# CMD283

## 2-6 GHz Ultra Low Noise Amplifier

## Product Overview

The CMD283 is a broadband MMIC low noise amplifier die ideally suited for EW and communications systems where small size and low power consumption are needed. The device is optimized for broadband performance and delivers 27 dB of gain with a corresponding noise figure of 0.6 dB at 4 GHz. The CMD283 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching. The CMD283 offers full passivation for increased reliability and moisture protection.

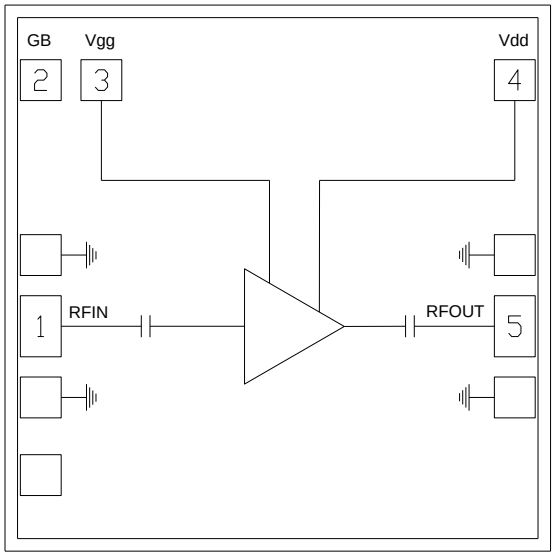
## Key Features

- Ultra Low Noise Figure
- High Gain Broadband Performance
- Low Power Dissipation
- Small Die Size: 1350 um x 1350 um

## Ordering Information

| Part No. | Description |
|---|---|
| CMD283 | 2-6 GHz Ultra Low Noise Amplifier, 100 Piece Gel Pack |

## Functional Block Diagram




## Electrical Performance ($V_{dd}$ = 3 V, $V_{gg}$ = 1.5 V, $T_A$ = 25 °C, F = 4 GHz)

| Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|
| Frequency Range | | 2 - 6 | | GHz |
| Gain | | 27 | | dB |
| Noise Figure | | 0.6 | | dB |
| Input Return Loss | | 15 | | dB |
| Output Return Loss | | 10 | | dB |
| Output P1dB | | 16 | | dBm |
| Supply Current | | 42 | | mA |

## Absolute Maximum Ratings

| Parameter | Rating |
|---|---|
| Drain Voltage, $V_{dd}$ | 5.5 V |
| Gate Voltage, $V_{gg}$ | 3.3 V |
| RF Input Power | +20 dBm |
| Channel Temperature, Tch | 150 °C |
| Power Dissipation, Pdiss | 921 mW |
| Thermal Resistance, $\theta_{JC}$ | 70 °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 |
|---|---|---|---|---|
| $V_{dd}$ | 2 | 3 | 5 | V |
| $I_{dd}$ | | 42 | | mA |
| $V_{gg}$ | | 1.5 | | V |
| $I_{gg}$ | | 0.5 | | mA |

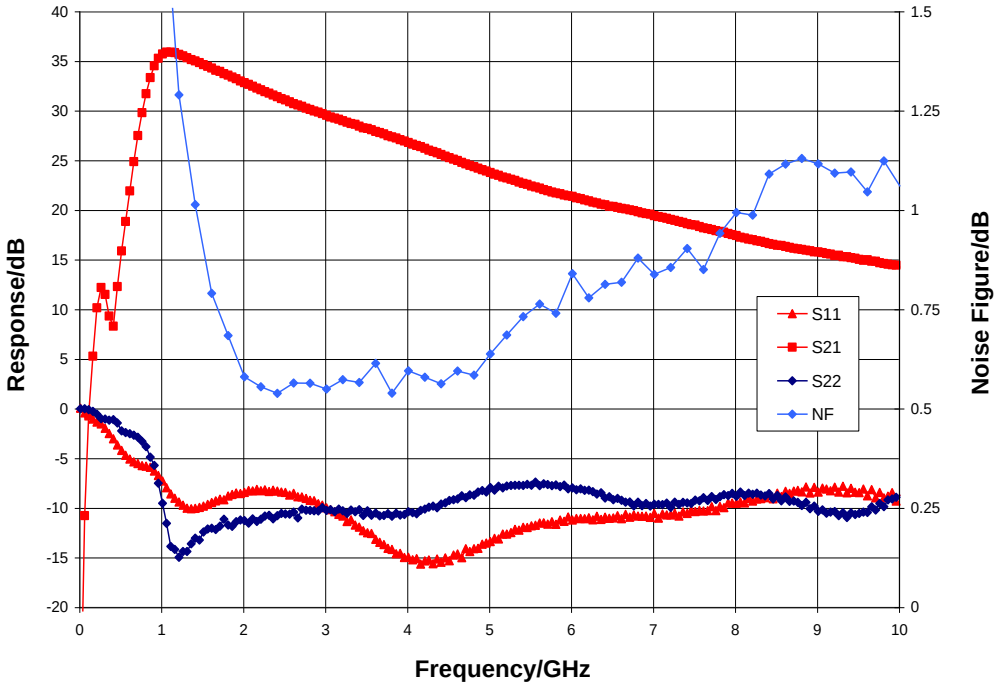
Electrical performance is measured at specific test conditions. Electrical specifications are not guaranteed over all recommended operating conditions.

