

# High Power PIN Diode

## 50 MHz - 2 GHz



MADP-011037

Rev. V3

### Features

- >125 W CW Incident Power Handling @ 1 GHz
- <0.2 dB Insertion Loss @ 1 GHz
- >15 dB Isolation @ 1 GHz
- Lead-Free 3 mm 16-lead HQFN Package

### Applications

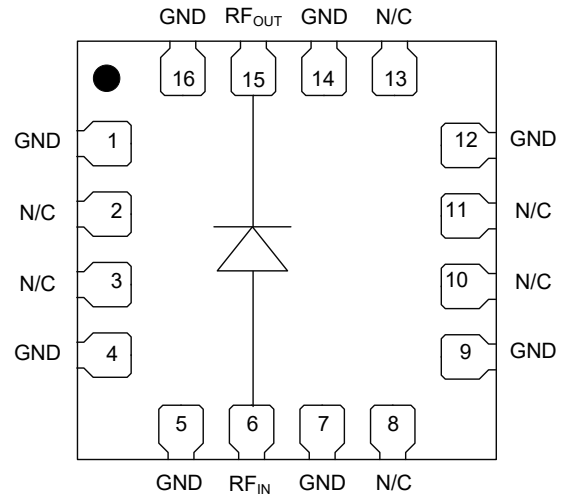
- ISM

### Description

The MADP-011037 is a high power PIN diode assembled in a lead-free 3 mm 16-lead HQFN plastic package. This series device provides exceptional switch or attenuator performance from 50 MHz to 2 GHz.

This compact device is ideally suitable for higher power switch and attenuator applications from HF through L band, where higher peak and CW power, lower loss, and higher linearity performance surface mount diode assemblies are required.

### Functional Schematic



### Pin Configuration<sup>2</sup>

Pin #	Pin Name	Description
1, 4, 5, 7, 9, 12, 14, 16	GND	Ground
2, 3, 8, 10, 11, 13	N/C	Connect to Ground
6	RF <sub>IN</sub>	Anode
15	RF <sub>OUT</sub>	Cathode
17	Paddle <sup>3</sup>	Ground

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

Part Number	Package
MADP-011037-139000	500 piece bag
MADP-011037-000SMB	Sample Board

1. All sample boards include 5 loose parts.

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

\* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

# High Power PIN Diode

## 50 MHz - 2 GHz



MADP-011037

Rev. V3

**Electrical Specifications: Freq. = 1250 MHz, T<sub>A</sub> = 25°C, Z<sub>0</sub> = 50 Ω (unless otherwise noted)**

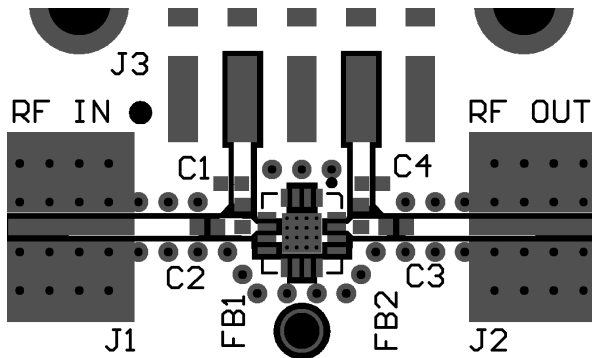
Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss	I <sub>F</sub> = 10 mA I <sub>F</sub> = 25 mA I <sub>F</sub> = 50 mA	dB	—	0.17 0.13 0.11	— 0.3 —
Input Return Loss	I <sub>F</sub> = 10 mA I <sub>F</sub> = 25 mA I <sub>F</sub> = 50 mA	dB	—	22 22 22	—
Isolation	V <sub>R</sub> = 0 V V <sub>R</sub> = 20 V V <sub>R</sub> = 50 V	dB	— 12 —	14 14 14	—
CW Incident Power	1 GHz, CW @ +50 mA	dBm	—	52	—
Minority Carrier Lifetime	+I <sub>F</sub> = 10 mA / I <sub>R</sub> = -6 mA (50% Control Voltage, 90% Output Voltage)	μs	—	1.0	—
CW Thermal Resistance (Θ <sub>JC</sub> )	(Infinite Heat Sink at Thermal Ground Plane) I High = 4 A, I low = 10 mA @ 10 kHz	°C/W	—	30	—
Power Dissipation	(Infinite Heat Sink at Thermal Ground Plane) +I <sub>F</sub> = 50 mA @ 1 GHz	W	—	5	—
Forward Voltage	+50 mA DC	V	—	0.9	—
Total Capacitance	-50 V @ 1 GHz	pF	—	0.30	—
Reverse Leakage Current	-200 V	nA	—	-20	—

