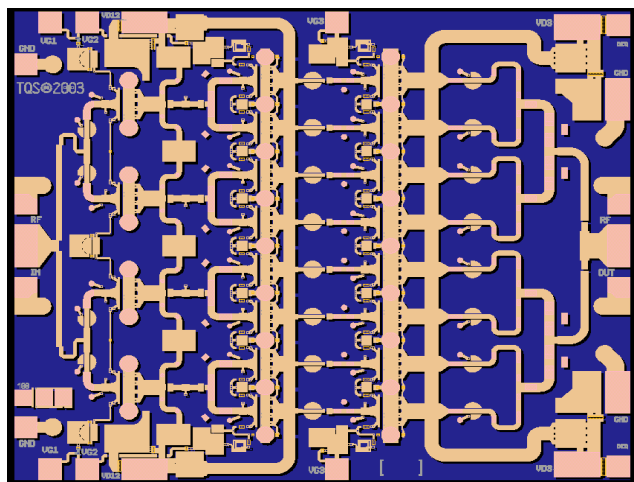


Ka Band 2W Power Amplifier



Key Features

- 30 - 40 GHz Bandwidth
- > 33 dBm Nominal Psat @ Pin = 20dBm
- 18 dB Nominal Gain
- Bias: 6 V, 1050 mA Idq (1.9A under RF Drive)
- 0.15 um 3MI pHEMT Technology
- Chip Dimensions: 2.79 x 2.315 x 0.1 mm (0.110 x 0.091 x 0.004) in

Primary Applications

- Military Radar Systems
- Ka-Band Sat-Com
- Point to Point Radio

Product Description

The TriQuint TGA4516 is a High Power MMIC Amplifier for Ka-band applications. The part is designed using TriQuint's 0.15um power pHEMT process. The small chip size is achieved by utilizing TriQuint's 3 metal layer interconnect (3MI) design technology that allows compaction of the design over competing products.

The TGA4516 provides >33 dBm saturated output power, and has typical gain of 18 dB at a bias of 6V and 1050mA (Idq). The current rises to 1.9A under RF drive.

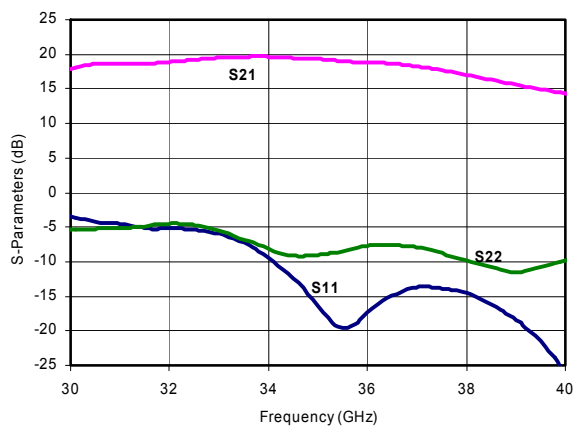
This HPA is ideally suited for many applications such as Military Radar Systems, Ka-band Sat-Com, and Point-to-Point Radios.

The TGA4516 is 100% DC and RF tested on-wafer to ensure performance compliance.

Lead-Free & RoHS compliant.

