

# Surface Mount PIN Diode Limiter

## LM200802-M-A-300 Series Datasheet



### Features

- Surface Mount Limiter in Compact Outline: 8mm L x 5mm W x 2.5 mm H
- Incorporates Anti-Parallel Limiter Diodes
- Broadband Performance (20 MHz – 8 GHz)
- Higher Average Power Handling than Plastic (44 dBm Avg Power)
- Lower Insertion Loss (1.4 dB) & Lower Flat Leakage Power (20 dBm)
- RoHS Compliant



### Description

The LM200802-M-A-300 Series of Surface Mount Silicon PIN Diode Limiters is manufactured using Aeroflex / Metelics proven hybrid manufacturing process incorporating Silicon NIP and PIN Diodes 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.

The design incorporates a NIP Diode with an Anti-Parallel PIN Diode to provide broadband microwave performance from 20 MHz – 8 GHz. Using NIP and PIN Limiter Diodes with lower thermal resistance, ( $< 55 \text{ }^\circ\text{C/W}$ ), RF C.W. incident power levels of +44 dBm and RF peak incident power levels of +50 dBm @ 1  $\mu\text{s}$  RF pulse width, 0.001 duty cycle are very achievable in broadband limiter applications. The lower PIN and NIP Diode series resistance, ( $< 1.5 \text{ } \Omega$ ), coupled with the smaller minority carrier lifetime, ( $< 500 \text{ ns}$ ), provides lower flat leakage power ( $< +20 \text{ dBm}$ ) and lower spike leakage energy ( $< 0.2 \text{ Ergs}$ ) for superior LNA protection.

### Applications

The LM200802-M-A-300 Limiter Series is ideal for 20 MHz to 8 GHz wideband 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 LM200802-M-A-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.



## LM200802-M-A-300 Electrical Specifications

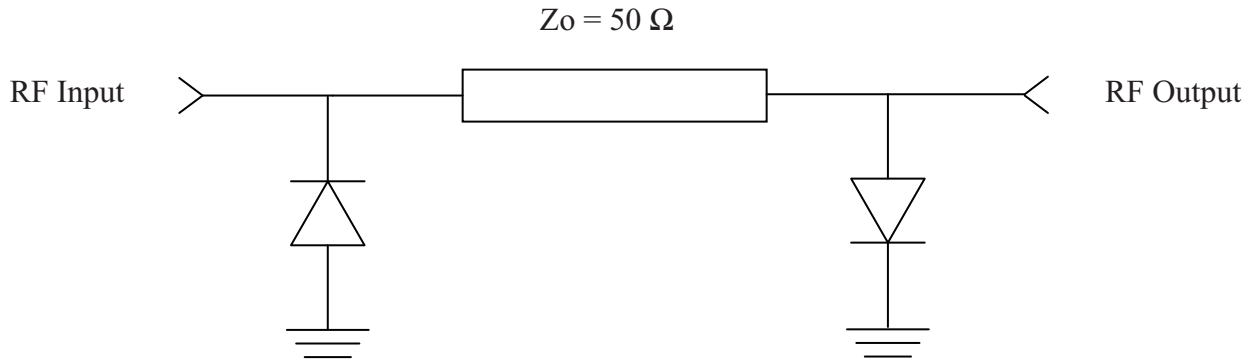
@  $Z_0 = 50 \Omega$ ,  $T_A = +25 \text{ }^\circ\text{C}$  (Unless Otherwise Defined)

