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

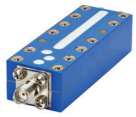
Feature	Advantages
Low insertion loss	Low signal loss results in better SNR in receiver front end and better power delivery to antenna in transmitters
Fast roll-off	Higher selectivity results in better adjacent channel rejection and dynamic range
Wide stopband	Wide, spur-free stop band results in better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

Suspended substrate stripline

Band Pass Filter

ZBSS-2250-S+

50Ω 1600 to 2900 MHz



Generic photo used for illustration purposes only

CASE STYLE: VC3115

Connectors	Model
SMA-F	ZBSS-2250-S+

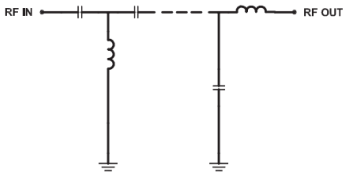
Features

- Wider fractional Bandwidth design of 58%
- 1dB Insertion Loss at fc, 2250MHz
- Sharper Rejection ~45dB within 10% of the Passband edge
- 100dB Rejection at lower frequency of <1000 MHz

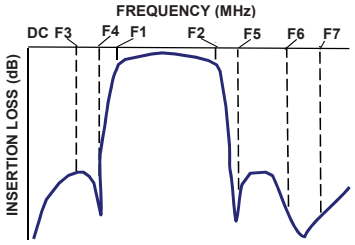
Applications

- Defense
- Broadband receivers
- Wireless communication system

Functional Schematic



Typical Frequency Response



+RoHS Compliant

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

Electrical Specifications at 25°C

Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Insertion Loss	F1-F2	1600 - 2900	-	2.5	3.5	dB
	VSWR	F1-F2	1600 - 2900	-	1.67	-	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC - 1170	40	50	-	dB
		F3-F4	1170 - 1300	20	30		dB
Stop Band, Upper	Insertion Loss	F5-F6	3250 - 3500	20	30	-	dB
		F6-F7	3500 - 6000	-	35	-	dB

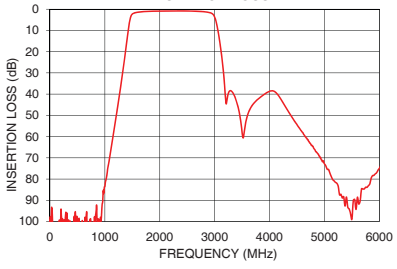
Maximum Ratings	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	3W max. @25°C

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

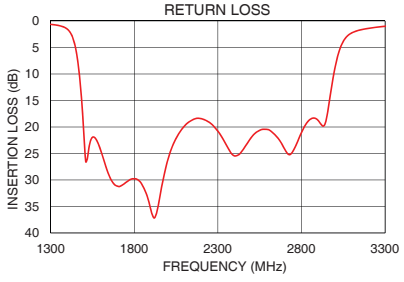
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
1	104.46	34331.58	1600	2.73
100	107.73	3481.32	1700	2.16
600	104.86	168.69	1800	1.85
1170	56.33	42.63	1900	1.65
1300	34.26	27.01	1950	1.58
1320	30.62	24.47	2000	1.51
1370	21.09	16.74	2050	1.46
1480	3.01	1.60	2100	1.41
1600	1.44	1.13	2200	1.34
1900	0.93	1.03	2250	1.32
2250	0.87	1.25	2300	1.30
2600	0.94	1.21	2400	1.29
2900	1.56	1.26	2450	1.29
2990	3.20	1.84	2500	1.30
3060	10.15	5.24	2550	1.31
3120	20.47	8.80	2600	1.33
3160	29.61	10.67	2650	1.37
3250	39.56	14.72	2700	1.42
3500	58.06	27.20	2800	1.60
6000	74.95	69.99	2900	2.02

