Applications

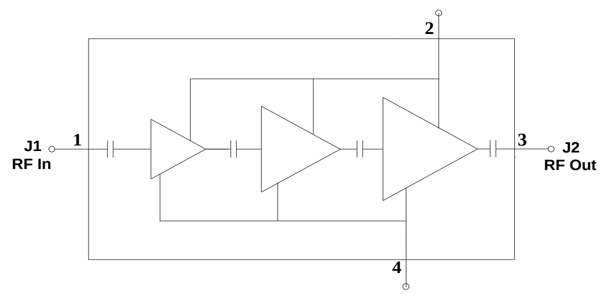
- Commercial and Military Radar
- Communications

Product Features

- Frequency Range: 6–12GHz
- NF: < 1.8dB (1.5dB midband)
- P1dB: 20dBm
- OTOI: 29dBm
- Small Signal Gain: >22dB
- Return Loss: >7dB
- Bias: V_D = 10V, I_{DQ} = 100mA, V_G = -2.3V Typical
- Chip Dimensions: 2.1 x 1.5 x 0.10mm

Performance features are typical across frequency, under recommended bias and at 25°C carrier backside.

Functional Block Diagram



General Description

TriQuint's TGA2612 is a broadband Low Noise Amplifier fabricated on TriQuint's production 0.25um GaN on SiC process (TQGaN25). Covering 6–12GHz, the TGA2612 typically provides P1dB of 20dBm, greater than 22dB of small signal gain, 1.5dB noise figure (mid-band) and 29dBm OTOI. In addition to the high 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 TGA2612 provides flexibility regarding receive chain protection resulting in lower costs and reduced board space.

Fully matched to 50 ohms with integrated DC blocking caps on both I/O ports, the TGA2612 is ideally suited for both military and commercial radar and communications applications.

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
TGA2612	EAR99	6 – 12 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)	250mA
Gate Current (I_G)	-1 to 7mA
Power Dissipation, 85 °C (P_{DISS})	6W
Input Power, CW, 50 Ω, (P_{IN})	34dBm
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})	100mA
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} = 100mA, V_G = -2.3V Typical

Parameter	Min	Typical	Max	Units
Operation Frequency Range	6.0		12.0	GHz
Small Signal Gain		>22		dB
Input Return Loss		>7		dB
Output Return Loss		>10		dB
Noise Figure		<1.8		dB
Output Power at 1 dB Gain Compression		20		dBm
Output TOI		29		dBm
Gain Temperature Coefficient		-0.044		dB/°C
Noise Figure Temperature Coefficient		-0.009		dB/°C

