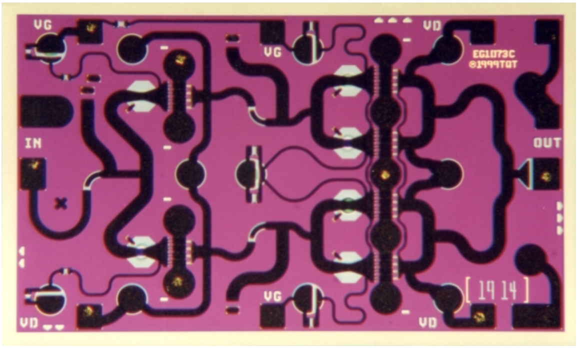
TriQuint SEMICONDUCTOR®

Product Datasheet

August 15, 2000

36 - 40 GHz Power Amplifier TGA1073C-SCC



The TriQuint TGA1073C-SCC is a two stage PA MMIC design using TriQuint's proven 0.25 µm Power pHEMT process to support a variety of millimeter wave applications including point-to-point digital radio and point-to-multipoint systems.

The two-stage design consists of two 400 µm input devices driving four 400 µm output devices.

The TGA1073C provides 24 dBm of output power at 1dB gain compression and 26 dBm saturated output power across the 36-40 GHz with a typical small signal gain of 15 dB.

The TGA1073C requires a minimum of off-chip components. Each device is 100% DC and RF tested on-wafer to ensure performance compliance. The device is available in chip form.

Typical Performance, 36-40 GHz

Parameter	Unit	+5V Supply	+6V Supply	+7V Supply
Small Signal Gain	dB		15	
Gain Flatness	dBpp		1	
Output P1dB	dBm	24	25	26
Saturated Output Power	dBm	26	27	28
Saturated PAE	%	23	22	20
Output OTOI	dBm		34	
IMR3 @ SCL = P1dB - 10dB	dBc		34	
Input Return Loss	dB		-10	
Output Return Loss	dB		-8	
Reverse Isolation	dB		-35	
Quiescent Current	mA	225	240	260

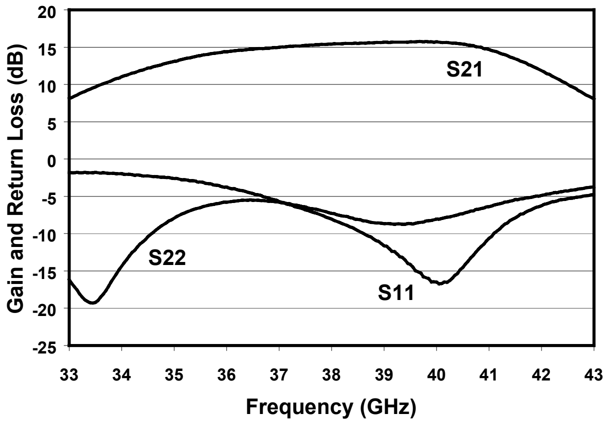
Key Features and Performance

- 0.25um pHEMT Technology
- 36-40 GHz Frequency Range
- 26 dBm Nominal Pout @ P1dB, 38GHz
- 15 dB Nominal Gain
- Bias 5-7V @ 240 mA
- Chip Dimensions 2.4 mm x 1.45 mm

Primary Applications

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

TGA1073C Typical RF Performance (Fixtured)



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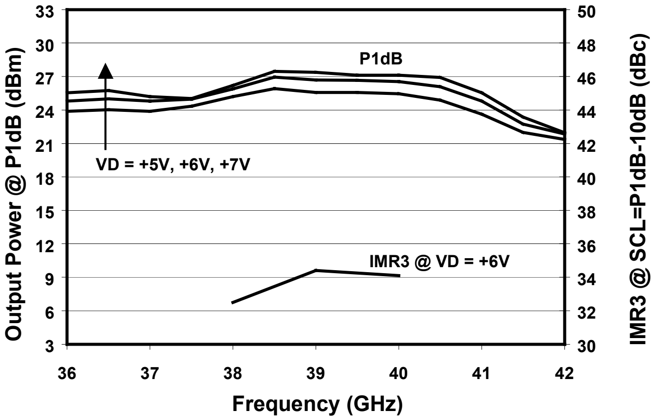


MAXIMUM RATINGS

SYMBOL	PARAMETER 5/	VALUE	NOTES
V^+	POSITIVE SUPPLY VOLTAGE	8 V	
I^+	POSITIVE SUPPLY CURRENT	480 mA	1/
P_{IN}	INPUT CONTINUOUS WAVE POWER	23 dBm	4/
P_D	POWER DISSIPATION	3.84 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 this device.

