TGA2613-SM

S-Band High Linearity LNA

Applications

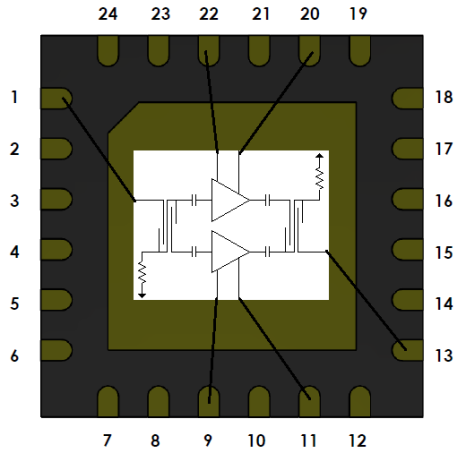
- Commercial and Military Radar
- Communications

Product Features

- Frequency Range: 2.5 – 4.0GHz
- NF: 2.5dB
- ITOI: 29dBm
- P1dB: >28.5dBm
- Small Signal Gain: 12dB
- Return Loss: >12dB
- Bias: V_D = 6V, I_{DQ} = 320mA, V_G = -0.7V
- Balance Topology
- Package Dimensions: 5 x 5 x 0.85mm

QFN 5x5 mm 24L

Functional Block Diagram



General Description

TriQuint's TGA2613-SM is a balanced S-Band high linearity Low Noise Amplifier. The balanced configuration supports low return loss and improves robustness into non-ideal loads. The TGA2613-SM operates from 2.5 to 4GHz and is designed using TriQuint's proven 0.15um pHEMT production process.

The TGA2613-SM typically provides 2.5dB noise figure, 29dBm ITOI, greater than 28.5dBm P1dB, and 12dB small signal gain.

The TGA2613-SM is available in a low cost, surface mount, 24-lead 5x5mm QFN. It is ideally suited to support for both radar and communication applications.

Both RF ports have intergraded DC blocking caps and are fully matched to 50Ω for simple system integration.

Lead-free and RoHS compliant

Evaluation Boards are available upon request.

Pad Configuration

Pad No.	Symbol
1	RF In
2 - 8, 10, 12, 14 - 19, 21, 23 - 24	N/C
9, 22	V_G
11, 20	V_D
13	RF Out

Ordering Information

Part	ECCN	Description
TGA2613-SM	EAR99	S-Band High Linearity LNA

Absolute Maximum Ratings

Parameter	Value
Drain Voltage (V_D)	6.5V
Gate Voltage Range (V_G)	-5 to 0V
Drain Current (I_D)	600mA
Gate Current (I_G)	-3.5 to 19mA
Power Dissipation, 85 °C (P_{DISS})	2.6W
Input Power, CW, 50 Ω, (P_{IN})	30dBm
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 (V_D)	6V
Drain Current (I_{DQ})	320mA
Gate Voltage (V_G)	-0.7V Typical

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed overall operating conditions.

Electrical Specifications

Test conditions unless otherwise noted: 25^0C, V_D = 6V, I_{DQ} = 320mA, V_G = -0.7V Typical

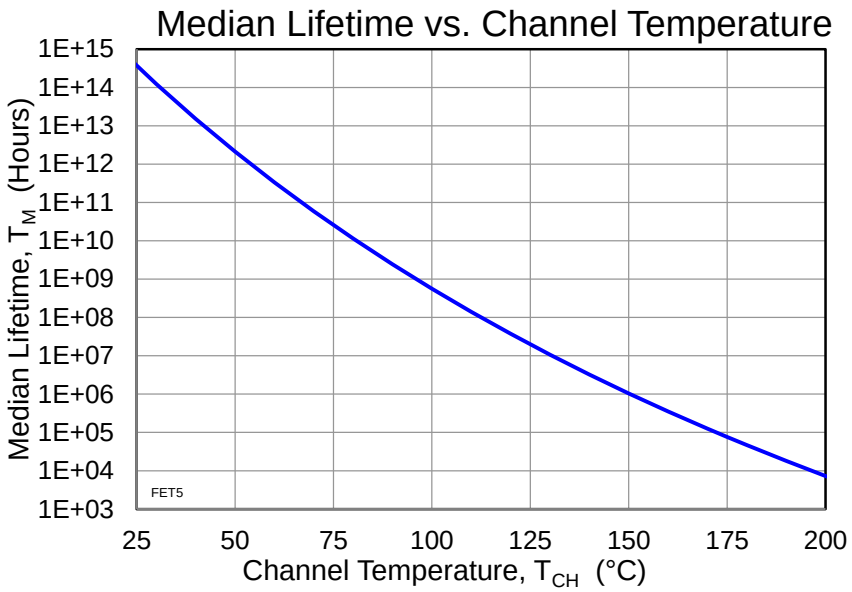
Parameter	Min	Typical	Max	Units
Operational Frequency Range	2.5		4.0	GHz
Small Signal Gain		12		dB
Input Return Loss		>12		dB
Output Return Loss		>12		dB
Noise Figure		2.5		dB
Output Power at 1 dB Gain Compression		>28.5		dBm
Input TOI		29		dBm
Gain Temperature Coefficient		-0.007		dB/°C

Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) (1)	T_{base} = 85°C V_D = 6V, I_{DQ} = 320mA, P_{DISS} = 1.92W	35.42	ºC/W
Channel Temperature (T_{CH})		153	°C
Median Lifetime (T_M)		7.5 x 10^5	Hrs

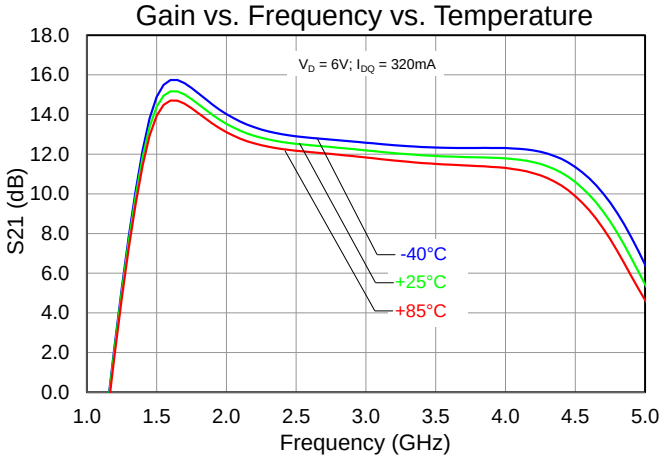
Notes:
1. Thermal resistance measured at back of the package.

Median Lifetime

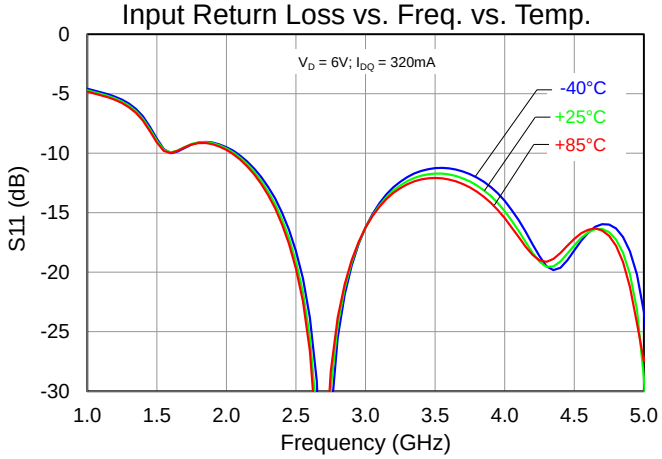


Typical Performance: Small Signal

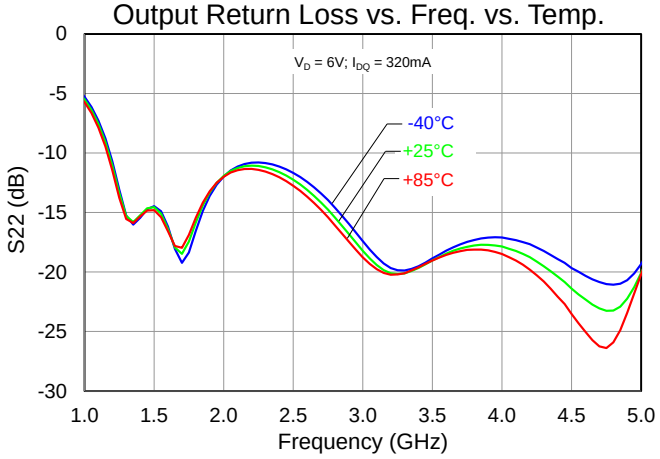
Gain vs. Frequency vs. Temperature



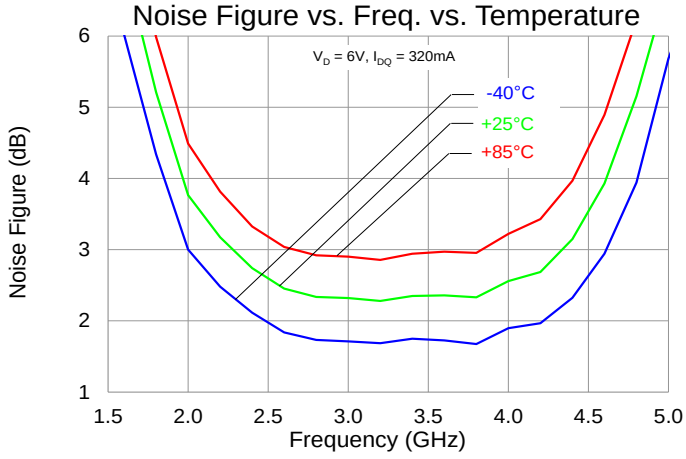
Input Return Loss vs. Freq. vs. Temp.



