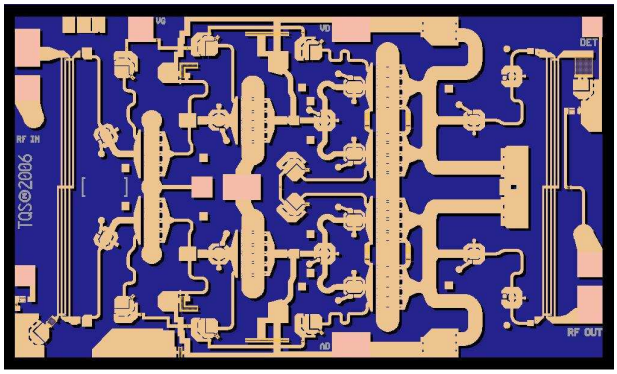
K Band High Linearity Power Amplifier

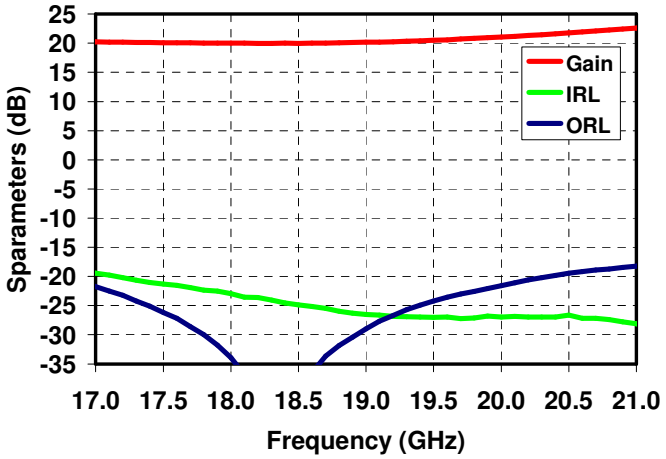


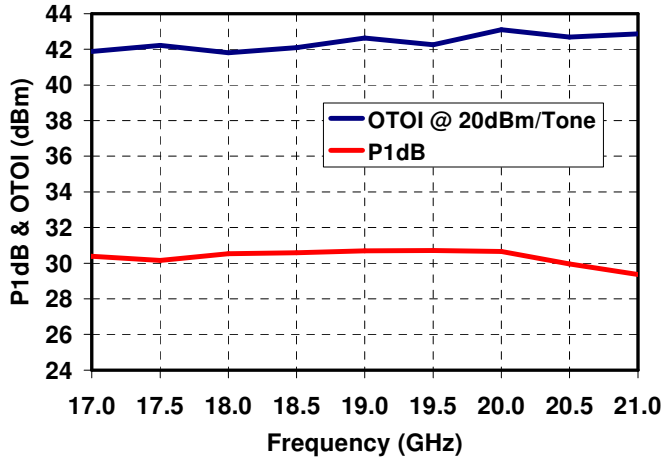
Key Features

- Frequency Range: 17 - 21 GHz
- 20 dB Gain
- 30 dBm nominal P1dB
- 42 dBm nominal OTOI
- 20 dB Return Loss
- Bias 5 - 7 V @ 825 mA
- 0.25 um 3MI pHEMT technology
- Chip Dimensions 2.43 x 1.45 x 0.1mm

Measured Fixtured Data

Bias Conditions: Vd = 7 V, Id = 825 mA





Primary Applications

- Point-to-Point Radio
- K Band Sat-Com

Product Description

The TriQuint TGA4530 is a High Power Amplifier MMIC for 17 – 21GHz applications. The part is designed using TriQuint's 0.25 um 3MI pHEMT production process.

The TGA4530 nominally provides 30 dBm output power @ 1dB gain compression and 42 dBm OTOI at a bias of 7 V and 825 mA. The typical gain is 20 dB.

The part is ideally suited for low cost emerging markets such as Point-to-Point Radio, and K-band Satellite Communications.

The TGA4530 is 100% DC and RF tested on-wafer to ensure performance compliance.

The TGA4530 has a protective surface passivation layer providing environmental robustness.

Lead-Free & RoHS compliant

Note: Device is early in the characterization process prior to finalizing all electrical specifications. Specifications are subject to change without notice

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TABLE I
ABSOLUTE MAXIMUM RATINGS 1/

SYMBOL	PARAMETER	VALUE	NOTES
Vd	Positive Supply Voltage	8 V	
Vg	Negative Supply Voltage Range	-5 V TO 0 V	
Id	Positive Supply Current	1.75 A	
$\| I_G \|$	Gate Supply Current	35 mA	
P_{IN}	Input Continuous Wave Power	26 dBm	
P_D	Power Dissipation	14.0 W	
Tchannel	Channel Temperature	200 °C	2/
	Mounting Temperature (30 Seconds)	320 °C	
	Storage Temperature	-65 to 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/ Junction operating temperature will directly affect the device median lifetime. For maximum life, it is recommended that junction temperatures be maintained at the lowest possible levels.

TABLE II
ELECTRICAL CHARACTERISTICS
(Ta = 25 °C Nominal)

PARAMETER	TYPICAL	UNITS
Frequency Range	17 - 21	GHz
Drain Voltage, Vd	7	V
Drain Current, Id	825	mA
Gate Voltage, Vg	-0.45	V
Small Signal Gain, S21	20	dB
Input Return Loss, S11	20	dB
Output Return Loss, S22	20	dB
Saturated Output Power @ Pin = 16dBm, Psat	32	dBm
Output Power @ 1dB Gain Compression, P1dB	30	dBm
Output Third Order Intercept, OTOI @ 20dBm/Tone	42	dBm
Small Signal Gain Temperature Coefficient	-0.03	$dB/^0C$
Noise Figure @ 19GHz	6	dB

TABLE III
THERMAL INFORMATION

PARAMETER	TEST CONDITIONS	Tchannel (°C)	θ_{JC} (°C/W)	T_m (HRS)
θ_{JC} Thermal Resistance (channel to Case)	Vd = 7 V Id = 825 mA P_{diss} = 5.78 W Small Signal	150	14.7	1.0E+6
θ_{JC} Thermal Resistance (channel to Case)	Vd = 7 V Id = 1050 mA @ Psat P_{out} = 1.6 W (RF) P_{diss} = 5.75 W	150	14.7	1.0E+6

Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20 mil CuMo Carrier at 65°C baseplate temperature.

