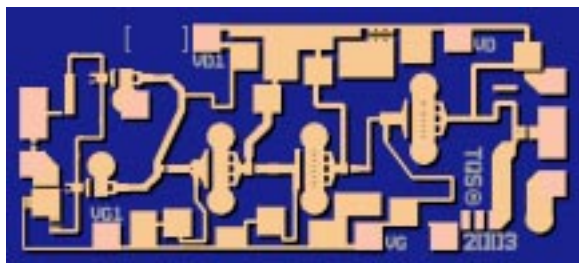


19 - 38GHz Medium Power Amplifier

TGA4036



Key Features

- Frequency Range: 19 - 38 GHz
- 20 dB Nominal Gain
- 22 dBm Nominal Psat
- 30 dBm Nominal TOI
- Bias: 5 V, 160 mA (210mA @ P1dB)
- 0.25 um 3MI pHEMT Technology
- Chip Dimensions 1.69 x 0.75 x 0.10 mm (0.066 x 0.030 x 0.004 in)

Product Description

The TriQuint TGA4036 is a compact Medium Power Amplifier MMIC for Wide-band applications. The part is designed using TriQuint's proven standard 0.25 um power pHEMT production process.

The TGA4036 provides a nominal 20 dB Gain from 19-36 GHz, with Saturated Output Power of 22 dBm.

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

The TGA4036 is 100% DC and RF tested on-wafer to ensure performance compliance.

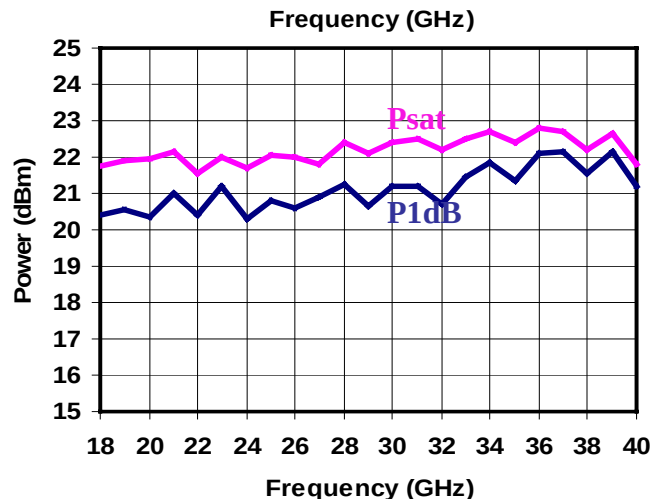
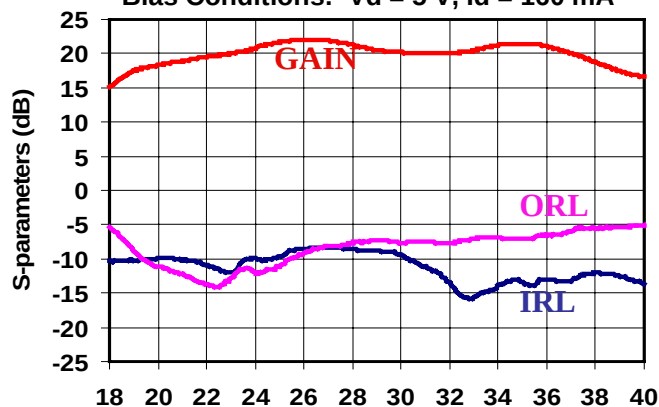
Evaluation boards are available.

Primary Applications

- Point-to-Point Radio
- Point-to-Multipoint Communications
- Instrumentation

Measured Fixtured Data

Bias Conditions: $V_d = 5\text{ V}$, $I_d = 160\text{ mA}$



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

TABLE I
MAXIMUM RATINGS 1/

SYMBOL	PARAMETER	VALUE	NOTES
V _d	Drain Voltage	7 V	<u>2/</u>
V _g	Gate Voltage Range	-1 TO +0.5 V	
I _d	Drain Current	400 mA	<u>2/ 3/</u>
I _g	Gate Current	7 mA	<u>3/</u>
P _{IN}	Input Continuous Wave Power	20 dBm	
P _D	Power Dissipation	1.54 W	<u>2/ 4/</u>
T _{CH}	Operating Channel Temperature	150 °C	<u>5/ 6/</u>
T _M	Mounting Temperature (30 Seconds)	320 °C	
T _{STG}	Storage Temperature	-65 to 150 °C	

- 1/ These ratings represent the maximum operable values for this device.
- 2/ Combinations of supply voltage, supply current, input power, and output power shall not exceed P_D.
- 3/ Total current for the entire MMIC.
- 4/ When operated at this bias condition with a base plate temperature of 70°C, the median life is 1.0E+6 hrs.
- 5/ Junction operating temperature will directly affect the device median time to failure (MTTF). For maximum life, it is recommended that junction temperatures be maintained at the lowest possible levels.
- 6/ These ratings apply to each individual FET.

