



RFLM-052402QC-290

Quasi Active 2KW PIN Diode Limiter Module - SMT

Features:

- Frequency Range: 500 MHz to 4.0 GHz
- Peak Power Handling: +63 dBm
- Average Power Handling: +53 dBm
- Low Insertion Loss: 0.5 dB
- Return Loss: 15 dB
- Low Flat Leakage Power: 17dBm
- Low Spike Energy Leakage: 0.5 ergs
- Surface Mount Limiter Module : 8mm x 5mm x 2.5mm
- DC Blocking Capacitors
- “Always On Protection”
 - - No external control lines or power supply required
- RoHS Compliant

Description:

The RFLM-052402QC-290 SMT Silicon PIN Diode Limiter Modules offers “Always On” High Power CW and Peak protection in the 500 MHz to 4.0 GHz frequency region. This Limiter Module is based on proven hybrid assembly technique utilized extensively in high reliability, mission critical applications. The RFLM-052402QC-290 offers excellent thermal characteristics in a compact, low profile 8mm x 5mm x 2.5mm package. It is designed for optimal small signal insertion loss permitting extremely low receiver noise figure while simultaneously offering very low Flat Leakage under high power conditions thereby offering excellent receiver protection across the 500 MHz to 4.0 GHz frequency range.

The RFLM-052402QC-290 Limiter Module provide outstanding passive receiver protection (Always on) which protects against High Average Power up to +53 dBm (CW), High Peak Power up to +63 dBm pulsed mode, while maintaining low Flat Leakage to less than 17dBm (typ), and reduces Spike Leakage to less than 0.5 ergs (typ).

ESD and Moisture Sensitivity Rating

The RFLM-052402QC-290 Limiter Module carries a Class 0 ESD rating (HBM) and an MSL 1 moisture rating.

Thermal Management Features

The proprietary design methodology minimizes the thermal resistance from the PIN Diode junction to base plate (R_{THJ-A}). The two stage limiter design employs a two stage detector circuit which enables ultra-fast turn on of the

High Power PIN Diodes. This circuit topology coupled with the thermal characteristic of the substrate design enables the Limiter Module to reliably handling High Input RF Power up to +53 dBm(CW) and RF Peak Power levels up to +63 dBm (25 usec pulse width @ 5.0% duty cycle) with base plate temperature at +85°C. The RFLM-052402QC-290 based substrate has been design to offer superior long term reliability in the customer's application by utilizing ultra-thin Au plating to combat Au embrittlement concerns.

Absolute Maximum Ratings

@ $Z_0=50\Omega$, $T_A= +25^\circ\text{C}$ as measured on the base ground surface of the device.

| Parameter | Conditions | Absolute Maximum Value |
|---|---|------------------------|
| Operating Temperature | | -65°C to 125°C |
| Storage Temperature | | -65°C to 150°C |
| Junction Temperature | | 175°C |
| Assembly Temperature | T = 30 seconds | 260°C |
| RF Peak Incident Power | $T_{\text{CASE}}= +85^\circ\text{C}$, source and load VSWR < 1.2:1, RF Pulse width = 25 usec, duty cycle = 5%, derated linearly to 0 W at $T_{\text{CASE}}=150^\circ\text{C}$ (note 1) | 63 dBm |
| RF CW Incident Power | $T_{\text{CASE}}= +85^\circ\text{C}$, source and load VSWR < 1.2:1, derated linearly to 0 W at $T_{\text{CASE}}=150^\circ\text{C}$ (note 1) | 53 dBm |
| RF Input & Output DC Block Capacitor Voltage Breakdown | | 100 V DC |

Note 1: T_{CASE} is defined as the temperature of the bottom ground surface of the device.

