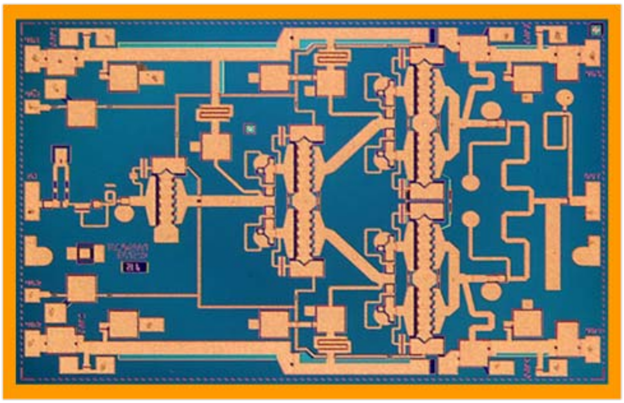
6 - 18 GHz 2.8 Watt Power Amplifier

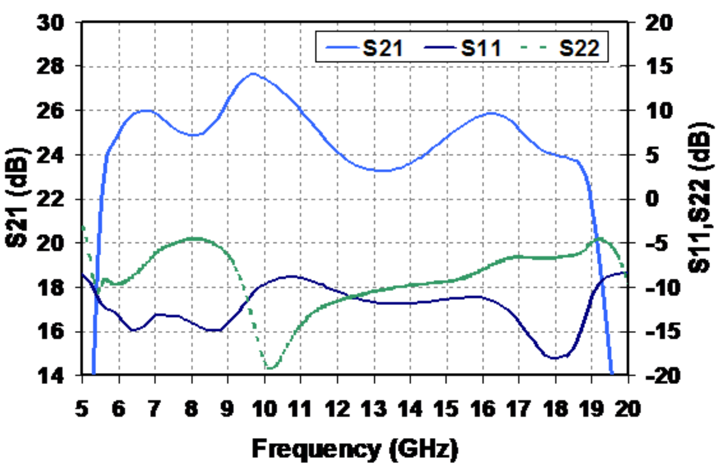


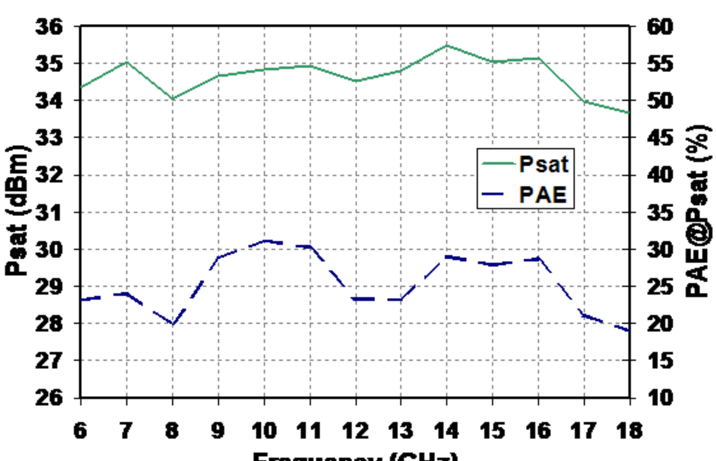
Key Features and Performance

- 34.5 dBm Midband Pout
- 24 dB Nominal Gain
- 10 dB Typical Input Return Loss
- 5 dB Typical Output Return Loss
- Bias Conditions: 8 V @ 1.2 A
- 0.25 µm Ku pHEMT 2MI
- Thermal Spreader dimensions: 4.445 x 3.023 mm

Preliminary Measured Performance

Bias Conditions: V_D = 8 V I_D = 1.2 A





Primary Applications

- X-Ku Point-to-Point
- ECCM

Product Description

TriQuint's TGA2501-TS is a wideband power amplifier fabricated on TriQuint's production-released 0.25um power pHEMT process. Operating from 6 to 18Ghz, it achieves 34.5dBm of saturated output power, 25% efficiency and 24dB of small signal gain. The TGA2501-TS is pre-assembled to a CuMo carrier (or Thermal Spreader) for improved thermal management and ease of handling. Using AuSn solder and a vacuum reflow process, attachment is made with minimal voiding and screened via x-ray to ensure acceptable attach.

Fully matched to 50 ohms, RoHS compliant and with integrated DC blocking caps on both I/O ports, the TGA2501-TS is ideally suited to support both commercial and defense related opportunities.

The TGA2501-TS is 100% DC and RF tested on-wafer to ensure compliance to performance specifications.

TABLE I
ABSOLUTE MAXIMUM RATINGS 1/

Symbol	Parameter	Value	Notes
V^+	Positive Supply Voltage	9 V	
V^-	Negative Supply Voltage Range	-5 V to 0 V	
I^+	Positive Supply Current (Quiescent)	2.0 A	
$\| I_G \|$	Gate Supply Current	52 mA	
P_{IN}	Input Continuous Wave Power	26 dBm	
P_D	Power Dissipation	18.0 W	
Tchannel	Channel Temperature	200 °C	2/
	Mounting Temperature (30 Seconds)	320 °C	
	Storage Temperature	-65 to 150 °C	

1/ These ratings represent the maximum operable values for this device. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device and/or affect device lifetime. These are stress ratings only, and functional operation of the device at these conditions is not implied.

2/ Junction operating temperature will directly affect the device median lifetime (T_M). For maximum life, it is recommended that junction temperatures be maintained at the lowest possible levels.

TABLE II
THERMAL INFORMATION

PARAMETER	TEST CONDITION	Tchannel (°C)	θ_{JC} (°C/W)	Tm (HRS)
θ_{JC} Thermal Resistance (Channel to Backside)	V_D = 8 V I_D = 1.2 A P_{DIS} = 9.6 W	144.56	7.77	1.6E+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.

