# CMD308
## 2-6 GHz Low Noise Amplifier

## Product Overview

The CMD308 is a broadband MMIC low noise amplifier ideally suited for microwave radios and S and C-band applications where small size and low power consumption are needed. At 4 GHz the device delivers 32 dB of gain with a corresponding output 1 dB compression point of +12 dBm and a noise figure of 1.5 dB. The CMD308 is a 50 ohm matched design eliminating the need for external DC blocks and RF port matching. The CMD308 offers full passivation for increased reliability and moisture protection.

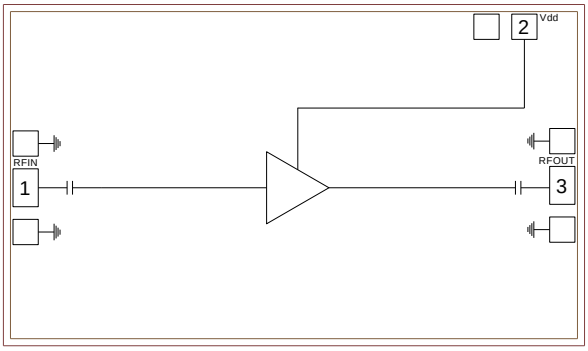
## Key Features

- Low Noise Figure
- High Gain Broadband Performance
- Low Current Consumption
- Single Positive Bias
- Small Die Size

## Ordering Information

| Part No. | Description |
|---|---|
| CMD308 | 100 pcs in gel pack |

## Functional Block Diagram




## Electrical Performance ($V_{dd}$ = 4.0 V, $T_A$ = 25° C, F = 4 GHz)

| Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|
| Frequency Range | | 2 - 6 | | GHz |
| Gain | | 32 | | dB |
| Noise Figure | | 1.5 | | dB |
| Input Return Loss | | 14 | | dB |
| Output Return Loss | | 10 | | dB |
| Output P1dB | | 12 | | dBm |
| Output IP3 | | 23 | | dBm |
| Supply Current | | 45 | | mA |

## Absolute Maximum Ratings

| Parameter | Rating |
|---|---|
| Drain Voltage, $V_{dd}$ | 5.5 V |
| RF Input Power | +20 dBm |
| Channel Temperature, Tch | 150° C |
| Power Dissipation, Pdiss | 494 mW |
| Thermal Resistance $Q_{JC}$ | 131 °C/W |
| Operating Temperature | -55 to 85° C |
| Drain Voltage, $V_{dd}$ | -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 | 4.0 | 5.0 | V |
| $I_{dd}$ | | 45 | | mA |

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

## Drain Current vs. Drain Voltage

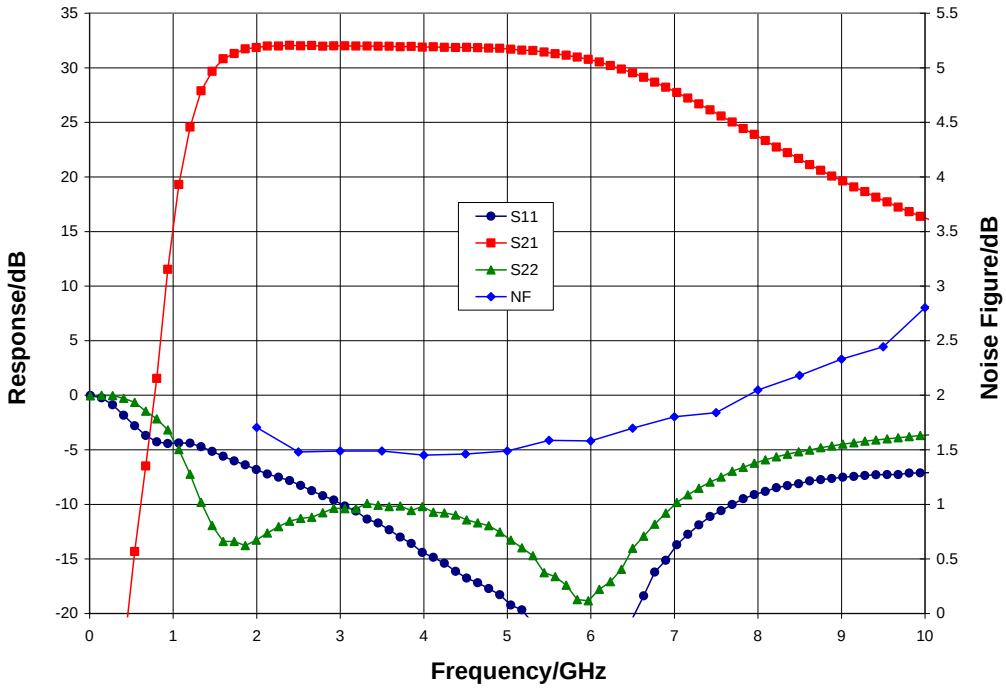
| $V_{dd}$ (V) | $I_{dd}$ (mA) |
|---|---|
| 3.0 | 41 |
| 4.0 | 45 |
| 5.0 | 48 |