Output Return Loss vs. Freq. vs. Temp.

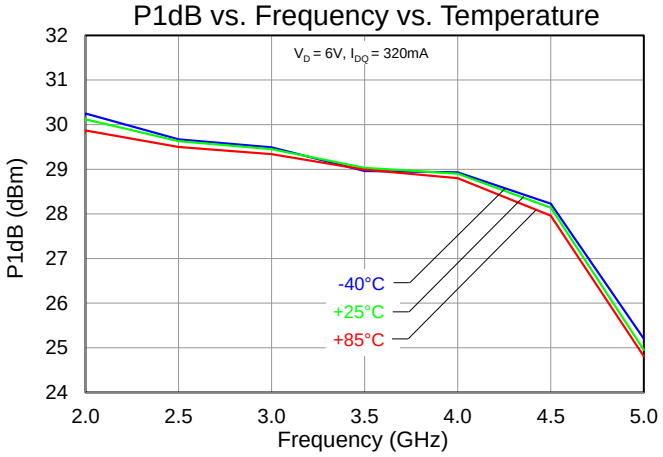


Noise Figure vs. Freq. vs. Temperature

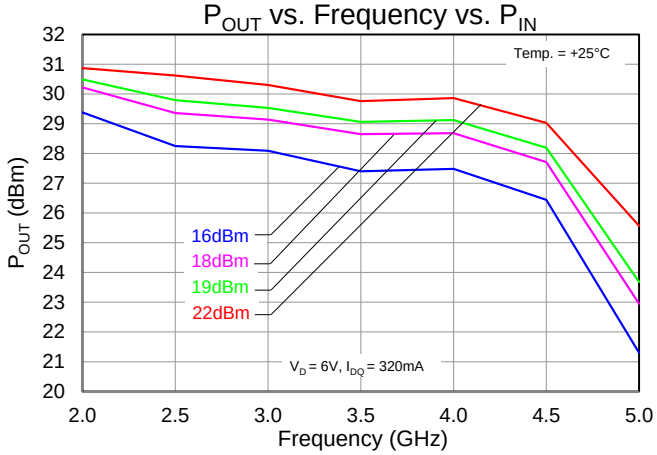


Typical Performance: Large Signal

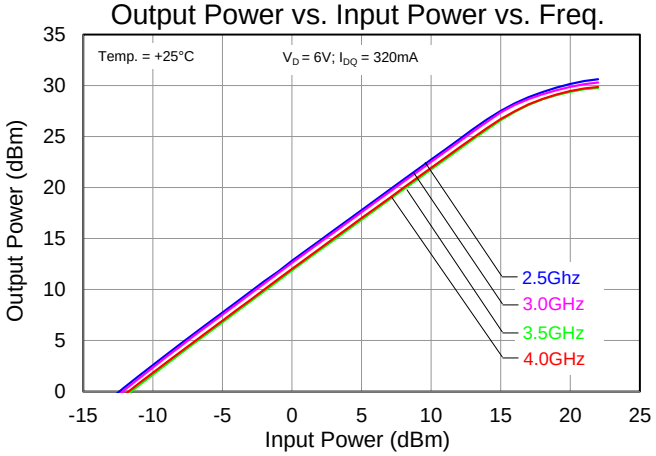
P1dB vs. Frequency vs. Temperature



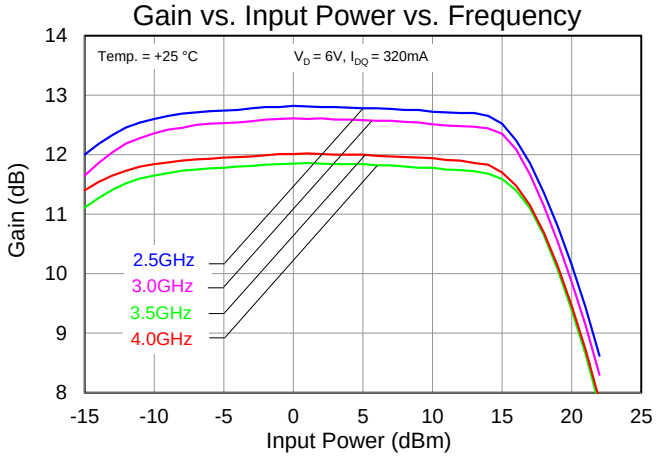
P_{OUT} vs. Frequency vs. P_{IN}



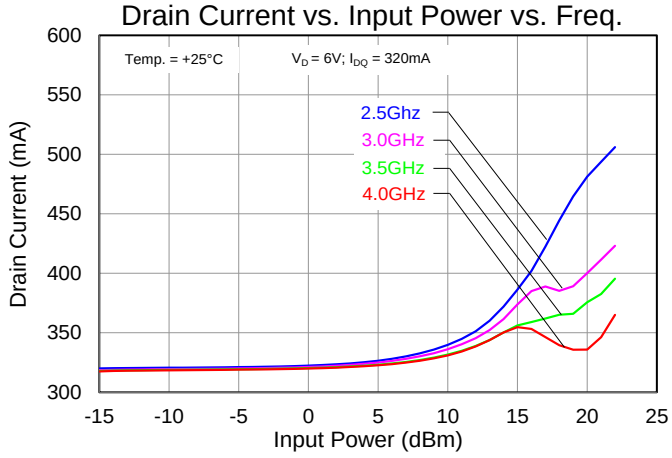
Output Power vs. Input Power vs. Freq.



Gain vs. Input Power vs. Frequency

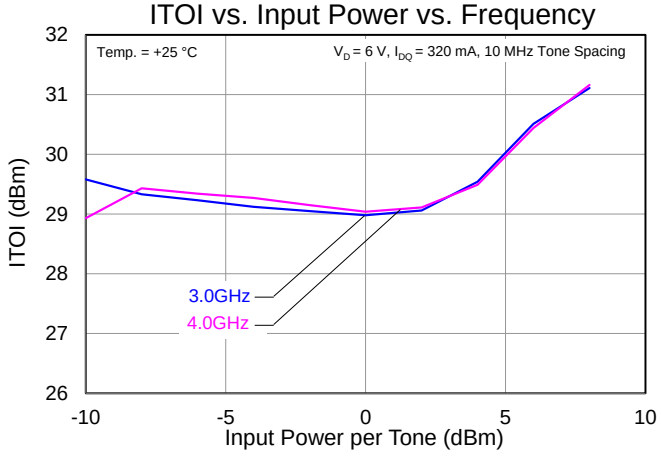


Drain Current vs. Input Power vs. Freq.

