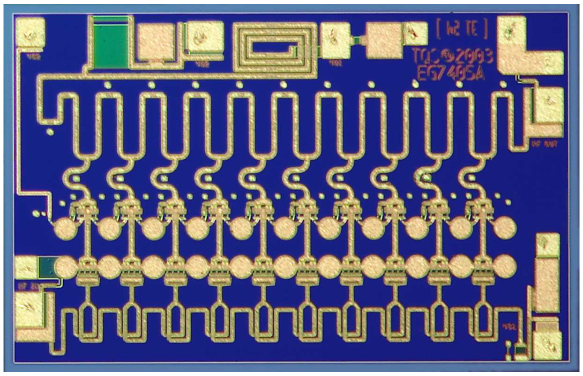
TriQuint SEMICONDUCTOR

Advance Product Information
September 2, 2005

Wideband LNA with AGC

TGA2513-EPU



Key Features
- Frequency Range: 2-23 GHz
- 17 dB Nominal Gain
- > 30 dB Adjustable Gain with Vg2
- 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-EPU is a compact LNA/Gain Block MMIC with AGC via the control gate. The LNA operates from 2-23 GHz and is designed using TriQuint's proven standard 0.15 um gate pHEMT production process.

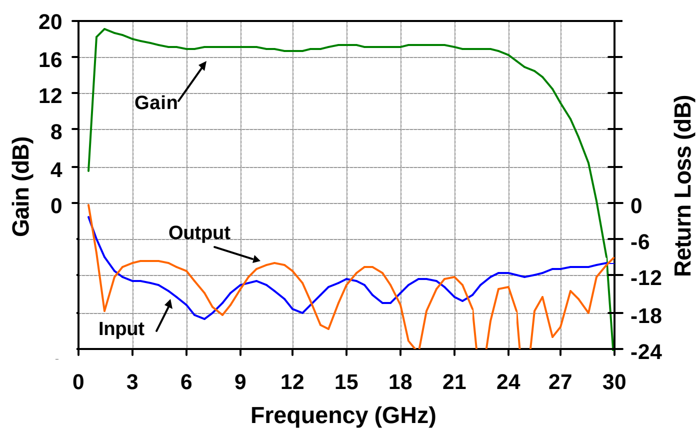
The TGA2513-EPU provides a nominal 16 dBm of output power at 1 dB gain compression with a small signal gain of 17 dB. Typical noise figure is < 3 dB from 2-18 GHz.

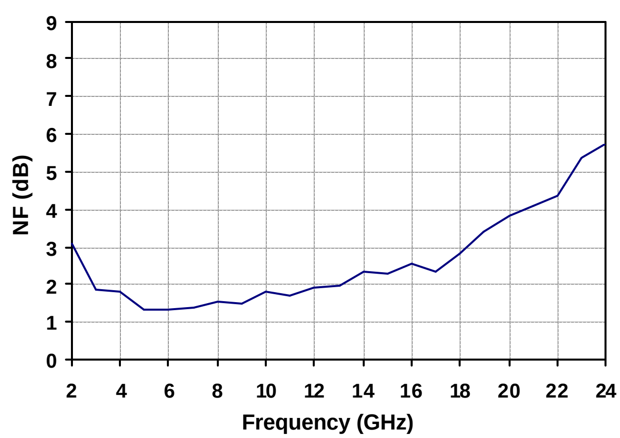
The TGA2513-EPU is suitable for a variety of wideband electronic warfare systems such as radar warning receivers, electronic counter measures, decoys, jammers and phased array systems.

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

Measured Fixtured Data

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





Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice

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TABLE I
MAXIMUM RATINGS 1/

SYMBOL	PARAMETER	VALUE	NOTES
V^+	Positive Supply Voltage	7 V	2/
V_{g1}	Gate 1 Supply Voltage Range	-2V TO 0 V	
V_{g2}	Gate 2 Supply Voltage Range	-0.5 V TO +3.5 V	
I^+	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	1.5 W	2/, 3/
T_{CH}	Operating Channel Temperature	117 °C	4/, 5/
T_M	Mounting Temperature (30 Seconds)	320 °C	
T_{STG}	Storage Temperature	-65 to 117 °C	

1/ These ratings represent the maximum operable values for this device.

2/ Current is defined under no RF drive conditions. 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+6 hours.

