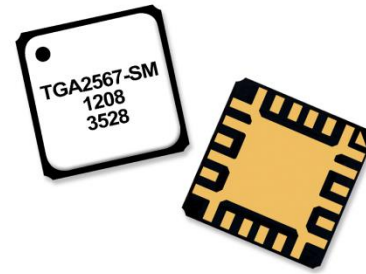


Product Description

Qorvo’s TGA2567-SM is a LNA Gain Block fabricated on Qorvo’s proven 0.15um pHEMT production process.

The TGA2567-SM operates from 2 to 20 GHz and typically provides 19 dBm of 1dB compressed output power with 17 dB of small signal gain. Greater than 16 dB of adjustable gain can be achieved by varying V_{G2} . The Noise Figure is typically 2 dB at mid band.

The TGA2567-SM is available in a low-cost, surface mount 24 lead 4x4 AIN QFN package base with an Air cavity LCP lid. TGA2567-SM is ideally suited to support both commercial and defense related applications.

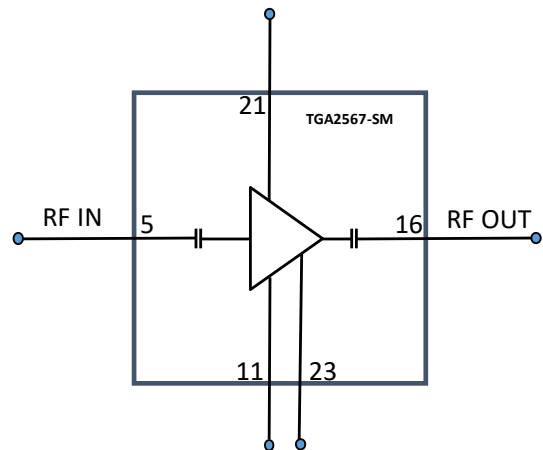


QFN 4x4 mm 24L

Product Features

- Frequency Range: 2 – 20 GHz
- P_{SAT} : 22 dBm
- P_{1dB} : 19 dBm
- Small Signal Gain: 17 dB
- Adjustable Gain Range (using V_{G2})
- Noise Figure: 2 dB
- OIP3: 29 dBm
- Bias: $V_D = 5 V$, $I_D = 100 mA$, $V_{G1} = -0.7 V$ typical, $V_{G2} = +1.3 V$
- ESD Protection Circuitry on V_D , V_{G1} and V_{G2}
- Package dimensions: 4.00 x 4.00 x 1.42 mm

Functional Block Diagram



Applications

- General Purpose LNA/Gain Block
- Point to Point Radio
- Electronic Warfare
- Military & Commercial Radar
- Communications

Ordering Information

| Part No. | Description |
|---------------|------------------------------------|
| TGA2567-SM | 2 – 20 GHz LNA / Gain Block |
| TGA2567-SMEVB | TGA2567-SM Evaluation Board, Qty 1 |

Absolute Maximum Ratings

| Parameter | Min Value | Max Value | Units |
|--|-----------|-----------|-------|
| Drain Voltage (V_D) | - | 6 | V |
| Drain to Gate Voltage (V_D-V_{G1}) | - | 8 | V |
| Gate Voltage Range (V_{G1}) | -2 | 1 | V |
| Gate Voltage Range (V_{G2}) | -2 | 4 | V |
| Drain Current (I_D) | - | 160 | mA |
| Gate Current Range (I_{G1}, I_{G2}) | -1 | 40 | mA |
| Power Dissipation (P_{DISS}) | - | 2.8 | W |
| RF Input Power, CW, 50 Ω , T =25 °C | - | 22 | dBm |
| Channel Temperature (T_{CH}) | - | 200 | °C |
| Mounting Temperature (30 Seconds) | - | 260 | °C |
| Storage Temperature | -55 | 150 | °C |

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

Recommended Operating Conditions

| Parameter | Value / Range | Units |
|---|---------------|-------|
| Drain Voltage (V_D) | 5 | V |
| Drain Current (I_{DQ}) | 100 | mA |
| Gate Voltage (V_{G1}), typical, can be adjusted to get I_{DQ} | -0.7 | V |
| Gate Voltage (V_{G2}), can be adjusted for gain control | +1.3 | V |
| Operating Temperature Range (T_{BASE}) | -40 to 85 | °C |

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications

| Parameter | Min | Typ | Max | Units |
|--|-----|--------|-----|-------|
| Operational Frequency Range | 2 | - | 20 | GHz |
| Small Signal Gain | - | 17 | - | dB |
| Input Return Loss | - | 15 | - | dB |
| Output Return Loss | - | 14 | - | dB |
| Noise Figure: 2 GHz | - | 2.8 | - | dB |
| Output TOI | - | 29 | - | dBm |
| Output Power (Saturation; $P_{IN} = 10$ dBm) | - | 22 | - | dBm |
| Output Power (1 dB Compression) | - | 19 | - | dBm |
| Small Signal Gain Temperature Coefficient | - | -0.013 | - | dB/°C |
| Noise Figure Temperature Coefficient | - | 0.009 | - | dB/°C |

Test conditions unless otherwise noted: 25 °C, $V_D = +5$ V, $I_{DQ} = 100$ mA, $V_{G1} = -0.7$ V Typical, $V_{G2} = 1.3$ V
Data are de-embedded to package.