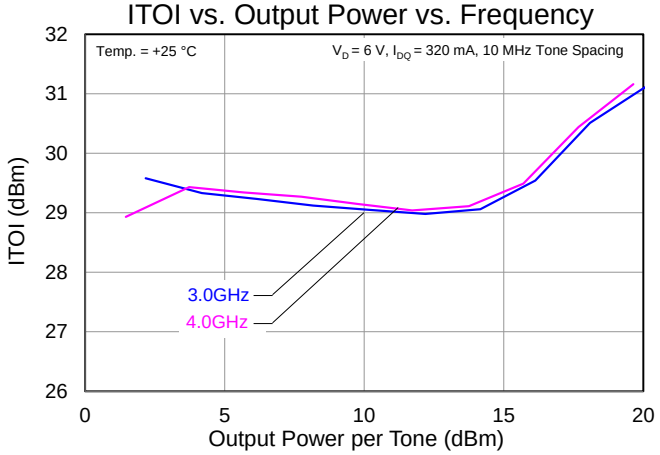


Typical Performance: Linearity

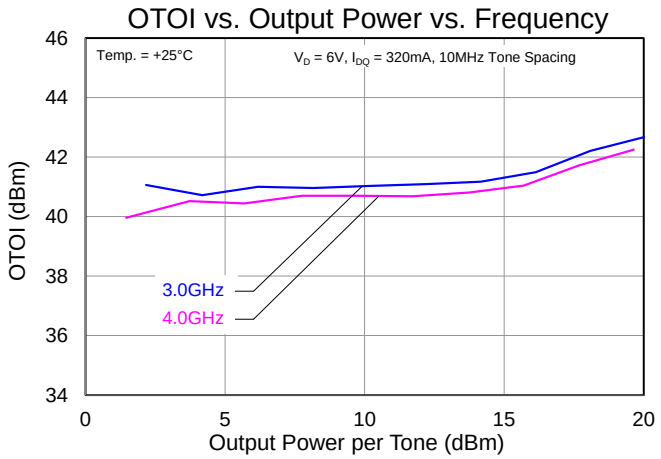
ITOI vs. Input Power vs. Frequency



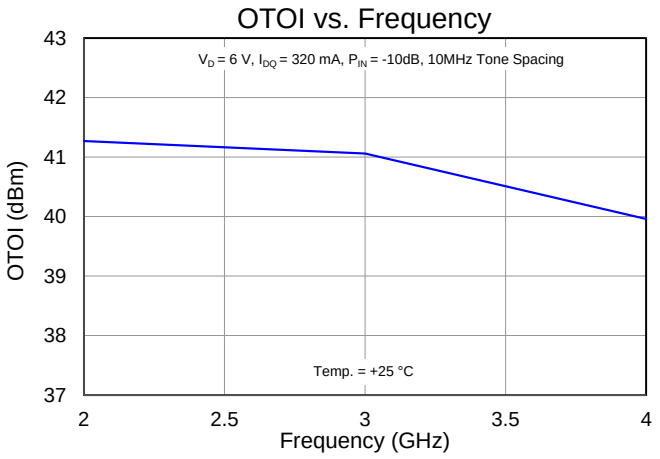
ITOI vs. Output Power vs. Frequency



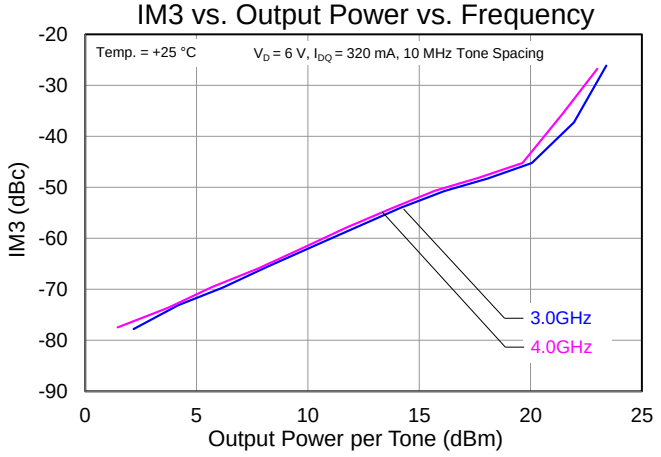
