# THE DATASHEET OF

CMD204

# CMD204

## DC-20 GHz SPST Non-reflective Switch

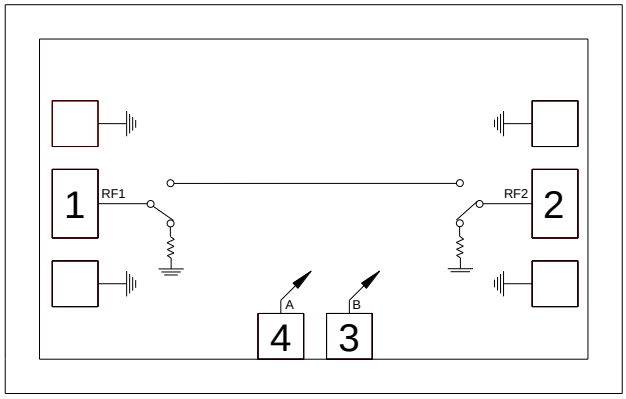
## Product Overview

The CMD204 die is a general purpose broadband high isolation non-reflective MMIC SPST switch. Covering DC to 20 GHz, the CMD204 features a low insertion loss of 1.0 dB and high isolation of 50 dB at 10 GHz. The switch operates using complementary control voltage logic lines of 0/-5 V and requires no bias supply. The CMD204 offers full passivation for increased reliability and moisture protection.

## Key Features

- Low Loss Broadband Performance
- High Isolation
- Fast Switching Speed
- Non-Reflective Design - RF1 and RF2
- Small Die Size: 1350 um x 850 um

## Functional Block Diagram




## Ordering Information

| Part No. | Description |
|---|---|
| CMD204 | DC-20 GHz SPST Non-reflective Switch, 100 Piece WP Sample |

## Electrical Performance ($V_{ctl}$ = 0/-5 V, $T_A$ = 25 °C, F = 10 GHz)

| Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|
| Frequency Range | | DC - 20 | | GHz |
| Insertion Loss | | 1.0 | | dB |
| Isolation | | 50 | | dB |
| Return Loss - On State | | 17 | | dB |
| Return Loss - Off State | | 17 | | dB |
| Input P0.1dB | | 25 | | dBm |
| Switching Characteristics<br>tRISE, tFALL (10/90% RF)<br>tON, tOFF (50% CTL to 10/90% RF) | | <br>1.8<br>18/7 | | <br>ns<br>ns |

## Absolute Maximum Ratings

| Parameter | Rating |
|---|---|
| RF Input Power | +27 dBm |
| Control Voltage Range (A, B) | +0.5V to -7.5V |
| Channel Temperature, Tch | 150 °C |
| Operating Temperature | -55 to 85 °C |
| Storage Temperature | -55 to 150 °C |
| Power Dissipation, Pdiss (isolation state) | 631 mW |
| Thermal Resistance, $\theta_{JC}$ (isolation state) | 96.2 °C/W |

Exceeding any one or combination of the maximum ratings may cause permanent damage to the device.

## Control Voltages

| State | Bias Condition |
|---|---|
| Low | 0 to -0.5V @ 1 uA Typ |
| High | -3V @ 1 uA Typ to -7V @ 6 uA Typ |

