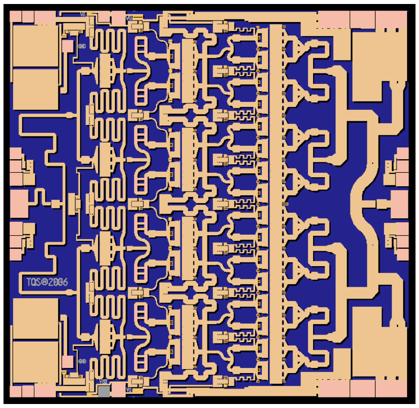
TriQuint SEMICONDUCTOR

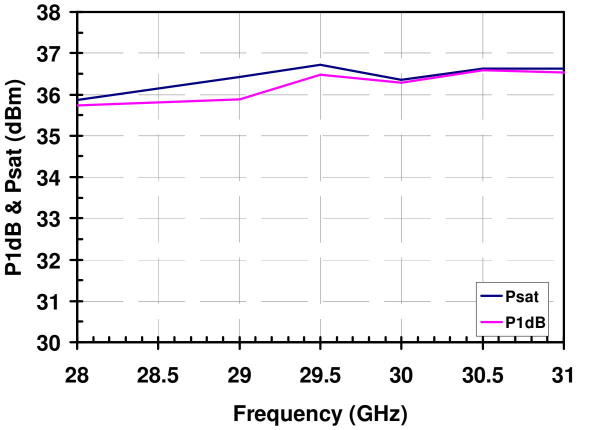
TGA4906

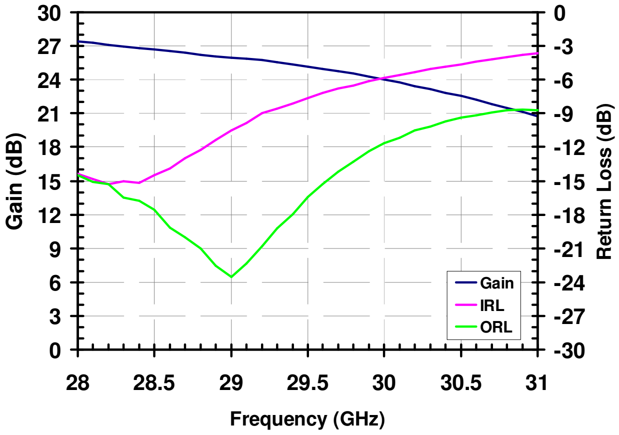
4 Watt Ka-Band HPA



Measured Performance

Bias conditions: Vd = 6 V, Idq = 1.6 A, Vg = -0.75 V Typical





Key Features

- Frequency Range: 28 - 31 GHz
- 36 dBm Nominal Psat
- Gain: 24 dB
- Return Loss: -8 dB
- Bias: Vd = 6 V, Idq = 1.6 A, Vg = -0.75 V Typical
- Technology: 3MI 0.15 um Power pHEMT
- Chip Dimensions: 2.98 x 2.90 x 0.05 mm

Primary Applications

- Ka-Band VSAT

Product Description

The TriQuint TGA4906 is a compact 4 Watt High Power Amplifier for Ka-band applications. The part is designed using TriQuint's proven standard 0.15 um gate Power pHEMT production process. The TGA4906 provides a nominal 36 dBm of output power at an input power level of 14 dBm with a small signal gain of 24 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.

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	3.7 A	2/
Ig	Gate Current Range	-15 to 202 mA	
Pin	Input Continuous Wave Power	26 dBm	2/
Tchannel	Channel Temperature	200 ºC	

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	1.6 A
Id_Drive	Drain Current under RF Drive	3.3 A
Vg	Gate Voltage	-0.75 V

1/ See assembly diagram for bias instructions.

Table III
RF Characterization Table
Bias: Vd = 6 V, Idq = 1.6 A, Vg = -0.75 V Typical

SYMBOL	PARAMETER	TEST CONDITIONS	MINIMUM	NOMINAL	UNITS
Gain	Small Signal Gain	f = 28 - 30 GHz f = 31 GHz	21 16	24	dB
IRL	Input Return Loss	f = 28 - 31 GHz		-8	dB
ORL	Output Return Loss	f = 28 - 31 GHz		-10	dB
Psat	Saturated Output Power	f = 28 GHz f = 29 - 31 GHz	34.3 35.3	36	dBm
OTOI	Output TOI	f = 28 - 31 GHz		39	dBm
	Gain Temp Coefficient	f = 28 - 31 GHz		-0.04	dB/^{0}C

