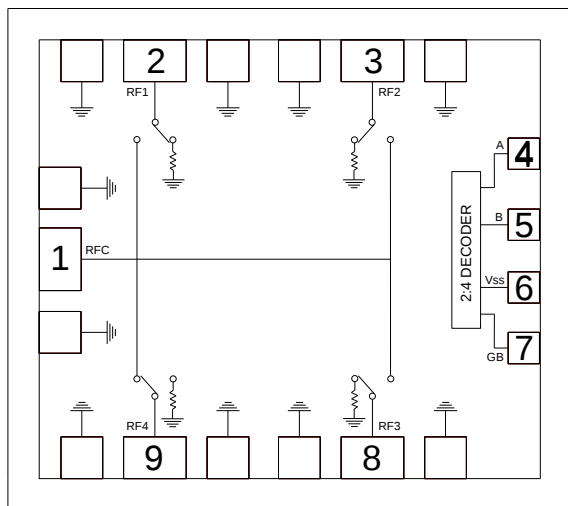


### Product Overview

The CMD203 is a broadband MMIC SP4T switch in die form. The CMD203 covers DC to 20 GHz and offers a low insertion loss of 2.4 dB and high isolation of 39 dB at 10 GHz. The switch also includes an on board binary decoder circuit which reduces the number of required logic control lines from four to two. The CMD203 operates using complementary control voltage logic lines of 0/-5 V and consumes little DC current.

### Functional Block Diagram



### Key Features

- Low Loss Broadband Performance
- High Isolation
- Non-Reflective Design
- Integrated 2:4 TTL Decoder
- Small Die Size: 1350 um x 1200 um

### Ordering Information

| Part No. | Description                                              |
|----------|----------------------------------------------------------|
| CMD203   | DC-20 GHz SP4T Non-reflective Switch, 50 Piece WP Sample |

### Electrical Performance ( $V_{ctl} = 0/-5\text{ V}$ , $V_{ss} = -5\text{ V}$ , $T_A = 25\text{ }^{\circ}\text{C}$ , $F = 10\text{ GHz}$ )

| Parameter                                  | Min                              | Typ     | Max | Units |
|--------------------------------------------|----------------------------------|---------|-----|-------|
| Frequency Range                            |                                  | DC - 20 |     | GHz   |
| Insertion Loss                             |                                  | 2.4     |     | dB    |
| Isolation                                  |                                  | 45      |     | dB    |
| Return Loss - On State                     |                                  | 9       |     | dB    |
| Return Loss RF1, RF2, RF3, RF4 - Off State |                                  | 11      |     | dB    |
| Input P1dB                                 |                                  | 21      |     | dBm   |
| Switching Characteristics                  | tRISE, tFALL (10/90% RF)         | 66      |     | ns    |
|                                            | tON, tOFF (50% CTL to 10/90% RF) | 81/8    |     |       |

## Absolute Maximum Ratings

| Parameter                         | Rating         |
|-----------------------------------|----------------|
| RF Input Power                    | +27 dBm        |
| Bias Voltage ( $V_{SS}$ )         | -7V            |
| Control Voltage Range (A, B)      | +0.5V to -7.5V |
| Channel Temperature, $T_{ch}$     | 150 °C         |
| Operating Temperature             | -40 to 85 °C   |
| Storage Temperature               | -55 to 150 °C  |
| Terminated Power Level            | 531 mW         |
| Thermal Resistance, $\theta_{JC}$ | 122.23° C/W    |

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

## Bias Voltage & Current

| <b><math>V_{SS}</math> Range = -5.0V <math>\pm</math> 10%</b> |                     |                     |
|---------------------------------------------------------------|---------------------|---------------------|
| $V_{SS}$ (V)                                                  | $I_{SS}$ (Typ) (mA) | $I_{SS}$ (Max) (mA) |
| -5                                                            | 4.5                 | 8.0                 |

