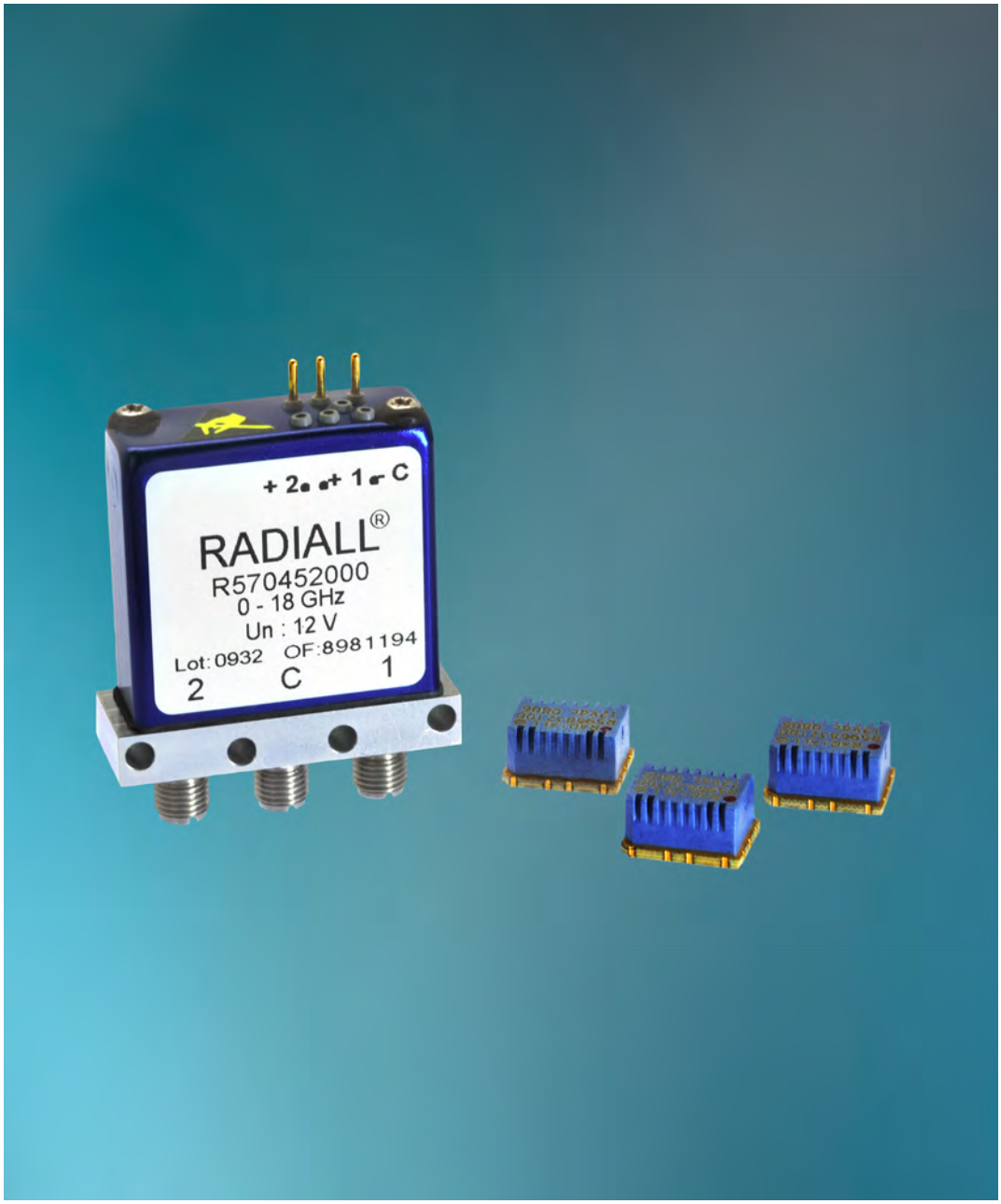
SECTION 2



SPDT

ROJONE PTY. LTD.

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SECTION 2 TABLE OF CONTENTS

SPDT PART NUMBER SELECTION GUIDE*

Digital Position		Slim Line	RAMSES			PLATINUM
	Configuration	SPDT	SPDT			SPDT
R 1-3:		R596	R570	R572	R570	R595
4: RF connectors	DC - 3 GHz	3	-	-	-	-
	DC - 8 GHz	8	-	-	-	-
	SMA 3 GHz	-	-	3	3	-
	SMA 6 GHz	-	-	-	-	3
	SMA 18 GHz	-	-	4	4	-
	SMA 20 GHz	-	-	-	-	4
	SMA 26.5 GHz	-	-	F	F	F
	SMA 2.9 40 GHz	-	-	8	8	8
	2.4mm 50 GHz	-	-	J	J	-
	SMB/SMC 3 GHz	-	-	B/C	B/C	-
	QMA 6 GHz	-	-	E	E	-
	DIN 1.6/5.6, 2.5 GHz	-	-	9	9	-
	Mini SMB 3 GHz	-	-	H	H	-
	Pc board mount 3 GHz	-	-	-	A	-
	N 3 GHz	-	0	-	-	-
	N 12.4 GHz	-	1	-	-	-
	BNC 3 GHz	-	2	-	-	-
	TNC 3 GHz	-	5	-	-	-
	TNC 12.4 GHz	-	6	-	-	-
	TNC 18 GHz	-	D	-	-	-
5: Type	Failsafe	1/9	1/2	1	1/2	-
	Latching	3	3/4/5/6	3	3/4/5/6	3/4/5/6
6: Voltage	12V	2	2	2	2	-
	15V	-	-	-	-	7
	24V	3	-	-	-	3
	28V	-	3	3	3	-
7: TTL opt./ model	Without	-	0	0	0	-
	With	-	1	-	1	-
	SPDT non terminated	-	-	-	-	1
		1	-	-	-	-
8: Options	Without option	-	0	0	0	1
	Positive common	-	1	1	1	1
	Supression diodes	-	3	-	3	-
	Suppression diodes and positive common	-	4	-	4	-
	Compatible with TTL driver	-	-	-	-	2
		0	-	-	-	-
9: Terminals	Standard packaging	0	-	-	-	-
	Tape and reel of 200 relays	2	-	-	-	-
	Tape and reel of 500 relays	5	-	-	-	-
	Tape without reel	9	-	-	-	-
	Soldered on a connectorized test fixture	T	-	-	-	-
	Solder pins	-	0	0	0	0
	D-Sub connector	-	5	-	-	5
10: Documentation	Certificate of conformity	-	-	-	-	-
	Calibration certificate	-	-	-	-	C
	Calibration certificate + RF curves	-	-	-	-	R

Example of P/N: R570F12010 is a SPDT SMA 26.5 GHz, failsafe, 12 Vdc, without TTL, with positive common, solder pins.

**For part number creation and available options, see detailed part number selection for each series.*

SMT Power Micro SPDT with 10 GHz Capabilities

SURFACE MOUNT TECHNOLOGY

Patent pending

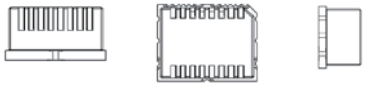
An innovative and original "micro-mechanical" design of the R596 SMT micro-relay offers, excellent RF performance, reliability, and repeatability. The miniature size, and low installation cost make these coaxial switches an ideal solution.

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.

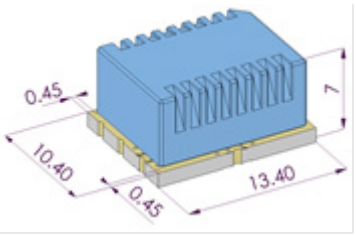
Failsafe models are offered in two RF configurations (direct and inverted). The association of these two products on the same PC board enables the product to perform the bypass function. (For bypass mounting, further information is available on page 2-8).

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

Actual Size



Typical Outline Drawing
(All dimensions in mm)



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

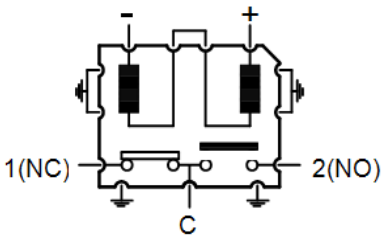
SMT Power Micro SPDT with 10 GHz Capabilities

SLIM LINE 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%)		Ω	330	1130	205	865
Operating current at 23 °C		mA	36	25	58	32
RF and command ports			1/2 hole gold plated, Infrared reflow, forced air oven or hand soldering (Compatible with lead free soldering processes)			
Switching time at nominal voltage	Making contacts Breaking contacts		Max 4ms (typical 1.8ms), including contact bounce time Max 1ms (typical 0.5ms)			
Life	- Cold switching (max 120 cycles/min) - Hot switching (max 20 cycles/min)		2 million cycles 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	-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, 1/2 sine		operating	

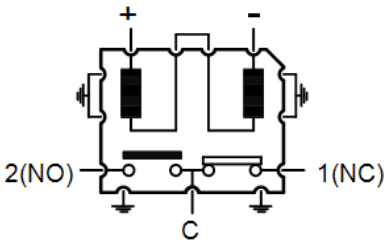
(5): Failsafe models may be used down to –40°C, but if coil remains permanently supplied at nominal voltage, the holding current value must be reduced from 45% to 55% to avoid internal condensation.
(for more details, see Radiall application note AN-R596-51 on page 2-10).

PIN IDENTIFICATION (TOP VIEW)



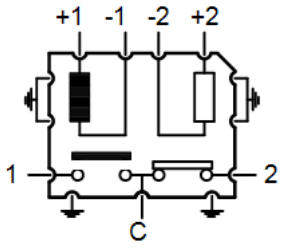
Failsafe model (Type 1)

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



Inverted failsafe model for Bypass application (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

SMT Power Micro SPDT with 10 GHz Capabilities

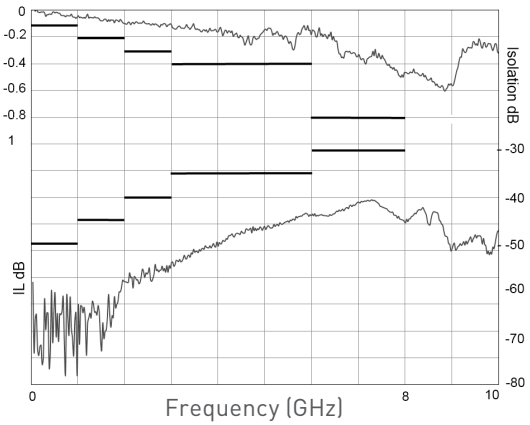
SLIM LINE PERFORMANCE (S PARAMETERS AVAILABLE ON REQUEST)

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 Ω
				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		

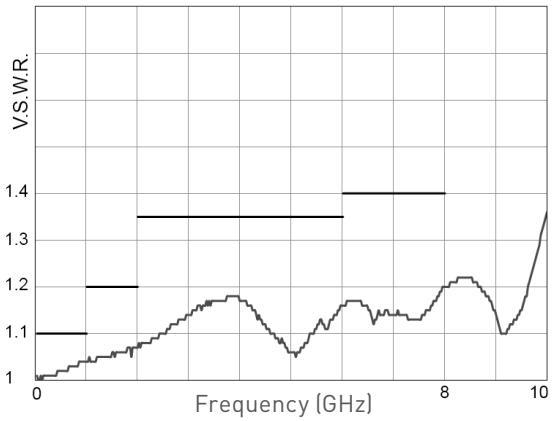
(6): taking account of the reduction of isolation due to coupling between PCB microstrip lines (see isolation dotted curve above and measurement method below)

TYPICAL RF PERFORMANCES

Insertion Loss and Isolation

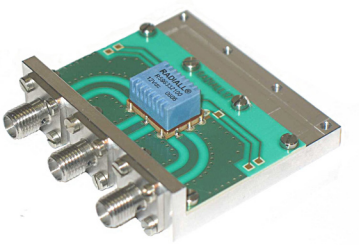


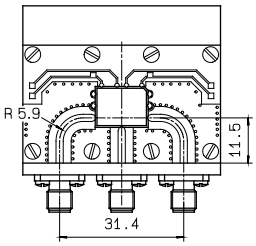
V.S.W.R



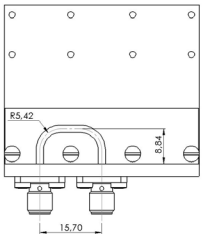
MEASUREMENT METHOD

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 is 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 is available. To order, please use the suffix "T" (part number R596 - - - - - T), as explained in page 2-2.

