

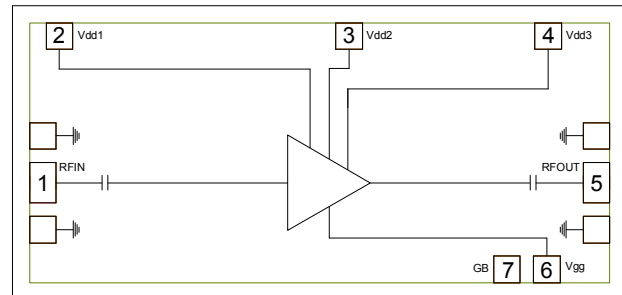
Features

- ▶ Wide bandwidth
- ▶ High linearity
- ▶ Low current consumption
- ▶ Small die size

Description

The CMD187 is a wideband GaAs MMIC driver amplifier ideally suited for military, space and communications systems where small size and high linearity are needed. At 10 GHz the device delivers greater than 22 dB of gain with a corresponding output 1 dB compression point of +14 dBm and an output IP3 of 29 dBm. The CMD187 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching. The CMD187 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 - $V_{dd} = 3.0\text{ V}$, $V_{gg} = 2.0\text{ V}$, $T_A = 25\text{ }^\circ\text{C}$, $F = 10\text{ GHz}$

| Parameter | Min | Typ | Max | Units |
|--------------------|--------|------|-----|-------|
| Frequency Range | 2 - 20 | | | GHz |
| Gain | | 22.5 | | dB |
| Input Return Loss | | 26 | | dB |
| Output Return Loss | | 23 | | dB |
| Output P1dB | | 14 | | dBm |
| Output IP3 | | 29 | | dBm |
| Supply Current | | 115 | | mA |

Specifications

Absolute Maximum Ratings

| Parameter | Rating |
|--------------------------------------|---------------|
| Drain Voltage, V _{dd} | 5 V |
| Gate Voltage, V _{gg} | 3 V |
| RF Input Power | +20 dBm |
| Channel Temperature, T _{ch} | 150 °C |
| Power Dissipation, P _{diss} | 655 mW |
| Thermal Resistance, Θ_{JC} | 99 °C/W |
| Operating Temperature | -55 to 85 °C |
| Storage Temperature | -55 to 150 °C |

Exceeding any one or combination of the maximum ratings may cause permanent damage to the device.

Recommended Operating Conditions

| Parameter | Min | Typ | Max | Units |
|-----------------|-----|-----|-----|-------|
| V _{dd} | 3.0 | 3.0 | 5.0 | V |
| I _{dd} | | 115 | | mA |
| V _{gg} | | 2.0 | | V |

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

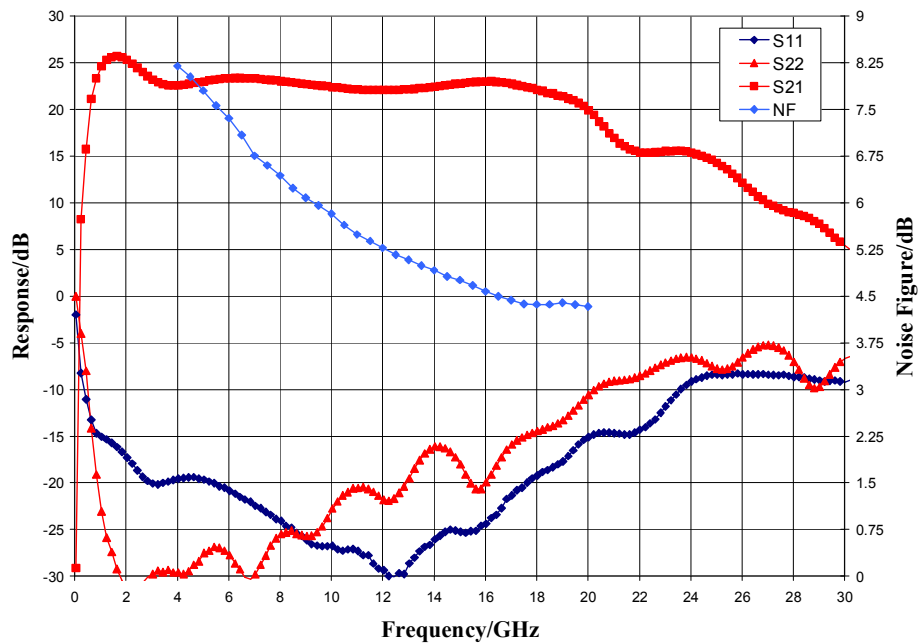
Electrical Specifications, V_{dd} = 3.0 V, V_{gg} = 2.0 V, T_A = 25 °C