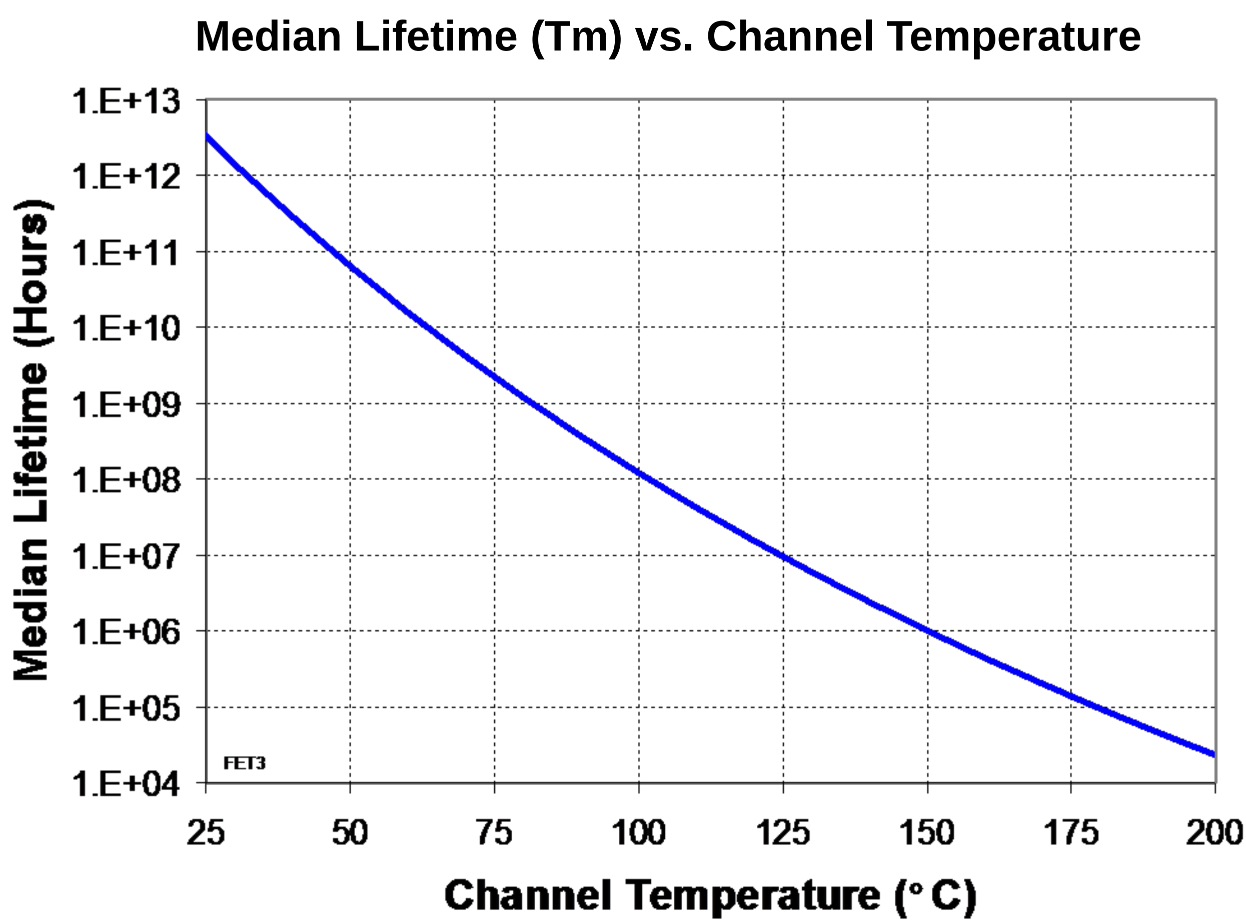


TABLE III
DC PROBE TEST
(TA = 25 °C, nominal)

NOTES	SYMBOL	LIMITS		UNITS
		MIN	MAX	
1/	$I_{DSS(Q1)}$	120	564	mA
1/	$G_{M\,(Q1)}$	264	636	mS
1/, **2/**	$\|V_P\|$	0.5	1.5	V
1/, **2/**	$\|V_{BVGS}\|$	13	30	V
1/, **2/**	$\|V_{BVGD}\|$	13	30	V

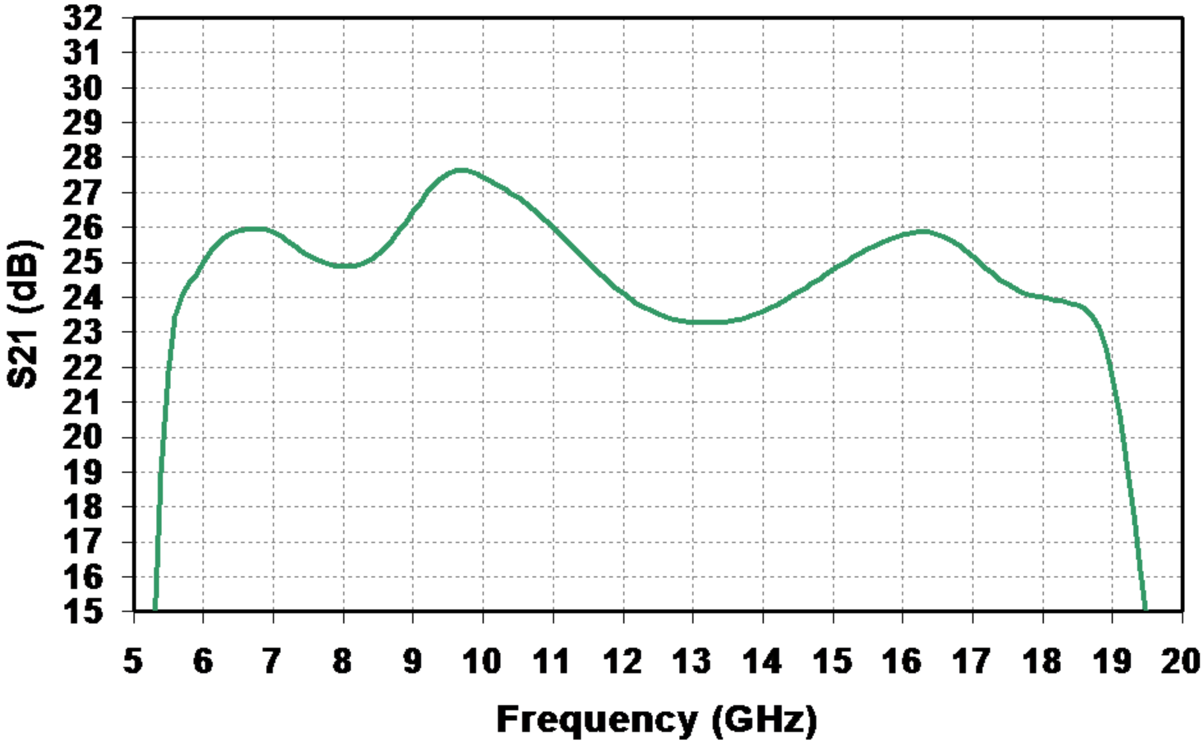
1/ Q1 is a 1200 μm FET
2/ V_P, V_{BVGD}, and V_{BVGS} are negative.

