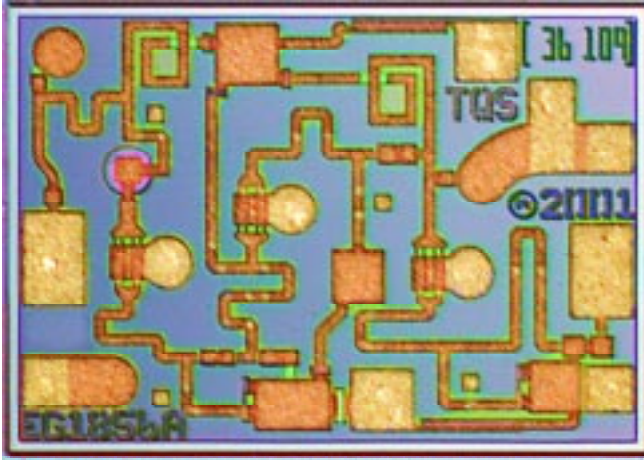


29-37 GHz Compact Driver Amplifier

**TGA4510-EPU**



**Key Features**

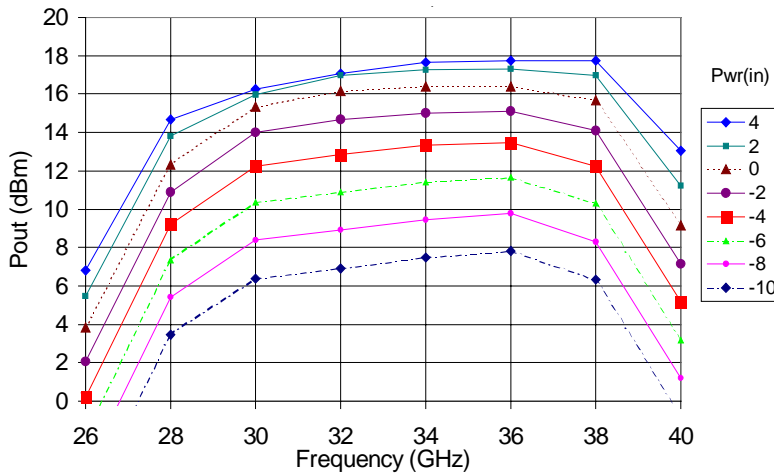
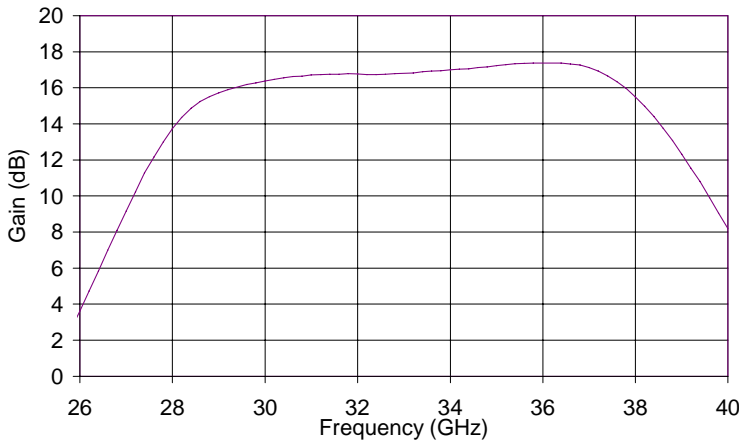
- 0.25 um pHEMT Technology
- >16 dB Nominal Gain @ 30 GHz
- 16 dBm Nominal Psat
- Bias Conditions:  $V_d = 6V$ ,  $I_d = 60\text{ mA}$
- Compact Chip Size:  $1.1 \times 0.8 \times 0.1\text{ mm}^3$

**Primary Applications**

- LMDS
- Point-to-Point
- Base Stations

**Fixtured Measured Performance**

Bias Conditions:  $V_d = 6V$ ,  $I_d = 60\text{ mA} \pm 5\%$



Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.