| Parameter | Min | Typ | Max | Min | Typ | Max | Units |
|--------------------------------------|--------|------|-----|---------|------|-----|-------|
| Frequency Range | 2 - 18 | | | 18 - 20 | | | GHz |
| Gain | 20 | 23 | 27 | 18 | 21.5 | 24 | dB |
| Noise Figure | | 6 | | | 4.5 | | dB |
| Input Return Loss | | 25 | | | 17 | | dB |
| Output Return Loss | | 20 | | | 13 | | dB |
| Output P1dB | 11 | 14 | | 11 | 13.5 | | dBm |
| Output IP3 | | 28 | | | 29 | | dBm |
| Supply Current | 80 | 115 | 160 | 80 | 115 | 160 | mA |
| Gain Temperature Coefficient | | 0.02 | | | 0.02 | | dB/°C |
| Noise Figure Temperature Coefficient | | 0.01 | | | 0.01 | | dB/°C |

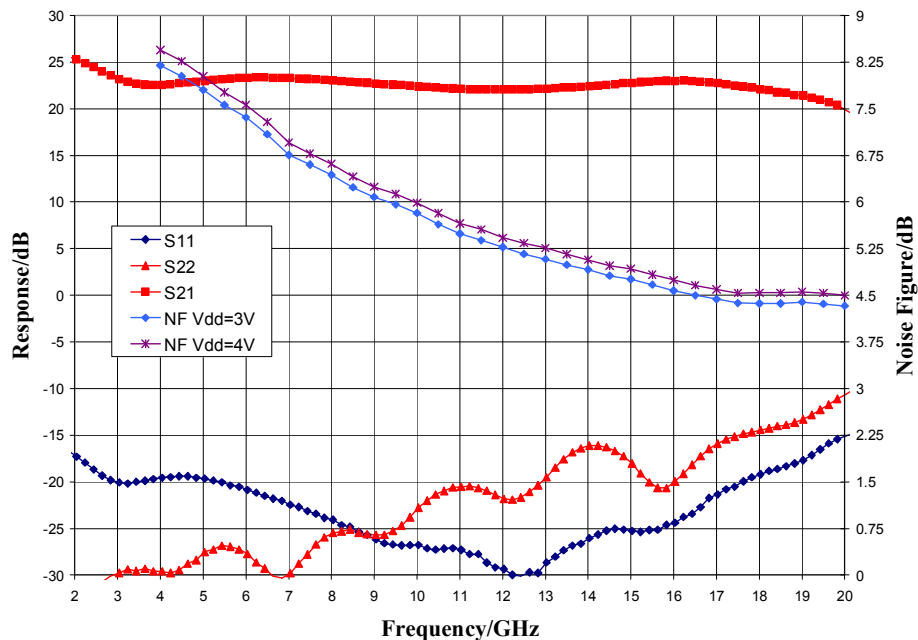
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Typical Performance

Broadband Performance, $V_{dd} = 3.0\text{ V}$, $V_{gg} = 2.0\text{ V}$, $I_{dd} = 115\text{ mA}$, $T_A = 25\text{ }^\circ\text{C}$



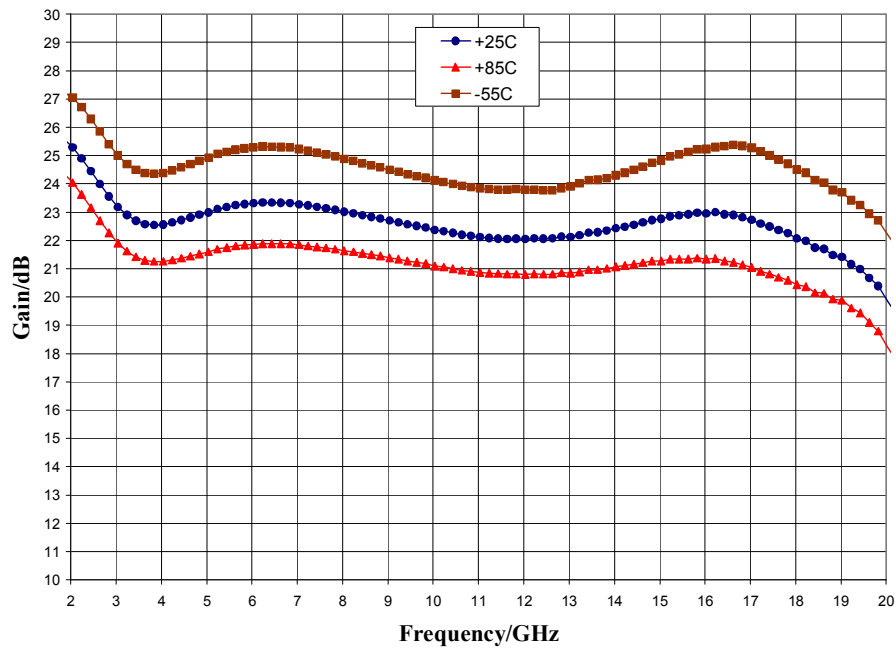
Narrow-band Performance, $V_{dd} = 3.0\text{ V}$, $V_{gg} = 2.0\text{ V}$, $I_{dd} = 115\text{ mA}$, $T_A = 25\text{ }^\circ\text{C}$



