

Suspended Substrate Stripline Filters and Multiplexers

50Ω DC to 26 GHz

The Big Deal

- Low insertion loss
- Ultra-wide passband width
- Fast roll-off with wide stopband
- Good power handling and temperature stability
- Passband up to 26 GHz
- Stopband up to 26.5 GHz can extend to 40 GHz



Product Overview

Mini-Circuits' Suspended Substrate Stripline filters offer low insertion loss by implementing printed circuit board suspended between two parallel ground planes, providing high Q. Low insertion loss combined with wide stopband makes them an excellent choice for wideband instruments and systems like ECM, ECCM, ELINT and ultra-broadband receivers.

Low pass, high pass, band pass, band stop, diplexer and multiplexer designs can be realized with this technology. Advanced filter design and construction can achieve stopband width greater than 6x the center frequency, and temperature stability will be better than other printed circuit realizations because the fields are mainly in the air rather than in a dielectric. The inside walls of the housing hold the circuit and prevent movement that could be caused by vibration or mechanical shock, making these designs excellent candidates for harsh operating environments.

Suspended substrate stripline filters can be realized in small form factors with high-quality, precise machining for applications where size is critical. Excellent repeatability across units is achieved through precise tuning and process control.

Key Features

Feature	Advantages
Low insertion loss	Low signal loss results in better SNR in receiver front end and better power delivery to antenna in transmitters
Fast roll-off	Higher selectivity results in better adjacent channel rejection and dynamic range
Wide stopband	Wide, spur-free stop band results in better receiver sensitivity
High power handling	Well suited for transmitter applications
Excellent temperature stability	Ensures minimal variation in electrical performance across temperature

Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp



Suspended substrate stripline Band Pass Filter

ZBSS-10G-S+

50Ω 8000 to 12000 MHz



Generic photo used for illustration purposes only

CASE STYLE:WD3296

Connectors Model

SMA - F ZBSS-10G-S+

Features

- Wide fractional bandwidth design of 40%
- 1dB typ. Insertion Loss at Center frequency
- Sharp roll-off
- High rejection floor of 90dB typ.
- Stop band up to 26.5 GHz
- Connectorized package

Applications

- Satellite communications
- Radio Navigation
- Maritime Mobile
- Military and defense
- Electronic warfare receiver
- Wideband receivers
- Space Research

Electrical Specifications at 25°C

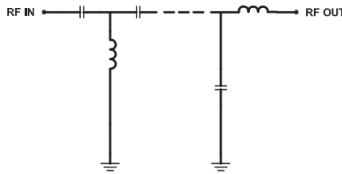
Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Unit	
Pass Band	Center Frequency	Fc	10000	-	1.0	-	dB
	Insertion Loss	F1-F2	8000 - 12000	-	1.5	2.5	dB
	VSWR	F1-F2	8000 - 12000	-	1.4	-	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC - 4500	60	80	-	dB
		F3-F4	4500 - 5300	40	60	-	dB
		F4-F5	5300 - 5800	20	40	-	dB
Stop Band, Upper	Insertion Loss	F6-F7	14200 - 15000	20	40	-	dB
		F7-F8	15000 - 16500	40	60	-	dB
		F8-F9	16500 - 25000	60	90	-	dB
		F9-F10	25000 - 26500	-	90	-	dB

Maximum Ratings

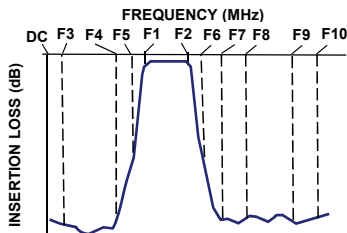
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	10W max. @ 25°C

Permanent damage may occur if any of these limits are exceeded.

