 312 000	63.45	53.45
R599 313 000	69.8	59.8
R599 314 000	74.6	64.6

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

FOR MODELS WITH CONNECTORS SMA, QMA, SMA2.9

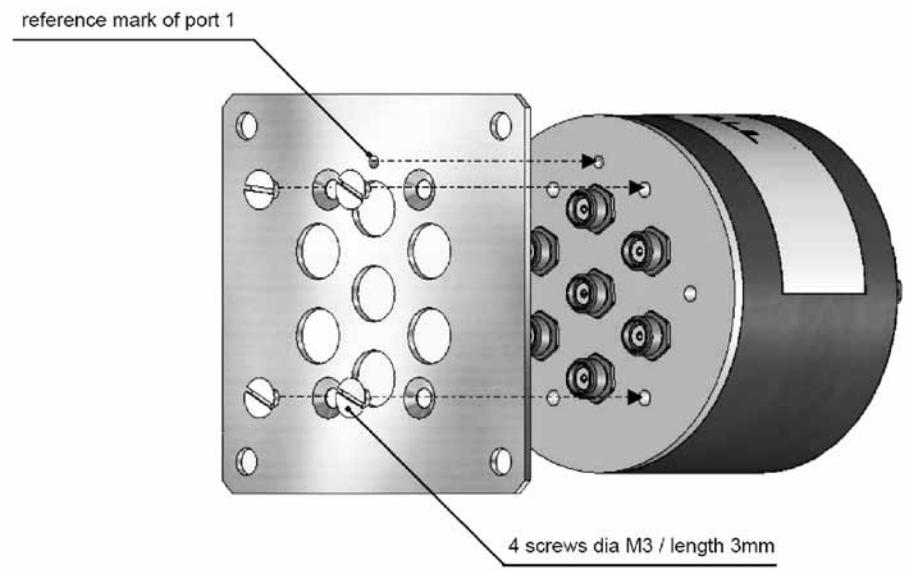
Number of positions	Type	Options	Model	Part Number
3 to 6 positions	All	All	R573 series	**R599310000**
			R574 series	**R599311000**
7 & 8 positions	All	All	R573 series	**R599312000**
			R574 series	
9 & 10 positions	All	All	R573 series	**R599313000**
			R574 series	
11 & 12 positions	All	All	R573 series	**R599314000**
			R574 series	

*For models with connectors 1.6/5.6, N, TNC, BNC: available upon request

FOR MODELS WITH CONNECTORS N, TNC, BNC

1) Assemble the square flange on the RF body of the switch as the following drawing below.
ATTENTION: Don't forget to correctly position the reference in line with the mark for port 1.

2) Tighten the 4 screws (delivered with the square flange).



To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

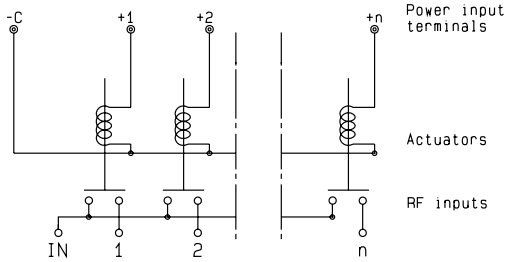
COAXIAL SPnT - ELECTRICAL SCHEMATICS

R573 - R574 Series

NORMALLY OPEN

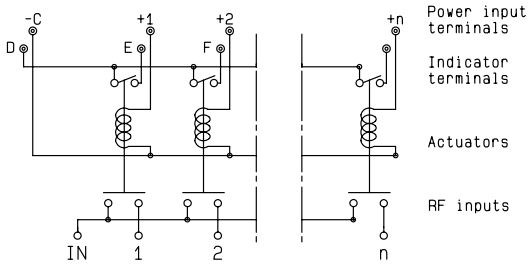
WITHOUT OPTION

R573 -0- -0- / R574 -0- -0-



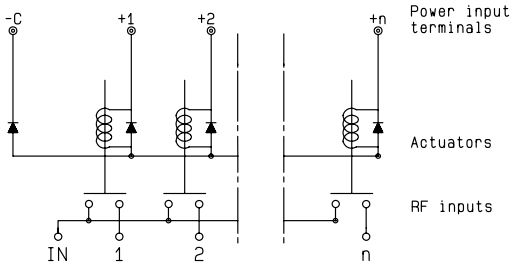
WITH INDICATOR CONTACT

R573 -1- -0-/ R574 -1- -0-



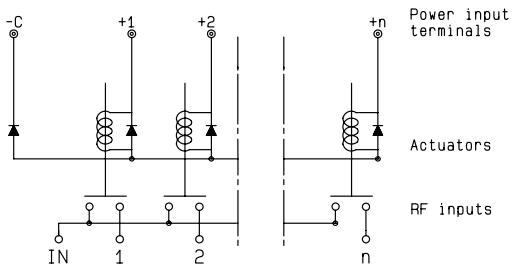
WITH SUPPRESSION DIODES

R573 -0- -3- / R574 -0- -3-



WITH SUPPRESSION DIODES AND INDICATOR CONTACT

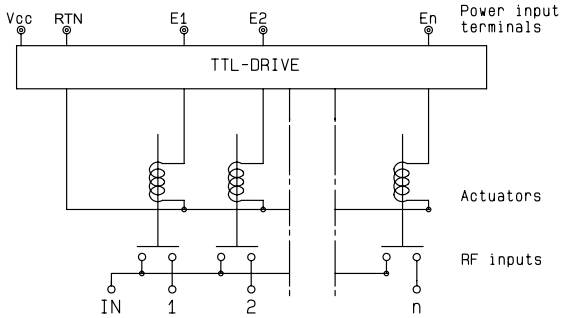
R573 -1- -3- / R574 -1- -3-



WITH TTL DRIVER

(suppression diodes are included)

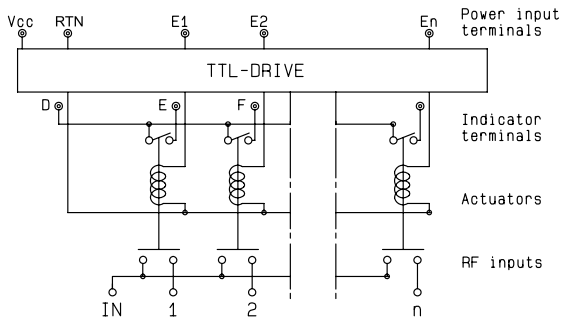
R573 -0- -2- / R574 -0- -2-



WITH TTL DRIVER AND INDICATOR CONTACT

(suppression diodes are included)

R573 -1- -2- / R574 -1- -2-

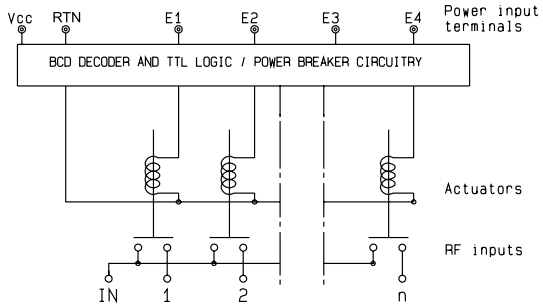


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

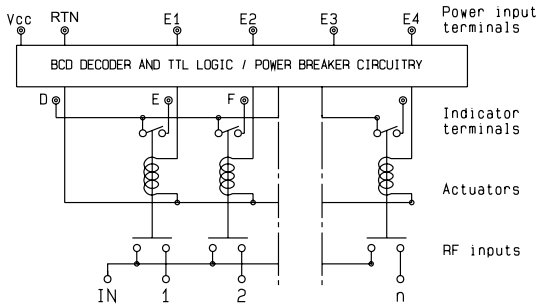
COAXIAL SPnT - ELECTRICAL SCHEMATICS
R573 - R574 Series

NORMALLY OPEN

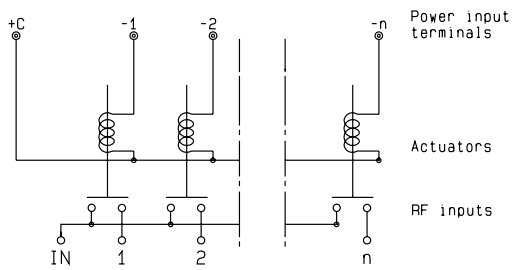
WITH BCD DRIVER, TTL COMPATIBLE
(suppression diodes are included)
573 -0- -8- / R574 -0- -8-



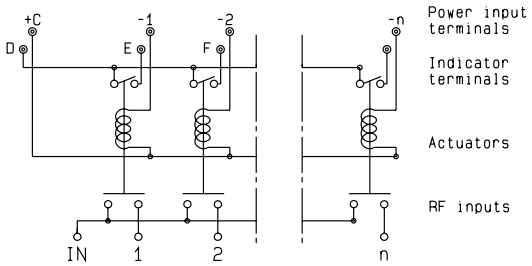
WITH BCD DRIVER, TTL COMPATIBLE AND INDICATOR CONTACT
(suppression diodes are included)
573 -1- -8- / R574 -1- -8-



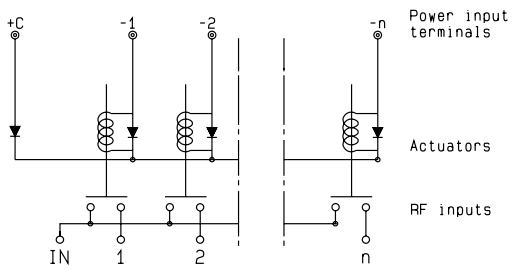
WITH POSITIVE COMMON
R573 -0- -1- / R574 -0- -1-



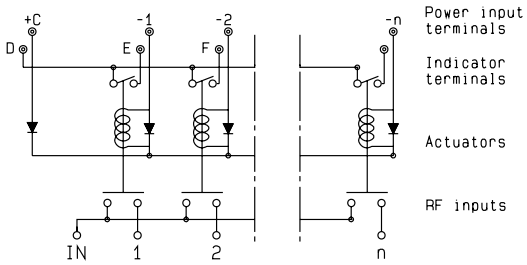
WITH POSITIVE COMMON AND INDICATOR CONTACT
R573 -1- -1- / R574 -1- -1-



WITH POSITIVE COMMON AND SUPPRESSION DIODES
R573 -0- -4- / R574 -0- -4-



WITH POSITIVE COMMON, SUPPRESSION DIODES AND INDICATOR CONTACT
R573 -1- -4- / R574 -1- -4-

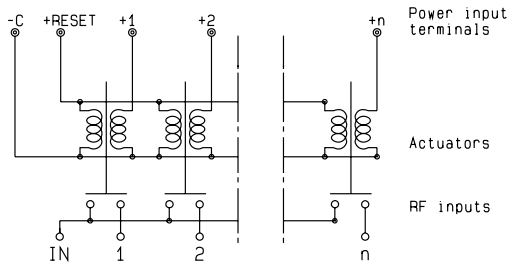


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

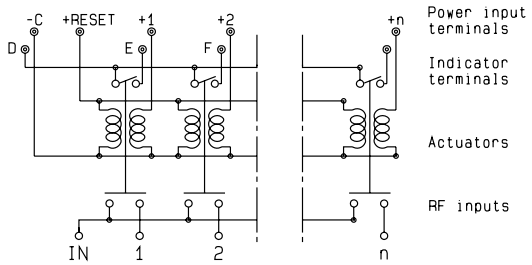
COAXIAL SPnT - ELECTRICAL SCHEMATICS
R573 - R574 Series

LATCHING

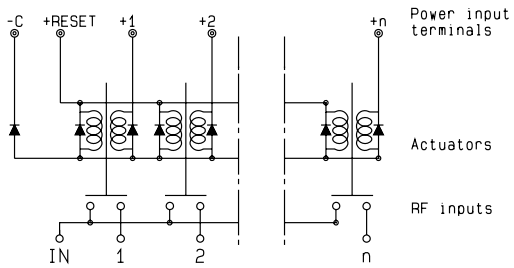
WITHOUT OPTION
R573 -2- -0- / R574 -2- -0-



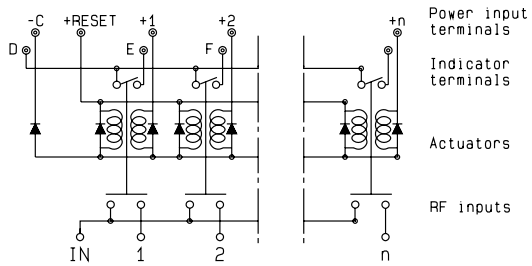
WITH INDICATOR CONTACT
R573 -3- -0-/ R574 -3- -0-



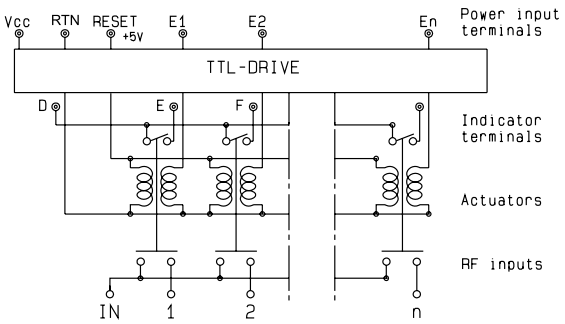
WITH SUPPRESSION DIODES
R573 -2- -3- / R574 -2- -3-



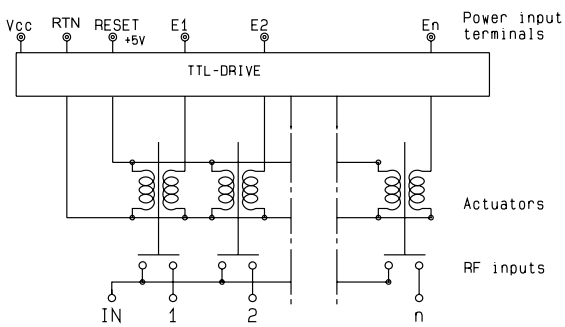
WITH SUPPRESSION DIODES AND INDICATOR CONTACT
R573 -3- -3- / R574 -3- -3-



WITH TTL DRIVER
(suppression diodes are included)
R573 -2- -2- / R574 -2- -2-



WITH TTL DRIVER AND INDICATOR CONTACT
(suppression diodes are included)
R573 -3- -2- / R574 -3- -2-

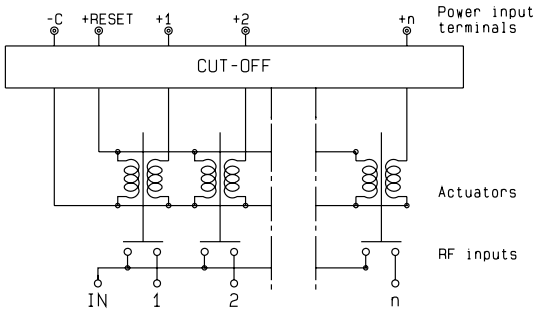


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

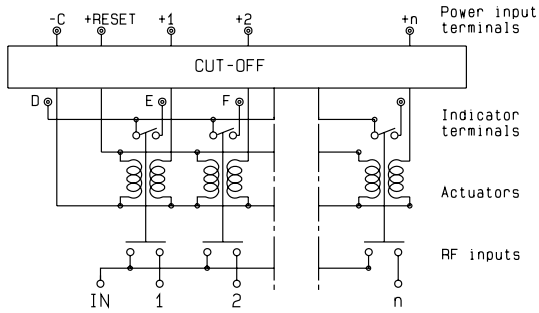
COAXIAL SPnT - ELECTRICAL SCHEMATICS
R573 - R574 Series

LATCHING

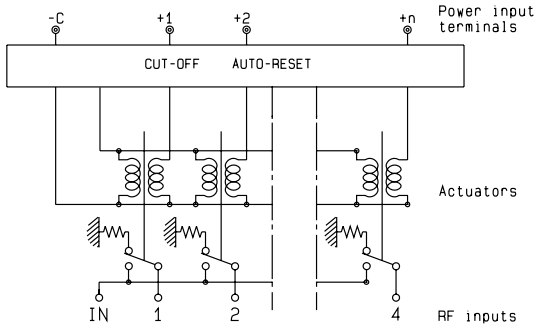
WITH CUT-OFF
(suppression diodes are included)
573 -4- -0- / R574 -4- -0-



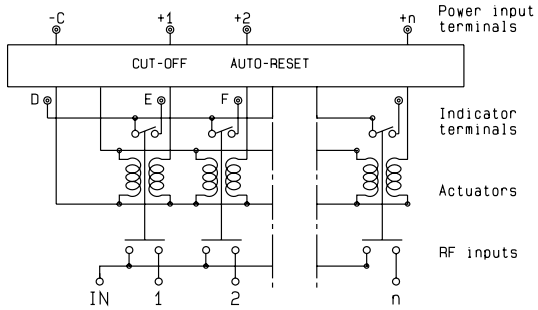
WITH CUT- OFF AND INDICATOR CONTACT
(suppression diodes are included)
573 -5- -0- / R574 -5- -0-



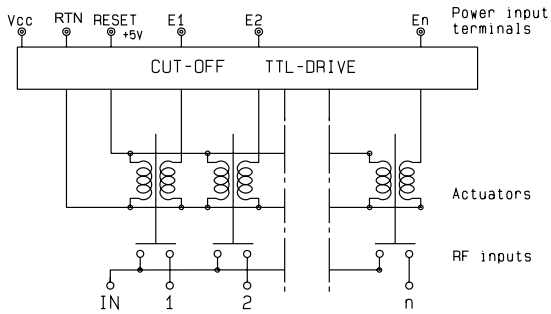
WITH CUT-OFF AND AUTO RESET
(Suppression diodes are included
R573 -8- -0- / R574 -8- -0-



