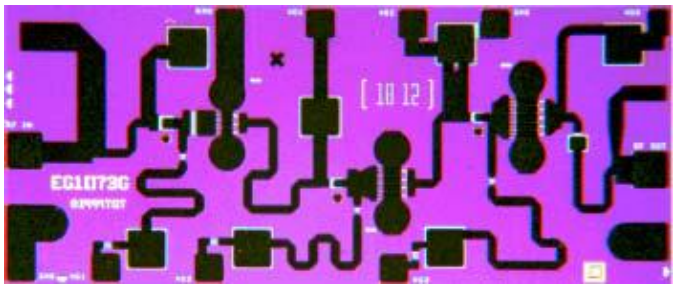
# TGA1073G-SCC

***19 to 27 GHz Medium Power Amplifier***

## Applications

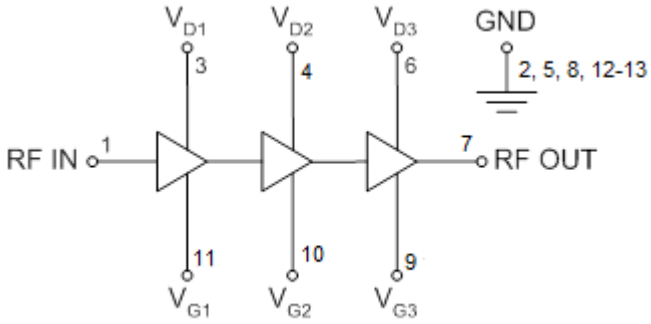
- Point-to-Point Radio
- Point-to-Multipoint Communications



## Product Features

- 0.25 µm pHEMT Technology
- 22 dB Nominal Gain
- 25 dBm Nominal $P_{OUT}$ at P1dB
- Bias: 5 to 7 V at 220 mA
- Chip Dimensions: 2.55 x 1.15 mm

## Functional Block Diagram




## General Description

The TriQuint TGA1073G-SCC is a three stage MPA MMIC design using TriQuint's proven 0.25 µm Power pHEMT process. The TGA1073G-SCC is designed to support a variety of millimeter wave applications including point-to-point digital radio and point-to-multipoint communications.

The three stage design consists of a 200 µm input device driving a 480 µm interstage device followed by an 800 µm output device.

The TGA1073G-SCC provides 25 dBm nominal output power at 1 dB compression across 19 to 27 GHz. Typical small signal gain is 22 dB.

The TGA1073G-SCC requires minimum off-chip components. Each device is 100% DC and RF tested on-wafer to ensure performance compliance. The device is available in chip form.

## Pin Configuration

| Pin No. | Label |
|---|---|
| 1 | RF IN |
| 2, 5, 8, 12-13 | GND |
| 3 | $V_{D1}$ |
| 4 | $V_{D2}$ |
| 6 | $V_{D3}$ |
| 7 | RF OUT |
| 9 | $V_{G3}$ |
| 10 | $V_{G2}$ |
| 11 | $V_{G1}$ |

## Ordering Information

| Part No. | ECCN | Description |
|---|---|---|
| TGA1073G-SCC | EAR99 | 19 to 27 GHz Medium PA |

## Absolute Maximum Ratings

| Parameter | Rating |
|---|---|
| Positive Supply Voltage ($V^+$) (3) | 8 V |
| Positive Supply Current ($I^+$) (1)(3) | 296 mA |
| Negative Supply Current ($I^-$) (1) | 8.8 mA |
| Input Continuous Wave Power ($P_{IN}$) (3) | 18.2 dBm |
| Power Dissipation ($P_D$) (2)(3) | 1.32 W |
| Mounting Temperature (30 seconds) | 320°C |
| Storage Temperature ($T_{STG}$) | −65 to 150°C |

Operation of this device outside the parameter ranges given above may cause permanent damage.

Notes:
1. Total current for all stages.
2. When operated at this bias condition with a baseplate temperature of 55°C, the median lifetime ($T_M$) is 1 x 10^6 hours.
3. Combinations of supply voltage, supply current, input power, and output power shall not exceed $P_D$.

## Recommended Operating Conditions

| Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|
| Operating Channel Temperature ($T_{CH}$) (1)(2) | | 200 | | °C |

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

Notes:
1. These ratings apply to each individual FET.
2. Junction operating temperature will directly affect the device median lifetime ($T_M$). For maximum life, it is recommended that junction temperatures be maintained to the lowest possible levels.

