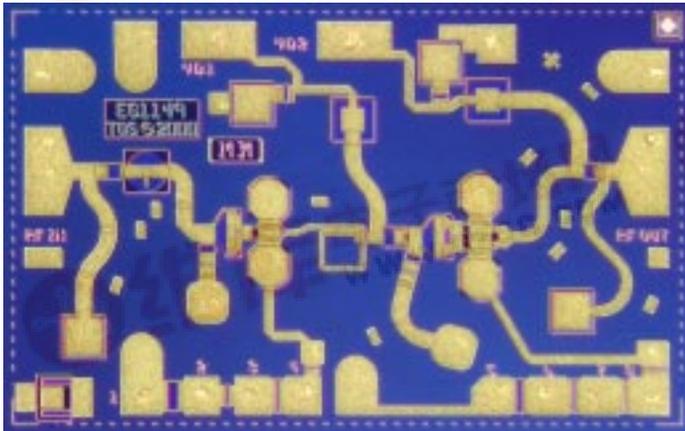


17-21 GHz Medium Power Amplifier TGA9088A-SCC



Chip Dimensions 2.4mm x 1.5 mm x 0.1mm

Key Features and Performance

- 0.25um PHEMT Technology
- 17-21GHz Frequency Range
- 22 dBm @ P2dB Nominal Pout
- 18.5 dB Nominal Gain
- IRL>18 dB, ORL>10 dB
- 7V, 66mA Self Bias

Primary Applications

- Satellite Systems
- Point-to-Point Radio

Description

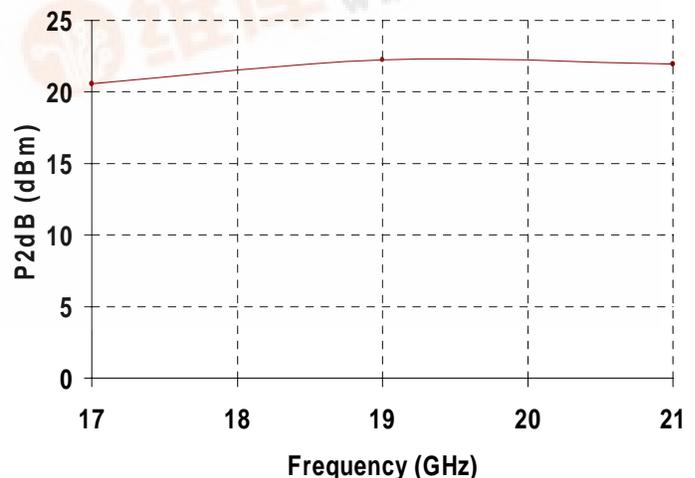
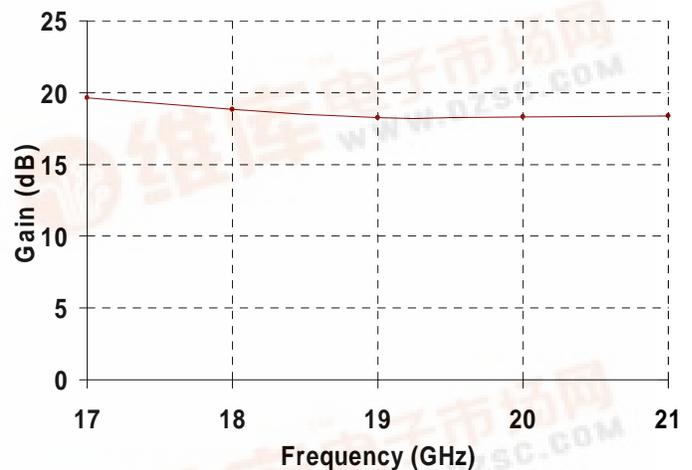
The TriQuint TGA9088A-SCC is a 17-21 GHz 0.125 Watt self-biased Medium Power Amplifier in MMIC form. The part is designed using TriQuint's proven standard 0.25 um gate PHEMT production process with 100 um substrate technology.

