

Diode Limiter

18 - 40 GHz



MADL-011108

Rev. V1

Features

- Peak Power Handling: 4 W @ 40 GHz
- CW Power Handling: 2 W
- Low Insertion Loss: 1.3 dB @ 40 GHz
- Flat Leakage Power: 17 dBm
- 4 mm Air cavity SMT package
- Passive Device
- RoHS* Compliant

Applications

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

Description

MADL-011108 is a fully integrated diode limiter. It is a passive device, DC decoupled at both input and output RF ports.

The limiter can handle 4 W peak power at 40 GHz with a low flat leakage of 17 dBm.

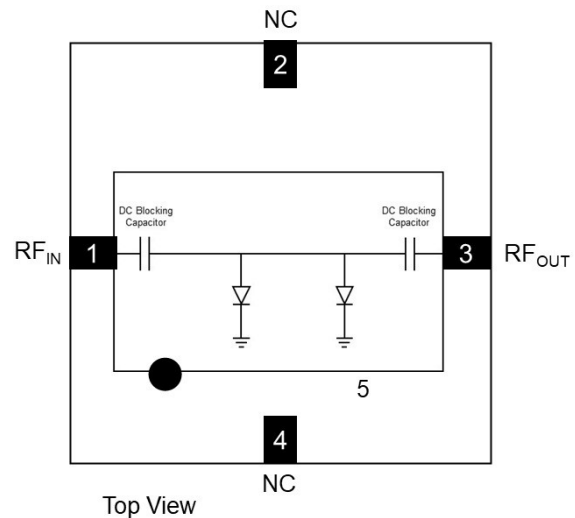
MADL-011108 is ideally suited for high frequency, high peak power receiver protection with the convenience of a highly integrated surface mount solution.

Ordering Information¹

Part Number	Package
MADL-011108-TR0500	500 piece reel
MADL-011108-SMB	Sample Board

1. Reference Application Note M513 for reel size information.

Functional Schematic



Pin Configuration²

Pin #	Function
1	RF Input
2, 4	NC
3	RF Output
5 (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.

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

Electrical Specifications: $T_A = +25^\circ\text{C}$, $Z_0 = 50 \Omega$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss	18 GHz	dB	—	0.9	1.1
	22 GHz			1.1	1.3
	34 GHz			1.2	1.5
	40 GHz			1.3	—
Input & Output Return Loss	18 GHz	dB	—	12	—
	22 GHz			12	
	34 GHz			20	
	40 GHz			16	
Input IP3	15 dBm per Tone, 10 MHz Offset, 18 - 27 GHz 27 - 40 GHz	dBm	—	27 53	—
CW Power Handling	—	dBm	—	33	—
CW Flat Leakage	18 - 27 GHz	dBm	—	17	—
	27 - 40 GHz			15	
CW P1dB	—	dBm	—	18	—
Pulsed Peak Power Handling	1 μs PW, 10% Duty Cycle	dBm	—	36	—
Spike Leakage Power	1 μs PW, 10% DC, 33 dBm Input 18 - 27 GHz 27 - 40 GHz	dBm	—	14	—
				10	
Spike Leakage Energy	1 μs PW, 10% DC, 33 dBm Input 18 - 27 GHz 27 - 40 GHz	ergs	—	2.3e-3	—
				0.6e-3	
1 dB Recovery Time	1 μs PW, 10% DC, 33 dBm Input	ns	—	42	—
3 dB Recovery Time	1 μs PW, 10% DC, 33 dBm Input	ns	—	32	—

Absolute Maximum Ratings^{4,5}

Parameter	Absolute Maximum
CW Incident Power	34 dBm @ +85°C
Peak Incident Power	37 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 $T_J \leq +150^\circ\text{C}$ will ensure $\text{MTTF} > 1 \times 10^6$ hours.