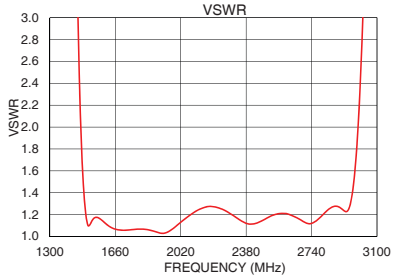
ZBSS-2250-S+
INSERTION LOSS



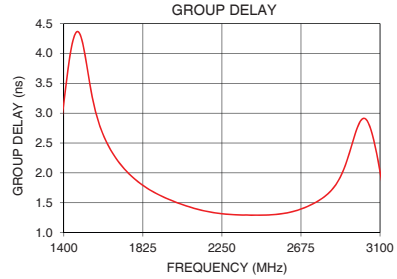
ZBSS-2250-S+
RETURN LOSS



ZBSS-2250-S+
VSWR



ZBSS-2250-S+
GROUP DELAY



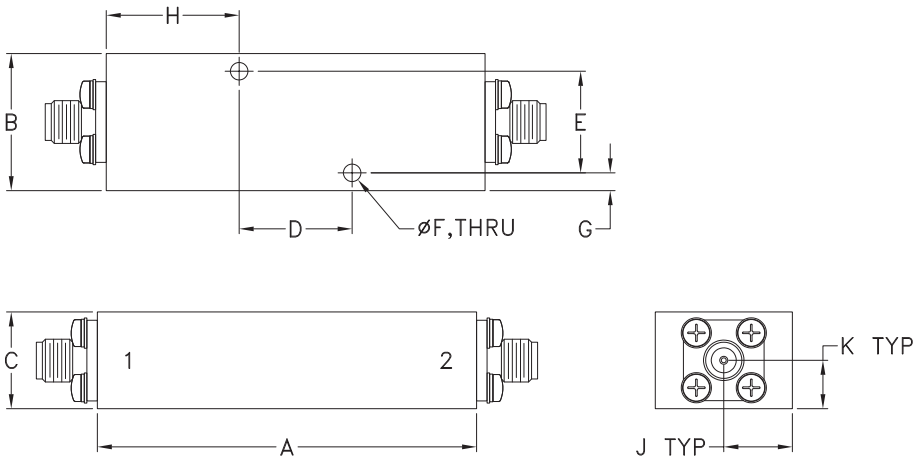
Notes

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

Coaxial Connections

PORT - 1	SMA FEMALE
PORT - 2	SMA FEMALE

Outline Drawing



Outline Dimensions (inch / mm)