## Truth Table

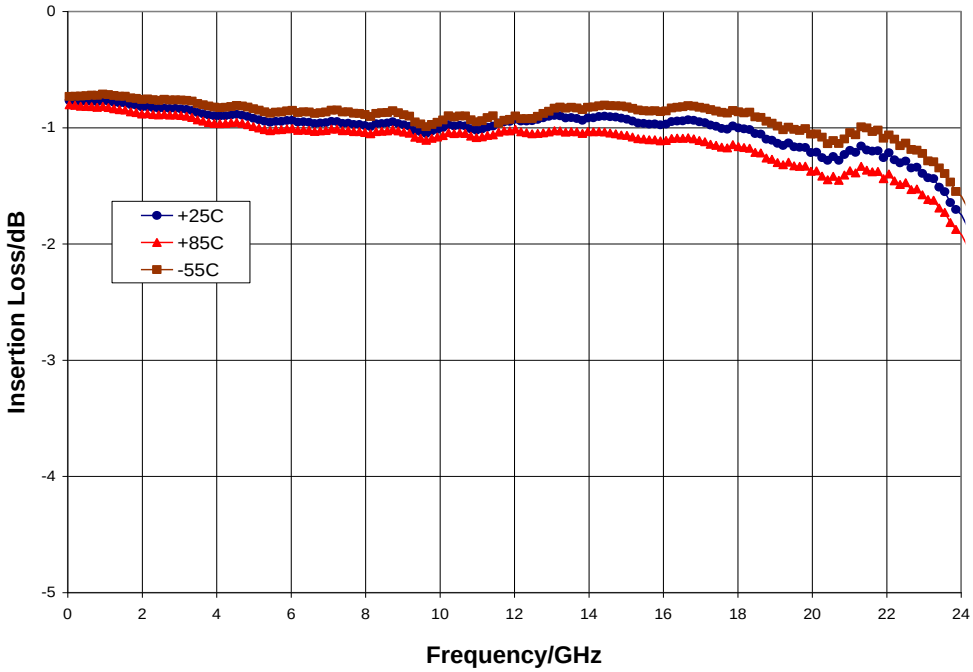
| Control Input | | Signal Path State |
|---|---|---|
| A | B | RF1 to RF2 |
| High | Low | On |
| Low | High | Off |

## Electrical Specifications ($V_{ctl}$ = 0/-5 V, $T_A$ = 25 °C)

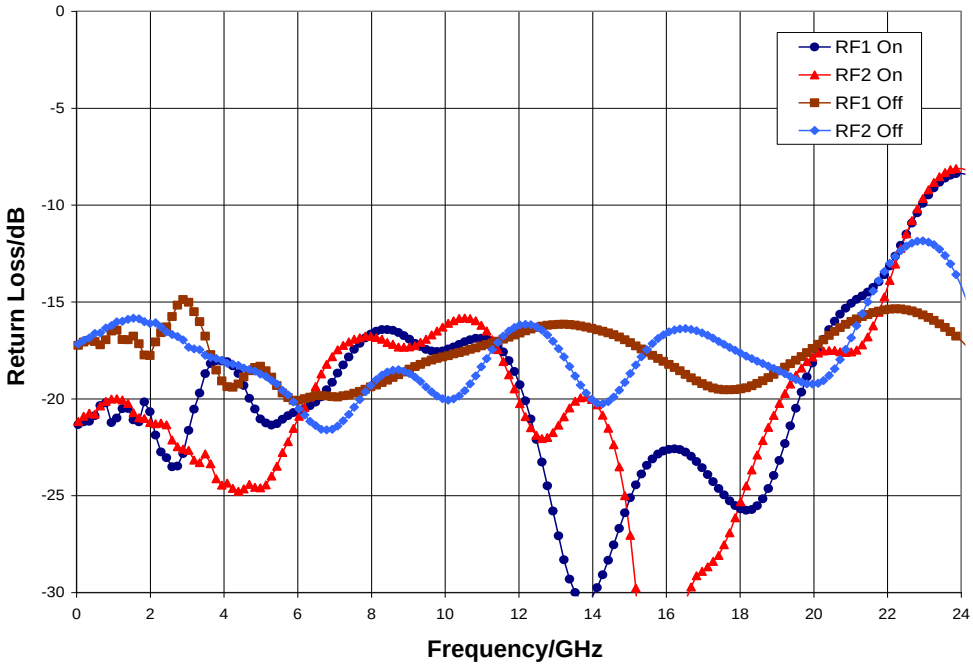
| Parameter | Min | Typ | Max | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Frequency Range | | DC - 10 | | | 10 - 20 | | GHz |
| Insertion Loss | | 0.9 | 1.4 | | 1.0 | 1.6 | dB |
| Isolation | 45 | 50 | | 36 | 43 | | dB |
| Return Loss - On State | | 17 | | | 17 | | dB |
| Return Loss - RF1, 2 - Off State | | 17 | | | 17 | | dB |
| Input P0.1dB | | 24 | | | 22 | | dBm |
| Input IP3 | | 38 | | | 37 | | dBm |
| Switching Characteristics<br>tRISE, tFALL (10/90% RF)<br>tON, tOFF (50% CTL to 10/90% RF) | | <br>1.8<br>18/7 | | | <br>1.8<br>18/7 | | <br>ns<br>ns |

