

## 360 W CW Power Limiter 0.3 - 1.0 GHz

Rev. V1

### Features

- 55.6 dBm CW Power Handling @ +25°C
- 54 dBm CW Power Handling @ +85°C
- 0.2 dB Insertion Loss (400 - 500 MHz)
- 25 dB Return Loss (400 - 500 MHz)
- 21 dBm Flat Leakage Power
- Lead-Free 10.1 x 6.2 x 3.2 mm<sup>3</sup> Package
- RoHS\* Compliant
- Hermetic Seal<sup>1</sup>

### Description

The MADL-011012 is a lead-free surface mount, high power limiter which integrates the equivalent of 20 PIN, Schottky, limiter diodes, capacitors, inductors, and resistors in a compact ceramic package. This device provides superior low and high signal performance from 0.3 - 1.0 GHz without DC bias.

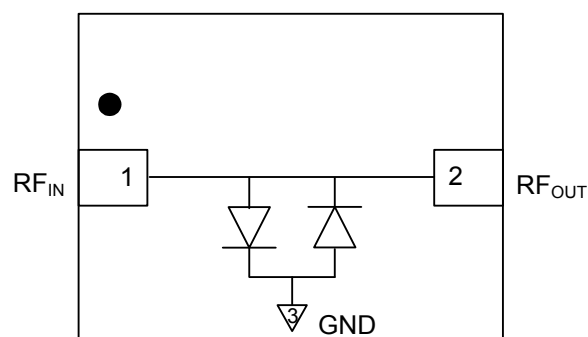
The MADL-011012 is ideally suitable for higher peak and CW power receiver-protector microwave circuits applications where higher performance surface mount limiter assemblies are required.

### Ordering Information

| Part Number        | Package           |
|--------------------|-------------------|
| MADL-011012-001    | bulk              |
| MADL-011012-001SMB | Sample Test Board |

1. Hermetic Seal provides fine leak rate < 5x10<sup>-8</sup> atm·cc/s.

### Functional Schematic



Top view

### Pin Configuration

| Pin No. | Pin Name            | Description |
|---------|---------------------|-------------|
| 1       | RF <sub>IN</sub>    | RF Input    |
| 2       | RF <sub>OUT</sub>   | RF Output   |
| 3       | Paddle <sup>2</sup> | Ground      |

2. The exposed paddle centered on the package bottom must be connected to RF, DC, and thermal ground.

\* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

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**Electrical Specifications:  $T_A = +25^\circ\text{C}$ ,  $Z_0 = 50\ \Omega$  (unless otherwise defined)**

| Parameter                                 | Test Conditions                                           | Units         | Min. | Typ.                 | Max.           |
|-------------------------------------------|-----------------------------------------------------------|---------------|------|----------------------|----------------|
| Insertion Loss                            | -10 dBm, 300 MHz<br>-10 dBm, 500 MHz<br>-10 dBm, 1000 MHz | dB            | —    | 0.25<br>0.20<br>0.55 | —<br>0.35<br>— |
| Return Loss                               | 10 dBm, 300 MHz<br>-10 dBm, 500 MHz<br>-10 dBm, 1000 MHz  | dB            | —    | 20<br>25<br>11       | —<br>—<br>—    |
| P1dB Input Compression Power              | 500 MHz                                                   | dBm           | —    | 13                   | —              |
| CW Incident Power <sup>3</sup>            | 500 MHz                                                   | dBm           | —    | 55.6                 | —              |
| Peak Incident Power <sup>3</sup>          | 1 ms pulse, 10% duty cycle, 500 MHz                       | dBm           | —    | 55.6                 | —              |
| Flat Leakage Power                        | 1 ms pulse, 10% duty cycle, 500 MHz                       | dBm           | —    | 20                   | —              |
| Spike Leakage Power                       | +55.6 dBm, 1 ms pulse, 10% duty cycle, 500 MHz            | dBm           | —    | 29                   | —              |
| Spike Leakage Energy                      | +55.6 dBm, 1 ms pulse, 10% duty cycle, 500 MHz            | ergs          | —    | 0.5                  | —              |
| Recovery Time<br>(3 dB of Insertion Loss) | +55.6 dBm, 1 ms pulse, 10% duty cycle, 500 MHz            | $\mu\text{s}$ | —    | 3                    | —              |
| Input 3rd Order Intermodulation (IIP3)    | -10 dBm, F1 = 500 MHz, F2 = 510 MHz                       | dBm           | —    | 29                   | —              |