## Electrical Specifications ($V_{dd}$ = 4.0 V, $T_A$ = 25° C)

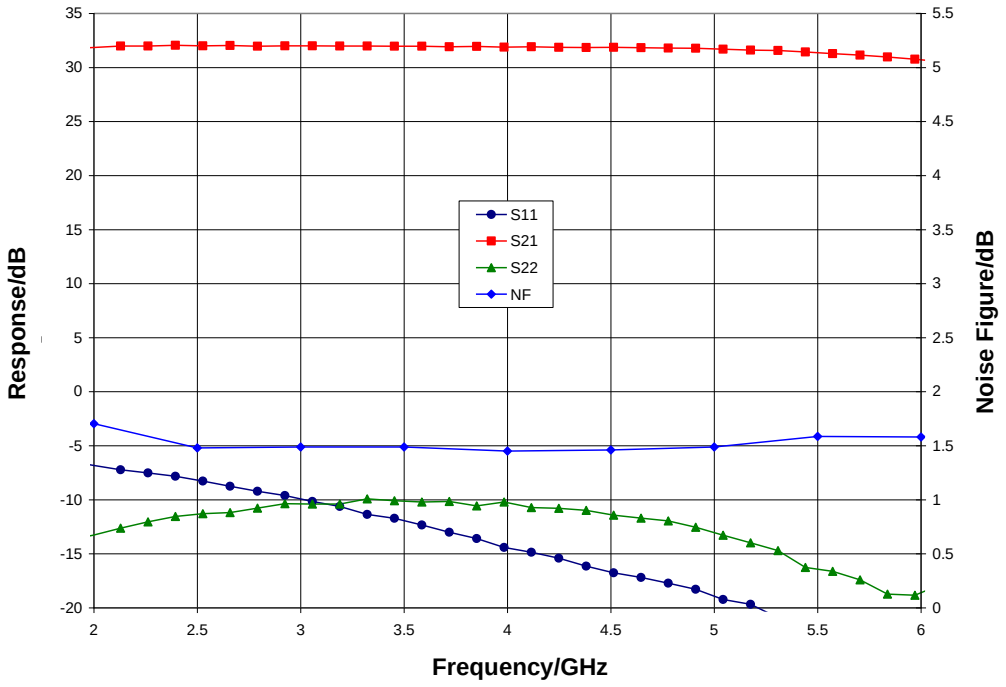
| Parameter | Min | Typ | Max | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Frequency Range | | 2 - 4 | | | 4 - 6 | | GHz |
| Gain | 29 | 32 | | 27.5 | 31.5 | | dB |
| Noise Figure | | 1.5 | 2.2 | | 1.5 | 2.1 | dB |
| Input Return Loss | | 10 | | | 18 | | dB |
| Output Return Loss | | 10 | | | 13 | | dB |
| Output P1dB | | 12.5 | | | 13 | | dBm |
| Output IP3 | | 22.5 | | | 23.5 | | dBm |
| Supply Current | 30 | 45 | 60 | 30 | 45 | 60 | mA |
| Gain Temperature Coefficient | | 0.012 | | | 0.012 | | dB/°C |
| Noise Figure Temperature Coefficient | | 0.007 | | | 0.007 | | dB/°C |