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

5/ These ratings apply to each individual FET.

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	-5	V
$V_{BVGS,\ Q1-Q10}$	Breakdown Voltage Gate-Source	-30	-5	V

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

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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 f = 2-18 GHz	2 < 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)	R_{qJC} (°C/W)	T_M (HRS)
$R_{\theta JC}$ Thermal Resistance (channel to backside of carrier)	Vd = 5 V I_D = 75 mA 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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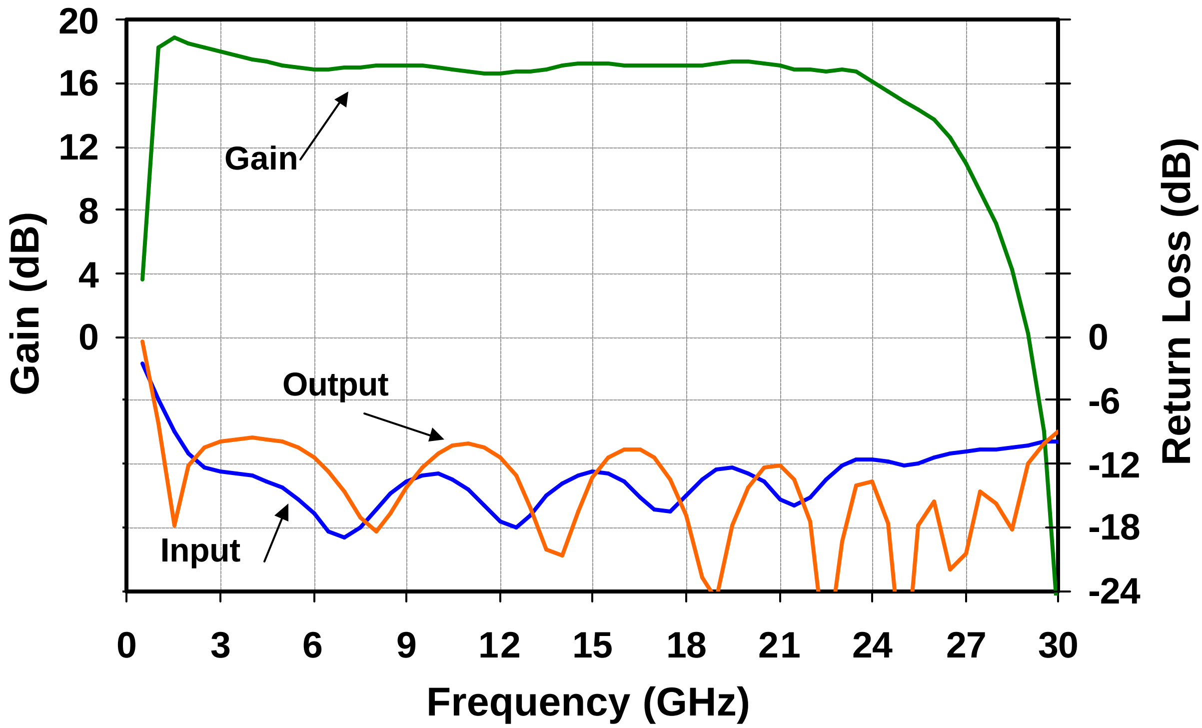

