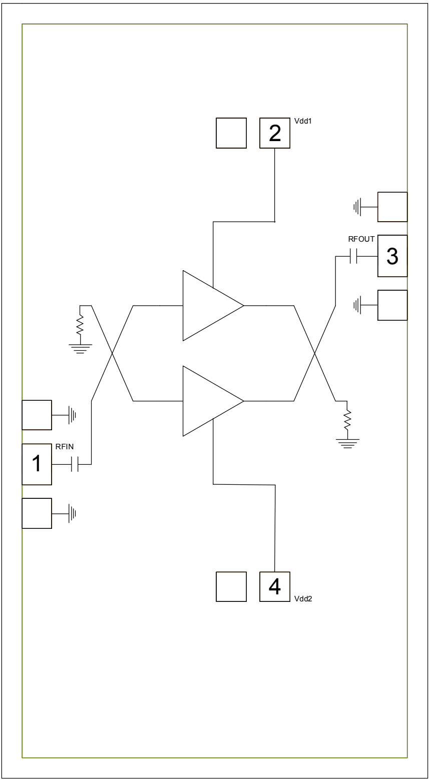
CMD199

26-35 GHz Balanced Driver Amplifier

Features

- ► Wide bandwidth
- ► Positive gain slope
- ► Low noise and high linearity
- ► Excellent return losses
- ► Small die size

Functional Block Diagram



Description

The CMD199 is a wideband GaAs MMIC driver amplifier ideally suited for military, space and communications systems where small size and high linearity are needed. At 30 GHz the device delivers 15 dB of gain with a corresponding output 1 dB compression point of +19.5 dBm and noise figure of 3.5 dB. The CMD199 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching. The CMD199 offers full passivation for increased reliability and moisture protection.

Electrical Performance - V_{dd1} = V_{dd2} = 5.0 V, T_A = 25 °C, F=30 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		26 - 35		GHz
Gain		15		dB
Noise Figure		3.5		dB
Input Return Loss		14		dB
Output Return Loss		20		dB
Output P1dB		19.5		dBm
Supply Current (I_{dd1} + I_{dd2})		72		mA

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Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd1, Vdd2	7.0 V
RF Input Power	+20 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	883 mW
Thermal Resistance	73.6 °C/W
Operating Temperature	-55 to 85 °C
Storage Temperature	-55 to 150 °C

Operation of this device outside the maximum ratings may cause permanent damage.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Vdd1, Vdd2	3.0	5.0	7.0	V
Idd1		36		mA
Idd2		36		mA

Electrical performance is measured at specific test conditions. Electrical specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications, $V_{dd1} = V_{dd2} = 5.0$ V, $T_A = 25\ ^oC$

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		26 - 30			30 - 35		GHz
Gain	11	14	18	12	15.5	18.5	dB
Noise Figure		4.5			3.5		dB
Input Return Loss		11			10		dB
Output Return Loss		13			8		dB
Output P1dB	16	19		14	19		dBm
Output IP3		24			24.5		dBm
Supply Current ($I_{dd1} + I_{dd2}$)	50	72	94	50	72	94	mA
Gain Temperature Coefficient		0.02			0.02		dB/°C
Noise Figure Temperature Coefficient		0.014			0.014		dB/°C

