*+12 to +33dBm*

# Limiter

## ULM-63-2W-N+

50Ω Broadband 30 to 6000 MHz



*Generic photo used for illustration purposes only*
CASE STYLE: FF779

## The Big Deal

- Extra wide frequency range, 30 MHz to 6 GHz
- Wide limiting range, +12 to +33 dBm
- Very fast recovery time, 5 nsec typical

## Product Overview

The ULM-63-2W-N+ reacts almost instantaneously to protect sensitive devices from power surges and other unwanted signals at the device input. For inputs >12 dBm, the output power remains about 11.5 dBm, whereas lower-level input losses are only 0.4 dB typ. These units are housed in a patented, rugged unibody enclosure (2.11” x 0.72”) specifically designed to function in tough environments such as manufacturing sites, train tunnels, weapon systems, or anywhere sensitive components, such as low noise amplifiers, need protection.

## Key Features

| Feature | Advantages |
|---|---|
| High power handling, up to 2.5W max | Affords protection against peak voltages of multi-tone signals |
| Very fast recovery time, 5 nsec typ. | Back in operation almost instantaneously following signal spikes |
| Wideband, 30 MHz to 6 GHz | Protection for a wide range of applications, from IF receivers to toll-booth operations |

**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

*+12 to +33dBm*

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50Ω Broadband 30 to 6000 MHz



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CASE STYLE: FF779

| Connectors | Model |
|---|---|
| **N (F/M)** | ULM-63-2W-N+ |

### Maximum Ratings

| | |
|---|---|
| Operating Temperature | -55°C to 100°C |
| Storage Temperature | -55°C to 100°C |
| RF Input Power | 2.5W CW |

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

### Features

- Wideband, 30 to 6000 MHz
- Low insertion loss 0.4 dB typ.
- Fast recovery time, 5nsec typ.
- Excellent VSWR 1.2:1 typ.

### Applications

- Protects low noise amplifiers and other devices from ESD or input power damage
- Military, Hi-rel application
- Telecommunication and Broadband wireless

***+RoHS Compliant***

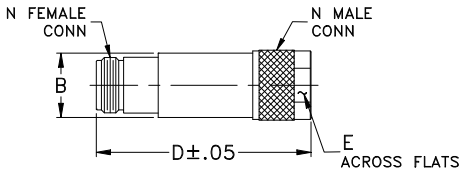
*The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications*

### Coaxial Connections*

| | |
|---|---|
| INPUT | N FEMALE |
| OUTPUT | N MALE |

*Suggested Connections. For reverse connections, consult Mini-Circuits.

### Outline Drawing




### Outline Dimensions (inch / mm)

| A | B | C | D | E | Wt. |
|---|---|---|---|---|---|
| -- | **.71** | -- | **2.11** | **.718** | grams |
| -- | 18.03 | -- | 53.59 | 18.24 | 72.5 |

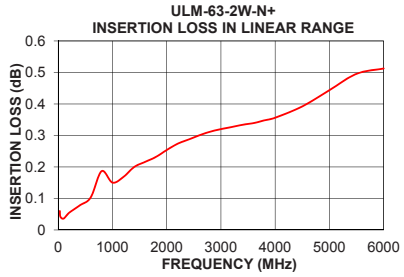
*Note: Please refer to case style drawing for details*

