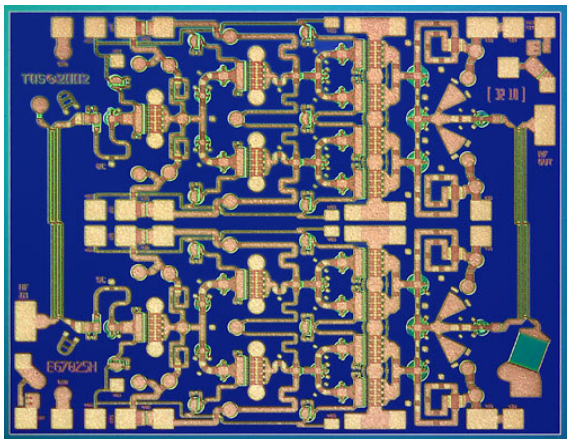
27 - 31 GHz 2W Balanced Power Amplifier TGA4513

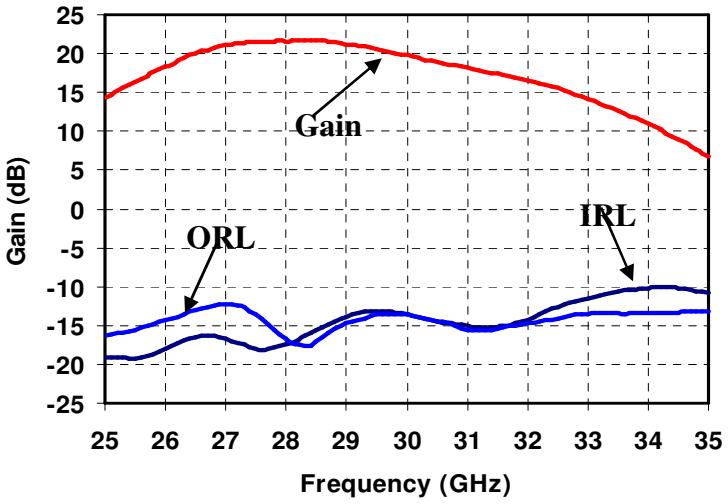


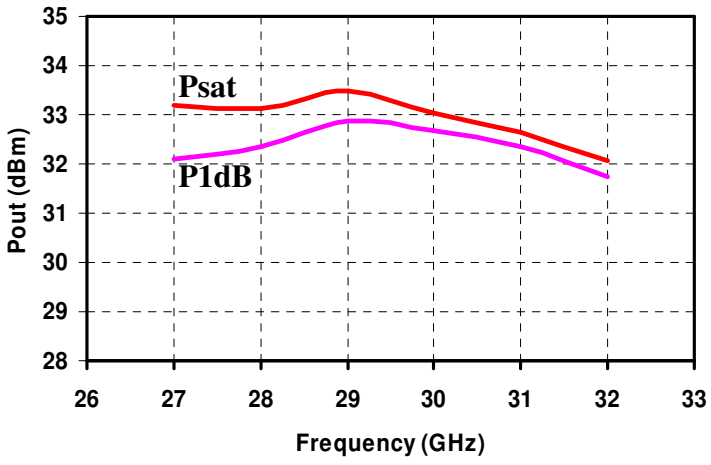
Key Features

- 27 - 31 GHz Bandwidth
- > 32 dBm P1dB
- 33 dBm Psat
- 20 dB Nominal Gain
- IMR3 is 37 dBc @ 18 dBm SCL
- 14 dB Nominal Return Loss
- Bias: 6 V, 840 mA
- 0.25 um 3MI MMW pHEMT Technology
- Chip Dimensions: 2.8 x 2.2 x 0.1 mm (0.110 x 0.087 x 0.004) in

Measured Data

Bias Conditions: Vd = 6 V, Id = 840 mA





Primary Applications

- Satellite Ground Terminal
- Point to Point Radio
- Point to Multi Point Radio
- LMDS

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 1/

SYMBOL	PARAMETER	VALUE	NOTES
V^+	Positive Supply Voltage	7 V	2/
V^-	Negative Supply Voltage Range	-3 TO 0 V	
I^+	Positive Supply Current	1.86 A	2/
$\lvert I_G \rvert$	Gate Supply Current	18 mA	3/
P_{IN}	Input Continuous Wave Power	22 dBm	
P_D	Power Dissipation	7.18 W	2/ 4/
T_{CH}	Operating Channel Temperature	150 ^{0}C	5/ 6/
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/ Total current for the entire MMIC.