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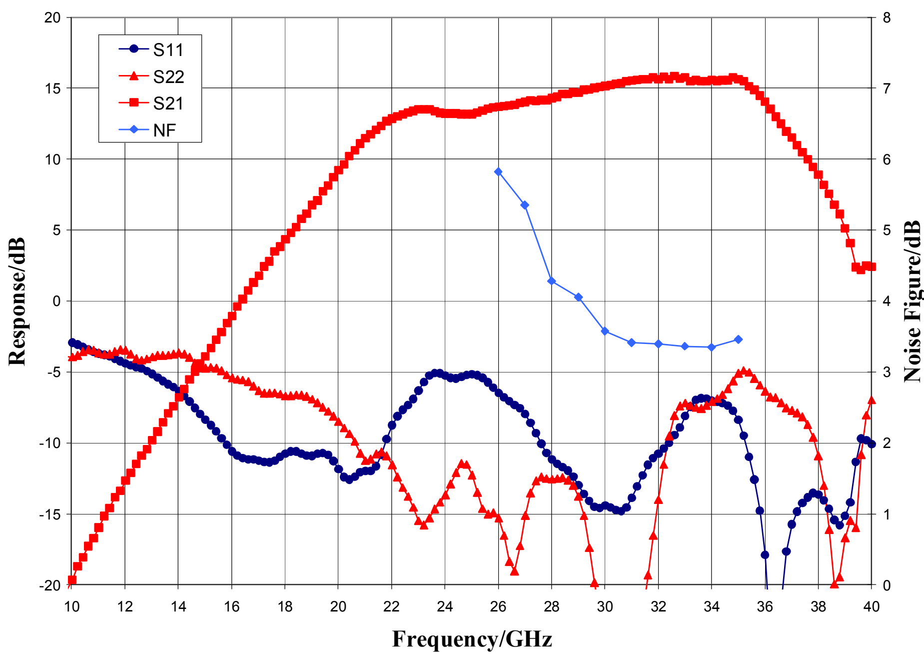
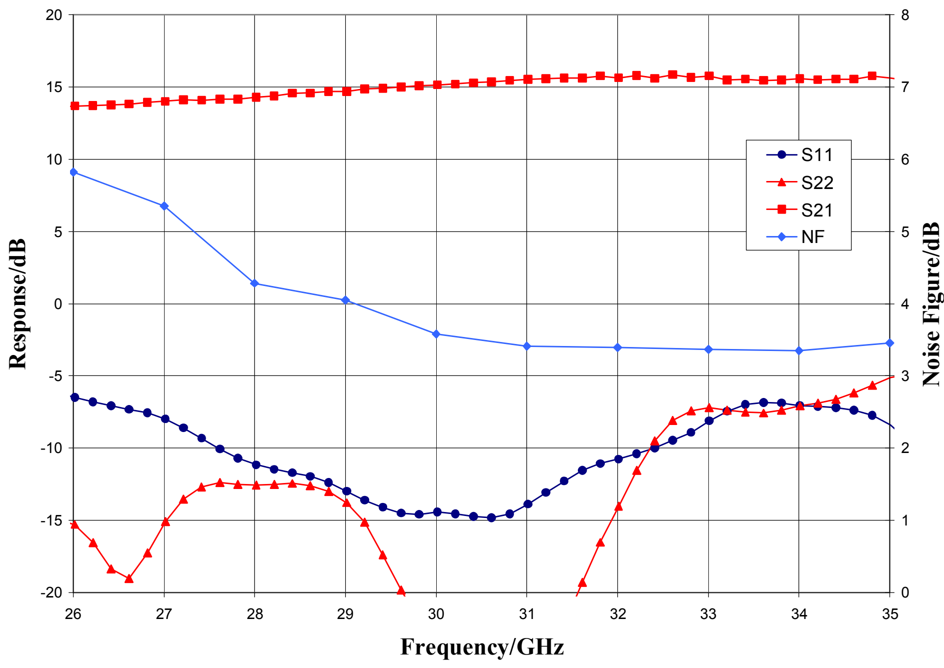
Typical Performance

Broadband Performance, $V_{dd1} = V_{dd2} = 5.0$ V, $I_{dd1} = I_{dd2} = 36$ mA, $T_A = 25$ °C



Narrow-band Performance, $V_{dd1} = V_{dd2} = 5.0$ V, $I_{dd1} = I_{dd2} = 36$ mA, $T_A = 25$ °C



