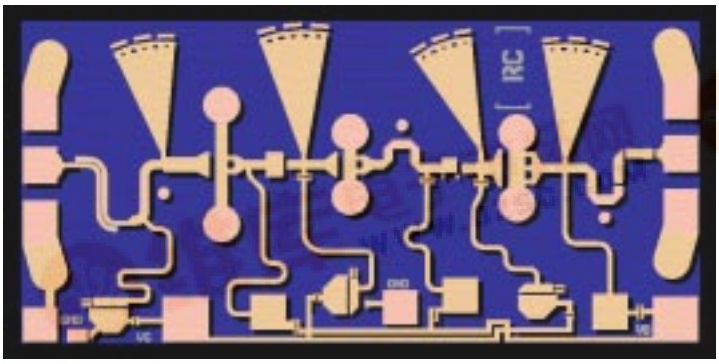
TriQuint SEMICONDUCTOR

Advance Product Information
October 28, 2003

60GHz Low Noise Amplifier

TGA4600-EPU

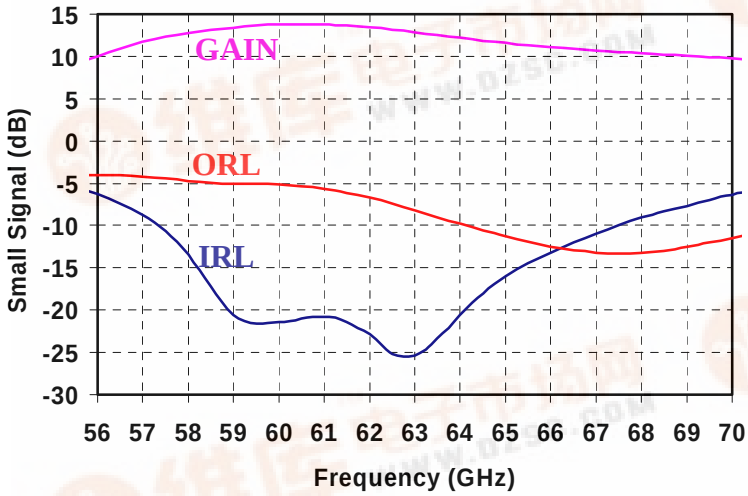


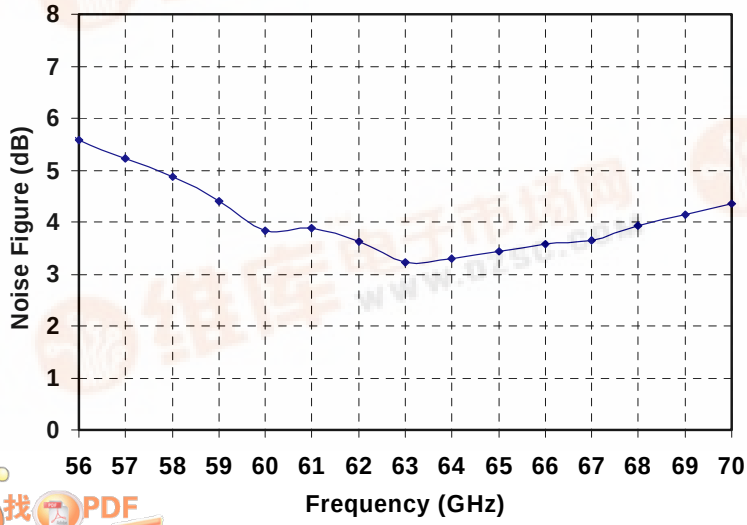
Key Features

- Typical Frequency Range: 57 - 65 GHz
- 4 dB Nominal Noise Figure
- 13 dB Nominal Gain
- Bias 3.0 V, 41 mA
- 0.15 um 3MI pHEMT Technology
- Chip Dimensions 1.62 x 0.84 x 0.10 mm
  (0.064 x 0.033 x 0.004 in)

RF Probe Data

Bias Conditions: Vd = 3.0 V, Id =41 mA





Primary Applications

- Wireless LAN
- Point-to-Point Radio

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
Vd	Drain Voltage	5 V	2/
Vg	Gate Voltage Range	-1 TO +0.5 V	
Id	Drain Current	200 mA	2/ 3/
$\|Ig\|$	Gate Current	5 mA	3/
P_{IN}	Input Continuous Wave Power	15 dBm	
P_D	Power Dissipation	0.39W	2/ 4/
T_{CH}	Operating Channel Temperature	150 ^{0}C	5/ 6/
T_M	Mounting Temperature (30 Seconds)	320 ^{0}C	
T_{STG}	Storage Temperature	-65 to 150 ^{0}C	

1/ These ratings represent the maximum operable values for this device.

