CMD249

DC-20 GHz Distributed Power Amplifier

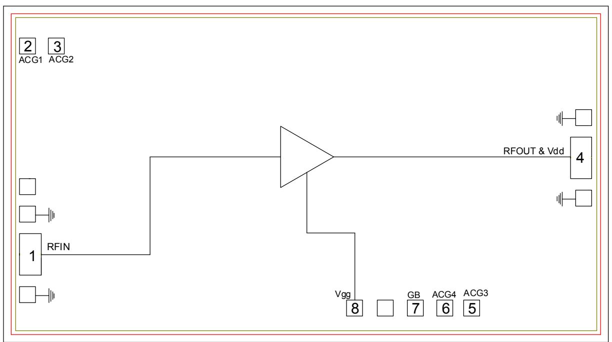
Features

- ► Ultra wideband performance
- ► High linearity
- ► High output power
- ► Excellent return losses
- ► Small die size

Description

The CMD249 is wideband GaAs MMIC distributed power amplifier die which operates from DC to 20 GHz. The amplifier delivers greater than 12 dB of gain with a corresponding output 1 dB compression point of +30 dBm and output IP3 of 38 dBm at 10 GHz. The CMD249 is a 50 ohm matched design which eliminates the need for RF port matching. The CMD249 offers full passivation for increased reliability and moisture protection.

Functional Block Diagram



Electrical Performance – V_{dd} = 10.0 V, V_{gg} = -0.95 V, T_A = 25 °C, F = 10 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		DC – 20		GHz
Gain		13		dB
Noise Figure		3.4		dB
Input Return Loss		16		dB
Output Return Loss		17		dB
Output P1dB		30		dBm
Supply Current		400		mA

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Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	10.5 V
Gate1 Voltage, Vgg	-2.0 to 0 V
RF Input Power	+30 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	4 W
Thermal Resistance, Θ_{JC}	16.25 °C/W
Operating Temperature	-55 to 85 °C
Storage Temperature	-55 to 150 °C

Exceeding any one or combination of the maximum ratings may cause permanent damage to the device.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Vdd	8.0	10.0	10.5	V
Idd	350	400	450	mA
Vgg		-0.95		V
Igg		-2.5		mA

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

Electrical Specifications – V_{dd} = 10.0 V, V_{gg} = -0.95 V, T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		DC – 6			6 – 20		GHz
Gain	10.5	13		11	13.5		dB
Noise Figure		5			3.5		dB
Input Return Loss		15			17		dB
Output Return Loss		10			18		dB
Output P1dB	28	30		27	29.5		dBm
Output IP3		40			35		dBm
Supply Current	300	400	500	300	400	500	mA
Gain Temperature Coefficient		0.009			0.014		dB/°C
Noise Figure Temperature Coefficient		0.01			0.012		dB/°C

