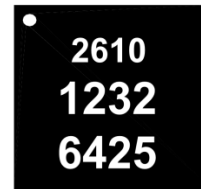


Applications

- VSAT
- Point-to-Point Radio
- Test Equipment & Sensors

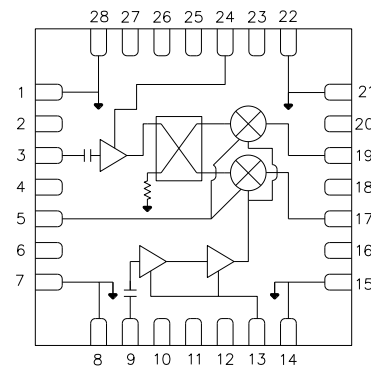


28-pin 5x5 mm QFN package

Product Features

- RF Frequency Range: 10 – 15.4 GHz
- IF Frequency: DC – 4 GHz
- LO Frequency: 6 – 19 GHz
- LO Input Power: 0 to 8 dBm
- Input IP3: 2 dBm
- Conversion Gain: 14 dB
- Noise Figure: ≤ 2.5 dB
- Package Dimensions: 5.0 x 5.0 x 1.3 mm

Functional Block Diagram



General Description

The TriQuint TGC2610-SM is a Ku-Band Image Reject Downconverter. The TGC2610-SM operates over an RF frequency range of 10 to 15.4 GHz and LO from 6 to 19 GHz with IF outputs from DC to 4 GHz. This part is designed using TriQuint’s pHEMT production process.

The TGC2610-SM integrates an LNA, and image reject mixer driven by an LO buffer amplifier. It typically provides an Input IP3 of 2 dBm at –25 dBm input power per tone and has a conversion gain of 14 dB and noise figure of 2.5 dB or less.

The TGC2610-SM is available in a low-cost, surface mount 28 lead 5x5 mm QFN package and is ideally suited for Point-to-Point Radio, and Ku-Band VSAT Ground Terminal applications.

Lead-free and RoHS compliant.

Evaluation Boards are available upon request.

Pin Configuration

| Pin No. | Label |
|--|-----------|
| 1, 2, 4, 6, 7, 8, 12, 14, 15, 16, 18, 20, 21, 22, 23, 25, 26, 27, 28 | GND |
| 3 | RF IN |
| 5 | VGX |
| 9 | LO IN |
| 10, 11 | NC |
| 13 | VDLO |
| 17 | IFOUT_LSB |
| 19 | IFOUT_USB |
| 24 | VDLNA |

Ordering Information

| Part No. | ECCN | Description |
|------------|-------|---------------------------------|
| TGC2610-SM | EAR99 | 10 GHz – 15.4 GHz Downconverter |

Standard T/R size = 500 pieces on a 7” reel

Absolute Maximum Ratings

| Parameter | Rating |
|-------------------------------|---------------|
| VDLNA | 6 V |
| VDLO | 6 V |
| IDRF | 140 mA |
| IDLO | 150 mA |
| VGX | 0 V |
| Power Dissipation, Pdiss | 1.7 W |
| RF Input Power, CW, T = 25 °C | 16 dBm |
| Channel Temperature, Tch | 200 °C |
| Mounting Temperature (30 sec) | 260 °C |
| Storage Temperature | -65 to 125 °C |

Operation of this device outside the parameter ranges given above may cause permanent damage.

Recommended Operating Conditions

| Parameter | Min | Typ | Max | Units |
|-----------------------------|-----|----------|-----|-------|
| Operating Temperature Range | -40 | +25 | +85 | °C |
| VDRF | 3 | 4 | 5 | V |
| IDRF | | 88 | | mA |
| VDLO | 3 | 4 | 5 | V |
| IDLO | | 71 | | mA |
| VGX | | See Note | | |
| LO Input Power | 0 | 4 | 8 | dBm |

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

Note: VGX is connected to 23 ohm resistor to ground

Electrical Specifications

Test conditions unless otherwise noted: : IF Input Power = -20 dBm, LO Input Power = 4 dBm, VDLO = 4 V, IDLO = 65 mA, VDRF = 4 V, IDRF = 58 mA.

| Parameter | Conditions | Min | Typ | Max | Units |
|--|------------|-----|-----|------|-------|
| RF Frequency Range | | 10 | | 15.4 | GHz |
| LO Frequency Range | | 6 | | 19 | GHz |
| IF Frequency Range | | 0 | | 4 | GHz |
| LO Input Power | | 0 | 4 | 8 | dBm |
| Drain Current, LO (IDLO) | | | 70 | | mA |
| Drain Current, RF (IDRF) | | | 90 | | mA |
| Conversion Gain | | | 14 | | dB |
| Input Third Order Intercept Point (IIP3) | | | 2 | | dBm |
| Image Rejection (IMR) | | | 18 | | dB |
| Noise Figure | | | 2 | | dB |
| | | | | | |
| | | | | | |

Notes:

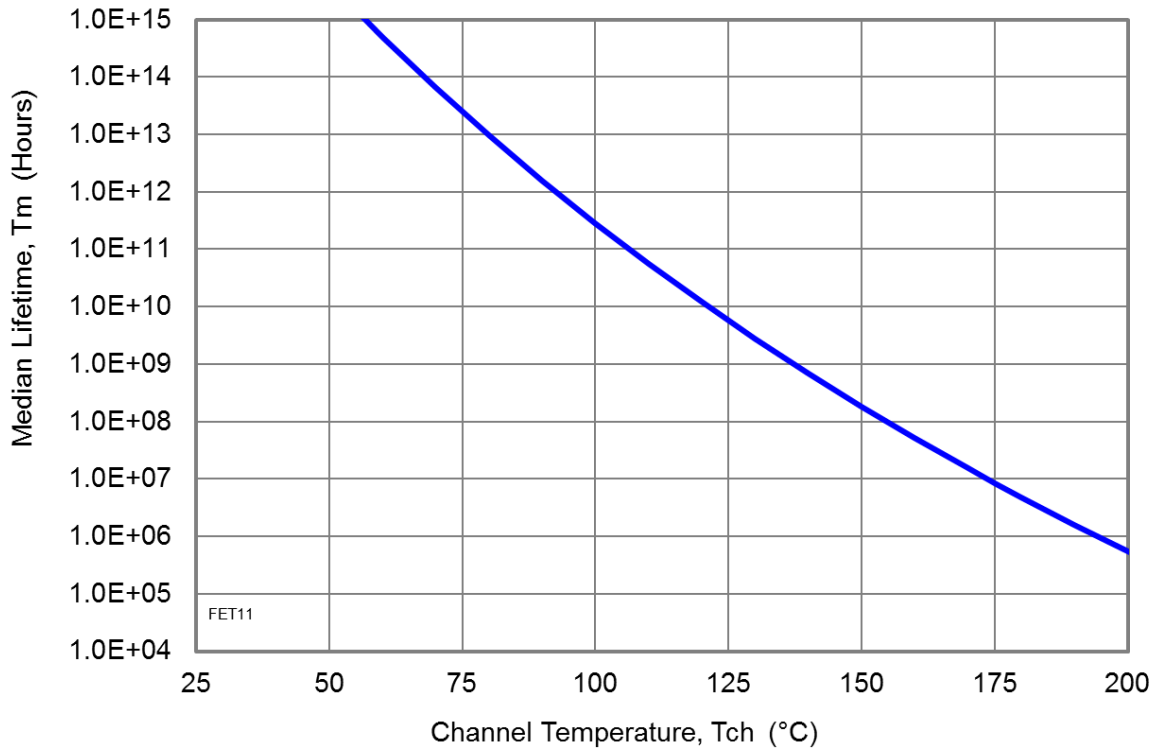
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Specifications

