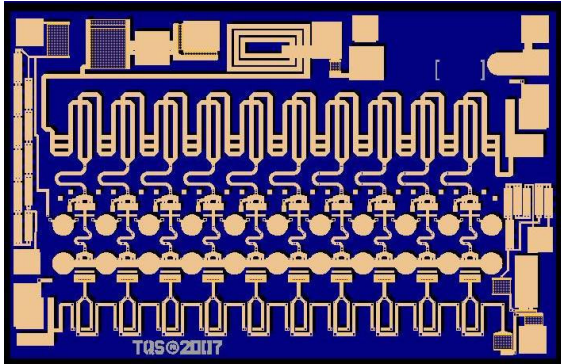
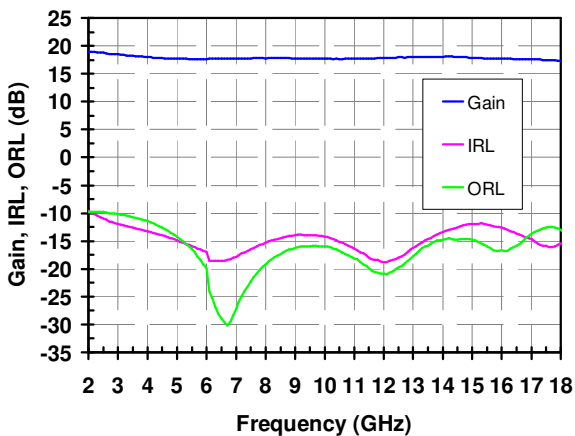
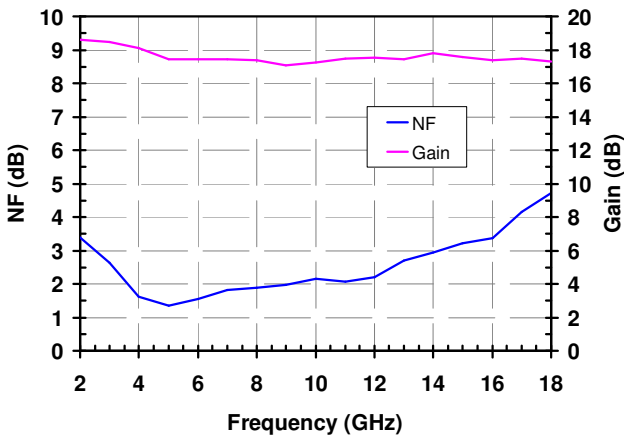


**2-18 GHz Low Noise Amplifier with AGC**



**Measured Performance**

Bias conditions:  $V_d = 5\text{ V}$ ,  $I_d = 75\text{ mA}$ ,  $V_{g1} = -0.6\text{ V}$ ,  $V_{g2} = +1.3\text{ V}$  Typical



**Key Features**

- Frequency Range: 2 - 18 GHz
- Midband NF: 2 dB
- Gain: 17 dB
- >30 dB adjustable gain with  $V_{g2}$
- TOI: 29 dBm Typical
- 22 dBm Nominal  $P_{sat}$ , 18 dBm Nominal  $P_{1dB}$
- ESD Protection circuitry on  $V_{g1}$  &  $V_{g2}$
- Bias:  $V_d = 5\text{ V}$ ,  $I_d = 75\text{ mA}$ ,  $V_{g1} = -0.6\text{ V}$ ,  $V_{g2} = +1.3\text{ V}$ , Typical
- Technology: 3MI 0.15  $\mu\text{m}$  Power pHEMT
- Chip Dimensions: 2.09 x 1.35 x 0.1 mm

**Primary Applications**

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

**Product Description**

The TriQuint TGA2525 is a compact LNA Gain Block MMIC with adjustable gain control (AGC). The LNA operates from 2-18 GHz and is designed using TriQuint's proven standard 0.15  $\mu\text{m}$  Power pHEMT production process.

The TGA2525 provides a nominal 18 dBm of output power at 1 dB gain compression with a small signal gain of 17 dB. Greater than 30 dB adjustable gain can be achieved using  $V_{g2}$  pin. Typical noise figure is 2 dB at 8 GHz. Special circuitry on both  $V_{g1}$  and  $V_{g2}$  pins provides ESD protection.

The TGA2525 is suitable for a variety of wideband systems such as point to point radios, radar warning receivers and electronic counter measures.