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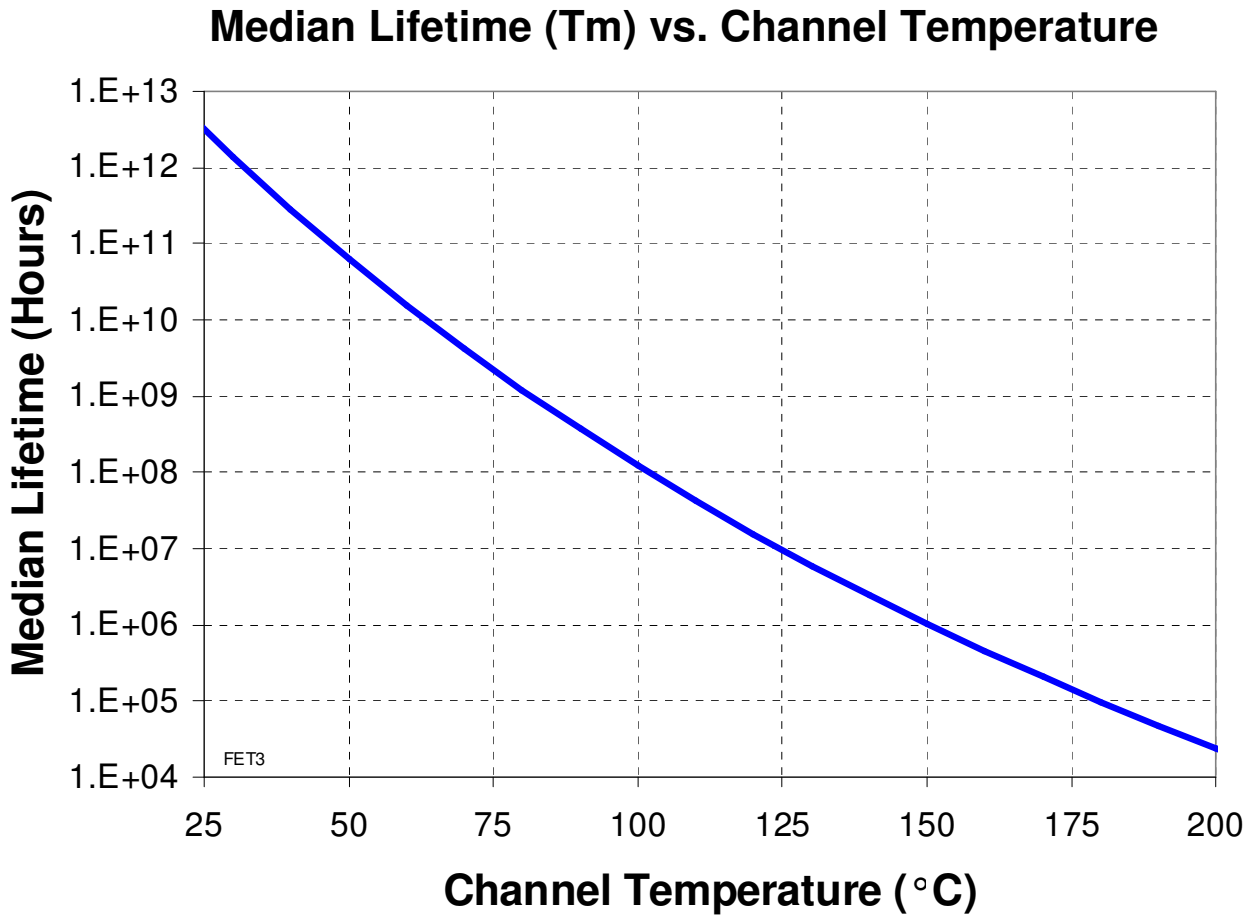
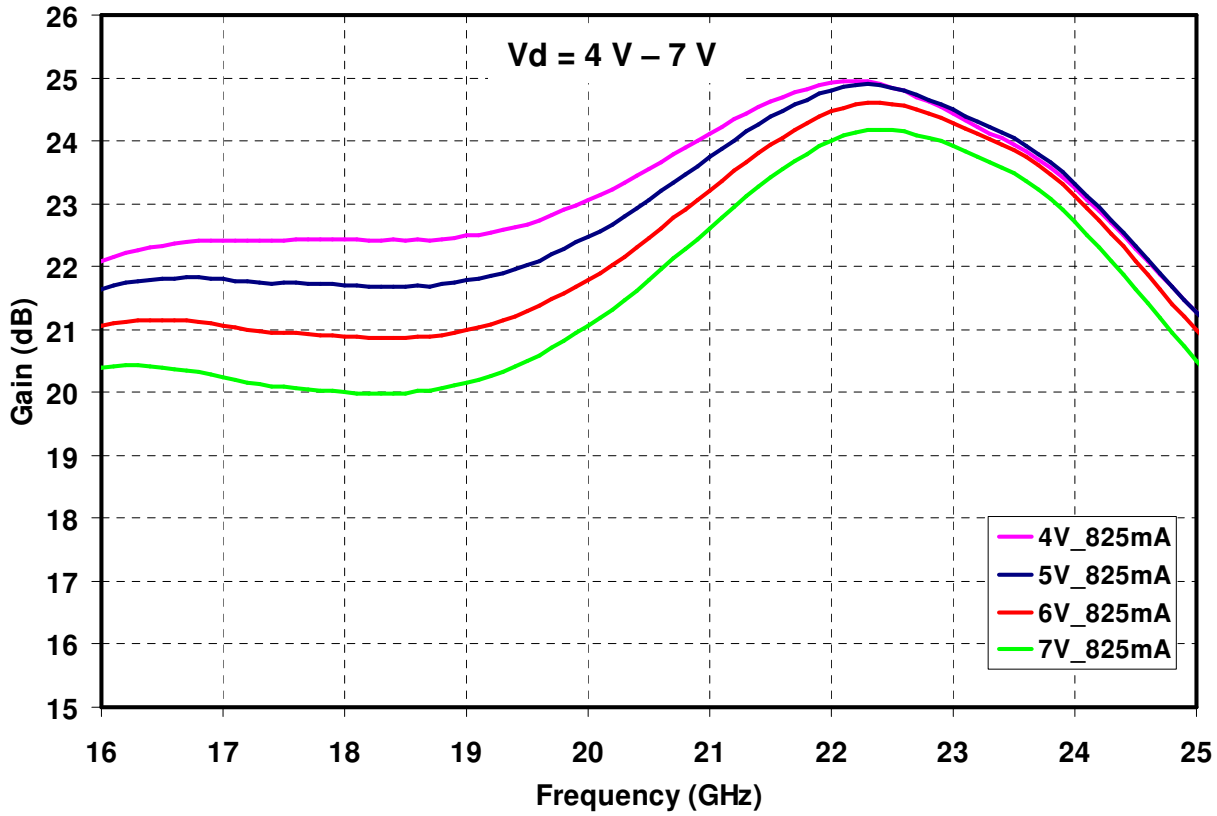
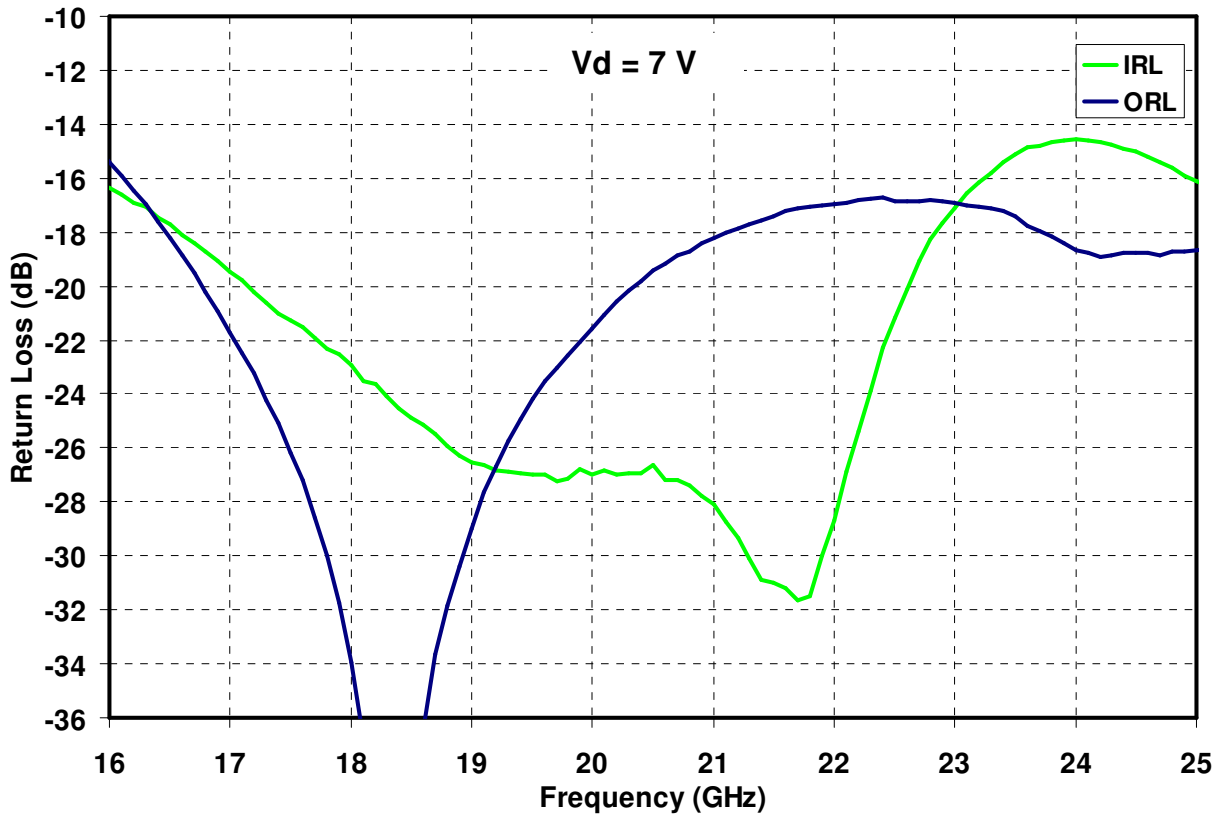


