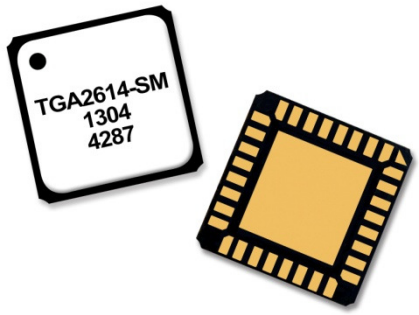
TGA2614-SM

S-Band High Gain LNA

Applications

- Commercial and Military Radar
- Satellite Communications

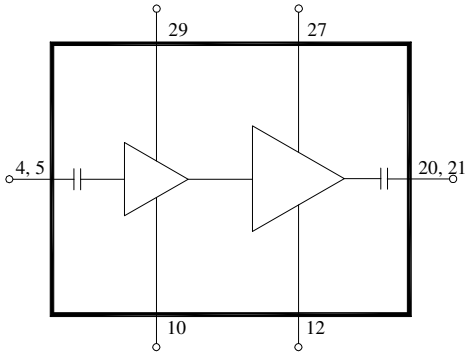


QFN 5x5 mm 32L

Product Features

- Frequency Range: 2.7 – 3.8 GHz
- NF: 1.2 dB
- SS Gain: 17 dB
- OTOI: 33 dBm
- P1db: 19 dBm
- Psat: 20 dBm
- Bias: Vd1 = Vd2 = 6 V, Idq1 = 40 mA, Idq2 = 80 mA, Vg1 ≈ -0.65 V (typ), Vg2 ≈ –0.7 V (typ)
- Additional ESD Protection
- Package Dimensions: 5.0 x 5.0 x 1.45 mm

Functional Block Diagram



General Description

The TGA2614-SM is a S-Band Low Noise Amplifier utilizing TriQuint's proven 0.15um pHEMT production technology. Achieving high gain and low noise figure over the 2.7-3.8 GHz bandwidth, the TGA2614-SM is ideal for serving both commercial and military radar along with various communication platforms.

The TGA2614-SM typically provides <1.2 dB of Noise Figure, 19 dBm of P1dB, 33 dBm of OTOI, and small signal gain of 17 dB. Both RF ports are fully matched to 50 ohms with integrated DC blocking caps.

For added handling robustness and ease of use, the TGA2614-SM is available in a low-cost, 5x5 mm ceramic, air-cavity QFN package.

Lead-free and RoHS compliant

Evaluation Boards are available upon request.

Pad Configuration

Pad No.	Symbol
1-3, 6-9, 11, 13-19, 22-26, 28, 30-33	GND
4-5	RF IN
10	Vg1
12	Vg2
20-21	RF OUT
27	Vd2
29	Vd1

Ordering Information

Part	ECCN	Description
TGA2614-SM	EAR99	S-Band High Gain LNA

Absolute Maximum Ratings

Parameter	Value
Drain Voltage (Vd1, Vd2)	+6.5 V
Gate Voltage Range (Vg1, Vg2)	-1.2 to +0.6 V
Drain Current (Id1, Id2)	TBD
Gate Current (Ig1)	-1.0 to 5 mA
Gate Current (Ig2)	-1.5 to 10 mA
Power Dissipation (Pdiss)	2.35 W
CW Input Power, 50 Ω, 25 °C (Pin)	20 dBm
Channel Temperature (T_{CH})	200 °C
Mounting Temperature (30 Seconds)	260 °C
Storage Temperature	-55 to 150 °C

Operation of this device outside the parameter ranges given above may cause permanent damage. These are stress ratings only, and functional operation of the device at these conditions is not implied.

Recommended Operating Conditions

Parameter	Value
Drain Voltage (Vd1, Vd2)	6 V
Drain Current (Id1)	40 mA
Drain Current (Id2)	80 mA
Gate Voltage (Vg1)	-0.65 V (Typ.)
Gate Voltage (Vg2)	-0.7 V (Typ.)

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

Electrical Specifications

Test conditions unless otherwise noted: 25 °C, Vd1 = Vd2 = 6 V, Id1 = 40 mA, Id2 = 80 mA, Vg1 = -0.65 V Typ., Vg2 = -0.7 V Typ.

