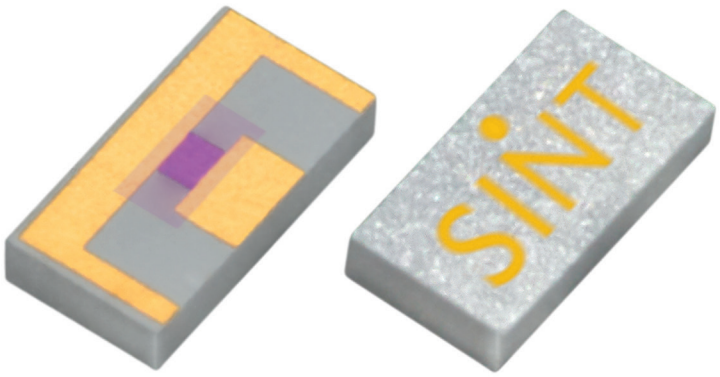
smiths interconnect

RF Microwave Components, Filters & Cable Assemblies for the 5G Market

High Frequency Surface Mountable Chip Terminations

SMT CHIP TERMINATION, DC-67 GHZ



The CTX SMT series of chip terminations offer a unique combination of high power and high frequency in a small package

Smiths Interconnect's High Frequency SMT Chip Terminations series is designed to offer excellent broadband performance up to 67GHz, providing optimized return loss across the frequency band.

The patented layout provides substantial power handling in a small lightweight package, up to 1 Watt CW of input power, thanks to the added thermal paths this product provides.

Several qualification tests have been completed to ensure long term reliability in critical applications, including thermal shock, burn, RF over temperature, low temperature operation, high temperature exposure, peak power, and solder mount integrity. The results have confirmed that CTX SMT design and RF performance are ideal to support RF and microwave applications in Defence, Space, Aerospace and 5G broadband demanding market segments.

Features and Benefits

- Frequency rating DC to 67 GHz with optimized return loss
- VSWR performance 1.25:1 Typical (1.50:1 Maximum)
- Power rating up to 1 Watts CW in a small 0603 package
- Qualification testing per MIL-PRF-55342
- Total thin film technology offering tighter mechanical tolerances for better control of the RF performance.
- Environmentally-friendly materials compliant to RoHS standards
- High volume production capability supporting customers' quick ramp up program needs

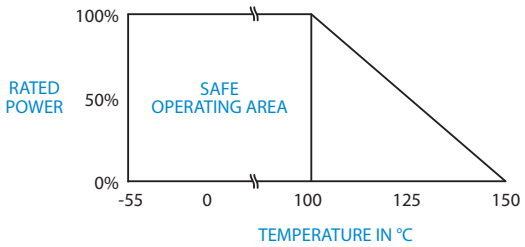
Applications

- Amplifier Circuits
- Isolators
- Transmit/Receive Modules
- Up/Down Converters
- Instrumentation
- Satellite Communications
- Radar

Technical Characteristics

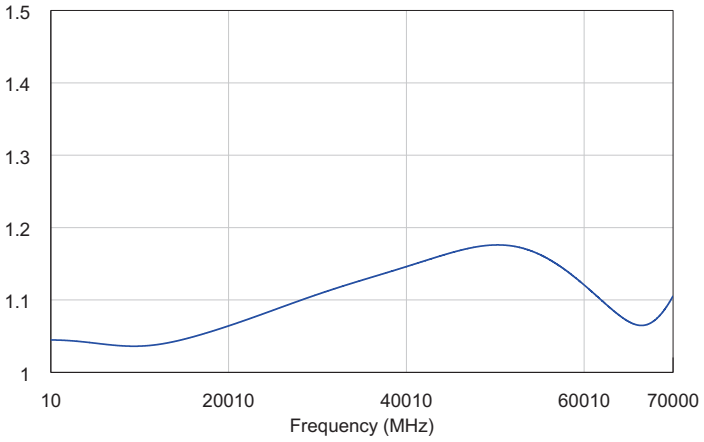
Mounting Configuration Options	CTH0603ALN1SMTF
Electrical	
Nominal Impedance	50 ohms ± 10%
Frequency Range	DC-67 GHz
Input Power CW	1 Watt
Peak Power	10X CW power based on 1 µS pulse width @ 1% Duty Cycle
VSWR	1.25:1 Typical; 1.50:1 Max Note: When properly matched in a 50 ohm system using Smiths Interconnect Suggested Mounting Guidelines.
Environmental	
Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Temperature Coefficient	± 200 PPM/°C Max
Moisture Sensitivity Level	MSL 1 - Unlimited
Mechanical	
Substrate Material	Aluminum Nitride
Resistive Film	Thin Film, Tantalum Nitride
Terminal Material	Thin Film, Gold over Nickel
Ground Bars	Thin Film, Gold over Nickel
Protective Coating	Silicon Nitride
Marking	
Unit Marking	SINT & Orientation Dot
Quality Assurance	
	Sample visual and mechanical inspection - 1.0 AQL per mechanical drawing requirements. Periodic electrical inspection performed for commerical grade products. High reliability tested products are available per MIL-PRF-55342.
Packaging	
Standard Packaging	Tape and Reel or Waffle Pack

Power Derating Curve



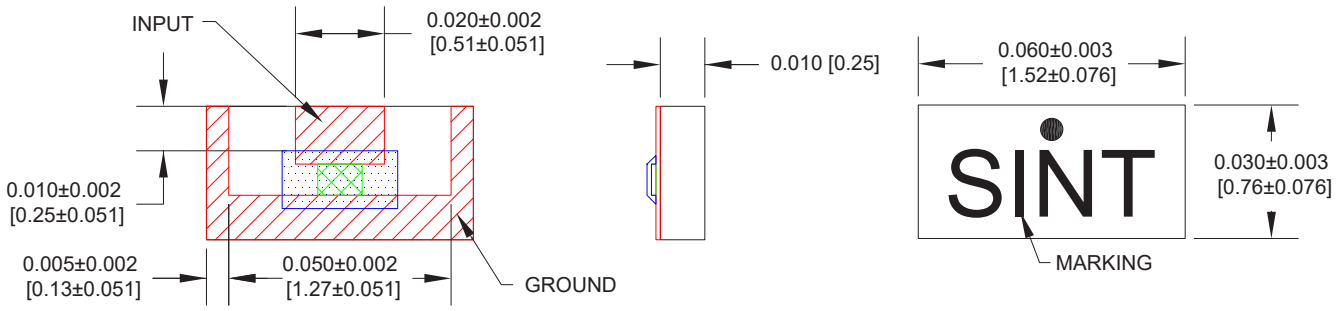
Typical Data

CTH0603ALN1SMTF Series VSWR



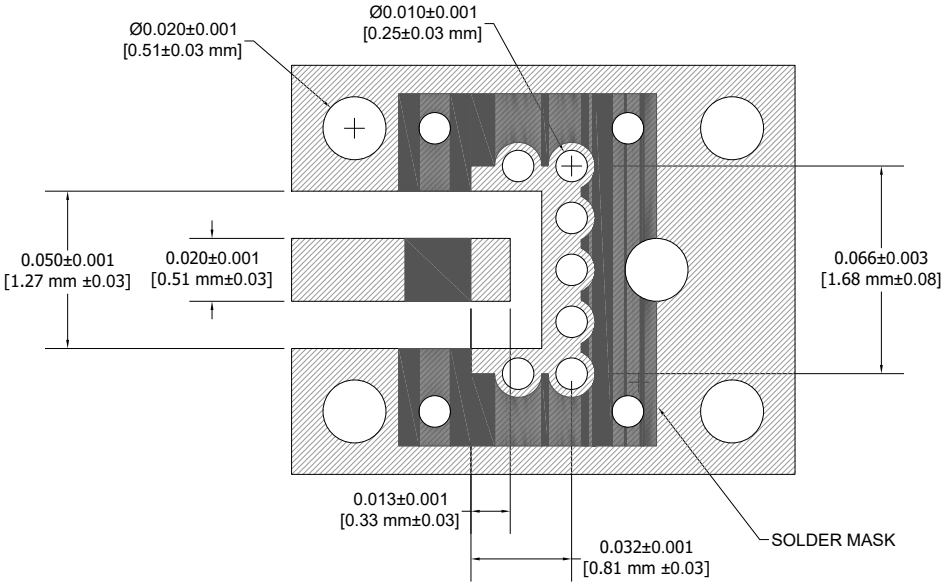
Mechanical

CTH0603ALN1SMTF - Surface Mountable



Unless otherwise specified, tolerance: X.XX = ±0.01" X.XXX = ±0.001"

Suggested Mounting Footprint



DESIGN BASED ON MICROSTRIP,
ROGERS 6035HTC, 0.010" SUBSTRATE

How To Order

Specify Model Number: **CTH 0603 ALN 1 SMT F**

C T H	0 6 0 3	A L N	1	S M T	F
1	2	3	4	5	6

1 Model Name	C T H Chip Termination
2 Dimensions	0 6 0 3 Length and Width (0.06" X .030")
3 Substrate	A L N Aluminum Nitride
4 Frequency	1 1 - DC-67 GHz
5 Options	S M T Surface Mount
6 Terminal Finish	F RoHS Compliant

Surface Mount Chip Equalizers

DC-40 GHZ

CEX Series is an easy-to-implement, surface mount platform solution for gain variation over frequency

Features and Benefits

- Configurable design approach providing optimized solutions for gain variation over frequency.
- Multiple slope options (1-4 dB) and excellent slope linearity (±0.25 dB or better).
- Frequency offering up to 40 GHz supporting a wide array of markets and applications.
- Proven thin and thick film process technology ensuring high performance in harsh environments
- Size, weight and power optimized for each unique design.

