

# Surface Mount PIN Diode Limiter

## LM501202-L-C-300 Series Datasheet



### Features

- Surface Mount Limiter in Compact Outline: 8mm L x 5mm W x 2.5 mm H
- Incorporates PIN Limiter Diodes, D.C. Blocks & D.C. Return
- Higher Peak Power Handling than Plastic ( 125 W Peak Power )
- Higher Average Power Handling than Plastic ( 5 W C.W Power )
- Lower Insertion Loss ( 0.4 dB ) & Lower Flat Leakage Power ( 21 dBm )
- RoHS Compliant



### Description

The LM501202-L-C-300 Surface Mount Silicon PIN Diode Limiter is manufactured using Aeroflex / Metelics proven hybrid manufacturing process incorporating PIN Diodes and passive devices integrated within a ceramic substrate. This low profile, compact, surface mount component, ( 8mm L x 5mm W x 2.5 mm H ) offers superior low and high signal performance to comparable MMIC devices in QFN packages. The Limiter Modules are designed to optimize small signal insertion loss, (N.F.) and high signal flat leakage performance in a compact, surface mount package from 0.5-2.0 GHz.

Using PIN Diodes with lower thermal resistance ( < 70 °C/W ), RF C.W. incident power levels of +37 dBm and RF peak incident power levels of +51 dBm @ 1µS RF pulse width, 0.1% duty cycle are very achievable. In addition, this design concept provides lower flat leakage power ( < +21 dBm ) and lower spike leakage energy ( < 0.2 Ergs ) for superior LNA protection.

### Applications

This LM501202-L-C-300 Limiters are ideal for octave band Radar applications, requiring high volume, surface mount, solder re-flow manufacturing. These products are durable, reliable, and capable of meeting all military, commercial, and industrial environments. The devices are fully RoHS compliant and are available in tube or tape-reel.

### Environmental Capabilities

The LM501202-L-C-300 Limiters are capable of meeting the environmental requirements of MIL-STD-750 and MIL-STD-202.

### ESD and Moisture Sensitivity Level Rating

PIN Diode Limiters are susceptible to ESD conditions as with all semiconductors. The ESD rating for this device is Class 0, HBM. The moisture sensitivity level rating for this device is MSL 2.



## LM501202-L-C-300 Electrical Specifications

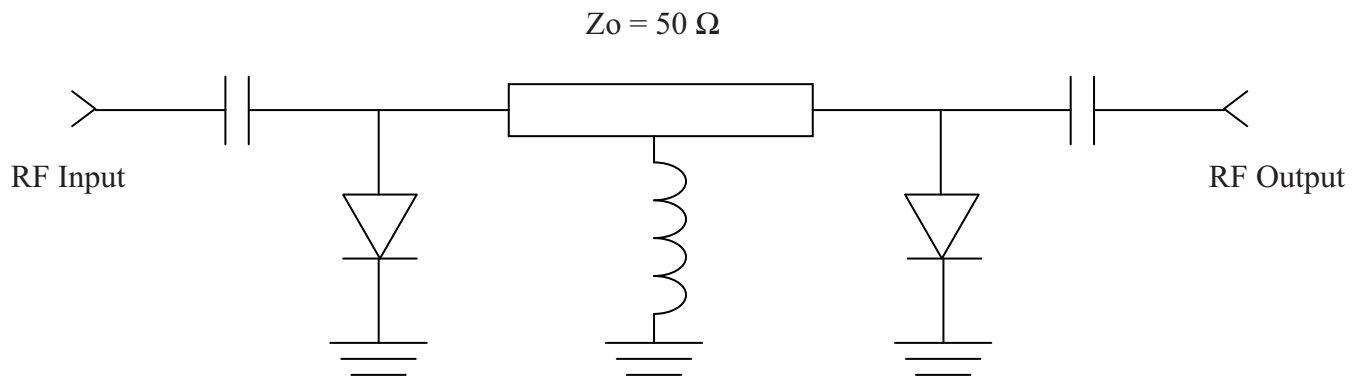
@  $Z_0 = 50 \Omega$ ,  $T_A = +25 \text{ }^\circ\text{C}$  (Unless Otherwise Defined)

