



Mini-Circuits®

MINIATURE CERAMIC

# Fixed Attenuator

**PAT-20+**

50Ω 1 W 20 dB DC to 7 GHz

## FEATURES

- Wideband, DC to 7 GHz
- Excellent VSWR Through Entire Band
- Miniature Size
- Aqueous Washable

## APPLICATIONS

- Power Leveling
- Impedance Match Improvement



Generic photo used for illustration purposes only

CASE STYLE: AF320

### +RoHS Compliant

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

## ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Condition (GHz)	Min.	Typ.	Max.	Unit
Frequency Range		DC		7	GHz
Attenuation, Nominal			20±1.3		dB
Attenuation, Flatness <sup>1</sup>	DC - 1			0.5	dB
	DC - 2.5			0.7	
	DC - 7			2.6	
VSWR	DC - 1			1.4	:1
	DC - 2.5			1.4	
	DC - 7			1.5	
Input Power <sup>2</sup>				1.0	W

1. Flatness = variation over band divided by 2.

2. RF power at +25°C case temperature: 1 Watt. Derate linearly to 0.1 Watt at +100°C.

## ABSOLUTE MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	-55°C to +100°C
Storage Temperature	-55°C to +100°C

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

REV. J  
ECO-024219  
PAT-20+  
MCL NY  
250114





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## Fixed Attenuator

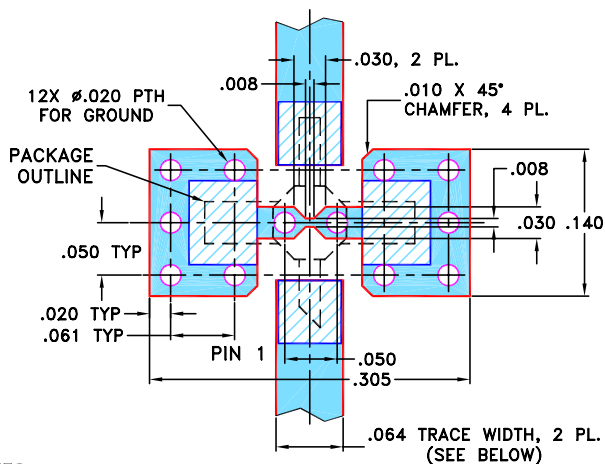
PAT-20+

50Ω 1 W 20 dB DC to 7 GHz

## PIN CONNECTIONS

INPUT	1
OUTPUT	3
GROUND	2,4

DEMO BOARD MCL P/N: TB-319  
SUGGESTED PCB LAYOUT (PL-208)

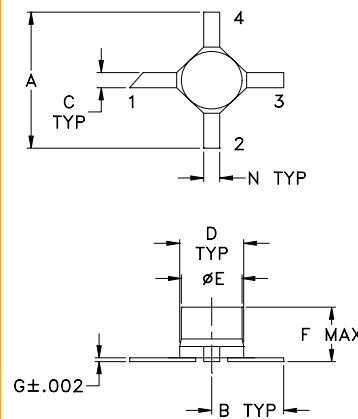


## NOTES:

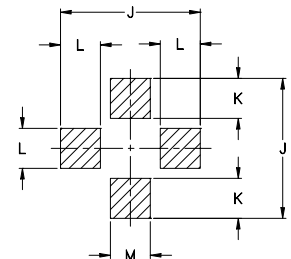
- TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS  $.030" \pm .002"$ ; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
- BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

- DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
- DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

## OUTLINE DRAWING



## PCB Land Pattern



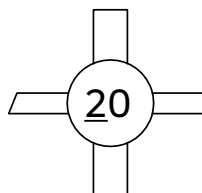
Suggested Layout,  
Tolerance to be within  $\pm .002$

## OUTLINE DIMENSIONS (Inch/mm)

A	B	C	D	E	F	G
.200	.100	.020	.070	.068	.057	.005
5.08	2.54	0.51	1.78	1.73	1.45	0.13
H	J	K	L	M	N	wt
--	.230	.065	.060	.080	.040	grams
--	5.84	1.65	1.52	2.03	1.02	0.04