The TGA2525 is 100% DC and RF tested on-wafer to ensure performance compliance. The TGA2525 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	10 V	
Vd	Drain Voltage	7 V	2/
Vg1	Gate #1 Voltage Range	-2 to 0 V	
Vg2	Gate #2 Voltage Range	-2 to +3 V	
Id	Drain Current	144 mA	2/
Ig1	Gate #1 Current Range	-24 to 24 mA	3/
Ig2	Gate #2 Current Range	-24 to 24 mA	
Pin	Input Continuous Wave Power	22 dBm	2/

- 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 both 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 1/	Value
Vd	Drain Voltage	5 V
Id	Drain Current	75 mA
Id_Drive	Drain Current under RF Drive	130 mA
Vg1	Gate #1 Voltage	-0.6 V
Vg2	Gate #2 Voltage	1.3 V

- 1/ See assembly diagram for bias instructions.

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

**Bias: Vd = 5 V, Id = 75 mA, Vg1 = -0.6 V, Vg2 = +1.3 V typical**

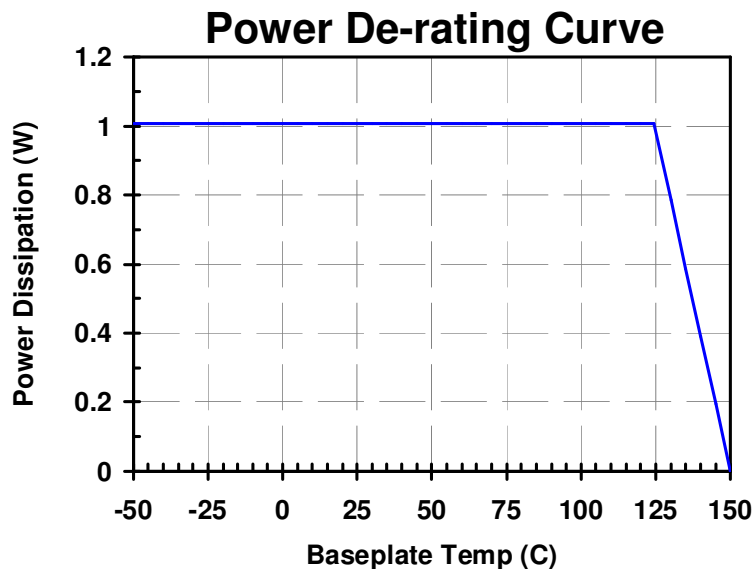
<b>SYMBOL</b>	<b>PARAMETER</b>	<b>TEST CONDITIONS</b>	<b>MIN</b>	<b>NOMINAL</b>	<b>MAX</b>	<b>UNITS</b>
Gain	Small Signal Gain	f = 2 - 14 GHz f = 14 - 18 GHz	14 14	17 17	- -	dB
IRL	Input Return Loss	f = 2 GHz f = 3 - 14 GHz f = 14 - 18 GHz	8.5 10 10	15 15 12	- - -	dB
ORL	Output Return Loss	f = 2 - 3 GHz f = 4 - 18 GHz	9 10	15 15	- -	dB
Psat	Saturated Output Power	f = 2 - 14 GHz f = 14 - 18 GHz	- -	22 20	- -	dBm
P1dB	Output Power @ 1dB Compression	f = 2 GHz f = 4, 8 GHz f = 10, 14 GHz f = 18 GHz	14 15 13 11	18 17 17 15	- - - -	dBm
TOI	Output TOI	f = 2 - 14 GHz f = 14 - 18 GHz	- -	29 25	- -	dBm
NF	Noise Figure	f = 2 - 14 GHz f = 14 - 18 GHz	- -	2 4	4 6	dB
S21/T	S21 Temperature Dependence	f = 2 - 18 GHz	-	-0.008	-	dB / °C

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

Parameter	Test Conditions	Value	Notes
Maximum Power Dissipation	Tbaseplate = 70 °C	Pd = 1.01 W Tchannel = 96 °C Tm = 9.7 E+8 Hrs	1/ 2/
Thermal Resistance, $\theta_{jc}$	Vd = 5 V Id = 75 mA Pd = 0.375 W	$\theta_{jc}$ = 41.4 (°C/W) Tchannel = 86 °C Tm = 4.3 E+9 Hrs	
Thermal Resistance, $\theta_{jc}$ Under RF Drive	Vd = 5 V Id = 120 mA Pout = 22 dBm Pd = 0.45 W	$\theta_{jc}$ = 41.4 (°C/W) Tchannel = 89 °C Tm = 2.7 E+9 Hrs	
Mounting Temperature	30 Seconds	320 °C	
Storage Temperature		-65 to 150 °C	

