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-A10G-S+

50Ω 2000 to 18000 MHz

Generic photo used for illustration purposes only

CASE STYLE:WG3316

Connectors	Model
SMA - F	ZBSS-A10G-S+

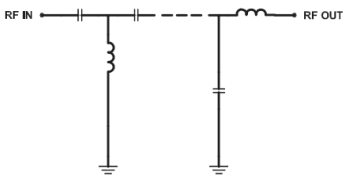
Features

- Wide fractional bandwidth design of 160%
- 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

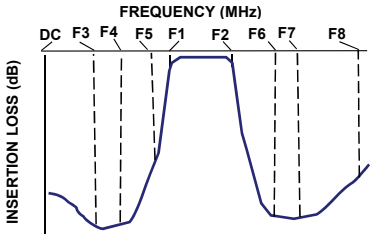
Applications

- Satellite communications
- Wideband receivers (S, C, X, Ku - bands)
- Military and defense
- Electronic warfare receiver

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	Center Frequency	Fc	10000	-	1	-	dB
	Insertion Loss	F1-F2	2000 - 18000	-	2.2	3.5	dB
	VSWR	F1-F2	2000 - 18000	-	1.9	-	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC - 1100	60	90	-	dB
		F3-F4	1100 - 1300	40	60	-	dB
		F4-F5	1300 - 1400	20	40	-	dB
Stop Band, Upper	Insertion Loss	F6-F7	20500 - 21500	20	40	-	dB
		F7-F8	21500 - 26500	-	40	-	dB

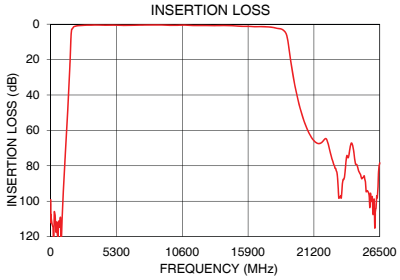
Maximum Ratings	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	5W max. @ 25°C

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

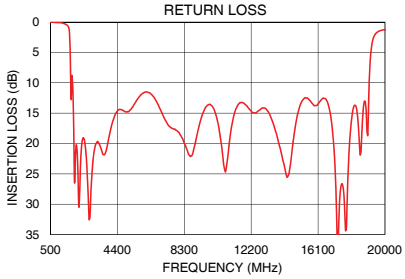
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
10	99.15	9119.04	2000	1.71
500	111.76	465.07	3000	0.67
1100	85.01	147.92	4000	0.49
1300	59.15	66.34	5000	0.43
1400	46.16	45.17	6000	0.39
1500	32.21	28.98	7000	0.38
1550	24.43	20.82	8000	0.37
1700	2.95	1.60	9000	0.37
2000	1.14	1.22	10000	0.37
6000	0.69	1.72	11000	0.38
10000	0.65	1.49	12000	0.38
14000	0.77	1.17	13000	0.40
18000	1.97	1.31	14000	0.42
18650	2.98	1.28	15000	0.44
19350	21.63	7.21	15200	0.44
19550	30.27	10.43	15500	0.46
20500	56.56	9.13	16000	0.48
21500	67.35	9.88	16500	0.50
23000	82.87	6.27	17000	0.55
26500	78.41	1.56	18000	0.67

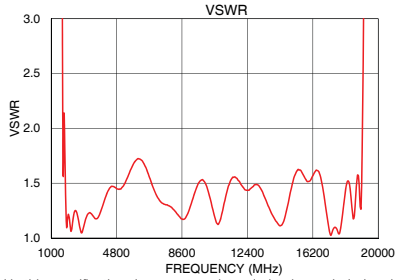
ZBSS-A10G-S+
INSERTION LOSS



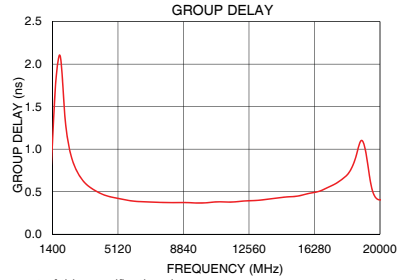
ZBSS-A10G-S+
RETURN LOSS



ZBSS-A10G-S+
VSWR



ZBSS-A10G-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.

