CMD173

DC-20 GHz Distributed Amplifier

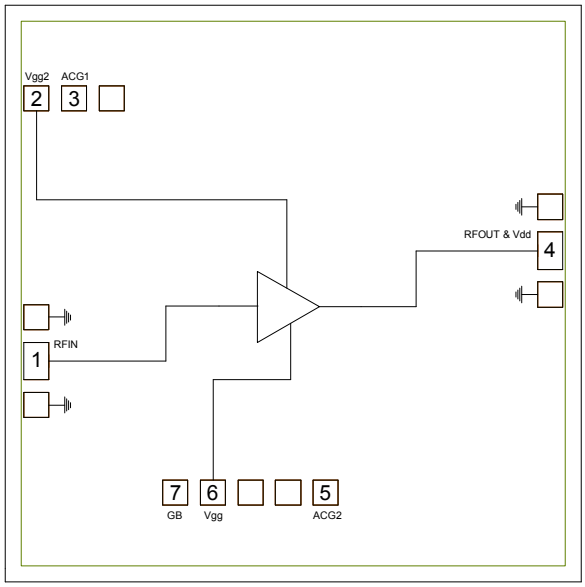
Features

- ► Ultra wideband performance
- ► Low noise figure
- ► Low current consumption
- ► Small die size

Description

The CMD173 is wideband GaAs MMIC distributed amplifier die which operates from DC to 20 GHz. The amplifier delivers greater than 15 dB of gain with a corresponding output 1 dB compression point of +18 dBm and noise figure of 2 dB at 10 GHz. The CMD173 is a 50 ohm matched design which eliminates the need for RF port matching. The CMD173 offers full passivation for increased reliability and moisture protection. This amplifier is the perfect alternative to higher cost hybrid amplifiers.

Functional Block Diagram



Note: Vgg2 is optional for gain control

Electrical Performance - V_{dd} = 8.0 V, V_{gg} = 3.0 V, T_A = 25 °C, F=10 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		DC - 20		GHz
Gain		15		dB
Noise Figure		2		dB
Input Return Loss		13		dB
Output Return Loss		14		dB
Output P1dB		18		dBm
Supply Current		78		mA

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Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	10.0
Gate Voltage, Vgg	4.0
RF Input Power	+20 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	904 mW
Thermal Resistance	72 °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
Vdd	5.0	8.0	10.0	V
Idd		78		mA
Vgg	0	3.0	4.0	V

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

Electrical Specifications, V_{dd} = 8.0 V, V_{gg} = 3.0 V, T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	DC - 10			10 - 20			GHz
Gain	13	15		13	15.5		dB
Noise Figure		1.7			2.6		dB
Input Return Loss		15			10		dB
Output Return Loss		18			17		dB
Output P1dB	16	18		14	17		dBm
Output IP3		28			25		dBm
Supply Current	55	78	110	55	78	110	mA
Gain Temperature Coefficient		0.01			0.01		dB/°C
Noise Figure Temperature Coefficient		0.01			0.01		dB/°C

