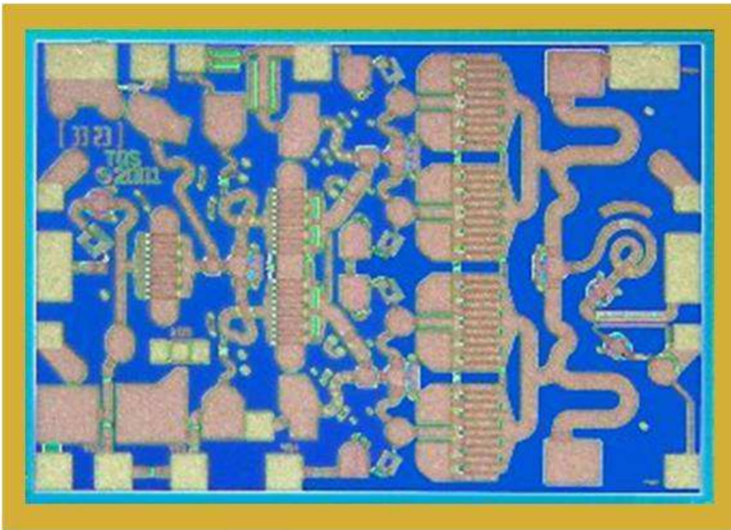
TriQuint SEMICONDUCTOR

# Ku Band, 2 Watt Power Amplifier TGA2510-TS



## Key Features and Performance

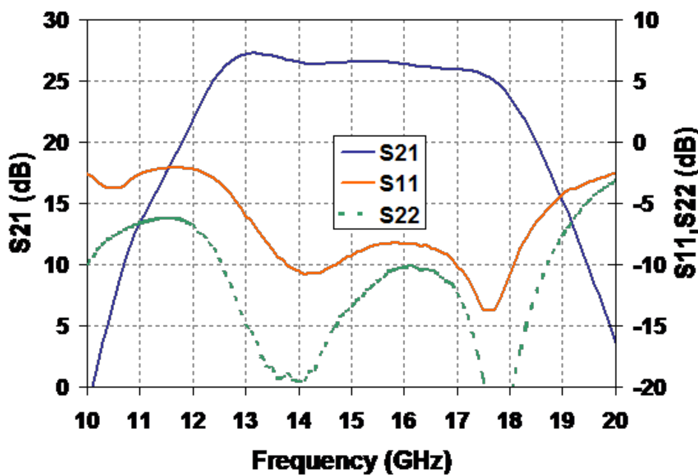
- 34 dBm Midband Psat
- 26 dB Nominal Gain
- 7 dB Typical Input Return Loss
- 12 dB Typical Output Return Loss
- 12.5 - 17 GHz Frequency Range
- Directional Power Detector with Reference
- 0.25µm pHEMT 3MI Technology
- Bias Conditions: 7.5V, 650mA
- Thermal Spreader Dimensions: 2.159 x 1.499 mm

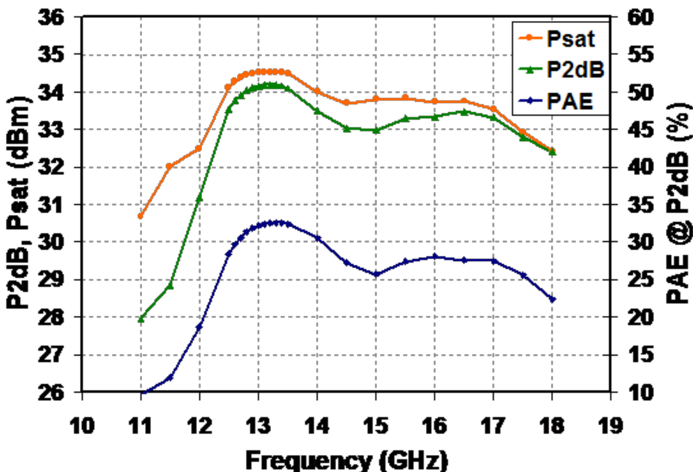
## Primary Applications

- VSAT
- Point to Point

## Preliminary Measured Performance

Bias Conditions: Vd=7.5V Id=650mA




*Note: Datasheet is subject to change without notice.*



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## TABLE I
## ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Notes |
|---|---|---|---|
| $V_D$ | Drain Voltage | 8 V | 1/ 2/ |
| $V_G$ | Gate Voltage Range | -5V to 0V | 1/ |
| $I_D$ | Drain Supply Current | 1300 mA | 1/ 2/ |
| $\| I_G \|$ | Gate Supply Current | 18 mA | 1/ |
| $P_{IN}$ | Input Continuous Wave Power | 24 dBm | 1/ 2/ |
| $P_D$ | Power Dissipation | 10.4 W | 1/ 2/ |
| $T_{CH}$ | Operating Channel Temperature | 200 $^0$C | 3/ |
| $T_M$ | 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 $P_D$ at a package base temperature of 70°C

3/ Junction operating temperature will directly affect the device median lifetime. For maximum life, it is recommended that channel temperatures be maintained at the lowest possible levels.

## TABLE II
## RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Value |
|---|---|---|
| Vd | Drain Voltage | 7.5 V |
| Id | Drain Current | 650 mA |
| Id_Drive | Drain Current under RF Drive | 1200 mA |
| Vg3, Vg4 | Gate Voltage | -0.65 V typical |



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**TABLE III**
**RF CHARACTERIZATION TABLE**
**($T_A$ = 25°C, Nominal)**
**(Vd = 7.5V, Idq = 650mA ±5%)**

