High Performance Multiport Switches

TITANIUM Series / SPnT up to 40 GHz

Radiall's TITANIUM switches are optimized 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 2.5 million switching cycles, Radiall's TITANIUM switches are a perfect solution 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 receptacle.

PART NUMBER SELECTION

R 51 _ _ _ _ _ _ _ _

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

Actuator Voltage:
3: 28 Vdc

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

Options:
1: Positive common (without TTL)
2: TTL/5V logic with 24 Vdc supply

Actuator Terminal:
7 : HE 10 receptacle, delivered with 750 mm (30 inches) ribbon cable + HE10 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.

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GENERAL SPECIFICATIONS

Operating mode		Latching	
Nominal operating voltage (across operating temperature)	Vdc	24 (20/32)	
Coil resistance (+/-10%)	Ω	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 **5-44** Hot switching: 1 Watt Cw	
Terminated Model	All models	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 Volts	-
Indicator specifications		Maximum withstanding voltage	60V
		Maximum current capacity	150 mA
		Maximum "ON" resistance	2.5 Ω
		Minimum "OFF" resistance	100MΩ
Switching time (Max)	ms	15	
Life (Min) for	SMA	2.5 million cycles	
	SMA 2.9	1 million cycles	
Connectors		SMA - SMA 2.9	
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, 1/2 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

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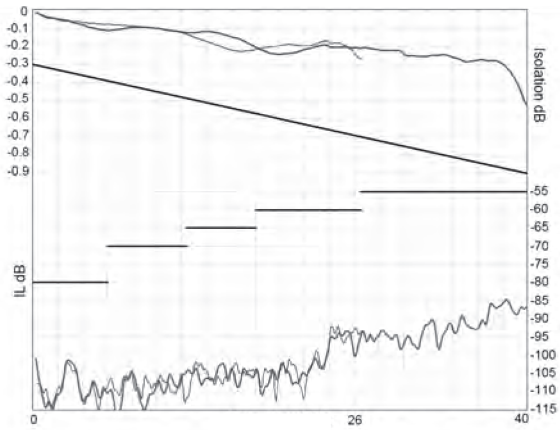
RF PERFORMANCES

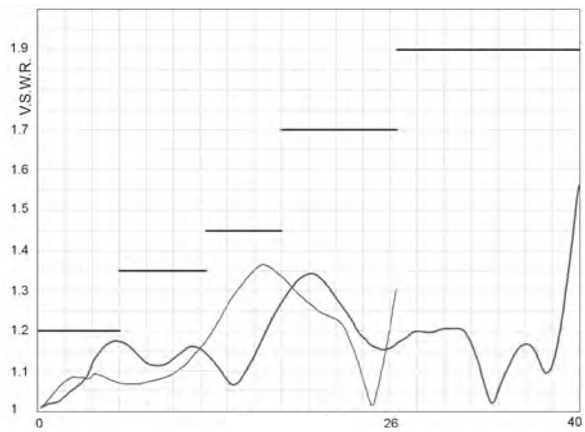
Part number		R51-3-34-7 R51-3-36-7	R51-4-34-7 R51-4-36-7	R51-F-34-7 R51-F-36-7	R51-8-34-7 R51-8-36-7
Frequency Range	GHz	DC to 6	DC to 20	DC to 26.5	DC to 40
Impedance	Ω	50			
Insertion Loss (Max)	dB	0.3 + 0.015 x frequency (GHz)			
Isolation (Min)	dB	80	DC to 6 GHz 80 6 to 12.4 GHz 70 12.4 to 20 GHz 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 18 GHz 65 18 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 20 GHz 1.45	DC to 6 GHz 1.20 6 to 12.4 GHz 1.35 12.4 to 20 GHz 1.45 20 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



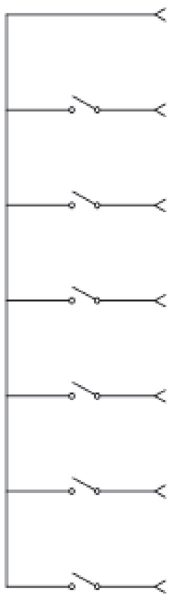
V.S.W.R.



SMA —— SMA 2.9 ▬

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 a 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.



Pin number	Function
2	Indicator Common
4	Indicator RF path 1
6	Indicator RF path 2
8	Indicator RF path 3
10	Indicator RF path 4
12	Indicator RF path 5
14	Indicator RF path 6

Ways 1 and 4 are not connected for SP4T switches.

