MADL-011014

320 W Peak Power Limiter
1 - 2 GHz

Rev. V4

Features
- +55 dBm Peak Power Handling @ +85°C
- +53 dBm CW Power Handling @ +85°C
- 0.35 dB Insertion Loss (1.2 - 1.4 GHz)
- 19 dB Return Loss (1.2 - 1.4 GHz)
- +19 dBm Flat Leakage Power
- Lead-Free 10.1 x 6.2 x 3.2 mm³ Package
- RoHS* Compliant and 260°C Reflow Compatible
- Hermetic Seal

Description
The MADL-011014 is a lead-free surface mount, high power limiter which integrates the equivalent of 19 PIN, Schottky, limiter diodes, capacitors, inductors, and resistors in a compact ceramic package. This device provides superior low and high signal performance from 1 - 2 GHz without DC bias.

The MADL-011014 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

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MADL-011014-001000</td>
<td>Hermetic Seal¹</td>
</tr>
<tr>
<td>MADL-011014-001SMB</td>
<td>Sample board (Hermetic Seal Limiter)</td>
</tr>
</tbody>
</table>

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

Functional Schematic

Pin Configuration

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Pin Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RFIN</td>
<td>RF Input</td>
</tr>
<tr>
<td>2</td>
<td>RFOUT</td>
<td>RF Output</td>
</tr>
<tr>
<td>3</td>
<td>Paddle²</td>
<td>Ground</td>
</tr>
</tbody>
</table>

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

320 W Peak Power Limiter
1 - 2 GHz

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Units</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
</tr>
</thead>
</table>
| Insertion Loss                                 | -10 dBm, 1.2 - 1.4 GHz
-10 dBm, 1.0 - 2.0 GHz                           | dB    | 0.35 | 0.8  | 0.6  |
| Return Loss                                    | -10 dBm, 1.2 - 1.4 GHz
-10 dBm, 1.0 - 2.0 GHz                           | dB    | 19   | 10   | —    |
| P1dB Input Compression Power                   | 1.3 GHz                                | dBm   | —    | +12  | —    |
| C.W. Incident Power$^3$                         | 1.3 GHz                                | dBm   | —    | 55   | —    |
| Peak Incident Power$^3$                         | 3 ms pulse, 10% duty cycle, 1.3 GHz    | dBm   | —    | 55   | —    |
| Flat Leakage Power                             | 3 ms pulse, 10% duty cycle, 1.3 GHz    | dBm   | —    | 19   | —    |
| Spike Leakage Power                             | +55 dBm, 3 ms pulse, 10% duty cycle, 1.3 GHz | dBm   | —    | 28   | —    |
| Spike Leakage Energy                            | +55 dBm, 3 ms pulse, 10% duty cycle, 1.3 GHz | ergs  | —    | 0.5  | —    |
| Recovery Time (3 dB of Insertion Loss)          | +55 dBm, 3 ms pulse, 10% duty cycle, 1.3 GHz | $\mu$s | —    | 3.5  | —    |
| Input 3rd Order Intermodulation Products (IIP3) | -10 dBm, $F_1 = 1.500 \ \text{GHz}, F_2 = 1.510 \ \text{GHz}$ | dBm   | —    | 20   | —    |

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

Absolute Maximum Ratings$^{4,5}$

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Incident Power 3 ms pulse, 10% duty @ +85°C</td>
<td>+55 dBm</td>
</tr>
<tr>
<td>CW Incident Power @ +85°C</td>
<td>+53 dBm</td>
</tr>
<tr>
<td>Junction Temperature$^6$</td>
<td>175°C</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-65°C to +125°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65°C to +150°C</td>
</tr>
</tbody>
</table>

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 $MTTF > 1 \times 10^6 \ \text{hours}$.

Typical Performance Curve

Pulse Width vs. Peak Input Power @ +85°C
(10% Duty Cycle, 1.3 GHz)
320 W Peak Power Limiter
1 - 2 GHz

Typical Performance Curves

**Insertion Loss vs. Frequency**

**Input Return Loss vs. Frequency**

**Pulsed Flat Leakage Power vs. \( P_{\text{IN}} \)**
(3 ms Pulse, 10% Duty Cycle, 1.3 GHz)

**CW Flat Leakage Power vs. \( P_{\text{IN}} \)**
(3 ms Pulse, 10% Duty Cycle, 1.3 GHz)

**Pulsed Spike Leakage Power vs. \( P_{\text{IN}} \)**
(3 ms Pulse, 10% Duty Cycle, 1.3 GHz)

**Pulsed 3 dB Recovery Time vs. \( P_{\text{IN}} \)**
(3 ms Pulse, 10% Duty Cycle, 1.3 GHz)

For further information and support please visit:
https://www.macom.com/support
SMB Layout

<table>
<thead>
<tr>
<th>Part</th>
<th>Quantity</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF Connector</td>
<td>2</td>
<td>Johnson 142-0701-851</td>
</tr>
<tr>
<td>Limiter</td>
<td>1</td>
<td>MADL-011014</td>
</tr>
</tbody>
</table>

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 1C devices.

Lead-Free 10.1 x 6.2 x 3.2 mm³ 2-Lead package†

† 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 L Band MADL-011014 Limiter