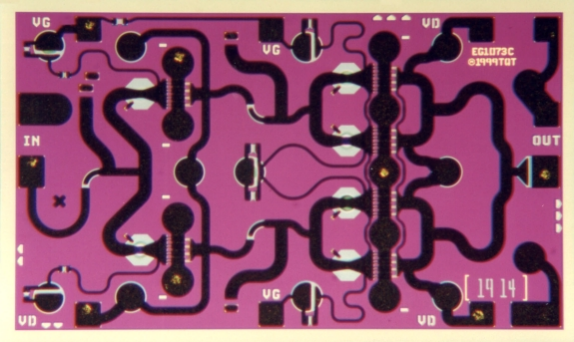
36 to 41 GHz Power Amplifier

TGA1073C-EPU



The TriQuint TGA1073C-EPU 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 36-41 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.

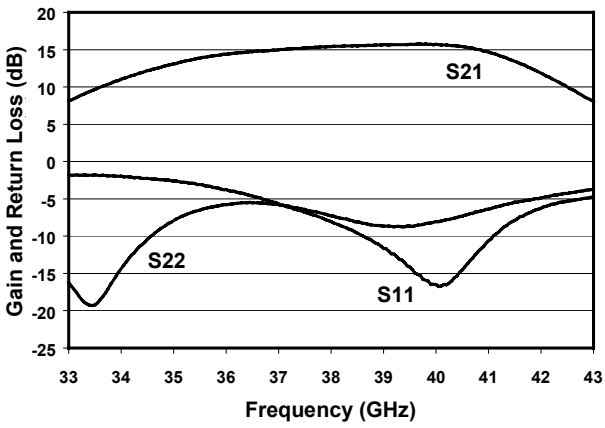
Key Features and Performance

- 0.25um pHEMT Technology
- 36-41 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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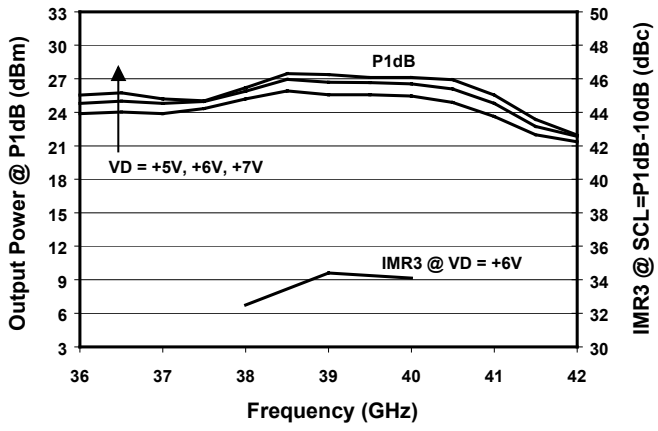

Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.

Electrical Characteristics

RECOMMENDED MAXIMUM RATINGS

Symbol	Parameter	Value	Notes
V^+	Positive Supply Voltage	8 V	
I^+	Positive Supply Current	720 mA	3/
P_D	Power Dissipation	5.76 W	
P_{IN}	Input Continuous Wave Power	23 dBm	
T_{CH}	Operating Channel Temperature	150 °C	1/, 2/
T_M	Mounting Temperature (30 seconds)	320 °C	
T_{STG}	Storage Temperature	-65 °C to 150 °C	

1/ These ratings apply to each individual FET

2/ Junction operating temperature will directly affect the device mean time to failure (MTTF). For maximum life it is recommended that junction temperatures be maintained at the lowest possible levels.