Applications

- Amplifier Circuits
- Transmit/Receive Modules
- Up/Down Converters
- Instrumentation
- Radar
- Broadcast

CEX Series offers a wide array of SMT chip equalizers optimized for gain variation over frequency. Various configuration options including frequency band, slope direction and slope magnitude are available to support multiple markets and applications.

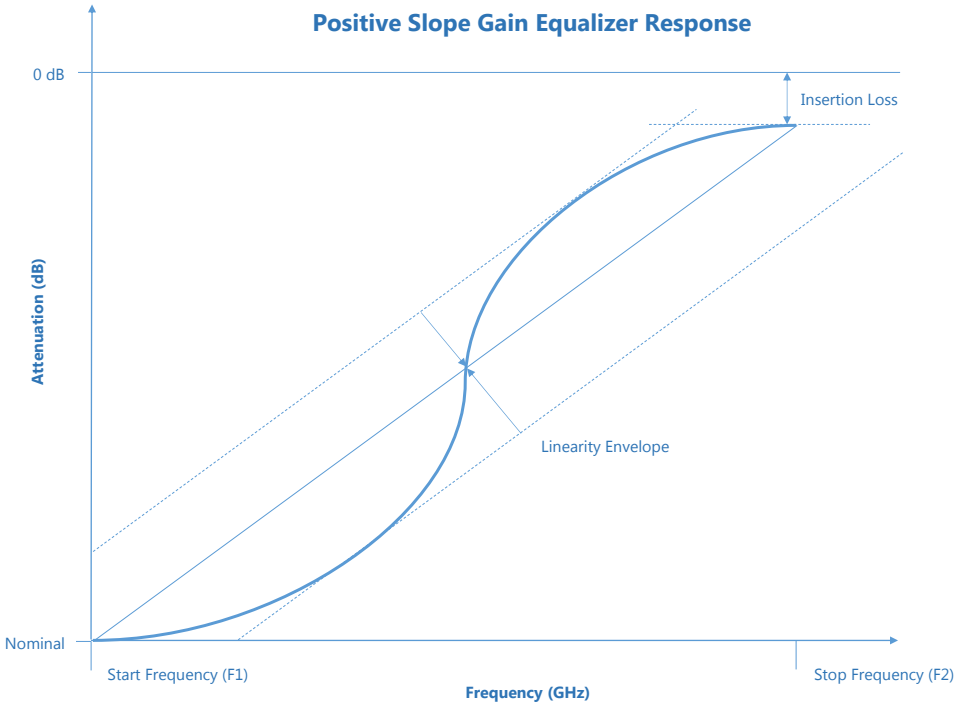
CEX series offers various compensation options from DC-40 GHz with multiple frequency bands and slope characteristics. The chip equalizers are designed for surface mount (SMT) applications and are manufactured using robust thick and thin film process technology. They are also lead free, RoHS compliant and are available in tape and reel packaging for high volume pick and place applications.

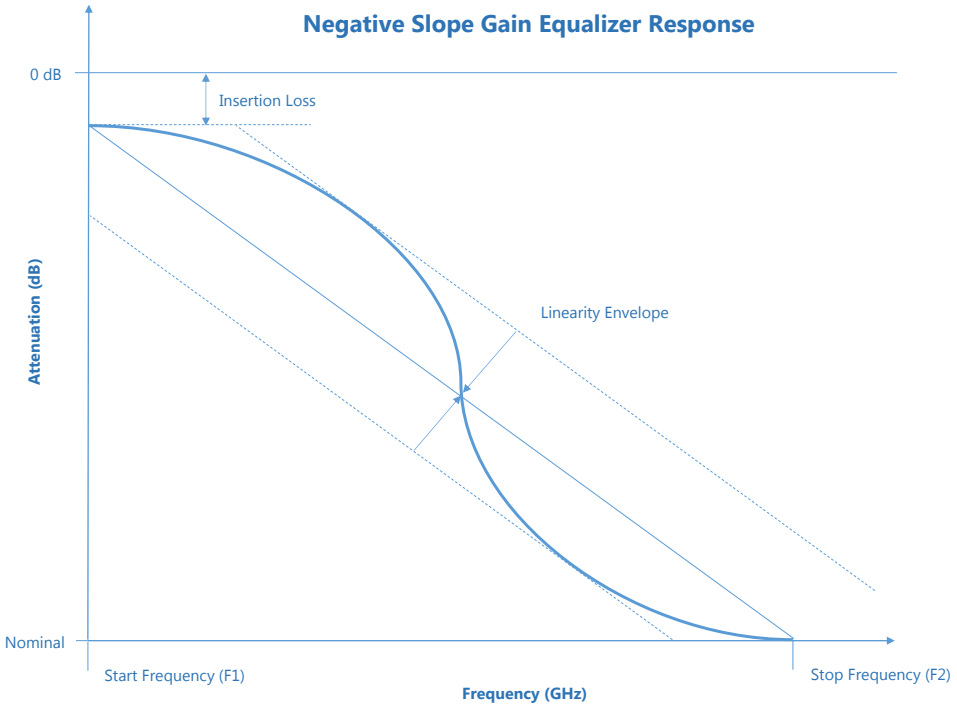
CEX series includes high frequency chip equalizers that have a slope compensation range at 1-4 db, a slope linearity at ±0.25 dB, a typical Voltage Standing Wave Ratio at 1.5:1 and a low insertion loss at 1 – 1.25 dB Max. Electrical and thermal performance have passed through simulation analysis and real-life tests to ensure the series qualification.

Technical Characteristics

Chip Equalizer Capabilities	CEXXXXXXXXSMTF (Standard Equalizer)	CEHFXXXXXXXXSMTF (High Frequency)
Electrical		
Nominal Impedance	50 ohms	50 Ohms ± 10%
Operating Frequency *See Table For Currently Available Values	Up to 10 GHz	Up To 40 GHz (in customizable bandwidth 20%)
Slope	1-4 dB	1-4 dB
Slope Linearity	± 0.25 dB	±0.25 dB Minimum
Insertion Loss	1.25 dB Max	0.5 dB Typical, 1.0 dB Max
VSWR	1 dB Slope: 1.3:1 Max 2 dB Slope: 1.5:1 Max 3 dB Slope: 1.8:1 Max 4 dB Slope: 1.8:1 Min	1.50:1 Typical, 1.70:1 Max
Input Power CW	0.25 Watts	200 mW
Peak Power	-	2.0 Watts Max (Based on 10 µS pulse width and 1.0% Duty Cycle)
Environmental		
Operating Temperature	-55°C to +150°C	
Storage Temperature	-65° to +150°C	
Moisture Sensitivity Level	1 - Unlimited	
Mechanical		
Configuration	Surface Mount	
Package Size	Varies based on Slope and Frequency Requirements	
Substrate Material	Alumina (Al2O3)	
Terminal Material	Thick Film, Nickel Barrier, Solderable Silver Plating	Thin Film Solderable Gold
Ground Plane Material	Thick Film, Nickel Barrier, Solderable Silver Plating	Thin Film Solderable Platinum
Resistive Element	Thin Film Nickel Chromium (NiCr)	Thin Film Tantalum Nitride (TaN)
Marking		
Unit Marking	Part Mark Code, based on slope and frequency	None
Quality Assurance		
	Sample visual and mechanical inspection - 1.0 AQL per mechanical drawing requirements. Periodic electrical inspection performed for commercial grade products. High reliability tested products are available.	
Packaging		
Standard Packaging	Waffle Pack or Tape and Reel	

Electrical


Positive Slope Gain Equalizer Response
0 dB
Insertion Loss
Attenuation (dB)
Linearity Envelope
Nominal
Start Frequency (F1)
Stop Frequency (F2)
Frequency (GHz)


Negative Slope Gain Equalizer Response
0 dB
Insertion Loss
Attenuation (dB)
Linearity Envelope
Nominal
Start Frequency (F1)
Stop Frequency (F2)
Frequency (GHz)

Available Values

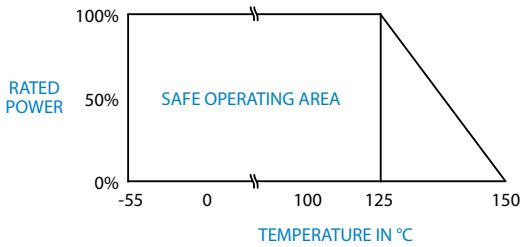
Standard Equalizer Values

Part Number	SLOPE (dB) Negative	Part Mark Code	Start Frequency (GHz)	Stop Frequency (GHz)	ΔF (GHz)
CE 1 015 P 029 SMTF	1	140	1.5	2.9	1.4
CE 1 015 P 035 SMTF	1	130	1.5	3.5	2
CE 1 020 P 040 SMTF	1	127	2	4	2
CE 1 025 P 045 SMTF	1	125	2.5	4.5	2
CE 1 030 P 055 SMTF	1	120	3	5.5	2.5
CE 1 035 P 070 SMTF	1	115	3.5	7	3.5
CE 1 040 P 075 SMTF	1	112	4	7.5	3.5
CE 1 050 P 095 SMTF	1	110	5	9.5	4.5
CE 2 007 P 028 SMTF	2	240	0.7	2.8	2.1
CE 2 010 P 030 SMTF	2	235	1	3	2
CE 2 010 P 035 SMTF	2	230	1	3.5	2.5
CE 2 010 P 040 SMTF	2	227	1	4	3
CE 2 015 P 045 SMTF	2	225	1.5	4.5	3
CE 2 020 P 055 SMTF	2	220	2	5.5	3.5
CE 2 020 P 065 SMTF	2	215	2	6.5	4.5
CE 2 025 P 070 SMTF	2	212	2.5	7	4.5
CE 2 030 P 090 SMTF	2	210	3	9	6
CE 3 005 P 027 SMTF	3	340	0.5	2.7	2.2
CE 3 008 P 035 SMTF	3	330	0.8	3.5	2.7
CE 3 010 P 030 SMTF	3	332	1	3	2
CE 3 010 P 040 SMTF	3	327	1	4	3
CE 3 010 P 045 SMTF	3	325	1	4.5	3.5
CE 3 015 P 055 SMTF	3	320	1.5	5.5	4
CE 3 015 P 065 SMTF	3	315	1.5	6.5	5
CE 3 015 P 070 SMTF	3	312	1.5	7	5.5
CE 3 020 P 090 SMTF	3	310	2	9	7
CE 4 010 P 030 SMTF	4	426	1	3	2
CE 3 005 N 027 SMTF	3	340	0.5	2.7	2.2