SMT Power Micro SPDT with 10 GHz Capabilities

RF POWER RATING FOR COLD SWITCHING USE

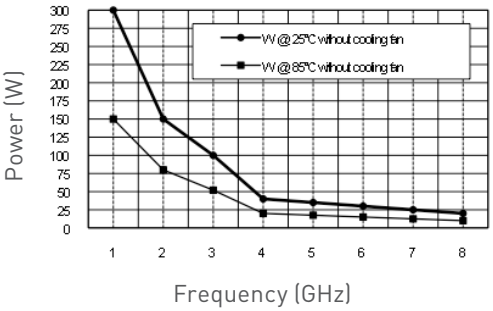
(Impedance 50 Ohms, V.S.W.R. < 1.25)

Power level depends on environmental conditions:

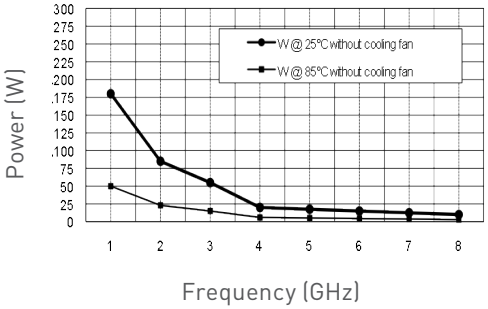
- R596 series have been designed to be used without a cooling fan even for high power applications. However, the power capability may be still improved by using the appropriate cooling fan.

- 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, to avoid internal overheating and increase the RF power level.

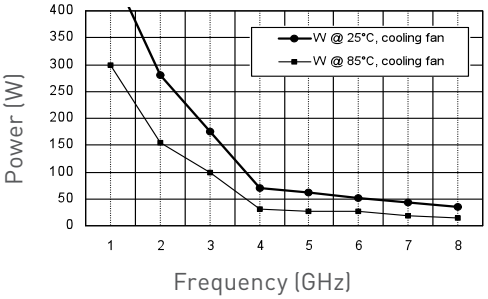
No cooling fan - Latching (all models)
Failsafe: NC pos. & No with low holding voltage



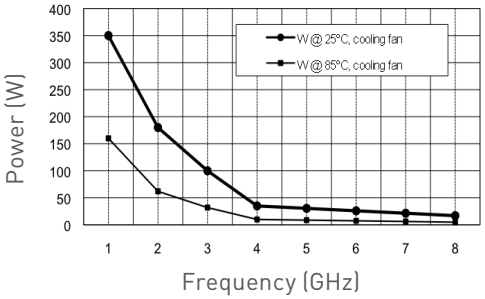
No cooling fan
Failsafe: No pos. Supplied at nominal voltage



With cooling fan - Latching (all models)
Failsafe: NC pos. & NO with low holding voltage



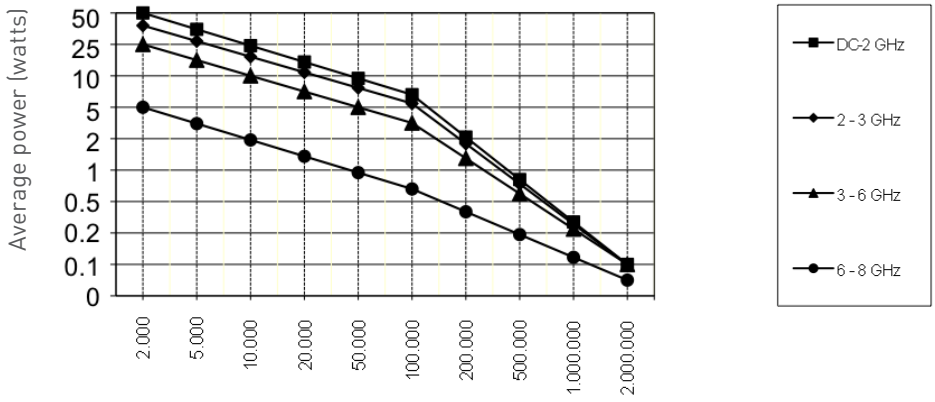
With cooling fan
Failsafe: No pos. Supplied at nominal voltage



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



SMT Power Micro SPDT with 10 GHz Capabilities

RELAY PACKAGING

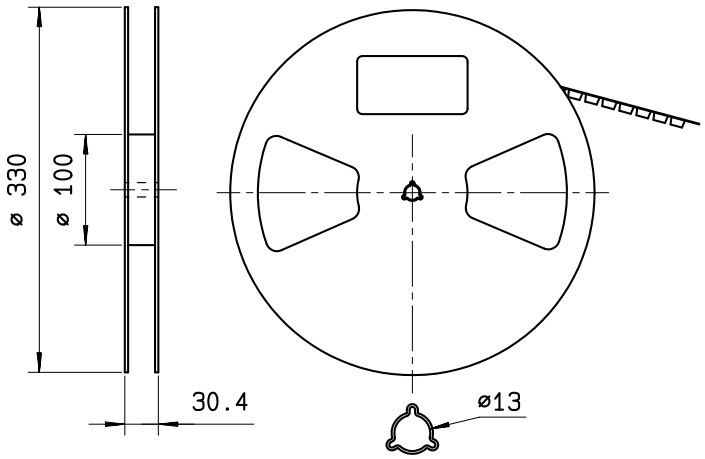
According to IEC 286-3 standard

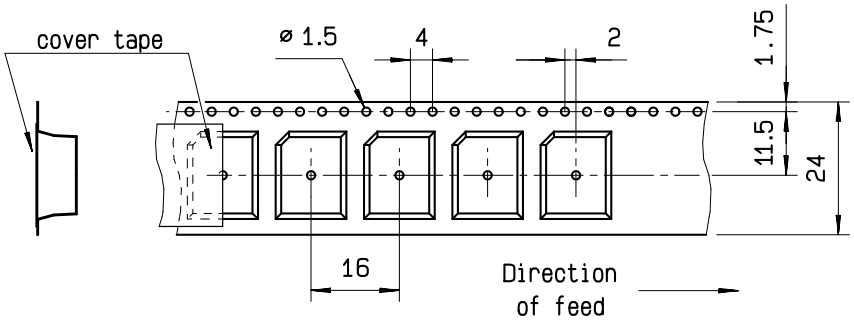
Materials:

Reel: polyester

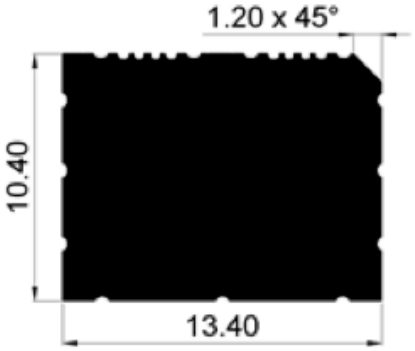
Carrier tape: antistatic PETG (polyester)

Cover tape: polyester

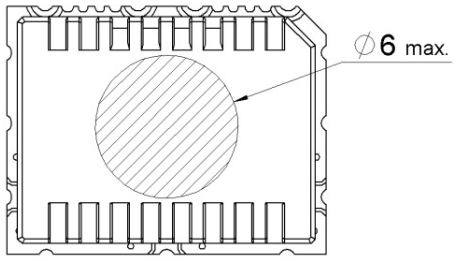




Video shadow of the relay



Aspiration Aera

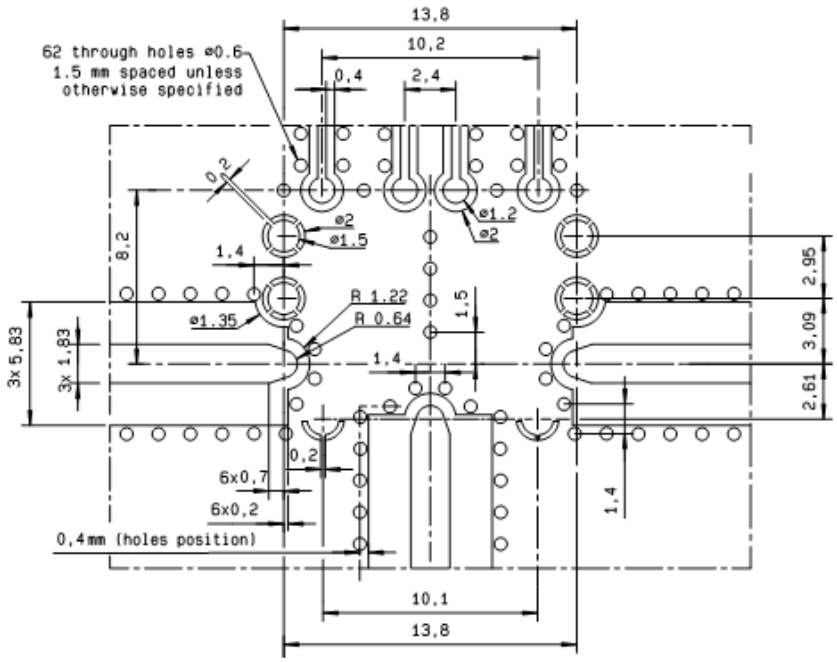


SMT Power Micro SPDT with 10 GHz Capabilities

PC BOARD MOUNTING

Board layout

DXF or Gerber format file
available upon request (8)



Subtrate types

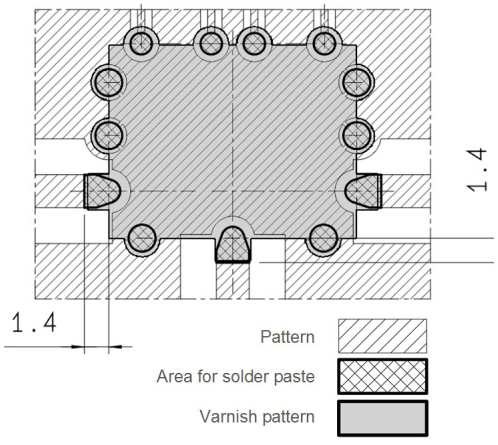
Recommended substrates are **ROGERS RO4003** or **ARLON 25N**

- **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

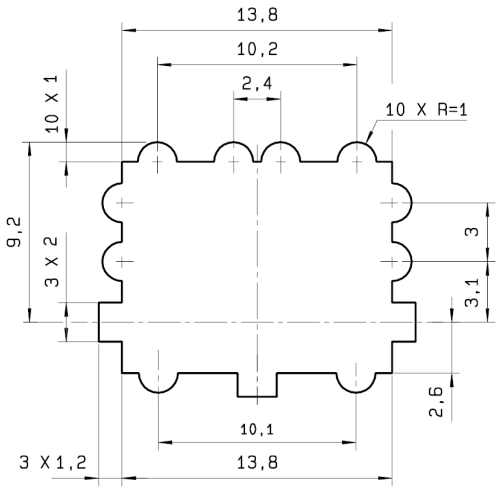
- **Opposite face:** Plating all over the face

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.

