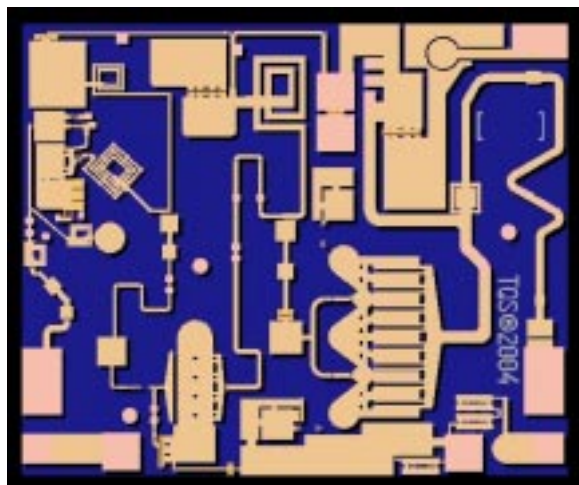


# X-Band Driver Amplifier

# TGA2700



## Key Features

- Frequency Range: 7-13 GHz
- 25 dB Nominal Gain
- 30dBm Output Power @ Pin=10dBm, Midband
- 12 dB Input Return Loss
- 10 dB Output Return Loss
- 0.25  $\mu$ m 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

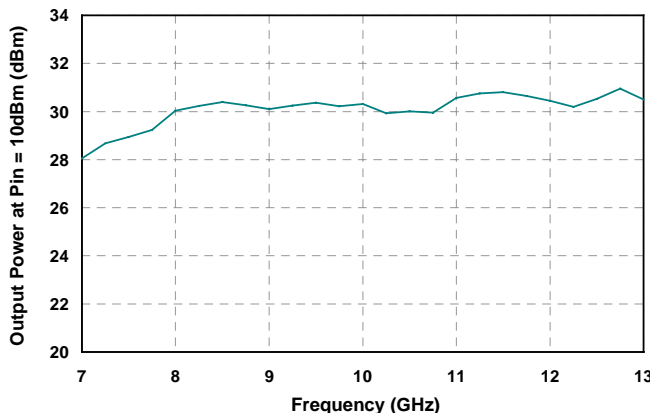
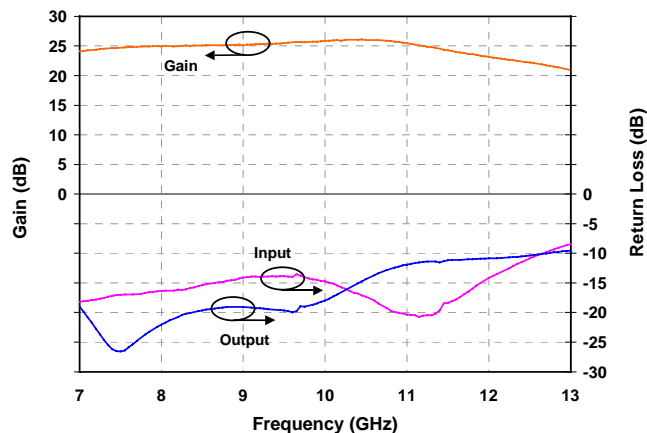
The TriQuint TGA2700-EPU is an X-band Driver Amplifier that operates between 7-13 GHz. The Driver Amplifier is designed using TriQuint's proven standard 0.25  $\mu$ m gate pHEMT production process.

The TGA2700-EPU provides typical 30dBm output power at +10 dBm input power @ 300mA and has a small signal gain of 25 dB.

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

## Measured Fixtured Data

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



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

**TABLE I  
MAXIMUM RATINGS**

Symbol	Parameter <u>1/</u>	Value	Notes
V <sup>+</sup>	Positive Supply Voltage	10 V	<u>2/</u>
V <sup>-</sup>	Negative Supply Voltage Range	-5V TO 0V	
I <sup>+</sup>	Positive Supply Current	536 mA	<u>2/</u>
I <sub>G</sub>	Gate Supply Current	14 mA	
P <sub>IN</sub>	Input Continuous Wave Power	20 dBm	<u>2/</u>
P <sub>D</sub>	Power Dissipation	2.7 W	<u>2/</u> , <u>3/</u>
T <sub>CH</sub>	Operating Channel Temperature	150 °C	<u>4/</u> , <u>5/</u>
T <sub>M</sub>	Mounting Temperature (30 Seconds)	320 °C	
T <sub>STG</sub>	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<sub>D</sub>.
- 3/ When operated at this bias condition with a base plate temperature of 55 °C, the median life is 1E+6 hours.
- 4/ Junction operating temperature will directly affect the device median time to failure (T<sub>M</sub>). 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<sub>A</sub> = 25 °C, Nominal)

Symbol	Parameter	Minimum	Maximum	Value
I <sub>DSS</sub>	Saturated Drain Current	75	353	mA
G <sub>m</sub>	Transconductance	165	398	mS
V <sub>P</sub>	Pinch-off Voltage	-1.5	-0.5	V
B <sub>VGS</sub>	Breakdown Voltage gate-source	-30	-8	V
B <sub>VGD</sub>	Breakdown Voltage gate-drain	-30	-12	V

**TABLE III**  
**RF CHARACTERIZATION TABLE**

( $T_A = 25^\circ\text{C}$ , 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
$P_{\text{sat}}$	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	%

