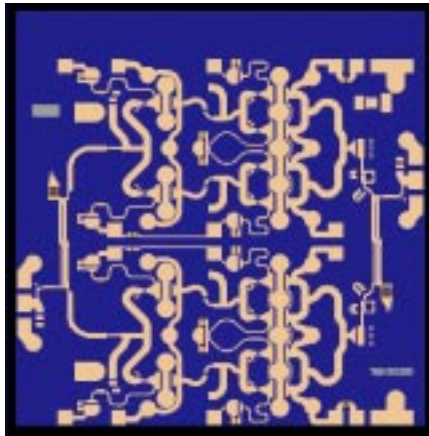


Q-band Power Amplifier

TGA4043-EPU



Key Features

- Frequency Range: 40-45 GHz
- 29 dBm Nominal Pout @ P1dB
- 10 dB Nominal Gain
- 0.25 um pHEMT Technology
- Bias 7V @ 500 mA
- Chip Dimensions 3.08 mm x 3.14 x 0.10 mm (0.121 x 0.124 x 0.004 in)

Primary Applications

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

Product Description

The TriQuint TGA4043-EPU is a compact High Power Amplifier MMIC for Q-band applications. The part is designed using TriQuint's proven standard 0.25 um gate power pHEMT production process.

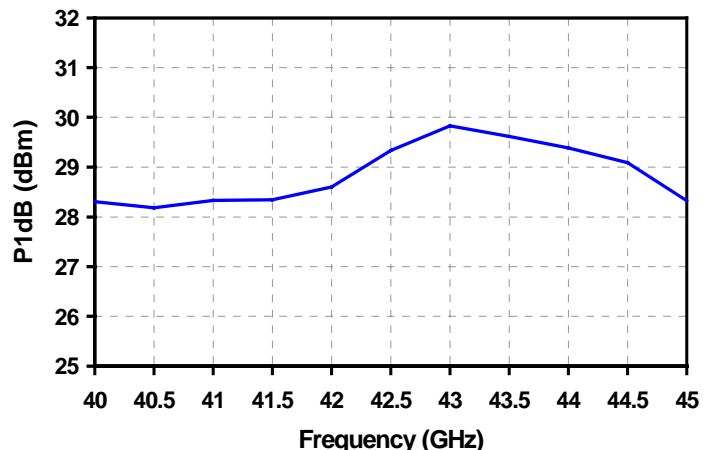
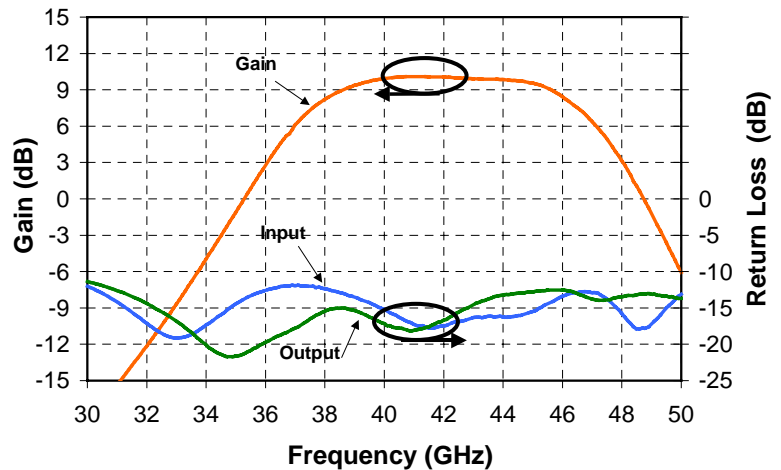
The TGA4043-EPU provides a nominal 28 dBm of output power at 1 dB gain compression from 40-45 GHz with a small signal gain of 10 dB.

The part is ideally suited for low cost emerging markets such as Point-to-Point Radio and Point-to-Multi Point Communications.

The TGA4043-EPU is 100% DC and RF tested on-wafer to ensure performance compliance.

