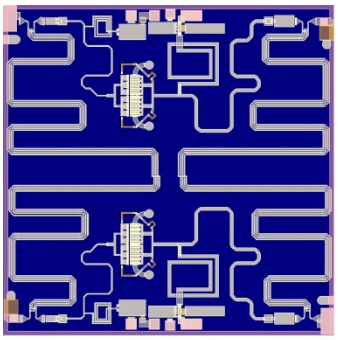
TGA2613

S-Band High Linearity LNA

Applications

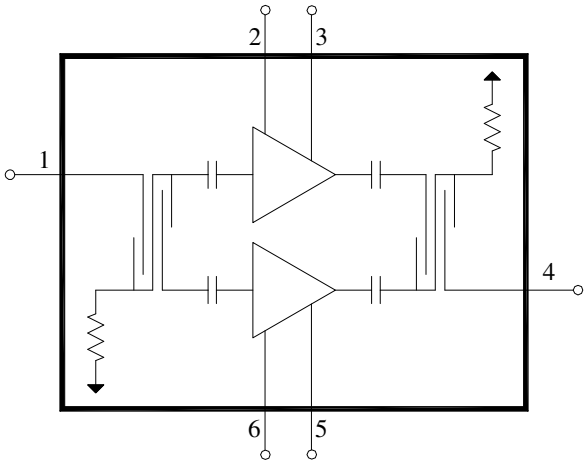
- Commercial and Military Radar
- Communications



Product Features

- Frequency Range: 2.5 – 4.0 GHz
- NF: 2.5 dB
- ITOI: 29 dBm
- P1dB: 29 dBm
- Small Signal Gain: 12.5 dB
- Return Loss: 20 dB
- Bias: V_D = 6 V, I_{DQ} = 320 mA, V_G = -0.7 V Typical
- Balanced Topology
- Chip Dimensions: 3.1 x 3.1 x 0.10 mm

Functional Block Diagram



General Description

The TriQuint TGA2613 is a balanced S-Band high linearity Low Noise Amplifier. The balanced configuration provides return loss and improves robustness into non-ideal loads. The TGA2613 operates from 2.5 to 4.0 GHz and is designed using TriQuint's proven 0.15um pHEMT production process.

The TGA2613 typically provides 2.5 dB of noise figure, 29 dBm of ITOI, 29 dBm of P1dB, and 12.5dB of small signal gain.

Fully matched to 50 ohms with integrated DC blocking caps on both I/O ports, the TGA2613 is ideally suited for radar and satellite communications.

Lead-free and RoHS compliant

Evaluation Boards are available upon request.

Pad Configuration

Pad No.	Symbol
1	RF In
2	V_{G1}
3	V_{D1}
4	RF Out
5	V_{D2}
6	V_{G2}

Ordering Information

Part	ECCN	Description
TGA2613	EAR99	S-Band High ITOI LNA

Absolute Maximum Ratings

Parameter	Value
Drain Voltage (V_D)	6.5 V
Gate Voltage Range (V_G)	-5 to 0 V
Drain Current (I_D)	600 mA
Gate Current (I_G)	-3.5 to 19 mA
Power Dissipation, 85 ℃ (P_{DISS})	3.8 W
Input Power, CW, 50 Ω, (P_{IN})	30 dBm
Channel tremperature (T_{CH})	200 ℃
Mounting Temperature (30 Seconds)	260 ℃
Storage Temperature	-55 to 150 ℃

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)	6 V
Drain Current (I_{DQ})	320 mA
Gate Voltage (V_G)	-0.7 V