Parameter	Symbol	Units	Test Conditions	Minimum Value	Typical Value	Maximum Value
Frequency	F	GHz	Swept Frequency	0.4	0.5 - 2.0	2.5
Insertion Loss	$I_L$	dB	Swept Frequency $P_o = 0 \text{ dBm}$		-0.4	-0.6
Return Loss	$R_L$	dB	Swept Frequency $P_o = 0 \text{ dBm}$	-18	-20	
Input Compression Power	P1dB	dBm	Swept Frequency	+7	+8	+10
2nd Harmonic	$2F_o$	dBc	$P_o = 0 \text{ dBm}$ $F_o = 2.0 \text{ GHz}$	45	50	
Peak Incident Power	$P_{inc}(Pk)$	dBm	RF Pulse Width = $1 \mu\text{s}$ , 0.1 % duty		+51	+52
C.W. Incident Power	$P_{inc}(CW)$	dBm	Swept Frequency		+36	+37
Flat Leakage Power	$P_f$	dBm	+50 dBm, RF Pulse Width = $1 \mu\text{s}$ , 0.001 duty		+21	+23
Spike Leakage Energy	$E_s$	Ergs	+50 dBm, RF Pulse Width = $1 \mu\text{s}$ , 0.1% duty		0.2	0.3
Recovery Time	$T_r$	$\eta\text{S}$	( 50% Trailing RF Pulse – 1dB IL ) +50 dBm, RF Pulse Width = $1 \mu\text{s}$ , 0.1 % duty		75	150

## Absolute Maximum Ratings

Parameter	Absolute Maximum Value
Operating Temperature	-65 °C to +125 °C
Storage Temperature	-65 °C to +150 °C
Junction Temperature	+175 °C
RF C.W. Incident Power @ +85 °C Source & Load VSWR < 1.2:1	+37 dBm
RF Peak. Incident Power @ +85 °C Source & Load VSWR < 1.2:1	+51 dBm, RF Pulse Width = $1 \mu\text{s}$ , 0.1% duty cycle
Insertion Loss Rate of Change with Operating Temperature	- 0.003 dB / ° C
$\theta_{jc}$ , C.W. Thermal Resistance ( Junction to Case )	70° C/W
Assembly Temperature	+260 °C for 10 Seconds

## LM501202-L-C-300 Limiter Schematic



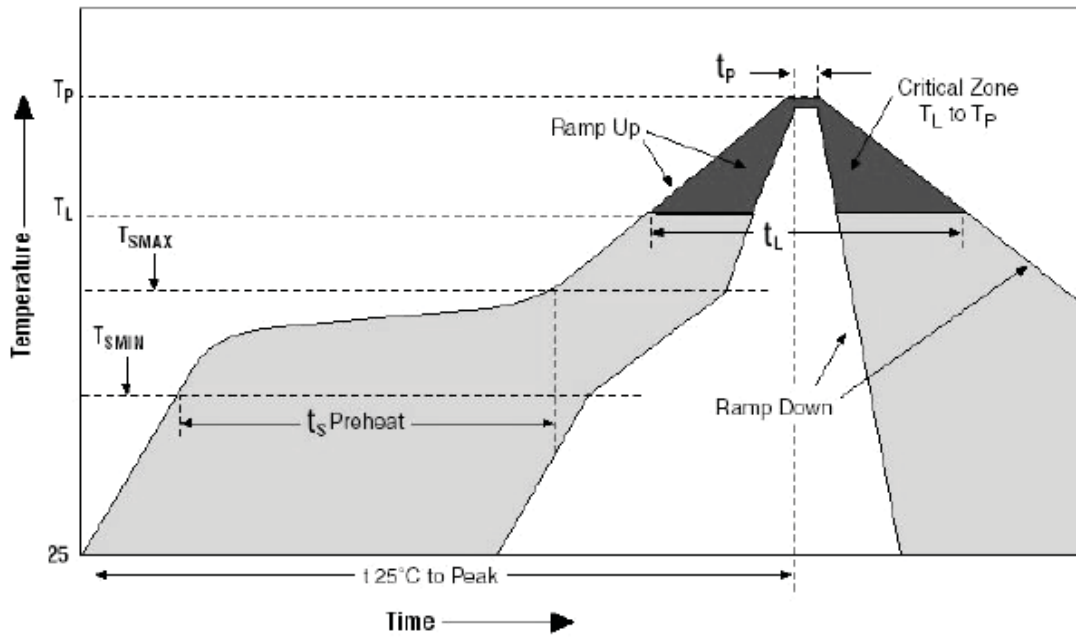
### Assembly Instructions

The LM501202-L-C-300 Limiters are capable of being placed onto circuit boards with pick and place manufacturing equipment from tube or tape-reel dispensing. The devices are attached to the circuit board using conventional solder re-flow or wave soldering procedures with RoHS type or Sn 63 / Pb 37 type solders per Table I and Graph I Time-Temperature recommended profile.