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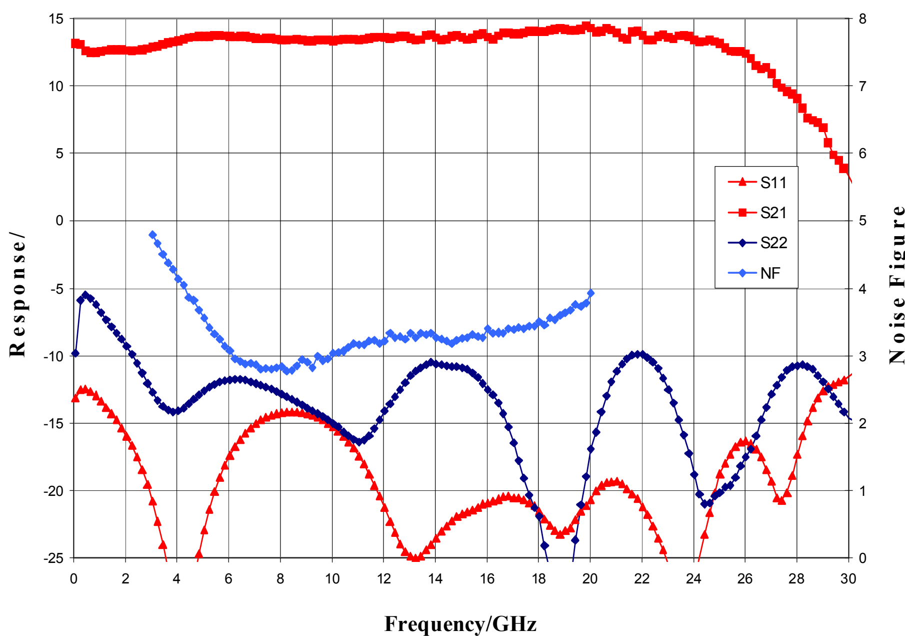
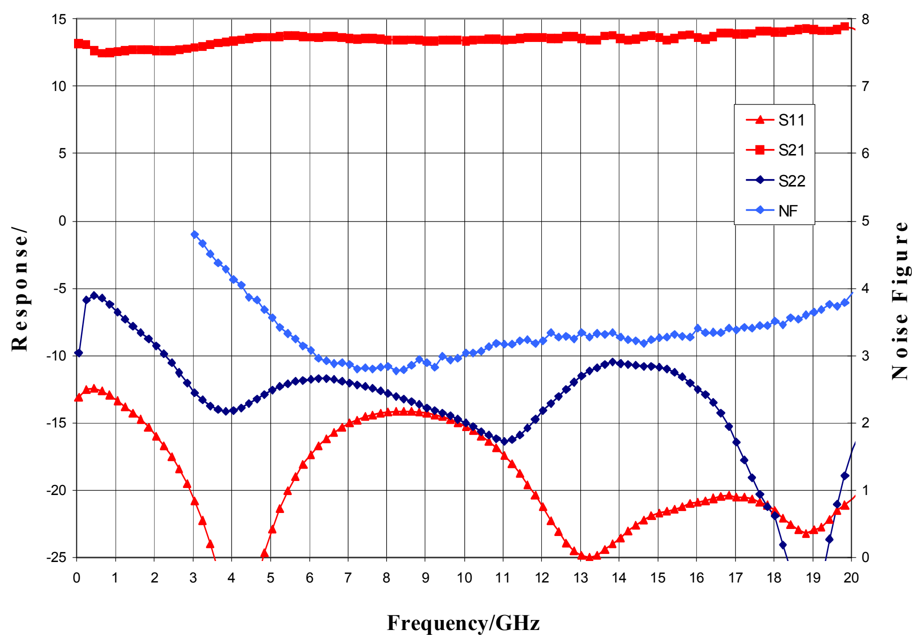
Typical Performance

Broadband Performance, V_{dd} = 10 V, V_{gg} = -0.95 V, I_{dd} = 400 mA, T_A = 25 °C



Narrow-band Performance, V_{dd} = 10 V, V_{gg} = -0.95 V, I_{dd} = 400 mA, T=25 °C



