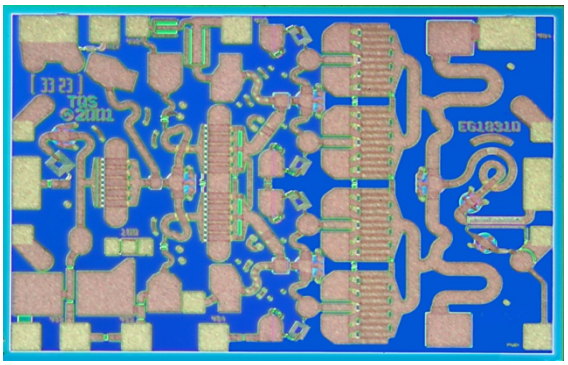
TriQuint SEMICONDUCTOR

TGA2505

13 - 17 GHz 2.5 Watt, 25dB Power Amplifier



Key Features and Performance

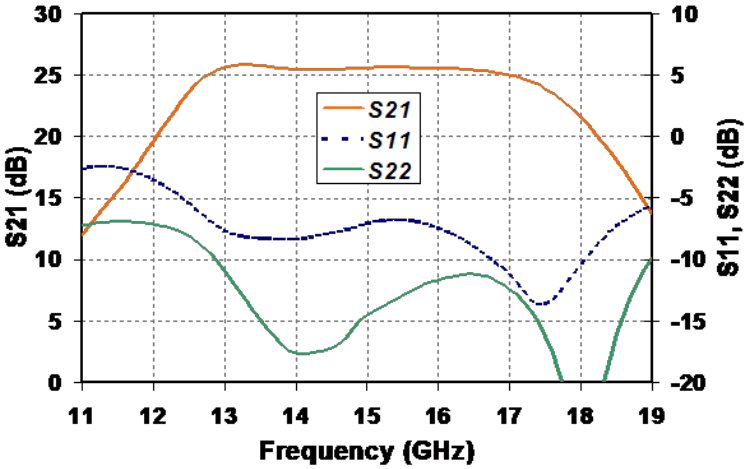
- 34 dBm Midband Pout
- 25 dB Nominal Gain
- 7 dB Typical Input Return Loss
- 12 dB Typical Output Return Loss
- Built-in Directional Power Detector with Reference
- 0.25µm pHEMT Technology
- Bias Conditions: 7V, 640mA
- Chip dimensions:
  2.03 x 1.39 x 0.10 mm
  (0.080 x 0.055 x 0.004 inches)

Primary Applications

- VSAT
- Point-to-Point

Preliminary Measured Performance

Bias Conditions: Vd=7V Id=640mA



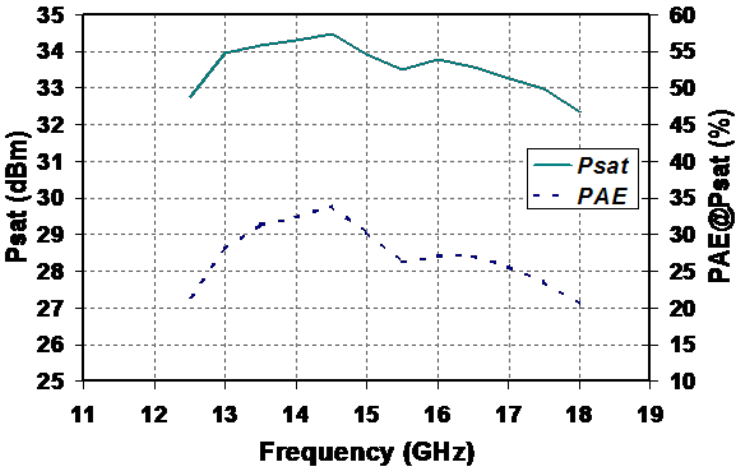


TABLE I
MAXIMUM RATINGS

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	10.5 W	2/ 3/
T_{CH}	Operating Channel Temperature	200 ^{0}C	4/ 5/
	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 2.3E4.

4/ These ratings apply to each individual FET.

5/ Junction operating temperature will directly affect the device median time to failure (Tm). 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%)