Handling Procedures

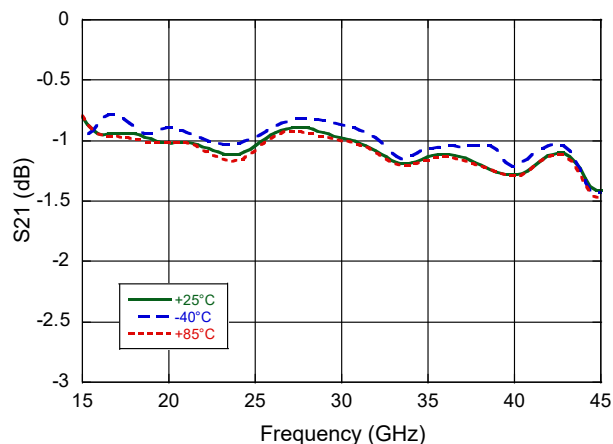
Please observe the following precautions to avoid damage:

Static Sensitivity

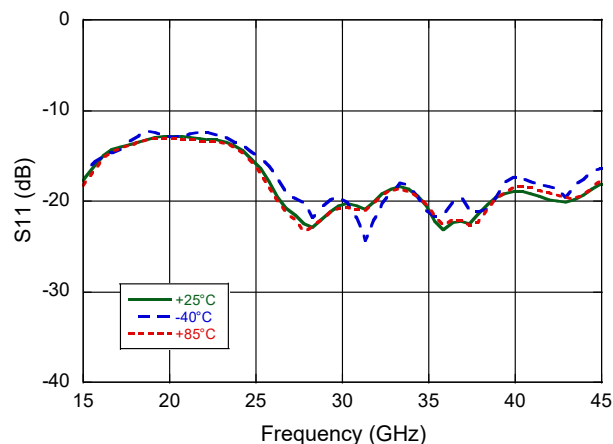
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Typical Small-Signal Performance, Package On-Board: $Z_0 = 50 \Omega$

