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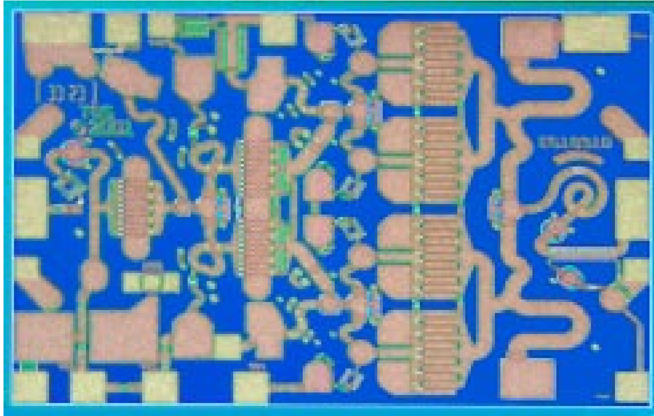
TriQuint SEMICONDUCTOR®

Advance Product Information
April 5, 2006

13 - 17 GHz 2.5 Watt, 25dB Power Amplifier TGA2505



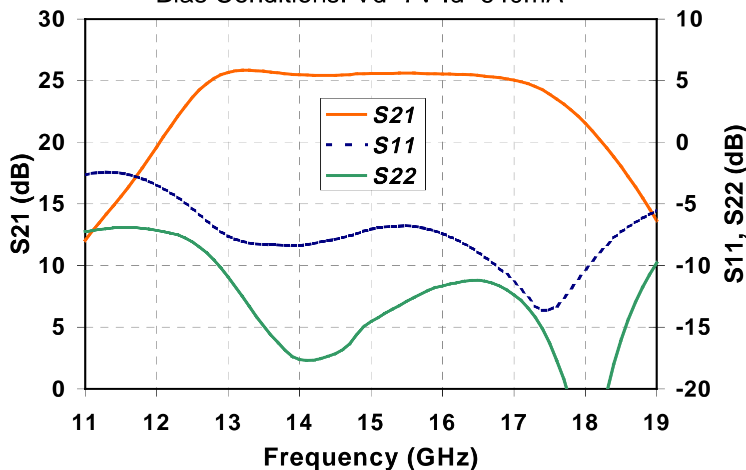
Key Features and Performance

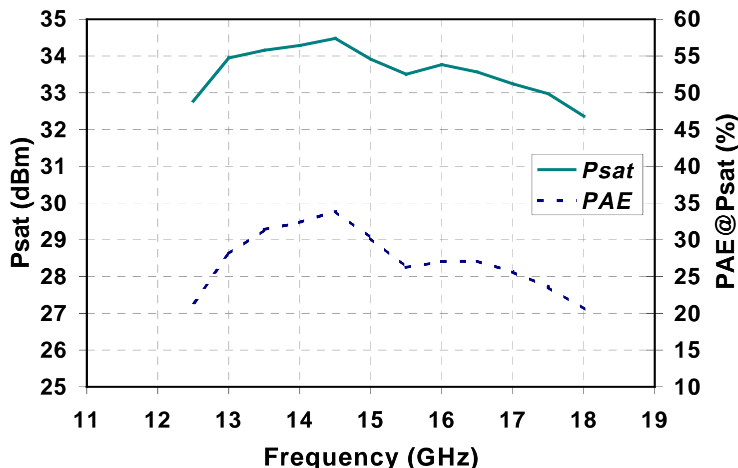
- 34 dBm Midband Pout
- 25 dB Nominal Gain
- 7 dB Typical Input Return Loss
- 12 dB Typical Output Return Loss
- Built-in Directional Power Detector with Reference
- 0.25µm pHEMT Technology
- Bias Conditions: 7V, 640mA
- Chip dimensions:
  2.03 x 1.39 x 0.10 mm
  (0.080 x 0.055 x 0.004 inches)

Primary Applications

- VSAT
- Point-to-Point

Preliminary Measured Performance





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 1/	Value	Notes
V^+	Positive Supply Voltage	8 V	2/
V^-	Negative Supply Voltage Range	-5V to 0V	
I^+	Positive Supply Current (Quiescent)	1300 mA	2/
$\| I_G \|$	Gate Supply Current	18 mA	
P_{IN}	Input Continuous Wave Power	24 dBm	2/
P_D	Power Dissipation	6.43 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	175	425	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.

