

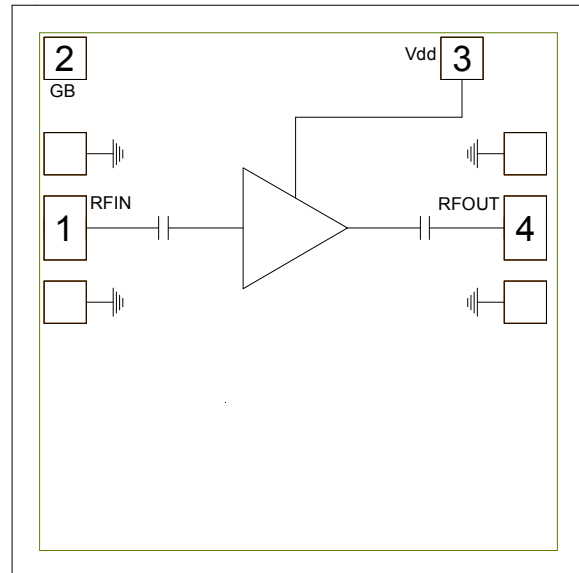
### Features

- ▶ Wide bandwidth
- ▶ Low noise performance
- ▶ High linearity
- ▶ Small die size

### Description

The CMD166 is a wideband GaAs MMIC low noise amplifier ideally suited for military, space and communications systems where small size and high linearity are needed. At 28 GHz the device delivers 9 dB of gain with a corresponding output 1 dB compression point of +16.5 dBm and noise figure of 4.25 dB. The CMD166 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching. The CMD166 offers full passivation for increased reliability and moisture protection. This amplifier is the perfect alternative to higher cost hybrid amplifiers.

### Functional Block Diagram



### Electrical Performance - $V_{dd} = 4.0\text{ V}$ , $T_A = 25\text{ }^\circ\text{C}$ , $F=28\text{ GHz}$

Parameter	Min	Typ	Max	Units
Frequency Range	20 - 40			GHz
Gain		9		dB
Noise Figure		4.25		dB
Input Return Loss		10		dB
Output Return Loss		16		dB
Output P1dB		16.5		dBm
Supply Current		75		mA

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# CMD166

## 20-40 GHz Low Noise Driver Amplifier

### Specifications

#### Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, V <sub>dd</sub>	4.5 V
RF Input Power	+20 dBm
Channel Temperature, T <sub>ch</sub>	150 °C
Power Dissipation, P <sub>diss</sub>	340 mW
Thermal Resistance	192 °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 <sub>dd</sub>	1.0	4.0	4.5	V
I <sub>dd</sub>		75		mA

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

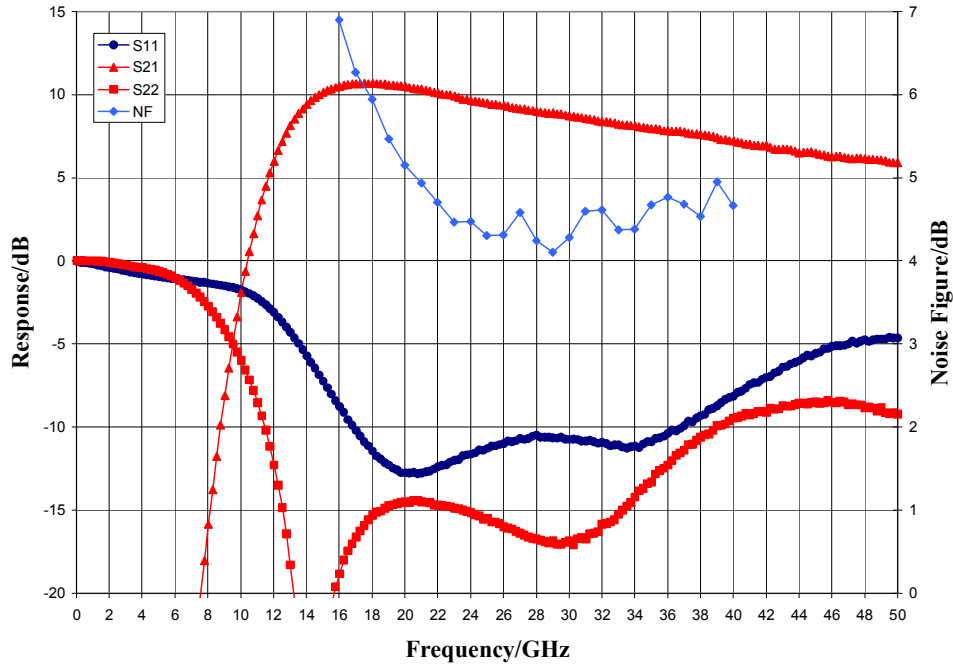
#### Electrical Specifications, V<sub>dd</sub> = 4.0 V, T<sub>A</sub> = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	20 - 30			30 - 40			GHz
Gain	8	9.5	11	6.5	8	9.5	dB
Noise Figure		4.5	5.5		4.5	5.5	dB
Input Return Loss		11			10		dB
Output Return Loss		15			13		dB
Output P1dB		16			17.5		dBm
Output IP3		25			27		dBm
Supply Current	55	75	95	55	75	95	mA
Gain Temperature Coefficient		0.012			0.012		dB/°C
Noise Figure Temperature Coefficient		0.012			0.012		dB/°C