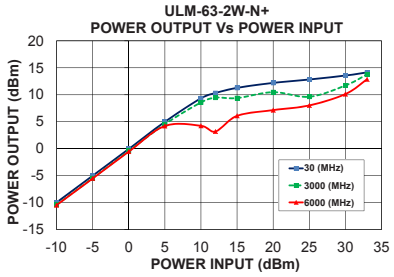
### Electrical Specifications

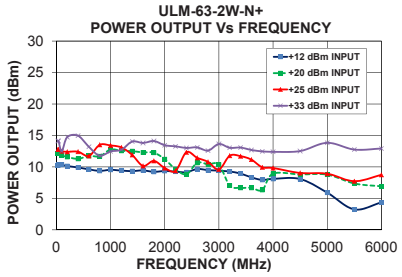
| Parameter | Condition | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Frequency Range | | 30 | | 6000 | MHz |
| Insertion Loss in Linear Range | <+4 dBm Input | — | 0.5 | 1.2 | dB |
| VSWR | <+4 dBm Input | — | 1.25 | 1.9 | :1 |
| Input Power Limiting Range | | +12 | — | +33 | dBm |
| Output Power | In limiting range | — | +13.5 | — | dBm |
| Recovery Time | 1 watt pulse 50 µsec pw 1kHz duty cycle recovery to within 90% of final value. | — | 5 | — | nsec |
| Response Time | -30 to +33 dBm input 50 µsec, BW 1 kHz duty cycle | — | 7 | — | nsec |
| Limiting Δ Output/1dB Δ Input | Input Power Range (dBm)<br>12 to 20<br>20 to 25<br>25 to 33 | <br>—<br>—<br>— | <br>0.3<br>0.5<br>0.6 | <br>—<br>—<br>— | dB/dB |

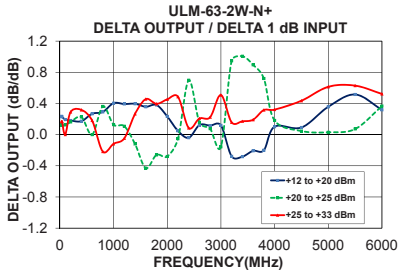
### Typical Performance Data

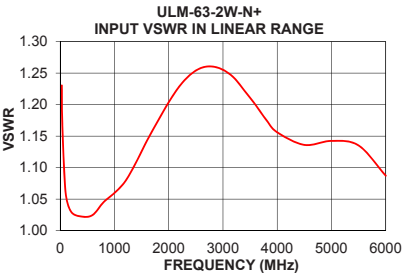
| Freq. (MHz) | I. Loss in Linear Range (dB) | VSWR in Linear Range (:1) | Power Output (dBm) | | | | Δ Output 1dB Δ Input | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | +12 dBm Input | +20 dBm Input | +25 dBm Input | +33 dBm Input | +12 to +20 dBm Input | +20 to +25 dBm Input | +25 to +33 dBm Input |
| 30 | 0.06 | 1.23 | 10.27 | 12.15 | 12.80 | 14.13 | 0.24 | 0.13 | 0.17 |
| 100 | 0.04 | 1.06 | 10.33 | 11.88 | 12.50 | 12.50 | 0.19 | 0.12 | 0.00 |
| 200 | 0.05 | 1.03 | 10.14 | 11.59 | 12.40 | 14.73 | 0.18 | 0.16 | 0.29 |
| 800 | 0.19 | 1.05 | 9.37 | 11.70 | 13.51 | 11.77 | 0.29 | 0.36 | -0.22 |
| 1200 | 0.17 | 1.08 | 9.42 | 12.56 | 13.10 | 12.72 | 0.39 | 0.11 | -0.05 |
| 1600 | 0.22 | 1.14 | 9.45 | 12.31 | 10.16 | 13.81 | 0.36 | -0.43 | 0.46 |
| 2000 | 0.25 | 1.20 | 9.36 | 11.23 | 9.83 | 13.45 | 0.23 | -0.28 | 0.45 |
| 2400 | 0.29 | 1.25 | 9.16 | 8.84 | 12.33 | 13.02 | -0.04 | 0.70 | 0.09 |
| 3000 | 0.32 | 1.26 | 9.41 | 10.36 | 9.58 | 13.65 | 0.12 | -0.16 | 0.51 |
| 3600 | 0.34 | 1.20 | 8.34 | 6.68 | 11.16 | 12.69 | -0.21 | 0.90 | 0.19 |
| 4000 | 0.36 | 1.16 | 8.10 | 8.92 | 9.83 | 12.40 | 0.10 | 0.18 | 0.32 |
| 5000 | 0.44 | 1.14 | 5.91 | 8.77 | 8.92 | 13.83 | 0.36 | 0.03 | 0.61 |
| 6000 | 0.51 | 1.09 | 4.36 | 6.91 | 8.74 | 12.92 | 0.32 | 0.37 | 0.52 |