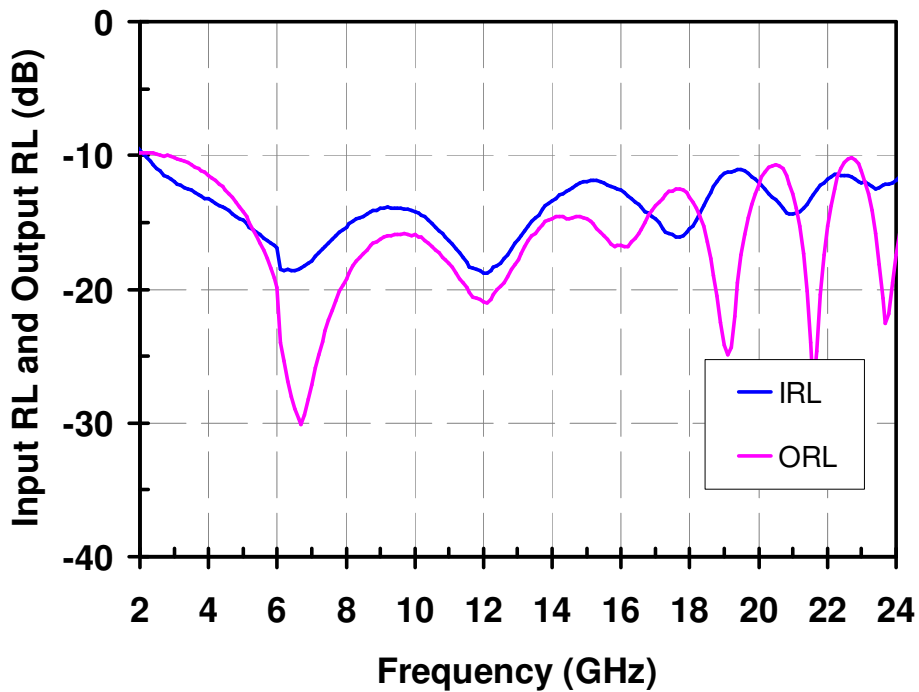
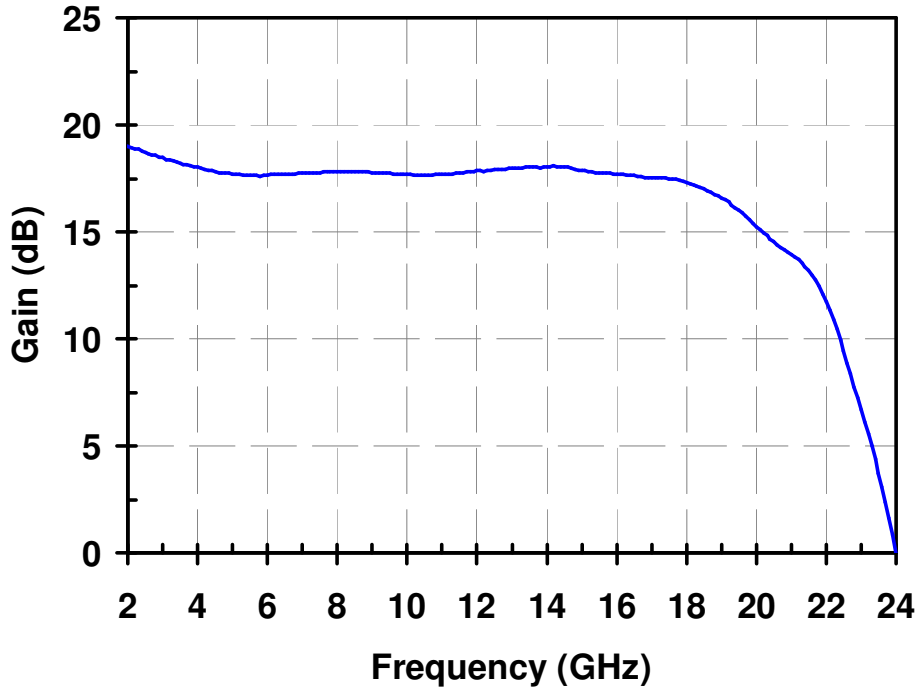
- 1/ For a median life of 1E+6 hours, Power Dissipation is limited to  

$$Pd(max) = (150\text{ °C} - Tbase\text{ °C})/\theta_{jc}.$$
- 2/ Channel operating temperature will directly affect the device median time to failure (MTTF). For maximum life, it is recommended that channel temperatures be maintained at the lowest possible levels.