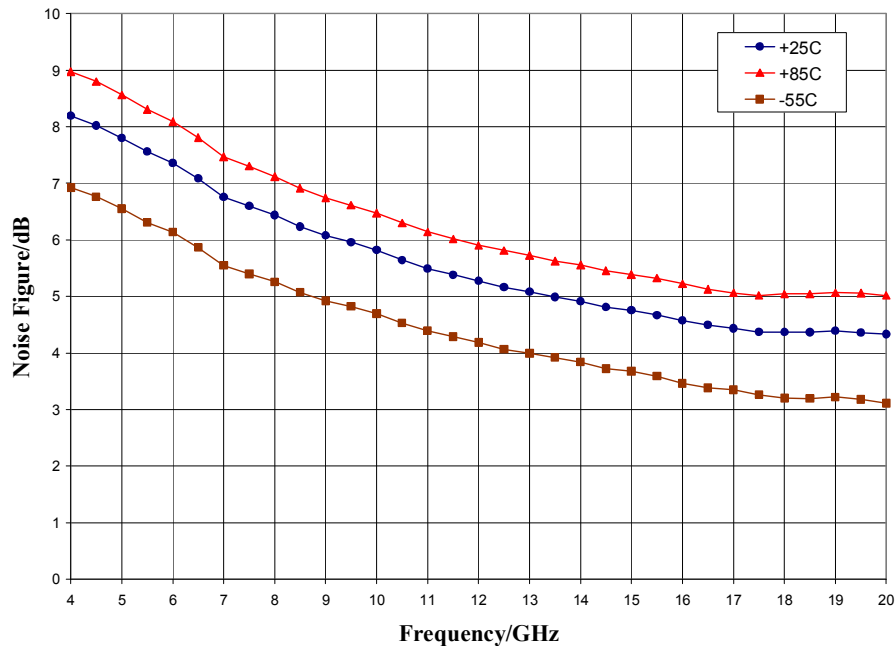
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Typical Performance

Gain vs. Temperature, $V_{dd} = 3.0\text{ V}$, $V_{gg} = 2.0\text{ V}$



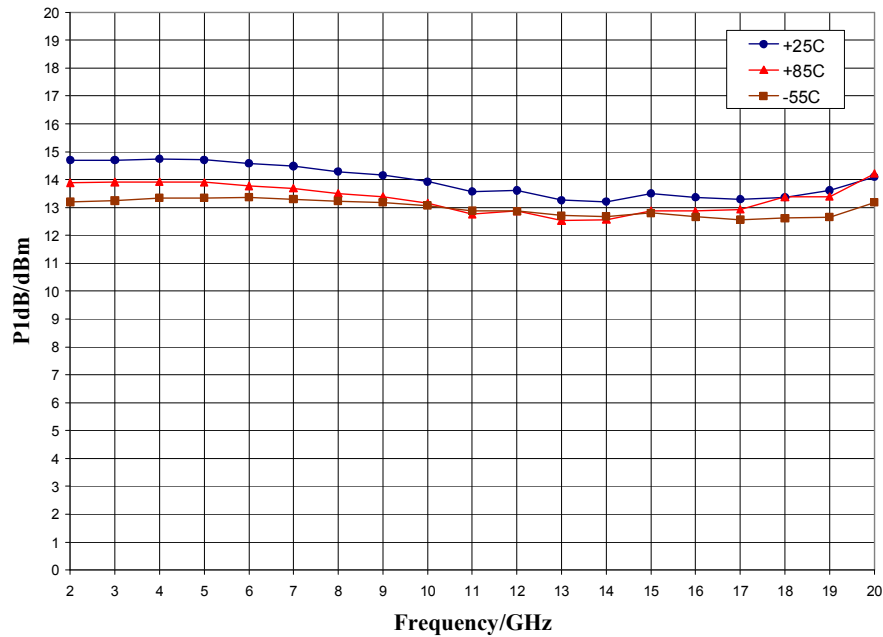
Noise Figure vs. Temperature, $V_{dd} = 3.0\text{ V}$, $V_{gg} = 2.0\text{ V}$



