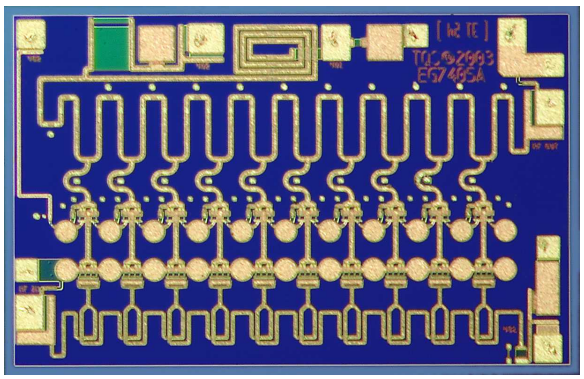
# Wideband LNA



## Key Features

- Frequency Range: 2-23 GHz
- 17 dB Nominal Gain
- 16 dBm Nominal P1dB
- < 2 dB Midband Noise Figure
- 0.15 um 3MI pHEMT Technology
- Nominal Bias: Vd = 5V, Id = 75 mA
- Chip Dimensions: 2.09 x 1.35 x 0.10 mm (0.082 x 0.053 x 0.004 in)

## Primary Applications

- Wideband Gain Block / LNA
- X-Ku Point to Point Radio
- IF & LO Buffer Applications

## Product Description

The TriQuint TGA2513 is a compact LNA/Gain Block MMIC. The LNA operates from 2-23 GHz and is designed using TriQuint's proven standard 0.15 um gate pHEMT production process.

The TGA2513 provides a nominal 16 dBm of output power at 1 dB gain compression with a small signal gain of 17 dB. Typical noise figure is < 3 dB from 2-18 GHz.

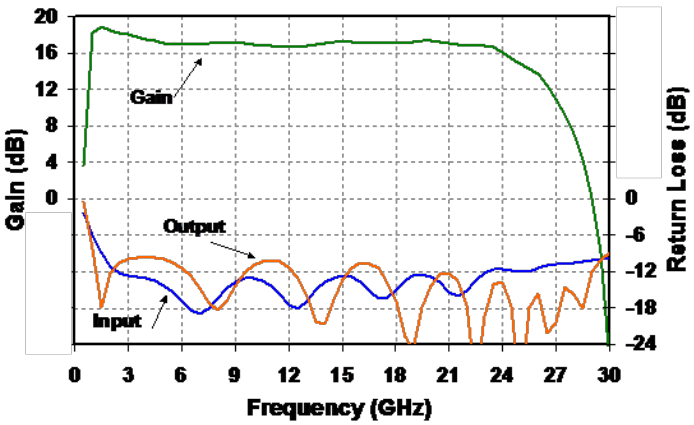
The TGA2513 is suitable for a variety of wideband electronic warfare systems such as radar warning receivers, electronic counter measures, decoys, jammers and phased array systems.

The TGA2513 is 100% DC and RF tested on-wafer to ensure performance compliance.

Lead-Free & RoHS compliant.
Evaluation Boards are available upon request.

## Measured Fixtured Data

**Vd = 5V, Id= 75mA, Vg2 = 2V, Typical Vg1 = -60mV**



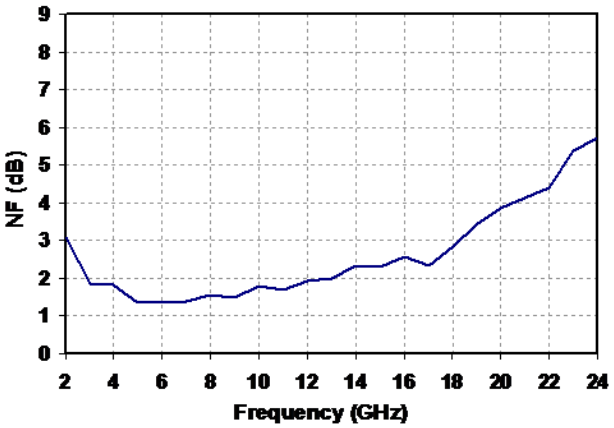










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**TABLE I**
**MAXIMUM RATINGS 1/**

