Surface Mount PIN Diode Limiters

LM202602-H-A-300 & LM202602-H-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, DC Blocks & DC Return
- High Average Power Handling than Plastic (100 W Peak Power)
- Low Insertion Loss (0.85 dB)
- Low Flat Leakage Power (19 dBm)
- RoHS Compliant

Description

The LM202602-H-A-300 and LM202602-H-C-300 are surface mount silicon PIN diode limiters manufactured using Aeroflex / Metelics proven hybrid manufacturing process incorporating PIN diodes and passive devices integrated on 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 and large signal flat leakage performance in a compact, surface mount package. The LM202602-H-A-300 has shunt PIN limiter diodes and a shunt coil with no DC blocks whereas the LM202602-H-C-300 incorporates shunt PIN limiters diodes, a shunt coil, and DC blocks.

Using PIN diodes with lower thermal resistance (< 40 °C/W), RF CW incident power levels of 36 dBm and RF peak incident power levels of 50 dBm @ 1 µs RF pulse width, 0.001 duty cycle are very achievable in broadband limiter applications. The low PIN diode series resistance (< 1.5 Ω) coupled with the low minority carrier lifetime (< 20 ns) provides low flat leakage power (less than 20 dBm) and low spike leakage energy (less than 0.1 ergs) for superior LNA protection.

Applications

The LM202602-H-A-300 and LM202602-H-C-300 limiters are ideal for 2 to 6 GHz Radar, IED, and WiMax 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. These devices are RoHS compliant and are available in tube and tape-reel.

Environmental Capabilities

The LM202602-H-A-300 and LM202602-H-C-300 limiters are capable of meeting the environmental requirements of MIL-STD-750, MIL-STD-202, and MIL-STD-883.

ESD and Moisture Sensitivity Level Rating

PIN diodes are susceptible to damage from electrostatic discharge (ESD) events, as are all semiconductor devices. The ESD rating for LM202602-H-A-300 & LM202602-H-C-300 is Class 0, HBM. The moisture sensitivity level (MSL) rating for this device is MSL1.

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LM202602-H-A-300 and LM202602-H-C-300 Electrical Specifications @ $Z_0 = 50\ \Omega$, $T_A = +25\ ^{\circ}C$ (Unless Otherwise Defined)

Parameter	Symbol	Test Conditions	Minimum Value	Typical Value	Maximum Value	Units
Frequency	F		- - -	2 to 6	- - -	GHz
Insertion loss	IL	Pinc = 0 dBm	- - -	0.85	1.1	dB
Return loss	RL	Pinc = 0 dBm.	13	14	- - -	dB
Input compression power	P1dB		7	8	10	dBm
2nd Harmonic	2Fo	Pinc = 0 dBm , F = 4 GHz	- - -	-50	-45	dBc
Peak incident power	Pinc(Pk)	RF Pulse width = 1 µs, 0.001 duty cycle	- - -	50	51	dBm
CW incident power	Pinc(CW)		- - -	35	36	dBm
Flat leakage power	Pf	+50 dBm, RF pulse width = 1 µs, 0.001 duty cycle	- - -	18	20	dBm
Spike leakage energy	Es	+50 dBm, RF pulse width = 1 µs, 0.001 duty cycle	- - -	0.1	0.2	ergs
Recovery time	Tr	50% Trailing RF pulse −1 dB IL	- - -	100	150	ns

Thermal Considerations

A proper heat sink must be supplied for high power applications, e.g. for input signals greater than 40 dBm (10 W). Aeroflex /Metelics recommends using the Aeroflex /Metelics Part # PNMN 13881 heat sink block which was developed for limiter family eval boards.

Evaluation Board Description

The LM series surface mount silicon PIN diode limiter evaluation board allows the full exercise of the limiter for small signal performance analysis, as well as for large signal operation with maximum input signal power of 45 dBm CW or peak power. The evaluation board includes the limiter module, DC blocking capacitors at each RF port.

The evaluation board comes mounted on a heat sink block.

Assembly Instructions

The LM202602-H-A-300 and LM202602-H-C300 limiter series is capable of being placed onto circuit boards with pick and place manufacturing equipment from tube, tape-reel, or waffle pack dispensing. The devices can be soldered to the circuit using conventional solder re-flow or wave soldering procedures with RoHS type or Sn 60 / Pb 40 type solders.

