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

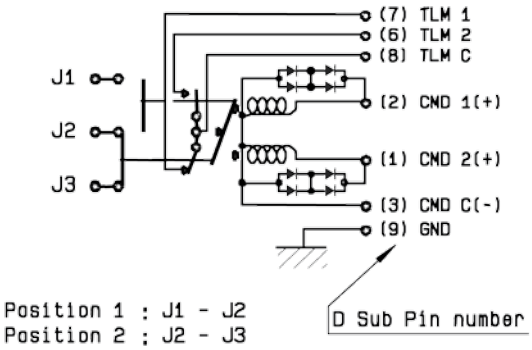
FREQUENCY	GHz	17.5-21.5	21.5 - 27.5	27.5 - 31
Insertion Loss (max)	dB	0.45	0.45	0.50
VSWR (max) Return Loss (min)	(dB)	1.33:1 (17.0)	1.35:1 (16.5)	1.40:1 (15.6)
Isolation (min)	dB	65	60	55
E-Field Shielding Effectiveness (min)	dBi	60	50	40
Power Handling (max)	W	10	5	

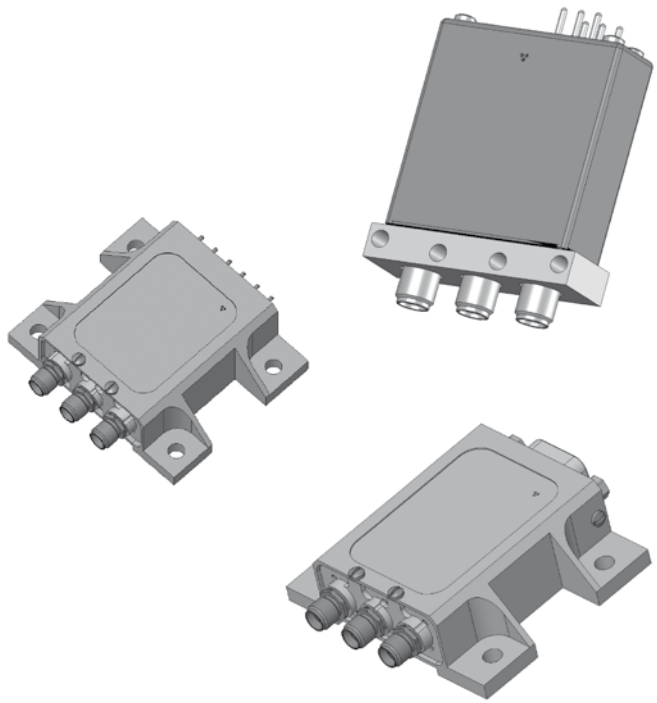
For more detailed technical information please consult Radiall customer support.