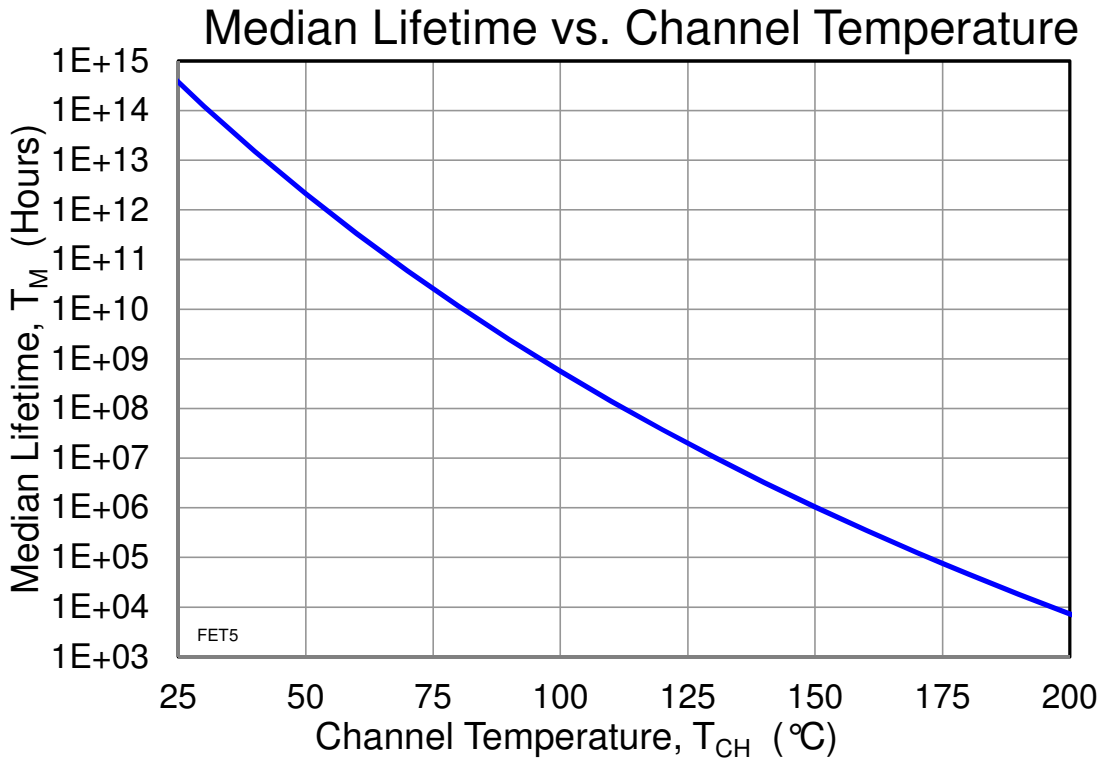
Parameter	Min	Typical	Max	Units
Operational Frequency Range	2.7		3.8	GHz
Gain		17		dB
Input Return Loss		15		dB
Output Return Loss		10		dB
Noise Figure		1.2		dB
Output Power at Saturation		20		dBm
Output Power at 1 dB Gain Compression		19		dBm
Output TOI at Pout/Tone = 4 dBm		33		dBm
Gain Temperature Coefficient		-0.01		dB/°C
Noise Figure Temperature Coefficient		-0.004		dB/°C
Output Power Temperature Coefficient		-0.01		dBm/°C

Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) (1)	Vd1 = Vd2 = 6 V, Id1 = 40 mA, Id2 = 80 mA, Pdiss = 0.72 W, Tbaseplate = 85 °C	49	°C/W
Channel Temperature (T_{CH})		120	°C
Median Lifetime (T_M)		3.7E+7	Hrs

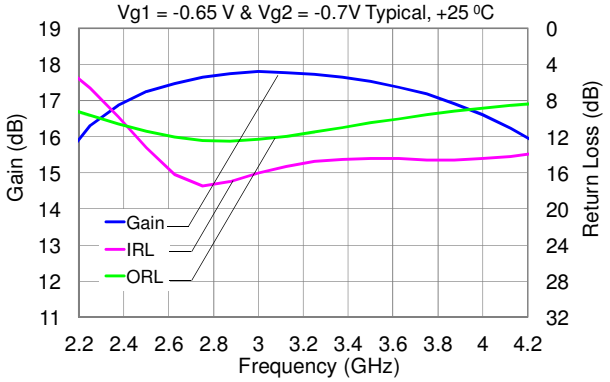
Notes:
1. Thermal resistance measured to back of package.