Table 1: Time-Temperature Profile for Sn60 / Pb40 or RoHS-Compliant Solders

Profile Feature	Sn-Pb 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 Maintauined 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	260 +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

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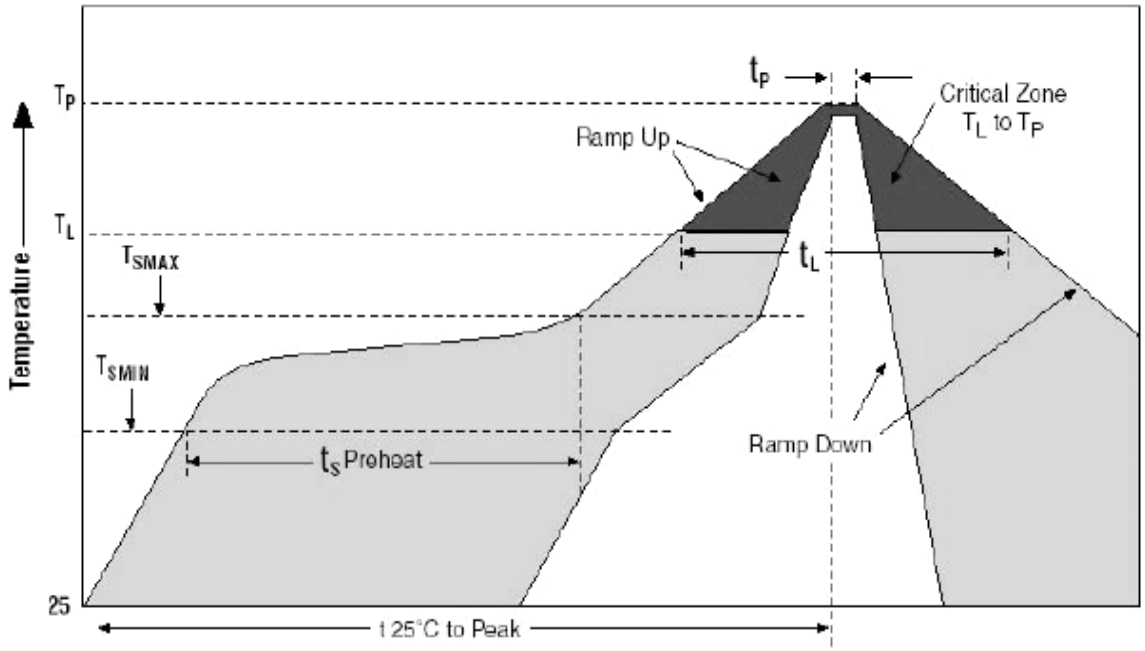
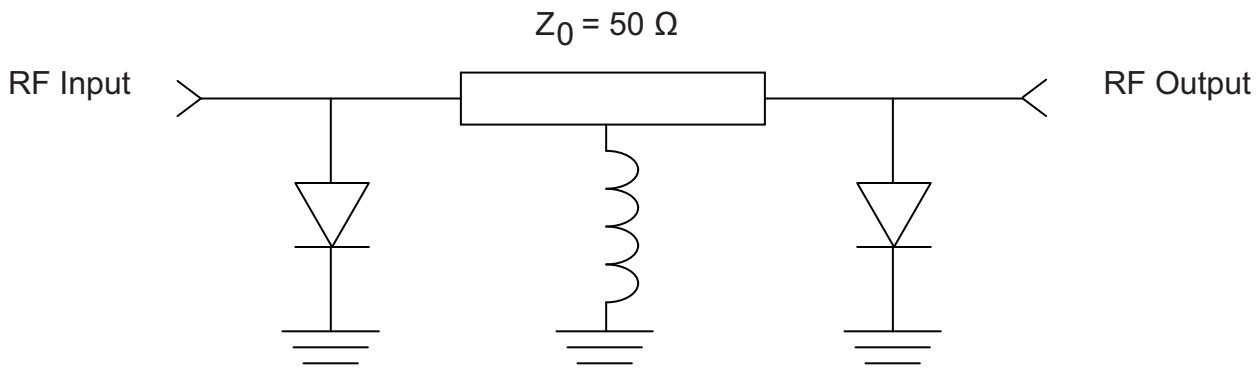
Graph1: Solder Re-Flow Time-Temperature Function