Thermal and Reliability Information

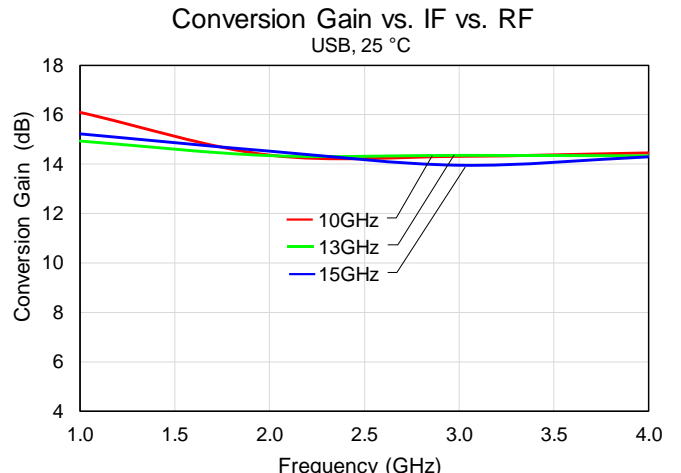
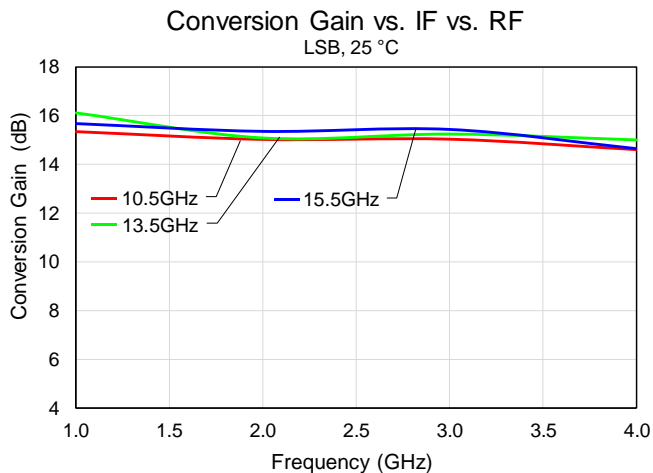
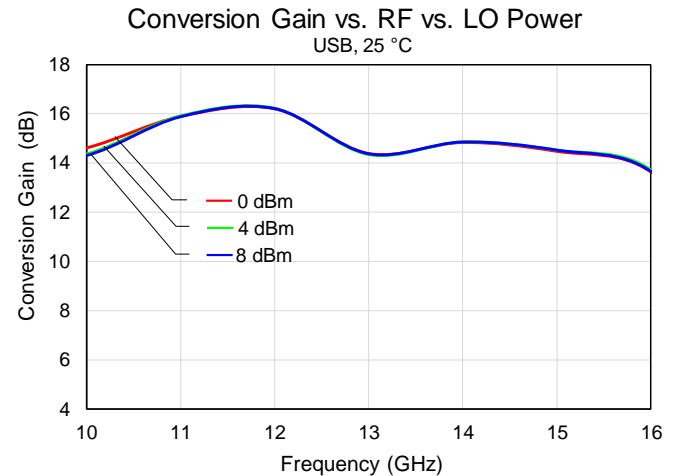
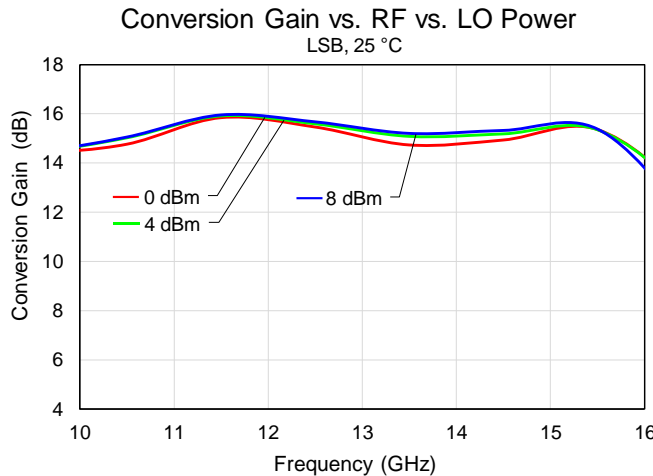
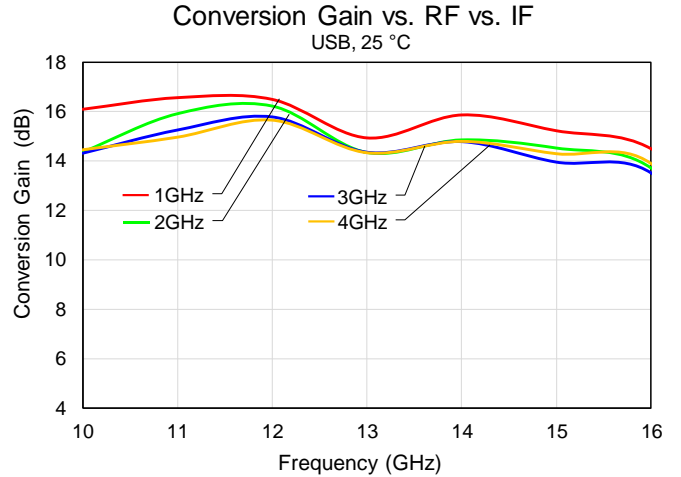
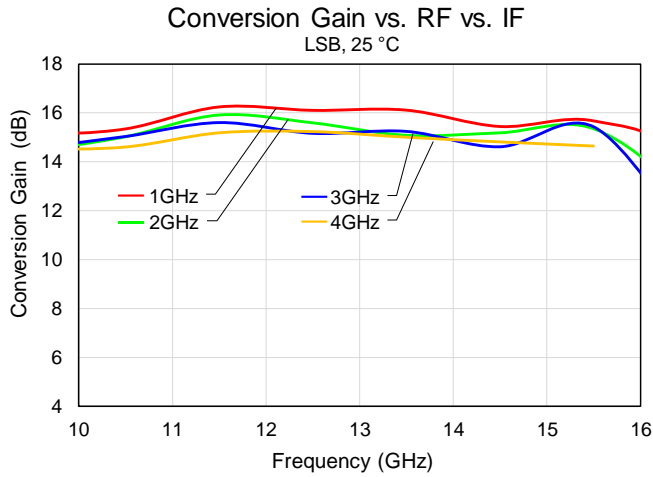
| Parameter | Conditions | Rating |
|---|--|---|
| Thermal Resistance, θ_{JC} , measured to back of package | Tbase = 85 °C | $\theta_{JC} = 75.5 \text{ }^\circ\text{C/W}$ |
| Channel Temperature (Tch), and Median Lifetime (Tm) | Tbase = 85 °C Vd = 4 V Id = 160 mA LO Power = 4dBm Pdiss = 0.64 W | Tch = 133 °C Tm = 1.8E+9 Hours |

Median Lifetime (Tm) vs. Channel Temperature (Tch)



