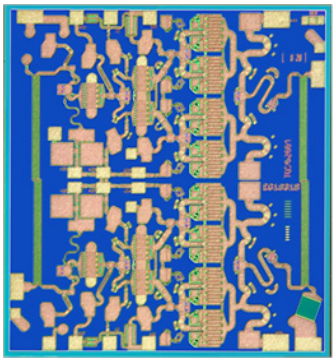
TriQuint SEMICONDUCTOR

# TGA2502

## 13 - 15 GHz 4W Power Amplifier

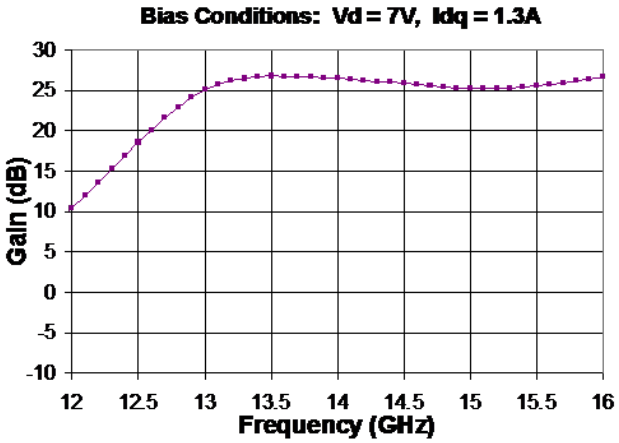


Chip Dimensions 2.5 mm x 2.7 mm x 0.1 mm

### Key Features

- 0.5 um pHEMT Technology
- >25 dB Nominal Gain
- >36 dBm Nominal Psat
- 44 dBm Nominal IP3 @ 14 GHz
- Bias 7V @ 1.3A Idq, 2.1A under RF drive
- Chip Dimensions 2.5mm x 2.7mm x 0.1 mm

### Fixtured Measured Performance




### Primary Applications

- Ku-Band VSAT Transmit

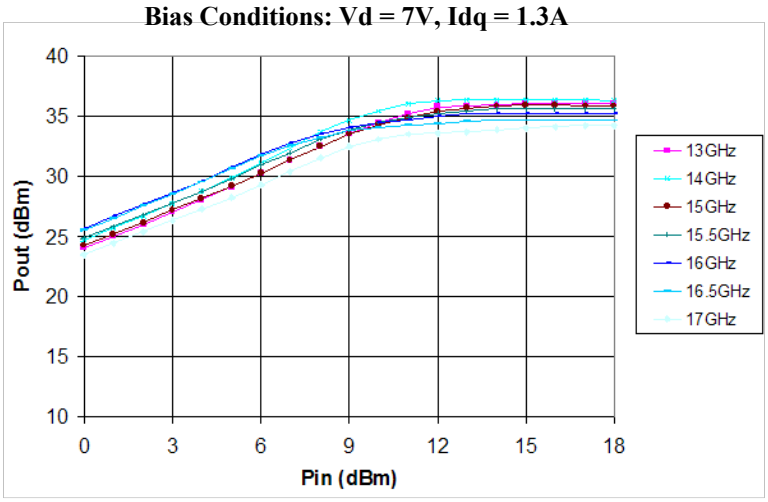


**TABLE I**
**MAXIMUM RATINGS 1/**

| Symbol | Parameter | Value | Notes |
|---|---|---|---|
| $V^+$ | Positive Supply Voltage | 8V | |
| $I^+$ | Positive Supply Current | 2.3 A | 2/ |
| $P_D$ | Power Dissipation | 18.4 | |
| $P_{IN}$ | Input Continuous Wave Power | 24 dBm | |
| $T_{CH}$ | Operating Channel Temperature | 200 °C | 3/, 4/ |
| | Mounting Temperature (30 seconds) | 320 °C | |
| $T_{STG}$ | Storage Temperature | -65 °C to 150 °C | |

1/ These values represent the maximum operable values of this device

2/ Total current for the entire MMIC

3/ These ratings apply to each individual FET

4/ Junction operating temperature will directly affect the device mean time to failure (Tm). For maximum life it is recommended that junction temperatures be maintained at the lowest possible levels.

