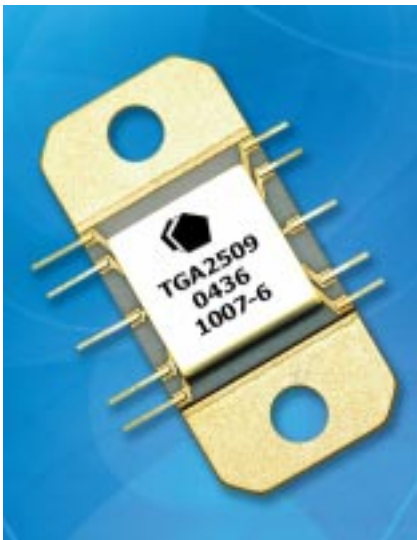


**Wideband Packaged HPA with AGC**

**TGA2509-EPU-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:  $V_d = 12\text{ V}$ ,  $I_{dQ} = 1.1\text{ A}$
- Package Dimensions: 0.7 x 0.3 x 0.1 in.

**Primary Applications**

- Wideband Power Amp
- Military EW and ECM
- Test Equipment
- VSAT and Digital Radio

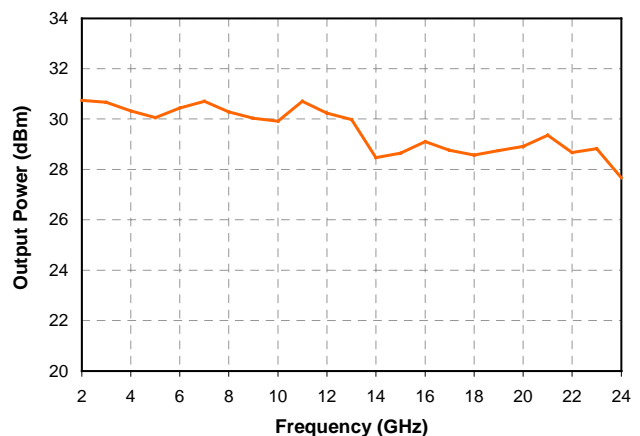
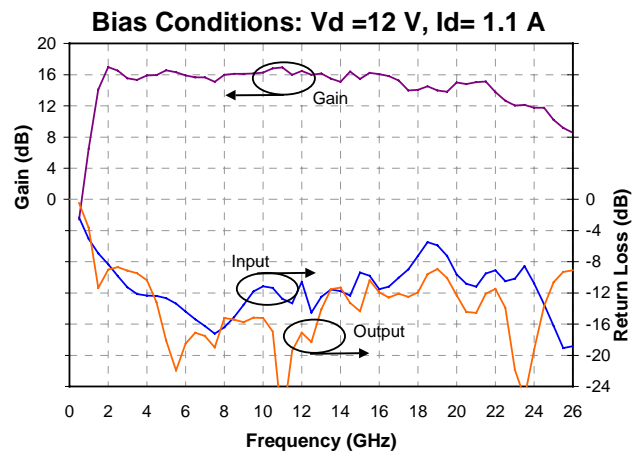
**Product Description**

The TriQuint TGA2509-EPU-FL is a Wideband High Power Amplifier with 25 dB AGC range. The HPA operates from 2-20 GHz and provides 29dBm of output power at 1 dB gain compression with small signal gain of 15 dB.

The TGA2509-EPU-FL is suitable for a variety of applications such as wideband electronic warfare systems, test equipment and VSAT and Digital Radio. The flange lead package has a high thermal conductivity copper alloy base.

Evaluation Boards are available.

**Measured Fixtured Data**



*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.*

**TABLE I**  
**MAXIMUM RATINGS 1/**

| SYMBOL           | PARAMETER                                     | VALUE  | NOTES  |
|------------------|---|--|--------|
| V <sup>+</sup>   | Positive Supply Voltage                       | 12.5 V   | 2/     |
| V <sub>g1</sub>  | Gate 1 Supply Voltage Range                   | -2V TO 0 V   |        |
| V <sub>g2</sub>  | Gate 2 Supply Voltage Range                   | -2V TO 0 V   |        |
| V <sub>c</sub>   | AGC Control Voltage Range                     | V <sub>c</sub> < +5 V<br>V <sup>+</sup> - V <sub>c</sub> < 14V |        |
| I <sup>+</sup>   | Positive Supply Current                       | 1.4 A  | 2/     |
| I <sub>G</sub>   | Gate Supply Current                           | 70 mA  |        |
| P <sub>IN</sub>  | Input Continuous Wave Power                   | 30 dBm   | 2/     |
| P <sub>D</sub>   | Power Dissipation (without using AGC)         | 13.2 W   | 2/, 3/ |
| P <sub>D</sub>   | Power Dissipation (when V <sub>c</sub> < +2V) | 10.6 W   | 2/, 3/ |
| T <sub>CH</sub>  | Operating Channel Temperature                 | 150 °C   | 4/, 5/ |
| T <sub>M</sub>   | Mounting Temperature (30 Seconds)             | 210 °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.
- 4/ Junction operating temperature will directly affect the device median time to failure (T<sub>M</sub>). For maximum life, it is recommended that junction temperatures be maintained at the lowest possible levels.
- 5/ These ratings apply to each individual FET.

