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

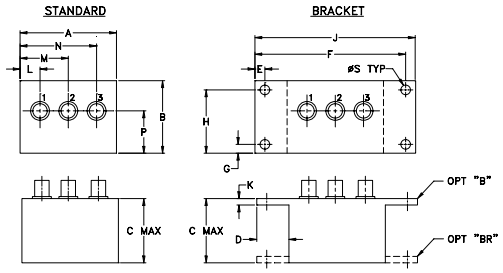
Features

- low conversion loss, 5.24 dB typ.
- high LO-RF 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)					
		Mid-Band m			Total Range	L		M		U		L		M		U	
LO/RF f_L-f_U	IF	$\overline{X}$	σ	Max.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.
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

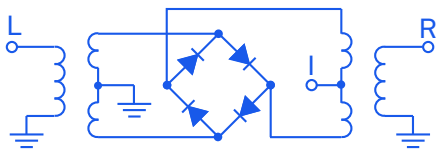
1 dB COMP.: +1 dBm typ.

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	59.27	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

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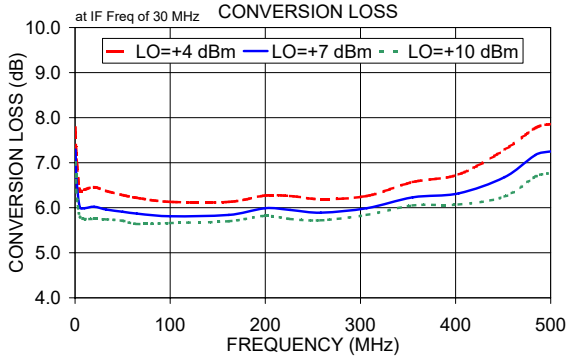
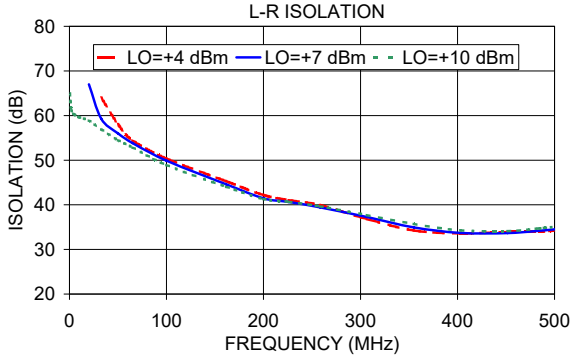
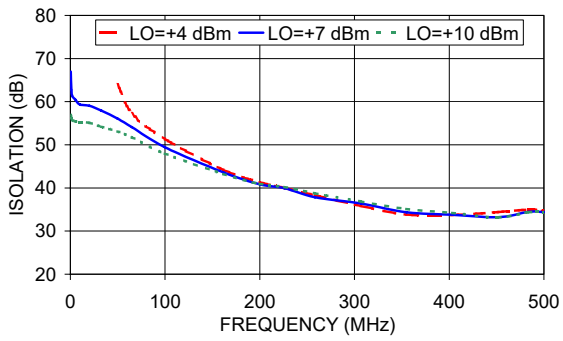
ZAD-1+
at IF Freq of 30 MHz CONVERSION LOSS



