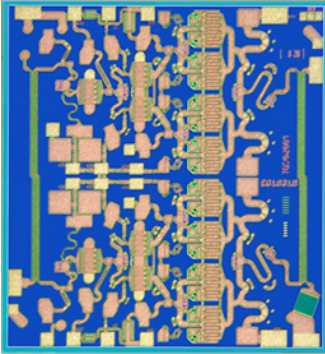


## 13 - 15 GHz 4W Power Amplifier



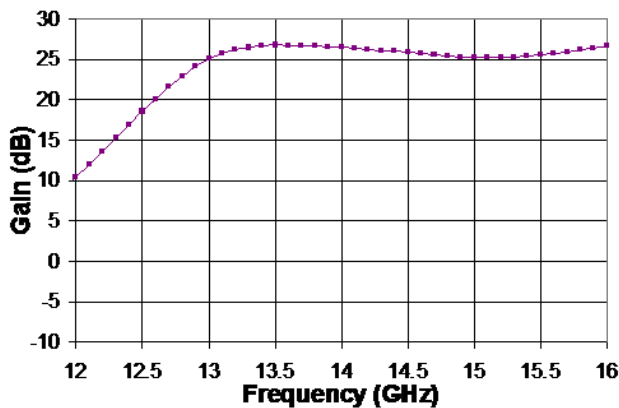
Chip Dimensions 2.5 mm x 2.7 mm x 0.1 mm

### Key Features

- 0.5  $\mu$ m 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

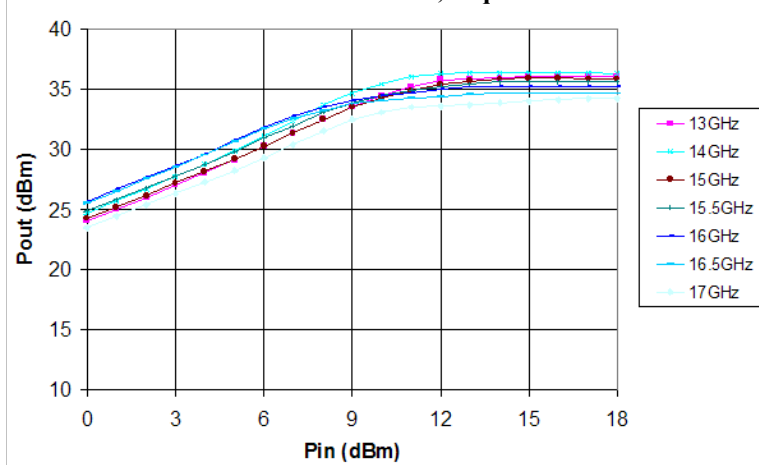
**Bias Conditions:  $V_d = 7V$ ,  $I_{dq} = 1.3A$**



### Primary Applications

- Ku-Band VSAT Transmit

**Bias Conditions:  $V_d = 7V$ ,  $I_{dq} = 1.3A$**



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

| Symbol    | Parameter                         | Value            | Notes                 |
|-----------|-----------------------------------|------------------|-----------------------|
| $V^+$     | Positive Supply Voltage           | 8V               |                       |
| $I^+$     | Positive Supply Current           | 2.3 A            | <u>2/</u>             |
| $P_D$     | Power Dissipation                 | 18.4             |                       |
| $P_{IN}$  | Input Continuous Wave Power       | 24 dBm           |                       |
| $T_{CH}$  | Operating Channel Temperature     | 200 °C           | <u>3/</u> , <u>4/</u> |
|           | 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 ( $T_m$ ). 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)**