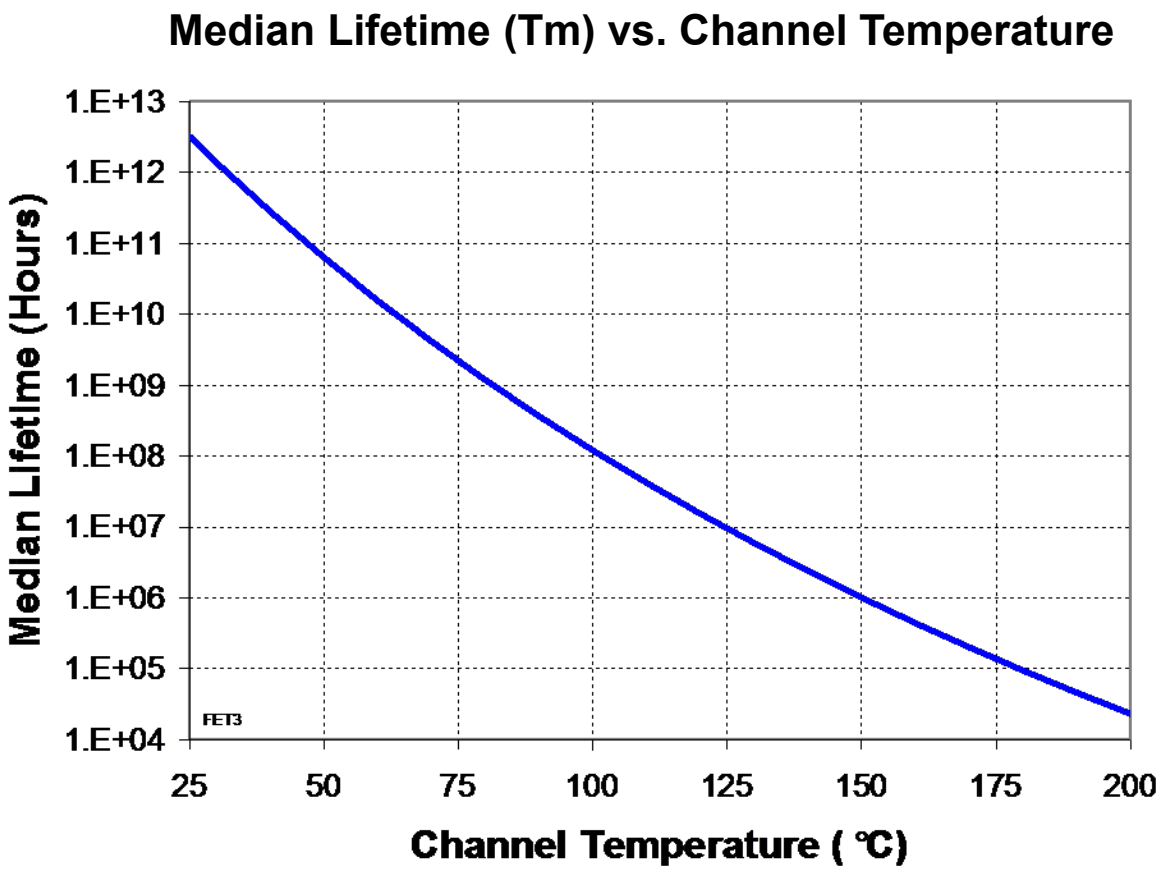
SYMBOL	PARAMETER	TEST CONDITION	LIMITS	UNITS
			TYP	
Gain	Small Signal Gain	F = 13 – 17 GHz	25	dB
IRL	Input Return Loss	F = 13 – 17 GHz	7	dB
ORL	Output Return Loss	F = 13 – 17 GHz	12	dB
PWR	Output Power @ Pin = +15 dBm	F = 13 – 17 GHz	34	dBm