## TAPE &amp; REEL INFORMATION: F26

## PRODUCT MARKING



Marking may contain other features or characters for internal lot control

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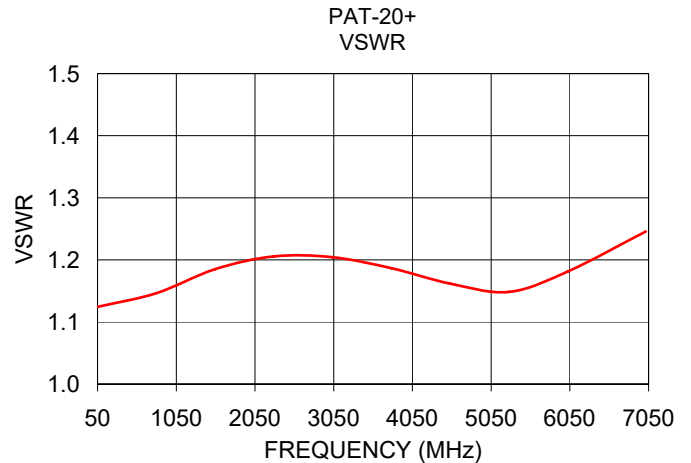
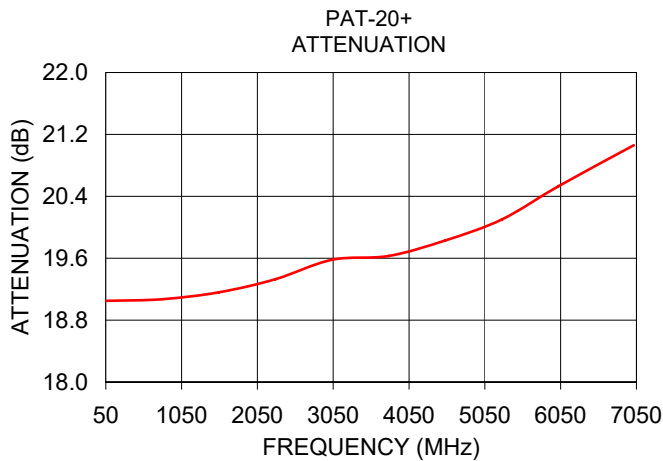
# Fixed Attenuator

PAT-20+

50Ω 1 W 20 dB DC to 2.5 GHz

## TYPICAL PERFORMANCE DATA AND CHARTS

Frequency (MHz)	Attenuation (dB)	VSWR (:1)
50.00	19.05	1.12
796.25	19.07	1.15
1542.50	19.16	1.19
2288.75	19.33	1.21
3035.00	19.58	1.20
3781.25	19.63	1.19
4527.50	19.83	1.16
5273.75	20.10	1.15
6020.00	20.53	1.18
7015.00	21.06	1.25



### 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-Circuits' 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/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)



## Typical Performance Data

FREQUENCY (MHz)	ATTENUATION (dB)	RETURN LOSS (dB)
50.00	19.05	24.65
796.25	19.07	23.32
1542.50	19.16	21.44
2288.75	19.33	20.61
3035.00	19.58	20.66
3781.25	19.63	21.37
4527.50	19.83	22.52
5273.75	20.10	23.21
6020.00	20.53	21.61
7015.00	21.06	19.22

