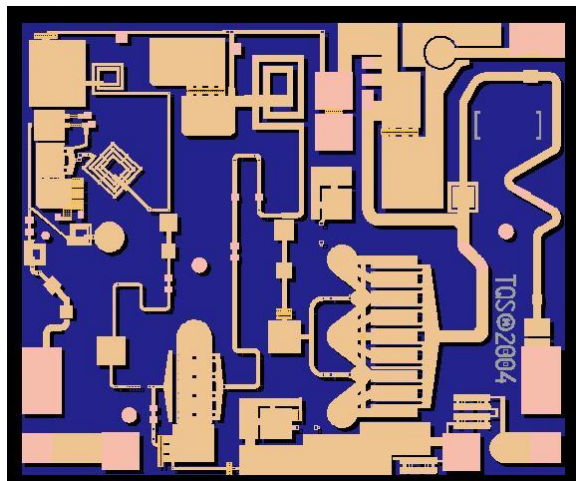


X Band Driver Amplifier



Key Features

- Frequency Range: 7-13 GHz
- 25 dB Nominal Gain
- 30dBm Output Power @ $P_{in}=10\text{dBm}$, Midband
- 12 dB Input Return Loss
- 10 dB Output Return Loss
- 0.25 μm 3MI pHEMT Technology
- Nominal Bias 9V @ 300 mA/225 mA
- Chip Dimensions: 1.57 x 1.33 x 0.10 mm
(0.062 x 0.052 x 0.004 in)

Primary Applications

- X-band Driver
- Point-to-Point Radio

Product Description

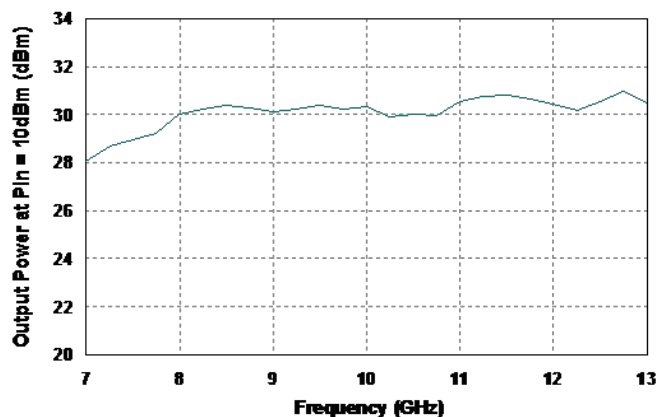
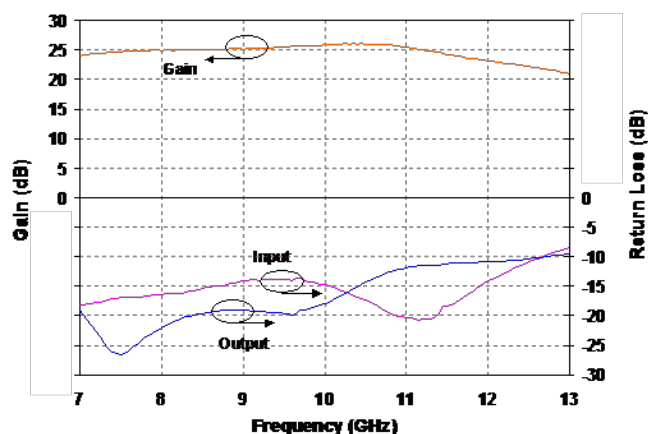
The TriQuint TGA2700 is an X-band Driver Amplifier that operates between 7-13 GHz. The Driver Amplifier is designed using TriQuint's proven standard 0.25 μm gate pHEMT production process.

The TGA2700 provides typical 30dBm output power at +10 dBm input power and has a small signal gain of 25 dB.

The TGA2700 is 100% DC and RF tested on-wafer to ensure performance compliance.

Measured Fixtured Data

Bias Conditions: $V_d = 9\text{V}$, $I_{dq} = 300\text{mA}$



**TABLE I
MAXIMUM RATINGS**

Symbol	Parameter <u>1/</u>	Value	Notes
V^+	Positive Supply Voltage	10 V	<u>2/</u>
V^-	Negative Supply Voltage Range	-5V TO 0V	
I^+	Positive Supply Current	536 mA	<u>2/</u>
$ I_G $	Gate Supply Current	14 mA	
P_{IN}	Input Continuous Wave Power	20 dBm	<u>2/</u>
P_D	Power Dissipation	3.7 W	<u>2/</u> , <u>3/</u>
T_{CH}	Operating Channel Temperature	200 °C	<u>4/</u> , <u>5/</u>
	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/ When operated at this bias condition with a base plate temperature of 70 °C, the median life is 2.3E4 hours.
- 4/ Junction operating temperature will directly affect the device median time to failure (T_m). For maximum life, it is recommended that junction temperatures be maintained at the lowest possible levels.
- 5/ These ratings apply to each individual FET.

**TABLE II
DC PROBE TESTS**
($T_A = 25\text{ °C}$, Nominal)

Symbol	Parameter	Minimum	Maximum	Value
I_{dss}	Saturated Drain Current	75	353	mA
G_m	Transconductance	165	398	mS
V_P	Pinch-off Voltage	-1.5	-0.5	V
B_{VGS}	Breakdown Voltage gate-source	-30	-8	V
B_{VGD}	Breakdown Voltage gate-drain	-30	-12	V

TABLE III
RF CHARACTERIZATION TABLE
 $(T_A = 25\text{ }^{\circ}\text{C, Nominal})$
 $V_d = 9\text{ V, } I_d = 300\text{ mA}$

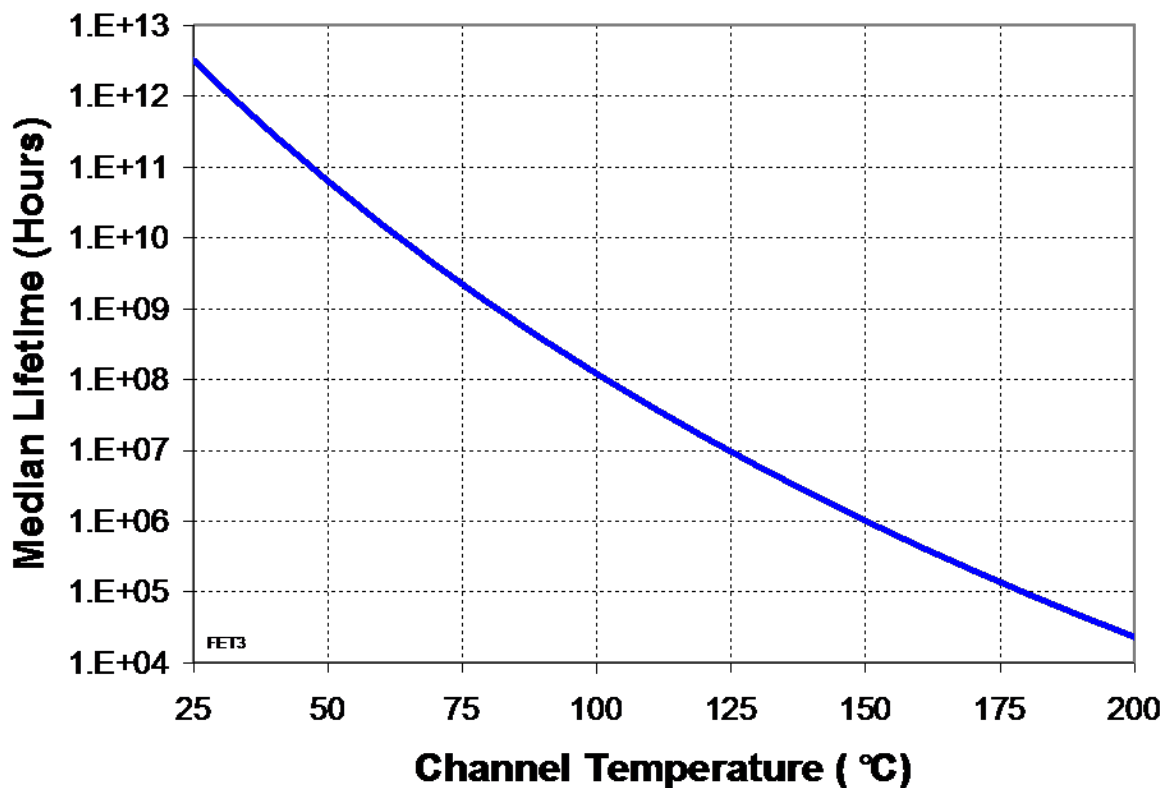
SYMBOL	PARAMETER	TEST CONDITION	NOMINAL	UNITS
Gain	Small Signal Gain	$f = 7\text{-}13\text{ GHz}$	25	dB
IRL	Input Return Loss	$f = 7\text{-}13\text{ GHz}$	12	dB
ORL	Output Return Loss	$f = 7\text{-}13\text{ GHz}$	10	dB
P_{sat}	Saturated Output Power	$f = 8\text{-}13\text{ GHz}$	30	dBm
TOI	Output TOI @ $P_{\text{in}} = -5\text{ dBm}$	$f = 8\text{-}12\text{ GHz}$	> 36	dBm
PAE	Power Added Efficiency	$f = 12\text{ GHz}$	27	%