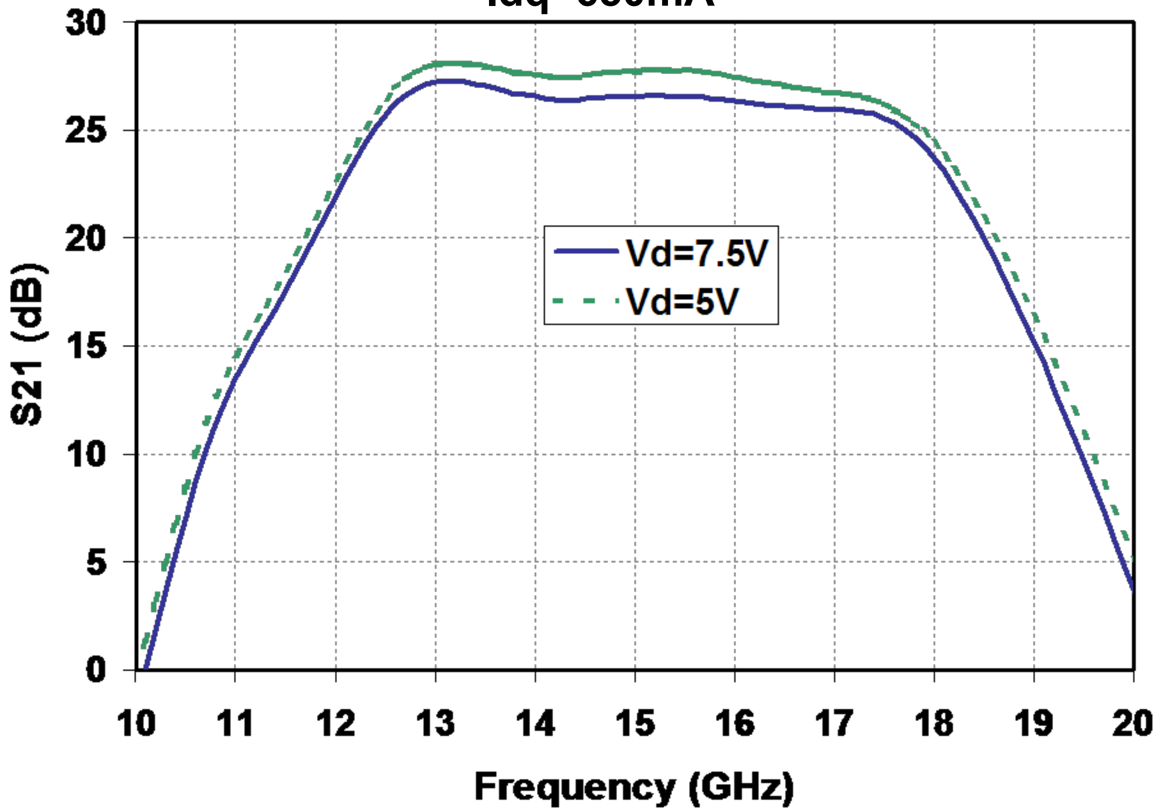
| Symbol | Parameter | Test Conditions | Typ | Units | Notes |
|---|---|---|---|---|---|
| Gain | Small Signal Gain | F = 12.5 – 17 GHz | 26 | dB | |
| IRL | Input Return Loss | F = 12.5 – 17 GHz | 7 | dB | |
| ORL | Output Return Loss | F = 12.5 – 17 GHz | 12 | dB | |
| PWR | Output Power @ Pin = +15dBm | F = 12.5 – 17 GHz | 34.0 | dBm | |
| PAE | Power Added Efficiency @ Pin=+15dBm | F = 12.5 – 17 GHz | 31 | % | |

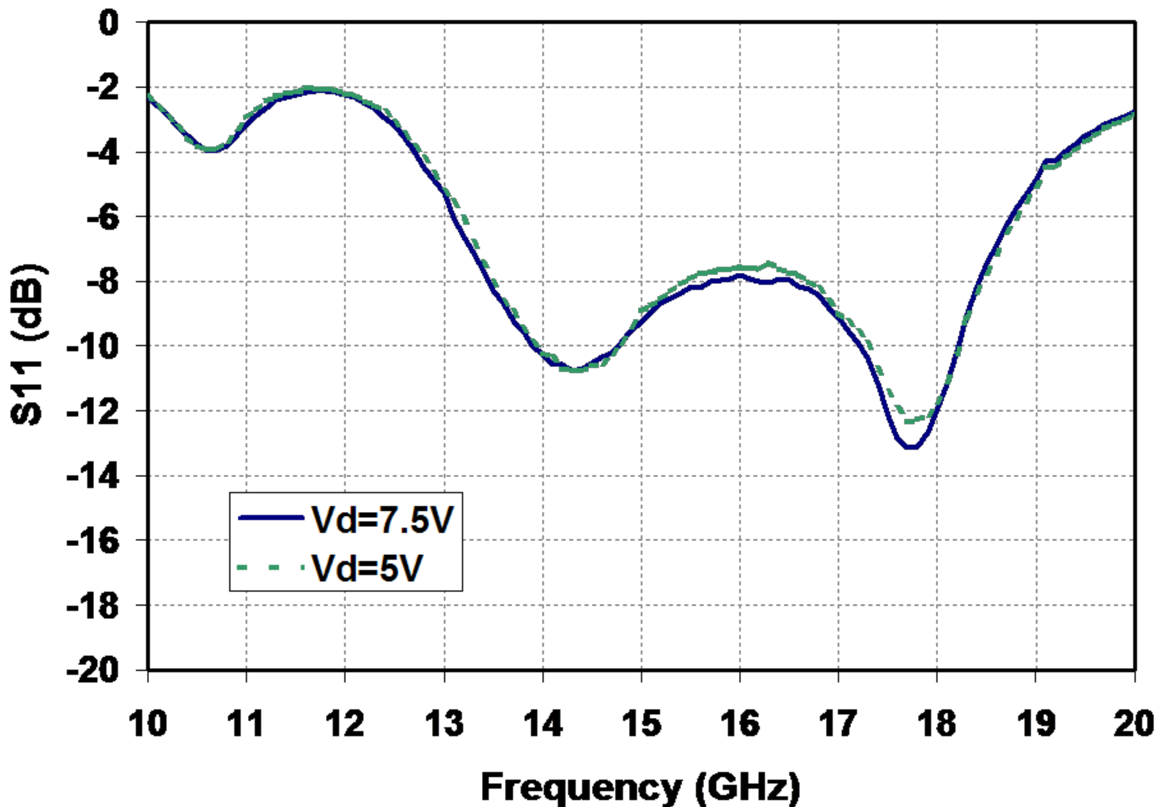
**TABLE IV**
**THERMAL INFORMATION**

| Parameter | Test Conditions | $T_{CH}$ (°C) | Θjc (°C/W) | Tm (hrs) |
|---|---|---|---|---|
| Θjc Thermal Resistance (Channel to Backside of Carrier) | $V_D$ = 7.5V<br>$I_D$ = 650mA<br>$P_{DISS}$ = 4.88W<br>$T_{BASE}$ = 70°C | 130.7 | 12.44 | 5.5E+6 |

