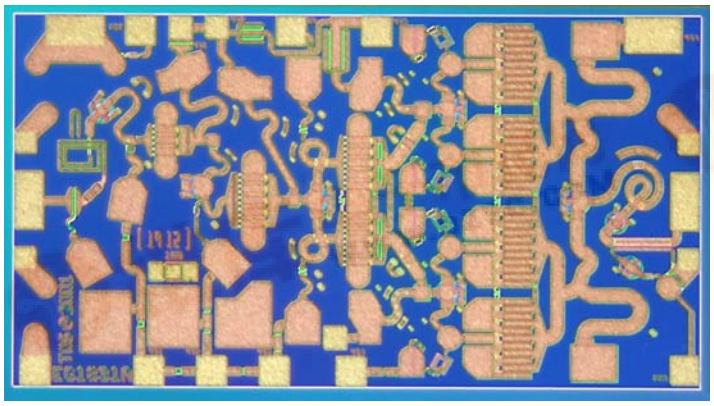
TriQuint SEMICONDUCTOR

Advance Product Information
December 17, 2002

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



Key Features and Performance

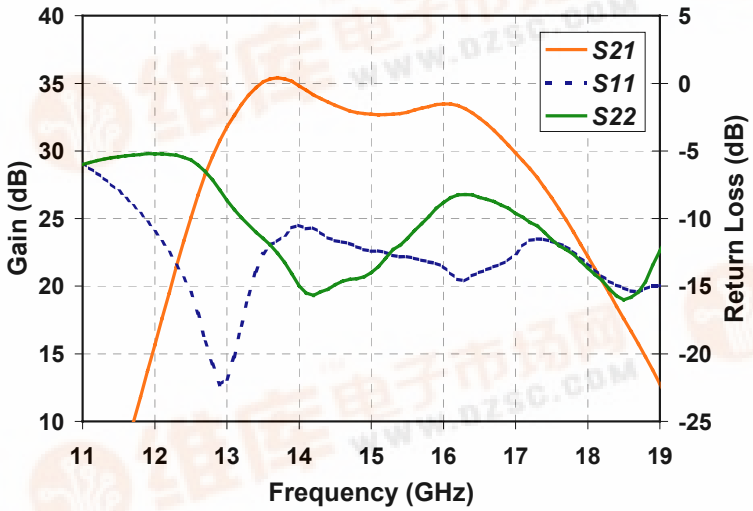
- 33 dBm Midband Pout
- 32 dB Nominal Gain
- 10 dB Typical Return Loss
- Built-in Directional Power Detector with Reference
- 0.5µm pHEMT, 3MI Technology
- Bias Conditions: 7V, 680mA
- Chip dimensions: 2.5 x 1.4 x 0.1 mm (98 x 55 x 4 mils)

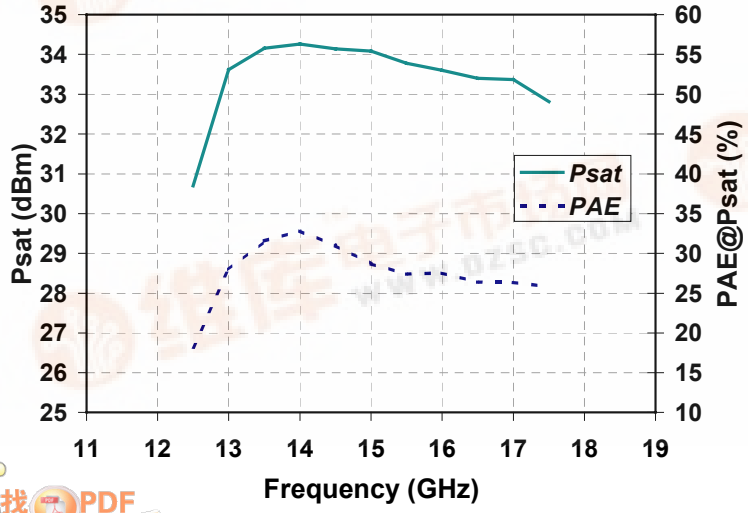
Primary Applications

- VSAT
- Point-to-Point

Preliminary Measured Data

Bias Conditions: Vd=7V Id=680mA





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 1/	Value	Notes
V^+	Positive Supply Voltage	8 V	2/
V^-	Negative Supply Voltage Range	-5V to 0V	
I^+	Positive Supply Current (Quiescent)	TBD	2/
$\| I_G \|$	Gate Supply Current	18 mA	
P_{IN}	Input Continuous Wave Power	21.4 dBm	2/
P_D	Power Dissipation	6.83 W	2/ 3/
T_{CH}	Operating Channel Temperature	150 ^{0}C	4/ 5/
T_M	Mounting Temperature (30 Seconds)	320 ^{0}C	
T_{STG}	Storage Temperature	-65 to 150 ^{0}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
(TA = 25 °C, Nominal)

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

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

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TABLE III
RF CHARACTERIZATION TABLE
(T_A = 25°C, Nominal)
(Vd = 7V, Id = 680mA ±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 @ Pin = +5 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} (°C)	$R_{\theta jc}$ (°C/W)	MTTF (HRS)
$R_{\theta jc}$ Thermal Resistance (Channel to Backside)	V_D = 7V I_D = 680mA P_D = 4.76W	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.