| SYMBOL | PARAMETER | VALUE | NOTES |
|---|---|---|---|
| Vd | Positive Supply Voltage | 5 V | 2/ |
| $V_{g1}$ | Gate 1 Supply Voltage Range | -1V to 0 V | |
| $V_{g2}$ | Gate 2 Supply Voltage Range | (Vd – 3) to (Vd – 2) V | |
| Id | Positive Supply Current | 151 mA | 2/ |
| $\| I_G \|$ | Gate Supply Current | 10 mA | |
| $P_{IN}$ | Input Continuous Wave Power | 21 dBm | 2/ |
| $P_D$ | Power Dissipation | 0.76 W | 2/, 3/ |
| $T_{CH}$ | Operating Channel Temperature | 200 °C | 4/ |
| | Mounting Temperature (30 Seconds) | 320 °C | |
| $T_{STG}$ | Storage Temperature | -65 to 150 °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 $P_D$.

3/ When operated at this power dissipation with a base plate temperature of 70 °C, the median life is 1 E+7 hours.

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

**TABLE II**
**DC PROBE TEST**
($T_A$ = 25 °C, Nominal)

| SYMBOL | PARAMETER | MINIMUM | MAXIMUM | UNIT |
|---|---|---|---|---|
| $I_{dss,\ Q1-Q10}$ | Saturated Drain Current | -- | 216 | mA |
| $V_{p,\ Q1-Q10}$ | Pinch-off Voltage | -1 | 0 | V |
| $V_{BVGD,\ Q1-Q10}$ | Breakdown Voltage Gate-Drain | -30 | -7 | V |
| $V_{BVGS,\ Q1-Q10}$ | Breakdown Voltage Gate-Source | -30 | -5 | V |

Note: Q1-Q10 is a 720um size FET.

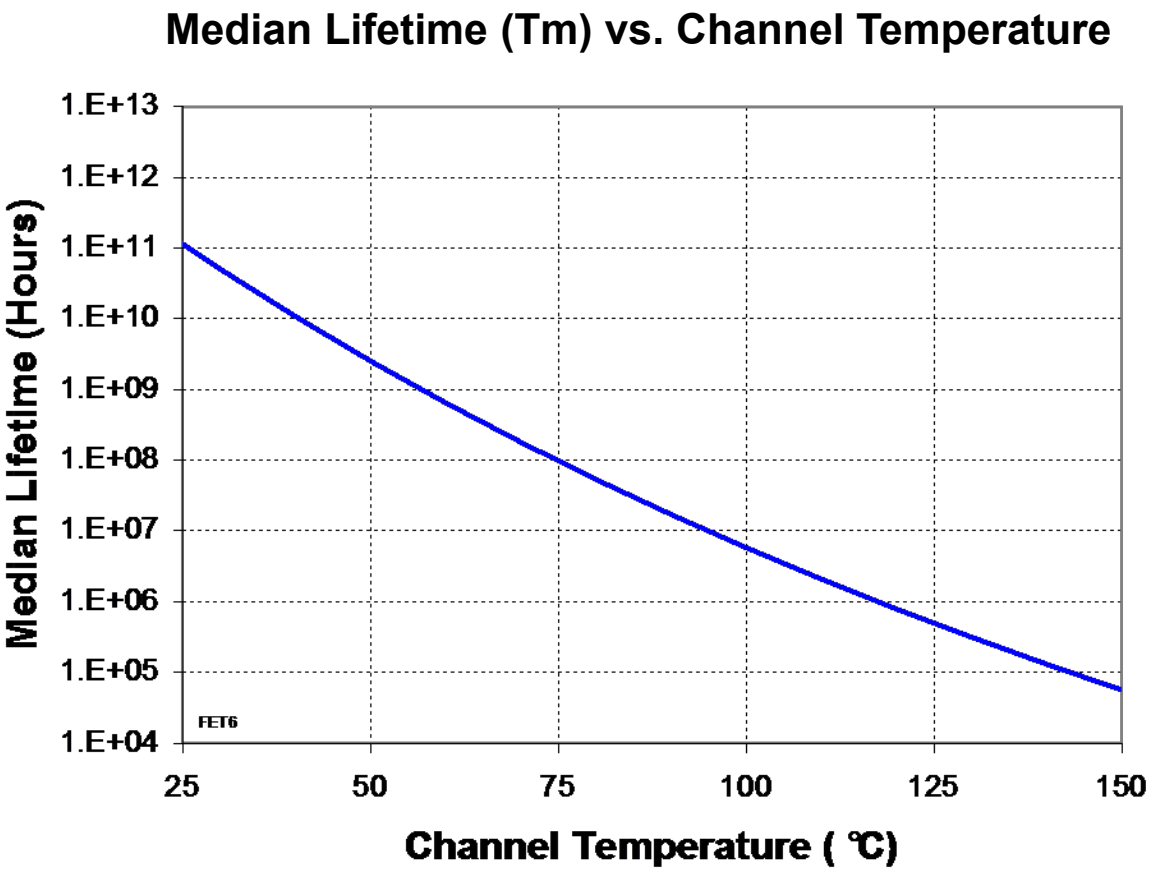
**TABLE III**
**RF CHARACTERIZATION TABLE**
($T_A$ = 25 °C, Nominal)
Vd = 5V, Id = 75 mA Vg2 = 2V