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**TABLE II**  
**RF CHARACTERIZATION TABLE**

( $T_A = 25\text{ }^\circ\text{C}$ , Nominal)  
 $V_d = 12\text{ V}$ ,  $I_d = 1.08\text{ A}$

| SYMBOL           | PARAMETER                                 | TEST CONDITION               | NOMINAL | UNITS |
|------------------|---|------------------------------|---------|-------|
| Gain             | Small Signal Gain                         | $f = 2\text{-}20\text{ GHz}$ | 15      | dB    |
| IRL              | Input Return Loss                         | $f = 2\text{-}20\text{ GHz}$ | 10      | dB    |
| ORL              | Output Return Loss                        | $f = 2\text{-}20\text{ GHz}$ | 12      | dB    |
| $P_{1\text{dB}}$ | Output Power @<br>1dB Gain<br>Compression | $f = 2\text{-}20\text{ GHz}$ | 29      | dBm   |

**TABLE III**  
**THERMAL INFORMATION**

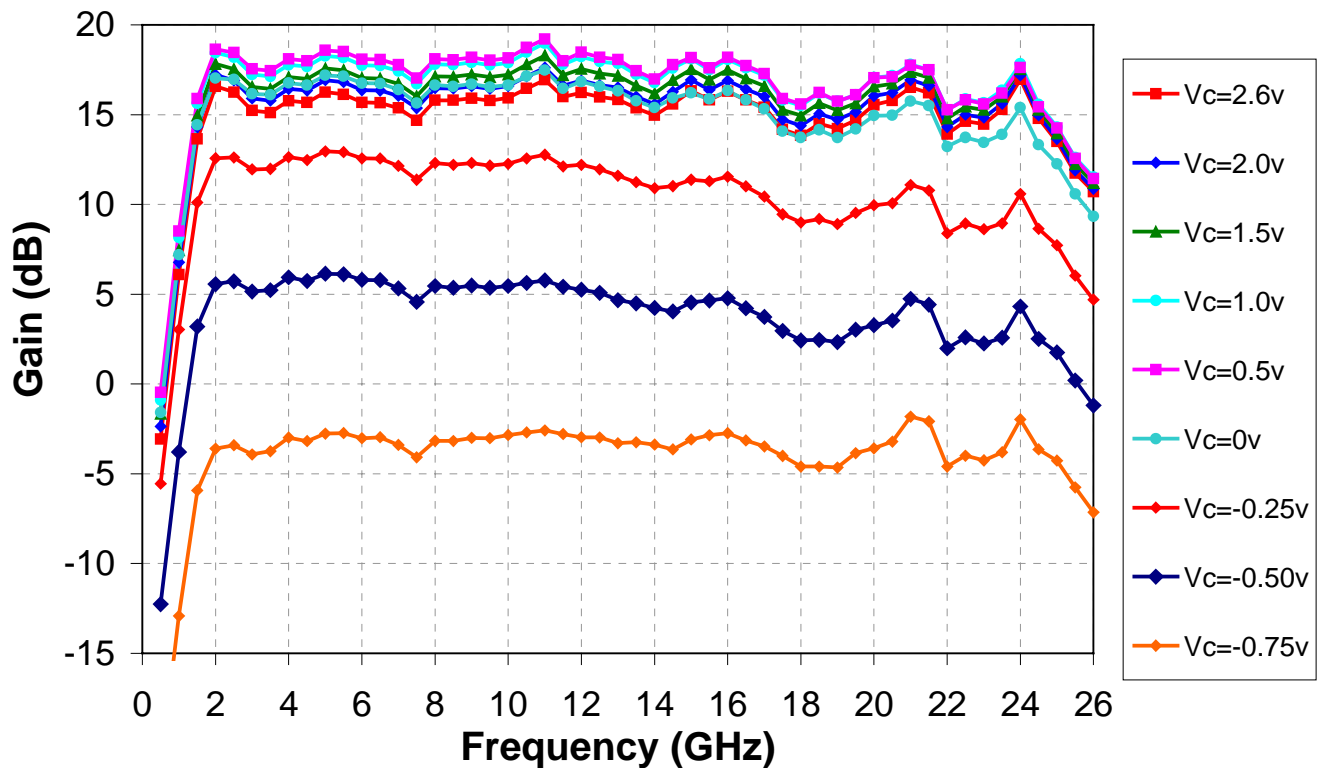
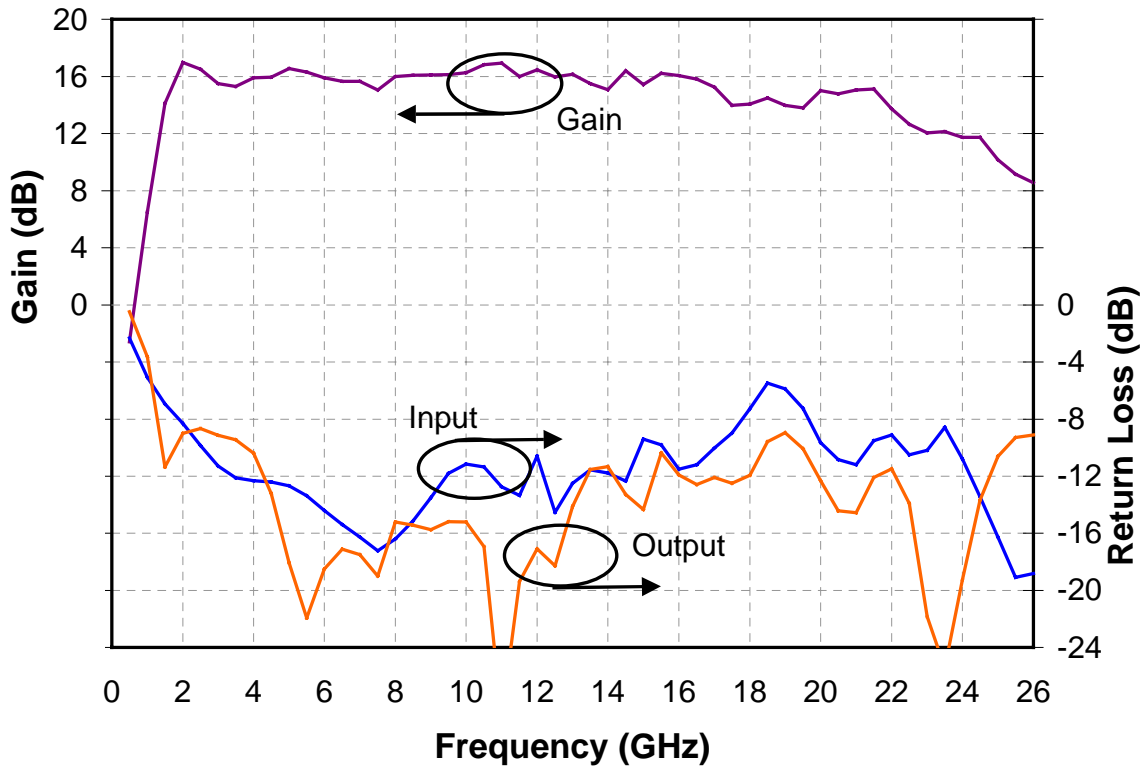
| Parameter   | Test Conditions  | $T_{\text{CH}}$<br>( $^\circ\text{C}$ ) | $R_{\theta\text{JC}}$<br>( $^\circ\text{C}/\text{W}$ ) | $T_M$<br>(HRS) |
|---|--|---|--|----------------|
| $R_{\theta\text{JC}}$ Thermal Resistance (channel to backside of package) | $V_d = 12\text{ V}$<br>$I_D = 1.08\text{ A}$<br>$P_{\text{diss}} = 13.2\text{ W}$<br>(without using AGC) | 150                                     | 6.4  | 1 E+6          |
| $R_{\theta\text{JC}}$ Thermal Resistance (channel to backside of package) | $V_d = 12\text{ V}$<br>$I_D = 0.88\text{ A}$<br>$P_{\text{diss}} = 10.6\text{ W}$<br>(when using AGC)    | 150                                     | 8.3  | 1 E+6          |

