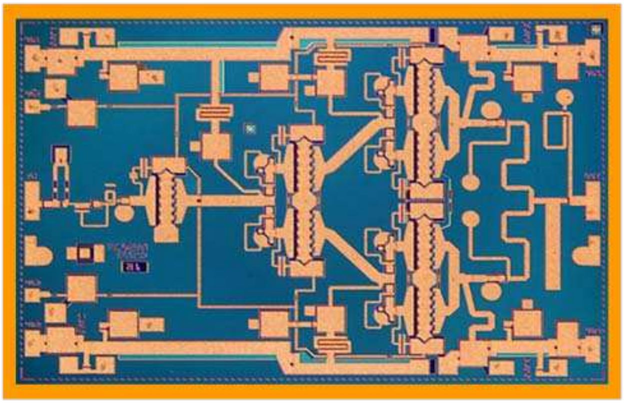
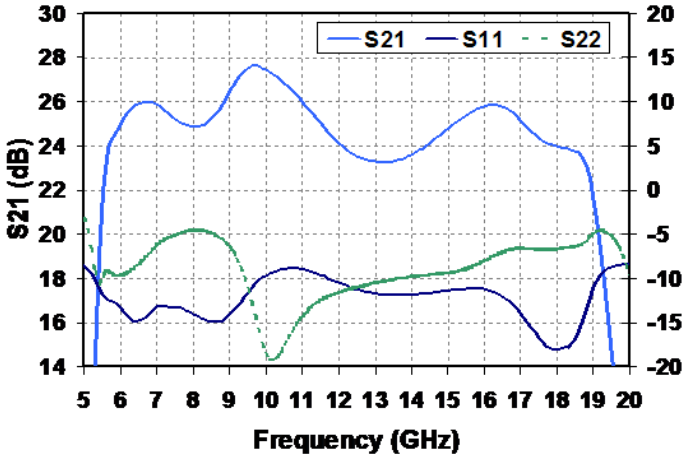
TGA2501-TS

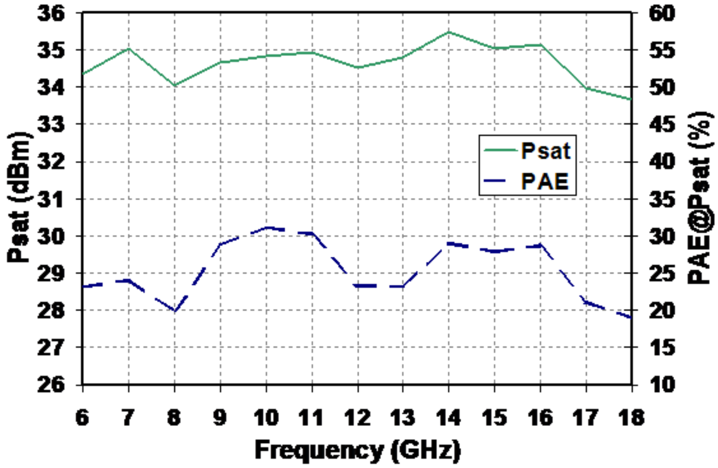
6 - 18 GHz 2.8 Watt Power Amplifier



Preliminary Measured Performance

Bias Conditions: V_D = 8 V I_D = 1.2 A





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

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.

