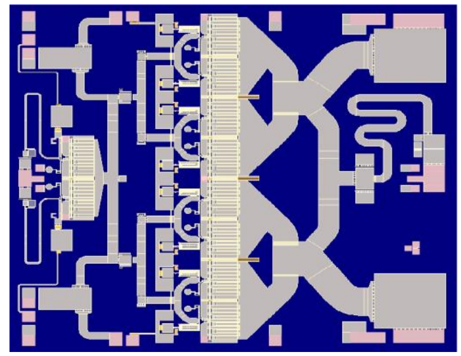
Applications

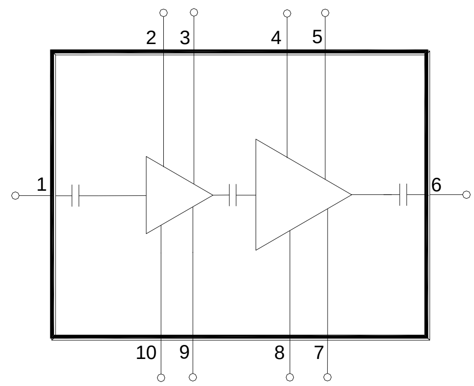
- Radar



Product Features

- Frequency Range: 3.1 – 3.6 GHz
- P_{SAT}: 49.5 dBm
- Power Gain > 22 dB Large Signal Gain
- PAE: 56%
- Bias: V_D = 30 V, I_{DQ} = 125 mA, V_G = -2.95 V Typical
- Characterized at PW = 15ms and DC = 30%
- Chip Dimensions: 5.41 x 5.19 x 0.10 mm

Functional Block Diagram



General Description

TriQuint's TGA2814 is a high-power, s-band amplifier fabricated on TriQuint's production 0.25um GaN on SiC process (TQGaN25). Covering 3.1-3.6GHz, the TGA2814 provides 80W of saturated output power and 22dB of large-signal gain while achieving 56% power-added efficiency.

The TGA2814 can also support a variety of operating conditions to best support system requirements. With good thermal properties, it can support a range of bias voltages and will perform well under both short and long pulse operations.

With DC blocking capacitors on both RF ports which are matched to 50ohms, the TGA2814 is ideal for both commercial and military radar systems.

Lead-free and RoHS compliant.

Pad Configuration

Pad No.	Symbol
1	RF In
2, 4, 8, 10	V_G
3, 5, 7, 9	V_D
6	RF Out

Ordering Information

Part	ECCN	Description
TGA2814	3A001.b.2.a	3.1 – 3.6 GHz 80W GaN Power Amplifier

Absolute Maximum Ratings

Parameter	Value
Drain Voltage (V_D)	40 V
Gate Voltage Range (V_G)	-8 to 0 V
Drain Current (I_D)	8.5 A
Gate Current (I_G)	-6 to 42 mA
Power Dissipation (P_{DISS})	166 W
Input Power, CW, 50 Ω, 85 °C, (P_{IN})	30 dBm
Input Power, VSWR 3:1, V_D = 30V, PW = 15ms, DC = 30%, 85 °C, (P_{IN})	27 dBm
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)	30 V
Drain Current (I_{DQ})	125 mA
Drain Current Under RF Drive (I_{D_Drive})	5000 mA
Gate Voltage (V_G)	-2.95 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 ^{0}C, V_D = 30 V, I_{DQ} = 125 mA, V_G = -2.95 V Typical, Pulsed: PW = 15ms, DC = 30%

Parameter	Min	Typical	Max	Units
Operational Frequency Range	3.1		3.6	GHz
Input Return Loss		-10		dB
Output Return Loss		-7		dB
Power Gain @ Saturation (Pin = 27dBm)		>22		dB
Output Power @ Saturation (Pin = 27dBm)		49.5		dBm
Power Added Efficiency (Pin = 27dBm)		56		%
Output Power Temperature Coefficient		-0.002		dBm/°C

Thermal and Reliability Information

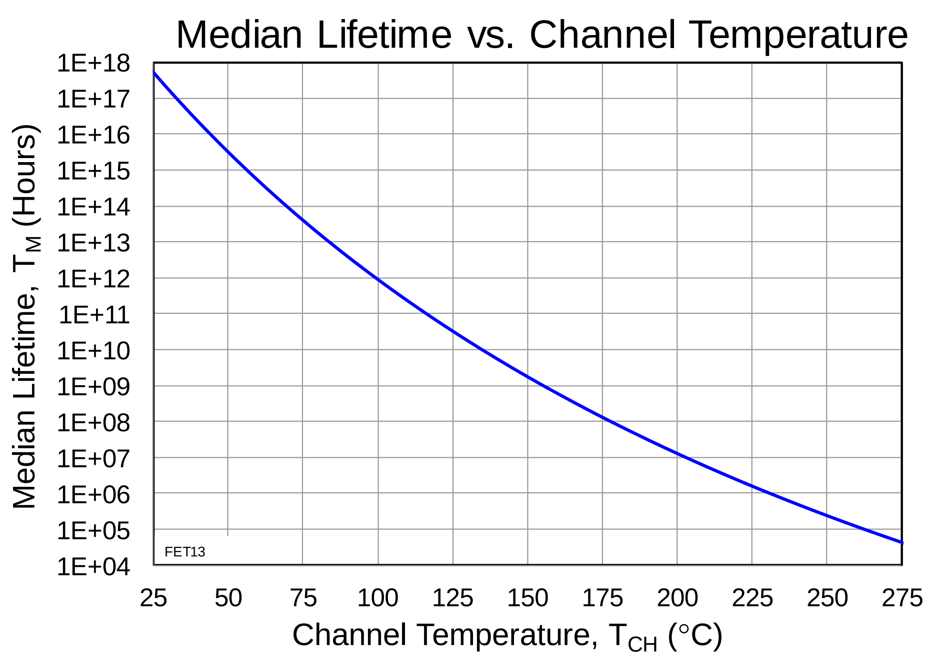
Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) [(1)]	T_{base} = 85 °C, **V_D = 30 V**, $I_{D\ Drive}$ = 5 A, Pout = 49.5 dBm, P_{DISS} = 59 W, Pulsed: PW = 15ms, DC = 30%	1.14	ºC/W
Channel Temperature (T_{CH})		152	°C
Median Lifetime (T_M)		1.41 x 10^9	Hrs
Thermal Resistance (θ_{JC}) [(1)]	T_{base} = 85 °C, **V_D = 32 V**, $I_{D\ Drive}$ = 5.3 A, Pout = 50.0 dBm, P_{DISS} = 59 W, Pulsed: PW = 15ms, DC = 30%	1.2	ºC/W
Channel Temperature (T_{CH})		156	°C
Median Lifetime (T_M)		9.14 x 10^8	Hrs