TABLE III
RF CHARACTERIZATION TABLE
(T_A = 25°C, Nominal)
(Vd = 7V, Id = 640mA ±5%)

SYMBOL	PARAMETER	TEST CONDITION	LIMITS	UNITS
			TYP	
Gain	Small Signal Gain	F = 13 – 17 GHz	25	dB
IRL	Input Return Loss	F = 13 – 17 GHz	7	dB
ORL	Output Return Loss	F = 13 – 17 GHz	12	dB
PWR	Output Power @ Pin = +15 dBm	F = 13 – 17 GHz	34	dBm

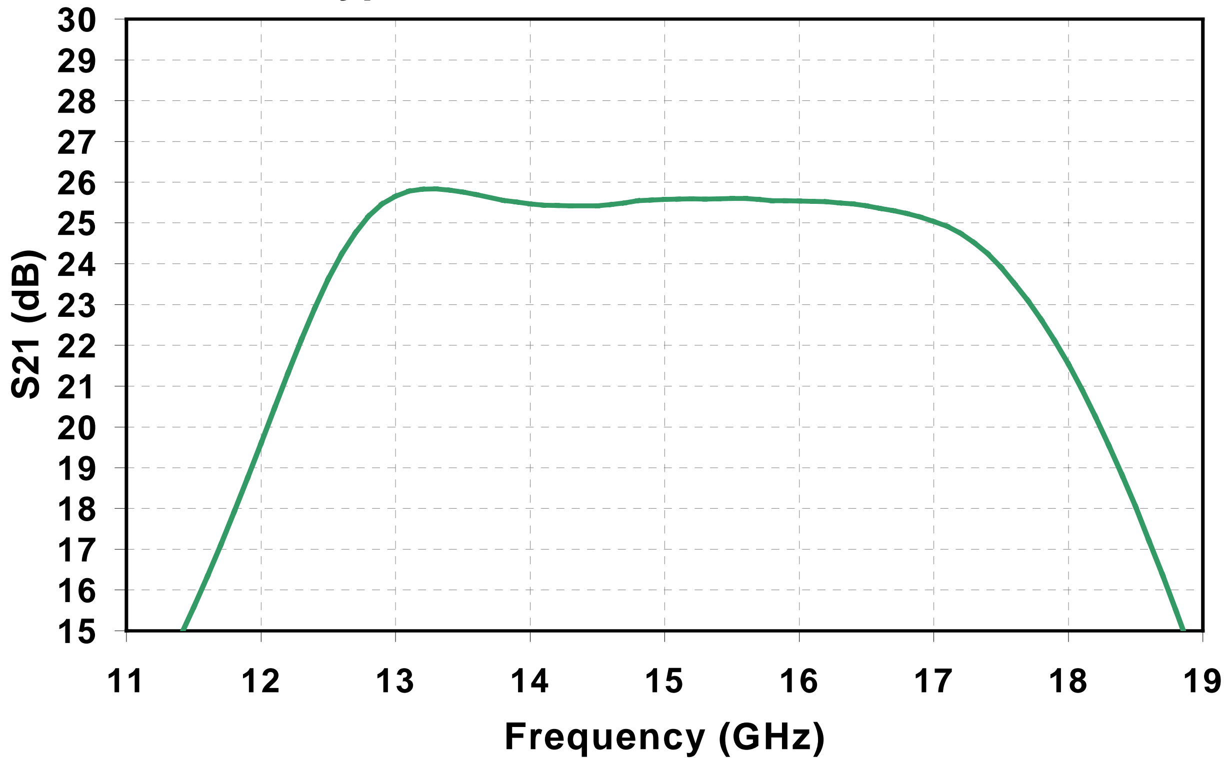
Note: Table III Lists the RF Characteristics of typical devices as determined by fixtured measurements.