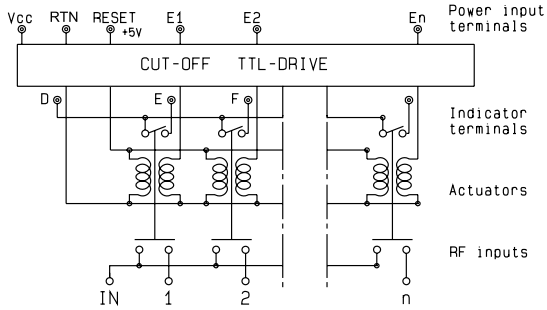
WITH CUT-OFF, AUTO RESET AND INDICATOR CONTACT
(Suppression diodes are included)
R573 -9- -0- / R574 -9- -0-



WITH TTL DRIVER AND CUT- OFF
(Suppression diodes are included)
R573 -4- -2- / R574 -4- -2-



WITH TTL DRIVER, CUT-OFF AND INDICATOR CONTACT
(Suppression diodes are included)
R573 -5- -2- / R574 -5- -2-

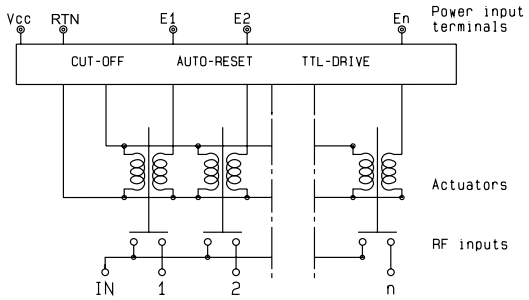


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

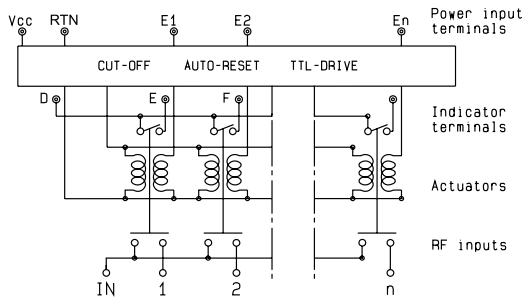
COAXIAL SPnT - ELECTRICAL SCHEMATICS
R573 - R574 Series

LATCHING

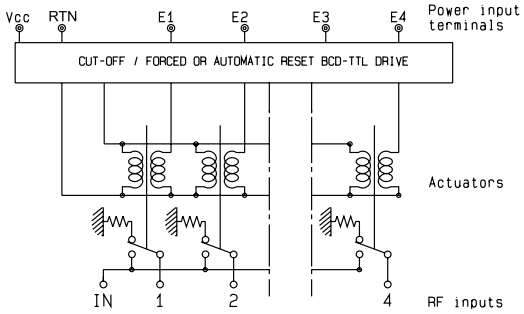
WITH TTL DRIVER, CUT-OFF AND AUTO RESET
(Suppression diodes are included)
R573 -8- -2- / R574 -8- -2-



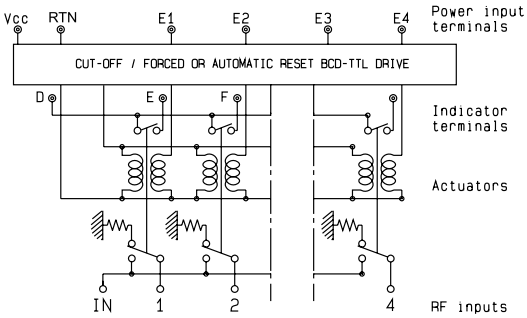
WITH TTL DRIVER, CUT-OFF, AUTO RESET AND INDICATOR CONTACT
(Suppression diodes are included)
R573 -9- -2-/ R574 -9- -2-



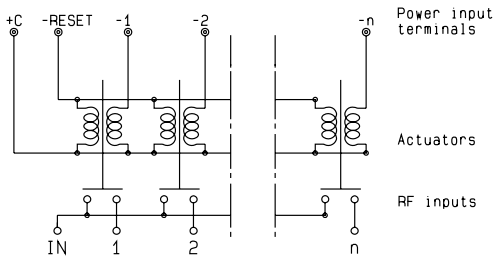
WITH CUT-OFF, FORCED OR AUTO RESET, BCD DRIVER, TTL COMPATIBLE
(Suppression diodes are included)
R573 -8- -8- / R574 -8- -8-



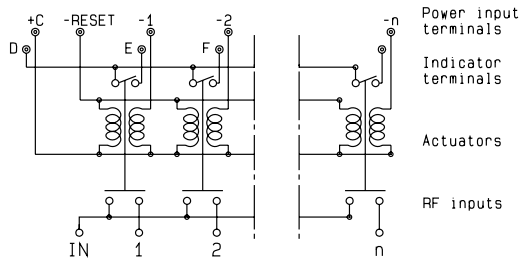
WITH CUT-OFF, FORCED OR AUTO RESET, BCD DRIVER, TTL COMPATIBLE AND INDICATOR CONTACT
(Suppression diodes are included)
R573 -9- -8- / R574 -9- -8-



WITH POSITIVE COMMON
R573 -2- -1- / R574 -2- -1-



WITH POSITIVE COMMON AND INDICATOR CONTACT
(suppression diodes are included)
R573 -3- -1- / R574 -3- -1-

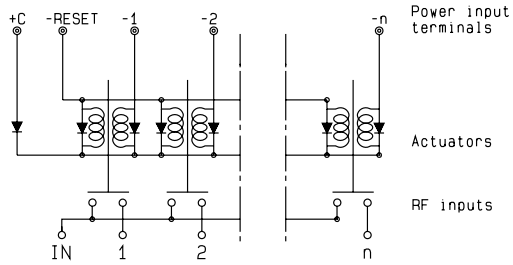


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

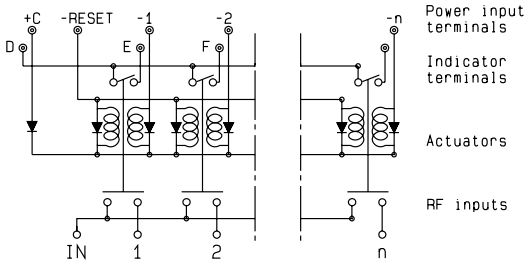
COAXIAL SPnT - ELECTRICAL SCHEMATICS
R573 - R574 Series

LATCHING

WITH POSITIVE COMMON AND SUPPRESSION DIODES
(suppression diodes are included)
573 -2- -4- / R574 -2- -4-

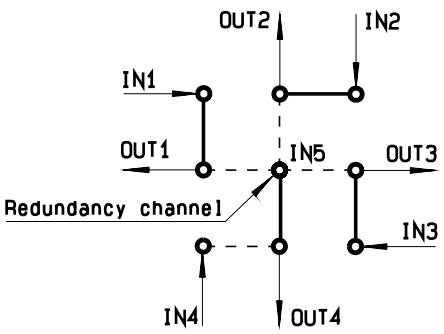


WITH POSITIVE COMMON, SUPPRESSION DIODES AND INDICATOR CONTACT
573 -3- -4- / R574 -3- -4-



OPTIONAL FEATURES FOR SPnT (see other examples on page 5-54)

Examples of dedicated application options



4P3T with redundancy channel on Out 4
In 1 to Out 1, In2 to Out 2, In 3 to Out 3

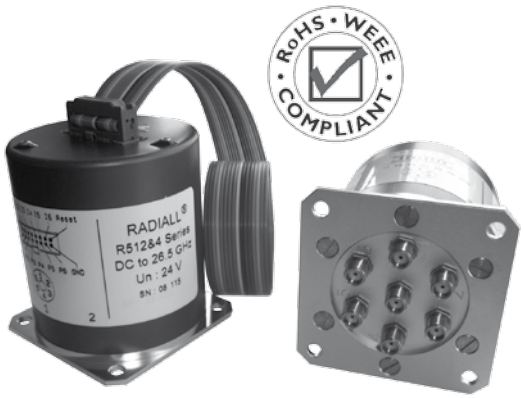
7P6T

SP6T terminated with External terminations

A Custom Matrix Switch (4P3T) with 4 Input ports and 4 Output ports configured for 3 transmission systems and one redundancy channel (N+1: N type). This product can be used also as a SP4T Terminated with low external VSWR or medium power terminations.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

HIGH PERFORMANCE MULTIPORT SWITCHES
TITANIUM Series / SPnT up to 40 GHz



Radiall's TITANIUM switches are optimised to perform at a high level over an extended life span. With outstanding RF performances, and a guaranteed Insertion Loss repeatability of 0.03 dB over a life span of 2.5 million switching cycles, RADIALL TITANIUM switches are perfect for automated test and measurement equipment, as well as signal monitoring devices.

Example of P/N:
R514F73617 is a SP6T SMA up to 26.5 GHz, Latching, Indicators, Self cut-off, Auto-Reset, 24 Vdc and HE10 connector.

PART NUMBER SELECTION

R 51 . . . 3 . . . .

Models:
2: Without 50 Ω terminations
4: With 50 Ω terminations

RF Connectors:
3: SMA up to 6 GHz
4: SMA up to 20 GHz
F: SMA up to 26.5 GHz
8: SMA 2.9 up to 40 GHz (1)

Type:
7: Latching + Self cut-off + Auto Reset + Indicators

Number of positions:
4: 4 Positions
6: 6 Positions

Options:
1: Positive common (without TTL) Type "4" or "7"
2: TTL/5V logic with 24 Vdc supply Type "7" only

Actuator Terminal:
.: HE 10 receptacle, delivered with 750 mm (30 inches) ribbon cable + E10 connector

Documentation:
-: Certificate Of Conformity
C: Calibration certificate
R: Calibration certificate + RF curves

(1) connector SMA 2.9 is equivalent to "K connector®", registered trademark of Anritsu.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

GENERAL SPECIFICATIONS

Operating mode			Latching	
Nominal operating voltage (across operating temperature)		Vdc	24 (20 / 32)	
Coil resistance (+/-10%)		Ohms	120	
Operating current at 23°C		mA	200	
Maximum stand-by current		mA	50	
Average power	All models		RF path Cold switching: see Power **page 5-45** Hot switching: 1 Watt CW	
	Terminated model		Internal terminations	1 Watt average into 50 Ω
TTL input	High Level		3 to 7 V	1.4 mA max at Vcc = Max
	Low Level		0 to 0.8 V	-
Indicator specifications			Maximum withstanding voltage Maximum current capacity Maximum « ON » resistance Minimum « OFF » resistance	60V 150 mA 2.5 Ω 100 MΩ
Switching time (max)		ms	15	
Life (min) for	SMA		2.5 million cycles	
	SMA 2.9		1 million cycles	
Connectors			SMA - SMA2.9	
Actuator terminals			HE10 ribbon receptacle	
Weight (max)		g	230	

ENVIRONMENTAL SPECIFICATIONS

Operating temperature range	-25°C to +75°C
Storage temperature range	-55°C to +85°C
Temperature cycling (MIL-STD-202, Method 107D, Cond.A)	-55°C to +85°C (10 cycles)
Vibration (MIL STD 202, Method 204D, Cond.D)	10-2000 Hz, 10g operating
Shock (MIL STD 202, Method 213B, Cond.C)	50g / 6 ms, ½ sine operating
Moisture resistance (MIL STD 202, Method 106E, Cond.E)	65°C, 95% RH, 10 days
Altitude storage (MIL STD 202, Method 105C, Cond.B)	50,000 feet (15,240 meters)
RFI (MIL STD 1344, Method 3008 or IEC 61726)	55dB at 20GHz
Magnetic field	< 5.10^{-5} gauss at 1 meter

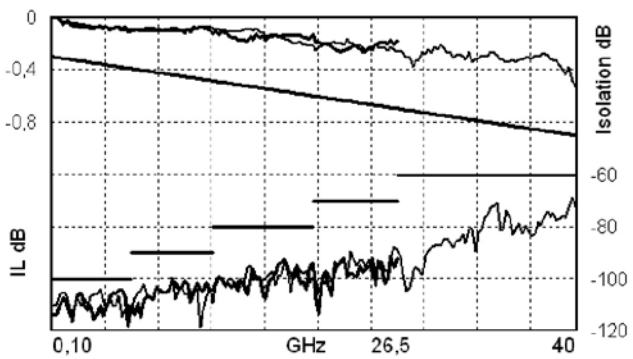
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

RF PERFORMANCES

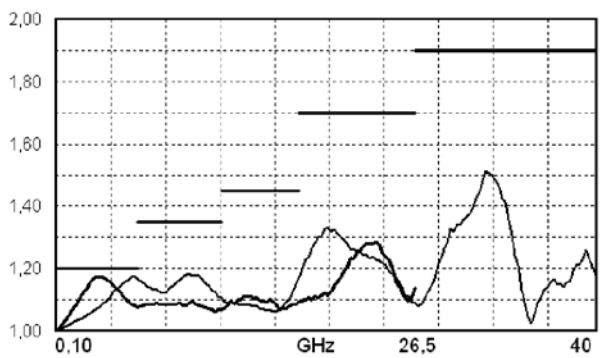
PART NUMBER		R51-3-34-7 R51-3-36-7	R51-4-34-7 R51-4-36-7	R51-F-34-7 R51-F-36-7	R51-8-34-7 R51-8-36-7
Frequency Range	GHz	DC to 6	DC to 20	DC to 26.5	DC to 40
Impedance	Ohms	50			
Insertion Loss (Max)	dB	0.3 + 0.015 x frequency (GHz)			
Isolation (Min)	dB	80	DC to 6 GHz 80 6 to 12.4 GHz 70 12.4 to 20 GHz 65	DC to 6 GHz 80 6 to 12.4 GHz 70 12.4 to 20 GHz 65 20 to 26.5 GHz 60	DC to 6 GHz 80 6 to 12.4 GHz 70 12.4 to 20 GHz 65 20 to 26.5 GHz 60 26.5 to 40 GHz 55
V.S.W.R. (Max)		1.20	DC to 6 GHz 1.20 6 to 12.4 GHz 1.35 12.4 to 18 GHz 1.45 18 to 20 GHz 1.70	DC to 6 GHz 1.20 6 to 12.4 GHz 1.35 12.4 to 18 GHz 1.45 18 to 26.5 GHz 1.70	DC to 6 GHz 1.20 6 to 12.4 GHz 1.35 12.4 to 18 GHz 1.45 18 to 26.5 GHz 1.70 26.5 to 40 GHz 1.90
Third order Inter Modulation		-120 dBc typical (2 carriers 20W)			
Repeatability (measured at 25°C)		0.03 dB			0.05 dB

TYPICAL RF PERFORMANCES

Insertion Loss and Isolation



V.S.W.R.

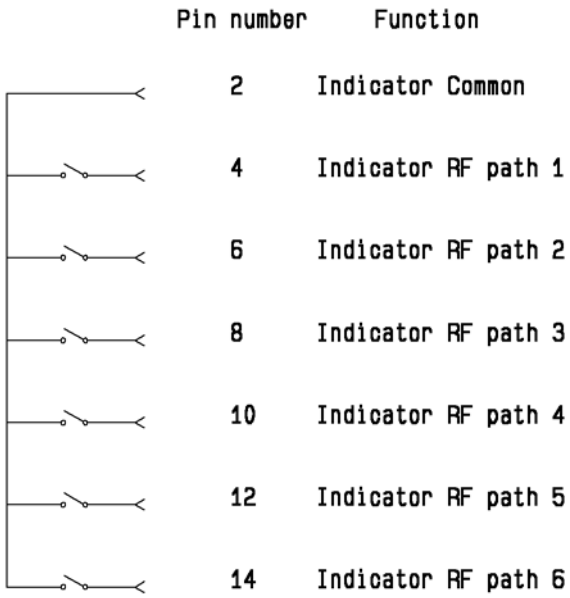


——— : 26.5 GHz model with **SMA** / ——— : 40 GHz model with **SMA2.9**

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

ELECTRONIC POSITION INDICATORS

The electronic position indicators use photo-MOS transistors which are driven by the mechanical position of the RF paths moving elements. The circuitry consists of a common which can be connected to an output corresponding to selected RF path. If one or several RF paths are closed, the corresponding indicators are connected to the common. The photo-MOS transistors are configured for AC and/or DC operation. The electronic position indicators require the supply (20 to 32 VDC) to be connected to pin 1 and ground connected to pin 15.

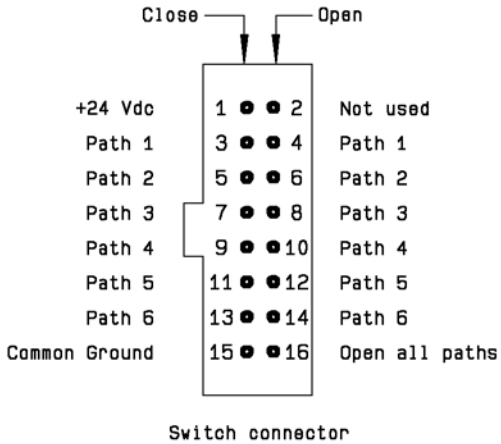


Ways 1 and 4 are not connected for SP4T switches.