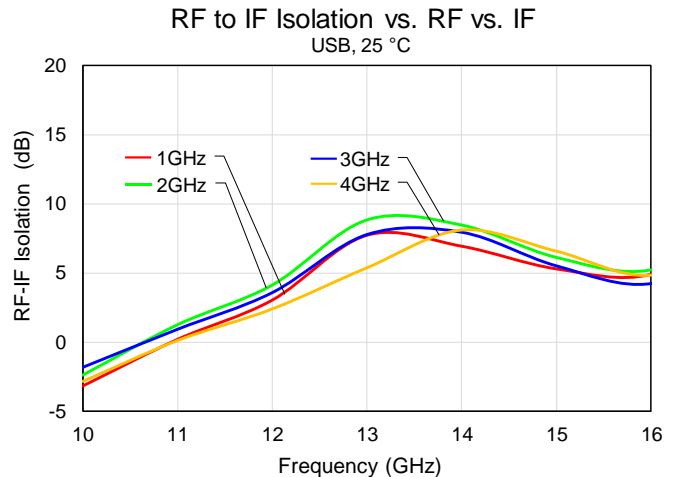
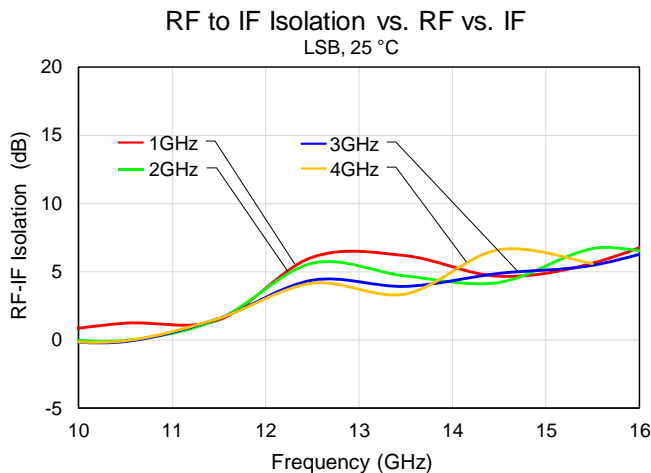
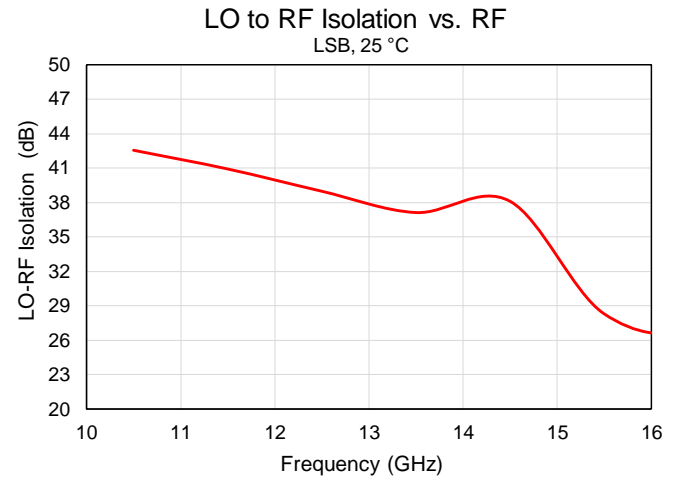
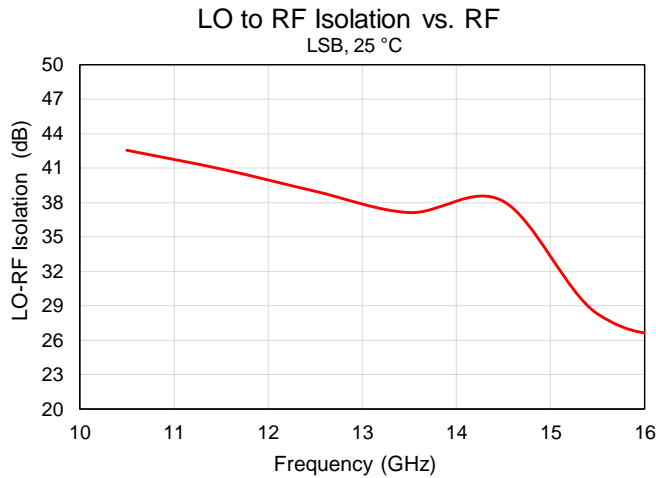
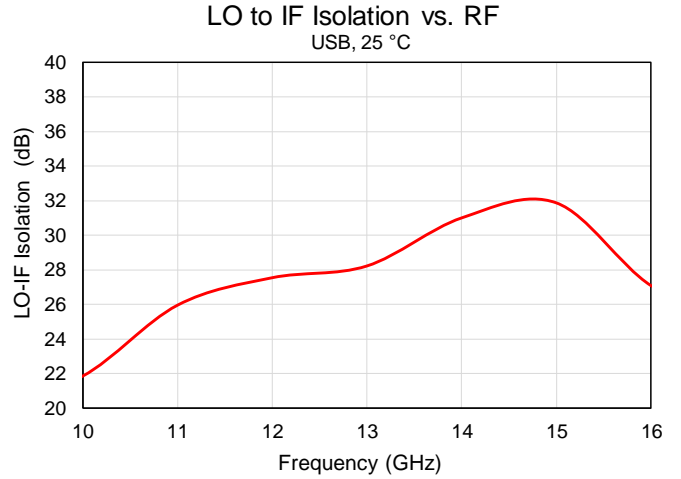
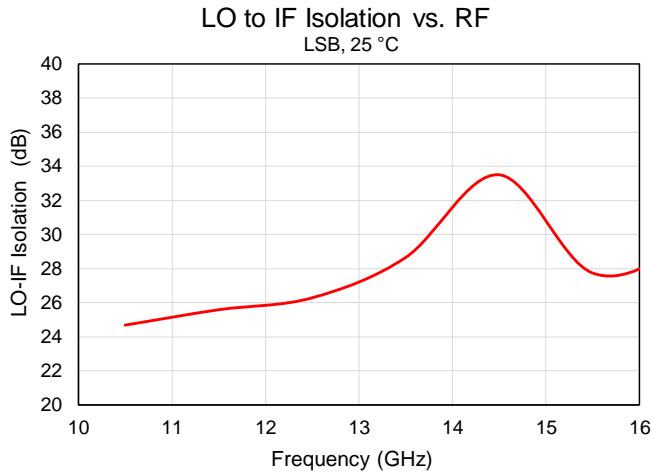
Typical Performance

IF Input Power = -25 dBm, VDLO = 4 V, IDLO = 65 mA, VDRF = 4 V, IDRf = 85 mA.
 Data taken with external IF hybrid.



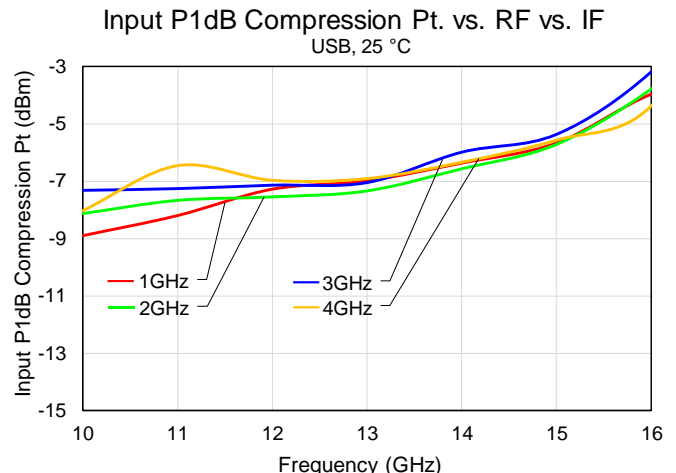
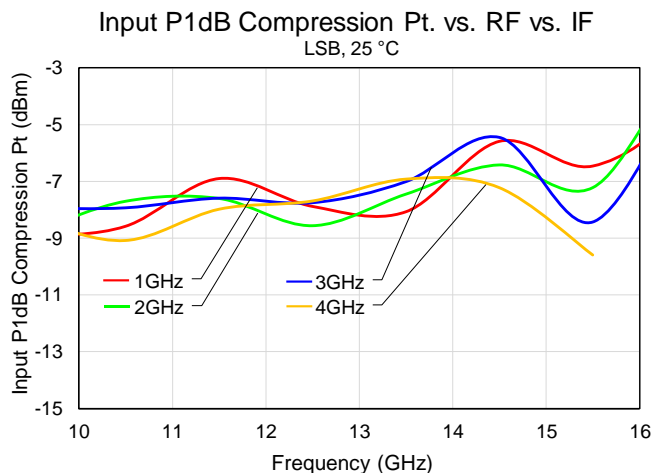
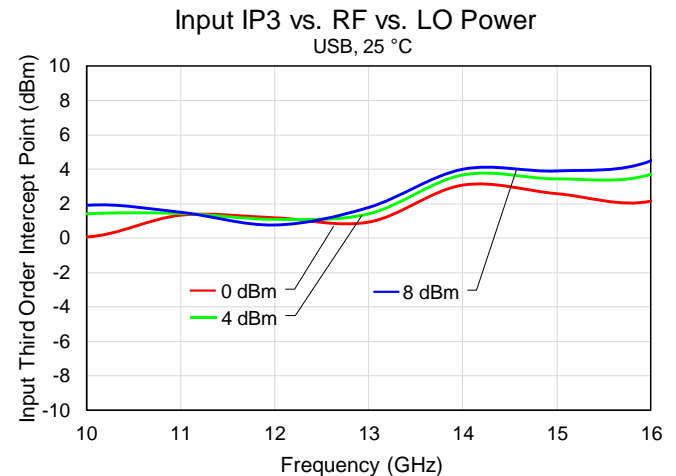
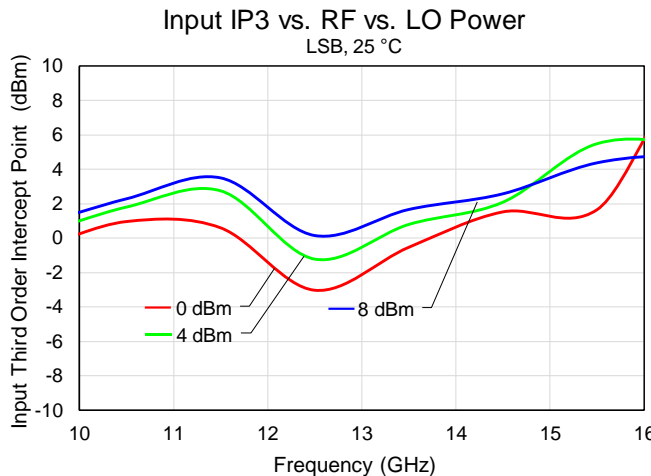
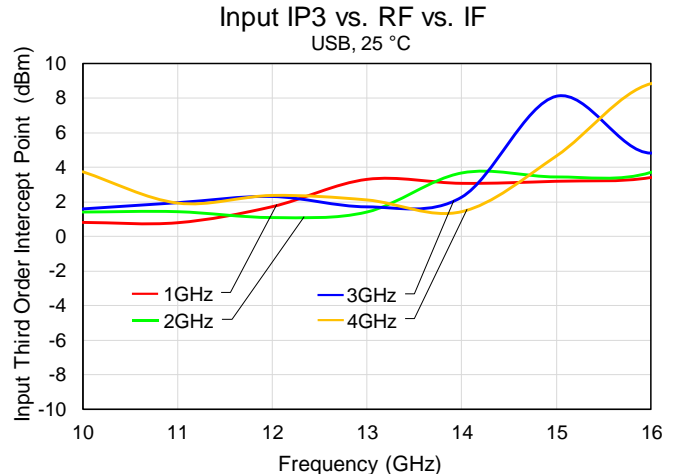
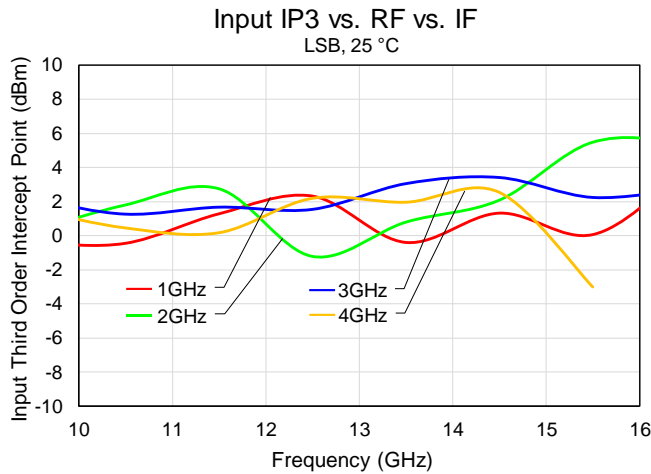
Typical Performance

