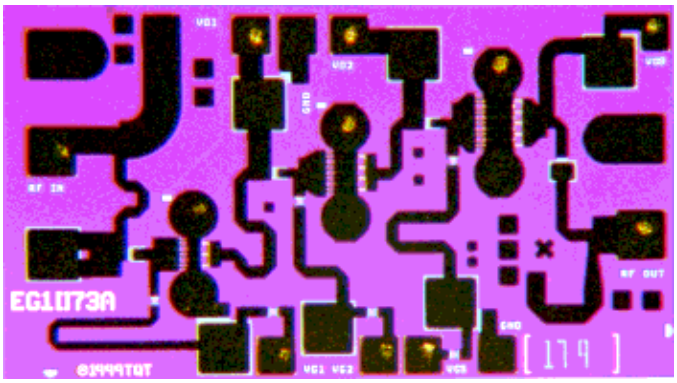
TriQuint SEMICONDUCTOR

Product Datasheet

August 15, 2000

26- 34 GHz Medium Power Amplifier TGA1073A-SCC



Key Features and Performance

- 0.25 um pHEMT Technology
- 19 dB Nominal Gain
- 25 dBm Nominal Pout @ P1dB
- -34.5 dBc IMR3 @ 15.5 dBm SCL
- Bias 5 - 7V @ 220 mA
- Chip Dimensions 1.95 mm x 1.12 mm

Primary Applications

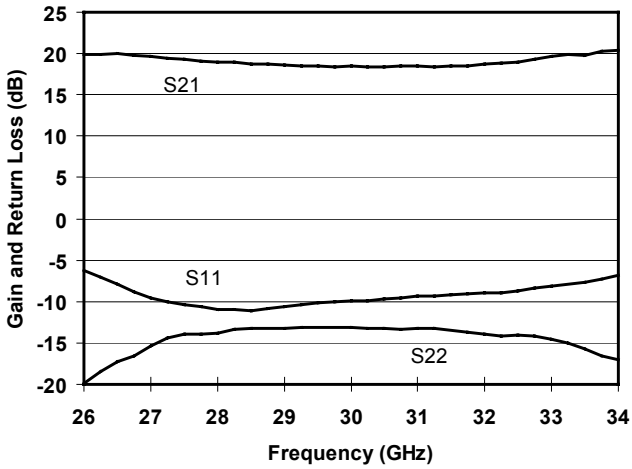
- Point-to-Point Radio
- Point-to-Multipoint Communications
- LMDS CPE PA

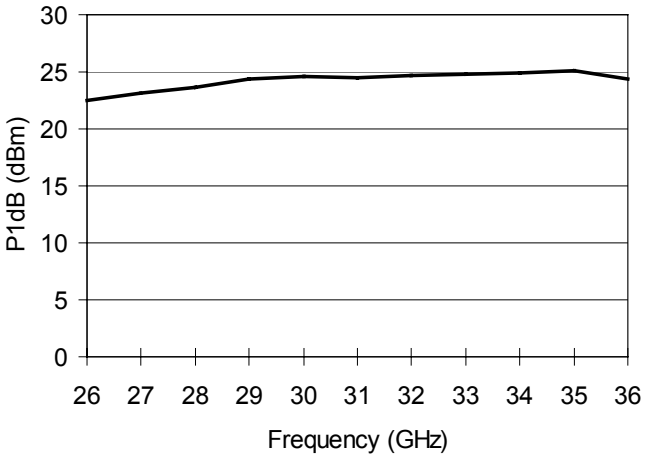
The TriQuint TGA1073A-SCC is a three stage MPA MMIC design using TriQuint's proven 0.25 um Power pHEMT process. The TGA1073A is designed to support a variety of millimeter wave applications including point-to-point digital radio and LMDS/LMCS.

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

The TGA1073A provides 25dBm nominal output power at 1dB compression across 26-34GHz. Typical small signal gain is 19 dB.