## Typical Performance

**Broadband Performance, $V_{dd}$ = 4.0 V, $T_A$ = 25° C**

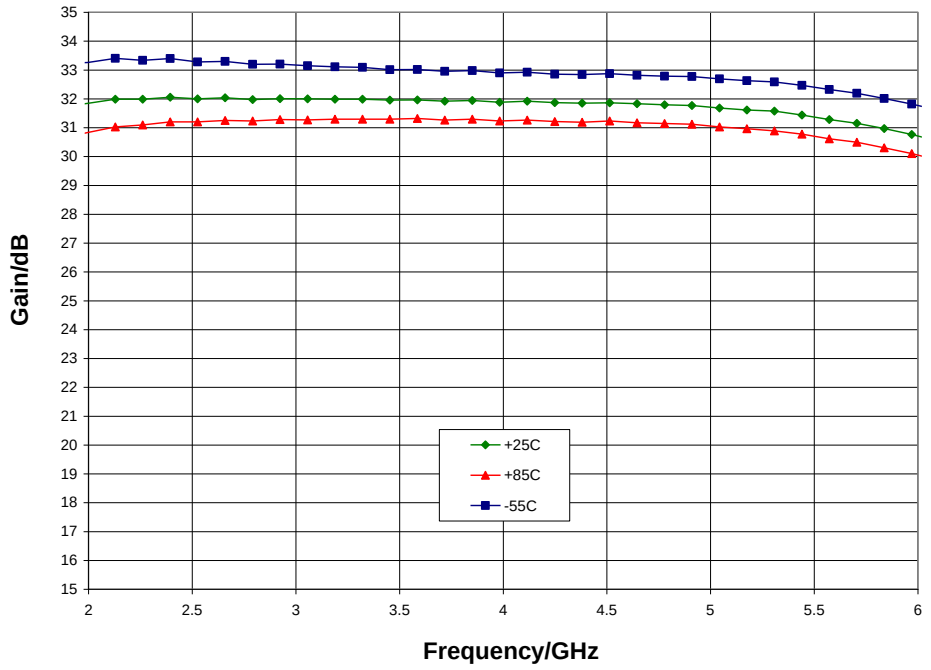



**Narrow-band Performance, $V_{dd}$ = 4.0 V, $T_A$ = 25° C**

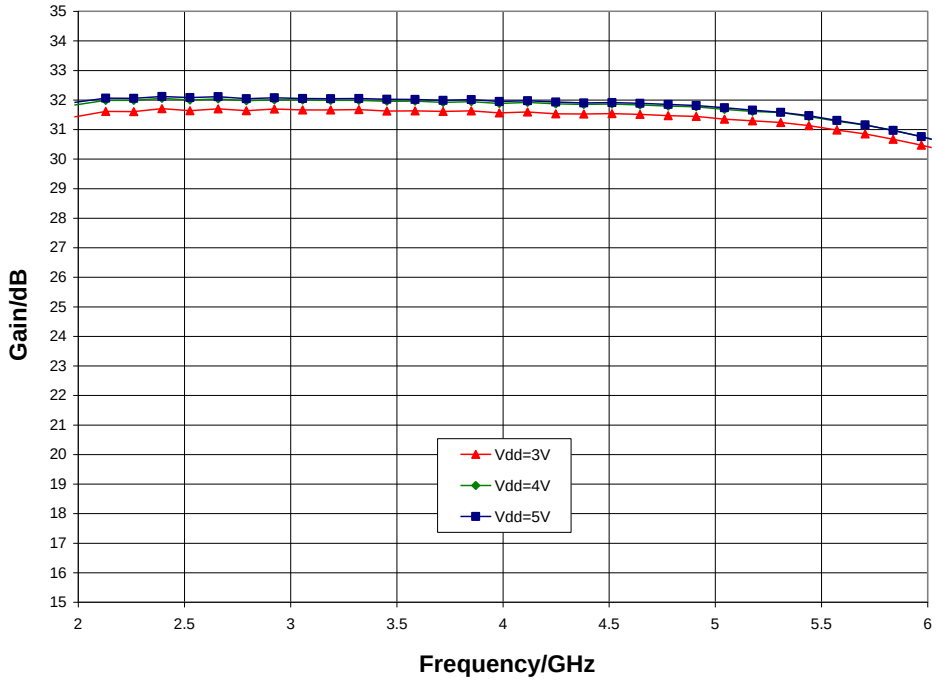


## Typical Performance

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

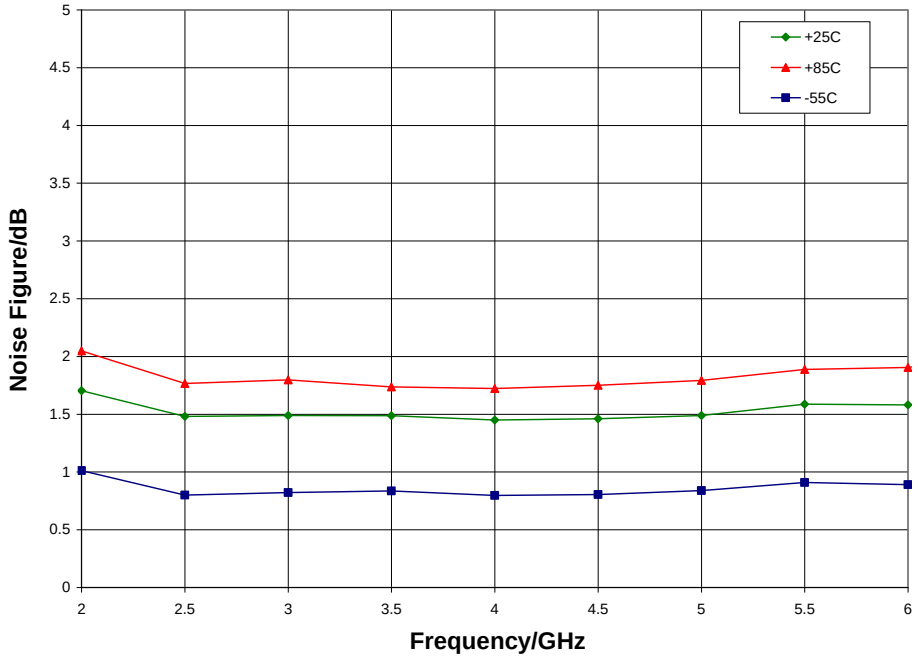



**Gain vs. $V_{dd}$, $T_A$ = 25° C**

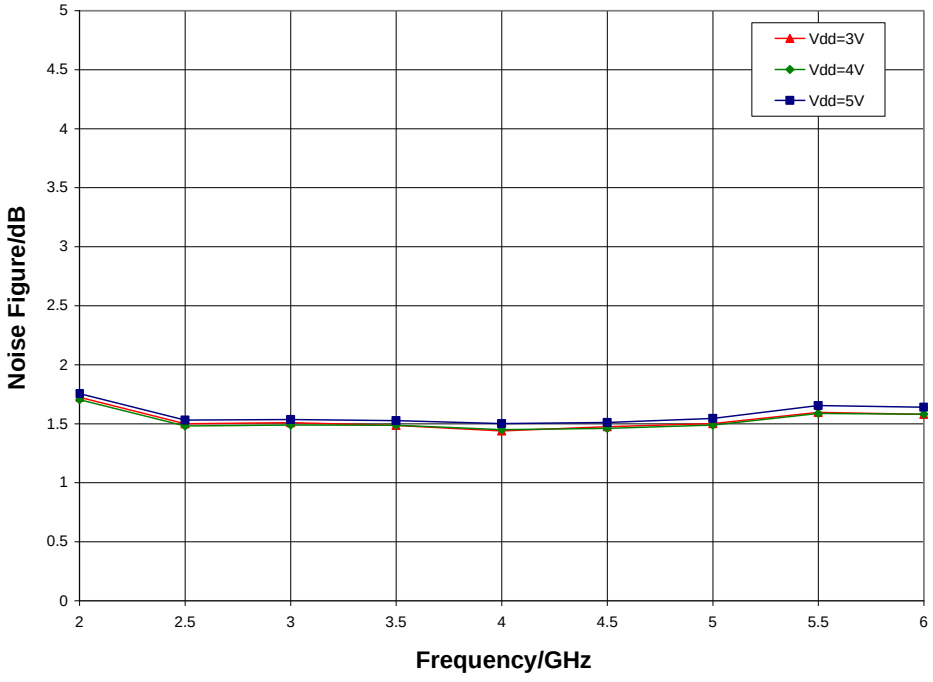