Measured Fixtured Data

Bias Conditions: Vd = 7V, Id = 500mA



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

TABLE I
MAXIMUM RATINGS 1/

SYMBOL	PARAMETER	VALUE	NOTES
V ⁺	Positive Supply Voltage	8 V	2/
V ⁻	Negative Supply Voltage Range	-5V TO 0V	
I ⁺	Positive Supply Current	960 mA	2/
I _G	Gate Supply Current	56 mA	
P _{IN}	Input Continuous Wave Power	27 dBm	2/
P _D	Power Dissipation	4.6 W	2/, 3/
T _{CH}	Operating Channel Temperature	150 °C	4/, 5/
T _M	Mounting Temperature (30 Seconds)	320 °C	
T _{STG}	Storage Temperature	-65 to 150 °C	

- 1/ These ratings represent the maximum operable values for this device.
- 2/ Current is defined under no RF drive conditions. Combinations of supply voltage, supply current, input power, and output power shall not exceed P_D.
- 3/ When operated at this power dissipation with a base plate temperature of 70 °C, the median life is 1 E+6 hours.
- 4/ 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.
- 5/ These ratings apply to each individual FET.

TABLE II
DC PROBE TEST
(T_A = 25 °C, Nominal)

SYMBOL	PARAMETER	MINIMUM	MAXIMUM	UNIT
I _{dss, Q1}	Saturated Drain Current	40	188	mA
G _{m, Q1}	Transconductance	88	212	mS
V _{p, Q1,2, 3-6, 7, 8, 9-12}	Pinch-off Voltage	-1.5	-0.5	V
V _{BVGD, Q1,2}	Breakdown Voltage Gate-Drain	-30	-8	V
V _{BVGS, Q1}	Breakdown Voltage Gate-Source	-30	-8	V

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TABLE III
RF CHARACTERIZATION TABLE

(T_A = 25 °C, Nominal)

V_d = 7V, I_d = 500 mA

SYMBOL	PARAMETER	TEST CONDITION	TYPICAL LIMITS	UNITS
Gain	Small Signal Gain	F = 40-45 GHz	10	dB
IRL	Input Return Loss	F = 40-45 GHz	14.5	dB
ORL	Output Return Loss	F = 40-45 GHz	12.5	dB
P _{1dB}	Output Power @ 1dB Gain Compression	F = 40-45 GHz	29	dBm