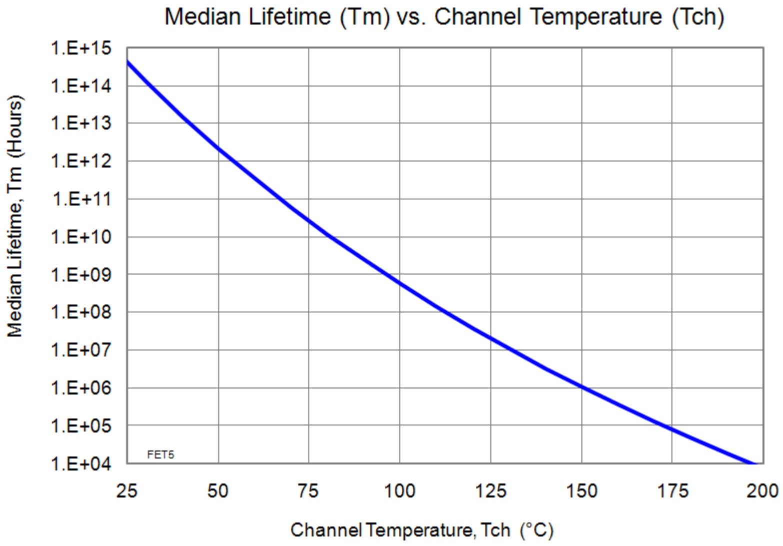
Table IV
Power Dissipation and Thermal Properties

Parameter	Test Conditions	Value	Notes
Maximum Power Dissipation	Tbaseplate = 70 ºC	Pd = 20.8 W Tchannel = 150 ºC Tm = 1.0E+6 Hrs	1/ 2/
Thermal Resistance, θjc	Vd = 6 V Id = 1600 mA Pd = 9.6 W Tbaseplate = 70 ºC	θjc = 3.85 (ºC/W) Tchannel = 107 ºC Tm = 2.0E+8 Hrs	
Thermal Resistance, θjc Under RF Drive	Vd = 6 V Id = 3300 mA Pout = 36 dBm Pd = 15.83 W Tbaseplate = 70 ºC	θjc = 3.85 (ºC/W) Tchannel = 131 ºC Tm = 9.2E+6 Hrs	
Mounting Temperature	30 Seconds	320 ºC	
Storage Temperature		-65 to 150 ºC	

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

Pd(max) = (150 ºC – Tbase ºC)/θjc.

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

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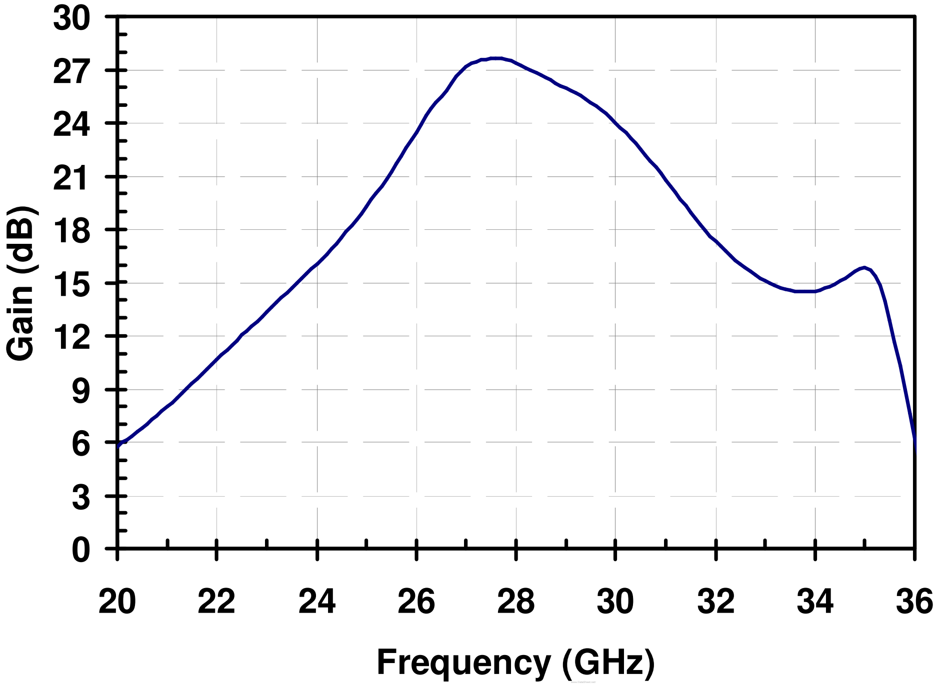