Soldering Pattern



Varnish Pattern

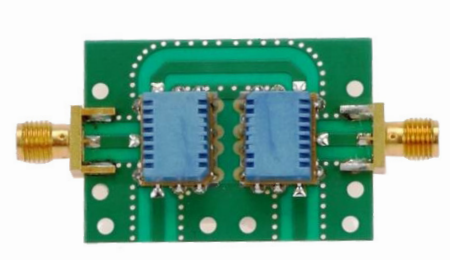


Please contact your local sales representative for additional information

SMT Power Micro SPDT with 10 GHz Capabilities

BYPASS APPLICATION

Failsafe Micro-relay typical implantation

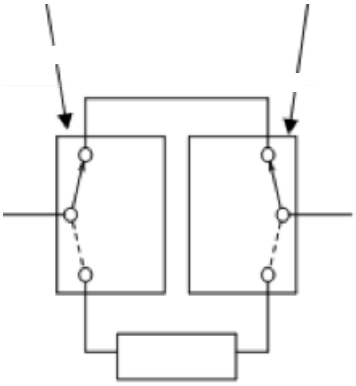


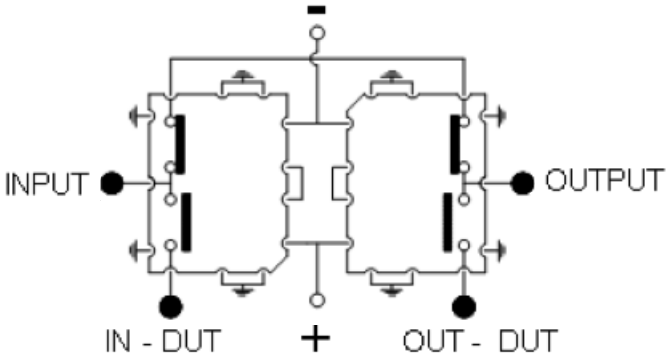
SPDT relays (Single Pole Double Throw) can be used to achieve a bypass switch function. For SMT applications, R596 series, relays are available in two failsafe versions, standard and inverted, to provide symmetric RF ports implantation possibility. The "side by side" implementation of these two versions on a PCB effectively produces the bypass function. The package size is reduced and interconnecting tracks are shortened. Required in order to protect the receiver for transmit/receive applications. 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

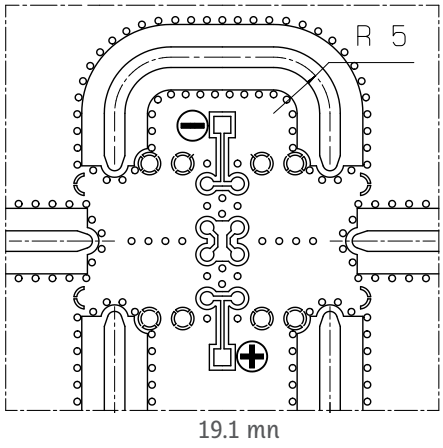




Voltage	RF continuity
De-energized	INPUT <--> OUTPUT (direct line)
Energized	INPUT <--> IN-DUT / OUT-DUT <--> OUTPUT

BYPASS PC BOARD MOUNTING

Example of Board layout for bypass application



(See detailed board layout on page 2-7)

SMT Power Micro SPDT with 10 GHz Capabilities

RECOMMENDED SOLDERING PROCEDURE

A-Soldering procedure using automatic pick and place equipment

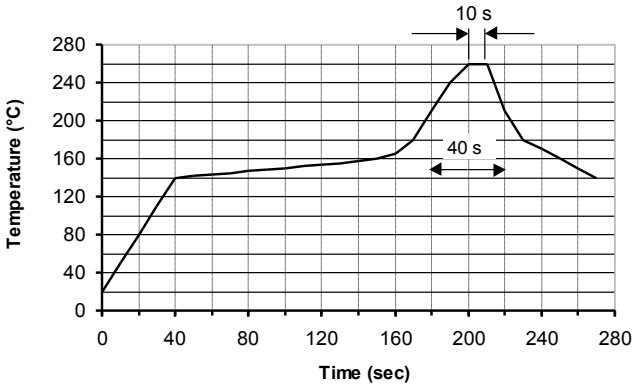
1-Solder paste
R596 series are Lead free. Lead free Sn-Ag3.5-Cu0.7 solder cream may be used as well as standard Sn63–Pb35– Ag2. Radiall recommends using a no clean - low residue solder cream (5% solid residue of flux quantity) that will permit the elimination of the cleaning operation step after soldering.

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 verify that the edges of the zone are clean and without contamination and that the PCB zoned areas have not oxidized. 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 an 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 refer to the recommended temperature profile for infra-red reflow or forced air convection:



Higher temperature (>260°C) and longer process duration would permanently damage 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. For solder joints, verify by visual inspection that the formation of meniscus on the pads are proper, and have a capillarity amount at least a third of the height.

B– Soldering procedure by manual operation

1-Solder paste and flux deposition
Refer to procedure A – 1
Deposit a thin layer of flux on mounting zone, and 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 maximum 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, 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. For solder joints, verify by visual inspection that the formation of meniscus on the pads are proper, and have a capillarity amount at least a third of the height.

SMT Power Micro SPDT with 10 GHz Capabilities

APPLICATION NOTE AN-R596-051

Subject: How to use failsafe R596 micro-relays over all the guaranteed temperature range, in 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.

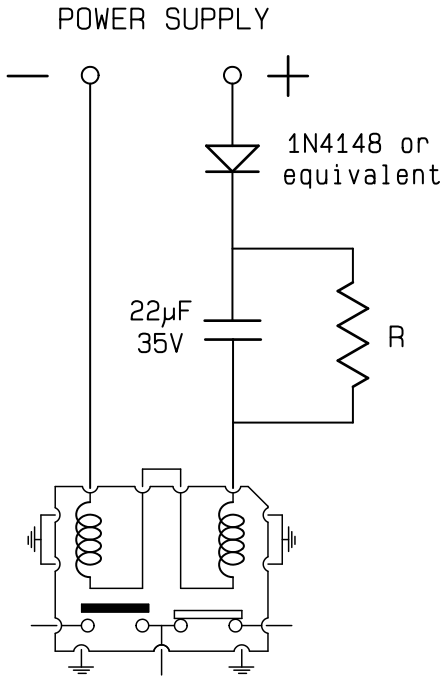
In extreme applications, with failsafe models used at low temperature, continuously in the N/O position (coil permanently supplied), N/C contact failures may occur, due to the high gradient of temperature between the coil (heated by the permanent power 500mW) and the RF paths. N/O contact resistance 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 continuously driven when energized from -40°C, if the coil is not permanently supplied at nominal voltage, and heating and internal condensation is avoided. 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

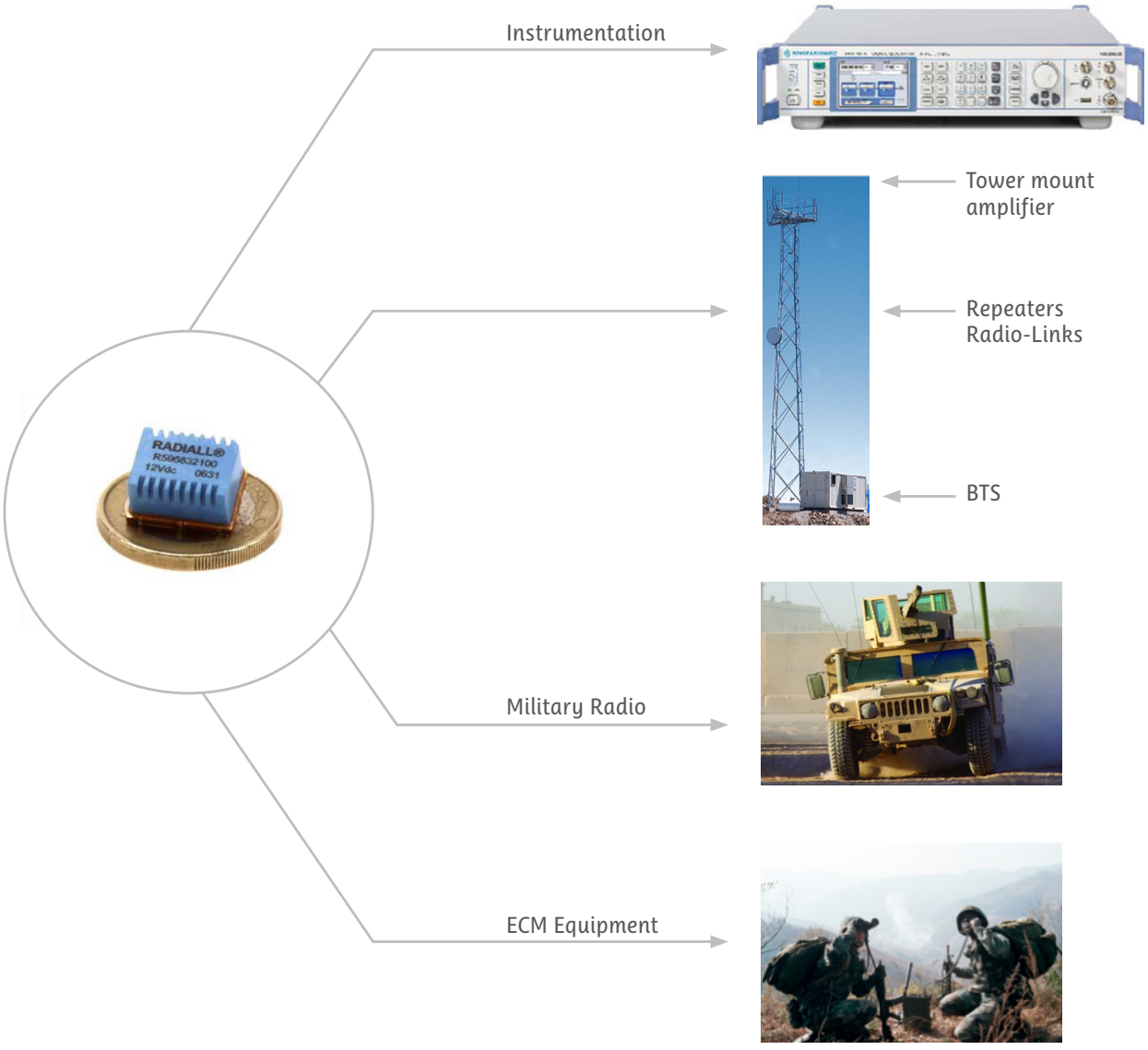
Applications

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 designed to meet all market specifications.



