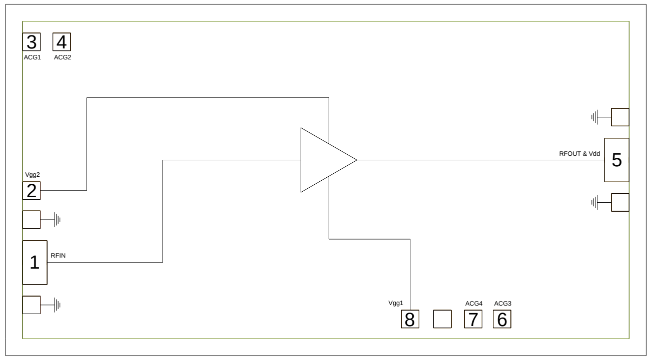
CMD201

DC-20 GHz Distributed Power Amplifier

Features

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

Functional Block Diagram



Description

The CMD201 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 +29 dBm and output IP3 of 38 dBm at 10 GHz. The CMD201 is a 50 ohm matched design which eliminates the need for RF port matching. The CMD201 offers full passivation for increased reliability and moisture protection.

Electrical Performance - V_{dd} = 10.0 V, V_{gg1} = -0.55 V, V_{gg2} = 5.0 V , T_A = 25 °C, F = 10 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		DC - 20		GHz
Gain		12		dB
Noise Figure		3.4		dB
Input Return Loss		16		dB
Output Return Loss		17		dB
Output P1dB		29		dBm
Supply Current		400		mA

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Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	12.0 V
Gate1 Voltage, Vgg1	-2.0 to 0 V
Gate2 Voltage, Vgg2	6.0 V
RF Input Power	+30 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	5.43 W
Thermal Resistance	11.9 °C/W
Operating Temperature	-55 to 85 °C
Storage Temperature	-55 to 150 °C

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Vdd	8.0	10.0	12.0	V
Idd	350	400	450	mA
Vgg1		-0.55		V
Vgg2		5.0		

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

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

Electrical Specifications, V_{dd} = 10.0 V, V_{gg1} = -0.55 V, V_{gg2} = 5.0 V, T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		DC - 6			6 - 20		GHz
Gain	8	11		9	12		dB
Noise Figure		5			3.5		dB
Input Return Loss		15			17		dB
Output Return Loss		10			18		dB
Output P1dB	27	29.5		25	29		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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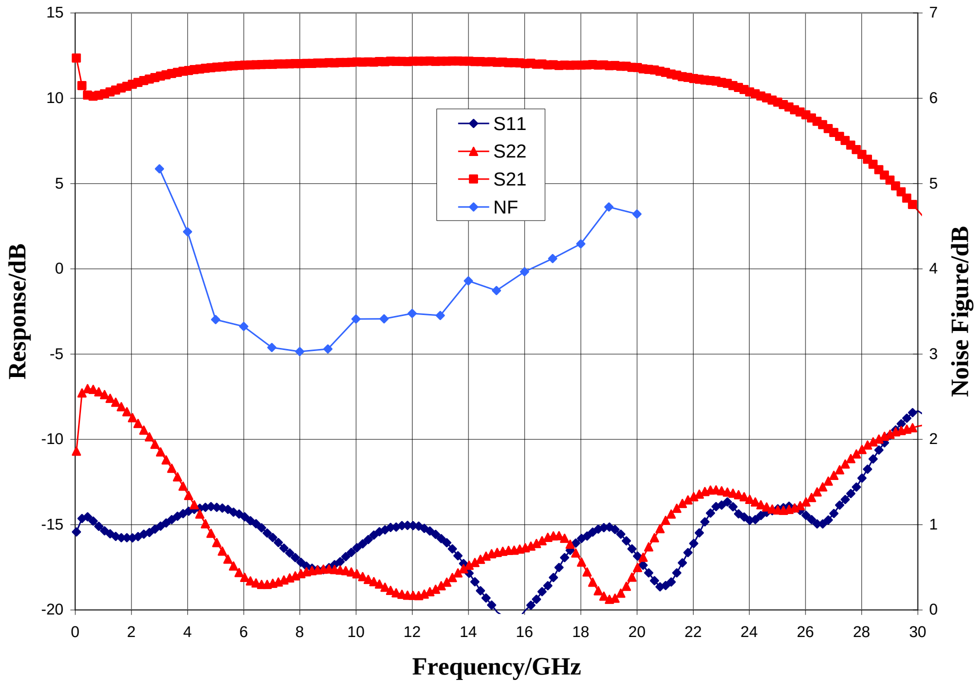
CMD201