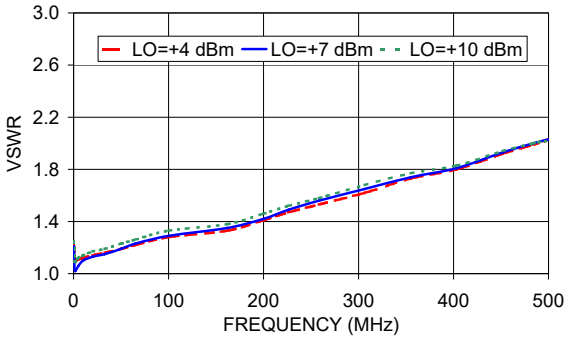
ZAD-1+
L-R ISOLATION



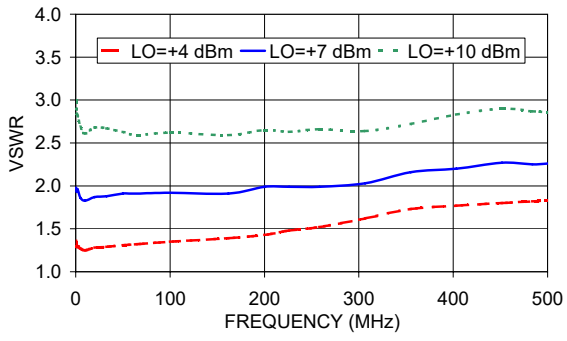
ZAD-1+
L-I ISOLATION



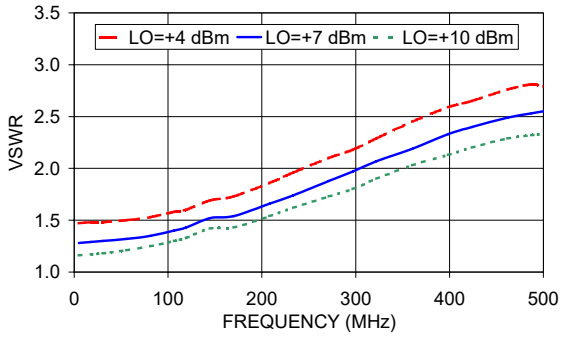
ZAD-1+
RF VSWR



ZAD-1+
LO VSWR



ZAD-1+
IF VSWR



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Frequency Mixer ZAD-1+

Typical Performance Data

RF (MHz)	LO (MHz)	CONVERSION LOSS (dB) @LO (dBm)		
		+4	+7	+10
0.5	30.5	7.78	7.29	7.01
1.0	31.0	7.34	6.89	6.61
2.0	32.0	6.97	6.49	6.20
5.0	35.0	6.39	6.01	5.80
10.0	40.0	6.40	5.99	5.75
20.0	50.0	6.46	6.02	5.75
32.7	62.7	6.37	5.96	5.74
50.0	80.0	6.28	5.91	5.71
65.0	95.0	6.22	5.87	5.64
100.0	70.0	6.13	5.81	5.66
161.6	131.6	6.13	5.84	5.70
200.0	170.0	6.27	5.99	5.82
226.1	196.1	6.26	5.95	5.75
258.3	228.3	6.19	5.89	5.72
306.7	276.7	6.26	5.99	5.84
355.0	325.0	6.57	6.23	6.05
403.3	373.3	6.74	6.32	6.07
451.7	421.7	7.29	6.68	6.25
483.9	453.9	7.77	7.17	6.69
500.0	470.0	7.86	7.25	6.77

LO (MHz)	LO-RF ISOLATION (dB) @LO (dBm)			LO-IF ISOLATION (dB) @LO (dBm)		
	+4	+7	+10	+4	+7	+10
0.5	64.00	67.00	64.94	64.00	67.00	56.93
1.0	64.00	67.00	63.22	64.00	62.73	56.27
2.0	64.00	67.00	61.14	64.00	61.28	55.71
5.0	64.00	67.00	60.28	64.00	60.55	55.46
10.0	64.00	67.00	59.63	64.00	59.37	55.25
20.0	64.00	67.00	58.89	64.00	59.08	55.09
32.7	64.00	59.27	56.91	64.00	57.92	54.20
50.0	58.05	56.01	54.48	64.00	56.08	53.11
65.0	54.46	53.83	52.86	57.32	54.11	51.72
100.0	50.35	49.90	48.91	51.33	49.45	47.96
161.6	45.29	44.60	44.03	44.16	43.60	43.25
200.0	42.19	41.47	41.29	41.32	40.82	40.93
226.1	41.04	40.62	40.68	39.98	39.96	40.20
258.3	39.93	39.44	39.63	38.30	37.84	38.74
306.7	36.83	37.26	37.70	35.84	36.42	36.87
355.0	34.24	34.94	35.71	33.81	34.34	35.10
403.3	33.60	33.70	34.26	33.74	33.77	34.23
451.7	33.90	33.66	34.10	34.38	33.23	33.15
483.9	33.99	34.17	34.71	34.99	34.46	34.37
500.0	34.23	34.51	35.08	34.62	34.41	34.36

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Typical Performance Data

RF/LO (MHz)	RF VSWR (:1) @LO (dBm)			LO VSWR (:1) @LO (dBm)		
	+4	+7	+10	+4	+7	+10
5.0	1.22	1.21	1.25	1.36	1.98	2.99
17.7	1.12	1.03	1.09	1.29	1.93	2.84
30.4	1.10	1.02	1.09	1.30	1.96	2.82
55.8	1.11	1.06	1.12	1.27	1.86	2.69
81.2	1.12	1.10	1.14	1.25	1.83	2.61
106.5	1.14	1.13	1.17	1.28	1.87	2.68
119.2	1.16	1.15	1.19	1.29	1.88	2.67
144.6	1.19	1.19	1.23	1.31	1.91	2.63
170.0	1.22	1.23	1.26	1.32	1.91	2.59
208.1	1.28	1.29	1.33	1.35	1.92	2.62
233.5	1.33	1.35	1.38	1.39	1.91	2.59
271.5	1.41	1.42	1.46	1.43	1.99	2.65
296.9	1.47	1.49	1.52	1.48	1.99	2.63
322.3	1.53	1.56	1.58	1.52	1.99	2.66
360.4	1.62	1.65	1.68	1.62	2.03	2.64
398.5	1.73	1.74	1.77	1.73	2.16	2.72
423.8	1.80	1.81	1.83	1.77	2.20	2.83
461.9	1.92	1.93	1.94	1.80	2.27	2.90
487.3	1.99	2.00	2.00	1.82	2.25	2.87
500.0	2.03	2.03	2.02	1.83	2.26	2.86