This MPA provides a nominal 22 dBm of output power at 2 dB gain compression with a nominal small signal gain of 18.5 dB.

The part provides an economical solution for a 20 GHz driver and provides application solutions for the Satellite and Point-to-Point Radio markets

The TGA9088A-SCC is 100% DC and RF tested on-wafer to ensure performance compliance.

Typical Electrical Characteristics 7V, 66mA Self Bias



**TABLE I
MAXIMUM RATINGS 6/**

| SYMBOL | PARAMETER | VALUE | NOTES |
|-----------|-------------------------------------|---------------|--------------|
| V^+ | Positive Supply Voltage | 8 V | <u>4/</u> |
| I^+ | Positive Supply Current (Quiescent) | 90 mA | <u>5/ 4/</u> |
| $ I_G $ | Gate Supply Current | 3.5 mA | |
| P_{IN} | Input Continuous Wave Power | 17 dBm | |
| P_D | Power Dissipation | 0.615 W | <u>3/ 4/</u> |
| T_{CH} | Operating Channel Temperature | 150 °C | <u>1/ 2/</u> |
| T_M | Mounting Temperature (30 Seconds) | 320 °C | |
| T_{STG} | Storage Temperature | -65 to 150 °C | |

- 1/ These ratings apply to each individual FET.
- 2/ 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.
- 3/ When operated at this bias condition with a base plate temperature of 70 °C ($T_{ch} = 149.27^\circ\text{C}$), the median life is reduced from 6.9E+6 to 1.1E+6 hrs.
- 4/ Combinations of supply voltage, supply current, input power, and output power shall not exceed P_D .
- 5/ Total current for the entire MMIC.
- 6/ These ratings represent the maximum operable values for this device.

**TABLE II
DC PROBE TESTS
($T_A = 25^\circ\text{C}$ Nominal)**

| SYMBOL | PARAMETER | MINIMUM | MAXIMUM | VALUE |
|--------------|-------------------------------|---------|---------|-------|
| I_{max1} | Maximum Current | 56 | 102 | mA |
| G_{M1} | Transconductance | 33 | 80 | mS |
| $V_{P1,2}$ | Pinch-off Voltage | -1.5 | -0.5 | V |
| $V_{BVG S1}$ | Breakdown Voltage gate-source | -30 | -8 | V |
| $V_{BVG D1}$ | Breakdown Voltage gate-drain | -30 | -12 | V |

TABLE III
ON-WAFER RF PROBE CHARACTERISTICS
 (T_A = 25 °C Nominal)
 Self Bias V_d = 7 V

| SYMBOL | PARAMETER | TEST CONDITION 45mA ≤ I _d ≤ 80mA | LIMIT | | | UNITS |
|--------|-----------------------------------|--|-------|------|-----|-------|
| | | | MIN | TYP | MAX | |
| Gain | Small Signal Gain | F = 17 – 21 GHz* | 16 | 18.5 | --- | dB |
| IRL | Input Return Loss | F = 17 – 21 GHz* | --- | -15 | -7 | dB |
| ORL | Output Return Loss | F = 17 – 21 GHz* | --- | -13 | -6 | dB |
| P2dB | Output Power @ 2dB Compression | F = 17 GHz** | 17 | 19 | --- | dBm |
| | | F = 19 - 21 GHz** | 20 | 22 | --- | |

* S-parameter data is taken at 1GHz step size.