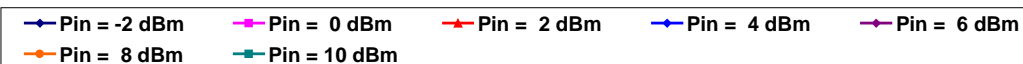
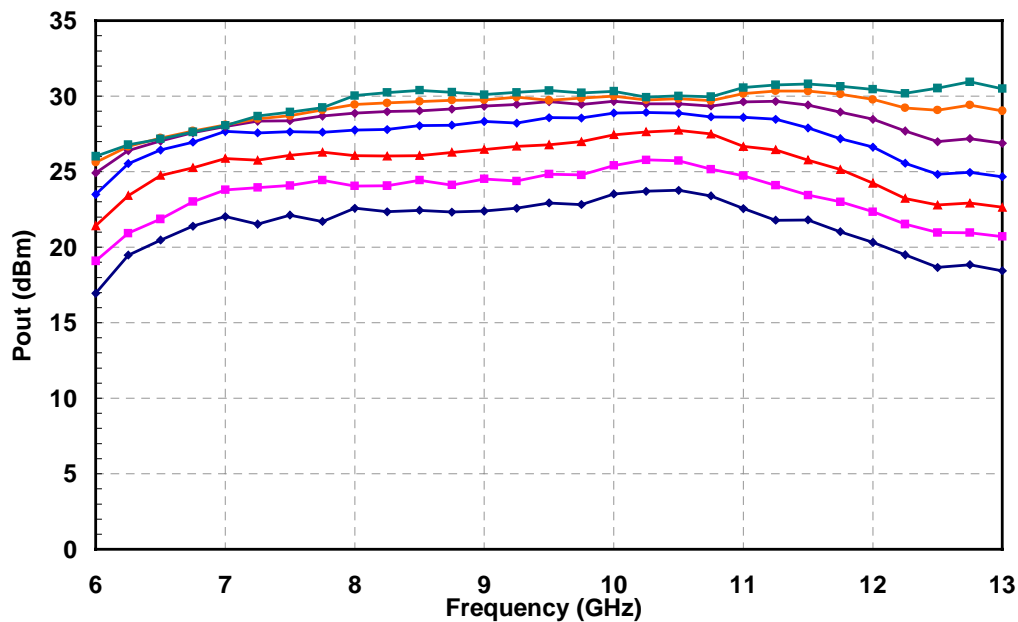
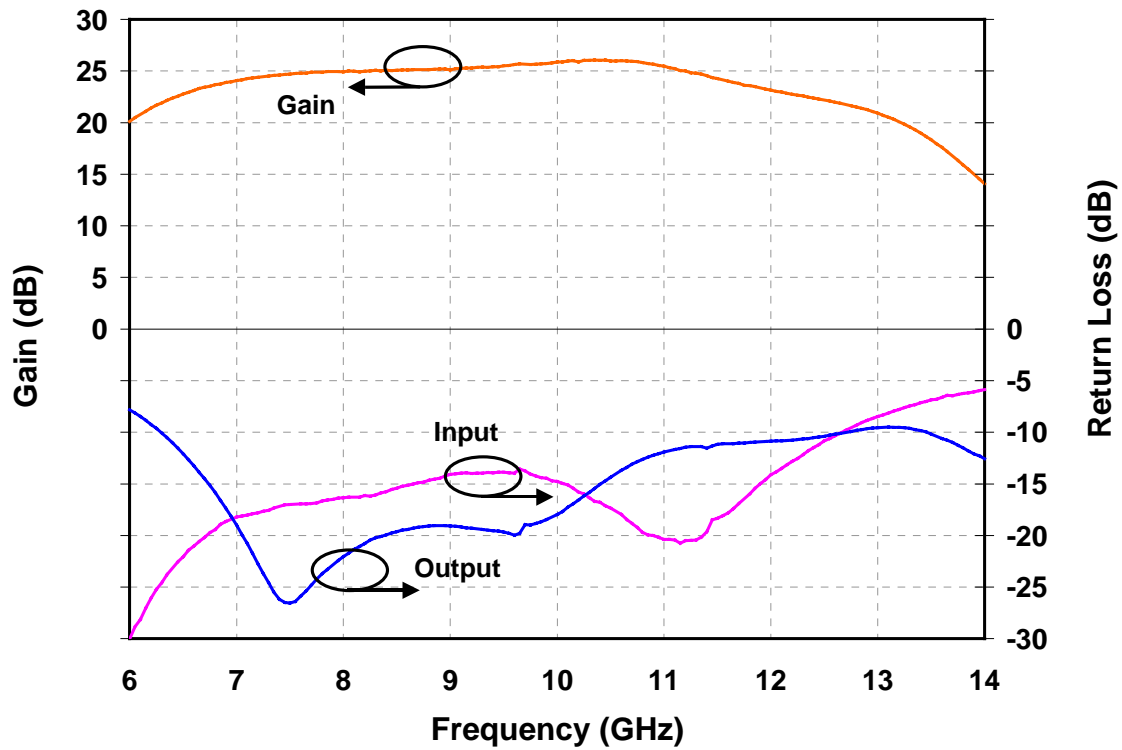
**TABLE IV**  
**THERMAL INFORMATION**

Parameter	Test Conditions	$T_{\text{baseplate}}$ ( $^\circ\text{C}$ )	$T_{\text{CH}}$ ( $^\circ\text{C}$ )	$R_{\theta\text{JC}}$ ( $^\circ\text{C/W}$ )	$T_M$ (HRS)
$R_{\theta\text{JC}}$ Thermal Resistance (channel to backside of package)	$V_d = 9\text{ V}$ $I_D = 225\text{ mA}$ $P_{\text{diss}} = 2.0\text{ W}$	70	140	34.7	2.4 E+6
	$V_d = 9\text{ V}$ $I_D = 300\text{ mA}$ $P_{\text{diss}} = 2.7\text{ W}$	55	150		1 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.