Thermal and Reliability Information

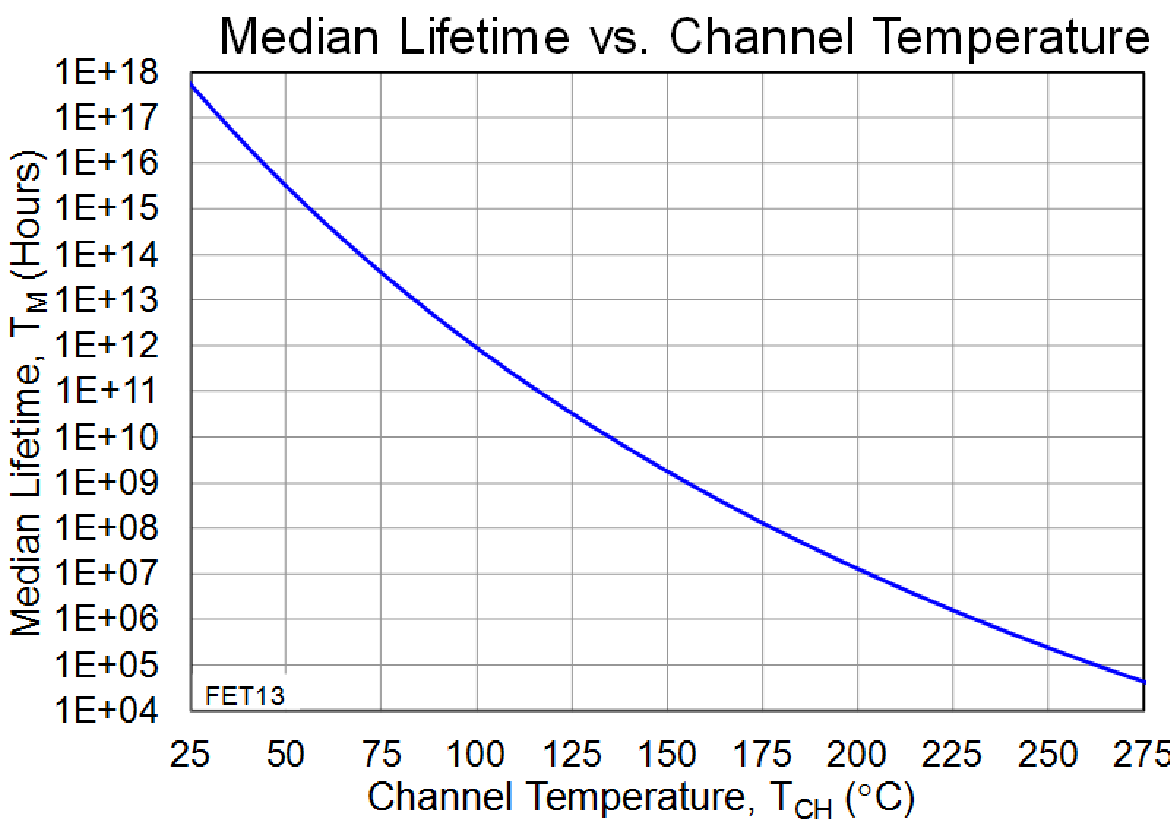
Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) [(1)]	$T_{baseplate}$ = 85°C, V_D = 10V, I_{DQ} = 100mA, P_{DISS} =1W	16	ºC/W
Channel Temperature, T_{CH} (Without RF)		101	°C
Median Lifetime (T_M)		7.9 x 10^11	Hrs
Thermal Resistance (θ_{JC}) [(1)]	$T_{baseplate}$ = 85°C, V_D = 10V, $I_{D\ Drive}$ = 208mA, P_{OUT} = 26.6dBm, P_{DISS} = 1.6W	16	ºC/W
Channel Temperature, T_{CH} (Under RF)		111	°C
Median Lifetime (T_M)		2 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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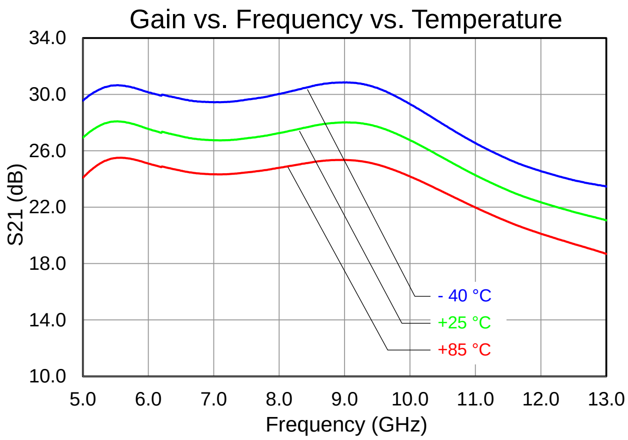