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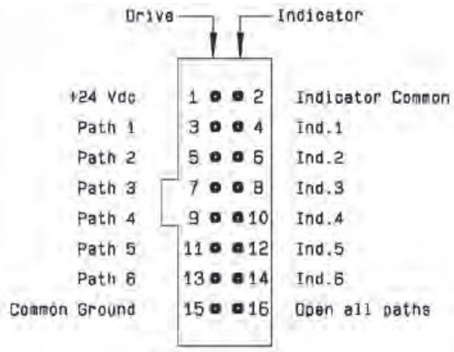
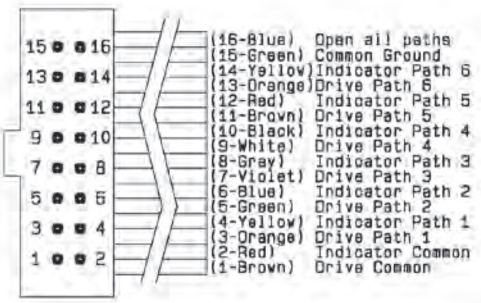
TYPE 7: WITH TTL (OPTION “2”) / WITHOUT TTL (OPTION “1”) AND INDICATORS

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

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), then 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), then 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 for at least 15 minutes (minimum), then 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

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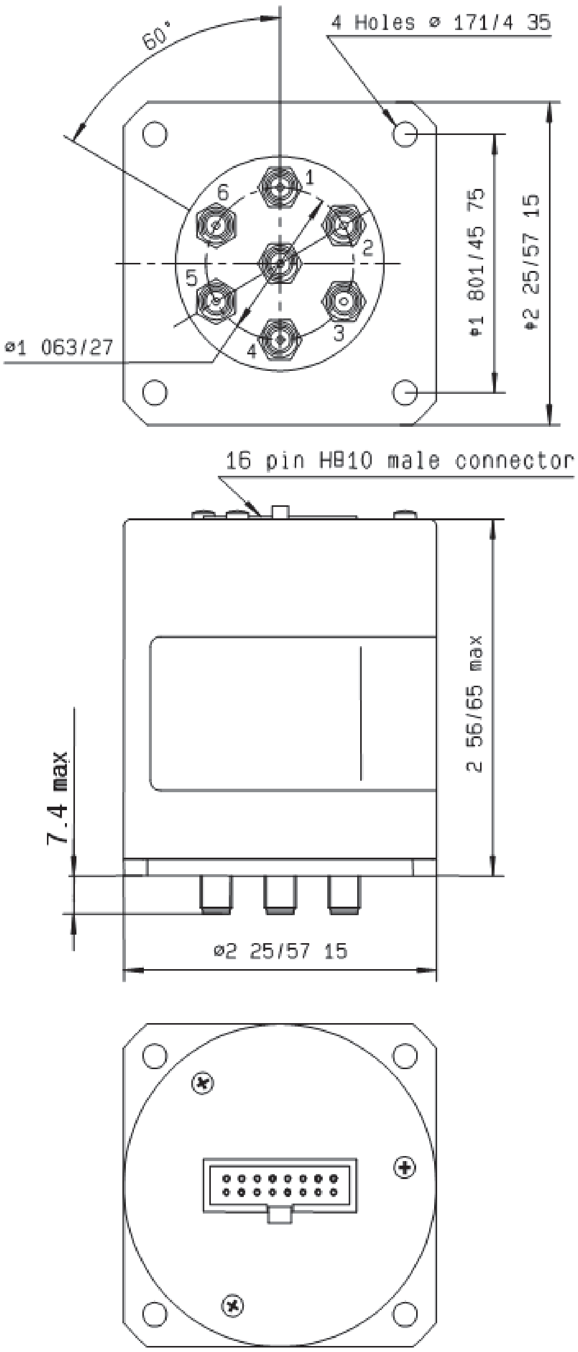
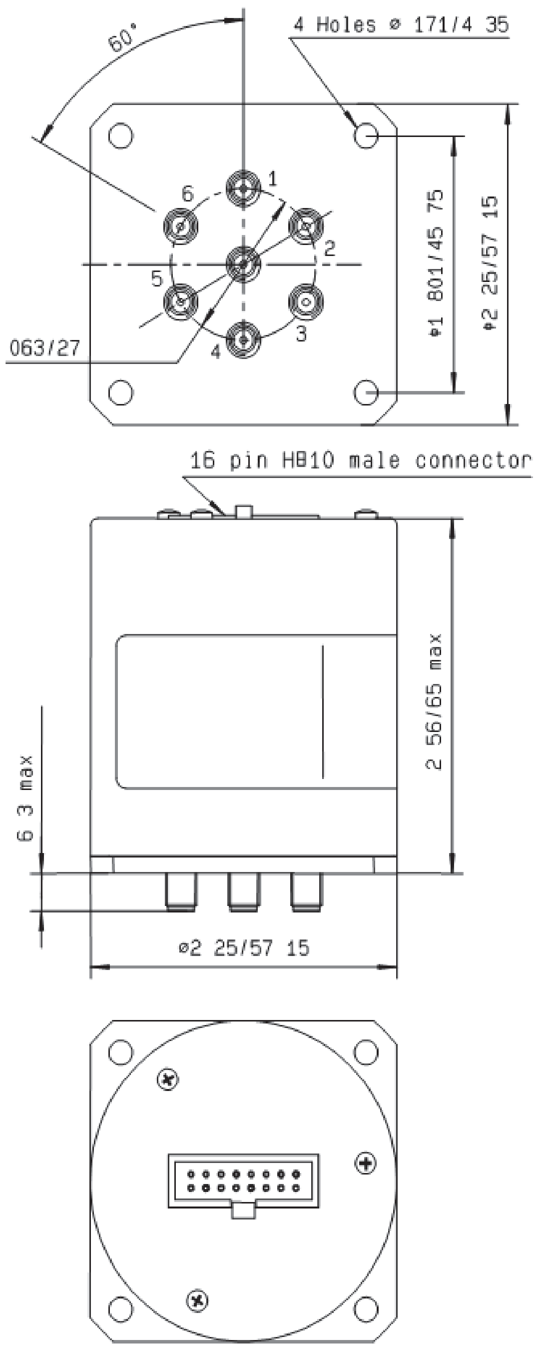
TYPICAL OUTLINE DRAWING