SPDT up to 50 GHz

Pc Board - SMA - SMA 2.9 - 2.4mm - QMA - SMC - SMB - mini SMB - DIN 1.6/5.6

Radiall's RAMSES SPDT switches offer excellent reliability, high performance and operating frequencies from DC to 50 GHz. Radiall's RAMSES concept (which provides for a life span of 10 million cycles) offers a variety of options to meet customer needs.

These switches 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: SMA 2.9 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

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

SPDT up to 50 GHz

Pc Board - SMA - SMA 2.9 - 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 **1-13**			
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	
Indicator rating			1 W / 30 V / 100mA			
Switching time		ms	10			
Life	SMA - SMA 2.9 - QMA		10 million cycles			
	DIN 1.6/5.6 - Pc Board		5 million cycles			
	Mini SMB - SMB - SMC		2.5 million cycles			
	2.4mm		2 million cycles			
Connectors			SMA - SMA 2.9 - QMA - DIN 1.6/5.6 - SMB - SMC Mini SMB - Pc Board - 2.4mm			
Operating temperature range	DIN 1.6/5.6 - SMB - SMC - mini SMB - 2.4mm		-25°C to +70°C			
	SMA - SMA 2.9 - 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 - SMA 2.9 - 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 Ω
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	
		3 - 6	1.30	0.30	70	
SMA	DC - 3 DC - 18 DC - 26.5	DC - 3	1.10	0.15	80	
		3 - 8	1.20	0.20	75	
		8 - 12.4	1.20	0.25	65	
		12.4 - 18	1.40	0.35	60	
		18 - 26.5	1.50	0.50	55	
SMA 2.9	DC - 40	DC - 6	1.30	0.30	70	
		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	
2.4 mm	DC - 50	DC - 6	1.30	0.30	70	
		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

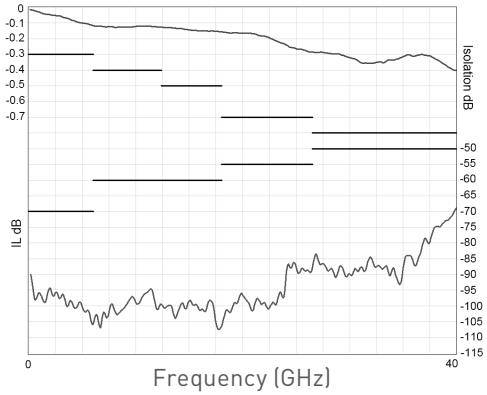
SPDT up to 50 GHz

Pc Board - SMA - SMA 2.9 - 2.4mm - QMA - SMC - SMB - mini SMB - DIN 1.6/5.6

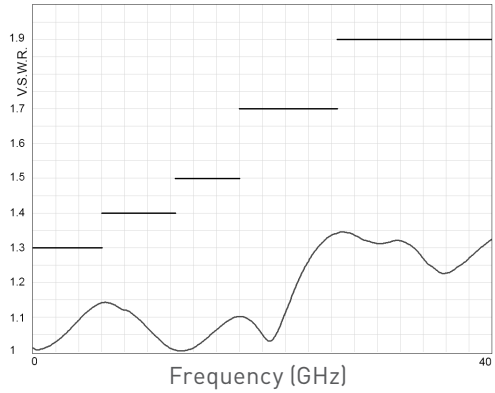
R570 AND R572 TYPICAL RF PERFORMANCE

Example: SPDT SMA 2.9 up to 40 GHz

Insertion Loss and Isolation

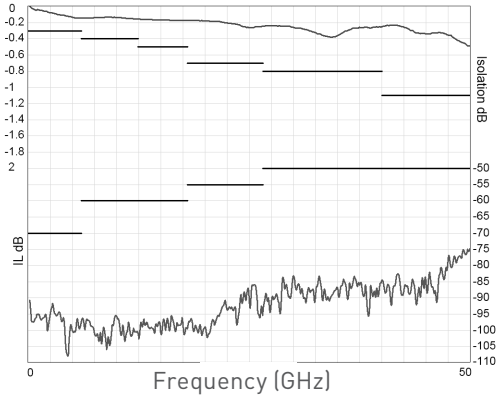


V.S.W.R.

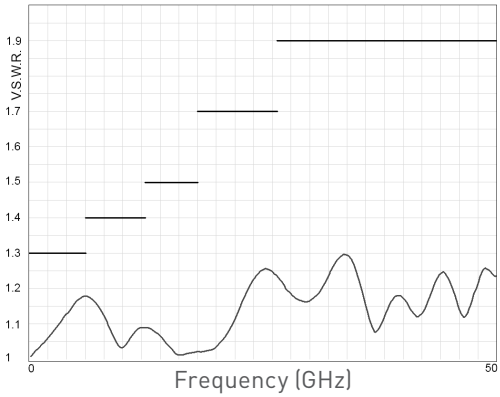


Example: SPDT 2.4mm up to 50 GHz

Insertion Loss and Isolation

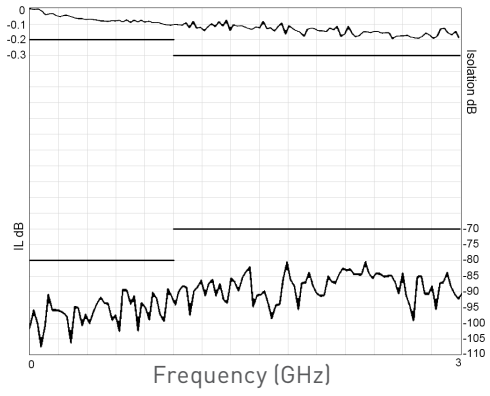


V.S.W.R.

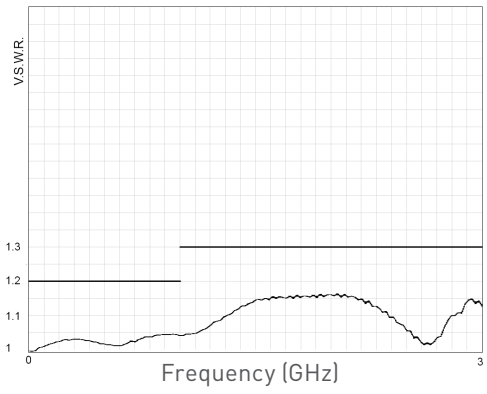


Example: SPDT mini SMB up to 3 GHz

Insertion Loss and Isolation



V.S.W.R.



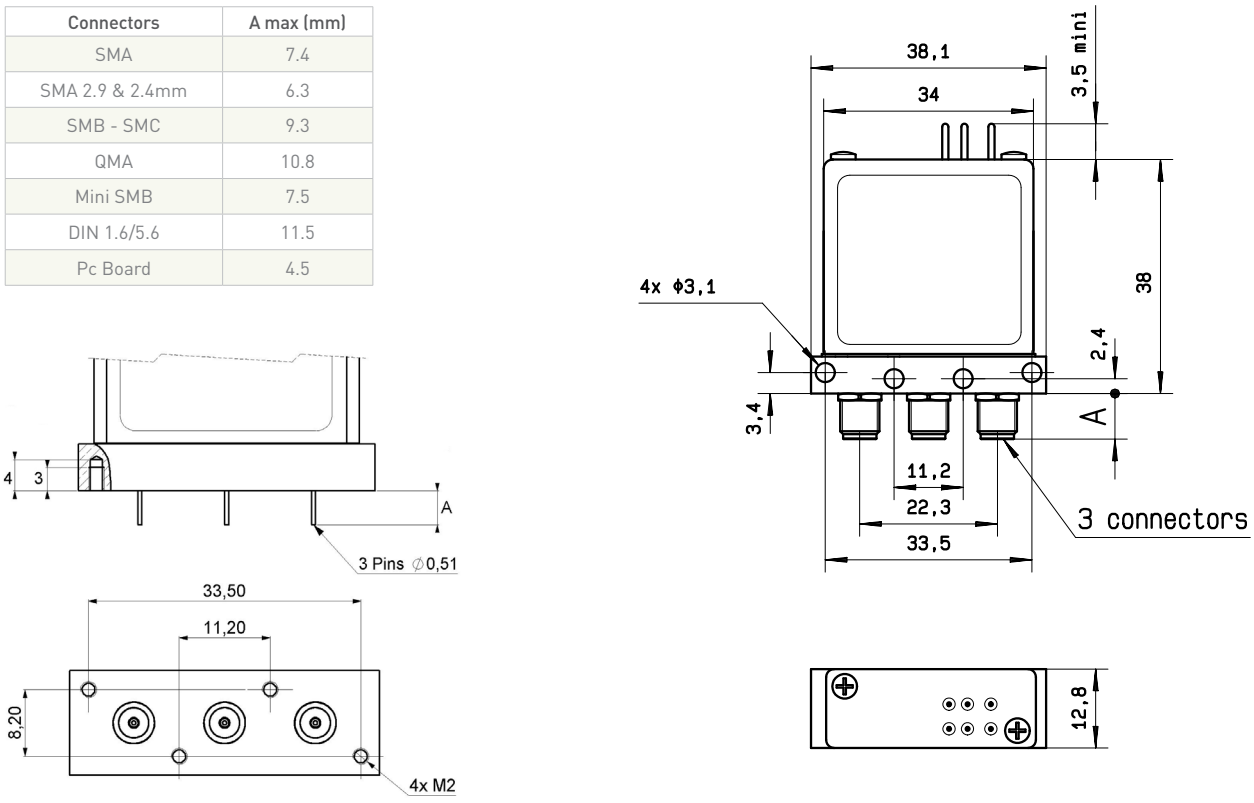
Note: see page 2-18 for other connectors

SPDT up to 50 GHz

Pc Board - SMA - SMA 2.9 - 2.4mm - QMA - SMC - SMB - mini SMB - DIN 1.6/5.6

TYPICAL OUTLINE DRAWING

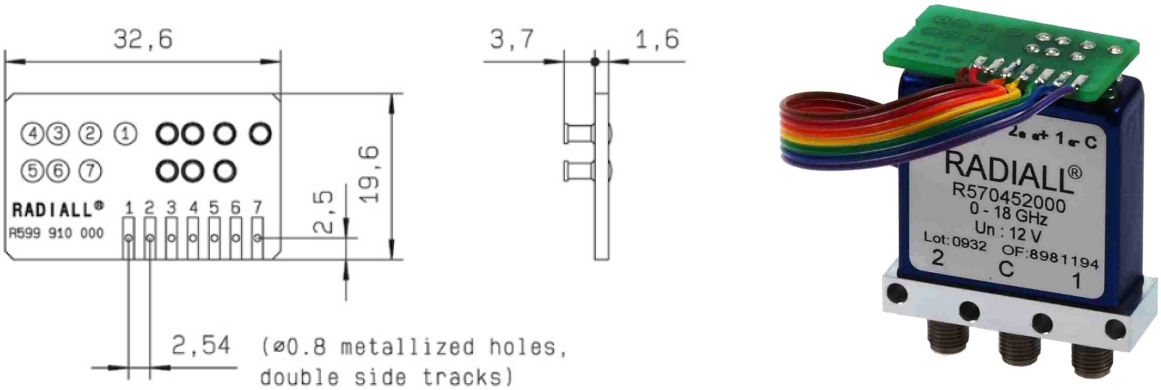
Connectors	A max (mm)
SMA	7.4
SMA 2.9 & 2.4mm	6.3
SMB - SMC	9.3
QMA	10.8
Mini SMB	7.5
DIN 1.6/5.6	11.5
Pc Board	4.5



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**



SPDT up to 50 GHz: Low Consumption & Reduced Size

SMA - SMA 2.9 - 2.4mm - QMA - SMC - SMB - mini SMB - DIN 1.6/5.6

Radiall's RAMSES R572 series are ideal for RF & microwave 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 switches are perfect for all market applications including: industrial, instrumentation, defense and telecommunications.