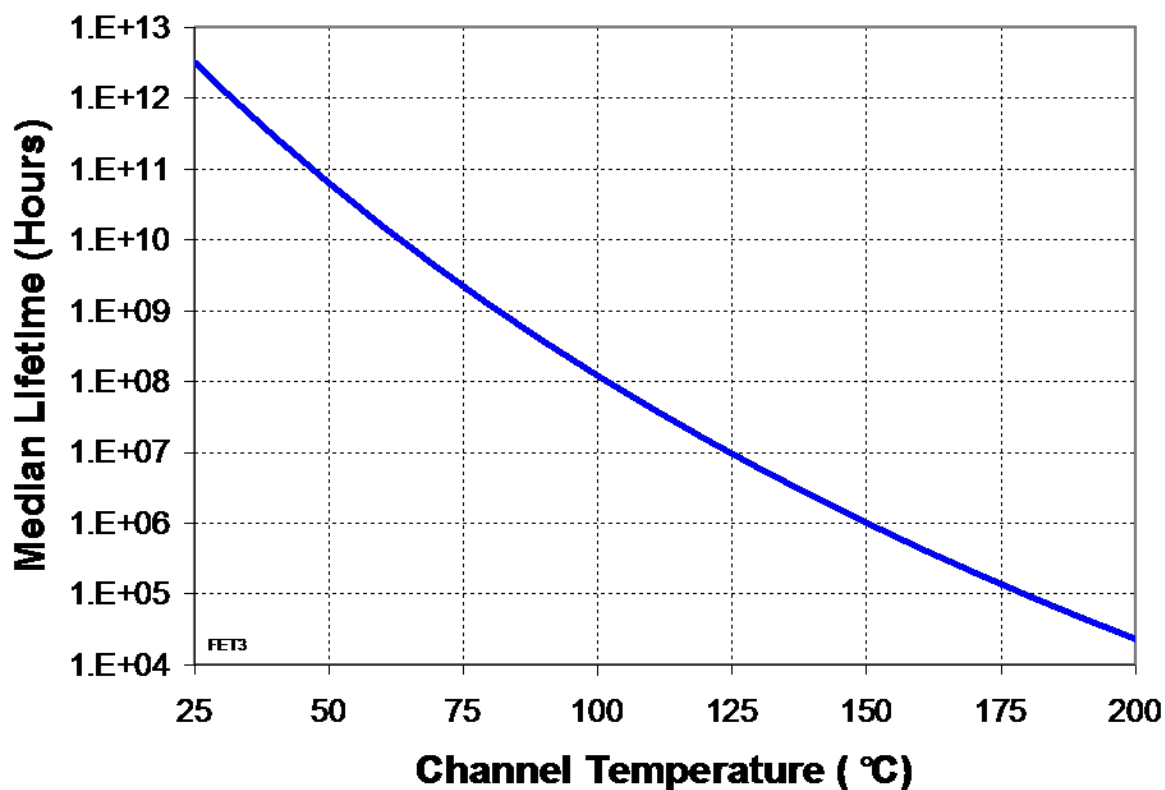
| PARAMETER                                   | TYPICAL | UNITS     |
|---------------------------------------------|---------|-----------|
| Drain Operating Voltage                     | 7       | V         |
| Quiescent Current                           | 1.3     | A         |
| Small Signal Gain                           | 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 °C) | -0.01   | dB/°C     |

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

| PARAMETER                                               | TEST CONDITIONS                         | T <sub>CH</sub><br>(°C) | θ <sub>JC</sub><br>(°C/W) | T <sub>m</sub><br>(HRS) |
|---------------------------------------------------------|-----------------------------------------|-------------------------|---------------------------|-------------------------|
| θ <sub>JC</sub> Thermal Resistance<br>(channel to Case) | Vd = 7 V<br>Id = 1.3 A<br>Pdiss = 9.1 W | 123                     | 5.8                       | 1.2E+7                  |