A	B	C	D	E	F
2.35	**.85**	**.60**	**.700**	**.630**	**.110**
59.7	21.6	15.2	17.78	16.00	2.80

G	H	J	K	Wt.
.11	**.82**	**.43**	**.30**	grams
2.8	20.9	10.8	7.6	140

Note: Please refer to case style drawing for details

Suspended substrate stripline

Band Pass Filter ZBSS-2250-S+

Typical Performance Data

FREQ.	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
(MHz)	(dB)			(dB)			(dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
1	98.41	104.46	100.56	0.00	0.00	0.00	0.00	0.00	0.00
50	103.46	102.20	99.09	0.00	0.00	0.00	0.00	0.00	0.01
100	106.52	107.73	97.86	0.00	0.00	0.01	0.00	0.01	0.01
150	94.98	102.12	102.49	0.00	0.01	0.01	0.01	0.03	0.03
200	99.59	94.29	96.54	0.00	0.02	0.02	0.03	0.05	0.06
250	96.59	100.47	114.57	0.01	0.02	0.03	0.05	0.07	0.08
300	96.25	99.80	97.47	0.02	0.03	0.04	0.08	0.10	0.11
350	104.80	110.98	101.02	0.03	0.04	0.05	0.11	0.13	0.14
400	105.58	102.19	99.61	0.04	0.06	0.07	0.14	0.16	0.18
450	103.98	106.91	92.85	0.04	0.06	0.08	0.16	0.19	0.21
500	101.45	101.92	105.99	0.05	0.08	0.09	0.18	0.22	0.24
600	106.85	104.86	96.76	0.07	0.10	0.12	0.23	0.27	0.30
700	101.72	109.12	98.33	0.10	0.14	0.15	0.24	0.29	0.32
800	106.93	106.38	98.13	0.13	0.17	0.19	0.24	0.29	0.33
900	100.38	101.79	104.20	0.17	0.22	0.24	0.26	0.32	0.35
1000	84.36	83.43	84.10	0.23	0.27	0.30	0.27	0.34	0.38
1170	56.70	56.33	56.09	0.35	0.41	0.45	0.39	0.47	0.52
1200	51.81	51.36	51.14	0.38	0.44	0.48	0.43	0.52	0.57
1250	43.47	43.01	42.71	0.45	0.52	0.57	0.54	0.64	0.69
1300	34.75	34.26	33.94	0.55	0.64	0.71	0.70	0.81	0.87
1330	29.29	28.77	28.41	0.65	0.75	0.83	0.84	0.96	1.04
1380	19.69	19.10	18.69	1.00	1.16	1.28	1.25	1.43	1.55
1430	9.72	9.17	8.81	2.51	2.95	3.26	2.73	3.20	3.55
1480	3.06	3.01	3.00	11.32	12.77	13.58	11.08	12.68	13.95
1600	1.33	1.44	1.52	23.64	24.44	24.16	24.67	24.83	24.72
1800	0.92	1.03	1.09	30.62	29.79	30.45	31.21	30.33	30.07
1950	0.80	0.90	0.97	34.53	33.75	31.20	28.08	27.69	26.32
2100	0.79	0.89	0.96	20.00	19.83	19.99	18.82	18.76	18.94
2250	0.78	0.87	0.93	18.31	19.15	20.04	17.62	18.31	19.06
2400	0.72	0.83	0.90	24.54	25.47	26.13	23.69	24.12	24.45
2600	0.82	0.94	1.01	20.60	20.47	20.72	19.55	19.44	19.68
2700	0.88	1.01	1.09	22.19	24.20	25.28	20.37	21.41	21.75
2800	1.03	1.19	1.29	21.19	21.05	20.96	19.86	19.61	19.37
2900	1.35	1.56	1.69	18.74	18.77	18.63	20.01	20.64	20.83
3000	3.10	3.76	4.11	9.90	8.89	8.50	9.52	8.54	8.22
3070	10.41	11.66	12.23	3.01	2.97	2.99	2.11	2.06	2.08
3130	21.02	22.52	23.18	1.75	1.88	1.97	0.90	0.98	1.03
3170	30.56	32.46	33.25	1.42	1.57	1.67	0.67	0.75	0.80
3200	41.15	42.93	43.26	1.25	1.40	1.50	0.57	0.66	0.70
3250	40.04	39.56	39.59	1.03	1.18	1.28	0.47	0.55	0.59
3400	42.89	43.62	44.17	0.65	0.77	0.84	0.30	0.38	0.43
3500	56.14	58.06	59.05	0.53	0.64	0.69	0.24	0.32	0.37
3600	50.71	49.84	49.34	0.47	0.57	0.62	0.19	0.27	0.32
3700	45.02	44.74	44.58	0.47	0.57	0.61	0.17	0.25	0.31
3800	42.25	42.10	42.03	0.53	0.64	0.70	0.15	0.23	0.29
3900	40.16	40.17	40.11	0.72	0.86	0.95	0.14	0.23	0.30
4000	38.48	38.64	38.65	1.20	1.39	1.52	0.14	0.23	0.30
4100	38.64	38.96	39.06	1.60	1.78	1.92	0.11	0.21	0.29
4200	41.87	42.13	42.32	1.11	1.25	1.32	0.10	0.20	0.27
4300	46.19	46.39	46.52	0.66	0.77	0.82	0.08	0.18	0.26
4400	50.27	50.52	50.59	0.45	0.55	0.59	0.08	0.18	0.26
4500	54.28	54.40	54.45	0.33	0.42	0.46	0.09	0.19	0.27
4600	58.03	58.09	58.21	0.26	0.35	0.39	0.09	0.21	0.29
4700	61.57	61.45	61.81	0.22	0.31	0.35	0.09	0.21	0.30
4800	64.92	65.24	65.63	0.18	0.28	0.32	0.07	0.19	0.28
5000	73.02	72.82	73.30	0.14	0.24	0.29	0.05	0.16	0.26
5200	81.45	81.54	84.71	0.11	0.22	0.28	0.10	0.22	0.31
5500	95.78	98.85	93.51	0.10	0.22	0.30	0.05	0.17	0.29
5800	85.28	83.10	83.17	0.11	0.26	0.35	0.09	0.22	0.32
6000	74.79	74.95	73.99	0.11	0.25	0.34	0.10	0.24	0.35