The TGA1073A 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^+	POSITIVE 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_{MAX3}	STD	300	516	mA
	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	26 – 33 GHz	17	19		dB
	POWER OUTPUT AT 1 dB GAIN COMPRESSION	27 GHz	22	24.5		dBm
		28 – 33 GHz	23			dBm
1/	INPUT RETURN LOSS MAGNITUDE	26 – 33 GHz		-15		dB
		28 – 32 GHz			-10	dB
1/	OUTPUT RETURN LOSS MAGNITUDE	26 – 33 GHz		-15		dB
		28 – 32 GHz			-10	dB
2/	OUTPUT THIRD ORDER INTERCEPT			32		dBm

1/ RF probe data is taken at 0.5 GHz steps.

2/ Minimum output third-order-intercept (OTOI) is generally 6dB minimum above the 1dB compression point (P1dB). Calculations are based on standard two-tone testing with each tone approximately 10dB 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.

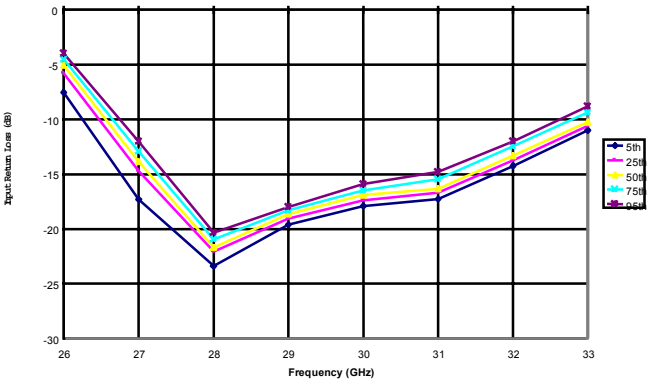
RELIABILITY DATA

PARAMETER	BIAS CONDITIONS		P_{DISS}	$R_{\theta JC}$	T_{CH}	T_M
	V_D (V)	I_D (mA)	(W)	(C/W)	(°C)	(HRS)
$R_{\theta JC}$ Thermal resistance (channel to backside of c/p)	6	220	1.32	69.4	146.6	1.3 E6

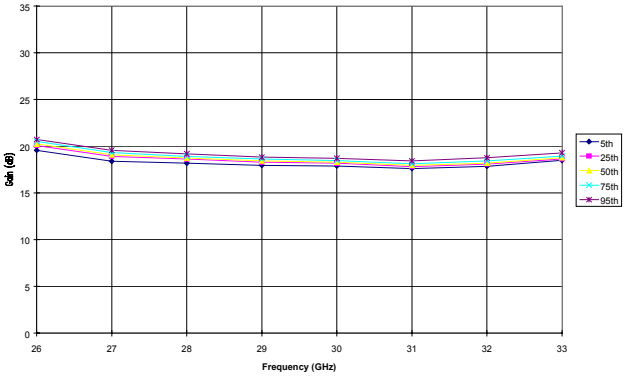
Note: Assumes eutectic attach using 1.5 mil thick 80/20 AuSn mounted to a 20mil CuMo Carrier at 55°C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

