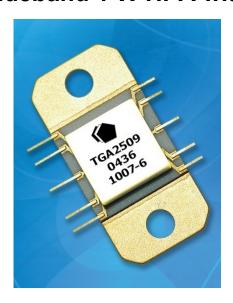


#### Wideband 1 W HPA with AGC

#### **TGA2509-FL**



#### **Key Features**

- Frequency Range: 2-20 GHz
- > 29 dBm Nominal P1dB
- 15 dB Nominal Gain, Midband
- 25dB AGC Range
- 10 lead flange package style
- Bias Conditions: Vd = 12 V, Idq = 1.1 A
- Package Dimensions: 0.7 x 0.3 x 0.1 in.

## **Primary Applications**

- Wideband Gain Block
- Military EW and ECM
- Test Equipment
- Millimeter Radio
- VSAT
- Space

## **Product Description**

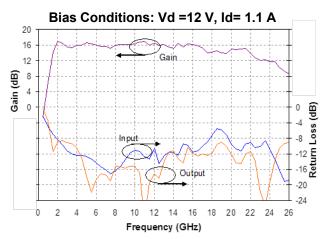
The TriQuint TGA2509-FL is a Wideband High Power Amplifier with 25 dB AGC range. The HPA operates from 2-20 GHz and is designed using TriQuint's power pHEMT production process.

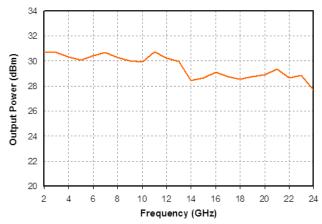
The TGA2509-FL provides typical 29dBm of output power at 1 dB gain compression with small signal gain of 15 dB.

The TGA2509-FL 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 flange lead package has a high thermal conductivity copper alloy base.

Evaluation Boards are available.

#### **Measured Fixtured Data**





Note: Datasheet is subject to change without notice.



# TABLE I MAXIMUM RATINGS 1/

SYMBOL	PARAMETER	VALUE	NOTES
V <sup>+</sup>	Positive Supply Voltage	12.5 V	<u>2/</u>
V <sub>g1</sub>	Gate 1 Supply Voltage Range	-2V TO 0 V	
$V_{g2}$	Gate 2 Supply Voltage Range	-2V TO 0 V	
V <sub>c</sub>	AGC Control Voltage Range	V <sub>c</sub> < +5 V	
		$V^{+} - V_{c} < 14V$	
I <sup>+</sup>	Positive Supply Current	1.4 A	<u>2/</u>
I <sub>G</sub>	Gate Supply Current	70 mA	
P <sub>IN</sub>	Input Continuous Wave Power	30 dBm	<u>2</u> /
$P_{D}$	Power Dissipation (without using AGC)	13.2 W	2/, <u>3</u> /
$P_{D}$	Power Dissipation (when Vc < +2V)	10.6 W	2/, <u>3</u> /
T <sub>CH</sub>	Operating Channel Temperature	200 °C	<u>4</u> /
$T_M$	Mounting Temperature (30 Seconds)	230 °C	
T <sub>STG</sub>	Storage Temperature	-65 to 150 °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<sub>D</sub>.
- 3/ When operated at this power dissipation with a base plate temperature of 60 °C, the median life is 1 E+6 hours.
- $\underline{4}$ / 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.



# TABLE II RF CHARACTERIZATION TABLE

 $(T_A = 25 \, ^{\circ}C, Nominal)$ Vd = 12 V, Id = 1.08 A

SYMBOL	PARAMETER	TEST CONDITION	NOMINAL	UNITS
Gain	Small Signal Gain	f = 2-20 GHz	15	dB
IRL	Input Return Loss	f = 2-20 GHz	10	dB
ORL	Output Return Loss	f = 2-20 GHz	12	dB
P <sub>1dB</sub>	Output Power @ 1dB Gain Compression	f = 2-20 GHz	29	dBm