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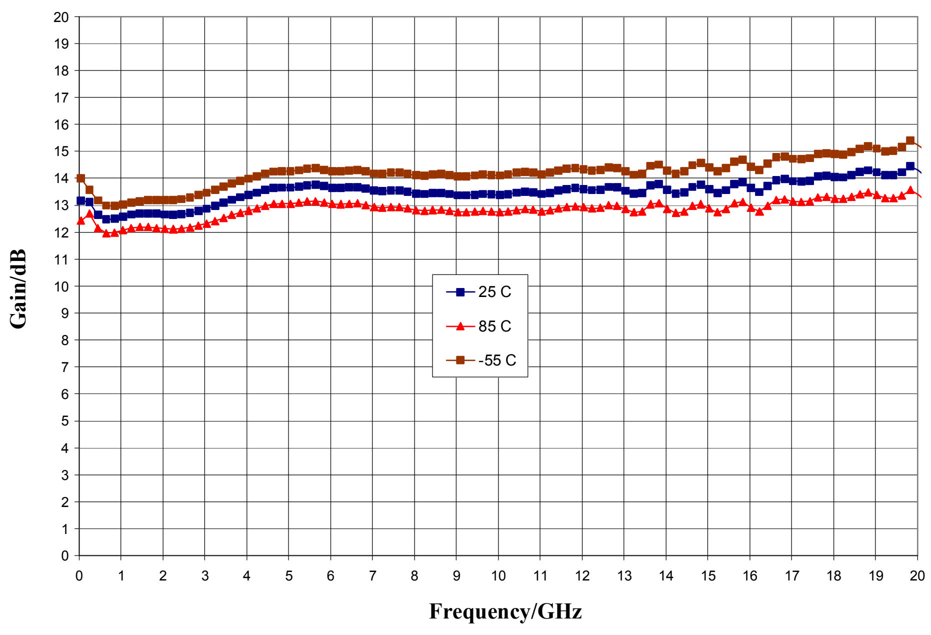
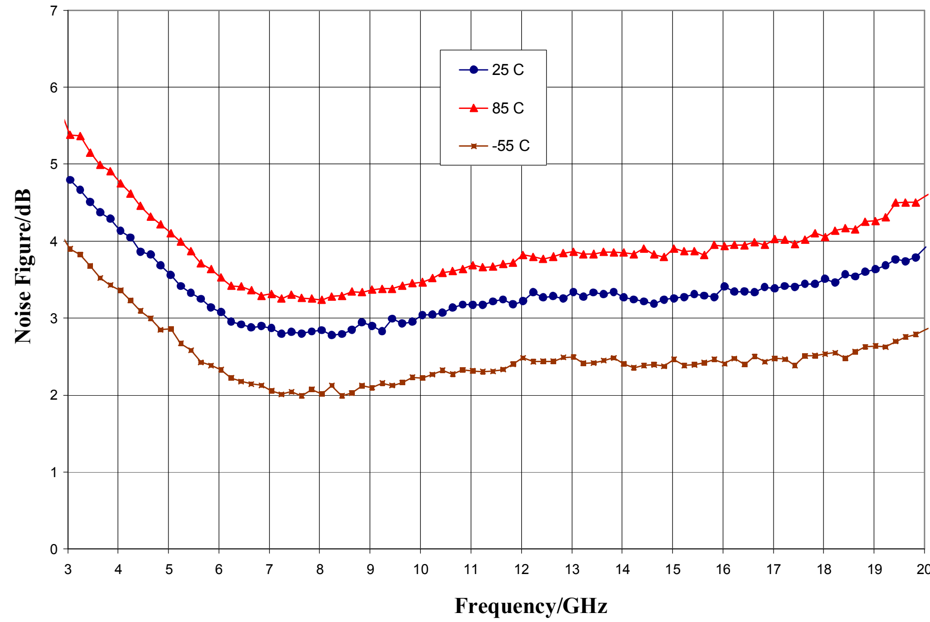
Typical Performance