Parameter	Symbol	Units	Test Conditions	Minimum Value	Typical Value	Maximum Value
Frequency	F	MHz	Swept Frequency		20 - 8000	8500
Insertion Loss	$I_L$	dB	Swept Frequency $P_o = 0 \text{ dBm}$		-1.4	-1.6
Return Loss	$R_L$	dB	Swept Frequency $P_o = 0 \text{ dBm}$	-13	-15	
Input Compression Power	P1dB	dBm	Swept Frequency	+6	+8	+10
2nd Harmonic	$2F_o$	dBc	$P_o = 0 \text{ dBm}$ $F_o = 2 \text{ GHz}$	40	50	
Peak Incident Power	$P_{inc(Pk)}$	dBm	RF Pulse Width = $1 \mu\text{s}$ , 0.001 duty		+50	+51
C.W. Incident Power	$P_{inc(CW)}$	dBm	Swept Frequency		+43	+44
Flat Leakage Power	$P_f$	dBm	+50 dBm, RF Pulse Width = $1 \mu\text{s}$ , 0.001 duty		+20	+23
Spike Leakage Energy	$E_s$	Ergs	+50 dBm, RF Pulse Width = $1 \mu\text{s}$ , 0.001 duty		0.2	0.3
Recovery Time	$T_r$	$\eta\text{S}$	( 50% Trailing RF Pulse – 1dB IL ) + 50 dBm, RF Pulse Width = $1 \mu\text{s}$ , 0.001 duty		500	800

## Absolute Maximum Ratings @ $T_A = +25 \text{ }^\circ\text{C}$ ( Unless Otherwise Defined )

Parameter	Absolute Maximum Value
Operating Temperature	-65 $^\circ\text{C}$ to +125 $^\circ\text{C}$
Storage Temperature	-65 $^\circ\text{C}$ to +150 $^\circ\text{C}$
Junction Temperature	+175 $^\circ\text{C}$
RF C.W. Incident Power @ + 85 $^\circ\text{C}$ Source & Load VSWR < 1.2:1	+42 dBm
RF Peak. Incident Power @ + 85 $^\circ\text{C}$ Source & Load VSWR < 1.2:1	+ 50 dBm, RF Pulse Width = $1 \mu\text{s}$ , 0.001 duty cycle
Insertion Loss Rate of Change with Operating Temperature	- 0.005 dB / $^\circ\text{C}$
$\theta_{jc}$ , C.W. Thermal Resistance ( Junction to Case )	55 $^\circ\text{C/W}$
Assembly Temperature	+260 $^\circ\text{C}$ for 10 Seconds