Measured Data

Bias Conditions: Idq = 825 mA





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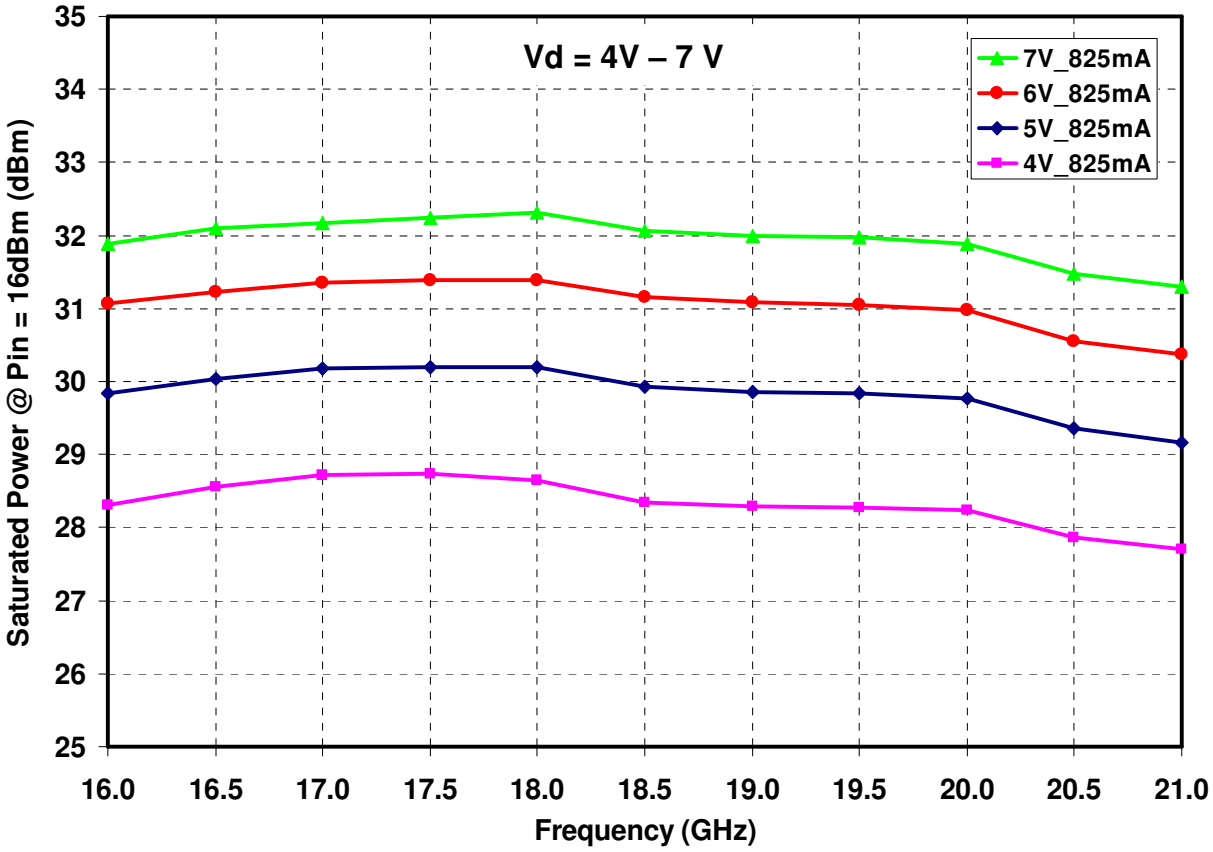
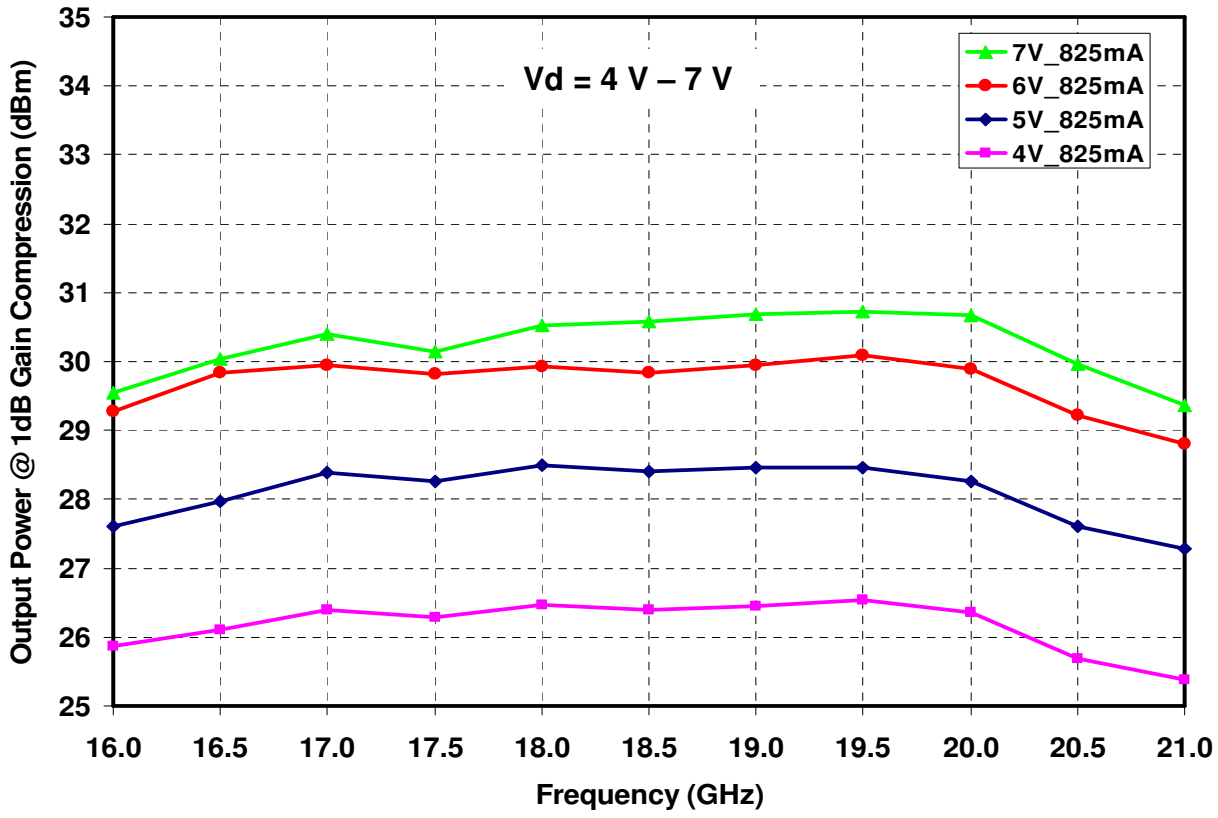
Measured Data

