WINSOURCE ELECTRONICS

# THE DATASHEET OF

CMD196

# CMD196

## DC - 28 GHz SPDT Non-reflective Switch

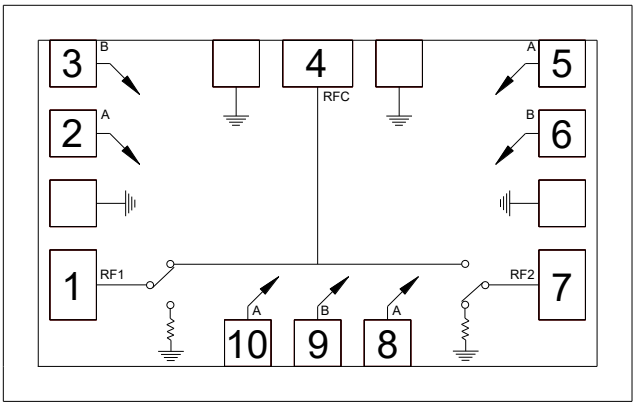
## Product Overview

The CMD196 is a general-purpose broadband high isolation non-reflective MMIC SPDT switch in die form. Covering DC to 28 GHz, the CMD196 features a low insertion loss of 1.75 dB and high isolation of 46 dB at 14 GHz. The CMD196 operates using complementary control voltage logic lines of 0/-5 V and requires no bias supply.

## Key Features

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

## Functional Block Diagram




## Ordering Information

| Part No. | Description |
|---|---|
| CMD196 | DC-28 GHz SPDT Non-reflective Switch, 100 Piece WP Sample |

## Electrical Performance ($V_{ctl}$ = 0/-5 V, $T_A$ = 25 °C, F = 14 GHz)

| Parameter | Min | Typ. | Max | Units |
|---|---|---|---|---|
| Frequency Range | | DC - 28 | | GHz |
| Insertion Loss | | 1.75 | | dB |
| Isolation | | 46 | | dB |
| Return Loss - On State | | 15 | | dB |
| Return Loss RF1, RF2 - Off State | | 25 | | dB |
| Input P1dB | | 23 | | dBm |
| Switching Characteristics<br>tRISE, tFALL (10/90% RF)<br>tON, tOFF (50% CTL to 10/90% RF) | | <br>1.8<br>11/4 | | <br>ns<br>ns |



© 2026 Qorvo US, Inc. – All Rights Reserved

## 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 |
| Thermal Resistance, $\theta_{JC}$ (insertion loss path) | 103 °C/W |
| Thermal Resistance, $\theta_{JC}$ (terminated path) | 258 °C/W |
| Terminated Power Level ($V_{ctl}$ = -5 V, CW) | +24 dBm |

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 | RFC to RF1 | RFC to RF2 |
| High | Low | On | Off |
| Low | High | Off | On |



© 2026 Qorvo US, Inc. – All Rights Reserved

## Electrical Specifications

Test conditions unless otherwise noted: 50 Ω, 25 °C, $V_{ctl}$ = 0/-5 V.