LOW POWER COAXIAL SPDT SWITCH

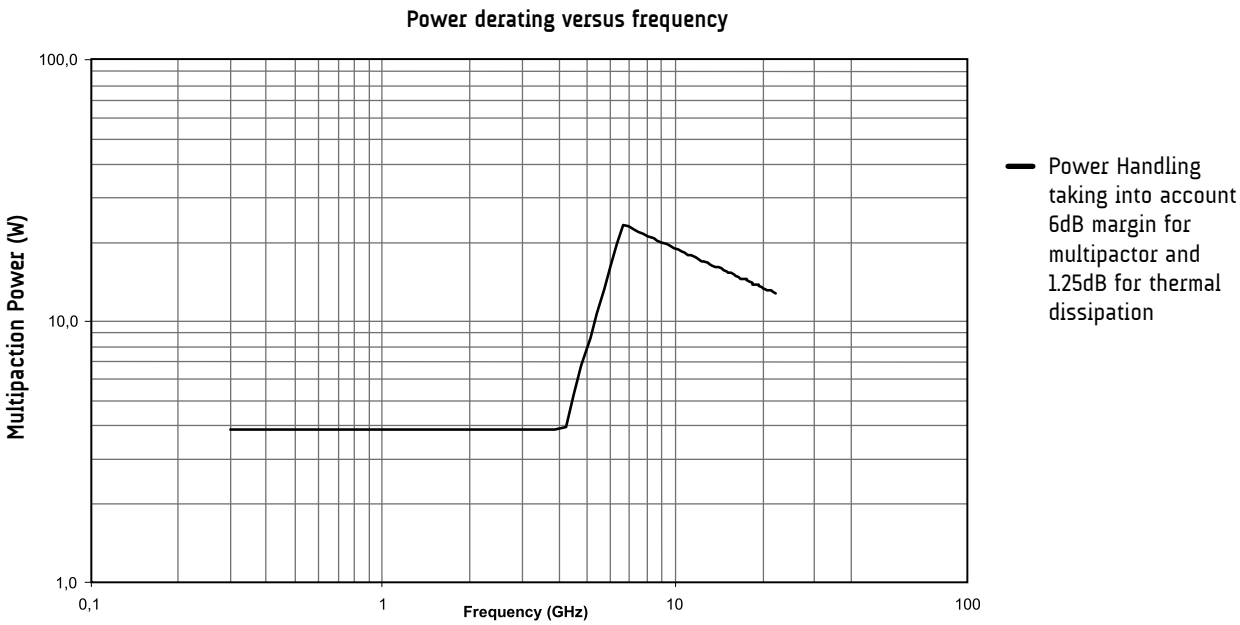
SCHEMATICS & DRAWINGS

SDPT, lay down, pins:



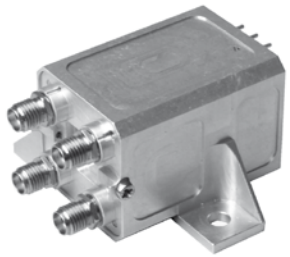


POWER DERATING GRAPH



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

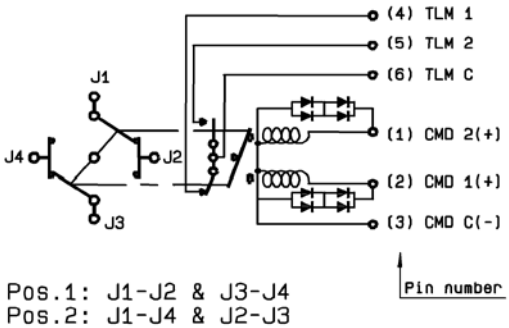
FREQUENCY	GHz	17.5 - 21.5	27.5 - 31
Insertion Loss (max)	dB	0.50	0.65
VSWR (max) Return Loss (min)	(dB)	1:30:1 (17.7)	1.40:1 (15.6)
Isolation (min)	dB	65	60
E-Field Shielding Effectiveness (min)	dBi	60	60
Power Handling (max)	W	10	5

For more detailed technical information please consult Radiall customer support.

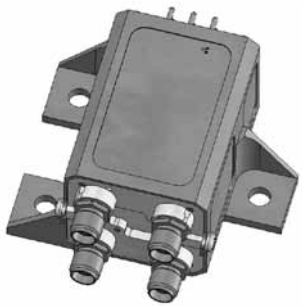
LOW POWER COAXIAL DPDT SWITCH

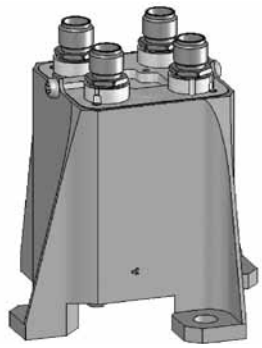
SCHEMATICS & DRAWINGS

C-Switch, SMA, Lay Down, pins:

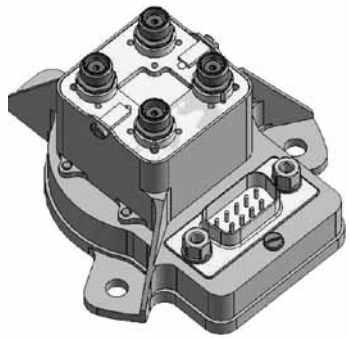


Pos.1: J1-J2 & J3-J4
Pos.2: J1-J4 & J2-J3



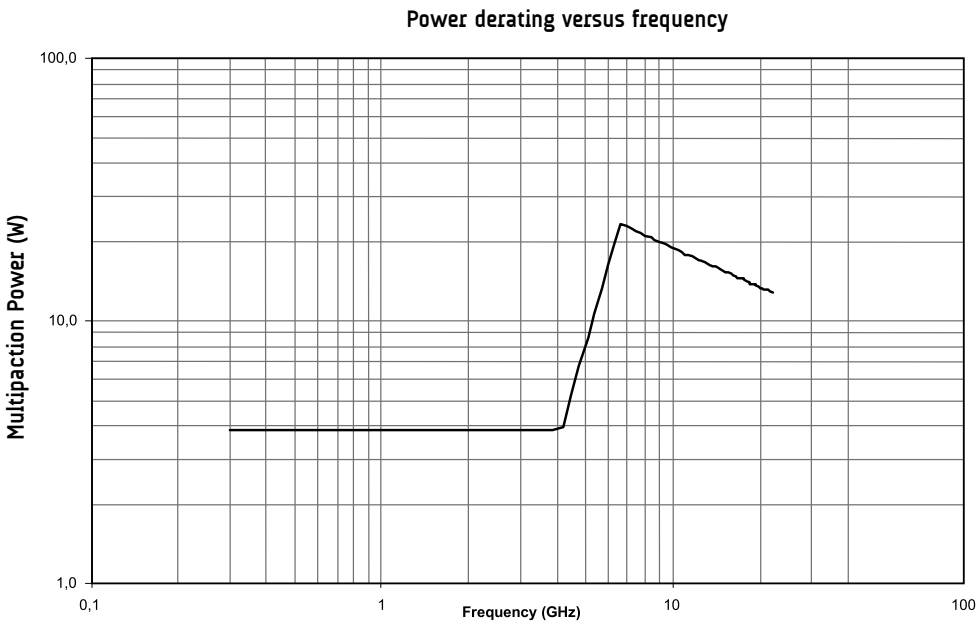


C-Switch, SMA, Stand Up, pins



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

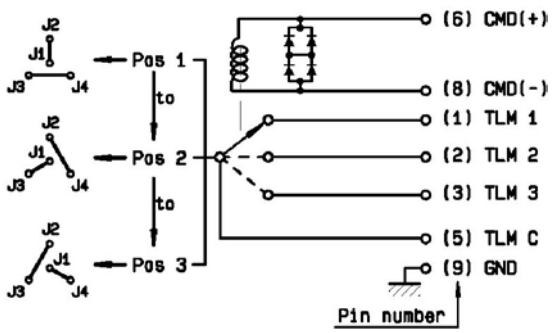
FREQUENCY	GHz	17.5 - 21.5	27.5 - 31
Insertion Loss (max)	dB	0.40	0.50
VSWR (max) Return Loss (min)	(dB)	1.30:1 (17.7)	1.40:1 (15.6)
Isolation (min)	dB	70	60
E-Field Shielding Effectiveness (min)	dBi	65	55
Power Handling (max)	W	10	5

For more detailed technical information please consult Radiall customer support.

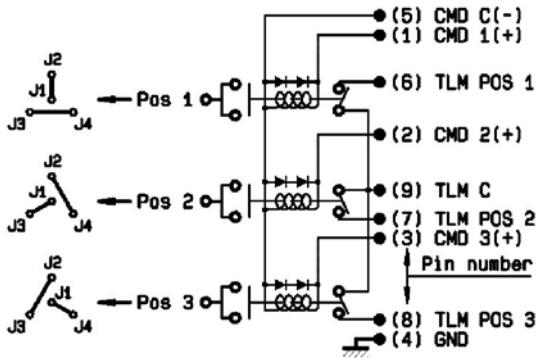
LOW POWER COAXIAL T SWITCH

SCHEMATICS & DRAWINGS

Sequential Drive:



Random Drive:

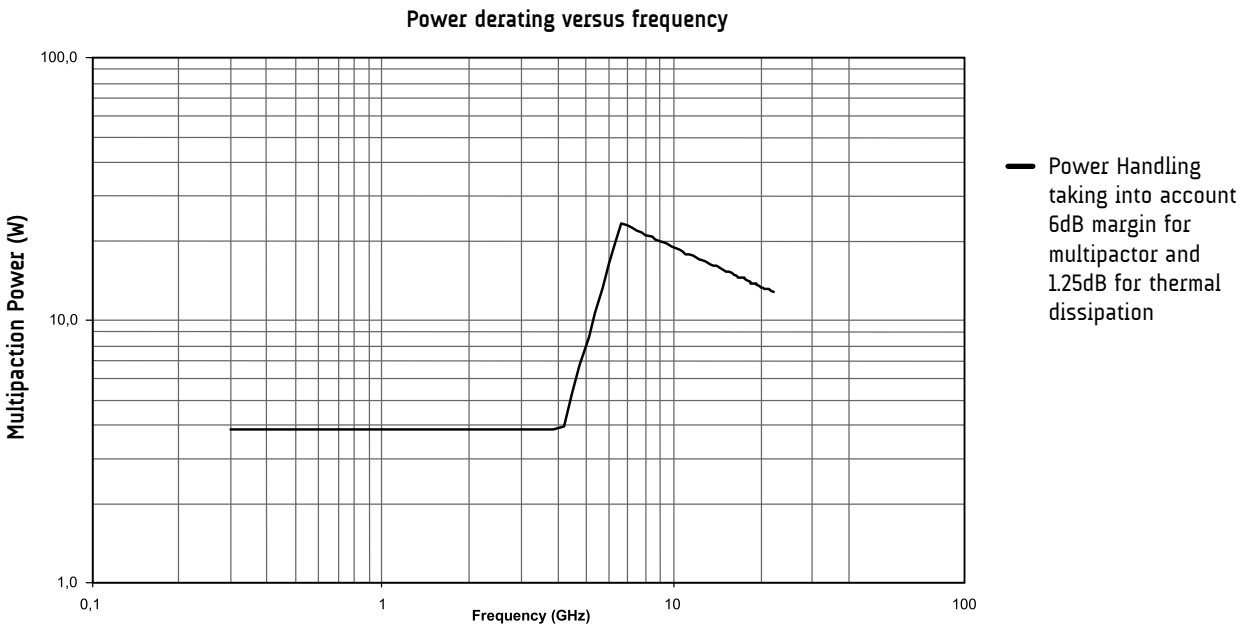


T-Switch, Lay Down with pins:

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

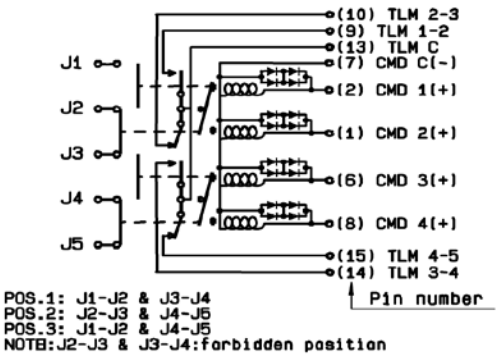
DC TO 18 GHZ

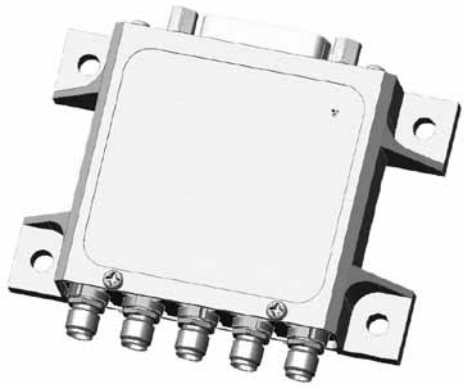
FREQUENCY	GHz	DC - 1.8	1.8 - 4.2	4.2 - 8.4	8.4 - 14.5	14.5 - 18
Insertion Loss (max)	dB	0.15	0.15	0.25	0.30	0.40
VSWR (max) Return Loss (min)	(dB)	1.15:1 (23.1)	1.20:1 (20.8)	1.25:1 (19.1)	1.25:1 (19.1)	1.40:1 (15.6)
Isolation (min)	dB	70				60
E-Field Shielding Effectiveness (min)	dBi	75				70

For more detailed technical information please consult Radiall customer support.