| SYMBOL | PARAMETER | TEST CONDITION | NOMINAL | UNITS |
|---|---|---|---|---|
| Gain | Small Signal Gain | f = 2-23 GHz | 17 | dB |
| IRL | Input Return Loss | f = 2-23 GHz | 14 | dB |
| ORL | Output Return Loss | f = 2-23 GHz | 14 | dB |
| NF | Noise Figure | f = 3-13 GHz<br>f = 2-18 GHz | 2<br>< 3 | dB |
| $P_{1dB}$ | Output Power @ 1dB Gain Compression | f = 2-23 GHz | 16 | dBm |

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

| Parameter | Test Conditions | $T_{CH}$ (°C) | $\theta_{JC}$ (°C/W) | Tm (HRS) |
|---|---|---|---|---|
| $\theta_{JC}$ Thermal Resistance (channel to backside of carrier) | Vd = 5 V<br>$I_D$ = 75 mA<br>Pdiss = 0.375 W | 82 | 32 | 4.5 E+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.





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## Measured Fixtured Data

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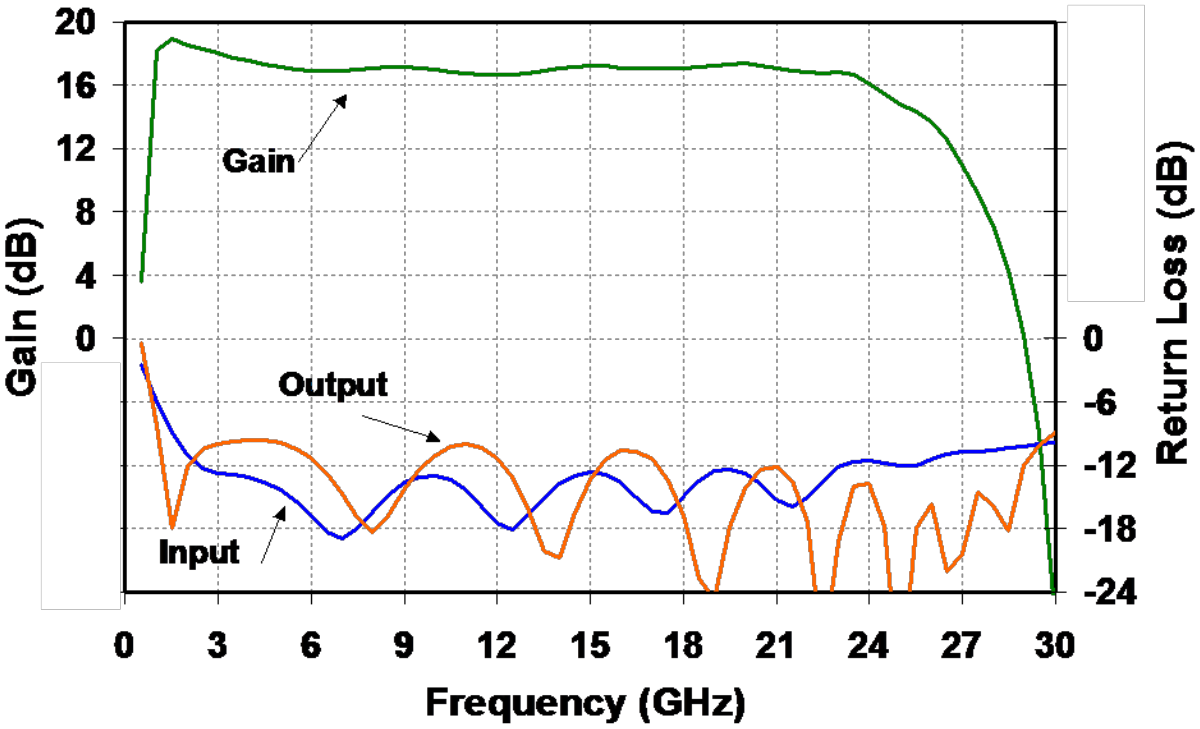


