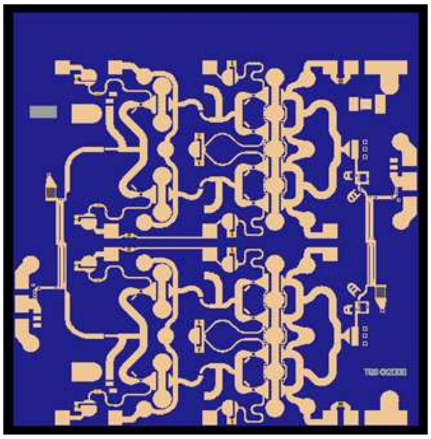
TriQuint SEMICONDUCTOR

TGA4043

Q Band Power Amplifier



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 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.

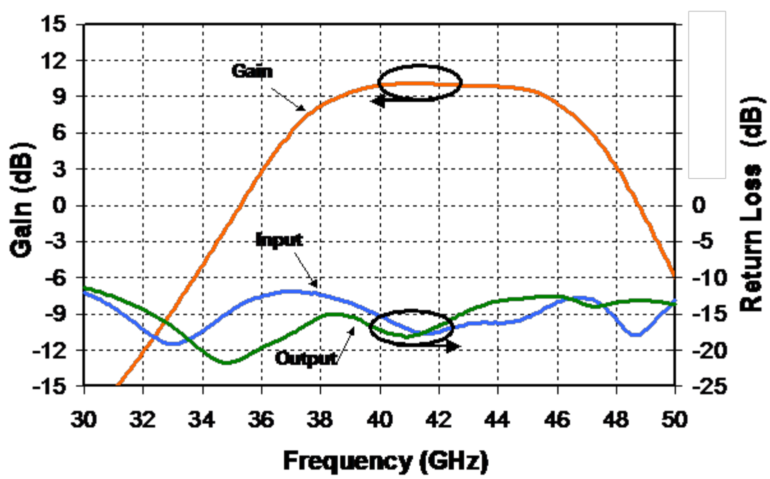
The TGA4043 provides a nominal 28 dBm of output power at 1 dB gain compression from 40-45 GHz with a small signal gain of 10 dB.

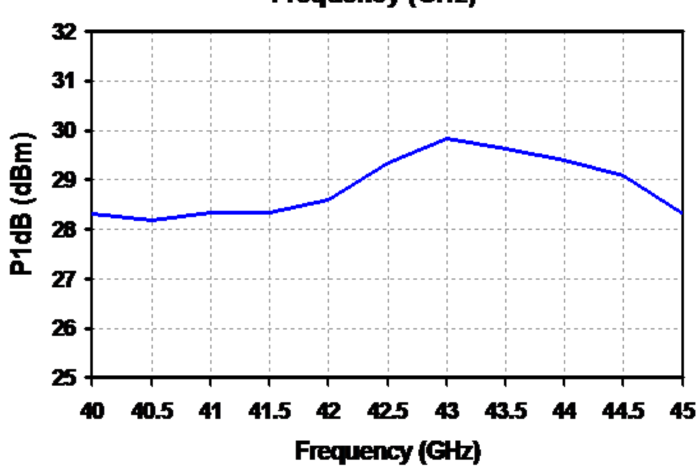
The part is ideally suited for low cost emerging markets such as Point-to-Point Radio and Point-to-Multi Point Communications.

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

Measured Fixtured Data

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





Datasheet subject to change without notice

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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	7.5 W	2/, 3/
T_{CH}	Operating Channel Temperature	200 °C	4/, 5/
	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 7.3E3 hours.

