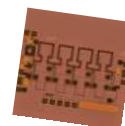




Let Performance Drive

CMD165

2-30 GHz Distributed Amplifier



Features

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

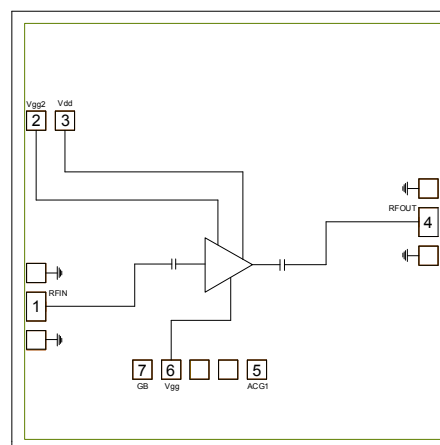
Description

The CMD165 is wideband GaAs MMIC distributed amplifier die which operates from 2 to 30 GHz. The amplifier delivers greater than 12 dB of gain with a corresponding output 1 dB compression point of +15 dBm and noise figure of 2.4 dB at 10 GHz. The CMD165 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching. The CMD165 offers full passivation for increased reliability and moisture protection. This amplifier is the perfect alternative to higher cost hybrid amplifiers.

Applications

- ▶ Microwave radio and VSAT
- ▶ Telecom infrastructure
- ▶ Test instrumentation
- ▶ Military and space
- ▶ Fiber Optics

Functional Block Diagram



Note: Vgg2 is optional for gain control

Electrical Performance - $V_{dd} = 8.0 \text{ V}$, $V_{gg} = 3.0 \text{ V}$, $T_A = 25^\circ\text{C}$, $F=10 \text{ GHz}$

Parameter	Min	Typ	Max	Units
Frequency Range	2 - 30			GHz
Gain		12		dB
Noise Figure		2.4		dB
Input Return Loss		19		dB
Output Return Loss		22		dB
Output P1dB		15.5		dBm
Supply Current		67		mA

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Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, V _{dd}	10.0
Gate Voltage, V _{gg}	4.0
RF Input Power	+20 dBm
Channel Temperature, T _{ch}	150 °C
Power Dissipation, P _{diss}	735 mW
Thermal Resistance	88.5 °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 _{dd}	5.0	8.0	10.0	V
I _{dd}		67		mA
V _{gg}	0	3.0	4.0	V

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

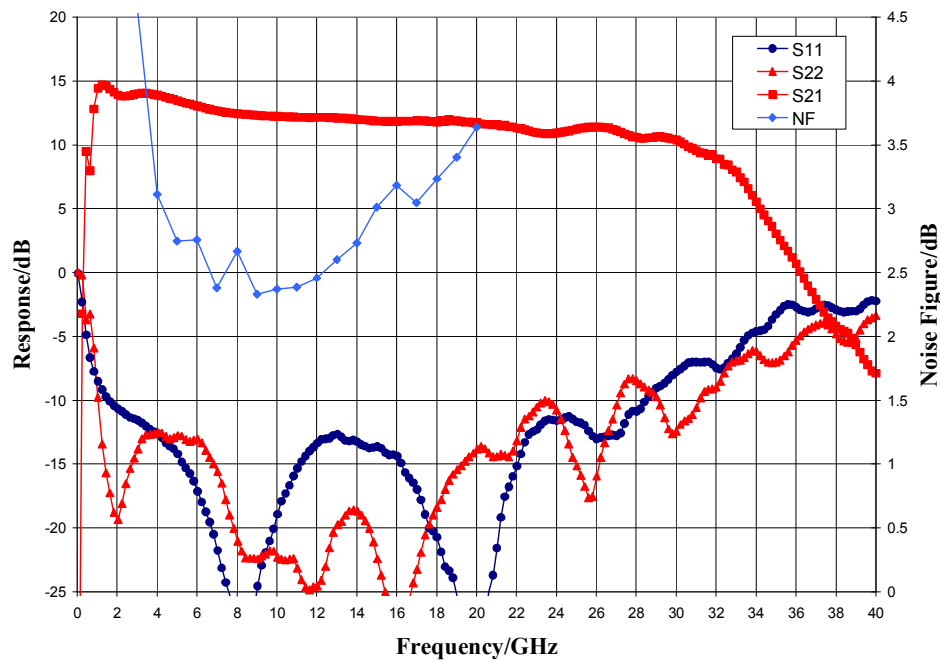
Electrical Specifications, V_{dd} = 8.0 V, V_{gg} = 3.0 V, T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	2 - 10			10 - 20			20 - 30			GHz
Gain	10	13		10	12		9	11		dB
Noise Figure		2.7			3					dB
Input Return Loss		15			13			12		dB
Output Return Loss		14			20			10		dB
Output P _{1dB}	14	16		12	15			13		dBm
Output IP ₃		26			22			20		dBm
Supply Current	50	67	85	50	67	85	50	67	85	mA
Gain Temperature Coefficient		0.01			0.01			0.01		dB/°C
Noise Figure Temperature Coefficient		0.01			0.01			0.01		dB/°C