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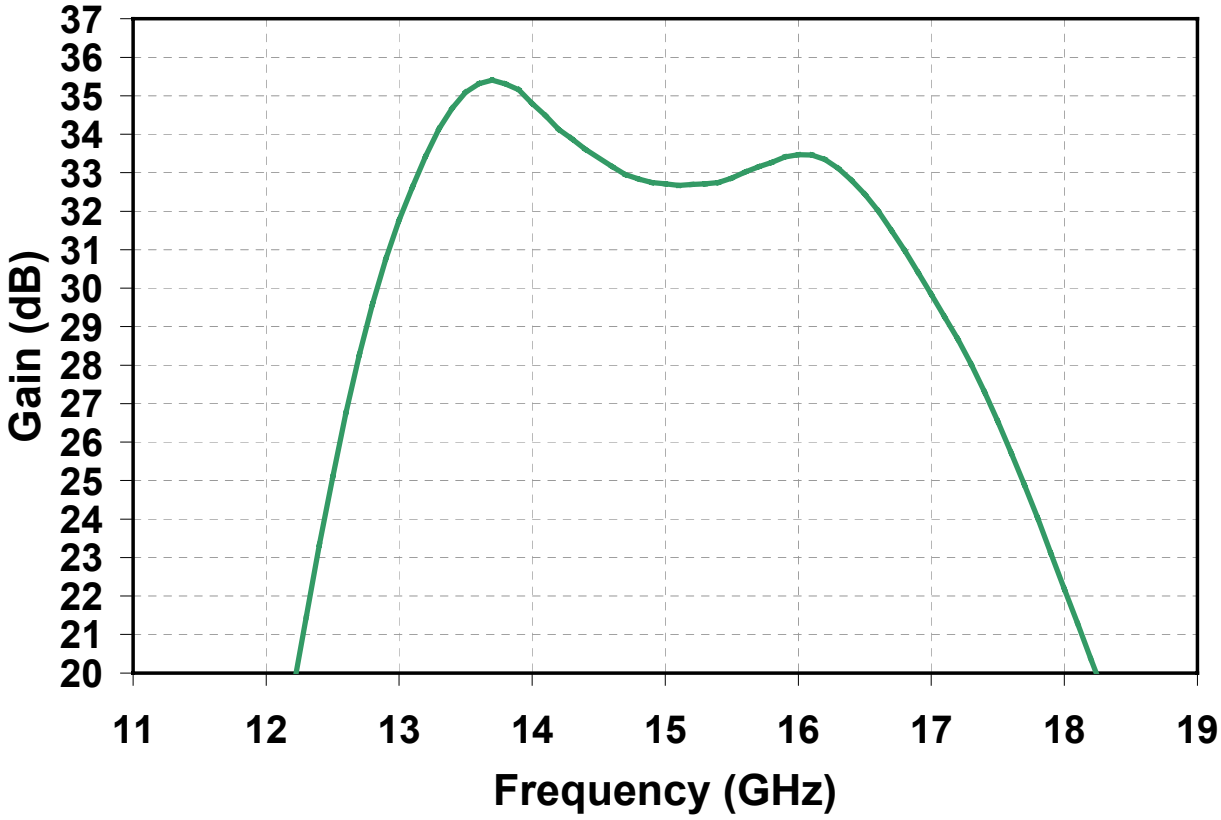
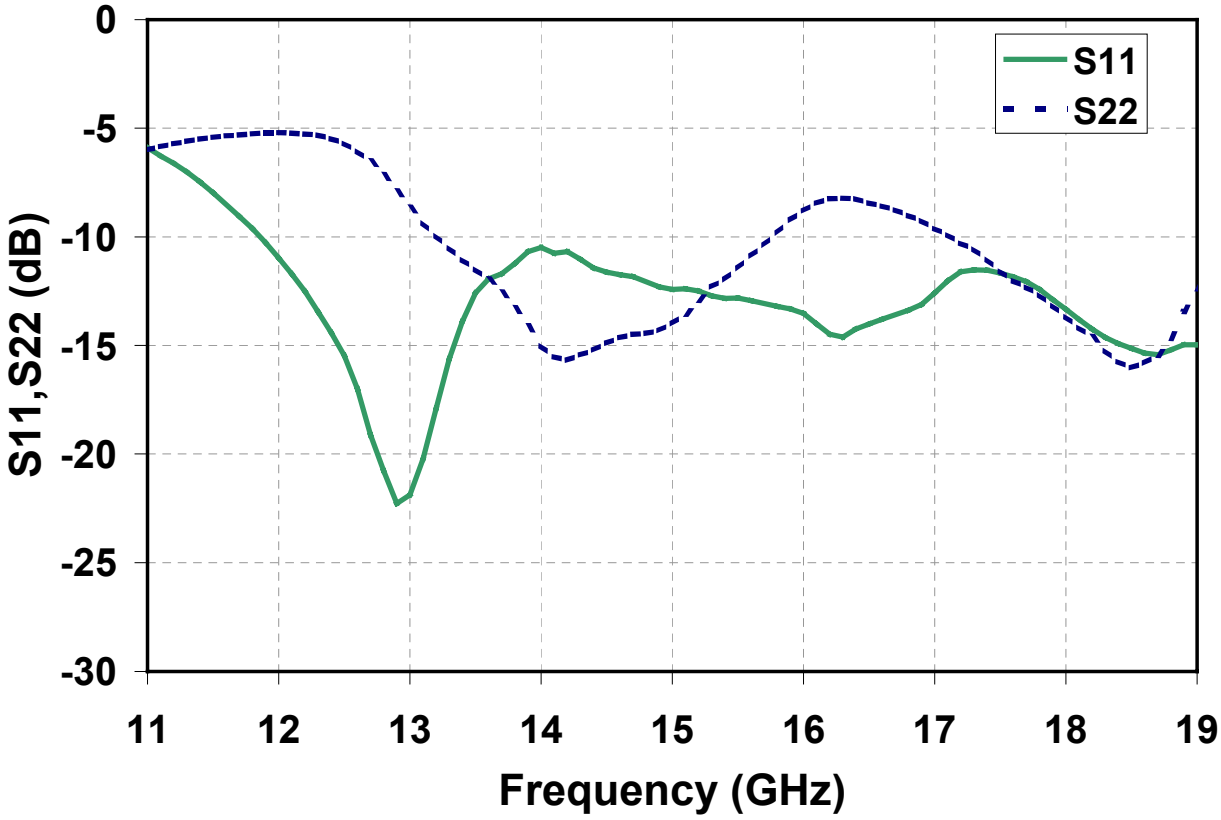
Typical Fixtured Performance