Notes:

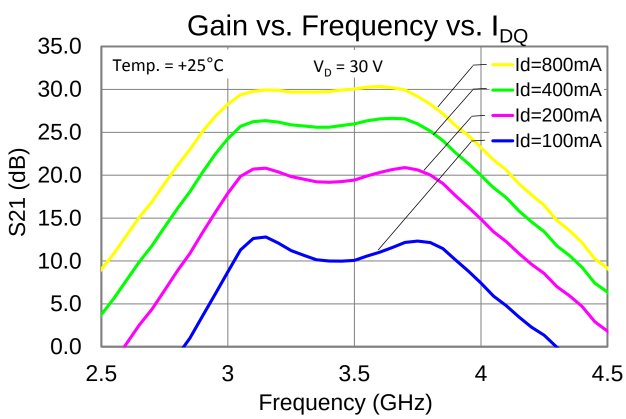
1. Thermal resistance measured to back of carrier plate. MMIC mounted on 20 mils CuMo (80/20) carrier using 1.5 mil AuSn.

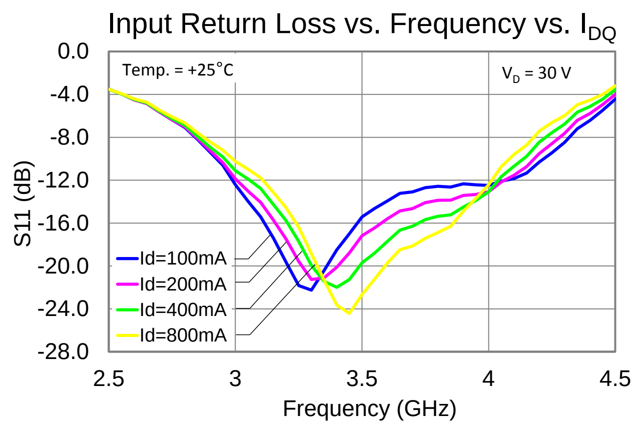
Median Lifetime

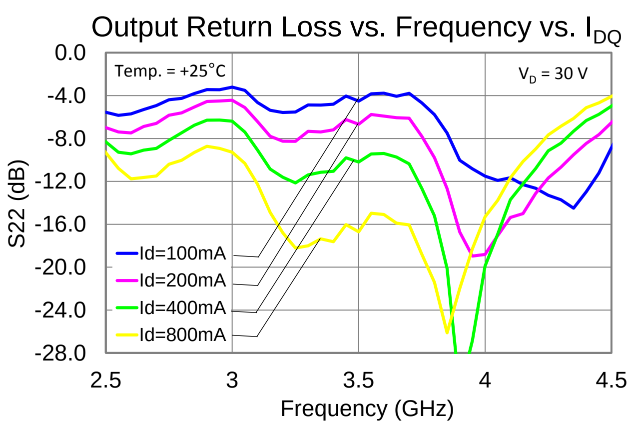
Test Conditions: V_D = 40 V; Failure Criteria = 10% reduction in I_{D_MAX}