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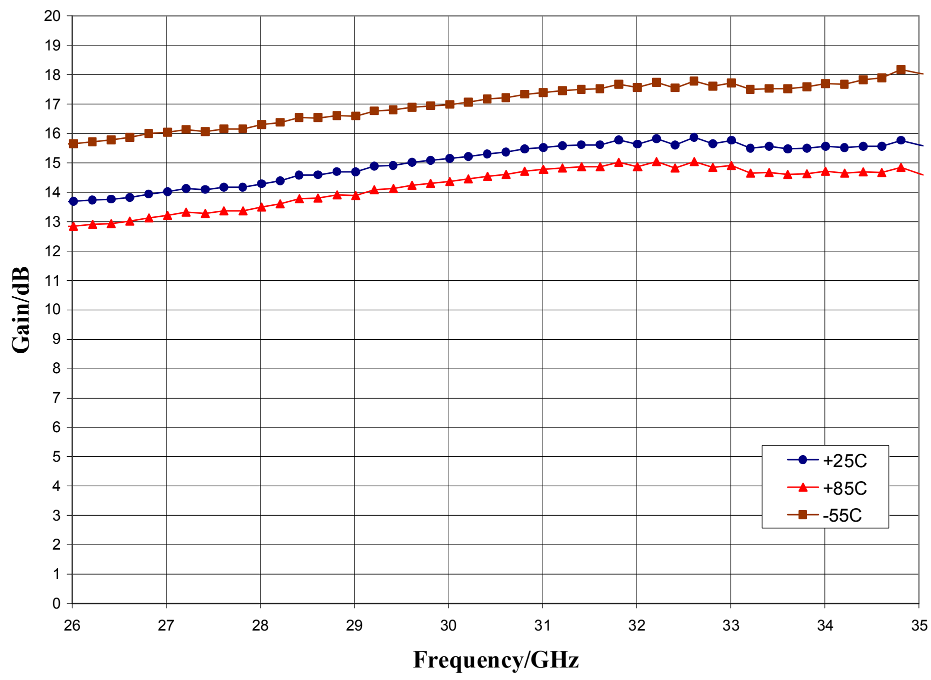
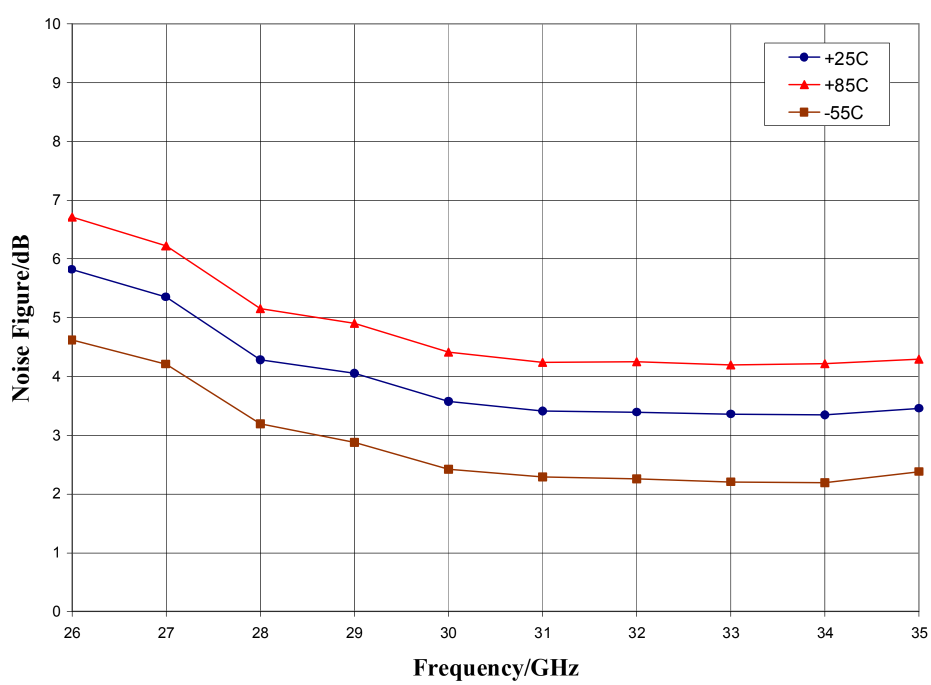
Typical Performance