OTOI vs. Output Power vs. Frequency



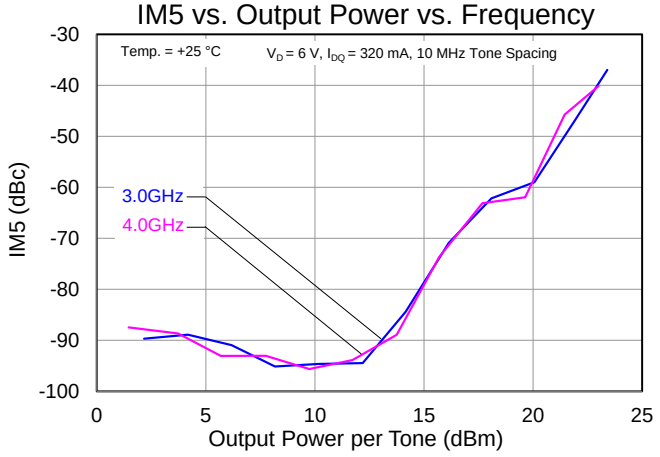
OTOI vs. Frequency



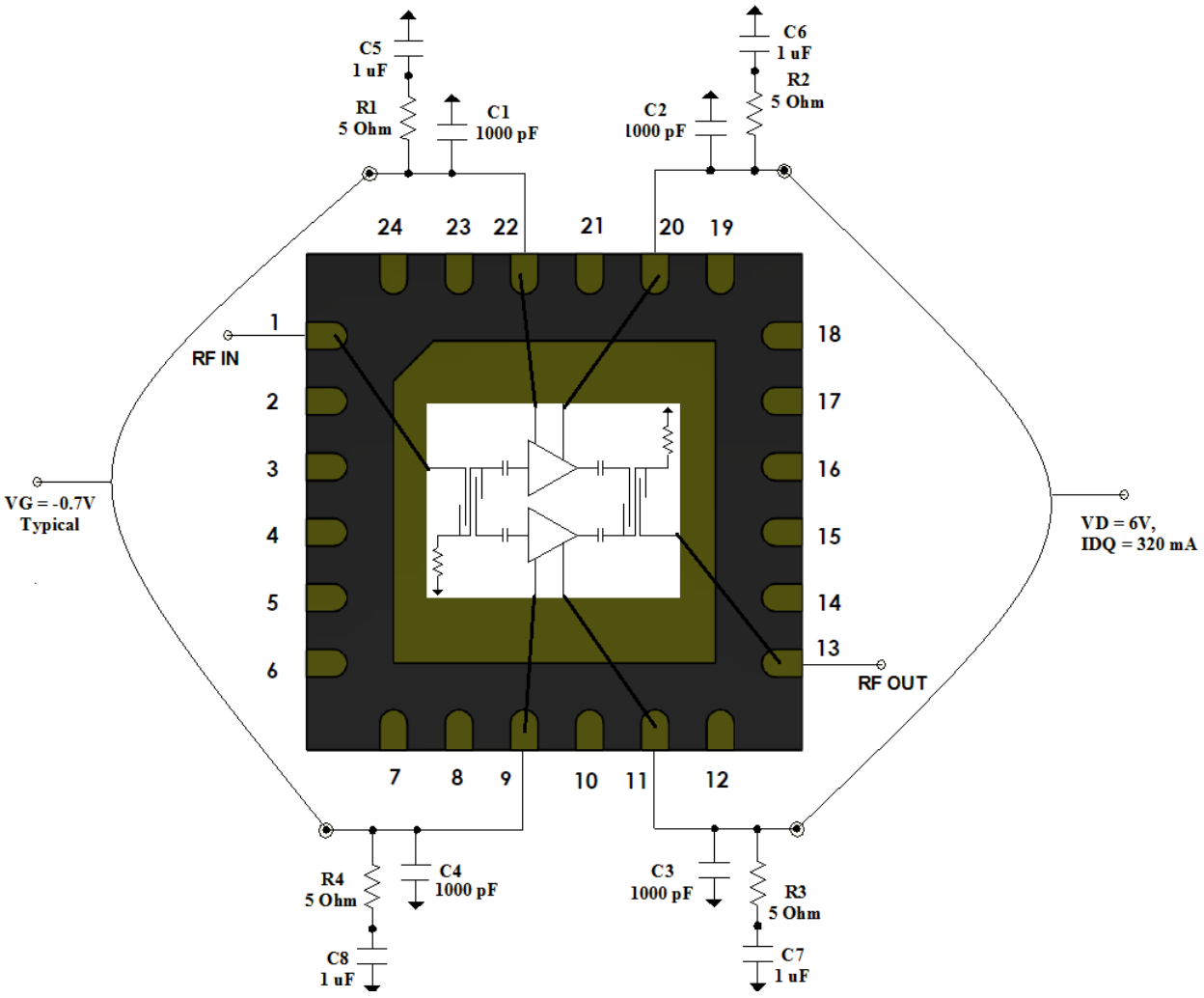
IM3 vs. Output Power vs. Frequency



IM5 vs. Output Power vs. Frequency



Application Circuit



Notes:

1. V_G & V_D must be biased from both sides (top and bottom.)

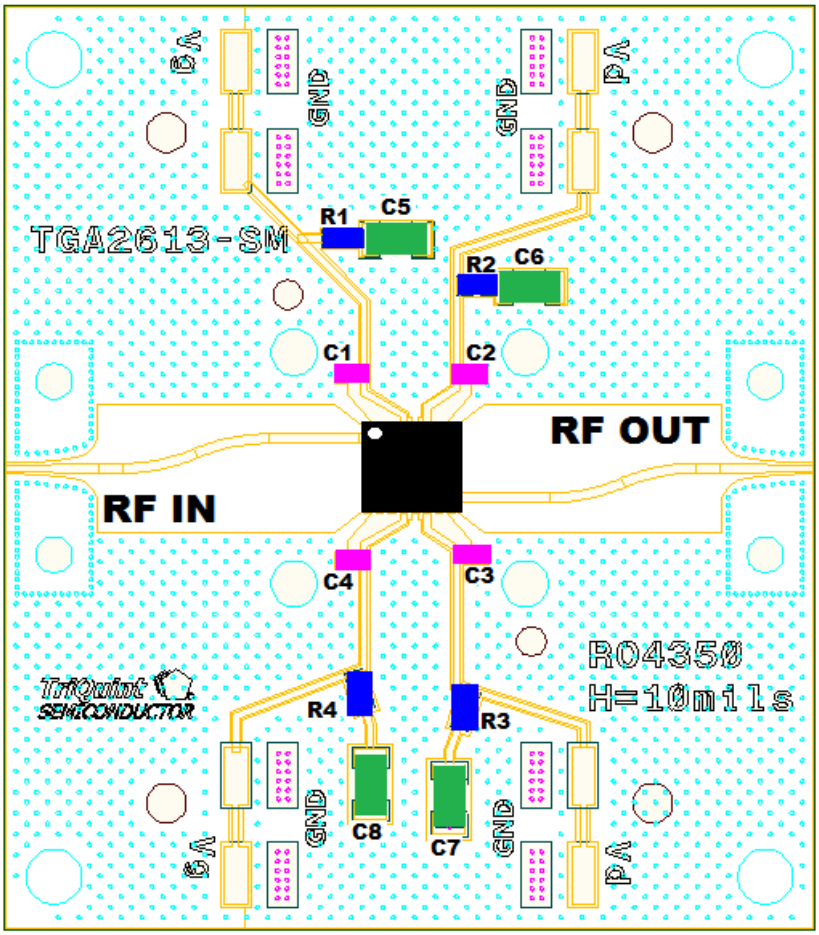
Bias-up Procedure

1. Set I_D limit to 550mA, I_G limit to 15mA
2. Set V_G to -2.0V
3. Set V_D +6V
4. Adjust V_G more positive until I_{DQ} = 320mA (V_G ~ -0.7V Typical)
5. Apply RF signal