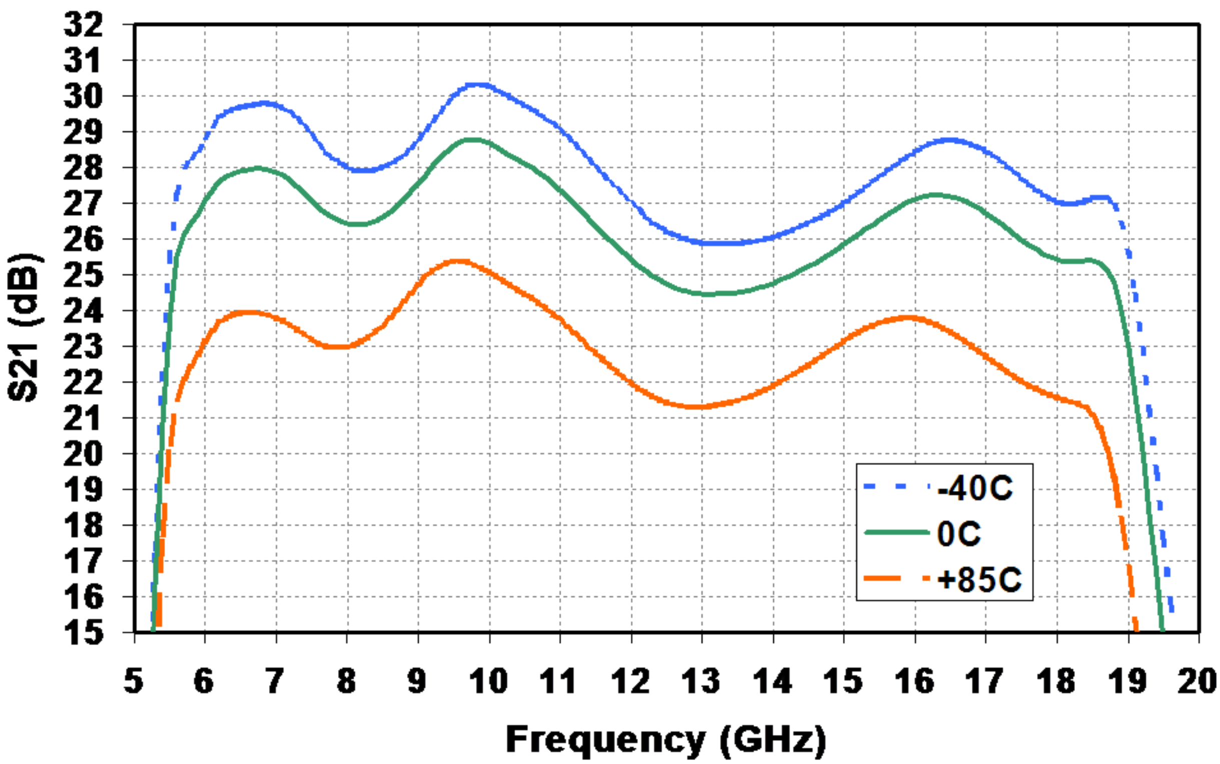
TABLE IV
RF CHARACTERIZATION TABLE
(T_A = 25 °C, nominal)
(Vd = 8 V, Idq = 1.2 A ±5%)

SYMBOL	PARAMETER	TEST CONDITION	MIN	TYPICAL	UNITS
Gain	Small Signal Gain	F = 6-11 GHz F = 12-18 GHz	22 20	25 24	dB
IRL	Input Return Loss	F = 6-18 GHz		10	dB
ORL	Output Return Loss	F = 6-18 GHz		5	dB
PAE	Power Added Efficiency	F = 6-18 GHz		25	%
PWR	Output Power @ Pin=+15dBm	F = 6-8 GHz F = 9-17 GHz F = 18 GHz	29.5 32.5 31.5	34.0 34.5 33.5	dBm

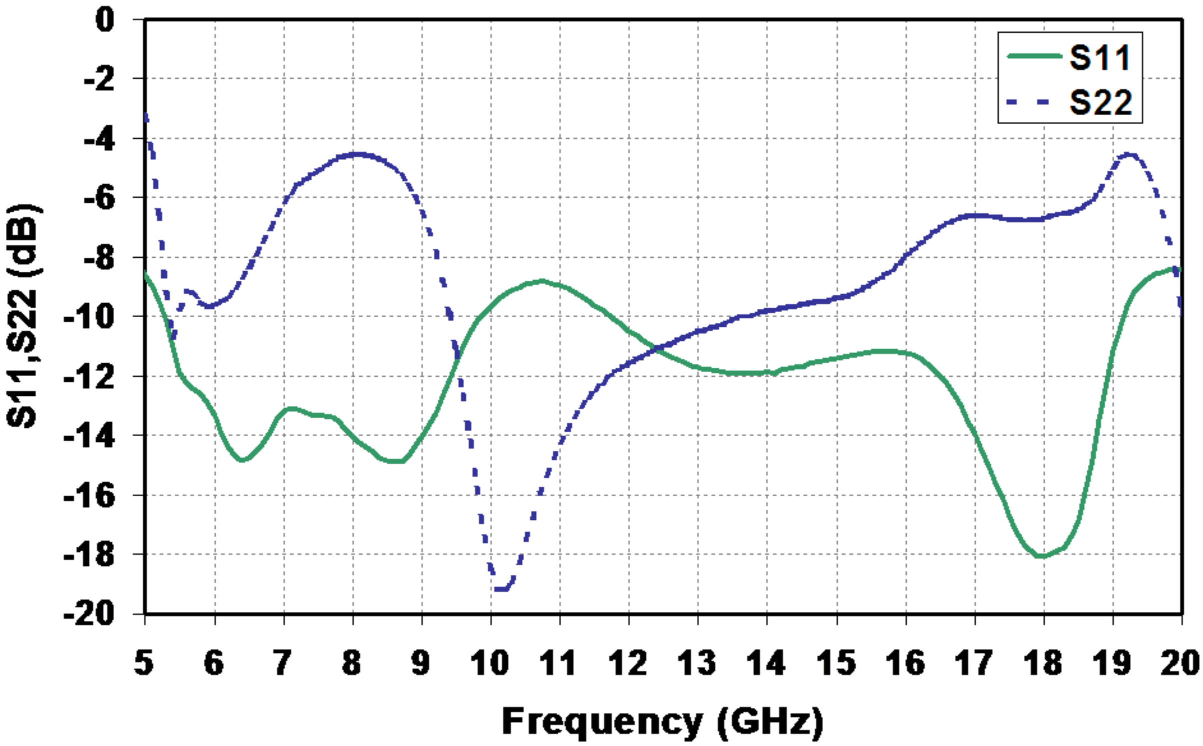
Note: Minimum specifications are based on RF wafer probe measurements