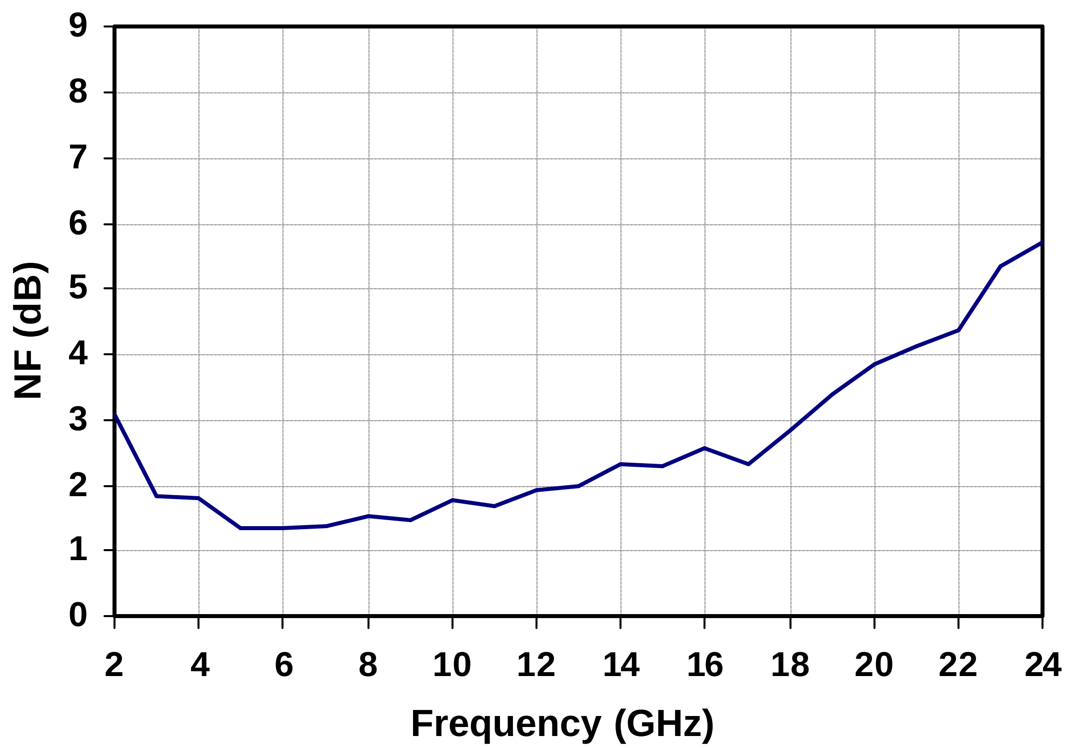

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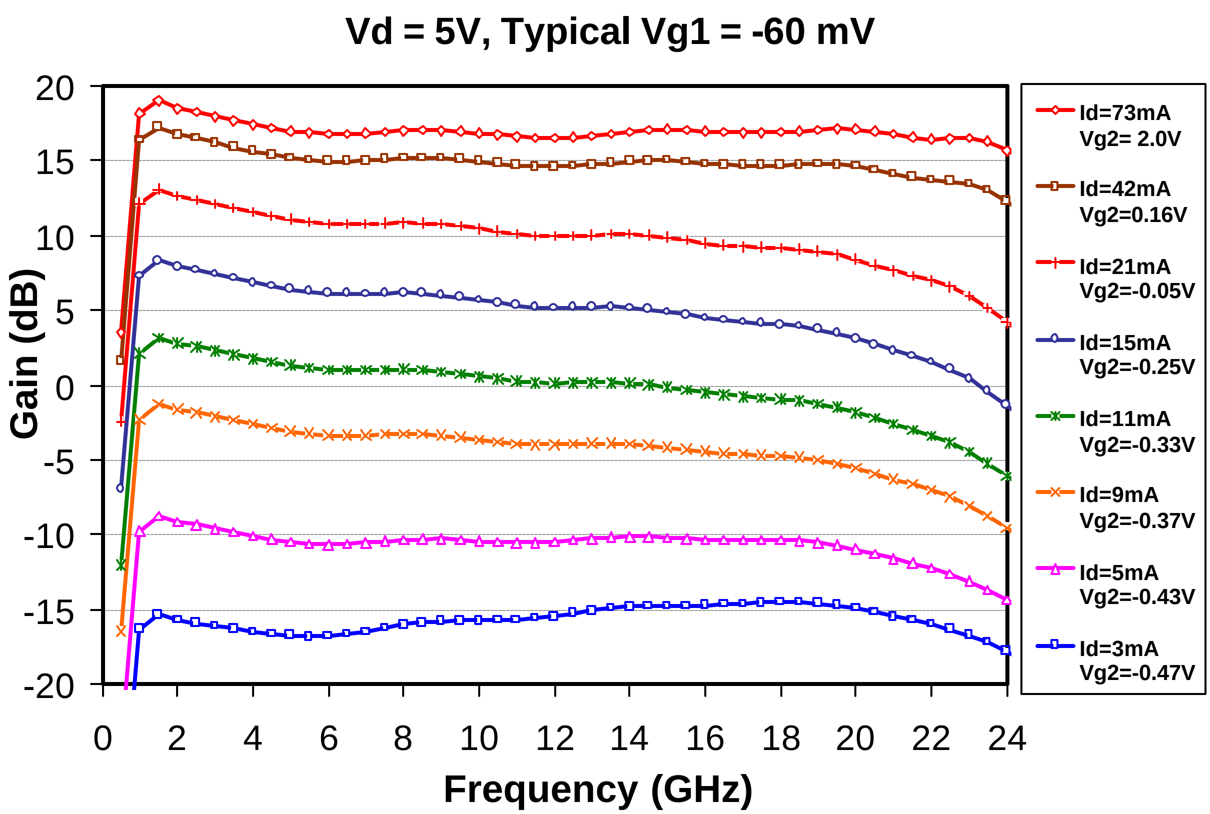