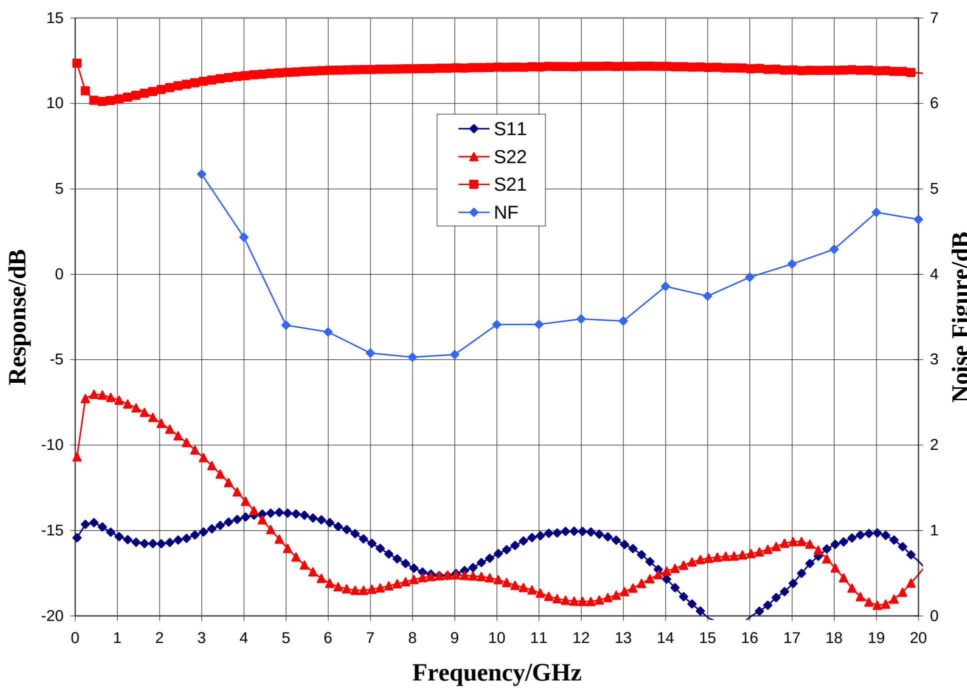
DC-20 GHz Distributed Power Amplifier

Typical Performance

Broadband Performance, V_{dd} = 10 V, V_{gg1} = -0.55 V, V_{gg2} = 5 V, I_{dd} = 400 mA, T_A = 25 °C



Narrow-band Performance, V_{dd} = 10 V, V_{gg1} = -0.55 V, V_{gg2} = 5 V, I_{dd} = 400 mA, T=25 °C