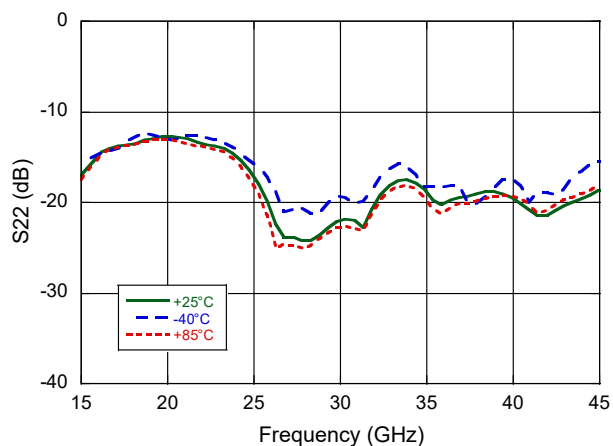
Insertion Loss



Input Return Loss

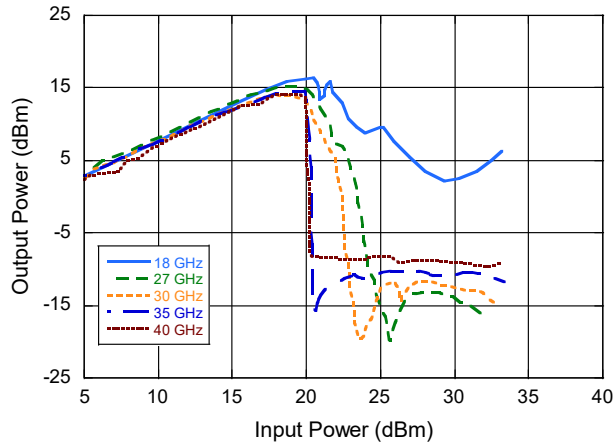


Output Return Loss

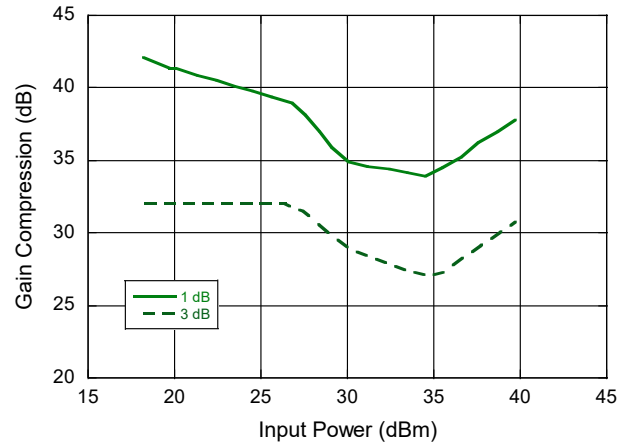


Typical RF Power Performance, Package On-Board: $Z_0 = 50 \Omega$

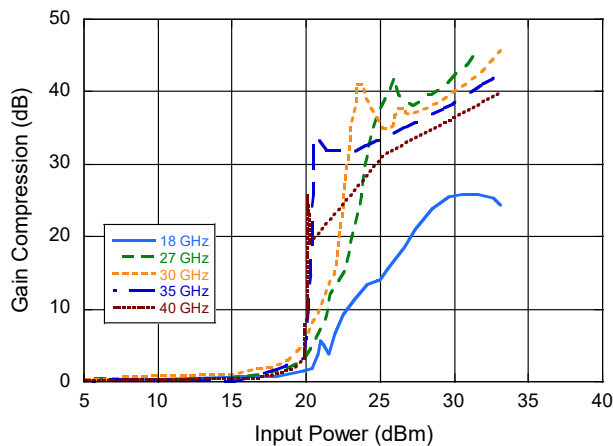
Pulsed Flat Leakage Power over Frequency
(1 μ s Pulse Width, 10% Duty Cycle), $T_A = 25^\circ\text{C}$



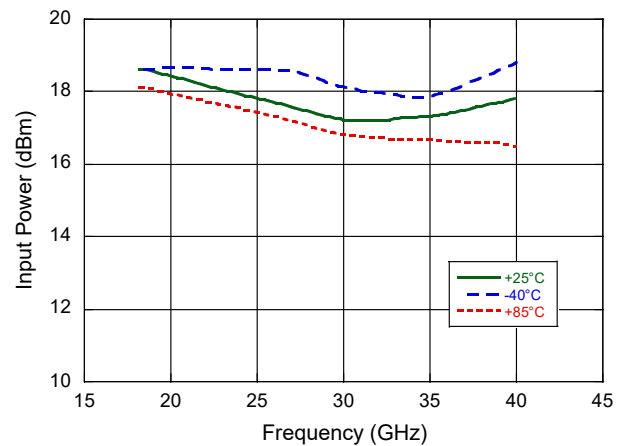
1dB and 3dB Recovery time at 33 dBm Input Power
(1 μ s Pulse Width, 10% Duty Cycle), $T_A = 25^\circ\text{C}$



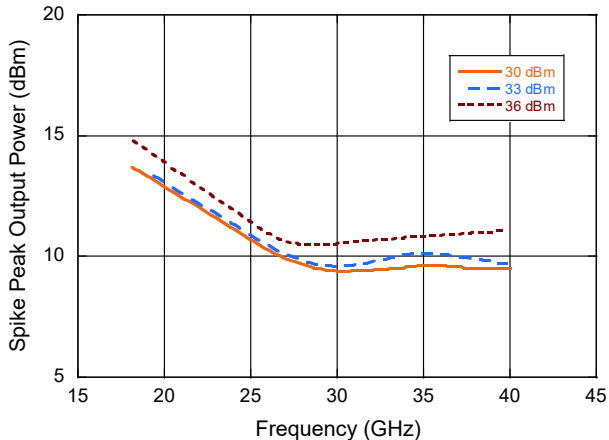
CW Gain Compression over Frequency, $T_A = 25^\circ\text{C}$



