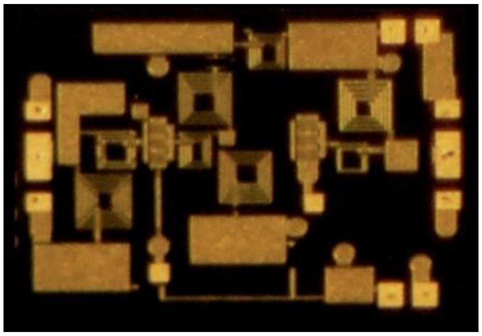
TriQuint

TGA2611

2-6 GHz GaN LNA

Applications

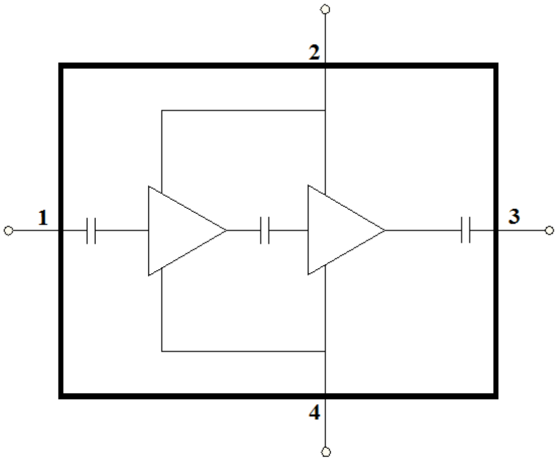
- Commercial and Military Radar
- Satellite Communications



Product Features

- Frequency Range: 2–6GHz
- NF: 1.5dB
- OTOI: 32dBm
- Small Signal Gain: 25dB
- Return Loss: >10dB
- P1dB: 22dBm
- Bias: V_D = 10V, I_{DQ} = 110mA, V_G = -2.3V Typical
- Chip Dimensions: 2.1 x 1.5 x 0.10mm

Functional Block Diagram



General Description

TriQuint's TGA2611 is a broadband Low Noise Amplifier fabricated on TriQuint's production 0.25um GaN on SiC process (TQGaN25). Covering 2–6GHz, the TGA2611 typically provides 22dBm P1dB, 25dB of small signal gain, 1.5dB of noise figure and 32dBm of OTOI. In addition to the high overall electrical performance, this GaN amplifier also provides a high level of input power robustness. Able to survive up to 2W of input power without performance degradation, TriQuint's TGA2611 provides flexibility regarding receive chain protection never before seen with GaAs technology.

Fully matched to 50 ohms with integrated DC blocking caps on both I/O ports, the TGA2611 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_D
3	RF Out
4	V_G

Ordering Information

Part	ECCN	Description
TGA2611	EAR99	2 – 6 GHz GaN LNA

Absolute Maximum Ratings

Parameter	Value
Drain Voltage (V_D)	40V
Gate Voltage Range (V_G)	-5 to 0V
Drain Current (I_D)	200mA
Gate Current (I_G)	-1 to 4.2mA
Power Dissipation, 85 °C (P_{DISS})	6W
Input Power, CW, 50 Ω, (P_{IN})	33dBm
Channel temperature (T_{CH})	275°C
Mounting Temperature (30 Seconds)	320°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)	10V
Drain Current (I_{DQ})	110mA
Gate Voltage (V_G)	-2.3V Typical

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

Electrical Specifications

Test conditions unless otherwise noted: 25 ^{0}C, V_D = 10V, I_{DQ} = 110mA, V_G = -2.3V Typical

Parameter	Min	Typical	Max	Units
Operational Frequency Range	2.0		6.0	GHz
Small Signal Gain		25		dB
Input Return Loss		>10		dB
Output Return Loss		>10		dB
Noise Figure		1.5		dB
Output Power at 1 dB Gain Compression		22		dBm
Output TOI		32		dBm
Gain Temperature Coefficient		-0.03		dB/°C
Noise Figure Temperature Coefficient		0.007		dB/°C

