High Directivity

Monolithic Amplifier 0.5-2.5 GHz

Product Features

- 3V & 5V operation
- no external biasing circuit required
- internal DC blocking at RF input and output
- high directivity, 20 dB typ.
- wide bandwidth, 0.5 to 2.5 GHz
- low noise figure, 6.7 dB typ.
- output power, up to +17 dBm typ.
- low cost

VNA-22

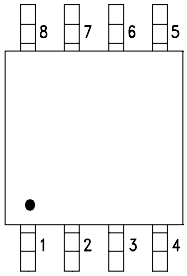
CASE STYLE: XX211-1
PRICE: Contact Sales Dept.

Typical Applications

- buffer amplifier
- cellular
- PCN

General Description

VNA-22 is a wideband amplifier offering high dynamic range. It has repeatable performance from lot to lot. It is enclosed in an 8-lead SOIC package. VNA-22 is fabricated using GaAs MESFET technology. Expected MTBF at 85°C case temperature is 20,000 years at 2.8V, 3,000 at 5V.



Pin description

Function	Pin Number	Description
RF IN	3	RF input pin.
RF OUT	6	RF output pin.
DC	1	Bias pin
GND	2,4,5,7,8	Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.

Electrical Specifications at 25°C

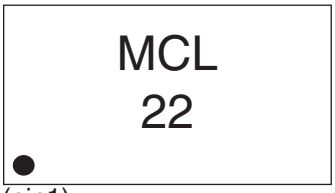
Parameter		Min.	Typ.		Max.		Units
Frequency Range		0.5			2.5		GHz
at DC Volts		5.0	5.0	2.8	5.0	2.8	V
Gain	f=0.5 GHz		10.3	9.6			dB
	f=1.0 GHz		13.3	12.3			
	f=1.5 GHz		13.8	12.6			
	f=2.0 GHz	11.8	13.3	11.9			
	f=2.5 GHz		12.2	10.8			
Input Return Loss	f=0.75 to 2.5 GHz		12.5	15.5			dB
Output Return Loss	f=0.75 to 2.5 GHz		12.5	14.0			dB
Output Power @ 1 dB compression	f=0.5 to 2.5 GHz		17	14			dBm
Output IP3	f=0.5 to 2.5 GHz		29	26			dBm
Noise Figure	f=0.5 to 2.5 GHz		6.7	7.0			dB
Directivity (Isolation - Gain)	f=0.5 to 2.5 GHz		17-27	17-29			dB
DC Current			80	72	95	80	mA
Thermal Resistance, junction-to-case[1]			102				°C/W

Absolute Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 150°C
DC Voltage	8V
Power Dissipation	800mW
Input Power	10dBm

Note: Permanent damage may occur if any of these limits are exceeded.
These ratings are not intended for continuous normal operation.
[1]Case is defined as ground leads.

Product Marking



(pin1)

or

(pin1)

Additional Detailed Technical Information

Additional information is available on our web site. To access this information enter the model number on our web site home page.

Performance data, graphs, s-parameter data set (.zip file)

Case Style: XX211-1

Plastic model, 8-lead SOIC, lead finish: tin-lead

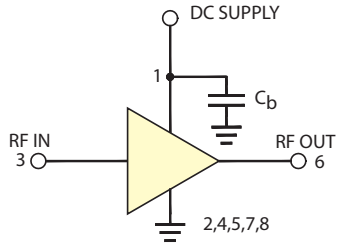
Tape & Reel: F16

Suggested Layout for PCB Design: PL-077

Evaluation Board: TB-01

Environmental Ratings: ENV08T1

Recommended Application Circuit



C_b= 100pF to 10 nF

Test Board includes case, connectors, and components (in bold) soldered to PCB

ESD Rating

Human Body Model (HBM): Class 1A (250 v to < 500 v) in accordance with ANSI/ESD STM 5.1 - 2001