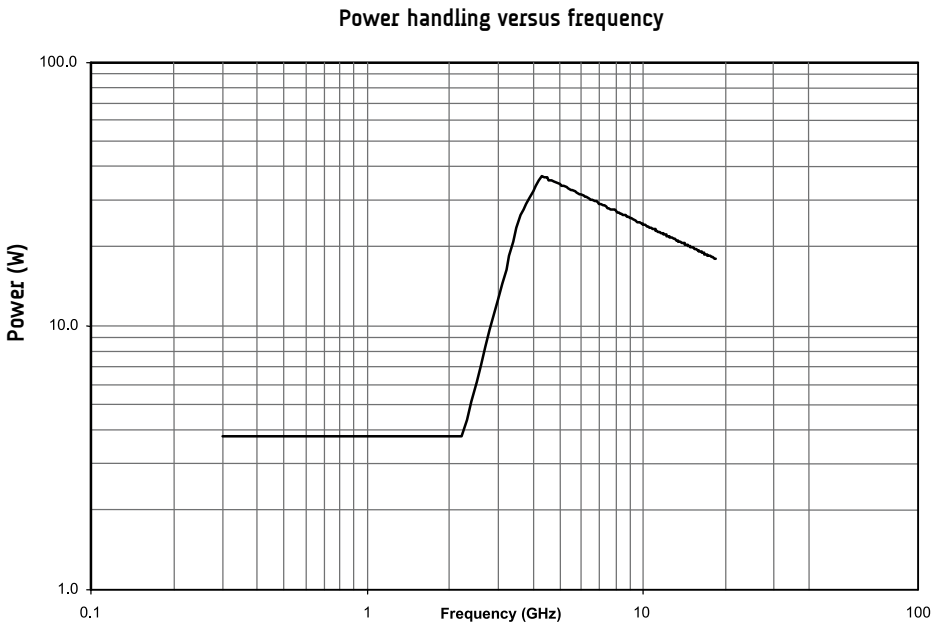
LOW POWER COAXIAL DP3T SWITCH

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.

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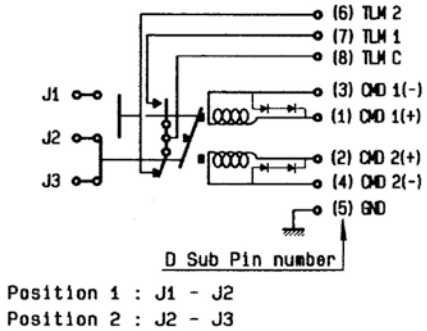
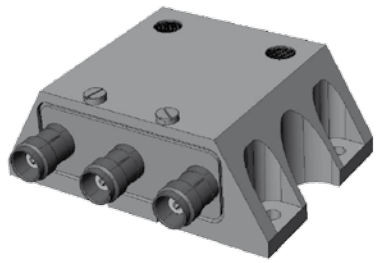
HIGH POWER COAXIAL SPDT SWITCH

SCHEMATICS & DRAWINGS



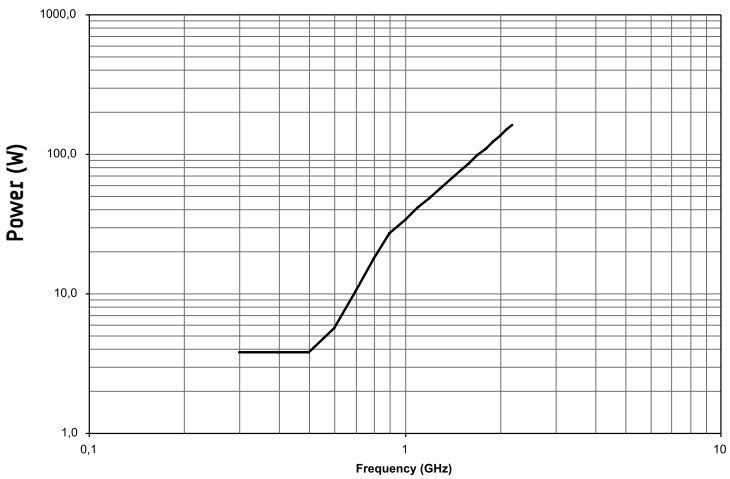
SPDT Switch, Lay Down, D-Sub, variant 001 & 002:



POWER DERATING GRAPH

Applicable for Variant 001

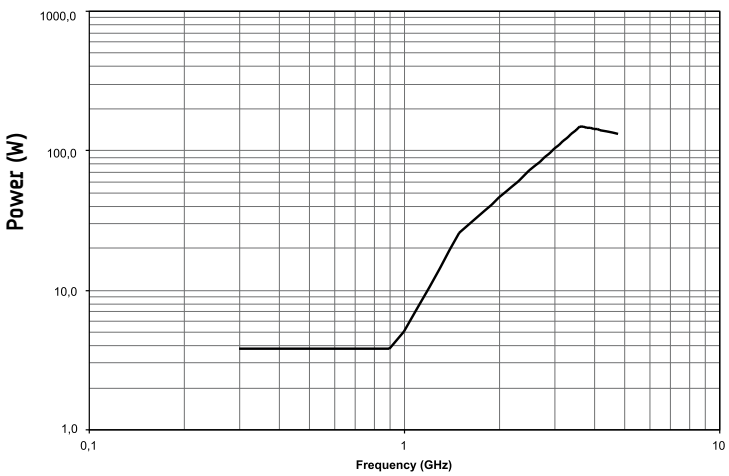
Power handling versus frequency



— 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

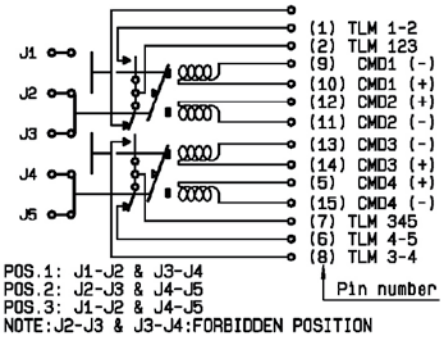
RF PERFORMANCES

		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

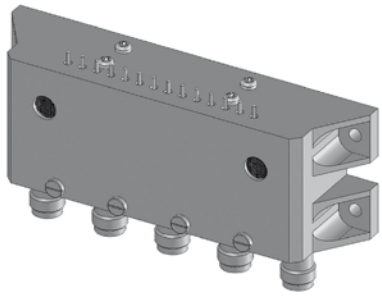
For more detailed technical information please consult Radiall customer support.

HIGH POWER COAXIAL DP3T SWITCH

SCHEMATICS & DRAWINGS



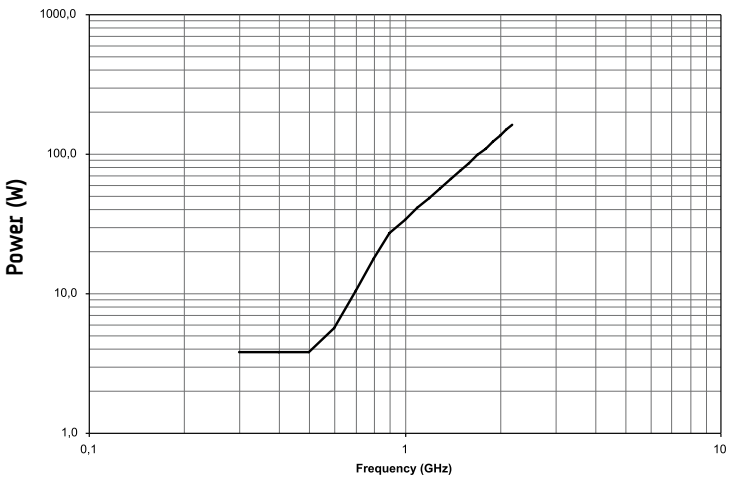
DP3T Switch, Lay Down, Pins:



POWER DERATING GRAPH

Variant 1, High Cavity

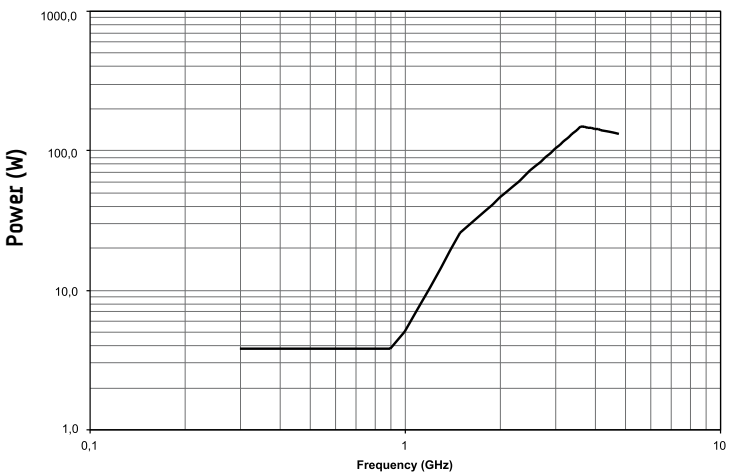
Power handling versus frequency



— 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 Contact Open Contact Current	 mΩ MΩ mA	 1 	 	 1000 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

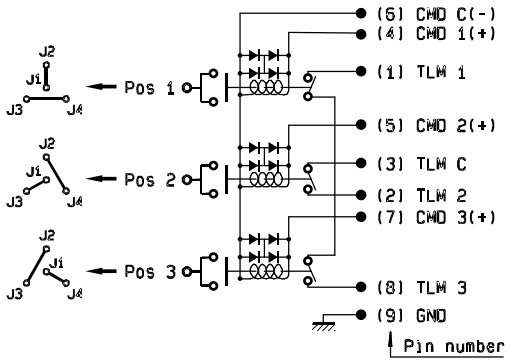
FREQUENCY	GHz	DC - 2	2 - 4.8	4.8 - 6	6 - 8
Insertion Loss (max)	dB	0.17	0.20	0.30	0.40
VSWR (max) Return Loss (min)	(dB)	1.10:1 (26.4)	1.25:1 (19.1)	1.35:1 (16.5)	1.50:1 (14)
Isolation (min)	dB	70			
E-Field Shielding Effectiveness (min)	dBi	75			70

For more detailed technical information please consult Radiall customer support.

HIGH POWER COAXIAL T SWITCH

SCHEMATICS & DRAWINGS

T-Switch, TNC, D-Sub, variant 001 & 002:

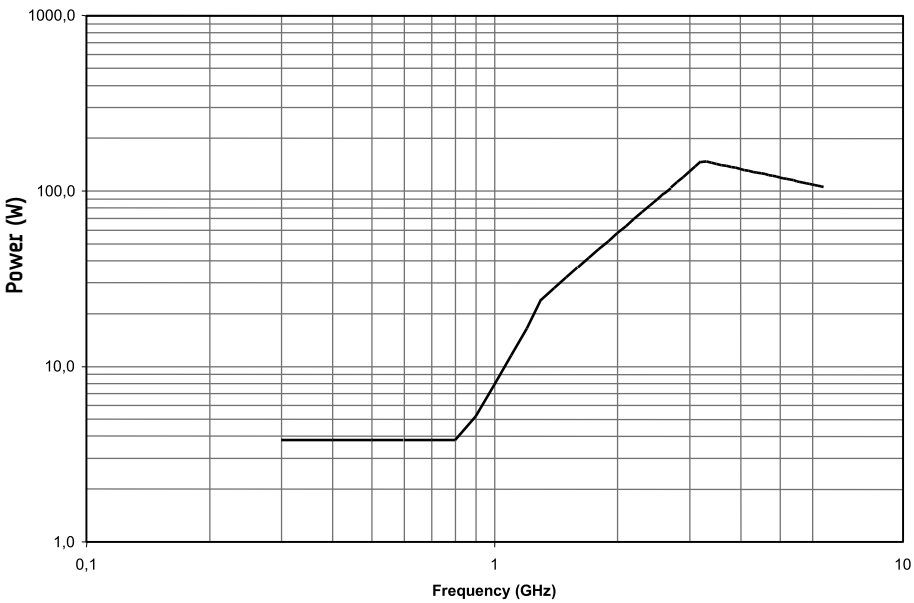


T-Switch, Lay Down, D-Sub, variant 001:

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.