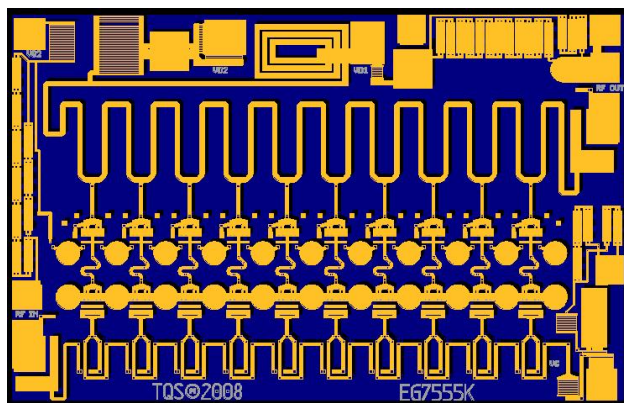
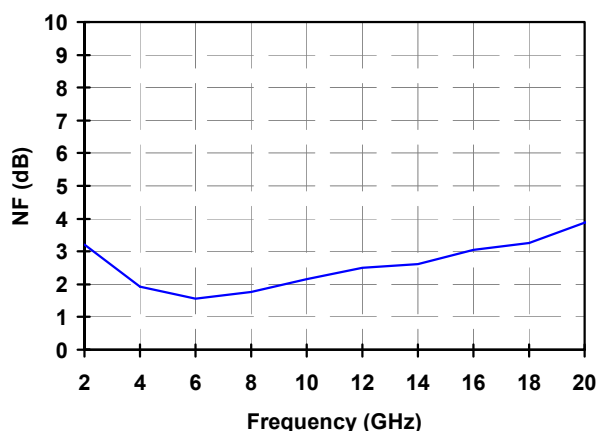
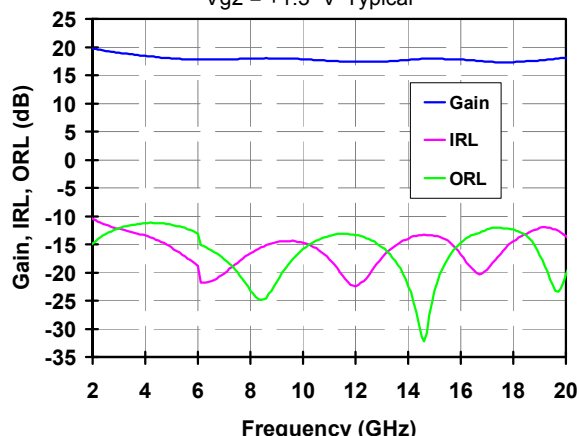


## 2 - 20 GHz Low Noise Amplifier with AGC



### Measured Performance

Bias conditions:  $V_d = 5\text{ V}$ ,  $I_d = 100\text{ mA}$ ,  $V_{g1} = -0.55\text{ V}$ ,  
 $V_{g2} = +1.3\text{ V}$  Typical



### Key Features

- Frequency Range: 2 - 20 GHz
- Midband NF: 2.5 dB
- Gain: 17.5 dB
- >30 dB adjustable gain with  $V_{g2}$
- TOI: 29 dBm Typical
- 22 dBm Nominal  $P_{sat}$ , 20 dBm Nominal  $P_{1dB}$
- ESD Protection circuitry on  $V_d$ ,  $V_{g1}$ , and  $V_{g2}$
- Bias:  $V_d = 5\text{ V}$ ,  $I_d = 100\text{ mA}$ ,  $V_{g1} = -0.55\text{ V}$ ,  $V_{g2} = +1.3\text{ V}$ , Typical
- Technology: 3M1 0.15  $\mu\text{m}$  Power pHEMT
- Chip Dimensions: 2.090 x 1.350 x 0.100 mm

### Primary Applications

- Wideband Gain Block / LNA
- X-Ku Point to Point Radio
- Electronic Warfare Applications

### Product Description

The TriQuint TGA2526 is a compact LNA Gain Block MMIC with adjustable gain control (AGC). The LNA operates from 2-20 GHz and is designed using TriQuint's proven standard 0.15  $\mu\text{m}$  Power pHEMT production process.

The TGA2526 provides a nominal 20 dBm of output power at 1 dB gain compression with a small signal gain of 17.5 dB. Greater than 30 dB adjustable gain can be achieved using the  $V_{g2}$  pin. Typical noise figure is 2.5 dB at 12 GHz. Special circuitry on  $V_d$ ,  $V_{g1}$  and  $V_{g2}$  pins provides ESD protection.

The TGA2526 is suitable for a variety of wideband systems such as point to point radios, radar warning receivers and electronic counter measures.

The TGA2526 is 100% DC and RF tested on-wafer to ensure performance compliance. The TGA2526 has a protective surface passivation layer providing environmental robustness.

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

*Datasheet subject to change without notice.*

**Table I**  
**Absolute Maximum Ratings 1/**

Symbol	Parameter	Value	Notes
Vd-Vg	Drain to Gate Voltage	9 V	
Vd	Drain Voltage	7 V	<u>2/</u>
Vg1	Gate # 1 Voltage Range	-2 to 0 V	
Vg2	Gate # 2 Voltage Range	-2 to +3 V	
Id	Drain Current	144 mA	<u>2/</u>
Ig1	Gate # 1 Current Range	-24 to 24 mA	
Ig2	Gate # 2 Current Range	-24 to 24 mA	
Pin	Input Continuous Wave Power	22 dBm	<u>2/</u>
Tchannel	Channel Temperature	200 °C	

- 1/ These ratings represent the maximum operable values for this device. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device and / or affect device lifetime. These are stress ratings only, and functional operation of the device at these conditions is not implied.
- 2/ Combinations of supply voltage, supply current, input power, and output power shall not exceed the maximum power dissipation listed in Table IV.
- 3/ ESD protection diodes on Vd, Vg1 and Vg2 will conduct current for voltages approaching turn-on voltages. Diode turn-on voltage levels will decrease with decreasing temperature.