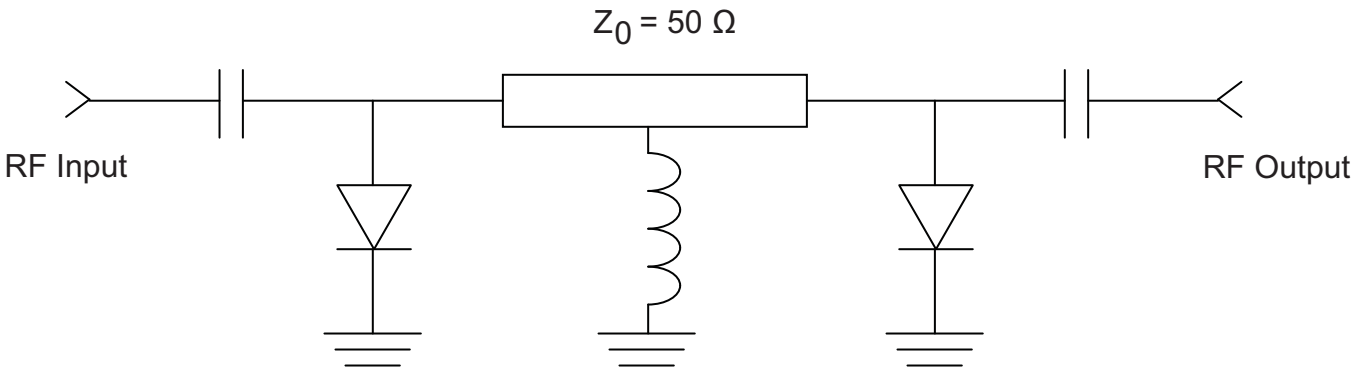
LM202602-H-A-300 & LM202602-H-C-300 Absolute Maximum Ratings

Parameter	Conditions	Absolute Maximum Value
Operating temperature		-65 ºC to +125 ºC
Storage temperature		-65 ºC to +150 ºC
Junction temperature		+175 ºC
RF CW Incident power	Source and load VSWR <1.2:1, T_{CASE} = 85 ºC	35 dBm
RF Peak. incident power	RF pulse width = 1 µs, duty cycle = 0.001, source and load VSWR <1.2:1, T_{CASE} = 85 ºC	50 dBm
Assembly temperature	t = 10 seconds	+260 ºC