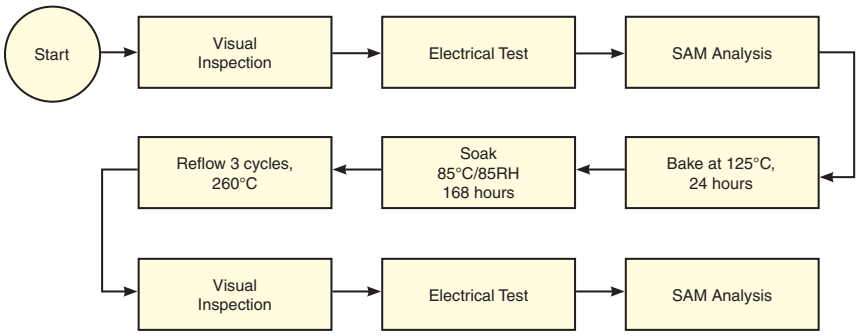
Charged Device Model (CDM): Class III (500 to 1000 v) in accordance with JESD22-C101A

MSL Rating

Moisture Sensitivity: MSL1 in accordance with IPC/JEDECJ-STD-020C

No.	Test Required	Condition	Standard	Quantity
1	Visual Inspection	Low Power Microscope Magnification 40x	MIP-IN-0003 (MCT spec)	10 units
2	Electrical Test	Room Temperature	SCD (MCL spec)	10 units
3	SAM Analysis	Less than 10% growth in term of delamination	J-Std-020C (Jedec Standard)	10 units
4	Moisture Sensitivity Level 1	Bake at 125°C for 24 hours Soak at 85°C/85%RH for 168 hours Reflow 3 cycles at 260°C peak	J-Std-020C (Jedec Standard)	10 units

MSL Test Flow Chart



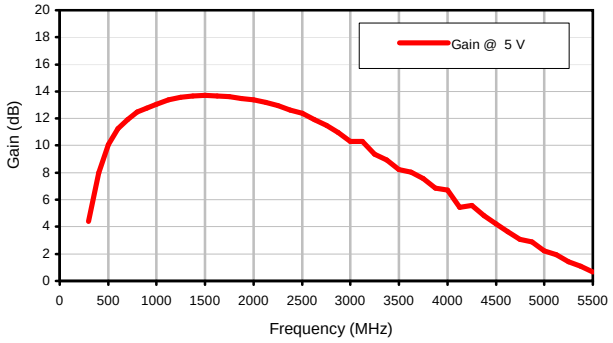
MMIC Amplifier VNA-22

Typical Performance Data

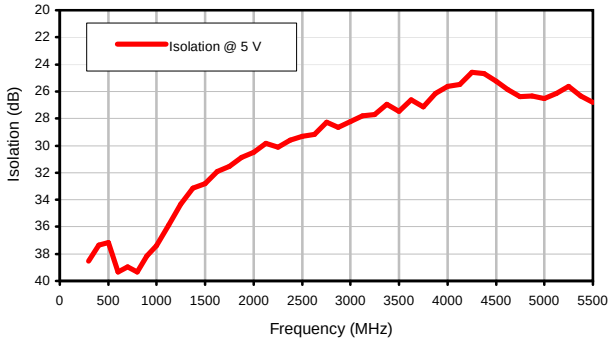
FREQUENCY (MHz)	GAIN (dB) 5 V	ISOLATION (dB) 5 V	RETURN LOSS IN (dB) 5 V	RETURN LOSS OUT (dB) 5 V
300	4.42	38.54	3.87	2.22
400	8.00	37.37	5.92	4.19
500	10.06	37.17	7.85	6.46
600	11.26	39.33	9.82	8.91
700	11.93	38.97	11.91	11.29
800	12.48	39.34	14.07	13.67
900	12.77	38.16	16.22	16.10
1000	13.07	37.38	18.42	18.69
1125	13.39	35.90	20.01	22.68
1250	13.55	34.31	19.68	27.73
1375	13.68	33.14	18.09	34.23
1500	13.73	32.81	16.38	43.65
1625	13.66	31.90	15.12	30.68
1750	13.64	31.54	14.10	26.91
1875	13.49	30.87	13.32	25.36
2000	13.38	30.50	12.77	23.89
2125	13.18	29.83	12.46	23.02
2250	12.95	30.13	12.29	22.20
2375	12.63	29.58	12.22	21.62
2500	12.37	29.33	12.27	20.86
2625	11.91	29.15	12.33	20.03
2750	11.48	28.27	12.37	18.93
2875	10.98	28.65	12.53	18.04
3000	10.30	28.23	12.52	16.76
3125	10.30	27.81	12.45	15.74
3250	9.37	27.72	12.17	14.55
3375	8.95	26.96	11.69	13.50
3500	8.25	27.49	11.13	12.88
3625	8.05	26.62	10.65	12.28
3750	7.56	27.16	10.05	11.52
3875	6.87	26.15	9.62	10.89
4000	6.70	25.61	9.23	10.31
4125	5.44	25.47	8.93	9.72
4250	5.60	24.60	8.45	9.28
4375	4.82	24.70	8.20	8.75
4500	4.19	25.27	7.31	8.44
4625	3.66	25.86	6.54	8.15
4750	3.05	26.40	6.11	7.79
4875	2.88	26.35	5.65	7.42
5000	2.23	26.53	5.27	7.00
5125	1.95	26.15	5.01	6.59
5250	1.41	25.65	4.83	6.35
5375	1.11	26.33	4.47	6.01
5500	0.65	26.82	4.22	5.76

