

**SWITCHING CONNECTORS / MOEBIUS
MC-CARD / RP-MCX**

R199 / R299

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MOEBIUS

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Our Most Important Connection is with You.™

Introduction

Radiall offers a complete range of switching connectors that consists of four families:

Microminiature, Moebius, for high life cycle mobile applications

Microminiature, MC-Card, for mobile applications

Reverse polarity MCX

Power, for infrastructure applications



Microminiature Moebius: Designed for life

We chose Moebius in reference to the Möbius strip as the origin of the infinity symbol.

A Möbius band (or strip) is an intriguing shape having a continuous looped surface with ONLY ONE SIDE and ONE EDGE. A strip with a non-orientable surface.

The Moebius interface is designed to be used as an antenna connection for handheld and mobile computing devices. The switching connector provides high RF performance and it is extremely durable and reliable as a snap-on connection.

Microminiature MC-Card

The MC-Card series are micro miniature, 50Ω connectors that feature snap-on mating and a frequency range of -8 GHz.

The MC-Card series was designed by Radiall in the 90's. With the success of the switching version, it made the MC-Card an excellent alternative to MMCX connectors for numerous wireless and telecom applications.

In addition, the MC-Card series offer the similar performance as the MMCX by featuring quick snap-on mating and unmating withstanding a minimum of 5,000 mating cycles.

The globally adopted switching connector version consists in a female edge card receptacle with an integrated switch for SMT assembly. It allows for automatic switching between two RF signal paths. This connector is mainly used for wireless PCMCIA-Cards or GPS devices to switch between the internal antenna and a higher-gain external antenna.

In addition to the standard MC-Card series, Radiall also offers a 3mm dia. MC-Card. With this version, wireless equipment can be differentiated and protected against wrong antenna connections.



APPLICATIONS

Wireless communication (Bluetooth, WLAN, WiFi, WiMax, ZigBee).

Handheld, Notebook, PCMCIA Card, Express Card, PDA, GPS, and any low power wireless equipment requiring transmission re-direction.

Introduction

Reverse Polarity MCX

A range of reverse polarity MCX connectors is available for handheld devices. Additional standard or reverse polarity switching connectors can be developed upon request.

Power switching connectors

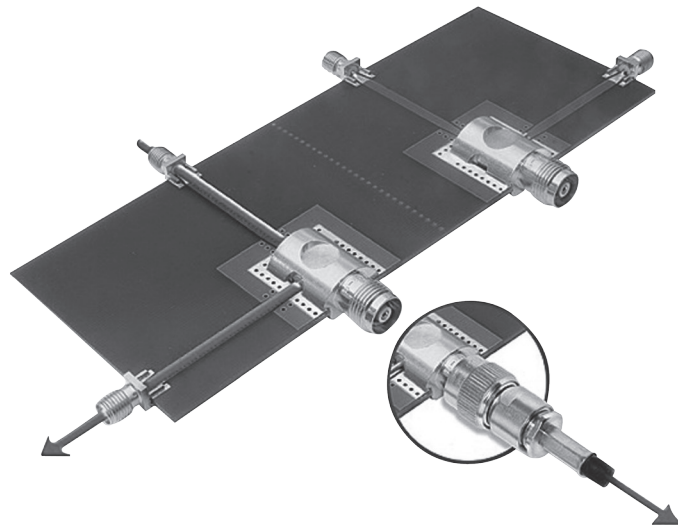
RF power switching connectors are surface/edge mountable. It's a two in one solution replacing the existing standard RF switches by integrating the switch function into a connector. This solution provides a unique means of switching between two RF signal paths. The switch is mechanically activated by mating and unmating the connector.

MAIN ADVANTAGES:

- Reliable
- Increases the density
- Excellent electrical and mechanical performances
- Cost savings
- Available in a right or left version
- Many interfaces available: N, TNC, SMA, QN, QMA and more

MAIN APPLICATIONS

- Telecom
- RF power amplifiers



Characteristics

	Not mated	Mated
Operating temperature range	-40°C to + 110°C	
Rated power	10 W / 900 MHz	
DC Current Withstanding	1 A max	
Frequency range	DC to 6 GHz	
V.S.W.R.	1.20 max DC to 3 GHz 1.50 max 3 to 6 GHz	1.15 max DC to 3 GHz 1.25 max 3 GHz to 6 GHz
Insertion loss	0.15 dB max DC to 2 GHz 0.20 dB max 2 GHz to 3 GHz 0.40 dB max 3 GHz to 6 GHz	0.10 dB max DC to 2 GHz 0.15 dB max 2 GHz to 3 GHz 0.20 dB max 3 GHz to 6 GHz
Isolation loss	- - -	35 dB min DC to 1 GHz 25 dB min 1 GHz to 3 GHz 25 dB min 3 GHz to 6 GHz