Median Lifetime

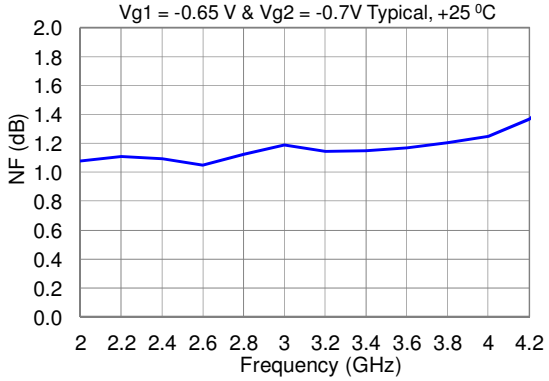


Typical Performance

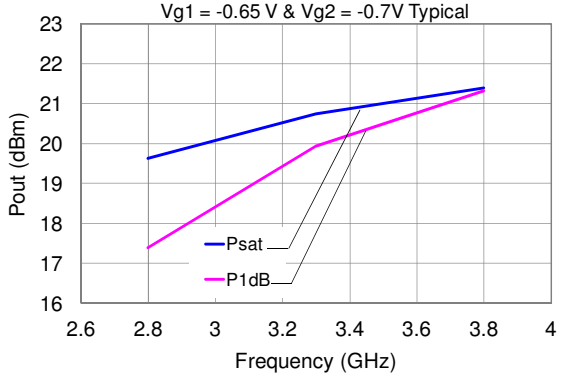
S-Parameters vs. Frequency
Vd1 = Vd2 = 6 V, Id1 = 40 mA, Id2 = 80mA
Vg1 = -0.65 V & Vg2 = -0.7V Typical, +25 °C



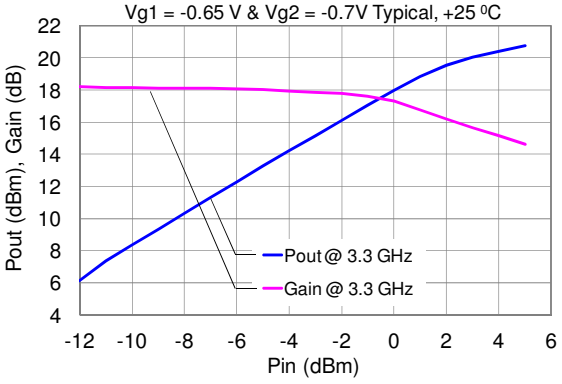
Noise Figure vs. Frequency
Vd1 = Vd2 = 6 V, Id1 = 40 mA, Id2 = 80mA
Vg1 = -0.65 V & Vg2 = -0.7V Typical, +25 °C



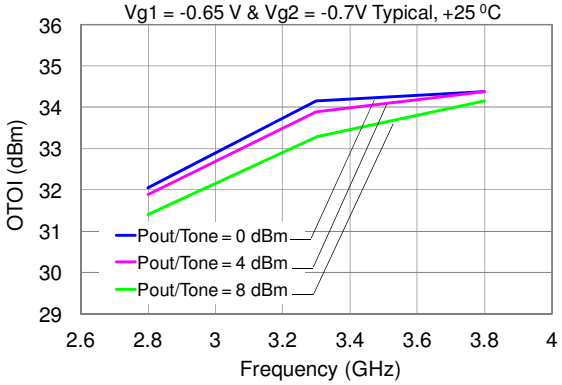
Output Power vs. Frequency
Vd1 = Vd2 = 6 V, Id1 = 40 mA, Id2 = 80mA
Vg1 = -0.65 V & Vg2 = -0.7V Typical



Pout, Gain vs. Pin
Vd1 = Vd2 = 6 V, Id1 = 40 mA, Id2 = 80mA
Vg1 = -0.65 V & Vg2 = -0.7V Typical, +25 °C

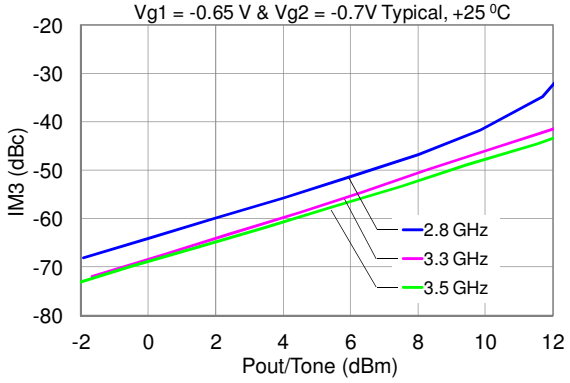


OTOI vs. Frequency vs. Pout/Tone
Vd1 = Vd2 = 6 V, Id1 = 40 mA, Id2 = 80mA
Vg1 = -0.65 V & Vg2 = -0.7V Typical, +25 °C

