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Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



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.

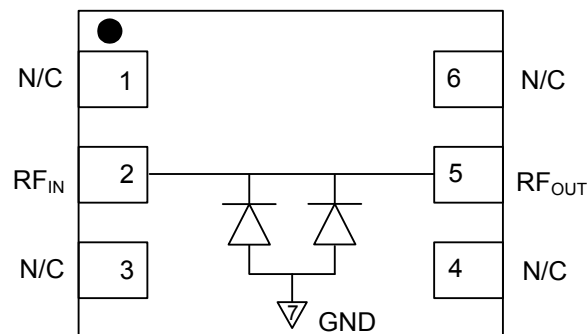
The MADS-011010 is ideally suitable for higher frequency and lower flat leakage limiter applications where higher performance surface mount diode assemblies are required.

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.

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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 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

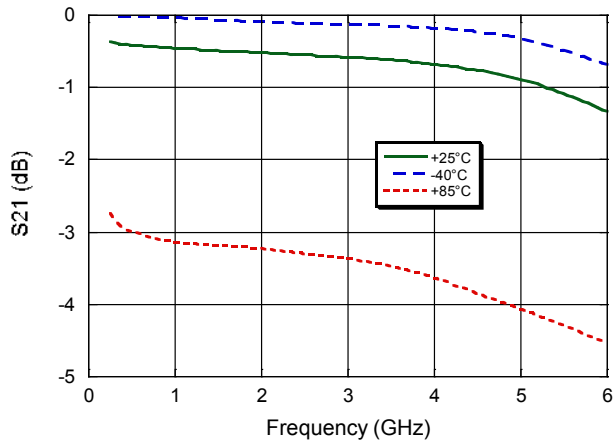
Please observe the following precautions to avoid damage:

Static Sensitivity

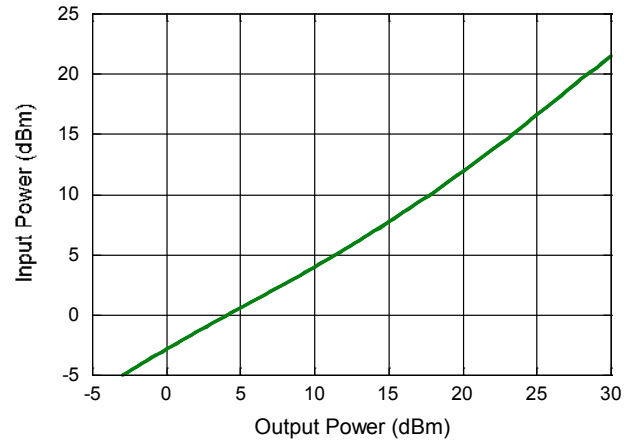
These devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class 0 devices.