## LM200802-M-A-300 Limiter Schematic



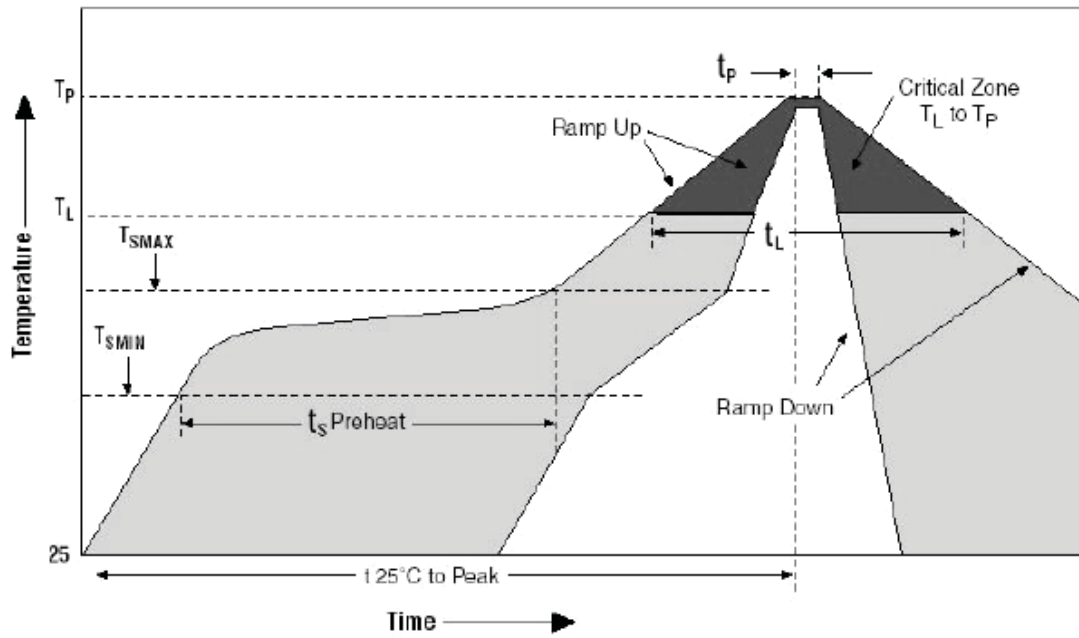
### Assembly Instructions

The LM200802-M-A-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