2/ Combinations of supply voltage, supply current, input power, and output power shall not exceed P_D.

3/ Total current for the entire MMIC.

4/ When operated at this bias condition with a base plate temperature of 70^{0}C, the median life is 1.0E+6 hrs.

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

6/ These ratings apply to each individual FET.

TABLE II
DC PROBE TESTS
(Ta = 25 ^{0}C, Nominal)

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNITS
$V_{BVGD, Q1-Q3}$	Breakdown Voltage Gate-Source	-30		-5	V
$V_{BVGS, Q3}$	Breakdown Voltage Gate-Source	-30		-5	V
$V_{P, Q1,2,3}$	Pinch-off Voltage	-1.0		-0.1	V

Q1 is 100 um FET, Q2 is 100 um FET, Q3 is 210 um FET.

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 III
ELECTRICAL CHARACTERISTICS
(Ta = 25 ^{0}C Nominal)

PARAMETER	TYPICAL	UNITS
Frequency Range	57 - 65	GHz
Drain Voltage, Vd	3.0	V
Drain Current, Id	41	mA
Gate Voltage, Vg	-0.5 - 0	V
Small Signal Gain, S21	13	dB
Input Return Loss, S11	20	dB
Output Return Loss, S22	6	dB
Noise Figure, NF	4	dB

TABLE IV
THERMAL INFORMATION

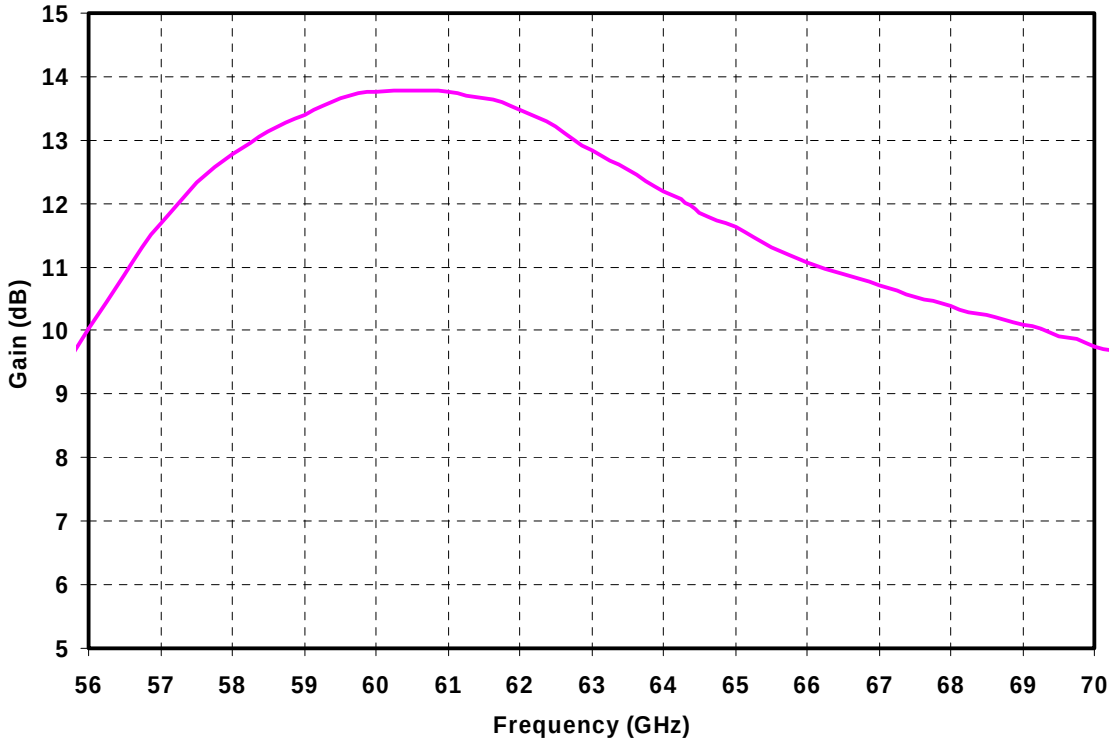
PARAMETER	TEST CONDITIONS	T_{CH} (^{O}C)	$R_{\theta JC}$ (°C/W)	T_M (HRS)
$R_{\theta JC}$ Thermal Resistance (channel to Case)	Vd = 3 V Id = 41 mA Pdiss = 0.12 W	80	83	1.2 E+9

