High Peak Power Surface Mount Limiter
2 - 18 GHz

MADL-011121
Rev. V1

Features

- Operating Frequency: 2 - 18 GHz
- Insertion Loss: 2 dB @ 18 GHz
- Peak Power Operation:
  60 dBm @ 2 GHz, 4 GHz, and 13.5 GHz
- Flat Leakage Power:
  43 dBm @ Input Power of 60 dBm
- Lead Free 8.8 x 5.0 x 1.8 mm Package
- Passive Device, No DC Bias Required
- Internal DC Blocks and Return

Applications

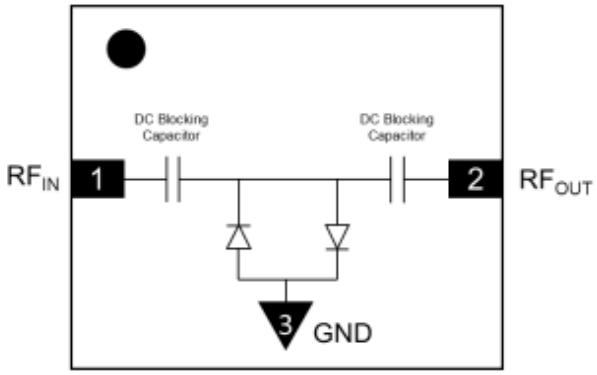
- Receiver Protector
- Ship and Airborne Radar

Description

The MADL-011121 is a lead-free wide band surface mount limiter that integrates multiple limiter stages and blocking capacitors in a compact laminate package. This device provides superior low and high signal performance from 2 to 18 GHz without DC Bias

The MADL-011121 is ideally suitable for high peak power receiver-protector microwave circuit applications where higher performance surface mount limiter assemblies are required.

Functional Schematic



Pin Configuration[1]

Pin #	Function
1	RF Input
2	RF Output
3 (Paddle)[2]	RF and DC Ground

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

Ordering Information

Part Number	Package
MADL-011121	waffle pack
MADL-011121-000SMB	Sample Board

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

Electrical Specifications: T_A = +25°C, Z_0 = 50 Ω, P_{IN}= -10 dBm (unless overwise specified)

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss	2 GHz 12 GHz 18 GHz	dB	—	0.4 1.0 2.0	0.8 1.8 3.0
Return Loss	2 GHz 10 GHz 18 GHz	dB	—	21 23 19	—
Input P1dB	2 -18 GHz	dBm		25	
IIP3	-10 dBm per Tone, 10 MHz Spacing	dBm	—	30	—
IIP2	-10 dBm per Tone, 10 MHz Spacing	dBm	—	50	—
Peak Power Handling[3]	13.5 GHz	dBm	—	59.5	—
CW Power Handling[3]	12 - 18 GHz	dBm	—	37	—
Flat Leakage Power	1 µs, 1% Duty Cycle, 13.5 GHz @ +60 dBm	dBm	—	43	—
Spike Leakage Power	1 µs, 1% Duty Cycle, 13.5 GHz @ +60 dBm	dBm	—	44	—
Spike Leakage Time	1 µs, 1% Duty Cycle, 13.5 GHz @ +58 dBm	ns	—	100	—
1 dB Recovery Time 3 dB Recovery Time	1 µs. 1% Duty Cycle, 13.5 GHz @ +57 dBm	ns	—	420 190	—

3. Both source and load VSWR < 1.2:1

Absolute Maximum Ratings[4,5]

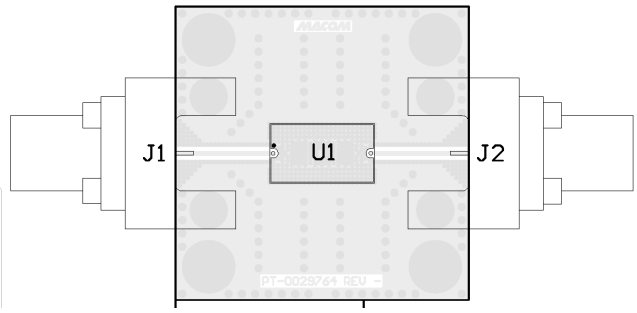
Parameter	Absolute Maximum
Peak Incident Power @ +85ºC, 1 µs pulse, 1% duty, 13.5 GHz	58 dBm
CW Incident Power @ +85ºC	37 dBm
Junction Temperature[6]	+175°C
DC Voltage	45 V
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +150°C