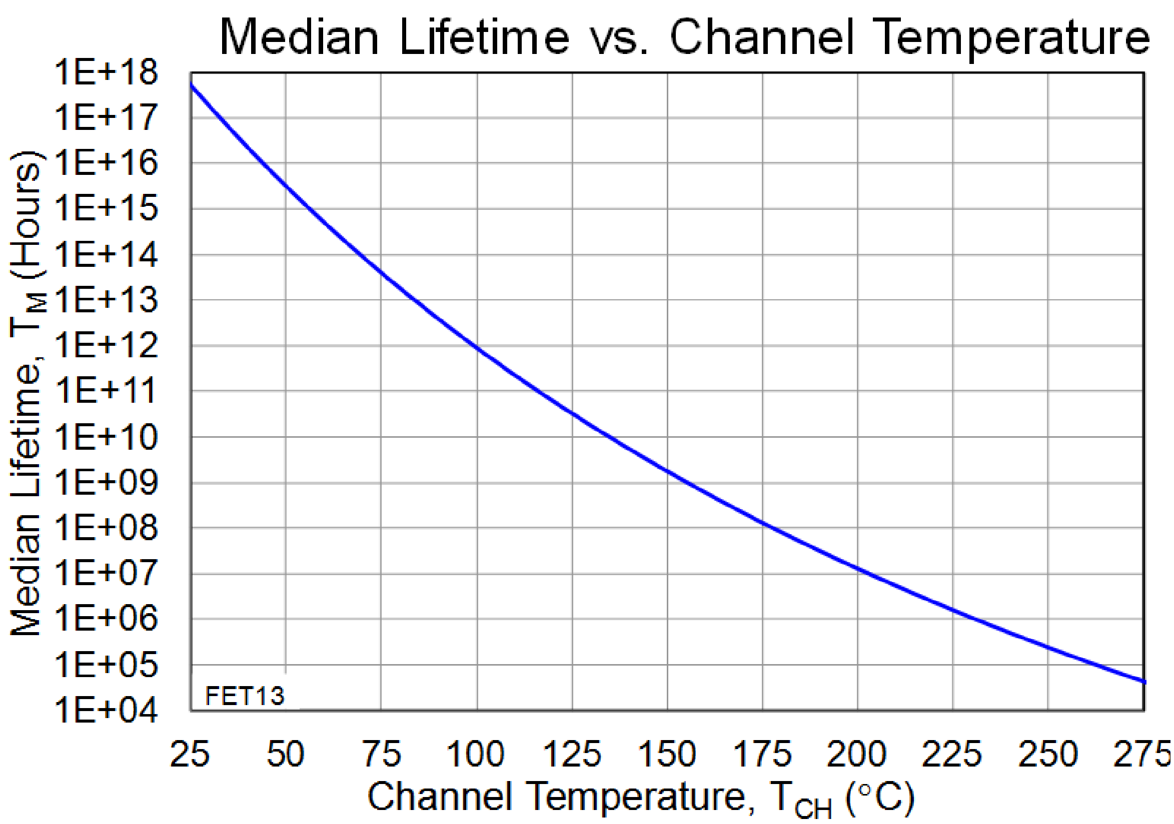
Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) [1]	V_D = 10V, I_{DQ} = 110mA, P_{DISS} = 1.1W, $T_{baseplate}$ = 85°C	18.6	ºC/W
Channel Temperature (T_{CH})		105	°C
Median Lifetime (T_M)		4.52 x 10^11	Hrs

Notes:
1. Thermal resistance measured to back of carrier plate. MMIC mounted on 40 mils CuMo carrier using 1.5 mil 80/20 AuSn.

Median Lifetime

Test Conditions: V_D = 40V; Failure Criteria is 10% reduction in I_{D_MAX}



Typical Performance

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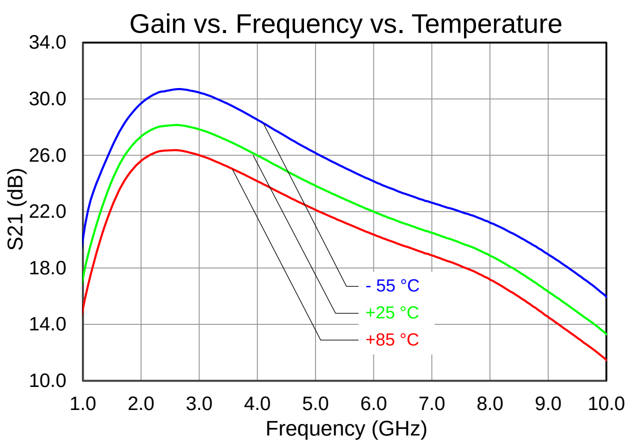