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

NOTES	SYMBOL	TEST CONDITIONS 2/	LIMITS		UNITS
			MIN	MAX	
	I_{DSS1}	STD	40	188	mA
	G_{M1}	STD	88	212	mS
1/	$\lvert V_{P1}\rvert$	STD	0.5	1.5	V
1/	$\lvert V_{P2}\rvert$	STD	0.5	1.5	V
1/	$\lvert V_{P3-6}\rvert$	STD	0.5	1.5	V
1/	$\lvert V_{BVGD1,2}\rvert$	STD	11	30	V
1/	$\lvert V_{BVGS1}\rvert$	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 @ 240mA	VALUE			UNITS
			MIN	TYP	MAX	
1/	SMALL-SIGNAL GAIN MAGNITUDE	36 – 39 GHz 40 GHz	12 9	15 14		dB dB
	POWER OUTPUT AT 1 dB GAIN COMPRESSION	37 GHz 38.5 GHz 40 GHz	23 23 21	26 26 25		dBm dBm dBm
1/	INPUT RETURN LOSS MAGNITUDE	36 – 40 GHz		-10		dB
1/	OUTPUT RETURN LOSS MAGNITUDE	36 – 40 GHz		-8		dB
	OUTPUT THIRD ORDER INTERCEPT			33		dBm

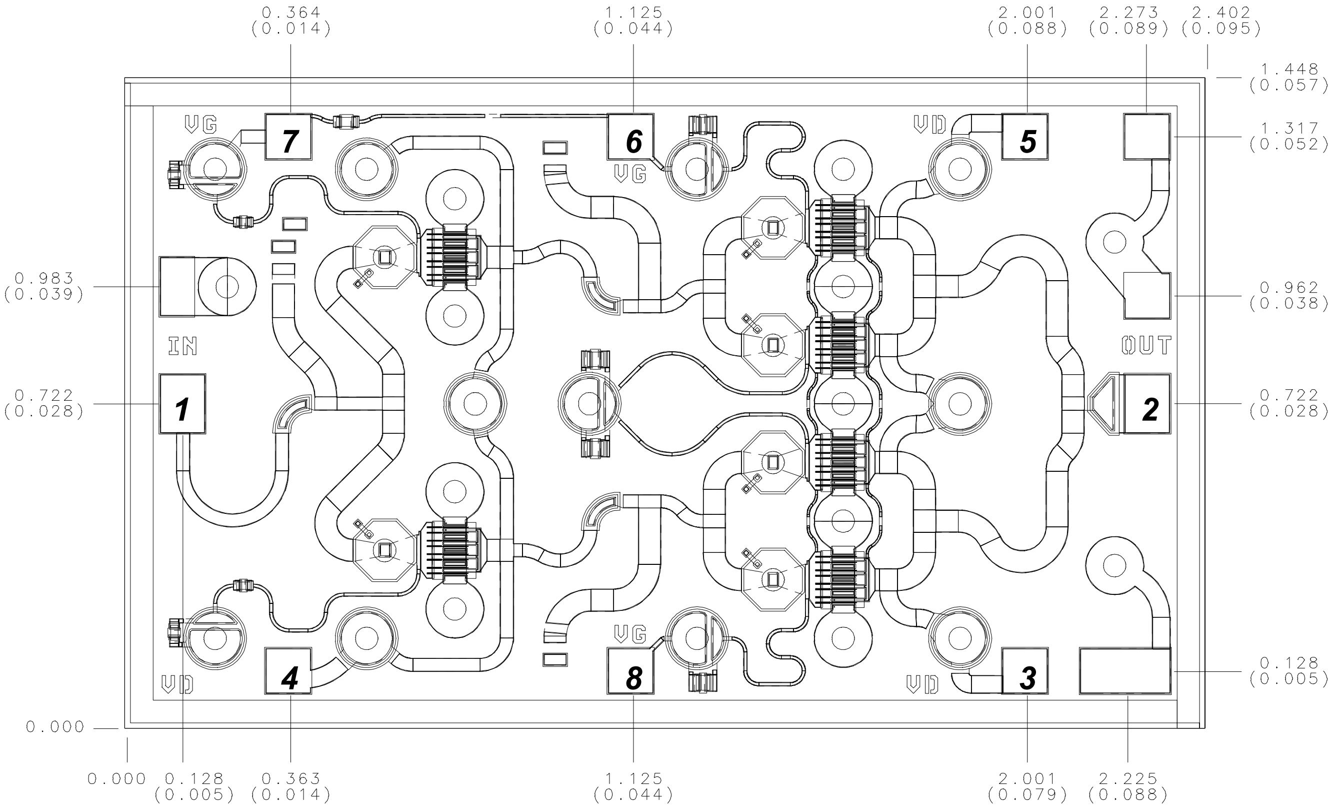
1/ RF probe data is taken at 1 GHz steps.

