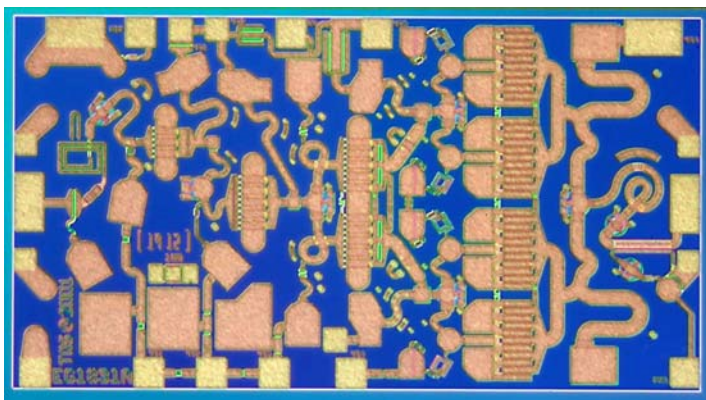


13 - 17 GHz 2 Watt, 32dB Power Amplifier TGA2503-EPU

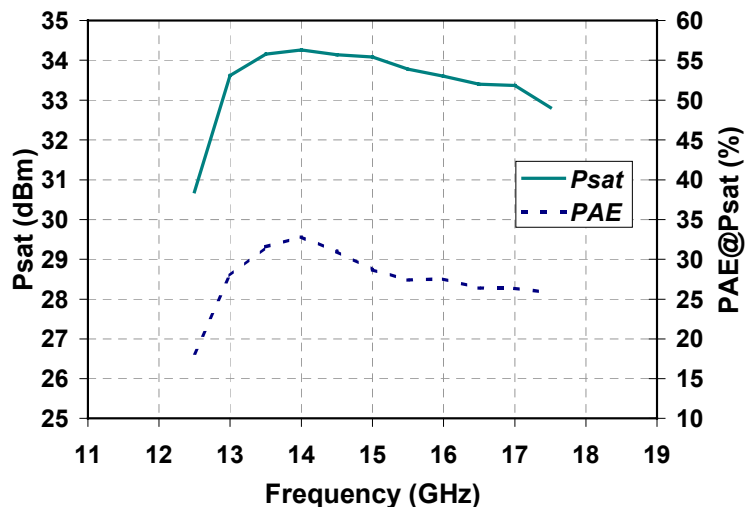
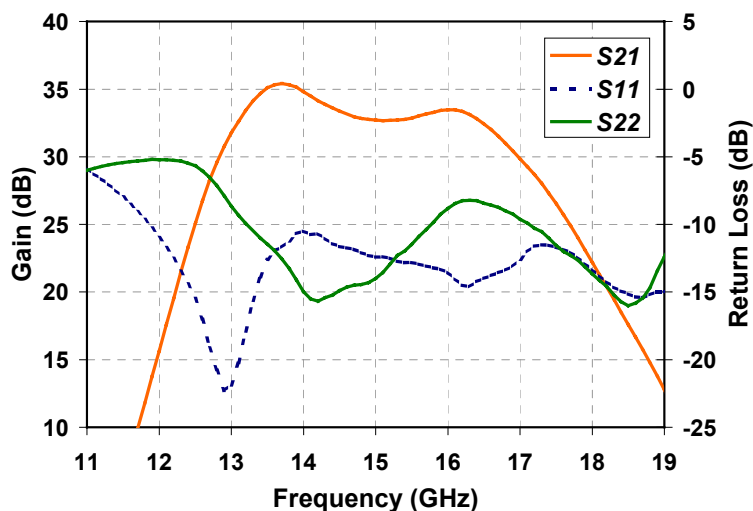


Key Features and Performance

- 33 dBm Midband Pout
- 32 dB Nominal Gain
- 10 dB Typical Return Loss
- Built-in Directional Power Detector with Reference
- 0.5μm pHEMT, 3MI Technology
- Bias Conditions: 7V, 680mA
- Chip dimensions: 2.5 x 1.4 x 0.1 mm (98 x 55 x 4 mils)

Preliminary Measured Data

Bias Conditions: $V_d=7V$ $I_d=680mA$



Primary Applications

- VSAT
- Point-to-Point

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

Symbol	Parameter <u>1/</u>	Value	Notes
V^+	Positive Supply Voltage	8 V	<u>2/</u>
V^-	Negative Supply Voltage Range	-5V to 0V	
I^+	Positive Supply Current (Quiescent)	TBD	<u>2/</u>
$ I_G $	Gate Supply Current	18 mA	
P_{IN}	Input Continuous Wave Power	21.4 dBm	<u>2/</u>
P_D	Power Dissipation	6.83 W	<u>2/</u> <u>3/</u>
T_{CH}	Operating Channel Temperature	150 °C	<u>4/</u> <u>5/</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/ When operated at this bias condition with a base plate temperature of 70°C, the median life is reduced from 8.9E+6 to 1E+6.
- 4/ These ratings apply to each individual FET.
- 5/ 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.