Gain vs. Temperature, V_{dd} = 10 V, V_{gg} = -0.95 V



Noise Figure vs. Temperature, V_{dd} = 10 V, V_{gg} = -0.95 V



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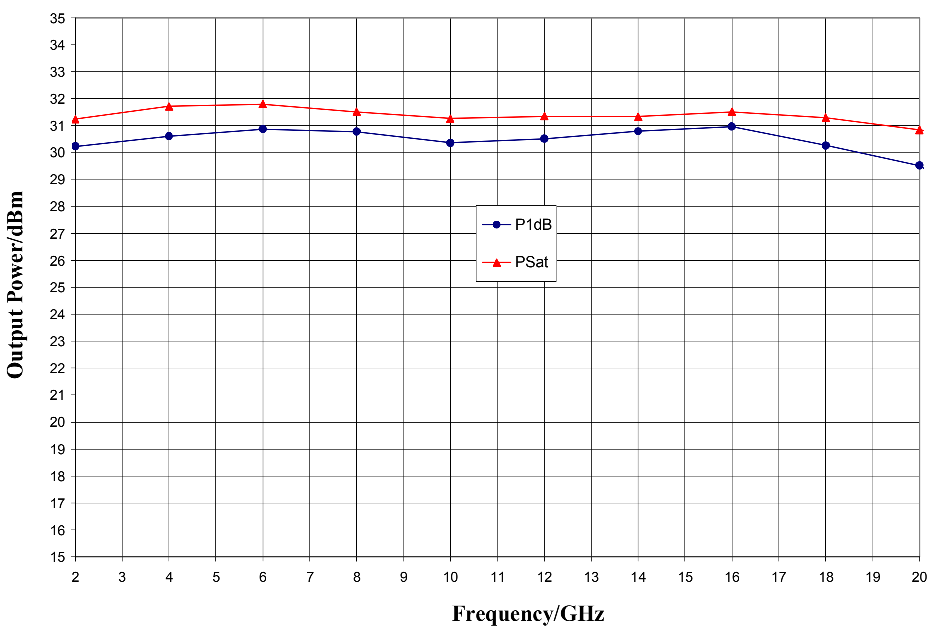
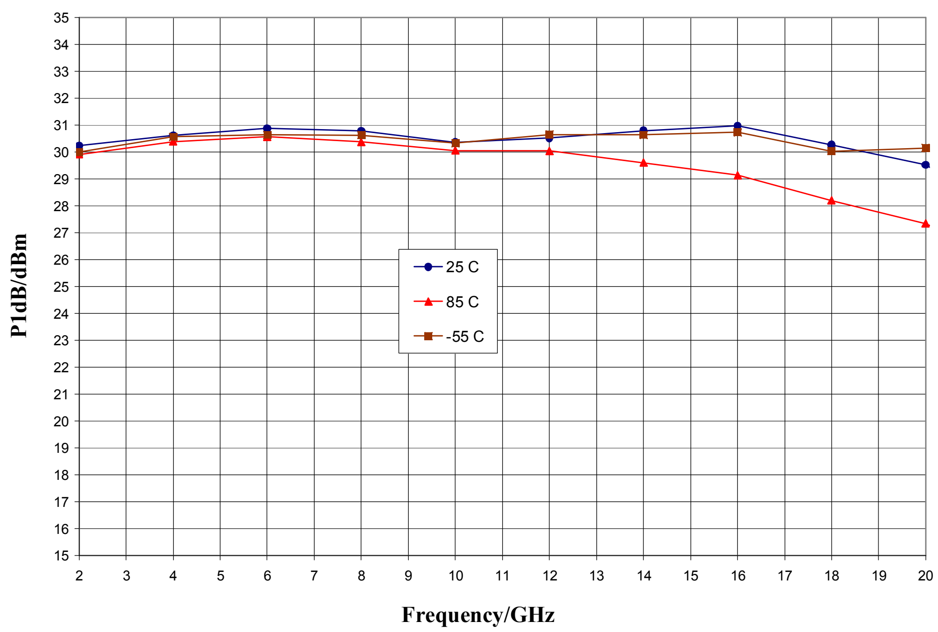
Typical Performance