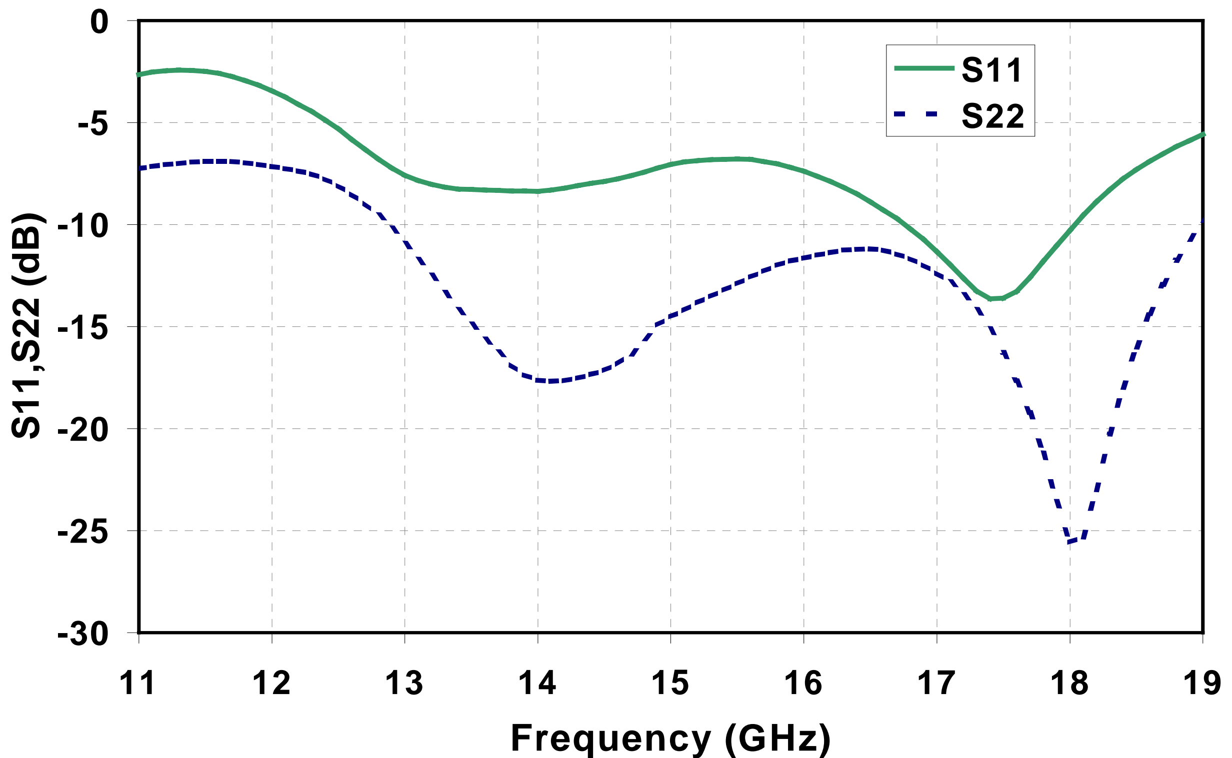
TABLE IV
THERMAL INFORMATION

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 = 640mA P_D = 4.48W	125.74	12.44	8.9E+6

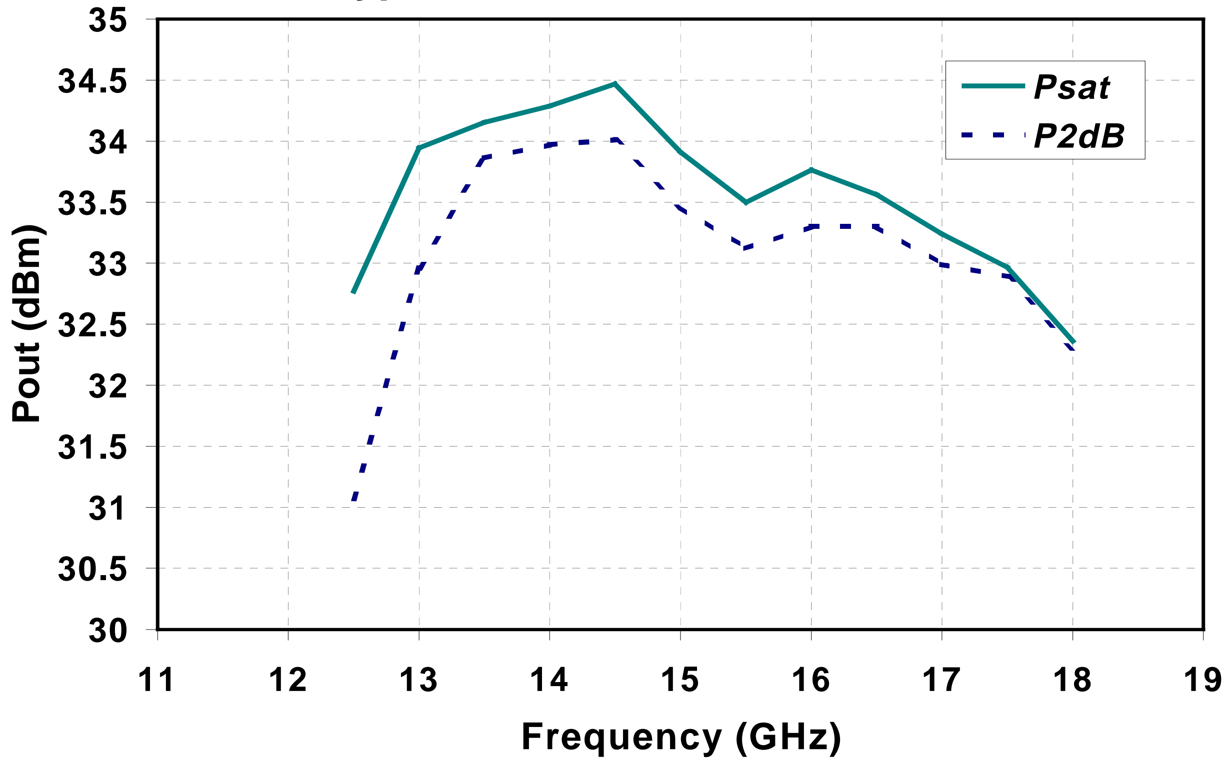
Note: Assumes eutectic attach using 1.5mil 80/20 AuSn mounted to a 20mil CuMo carrier at 70°C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

