

4 - 14 GHz balanced LNA

TGA2512-SM



Self Bias



Gate Bias

Key Features

- Typical Frequency Range: 4 - 14 GHz
- 2.3 dB Nominal Noise Figure
- 25 dB Nominal Gain
- 15 dB AGC Range
- 13 dBm Nominal P1dB
- 24dBm Nominal OIP3
- Bias: 5 V, 160 mA Gate Bias
5 V, 90 mA Self Bias
- Package Dimensions:
4.0 x 4.0 x 0.9 mm

Primary Applications

- X-Band Radar
- EW, ECM
- Point-to-Point Radio

Product Description

The TriQuint TGA2512-SM is a packaged X-band balanced LNA with AGC amplifier for EW, ECM, and RADAR receiver or driver amplifier applications. The TGA2512-SM provides excellent noise performance with typical midband NF of 2.3dB, and high gain, 25dB from 4-14GHz

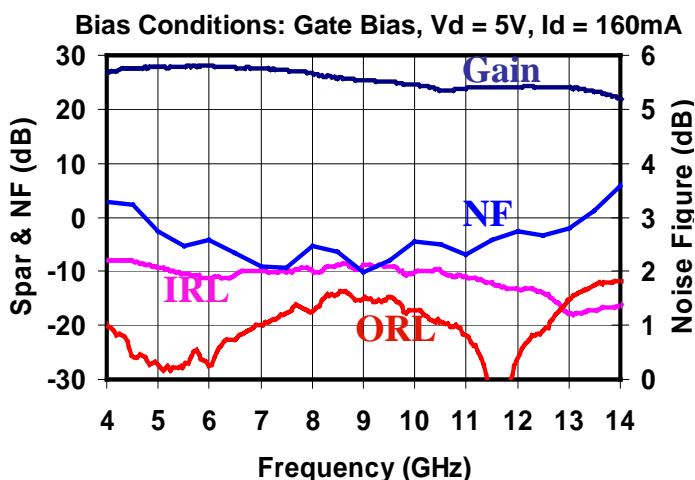
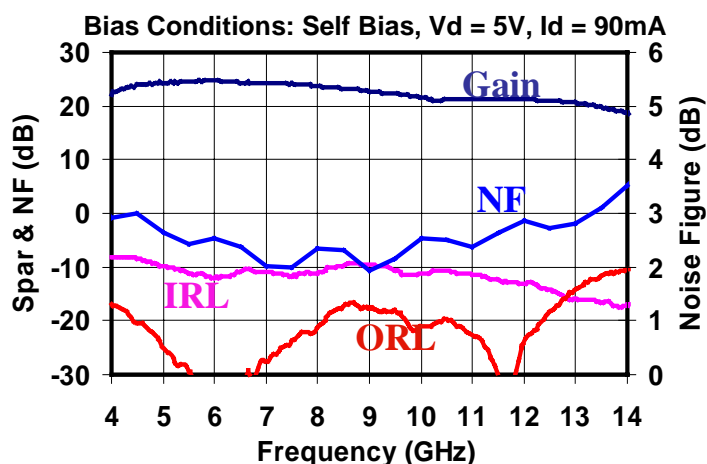
The TGA2512-SM is designed for maximum ease of use. TGA2512-SM can handle up to 21dBm input power reliably, while the build-in gain control provides 15dB of typical gain control range. The part can be used in self-biased mode, with a single +5V supply connection, or in gate biased mode, allowing the user to control the current for a particular application.

In self-biased mode the TGA2512-SM achieves 6dBm typical P1dB, while in gate-biased mode the typical P1dB is over 13dBm.

Lead-Free & RoHS compliant.

Evaluation boards are available.

Measured Data



Note: Device is early in the characterization process prior to finalizing all electrical specifications. Specifications are subject to change without notice

TABLE I
MAXIMUM RATINGS 1/

| SYMBOL | PARAMETER | VALUE | NOTES |
|-------------------|-----------------------------------|-------------------------------------|---------------------|
| V _d | Drain Voltage | [3.5 + (0.0125)(I _d)] V | <u>2/</u> <u>3/</u> |
| V _g | Gate Voltage Range | -1 TO +0.5 V | |
| I _d | Drain Current (gate biased) | 240 mA | <u>2/</u> |
| I _g | Gate Current | 7.04 mA | |
| P _{IN} | Input Continuous Wave Power | 21 dBm | |
| P _D | Power Dissipation | See note <u>4/</u> | <u>2/</u> |
| T _{CH} | Operating Channel Temperature | 117 °C | <u>5/</u> |
| T _M | Mounting Temperature (30 Seconds) | 260 °C | |
| T _{STG} | Storage Temperature | -65 to 150 °C | |
| T _{CASE} | Package Operating Temperature | -40 to 110 °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/ Unit for I_d is A

4/ For a median life time of 1E+6 hrs, Power dissipation is limited to:

$$P_D(\text{max}) = (117\text{ }^{\circ}\text{C} - T_{\text{BASE}}\text{ }^{\circ}\text{C}) / \theta_{\text{JC}}\text{ (}^{\circ}\text{C/W)}$$

Where T_{BASE} is the base plate temperature.

θ_{JC} for self bias is 28.2 °C/W

θ_{JC} for gate bias is 37.6 °C/W

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

TABLE II
ELECTRICAL CHARACTERISTICS

(Ta = 25 °C, Nominal)

| PARAMETER | Gate Bias | Self Bias | UNITS |
|---|-----------|-----------|-------|
| Frequency Range | 4 - 14 | 4 - 14 | GHz |
| Drain Voltage, Vd | 5.0 | 5.0 | V |
| Drain Current, Id | 160 | 90 | mA |
| Gate Voltage, Vg | -0.1 | - | V |
| Small Signal Gain, S21 | 25 | 22 | dB |
| Input Return Loss, S11 | 10 | 10 | dB |
| Output Return Loss, S22 | 20 | 20 | dB |
| Noise Figure, NF | 2.3 | 2.3 | dB |
| Output Power @ 1dB Gain Compression, P1dB | 13 | 6 | dBm |
| OIP3 | 24 | 16 | dBm |
| Temperature Gain Coefficient | -0.02 | -0.02 | dB/°C |

Note: Table II Lists the RF Characteristics of typical devices as determined by fixtured measurements.

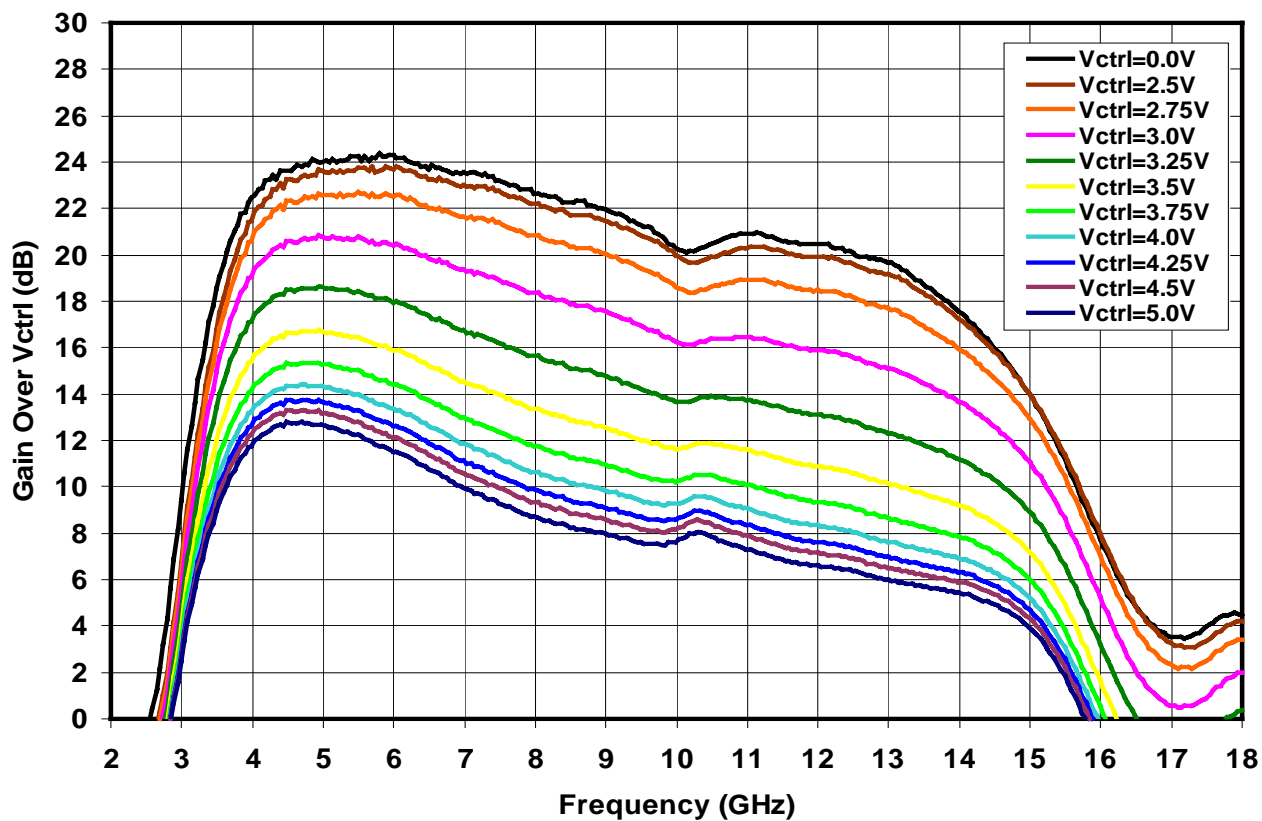
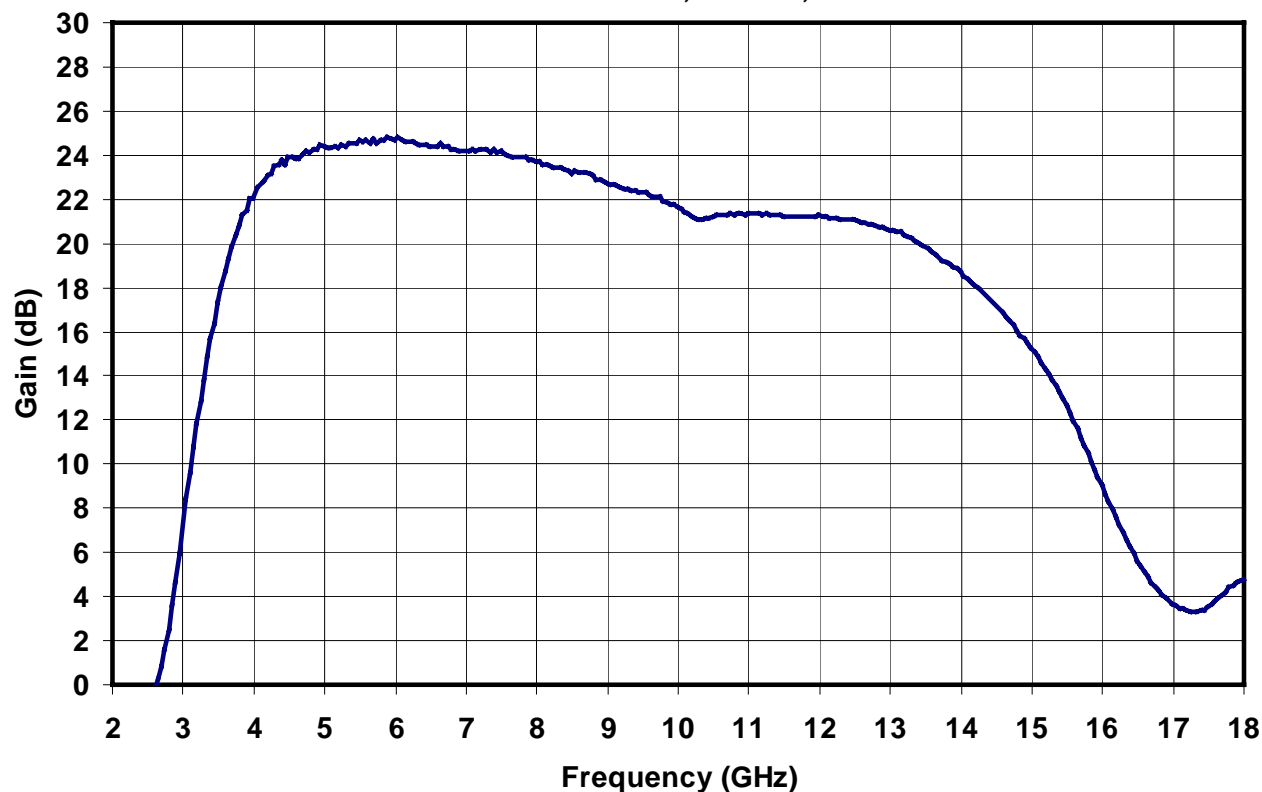
TABLE III
THERMAL INFORMATION