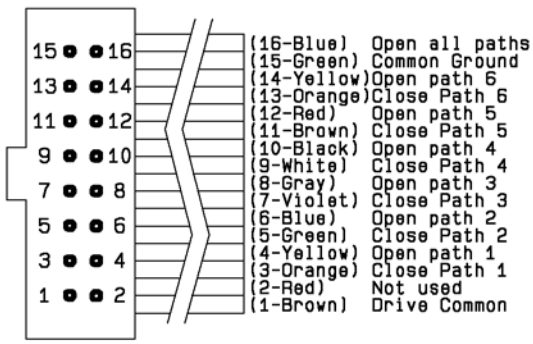
DRIVING THE SWITCH

Each RF path is driven independently. Each path can be closed or open by applying ground to the corresponding "open" or “close" pin.

Type 4: without TTL and without indicator



Switch connector



Mating cable connector

Ways 1 and 4 are not connected for SP4T switches.

Standard drive:

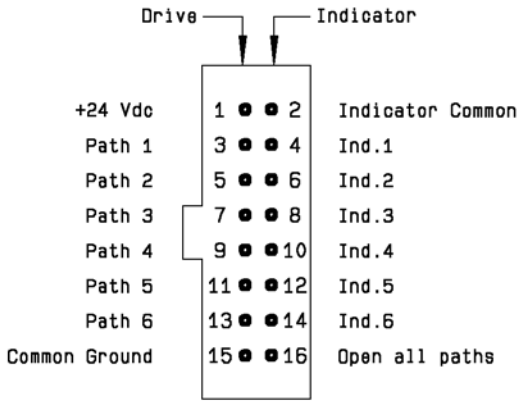
- Connect pin 15 to ground.
- Connect pin 1 to supply (+20 VDC to +32 VDC).
- Select desired RF path by applying ground to the corresponding "close" pin (Ex: ground pin 3 to close RF path 1).
- To open desired RF path connect ground to the corresponding "open" pin (Ex: ground pin 4 to open RF path 1).
- To open all RF paths, first ensure that all RF path "close" pins are disconnected from ground. To complete the operation, connect pin 16 to ground.

Make-Before-Break:

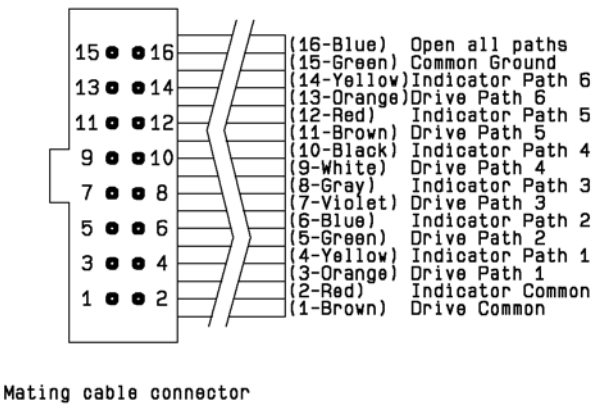
Make-Before-Break switching can be accomplished by closing the new RF path before opening the previously selected RF path. To complete the operation, close the new RF port. A minimum of 15 ms must be allowed before opening the previously selected RF port.

Type 7: with TTL (option "2") / without TTL (option "1") and indicators.

Each RF path can be closed by applying Ground or TTL "High" for option 2 to the corresponding "drive" pin. In general, except for Make-Before-Break drive, all other RF paths are simultaneously opened by internal logic.



Switch connector



Mating cable connector

Ways 1 and 4 are not connected for SP4T switches.

Standard drive option "1":

- Connect pin 15 to ground.
- Connect pin 1 to supply (+20 VDC to +32 VDC)
- Select (close) desired RF path by applying Ground to the corresponding "drive" pin (Ex: apply Ground to pin 3 to close RF path 1).
- To select another path, ensure that all unwanted RF path "drive" pins are disconnected from Ground (to prevent multiple RF path engagement). Apply Ground to the "drive" pin which corresponds to the desired RF path.
- To open all RF paths, ensure that all RF path "drive" pins are disconnected from Ground. Complete the operation by applying Ground to pin 16.

TTL drive option "2":

- Connect pin 15 to ground.
- Connect pin 1 to supply (+20 VDC to +32 VDC)
- Select (close) desired RF path by applying TTL "High" to the corresponding "drive" pin (Ex: apply TTL "High" to pin 3 to close RF path 1).
- To select another path, ensure that all unwanted RF path "drive" pins are in TTL "Low" position (to prevent multiple RF path engagement). Apply TTL "High" to the "drive" pin which corresponds to the desired RF path.
- To open all RF paths, ensure that all RF path "drive" pins are in TTL "Low" position. Complete the operation by applying TTL "High" to pin 16.

Break-Before-Make:

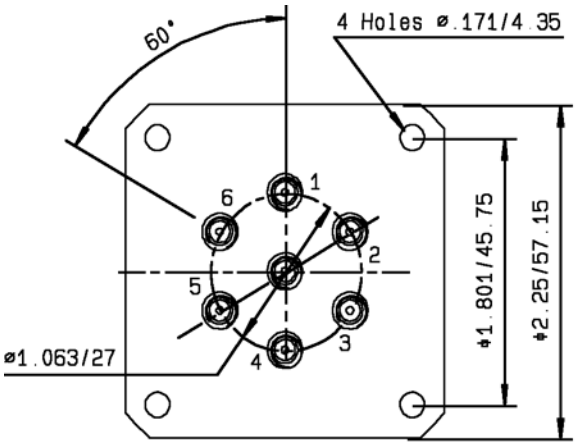
Open the undesired RF path. After 15 ms (minimum), close the new RF port.

Make-Before-Break:

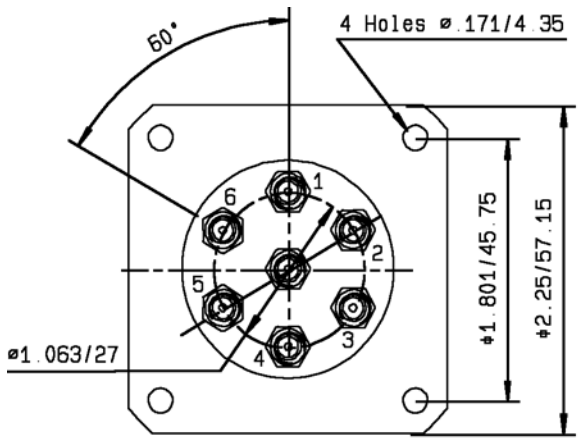
Ensure that the previously selected RF path "drive" is connected to Ground (or TTL "High" for option "2"), then close the new RF path.

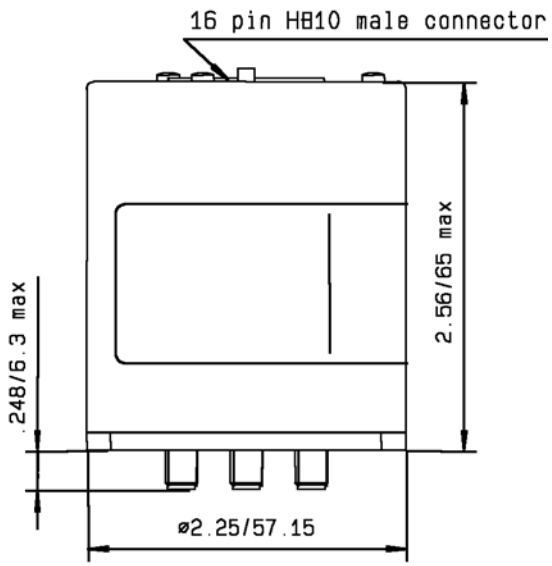
TYPICAL OUTLINE DRAWING

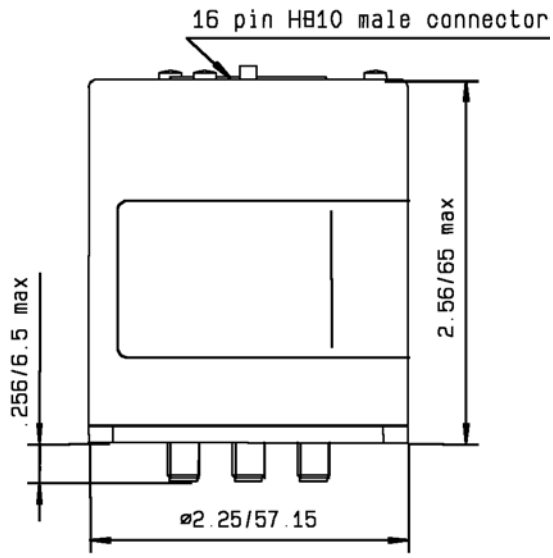
SMA connectors

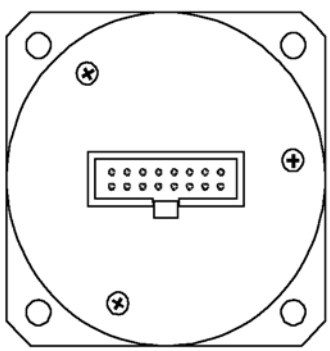


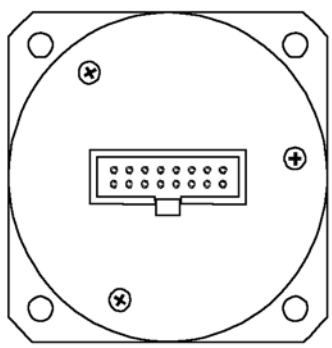
SMA2.9 connectors











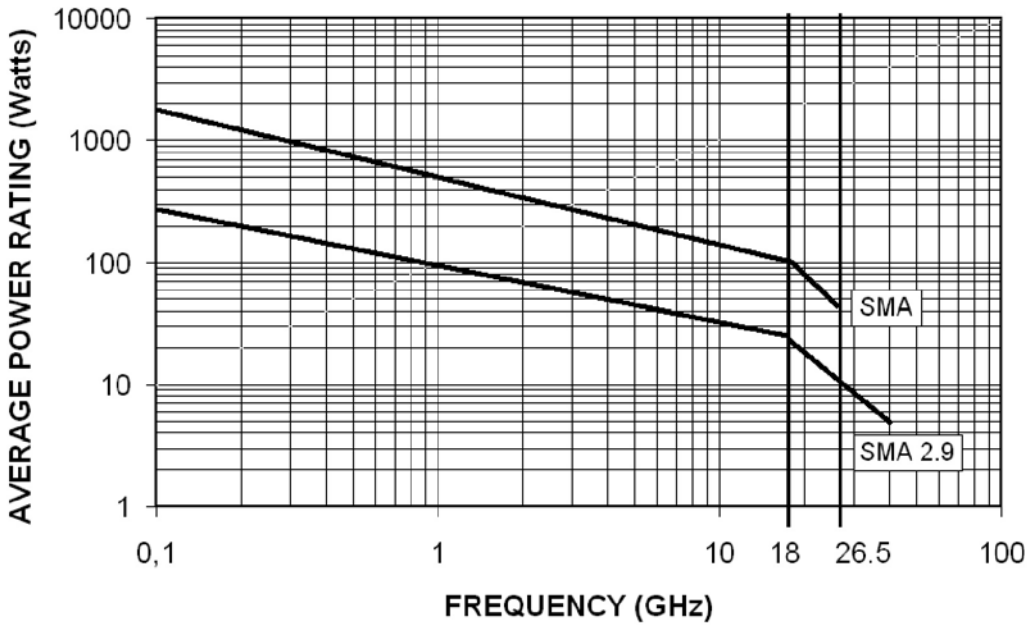
Ways 1 and 4 are not connected for SP4T switches.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

POWER RATING CHART

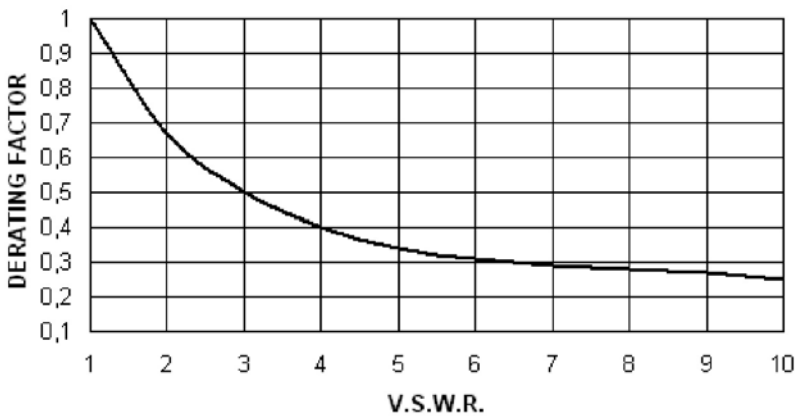
This graph is based on the following conditions:

- Ambient temperature: + 25°C
- Sea level
- V.S.W.R.: 1 and cold switching



DERATING FACTOR VERSUS VSWR

The average power input must be reduced for load V.S.W.R. above 1:1.



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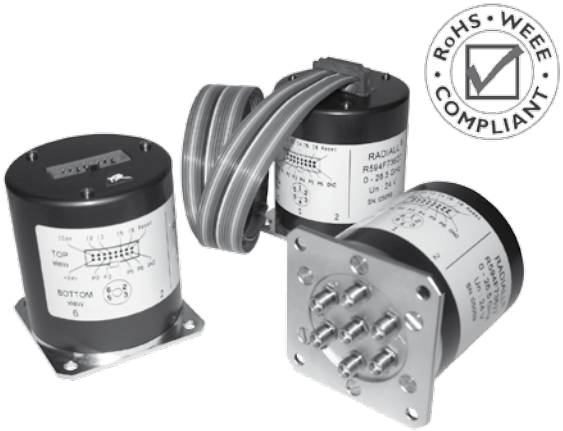
HIGH PERFORMANCE MULTIPORT SWITCHES

PLATINUM Series / SPnT terminated up to 40 GHz



Radiall's PLATINUM SERIES switches are optimised to perform at a high level over an extended life span. With outstanding RF performances, and a guaranteed Insertion Loss repeatability of 0.03 dB over a life span of 10 million switching cycles, PLATINUM SERIES switches are perfect for automated test and measurement equipment, as well as signal monitoring devices.

Example of P/N:
R594873427 is a SPnT SMA2.9 up to 40 GHz, Latching with Indicators, Self cut-off, Auto-Reset, TTL driver and HE10 connector.

PART NUMBER SELECTION

R 594 . . 3 . . . .

RF Connectors:
3: SMA up to 6 GHz
4: SMA up to 20 GHz
F: SMA up to 26.5 GHz
8: SMA 2.9 up to 40 GHz (1)

Type:
4: Latching + Self cut-off without indicator
7: Latching + Self cut-off + Auto Reset + Indicators

Number of positions:
4: 4 Positions
6: 6 Positions

Documentation:
-: Certificate Of Conformity
C: Calibration certificate
R: Calibration certificate + RF curves

Actuator Terminal:
.: HE 10 receptacle, delivered with 750 mm (30 inches) ribbon cable + E10 connector

Options:
1: Positive common (without TTL) Type "4" or "7"
2: TTL/5V logic with 24 Vdc supply Type "7" only

(1) connector SMA 2.9 is equivalent to "K connector®", registered trademark of Anritsu.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

HIGH PERFORMANCE MULTIPORT SWITCHES
PLATINUM Series / SPnT terminated up to 40 GHz

GENERAL SPECIFICATIONS

Operating mode			Latching	
Nominal operating voltage (across operating temperature)		Vdc	24 (20 / 32)	
Coil resistance (+/-10%)		Ohms	120	
Operating current at 23°C		mA	200	
Maximum stand-by current		mA	50	
Average power			RF path Cold switching: See RF Power Rating Chart on **page 5-53** Hot switching: 1 Watt CW	
			Internal terminations	1 Watt average into 50 Ω
TTL input	High Level		3 to 7 V	1.4 mA max at Vcc = Max
	Low Level		0 to 0.8 V	-
Indicator specifications			Maximum withstanding voltage Maximum current capacity Maximum « ON » resistance Minimum « OFF » resistance	60V 150 mA 2.5 Ω 100 MΩ
Switching time (max)		ms	15	
Life (min) for	SMA		10 million cycles	
	SMA 2.9		2.5 million cycles	
Connectors			SMA - SMA2.9	
Actuator terminals			HE10 ribbon receptacle	
Weight (max)		g	230	

ENVIRONMENTAL SPECIFICATIONS

Operating temperature range	-25°C to +75°C
Storage temperature range	-55°C to +85°C
Temperature cycling (MIL-STD-202, Method 107D, Cond.A)	-55°C to +85°C (10 cycles)
Vibration (MIL STD 202, Method 204D, Cond.D)	10-2000 Hz, 10g operating
Shock (MIL STD 202, Method 213B, Cond.C)	50g / 6 ms, ½ sine operating
Moisture resistance (MIL STD 202, Method 106E, Cond.E)	65°C, 95% RH, 10 days
Altitude storage (MIL STD 202, Method 105C, Cond.B)	50,000 feet (15,240 meters)
RFI (MIL STD 1344, Method 3008 or IEC 61726)	55dB at 20GHz
Magnetic field	< 5.10^{-5} gauss at 1 meter