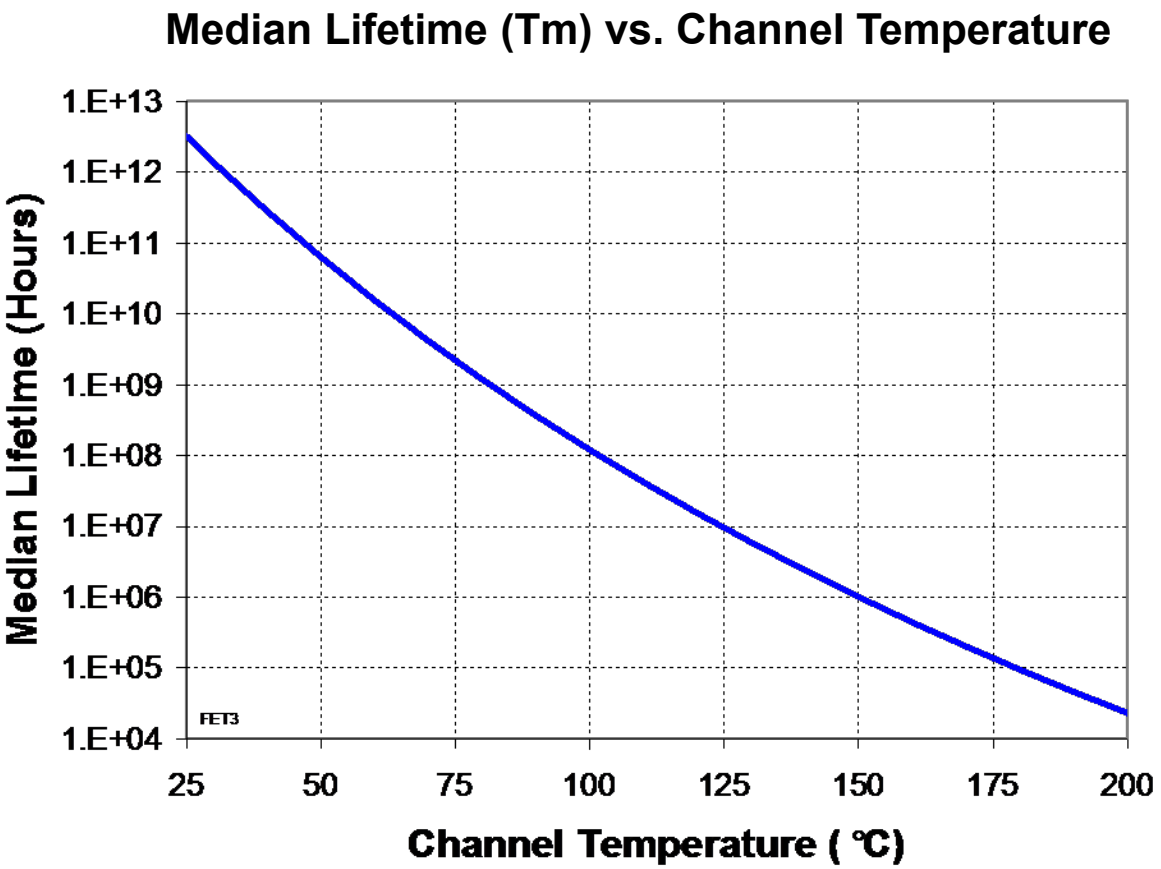
**TABLE II**
**ELECTRICAL CHARACTERISTICS**
**(Ta = 25°C ± 5°C)**

| PARAMETER | TYPICAL | UNITS |
|---|---|---|
| Drain Operating Voltage | 7 | V |
| Quiescent Current | 1.3 | A |
| Small Signal Gain | 25 | dB |
| Gain Flatness (Freq=13.5 – 15 GHz) | 0.1 | dB/100MHz |
| Input Return Loss (Linear Small Signal) | 16 | dB |
| Output Return Loss (Linear Small Signal) | 16 | dB |
| Reverse Isolation | <-50 | dB |
| CW Output Power @ Psat at 14.5Ghz | 36 | dBm |
| Power Add Efficiency @ Psat | 30 | % |
| P1dB Temperature Coeff. TC (-40 to + 70 $^0$C) | -0.01 | dB/$^0$C |

