Diode Limiter, 10 W
2 - 22 GHz

MADL-011143
Rev. V1

Features

- CW Power Handling: 10 W
- Low Insertion Loss: 0.8 dB @ 20 GHz
- Flat Leakage Power: 17 dBm @ 18 GHz
- 3 mm Plastic QFN package
- Passive Device
- RoHS* Compliant

Applications

- Receiver Protection
- Radar Systems
- Radio Frequency Front-End Modules

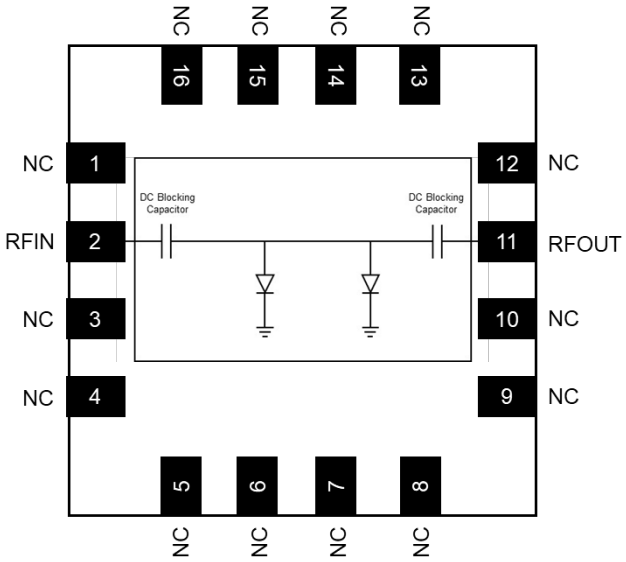
Description

MADL-011143 is a fully integrated diode limiter. It is a passive device, DC decoupled at both input and output RF ports.

The limiter can handle 10 W CW power at 18 GHz with a low flat leakage of 17 dBm.

MADL-011143 is ideally suited for high frequency, high peak power receiver protection with the convenience of a highly integrated surface mount solution.

Functional Schematic



Pin Configuration[2]

Pin #	Function
1, 3 - 10, 12 - 16	NC
2	RF Input
11	RF Output
Paddle	Ground[3]

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.

Ordering Information[1]

Part Number	Package
MADL-011143	Waffle Pack
MADL-011143-SMB	Sample Board

1. Reference Application Note M513 for reel size information.

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

Electrical Specifications: T_A = +25°C, Z_0 = 50 Ω

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss	2 GHz 8 GHz 16 GHz 20 GHz	dB	—	0.7 0.5 0.8 1.0	1.0 1.1 1.3 1.7
Input & Output Return Loss	—	dB	8	17	—
CW Power Handling	—	dBm	—	40	—
CW Flat Leakage	2 GHz 10 GHz 18 GHz	dBm	—	21 20 17	—
CW P1dB	—	dBm	—	19	—
Pulsed Peak Power Handling	1 µs PW, 10% Duty Cycle	dBm	—	41	—
Spike Leakage Power	1 µs PW, 10% DC, 33 dBm Input 2 GHz 10 GHz 18 GHz	dBm	—	20 20 15	—
Spike Leakage Energy	1 µs PW, 10% DC, 33 dBm Input 10 GHz 18 GHz	ergs	—	5e-3 2e-3	—
1 dB Recovery Time	1 µs PW, 10% DC, 33 dBm Input	ns	—	45	—
3 dB Recovery Time	1 µs PW, 10% DC, 33 dBm Input	ns	—	35	—

Absolute Maximum Ratings[4,5]

Parameter	Absolute Maximum
CW Incident Power	38 dBm @ +85°C
Peak Incident Power	40 dBm @ +85°C
Junction Temperature[6]	+150°C
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +150°C

4. Exceeding any one or combination of these limits may cause permanent damage to this device.
5. MACOM does not recommend sustained operation near these survivability limits.
6. Operating at nominal conditions with $T_J \leq$ +150°C will ensure MTTF > 1 x 10^6 hours.