IF (MHz)	IF VSWR (:1) @LO (dBm)		
	+4	+7	+10
5.0	1.47	1.28	1.16
17.7	1.48	1.29	1.17
30.4	1.48	1.30	1.18
55.8	1.50	1.32	1.21
81.2	1.53	1.35	1.25
106.5	1.58	1.40	1.30
119.2	1.60	1.43	1.33
144.6	1.69	1.52	1.42
170.0	1.73	1.54	1.43
208.1	1.86	1.66	1.54
233.5	1.96	1.74	1.62
271.5	2.10	1.88	1.73
296.9	2.18	1.97	1.80
322.3	2.29	2.07	1.90
360.4	2.45	2.19	2.03
398.5	2.59	2.33	2.13
423.8	2.65	2.40	2.20
461.9	2.76	2.49	2.29
487.3	2.81	2.53	2.32
500.0	2.79	2.55	2.33

LO/RF (MHz) @LO (dBm) +7	max. DC output (mV)	DC Offset (mV)
10.0	-270.8	-0.24
20.0	-267.8	-0.23
24.0	-265.0	-0.21
50.0	-261.2	-0.19
80.0	-263.8	-0.16
100.0	-264.4	-0.15
122.0	-267.7	-0.12
150.0	-263.5	-0.11
178.0	-262.1	-0.07
200.0	-261.2	-0.13
248.0	-265.8	-0.10
276.0	-270.4	-0.18
304.0	-266.9	-0.26
332.0	-250.0	-0.23
360.0	-231.2	-0.47
388.0	-211.9	-0.18
430.0	-189.5	-0.45
458.0	-184.4	-0.03
486.0	-184.5	-0.13
500.0	-181.3	-0.33

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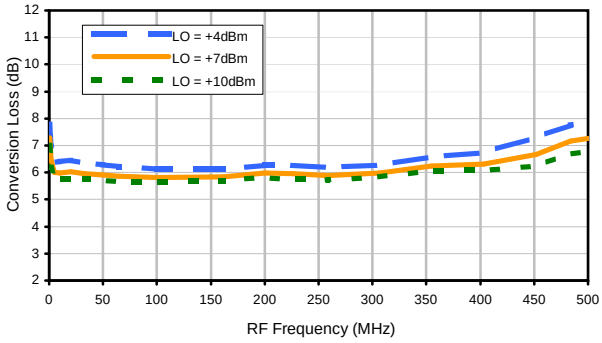
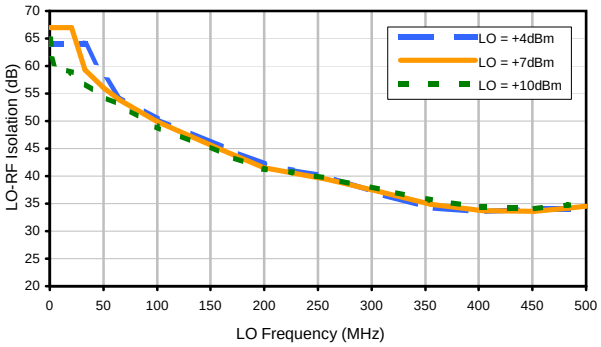
Frequency Mixer ZAD-1+