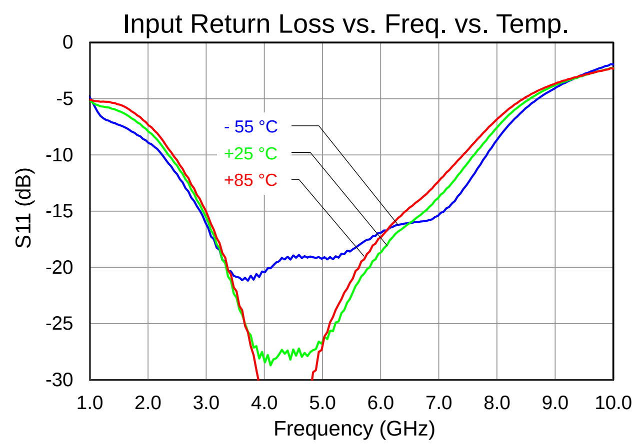

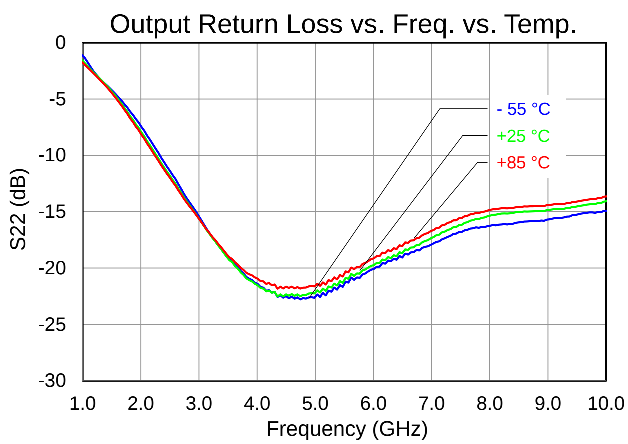

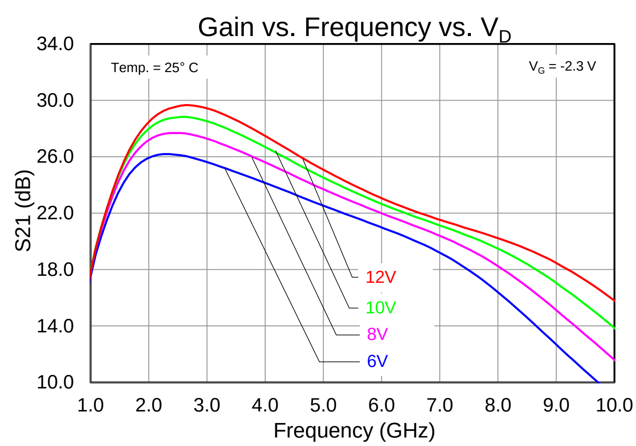

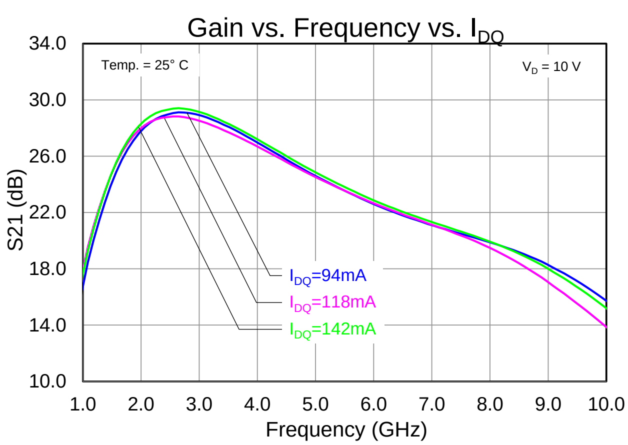

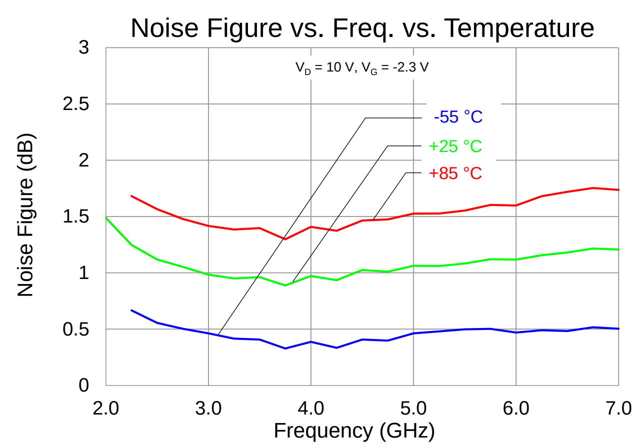

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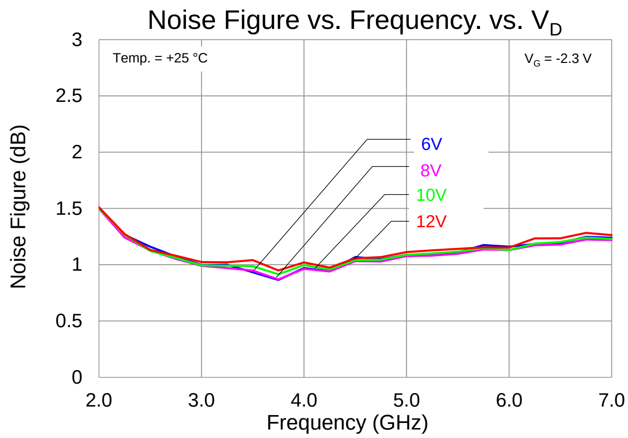