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

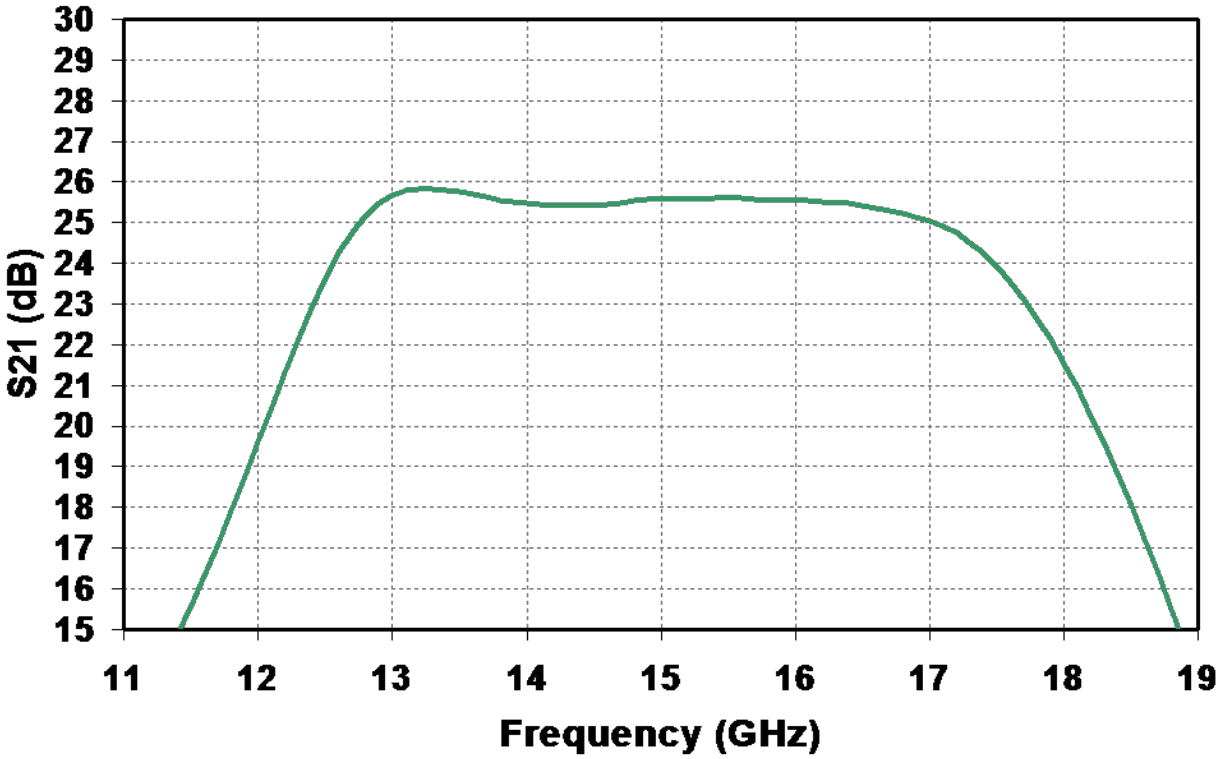
TABLE IV
THERMAL INFORMATION

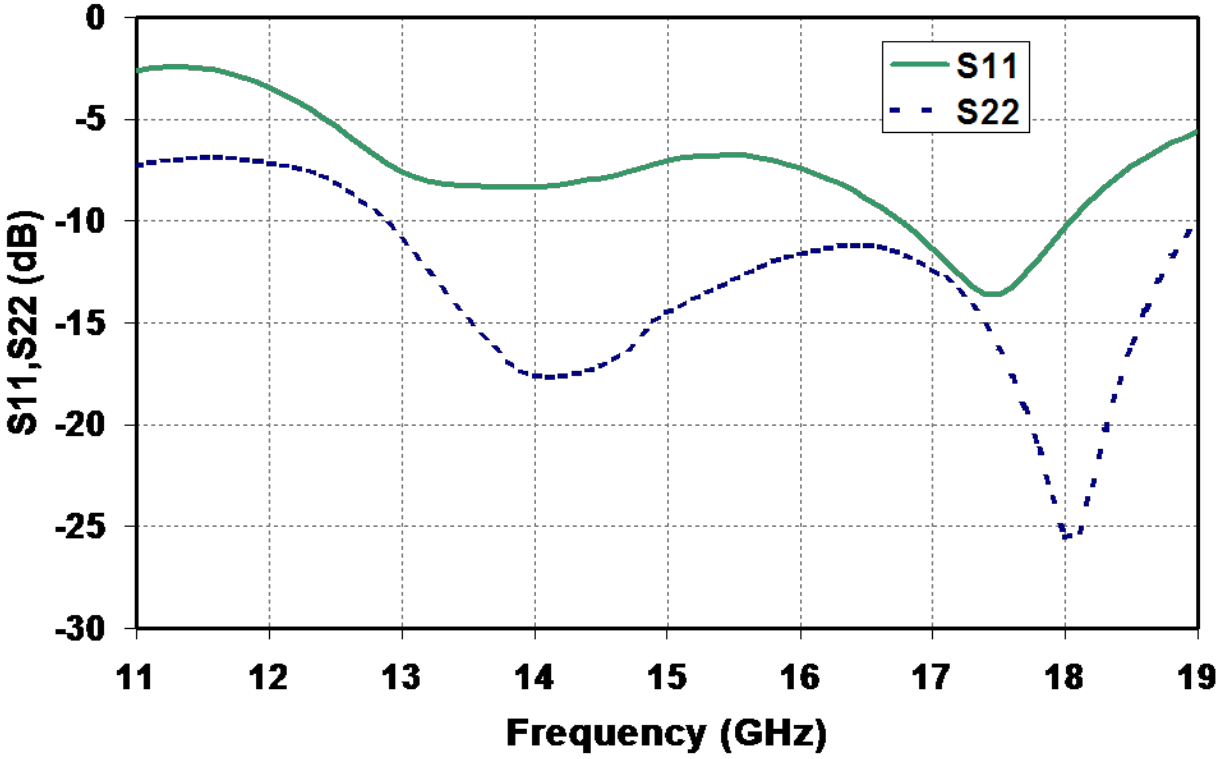
PARAMETER	TEST CONDITION	T_{CH} (°C)	θ_{JC} (°C/W)	Tm (HRS)
θ_{JC} Thermal Resistance (Channel to Backside)	V_D = 7V I_D = 640mA P_D = 4.48W	125.7	12.44	8.9E+6