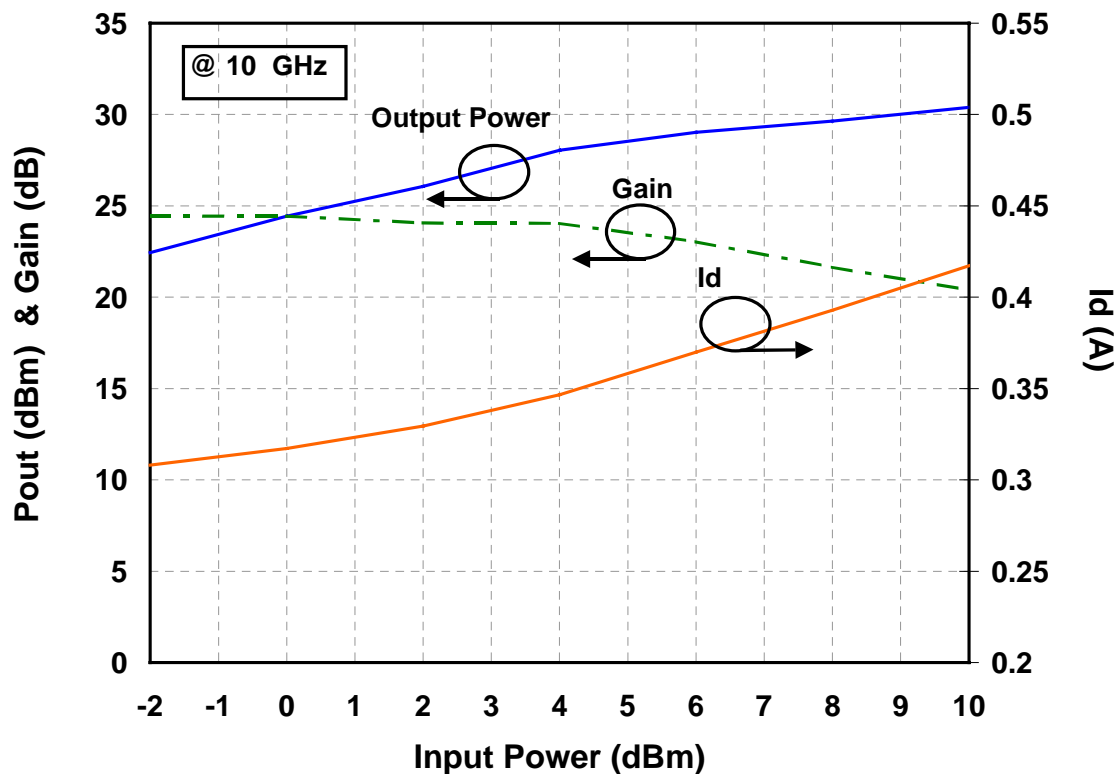
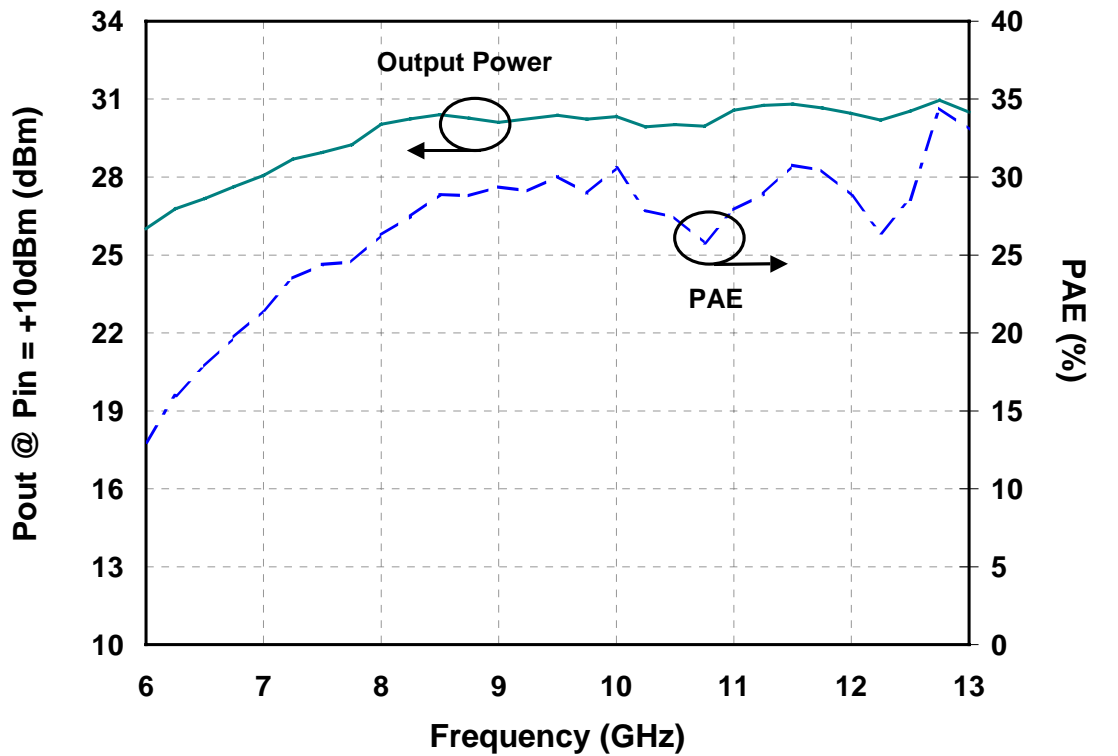
## Typical Fixtured Performance