## Typical Performance

**Insertion Loss vs. Temperature**

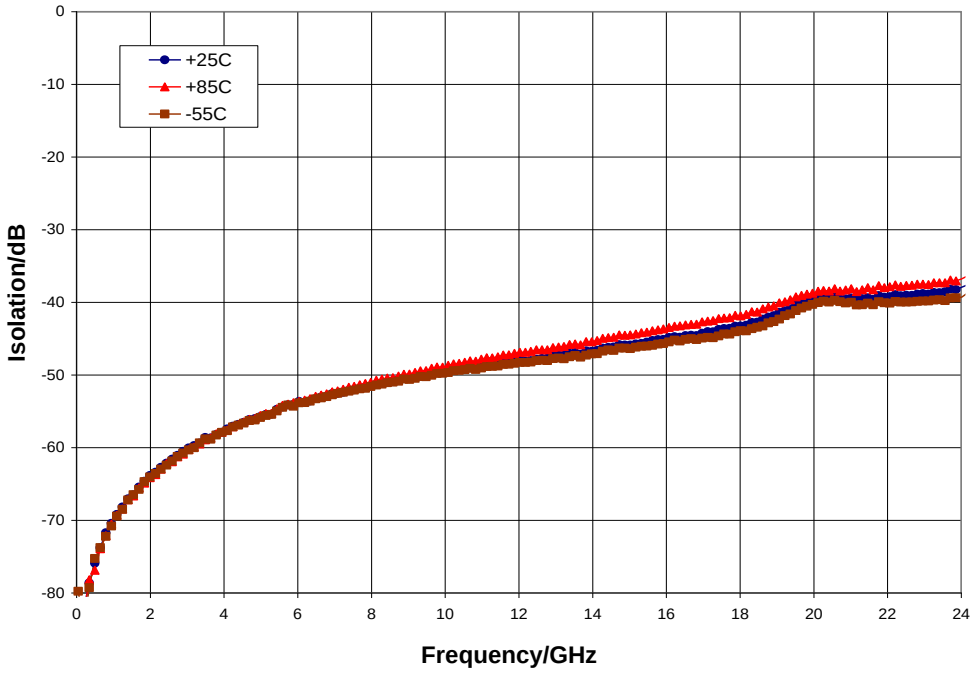



**Return Loss**

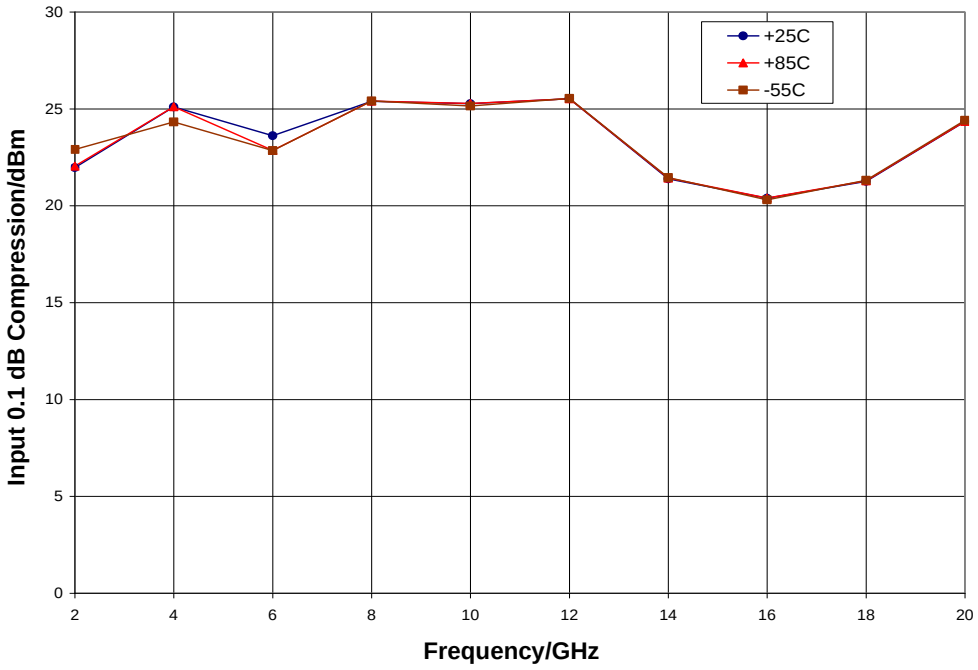