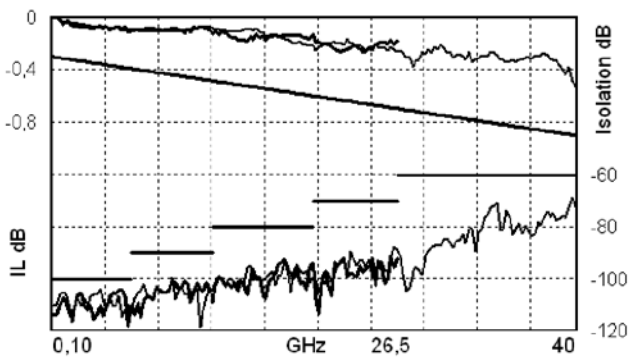
To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

RF PERFORMANCES

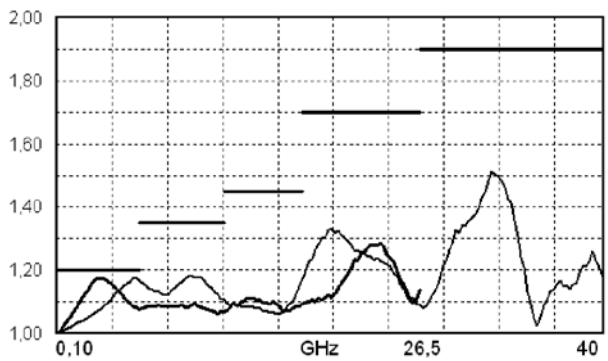
PART NUMBER		R5943-34-7	R5944-34-7 R5944-36-7	R594F-34-7 R594F-36-7	R5948-34-7 R5948-36-7
Frequency Range	GHz	DC to 6	DC to 20	DC to 26.5	DC to 40
Impedance	Ohms	50			
Insertion Loss (Max)	dB	0.3 + 0.015 x frequency (GHz)			
Isolation (Min)	dB	100	DC to 6 GHz 100 6 to 12.4 GHz 90 12.4 to 20 GHz 80	DC to 6 GHz 100 6 to 12.4 GHz 90 12.4 to 20 GHz 80 20 to 26.5 GHz 70	DC to 6 GHz 100 6 to 12.4 GHz 90 12.4 to 20 GHz 80 20 to 26.5 GHz 70 26.5 to 40 GHz 60
V.S.W.R. (Max)		1.20	DC to 6 GHz 1.20 6 to 12.4 GHz 1.35 12.4 to 18 GHz 1.45 18 to 20 GHz 1.70	DC to 6 GHz 1.20 6 to 12.4 GHz 1.35 12.4 to 18 GHz 1.45 18 to 26.5 GHz 1.70	DC to 6 GHz 1.20 6 to 12.4 GHz 1.35 12.4 to 18 GHz 1.45 18 to 26.5 GHz 1.70 26.5 to 40 GHz 1.90
Repeatability (measured at 25°C)		0.03 dB			0.05 dB

TYPICAL RF PERFORMANCES

Insertion Loss and Isolation



V.S.W.R.



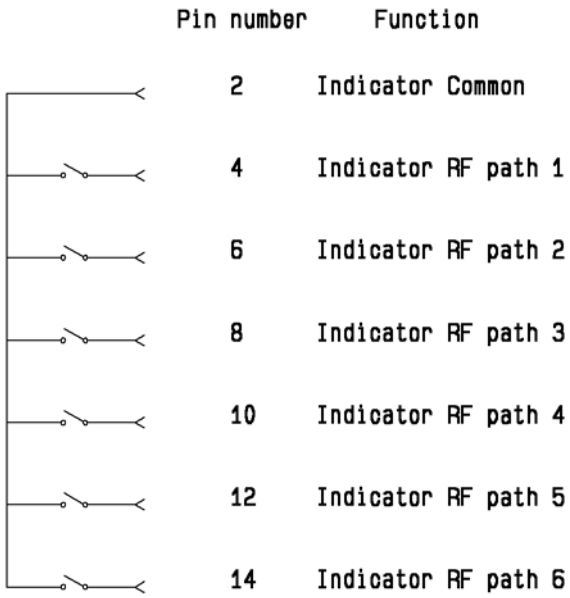
——— : 26.5 GHz model with **SMA** / ——— : 40 GHz model with **SMA2.9**

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

ELECTRONIC POSITION INDICATORS

This option is not available with type 4.

The electronic position indicators use photo-MOS transistors which are driven by the mechanical position of the RF paths moving elements. The circuitry consists of a common which can be connected to an output corresponding to selected RF path. If one or several RF paths are closed, the corresponding indicators are connected to the common. The photo-MOS transistors are configured for AC and/or DC operation. The electronic position indicators require the supply (20 to 32 VDC) to be connected to pin 1 and ground connected to pin 15.

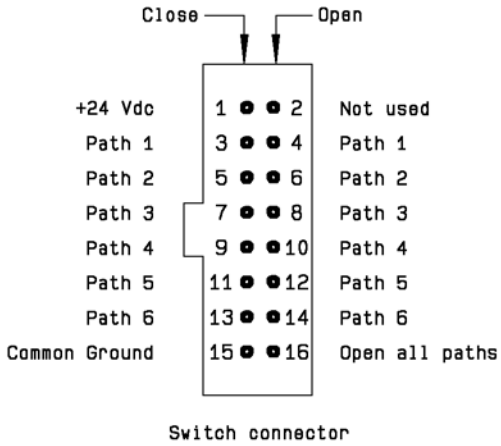


Ways 1 and 4 are not connected for SP4T switches.

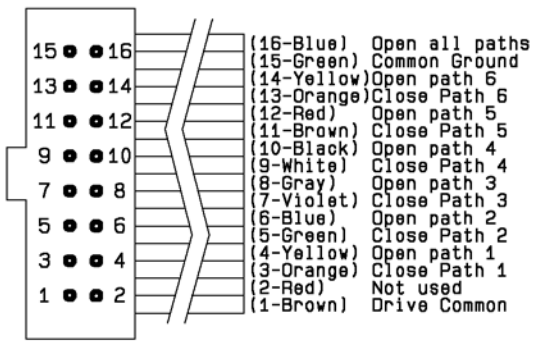
DRIVING THE SWITCH

Each RF path is driven independently. Each path can be closed or open by applying ground to the corresponding "open" or “close" pin.

Type 4: without TTL and without indicator



Switch connector



Mating cable connector

Standard drive:

- Connect pin 15 to ground.
- Connect pin 1 to supply (+20 VDC to +32 VDC).
- Select desired RF path by applying ground to the corresponding "close" pin (Ex: ground pin 3 to close RF path 1).
- To open desired RF path connect ground to the corresponding "open" pin (Ex: ground pin 4 to open RF path 1).
- To open all RF paths, first ensure that all RF path "close" pins are disconnected from ground. To complete the operation, connect pin 16 to ground.

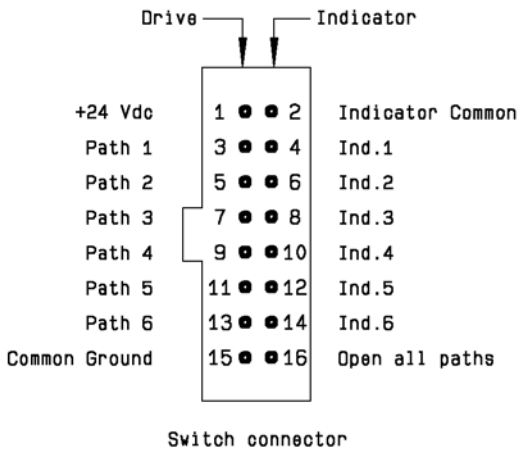
Make-Before-Break:

Make-Before-Break switching can be accomplished by closing the new RF path before opening the previously selected RF path. To complete the operation, close the new RF port. A minimum of 15 ms must be allowed before opening the previously selected RF port.

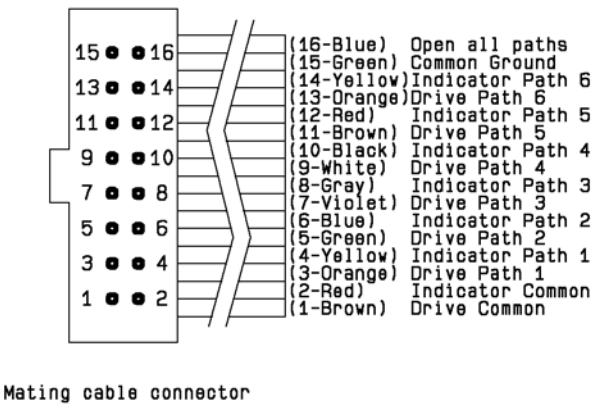
Ways 1 and 4 are not connected for SP4T switches.

Type 7: with TTL (option "2") / without TTL (option "1") and indicators.

Each RF path can be closed by applying Ground or TTL "High" for option 2 to the corresponding "drive" pin. In general, except for Make-Before-Break drive, all other RF paths are simultaneously opened by internal logic.



Switch connector



Mating cable connector

Ways 1 and 4 are not connected for SP4T switches.

Standard drive option "1":

- Connect pin 15 to ground.
- Connect pin 1 to supply (+20 VDC to +32 VDC)
- Select (close) desired RF path by applying Ground to the corresponding "drive" pin (Ex: apply Ground to pin 3 to close RF path 1).
- To select another path, ensure that all unwanted RF path "drive" pins are disconnected from Ground (to prevent multiple RF path engagement). Apply Ground to the "drive" pin which corresponds to the desired RF path.
- To open all RF paths, ensure that all RF path "drive" pins are disconnected from Ground. Complete the operation by applying Ground to pin 16.

TTL drive option "2":

- Connect pin 15 to ground.
- Connect pin 1 to supply (+20 VDC to +32 VDC)
- Select (close) desired RF path by applying TTL "High" to the corresponding "drive" pin (Ex: apply TTL "High" to pin 3 to close RF path 1).
- To select another path, ensure that all unwanted RF path "drive" pins are in TTL "Low" position (to prevent multiple RF path engagement). Apply TTL "High" to the "drive" pin which corresponds to the desired RF path.
- To open all RF paths, ensure that all RF path "drive" pins are in TTL "Low" position. Complete the operation by applying TTL "High" to pin 16.

Break-Before-Make:

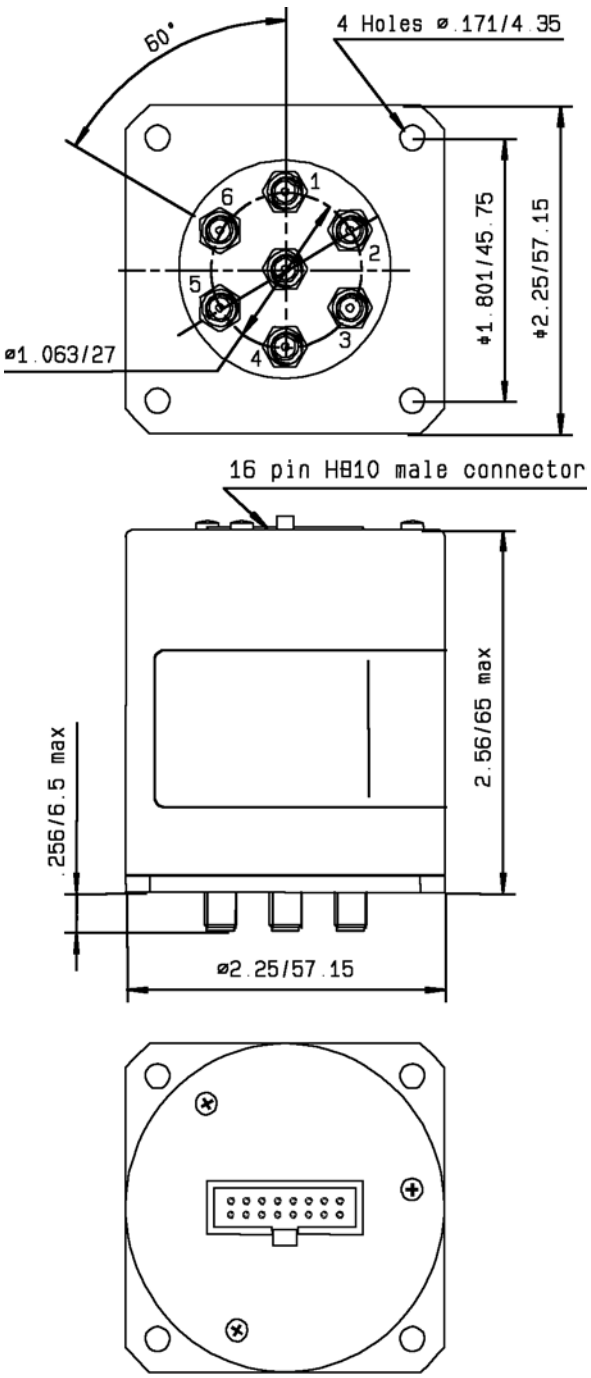
Open the undesired RF path. After 15 ms (minimum), close the new RF port.

Make-Before-Break:

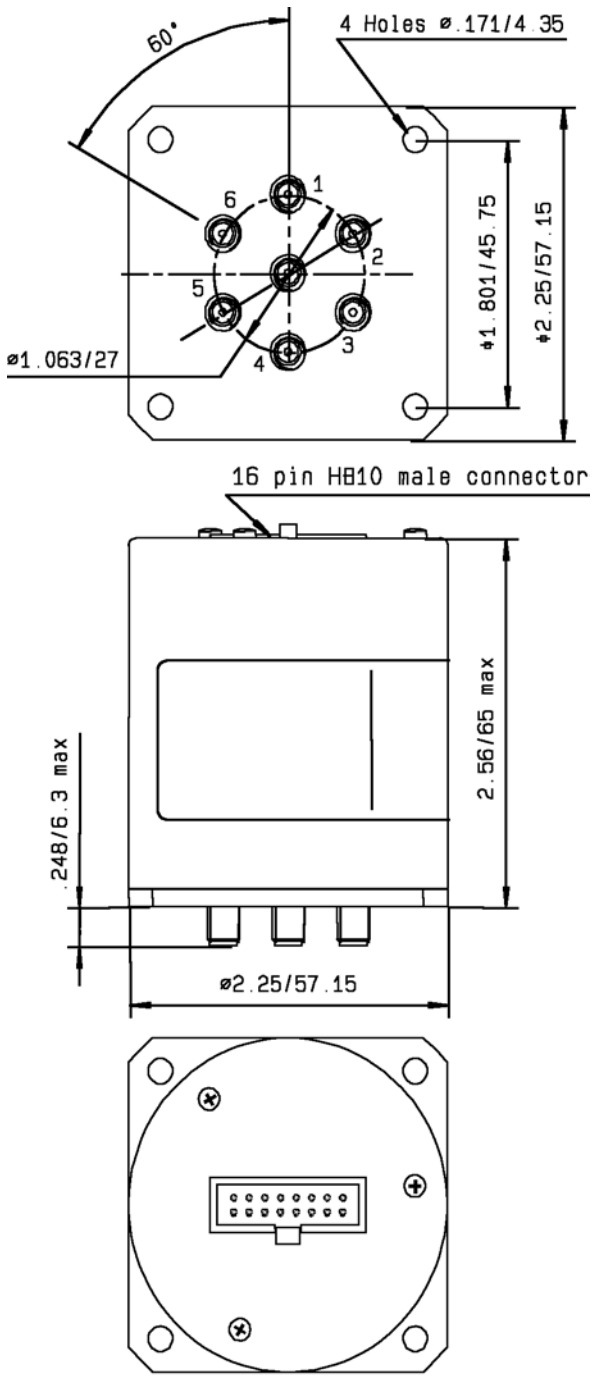
Ensure that the previously selected RF path "drive" is connected to Ground (or TTL "High" for option "2"), then close the new RF path.