Functional Schematic



Typical Frequency Response

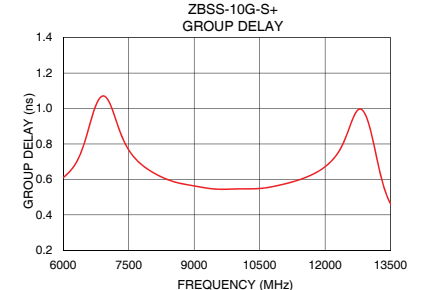
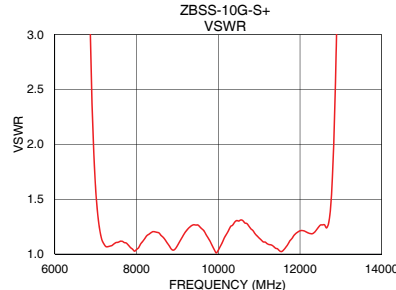
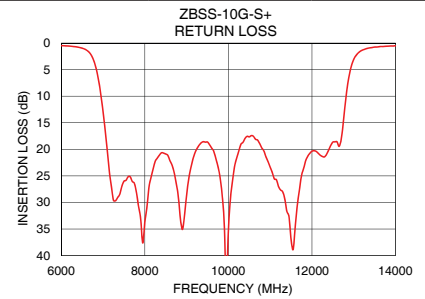
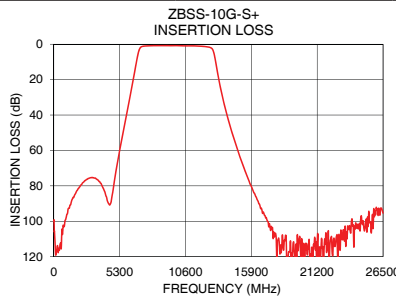


Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
10	100.02	3077.92	6000	0.61
1000	97.75	2216.35	6300	0.70
2000	81.42	211.36	6600	0.90
4500	90.83	81.53	6900	1.07
5300	60.03	60.13	7200	0.94
5800	41.81	38.61	7500	0.77
6400	19.72	22.46	7800	0.68
6850	3.68	3.38	8100	0.63
8000	0.84	1.04	8400	0.60
9000	0.79	1.08	8700	0.58
10000	0.82	1.04	9000	0.56
11000	0.94	1.15	9300	0.55
12000	1.24	1.21	9600	0.54
12800	3.25	1.76	9900	0.55
13300	20.62	16.30	10200	0.55
14200	46.52	35.58	10500	0.55
15000	64.00	45.65	10800	0.56
16500	90.06	82.19	11100	0.58
25000	105.48	39.16	11500	0.61
26500	95.37	64.57	12000	0.67

+RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications



Notes

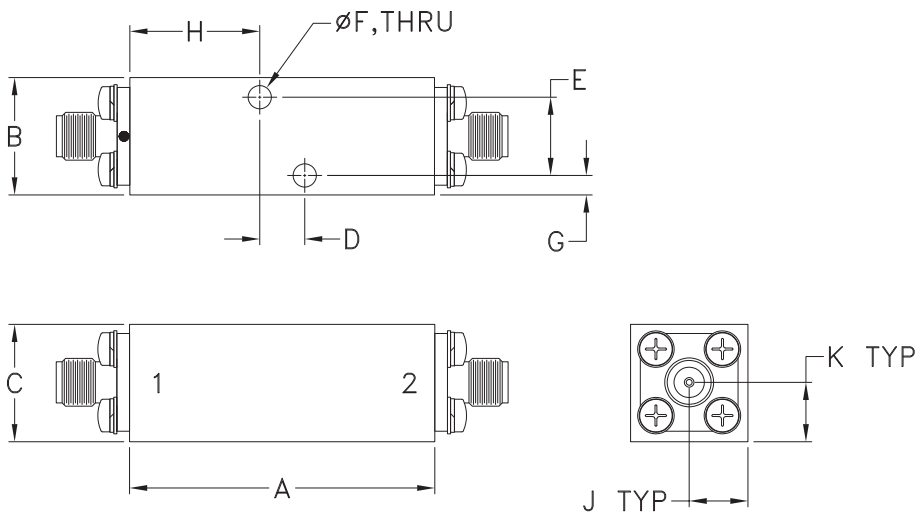
- Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp



