

Diode Limiter

2 - 20 GHz



MADL-011125-DIE

Rev. V1

Features

- Peak Power Handling: 16 W
- CW Power Handling: 6.3 W
- Low Insertion Loss: 0.7 dB @ 20 GHz
- Flat Leakage Power: 16.5 dBm @ 18 GHz
- Die size: 1.77 x 0.97 x 0.10 mm
- Passive Device
- RoHS* Compliant

Applications

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

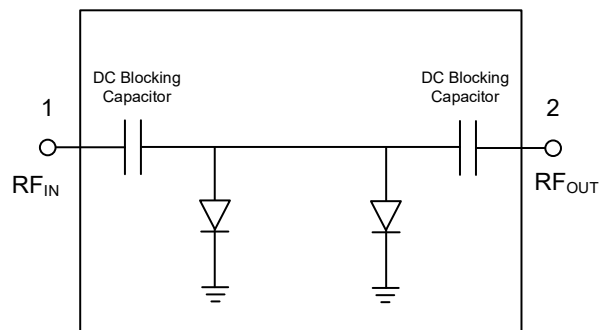
Description

MADL-011125-DIE is a fully integrated diode limiter. It is a passive device, DC decoupled at both input and output RF ports.

The limiter can handle 16 W peak power with a low flat leakage of 16.5 dBm at 18 GHz.

MADL-011125-DIE is available in die form. It is ideally suited for high frequency, high peak power receiver protection.

Functional Schematic



Pin Configuration

| Pin # | Function |
|----------|---------------------|
| 1 | RF Input |
| 2 | RF Output |
| Backside | Ground ¹ |

1. The entire exposed pad on the die bottom must be connected to RF, DC and thermal ground.

Ordering Information

| Part Number | Package |
|-----------------|--------------|
| MADL-011125-DIE | Gel-Pak |
| MADL-011125-SMB | Sample Board |

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

Electrical Specifications: $T_A = +25^\circ\text{C}$, $Z_0 = 50 \Omega$

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|----------------------------|---|-------|------|--------|------|
| Insertion Loss | 2 GHz | dB | — | 0.7 | — |
| | 8 GHz | | | 0.3 | |
| | 16 GHz | | | 0.6 | |
| | 20 GHz | | | 0.7 | |
| Input & Output Return Loss | 2 GHz | dB | — | 18 | — |
| | 8 GHz | | | 18 | |
| | 16 GHz | | | 18 | |
| | 20 GHz | | | 18 | |
| CW Power Handling | — | dBm | — | 38 | — |
| CW Flat Leakage | 2 GHz | dBm | — | 20.5 | — |
| | 10 GHz | | | 21.0 | |
| | 18 GHz | | | 16.5 | |
| CW P1dB | — | dBm | — | 19 | — |
| Pulsed Peak Power Handling | 1 μs PW, 1% Duty Cycle | dBm | — | 42 | — |
| Spike Leakage Power | 1 μs PW, 1% DC, 33 dBm Input | dBm | — | 20 | — |
| | 2 GHz | | | 16 | |
| | 18 GHz | | | 12 | |
| Spike Leakage Energy | 1 μs PW, 1% DC, 33 dBm Input | ergs | — | 1.9e-3 | — |
| | 10 GHz | | | 0.8e-3 | |
| | 18 GHz | | | | |
| 1 dB Recovery Time | 1 μs PW, 1% DC, 33 dBm Input | ns | — | 45 | — |
| 3 dB Recovery Time | 1 μs PW, 1% DC, 33 dBm Input | ns | — | 35 | — |

Absolute Maximum Ratings^{2,3}

| Parameter | Absolute Maximum |
|-----------------------------------|------------------|
| CW Incident Power | 38.5 dBm @ +85°C |
| Peak Incident Power | 42.4 dBm @ +85°C |
| Junction Temperature ⁶ | +150°C |
| Operating Temperature | -40°C to +85°C |
| Storage Temperature | -55°C to +150°C |

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- MACOM does not recommend sustained operation near these survivability limits.
- Operating at nominal conditions with $T_J \leq +150^\circ\text{C}$ will ensure $\text{MTTF} > 1 \times 10^6$ hours.

