

Product Overview

The CMD184 is a 4.5 W wideband GaN MMIC power amplifier die which operates from 0.5 to 20 GHz. The amplifier delivers greater than 13 dB of gain with a corresponding output 1 dB compression point of +34.5 dBm and a saturated output power of +36.5 dBm. The CMD184 is a 50 ohm matched design which eliminates the need for RF port matching. The CMD184 offers full passivation for increased reliability and moisture protection.

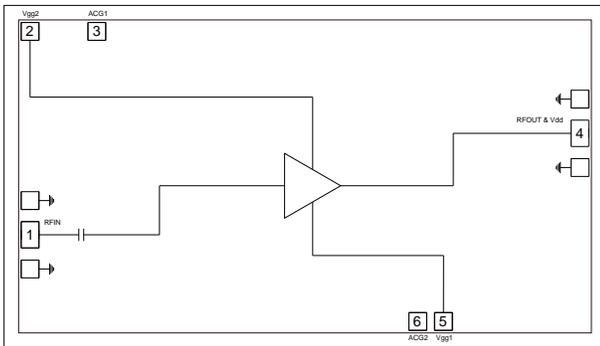
Key Features

- Ultra Wideband Performance
- High Output Power
- High Gain
- High Linearity

Ordering Information

| Part No. | Description |
|----------|---|
| CMD184 | 0.5-20 GHz GaN Power Amplifier, 10 Piece Gel Pack |

Functional Block Diagram



Electrical Performance ($V_{dd} = 28\text{ V}$, $V_{gg1} = -2.8\text{ V}$, $V_{gg2} = 10\text{ V}$, $T_A = 25\text{ }^\circ\text{C}$, $F = 10\text{ GHz}$)

| Parameter | Min | Typ | Max | Units |
|--------------------|-----|----------|-----|-------|
| Frequency Range | | 0.5 - 20 | | GHz |
| Gain | | 13 | | dB |
| Input Return Loss | | 19 | | dB |
| Output Return Loss | | 25 | | dB |
| P1dB | | 34.5 | | dBm |
| Psat | | 36.5 | | dBm |
| Supply Current | | 700 | | mA |

Absolute Maximum Ratings

| Parameter | Rating |
|-----------------------------------|------------------------------|
| Drain Voltage, V_{dd} | 40 V |
| Gate Voltage, V_{gg1} | -10 V |
| Gate Voltage, V_{gg2} | 1/3 V_{dd} to 2/3 V_{dd} |
| RF Input Power | +30 dBm |
| Channel Temperature, T_{ch} | 200 °C |
| Power Dissipation, P_{diss} | 72 W |
| Thermal Resistance, θ_{JC} | 1.25 °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} | | 28 | | V |
| I_{dd} | | 700 | | mA |
| V_{gg1} | | -2.8 | | V |
| V_{gg2} | | 10 | | V |

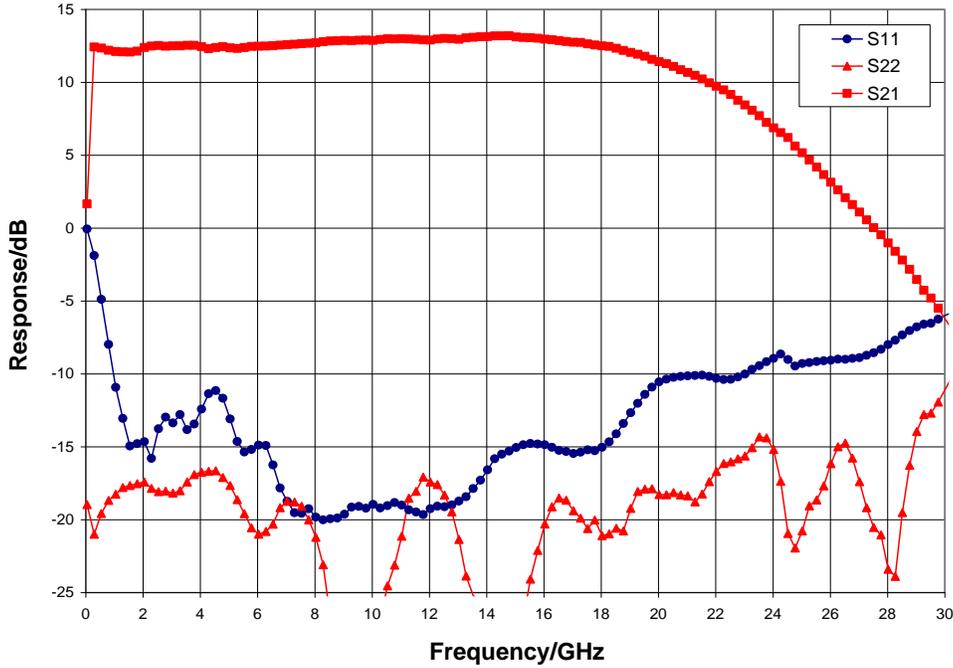
Electrical performance is measured at specific test conditions. Electrical specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications ($V_{dd} = 28$ V, $V_{gg1} = -2.8$ V, $V_{gg2} = 10$ V, $T_A = 25$ °C)