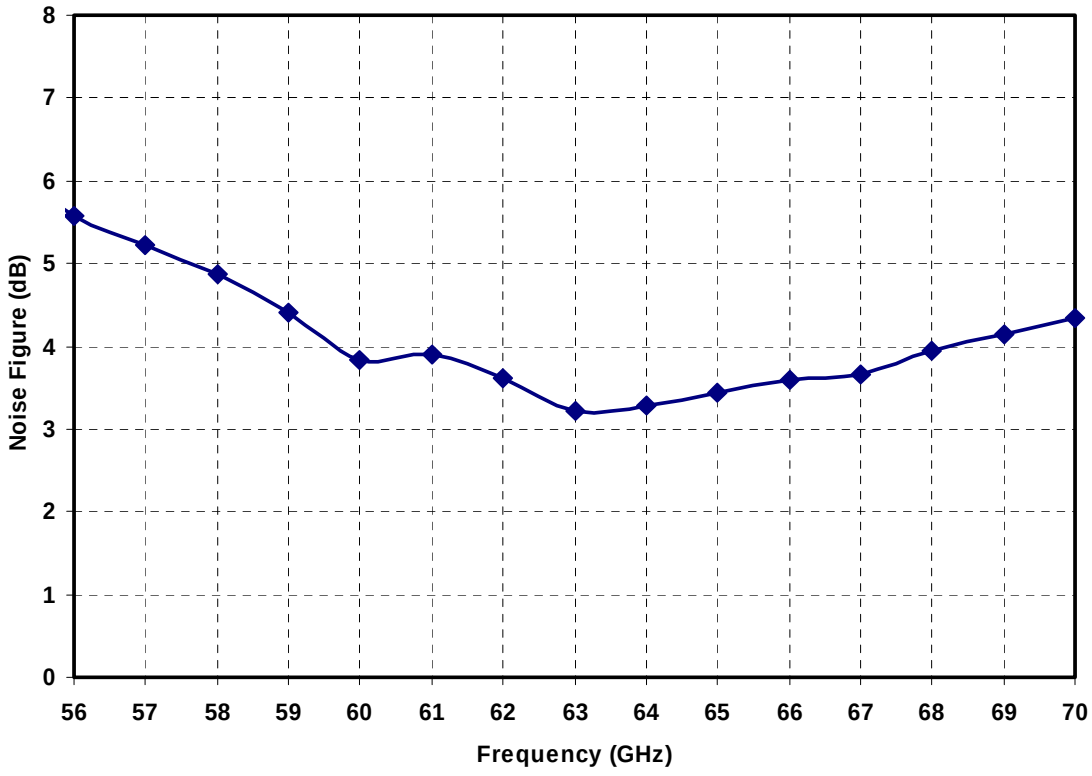
Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20 mil CuMo Carrier at 70^{o}C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