TABLE IV
THERMAL INFORMATION

Parameter	Test Conditions	T _{baseplate} (°C)	T _{CH} (°C)	θ _{JC} (°C/W)	T _m (HRS)
θ _{JC} Thermal Resistance (channel to backside of package)	V _d = 9 V I _D = 225 mA P _{diss} = 2.0 W	70	140	34.7	2.4 E+6

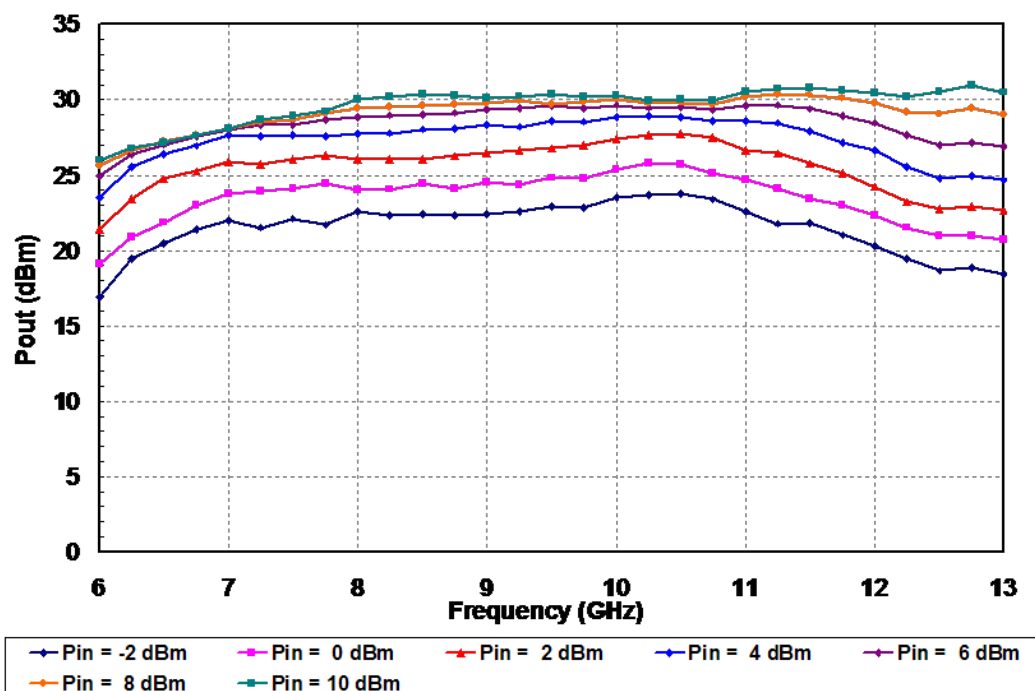
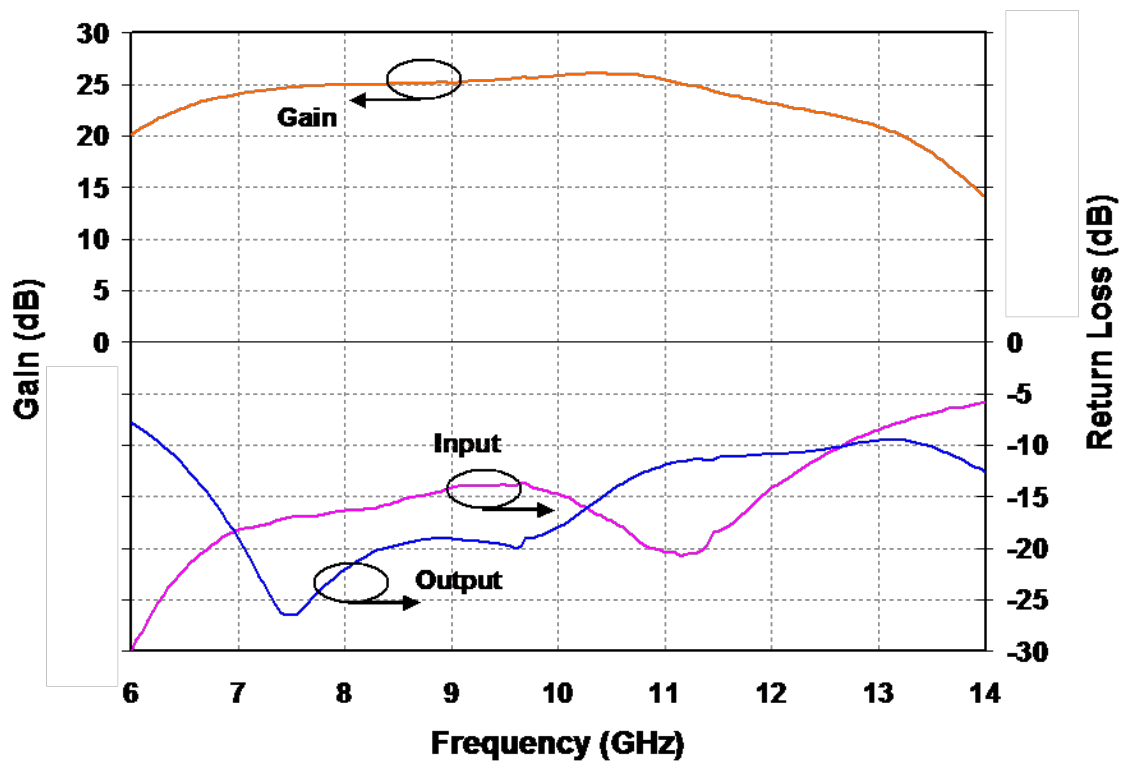
Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20 mil CuMo Carrier. Worst case condition with no RF applied, 100% of DC power is dissipated.