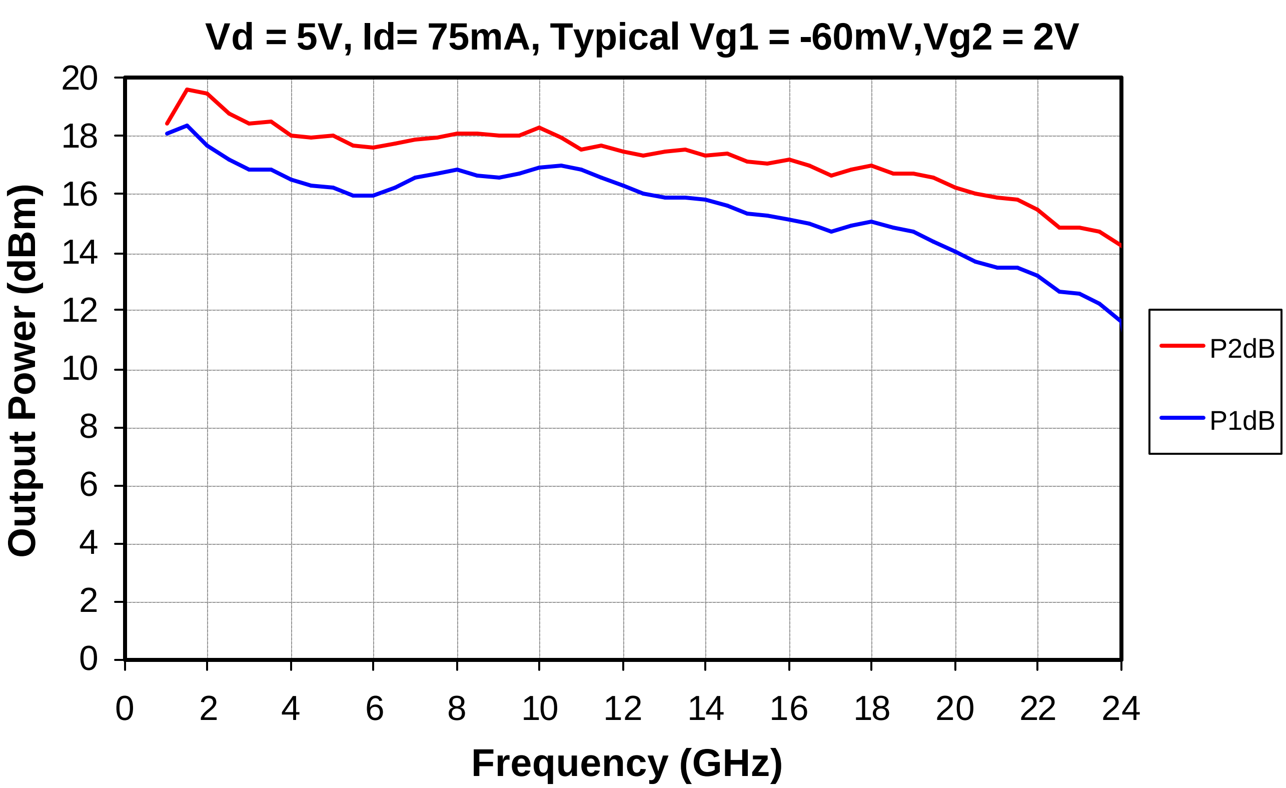

