

Diode Limiter

18 - 40 GHz



MADL-011122-DIE

Rev. V2

Features

- Peak Power Handling: 4 W @ 40 GHz
- CW Power Handling: 2 W
- Low Insertion Loss: 0.8 dB @ 40 GHz
- Flat Leakage Power: 15 dBm
- Die size: 1.77 x 0.87 x 0.10 mm
- Passive Device
- RoHS* Compliant

Applications

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

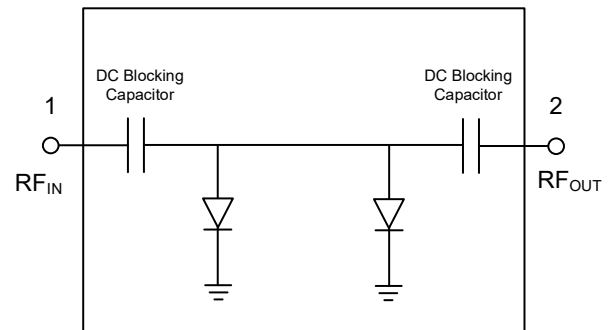
Description

MADL-011122-DIE 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 15 dBm.

MADL-011122-DIE is available in die form. It is ideally suited for high frequency, high peak power receiver protection.

Functional Schematic



Pin Configuration

Pin #	Function
1	RF Input
2	RF Output
Backside	Ground ¹

1. The entire exposed pad on the die bottom must be connected to RF, DC and thermal ground.

Ordering Information

Part Number	Package
MADL-011122-DIE	Gel-Pak
MADL-011122-SMB	Sample Board

* 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 22 GHz 34 GHz 40 GHz	dB	—	0.3 0.4 0.5 0.8	—
Input & Output Return Loss	18 GHz 22 GHz 34 GHz 40 GHz	dB	—	20 18 10 18	—
Input IP3	15 dBm per Tone, 10 MHz Offset, 30 GHz	dBm	—	47	—
CW Power Handling	—	dBm	—	33	—
CW Flat Leakage	30 GHz	dBm	—	15	—
CW P1dB	30 GHz	dBm	—	17	—
Pulsed Peak Power Handling	1 μs PW, 10% Duty Cycle	dBm	—	36	—
Spike Leakage Power	1 μs PW, 10% DC, 33 dBm Input 18 GHz 27 - 40 GHz	dBm	—	14 10	—
Spike Leakage Energy	1 μs PW, 10% DC, 33 dBm Input 18 GHz 27 - 40 GHz	ergs	—	2.3e-3 0.6e-3	—
1 dB Recovery Time	1 μs PW, 10% DC, 33 dBm Input	ns	—	40	—
3 dB Recovery Time	1 μs PW, 10% DC, 33 dBm Input	ns	—	30	—

Absolute Maximum Ratings^{2,3}

Parameter	Absolute Maximum
CW Incident Power	34 dBm @ +85°C
Peak Incident Power	37 dBm @ +85°C
Junction Temperature ⁴	+150°C
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°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.
- Operating at nominal conditions with $T_J \leq +150^\circ\text{C}$ will ensure $\text{MTTF} > 1 \times 10^6$ hours.

Handling Procedures

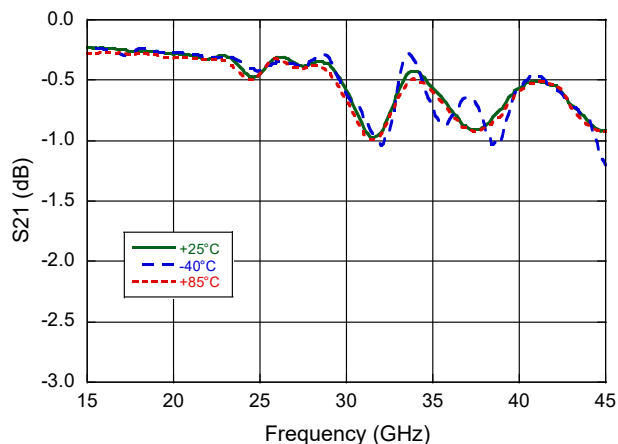
Please observe the following precautions to avoid damage:

Static Sensitivity

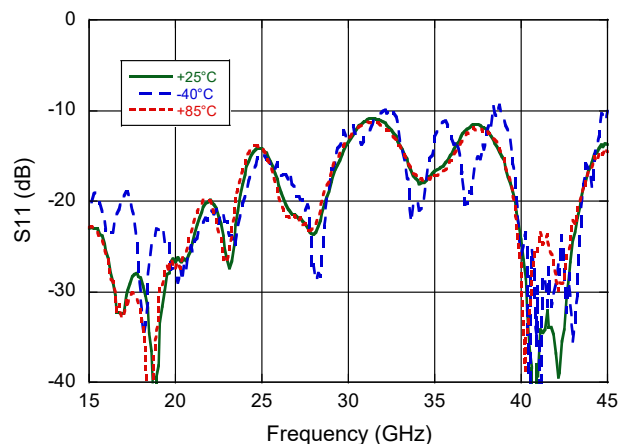
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Typical Small-Signal Performance, De-embedded Die On-Board: $Z_0 = 50 \Omega$

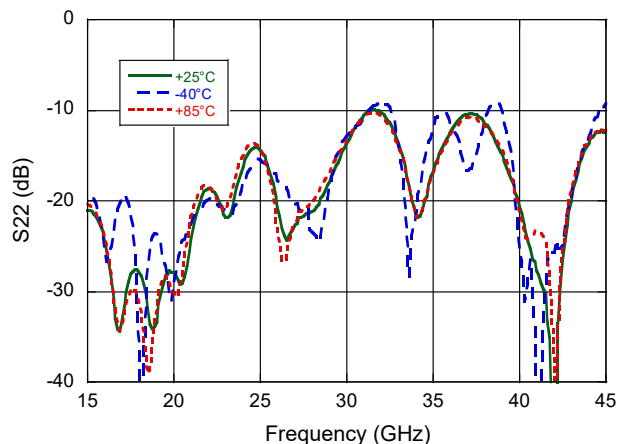
Insertion Loss



Input Return Loss

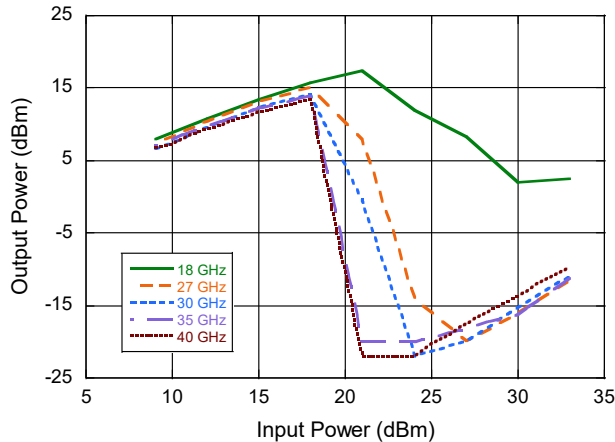


Output Return Loss

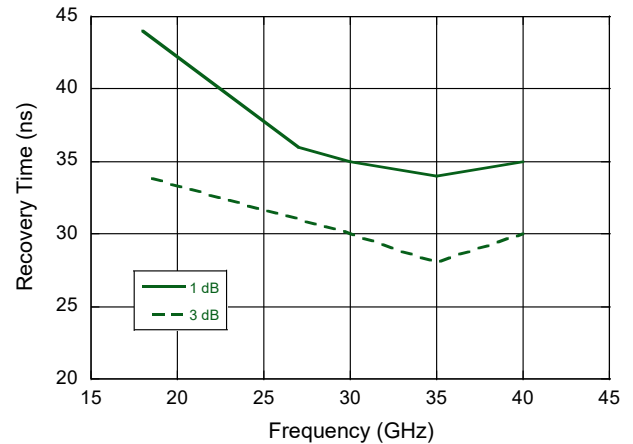


Typical RF Power Performance, De-embedded Die On-Board: $Z_0 = 50 \Omega$