## TTL/CMOS Control Voltages

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

## Truth Table

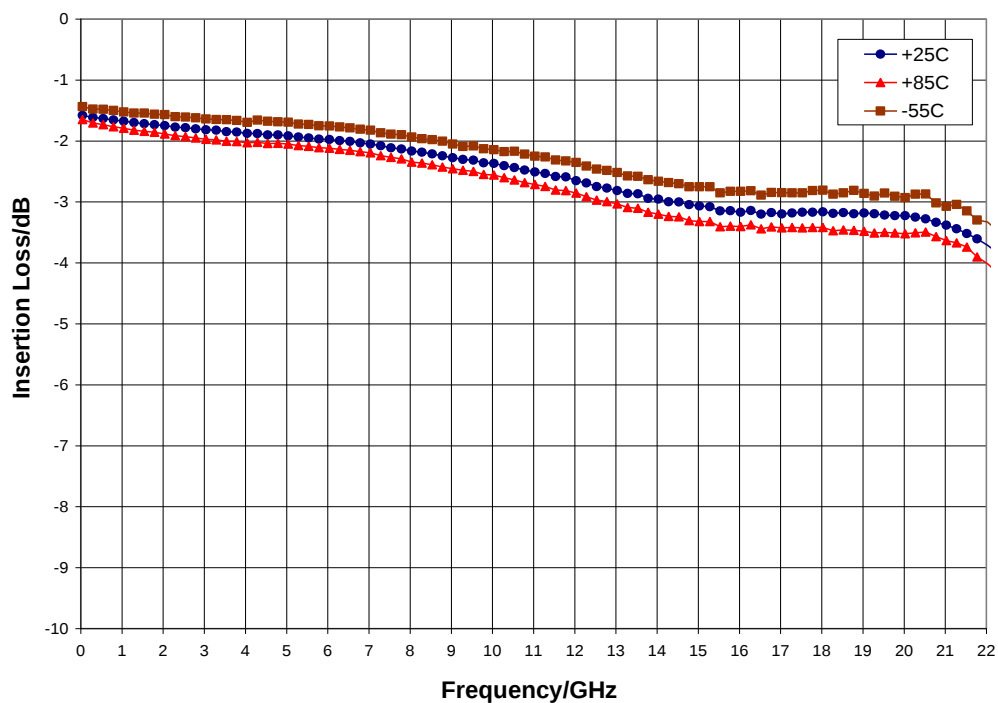
| Control Input |      | Signal Path State |
|---------------|------|-------------------|
| A             | B    | RFC to:           |
| High          | High | RF1               |
| Low           | High | RF2               |
| High          | Low  | RF3               |
| Low           | Low  | RF4               |