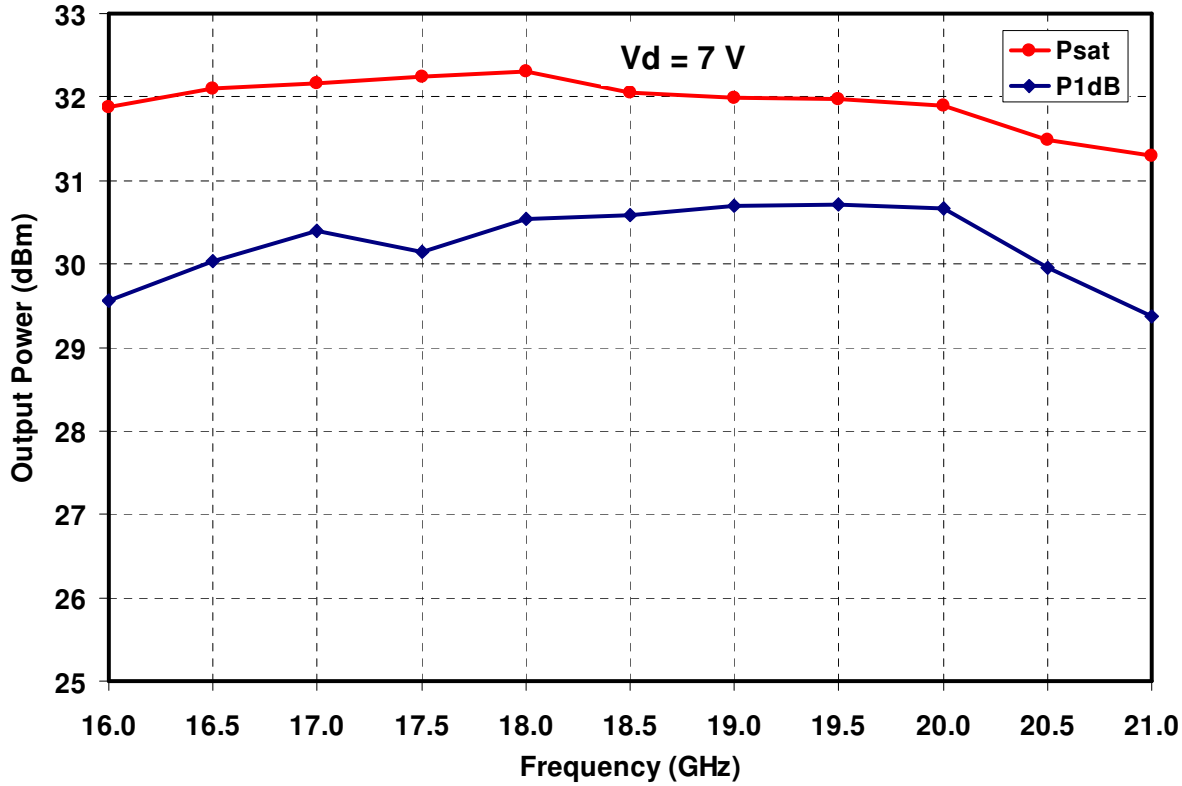
Bias Conditions: Vd = 4 V – 7 V, Idq = 825 mA

