Surface Mount PIN Diode Limiter

LM401102-Q-C-301 Series Datasheet

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Features

- Surface Mount Limiter in Compact Outline:
  8mm L x 5mm W x 2.5 mm H
- Incorporates PIN Limiter & Schottky Diodes, D.C. Blocks & D.C. Return
- Higher Average Power Handling than Plastic (100 W C.W. Power)
- Lower Insertion Loss (0.3 dB) & Lower Flat Leakage Power (18 dBm)
- RoHS Compliant

Description

The LM401102-Q-C-301 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.

Using PIN Diodes with lower thermal resistance (< 15 ºC/W), and a de-coupled Schottky detector network as a current source, RF C.W. incident power levels of +50 dBm and RF peak incident power levels of +63 dBm @ 25 µS RF pulse width, 10% duty cycle are very achievable. In addition, this design concept provides lower flat leakage power (< + 18 dBm) and lower spike leakage energy (< 0.4 Ergs) for superior LNA protection. The LM401102-Q-C-301 limiter can be configured without a D.C. block on the output to obtain lower flat leakage power, (< +18 dBm) with an external ZBD schottky diode. This Limiter Part Number is LM401102-Q-B-301.

Applications

These LM401102-Q-C-301 and LM401102-Q-B-301 Limiters are ideal for octave band Radar applications, from 400-1,000 MHz, 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 LM401102-Q-C-301 and LM401102-Q-B-301 Limiters are capable of meeting the environmental requirements of MIL-STD-750 and MIL-STD-202.

ESD 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.

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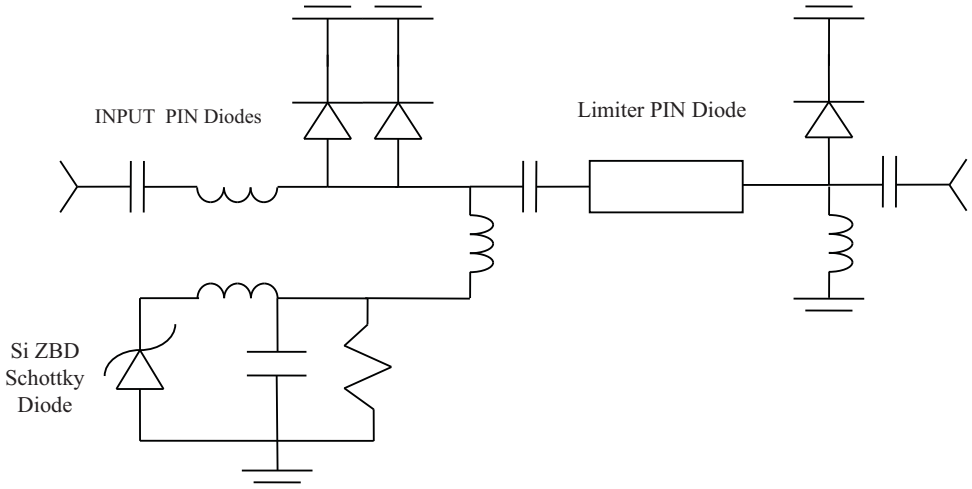
LM401102-Q-C-301 & LM401102-Q-B-301 Electrical Specifications @ Zo = 50 Ω, TA=+ 25 ºC (Unless Otherwise Defined)

Parameter	Symbol	Units	Test Conditions	Minimum Value	Typical Value	Maximum Value
Frequency	F	MHz	Swept Frequency	350	400 - 1000	1500
Insertion Loss	I_L	dB	Swept Frequency Po = 0 dBm		| -0.3 |	| -0.5 |
Return Loss	R_L	dB	Swept Frequency Po = 0 dBm	| -15 |	| -17 |	
Input Compression Power	P1dB	dBm	Swept Frequency	+8	+10	+12
2nd Harmonic	$2F_o$	dBc	Po = 0 dBm Fo = 2 GHz	45	50	
Peak Incident Power	P_{inc}(Pk)	dBm	RF Pulse Width = 1µS, 0.001 duty		+60	+60
C.W. Incident Power	P_{inc}(CW)	dBm	Swept Frequency		+50	+51
Flat Leakage Power	P_f	dBm	+50 dBm, RF Pulse Width = 1µS, 0.001 duty		+18	+21
Spike Leakage Energy	E_s	Ergs	+50 dBm, RF Pulse Width = 1µS, 0.001 duty		0.4	0.5
Recovery Time	T_r	ηS	(50% Trailing RF Pulse – 1dB IL) + 50 dBm, RF Pulse Width = 1µS, 0.001 duty		5	10