TABLE II
DC PROBE TEST
($T_A = 25^\circ\text{C}$, Nominal)

NOTES	SYMBOL	LIMITS		UNITS
		MIN	MAX	
<u>1/</u>	I_{DSS}	80	381	mA
<u>1/</u>	G_M	176	424	mS
<u>2/</u>	$ V_P $	0.5	1.5	V
<u>2/</u>	$ V_{BVGs} $	8	30	V
<u>2/</u>	$ V_{BVGD} $	13	30	V

- 1/ Measurements are performed on a 800 μm FET.
- 2/ V_P , V_{BVGD} , and V_{BVGs} are negative.

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TABLE III
RF CHARACTERIZATION TABLE
($T_A = 25^\circ\text{C}$, Nominal)
($V_d = 7\text{V}$, $I_d = 680\text{mA} \pm 5\%$)

SYMBOL	PARAMETER	TEST CONDITION	LIMITS			UNITS
			MIN	TYP	MAX	
Gain	Small Signal Gain	$F = 13-17$		32		dB
IRL	Input Return Loss	$F = 13-17$		10		dB
ORL	Output Return Loss	$F = 13-17$		10		dB
PWR	Output Power @ $P_{in} = +5 \text{ dBm}$	$F = 13-17$		33		dBm

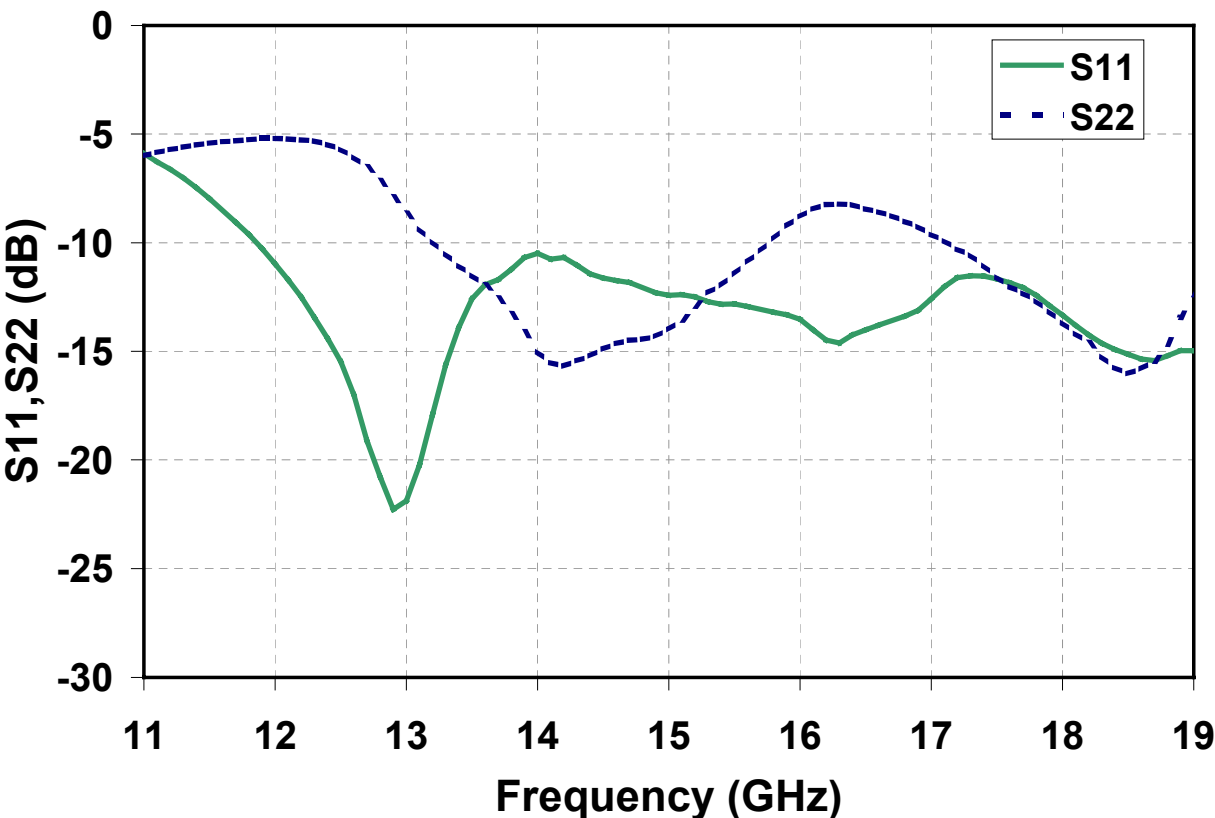
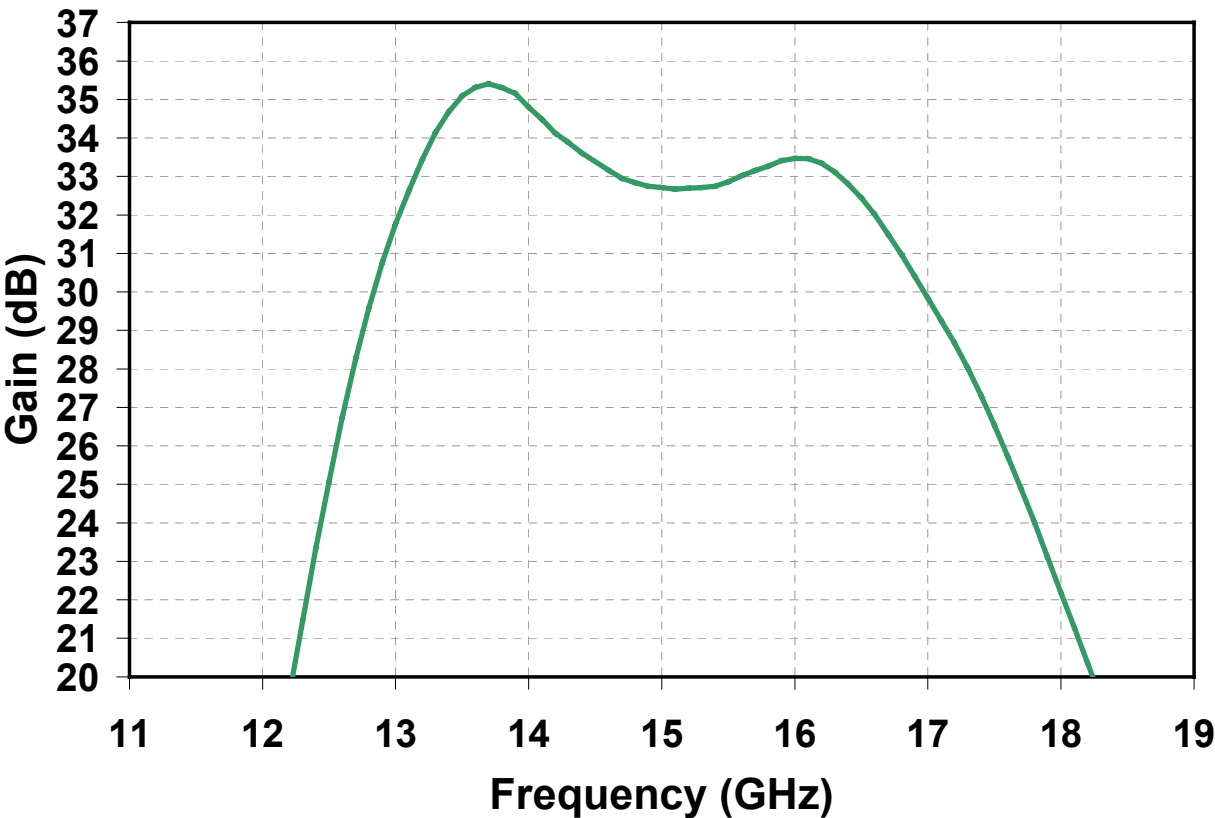
Note: Table III Lists the RF Characteristics of typical devices as determined by fixtured measurements.