Typical Performance Curves

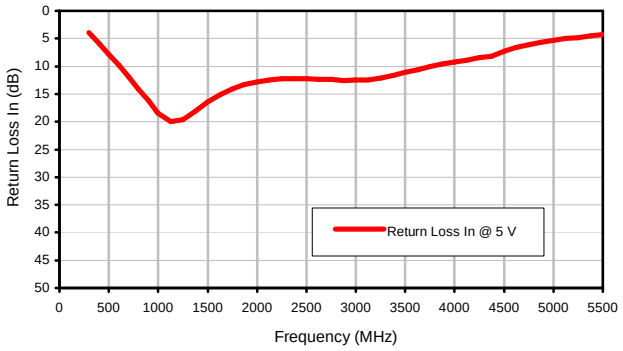
Gain



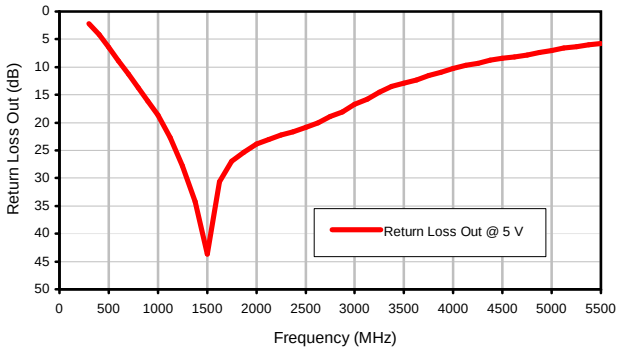
ISOLATION



Return Loss In



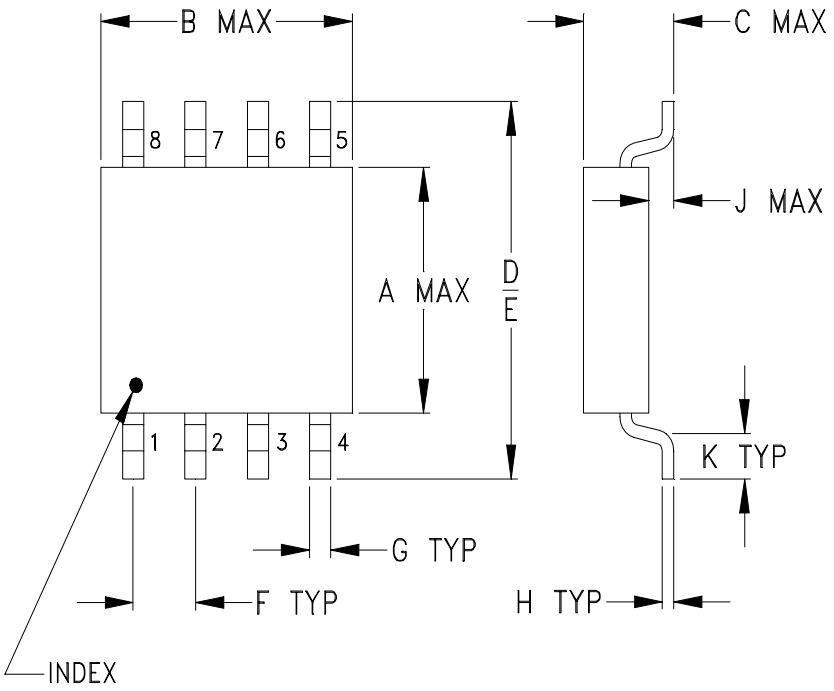
Return Loss Out



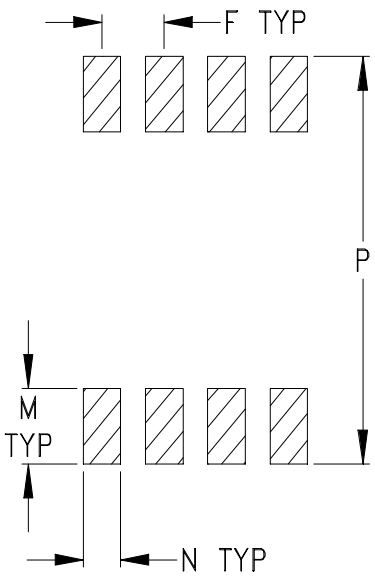
Case Style XX

XX211-1

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N	P
XX211-1	.163 (4.14)	.210 (5.33)	.077 (1.96)	.250 (6.35)	.220 (5.59)	.050 (1.27)	.017 (0.43)	.009 (0.23)	.025 (0.64)	.030 (0.76)	-- --	.050 (1.27)	.030 (0.76)	.270 (6.86)