4/ Junction operating temperature will directly affect the device median time to failure (Tm). 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
$V_{p, Q1,2, 3\text{-}6, 7, 8, 9\text{-}12}$	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

TABLE III
RF CHARACTERIZATION TABLE
(T_A = 25 °C, Nominal)
Vd = 7V, Id = 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

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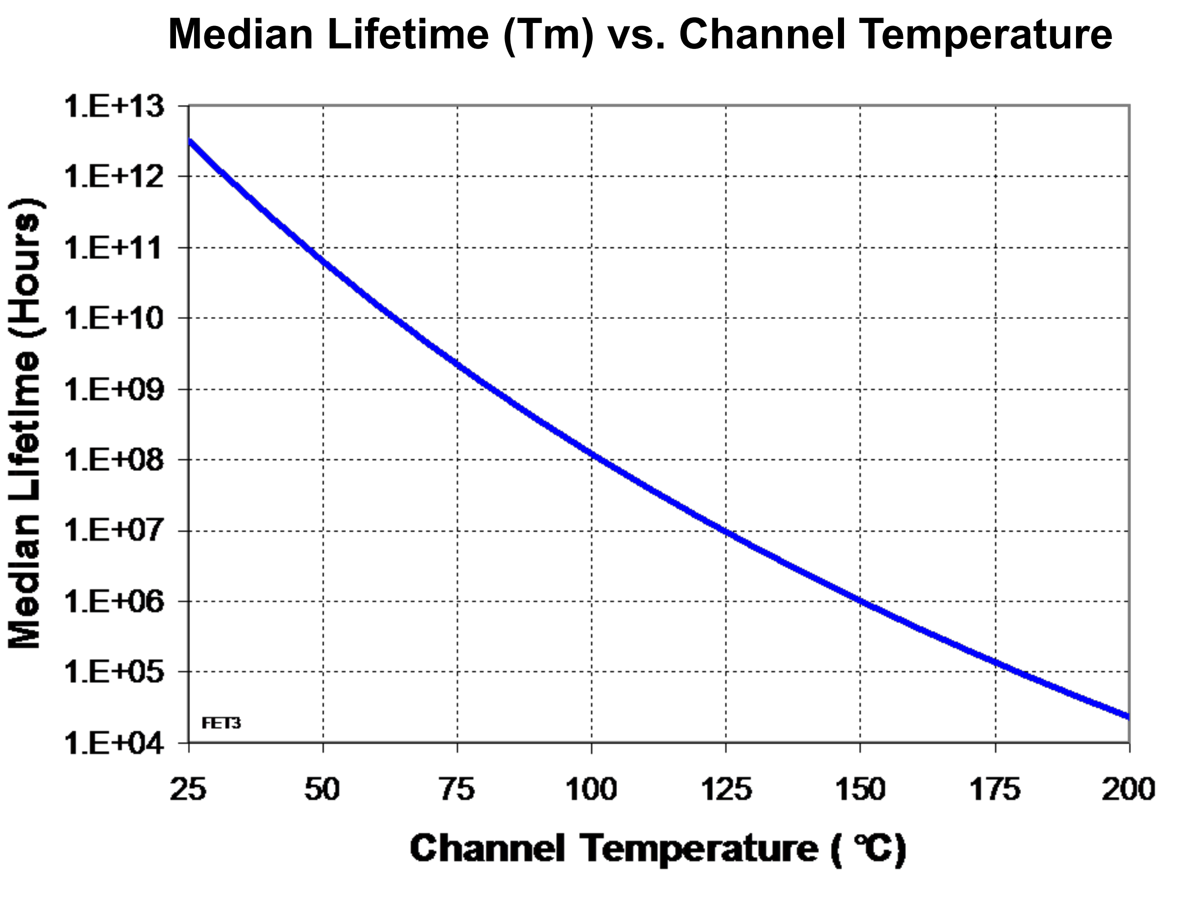
TABLE IV
THERMAL INFORMATION