4/ When operated at this bias condition with a base plate temperature of 70 ^{o}C, the median life is 1.0E+6 hrs.

5/ Junction iperating temperature will directly affect the device median time to failure (MTTF). For maximum life, it is recommended that junction temperatures be maintained at the lowest possible levels.

6/ These ratings apply to each individual FET.

TABLE II
DC PROBE TESTS
(T_A = 25 °C Nominal)

SYMBOL	PARAMETER	MINIMUM	MAXIMUM	VALUE
I_{DSS1}	Saturated Drain Current	60	282	V
G_{M1}	Transconductance	132	318	mS
V_{BVGS1}	Breakdown Voltage gate-source	-30	-8	V
V_{BVGD1}	Breakdown Voltage gate-drain	-30	-11	V
$V_{P1,8}$	Pinch-off Voltage	-1.5	-0.5	V

TABLE III
ELECTRICAL CHARACTERISTICS
(Ta = 25 ^{0}C, Nominal)

PARAMETER	TYPICAL	UNITS
Drain Operating	6	V
Quiescent Current	840	mA
Small Signal Gain, S21	20	dB
Input Return Loss, S11	14	dB
Output Return Loss, S22	14	dB
Reverse Isolation, S12	-40	dB
Output Power @ 1 dB Compression Gain, P1dB	> 32	dBm
Power @ saturated, Psat	33	dBm
IMR3 @ 18 dBm SCL	37	dBc

TABLE IV
THERMAL INFORMATION

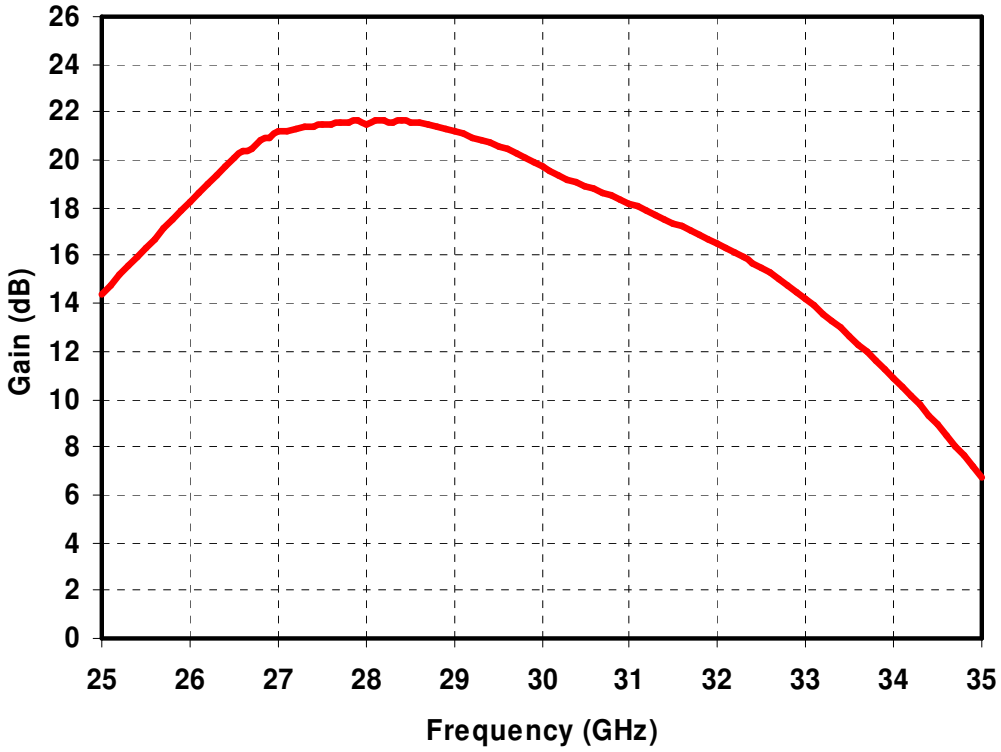
Parameter	Test Conditions	T_{CH} (°C)	θ_{JC} (°C/W)	T_M (hrs)
θ_{JC} Thermal Resistance (Channel Case)	V_D = 6 V I_D = 0.84 A (Quiescent) P_{DISS} = 5.04 W Tbase = 70 °C	130.1	11.92	5.9 E+6