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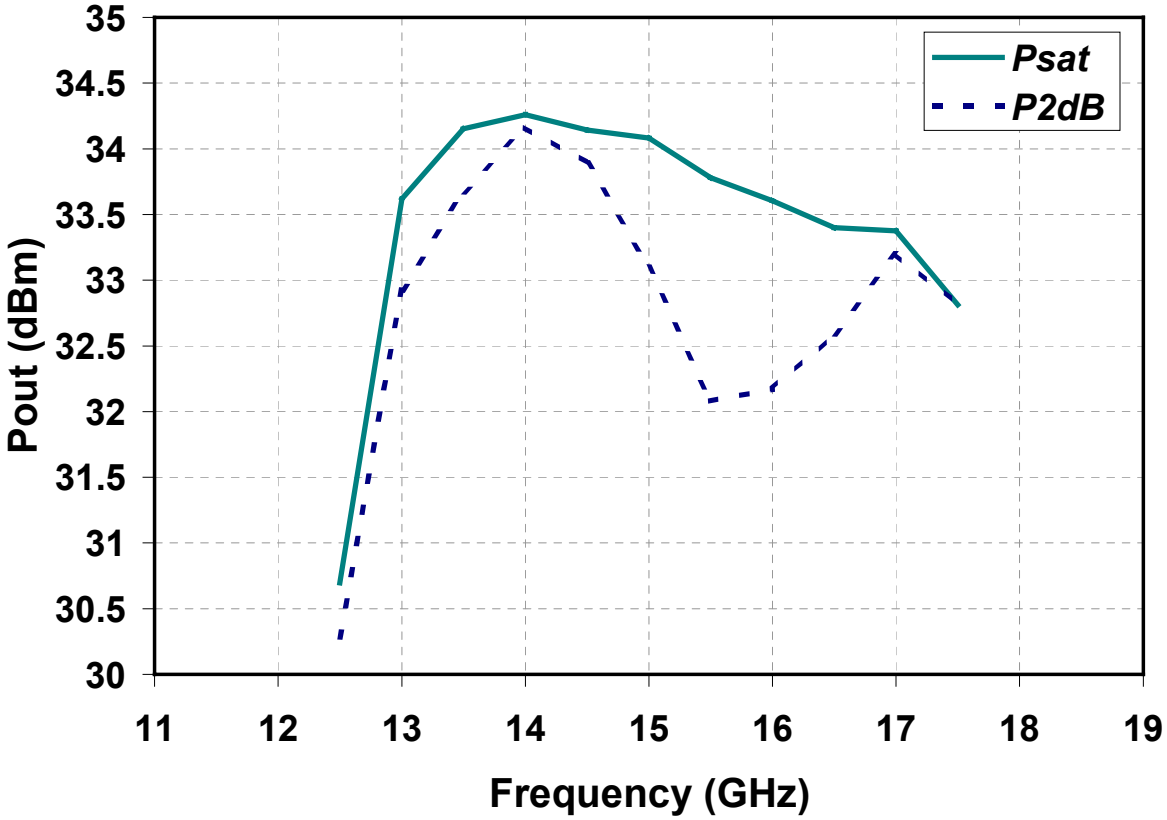