Handling Procedures

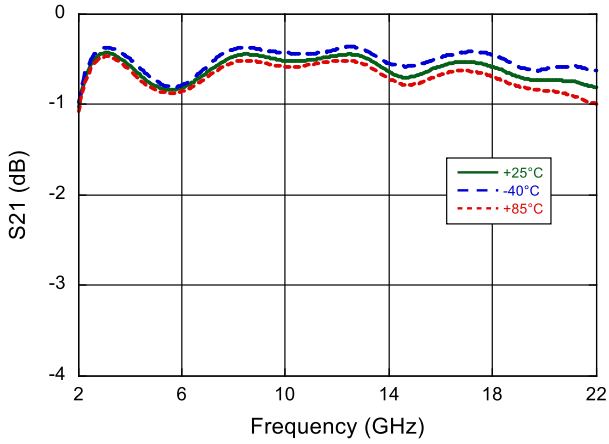
Please observe the following precautions to avoid damage:

Static Sensitivity

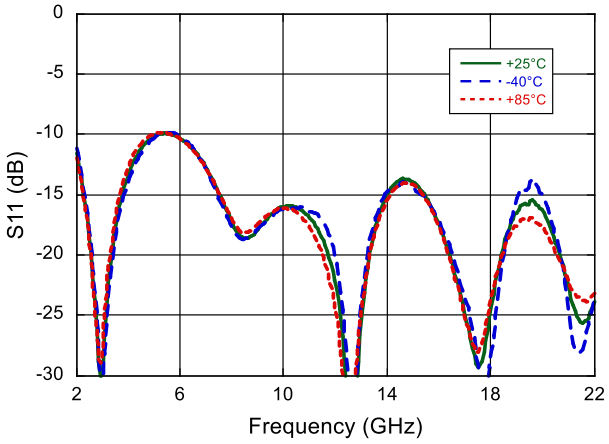
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HBM Class 1B and CDM Class C5 devices.

Typical Small-Signal Performance Curves: Packaged On-Board, over Temperature, Z_0 = 50 Ω