** Power data is taken at 2 GHz step size.

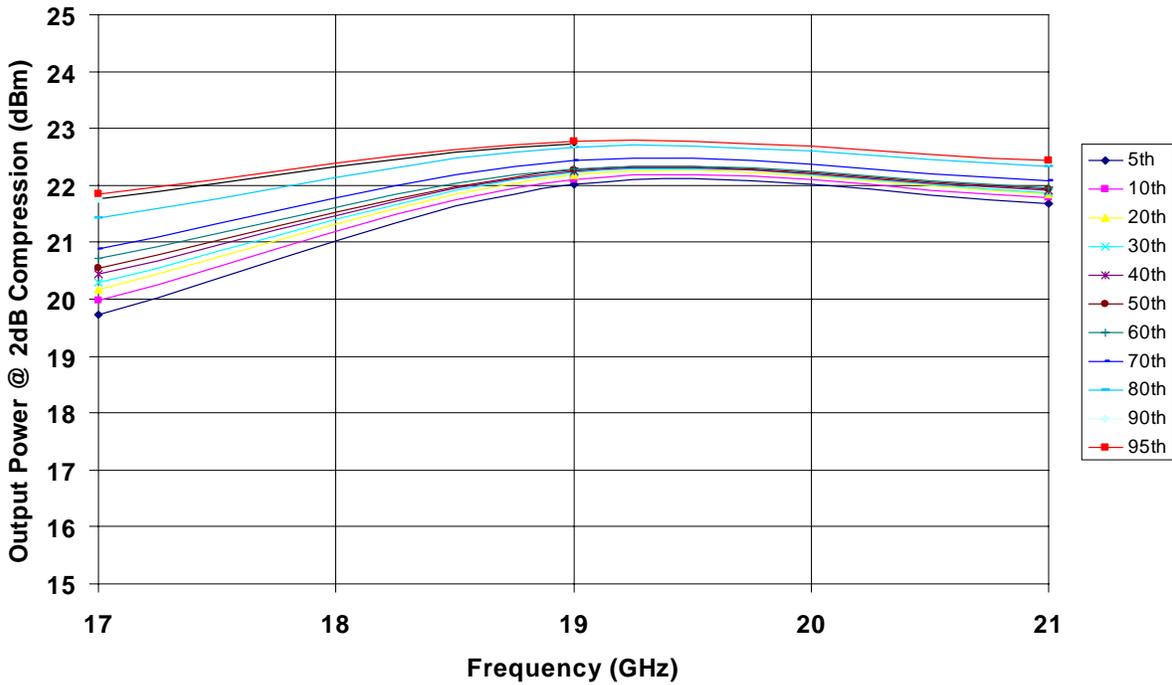
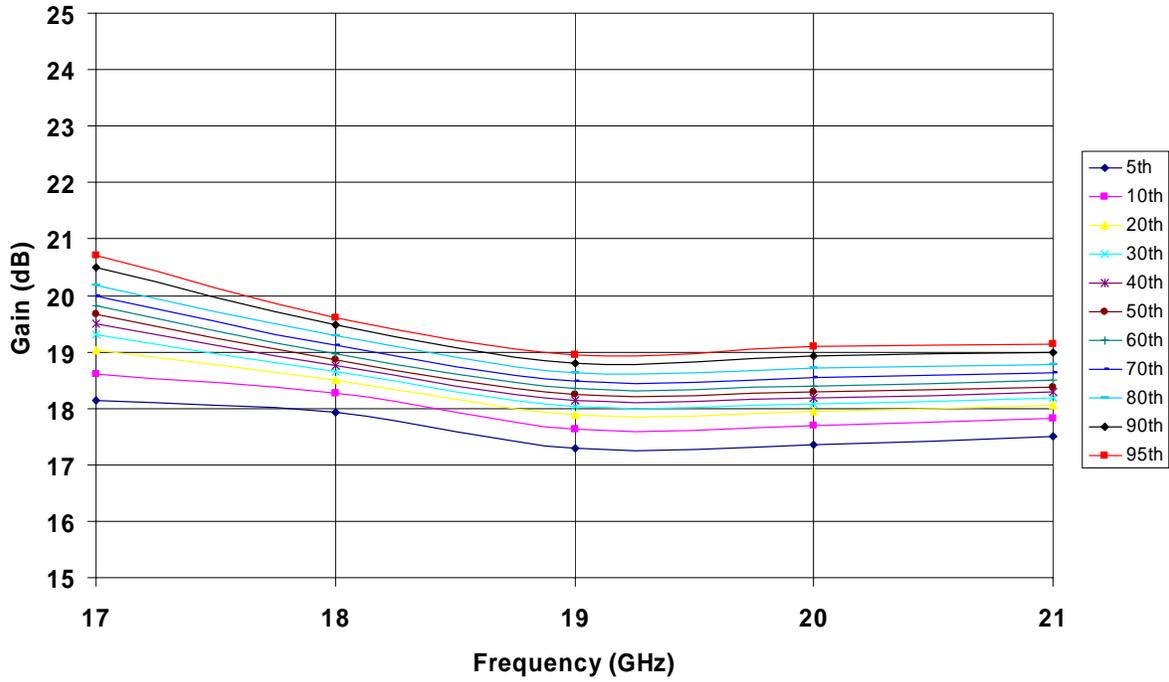
TABLE IV
THERMAL INFORMATION*