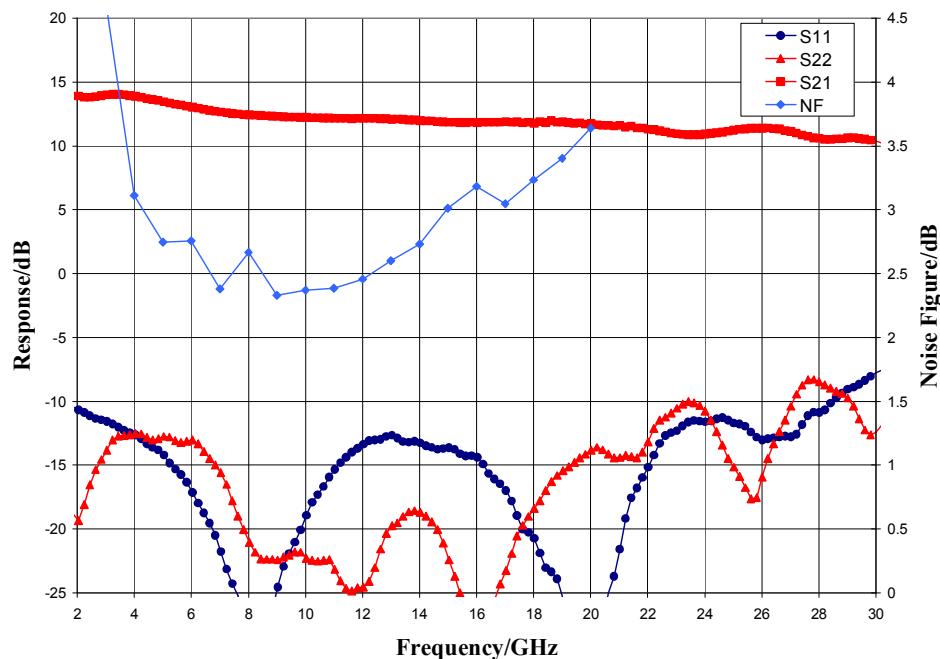
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Typical Performance

Broadband Performance, $V_{dd} = 8.0$ V, $V_{gg} = 3.0$ V, $I_{dd} = 67$ mA, $T_A = 25$ °C



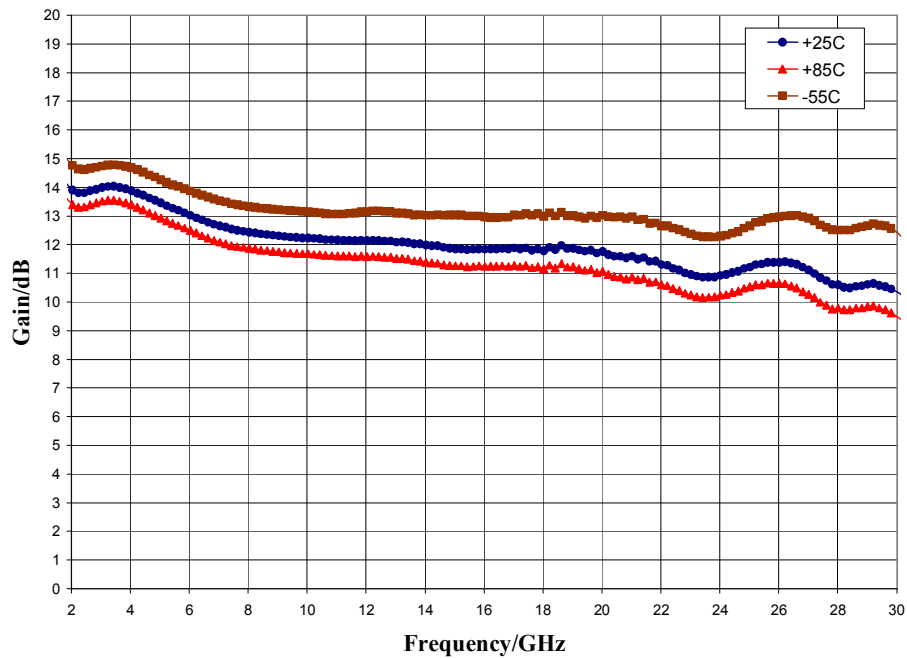
Narrow-band Performance, $V_{dd} = 8.0$ V, $V_{gg} = 3.0$ V, $I_{dd} = 67$ mA, $T_A = 25$ °C