High Frequency Equalizer Values

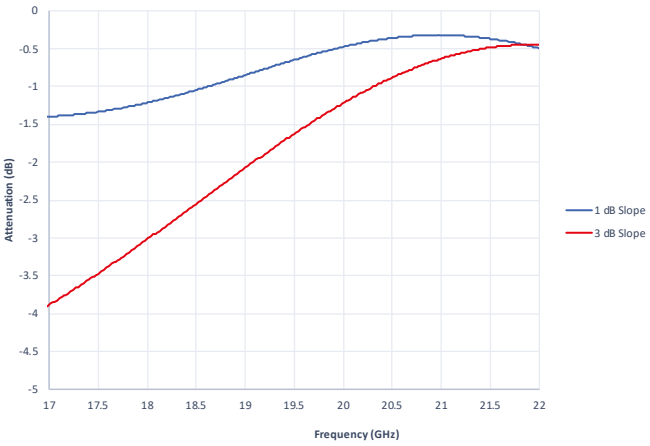
CEHF 1 170 P 220 SMTF	1	N/A	17	22	5
CEHF 3 170 P 220 SMTF	3	N/A	17	22	5
CEHF 1 270 P 320 SMTF	1	N/A	27	32	5
CEHF 3 270 P 320 SMTF	3	N/A	27	32	5

Power Derating Curve

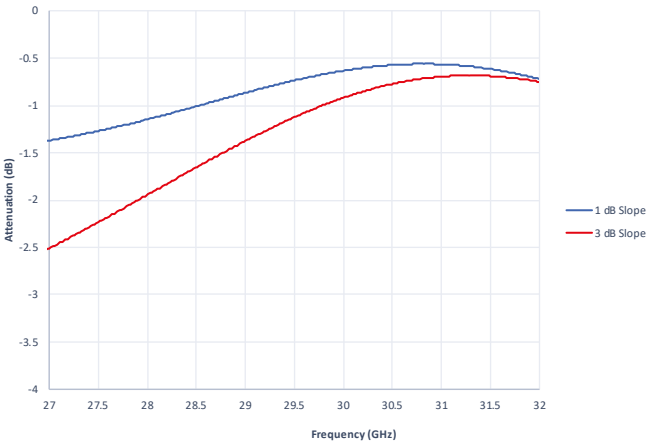


Typical Data

High Frequency Chip Equalizer Band 1

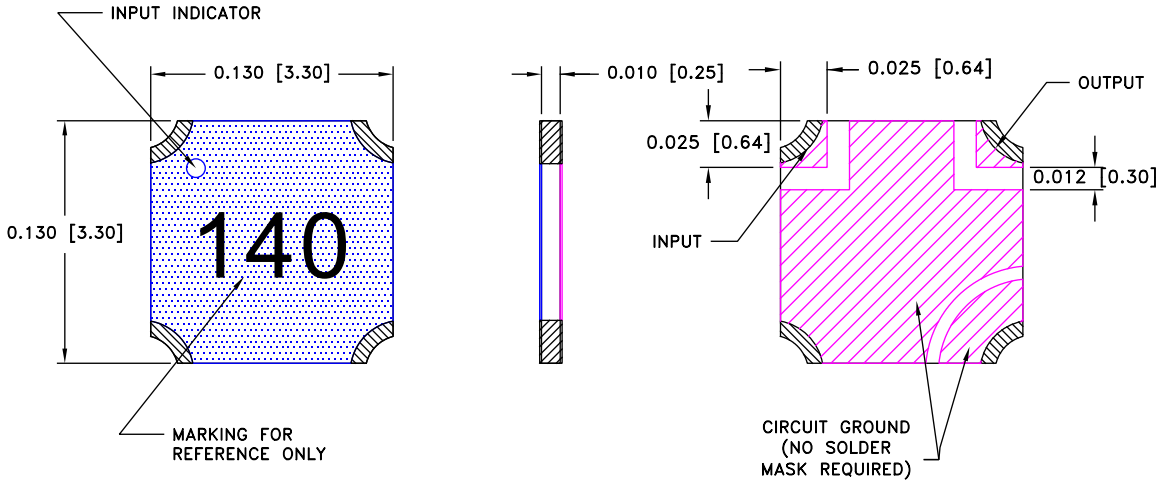


High Frequency Chip Equalizer Band 3

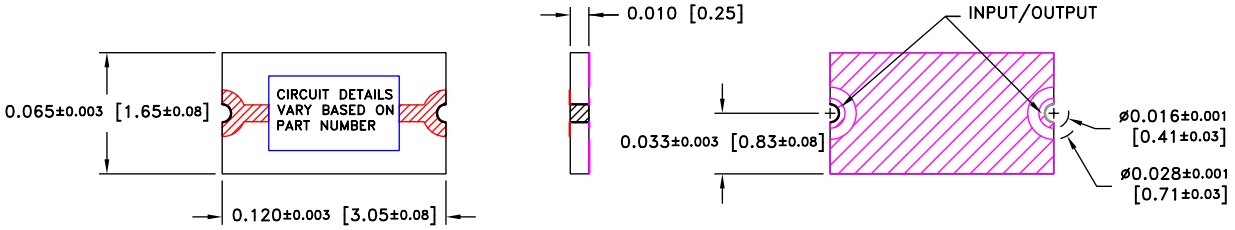


Mechanical

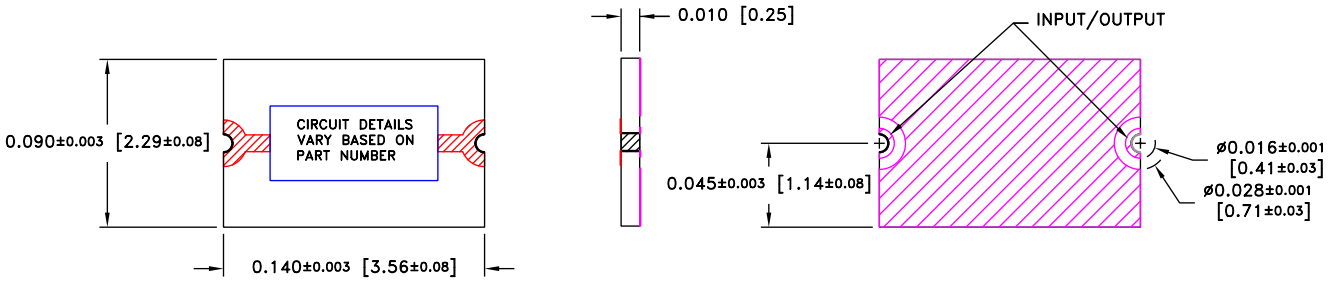
Standard Series



High Frequency Band 1 Series



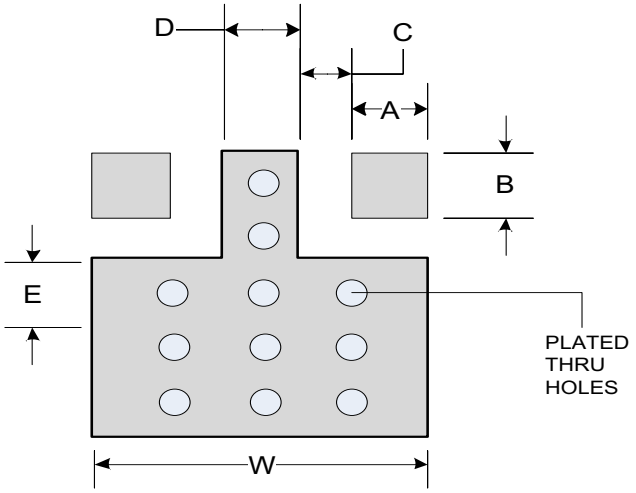
High Frequency Band 3 Series



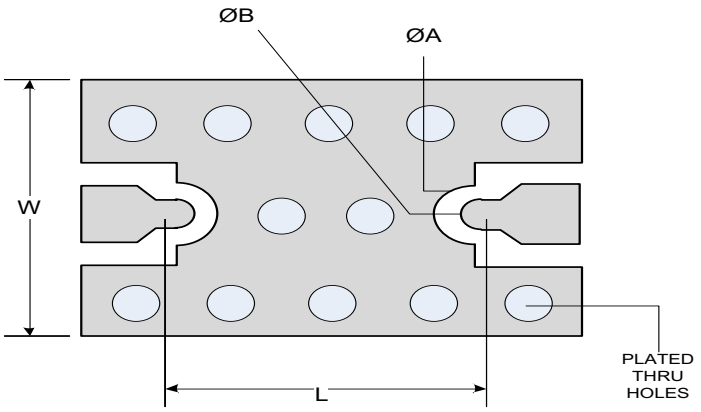
Unless otherwise specified, tolerance: X.XXX = ±0.01" X.XXX = ±0.001"