**TABLE I**  
**MAXIMUM RATINGS <sup>1/</sup>**

Symbol	Parameter	Value	Notes
V <sup>+</sup>	Positive Supply Voltage	8V	
I <sup>+</sup>	Positive Supply Current (Quiescent)	81mA	<sup>2/</sup>
I <sub>G</sub>	Gate Current	3.5 mA	
P <sub>D</sub>	Power Dissipation	TBD	
P <sub>IN</sub>	Input Continuous Wave Power	18 dBm	
T <sub>CH</sub>	Operating Channel Temperature	150 °C	<sup>3/</sup> , <sup>4/</sup>
T <sub>M</sub>	Mounting Temperature (30 seconds)	320 °C	
T <sub>STG</sub>	Storage Temperature	-65 °C to 150 °C	

- <sup>1/</sup> These values represent the maximum operable values of this device
- <sup>2/</sup> Total current for the entire MMIC
- <sup>3/</sup> These ratings apply to each individual FET
- <sup>4/</sup> Junction operating temperature will directly affect the device mean time to failure (MTTF). For maximum life it is recommended that junction temperatures be maintained at the lowest possible levels.

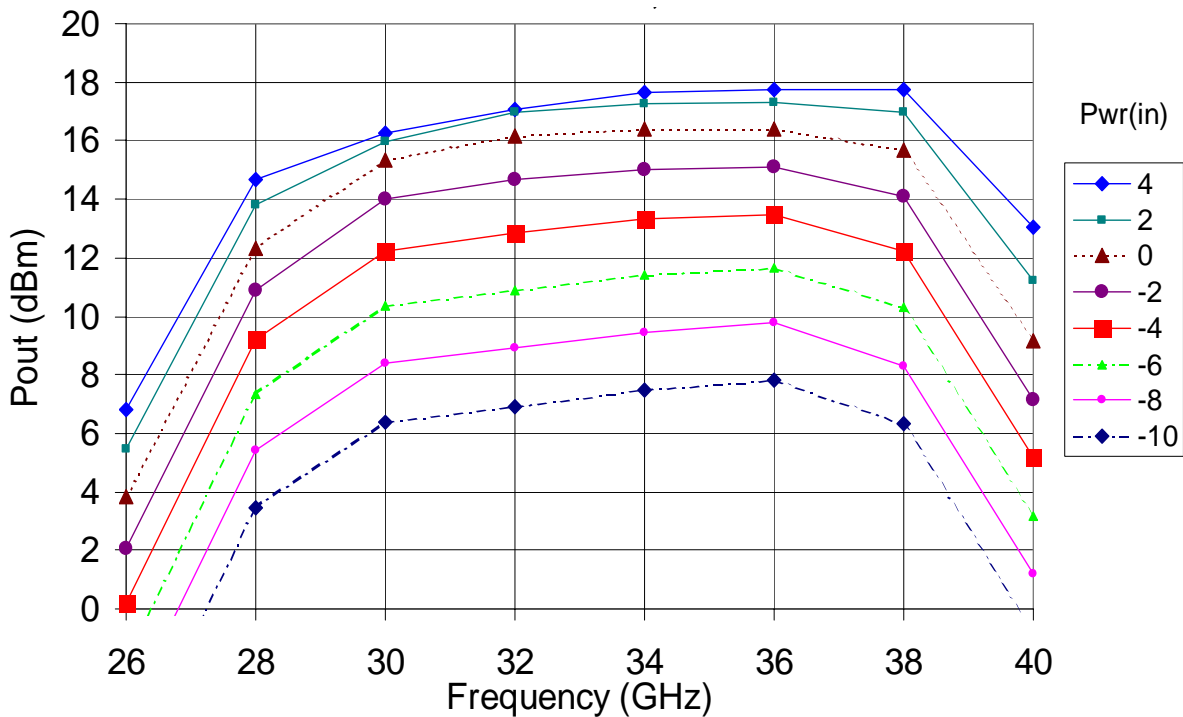
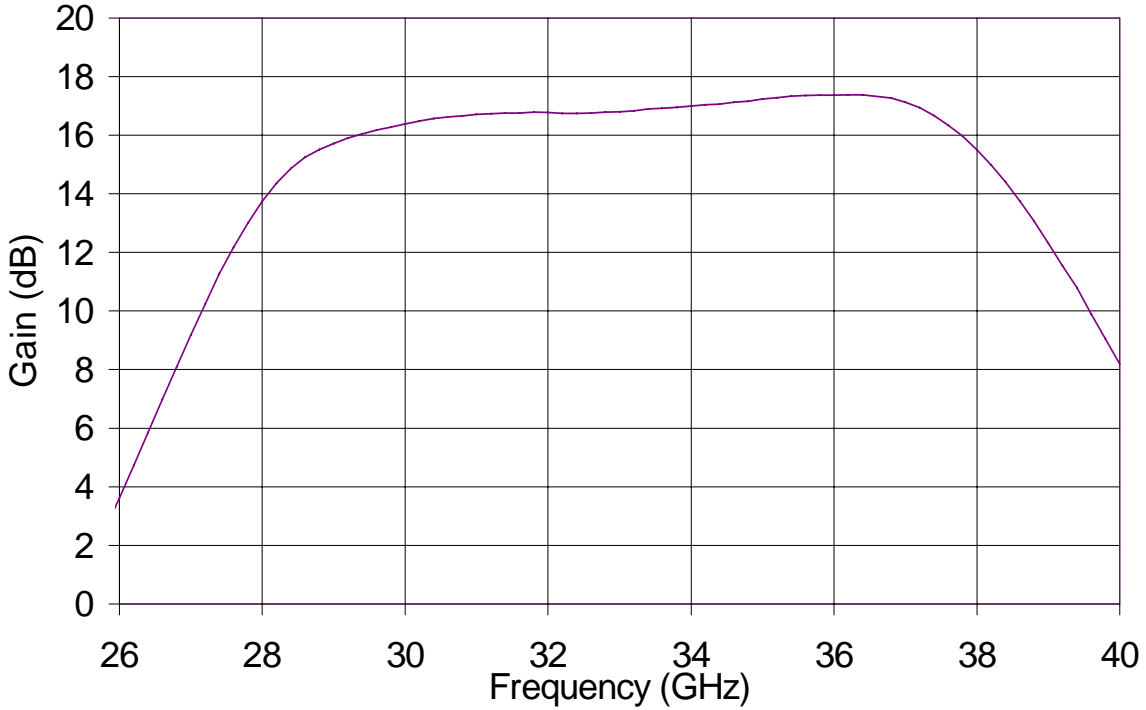
**TABLE II**  
**ELECTRICAL CHARACTERISTICS**  
**(T<sub>a</sub> = 25°C ± 5°C)**