Fixtured Data

$V_D = 6V, I_D = 1050mA$



Pout @ Pin = 20dBm

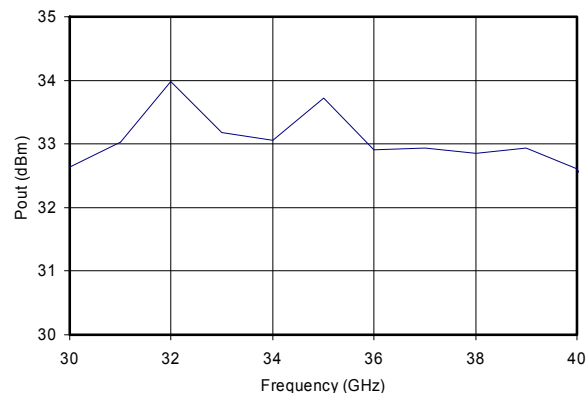


TABLE I
MAXIMUM RATINGS 1/

SYMBOL	PARAMETER	VALUE	NOTES
V ⁺	Positive Supply Voltage	6.5 V	<u>2/</u>
V ⁻	Negative Supply Voltage Range	-5 TO 0 V	
I ⁺	Positive Supply Current	3 A	<u>2/ 3/</u>
I _G	Gate Supply Current	85 mA	<u>3/</u>
P _{IN}	Input Continuous Wave Power	267 mW	
P _D	Power Dissipation	12.7 W	<u>2/ 4/</u>
T _{CH}	Operating Channel Temperature	200 °C	<u>5/ 6/</u>
	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/ Total current for the entire MMIC.
- 4/ When operated at this bias condition with a base plate temperature of 70 °C, the median life is 7.3E3 hrs.
- 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.