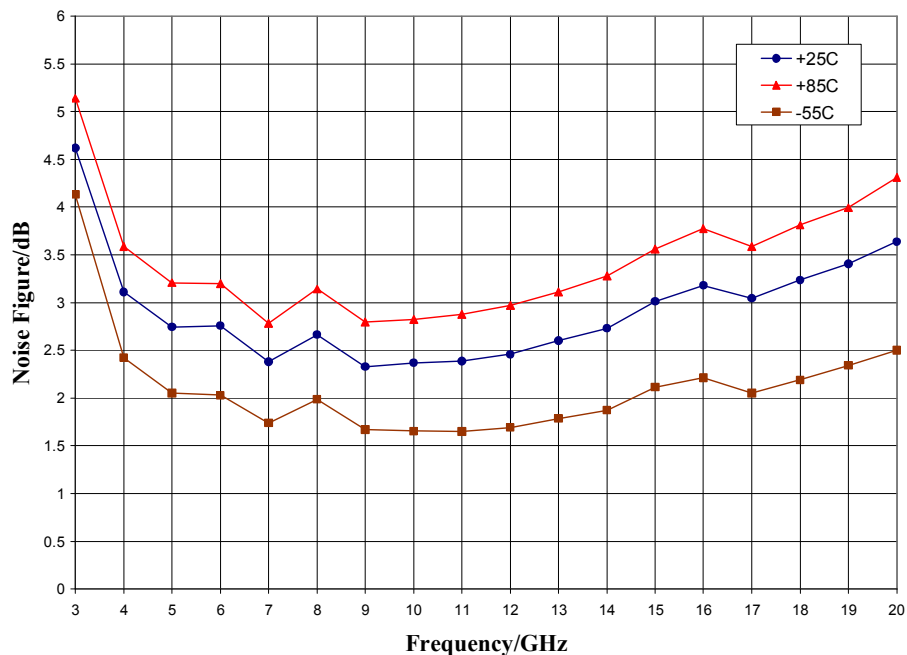
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Typical Performance

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



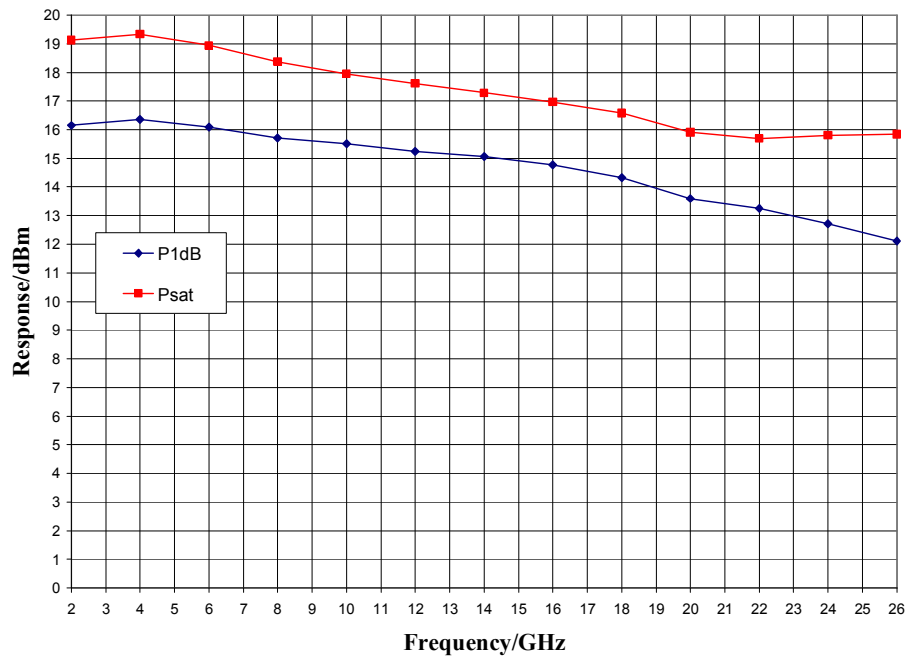
Noise Figure vs. Temperature, $V_{dd} = 8.0\text{ V}$, $V_{gg} = 3.0\text{ V}$