Median Lifetime (T_m) vs. Channel Temperature



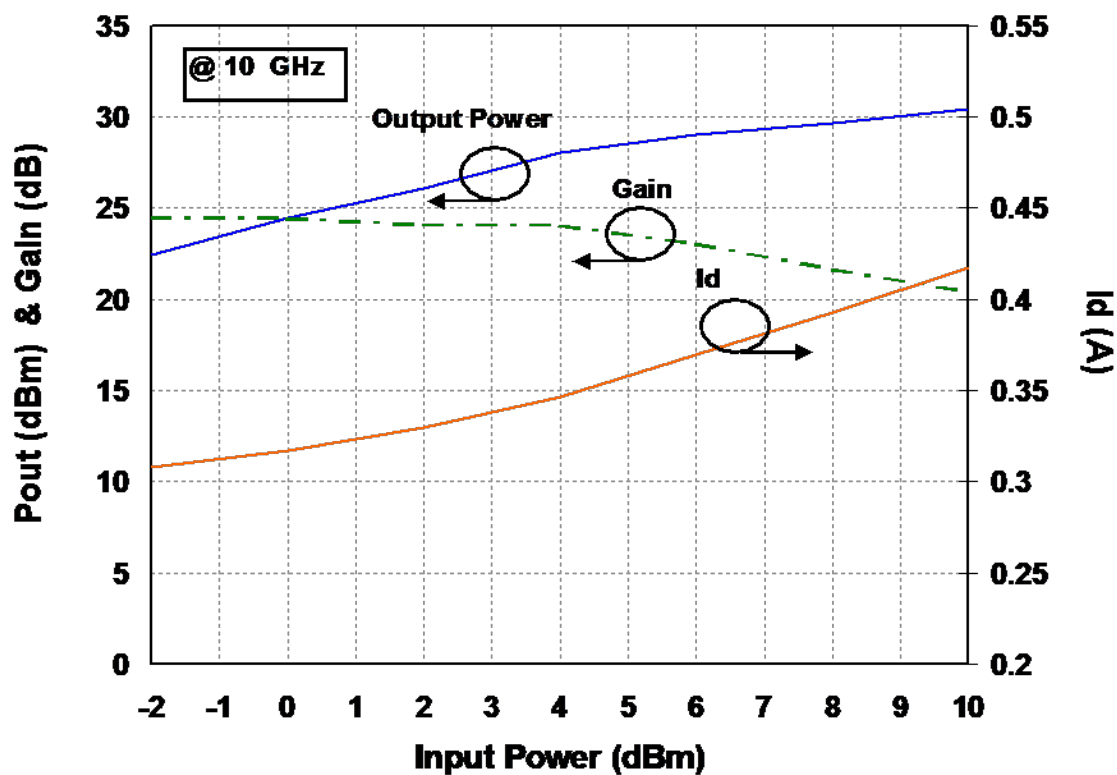
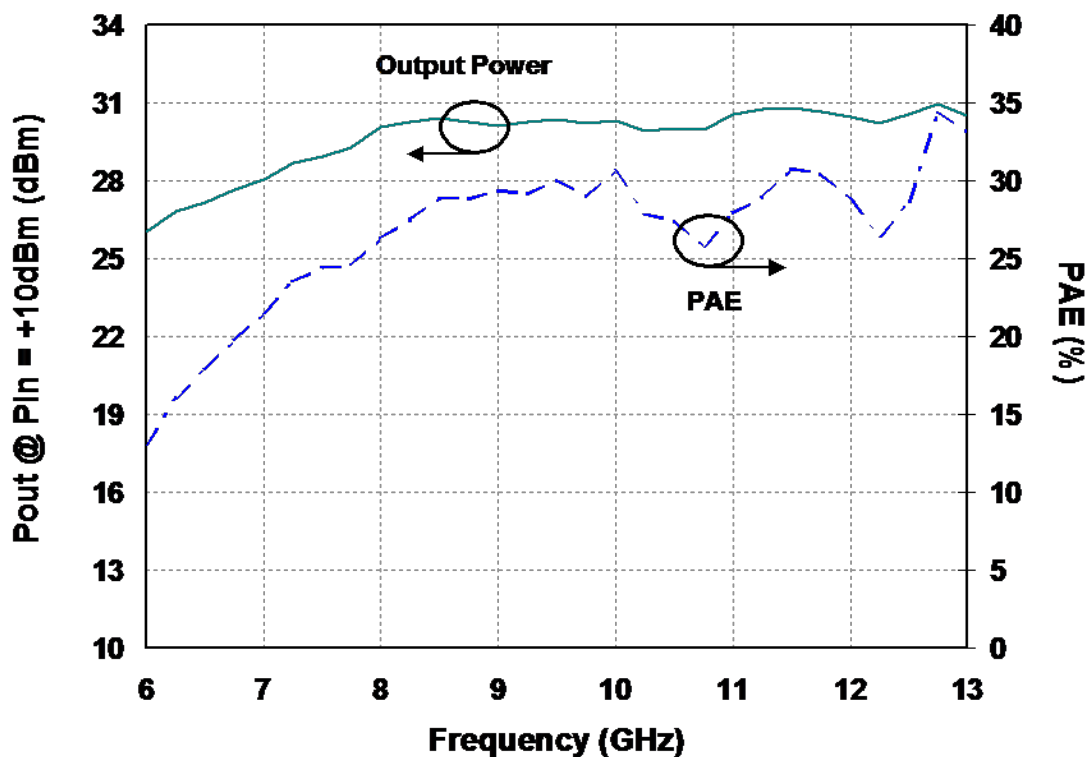
Typical Fixtured Performance