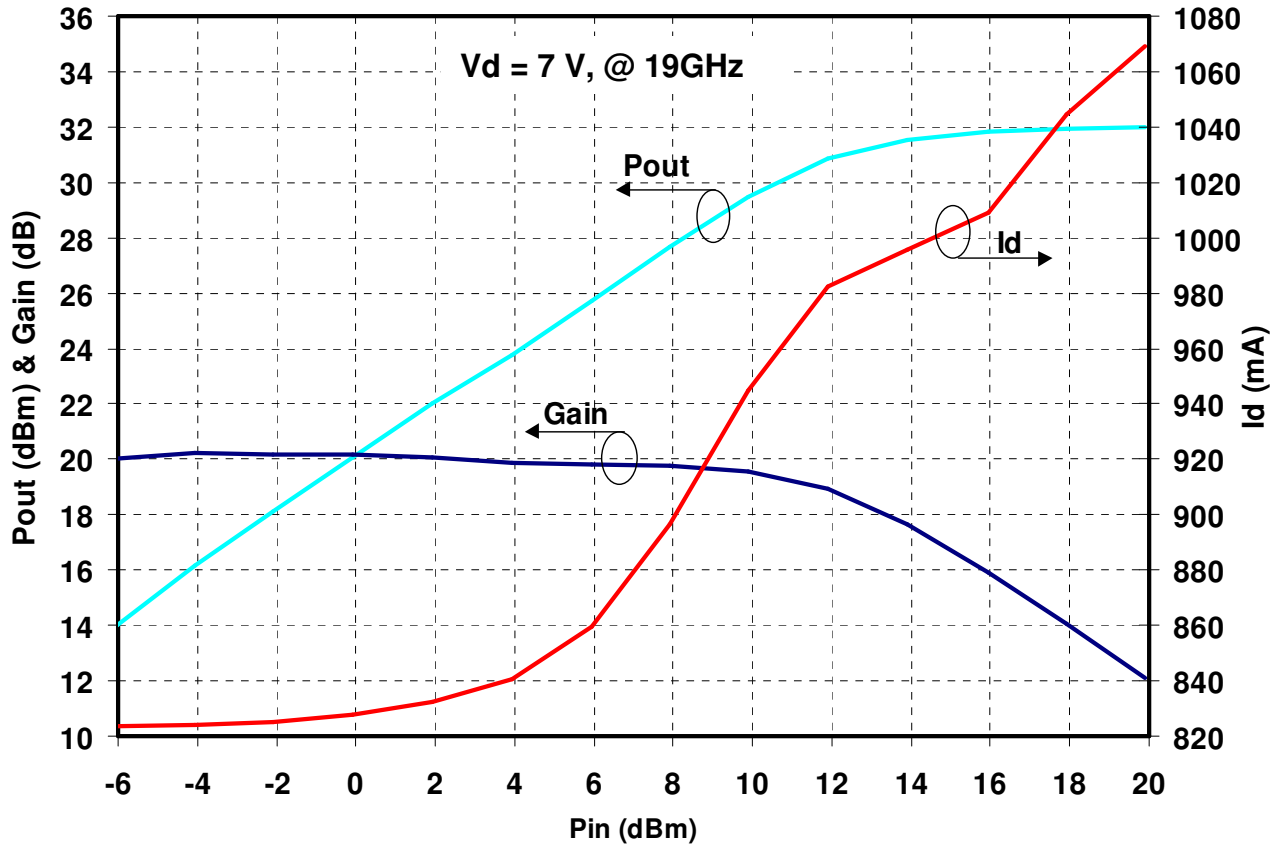




Measured Data

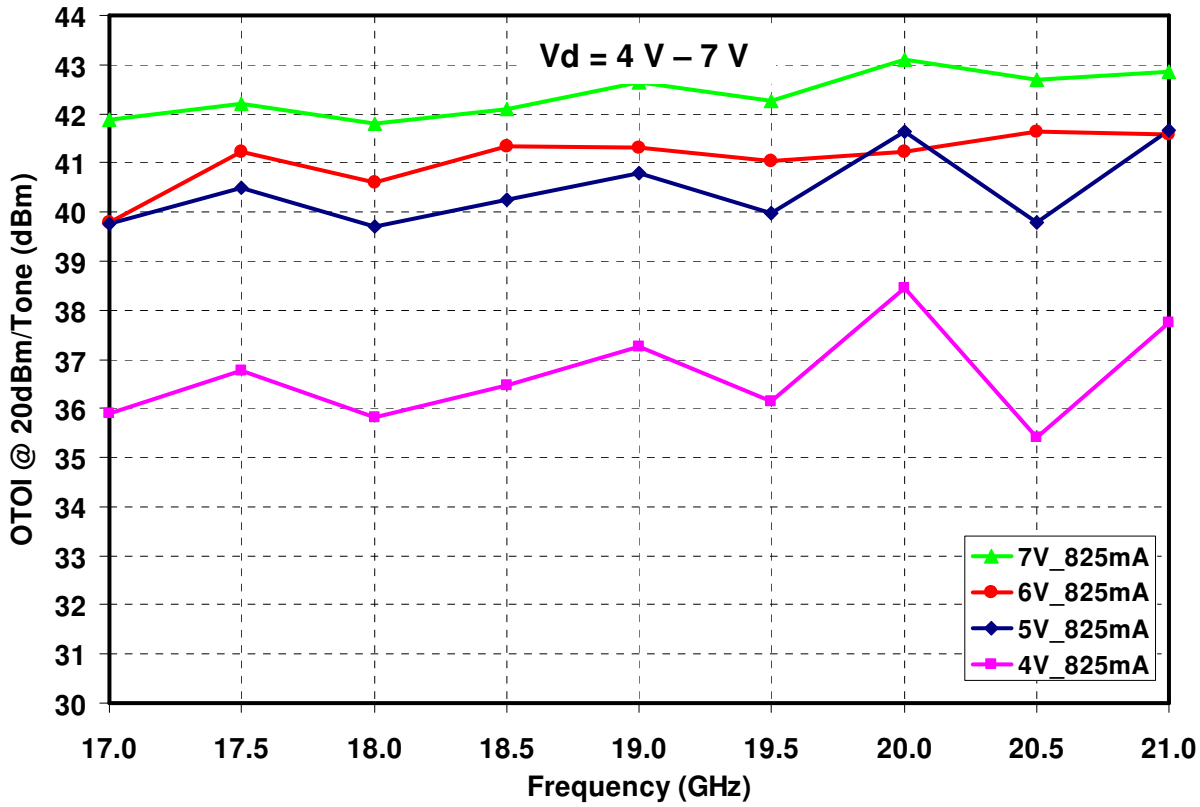
Bias Conditions: Vd = 7 V, Idq = 825 mA