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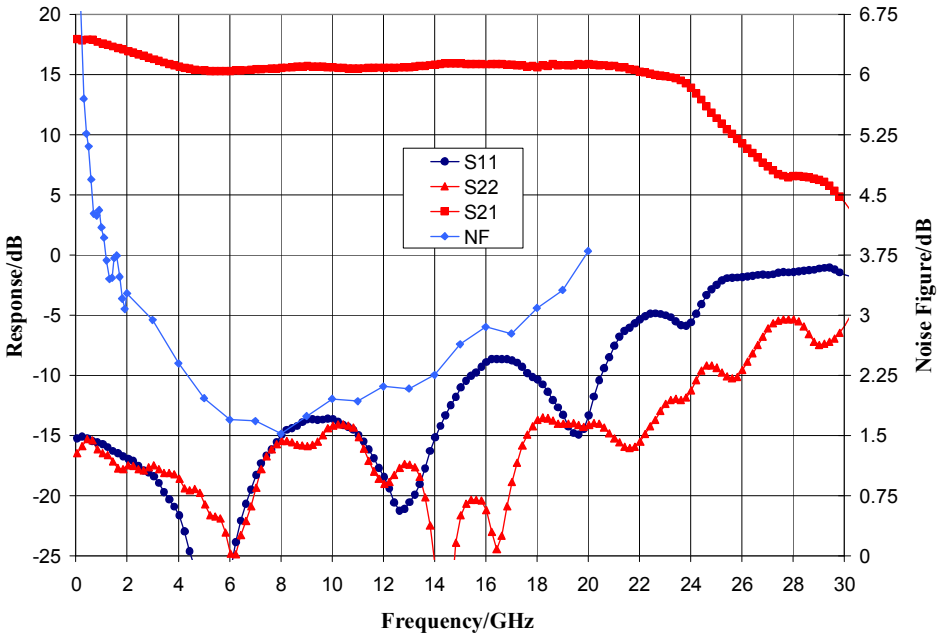
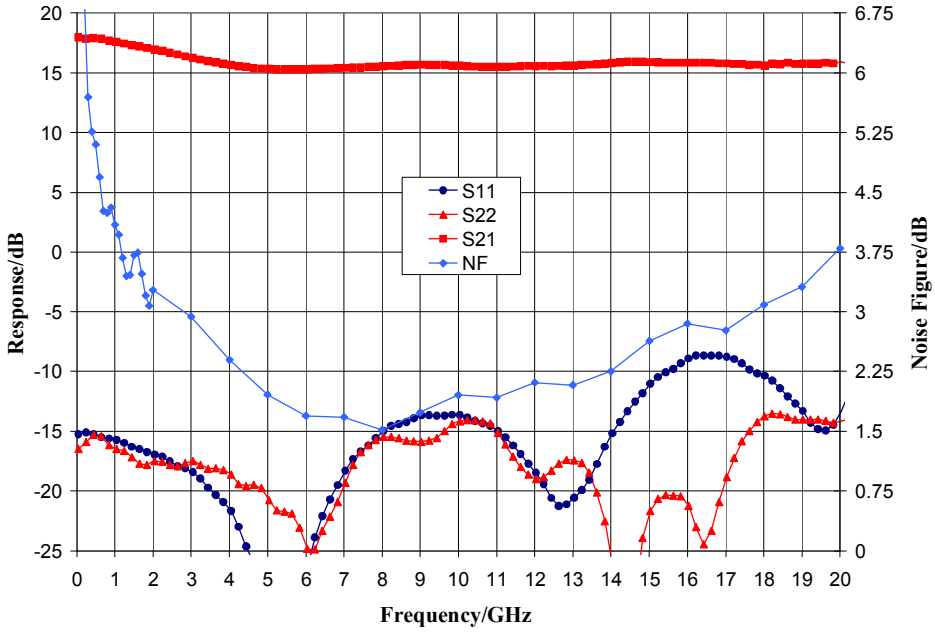
Typical Performance

Broadband Performance, V_{dd} = 8.0 V, V_{gg} = 3.0 V, I_{dd} = 78 mA, T_A = 25 °C



Narrow-band Performance, V_{dd} = 8.0 V, V_{gg} = 3.0 V, I_{dd} = 78 mA, T_A = 25 °C



