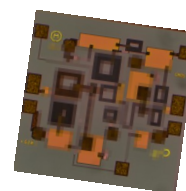




# Let Performance Drive

## CMD132

### 5-11 GHz Low Noise Amplifier



#### Features

- ▶ Ultra low noise figure
- ▶ Low current consumption
- ▶ High gain broadband performance
- ▶ Single supply voltage: +3.6 V @ 30 mA
- ▶ Small die size

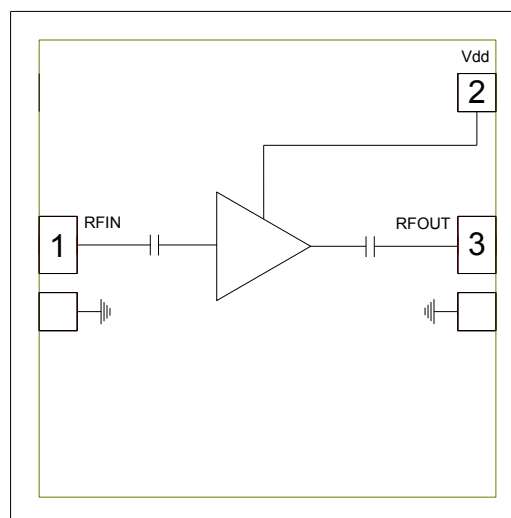
#### Description

The CMD132 is a broadband MMIC low noise amplifier ideally suited for microwave radios and C and X-band applications where small size and low power consumption are needed. The broadband device delivers greater than 22 dB of gain with a corresponding output 1 dB compression point of +10 dBm and a noise figure of 1.4 dB. The CMD132 is a 50 ohm matched design eliminating the need for external DC blocks and RF port matching. The CMD132 amplifier is the perfect alternative to costly hybrid amplifiers.

#### Applications

- ▶ Point-to-point radios
- ▶ Point-to-multi-point radios
- ▶ Military and Space
- ▶ Test instrumentation

#### Functional Block Diagram



#### Electrical Performance - $V_{dd} = 3.6 \text{ V}$ , $T_A = 25^\circ \text{C}$

| Parameter          | Min    | Typ | Max | Units |
|--------------------|--------|-----|-----|-------|
| Frequency Range    | 5 - 11 |     |     | GHz   |
| Gain               |        | 23  |     | dB    |
| Noise Figure       |        | 1.4 |     | dB    |
| Input Return Loss  |        | 10  |     | dB    |
| Output Return Loss |        | 17  |     | dB    |
| Output P1dB        |        | 10  |     | dBm   |
| Supply Current     |        | 30  |     | mA    |

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### Specifications

#### Absolute Maximum Ratings

| Parameter                            | Rating        |
|--------------------------------------|---------------|
| Drain Voltage, Vdd                   | 5.0 V         |
| RF Input Power                       | +20 dBm       |
| Channel Temperature, Tch             | 150 °C        |
| Power Dissipation, P <sub>diss</sub> | 367 mW        |
| Thermal Resistance                   | 177 °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       | 2.0 | 3.6 | 4.5 | V     |
| Idd       |     | 30  |     | mA    |

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

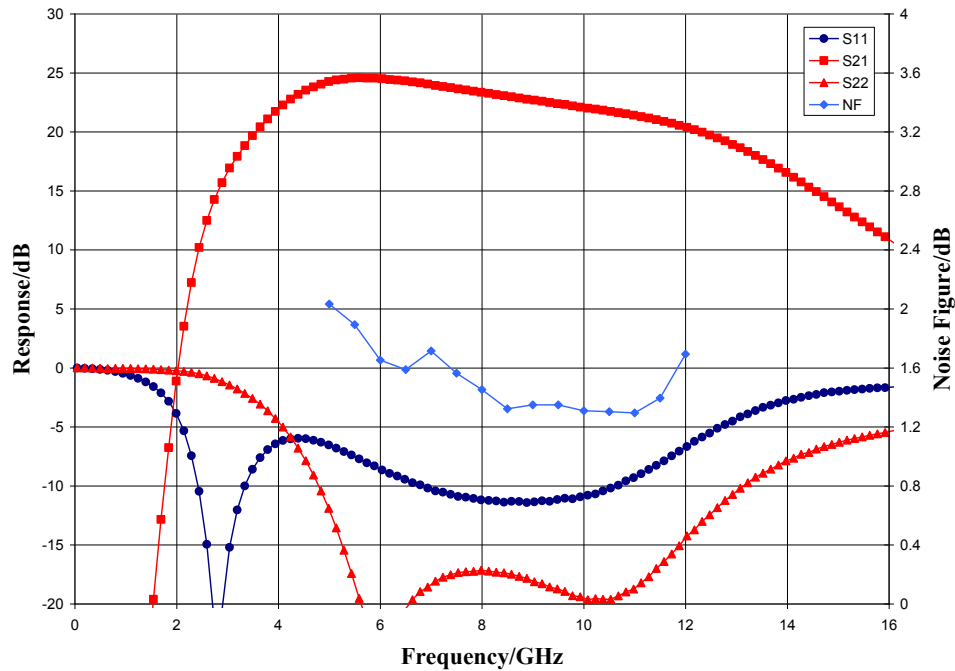
#### Electrical Specifications - V<sub>dd</sub> = 3.6 V, T<sub>A</sub> = 25 °C