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

## Typical Fixtured Performance
## Idq=650mA



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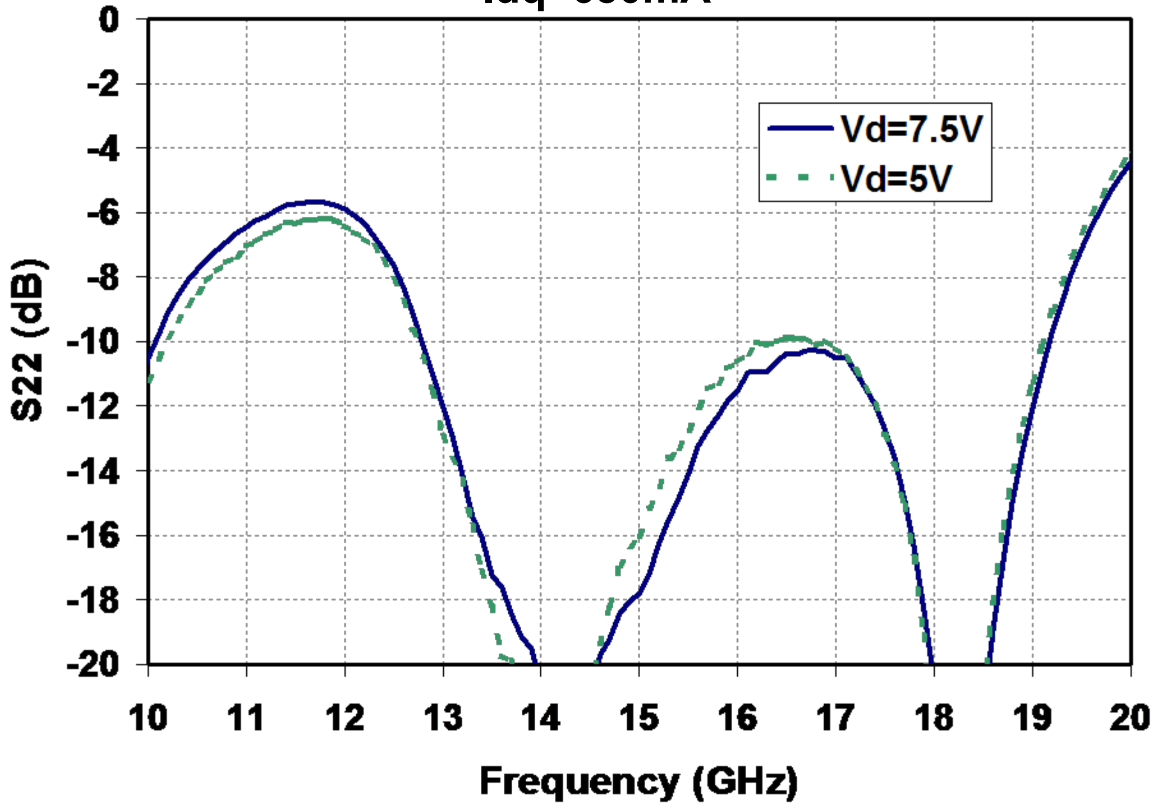