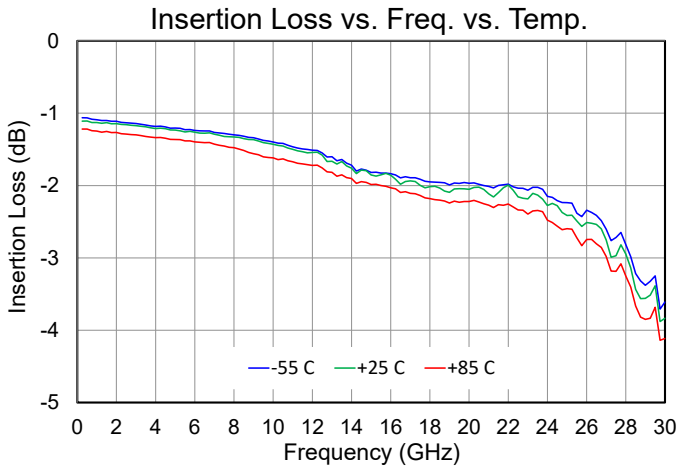
| Parameter | | Test conditions | Min | Typ. | Max | Units |
|---|---|---|---|---|---|---|
| Frequency Range | | | DC | - | 28 | GHz |
| Insertion Loss | | Frequency: 2 GHz | - | 1.1 | 1.9 | dB |
| | | Frequency: 8.5 GHz | - | 1.3 | 2.2 | |
| | | Frequency: 15 GHz | - | 1.9 | 2.8 | |
| | | Frequency: 21.5 GHz | - | 2.3 | 3.2 | |
| | | Frequency: 24 GHz | - | 2.8 | 3.8 | |
| | | Frequency: 26 GHz | - | 3.1 | 4.5 | |
| | | Frequency: 28 GHz | - | 4.3 | 5.0 | |
| Isolation | | Frequency: 2 GHz | 45 | 63 | - | dB |
| | | Frequency: 8.5 GHz | 37 | 48 | - | |
| | | Frequency: 15 GHz | 30 | 33 | - | |
| | | Frequency: 21.5 GHz | 30 | 38 | - | |
| | | Frequency: 24 GHz | 30 | 35 | - | |
| | | Frequency: 26 GHz | 30 | 36 | - | |
| | | Frequency: 28 GHz | 30 | 42 | - | |
| Return Loss – On State | | Frequency: DC – 8 GHz | - | 18 | - | dB |
| | | Frequency: 8 – 20 GHz | - | 12 | - | |
| | | Frequency: 20 – 28 GHz | - | 18 | - | |
| Return Loss<br>RF1, RF2 – OFF State | | Frequency: DC – 8 GHz | - | 17 | - | dB |
| | | Frequency: 8 – 20 GHz | - | 25 | - | |
| | | Frequency: 20 – 28 GHz | - | 15 | - | |
| Input P1dB | | Frequency: DC – 8 GHz | - | 23 | - | dBm |
| | | Frequency: 8 – 20 GHz | - | 23 | - | |
| | | Frequency: 20 – 28 GHz | - | 23 | - | |
| Input IP3 | | Frequency: DC – 8 GHz | - | 37 | - | dBm |
| | | Frequency: 8 – 20 GHz | - | 37 | - | |
| | | Frequency: 20 – 28 GHz | - | 38 | - | |
| Switching Characteristic | tRISE, tFALL<br>(10/90% RF) | Frequency: DC – 8 GHz | - | 1.8 | - | ns |
| | | Frequency: 8 – 20 GHz | - | 1.8 | - | |
| | | Frequency: 20 – 28 GHz | - | 1.8 | - | |
| | tON, tOFF<br>(50% CTL to 10/90% RF) | Frequency: DC – 8 GHz | - | 11/4 | - | ns |
| | | Frequency: 8 – 20 GHz | - | 11/4 | - | |
| | | Frequency: 20 – 28 GHz | - | 11/4 | - | |