Note: Package attached with mounting hardware and metal shim (Al or In) to carrier at  $65\text{ }^\circ\text{C}$  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  $90\text{ }^\circ\text{C}$ . Baseplate temperature must be reduced to  $60\text{ }^\circ\text{C}$  to remain below the  $150\text{ }^\circ\text{C}$  maximum channel temperature.

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**Typical Fixtured Performance**

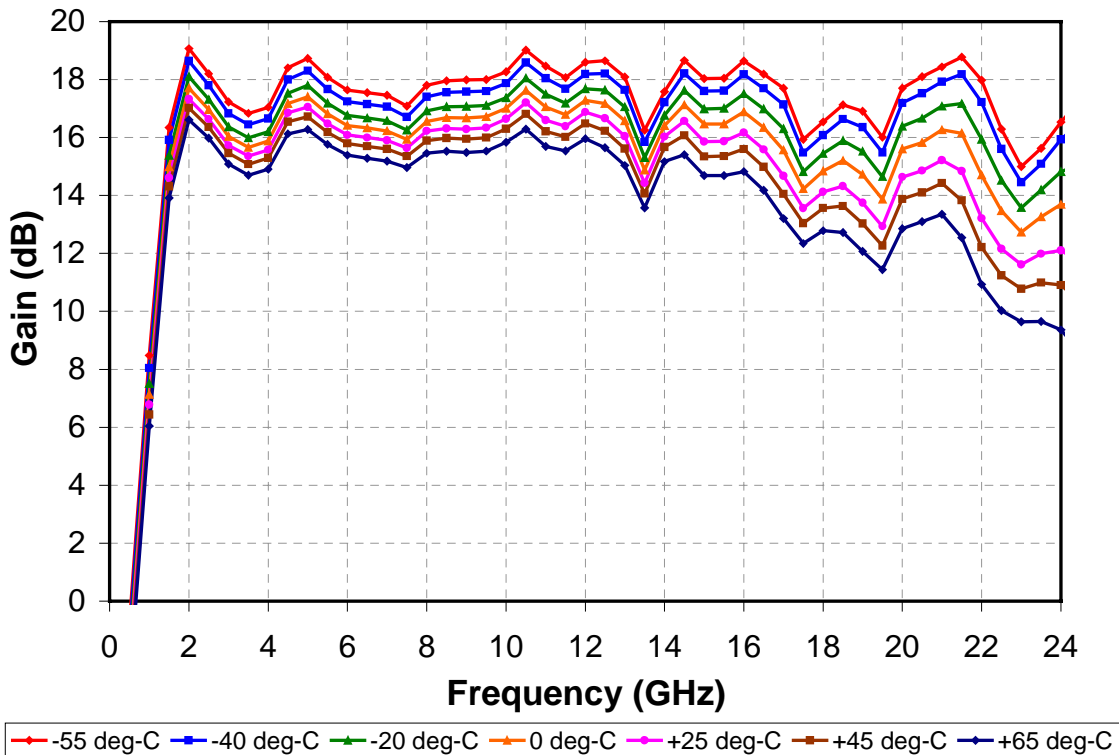
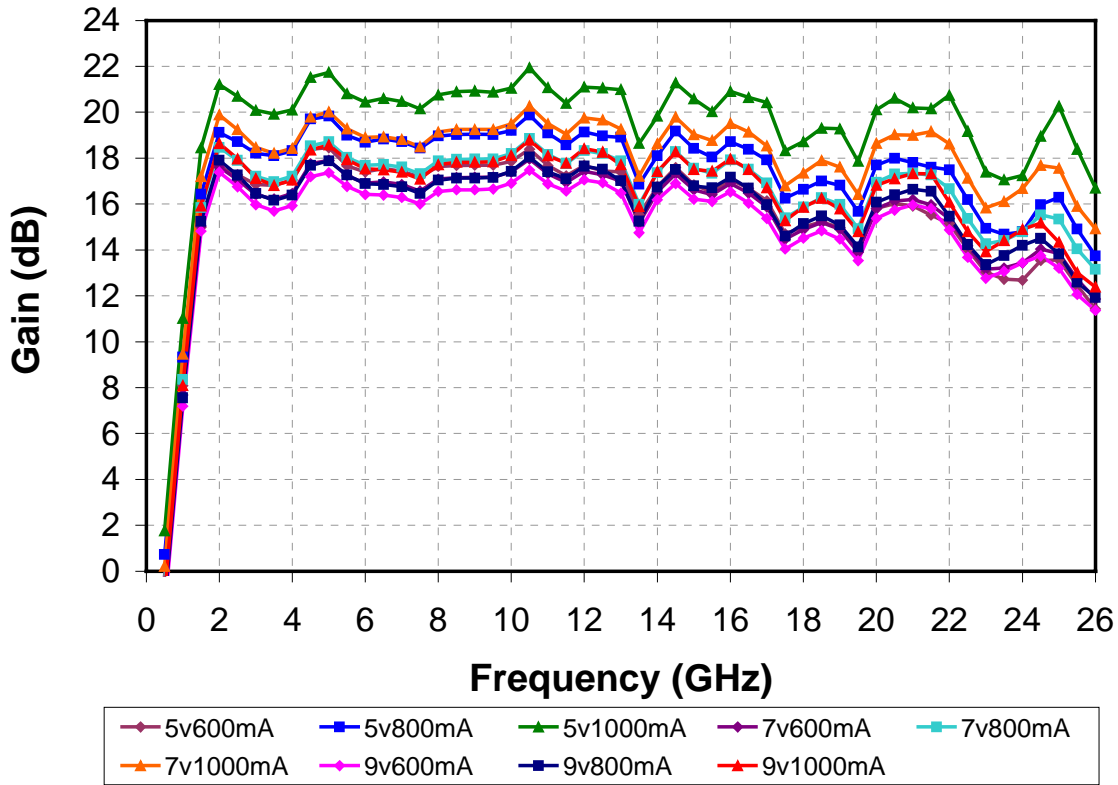
Bias Conditions:  $V_d = 12V$ ,  $I_d = 1.08A$ ,  $V_{g1} = -0.28V$  Typical,  $V_{g2} = -0.35V$  Typical,  $V_c$  (optional) = 2.6V Typical