- 6/ These ratings apply to each individual FET.

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

SYMBOL	PARAMETER	MIN.	MAX.	UNITS
I _{DSS,Q1}	Saturated Drain Current	80	240	mA
V _{BVGS,Q1}	Breakdown Voltage Gate-Source	-18	-8	V
V _{BVGD,Q1-Q6}	Breakdown Voltage Gate-Drain	-18	-11	V
V _{P,Q1-Q6}	Pinch_off Voltage	-1.5	-0.5	V

Q1- Q4 are 400 um FETs, Q5 is 2560 um FET, Q6 is 4160 um FET

TABLE III
ELECTRICAL CHARACTERISTICS
(Ta = 25 °C, Nominal)

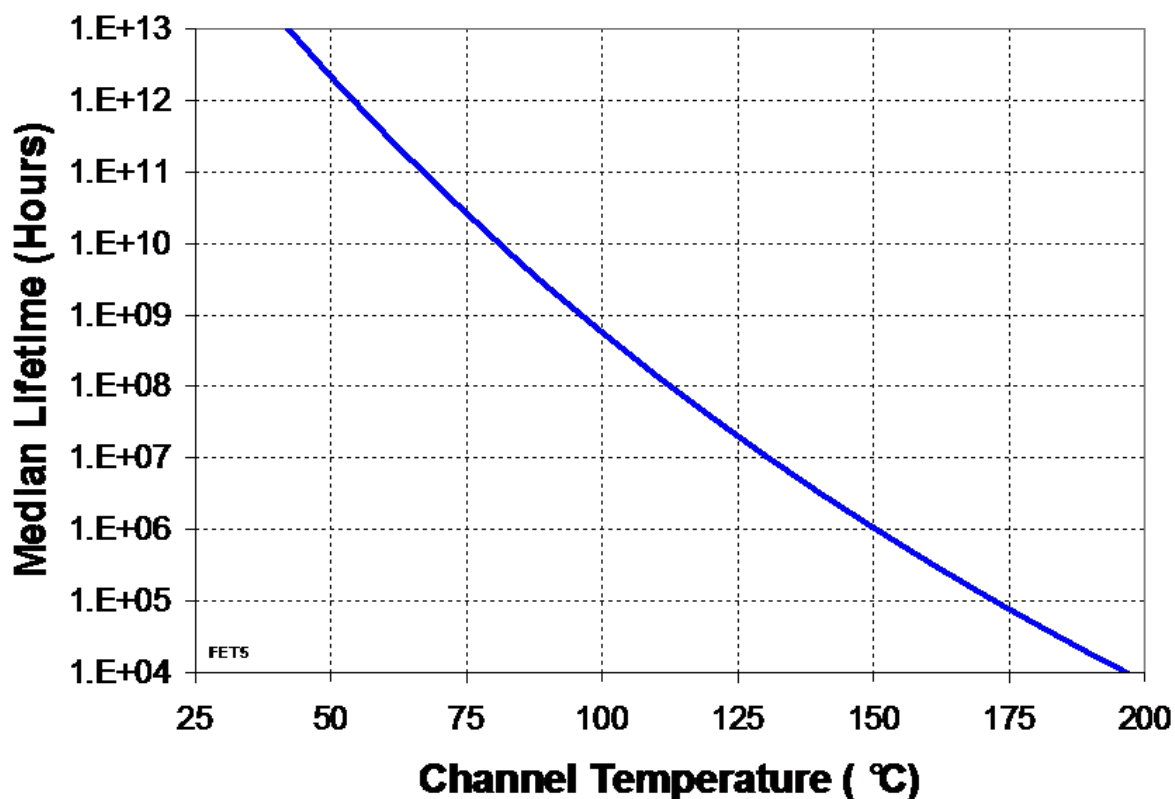
PARAMETER	TYPICAL	UNITS
Drain Operating	6	V
Quiescent Current	1050	mA
Frequency Range	30 - 40	GHz
Small Signal Gain, S21	18	dB
Input Return Loss, S11	10	dB
Output Return Loss, S22	7	dB
Power @ saturated, Psat	33	dBm