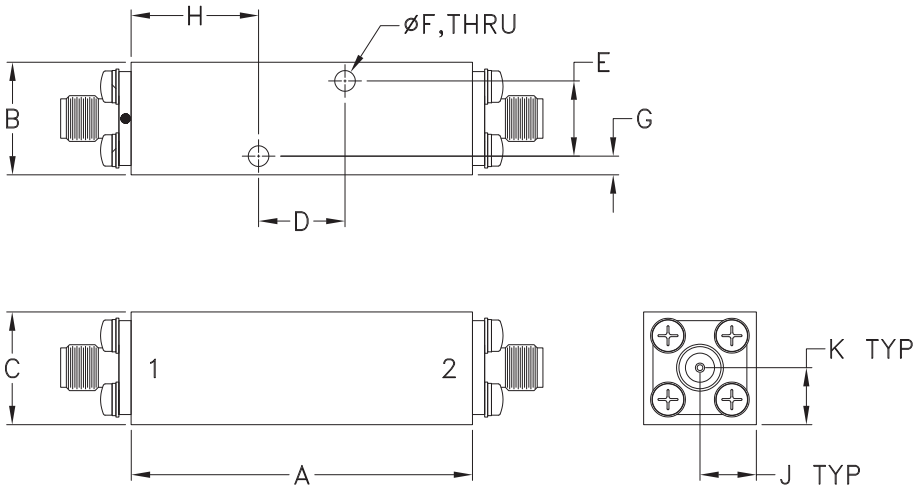
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.

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
1.82	**.60**	**.60**	**.460**	**.400**	**.110**
46.2	15.2	15.2	11.68	10.16	2.80
G	H	J	K		Wt.
.10	**.68**	**.30**	**.30**		grams
2.5	17.2	7.6	7.7		84