**Table II**  
**Recommended Operating Conditions**

Symbol	Parameter <u>1/</u>	Value
Vd	Drain Voltage	5 V
Id	Drain Current	100 mA
Id_Drive	Drain Current under RF Drive	144 mA
Vg1	Gate # 1 Voltage	-0.55 V
Vg2	Gate # 2 Voltage	1.3 V

- 1/ See assembly diagram for bias instructions.

**Table III**  
**RF Characterization Table**

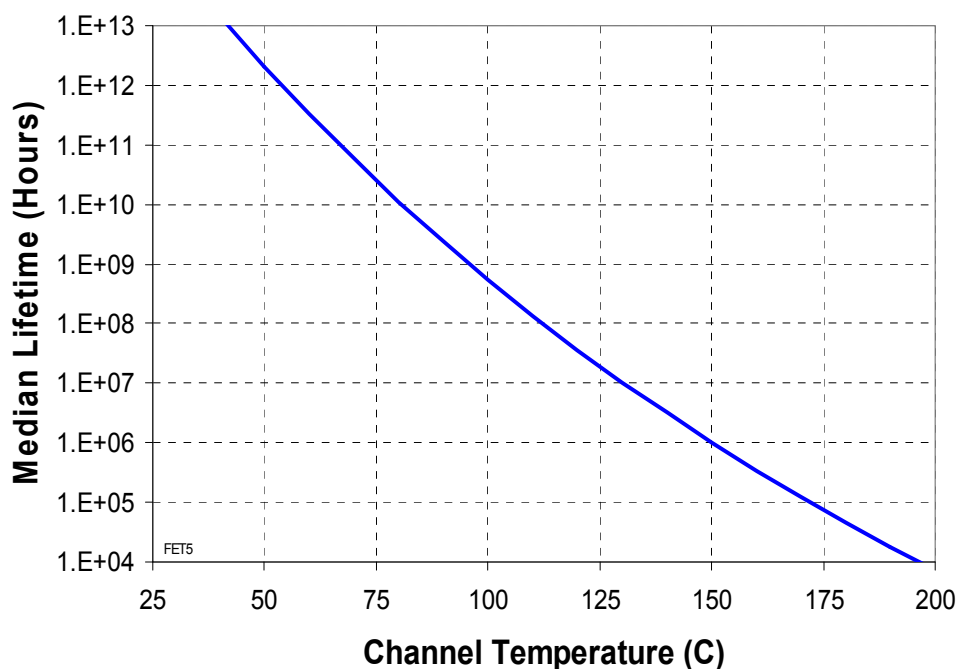
**Bias:  $V_d = 5\text{ V}$ ,  $I_d = 100\text{ mA}$ ,  $V_{g1} = -0.55\text{ V}$ ,  $V_{g2} = +1.3\text{ V}$ , typical**

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	NOMINAL	MAX	UNITS
Gain	Small Signal Gain	$f = 2 - 20\text{ GHz}$	-	17.5	-	dB
IRL	Input Return Loss	$f = 2 - 4\text{ GHz}$	-	11	-	dB
		$f = 4 - 20\text{ GHz}$	-	13	-	
ORL	Output Return Loss	$f = 2 - 6\text{ GHz}$	-	11	-	dB
		$f = 6 - 20\text{ GHz}$	-	13	-	
Psat	Saturated Output Power	$f = 2 - 18\text{ GHz}$	-	22	-	dBm
		$f = 18 - 20\text{ GHz}$	-	20	-	
P1dB	Output Power @ 1dB Compression	$f = 2 - 16\text{ GHz}$	-	20	-	dBm
		$f = 16 - 20\text{ GHz}$	-	17	-	
TOI	Output TOI	$f = 2 - 12\text{ GHz}$	-	30	-	dBm
		$f = 12 - 20\text{ GHz}$	-	26	-	
NF	Noise Figure	$f = 2 - 16\text{ GHz}$	-	2.5	-	dB
		$f = 16 - 20\text{ GHz}$	-	3.5	-	