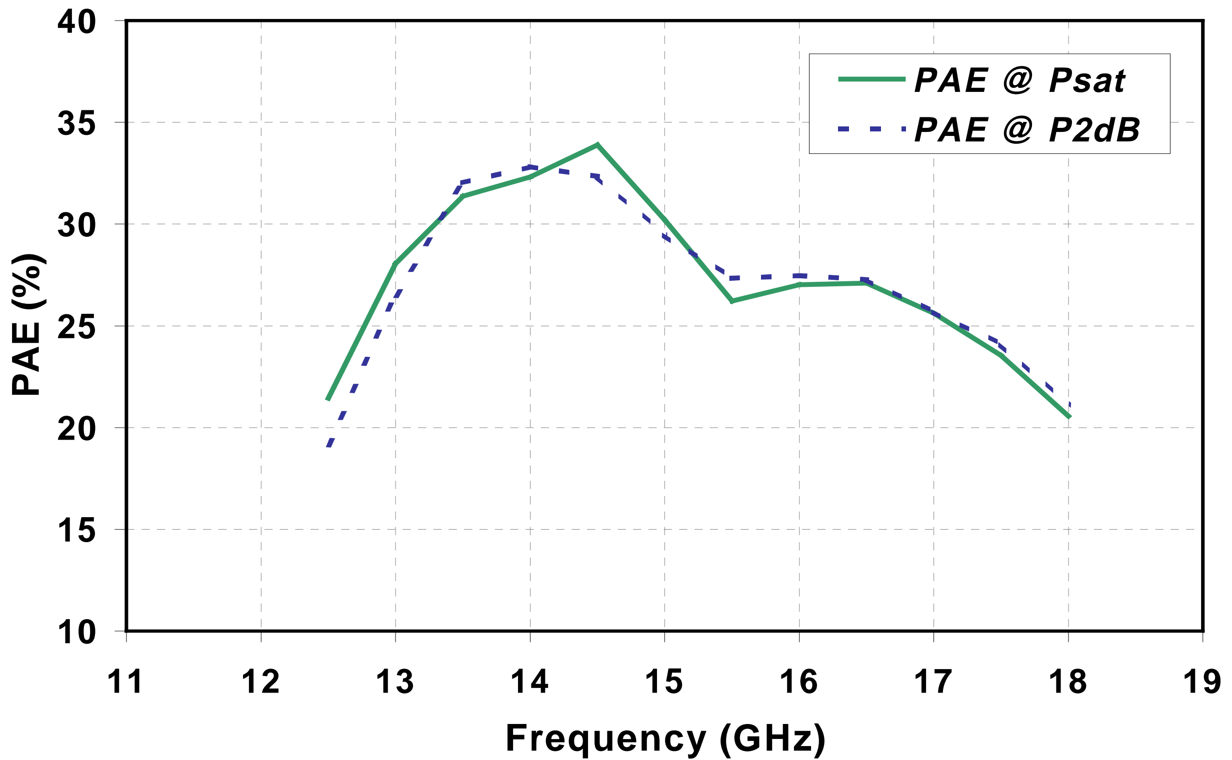
Typical Fixtured Performance





Typical Fixtured Performance