SMA connectors



SMA2.9 connectors



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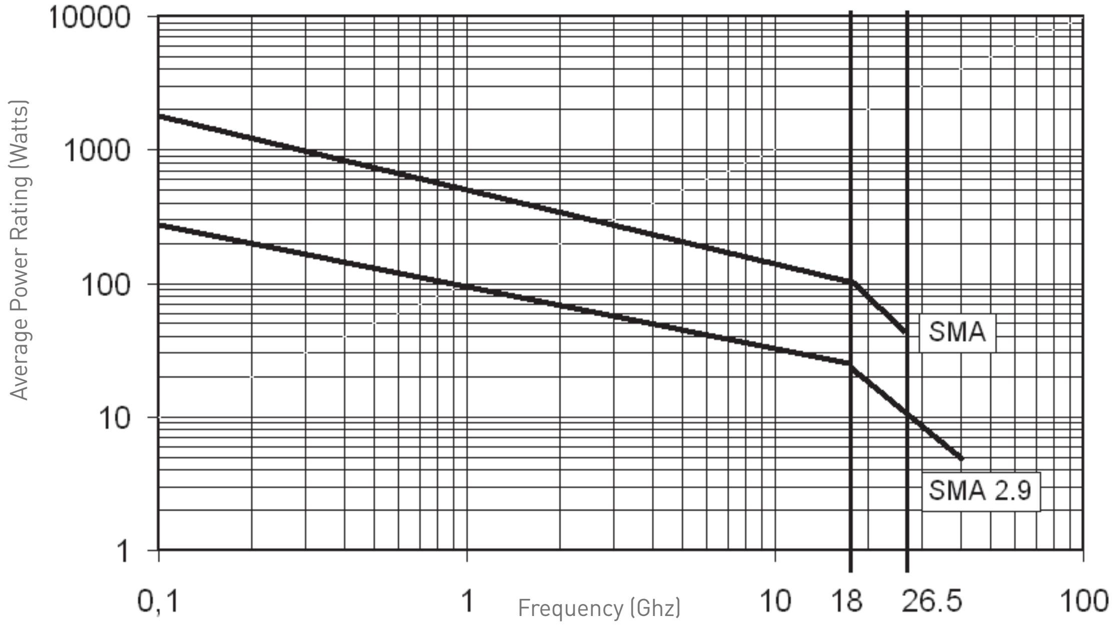
POWER RATING CHART

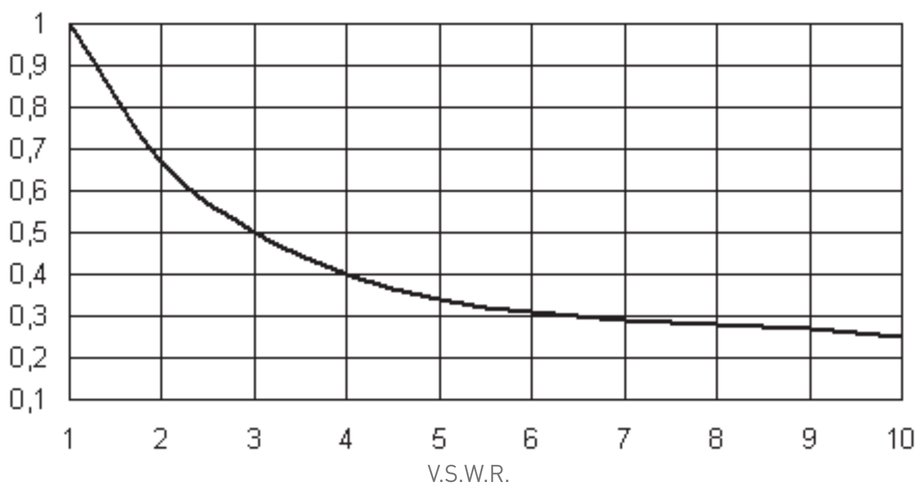
This graph is based on the following conditions:

- 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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