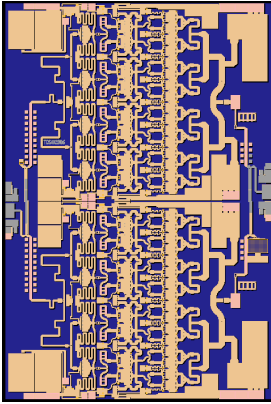
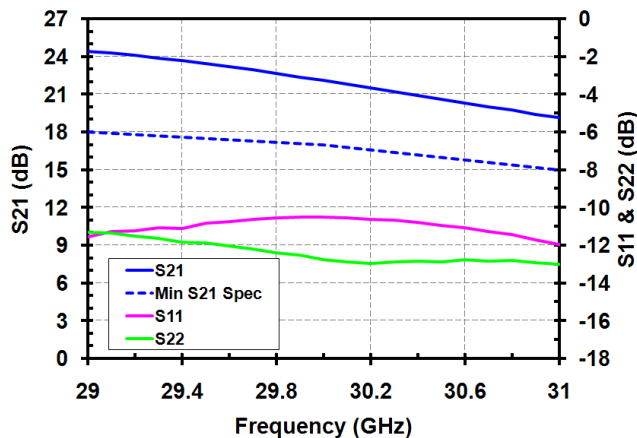
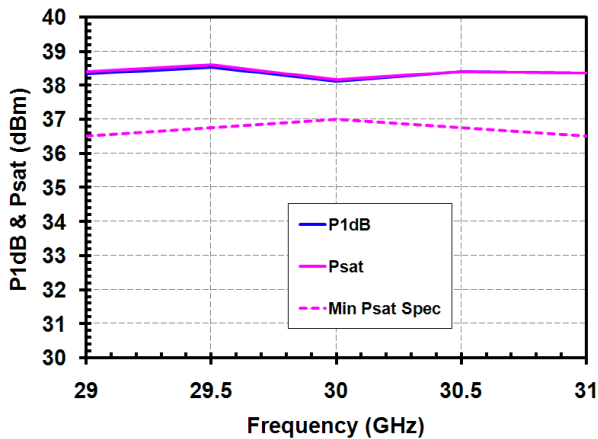


## 7 Watt Ka-Band HPA



### Measured Performance

Bias conditions:  $V_d = 6\text{ V}$ ,  $I_{dq} = 3200\text{ mA}$ ,  $V_g = -0.7\text{ V}$   
Typical



### Key Features

- Frequency Range: 29 - 31 GHz
- 38.5 dBm Nominal Psat, 38 dBm Nominal P1dB
- Gain: 21 dB
- Return Losses: -10 dB
- Bias:  $V_d = 6\text{ V}$ ,  $I_{dq} = 3.2\text{ A}$ ,  $V_g = -0.7\text{ V}$   
Typical,  $I_d$  under RF drive = 6 A
- Technology: 3MI 0.15  $\mu\text{m}$  Power pHEMT
- Chip Dimensions: 3.86 x 5.71 x 0.05 mm

### Primary Application

- Ka-Band VSAT

### Product Description

The TriQuint TGA4916 is a compact 7 Watt High Power Amplifier for Ka-band applications. The part is designed using TriQuint's proven standard 0.15  $\mu\text{m}$  gate Power pHEMT production process. The TGA4916 provides a nominal 38.5 dBm of output power at an input power level of 19 dBm with a small signal gain of 21 dB.

The part is ideally suited for low cost emerging markets such as base station transmitters for satellite ground terminals and point to point radio.

*Datasheet subject to change without notice.*

**Table I**  
**Absolute Maximum Ratings 1/**

Symbol	Parameter	Value	Notes
Vd-Vg	Drain to Gate Voltage	11 V	
Vd	Drain Voltage	6.5 V	2/
Vg	Gate Voltage Range	-5 to 0 V	
Id	Drain Current	6760 mA	2/
Ig	Gate Current Range	-31 to 403 mA	
Pin	Input Continuous Wave Power	29 dBm	2/
Tchannel	Channel Temperature	200 °C	

- 1/ These ratings represent the maximum operable values for this device. Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device and/or affect device lifetime. These are stress ratings only, and functional operation of the device at these conditions is not implied.
- 2/ Combinations of supply voltage, supply current, input power, and output power shall not exceed the maximum power dissipation listed in Table IV.

