

PIN-Schottky Anti-Parallel Diode Limiter 10 MHz - 6 GHz

Rev. V2

Features

- 3 Terminal LPF Broadband Shunt Structure
- 10 MHz - 6 GHz Broadband Frequency
- > 2.5 W Peak and CW Power Handling
- < 0.5 dB Shunt Insertion Loss
- < +15 dBm Flat Leakage Power
- Lead-Free 1.5 x 1.2 mm 6-lead TDFN Package
- RoHS* Compliant and 260°C Reflow Compatible

Description

The MADL-011021 is a lead-free 1.5 x 1.2 mm TDFN surface mount plastic packaged that provides both low and high signal frequency operation from 10 MHz to 6 GHz. The anti-parallel arrangement of the PIN limiter and schottky diode provides for broadband performance, eliminating the need for a shunt coil as a DC return.

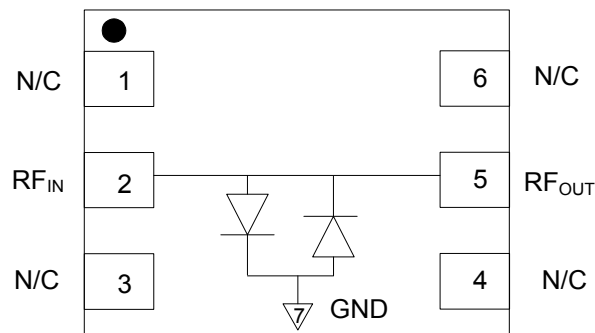
This device is ideally suitable for usage in higher frequency and lower flat leakage limiter microwave circuits applications where higher performance surface mount diode assemblies are required.

Ordering Information^{1,2}

| Part Number | Package |
|--------------------|-----------------|
| MADL-011021-14150T | 3000 piece reel |
| MADL-011021-000SMB | Sample board |

1. Reference Application Note [M513](#) for reel size information.
2. All RF Sample boards include 5 loose parts.

Functional Schematic



Top view

Pin Configuration³

| Pin No. | Pin Name | Description |
|---------|---------------------|---------------|
| 1 | N/C | No Connection |
| 2 | RF _{IN} | RF Input |
| 3 | N/C | No Connection |
| 4 | N/C | No Connection |
| 5 | RF _{OUT} | RF Output |
| 6 | N/C | No Connection |
| 7 | Paddle ⁴ | Ground |

3. MACOM recommends connecting unused package pins to ground.
4. The exposed pad 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: $T_A = +25^\circ\text{C}$

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|--|---|-------|------|------|------|
| Insertion Loss | P incident = -10 dBm, F = 750 MHz | dB | — | 0.15 | 0.20 |
| Return Loss | P incident = -10 dBm, F = 750 MHz | dB | — | 20 | — |
| P1dB Input Compression Power | F = 1 GHz | dBm | — | +5 | — |
| C.W. Incident Power ⁵ | F = 4 GHz | dBm | — | 34 | — |
| Peak Incident Power ⁵ | 1 μs , 1 % duty @ 4 GHz | dBm | — | 34 | — |
| Flat Leakage Power ⁶ | +34 dBm, 1 μs , 1 % duty @ 4 GHz | dBm | — | 18 | — |
| Spike Leakage Power ^{6,7} | +34 dBm, 1 μs , 1 % duty @ 4 GHz | dBm | — | 20 | — |
| Spike Leakage Energy ^{6,7} | +34 dBm, 1 μs , 1 % duty @ 4 GHz | ergs | — | 0.01 | — |
| Recovery Time ^{5,6,7} (1 db of Insertion Loss) | +34 dBm, 1 μs , 1 % duty @ 4 GHz | ns | — | 100 | — |
| Input 3rd Order Intermodulation Products (IIP3) | P incident = -10 dBm, F1 = 1.000 GHz, F2 = 1.010 GHz | dBm | — | 15 | — |

5. Incident power ratings defined with 1.2:1 source VSWR and 1.2:1 max load VSWR.

6. Peak incident power defined at 1 μs RF pulse width, 1% duty cycle

7. Spike leakage power and recovery time values are defined at peak power conditions.

Absolute Maximum Ratings^{8,9}

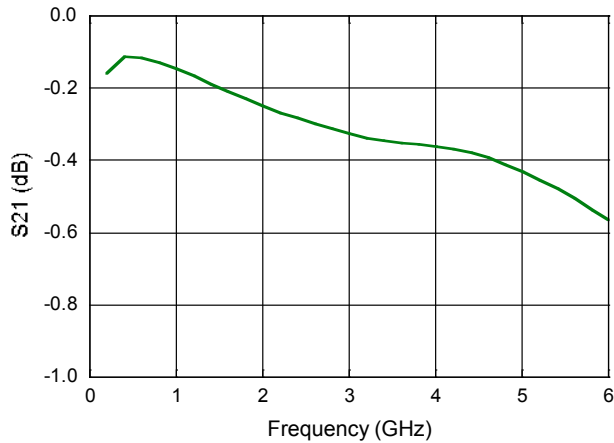
| Parameter | Absolute Maximum |
|--|------------------|
| Peak Incident Power 1 μs pulse, 1% duty (+85°C) | +33 dBm |
| CW Incident Power (+85°C) | +33 dBm |
| Junction Temperature | +175°C |
| Operating Temperature | -65°C to +125°C |
| Storage Temperature | -65°C to +150°C |