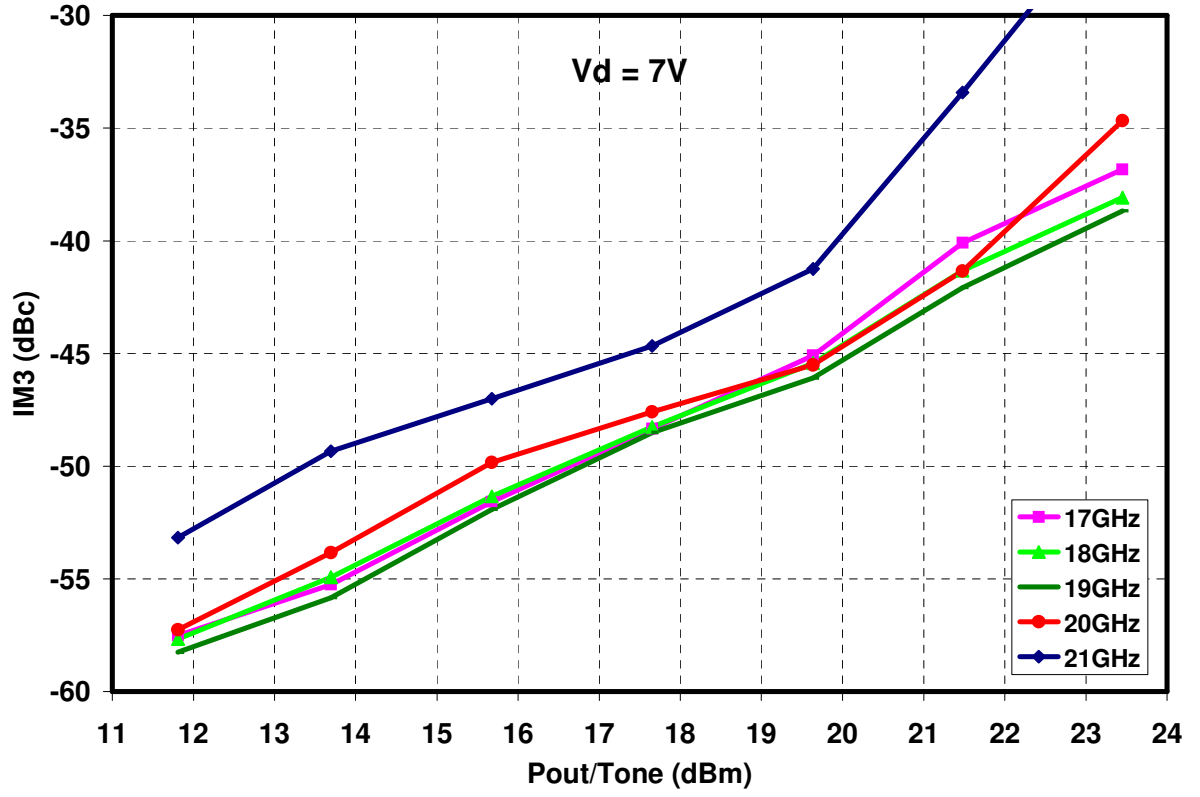




Measured Data

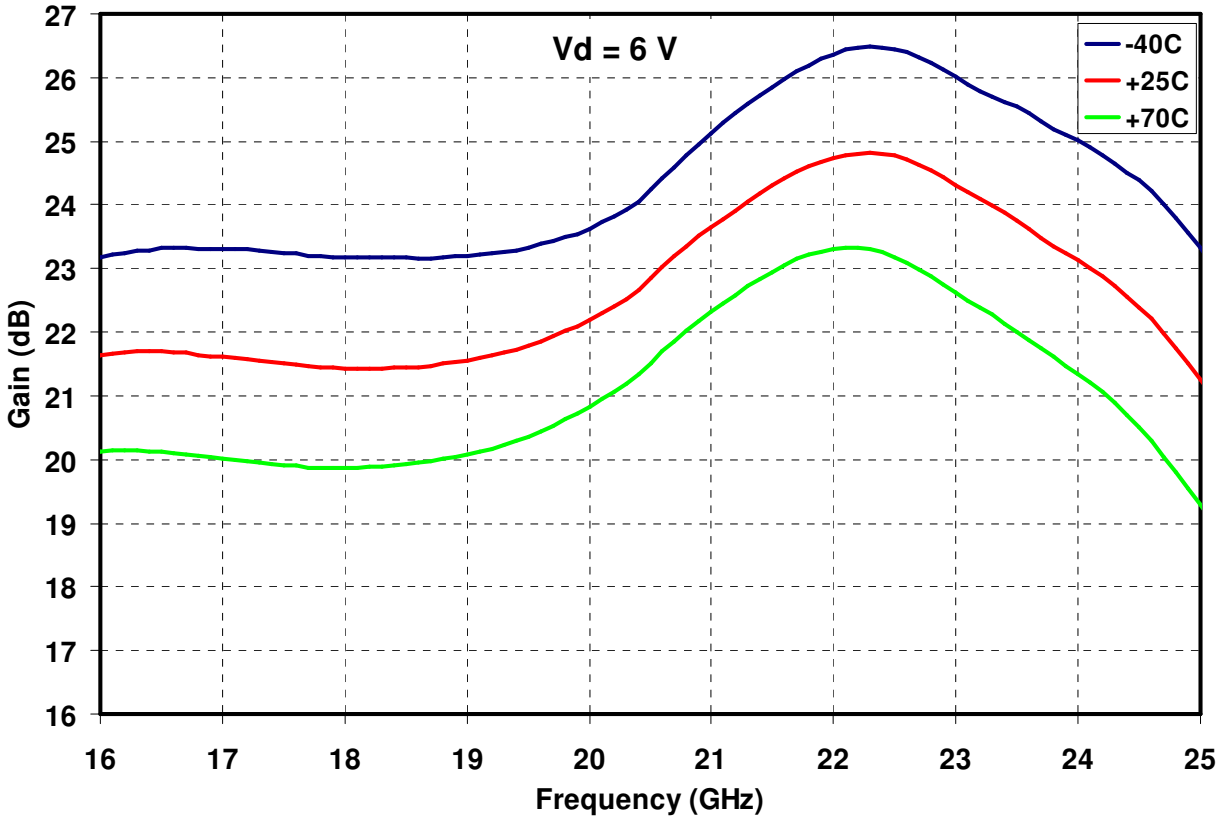
Bias Conditions: Vd=4 V – 7 V, Idq = 825 mA, ΔF = 1MHz