**Table II**  
**Recommended Operating Conditions**

Symbol	Parameter 1/	Value
Vd	Drain Voltage	6 V
Idq	Drain Current	3200 mA
Id_Drive	Drain Current under RF Drive	5700 mA
Vg	Gate Voltage	-0.7 V

- 1/ See assembly diagram for bias instructions.

**Table III**  
**RF Characterization Table**

Bias:  $V_d = 6\text{ V}$ ,  $I_{dq} = 3200\text{ mA}$ ,  $V_g = -0.7\text{ V}$ , typical

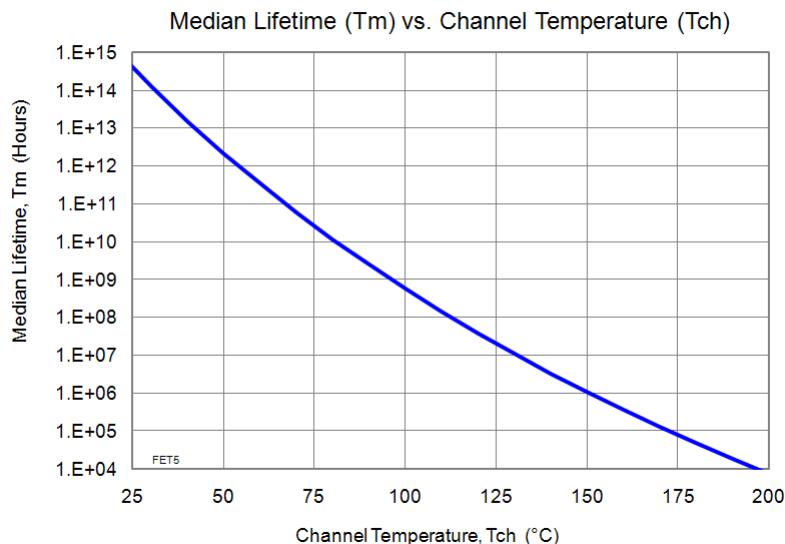
SYMBOL	PARAMETER	TEST CONDITIONS	MINIMUM	NOMINAL	UNITS
Gain	Small Signal Gain	f = 29 GHz	18	21	dB
		f = 30 GHz	17	21	
		f = 31 GHz	15	19	
IRL	Input Return Loss	f = 29 - 31 GHz	-	-10	dB
ORL	Output Return Loss	f = 29 - 31 GHz	-	-12	dB
Psat	Saturated Output Power	f = 29 GHz	36.5	38.5	dBm
		f = 30 GHz	37.0	38.5	
		f = 31 GHz	36.5	38.5	
P1dB	Output Power @ 1dB Compression	f = 29 - 31 GHz	-	38	dBm
	Gain Temp Coefficient	f = 29 - 31 GHz	-	-0.05	dB / °C

**Table IV**  
**Power Dissipation and Thermal Properties**

Parameter	Test Conditions	Value	Notes
Maximum Power Dissipation	Tbaseplate = 70 °C	Pd = 41.45 W Tchannel = 150 °C Tm = 1E+6 Hrs	1/ 2/
Thermal Resistance, $\theta_{jc}$	Vd = 6 V Id = 3200 mA Pd = 19.2 W Tbaseplate = 70 °C	$\theta_{jc}$ = 1.93 (°C/W) Tchannel = 108 °C Tm = 1.8E+8 Hrs	
Thermal Resistance, $\theta_{jc}$ Under RF Drive	Vd = 6 V Id = 6200 mA Pout = 38 dBm Pd = 30.97 W Tbaseplate = 70 °C	$\theta_{jc}$ = 1.93 (°C/W) Tchannel = 130 °C Tm = 2E+7 Hrs	
Mounting Temperature	30 Seconds	320 °C	
Storage Temperature		-65 to 150 °C	

