

Schottky Limiter DC - 6 GHz

Rev. V1

Features

- 3 Terminal LPF Broadband Shunt Structure
- Low Slope Resistance, 7 Ω
- +30 dBm Peak and CW Power Handling
- 0.6 dB Shunt Insertion Loss
- +20 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 MADS-011010 is a Schottky limiter assembled in a lead-free 1.5 x 1.2 mm TDFN surface mount plastic package. This device provides broadband performance as well as exceptional lower flat leakage power.

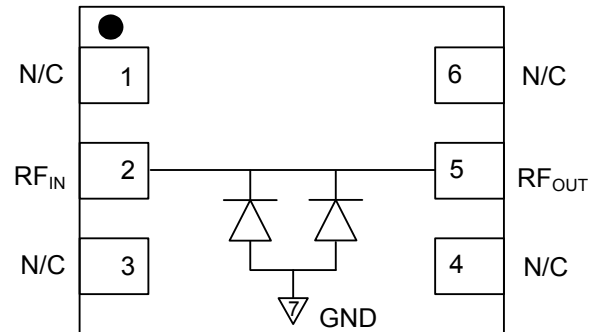
The MADS-011010 is ideally suitable for higher frequency and lower flat leakage limiter applications where higher performance surface mount diode assemblies are required.

Ordering Information^{1,2}

| Part Number | Package |
|--------------------|-----------------|
| MADS-011010-14150T | 3000 piece reel |
| MADS-011010-000SMB | 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.

Schottky Limiter DC - 6 GHz

Rev. V1

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

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|--|---|-------|------|------|------|
| Insertion Loss | $P_{IN} = -20 \text{ dBm @ } 1.25 \text{ GHz}$ | dB | — | 0.5 | 0.75 |
| P1dB Input Compression Power | @ 1 GHz | dBm | — | -2 | — |
| Peak & CW Incident Power ⁵ | 1 μs , 0.1% duty @ 1 GHz | dBm | — | +30 | — |
| Flat Leakage Power ⁶ | +30 dBm, 1 μs , 0.1% duty @ 1 GHz | dBm | — | +22 | — |
| Spike Leakage Power ⁶ | +30 dBm, 1 μs , 0.1% duty @ 1 GHz | dBm | — | +22 | — |
| Spike Leakage Energy ⁶ | +30 dBm, 1 μs , 0.1% duty @ 1 GHz | ergs | — | 0.01 | — |
| Recovery Time ⁶ (1 dB of Insertion Loss) | +30 dBm, 1 μs , 0.1% duty @ 1 GHz | ns | — | 50 | — |
| Input 3rd Order ⁶ Intermodulation Products | $P_{IN} = -20 \text{ dBm}$, $F1 = 1.000 \text{ GHz}$, $F2 = 1.010 \text{ GHz}$ | dBm | — | +15 | — |
| Forward Voltage (Vf) | Vf @ 1 mA | mV | — | 100 | — |
| Voltage Breakdown (Vb) | Vb @ 1 mA | V | — | 3 | — |
| Slope Resistance (Rd) | Rd @ 9.5 –10.5 mA | Ohms | — | 7 | — |
| Capacitance (Ct) | Ct @ -0.5 volts | pF | — | 0.34 | — |

5. Both Source and Load VSWR <1.2:1 at Peak and CW Incident Power.

6. High power output parameters are tested with RF evaluation board component values defined on PCB schematic, pg 4.

Absolute Maximum Ratings^{7,8}

| Parameter | Absolute Maximum |
|--|------------------|
| Peak & CW Incident Power 1 μs pulse, 0.1% duty @ +85°C | +27 dBm |
| Junction Temperature | 175°C |
| Operating Temperature | -65°C to +125°C |
| Storage Temperature | -65°C to +150°C |

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

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

Handling Procedures

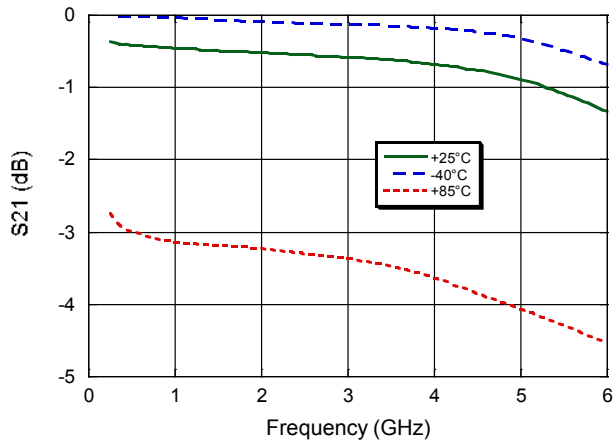
Please observe the following precautions to avoid damage:

Static Sensitivity

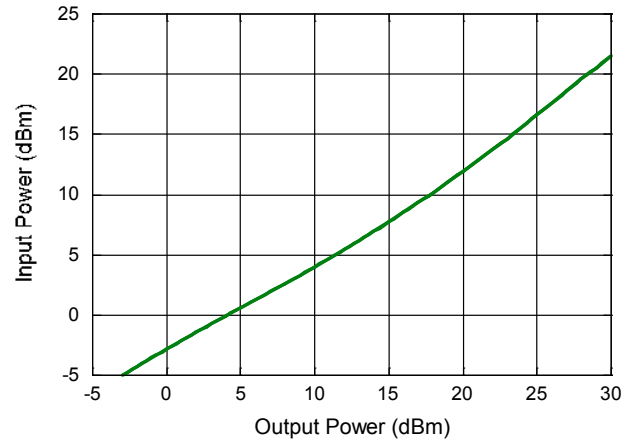
These devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class 0 devices.

Typical Performance Curves

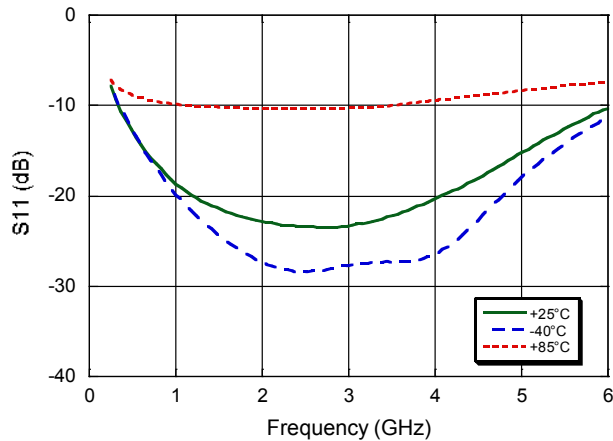
Insertion Loss vs. Frequency



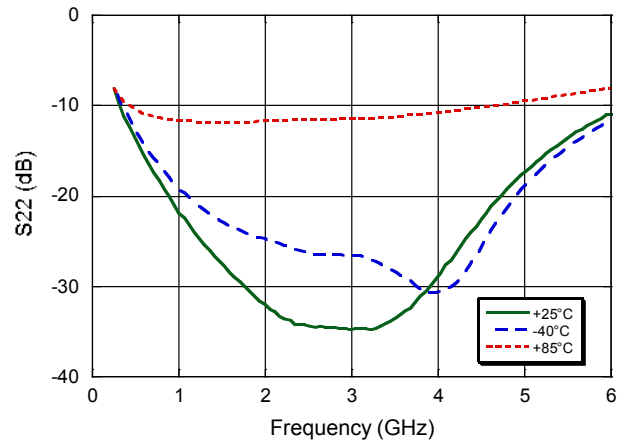
Flat Leakage Power @ CW, 1 GHz



Input Return Loss vs. Frequency



Output Return Loss vs. Frequency



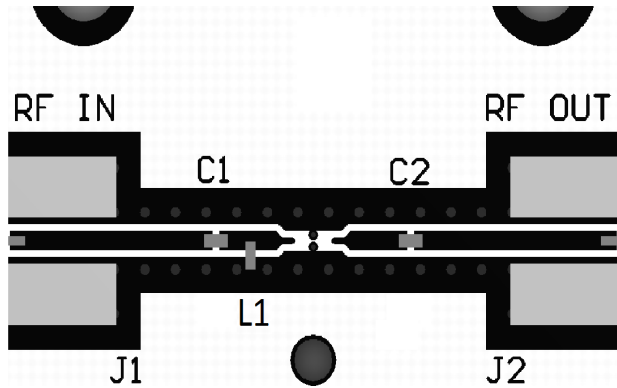
MADS-011010-14150T



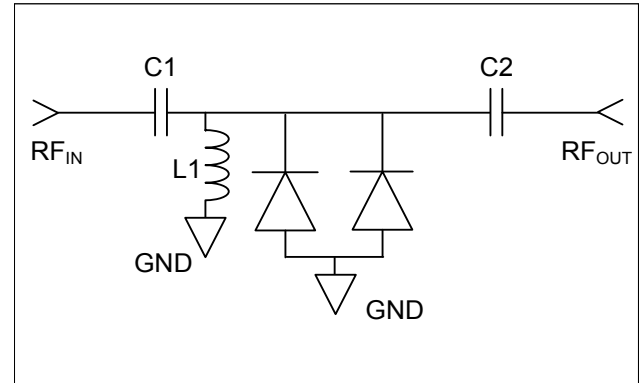
Schottky Limiter
DC - 6 GHz

Rev. V1

PCB Layout



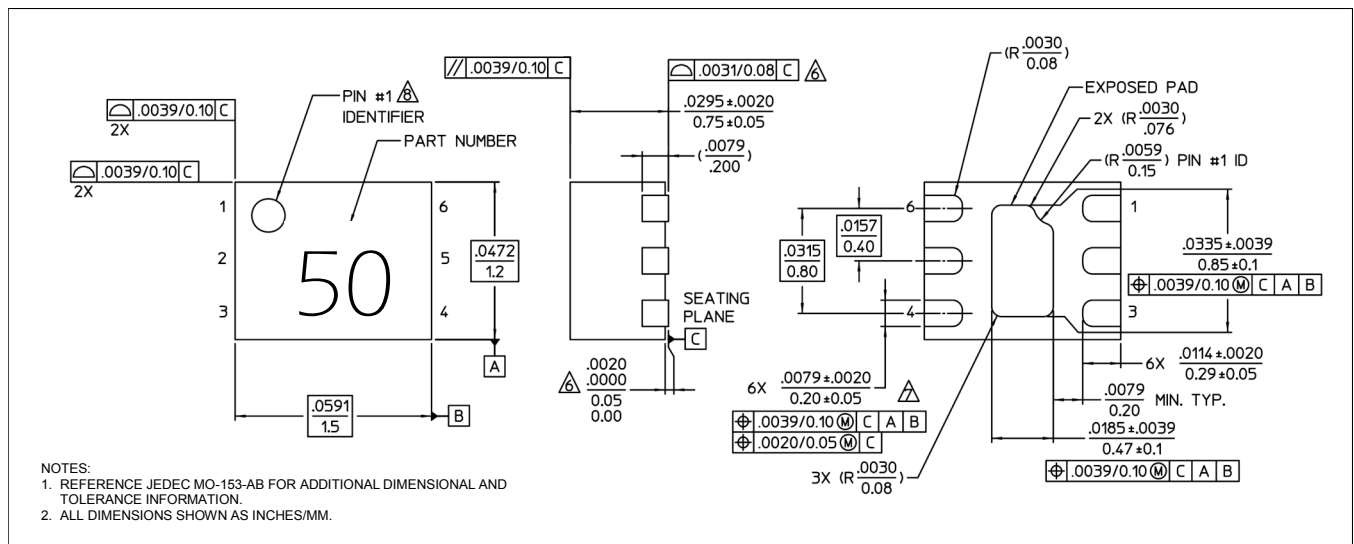
PCB Schematic



Parts List

| Part | Value | Case Style |
|-------------------------|--------|------------|
| C1, C2 (DC Blocks) | 100 pF | 0402 |
| L1 | 27 nH | 0402 |

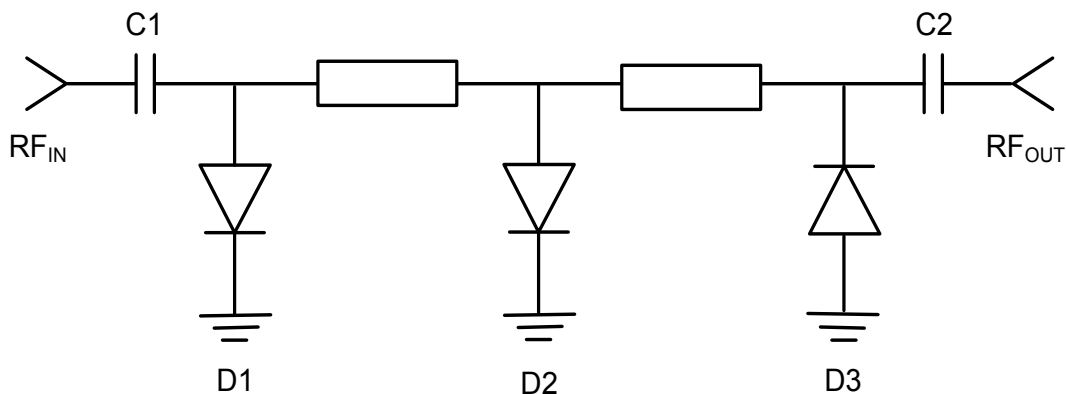
Lead-Free 1.5 x 1.2 mm 6-Lead TDFN[†]



[†] Reference Application Note [S2083](#) for lead-free solder reflow recommendations.
 Meets JEDEC moisture sensitivity level 1 requirements.
 Plating is 100% matte tin over copper.

Applications Section

Schematic of 3 Stage Limiter using MADS-011010-14150T
 $F = 1 - 4 \text{ GHz}$, $P_{in} = +40 \text{ dBm CW}$, $+43 \text{ dBm}$, $5 \mu\text{s}$, $1\% \text{ duty}$



Parts List

| Part | Part # / Value | Case Style | Description | Quantity |
|--------|--------------------|------------|--|----------|
| D1 | MADP-011029-14150T | ODS-1415 | Input PIN Diode | 1 |
| D2 | MADL-011021-14150T | ODS-1415 | 2 nd Stage PIN Diode | 1 |
| D3 | MADS-011010-14150T | ODS-1415 | 3 rd Stage Schottky Limiter | 1 |
| C1, C2 | 22 pF | 0402 | DC Block | 2 |