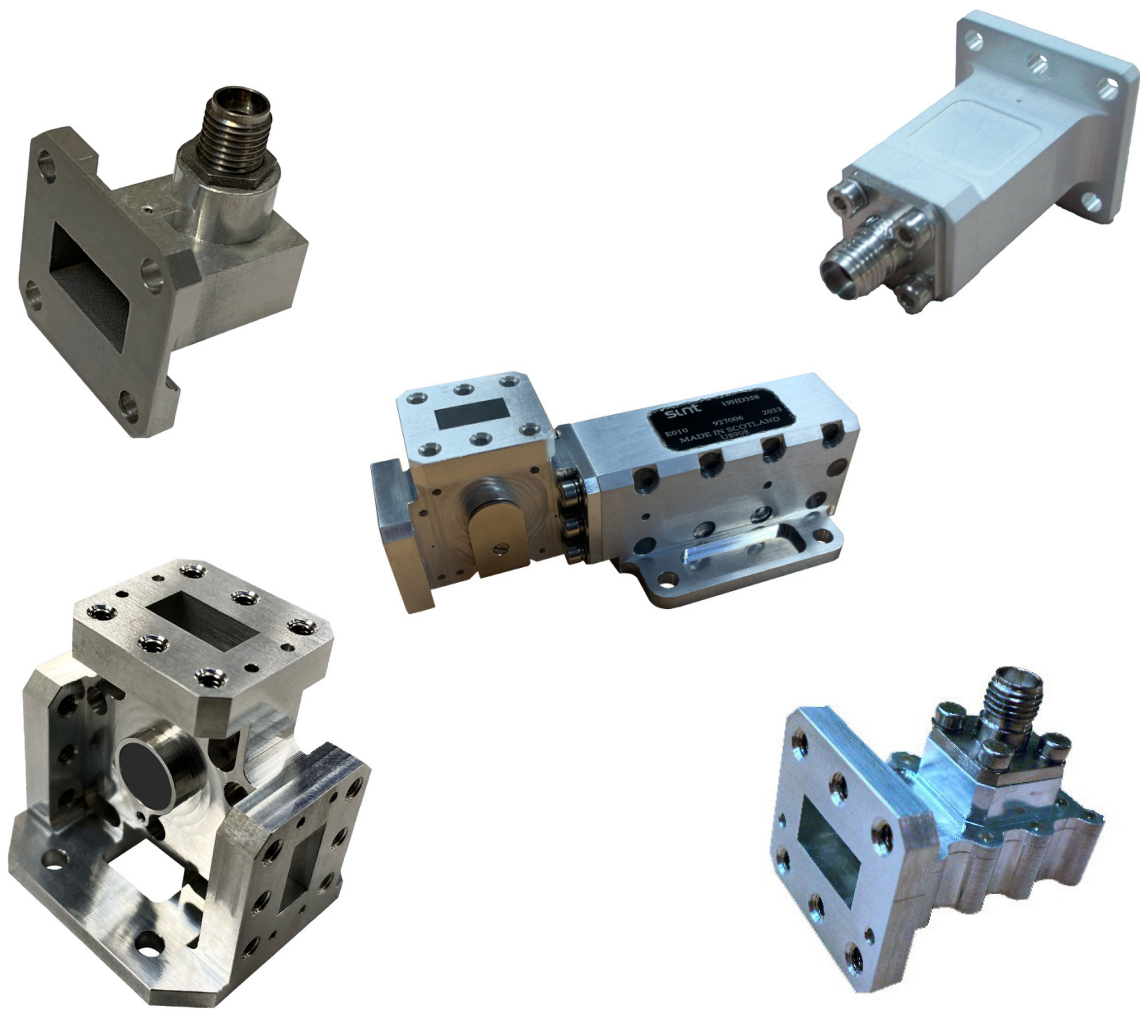


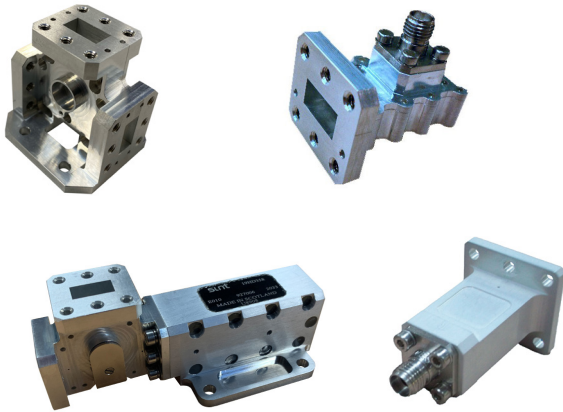
K-BAND WAVEGUIDE COMPONENTS

Space Qualified WR51 Isolators, Circulators, Transitions and Loads



K-Band Waveguide Components

WR51 passive components for Space applications



Smiths Interconnect's broad range of WR51 K-Band passive components are specifically designed for satellite communication payloads in GEO/MEO and LEO orbits.

The devices are tuneless and optimised to operate over broad assigned bands. Qualification for spacecraft use has been completed for each product using our comprehensive in-house test facilities and comprises sine and random vibration, mechanical shock and where appropriate RF power TVAC, average power and multipaction, and critical power testing. Summary and qualification data reports are available to prospective customers. Aluminum housings are supplied with a standard clear passivation coating but can be supplied with low emissivity black paint finish if desired.

In addition to waveguide isolators, circulators, terminations, transitions, hybrids and integrated multi-function assemblies operating in frequency ranges from S to V-band, Smiths Interconnect designs and manufactures coaxial, stripline and microstrip space qualified isolators, circulators and terminations operating from UHF to Ka-band.

All products are designed for specific payload applications and are produced, qualified and screened depending on their power and mechanical environments.

K-Band components
for satellite
communication
payloads in GEO/MEO
and LEO orbits.