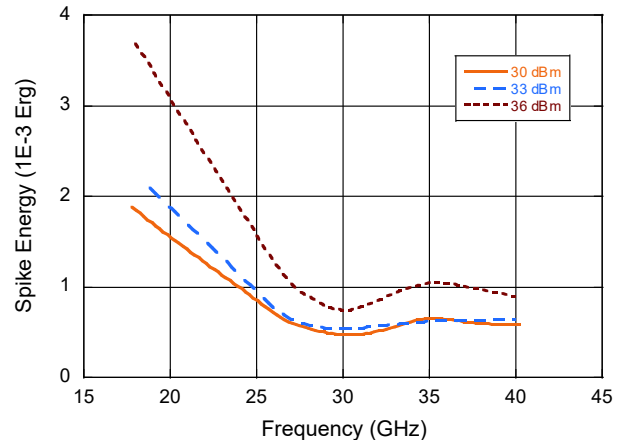
CW 1dB Compression Point over Temperature



Pulsed Spike Peak Power over Input Power
(1 μ s Pulse Width, 10% Duty Cycle), $T_A = 25^\circ\text{C}$

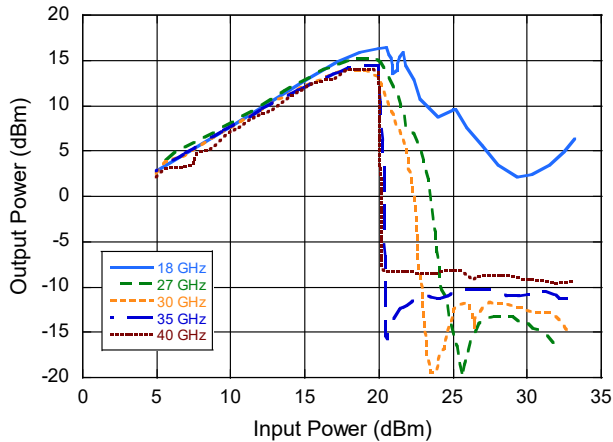


Pulsed Spike Energy Power over Input Power
(1 μ s Pulse Width, 10% Duty Cycle), $T_A = 25^\circ\text{C}$

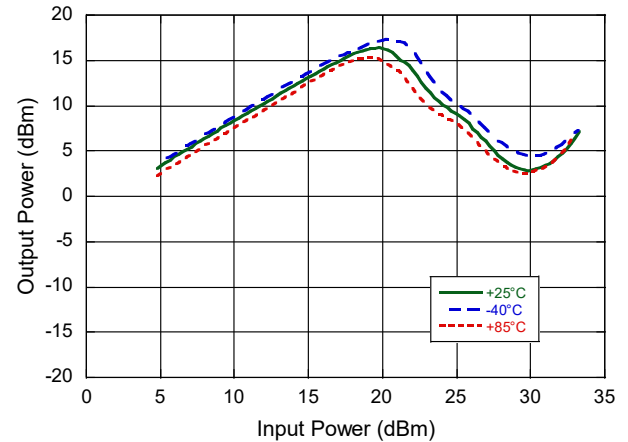


Typical RF Power Performance, Package On-Board: $Z_0 = 50 \Omega$

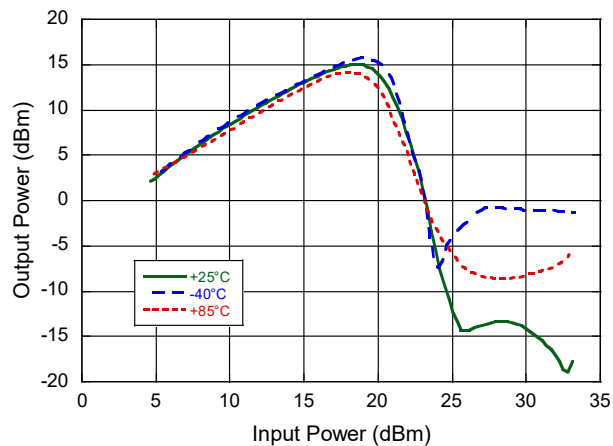
CW Flat leakage Power over Frequency, $T_A = 25^\circ\text{C}$



