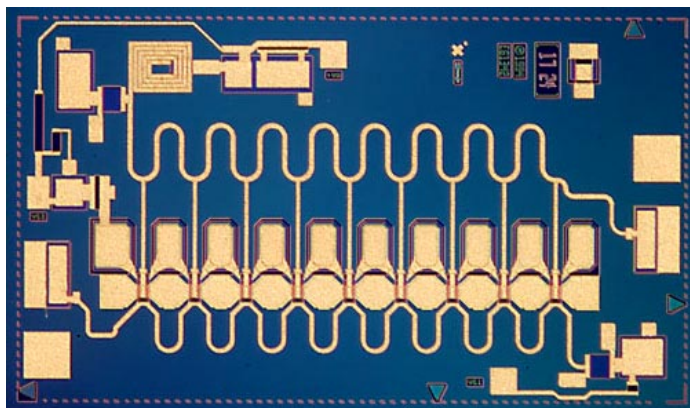


2-20 GHz Wideband AGC Amplifier

TGA1342-SCC

May 28, 2004



Chip Dimensions: 3.4 x 2.0 x 0.1 mm

Key Features and Performance

- 0.5 μ m MESFET Technology
- 9 dB Nominal Gain
- 3.5 dB NF Typical Midband
- 17.5 dBm Nominal Pout @ P1dB
- Bias 5-8V @ 60 mA
- Dimensions 3.4 x 2.0 x 0.1 mm

Primary Applications

- Wideband Gain Block / LN Amplifier
- X-Ku Point to Point Radio
- IF & LO Buffer Applications

Description

The TriQuint TGA1342-SCC is a monolithic dual gate low noise distributed amplifier with AGC via the control gate. This LNA operates from 2 to 20 GHz. Nine 120 μ m gatewidth FETs typically provide 3.5 dB of noise figure, 17.5 dBm of output power at 1 dB gain compression, and 9 dB small signal gain. Typical input return loss and output return loss are 20 dB. Ground is provided to the circuitry through vias to the backside metallization. The TGA1342-SCC low noise distributed amplifier is suitable for a commercial radio and variety of wideband electronic warfare systems such as radar warning receivers, electronic counter measures, decoys, jammers and phased array systems.

Bond pad and backside metallization is gold plated for compatibility with eutectic alloy attachment methods as well as the thermocompression and thermosonic wire bonding processes. The TGA1342-SCC is supplied in chip form and is assembled using automated equipment.

Typical Electrical Characteristics

Vd = 6V, Id = 60mA, Vg = -0.8V, Vctrl = 0V

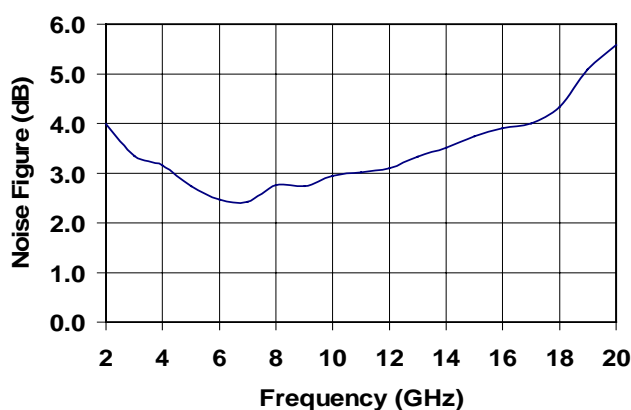
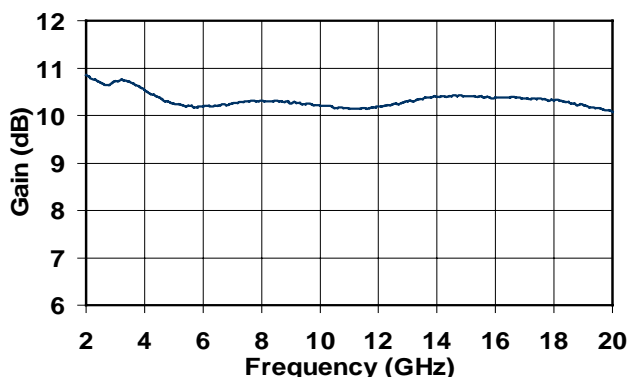