| PARAMETER | TEST CONDITIONS | T _{CH} (°C) | θ _{JC} (°C/W) | T _M (HRS) |
|---|---|-------------------------|---------------------------|-------------------------|
| θ _{JC} Thermal Resistance (channel to Case) | Vd = 5 V Id = 160 mA Gate Bias P _{diss} = 0.80 W | 100 | 37.6 | 5.8E+6 |
| θ _{JC} Thermal Resistance (channel to Case) | Vd = 5 V Id = 90 mA Self Bias P _{diss} = 0.45 W | 82.7 | 28.2 | 4.1E+7 |

Note: Worst case condition with no RF applied, 100% of DC power is dissipated, Case Temperature @ 70 °C

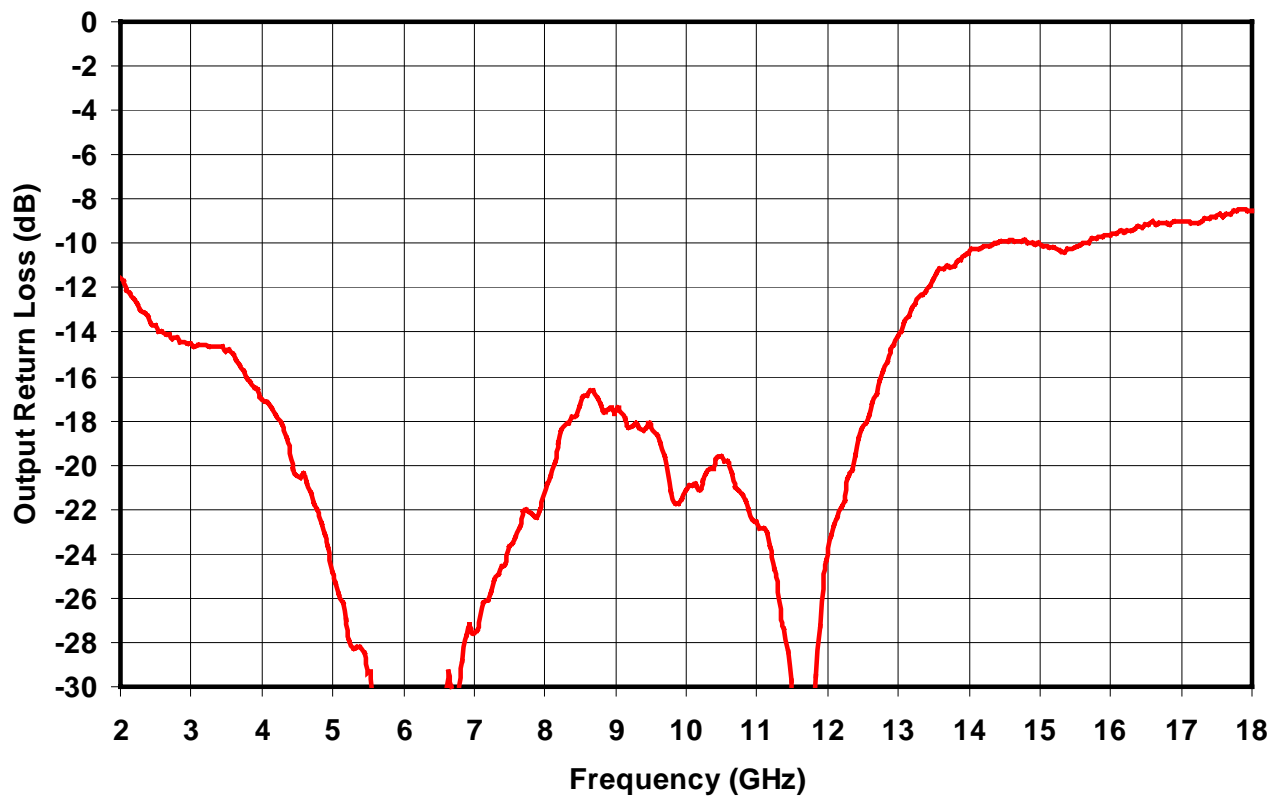
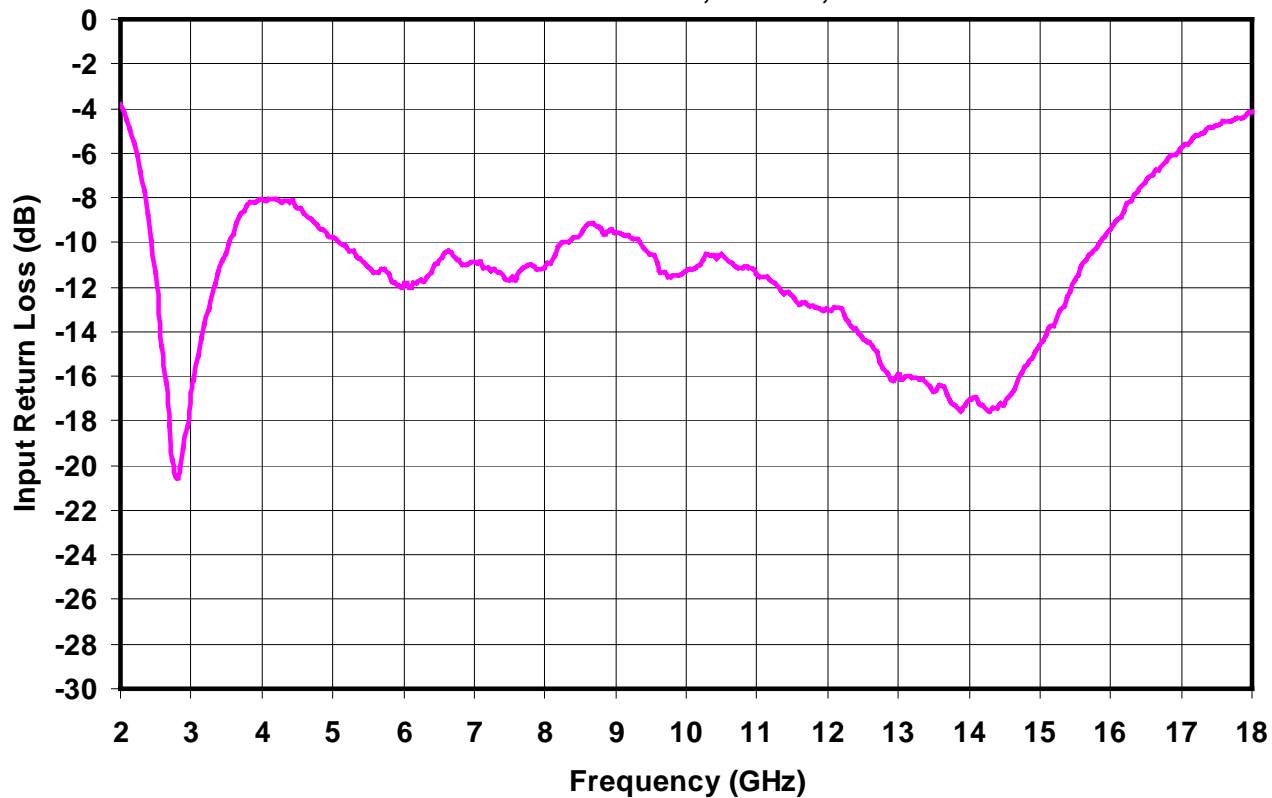
Measured Data