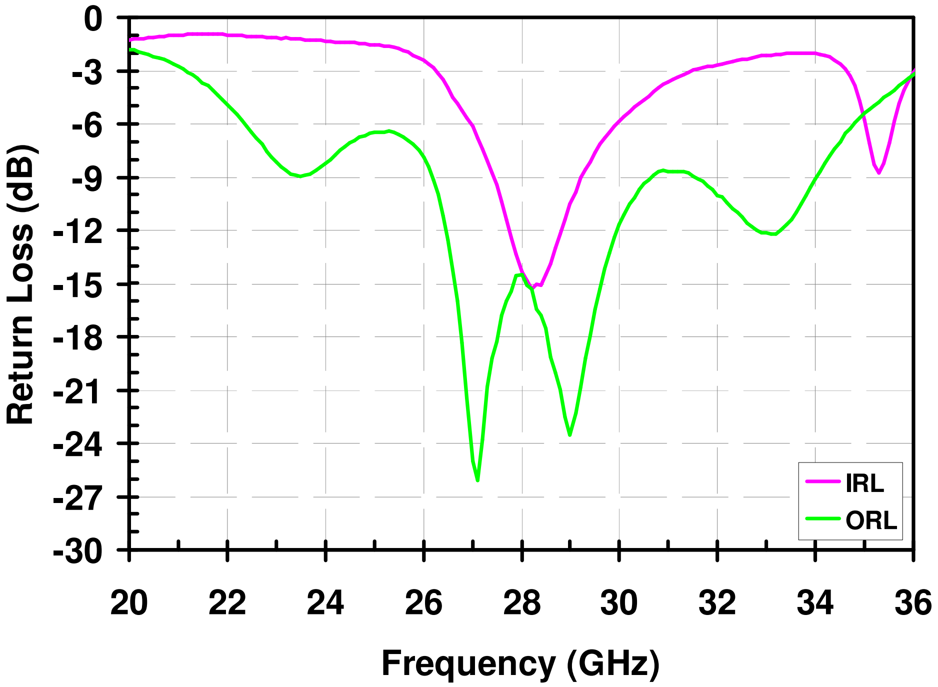

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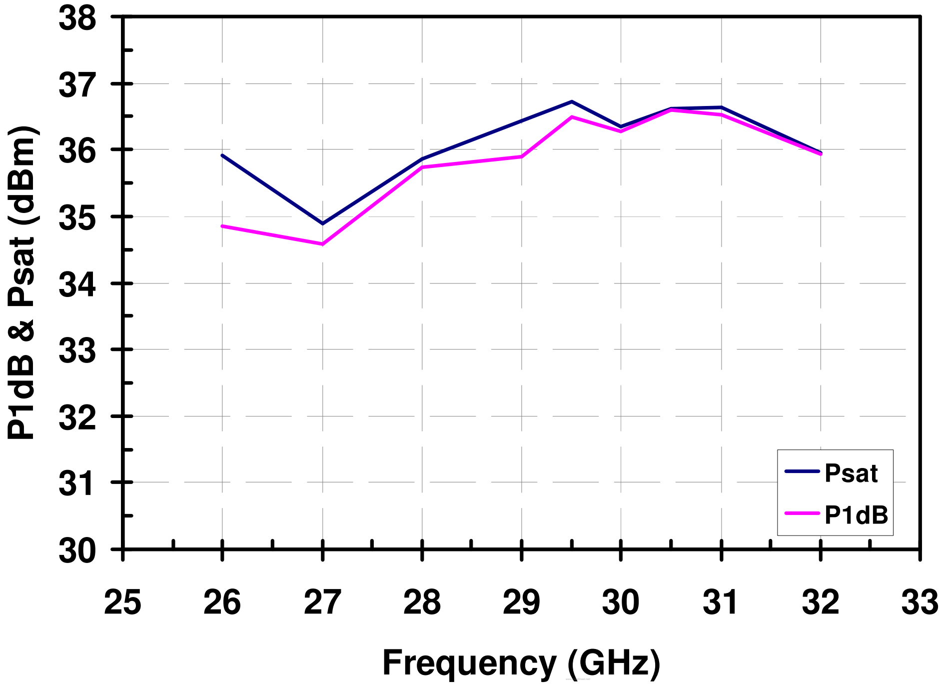