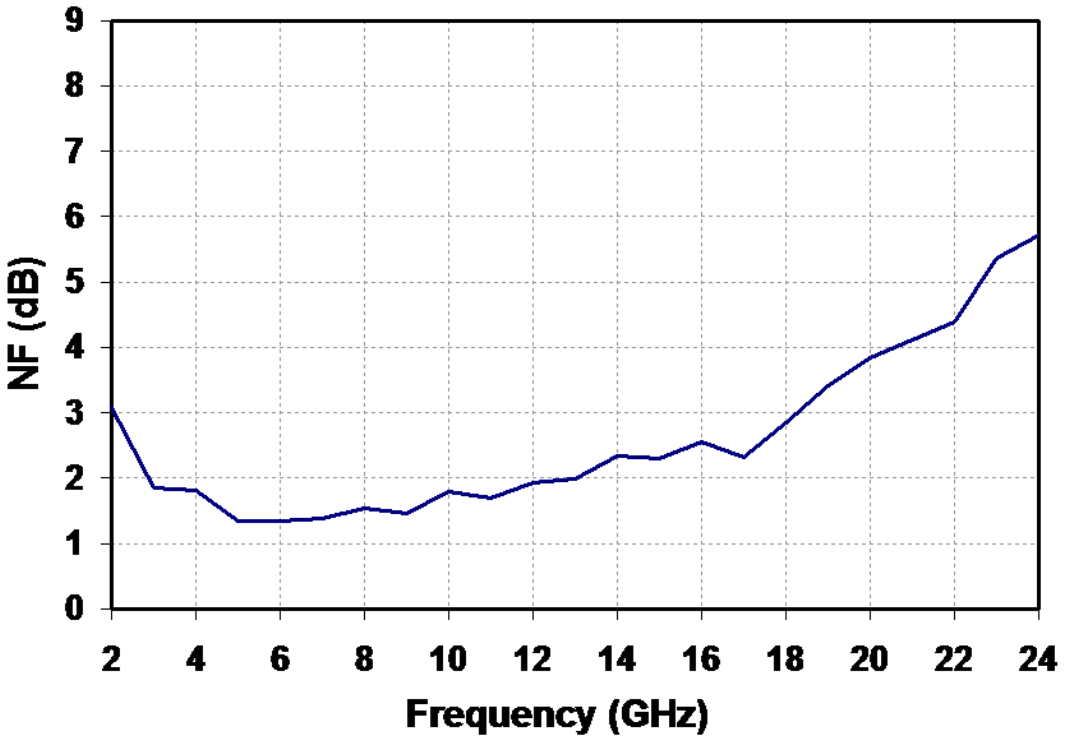

