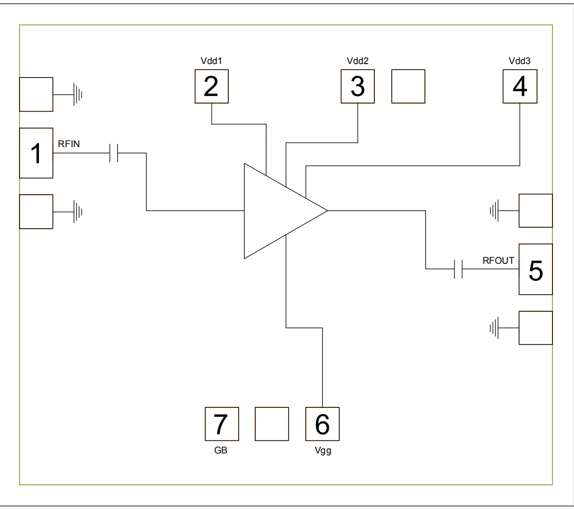
CMD207

20-40 GHz Driver Amplifier

Features

- ► Wide bandwidth
- ► High gain
- ► High linearity
- ► Small die size

Functional Block Diagram



Description

The CMD207 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 35 dB of gain with a corresponding output 1 dB compression point of +18.5 dBm and noise figure of 5.5 dB. The CMD207 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching. The CMD207 offers full passivation for increased reliability and moisture protection.

Electrical Performance - $V_{dd1} = V_{dd2} = V_{dd3} = 4.0$ V, $V_{gg} = 3.0$ V $T_A = 25$ °C, F=30 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		20 - 40		GHz
Gain		35		dB
Noise Figure		5.5		dB
Input Return Loss		8		dB
Output Return Loss		7		dB
Output P1dB		18.5		dBm
Supply Current ($I_{dd1} + I_{dd2} + I_{dd3}$)		270		mA

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Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, $V_{dd1, 2, 3}$	4.0 V
Gate Voltage, V_{gg}	3.0 V
RF Input Power	+10 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	1170 mW
Thermal Resistance	55 °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
$V_{dd1, 2, 3}$	+2.0	+4.0	+4.0	V
$I_{dd1}+I_{dd2}+I_{dd3}$		270		mA
V_{gg}		+3.0		V
I_{gg}		2.5		mA

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

Electrical Specifications, $V_{dd1} = V_{dd2} = V_{dd3} = 4.0$ V, $V_{gg} = 3.0$ V $T_A = 25$ °C

Parameter	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		20 - 26			26 - 34			34 - 40		GHz
Gain	28	31		29	33		23	27		dB
Noise Figure		6.5			5.5			5.3		dB
Input Return Loss		7			8			8		dB
Output Return Loss		10			7			10		dB
Output P1dB	14	18		16	18.5		15	18.5		dBm
Output IP3		31			29			26		dBm
Supply Current ($I_{dd1} + I_{dd2} + I_{dd3}$)	190	270	350	190	270	350	190	270	350	mA
Gain Temperature Coefficient		0.025			0.038			0.028		dB/°C
Noise Figure Temperature Coefficient		0.015			0.015			0.015		dB/°C