TYPICAL OUTLINE DRAWING

SMA connectors



SMA2.9 connectors



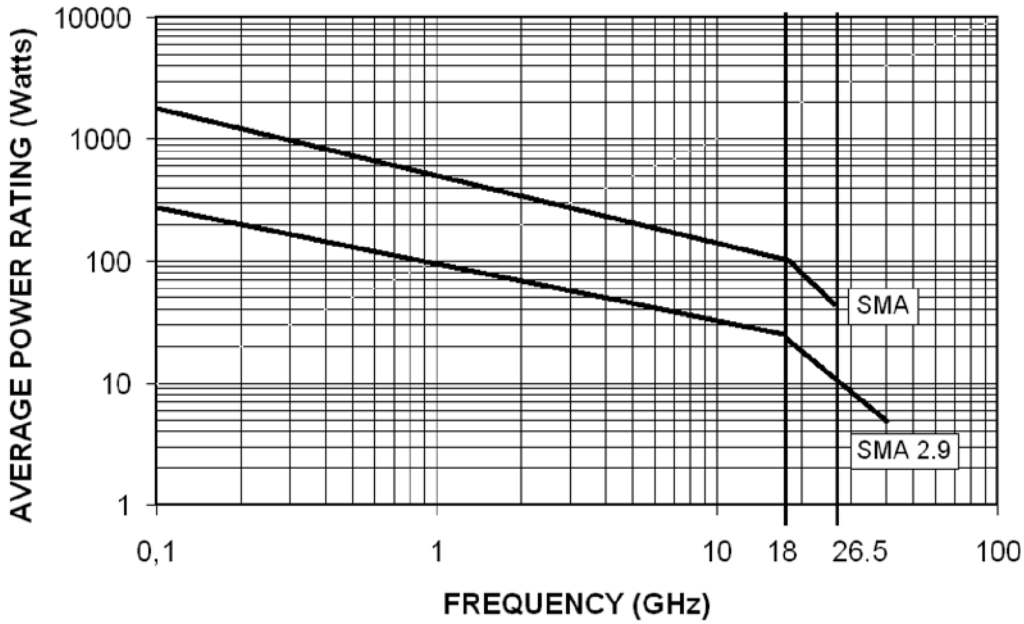
Ways 1 and 4 are not connected for SP4T switches.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

POWER RATING CHART

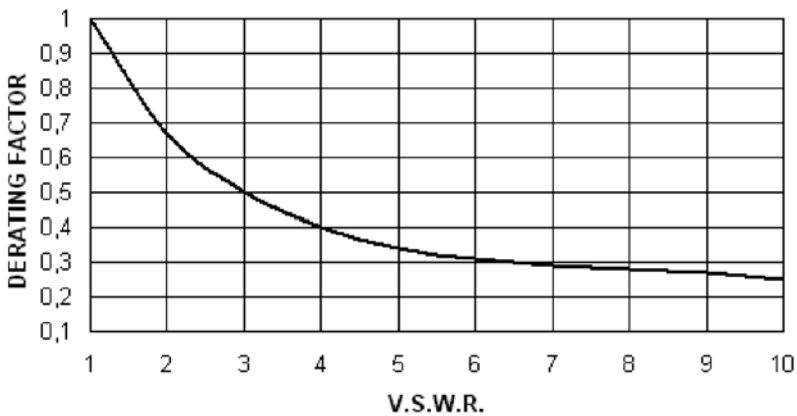
This graph is based on the following conditions:

- Ambient temperature: + 25°C
- Sea level
- V.S.W.R.: 1 and cold switching



DERATING FACTOR VERSUS VSWR

The average power input must be reduced for load V.S.W.R. above 1:1.



To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

OPTIONAL FEATURES FOR SPnT

Examples of dedicated application options

SPnT with flat ribbon cable for easy installation with limited space.

Thermal vacuum SPnT designed based on our expertise in Space. For more detailed informations, see page 7-6 to 7-8.

SPnT with special mounting bracket for easy mounting in Automatic Test Equipment.

Subminiature SP6T with a micro D connector instead of solder pins.

SP3T used for a military application with sequential access and severe environmental characteristics.

Subminiature SP6T developed for test bench applications requiring low RF leakage.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SPACE SECTION

SECTION 6

GENERAL INFORMATION / SPECIFICATIONS

Radiall Hi-Rel switches are manufactured based on over 40 years of experience and thousands of products that have been designed, qualified, and delivered for both commercial and military applications.
With a space heritage of over 25 years and products in flight on over 220 satellites around the world, RADIALL guarantees our products are manufactured with highest level of quality and reliability.

RADIALL Hi-Rel coaxial switches have been fully evaluated and approved by the European Space Agency for Space use according to the generic specification ESCC3603.
Radiall offers products tested at several levels based on the same hardware including:
- EM: Engineering Model
- QM: Qualification Model
- PFM: Proto Flight Model
- FM: Flight Model

RADIALL also provides a full range of Hi-Rel switches for space use which offers our customers significant cost savings, in line with requirements for communication satellite applications according to RAD-GEN-SWIT-001 and following detailed specifications including the non exhaustive Radiall Part Number list (see page 6-16).

ENVIRONMENTAL CHARACTERISTICS

		Qualification Level
Operation temperature range		- 30°C / + 85°C
Non operation temperature range		- 40°C / + 85°C
Vibration	Sinus	5 – 100 Hz / 20g
	Random	20 – 2000 Hz / 28,57 grms
Schocks		½ sinus / 1200g / 0.25 ms
Pressure		Free space vacuum

For more detailed technical information please consult Radiall customer support.

LOW POWER COAXIAL SPDT SWITCH

LOW-POWER LATCHING COAXIAL SPDT SWITCH according to RADIALL Specification RAD-DET-SPDT-001

- S switch configuration
- DC to 22 GHz with SMA connectors
- Up to 31 GHz with SMA 2.9 connectors
- Telemetry circuit
- Suppression diodes
- D-Sub or solder pins
- Lay Down or Fixing plate
- 49 grams and up

GENERAL SPECIFICATIONS

	Unit	Min	Typical	Max
Actuation Voltage	V	+22	+26	+29
Pick-Up Voltage	V			+20.5
Actuation Current @+29V, +25°C @+29V, -30°C @+29V, +85°C	mA		 129 164 105	 139 176 113
Switching Time	ms			20
Pulse Duration	ms	20		1000
Coil Resistance (at +25°C)	Ω	210	225	
RF Contact Resistance	mΩ			100
TLM Indicator Contact Resistance				
Contact closed	mΩ			1000
Contact Open	MΩ	10		
Contact Current	mA			100
Coil Isolation at 500 VDC	MΩ	10		
Dielectric Withstanding at 50 or 60Hz	Vrms	500		
Mass Variant 001: SPDT, Fixing Plate, Pins Variant 002: SPDT, Lay Down, Pins Variant 003: SPDT, Lay Down, D-Sub	grams			 44 62 72
Torque Screws for Fixing unit For DC connector For SMA connector	N.m	 0.27 0.8	 1.1	 2.0 0.44 1.15

RF PERFORMANCES

DC TO 22 GHZ SMA

FREQUENCY	GHz	DC - 4.2	4.2 - 10.7	10.7 - 12.75	12.75 - 14.5	14.5 - 22
Insertion Loss (max)	dB	0.12	0.20	0.25	0.30	0.35
VSWR (max) Return Loss (min)	(dB)	1.20:1 (21)	1.20:1 (21)	1.20:1 (21)	1.25:1 (19)	1.33:1 (17)
Isolation (min)	dB	70			65	65
E-Field Shielding Effectiveness (min)	dBi	75	70	70	70	70

KA – BAND SMA2.9

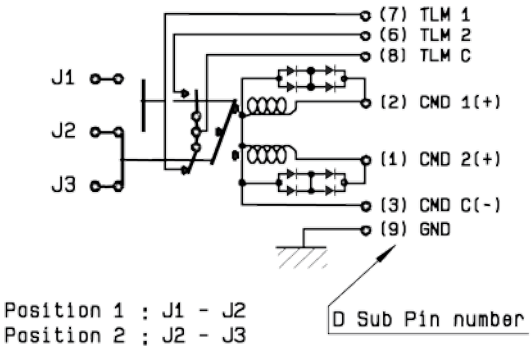
FREQUENCY	GHz	17.5-21.5	21.5 - 27.5	27.5 - 31
Insertion Loss (max)	dB	0.45	0.45	0.50
VSWR (max) Return Loss (min)	(dB)	1.33:1 (17.0)	1.35:1 (16.5)	1.40:1 (15.6)
Isolation (min)	dB	65	60	55
E-Field Shielding Effectiveness (min)	dBi	60	50	40
Power Handling (max)	W	10	5	

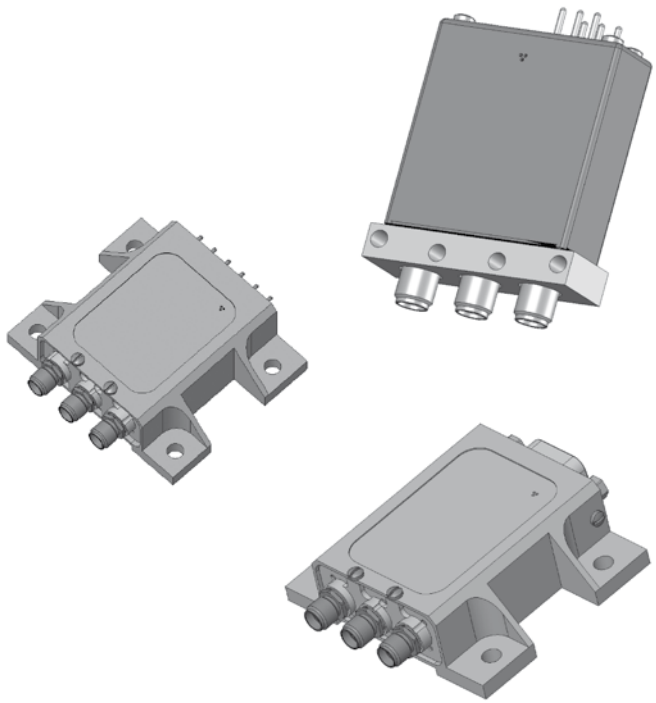
For more detailed technical information please consult Radiall customer support.

LOW POWER COAXIAL SPDT SWITCH

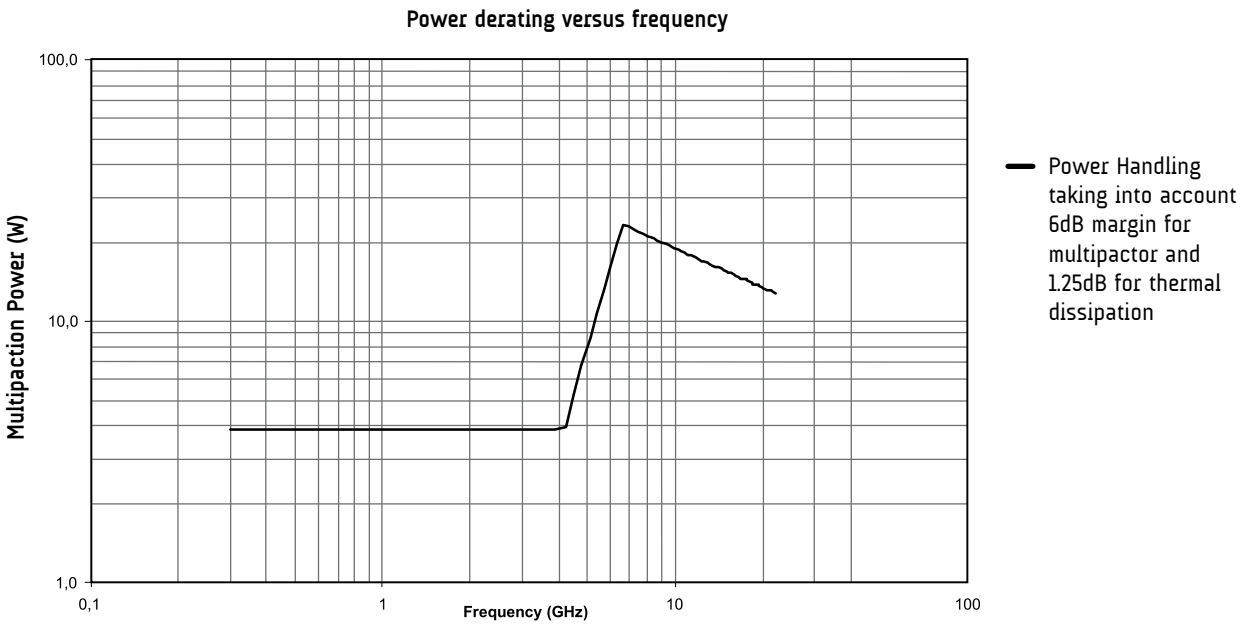
SCHEMATICS & DRAWINGS

SDPT, lay down, pins:



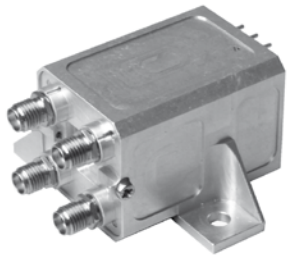


POWER DERATING GRAPH



For more detailed technical information please consult Radiall customer support.

LOW POWER COAXIAL DPDT SWITCH



LOW-POWER LATCHING COAXIAL DPDT SWITCH according to RADIALL Specification RAD-DET-DPDT-006

- C switch configuration
- DC to 22 GHz with SMA connectors
- Up to 31 GHz with SMA 2.9 connectors
- Telemetry circuit
- Suppression diodes
- D-Sub or solder pins
- Stand up or Lay Down
- 55 grams and up

GENERAL SPECIFICATIONS

	Unit	Min	Typical	Max
Actuation Voltage	V	+22	+26	+29
Pick-Up Voltage	V			+20.5
Actuation Current @+29V, +25°C @+29V, -30°C @+29V, +85°C	mA		 129 164 105	 139 176 113
Switching Time	ms			25
Pulse Duration	ms	20		1000
Coil Resistance (at +25°C)	Ω	210	225	
RF Contact Resistance	mΩ			100
TLM indicator circuit				
Contact closed	mΩ			1000
Contact Open	MΩ	10		
Contact Current	mA			100
Coil Isolation at 500 VDC	MΩ	10		
Dielectric Withstanding at 50 or 60Hz	Vrms	500		
Mass Variant 001: C-Switch Stand up D-Sub Variant 002: C-Switch Lay Down Pins Variant 003: C-Switch Stand up Pins	grams			 80 55 60
Torque Screws for Fixing unit For DC connector For SMA connector	N.m	 0.27 0.8	 1.1	 2.0 0.44 1.15

RF PERFORMANCES

DC TO 22 GHZ SMA

FREQUENCY	GHz	DC - 4.2	4.2 - 8.4	8.4 - 14.5	14.5 - 18	18 - 22
Insertion Loss (max)	dB	0.15	0.25	0.30	0.40	0.50
VSWR (max) Return Loss (min)	(dB)	1.20:1 (21)	1.25:1 (19)	1.25:1 (19)	1.33:1 (17)	1.33:1 (17)
Isolation (min)	dB	70			65	
E-Field Shielding Effectiveness (min)	dBi	75	70	65		60

KA - BAND SMA2.9

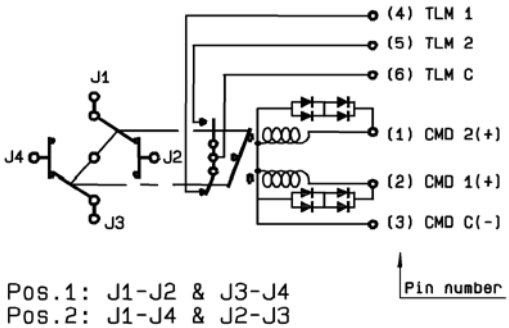
FREQUENCY	GHz	17.5 - 21.5	27.5 - 31
Insertion Loss (max)	dB	0.50	0.65
VSWR (max) Return Loss (min)	(dB)	1:30:1 (17.7)	1.40:1 (15.6)
Isolation (min)	dB	65	60
E-Field Shielding Effectiveness (min)	dBi	60	60
Power Handling (max)	W	10	5

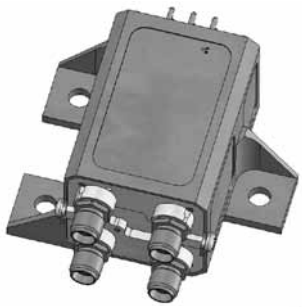
For more detailed technical information please consult Radiall customer support.

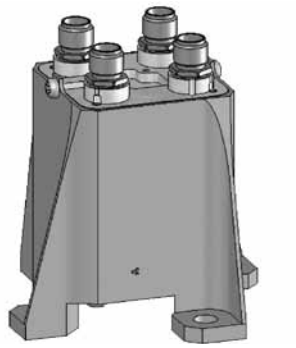
LOW POWER COAXIAL DPDT SWITCH

SCHEMATICS & DRAWINGS

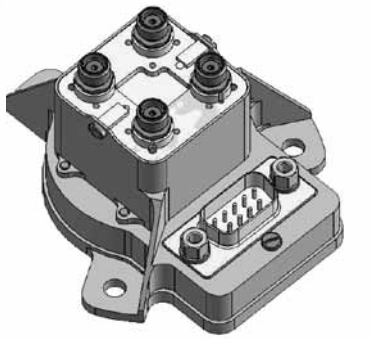
C-Switch, SMA, Lay Down, pins:





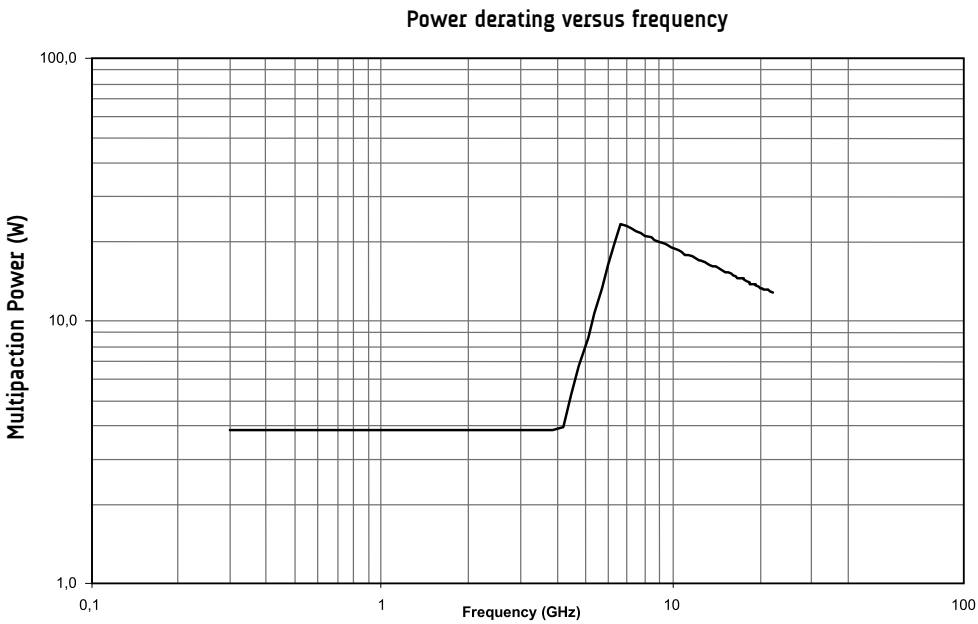


C-Switch, SMA, Stand Up, pins



C-Switch, SMA, Stand Up, D-Sub

POWER DERATING GRAPH



For more detailed technical information please consult Radiall customer support.