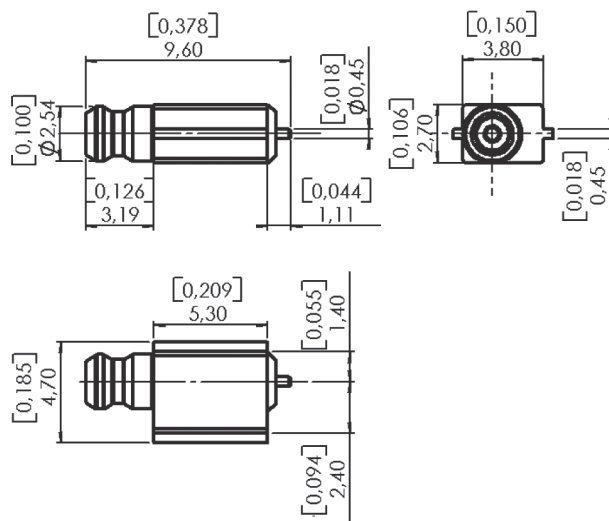
Item	Specification	Conditions
Contact resistance	200 mΩ max	100 mA
Insulation resistance	3000 MΩ min	250 V DC
Withstanding voltage	No flashover or insulation breakdown	250 V rms
Vibration	No discontinuities > 1μs under 100mA	Sinus: 5-500Hz / displacement 0.75 peak / acceleration 10 g duration 2h in each direction Random: 5-1000Hz / displacement 0.75 peak / acceleration 3.3 g duration 1h in each direction 25 dB min 3 GHz to 6 GHz
Shock	No discontinuities > 1μs under 100mA	Acceleration 50 g / duration pulse 11 ms / waveform pulse half sinus / number of shocks 3 per direction
Free fall	Center contact resistance RF measurements No discontinuities > 1 ms under 100mA	NFC 20732 method 1 Test area concrete / fall height 1 m / duration 2*2 falls
Temperature life	Center contact resistance RF measurements	T + 90°C / duration 1000 h / 40% HR
Thermal shock	Center contact resistance RF measurements	T - 40°C to + 90°C Exposure 15mn / transfert time < 10 s / 100 cycles
Damp heat	Center contact resistance RF measurements	40°C / 93% / 21 days
Retention Force Insertion Force - mating Extraction Force - unmating	9N 12N	Initial
Durability	Mating - unmating force Center contact resistance RF measurements	25.000 cycles

MATERIALS AND PLATING

	Material	Plating
Body	Brass	NPGR
Center contact	Brass	NPGR
Outer contact	Brass	NPGR
Insulator	PTFE / nc	
Others parts	Beryllium copper	NPGR