CASE #	Q	R	S	WT. GRAM
XX211-1	-- --	-- --	-- --	.10

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

Notes:

1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Tin plate. All models, (+) suffix.
   For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.
3. Special Tolerances: Termination width ± .005 inch, termination thickness ± .003 inch.

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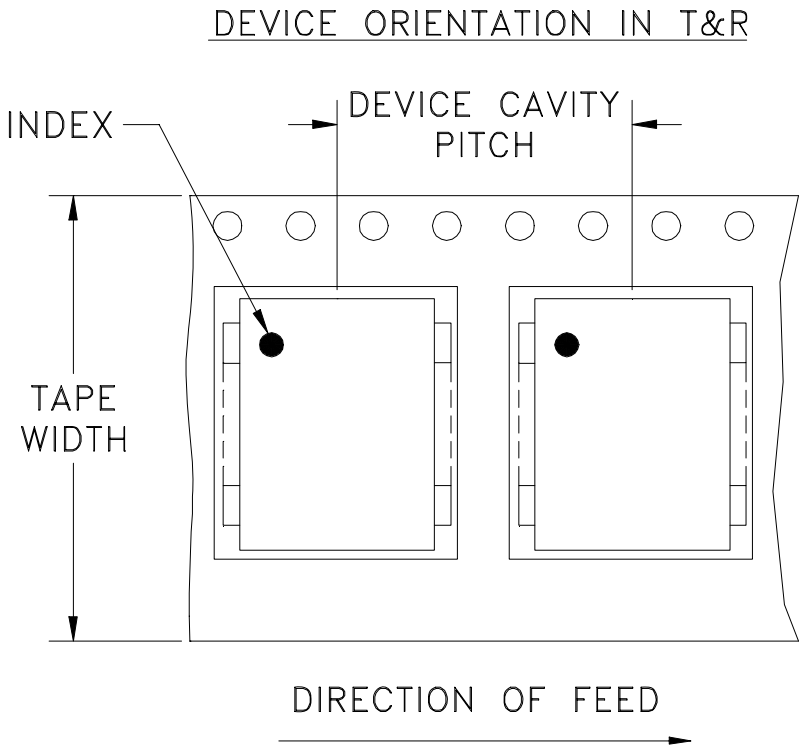
Tape & Reel Packaging TR-F16