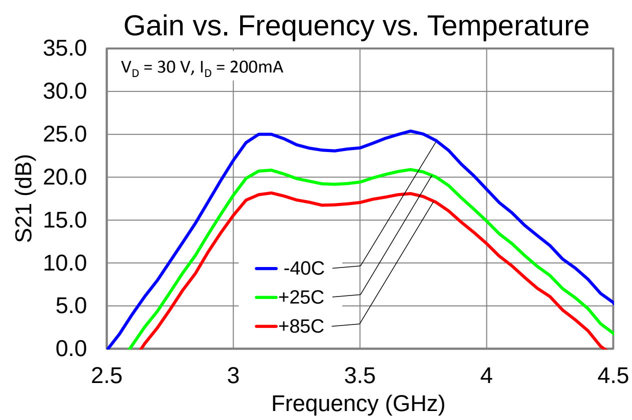


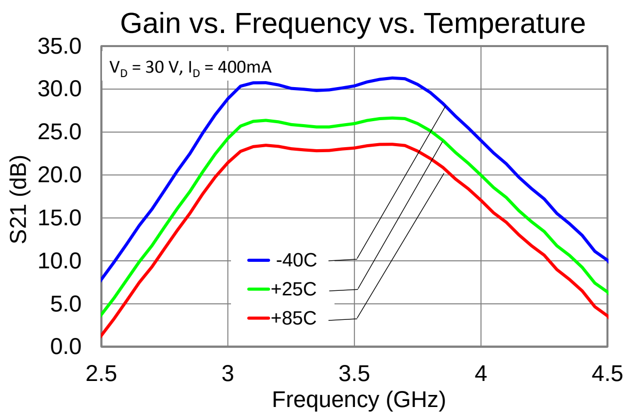
Typical Performance

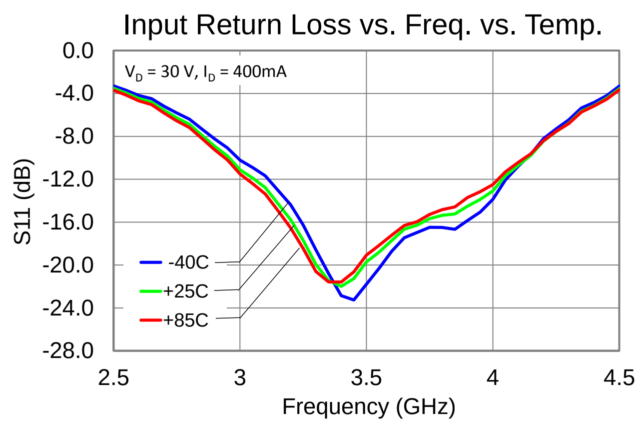




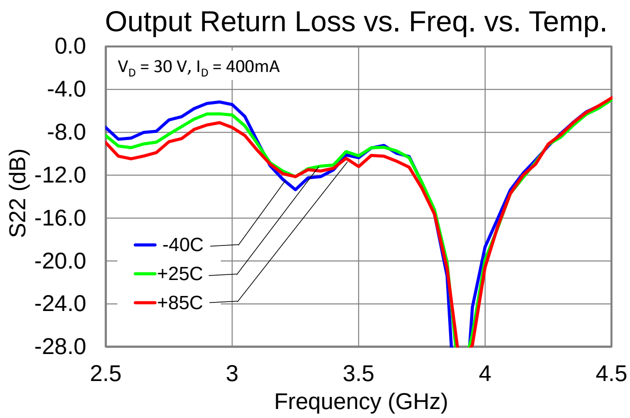


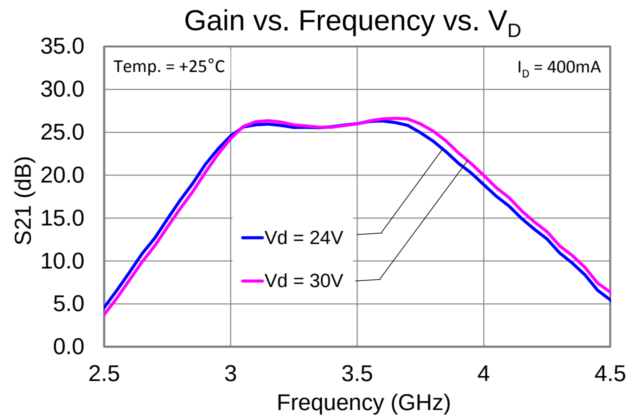


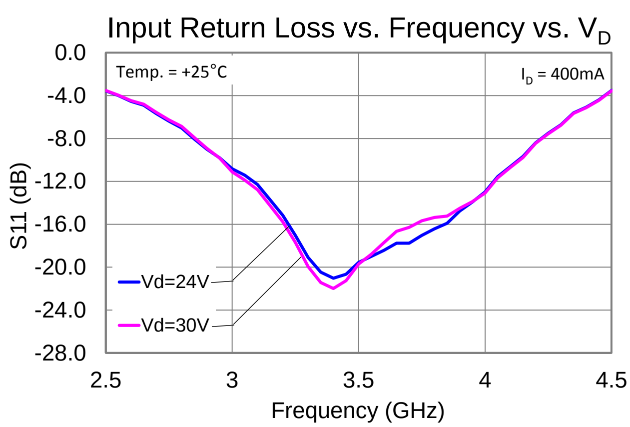