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

Electrical Specifications

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

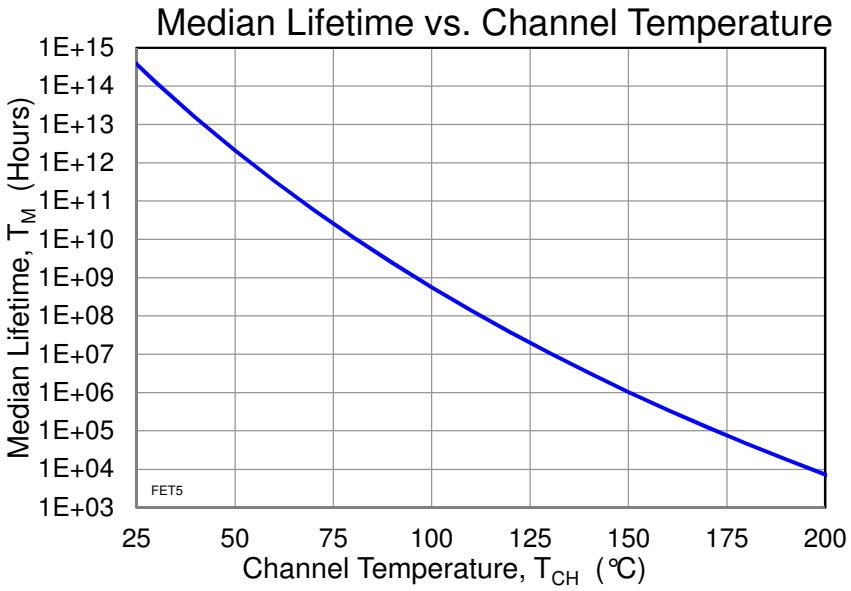
Parameter	Min	Typical	Max	Units
Operational Frequency Range	2.5		4.0	GHz
Small Signal Gain		12.5		dB
Input Return Loss		20		dB
Output Return Loss		20		dB
Noise Figure		2.5		dB
Output Power at 1 dB Gain Compression		29		dBm
Input TOI		29		dBm
Gain Temperature Coefficient		-0.007		dB/℃
Noise Figure Temperature Coefficient		-0.01		dB/℃

Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) (1)	V_D = 6 V, I_{DQ} = 320 mA, P_{DISS} = 1.92 W, T_{base} = 85 °C	30	ºC/W
Channel Temperature (T_{CH})		143	°C
Median Lifetime (T_M)		2.3E+6	Hrs

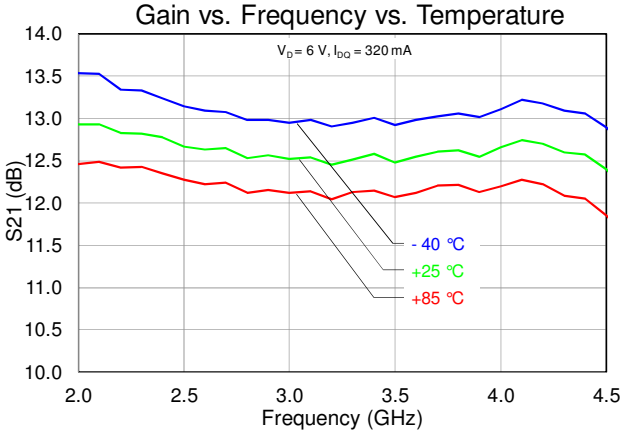
Notes:
1. Thermal resistance measured to back of carrier plate. MMIC mounted on 20 mils thick CuMo carrier using 1.5 mil 80/20