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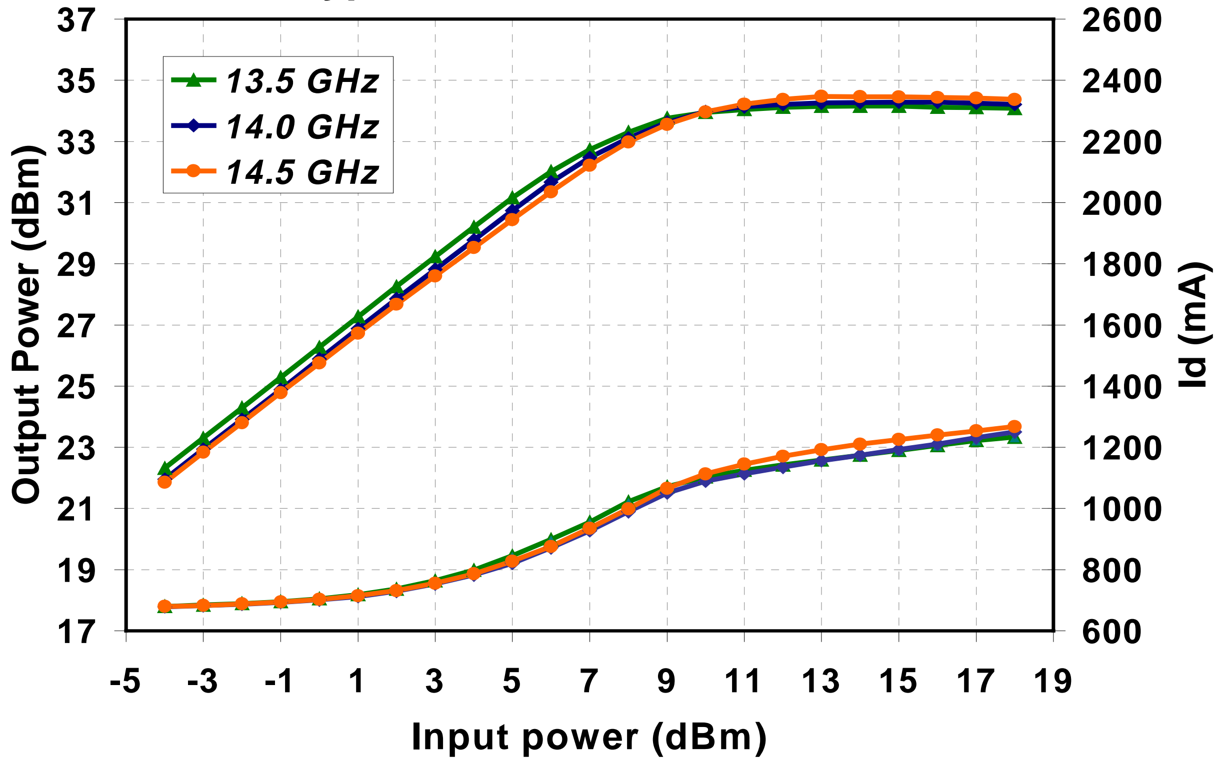