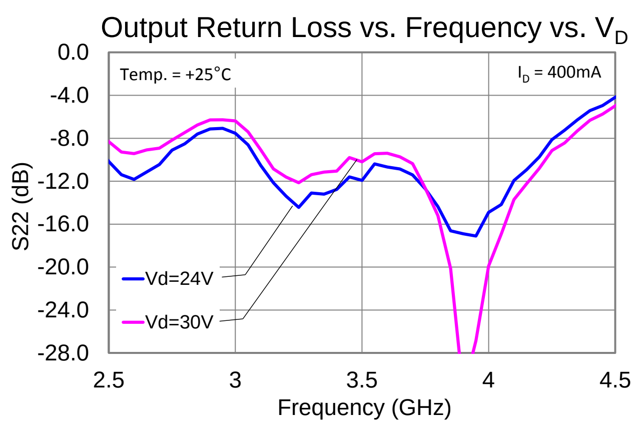


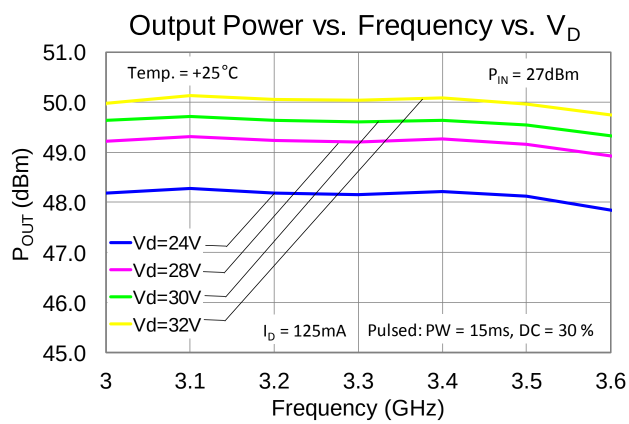
Typical Performance

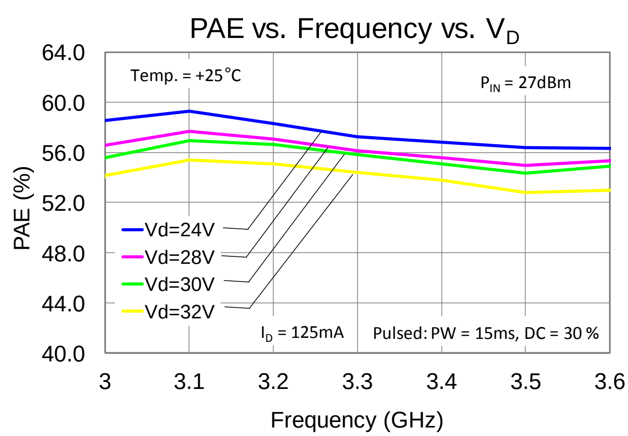




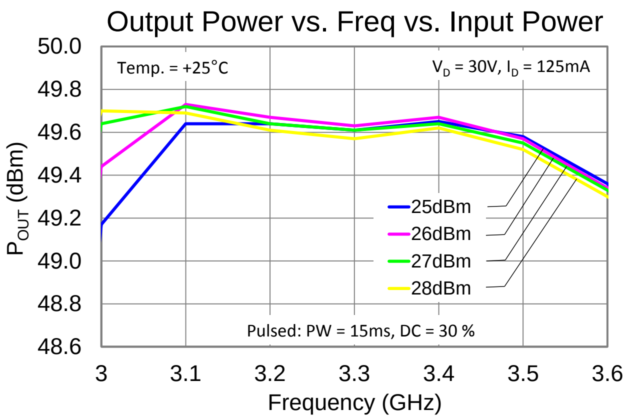


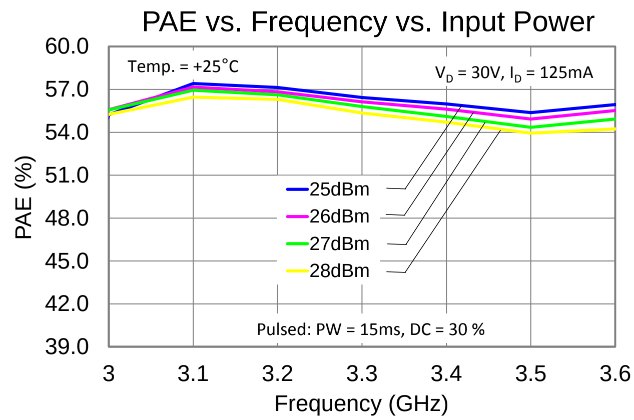


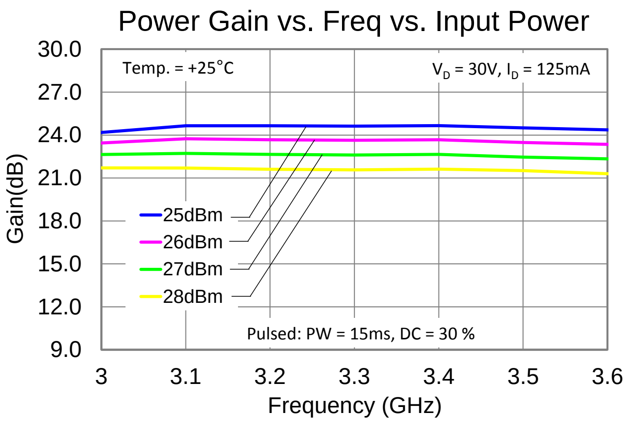


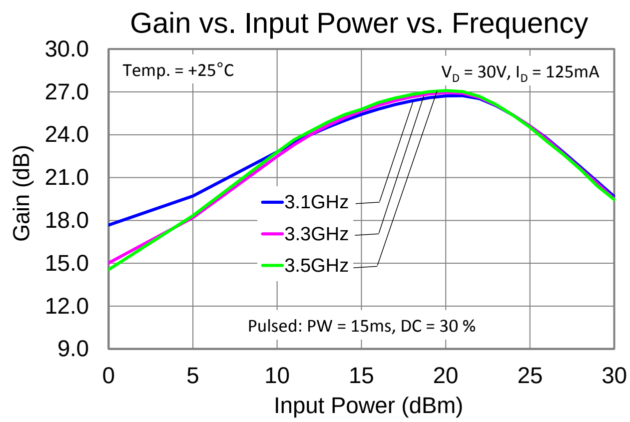