Gain vs. Temperature, $V_{dd1} = V_{dd2} = 5.0$ V



Noise Figure vs. Temperature, $V_{dd1} = V_{dd2} = 5.0$ V



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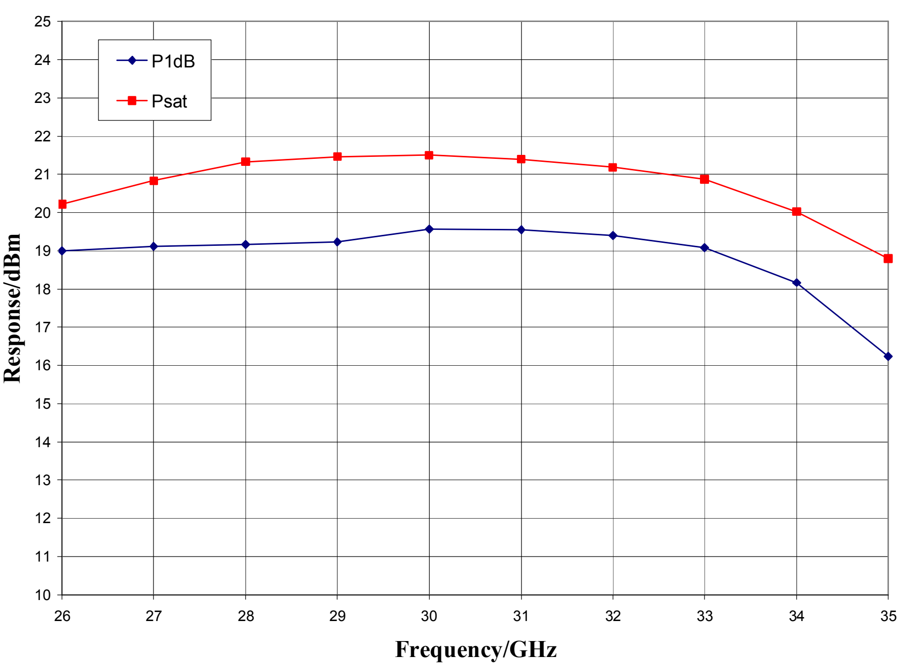
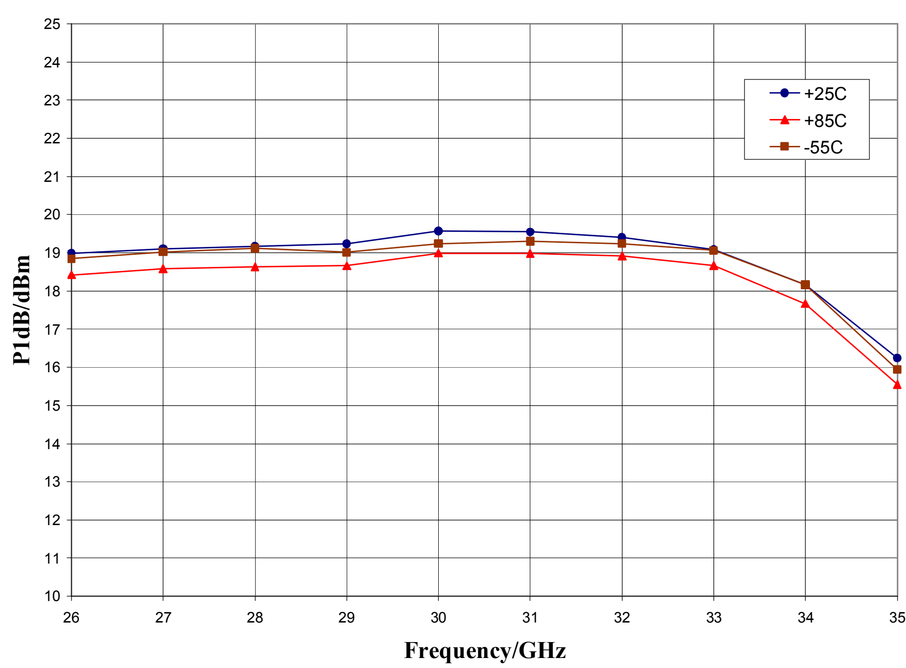
Typical Performance