REV. X1  
PAT-20+  
061108  
Page 1 of 1



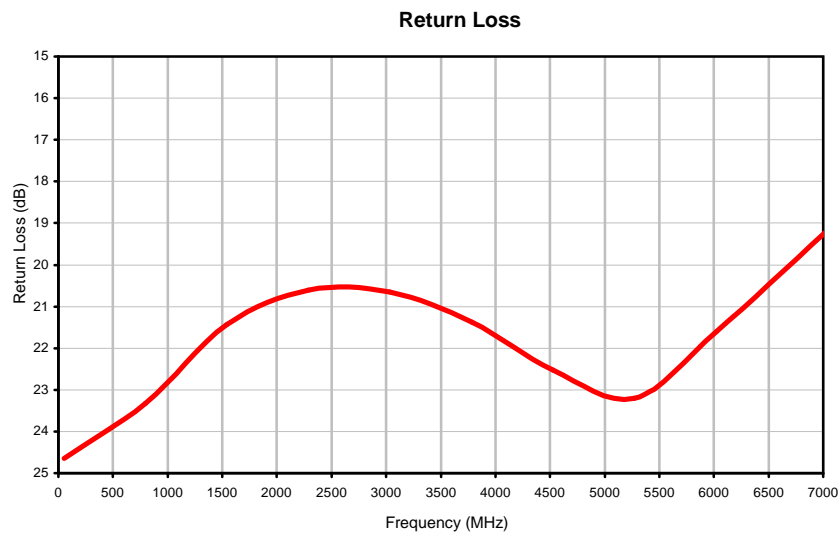
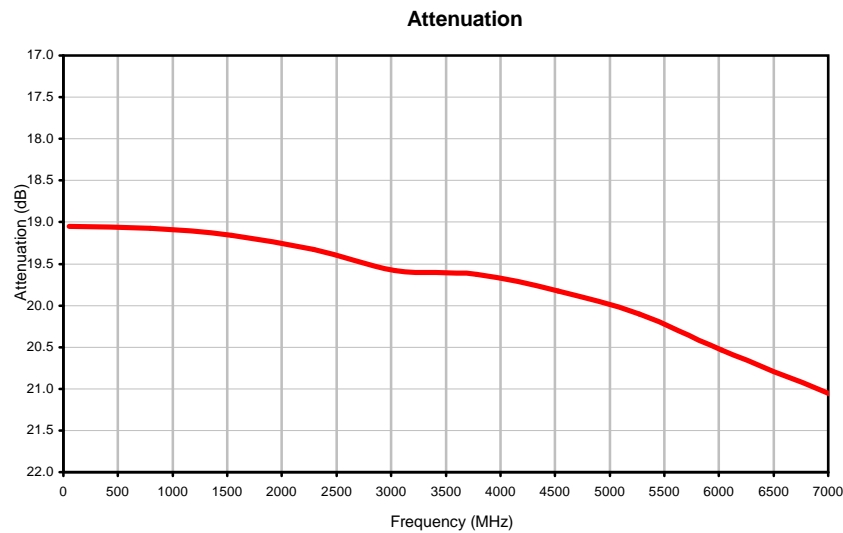
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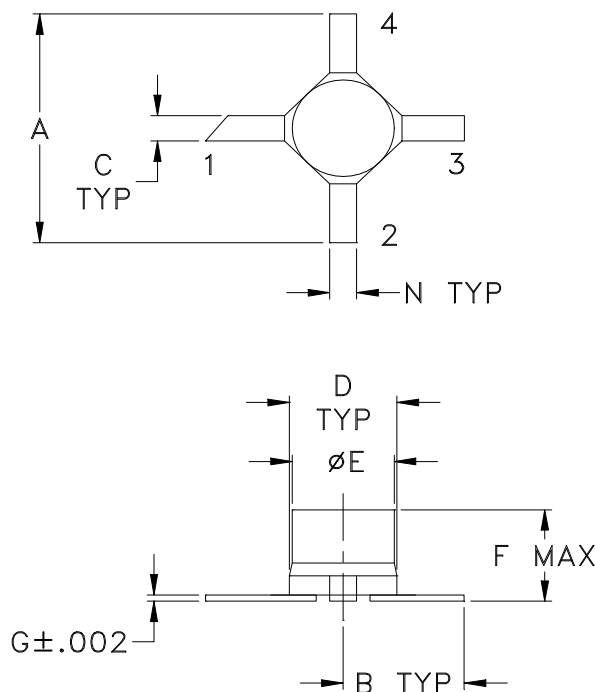
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see



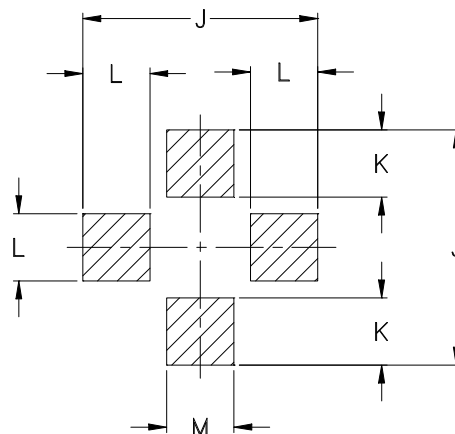
## Typical Performance Curves



### Outline Dimensions



### PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm .002$

CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N	WT. GRAM
AF320	.200 (5.08)	.100 (2.54)	.020 (0.51)	.070 (1.78)	.068 (1.73)	.057 (1.45)	.005 (0.13)	-	.230 (5.84)	.065 (1.65)	.060 (1.52)	.080 (2.03)	.040 (1.02)	.04

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

#### Notes:

- Case material: Ceramic.
- Termination material:  
Nickel-Iron alloy 42.
- Termination finish:  
For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier or Matte-Tin. (See Data Sheet)  
For RoHS-5 Case Styles: Tin-Lead plate.
- Termination (1):  
May have diagonal cut. Input and output interchangeable for PAT models only.
- Special Tolerances: Termination width  $\pm .005$  inch, termination thickness  $\pm .002$  inch, cap diameter  $\pm .005$  inch.