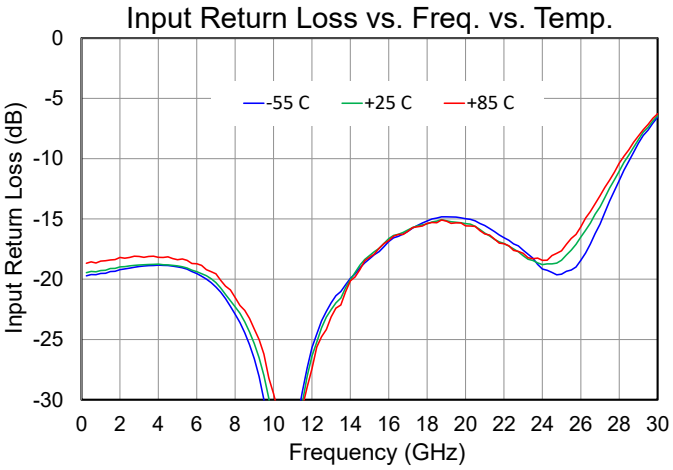


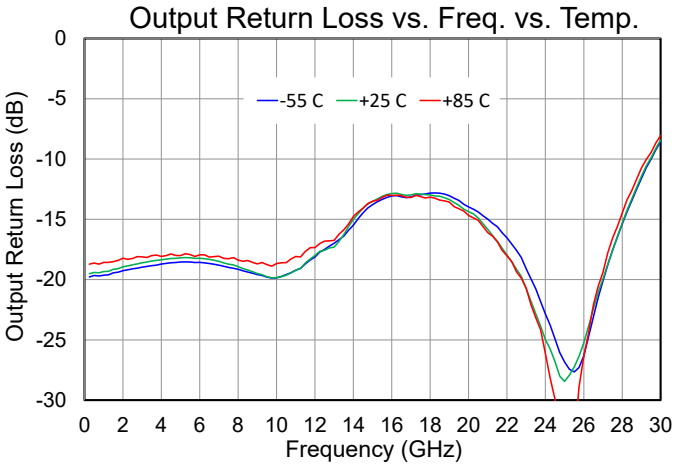
© 2026 Qorvo US, Inc. – All Rights Reserved