IF Input Power = -25 dBm, VDLO = 4 V, IDLO = 65 mA, VDRF = 4 V, IDRf = 85 mA.
 Data taken with external IF hybrid.



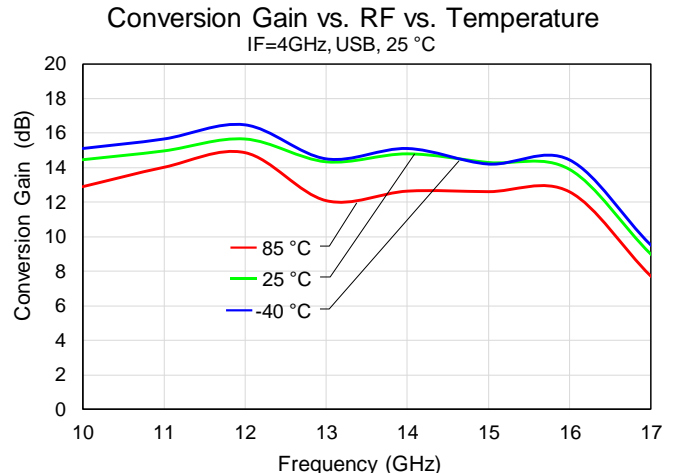
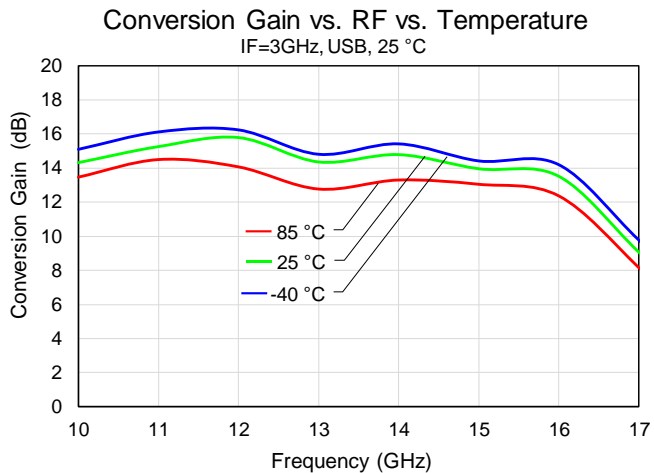
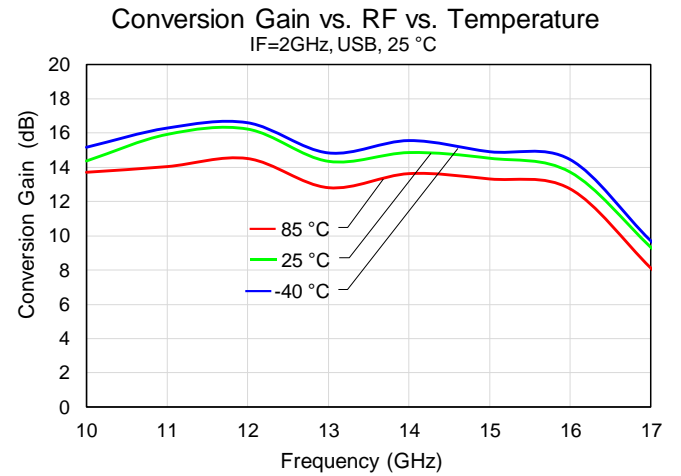
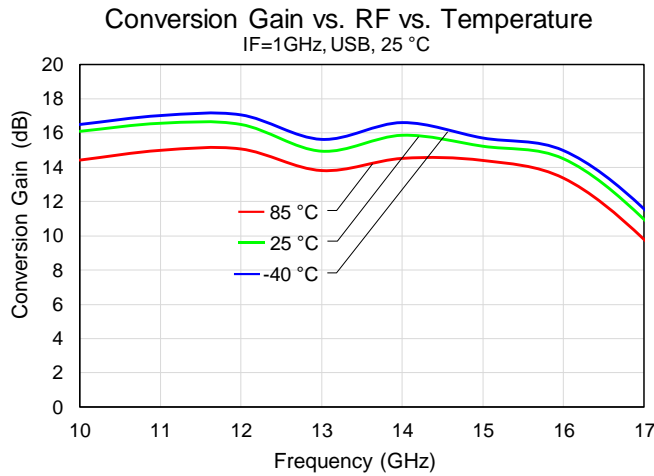
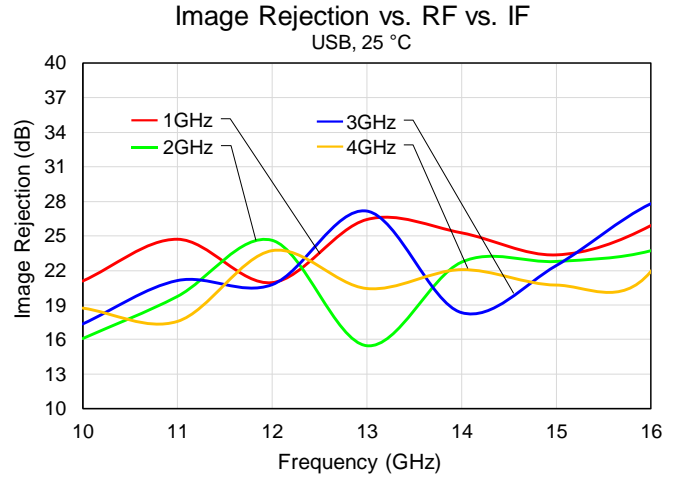
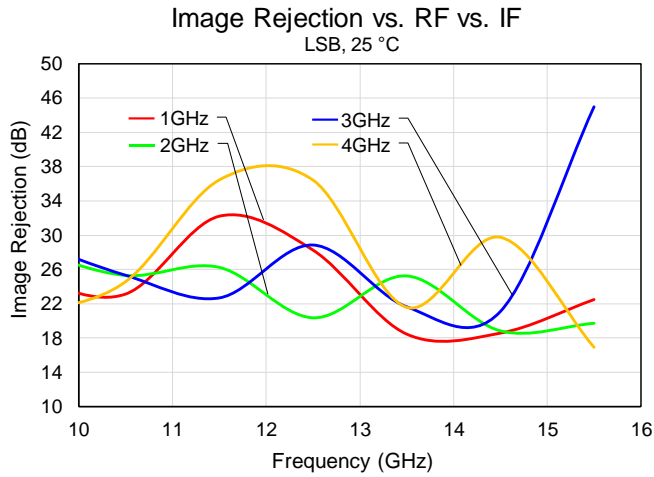
Typical Performance

