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

#### 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  $1.5 \times 1.2 \text{ mm}$ 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**<sup>1,2</sup>

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

1. Reference Application Note  $\underline{M513}$  for reel size information.

2. All RF Sample boards include 5 loose parts.

#### **Functional Schematic**



### 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<sub>A</sub> = +25°C

Parameter	Test Conditions	Units	Min.	Тур.	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 <sup>5</sup>	F = 4 GHz	dBm		34	
Peak Incident Power <sup>5</sup>	1 µs, 1 % duty @ 4 GHz	dBm	_	34	
Flat Leakage Power <sup>6</sup>	+34 dBm, 1 µs, 1 % duty @ 4 GHz	dBm		18	
Spike Leakage Power <sup>6,7</sup>	+34 dBm, 1 µs, 1 % duty @ 4 GHz	dBm		20	
Spike Leakage Energy <sup>6,7</sup>	+34 dBm, 1 µs, 1 % duty @ 4 GHz	ergs	_	0.01	
Recovery Time <sup>5,6,7</sup> ( 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<sup>8,9</sup>

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.

 MACOM does not recommend sustained operation near these survivability limits.

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#### **PCB Schematic**



#### Parts List

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

#### **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 devices.



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

<sup>†</sup> Reference Application Note <u>S2083</u> for lead-free solder reflow recommendations. Meets JEDEC moisture sensitivity level 1 requirements. Plating is 100% matte tin over copper.

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#### Typical Performance Curves @ +25°C

#### Insertion Loss vs. Frequency



Flat Leakage Power @ CW and Pulsed Power, 4 GHz



Return Loss vs. Frequency



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**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 List<sup>10</sup>

Part	PN	Case Style	Description	Quantity
D1	MADP-011029-14150T	ODS-1415	Input PIN Diode	1
D2, D3 <sup>11</sup>	MADL-011021-14150T	ODS-1415	2 <sup>nd</sup> & 3 <sup>rd</sup> 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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