### Absolute Maximum Ratings<sup>4,5</sup>

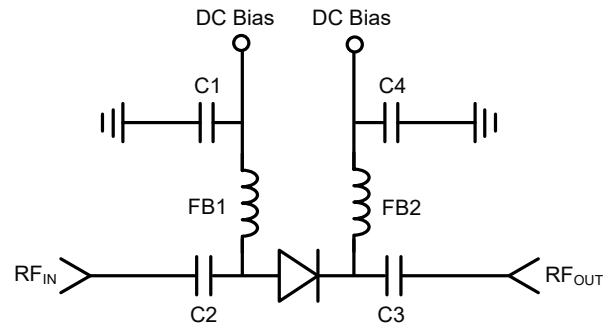
Parameter	Absolute Maximum
CW Incident Power <sup>6</sup> 50 mA, 1 GHz @ +85°C	51 dBm
DC Forward Voltage +250 mA	1.2 V
DC Forward Current	250 mA
DC Reverse Voltage	-400 V
Junction Temperature <sup>7,8</sup>	+175°C
Operating Temperature	-65°C to +125°C
Storage Temperature	-65°C to +150°C

- 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.
- Incident Power measured with Source and Load VSWR < 1.2:1.
- Operating at nominal conditions with T<sub>J</sub> ≤ +175°C will ensure MTTF > 1 x 10<sup>6</sup> hours.
- Junction Temperature (T<sub>J</sub>) = T<sub>A</sub> + (Θ<sub>JC</sub>) \* (P<sub>D</sub>).

### PCB Layout



### PCB Schematic



### Parts List<sup>9</sup>

Part	Value	Case Style
C1, C4	62 pF	0402
C2, C3	100 pF	0402
FB1, FB2 <sup>10</sup>	470 $\Omega$ @ 1 GHz	0402

9. DC voltage with recommended components should not exceed 100 V.

10. 470  $\Omega$  resistance is included in FB1 and FB2 (recommend Murata part number BLM15GG471SN1).

### Handling Procedures

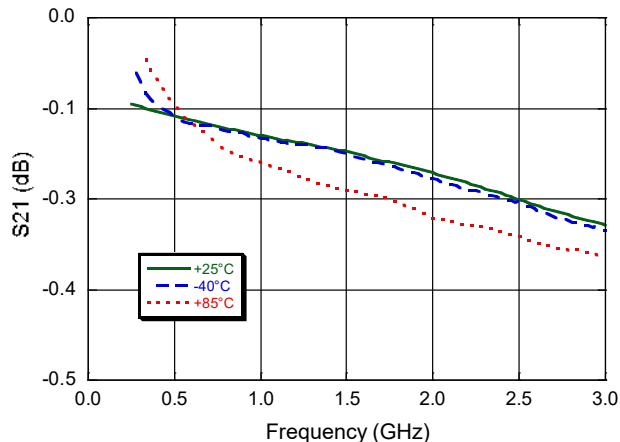
Please observe the following precautions to avoid damage:

### Static Sensitivity

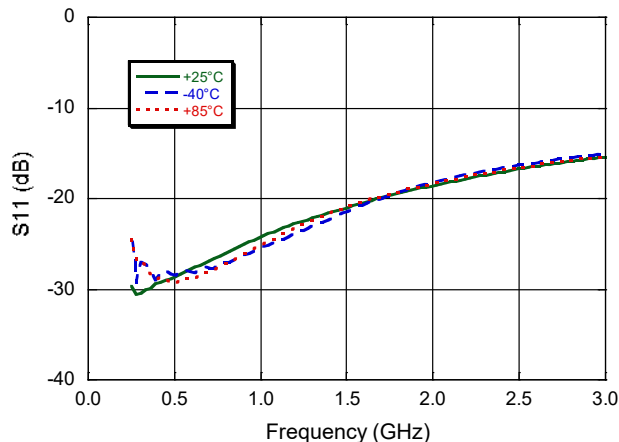
These devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class 2 devices.

### Typical RF Small Signal Performance Curves

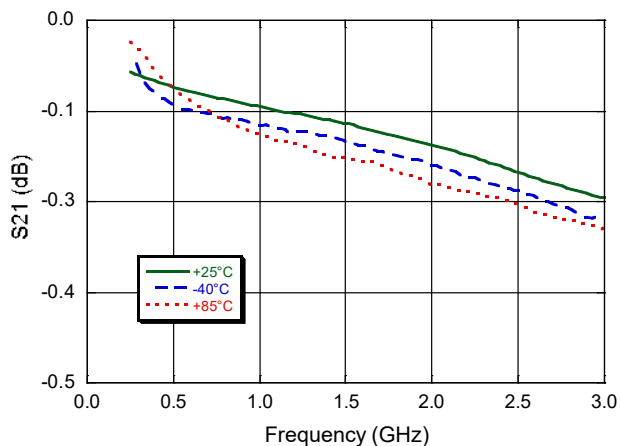
**Insertion Loss, 10 mA Forward Bias**



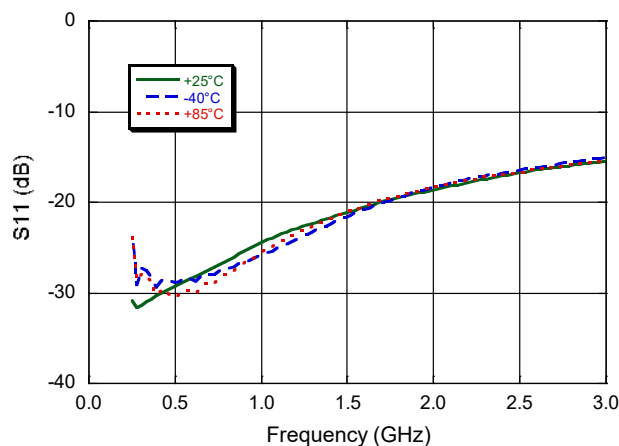
**Return Loss, 10 mA Forward Bias**



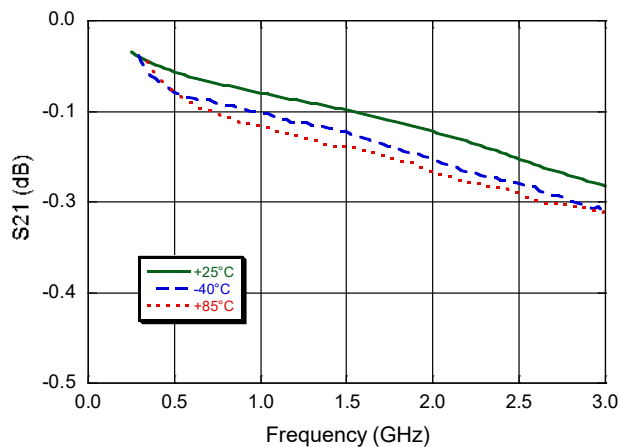
**Insertion Loss, 25 mA Forward Bias**



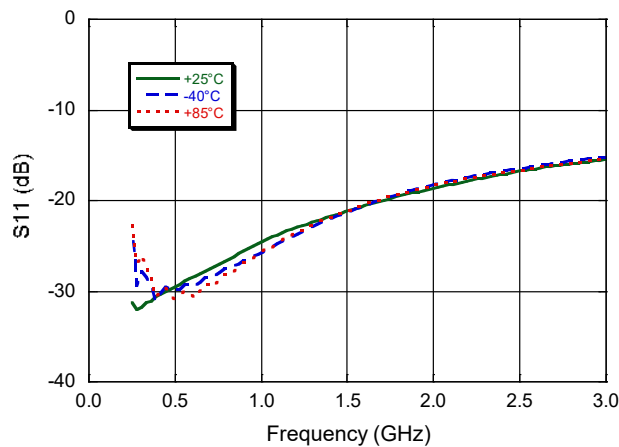
**Return Loss, 25 mA Forward Bias**



**Insertion Loss, 50 mA Forward Bias**

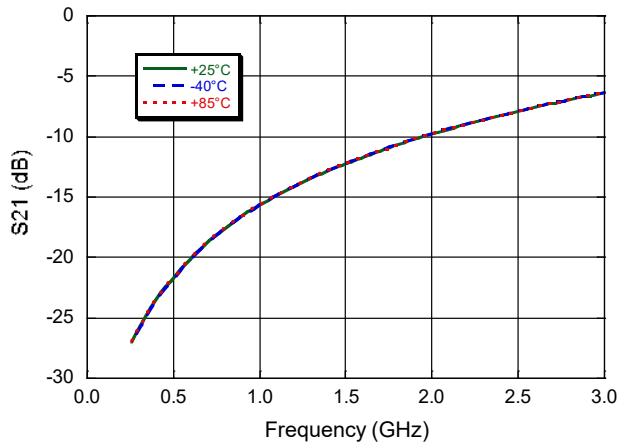


**Return Loss, 50 mA Forward Bias**

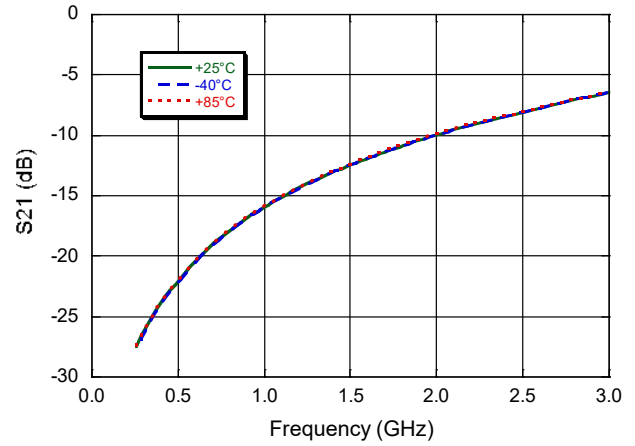


