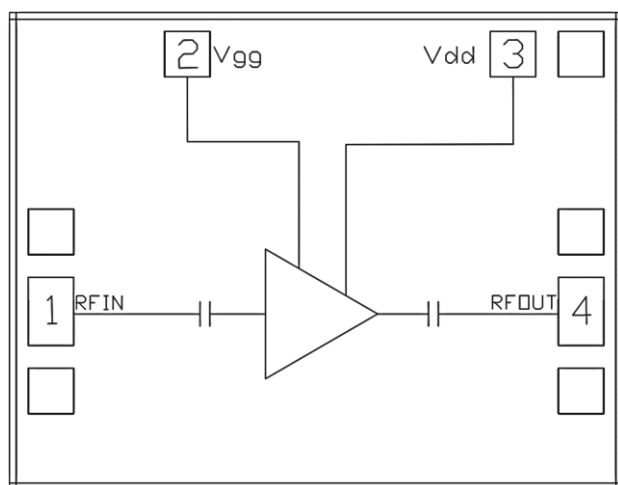


Product Overview

The CMD319 is a broadband MMIC low noise amplifier that is 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 20 dB of gain with a corresponding ultra low noise figure. The CMD319 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching.



Functional Block Diagram



Key Features

- Ultra Low Noise Figure
- High Gain Broadband Performance
- Low Power Dissipation
- Small Die Size: 1350 um x 1050 um

Ordering Information

| Part No. | Description |
|----------|---|
| CMD319 | 8-12 GHz Ultra Low Noise Amplifier, 50 Piece Gel Pack |

Electrical Performance ($V_{dd} = 3\text{ V}$, $V_{gg} = 1.5\text{ V}$, $T_A = 25\text{ }^{\circ}\text{C}$, $F = 10\text{ GHz}$)

| Parameter | Min | Typ | Max | Units |
|--------------------|-----|--------|-----|-------|
| Frequency Range | | 8 - 12 | | GHz |
| Gain | | 20 | | dB |
| Noise Figure | | 0.98 | | dB |
| Input Return Loss | | 19 | | dB |
| Output Return Loss | | 16 | | dB |
| Output P1dB | | 16 | | dBm |
| Supply Current | | 30 | | 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, T_{ch} | 150 °C |
| Power Dissipation, P_{diss} | 921 mW |
| Thermal Resistance, θ_{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