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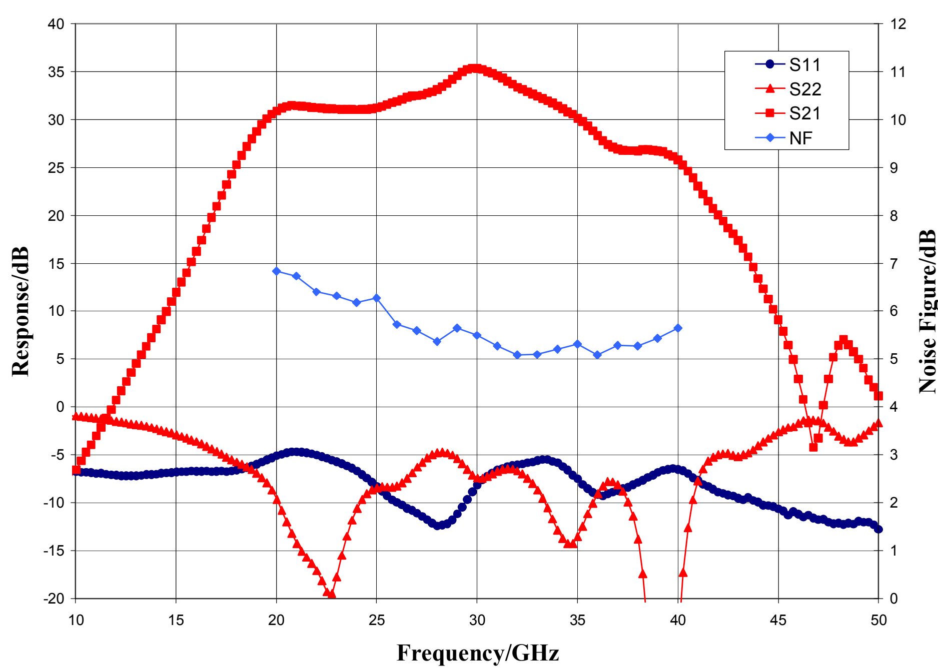
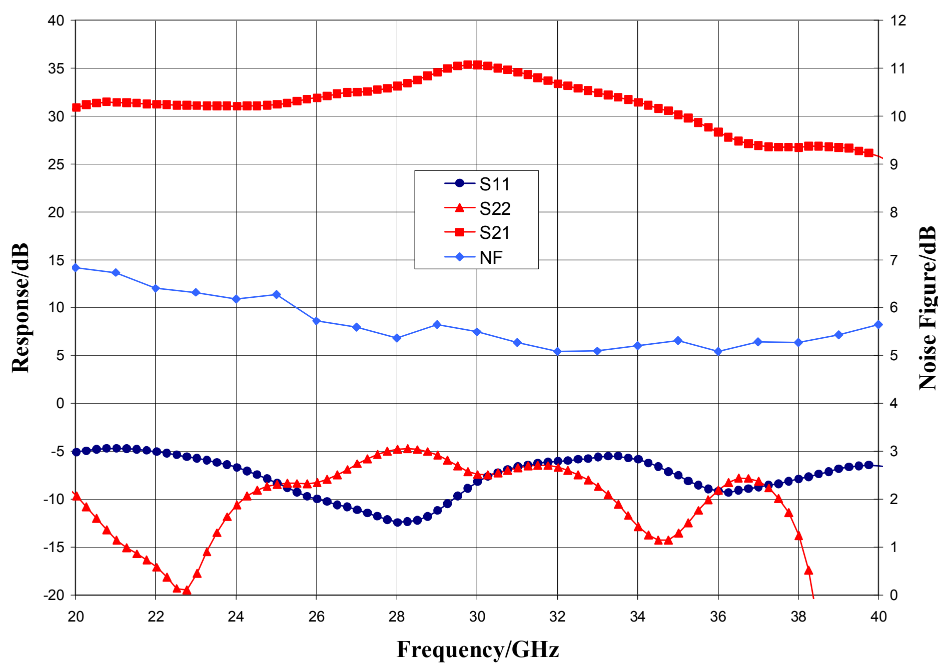
Typical Performance

Broadband Performance, V_{dd} = 4.0 V, V_{gg} = 3.0 V, I_{dd} = 270 mA, T_A = 25 °C



Narrow-band Performance, V_{dd} = 4.0 V, V_{gg} = 3.0 V, I_{dd} = 270 mA, T_A = 25 °C