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

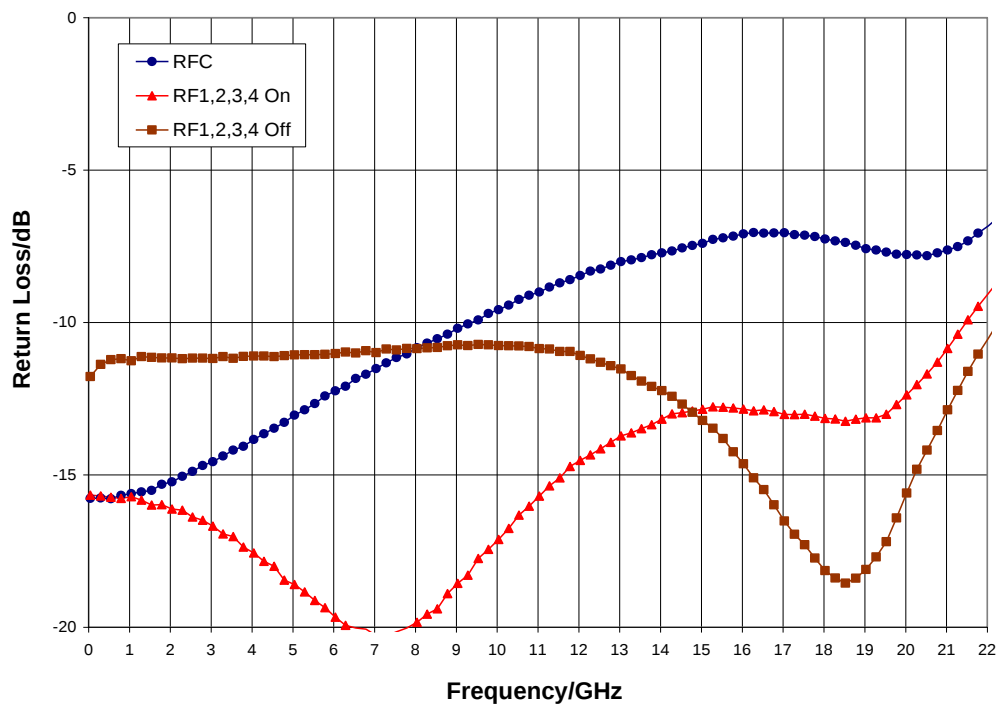
| Parameter                 | Min                                         | Typ  | Max | Min     | Typ  | Max | Min     | Typ  | Max | Units |
|---------------------------|---------------------------------------------|------|-----|---------|------|-----|---------|------|-----|-------|
| Frequency Range           | DC - 6                                      |      |     | DC - 14 |      |     | DC - 20 |      |     | GHz   |
| Insertion Loss            |                                             | 2    | 2.4 |         | 2.9  | 3.7 |         | 3.2  | 4   | dB    |
| Isolation                 | 36                                          | 50   |     | 27.5    | 40   |     | 24      | 32   |     | dB    |
| Return Loss - On State    |                                             | 11   |     |         | 8    |     |         | 8    |     | dB    |
| Return Loss - Off State   |                                             | 11   |     |         | 12   |     |         | 15   |     | dB    |
| Input P1dB                |                                             | 19.5 |     |         | 21   |     |         | 22   |     | dBm   |
| Input IP3                 |                                             | 28   |     |         | 30   |     |         | 30   |     | dBm   |
| Switching Characteristics | $t_{ON}$ , $t_{OFF}$ (50% CTL to 10/90% RF) | 66   |     |         | 66   |     |         | 66   |     | ns    |
|                           | $t_{RISE}$ , $t_{FALL}$ (10/90% RF)         | 81/8 |     |         | 81/8 |     |         | 81/8 |     |       |