Bias Conditions: **Self Bias**, $V_d = 5\text{ V}$, $I_d = 90\text{ mA}$



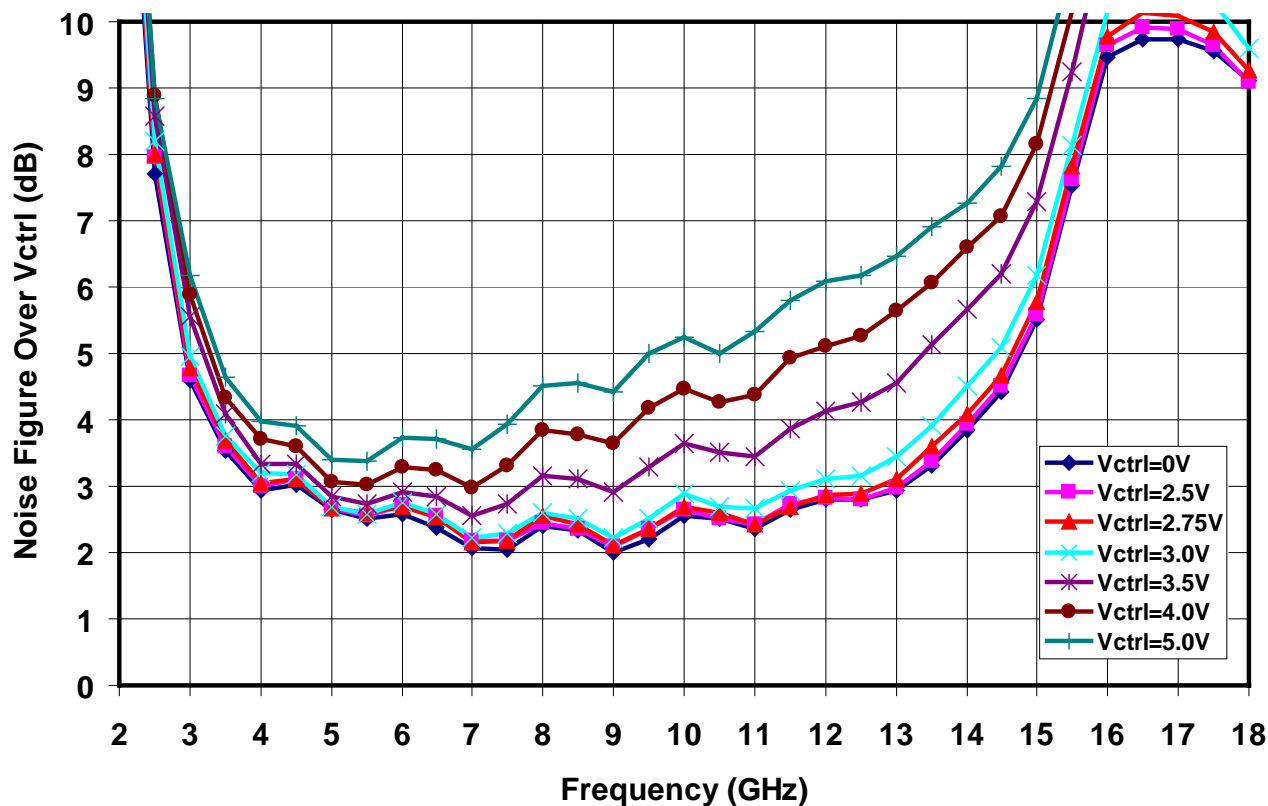
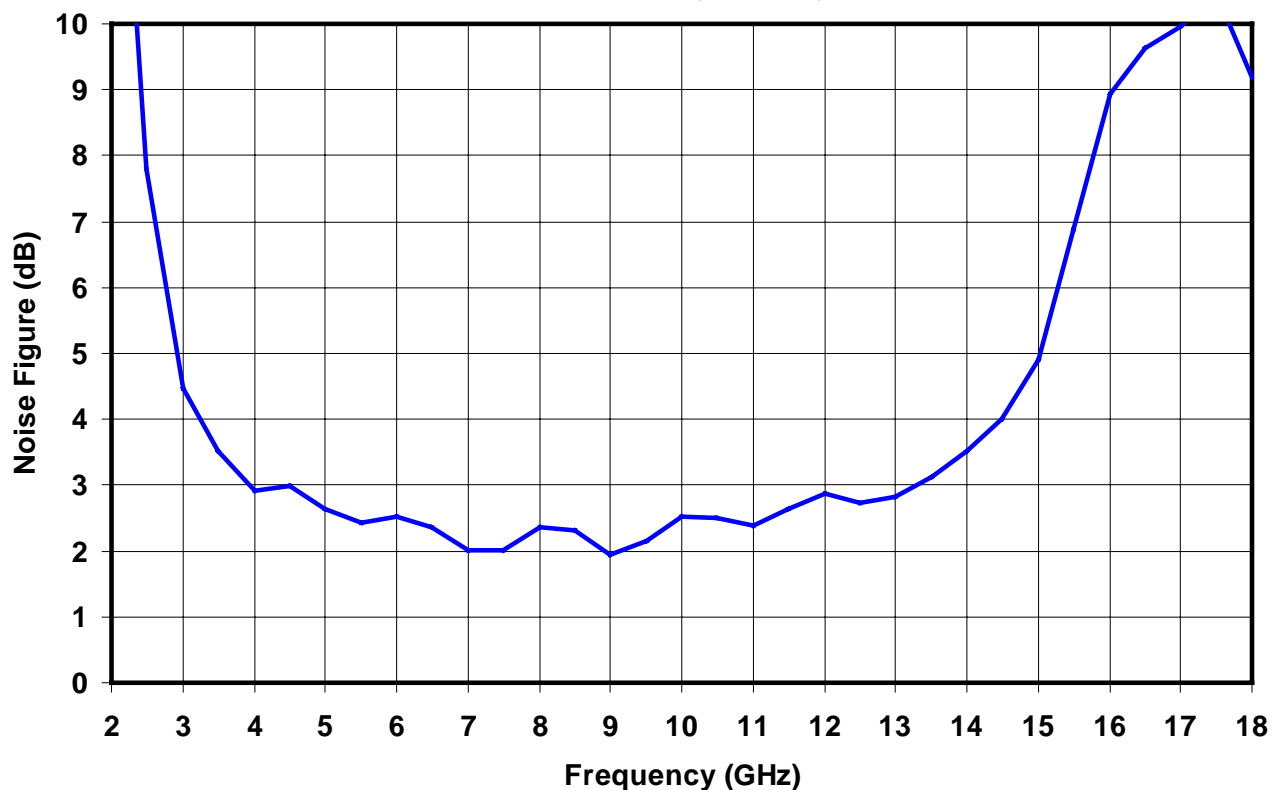
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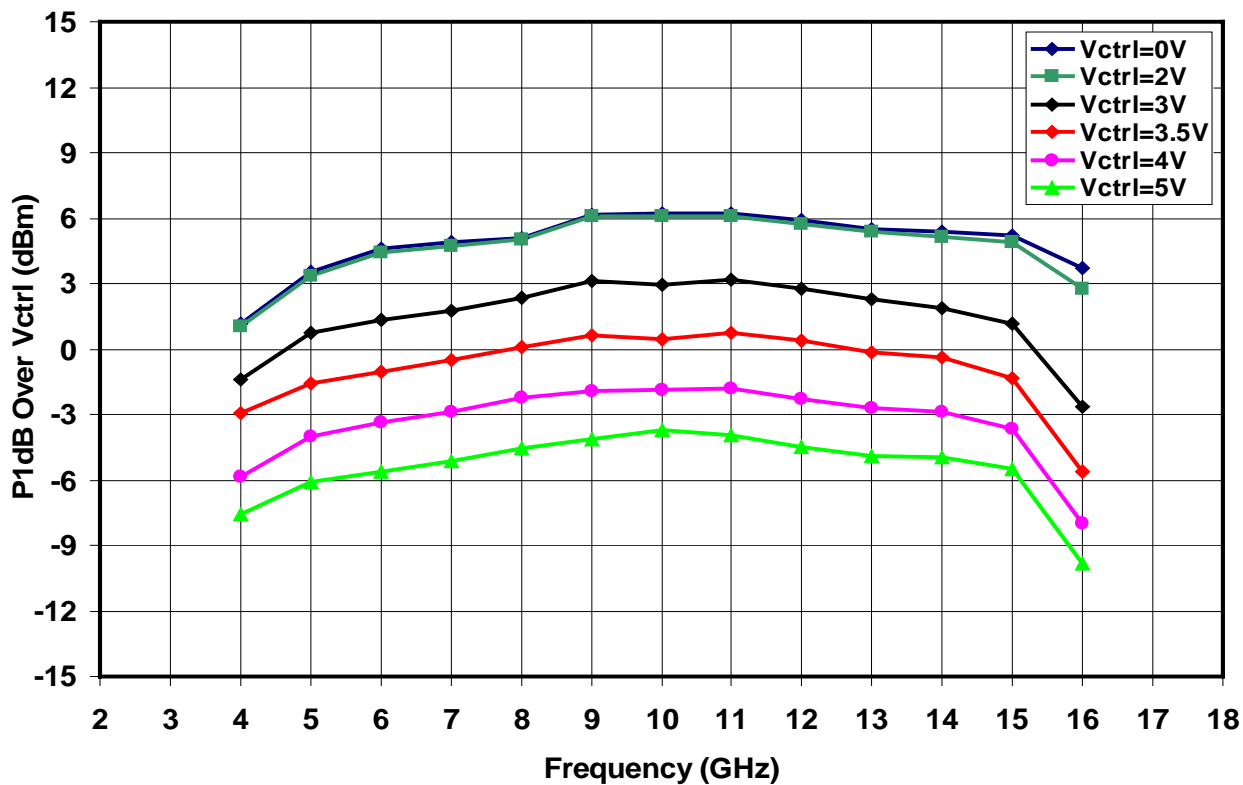