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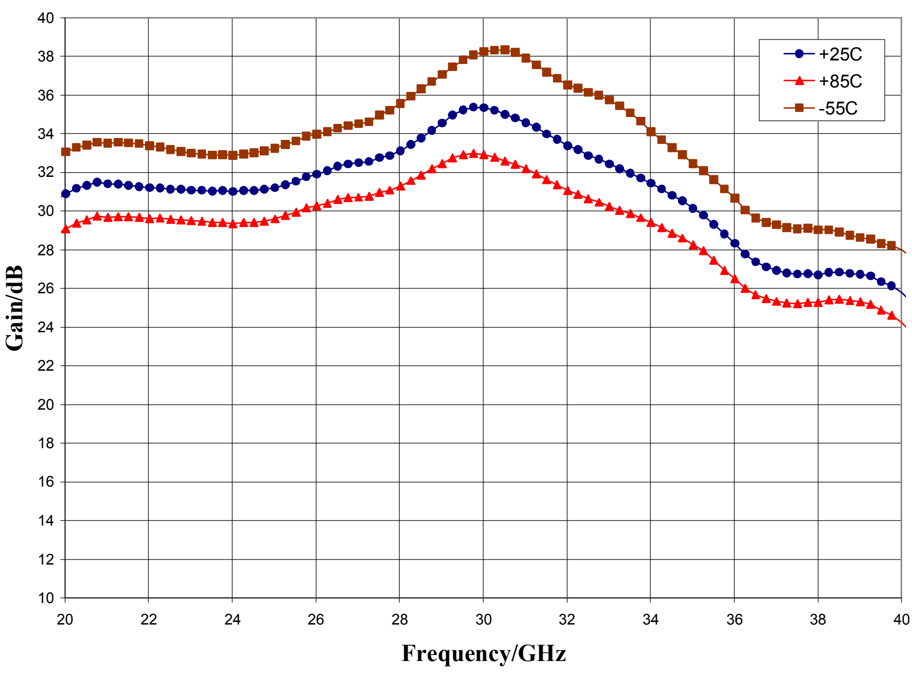
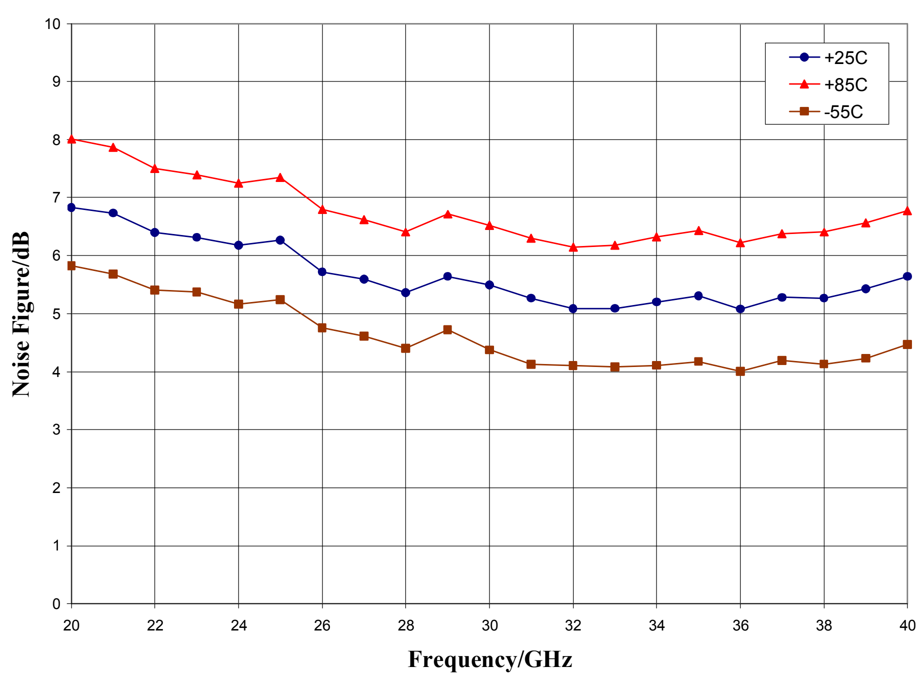
Typical Performance