## Typical Performance

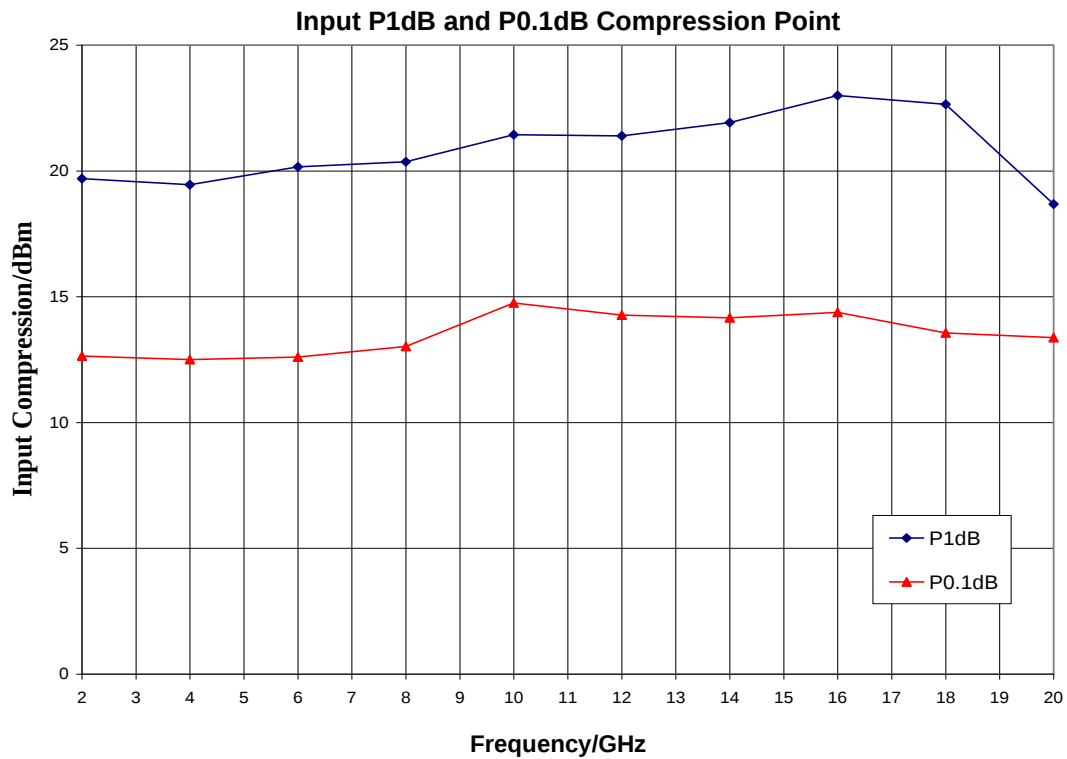
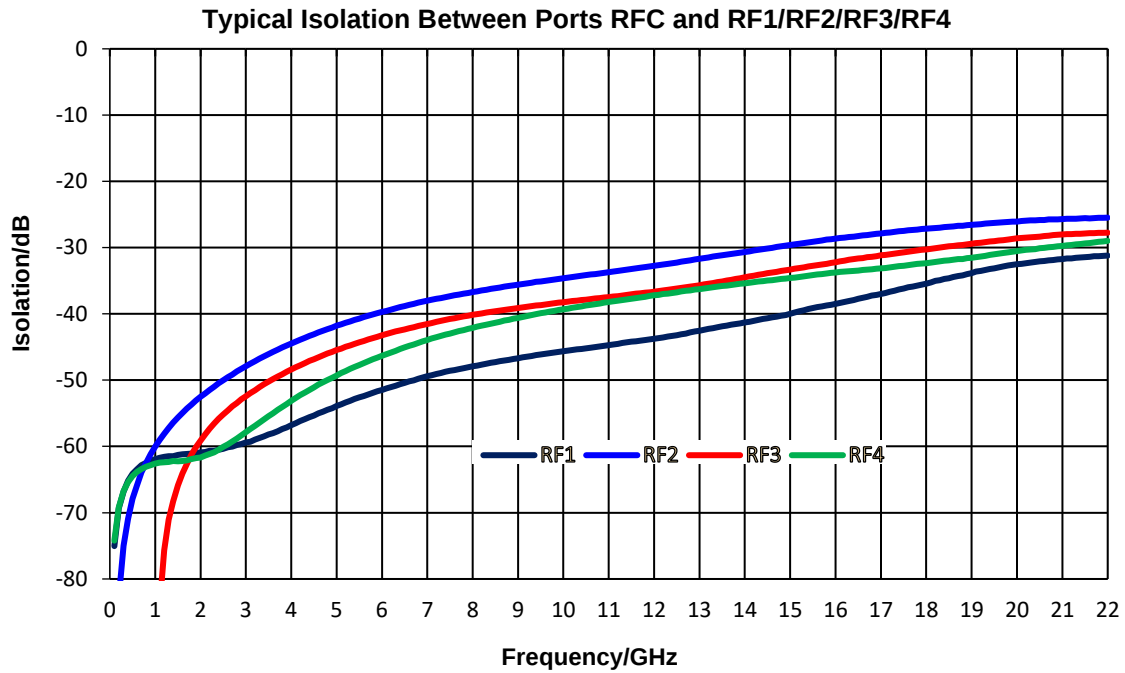
Insertion Loss vs. Temperature