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: SMA 2.9 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

SPDT up to 50 GHz: Low Consumption & Reduced Size

SMA - SMA 2.9 - 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	28	12	28
			(10.2 to 13)	(24 to 30)	(10.2 to 13)	(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 **1-13**			
Switching time		ms	10			
Life			2.5 million cycles			
Connectors			SMA - SMA 2.9 - QMA - DIN 1.6/5.6 - SMB - SMC Mini SMB - 2.4mm			
Operating temperature range	DIN 1.6/5.6 - SMB - SMC - mini SMB - 2.4mm		-25°C to +70°C			
	SMA - SMA 2.9 - QMA		-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 - SMA 2.9 - QMA		-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 Ω
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	
		3 - 6	1.30	0.30	70	
SMA	DC - 3 DC - 18 DC - 26.5	DC - 3	1.10	0.15	80	
		3 - 8	1.20	0.20	75	
		8 - 12.4	1.20	0.25	65	
		12.4 - 18	1.40	0.35	60	
		18 - 26.5	1.50	0.50	55	
SMA 2.9	DC - 40	DC - 6	1.30	0.30	70	
		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	
2.4 mm	DC - 50	DC - 6	1.30	0.30	70	
		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	

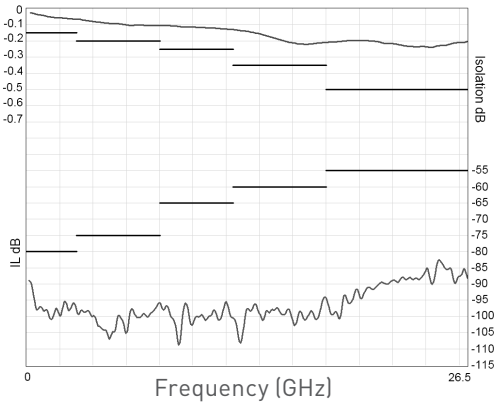
SPDT up to 50 GHz: Low Consumption & Reduced Size

SMA - SMA 2.9 - 2.4mm - QMA - SMC - SMB - mini SMB - DIN 1.6/5.6

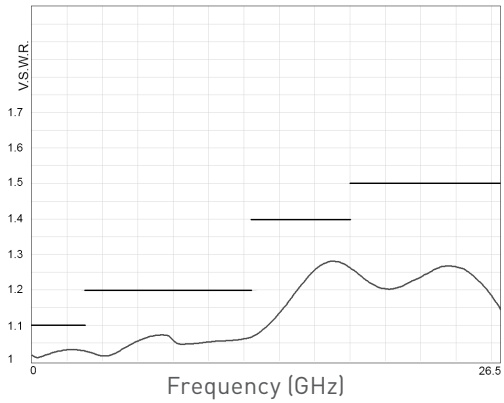
R570 AND R572 TYPICAL RF PERFORMANCES

Example: SPDT SMA up to 26.5 GHz

Insertion Loss and Isolation

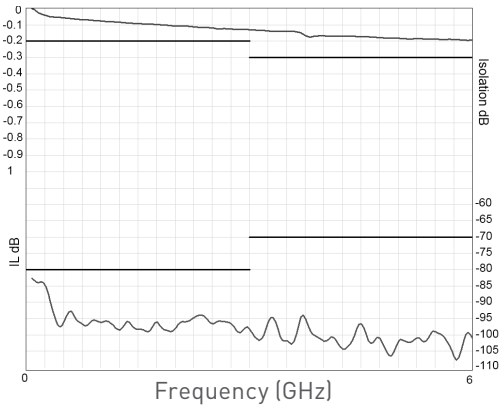


V.S.W.R.

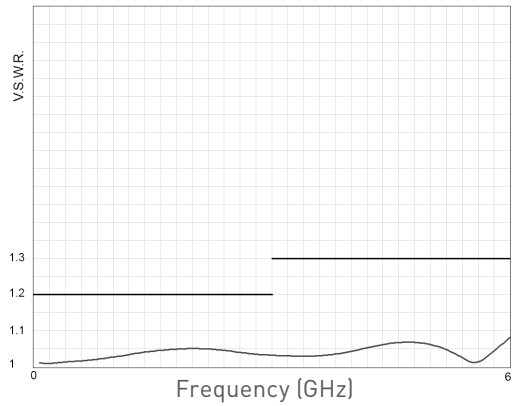


Example: SPDT QMA up to 6 GHz

Insertion Loss and Isolation



V.S.W.R.



Note: see page 2-14 for other connectors

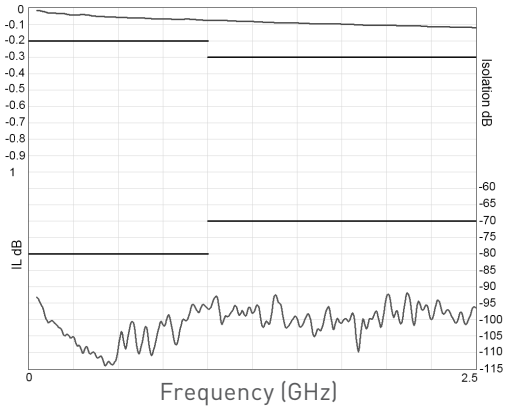
SPDT up to 50 GHz: Low Consumption & Reduced Size

SMA - SMA 2.9 - 2.4mm - QMA - SMC - SMB - mini SMB - DIN 1.6/5.6

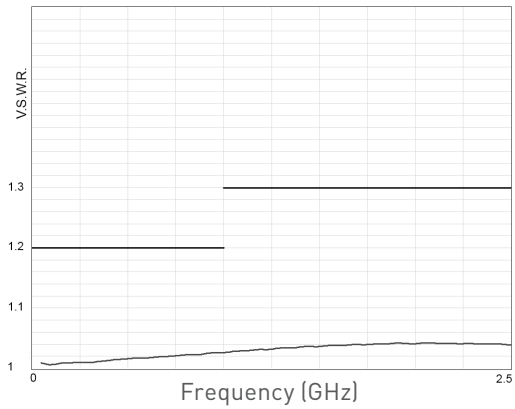
R570 AND R572 TYPICAL RF PERFORMANCES

Example: SPDT DIN 1.6/5.6 up to 2.5 GHz

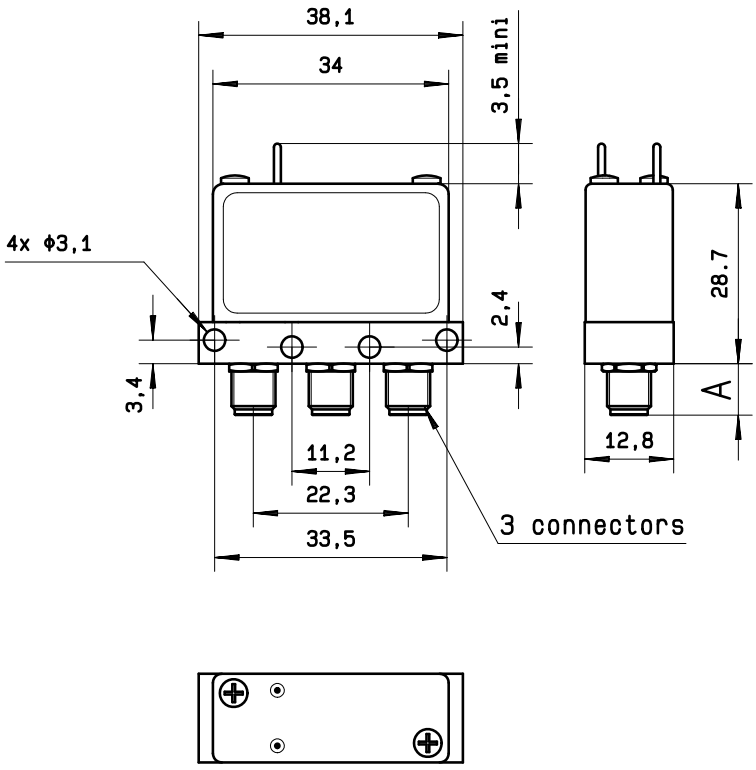
Insertion Loss and Isolation



V.S.W.R.



Connectors	A max (mm)
SMA	7.4
SMA 2.9 & 2.4mm	6.3
SMB - SMC	9.3
QMA	10.8
Mini SMB	7.5
DIN 1.6/5.6	11.5



Note: see page 2-27 for pin identification

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.

Radiall's RAMSES concept (modular concept) offers a full range of configurations. They are commonly used for applications where high power handling capability is required.

These switches 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

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

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

SPDT up to 18 GHz

N - TNC - BNC

GENERAL SPECIFICATION

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	38	200	38	225
Operating current at 23°C		mA	320	140	320	125
Average power			See Power Rating Chart page **1-13**			
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	10			
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 temperature range			-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 Ω
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	
		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	
		1 - 2	1.20	0.20	80	
		2-3	1.25	0.25	75	

Note: see page 2-22 for typical RF performances

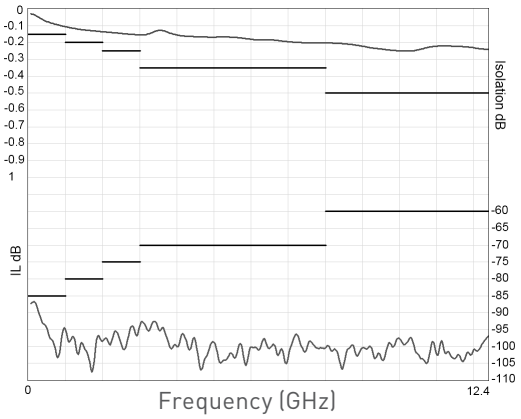
SPDT up to 18 GHz

N - TNC - BNC

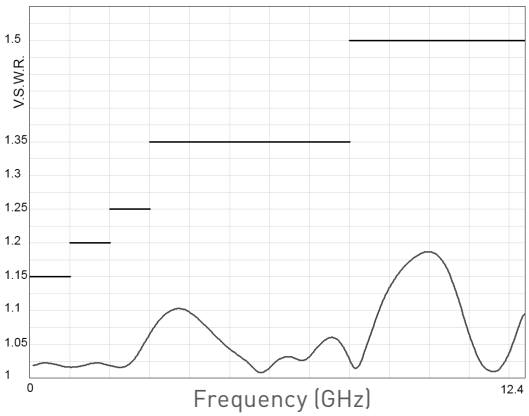
R570 TYPICAL RF PERFORMANCES

Example: SPDT N and TNC up to 12.4 GHz

Insertion Loss and Isolation

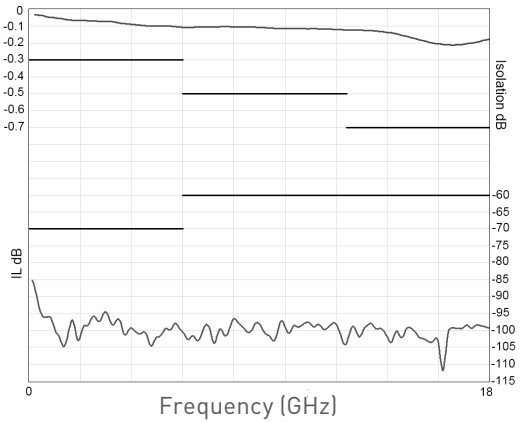


V.S.W.R.