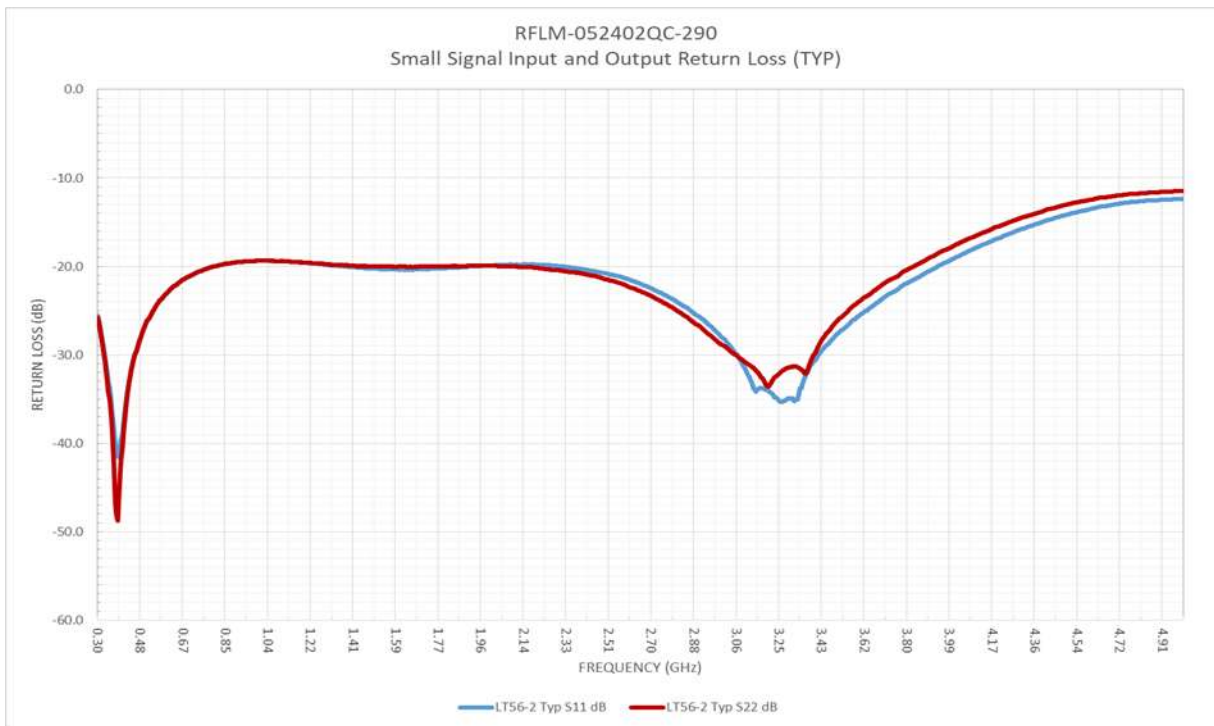
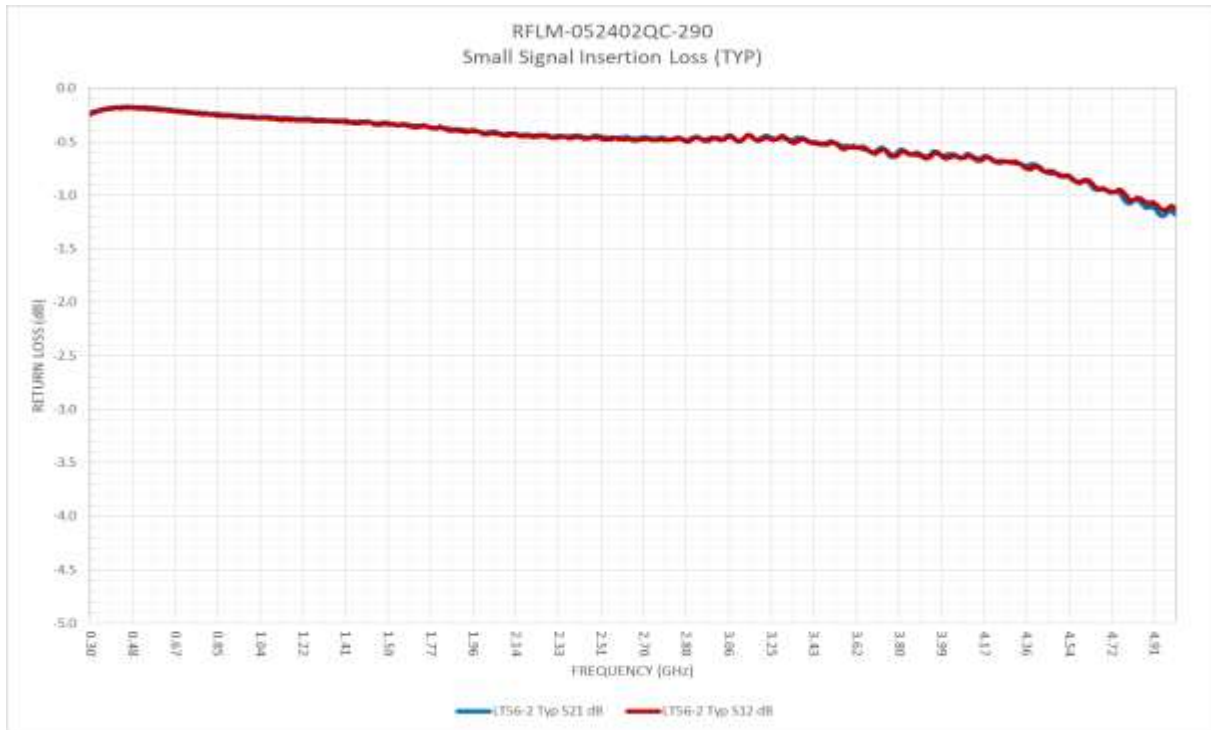
RFLM-052402QC-290 Electrical Specifications