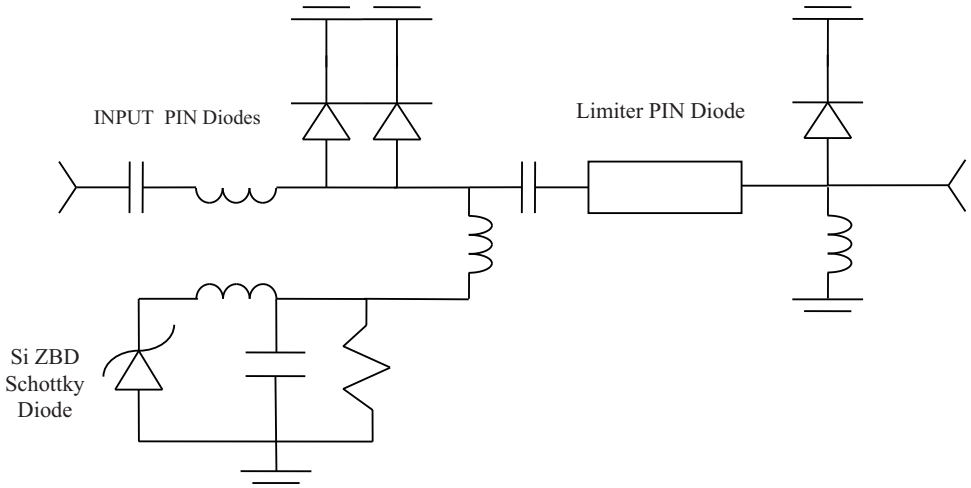
Absolute Maximum Ratings @ T_A = + 25 ºC (Unless Otherwise Defined)

Parameter	Absolute Maximum Value
Operating Temperature	-65 ºC to +125 ºC
Storage Temperature	-65 ºC to +150 ºC
Junction Temperature	+175 ºC
RF C.W. Incident Power @ +85 ºC Source & Load VSWR < 1.2:1	+50 dBm
RF Peak. Incident Power @ +85 ºC Source & Load VSWR < 1.2:1	+63 dBm, RF Pulse Width = 25 µS, 5% duty cycle +60 dBm, RF Pulse Width = 50µS, 1% duty cycle
Insertion Loss Rate of Change with Operating Temperature	| - 0.0025 dB / º C |
θjc C.W. Thermal Resistance (Junction to Case)	8 º C/W
Assembly Temperature	+260 ºC for 10 Seconds

LM401102-Q-C-301 Limiter Schematic



LM401102-Q-B-301 Limiter Schematic



Part Number Ordering Information:

Part Number	DC Blocking Configuration	Description
LM401102-Q-C-301-T	D.C. Blocks on Input & Output	Tube Packaging
LM401102-Q-C-301-R	D.C. Blocks on Input & Output	Tape-Reel Packaging
LM401102-Q-C-301-E	D.C. Blocks on Input & Output	RF Evaluation Board
LM401102-Q-B-301-T	D.C. Block on Input Only	Tube Packaging
LM401102-Q-B-301-R	D.C. Block on Input Only	Tape-Reel Packaging
LM401102-Q-B-301-E	D.C. Block on Input Only	RF Evaluation Board