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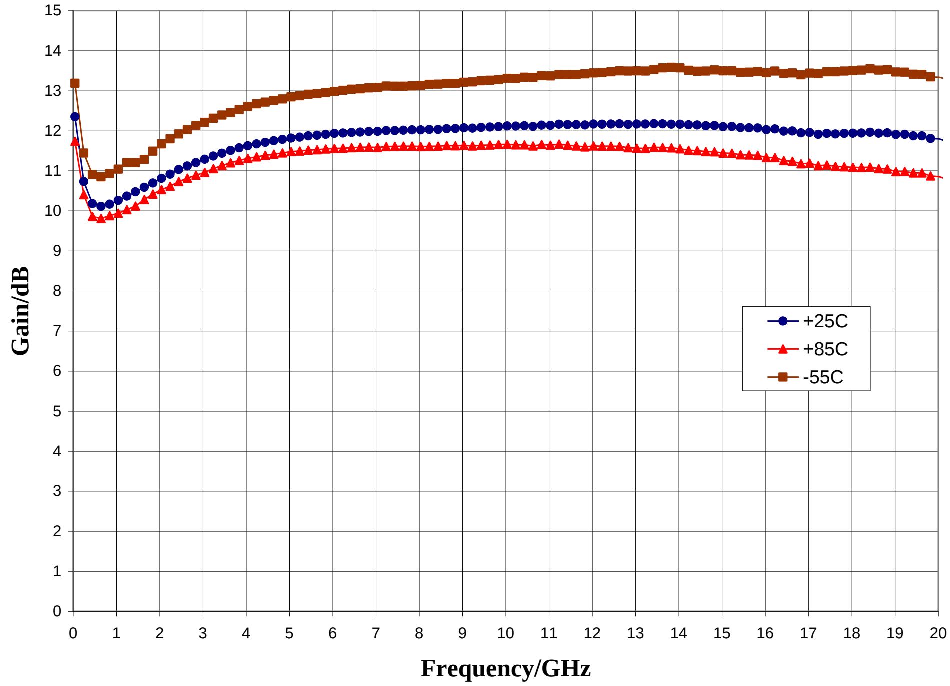
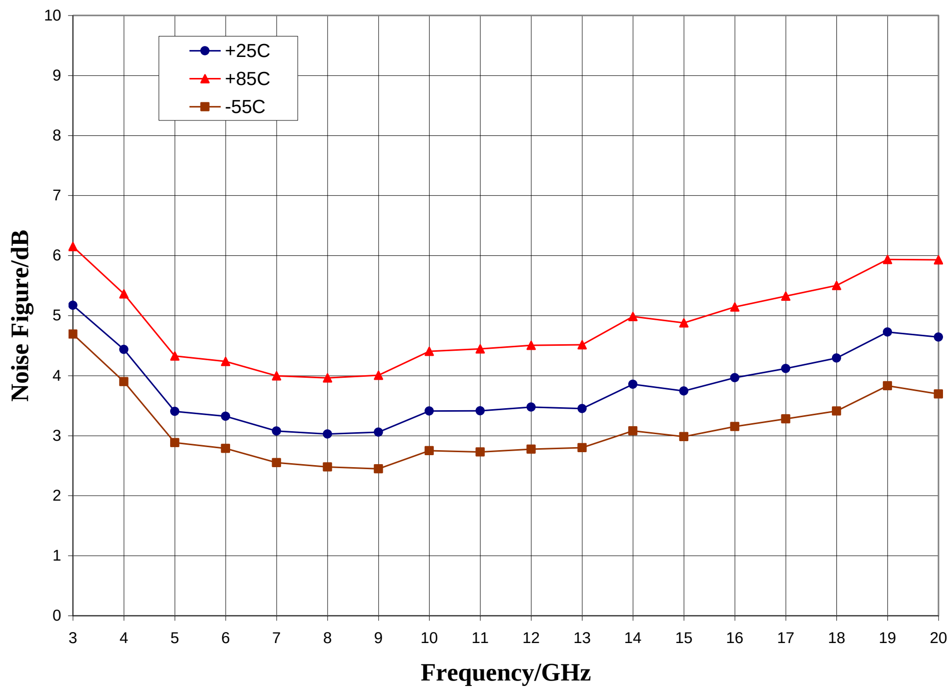
Typical Performance