LOW POWER COAXIAL T SWITCH

LOW-POWER LATCHING COAXIAL T SWITCH according to RADIALL Specification RAD-DET-TSSD-002 & RAD-DET-TSRD-003

- Random or Sequential drive
- DC to 22 GHz with SMA connectors
- Up to 31 GHz with SMA 2.9 connectors
- Telemetry circuit
- Suppression diodes
- D-Sub or solder pins
- Stand up or Lay Down or Fixing plate
- 58 grams and up

GENERAL SPECIFICATIONS

		RAD - DET- TSSD – 002 SEQUENTIAL DRIVE			RAD - DET- TSRD – 003 RANDOM DRIVE		
	Unit	Min	Typical	Max	Min	Typical	Max
Actuation Voltage	V	+22	+26	+29	+22	+26	+29
Pick-Up Voltage	V			+20.5			+20.5
Actuation Current @+29V, +25°C @+29V, -30°C @+29V, +85°C	mA		 345 439 280	 364 462 295		 285 365 234	 305 390 250
Switching Time	ms			25			20
Pulse Duration	ms	20		1000	20		1000
Coil Resistance (at +25°C)	Ω	79.8	84		88	95	
RF Contact Resistance	mΩ			100			100
TLM indicator circuit							
Contact closed	mΩ			1000			1000
Contact Open	MΩ	10			10		
Contact Current	mA			100			100
Coil Isolation at 500 VDC	MΩ	10			10		
Dielectric Withstanding at 50 or 60Hz	Vrms	500			500		
Mass T-Switch, Lay Down Pins T-Switch, Stand Up D-Sub T-Switch, Stand Up Pins T-Switch, Fixing Plate	grams			 73 100 75 -			 63 - 75 58
Torque Screws for Fixing unit For DC connector For SMA connector	N.m	 0.27 0.8	 1.1	 2.0 0.44 1.15	 0.8	 1.1	 2.0 NA 1.15

RF PERFORMANCES

DC TO 22 GHZ SMA

FREQUENCY	GHz	DC - 4.2	4.2 - 5.5	5.5 - 6.6	6.6 - 7.7	7.7 - 8.8	8.8 - 10.5	10.5 - 14.5	14.5 - 17.8	17.8 - 22
Insertion Loss (max)	dB	0.15	017	0.18	0.21	0.24	0.30	0.35	0.45	0.50
VSWR (max) Return Loss (min)	(dB)	1.20:1 (21)	1.22:1 (20)	1.25:1 (19)	1.25:1 (19)	1.25:1 (19)	1.25:1 (19)	1.25:1 (19)	1.33:1 (17)	1.33:1 (17)
Isolation (min)	dB	70						65		
E-Field Shielding Effectiveness (min)	dBi	75			70		65			

KA - BAND SMA2.9

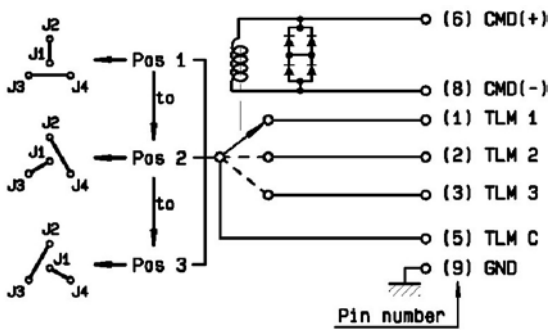
FREQUENCY	GHz	17.5 - 21.5	27.5 - 31
Insertion Loss (max)	dB	0.40	0.50
VSWR (max) Return Loss (min)	(dB)	1.30:1 (17.7)	1.40:1 (15.6)
Isolation (min)	dB	70	60
E-Field Shielding Effectiveness (min)	dBi	65	55
Power Handling (max)	W	10	5

For more detailed technical information please consult Radiall customer support.

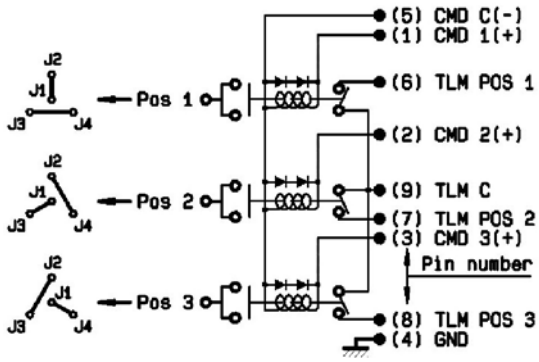
LOW POWER COAXIAL T SWITCH

SCHEMATICS & DRAWINGS

Sequential Drive:

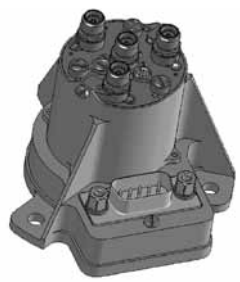


Random Drive:



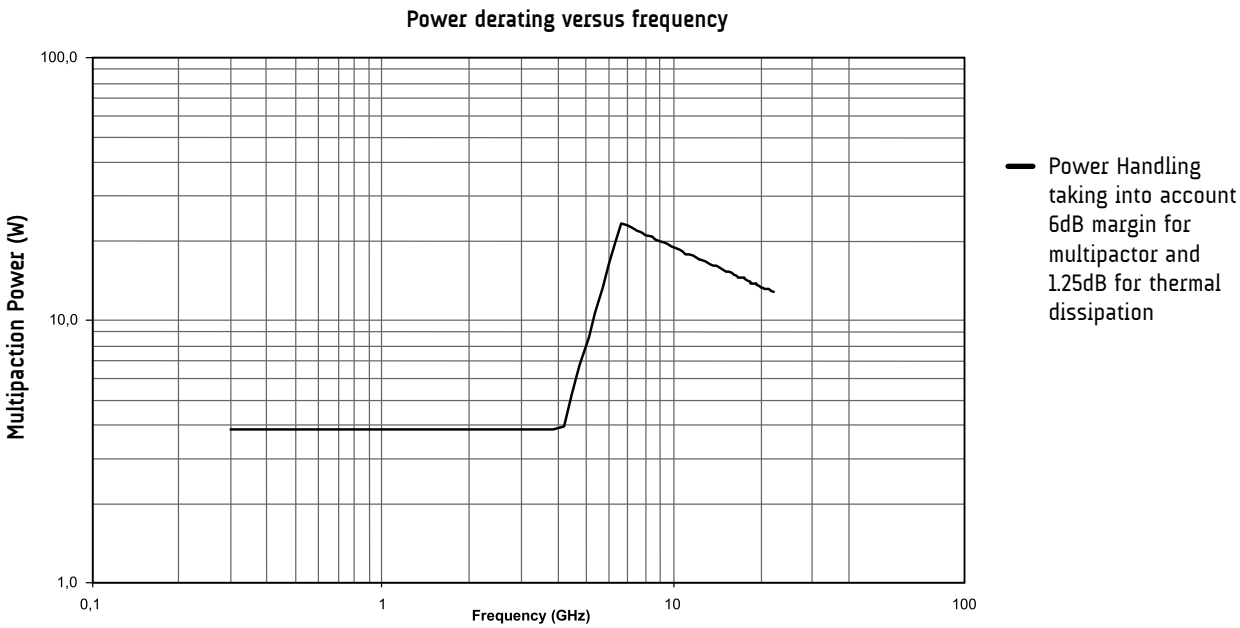
T-Switch, Lay Down with pins:

T-Switch, Stand Up with D-Sub:



T-Switch, Fixing plate with pins:

POWER DERATING GRAPH



For more detailed technical information consult Radiall customer support.

LOW POWER COAXIAL DP3T SWITCH

LOW-POWER LATCHING COAXIAL DP3T SWITCH according to RADIALL Specification RAD-DET-DP3T-001

- DC to 18 GHz with SMA connectors
- Telemetry circuit
- Suppression diodes
- D-Sub or solder pins
- Lay Down
- 125 grams and up

GENERAL SPECIFICATIONS

	Unit	Min	Typical	Max
Actuation Voltage	V	+22	+26	+29
Pick-Up Voltage	V			+20.5
Actuation Current @+29V, +25°C @+29V, -30°C @+29V, +85°C	mA		 129 164 105	 139 176 113
Switching Time	ms			20
Pulse Duration	ms	20		1000
Coil Resistance (at +25°C)	Ω	210	225	
RF Contact Resistance	mΩ			100
TLM indicator circuit				
Contact closed	mΩ			1000
Contact Open	MΩ	10		
Contact Current	mA			100
Coil Isolation at 500 VDC	MΩ	10		
Dielectric Withstanding at 50 or 60Hz	Vrms	500		
Mass	grams			125
Torque Screws for Fixing unit For DC connector For SMA connector	N.m	 0.27 0.8	 1.1	 2.0 0.44 1.15

RF PERFORMANCES

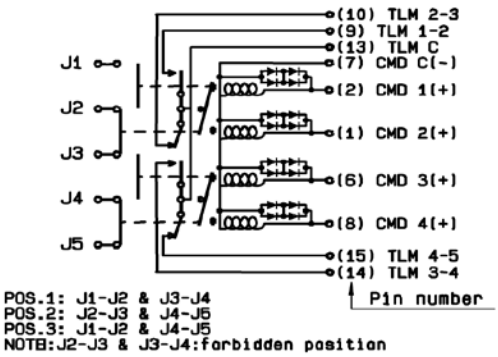
DC TO 18 GHZ

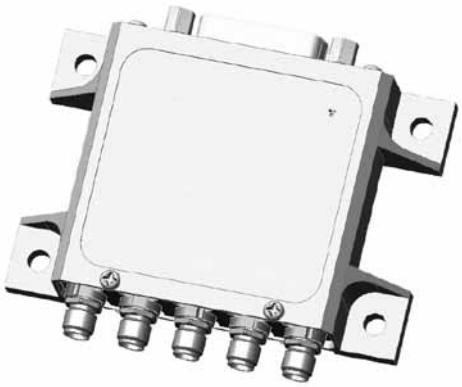
FREQUENCY	GHz	DC - 1.8	1.8 - 4.2	4.2 - 8.4	8.4 - 14.5	14.5 - 18
Insertion Loss (max)	dB	0.15	0.15	0.25	0.30	0.40
VSWR (max) Return Loss (min)	(dB)	1.15:1 (23.1)	1.20:1 (20.8)	1.25:1 (19.1)	1.25:1 (19.1)	1.40:1 (15.6)
Isolation (min)	dB	70				60
E-Field Shielding Effectiveness (min)	dBi	75				70

For more detailed technical information please consult Radiall customer support.

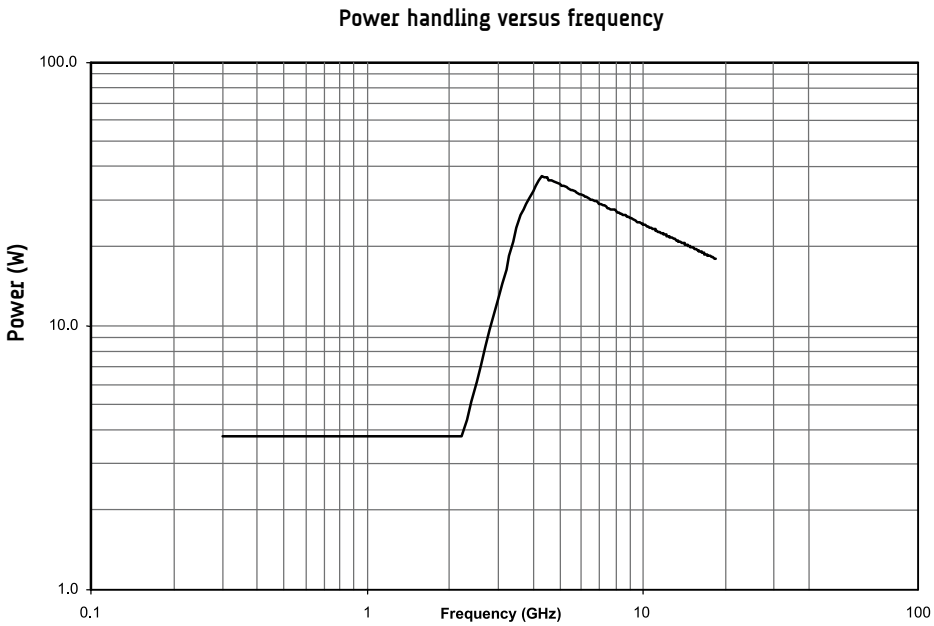
LOW POWER COAXIAL DP3T SWITCH

SCHEMATICS & DRAWINGS





POWER DERATING GRAPH



— Power Handling taking into account 6dB margin for multipactor and 1.25dB for thermal dissipation

For more detailed technical information consult Radiall customer support.

HIGH POWER COAXIAL SPDT SWITCH

HIGH-POWER LATCHING COAXIAL SPDT SWITCH according to RADIALL specification RAD-DET-SPDT-002

- S switch configuration
- TNC connectors
- Up to 2.2 GHz, up to 160 Watts CW
- Up to 4.8 GHz, up to 150 Watts CW
- Telemetry circuit
- Suppression diodes
- D-Sub
- Lay Down

GENERAL SPECIFICATIONS

	Unit	Min	Typical	Max
Actuation Voltage	V	+22	+26	+30
Pick-Up Voltage	V			+20.5
Actuation Current @+29V, +25°C @+29V, -30°C @+29V, +85°C	mA		 188 239 153	 198 251 161
Switching Time	ms		25	35
Pulse Duration	ms	50		1000
Coil Resistance (at +25°C)	Ω	152	160	
RF Contact Resistance	mΩ			100
TLM indicator circuit Contact closed Contact Open Contact Current	 mΩ MΩ mA			 1000 100
Coil Isolation at 500 VDC	MΩ	1		
Dielectric Withstanding at 50 or 60Hz	Vrms	500		
Mass variant 001 & 002	grams			275
Torque Screws for Fixing unit For DC connector For TNC connector	N.m			 2.0 0.44 2.65

RF PERFORMANCES

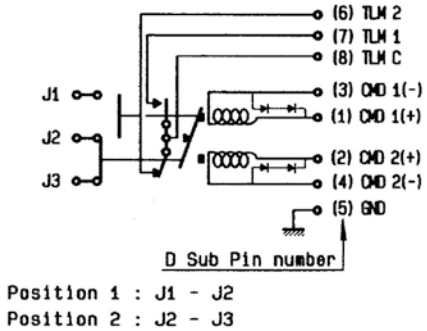
		DC - 2.2 GHz Variant 001			DC - 4.8 GHz Variant 002			
FREQUENCY	GHz	0.04 – 1.0	1.0 – 1.6	1.6 – 2.2	0.04 – 1.0	1.0 – 1.6	1.6 – 2.2	2.2 – 4.8
Insertion Loss (max)	dB	0.12			0.12			0.22
VSWR (max) Return Loss (min)	(dB)	1.20:1 (20.8)			1.20:1 (20.8)			1.38:1 (15.9)
Isolation (min)	dB	70			70			
E-Field Shielding Effectiveness (min)	dBi	70			70			60
Power Handling (max)	W	33 @ 1 GHz	85 @ 1.6 GHz	160 @ 2.2 GHz	5 @ 1 GHz	29 @ 1.6 GHz	55 @ 2.2 GHz	102 @ 3 GHz

For more detailed technical information please consult Radiall customer support.

www.radiall.com

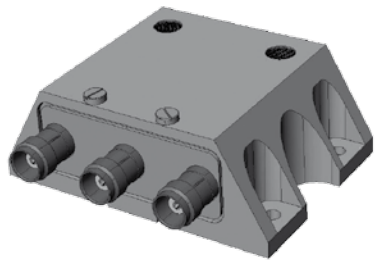
HIGH POWER COAXIAL SPDT SWITCH

SCHEMATICS & DRAWINGS



Position 1 : J1 - J2
Position 2 : J2 - J3

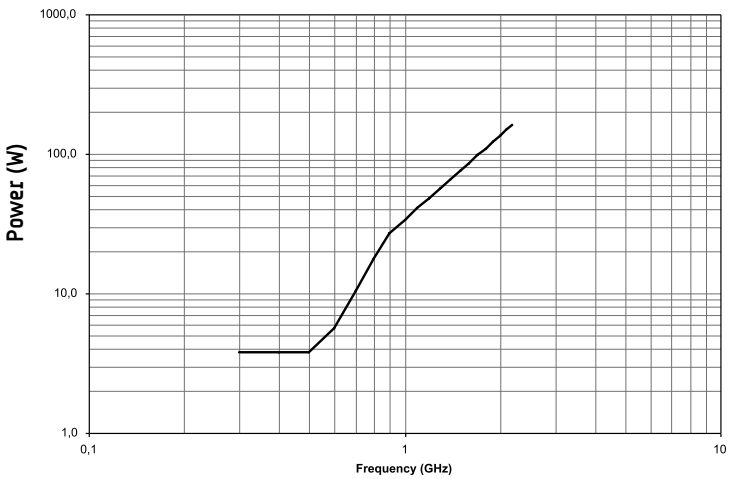
SPDT Switch, Lay Down, D-Sub, variant 001 & 002:



POWER DERATING GRAPH

Applicable for Variant 001

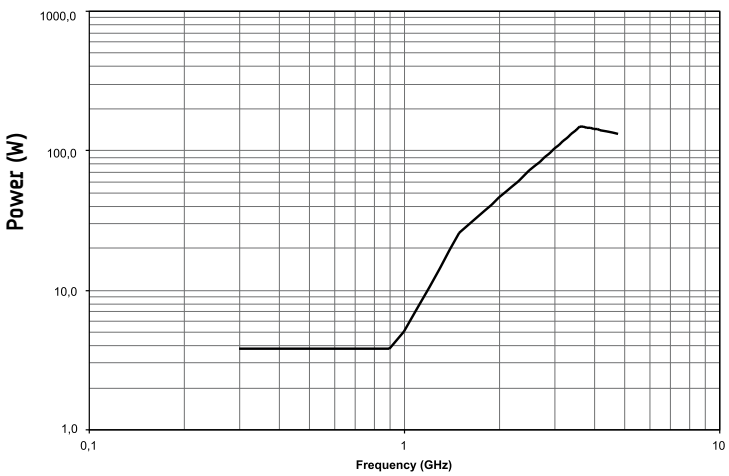
Power handling versus frequency



— Power Handling taking into account 6dB Margin for multipactor

Applicable for Variant 002

Power handling versus frequency



— Power Handling taking into account 6dB Margin for multipactor

For more detailed technical information please consult Radiall customer support.