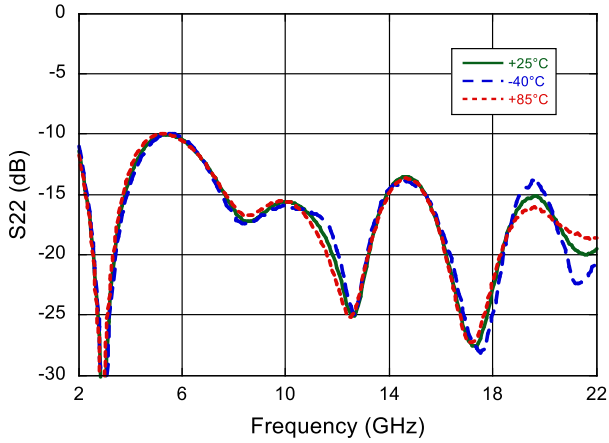
Insertion Loss



Input Return Loss

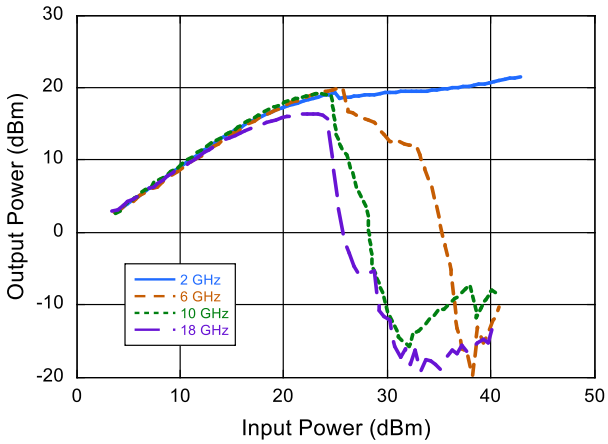


Output Return Loss

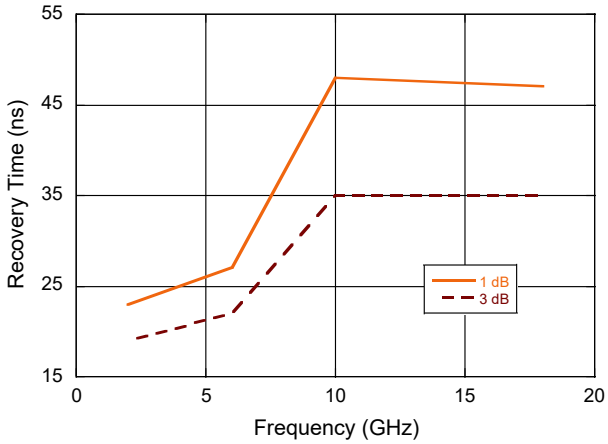


Typical RF Power Performance Curves: Packaged On-Board, T_A = 25°C, Z_0 = 50 Ω, 1 µs Pulse Width, 10% Duty Cycle

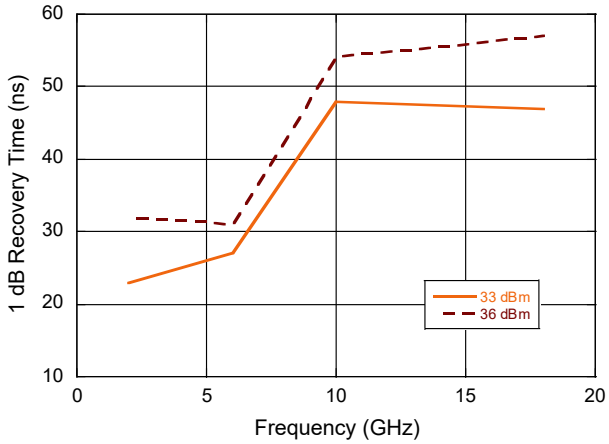
Output Power vs. Input Power over Frequency