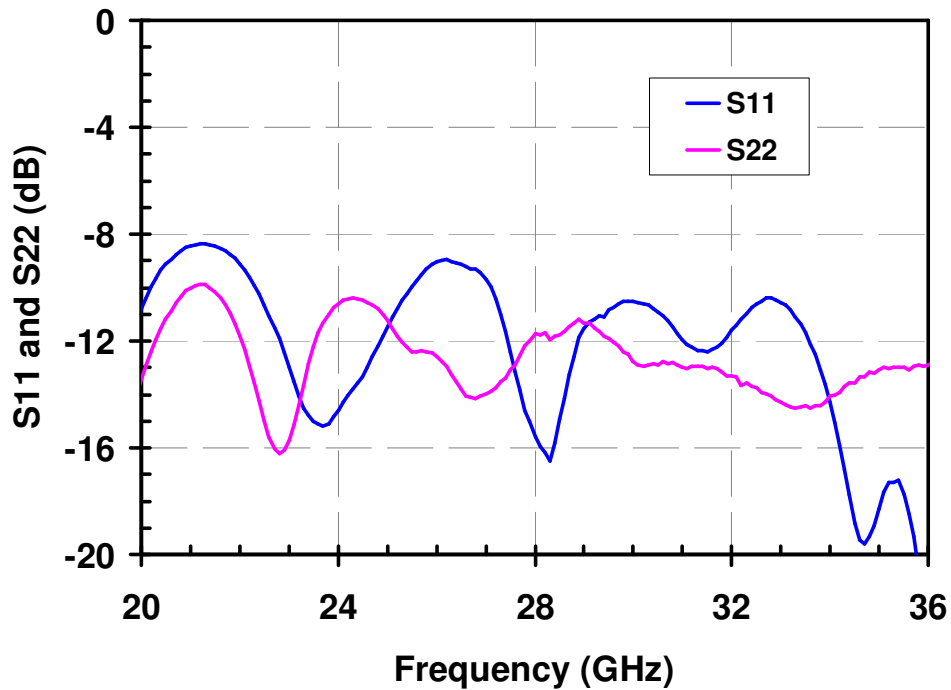
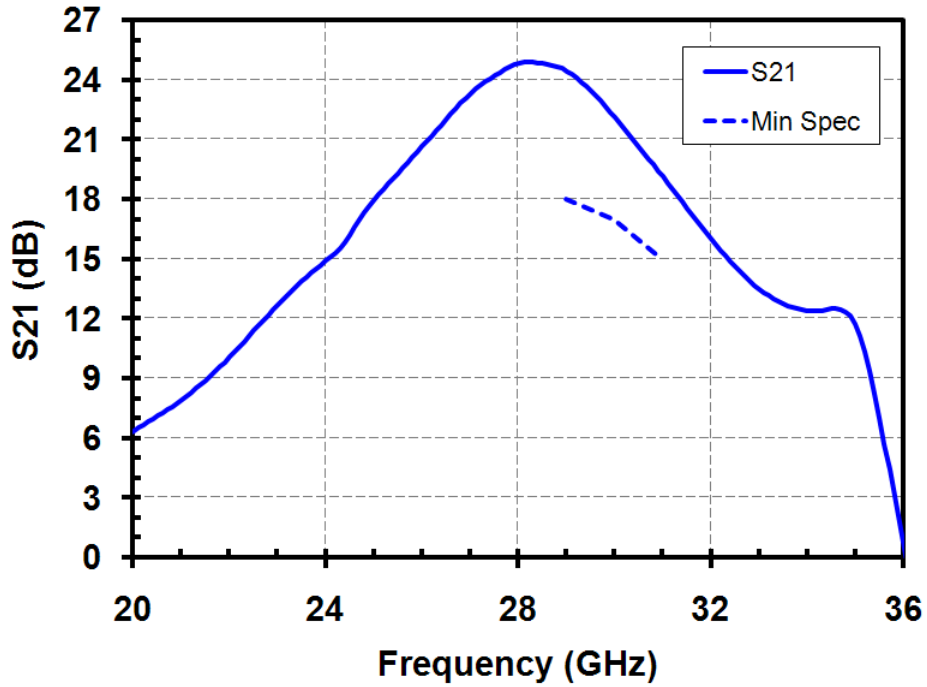
- 1/ For a median life of 1E+6 hours, Power Dissipation is limited to  

$$Pd(max) = (150\text{ °C} - Tbase\text{ °C})/\theta_{jc}.$$
- 2/ Channel operating temperature will directly affect the device median time to failure (MTTF). For maximum life, it is recommended that channel temperatures be maintained at the lowest possible levels.