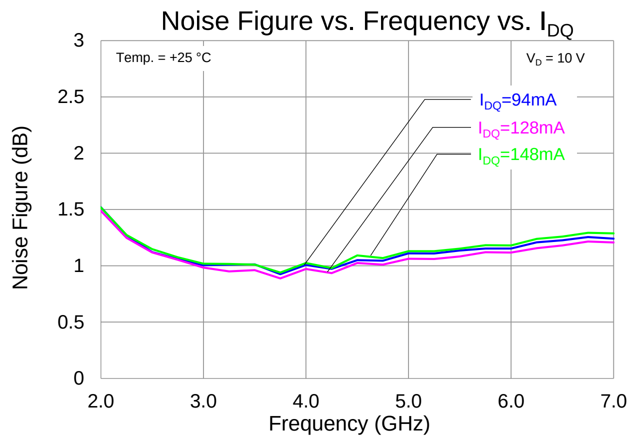

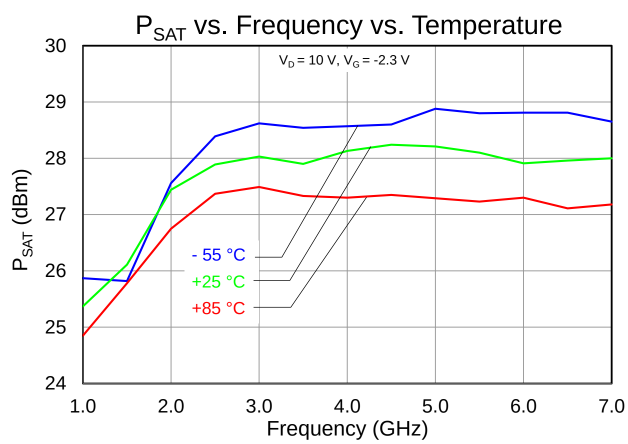

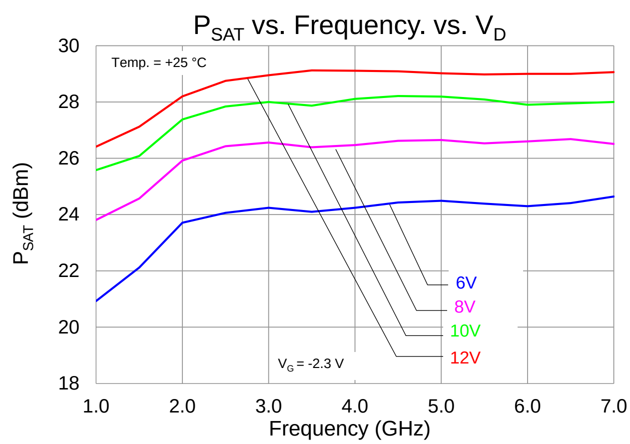

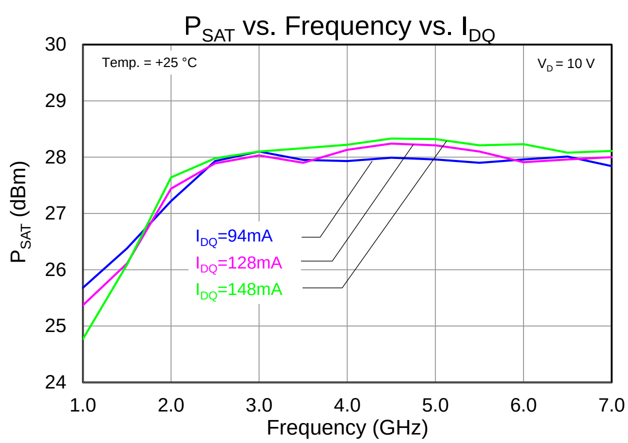

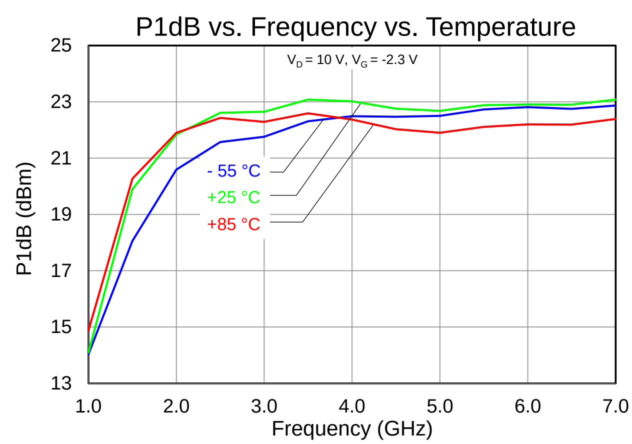