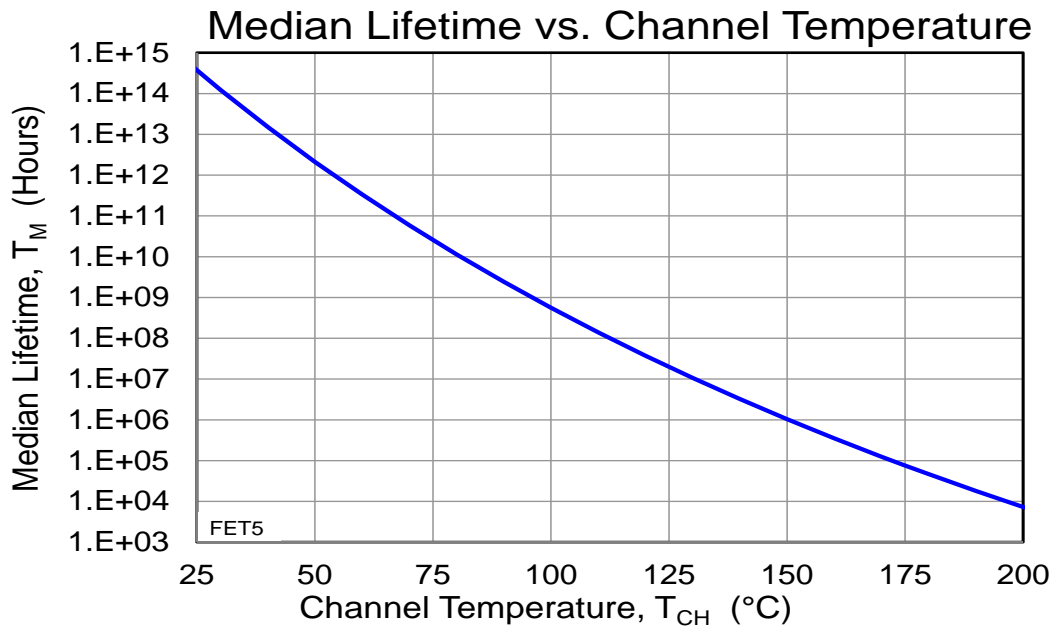
Thermal and Reliability Information

| Parameter | Test Conditions | Value | Units |
|--|---|-------------------|-------|
| Thermal Resistance, θ_{JC} (1) | Tbaseplate = 85 °C | 41 | °C/W |
| Channel Temperature, T_{CH} (Without RF Drive) | Tbaseplate = 85 °C, $V_D = 5$ V, $I_{DQ} = 100$ mA, $P_{DISS} = 0.5$ W | 106 | °C |
| Median Lifetime, T_M (Without RF Drive) | | 2.4×10^8 | Hrs |
| Channel Temperature, T_{CH} (Under RF Drive) | Tbaseplate = 85 °C, $V_D = 5$ V, $I_{DD} = 156$ mA, $P_{OUT} = 22.8$ dBm, $P_{DISS} = 0.59$ W | 109 | °C |
| Median Lifetime, T_M (Under RF Drive) | | 1.6×10^8 | Hrs |

Notes: (1) Thermal resistance measured to back of package.