Median Lifetime

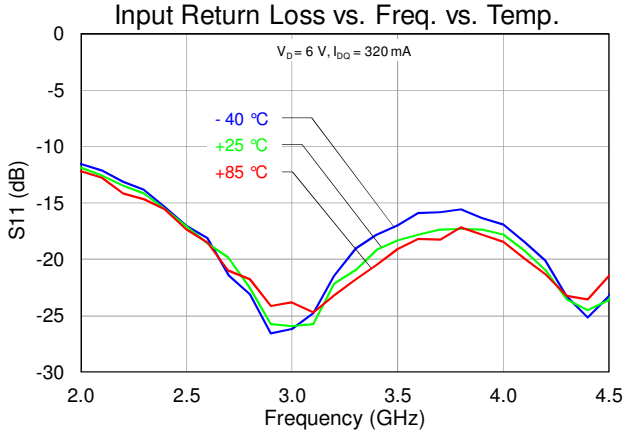


Typical Performance

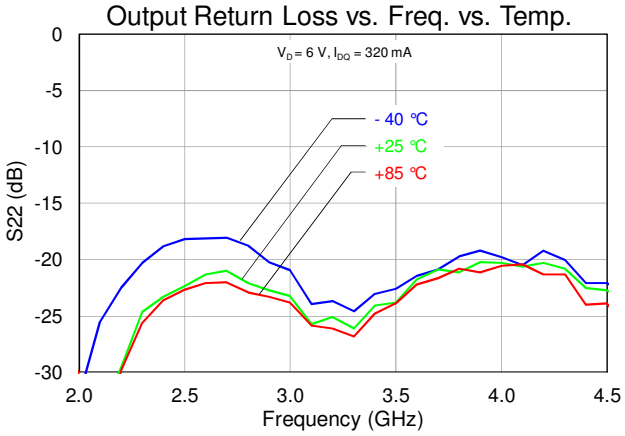
Gain vs. Frequency vs. Temperature



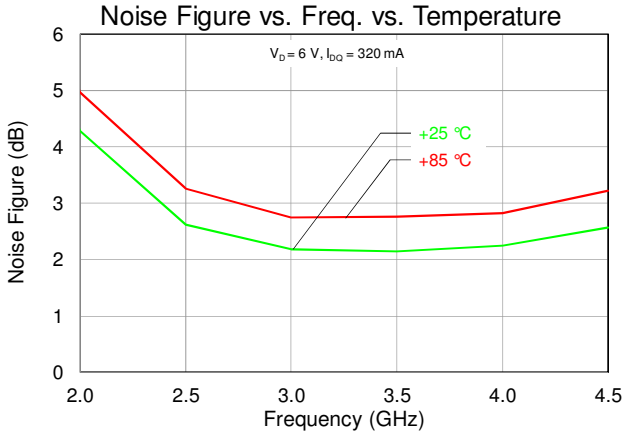
Input Return Loss vs. Freq. vs. Temp.



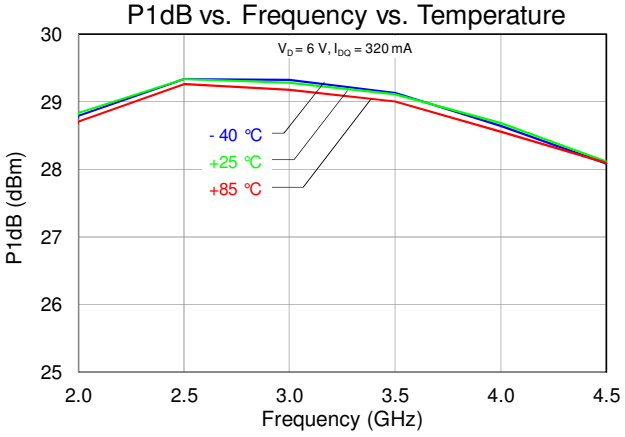
Output Return Loss vs. Freq. vs. Temp.