Bias-down Procedure

1. Turn off RF signal
2. Reduce V_G to -2.0V. Ensure I_{DQ} ~ 0mA
3. Set V_D to 0V
4. Turn off V_D supply
5. Turn off V_G supply

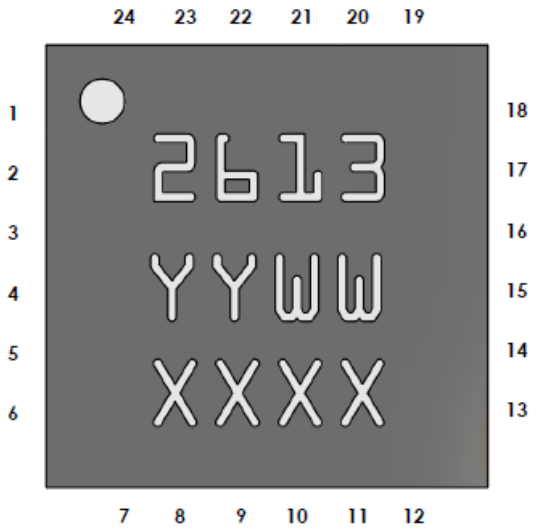
Evaluation Board

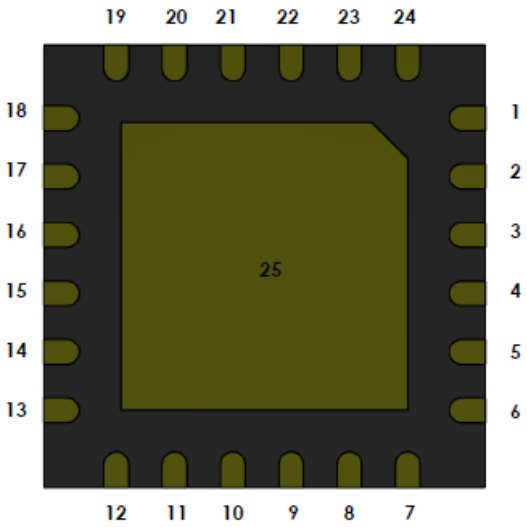


Bill of Material

Reference Des.	Value	Description	Manuf.	Part Number
C1 - C4	1000pF	Cap, 0402, 50 V, 10%, X7R	Various	
C5 - C8	1µF	Cap, 1206, 50 V, 10%, X7R	Various	
R1 - R4	5 Ohms	Res, 0603, 5%	Various	