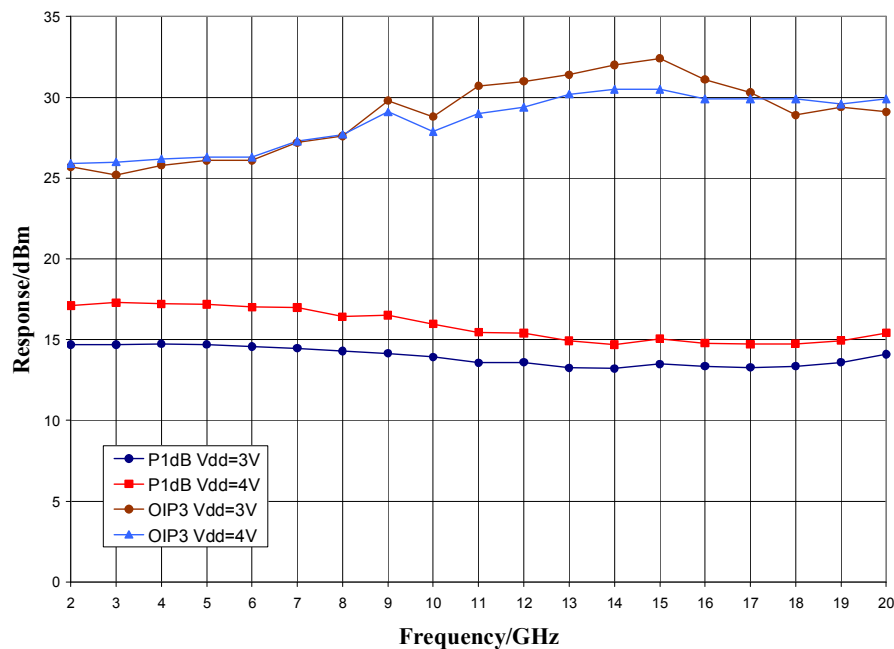
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Typical Performance

P1dB vs. Temperature, $V_{dd} = 3.0\text{ V}$, $V_{gg} = 2.0\text{ V}$



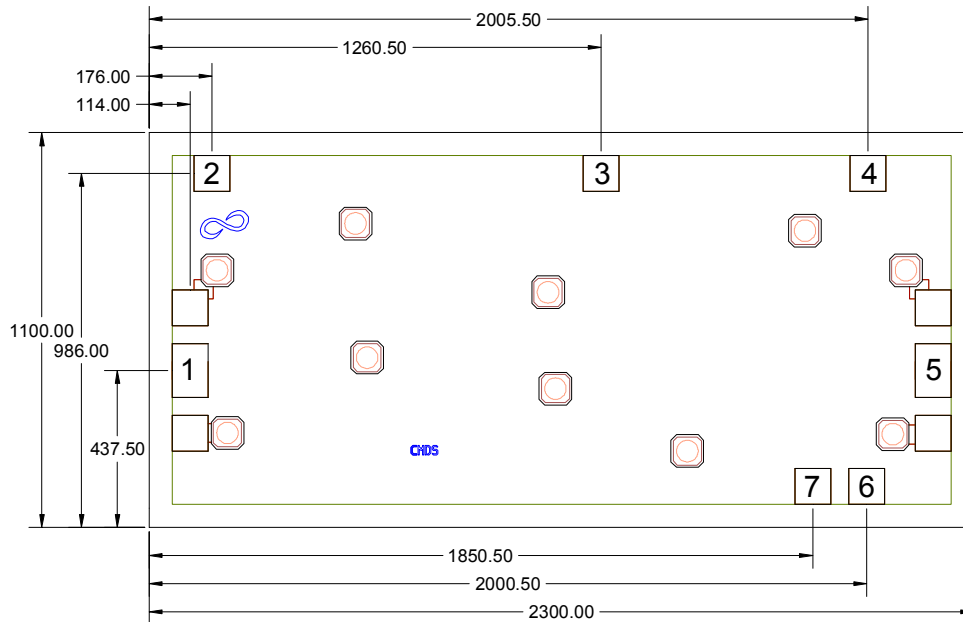
P1dB & Output IP3, $V_{dd}=3\text{V}$, 4V , $V_{gg} = 2.0\text{ V}$



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Mechanical Information

Die Outline (all dimensions in microns)