| Parameter                            | Min     | Typ   | Max | Min      | Typ   | Max | Units |
|--------------------------------------|---------|-------|-----|----------|-------|-----|-------|
| Frequency Range                      | 5 - 8.5 |       |     | 8.5 - 11 |       |     | GHz   |
| Gain                                 | 21      | 24    | 27  | 19       | 22    | 25  | dB    |
| Noise Figure                         |         | 1.7   | 2.3 |          | 1.3   | 1.7 | dB    |
| Input Return Loss                    |         | 9     |     |          | 11    |     | dB    |
| Output Return Loss                   |         | 17    |     |          | 18    |     | dB    |
| Output P1dB                          |         | 10    |     |          | 11    |     | dBm   |
| Output IP3                           |         | 22    |     |          | 22.5  |     | dBm   |
| Supply Current                       | 21      | 30    | 39  | 21       | 30    | 39  | mA    |
| Gain Temperature Coefficient         |         | 0.015 |     |          | 0.015 |     | dB/°C |
| Noise Figure Temperature Coefficient |         | 0.008 |     |          | 0.008 |     | dB/°C |

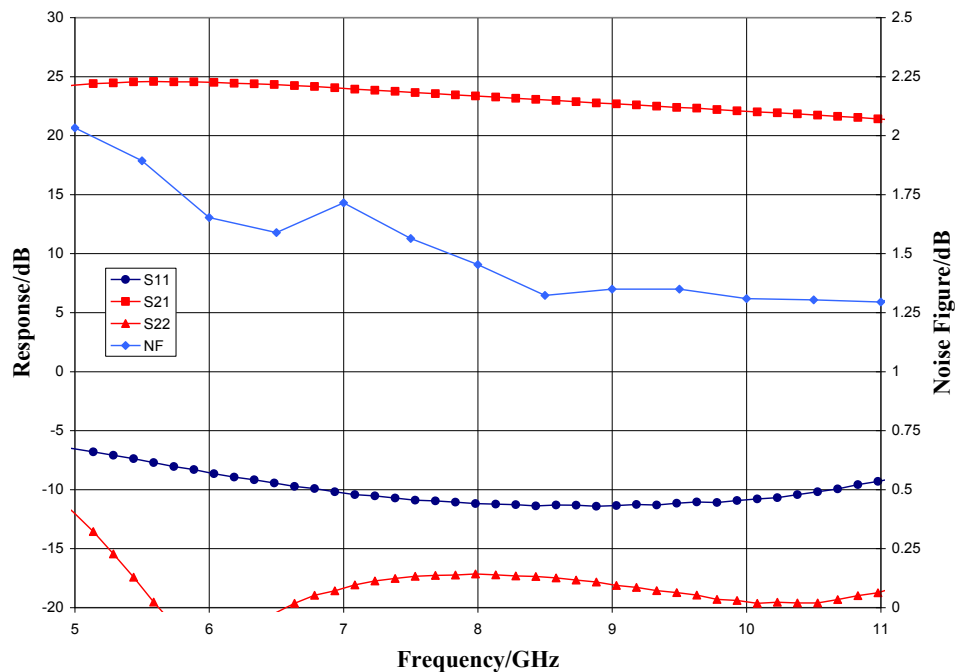
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### Typical Performance