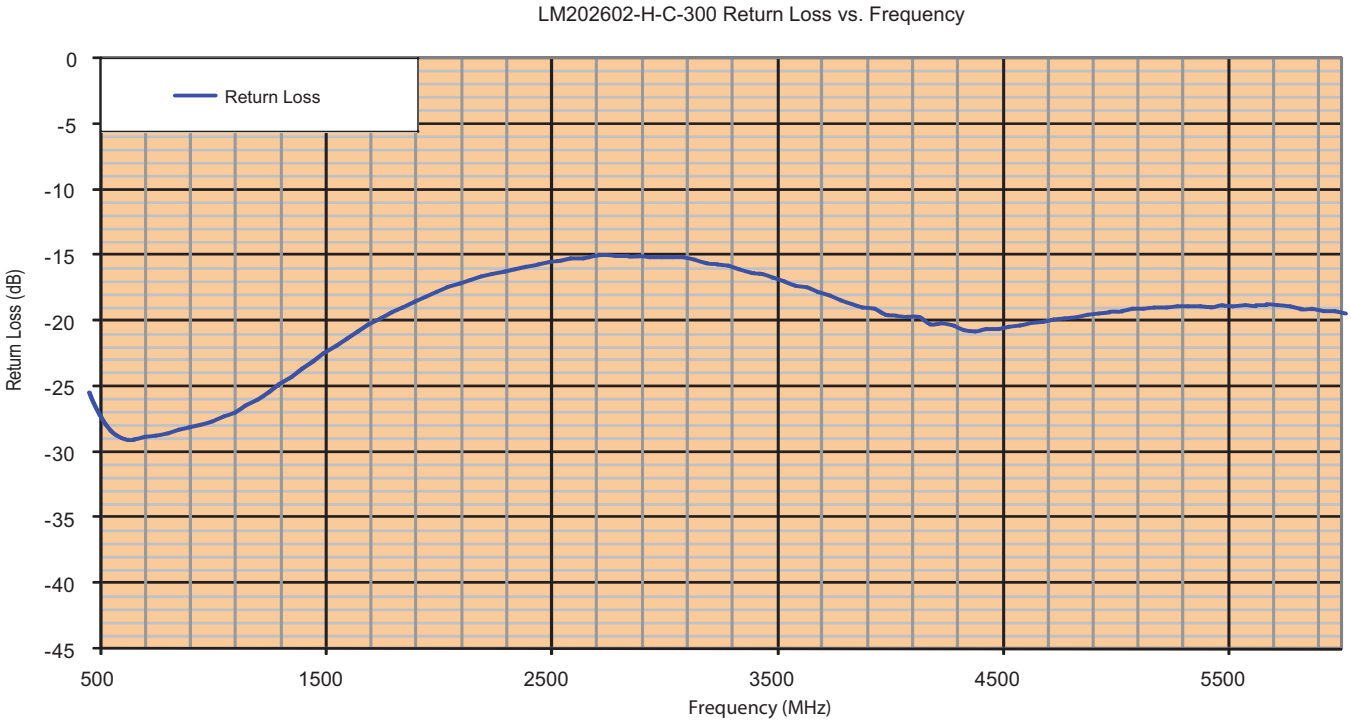
LM202602-H-A-300 Limiter Schematic

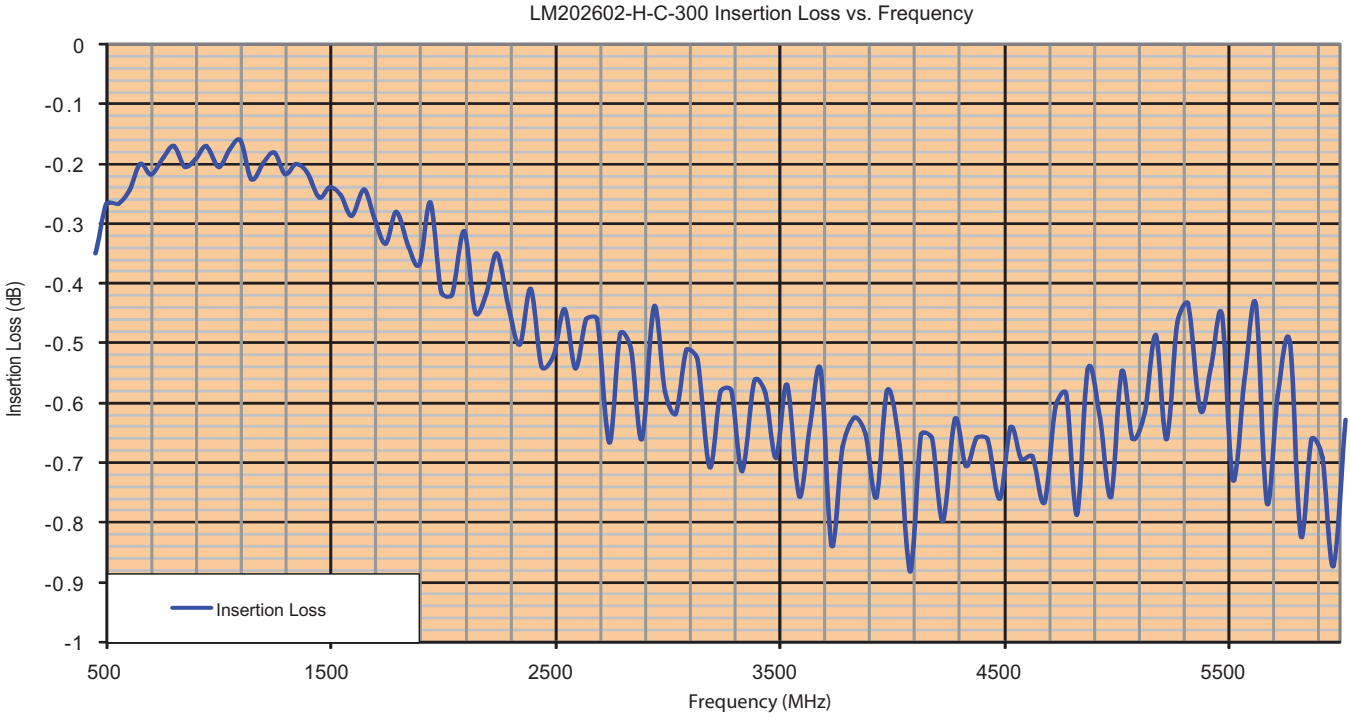


LM202602-H-C-300 Limiter Schematic