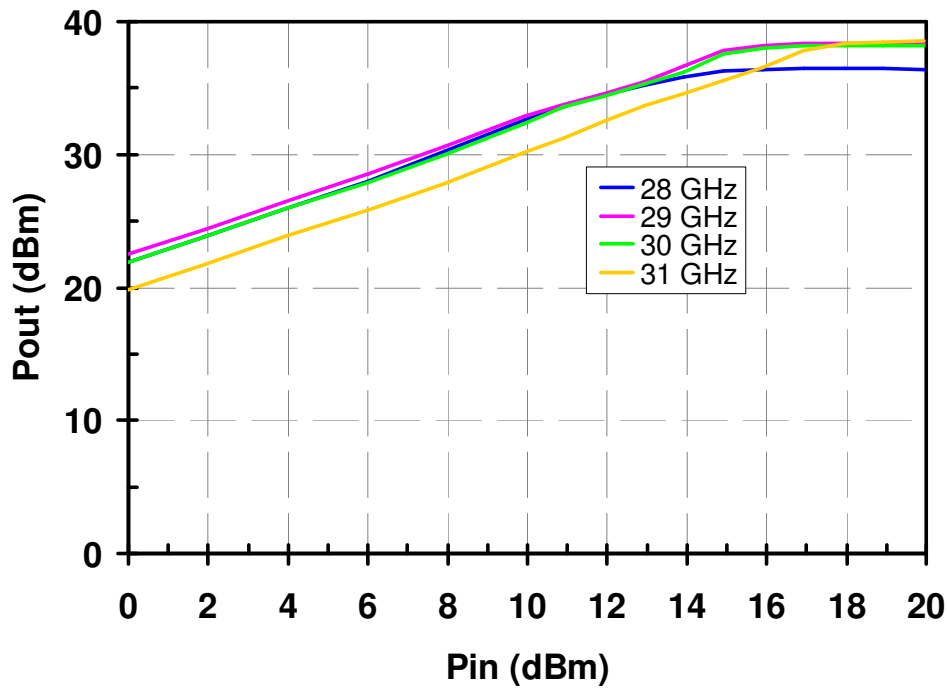
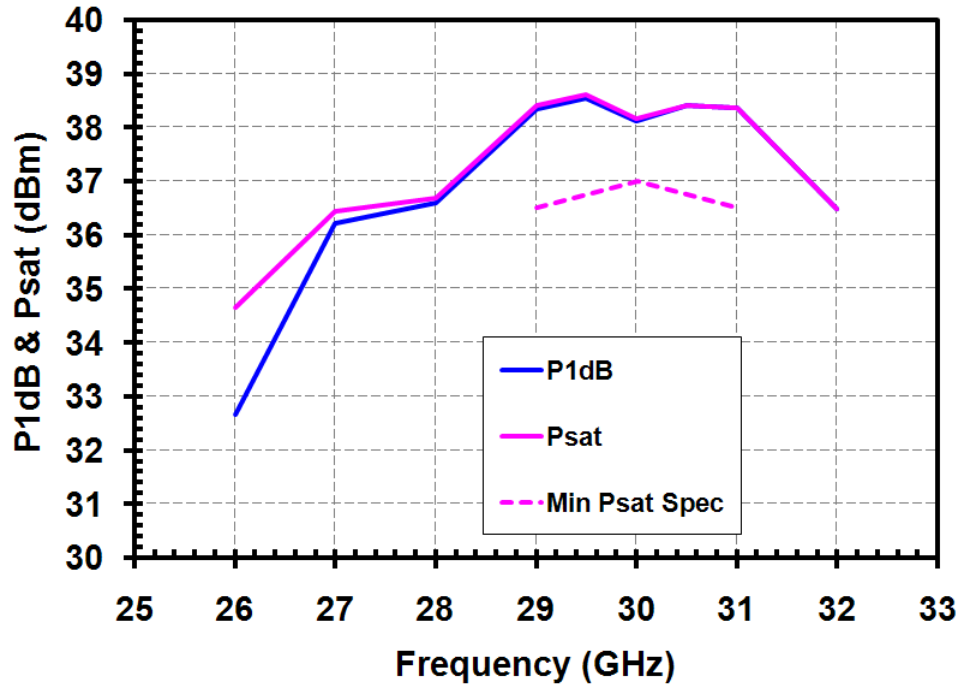
**Measured Data**

Bias conditions:  $V_d = 6\text{ V}$ ,  $I_{dq} = 3200\text{ mA}$ ,  $V_g = -0.7\text{ V}$  Typical