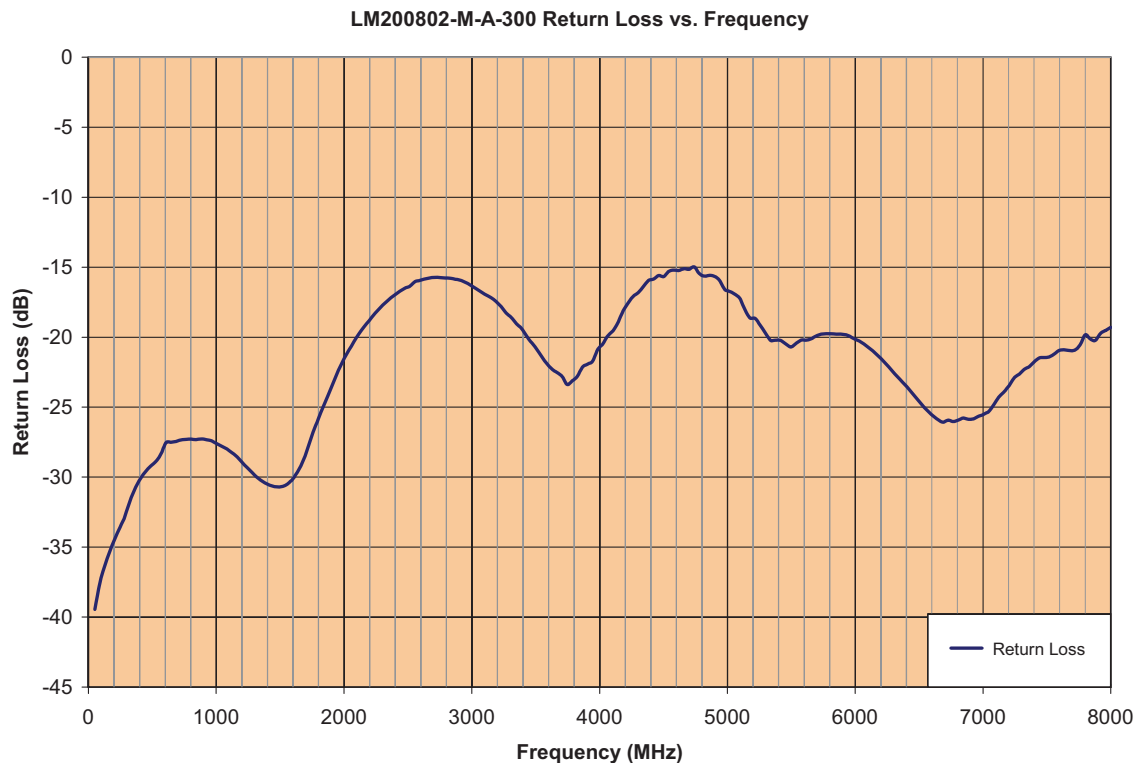
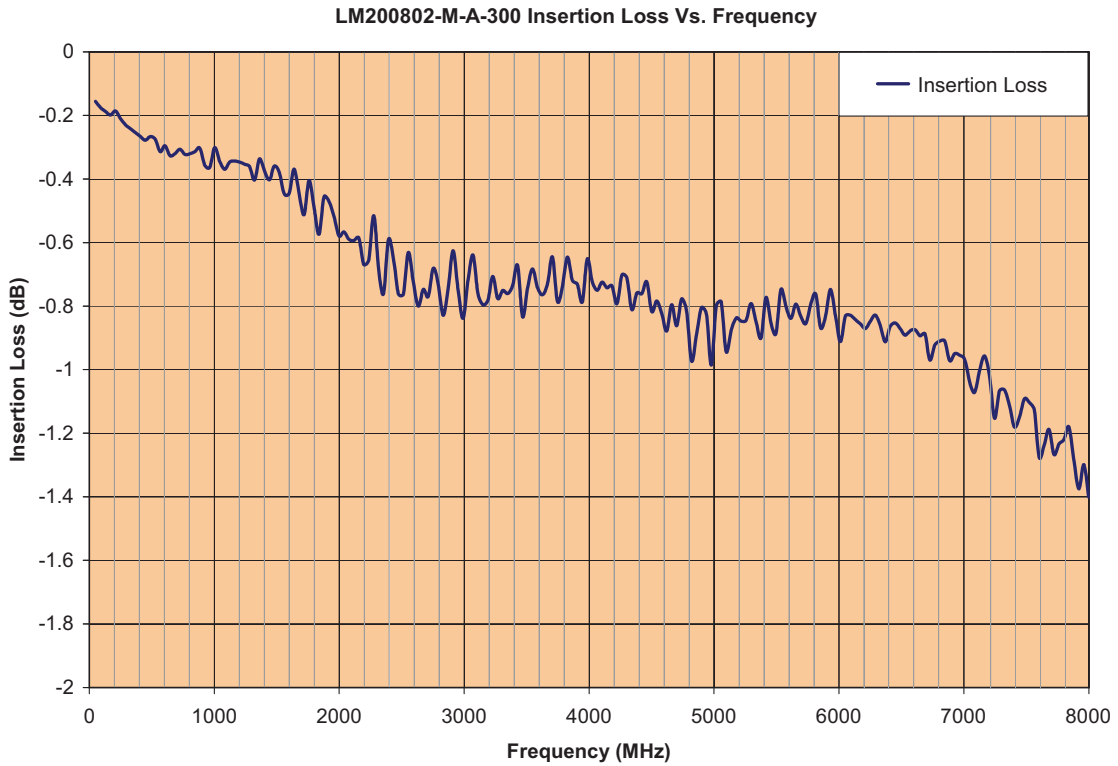
**Graph 1: Solder Re-Flow Time-Temperature Function**