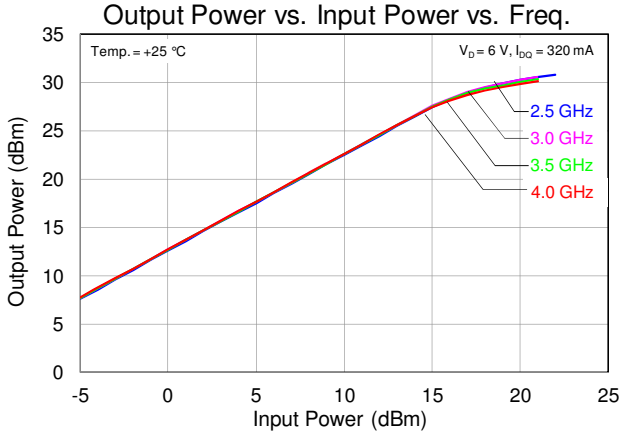
Noise Figure vs. Freq. vs. Temperature



P1dB vs. Frequency vs. Temperature

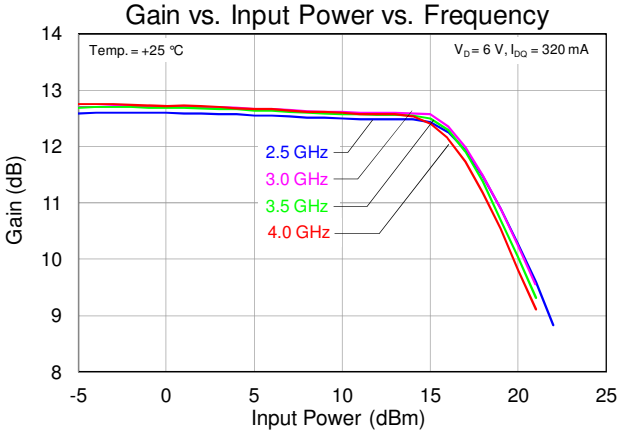


Output Power vs. Input Power vs. Freq.