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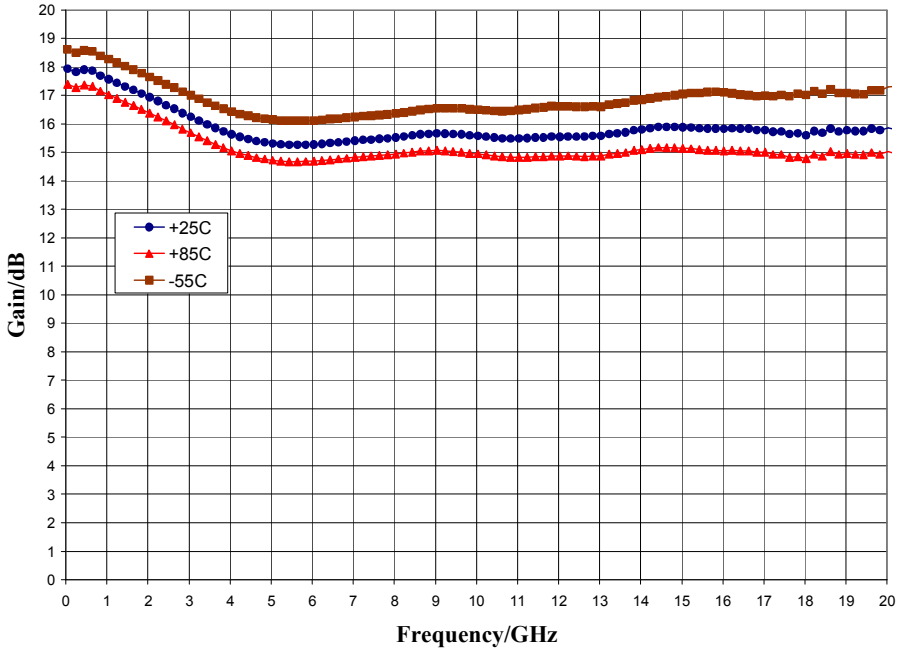
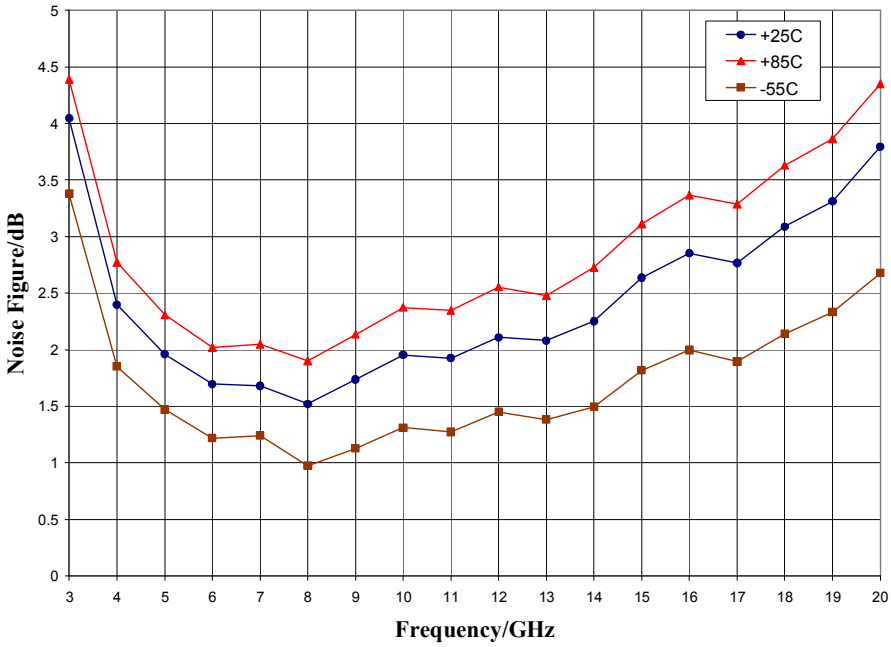
Typical Performance