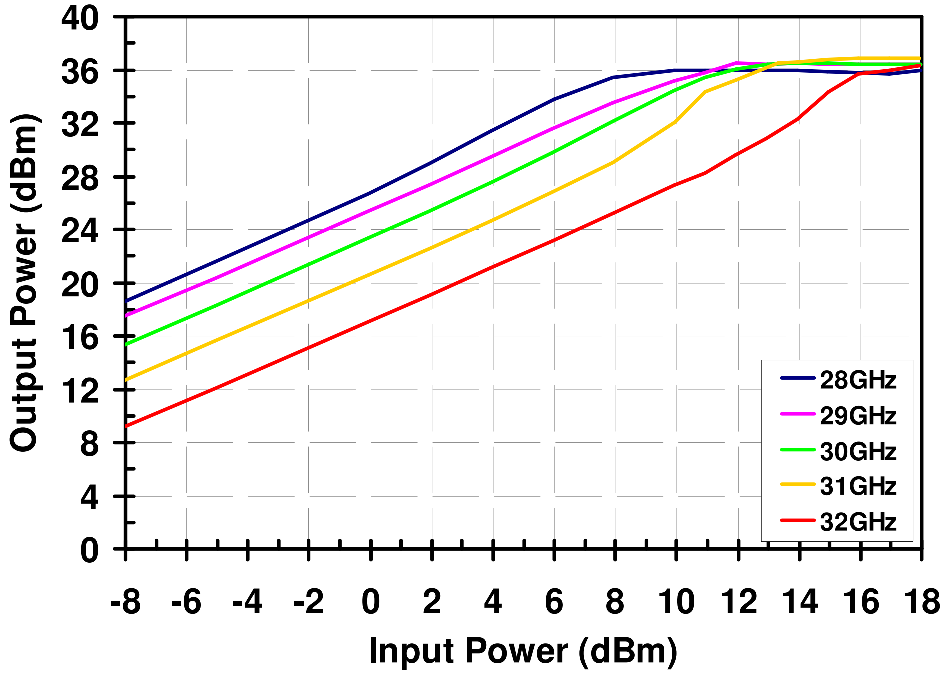

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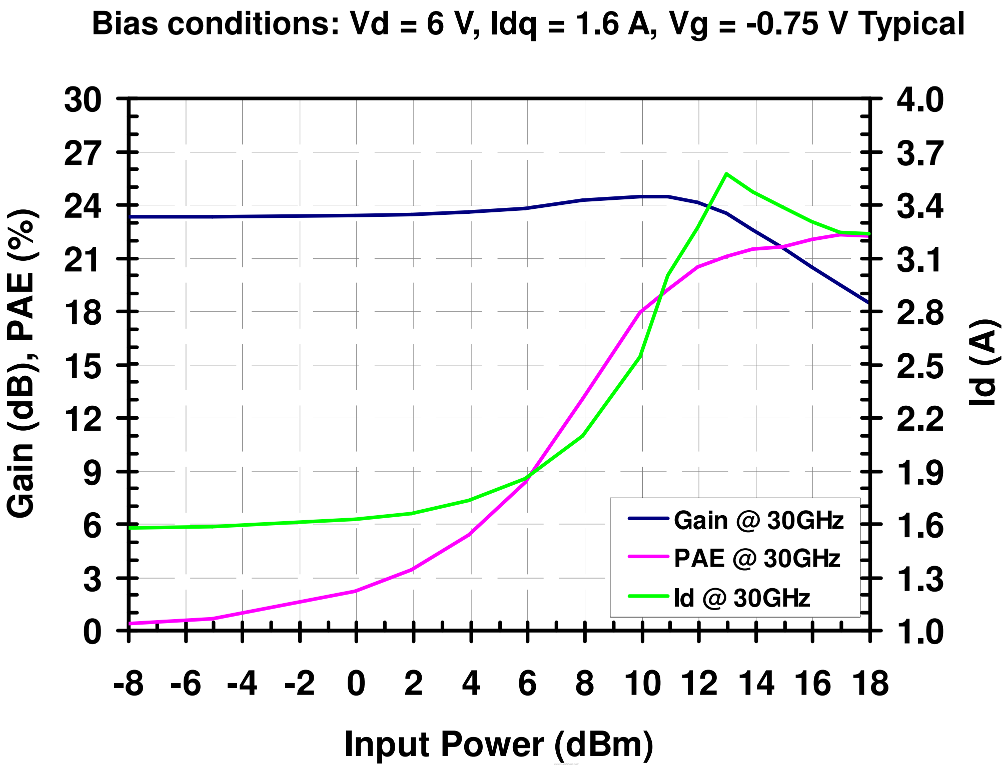