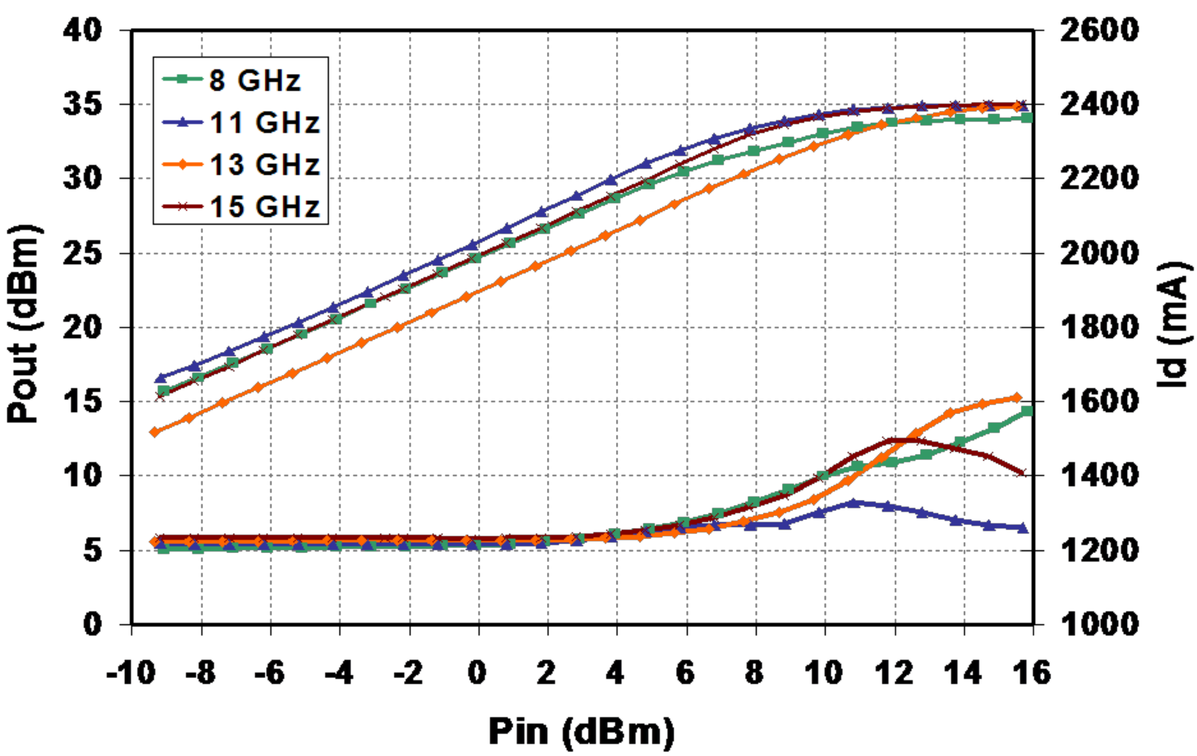
Fixtured Performance



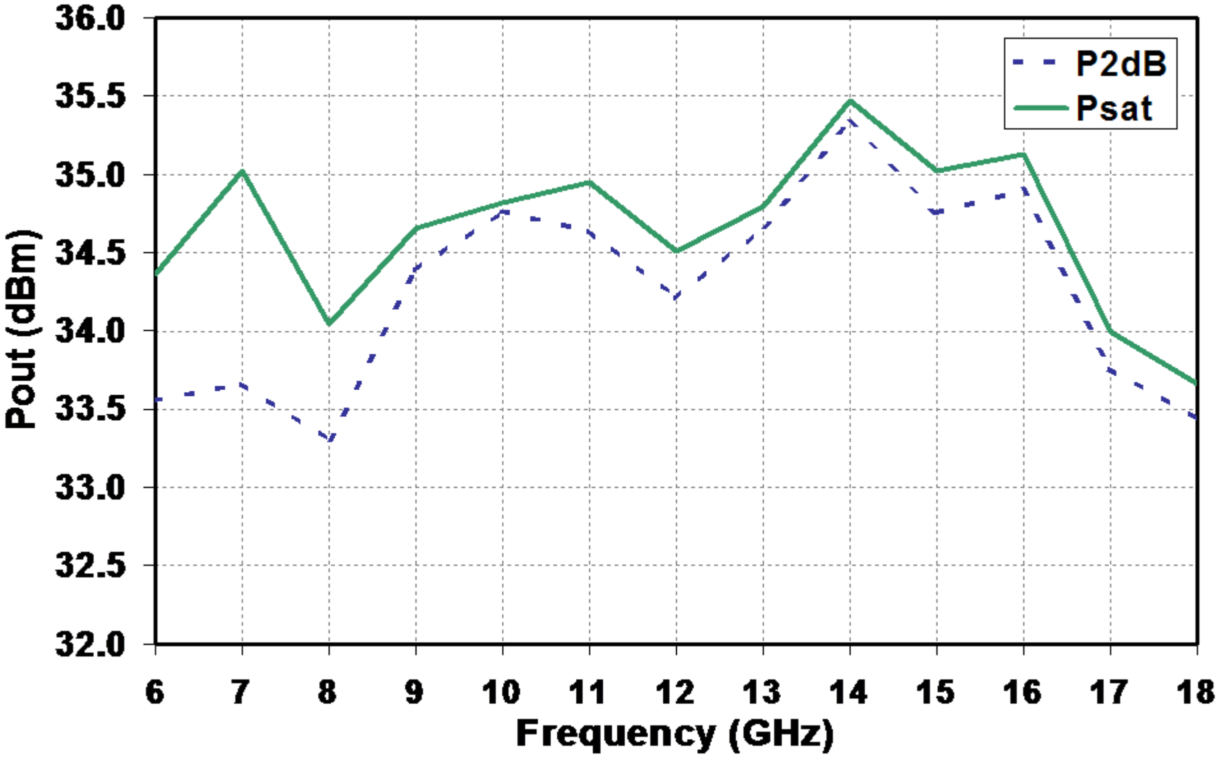


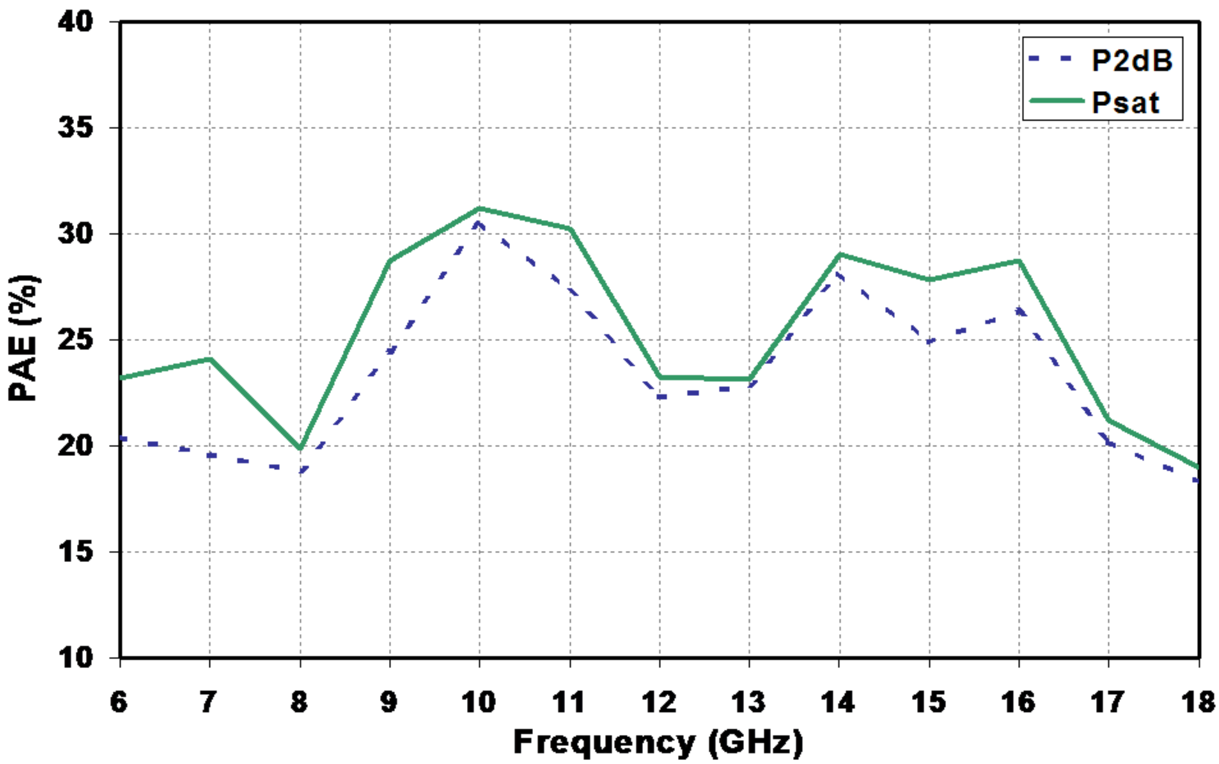
Fixtured Performance



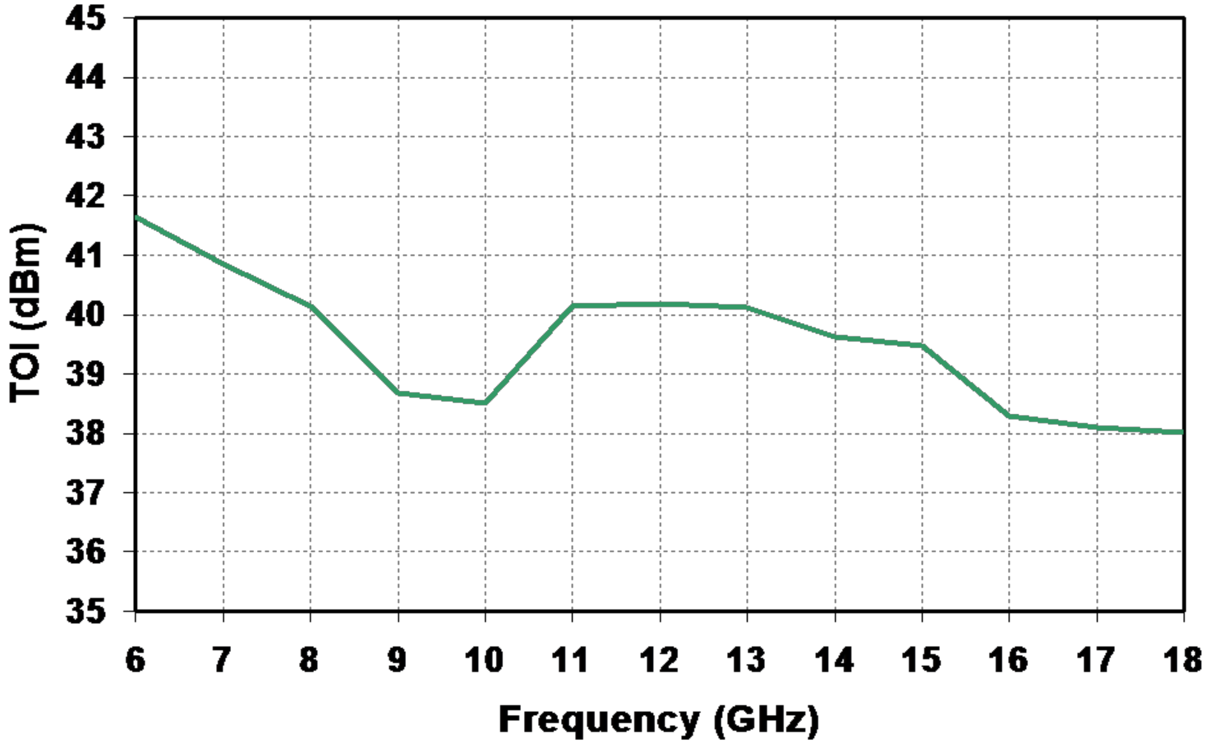


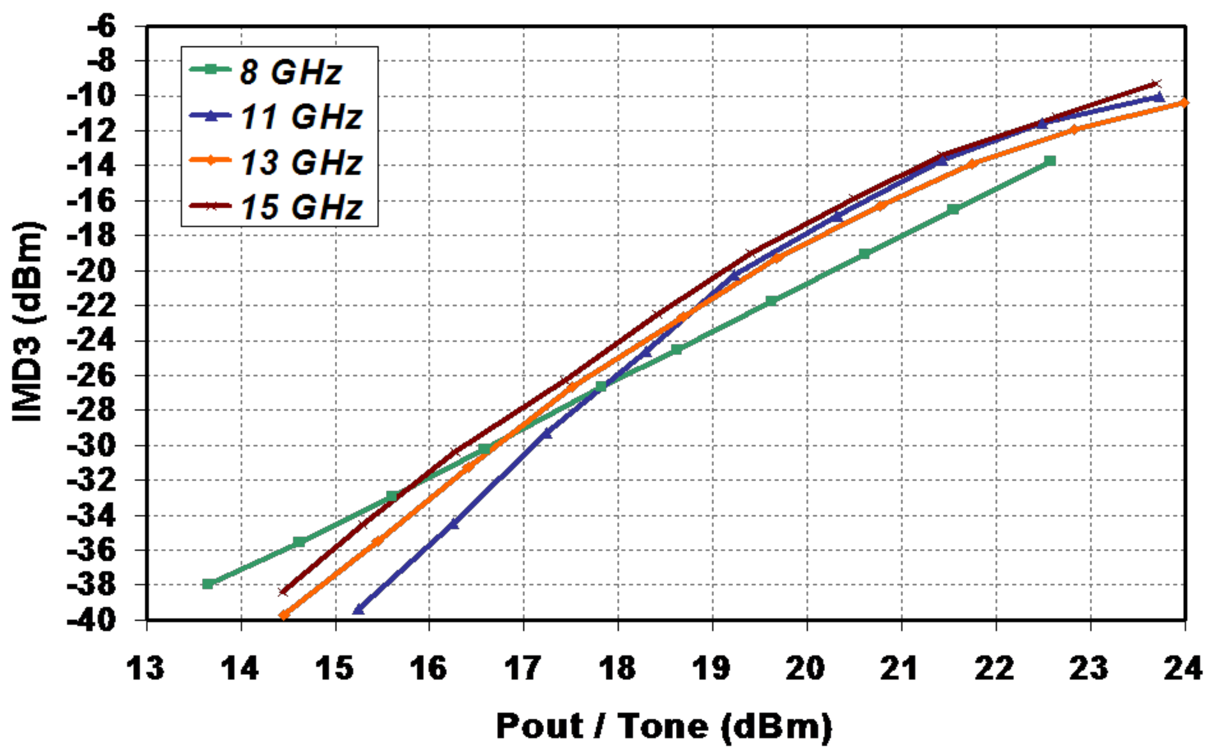
Fixtured Performance