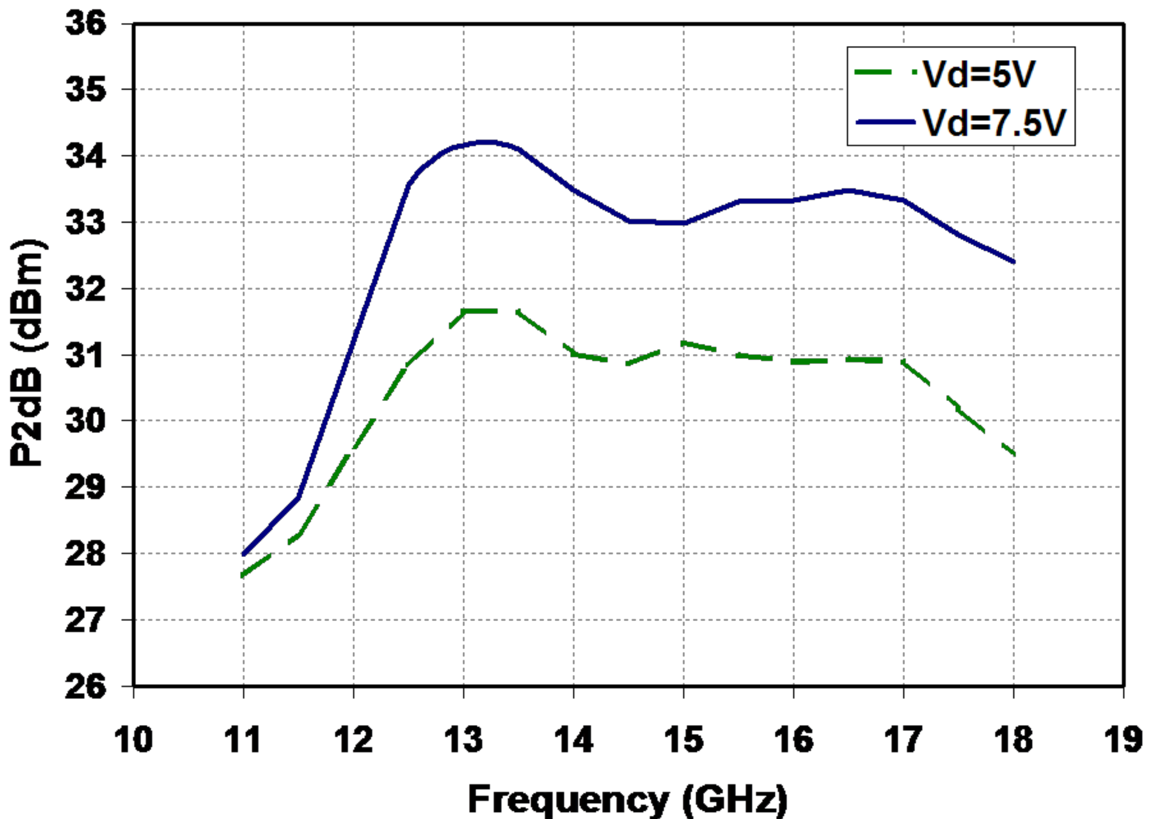




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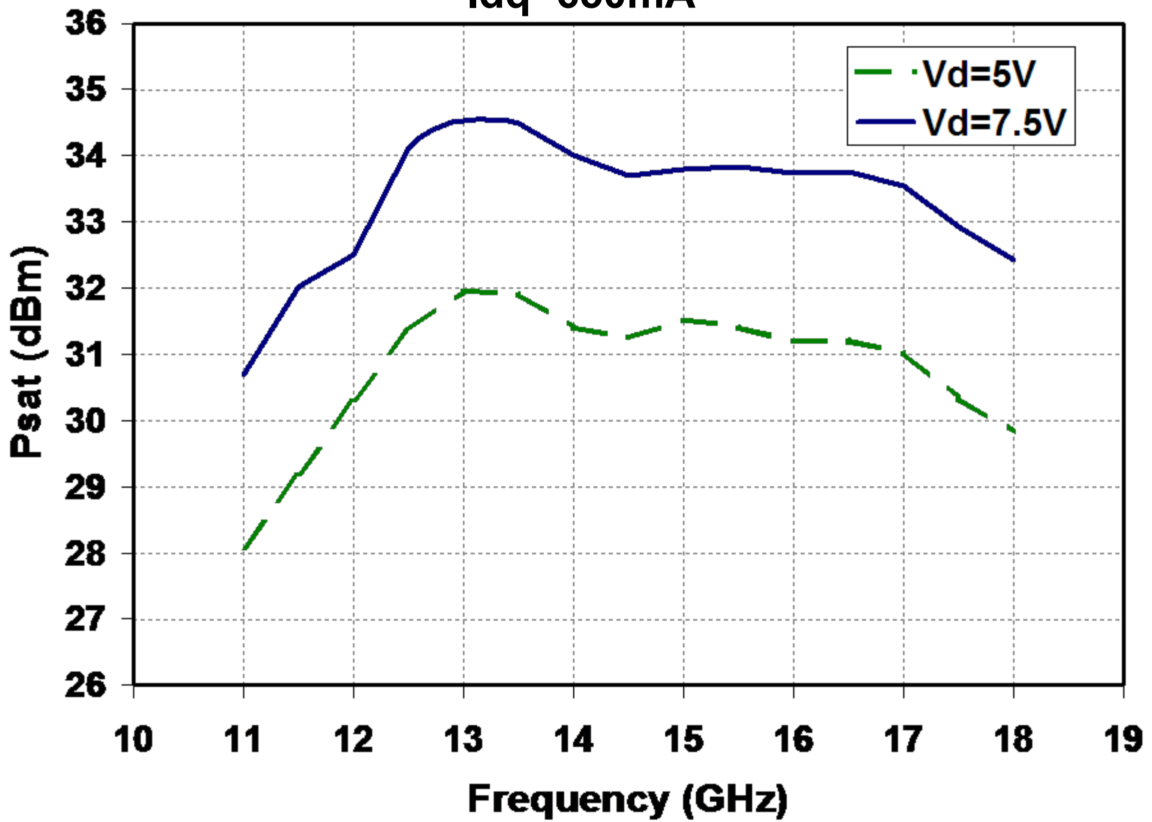