Typical Performance

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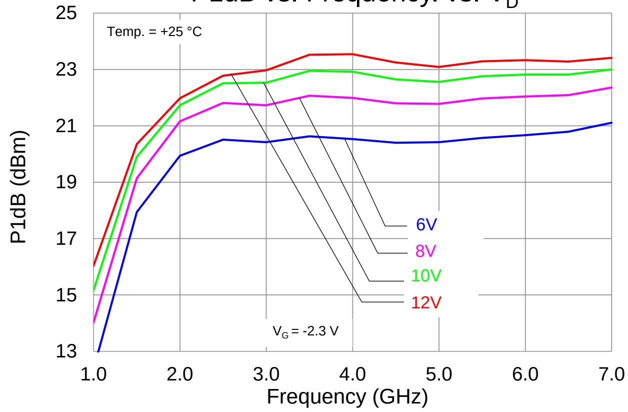
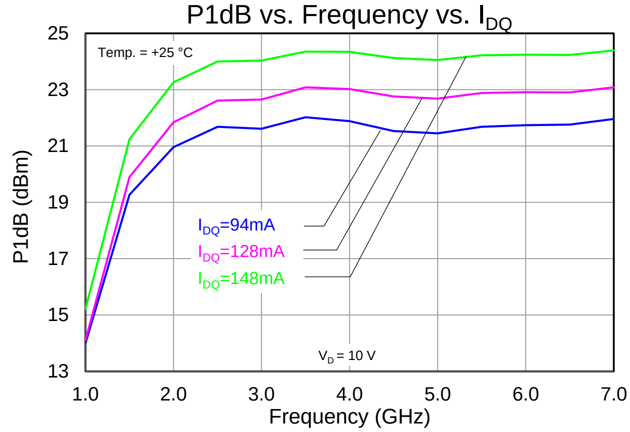
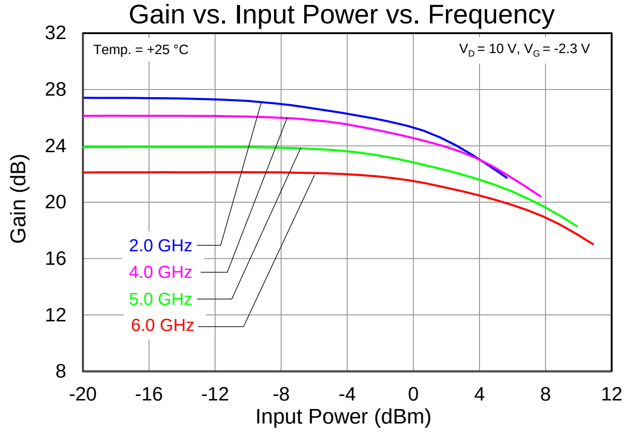
P1dB vs. Frequency. vs. V_D