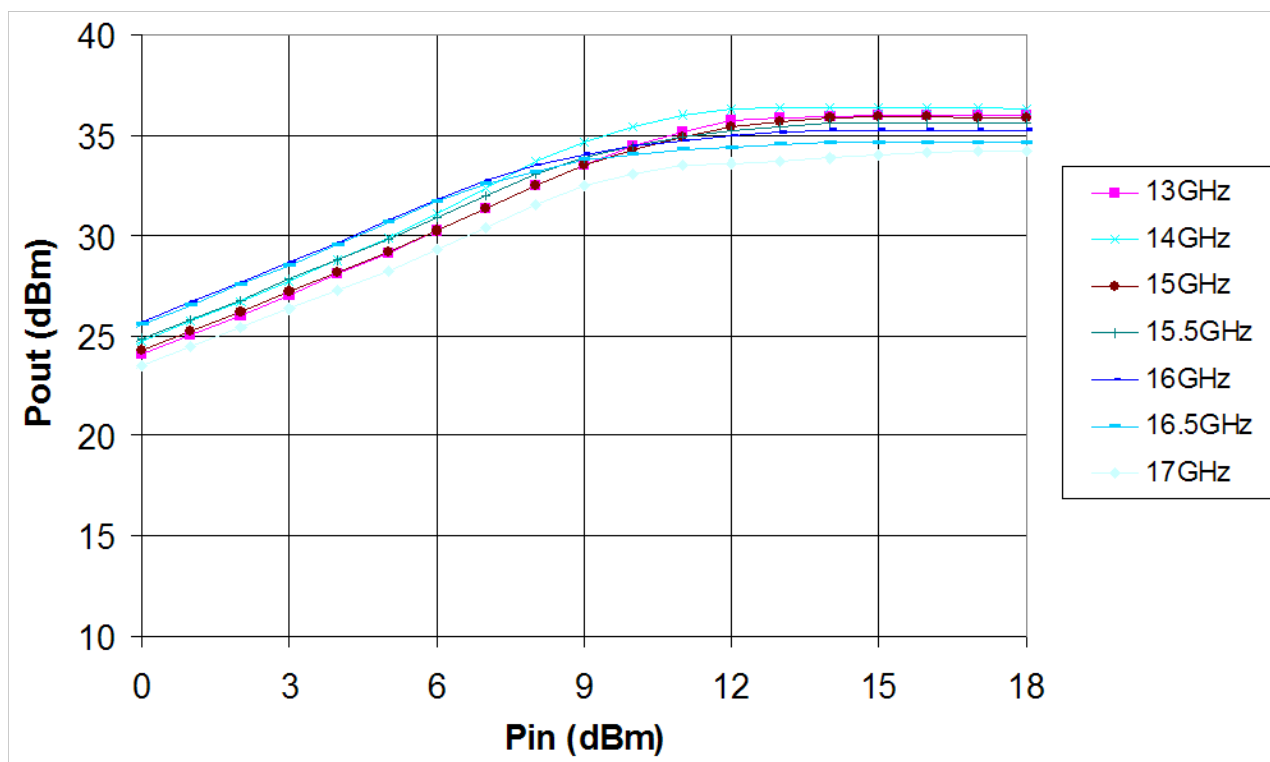
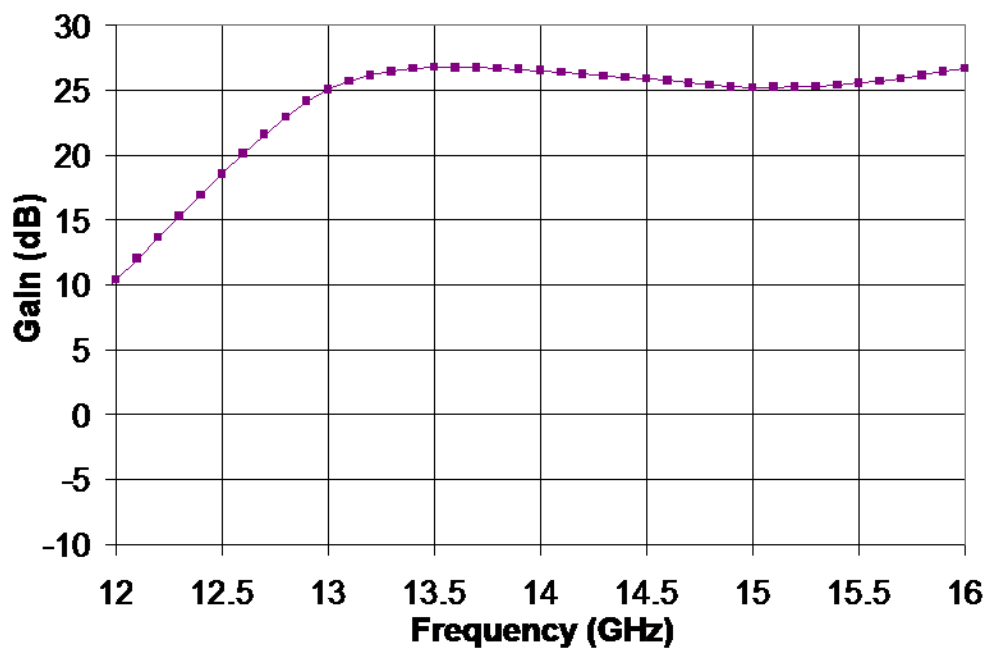
Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20 mil CuMo Carrier at 70°C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