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
12	8	7	Small quantity standards (see note)	20
				50
				100
				200
				500
			Standard	1000*
		13	Standard	2000**

Note : Please Consult individual model data sheet to determine device per reel availability
* BP models only
** MSW and MSWA models

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

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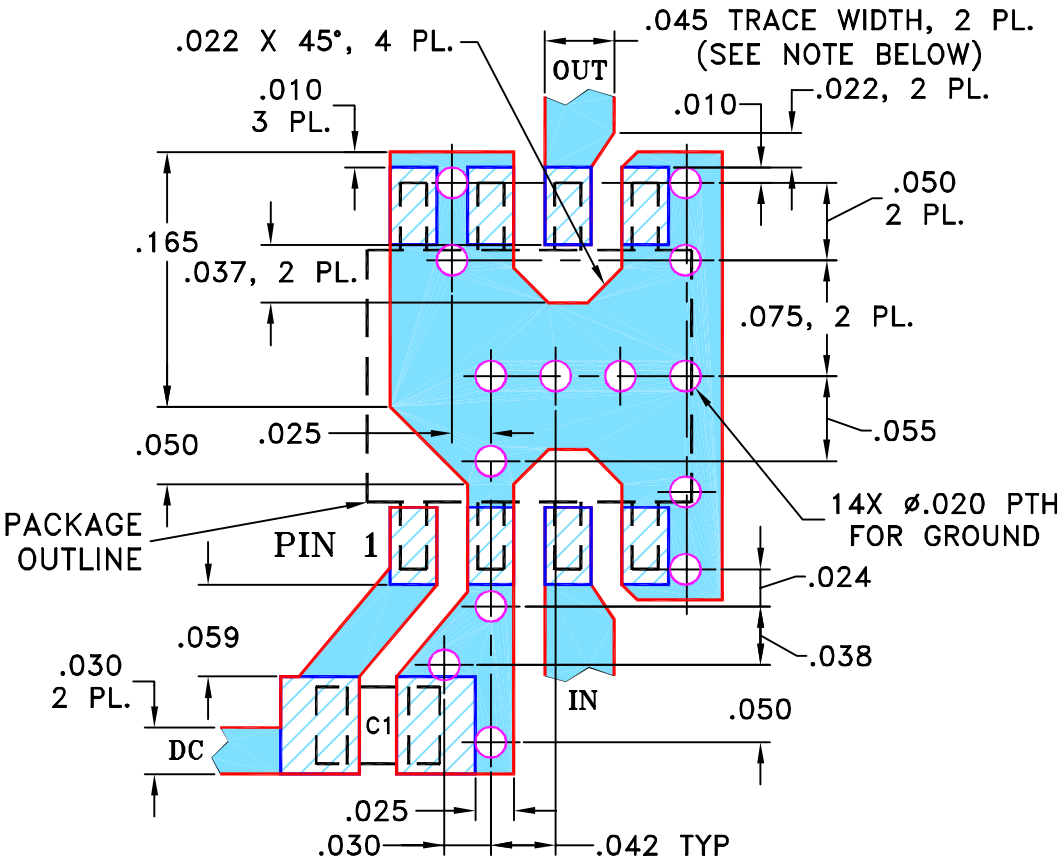
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M82272	NEW RELEASE	08/05/02	GF	DJ
A	M84246	UPDATED DRAWING	11/21/02	AV	LC
B	M91639	REMOVED NOTE 2, UPDATED DIMENSIONS	04/14/04	AV	DJ
C	M102713	UPDATED DWG. & ADDED "...WITH SMOBC"	01/25/06	MMG	DJ