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

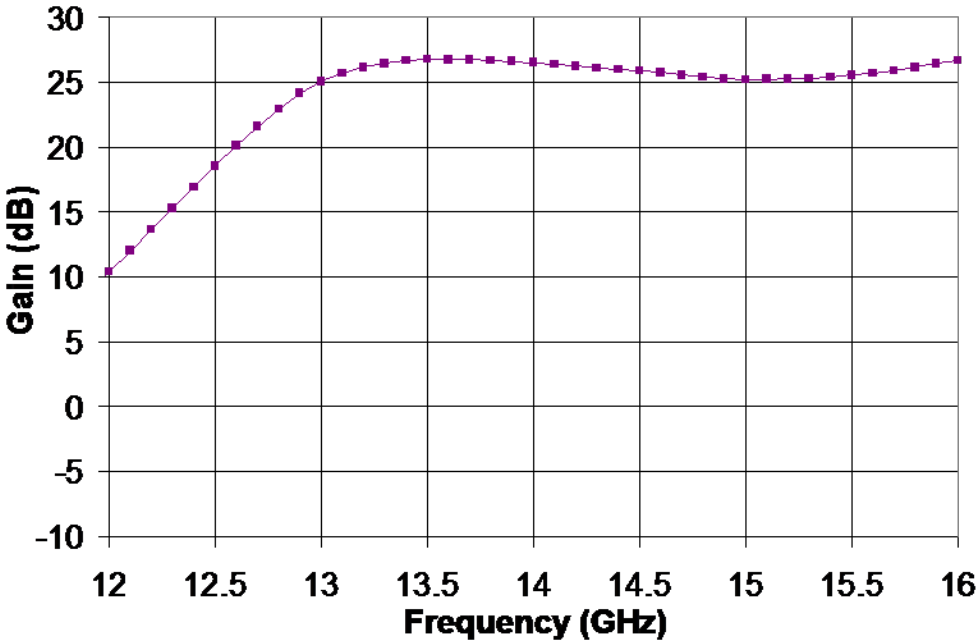
| PARAMETER | TEST CONDITIONS | $T_{CH}$ (°C) | $\theta_{JC}$ (°C/W) | $T_m$ (HRS) |
|---|---|---|---|---|
| $\theta_{JC}$ Thermal Resistance (channel to Case) | Vd = 7 V<br>Id = 1.3 A<br>Pdiss = 9.1 W | 123 | 5.8 | 1.2E+7 |