TABLE II
DC PROBE TEST
(T_A = 25 °C ± 5 °C)

SYMBOL	PARAMETER	MINIMUM	MAXIMUM	UNIT
I _{dss} (Q1A)	Saturated Drain Current	15	94	mA
G _m (Q1A)	Transconductance	33	106	mS
V _p (Q1)	Pinch-off Voltage	-1.5	-0.5	V
BVGS (Q1A)	Breakdown Voltage Gate-Source	-30	-8	V
BVGD (Q1A,Q1B)	Breakdown Voltage Gate-Drain	-30	-10	V

Q1A and Q1B are 150um Input FETs

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

PARAMETER	TYPICAL	UNITS
Frequency Range	19 - 38	GHz
Drain Voltage, Vd	5.0	V
Drain Current, Id	160	mA
Gate Voltage, Vg	-0.6	V
Small Signal Gain, S21	20	dB
Input Return Loss, S11	11	dB
Output Return Loss, S22	8	dB
Output Power @ 1dB Gain compression, P1dB	21	dBm
Saturated Output Power, Psat	22	dBm
Output TOI @ Pin/tone = -10dBm	30	dBm
Temperature Coefficient	0.038	dB/°C

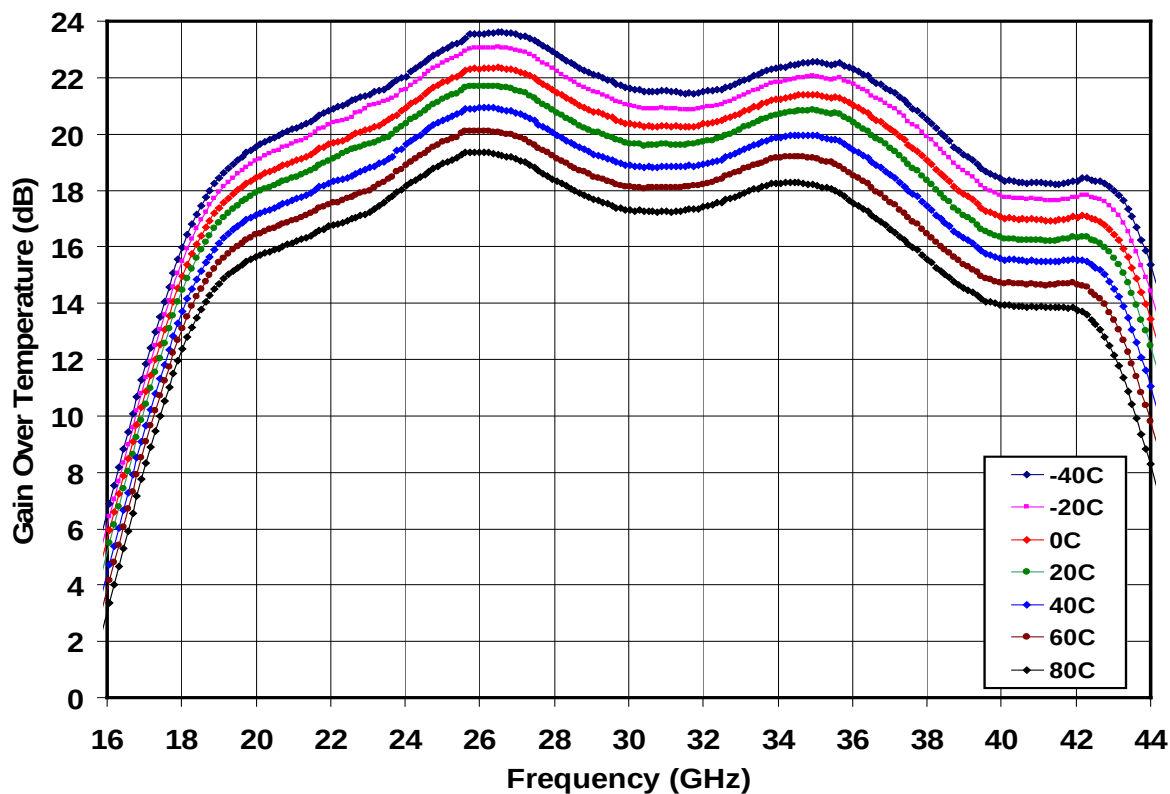
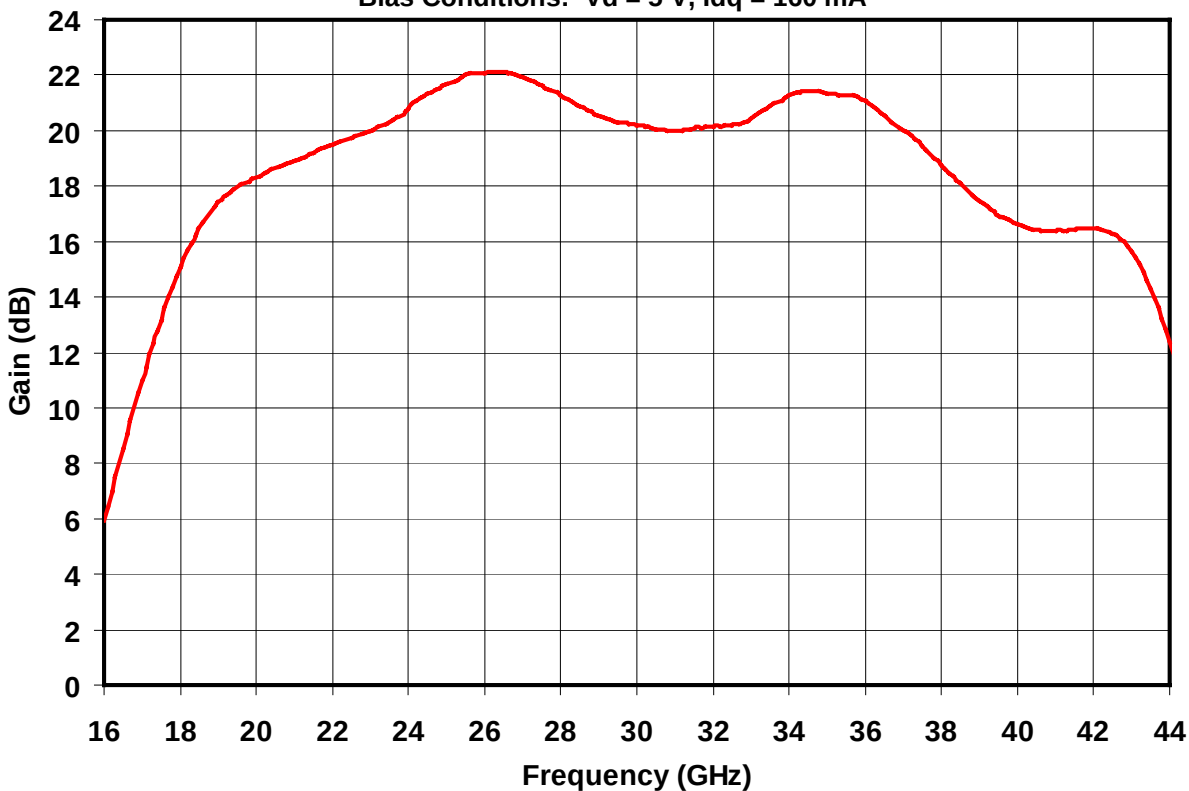
TABLE IV
THERMAL INFORMATION