Maximum Survivability Ratings[4,5]

Parameter	Maximum Survivability
Peak Incident Power @ +85ºC, 1 µs pulse, 1% duty, 13.5 GHz	60 dBm
CW Incident Power @ +85ºC	39 dBm
Junction Temperature	+250°C
DC Voltage	45 V
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 $T_J \leq$ +175°C will ensure MTTF > 1 x 10^6 hours.

PCB Layout



Handling Procedures

Please observe the following precautions to avoid damage:

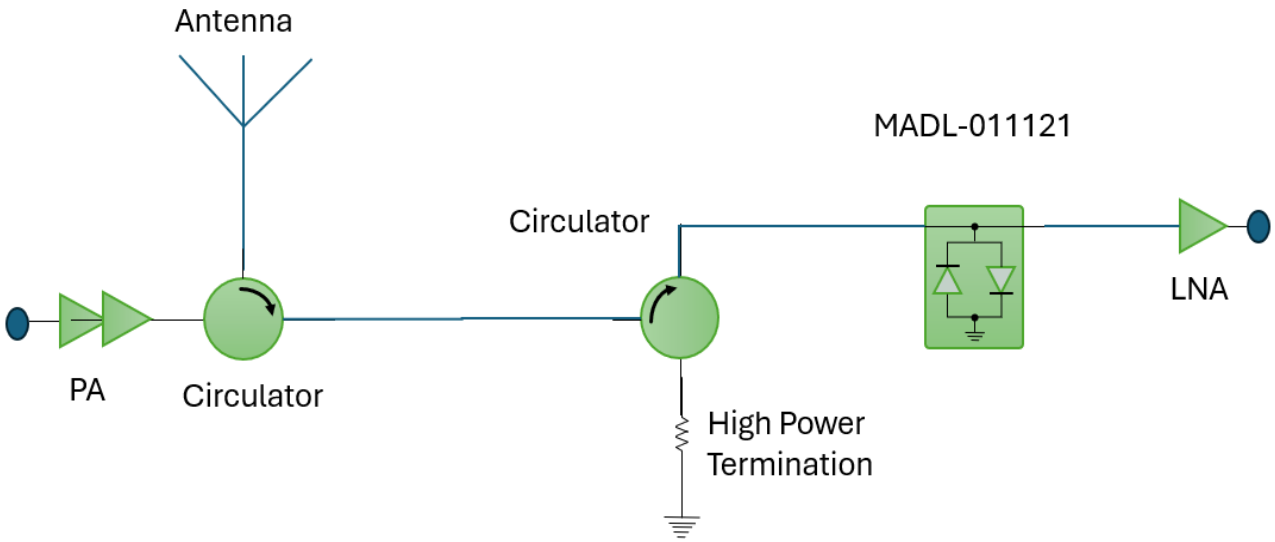
Static Sensitivity

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.

Parts List

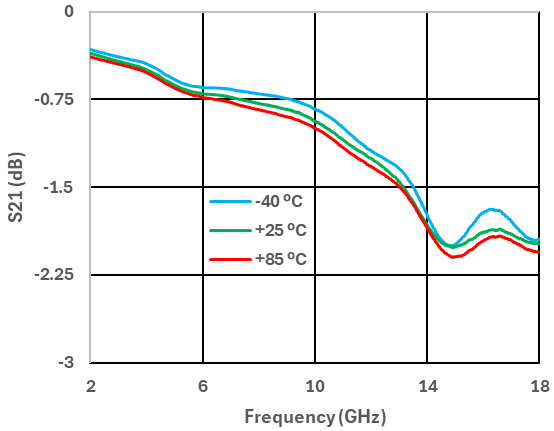
Part	Value	Case Style
MADL-011121	U1	8.8 x 5 mm 2LD
1092-03A-6	J1, J2	SW Connector
PT-0034684	SMB	