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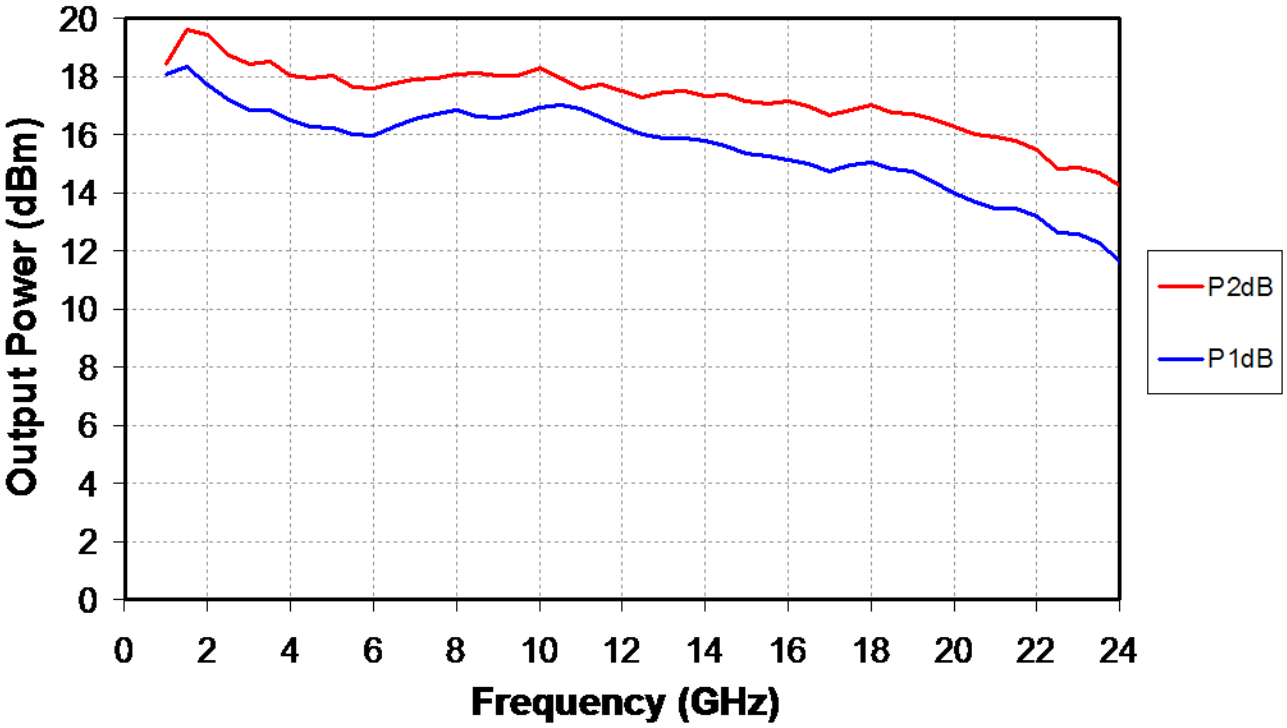