## Typical Performance

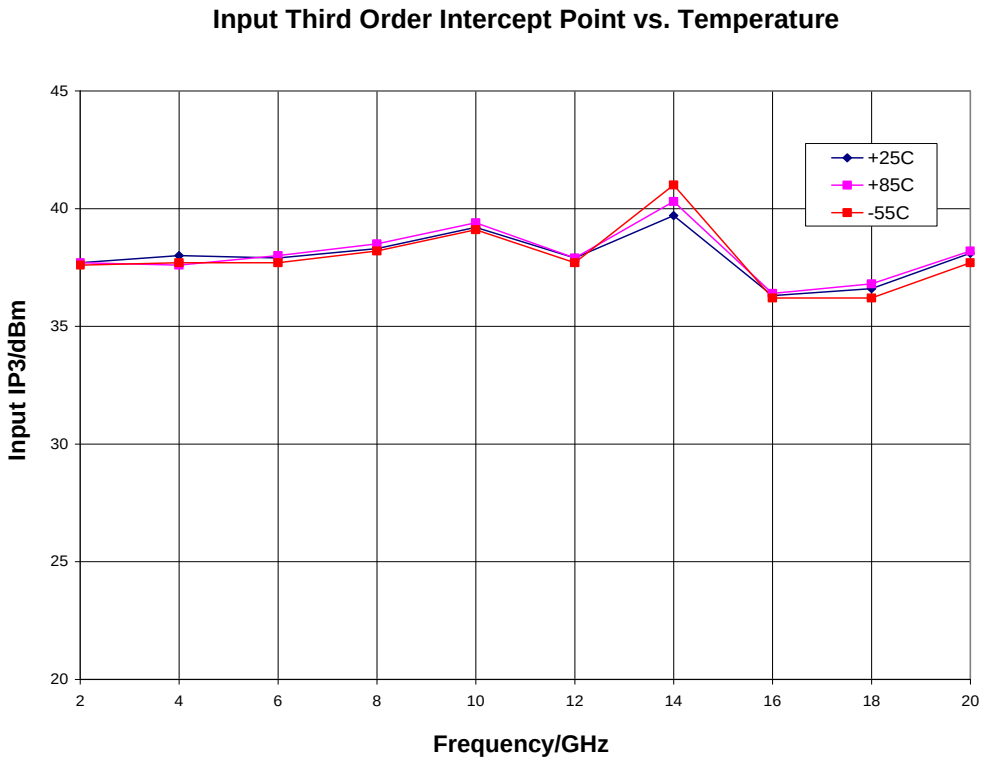
**Isolation Between Ports RF1 and RF2 vs. Temperature**