Gain vs. Temperature, V_{dd} = 8.0 V, V_{gg} = 3.0 V



Noise Figure vs. Temperature, V_{dd} = 8.0 V, V_{gg} = 3.0 V



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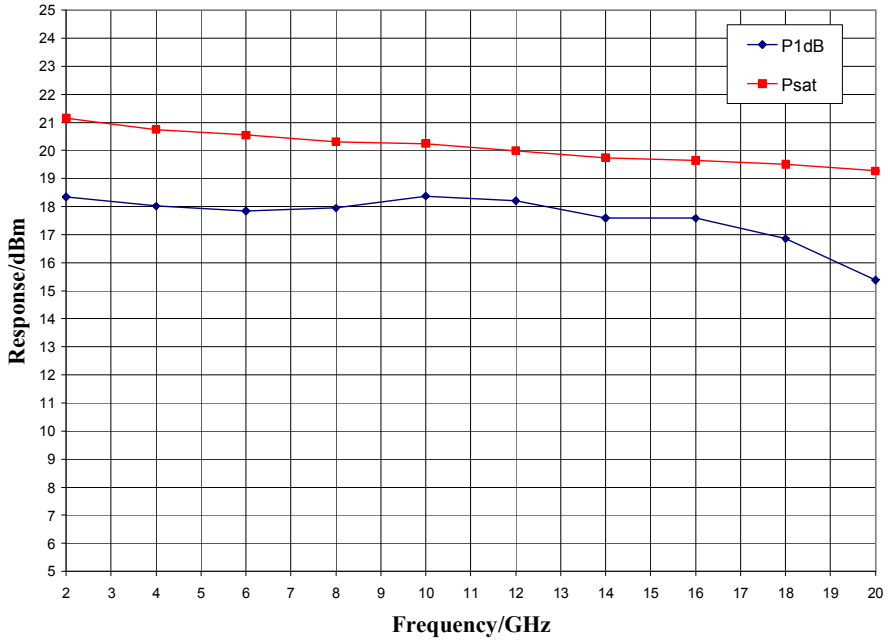
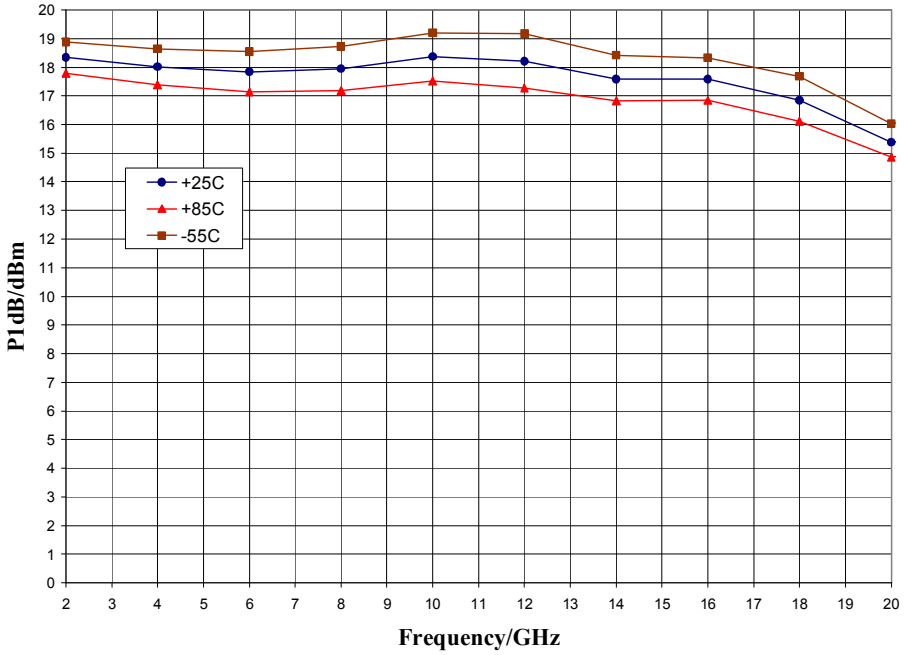
Typical Performance

Output Power, V_{dd} = 8.0 V, V_{gg} = 3.0 V, T_A = 25 °C



P1dB vs. Temperature, V_{dd} = 8.0 V, V_{gg} = 3.0 V, T_A = 25 °C



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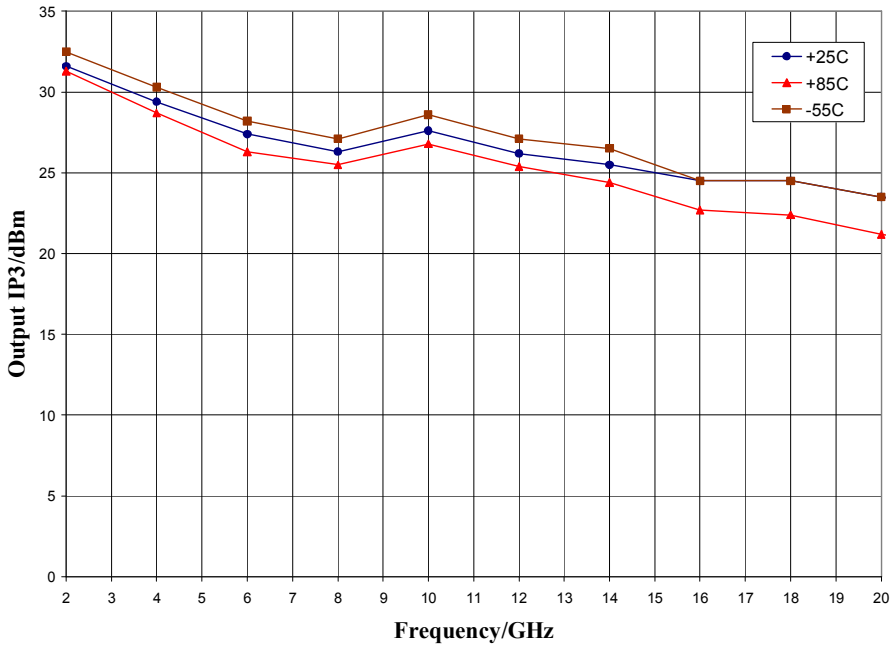
Typical Performance