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.

### Typical Fixtured Performance

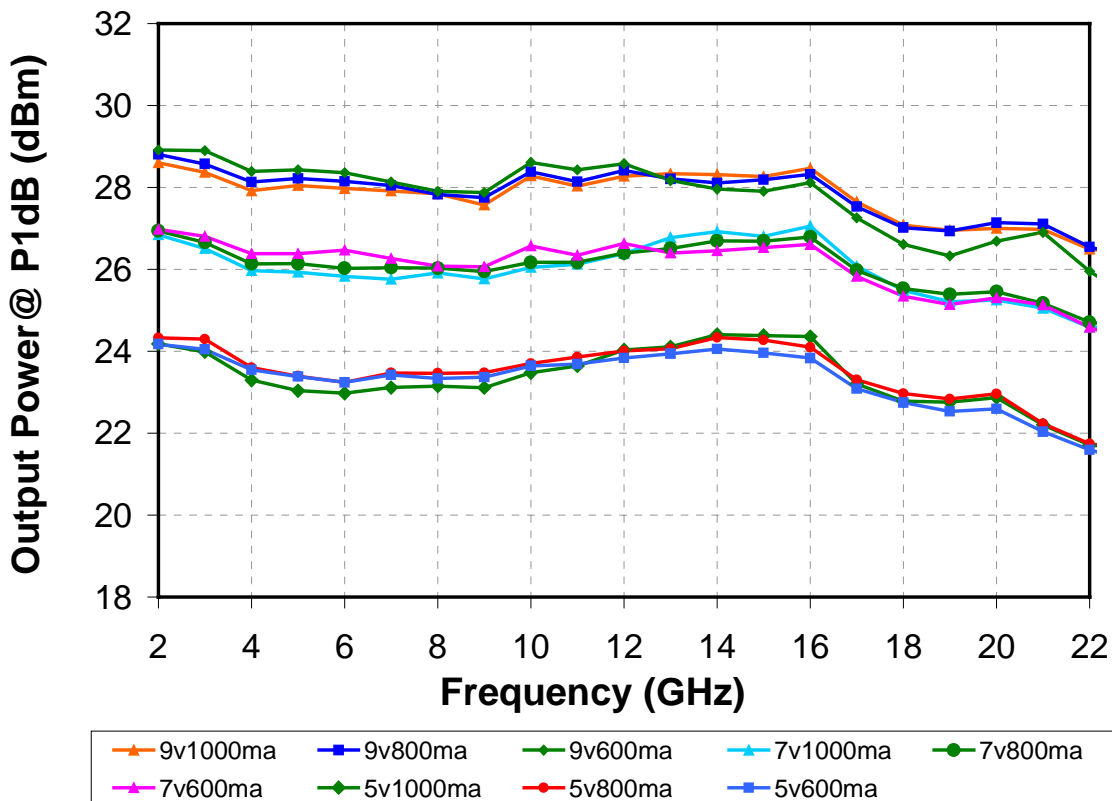
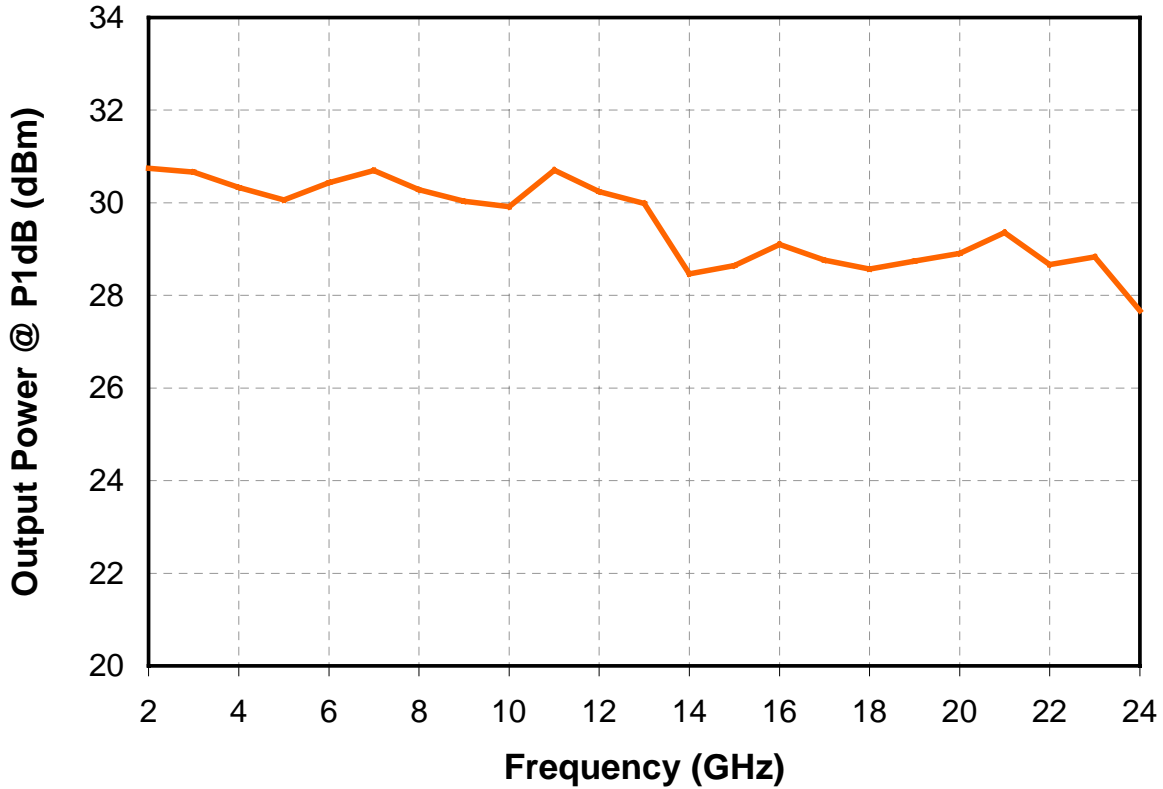
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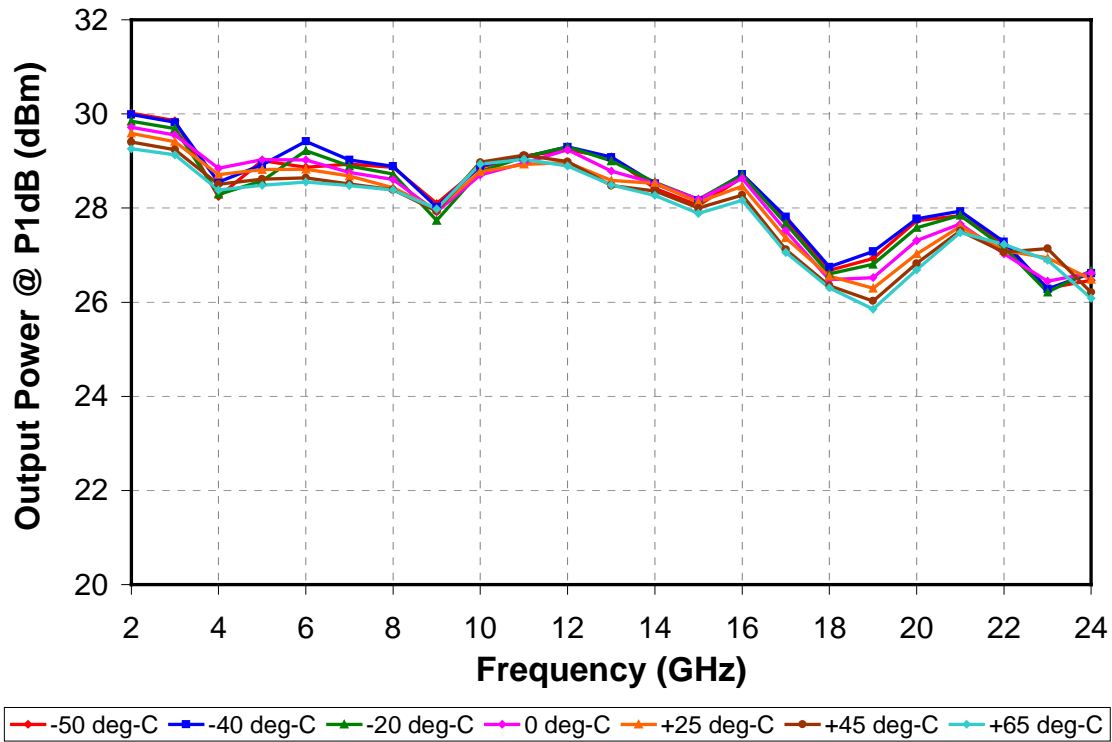