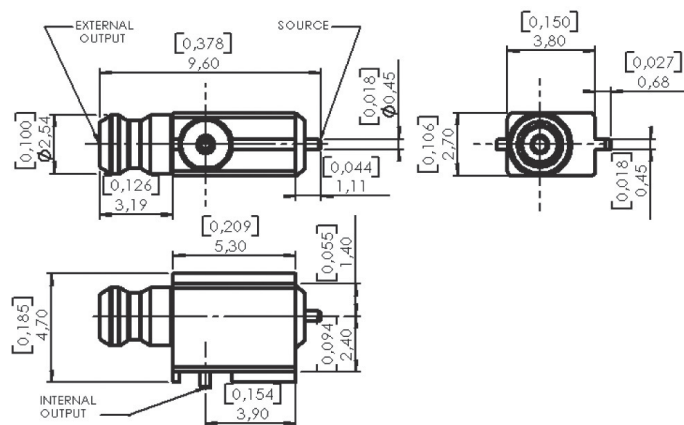
Receptacle and switching connector

RECEPTACLE



Part number	Packaging	RoHS
R199 006 413	100 pieces/reel	yes

SWITCHING CONNECTOR



Part number	Packaging	RoHS
R199 006 813	100 pieces/reel	yes



Plugs, adapter and PCB pattern

STRAIGHT AND RIGHT ANGLE PLUGS

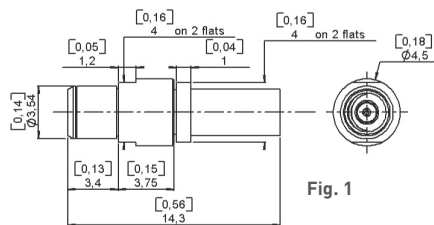


Fig. 1

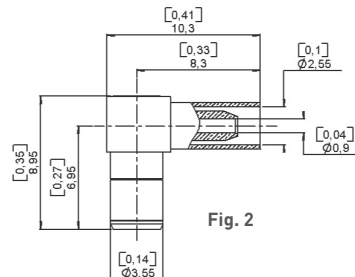


Fig. 2

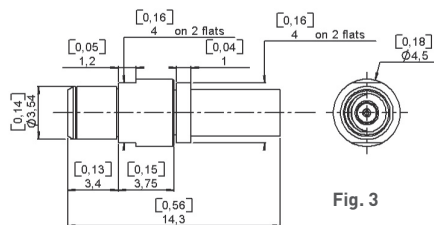


Fig. 3

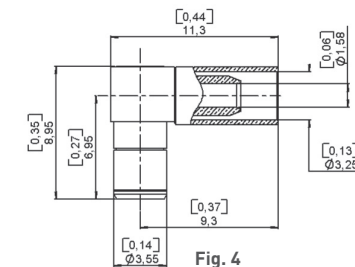
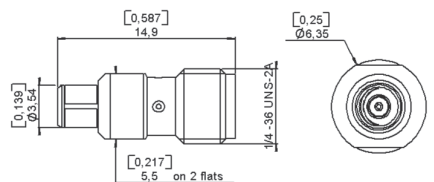


Fig. 4

Cable group	Cable group dia.	Part number	Fig.	Packaging	RoHS
RG178/RG196	2/50/S	R199 006 203	1	100/Box	yes
		R199 006 213	2		
RG174/RG316	2.6/50/S	R199 006 263	3		
		R199 006 273	4		

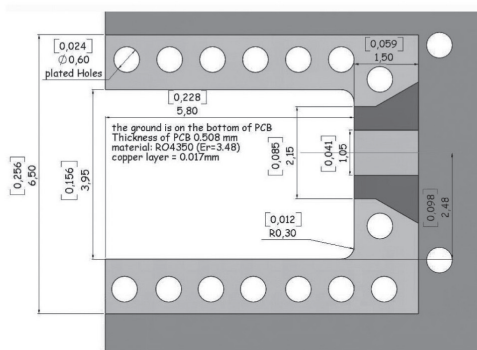
SMA ADAPTER



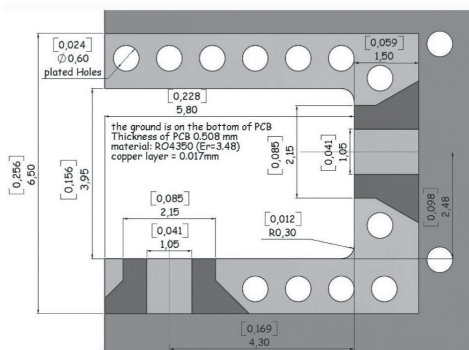
Part number	Packaging	RoHS
R191 857 000	Unit	yes

PCB pattern

P01



Receptacles



Switching Connectors

Characteristics

Test/characteristics	Values/remarks
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ELECTRICAL CHARACTERISTICS

Impedance	50Ω				
Frequency range	Connectors: DC - 8 GHz Switch: DC - 3 GHz				
Typical V.S.W.R. • Straight models 2/50 cable • Right angle models 2/50 cable 2.6/50 cable	1	2.5	4	6	8
	1.07	1.15	1.16	1.17	1.25
	1.08	1.17	1.22	1.26	1.30
Insertion loss (dB) • Straight connectors • Right angle connectors	1.05	1.08	1.10	1.13	1.12
	0.04	0.08	0.11	0.15	0.15
	0.05	0.10	0.15	0.20	0.25
RF leakage (dB max)	-65 dB max at 8 GHz				
Insulation resistance	5000 MΩ min				
Contact resistance • Center contact • Outer contact	1.5 mΩ				
	0.2 mΩ				
Working voltage in V.R.M.S. • at sea level (at 21000 m)	170				
Dielectric withstanding voltage in V.R.M.S. • at sea level	500				
RF testing voltage sea level in V.R.M.S.	500				

MECHANICAL CHARACTERISTICS

Durability	5000 matings
Force to engage and disengage	6.2 N
Force to disengage	8.8 N
Cable retention force • 2/50 cable • 2.6/50 cable	58 N
	110 N
Center contact retention force	slide-on

ENVIRONMENTAL CHARACTERISTICS

Temperature range • switches • others	-40°C / +110°C -25°C / +125°C
Thermal cycling test	MIL STD 202, method 107, condition B
High temperature endurance	MIL STD 202, method 108
Corrosion (salt spray)	MIL STD 202, method 101, condition B
Vibration	MIL STD 202, method 204, condition B
Shock	MIL STD 202, method 213, condition G
Moisture resistance	MIL STD 202, method 106
Hermeticity	MIL STD 202, method 112, condition C Vacuum 10 ⁻⁶ Hgmm (Torr) Leakage rate 10 ⁻⁶ atm/cm ³ /s
Barometric pressure	Pressure test: 3.5 bars; duration: 2 mn; Temperature: 15°C to 25 °C