TGA1073A - RF Probe Data Summary - S parameters and P1dB
Vd=6V, Id=220mA, Ta=25C

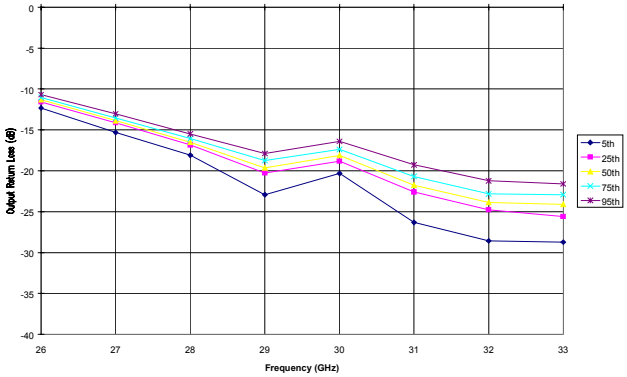
s11



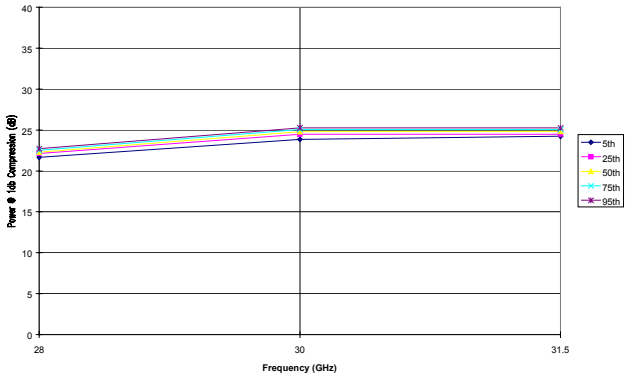
s21



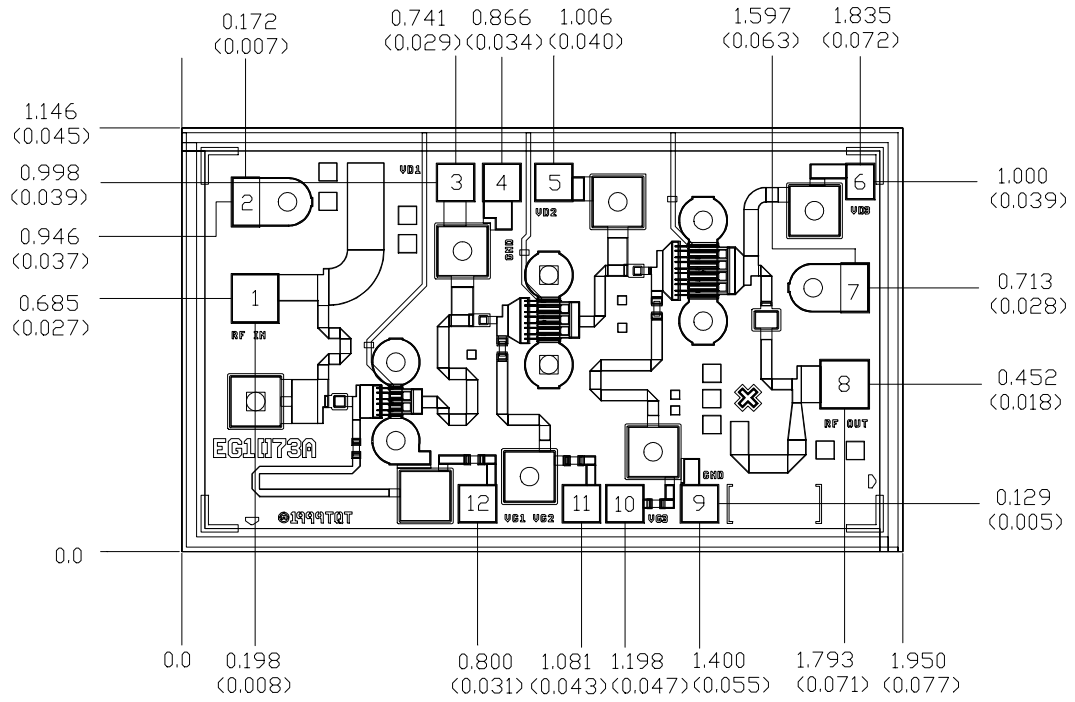
s22



P1dB



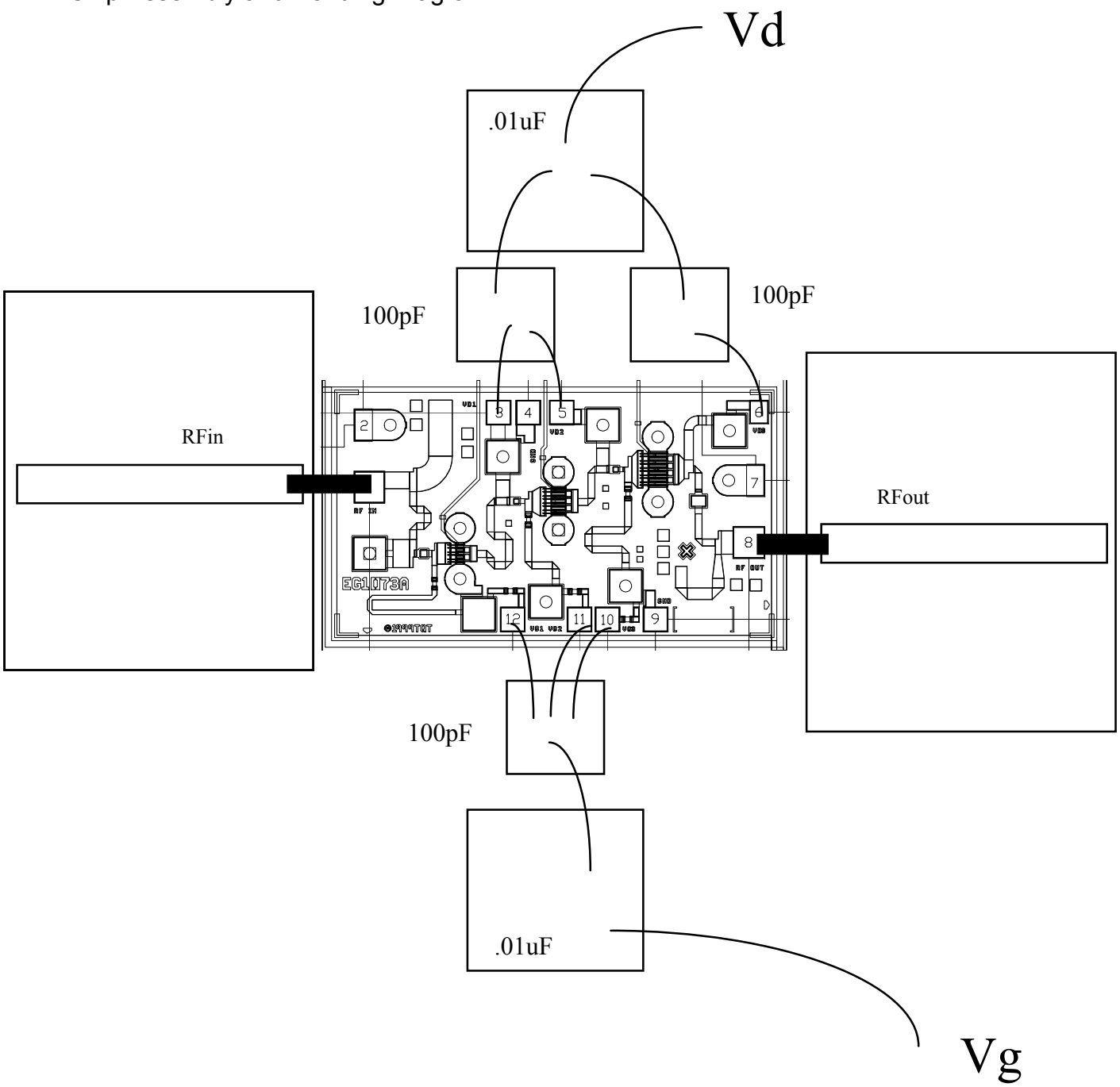
Mechanical Characteristics



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)	0.078 x 0.136 (0.003 x 0.005)
Bond Pad #3 (VD1)	0.105 x 0.105 (0.004 x 0.004)
Bond Pad #4 (GND)	0.105 x 0.105 (0.004 x 0.004)
Bond Pad #5 (VD2)	0.080 x 0.100 (0.003 x 0.004)
Bond Pad #6 (VD3)	0.078 x 0.136 (0.003 x 0.005)
Bond Pad #7 (GND)	0.135 x 0.135 (0.005 x 0.005)
Bond Pad #8 (RF Output)	0.105 x 0.105 (0.004 x 0.004)
Bond Pad #9 (GND)	0.105 x 0.105 (0.004 x 0.004)
Bond Pad #10 (VG3)	0.105x 0.105 (0.004 x 0.004)
Bond Pad #11 (VG2)	0.105 x 0.105 (0.004 x 0.004)
Bond Pad #12 (VG1)	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.