**Table IV**  
**Power Dissipation and Thermal Properties**

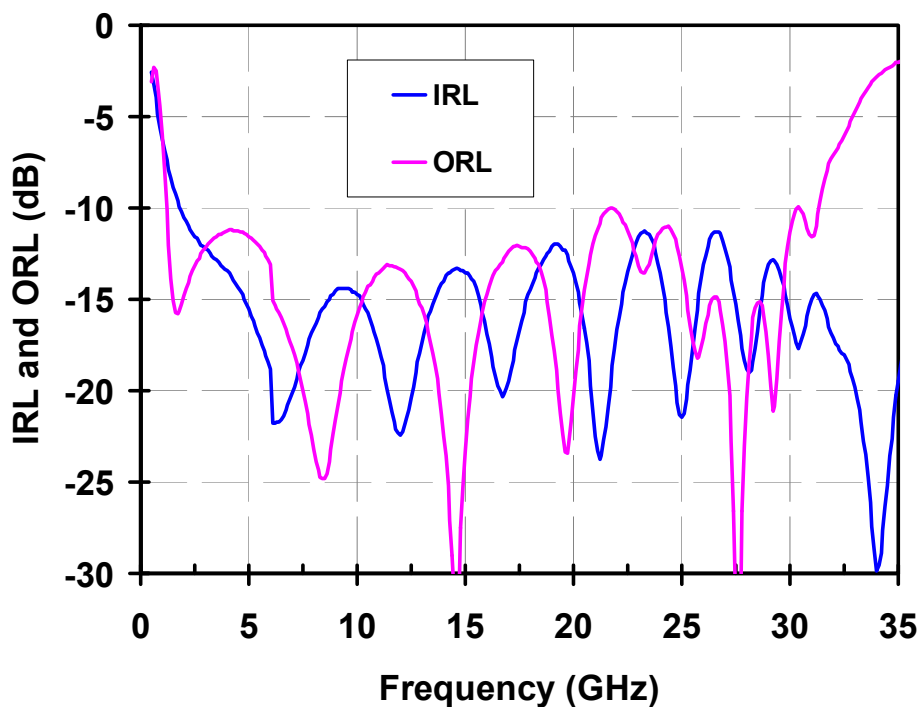
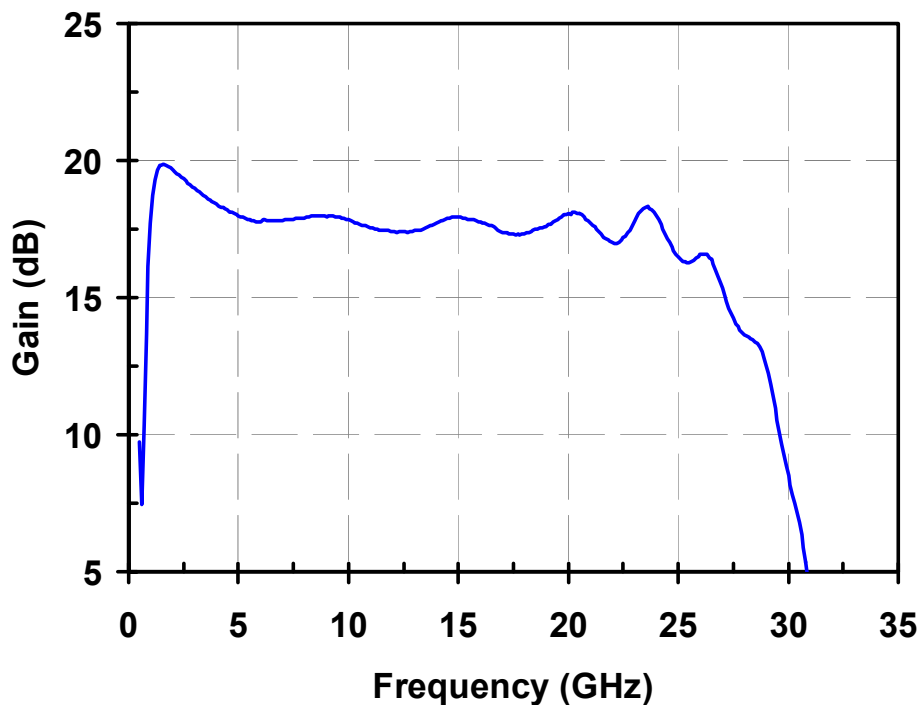
Parameter	Test Conditions	Value
Maximum Power Dissipation	Tbaseplate = 70 °C	Pd = 1.01 W Tchannel = 113 °C Tm = 9.1 E+7 Hrs
Thermal Resistance, $\theta_{jc}$	Vd = 5 V Id = 100 mA Pd = 0.5 W	$\theta_{jc}$ = 42.2 °C/W Tchannel = 91 °C Tm = 2.0 E+9 Hrs
Thermal Resistance, $\theta_{jc}$ Under RF Drive	Vd = 5 V Id = 144 mA Pout = 22 dBm Pd = 0.562 W	$\theta_{jc}$ = 42.2 °C/W Tchannel = 94 °C Tm = 1.3 E+9 Hrs
Mounting Temperature	30 Seconds	320 °C
Storage Temperature		-65 to 150 °C