Output Power, $V_{dd1} = V_{dd2} = 5.0$ V, $T_A = 25$ °C



P1dB vs. Temperature, $V_{dd1} = V_{dd2} = 5.0$ V



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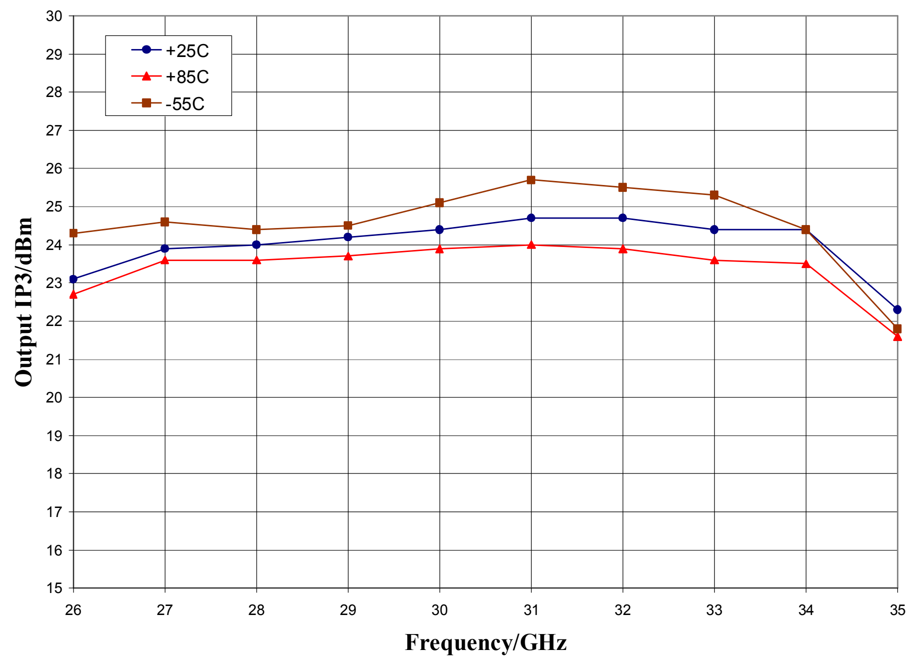
Typical Performance

Output IP3 vs. Temperature, $V_{dd1} = V_{dd2} = 5.0$ V



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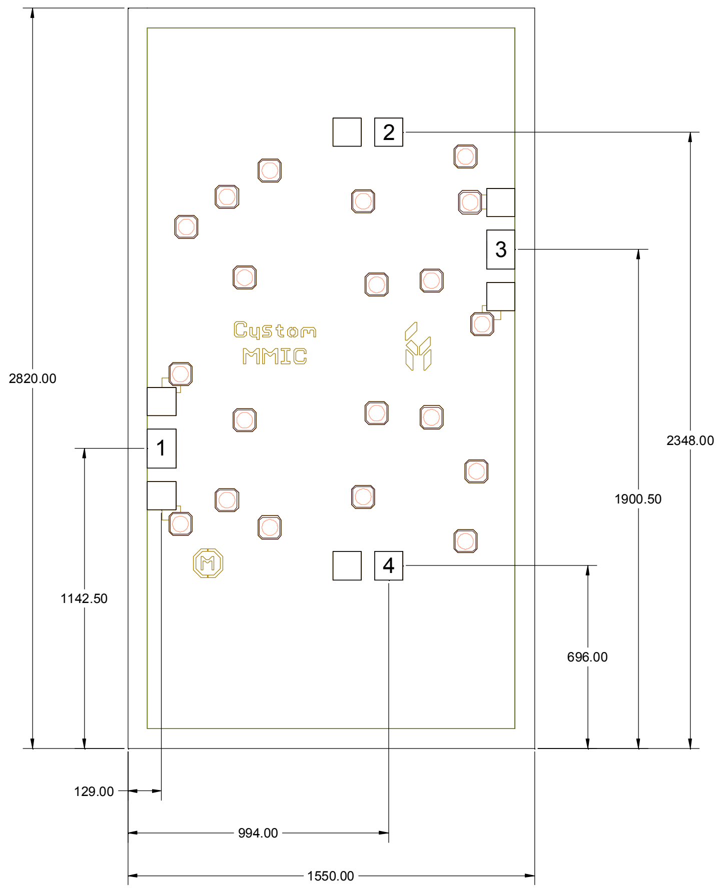
Mechanical Information