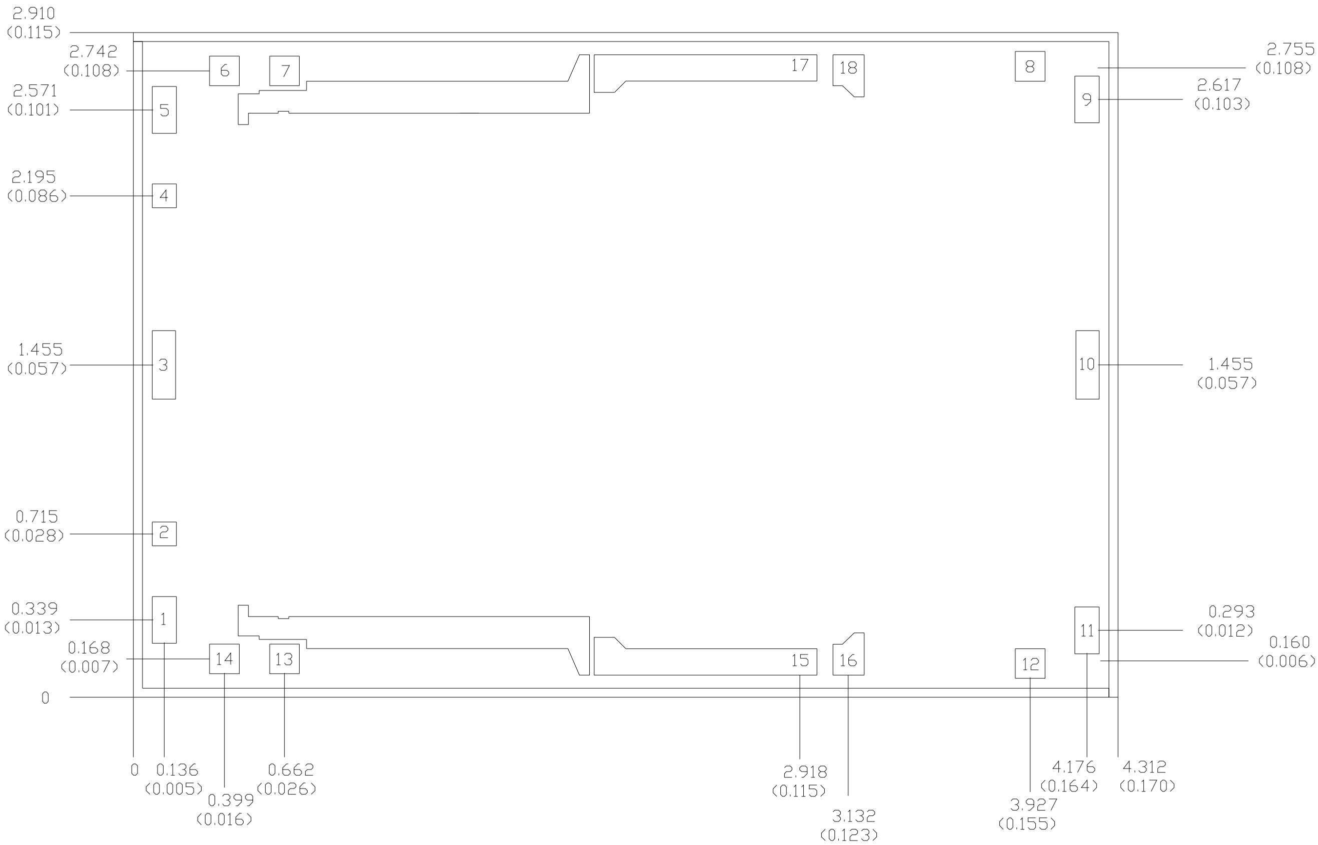


Fixtured Performance





Mechanical Drawing
TGA2501 MMIC only



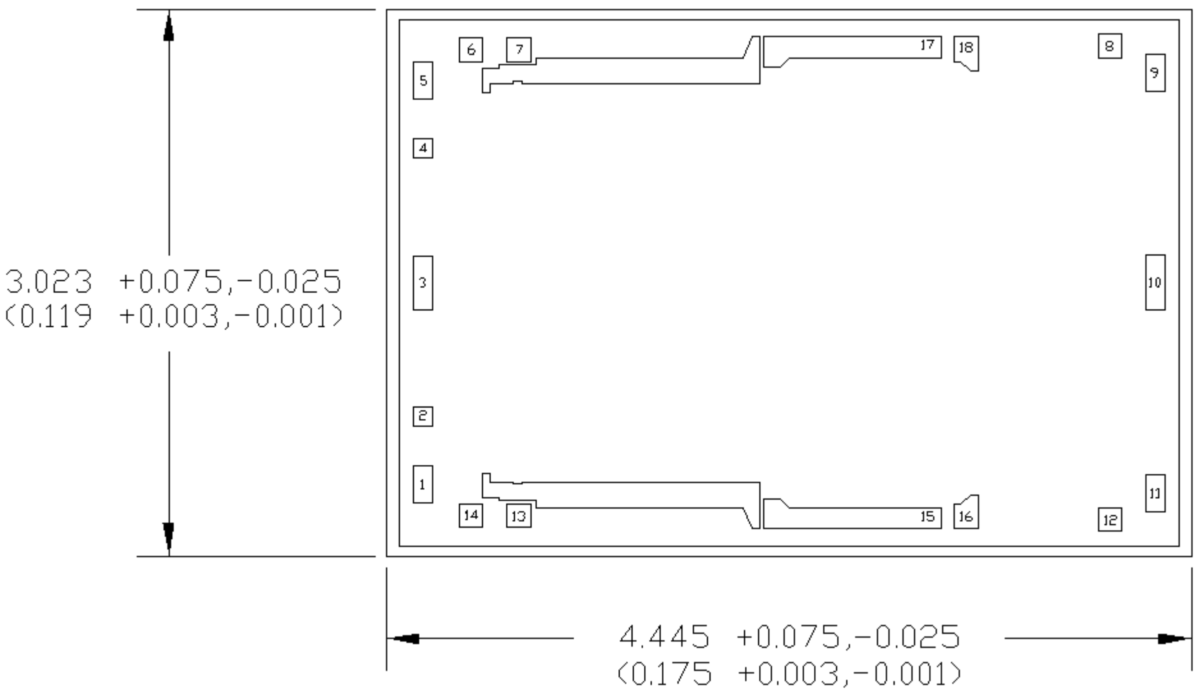
Units: millimeters (inches)
Thickness: 0.1016 (0.004) (reference only)
Chip edge to bond pad dimensions are shown to center of Bond pads.