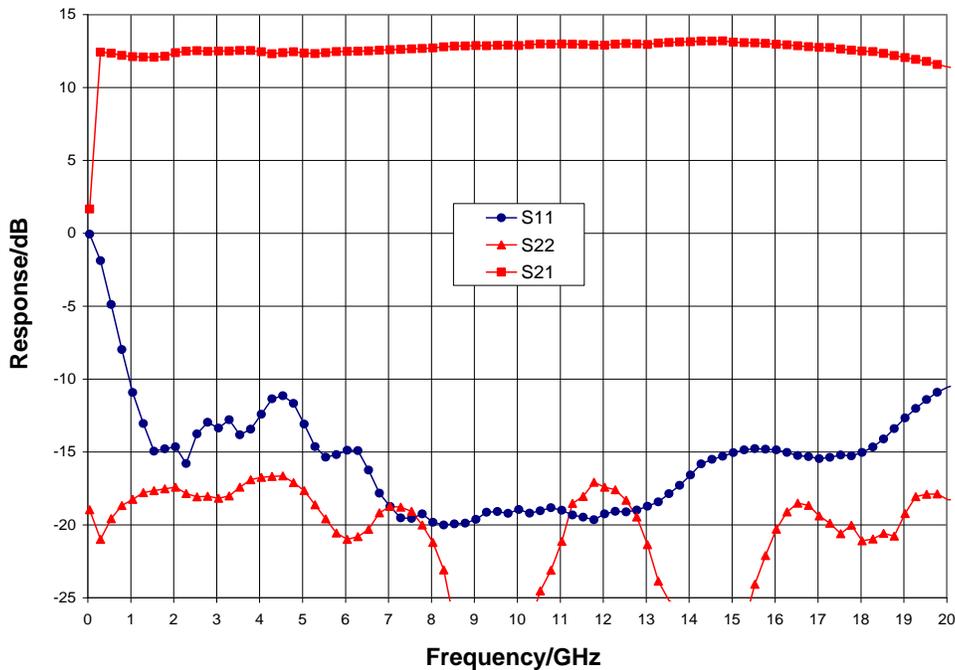
| Parameter | Min | Typ | Max | Min | Typ | Max | Units |
|------------------------------|-----|----------|-----|-----|---------|-----|-------|
| Frequency Range | | 0.5 - 12 | | | 12 - 20 | | GHz |
| Gain | 10 | 12.5 | | 9.5 | 13 | | dB |
| Input Return Loss | | 15 | | | 15 | | dB |
| Output Return Loss | | 18 | | | 20 | | dB |
| Output P1dB | 32 | 34.5 | | 29 | 32.5 | | dBm |
| Output IP3 | | 42 | | | 41 | | dBm |
| Supply Current | 500 | 700 | 750 | 500 | 700 | 750 | mA |
| Gain Temperature Coefficient | | 0.012 | | | 0.02 | | dB/°C |

Typical Performance

Broadband Performance, $V_{dd} = 28\text{ V}$, $V_{gg1} = -2.8\text{ V}$, $V_{gg2} = 10\text{ V}$, $I_{dd} = 700\text{ mA}$, $T_A = 25\text{ }^\circ\text{C}$