**Median Lifetime vs Channel Temperature**



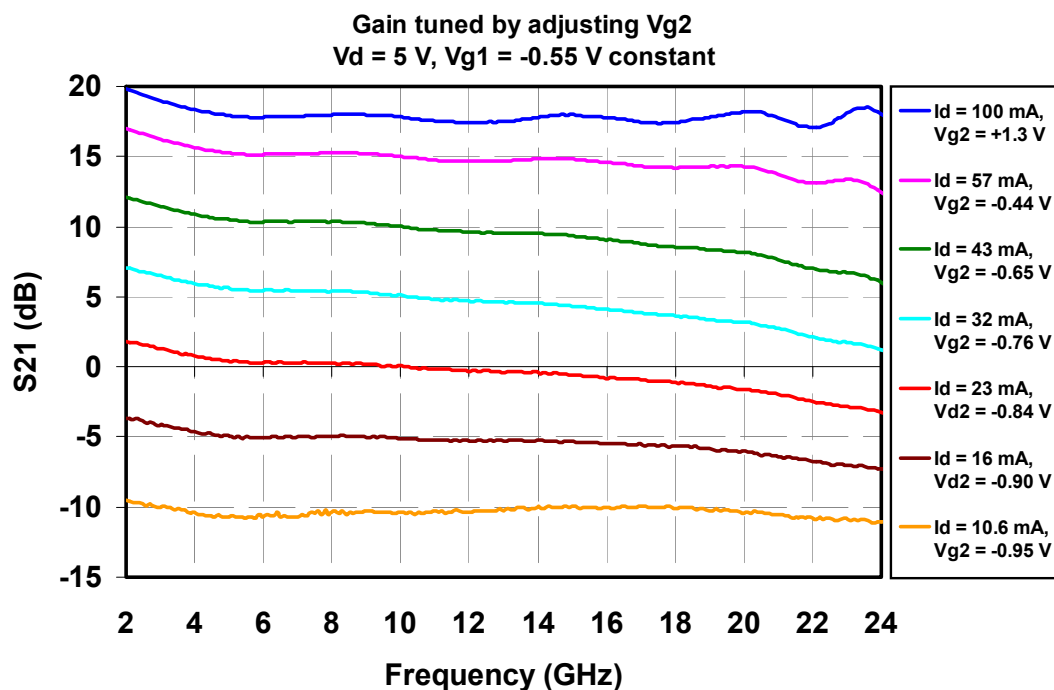
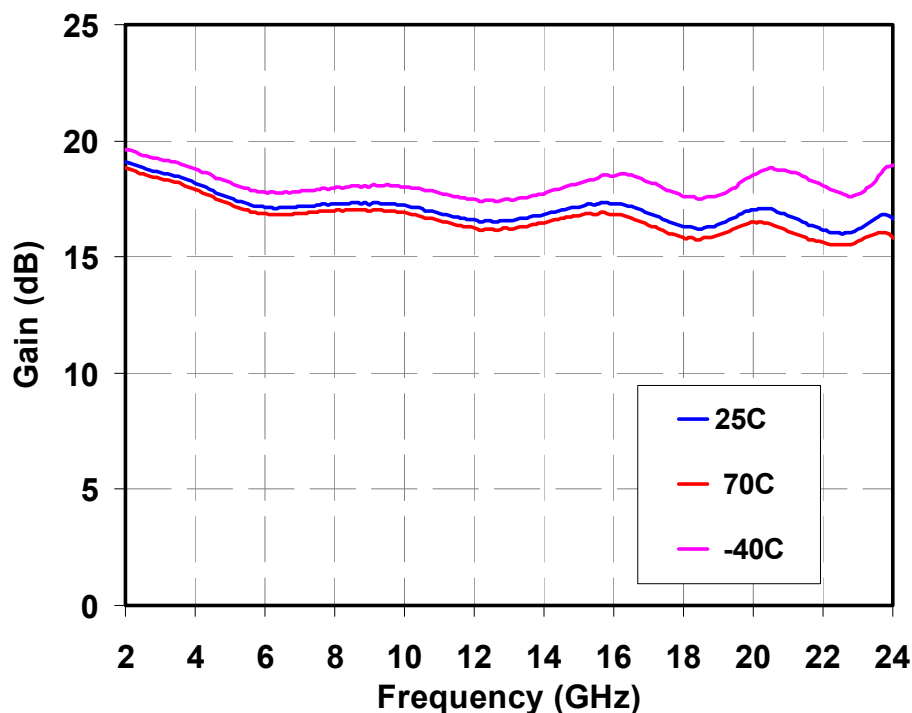
## Measured Data

Bias conditions:  $V_d = 5\text{ V}$ ,  $I_d = 100\text{ mA}$ ,  $V_{g1} = -0.55\text{ V}$ ,  $V_{g2} = +1.3\text{ V}$  Typical