TABLE IV
THERMAL INFORMATION

PARAMETER	TEST CONDITION	$T_{CH} (^\circ\text{C})$	$R_{\theta jc} (^\circ\text{C/W})$	MTTF (HRS)
$R_{\theta jc}$ Thermal Resistance (Channel to Backside)	$V_D = 7\text{V}$ $I_D = 680\text{mA}$ $P_D = 4.76\text{W}$	125.74	11.71	8.9E+6

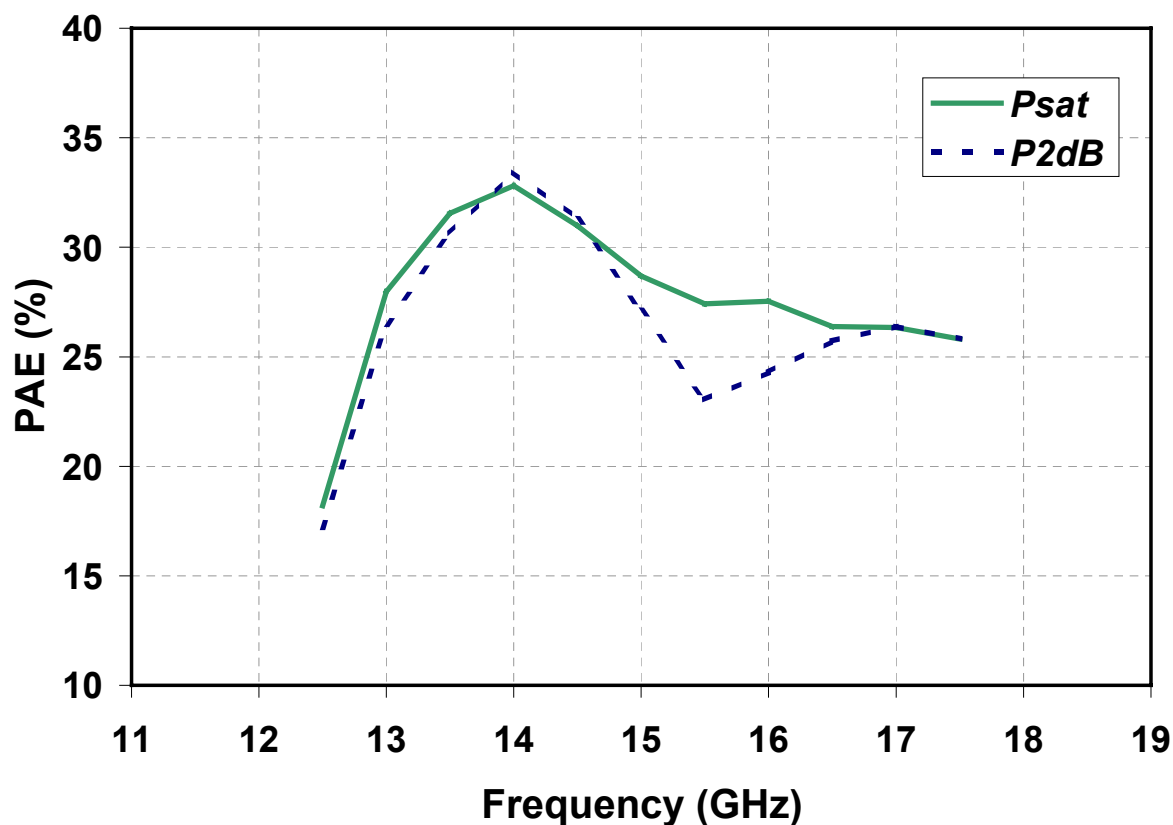
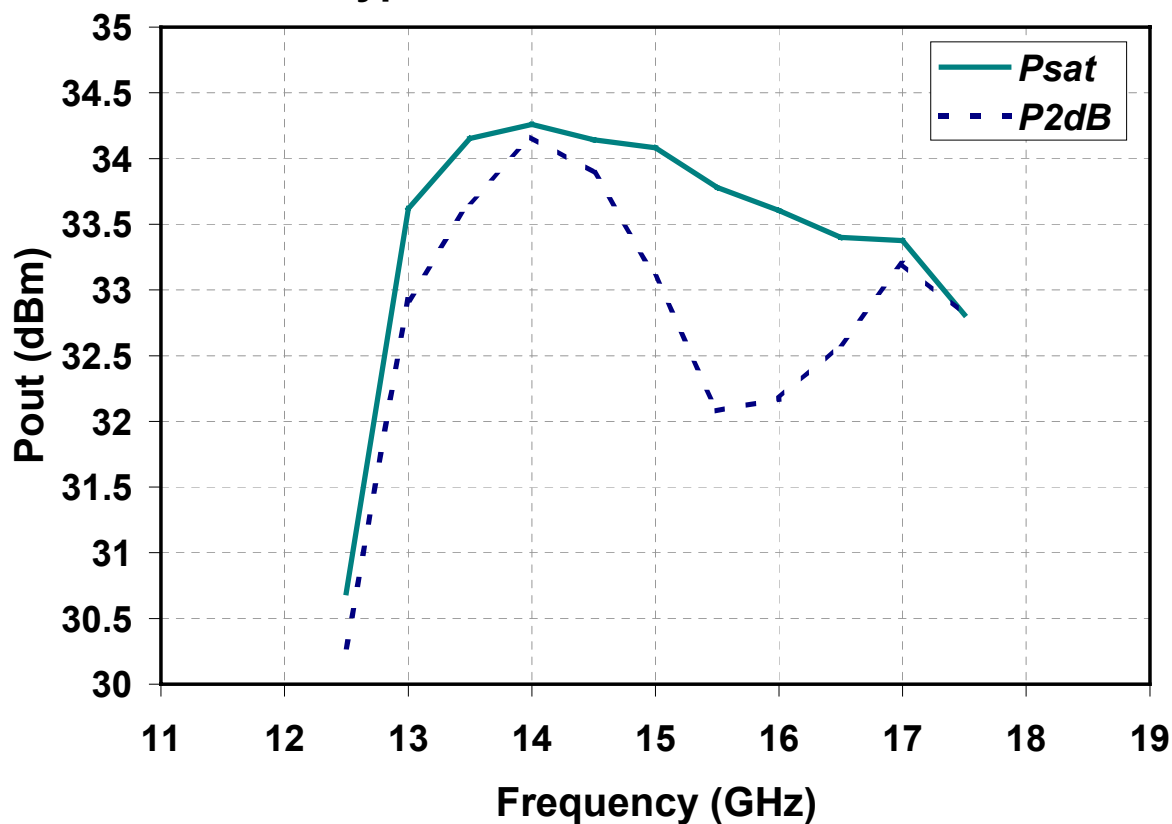
Note: Assumes eutectic attach using 1.5mil 80/20 AuSn mounted to a 20mil CuMo carrier at 70°C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