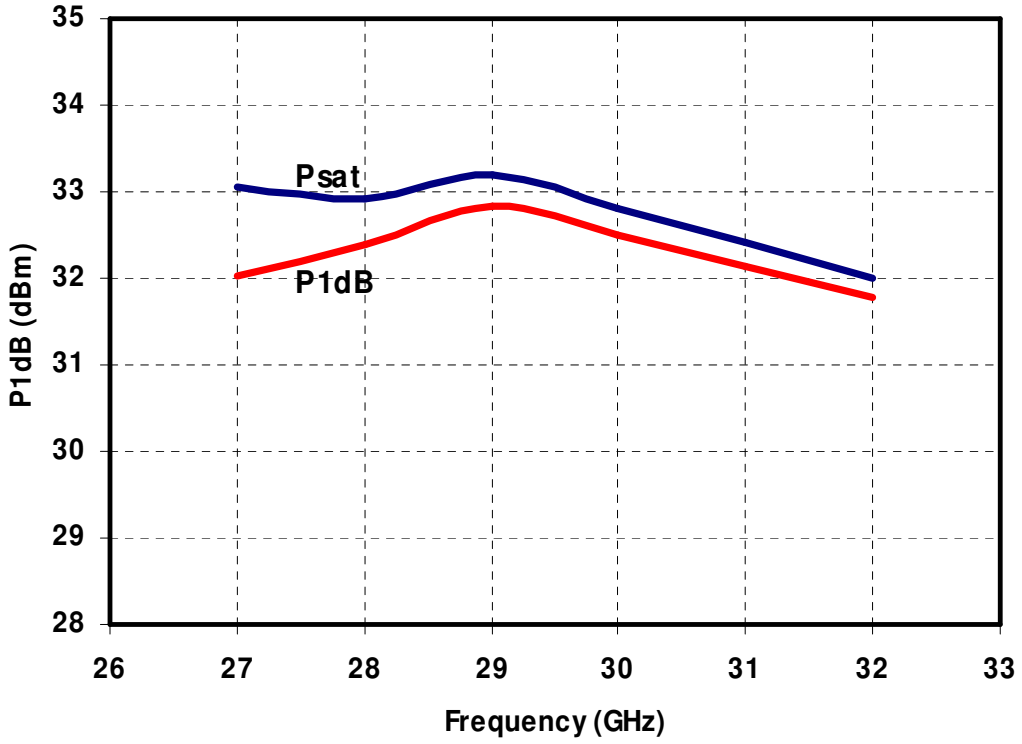
Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20 mil CuMo Carrier at 70°C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

TriQuint Semiconductor Texas: Phone (972)994-8465 Fax (972)994-8504 Email: Info-mmw@tqs.com Web: www.triquint.com