**Broadband Performance,  $V_{dd} = 3.6$  V,  $I_{dd} = 30$  mA,  $T_A = 25$  °C**



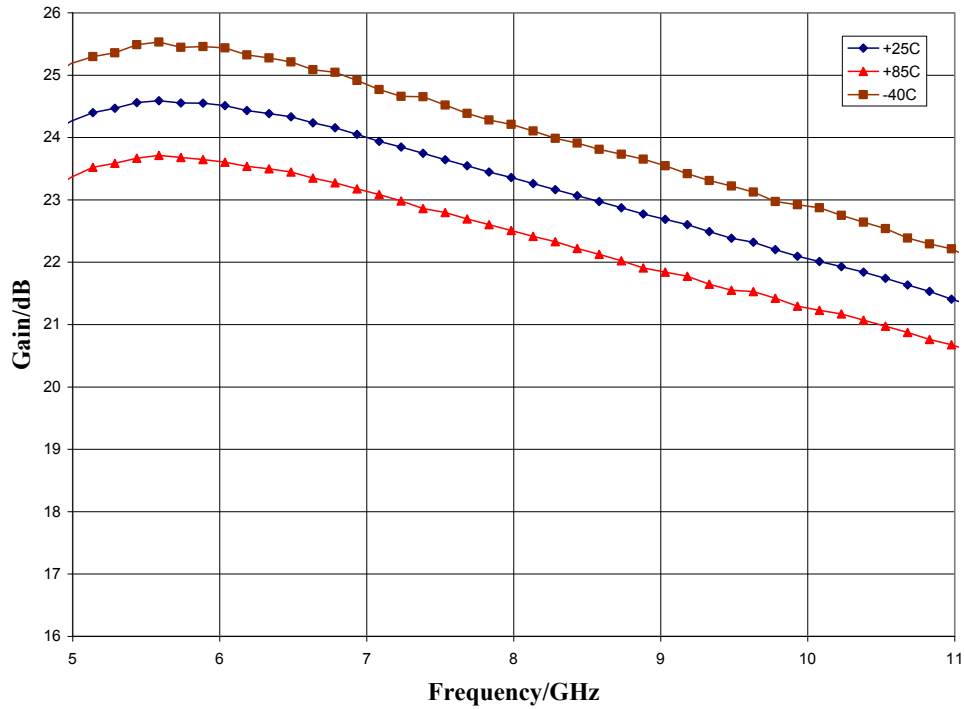
**Narrow-band Performance,  $V_{dd} = 3.6$  V,  $I_{dd} = 30$  mA,  $T_A = 25$  °C**



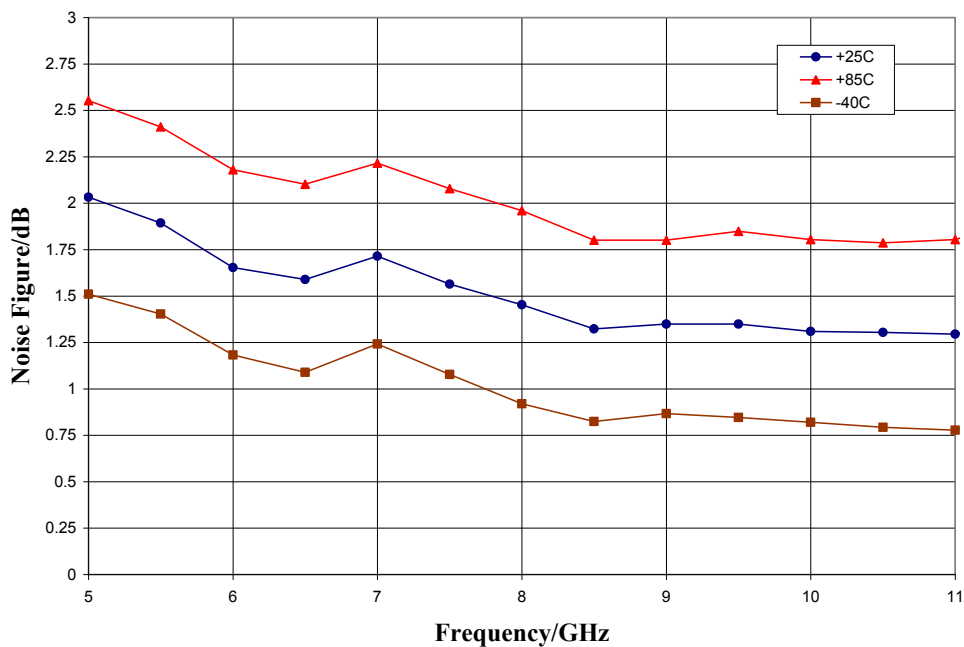
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### Typical Performance

