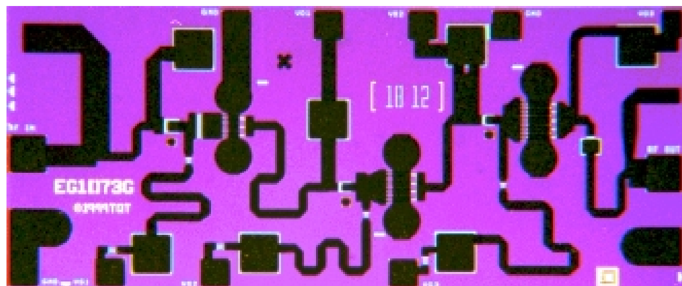
TriQuint SEMICONDUCTOR®

Product Datasheet

August 15, 2000

19 - 27 GHz Medium Power Amplifier TGA1073G-SCC



Key Features and Performance

- 0.25 um pHEMT Technology
- 22 dB Nominal Gain
- 25 dBm Nominal Pout @ P1dB
- Bias 5-7V @ 220 mA
- Chip Dimensions 2.55 mm x 1.15mm

Primary Applications

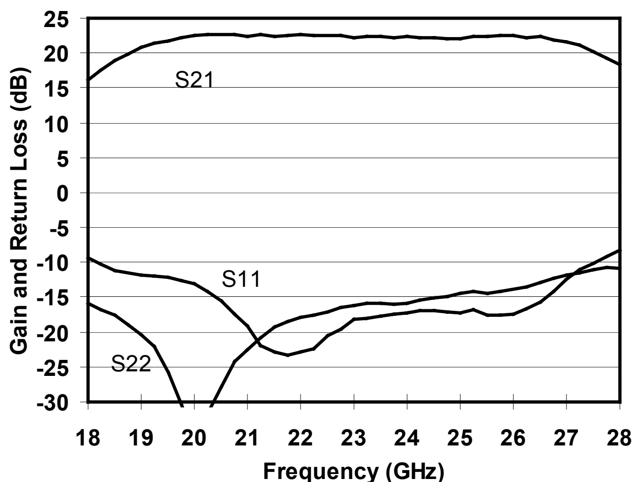
- Point-to-Point Radio
- Point-to-Multipoint Communications

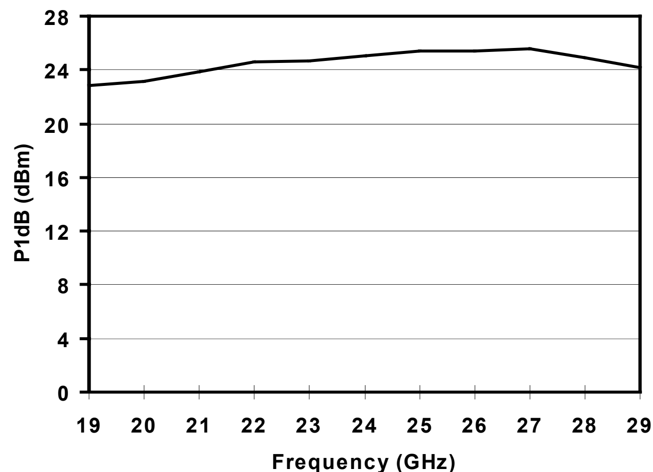
The TriQuint TGA1073G-SCC is a three stage MPA MMIC design using TriQuint's proven 0.25 um Power pHEMT process. The TGA1073G is designed to support a variety of millimeter wave applications including point-to-point digital radio and point-to-multipoint communications.

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

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

The TGA91073G 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.





MAXIMUM RATINGS

SYMBOL	PARAMETER 5/	VALUE	NOTES
V^+	POSITIVE SUPPLY VOLTAGE	8 V	
I^+	POSSITIVE SUPPLY CURRENT	296 mA	1/
P_{IN}	INPUT CONTINUOUS WAVE POWER	23 dBm	4/
P_D	POWER DISSIPATION	2.37 W	
T_{CH}	OPERATING CHANNEL TEMPERATURE	150 ^{0}C	2/ 3/
T_M	MOUNTING TEMPERATURE (30 SECONDS)	320 ^{0}C	
T_{STG}	STORAGE TEMPERATURE	-65 to 150 ^{0}C	

1/ Total current for all stages.

2/ These ratings apply to each individual FET.

3/ 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.

4/ This value reflects an estimate. Actual value will be inserted as soon as it is determined.

5/ These ratings represent the maximum operable values for the device.