Suggested Mounting Footprint

	Inches						Millimeters					
Part Number	A	B	C	D	E	W	A	B	C	D	E	W
CEXXXXXXXXSMTF	0.030	0.030	0.012	0.056	0.093	0.140	0.76	0.76	0.30	1.42	2.36	3.56



	Inches				Millimeters			
Part Number	A	B	L	W	A	B	L	W
CEHFX170X220SMTF (17-22 GHz)	0.016	0.028	0.140	0.095	0.41	0.71	3.56	2.41
CEHFX270X320SMTF (27-32 GHz)	0.016	0.028	0.120	0.070	0.41	0.71	3.05	1.78



How To Order

Specify Model Number: **CE XX X XXX X XXX SMTF**

CE						SMT	F
1	2	3	4	5	6	7	8

1 Series Name	CE Series
2 Frequency	Standard HF High Frequency
3 Slope	dB
4 Start Frequency F1	(XX.X GHz)
5 Slope Direction	N Negative P Positive
6 Stop Frequency F2	(XX.X GHz)
7 SMT	SMT Surface Mount
8 Terminal Finish	F RoHS Compliant

Surface Mount Outrigger Resistors and Terminations

OUTRIGGER RESISTIVES, DC-27 GHz

Outrigger Resistors and Terminations with improved power handling over conventional resistives without compromising the broadband performance

Smiths Interconnect's Surface Mount Chip Resistors and Terminations offer increased power handling over conventional solutions.

CXH Series uses a patented layout to provide improved power handling over conventional flip chart resistors, without compromising broadband performance. This makes the Series well suited for a wide array of RF applications, particularly in the Space and Defence markets.

The power increase from the patented design (US 8, 994, 490), with added solderable outrigger pads on the sides of the chip, allows to dissipate significantly more power through the extra thermal paths (approximately 50% more than conventional surface mount solutions).

The products are designed for surface mount (SMT) applications and are manufactured using robust thick and thin film process technology.
CXH Series is lead free, RoHS compliant and available in tape and reel packaging for high volume pick and place applications.

Features and Benefits

- Up to 27 GHz of operating frequency when properly matched in a coplanar waveguide structure.
- Up to 12.5 watts of power to supply a wide array of applications and satisfy different customers' needs.
- Robust thick and thin film process technology, ideal for harsh environments.
- Standard resistance values ranging from 10-500 ohms with a standard tolerance of ±5%.
- Power handling performance tested according to MIL-PRF-55432 to ensure series qualification.

Applications

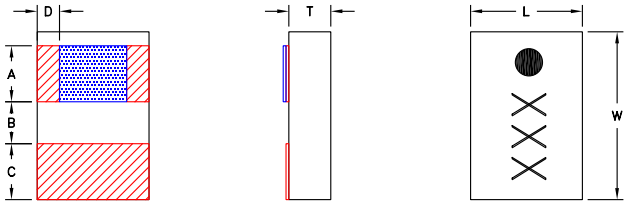
- Amplifier Circuits
- Transmit/Receive Modules
- Up/Down Converters
- Instrumentation
- Radar
- Broadcast

Technical Characteristics

Electrical	
Resistance Range	10-500 Ohms
Resistance Tolerance	±5% Standard, ±2% Available
Nominal Impedance	50 ohms
VSWR (Termination Configuration)	DC-6 GHz 1.25:1 6-12 GHz 1.60:1
Environmental	
Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Temperature Coefficient	± 200 PPM/°C Max
Moisture Sensitivity Level	MSL 1 - Unlimited
Mechanical	
Substrate Material	Alumina 96% or Aluminum Nitride
Resistive Film	Thick Film
Terminal Material	Thick Film, Silver Plated
Protective Coating	Polymer
Marking	
Unit Marking	Ohm Value and Orientation Dot
Quality Assurance	
	Sample visual and mechanical inspection - 1.0 AQL per mechanical drawing requirements. Periodic electrical inspection performed for commercial grade products. High reliability tested products are available per MIL-PRF-55342.
Packaging	
Standard Packaging	Tape and Reel

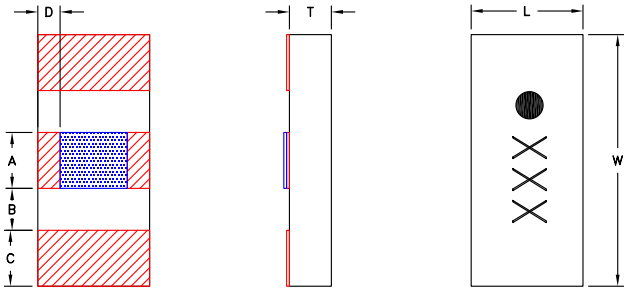
Part Number	Configuration	Frequency Range	Input Power CW (Maximum)	Peak Power (Based on 10 µS pulse width, 1% Duty Cycle)
CRH0406XXXXF	Single Outrigger	DC-27 GHz	500 mW	5 Watts
CRH0607XXXXF	Single Outrigger	DC-27 GHz	1.5 Watts	15 Watts
CRH0808XXXXF	Single Outrigger	DC-25 GHz	1.75 Watts	17.5 Watts
CRHA0808XXXXF	Single Outrigger	DC-25 GHz	6.0 Watts	60 Watts
CRH1211XXXXF	Single Outrigger	DC-20 GHz	2.75 Watts	27.5 Watts
CRHA1211XXXXF	Single Outrigger	DC-20 GHz	9.5 Watts	95 Watts
CRH0409XXXXF	Dual Outrigger	DC-27 GHz	1.0 Watt	10 Watts
CRH0610XXXXF	Dual Outrigger	DC-27 GHz	1.75 Watts	17.5 Watts
CRH0811XXXXF	Dual Outrigger	DC-25 GHz	2.5 Watts	25 Watts
CRHA0811XXXXF	Dual Outrigger	DC-25 GHz	8.5 Watts	85 Watts
CRH1216XXXXF	Dual Outrigger	DC-20 GHz	4 Watts	40 Watts
CRHA1216XXXXF	Dual Outrigger	DC-20 GHz	12.5 Watts	125 Watts
CTH0610F	Outrigger Termination	DC-12 GHz	3 Watts	20 Watts

Available Configurations and Mechanical Drawings



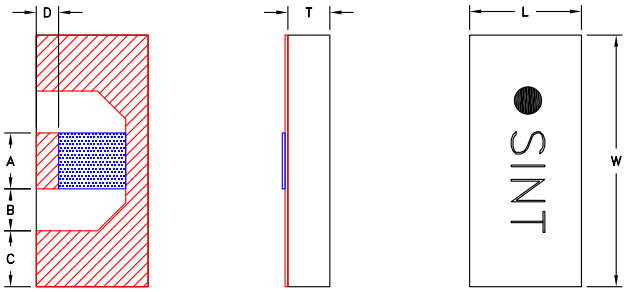
Single Outrigger Configuration

	Inches							Millimeters						
Part Number	L	W	T	A	B	C	D	L	W	T	A	B	C	D
CRH0406XXXXF	0.040	0.060	0.015	0.020	0.015	0.020	0.008	1.016	1.524	0.381	0.508	0.381	0.508	.2032
CRH0607XXXXF	0.060	0.070	0.015	0.030	0.015	0.020	0.012	1.524	1.778	0.381	0.762	0.381	0.508	.3048
CRH0808XXXXF	0.080	0.085	0.015	0.040	0.020	0.020	0.012	2.032	2.159	0.381	1.016	0.508	0.508	.3048
CRHA0808XXXXF	0.080	0.085	0.040	0.040	0.020	0.020	0.012	2.032	2.159	1.016	1.016	0.508	0.508	.3048
CRH1211XXXXF	0.120	0.115	0.020	0.060	0.030	0.020	0.016	3.048	2.921	0.508	1.524	0.762	0.508	.4064
CRHA1211XXXXF	0.120	0.115	0.040	0.060	0.030	0.020	0.016	3.048	2.921	1.016	1.524	0.762	0.508	.4064



Dual Outrigger Configuration

	Inches							Millimeters						
Part Number	L	W	T	A(2X)	B(2X)	C(2X)	D	L	W	T	A	B	C	D
CRH0409XXXXF	0.040	0.090	0.015	0.020	0.015	0.020	0.008	1.016	2.286	0.381	0.508	0.381	0.508	.2032
CRH0610XXXXF	0.060	0.100	0.015	0.030	0.015	0.020	0.012	1.524	2.540	0.381	0.762	0.381	0.508	.3048
CRH0811XXXXF	0.080	0.115	0.015	0.040	0.018	0.020	0.012	2.032	2.921	0.381	1.016	.4572	0.508	.3048
CRHA0811XXXXF	0.080	0.115	0.040	0.040	0.018	0.020	0.012	2.032	2.921	1.016	1.016	.4572	0.508	.3048
CRH1216XXXXF	0.120	0.160	0.020	0.060	0.030	0.020	0.012	3.048	4.064	0.508	1.524	0.762	0.508	.3048
CRHA1216XXXXF	0.120	0.160	0.040	0.060	0.030	0.020	0.012	3.048	4.064	1.016	1.524	0.762	0.508	.3048