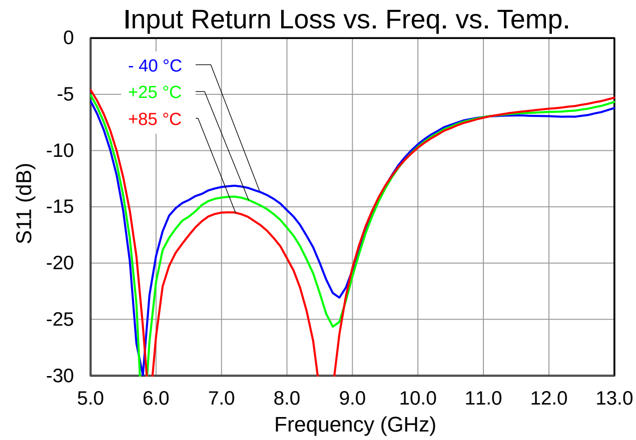

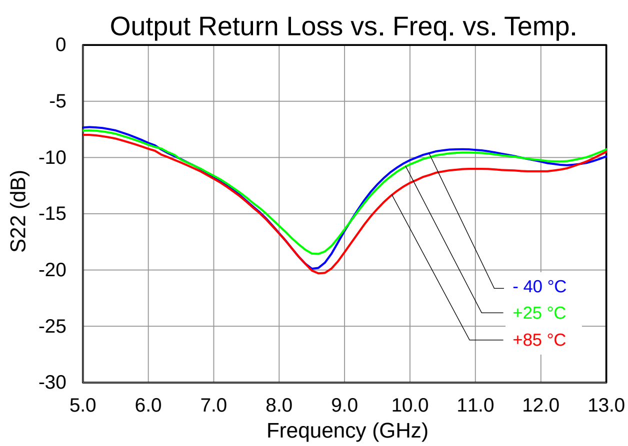

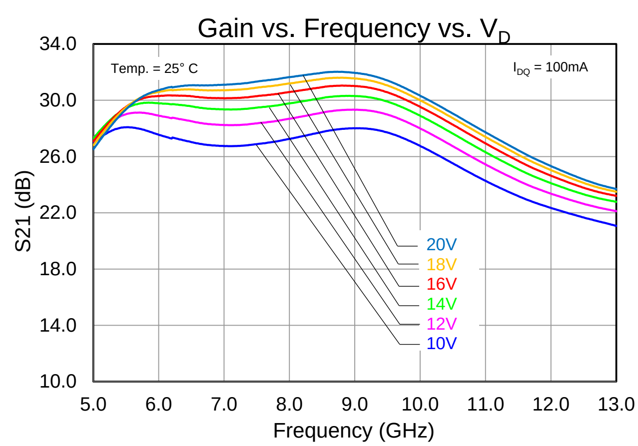

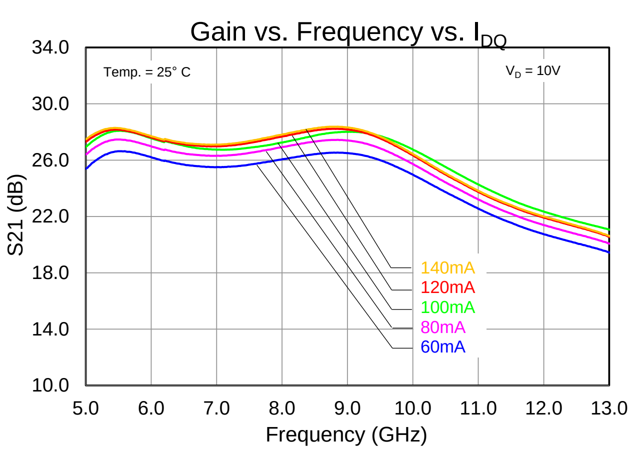

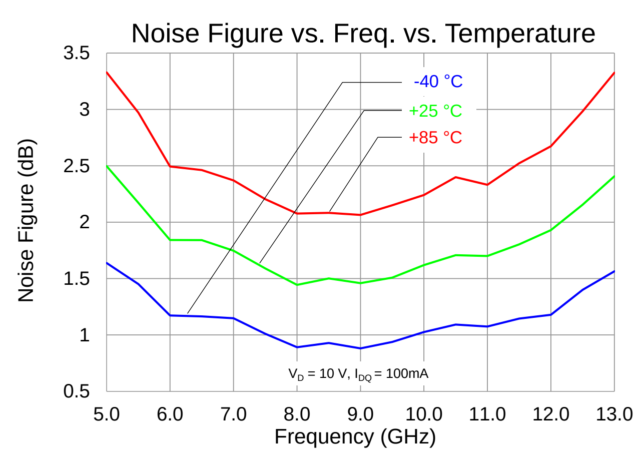

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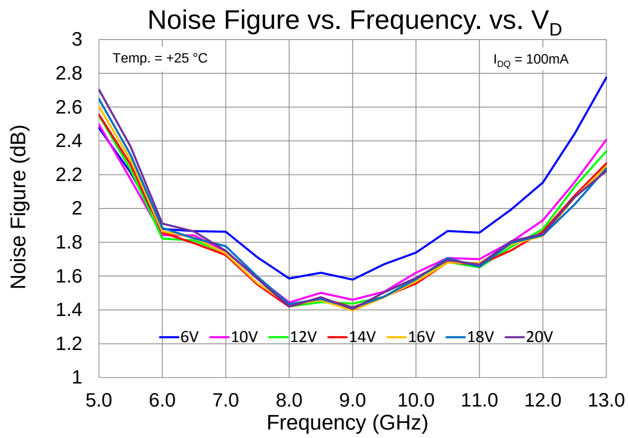