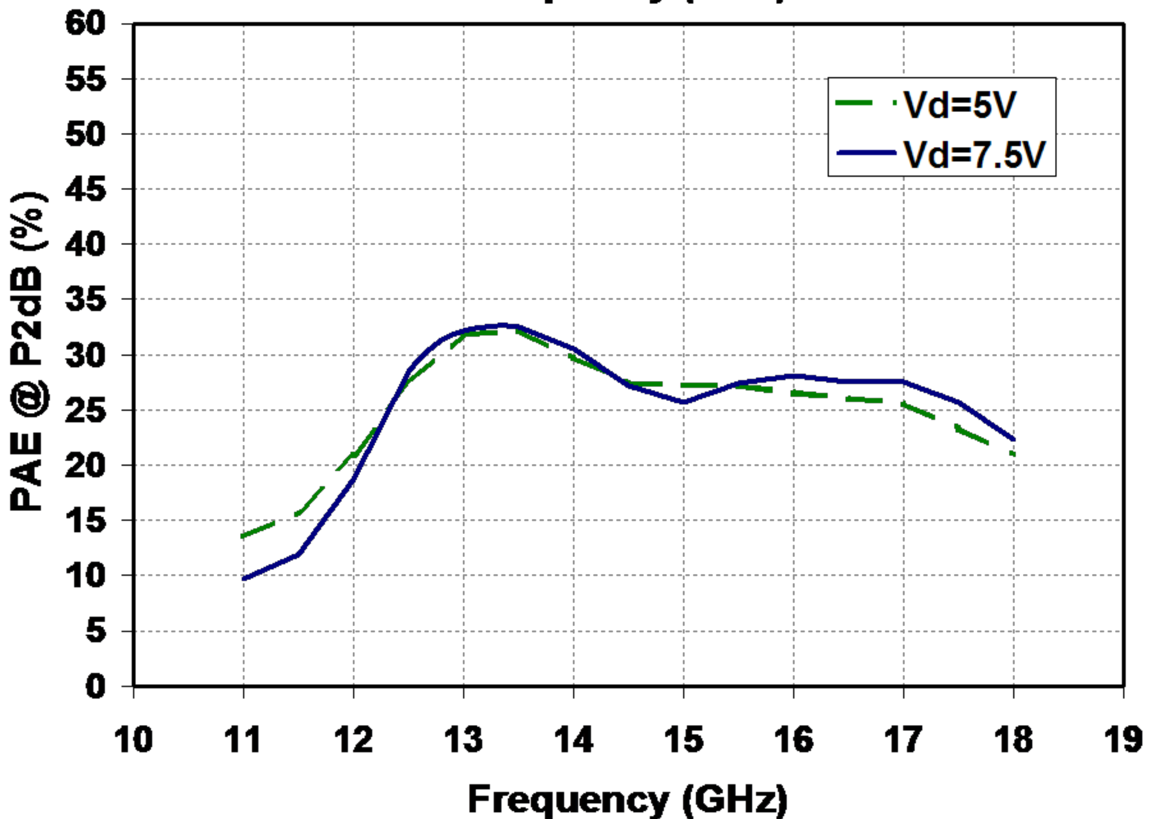

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