### Typical RF Small Signal Performance Curves

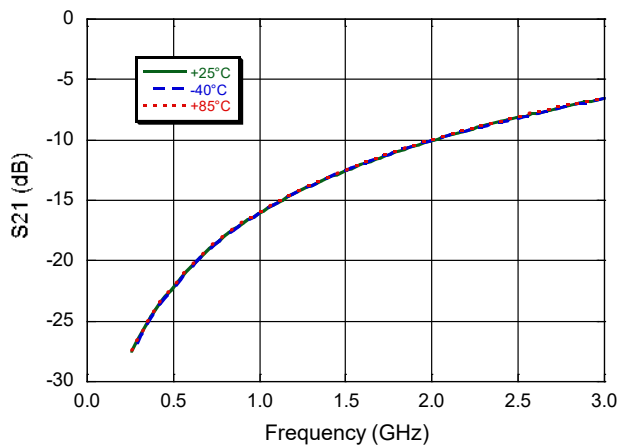
Isolation, 0 V Reverse Bias



Isolation, 20 V Reverse Bias

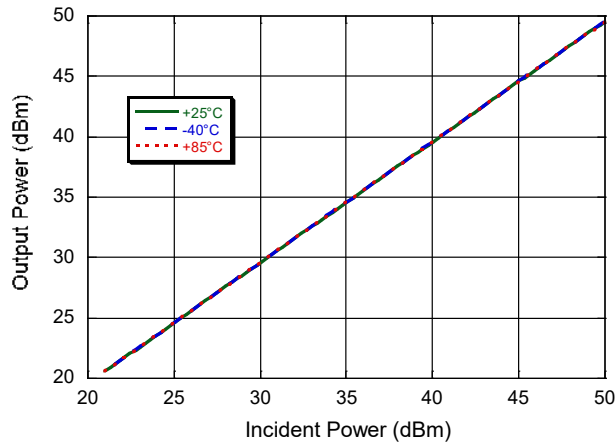


Isolation, 50 V Reverse Bias



### Typical High Power Performance Curves

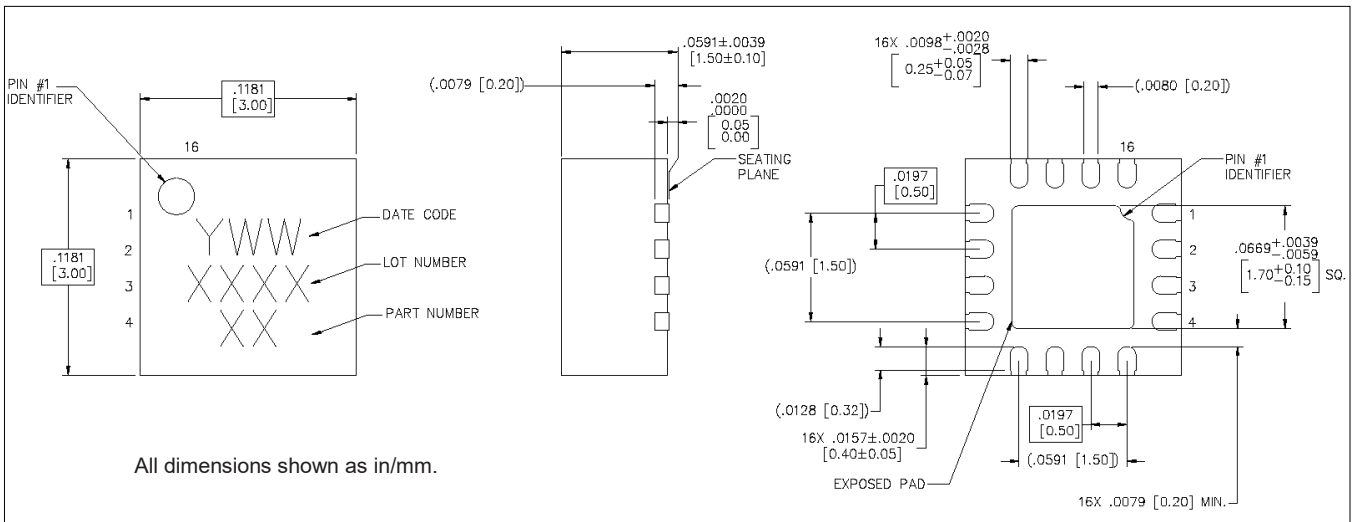
**Output Power vs. Incident Power**



**Junction Temperature 1 GHz, CW @ T<sub>A</sub> = +85°C**



### Lead-Free 3 mm 16-Lead HQFN<sup>†</sup>



<sup>†</sup> Reference Application Note S2083 for lead-free solder reflow recommendations.

MACOM Technology Solutions Inc. ("MACOM"). All rights reserved.

These materials are provided in connection with MACOM's products as a service to its customers and may be used for informational purposes only. Except as provided in its Terms and Conditions of Sale or any separate agreement, MACOM assumes no liability or responsibility whatsoever, including for (i) errors or omissions in these materials; (ii) failure to update these materials; or (iii) conflicts or incompatibilities arising from future changes to specifications and product descriptions, which MACOM may make at any time, without notice. These materials grant no license, express or implied, to any intellectual property rights.

THESE MATERIALS ARE PROVIDED "AS IS" WITH NO WARRANTY OR LIABILITY, EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHT, ACCURACY OR COMPLETENESS, OR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.