Output IP3 vs. Temperature, V_{dd} = 8.0 V, V_{gg} = 3.0 V, T_A = 25 °C



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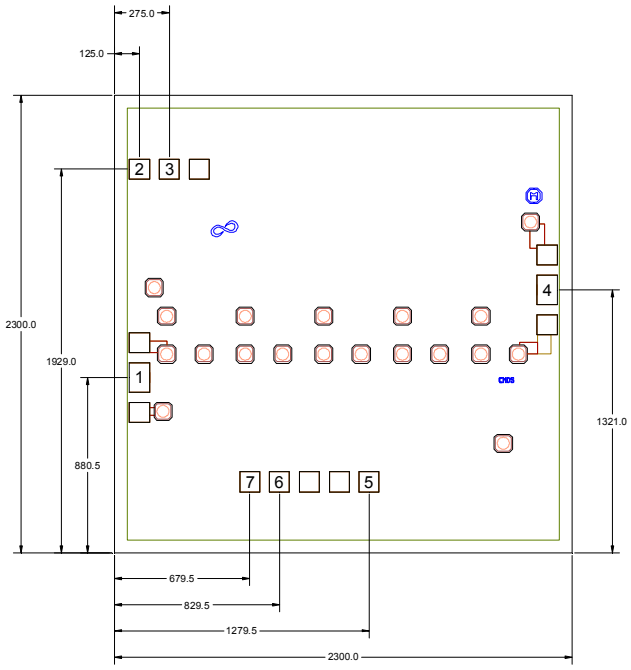
Mechanical Information

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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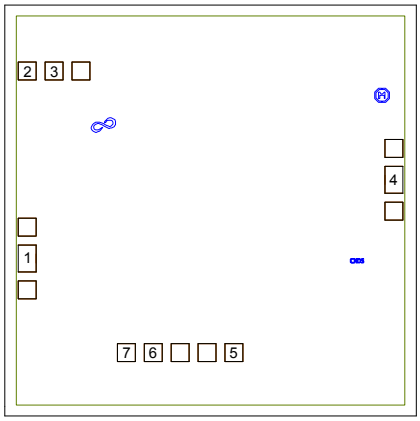
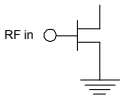
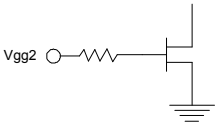
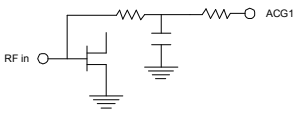
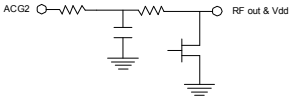
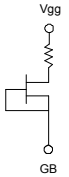
Pad Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	RF in	50 ohm matched input	
2	Vgg2	Optional supply voltage for gain control Decoupling and bypass caps required	
3	ACG1	Low frequency termination. Attach bypass capacitor per application circuit	
4	RF out & Vdd	Power supply voltage and 50 ohm matched output	
5	ACG2	Low frequency termination. Attach bypass capacitor per application circuit	
6	Vgg	Power supply voltage Decoupling and bypass caps required	
7	GB	Connect to DC ground	
Backside	Ground	Connect to RF / DC ground	