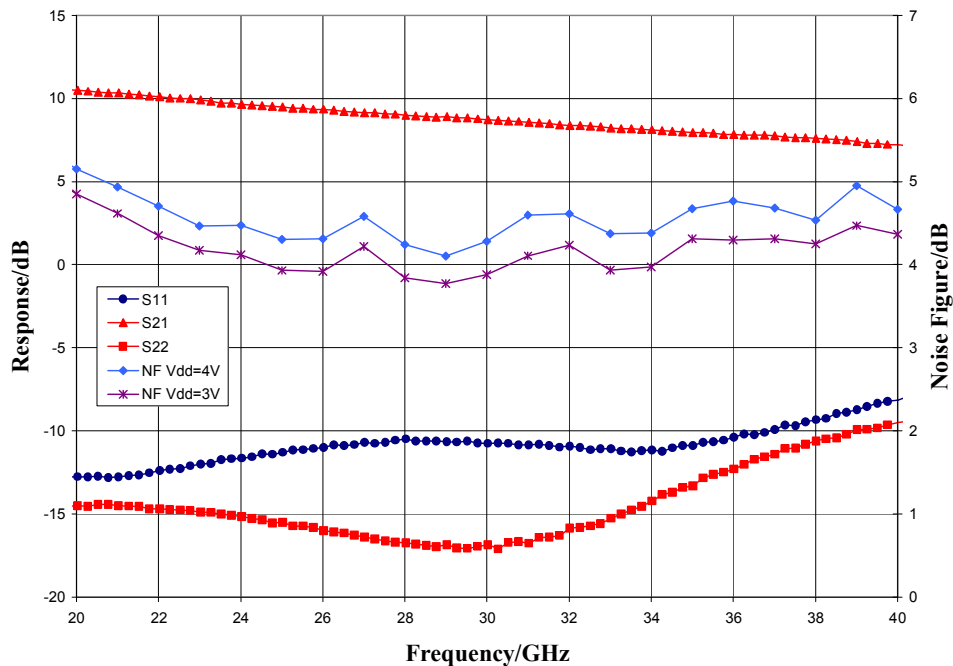
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### Typical Performance

**Broadband Performance,  $V_{dd} = 4.0\text{ V}$ ,  $I_{dd} = 75\text{ mA}$ ,  $T_A = 25\text{ }^\circ\text{C}$**



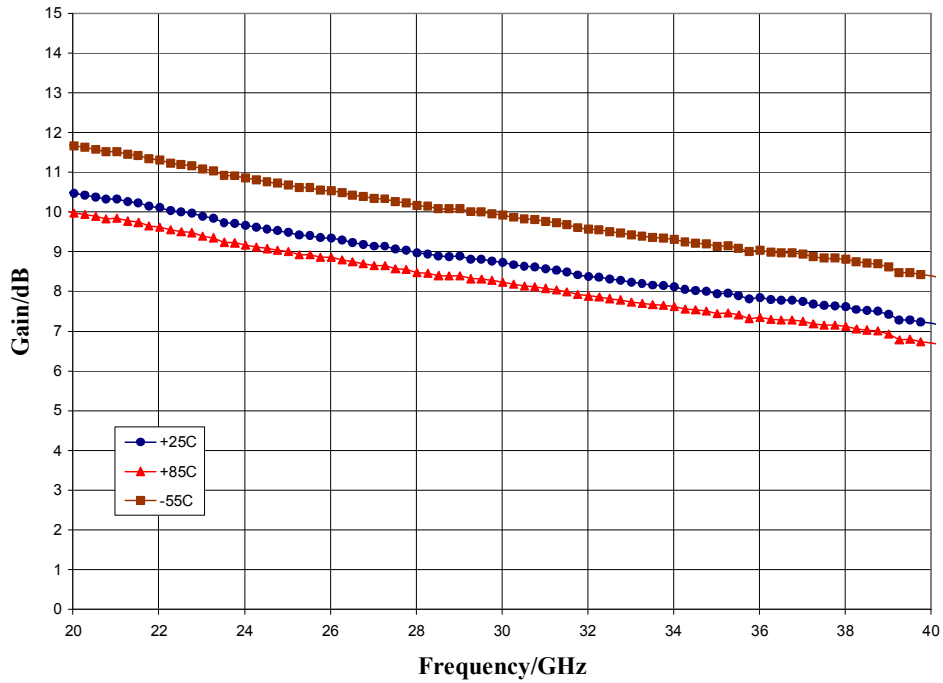
**Narrow-band Performance,  $V_{dd} = 4.0\text{ V}$ ,  $I_{dd} = 75\text{ mA}$ ,  $T_A = 25\text{ }^\circ\text{C}$**