IF Input Power = -25 dBm, VDLO = 4 V, IDLO = 65 mA, VDRF = 4 V, IDRf = 85 mA.
 Data taken with external IF hybrid.



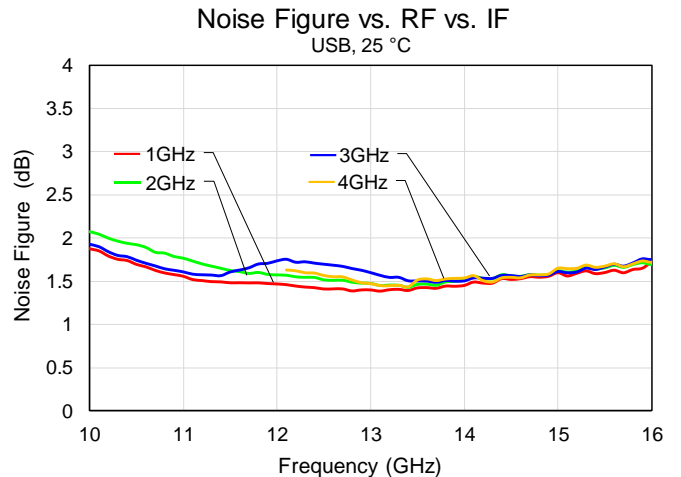
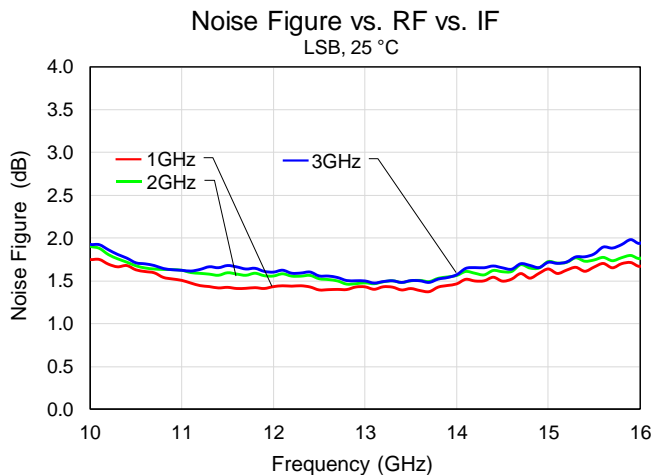
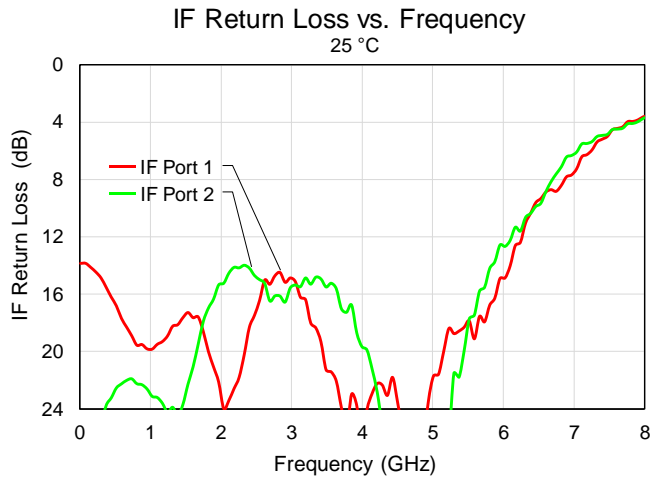
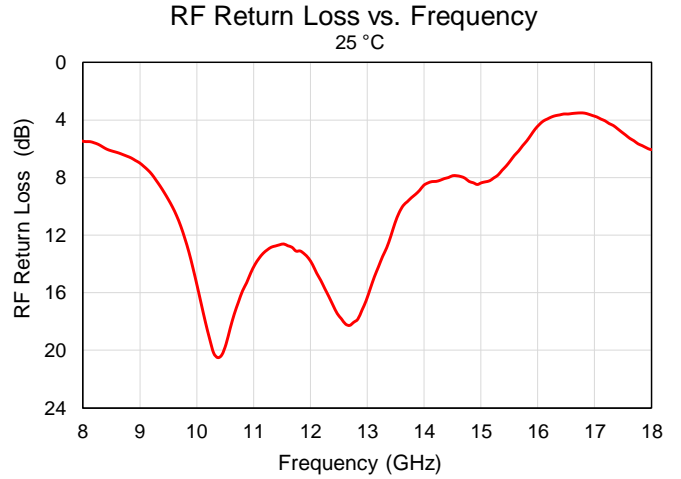
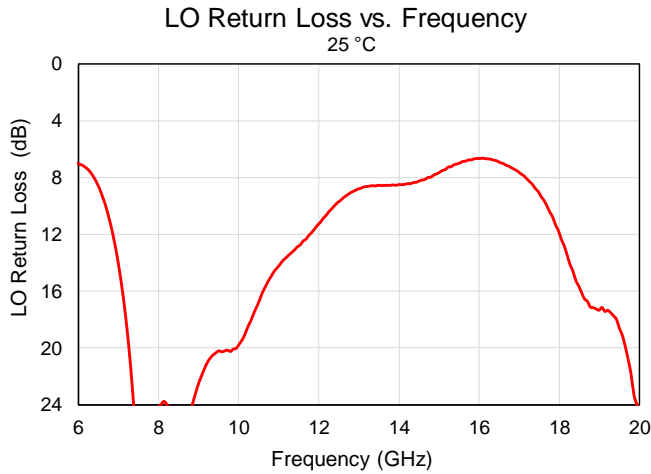
Typical Performance

IF Input Power = -25 dBm, VDLO = 4 V, IDLO = 65 mA, VDRF = 4 V, IDRf = 85 mA.
 Data taken with external IF hybrid.



Typical Performance

IF Input Power = -25 dBm, VDLO = 4 V, IDLO = 65 mA, VDRF = 4 V, IDRf = 85 mA.
 Data taken with external IF hybrid.



Typical Performance

IF Input Power = -20 dBm, VDLO = 4 V, IDLO = 71 mA, VDRF = 4 V, IDRf = 88 mA, LO Power = 4 dBm.
 Data taken with external IF hybrid.

Spur Tables

Spur tables are $M \times f_{LO} + N \times f_{RF}$ mixer spurious products for -20 dBm RF input power.

Desired IF is at $|1LO - 1RF|$.

All values in dBc below the IF output power level.