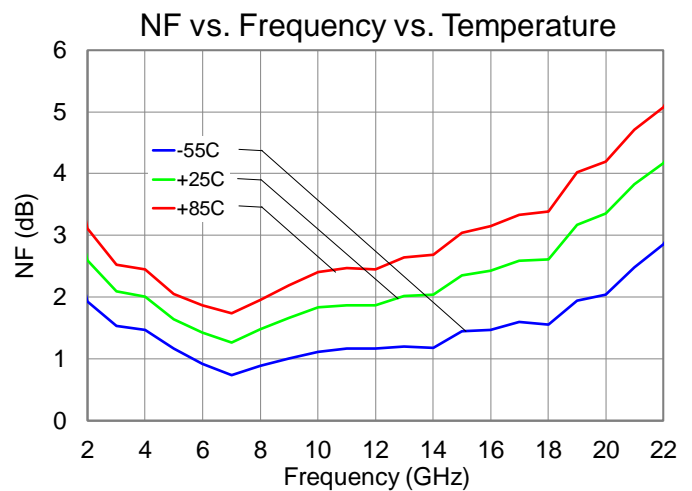
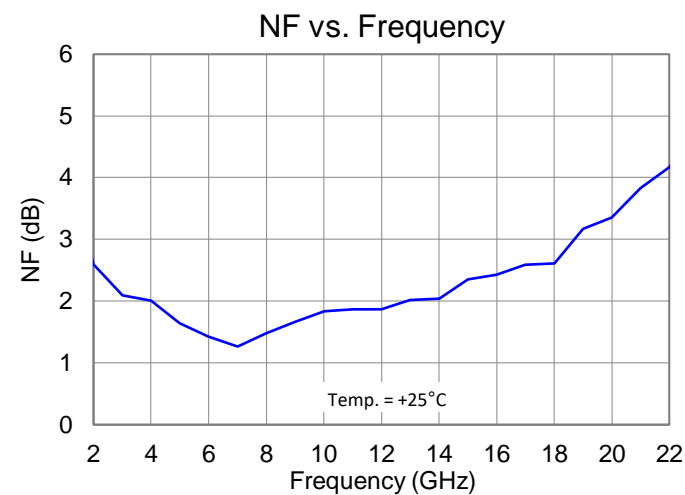
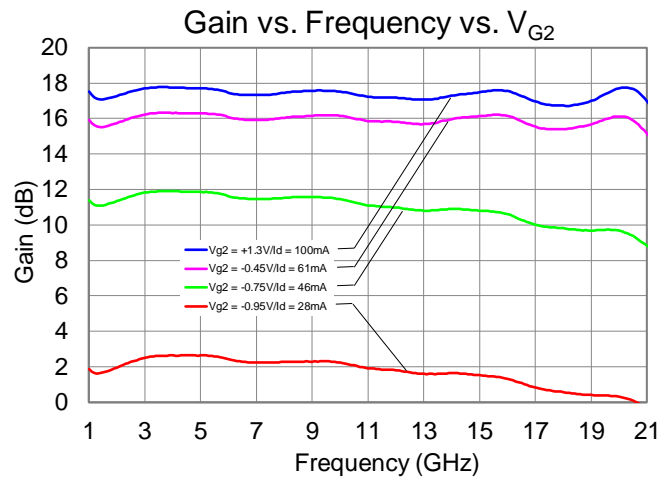
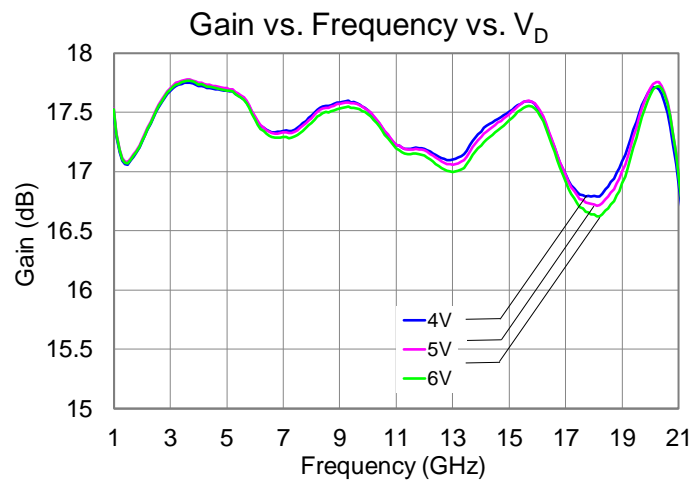
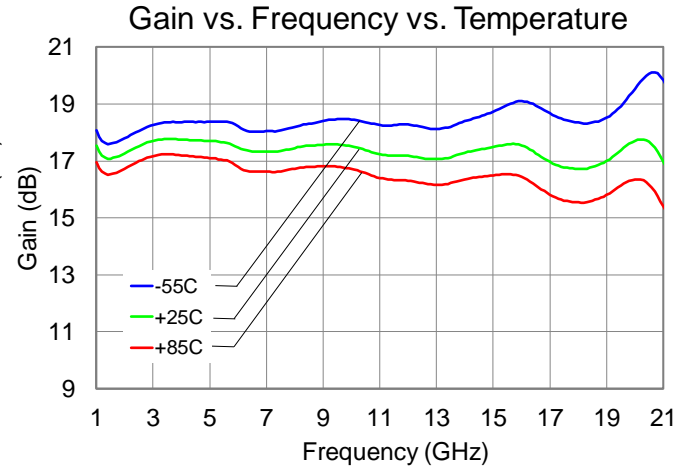
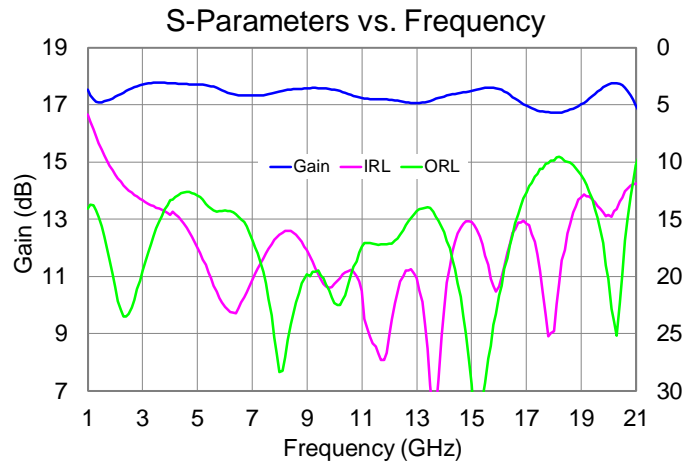
Median Lifetime