Note: Please refer to case style drawing for details

Suspended substrate stripline

Band Pass Filter ZBSS-A10G-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
10	102.33	99.15	98.35	0.00	0.00	0.00	0.00	0.00	0.00
50	115.69	109.20	102.10	0.00	0.00	0.00	0.02	0.01	0.02
100	111.96	111.88	110.70	0.01	0.01	0.01	0.02	0.01	0.01
150	104.02	113.87	110.69	0.03	0.02	0.02	0.03	0.02	0.02
200	113.11	114.92	107.20	0.06	0.03	0.04	0.06	0.03	0.04
250	117.63	126.52	113.51	0.08	0.05	0.05	0.05	0.02	0.03
300	108.13	105.99	115.13	0.10	0.06	0.07	0.09	0.04	0.06
350	103.23	106.92	114.34	0.11	0.07	0.08	0.07	0.02	0.04
400	108.22	112.10	131.23	0.11	0.06	0.08	0.07	0.02	0.03
450	111.02	117.63	115.54	0.11	0.05	0.07	0.06	0.00	0.02
500	109.56	111.76	122.49	0.09	0.04	0.06	0.02	0.03	0.02
550	117.05	118.64	108.52	0.07	0.01	0.04	0.02	0.04	0.03
600	128.32	120.13	118.39	0.05	0.01	0.01	0.03	0.08	0.08
650	122.65	111.32	105.94	0.03	0.03	0.02	0.05	0.09	0.10
700	117.63	111.52	114.50	0.01	0.05	0.04	0.07	0.12	0.13
800	119.11	109.49	108.46	0.02	0.07	0.07	0.11	0.16	0.17
1000	101.01	99.22	98.40	0.04	0.09	0.10	0.15	0.22	0.23
1100	85.40	85.01	85.25	0.06	0.12	0.13	0.18	0.26	0.26
1300	59.55	59.15	58.91	0.18	0.26	0.28	0.31	0.40	0.41
1400	46.60	46.16	45.92	0.29	0.38	0.41	0.38	0.47	0.50
1500	32.73	32.21	31.94	0.48	0.60	0.64	0.52	0.63	0.68
1550	25.03	24.43	24.15	0.68	0.84	0.89	0.69	0.83	0.90
1600	16.40	15.73	15.44	1.23	1.50	1.63	1.22	1.48	1.62
1700	2.73	2.95	3.08	13.82	12.72	12.26	14.00	12.77	12.22
2000	0.99	1.14	1.20	20.12	20.23	20.31	19.24	19.38	19.49
3000	0.45	0.57	0.60	22.13	22.15	22.24	21.12	21.22	21.16
4000	0.40	0.52	0.55	17.64	17.78	17.66	17.09	17.31	17.21
5000	0.43	0.55	0.58	14.55	14.76	14.60	14.67	14.91	14.76
6000	0.56	0.69	0.72	11.34	11.55	11.46	11.40	11.61	11.53
8000	0.31	0.47	0.50	17.95	18.22	17.96	19.14	19.14	18.97
10000	0.47	0.65	0.68	14.18	14.19	14.56	14.36	14.48	14.73
12000	0.56	0.75	0.81	13.67	14.04	14.07	13.81	14.30	14.31
13000	0.59	0.82	0.88	14.51	14.20	14.31	15.59	15.39	15.60
14000	0.55	0.77	0.85	21.97	22.14	22.35	22.03	22.18	22.19
16000	0.95	1.25	1.36	14.03	13.74	13.74	16.38	16.47	16.63
18000	1.52	1.97	2.16	18.24	17.46	16.96	18.32	17.83	17.19
18650	2.30	2.98	3.26	22.16	18.31	17.35	23.28	19.89	18.58
19100	6.99	9.44	10.28	10.79	8.40	7.96	4.73	3.99	3.85
19350	18.77	21.63	22.44	2.38	2.43	2.50	1.40	1.52	1.58
19550	27.84	30.27	30.94	1.43	1.67	1.79	0.88	1.06	1.13
19800	37.17	39.16	39.70	1.04	1.36	1.49	0.65	0.83	0.91
20000	43.47	45.15	45.61	0.92	1.27	1.42	0.50	0.69	0.76
20200	48.91	50.28	50.70	0.99	1.41	1.57	0.37	0.58	0.64
20500	55.54	56.56	57.01	1.38	1.91	2.11	0.28	0.47	0.54
20800	60.64	61.44	61.97	1.96	2.43	2.60	0.22	0.43	0.49
21000	63.43	64.01	64.54	2.08	2.45	2.58	0.18	0.40	0.46
21200	65.61	65.80	66.39	1.86	2.18	2.29	0.09	0.32	0.37
21500	67.81	67.35	67.81	1.41	1.76	1.89	0.02	0.25	0.30
21800	67.93	66.93	67.31	1.37	1.93	2.16	0.04	0.27	0.31
22000	66.65	65.47	65.81	2.19	3.43	4.07	0.03	0.25	0.30
22200	65.00	64.85	65.67	7.85	11.87	13.64	0.02	0.23	0.28
22400	68.30	69.19	70.30	5.67	4.93	4.74	0.01	0.20	0.25
22600	74.12	74.68	75.66	2.18	2.41	2.49	0.03	0.19	0.24
22800	78.74	79.38	79.94	1.45	1.86	2.02	0.01	0.20	0.25
23000	82.44	82.87	83.34	1.70	2.80	3.26	0.01	0.20	0.25
23500	94.09	89.57	89.75	2.10	2.95	3.28	0.04	0.16	0.21
24000	75.98	74.67	74.70	7.23	5.16	5.41	0.06	0.14	0.19
24500	74.40	77.27	78.93	6.49	5.34	5.12	0.10	0.11	0.16
25000	84.70	86.32	87.55	6.27	5.24	4.91	0.14	0.09	0.14
26500	81.50	78.41	79.33	10.79	13.20	12.62	0.20	0.04	0.10