Parameter	Units	Typical
Frequency Band	GHz	29 - 37
Drain Operating Voltage	V	6
Gate Operating Voltage	V	-0.6
Drain Current, Quiescent	mA	60
Typical DC Power Consumption	W	0.36
Small Signal Gain	dB	15.8 – 17.6
Gain Flatness	dB	< 0.05
Input Return Loss	dB	> 8
Output Return Loss	dB	> 11
TOI (Single Tone Power) @ 30 GHz	dBm	22
CW Output Power @ P1dB (dBm)	dBm	14.0 – 16.2

*Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.*

**Measured Fixtured Data**

Bias Conditions:  $V_d = 6V$ ,  $I_d = 60mA \pm 5\%$

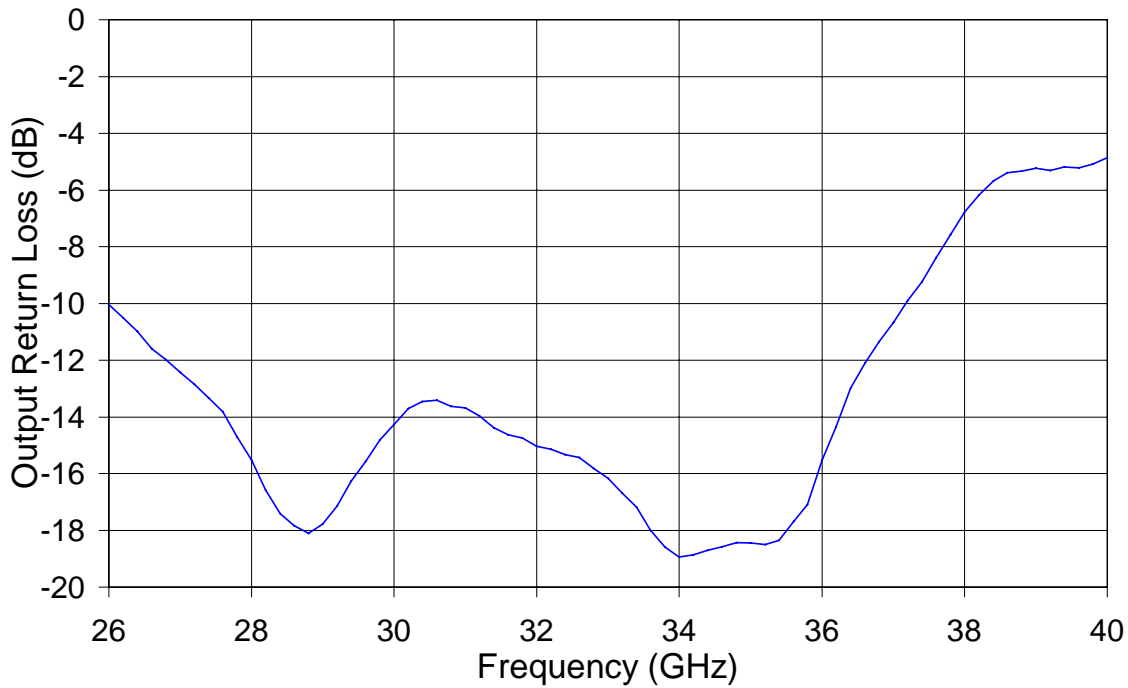
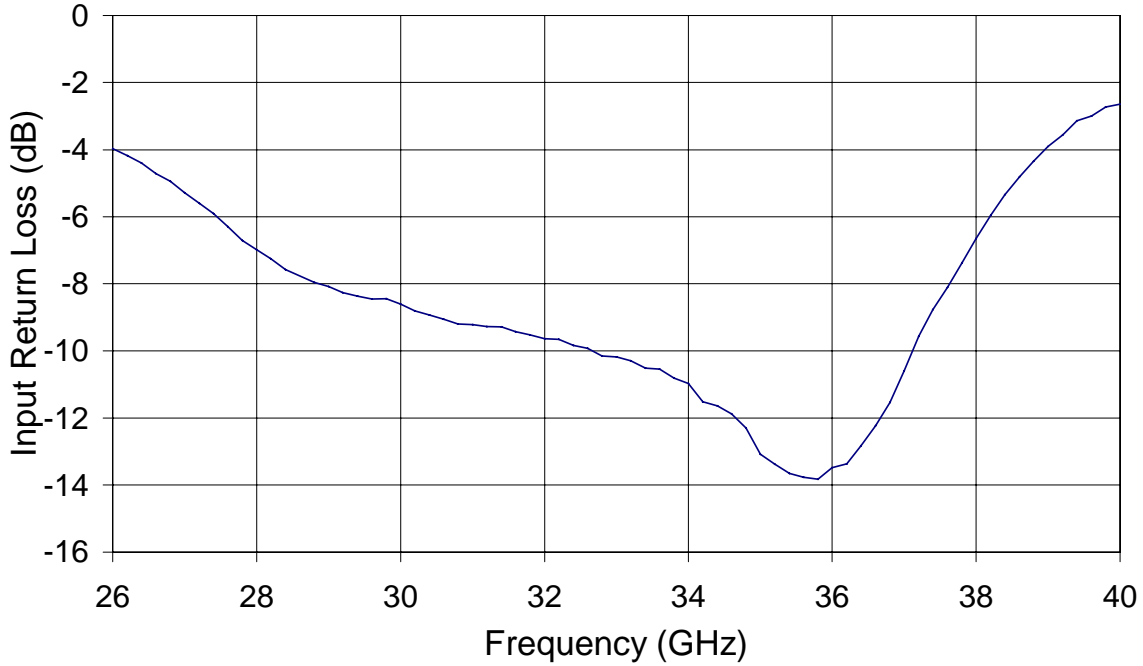


Note:  $P_{wr}(in) = 0dBm$  is approximately  $P_{1dB}(dBm)$

Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.

