Let Performance Drive

CMD194

6-20 GHz Low Noise Amplifier

Features

- Low noise figure
- High gain broadband performance
- Single positive supply voltage
- Small die size

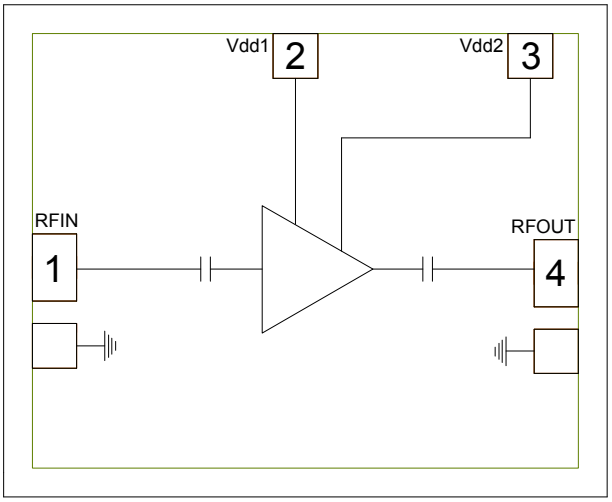
Applications

- Point-to-point radios
- Point-to-multi-point radios
- Military EW
- Test instrumentation

Description

The CMD194 is a broadband MMIC low noise amplifier die ideally suited for EW and communications systems where small size and low power consumption are needed. The broadband device delivers greater than 20 dB of gain with a corresponding output 1 dB compression point of +15 dBm and a noise figure of 1.75 dB. The CMD194 is a 50 ohm matched design eliminating the need for external DC blocks and RF port matching. The CMD194 offers full passivation for increased reliability and moisture protection.

Functional Block Diagram



Electrical Performance - $V_{dd1} = V_{dd2} = 4.0$ V, $T_A = 25$ °C, F = 13 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		6 - 20		GHz
Gain		20.5		dB
Noise Figure		1.75		dB
Input Return Loss		10		dB
Output Return Loss		17		dB
Output P1dB		15.5		dBm
Supply Current		120		mA

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Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd1, 2	5 V
RF Input Power	+20 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	866 mW
Thermal Resistance	75 °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, 2	2.0	4.0	5.0	V
Idd1 + Idd2		120		mA

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

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

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	6 - 20			9 - 17			GHz
Gain	15	20	24	16.5	20.5	24	dB
Noise Figure		2	3.25		1.75	2.3	dB
Input Return Loss		10			10		dB
Output Return Loss		15			17		dB
Output P1dB		15			15		dBm
Output IP3		26			26		dBm
Supply Current	90	120	150	90	120	150	mA
Gain Temperature Coefficient		0.014			0.014		dB/°C
Noise Figure Temperature Coefficient		0.01			0.01		dB/°C