TABLE I
MAXIMUM RATINGS 5/

SYMBOL	PARAMETER	VALUE	NOTES
V^+	Positive Supply Voltage	9 V	<u>4/</u>
V^-	Negative Supply Voltage Range	-5V TO 0V	
I^+	Positive Supply Current (Quiescent)	220 mA	<u>4/</u>
$ I_G $	Gate Supply Current	8.73 mA	
P_{IN}	Input Continuous Wave Power	23 dBm	
P_D	Power Dissipation	2.16W	<u>3/</u> <u>4/</u>
T_{CH}	Operating Channel Temperature	150 °C	<u>1/</u> <u>2/</u>
T_M	Mounting Temperature (30 Seconds)	320 °C	
T_{STG}	Storage Temperature	-65 to 150 °C	

- 1/ These ratings apply to each individual FET.
- 2/ 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.
- 3/ When operated at this bias condition with a base plate temperature of 70 °C, the median life is reduced from 3.7E+11 to 1.9E+8 hours.
- 4/ Combinations of supply voltage, supply current, input power, and output power shall not exceed P_D .
- 5/ These ratings represent the maximum operable values for this device.

TABLE II
DC PROBE TESTS (100%)
 ($T_A = 25\text{ °C} \pm 5\text{ °C}$)

NOTES	SYMBOL	LIMITS		UNITS
		MIN	MAX	
	I_{DSS1}	97	292	mA
	G_{M1}	130	280	mS
<u>1/</u>	$ V_P $	0.5	2.1	V
<u>1/</u>	$ V_{BVG D1} $	6	30	V
<u>1/</u>	$ V_{BVG S1} $	6	30	V

- 1/ V_P , $V_{BVG D}$, and $V_{BVG S}$ are negative.

TABLE III
RF CHARACTERISTICS

(T_A = 25°C ± 5°C)

NOTE	TEST	MEASUREMENT CONDITIONS V _d =6V, I _d =60mA	VALUE			UNITS
			MIN	TYP	MAX	
<u>1/</u>	Small Signal Gain Magnitude	F = 2 – 14 GHz	9			dB
		F = 16 – 20 GHz	8			dB
						dB
	Power Output @ 1 dB Gain Compression	F = 2 - 20 GHz		17.5		dBm
<u>2/</u>	Noise Figure	F = 2 GHz			5.5	dB
		F = 4 – 15 GHz			4.5	dB
		F = 18 GHz			5.5	dB
<u>1/</u>	Input Return Loss Magnitude	F = 2 GHz			-10	dB
		F = 4 – 18 GHz			-12	dB
		F = 20 GHz			-10	dB
<u>1/</u>	Output Return Loss Magnitude	F = 2– 20 GHz			-10.5	dB

1/ RF probe data is taken at 2 GHz steps from 2-20 GHz

2/ RF probe data is taken at 2 GHz steps from 2-6 GHz, 3 GHz steps from 9-18 GHz, and at 20GHz.