Gain vs. Temperature, V_{dd} = 10 V, V_{gg1} = -0.55 V, V_{gg2} = 5 V



Noise Figure vs. Temperature, V_{dd} = 10 V, V_{gg1} = -0.55 V, V_{gg2} = 5 V



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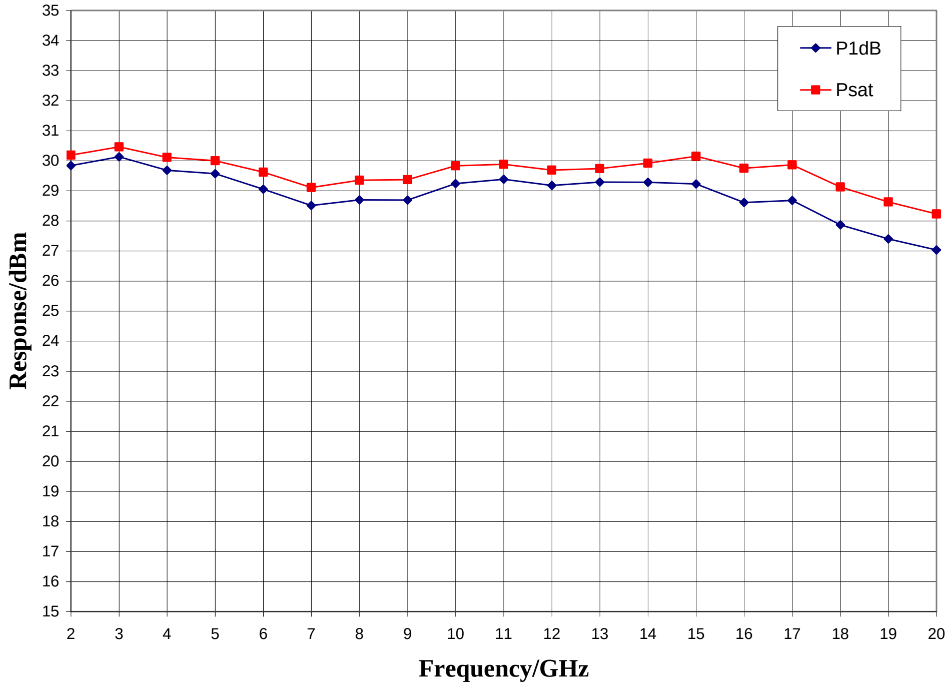
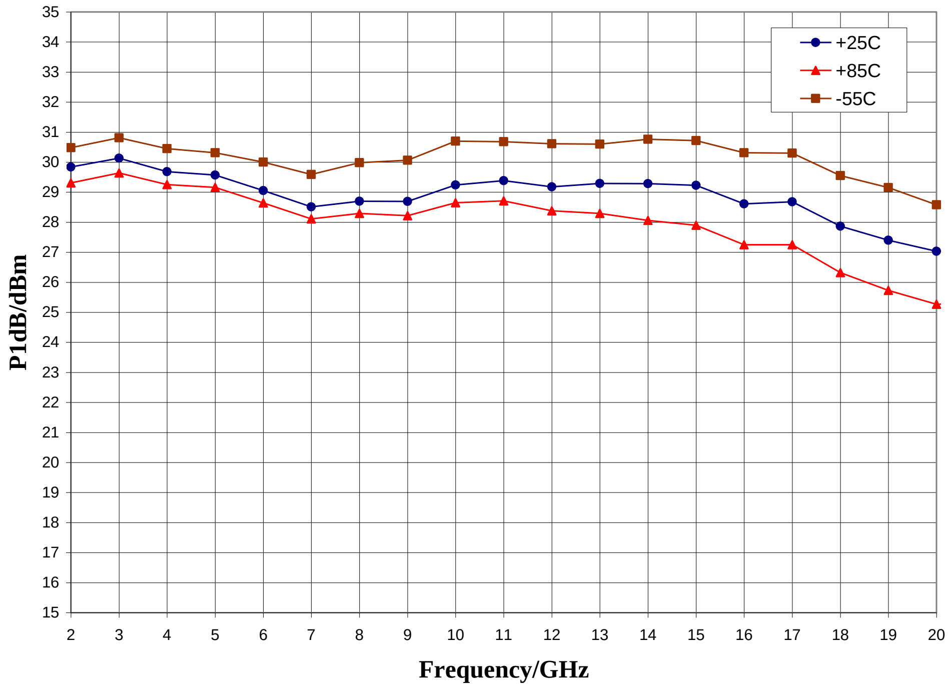
Typical Performance