TABLE IV
THERMAL INFORMATION

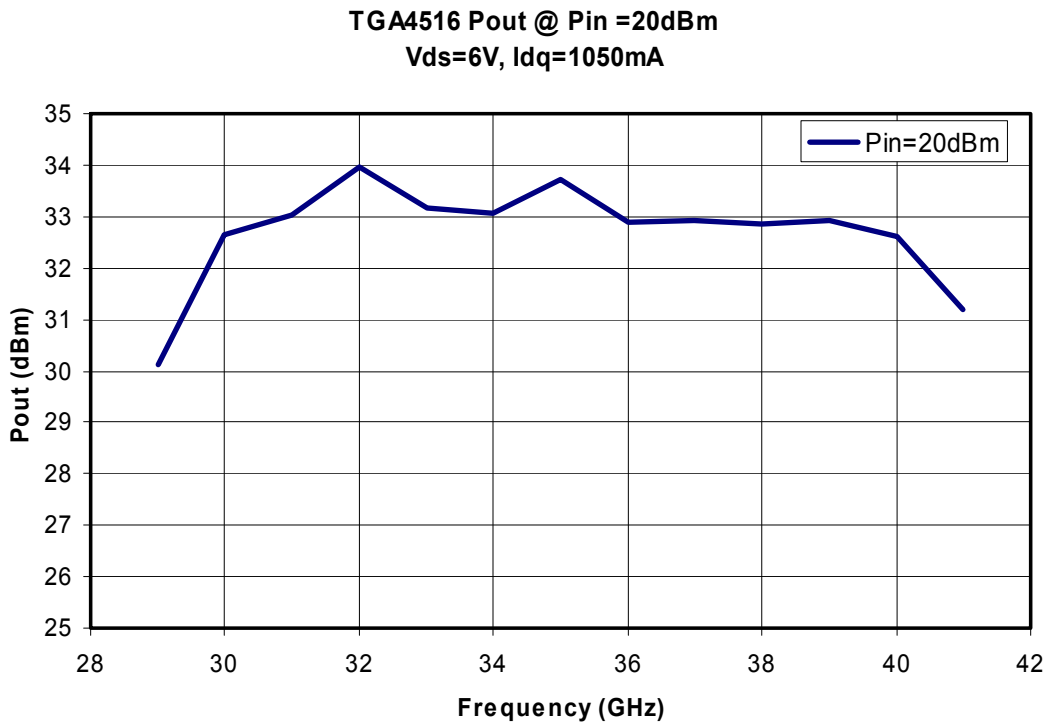
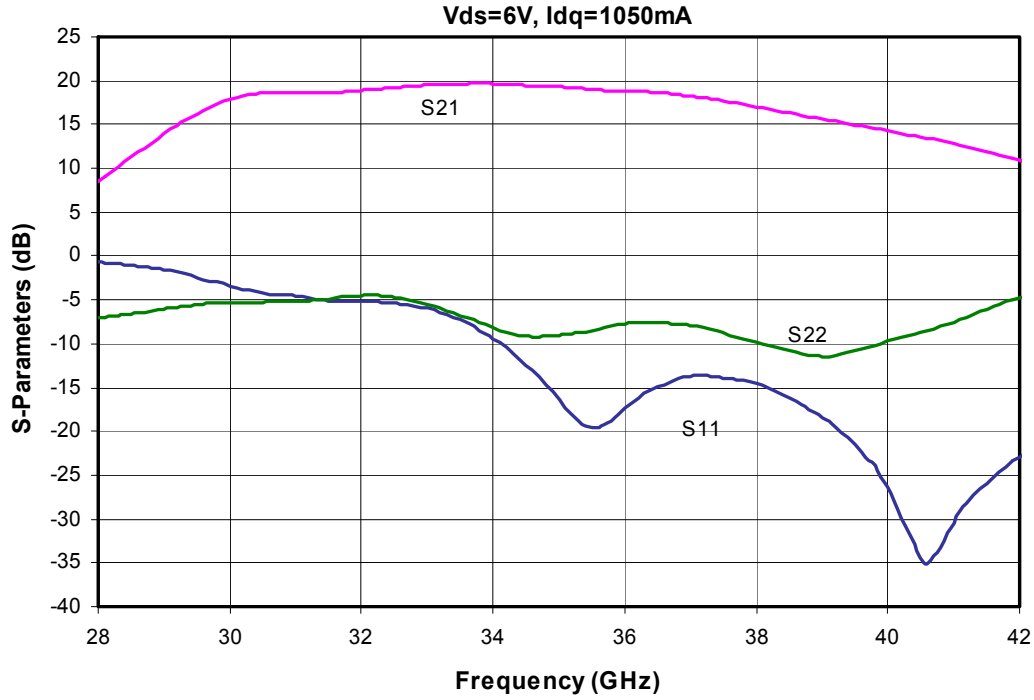
Parameter	Test Conditions	T _{ch} (°C)	θ _{JC} (°C/W)	T _m (HRS)
θ _{JC} Thermal Resistance (channel to backside of carrier)	Vd = 6 V Id = 1700 mA Freq = 35 GHz P _{diss} = 7.8 W	150	10.2	1E+6