**Part Number Ordering Information:**

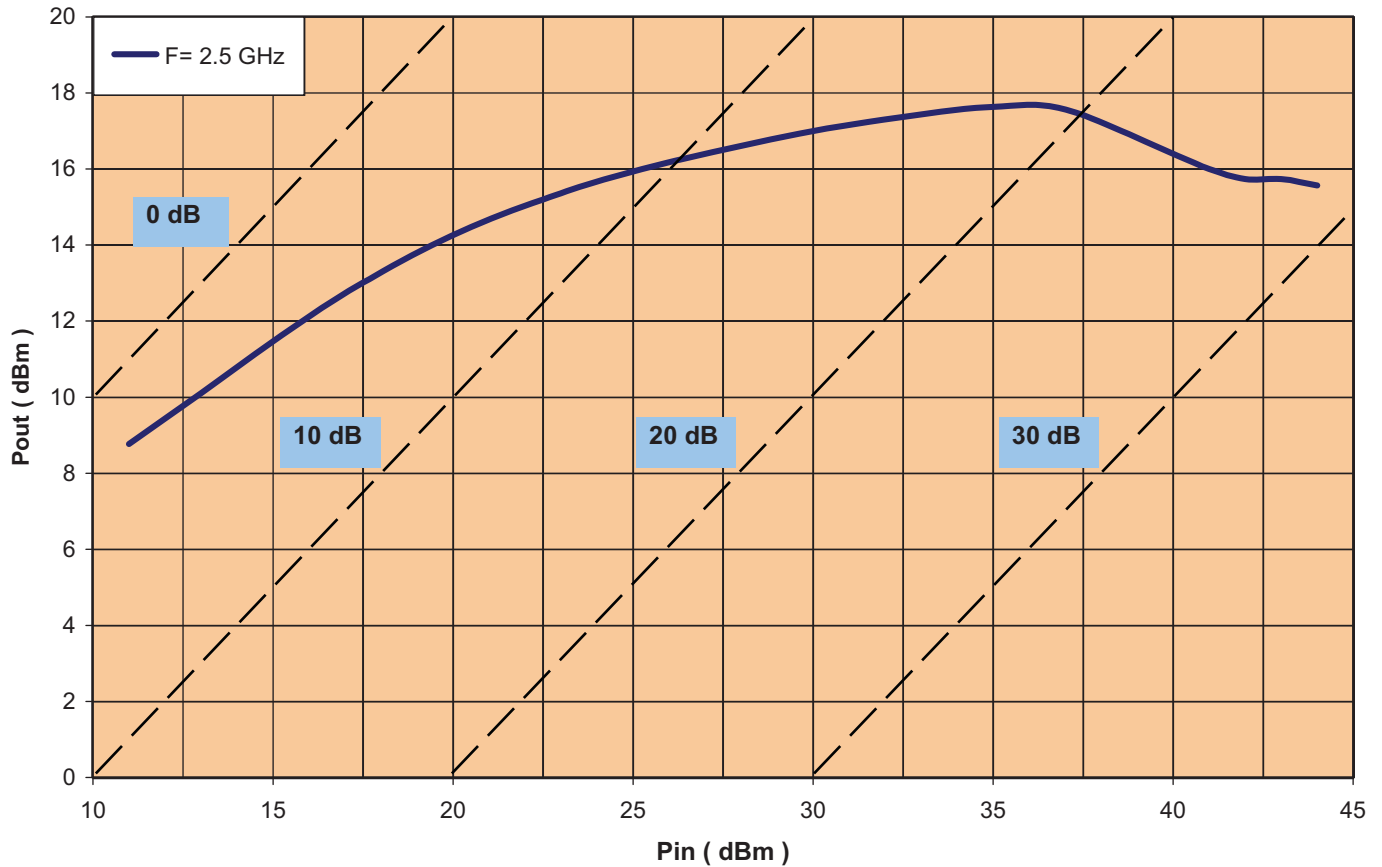
Part Number	Description
LM200802-M-A-300 -T	Tube
LM200802-M-A-300 -R	Tape-Reel
LM200802-M-A-300-E	RF Eval Board