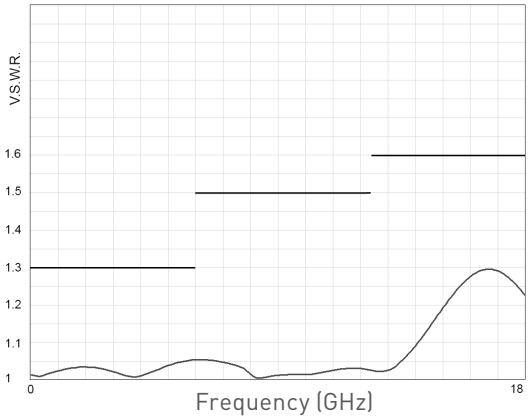


Example: SPDT TNC up to 18 GHz

Insertion Loss and Isolation



V.S.W.R.

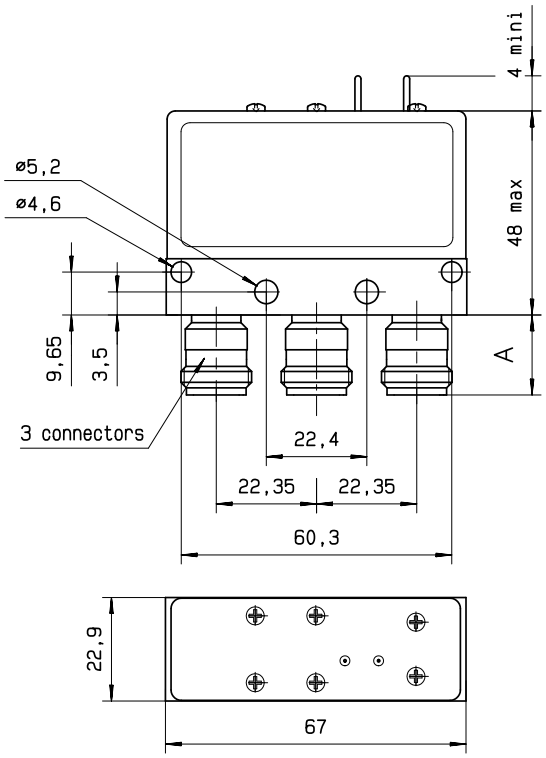


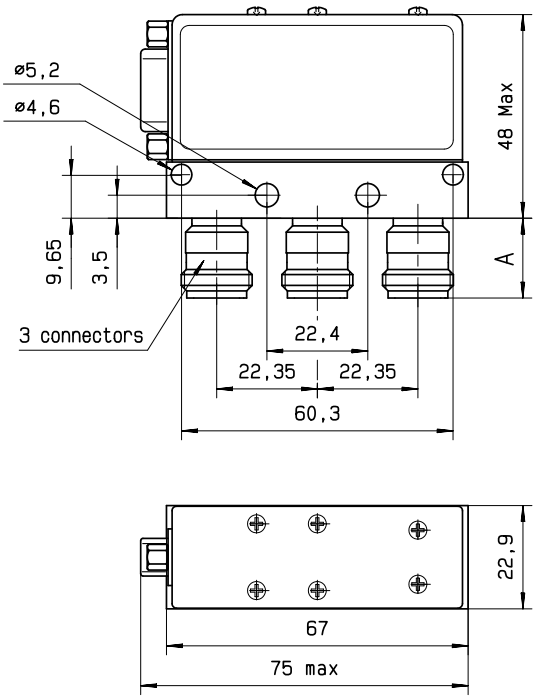
SPDT up to 18 GHz

N - TNC - BNC

TYPICAL OUTLINE DRAWING

Example: SPDT N and TNC up to 12.4 GHz





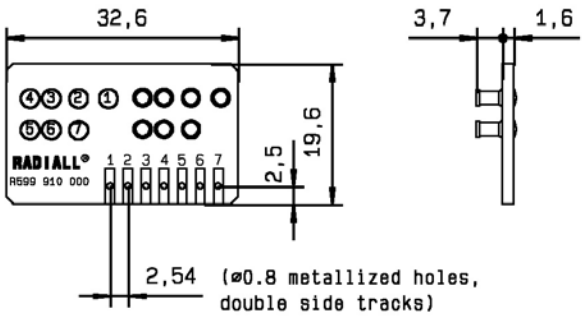
See page 2-27 for pin allocation

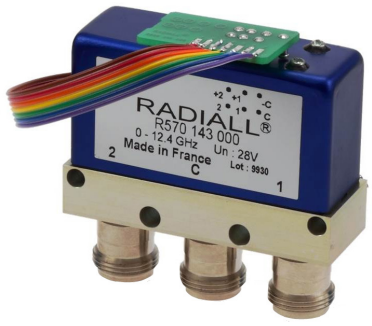
See page 2-27 for D-Sub pin allocation

Connectors	N	TNC	BNC
A max (mm)	18.8	11	11

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**



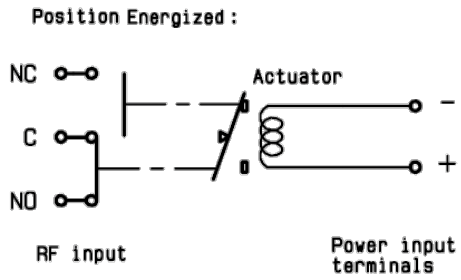


Coaxial SPDT - Electrical Schematics

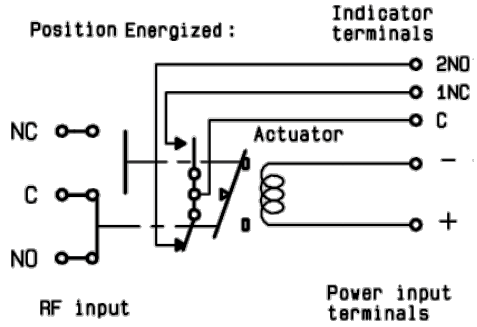
R570/R572 Series

FAILSAFE

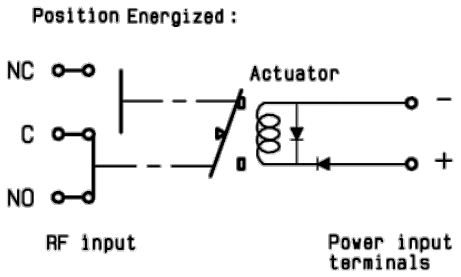
WITHOUT OPTION
R570 -1- 000 / R572 -1- 000



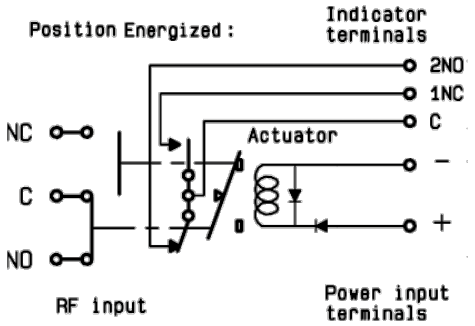
WITH INDICATOR CONTACT
R570 -2- 000



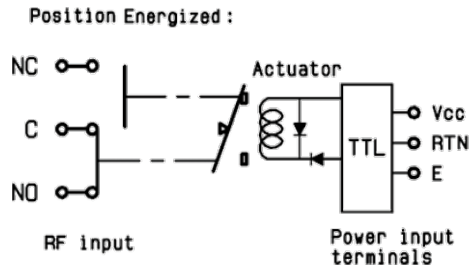
WITH SUPPRESSION DIODES
R570 -1- 030



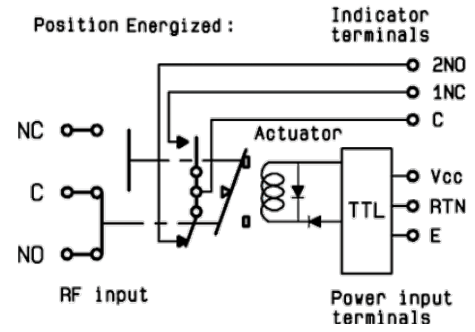
WITH SUPPRESSION DIODES AND INDICATOR CONTACT
R570 -2- 030



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



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

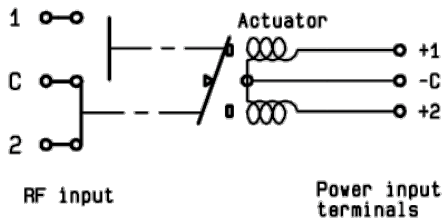


Coaxial SPDT - Electrical Schematics

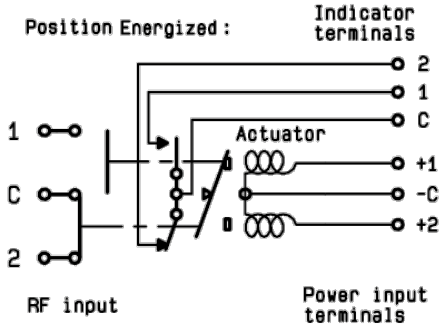
R570/R572 Series

LATCHING

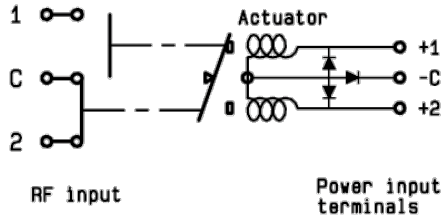
WITHOUT OPTION
R570-3- 000 AND R572 -3- 000



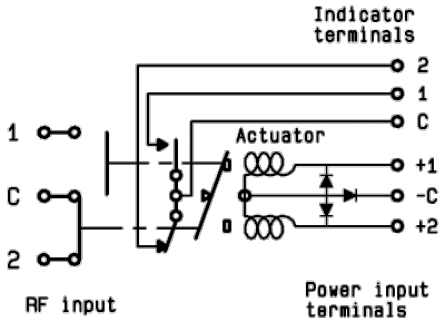
WITH INDICATOR CONTACT
R570 -4- 000



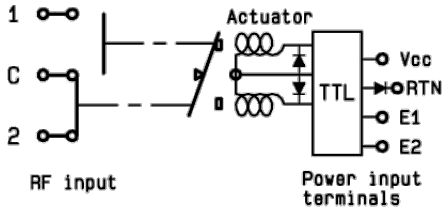
WITH SUPPRESSION DIODES
R570 -3- 030



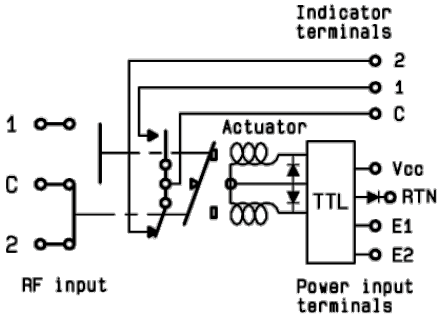
WITH SUPPRESSION DIODES AND INDICATOR CONTACT
R570 -4- 030