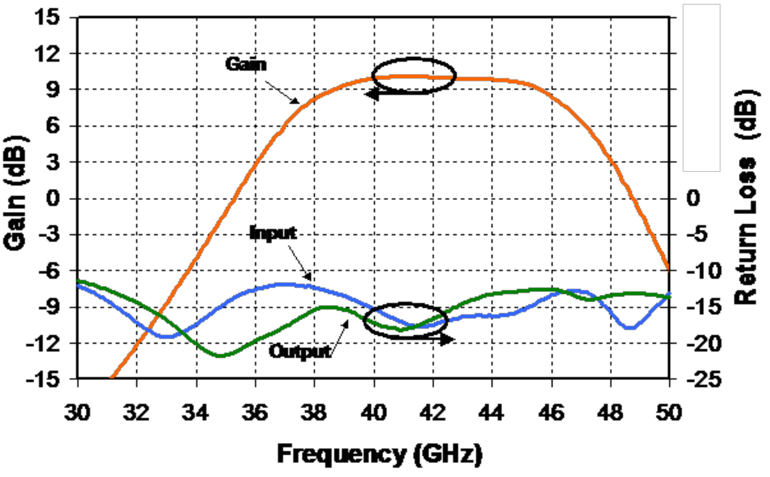
Parameter	Test Conditions	T_{CH} (°C)	θ_{JC} (°C/W)	Tm (HRS)
θ_{JC} Thermal Resistance (channel to backside of carrier)	Vd = 7 V I_D = 500 mA Pdiss = 3.5 W	130	17.3	5.9 E+6

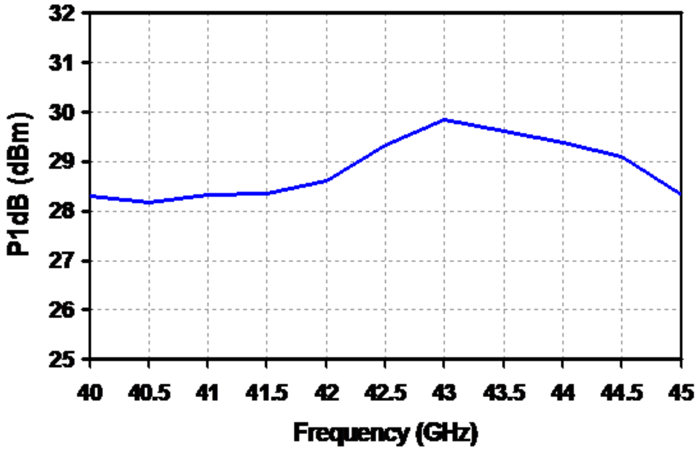
Note: Assumes eutectic attach using 1.5 mil 80/20 AuSn mounted to a 20 mil CuMo Carrier at 70 °C baseplate temperature. Worst case condition with no RF applied, 100% of DC power is dissipated.