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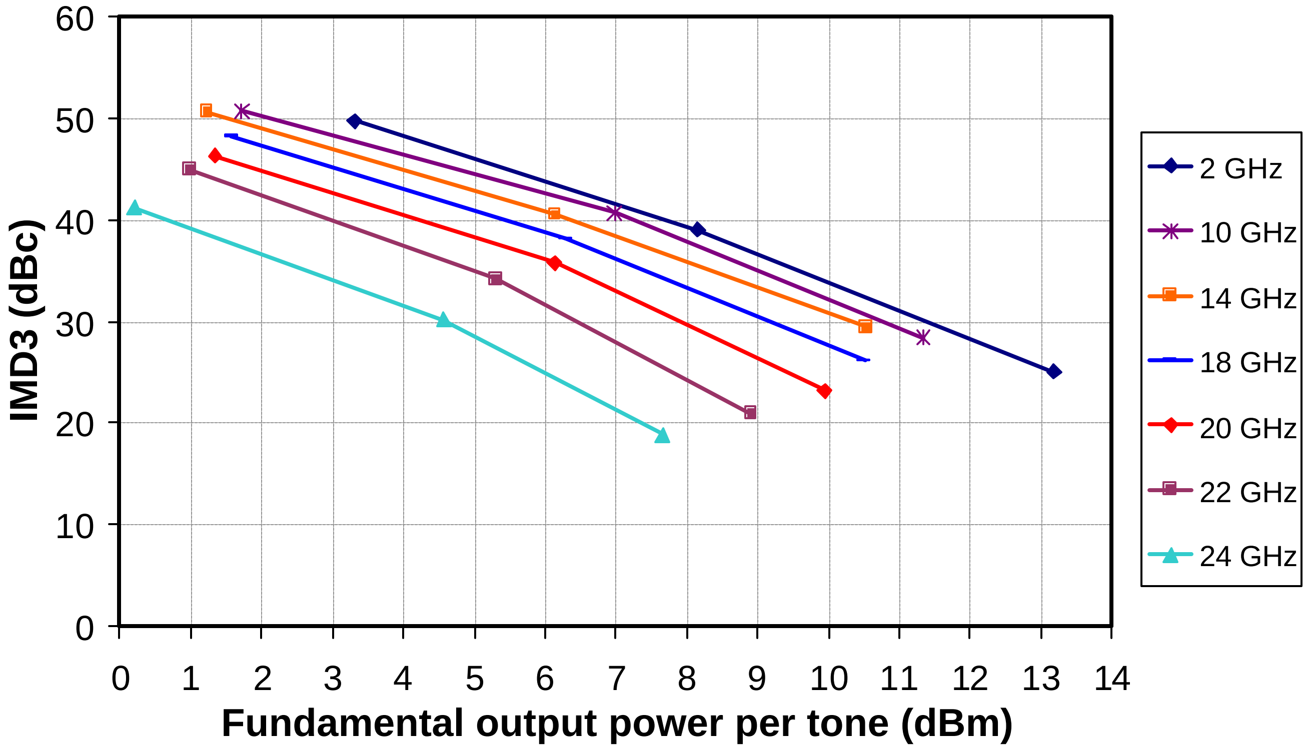