Typical Fixtured Performance



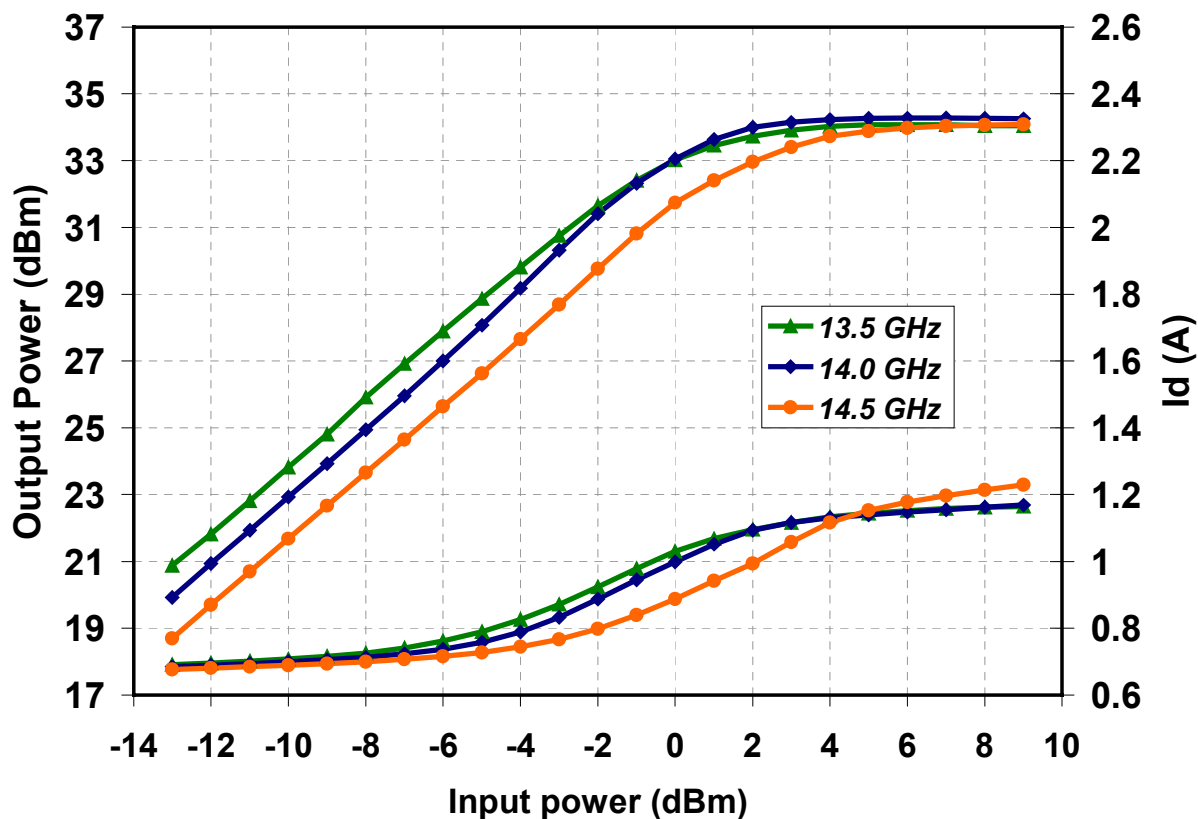
Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.

Typical Fixtured Performance