Application Schematic

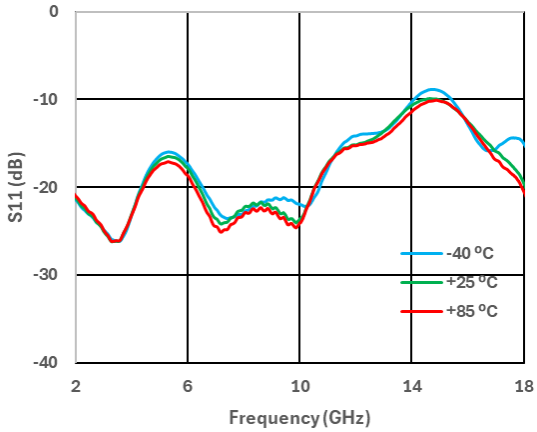


Typical Performance Curves

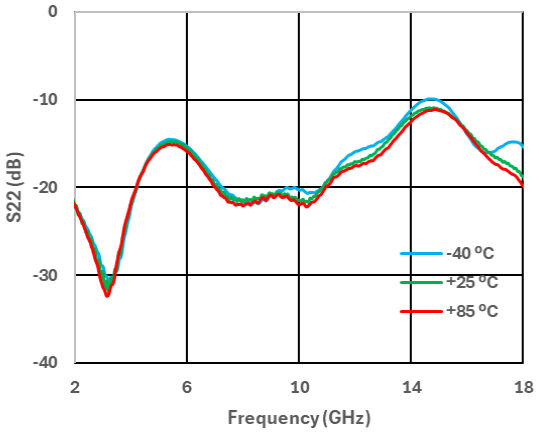
Insertion Loss



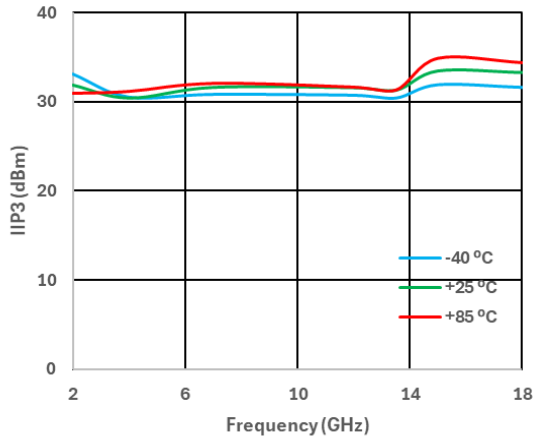
Input Return Loss



Output Return Loss

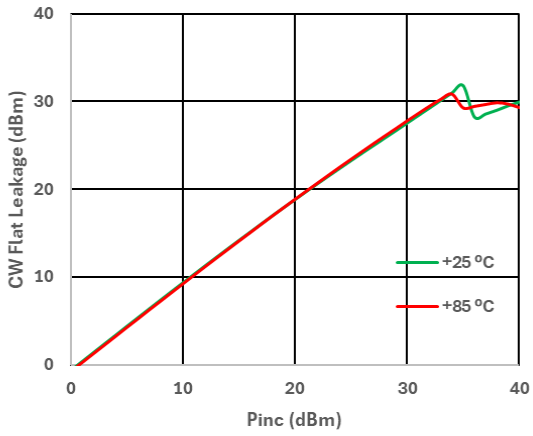


IP3

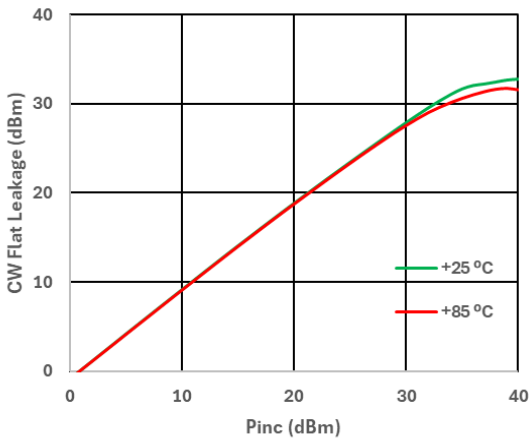


Typical Performance Curves:

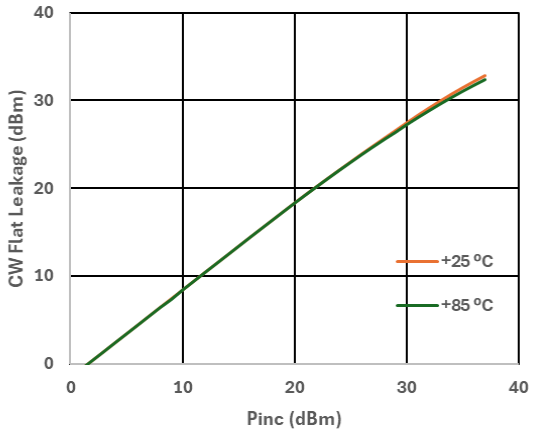
Flat Leakage CW Power @ 2 GHz



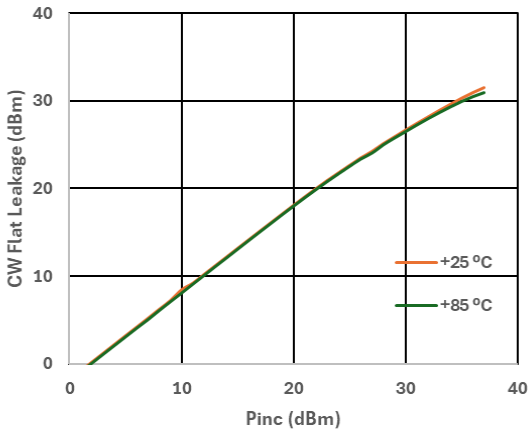
Flat Leakage CW Power @ 4 GHz



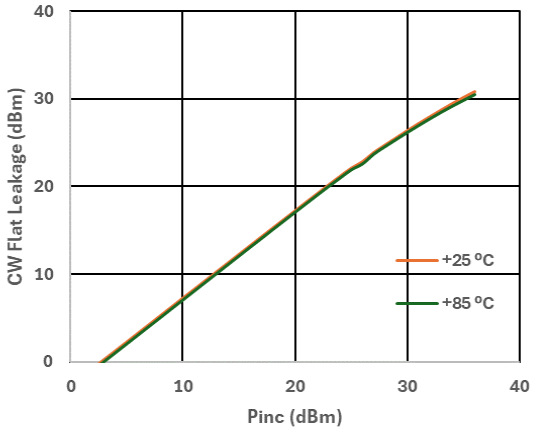
Flat Leakage CW Power @ 8 GHz



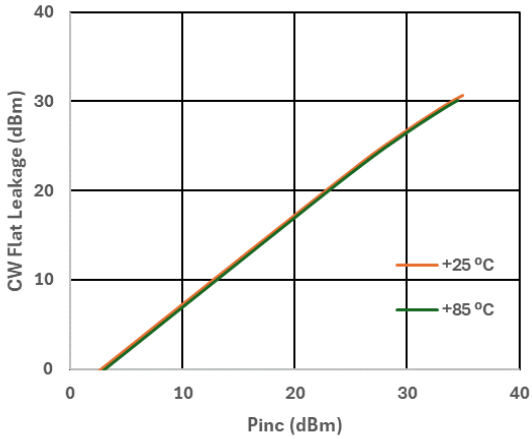
Flat Leakage CW Power @ 12 GHz



Flat Leakage CW Power @ 15 GHz

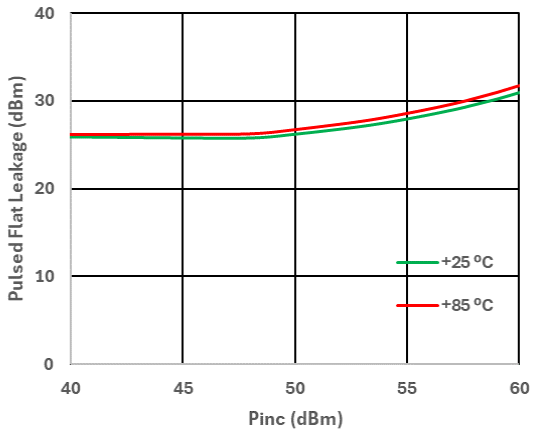


Flat Leakage CW Power @ 18 GHz