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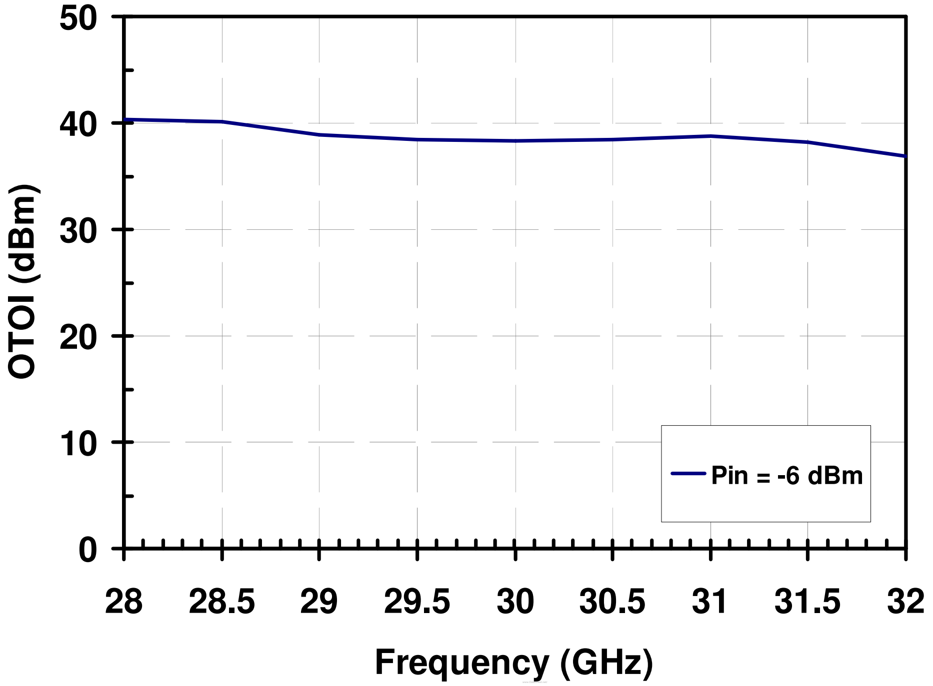

