



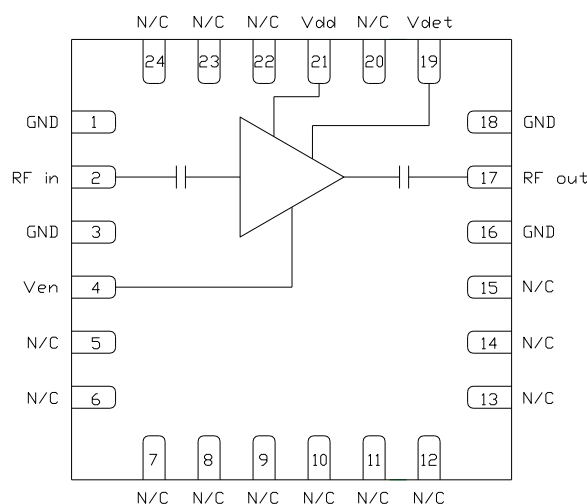
# CMD169P4

## 5-7 GHz Driver Amplifier

### Product Overview

The CMD169P4 is a GaAs MMIC driver amplifier housed in a leadless 4x4 mm plastic surface mount package. The CMD169P4 is ideally suited for complex communications systems where small size and high linearity are needed. At 6 GHz the device delivers 19 dB of gain with a corresponding output 1 dB compression point of greater than +28 dBm. The CMD169P4 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching. The CMD169P4 is also equipped with an on-chip detector for applications where power leveling is required.

### Functional Block Diagram



### Key Features

- High Output Power
- On-Chip Detector
- All Positive Bias
- Pb-Free RoHs Compliant 4x4 QFN Package

### Ordering Information

Part No.	Description
CMD169P4	5 - 7 GHz Driver Amplifier, 100 Piece 7" Reel
CMD169P4-EVB	Evaluation Board

### Electrical Performance ( $V_{dd} = 7.0$ V, $V_{en} = 3.0$ V, $T_A = 25$ °C, $F = 6$ GHz)

Parameter	Min	Typ	Max	Units
Frequency Range		5 - 7		GHz
Gain		19		dB
Input Return Loss		18		dB
Output Return Loss		12		dB
Output P1dB		28.4		dBm
Supply Current ( $V_{dd} = 7$ V)		375		mA
Enable Current ( $V_{en} = 3$ V)		19		mA

## Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, $V_{dd}$	8.0 V
Enable Voltage, $V_{en}$	4.0 V
RF Input Power	+25 dBm
Channel Temperature, $T_{ch}$	150 °C
Power Dissipation, $P_{diss}$	3.69 W
Thermal Resistance, $\theta_{JC}$	17.6 °C/W
Operating Temperature	-40 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
$V_{dd}$	5.0	7.0	8.0	V
$I_{dd}$		375		mA
$V_{en}$	0	3.0	4.0	V
$I_{en}$		19		mA

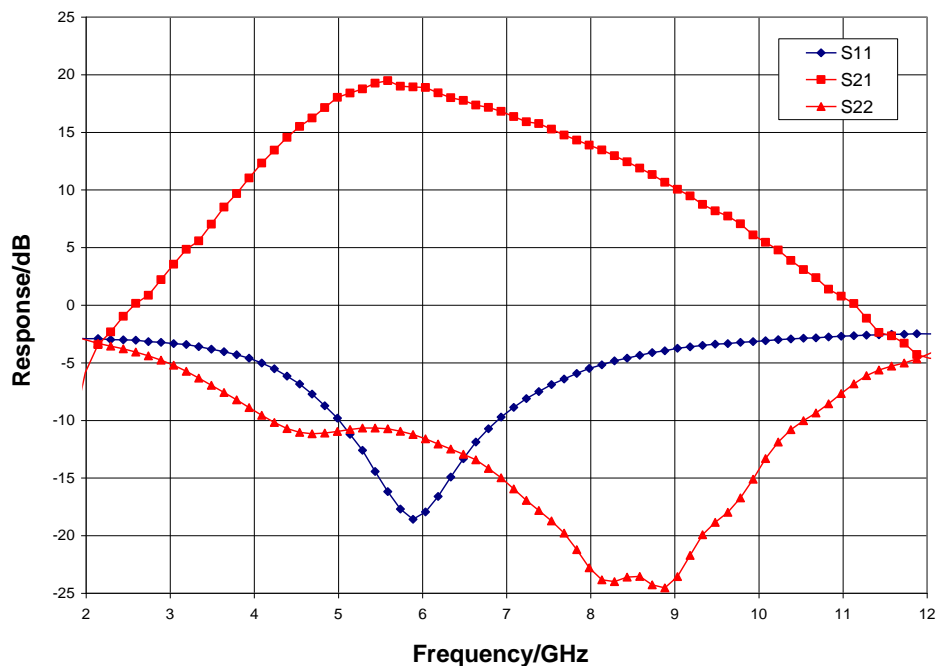
Electrical performance is measured at specific test conditions.  
 Electrical specifications are not guaranteed over all recommended operating conditions.