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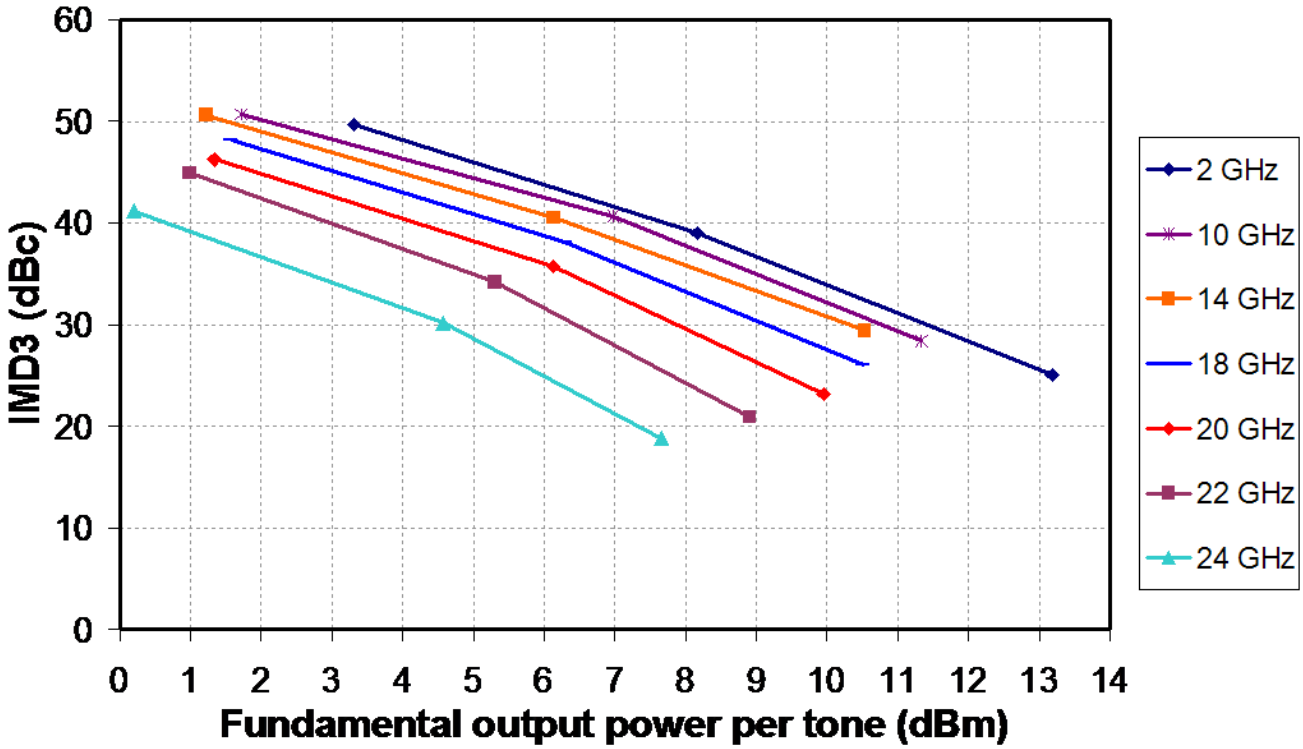