Output Power, V_{dd} = 10 V, V_{gg} = -0.95 V, T_A = 25 °C



P1dB vs. Temperature, V_{dd} = 10 V, V_{gg} = -0.95 V



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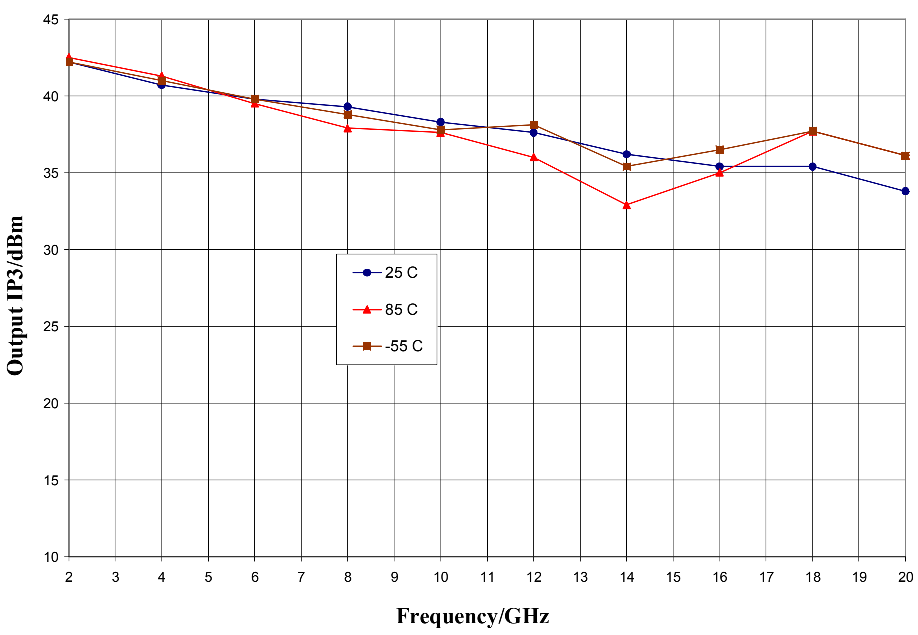
Typical Performance

Output IP3 vs. Temperature, V_{dd} = 10 V, V_{gg} = -0.95 V



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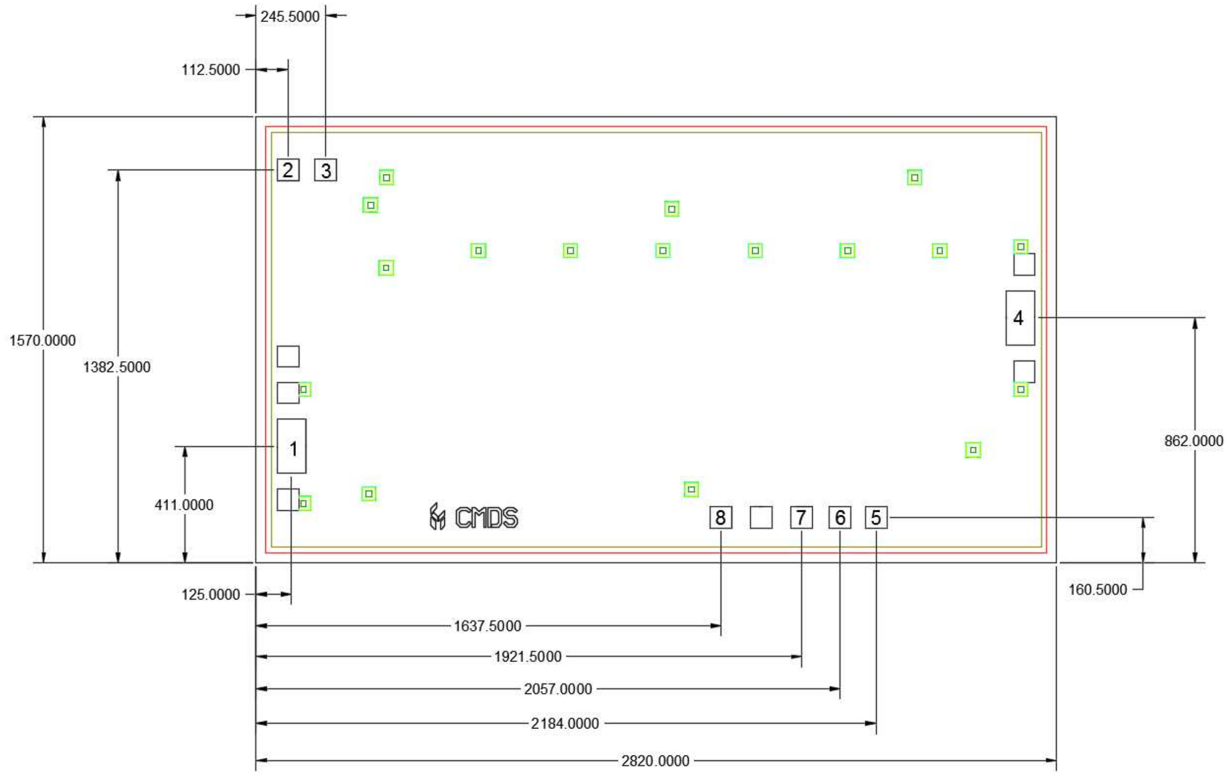
Mechanical Information