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





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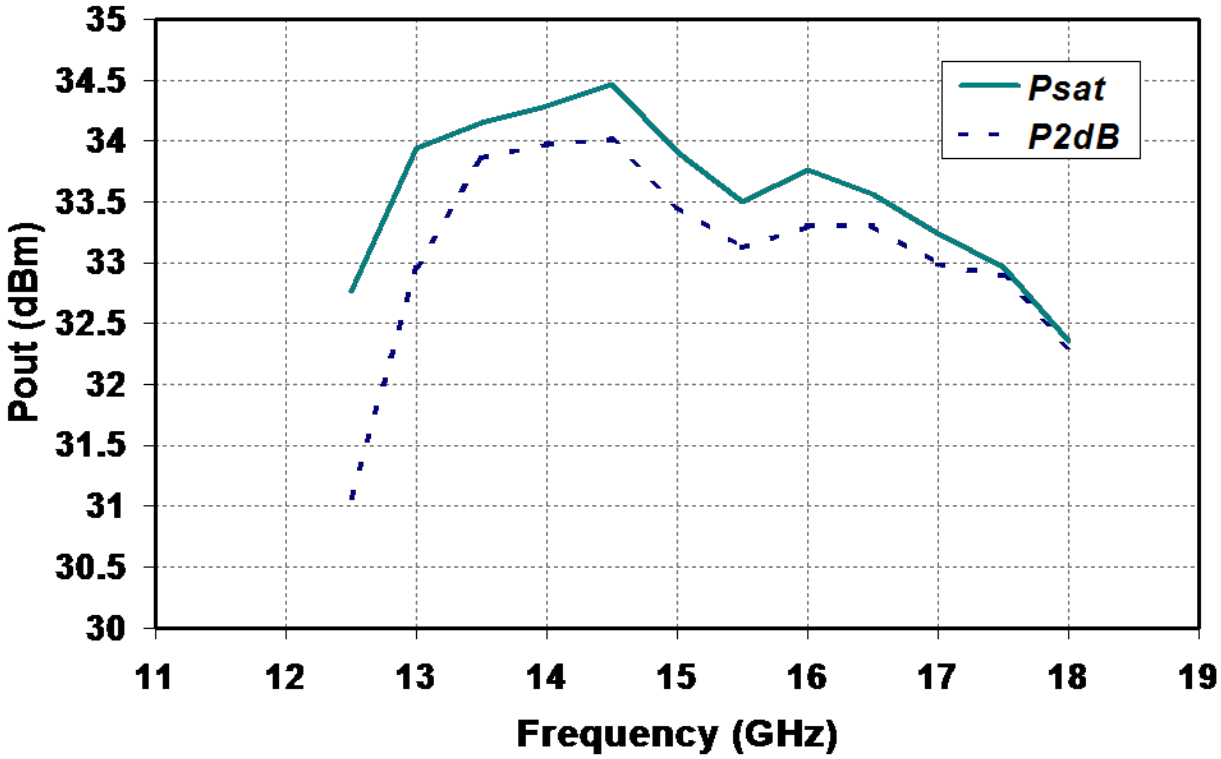