| PARAMETER | TEST CONDITIONS | T _{CH} (°C) | R _{θJC} (°C/W) | T _M (HRS) |
|--|---|-------------------------|----------------------------|-------------------------|
| R _{θJC} Thermal Resistance (channel to backside of carrier) | V _d = 7 V I _D = 66 mA Self Bias P _{diss} = 0.462 W | 128.35 | 126.30 | 6.9E+6 |

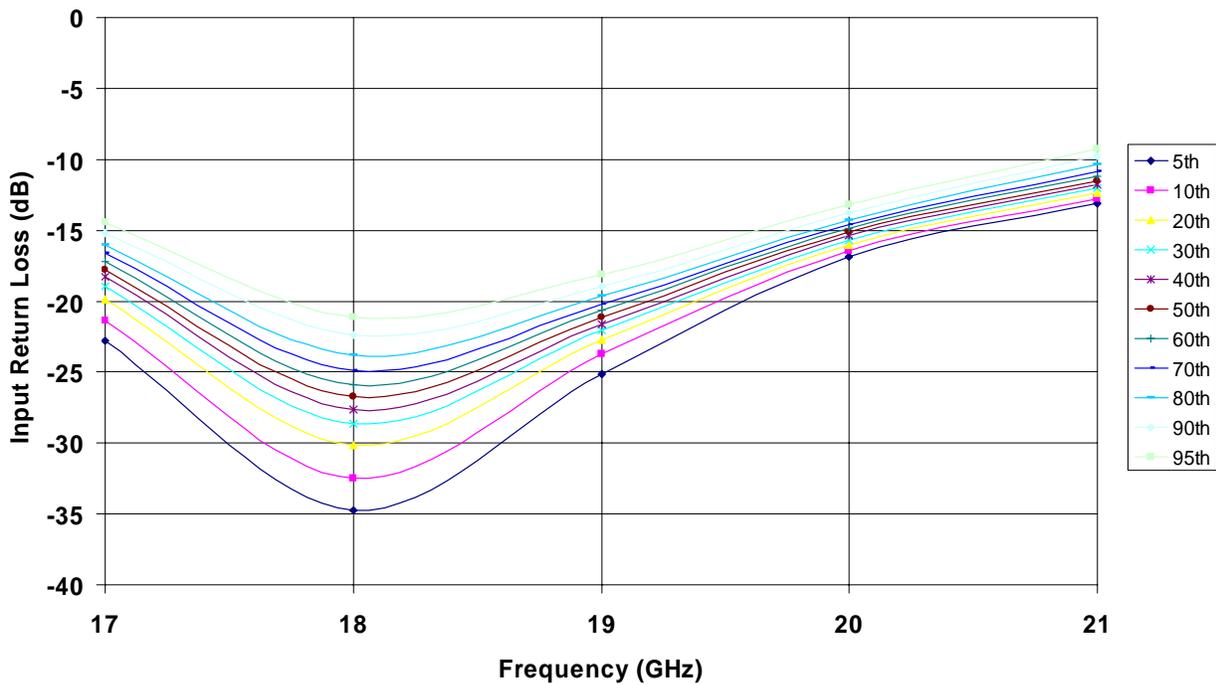
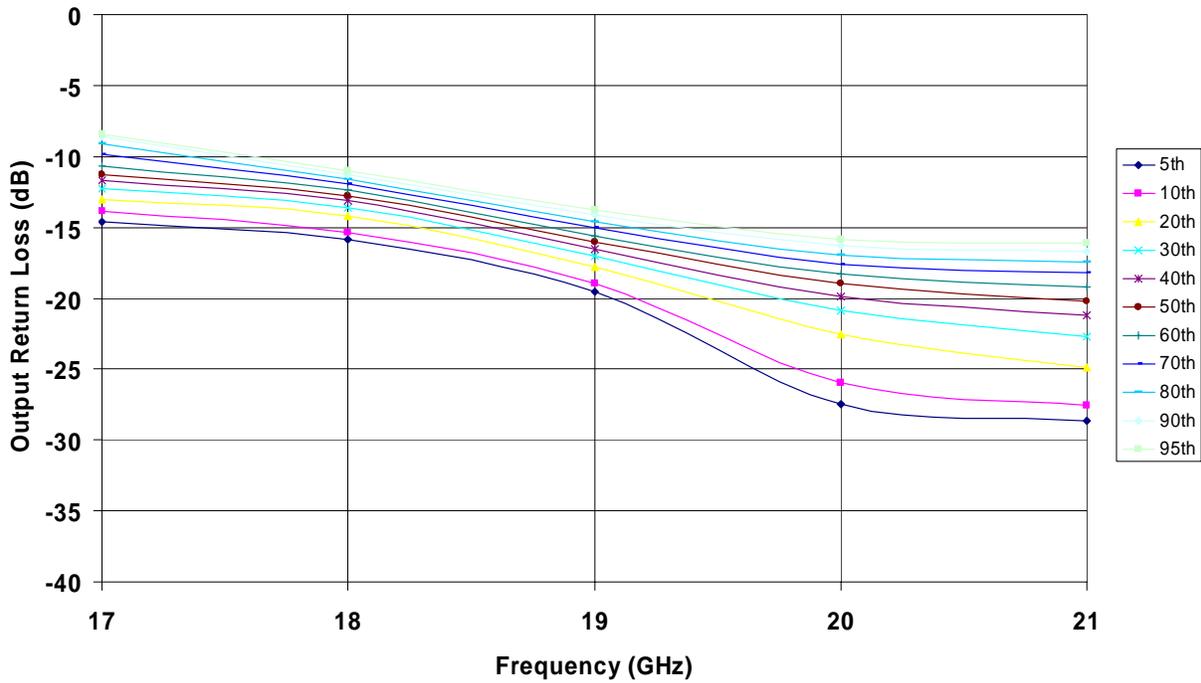
Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn Solder mounted to a 20 mil CuMo Carrier at 70°C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

* This information is a result of a thermal model.