Suspended substrate stripline

Band Pass Filter ZBSS-A10G-S+

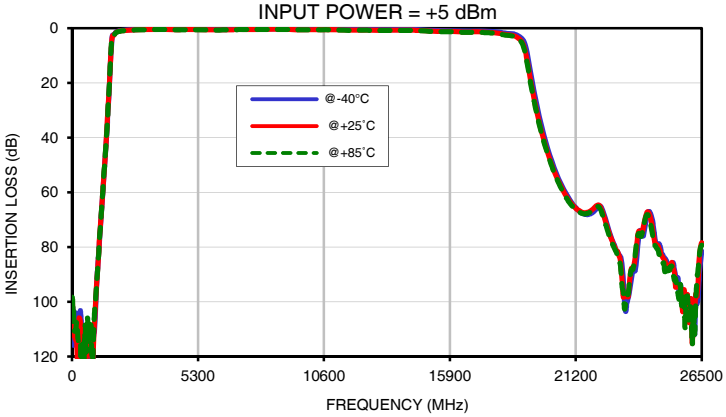
Typical Performance Data

FREQ. (MHz)	GROUP DELAY (nsec)		
	@-40°C	@+25°C	@+85°C
2000	1.73	1.71	1.70
2200	1.21	1.20	1.20
2300	1.07	1.07	1.07
2400	0.97	0.97	0.97
2700	0.78	0.78	0.78
3000	0.67	0.67	0.67
3300	0.59	0.59	0.59
3600	0.54	0.54	0.54
3900	0.51	0.50	0.50
4200	0.47	0.47	0.47
4500	0.45	0.45	0.45
4800	0.43	0.43	0.43
5100	0.42	0.42	0.42
5400	0.41	0.41	0.41
5700	0.40	0.40	0.40
6000	0.39	0.39	0.39
6300	0.38	0.38	0.38
6600	0.38	0.38	0.38
6900	0.38	0.38	0.38
7200	0.38	0.38	0.38
7500	0.37	0.37	0.37
7800	0.37	0.37	0.37
8100	0.37	0.37	0.37
8400	0.37	0.37	0.37
8700	0.37	0.37	0.37
9000	0.37	0.37	0.37
9300	0.37	0.37	0.37
9600	0.37	0.37	0.37
9900	0.37	0.37	0.37
10200	0.37	0.37	0.37
10500	0.38	0.38	0.38
10800	0.38	0.38	0.38
11100	0.38	0.38	0.38
11500	0.38	0.38	0.38
12000	0.38	0.38	0.39
13000	0.40	0.40	0.40
14000	0.42	0.42	0.42
15000	0.44	0.44	0.44
16000	0.48	0.48	0.48
17000	0.54	0.55	0.55
18000	0.66	0.67	0.67

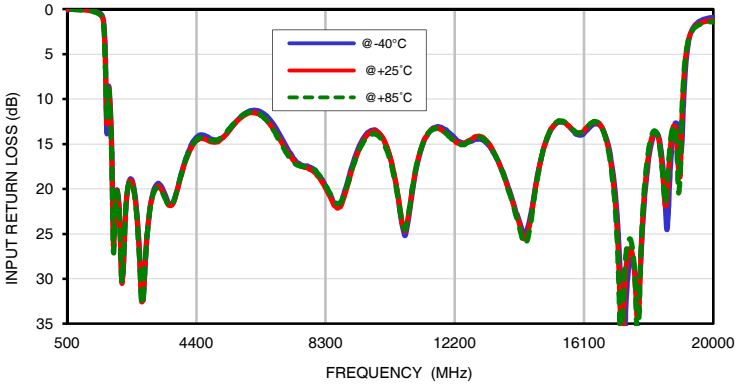
Band Pass Filter ZBSS-A10G-S+

Typical Performance Curves

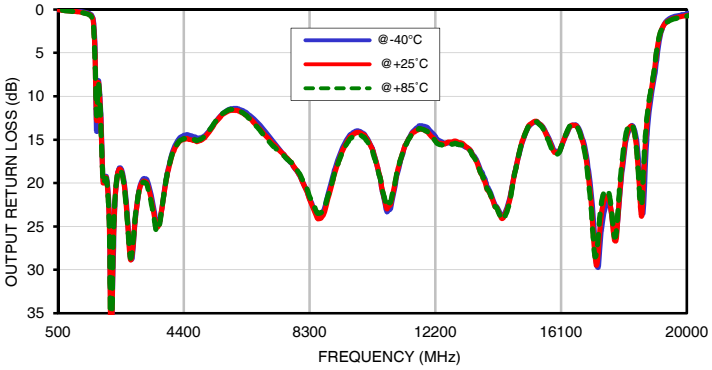
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = +5 dBm