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



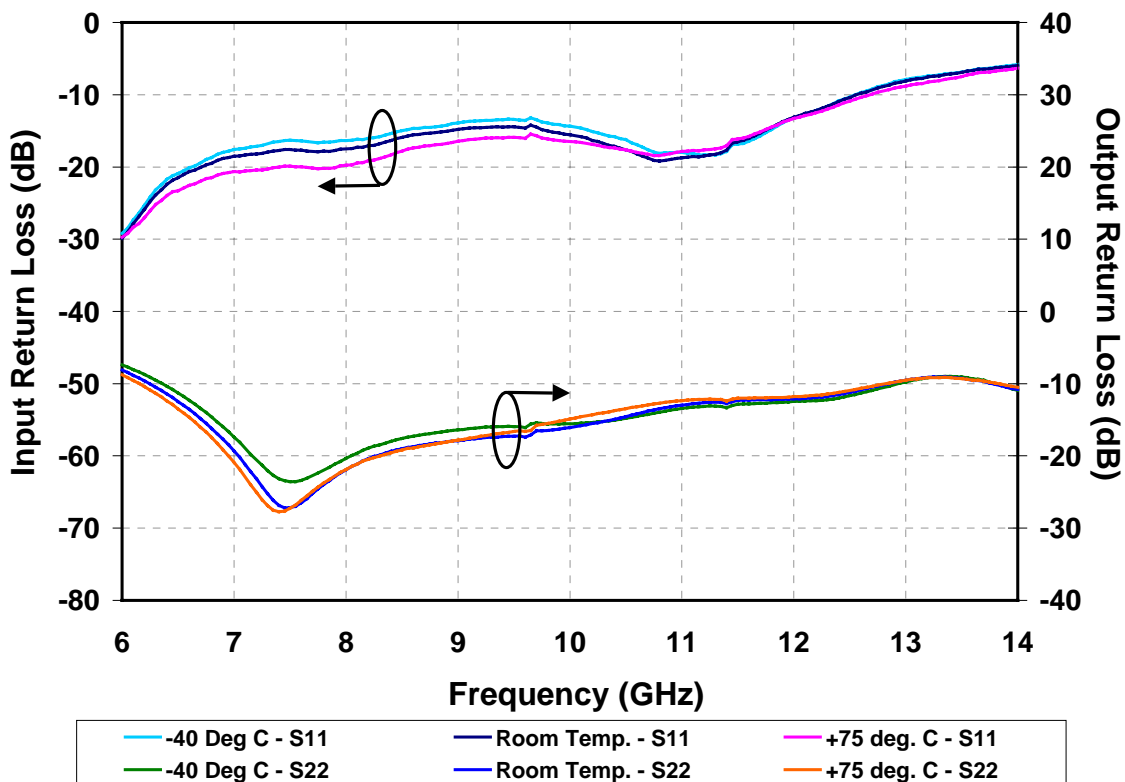
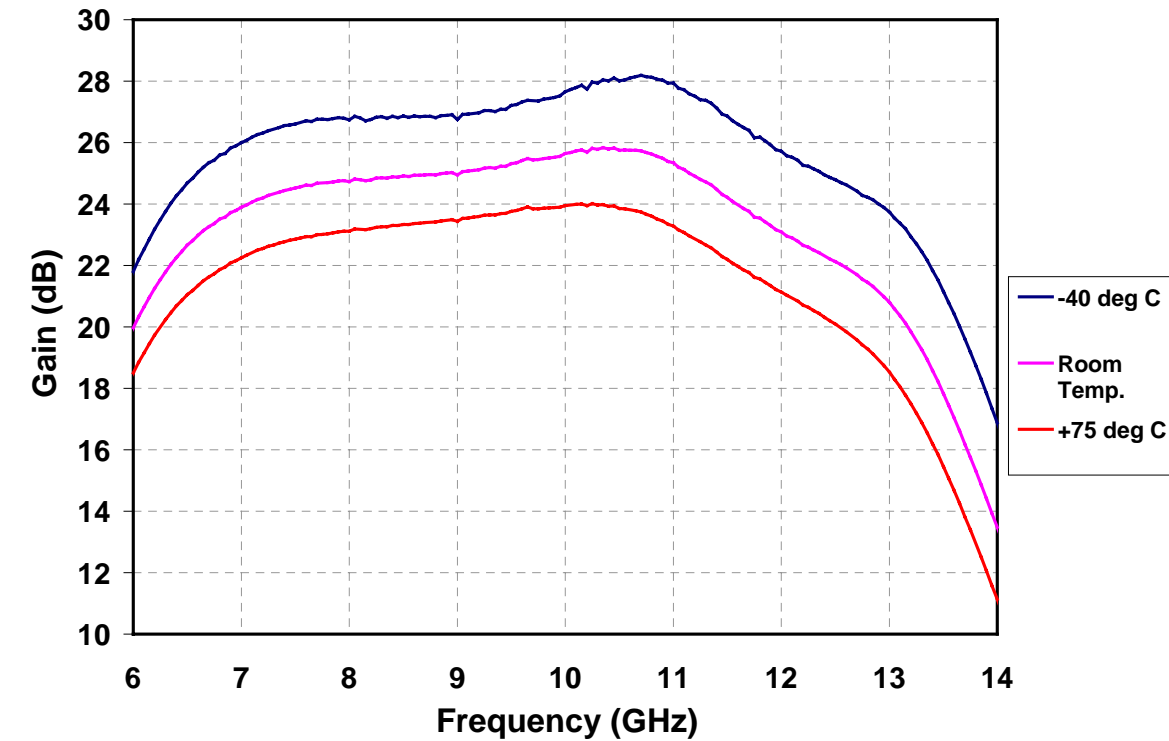
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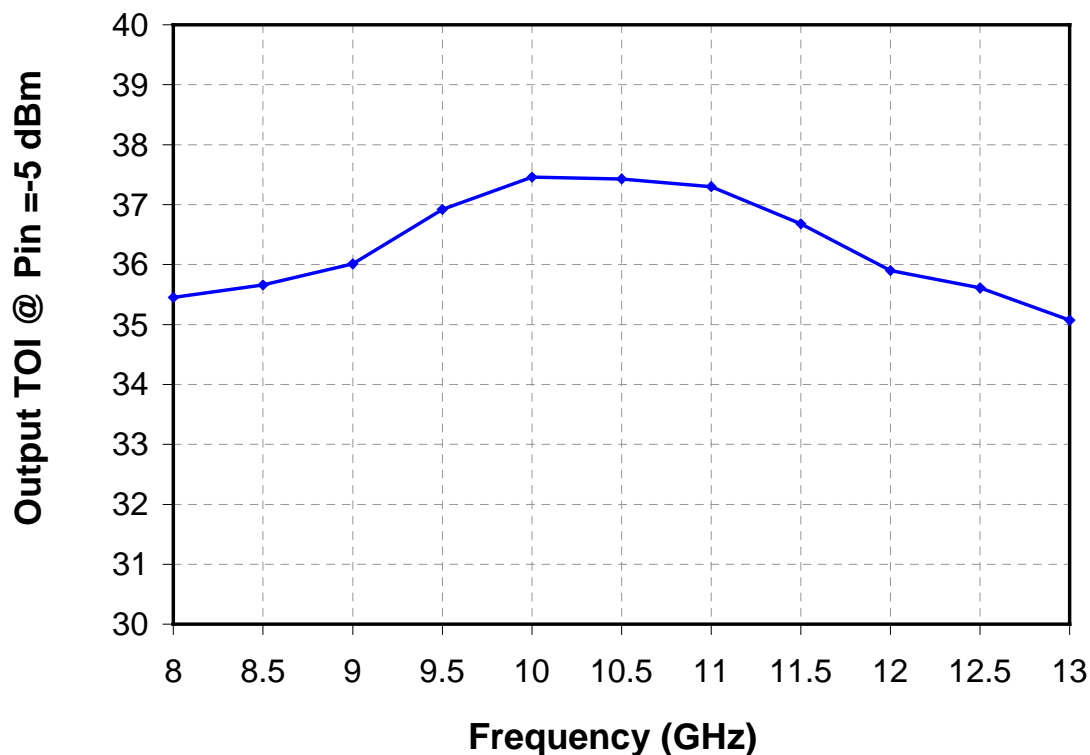
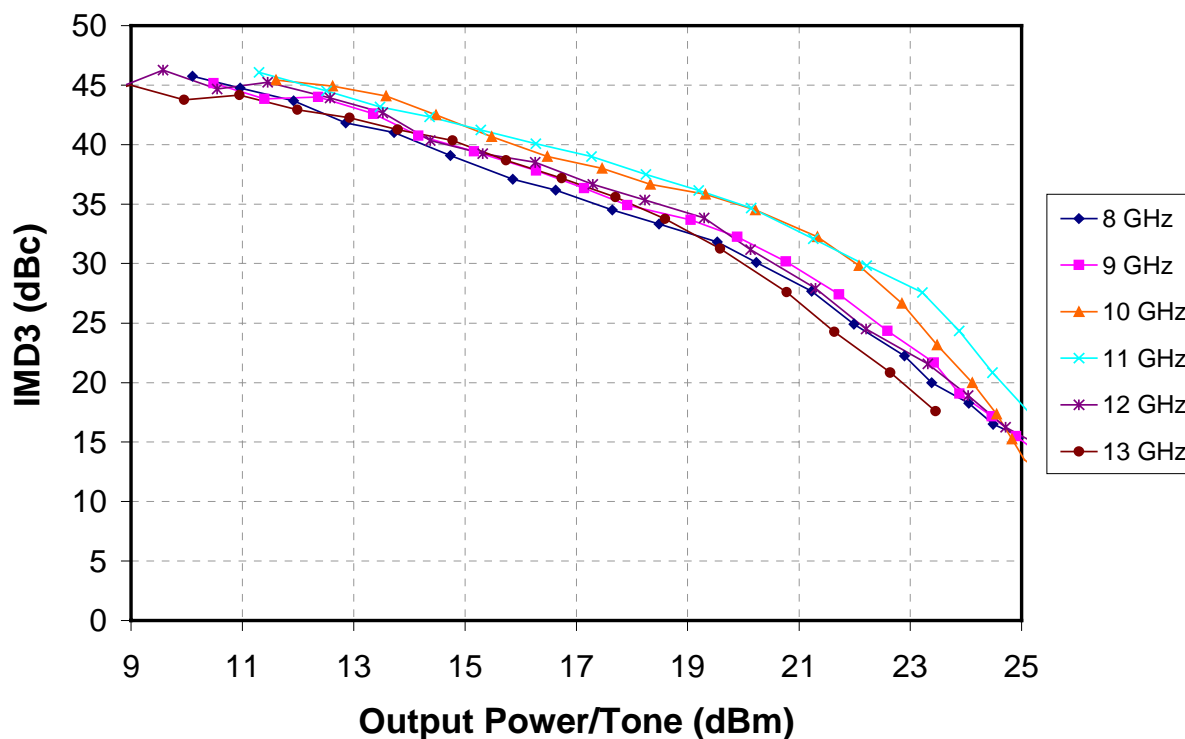
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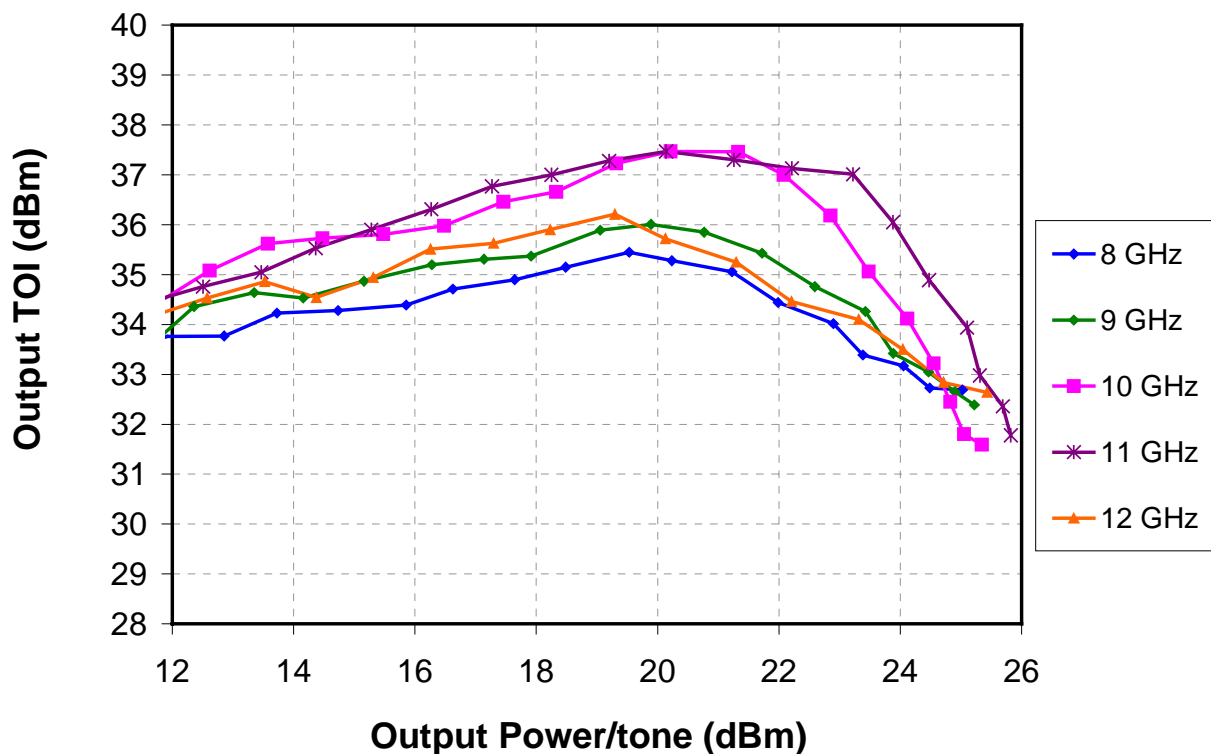
# **Typical Fixtured Performance**