### Median Lifetime (T<sub>m</sub>) vs. Channel Temperature



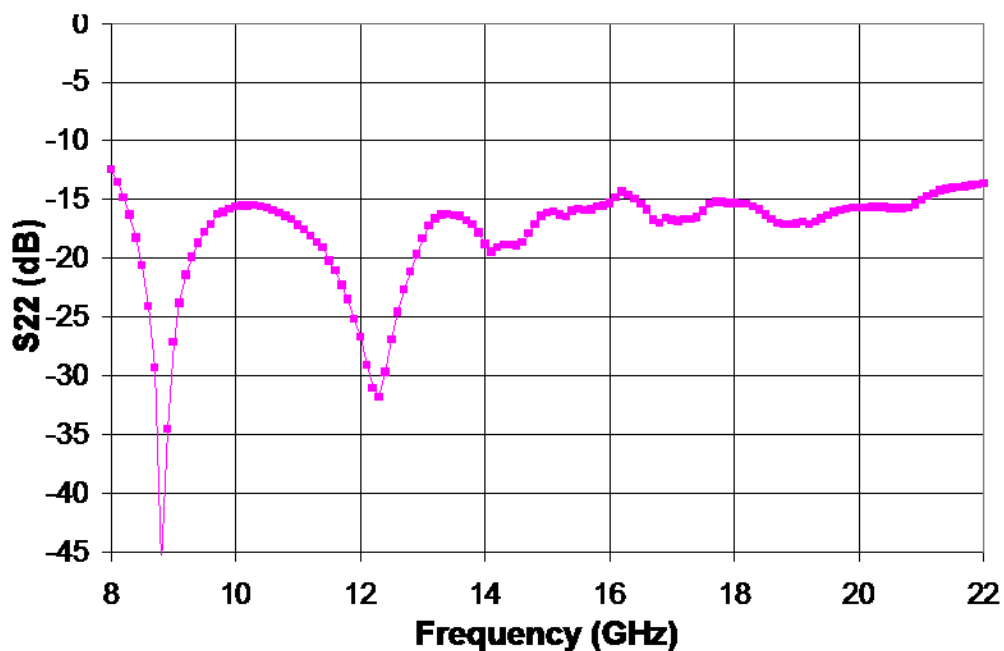
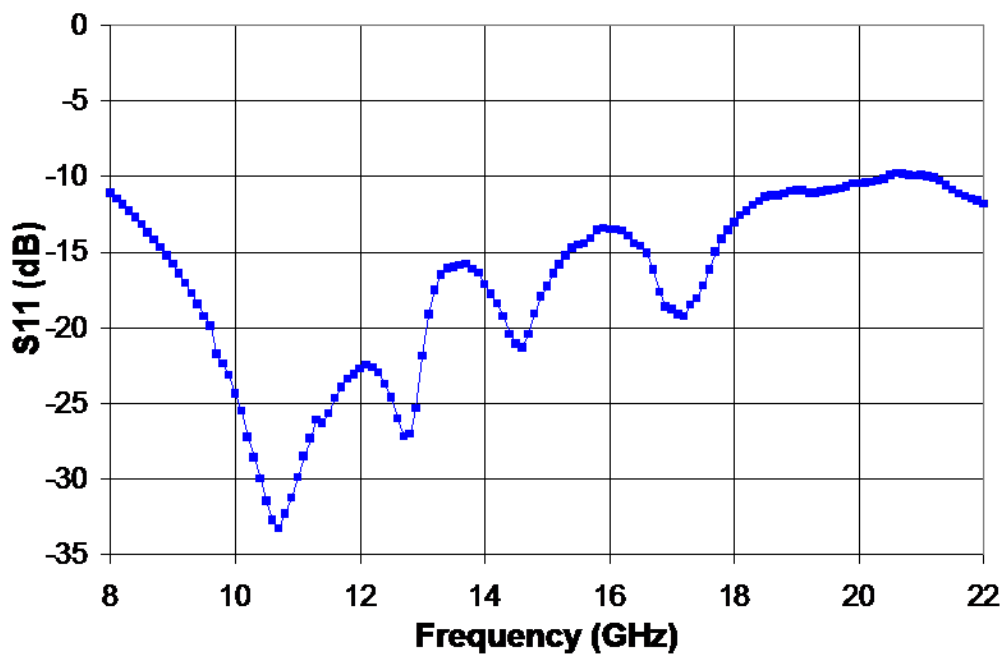
## Measured Fixtured Data