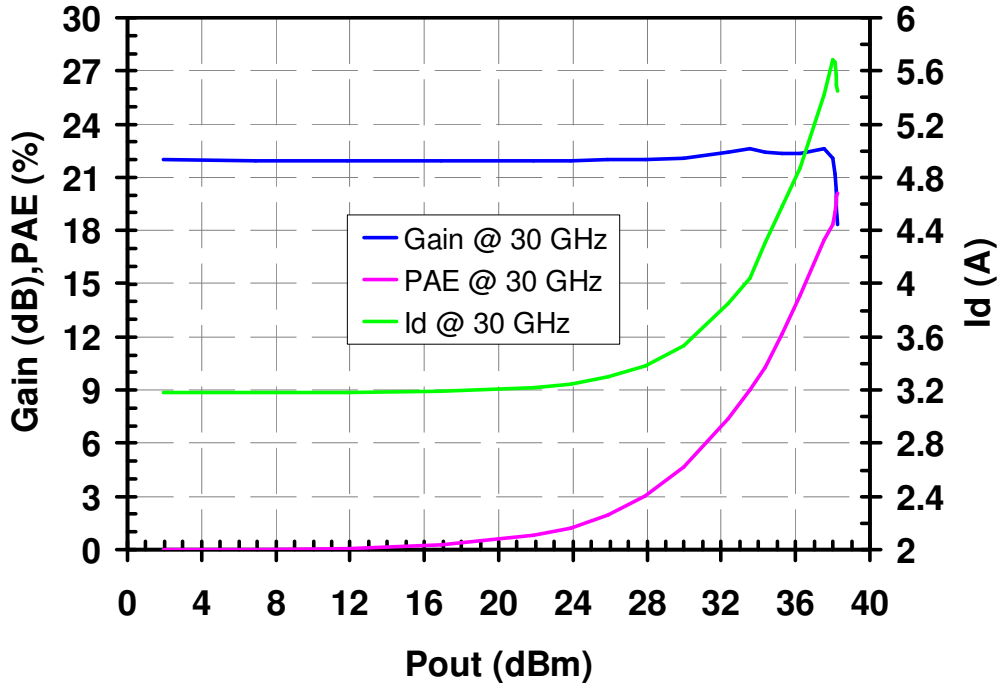
**Measured Data**

Bias conditions:  $V_d = 6\text{ V}$ ,  $I_{dq} = 3200\text{ mA}$ ,  $V_g = -0.7\text{ V}$  Typical