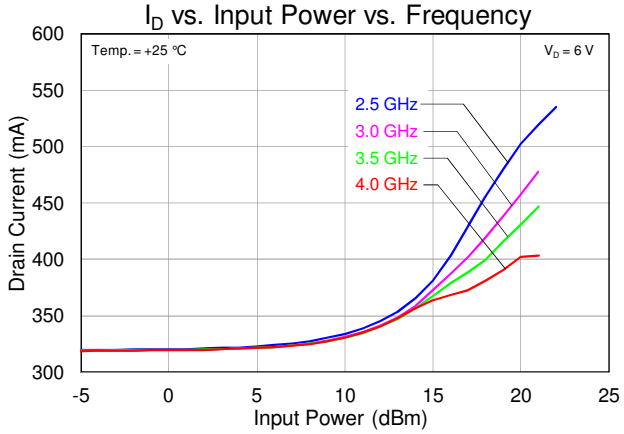


Typical Performance

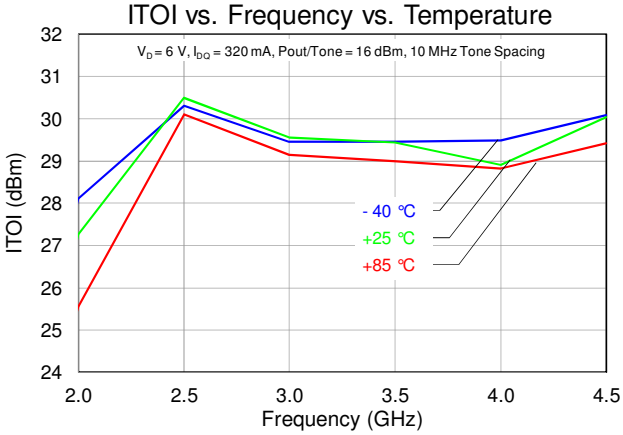
Gain vs. Input Power vs. Frequency



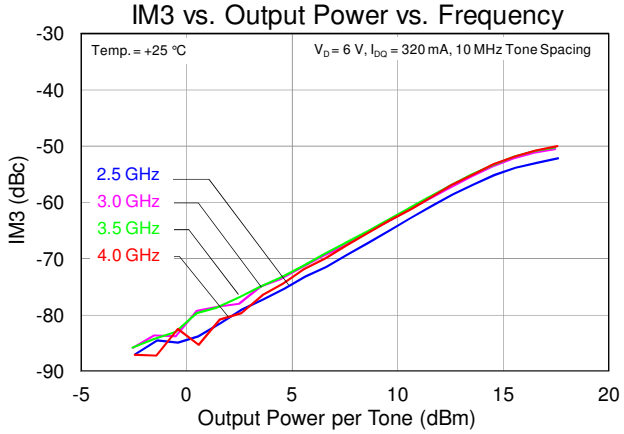
I_D vs. Input Power vs. Frequency



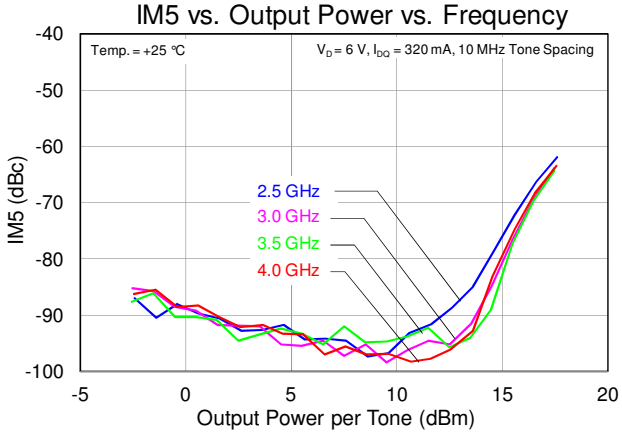
ITOI vs. Frequency vs. Temperature



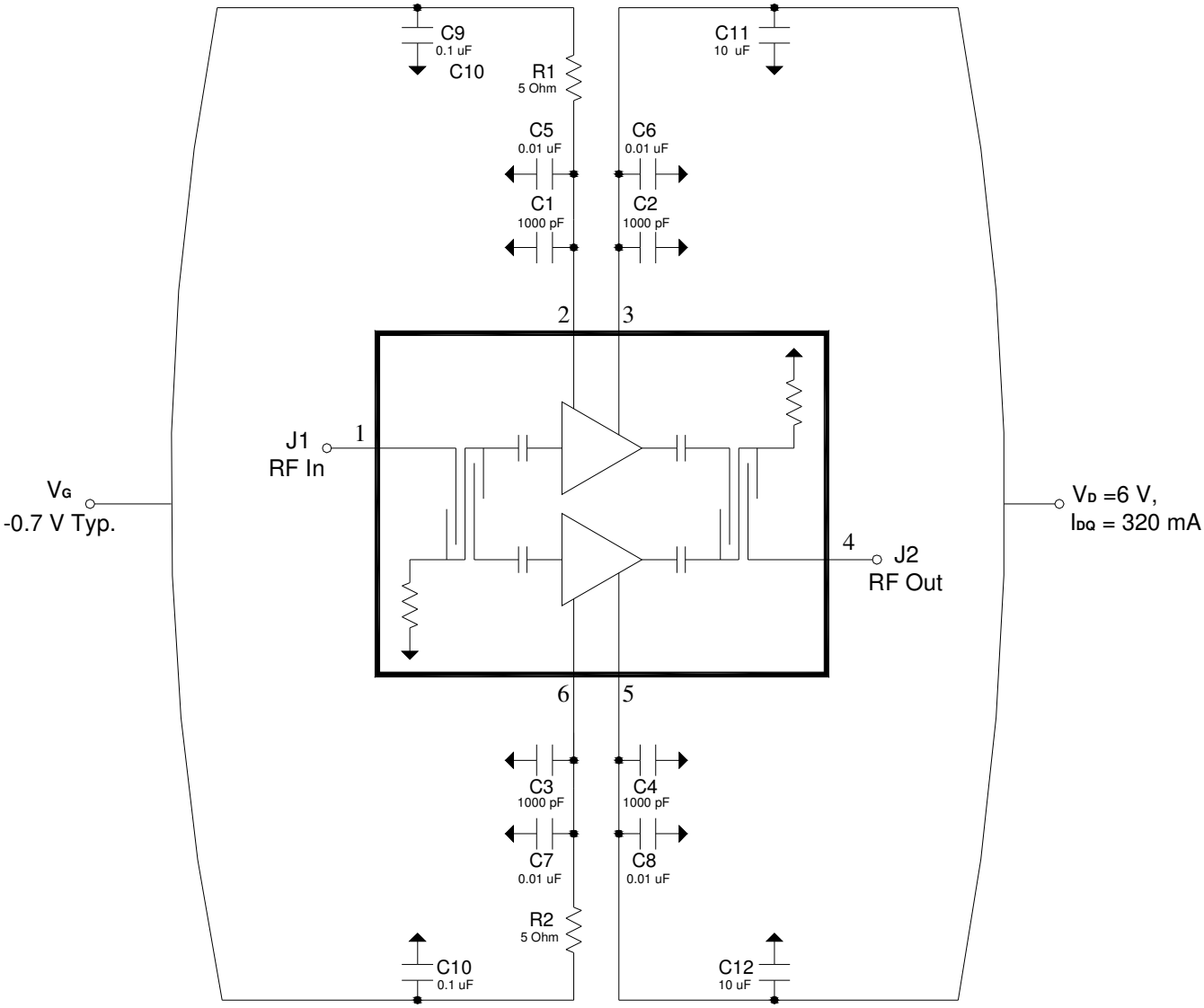