MATERIALS

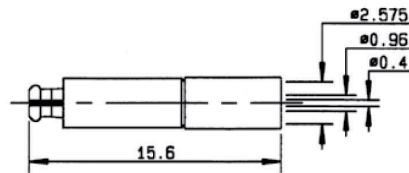
Bodies	Brass	
Center contact	male	Brass
	female	Bronze or heat treated Beryllium following QQ-C-530
Insulator	cable connectors	PTFE
	switches	Polyether ethercetone 30% GF
Gasket	Silicon rubber	

PLATING

Bodies	cable connectors edge card receptacles switches	SMT receptacles	Nickel or BBR
			Gold
			Gold
			Gold
Center contacts			Gold

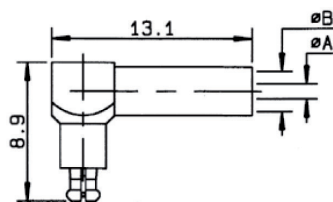
Plugs and SMT receptacle

STRAIGHT PLUGS



Cable group	Cable group dia.	Part number	Captive center contact	Finish	Note	Packaging
RG178/RG196	2/50/S	R199 005 200	no	nickel	crimp type	100 pieces

RIGHT ANGLE PLUGS



Cable group	Cable group dia.	Part number	Dimensions (mm)	Captive center contact	Finish	Note	Packaging
RG178/RG196	2/50/S	R199 005 240	2.57 0.96	yes	nickel	crimp type	100 pieces
RG174/RG316	2.6/50/S	R199 005 250	3.25 1.63				

SMT RECEPTACLE

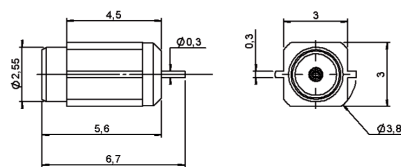
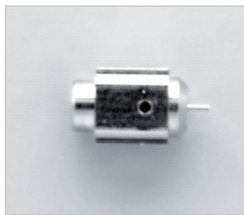


Fig. 1

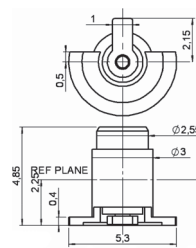


Fig. 2

Part number	Fig.	Captive center contact	Assembly instructions	PCB pattern	Finish	Packaging
R199 005 800	1	yes	M01	P02	gold	400 pieces/reel
R199 005 820	2					100 piece/reel

SMT Switches and adapters

SMT SWITCHES

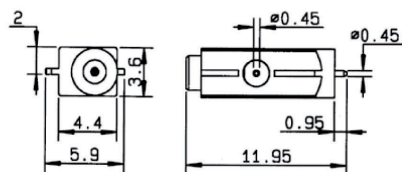


Fig. 1

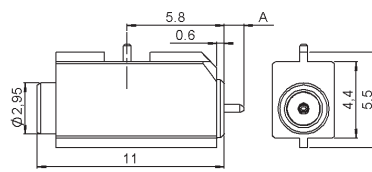


Fig. 2

Part number	Fig	Dimension A (mm)	Captive center contact	Assembly instructions	PCB pattern	Finish	Packaging	Note
R199 005 890	1			M01	P01	Gold	500 pieces/reel	
R299 794 800*	2	0.93	yes					MC-CARD 3mm dia.

*Specific 3 mm interface = not compatible with standard interface plug

Electrical diagram on "M01"

BETWEEN SERIES ADAPTERS

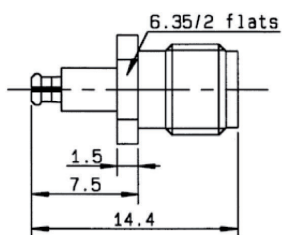


Fig. 1

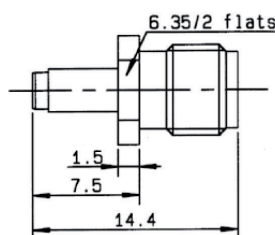
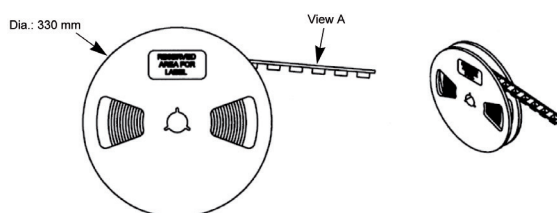
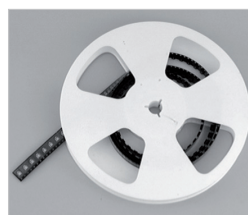


Fig. 2

Part number	Fig.	Series	Body and finish
R191 366 071	1	SMA female / MC CARD male	passivated stainless steel
R191 366 091	2	SMA female / MC CARD female	