Median Lifetime (Tm) vs. Channel Temperature

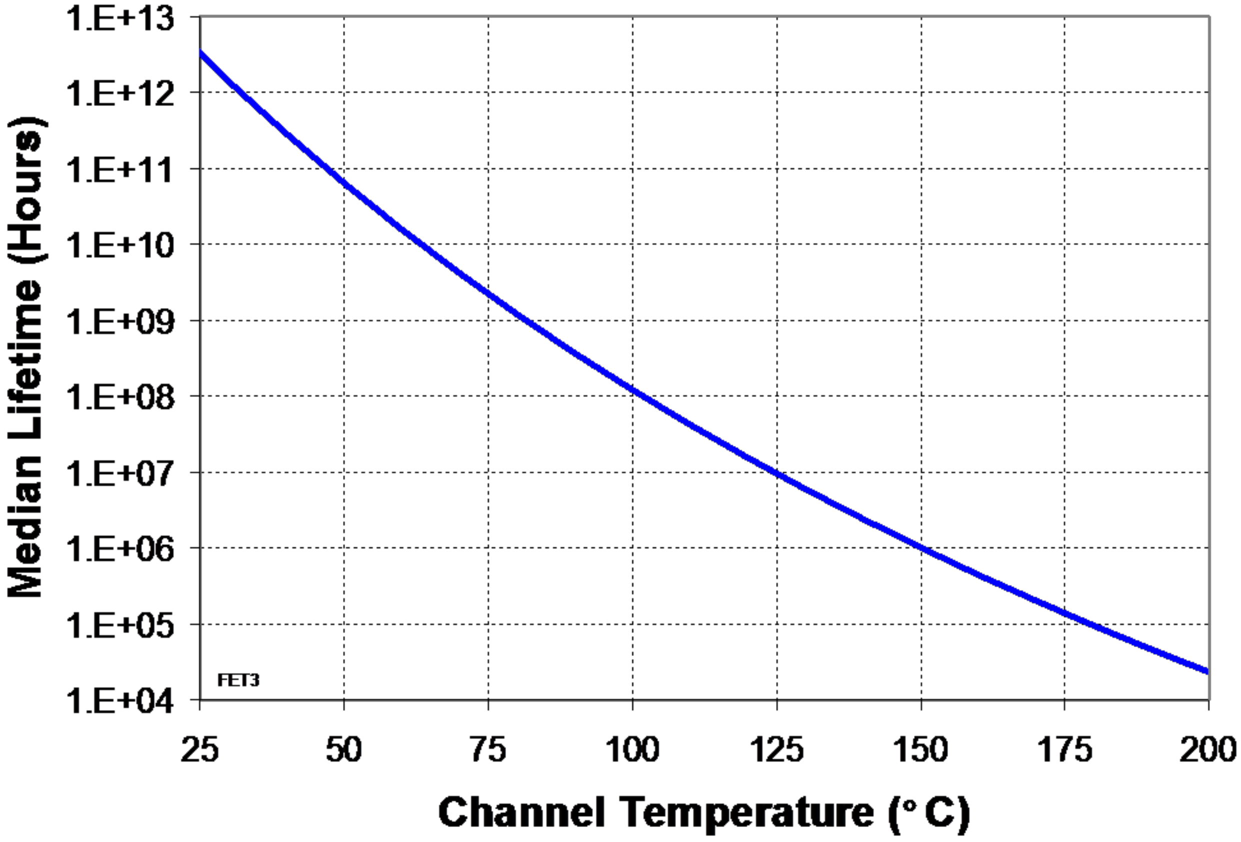


TABLE III
DC PROBE TEST
(TA = 25 °C, nominal)

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

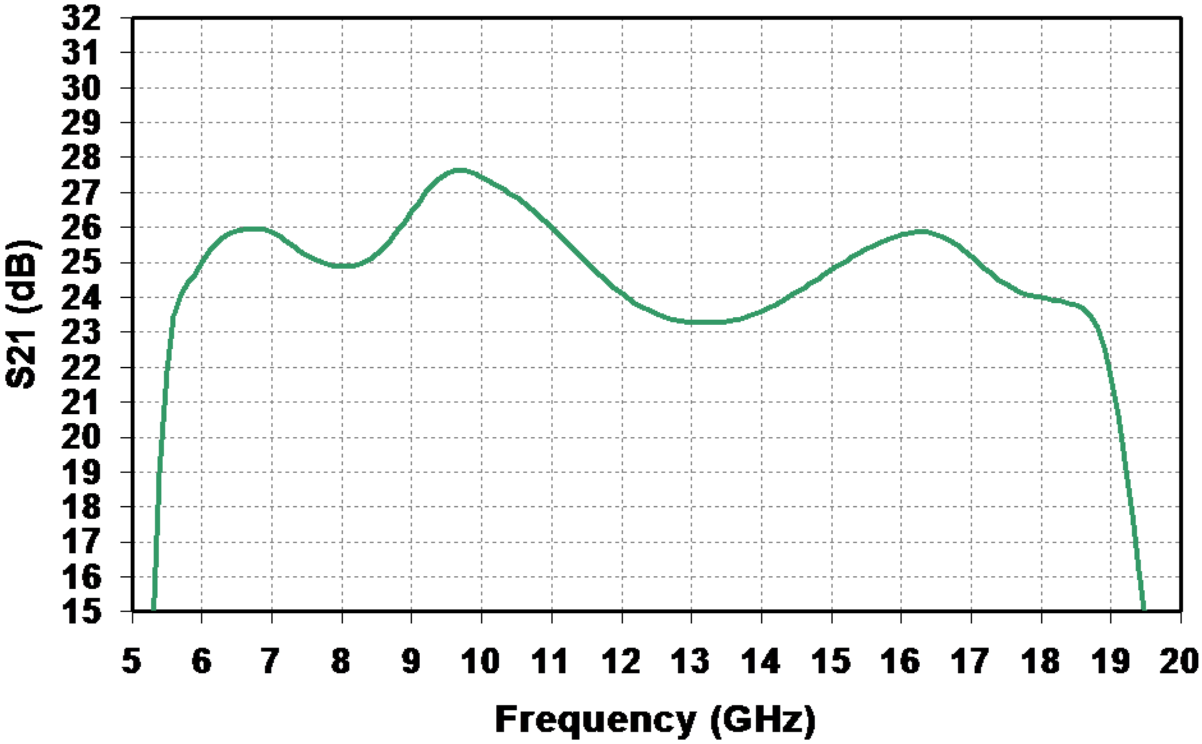
1/ Q1 is a 1200 µm FET
2/ V_P, V_{BVGD}, and V_{BVGS} are negative.

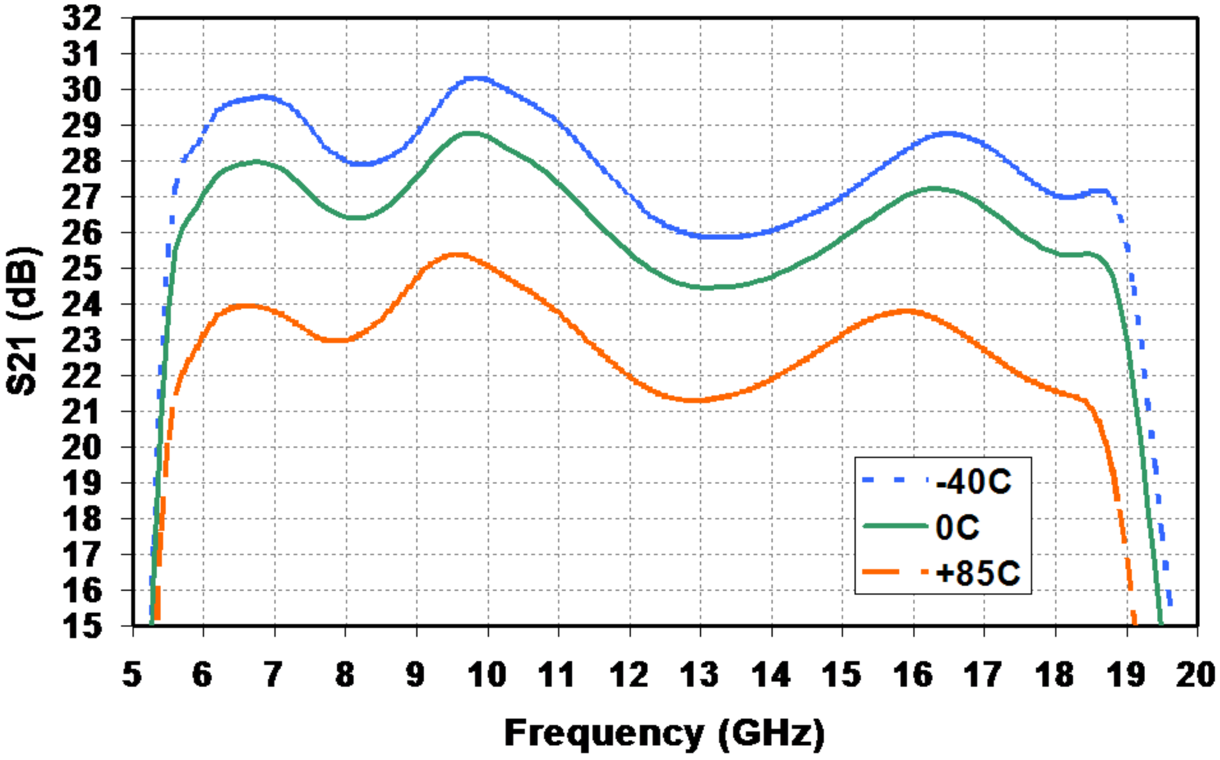
TABLE IV
RF CHARACTERIZATION TABLE
(T_A = 25 °C, nominal)
(Vd = 8 V, Idq = 1.2 A ±5%)

