

Coaxial Frequency Mixer

Level 7 (LO Power +7 dBm) 0.5 to 500 MHz

ZAD-1+



Generic photo used for illustration purposes only

CASE STYLE: M22

Connectors	Model
BNC	ZAD-1+
BRACKET (OPTION "B")	
BRACKET (OPTION "BR")	

+RoHS Compliant

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

Maximum Ratings

Operating Temperature	-55°C to 100°C
Storage Temperature	-55°C to 100°C
RF Power	50mW
IF Current	40mA

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

Coaxial Connections

LO	1
RF	3
IF	2

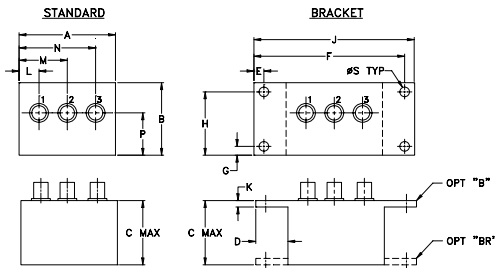
Features

- low conversion loss, 5.24 dB typ.
- high L-R isolation, 45 dB typ.
- rugged shielded case

Applications

- VHF/UHF
- instrumentation

Outline Drawing



Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H
2.25	1.38	1.24	.50	.150	3.100	.138	1.238
57.15	35.05	31.50	12.70	3.81	78.74	3.51	31.45

J	K	L	M	N	P	S	wt
3.25	.10	.40	1.15	1.86	.64	.150	grams
82.55	2.54	10.16	29.21	47.24	16.26	3.81	74.0

Electrical Specifications

FREQUENCY (MHz)	CONVERSION LOSS (dB)	LO-RF ISOLATION (dB)						LO-IF ISOLATION (dB)									
		L		M		U		L		M		U					
$f_L - f_U$	Mid-Band m																
\bar{X}	σ	Total Range Max.															
0.5-500	DC-500	5.24	0.10	7.0	8.5	50	45	45	30	35	25	45	35	40	25	30	20

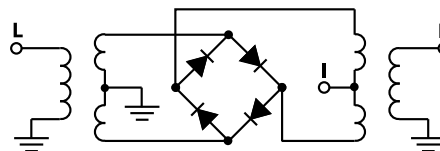
1 dB COMP.: +1 dBm typ.

L = low range [f_L to $10 f_L$] M = mid range [$10 f_L$ to $f_U/2$] U = upper range [$f_U/2$ to f_U]
m = mid band [$2f_L$ to $f_U/2$]

Typical Performance Data

Frequency (MHz)		Conversion Loss (dB)	Isolation L-R (dB)	Isolation L-I (dB)	VSWR RF Port (:1)	VSWR LO Port (:1)
RF	LO	LO +7dBm	LO +7dBm	LO +7dBm	LO +7dBm	LO +7dBm
0.50	30.50	7.29	>67.00	>67.00	1.21	1.98
1.00	31.00	6.89	>67.00	62.73	1.03	1.93
2.00	32.00	6.49	>67.00	61.28	1.02	1.96
5.00	35.00	6.01	>67.00	60.55	1.06	1.86
10.00	40.00	5.99	>67.00	59.37	1.10	1.83
20.00	50.00	6.02	>67.00	59.08	1.13	1.87
32.73	62.73	5.96	41.47	57.92	1.15	1.88
50.00	80.00	5.91	56.01	56.08	1.19	1.91
64.95	94.95	5.87	53.83	54.11	1.23	1.91
100.00	70.00	5.81	49.90	49.45	1.29	1.92
161.63	131.63	5.84	44.60	43.60	1.35	1.91
200.00	170.00	5.99	41.47	40.82	1.42	1.99
226.08	196.08	5.95	40.62	39.96	1.49	1.99
258.31	228.31	5.89	39.44	37.84	1.56	1.99
306.65	276.65	5.99	37.26	36.42	1.65	2.03
354.99	324.99	6.23	34.94	34.34	1.74	2.16
403.33	373.33	6.32	33.70	33.77	1.81	2.20
451.66	421.66	6.68	33.66	33.23	1.93	2.27
483.89	453.89	7.17	34.17	34.46	2.00	2.25
500.00	470.00	7.25	34.51	34.41	2.03	2.26