DC SPECIFICATIONS (100%)
(T_A = 25 °C ± 5 °C)

NOTES	SYMBOL	TEST CONDITIONS 2/	LIMITS		UNITS
			MIN	MAX	
	I_{DSS3}	STD	80	376	mA
	G_{M3}	STD	176	424	mS
1/	$\|V_{P1}\|$	STD	0.5	1.5	V
1/	$\|V_{P2}\|$	STD	0.5	1.5	V
1/	$\|V_{P3}\|$	STD	0.5	1.5	V
1/	$\|V_{BVGD1}\|$	STD	11	30	V
1/	$\|V_{BVGS1}\|$	STD	11	30	V

1/ V_P, V_{BVGD}, and V_{BVGS} are negative.

2/ The measurement conditions are subject to change at the manufacture's discretion (with appropriate notification to the buyer).

RF SPECIFICATIONS
(T_A = 25°C ± 5°C)

NOTE	TEST	MEASUREMENT CONDITIONS 6V @ 220mA	VALUE			UNITS
			MIN	TYP	MAX	
1/	SMALL-SIGNAL GAIN MAGNITUDE	19 GHz	16	20		dB
		20 – 25 GHz	19	23		dB
	POWER OUTPUT AT 1 dB GAIN COMPRESSION	20 GHz	21	23		dBm
		22 GHz	24	25		dBm
		23.5 GHz	24	26		dBm
1/	INPUT RETURN LOSS MAGNITUDE	19 – 25 GHz		-20		dB
1/	OUTPUT RETURN LOSS MAGNITUDE	19 – 25 GHz		-15		dB
2/	OUTPUT THIRD ORDER INTERCEPT			32		dBm

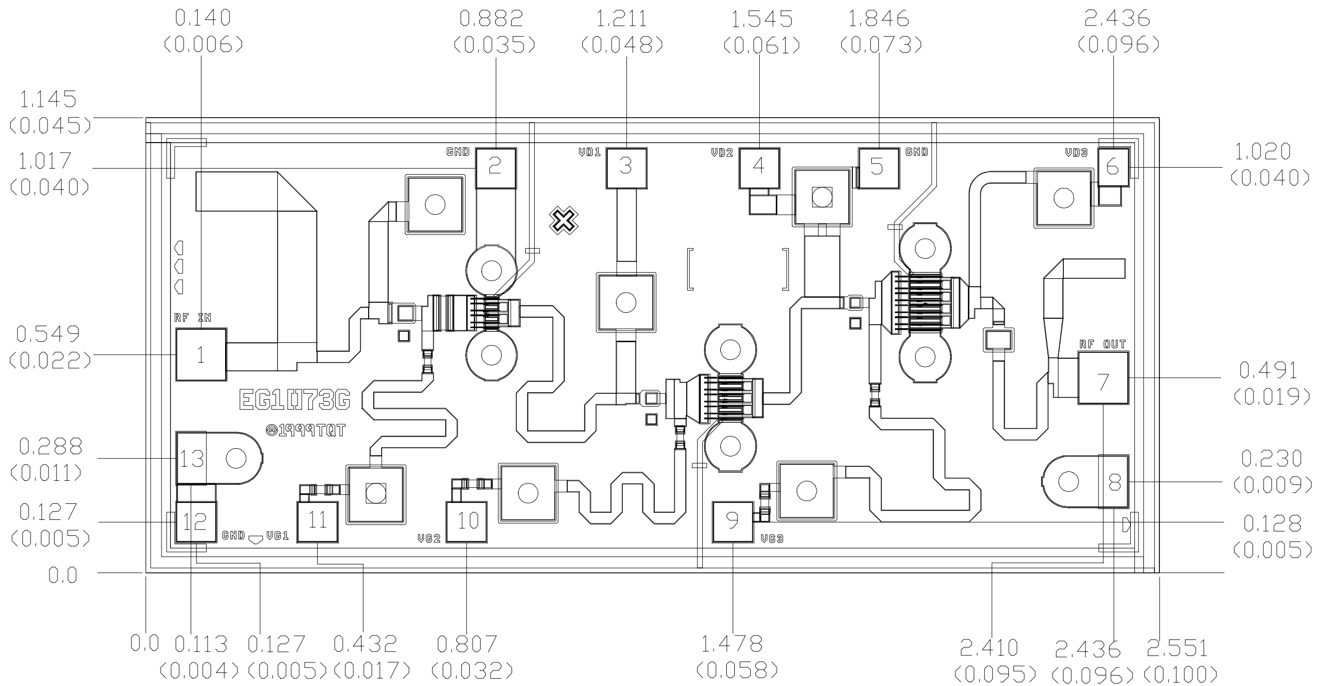
1/ RF probe data is taken at 1 GHz steps.