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	240	1.44	32.43	116.7	2.1 E7

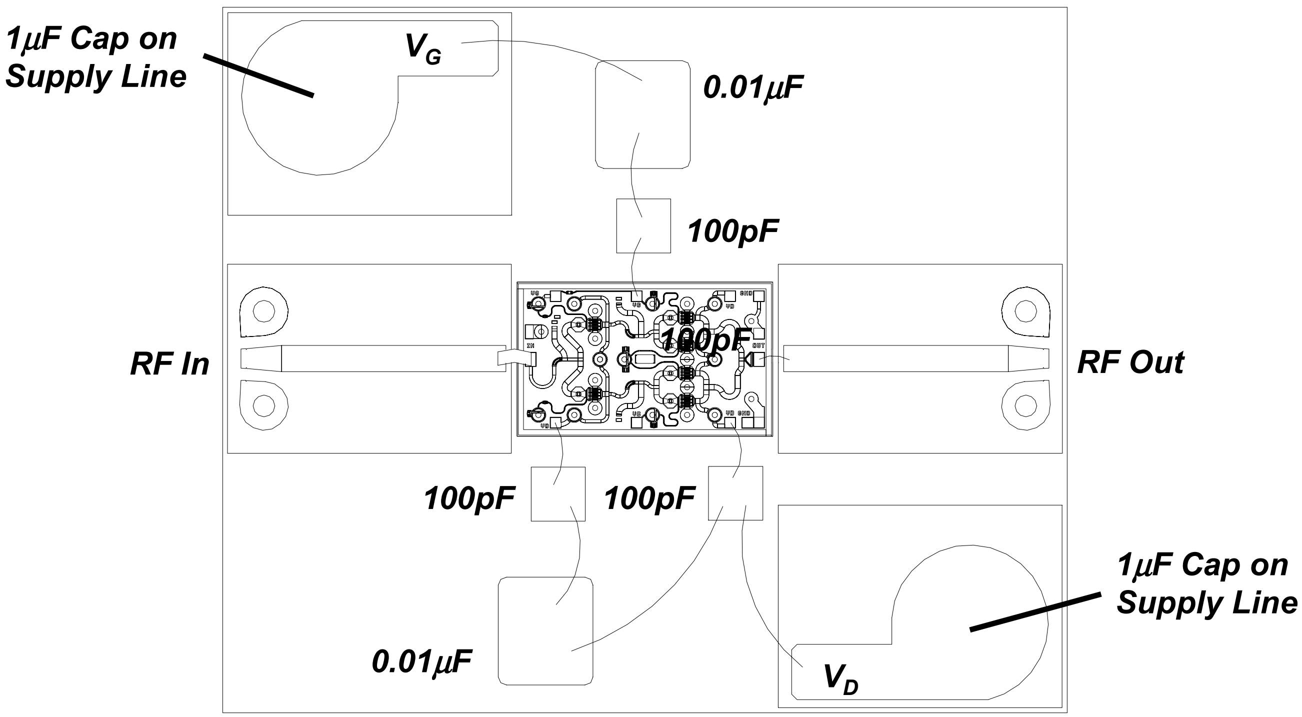
Note: Assumes eutectic attach using 1.5 mil thick 80/20 AuSn mounted to a 20mil CuMo Carrier at 70°C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

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: +/- 0.0508 (0.002)

Bond Pad #1	(RF Input)	0.100 x 0.130 (0.004 x .005)
Bond Pad #2	(RF Output)	0.100 x 0.130 (0.004 x .005)
Bond Pads #3, 4, 5	(VD)	0.100 x 0.100 (0.004 x .004)
Bond Pads #6, 7, 8	(VG)	0.100 x 0.100 (0.004 x .004)



Chip Assembly and Bonding Diagram

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

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

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