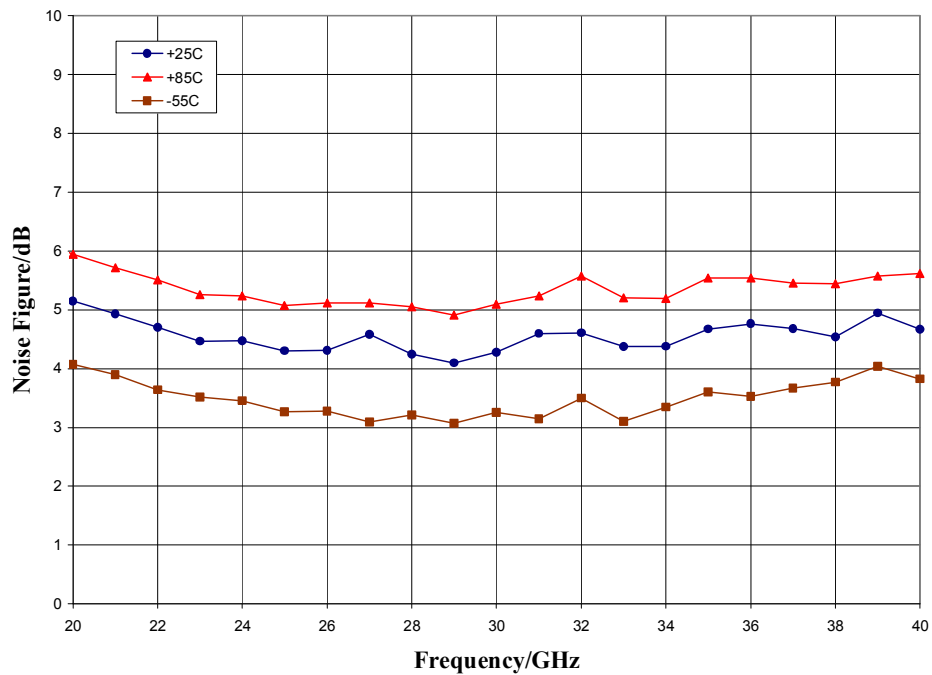
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### Typical Performance