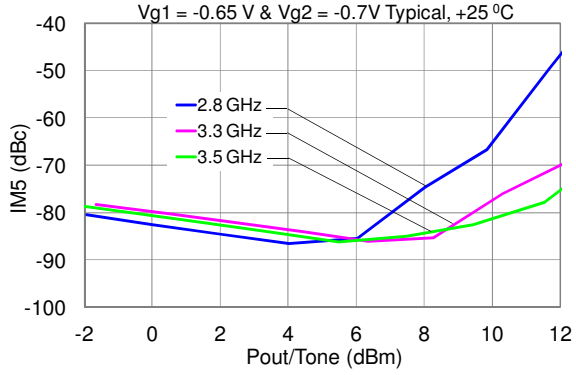


Typical Performance

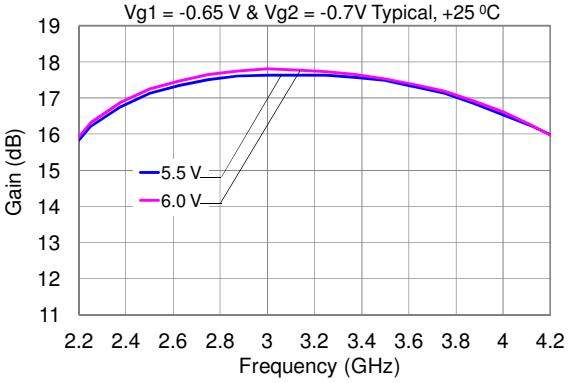
IM3 vs. Pout/Tone vs. Frequency
Vd1 = Vd2 = 6 V, Id1 = 40 mA, Id2 = 80mA
Vg1 = -0.65 V & Vg2 = -0.7V Typical, +25 °C



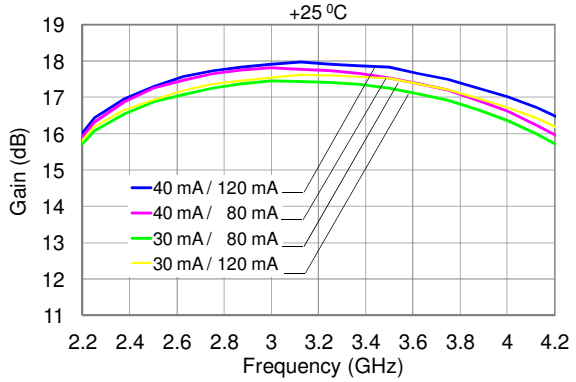
IM5 vs. Pout/Tone vs. Frequency
Vd1 = Vd2 = 6 V, Id1 = 40 mA, Id2 = 80mA
Vg1 = -0.65 V & Vg2 = -0.7V Typical, +25 °C



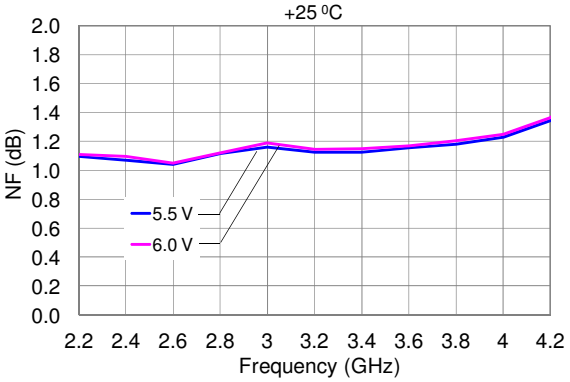
Gain vs. Frequency vs. Vd
Id1 = 40 mA, Id2 = 80mA
Vg1 = -0.65 V & Vg2 = -0.7V Typical, +25 °C



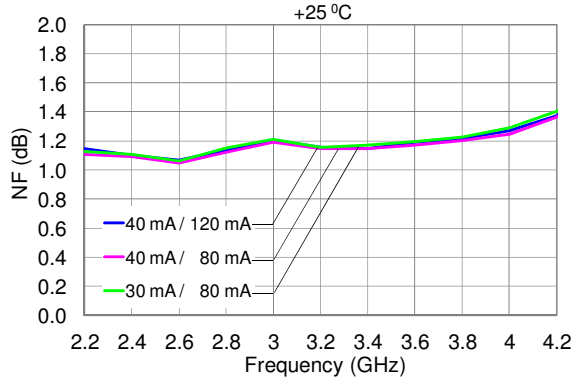
Gain vs. Frequency vs. Id1 / Id2
Vd1 = Vd2 = 6 V
+25 °C