TABLE IV
THERMAL INFORMATION*

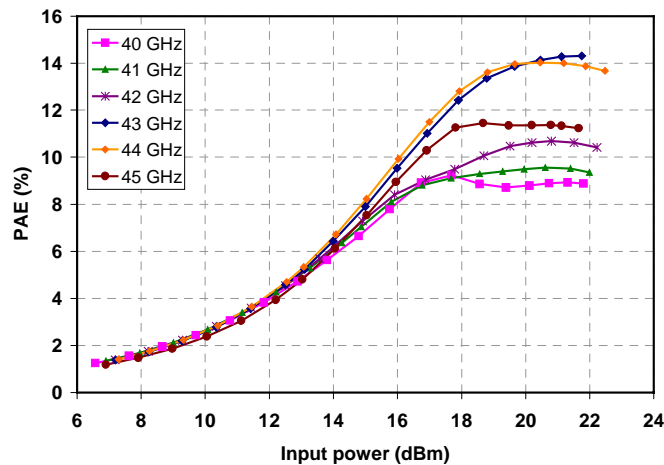
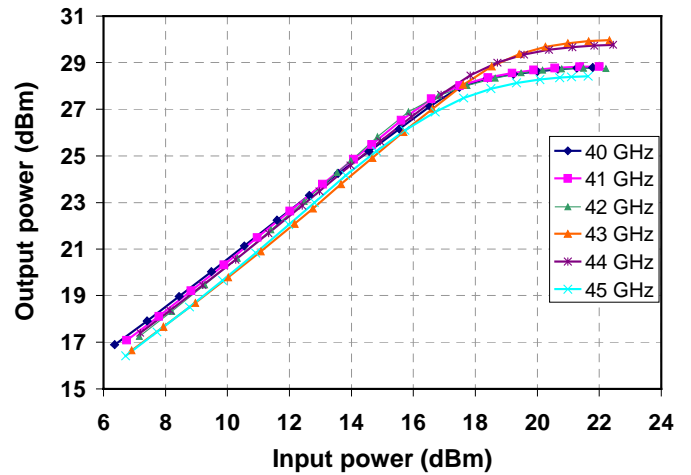
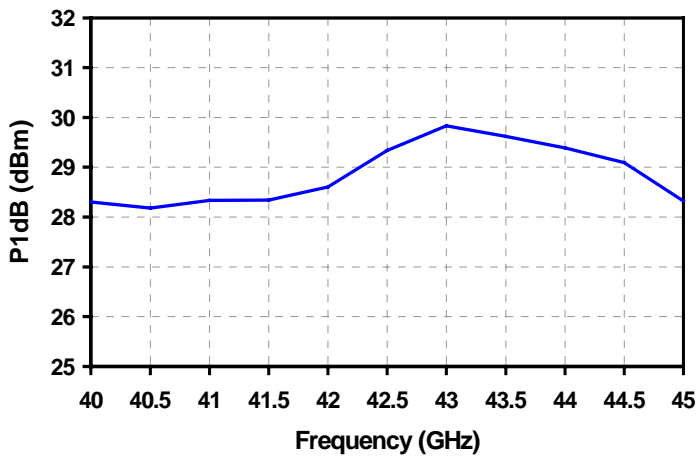
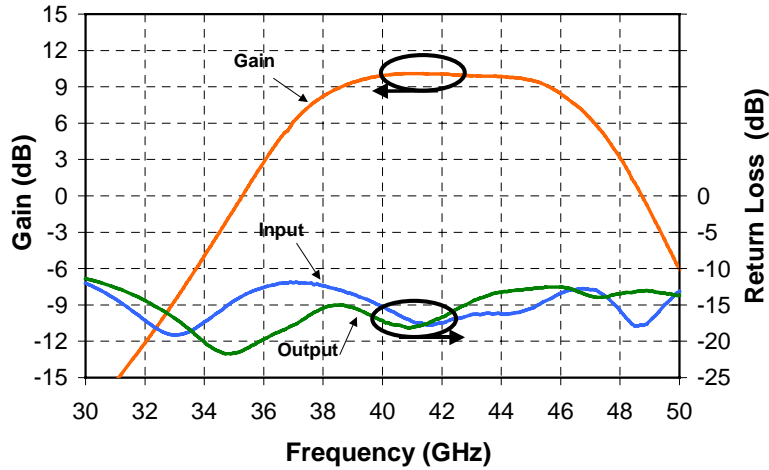
Parameter	Test Conditions	T _{CH} (°C)	R _{θJC} (°C/W)	T _M (HRS)
R _{θJC} Thermal Resistance (channel to backside of carrier)	V _d = 7 V I _D = 500 mA P _{diss} = 3.5 W	130	17.3	5.9 E+6