PARAMETER	TEST CONDITIONS	T _{CH} (°C)	R _{θJC} (°C/W)	T _M (HRS)
θ _{JC} Thermal Resistance (channel to Case)	Vd = 5 V Id = 160 mA Pdiss = 0.80 W	112	51.9	3.4E+7

Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20 mil CuMo Carrier at 70°C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

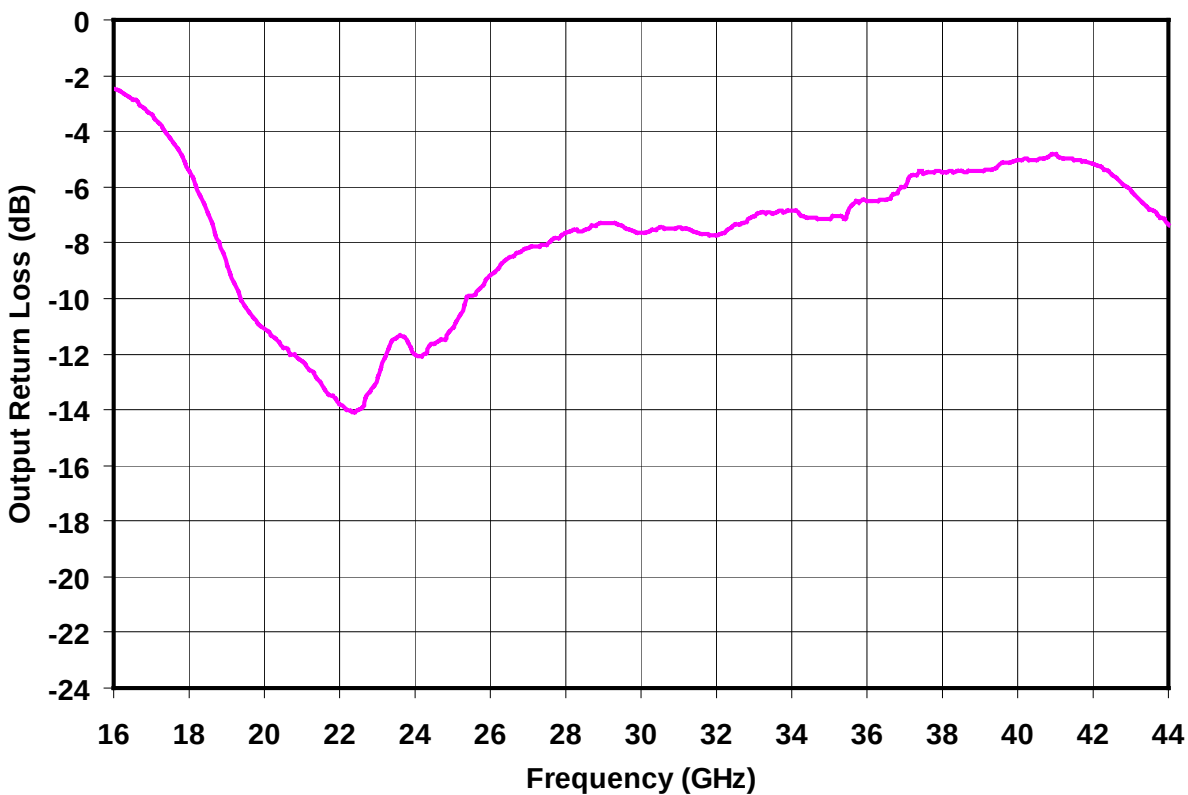
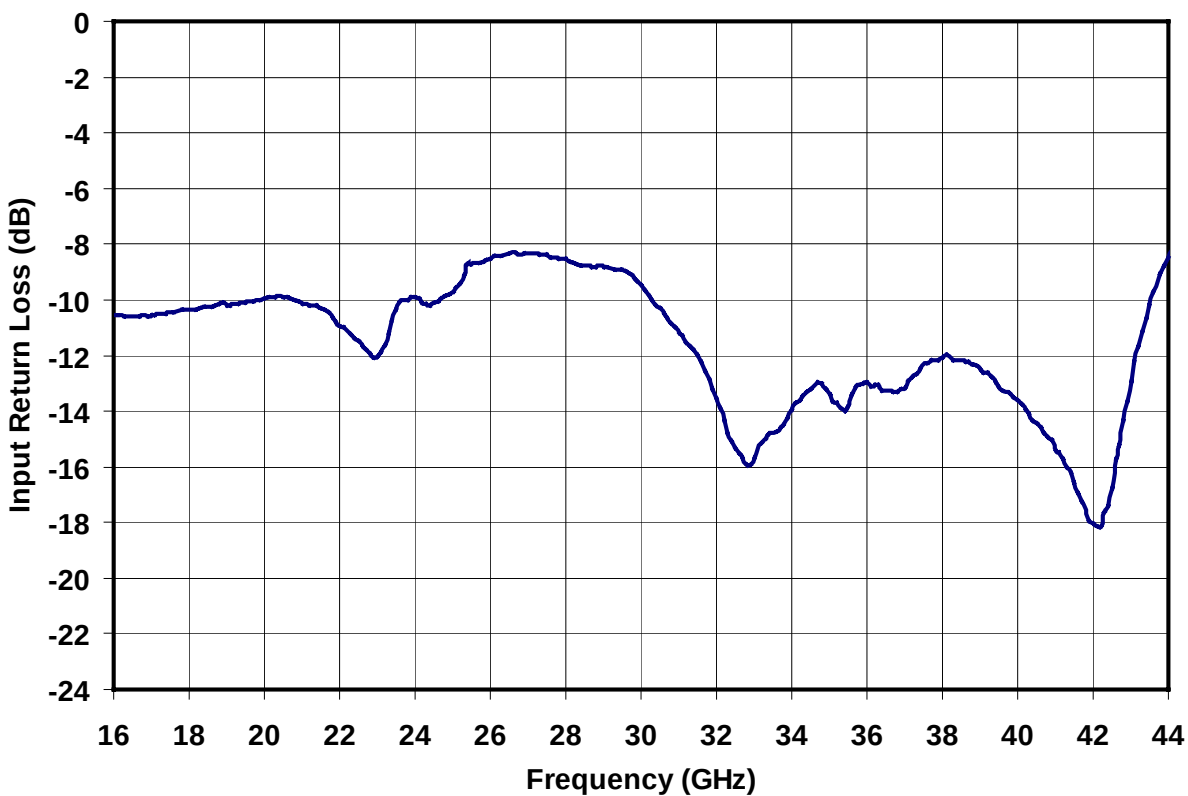
Preliminary Measured Data