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



# **Typical Fixtured Performance**

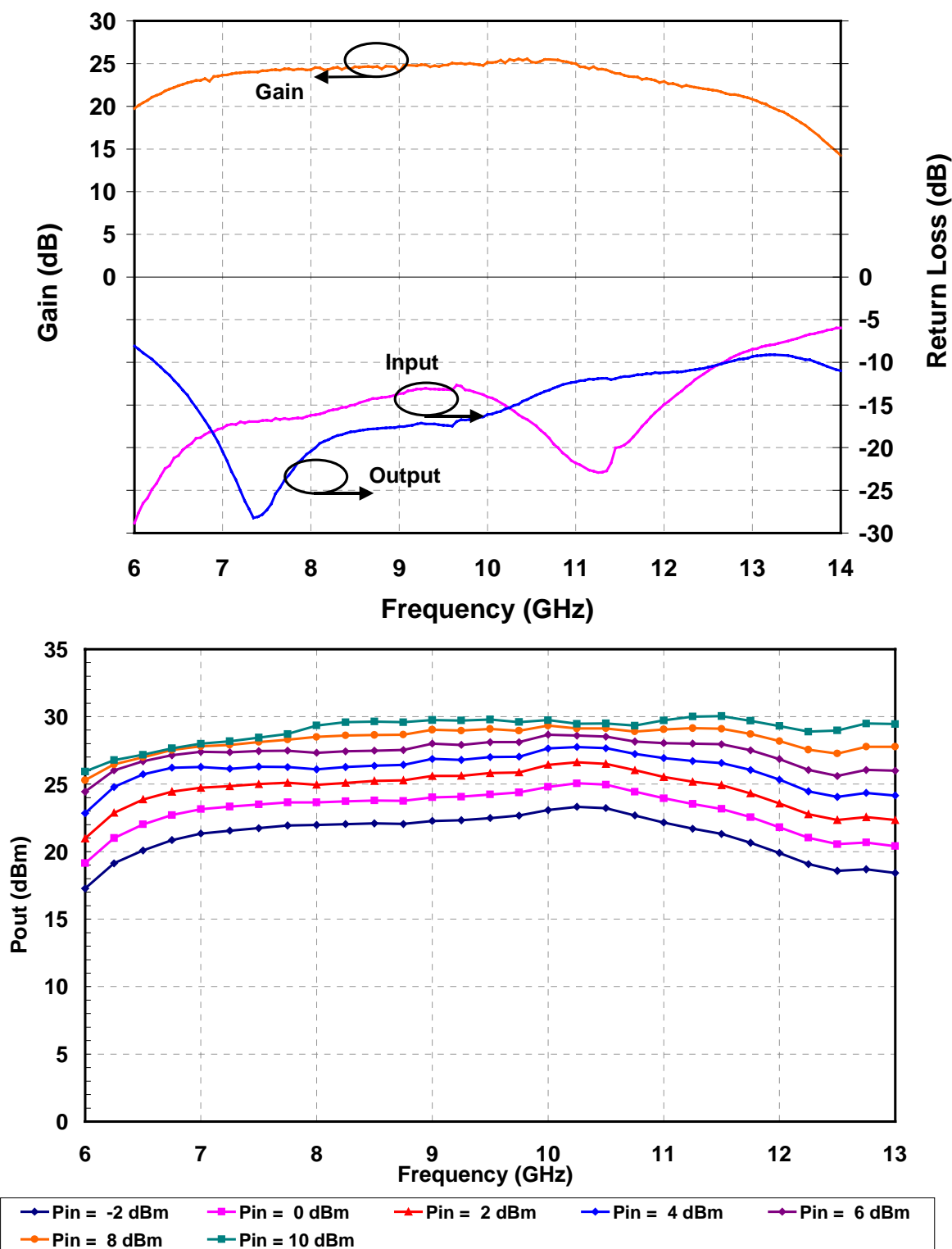
Bias Conditions:  $V_d = 9V$ ,  $I_{dq} = 300mA$