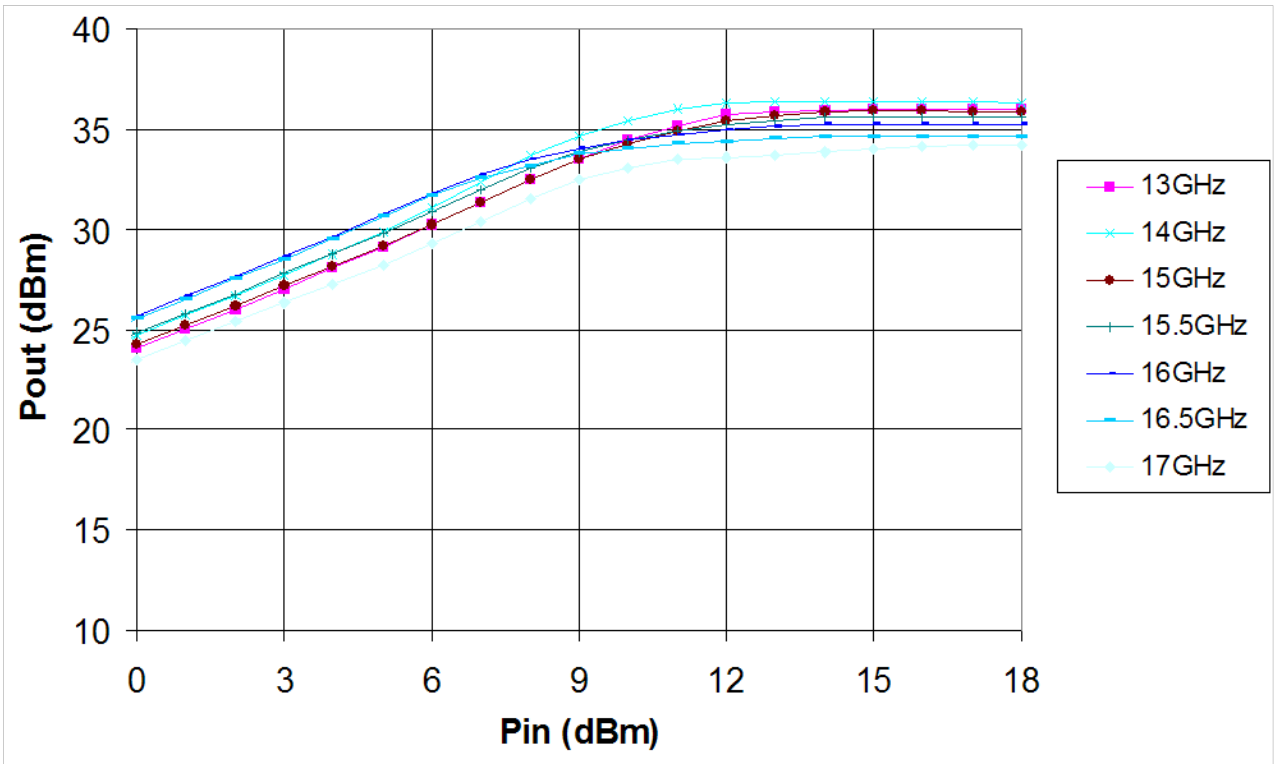
Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20 mil CuMo Carrier at 70°C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.



## Measured Fixtured Data

**Bias Conditions: Vd = 7V, Idq = 1.3A ± 5%**



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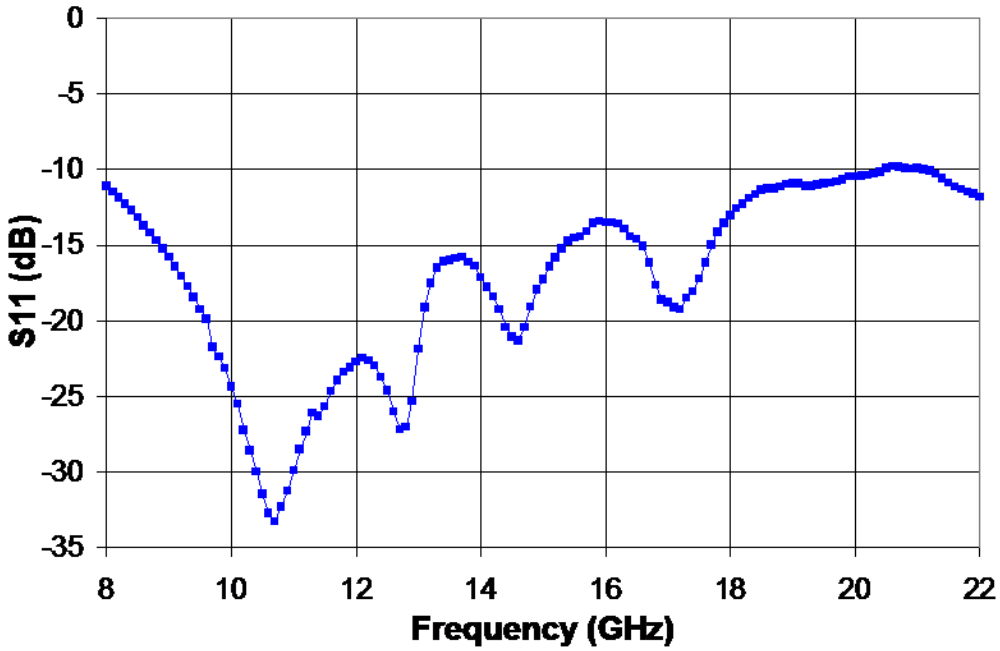