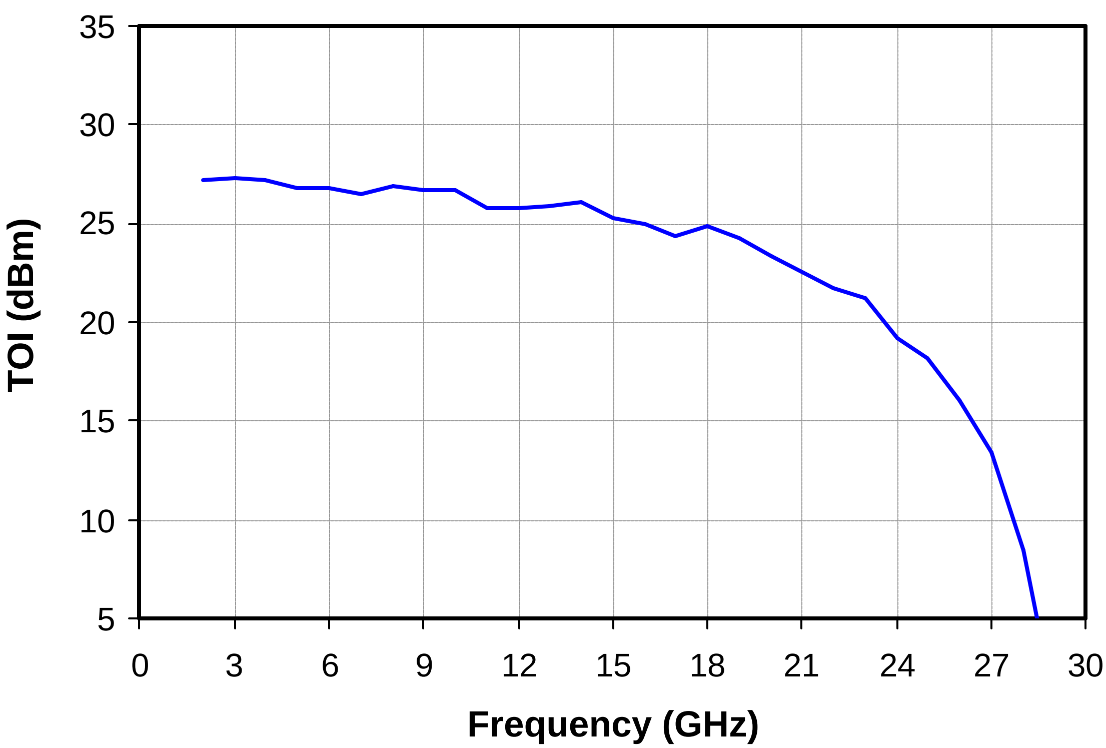

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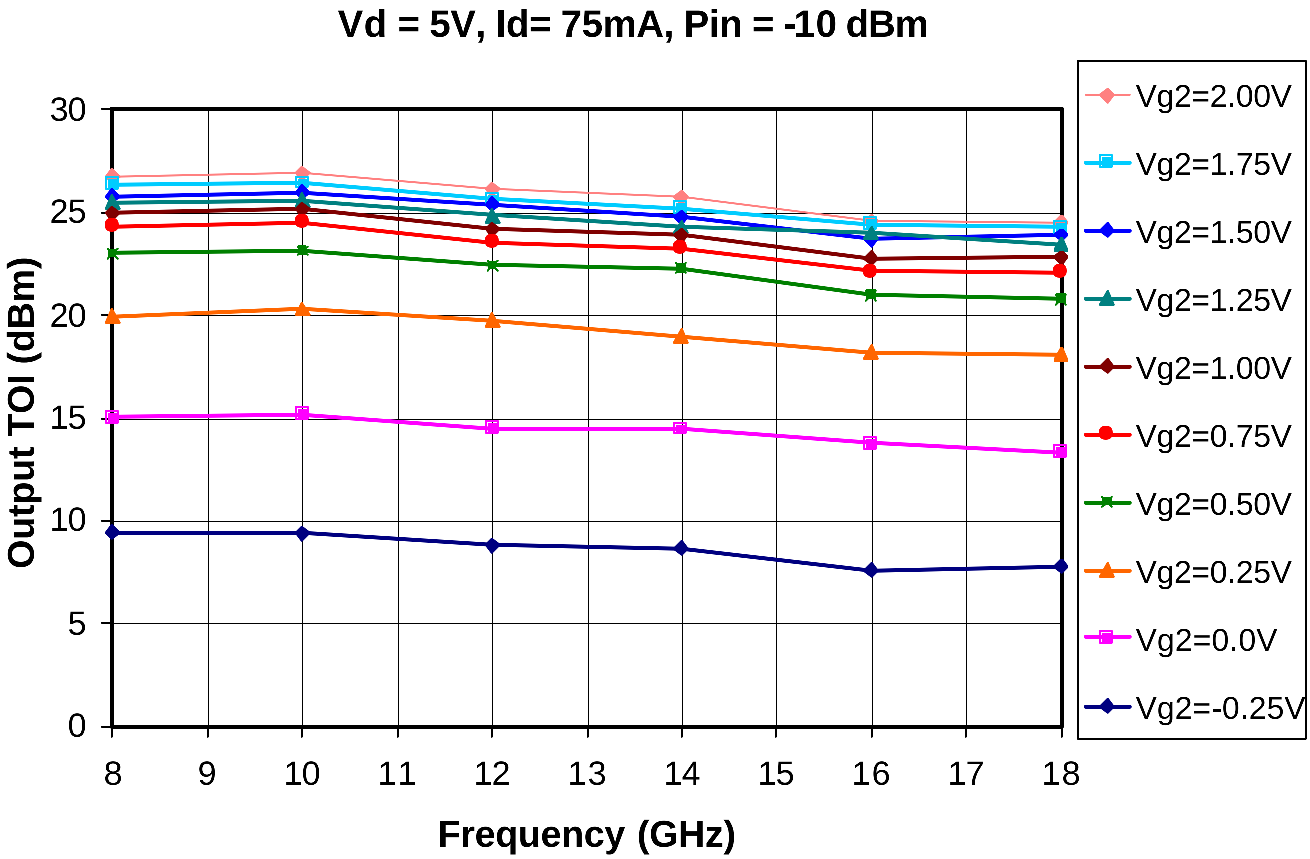