### Measured Fixtured Data

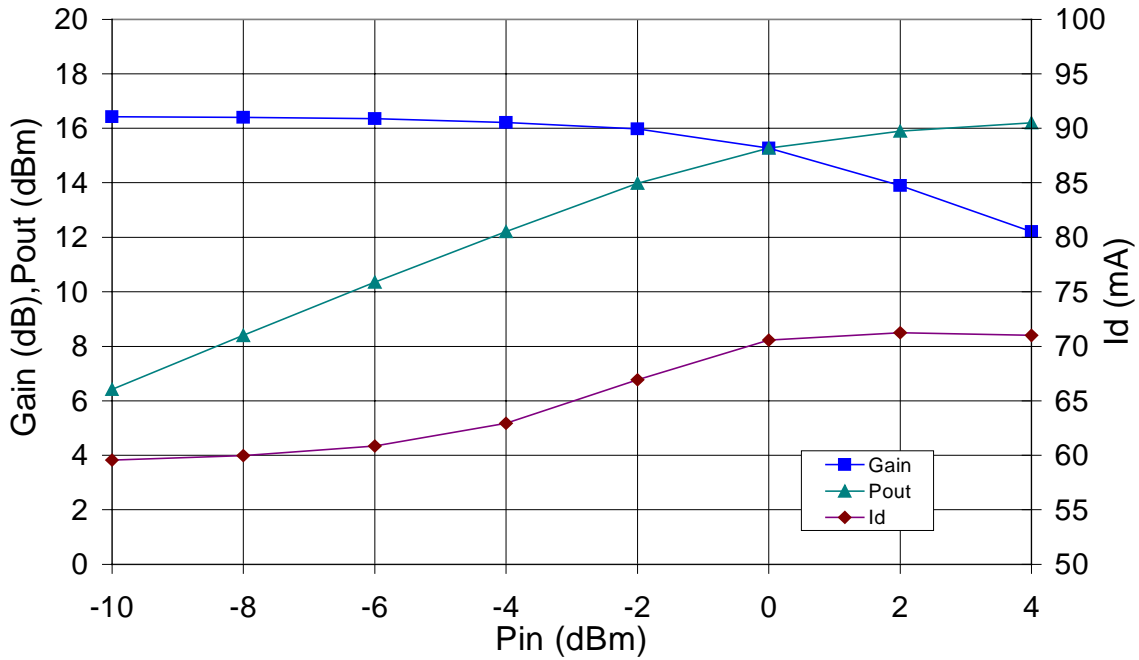
Bias Conditions:  $V_d = 6V$ ,  $I_d = 60mA \pm 5\%$



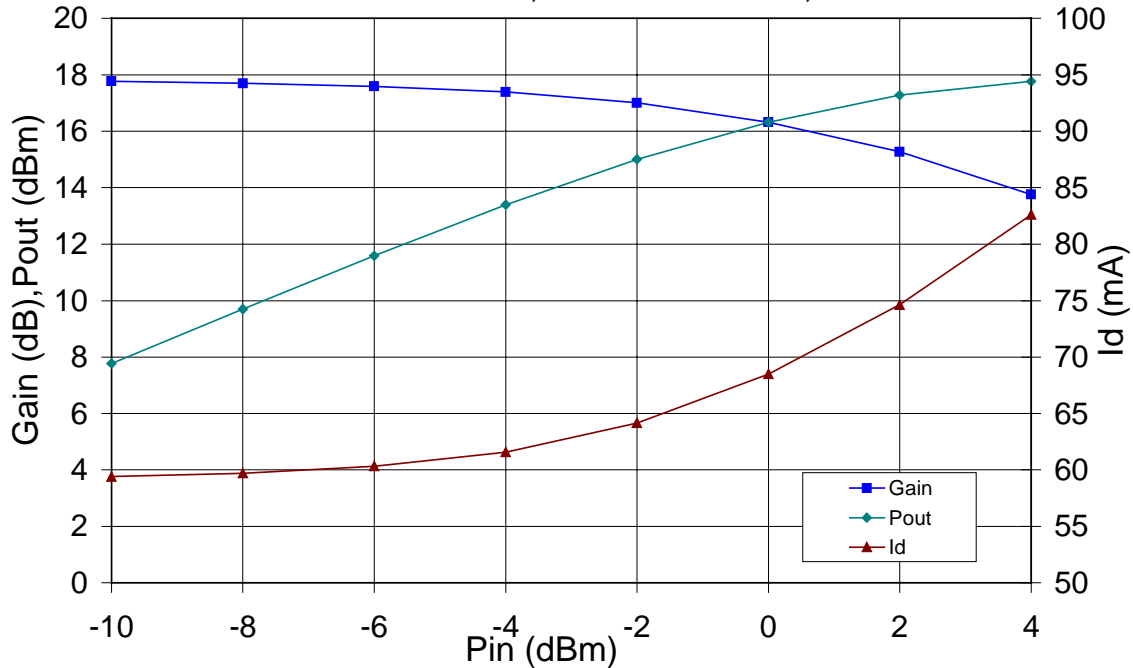
Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.