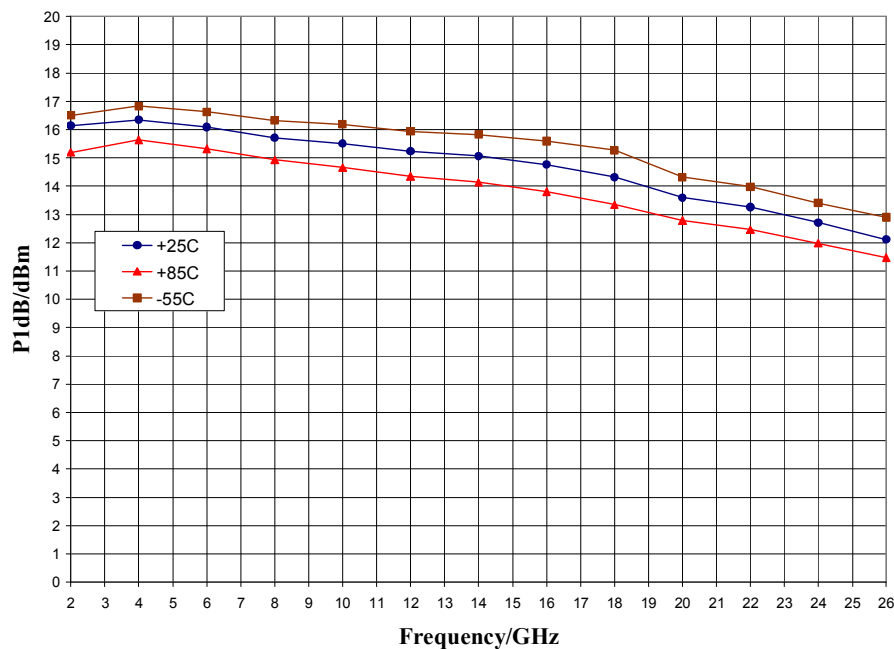
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Typical Performance

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



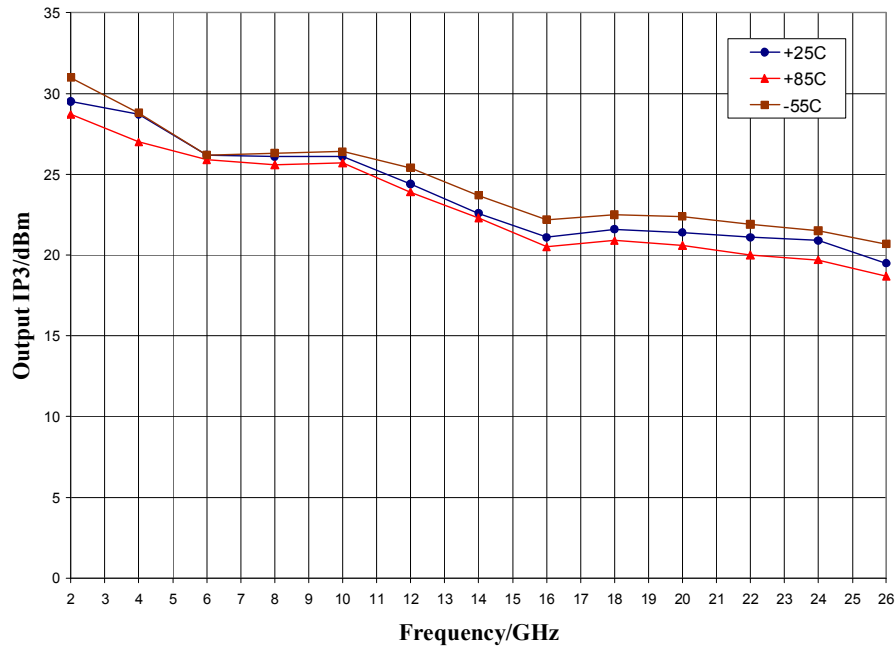
P1dB vs. Temperature, $V_{dd} = 8.0$ V, $V_{gg} = 3.0$ V, $T_A = 25$ °C