3/ Total current for the entire MMIC

DC PROBE TESTS
(T_A = 25 °C ± 5°C)

Symbol	Parameter	Minimum	Maximum	Value
$Idss_{3-6}$	Saturated Drain Current	100	470	mA/mm
V_{P1-6}	Pinch-off Voltage	-1.5	-0.5	V
BV_{3-6}	Breakdown Voltage gate-source	-30	-8	V
BV_{3-6}	Breakdown Voltage gate-drain	-30	-8	V

ON-WAFER RF PROBE CHARACTERISTICS
(T_A = 25 °C ± 5°C)

Symbol	Parameter	Test Condition Vd=5V, LO=-5dBm	Limit Min	Nom	Max	Units
Gain	Small Signal Gain	F = 35 to 40 GHz Step = 1 GHz		15		dB
IRL	Input Return Loss	F = 35 to 40 GHz Step = 1 GHz		-8		dB
ORL	Output Return Loss	F = 35 to 40 GHz Step = 1 GHz		-6		dB
PWR	Output Power @ P1dB	F = 36 to 40 GHz Step = 2 GHz		24		dBm

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RF-Probe Performance Summary

Frequency	***38 GHz***
Quiescent Point (VD / ID)	***6.0 V / 240 mA***
Small Signal Gain Mean	***15.3 dB***
Small Signal Gain Sigma	***0.39 dB***
Output P1dB Mean	***26.0 dBm***
Output P1dB Sigma	***0.57 dB***
Number of Process Lots	***5***
Number of Wafers	***23***
Number of Devices	***~ 2200***

Typical Performance Over the 36-41 GHz Band

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

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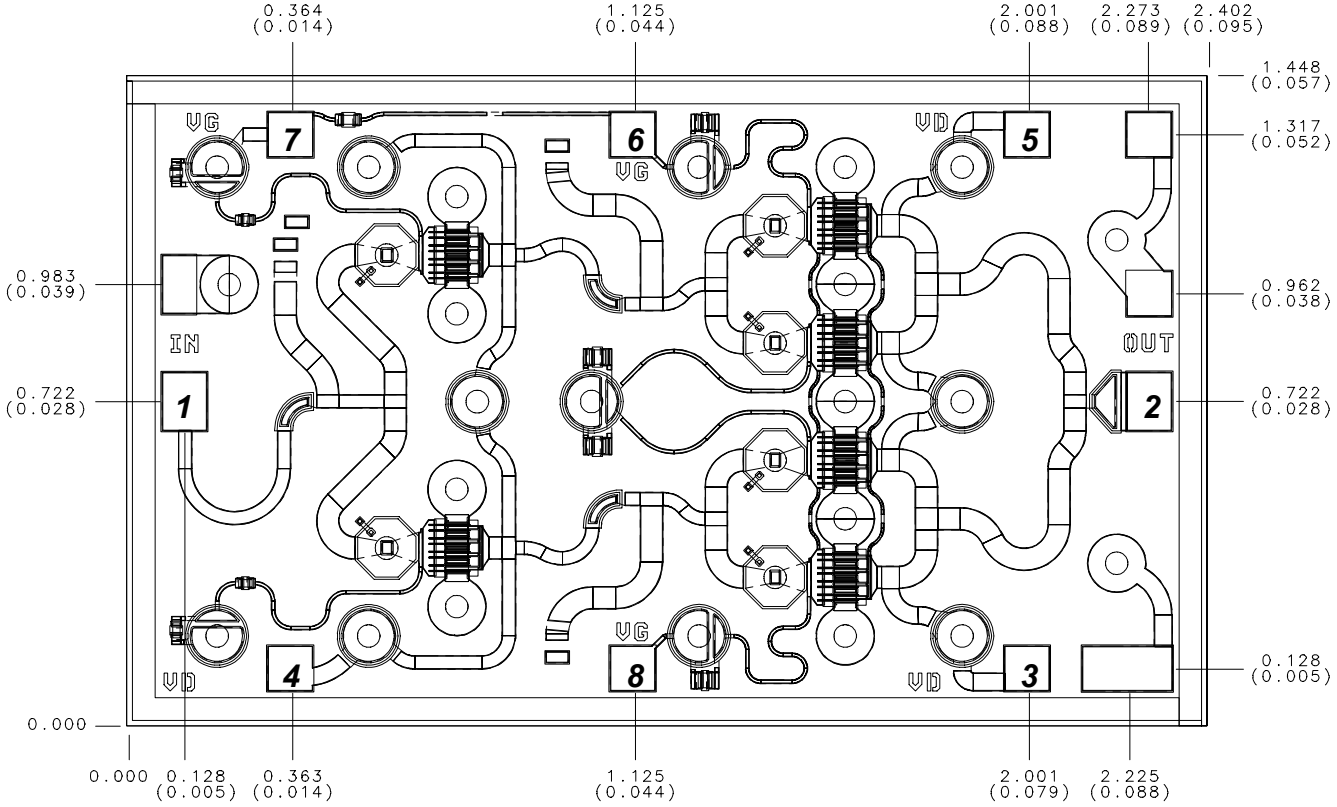
Mechanical Characteristics