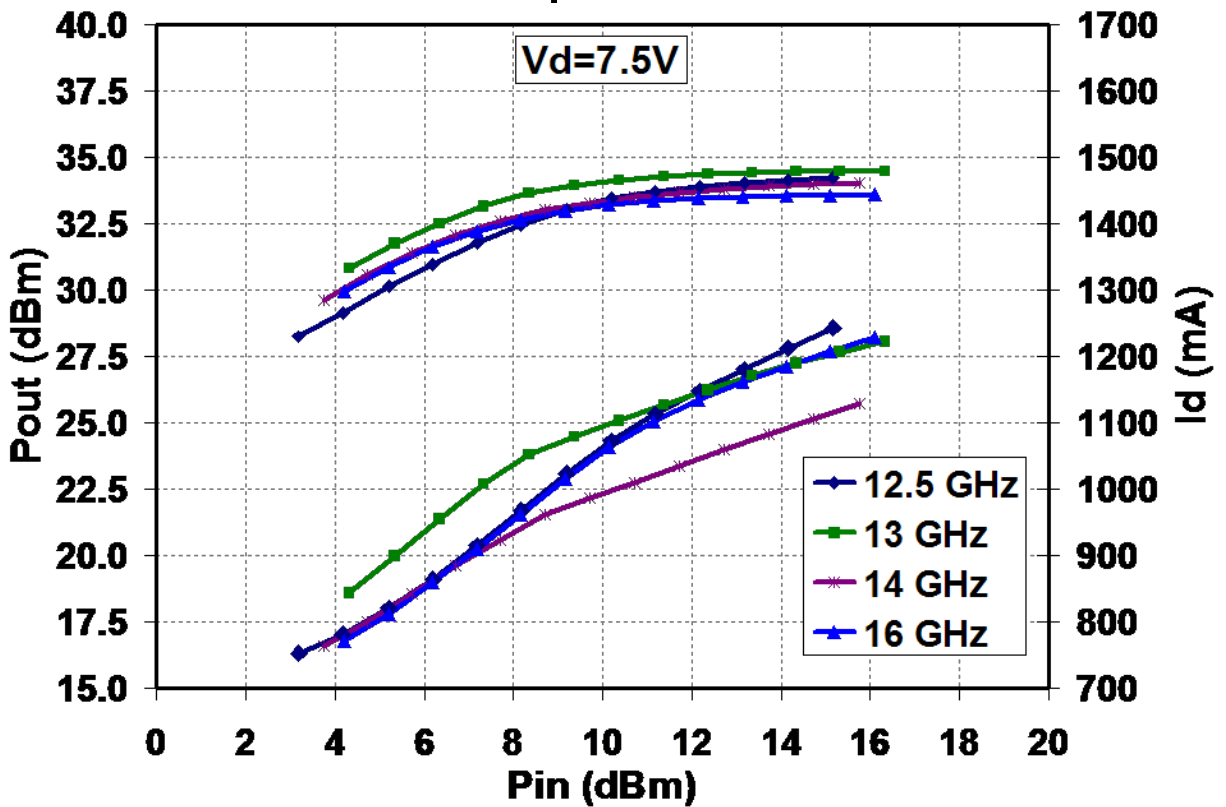
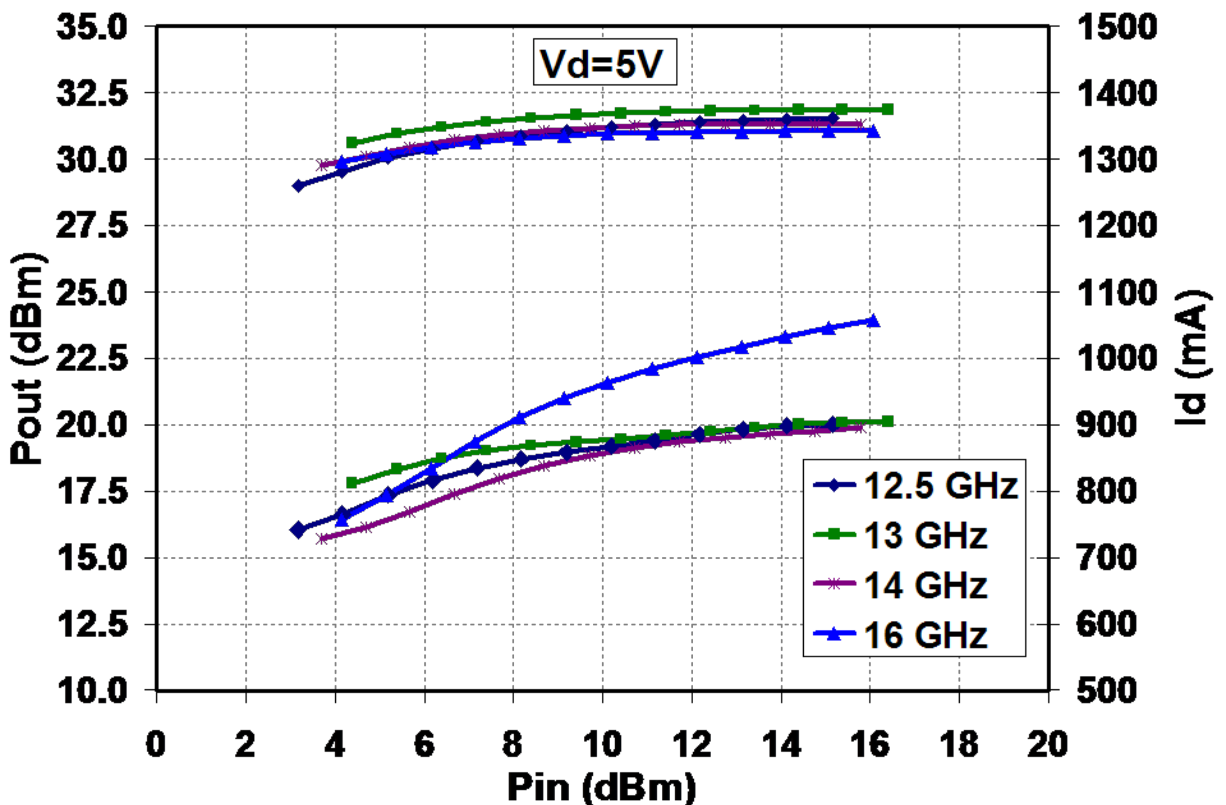
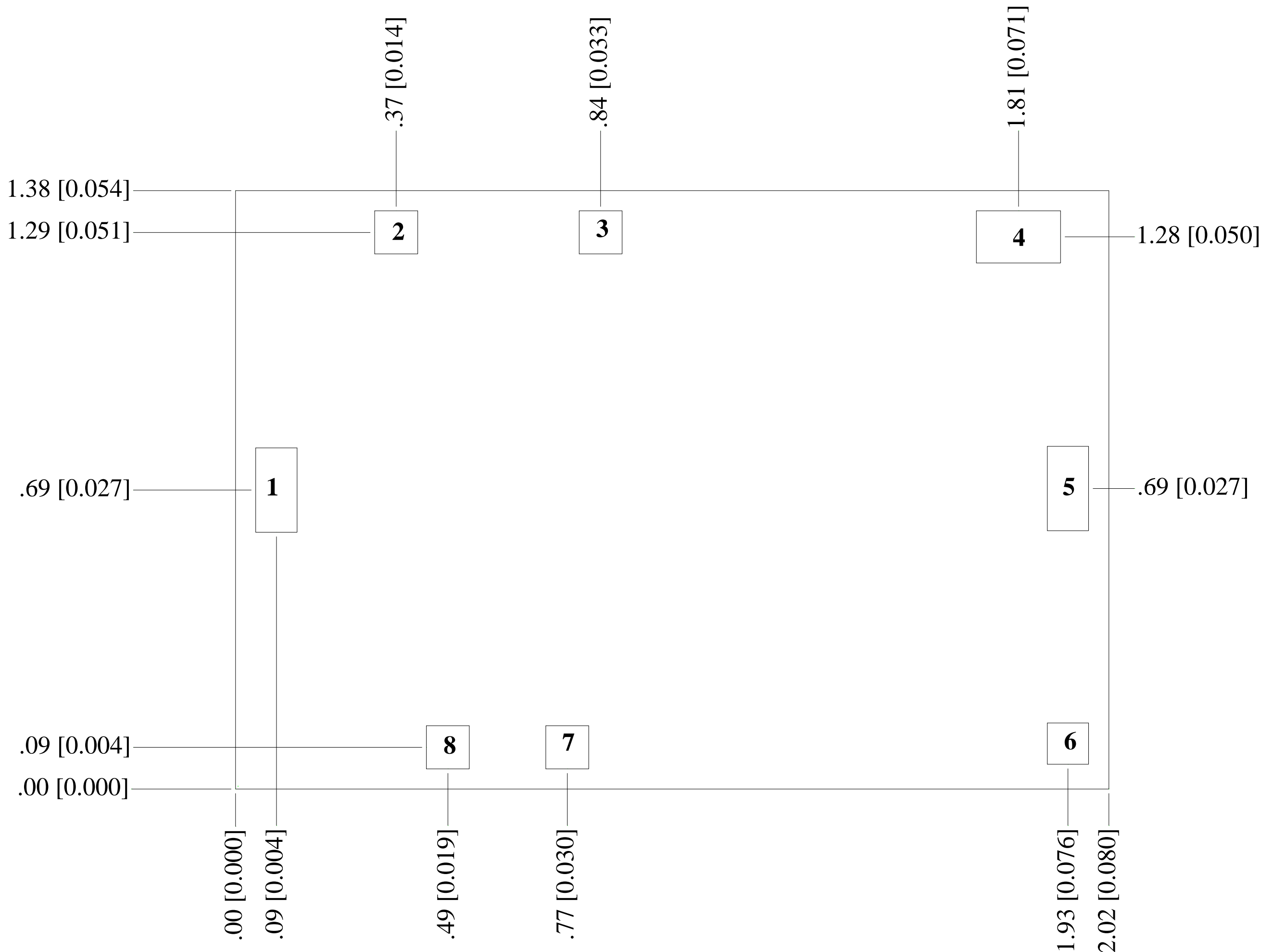