Bias Conditions: $V_d = 5\text{ V}$, $I_{dq} = 160\text{ mA}$



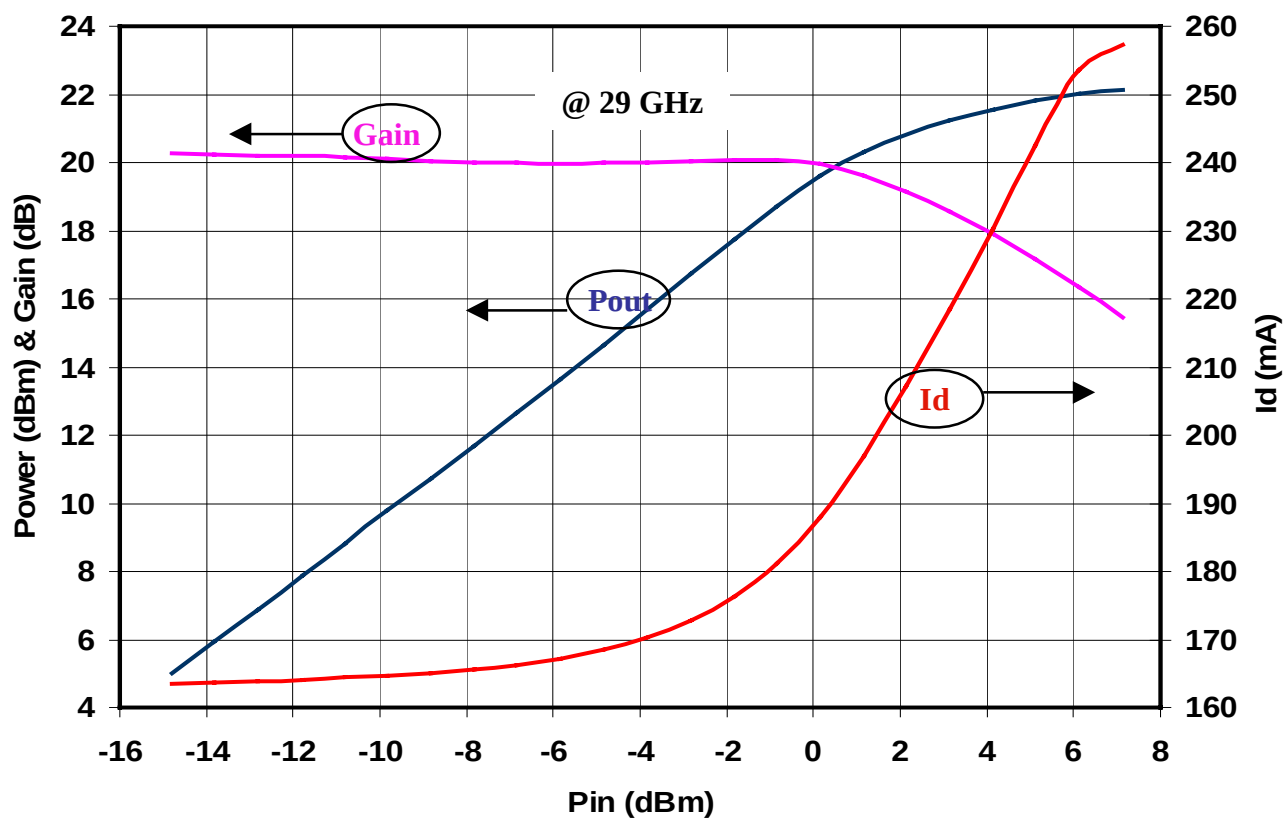
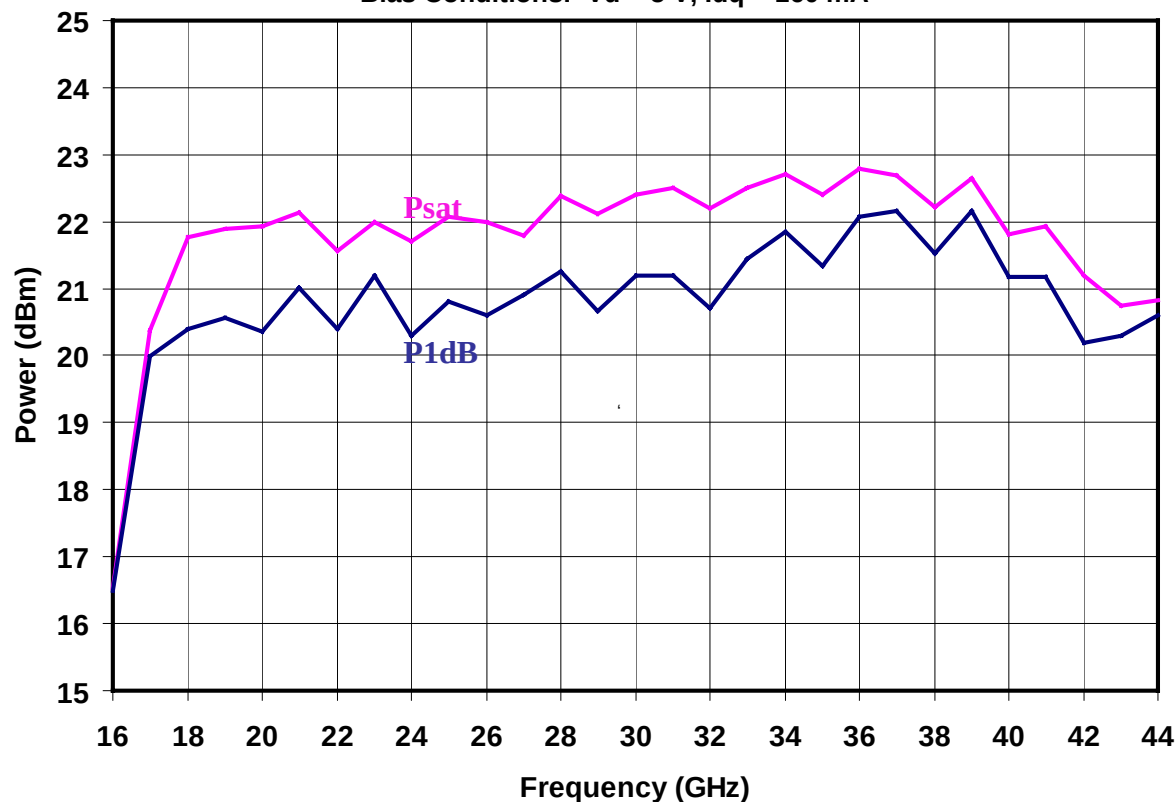
Preliminary Measured Data