Noise Figure vs. Frequency vs. Vd
Id1 = 40 mA, Id2 = 80mA
+25 °C

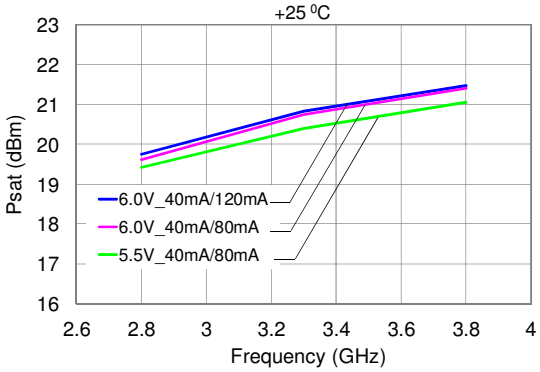


Noise Figure vs. Frequency vs. Id1 / Id2
Vd1 = Vd2 = 6 V
+25 °C

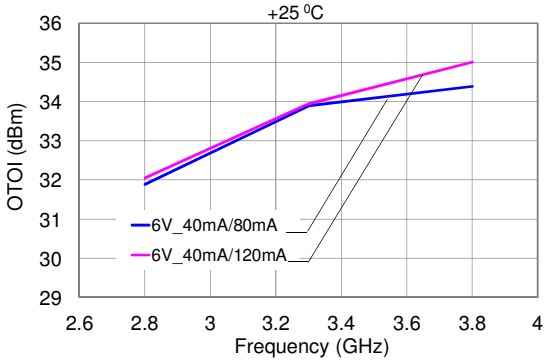


Typical Performance

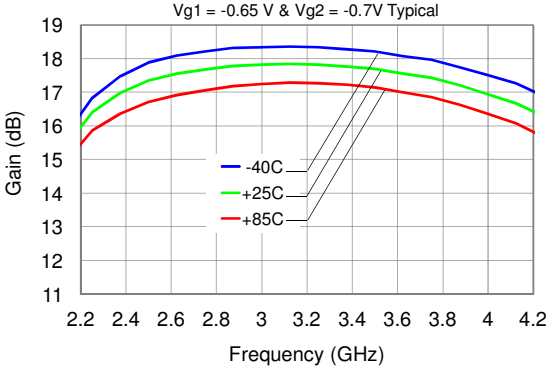
Psat vs. Frequency vs. Bias
Vd1 = Vd2 = Varies, Id1 & Id2: Varies
+25 °C



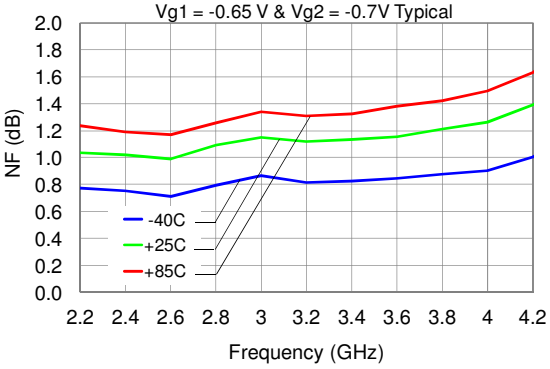
OTOI vs. Frequency vs. Bias
Vd1 = Vd2 = 6 V, Pout/Tone = 4 dBm
+25 °C



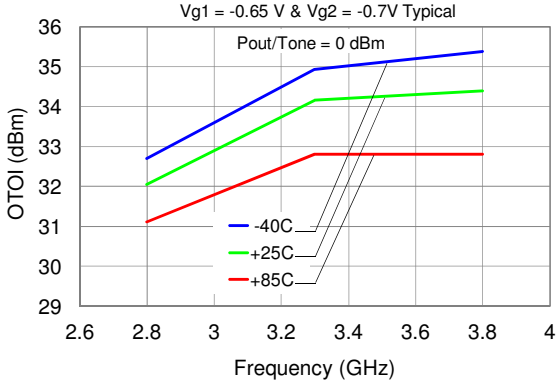
Gain vs. Frequency vs. Temp
Vd1 = Vd2 = 6 V, Id1 = 40 mA, Id2 = 80mA
Vg1 = -0.65 V & Vg2 = -0.7V Typical