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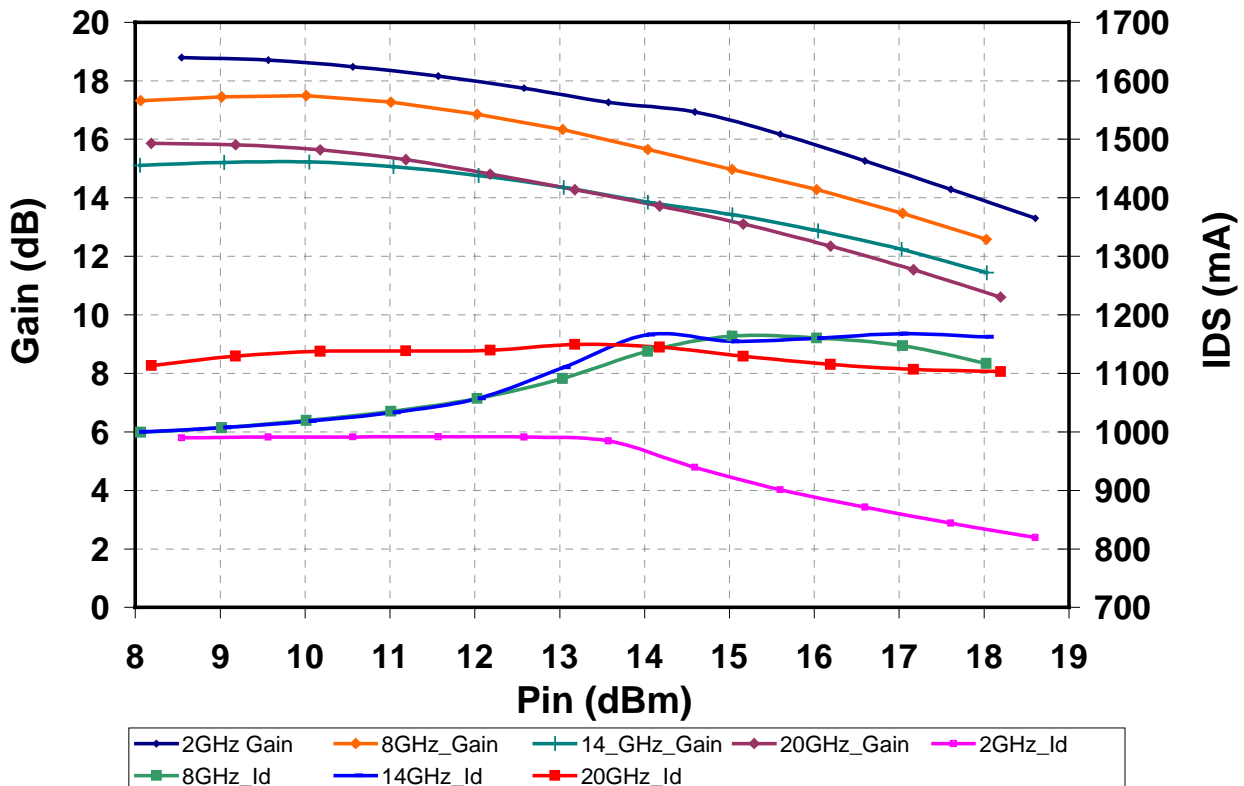
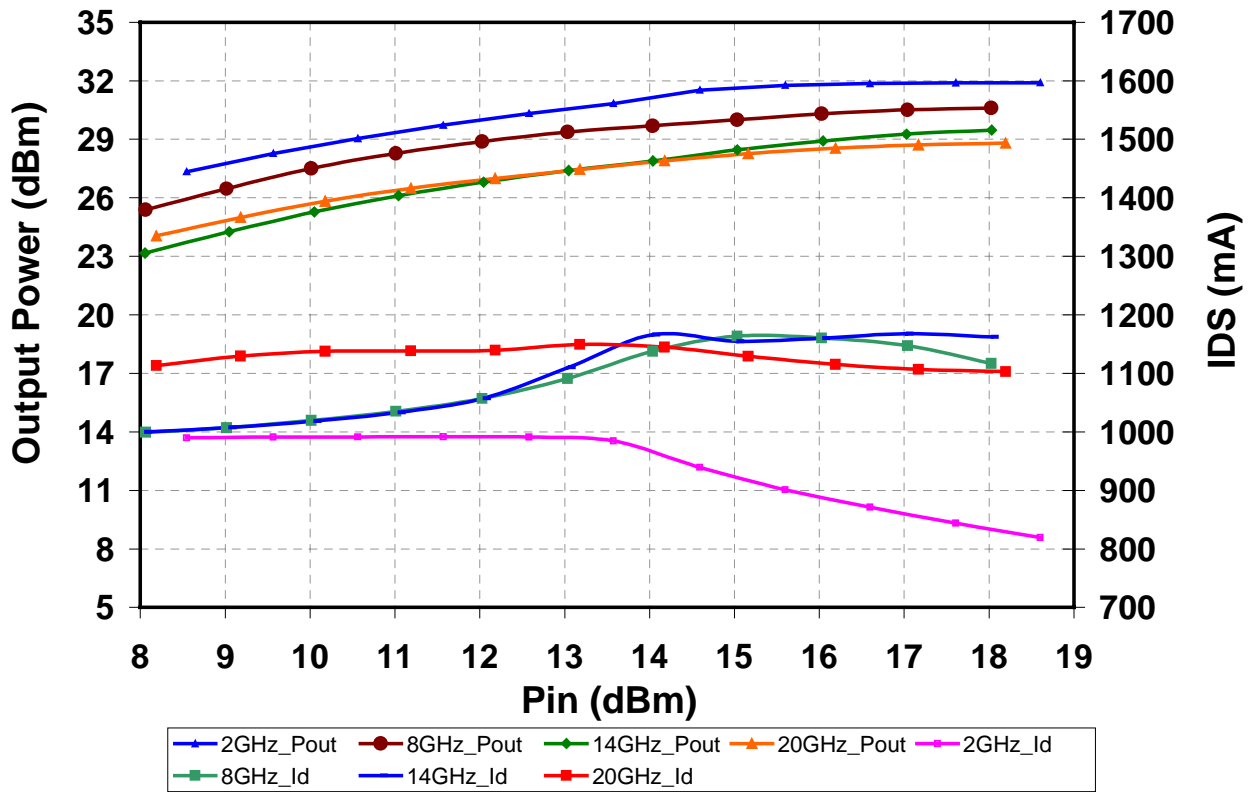
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### Typical Fixtured Performance