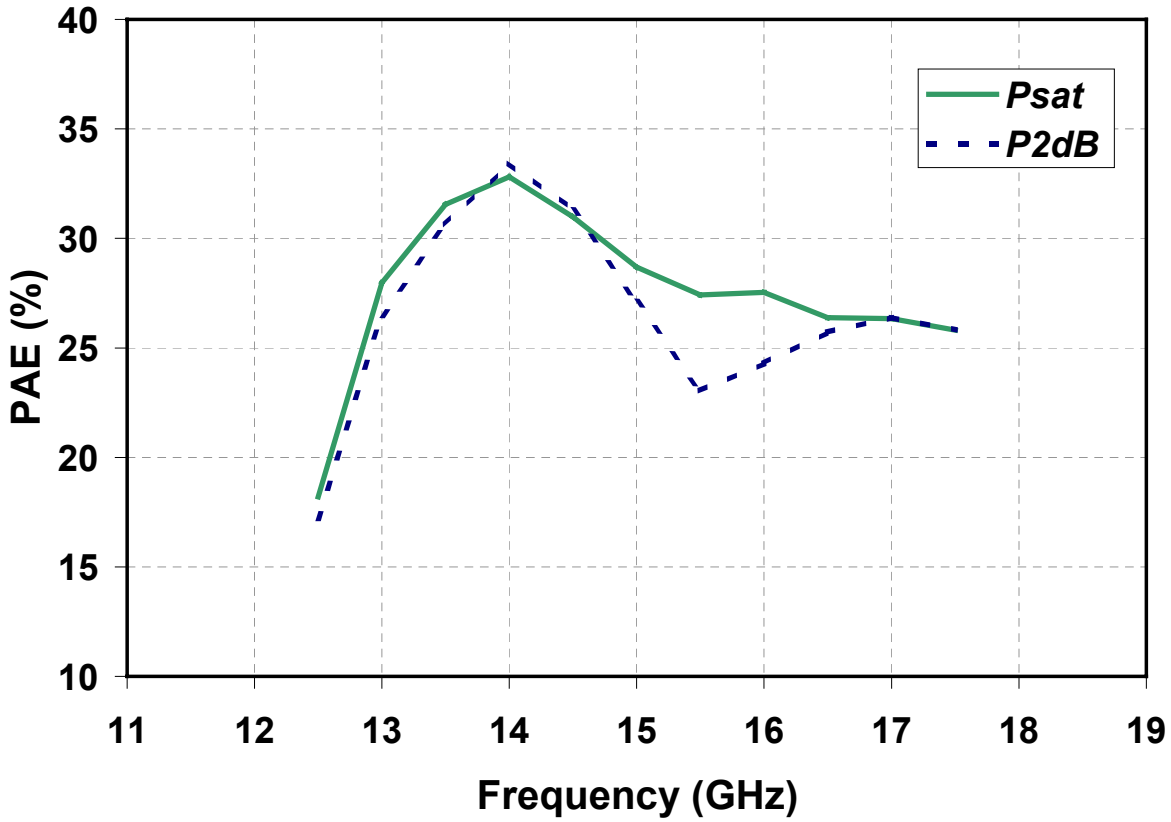

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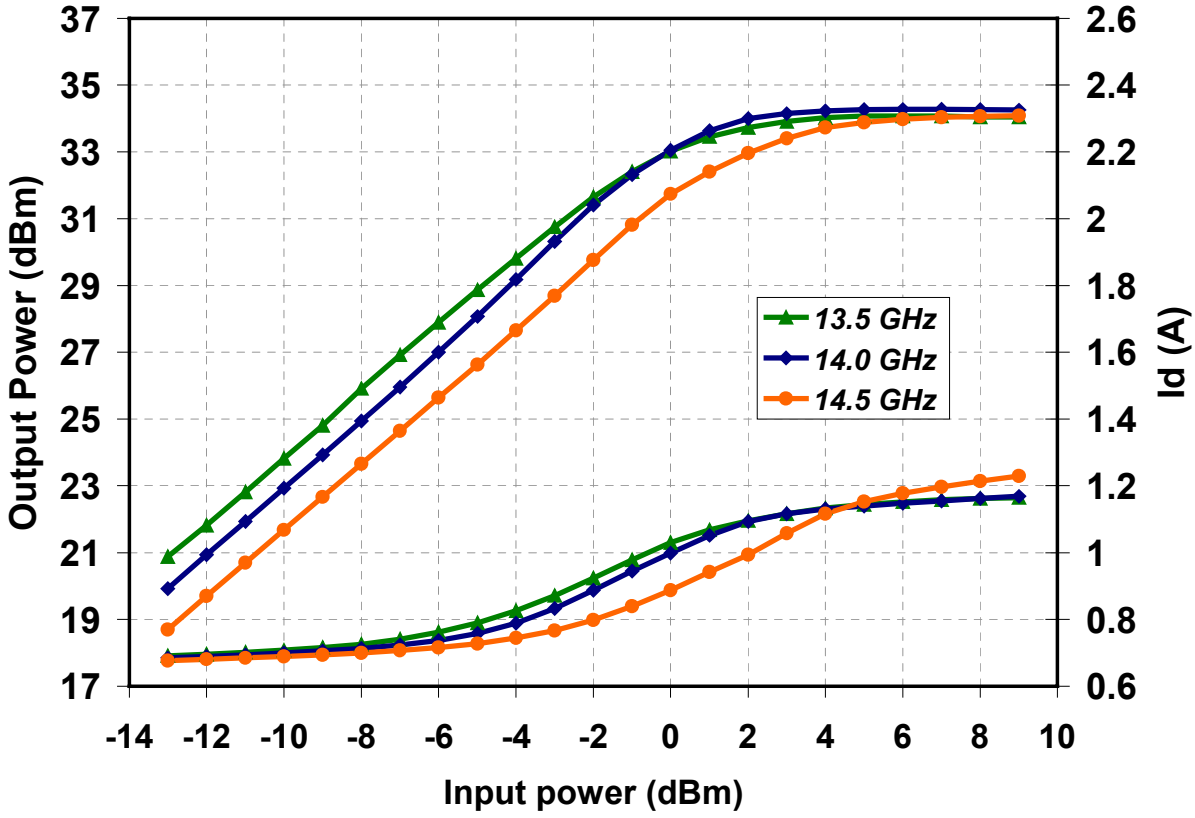