## Typical Performance

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

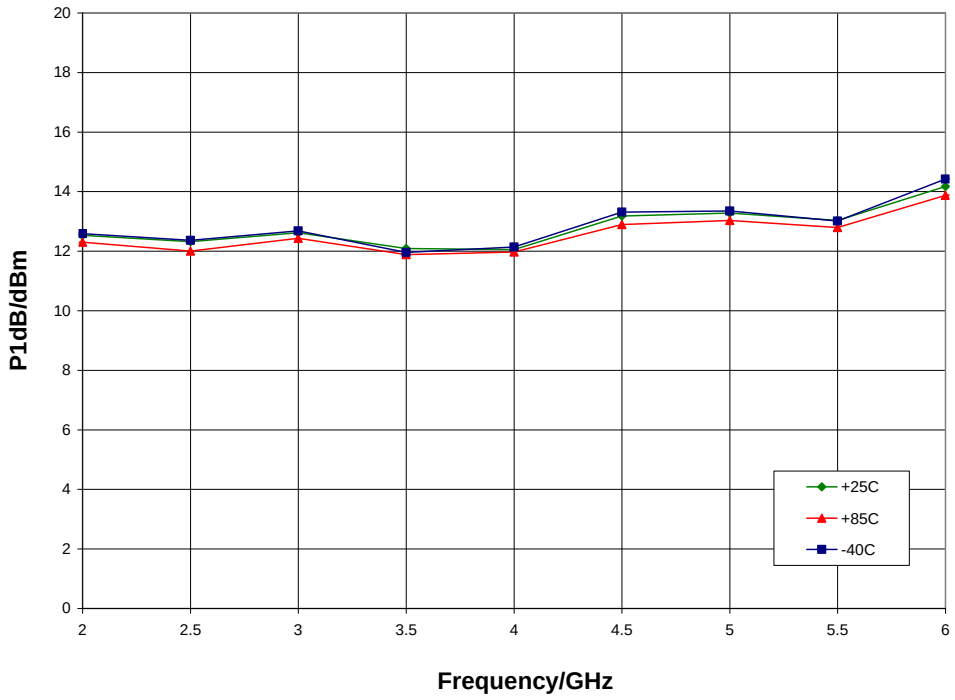



**Noise Figure vs. $V_{dd}$, $T_A$ = 25° C**

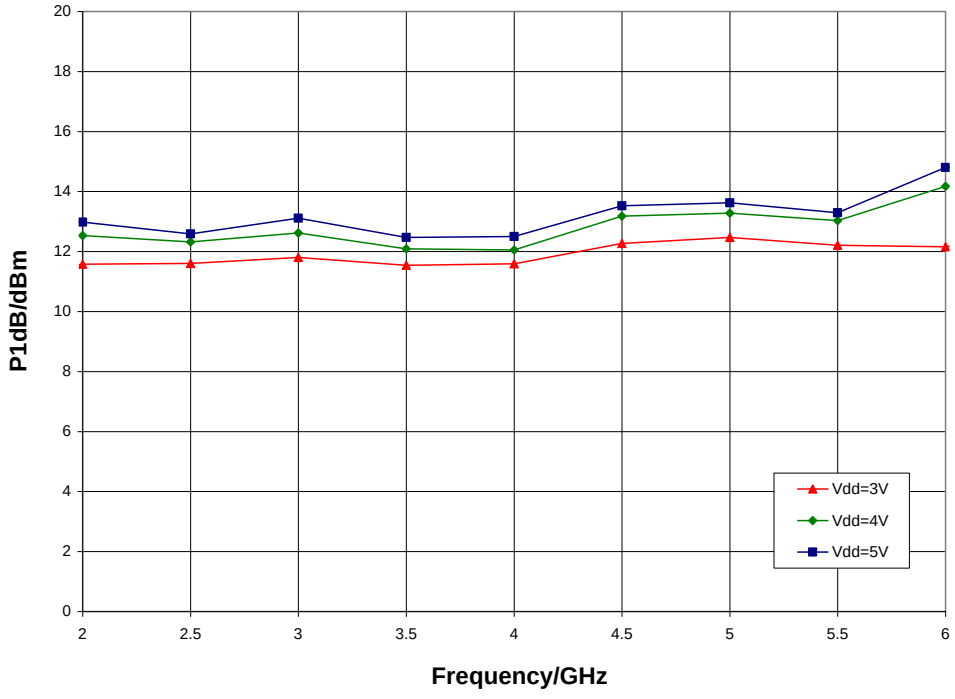


## Typical Performance

**P1dB vs. Temperature, $V_{dd}$ = 4.0 V**

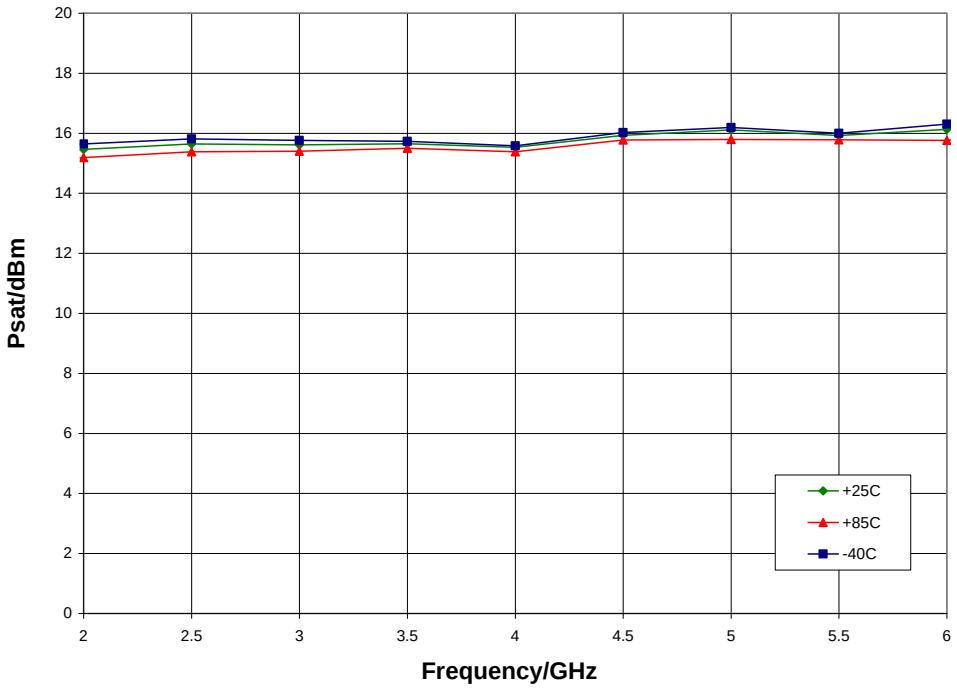



**P1dB vs. $V_{dd}$, $T_A$ = 25° C**

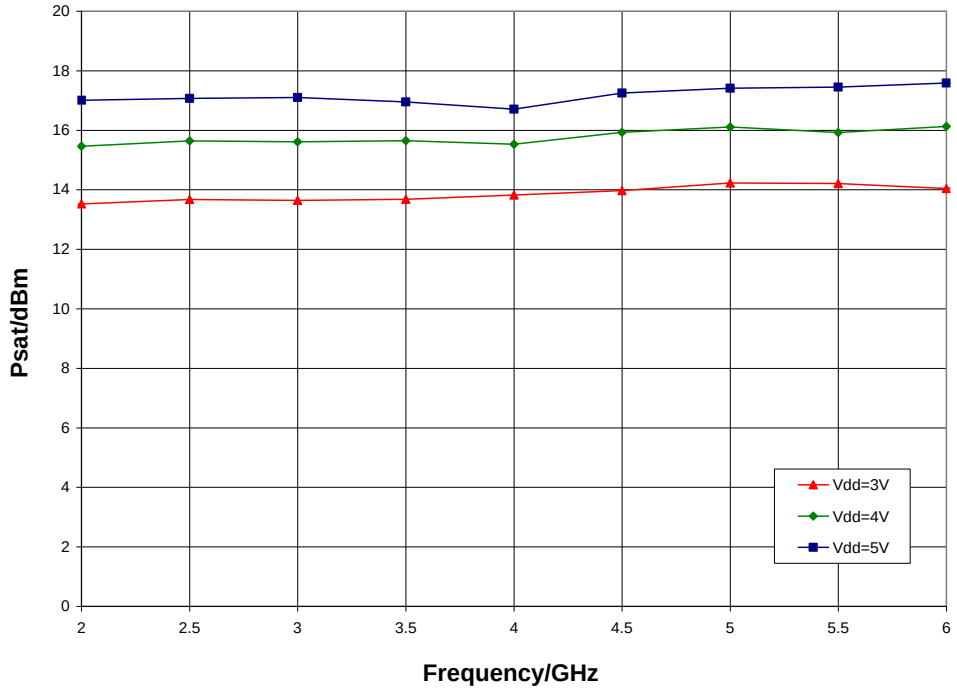