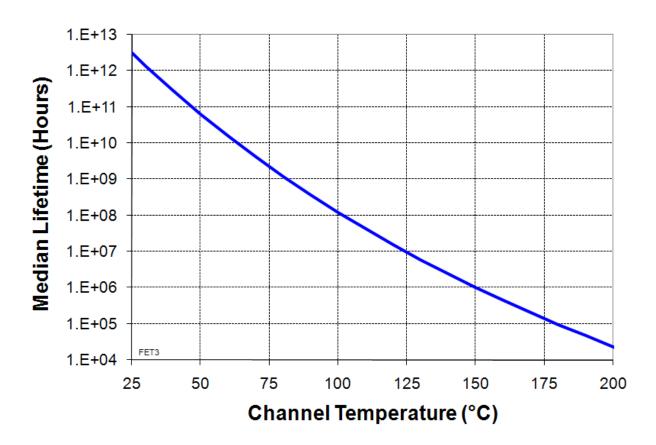
# TABLE III THERMAL INFORMATION

Parameter	Test Conditions	T <sub>CH</sub> (°C)	R <sub>θJC</sub> (°C/W)	T <sub>M</sub> (HRS)
R <sub>0JC</sub> Thermal Resistance (channel to backside of package)	$Vd = 12 V$ $I_D = 1.08 A$ $Pdiss = 13.2 W$ (without using AGC)	150	6.4	1 E+6
R <sub>eJC</sub> Thermal Resistance (channel to backside of package)	$Vd = 12 V$ $I_D = 0.88 A$ $Pdiss = 10.6 W$ $(when using AGC)$	150	8.3	1 E+6

Note: Package attached with mounting hardware and metal shim (Al or In) to carrier at 65°C baseplate temperature. Worst case is at saturated output power when DC power consumption rises to 15 W with 1 W RF power delivered to load. Power dissipated is 14 W and the temperature rise in the channel is 90 °C. Baseplate temperature must be reduced to 60 °C to remain below the 150 °C maximum channel temperature.



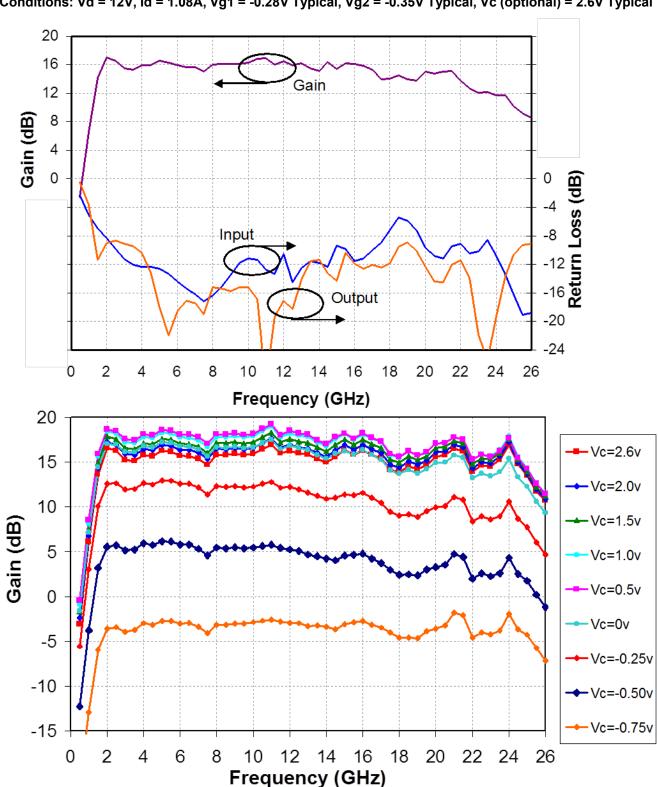
## **Median Lifetime vs Channel Temperature**





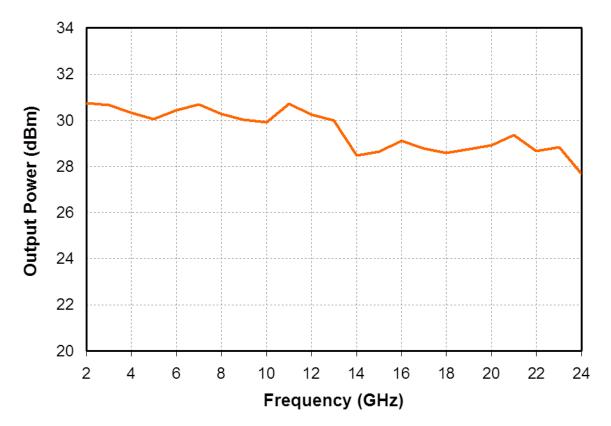
# **Typical Fixtured Performance**

Bias Conditions: Vd = 12V, Id = 1.08A, Vg1 = -0.28V Typical, Vg2 = -0.35V Typical, Vc (optional) = 2.6V Typical