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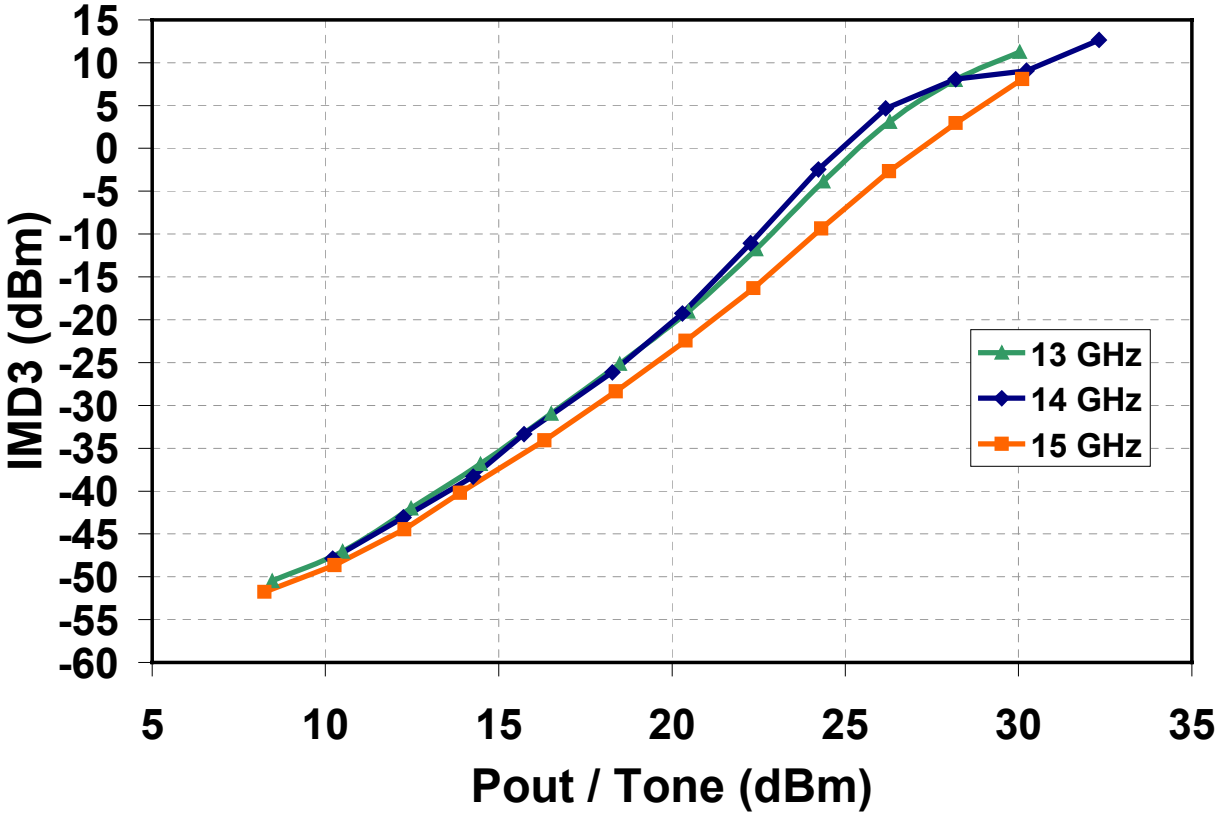