Measured Data

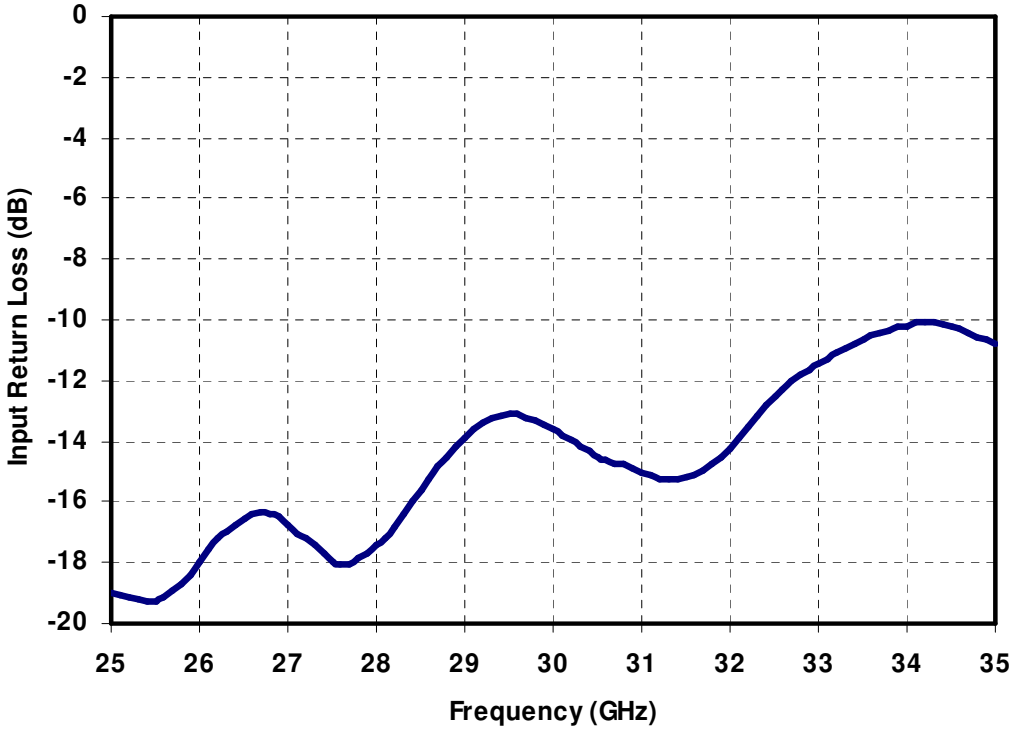
Bias Conditions: Vd = 6 V, Id = 840 mA

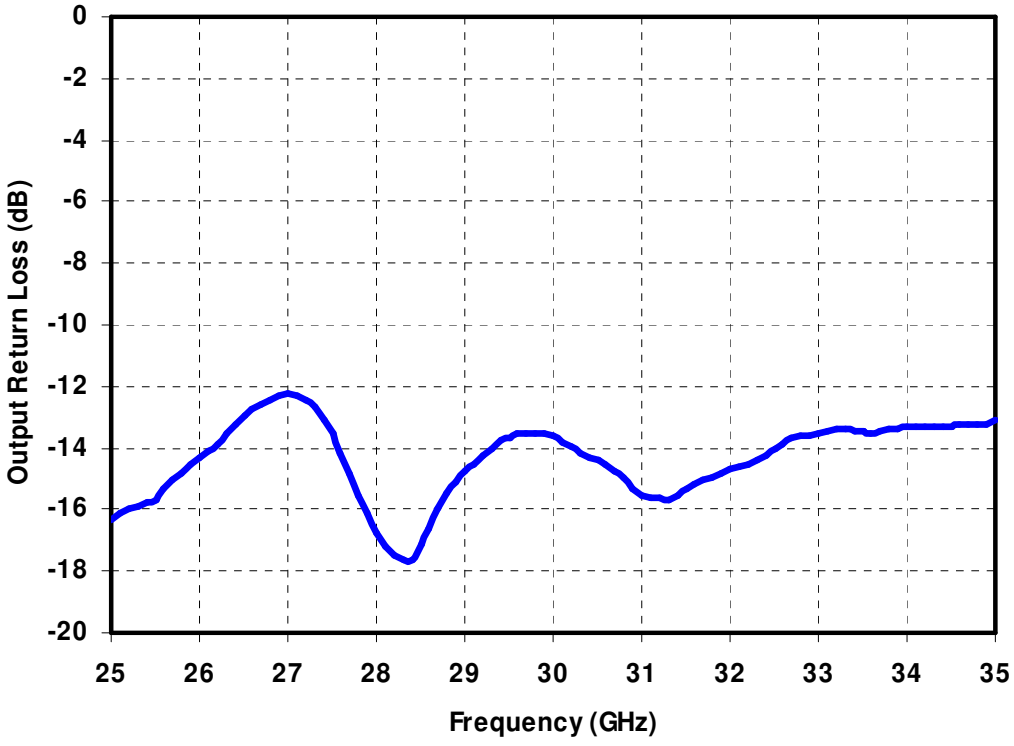




Measured Data

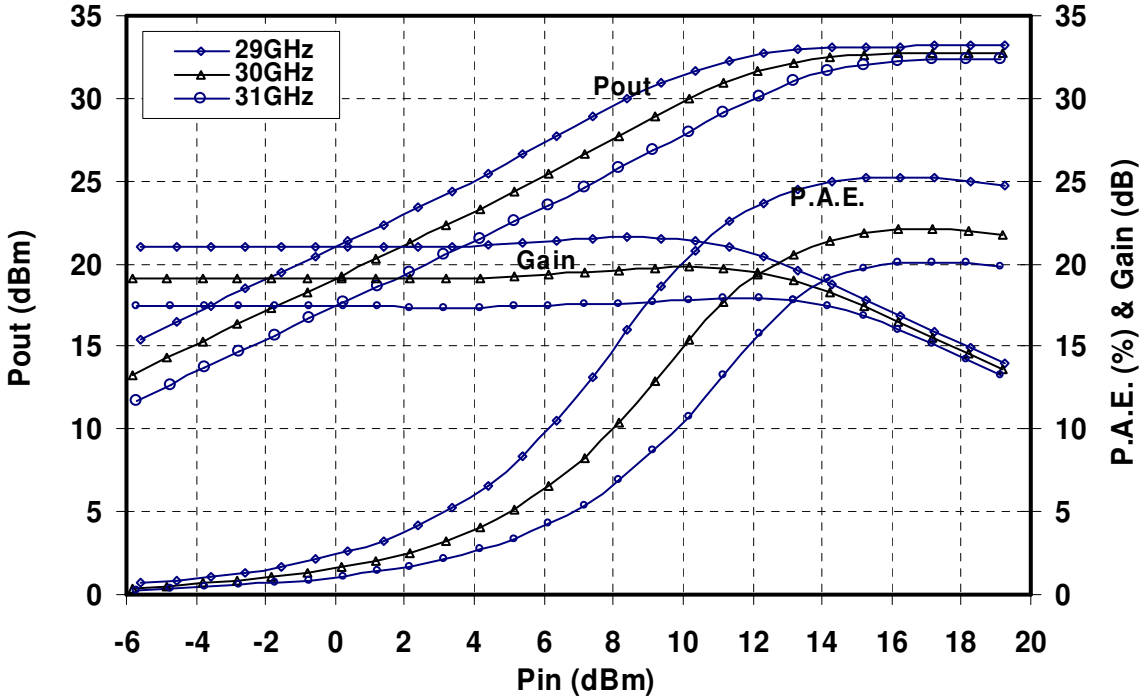
Bias Conditions: Vd = 6 V, Id = 840 mA

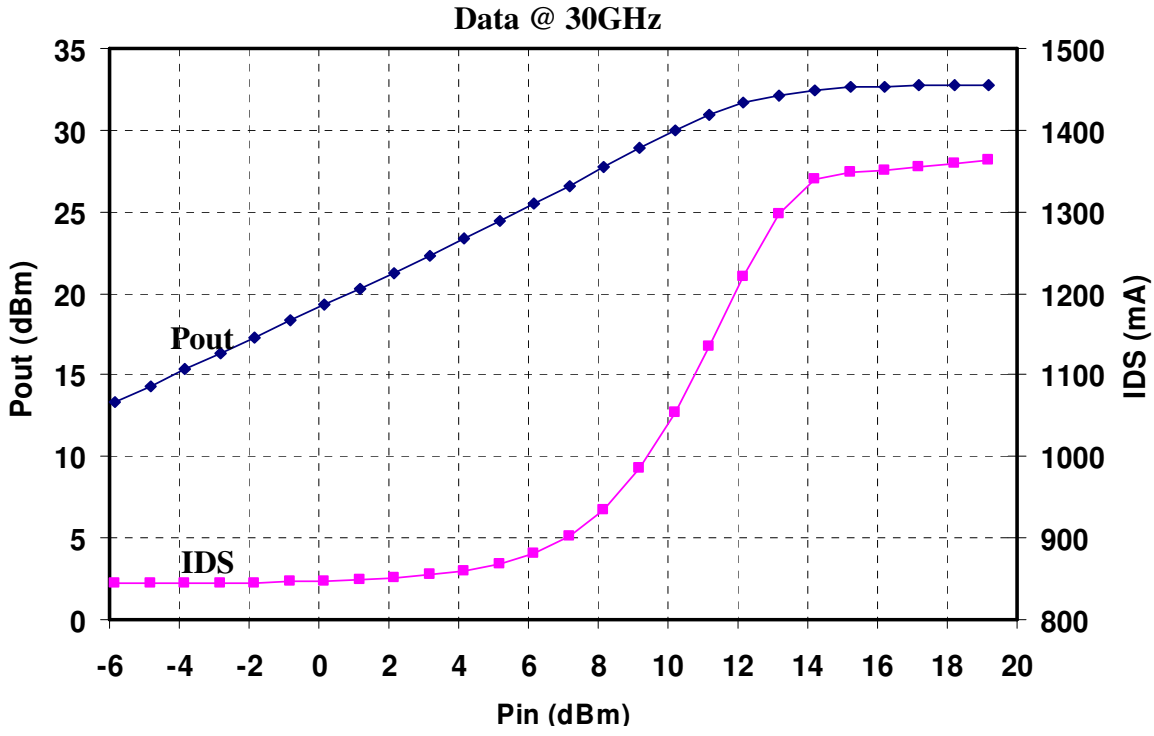




Measured Data

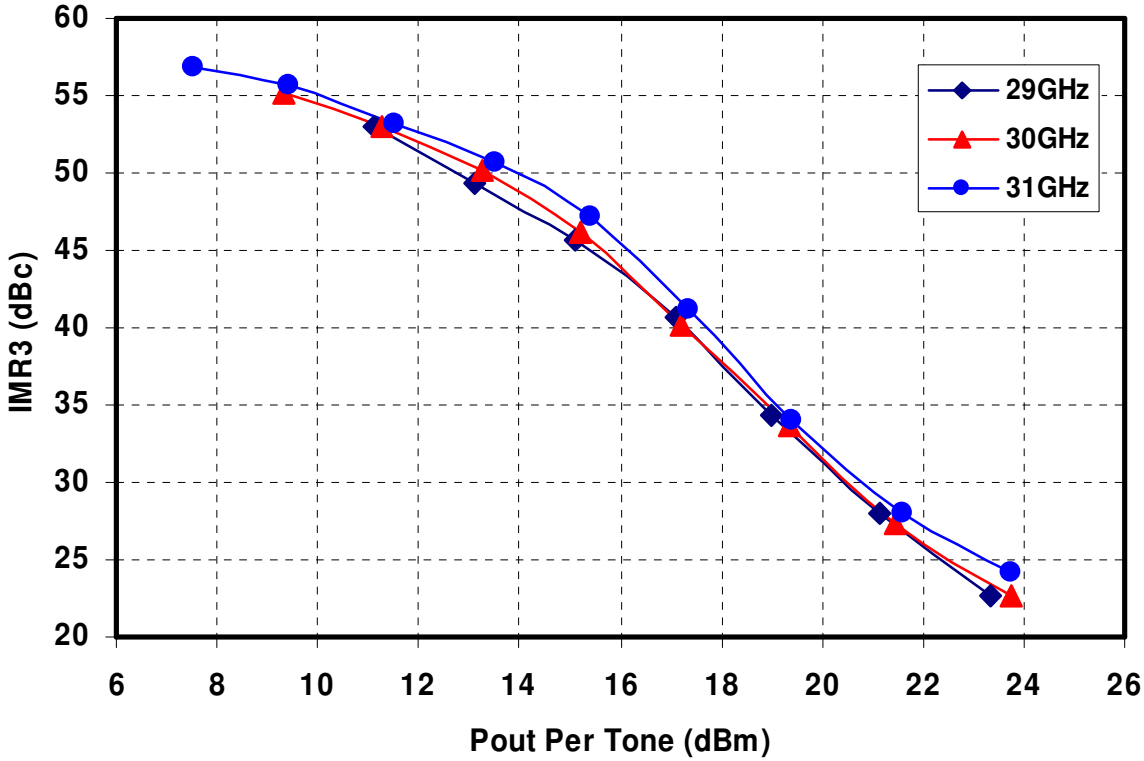
Bias Conditions: Vd = 6 V, Id = 840 mA