Gain vs. Temperature, V_{dd} = 4.0 V, V_{gg} = 3.0 V



Noise Figure vs. Temperature, V_{dd} = 4.0 V, V_{gg} = 3.0 V



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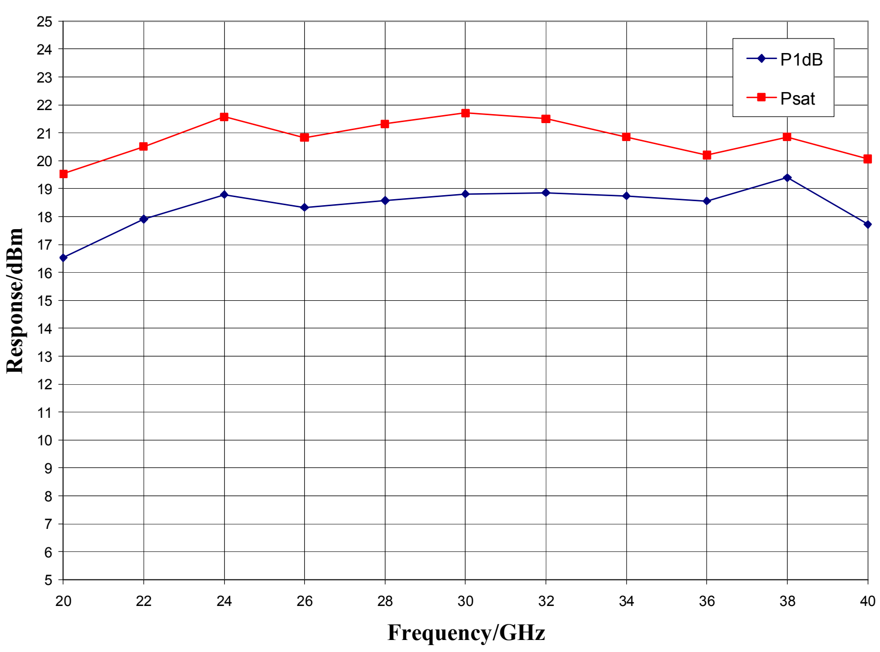
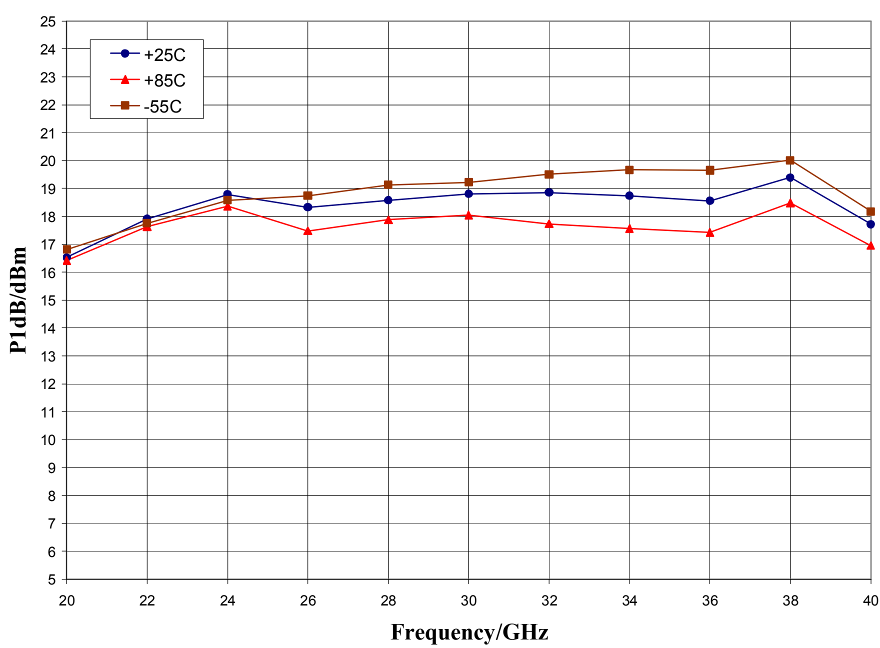
Typical Performance