Receptacle packaging



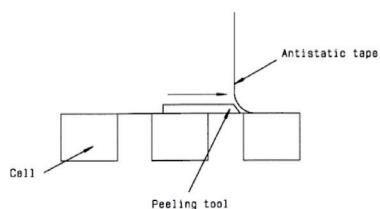
ACCORDING TO IEC 286-3 STANDARD

MATERIALS

Reel: polyester

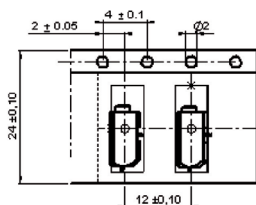
Carrier tape: antistatic PETG (polyester)

Cover tape: polyester

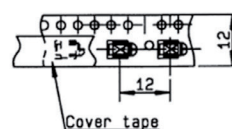


VIEW A

Part number
R199 005 890
R299 794 800



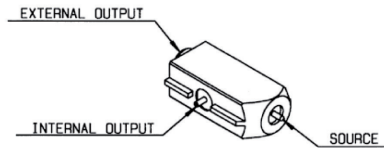
Part number
R199 005 800



Assembly instructions

M01

ELECTRICAL DIAGRAM



Part number	Step 1	Step 2
R199 005 890 R299 794 800	<p>UNMATED CONNECTOR</p>	<p>MATED WITH MC CARD PLUG</p>

VIDEO SHADOW AND ASPIRATION AREA

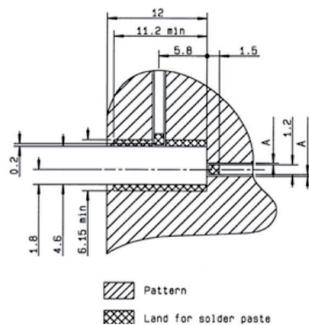
Part number	Video shadow of receptacle	Aspiration area
R199 005 800		
R199 005 890 R299 794 800		

*2.95 for: R299 795 830 - R299 794 800

PCB pattern

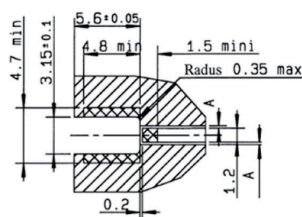
P01

Part number
R199 005 890 R299 794 800



P02

Part number
R199 005 800

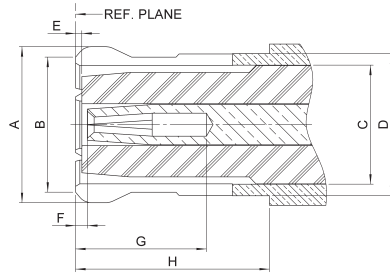


PCB thickness (mm)	Coplanar line A (mm)
0.8	0.183
1.0	0.190
1.2	0.195
1.6	0.200

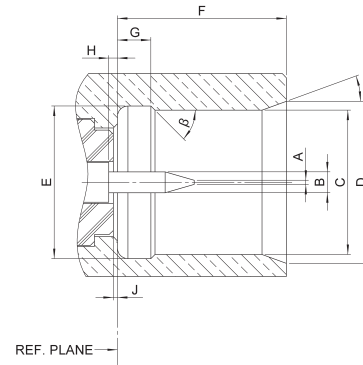
Interface

RP-MCX

PLUG



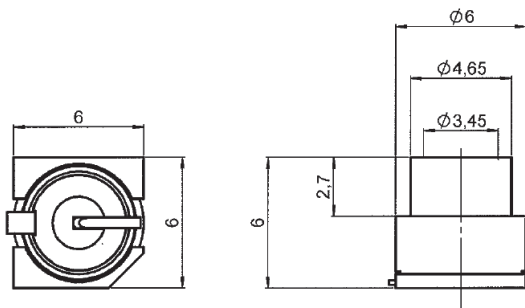
JACK



Letter	mm		inch	
	min.	max.	min.	max.
A DIA		3.80		.150
B DIA		3.60		.142
C DIA		3.00		.118
D DIA		3.40		.134
E	0		0	.004
F	0		0	.008
G	2.60		.110	
H	4.15		.163	

Letter	mm		inch	
	min.	max.	min.	max.
A DIA	3.15	3.20	.124	.126
B DIA	2.74	2.84	.108	.112
C DIA	0.52	0.60	.0205	.0235
D DIA	0		0	
E DIA	1.14	1.40	.045	.055
F	0.36	0.41	.014	.016
G	3.53	3.68	.139	.145
H			0	
J			0	
a	18°	22°	18°	22°
b	43°	47°	43°	47°