Coaxial Connections

PORT - 1	SMA FEMALE
PORT - 2	SMA FEMALE

Outline Drawing



Outline Dimensions ($\frac{\text{inch}}{\text{mm}}$)

A	B	C	D	E	F
1.56	.60	.60	.230	.400	.110
39.6	15.2	15.2	5.84	10.16	2.80
G	H	J	K		Wt.
.10	.66	.30	.30		grams
2.5	16.9	7.6	7.7		72

Note: Please refer to case style drawing for details

Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp



Suspended substrate stripline Band Pass Filter

ZBSS-10G-S+

Typical Performance Data

FREQ. (MHz)	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
	(dB)			(dB)			(dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
10	95.82	100.02	98.09	0.01	0.01	0.02	0.01	0.00	0.02
50	101.48	105.56	101.52	0.03	0.01	0.03	0.00	0.00	0.00
100	115.65	112.22	118.31	0.03	0.01	0.02	0.00	0.00	0.00
200	116.40	117.82	119.06	0.07	0.03	0.04	0.02	0.00	0.00
300	124.87	113.82	107.67	0.09	0.04	0.06	0.03	0.00	0.00
400	109.68	115.32	113.00	0.10	0.04	0.07	0.02	0.02	0.02
500	110.29	113.27	106.04	0.10	0.04	0.06	0.02	0.06	0.06
600	110.05	115.35	107.33	0.09	0.04	0.06	0.07	0.10	0.12
800	103.82	103.18	103.80	0.09	0.03	0.04	0.12	0.16	0.18
1000	97.38	97.75	98.96	0.07	0.01	0.02	0.15	0.20	0.22
1500	87.89	87.38	87.77	0.08	0.00	0.01	0.19	0.25	0.27
2000	81.55	81.42	81.13	0.01	0.08	0.08	0.20	0.26	0.29
2500	76.97	77.08	77.14	0.01	0.09	0.10	0.32	0.41	0.45
3000	75.34	75.35	75.42	0.08	0.19	0.20	0.41	0.51	0.54
3500	76.32	76.52	76.50	0.07	0.19	0.20	0.37	0.47	0.52
4000	81.14	81.66	81.60	0.09	0.22	0.23	0.49	0.61	0.67
4500	91.43	90.83	91.49	0.07	0.21	0.23	0.72	0.86	0.92
5000	72.13	71.82	71.78	0.09	0.25	0.27	0.67	0.82	0.89
5300	60.38	60.03	59.92	0.13	0.29	0.32	0.70	0.86	0.94
5800	42.13	41.81	41.67	0.29	0.45	0.49	1.02	1.19	1.28
6100	31.13	30.85	30.72	0.36	0.53	0.58	1.02	1.20	1.28
6400	20.03	19.72	19.58	0.58	0.77	0.84	0.97	1.18	1.28
6650	10.38	10.08	9.94	1.27	1.61	1.71	1.71	2.04	2.21
6850	3.71	3.68	3.66	4.57	5.30	5.56	5.33	6.05	6.40
8000	0.64	0.84	0.91	32.84	33.69	34.37	31.03	31.38	31.56