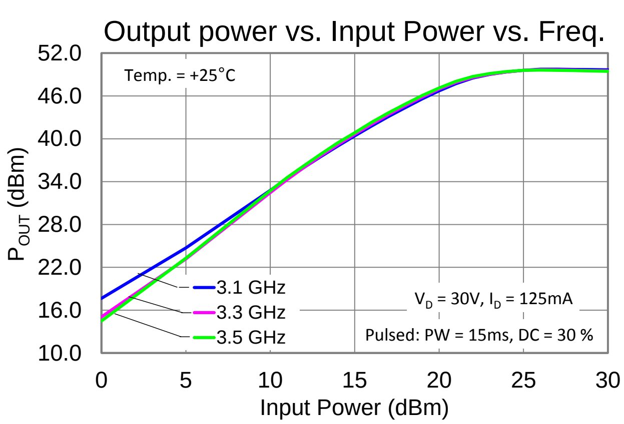
Typical Performance

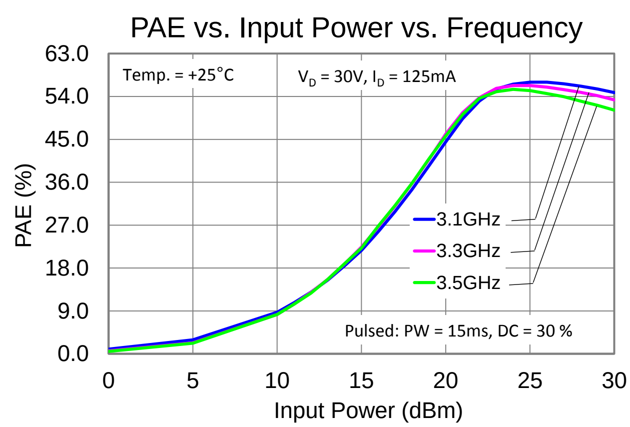




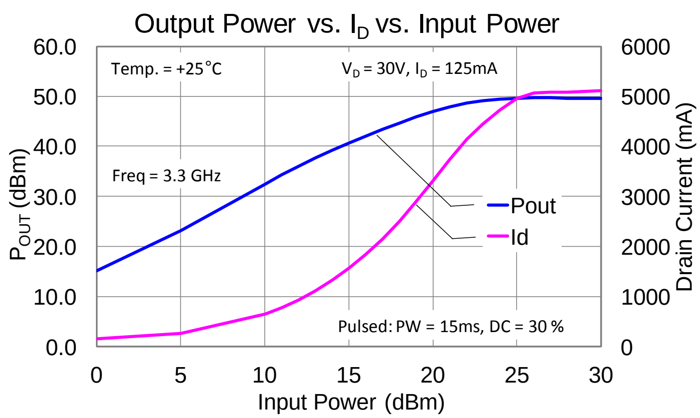


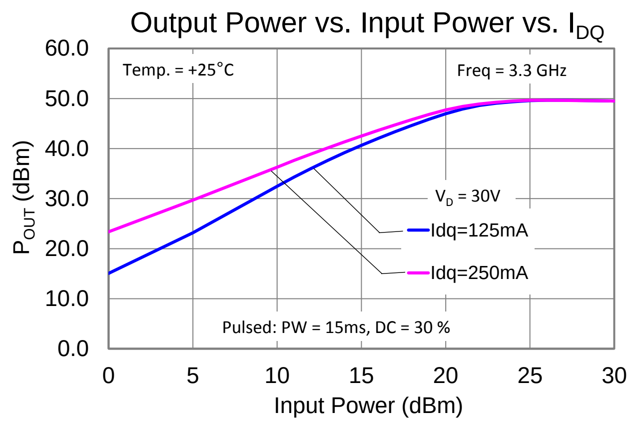


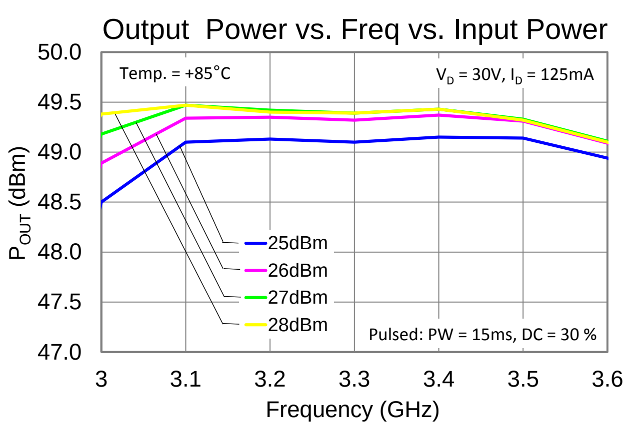


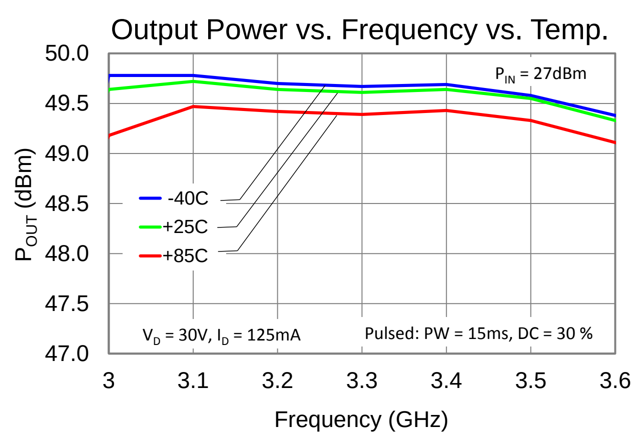