SMT switches



Part number	Packaging
R299 137 800	Reel of 200
R299 137 801	Reel of 900

RF POWER SWITCHING CONNECTORS

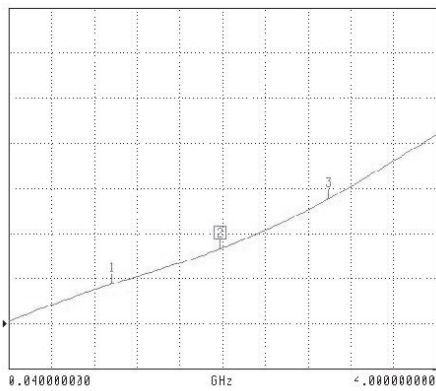
QMA RF power switching connectors

Test/characteristics	Values/remarks
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ELECTRICAL CHARACTERISTICS

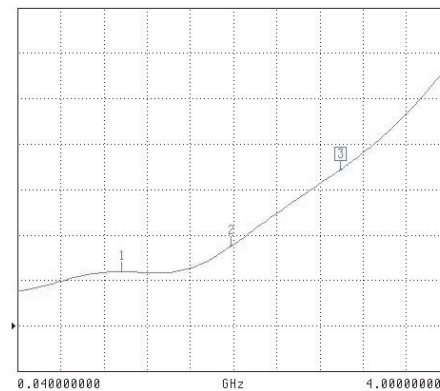
	QMA
Impedance	50Ω
Frequency range	DC - 3 GHz
Typical V.S.W.R.	1.1 + 0.1000 x F (GHz) Maxi
Isolation at • DC to 1 GHz • 1 to 2 GHz • 2 to 3 GHz	-47 dB typical -43 dB typical -40 dB typical
Insertion Loss at • DC to 1 GHz • 1 to 2 GHz • 2 to 3 GHz	0.1 dB maxi 0.15 dB maxi 0.2 dB maxi
RF leakage	NA
Voltage rating	300 Veff maxi
Dielectric withstanding voltage	500 Veff mini
Insulation resistance	5000 MΩ mini
Power withstanding	110 W (at 2 GHz)

VSWR direct line



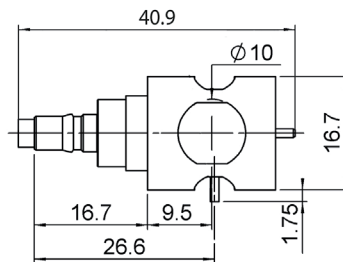
m1	freq=1.0 GHz	VSWR = 1.087
m2	freq=2.0 GHz	VSWR = 1.165
m3	freq=3.0 GHz	VSWR = 1.275

VSWR switched line



m1	freq=1.0 GHz	VSWR = 1.048
m2	freq=2.0 GHz	VSWR = 1.070
m3	freq=3.0 GHz	VSWR = 1.137

QMA TYPE



Part number	Type
R123 422 801	right

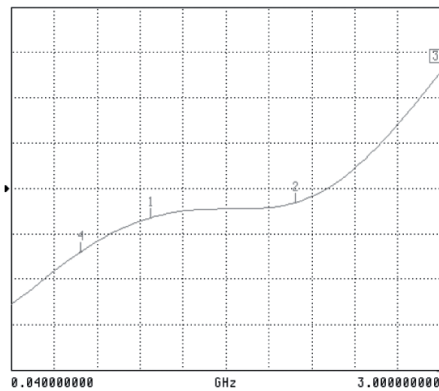
N RF power switching connectors

Test/characteristics	Values/remarks
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ELECTRICAL CHARACTERISTICS

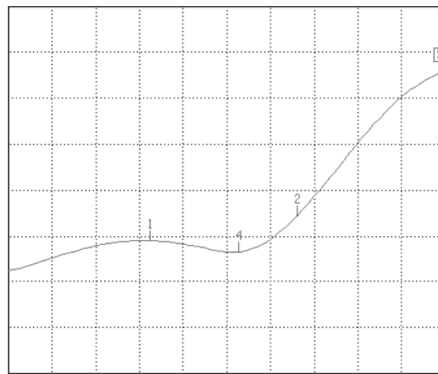
	N
Impedance	50Ω
Frequency range	DC - 3 GHz
Typical V.S.W.R.	1.1 + 0.1000 x F [GHz] Maxi
Isolation at • DC to 1 GHz • 1 to 2 GHz • 2 to 3 GHz	-47 dB typical -43 dB typical -40 dB typical
Insertion Loss at • DC to 1 GHz • 1 to 2 GHz • 2 to 3 GHz	0.1 dB maxi 0.15 dB maxi 0.2 dB maxi
RF leakage	NA
Voltage rating	300 Veff maxi
Dielectric withstanding voltage	500 Veff mini
Insulation resistance	5000 MΩ mini
Power withstanding	100 W (at 0.9 GHz and 1.8 GHz)