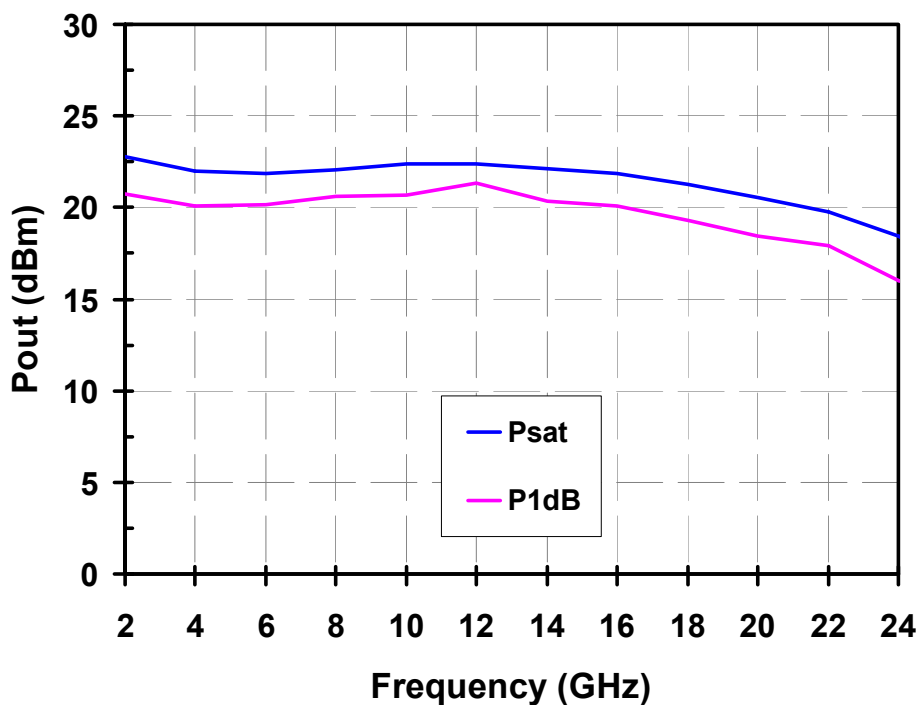
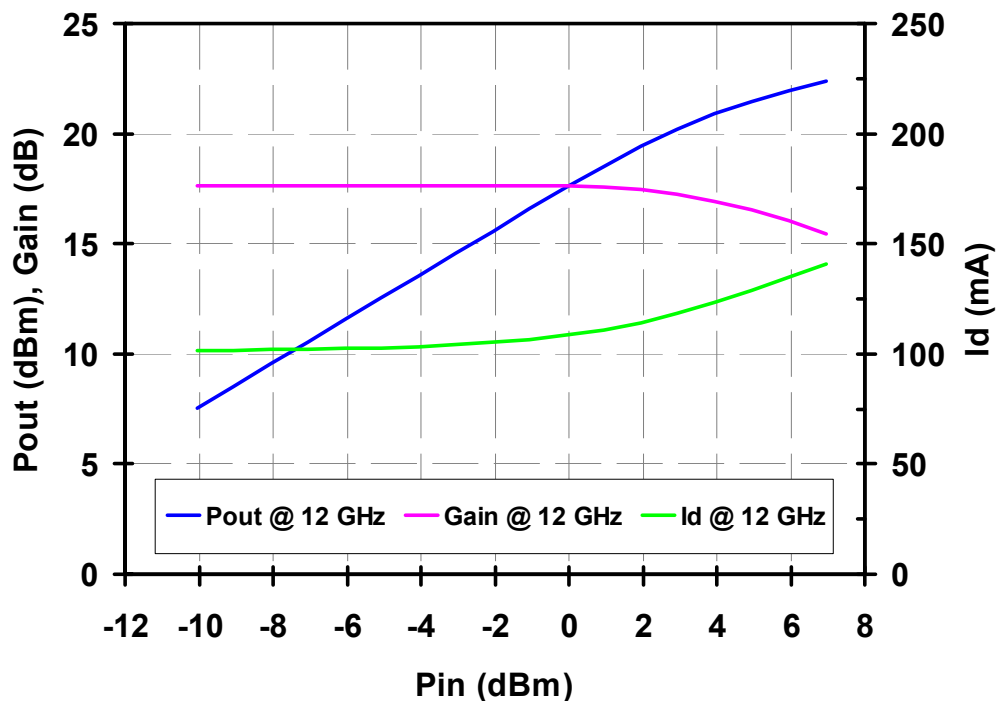
## Measured Data

Bias conditions:  $V_d = 5\text{ V}$ ,  $I_d = 100\text{ mA}$ ,  $V_{g1} = -0.55\text{ V}$ ,  $V_{g2} = +1.3\text{ V}$  Typical



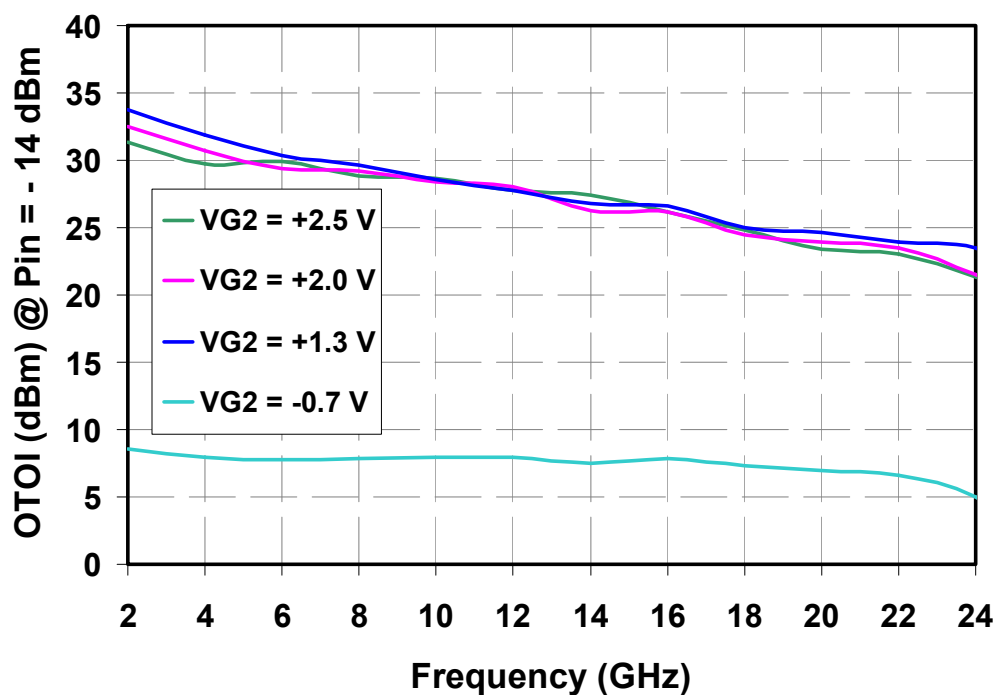
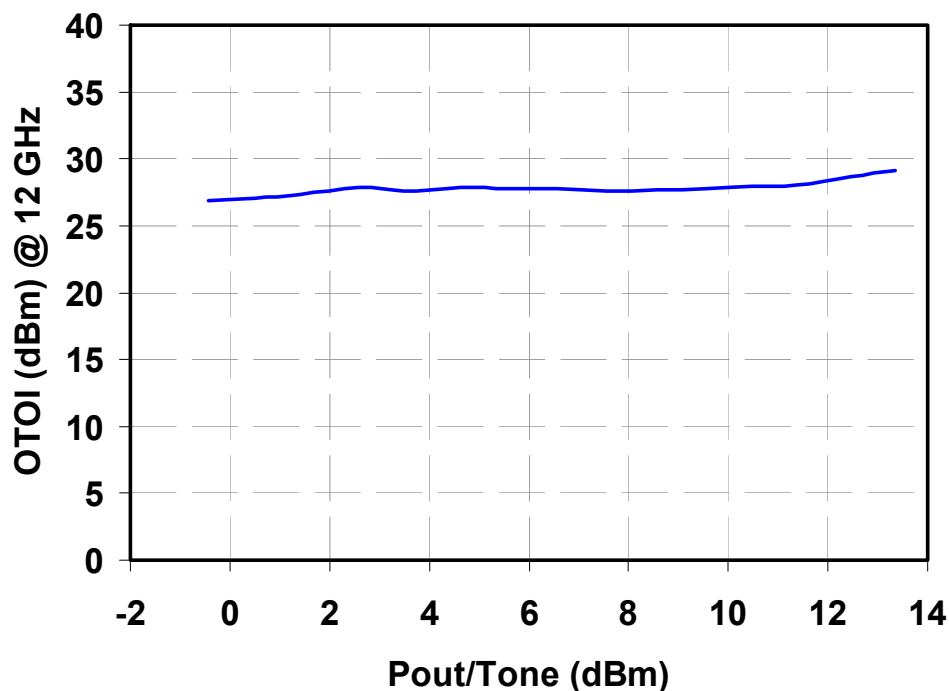
## Measured Data