Table 1: Time-Temperature Profile for Sn 60/Pb40 or RoHS Type Solders

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate ( $T_L$ to $T_P$ )	3°C/second maximum	3°C/second maximum
Preheat - Temperature Minimum ( $T_{SMIN}$ ) - Temperature Maximum ( $T_{SMAX}$ ) - Time (Minimum to maximum) ( $t_S$ )	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
$T_{SMAX}$ to $T_L$ - Ramp-up Rate		3°C/second maximum
Time Maintained above: - Temperature ( $T_L$ ) - Time ( $t_L$ )	183°C 60-150 seconds	217°C 60-150 seconds
Peak Temperature ( $T_P$ )	225 +0 / -5°C	245 +0/-5°C
Time within 5°C of actual Peak Temperature ( $T_P$ )	10-30 seconds	20-40 seconds
Ramp-down Rate	6°C/second maximum	6°C/second maximum
Time 25°C to Peak Temperature	6 minutes maximum	8 minutes maximum

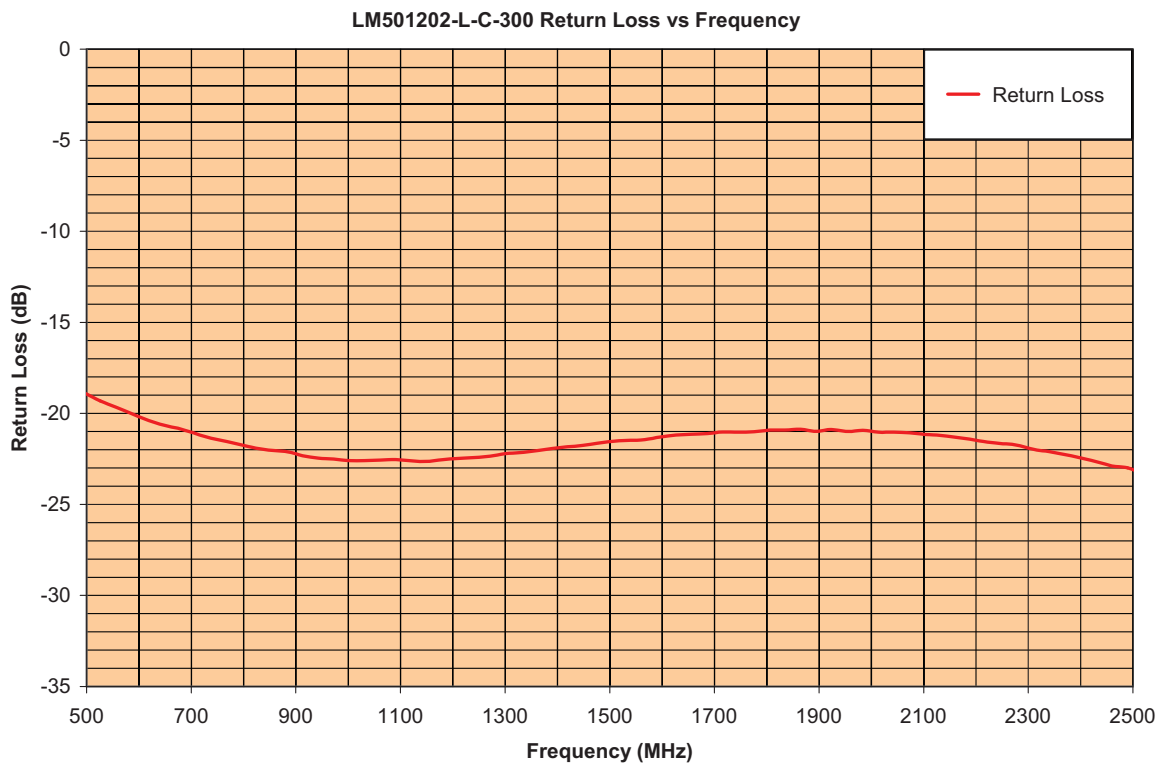
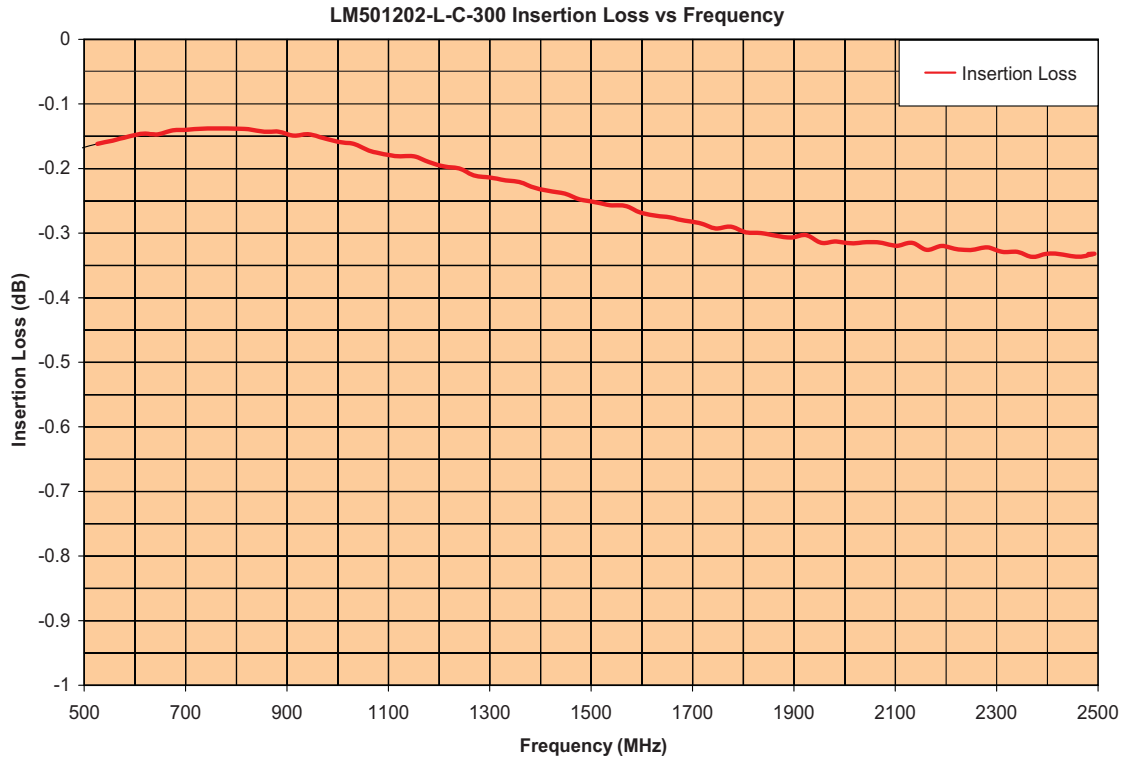
**Graph 1: Solder Re-Flow Time-Temperature Function**