Handling Procedures

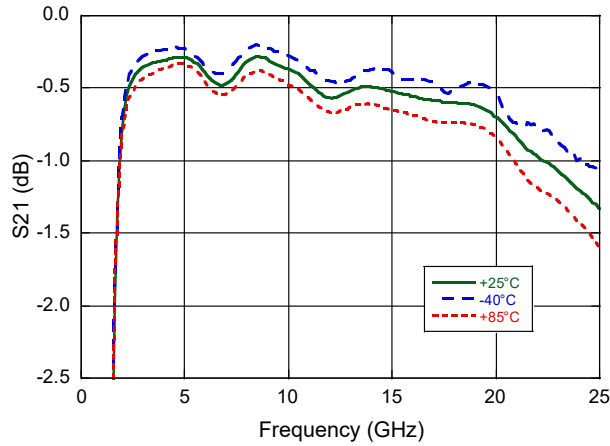
Please observe the following precautions to avoid damage:

Static Sensitivity

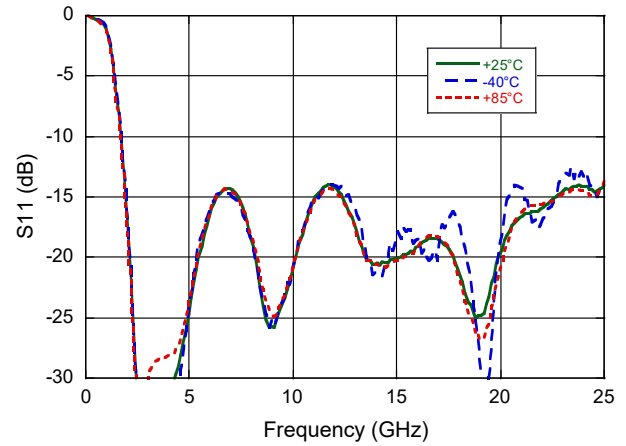
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Typical Small-Signal Performance, Die On-Board: Over Temperature, $Z_0 = 50 \Omega$

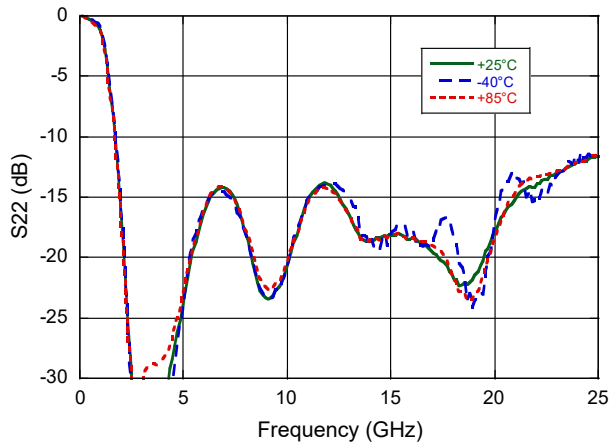
De-embedded Insertion Loss



Input Return Loss

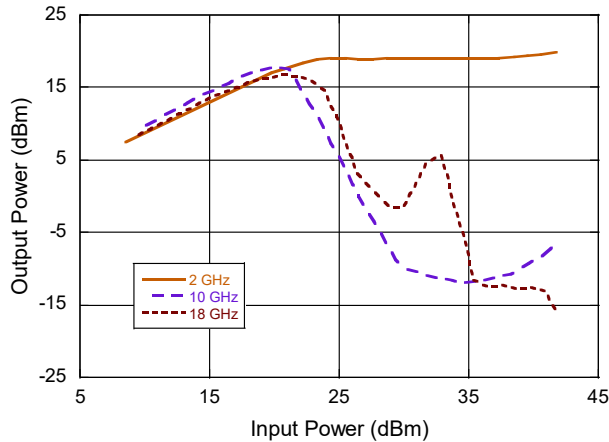


Output Return Loss

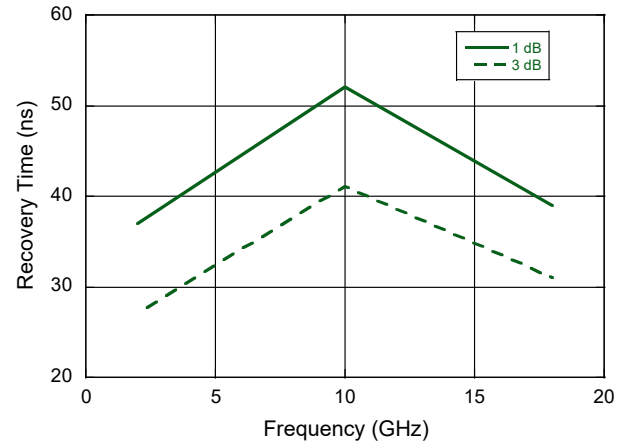


Typical RF Power Performance, Die On-Board: $Z_0 = 50 \Omega$, $T_A = 25^\circ\text{C}$,
 1 μs Pulse Width, 1% Duty Cycle