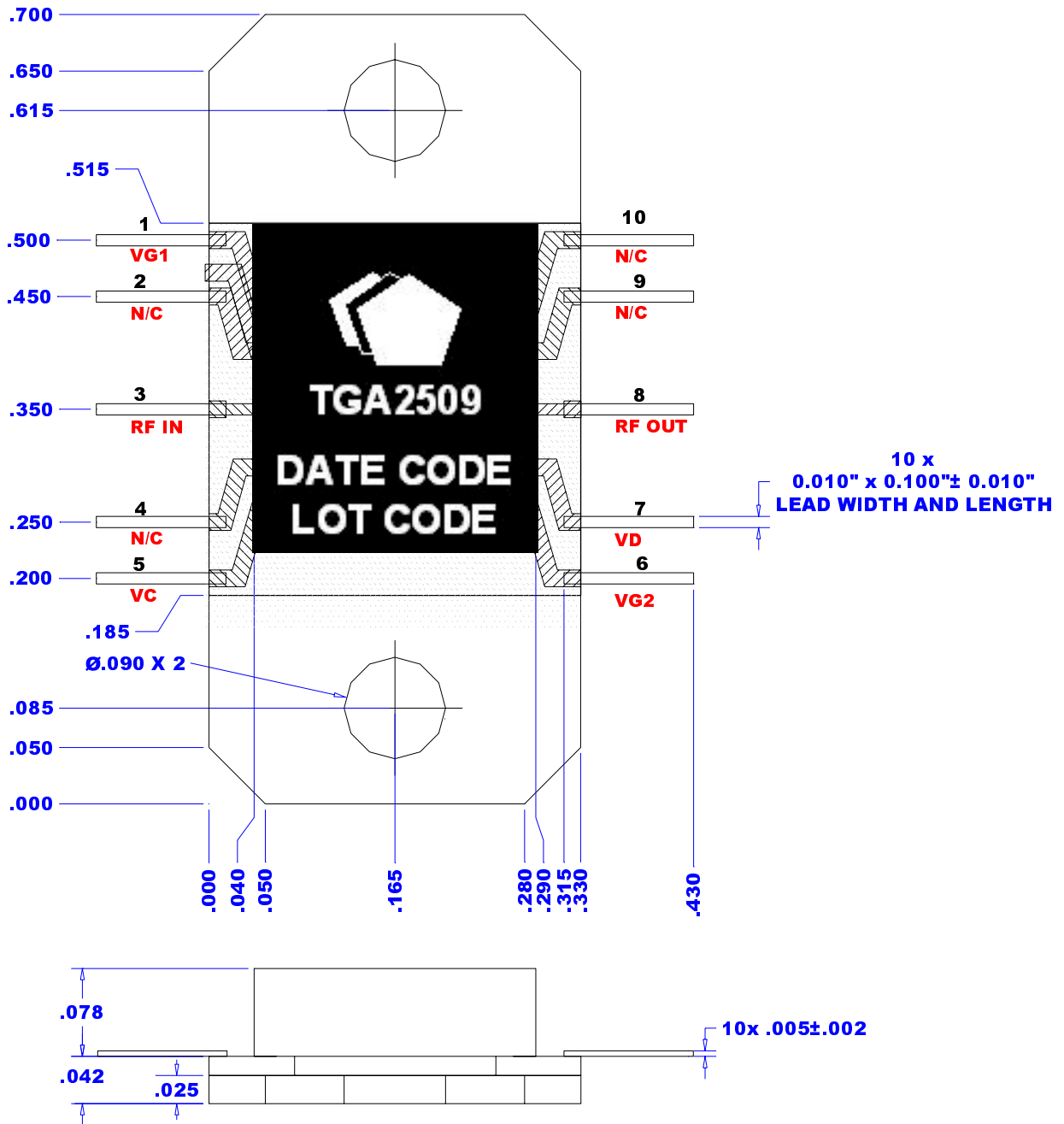
Bias Conditions:  $V_d = 12V$ ,  $I_d = 1.08A$ ,  $V_{g1} = -0.28V$  Typical,  $V_{g2} = -0.35V$  Typical,  $V_c$  (optional) = 2.6V Typical