**Bias Conditions:  $V_d = 7V$ ,  $I_{dQ} = 1.3A \pm 5\%$**



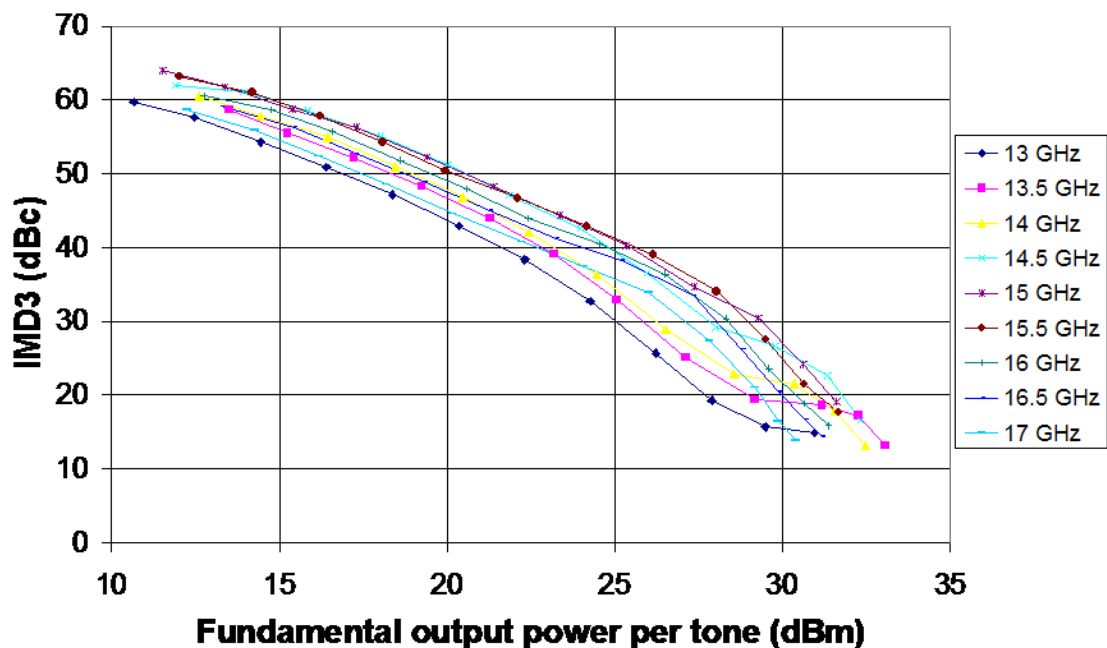
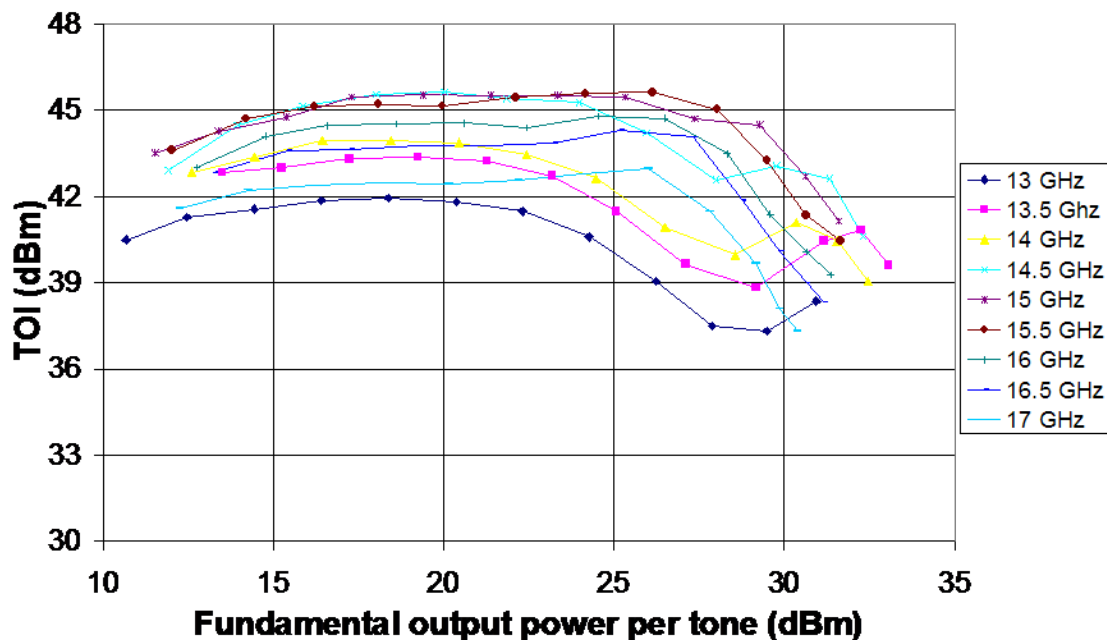
# Measured Fixtured Data