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 is at saturated output power when DC power consumption rises to 10.6 W with 2.3 W RF power delivered to load. Power dissipated is 8.2 W and the temperature rise in the channel is 84 °C.

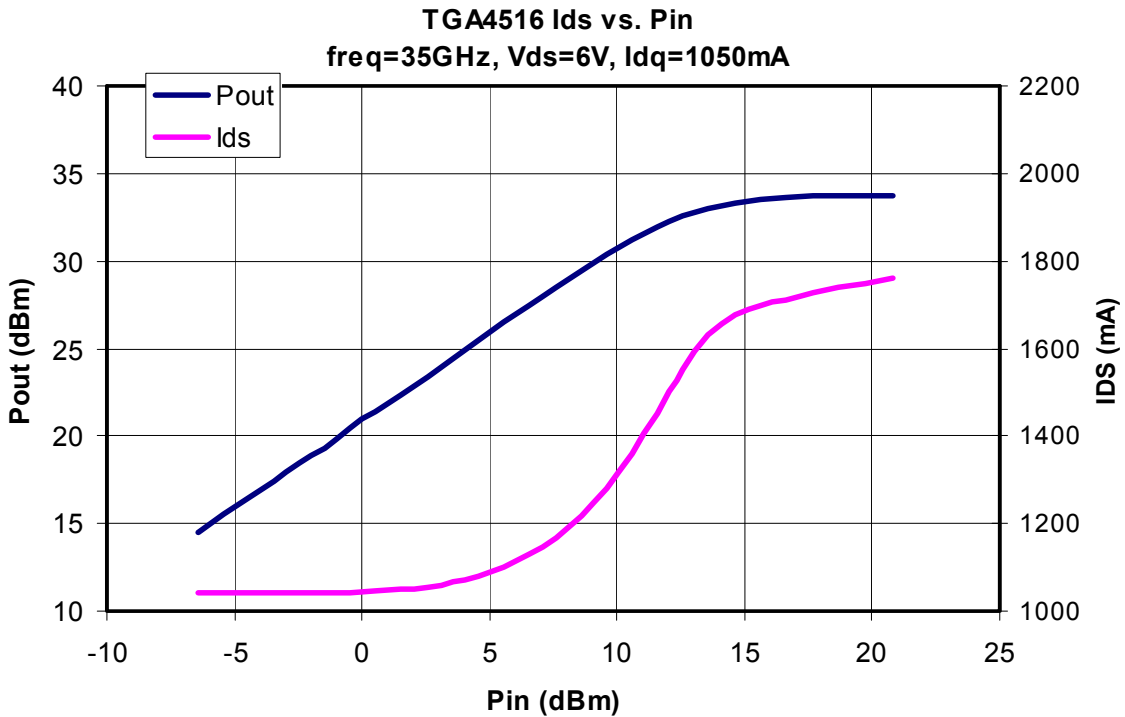
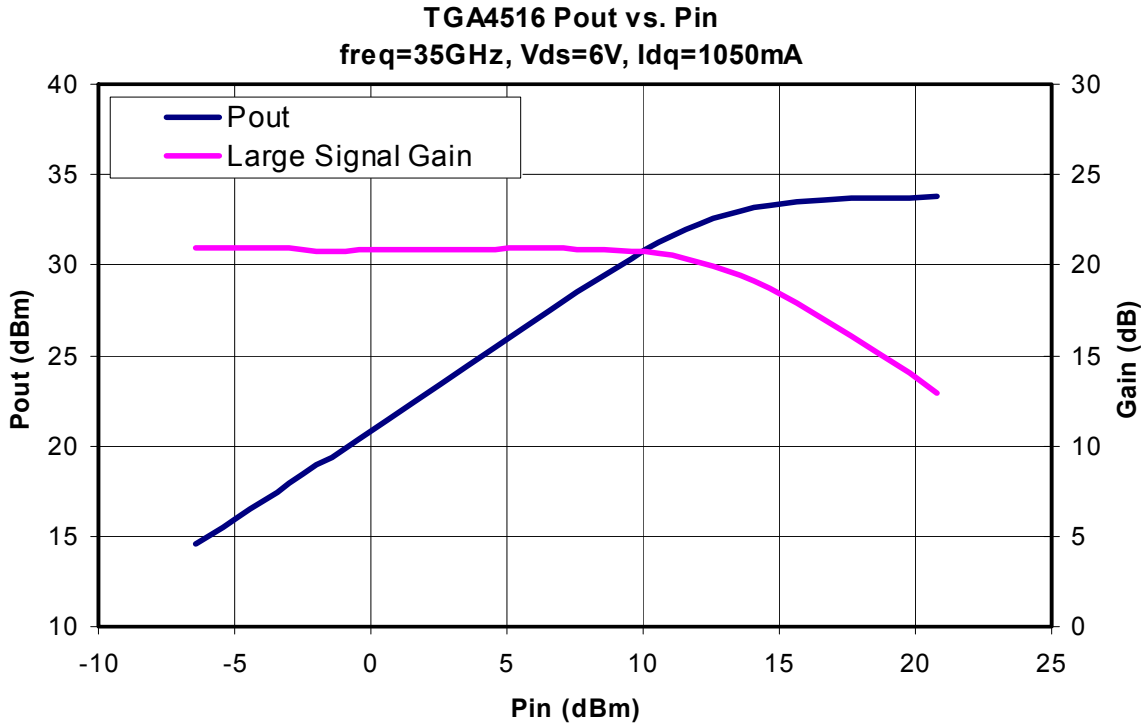
Median Lifetime (T_m) vs. Channel Temperature