HIGH POWER COAXIAL DP3T SWITCH

HIGH-POWER LATCHING COAXIAL DP3T SWITCH according to RADIALL specification RAD-DET-DP3T-002

- TNC connectors
- DC to 2.2 GHz, up to 160 Watts CW
- DC to 4.8 GHz, up to 150 Watts CW
- Telemetry circuit
- Suppression diodes
- D-Sub or Pins
- Lay Down

GENERAL SPECIFICATIONS

	Unit	Min	Typical	Max
Actuation Voltage	V	+20	+26	+30
Pick-Up Voltage	V			+19
Actuation Current @+29V, +25°C @+29V, -30°C @+29V, +85°C	mA		 188 239 153	 198 251 161
Switching Time	ms		25	35
Pulse Duration	ms	50		1000
Coil Resistance (at +25°C)	Ω	152	160	
RF Contact Resistance	mΩ			100
TLM indicator circuit				
Contact closed	mΩ			1000
Contact Open	MΩ	2		
Contact Current	mA			100
Coil Isolation at 500 VDC	MΩ	1		
Dielectric Withstanding at 50 or 60Hz	Vrms	500		
Mass Variant 001: Lay Down D-Sub Variant 002: Lay Down D-Sub Variant 003: Lay Down Pins	grams			 460 445 390
Torque Screws for Fixing unit For DC connector For TNC connector	N.m			 2.0 0.44 2.65

RF PERFORMANCES

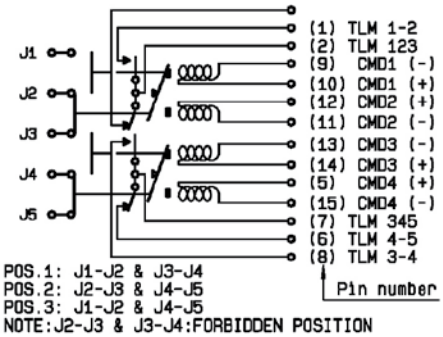
		DC - 2.2 GHz Variant 001			DC - 4.8 GHz Variant 002 & 003			
FREQUENCY	GHz	0.04 – 1.0	1.0 – 1.6	1.6 – 2.2	0.04 – 1.0	1.0 – 1.6	1.6 – 2.2	2.2 – 4.8
Insertion Loss (max)	dB	0.12			0.12			0.22
VSWR (max) Return Loss (min)	(dB)	1.20:1 (20.8)			1.20:1 (20.8)			1.38:1 (15.9)
Isolation (min)	dB	70			70			
E-Field Shielding Effectiveness (min)	dBi	70			70			60
Power Handling (max)	W	33 @ 1 GHz	85 @ 1.6 GHz	160 @ 2.2 GHz	5 @ 1 GHz	29 @ 1.6 GHz	55 @ 2.2 GHz	102 @ 3 GHz

For more detailed technical information please consult Radiall customer support.

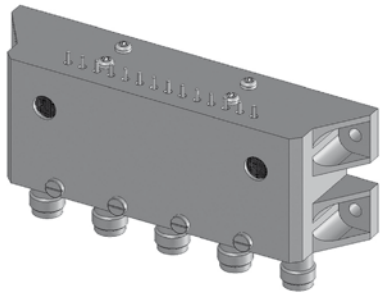
www.radiall.com

HIGH POWER COAXIAL DP3T SWITCH

SCHEMATICS & DRAWINGS



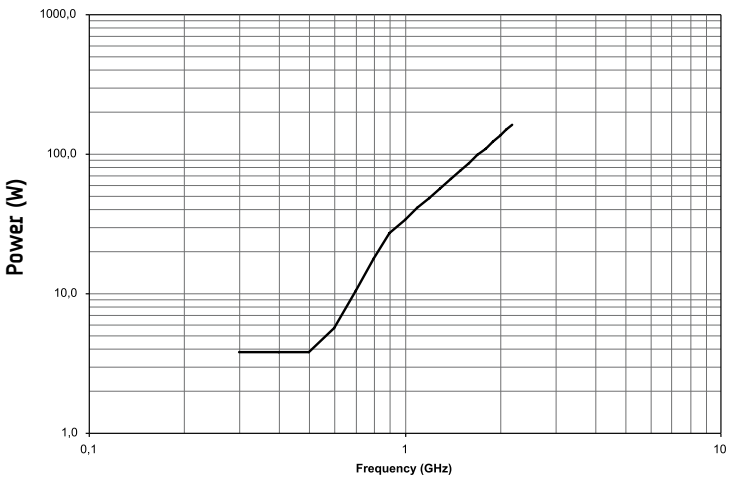
DP3T Switch, Lay Down, Pins:



POWER DERATING GRAPH

Variant 1, High Cavity

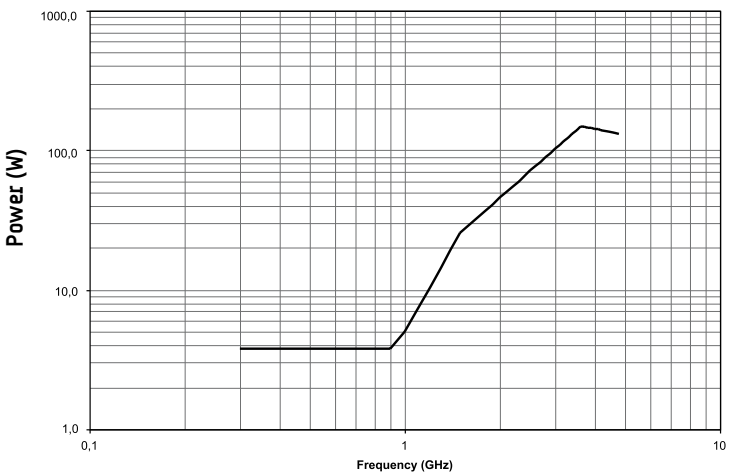
Power handling versus frequency



— Power Handling taking into account 6dB Margin for multipactor

Variant 2, Standard Cavity

Power handling versus frequency



— Power Handling taking into account 6dB Margin for multipactor

For more detailed technical information please consult Radiall customer support.

HIGH POWER COAXIAL T SWITCH

HIGH-POWER LATCHING COAXIAL T SWITCH according to RADIALL specification: RAD-DET-TSRD-002

- TNC connectors
- DC to 8 GHz
- Up to 120 Watts CW @ 4 GHz
- Random Drive
- Telemetry circuit
- Suppression diodes
- D-Sub or solder pins
- Lay Down or Stand Up
- 340 grams and up

GENERAL SPECIFICATIONS

	Unit	Min	Typical	Max
Actuation Voltage	V	+22	+26	+29
Pick-Up Voltage	V			+20.5
Actuation Current @+29V, +25°C @+29V, -25°C @+29V, -30°C @+29V, +80°C @+29V, +85°C	mA		 470 585 595 385 380	 490 610 620 405 397
Switching Time	ms			35
Pulse Duration	ms	35		1000
Coil Resistance (at +25°C)	Ω	59.3	61.8	
RF Contact Resistance	mΩ			100
TLM indicator circuit				
Contact closed	mΩ			1000
Contact Open	MΩ	1		
Contact Current	mA			100
Coil Isolation at 500 VDC	MΩ	1		
Dielectric Withstanding at 50 or 60Hz	Vrms	500		
Mass T-Switch, Lay Down, D-Sub T-Switch, Stand Up, D-Sub	grams			 360 355
Torque Screws for Fixing unit For DC connector For TNC connector	N.m			 2.0 0.44 2.65

RF PERFORMANCES

FREQUENCY	GHz	DC - 2	2 - 4.8	4.8 - 6	6 - 8
Insertion Loss (max)	dB	0.17	0.20	0.30	0.40
VSWR (max) Return Loss (min)	(dB)	1.10:1 (26.4)	1.25:1 (19.1)	1.35:1 (16.5)	1.50:1 (14)
Isolation (min)	dB	70			
E-Field Shielding Effectiveness (min)	dBi	75			70

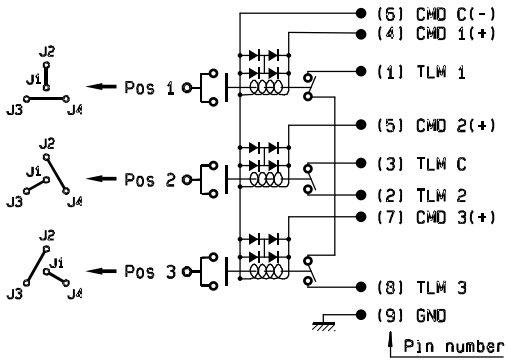
For more detailed technical information please consult Radiall customer support.

www.radiall.com

HIGH POWER COAXIAL T SWITCH

SCHEMATICS & DRAWINGS

T-Switch, TNC, D-Sub, variant 001 & 002:

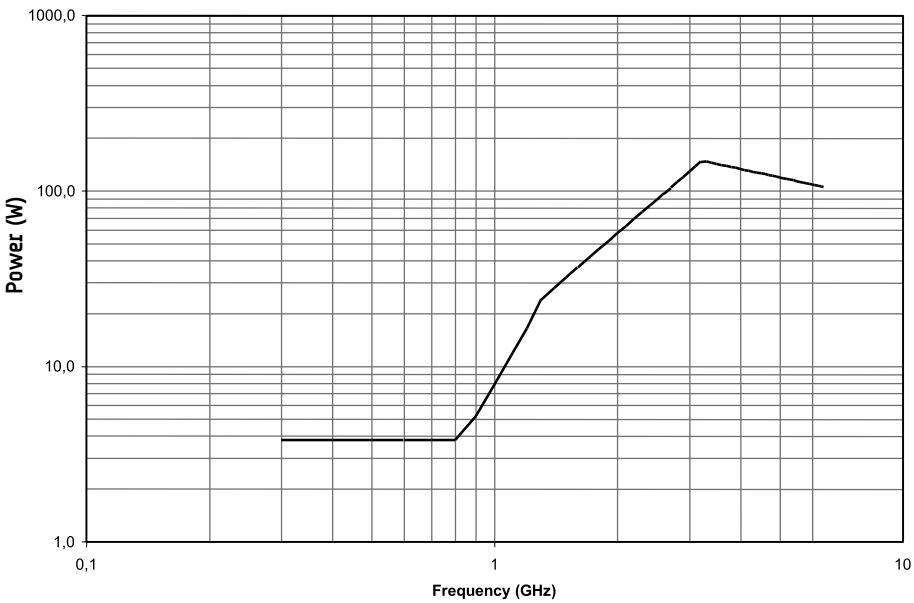


T-Switch, Lay Down, D-Sub, variant 001:

T-Switch, Stand Up, D-Sub, variant 002:

POWER DERATING GRAPH

Power handling versus frequency



Power Handling taking into account 6dB Margin for multipactor

For more detailed technical information please consult Radiall customer support.

RADIALL SPECIFICATIONS

RADIALL BEST RUNNERS PART LIST (FM P/N):

Detail Specification	Product	Power cap.	Connectors	Radiall P/N FM	Designation
RAD - DET - SPDT - 001	SPDT	Low power	SMA	R571 492 601	Fixing plate with pins
				R571 472 601	Lay Down with pins
				R571 471 601	Lay Down with D-sub
			SMA2.9	R571 892 601	Fixing plate with pins
				R571 872 601	Lay Down with pins
				R571 871 601	Lay Down with D-sub
RAD - DET - SPDT - 002	SPDT	High power	TNC	R565 271 601	Lay Down with D-sub, High Cavity
				R565 371 601	Lay Down with D-sub, Standard Cavity
RAD - DET - DPDT - 006	DPDT	Low Power	SMA	R578 483 601	Stand Up with D-sub
				R578 472 601	Lay Down with D-sub
				R578 482 601	Stand Up with pins
			SMA2.9	R578 872 601	Lay Down with pins
RAD - DET - TSSD - 002	T-Switch Sequentiel	Low power	SMA	R587 432 601	Lay Down with pins
				R587 443 601	Stand up with D-sub connector
				R587 442 601	Stand up with pins
RAD - DET - TRSD - 002	T-Switch	High power	TNC	R588 371 601	Lay Down with D-sub
				R588 381 611	Stand up with D-sub
RAD - DET - TRSD - 003	T-Switch Random	Low power	SMA	R587 492 601	Fixing plate with pins
				R587 472 601	Lay Down with pins
				R587 482 601	Stand up with pins
RAD - DET - DP3T - 001	DP3T	Low power	SMA	R586 471 601	Lay Down with D-sub
RAD - DET - DP3T - 002	DP3T	High power	TNC	R564 271 601	Lay Down with D-sub, High Cavity
				R564 371 601	Lay Down with D-sub, Standard Cavity
				R564 372 601	Lay Down with pins, Standard Cavity

For more detailed technical information please consult Radiall customer support.

OTHER COMPONENTS

For more detailed technical information please consult Radiall customer support.

GENERAL INFORMATION

Specialized in passive RF & Microwave components, RADIALL engineering staff develops and manufactures a wide range of others coaxial standard devices including terminations, attenuators, couplers, coaxial detectors, lightning protectors, rotary joints, covering a wide frequency spectrum from DCto 40 GHz for telecom, aeronautic, intrumentation and military application.

Radiall introduces TestPro cables assemblies on the market place for test and mesurement applications to meet customers needs.

For SPACE applications, RADIALL offers also a full range of space components built according to ESA specifications including attenuators, terminations, couplers, connectors, coaxial cable assemblies (flexible or semi-rigid cables) for L, S, C, X, Ku and Ka band applications.

RF & MICROWAVE COAXIAL PRODUCTS

Terminations & Attenuators up to 40 GHz

Terminations (R404 & R405 Series)
50 & 75Ω

Attenuators (R410 to R420 Series)
50 & 75Ω

1W to 120W. Connectorized in SMA, QMA, SMB, SMC, BNC, N, TNC, QN, 7/16.

Also available: **cable loads**...

Lightning protectors up to 6 GHz

(R445 & R446 Series) 50Ω. Quarter wave stub and gas discharge technologies. Available in N, 7/16, TNC, QN, etc. style.

Rotary joints up to 18 GHz

(R447 Series) 50Ω. Available in SMA and N style up to 18 GHz.

Phase Shifters up to 18 GHz

(R499 Series) 50Ω. Available in SMA style, 0 to 180° phase shift.

DC Blocks up to 40 GHz

(R410 & R420 Series) 50 & 75Ω. Connectorized in SMA, QMA, SMB, SMC, BNC, N, TNC, QN, 7/16.

3 dB Hybrid and directionnal couplers, power dividers up to 18 GHz

(R432 & R433 Series) 50Ω. Connectorized in SMA and N type. Hybrid (3 dB) and directional (6, 10, 20, 30 dB), octave narrow band or broadband response.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

www.radiall.com

TESTPRO CABLES ASSEMBLIES

The TestPro product range is dedicated to Test and Measurement applications requiring excellent electrical performance, high mechanical endurance and excellent resistance to wear and corrosion. We offer 2 product categories to meet your needs:

- **TestPro 4.2 and TestPro 3 « Phase Stable »** are suitable for test benches in production or labs due to its long life and stability in dynamic use.

- **TestPro 5 & 8 « Ultra low loss »** allow the use of long length cables with remote test stations and anechoic chambers. Their high stability with temperature makes them easy to use in thermal chambers. They are also suitable for high power applications.