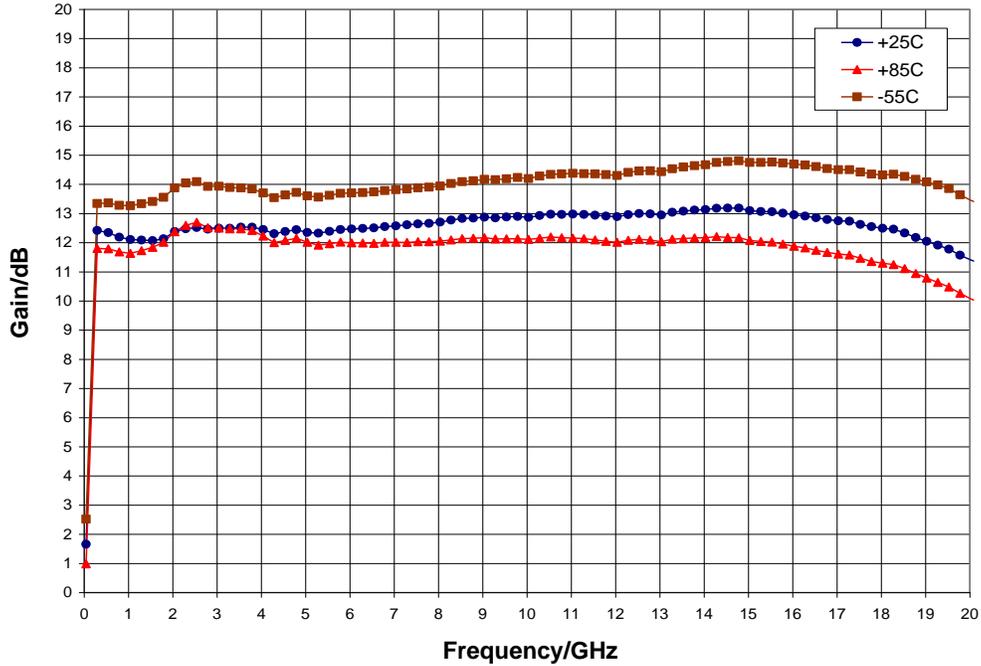


Narrow-band Performance, $V_{dd} = 28\text{ V}$, $V_{gg1} = -2.8\text{ V}$, $V_{gg2} = 10\text{ V}$, $I_{dd} = 700\text{ mA}$, $T_A = 25\text{ }^\circ\text{C}$

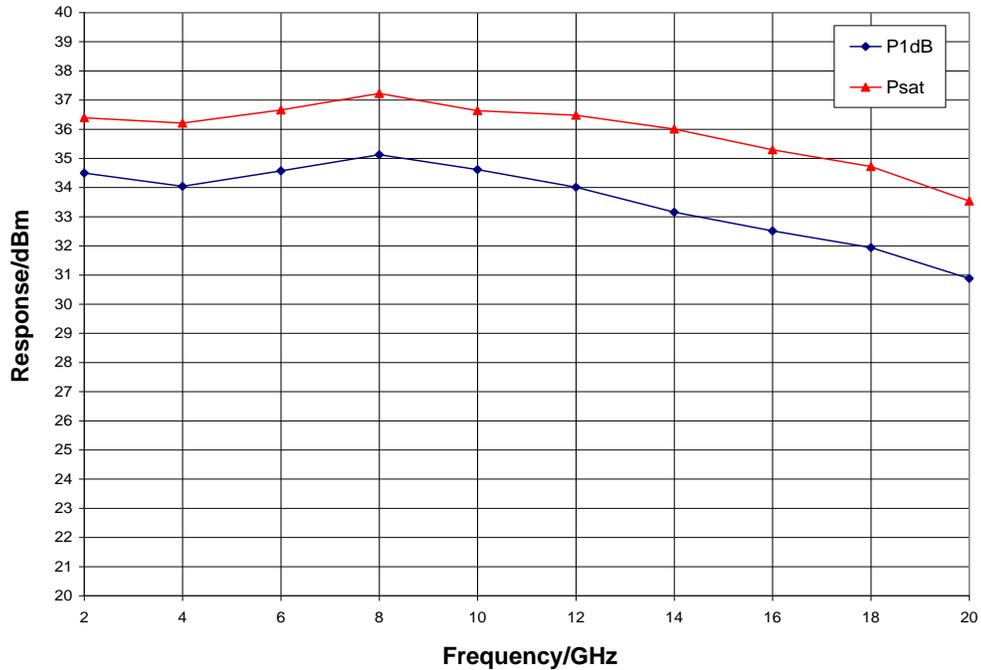


Typical Performance

Gain vs. Temperature, $V_{dd} = 28\text{ V}$, $V_{gg1} = -2.8\text{ V}$, $V_{gg2} = 10\text{ V}$