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

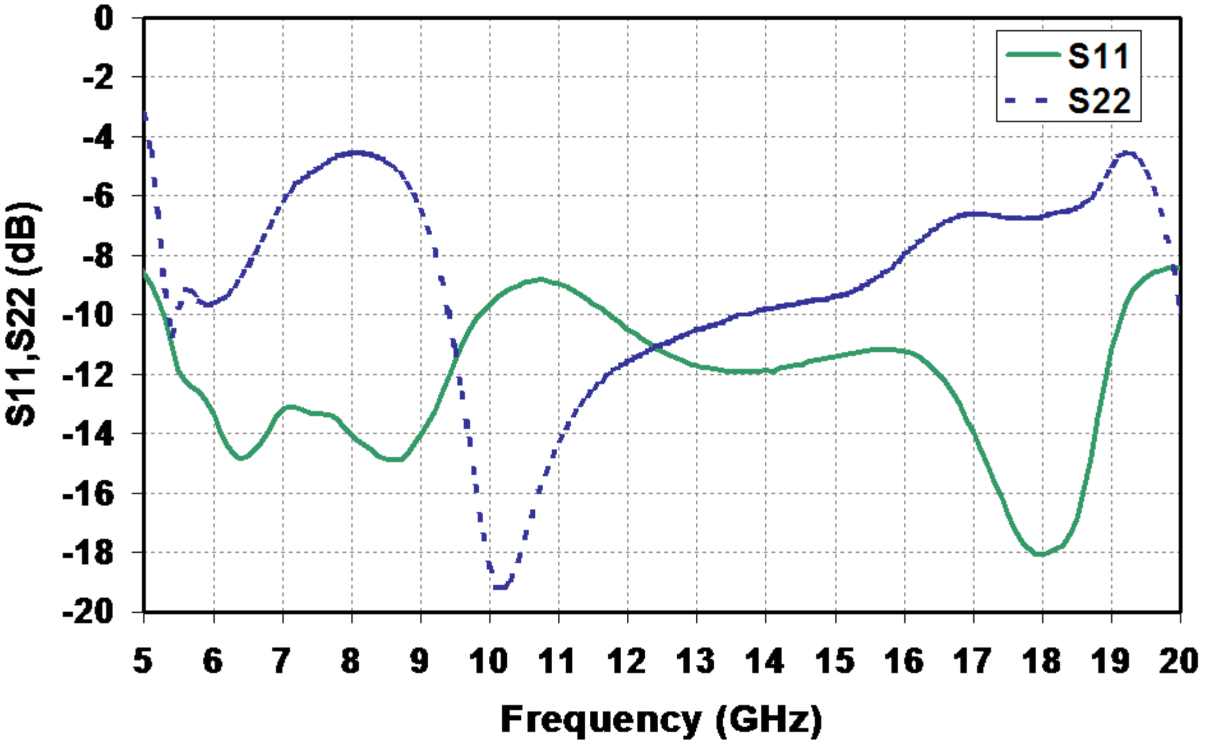
Note: Minimum specifications are based on RF wafer probe measurements