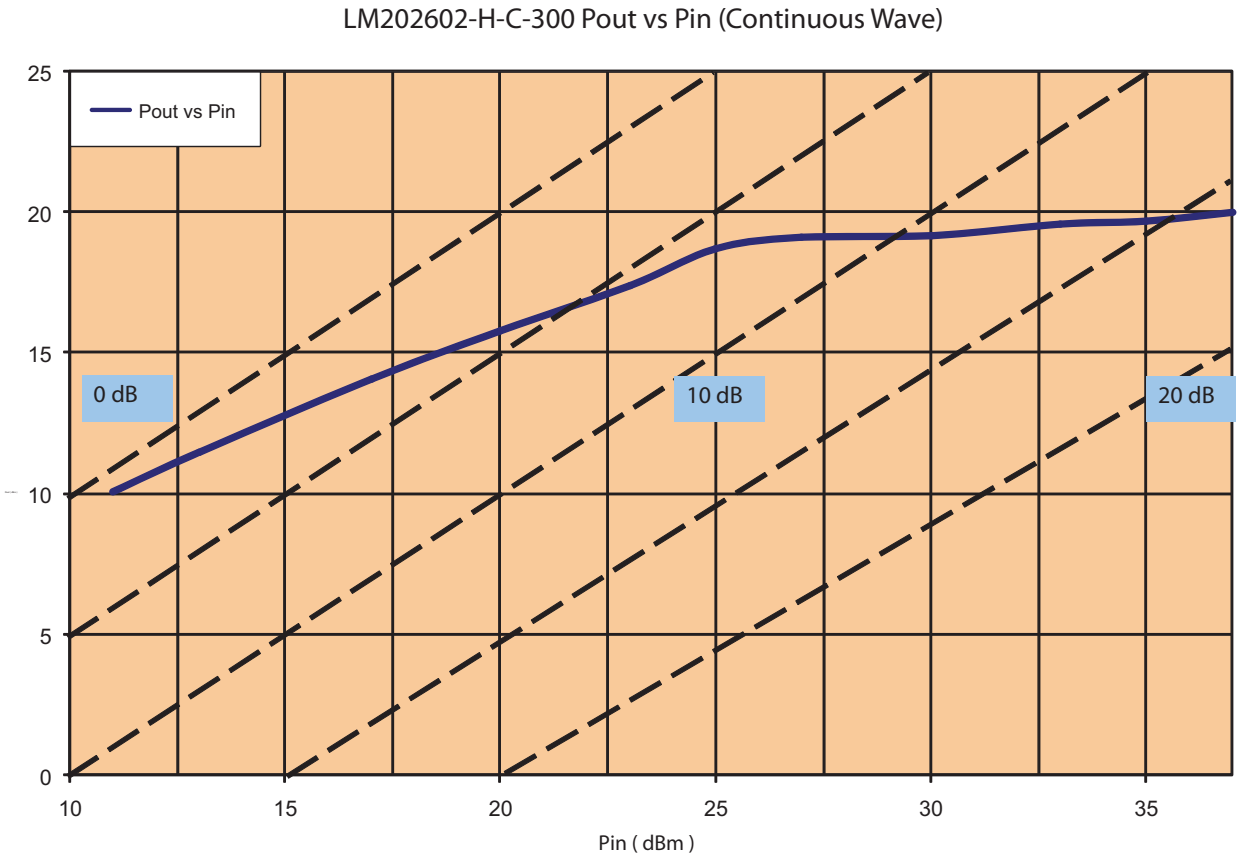


LM202602-H-C-300 Typical RF Small Signal Performance, T_{CASE} = +25 ºC, Z_0 = 50 Ω