8500	0.65	0.84	0.90	20.43	20.89	21.52	19.35	19.65	20.19
9000	0.58	0.79	0.85	28.73	28.58	29.33	28.22	27.84	28.58
9500	0.65	0.86	0.91	18.48	18.63	19.04	18.46	18.51	18.98
9800	0.61	0.83	0.89	24.49	25.21	25.13	24.79	25.31	25.59
10000	0.60	0.82	0.89	38.21	35.19	36.38	35.58	33.76	35.84
10200	0.64	0.86	0.93	21.83	21.62	22.05	22.01	21.78	22.40
10500	0.72	0.95	1.02	17.53	17.66	17.77	17.96	18.13	18.39
11000	0.70	0.94	1.02	22.80	23.35	22.88	23.97	24.74	24.19
11500	0.76	1.03	1.11	36.28	36.92	36.78	32.75	35.70	38.62
12000	0.95	1.24	1.34	20.34	20.35	20.47	19.96	20.19	20.41
12800	2.51	3.25	3.59	12.21	11.17	10.66	9.59	8.65	8.23
13050	9.54	10.89	11.46	2.25	2.37	2.36	1.85	1.86	1.88
13300	19.41	20.62	21.10	0.81	1.07	1.13	0.65	0.80	0.87
13600	29.48	30.53	30.89	0.45	0.71	0.76	0.36	0.51	0.58
13900	38.01	38.96	39.27	0.28	0.55	0.60	0.27	0.42	0.49
14200	45.66	46.52	46.83	0.22	0.49	0.55	0.25	0.39	0.46
14500	52.64	53.45	53.78	0.15	0.42	0.47	0.23	0.37	0.44
15000	63.19	64.00	64.33	0.13	0.38	0.42	0.24	0.37	0.44
15500	72.68	73.51	73.80	0.12	0.36	0.40	0.24	0.37	0.45
16500	89.62	90.06	90.10	0.06	0.21	0.27	0.25	0.38	0.46
17000	95.34	96.80	97.81	0.15	0.14	0.18	0.26	0.39	0.48
17500	105.38	102.94	103.24	0.15	0.14	0.19	0.26	0.39	0.49
18000	106.15	110.92	109.45	0.14	0.14	0.20	0.26	0.39	0.49
18500	111.24	116.28	116.76	0.11	0.16	0.19	0.24	0.38	0.48
19000	117.37	116.93	125.29	0.02	0.23	0.29	0.23	0.38	0.48
19500	120.65	112.96	116.46	0.08	0.19	0.23	0.19	0.35	0.45
20000	120.06	118.47	109.70	0.01	0.26	0.31	0.17	0.32	0.43
20500	122.16	115.41	124.29	0.04	0.25	0.30	0.10	0.27	0.35
21000	120.14	109.09	117.38	0.10	0.20	0.26	0.09	0.25	0.33
21500	112.19	116.76	120.89	0.08	0.23	0.29	0.09	0.23	0.36
22000	114.75	112.32	116.44	0.03	0.28	0.33	0.06	0.22	0.32
23000	104.25	113.32	111.69	0.01	0.31	0.38	0.10	0.26	0.36
24000	103.61	98.68	107.86	0.11	0.42	0.48	0.12	0.28	0.38
25000	100.13	105.48	100.20	0.09	0.44	0.51	0.11	0.28	0.37
26500	92.83	95.37	95.97	0.06	0.27	0.33	0.08	0.25	0.36