VSWR direct line



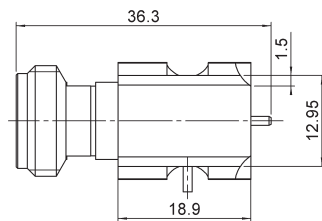
m1	freq=1.0 GHz	VSWR = 1.084
m2	freq=2.0 GHz	VSWR= 1.097
m3	freq=3.0 GHz	VSWR= 1.212
m4	freq=0.52 GHz	VSWR= 1.054

VSWR switched line



m1	freq=1.0 GHz	VSWR = 1.027
m2	freq=2.0 GHz	VSWR = 1.043
m3	freq=3.0 GHz	VSWR = 1.137
m4	freq=1.6 GHz	VSWR = 1.020

N TYPE



Part number	Type
R161 428 223	left
R161 428 233	right

RF POWER SWITCHING CONNECTORS

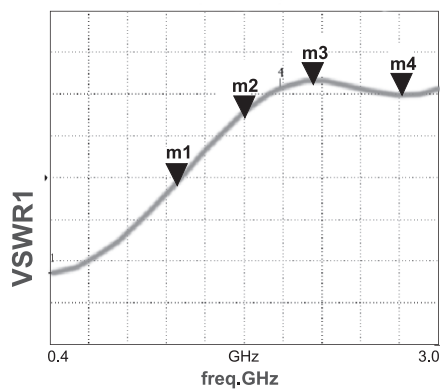
SMA RF power switching connectors

Test/characteristics	Values/remarks
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ELECTRICAL CHARACTERISTICS

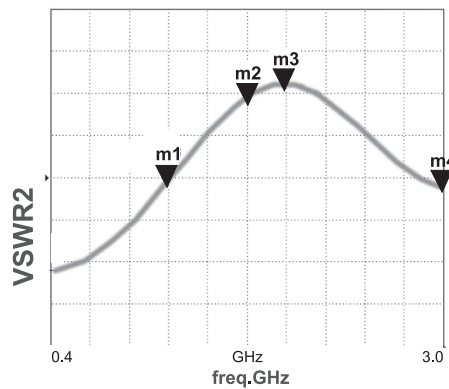
Test/characteristics	Values/remarks
	SMA
Impedance	50Ω
Frequency range	DC - 3 GHz
Typical V.S.W.R.	1.1 + 0.1000 x F (GHz) Maxi
Isolation at • DC to 1 GHz • 1 to 2 GHz • 2 to 3 GHz	-47 dB typical -43 dB typical -40 dB typical
Insertion Loss at • DC to 1 GHz • 1 to 2 GHz • 2 to 3 GHz	0.1 dB maxi 0.15 dB maxi 0.2 dB maxi
RF leakage	NA
Voltage rating	300 Veff maxi
Dielectric withstanding voltage	500 Veff mini
Insulation resistance	5000 MΩ mini
Power withstanding	80 W (at 0.9 GHz) 50 W (at 1.8 GHz)

VSWR direct line



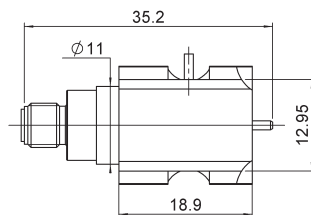
m1 freq=1.0 GHz VSWR=1.125
 m2 freq=1.52 GHz VSWR=1.193
 m3 freq=2.04 GHz VSWR=1.223
 m4 freq=2.72 GHz VSWR=1.209

VSWR switched line



m1 freq=0.92 GHz VSWR=1.088
 m2 freq=1.52 GHz VSWR=1.149
 m3 freq=1.8 GHz VSWR=1.158
 m4 freq=3.0 GHz VSWR=1.084

SMA TYPE



Part number	Type
R124 422 001	right

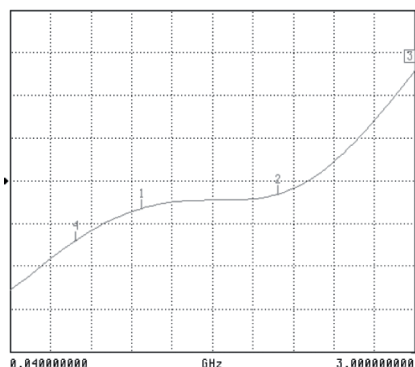
QN RF power switching connectors

Test/characteristics	Values/remarks
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ELECTRICAL CHARACTERISTICS