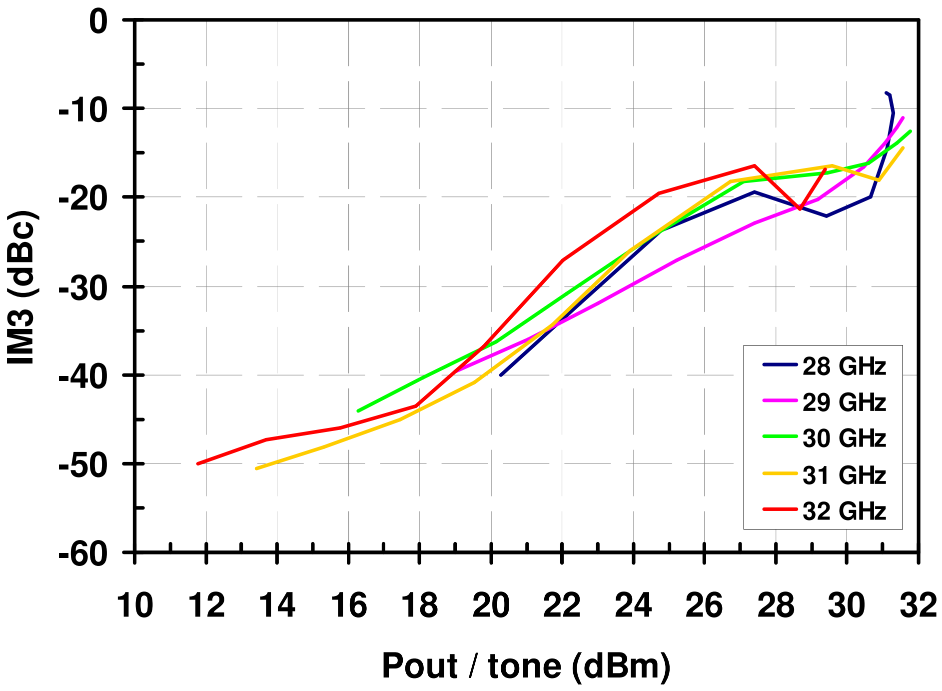

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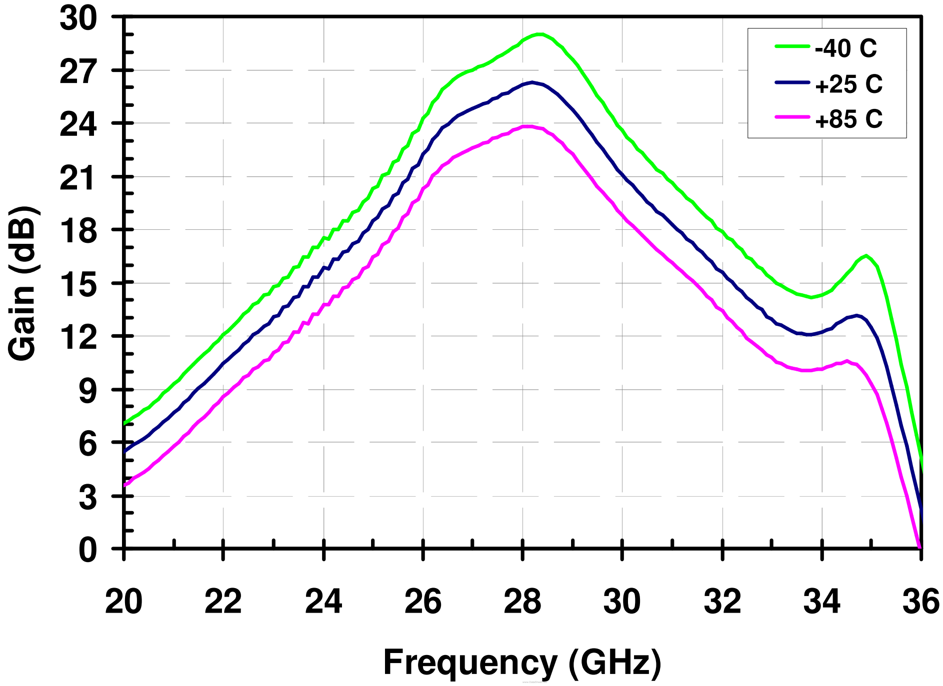
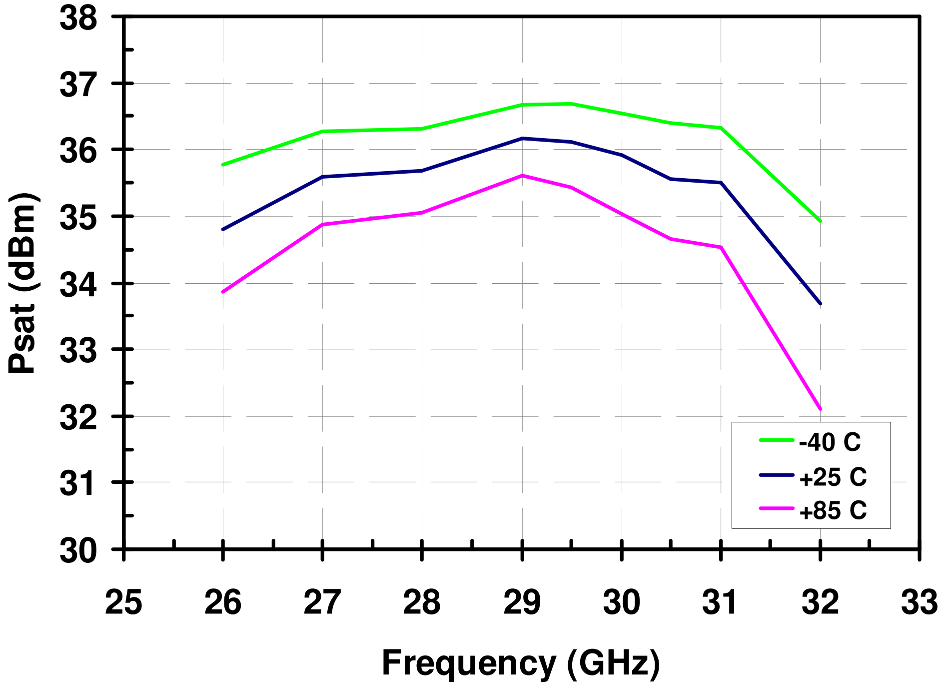
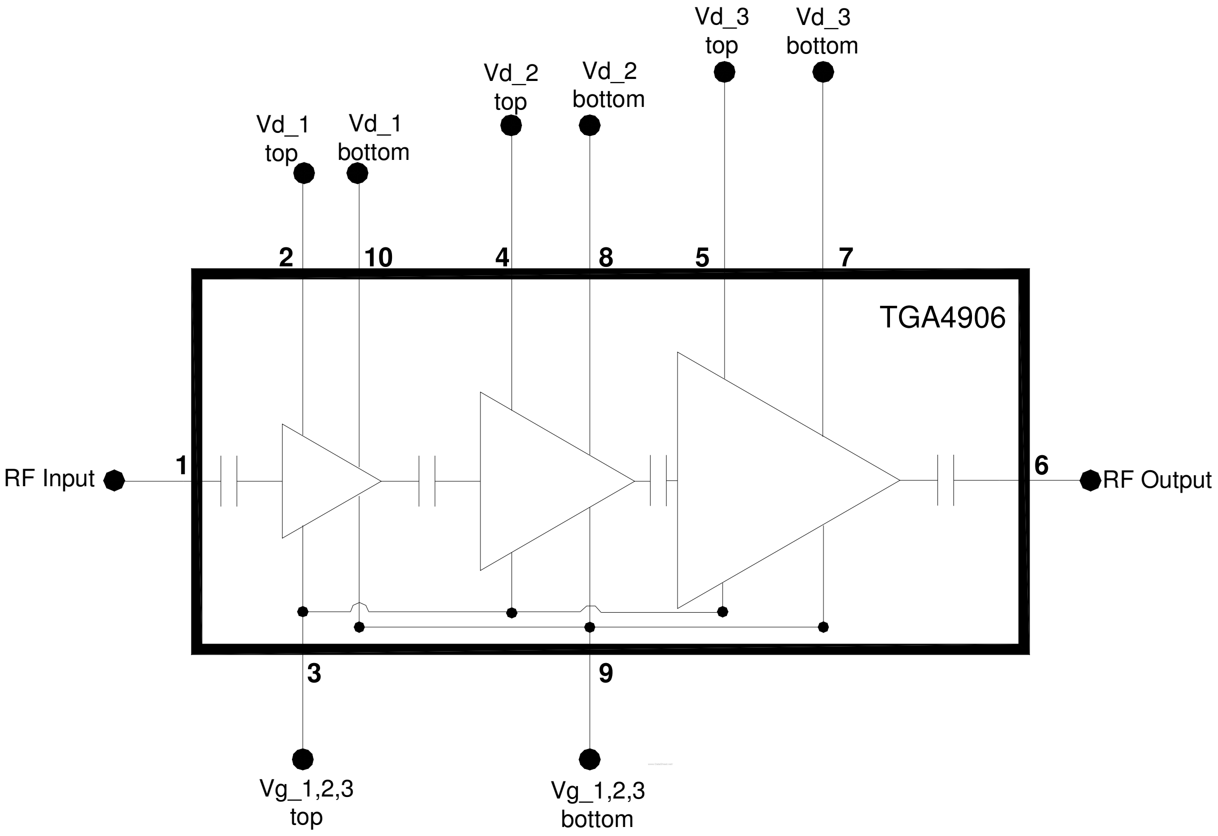