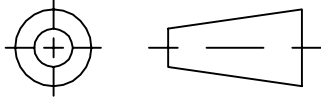
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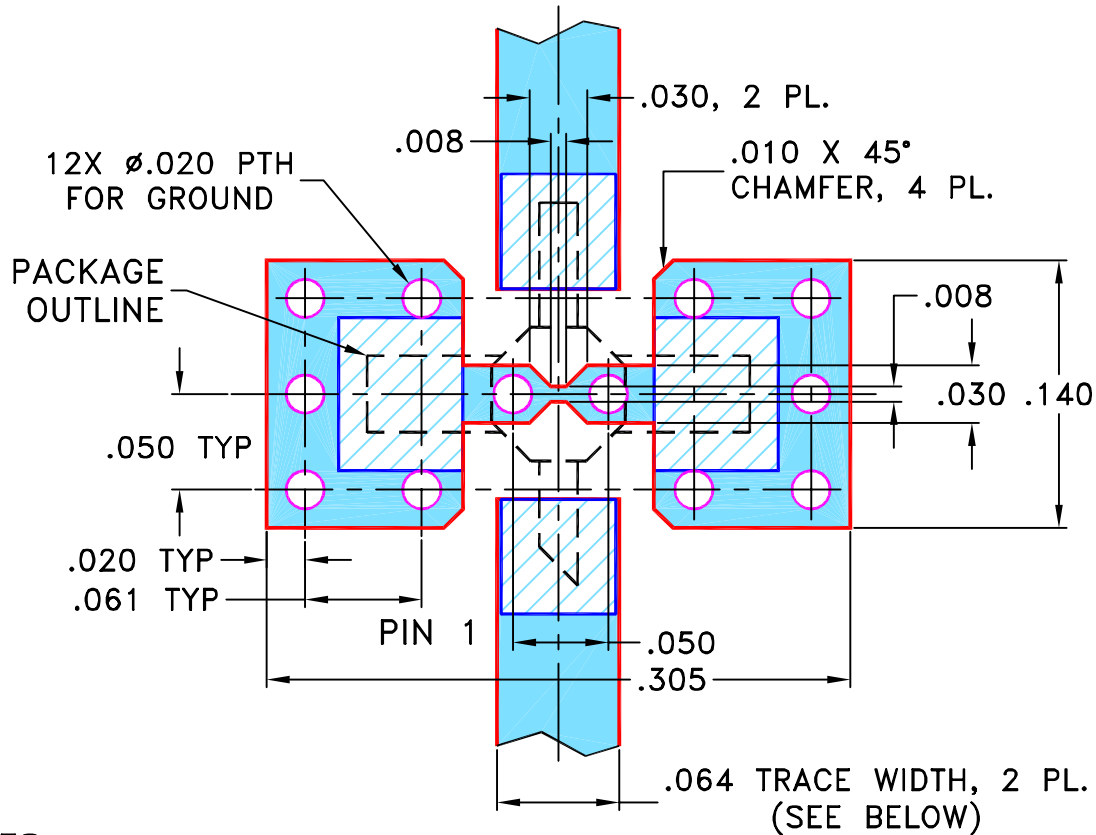
## THIRD ANGLE PROJECTION




## REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M100749	NEW RELEASE	09/19/05	MMG	MM
A	M102713	ADDED "...WITH SMOBC"	01/12/06	GT	IL

SUGGESTED MOUNTING CONFIGURATION FOR  
AF320 CASE STYLES, "hl" PIN CONNECTION

NOTES:

1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030"  $\pm$  .002"; 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.

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-  DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

TOLERANCES ON:

2 PL DECIMALS  $\pm$ 3 PL DECIMALS  $\pm$  .005ANGLES  $\pm$  1°FRACTIONS  $\pm$ 

DRAWN

MMG

09/12/05

CHECKED

AV

09/16/05

APPROVED

MM


09/19/05



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13 Neptune Avenue  
Brooklyn NY 11235