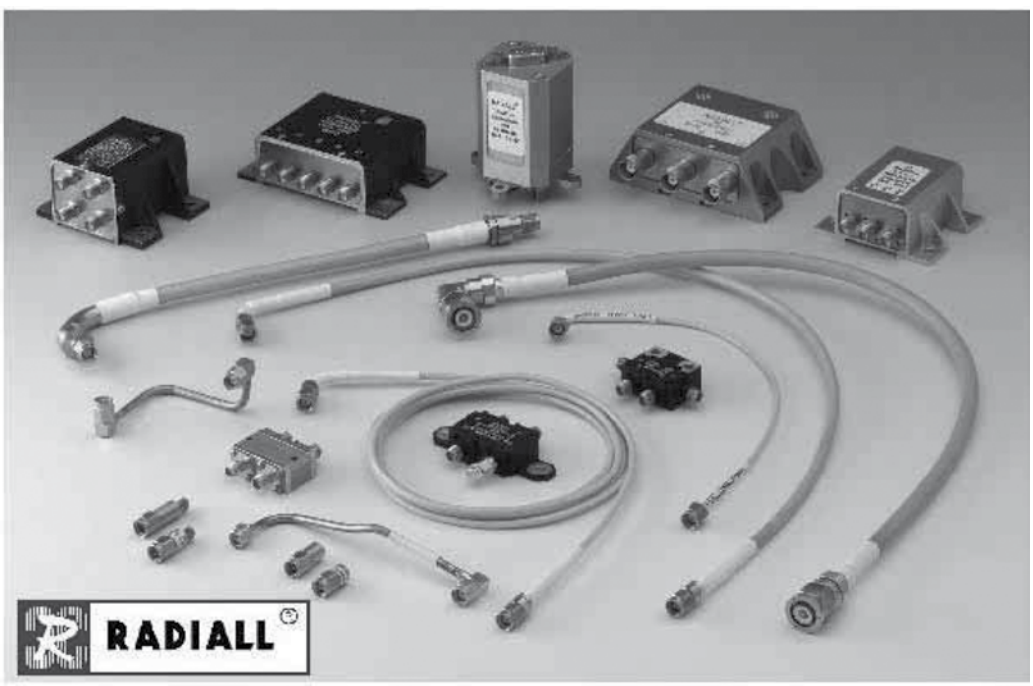
Our TestPro product range is designed to operate in the DC - 40 GHz frequency range depending on connector and cable choice.

Our optional protective jacket “ProJack” protects lab cable assemblies for increased life. “ProJack” is also designed for all outdoor defense test systems.

All components are designed and manufactured by RADIALL in facilities operated under ISO9001-V2000/ASN9100 quality standards.

SPACE QUALIFIED COAXIAL PRODUCTS

- Connectors DC to 40 GHz
- Couplers and power dividers up to 31 GHz
- Low losses cable assemblies DC to 40 GHz
- Semi-rigid cable assemblies DC to 40 GHz
- Switches DC to 31 GHz
- Terminations DC to 40 GHz
- Phase shifters DC to 18 GHz
- Attenuators DC to 40 GHz

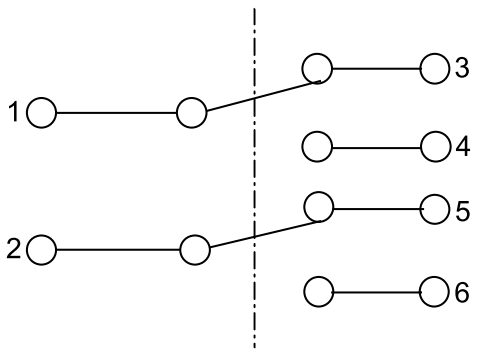


To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

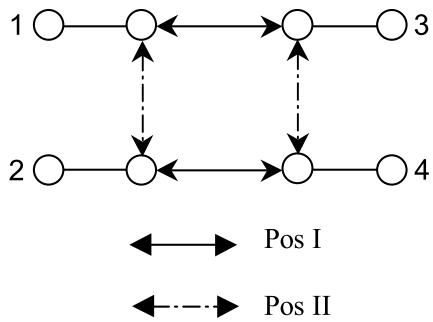
COAXIAL TRANSFER SWITCHES (DPDT)

A DPDT is Double Pole Double Throw switch that provides two independent pairs of RF paths through it. These pairs are actuated simultaneaously .The transfer switch is basically a modified DPDT device. A true DPDT switch is a six port device that contains completely independent transmission paths.

In a transfert switch, two transmission paths are not totallity independent as shown below:



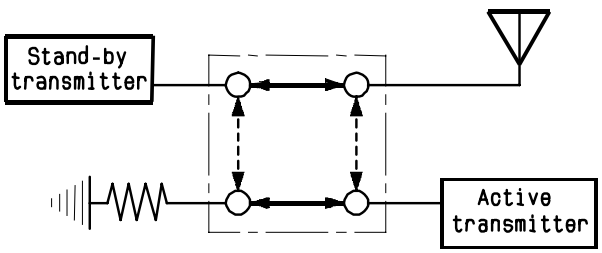
DPDT



TRANSFER

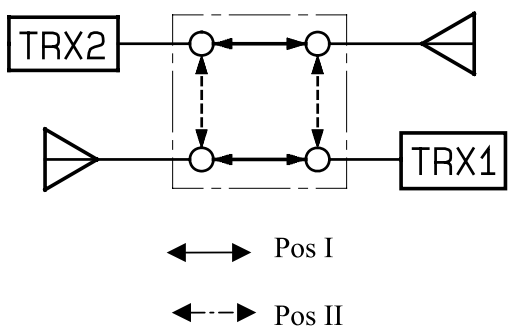
Examples of transfer switch applications:
R577 Ramses, R593 Platinum or R513 Titanium series can be selected for this application

Redundancy of two transmitters:



Active transmitter is connected to the antenna. A second transmitter is terminated to a medium power termination, in hot stand by position, ready to switch to the antenna in case of a failure of the active transmitter. This is done to create redundancy for antenna maintenance.

Two transmitters to two antennas:

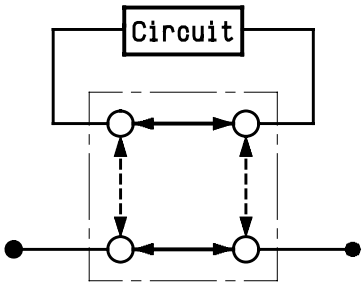


For better signal diversity, 2 antennas are alternately connected to either of the two transmitters.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

SWITCHES APPLICATIONS

Coaxial Transfer as a Bypass switch for circuit insertion applications:

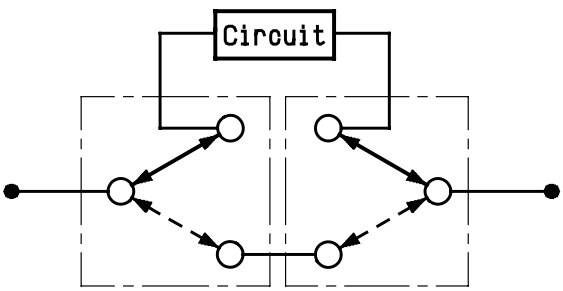


A full RF or microwave passive circuit or circuit element as a filter can be inserted into a coaxial transmission line by using a transfer switch. This element is shortened by a transfer blade in through way position

Other RF arrangements for a Bypass function:

=> Two SPDT switches configured to operate as a Bypass switch

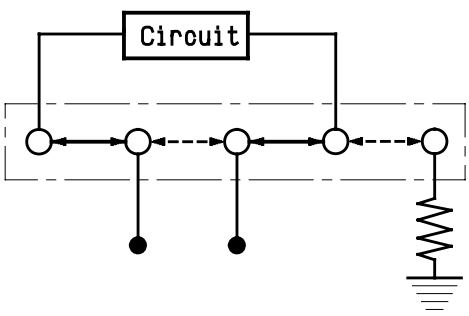
R570 RAMSES, R596 (Surface Mount Technology) or R595 PLATINUM series can be used to achieve a Bypass function

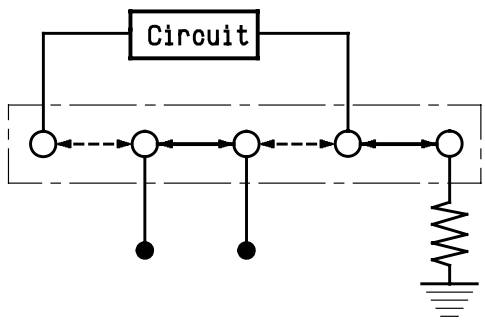


The basic product called SPDT (Single Pole Double Throw) can be used to perform a Bypass switch function. The advantage of using 2 SPDT relays instead of a transfer switch is a possible reduction in total package size. In general, the use of 2 SPDT creates a higher isolation than a transfer switch.

=> A DP3T switch configured to operate as a transfer switch

A R585 Ramses or R595 Platinum series can be selected to insert a passive or active component or circuit in a RF or microwave line.





An active component as an amplifier can be inserted in a microwave line; this amplifier is connected to a 50 Ohm termination (as a booster in Hot stand-by status) when non inserted in the main coaxial line.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

THERMAL VACUUM SWITCHES

With more than 25 years of experience in the space industry, RADIALL has developed a product offering that emphasizes reliability and performance. The latest addition to the range includes SPDT, DPDT and SPnT RF switches designed to operate in thermal vacuum environments.

These products can be mounted on ground based test benches used in test equipment that space vacuum conditions.

TVAC Series switches are designed in accordance with our standard RAMSES product offering and offer identical configurations with excellent performance.

PART NUMBER SELECTIONS

3 standard models are available for test benches dedicated to space equipment in Thermal Vacuum environment:

- **40GHz SPDT coaxial switch: R571 863 121**
- **40GHz DPDT coaxial switch: R578 863 121**
- **40GHz non terminated SP6T coaxial switch: R583 833 121**

NOTE: All other configurations will be only available upon request and will be reviewed on a case by case by RADIALL.

GENERAL INFORMATIONS

Operating mode		Latching
Nominal operating voltage (across operating temperature)	Vdc	28 (24 / 30)
Coil resistance (+/-10%)	Ohms	DPDT and SP6T: 225 / SPDT: 350
Nominal operating current at 23°C	mA	DPDT and SP6T: 125 / SPDT: 80
Average power (Thermal vacuum condition)		See Power rating chart on page 7-8
Switching time (max)		SPDT and DPDT: 10ms / SP6T: 15ms
	SPDT	10 million cycles
	DPDT	2.5 million cycles
	SP6T	2 million cycles
Connectors (1)		SMA2.9

(1) : Connector SMA2.9 is equivalent to "K connector®", registered trademark of Anritsu

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
For more detailed technical information please consult Radiall customer support.

THERMAL VACUUM SWITCHES

ADDITIONAL SPECIFICATION

Polarity		Positive common
Actuator terminals	SPDT	Solder Pins
	DPDT	Male 9 pins D-Sub connector
	SP6T	Male 25 pins D-Sub connector
Operating tetmperature range		-40°C to 85°C
Storage temperature range		-55°C to 85°C
Construction		Thermal Vacuum compatible

RF PERFORMANCES

Model		SPDT	DPDT	SP6T
Impedance	Ω	50		
Insertion Loss (max)	dB	DC-6GHz: 0.30 6GHz - 12.4GHz: 0.40 12.4GHz - 18GHz: 0.50 18GHz - 26.5GHz: 0.70		
		26.5GHz - 40GHz: 0.80		26.5GHz - 40GHz: 1.10
Isolation (min)	dB	DC-6GHz: 70 6GHz - 12.4GHz: 60 12.4GHz - 18GHz: 60 18GHz - 26.5GHz: 55 26.5GHz - 40GHz: 50		
V.S.W.R. (max)		DC-6GHz: 1.30 6GHz - 12.4GHz: 1.40 12.4GHz - 18GHz: 1.50 18GHz - 26.5GHz: 1.70		
		26.5GHz - 40GHz: 1.90		26.5GHz - 40GHz: 2.20
Average Power At sea level and ambient temperature		DC-6GHz: 80 watts 6GHz - 12.4GHz: 60 watts 12.4GHz - 18GHz: 50 watts 18GHz - 26.5GHz: 20 watts 26.5GHz - 40GHz: 10 watts		DC-6GHz: 40 watts 6GHz - 12.4GHz: 25 watts 12.4GHz - 18GHz: 15 watts 18GHz - 26.5GHz: 10 watts 26.5GHz - 40GHz: 3 watts
Switch repeatability		0.03 dB peak change in Insertion Loss over 100 cycles		

WHY A VACUUM TEST BENCH INSIDE A THERMAL VACUUM CHAMBER ?

- It limits the need of hermetic adaptors and cable assemblies.
- It improves RF performances.
- It decreases the complexity of the Test bench.

To download technical data sheets, visit www.radiall.com & enter the part number in the Search box.
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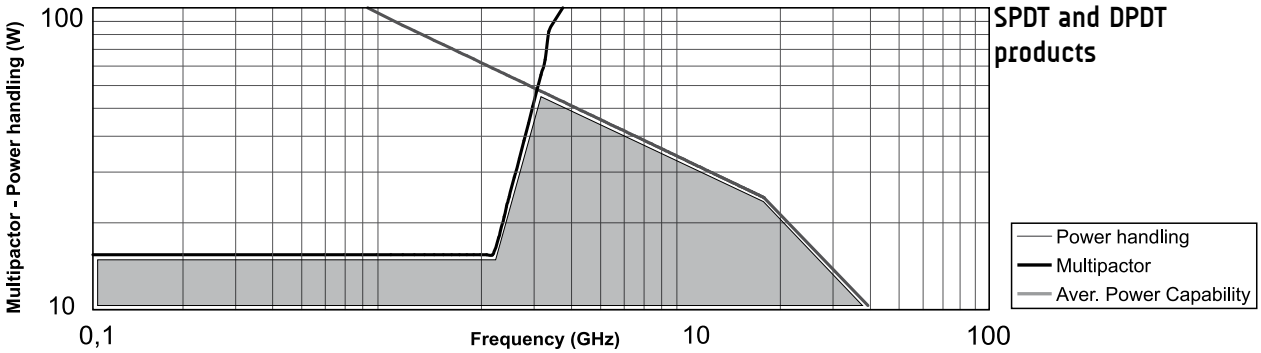
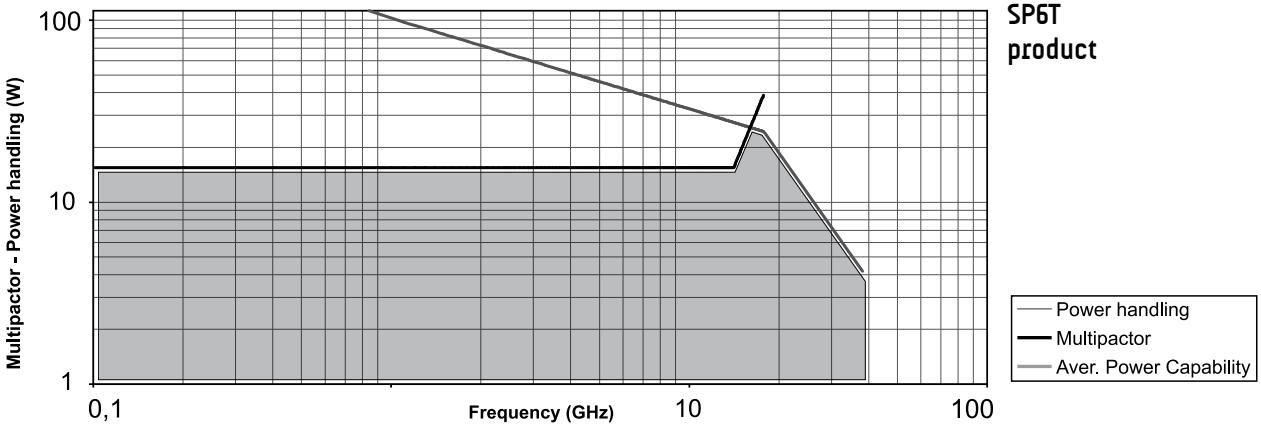
THERMAL VACUUM SWITCHES

RF POWER CHART UNDER VACUUM

Multipactor and Power handling under vacuum (max value)

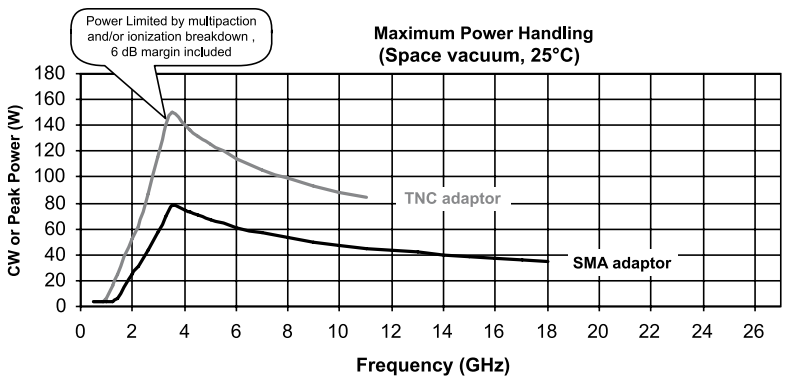


Multipactor and Power handling under vacuum (max value)



HERMETIC FEMALE / FEMALE ADAPTATORS

- SMA DC - 18 GHz
- TNC DC - 11 GHz
- ESA qualified
- RADIALL High reliability products.



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