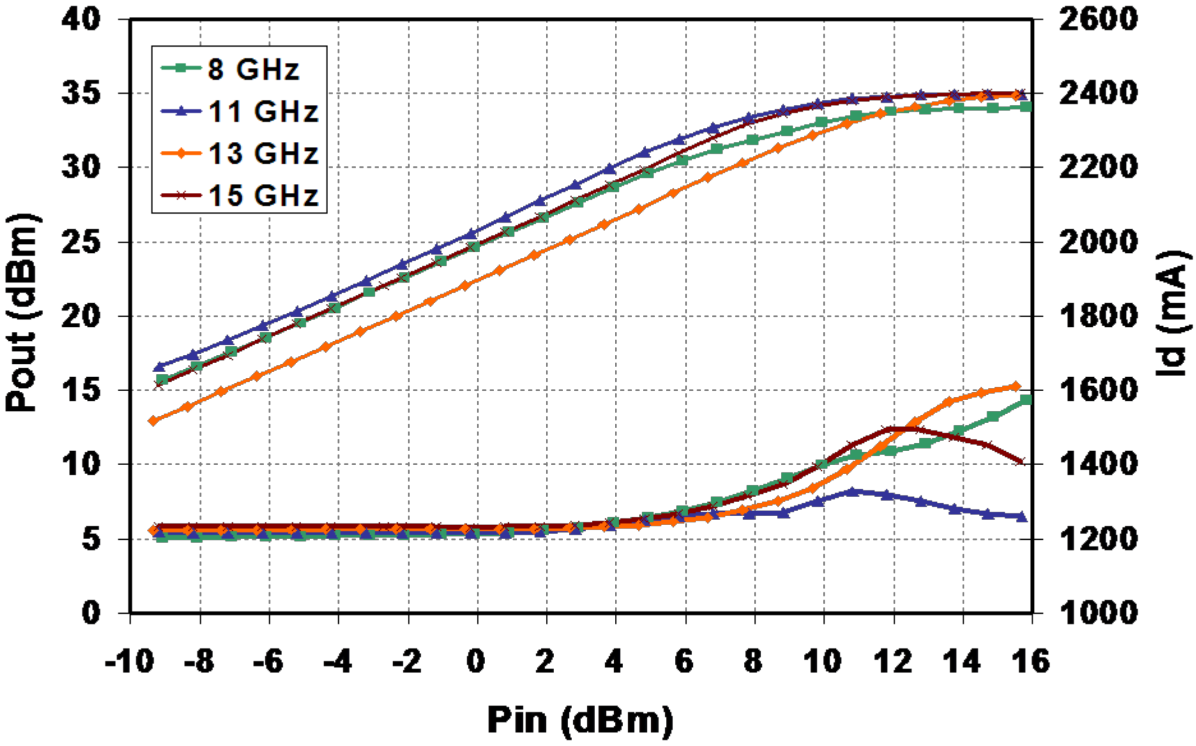
Fixtured Performance





Fixtured Performance





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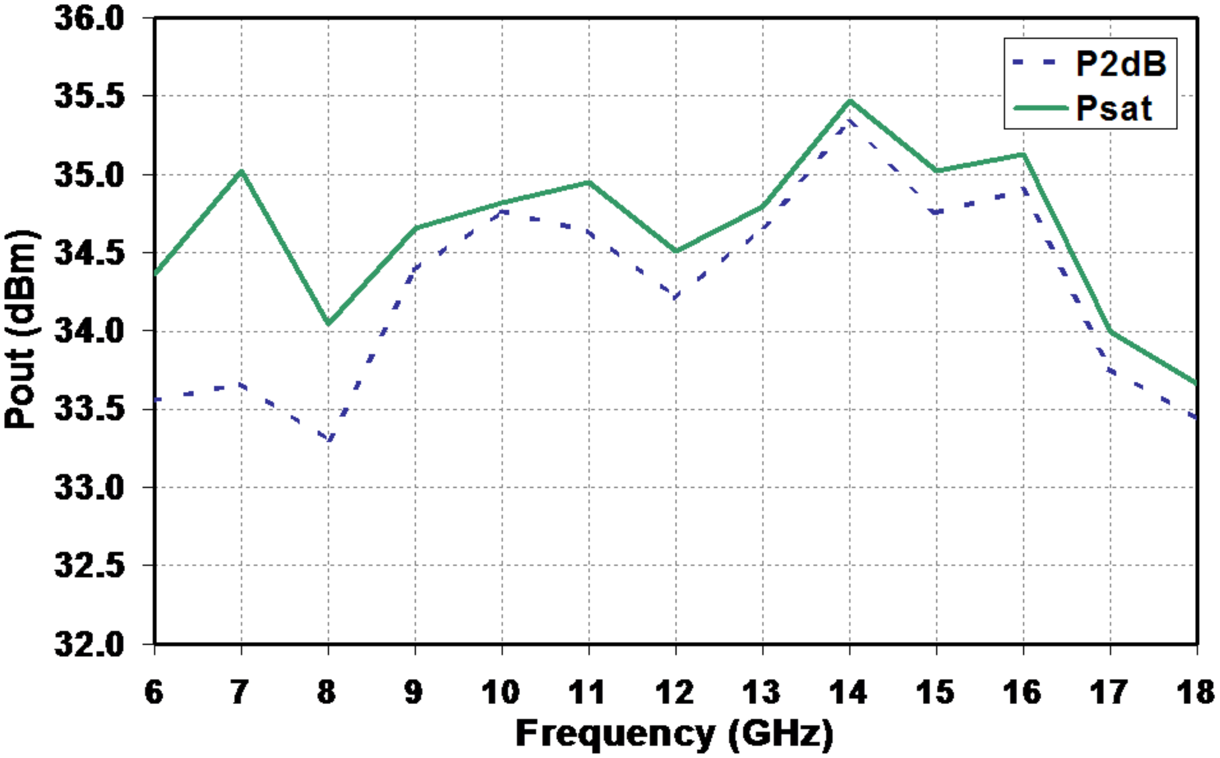