## LM200802-M-A-300 Typical RF Small Signal Performance @ +25 °C



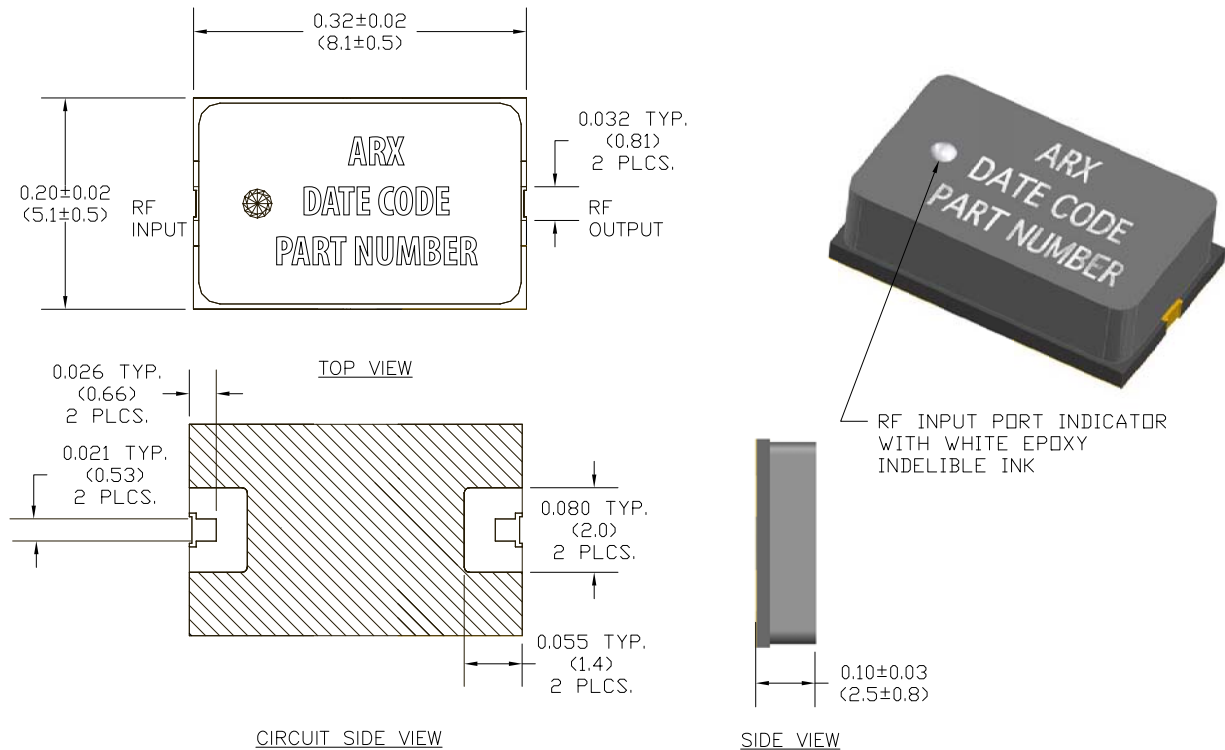
**LM200802-M-A-300 High Signal Parametric Data**

**LM200802-M-A-300 Pout vs Pin Function (Continuous Wave)**



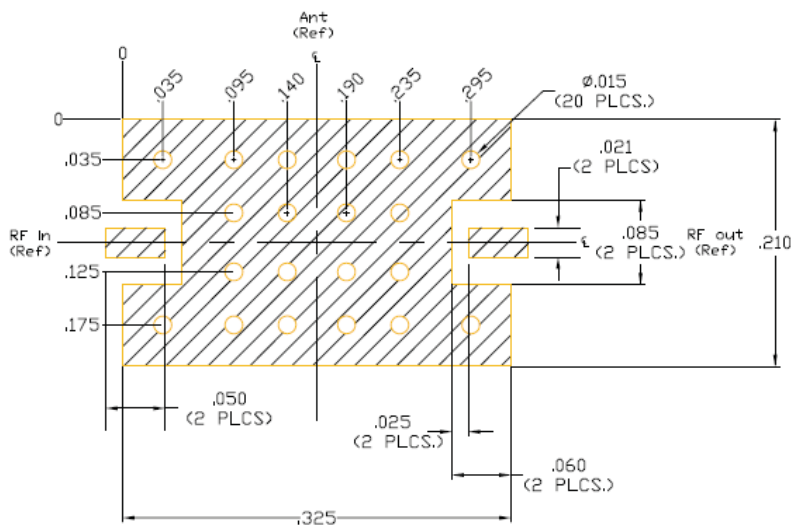
# PIN Diode Limiter

## LM200802-M-A-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  $\mu$  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.

## Aeroflex / Metelics, Inc.

54 Grenier Field Road, Londonderry, NH 03053  
Tel: (603) 641-3800  
Sales: (888) 641-SEMI (7364)  
Fax: (603)-641-3500

975 Stewart Drive, Sunnyvale, CA 94085  
Tel: (408) 737-8181  
Fax: (408) 733-7645

[www.aeroflex.com/metelics](http://www.aeroflex.com/metelics)      [metelics-sales@aeroflex.com](mailto:metelics-sales@aeroflex.com)

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