Test Conditions: $V_D = 6$ V; Failure Criteria = 10 % reduction in ID_MAX during DC Testing



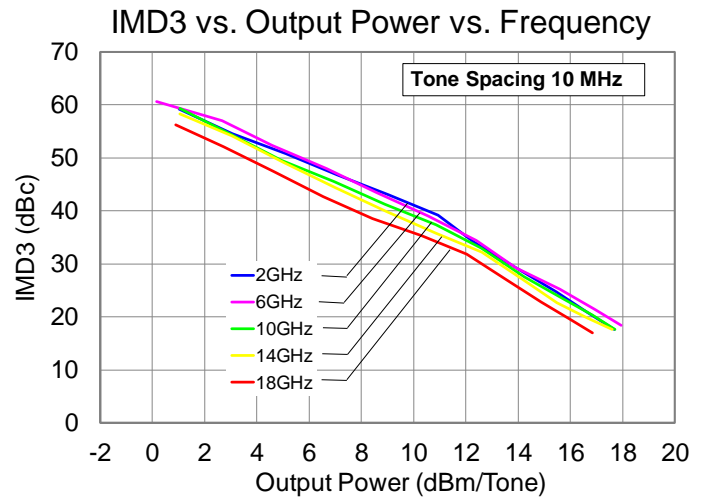
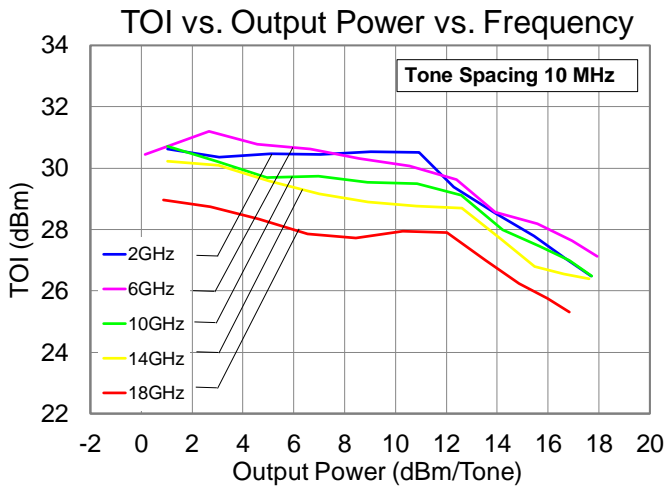
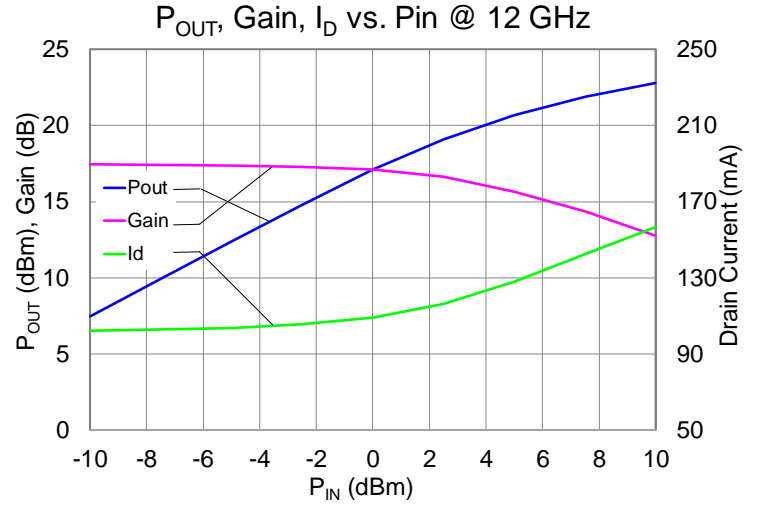
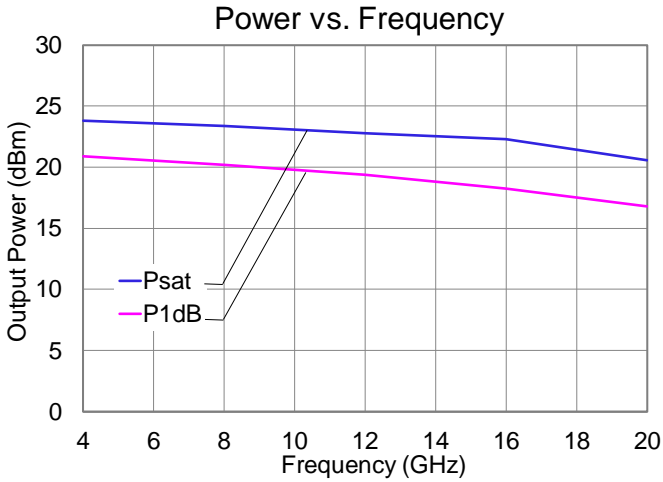
Performance Plots – Small Signal & Noise Figure