## DC Electrical Specifications

Test conditions unless otherwise noted: STD, 25°C Nominal

| Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|
| $I_{DSS3}$ | 80 | | 376 | mA |
| $G_{M3}$ | 176 | | 424 | mS |
| $\|V_{P1}\|$ (1) | 0.5 | | 1.5 | V |
| $\|V_{P2}\|$ (1) | 0.5 | | 1.5 | V |
| $\|V_{P3}\|$ (1) | 0.5 | | 1.5 | V |
| $\|V_{BVGD1}\|$ (1) | 11 | | 30 | V |
| $\|V_{BVGS1}\|$ (1) | 11 | | 30 | V |

Notes:
1. $V_P$, $V_{BVGD}$, and $V_{BVGS}$ are negative.
2. The measurement conditions are subject to change at the manufacturer's discretion (with appropriate notification to the buyer).

## RF Electrical Specifications

Test conditions unless otherwise noted: $T_A$ = 25°C, Nominal, $V_D$ = 6 V, $I_D$ = 220 mA.

| Test | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Small-Signal Gain Magnitude (1) | 19 GHz<br>20 to 25 GHz | 16<br>19 | 20<br>23 | | dB |
| Power Output at 1 dB Gain Compression | 20 GHz<br>22 GHz<br>23.5 GHz | 21<br>24<br>24 | 23<br>25<br>26 | | dBm |
| Input Return Loss Magnitude (1) | 19 to 25 GHz | | −20 | | dB |
| Output Return Loss Magnitude (1) | 19 to 25 GHz | | −15 | | dB |
| Output Third Order Intercept (2) | | | 32 | | dBm |

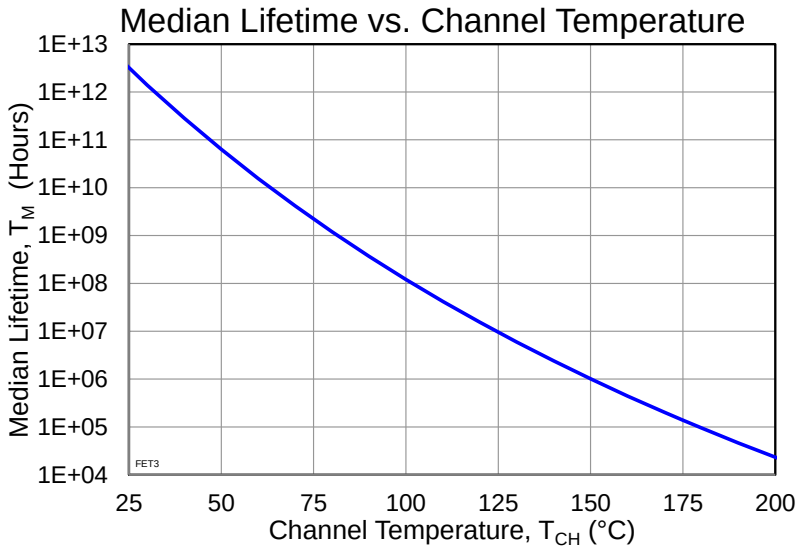
Notes:
1. RF probe data is taken at 1 GHz steps.
2. Minimum output third-order-intercept (OTOI) is generally 6 dB minimum above the 1 dB compression point (P1dB). Calculations are based on standard two-tone testing with each tone approximately 10 dB below the nominal P1dB. Factors that may affect OTOI performance include device bias, measurement frequency, operating temperature, output interface, and output power level for each tone.