**Gain vs. Temperature,  $V_{dd} = 4.0\text{ V}$**



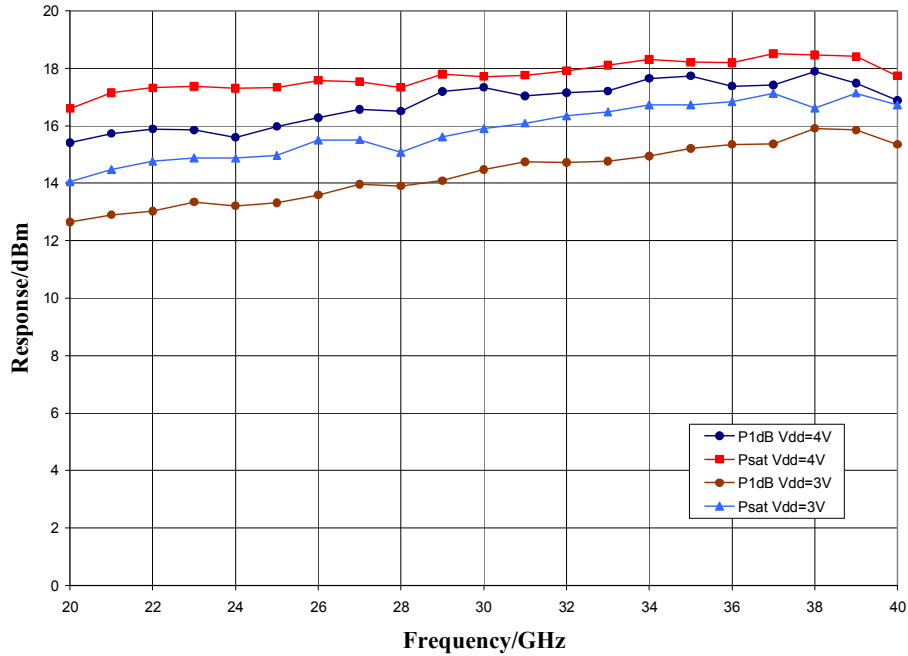
**Noise Figure vs. Temperature,  $V_{dd} = 4.0\text{ V}$**



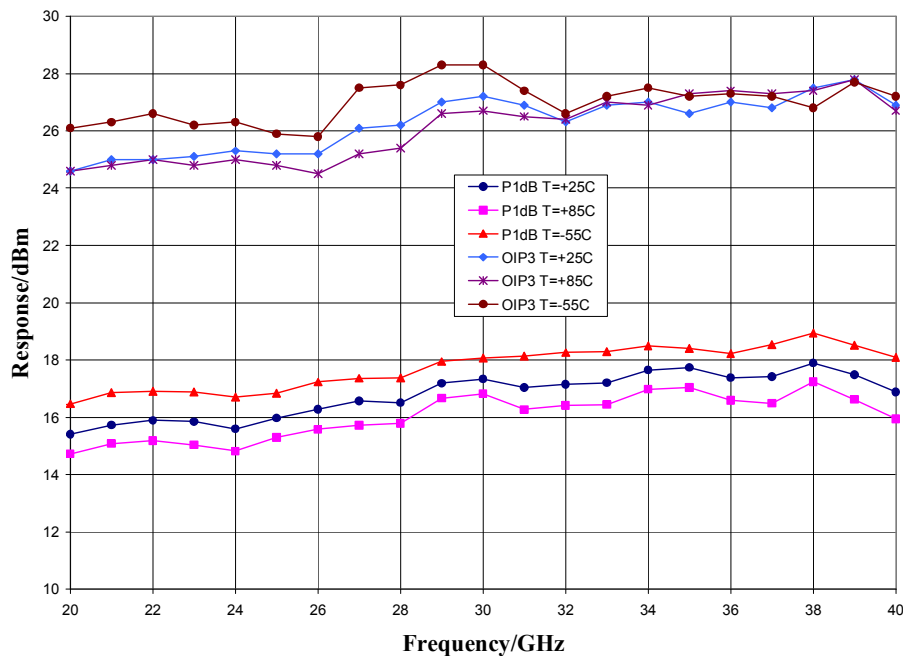
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### Typical Performance

Output Power,  $V_{dd} = 3.0\text{ V} \ \& \ 4.0\text{ V}$ ,  $T_A = 25\text{ }^\circ\text{C}$



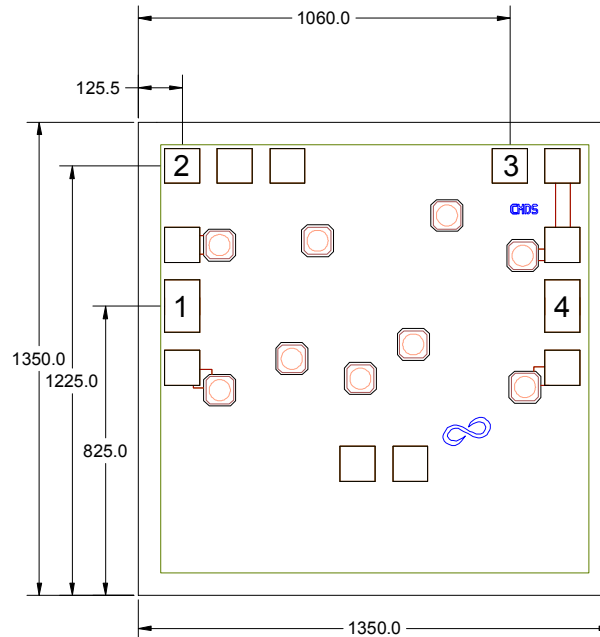
P1dB & Output IP3 vs. Temperature,  $V_{dd} = 4.0\text{ V}$