RELIABILITY DATA

PARAMETER	BIAS CONDITIONS		P_{DISS} (W)	$R_{\theta JC}$ (C/W)	T_{CH} (°C)	T_M (HRS)
	V_D (V)	I_D (mA)				
$R_{\theta JC}$ Thermal resistance (channel to backside of c/p)	6	220	1.32	71.7	149.6	1.0 E6

Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20mil CuMo Carrier at 55°C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

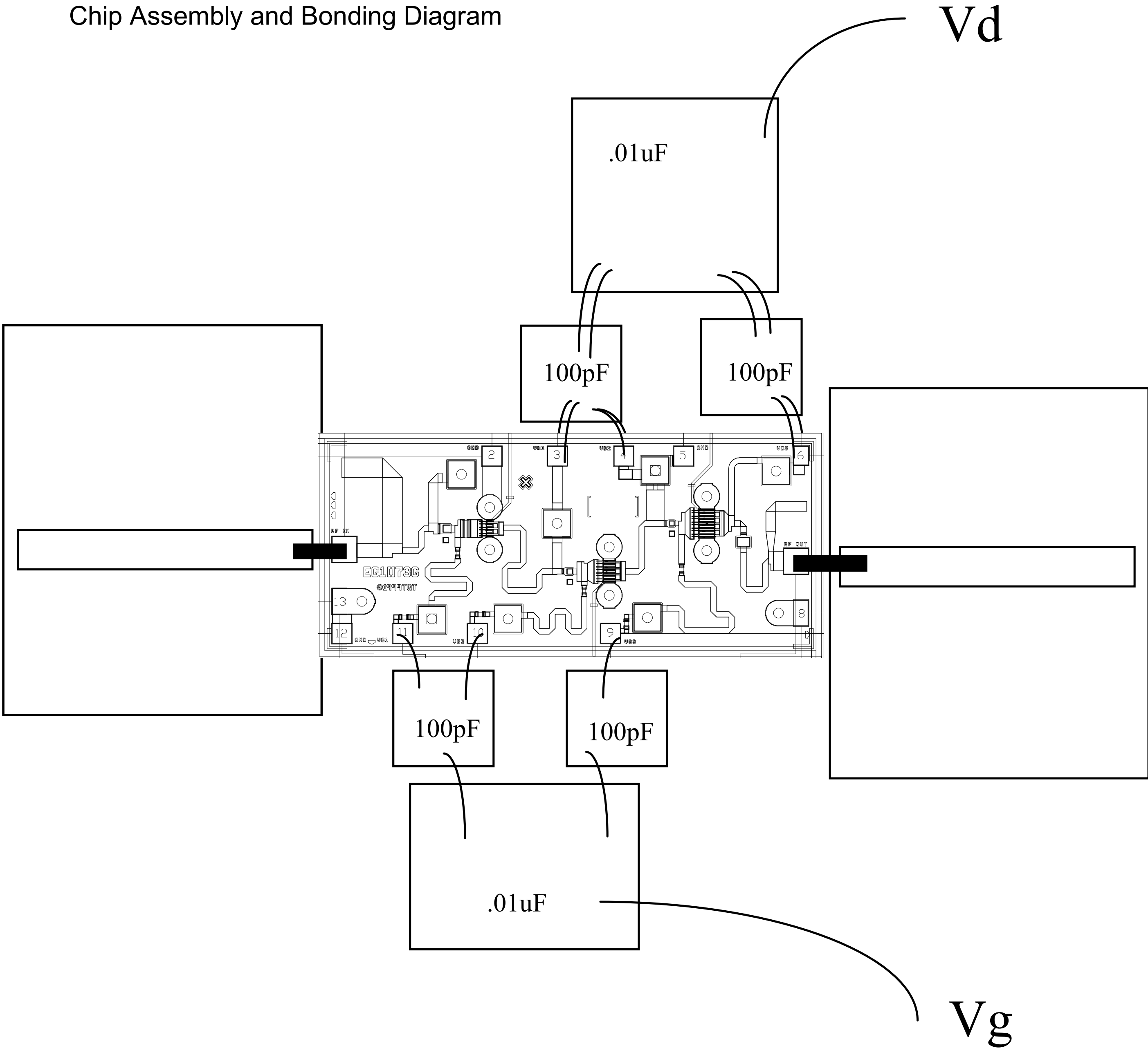
Mechanical Characteristics



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)

Chip Assembly and Bonding Diagram



Reflow process assembly notes:

- AuSn (80/20) solder with limited exposure to temperatures at or above 300°C
- alloy station or conveyor furnace with reducing atmosphere
- no fluxes should be utilized
- coefficient of thermal expansion matching is critical for long-term reliability
- storage in dry nitrogen atmosphere

Component placement and adhesive attachment assembly notes:

- vacuum pencils and/or vacuum collets preferred method of pick up
- avoidance of air bridges during placement
- force impact 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: 200°C

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