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

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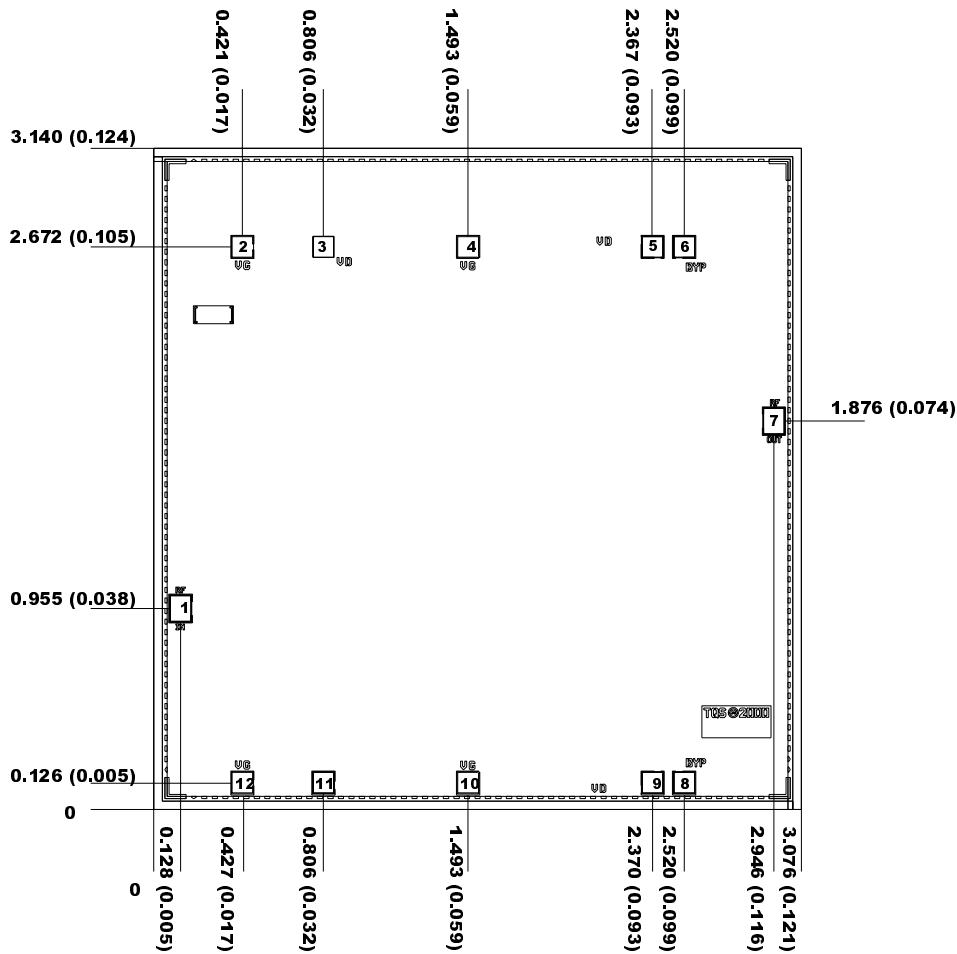
Measured Fixtured Data

Bias Conditions: $V_d = 7V$, $I_d = 500mA$



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

Mechanical Characteristics



Units: millimeters (inches)

Thickness: 0.100 (0.004) (reference only)

Chip edge to bond pad dimensions are shown to center of bond pad

Chip size tolerance: +/- 0.051 (0.002)