IM3 vs. Output Power vs. Frequency



IM5 vs. Output Power vs. Frequency



Application Circuit



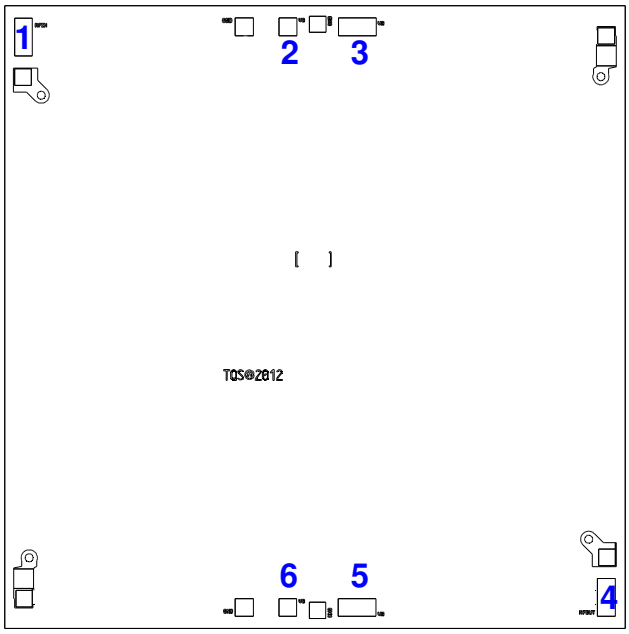
Bias-up Procedure

1. Set I_D limit to 650 mA, I_G limit to 15 mA
2. Apply -1.5 V to V_G for pinch off
3. Apply +6 V to V_D
4. Adjust V_G more positive unitl I_{DQ} = 320 mA (V_G ~ -0.7 V Typical)
5. Apply RF signal