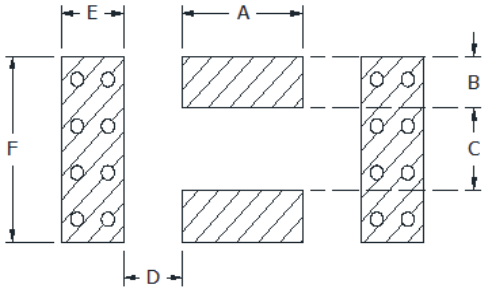


Outrigger Termination

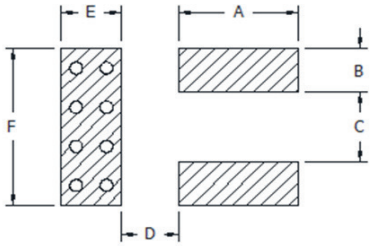
	Inches							Millimeters						
Part Number	L	W	T	A	B	C	D	L	W	T	A	B	C	D
CTH0610F	0.060	0.100	0.015	0.030	0.015	0.020	0.012	1.524	2.540	0.381	0.762	0.381	0.508	.3048

Unless otherwise specified, tolerance: X.XX = ±0.010" X.XXX = ±0.005"

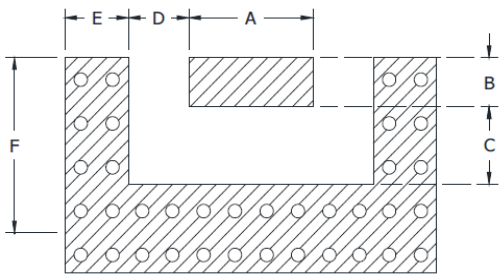
Suggested Mounting Footprint



	Inches						Millimeters					
Part Number	A	B	C	D	E	F	A	B	C	D	E	F
CRH0409XXXXF	0.025	0.010	0.024	0.015	0.025	0.045	0.635	0.25	0.61	0.38	0.64	1.14
CRH0610XXXXF	0.035	0.014	0.036	0.015	0.025	0.065	0.889	0.36	0.91	0.38	0.64	1.65
CRH0811XXXXF	0.045	0.014	0.056	0.018	0.025	0.085	1.143	0.36	1.42	0.44	0.64	2.16
CRHA0811XXXXF	0.045	0.014	0.056	0.018	0.025	0.085	1.143	0.36	1.42	0.44	0.64	2.16
CRH1216XXXXF	0.065	0.017	0.090	0.030	0.025	0.125	1.651	0.43	2.29	0.76	0.64	3.18
CRHA1216XXXXF	0.065	0.017	0.090	0.030	0.025	0.125	1.651	0.43	2.29	0.76	0.64	3.18

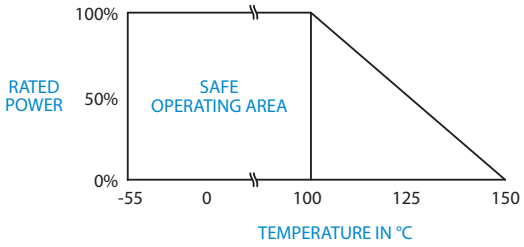


	Inches						Millimeters					
Part Number	A	B	C	D	E	F	A	B	C	D	E	F
CRH0406XXXXF	0.025	0.010	0.024	0.015	0.025	0.045	0.635	0.25	0.61	0.38	0.64	1.14
CRH0607XXXXF	0.035	0.014	0.036	0.015	0.025	0.065	0.889	0.36	0.91	0.38	0.64	1.65
CRH0808XXXXF	0.045	0.014	0.056	0.018	0.025	0.085	1.143	0.36	1.42	0.44	0.64	2.16
CRHA0808XXXXF	0.045	0.014	0.056	0.018	0.025	0.085	1.143	0.36	1.42	0.44	0.64	2.16
CRH1211XXXXF	0.065	0.016	0.088	0.039	0.025	0.125	1.651	0.41	2.24	0.99	0.64	3.18
CRHA1211XXXXF	0.065	0.016	0.088	0.039	0.025	0.125	1.651	0.41	2.24	0.99	0.64	3.18



	Inches						Millimeters					
Part Number	A	B	C	D	E	F	A	B	C	D	E	F
CTH0610F	0.035	0.014	0.039	0.007	0.030	0.065	0.889	0.36	0.99	0.18	0.76	1.65

Power Derating Curve



How To Order

Specify Model Number: **CRH A XXXX XXX, X F**

C R H					F
1	2	3	4	5	6

1 Series Name	C R H Chip Resistor Heatsink
2 Substrate	Alumina A ALN
3 Dimensions	Length x Width (ie 0409 = 0.040" x 0.90")
4 Resistance Range	(in ohms)
5 Resistance Tolerance	5% Standard, 2 or 1% available
6 Terminal Finish	F RoHS Compliant

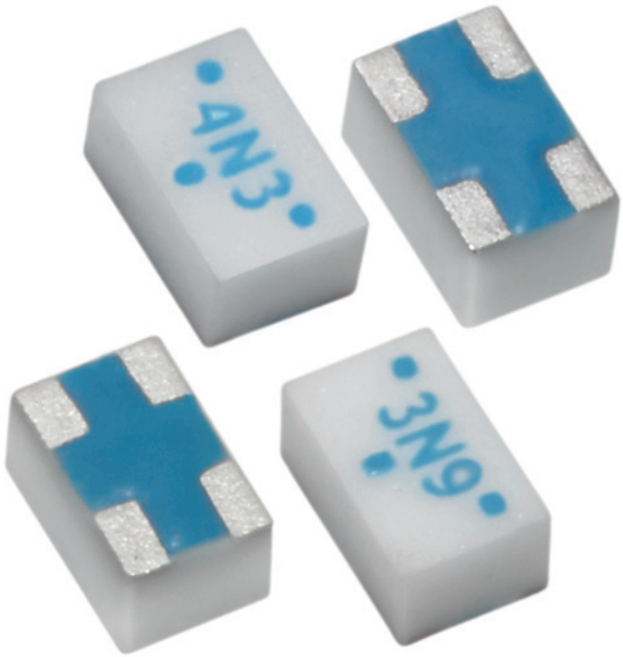
Specify Model Number: **CTH XXXX F**

C T H		F
1	2	3

1 Series Name	C T H Chip Termination Heatsink
2 Dimensions	Length x Width (ie 0409 = 0.040" x 0.90")
3 Terminal Finish	F RoHS Compliant

AN7 Thermopad® Series

ATTENUATOR TEMPERATURE VARIABLE CHIP 200 MILLIWATTS



AN7 Thermopad® Series offer a passive solution for gain compensation over temperature with proven high reliability.

Smiths Interconnect is the world leader in temperature variable chip attenuators offering the widest selection of products from DC through Ka band. Thermopad® products have been a highly reliable passive solution for gain compensation over temperature for more than 20 years. Backed by proven performance and significant heritage, Smiths Interconnect is the leader in high reliability components.

The AN7 platform offers proven performance in a cost effective commercial grade product for high volume applications. Offered in tape and reel for easy pick and place mounting. Rated for DC-6 GHz with excellent response, the AN7 series of products supports a wide range of applications. It is constructed on an Alumina substrate with rugged thick film terminations and thick film thermistor technology. The product also includes a protective coating for added protection from various environmental conditions. Multiple attenuation values, temperature shift options all in a surface mount applications. This product comes in a RoHS compliant finish.

Features and Benefits

- Small Footprint
- Multiple Mounting Configurations
- DC-6 GHz Frequency Range
- Low VSWR
- Wide Range of Attenuation Values
- Multiple Temperature Shift Options
- Tape and Reel Package
- RoHS Compliant

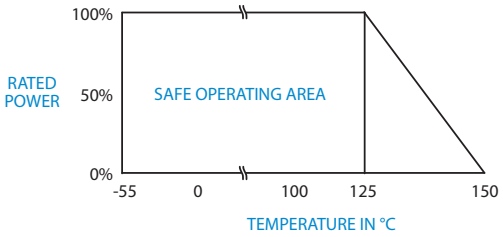
Applications

- Amplifier Circuits
- Transmit/Receive Modules
- Up/Down Converters
- Instrumentation
- Satellite Communications
- Radar
- Broadcast