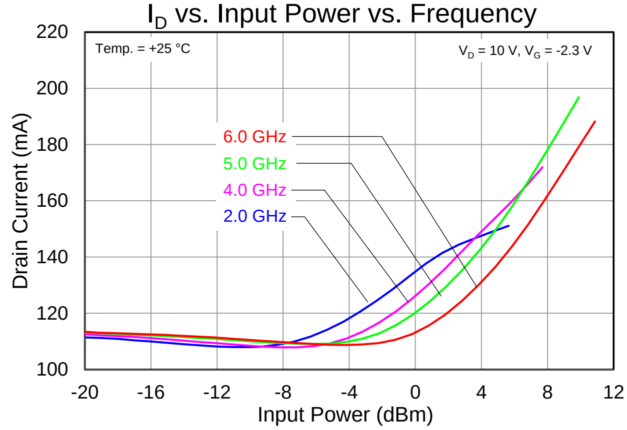
P1dB vs. Frequency vs. I_{DQ}



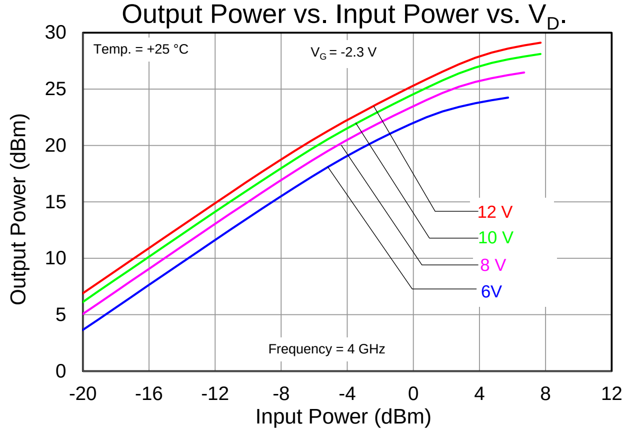
Gain vs. Input Power vs. Frequency



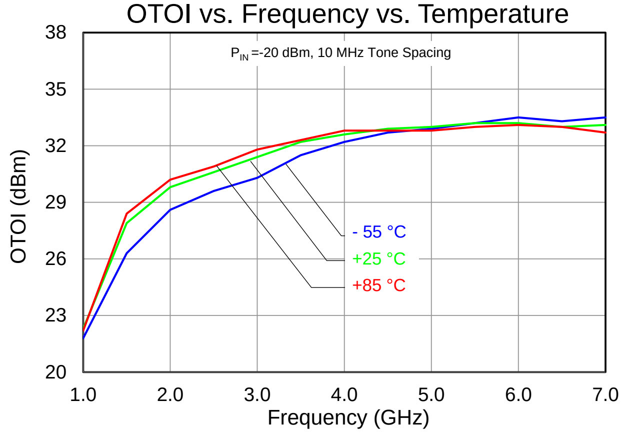
I_D vs. Input Power vs. Frequency



Output Power vs. Input Power vs. V_D.