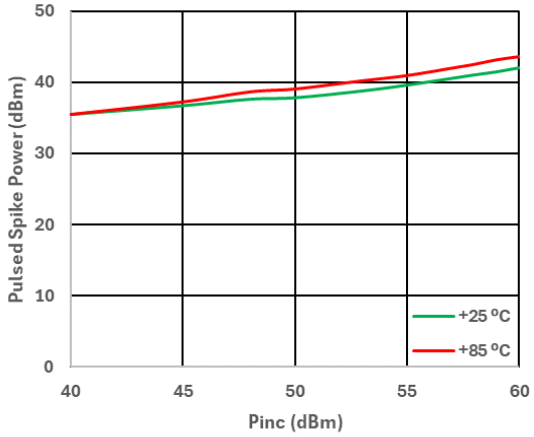


Typical Performance Curves: 1uS Pulse Width, 1% Duty Cycle

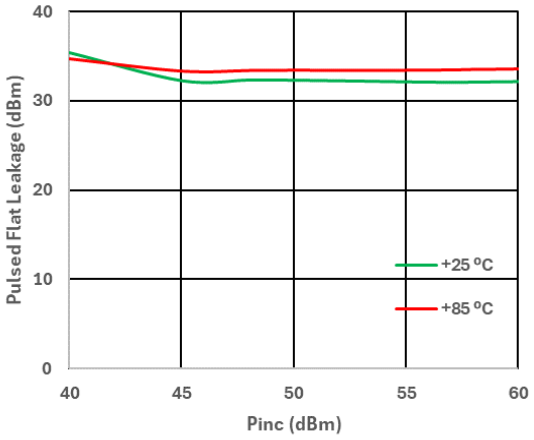
Pulsed Flat Leakage Power @ 2 GHz



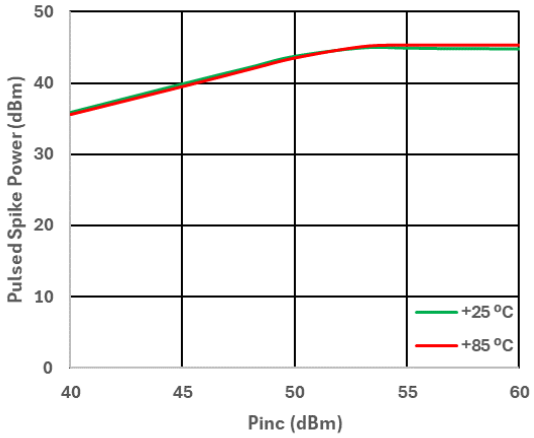
Pulsed Spike Power @ 2 GHz



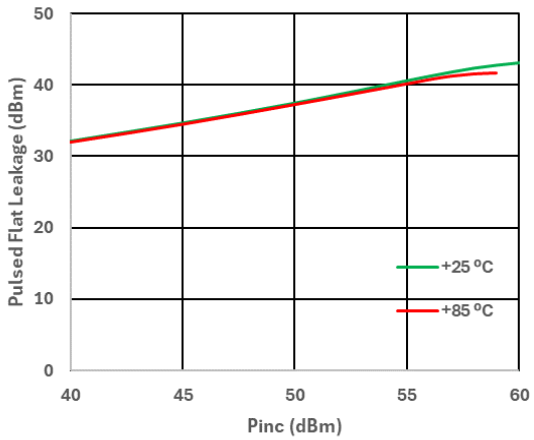
Pulsed Flat Leakage Power @ 4 GHz



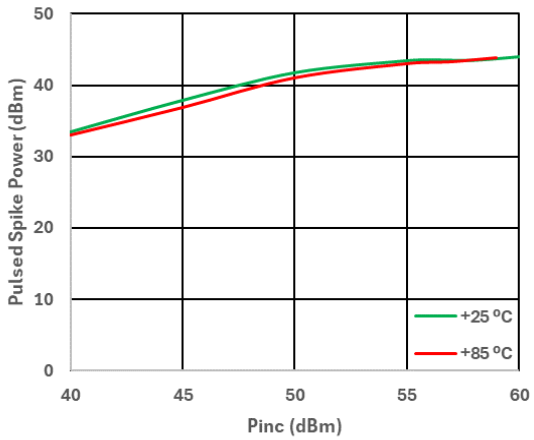
Pulsed Spike Power @ 4 GHz