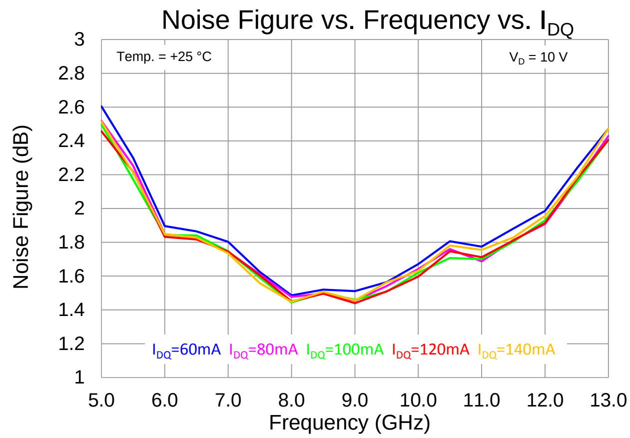

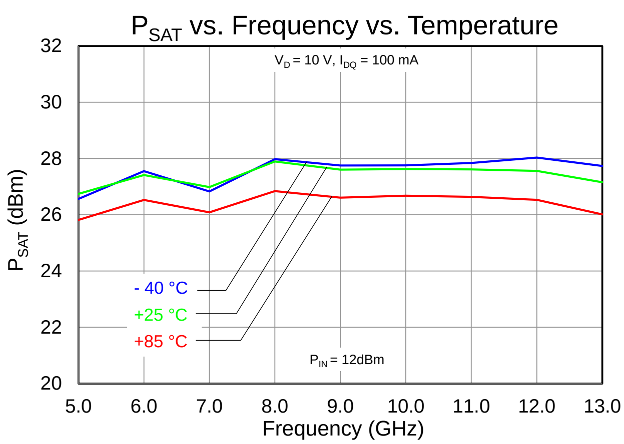

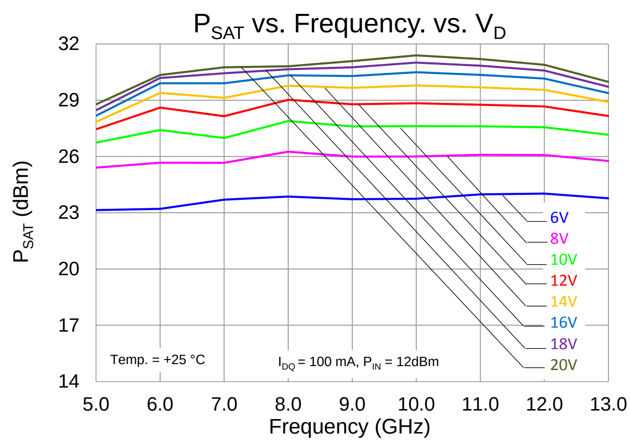

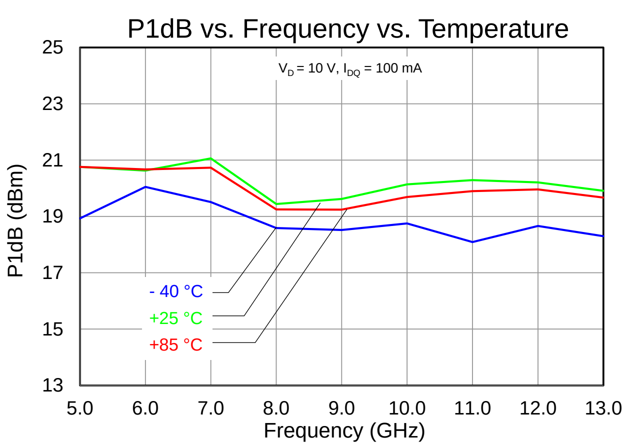

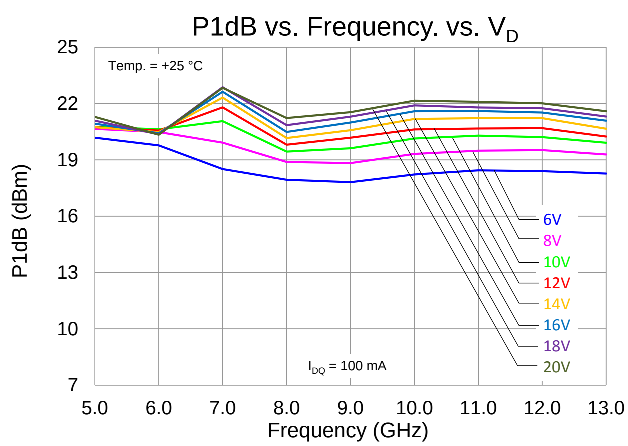

Typical Performance

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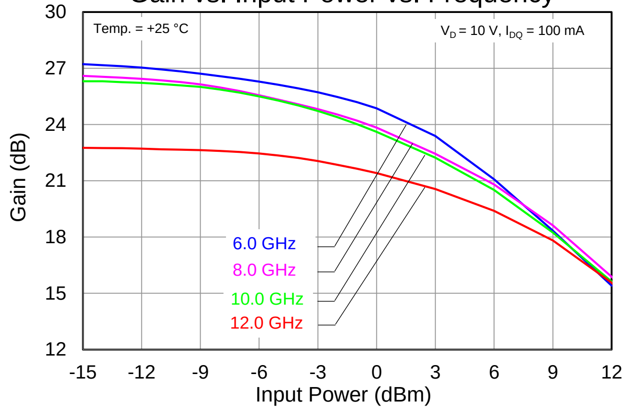