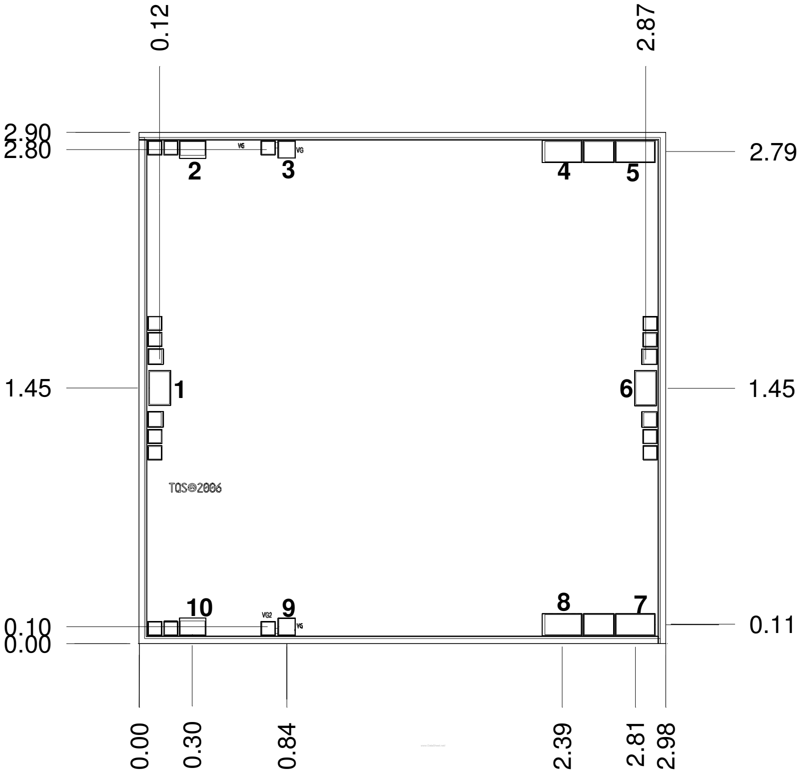
Electrical Schematic



Bias Procedures

Bias-up Procedure	**Bias-down Procedure**
Vg set to -1.5 V	Turn off RF supply
Vd_set to +6 V	Reduce Vg to -1.5V. Ensure Idq ~ 0 mA
Adjust Vg more positive until Idq is 1.6 A. This will be ~ Vg = -0.75 V	Turn Vd to 0 V
Apply RF signal to input	Turn Vg to 0 V