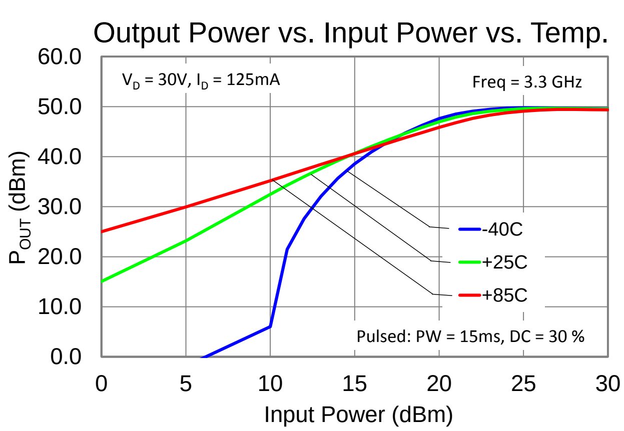
Typical Performance

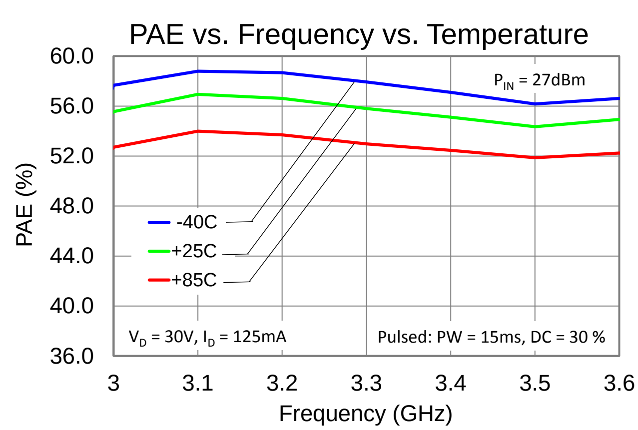




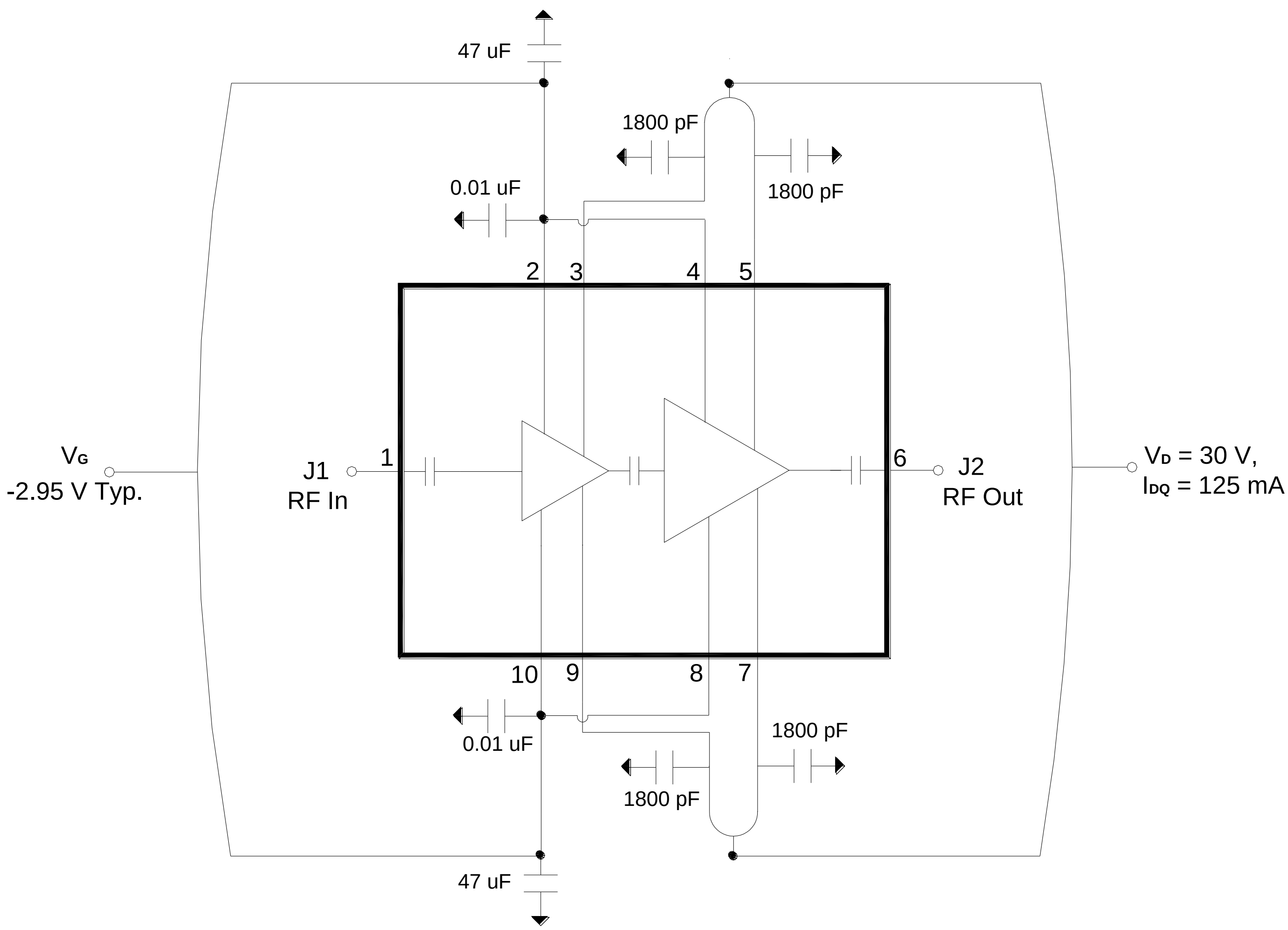








Application Circuit



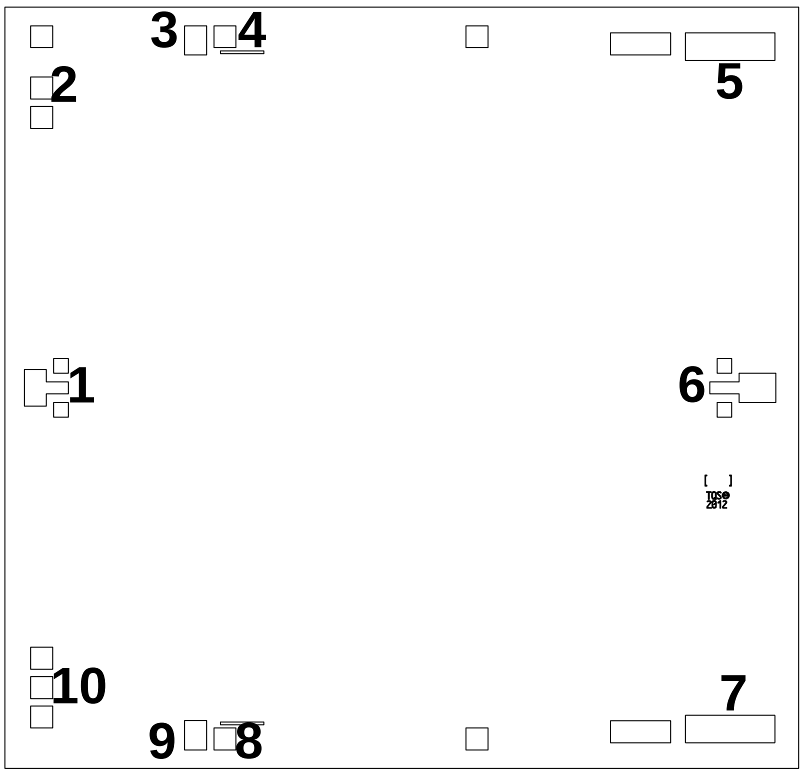
Bias-up Procedure

1. Set I_D limit to 6 A, I_G limit to 30 mA
2. Apply -5.0 V to V_G
3. Apply +30 V to V_D