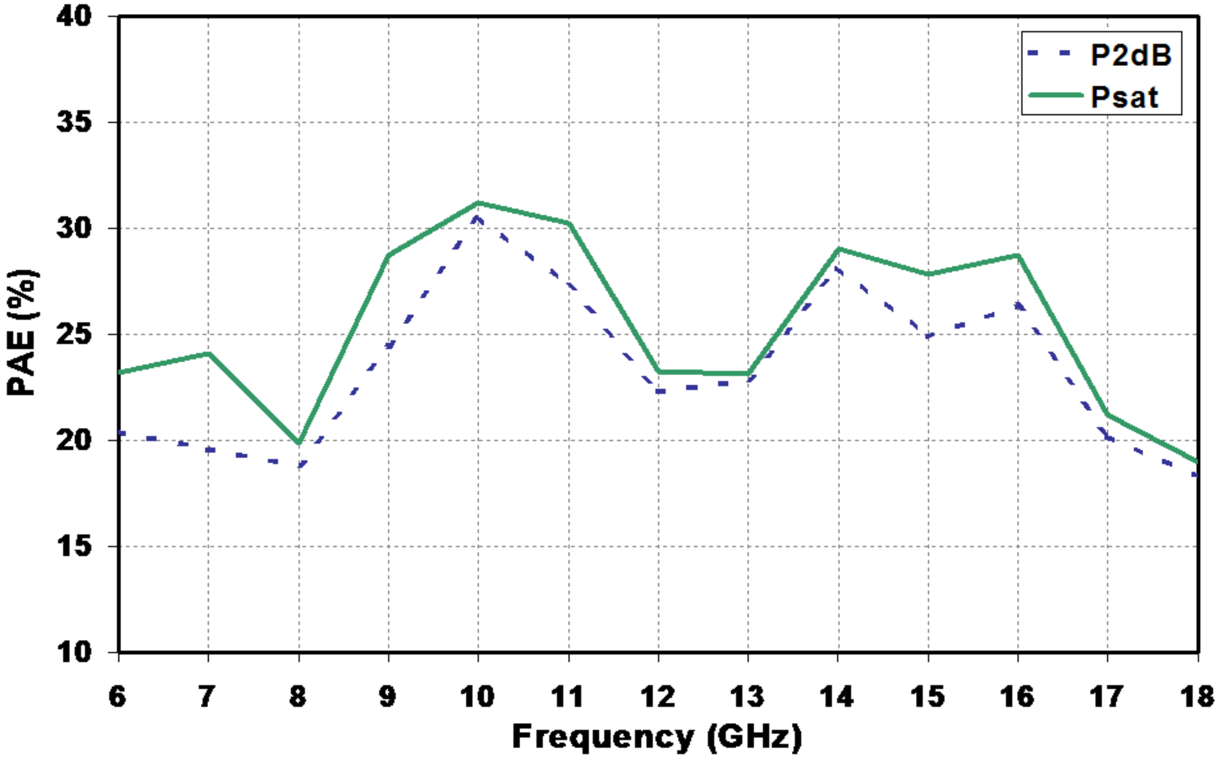

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