Bias Conditions: $V_d = 5\text{ V}$, $I_{dq} = 160\text{ mA}$



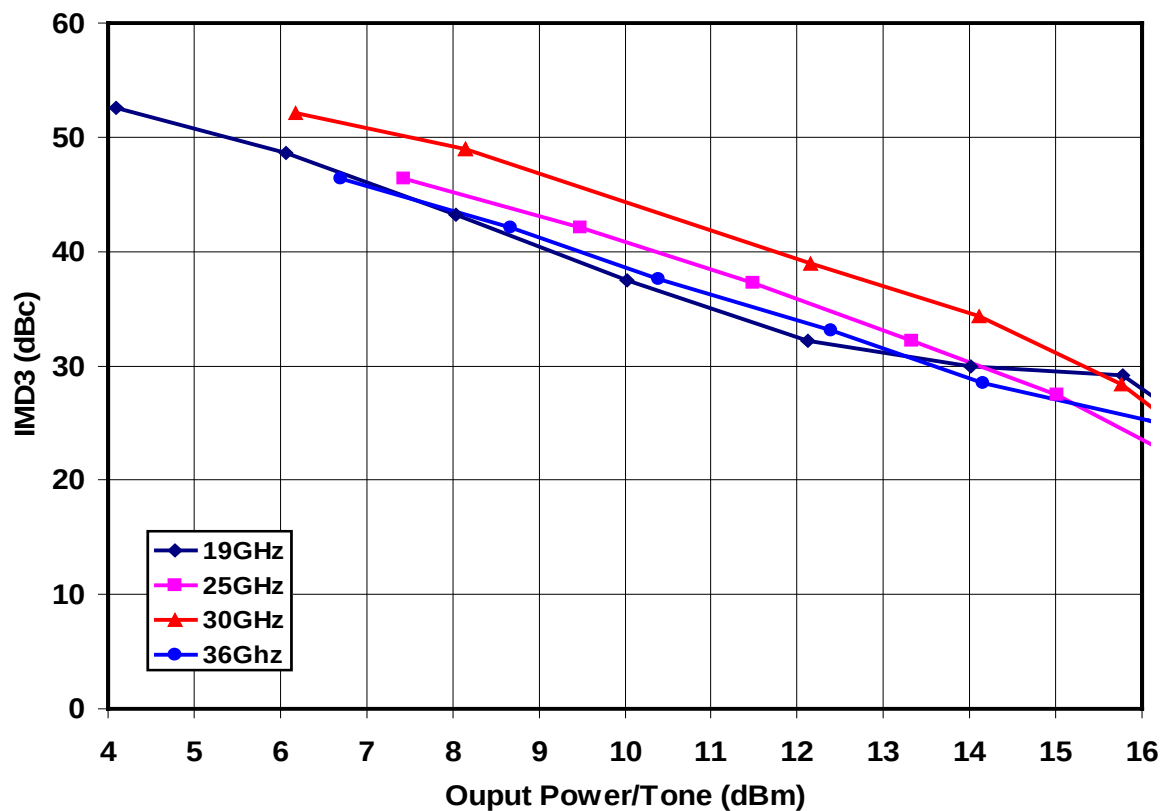
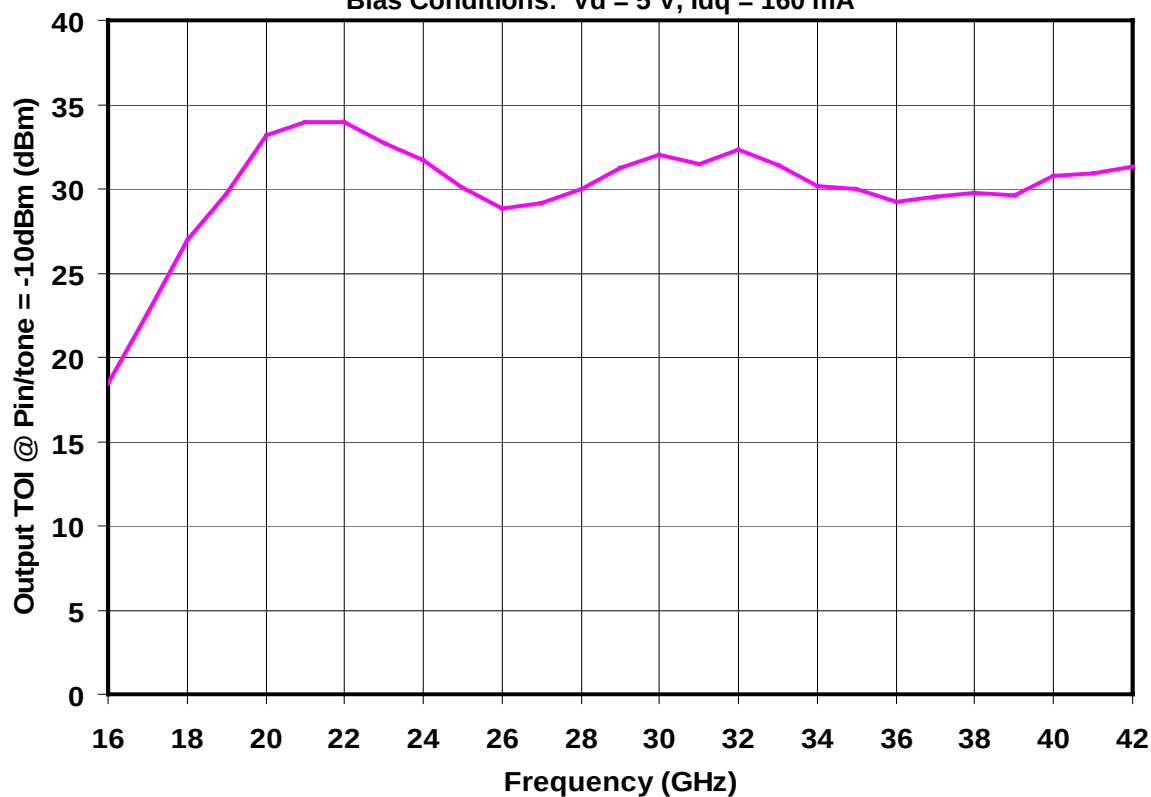
Preliminary Measured Data