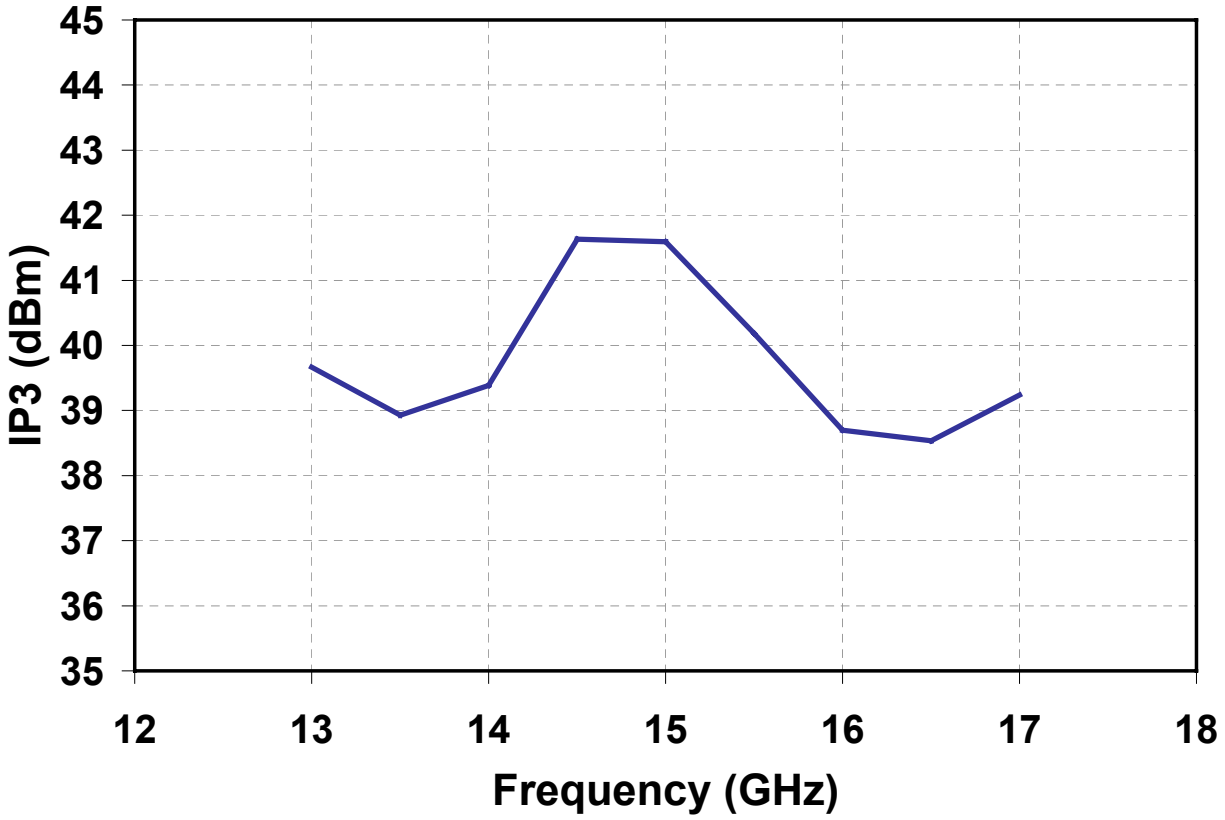

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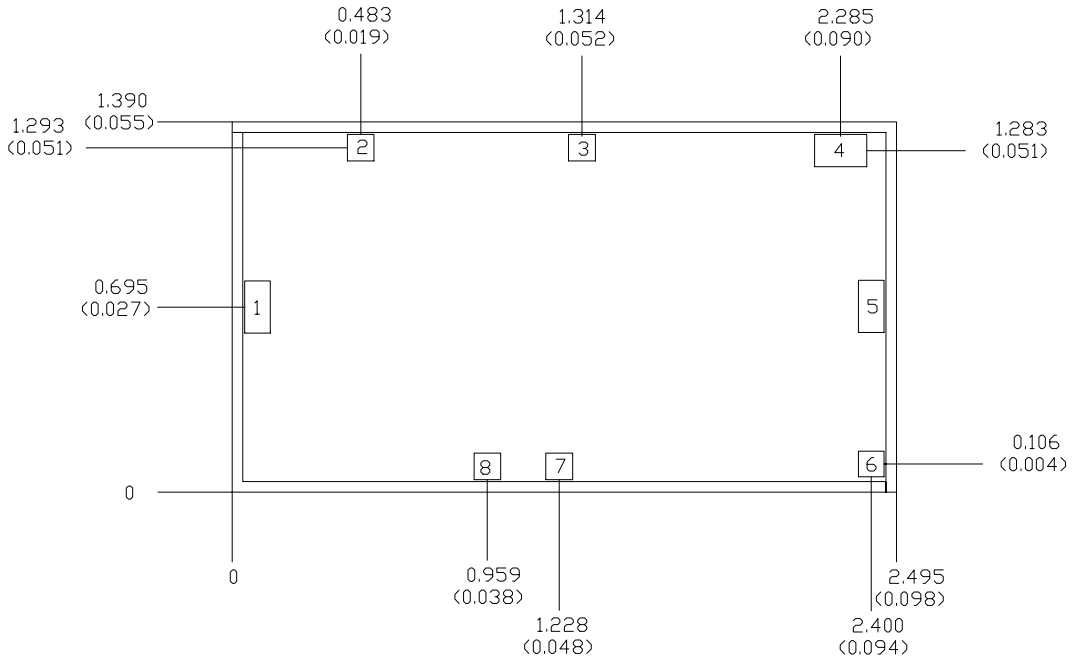
Mechanical Drawing