Pulsed Flat Leakage Power @ 13.5 GHz

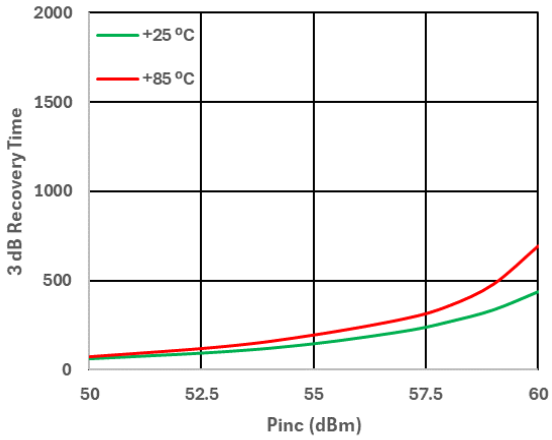


Pulsed Spike Power @ 13.5 GHz

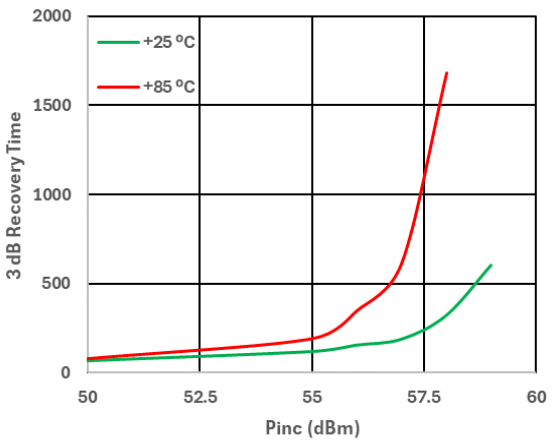


Typical Performance Curves: 1uS Pulse Width, 1% Duty Cycle

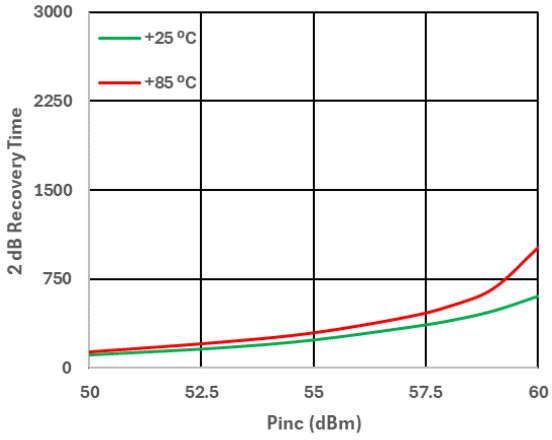
3 dB Recoverv Time. 4 GHz



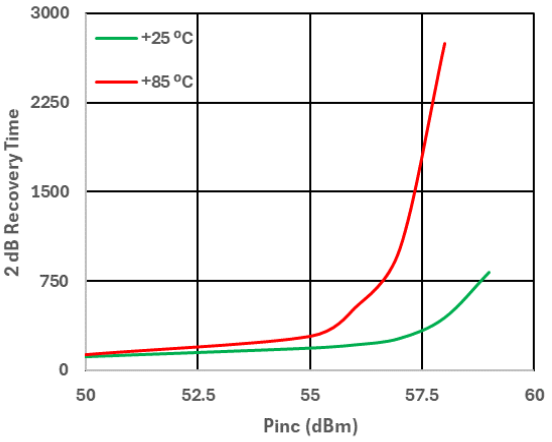
3 dB Recovery Time, 13.5 GHz



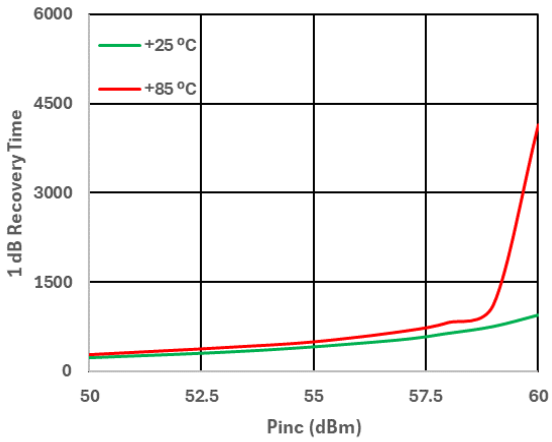