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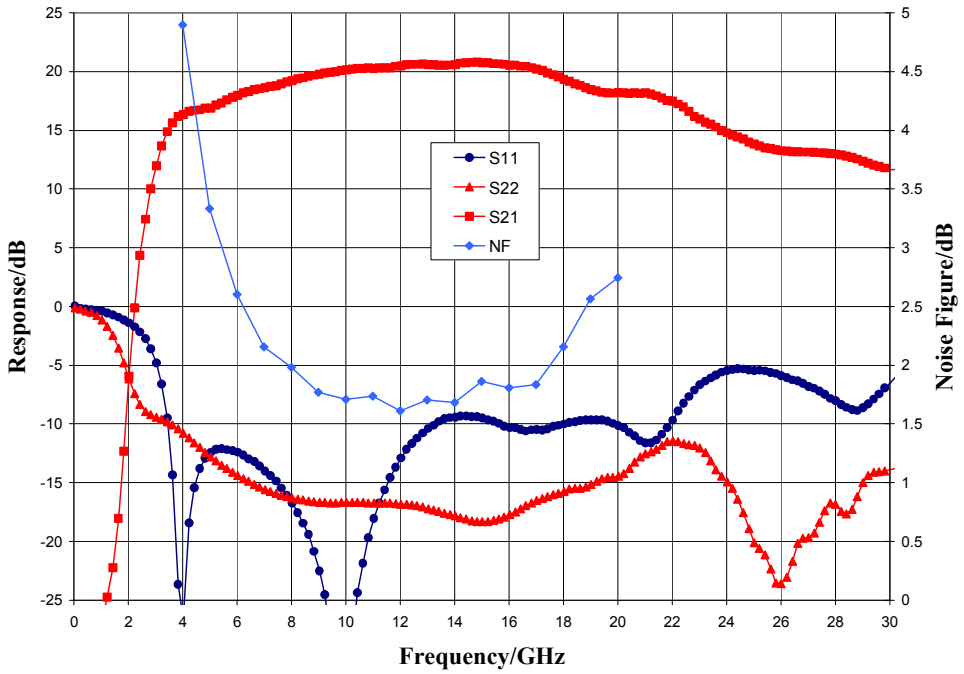
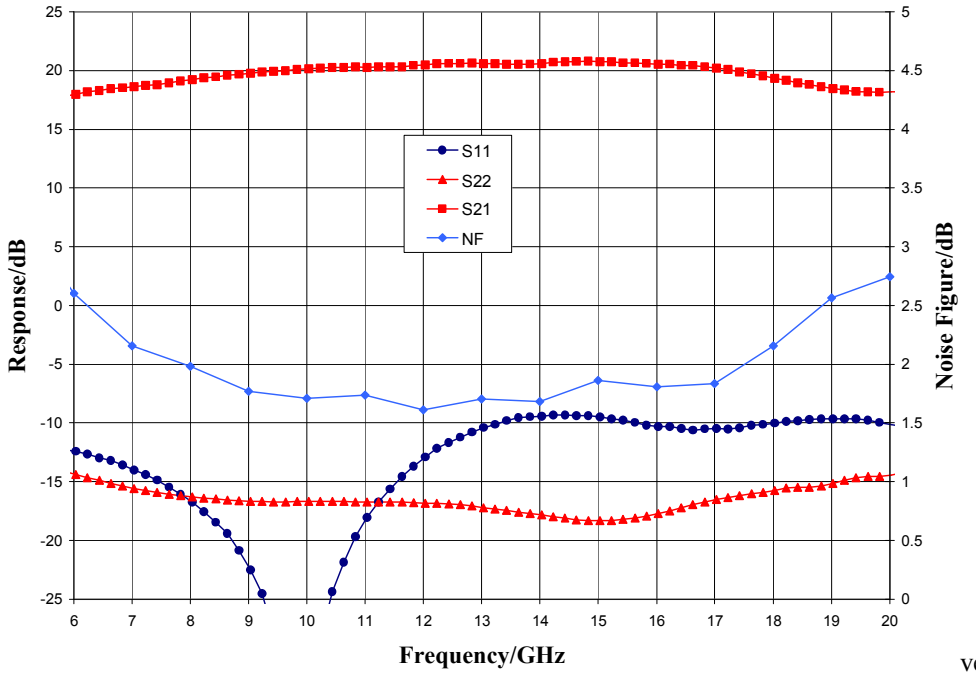
Typical Performance