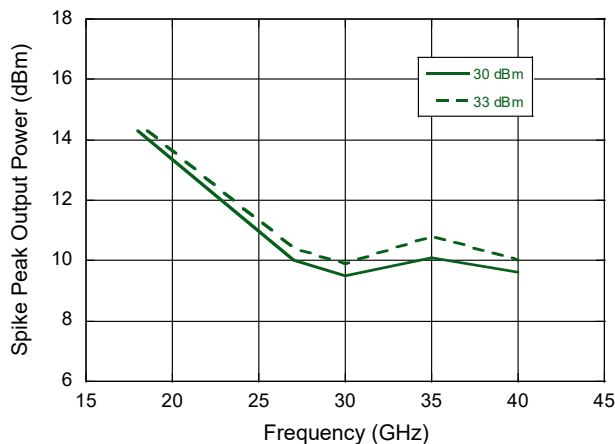
Pulsed Flat Leakage Power over Frequency
(1 μ s Pulse Width, 10% Duty Cycle), $T_A = 25^\circ\text{C}$



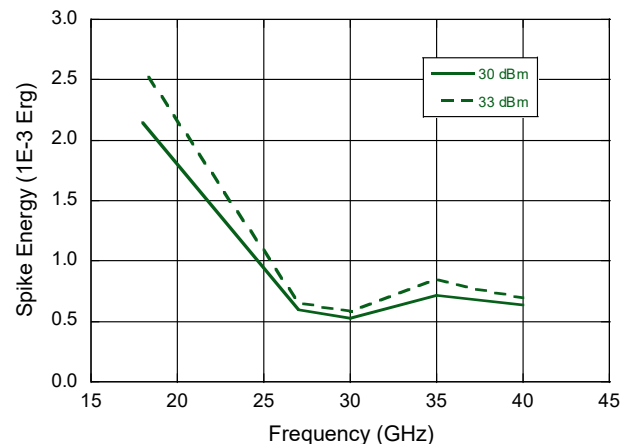
1dB and 3dB Recovery time at 33 dBm Input Power
(1 μ s Pulse Width, 10% Duty Cycle), $T_A = 25^\circ\text{C}$



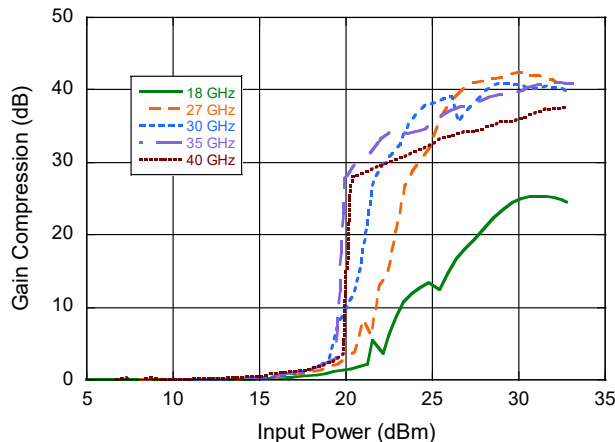
Pulsed Spike Peak Power over Input Power
(1 μ s Pulse Width, 10% Duty Cycle), $T_A = 25^\circ\text{C}$