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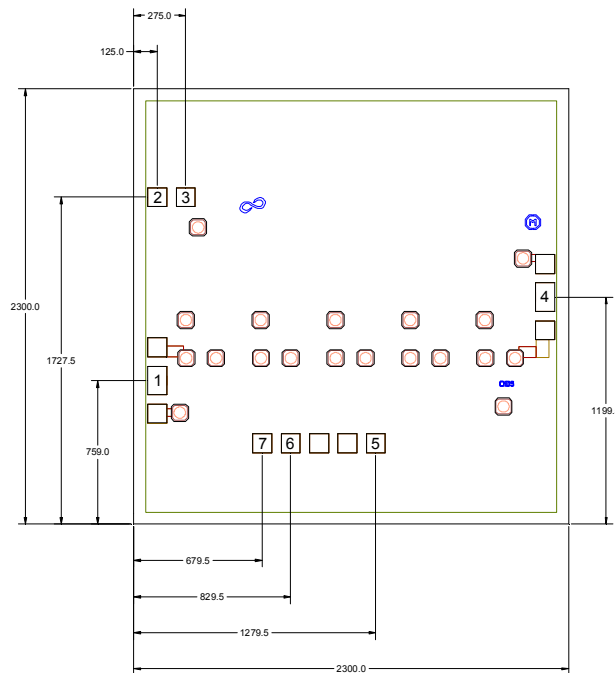
Typical Performance

Output IP3 vs. Temperature, $V_{dd} = 8.0\text{ V}$, $V_{gg} = 3.0\text{ V}$, $T_A = 25\text{ }^{\circ}\text{C}$



Mechanical Information

Die Outline (all dimensions in microns)

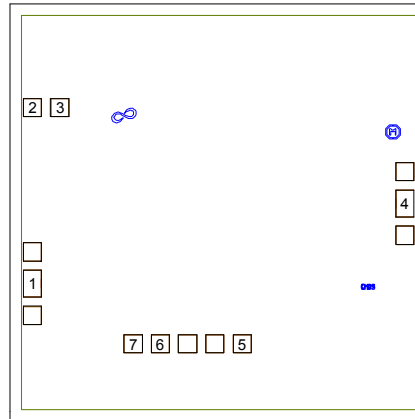


Notes:

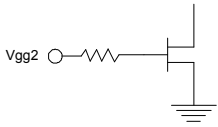
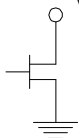
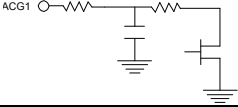
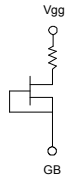
1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 85 microns thick
5. DC bond pads are 100 microns square

Pad Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	RF in	DC blocked and 50 ohm matched	
2	Vgg2	Optional supply voltage for gain control Decoupling and bypass caps required	
3	Vdd	Power supply voltage Decoupling and bypass caps required	
4	RF out	DC blocked and 50 ohm matched	
5	ACG1	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