Bias Conditions: $V_d = 5\text{ V}$, $I_{dq} = 160\text{ mA}$

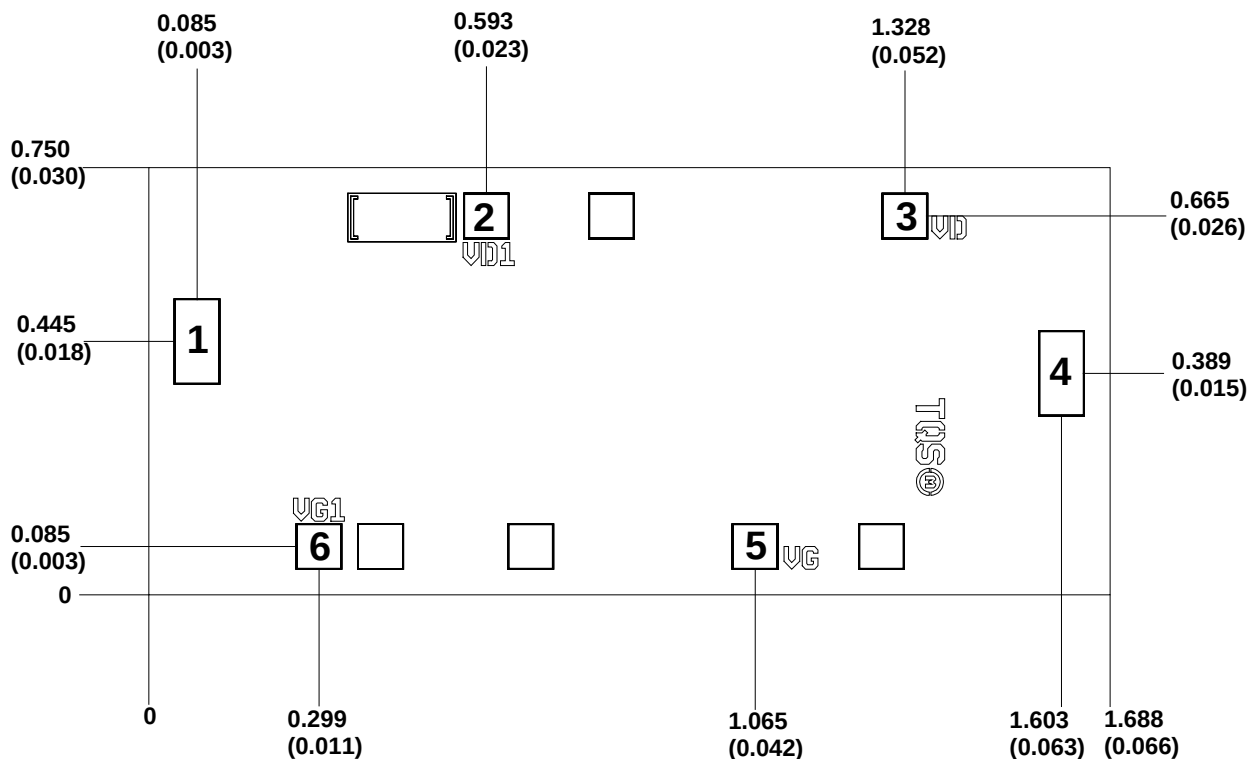


Preliminary Measured Data

Bias Conditions: $V_d = 5\text{ V}$, $I_{dQ} = 160\text{ mA}$



Mechanical Drawing



Units: Millimeters (inches)