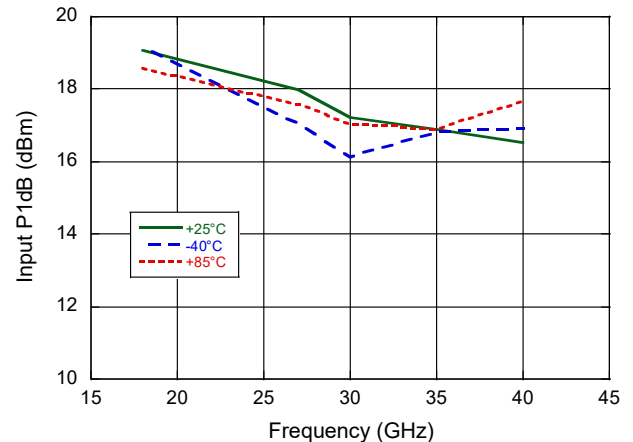
Pulsed Spike Energy Power over Input Power
(1 μ s Pulse Width, 10% Duty Cycle), $T_A = 25^\circ\text{C}$



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

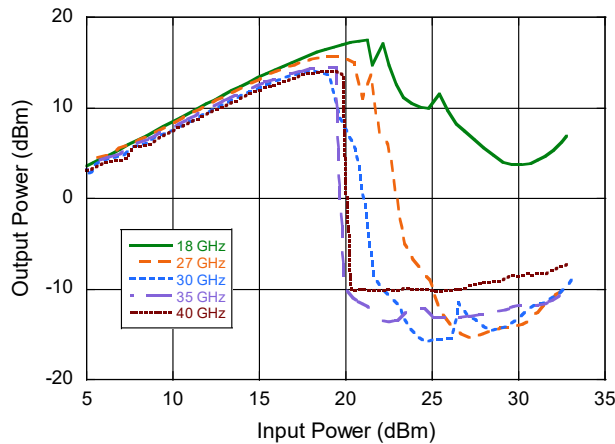


CW 1dB Compression Point over Temperature

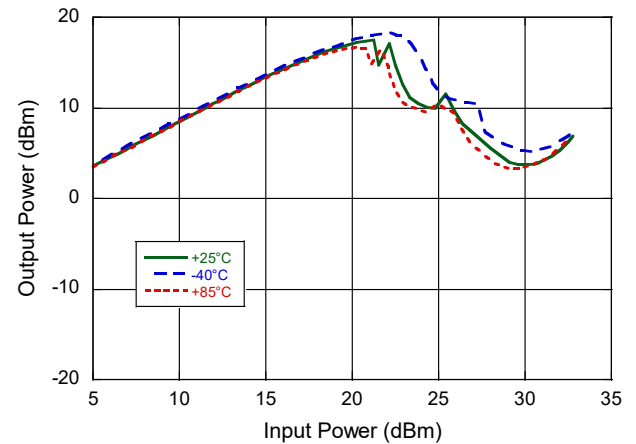


Typical RF Power Performance, De-embedded Die On-Board: $Z_0 = 50 \Omega$

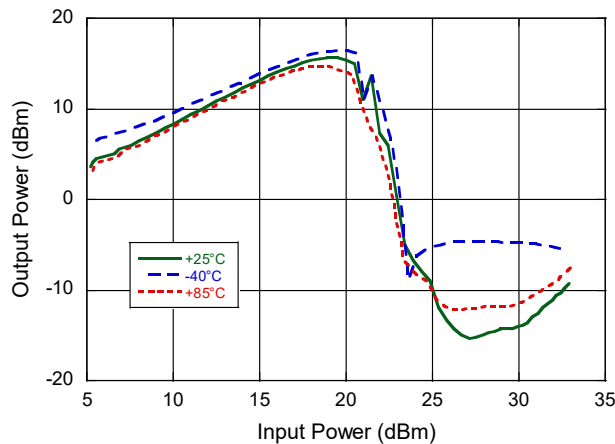
CW Flat leakage Power over Frequency, $T_A = 25^\circ\text{C}$