Return Loss

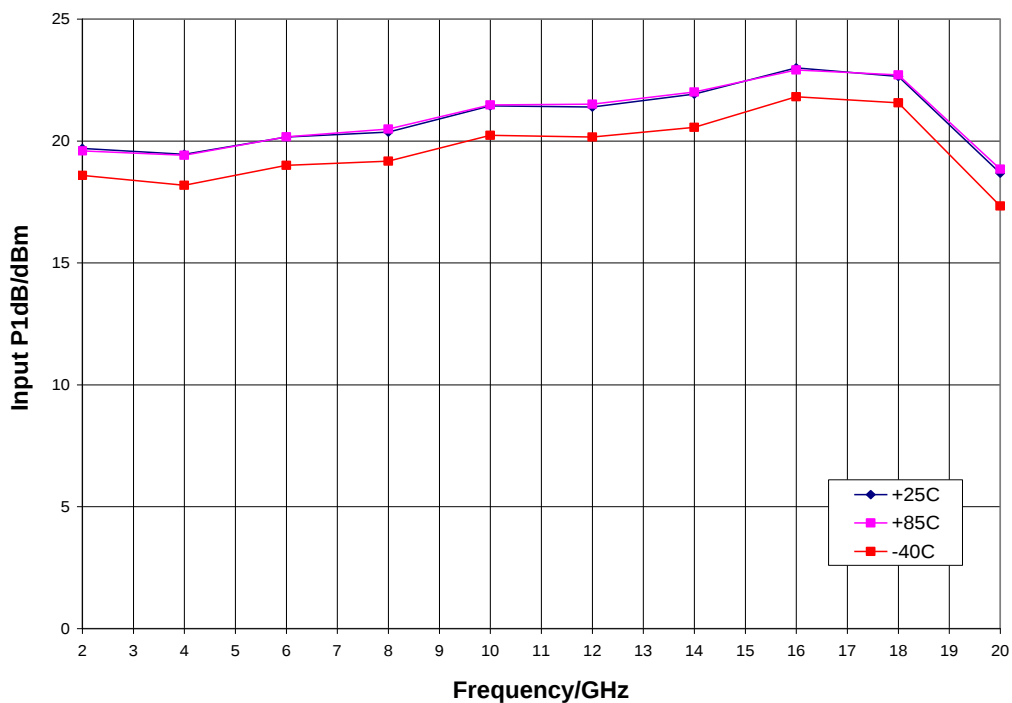


## Typical Performance

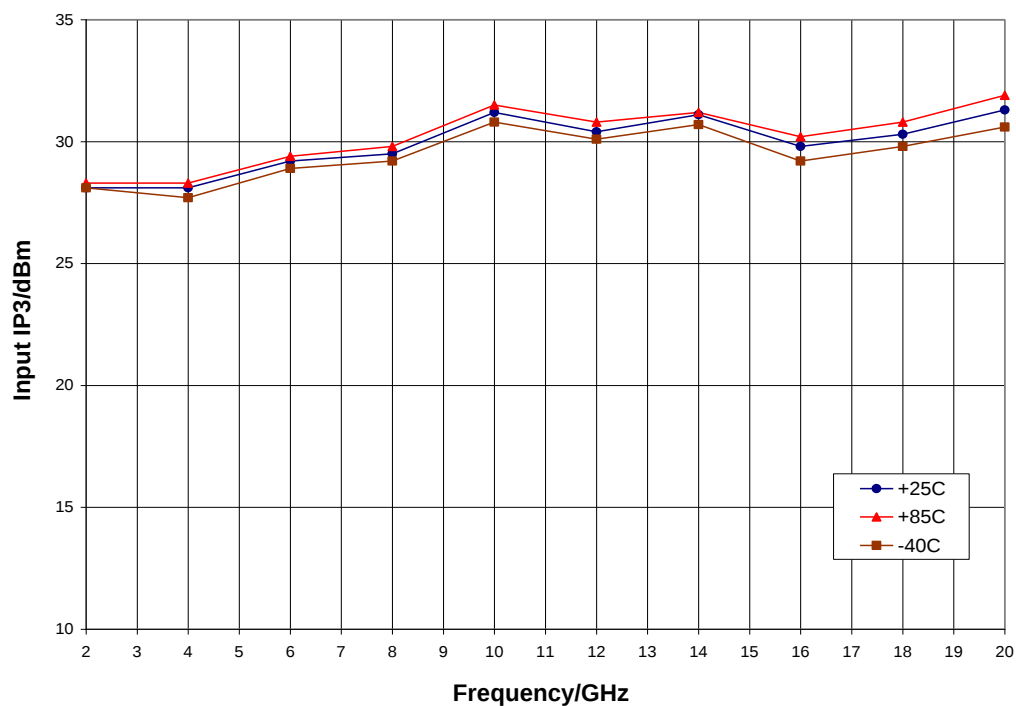


## Typical Performance

Input P1dB vs. Temperature