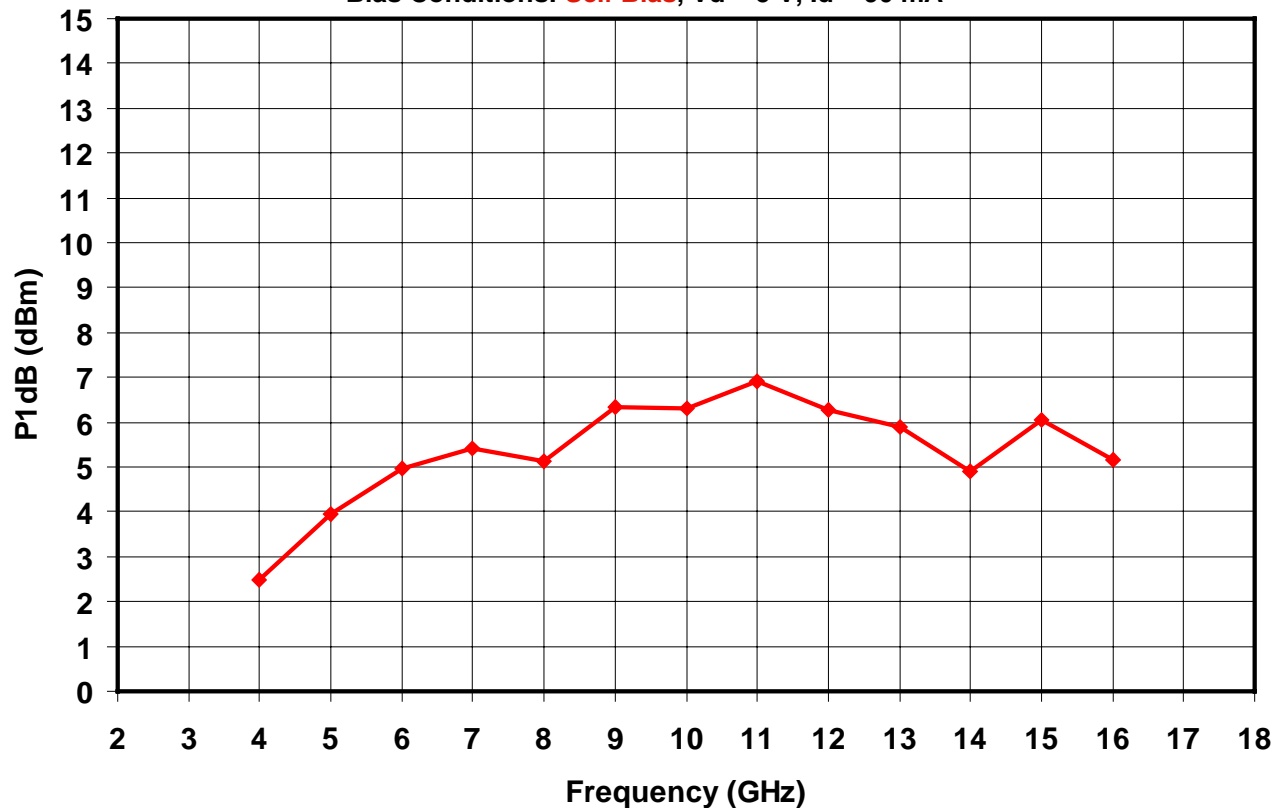
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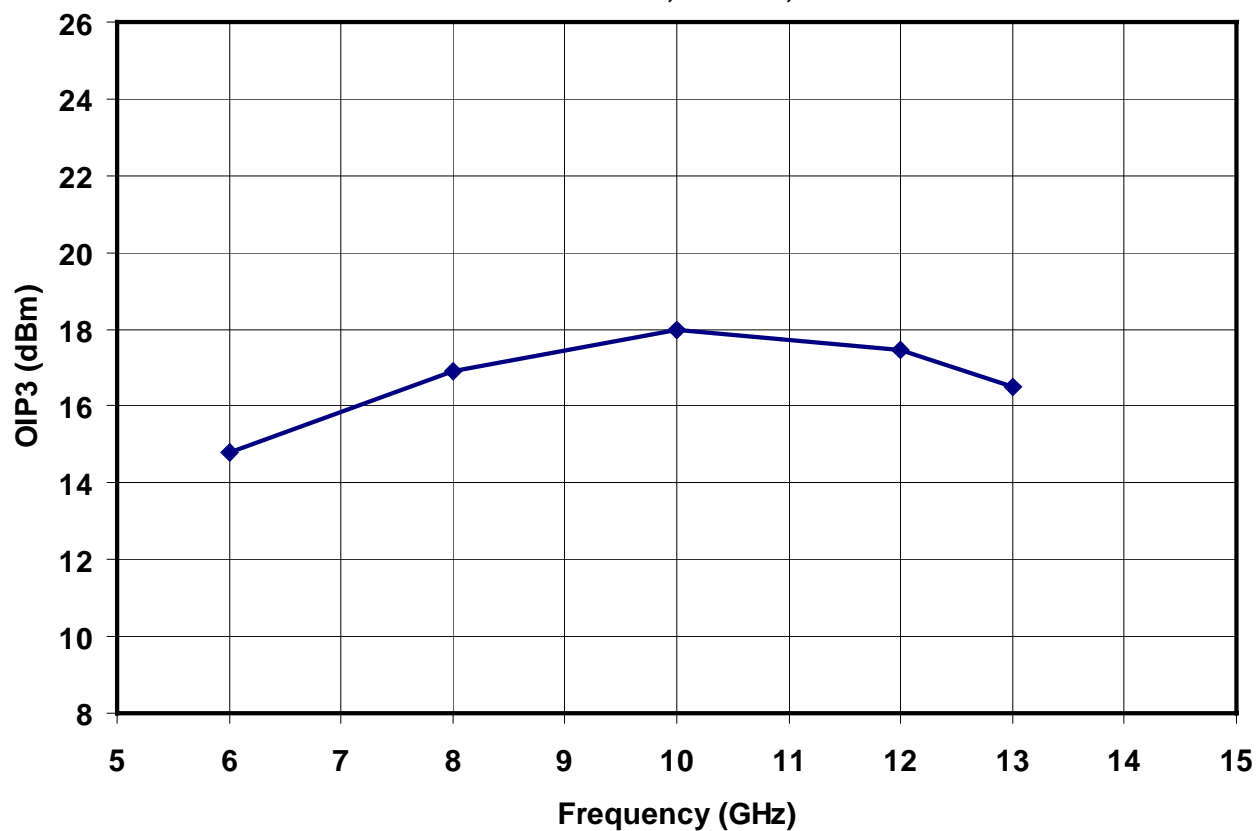
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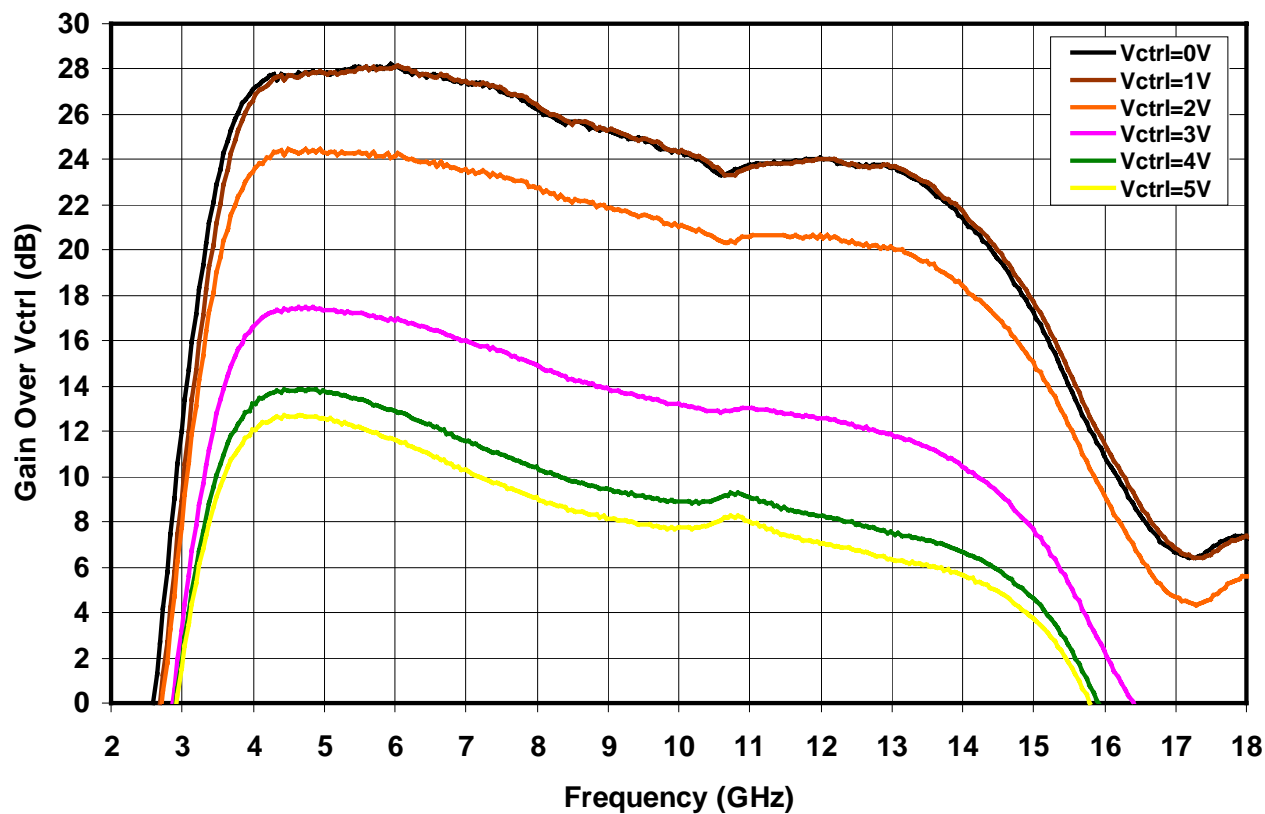