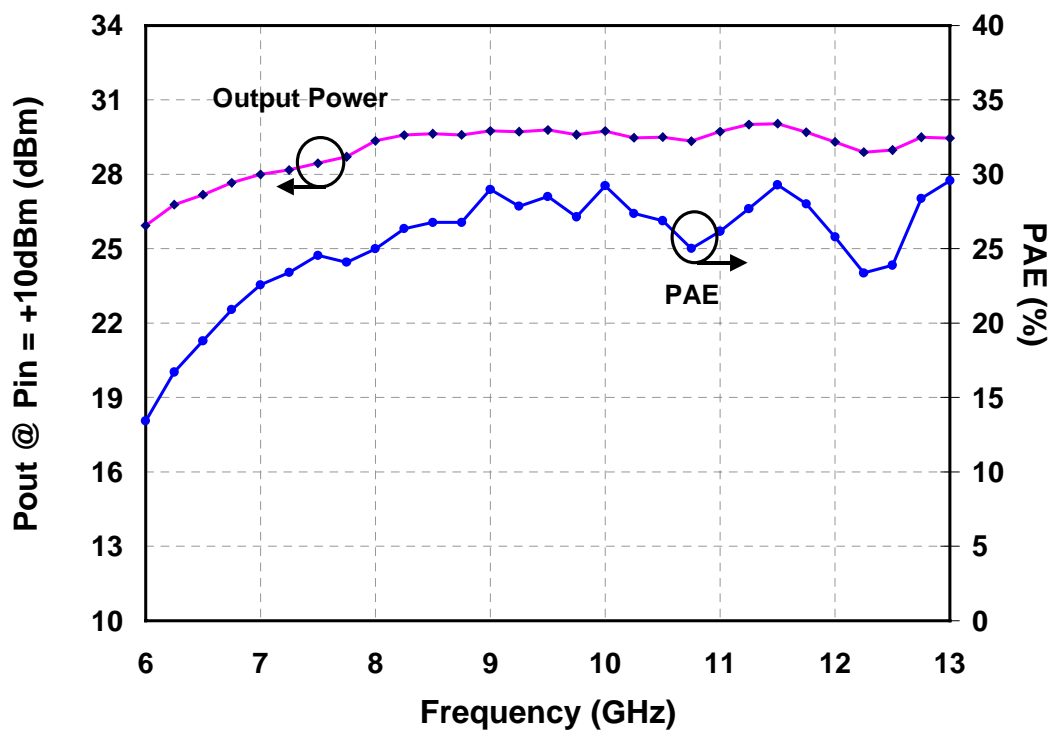
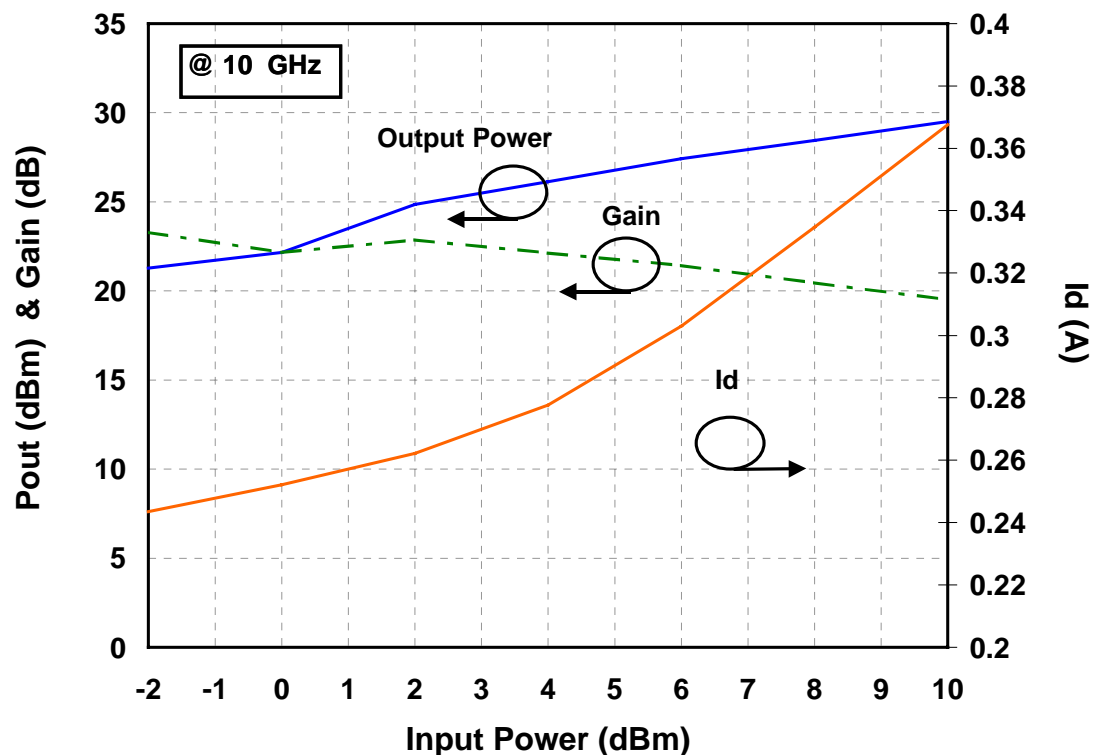
# **Typical Fixtured Performance**