Bias conditions:  $V_d = 5\text{ V}$ ,  $I_d = 100\text{ mA}$ ,  $V_{g1} = -0.55\text{ V}$ ,  $V_{g2} = +1.3\text{ V}$  Typical



## Measured Data

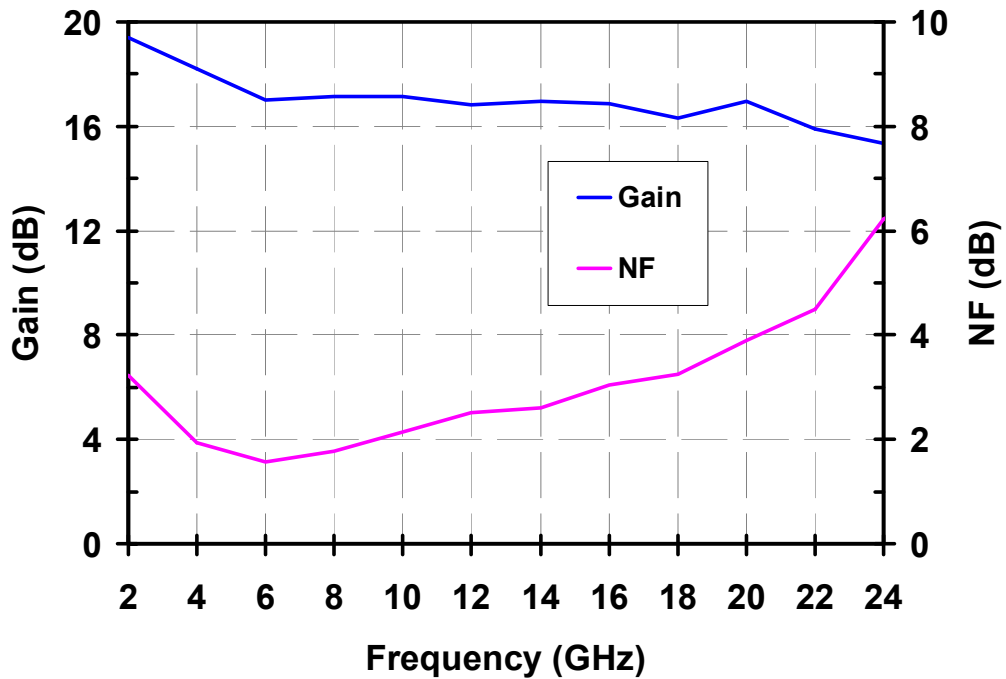
Bias conditions:  $V_d = 5\text{ V}$ ,  $I_d = 100\text{ mA}$ ,  $V_{g1} = -0.55\text{ V}$ ,  $V_{g2} = +1.3\text{ V}$  Typical