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)

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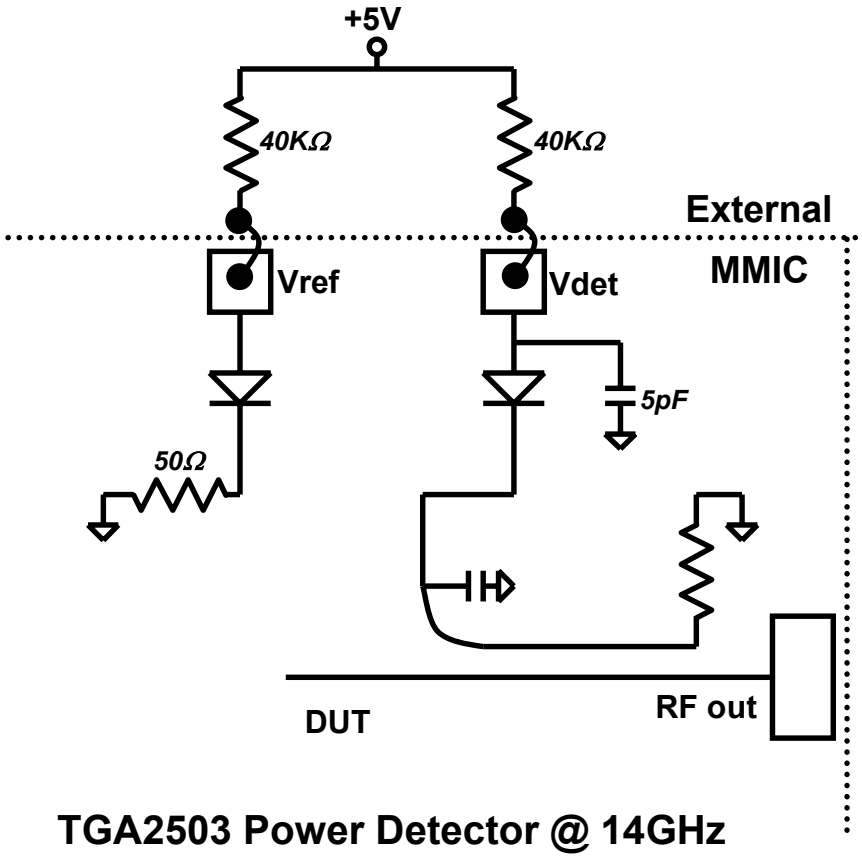
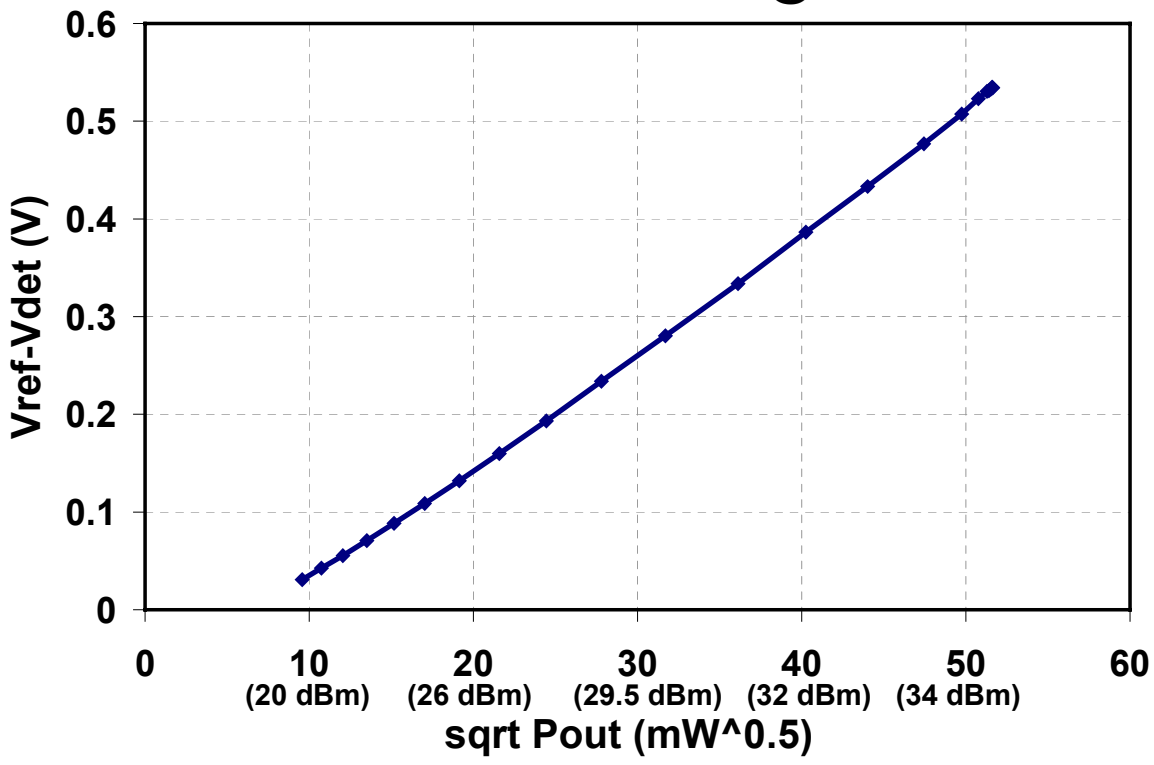
Power Detector