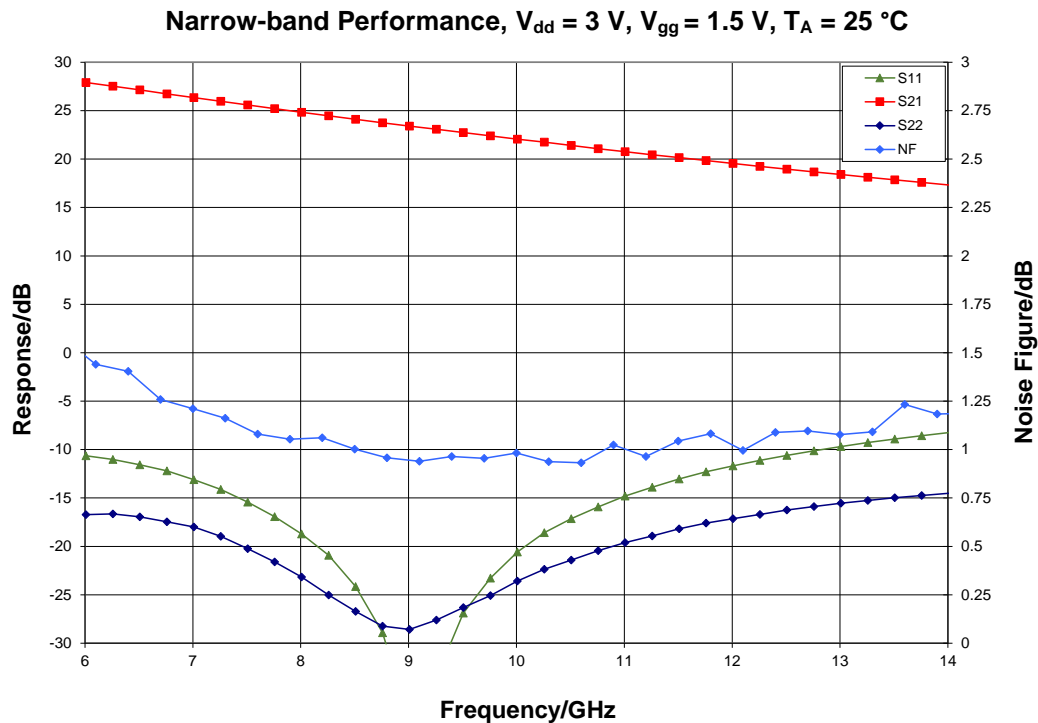
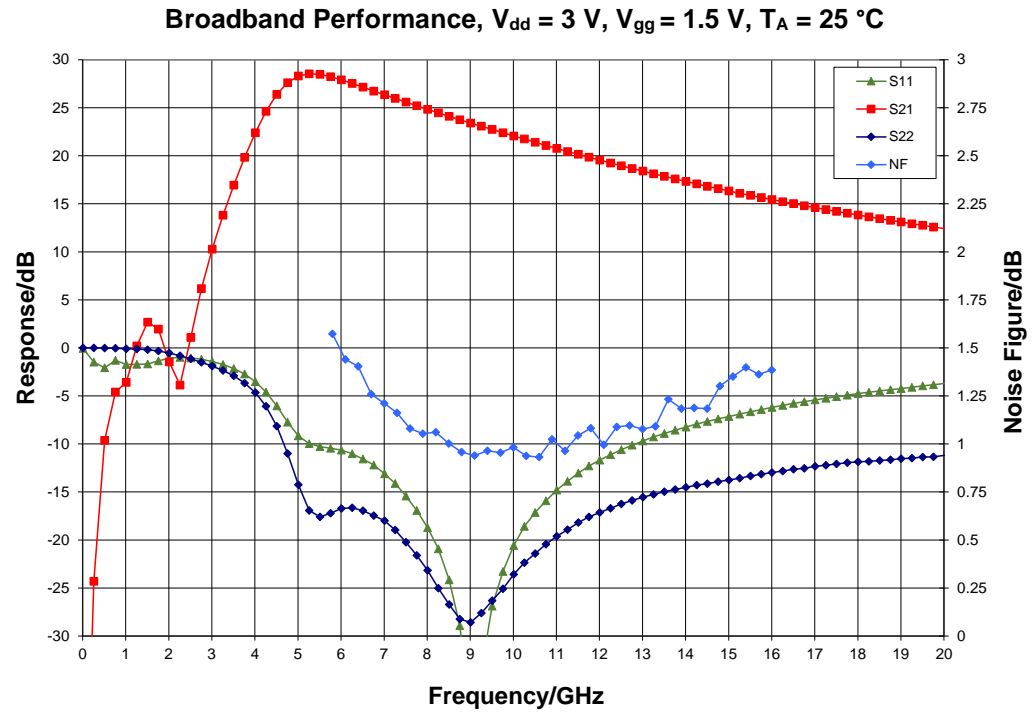
| Parameter | Min | Typ | Max | Units |
|-----------|-----|-----|-----|-------|
| V_{dd} | 2 | 3 | 5 | V |
| V_{gg} | 0 | 1.5 | 3 | V |
| I_{dd} | | 30 | | mA |
| I_{gg} | | 2 | | mA |

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)

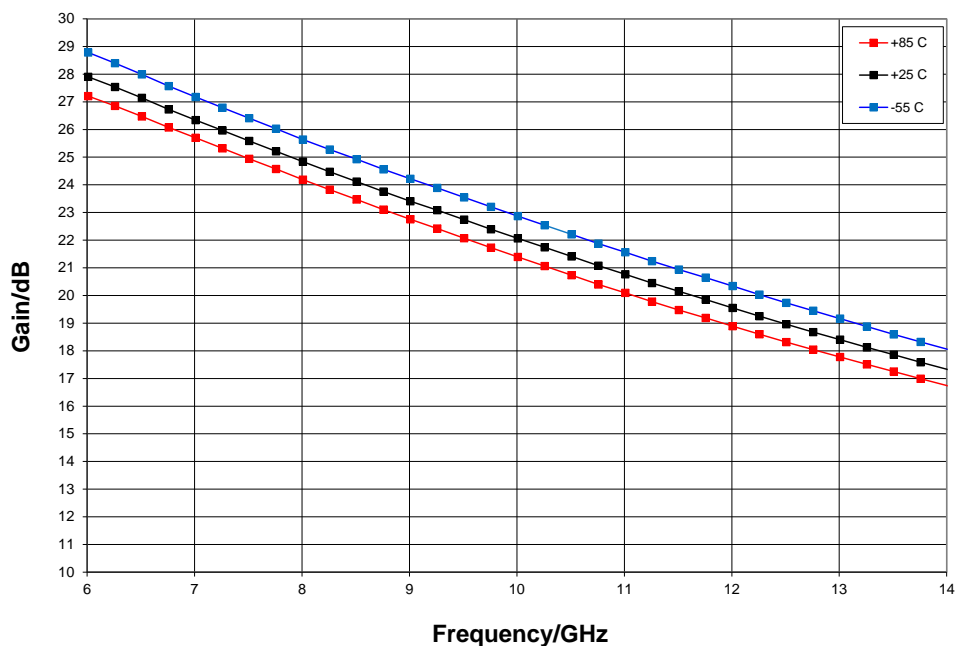
| Parameter | Min | Typ | Max | Min | Typ | Max | Units |
|--------------------------------------|-----|--------|-----|---------|--------|-----|-------|
| Frequency Range | | 8 - 10 | | 10 - 12 | | | GHz |
| Gain | 19 | 22 | | 16 | 19 | | dB |
| Noise Figure | | 0.95 | 1.2 | | 1.05 | 1.4 | dB |
| Input Return Loss | | 19 | | | 15 | | dB |
| Output Return Loss | | 17 | | | 12 | | dB |
| Output P1dB | | 16 | | | 16 | | dBm |
| Output IP3 | | 25 | | | 26 | | dBm |
| Supply Current | 20 | 30 | 40 | 20 | 30 | 40 | mA |
| Gain Temperature Coefficient | | 0.013 | | | 0.013 | | dB/°C |
| Noise Figure Temperature Coefficient | | 0.0066 | | | 0.0066 | | dB/°C |