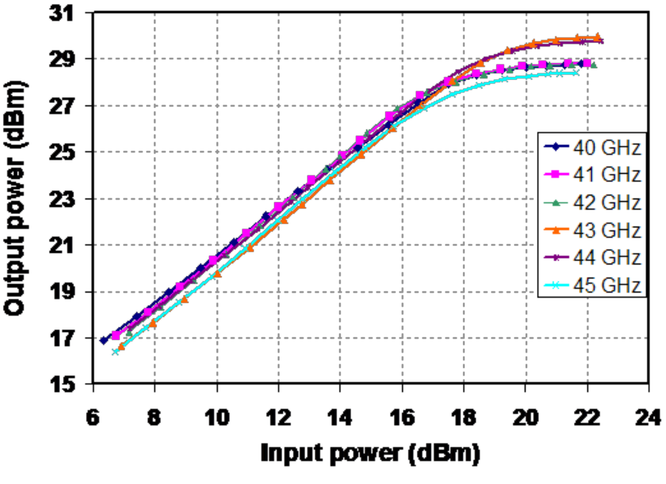


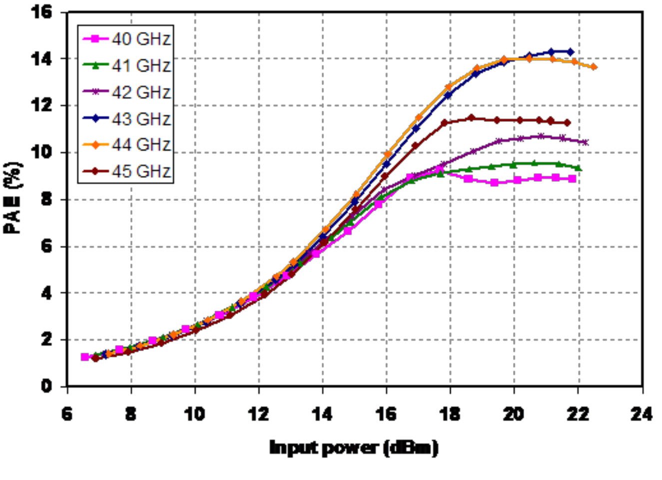
Measured Fixtured Data

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

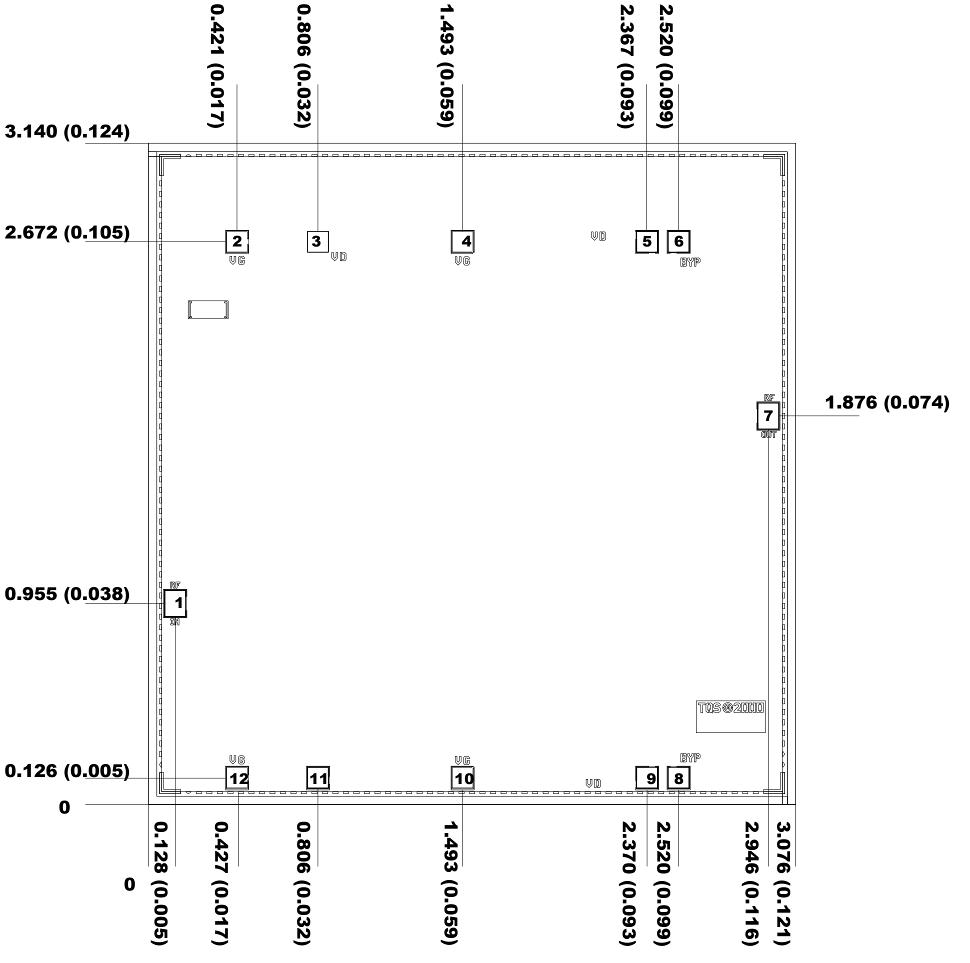








Mechanical Characteristics



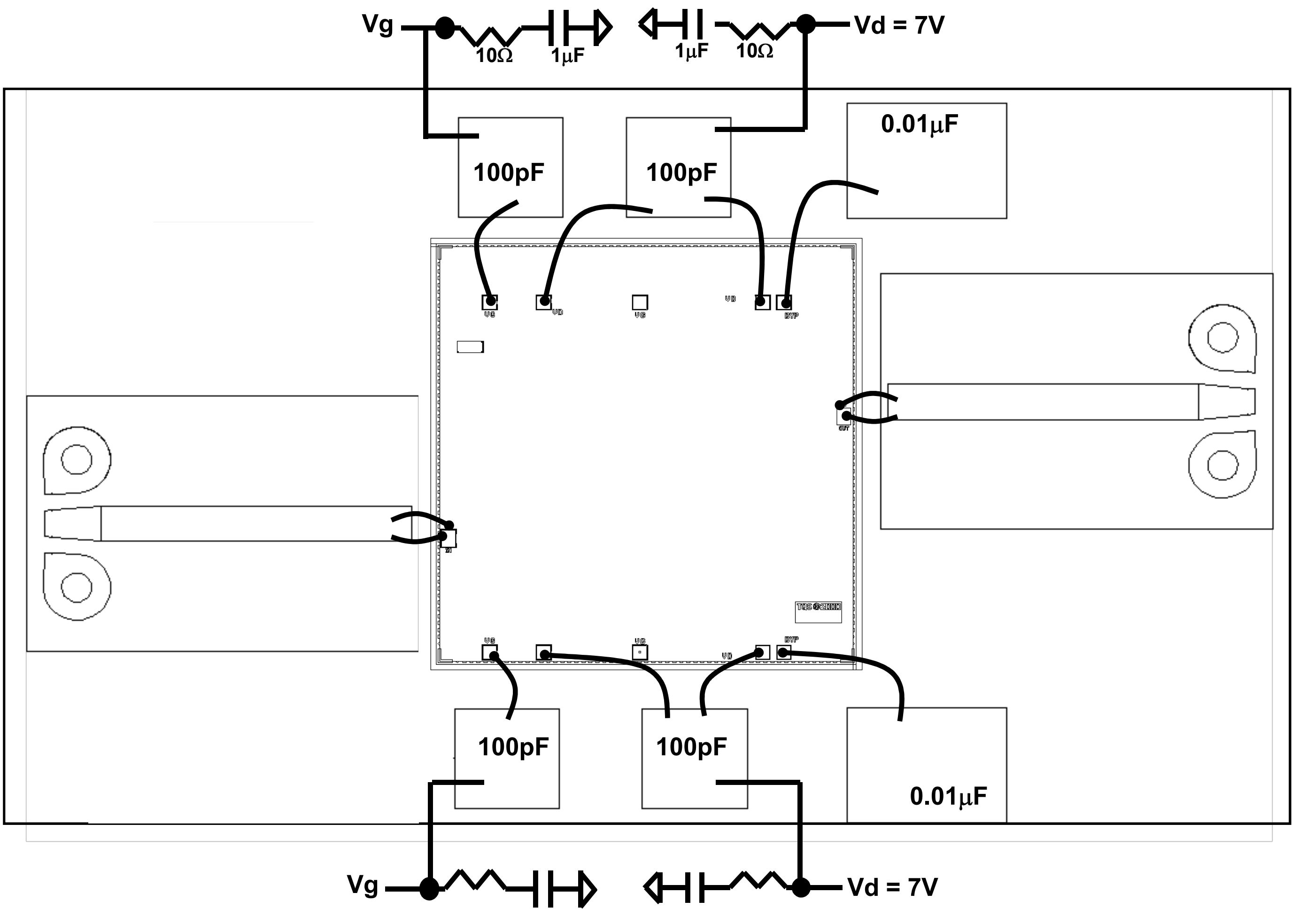
Units: millimeters (inches)
Thickness: 0.100 (0.004) (reference only)
Chip edge to bond pad dimensions are shown to center of bond pad
Chip size tolerance: +/- 0.051 (0.002)

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.

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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