**Measured Fixtured Data**

Bias Conditions:  $V_d = 6V$ ,  $I_d = 60\text{ mA} \pm 5\%$ , @ 30 GHz



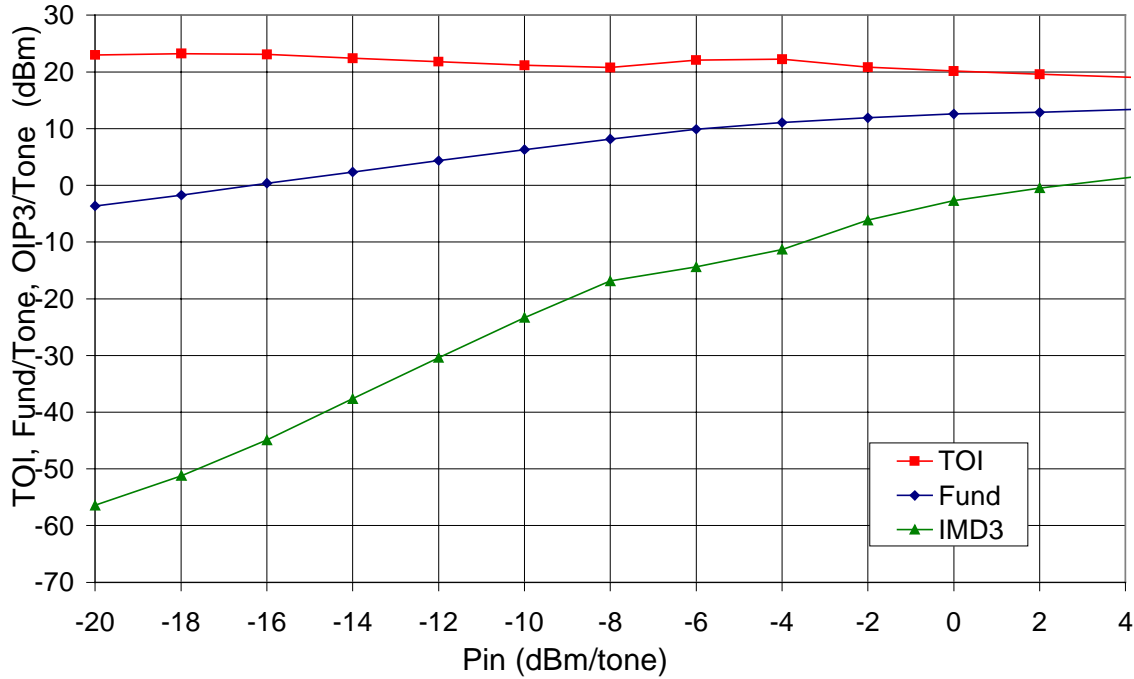
Bias Conditions:  $V_d = 6V$ ,  $I_d = 60\text{ mA} \pm 5\%$ , @ 36 GHz



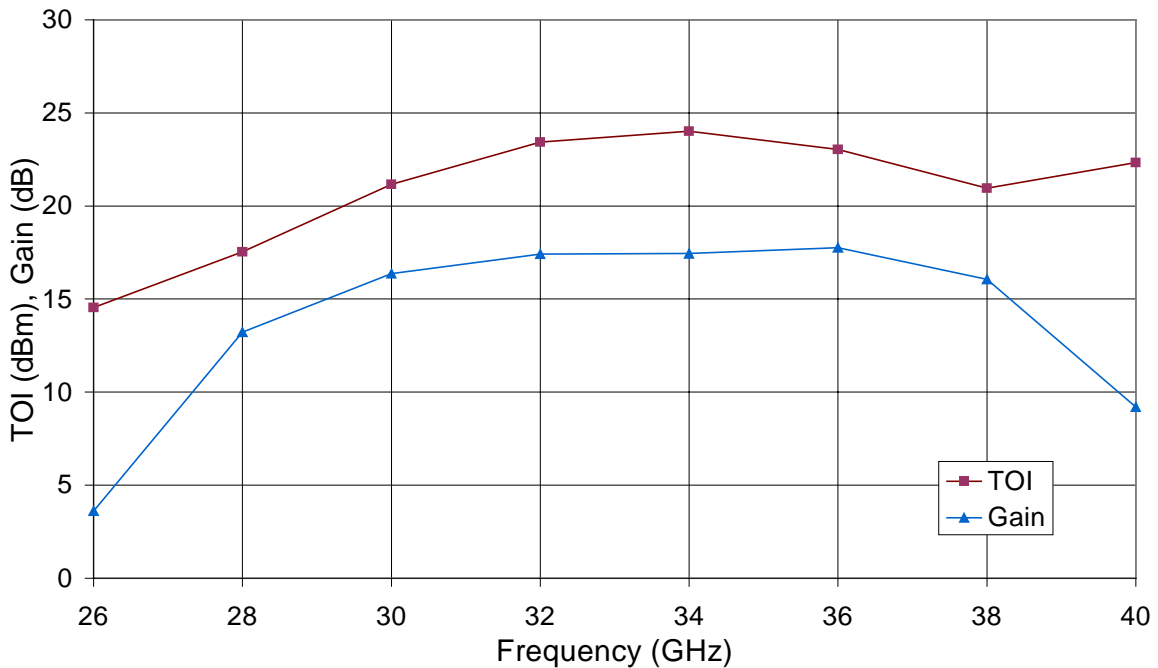
Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.