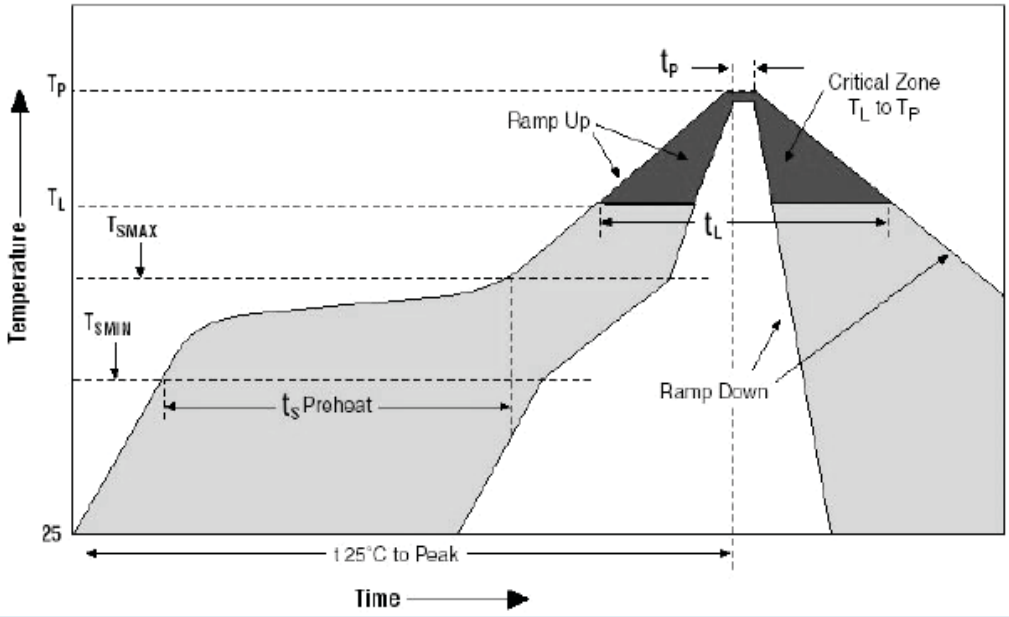
Assembly Instructions

TheLM401102-Q-C-301 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.

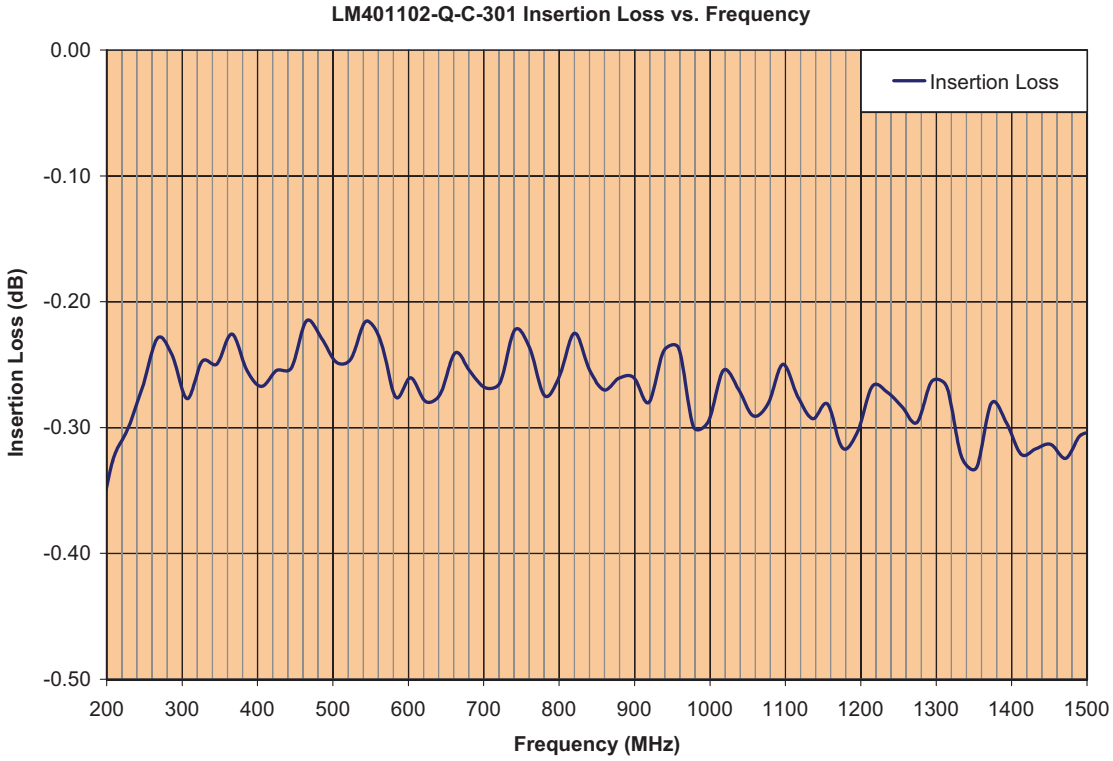
Table 1: Time-Temperature Profile for Sn 60/Pb40 or RoHS Type Solders