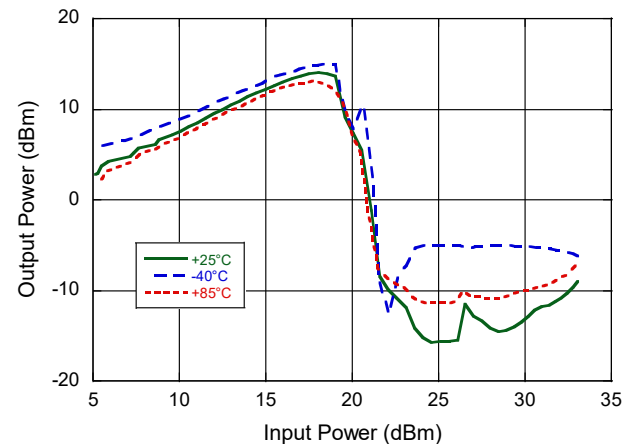
CW Flat leakage Power over Temperature @ 18 GHz



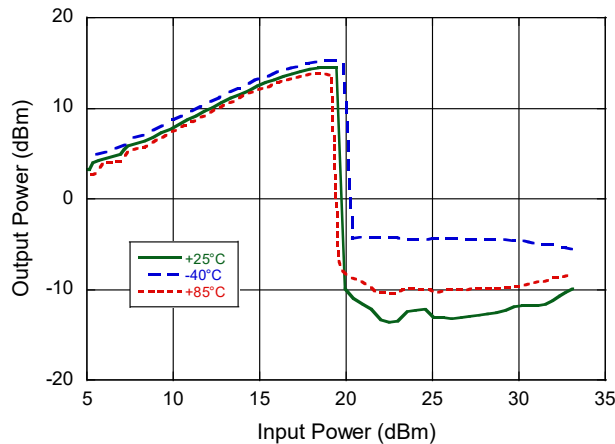
CW Flat leakage Power over Temperature @ 27 GHz



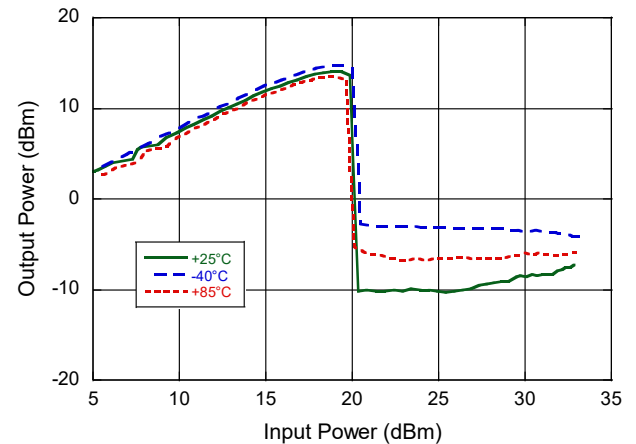
CW Flat leakage Power over Temperature @ 30 GHz