Thickness: 0.100 (0.004) (Reference Only)

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

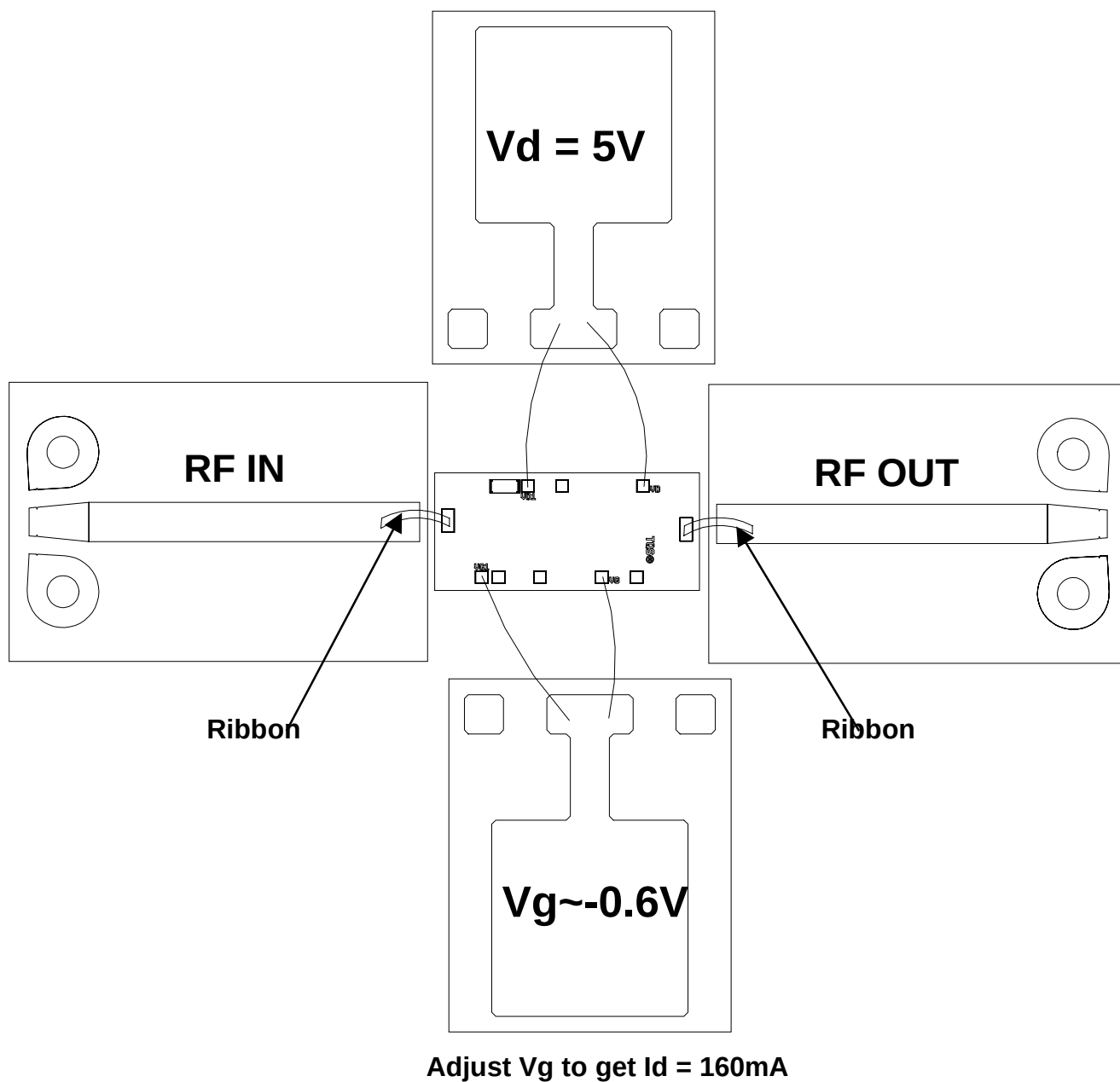
Chip size tolerance: +/- 0.051 (0.002)

RF Ground is backside of MMIC

Bond pad #1:	(RF In)	0.080 x 0.150 (0.003 x 0.006)
Bond pad #2, #3:	(Vd)	0.080 x 0.080 (0.003 x 0.003)
Bond pad #4:	(RF Out)	0.080 x 0.150 (0.003 x 0.006)
Bond pad #5, #6:	(Vg)	0.080 x 0.080 (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 Chip Assembly Diagram



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

Assembly Process Notes

Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300°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°C.

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