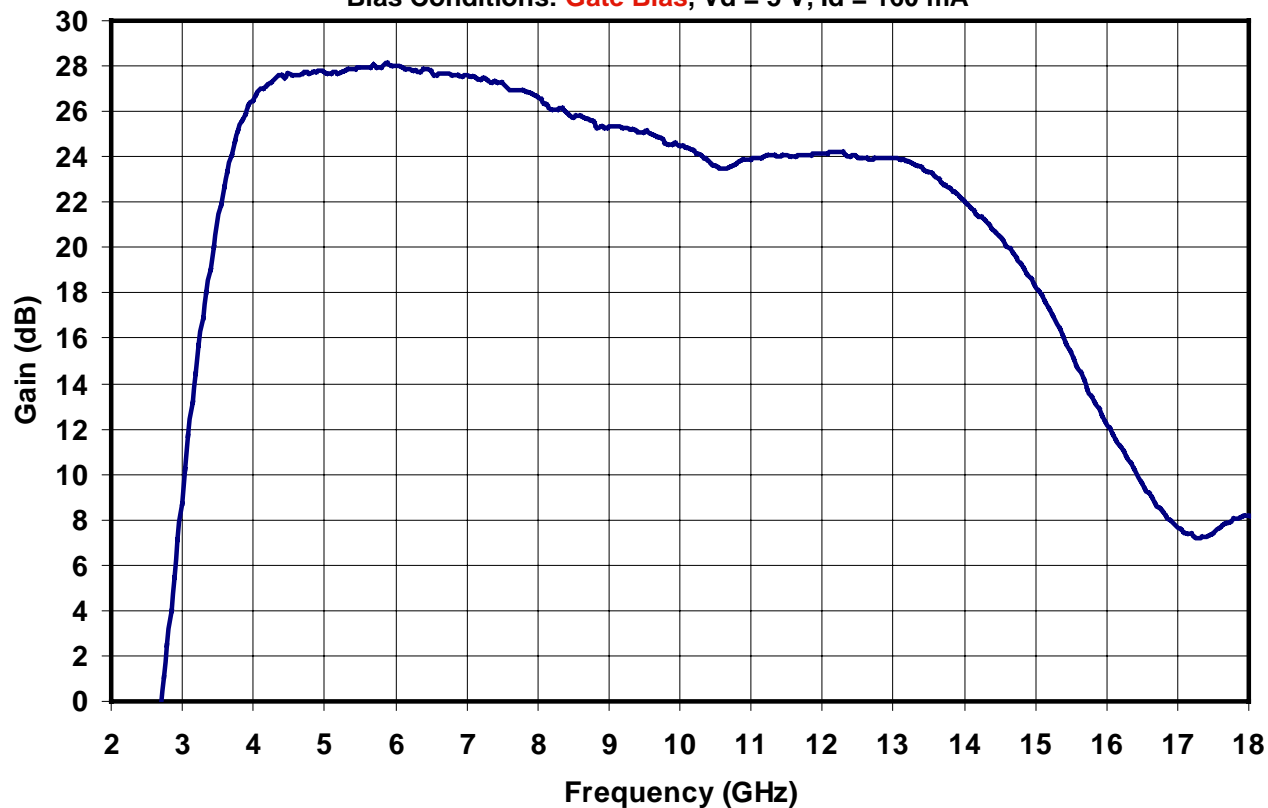
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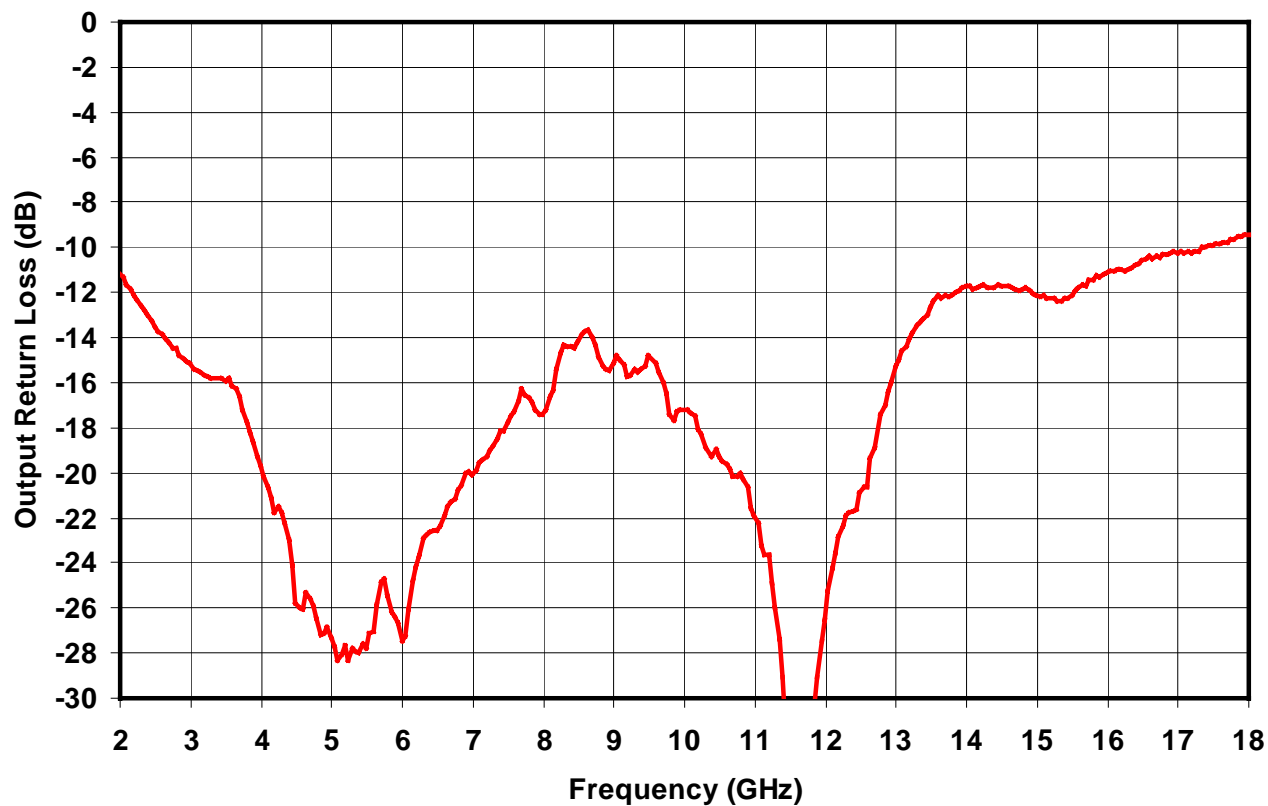
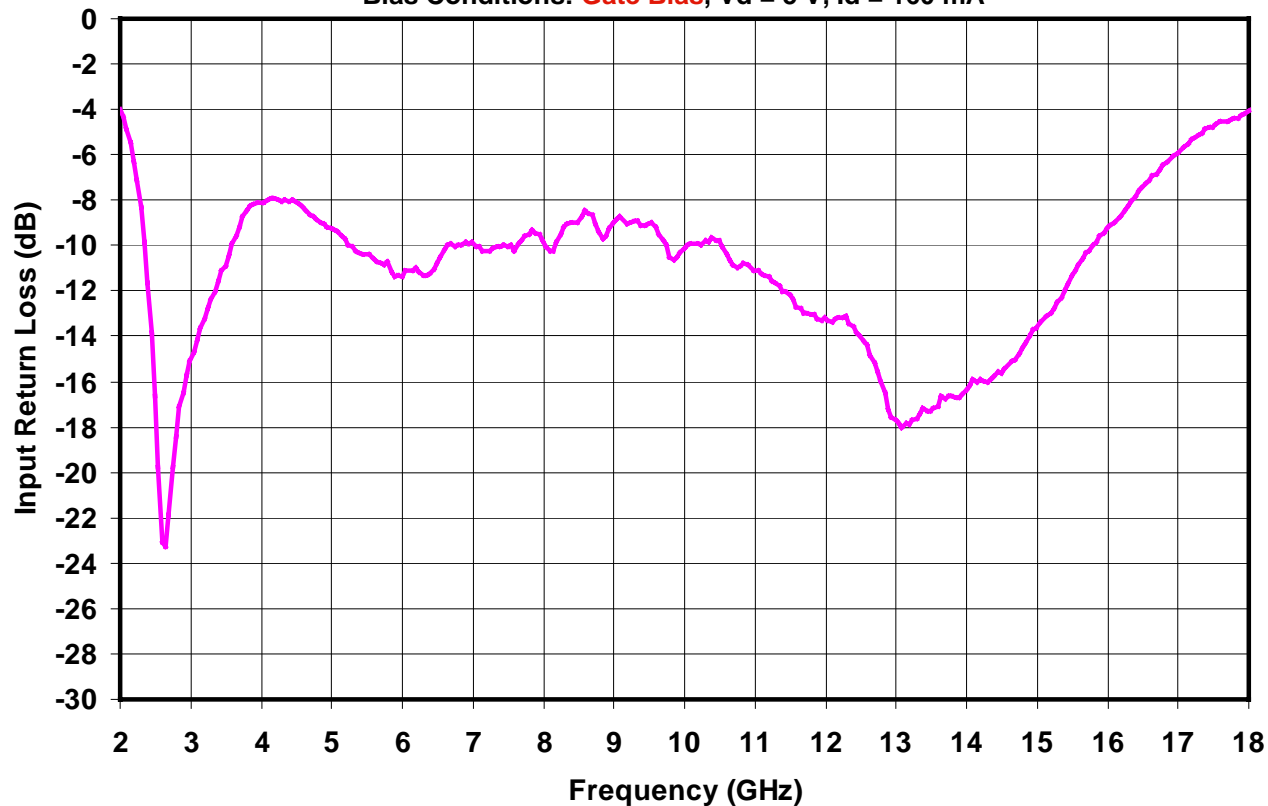
Measured Data