Output Power, V_{dd} = 4.0 V, V_{gg} = 3.0 V, T_A = 25 °C



P1dB vs. Temperature, V_{dd} = 4.0 V, V_{gg} = 3.0 V



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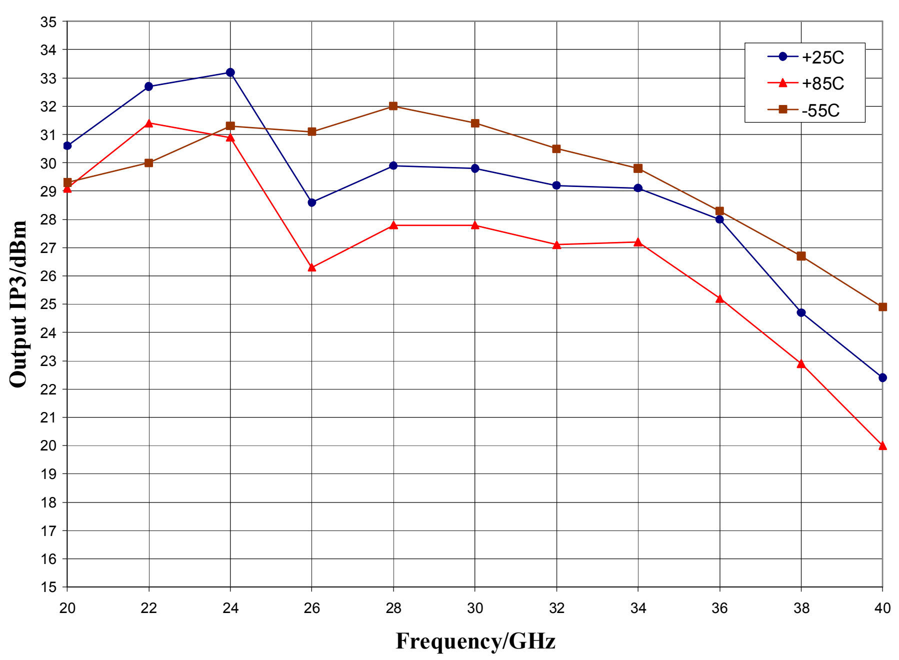
Typical Performance

Output IP3 vs. Temperature, V_{dd} = 4.0 V, V_{gg} = 3.0 V



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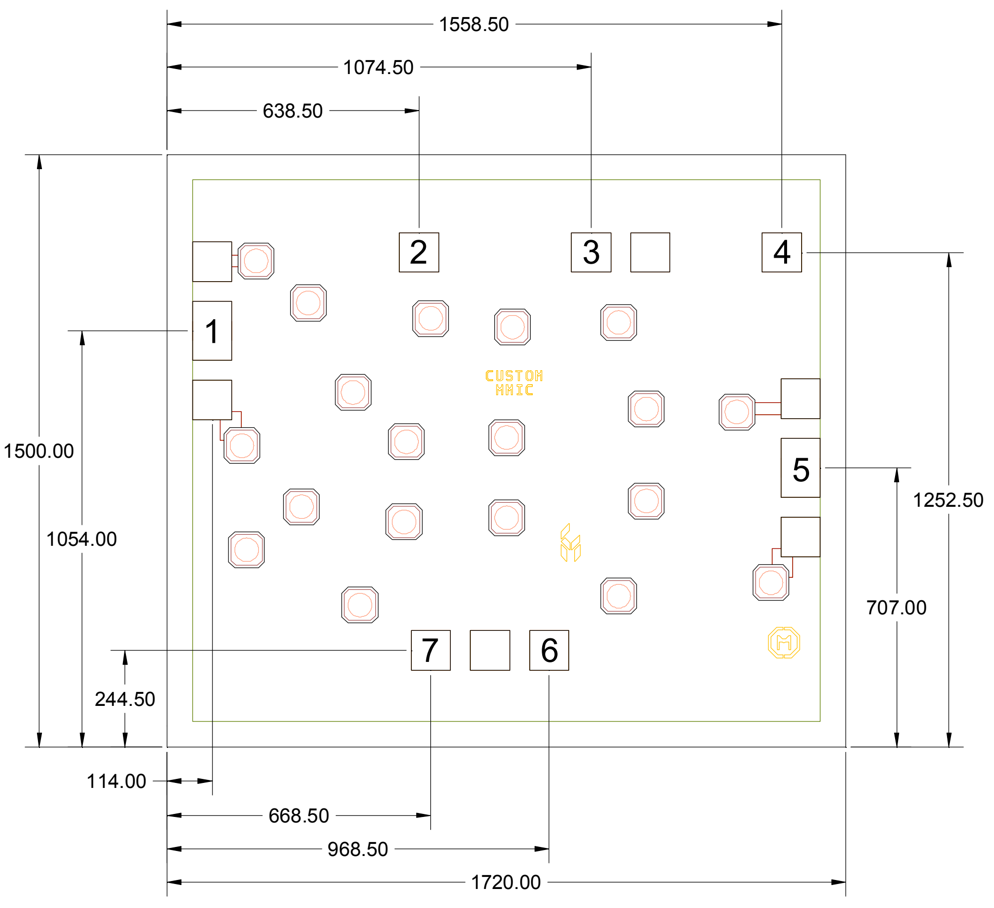
Mechanical Information