OTOI vs. Frequency vs. Temperature



Typical Performance

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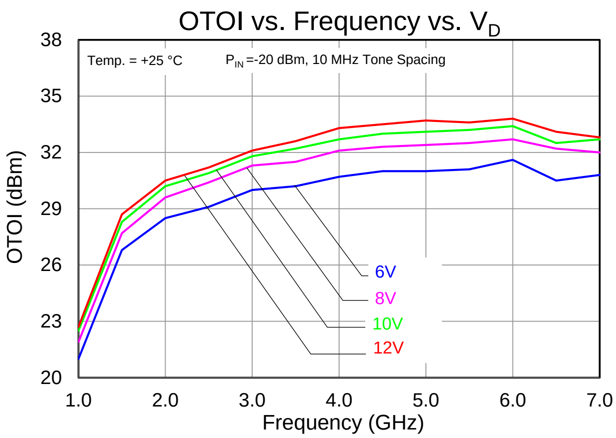
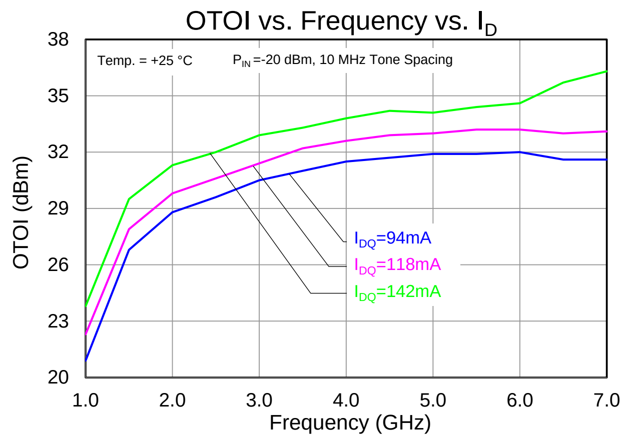
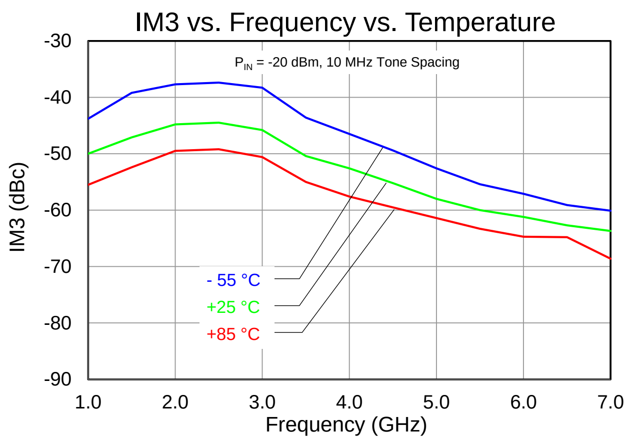
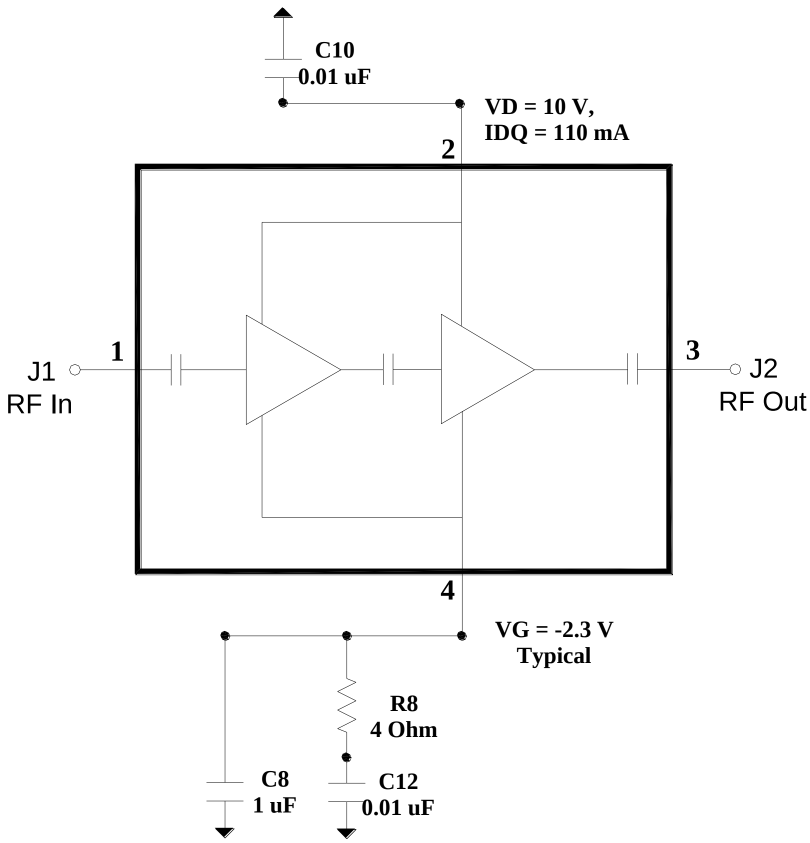