## Electrical Specifications ($V_{dd}$ = 3 V, $V_{gg}$ = 1.5 V, $T_A$ = 25 °C)

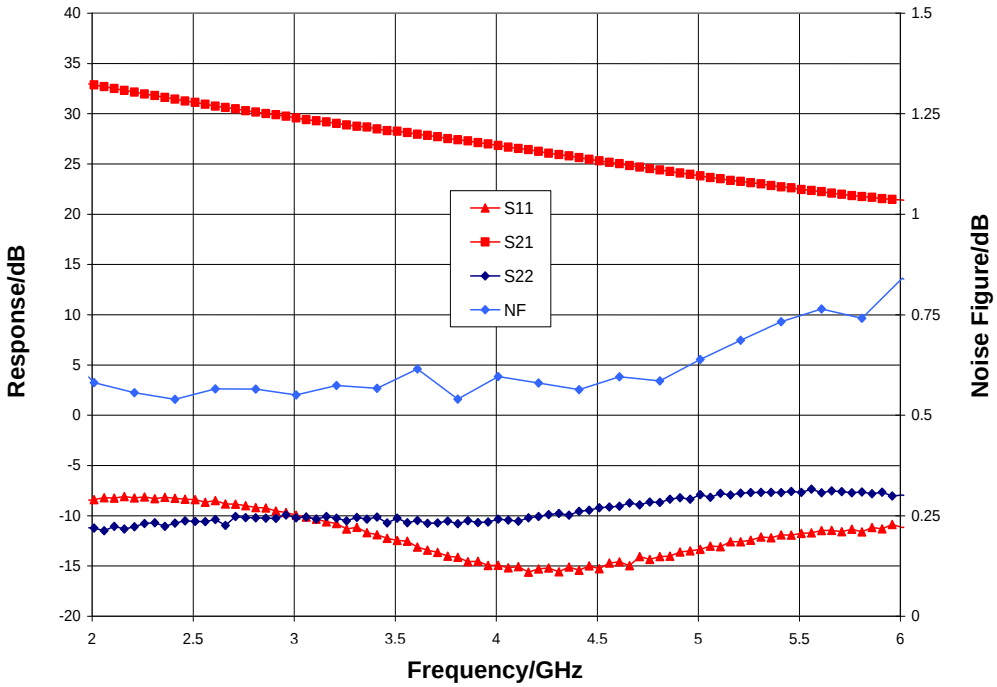
| Parameter | Min | Typ | Max | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Frequency Range | | 2 - 4 | | | 4 - 6 | | GHz |
| Gain | 24 | 30 | | 18 | 24 | | dB |
| Noise Figure | | 0.6 | 0.9 | | 0.7 | 1.1 | dB |
| Input Return Loss | | 10 | | | 13 | | dB |
| Output Return Loss | | 10 | | | 8 | | dB |
| Output P1dB | | 16 | | | 16 | | dBm |
| Output IP3 | | 26 | | | 26 | | dBm |
| Supply Current | 29 | 42 | 80 | 29 | 42 | 80 | mA |
| Gain Temperature Coefficient | | 0.015 | | | 0.015 | | dB/°C |
| Noise Figure Temperature Coefficient | | 0.006 | | | 0.006 | | dB/°C |