2 dB Recovery Time, 4 GHz



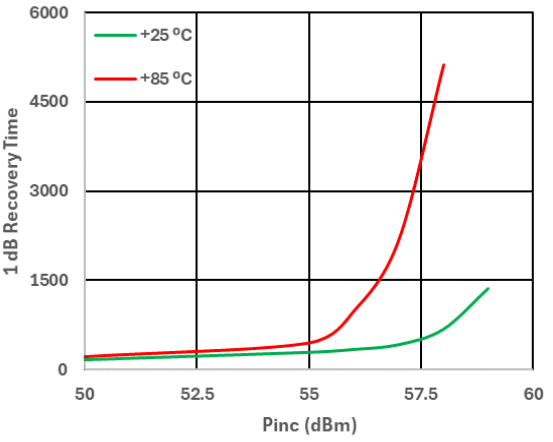
2 dB Recovery Time, 13.5 GHz



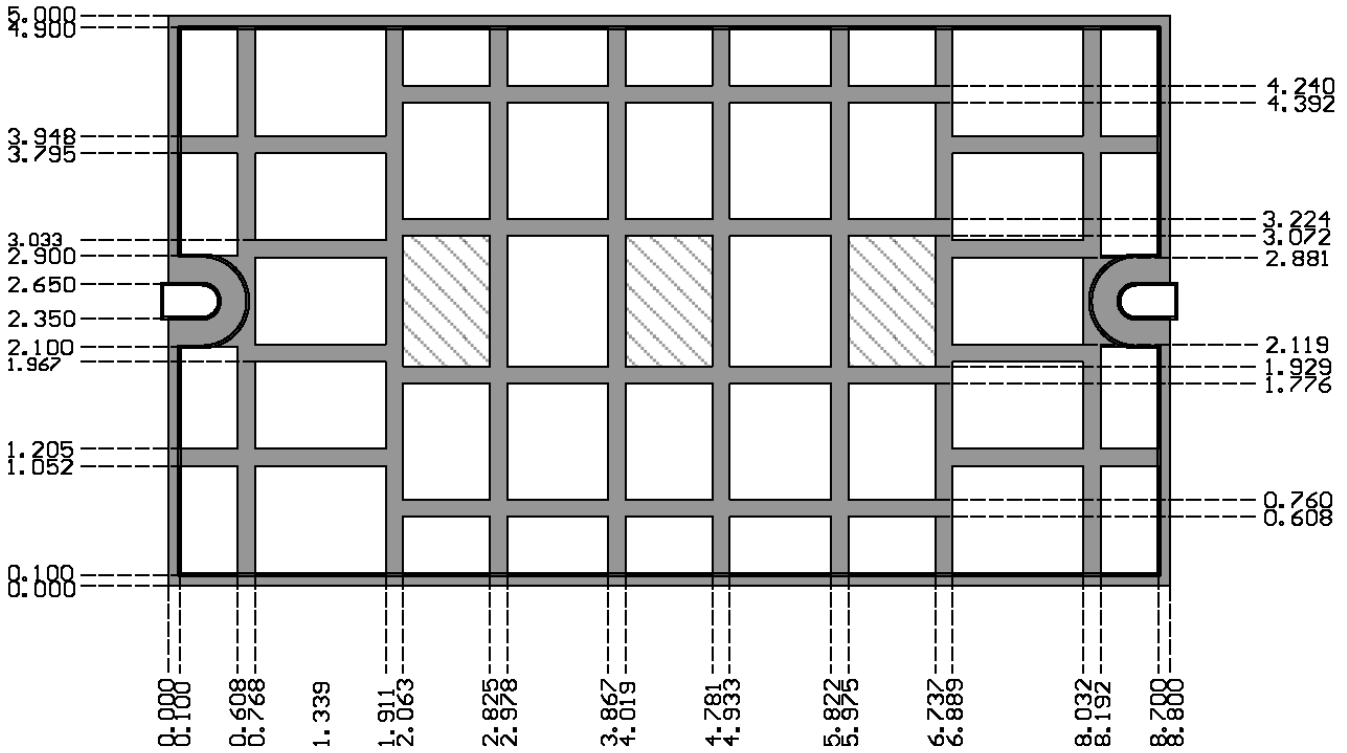
1 dB Recovery Time, 4 GHz



1 dB Recovery Time, 13.5 GHz



Recommended Solder Mask Pattern on SMB to prevent Voiding (units in mm)

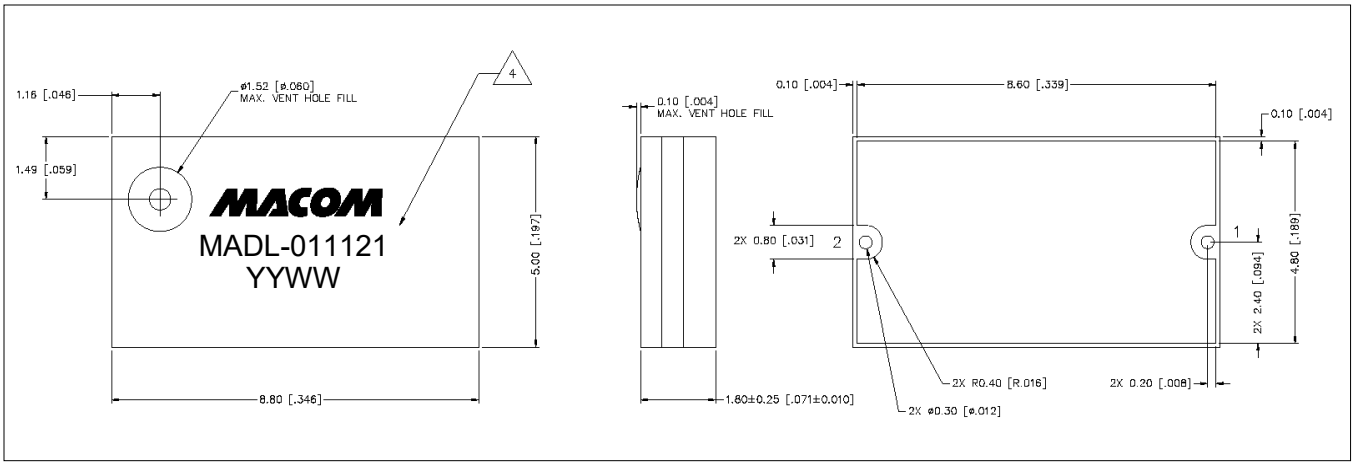


Diode Locations: Minimize solder voiding

Recommended Attachment

A High density solid Cu via farm or Solid Cu heat Slug is recommended under the attach pad for optimum thermal heat dissipation. Solder voiding under the package should be minimized and no voiding should be present under the diode locations.

Outline Drawing: Lead-Free 8.8 x 5.0 x 1.8 mm 2-Lead Package†



† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level (MSL) 3 requirements.
Plating is Au over Pd over Ni over Cu