

## Schottky Limiter DC - 6 GHz

Rev. V1

### Features

- 3 Terminal LPF Broadband Shunt Structure
- Low Slope Resistance, 7  $\Omega$
- +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.

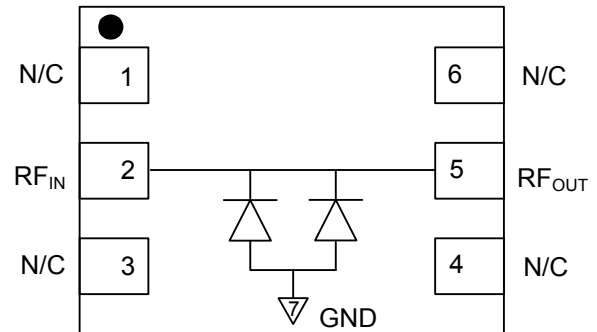
The MADS-011010 is ideally suitable for higher frequency and lower flat leakage limiter applications where higher performance surface mount diode assemblies are required.

### Ordering Information<sup>1,2</sup>

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 Configuration<sup>3</sup>

Pin No.	Pin Name	Description
1	N/C	No Connection
2	RF <sub>IN</sub>	RF Input
3	N/C	No Connection
4	N/C	No Connection
5	RF <sub>OUT</sub>	RF Output
6	N/C	No Connection
7	Paddle <sup>4</sup>	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: $T_A = +25^\circ\text{C}$ , $Z_0 = 50 \Omega$ (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 <sup>5</sup>	1 $\mu\text{s}$ , 0.1% duty @ 1 GHz	dBm	—	+30	—
Flat Leakage Power <sup>6</sup>	+30 dBm, 1 $\mu\text{s}$ , 0.1% duty @ 1 GHz	dBm	—	+22	—
Spike Leakage Power <sup>6</sup>	+30 dBm, 1 $\mu\text{s}$ , 0.1% duty @ 1 GHz	dBm	—	+22	—
Spike Leakage Energy <sup>6</sup>	+30 dBm, 1 $\mu\text{s}$ , 0.1% duty @ 1 GHz	ergs	—	0.01	—
Recovery Time <sup>6</sup> (1 dB of Insertion Loss)	+30 dBm, 1 $\mu\text{s}$ , 0.1% duty @ 1 GHz	ns	—	50	—
Input 3rd Order <sup>6</sup> 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<sup>7,8</sup>

Parameter	Absolute Maximum
Peak & CW Incident Power 1 $\mu\text{s}$ 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

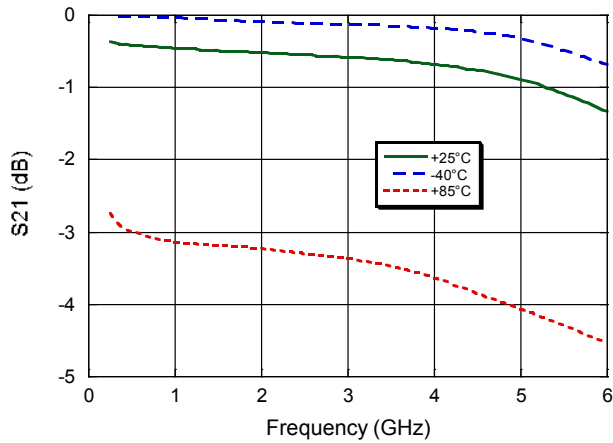
Please observe the following precautions to avoid damage:

### Static Sensitivity

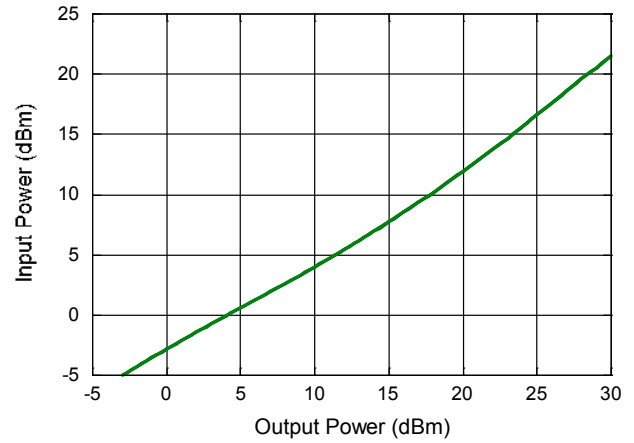
These devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class 0 devices.