3. Incident power ratings defined with 1.2:1 source VSWR and 1.2:1 maximum load VSWR.

**Absolute Maximum Ratings<sup>4,5</sup>**

| Parameter                                                         | Absolute Maximum                            |
|-------------------------------------------------------------------|---------------------------------------------|
| Peak Incident Power<br>2 ms pulse, 10% duty @ $+85^\circ\text{C}$ | 55.6 dBm                                    |
| CW Incident Power @ $+85^\circ\text{C}$                           | 54 dBm                                      |
| Junction Temperature <sup>6</sup>                                 | $175^\circ\text{C}$                         |
| Operating Temperature                                             | $-65^\circ\text{C}$ to $+125^\circ\text{C}$ |
| Storage Temperature                                               | $-65^\circ\text{C}$ to $+150^\circ\text{C}$ |

4. Exceeding any one or combination of these limits may cause permanent damage to this device.  
 5. MACOM does not recommend sustained operation near these survivability limits.  
 6. Operating at nominal conditions with  $T_J \leq +175^\circ\text{C}$  will ensure MTTF >  $1 \times 10^6$  hours.

**Typical Performance Curve**

**Pulse Width vs. Peak Input Power @  $+85^\circ\text{C}$**   
**(10% Duty Cycle, 500 MHz)**

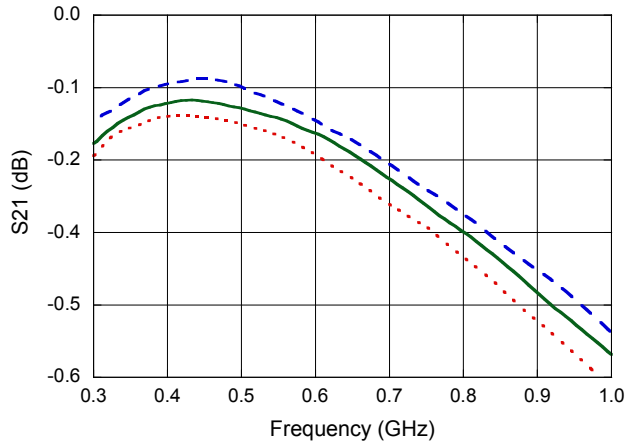


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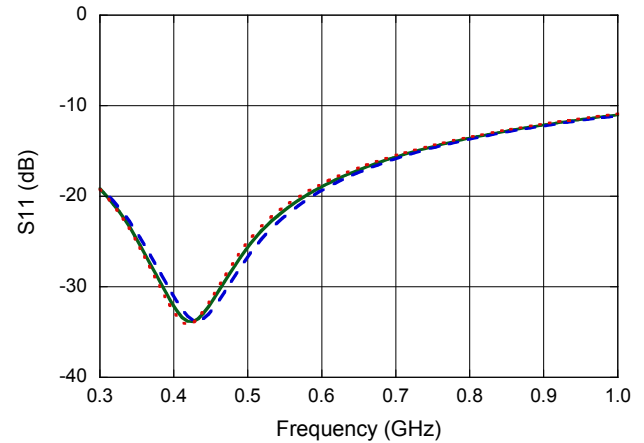
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### Typical Performance Curves