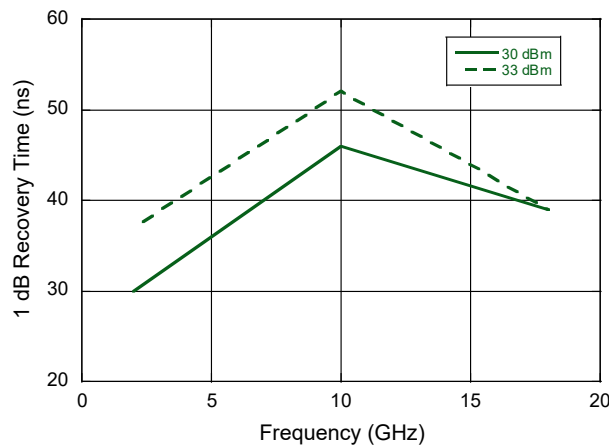
Pulsed Flat Leakage Power over Frequency



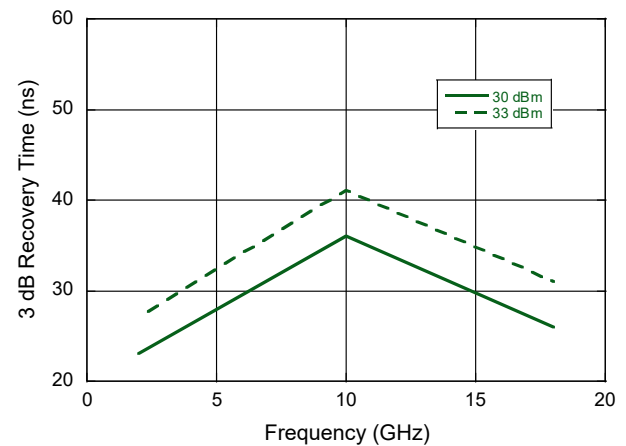
1dB and 3dB Recovery time at 33 dBm Input Power



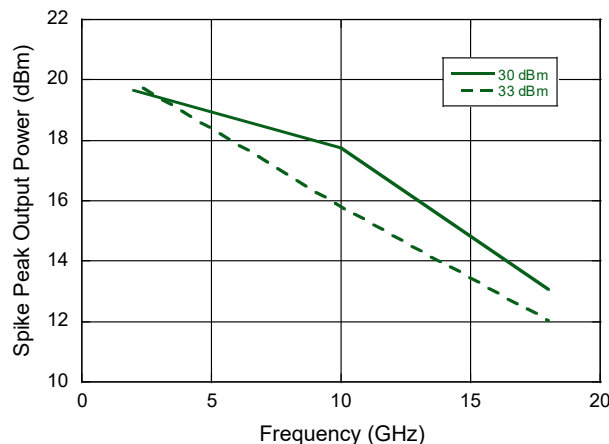
1dB Recovery time @ 30 & 33 dBm Input Power



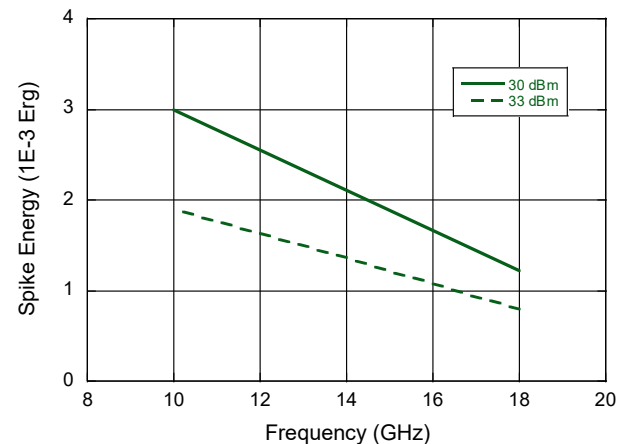
3dB Recovery time @ 30 & 33 dBm Input Power