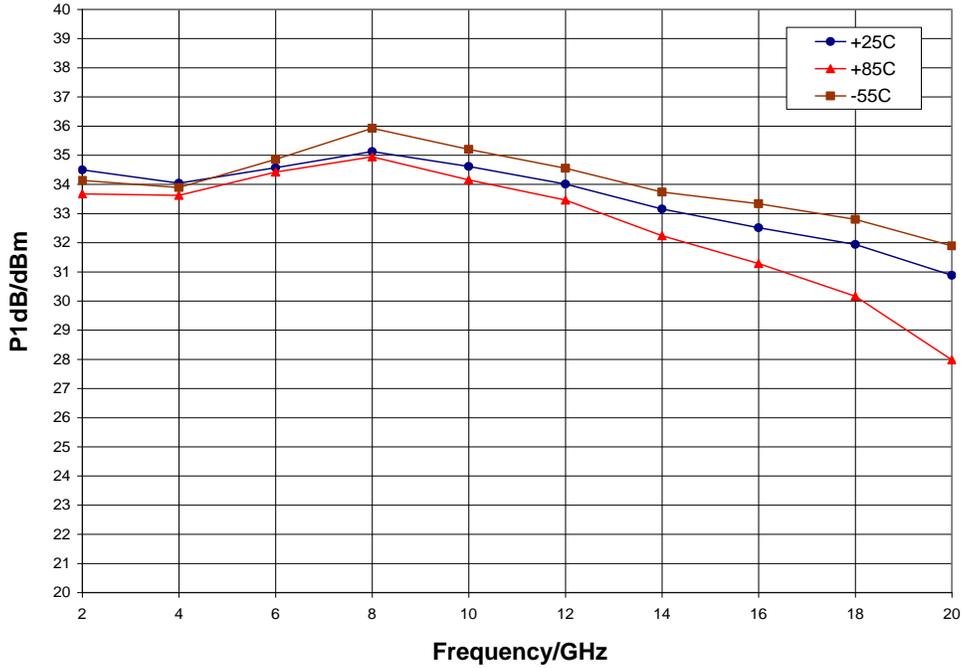


Output Power, $V_{dd} = 28\text{ V}$, $V_{gg1} = -2.8\text{ V}$, $V_{gg2} = 10\text{ V}$, $T_A = 25\text{ °C}$

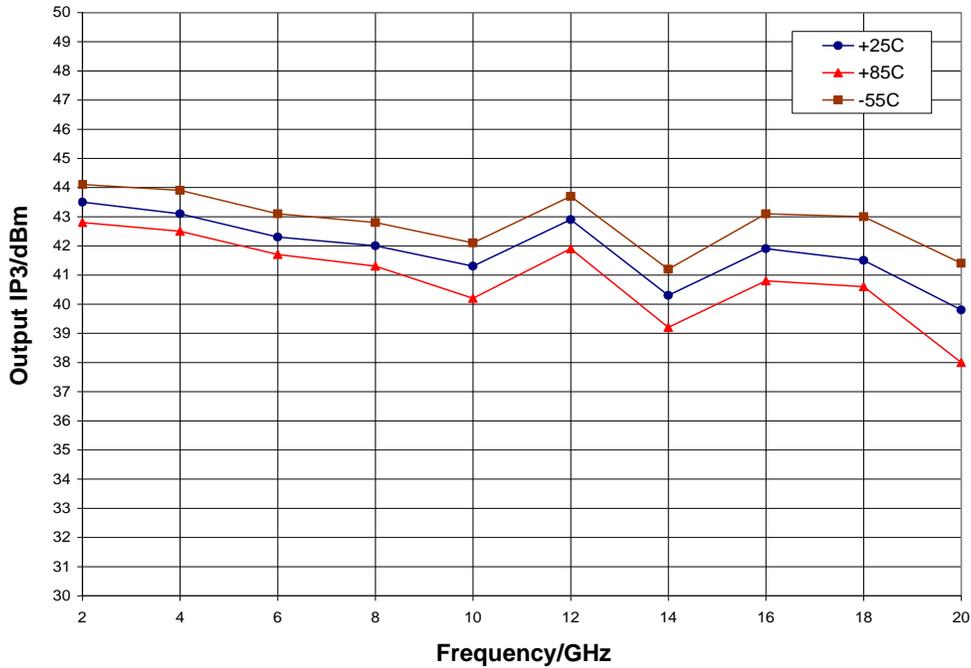


Typical Performance

P1dB vs. Temperature, $V_{dd} = 28\text{ V}$, $V_{gg1} = -2.8\text{ V}$, $V_{gg2} = 10\text{ V}$