Broadband Performance, V_{dd} = 4.0 V, I_{dd} = 120 mA, T_A = 25 °C



Narrow-band Performance, V_{dd} = 4.0 V, I_{dd} = 120 mA, T_A = 25 °C



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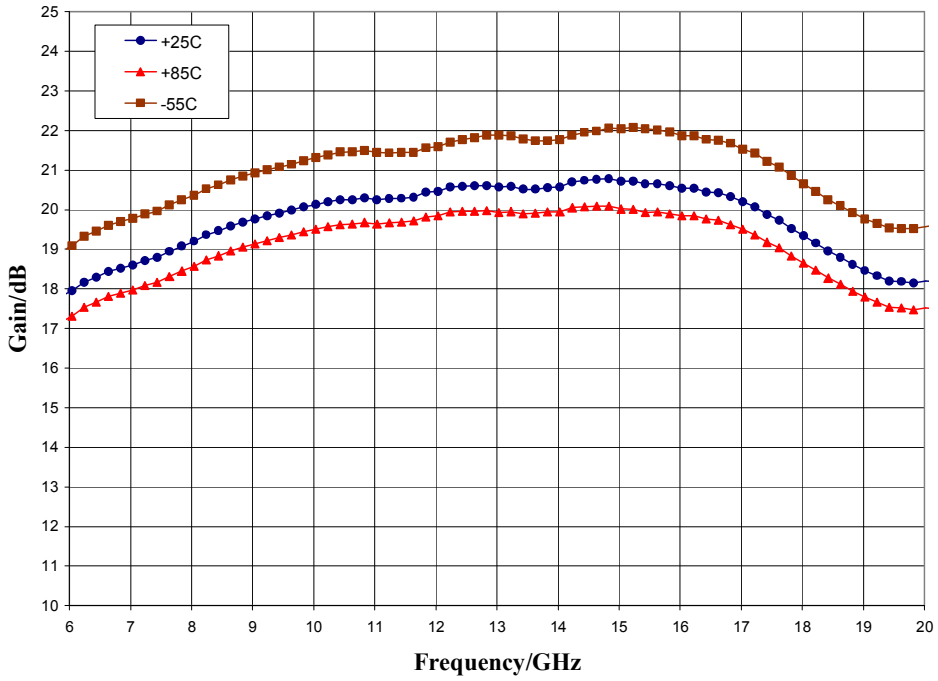
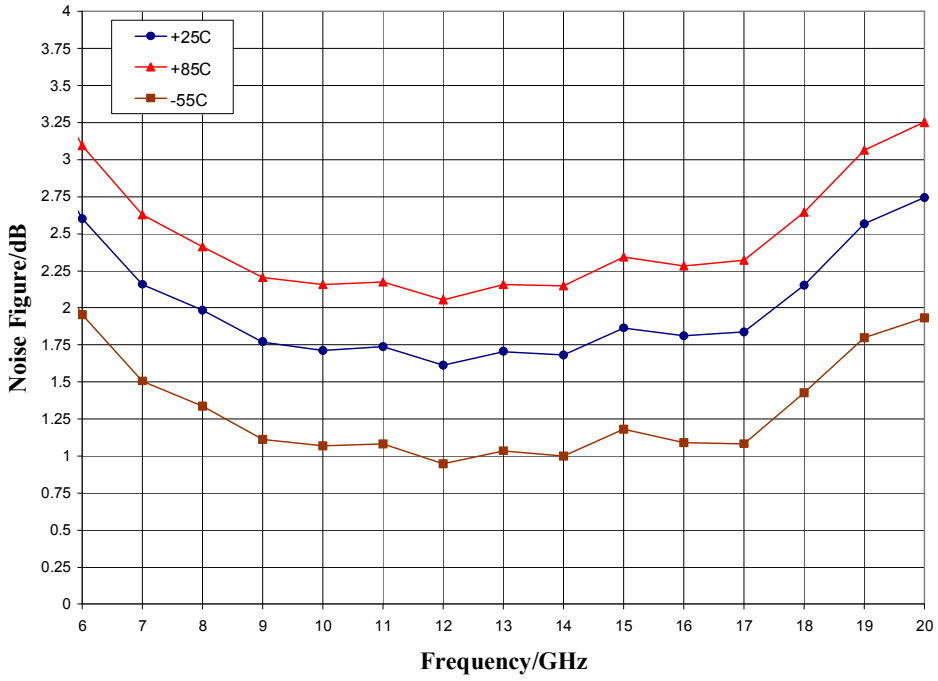
Typical Performance