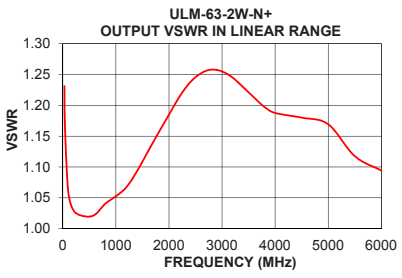



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*Typical Performance Data*

| Freq. | LOW INPUT POWER | | | POWER OUTPUT (dBm) | | | | DELTA OUTPUT/1dB DELTA INPUT (dB/dB) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | INSERTION LOSS | VSWR | | | | | | | | |
| (MHz) | (dB) | INPUT (:1) | OUTPUT (:1) | +12dBm INPUT | +20dBm INPUT | +25dBm INPUT | +33dBm INPUT | +12 to +20dBm INPUT | +20 to +25dBm INPUT | +25 to +33dBm INPUT |
| 30.0 | 0.06 | 1.23 | 1.23 | 10.27 | 12.15 | 12.80 | 14.13 | 0.24 | 0.13 | 0.17 |
| 40.0 | 0.04 | 1.17 | 1.17 | 10.32 | 12.15 | 12.76 | 14.12 | 0.23 | 0.12 | 0.17 |
| 100.0 | 0.04 | 1.06 | 1.06 | 10.33 | 11.88 | 12.50 | 12.50 | 0.19 | 0.12 | 0.00 |
| 200.0 | 0.05 | 1.03 | 1.03 | 10.14 | 11.59 | 12.40 | 14.73 | 0.18 | 0.16 | 0.29 |
| 400.0 | 0.08 | 1.02 | 1.02 | 9.91 | 11.29 | 12.42 | 14.96 | 0.17 | 0.23 | 0.32 |
| 600.0 | 0.10 | 1.02 | 1.02 | 9.61 | 11.75 | 11.75 | 13.20 | 0.27 | 0.00 | 0.18 |
| 800.0 | 0.19 | 1.05 | 1.04 | 9.37 | 11.70 | 13.51 | 11.77 | 0.29 | 0.36 | -0.22 |
| 1000.0 | 0.15 | 1.06 | 1.05 | 9.54 | 12.77 | 13.41 | 12.47 | 0.40 | 0.13 | -0.12 |
| 1200.0 | 0.17 | 1.08 | 1.07 | 9.42 | 12.56 | 13.10 | 12.72 | 0.39 | 0.11 | -0.05 |
| 1400.0 | 0.20 | 1.11 | 1.09 | 9.34 | 12.51 | 11.91 | 14.04 | 0.40 | -0.12 | 0.27 |
| 1600.0 | 0.22 | 1.14 | 1.12 | 9.45 | 12.31 | 10.16 | 13.81 | 0.36 | -0.43 | 0.46 |
| 1800.0 | 0.23 | 1.17 | 1.16 | 9.22 | 12.26 | 10.96 | 14.12 | 0.38 | -0.26 | 0.40 |
| 2000.0 | 0.25 | 1.20 | 1.18 | 9.36 | 11.23 | 9.83 | 13.45 | 0.23 | -0.28 | 0.45 |
| 2200.0 | 0.27 | 1.23 | 1.21 | 9.25 | 9.64 | 9.38 | 13.27 | 0.05 | -0.05 | 0.49 |
| 2400.0 | 0.29 | 1.25 | 1.24 | 9.16 | 8.84 | 12.33 | 13.02 | -0.04 | 0.70 | 0.09 |
| 2600.0 | 0.30 | 1.26 | 1.25 | 9.67 | 10.65 | 11.44 | 13.10 | 0.12 | 0.16 | 0.21 |
| 2800.0 | 0.31 | 1.26 | 1.26 | 9.49 | 10.42 | 10.80 | 12.59 | 0.12 | 0.08 | 0.22 |
| 3000.0 | 0.32 | 1.26 | 1.26 | 9.41 | 10.36 | 9.58 | 13.65 | 0.12 | -0.16 | 0.51 |
| 3200.0 | 0.33 | 1.24 | 1.24 | 9.27 | 7.04 | 11.78 | 13.04 | -0.28 | 0.95 | 0.16 |
| 3400.0 | 0.33 | 1.22 | 1.23 | 8.94 | 6.68 | 11.71 | 13.08 | -0.28 | 1.01 | 0.17 |
| 3600.0 | 0.34 | 1.20 | 1.21 | 8.34 | 6.68 | 11.16 | 12.69 | -0.21 | 0.90 | 0.19 |
| 3800.0 | 0.35 | 1.18 | 1.20 | 7.94 | 6.34 | 9.94 | 12.47 | -0.20 | 0.72 | 0.32 |
| 4000.0 | 0.36 | 1.16 | 1.19 | 8.10 | 8.92 | 9.83 | 12.40 | 0.10 | 0.18 | 0.32 |
| 4500.0 | 0.39 | 1.14 | 1.18 | 8.08 | 8.81 | 9.04 | 12.52 | 0.09 | 0.05 | 0.44 |
| 5000.0 | 0.44 | 1.14 | 1.17 | 5.91 | 8.77 | 8.92 | 13.83 | 0.36 | 0.03 | 0.61 |
| 5500.0 | 0.50 | 1.14 | 1.12 | 3.25 | 7.37 | 7.73 | 12.76 | 0.52 | 0.07 | 0.63 |
| 6000.0 | 0.51 | 1.09 | 1.09 | 4.36 | 6.91 | 8.74 | 12.92 | 0.32 | 0.37 | 0.52 |