Features & Benefits

- Broad range of space qualified passive products available with qualification data
- Broadband requiring fewer part options to address the allocated frequency band
- Temperature stable, broadband and multipaction free waveguide isolators and circulators and terminations
- Mechanical variants (circulation, flange detail etc) available on request
- In-house facilities for average, multipaction, corona discharge power, and mechanical-shock and sine/random vibration environmental stress screening testing
- Sample data and test reports available to assist the design and qualification process

Compact In-line 2.92mm to WR51 Transition

19TM107

Specifications



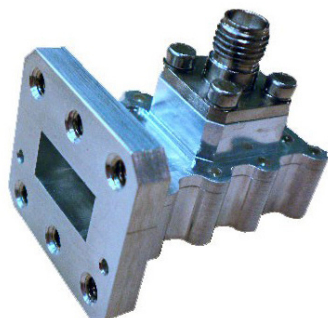
Parameter	Performance
Non-operating Temperature	-75 to +110C
Qualification/Acceptance Temperature	-65 to +100C
Operating Frequency	17.3 to 21.0GHz
Insertion Loss	0.15dB max
Return Loss	26dB min
Power Handling	2W CW
Radiated Emissions	80dBi min
Mass	15g nom [0.53 oz]

The 19TM107 is a compact in-line 2.92mm to WR51 transition. The internal structure employs a shorted pin to provide a zero Ohm DC bleed path. The transition was designed to be used in generic applications aboard GEO/MEO payloads and has been qualified in-house by Smiths Interconnect and supplied for spaceflights. Key design performance goals were electrical performance over a wide operating bandwidth and operating temperature range. Quoted performance levels are guaranteed under worst case operating conditions. The transition has been used in filter, INET and power combiners.