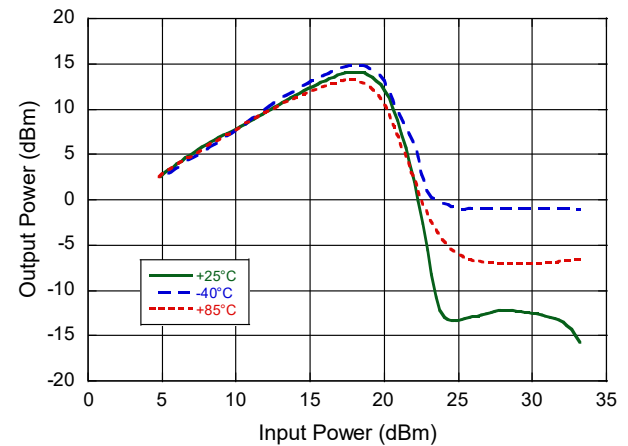
CW Flat leakage Power over Temperature @ 18 GHz



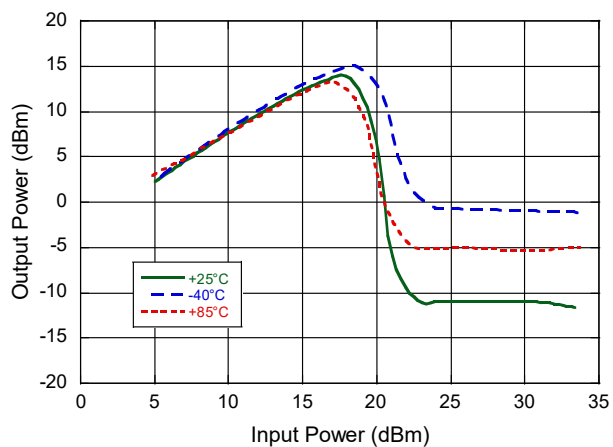
CW Flat leakage Power over Temperature @ 27 GHz



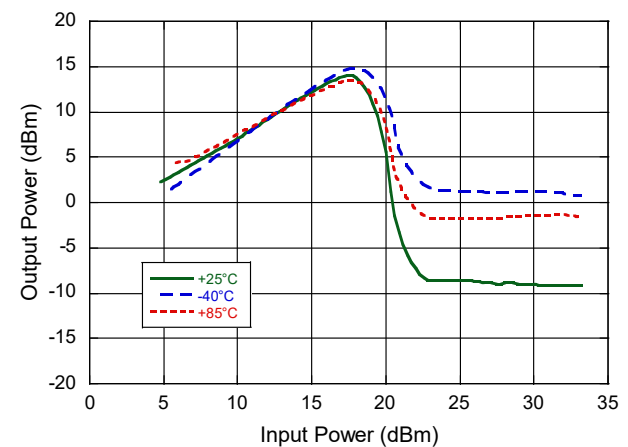
CW Flat leakage Power over Temperature @ 30 GHz