Bias Conditions: $V_d = 9V$, $I_{dq} = 300mA$



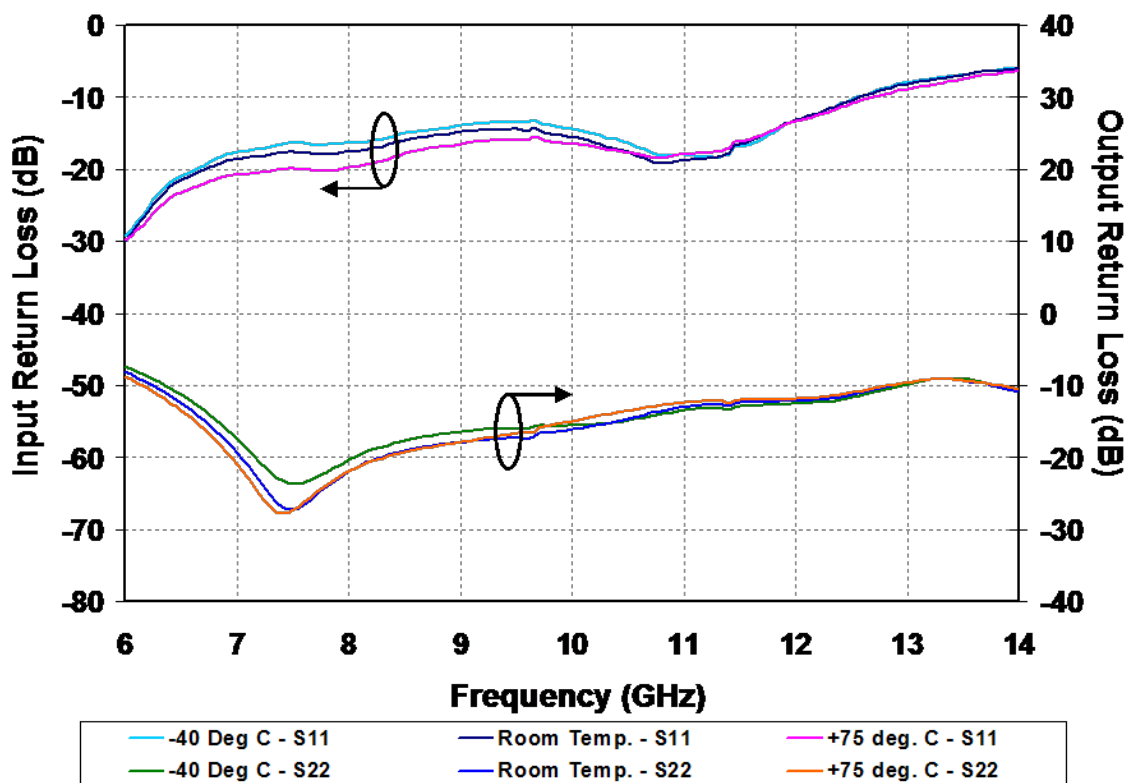
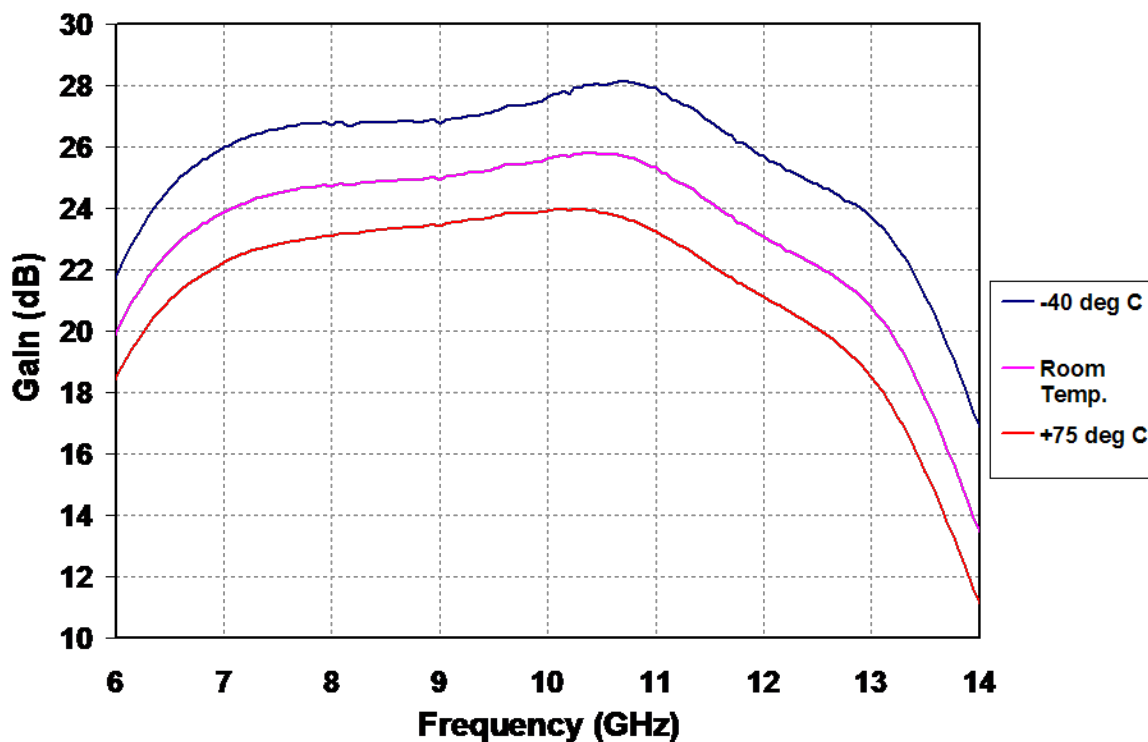
Typical Fixtured Performance

Bias Conditions: $V_d = 9V$, $I_{dq} = 300mA$



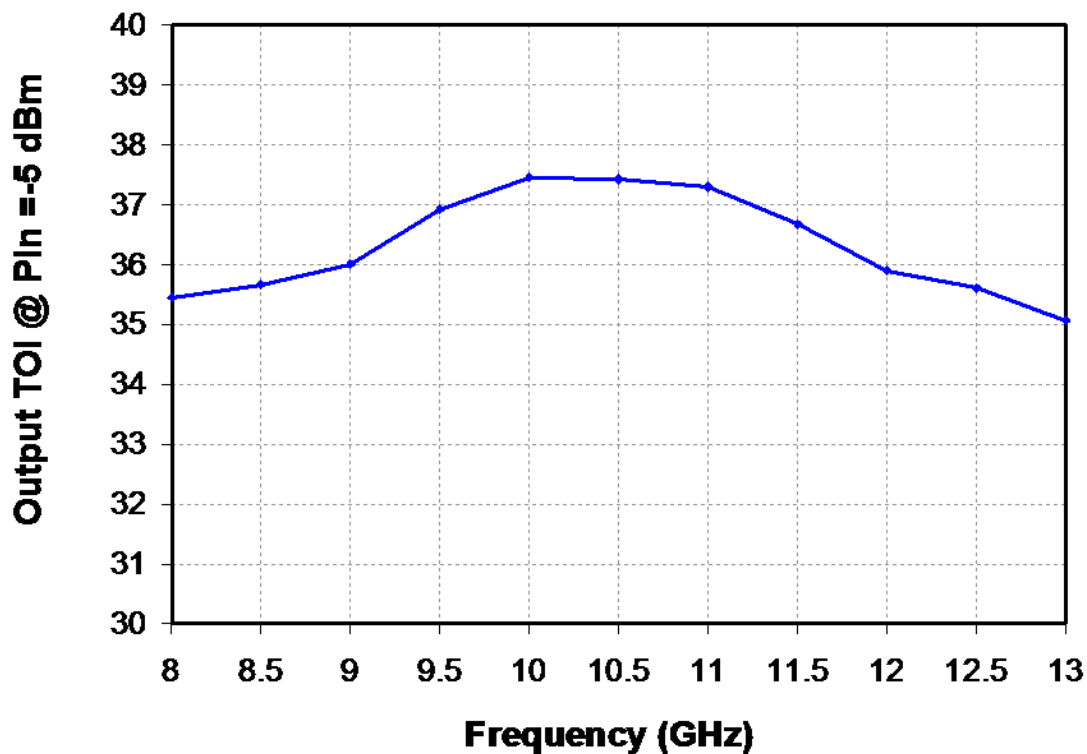
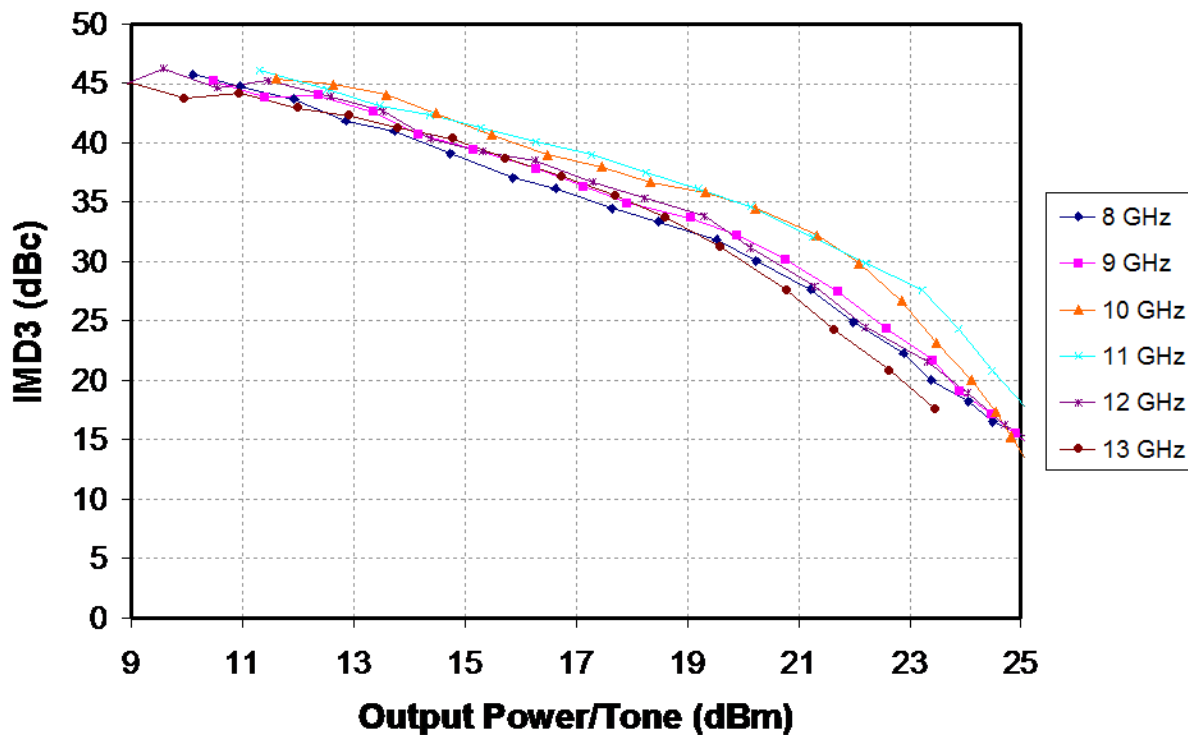
Typical Fixtured Performance