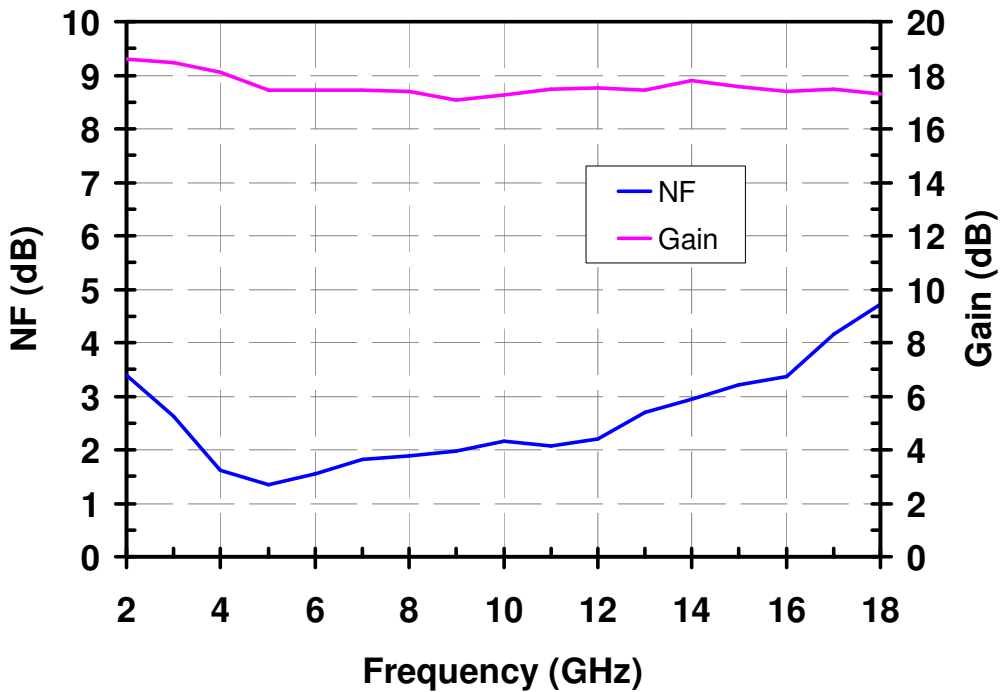
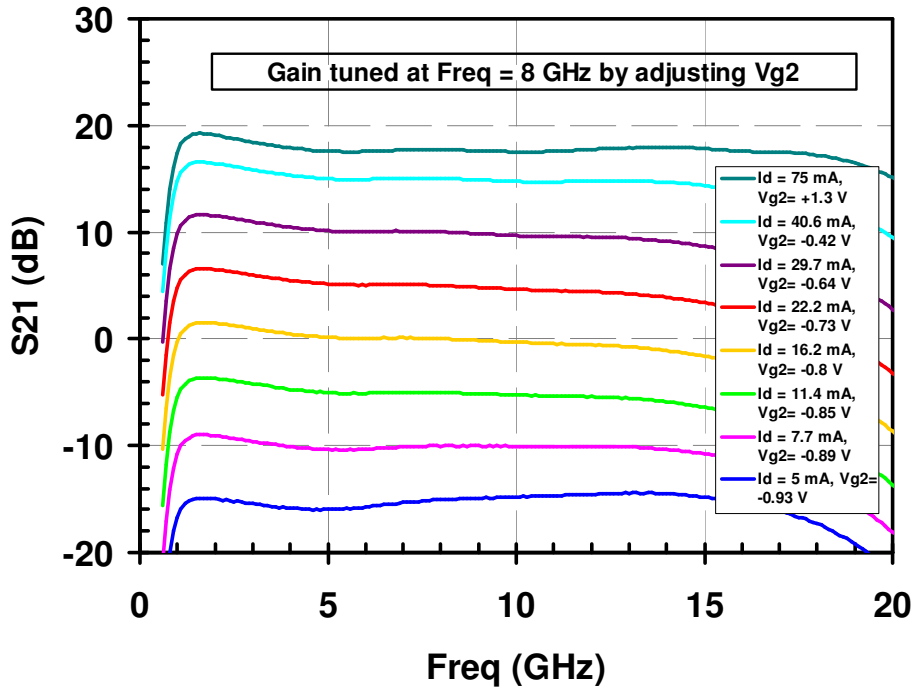
**Measured Data**

Bias conditions:  $V_d = 5\text{ V}$ ,  $I_d = 75\text{ mA}$ ,  $V_{g1} = -0.6\text{ V}$ ,  $V_{g2} = +1.3\text{ V}$  Typical