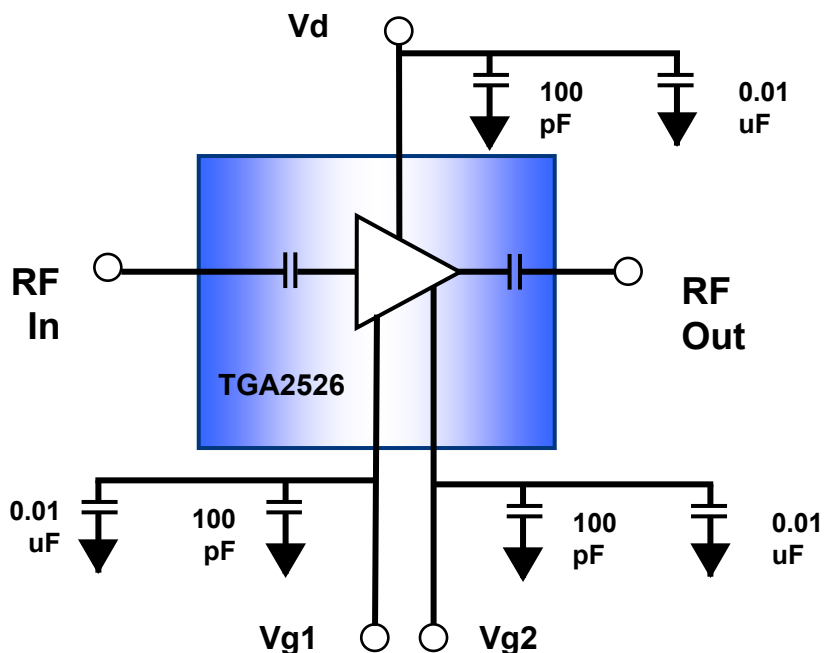


## Measured Data

Bias conditions:  $V_d = 5\text{ V}$ ,  $I_d = 100\text{ mA}$ ,  $V_{g1} = -0.55\text{ V}$ ,  $V_{g2} = +1.3\text{ V}$  Typical



## Electrical Schematic



## Bias Procedures

### Bias-up Procedure

Vg1 set to -1.5 V

Vd set to +5 V

Vg2 set to +1.3 V

Adjust Vg1 more positive until Id is 100 mA.  
This will be ~ Vg1 = -0.55 V

Apply RF signal to input

Adjust Vg2 to obtain desired gain.