## Typical Performance Curves

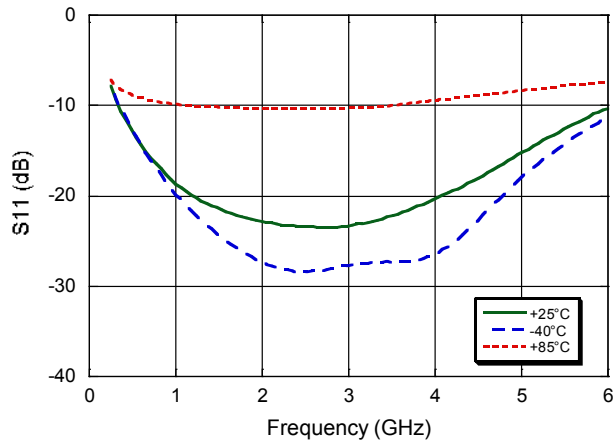
Insertion Loss vs. Frequency



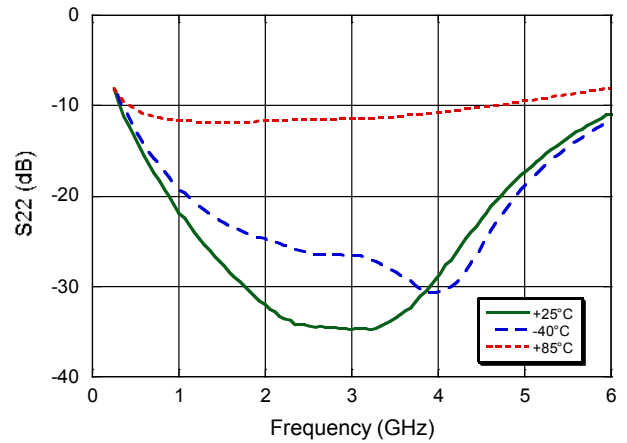
Flat Leakage Power @ CW, 1 GHz



Input Return Loss vs. Frequency



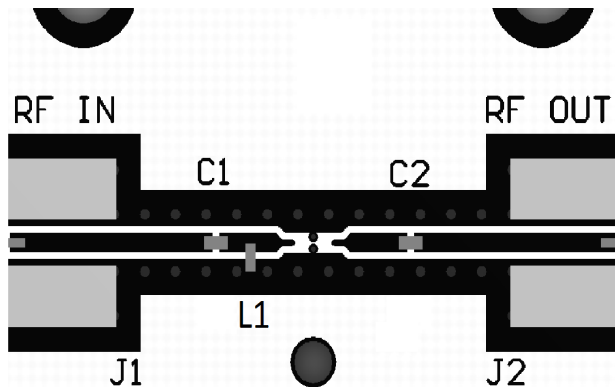
Output Return Loss vs. Frequency



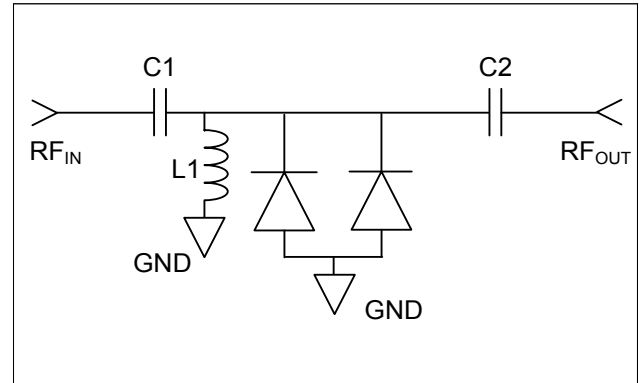
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### PCB Layout