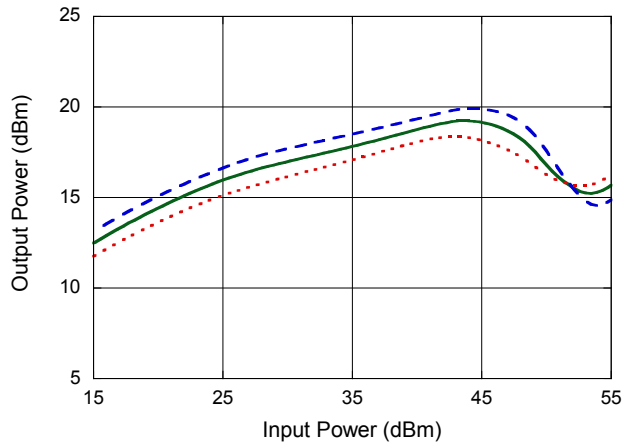
**Insertion Loss vs. Frequency**



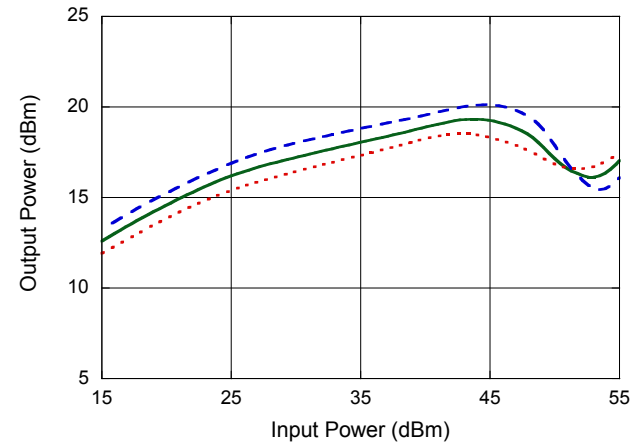
**Input Return Loss vs. Frequency**



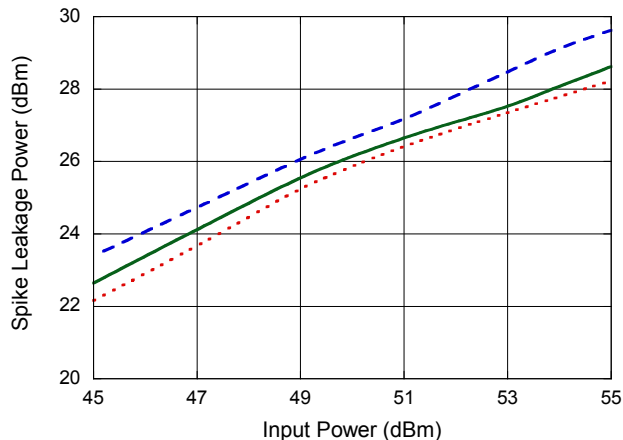
**Pulsed Flat Leakage Power vs.  $P_{IN}$**   
(1 ms Pulse, 10% Duty Cycle, 500 MHz)



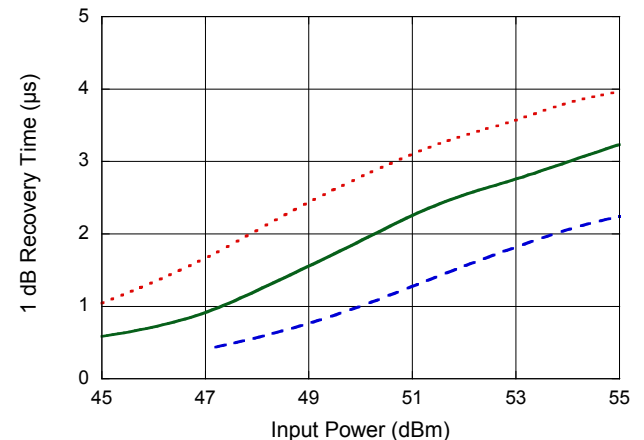
**CW Flat Leakage Power vs.  $P_{IN}$  @ 500 MHz**