### Bias-down Procedure

Set Vg2 to +1.3 V

Turn off RF supply

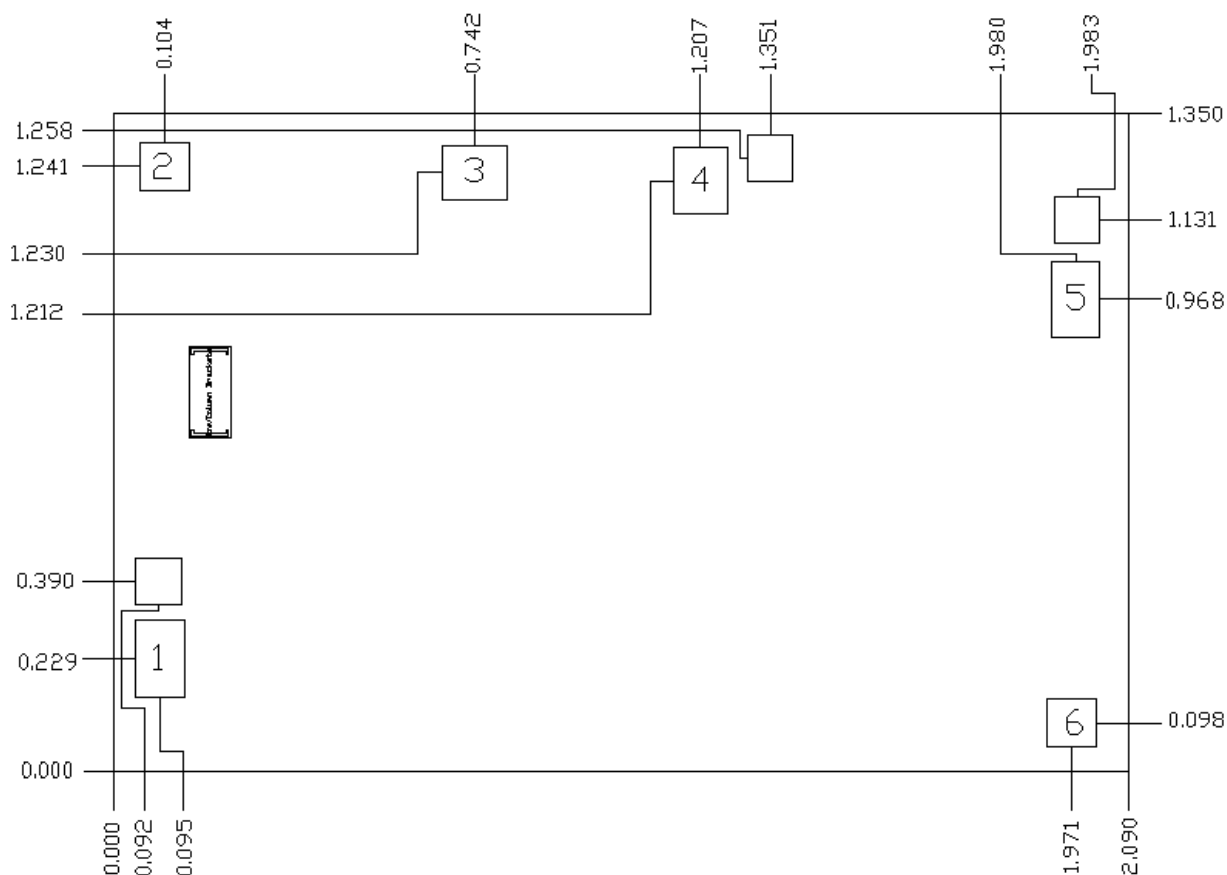
Reduce Vg1 to -1.5 V. Ensure Id ~ 0 mA

Turn Vg2 to 0 V

Turn Vd to 0 V

Turn Vg1 to 0 V

# Mechanical Drawing



Units: millimeters

Thickness: 0.10

Die x,y size tolerance:  $\pm 0.050$

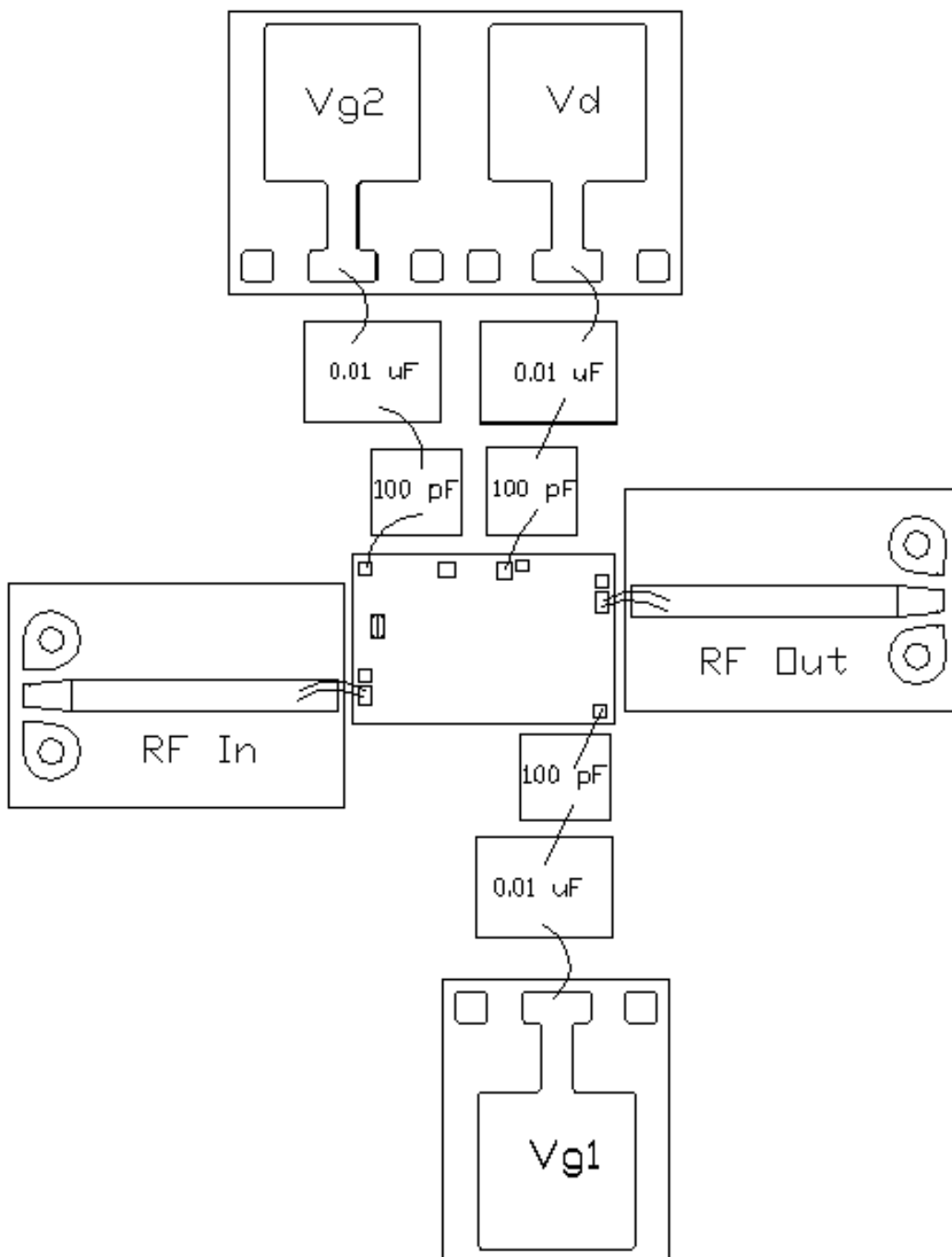
Chip edge to bond pad dimensions are shown to center of pad

Ground is backside of die

Bond Pad # 1	RF In	0.100 x 0.158	Bond Pad # 4	Vd1	0.110 x 0.135
Bond Pad # 2	Vg2	0.100 x 0.100	Bond Pad # 5	RF Out	0.100 x 0.158
Bond Pad # 3	Vd2 (Not used)	0.135 x 0.110	Bond Pad # 6	Vg1	0.100 x 0.100

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

## Recommended Assembly Diagram



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

## Assembly Notes

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 (i.e. epoxy) can be used in low-power applications.
- Curing should be done in a convection oven; proper exhaust is a safety concern.

Reflow process assembly notes:

- Use AuSn (80/20) solder and limit exposure to temperatures above 300°C to 3-4 minutes, maximum.
- An alloy station or conveyor furnace with reducing atmosphere should be used.
- Do not use any kind of flux.
- Coefficient of thermal expansion matching is critical for long-term reliability.
- Devices must be stored in a dry nitrogen atmosphere.

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.

## Ordering Information

Part	ECCN	Package Style
TGA2526	EAR99	GaAs MMIC Die

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