## Typical Performance

**Broadband Performance, $V_{dd}$ = 3 V, $V_{gg}$ = 1.5 V, $I_{dd}$ = 42 mA, $T_A$ = 25 °C**

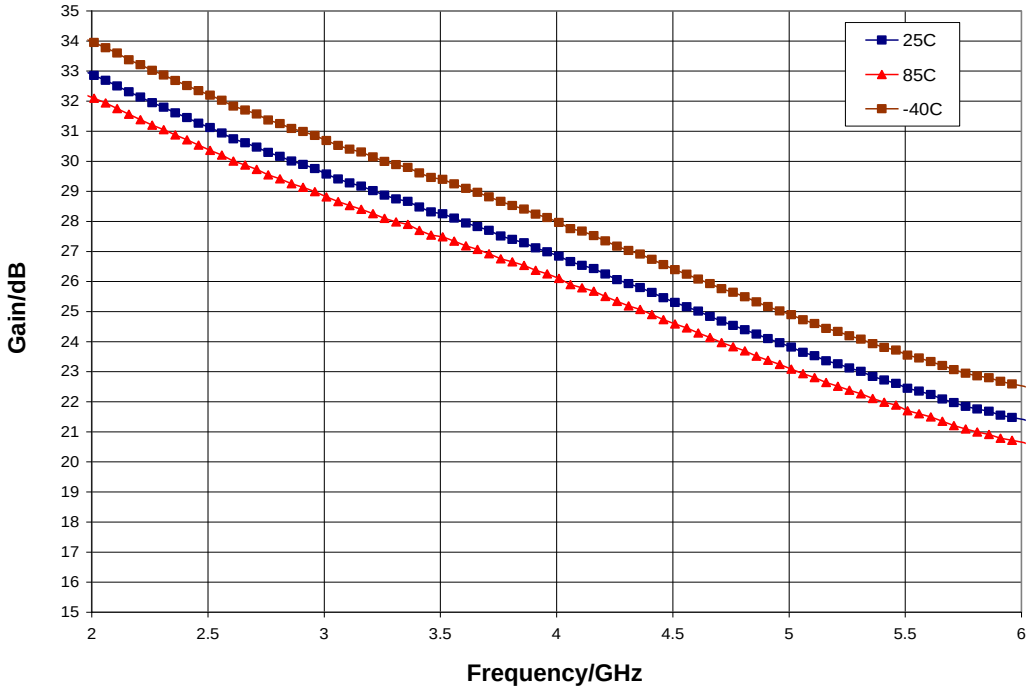



**Narrow-band Performance, $V_{dd}$ = 3 V, $V_{gg}$ = 1.5 