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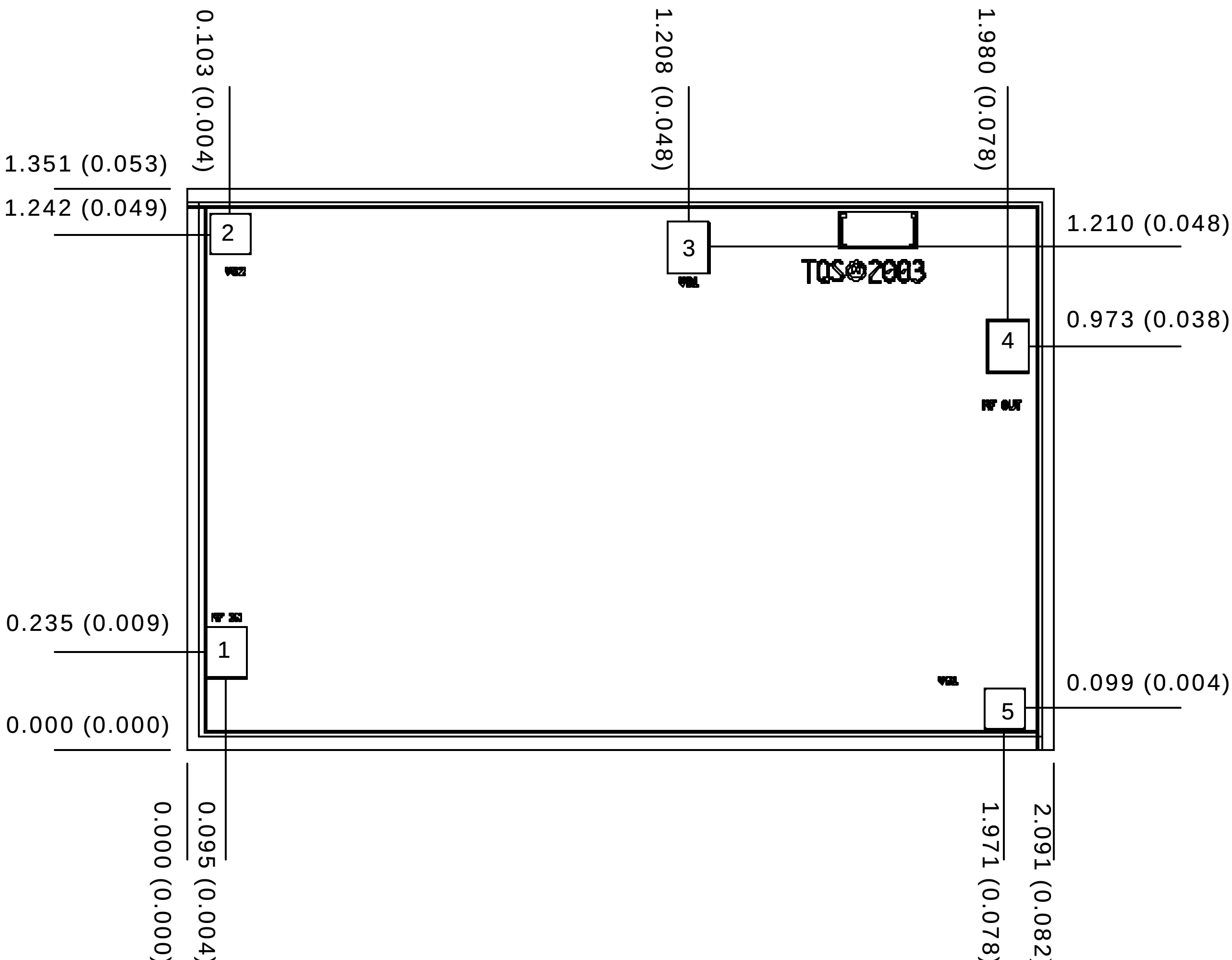
Mechanical Characteristics



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.