## Thermal and Reliability Information

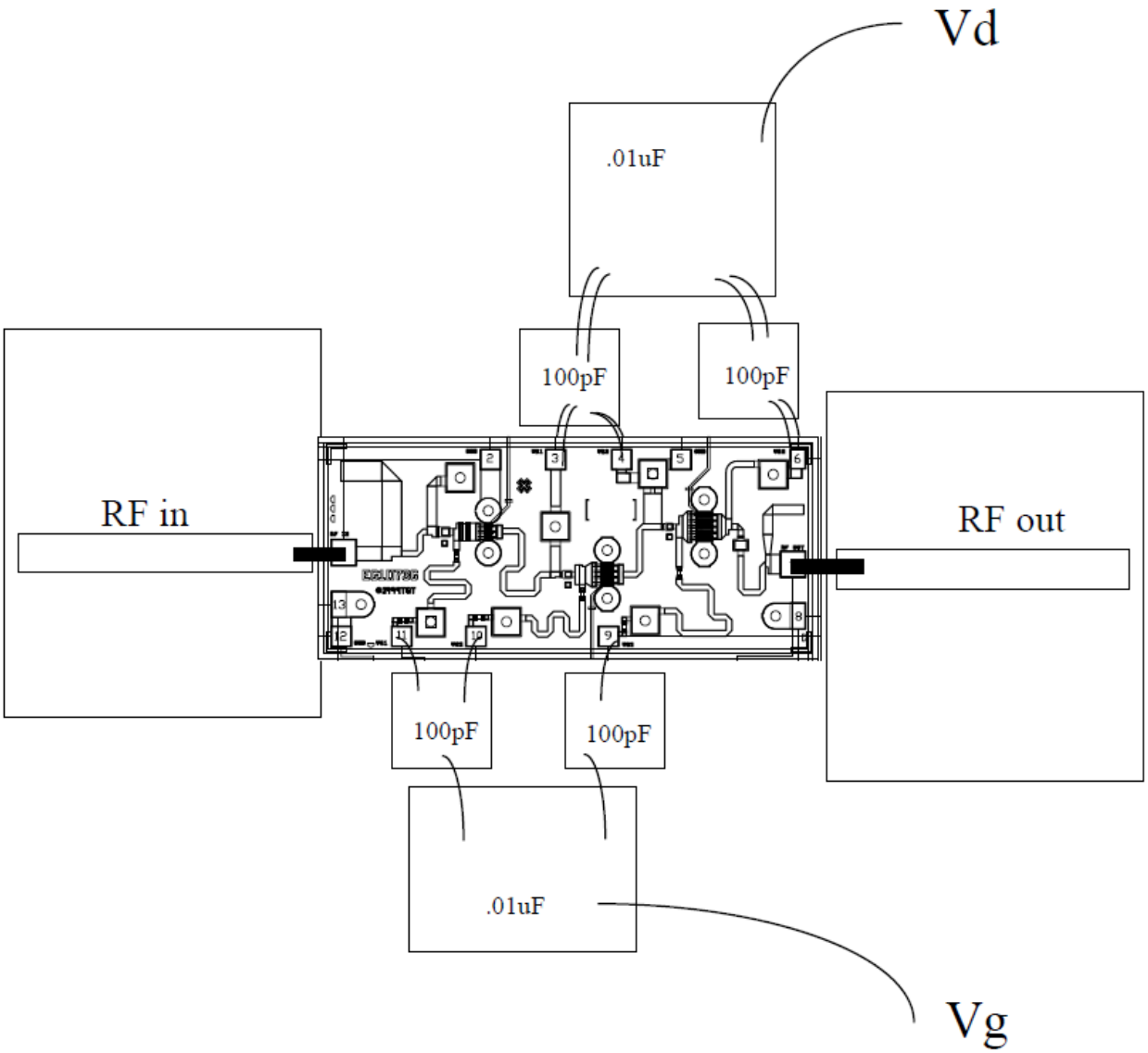
| Parameter | Condition | Rating |
|---|---|---|
| Thermal Resistance ($\theta_{JC}$) (1) | $V_D$ = 6 V, $I_D$ = 220 mA, $P_{DISS}$ = 1.32 W | 71.7°C/W |
| Channel Temperature ($T_{CH}$) | | 149.6°C |
| Median Lifetime ($T_M$) | | 1.0 x 10^6 Hours |

Notes:
1. Measured from channel to chip backside.
2. Assumes eutectic attach using 1.5 mil thick 80/20 AuSn mounted to a 20 mil CuMo Carrier at 55°C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