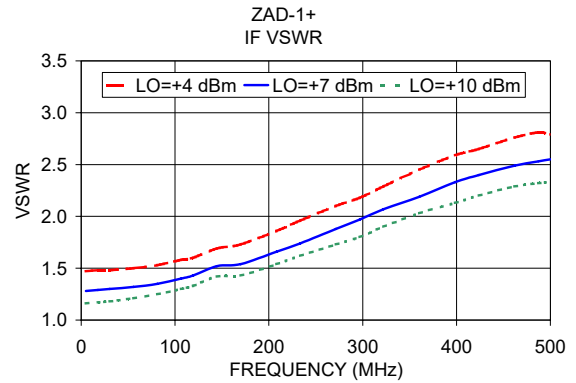
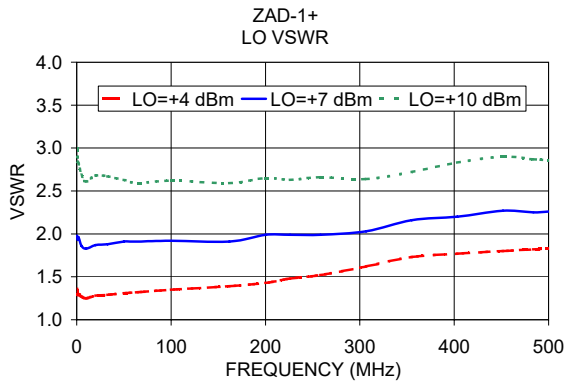
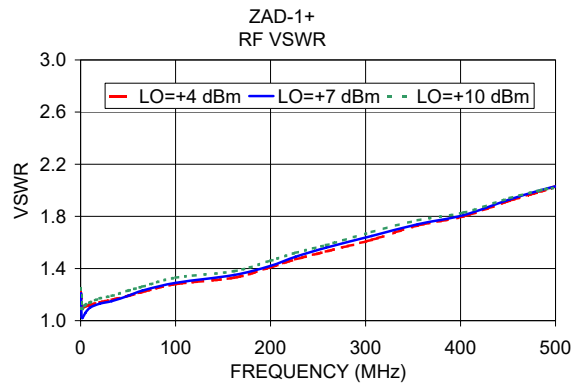
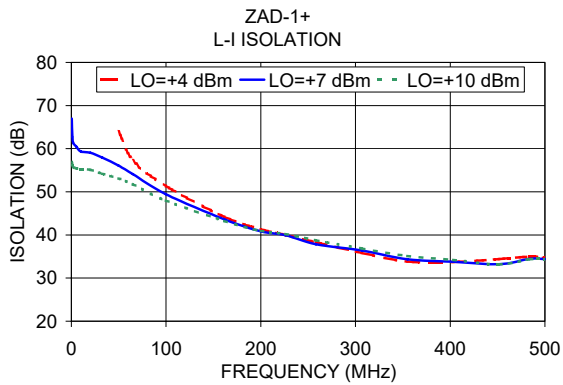
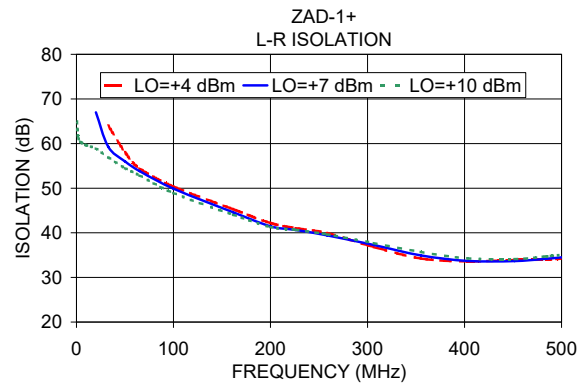
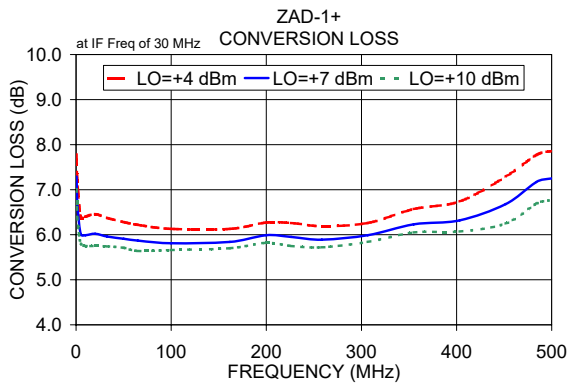
Electrical Schematic