**Gain vs. Temperature,  $V_{dd} = 3.6$  V**



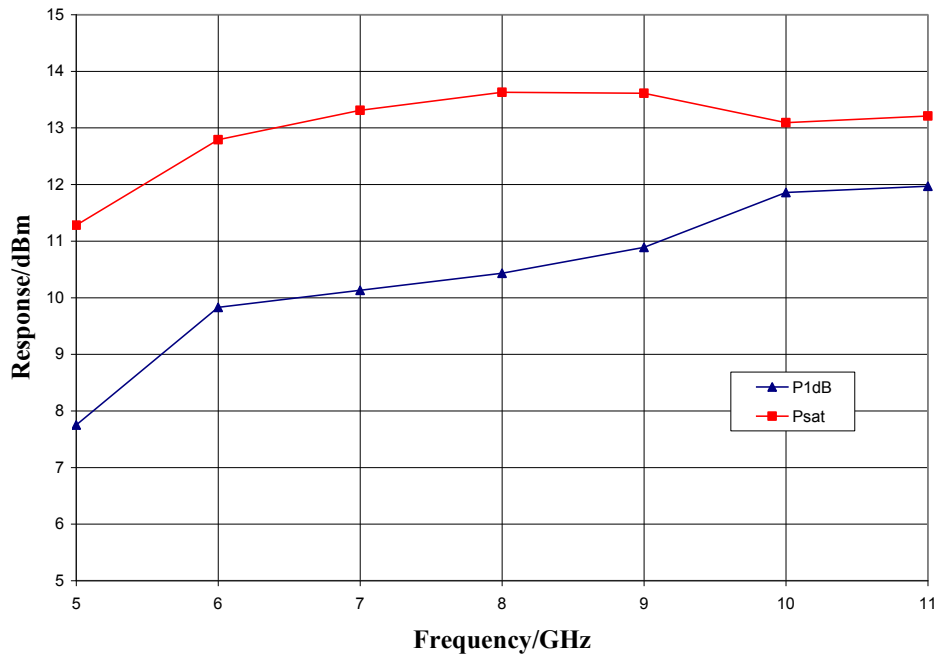
**Noise Figure vs. Temperature,  $V_{dd} = 3.6$  V**



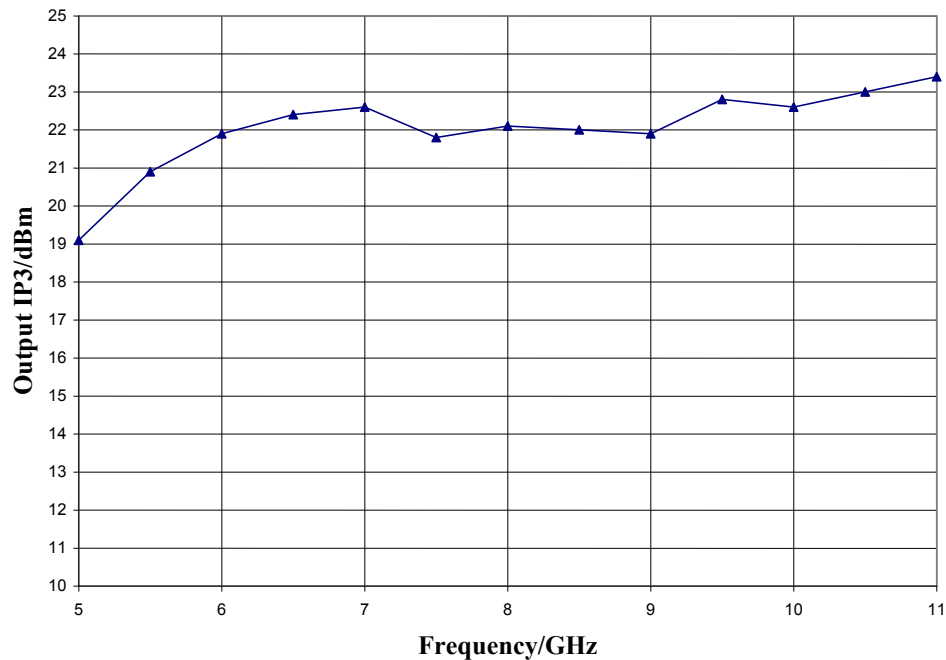
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### Typical Performance