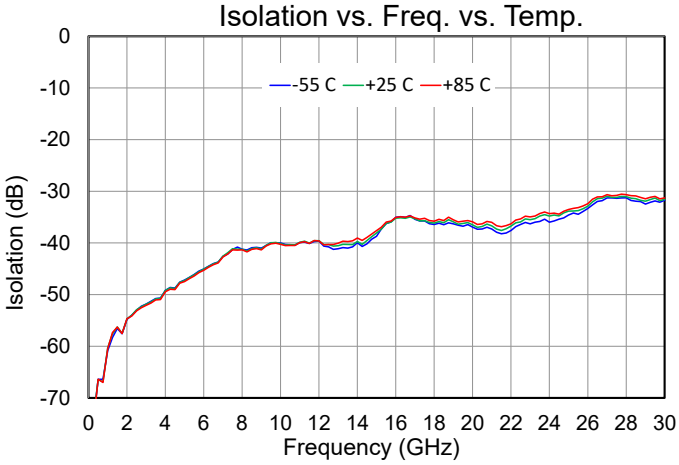
## Performance Plots – Small Signal

Test conditions unless otherwise noted: 50 Ω, $V_{CTL}$ = 0/-5 V, 25 °C



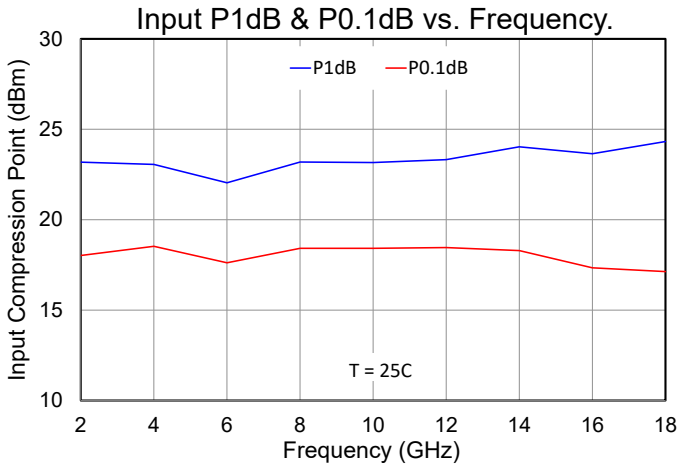



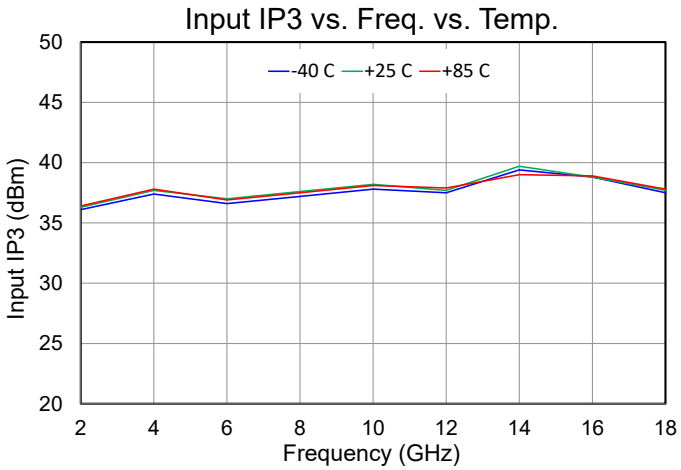



© 2026 Qorvo US, Inc. – All Rights Reserved

## Performance Plots – Large Signal & Linearity

Test conditions unless otherwise noted: 50 Ω, $V_{CTL}$ = 0/-5 V, 25 °C