V, $I_{dd}$ = 42 mA, $T_A$ = 25 °C**

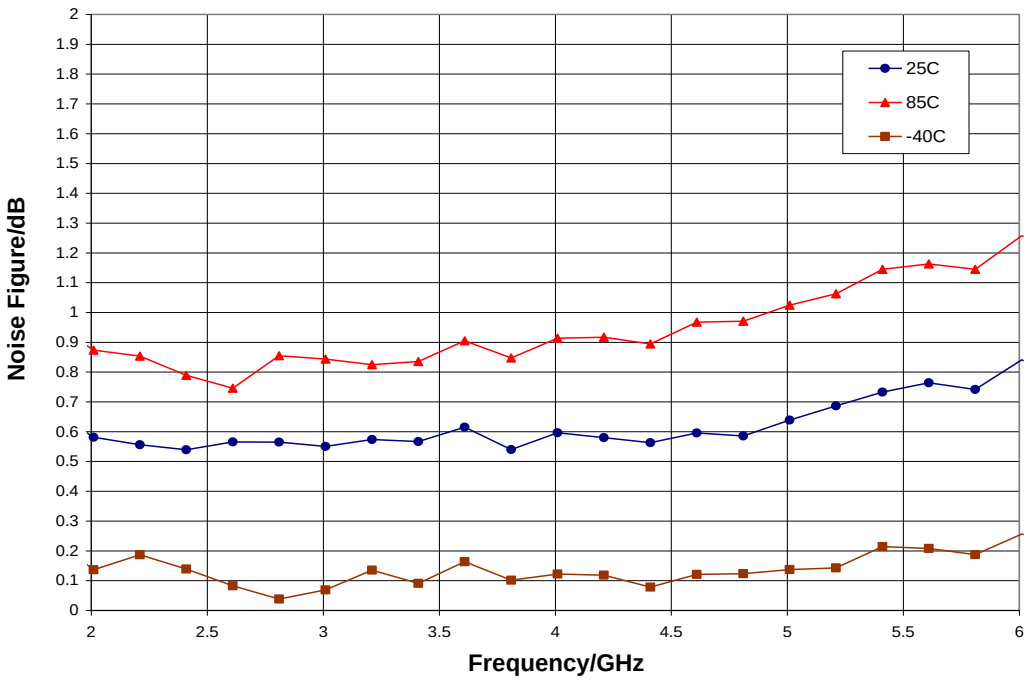


## Typical Performance

**Gain vs. Temperature, $V_{dd}$ = 3 V, $V_{gg}$ = 1.5 V**

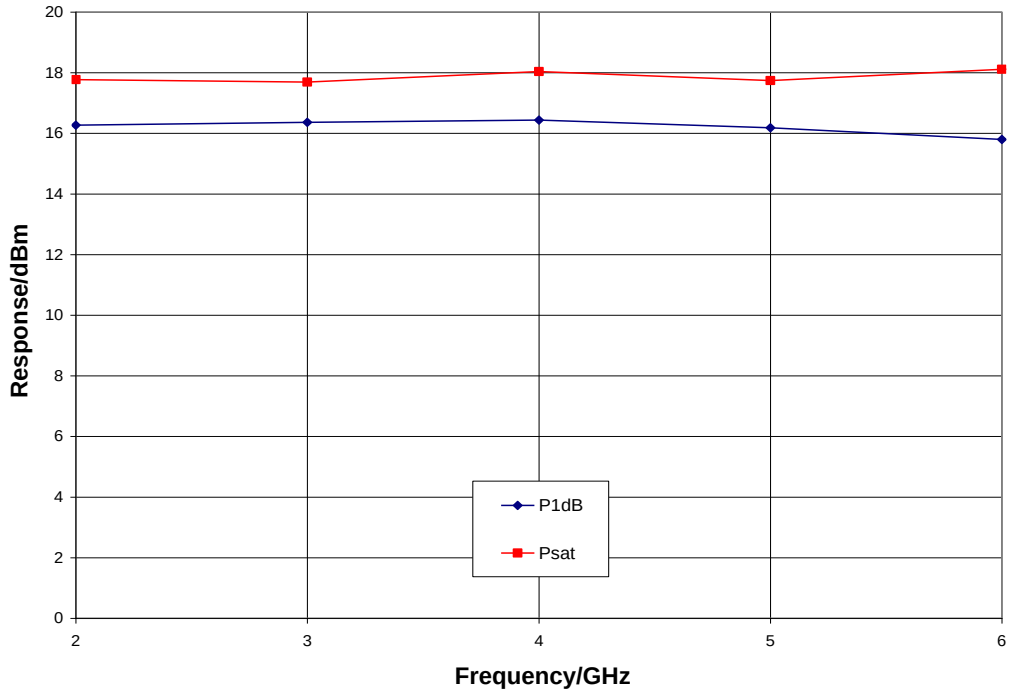