## Typical Performance

**Psat vs. Temperature, $V_{dd}$ = 4.0 V**

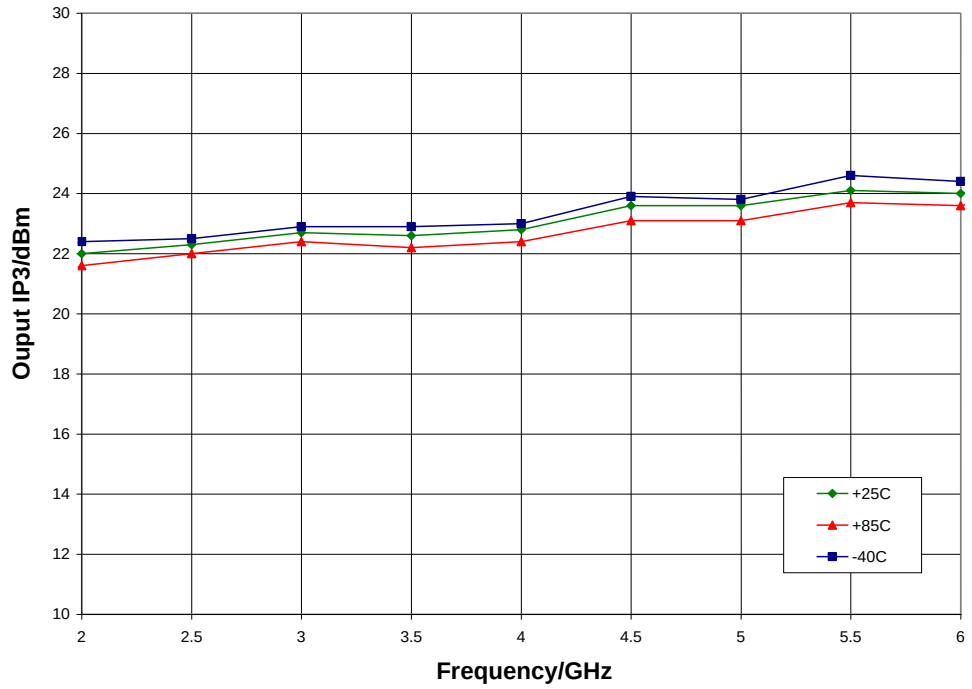



**Psat vs. $V_{dd}$, $T_A$ = 25° C**

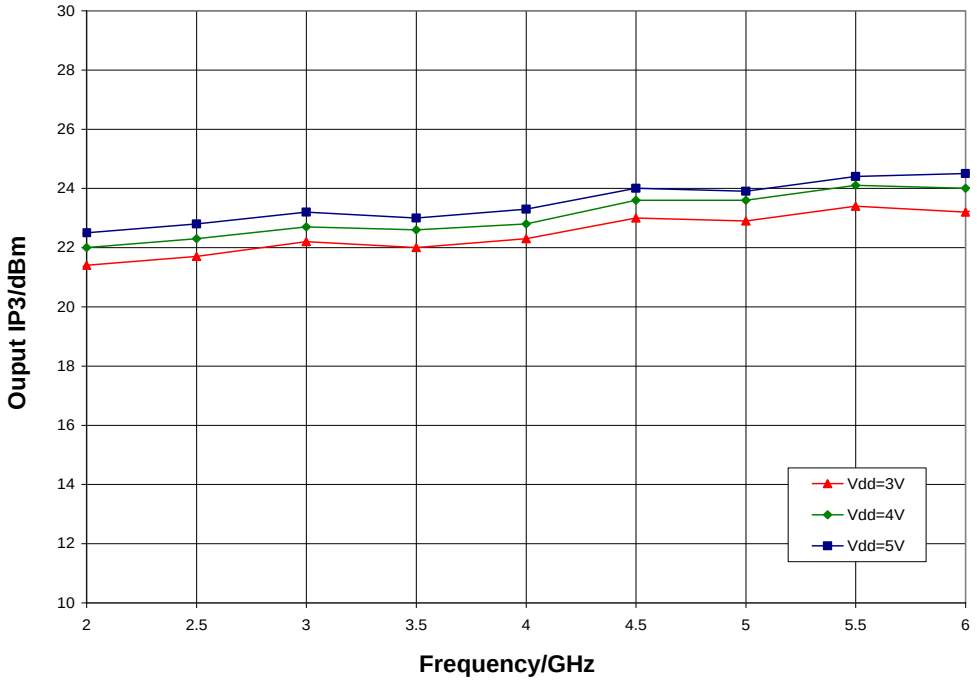


## Typical Performance

**Output IP3 vs. Temperature, $V_{dd}$ = 4.0 V**

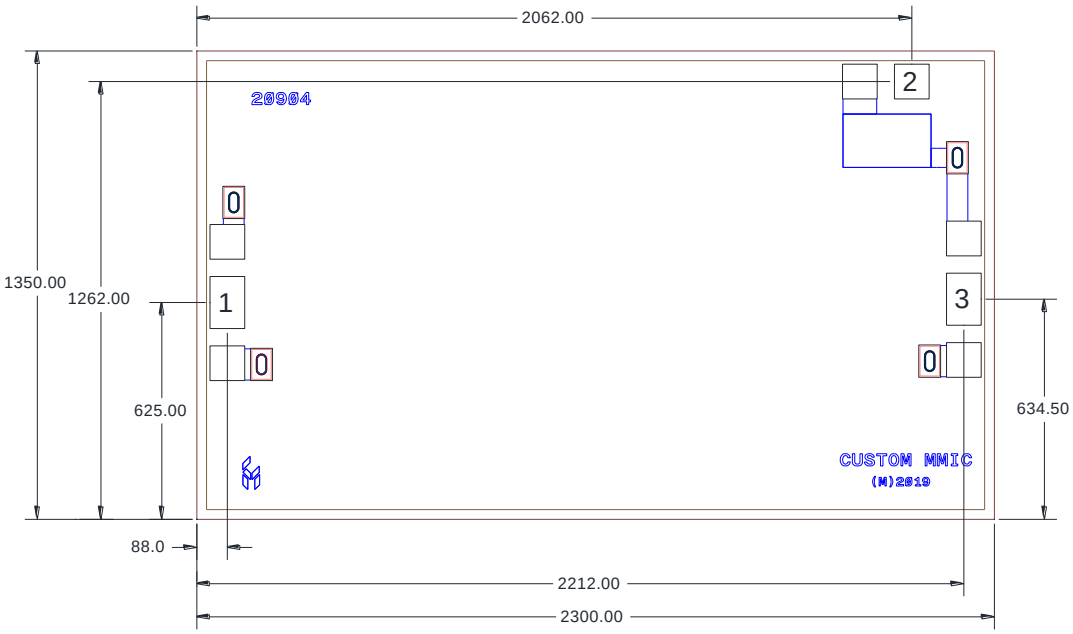