@ $Z_0=50\Omega$, $T_A=+25^\circ\text{C}$ as measured on the base ground surface of the device.

| Parameters | Symbol | Test Conditions | Min Value | Typ Value | Max Value | Units |
|--|--------------------------|--|-----------|-----------|-----------|----------------------|
| Frequency | F | $500\text{ MHz} \leq F \leq 4\text{ GHz}$ | 0.5 | | 4.0 | GHz |
| Insertion Loss | IL | $500\text{ MHz} \leq F \leq 4\text{ GHz}$, $P_{in} = -20\text{dBm}$ | | | 0.5 | dB |
| Insertion Loss Rate of Change vs Operating Temperature | ΔIL | $500\text{ MHz} \leq F \leq 4\text{ GHz}$, $P_{in} \leq -20\text{ dBm}$ | | 0.005 | | dB/ $^\circ\text{C}$ |
| Return Loss | RL | $500\text{ MHz} \leq F \leq 4\text{ GHz}$, $P_{in} = -20\text{dBm}$ | 15 | | | dB |
| Input 1 dB Compression Point | $\text{IP}_{1\text{dB}}$ | $500\text{ MHz} \leq F \leq 4\text{ GHz}$ | | 10 | | dBm |
| 2 nd Harmonic | $2F_o$ | $P_{in} = -20\text{ dBm}$, $F_o = 2.0\text{ GHz}$ | | -40 | | dBc |
| Peak Incident Power | $P_{inc(PK)}$ | RF Pulse = 25 usec, duty cycle = 5%, $t_{rise} \leq 3\mu\text{s}$, $t_{fall} \leq 3\mu\text{sec}$ | | | 63 | dBm |
| CW Incident Power | $P_{inc(CW)}$ | $500\text{ MHz} \leq F \leq 4\text{ GHz}$ | | | 53 | dBm |
| Flat Leakage | FL | $P_{in} = +63\text{ dBm}$, RF Pulse Width = 25 us, Duty Cycle = 5%, $t_{rise} \leq 3\text{ us}$, $t_{fall} \leq 3\text{ us}$ | | | 17 | dBm |
| Spike Leakage | SL | $P_{in} = +63\text{ dBm}$, RF Pulse Width = 25 us, Duty Cycle = 5% | | | 0.5 | erg |
| Recovery Time | T_R | 50% falling edge of RF Pulse to 1 dB IL, $P_{in} = +63\text{ dBm}$ peak, RF PW = 25 us, Duty Cycle = 5%, $t_{rise} \leq 3\mu\text{s}$, $t_{fall} \leq 3\mu\text{sec}$ | | | 1.5 | usec |

RFLM-052402QC-290 Typical Performance

$Z_0 = 50\Omega$, $T_{CASE} = 25^\circ\text{C}$, $PIN = -20\text{dBm}$ as measured on the Ground Plane of the device.