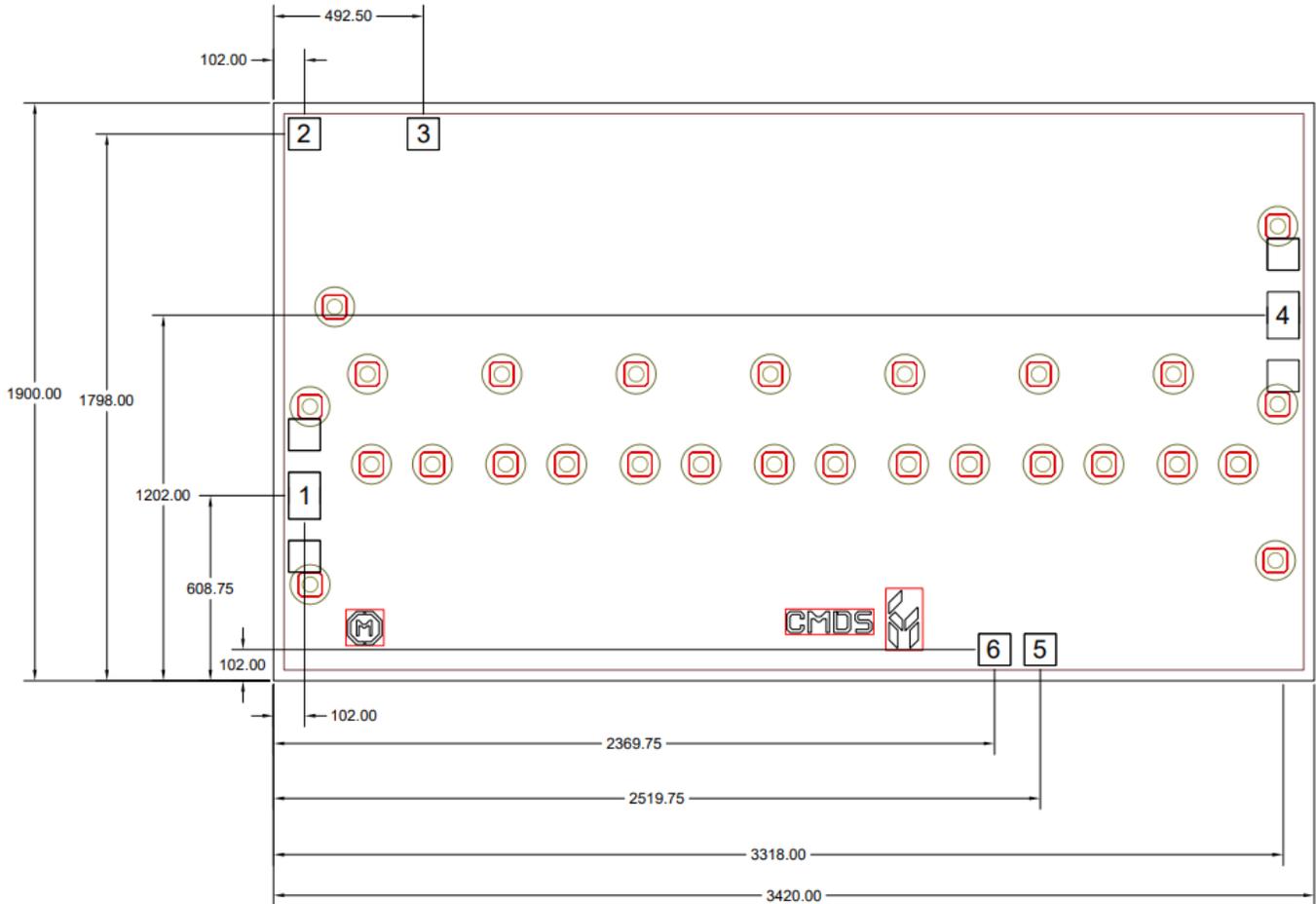


Output IP3, $V_{dd} = 28\text{ V}$, $V_{gg1} = -2.8\text{ V}$, $V_{gg2} = 10\text{ V}$, $I_{dd} = 700\text{ mA}$, $T_A = 25\text{ °C}$