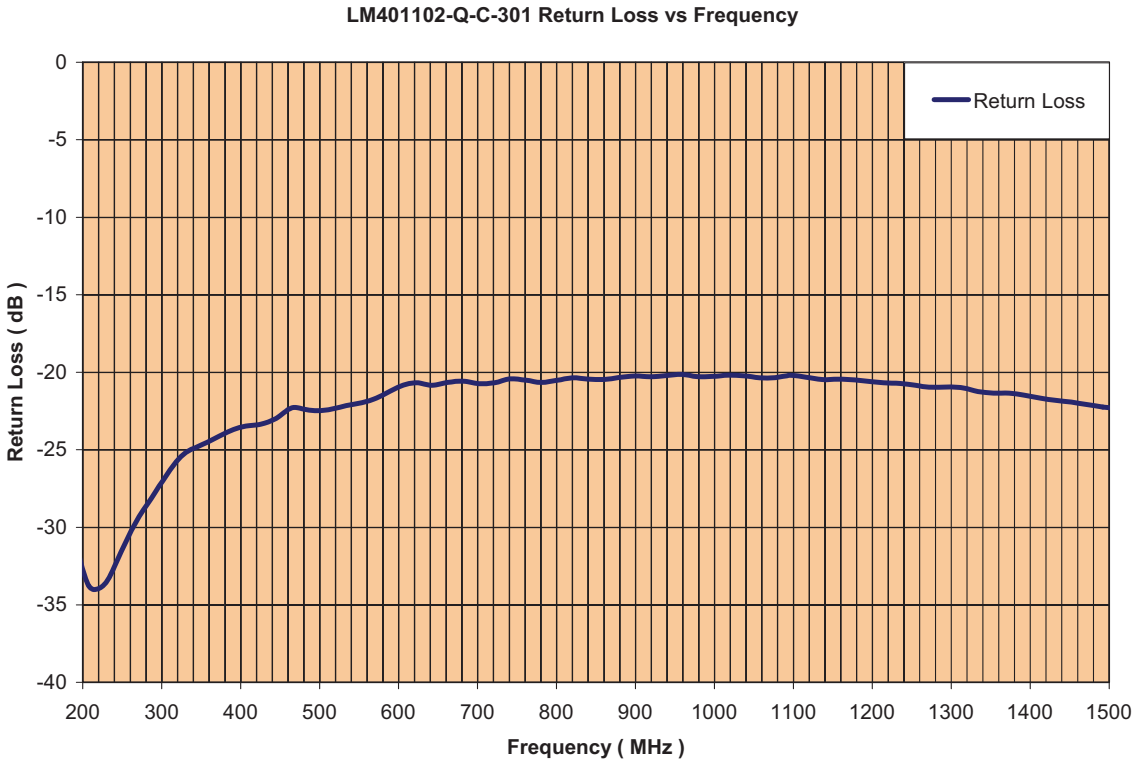
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	3°C/second maximum	3°C/second maximum
Preheat - Temperature Minimum (T_{SMIN}) - Temperature Maximum (T_{SMAX}) - Time (Minimum to maximum) (t_S)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
T_{SMAX} to T_L - Ramp-up Rate		 3°C/second maximum
Time 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	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

Graph1: Solder Re-Flow Time-Temperature Function



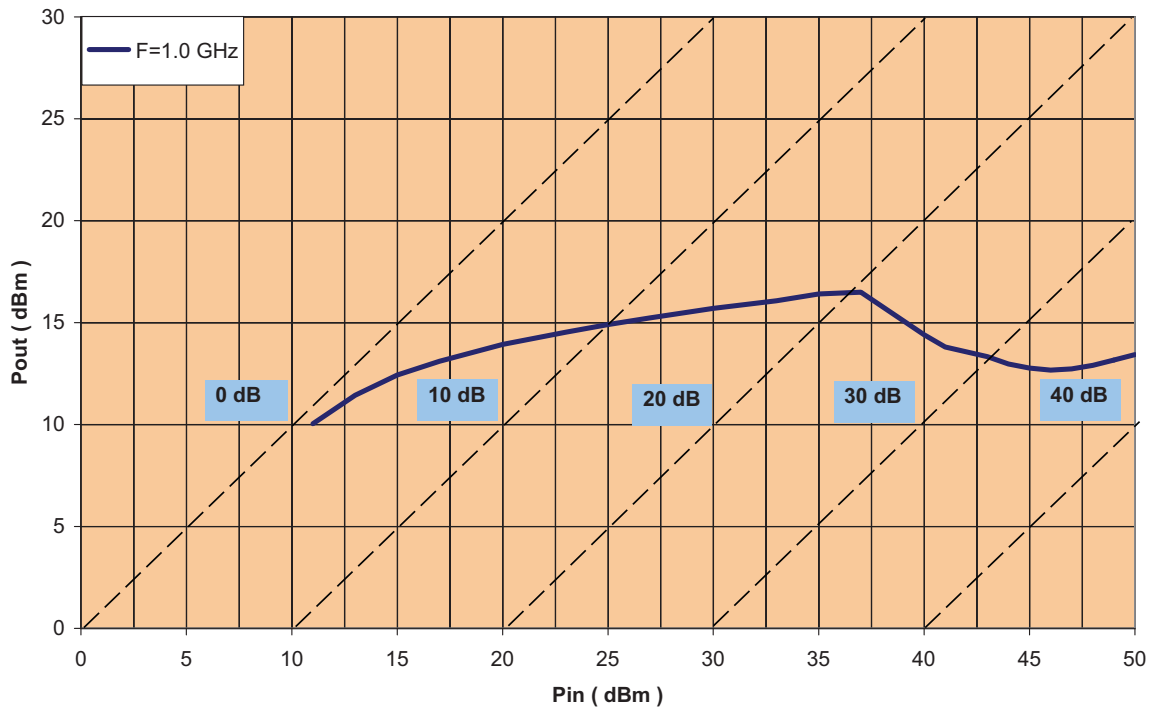
LM401102-Q-C-301 Typical RF Small Signal Performance @ +25 ºC