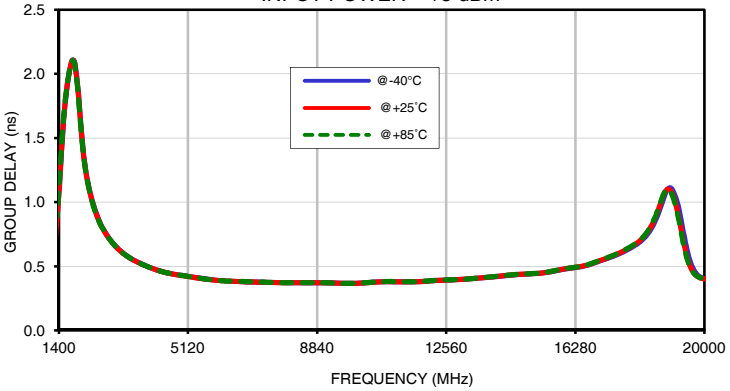
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = +5 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = +5 dBm



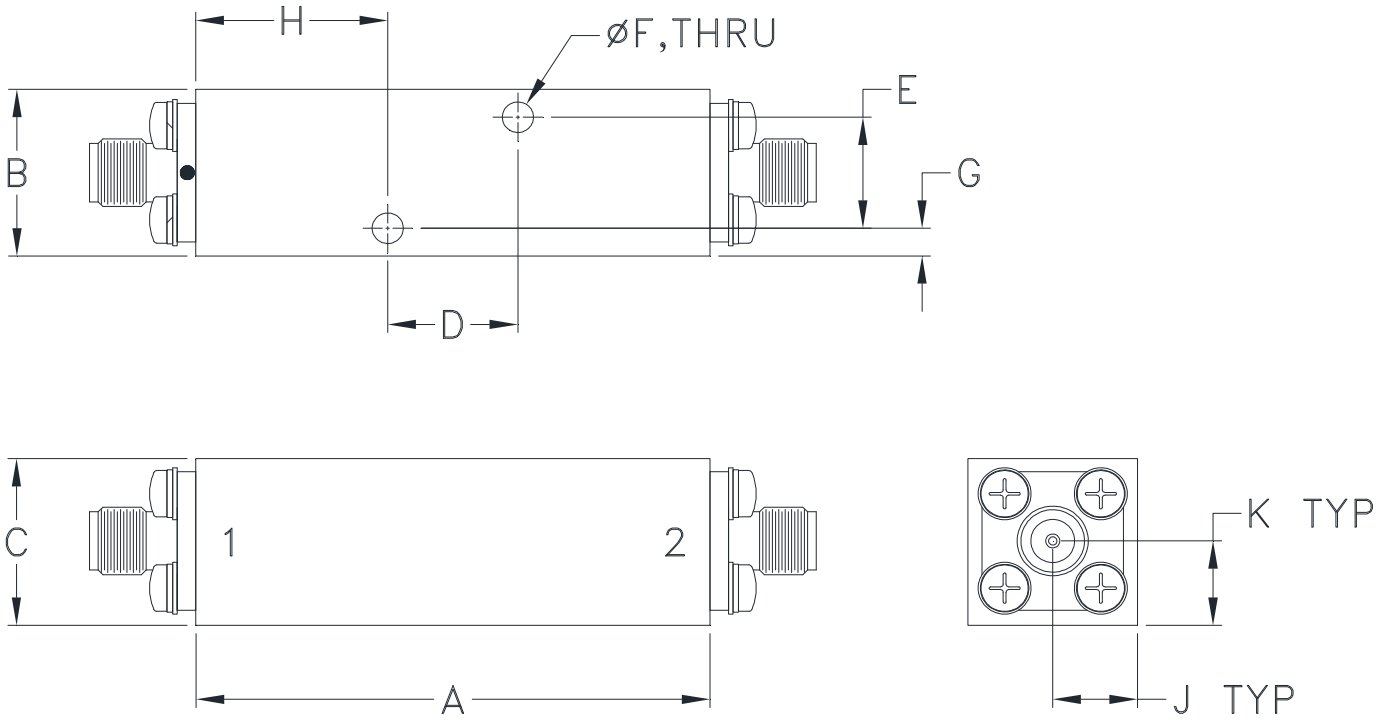
GROUP DELAY vs. TEMPERATURE
INPUT POWER = +5 dBm



Case Style WG

Outline Dimensions

WG3316



CASE#	A	B	C	D	E	F
WG3316	1.82 (46.2)	.60 (15.2)	.60 (15.2)	.460 (11.68)	.400 (10.16)	.110 (2.80)

CASE#	G	H	J	K	WT.GRAMS
WG3316	.10 (2.5)	.68 (17.2)	.30 (7.6)	.30 (7.7)	84

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