Mechanical Information

Die Outline (all dimensions in microns)

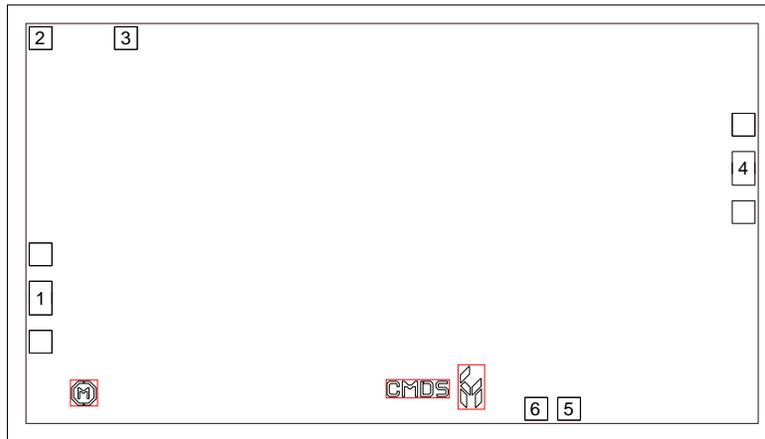


Notes:

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 pads (2, 3, 5, 6) are 100 x 100 microns
6. RF bond pads (1, 4) are 100 x 150 microns

Pad Description

Pad Diagram



Functional Description

| Pad | Function | Description | Schematic |
|----------|--------------------------|--|-----------|
| 1 | RF in | 50 ohm matched input | |
| 2 | V _{gg2} | Power supply voltage Decoupling and bypass caps required | |
| 3 | ACG1 | Low frequency termination Attach bypass capacitor per application circuit | |
| 4 | RF out & V _{dd} | Power supply voltage and 50 ohm matched output | |
| 6 | ACG2 | Low frequency termination Attach bypass capacitor per application circuit | |
| 5 | V _{gg1} | Power supply voltage Decoupling and bypass caps required | |
| Backside | Ground | Connect to RF / DC ground | |