Bias Conditions: **Gate Bias**, $V_d = 5\text{ V}$, $I_d = 160\text{ mA}$



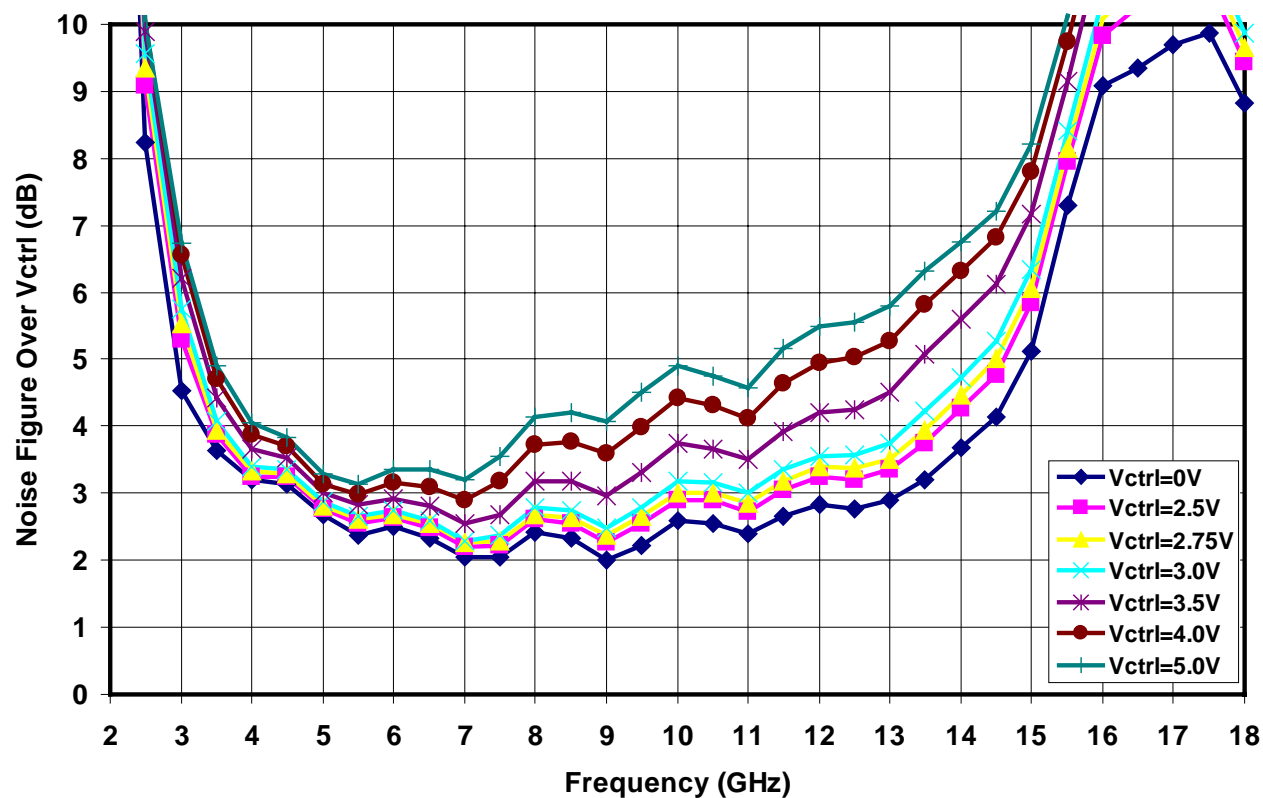
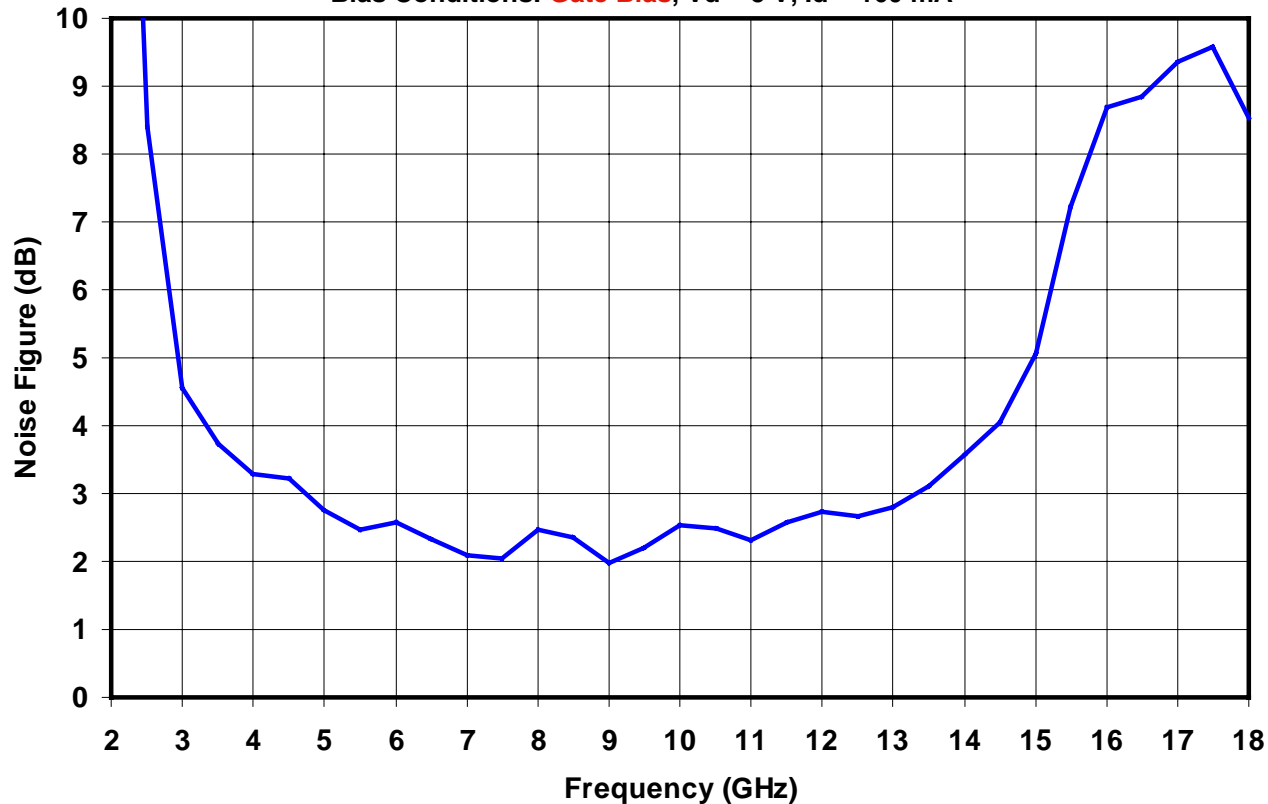
Measured Data