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 70 microns thick
5. DC bond pads (2, 3, 5, 6, 7, and 8) are 78 microns square
6. RF bond pads (1 and 4) are 108 x 193 microns

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Pad Description

Pad Diagram

Functional Description

Pad	Function	Description	Schematic
1	RF in	50 ohm matched input	RF in
2, 3	ACG1, 2	Low frequency termination. Attach bypass capacitor per application circuit	ACG1, ACG2, RF out & Vdd
4	RF out & Vdd	Power supply voltage and 50 ohm matched output	
5, 6	ACG3, 4	Low frequency termination. Attach bypass capacitor per application circuit	ACG3, ACG4, RF in
7	GB	Connect to DC ground	GB, Vgg
8	Vgg	Power supply voltage Decoupling and bypass caps required	
Backside	Ground	Connect to RF / DC ground	GND

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Applications Information

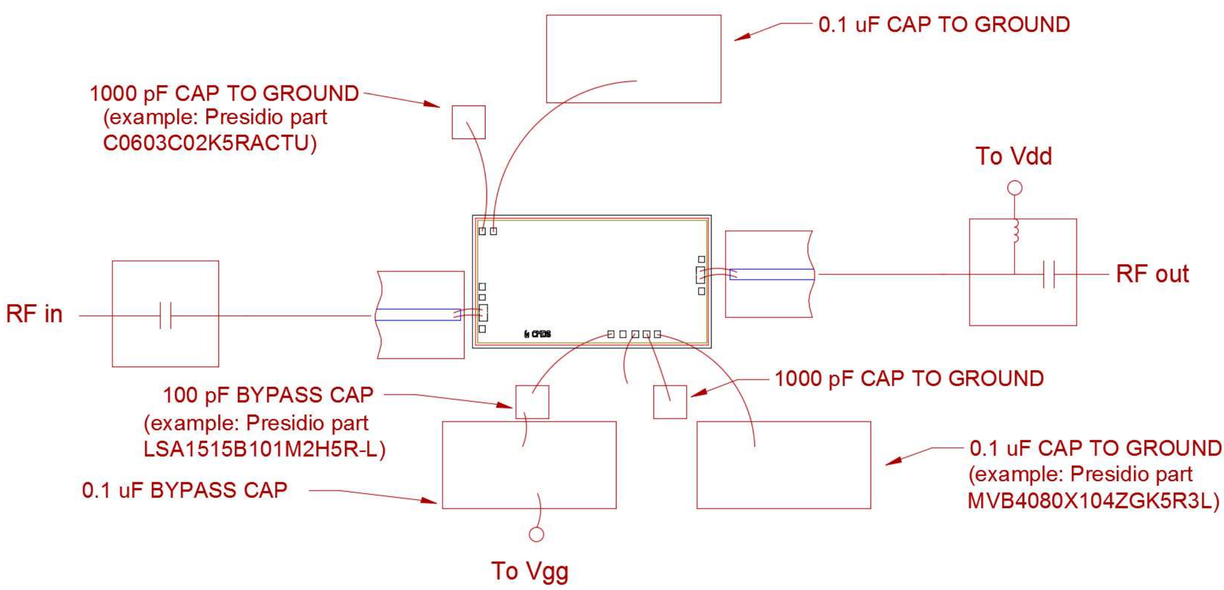
Assembly Guidelines

The backside of the CMD249 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 70 um thick and should be handled by the sides of the die or with a custom collect. 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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