Chip size tolerance: +/- 0.0508 (0.002)
RF Ground on backside of MMIC

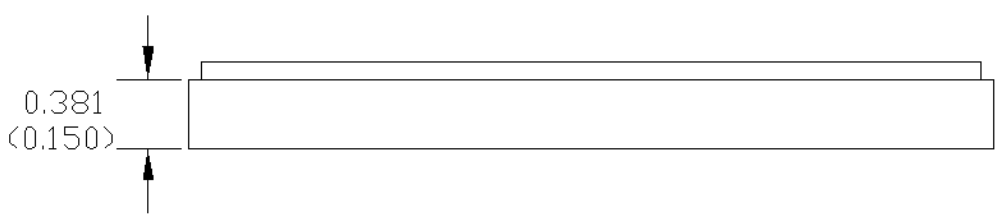
Bond Pad #1,5 (Vd1&Vd2)	0.100 x 0.200	(0.004 x 0.008)
Bond Pad #9,11 (Vd3)	0.100 x 0.200	(0.004 x 0.008)
Bond Pad #2,4 (Vg)	0.100 x 0.100	(0.004 x 0.004)
Bond Pad #3 (RF Input)	0.100 x 0.300	(0.004 x 0.012)
Bond Pad #10 (RF Output)	0.100 x 0.300	(0.004 x 0.012)
Bond Pad #6,7,13,14 (DQ)	0.125 x 0.125	(0.005 x 0.005)
Bond Pad #15,16,17,18 (Vd)	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.