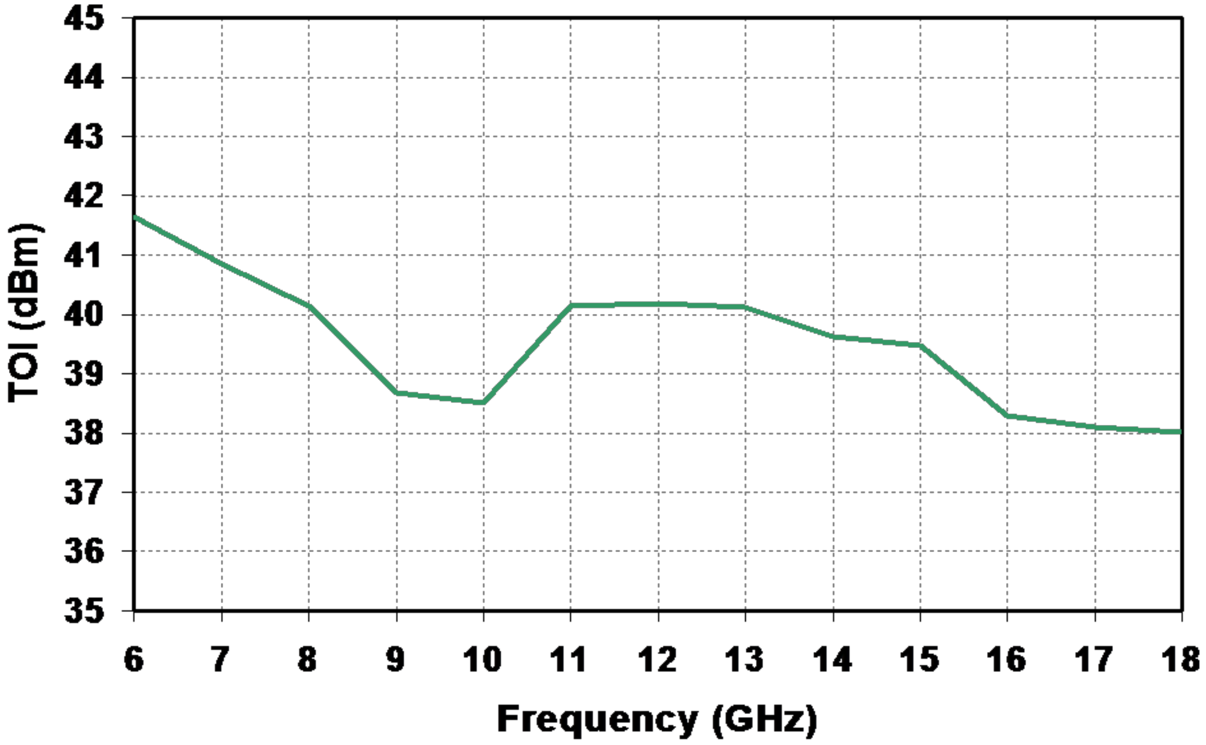
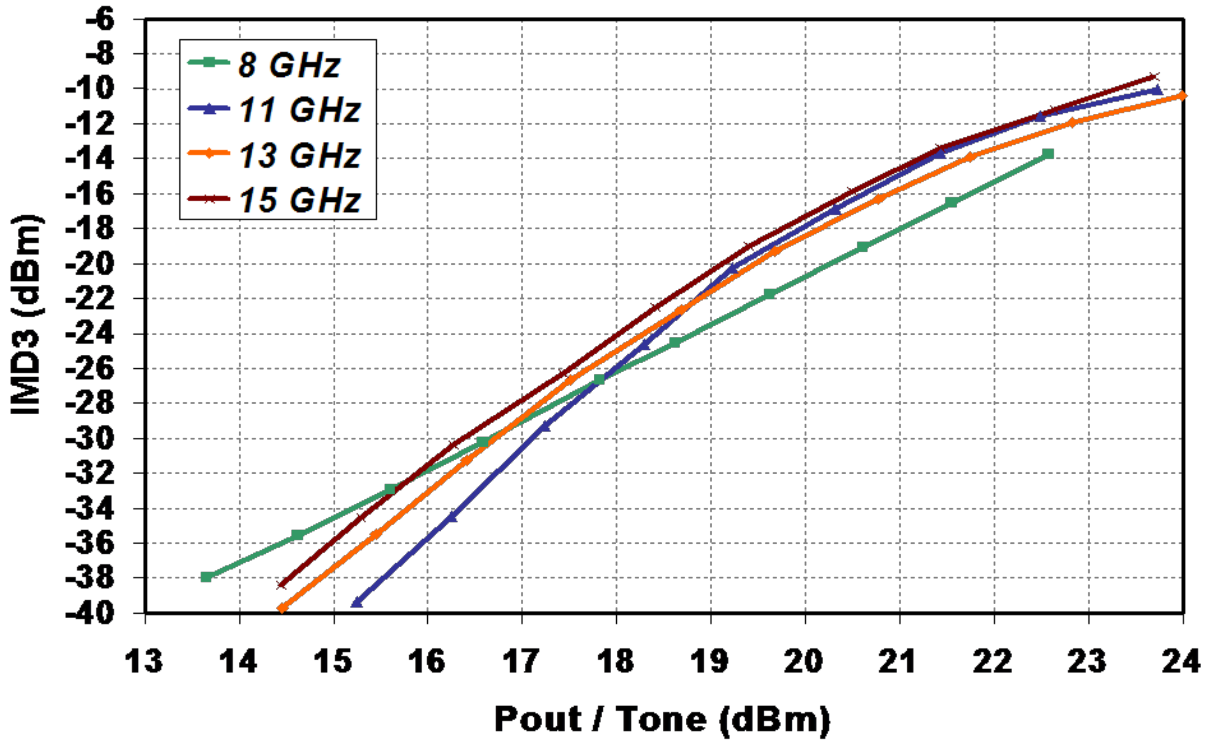
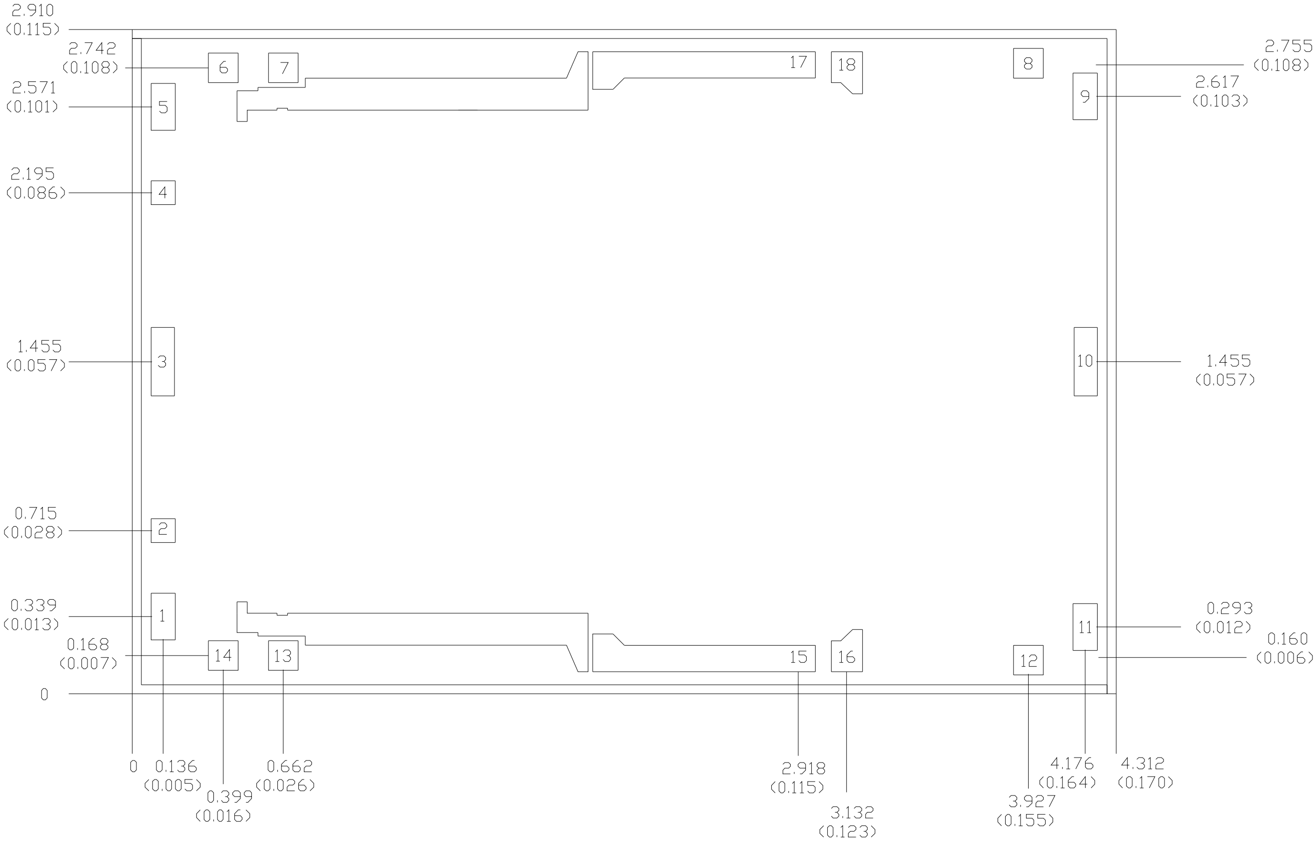