Typical Performance Curves

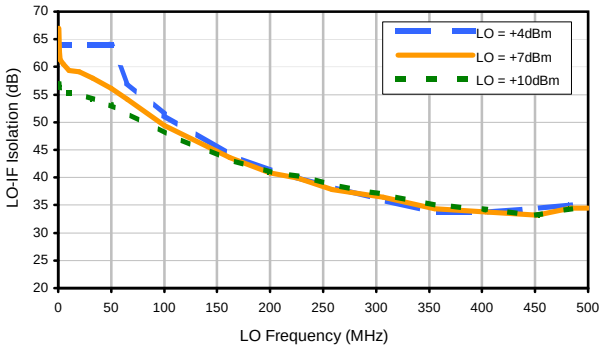
Conversion Loss



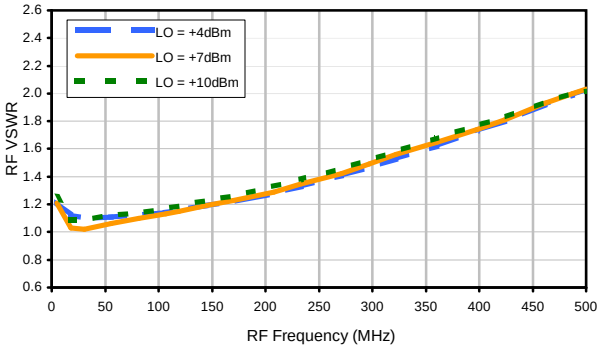
LO-RF Isolation



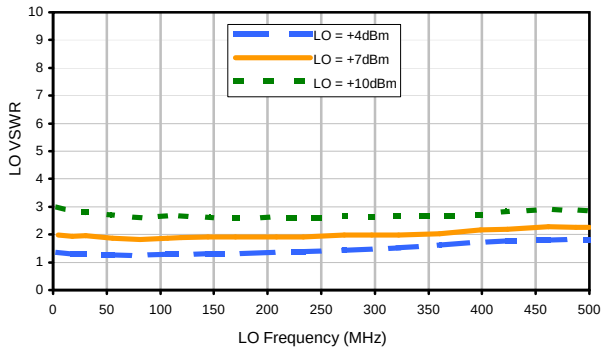
LO-IF Isolation



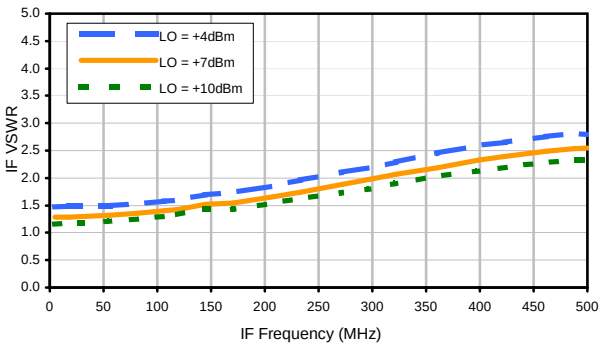
RF VSWR



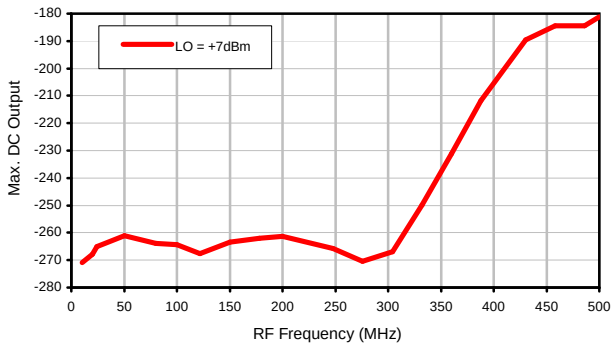
LO VSWR



IF VSWR



Max. DC Output



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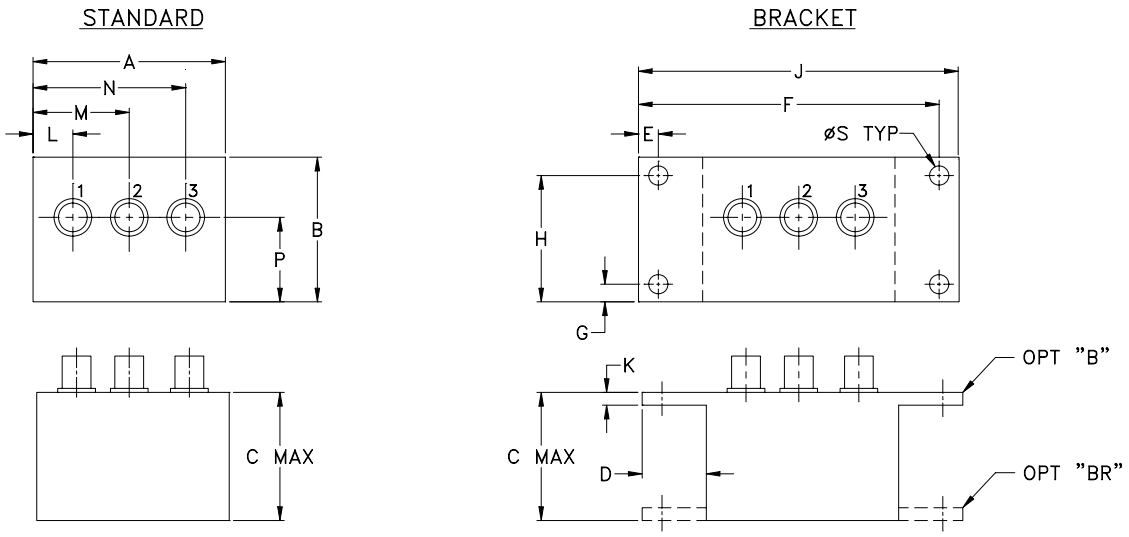
Case Style M

Outline Dimensions

M21
M22
M23



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. ± .03; 3 Pl. ± .015

Notes:

1. Case material: Aluminum alloy.
2. 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.
3. 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.

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Mini-Circuits

Environmental Specifications ENV28

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

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