Output Power, V_{dd} = 10 V, V_{gg1} = -0.55 V, V_{gg2} = 5 V, T_A = 25 °C



P1dB vs. Temperature, V_{dd} = 10 V, V_{gg1} = -0.55 V, V_{gg2} = 5 V



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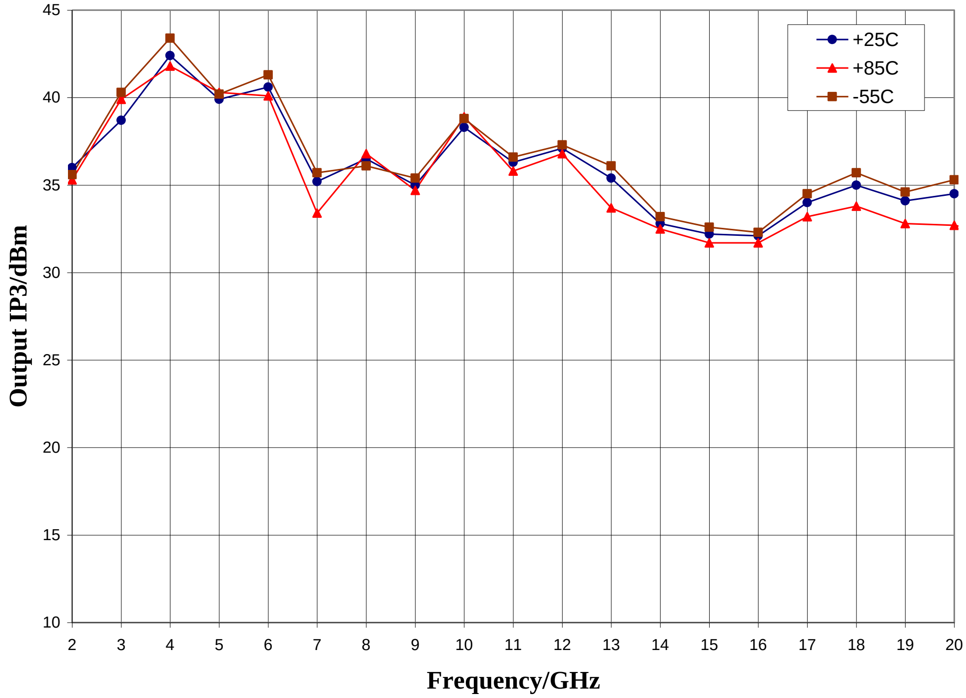
Typical Performance

Output IP3 vs. Temperature, V_{dd} = 10 V, V_{gg1} = -0.55 V, V_{gg2} = 5 V



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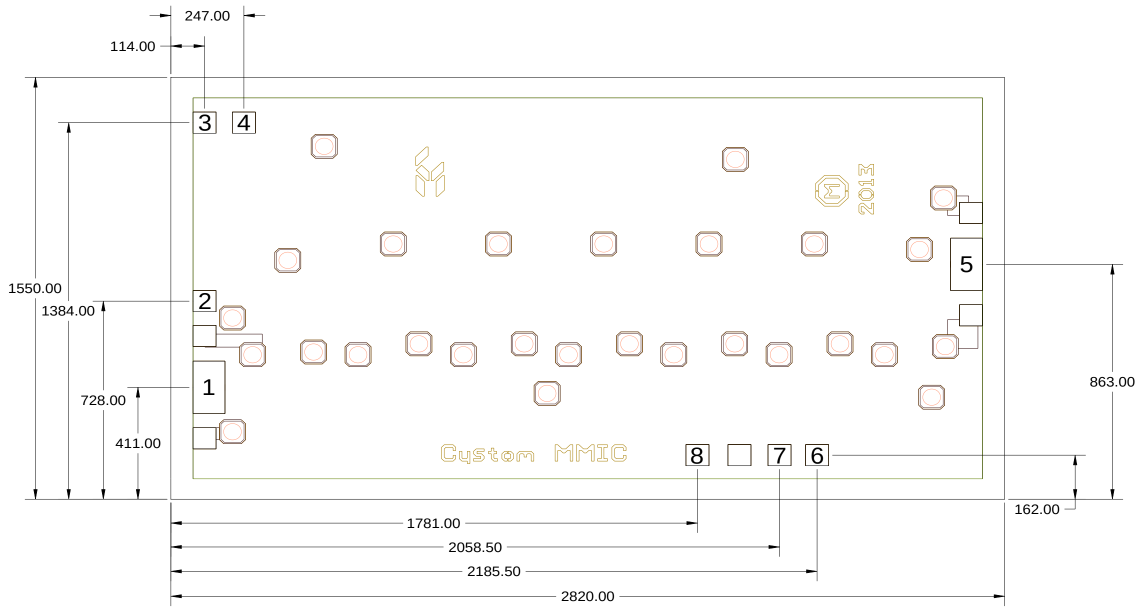
Mechanical Information