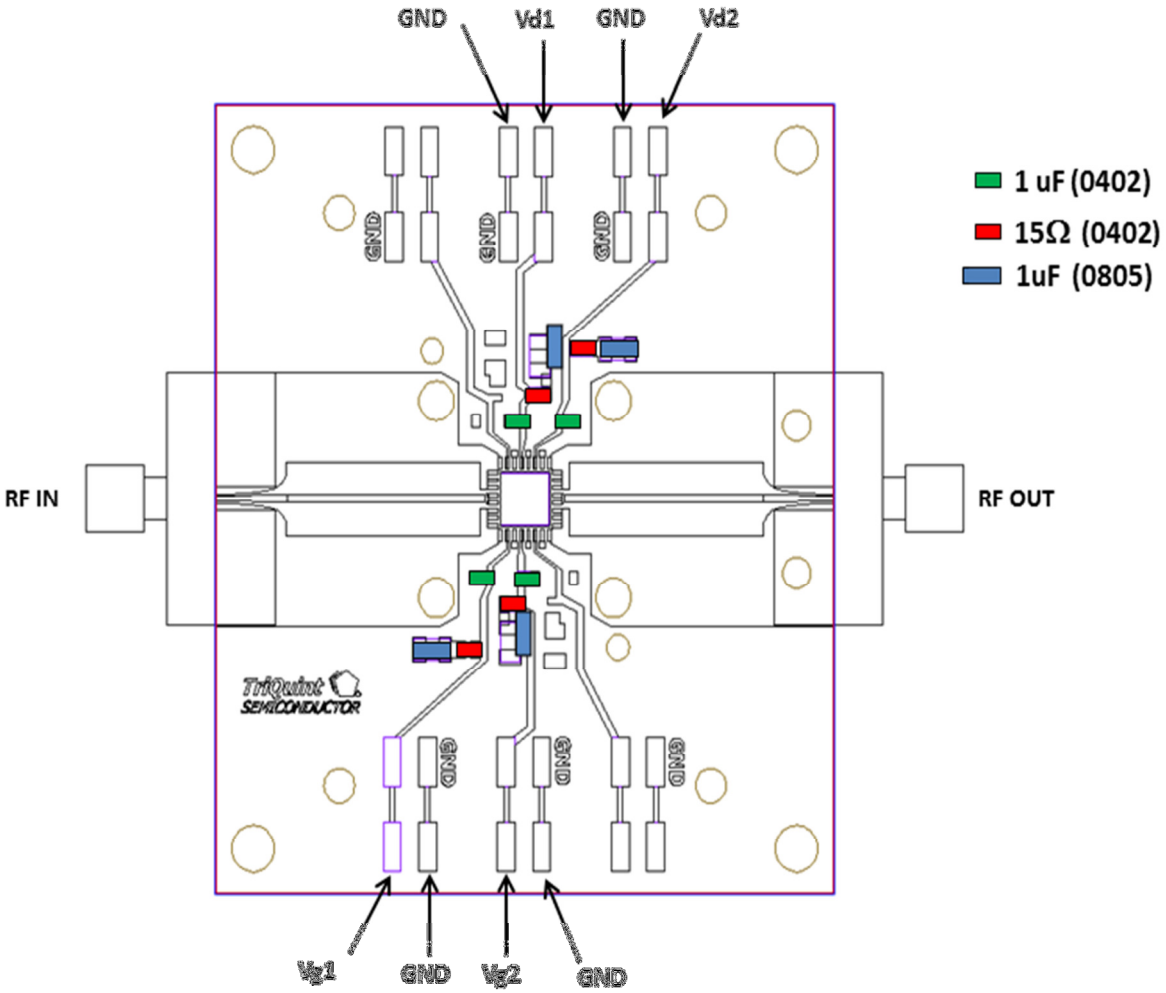
Noise Figure vs. Frequency vs. Temp
Vd1 = Vd2 = 6 V, Id1 = 40 mA, Id2 = 80mA
Vg1 = -0.65 V & Vg2 = -0.7V Typical



OTOI vs. Frequency vs. Temp
Vd1 = Vd2 = 6 V, Id1 = 40 mA, Id2 = 80mA
Vg1 = -0.65 V & Vg2 = -0.7V Typical



Applications Information



For bias of Vd1 = Vd2 = 6 V, Idq1 = 30 mA, Idq2 = 80 mA:
Vd1 and Vd2 can be tied together for 6V, Idq_{TOTAL} = 110 mA
Vg1 and Vg2 can be tied together, Vg_{TOTAL} = –0.7 V Typical