Typical Performance

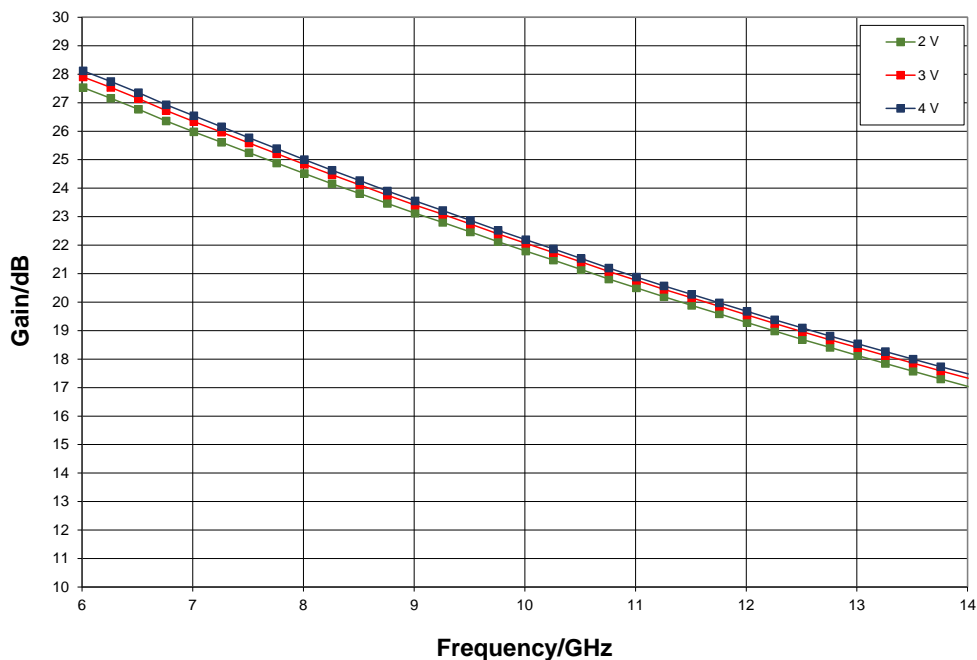


Typical Performance

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

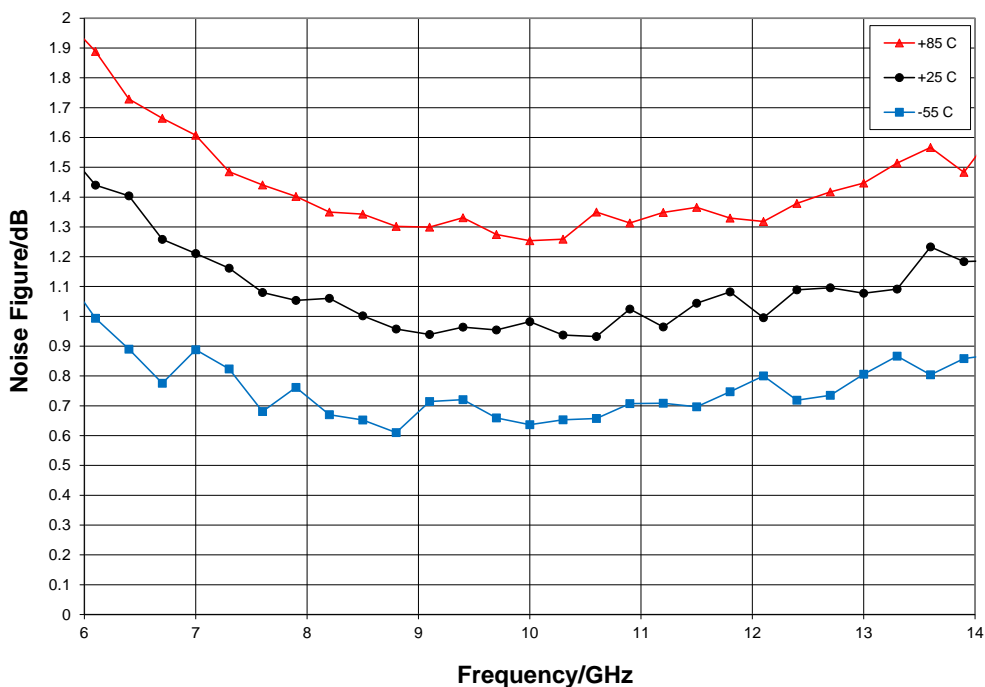


Gain vs. V_{dd} , $V_{gg} = 1.5\text{ V}$, $T_A = 25\text{ °C}$