Orthogonal High Power SMA to WR51 Transition

19TM106

Specifications



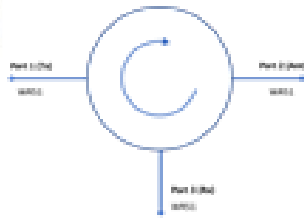
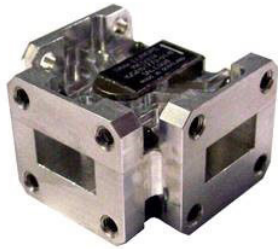
Parameter	Performance
Non-operating Temperature	-55 to +125C
Qualification	-30 to +125C
Acceptance	-25 to +120C
Operating Frequency	17.7-20.2 GHz
Insertion Loss	0.15dB max
Return Loss	23dB min
Power Handling	20W CW [PFM]
Critical Power (Corona)	20W CW [PFM]
Radiated Emissions	80dBi min
Connector	SMA, zero Ohms to ground
Mass	23g nom

The 19TM106 is a compact orthogonal SMA to WR51 transition. The internal structure employs a shorted pin to provide a zero Ohm DC bleed path. The transition was designed to be used in generic applications aboard GEO/MEO payloads and has been qualified in house by Smiths Interconnect and supplied for spaceflights. Key design performance goals were electrical performance over a wide operating bandwidth and a wide operating temperature range. Quoted performance levels are guaranteed under worst case operating conditions. The transition has been used in filter, INET and power combiners.

Low Power WR51 Circulator

19CD328

Specifications



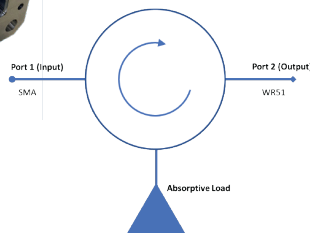
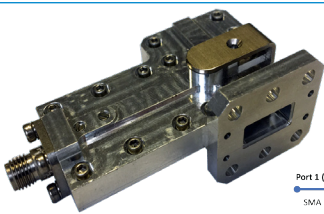
Parameter	Performance
Non-operating Temperature	-40 to +105C
Qualification Temperature	-35 to +80C
Acceptance Temperature	-30 to +75C
Operating Frequency	18.0 to 20.0GHz
Insertion Loss	0.15dB max
Return Loss	23dB min
Isolation [if supplied as an isolator]	23dB min
Power Handling	2W CW
Radiated Emissions	80dBi min
Mass	38g nom [1.34 oz]

The 19CD328 is a low power circulator designed specifically for waveguide demultiplexers (channel droppers) and is arranged mechanically so that these devices can be cascaded to suit the number of channels required. This circulator used in conjunction with a compact termination allows maximum flexibility to create an isolator with the loaded port selected to suit the designer's mechanical constraints. Quoted performance levels are guaranteed under worst case operating conditions. The device can be supplied with flange details to suit specific user requirements

SMA to WR51 Isolating Transition (iso-adapter)

19HD353

Specifications



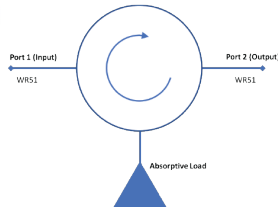
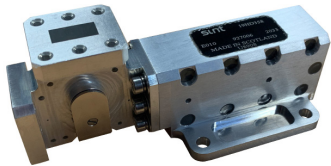
Parameter	Performance
Non-operating Temperature	-40 to +85C
Qualification Temperature	-30 to +80C
Acceptance Temperature	-25 to +75C
Operating Frequency	17.8 to 20.2GHz
Insertion Loss	0.30dB max
Return Loss	23dB min
Isolation	23dB min
Power Handling	2W CW
Radiated Emissions	80dBi min
Mass	38g nom [1.34 oz]

The 19HD353 is a compact isolated transition or iso-adapter. The part features a 2.92mm cconnector where the centre contact is shorted to ground to provide a zero Ohm DC bleed path. The isolation is achieved using a waveguide isolator to provide minimum insertion loss. The transition was designed to be used in the filter system applications aboard GEO/MEO payloads and has been qualified in house by Smiths Interconnect and supplied for spaceflight. The key design performance goal was superior electrical performance over a wide operating bandwidth. Quoted performance levels are guaranteed under worst case operating conditions. The 19HD353 is available as the 19HD352 with the opposite direction of circulation.