TABLE IV
THERMAL INFORMATION*

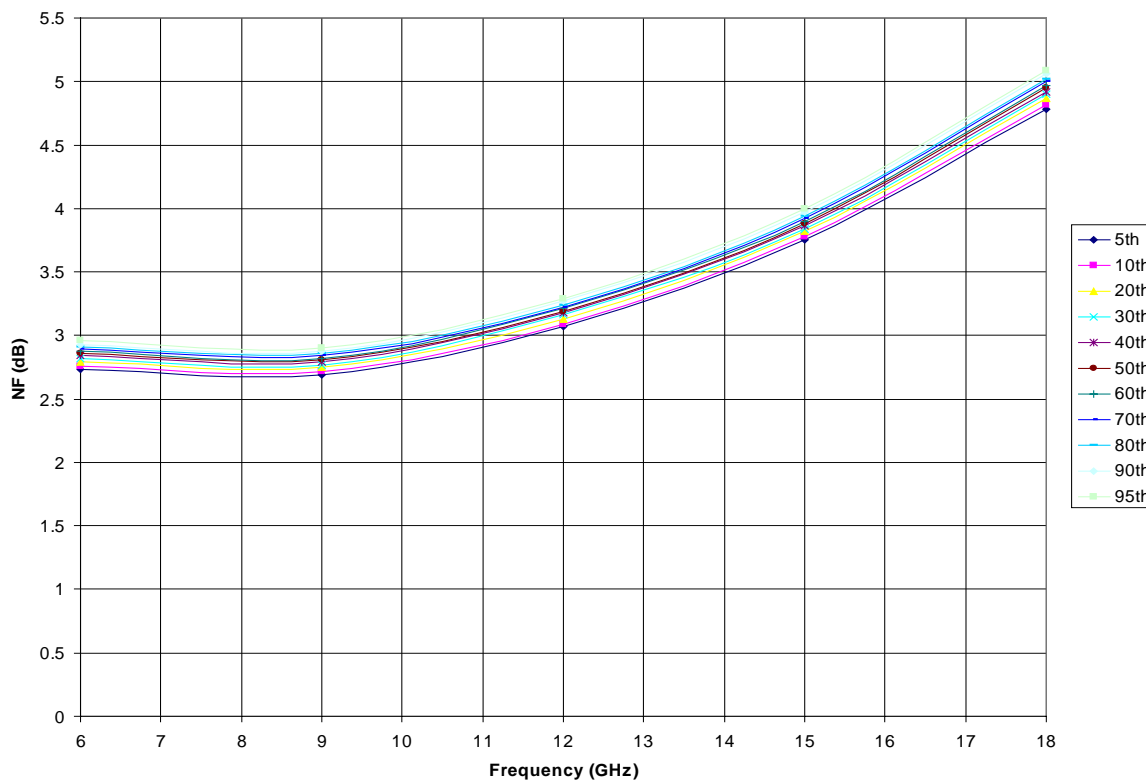
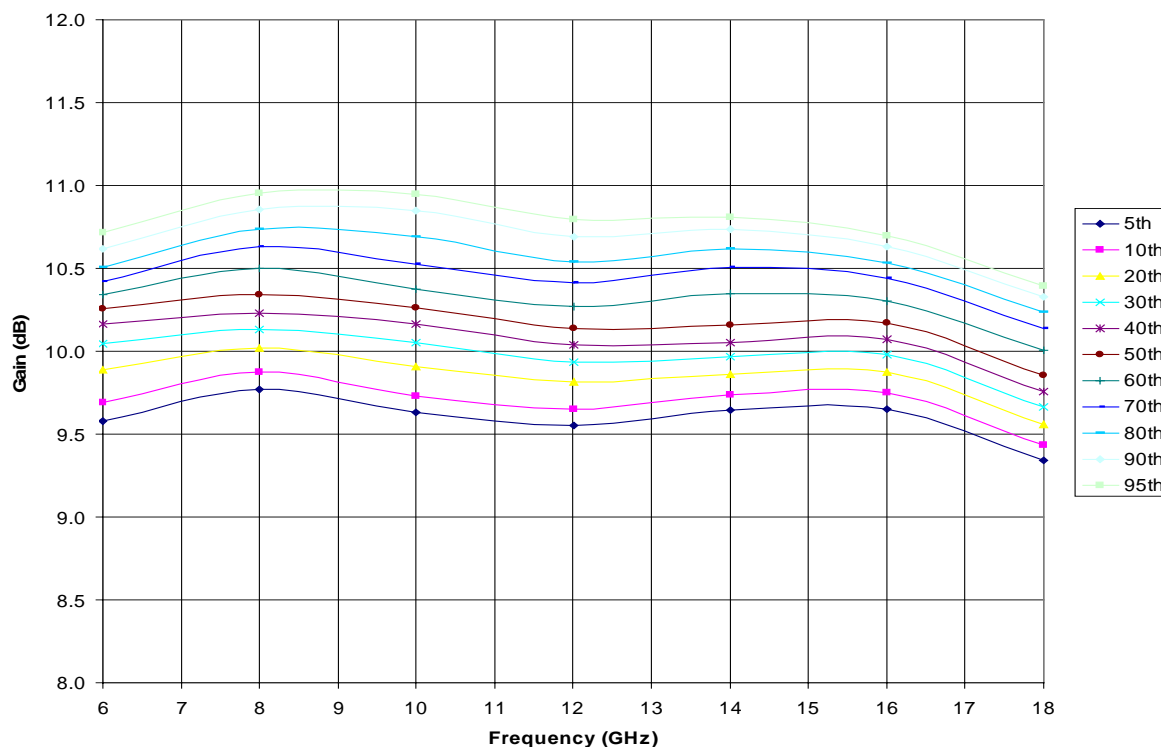
PARAMETER	TEST CONDITIONS	T _{CH} (°C)	R _{θJC} (°C/W)	T _M (HRS)
R _{θJC} Thermal Resistance (channel to backside of carrier)	V _d = 6 V I _D = 60 mA P _{diss} = 0.36 W	81.30	31.388	3.7E+11