CW Flat leakage Power over Temperature @ 35 GHz

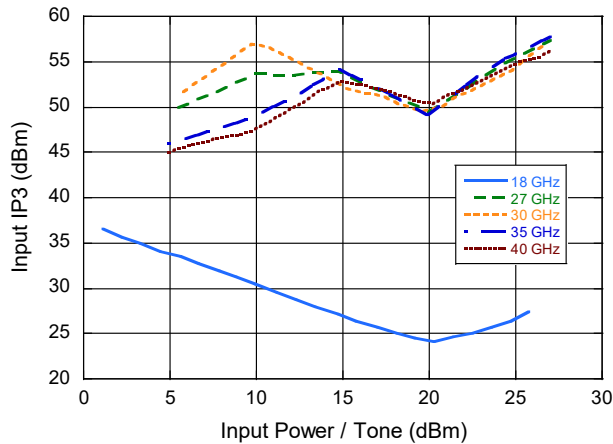


CW Flat leakage Power over Temperature @ 40 GHz

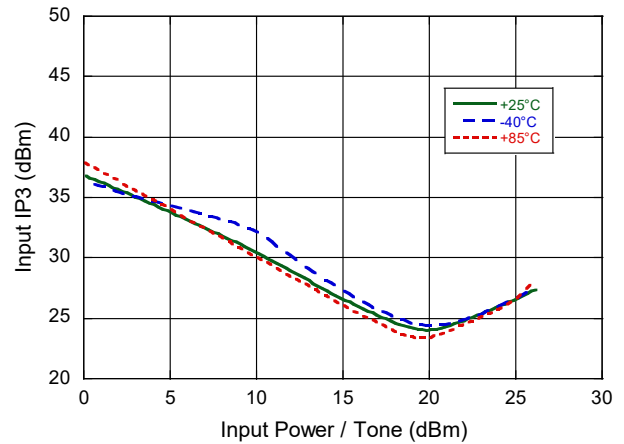


Typical RF Power Performance, Package On-Board: $Z_0 = 50 \Omega$

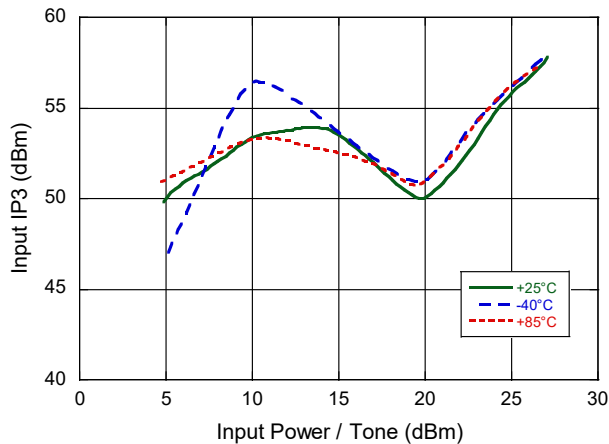
Input IP3 over Frequency, $T_A = 25^\circ\text{C}$