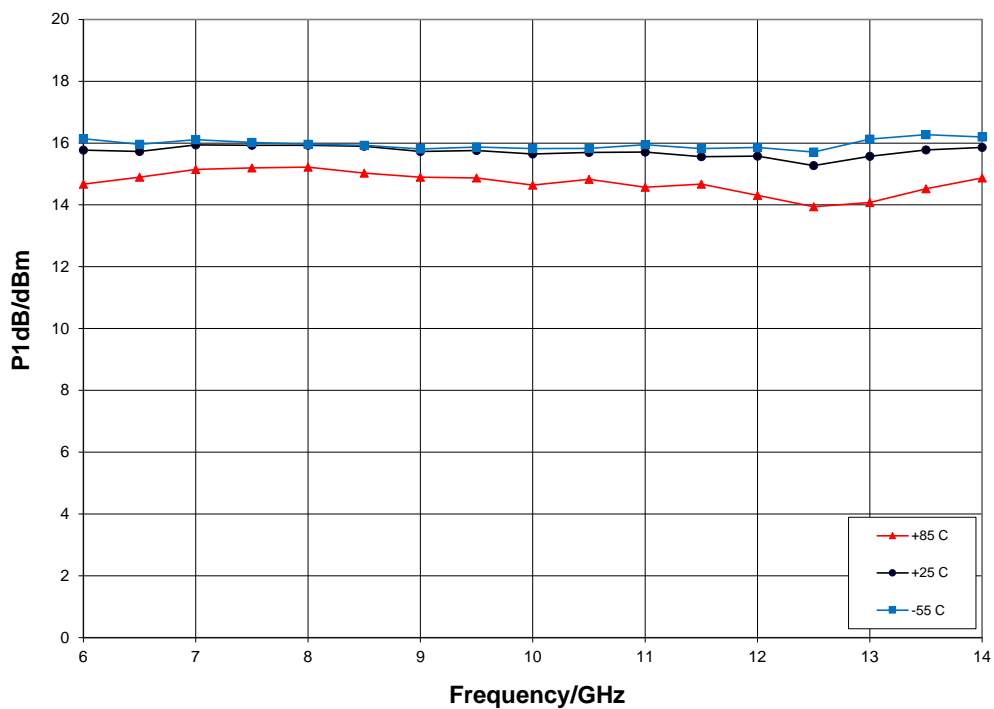


Typical Performance

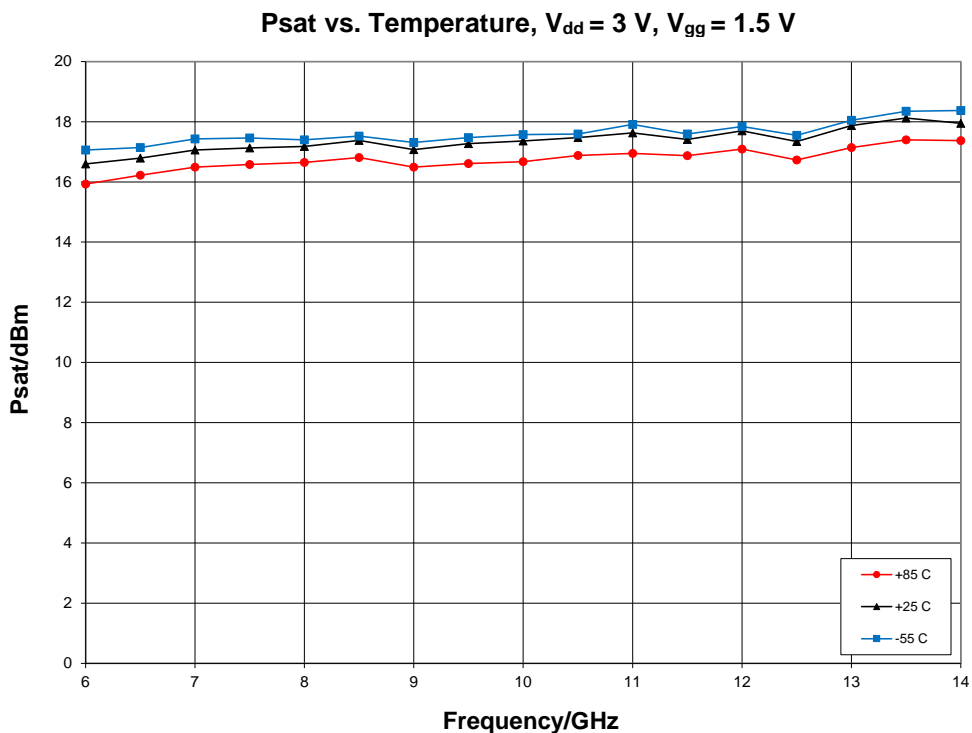
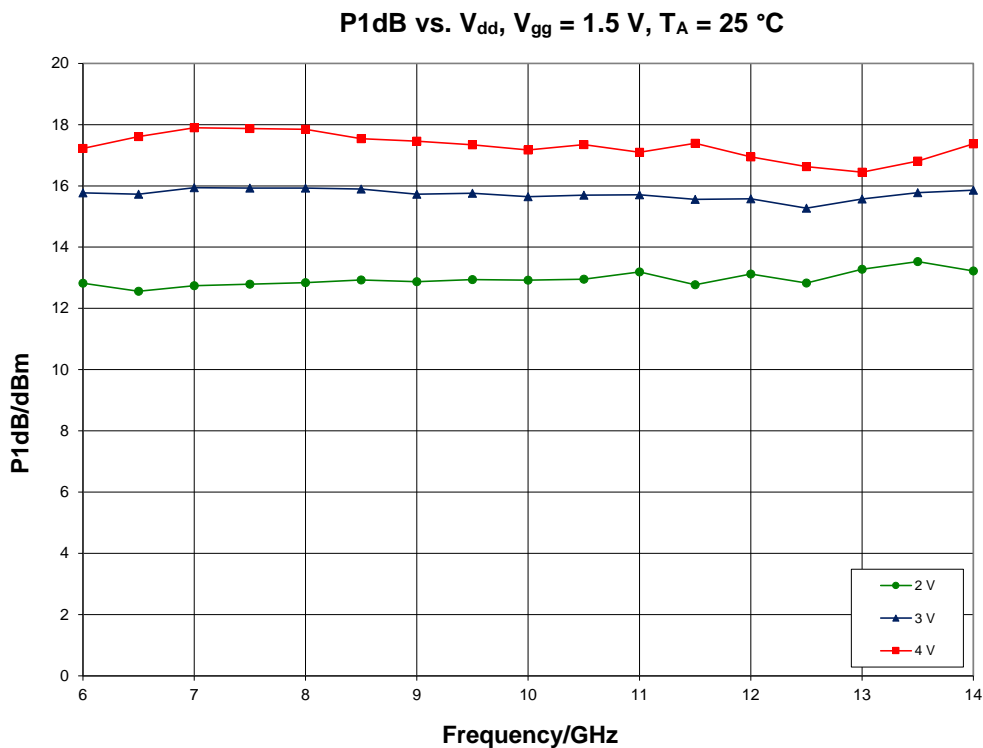
Noise Figure vs. Temperature, $V_{dd} = 3\text{ V}$, $V_{gg} = 1.5\text{ V}$