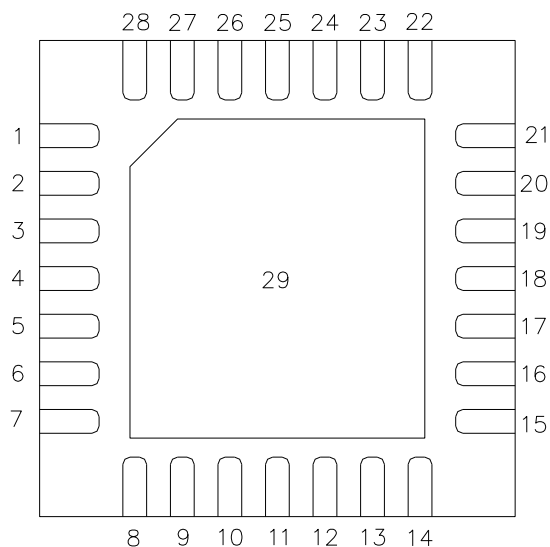
M x N Spurious Outputs for LSB, IF = 2.0 GHz

| | | M x f _{LO} | | | | | | |
|---------------------------|----|---------------------|----|----|----|----|----|----|
| | | 0 | 1 | 2 | 3 | 4 | 5 | |
| N x f _{RF} | -5 | -- | 99 | 99 | 99 | 99 | 99 | 99 |
| | -4 | -- | 99 | 99 | 99 | 99 | 99 | 99 |
| | -3 | -- | 99 | 61 | 48 | 99 | 99 | 99 |
| | -2 | -- | 99 | 33 | 48 | 99 | 99 | 99 |
| | -1 | -- | 0 | 35 | 29 | 99 | 99 | 99 |
| | 0 | -- | 17 | 10 | 46 | 99 | 99 | 99 |
| | 1 | 15 | 15 | 45 | 53 | 99 | 99 | 99 |
| | 2 | 40 | 57 | 53 | 99 | 99 | 99 | 99 |
| | 3 | 47 | 52 | 99 | 99 | 99 | 99 | 99 |
| | 4 | 53 | 55 | 99 | 99 | 99 | 99 | 99 |
| 5 | 58 | 99 | 99 | 99 | 99 | 99 | 99 | |

M x N Spurious Outputs for USB, IF = 2.0 GHz

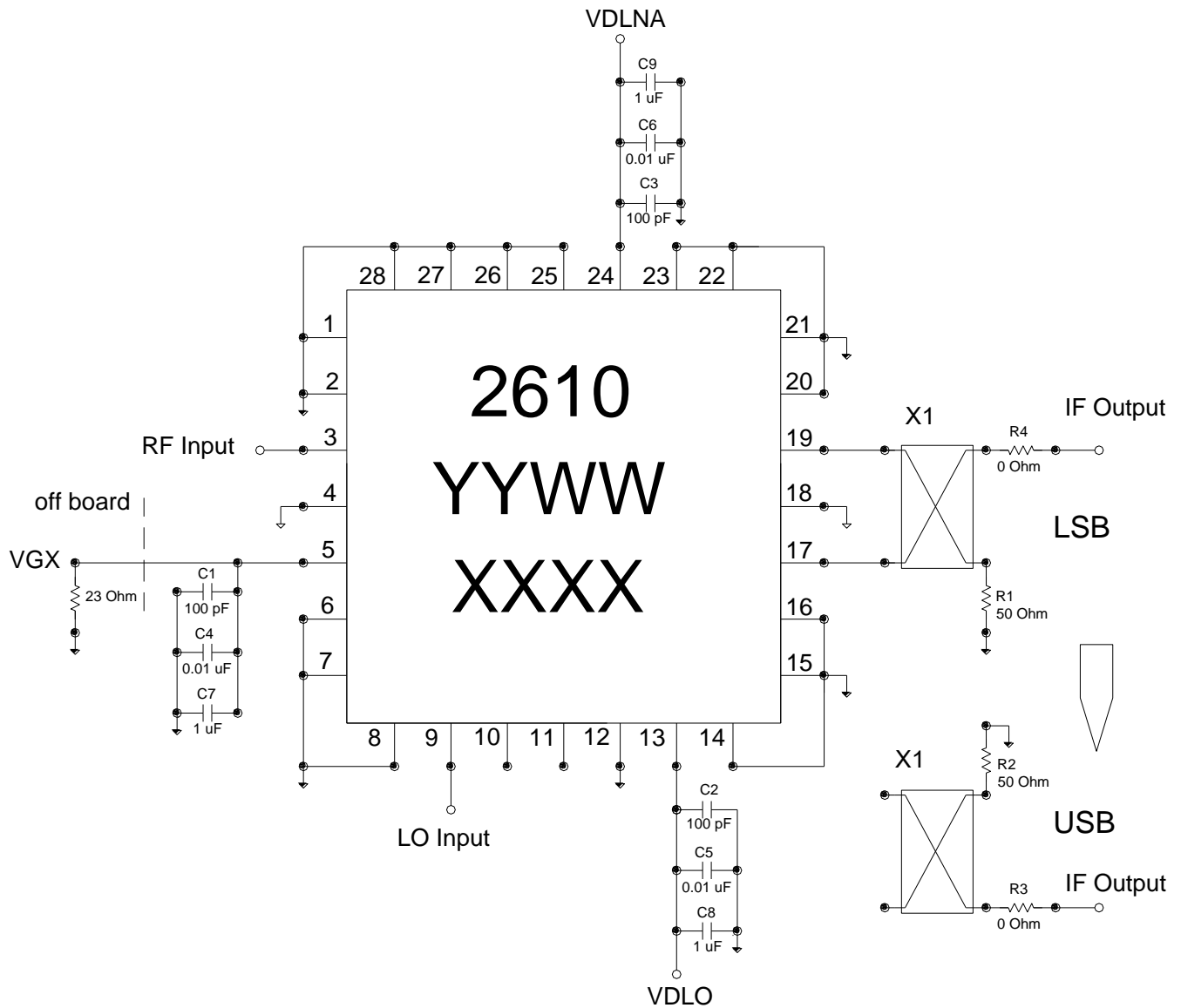
| | | M x f _{LO} | | | | | | |
|---------------------------|----|---------------------|----|----|----|----|----|----|
| | | 0 | 1 | 2 | 3 | 4 | 5 | |
| N x f _{RF} | -5 | -- | 99 | 99 | 99 | 99 | 99 | 99 |
| | -4 | -- | 99 | 99 | 71 | 99 | 99 | 99 |
| | -3 | -- | 99 | 99 | 56 | 99 | 99 | 99 |
| | -2 | -- | 99 | 38 | 32 | 99 | 99 | 99 |
| | -1 | -- | 0 | 21 | 27 | 99 | 99 | 99 |
| | 0 | -- | 11 | 12 | 23 | 99 | 99 | 99 |
| | 1 | 12 | 22 | 33 | 45 | 99 | 99 | 99 |
| | 2 | 48 | 56 | 55 | 55 | 99 | 99 | 99 |
| | 3 | 56 | 52 | 59 | 99 | 99 | 99 | 99 |
| | 4 | 54 | 55 | 99 | 99 | 99 | 99 | 99 |
| 5 | 51 | 99 | 99 | 99 | 99 | 99 | 99 | |

Pin Configuration and Description



| Pin No. | Label | Description |
|--|-----------|---|
| 1, 2, 4, 6, 7, 8, 12, 14, 15, 16, 18, 20, 21, 22, 23, 25, 26, 27, 28 | GND | Internal Grounding; must be grounded on PCB. |
| 3 | RF IN | RF Input matched to 50 ohms, AC Coupled. |
| 5 | VGX | Mixer Gate Voltage. Bias network is required; see Application Circuit on page 11 as an example. |
| 9 | LO IN | LO Input, matched to 50 ohms, AC coupled. |
| 10, 11 | NC | No internal connection; must be grounded on PCB. |
| 13 | VDLO | LO Drain Voltage. Bias network is required; see Application Circuit on page 11 as an example. |
| 17 | IFOUT_LSB | IF Output matched to 50 ohms, DC coupled. |
| 19 | IFOUT_USB | IF Output matched to 50 ohms, DC coupled. |
| 24 | VDLNA | LNA Drain Voltage. Bias network is required; see Application Circuit on page 11 as an example. |