Application Circuit



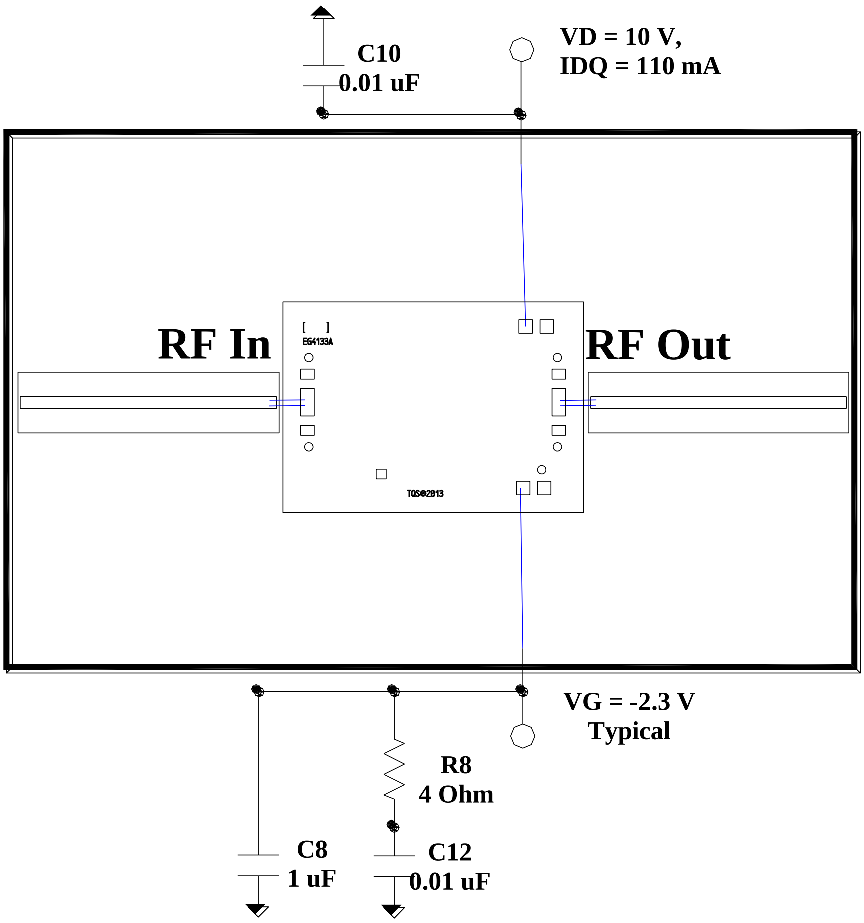
Bias-up Procedure

1. Set I_D limit to 175mA, I_G limit to 1mA
2. Apply -5V to V_G for pinch off
3. Apply +10V to V_D
4. Adjust V_G more positive until I_{DQ} = 110mA (V_G ~ -2.3 V Typical)
5. Apply RF signal

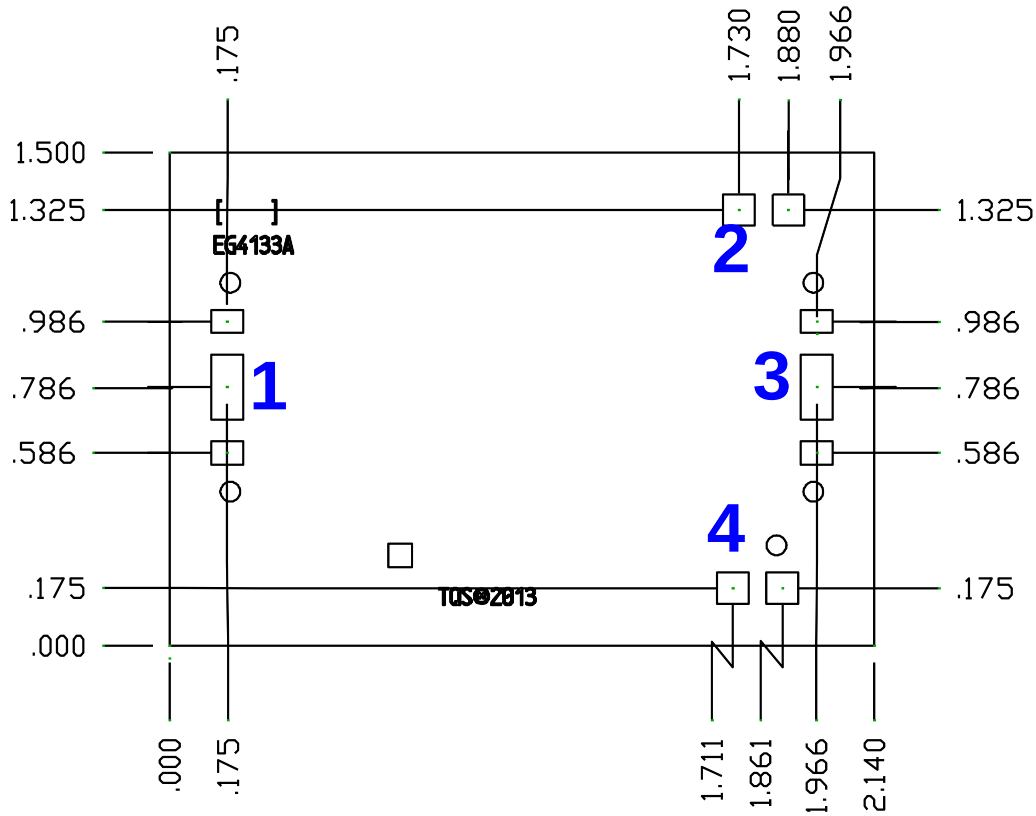
Bias-down Procedure

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

Assembly Drawing



Mechanical Drawing & Bond Pad Description



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	Description
1	RF In	0.096 x 0.196	Input; matched to 50 ohms
2	V_D	0.096 x 0.096	Drain voltage, V_D. Bias network is required; see Application Circuit on page 8 as an example.
3	RF Out	0.096 x 0.196	Output; matched to 50 ohms
4	V_G	0.096 x 0.096	Gate voltage, V_G. Bias network is required; see Application Circuit on page 8 as an example.

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 ultrasonic are critical parameters.
- Aluminum wire should not be used.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.