Mechanical Drawing
TGA2501 MMIC only



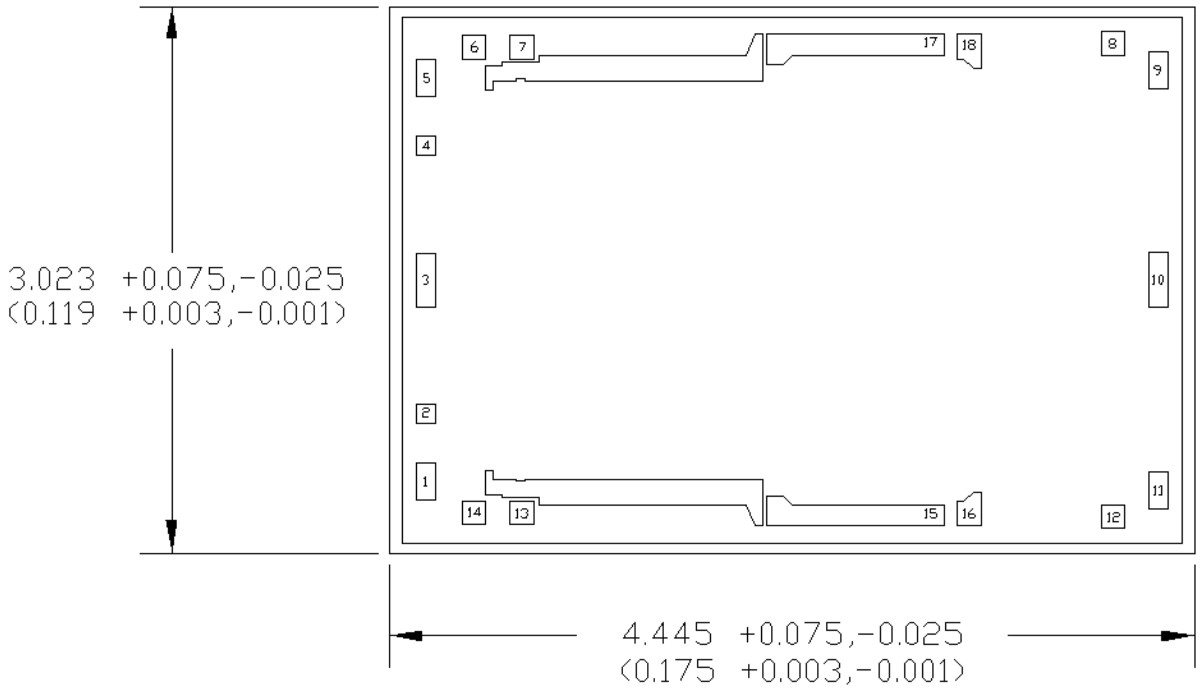
Units: millimeters (inches)
Thickness: 0.1016 (0.004) (reference only)
Chip edge to bond pad dimensions are shown to center of Bond pads.
Chip size tolerance: +/- 0.0508 (0.002)
RF Ground on backside of MMIC

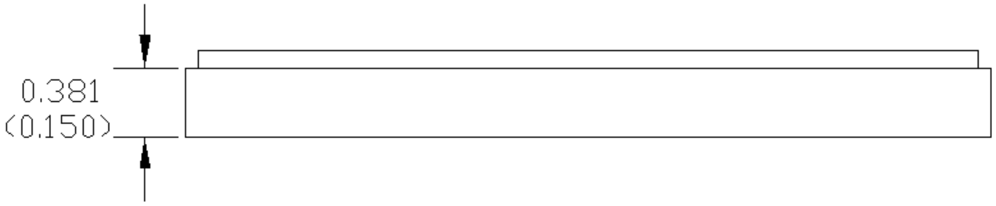
Bond Pad #1,5 (Vd1&Vd2)	0.100 x 0.200	(0.004 x 0.008)
Bond Pad #9,11 (Vd3)	0.100 x 0.200	(0.004 x 0.008)
Bond Pad #2,4 (Vg)	0.100 x 0.100	(0.004 x 0.004)
Bond Pad #3 (RF Input)	0.100 x 0.300	(0.004 x 0.012)
Bond Pad #10 (RF Output)	0.100 x 0.300	(0.004 x 0.012)
Bond Pad #6,7,13,14 (DQ)	0.125 x 0.125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