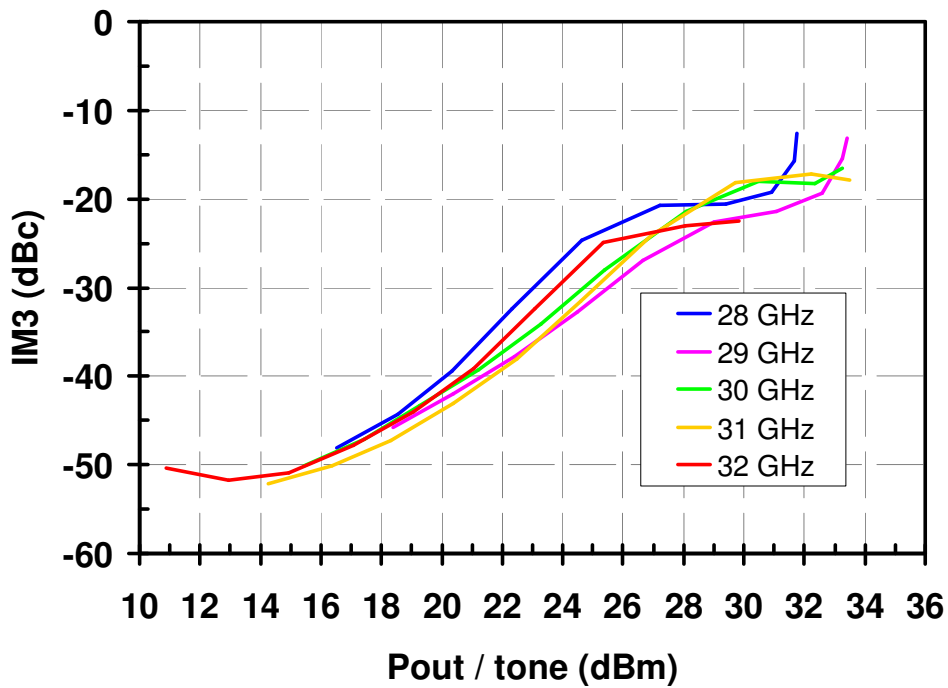
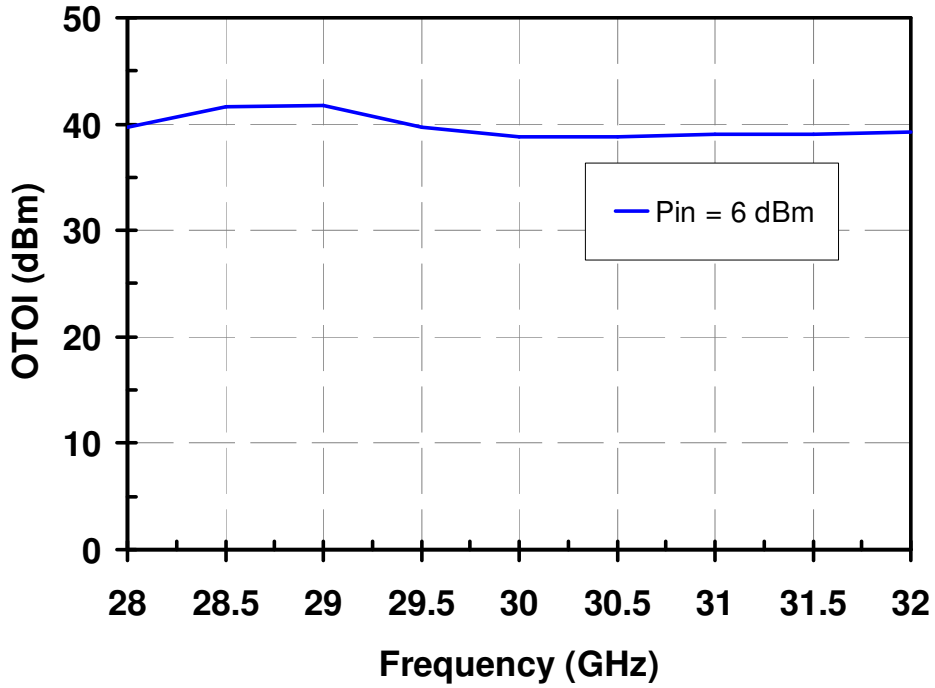
**Measured Data**

Bias conditions:  $V_d = 6\text{ V}$ ,  $I_{dq} = 3200\text{ mA}$ ,  $V_g = -0.7\text{ V}$  Typical