Bias Conditions: $V_d = 9V$, $I_{dq} = 300mA$



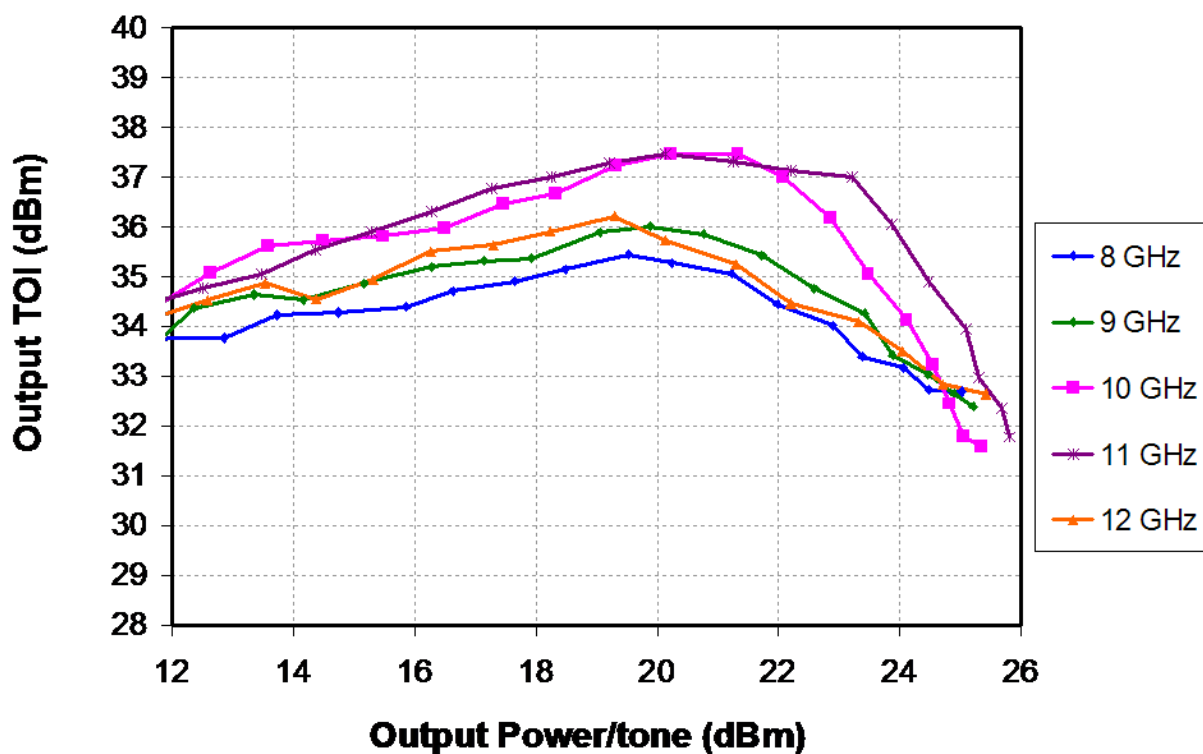
Typical Fixtured Performance

Bias Conditions: $V_d = 9V$, $I_{dq} = 300mA$



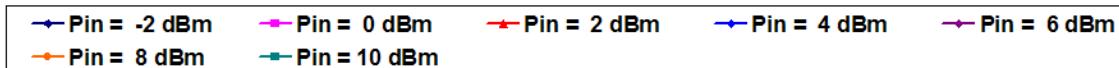
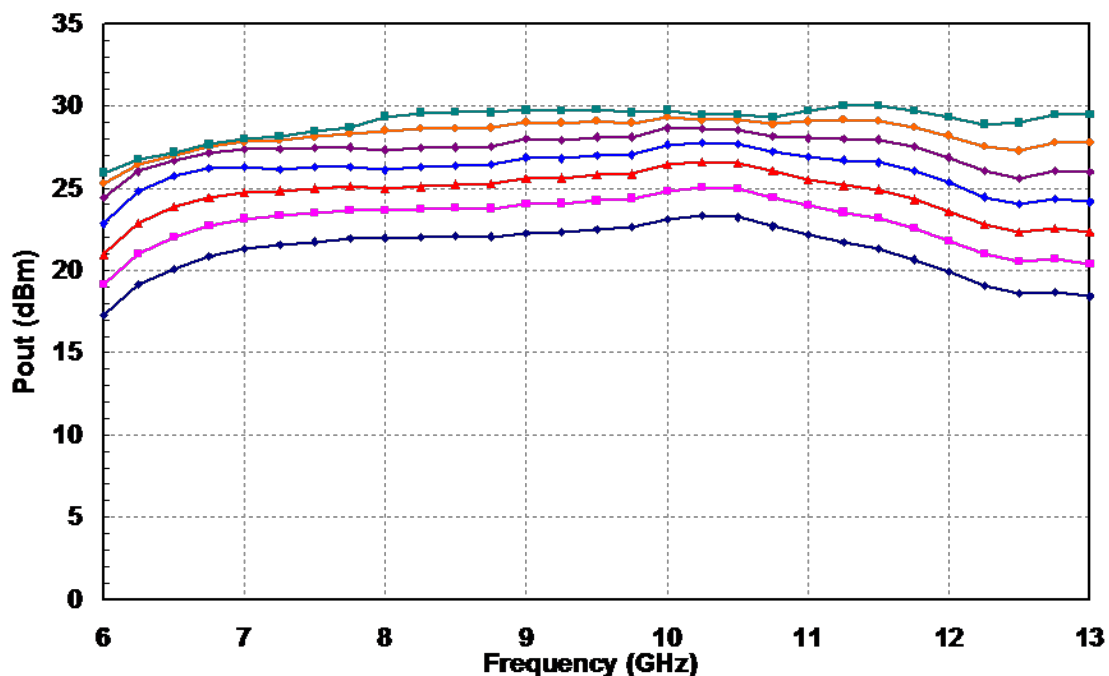
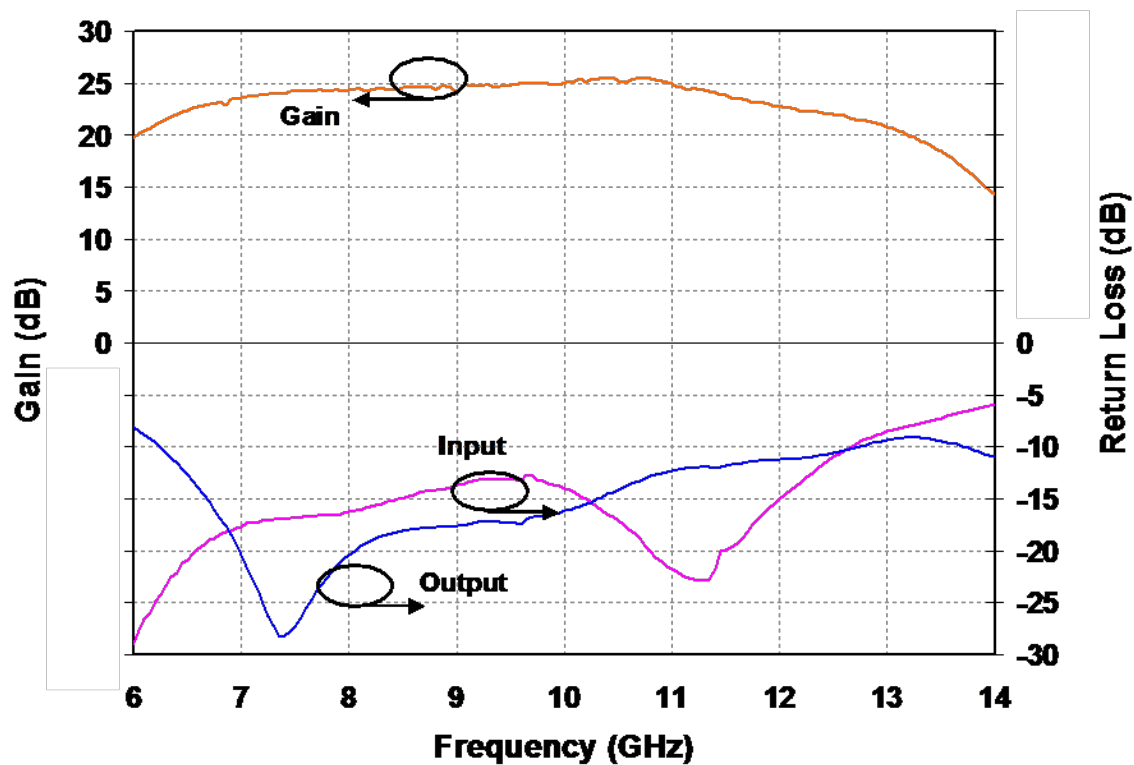
Typical Fixture Performance