Conditions unless otherwise specified: $V_D = 5\text{ V}$, $I_{DQ} = 100\text{ mA}$, $V_{G1} = -0.7\text{ V}$ Typical, $V_{G2} = 1.3\text{ V}$, $25\text{ }^\circ\text{C}$

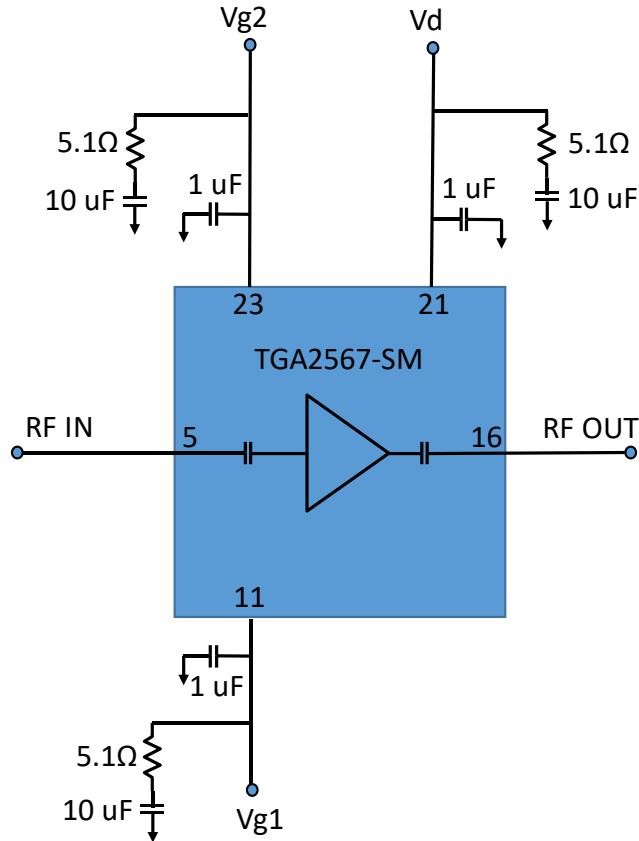


Performance Plots – Large Signal & Linearity

Conditions unless otherwise specified: $V_D = 5V$, $I_{DQ} = 100mA$, $V_{G1} = -0.7V$ Typical, $V_{G2} = 1.3V$. 25 °C