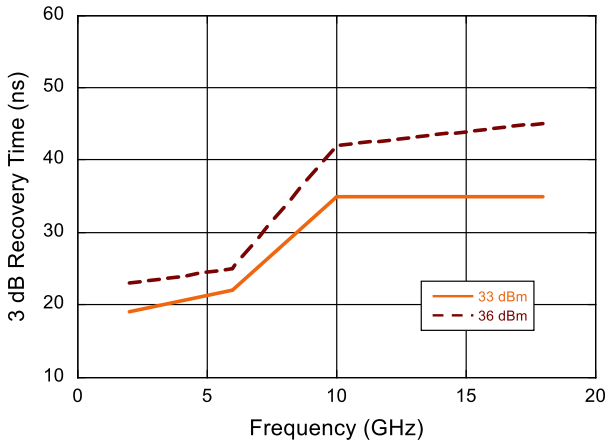
Recovery Time vs. Frequency



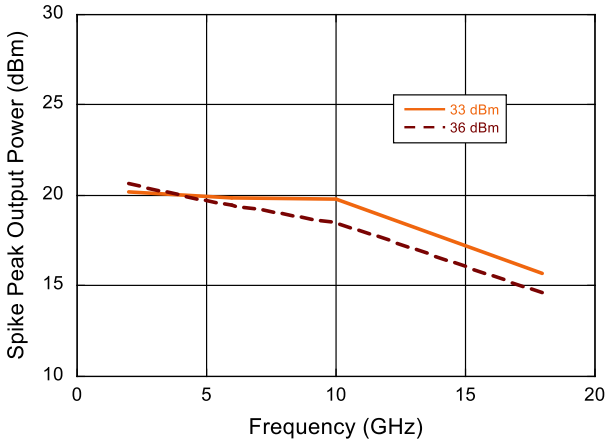
1 dB Recovery Time over Input Power



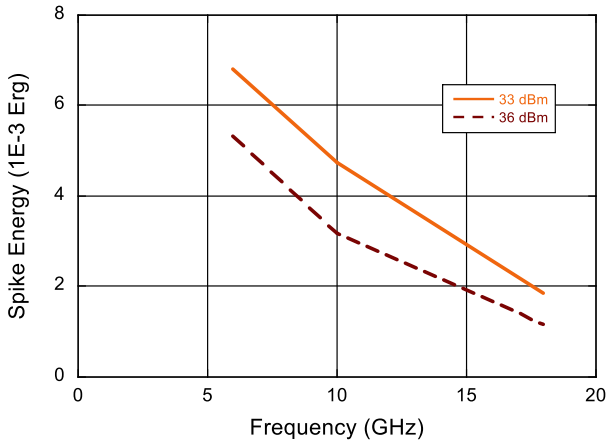
3 dB Recovery Time over Input Power



Pulsed Spike Peak Power over Input Power

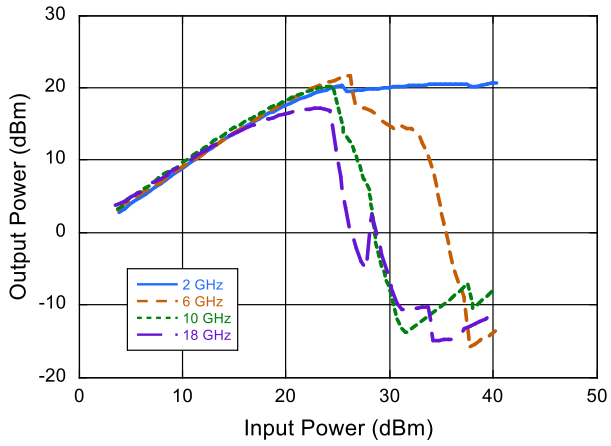


Pulsed Spike Energy Power over Input Power

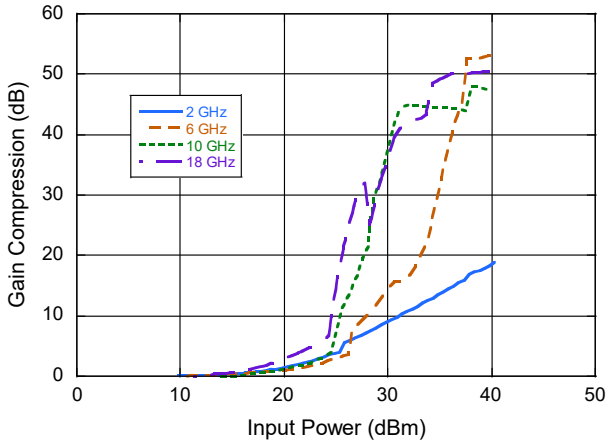


Typical RF Power Performance Curves: Packaged On-Board, T_A = 25°C, Z_0 = 50 Ω,