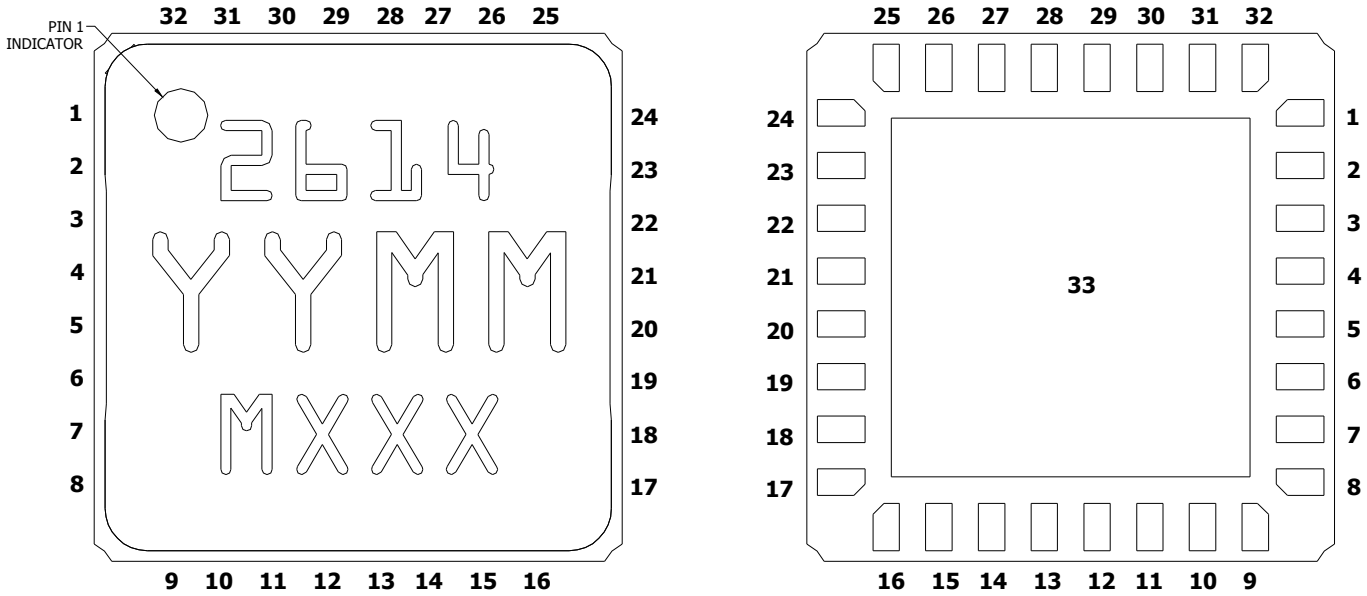
Bias-up Procedure

1. Set Vg1 and Vg2 to -1.0 V for pinch off.
2. Set Vd1 and Vd2 to +6 V.
3. Adjust Vg1 more positive until Idq1 is 40 mA. This will be approximately Vg1 = –0.65 V.
4. Adjust Vg2 more positive until Idq2 is 80 mA. This will be approximately Vg2 = –0.7 V.
5. Apply RF signal.

Bias-down Procedure

1. Turn off RF supply.
2. Reduce V_{G2} to –1.0 V. Ensure Idq2 is approx. 0 mA.
3. Reduce V_{G1} to –1.0 V. Ensure Idq1 is approx. 0 mA.
4. Set Vd1 and Vd2 to 0 V
5. Turn off Vd1 and Vd2 supply (if needed)