SUGGESTED MOUNTING CONFIGURATION FOR XX211 CASE STYLE, "hj" PIN CONNECTION



CAPACITOR C1: .01 uF, 0805 SIZE

NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020 ± .0015; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	GF	07/19/02
TOLERANCES ON:	CHECKED	LC	08/01/02
2 PL DECIMALS ±	APPROVED	DJ	08/05/02
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

ASHEETA1.DWG REV:A DATE:01/12/95

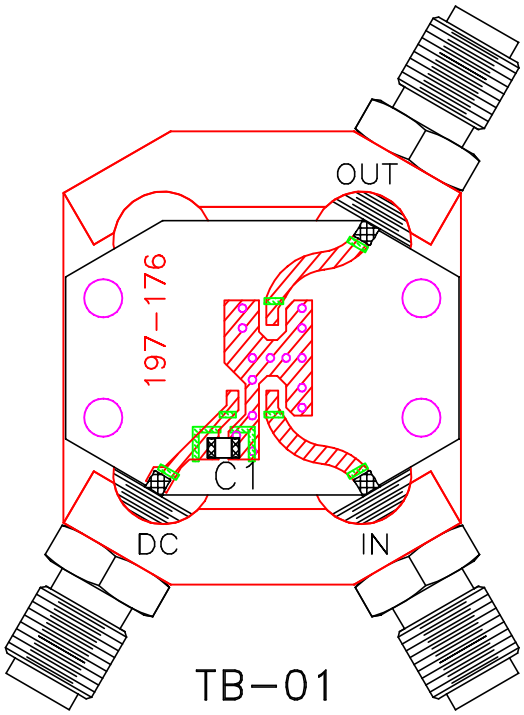
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, hj, XX211, VNA, TB-01

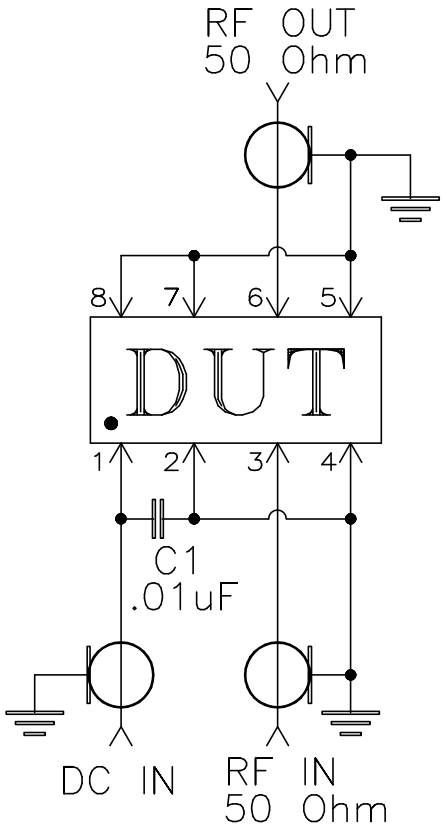
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-077	C

FILE:	SCALE:	SHEET:
98PL077	8:1	1 OF 1

Evaluation Board and Circuit



TB-01



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.020 inch.

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Environmental Specifications **ENV08T1**

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	-40° to 85° C or -45° to 85° C or -55° to 105° C or -40° to 105° C or -40° to 95° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C or -65° to 150° Ambient Environment	Individual Model Data Sheet
HTOL	1000 hours at 125°C	MIL-STD-883, Method 1005, Condition B
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Mechanical Shock	1.5Kg, 0.5 ms, 5 shock pulses, Y1 direction only	MIL-STD-883, Method 2002, Condition B, except Y1 direction only
Vibration (Variable Frequency)	50g peak	MIL-STD-883, Method 2007, Condition B
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102, Condition C
HAST	130°C, 85% RH, 96 hours	JESD22-A110
Solderability	10X Magnification	J-STD-002, Para 4.2.5, Test S, 95% Coverage
Solder Reflow Heat	Sn-Pb Eutetic Process: 240°C peak Pb-Free Process: 260°C peak	J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1
Moisture Sensitivity: Level 1	Bake at 125°C for 24 hours Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 260°C peak	J-STD-020

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
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215