Typical Performance Data

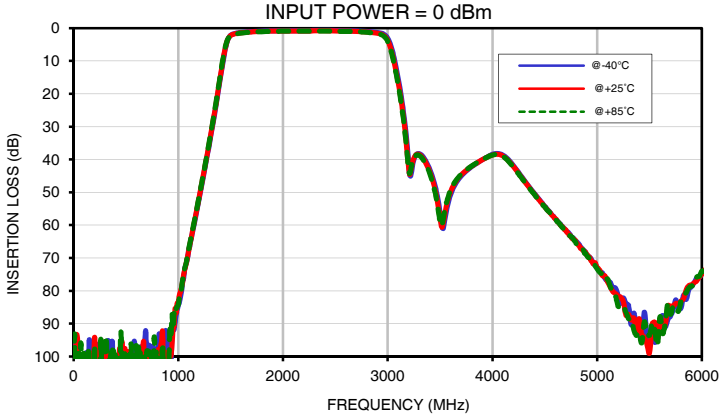
FREQ.	GROUP DELAY		
(MHz)	(nsec)		
	@-40°C	@+25°C	@+85°C
1600	2.77	2.73	2.71
1620	2.62	2.58	2.56
1640	2.49	2.45	2.43
1670	2.32	2.29	2.28
1700	2.19	2.16	2.15
1730	2.08	2.05	2.04
1760	1.98	1.96	1.94
1800	1.87	1.85	1.84
1830	1.80	1.78	1.77
1860	1.74	1.72	1.71
1880	1.70	1.68	1.68
1900	1.67	1.65	1.64
1920	1.64	1.62	1.61
1940	1.61	1.59	1.58
1960	1.58	1.56	1.55
1980	1.55	1.54	1.53
2000	1.53	1.51	1.50
2020	1.50	1.49	1.48
2040	1.48	1.47	1.46
2060	1.46	1.45	1.44
2080	1.44	1.43	1.42
2100	1.42	1.41	1.40
2120	1.40	1.39	1.38
2140	1.39	1.38	1.37
2160	1.37	1.36	1.36
2180	1.36	1.35	1.34
2200	1.35	1.34	1.33
2210	1.34	1.33	1.33
2230	1.33	1.32	1.32
2250	1.33	1.32	1.31
2270	1.32	1.31	1.31
2300	1.31	1.30	1.30
2320	1.31	1.30	1.29
2350	1.30	1.30	1.29
2370	1.30	1.29	1.29
2400	1.30	1.29	1.29
2420	1.30	1.29	1.29
2450	1.30	1.29	1.29
2480	1.31	1.29	1.29
2500	1.31	1.30	1.29
2520	1.31	1.30	1.29
2550	1.32	1.31	1.30
2580	1.33	1.32	1.32
2600	1.34	1.33	1.33
2620	1.35	1.34	1.34
2650	1.37	1.37	1.37
2670	1.39	1.39	1.39
2690	1.41	1.41	1.41
2710	1.44	1.44	1.44
2730	1.47	1.47	1.47
2750	1.50	1.50	1.50
2770	1.53	1.54	1.54
2800	1.59	1.60	1.60
2810	1.62	1.62	1.63
2830	1.67	1.68	1.69
2840	1.70	1.71	1.72
2860	1.78	1.79	1.80
2880	1.87	1.89	1.90
2890	1.92	1.95	1.97
2900	1.99	2.02	2.04

Suspended substrate stripline

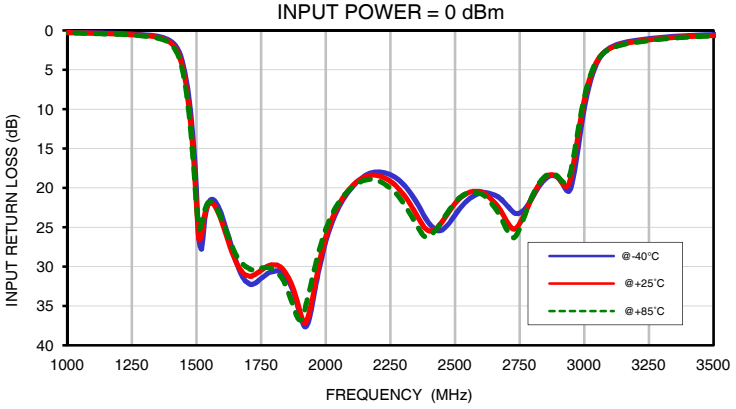
Band Pass Filter ZBSS-2250-S+

Typical Performance Curves

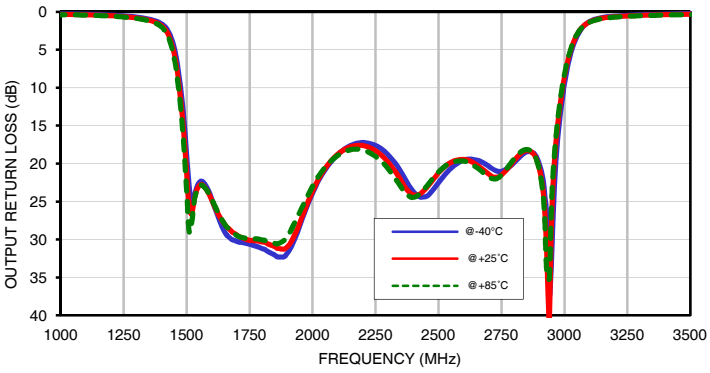
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