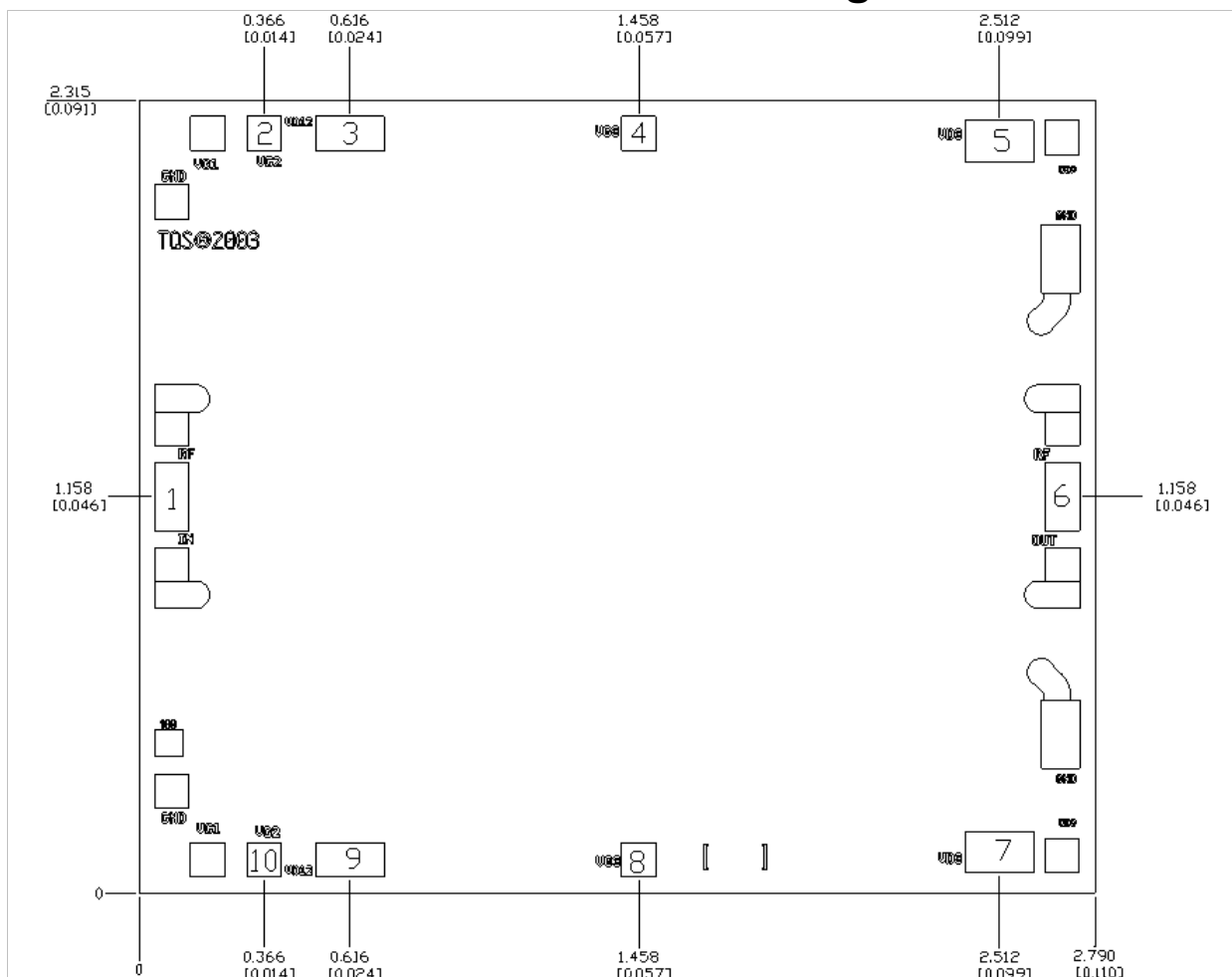
Fixtured Performance



Fixtured Performance



Mechanical Drawing



Units: Millimeters [inches]

Thickness: 0.100 [0.004] (reference only)