**Output IP3 vs. $V_{dd}$, $T_A$ = 25° C**



## Mechanical Information

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

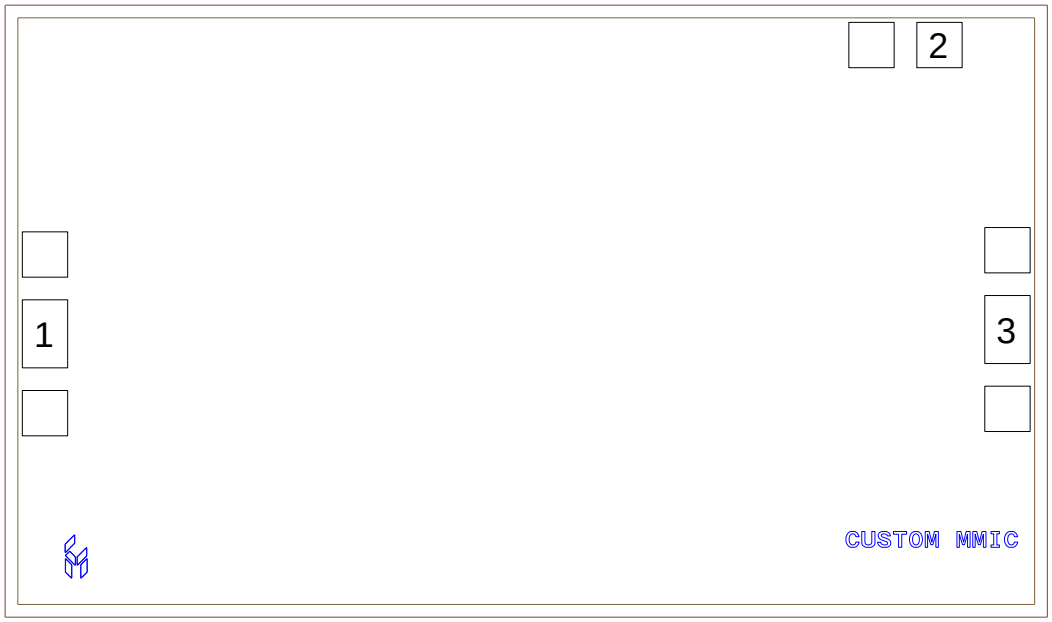



Notes:

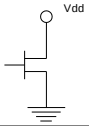
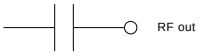
1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 100 microns thick
5. DC bond pad (2) is 100 x 100 microns
6. RF bond pads (1, 3) are 100 x 150 microns