Mechanical Drawing

TGA2501 on Thermal Spreader

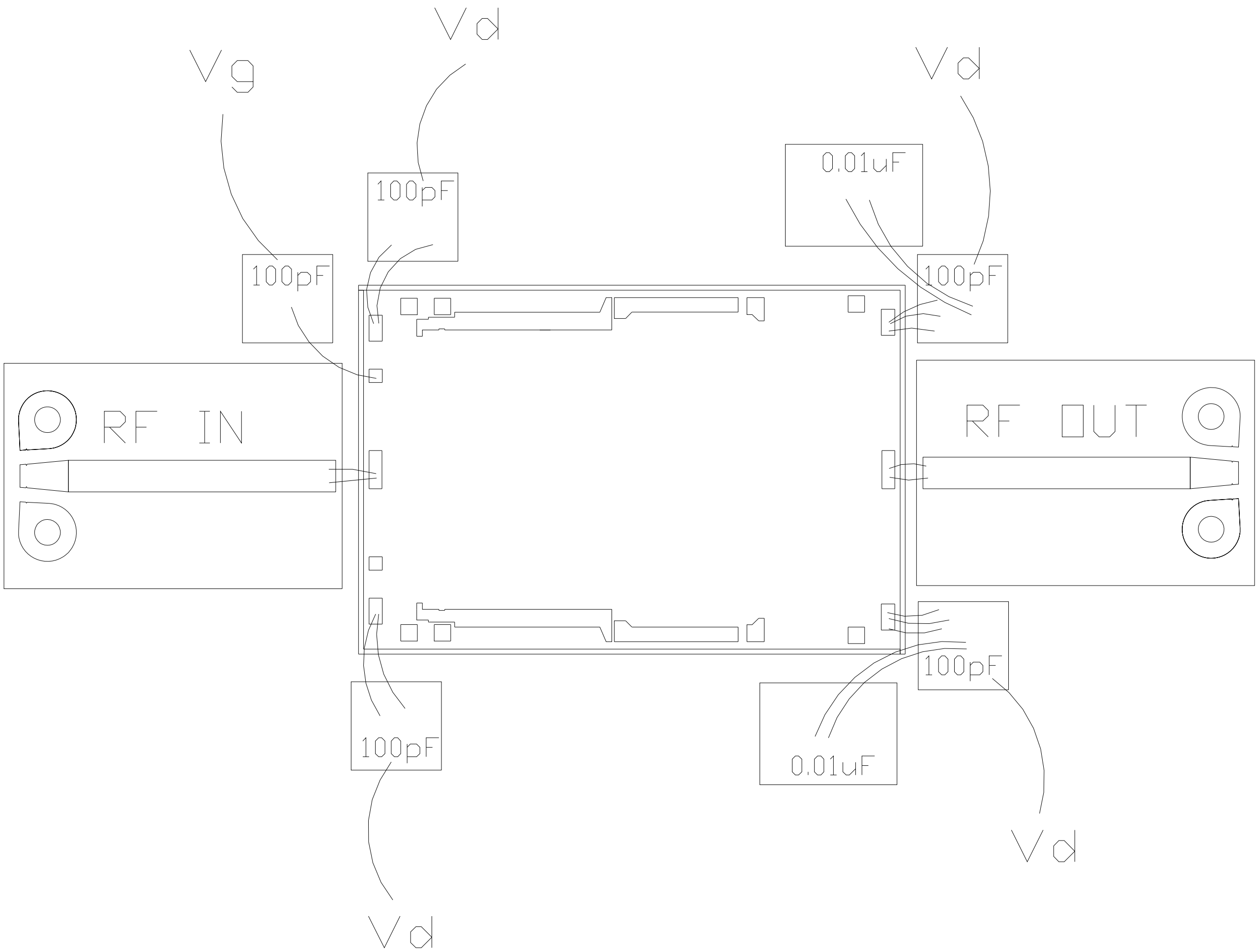




Notes:
1. Dimensions are in mm[inches].
2. Dimension limits apply after plating.
3. Dimension of surface roughness is in micrometers(microinches).
4. Material: Cu13/Mo74/Cu13.
5. Plating:
   Electrolytic Gold (Au) 2.5 um minimum per MIL-G45204
   over
   Electrolytic Nickel (Ni) 2.5-7.5 um per QQ-N-290
6. MMIC is attached to thermal spreader using AuSn solder.

TriQuint Semiconductor: www.triquint.com (972)994-8465 Fax (972)994-8504 Info-products@tqs.com

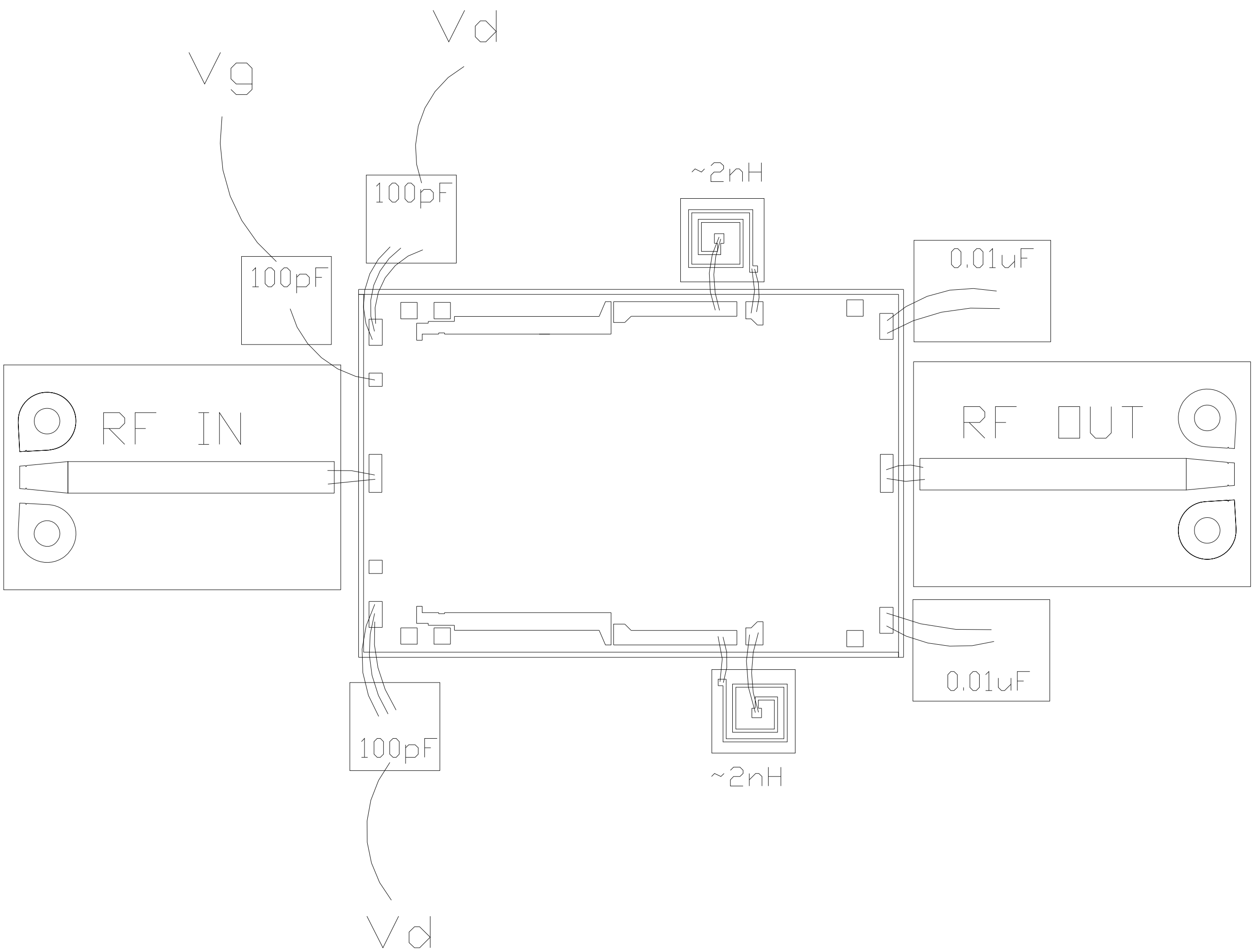
Chip Assembly & Bonding Diagram



1uF or larger capacitors (not shown) should be on the gate and drain line.

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

Alternative Chip Assembly & Bonding Diagram



1uF or larger capacitors (not shown) should be on the gate and drain line.

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

Assembly Process Notes

Component storage 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.
- Attachment of the thermal spreader should use an epoxy with high thermal conductivity.
- Curing should be done in a convection oven.
- Microwave or radiant curing should not be used because of differential heating.

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.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.
- Maximum stage termperature is 200 °C.

Ordering Information

Part	Package Style
TGA2501-TS	GaAs MMIC Die on Thermal Spreader

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