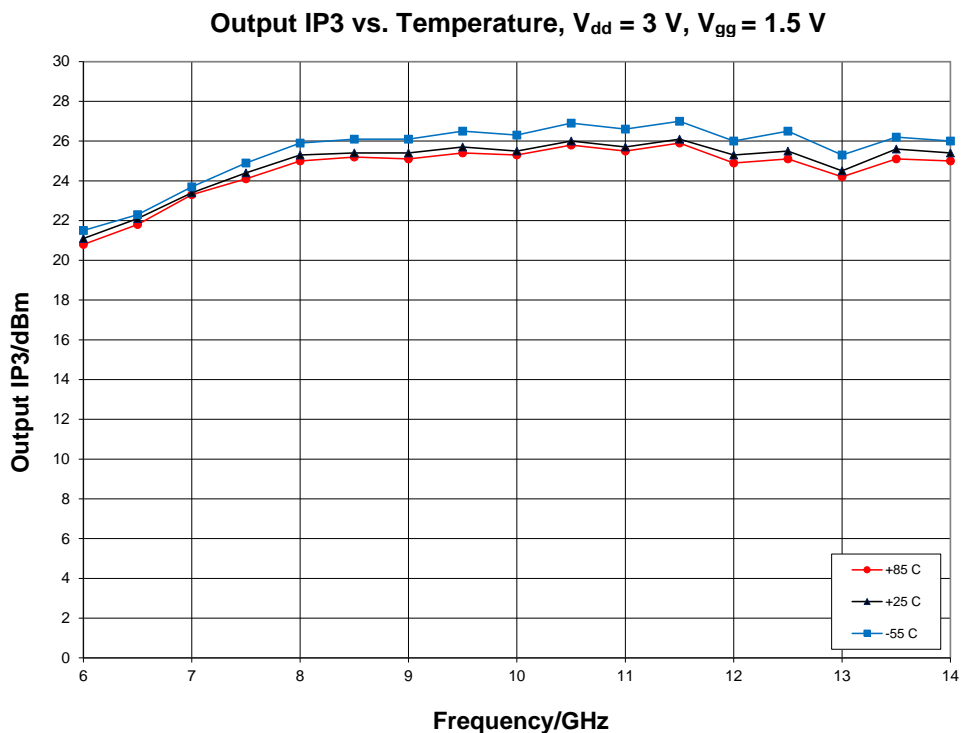
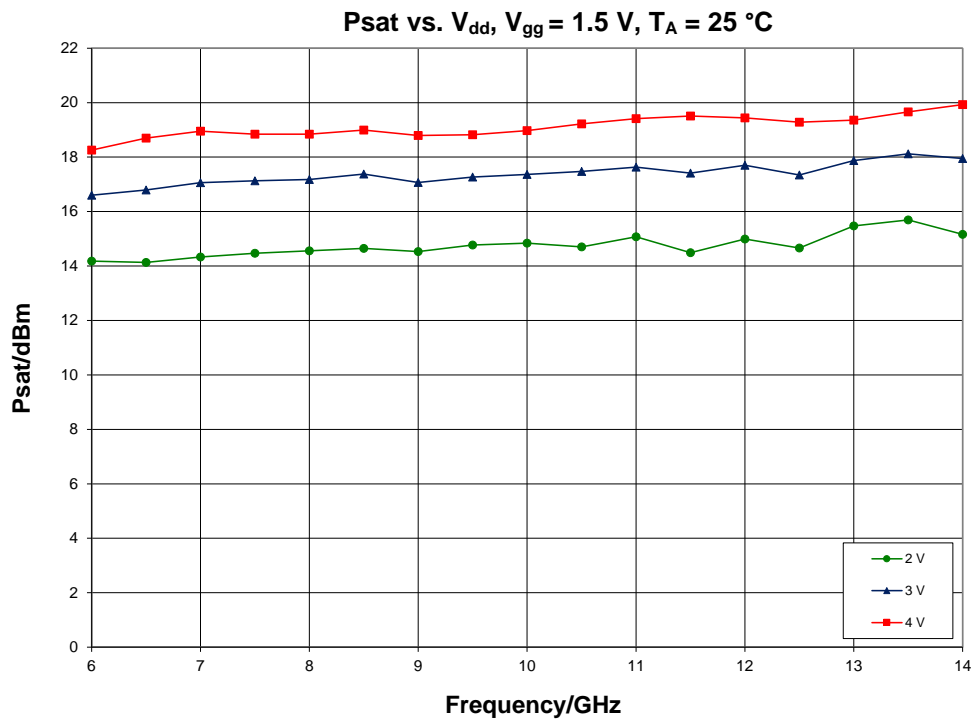
P1dB vs. Temperature, $V_{dd} = 3\text{ V}$, $V_{gg} = 1.5\text{ V}$