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.

* This information is a result of a thermal model.

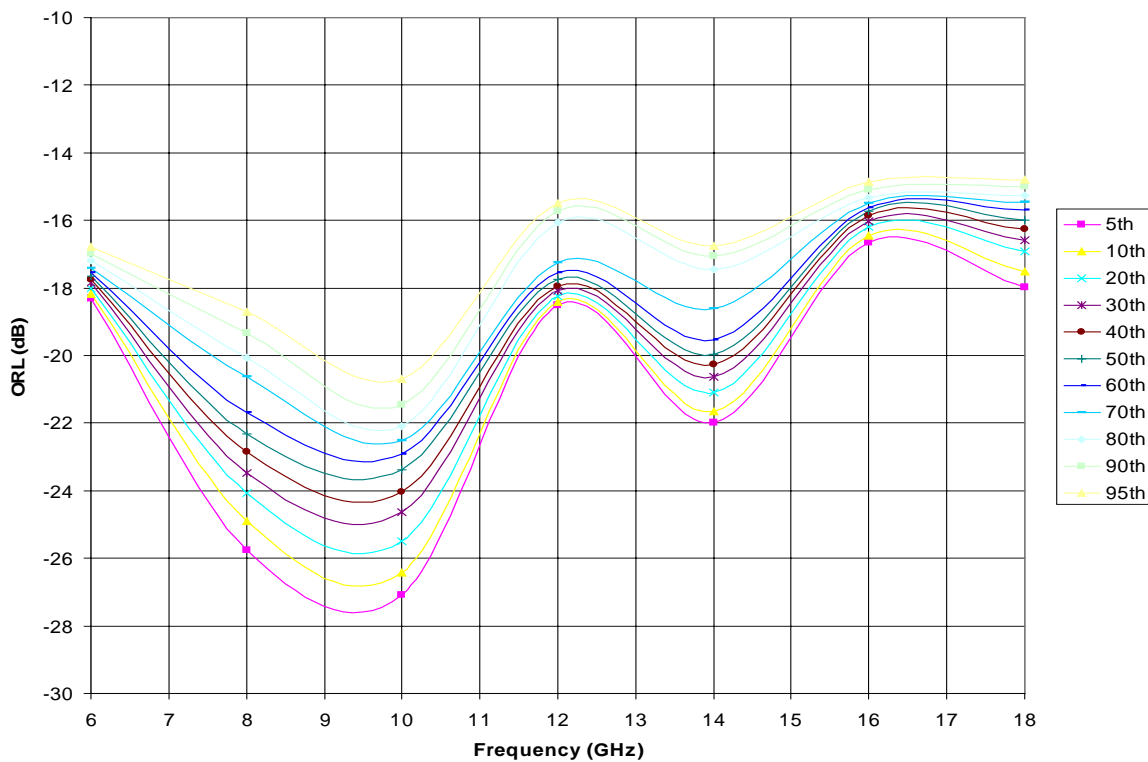
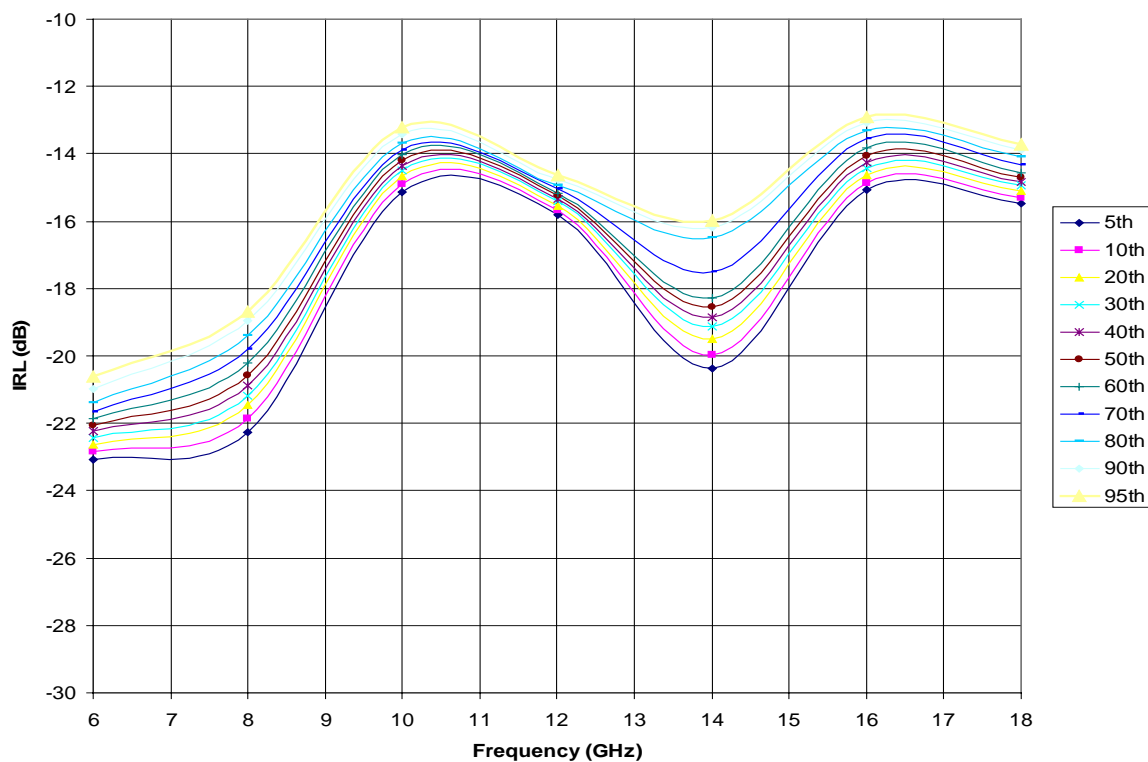
Typical On-Wafer Electrical Characteristics