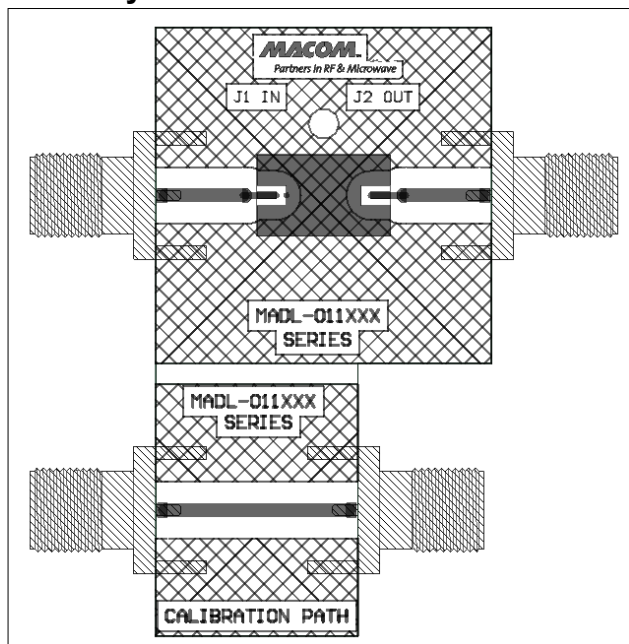
**Pulsed Spike Leakage Power vs.  $P_{IN}$**   
(1 ms Pulse, 10% Duty Cycle, 500 MHz)



**Pulsed 1 dB Recovery Time vs.  $P_{IN}$**   
(1 ms Pulse, 10% Duty Cycle, 500 MHz)



## SMB Layout



## SMB Layout

| Part         | Quantity | Part Number          |
|--------------|----------|----------------------|
| RF Connector | 2        | Johnson 142-0701-851 |
| Limiter      | 1        | MADL-011012          |

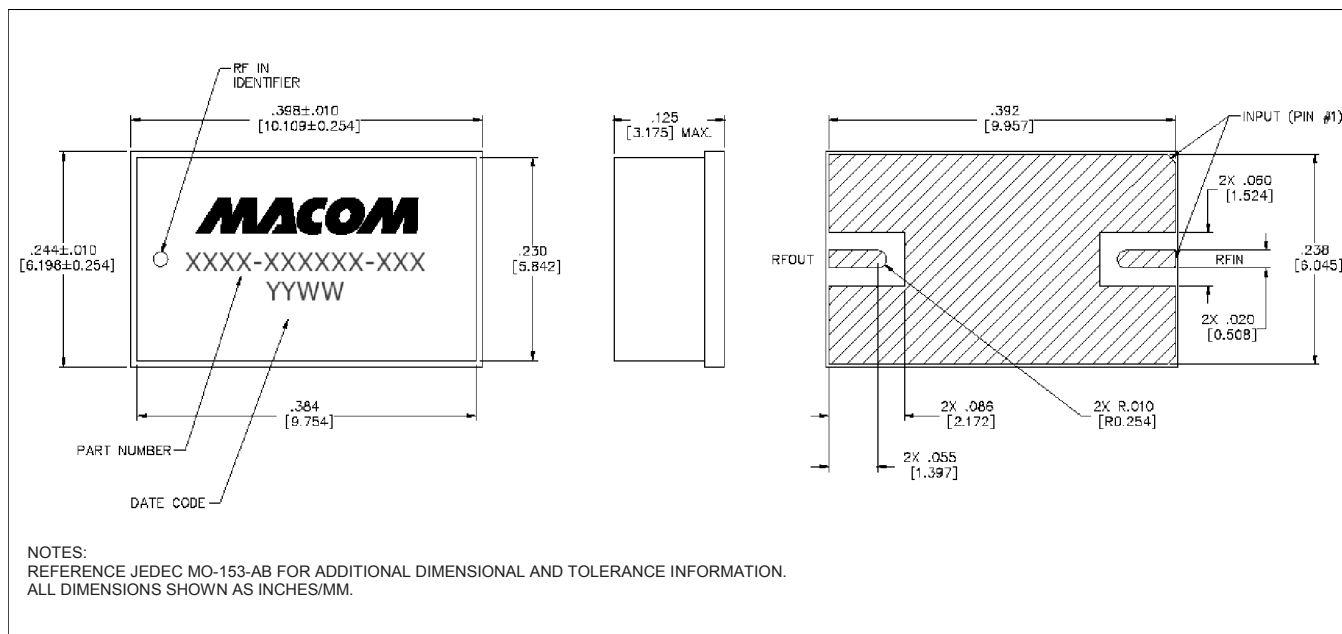
## Handling Procedures

Please observe the following precautions to avoid damage:

## Static Sensitivity

These devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HBM Class 1B devices.