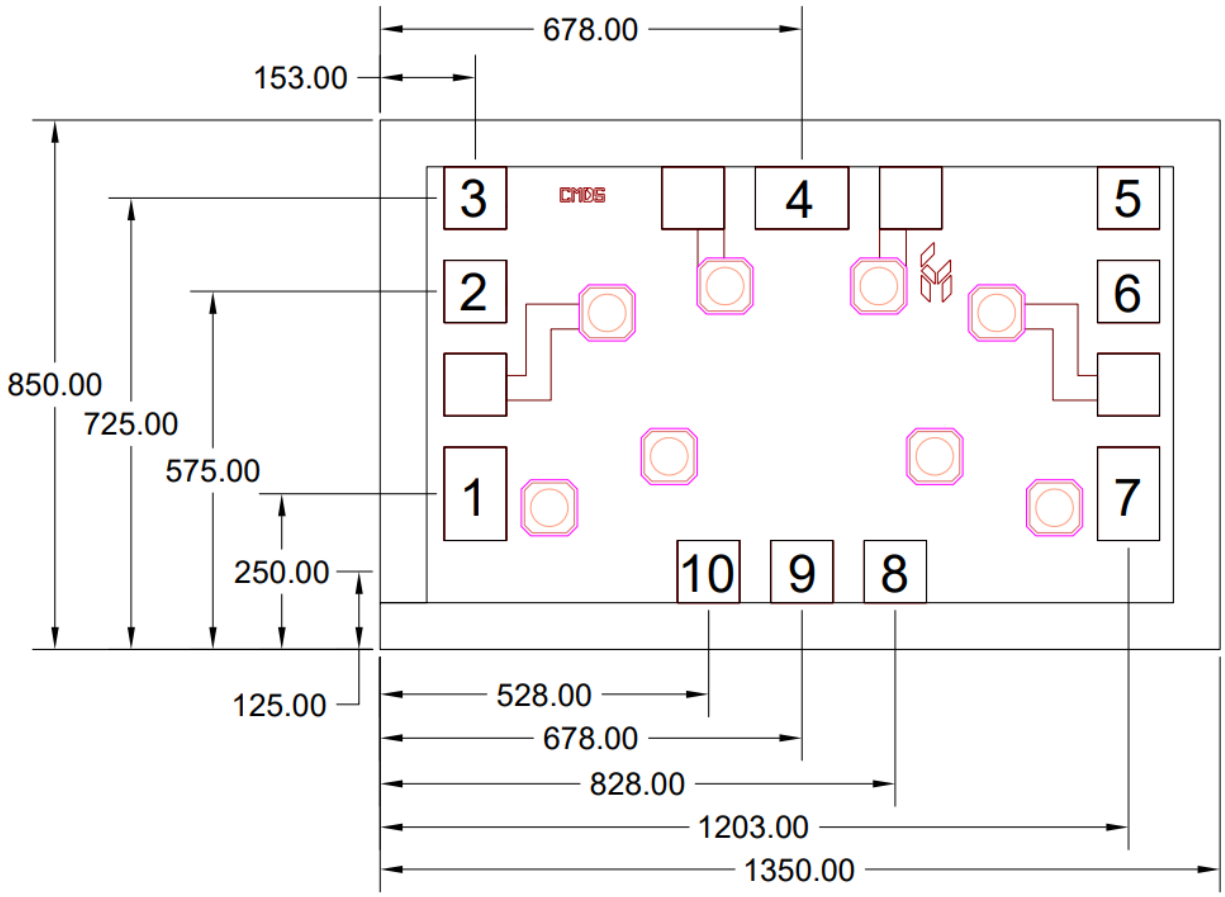






© 2026 Qorvo US, Inc. – All Rights Reserved

## Mechanical Information

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




Notes:

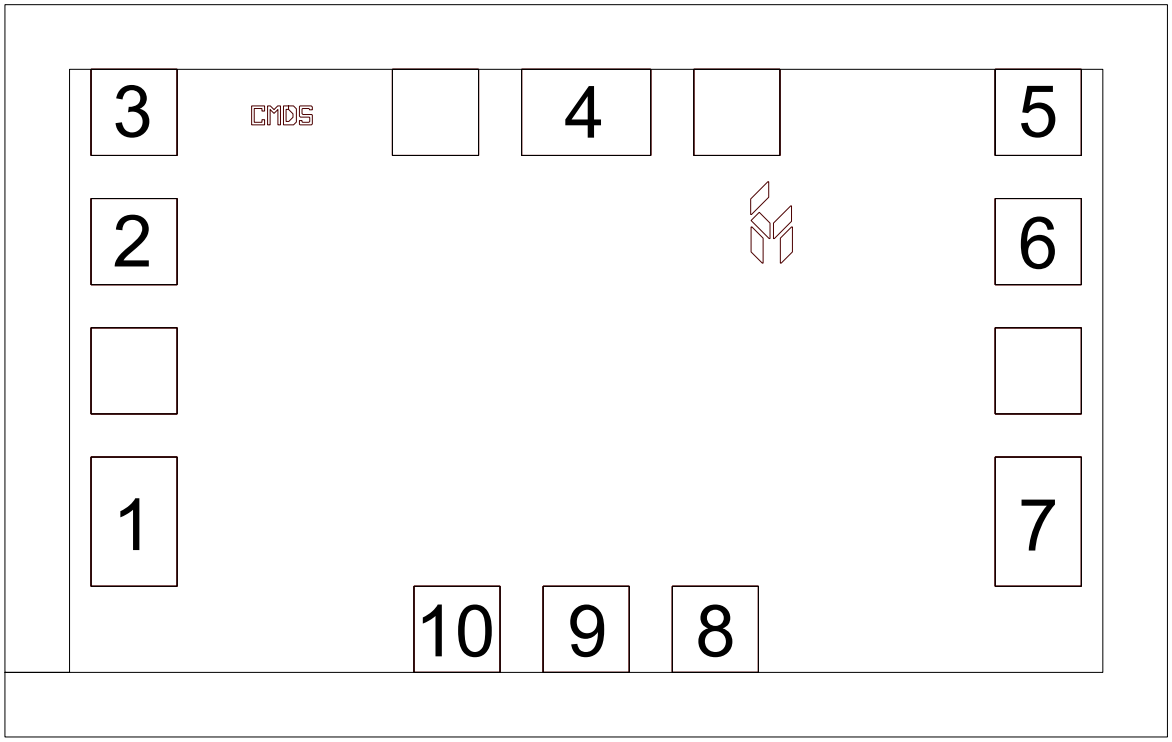
1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 85 microns thick
5. DC bond pads (2, 3, 5, 6, 8, 9, 10) are 100 x 100 microns
6. RF bond pads (1, 4, 7) are 100 x 150 microns