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





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Frequency Mixer

ZAD-1+

Typical Performance Data

RF (MHz)	LO (MHz)	CONVERSION LOSS (dB)			LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
		@LO (dBm)				@LO (dBm)			@LO (dBm)		
		+4	+7	+10		+4	+7	+10	+4	+7	+10
0.5	30.5	7.78	7.29	7.01	0.5	64.00	67.00	64.94	64.00	67.00	56.93
1.0	31.0	7.34	6.89	6.61	1.0	64.00	67.00	63.22	64.00	62.73	56.27
2.0	32.0	6.97	6.49	6.20	2.0	64.00	67.00	61.14	64.00	61.28	55.71
5.0	35.0	6.39	6.01	5.80	5.0	64.00	67.00	60.28	64.00	60.55	55.46
10.0	40.0	6.40	5.99	5.75	10.0	64.00	67.00	59.63	64.00	59.37	55.25
20.0	50.0	6.46	6.02	5.75	20.0	64.00	67.00	58.89	64.00	59.08	55.09
32.7	62.7	6.37	5.96	5.74	32.7	64.00	59.27	56.91	64.00	57.92	54.20
50.0	80.0	6.28	5.91	5.71	50.0	58.05	56.01	54.48	64.00	56.08	53.11
65.0	95.0	6.22	5.87	5.64	65.0	54.46	53.83	52.86	57.32	54.11	51.72
100.0	70.0	6.13	5.81	5.66	100.0	50.35	49.90	48.91	51.33	49.45	47.96
161.6	131.6	6.13	5.84	5.70	161.6	45.29	44.60	44.03	44.16	43.60	43.25
200.0	170.0	6.27	5.99	5.82	200.0	42.19	41.47	41.29	41.32	40.82	40.93
226.1	196.1	6.26	5.95	5.75	226.1	41.04	40.62	40.68	39.98	39.96	40.20
258.3	228.3	6.19	5.89	5.72	258.3	39.93	39.44	39.63	38.30	37.84	38.74
306.7	276.7	6.26	5.99	5.84	306.7	36.83	37.26	37.70	35.84	36.42	36.87
355.0	325.0	6.57	6.23	6.05	355.0	34.24	34.94	35.71	33.81	34.34	35.10
403.3	373.3	6.74	6.32	6.07	403.3	33.60	33.70	34.26	33.74	33.77	34.23
451.7	421.7	7.29	6.68	6.25	451.7	33.90	33.66	34.10	34.38	33.23	33.15
483.9	453.9	7.77	7.17	6.69	483.9	33.99	34.17	34.71	34.99	34.46	34.37
500.0	470.0	7.86	7.25	6.77	500.0	34.23	34.51	35.08	34.62	34.41	34.36