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)***

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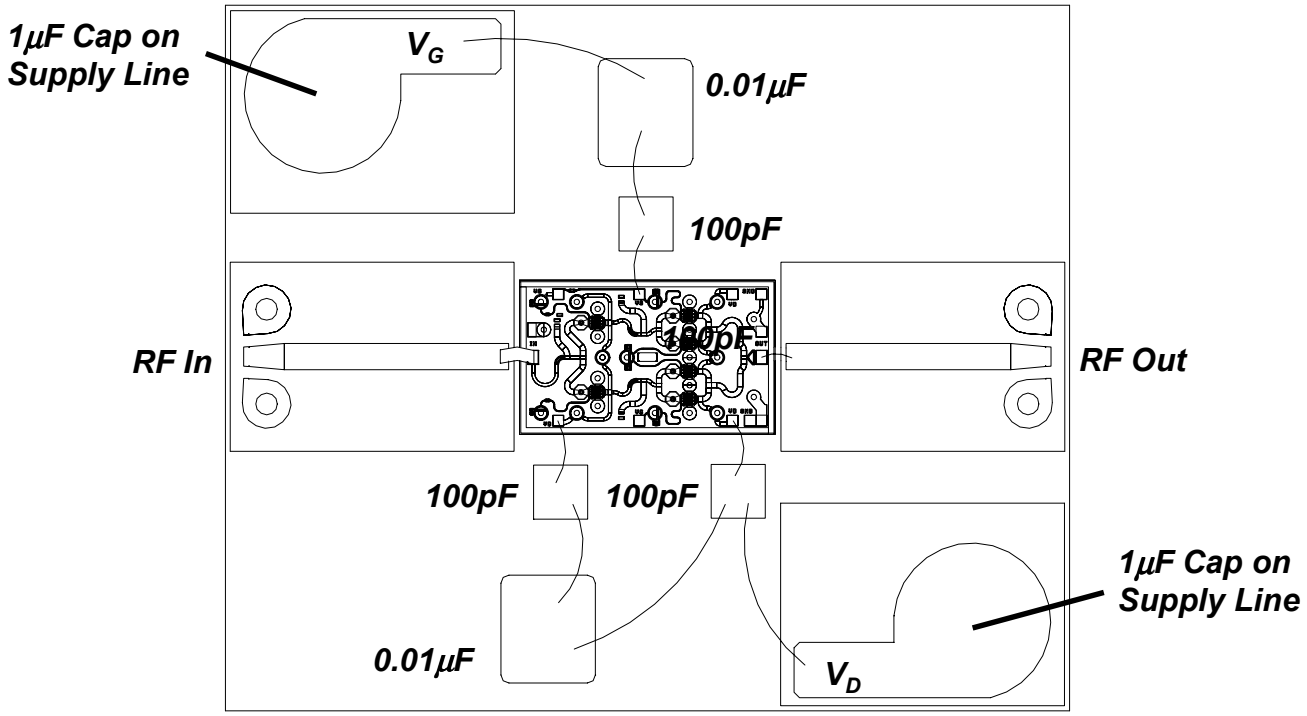

Chip Assembly and Bonding Diagram

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.