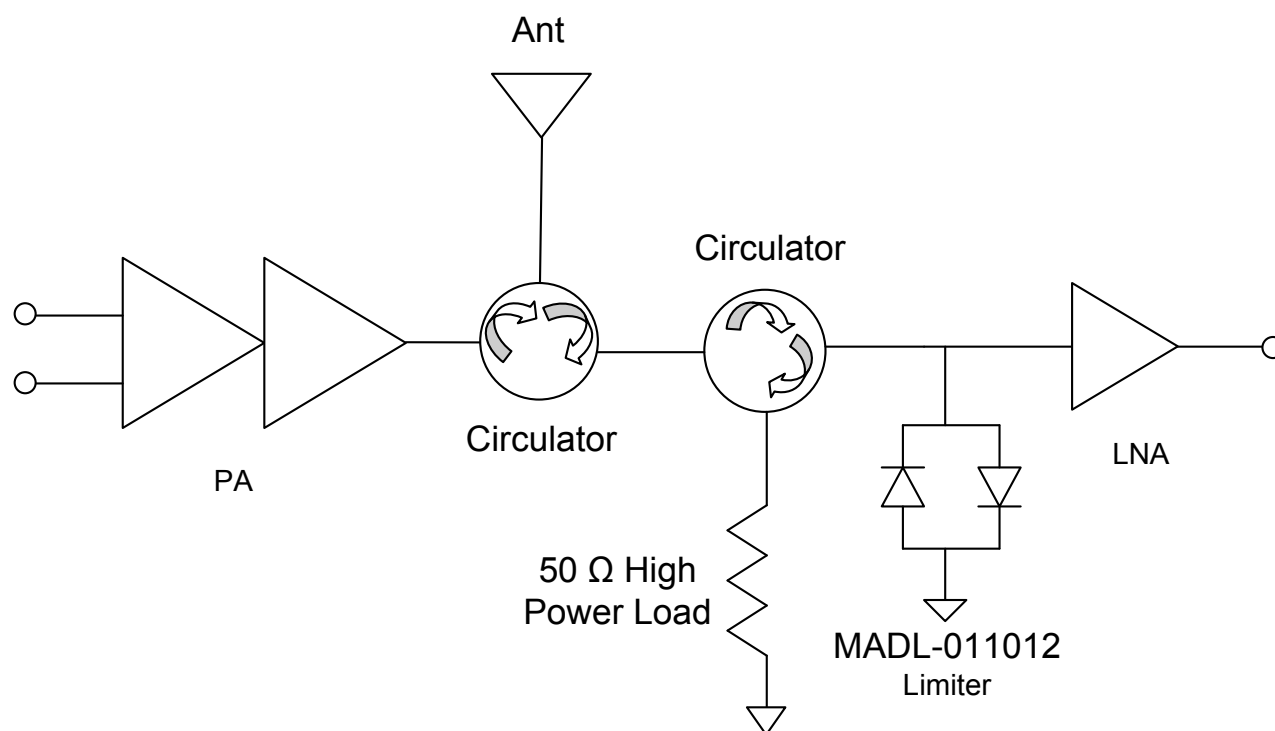
## Lead-Free 10.1 x 6.2 x 3.2 mm<sup>3</sup> 2-Lead package<sup>†</sup>



<sup>†</sup> Reference Application Note [S2083](#) for lead-free solder reflow recommendations.  
Plating is Au over Ni over Cu.

## Application Section

### Transmit-Receive Block Diagram using the UHF Band MADL-011012 Limiter



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