Bias Conditions: $V_d = 9V$, $I_{dq} = 300mA$



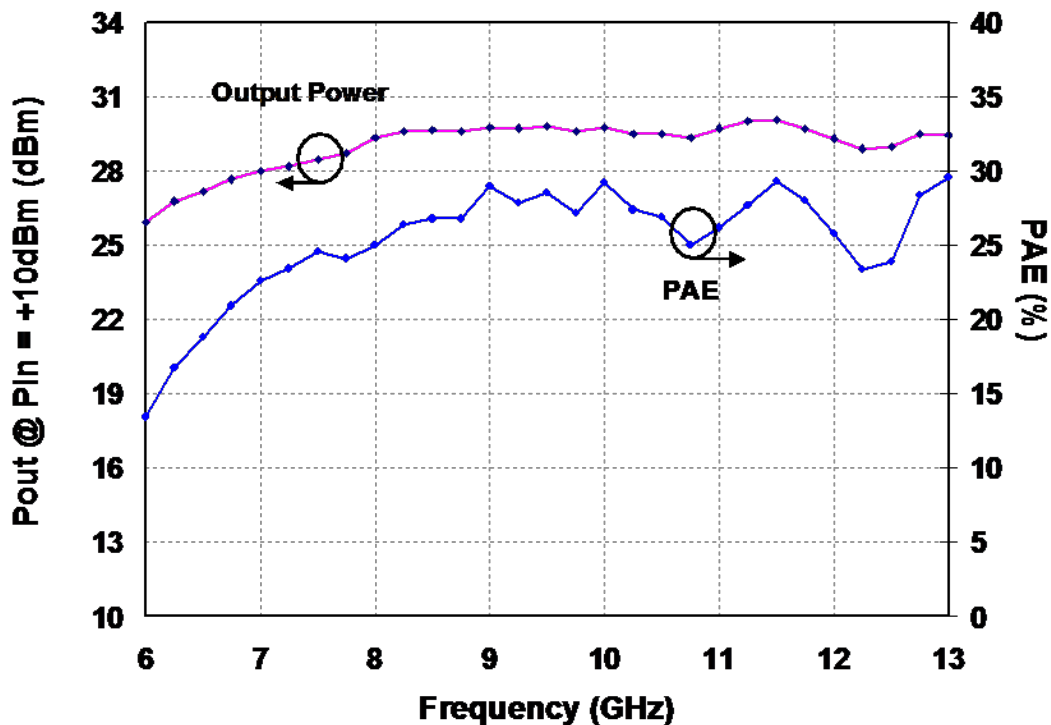
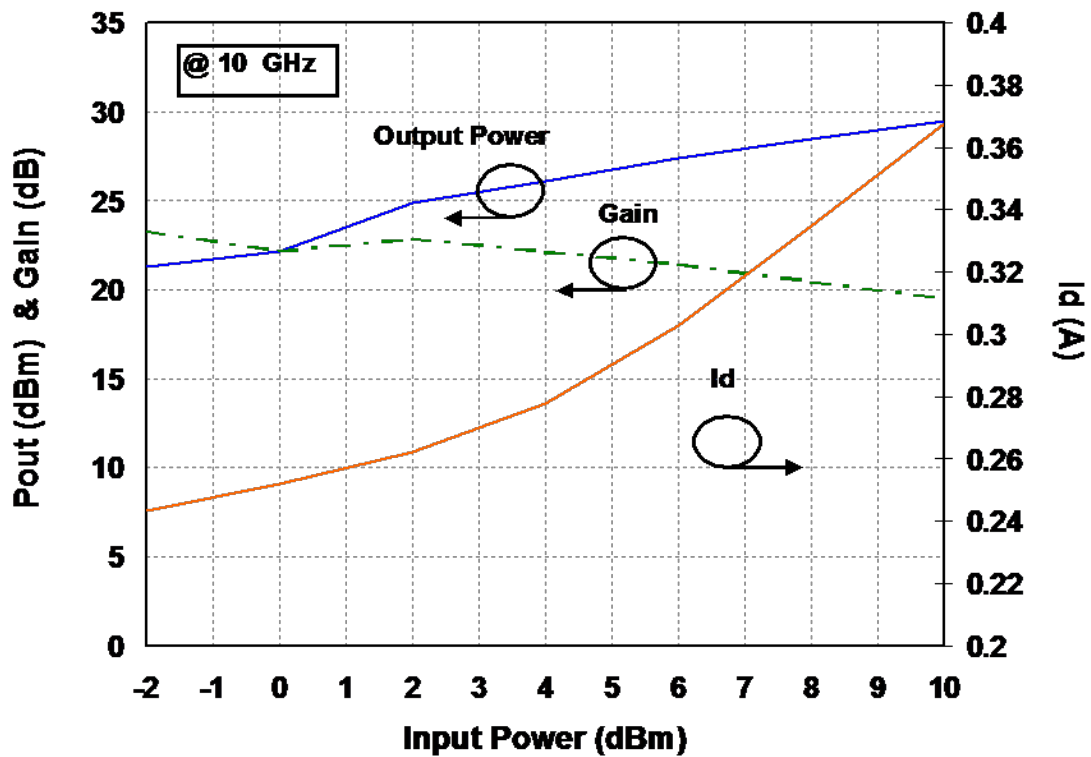
Typical Fixtured Performance