Applications Information

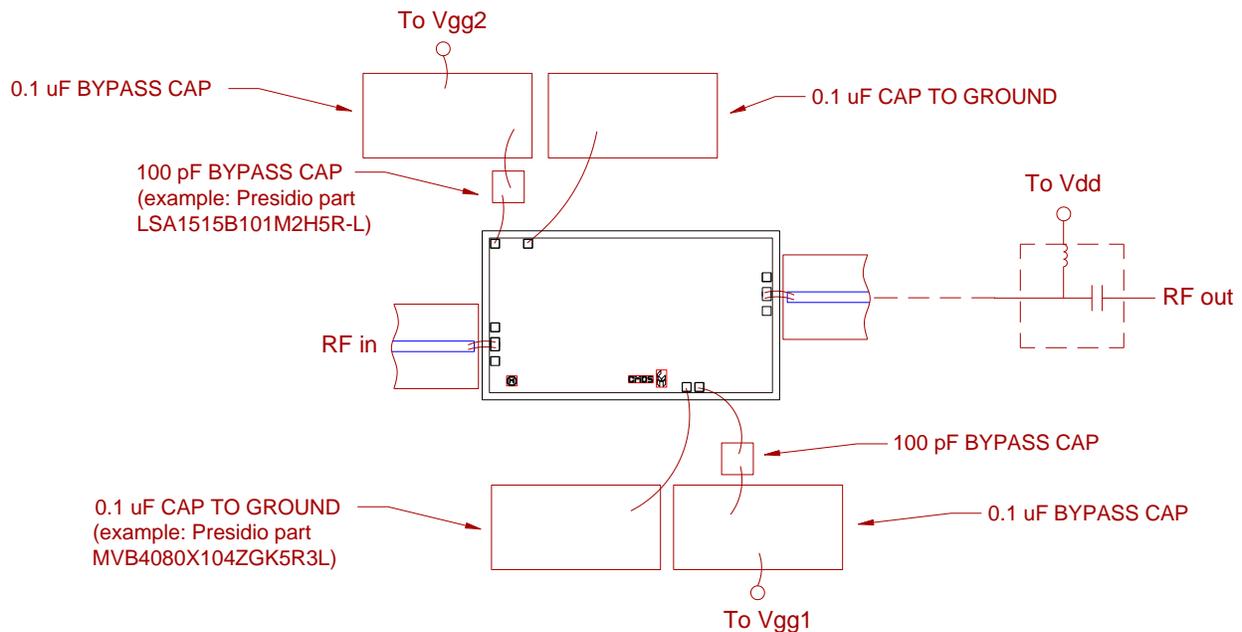
Assembly Guidelines

The backside of the CMD184 is RF ground. Eutectic die attach is 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 μm 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.

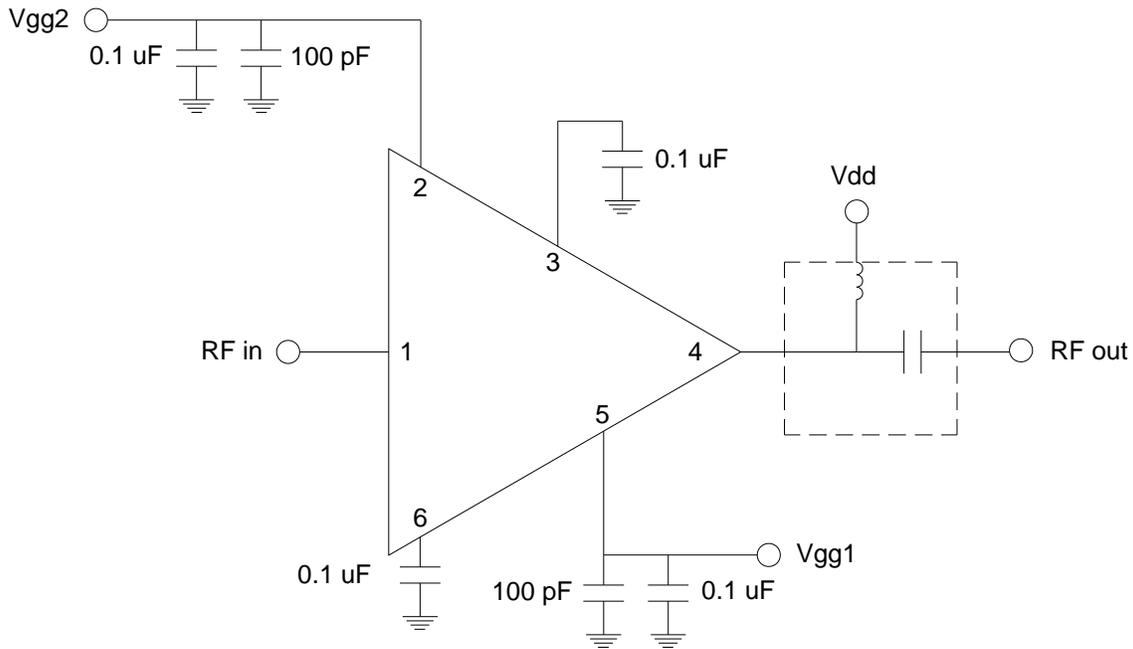
Assembly Diagram



GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.

Applications Information

Application Circuit



Note: Drain voltage (V_{dd}) must be applied through a broadband bias tee or external bias network.

Biasing and Operation

The CMD184 is biased with a positive drain supply, positive gate supply and negative gate supply.

Turn ON procedure:

1. Apply gate voltage V_{gg1} and set to a voltage sufficient to pinch off drain current (~ -8 V)
2. Apply drain voltage V_{dd} and set to +28 V
3. Apply gate voltage V_{gg2} and set to +10 V
4. Increase V_{gg1} (less negative) to achieve a drain current of 700 mA

Turn OFF procedure:

1. Turn off gate voltage V_{gg2}
2. Turn off drain voltage V_{dd}
3. Turn off gate voltage V_{gg1}

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
- Halogen Free
- PFOS Free

Contact Information

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

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