Pin Layout

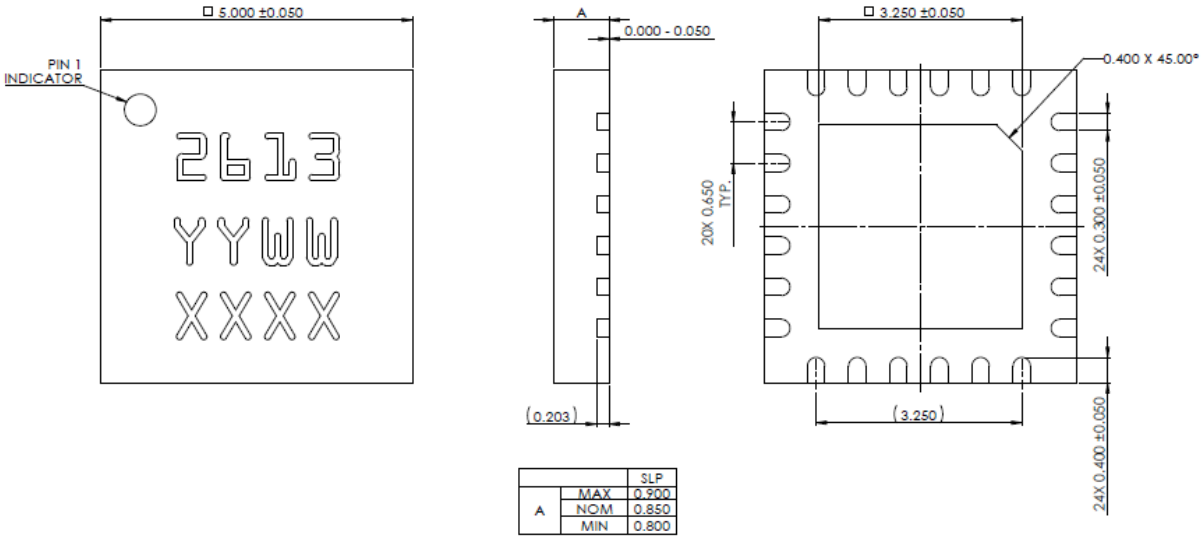




Pin Description

Pin No.	Symbol	Description
1,	RF IN	Input; matched to 50 Ω. DC Blocked
2 - 8, 10, 12, 14 - 19, 21, 23 - 24	NC	No Connection – Recommended grounding on PCB.
9, 22	GATE	Gate voltage; bias network is required; must be biased from both sides; see recommended Application Information on page 7
11, 20	DRAIN	Drain voltage; bias network is required; must bebiased from both sides; see recommended Application Information on page 7.
13	RF OUT	Output; matched to 50 Ω. DC Blocked
25	GND	Ground Paddle. Multiple vias should be employed to minimize inductance and thermal resistance.

Mechanical Information



Units: millimeter

Tolerances: unless specified

x.xxx = ± 0.127

Materials:

Package Metal and Leads are NiPdAu Plated

Base: Cu alloy

Part is mold encapsulated

Marking:

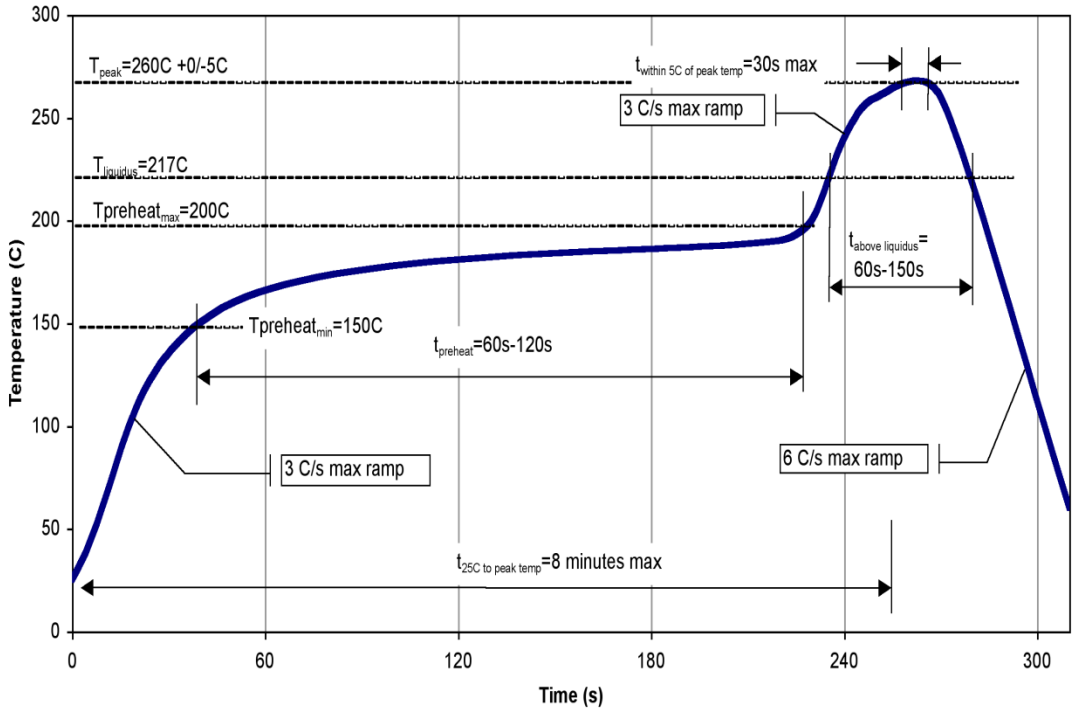
2613: Part number

YY: Part Assembly year

WW: Part Assembly week

XXXX: LOT NO.

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
This part is rated Moisture Sensitivity Level TBD at TBD °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:

Web: www.triquint.com **Tel:** +1.972.994.8465
Email: info-sales@triquint.com **Fax:** +1.972.994.8504

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

Important Notice

The information contained herein is believed to be reliable. TriQuint makes no warranties regarding the information contained herein. TriQuint assumes no responsibility or liability whatsoever for any of the information contained herein. TriQuint assumes no responsibility or liability whatsoever for the use of the information contained herein. The information contained herein is provided "AS IS, WHERE IS" and with all faults, and the entire risk associated with such information is entirely with the user. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for TriQuint products. The information contained herein or any use of such information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights, whether with regard to such information itself or anything described by such information.

TriQuint products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death.