Mechanical Drawing

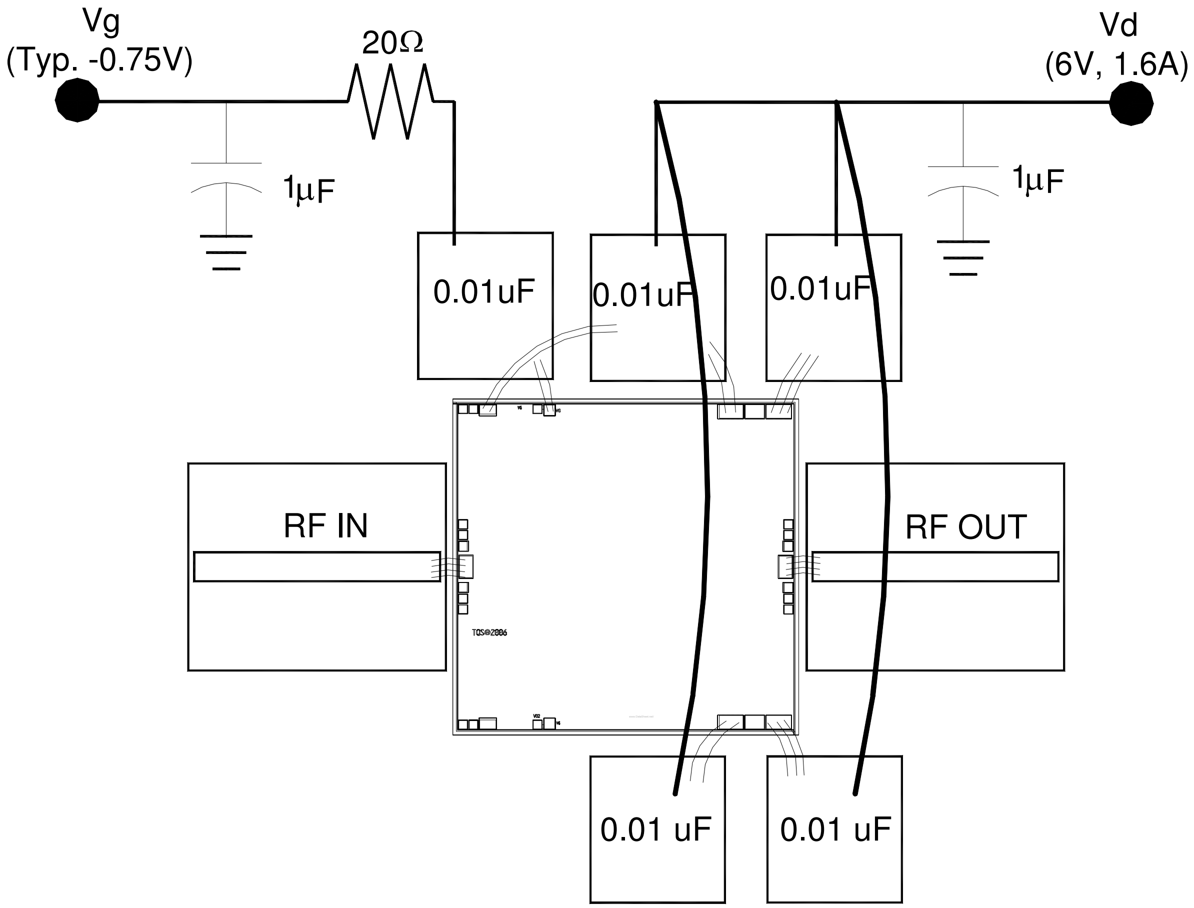


Units: millimeters
Thickness: 0.05
Die x,y size tolerance: +/- 0.050
Chip edge to bond pad dimensions are shown to center of pad
Ground is backside of die

Bond Pad #1	RF In	0.125 x 0.200	Bond Pad #6	RF Out	0.125 x 0.200
Bond Pad #2	Vd_1 top	0.150 x 0.100	Bond Pad #7	Vd_3 bottom	0.225 x 0.125
Bond Pad #3	Vg_1,2,3 top	0.100 x 0.100	Bond Pad #8	Vd_2 bottom	0.225 x 0.125
Bond Pad #4	Vd_2 top	0.225 x 0.125	Bond Pad #9	Vg_1,2,3 bottom	0.100 x 0.100
Bond Pad #5	Vd_3 top	0.225 x 0.125	Bond Pad #10	Vd_1 bottom	0.150 x 0.100

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

Recommended Assembly Diagram



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
TGA4906	GaAs MMIC Die

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