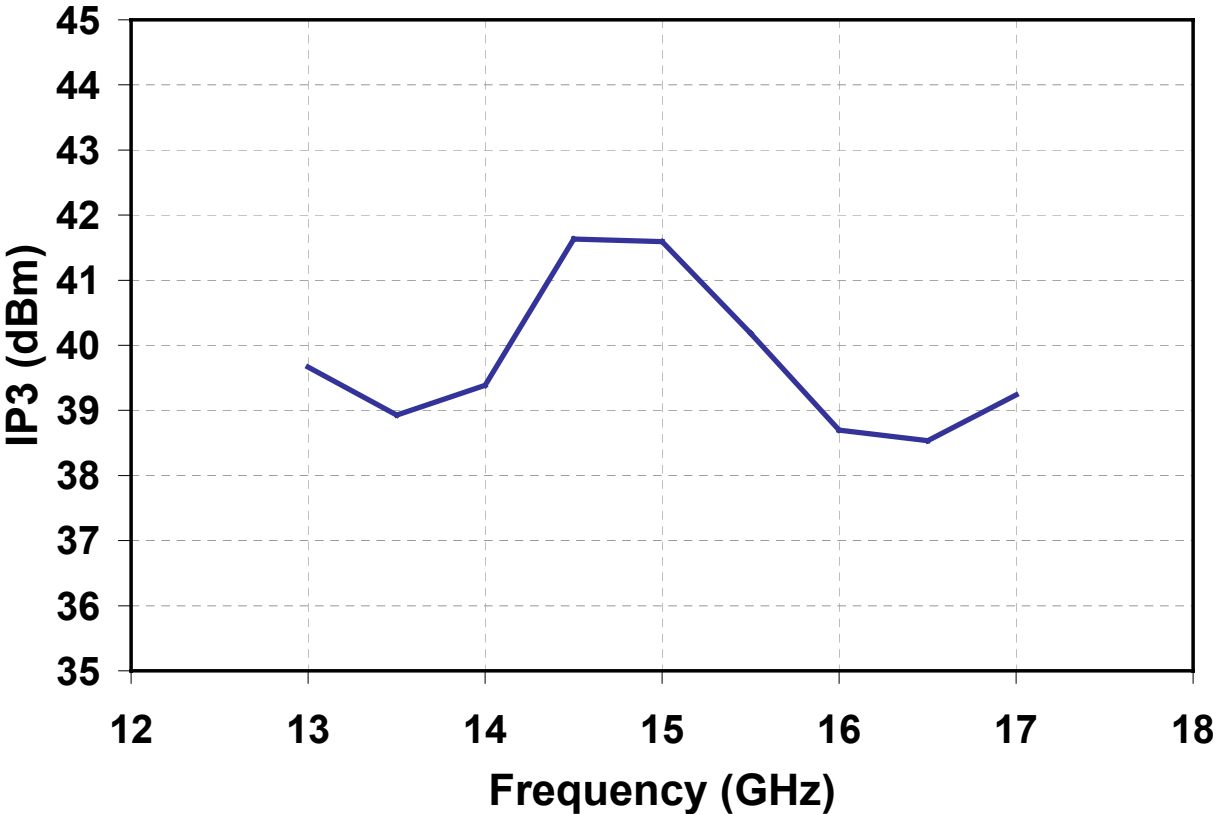
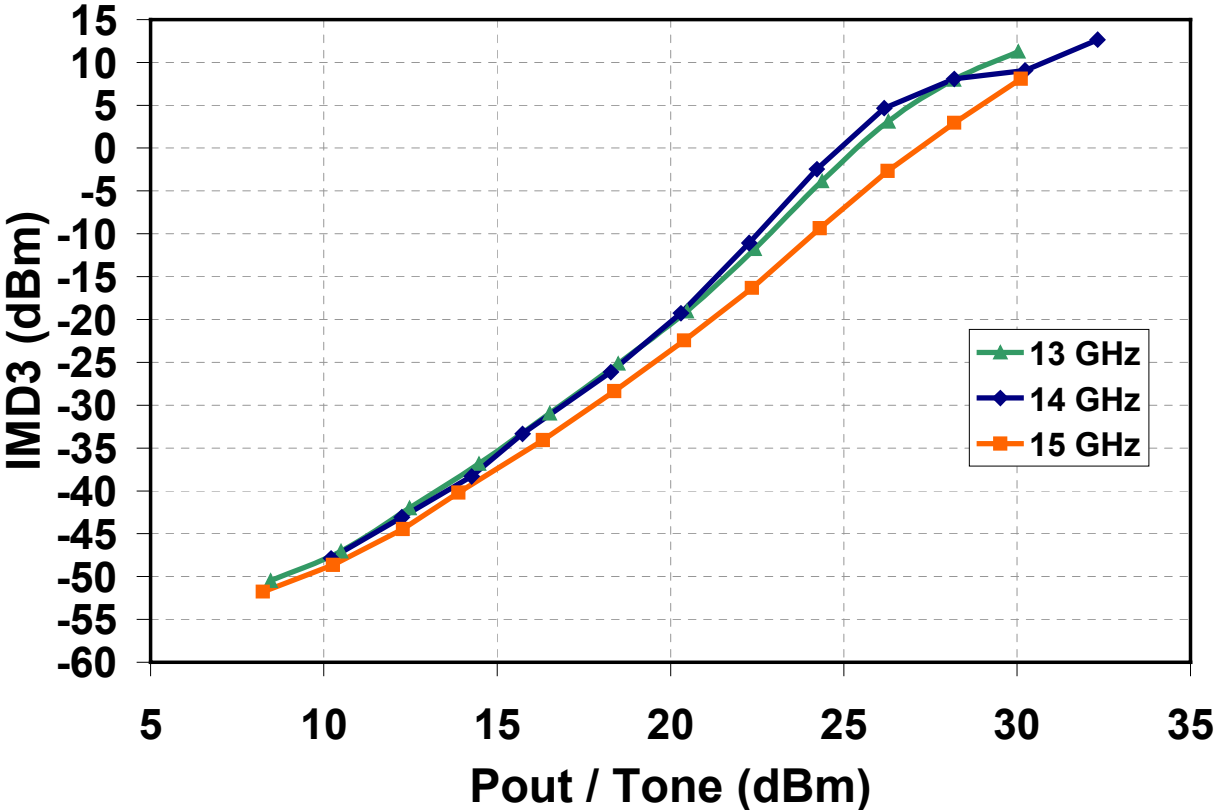
Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.