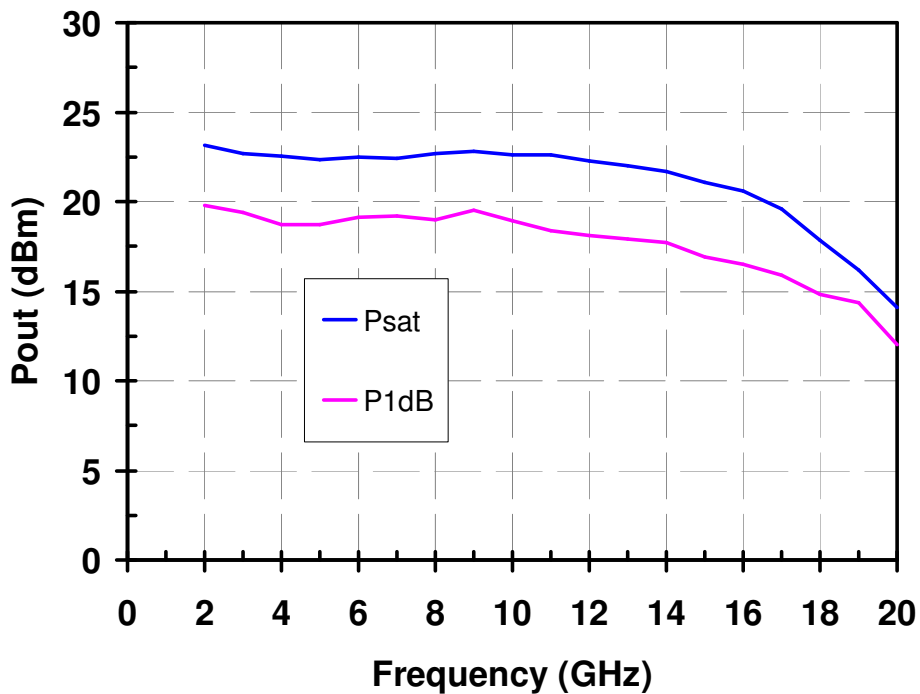
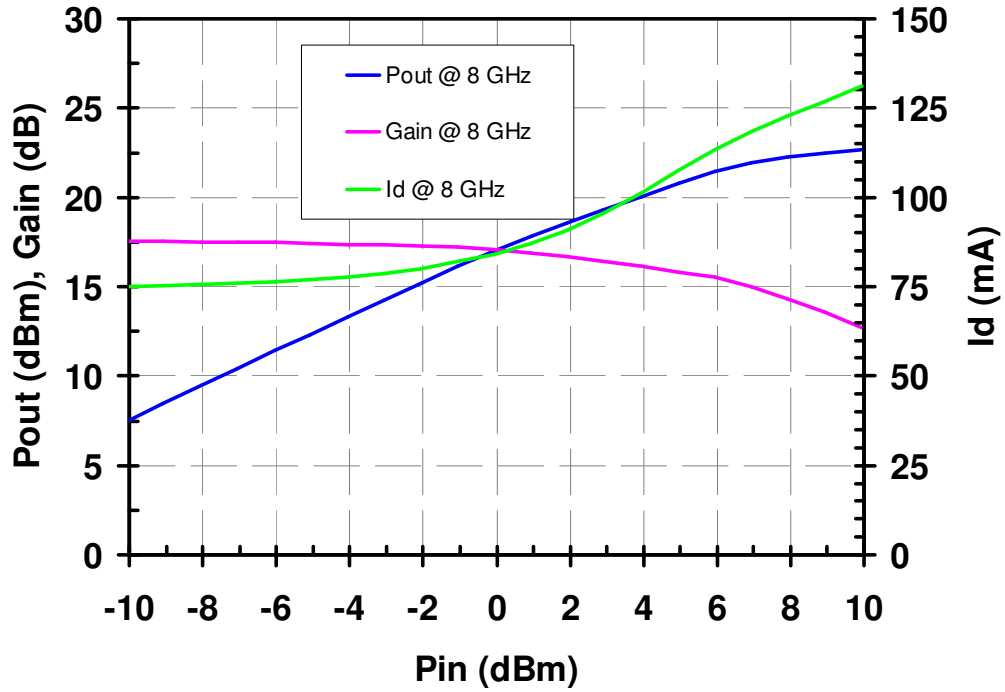
**Measured Data**

Bias conditions:  $V_d = 5\text{ V}$ ,  $I_d = 75\text{ mA}$ ,  $V_{g1} = -0.6\text{ V}$ ,  $V_{g2} = +1.3\text{ V}$  Typical