Die Outline (all dimensions in microns)



Notes:
1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 85 microns thick
5. DC bond pads are 100 microns square

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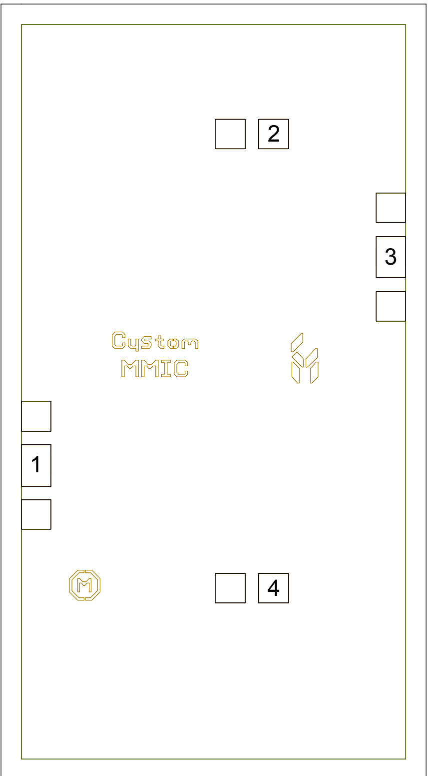
Pad Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	RF in	DC blocked and 50 ohm matched	RF in
2, 4	Vdd1, Vdd2	Power supply voltage Decoupling and bypass caps required	Vdd
3	RF out	DC blocked and 50 ohm matched	RF out
Backside	Ground	Connect to RF / DC ground	GND

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Applications Information

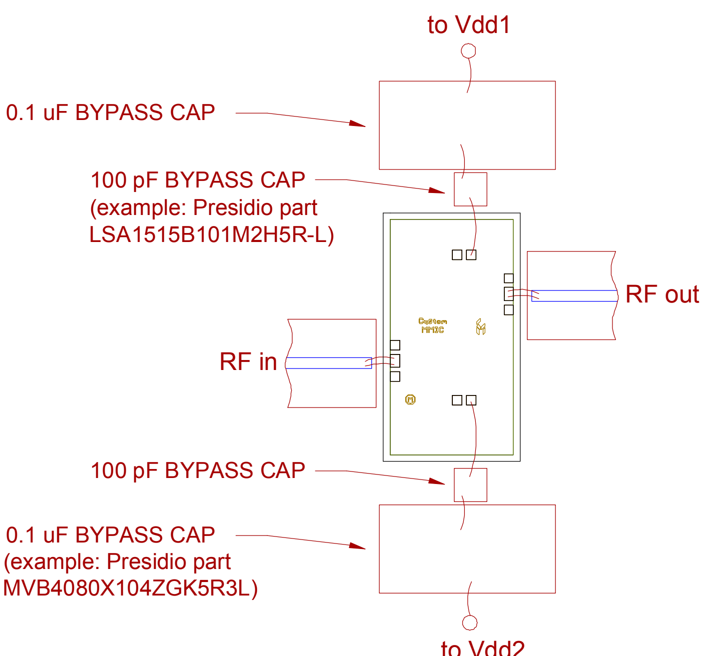
Assembly Guidelines

The backside of the CMD199 is RF ground. Die attach should be accomplished with electrically and thermally conductive epoxy only. Eutectic attach is not recommended. Standard assembly procedures should be followed for high frequency devices. The top surface of the semiconductor should be made planar to the adjacent RF transmission lines, and the RF decoupling capacitors placed in close proximity to the DC connections on chip.

RF connections should be made as short as possible to reduce the inductive effect of the bond wire. Use of a 0.8 mil thermosonic wedge bonding is highly recommended as the loop height will be minimized. The RF input and output require a double bond wire as shown.

The semiconductor is 85 um thick and should be handled by the sides of the die or with a custom collet. Do not make contact directly with the die surface as this will damage the monolithic circuitry. Handle with care.

Assembly Diagram



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

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