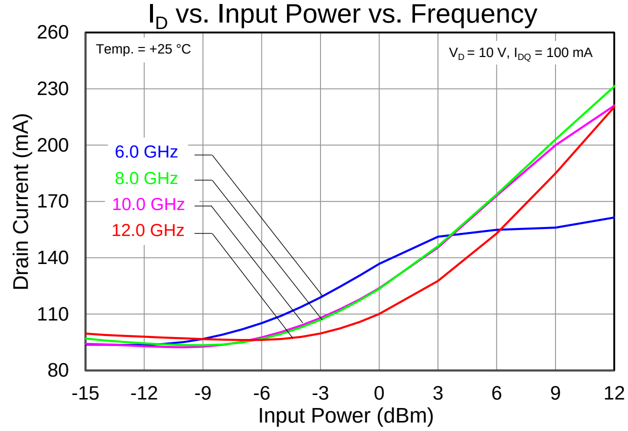
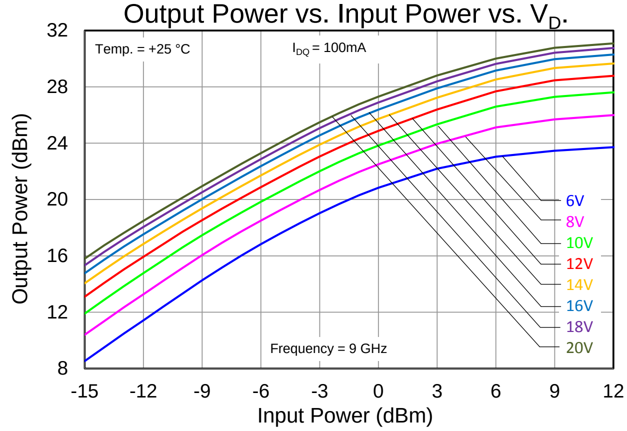
Gain vs. Input Power vs. Frequency



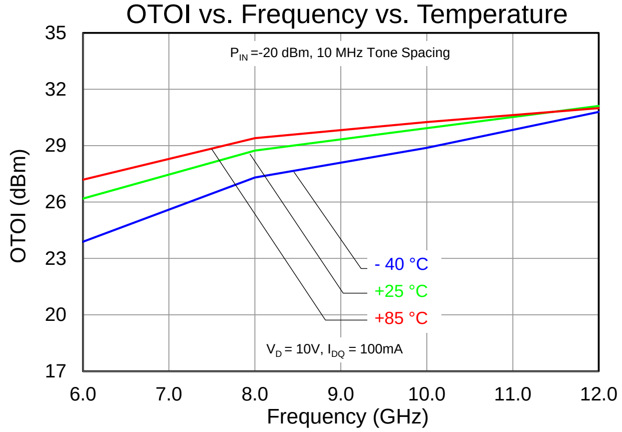
ID vs. Input Power vs. Frequency



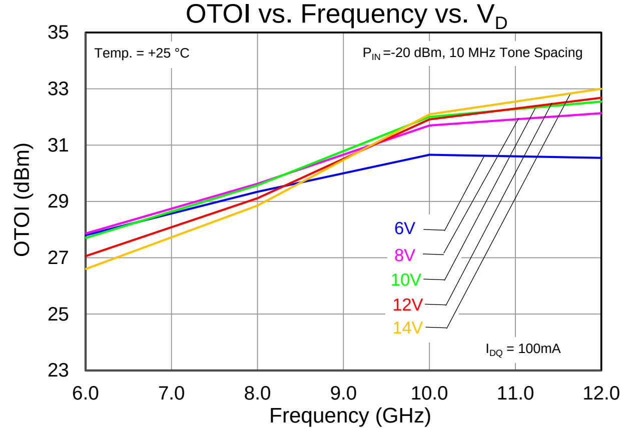
Output Power vs. Input Power vs. VD.