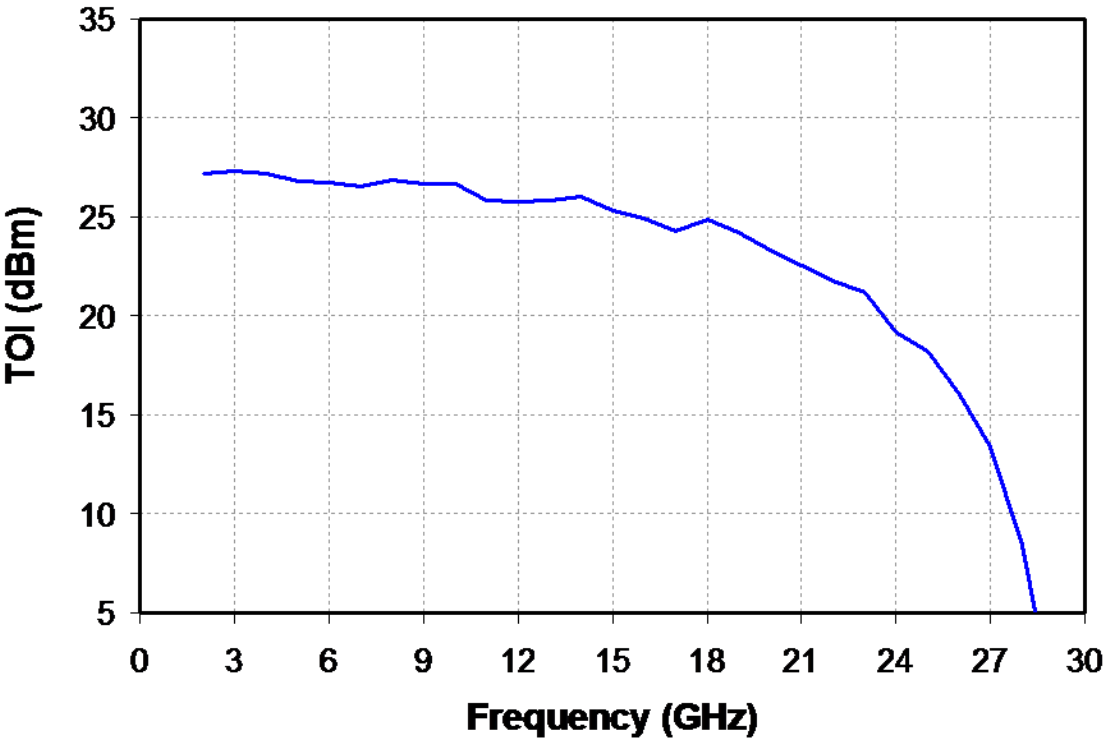
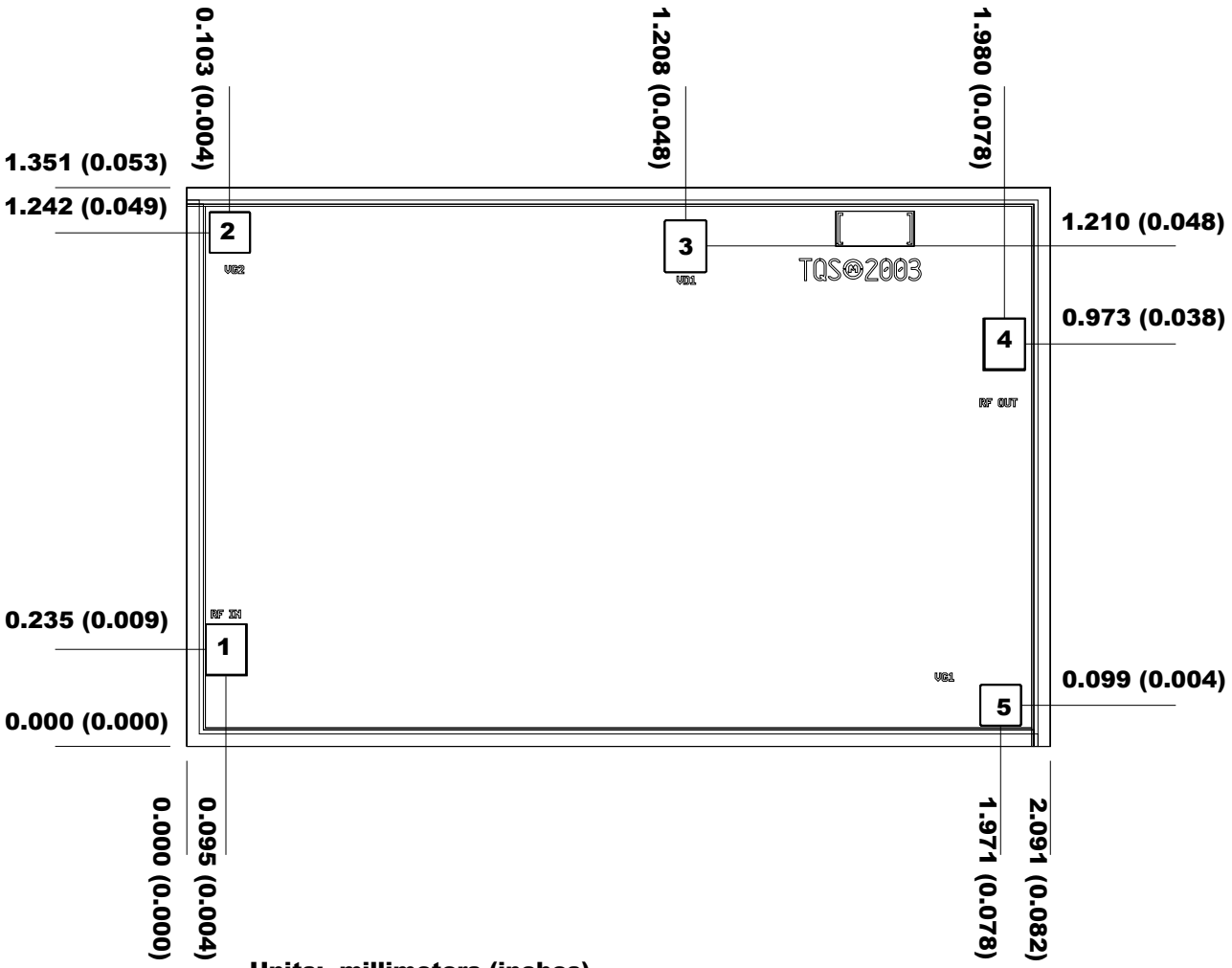