**Input P0.1dB Compression Point vs. Temperature**

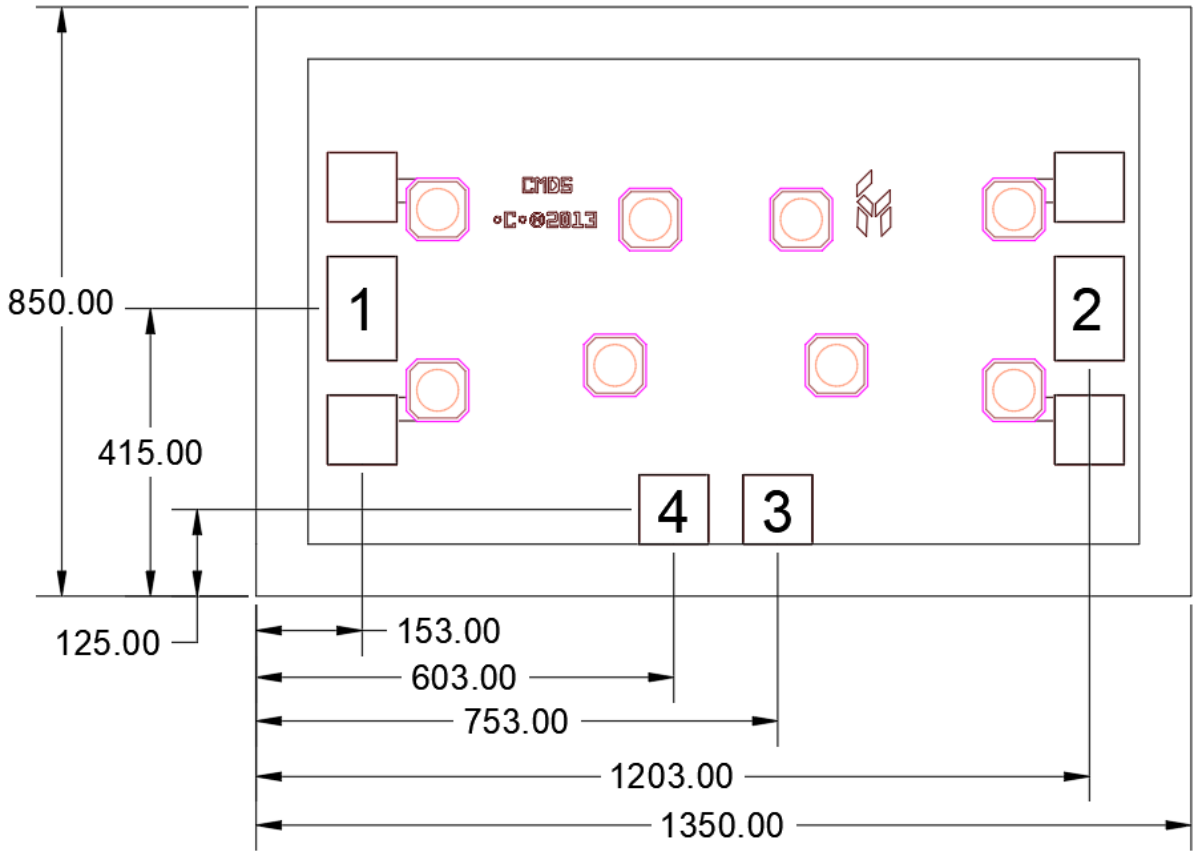


## Typical Performance



## Mechanical Information

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

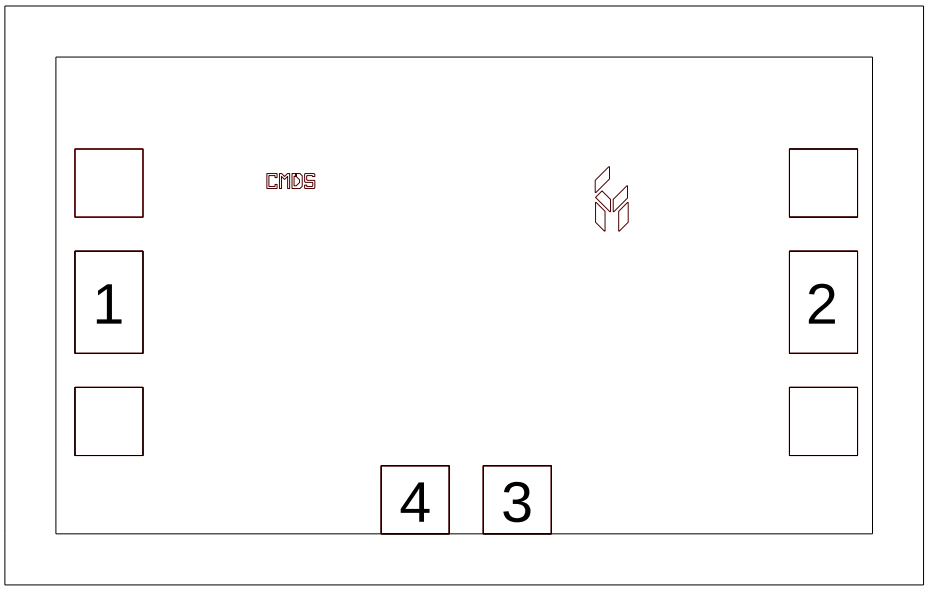



Notes:

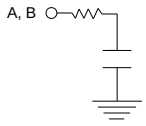
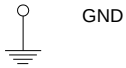
1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 85 microns thick
5. DC bond pads (3, 4) are 100 x 100 microns
6. RF bond pads (1, 2) are 100 x 150 microns