CW Flat leakage Power over Temperature @ 35 GHz

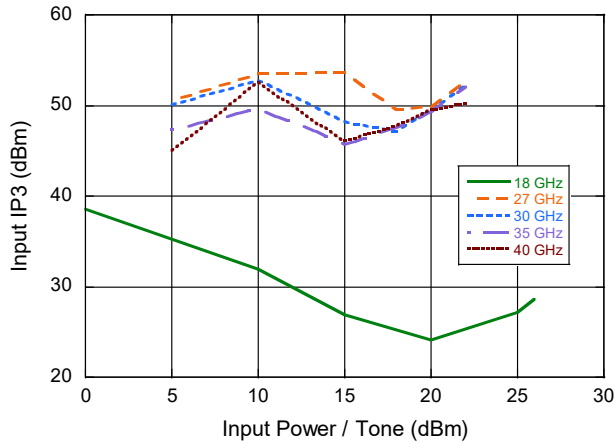


CW Flat leakage Power over Temperature @ 40 GHz

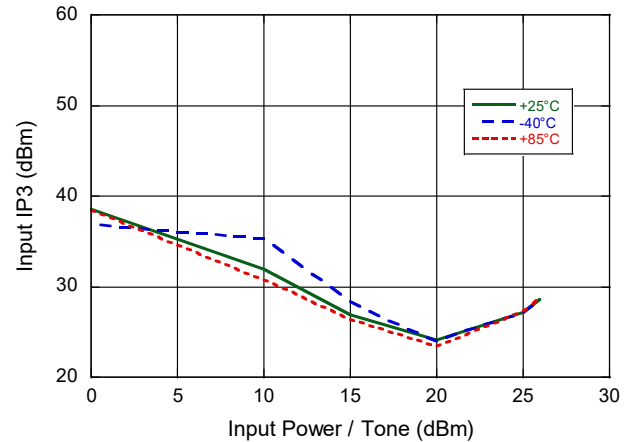


Typical RF Power Performance, De-embedded Die On-Board: $Z_0 = 50 \Omega$

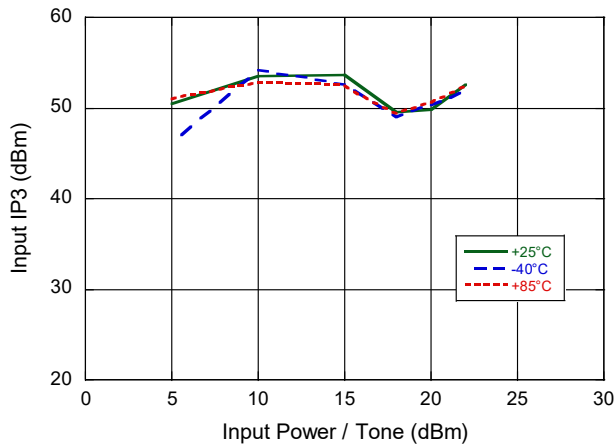
Input IP3 over Frequency, $T_A = 25^\circ\text{C}$