Suspended substrate stripline Band Pass Filter

ZBSS-10G-S+

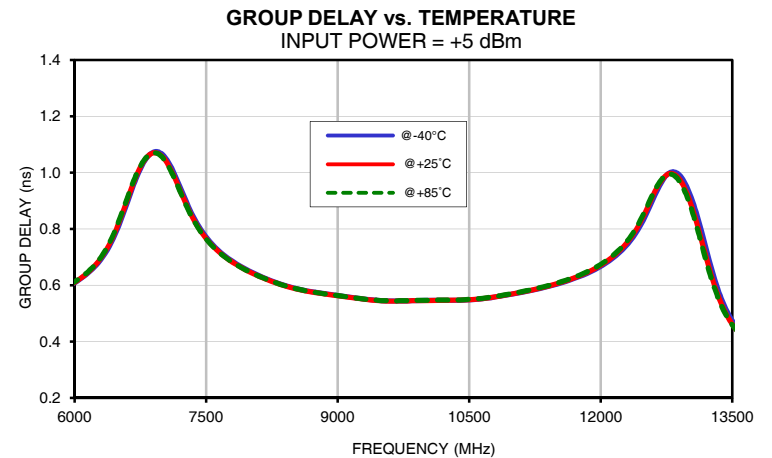
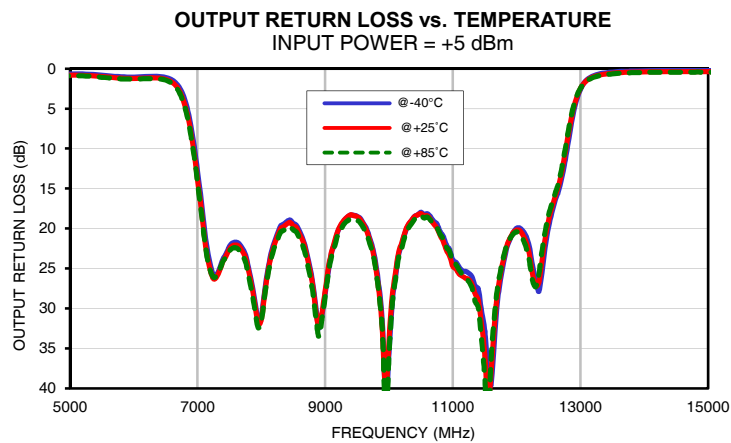
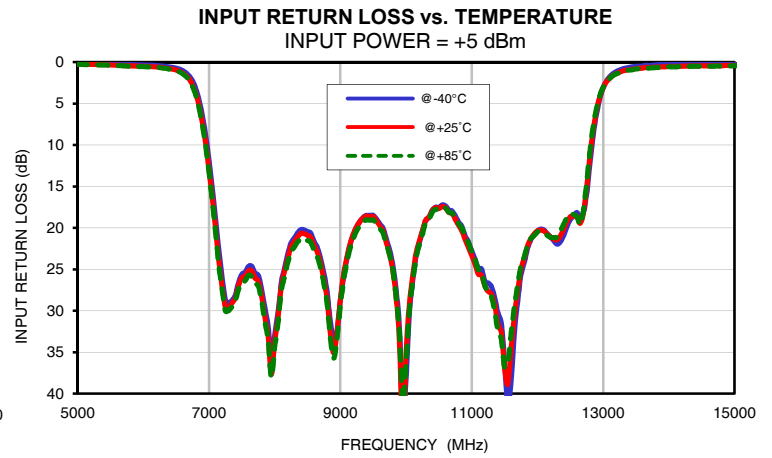
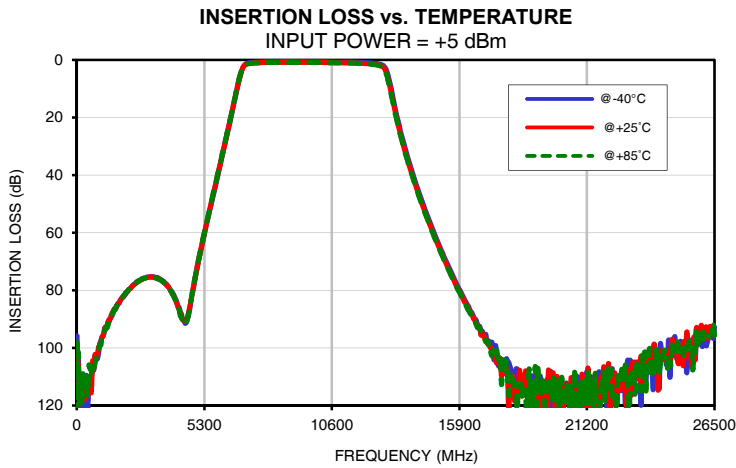
Typical Performance Data