# Mechanical Drawing

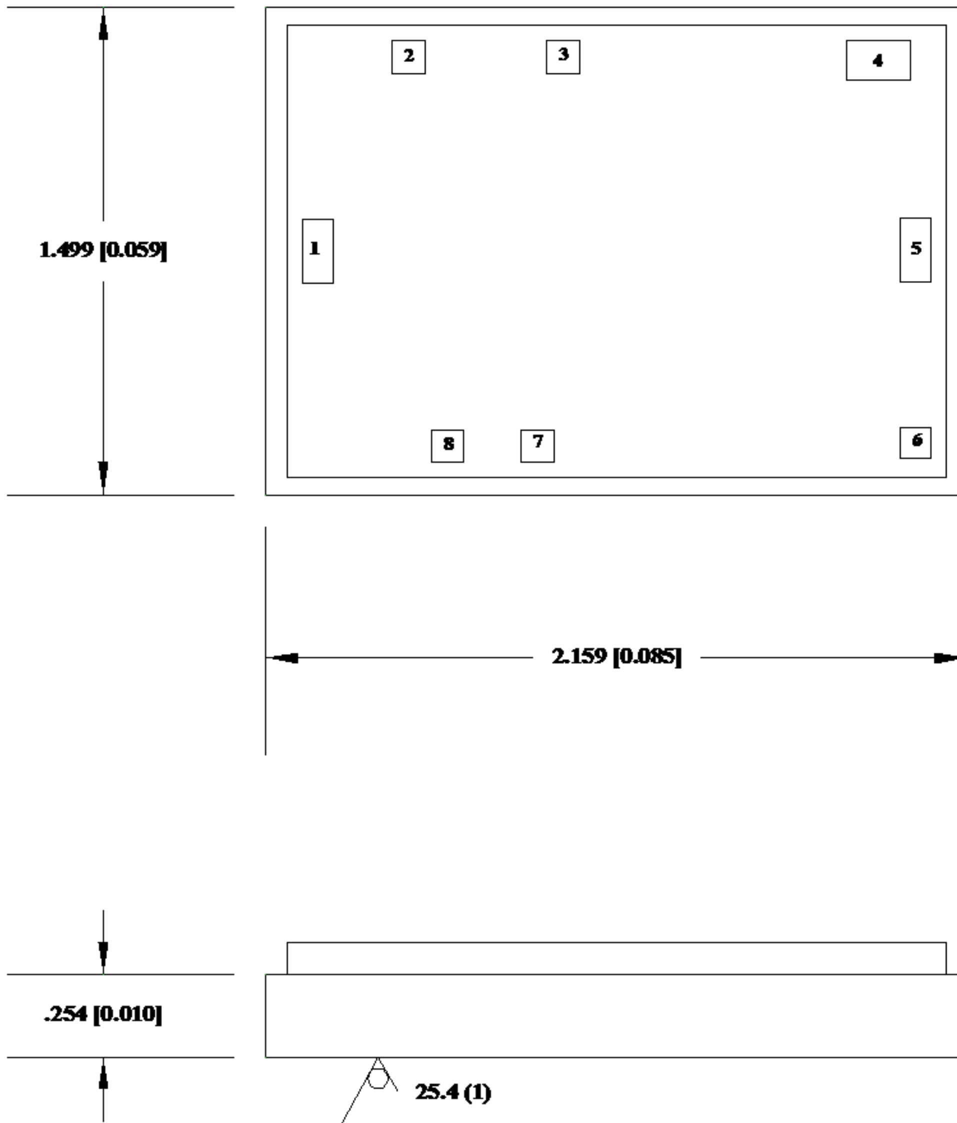



Units: millimeters [inches]
Thickness: 0.10 [0.004] (reference only)
Chip edge to bond pad dimensions are shown to center of bond pads.
Chip size tolerance: ±0.05 [0.002]
RF ground through backside

| | | | |
|---|---|---|---|
| Bond Pad #1 | RF Input | 0.10 x 0.20 | [0.004 x 0.008] |
| Bond Pad #2 | Vref | 0.10 x 0.10 | [0.004 x 0.004] |
| Bond Pad #3 | Vd3 | 0.10 x 0.20 | [0.004 x 0.008] |
| Bond Pad #4 | Vd4 | 0.20 x 0.13 | [0.008 x 0.005] |
| Bond Pad #5 | RF Output | 0.10 x 0.20 | [0.004 x 0.008] |
| Bond Pad #6 | Vdet | 0.10 x 0.10 | [0.004 x 0.004] |
| Bond Pad #7 | Vg4 | 0.10 x 0.10 | [0.004 x 0.004] |
| Bond Pad #8 | Vg3 | 0.10 x 0.10 | [0.004 x 0.004] |