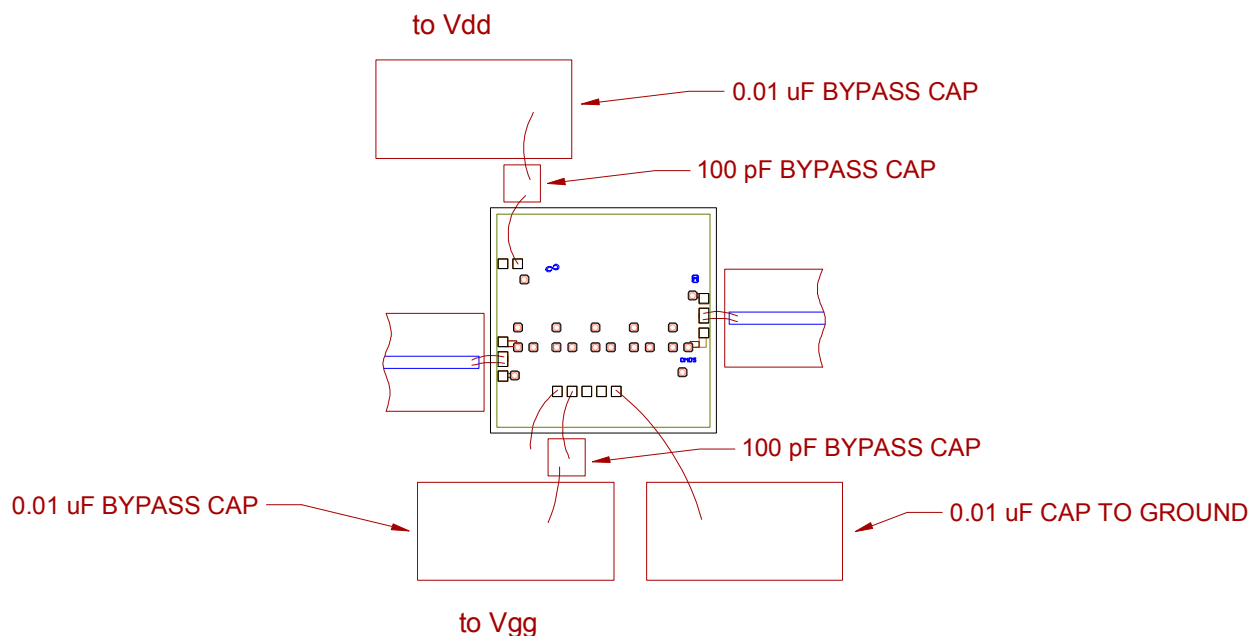
Assembly Guidelines

The backside of the CMD165 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 μm 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

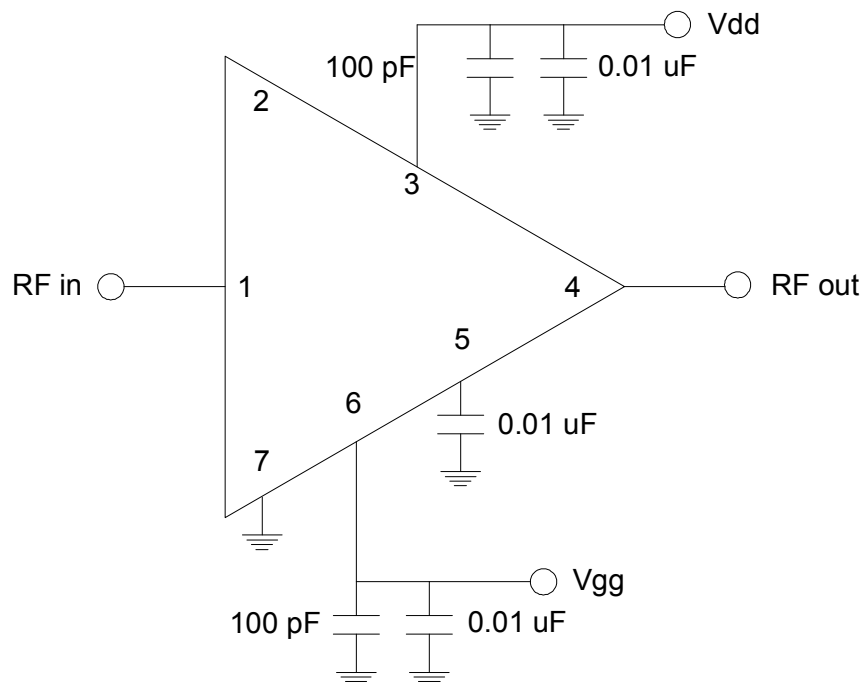


GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.

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Applications Information

Application Circuit



Biasing and Operation

The CMD165 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.