8. Exceeding any one or combination of these limits may cause permanent damage to this device.

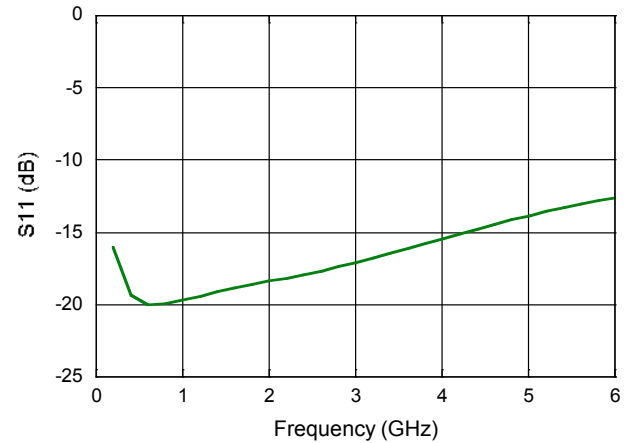
9. MACOM does not recommend sustained operation near these survivability limits.

Typical Performance Curves @ +25°C

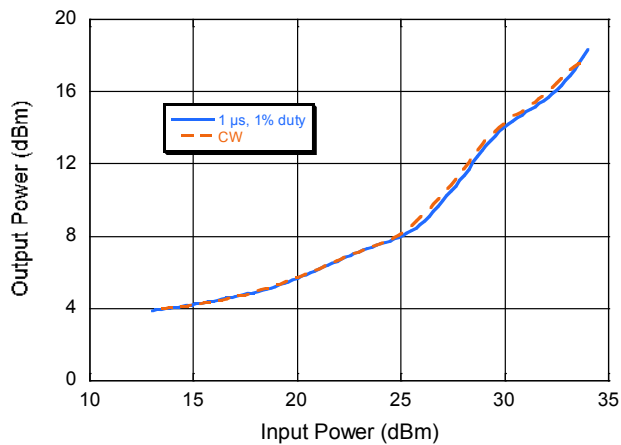
Insertion Loss vs. Frequency



Return Loss vs. Frequency

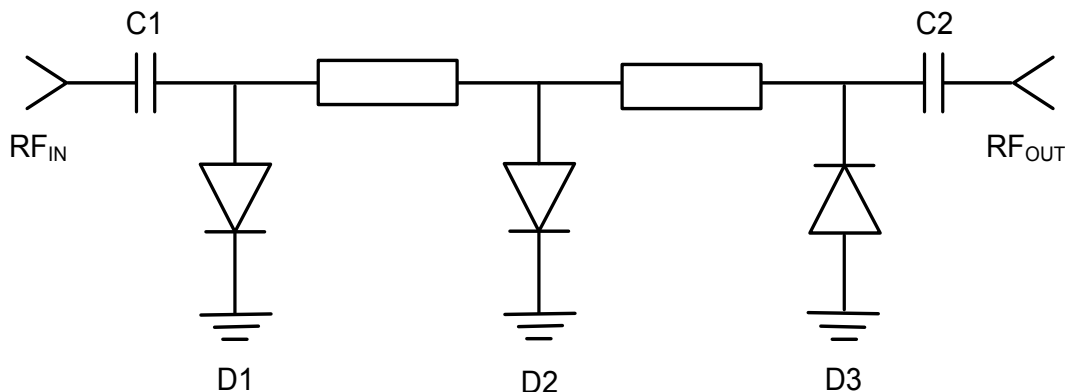


Flat Leakage Power @ CW and Pulsed Power, 4 GHz



Applications Section

Schematic of 3 Stage Limiter using MADL-011021-14150T
F = 1 - 6 GHz, P_{inc} = +40 dBm CW, + 47 dBm, 5 us, 1 % duty



Parts List¹⁰

| Part | PN | Case Style | Description | Quantity |
|----------------------|--------------------|------------|---|----------|
| D1 | MADP-011029-14150T | ODS-1415 | Input PIN Diode | 1 |
| D2, D3 ¹¹ | MADL-011021-14150T | ODS-1415 | 2 nd & 3 rd Stage PIN Diode | 1 |
| C1, C2 | 22 pF | 0402 | DC Block | 2 |

10. Parts list is shown for 1 - 6 GHz operation. Component values can be scaled for various frequency bands.

11. D2 and D3 are combined as single MADL-011021-14150T.

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