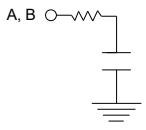
© 2026 Qorvo US, Inc. – All Rights Reserved

## Pad Description

### Pad Diagram




### Functional Description

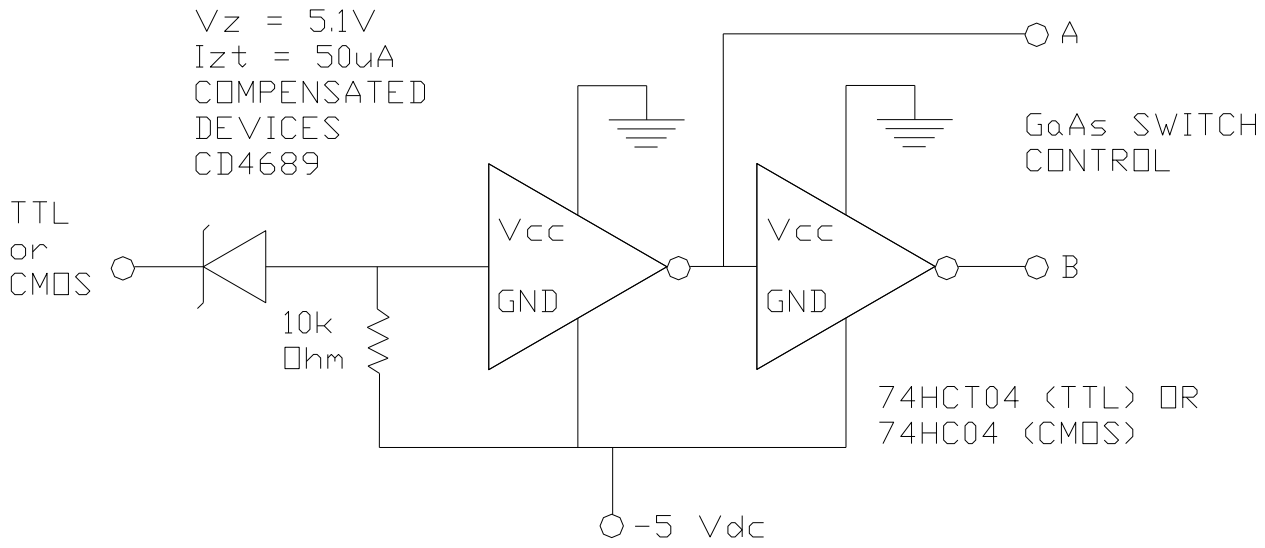
| Pin | Function | Description | Schematic |
|---|---|---|---|
| 1, 4, 7 | RF1, RFC, RF2 | These pins are DC coupled and matched to 50 ohm Blocking capacitors are required if RF line potential is not equal to 0 V | |
| 2, 5, 8, 10 | CTRLA | See truth table and control voltage table |   |
| 3, 6, 9 | CTRLB | See truth table and control voltage table | |
| Backside | Ground | Connect to RF / DC ground |   |