Typical Performance Curves

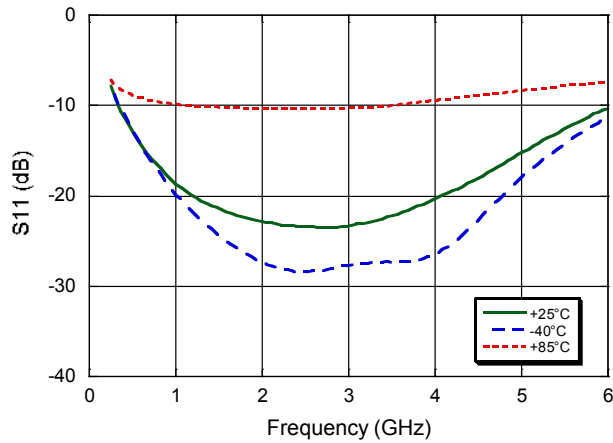
Insertion Loss vs. Frequency



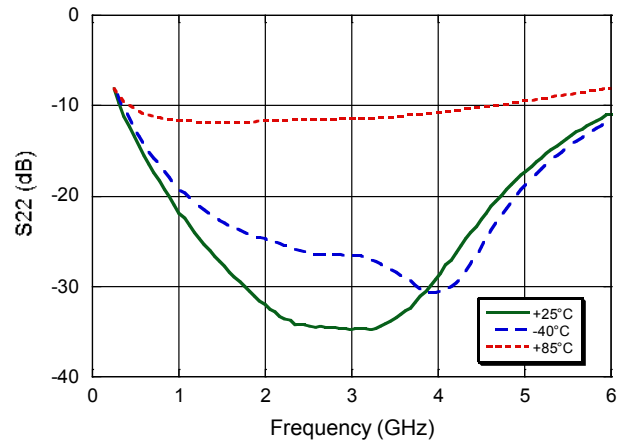
Flat Leakage Power @ CW, 1 GHz



Input Return Loss vs. Frequency



Output Return Loss vs. Frequency



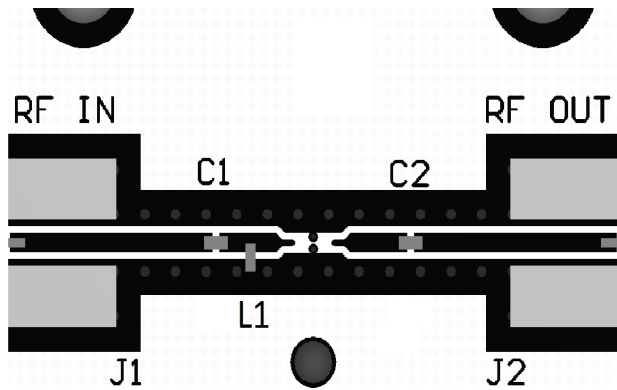
MADS-011010-14150T



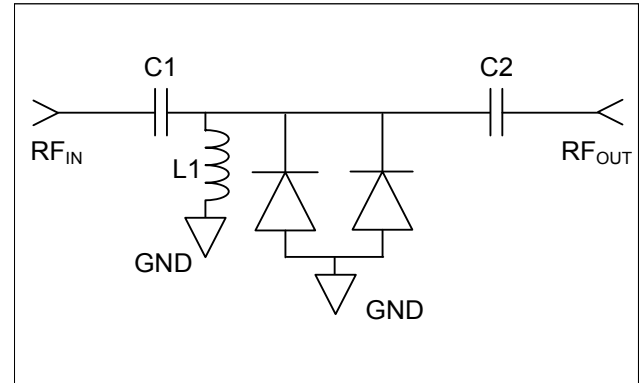
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PCB Layout



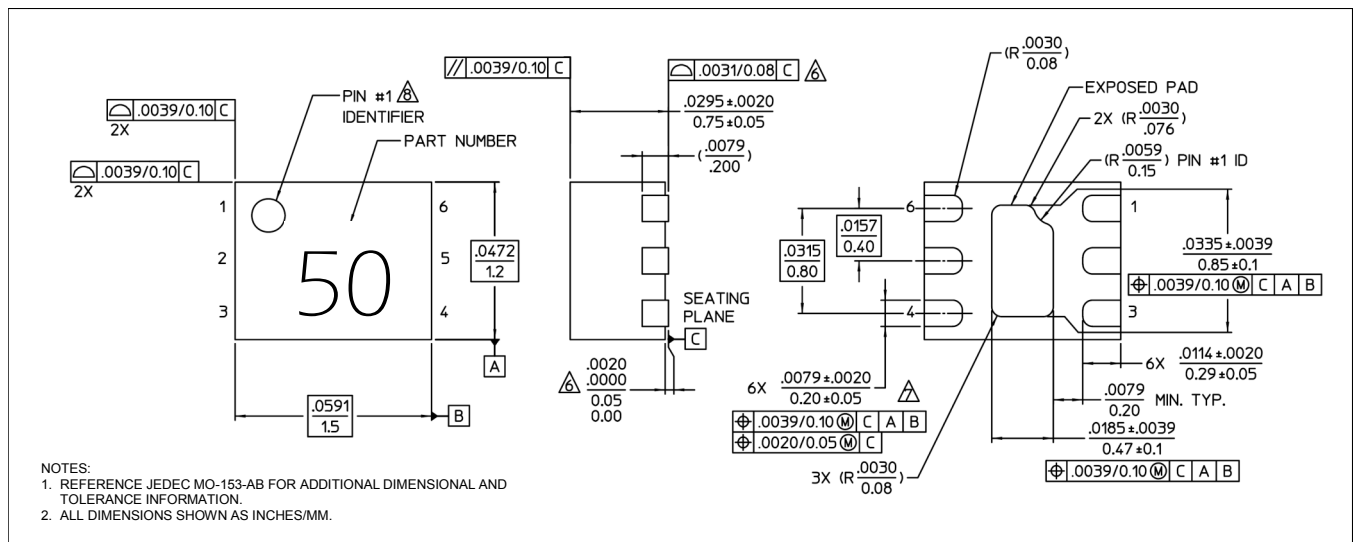
PCB Schematic



Parts List

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

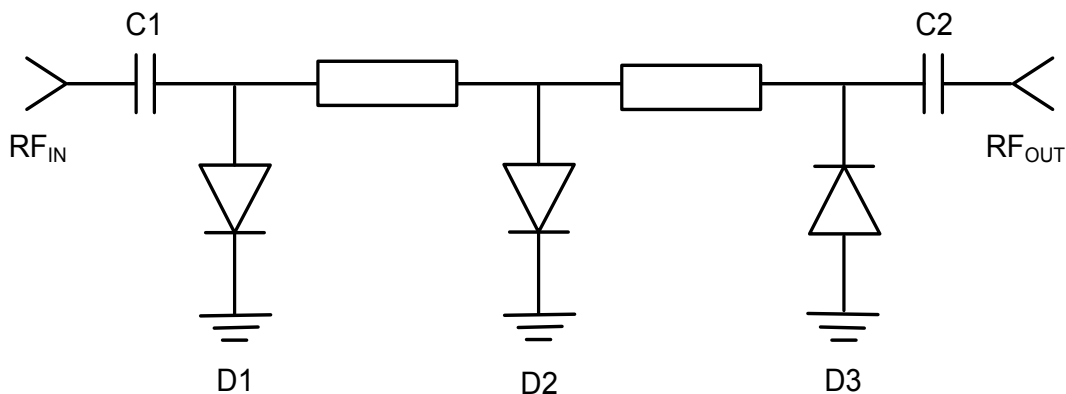
Lead-Free 1.5 x 1.2 mm 6-Lead TDFN†



† 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