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



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



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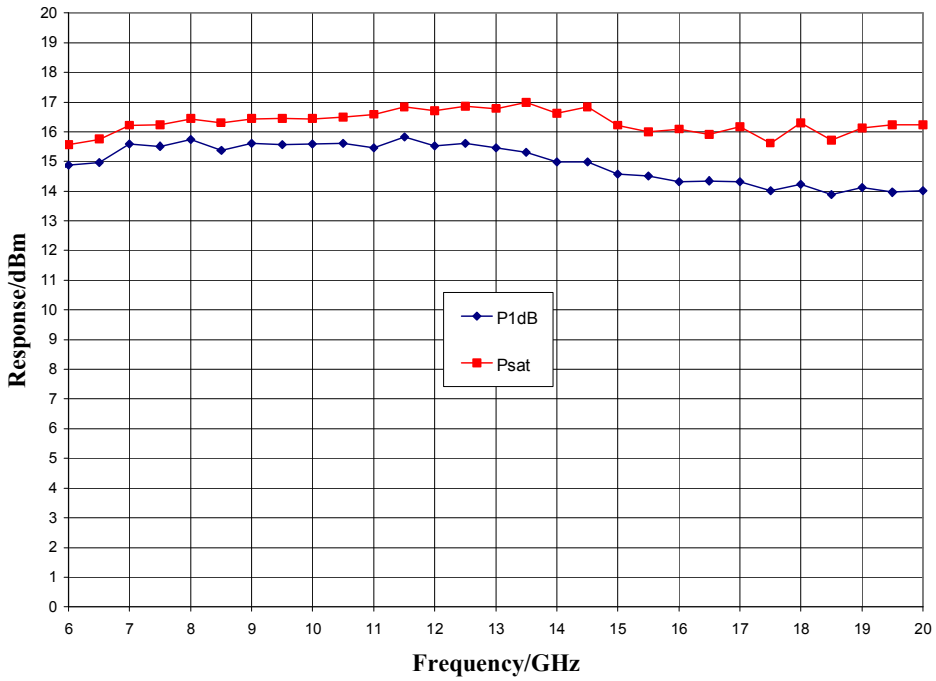
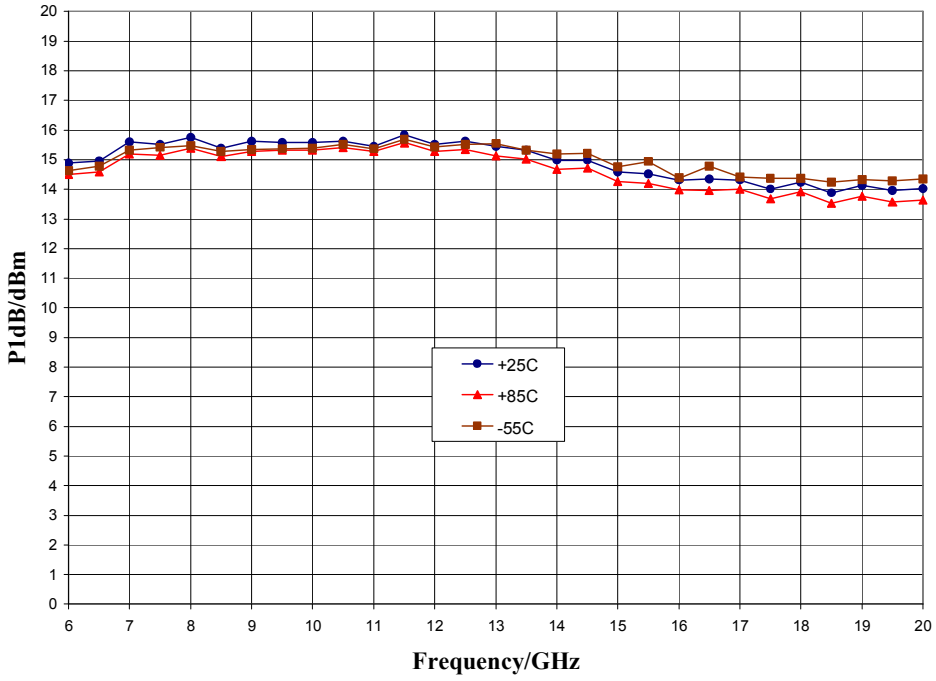
Typical Performance

Output Power, V_{dd} = 4.0 V, I_{dd} = 120 mA, T_A = 25 °C



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



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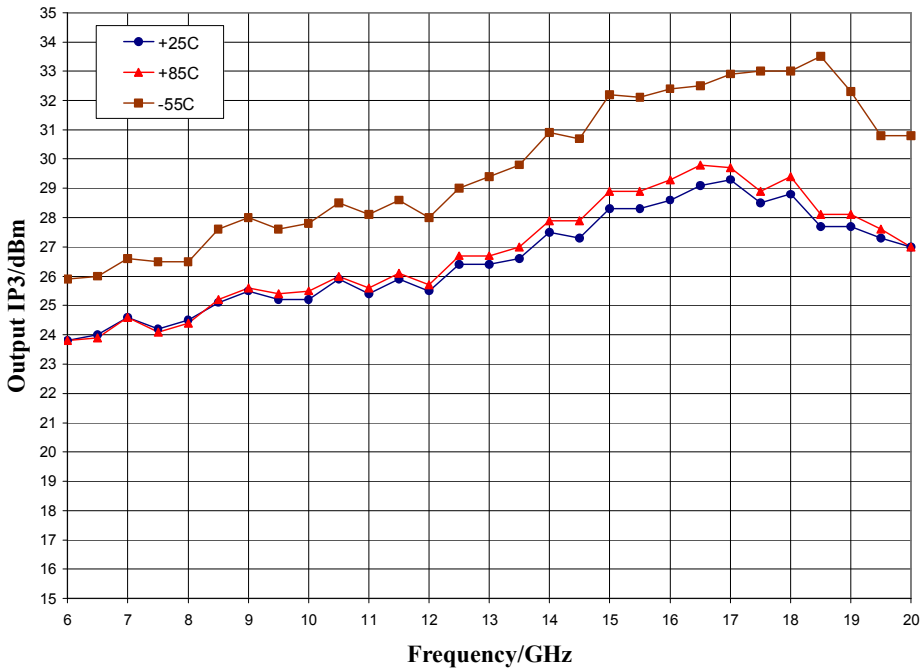
Typical Performance