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



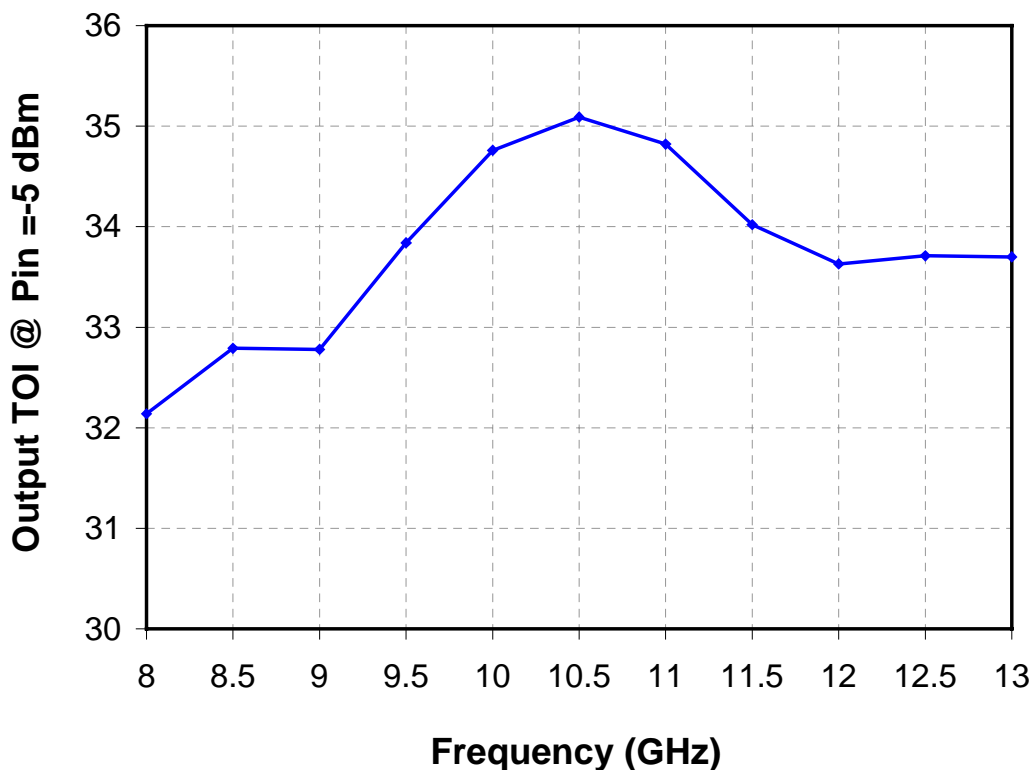
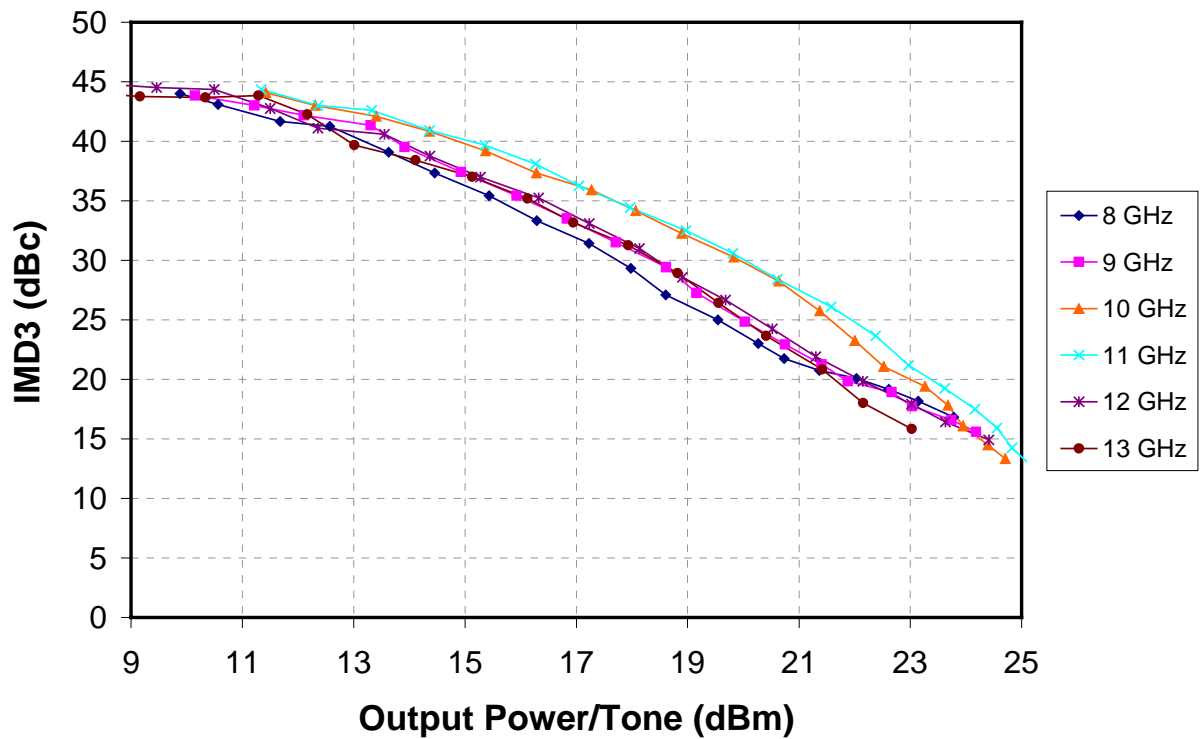
## Typical Fixtured Performance