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



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

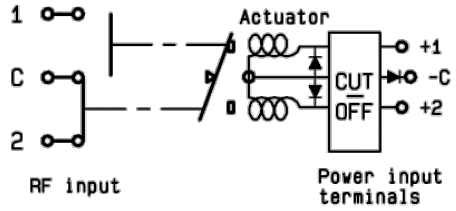


Coaxial SPDT - Electrical Schematics

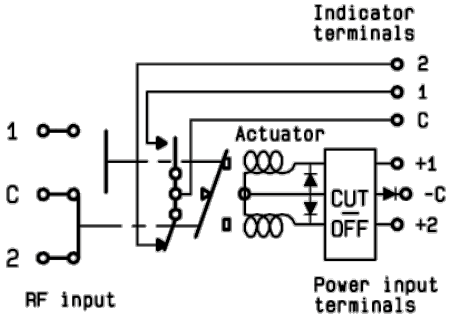
R570/R572 Series

LATCHING

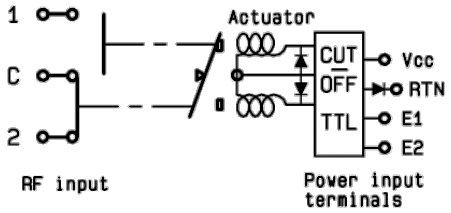
WITH CUT-OFF
(supression diodes are included)
R570 -5- 000



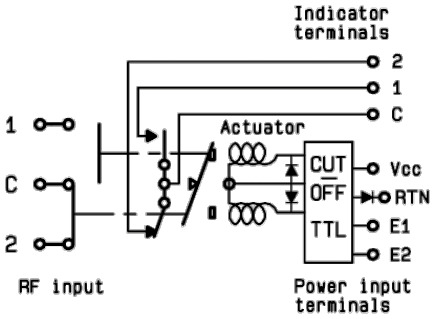
WITH CUT-OFF AND INDICATOR CONTACT
(supression diodes are included)
R570 -6- 000



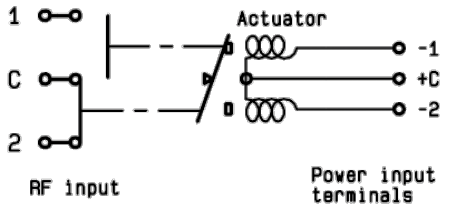
WITH CUT-OFF AND TTL DRIVER
(supression diodes are included)
R570 -5- 100



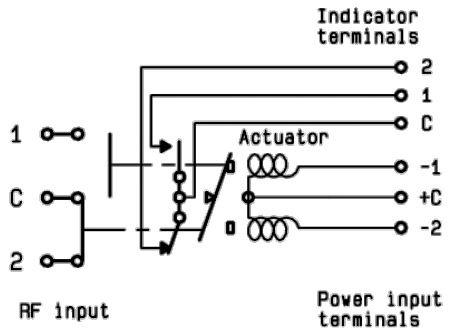
WITH CUT-OFF, TTL AND INDICATOR CONTACT
(supression diodes are included)
R570 -6- 100



WITH POSTIVE COMMMON, NO OPTION
R570 -3- 010 / R572 -3- 010



WITH POSTIVE COMMMON AND INDICATOR CONTACT
R570 -4- 010

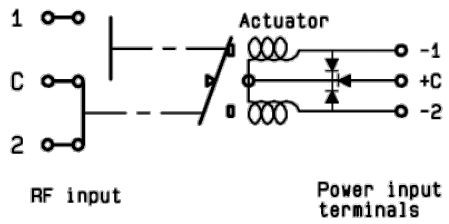


Coaxial SPDT - Electrical Schematics

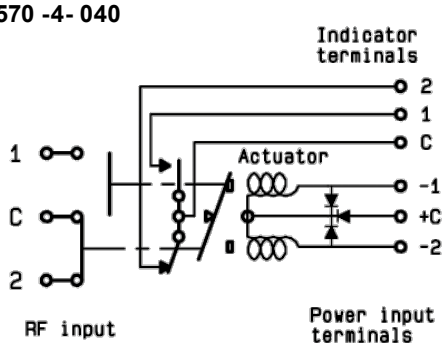
R570/R572 Series

LATCHING

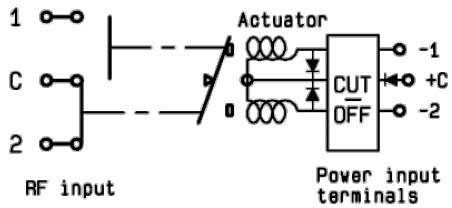
WITH POSITIVE COMMON AND SUPPRESSION DIODES
R570 -3- 040



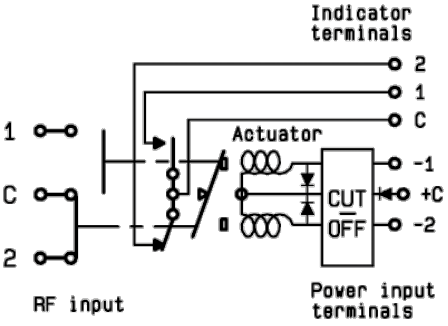
WITH POSITIVE COMMON, SUPPRESSION DIODES AND INDICATOR CONTACT
R570 -4- 040



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

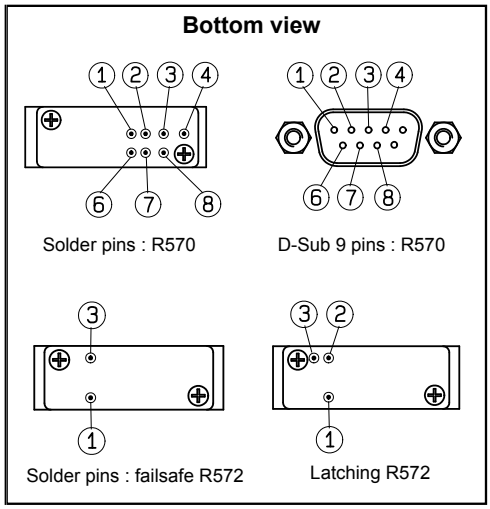


WITH POSITIVE COMMON, CUT-OFF AND INDICATOR CONTACT (supression diodes are included)
R570 -6- 010



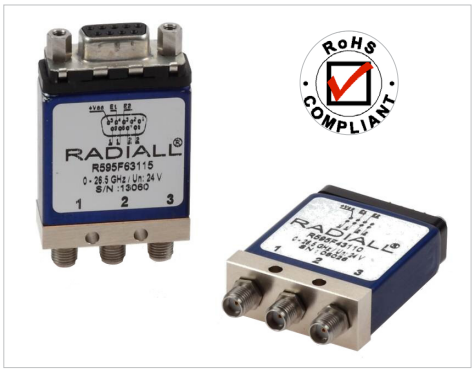
PIN IDENTIFICATION

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



High performance SPDT up to 40 GHz

SMA - SMA 2.9



Radiall's PLATINUM series switches are optimised to perform at a high level over an extended life cycle, with outstanding RF performance, 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

Frequency Range:
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

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

Actuator Voltage:
3: 24 Vdc
7: 15 Vdc

I.C.: Indicator contact - S.C.O.: Self Cut-Off
(1): Suppression diodes are already included

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)

Switch model :
1: Non terminated SPDT switch

High performance SPDT up to 40 GHz

SMA - SMA 2.9

GENERAL SPECIFICATIONS

Operating mode		Latching	
Nominal operating voltage (across temperature range)	Vdc	24 (24 to 30)	15 (12 to 20)
Coil resistance at 23°C (+/-10%)	Ω	350	120
Operating current at 23°C	mA	68	125
TTL input	High level	3 to 7 Volts: 800µA max 7 Volts	
	Low level	0 to 0.8 Volts: 20µA max 0.8 Volts	
Switching time	ms	15	
Life (Min)	SMA	10 million cycles	
	SMA 2.9	5 million cycles	
Actuator terminals		D-Sub 9 pin female Solder pins	
Weight	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)	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)

High performance SPDT up to 40 GHz

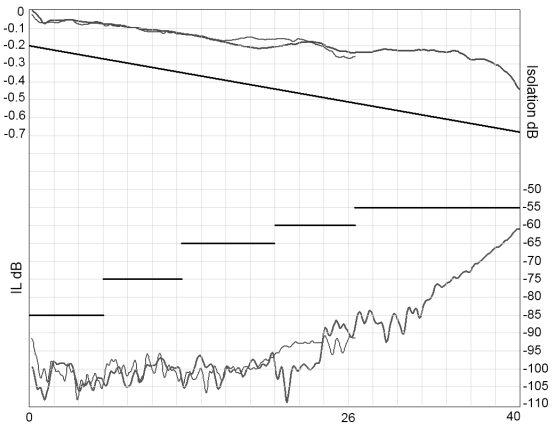
SMA - SMA 2.9

RF PERFORMANCES

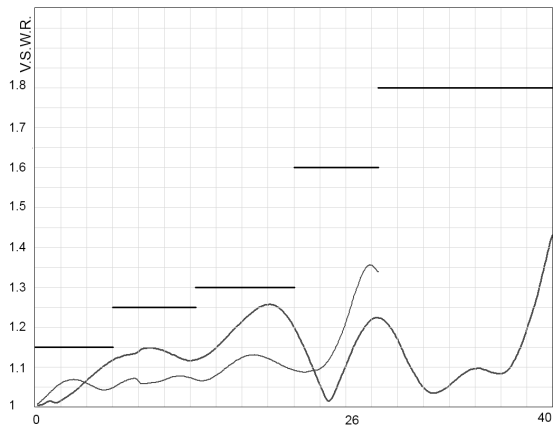
Part Number		R5953--1--	R5954--1--		R595F--1--		R595F--1--	
Frequency range	GHz	DC to 6	DC to 20		DC to 26.5		DC to 40	
Impedance	Ω	50						
Insertion Loss (Max)	dB	0.20 + (0.45 / 26.5) x frequency (GHz)						
Isolation (Min)	dB	85	DC to 6 GHz 6 to 12.4 GHz 12.4 to 20 GHz	85 75 65	DC to 6 GHz 6 to 12.4 GHz 12.4 to 20 GHz 20 to 26.5 GHz	85 75 65 60	DC to 6 GHz 6 to 12.4 GHz 12.4 to 20 GHz 20 to 26.5 GHz 26.5 to 40 GHz	85 75 65 60 55
V.S.W.R (Max)		1.15	DC to 6 GHz 6 to 12.4 GHz 12.4 to 18 GHz 18 to 20 GHz	1.15 1.25 1.30 1.60	DC to 6 GHz 6 to 12.4 GHz 12.4 to 20 GHz 18 to 26.5 GHz	1.15 1.25 1.30 1.60	DC to 6 GHz 6 to 12.4 GHz 12.4 to 18 GHz 18 to 26.5 GHz 26.5 to 40 GHz	1.15 1.25 1.30 1.60 1.80
Repeatability (up to 10 million cycles mesured at 25°C)	dB	0.03 dB maximun					0.05 dB maximun	

TYPICAL RF PERFORMANCES

Insertion Loss and Isolation



V.S.W.R.