Output IP3 vs. Temperature, Vdd=4.0V



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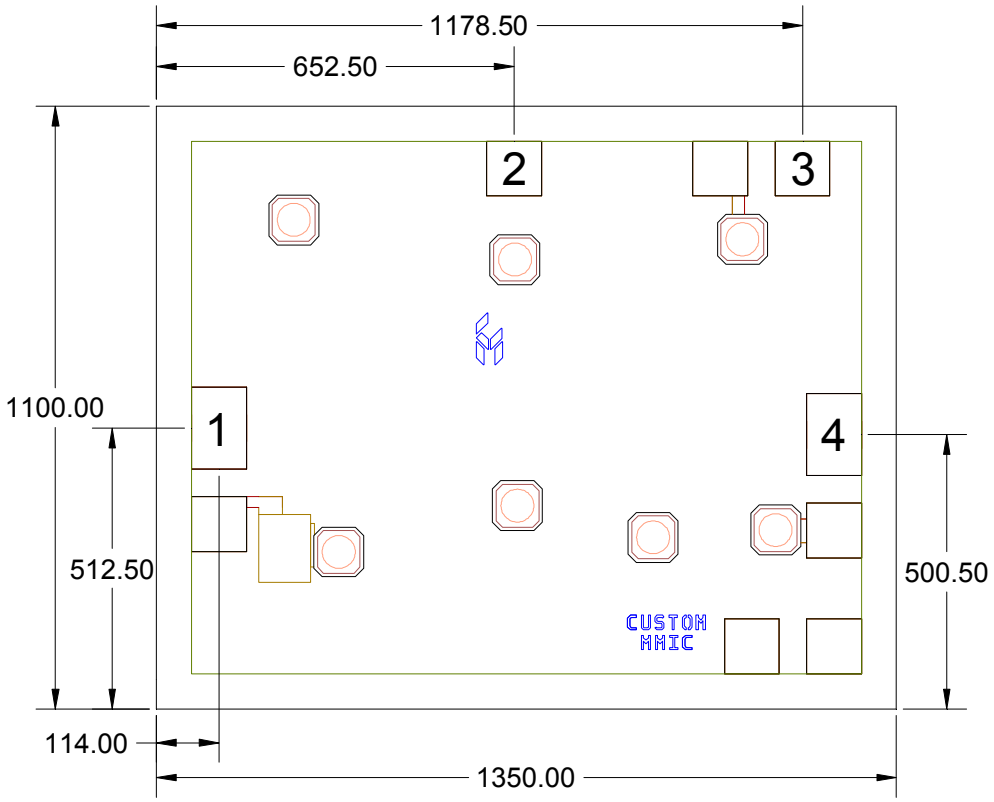
Mechanical Information

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
6. RF bond pads are 100 x 150 microns