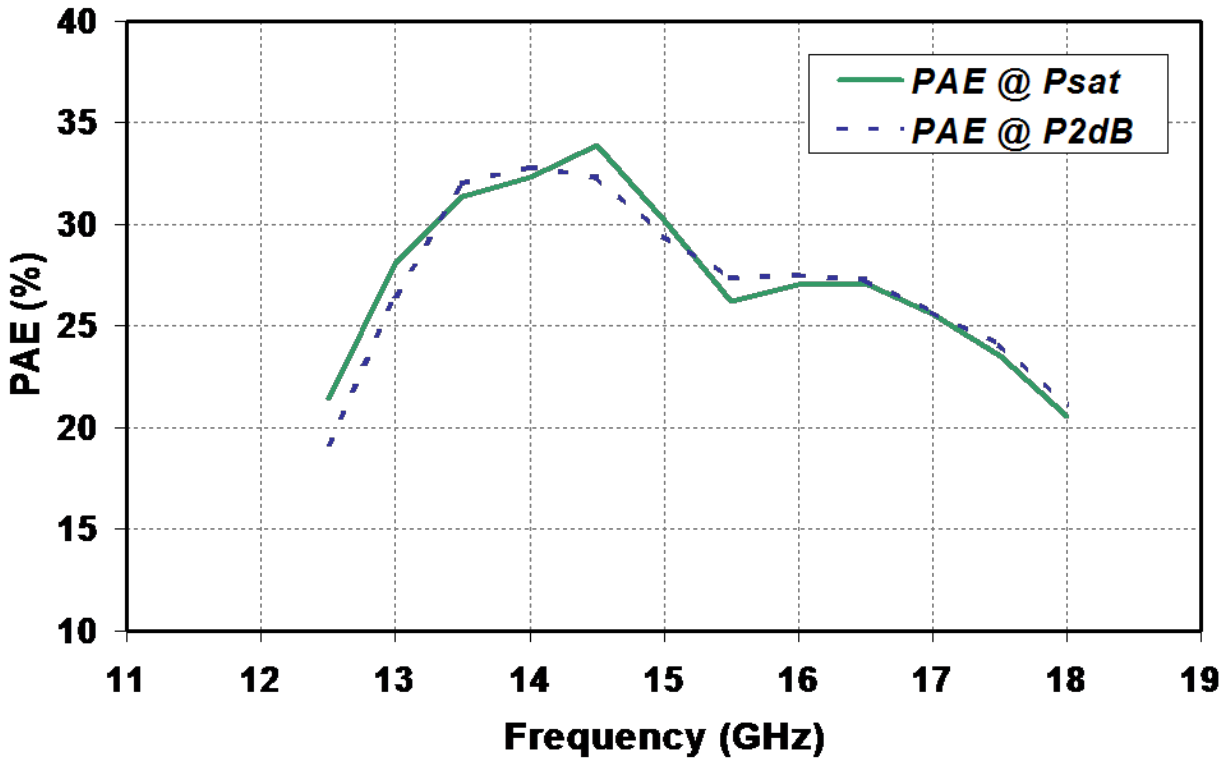

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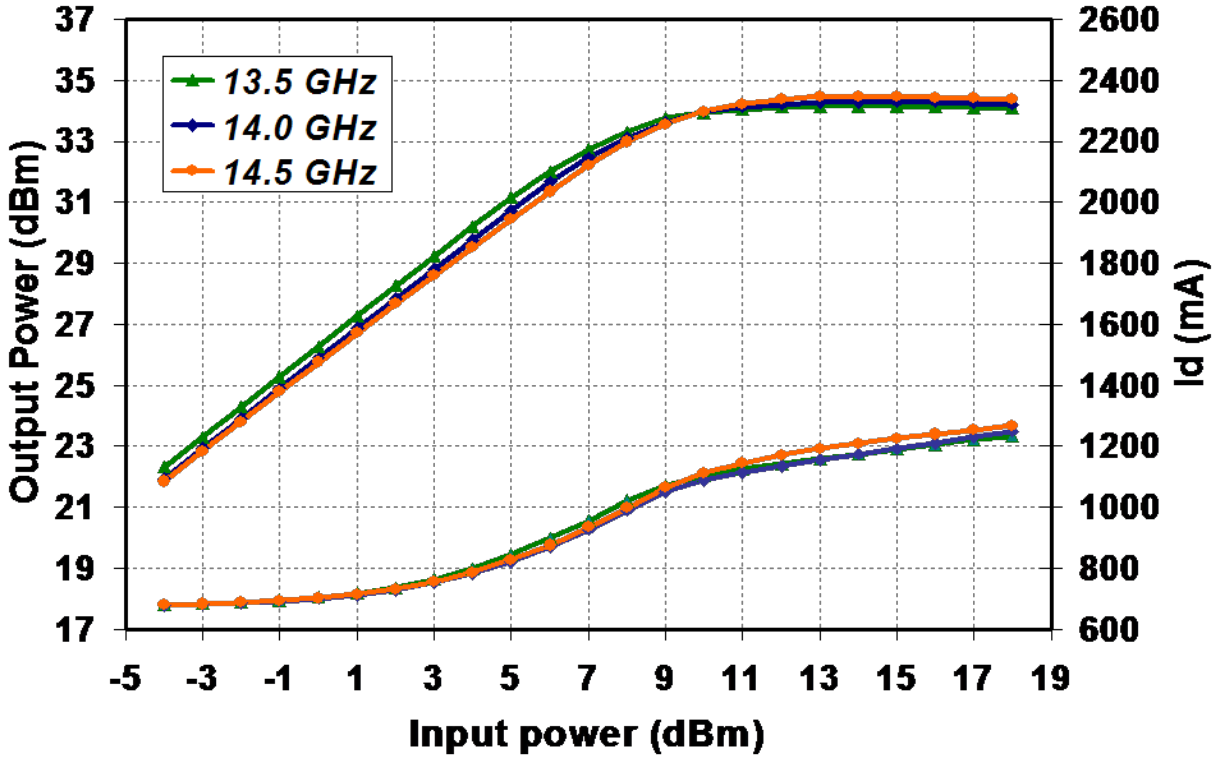