Chip edge to bond pad dimensions are shown to center of bond pad

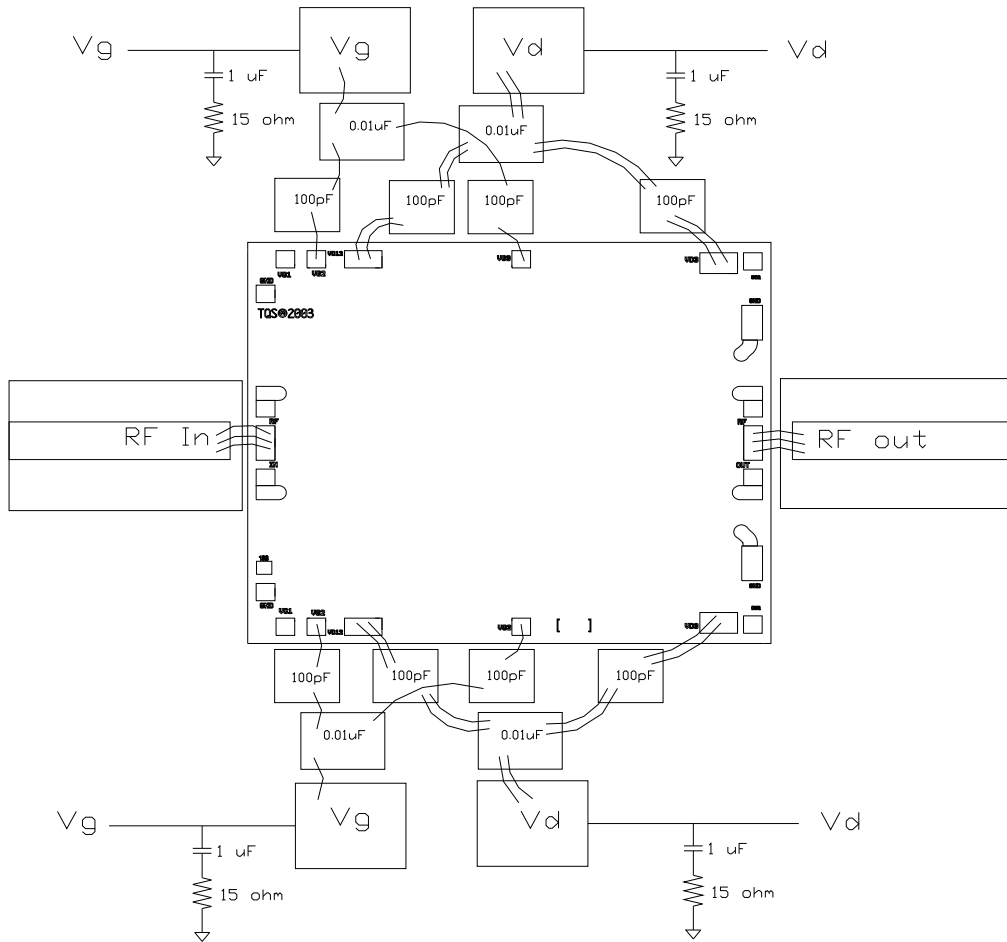
Chipsize: 2.79 x 2.315 [0.110 x 0.091] +/- 0.51 [0.002]

RF Ground is backside of MMIC

Bond pad #1	(RF Input)	0.100 x 0.200	[0.004 x 0.008]
Bond pad #2	(Vg2)	0.100 x 0.100	[0.004 x 0.004]
Bond pad #3	(Vd12)	0.100 x 0.200	[0.004 x 0.008]
Bond pad #4	(Vg3)	0.100 x 0.100	[0.004 x 0.004]
Bond pad #5	(Vd3)	0.100 x 0.100	[0.004 x 0.004]
Bond pad #6	(RF Output)	0.100 x 0.200	[0.004 x 0.008]
Bond pad #7	(Vd3)	0.100 x 0.200	[0.004 x 0.008]
Bond pad #8	(Vg3)	0.100 x 0.100	[0.004 x 0.004]
Bond pad #9	(Vd12)	0.100 x 0.200	[0.004 x 0.008]
Bond pad #10	(Vg2)	0.100 x 0.100	[0.004 x 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



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.