Pin Description

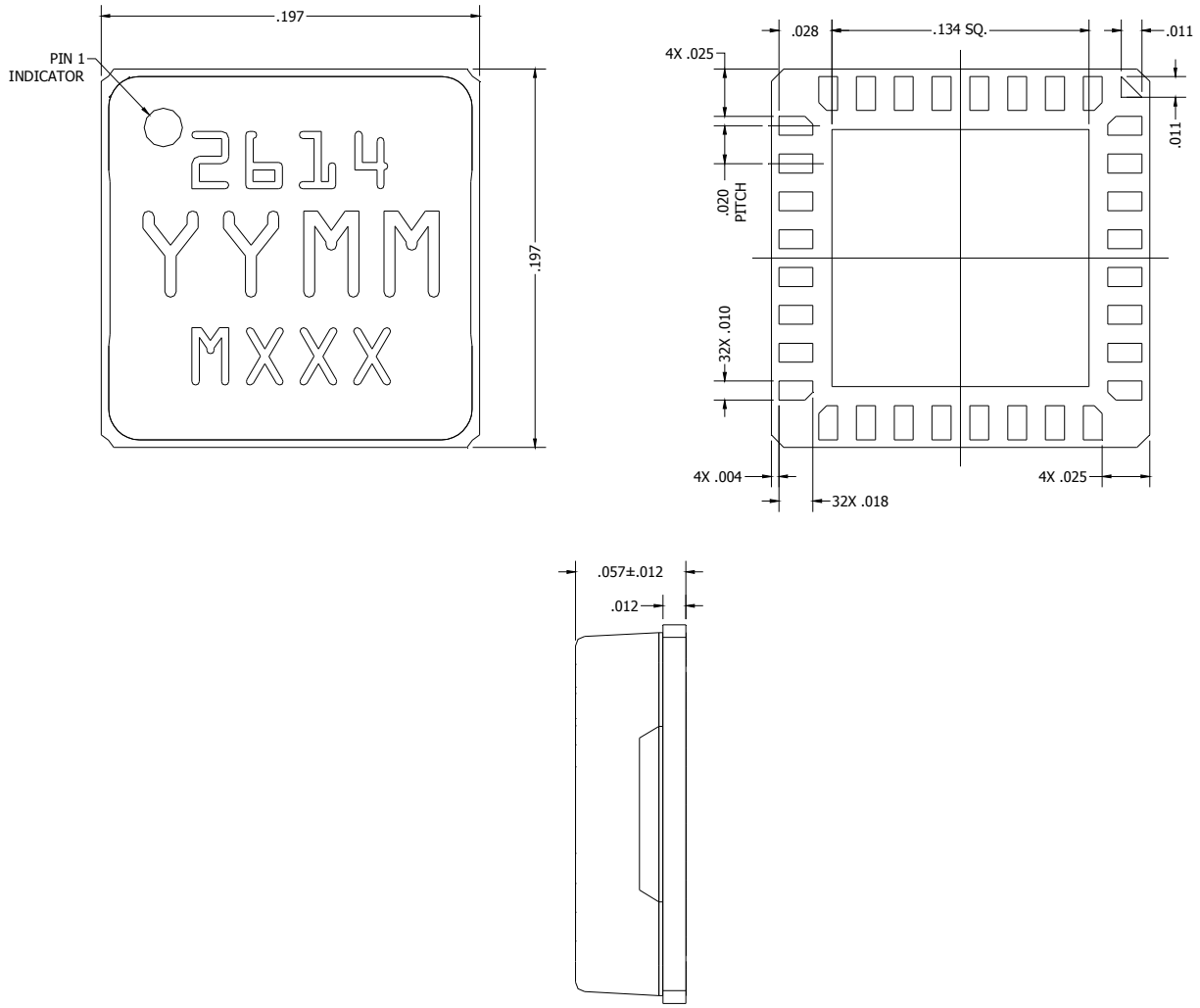


Bond Pads

Pin No.	Symbol	Description
1-3, 6-9, 11, 13-19, 22-26, 28, 30-32	GND	Internal grounding; can be grounded on PCB or left open
4, 5	RF IN	Input matched to 50 ohms.
10	Vg1	Gate voltage. ESD protection included; Bias network is required; see Application Information on page 7 as an example.
12	Vg2	Gate voltage. ESD protection included; Bias network is required; see Application Information on page 7 as an example.
27	Vd2	Drain voltage. Bias network is required; see Application Information on page 7 as an example.
29	Vd1	Drain voltage. Bias network is required; see Application Information on page 7 as an example.
20, 21	RF OUT	Output matched to 50 ohms .
33	GND	Backside Paddle. Multiple vias should be employed to minimize inductance and thermal resistance.

Mechanical Information

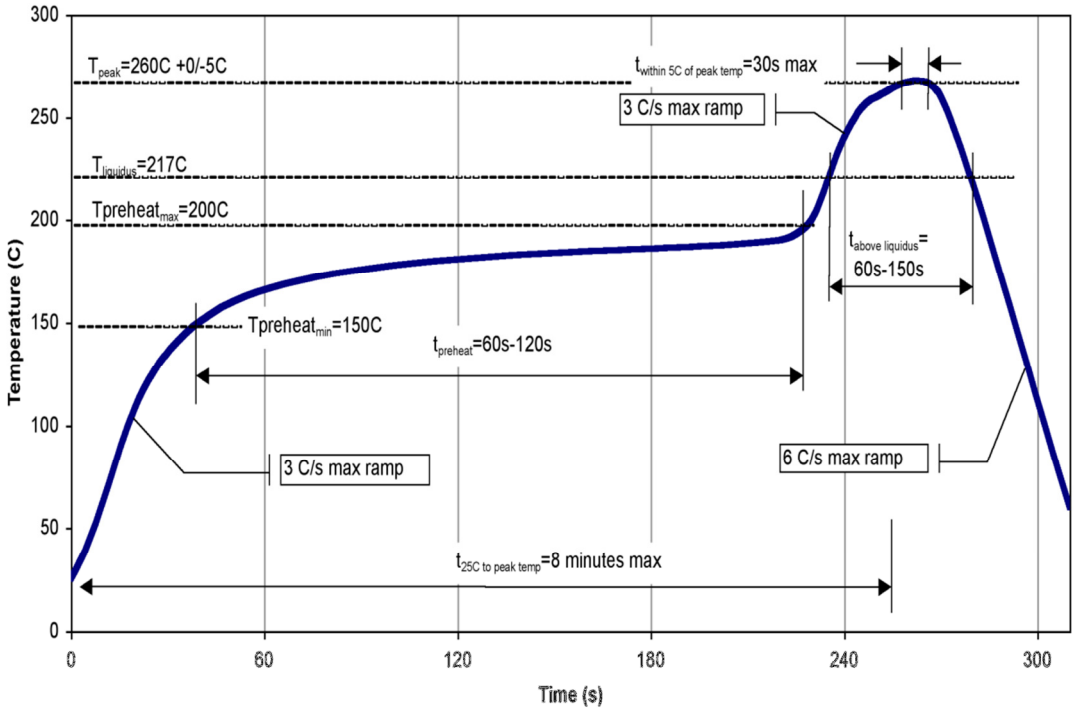
All dimensions are in inches.



NOTES:

1. MATERIAL:
   PACKAGE BASE : ALUMINUM NITRIDE (AIN)
   LID : PLASTIC WITH EPOXY
2. FINISH:
   ELECTROLESS GOLD (Au) : 0.5 - 1.5um
   OVER
   ELECTROLESS NICKEL (Ni) : 2.0um MIN.
3. PART MARKING:
   2614 : PART NUMBER
   YY : PART ASSEMBLY YEAR
   WW : PART ASSEMBLY WEEK
   MXXX : BATCH ID

Recommended Soldering Temperature Profile



Product Compliance Information

ESD Sensitivity Ratings

Caution! ESD-Sensitive Device

ESD Rating: TBD
Value: TBD
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

MSL Rating

Level TBD at +260 °C convection reflow
The part is rated Moisture Sensitivity Level 1 at 260°C per JEDEC standard IPC/JEDEC J-STD-020.

ECCN

US Department of Commerce EAR99

Solderability

Compatible with the latest version of J-STD-020, Lead-free solder, 260 °C

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 ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

Contact Information

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

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Email: info-sales@triquint.com **Fax:** +1.972.994.8504

For technical questions and application information: **Email:** info-products@triquint.com

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