4. Adjust V_G more positive until I_{DQ} = 125 mA (V_G ~ -2.95 V Typical)
5. Apply RF signal

Bias-down Procedure

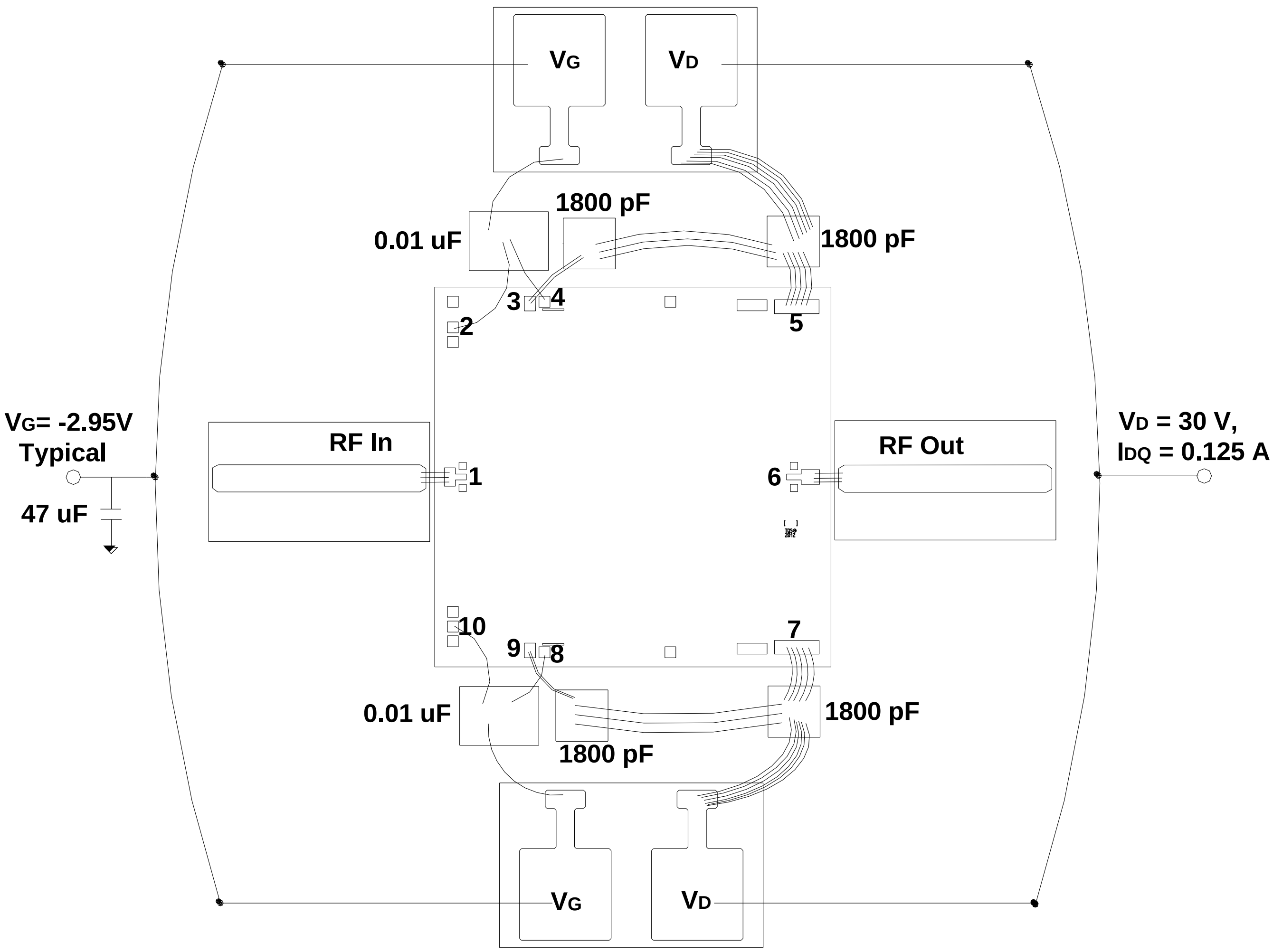
1. Turn off RF signal
2. Reduce V_G to -5.0 V. Ensure I_{DQ} ~ 0 mA
3. Set V_D to 0 V
4. Turn off V_D supply
5. Turn off V_G supply