Vd=6V, Id=60mA, Room Temperature

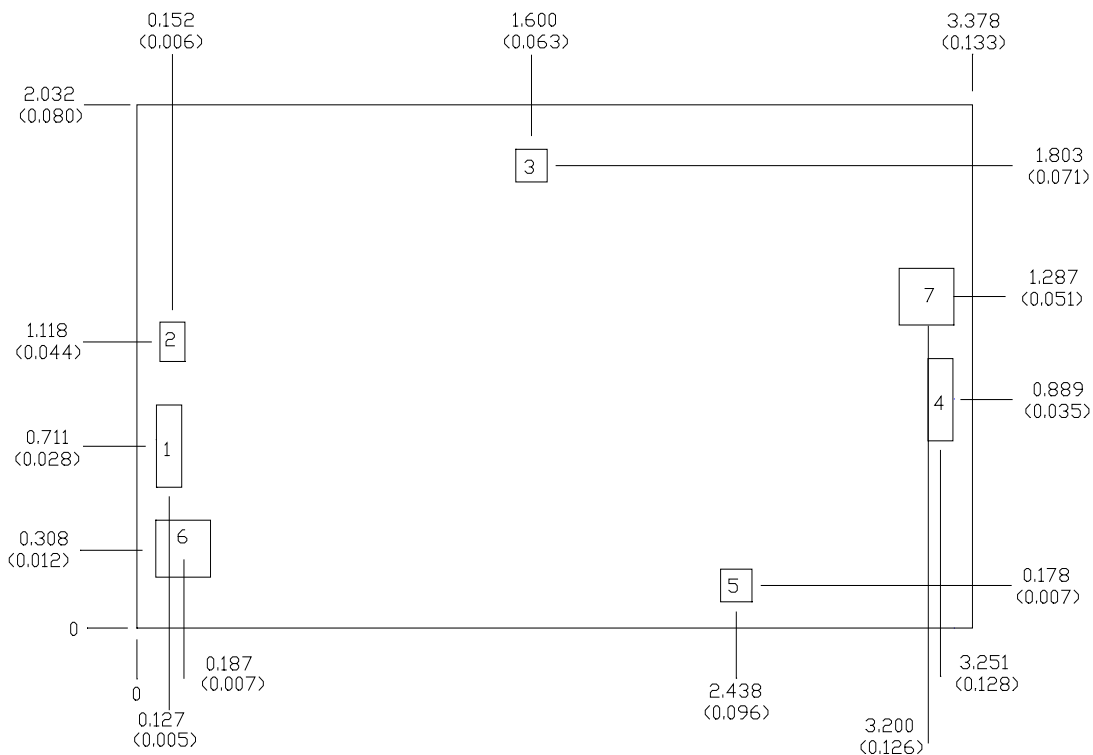


Typical On-Wafer Electrical Characteristics

V_d=6V, I_d=60mA, Room Temperature



Mechanical Characteristics



Units: millimeters (inches)

Thickness: 0.1016 (0.004) (reference only)

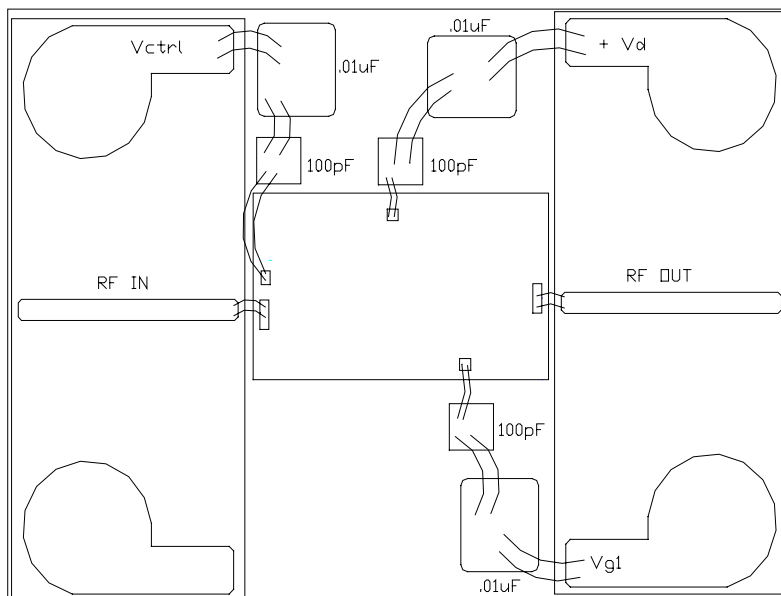
Chip edge to bond pad dimensions are shown to center of bond pads.

Chip size tolerance: ± 0.0508 (0.002)

Bond Pad #1 (RF Input)	0.102 x 0.330 (0.004 x 0.013)
Bond Pad #2 (Vg2) (Vcontrol)	0.102 x 0.152 (0.004 x 0.006)
Bond Pad #3 (Vd)	0.127 x 0.127 (0.005 x 0.005)
Bond Pad #4 (RF Output)	0.102 x 0.330 (0.004 x 0.013)
Bond Pad #5 (Vg1)	0.127 x 0.127 (0.005 x 0.005)
Bond Pad #6, 7 (GND)	0.221 x 0.221 (0.009 x 0.009)

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

Chip Assembly and Bonding Diagram



Assembly Process Notes

Reflow process assembly notes:

- Use AuSn (80/20) solder with limited exposure to temperatures at or above 300°C (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°C.

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