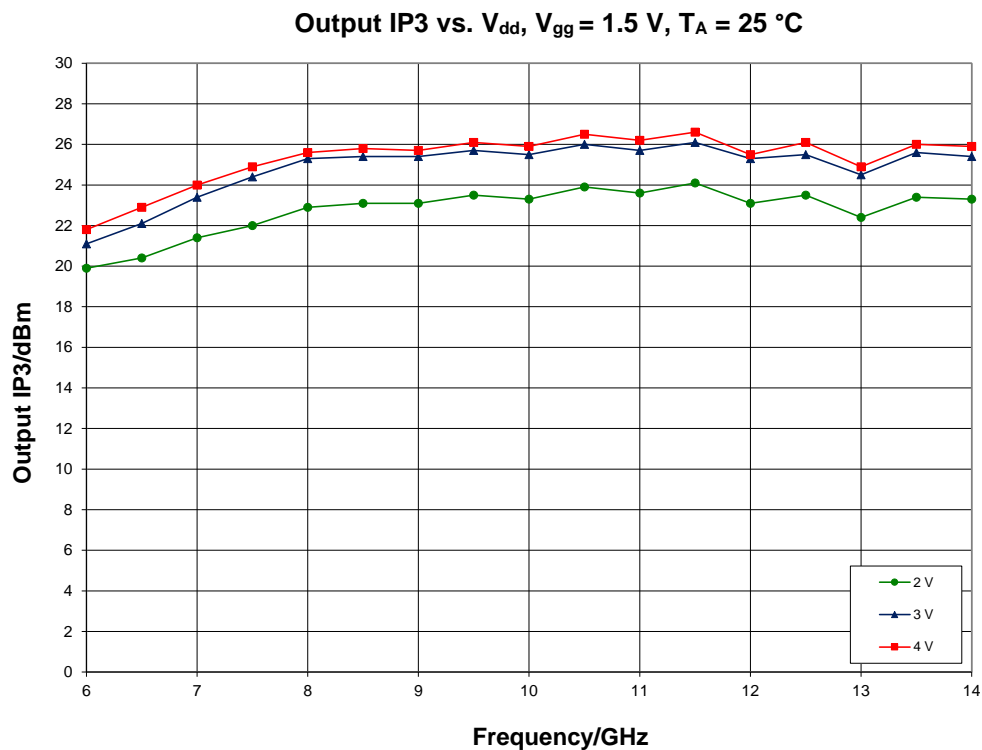
Typical Performance



Typical Performance

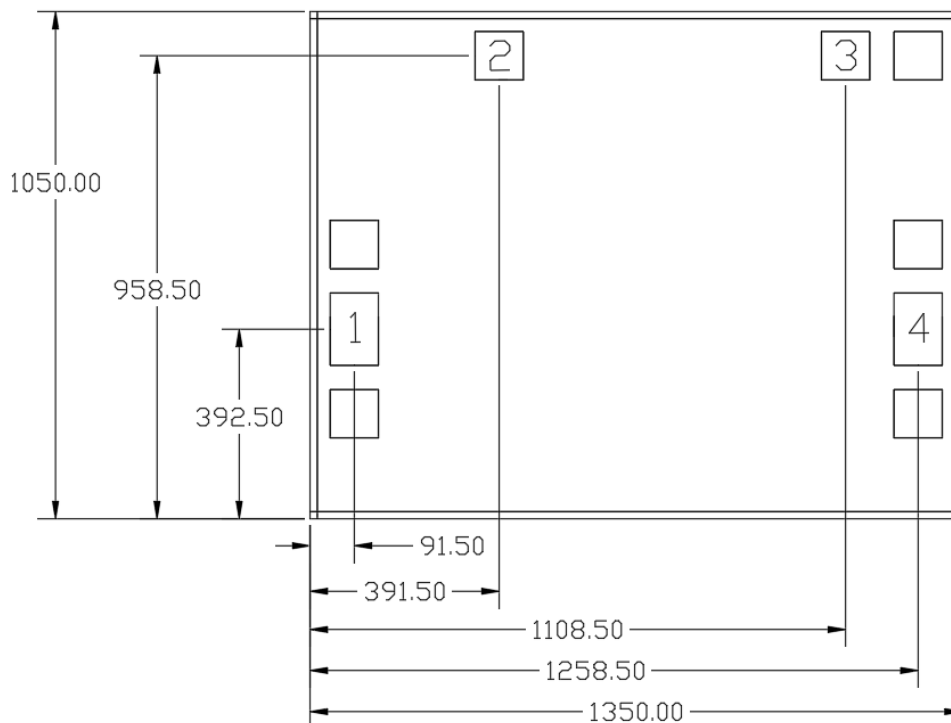


Typical Performance



Mechanical Information

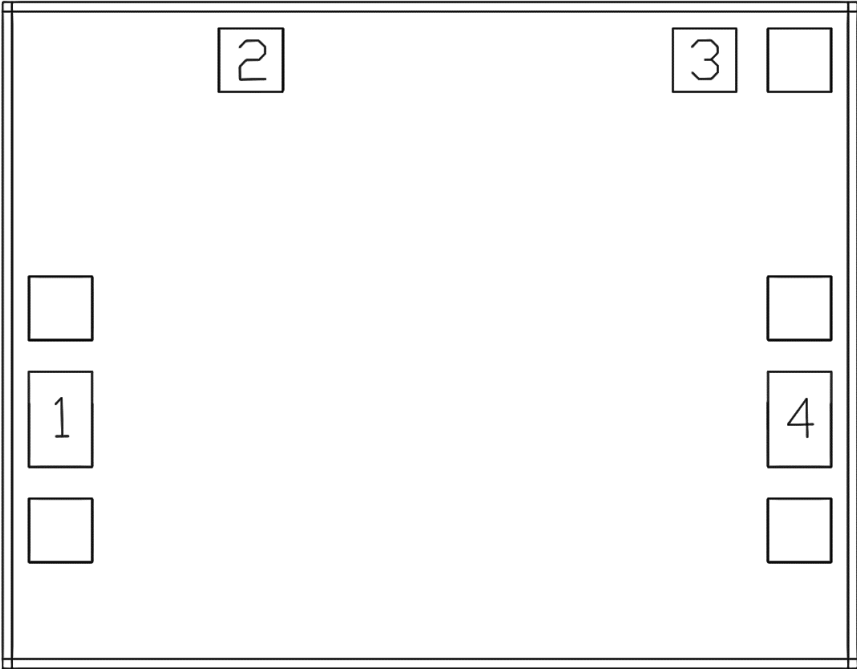
Package Information and Dimensions



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) are 100 x 100 microns
6. RF bond pads (1, 4) are 100 x 150 microns

Pin Description

Pin Diagram



Functional Description

| Pin | Function | Description | Schematic |
|----------|-----------------|---|-----------|
| 1 | RF in | DC blocked and 50 ohm matched | |
| 2 | V _{gg} | Power supply voltage Decoupling and bypass caps required | |
| 3 | V _{dd} | 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

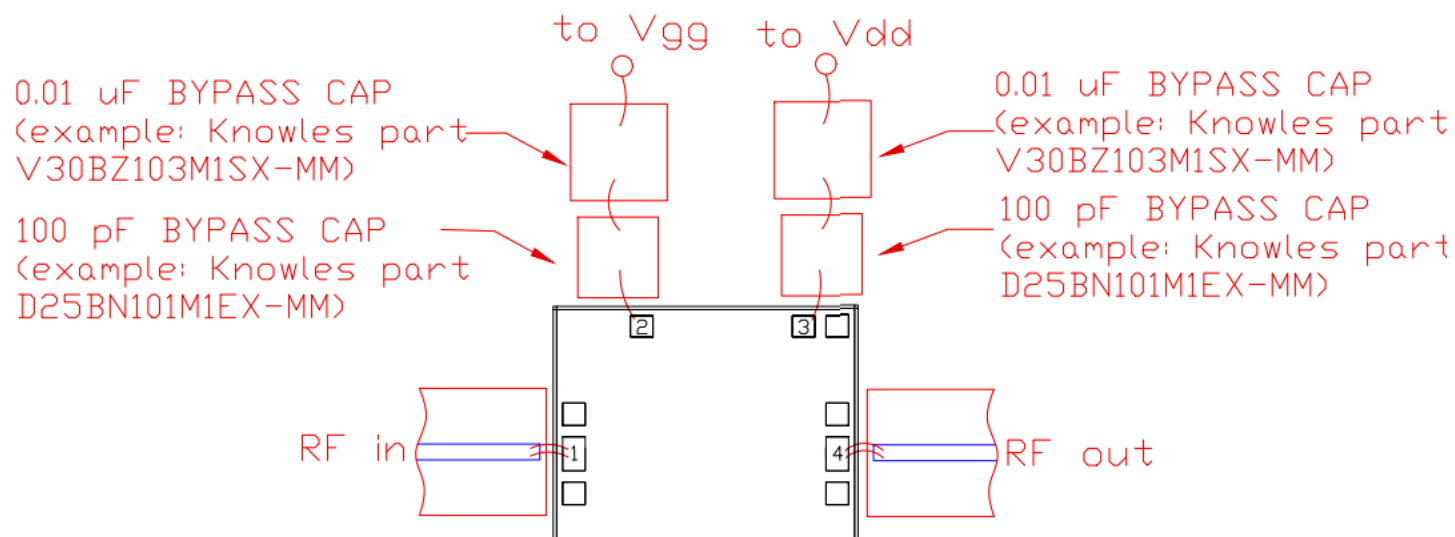
Assembly Guidelines

The backside of the CMD319 is RF ground. Die attach with electrically and thermally conductive epoxy is recommended although eutectic attach is also possible. 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.

Application Information

Biasing and Operation

The CMD319 is biased with a 3 V positive drain supply and a 1.5 V positive gate supply.

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}

Refer to Application Note 103: Amplifier Biasing Techniques for instructions on how to implement a single supply biasing scheme.

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 (C₁₅H₁₂Br₄O₂) Free
- SVHC Free
- PFOS Free
- Halogen Free

Contact Information

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

Web: www.qorvo.com

Tel: 1-844-890-8163

Email: customer.support@qorvo.com

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