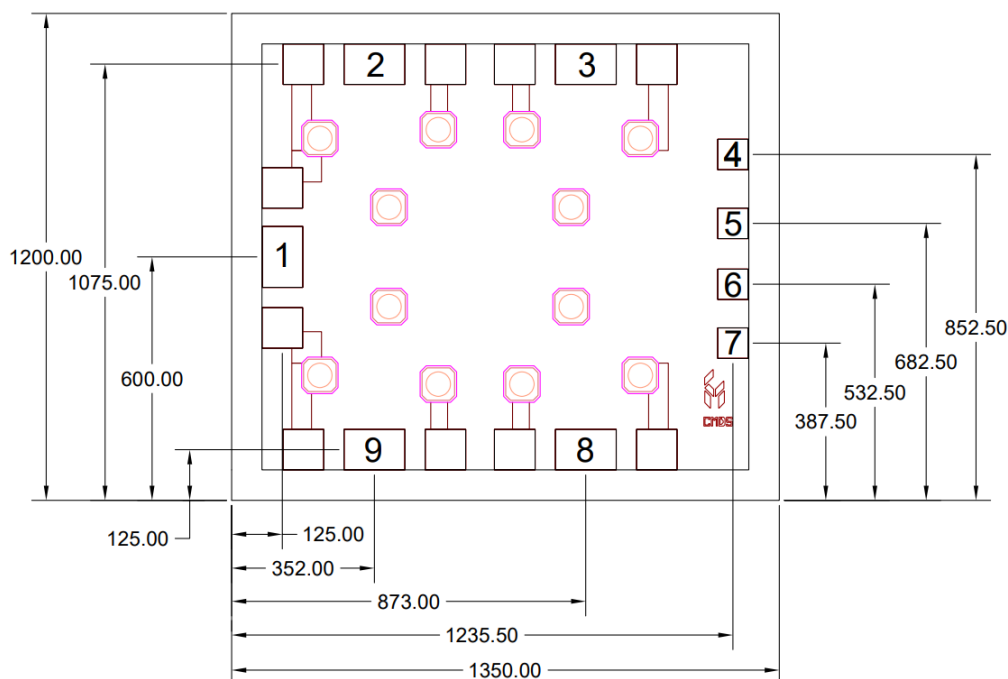


Input Third Order Intercept Point vs. Temperature



## Mechanical Information

Die Outline (all dimensions in microns)