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Applications Information

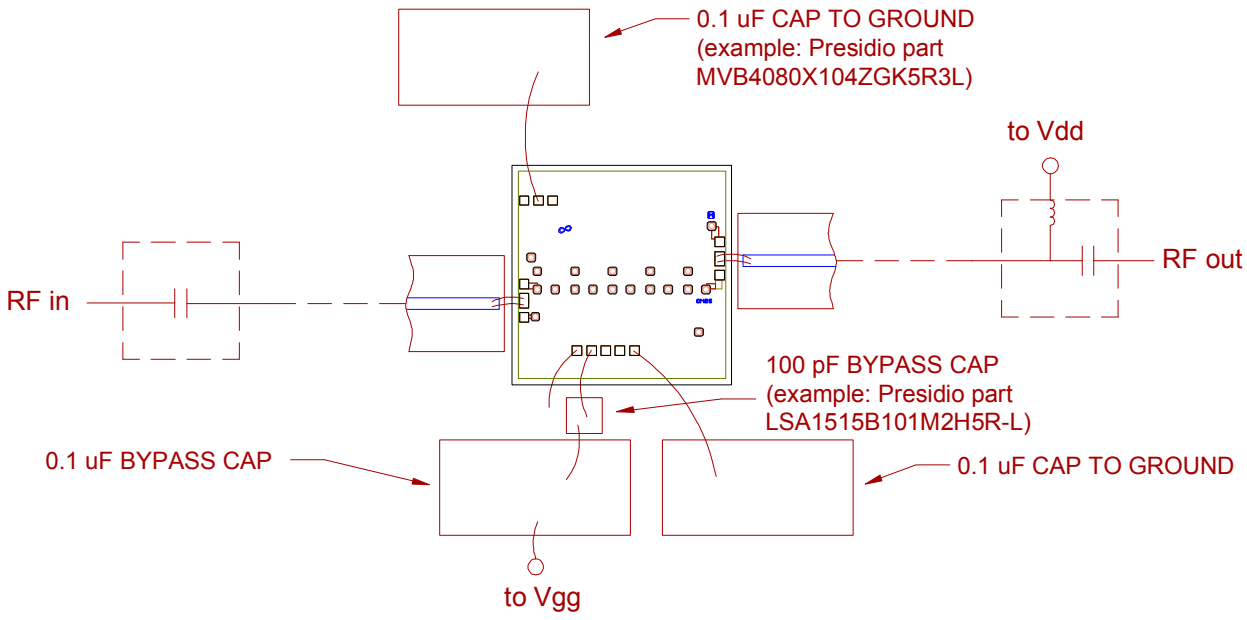
Assembly Guidelines

The backside of the CMD173 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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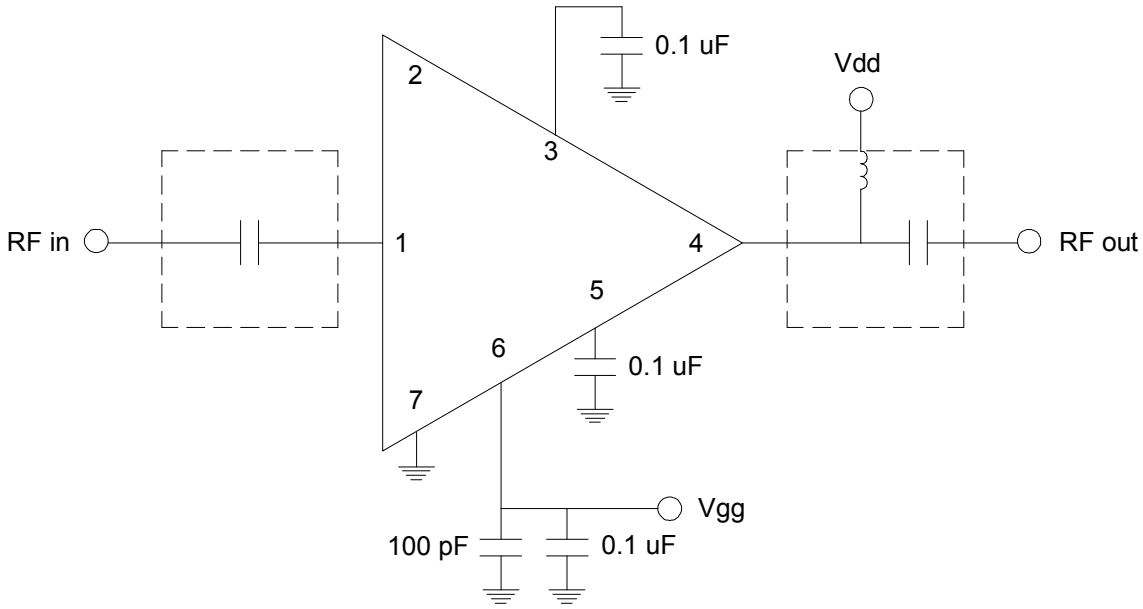
Applications Information

Application Circuit



Note: Drain voltage (Vdd) must be applied through a broadband bias tee or external bias network.

Biasing and Operation

The CMD173 is biased with a positive drain supply and positive gate supply. Performance is optimized when the drain voltage is set to +8.0 V. The recommended gate voltage is +3.0 V.

Turn ON procedure:

1.Apply drain voltage V_{dd} and set to +8 V
2.Apply gate voltage V_{gg} and set to +3 V

Turn OFF procedure:

1.Turn off gate voltage V_{gg}
2.Turn off drain voltage V_{dd}

RF power can be applied at any time.

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