Typical Fixtured Performance



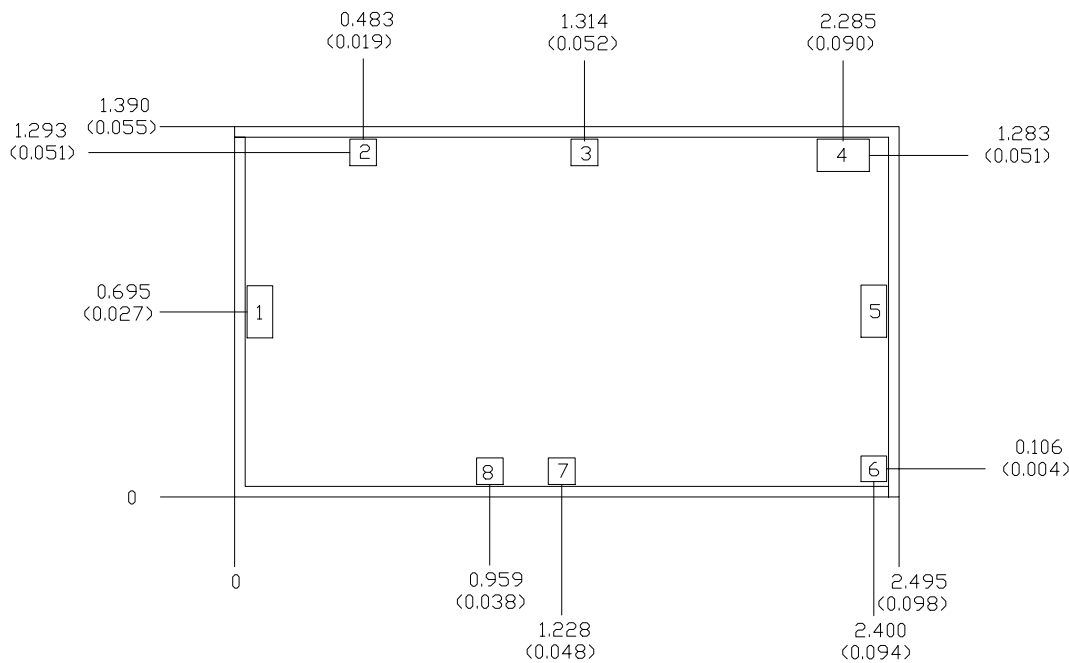
Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.