**Part Number Ordering Information:**

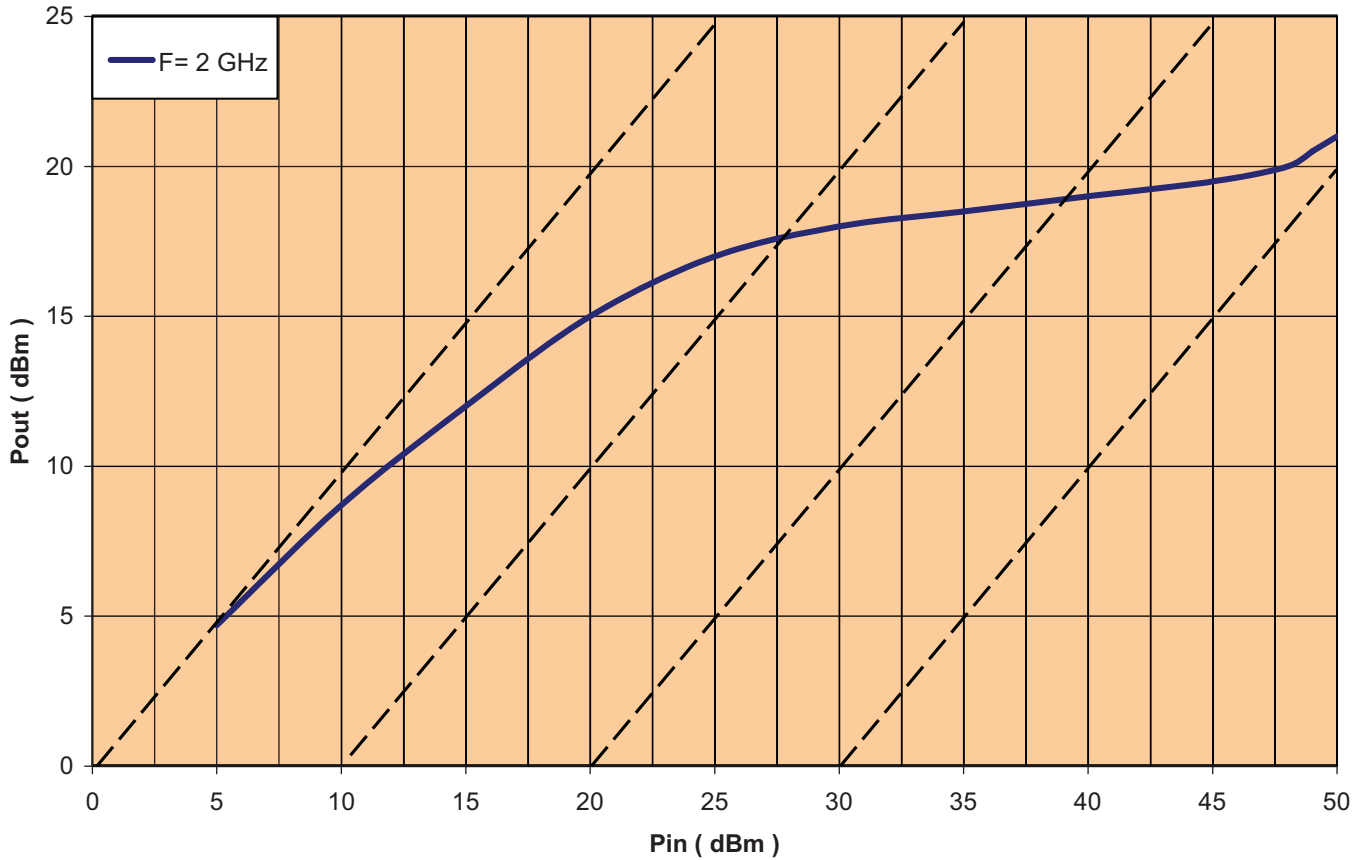
Part Number	Description
LM501202-LC-300 -T	Tube Packaging
LM501202-LC-300 -R	Tape-Reel Packaging
LM501202-LC-300 -E	RF Evaluation Board