**Bias Conditions:  $V_d = 7V$ ,  $I_{dq} = 1.3A \pm 5\%$**



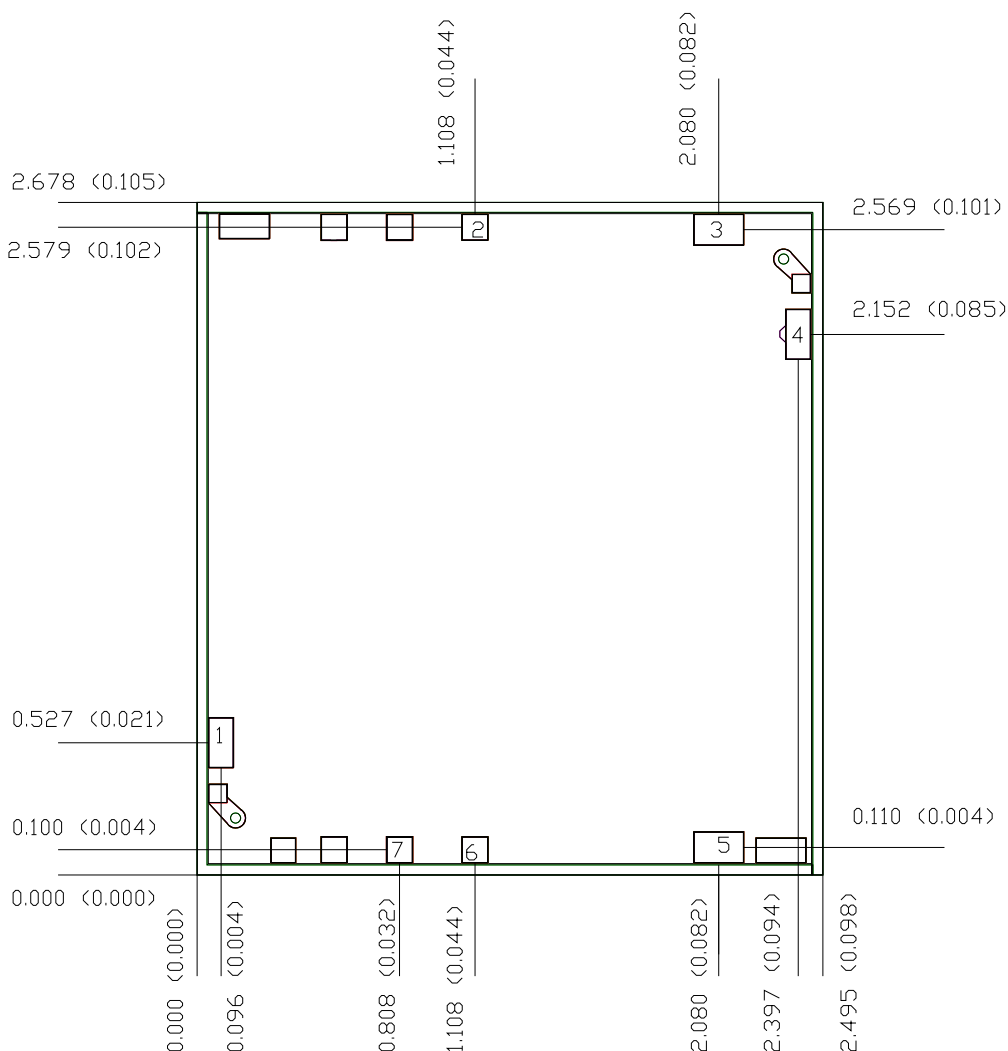
## Measured Fixtured Data

**Bias Conditions:  $V_d = 7V$ ,  $I_{dQ} = 1.3A \pm 5\%$**



[illegible]

**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<sup>0</sup>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<sup>0</sup>C.

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