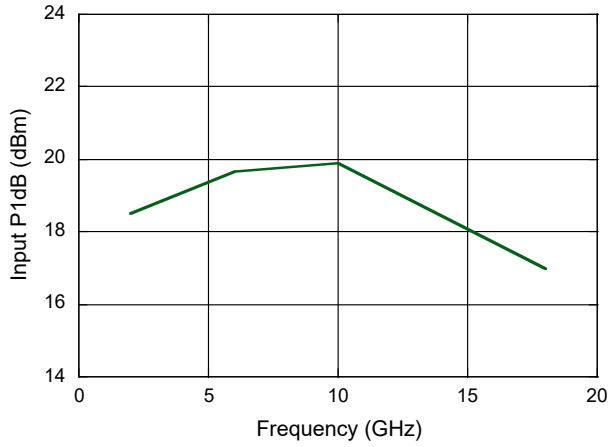
CW Flat Leakage Power over Frequency



CW Gain Compression over Frequency

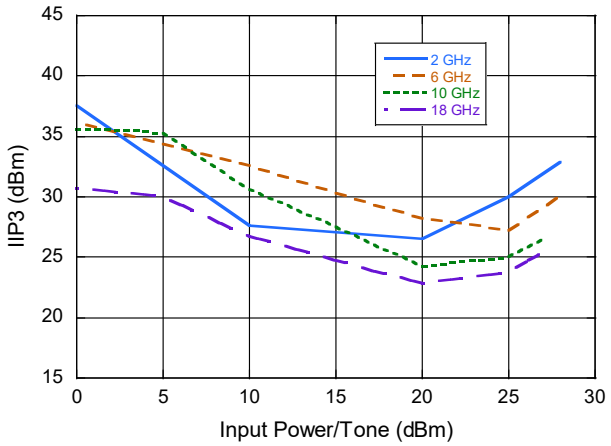


CW 1 dB Compression Point

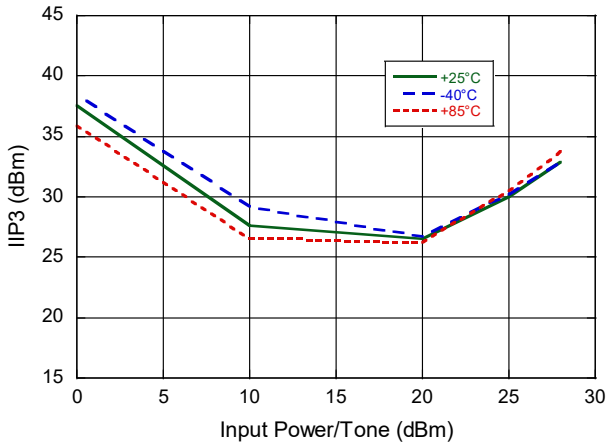


Typical RF Power Performance Curves: Packaged On-Board, Z_0 = 50 Ω

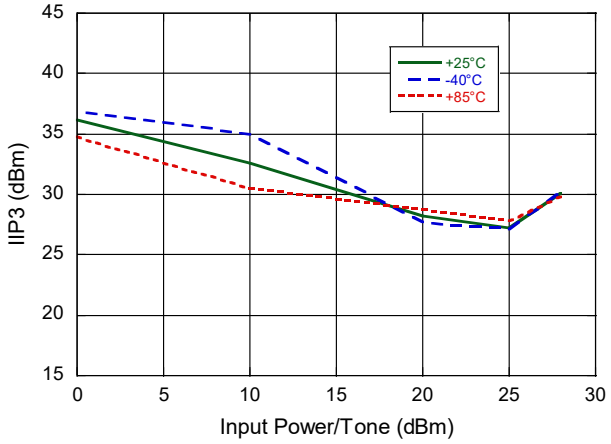
Input IP3 over Frequency @ T_A = 25°C



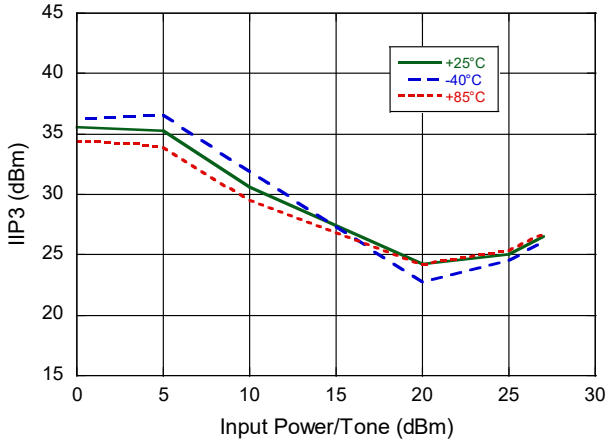
Input IP3 over Temperature @ 2 GHz



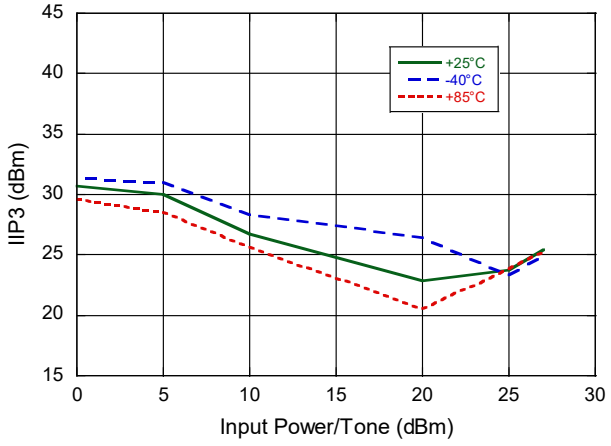