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Frequency Mixer

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Typical Performance Data

RF/LO (MHz)	RF VSWR (:1)			LO VSWR (:1)			IF (MHz)	IF VSWR (:1)			LO/RF (MHz)	max. DC output (mV)	DC Offset (mV)
	@LO (dBm)			@LO (dBm)				@LO (dBm)			@LO (dBm)		
	+4	+7	+10	+4	+7	+10		+4	+7	+10	+7		
5.0	1.22	1.21	1.25	1.36	1.98	2.99	5.0	1.47	1.28	1.16	10.0	-270.8	-0.24
17.7	1.12	1.03	1.09	1.29	1.93	2.84	17.7	1.48	1.29	1.17	20.0	-267.8	-0.23
30.4	1.10	1.02	1.09	1.30	1.96	2.82	30.4	1.48	1.30	1.18	24.0	-265.0	-0.21
55.8	1.11	1.06	1.12	1.27	1.86	2.69	55.8	1.50	1.32	1.21	50.0	-261.2	-0.19
81.2	1.12	1.10	1.14	1.25	1.83	2.61	81.2	1.53	1.35	1.25	80.0	-263.8	-0.16
106.5	1.14	1.13	1.17	1.28	1.87	2.68	106.5	1.58	1.40	1.30	100.0	-264.4	-0.15
119.2	1.16	1.15	1.19	1.29	1.88	2.67	119.2	1.60	1.43	1.33	122.0	-267.7	-0.12
144.6	1.19	1.19	1.23	1.31	1.91	2.63	144.6	1.69	1.52	1.42	150.0	-263.5	-0.11
170.0	1.22	1.23	1.26	1.32	1.91	2.59	170.0	1.73	1.54	1.43	178.0	-262.1	-0.07
208.1	1.28	1.29	1.33	1.35	1.92	2.62	208.1	1.86	1.66	1.54	200.0	-261.2	-0.13
233.5	1.33	1.35	1.38	1.39	1.91	2.59	233.5	1.96	1.74	1.62	248.0	-265.8	-0.10
271.5	1.41	1.42	1.46	1.43	1.99	2.65	271.5	2.10	1.88	1.73	276.0	-270.4	-0.18
296.9	1.47	1.49	1.52	1.48	1.99	2.63	296.9	2.18	1.97	1.80	304.0	-266.9	-0.26
322.3	1.53	1.56	1.58	1.52	1.99	2.66	322.3	2.29	2.07	1.90	332.0	-250.0	-0.23
360.4	1.62	1.65	1.68	1.62	2.03	2.64	360.4	2.45	2.19	2.03	360.0	-231.2	-0.47
398.5	1.73	1.74	1.77	1.73	2.16	2.72	398.5	2.59	2.33	2.13	388.0	-211.9	-0.18
423.8	1.80	1.81	1.83	1.77	2.20	2.83	423.8	2.65	2.40	2.20	430.0	-189.5	-0.45
461.9	1.92	1.93	1.94	1.80	2.27	2.90	461.9	2.76	2.49	2.29	458.0	-184.4	-0.03
487.3	1.99	2.00	2.00	1.82	2.25	2.87	487.3	2.81	2.53	2.32	486.0	-184.5	-0.13
500.0	2.03	2.03	2.02	1.83	2.26	2.86	500.0	2.79	2.55	2.33	500.0	-181.3	-0.33

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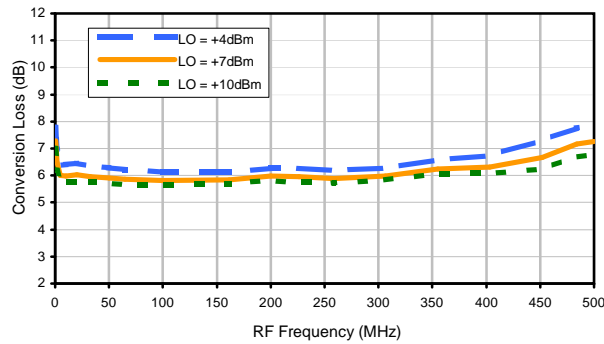


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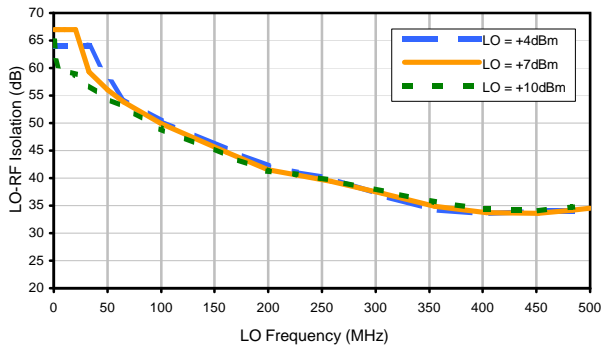