LM202602-H-C-300 RF CW Incident Power Performance, T_{CASE} = +25 °C, Z_0 = 50 Ω



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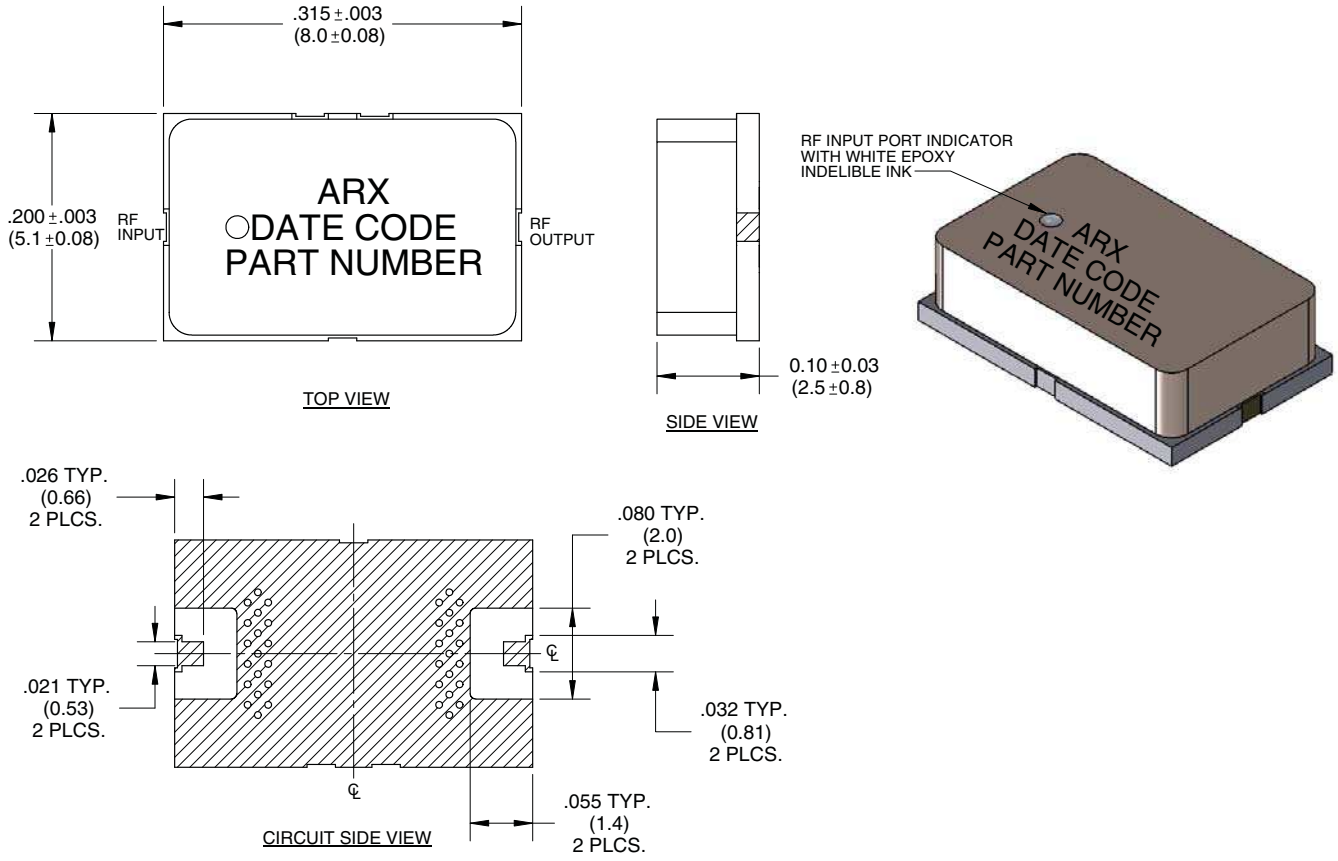
LM202602-H-A-300 and LM202602-H-C-300
Outline Drawing, Case Style 300, (CS300)



NOTES:
1. SUBSTRATE MATERIAL: 20 MIL THICK ALUMINA NITRIDE (AIN) RF COVER: BLACK CERAMIC.
2. TOP SIDE AND BACKSIDE METALLIZATION: REF: PNLB 12892.
3. DIMENSION IN PARENTHESIS ARE IN MM.

Part Number Ordering Information:

Part Number	Packaging
LM202602-H-A-300-T	Tube packaging
LM202602-H-A-300-R	Tape-reel packaging (Quantities of 250 or 500)
LM202602-H-A-300-W	Waffle packaging
LM202602-H-A-300-E	Eval board with heat sink
LM202602-H-C-300-T	Tube packaging
LM202602-H-C-300-R	Tape-reel packaging (Quantities of 250 or 500)
LM202602-H-C-300-W	Waffle packaging
LM202602-H-C-300-E	Eval board with heat sink

AEROFLEX METELICS

PIN Diode Limiters

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