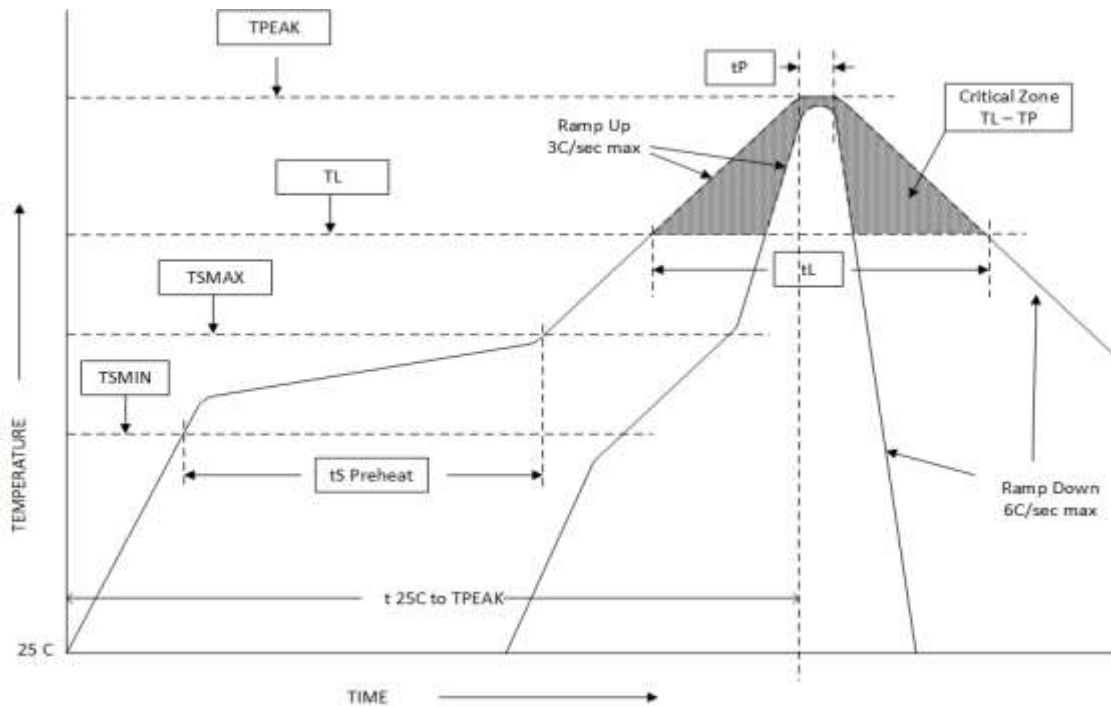


Assembly Instructions

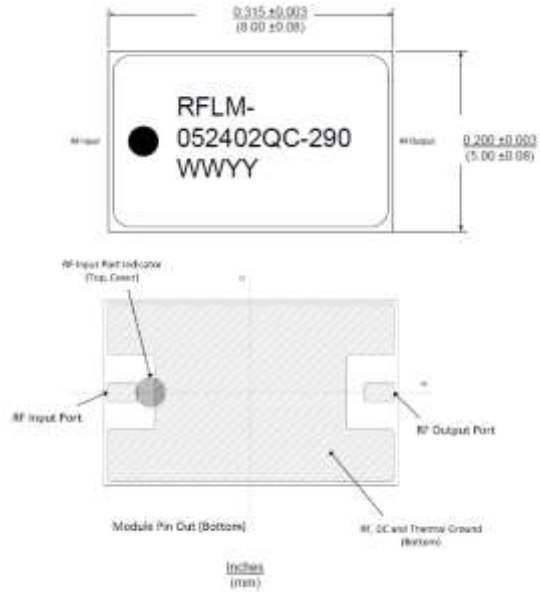
The RFLM-052402QC-290 may be attached to the printed circuit card using solder reflow procedures using either RoHS or Sn63/ Pb37 type solders per the Table and Temperature Profile Graph shown below:

| Profile Parameter | Sn-Pb Assembly Technique | RoHS Assembly Technique |
|--|--------------------------|-------------------------|
| Average ramp-up rate (T _L to T _P) | 3°C/sec (max) | 3°C/sec (max) |
| Preheat | | |
| Temp Min (T _{smin}) | 100°C | 100°C |
| Temp Max (T _{smax}) | 150°C | 150°C |
| Time (min to max) (t _s) | 60 – 120 sec | 60 – 180 sec |
| T _{smax} to T _L | | |
| Ramp up Rate | | 3°C/sec (max) |
| Peak Temp (T _P) | 225°C +0°C / -5°C | 260°C +0°C / -5°C |
| Time within 5°C of Actual Peak Temp (T _P) | 10 to 30 sec | 20 to 40 sec |
| Time Maintained Above: | | |
| Temp (T _L) | 183°C | 217°C |
| Time (t _L) | 60 to 150 sec | 60 to 150 sec |
| Ramp Down Rate | 6°C/sec (max) | 6°C/sec (max) |
| Time 25°C to T _P | 6 minutes (max) | 8 minutes (max) |