Typical Fixtured Performance



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.

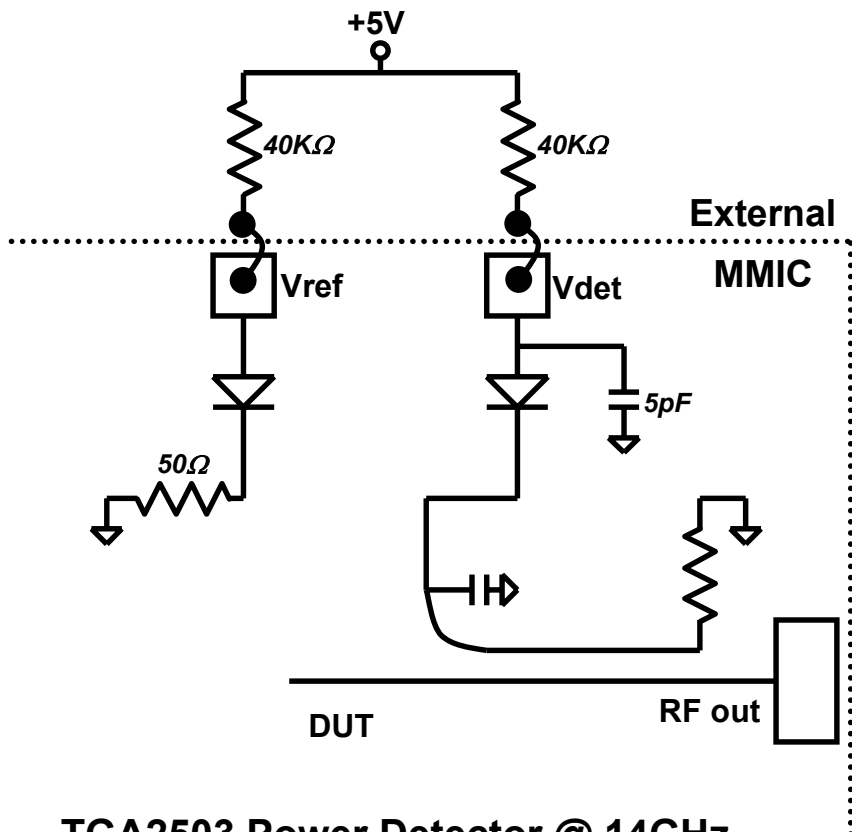
Mechanical Drawing



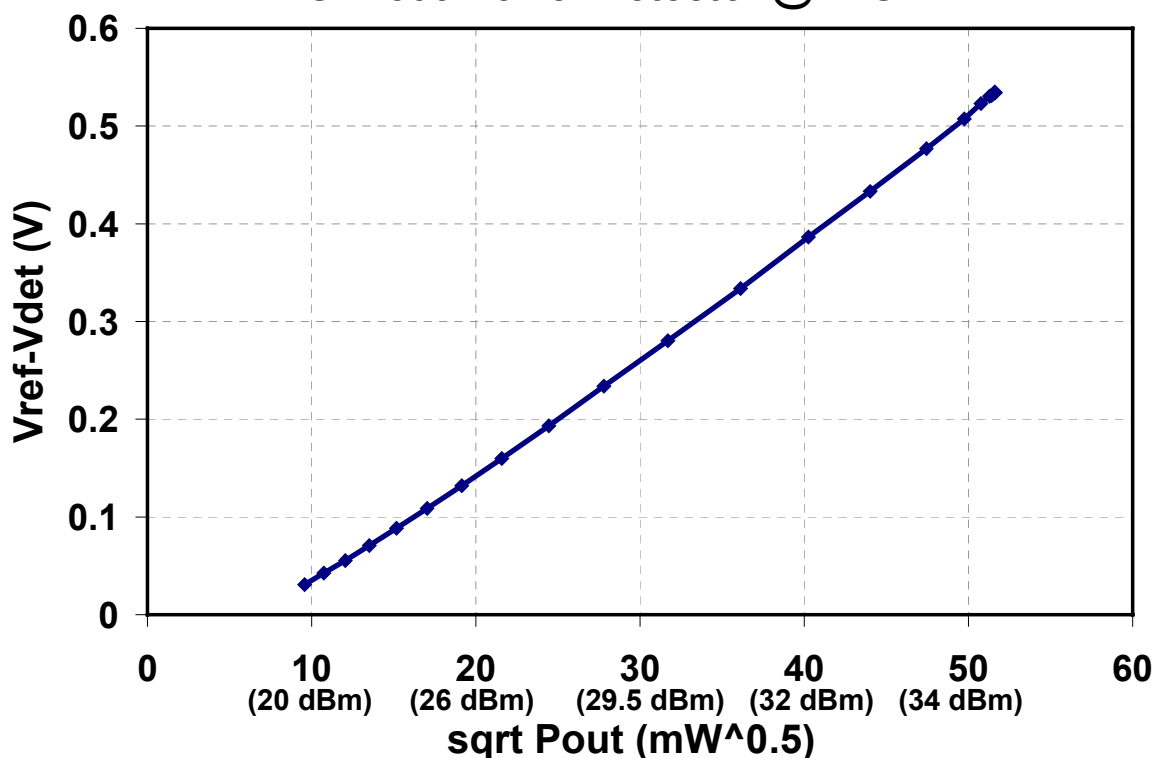
Units: millimeters (inches)
Thickness: 0.1016 (0.004) (reference only)
Chip edge to bond pad dimensions are shown to center of Bond pads.
Chip size tolerance: +/- 0.0508 (0.002)
RF Ground through Backside