## Electrical Specifications ( $V_{dd} = 7.0$ V, $V_{en} = 3.0$ V, $T_A = 25$ °C)

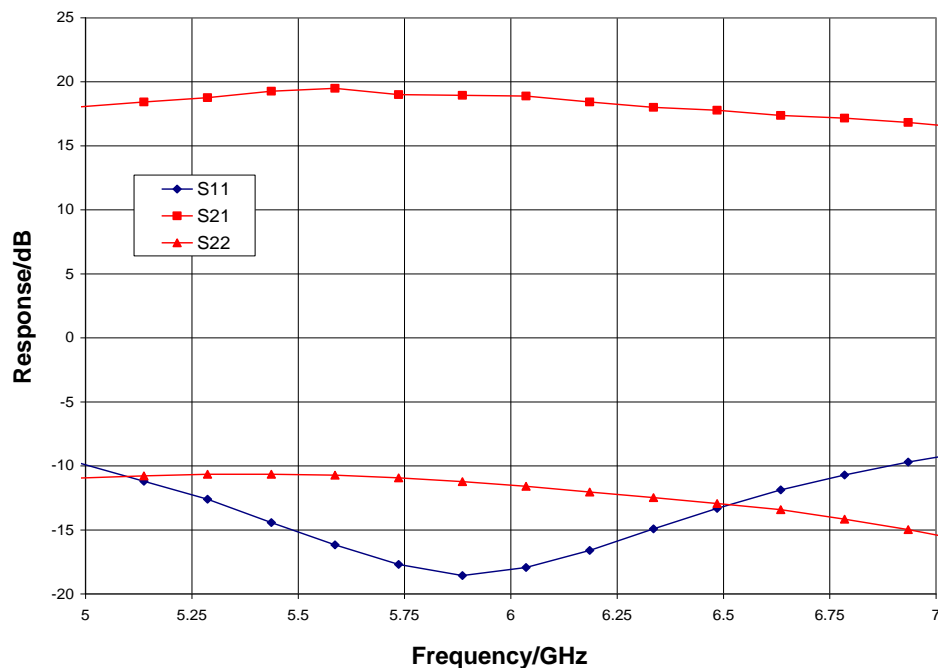
Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		5 - 7			5.6 - 6		GHz
Gain	15	18	21	16	19	22	dB
Input Return Loss		13			18		dB
Output Return Loss		12			12		dB
Output P1dB	27	28.4		27	28.4		dBm
Output IP3		34			37		dBm
Supply Current	345	375	405	345	375	405	mA
Enable Current		19			19		mA
Gain Temperature Coefficient		0.025			0.025		dB/°C