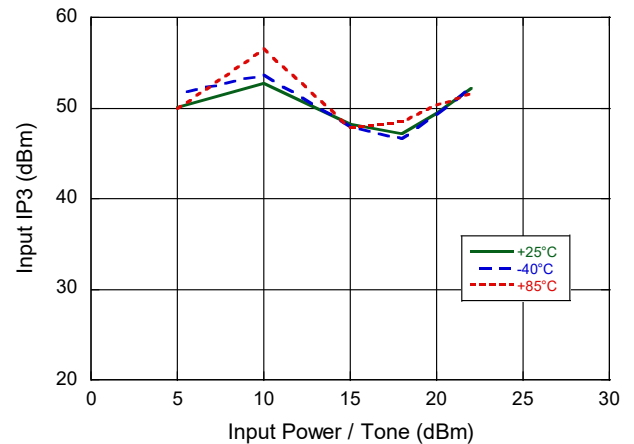
Input IP3 over temperature @ 18 GHz



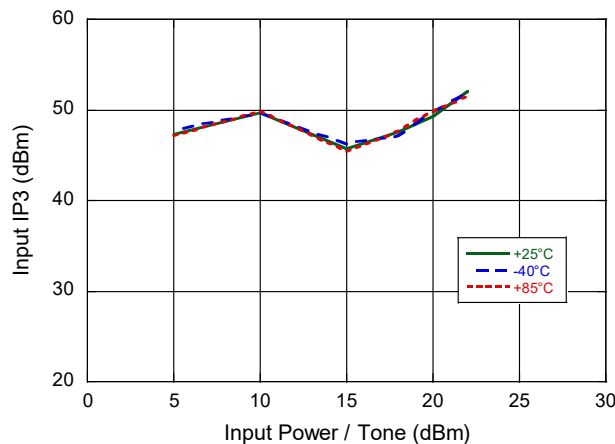
Input IP3 over temperature @ 27 GHz



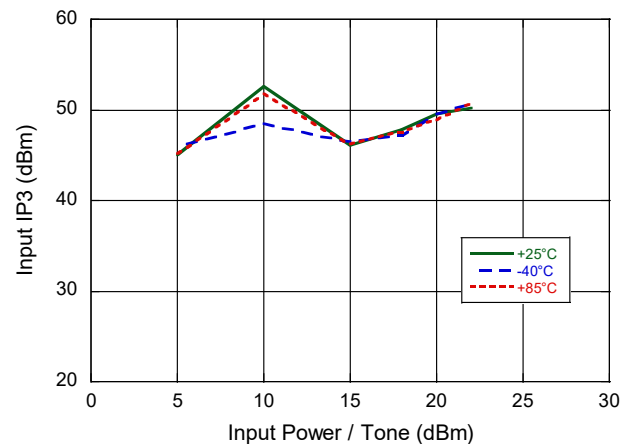
Input IP3 over temperature @ 30 GHz



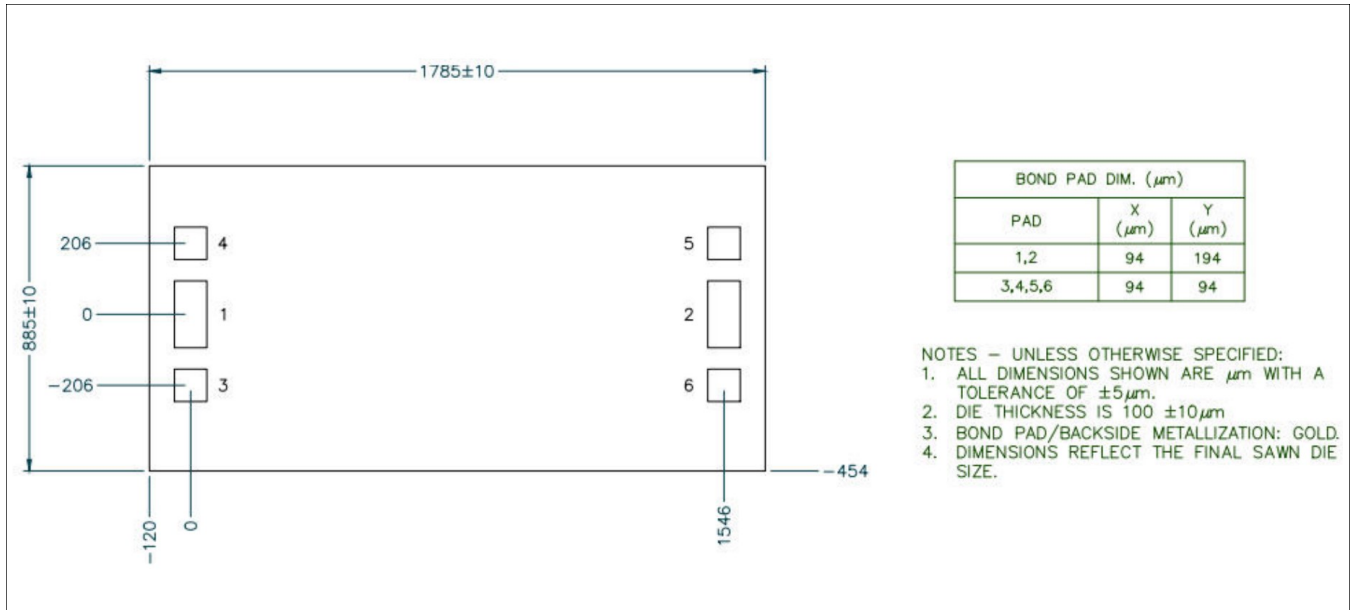
Input IP3 over temperature @ 35 GHz



Input IP3 over temperature @ 40 GHz



Die Outline Drawing



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.