Applications Information



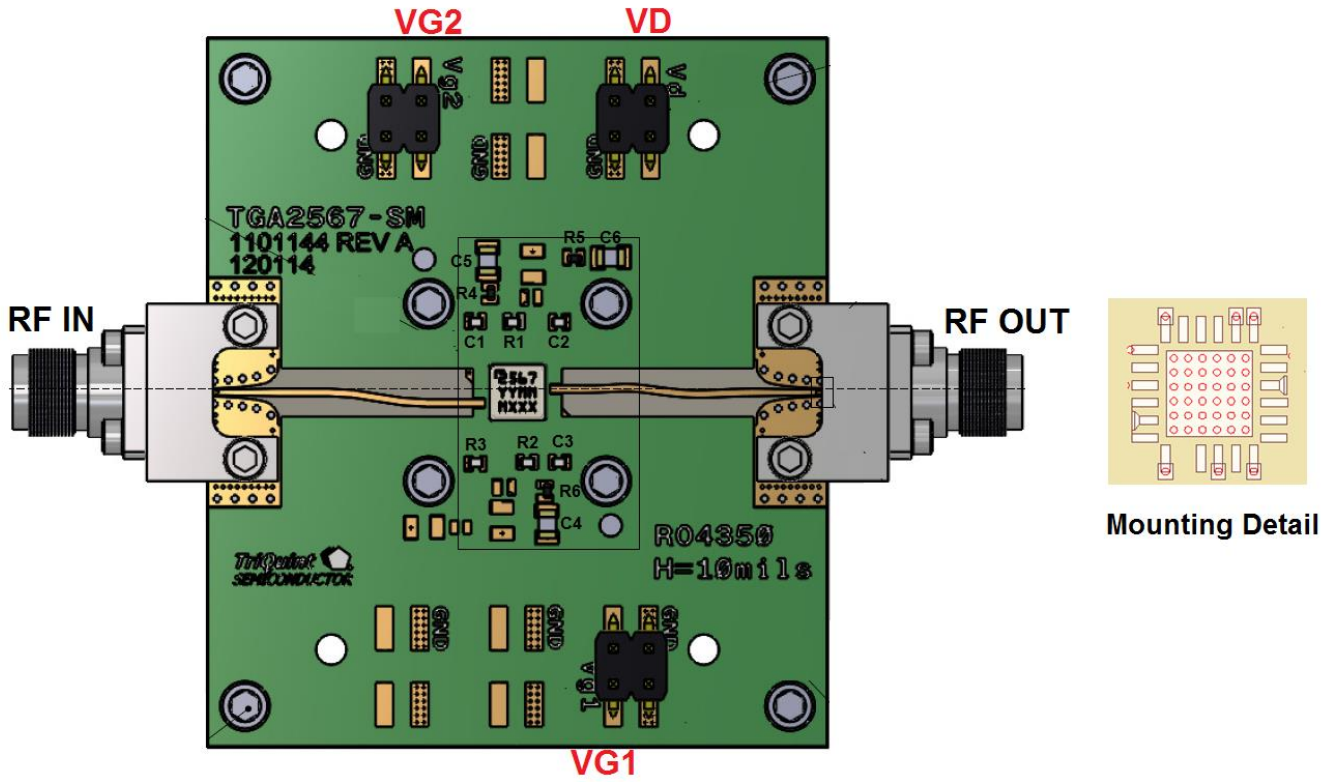
Bias Up Procedure

1. Set I_D limit to 160 mA, I_G limit to 24 mA
2. Apply -1.5 V to V_{G1}
3. Apply $+5\text{ V}$ to V_D ; ensure I_{DQ} is approx. 0 mA
4. Apply $+1.3\text{ V}$ to V_{G2}
5. Adjust V_{G1} until $I_{DQ} = 100\text{ mA}$ ($V_{G1} \sim -0.7\text{ V Typ.}$)
6. Adjust V_{G2} to obtain desired gain
7. Turn on RF supply

Bias Down Procedure

1. Turn off RF supply
2. Reduce V_{G1} to -1.5 V ; ensure I_{DQ} is approx. 0 mA
3. Set V_{G2} to 0 V
4. Set V_D to 0 V
5. Turn off V_D supply
6. Turn off V_{G1} and V_{G2} supplies

Evaluation Board Layout Assembly and Mounting Pattern



Top dielectric material is ROGERS 4350, 0.010 inch thickness with 0.5 oz copper.

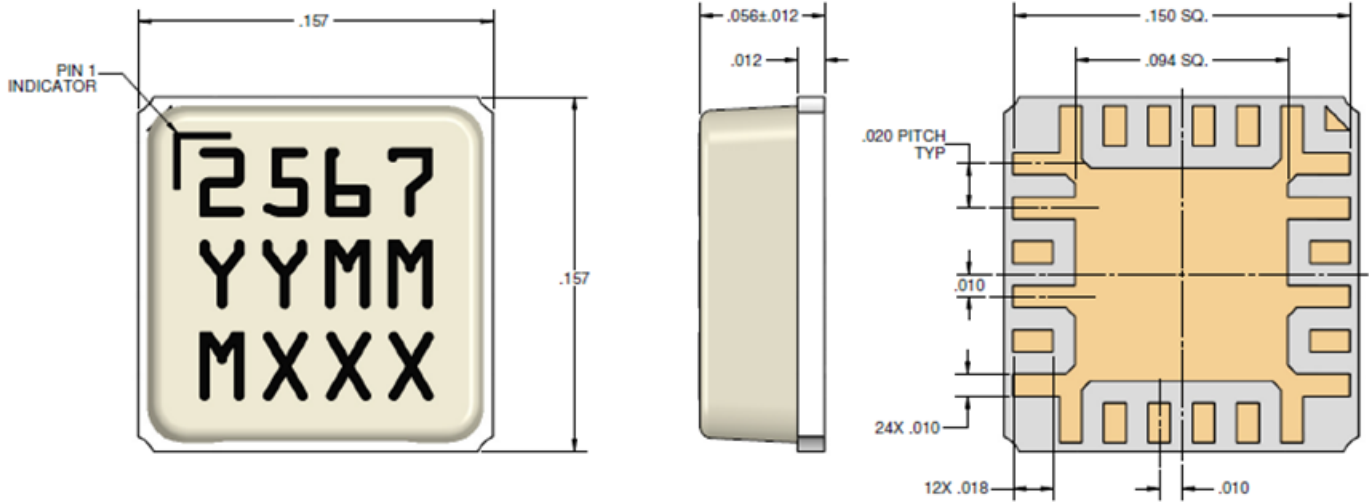
The pad pattern shown above has been developed and tested for optimized assembly at Qorvo. The PCB land pattern has been developed to accommodate lead and package tolerances. Since surface mount processes vary from company to company, careful process development is recommended.