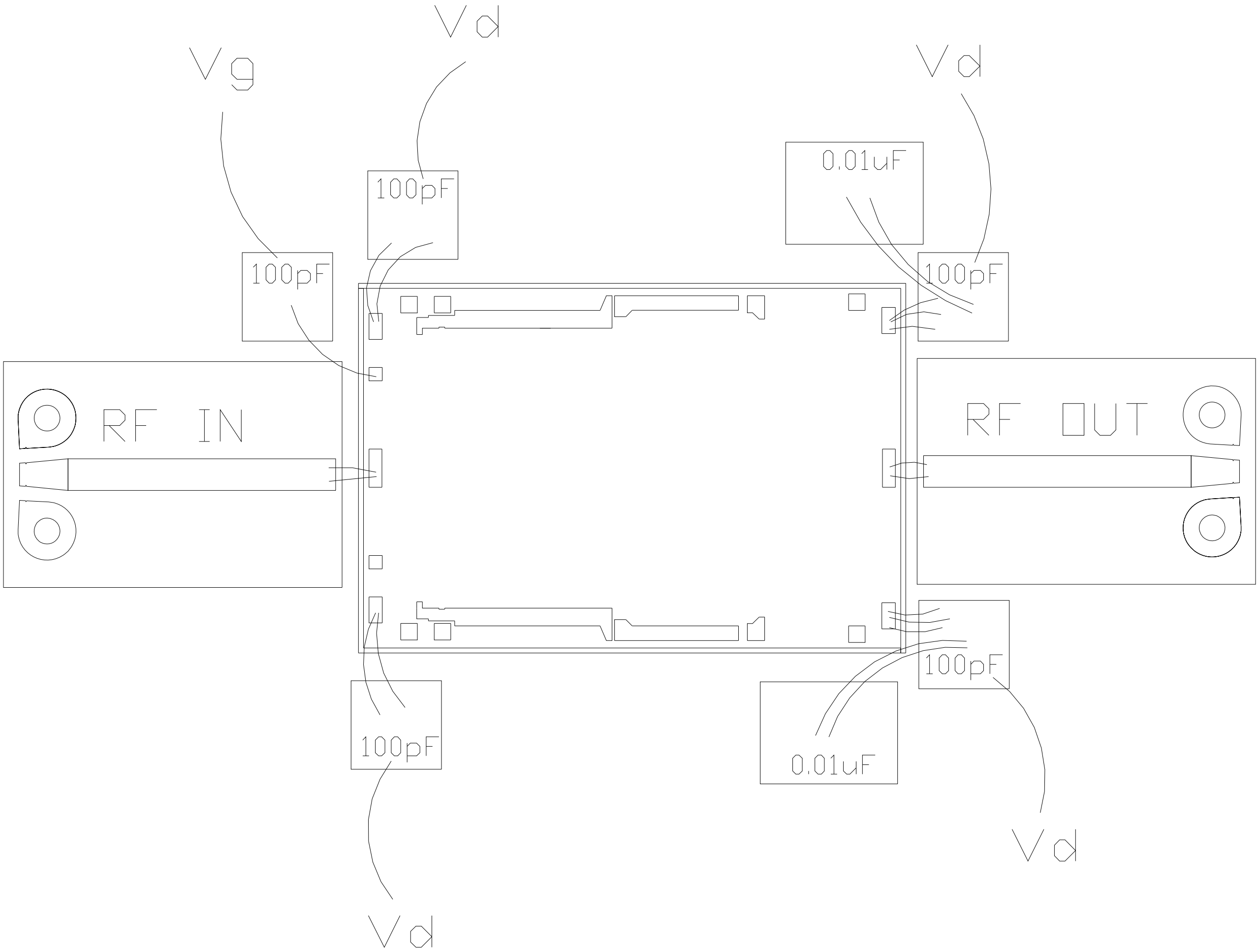
TGA2501 on Thermal Spreader





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.

Chip Assembly & Bonding Diagram



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

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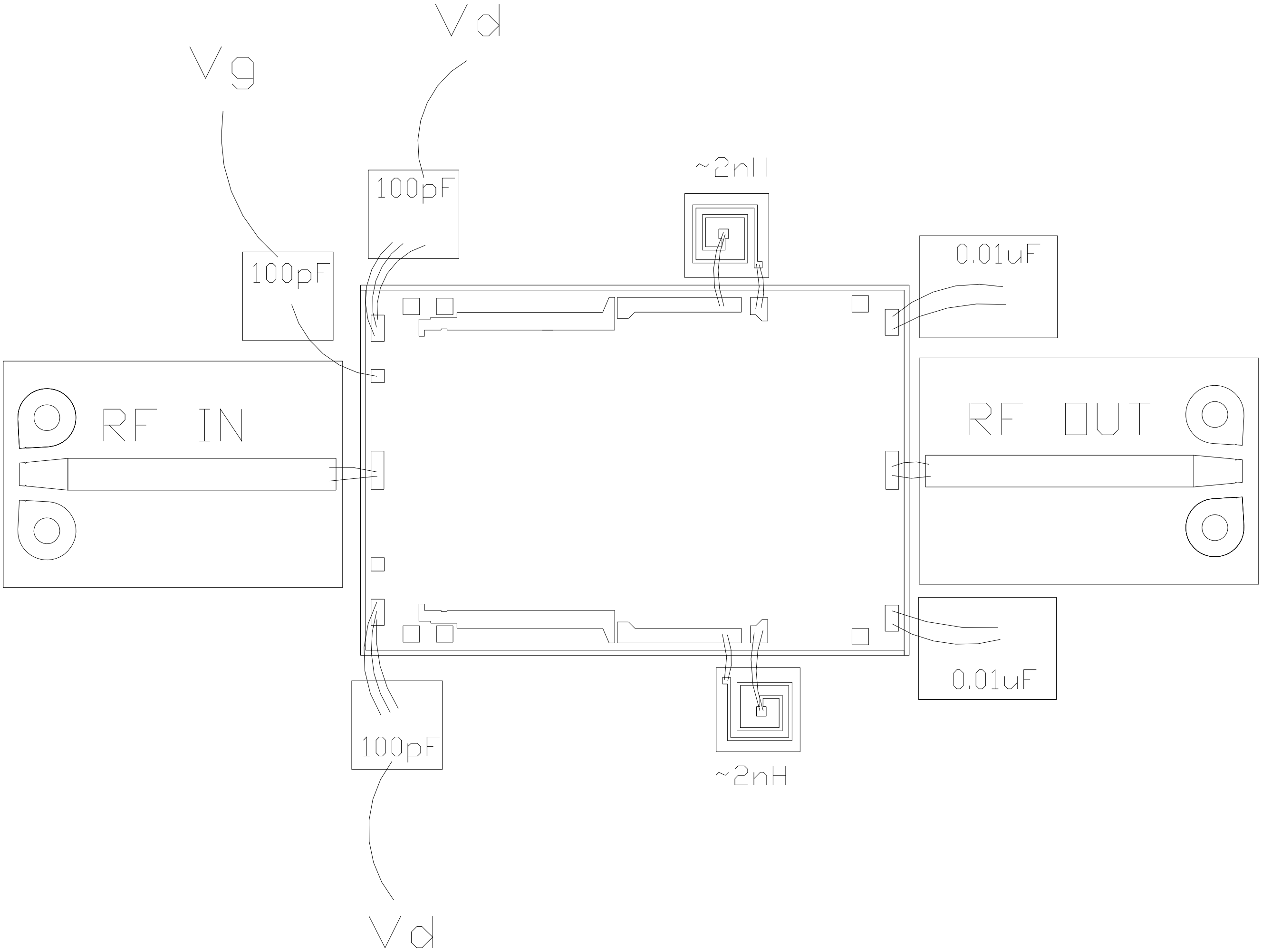
Alternative Chip Assembly & Bonding Diagram



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

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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

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