

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

Rev. V1

#### **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</li>
- < +15 dBm Flat Leakage Power</li>
- 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.

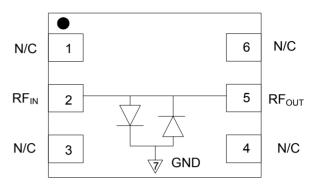
This device is ideally suitable for usage in higher frequency and lower flat leakage limiter microwave circuits applications where higher performance surface mount diode assemblies are required.

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

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 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	

- MACOM recommends connecting unused package pins to ground.
- The exposed pad centered on the package bottom must be connected to RF, DC, and thermal ground.

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<sup>\*</sup> 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	_

<sup>5.</sup> Incident power ratings defined with 1.2;1 source VSWR and 1.2:1 max load VSWR.

# **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

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

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

<sup>7.</sup> Spike leakage power and recovery time values are defined at peak power conditions.

MACOM does not recommend sustained operation near these survivability limits.

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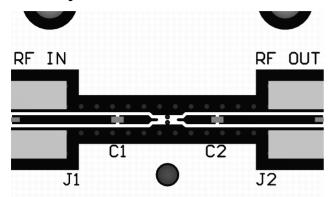
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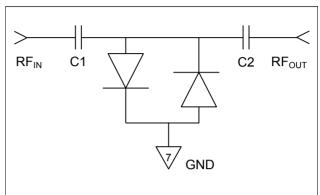
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#### **PCB Layout**



## **PCB Schematic**



#### **Parts List**

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

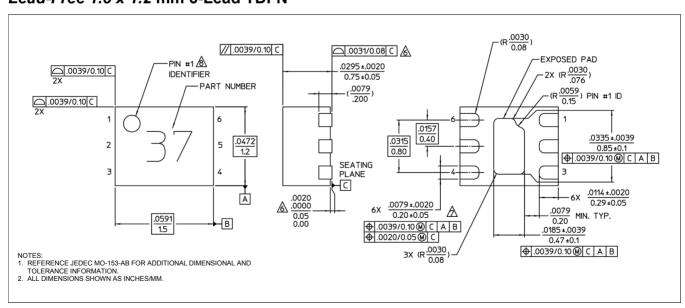
### **Handling Procedures**

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>lt;sup>†</sup> Reference Application Note <u>\$2083</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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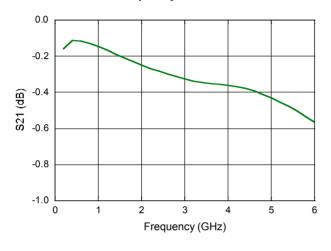


# **PIN-Schottky Anti-Parallel Diode Limiter** 10 MHz - 6 GHz

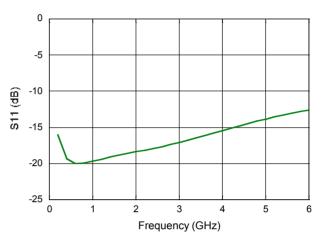
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## Typical Performance Curves @ +25°C

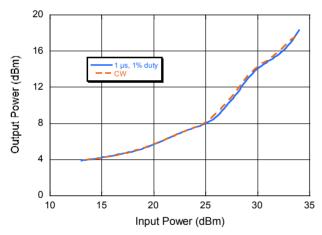
#### Insertion Loss vs. Frequency



#### Return Loss vs. Frequency



#### Flat Leakage Power @ CW and Pulsed Power, 4 GHz



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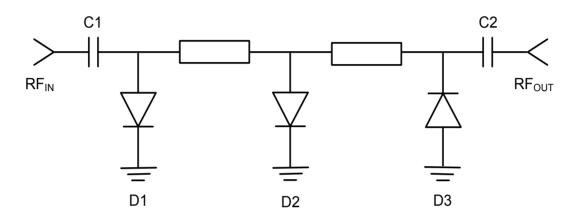


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## **Applications Section**

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

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

<sup>11.</sup> D2 and D3 are combined as single MADL-011021-14150T.