Ground / thermal vias are critical for the proper performance of this device. Vias should use a 0.008 in. diameter drill, filled with copper plating.

Bill of Materials

| Reference Des. | Value | Description | Manuf. | Part Number |
|----------------|--------------|-----------------------------------|---------|-------------|
| C1, C2, C3 | 1.0 μ F | Cap, 0402, +16V, \pm 20 %, X5R | Various | – |
| C4, C5, C6 | 10.0 μ F | Cap, 0805, +10 V, \pm 10 %, X7R | Various | – |
| R1, R2, R3 | 0 Ω | Res, 0402, SMT | Various | – |
| R4, R5, R6 | 5.1 Ω | Res, 0402, SMT | Various | – |

Mechanical Drawing

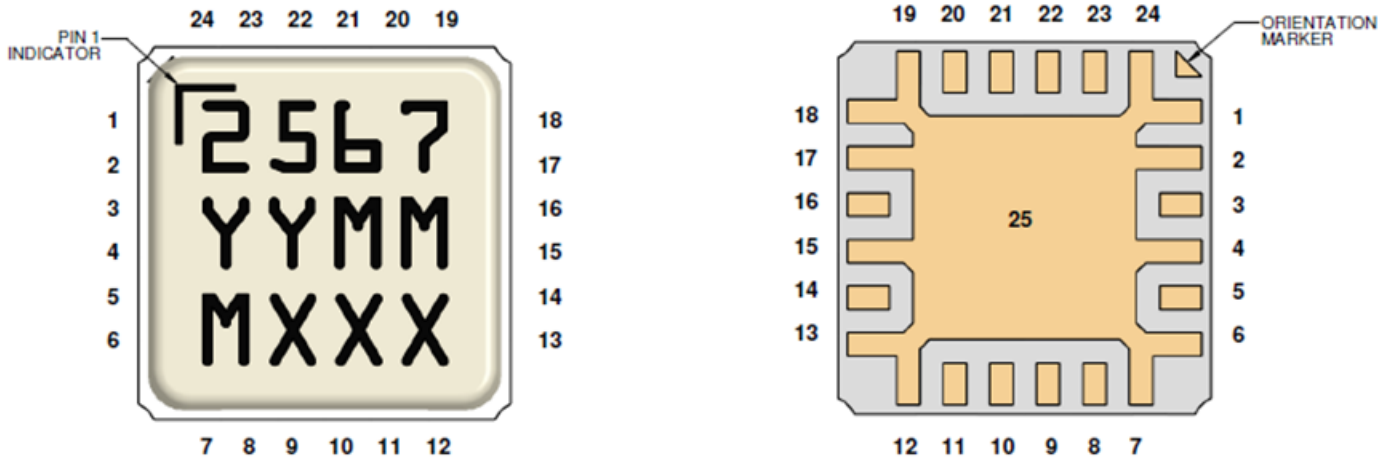


All dimensions are in inches. Unless specified otherwise, tolerances: ± 0.005 in.

Marking: Part number – 2567, Year/Month code – YYMM, Batch ID – MXXX.
Package Materials: Ceramic with plastic lid.

Part is epoxy sealed, finish pads are gold plated.