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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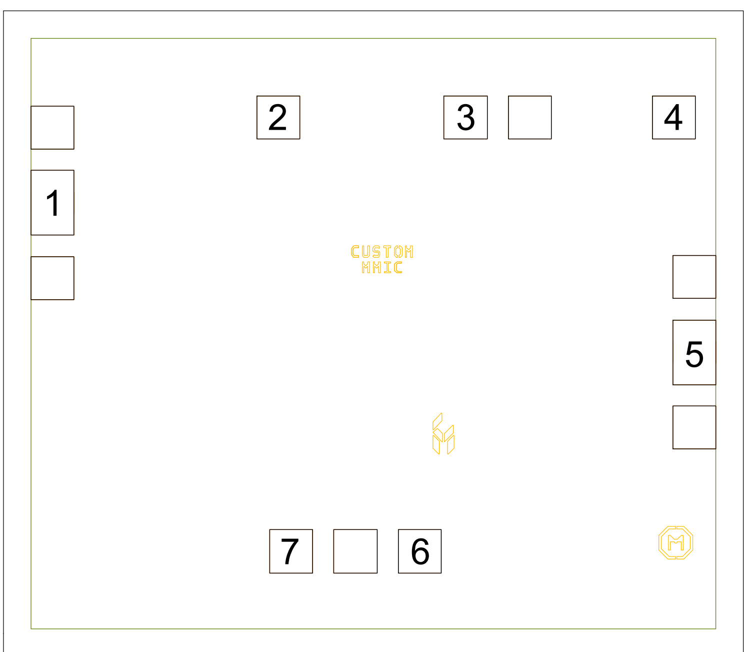
Pad Description

Pad Diagram



Functional Description

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

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Applications Information

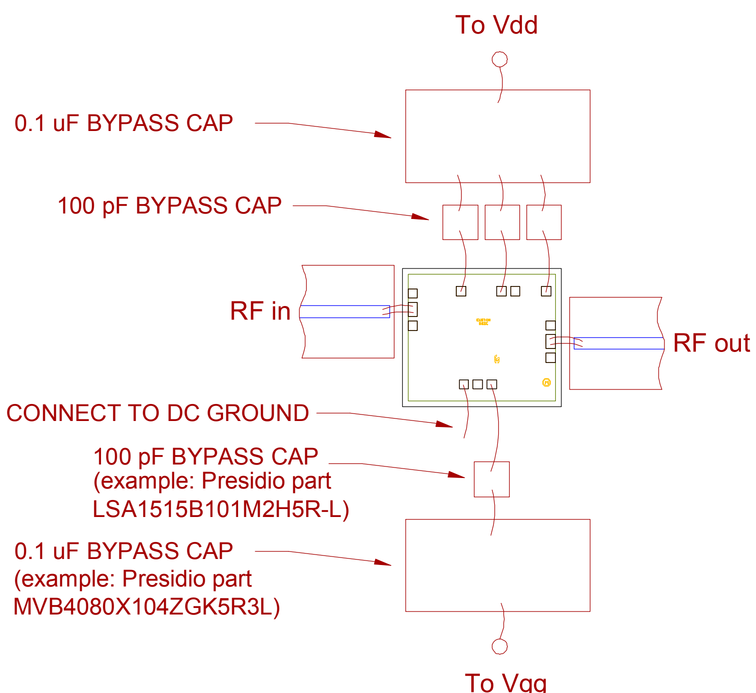
Assembly Guidelines

The backside of the CMD207 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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Applications Information

Biasing and Operation

The CMD207 is biased with a positive drain supply and positive gate supply. Performance is optimized when the drain voltage is set to +4.0 V.

Turn ON procedure:

1. Apply drain voltage V_{dd} and set to +4 V
2. Apply gate voltage V_{gg} and set to +3 V

Turn OFF procedure:

1. Turn off gate voltage
2. Turn off drain voltage

RF power can be applied at any time.

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