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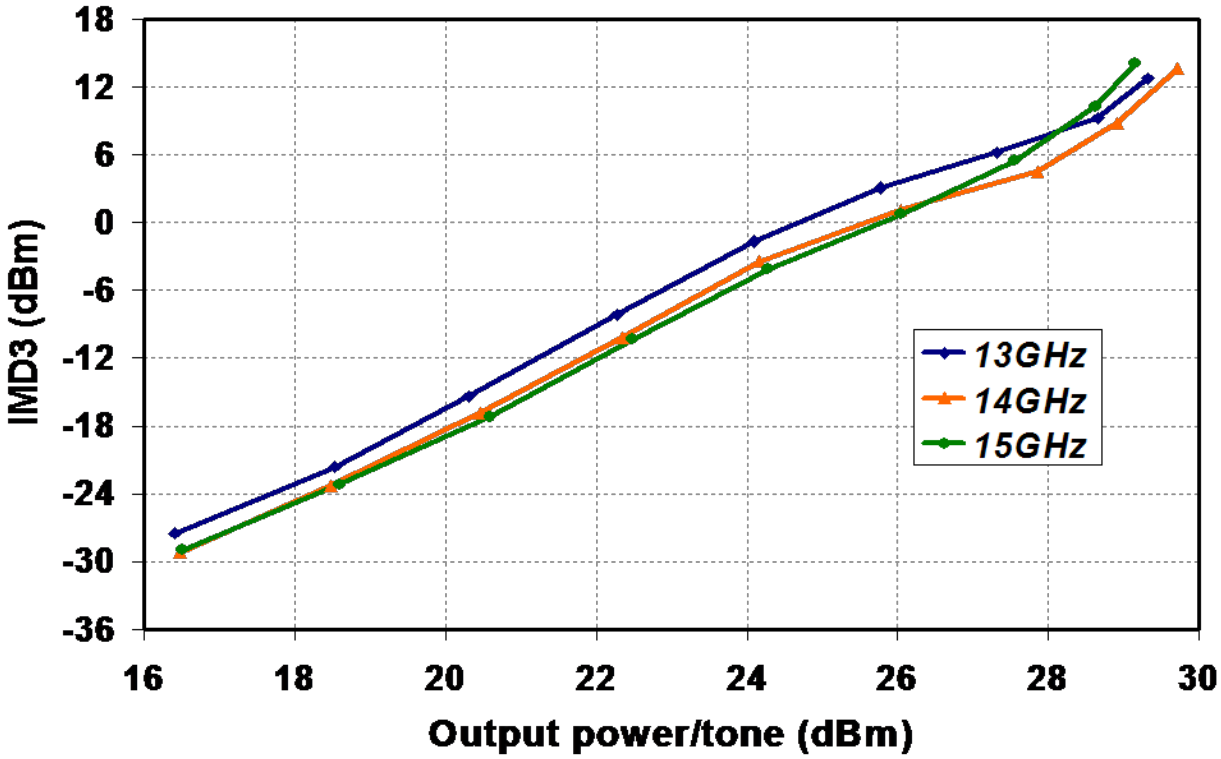
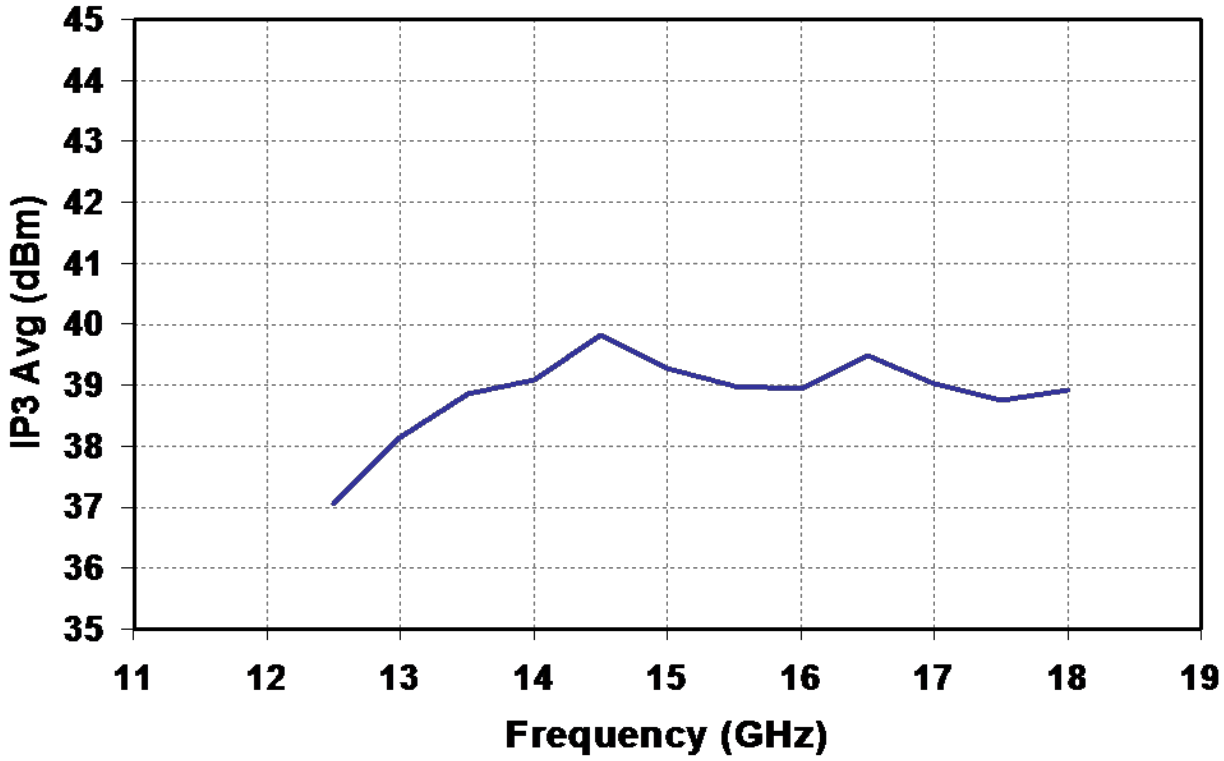
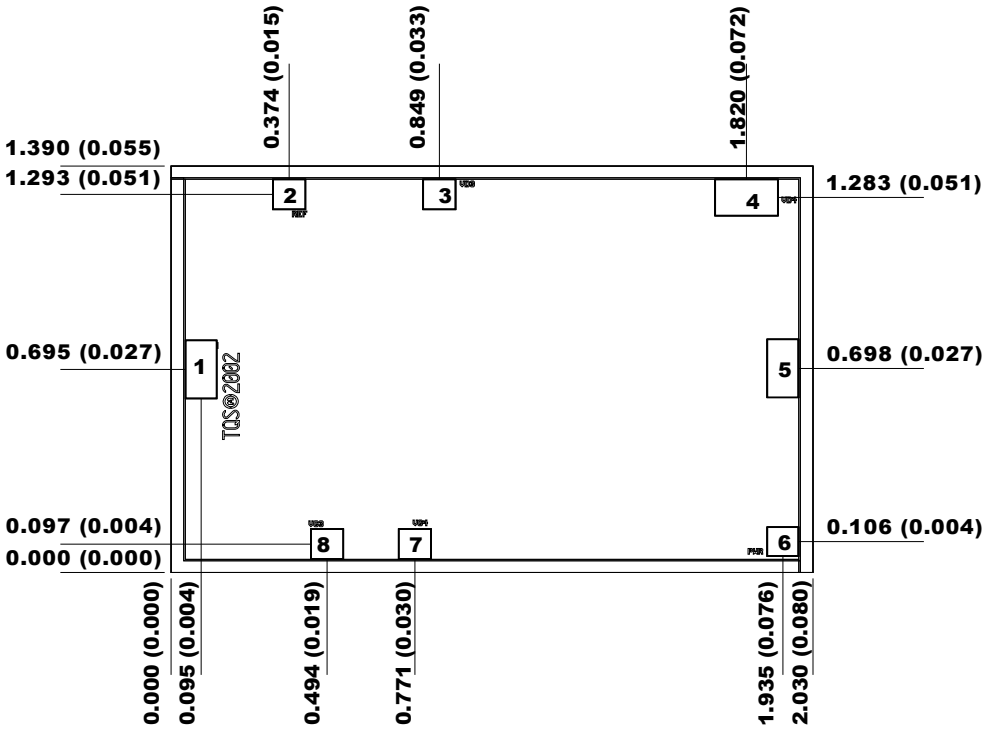