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

RF Probe Data

Bias Conditions: Vd = 3.0 V, Id = 41 mA

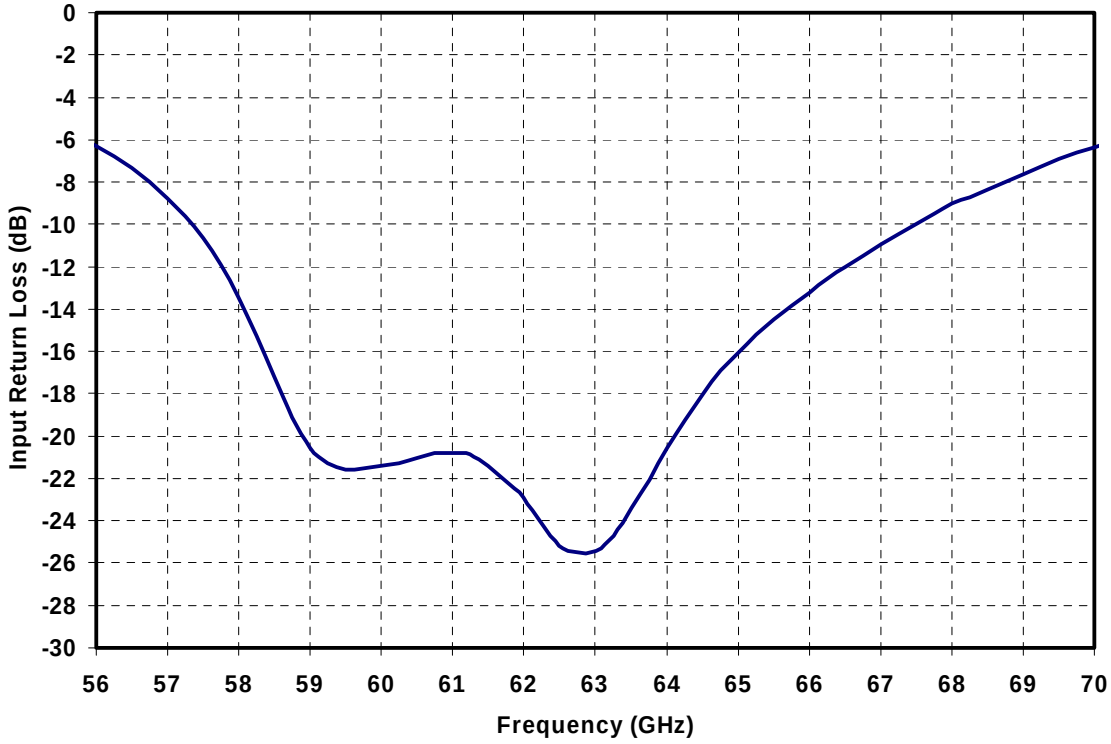


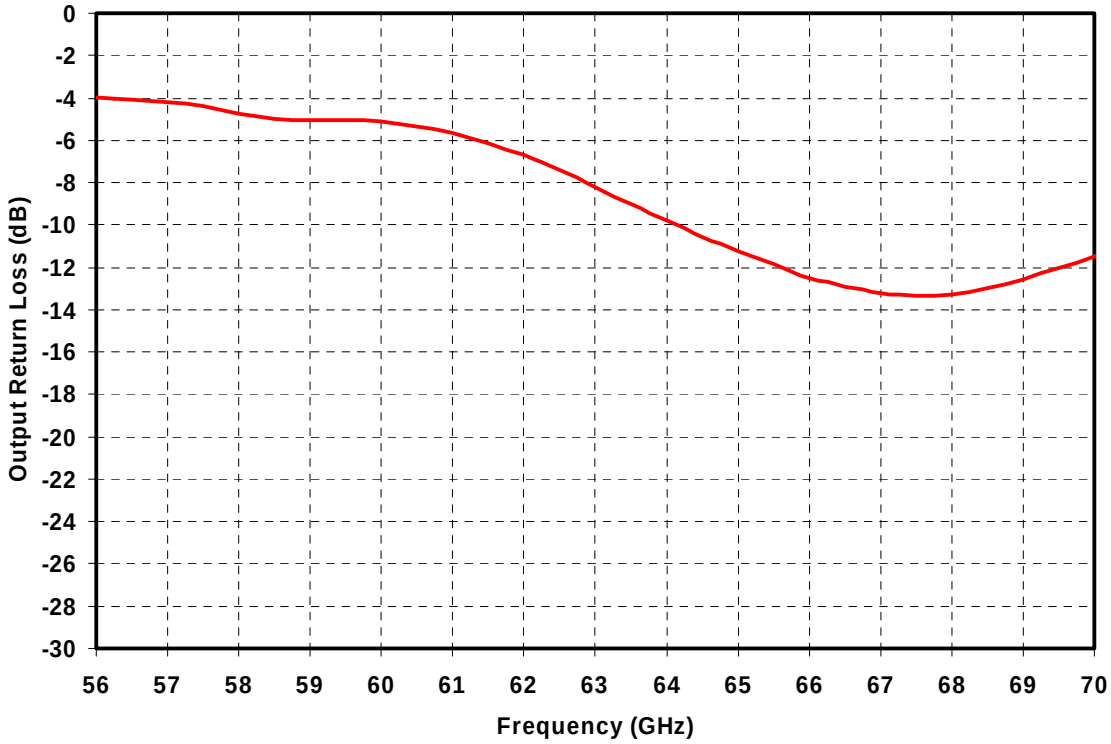


Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice

RF Probe Data

Bias Conditions: Vd = 3.0 V, Id = 41 mA





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

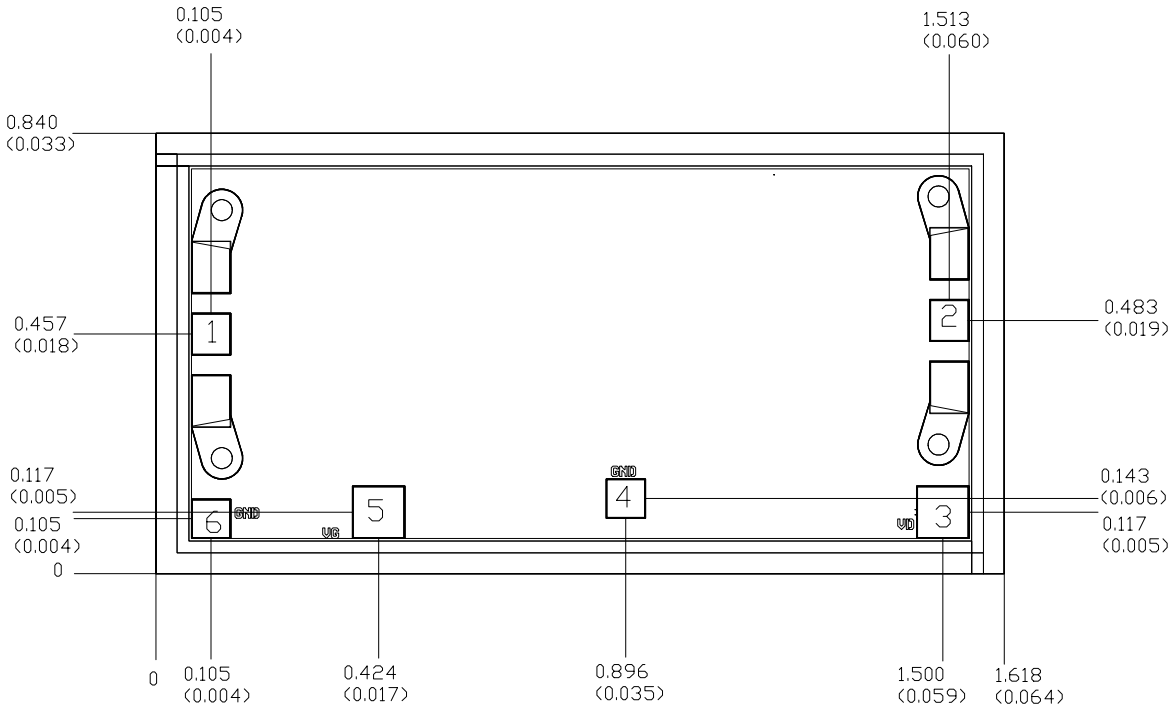
TriQuint SEMICONDUCTOR

Advance Product Information

October 28, 2003

TGA4600-EPU

Mechanical Drawing



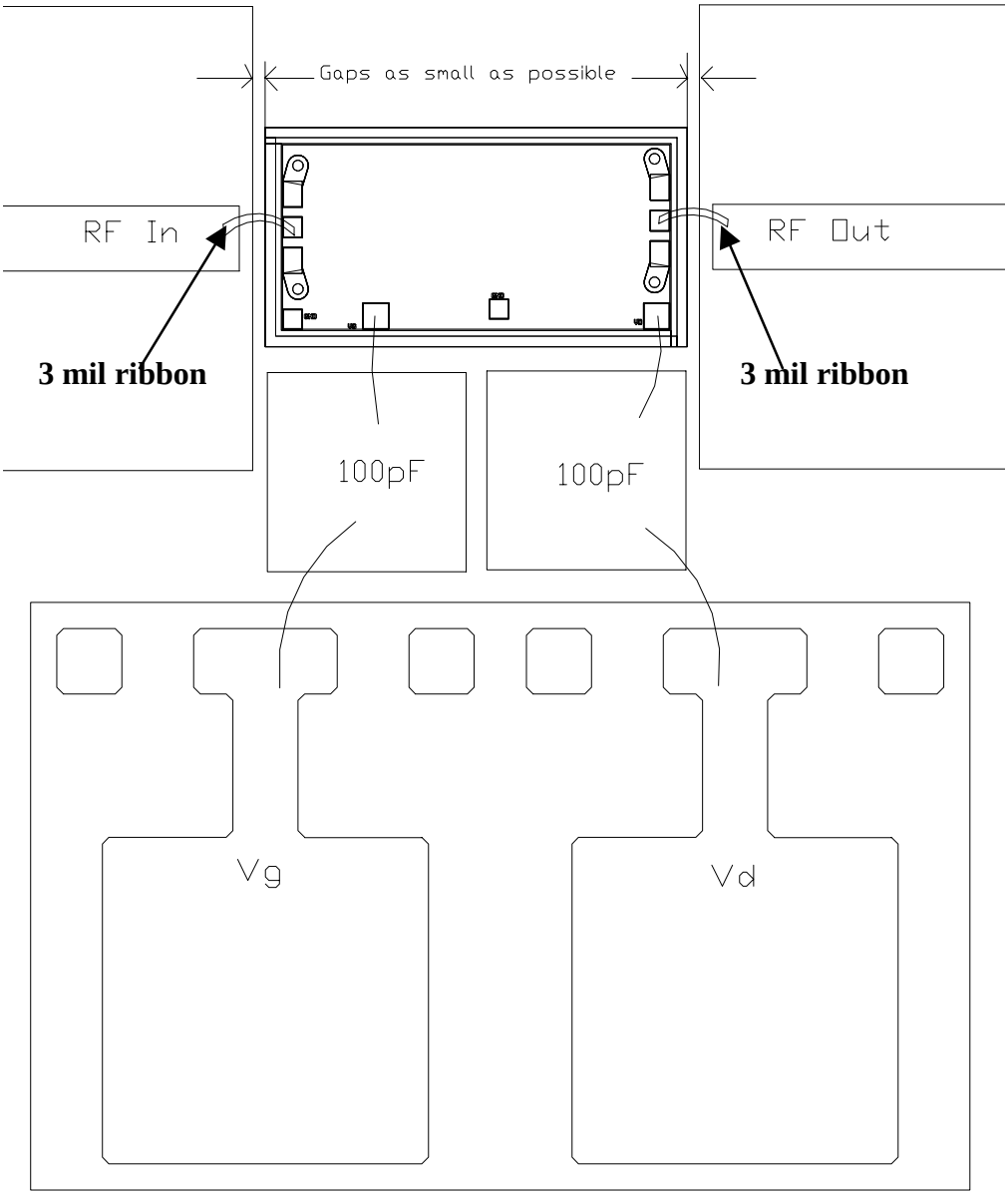
Units: Millimeters (inches)
Thickness: 0.050 (0.002) (reference only)
Chip edge to bond pad dimensions are shown to center of bond pad
Chip size tolerance: +/- 0.051 (0.002)
RF Ground is backside of MMIC

Bond pad #1:	(RF In)	0.075 x 0.080 (0.003 x 0.003)
Bond pad #2:	(RF Out)	0.075 x 0.080 (0.003 x 0.003)
Bond pad #3:	(Vd)	0.100 x 0.100 (0.004 x 0.004)
Bond pad #4 & #6:	(GND, N/C)	0.075 x 0.075 (0.003 x 0.003)
Bond pad #5:	(Vg)	0.100 x 0.100 (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.

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

Recommended Chip Assembly Diagram



Ribbons as short as possible

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

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

TriQuint SEMICONDUCTOR

Advance Product Information

October 28, 2003

TGA4600-EPU

Assembly Process Notes

Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300^0C (30 seconds max).
- 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.
- Maximum stage temperature is 200^0C.

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

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