## Typical Performance

**Broadband Performance,  $V_{dd} = 7.0$  V,  $V_{en} = 3.0$  V,  $I_{dd} = 375$  mA,  $T_A = 25$  °C**

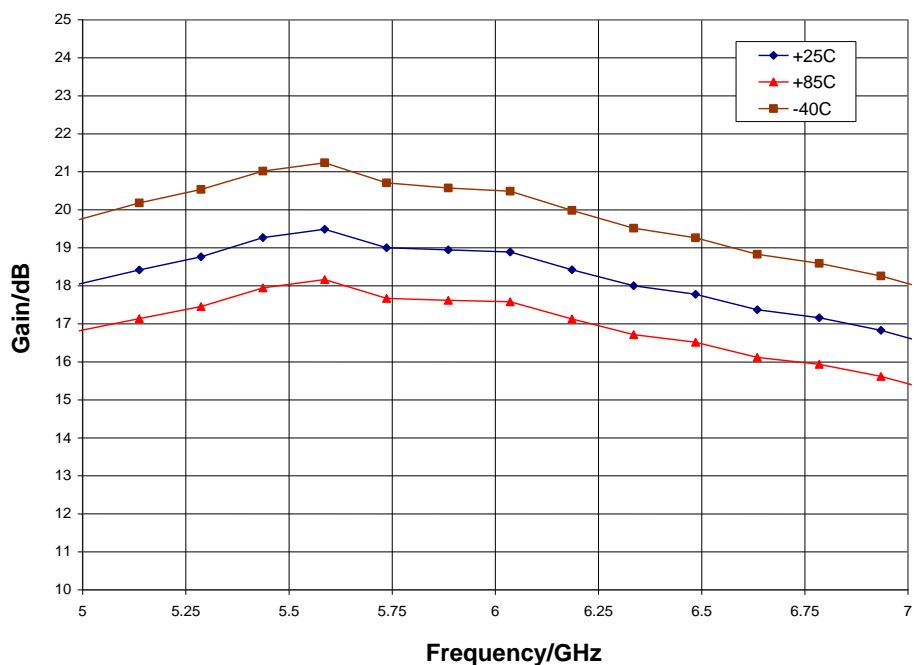


**Narrow-band Performance,  $V_{dd} = 7.0$  V,  $V_{en} = 3.0$  V,  $I_{dd} = 375$  mA,  $T_A = 25$  °C**

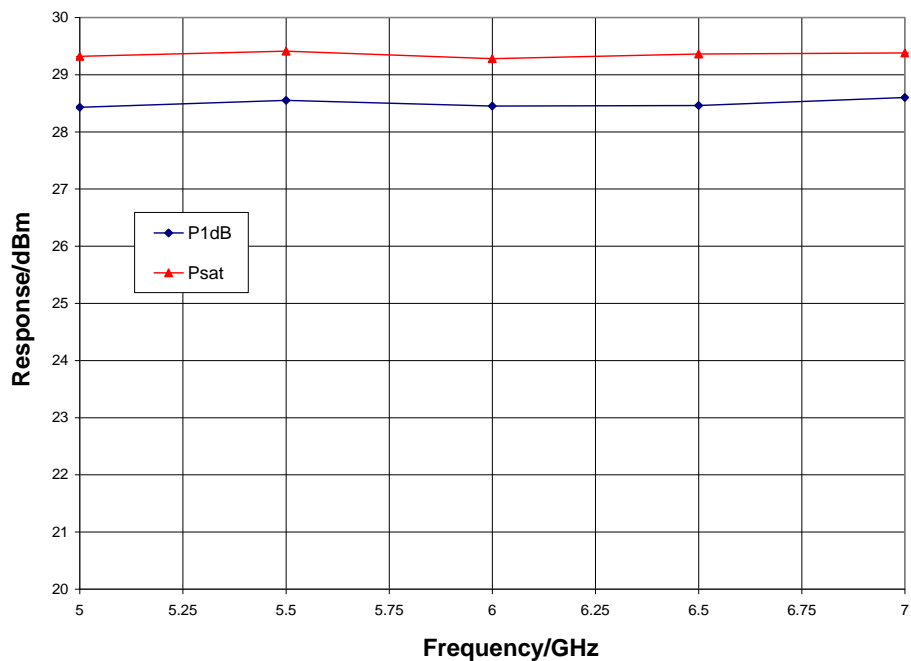


## Typical Performance

Gain vs. Temperature,  $V_{dd} = 7.0\text{ V}$ ,  $V_{en} = 3.0\text{ V}$

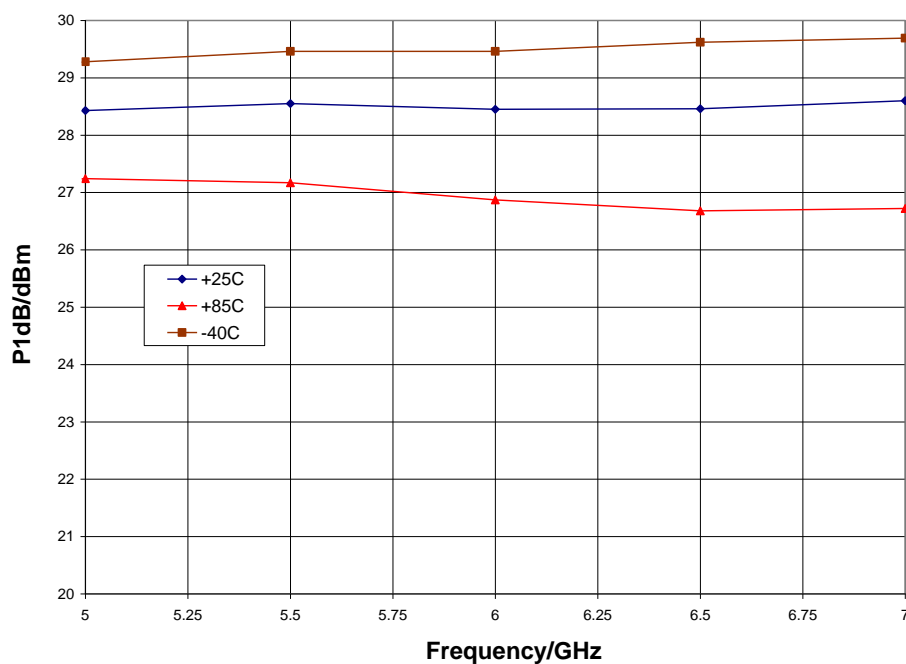


Output Power,  $V_{dd} = 7.0\text{ V}$ ,  $V_{en} = 3.0\text{ V}$ ,  $T_A = 25\text{ °C}$