Pulsed Spike Peak Power over Input Power



Pulsed Spike Energy Power over Input Power



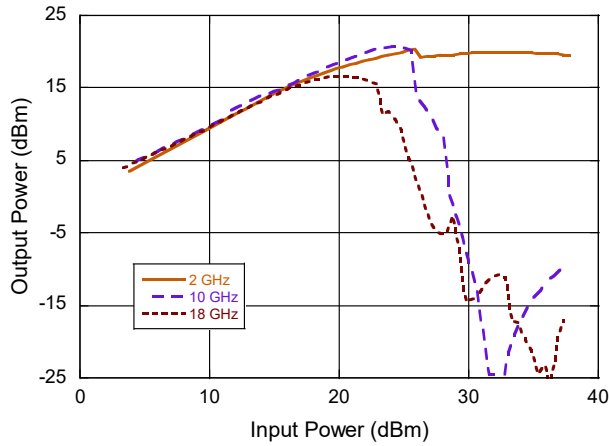
Diode Limiter 2 - 20 GHz



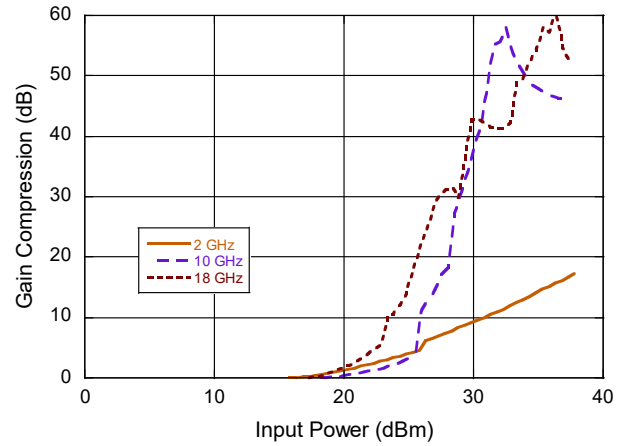
MADL-011125-DIE
Rev. V1

Typical RF Power Performance, Die On-Board: $Z_0 = 50 \Omega$, $T_A = 25^\circ\text{C}$

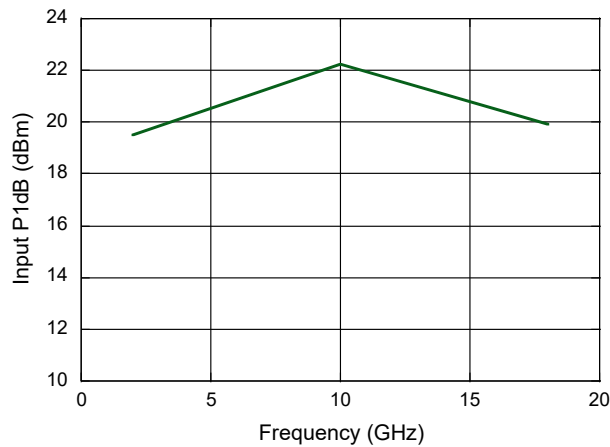
CW Flat Leakage Power over Frequency



CW Gain Compression over Frequency



CW 1dB Compression Point



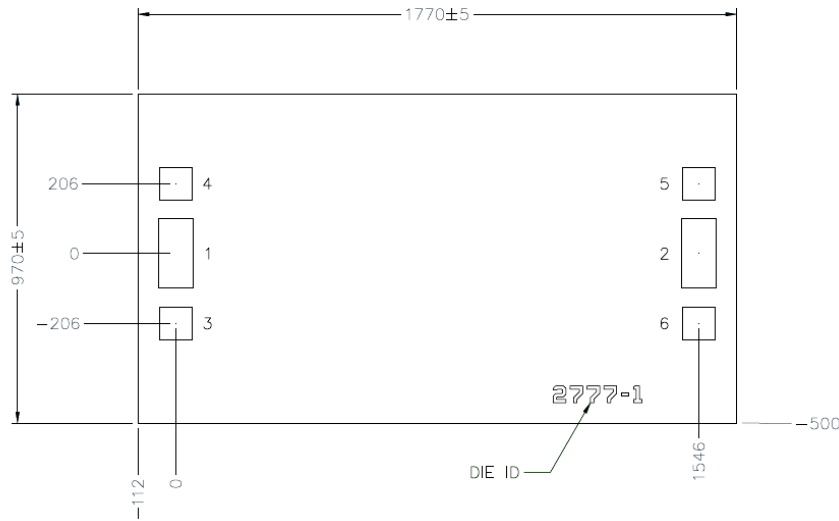
Diode Limiter 2 - 20 GHz



MADL-011125-DIE

Rev. V1

Die Outline Drawing



| BOND PAD DIM. (μm) | | |
|---------------------------------|---------------------|---------------------|
| PAD | X (μm) | Y (μm) |
| 1,2 | 104 | 204 |
| 3,4,5,6 | 96 | 96 |

- NOTES – UNLESS OTHERWISE SPECIFIED:
1. ALL DIMENSIONS SHOWN ARE μm WITH A TOLERANCE OF $\pm 5\mu\text{m}$.
 2. DIE THICKNESS IS $100 \pm 10\mu\text{m}$
 3. BOND PAD/BACKSIDE METALLIZATION: GOLD.
 4. DIMENSIONS REFLECT THE FINAL SAWN DIE SIZE.

MACOM Technology Solutions Inc. ("MACOM"). All rights reserved.

These materials are provided in connection with MACOM's products as a service to its customers and may be used for informational purposes only. Except as provided in its Terms and Conditions of Sale or any separate agreement, MACOM assumes no liability or responsibility whatsoever, including for (i) errors or omissions in these materials; (ii) failure to update these materials; or (iii) conflicts or incompatibilities arising from future changes to specifications and product descriptions, which MACOM may make at any time, without notice. These materials grant no license, express or implied, to any intellectual property rights.

THESE MATERIALS ARE PROVIDED "AS IS" WITH NO WARRANTY OR LIABILITY, EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHT, ACCURACY OR COMPLETENESS, OR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.