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 78 microns square
6. RF bond pads are 108 x 193 microns

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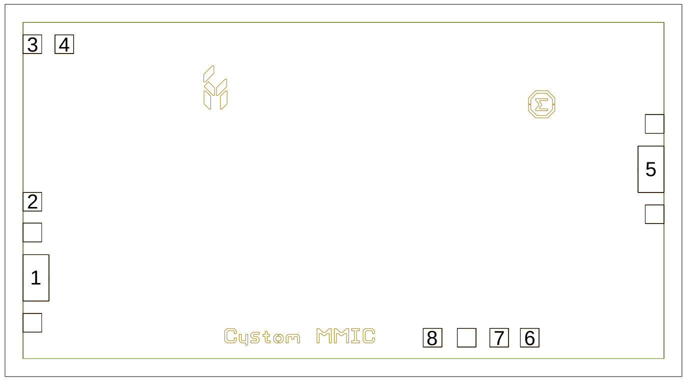
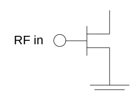
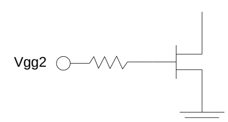
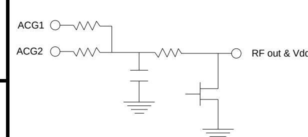
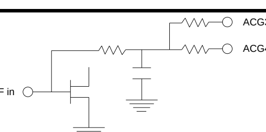
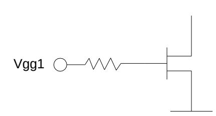
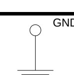
Pad Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	RF in	50 ohm matched input	
2	Vgg2	Power supply voltage Decoupling and bypass caps required	
3, 4	ACG1, 2	Low frequency termination. Attach bypass capacitor per application circuit	
5	RF out & Vdd	Power supply voltage and 50 ohm matched output	
6, 7	ACG3, 4	Low frequency termination. Attach bypass capacitor per application circuit	
8	Vgg1	Power supply voltage Decoupling and bypass caps required	
Backside	Ground	Connect to RF / DC ground	