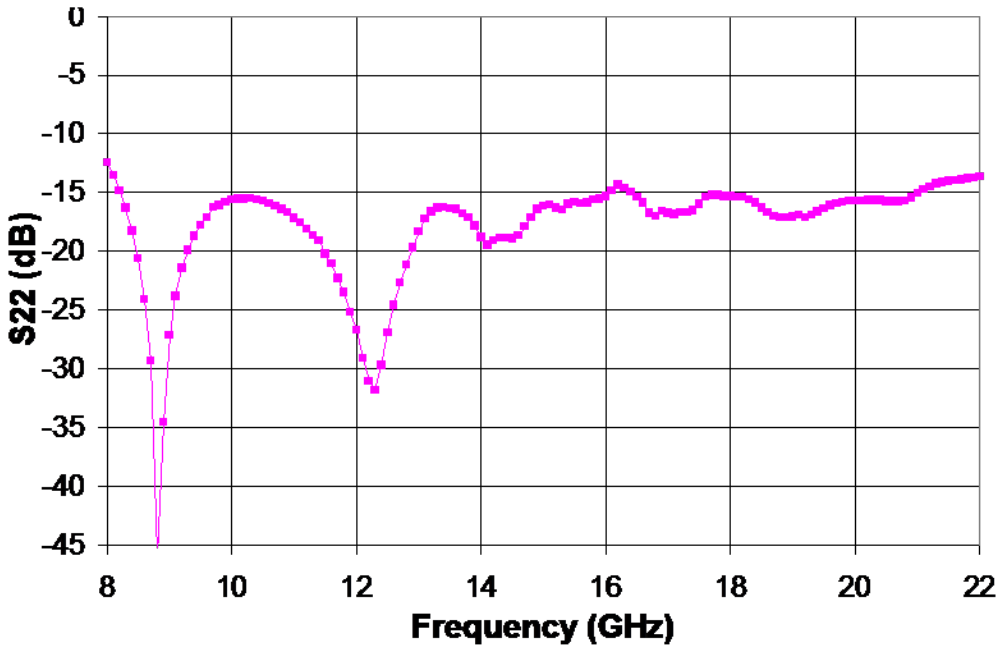

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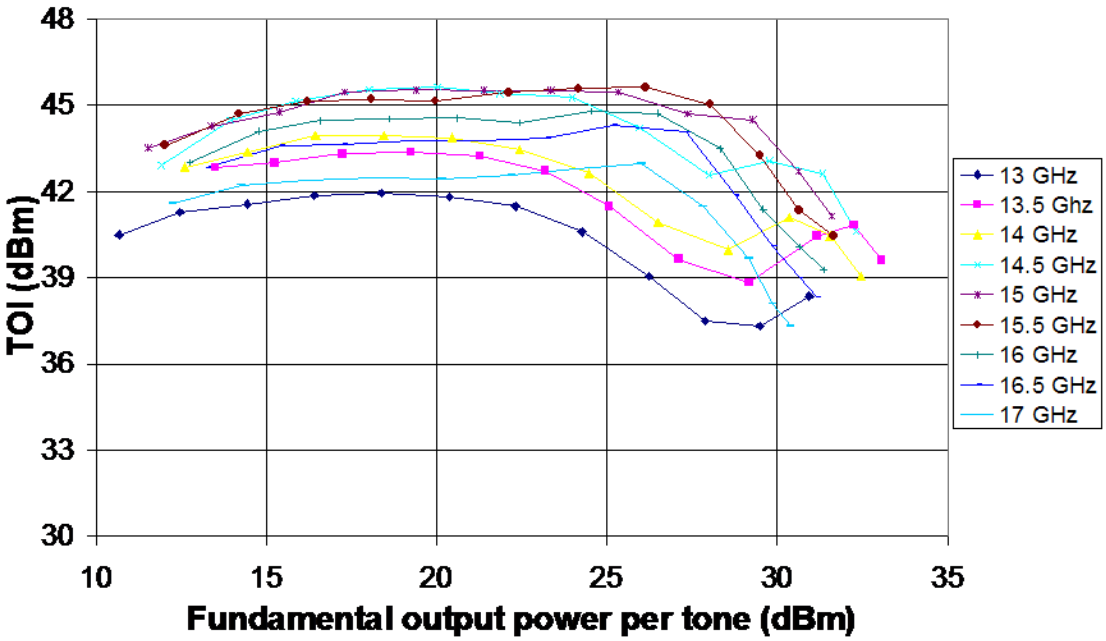
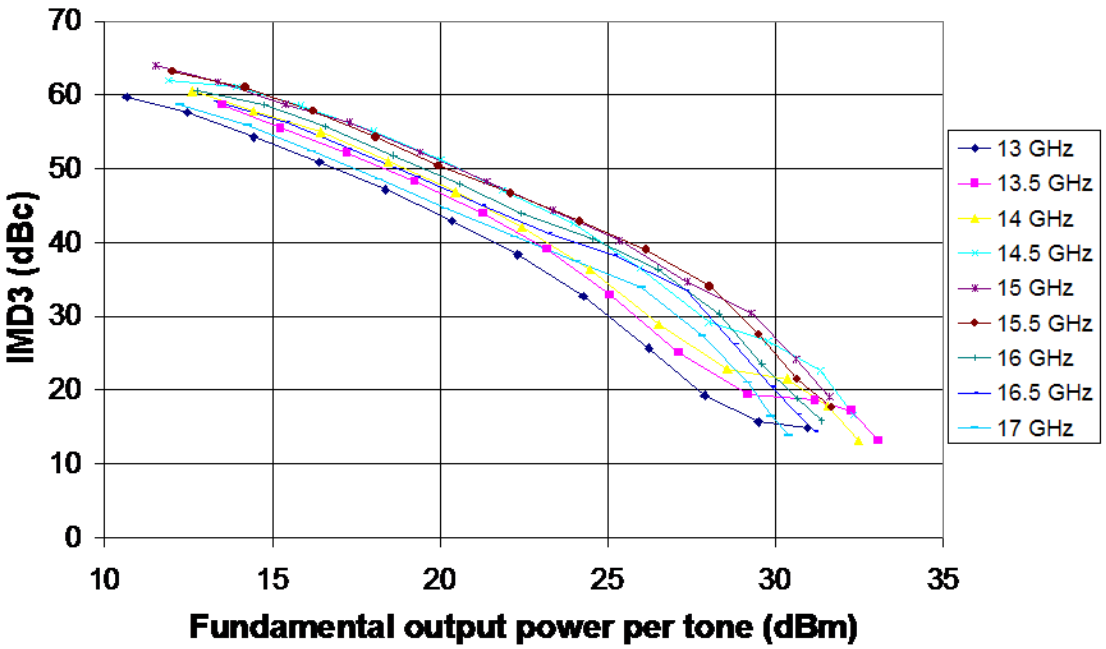
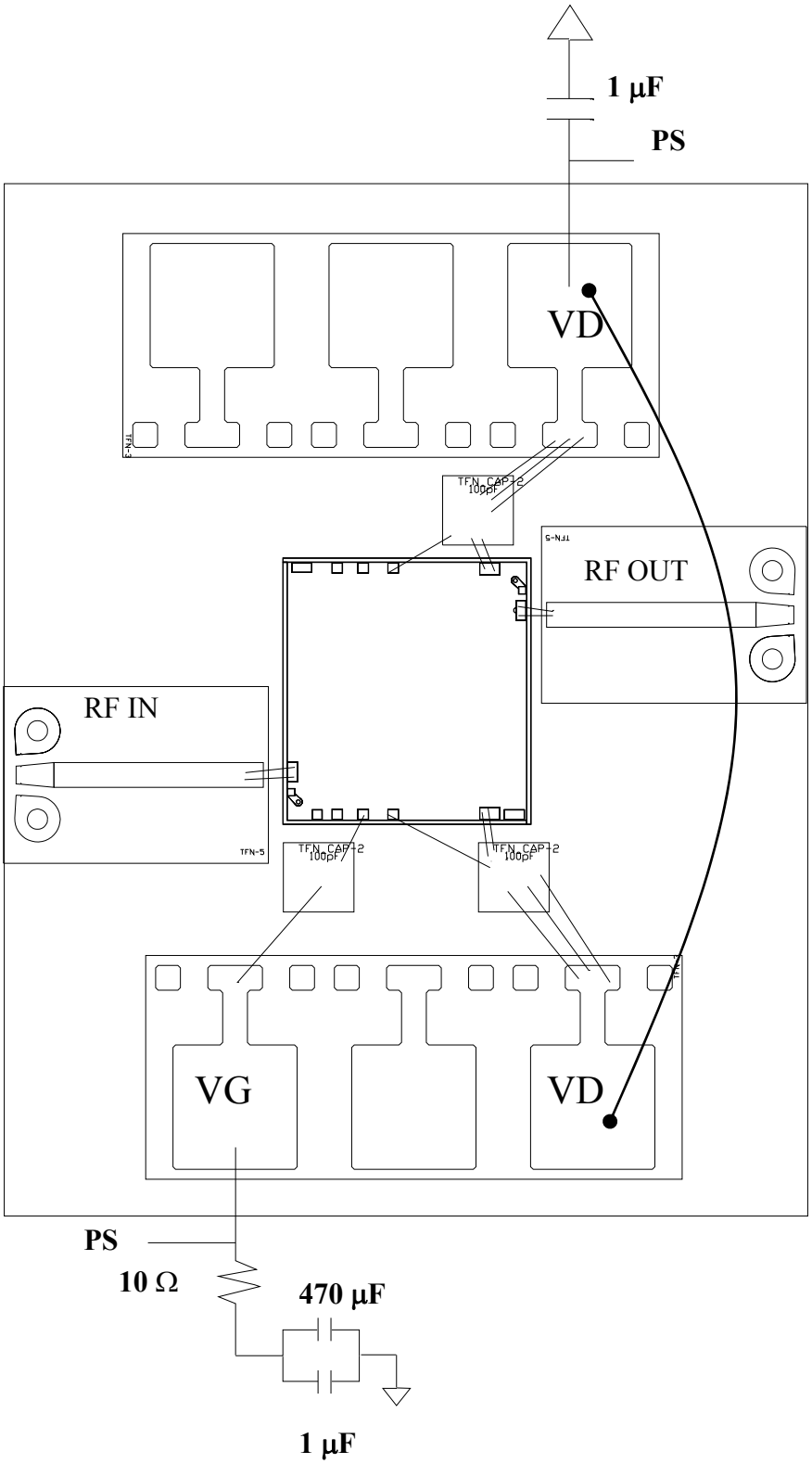
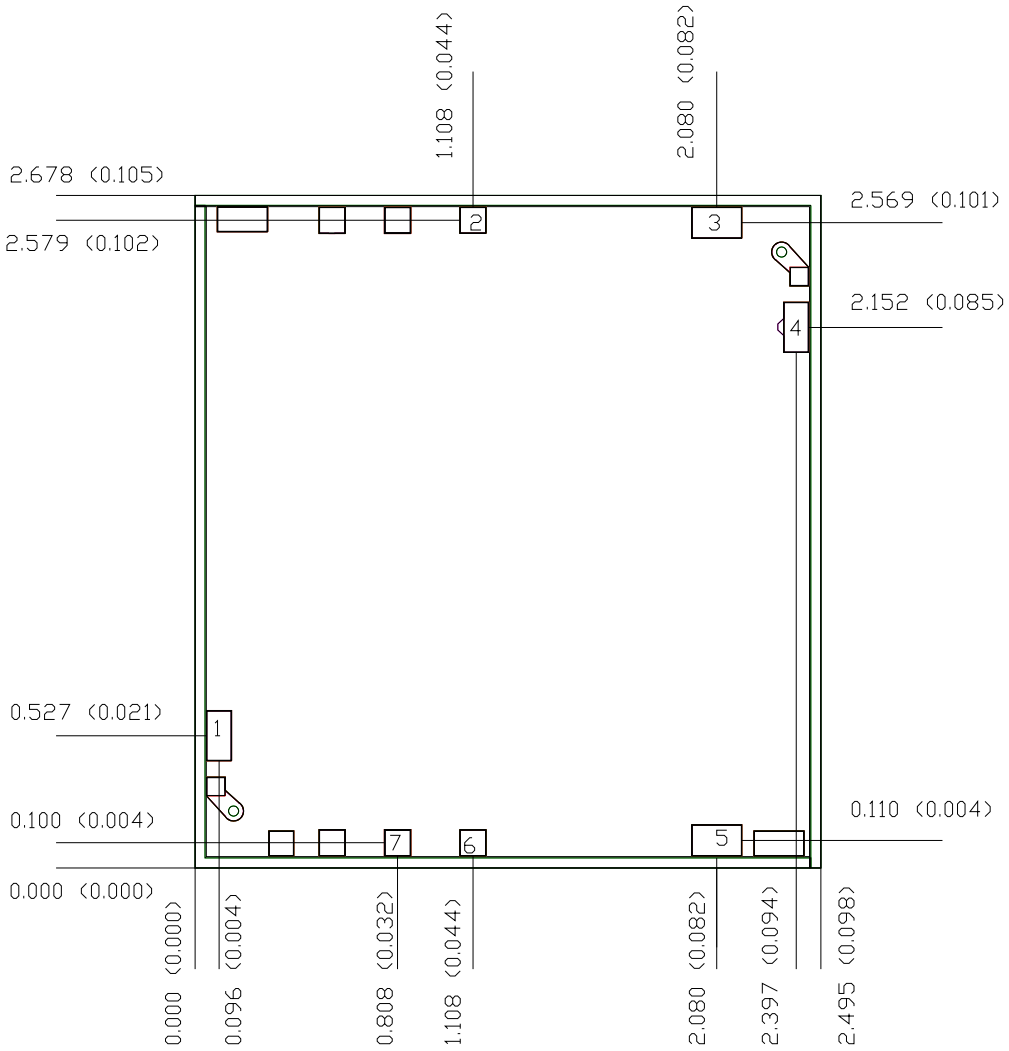


## Chip & Assembly Diagram



## Mechanical Drawing




Units: millimeters (inches)
Thickness: 0.1016 (0.004)
Chip edge to bond pad dimensions are shown to center of bond pad
Chip size tolerance: +/- 0.051 (0.002)

| | | |
|---|---|---|
| Bond pad #1 | (RF In) | 0.100 x 0.200 (0.004 x 0.008) |
| Bond pad #2 | (Vd) | 0.100 x 0.100 (0.004 x 0.004) |
| Bond pad #3 | (Vd) | 0.200 x 0.120 (0.008 x 0.005) |
| Bond pad #4 | (RF Out) | 0.100 x 0.200 (0.004 x 0.008) |
| Bond pad #5 | (Vd) | 0.200 x 0.120 (0.008 x 0.005) |
| Bond pad #6 | (Vd) | 0.100 x 0.100 (0.004 x 0.004) |
| Bond pad #7 | (Vg) | 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.***

## Assembly Process Notes

Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300$^0$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$^0$C.

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