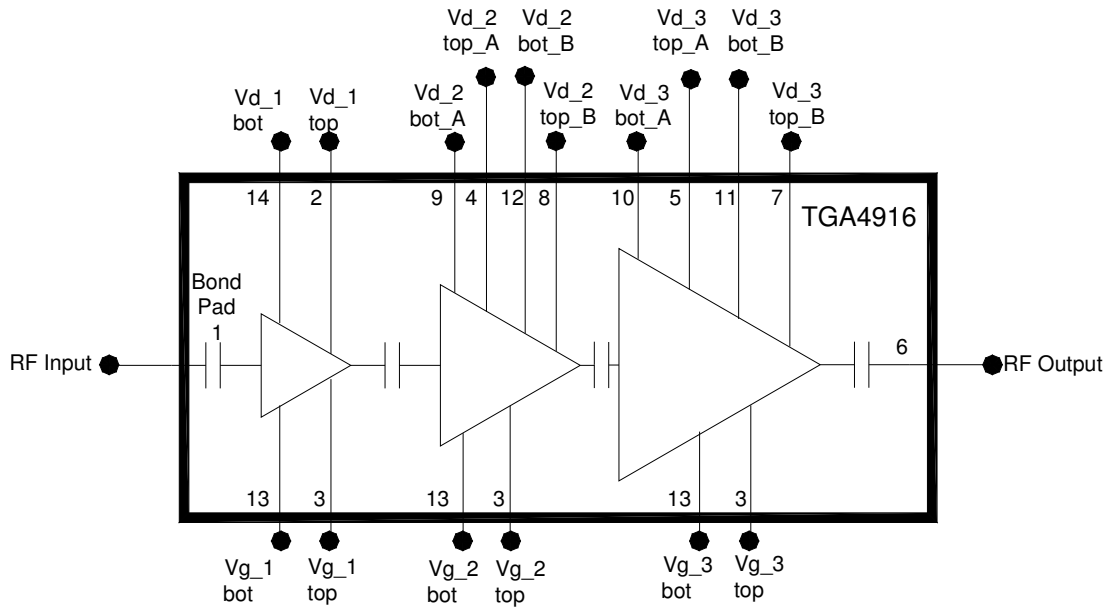
**Measured Data**

Bias conditions:  $V_d = 6\text{ V}$ ,  $I_{dQ} = 3200\text{ mA}$ ,  $V_g = -0.7\text{ V}$  Typical