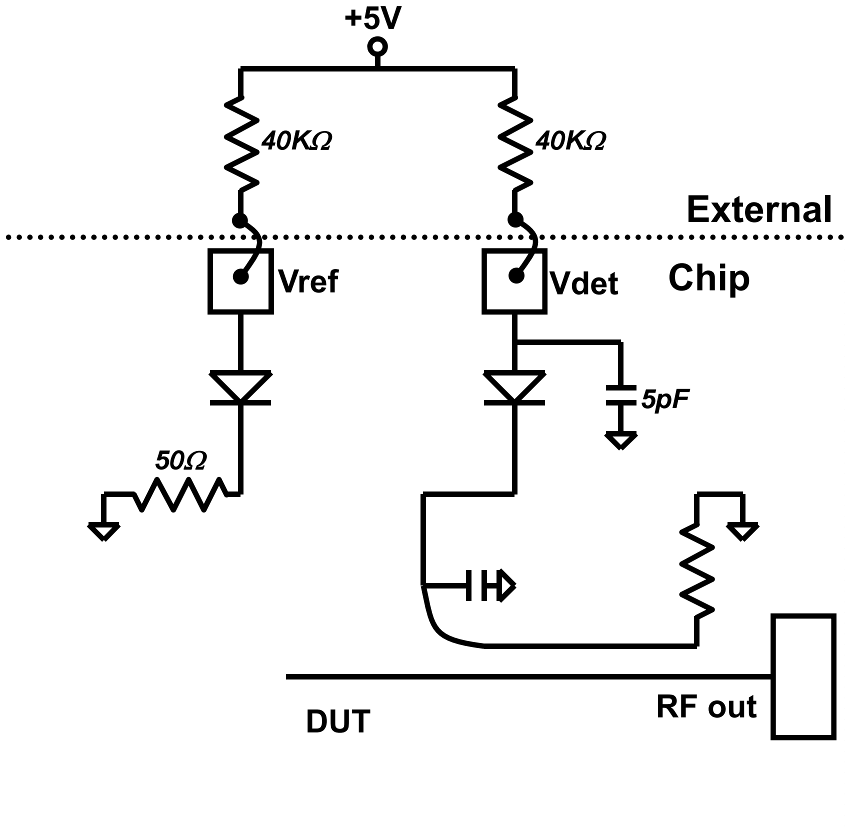
## Mechanical Drawing

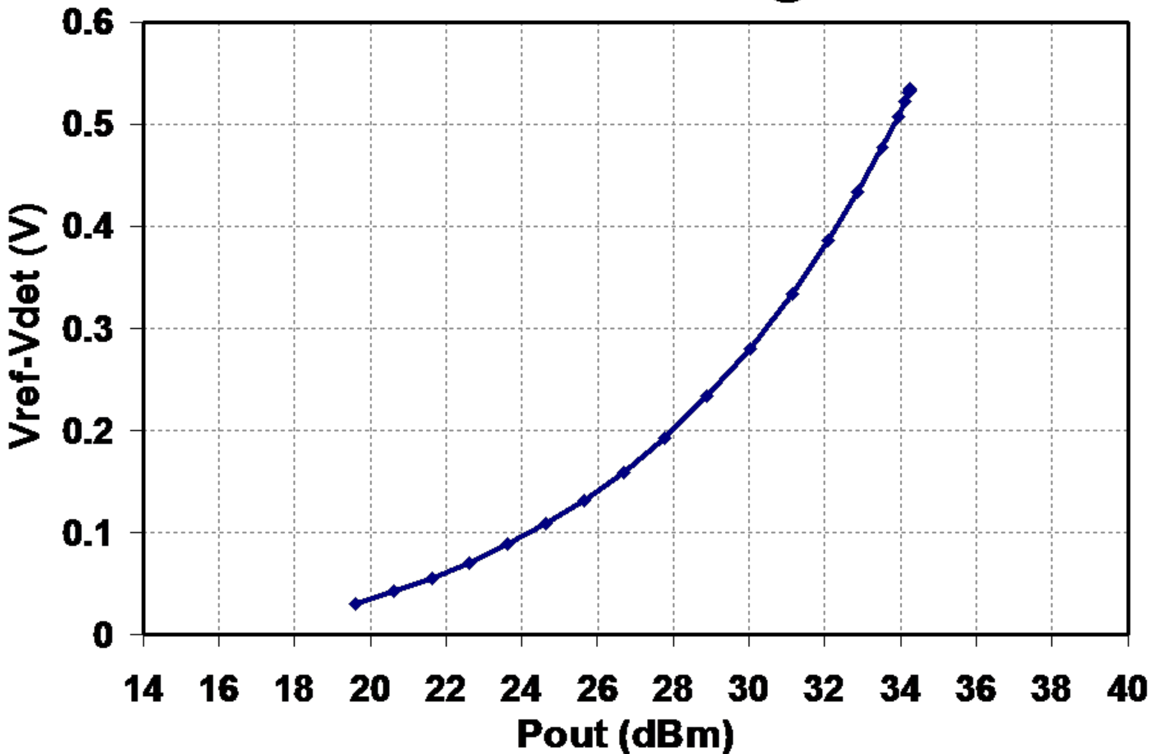
## TGA2510 on Thermal Spreader



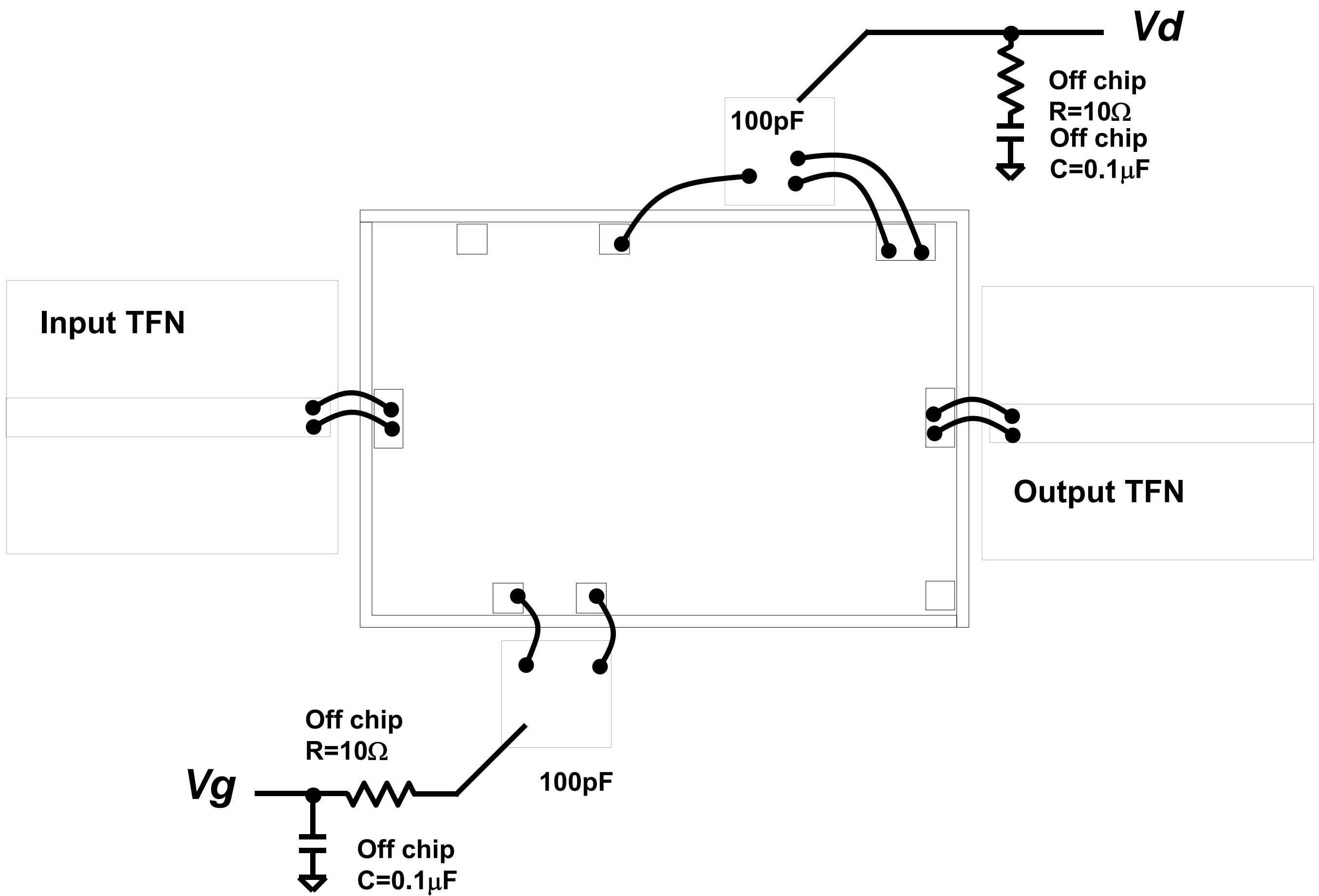

Notes:
1. Dimensions are in mm[inches].
2. Dimension limits apply after plating.
3. Dimension of surface roughness is in micrometer(microinch).
4. Tolerances unless otherwise stated +0.075, - 0.025 [+0.003, -0.001]
5. Thermal Spreader Material:
   Copper and Molybdenum metal matrix material (AMC8515) with a CTE of 7.0 ppm/C.
6. Plating:
   Gold (Au) 1.27-2.54 um per ASTM B 488, Type 1, Code A.
   over
   Nickel (Ni) 2.5-7.5 um per QQ-N-290, Class 1.
7. MMIC is attached to thermal spreader using AuSn solder.

## 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

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 |
|---|---|
| TGA2510-TS | GaAs MMIC Die on Thermal Spreader |

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