Technical Characteristics

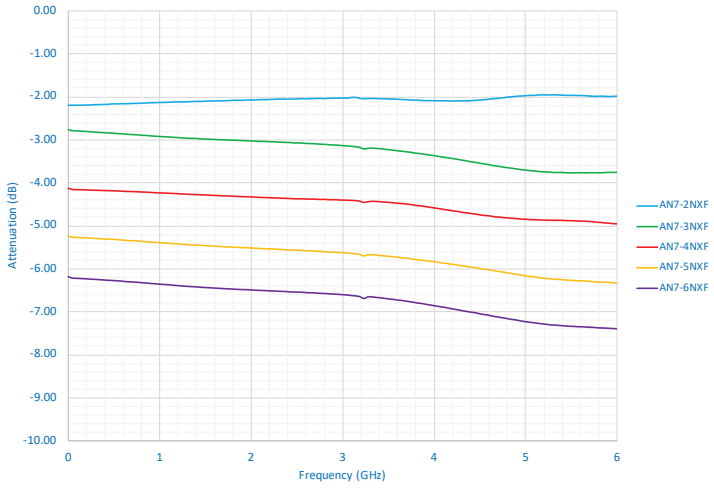
Mounting Configuration Options	Planar
Electrical	
Nominal Impedance	50 ohms
Frequency Range	DC-6 GHz
Attenuation Values Available	0-9 in 1 dB Increments
Attenuation Accuracy	± 0.5 dB @ 1 GHz @ 25°C
Temperature Coefficient of Attenuation (TCA)	-0.003 through -0.009 dB/dB/°C in 0.001dB/dB/°C increments and -0.009
Temperature Coefficient Tolerance	± 0.001 dB/dB/°C
Input Power CW	200 Milliwatts Max up to 125°C (See derating curve)
Peak Power	2 Watts based on 10 µS pulse width @ 1% Duty Cycle
VSWR	1.30:1 Max @ 1 GHz
Environmental	
Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Moisture Sensitivity Level	MSL 1 - Unlimited
Mechanical	
Substrate Material	Alumina (Al_2O_3) 96%
Resistive Film	Thick Film, Thermistor
Terminal Material	Thick Film
Protective Coating	Polymer
Finish Options -F	Silver Plated (RoHS Compliant)
Marking	
Unit Marking	dB Value (X), Direction of shift (N), & TCA value (X)
Quality Assurance	
	Sample visual and mechanical Inspection - 1.0 AQL per mechanical drawing requirements. **TCA Calculation Method** - Measure Attenuation @ DC every 20°C over the temperature range of -55°C to +125°C Calculate the slope of the curve using linear regression. Calculate TCA using the following formula: $TCA = \frac{Slope}{Attenuation\ @\ 25^{\circ}C}$
Packaging	
Standard Packaging	Tape and Reel

Power Derating Curve

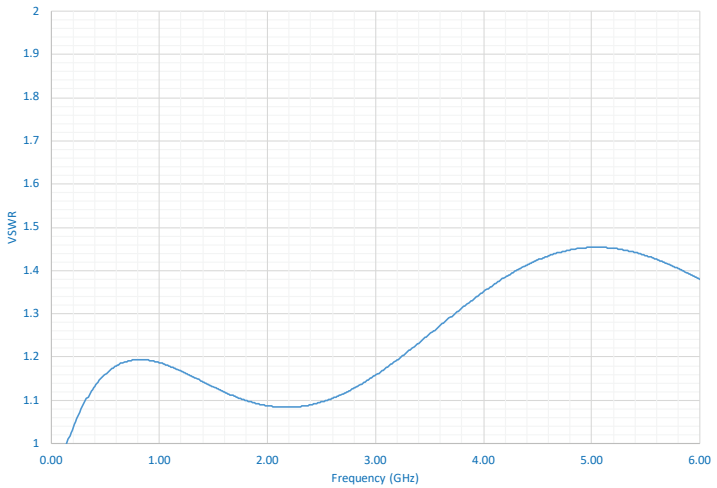


Typical Data

AN7-XNXF Series Attenuation

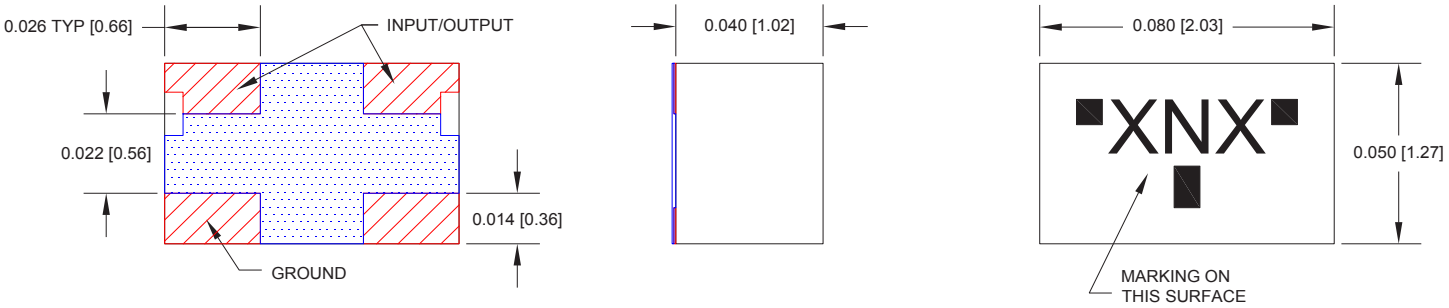


AN7-XNXF Series VSWR



Mechanical

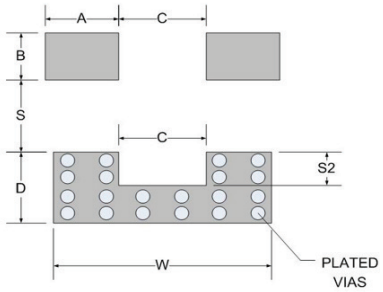
AN7 - Planar Option



Unless otherwise specified, tolerance: X.XXX = ±0.005"

Suggested Mounting Footprint

	Inches							MM						
Part Number	A	B	C	D	S	S2	W	A	B	C	D	S	S2	W
AN7-XNXF (Planar)	0.028	0.018	0.028	0.028	0.024	0.013	0.083	0.71	0.46	0.71	0.71	0.61	0.33	2.11



How To Order

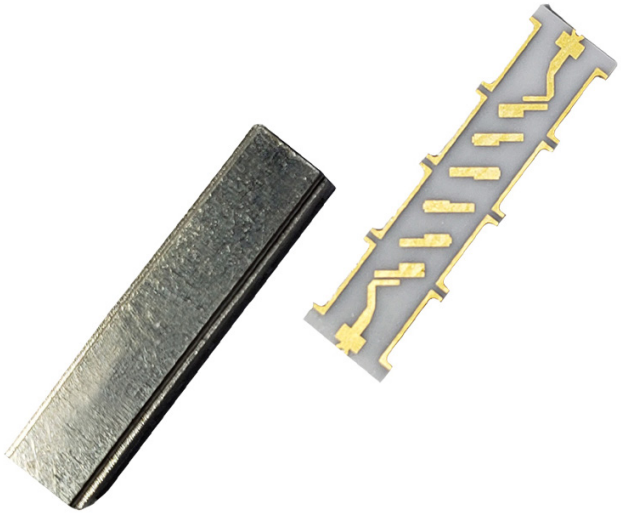
Specify Model Number: **AN7-XNXF**

A N 7		N		F
1	2	3	4	5

1 Series Name	A N 7 Series
2 Attenuation Value	1 1 dB through 9 dB
3 TCA Slope	N Negative
4 TCA Shift Option (dB/dB/°C)	3 3=0.003 4 4=0.004 5 5=0.005 6 06=0.006 7 07=0.007 9 9=0.009
5 Terminal Finish	F RoHS

Planar X Series

THIN FILM BANDPASS RF FILTERS



Best-in-class RF Filter solutions in the X, Ku and Ka Bands designed and tested to support various applications and markets.

Planar X Series of standard bandpass filters provide system engineers with high performance, compact, light-weight solutions for critical RF filtering in X, Ku, and Ka bands. Planar X Series compliments Smiths Interconnect's broad portfolio of RF/Microwave components with an off-the-shelf product reducing the lead times of custom designs.

Planar X Standard Bandpass filters leverage thin film process technology on various dielectric substrates which are designed for use in harsh environments. The small footprint, light weight and surface mountable configuration allow for high volume pick and place applications and are ideal for SATCOM, Radar and Broadcasting industries. Smiths Interconnect can also offer value added, high-reliability test options providing assurance in mission critical defense and space applications.

In addition to the standard products, Smiths Interconnect can provide custom Planar X filter designs that are specific to the requirements of the application. Regardless of the application, our internal processes and procedures ensure that all filters are fully compliant to customers' specifications.

Features and Benefits

- Compact size – reduced PCB footprint
- Light weight – reducing overall system mass in critical space and defense applications
- Excellent rejection characteristics - best-in-class RF performancee
- Low insertion loss – enhanced system performance
- Surface mountable – ideal for pick-and-place applications
- Robust materials – suitable for harsh environments
- Standard frequency bands – X band, Ku band and Ka band

Applications

- Radar
- EW/SIGINT
- SATCOM
- Communications
- LEO constellation

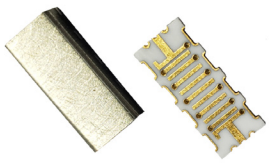
Technical Characteristics

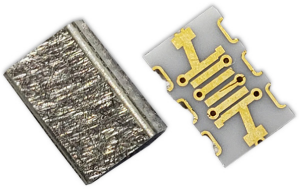
Filter Specifications			
Electrical	**11PFX-10000/R4000-M**	**6PFX-15000/R6000-M**	**6PFX-28000/R1000-M**
Characteristic Impedance	50 ohms	50 ohms	50 ohms
Operating Frequency	8 – 12 GHz	12-18 GHz	27.5 – 28.5 GHz
Low Side Rejection	40 dB DC to 6 GHz	30 dB DC to 8 GHz	30 dB DC to 26.1 GHz
High Side Rejection	40 dB 14 to 18 GHz	40 dB 22.75 to 25 GHz	30 dB 30 to 37 GHz
Size	0.400 x 0.180 x 0.100 in	0.550 x 0.150 x 0.098 in	0.550 x 0.140 x 0.083 in
Environmental			
Operating Temperature	-40°C to +85°C		
Storage Temperature	-65°C to +150°C		
Moisture Sensitivity Level	1 – Unlimited		

Mechanical	
Configuration	Surface Mount
Substrate Materials	Alumina
Conductor Material	Thin Film Gold - 25 microns nominal
Shielding Material	Nickel Silver

Quality Assurance	
	Sample visual and mechanical inspection - 1.0 AQL per mechanical drawing requirements Periodic electrical inspection performed for commercial grade products High reliability tested products are available

Packaging	
Standard Packaging	Waffle Pack or Tape and Reel





Additional Test Capabilities

Smiths Interconnect can provide a wide array of add-on test services to suit market and program needs. Below is a list of standard available test options. Please consult factory for individual program needs.