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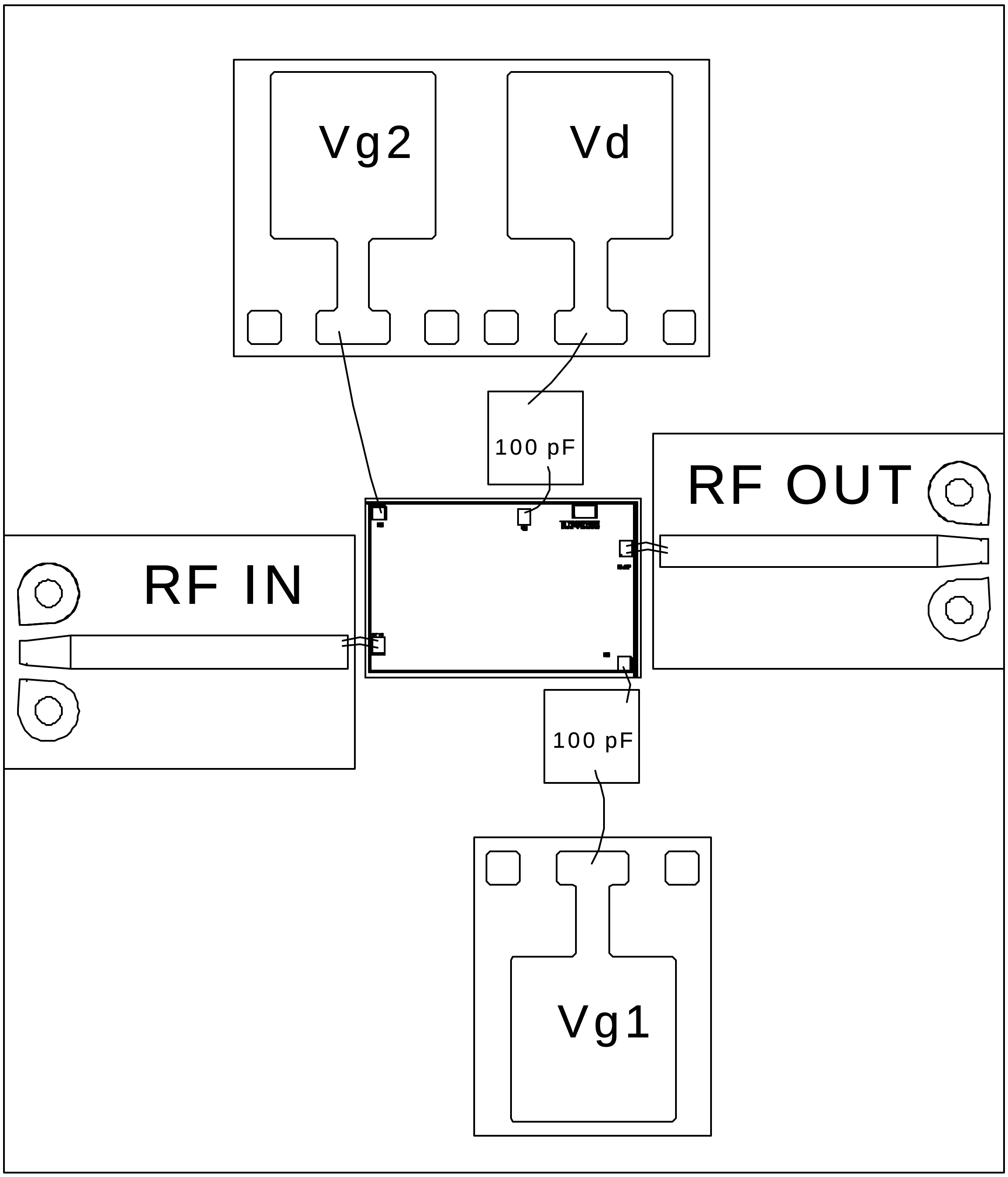
Recommended Assembly Diagram



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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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