OTOI vs. Frequency vs. Temperature



OTOI vs. Frequency vs. VD



Typical Performance

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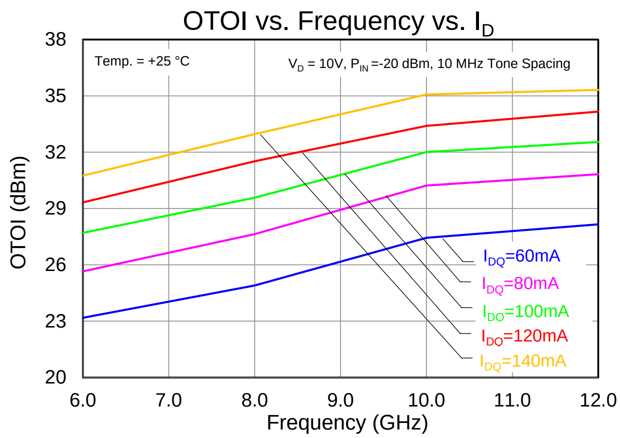
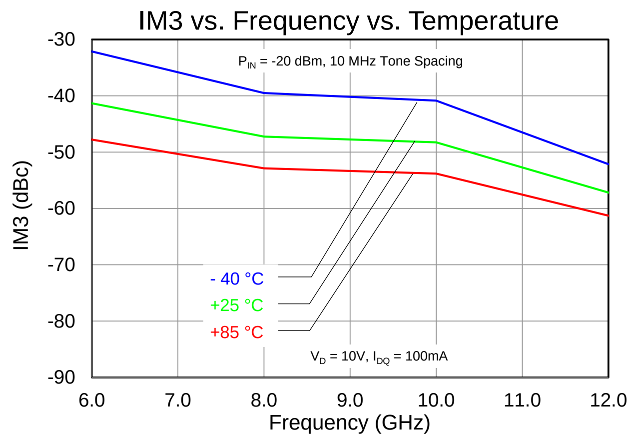
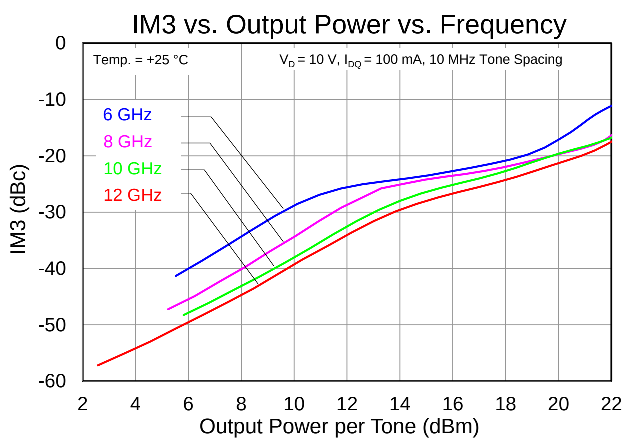
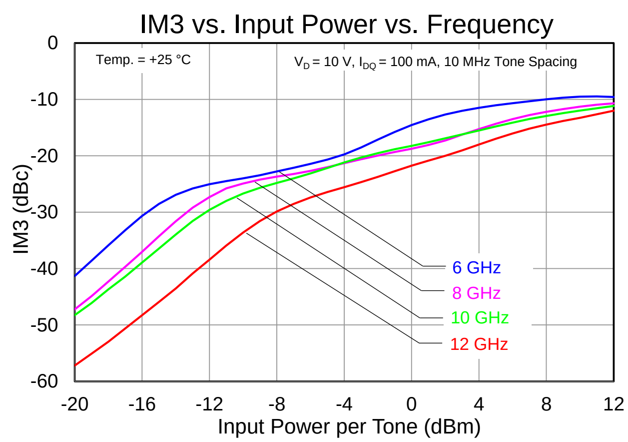
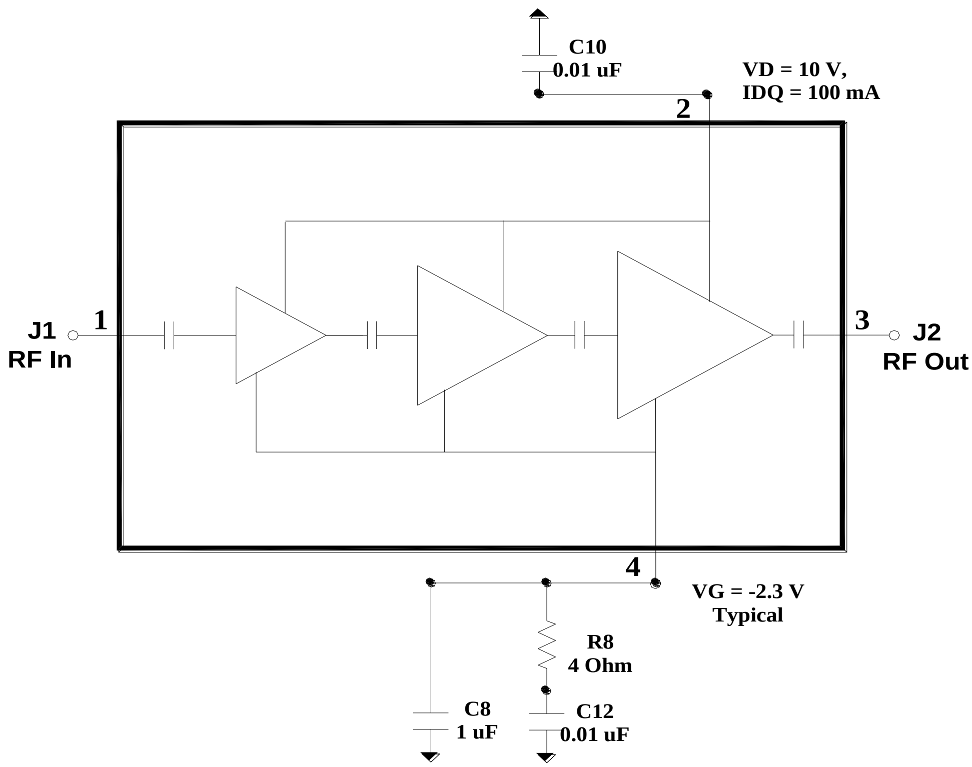