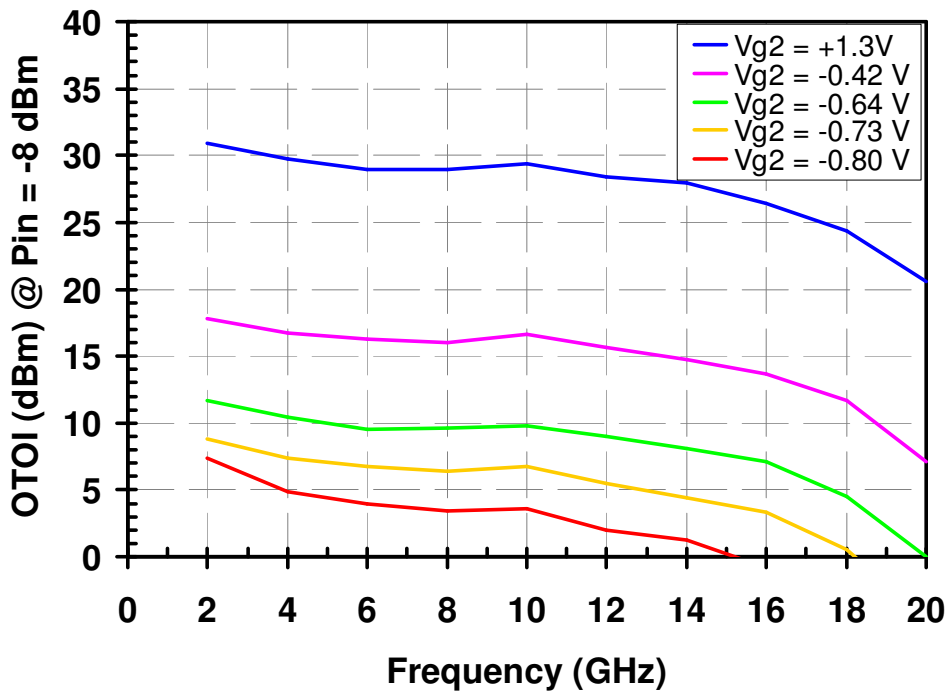
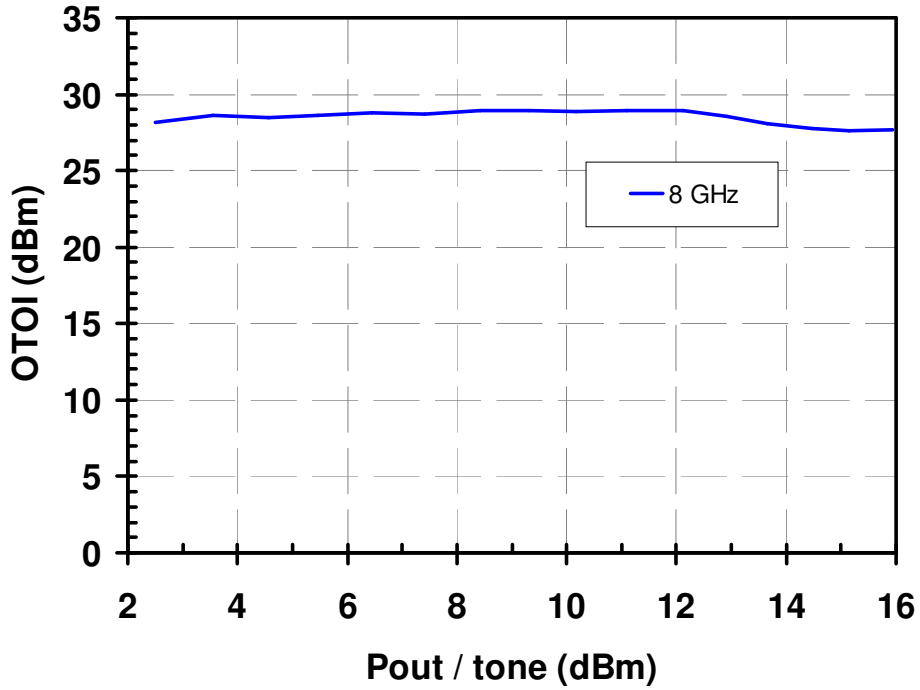
**Measured Data**

Bias conditions:  $V_d = 5\text{ V}$ ,  $I_d = 75\text{ mA}$ ,  $V_{g1} = -0.6\text{ V}$ ,  $V_{g2} = +1.3\text{ V}$  Typical