## Pad Description

### Pad Diagram

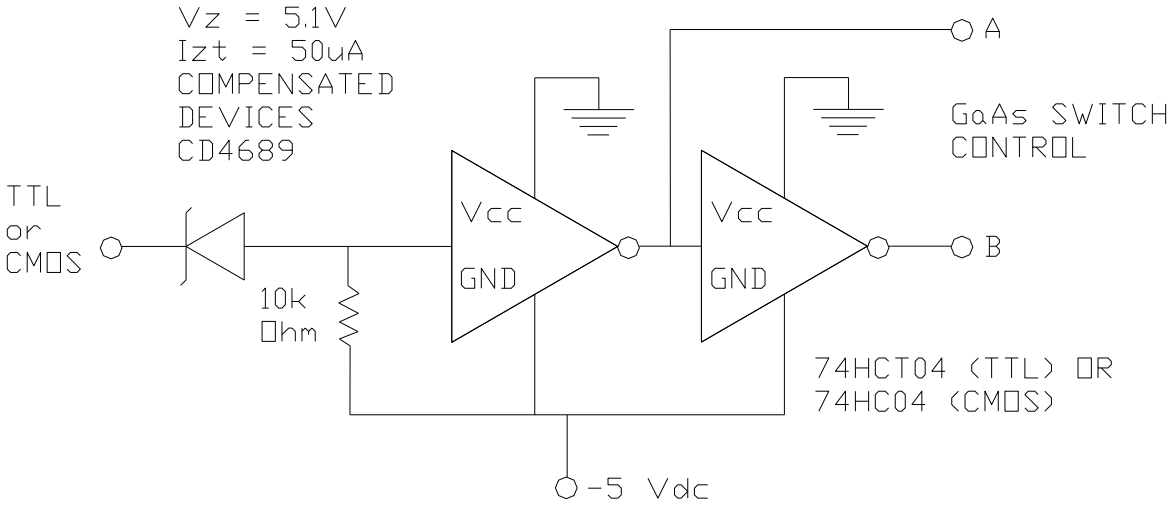



### Functional Description

| Pin | Function | Description | Schematic |
|---|---|---|---|
| 1, 2 | RF1, RF2 | These pins are DC coupled and matched to 50 ohm. Blocking capacitors are required if RF line potential is not equal to 0 V | |
| 3 | CTLB | See truth table and control voltage table |   |
| 4 | CTLA | See truth table and control voltage table | |
| Backside | Ground | Connect to RF / DC ground |   |

## Applications Information

**Suggested Driver Circuit**




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

## Applications Information

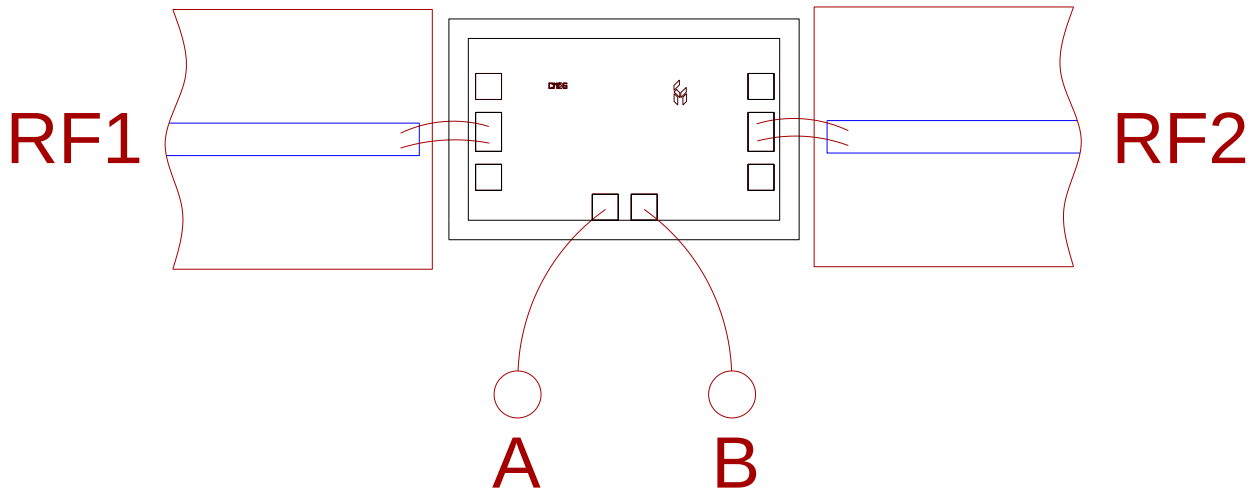
### Assembly Guidelines

The backside of the CMD204 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 85 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



## 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 ($C_{15}H_{12}Br_40_2$) Free
- SVHC Free
- Halogen Free
- PFOS 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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