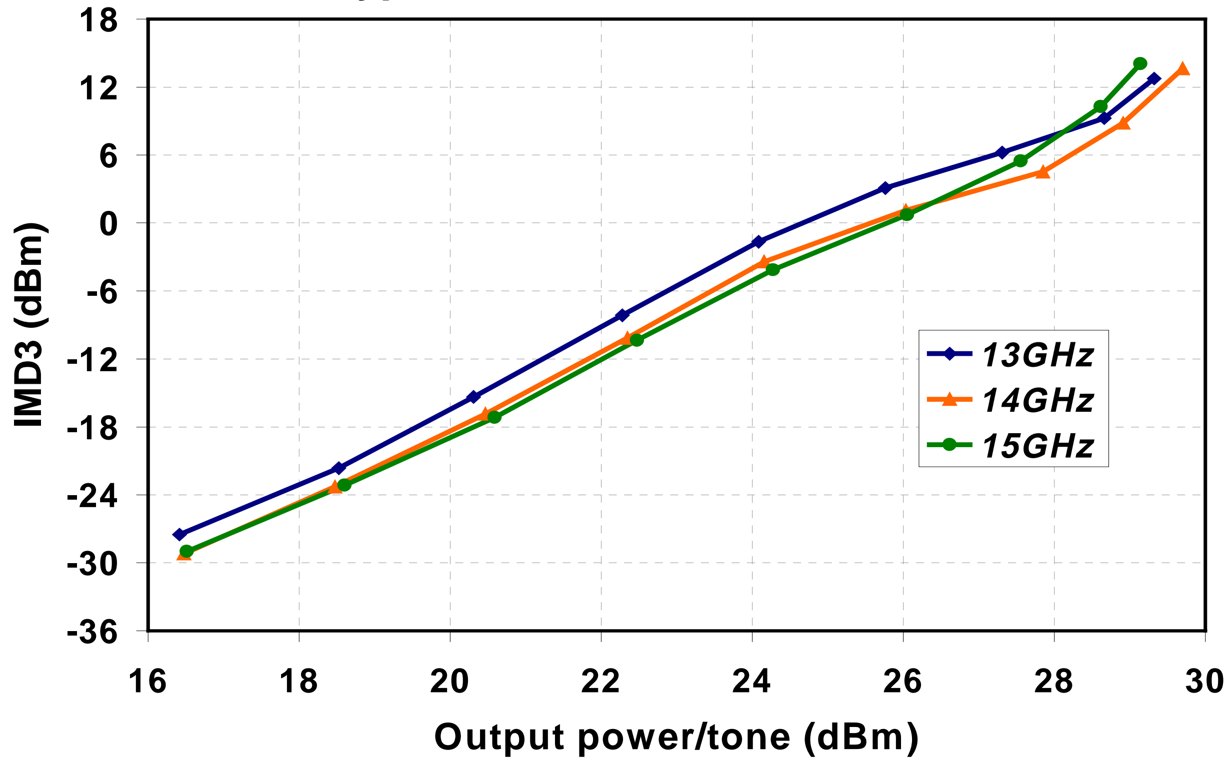
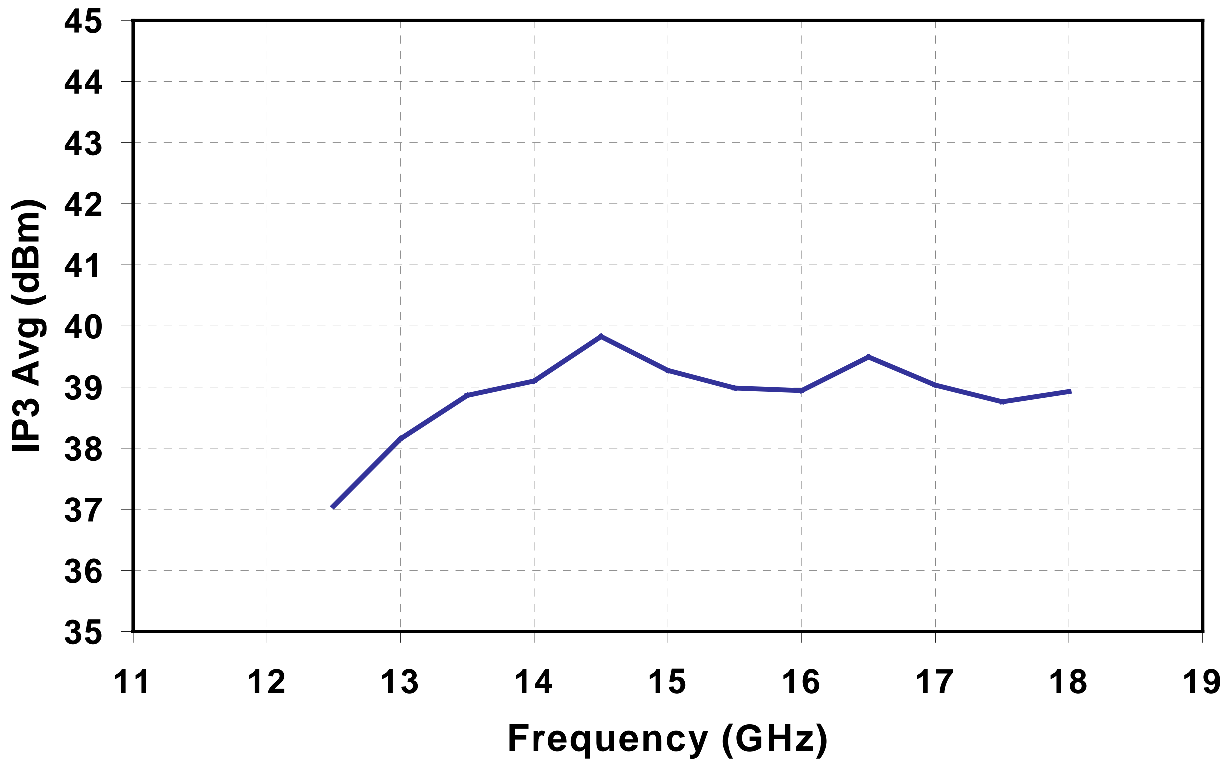
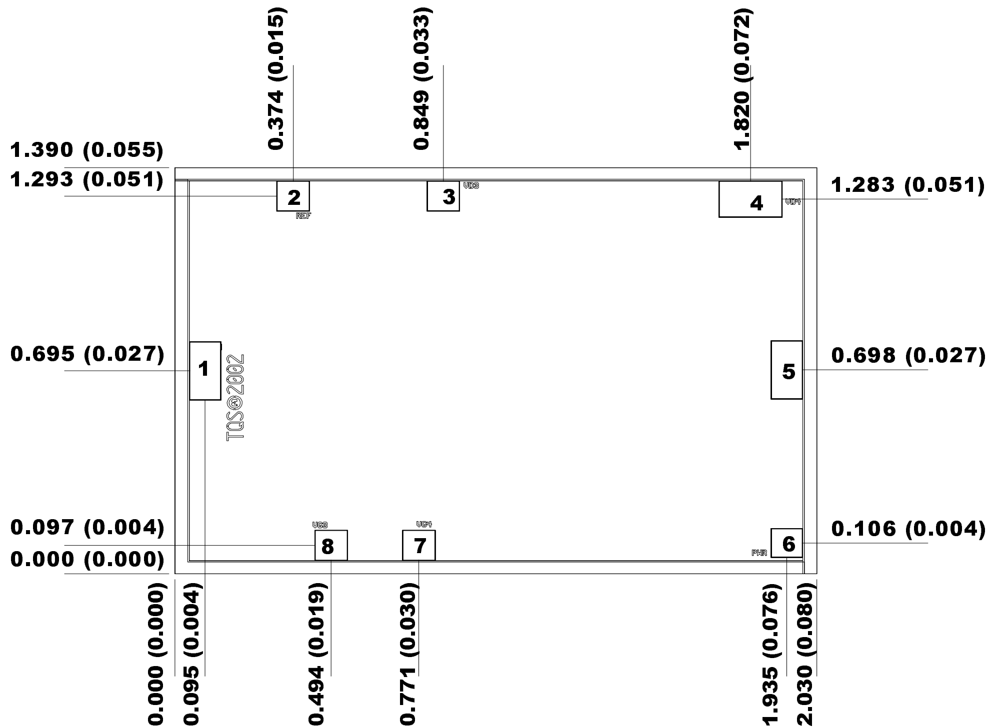