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**Package Dimensional Drawing**



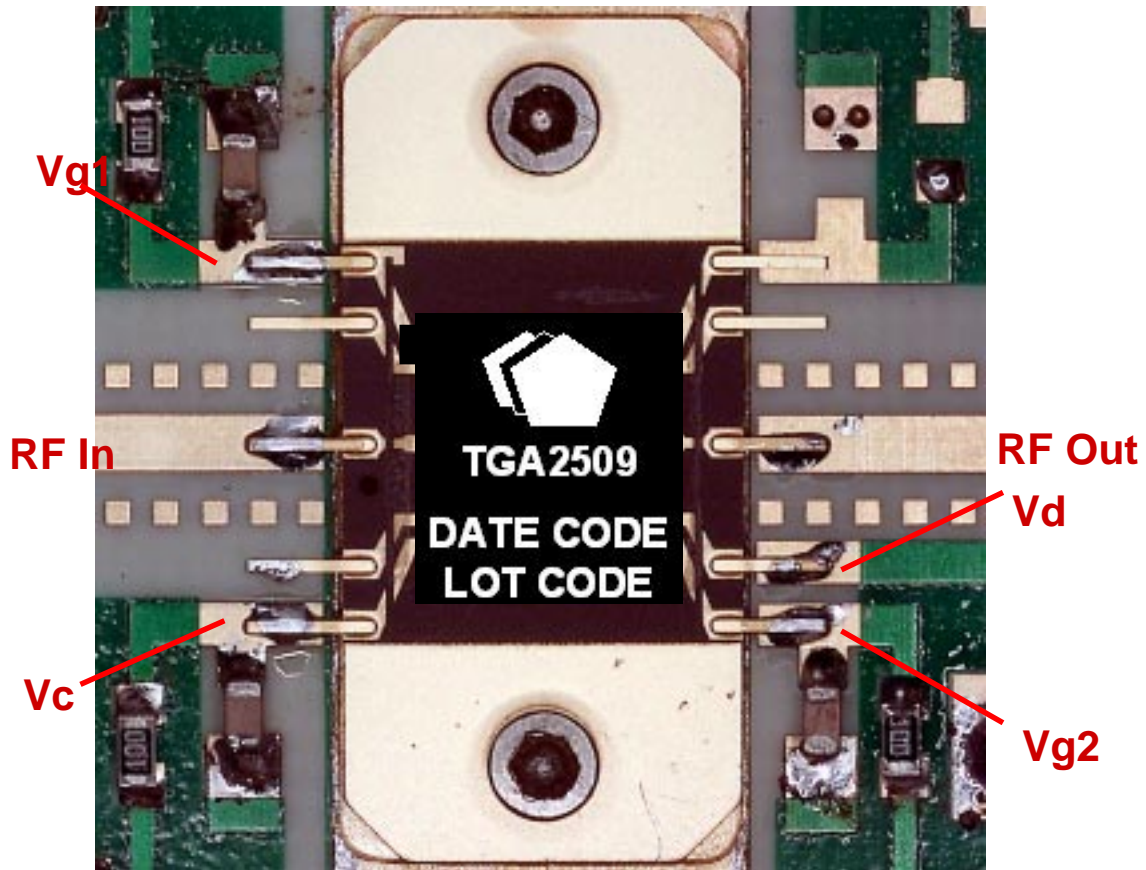
Note: Units are in inches.