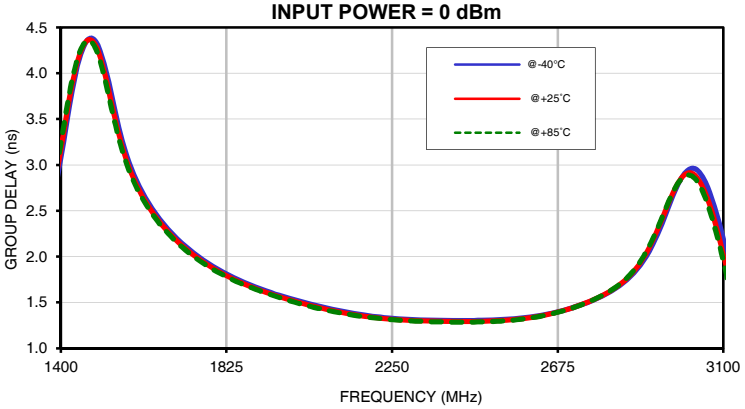
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



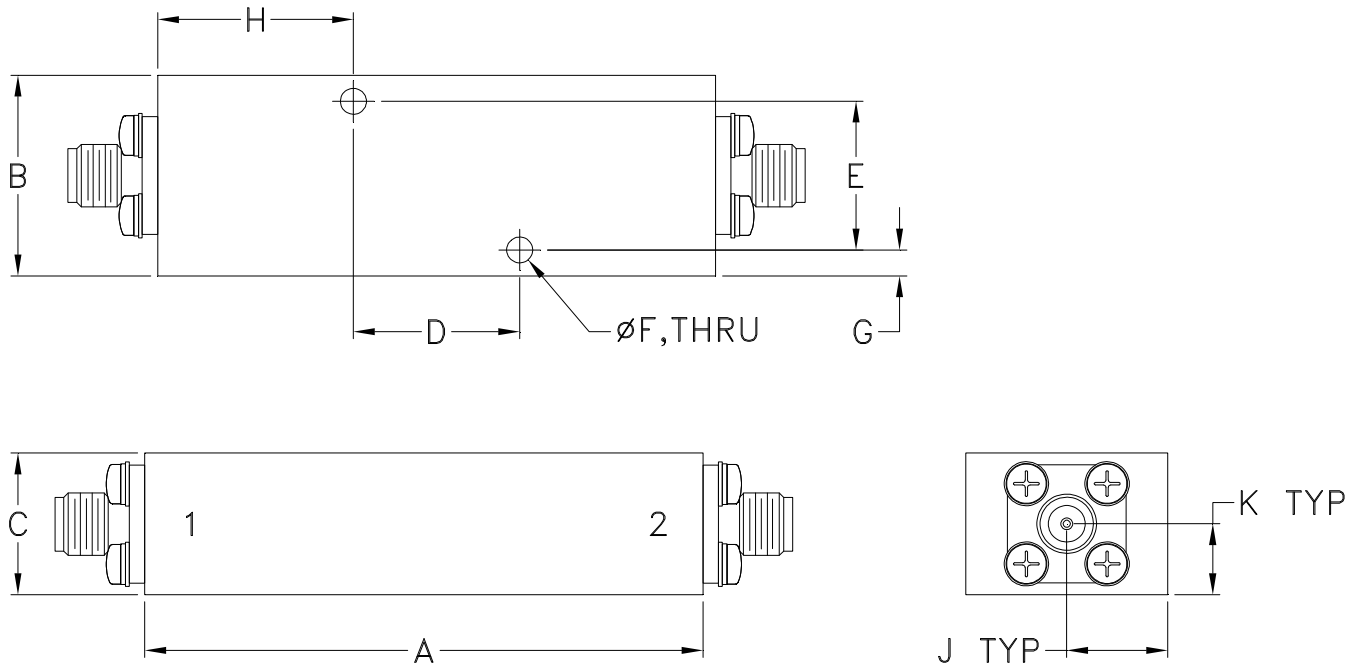
GROUP DELAY vs. TEMPERATURE
INPUT POWER = 0 dBm



Case Style VC

Outline Dimensions

VC3115



CASE#	A	B	C	D	E	F
VC3115	2.35 (59.7)	.85 (21.6)	.60 (15.2)	.700 (17.78)	.630 (16.00)	.110 (2.80)

CASE#	G	H	J	K	WT.GRAMS
VC3115	.11 (2.8)	.82 (20.9)	.43 (10.8)	.30 (7.6)	140

Dimensions are in inches (mm). Tolerances: 2 Pl. ± .100; 3 Pl. ± .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.

Mini-Circuits

Environmental Specifications ENV46

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, Condintion 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