*Typical Performance Data*

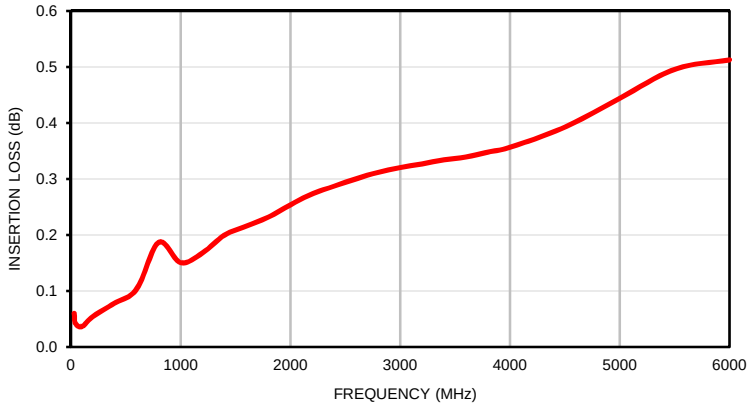
| POWER INPUT | POWER OUTPUT |
|---|---|
| @ 30 MHz | |
| (dBm) | |
| -10 | -9.98 |
| -5 | -5.01 |
| 0 | -0.05 |
| 5 | 4.98 |
| 10 | 9.35 |
| 12 | 10.32 |
| 15 | 11.28 |
| 20 | 12.2 |
| 25 | 12.83 |
| 30 | 13.56 |
| 33 | 14.15 |

| POWER INPUT | POWER OUTPUT |
|---|---|
| @ 3000 MHz | |
| (dBm) | |
| -10 | -10.41 |
| -5 | -5.46 |
| 0 | -0.42 |
| 5 | 4.55 |
| 10 | 8.58 |
| 12 | 9.46 |
| 15 | 9.39 |
| 20 | 10.48 |
| 25 | 9.63 |
| 30 | 11.72 |
| 33 | 13.77 |

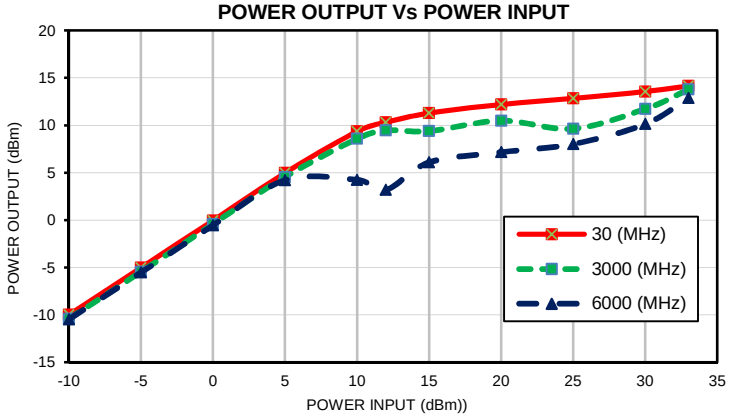
| POWER INPUT | POWER OUTPUT |
|---|---|
| @ 6000 MHz | |
| (dBm) | |
| -10 | -10.47 |
| -5 | -5.53 |
| 0 | -0.55 |
| 5 | 4.21 |
| 10 | 4.24 |
| 12 | 3.18 |
| 15 | 6.09 |
| 20 | 7.16 |
| 25 | 8.02 |
| 30 | 10.13 |
| 33 | 12.86 |