Broadband, Medium Power WR51 Isolator

19HD358

Specifications



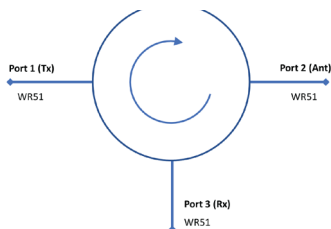
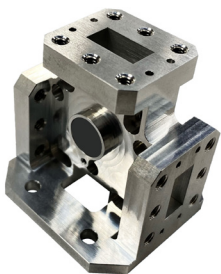
Parameter	Performance
Non-operating Temperature	-54 to +100C
Qualification Temperature	-30 to +85C
Operating Frequency	17.3 to 21.2GHz
Insertion Loss	0.20dB max
Return Loss	21dB min
Isolation	21dB min
Power Handling	20W CW
Multipaction	80W peak min
Radiated Emissions	70dBi min
Mass	166g nom [8.86 oz]

The 19HD358 was designed to be used on the output of a TWTA employed in the transmission network of a GEO/MEO payload and following qualification by Smiths Interconnect including multipaction, has been supplied for spaceflight. Key design performance goals were power handling, thermal stability and operating bandwidth with quoted performance levels being that guaranteed under worst case operating conditions. The isolator uses a variation of the junction employed in the 19HD359 and employs a load based on the 19TE111. Power handling in this device was limited by the demands of the launch customers.

High Power WR51 Circulator

19HD359

Specifications



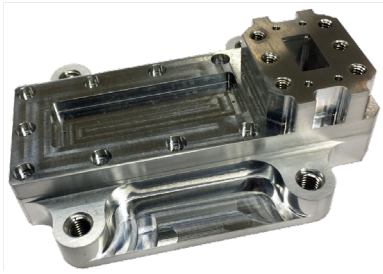
Parameter	Performance
Non-operating Acceptance	-54 to +100C
Operating Frequency	-25 to +120C
Insertion Loss	17.7-20.2GHz
Return Loss	0.20dB max
Power Handling	20dB min
Multipaction	183W CW [PFM]
Radiated Emissions	580W peak min
Mass	70dBi min
	62g nom [2.19 oz]

The 19CD359 was designed to be used in the transmission network of a GEO/MEO payload. Smiths Interconnect has qualified the device including multipaction and the circulator has been supplied for spaceflight. Key design performance goals were power handling, thermal stability and operating bandwidth with quoted performance levels guaranteed under worst case operating conditions. The circulator was designed to be used in conjunction with a remote WR19 termination (such as the 19TE110). The mechanical mounting arrangement, direction of circulation and flange details can be adapted to meet specific customer requirements.

High Power WR51 Load

19TE110

Specifications



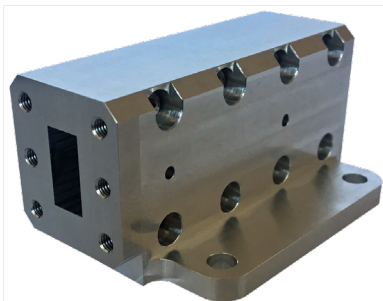
Parameter	Performance
Non-operating Temperature	-45 to +125C
Qualification Temperature	-65 to +100C
Acceptance Temperature	-25 to +120C
Operating Frequency	17.3 to 22.0GHz
Return Loss	26dB min
Power Handling	200W CW
Radiated Emissions	80dBi min
Multipaction	400W pk min.
Mass	120g nom [4.23 oz]

The 19TE110 was designed to be used in the transmission network of a GEO/MEO payload and has qualified, including multipaction, and has been supplied for spaceflight. Key design performance goals were power handling, thermal stability and operating bandwidth with quoted performance levels guaranteed under worst case operating conditions. The circulator was designed to be used in conjunction with a remote WR51 termination (such as the 19CD359). The mechanical mounting arrangements can be customized to suit specific cold plate mounting pitches. Please note the power handling of this device is dependent on the thermal capacity on the cold plate on which it is mounted.