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Applications Information

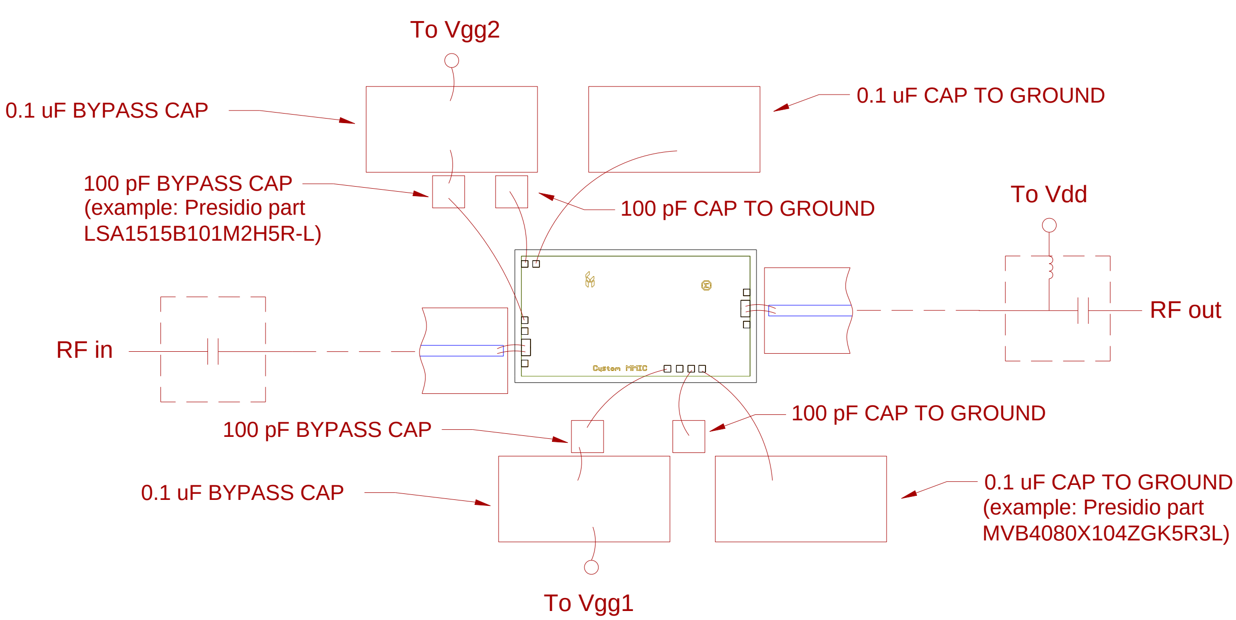
Assembly Guidelines

The backside of the CMD201 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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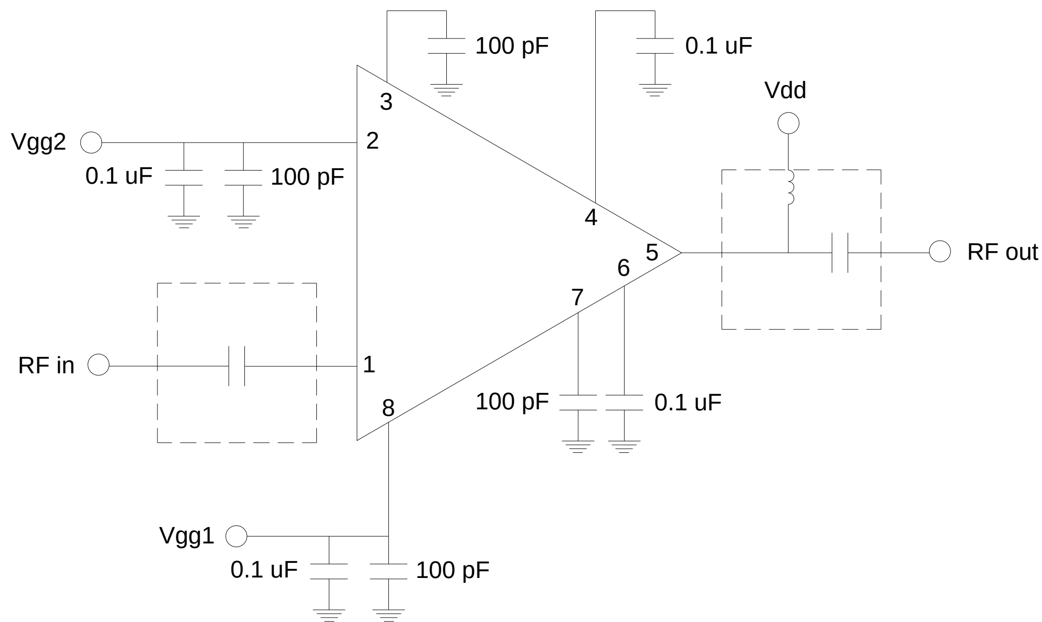
Applications Information

Application Circuit



Note: Drain voltage (Vdd) must be applied through a broadband bias tee or external bias network.
External DC block is required on RF input.

Biasing and Operation

The CMD201 is biased with a positive drain supply, a negative gate1 supply and a positive gate2 supply. Performance is optimized when the drain voltage is set to +10 V. The recommended gate1 and gate2 voltages are -0.55 V and +5 V respectively.

Turn ON procedure:

1.Apply gate voltage V_{gg1} and set to -0.55 V
2.Apply drain voltage V_{dd} and set to +10 V
3.Apply gate voltage V_{gg2} and set to +5V

Turn OFF procedure:

1.Turn off gate voltage V_{gg2}
2.Turn off drain voltage V_{dd}
3.Turn off gate voltage V_{gg1}

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