Bias-down Procedure

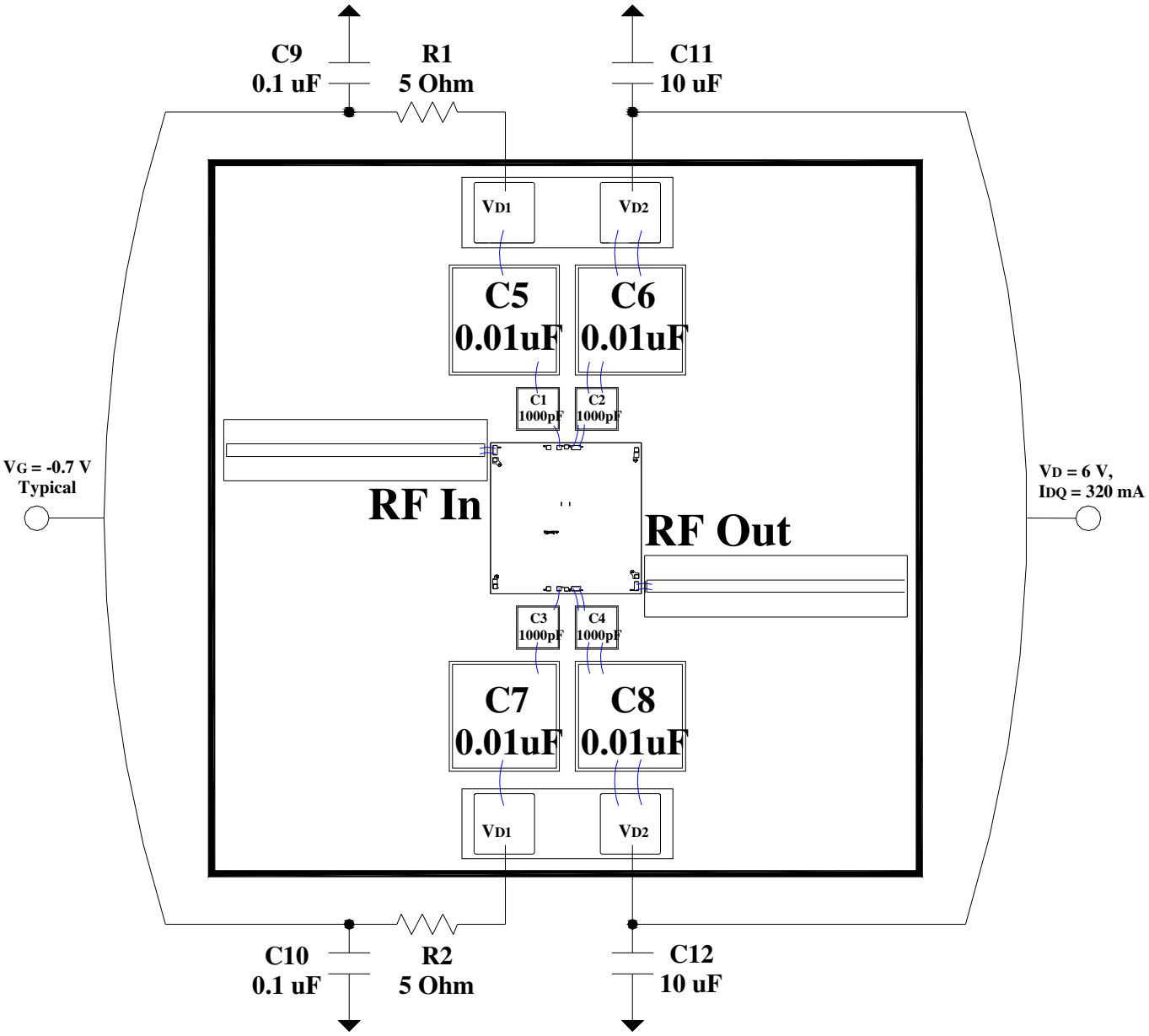
1. Turn off RF signal
2. Reduce V_G to -1.5 V. Ensure I_{DQ} ~ 0 mA
3. Set V_D to 0 V
4. Turn off V_D suppy
5. Turn off V_G suppy