Bias Conditions: $V_d = 9V$, $I_{dq} = 225mA$



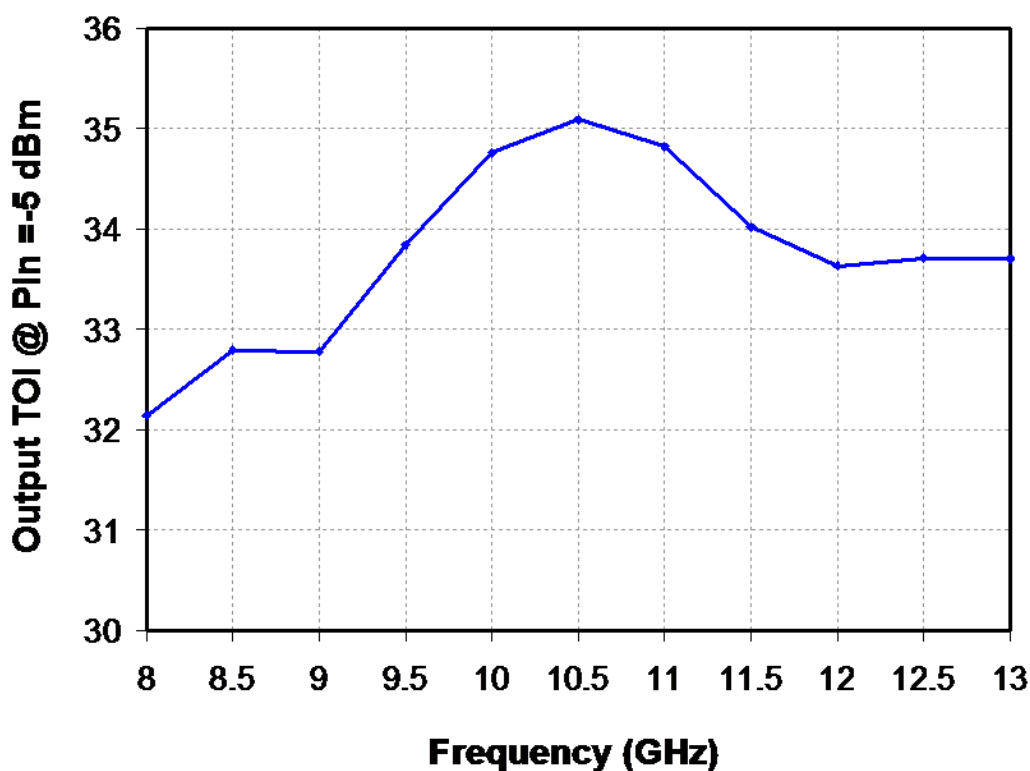
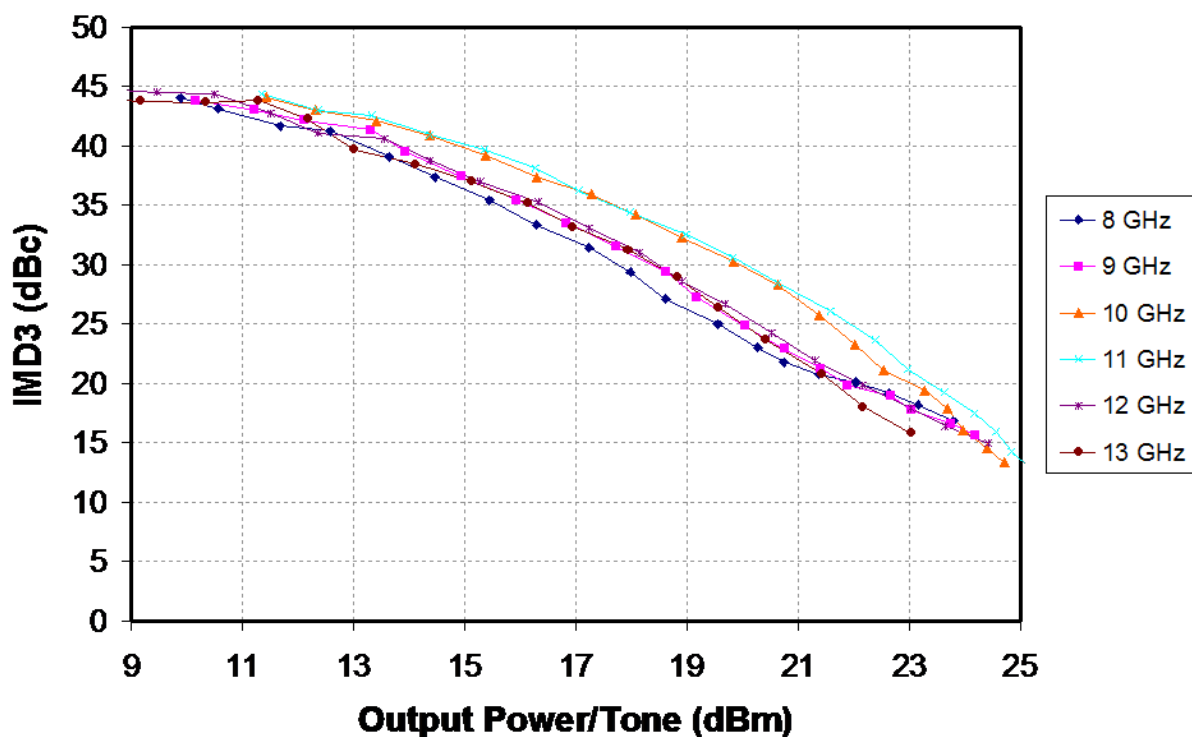
Typical Fixtured Performance