High Power WR51 Load

19TE111

Specifications



Parameter	Performance
Non-operating Temperature	-45 to +125C
Qualification Temperature	-30 to +125C
Acceptance Temperature	-25 to +120C
Operating Frequency	17.3 to 22.0GHz
Return Loss	26dB min
Power Handling	180W CW
Radiated Emissions	80dBi min
Multipaction	400W pk min.
Mass	110g nom [4.23 oz]

The 19TE111 was designed to be used in the transmission network of a GEO/MEO payload. It has been qualified, including multipaction, and has been supplied for spaceflight. Key design performance goals were power handling, thermal stability and operating bandwidth with quoted performance levels guaranteed under worst case operating conditions. The termination was designed to be used in conjunction with a WR51 junction circulator. The mechanical mounting arrangements can be customized to suit specific cold plate mounting pitches. Please note the power handling of this device is dependent on the thermal capacity of the cold plate on which it is mounted.

Full Band Low Power WR51 Termination

19TE109

Specifications



Parameter	Performance
Non-operating Temperature	-45 to +125C
Qualification Temperature	-35 to +125C
Acceptance Temperature	-30 to +125C
Operating Frequency	15.0 to 22.0GHz
Return Loss	23dB min
Power Handling	2W CW
Radiated Emissions	80dBi min
Mass	7g nom [0.25 oz]

The 19TE109 was designed for generic applications aboard GEO/MEO/LEO payloads and has been qualified by Smiths Interconnect and supplied for spaceflight. Key design performance goals were electrical performance over a wide operating bandwidth. Quoted performance levels are guaranteed under worst case operating conditions. The termination was designed to be used in conjunction with WR51 low power junction circulators, on waveguide switch assemblies and to terminate 3dB hybrids.

Manufacturing process, screening and qualification capabilities

Smiths Interconnect has a wide array of capabilities that expand through routine investment as the demands of the Space industry evolve. For further details please contact your local Sales Representative.

Design & Analysis	RF & Microwave Testing	Inspection & Quality Assurance
RF modeling and simulation	Low power RF testing (VNA, 2 & 4 port) to 110 GHz	Dynamic 3D X-ray with color tomography
Mechanical modeling and drafting		XRF
Magnetic finite element analysis	High power RF testing (TVAC, Corona & Multipaction) in assigned bands	X-section
Static and dynamic thermal analysis		Automated bond pull test
Reliability analysis (FMECA, worst case)	EMC reverberation chamber (1-40GHz)	Visual inspection to 250x
	Spectrum Analysis to 50 GHz	RF connector measurement
Operational Support	Magnet charging & magnetic moment measurement	Automated epoxy mixing
CNC and ceramic grinding	Continuous S-parameter test and data capture (as a function of temperature), 14 channels to 30 GHz	Climatic & Environmental
Automated co-ordinate measurement	RF burn-in	Temperature cycling & storage - 8 systems
Laser etching		Humidity chambers
Plasma cleaning	DC Electrical	Thermal vacuum - 3 systems
3D wire erosion	Insulation testing	SRS/Mechanical shock
Force gauge & die shear testing	Signal measurement	Dry heat/bake
Wire & ribbon bonding	Dielectric withstanding voltage measurements	Vibration (random & sine) -3 systems
Cobotic assembly	Continuity testing	
PCB routing	DC burn-in	
VHT paint and RF absorber application		
Prototypelcircuit photo etching		

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