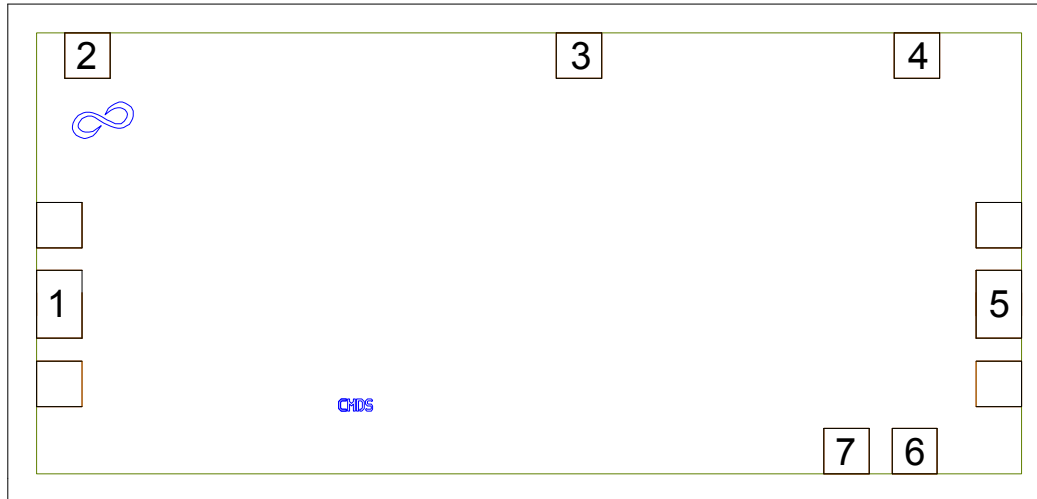


Notes:


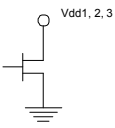

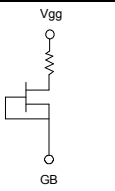

1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 85 microns thick
5. DC bond pads (2, 3, 4, 6, 7) are 100 x 100 microns
6. RF bond pads (1, 5) are 100 x 150 microns

Pad Description

Pad Diagram



Functional Description

| Pad | Function | Description | Schematic |
|----------|------------|---|---|
| 1 | RF in | DC blocked and 50 ohm matched |  |
| 2, 3, 4 | Vdd1, 2, 3 | Power supply voltage Decoupling and bypass caps required |  |
| 5 | RF out | DC blocked and 50 ohm matched |  |
| 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

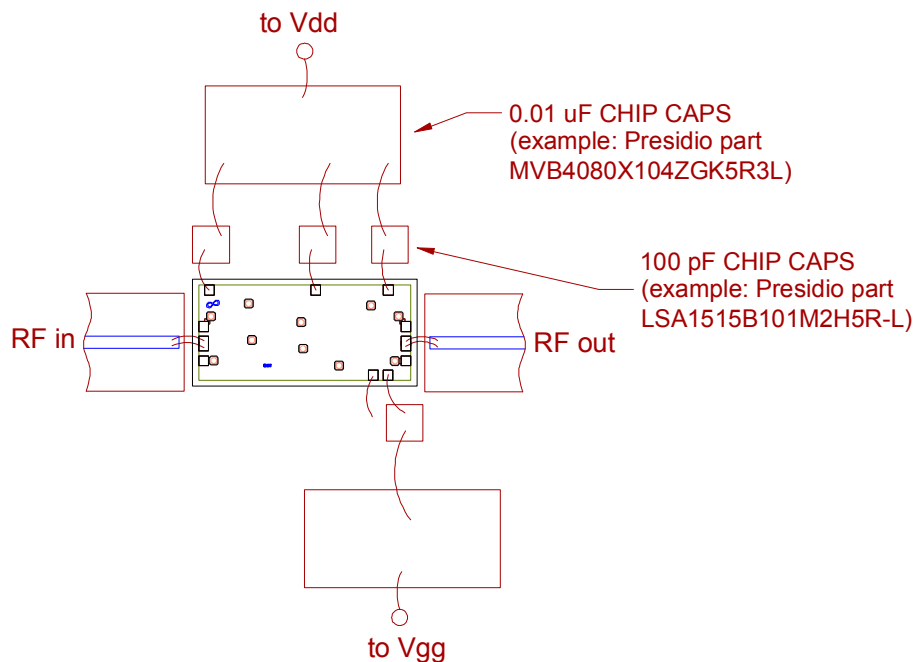
Assembly Guidelines

The backside of the CMD187 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.

Applications Information

Biasing and Operation

The CMD187 is biased with a positive drain supply and positive gate supply. Performance is optimized when the drain voltage is set to +3.0 V. The recommended gate voltage is +2.0 V.

Turn ON procedure:

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