**Measured Fixtured Data**

Bias Conditions:  $V_d = 6V$ ,  $I_d = 60\text{ mA} \pm 5\%$ , @ 30 GHz

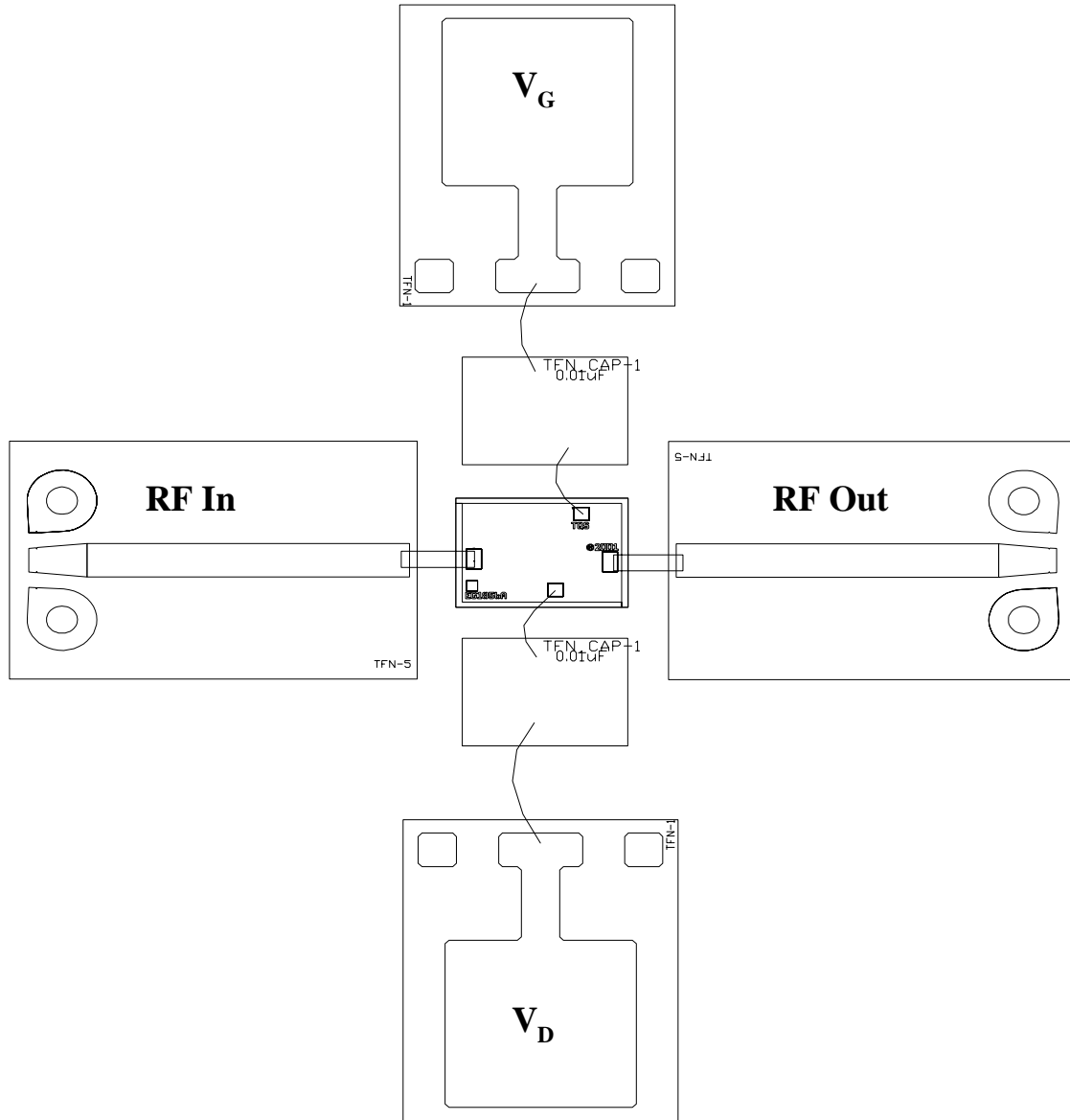


Bias Conditions:  $V_d = 6V$ ,  $I_d = 60\text{ mA} \pm 5\%$ , @ Pin = -10dBm/Tone



Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.

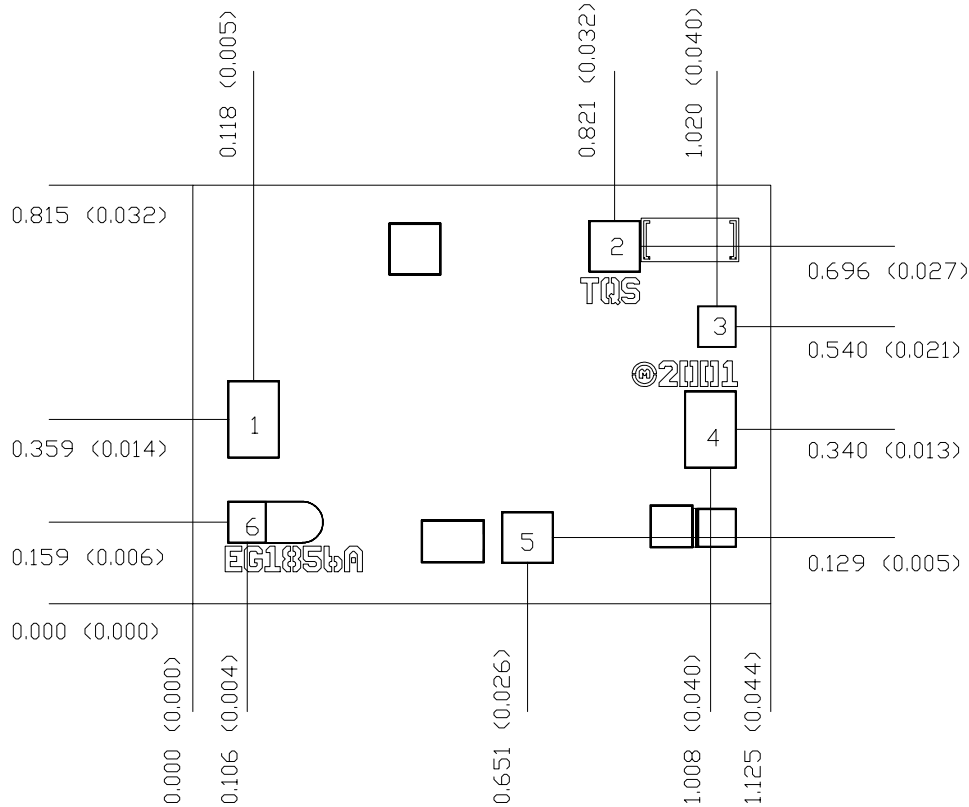
## Chip Assembly and Bonding Diagram



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

*Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.*

**Mechanical Drawing**



Units: millimeters (inches)

Thickness: 0.1016 (0.004)

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

Chip size tolerance: +/- 0.051 (0.002)

Bond Pad #1 (RF Input)	0.096 x 0.146 (0.004 x 0.006)
Bond Pad #2 (VG)	0.096 x 0.096 (0.004 x 0.004)
Bond Pad #3 (GND)	0.075 x 0.075 (0.003 x 0.003)
Bond Pad #4 (RF OUT)	0.098 x 0.148 (0.004 x 0.006)
Bond Pad #5 (VD)	0.096 x 0.096 (0.004 x 0.004)
Bond Pad #6 (GND)	0.075 x 0.075 (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.**

Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.



## **Assembly Process Notes**

Reflow process assembly notes:

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

*Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.*