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### Mechanical Information

#### Die Outline (all dimensions in microns)

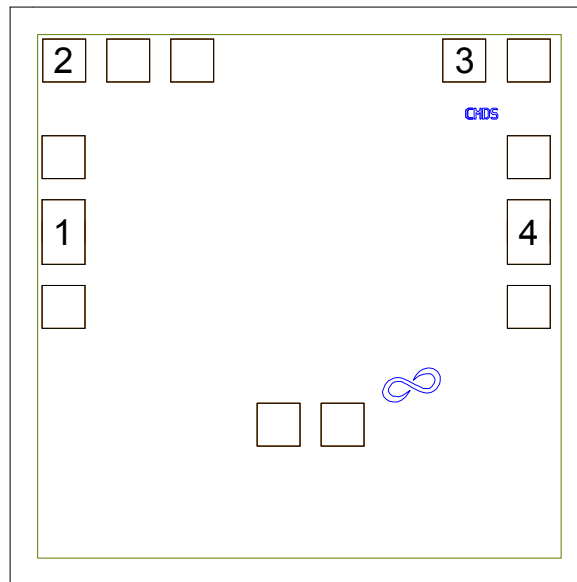


#### Notes:


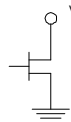


1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 85 microns thick
5. DC bond pads are 100 microns square

### Pad Description

### Pad Diagram



### Functional Description

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

### Applications Information

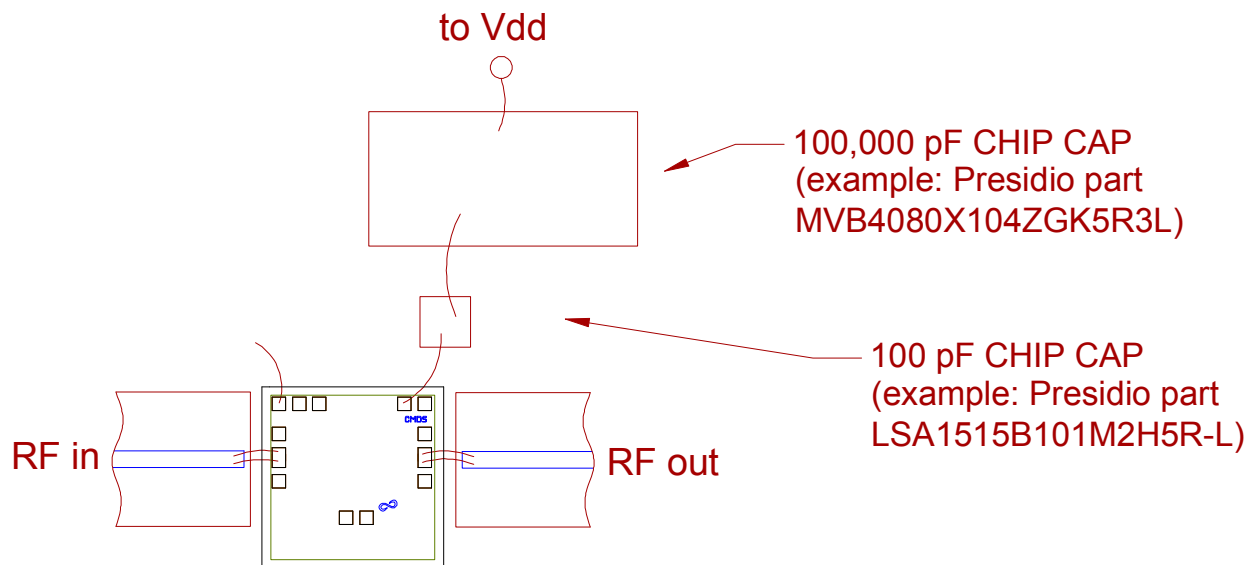
#### Assembly Guidelines

The backside of the CMD166 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 CMD166 is biased with a single positive drain supply. Performance is optimized when the drain voltage is set to +4.0 V, though it may be set to a minimum of +2.0 V and a maximum of +4.0 V.

Turn ON procedure:

1. Apply drain voltage  $V_{dd}$  and set to +4 V

Turn OFF procedure:

1. Turn off drain voltage  $V_{dd}$

RF power can be applied at any time.