Per MIL-PRF-55342	
Outgassing (space level only)	Thermal Shock
Visual and Mechanical	Power Conditioning (space level only)
Precap Visual Inspection	Low Temperature Operation
Solderability	Short Time Overload
Solder Mounting Integrity	High Temperature Exposure
Bondable Mounting Integrity	Moisture Resistance
Wire Bonding Integrity	Life Testing
Resistance to Solvents	Resistance to Soldering Heat
Marking Legibility Test	Resistance to Bonding Exposure
Per MIL-STD-883	
Barometric Pressure, Reduced (Altitude Operation)	Moisture Resistance
Insulation Resistance	Salt At

How To Order

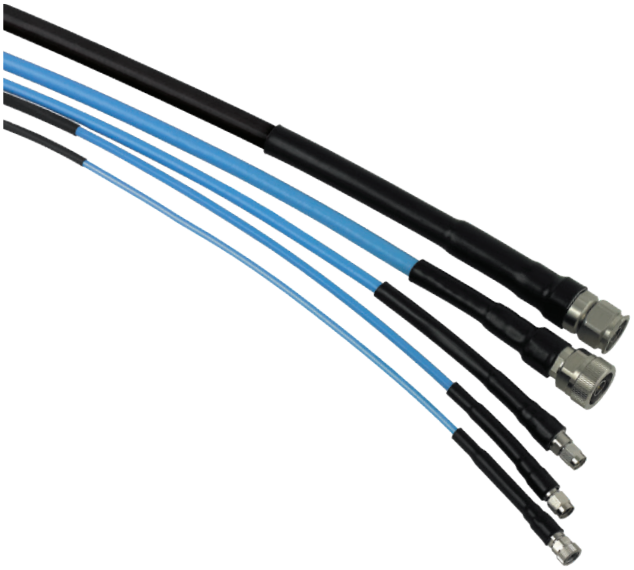
Specify Model Number: **XPFX-XXXXX/RXXXX-M**

XPFX	XXXXX	XXXX	M
1	2	3	4

1 Series Name	XPFX X - Number of Sections PFX - Printed Filter
2 Frequency	XXXXX - Center Frequency in MHz
3 Bandwidth	RXXXX - Equiripple Bandwidth in MHz
4 Options	M Surface Mount

Lab-Flex® S Series

High Performance Coaxial Cable Assemblies



Lab-Flex® S Series, precision cable for dynamic applications.

Smiths Interconnect's Lab-Flex S product portfolio provides customers with a robust high performance solution for multiple applications and markets. The combination of repeatable, consistent performance and high reliability products translates to lower cost of ownership while improving system performance. The benefits enable customers to be more competitive with support of an established technology partner.

The Lab-Flex S series was developed for high dynamic flexure applications using precision grade low loss PTFE and stranded center conductors designed for Test & Measurement, Defense, Commercial and other markets which need the ultimate in performance requirements.

This cable series has a very long heritage in high shock and vibration applications such as missile technology as well as repeatable performance in the Test & Measurement environment. The Lab-Flex S cable has a low loss PTFE insulator for minimum attenuation and a stranded silver plated copper center conductor for maximum flexure capability. The 160S, 180SP, 235SP, 335SP and 490S products represent the most common sizes needed for today's applications. These Lab-Flex S cables are an excellent choice for use in SatCom, Radar, Missile Guidance and Test & Measurement applications. Test data is available on request.

Features and Benefits

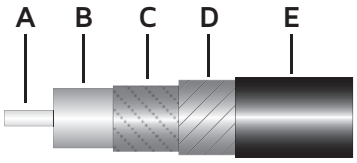
- Up to 40GHz
- Low Loss (30% less than solid PTFE dielectrics)
- Superior EMI Shielding >90dB
- Phased Matched Pairs and Sets Available (standard tolerance is +/- one degree per GHz or +/-2.8 picoseconds)

Applications

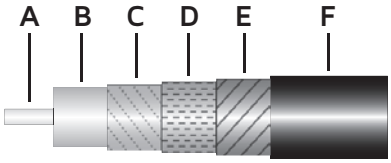
- Ground SatCom
- Missile Guidance
- Radar
- Test & Measurement
- Communication Systems
- Point to Point Radio

Technical Characteristics

Lab-Flex Series		160S	180SP	235SP	335SP	490S
Electrical						
Frequency, Max (GHz)		40	40	26.5	18	10
Impedance, nominal (Ω)		50	50	50	50	50
Velocity of Propagation (%)		77	78	78	78	80
Shielding Effectiveness, 18 GHz (dB/ft)		>100	>90	>90	>90	>90
Capacitance (pF/ft)		26.2	26.9	26.9	26.9	25.5
Delay (ns/ft), (ns/meter)		1.32 (4.33)	1.30 (4.27)	1.30 (4.27)	1.30 (4.27)	1.27 (4.16)
Attenuation k1 (db/100ft) @ 23°C		0.287	0.522	0.3440	0.154	0.116
Attenuation k2 (db/100ft) @ 23°C		0.00049	0.000594	0.000525	0.000743	0.000179
Attenuation (Typical) at any Frequency = k1 x SqRt (FMHz) + k2 x (FMHz)						
Mechanical & Environmental						
Weight (lbs/100ft), (Kg/100m)		3.4 (5.00)	2.7 (4.06)	5.1 (7.67)	9.0 (13.39)	19.20 (28.57)
Temperature Range (˚C)		-55/+135	-65/+85	-65/+85	-65/+85	-55/+200
Minimum Bend Radius (inch), (mm)		0.750 (19.05)	0.470 (11.94)	1.20 (30.48)	1.6 (40.64)	2.5 (63.50)
Construction						
Inner Conductor	A	Stranded SPC	Stranded SPC	Stranded SPC	Stranded SPC	Stranded SPC
Dielectric	B	ePTFE	ePTFE	ePTFE	ePTFE	PTFE Tape
First Outer Shield	C	SPC Spiral	SPC Flat	SPC Flat	SPC Flat	SPC Flat
Second Outer Shield	D	SPC Round	Metalized Foil	Metalized Foil	Metalized Foil	Metalized Foil
Third Outer Shield	E	-	SPC Round	SPC Round	SPC Round	SPC Round
Jacket (inch O.D.)	F	FEP (.160)	Polyurethane (.180)	Polyurethane (.235)	Polyurethane (.335)	FEP (.490)



Lab-Flex® 160S



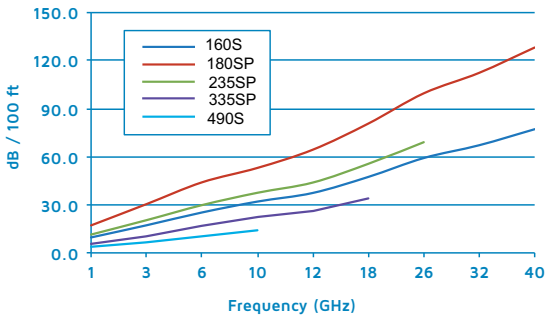
Lab-Flex® S

Attenuation (dB/100ft)

GHz	160S	180SP	235SP	335SP	490S
1	9.6	17.1	11.4	5.6	3.8
3	17.2	30.4	20.4	10.7	6.9
6	25.2	44.0	29.8	16.4	9.9
10	32.0	53.0	37.5	22.5	14.1
12	37.4	64.4	43.9	25.8	
18	47.4	80.7	55.6	34.0	
26	59.2	99.6	69.1		
32	67.2	112.4			
40	77.2	128.2			

Typical Cable Loss at +25° C & Sea Level

Attenuation vs Frequency



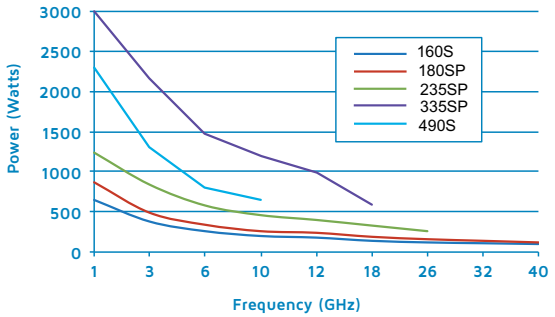
Technical Characteristics

Average Power Rating (Watts)

GHz	160S	180SP	235SP	235SP	490S
1	650	870	1240	3002	2300
3	380	490	840	2160	1300
6	260	340	580	1470	800
10	200	260	460	1200	650
12	180	240	400	990	
18	140	190	330	590	
26	120	160	260		
32	110	140			
40	100	120			