## LM501202-L-C-300 Low Signal Parametric Performance @ 0 dBm



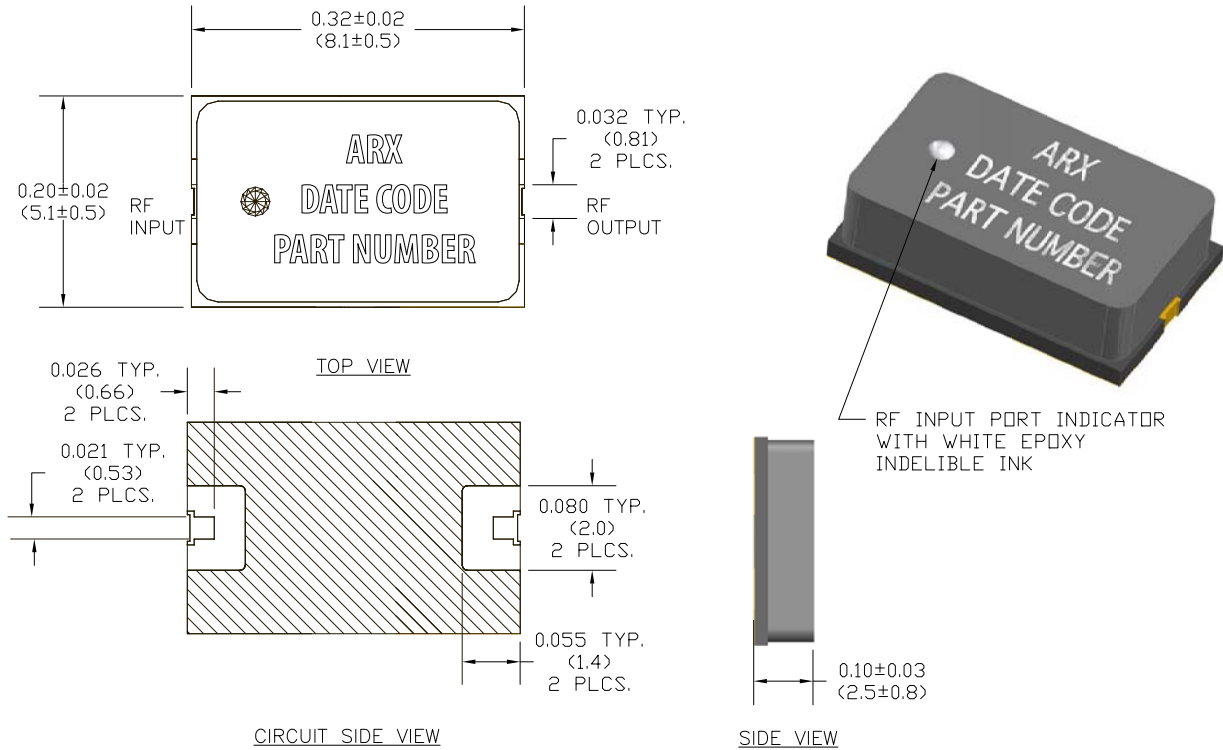
**LM501202-L-C-300 High Signal C.W. Parametric Performance**

LM501202-L-C-300 Peak Power Pout vs Pin ( Trf = 1 uS, 0.001 duty )



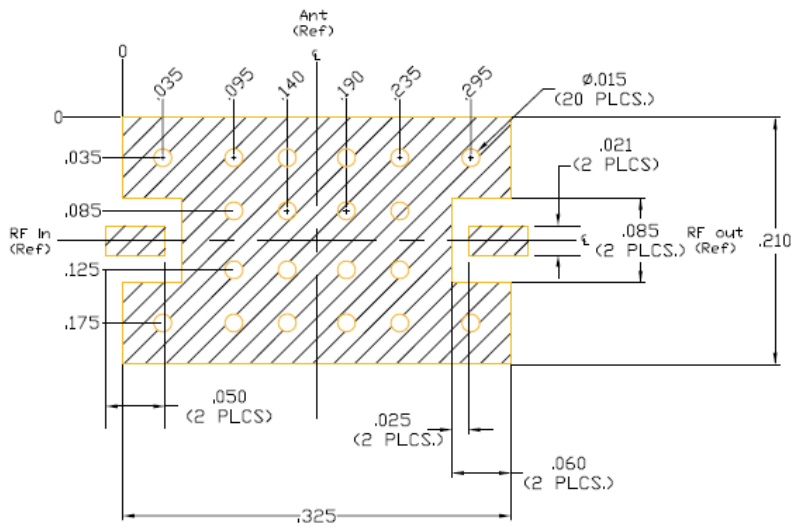
# PIN Diode Limiter

## LM501202-L-C-300 Outline Drawing Case Style 300 (CS300)



- NOTES:
- SUBSTRATE MATERIAL: 20 MIL THICK ALUMINA NITRIDE (ALN) RF COVER: BLACK CERAMIC.
  - TOP SIDE AND BACKSIDE METALLIZATION: 100 μ IN. TYPICAL PLATED Au OVER Ti-Pd.
  - DIMENSION IN PARENTHESIS ARE IN MM.

## RF Circuit Solder Footprint for Case Style 300 (CS 300)



- NOTES:
- RECOMMENDED RF CIRCUIT IS ROGERS, R04350B, 10 MILS THICK.

Thatched Area is RF, D.C., and Thermal Ground. Vias should be solid copper fill and gold plated for optimum heat transfer from backside of limiter module through Circuit Vias to metal thermal ground.

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