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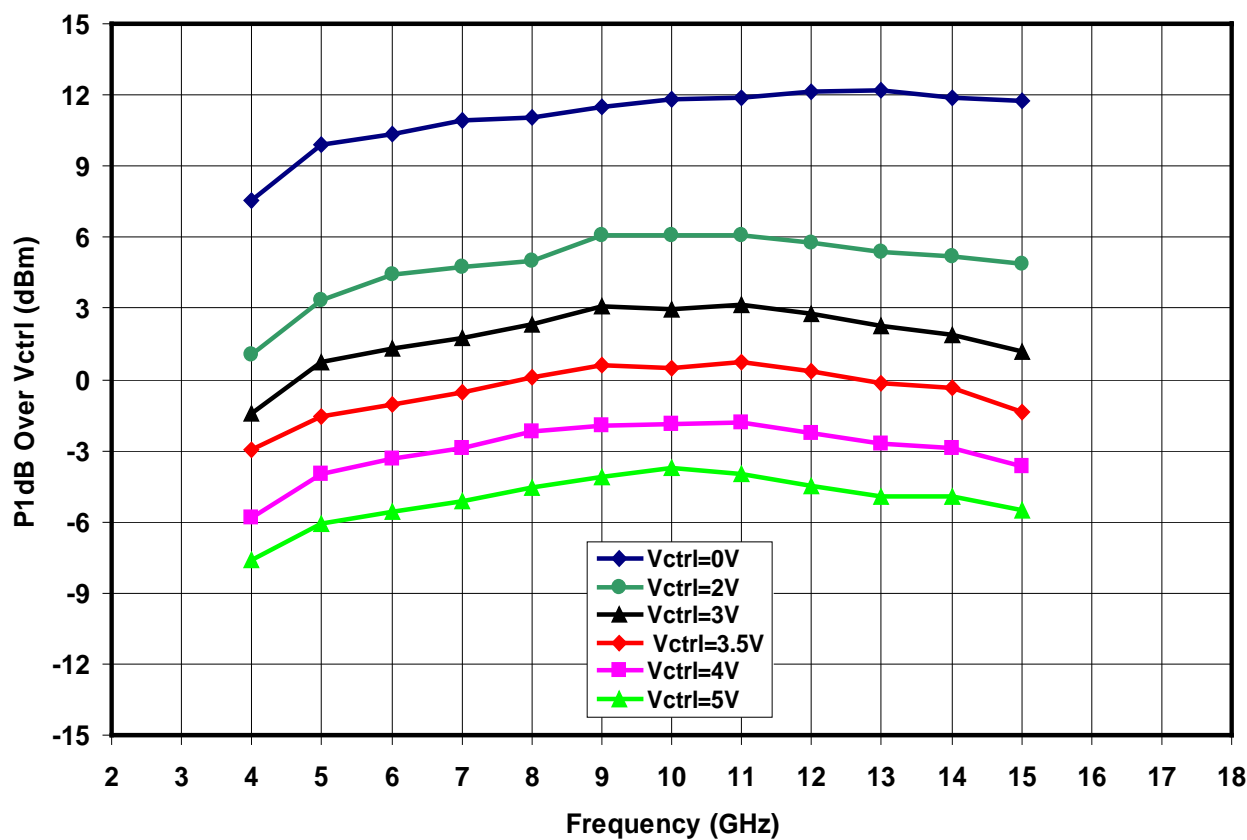
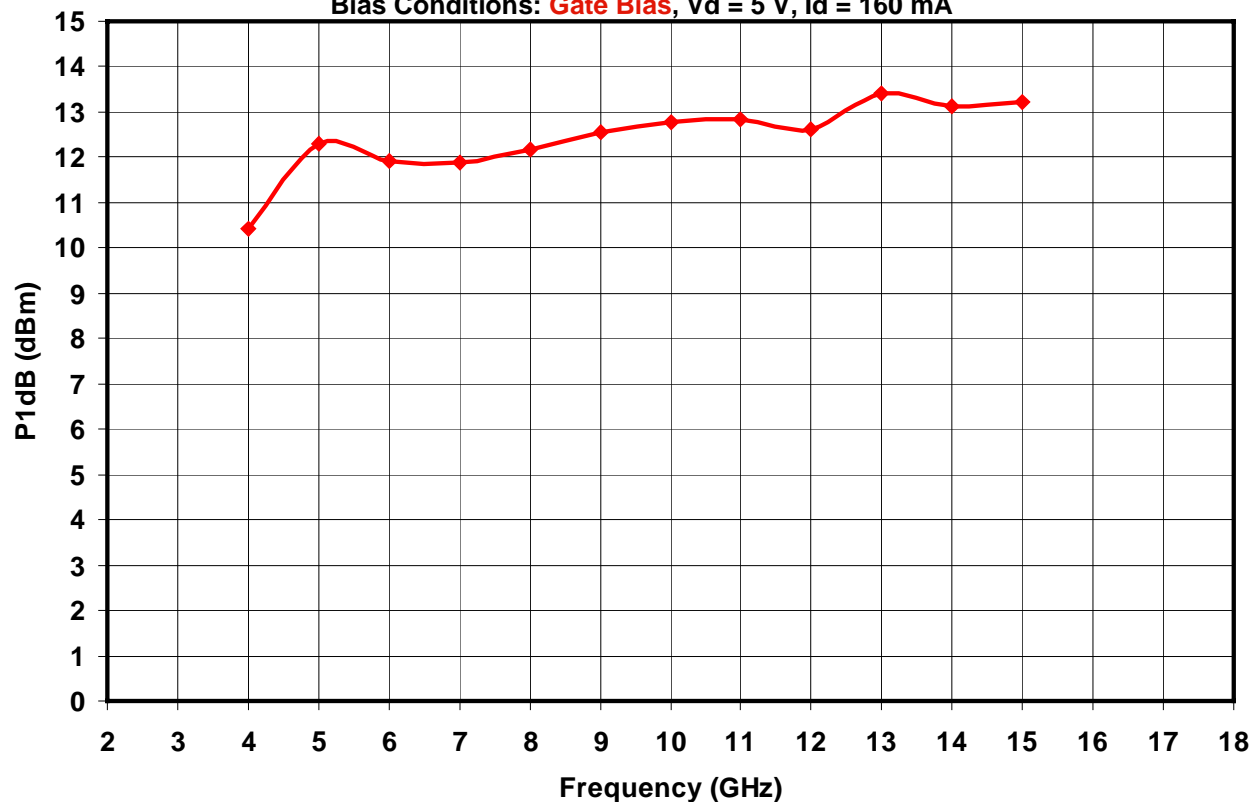
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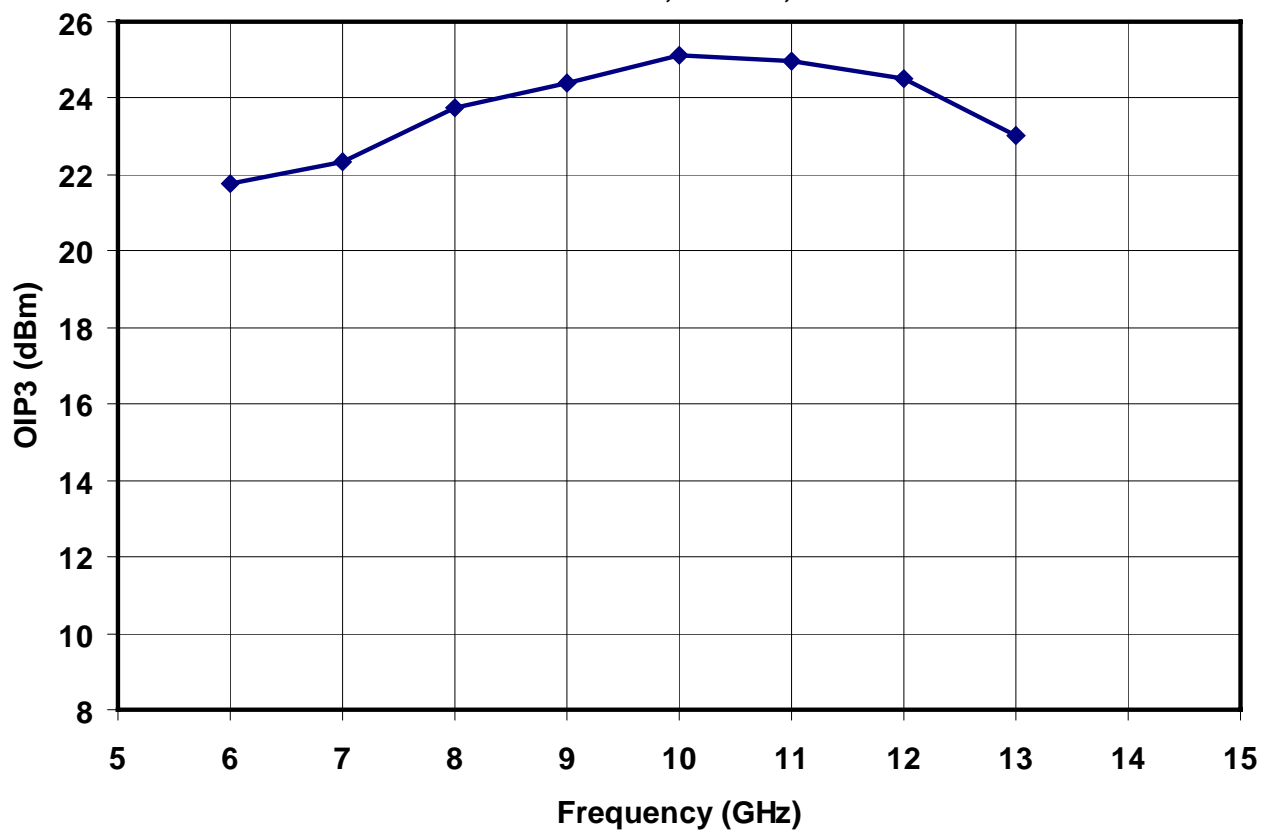
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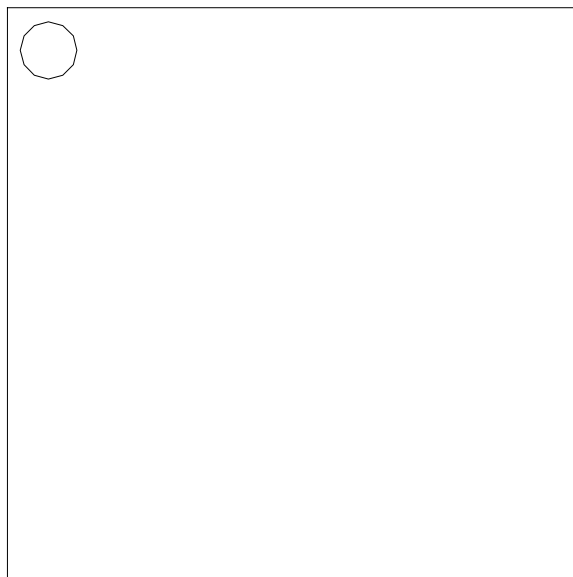


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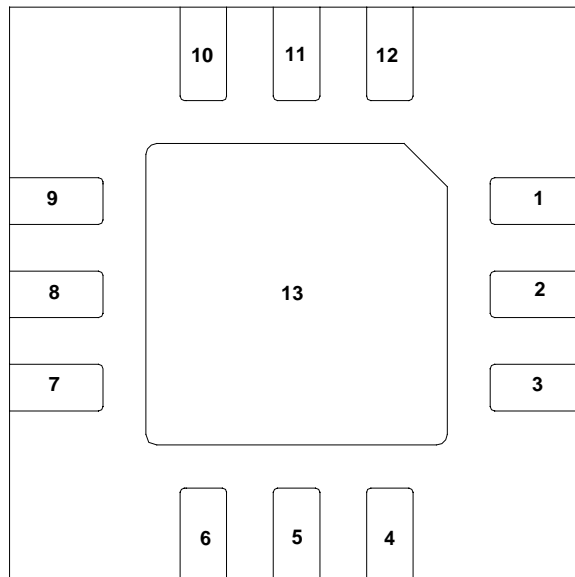


Package Pinout Diagram



Top View

Dot indicates Pin 1



Bottom View

Self Bias

| Pin | Description |
|------------------------|-------------|
| 1,3, 4, 5, 6, 7, 9, 12 | NC |
| 2 | RF Input |
| 8 | RF Output |
| 10 | Vd |
| 11 | Vctrl |
| 13 | Gnd |

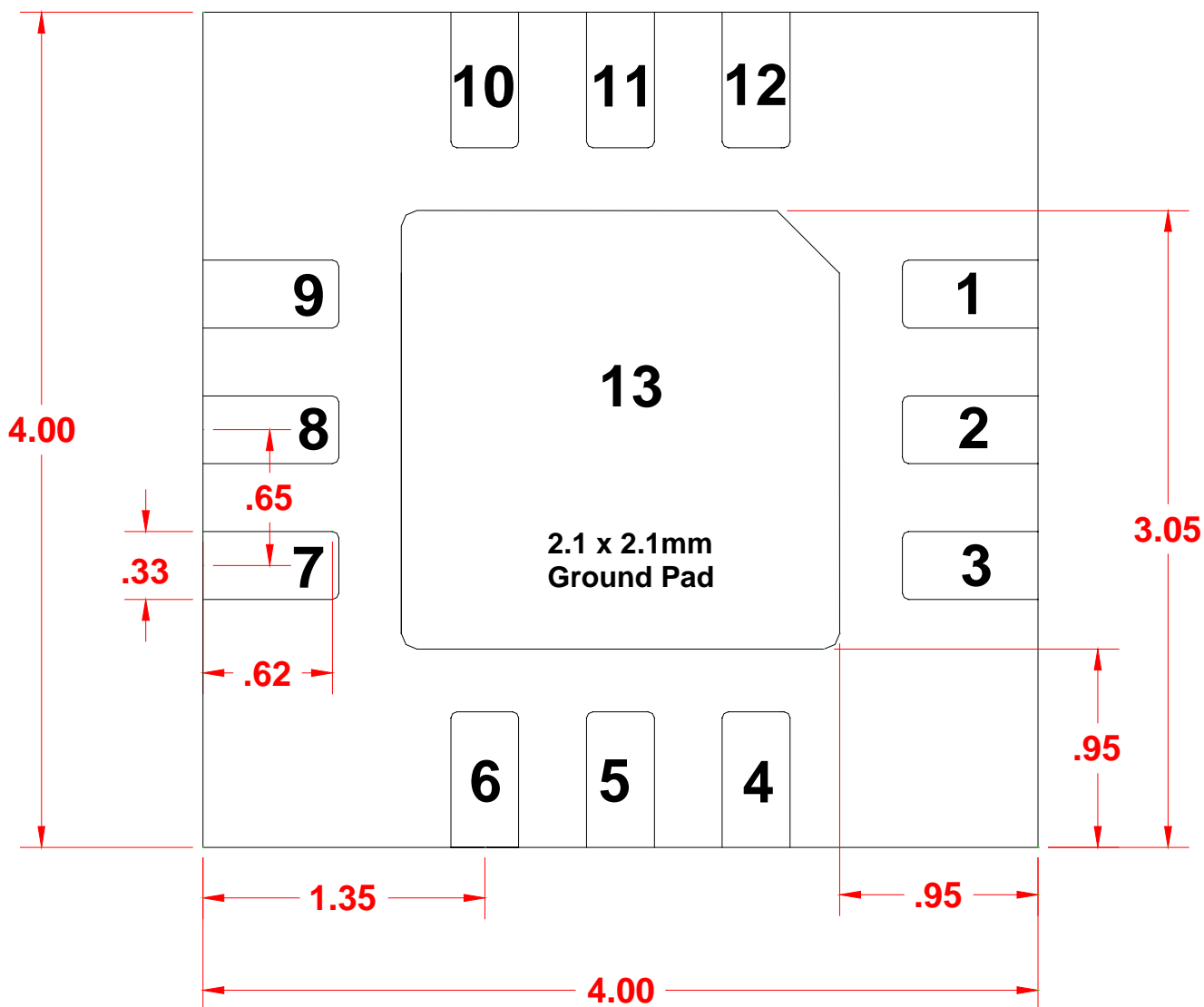
Self Bias: Vd = 5V (Id = ~90mA), Vctrl = 0 to +5V for Gain adjustment