**Noise Figure vs. Temperature, $V_{dd}$ = 3 V, $V_{gg}$ = 1.5 V**

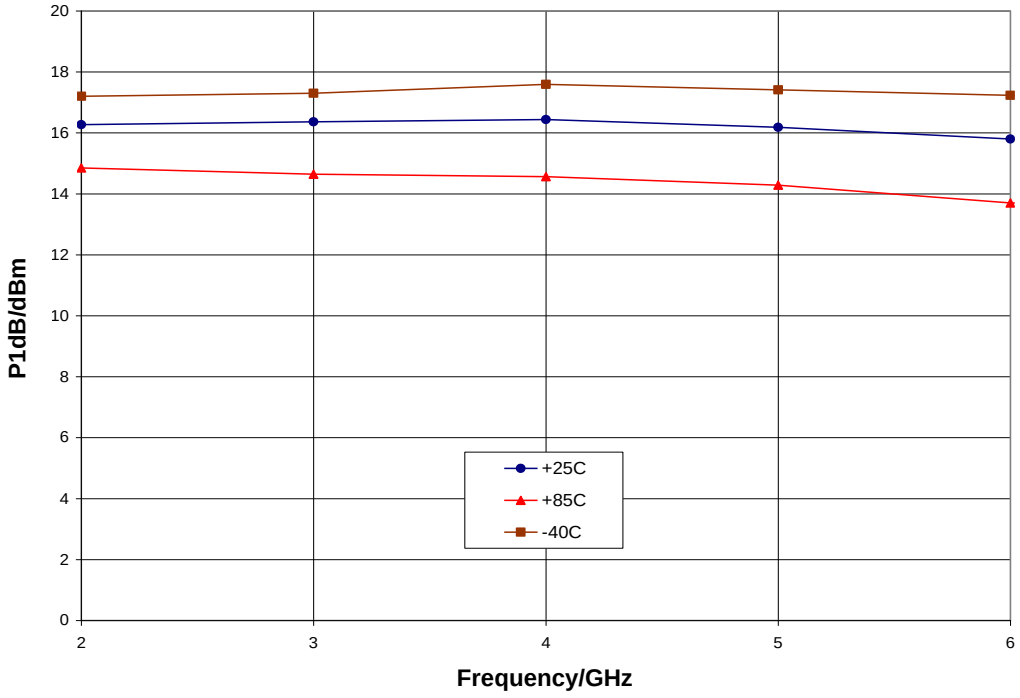


## Typical Performance

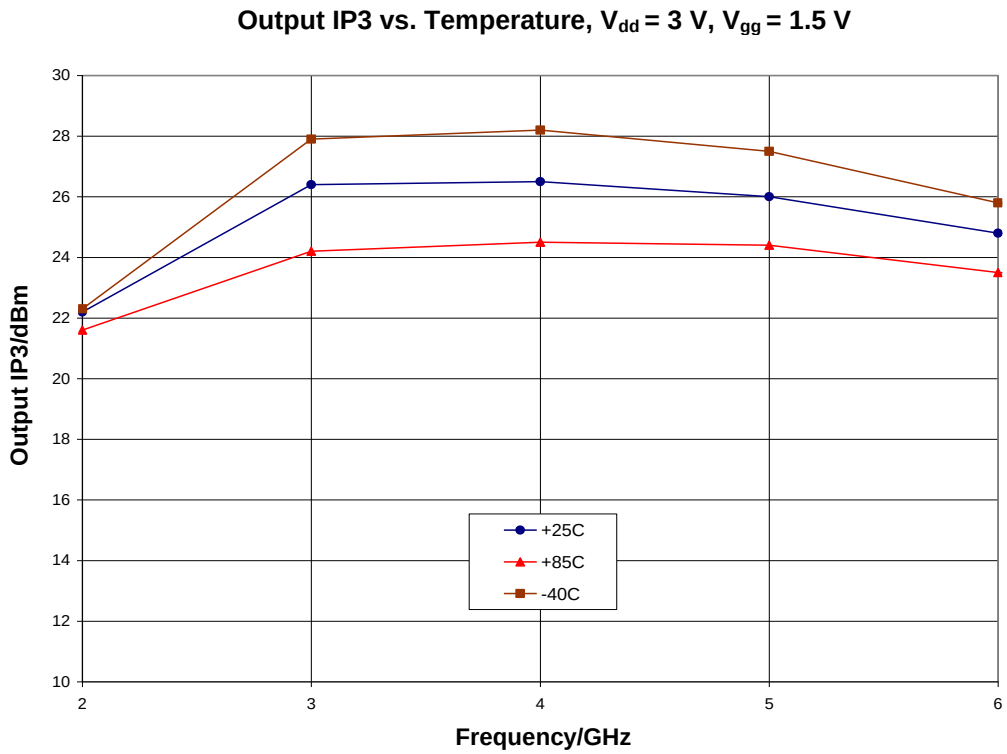
**Output Power, $V_{dd}$ = 3 V, $V_{gg}$ = 1.5 V, $T_A$ = 25 °C**