Pin Layout



Pad Description

| Pin | Symbol | Description |
|--------------------------------|-----------------|---|
| 1,2,4,6,7,12,13,15,17-19,24,25 | GND | Backside paddles; must be grounded on PCB. Multiple vias should be employed to minimize inductance and thermal resistance. ⁽²⁾ |
| 3,8-10,14,20,22 | N/C | No internal connection; must be grounded on PCB. |
| 5 | RF IN | RF input |
| 11 | V _{G1} | Gate voltage. Bias network is required. ⁽¹⁾ |
| 16 | RF OUT | RF output. |
| 21 | V _D | Drain voltage. Bias network is required. ⁽¹⁾ |
| 23 | V _{G2} | Gate voltage. Bias network is required. ⁽¹⁾ |

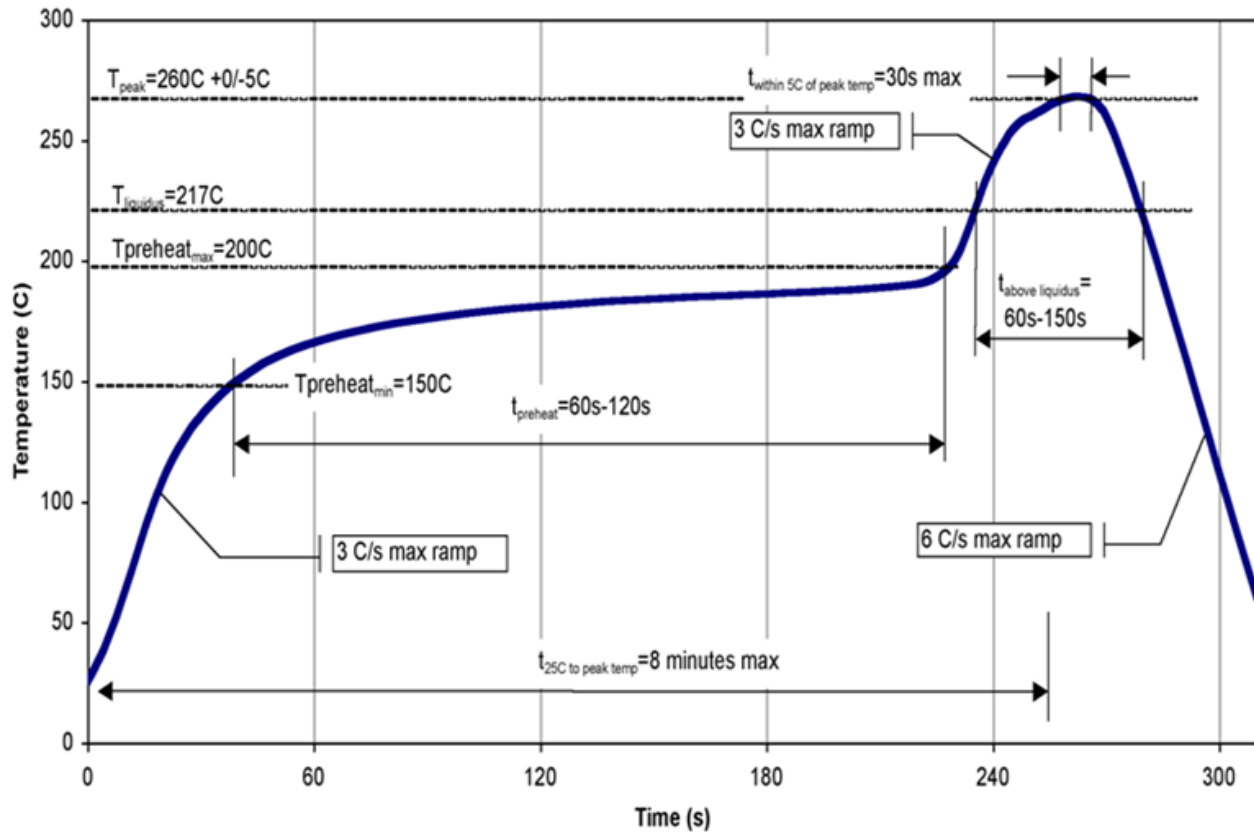
Notes:

1. See Application Circuit on page 6 as an example.
2. See Mounting Configuration on page 7 for suggested footprint.

Solderability

1. Compatible with lead-free soldering process with 260° C peak reflow temperature.
2. This package is non-hermetic, and therefore cannot be subjected to aqueous washing. The use of no-clean solder to avoid washing is highly recommended.

Recommended Soldering Temperature Profile



Handling Precautions

| Parameter | Rating | Standard |
|---------------------------------|--------|-----------------------------|
| ESD – Human Body Model (HBM) | 0B | ANSI/ESD/JEDEC JS-001, 2017 |
| ESD – Charge Device Model (CDM) | C2a | ANSI/ESD/JEDEC JS-002, 2014 |
| MSL – 260 °C Convection Reflow | 3 | IPC/JEDEC J-STD-020 |



Caution!
ESD-Sensitive Device

RoHS Compliance

This product is compliant with the 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), as amended by Directive 2015/863/EU. This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- PFOS Free
- SVHC Free

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

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Tel: 1-844-890-8163

Email: customer.support@qorvo.com

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