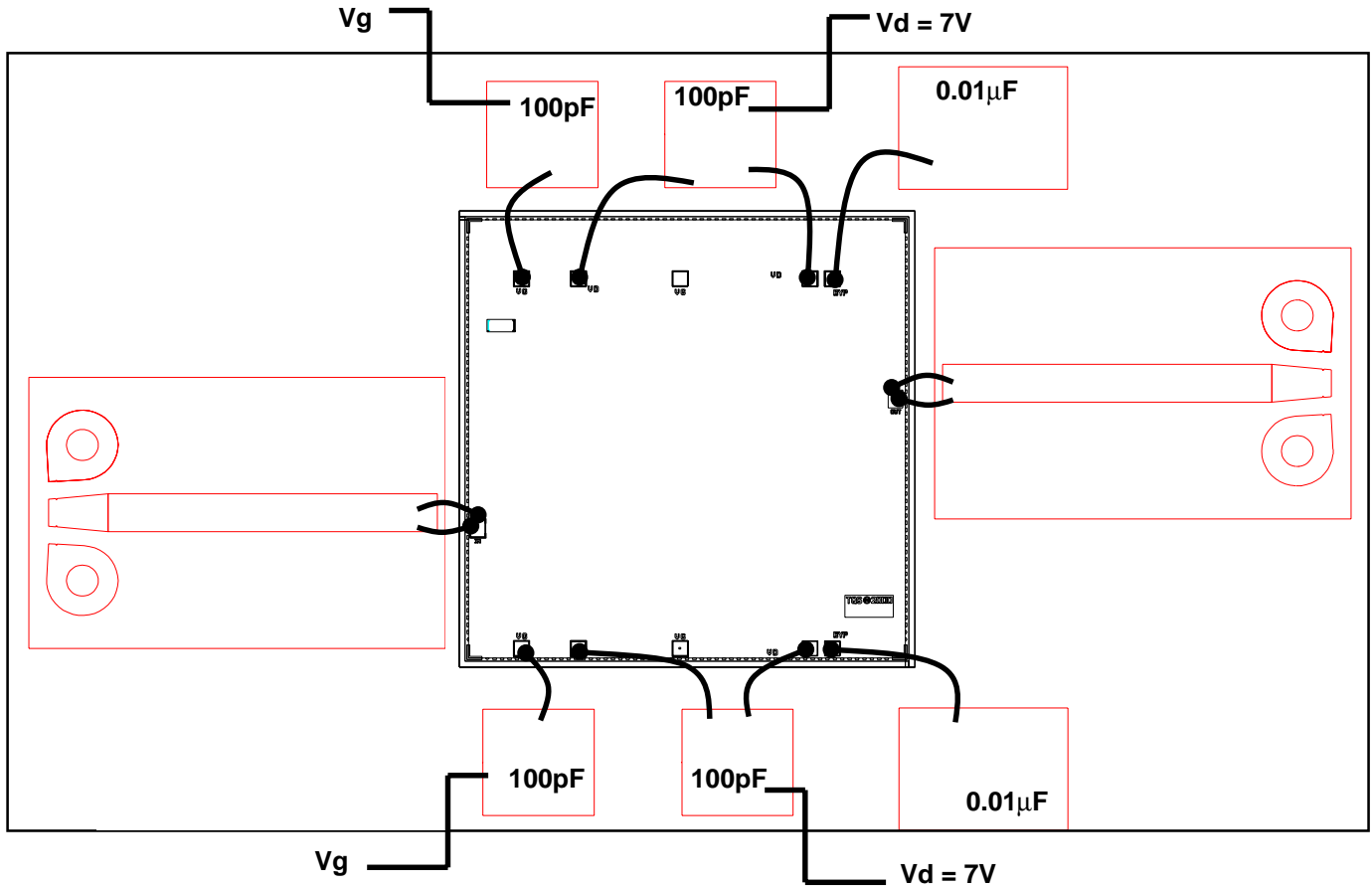
GND IS BACKSIDE OF MMIC

Bond Pad #1 (RF Input)	0.105 x 0.130 (0.004 x 0.005)
Bond Pad #2 (Vg 1)	0.105 x 0.105 (0.004 x 0.004)
Bond Pad #3 (Vd 1)	0.105 x 0.105 (0.004 x 0.004)
Bond Pad #4 (Vg 1)	0.105 x 0.105 (0.004 x 0.004)
Bond Pad #5 (Vd 1)	0.105 x 0.105 (0.004 x 0.004)
Bond Pad #6 (Bypass)	0.105 x 0.105 (0.004 x 0.004)
Bond Pad #7 (RF Output)	0.105 x 0.130 (0.004 x 0.005)
Bond Pad #8 (Bypass)	0.105 x 0.130 (0.004 x 0.005)
Bond Pad #9 (Vd 2)	0.105 x 0.105 (0.004 x 0.004)
Bond Pad #10 (Vg 2)	0.105 x 0.105 (0.004 x 0.004)
Bond Pad #11 (Vd #2)	0.105 x 0.105 (0.004 x 0.004)
Bond Pad #12 (Vg #2)	0.105 x 0.105 (0.004 x 0.004)

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

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Recommended Assembly Diagram



Note:

We recommend 1µF caps on the bias lines to suppress possible low frequency oscillations.

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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.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.
- Maximum stage temperature is 200 °C.

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