## Pad Description

### Pad Diagram




### Functional Description

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

## Applications Information

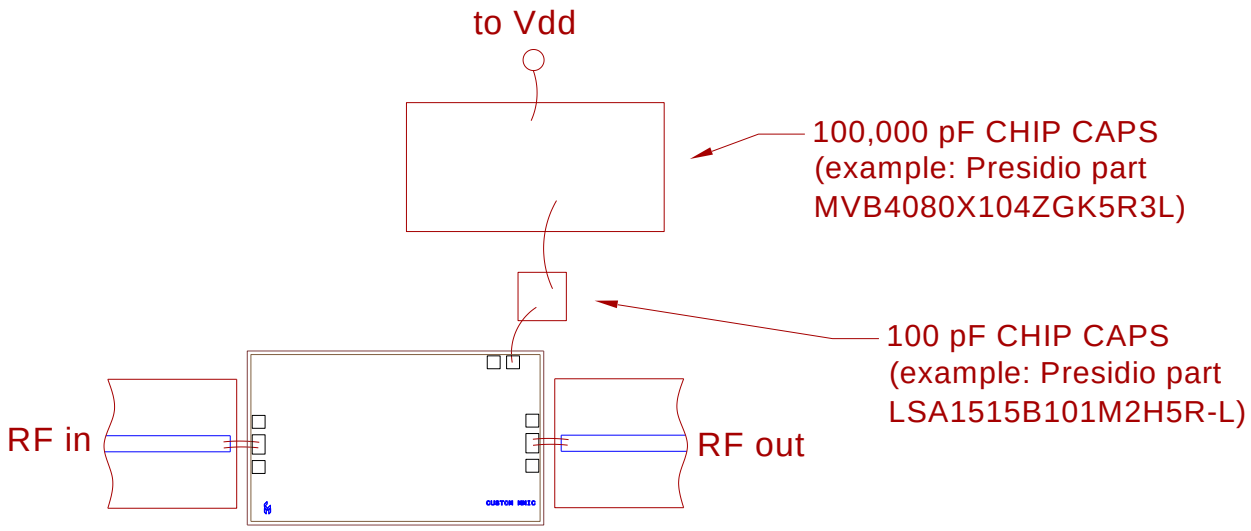
### Assembly Guidelines

The backside of the CMD308 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 100um 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

### Assembly Guidelines

The CMD308 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 +3.0 V and a maximum of +5.0 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.

## 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
- PFOS Free
- Halogen Free


## Contact Information

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

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**Email:** customer.support@qorvo.com

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