SMA —— SMA 2.9 ——

High performance SPDT up to 40 GHz

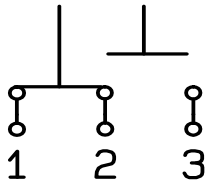
SMA - SMA 2.9

SWITCH MODEL: NON TERMINATED SPDT SWITCH

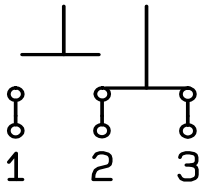
The non terminated SPDT switch is a single pole double throw switch. This switch is considered "break before make".

RF SCHEMATIC DIAGRAM

Position E1

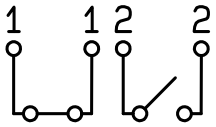


Position E2

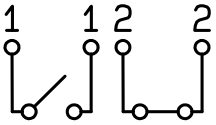


POSITION INDICATOR

State 11



State 22

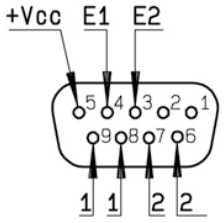


Standard drive option "1"
(Positive common):

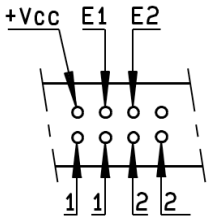
- Connect pin +Vcc to supply (+20 Vdc to +32 Vdc)
- Select desired RF path by applying ground to the corresponding "close" pin (Ex: ground pin E1 to switch to position E1. RF path 1-2 closed and RF path 2-3 open)
- To open desired path and close the new RF path, connect ground to the corresponding "close"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

TTL drive option "2"

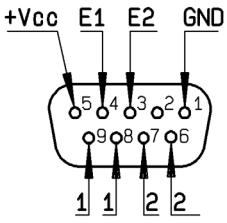
- Connect pin GND to ground
- Connect pin +Vcc to supply (+20 Vdc to +32 Vdc)
- Select (close) desired RF path by applying TTL "High" to the corresponding "drive" pin (Ex: apply TTL "High" to pin E1 to switch to position E1. RF path 1-2 closed and RF path 2-3 open)
- To open desired path and close the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



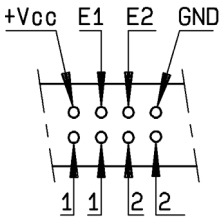
D-Sub connector



Solder pins



D-Sub connector



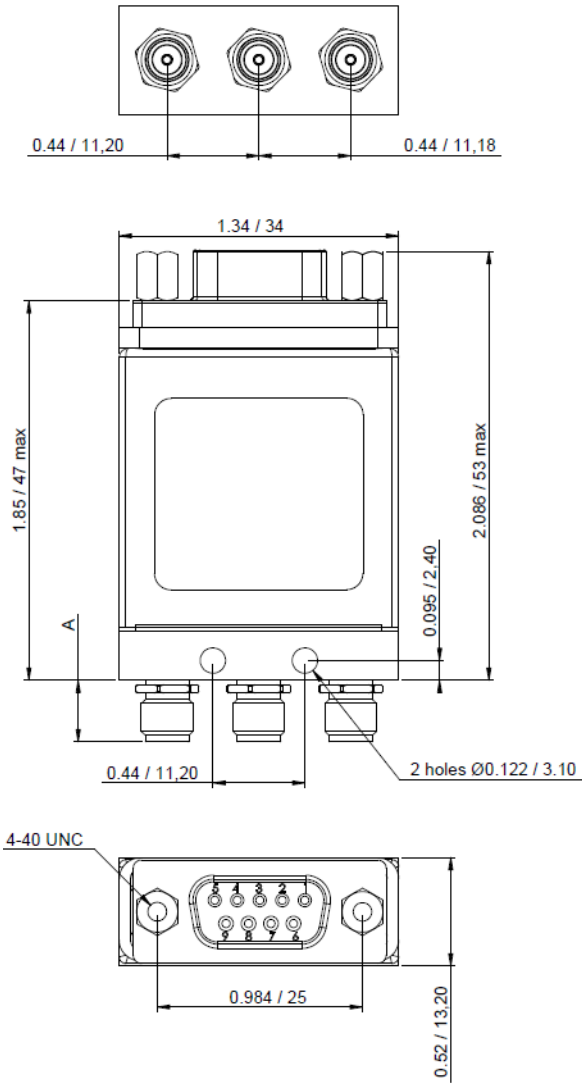
Solder pins

High performance SPDT up to 40 GHz

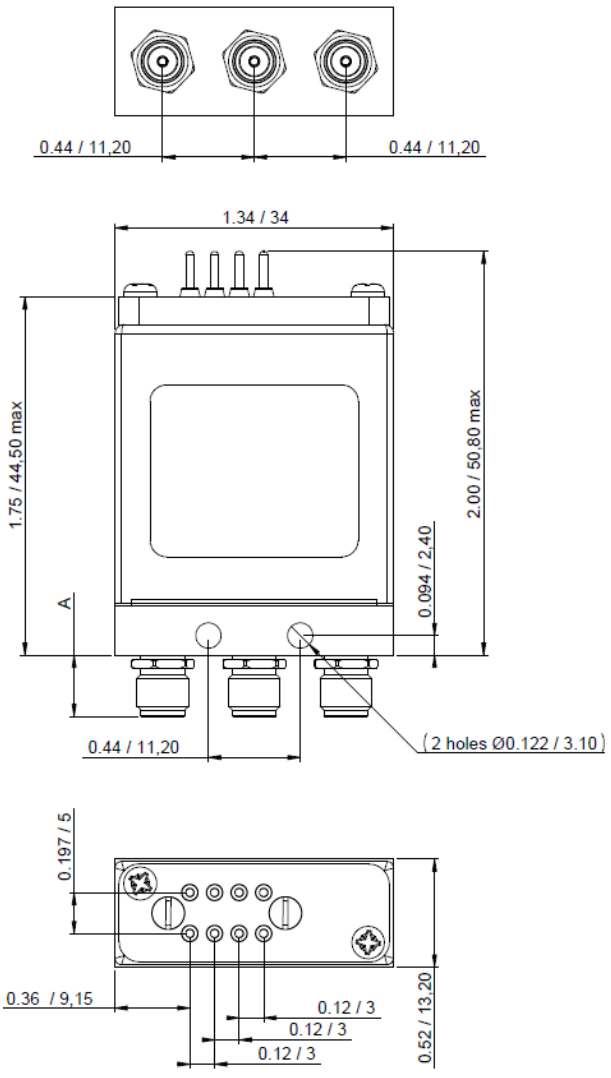
SMA - SMA 2.9

TYPICAL OUTLINE DRAWING

With D-Sub connector



With solder pins



All dimensions are in inches/millimeters

Connectors	A max (mm)
SMA	7.4
SMA 2.9	6.3

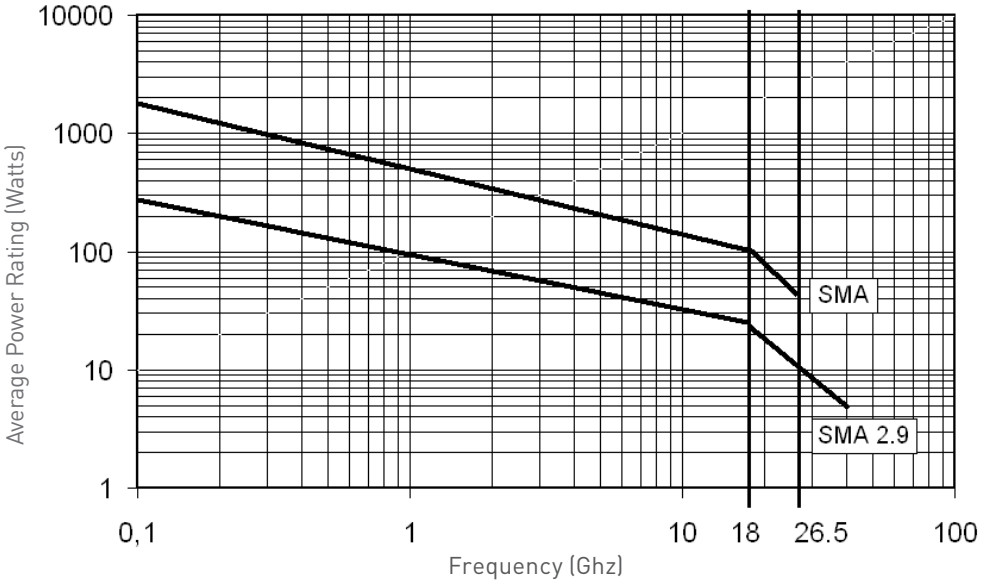
High performance SPDT up to 40 GHz

SMA - SMA 2.9

RF POWER RATING CHART

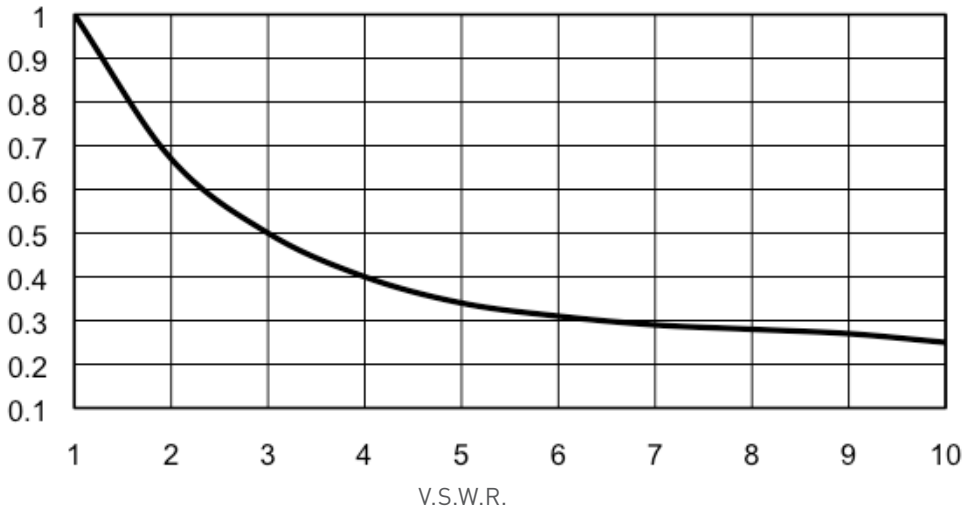
This graph is based on the following conditions:

- 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



Optional Features for SPDT

GENERAL

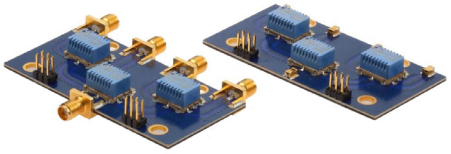
All miniature SPDT switches fitted with SMA, QMA, SMC, SMB or SMA2.9 connectors can be delivered with 34 mm narrow width RF body. Contact Radiall sales directly for availability.

Examples of dedicated application options:

SMA SPDT with a SINGLE input TTL driver. This option is available in a latching configuration upon special request. Key advantages include less wires and 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.