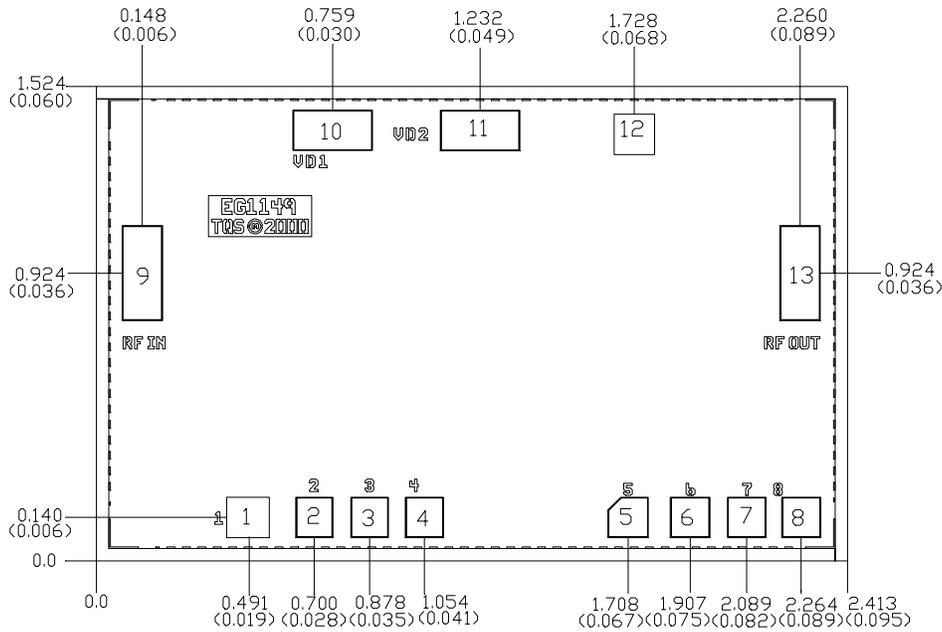
Typical On-Wafer Electrical Characteristics
7V, 66mA Self Bias



Typical On-Wafer Electrical Characteristics
7V, 66mA Self Bias



Mechanical Drawing



Units: millimeters (inches)

Thickness: 0.100 (0.004)

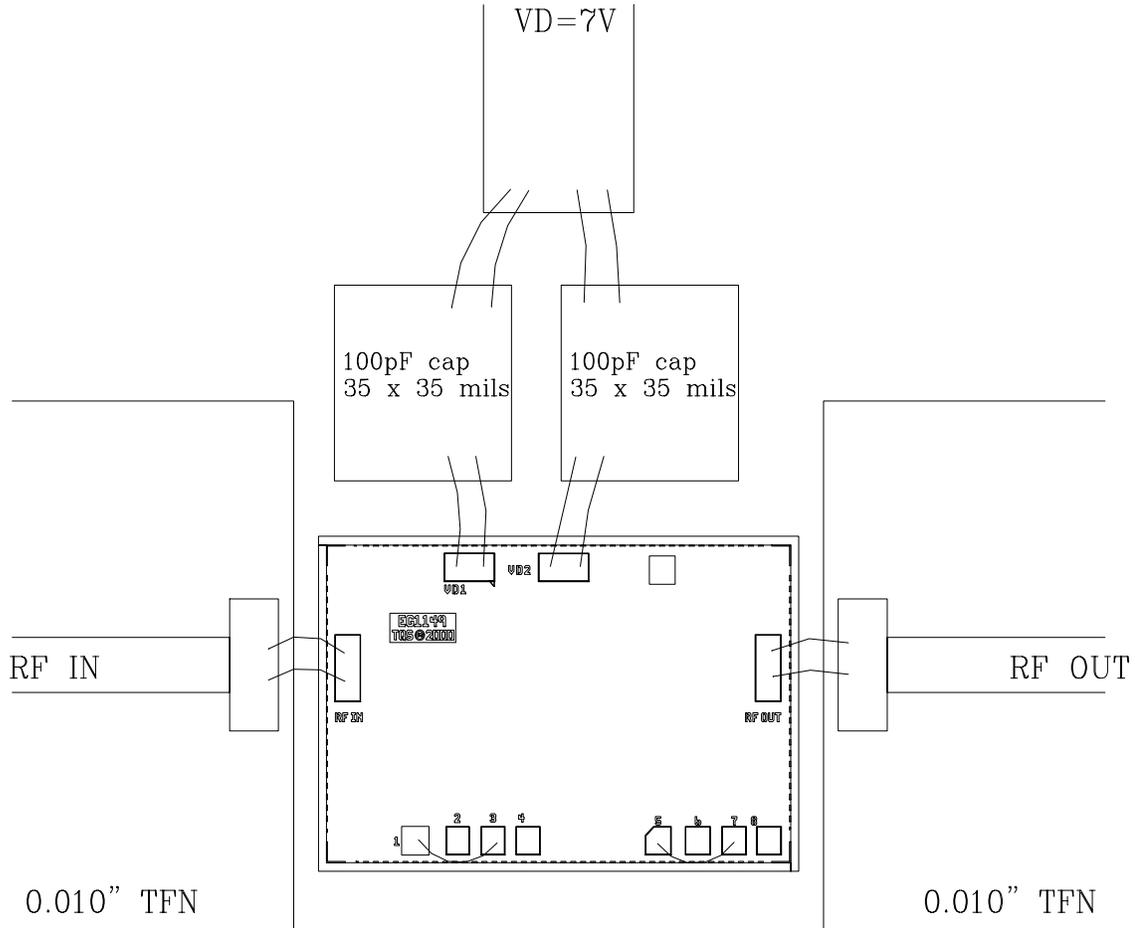
Chip edge to bond pad dimensions are shown to center of bond pad