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



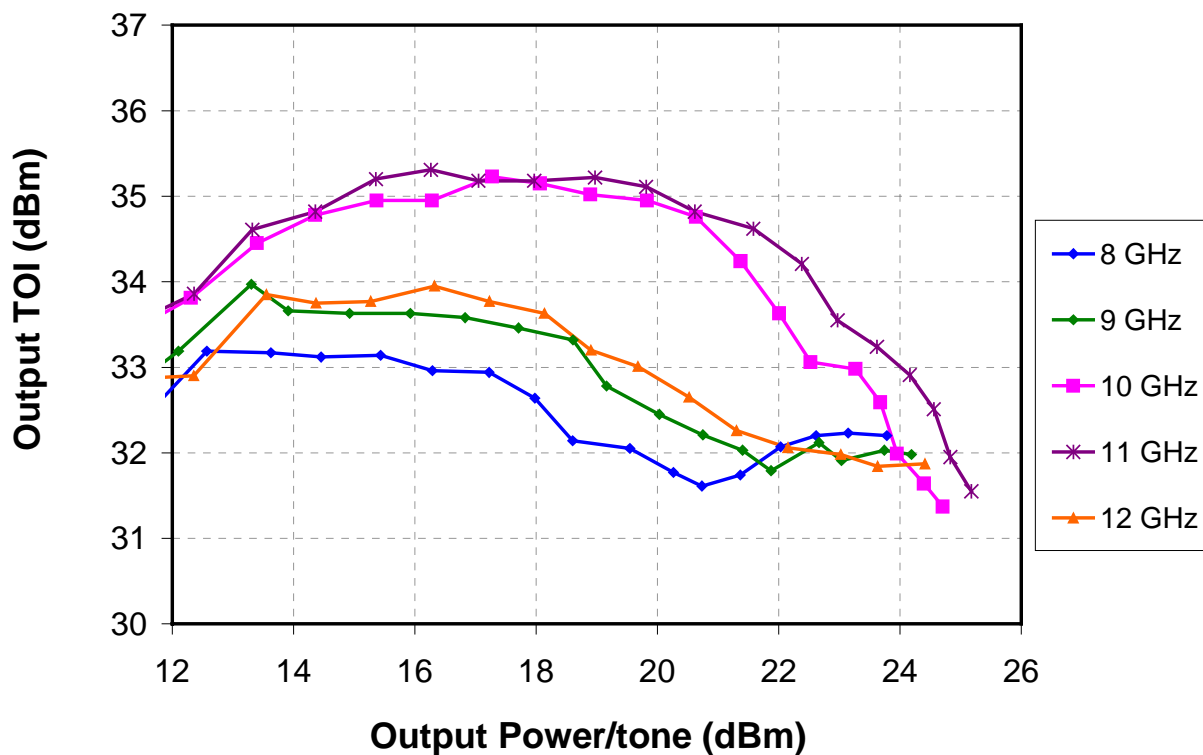
## Typical Fixtured Performance

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

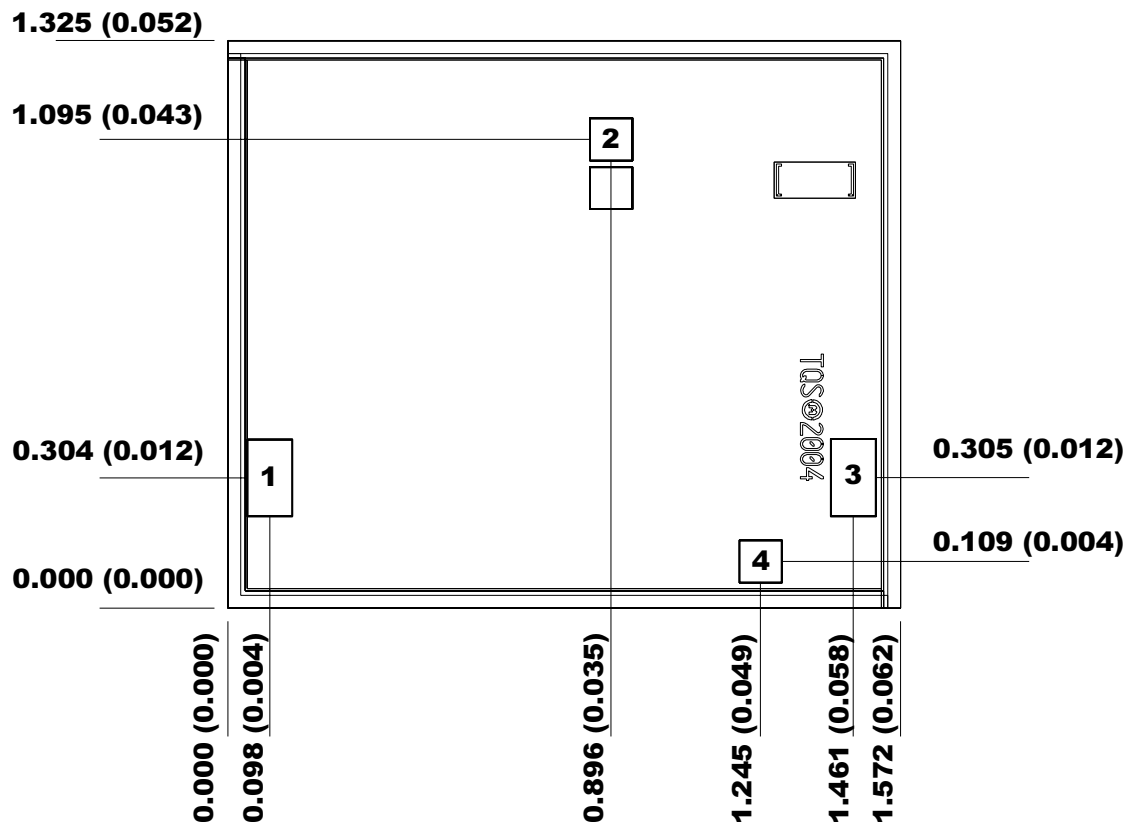


## Typical Fixtured Performance

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**

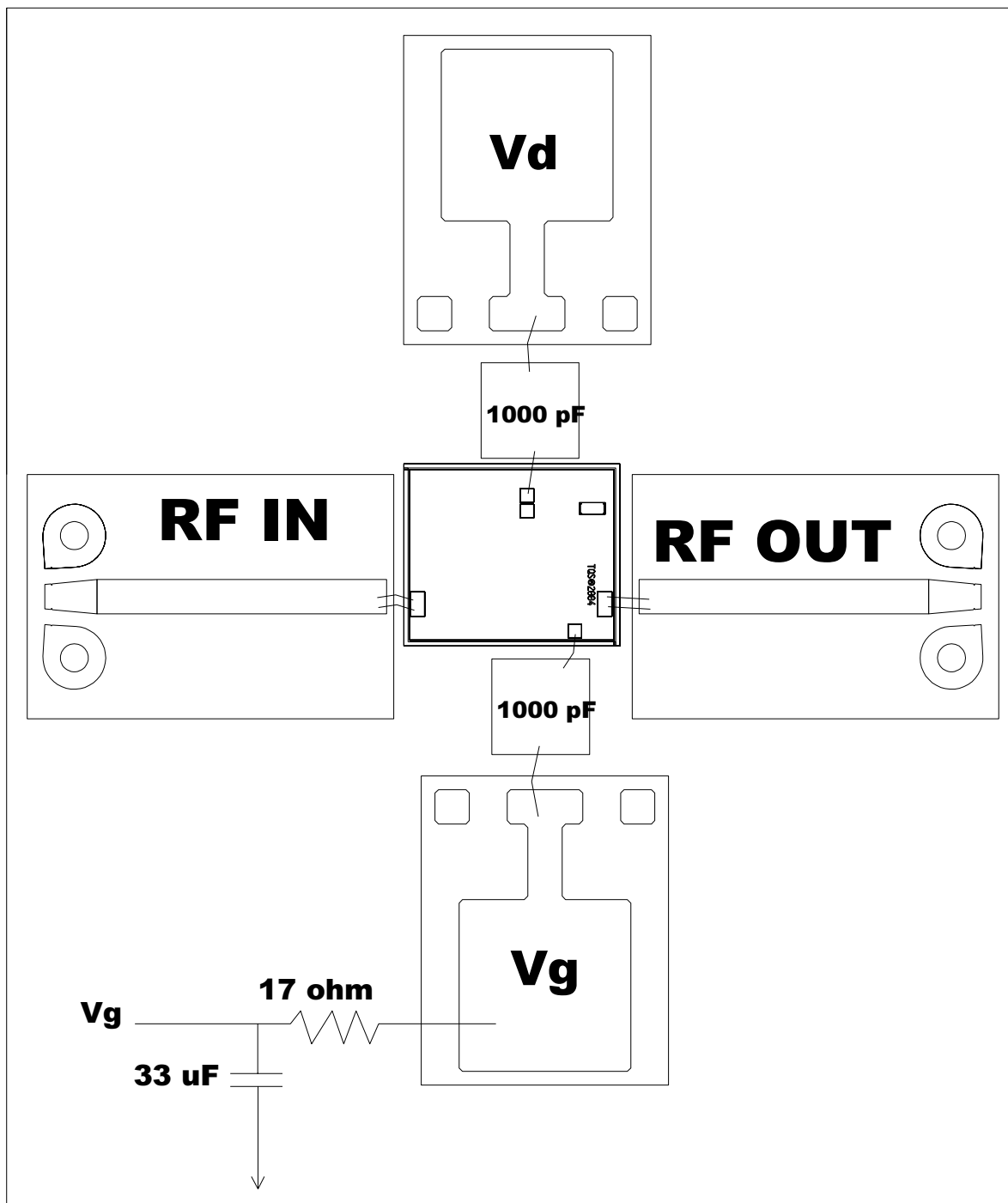
**Chip size tolerance: +/- 0.051 (0.002)**

**GND IS BACKSIDE OF MMIC**

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

*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.***