TGA2503 Power Detector @ 14GHz



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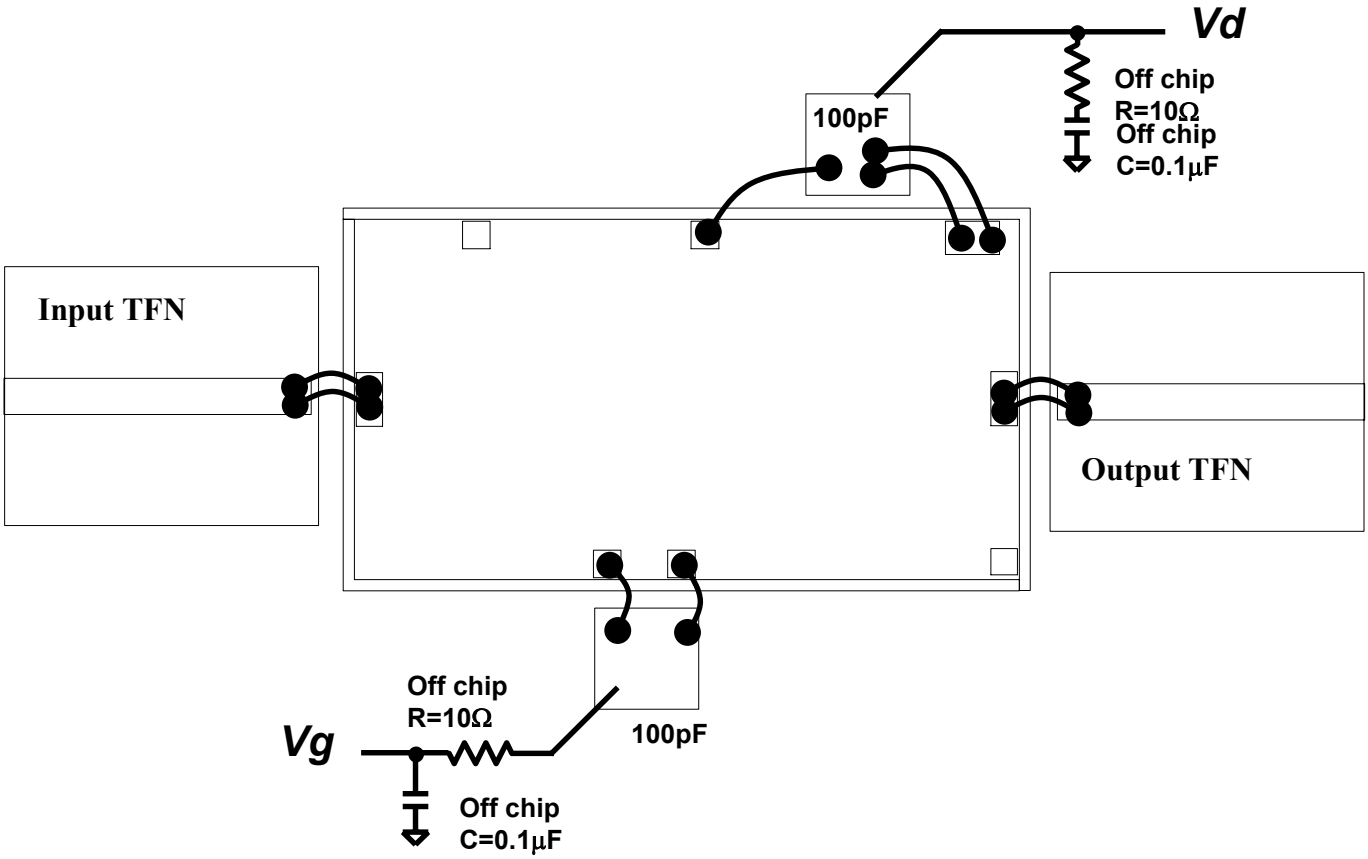
Chip Assembly & Bonding Diagram



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.

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