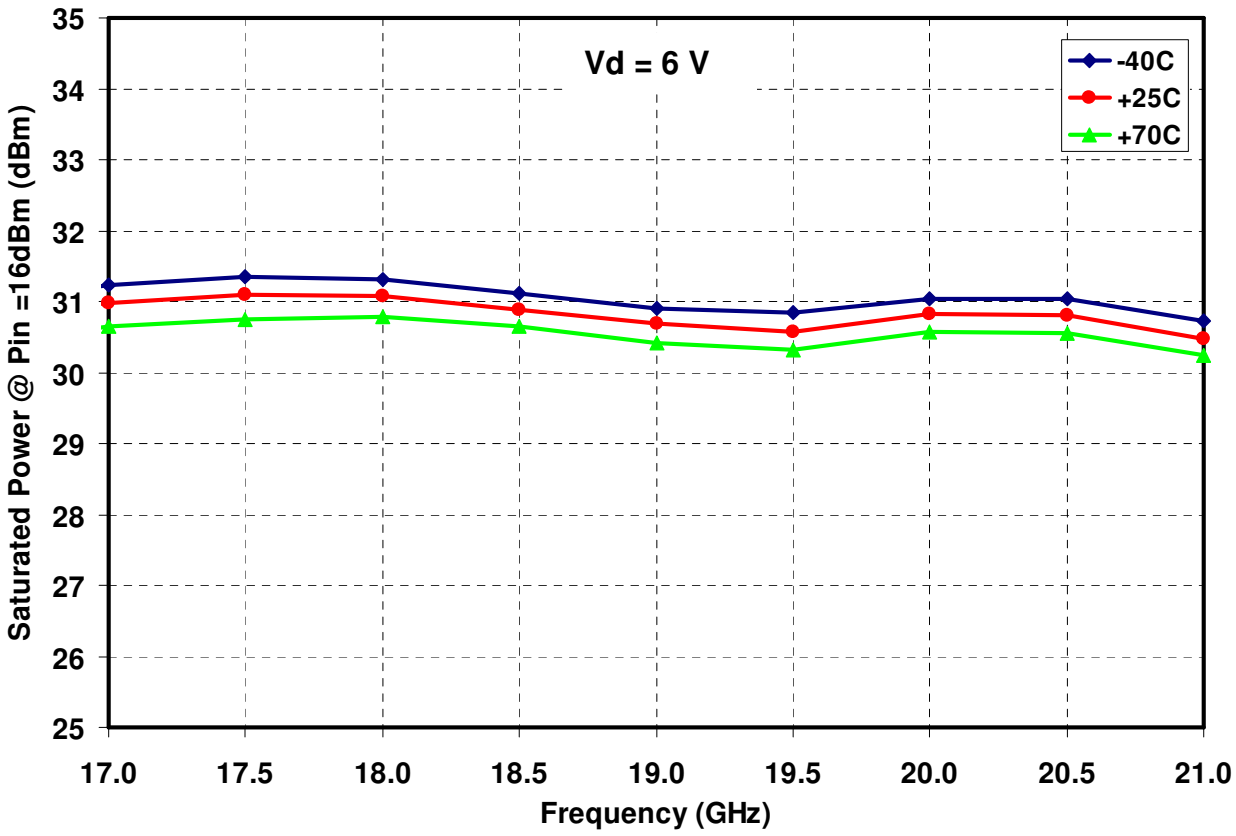




Measured Data

Bias Conditions: Vd = 6 V, Idq = 825 mA





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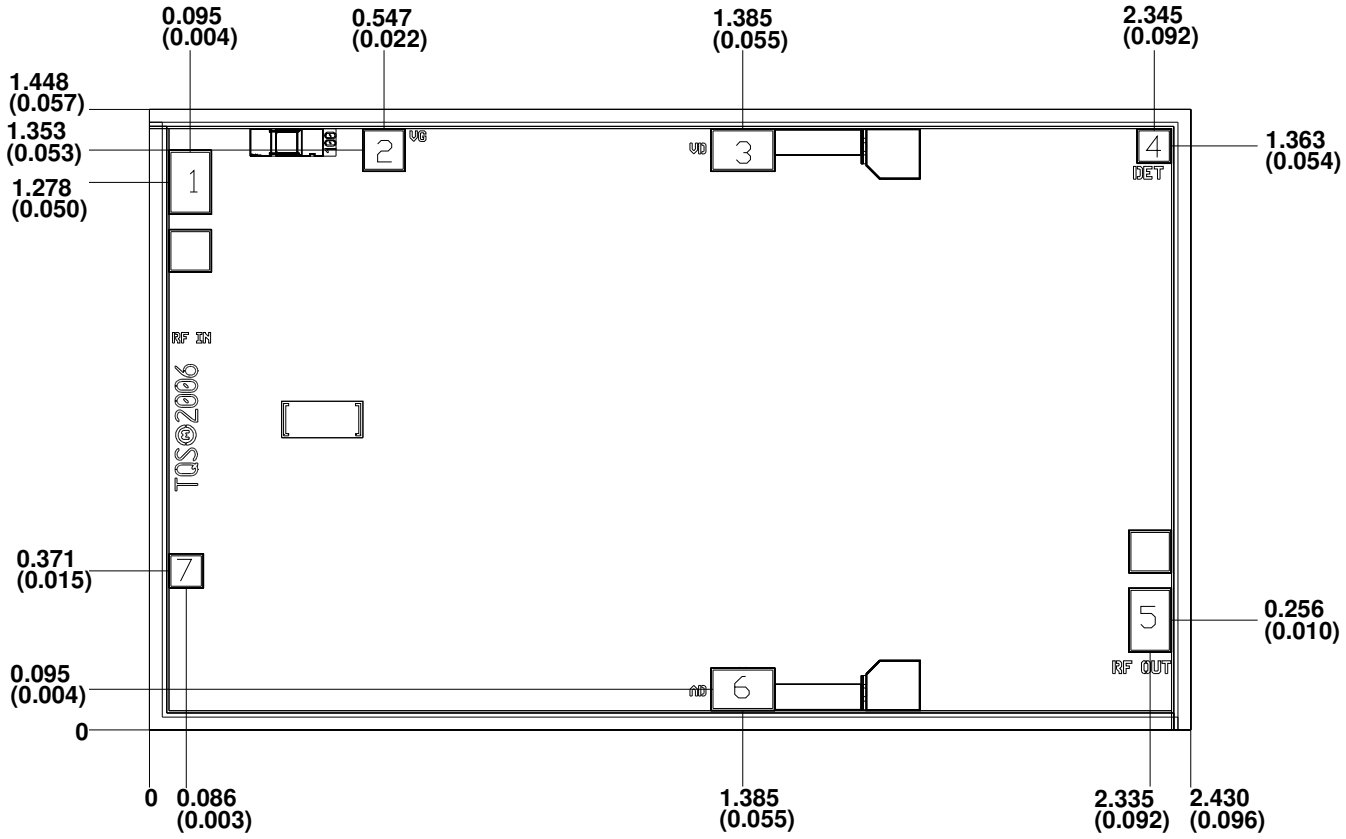
Mechanical Drawing



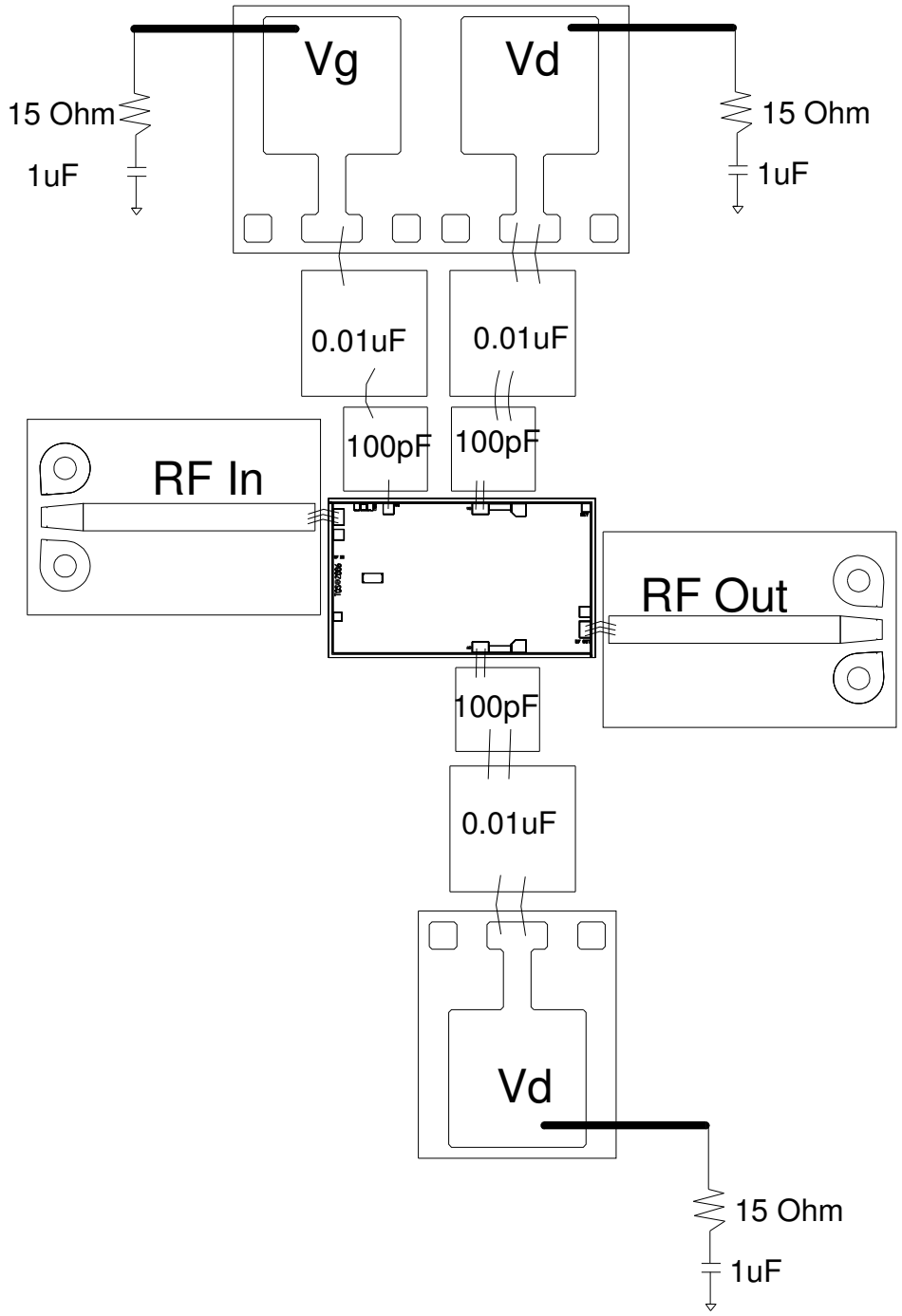
Units: Millimeters (inches)
Thickness: 0.10 (0.004)
Chip edge to bond pad dimensions are shown to center of bond pad
Chip size tolerance: +/- 0.05 (0.002)