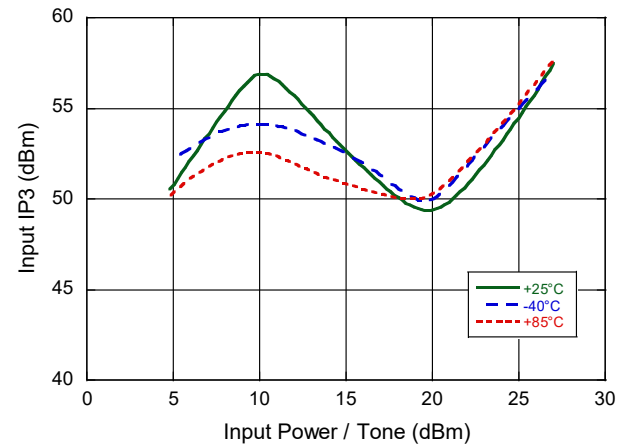
Input IP3 over temperature @ 18 GHz



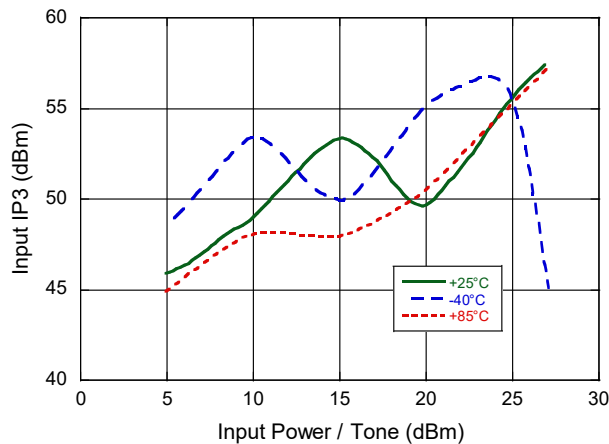
Input IP3 over temperature @ 27 GHz



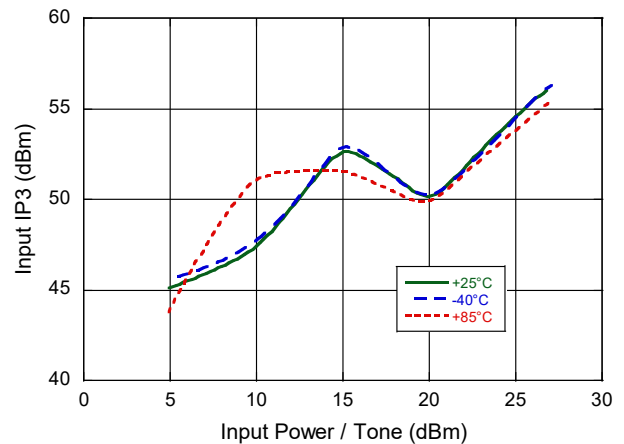
Input IP3 over temperature @ 30 GHz



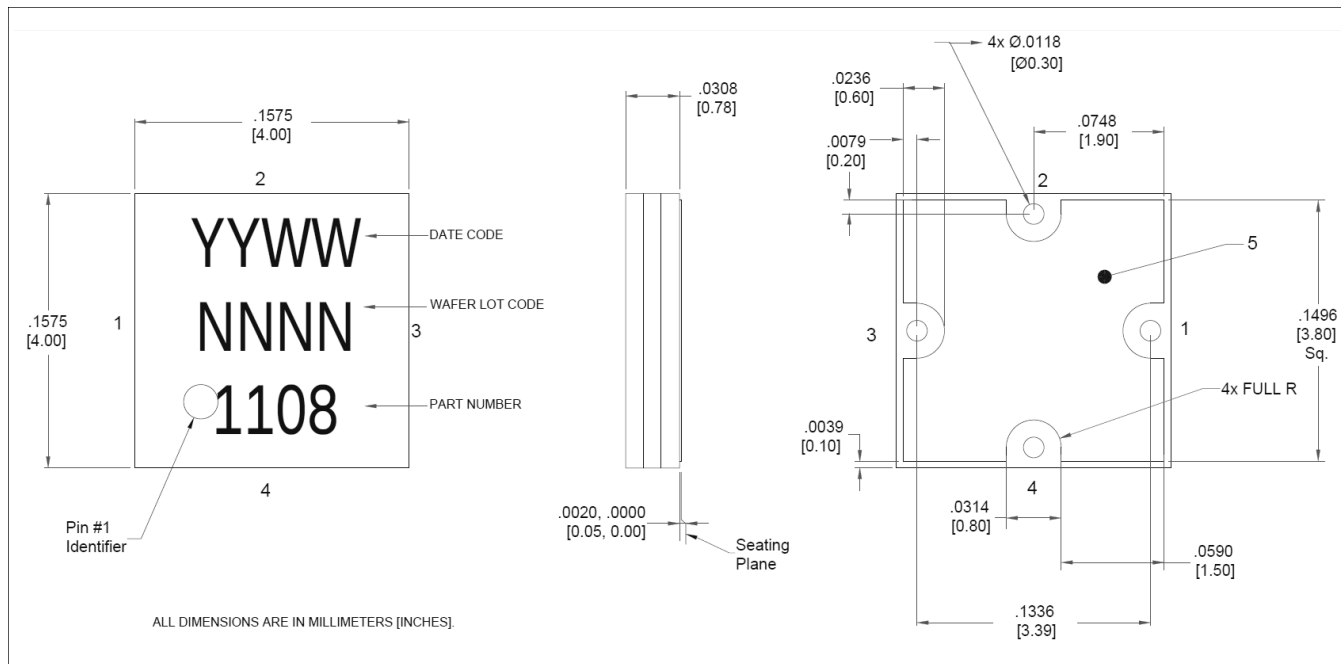
Input IP3 over temperature @ 35 GHz



Input IP3 over temperature @ 40 GHz



Lead-Free 4 mm 4-Lead PQFN[†]



[†] Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level MSL 3 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.

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