Cable Power handling at +25° C & Sea Level

Average Power Rating

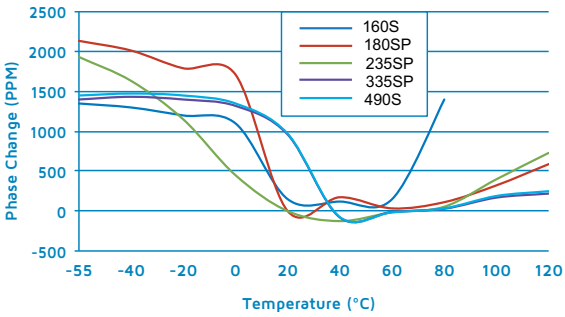


Phase vs. Temperature (PPM)

Temp	160S	180SP	235SP	335SP	490S
-55	1350	2135	1933	1400	1450
-40	1300	2013	1633	1434	1475
-20	1200	1791	1150	1400	1450
0	1100	1712	450	1320	1350
20	150	0	0	960	970
40	120	174	-125	-80	-75
60	150	34	-15	-10	-15
80	1400	112	55	30	35
100		323	400	170	190
120		589	730	220	250

Typical Values

Phase vs Temperature (°C)

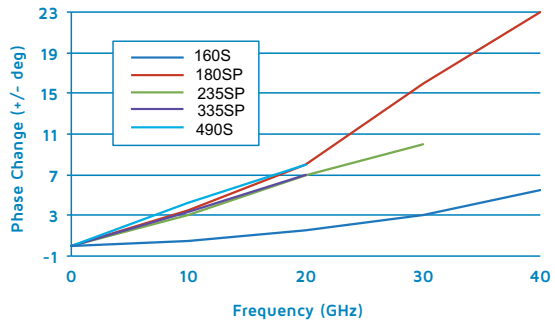


Phase vs. Flexure

Freq.	160S(+/-deg)	180SP(+/-deg)	235SP(+/-deg)	335SP(+/-deg)	490S(+/-deg)
0	0	0	0	0	0
10	0.5	3.5	3.1	3.4	4.2
20	1.5	8	7	7	8
30	3	16	10		
40	5.5	23			

Typical Values +25°C

Phase vs Flexure



Technical Characteristics

Cable Code	Connector Code	Series	Gender	Type	C-Nut Style[1]	Body Material[2]	Body Finish[3]	Loss per GHz	Frequency Max GHz
160S, 180SP, 235SP, 335SP	SMS	SMA	Male	Straight	H	SS	P	0.01	18
235SP	SFS	SMA	Female	Straight	N/A	SS	P	0.015	18
180SP, 235SP	SMR	SMA	Male	R/A	H	SS	P	0.02	18
235SP	SFBS	SMA	Female	Straight	N/A	SS	P	0.015	18
160S, 180SP, 235SP	KMS	2.92mm	Male	Straight	H	SS	P	0.01	40
180SP	KFS	2.92mm	Female	Straight	N/A	SS	P	0.015	40
160S, 180SP	MMS	2.4mm	Male	Straight	H	SS	P	0.01	50
180SP	MFS	2.4mm	Female	Straight	N/A	SS	P	0.015	50
160S, 180SP, 235SP, 335SP, 490S	NMS	Type-N	Male	Straight	H	SS	P	0.01	18
180SP, 235SP, 490S	NMR	Type-N	Male	R/A	N/A	SS	P	0.02	18
180SP, 235SP	NFBS	Type-N	Female	Straight	N/A	SS	P	0.015	18
180SP, 235SP, 335SP, 490S	TMS	TNC	Male	Straight	H	SS	P	0.01	18
335SP	7/16MS	7/16	Male	Straight	H	B	WB	0.01	6

[1] C-Nut Style: H=Hex, K-Knurled, HK=Hex Nut & Knurled
[2] Body Materials: B=Brass, SS=Stainless, Be=Berylium Copper
[3] Body Finish: N=Nickel, S=Silver, G=Gold, P=Passivated, WB=White Bronze
Connector gender is determined by center conductor

Cable Code	Option Code	Option Description	Option Details
160S, 180SP, 235SP, 335SP	A	Armorized Protection	SS Interlock Armor
160S, 180SP	W	Weatherized	Extruded PVC cover
160S, 180SP, 235SP, 335SP	AW	Armorized/Weatherized Covering	SS Interlock Armor with Extruded PVC Cover
160S, 180SP, 235SP, 335SP	Z	Water Tight	Cable to Connector junction "Sealed"
160S, 180SP, 235SP, 335SP	D	Dust Caps	Dust Cap with Tether
160S, 180SP, 235SP, 335SP	+/-2.8 ps[4]	Phase Match	Standard Tolerance of +/-2.8ps
160S, 180SP, 235SP, 335SP	E	Extended Boots	Layered Adhesive lined Shrink Tubing
160S, 180SP, 235SP, 335SP	RoHS[5]	RoHS Compliant	Per EU Directive 2002/95/EC

[4]for phase matched assemblies (+/-2.8ps) is required to be added to the end of standard part number
example: NMS-235SP-120.0-NMS +/-2.8ps

[5]for RoHS assemblies (RoHS) is required to be added to the end of standard part number
example: NMS-235SP-120.0-NMS - RoHS

Custom Options:
The above connectors and options represent the most common types used. Smiths Interconnect offers a wide range of cables, connectors and options.
If you do not see an option you require please consult the sales department.

How To Order

1	–	2	–	3	–	4	–	5

1 Connector #1

SMS	SMA Male Straight	KFS	2.92mm Female Straight	NFBS	Type-N Female Bulkhead Str
SFS	SMA Female Straight	MMS	2.4 Male Straight	TMS	TNC Male Straight
SMR	SMA Male R/A	MFS	2.4 Female Straight	7/16MS	7/16 Male Straight
SFBS	SMA Female Bulkhead Str	NMS	Type-N Male Straight		
KMS	2.92mm Male Straight	NMR	Type-N Male R/A		

2 Cable *(fixed)*

160S	Lab-Flex 160S	235SP	Lab-Flex 235SP	490S	Lab-Flex 490S
180SP	Lab-Flex 180SP	190S	Lab-Flex 190S		

3 Length *(inches);*

36.0	Example: 36 in.

4 Connector #2

SMS	SMA Male Straight	MMS	2.4mm Male Straight	TMS	TNC Male Straight
SMR	SMA Male R/A	NMS	Type-N Male Straight	7/16MS	7/16 Male Straight
KMS	2.92mm Male Straight	NMR	Type-N Male R/A		

5 Assembly Option

+/-2.8ps	+/-2.8ps Phase Matched Electrical Length	RoHS	RoHS Compliant Per EU Directive 2002/95/EC

Additional Testing Service

In addition to standard testing, Smiths Interconnect offers a wide array of additional test servces to support various application and market requirements. We can develop a custom test plan per a customer supplied test plan or unique application specific requirements offering ultimate flexibility. With over 40 years of heritage, Smiths Interconnect is a global leader in high reliability RF microwave components supporting the stringent requirements of the space, aerospace, defense and 5G markets.

Products Test Capabilities

Stability of Attenuation After:

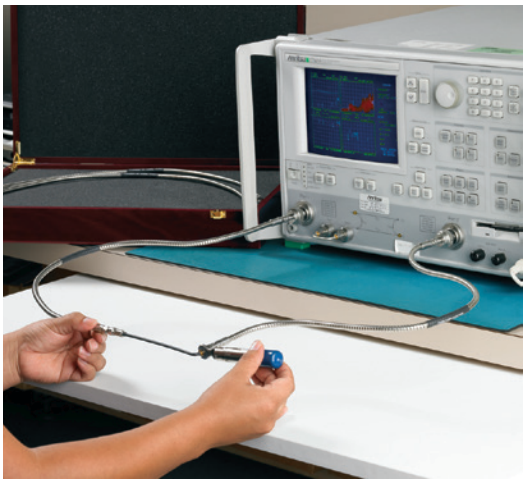
- Temperature Change
- Thermal Shock
- Vibration
- Shock
- Moisture Resistance
- Peak Power
- Salt Spray

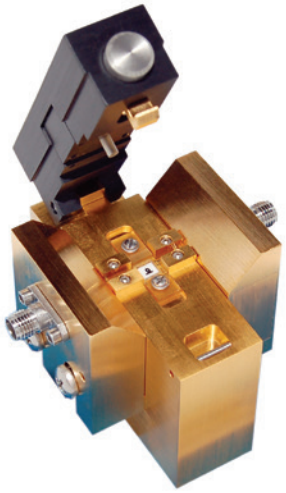
Sensitivity of Attenuation After:

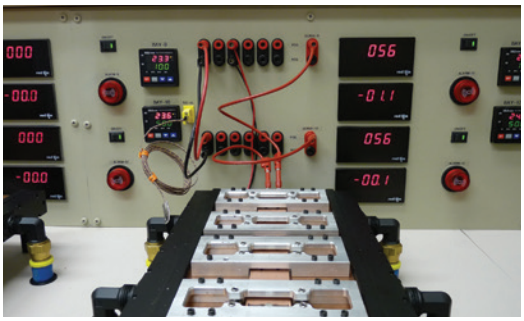
- Change in Input Power
- Change in Frequency
- Change in Temperature

Additional Test Capabilities:

- Vibration and Shock Testing
- Moisture Resistance
- Peak Power
- Salt Spray
- Barometric Pressure
- Outgassing
- Endurance
- Resistance to Bonding Exposure
- Low Temperature Operation
- Short Term Overload
- High Temperature Exposure
- Solderable Mounting Integrity
- Bondable Mounting Integrity
- Resistance to Solvents
- Gross and Fine Leak Detection
- Radiographic Inspection
- First Article Inspection
- Pre-Cap Inspection
- Source Inspection
- Additional testing services available upon request







Worldwide Support

Connectors

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