Package size tolerance  $\pm 0.005$  in.

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

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## 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).

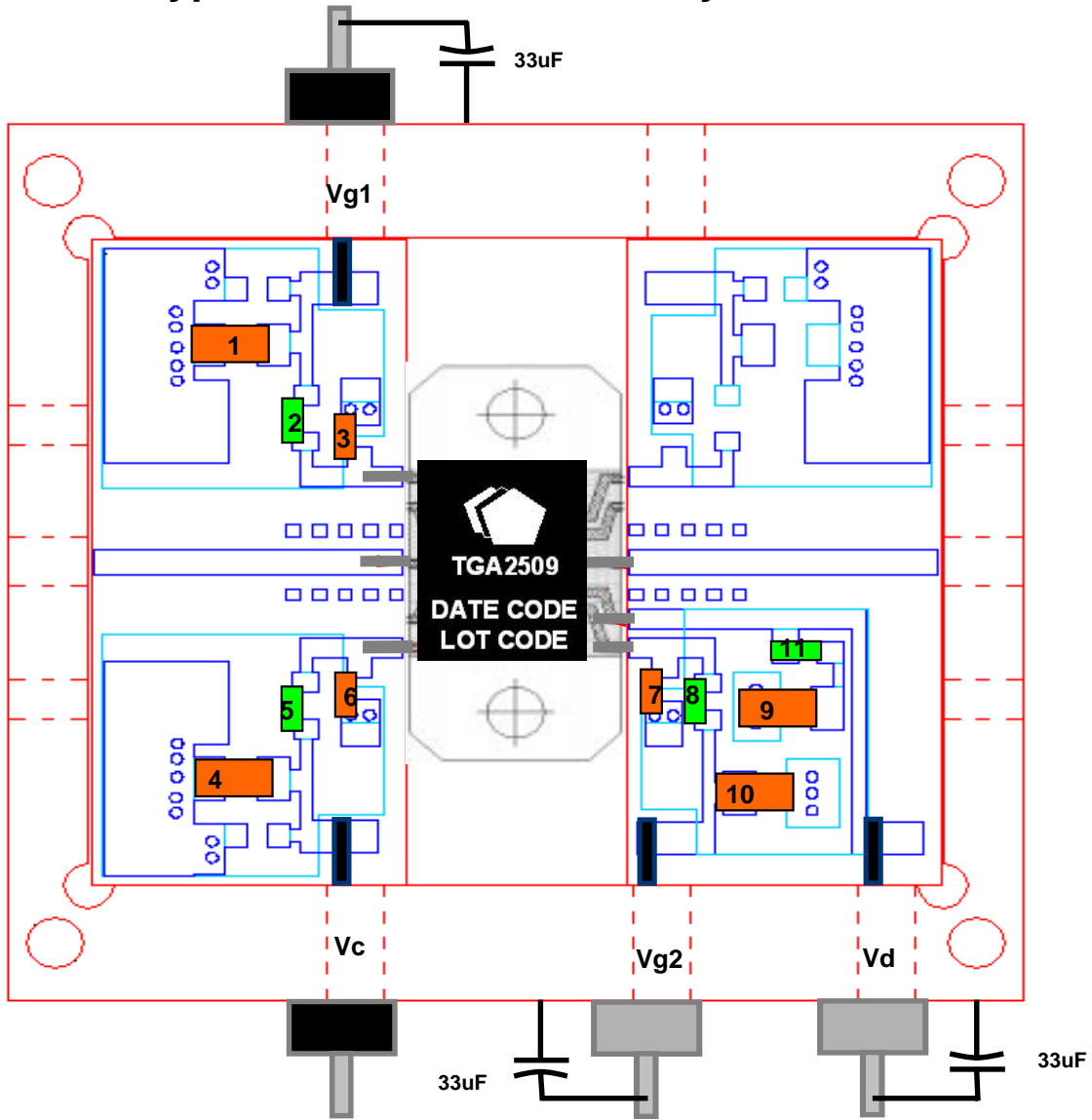
#### For biasing with AGC control:

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.

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

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**Typical Evaluation Board Layout \***



| COMPONENT  | VALUE   |
|------------|---------|
| 1, 4, 9,10 | 1 uF    |
| 2, 5, 8    | 10 Ω    |
| 3, 6, 7    | 0.01 uF |
| 11         | 100 Ω   |

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

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## **Assembly of a TGA2509-EPU 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 using two # 0-80 bolts to attach a heat sink 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.
4. Clean the assembly with alcohol.

### **Ordering Information**

| <b>Part</b>   | <b>Package Style</b>       |
|---------------|----------------------------|
| TG2509-EPU-FL | Flange (Leads bolted down) |

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

*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.*