PL, hl, AF320, PAT, TB-319

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

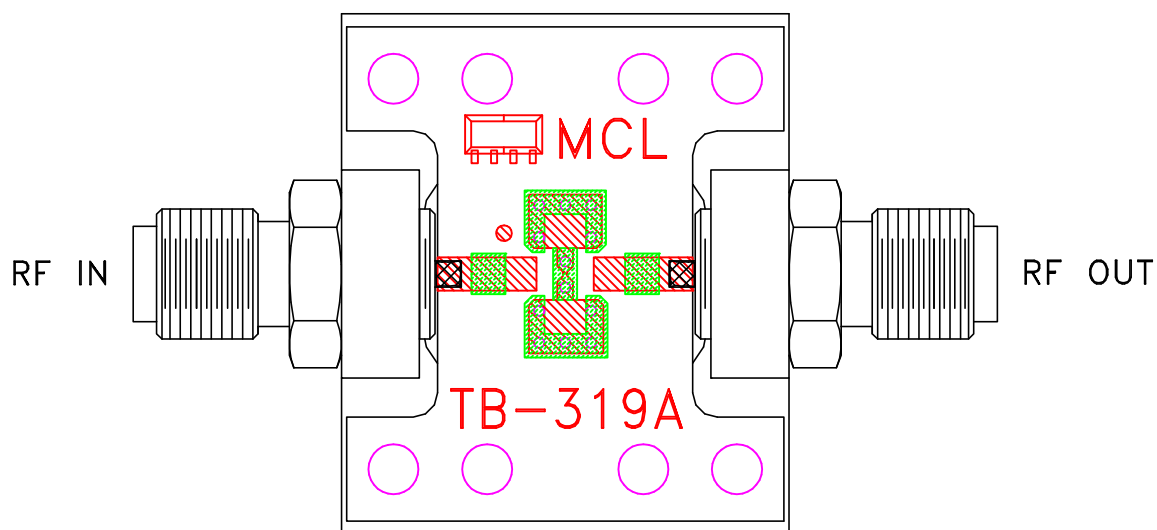
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98-PL-208REV:  
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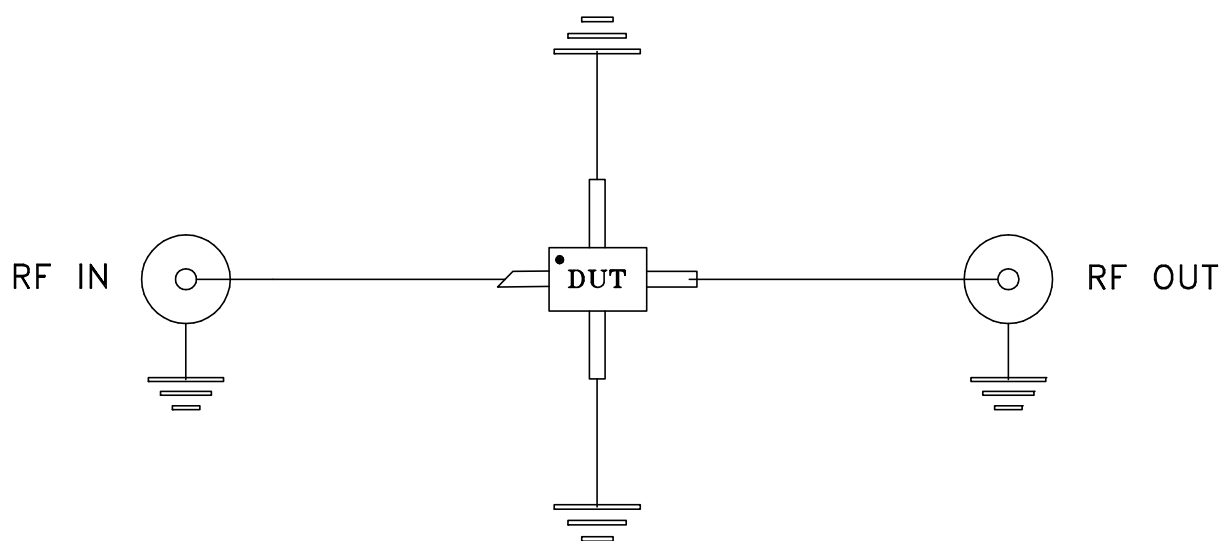
SCALE: 10:1

SHEET: 1 OF 1

# Evaluation Board and Circuit




TB-319



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent,  
Dielectric Constant=3.5, Thickness=.030 inch.

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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	-54° to 100°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-65° to 150° C Ambient Environment	Individual Model Data Sheet
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102-C, Condition C
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
Constant Acceleration	Y1 plane only, 5 Kg	MIL-STD-883, Method 2001, Condition A, except Y1 plane only
Seal	Perfluorocarbon gross leak	MIL-STD-883, Method 1014, 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



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
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
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