**Output Power,  $V_{dd} = 3.6$  V,  $I_{dd} = 30$  mA,  $T_A = 25$  °C**



**Output IP3,  $V_{dd} = 3.6$  V,  $I_{dd} = 30$  mA,  $T_A = 25$  °C**



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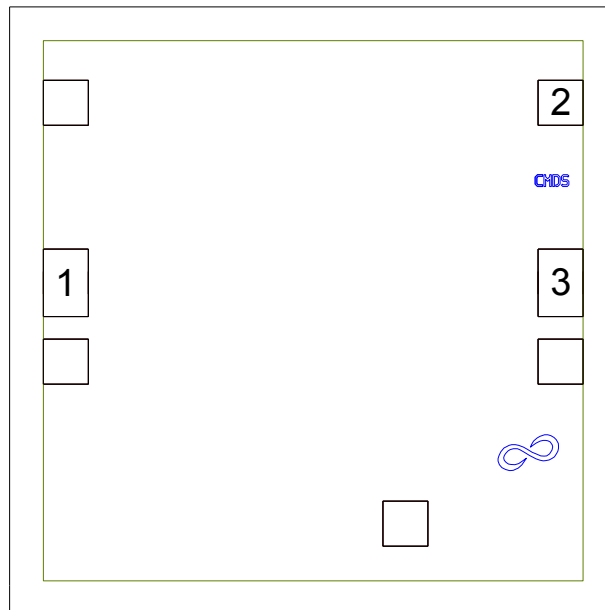
### Die Outline (all dimensions in microns)



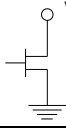
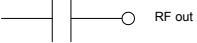
1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 100 microns thick
5. DC bond pads are 100 microns square

### Pad Description

### Pad Diagram



### Functional Description

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

### Applications Information

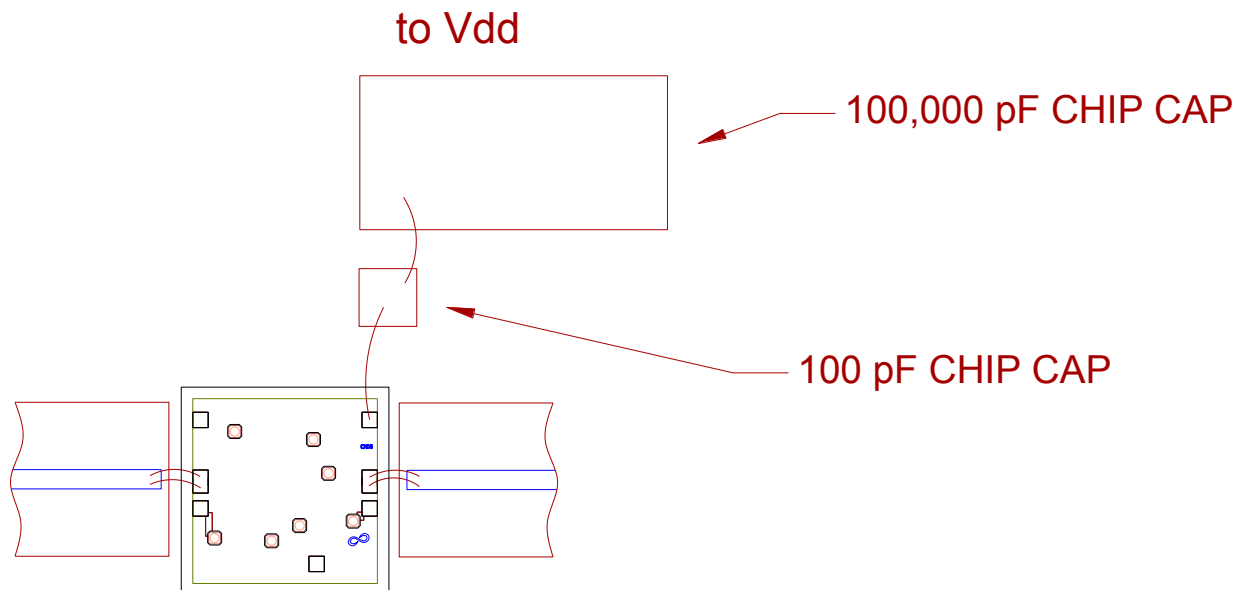
#### Assembly Guidelines

The backside of the CMD132 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 100  $\mu\text{m}$  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 CMD132 is biased with a positive drain supply. Performance is optimized when the drain voltage is set to +3.6 V, though it may be set to a minimum of +2.0 V and a maximum of +4.5 V.

Turn ON procedure:

1. Apply drain voltage  $V_{dd}$  and set to +3.6 V

Turn OFF procedure:

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

RF power can be applied at any time.