*Typical Performance Curves*

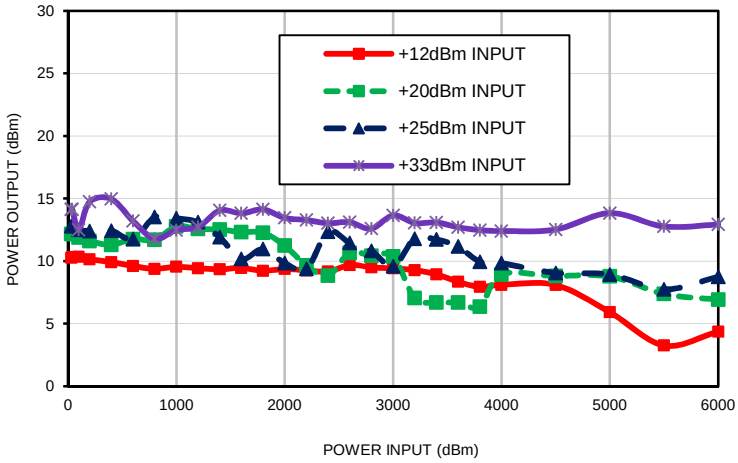
**INSERTION LOSS**



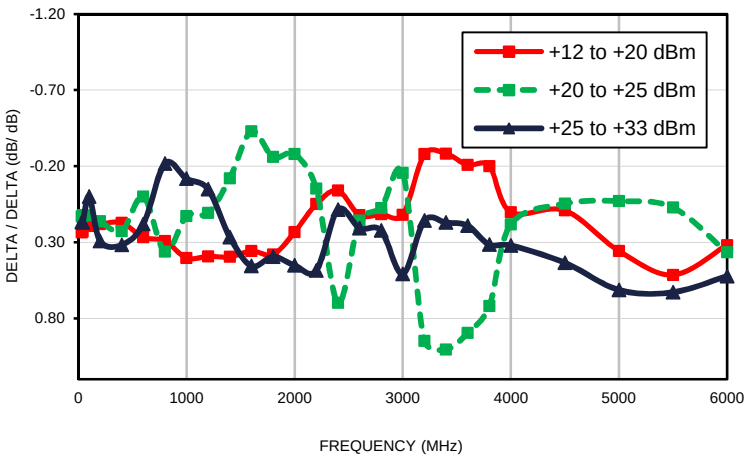

**POWER OUTPUT Vs POWER INPUT**



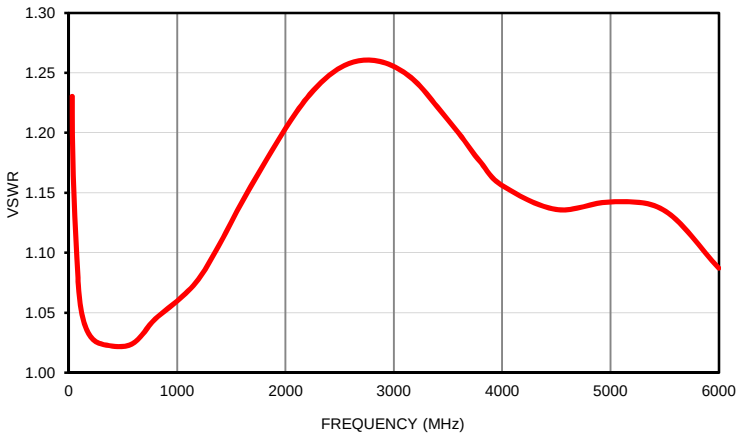

**POWER OUTPUT Vs. FREQUENCY**



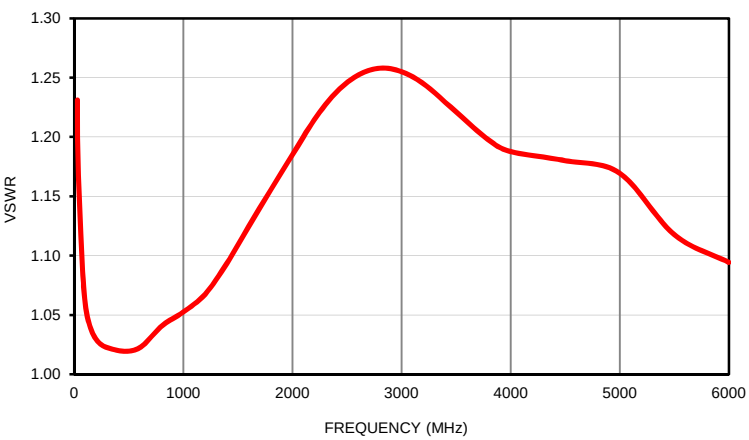

**DELTA OUTPUT / DELTA 1 dB INPUT**




**INPUT VSWR IN LINEAR RANGE**



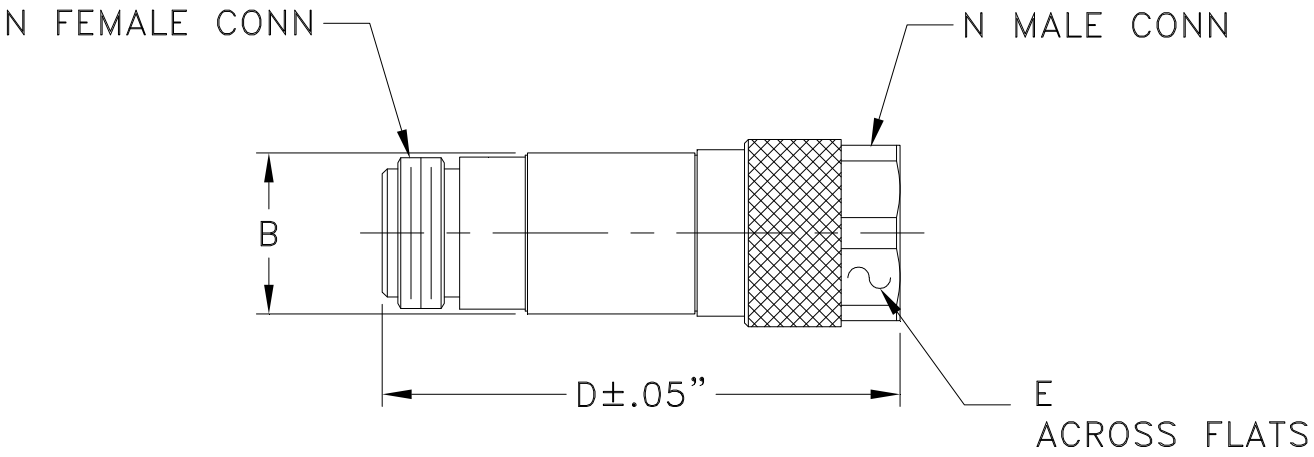

**OUTPUT VSWR IN LINEAR RANGE**



# Case Style FF

**FF779**

## Outline Dimensions




| CASE #. | A | B | C | D | E | WT GRAMS |
|---|---|---|---|---|---|---|
| FF779 | --<br>-- | .71<br>(18.03) | --<br>-- | 2.11<br>(53.59) | .718<br>(18.24) | 72.5 |

**Dimensions are in inches (mm). Tolerances: 2Pl. +.05/-.04; 3Pl. ± .030**

**Notes:**

1. Case material: Brass.
2. Case finish: Nickel plate.



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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<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C<br>Ambient Environment | Individual Model Data Sheet |
| Barometric Pressure | 100,000 Feet | MIL-STD-202, Method 105, Condition D |
| Humidity | 90% RH, 65°C<br>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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