## Mechanical Characteristics



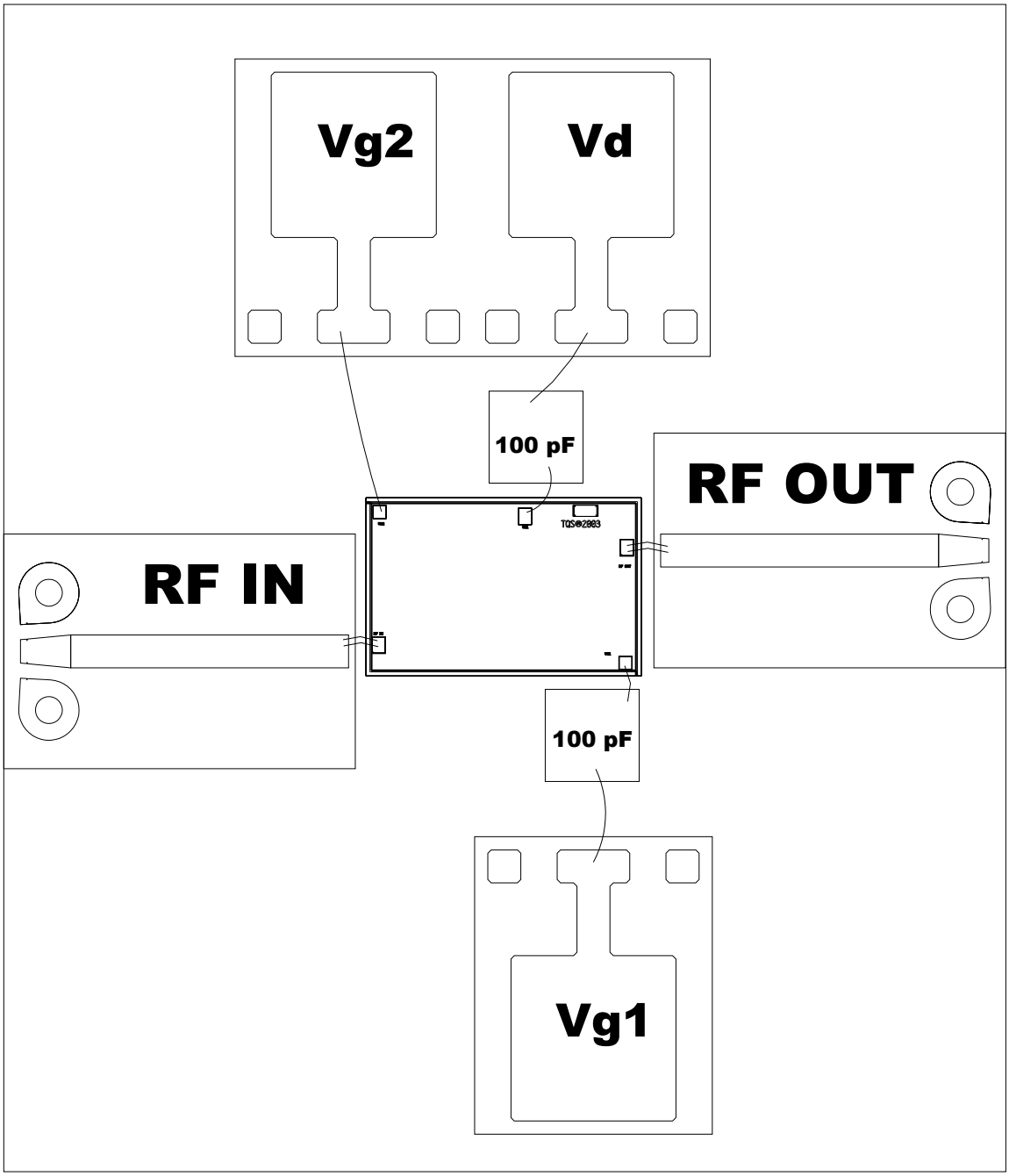

**Units: millimeters (inches)**
**Thickness: 0.100 (0.004) (reference only)**
**Chip edge to bond pad dimensions are shown to center of pad**
**Chip size tolerance: +/- 0.051 (0.002)**

**GND IS BACKSIDE OF MMIC**

| | | |
|---|---|---|
| **Bond Pad #1:** | **RF IN** | **0.100 x 0.125 (0.004 x 0.005)** |
| **Bond Pad #2:** | **VG2** | **0.100 x 0.100 (0.004 x 0.004)** |
| **Bond Pad #3:** | **VD** | **0.100 x 0.125 (0.004 x 0.005)** |
| **Bond Pad #4:** | **RF OUT** | **0.100 x 0.125 (0.004 x 0.005)** |
| **Bond Pad #5:** | **VG1** | **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.***

## Recommended Assembly Diagram

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## Assembly Process Notes

Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300 °C for 30 sec
- 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.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.
- Maximum stage temperature is 200 °C.

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