© 2026 Qorvo US, Inc. – All Rights Reserved

## 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.**



© 2026 Qorvo US, Inc. – All Rights Reserved

## Applications Information

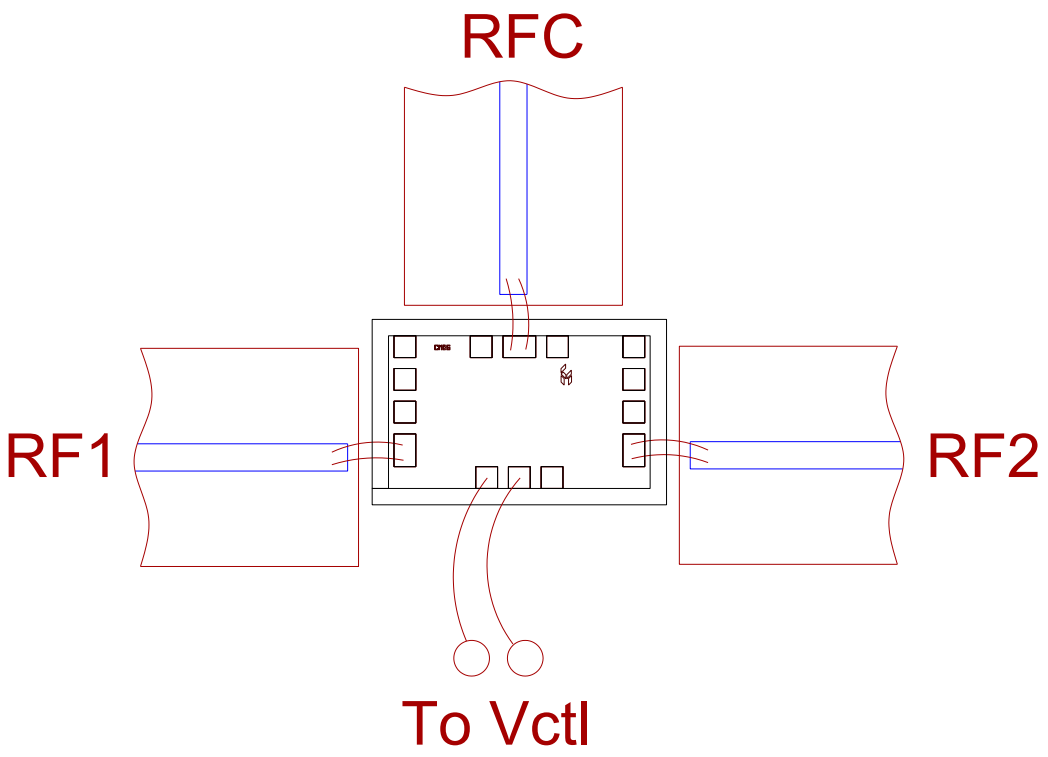
### Assembly Guidelines

The backside of the CMD196 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 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






© 2026 Qorvo US, Inc. – All Rights Reserved

## 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

## Important Notice

The information contained in this Data Sheet and any associated documents (“Data Sheet Information”) is believed to be reliable; however, Qorvo makes no warranties regarding the Data Sheet Information and assumes no responsibility or liability whatsoever for the use of said information. All Data Sheet Information is subject to change without notice. Customers should obtain and verify the latest relevant Data Sheet Information before placing orders for Qorvo® products. Data Sheet Information or the use thereof does not grant, explicitly, implicitly or otherwise any rights or licenses to any third party with respect to patents or any other intellectual property whether with regard to such Data Sheet Information itself or anything described by such information.

DATA SHEET INFORMATION DOES NOT CONSTITUTE A WARRANTY WITH RESPECT TO THE PRODUCTS DESCRIBED HEREIN, AND QORVO HEREBY DISCLAIMS ANY AND ALL WARRANTIES WITH RESPECT TO SUCH PRODUCTS WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Without limiting the generality of the foregoing, Qorvo® products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death. Applications described in the Data Sheet Information are for illustrative purposes only. Customers are responsible for validating that a particular product described in the Data Sheet Information is suitable for use in a particular application.

© 2026 Qorvo US, Inc. All rights reserved. This document is subject to copyright laws in various jurisdictions worldwide and may not be reproduced or distributed, in whole or in part, without the express written consent of Qorvo US, Inc. | QORVO® is a registered trademark of Qorvo US, Inc.



© 2026 Qorvo US, Inc. – All Rights Reserved

## Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

- View CMD196 on WIN SOURCE
- Qorvo US Inc. Information

## Optimize Your Supply Chain with WIN SOURCE Solutions

- Global Sourcing Solution
- Obsolete Management
- Cost Control Management
- Shortage Management
- Alternative Solution
- Excess Inventory Management