Application Circuit

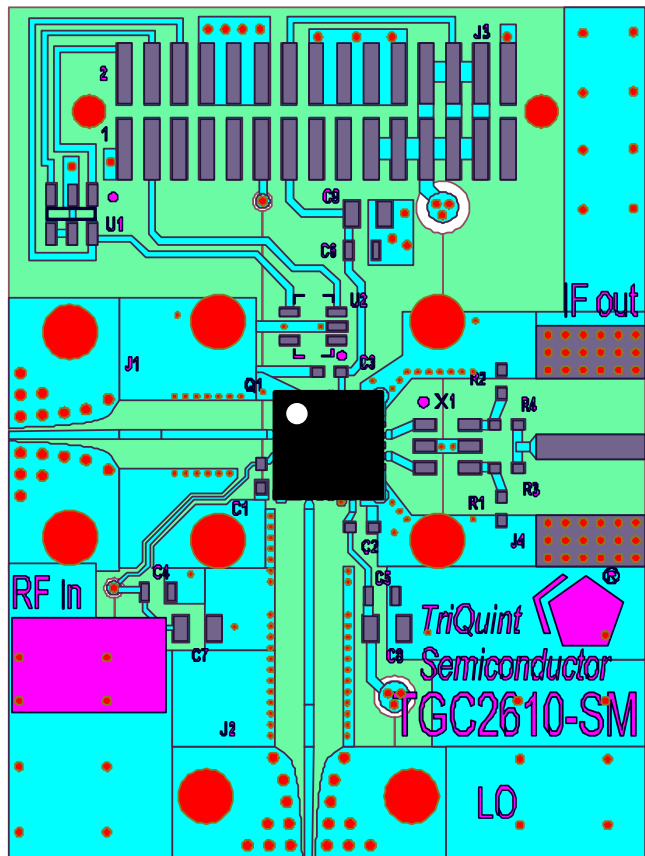


| Bias-up Procedure | Bias-down Procedure |
|---|----------------------------|
| Turn VDLO to 4 V | Turn off RF and LO signals |
| Turn VDLNA to 4 V | Turn VDLNA to 0 V |
| VGX is connected to 23 ohm resistor to ground | Turn VDLO to 0 V |
| Apply LO and RF signals | |

Application Circuit

PC Board Layout

Board material is RO4003 0.008" thickness with ½ oz copper cladding.
 For further technical information, refer to the [TGC2610-SM](#) Product Information page.



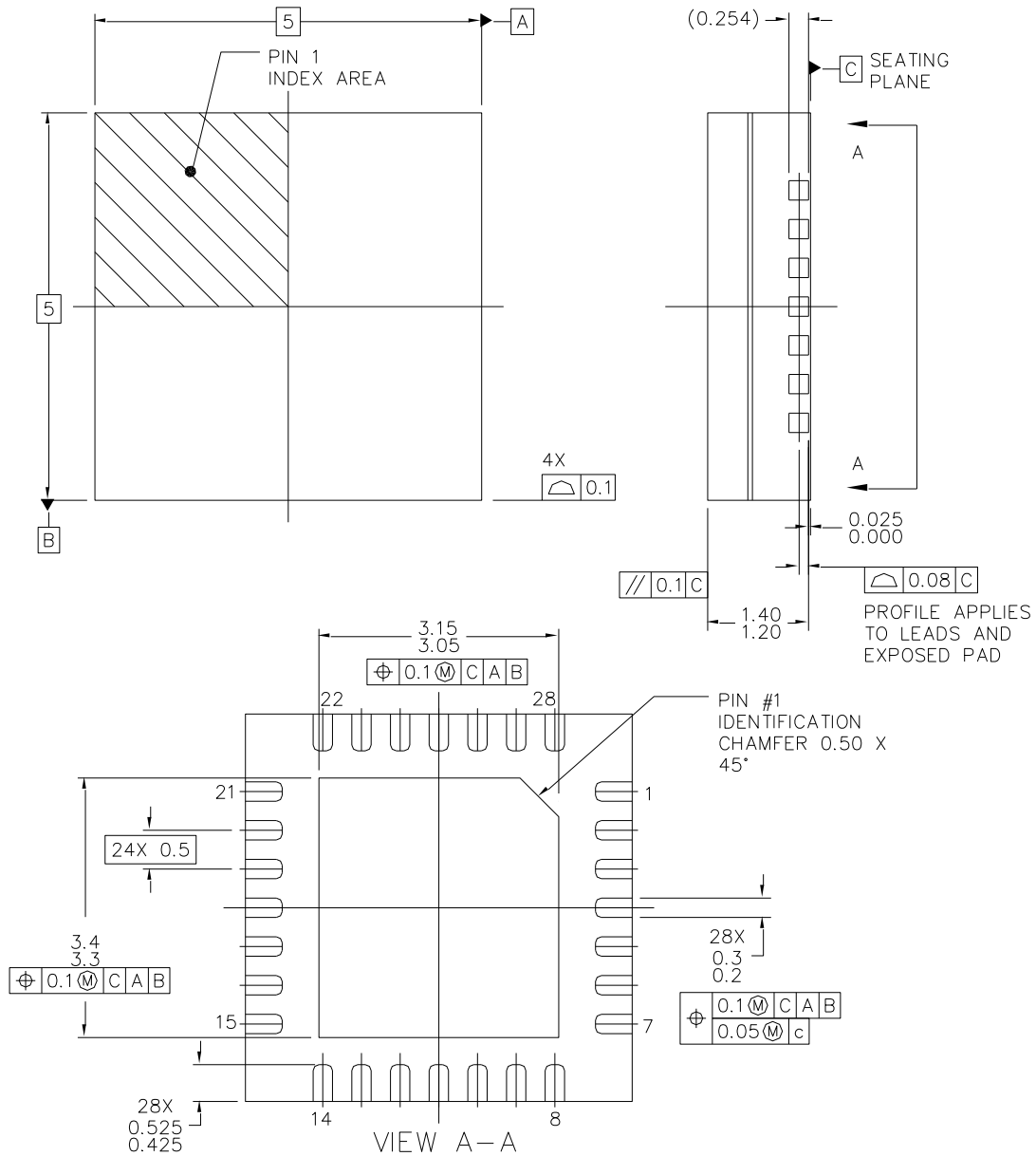
Bill of Material

| Ref Des | Value | Description | Manufacturer | Part Number |
|--------------------------|---------|-----------------------------------|--------------|--------------------|
| C1, C2, C3 | 100 pF | Cap, 0402, 50V, 5%, NPO | various | |
| C4, C5, C6 | 0.01 µF | Cap, 0603, 25V, 5%, COG | various | |
| C7, C8, C9 | 1 µF | Cap, 0805, 25V, 5%, X5R | various | |
| U1 | | Ku-Band Downconverter | TriQuint | TGC2610-SM |
| LSB Configuration | | | | |
| R1 | 50 ohm | Res, 0402, 0.05W, 5%, SMD | various | |
| R4 | 0 ohm | Res, 0402, 0.01W, SMD | various | |
| R2, R3 | | DNP | | |
| X1 | | 2-Way 90° Power combiner/Splitter | Mini-circuit | QCN-25+ or QCN-45+ |