Mechanical Drawing

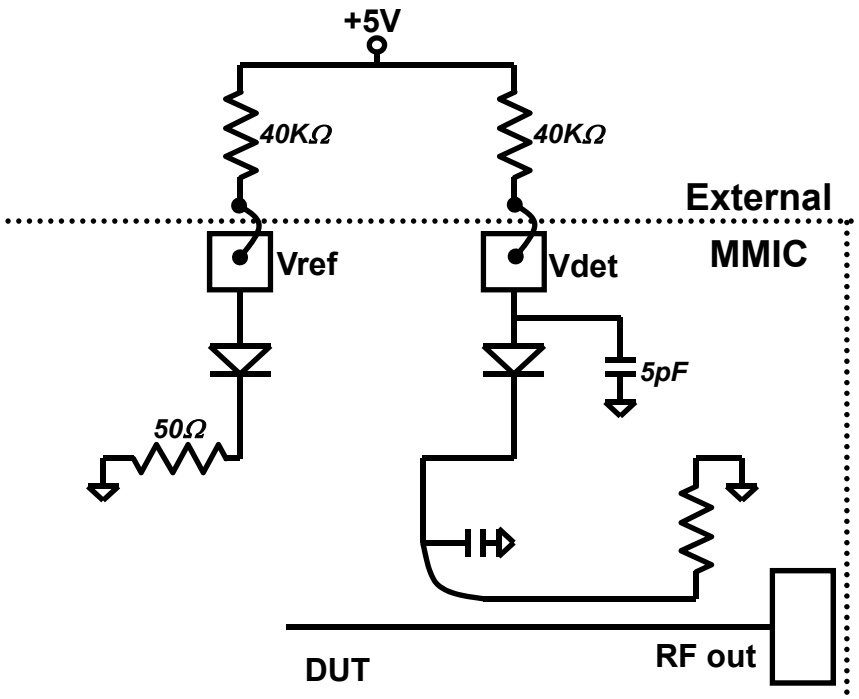


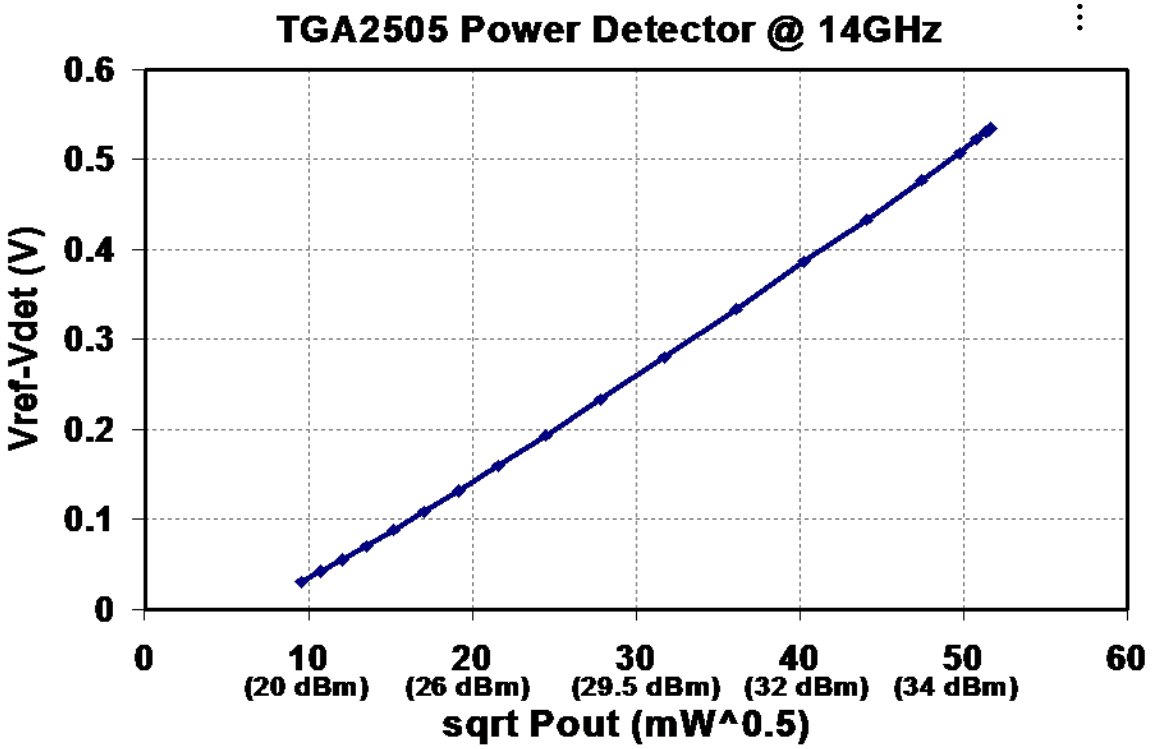
Units: millimeters (inches)
Thickness: 0.100 (0.004)
Chip edge to bond pad dimensions are shown to center of bond pad
Chip size tolerance: +/- 0.051 (0.002)