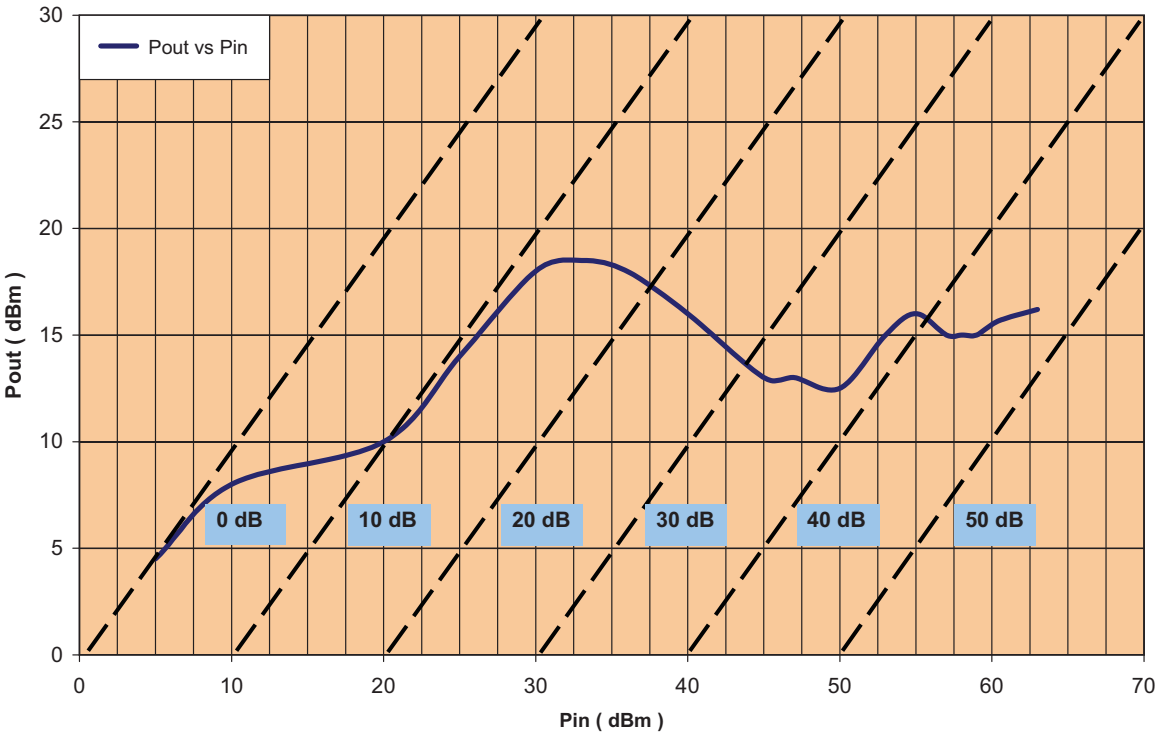


LM401102-Q-C-301 High Signal Parametric Data

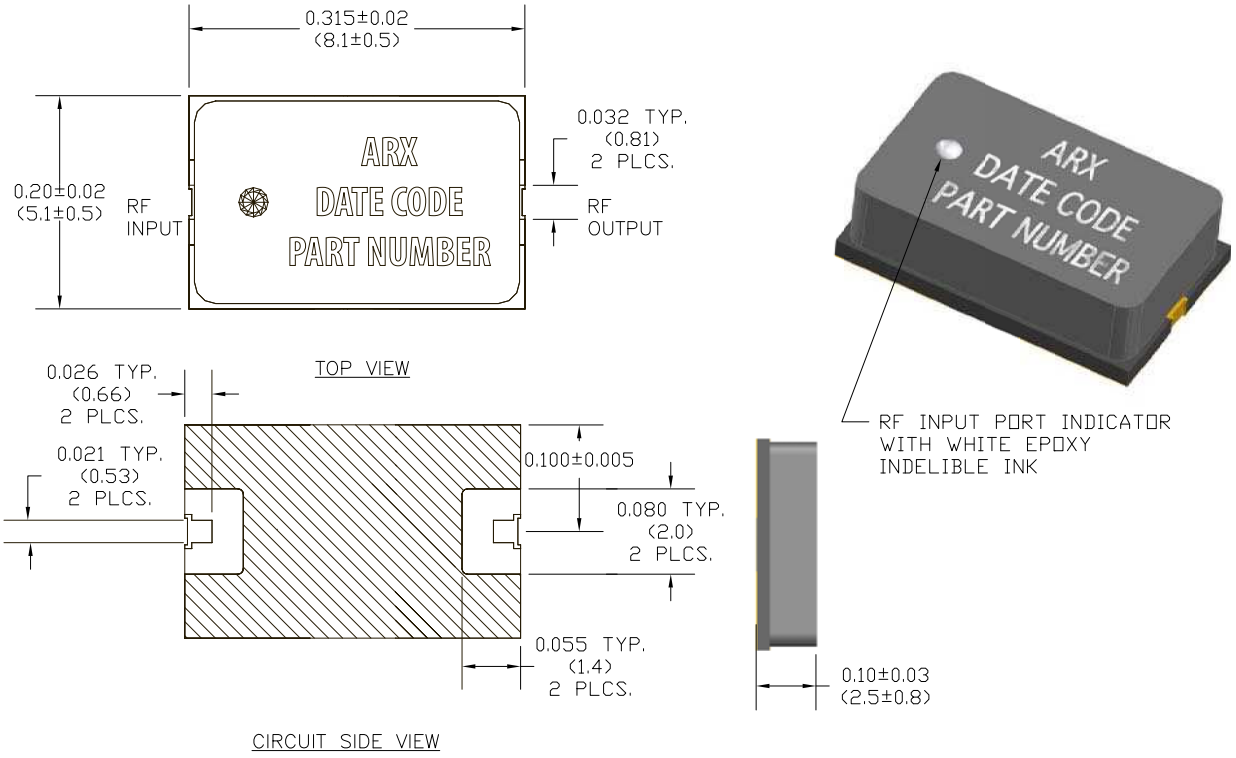
LM401102-Q-C-301 Pout vs Pin C.W. Performance



LM401102-Q-C-301 Peak Power Function (F = 1.0 GHz, RF Pulse Width = 25 uS, Duty = 1 %)

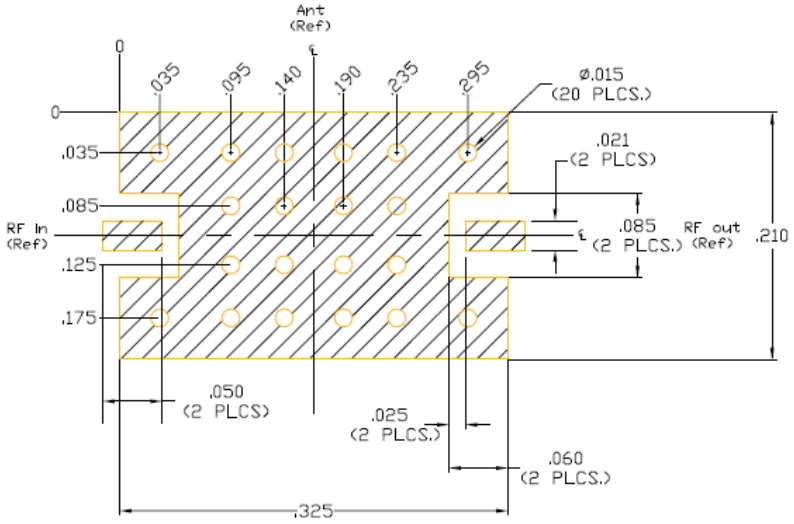


LM401102-Q-C-301 Outline Drawing, Case Style 301, (CS301)



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

RF Circuit Solder Footprint for Case Style 301 (CS 301)



NOTES:
1. 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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