Bond Pad Description

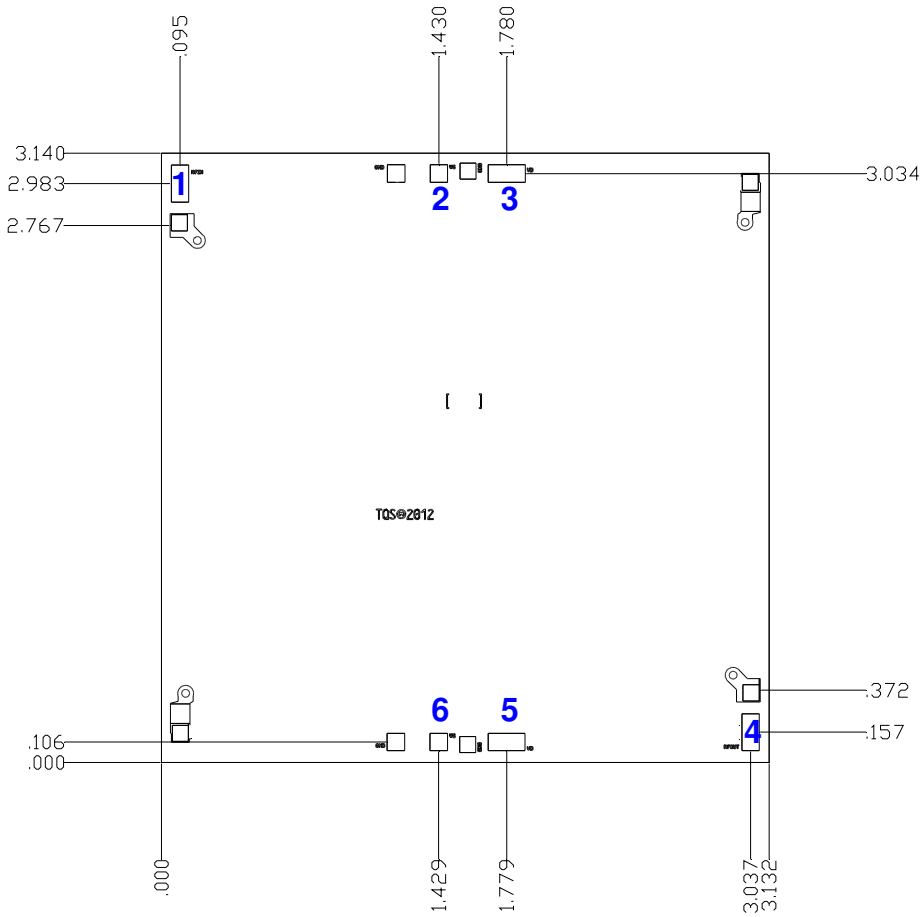


Bond Pad	Symbol	Description
1	RF In	Input; matched to 50 ohms; DC decoupled
2	V_{G1}	Gate voltage, V_{G1}. Bias network is required; see Application Circuit on page 7 as an example.
3	V_{D1}	Drain voltage, V_{D1}. Bias network is required; see Application Circuit on page 7 as an example.
4	RF Out	Output; matched to 50 ohms; DC decoupled
5	V_{D2}	Drain voltage, V_{D2}. Bias network is required; see Application Circuit on page 7 as an example.
6	V_{G2}	Gate voltage, V_{G2}. Bias network is required; see Application Circuit on page 7 as an example.

Assembly Drawing



Mechanical Drawing



Unit: millimeters
Thickness: 0.10
Die x, y size tolerance: +/- 0.050
Chip edge to bond pad dimensions are shown to center of pad
Ground is backside of die

Bond Pad	Symbol	Pad Size	Bond Pad	Symbol	Pad Size
1	RF In	0.100 x 0.200	4	RF Out	0.100 x 0.200
2	V_{G1}	0.100 x 0.100	5	V_{D2}	0.200 x 0.100
3	V_{D1}	0.200 x 0.100	6	V_{G2}	0.100 x 0.100

Assembly Notes

Component placement and adhesive attachment assembly notes:

- Vacuum pencils and/or vacuum collets are the preferred method of pick up.
- Air bridges must be avoided during placement.
- The force impact is critical during auto placement.
- Organic attachment (i.e. epoxy) can be used in low-power applications.
- Curing should be done in a convection oven; proper exhaust is a safety concern.

Reflow process assembly notes:

- Use AuSn (80/20) solder and limit exposure to temperatures above 300°C to 3-4 minutes, maximum.
- An alloy station or conveyor furnace with reducing atmosphere should be used.
- Do not use any kind of flux.
- Coefficient of thermal expansion matching is critical for long-term reliability.
- Devices must be stored in a dry nitrogen atmosphere.

Interconnect process assembly notes:

- Thermosonic ball bonding is the preferred interconnect technique.
- Force, time, and ultrasonics are critical parameters.
- Aluminum wire should not be used.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.

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

Solderability

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

ECCN

US Department of Commerce: EAR99

Contact Information

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