Bias Conditions: $V_d = 9V$, $I_{dq} = 225mA$



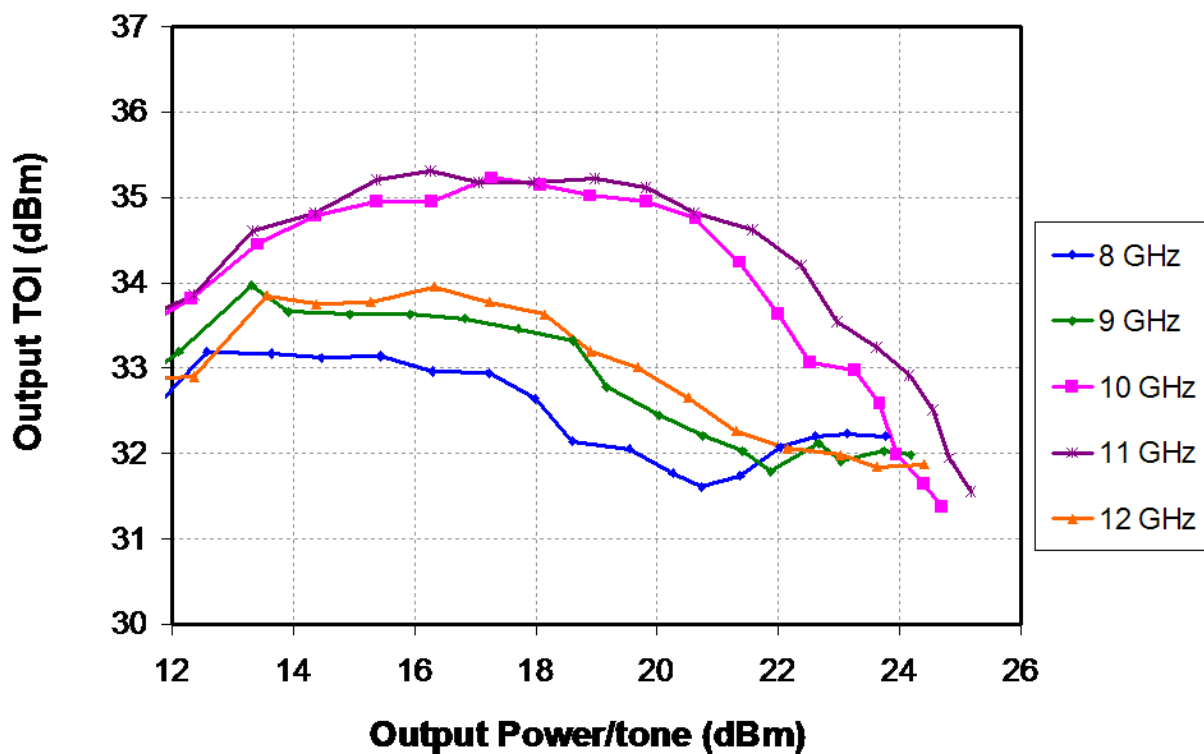
Typical Fixtured Performance

Bias Conditions: $V_d = 9V$, $I_{dq} = 225mA$

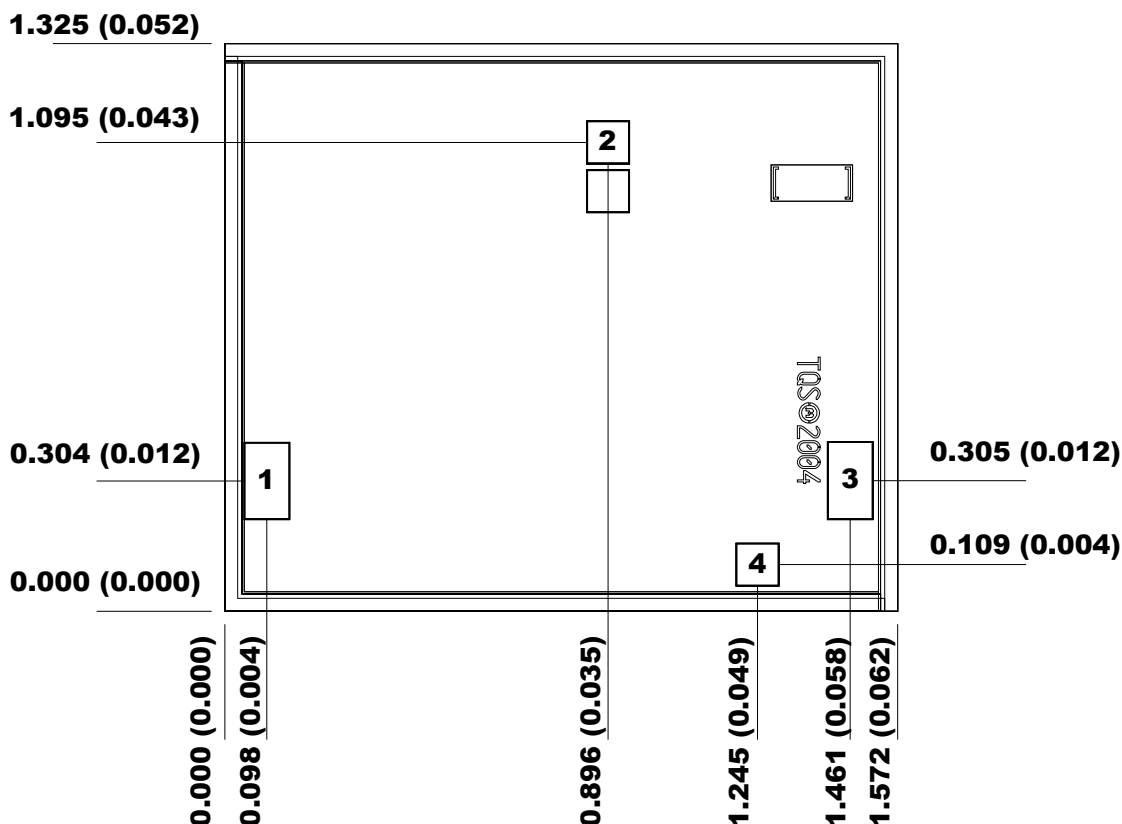


Typical Fixtured Performance

Bias Conditions: $V_d = 9V$, $I_{dq} = 225mA$



Mechanical Characteristics



Units: millimeters (inches)

Thickness: 0.100 (0.004)

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

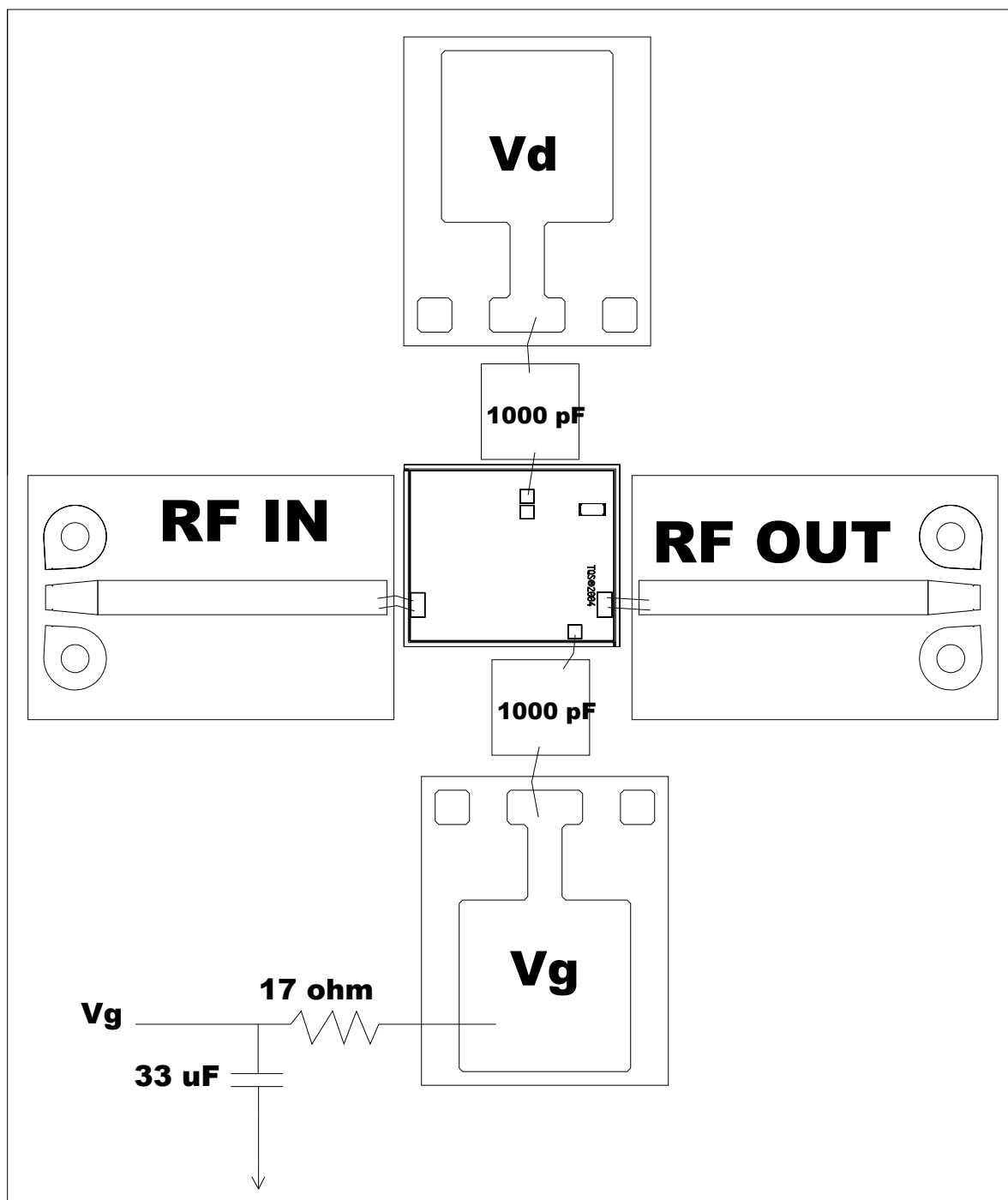
Chip size tolerance: +/- 0.051 (0.002)

GND IS BACKSIDE OF MMIC

Bond pad #1	(RF In)	0.105 x 0.180 (0.004 x 0.007)
Bond pad #2	(Vd)	0.098 x 0.098 (0.004 x 0.004)
Bond pad #3	(RF Out)	0.105 x 0.180 (0.004 x 0.007)
Bond pad #4	(Vg)	0.098 x 0.098 (0.004 x 0.004)

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

Recommended 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 for 30 sec
- 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.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.
- 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.

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