**Electrical Schematic**



**Bias Procedures**

**Bias-up Procedure**

Vg set to -1.5 V

Vd\_top set to +6 V

Vd\_bottom set to +6 V

Adjust Vg more positive until Idq is 3200 mA.  
This will be ~ Vg = -0.72 V

Apply RF signal to input

**Bias-down Procedure**

Turn off RF supply

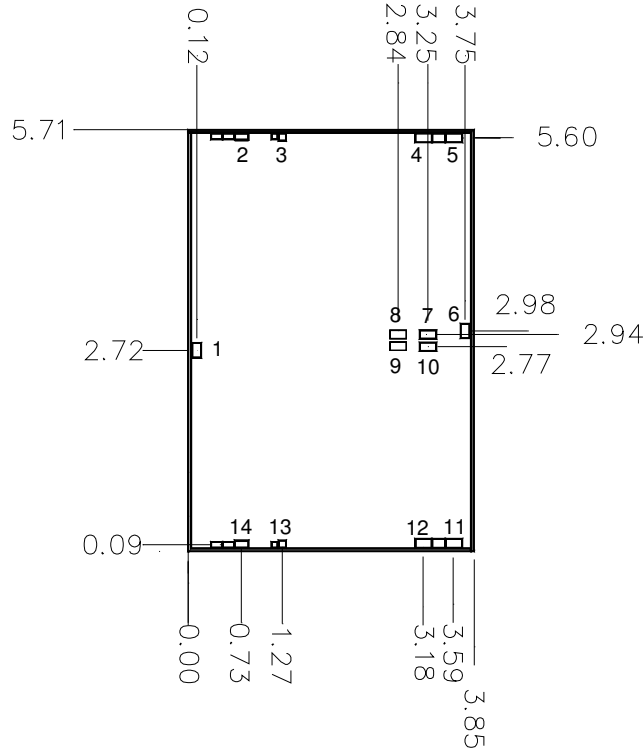
Reduce Vg to -1.5V. Ensure Idq ~ 0 mA

Turn Vd\_top to 0 V

Turn Vd\_bottom to 0 V

Turn Vg to 0 V

**Mechanical Drawing**



Units: millimeters

Thickness: 0.05

Die x,y size tolerance: +/- 0.050

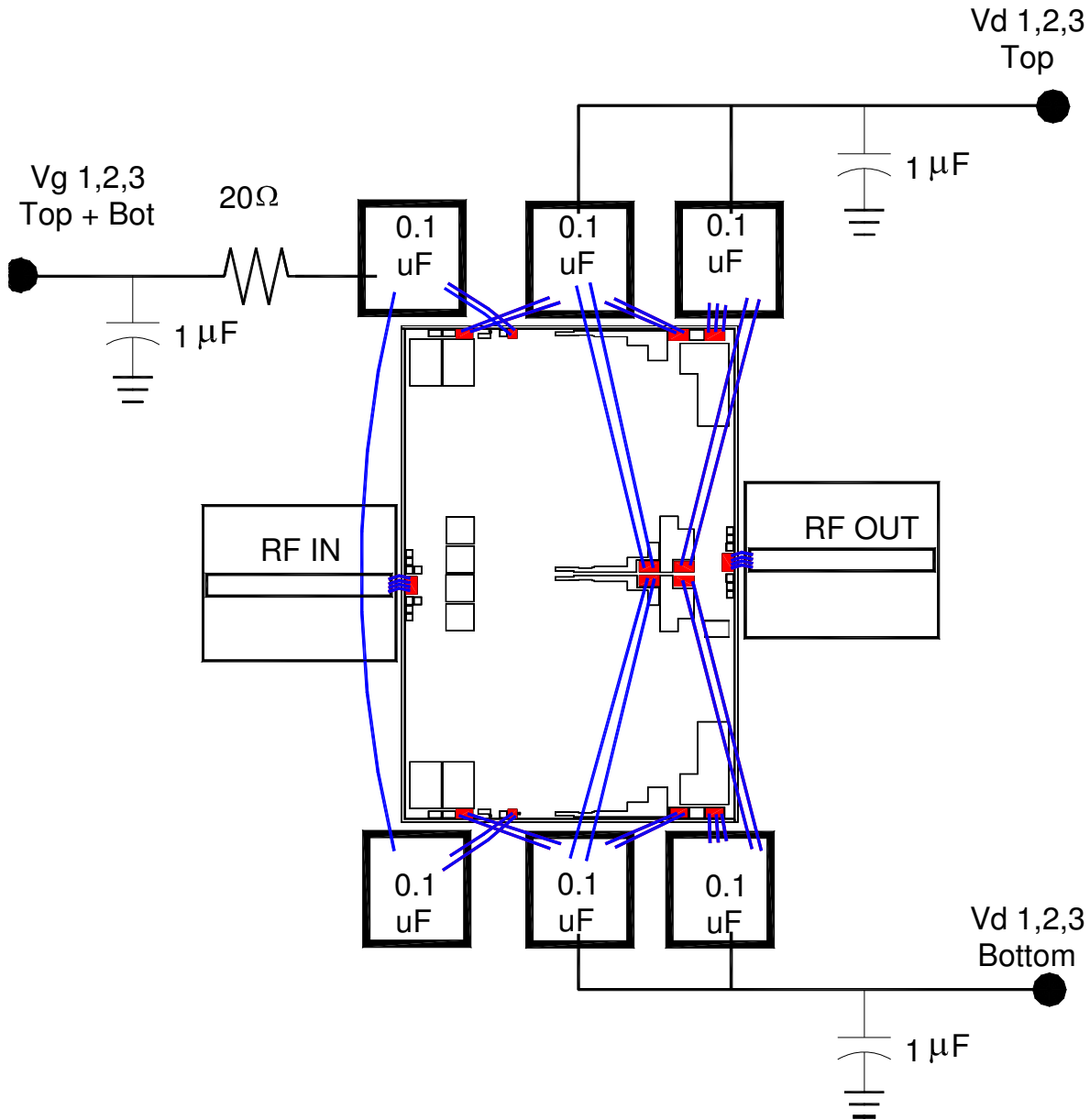
Chip edge to bond pad dimensions are shown to center of pad

Ground is backside of die

Bond Pad #1	RF Input	0.125 x 0.20	Bond Pad #8	Vd_2_top_B	0.225 x 0.115
Bond Pad #2	Vd_1_top	0.187 x 0.10	Bond Pad #9	Vd_2_bot_A	0.225 x 0.115
Bond Pad #3	Vg_1,2,3_top	0.10 x 0.10	Bond Pad #10	Vd_3_bot_A	0.225 x 0.115
Bond Pad #4	Vd_2_top_A	0.225 x 0.125	Bond Pad #11	Vd_3_bot_B	0.225 x 0.125
Bond Pad #5	Vd_3_top_A	0.225 x 0.125	Bond Pad #12	Vd_2_bot_B	0.225 x 0.125
Bond Pad #6	RF Output	0.125 x 0.20	Bond Pad #13	Vg_1,2,3_bot	0.10 x 0.10
Bond Pad #7	Vd_3_top_B	0.225 x 0.115	Bond Pad #14	Vd_1_bot	0.187 x 0.10

**GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.**

**Recommended Assembly Diagram**



- 1/ Bond only to hatched bond pads, designated in blue. Bonding to other areas may damage MMIC.
- 2/ For optimal performance, RF Input and RF Output should be bonded with 4 wires, using wedge bonding, or a gold ribbon. Alternatively, 3 ball bonds can be used.
- 3/ All DC connections from 0.1 uF decoupling caps to chip should have 2 bonds.

**GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.**

## 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:

- Ball bonding is the preferred interconnect technique, except where noted on the assembly diagram.
- Force, time, and ultrasonics are critical bonding parameters.
- Aluminum wire should not be used.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.

## Ordering Information

Part	Package Style
TGA4916	GaAs MMIC Die

***GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.***