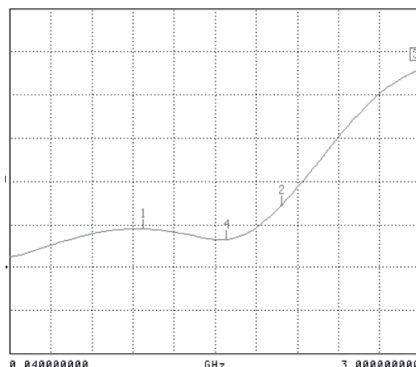
Test/characteristics	Values/remarks
Impedance	QN 50Ω
Frequency range	DC - 3 GHz
Typical V.S.W.R.	1.1 + 0.09 x F (GHz) Maxi
Isolation at • DC to 1 GHz • 1 to 2 GHz • 2 to 3 GHz	-47 dB typical -43 dB typical -40 dB typical
Insertion Loss at • DC to 1 GHz • 1 to 2 GHz • 2 to 3 GHz	0.1 dB maxi 0.15 dB maxi 0.2 dB maxi
RF leakage	NA
Voltage rating	300 Veff maxi
Dielectric withstanding voltage	500 Veff mini
Insulation resistance	5000 MΩ mini
Power withstanding	110 W (at 2 GHz)

VSWR direct line



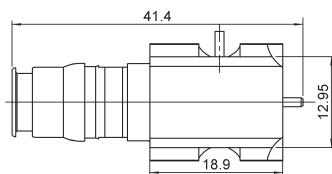
m1	freq=1.0 GHz	VSWR = 1.084
m2	freq=2.0 GHz	VSWR = 1.097
m3	freq=3.0 GHz	VSWR = 1.212
m4	freq=0.52 GHz	VSWR = 1.054

VSWR switched line



m1	freq=1.0 GHz	VSWR = 1.027
m2	freq=2.0 GHz	VSWR = 1.043
m3	freq=3.0 GHz	VSWR = 1.137
m4	freq=1.6 GHz	VSWR = 1.020

QN TYPE



Part number	Type
R164 428 823	left
R164 428 833	right

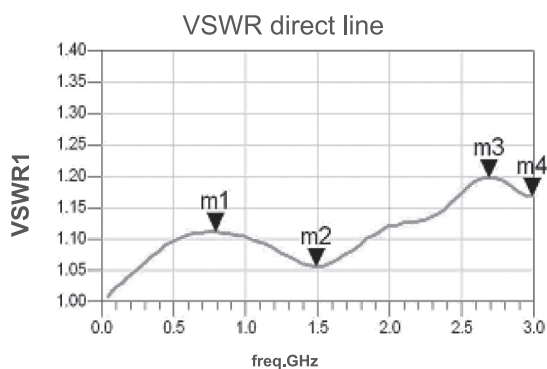
RF POWER SWITCHING CONNECTORS

TNC RF power switching connectors

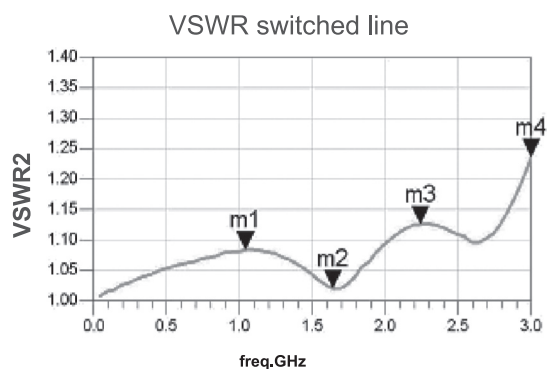
Test/characteristics	Values/remarks
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ELECTRICAL CHARACTERISTICS

Impedance	50Ω
Frequency range	DC - 3 GHz
Isolation at • DC to 1 GHz • 1 to 2 GHz • 2 to 3 GHz	-47 dB typical -43 dB typical -40 dB typical
Insertion Loss at • DC to 1 GHz • 1 to 2 GHz • 2 to 3 GHz	0.1 \sqrt{f} (GHz) dB maxi 0.15 dB maxi 0.2 dB maxi
Voltage rating	300 Veff maxi
Power withstanding	80 W (at 0.9 GHz) 50 W (at 1.9 GHz)

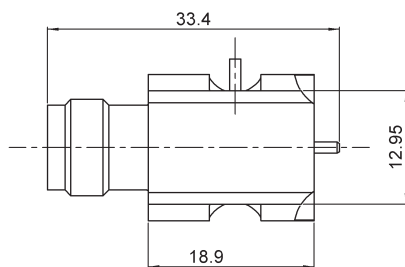


m1 freq=790.0 MHz VSWR1=1.112
m2 freq=1.490 GHz VSWR1=1.056
m3 freq=2.690 GHz VSWR1=1.197
m4 freq=2.990 GHz VSWR1=1.169



m1 freq=1.040 GHz VSWR2=1.084
m2 freq=1.640 GHz VSWR2=1.021
m3 freq=2.240 GHz VSWR2=1.126
m4 freq=3.000 GHz VSWR2=1.236

TNC TYPE



Part number	Type
R143 422 947	left
R143 422 957	right