Gate Bias

| Pin | Description |
|--------------------|-------------|
| 1,3, 4, 5, 6, 7, 9 | NC |
| 2 | RF Input |
| 8 | RF Output |
| 10 | Vd |
| 11 | Vctrl |
| 12 | Vg |
| 13 | Gnd |

Gate Bias: Vd = 5V , Vctrl = 0 to +5V for Gain adjustment
Vg = Range, -0.5 to 0, typically ~ -0.1 will provide ~160mA of Id.

Mechanical Drawing



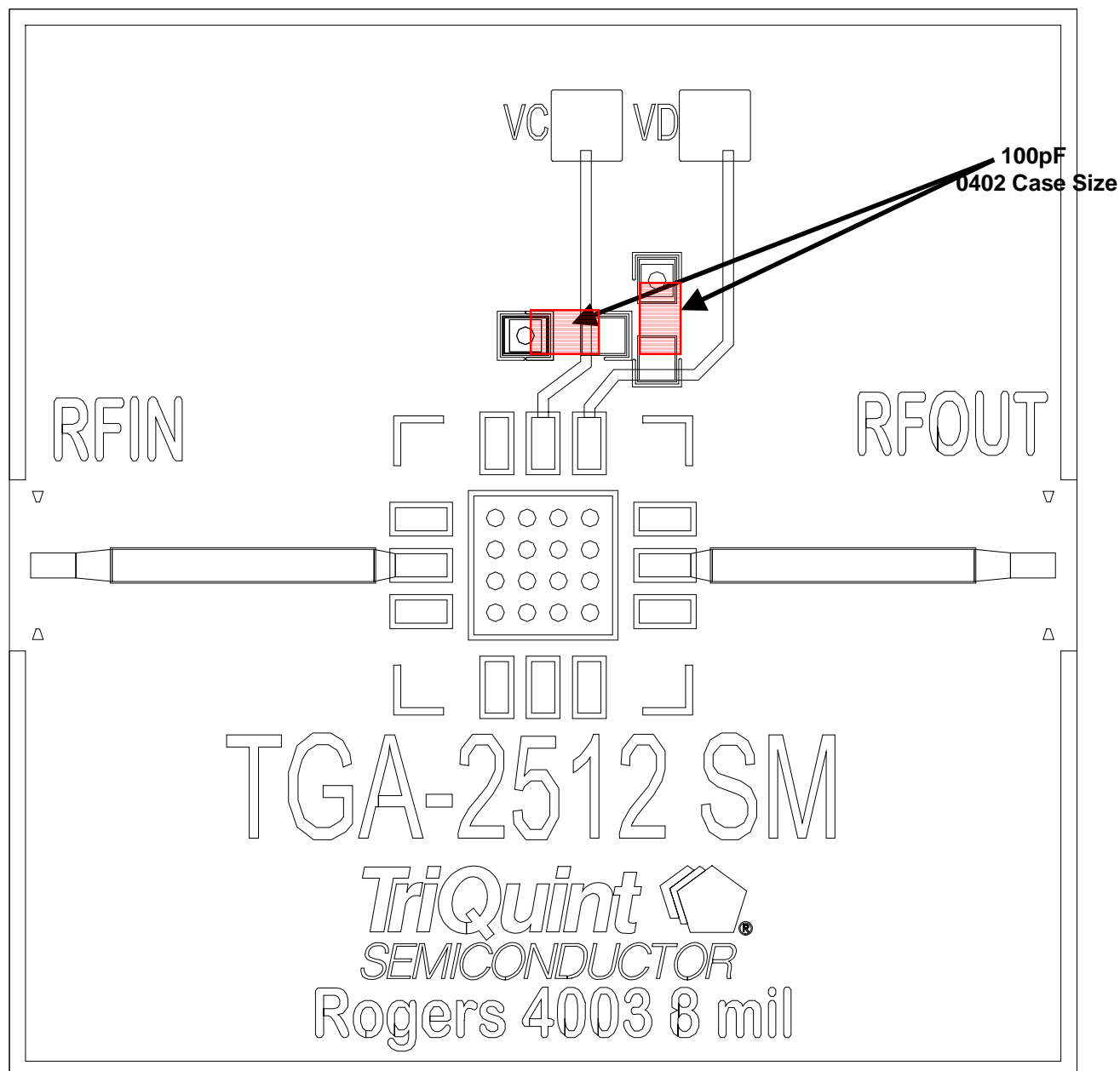
Bottom View

Units: Millimeters. Package tolerance: +/- 0.10

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

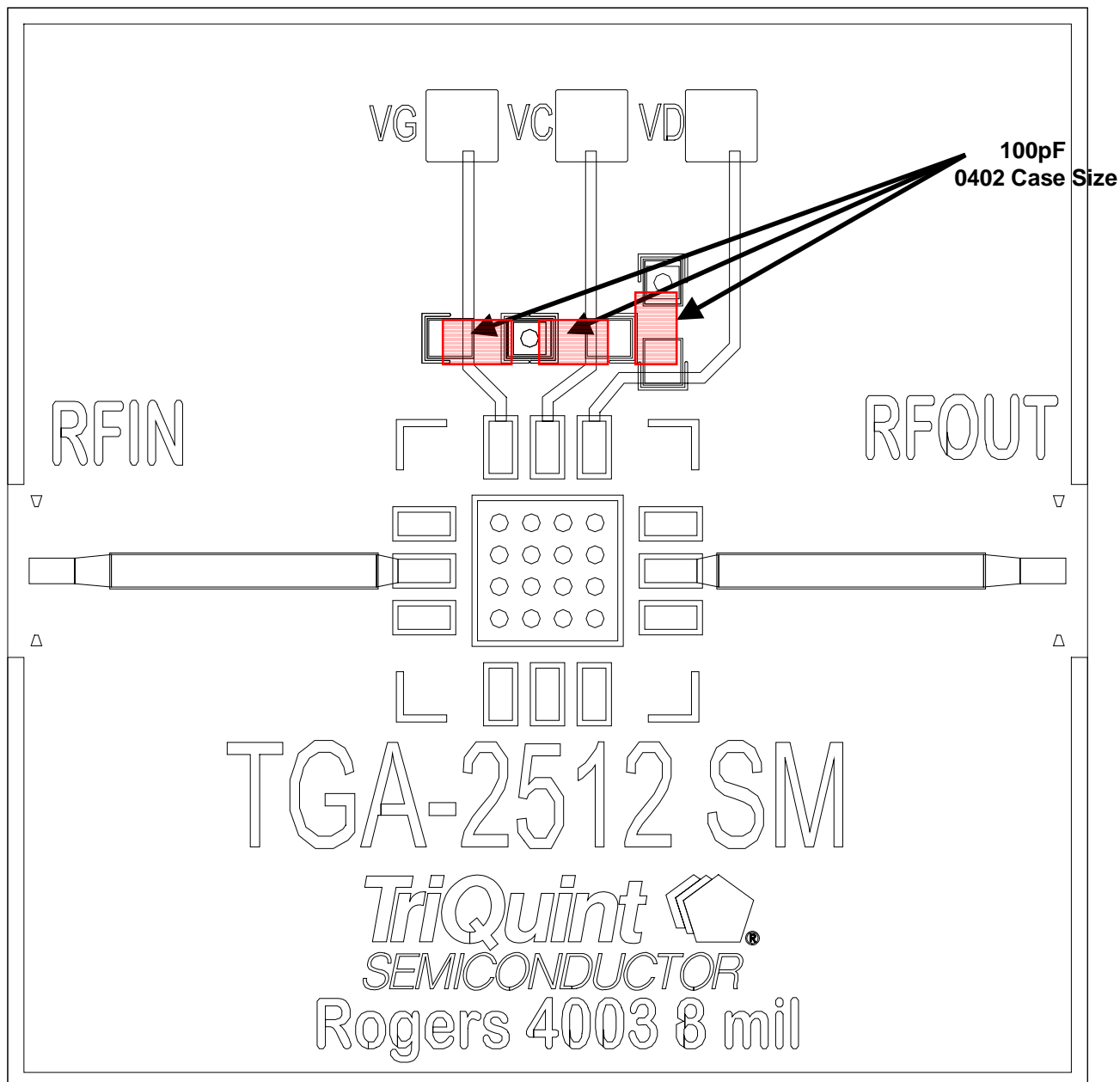
Recommended Board Layout Assembly

Self Bias



Recommended Board Layout Assembly

Gate Bias



Ordering Information

| Part | Package Style |
|--------------|-----------------------------------|
| TGA2512-SM-1 | QFN 4x4 Surface Mount – Self Bias |
| TGA2512-SM-2 | QFN 4x4 Surface Mount – Gate Bias |