Bond Pad Description

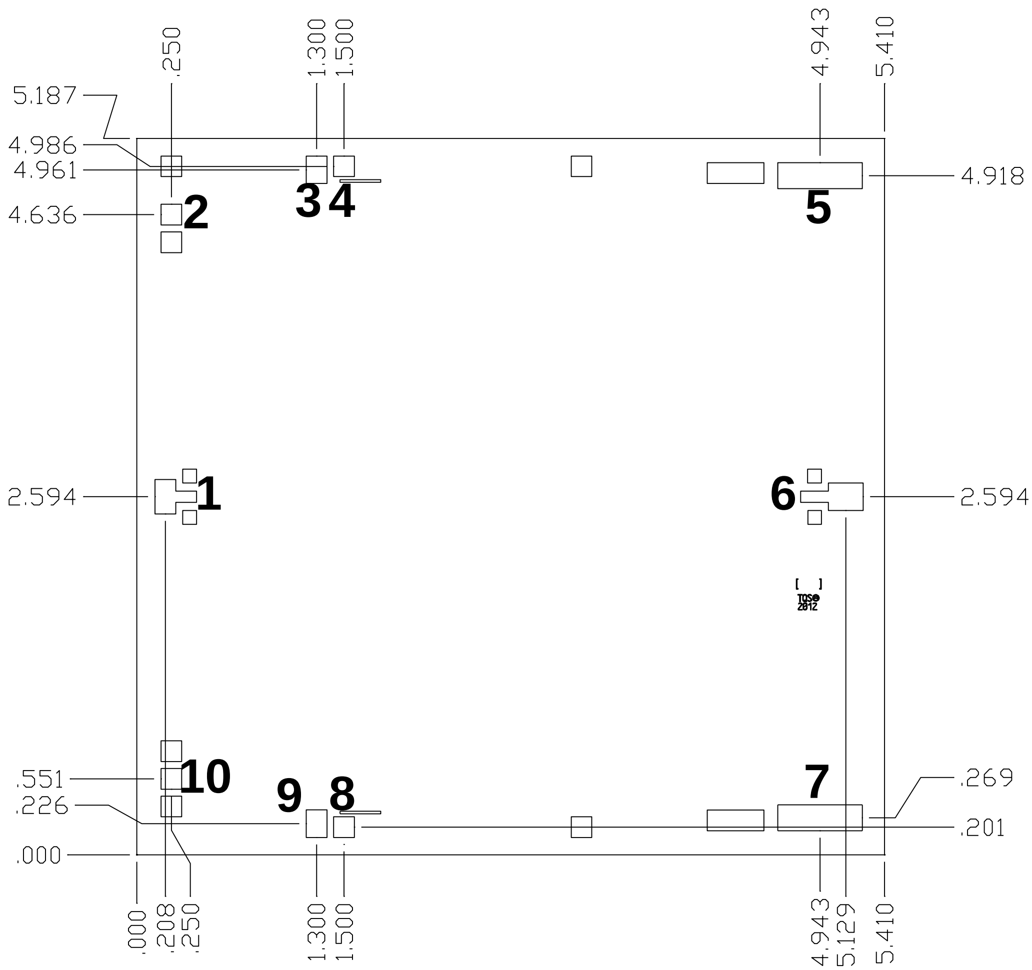


Bond Pad	Symbol	Description
1	RF In	Input; matched to 50 ohms; DC coupled.
2, 4, 8, 10	V_G	Gate voltage, V_G top and bottom. Bias network is required; must be biased from both sides; see Application Circuit on page 8 as an example.
3, 5, 7, 9	V_D	Drain voltage, V_D top and bottom. Bias network is required; must be biased from both sides; see Application Circuit on page 8 as an example.
6	RF Out	Output; matched to 50 ohms; DC coupled.

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	0.150 x 0.250	8	RF Out	0.250 x 0.200
2, 4, 8 10	V_G	0.150 x 0.150	5, 7	V_D	0.610 x 0.190
3, 9	V_D	0.150 x 0.200			

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: 3A001.b.2.a

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.