## Median Lifetime

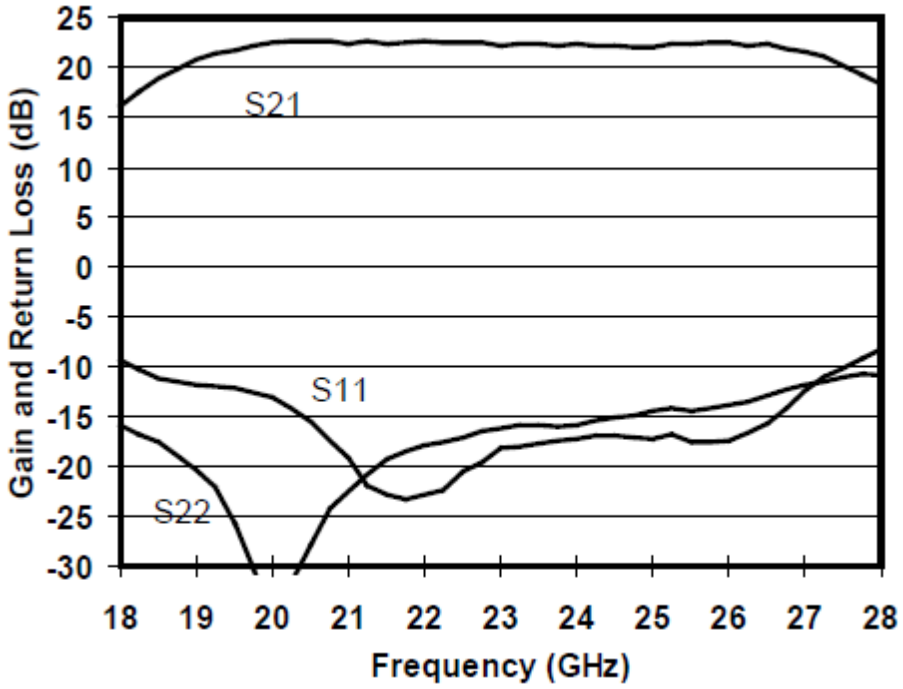


## Chip Assembly and Bonding Diagram

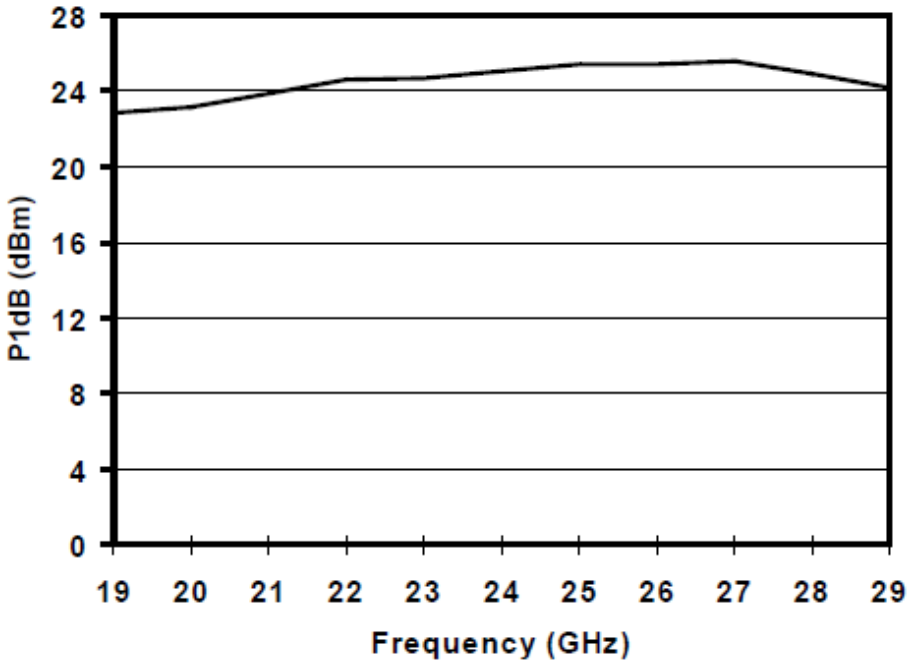


## Performance Plots

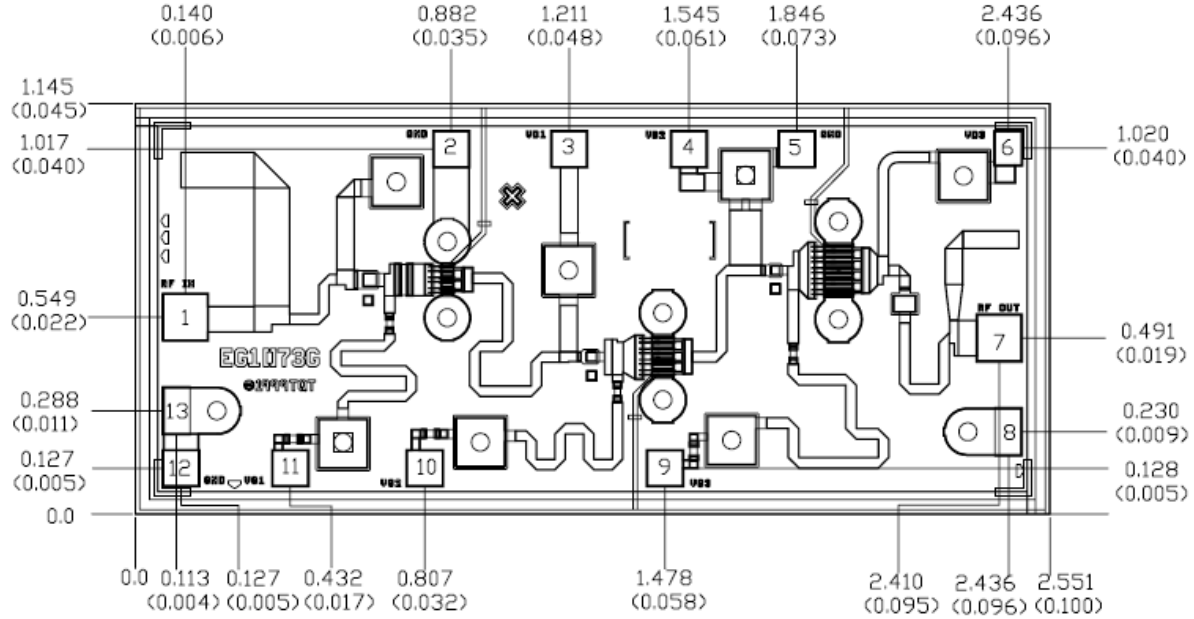
**Gain and Return Loss vs. Frequency**




**P1dB vs. Frequency**



## Mechanical Characteristics




Units: millimeters (inches)
Thickness: 0.1016 (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 (RF Input) | 0.130 x 0.135 (0.005 x 0.005) |
| Bond Pad #2 (GND) | 0.105 x 0.105 (0.004 x 0.004) |
| Bond Pad #3 (VD1) | 0.105 x 0.105 (0.004 x 0.004) |
| Bond Pad #4 (VD2) | 0.105 x 0.105 (0.004 x 0.004) |
| Bond Pad #5 (GND) | 0.105 x 0.105 (0.004 x 0.004) |
| Biond Pad #6 (VD3) | 0.081 x 0.100 (0.003 x 0.004) |
| Bond Pad #7 (RF Output) | 0.130 x 0.135 (0.005 x 0.005) |
| Bond Pad #8 (GND) | 0.078 x 0.136 (0.003 x 0.005) |
| Bond Pad #9 (VG3) | 0.105 x 0.105 (0.004 x 0.004) |
| Bond Pad #10 (VG2) | 0.105 x 0.105 (0.004 x 0.004) |
| Bond Pad #11 (VG1) | 0.105 x 0.105 (0.004 x 0.004) |
| Bond Pad #12 (GND) | 0.105 x 0.105 (0.004 x 0.004) |
| Bond Pad #13 (GND) | 0.105 x 0.105 (0.004 x 0.004) |

Notes:
1. All dimensions are in millimeters (inches). Angles are in degrees.

## Assembly Process Notes

Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300°C for 30 sec.
- 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.

## Product Compliance Information

### ESD Sensitivity Ratings

Caution! ESD-Sensitive Device

ESD Rating: TBD
Value: TBD
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

### ECCN

US Department of Commerce EAR99

## Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations, and information about TriQuint:

**Web:** www.triquint.com **Tel:** +1.972.994.8465
**Email:** info-sales@triquint.com **Fax:** +1.972.994.8504

For technical questions and application information:

**Email:** info-networks@triquint.com

## Important Notice

The information contained herein is believed to be reliable. TriQuint makes no warranties regarding the information contained herein. TriQuint assumes no responsibility or liability whatsoever for any of the information contained herein. TriQuint assumes no responsibility or liability whatsoever for the use of the information contained herein. The information contained herein is provided "AS IS, WHERE IS" and with all faults, and the entire risk associated with such information is entirely with the user. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for TriQuint products. The information contained herein or any use of such information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights, whether with regard to such information itself or anything described by such information.

TriQuint products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death.