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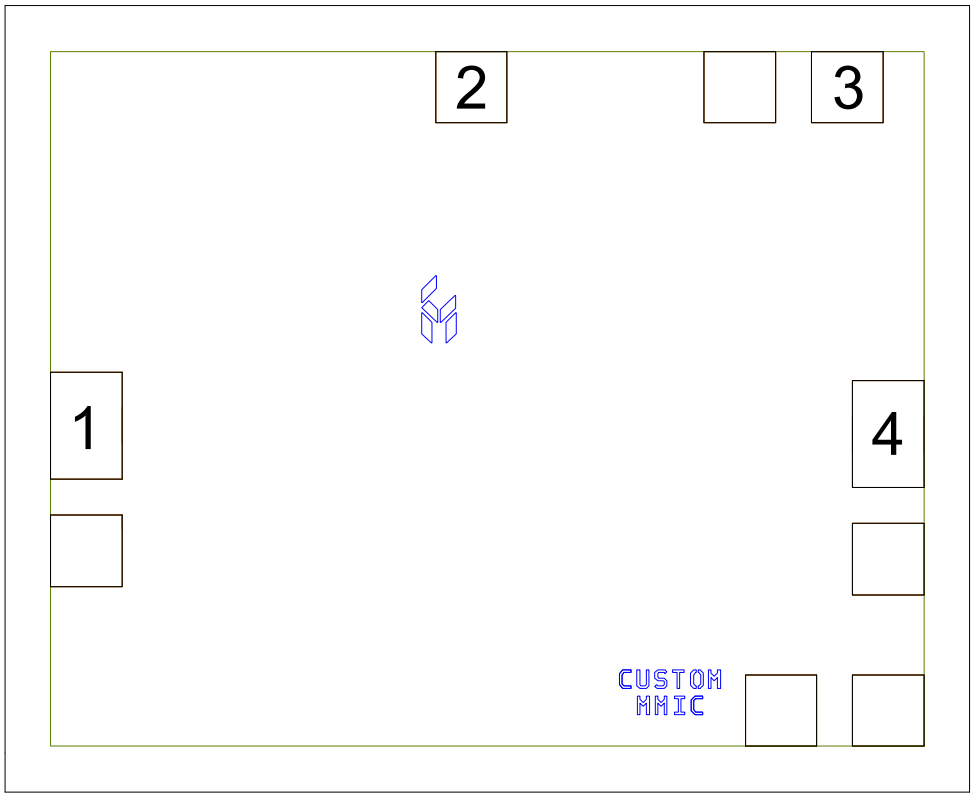
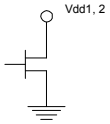
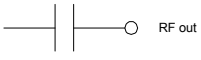
Pin Description

Pad Diagram



Functional Description

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

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Applications Information

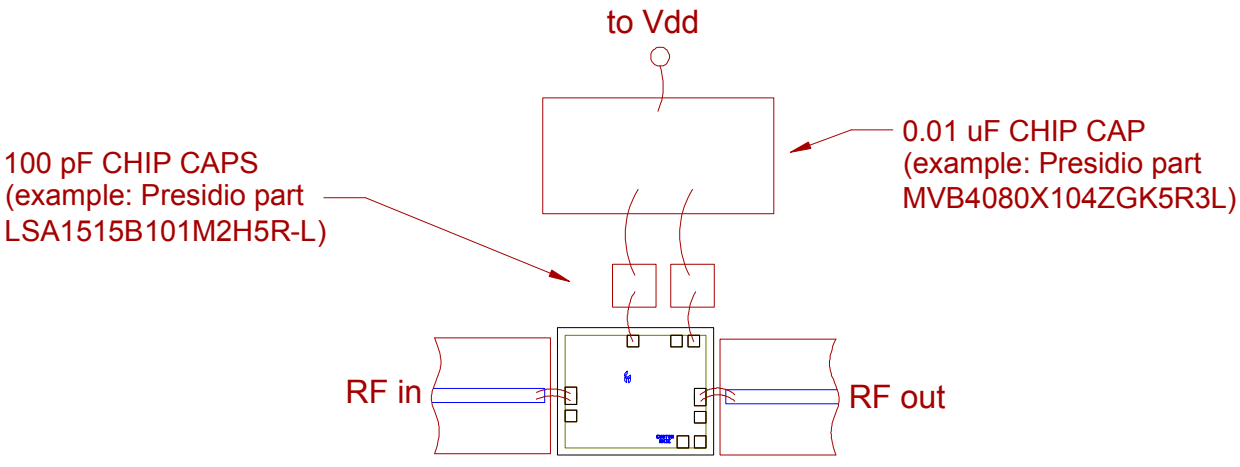
Assembly Guidelines

The backside of the CMD194 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 CMD194 is biased with a positive drain supply. Performance is optimized when the drain voltage is set to +4.0 V.

Turn ON procedure:

1. Apply drain voltage $V_{dd1,}$ V_{dd2} and set to +4 V

Turn OFF procedure:

1. Turn off drain voltage $V_{dd1,}$ V_{dd2}

RF power can be applied at any time.

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