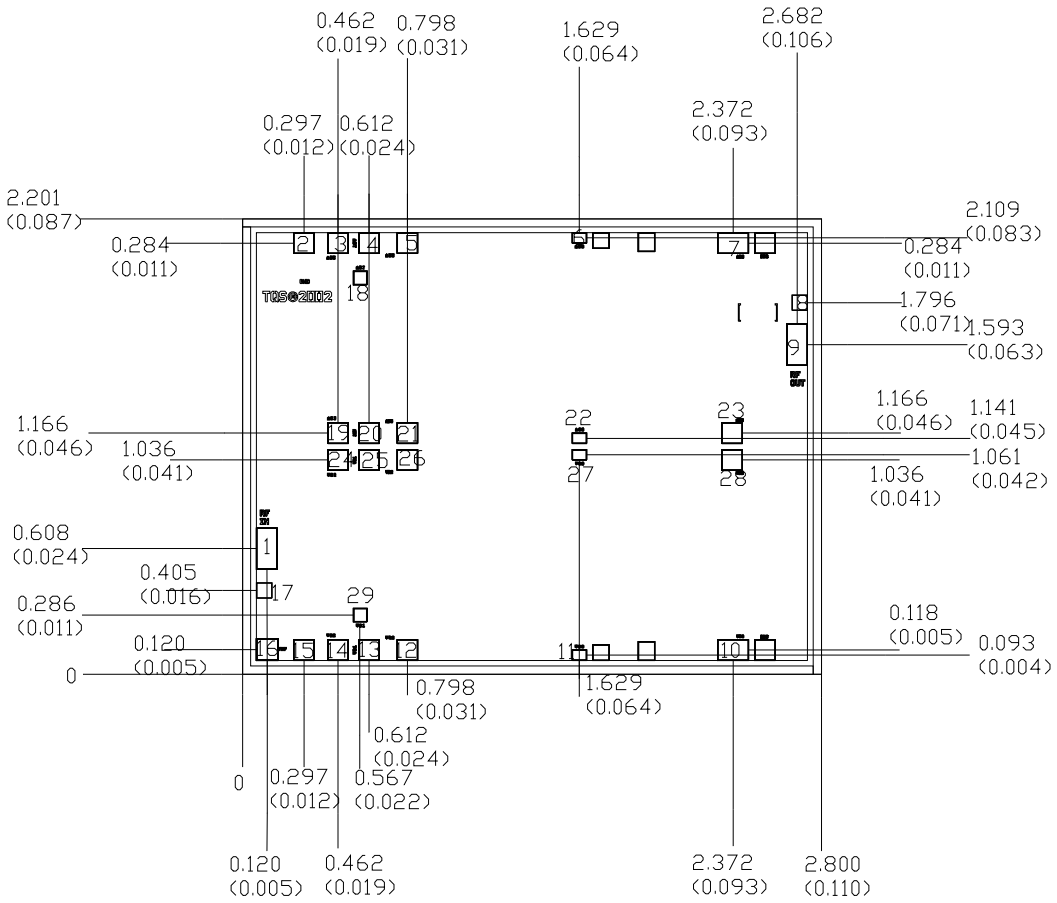


Measured Data

Bias Conditions: Vd = 6 V, Id = 840 mA, Δf = 10 MHz



Mechanical Drawing

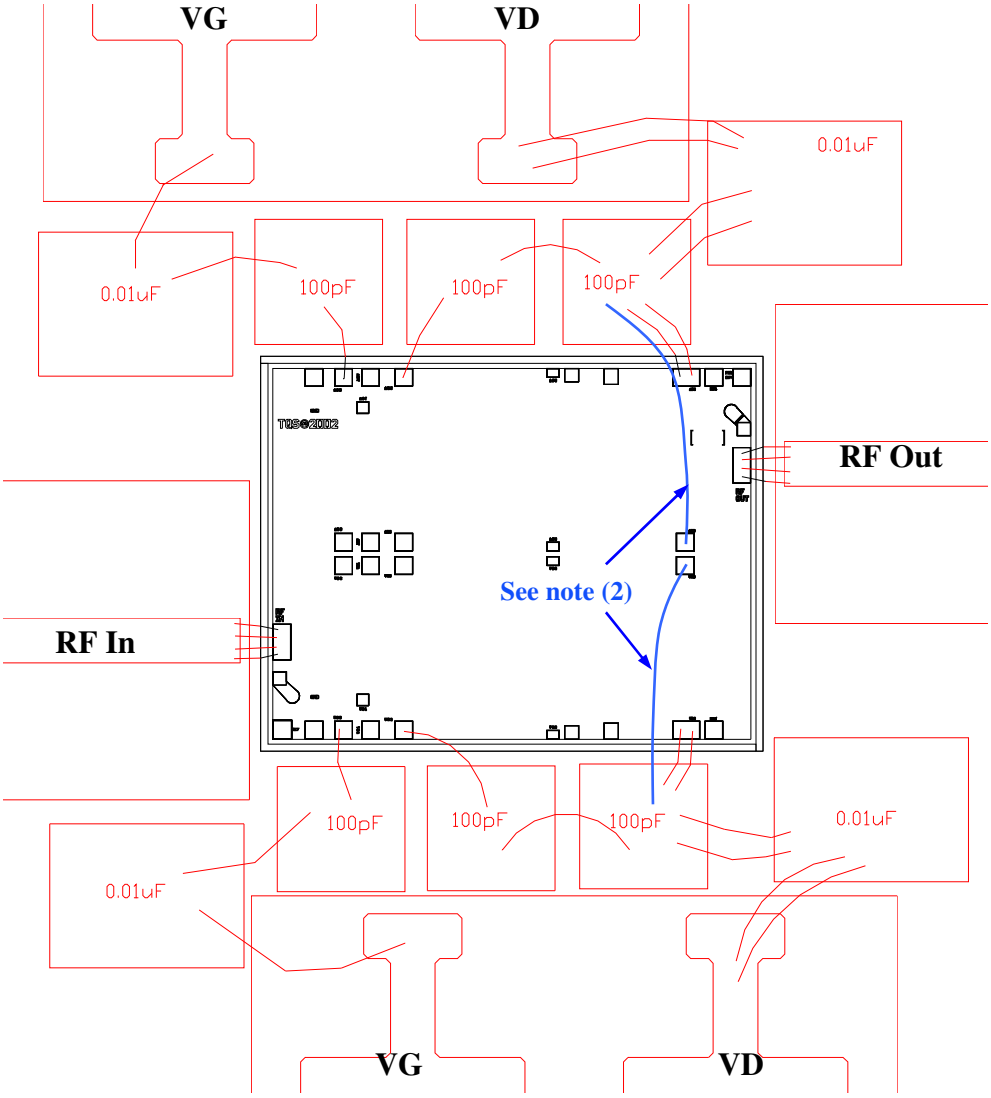


Units: millimeters (inches)
Thickness: 0.100 (0.004)
Chip edge to bond pad dimensions are shown to center of bond pad
Chip size tolerance: +/- 0.051 (0.002)
GND is back side of MMIC