Application Circuit



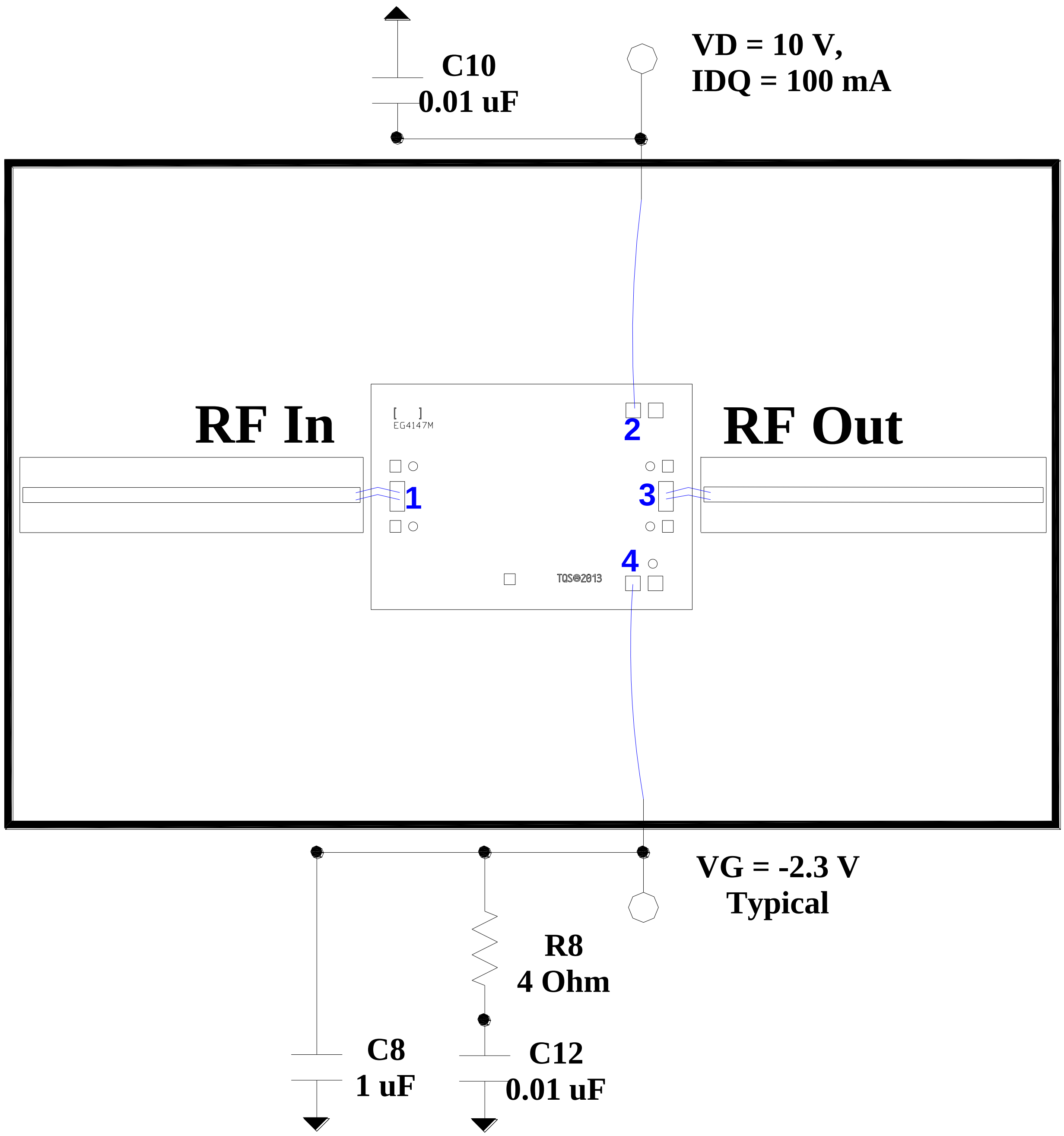
Bias-up Procedure

1. Set I_D limit to 230mA, 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} = 100mA (V_G ~ -2.3 V Typical)
5. Apply RF signal

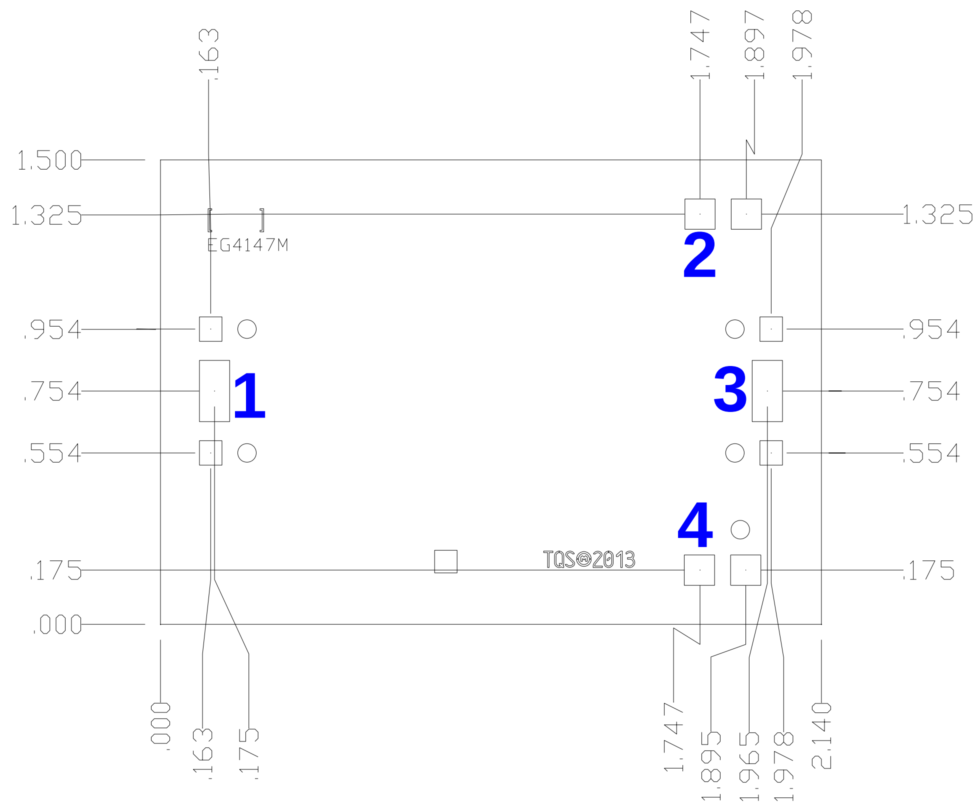
Bias-down Procedure

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	0.098 x 0.198	Input; matched to 50 ohms
2	V_D	0.098 x 0.098	Drain voltage, VD. Bias network is required; see Application Circuit on page 8 as an example.
3	RF Out	0.098 x 0.198	Output; matched to 50 ohms
4	V_G	0.098 x 0.098	Gate voltage, VG. 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.

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 ($C_{15}H_{12}Br_{4}0_{2}$) Free
- PFOS Free
- SVHC Free

ECCN

US Department of Commerce: EAR99

Contact Information

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