Mechanical Information

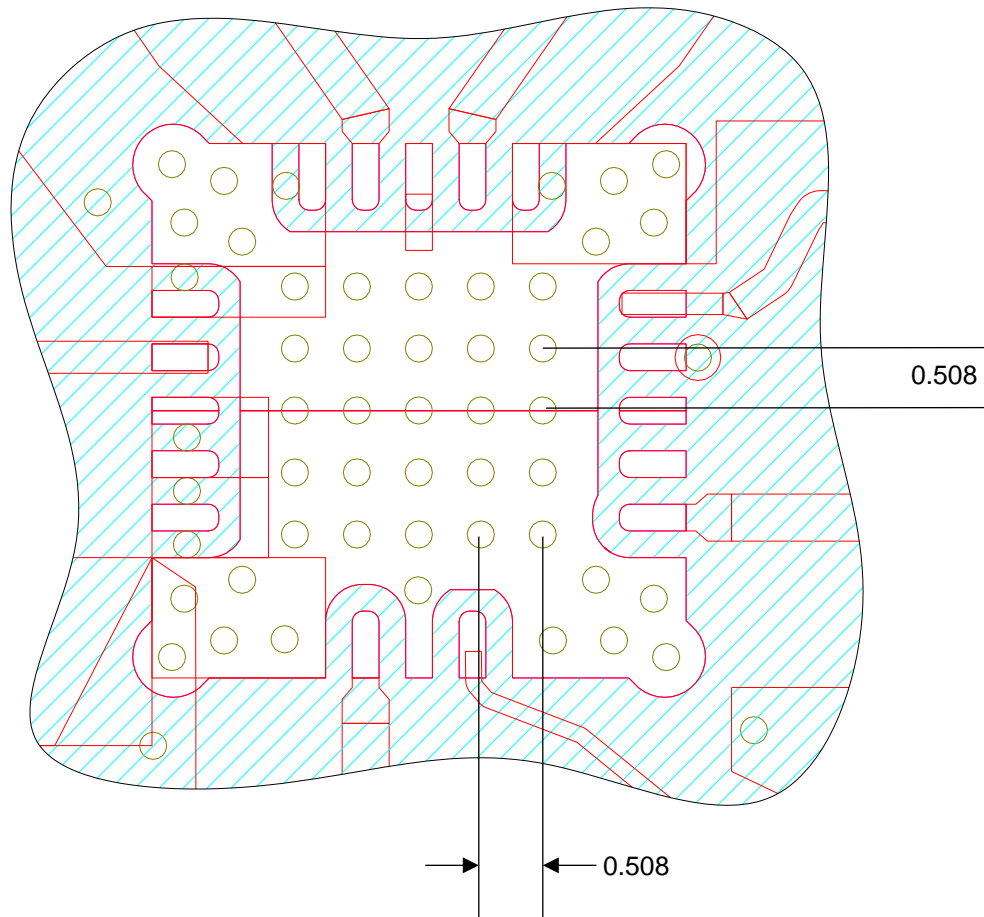
Package Marking and Dimensions

All dimensions are in millimeters.



The TGC2610-SM will be marked with the “YYWW” designator and a lot code marked below the part designator. The “YY” represents the last two digits of the year the part was manufactured, the “WW” is the work week, and the “XXXX” is an auto-generated number.

This package is lead-free/RoHS-compliant with a copper alloy base (CDA194), and the plating material on the leads is NiPdAu. It is compatible with a lead-free (maximum 260 °C reflow temperature) soldering process.

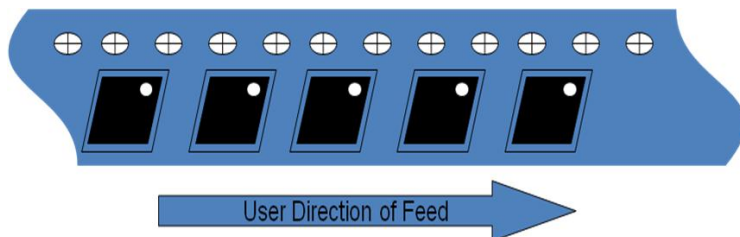
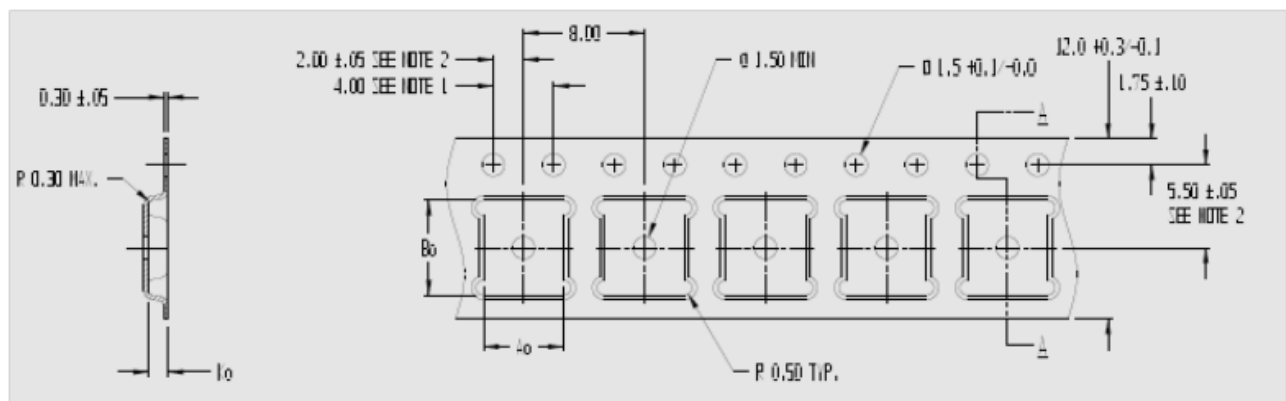
Mechanical Information**PCB Mounting Pattern****Notes:**

1. The pad pattern shown has been developed and tested for optimized assembly at TriQuint Semiconductor. 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.
2. Ground vias are critical for the proper performance of this device. Vias should have a final plated thru diameter of .25 mm (.010").

Tape and Reel Information

Standard T/R size = 500 pieces on a 7" reel.

| Material | | Cavity (mm) | | | | Distance Between Centerline (mm) | | Carrier Tape (mm) | Cover Carrier (mm) |
|----------|------------------------|-------------|------------|------------|------------|----------------------------------|---------------------|-------------------|--------------------|
| Vendor | Vendor P/N | Length (A0) | Width (B0) | Depth (K0) | Pitch (P1) | Length direction (P2) | Width Direction (F) | Width (W) | Width (W) |
| Tek-Pak | QFN0500X0 500F-L500 | 5.3 | 5.3 | 1.65 | 8.0 | 2.00 | 5.50 | 12.0 | 9.20 |



Product Compliance Information

ESD Sensitivity Ratings



Caution! ESD-Sensitive Device

ESD Rating: Class 1B
 Value: ≥ 500 V and < 1000 V
 Test: Human Body Model (HBM)
 Standard: JEDEC Standard JESD22-A114

MSL Rating

MSL Rating: Level 3
 Test: 260°C convection reflow
 Standard: JEDEC Standard IPC/JEDEC J-STD-020

Solderability

Compatible with lead-free (260°C maximum reflow temperature) soldering processes.

Package lead plating: NiPdAu.

The use of no-clean solder to avoid washing after soldering is recommended.

This package is not compatible with solder containing lead.

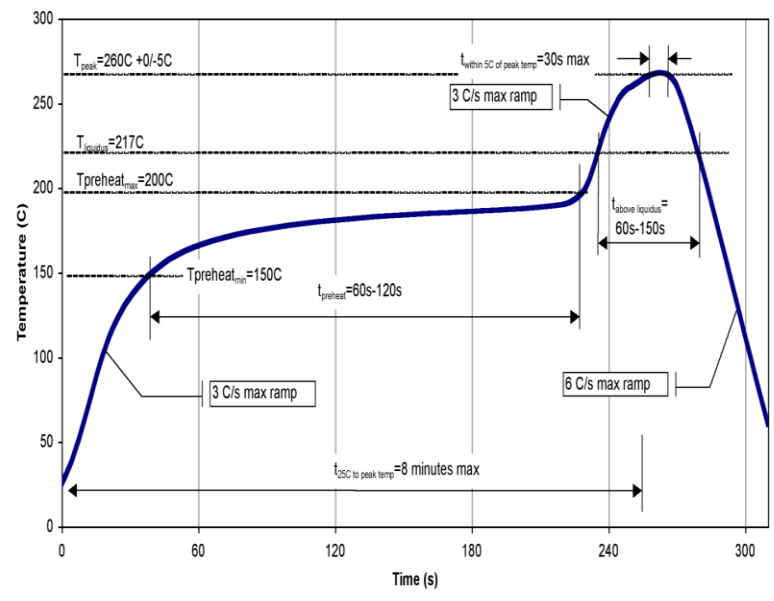
RoHS Compliance

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

This product also has the following attributes:

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

Recommended Solder Temperature Profile



Contact Information

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

Web: www.triquint.com
Email: info-sales@tqs.com

Tel: +1.972.994.8465
Fax: +1.972.994.8504

For technical questions and application information: **Email:** info-networks@tqs.com

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