Diode Limiter
18 - 40 GHz

Features
- Peak Power Handling: 4 W @ 40 GHz
- CW Power Handling: 2 W
- Low Insertion Loss: 1.3 dB @ 40 GHz
- Flat Leakage Power: 17 dBm
- 4 mm Air cavity SMT package
- Passive Device
- RoHS* Compliant

Applications
- Receiver Protection
- Radar Systems
- Radio Frequency Front-End Modules

Description
MADL-011108 is a fully integrated diode limiter. It is a passive device, DC decoupled at both input and output RF ports.

The limiter can handle 4 W peak power at 40 GHz with a low flat leakage of 17 dBm.

MADL-011108 is ideally suited for high frequency, high peak power receiver protection with the convenience of a highly integrated surface mount solution.

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MADL-011108-TR0500</td>
<td>500 piece reel</td>
</tr>
<tr>
<td>MADL-011108-SMB</td>
<td>Sample Board</td>
</tr>
</tbody>
</table>

1. Reference Application Note M513 for reel size information.

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

For further information and support please visit: https://www.macom.com/support
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**Electrical Specifications: \( T_A = +25^\circ C, \ Z_0 = 50 \ \Omega \)**

<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                 | 18 GHz  
  22 GHz  
  34 GHz  
  40 GHz                                      | dB    | 0.9  | 1.1  | 1.3  |
| Input & Output Return Loss     | 18 GHz  
  22 GHz  
  34 GHz  
  40 GHz                                      | dB    | 12   | 20   | 16   |
| Input IP3                      | 15 dBm per Tone, 10 MHz Offset, 18 - 27 GHz  
  27 - 40 GHz                                      | dBm   | 27   | 53   | —    |
| CW Power Handling              | —                                               | dBm   | 33   | —    | —    |
| CW Flat Leakage                | 18 - 27 GHz  
  27 - 40 GHz                                      | dBm   | 17   | 15   | —    |
| CW P1dB                        | —                                               | dBm   | 18   | —    | —    |
| Pulsed Peak Power Handling     | 1 µs PW, 10% Duty Cycle                          | dBm   | 36   | —    | —    |
| Spike Leakage Power            | 1 µs PW, 10% DC, 33 dBm Input  
  18 - 27 GHz  
  27 - 40 GHz                                      | dBm   | 14   | 10   | —    |
| Spike Leakage Energy           | 1 µs PW, 10% DC, 33 dBm Input  
  18 - 27 GHz  
  27 - 40 GHz                                      | ergs  | 2.3e-3 | 0.6e-3 | —    |
| 1 dB Recovery Time             | 1 µs PW, 10% DC, 33 dBm Input                   | ns    | 42   | —    | —    |
| 3 dB Recovery Time             | 1 µs PW, 10% DC, 33 dBm Input                   | ns    | 32   | —    | —    |

**Absolute Maximum Ratings**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW Incident Power</td>
<td>34 dBm @ +85°C</td>
</tr>
<tr>
<td>Peak Incident Power</td>
<td>37 dBm @ +85°C</td>
</tr>
<tr>
<td>Junction Temperature(^6)</td>
<td>+150°C</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°C to +85°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-55°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 \( T_J \leq +150^\circ C \) will ensure \( MTTF > 1 \times 10^6 \) hours.

**Handling Procedures**

Please observe the following precautions to avoid damage:

**Static Sensitivity**

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.
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Typical Small-Signal Performance, Package On-Board: $Z_0 = 50 \, \Omega$

**Insertion Loss**

**Input Return Loss**

**Output Return Loss**
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Typical RF Power Performance, Package On-Board: \( Z_0 = 50 \, \Omega \)

**Pulsed Flat Leakage Power over Frequency**
(1 \( \mu \)s Pulse Width, 10% Duty Cycle), \( T_A = 25^\circ C \)

**CW Gain Compression over Frequency**, \( T_A = 25^\circ C \)

**1dB and 3dB Recovery time at 33 dBm Input Power**
(1 \( \mu \)s Pulse Width, 10% Duty Cycle), \( T_A = 25^\circ C \)

**CW 1dB Compression Point over Temperature**

**Pulsed Spike Peak Power over Input Power**
(1 \( \mu \)s Pulse Width, 10% Duty Cycle), \( T_A = 25^\circ C \)

**Pulsed Spike Energy Power over Input Power**
(1 \( \mu \)s Pulse Width, 10% Duty Cycle), \( T_A = 25^\circ C \)
Typical RF Power Performance, Package On-Board: $Z_0 = 50 \, \Omega$

**CW Flat leakage Power over Frequency, $T_A = 25^\circ C$**

![Graph showing CW flat leakage power over frequency at 25°C.](image)

**CW Flat leakage Power over Temperature @ 18 GHz**

![Graph showing CW flat leakage power over temperature at 18 GHz.](image)

**CW Flat leakage Power over Temperature @ 27 GHz**

![Graph showing CW flat leakage power over temperature at 27 GHz.](image)

**CW Flat leakage Power over Temperature @ 30 GHz**

![Graph showing CW flat leakage power over temperature at 30 GHz.](image)

**CW Flat leakage Power over Temperature @ 35 GHz**

![Graph showing CW flat leakage power over temperature at 35 GHz.](image)

**CW Flat leakage Power over Temperature @ 40 GHz**

![Graph showing CW flat leakage power over temperature at 40 GHz.](image)
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Typical RF Power Performance, Package On-Board: Z₀ = 50 Ω

Input IP3 over Frequency, Tₐ = 25°C

Input IP3 over temperature @ 18 GHz

Input IP3 over temperature @ 27 GHz

Input IP3 over temperature @ 30 GHz

Input IP3 over temperature @ 35 GHz

Input IP3 over temperature @ 40 GHz
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Lead-Free 4 mm 4-Lead PQFN†

† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level MSL 3 requirements.
Plating is gold. This device is non-hermetic with an open vent hole. MACOM does not recommend performing any aqueous cleaning process post-assembly unless the vent hole has been filled post-reflow.
Limiter is NOT Bi-Directional, pin 1 is RF Input.
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