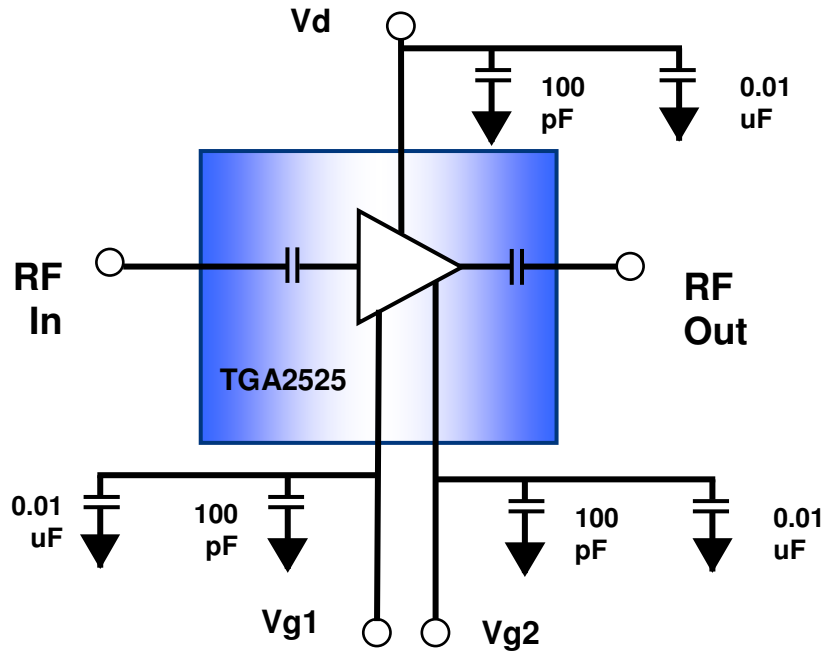
**Measured Data**

Bias conditions:  $V_d = 5\text{ V}$ ,  $I_d = 75\text{ mA}$ ,  $V_{g1} = -0.6\text{ V}$ ,  $V_{g2} = +1.3\text{ V}$  Typical





**Electrical Schematic**



**Bias Procedures**

**Bias-up Procedure**

Vg1 set to -1.5 V

Vd set to +5 V

Vg2 set to +1 V

Adjust Vg1 more positive until Id is 75 mA. This will be ~ Vg1 = -0.6 V

Apply RF signal to input

Adjust Vg2 to obtain desired gain.