Bond pad #1	RF In	0.100 × 0.200	(0.004 × 0.008)
Bond pad #2, 15, 16	N/C	0.100 × 0.100	(0.004 × 0.004)
Bond pad #3, 14, 19, 24	VG2	0.100 × 0.100	(0.004 × 0.004)
Bond pad #4, 13, 20, 25	VD1	0.100 × 0.100	(0.004 × 0.004)
Bond pad # 5, 12, 21, 26	VD2	0.100 × 0.100	(0.004 × 0.004)
Bond pad # 6, 11, 22, 27	VG3	0.070 × 0.050	(0.003 × 0.002)
Bond pad # 7, 10	VD3	0.150 × 0.100	(0.006 × 0.004)
Bond pad # 8, 17	N/C	0.075 × 0.075	(0.003 × 0.003)
Bond pad # 9	RF Out	0.100 × 0.200	(0.004 × 0.008)
Bond pad # 18, 29	VG1	0.065 × 0.065	(0.003 × 0.003)
Bond pad # 23, 28	VD3	0.100 × 0.100	(0.004 × 0.004)

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

Chip Assembly Diagram(1)



Note
(1): Minimum 1 uF bypass Capacitors are required on both drain and gate power supplies.
(2): Alternate configuration without these bondwires: the maximum positive supply current is reduced to 1.3A.

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 max).
- 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.
- 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.

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