Typical Fixtured Performance





Mechanical Drawing

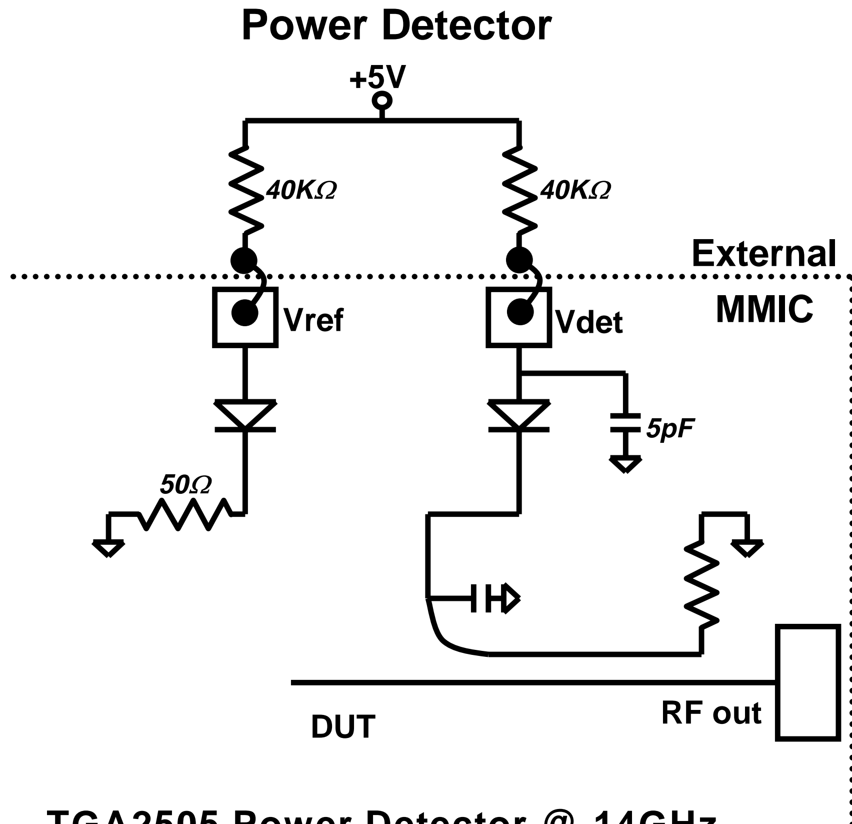


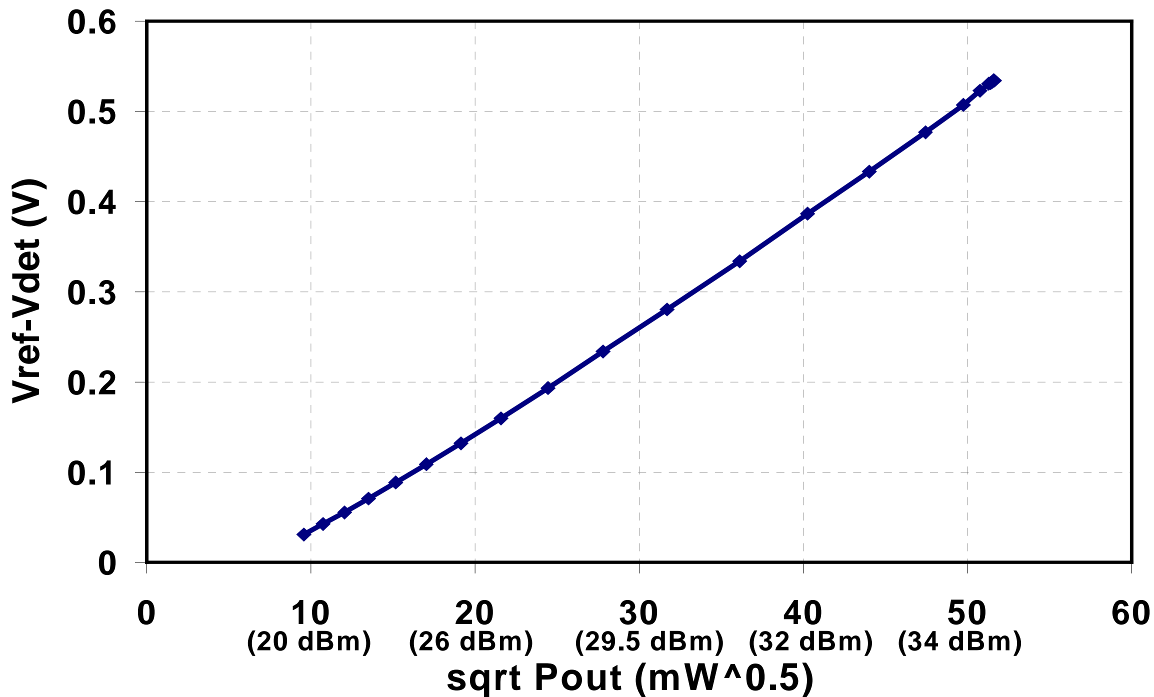
Units: millimeters (inches)
Thickness: 0.100 (0.004)
Chip edge to bond pad dimensions are shown to center of bond pad
Chip size tolerance: +/- 0.051 (0.002)