Bond Pad #1	(RF Input)	0.100 x 0.200	(0.004 x 0.008)
Bond Pad #2	(Vref)	0.100 x 0.100	(0.004 x 0.004)
Bond Pad #3	(Vd3)	0.100 x 0.100	(0.004 x 0.004)
Bond Pad #4	(Vd4)	0.200 x 0.125	(0.008 x 0.005)
Bond Pad #5	(RF Output)	0.100 x 0.200	(0.004 x 0.008)
Bond Pad #6	(Vdet)	0.100 x 0.100	(0.004 x 0.004)
Bond Pad #7	(Vg4)	0.100 x 0.100	(0.004 x 0.004)
Bond Pad #8	(Vg3)	0.100 x 0.100	(0.004 x 0.004)

Power Detector

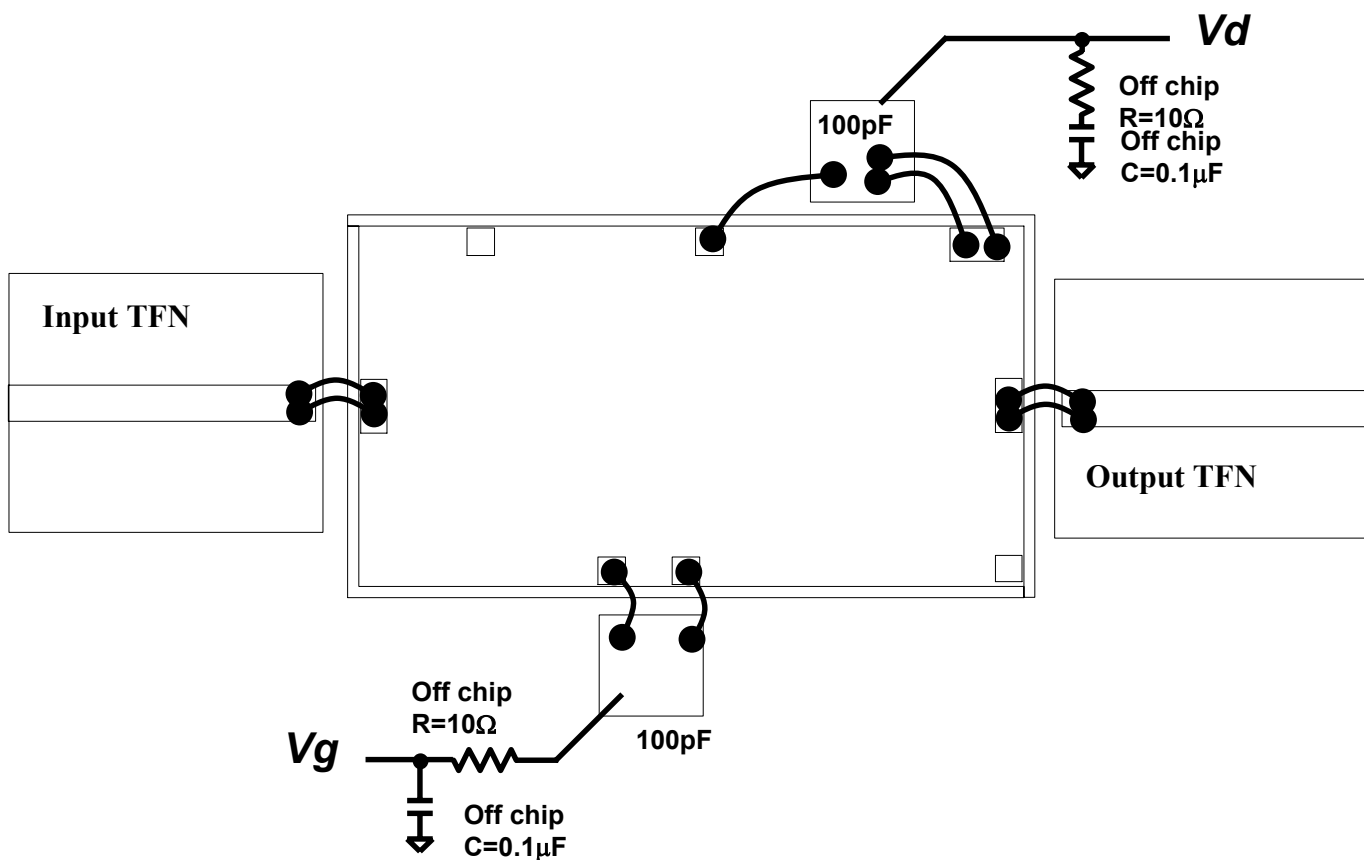


TGA2503 Power Detector @ 14GHz



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 & Bonding Diagram



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

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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°C. (30 seconds maximum)
- 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.