**Bias-down Procedure**

Reduce Vg2 to +1 V

Turn off RF supply

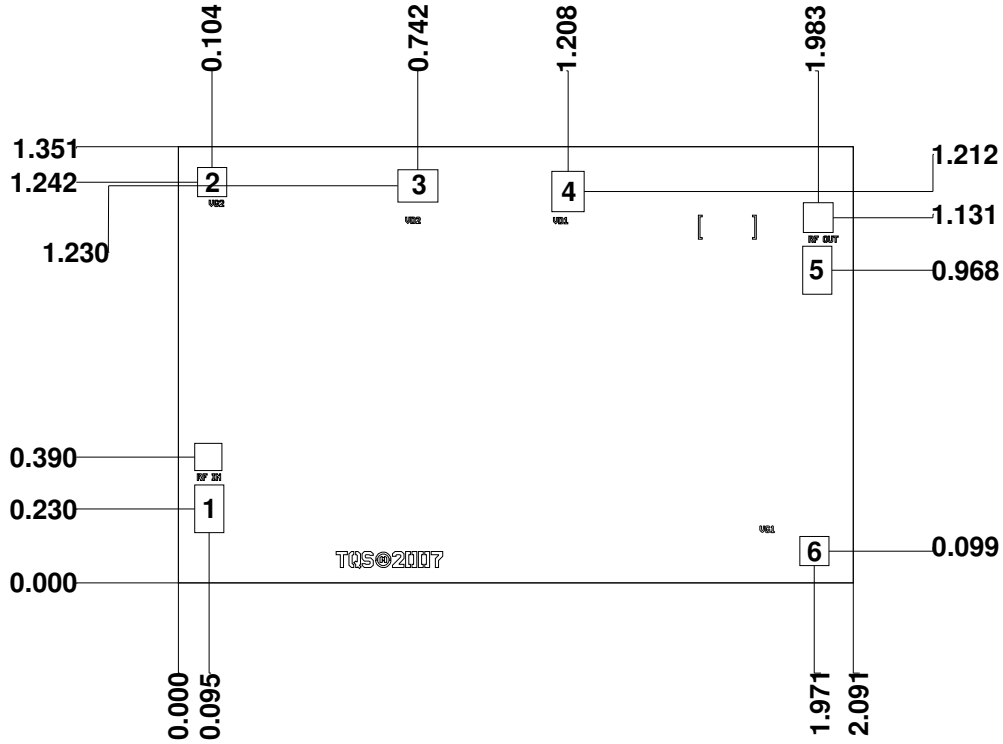
Reduce Vg1 to -1.5V. Ensure Id ~ 0 mA

Vg2 to 0 V

Turn Vd to 0 V

Turn Vg1 to 0 V

**Mechanical Drawing**

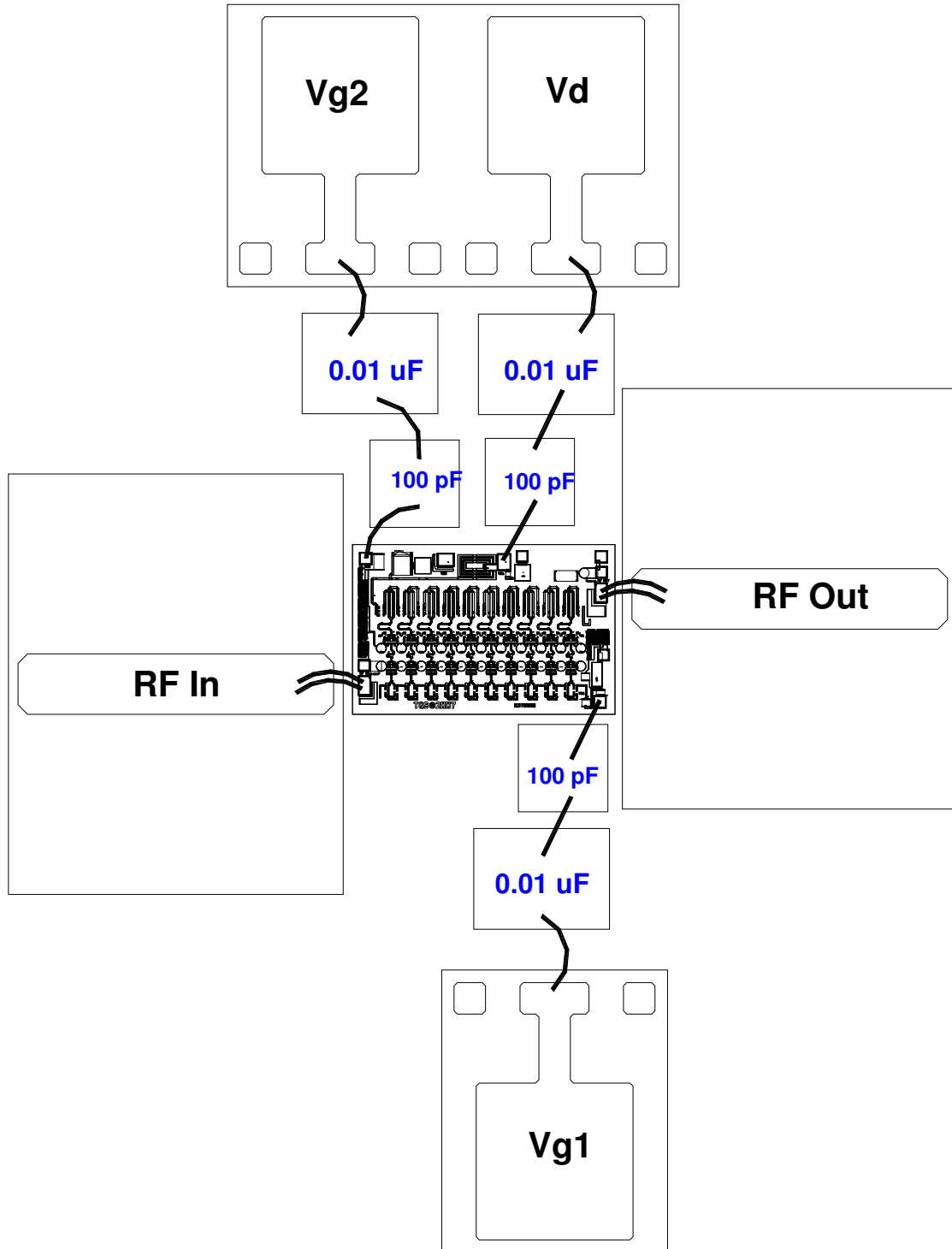


Units: millimeters  
 Thickness: 0.10  
 Die x,y size tolerance: +/- 0.050  
 Chip edge to bond pad dimensions are shown to center of pad  
 Ground is backside of die

Bond Pad #1	RF In	0.090 x 0.148	Bond Pad #4	Vd1	0.100 x 0.125
Bond Pad #2	Vg2	0.090 x 0.090	Bond Pad #5	RF Out	0.090 x 0.148
Bond Pad #3	Vd2 (Not used)	0.125 x 0.100	Bond Pad #6	Vg1	0.090 x 0.090

**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
TGA2525	EAR99	GaAs MMIC Die

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