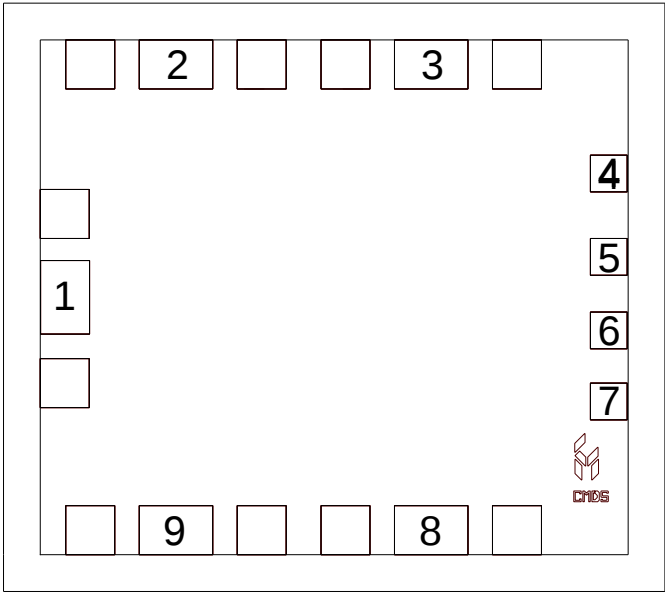
Notes:

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 (4, 5, 6, 7) are 100 x 100 microns
6. RF bond pads (1, 2, 3, 8, 9) are 100 x 150 microns

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

Pin Description

Pad Diagram



Functional Description

| Pin           | Function                | Description                                                                                                                  | Schematic |
|---------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1, 2, 3, 8, 9 | RFC, RF1, RF2, RF3, RF4 | These pins are DC coupled and matched to 50 ohm<br>Blocking capacitors are required if RF line potential is not equal to 0 V |           |
| 4             | CTLA                    | See truth table and control voltage table                                                                                    |           |
| 5             | CTLB                    | See truth table and control voltage table                                                                                    |           |
| 6             | Vss                     | Power supply voltage                                                                                                         |           |
| 7             | GB                      | Connect to DC ground                                                                                                         |           |
| Backside      | Ground                  | Connect to RF / DC ground                                                                                                    |           |

## Applications Information

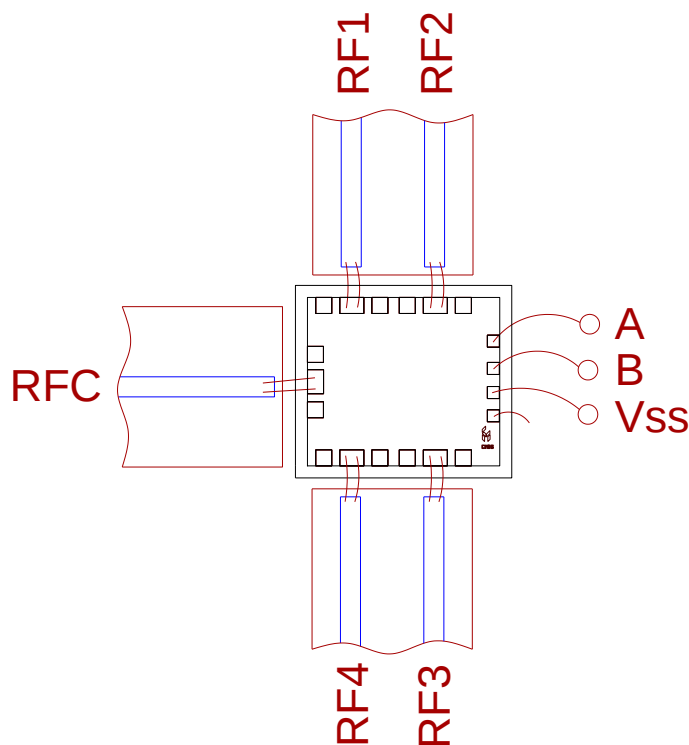
### Assembly Guidelines

The backside of the CMD203 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 inputs and outputs require a double bond wire as shown.

The semiconductor is 85  $\mu\text{m}$  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<sub>15</sub>H<sub>12</sub>Br<sub>4</sub>O<sub>2</sub>) 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](http://www.qorvo.com)

**Tel:** 1-844-890-8163

**Email:** [customer.support@qorvo.com](mailto:customer.support@qorvo.com)

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