Chip size tolerance: +/- 0.051 (0.002)

| | |
|--|---------------|
| Bond pad #1 (DC GND) | 0.130 x 0.137 |
| Bond pad #2 (Alternate bonding connection) | 0.114 x 0.125 |
| Bond pad #3 (Alternate bonding connection) | 0.116 x 0.125 |
| Bond pad #4 (Alternate bonding connection) | 0.118 x 0.125 |
| Bond pad #5 (DC GND) | 0.125 x 0.125 |
| Bond pad #6 (Alternate bonding connection) | 0.125 x 0.123 |
| Bond pad #7 (Alternate bonding connection) | 0.125 x 0.119 |
| Bond pad #8 (Alternate bonding connection) | 0.125 x 0.121 |
| Bond pad #9 (RF input) | 0.125 x 0.300 |
| Bond pad #10 (VD1) | 0.125 x 0.250 |
| Bond pad #11 (VD2) | 0.125 x 0.250 |
| Bond pad #12 (DC GND) | 0.125 x 0.125 |
| Bond pad #13 (RF output) | 0.125 x 0.300 |

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

Chip Assembly Diagram



This configuration is for a self-bias logic pad current search with connections for bin G06. See Table V for alternate pad connections corresponding with the bins number listed.

TABLE V
PAD CONNECTIONS

| NUMBER | CONNECTION 1 | CONNECTION 2 | BINS |
|--------|----------------|----------------|------|
| 1 | None | None | G01 |
| 2 | Pad 3 to Pad 4 | Pad 7 to Pad 8 | G02 |
| 3 | Pad 2 to Pad 3 | Pad 6 to Pad 7 | G03 |
| 4 | Pad 2 to Pad 4 | Pad 6 to Pad 8 | G04 |
| 5 | Pad 1 to Pad 2 | Pad 5 to Pad 6 | G05 |
| 6 | Pad 1 to Pad 3 | Pad 5 to Pad 7 | G06 |
| 7 | Pad 1 to Pad 4 | Pad 5 to Pad 8 | G07 |

Assembly Process Notes

Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300°C.
- An alloy station or conveyor furnace with reducing atmosphere should be used.
- No fluxes should be utilized.
- Coefficient of thermal expansion matching is critical for long-term reliability.
- Devices must be stored in a dry nitrogen atmosphere.

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 can be used in low-power applications.
- Curing should be done in a convection oven; proper exhaust is a safety concern.
- Microwave or radiant curing should not be used because of differential heating.
- Coefficient of thermal expansion matching is critical.

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.
- Discrete FET devices with small pad sizes should be bonded with 0.0007-inch wire.
- Maximum stage temperature is 200°C.

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