GND IS BACKSIDE OF MMIC

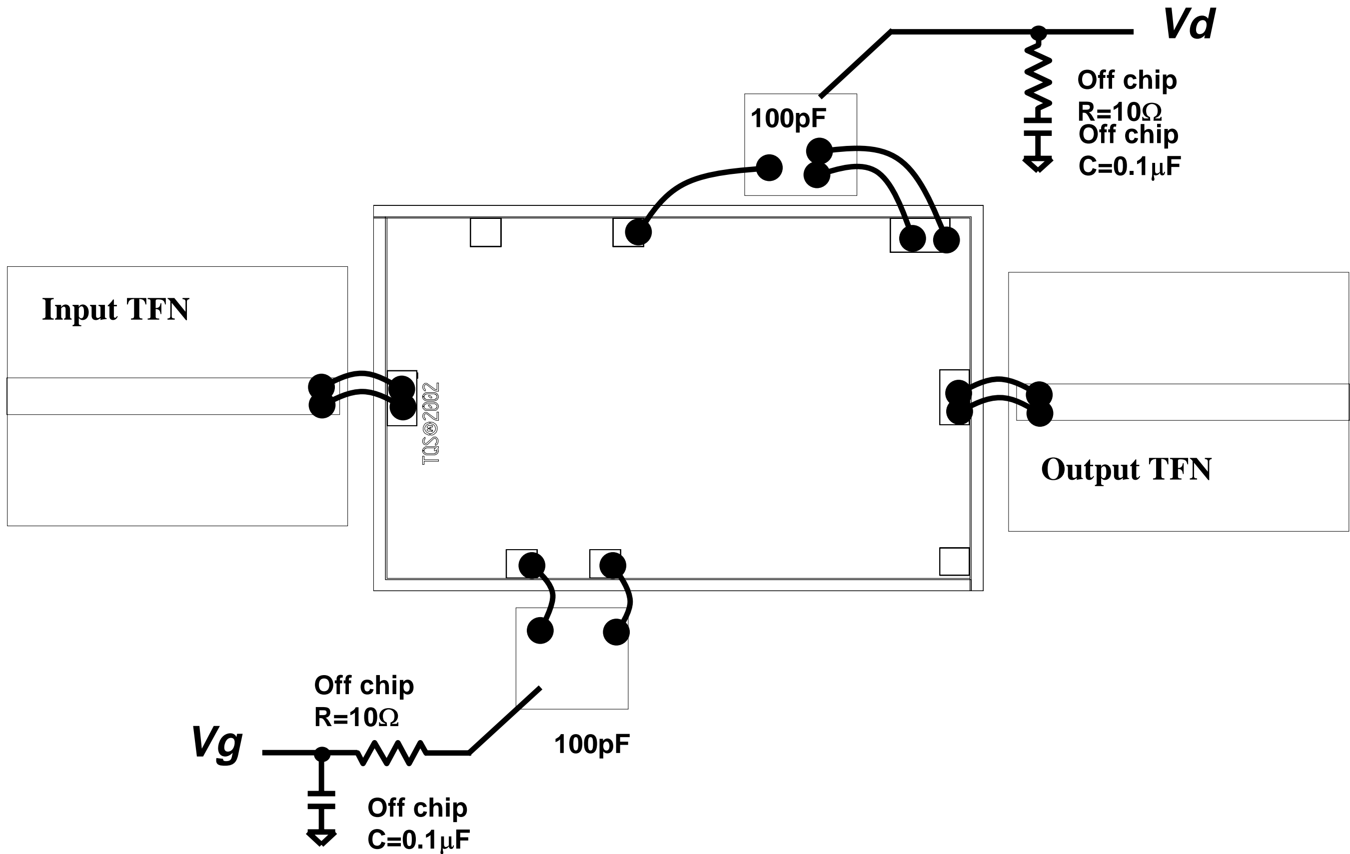
Bond pad #1	**(RF Input)**	**0.100 x 0.200 (0.004 x 0.008)**
Bond pad #2	**(Vref)**	**0.100 x 0.100 (0.004 x 0.004)**
Bond pad #3	**(Vd3)**	**0.100 x 0.100 (0.004 x 0.004)**
Bond pad #4	**(Vd4)**	**0.200 x 0.125 (0.008 x 0.005)**
Bond pad #5	**(RF Output)**	**0.100 x 0.200 (0.004 x 0.008)**
Bond pad #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





Chip Assembly & Bonding 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. (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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