Solder Re-Flow Time-Temperature Profile



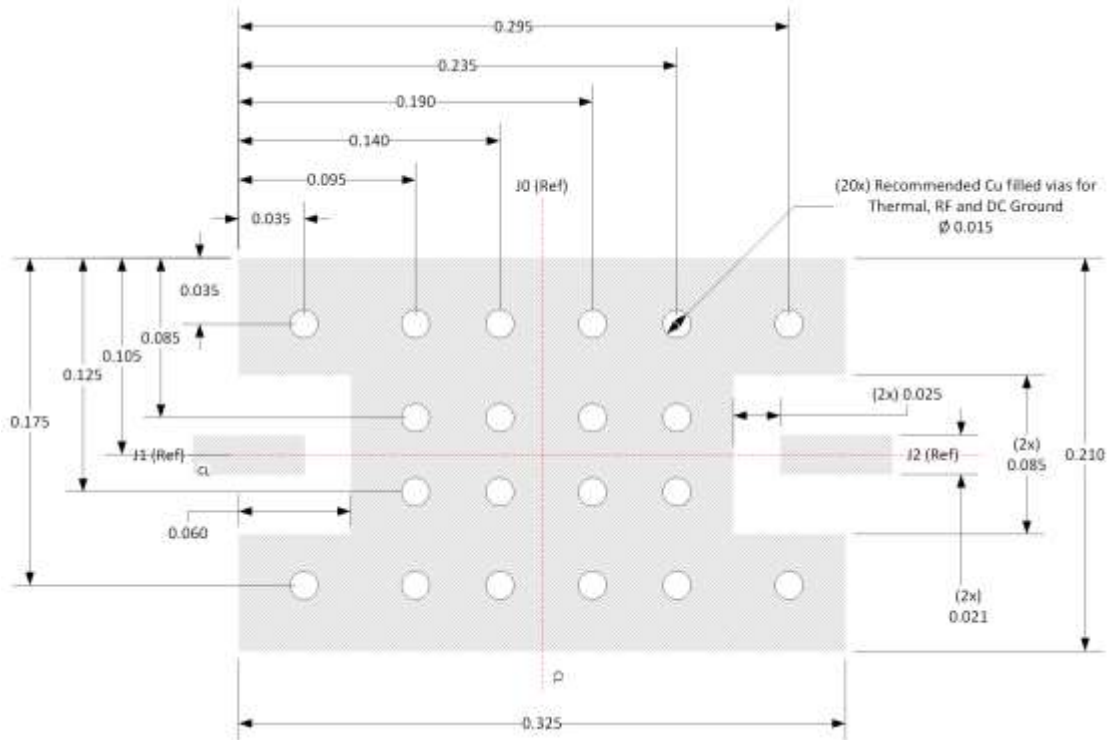
RFLM-052402QC-290 Limiter Module Package Outline Drawing



Notes:

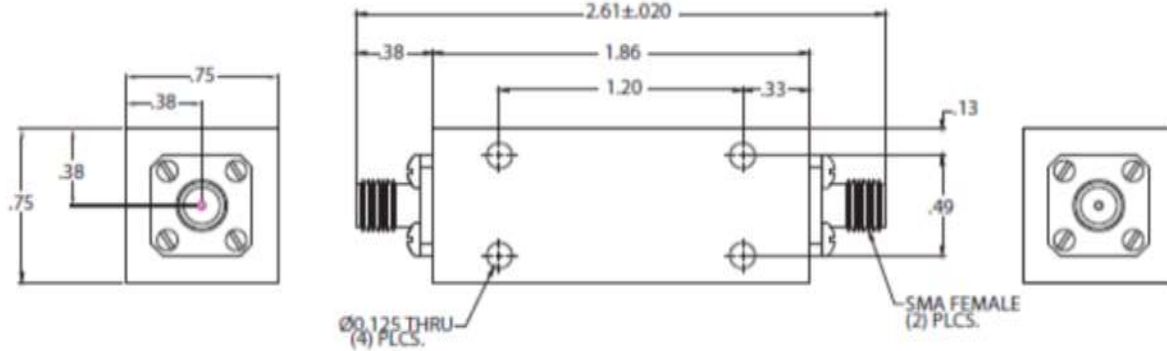
- 1) Metalized area on backside is the RF, DC and Thermal ground. In user's end application this surface temperature must be managed to meet the power handling requirements.
- 2) Back side metallization is thin Au termination plating to combat Au embrittlement (Au plated over Cu).
- 3) Unit = mils

Recommended RF Circuit Solder Footprint for the RFLM-052402QC-290



Connectorized Package Option

The RFLM-052402QC-290 High Power Limiter is available in a Connectorized Package with two female SMA connectors (input & output) and is denoted by the “C” suffix: RFLM-052402QC-290C. The packaged outline drawing is shown below:



Part Number Ordering Detail:

The RFLM-052402QC-290 Limiter Module is available in the following shipping formats:

| Part Number | Description | Packaging |
|--------------------------|---|-----------|
| RFLM-052402QC-290 | 500 MHz to 4.0 GHz Limiter with Input & Output DC Blocking Caps | Gel-Pack |
| RFLM-052402QC-290 SS EVB | RFLM-052402QC-290 Small Signal Evaluation Board | Box |
| RFLM-052402QC-290 HP EVB | RFLM-052402QC-290 High Power Evaluation Board | Box |
| RFLM-052402QC-290C | SMA Connectorized RFLM-052402QC-290 with Female-Female | Box |