GND IS BACKSIDE OF MMIC

Bond pad # 1	**(RF Input)**	**0.100 x 0.150 (0.004 x 0.006)**
Bond pad # 2	**(Vg)**	**0.100 x 0.100 (0.004 x 0.004)**
Bond pad # 3	**(Vd)**	**0.150 x 0.100 (0.006 x 0.004)**
Bond pad # 4	**(Vdet)**	**0.081 x 0.081 (0.003 x 0.003)**
Bond pad # 5	**(RF Out)**	**0.100 x 0.150 (0.004 x 0.006)**
Bond pad # 6	**(Vd)**	**0.150 x 0.100 (0.006 x 0.004)**
Bond pad # 7	**(Vref)**	**0.081 x 0.081 (0.003 x 0.003)**

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

Recommended Assembly Diagram



Vd = 5 to 7 V
Id = 825 mA
Vg = -0.45 V (Typical for 7 V Vd bias)

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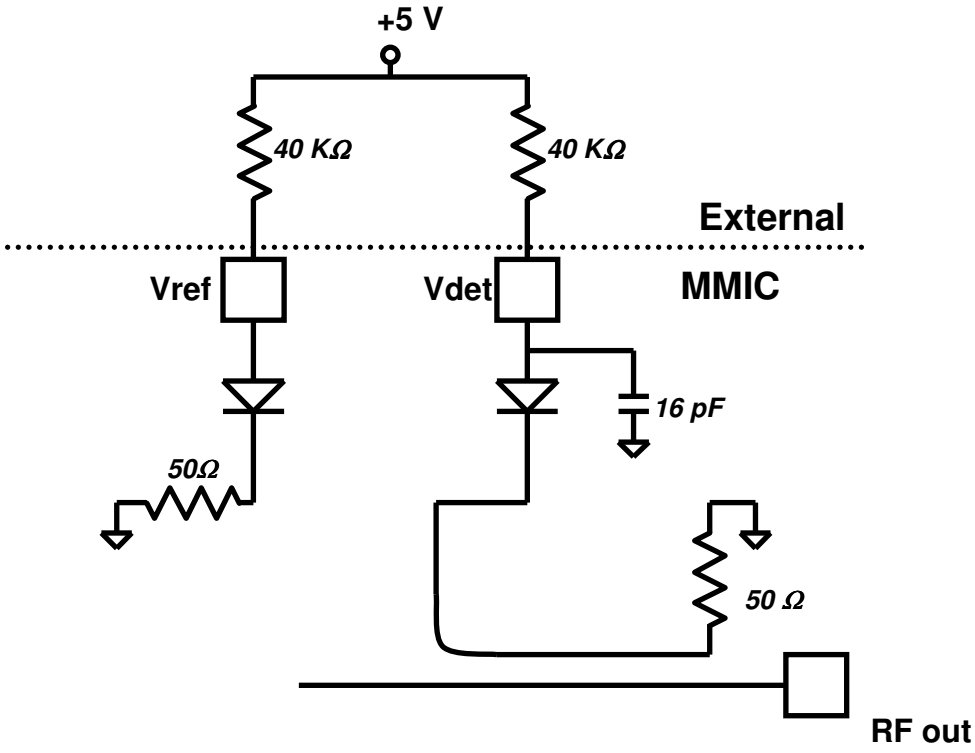
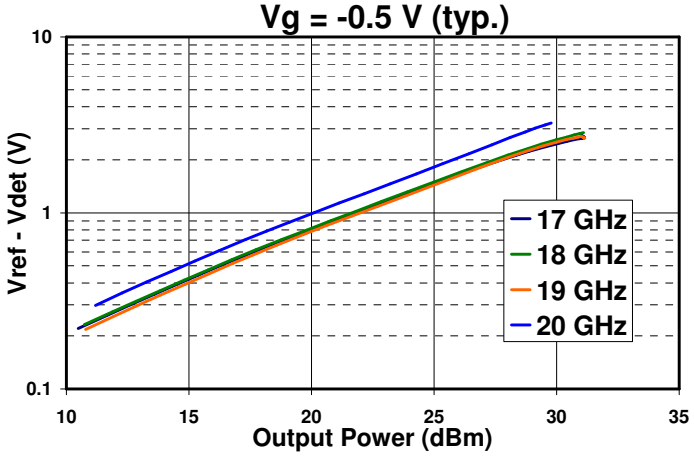
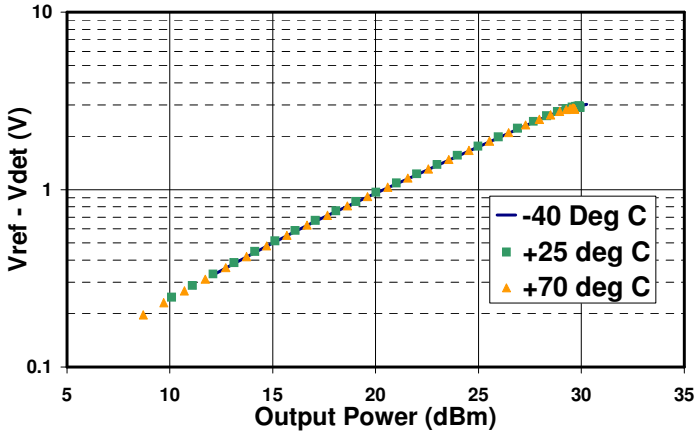
Power Detector



Vd = 6 V, Id = 825 mA
Vg = -0.5 V (typ.)





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Assembly Process Notes

Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300 ^{0}C (30 seconds max).
- An alloy station or conveyor furnace with reducing atmosphere should be used.
- No fluxes should be utilized.
- Coefficient of thermal expansion matching is critical for long-term reliability.
- Devices must be stored in a dry nitrogen atmosphere.

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 can be used in low-power applications.
- Curing should be done in a convection oven; proper exhaust is a safety concern.
- Microwave or radiant curing should not be used because of differential heating.
- Coefficient of thermal expansion matching is critical.

Interconnect process assembly notes:

- Thermosonic ball bonding is the preferred interconnect technique.
- Force, time, and ultrasonics are critical parameters.
- Aluminum wire should not be used.
- Maximum stage temperature is 200 ^{0}C.

Ordering Information

Part	Package Style
TGA4530	GaAs MMIC Die

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