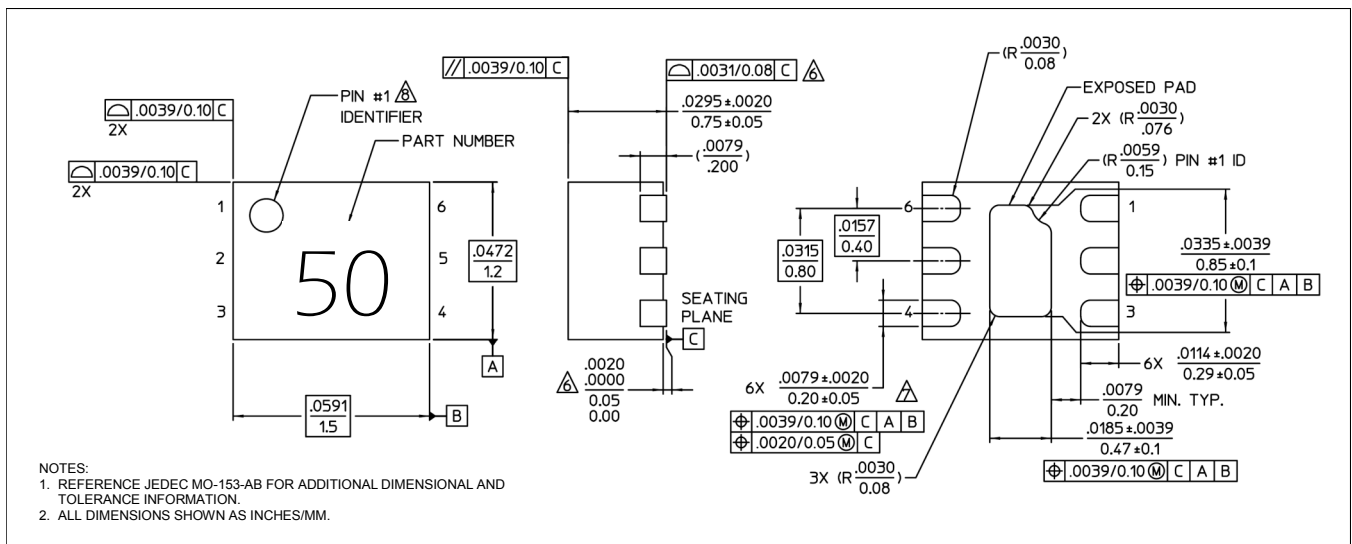
### PCB Schematic



### Parts List

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

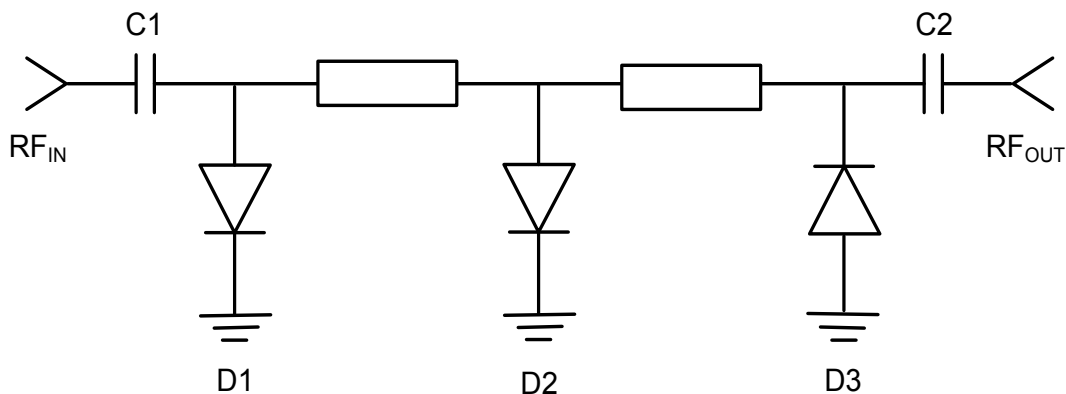
### Lead-Free 1.5 x 1.2 mm 6-Lead TDFN<sup>†</sup>



<sup>†</sup> 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 <sup>nd</sup> Stage PIN Diode	1
D3	MADS-011010-14150T	ODS-1415	3 <sup>rd</sup> Stage Schottky Limiter	1
C1, C2	22 pF	0402	DC Block	2

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