FREQ. (MHz)	GROUP DELAY		
	(nsec)		
	@-40°C	@+25°C	@+85°C
8000	0.65	0.65	0.65
8100	0.64	0.63	0.63
8200	0.62	0.62	0.62
8300	0.61	0.61	0.61
8400	0.60	0.60	0.60
8500	0.59	0.59	0.59
8600	0.58	0.58	0.58
8700	0.58	0.58	0.58
8800	0.57	0.57	0.57
8900	0.57	0.57	0.57
9000	0.56	0.56	0.56
9100	0.56	0.56	0.56
9200	0.56	0.55	0.56
9300	0.55	0.55	0.55
9400	0.55	0.55	0.55
9500	0.55	0.55	0.55
9600	0.54	0.54	0.55
9700	0.54	0.54	0.55
9800	0.55	0.54	0.55
9900	0.55	0.55	0.55
10000	0.55	0.55	0.55
10100	0.55	0.55	0.55
10200	0.55	0.55	0.55
10300	0.55	0.55	0.55
10400	0.55	0.55	0.55
10500	0.55	0.55	0.55
10600	0.55	0.55	0.55
10700	0.55	0.55	0.56
10800	0.56	0.56	0.56
10900	0.56	0.56	0.57
11000	0.57	0.57	0.57
11100	0.58	0.58	0.58
11200	0.58	0.58	0.58
11300	0.59	0.59	0.59
11400	0.60	0.60	0.60
11500	0.60	0.61	0.61
11600	0.61	0.62	0.62
11700	0.62	0.63	0.63
11800	0.64	0.64	0.64
11900	0.65	0.65	0.66
12000	0.67	0.67	0.67

Suspended substrate stripline Band Pass Filter

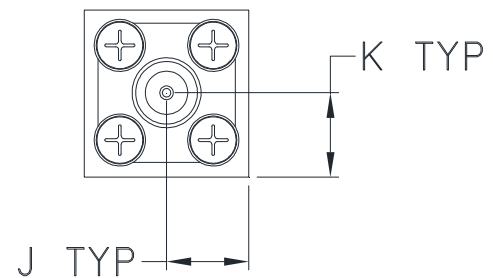
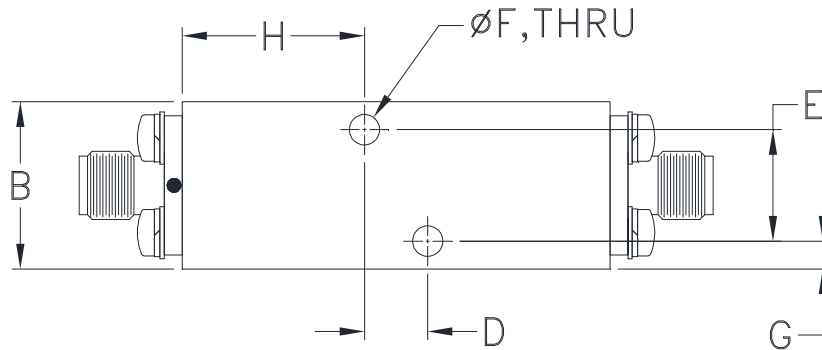
ZBSS-10G-S+

Typical Performance Curves



Outline Dimensions

WD3296



CASE#	A	B	C	D	E	F
WD3296	1.56 (39.6)	.60 (15.2)	.60 (15.2)	.230 (5.84)	.400 (10.16)	.110 (2.79)

CASE#	G	H	J	K	WT. GRAMS
WD3296	.10 (2.5)	.66 (16.9)	.30 (7.6)	.30 (7.7)	72

Dimensions are in inches (mm). Tolerances: 2 Pl. $\pm .100$; 3 Pl. $\pm .015$

Notes:

1. Case material: Brass.
2. Case Finish: Powder coated over silver plating.
3. Refer to the individual model data sheet for the type of connectors available.



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-55° to 100°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Humidity	90 to 95% RH, 40°C, 96 hours; Units may require bake-out after humidity to restore full performance.	MIL-STD-202, Method 103, Condition B
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Vibration (High Frequency)	20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)	MIL-STD-202, Method 204, Condition D
Mechanical Shock	50g, 11ms half-sine, 3 shocks each direction 3 axes (total 18)	MIL-STD-202, Method 213, Condition A