**P1dB vs. Temperature, $V_{dd}$ = 3 V, $V_{gg}$ = 1.5 V**

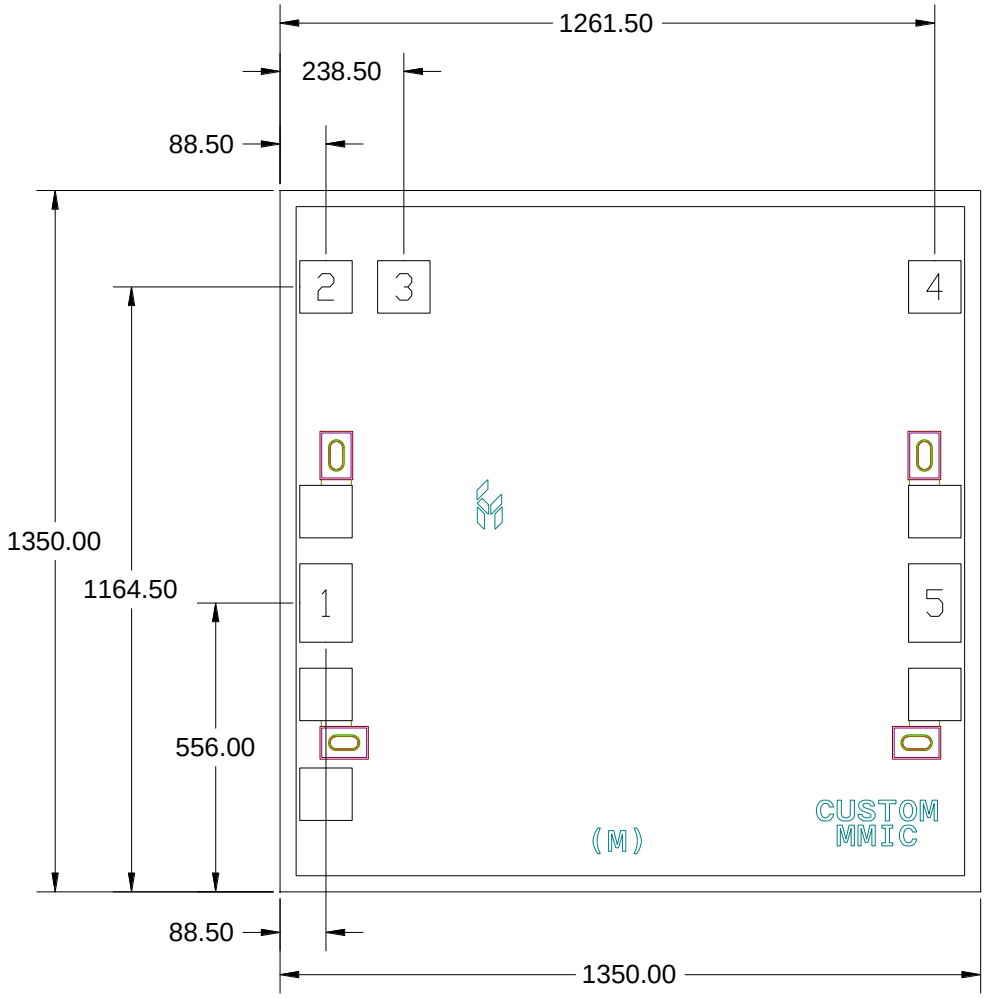


## Typical Performance



## Mechanical Information

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

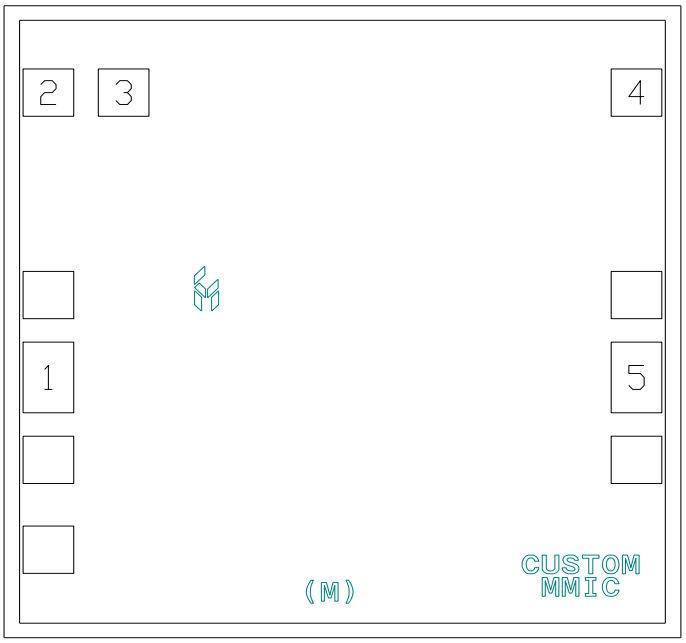



Notes:

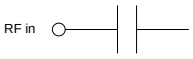
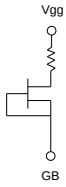
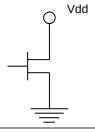
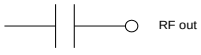
1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 100 microns thick
5. DC bond pads (2, 3, 4) are 100 x 100 microns
6. RF bond pads (1, 5) are 100 x 150 microns

## Pad Description

### Pad Diagram




### Functional Description

| Pin | Function | Description | Schematic |
|---|---|---|---|
| 1 | RF in | DC blocked and 50 ohm matched |   |
| 2 | GB | Connect to DC ground |   |
| 3 | $V_{gg}$ | Power supply voltage<br>Decoupling and bypass caps required | |
| 4 | $V_{dd}$ | Power supply voltage<br>Decoupling and bypass caps required |   |
| 5 | RF out | DC blocked and 50 ohm matched |   |
| Backside | Ground | Connect to RF / DC ground |   |

## Applications Information

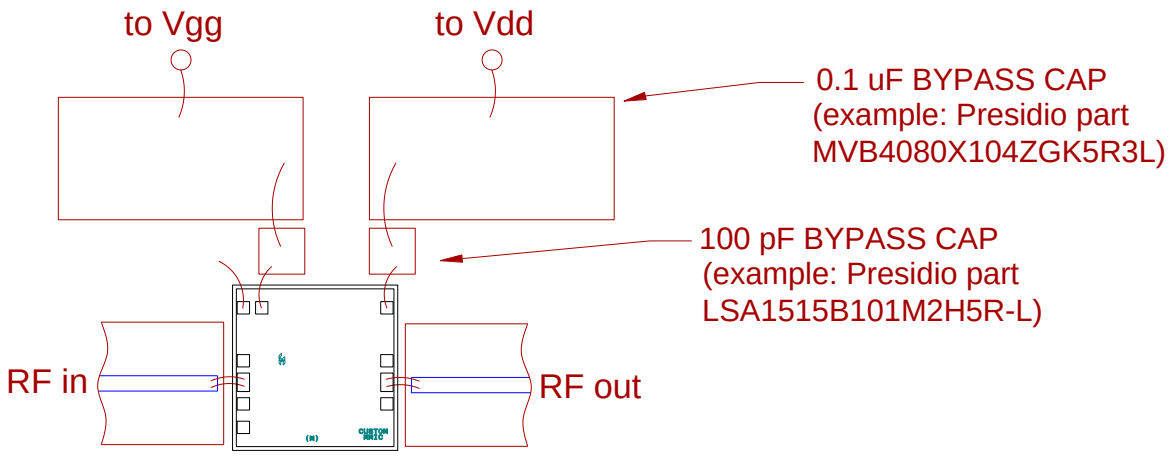
### Assembly Guidelines

The backside of the CMD283 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 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 CMD283 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 +1.5 V.

Turn ON procedure:

1. Apply drain voltage $V_{dd}$ and set to +3 V
2. Apply gate voltage $V_{gg}$ and set to +1.5 V

Turn OFF procedure:

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

The preferred biasing procedure has been proven to be robust and should be used whenever possible. However, the CMD283 does allow for simultaneous biasing (applying $V_{dd}$ and $V_{gg}$ at the same time).

Refer to Application Note 103: Amplifier Biasing Techniques for instructions.

For either approach, RF power can be applied at any time.

## Handling Precautions

| Parameter | Rating | Standard |
|---|---|---|
| ESD – Human Body Model (HBM) | Class 1A | ESDA / JEDEC JS-001-2012 |

Caution!
ESD-Sensitive Device

## RoHS Compliance

This part is compliant with 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead Free
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- SVHC Free
- Halogen Free
- PFOS Free

## Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

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