Input IP3 over Temperature @ 6 GHz



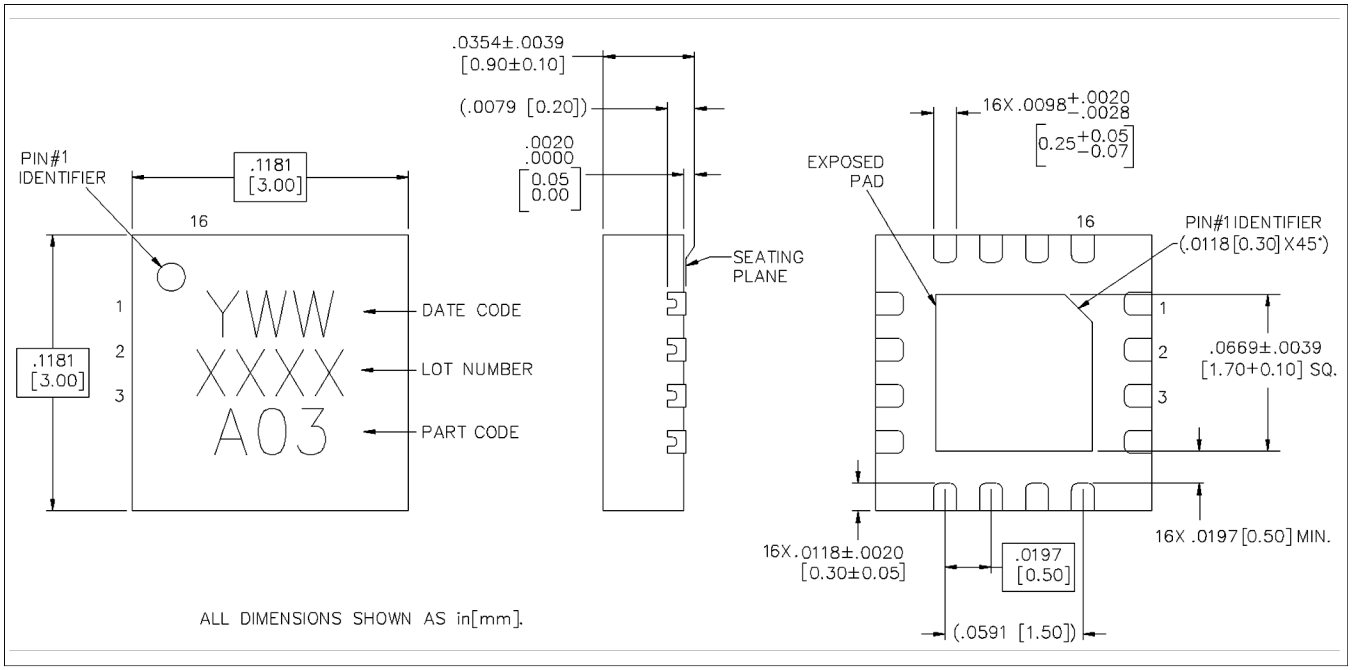
Input IP3 over Temperature @ 10 GHz



Input IP3 over Temperature @ 18 GHz



Lead-Free 3 mm 16-Lead PQFN†



† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level MSL 1 requirements.
Plating is gold. This device is non-hermetic with an open vent hole. MACOM does not recommend performing any aqueous cleaning process post-assembly unless the vent hole has been filled post-reflow.
Limiter is NOT Bi-Directional, pin 1 is RF Input.