GND IS BACKSIDE OF MMIC

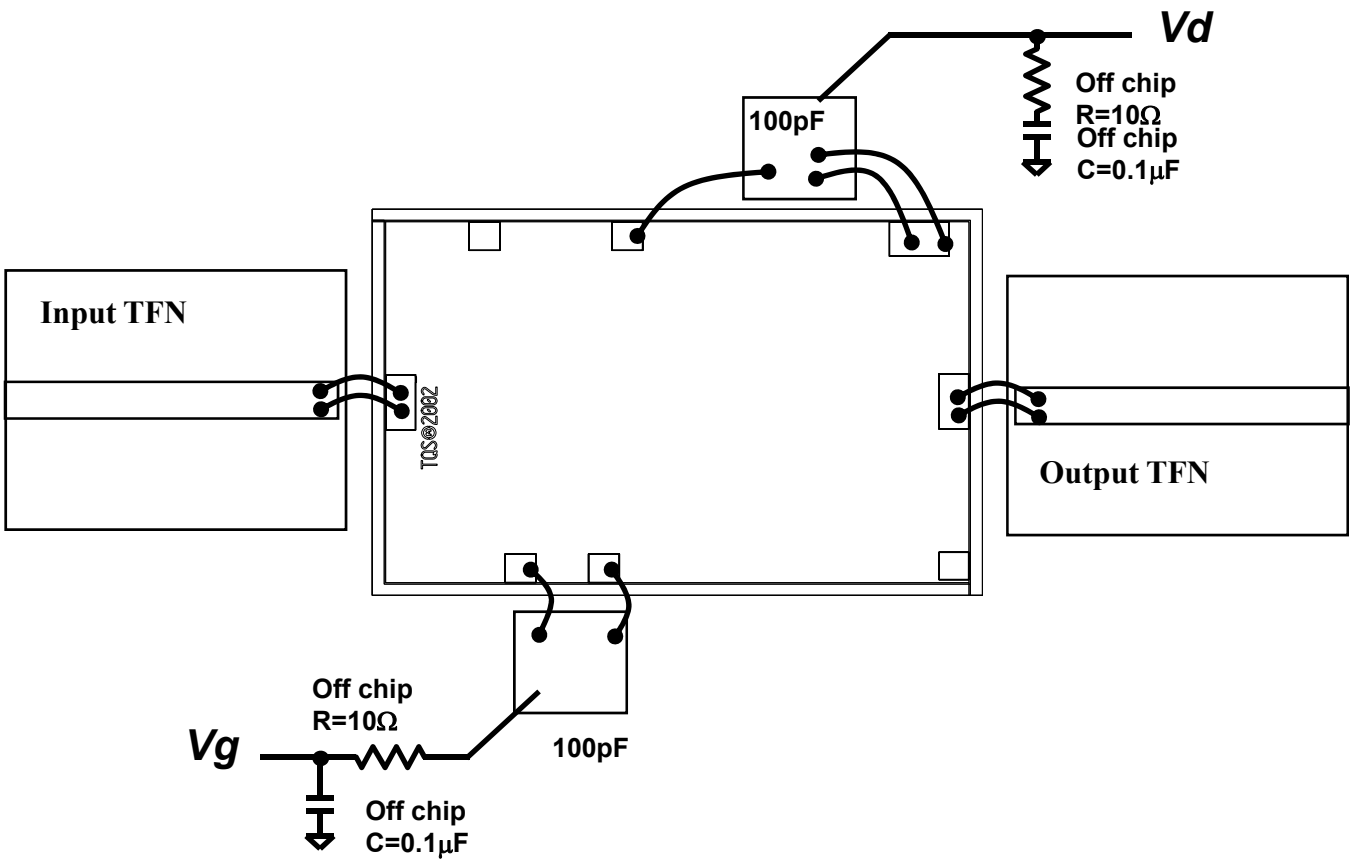
Bond pad #1	**(RF Input)**	**0.100 x 0.200 (0.004 x 0.008)**
Bond pad #2	**(Vref)**	**0.100 x 0.100 (0.004 x 0.004)**
Bond pad #3	**(Vd3)**	**0.100 x 0.100 (0.004 x 0.004)**
Bond pad #4	**(Vd4)**	**0.200 x 0.125 (0.008 x 0.005)**
Bond pad #5	**(RF Output)**	**0.100 x 0.200 (0.004 x 0.008)**
Bond pad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