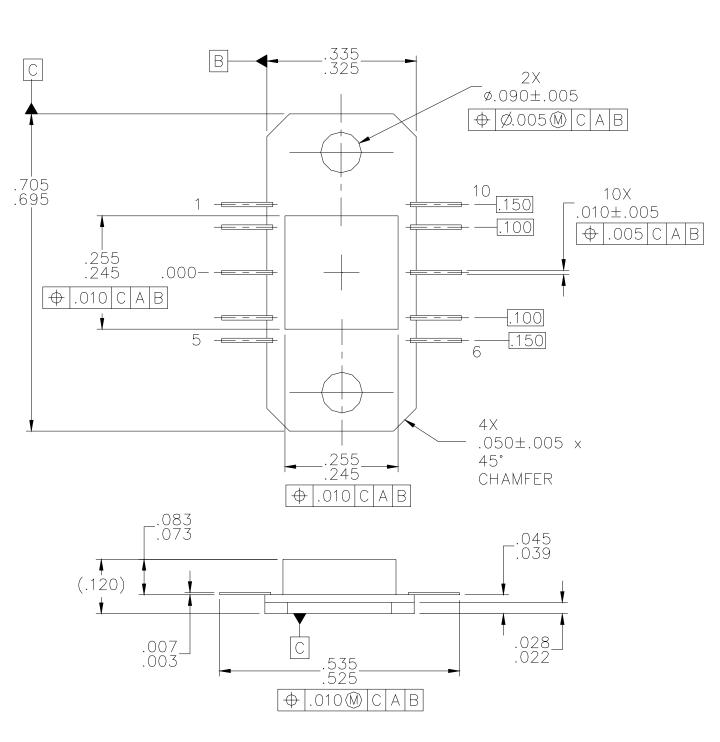
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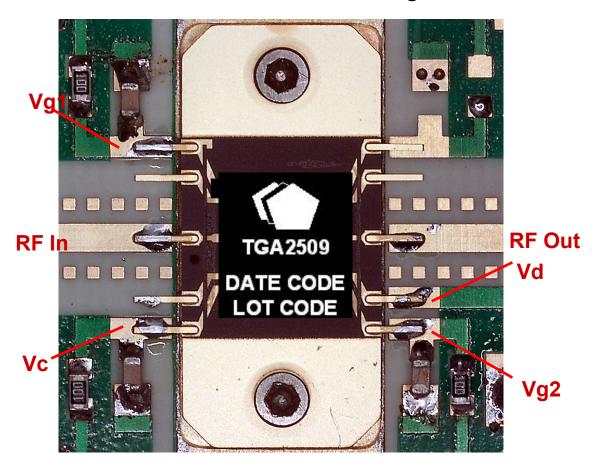
# **Package Dimensional Drawing**

Units: Inches





# **Evaluation Board Drawing**



#### **Bias Procedures:**

Vc bias connection is optional, but the 0.1uF cap always needs to be connected.

#### For biasing without AGC control:

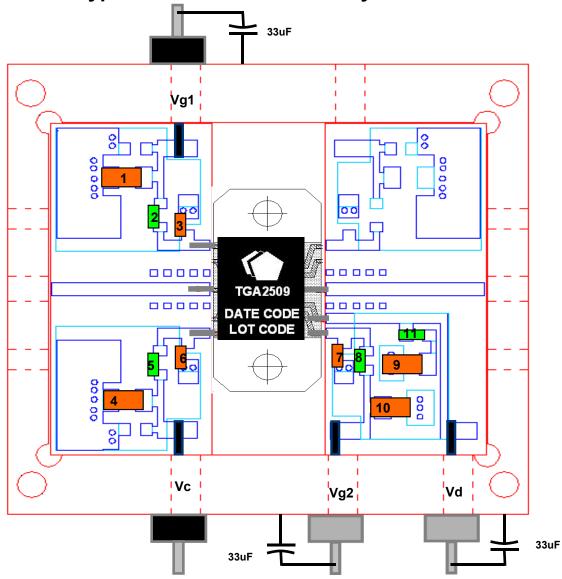
- 1. Apply -1.2V to Vg1, and -1.2V to Vg2.
- 2. Apply +12V to Vd.
- 4. Adjust Vg1 to attain 580 mA drain current (Id)
- 4. Adjust Vg2 to attain 1080 mA total drain current (Id).

#### For biasing with AGC control:

- 1. Apply -1.2V to Vg1 and -1.2V to Vg2
- 2. Apply +12V to Vd
- 3. Apply +2.6V to Vc
- 4. Adjust Vg1 to attain 580 mA drain current (Id)
- 5. Adjust Vg2 to attain 1080 mA total drain current (Id).
- 6. Adjust Vc as needed to control gain level.



**Typical Evaluation Board Layout** 



COMPONENT	VALUE
1, 4, 9,10	1 uF
2, 5, 9	10 Ω
3, 6, 7	0.01 uF
11	100 Ω



### Assembly of a TGA2509-FL Flange Mount Package onto a Motherboard

#### **Manual Assembly for Prototypes**

- 1. Clean the motherboard or the similar module with Acetone. Rinse with alcohol and DI water. Allow the circuit to fully dry.
- 2. To improve the thermal and RF performance, TriQuint recommends a heat sink attached to the bottom of the package with an indium alloy preform, or equivalent, between the two.
- 3. Apply Tin/Lead solder, or equivalent, to each active pin of the TGA2509-FL.
- 4 Clean the assembly with alcohol.

#### **Ordering Information**

Part	Package Style
TG2509-FL	Flange (Leads bolted down)