Typical Performance Curves

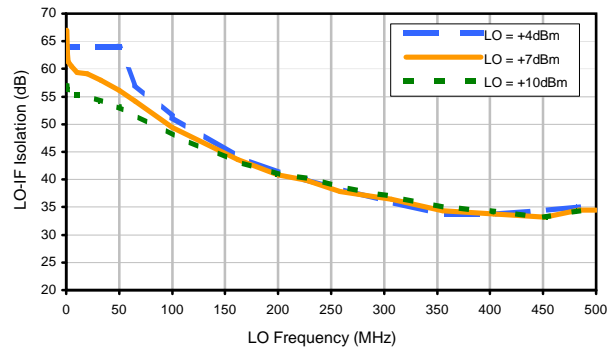
Conversion Loss



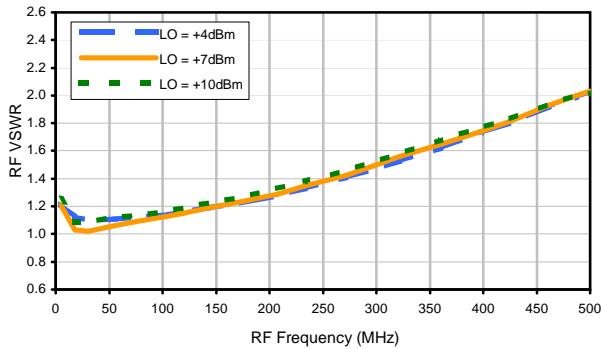
LO-RF Isolation



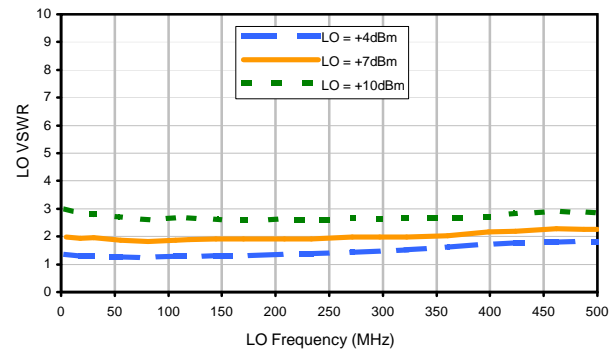
LO-IF Isolation



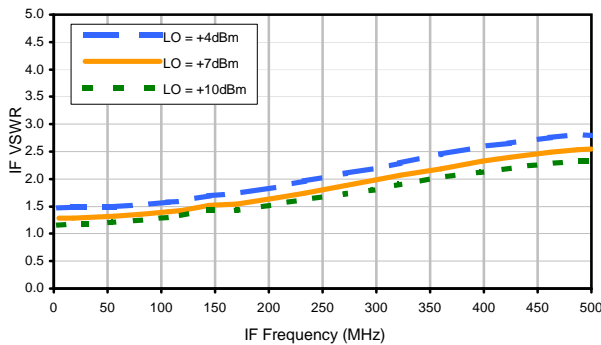
RF VSWR



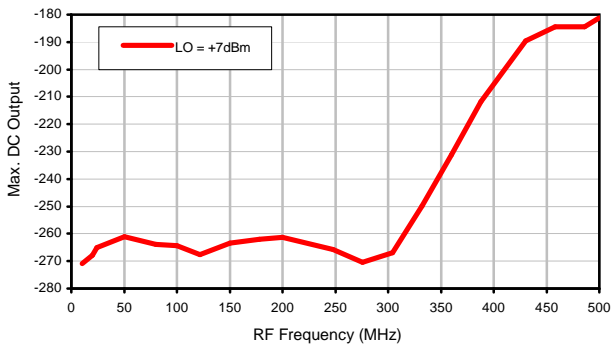
LO VSWR



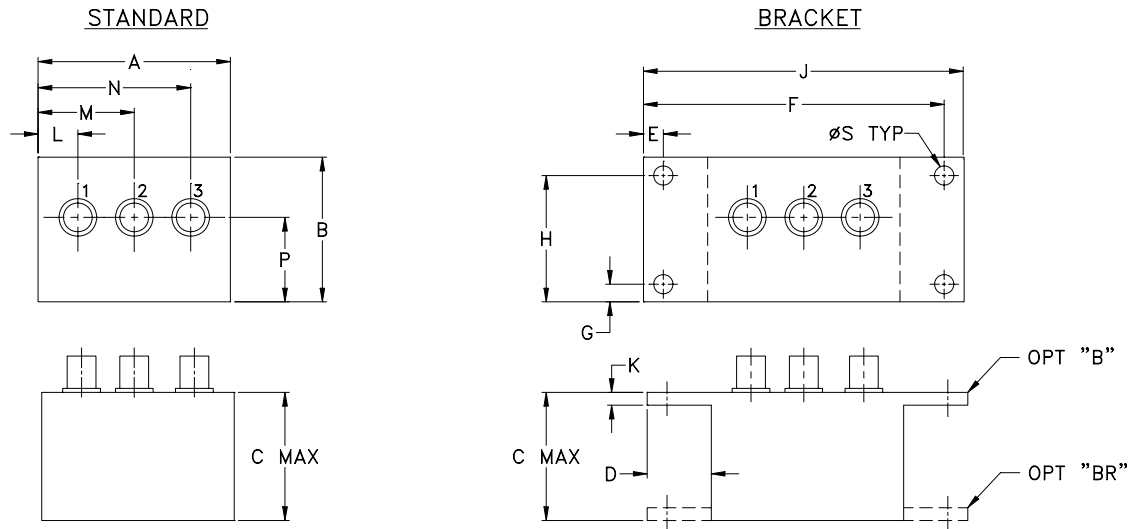
IF VSWR



Max. DC Output



Outline Dimensions



CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N
M21	1.50 (38.10)	1.13 (28.70)	1.00 (25.40)	.50 (12.70)	.155 (3.94)	2.345 (59.56)	.138 (3.51)	.987 (25.07)	2.50 (63.50)	.10 (2.54)	.31 (7.87)	.75 (19.05)	1.19 (30.23)
M22	2.25 (57.15)	1.38 (35.05)	1.24 (31.50)		.150 (3.81)	3.100 (78.74)		1.238 (31.45)	3.25 (82.55)		.40 (10.16)	1.15 (29.21)	1.86 (47.24)
M23	2.25 (57.15)	1.38 (35.05)	1.24 (31.50)		.150 (3.81)	3.100 (78.74)		1.238 (31.45)	3.25 (82.55)		.63 (16.00)	1.06 (26.92)	1.63 (41.40)

CASE#	P	Q	R	S	WT. GRAMS
M21	.66 (16.76)	--	--	.150 (3.81)	40.0
M22	.64 (16.26)	--	--		74.0
M23	.69 (17.53)	--	--		70.0

Dimensions are in inches (mm). Tolerances: 2 Pl. $\pm .03$; 3 Pl. $\pm .015$

Notes:

- Case material: Aluminum alloy.
- Case finish:
 - For RoHS Case Styles: Clear chemical conversion coating, non-chrome or trivalent chrome based.
 - For Non-RoHS Case Styles: Yellow hexavalent chrome based conversion coating.
Due to transition from non-RoHS to RoHS, models will be supplied with either case style finish until the non-RoHS case inventory is depleted.
- Mounting bracket available on request. For bracket mounted on connector end add suffix B to part number and add \$5.00 to unit cost. For bracket mounted on the rear, add suffix BR to part number and add \$1.50 to unit cost.



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
Barometric Pressure	100,000 Feet	MIL-STD-202, Method 105, Condition D
Humidity	90% RH, 65°C Units may require bake-out after humidity to restore full performance.	MIL-STD-202, Method 103
Thermal Shock	-65° to 125°C, 5 cycles	MIL-STD-202, Method 107, Condition B
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	100g, 6ms sawtooth, 3 shocks each direction 3 axes (total 18)	MIL-STD-202, Method 213, Condition I