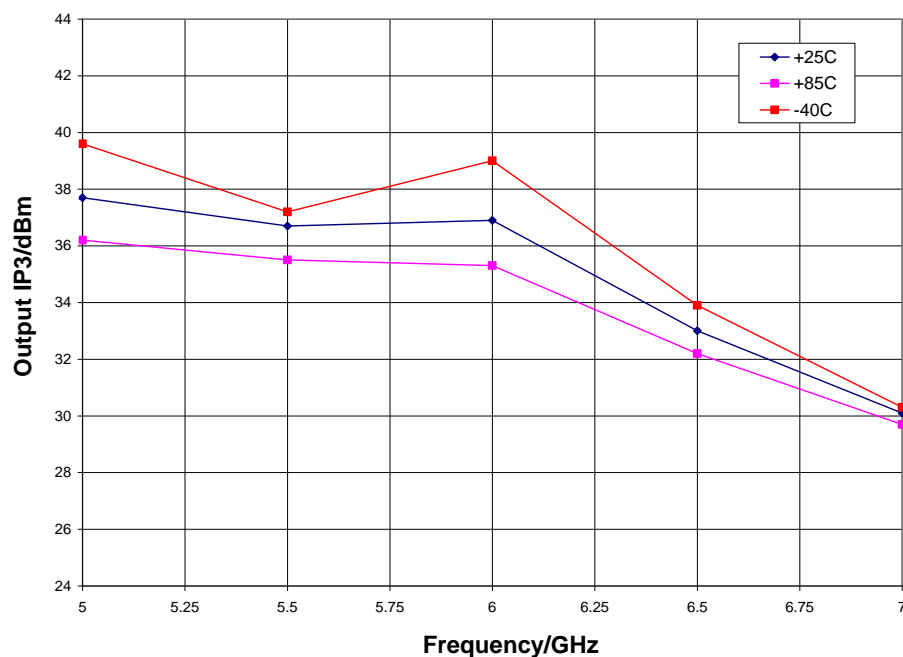


## Typical Performance

P1dB vs. Temperature,  $V_{dd} = 7.0\text{ V}$ ,  $V_{en} = 3.0\text{ V}$

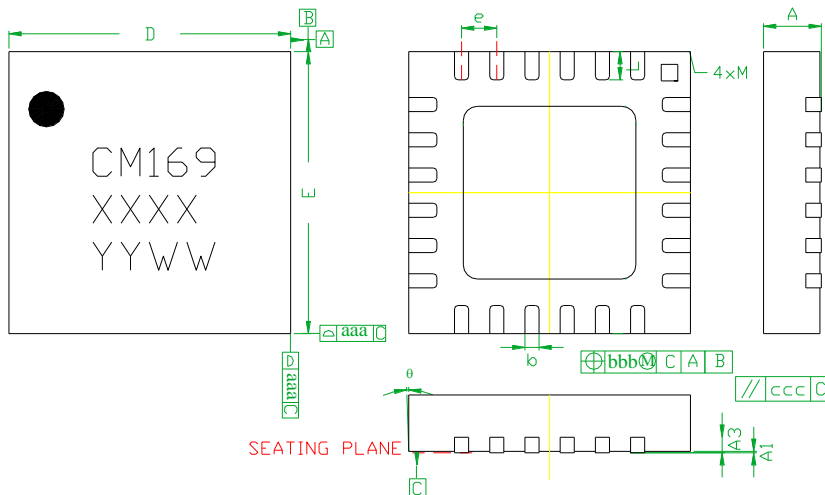


Output IP3 vs. Temperature,  $V_{dd} = 7.0\text{ V}$ ,  $V_{en} = 3.0\text{ V}$



## Mechanical Information

### Package Information and Dimensions



SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	0.80	0.90	1.00
A1	0	0.02	0.05
A3	—	0.25REF.	—
b	0.18	0.23	0.30
D	3.85	4.00	4.15
D1	—	2.45BSC	—
E	3.85	4.00	4.15
E1	—	2.45BSC	—
e	—	0.50BSC	—
L	0.30	0.40	0.50
theta	0	—	12
aaa	—	0.25	—
bbb	—	0.10	—
ccc	—	0.10	—
M	—	—	0.05

#### Notes:

1. Dimensions are in millimeters
2. RoHs compliant mold compound
3. Lead frame material: Copper alloy
4. Lead finish: 100% matte Sn
5. Indicated dimension/tolerance applies to leads and exposed pads

### Recommended PCB Land Pattern

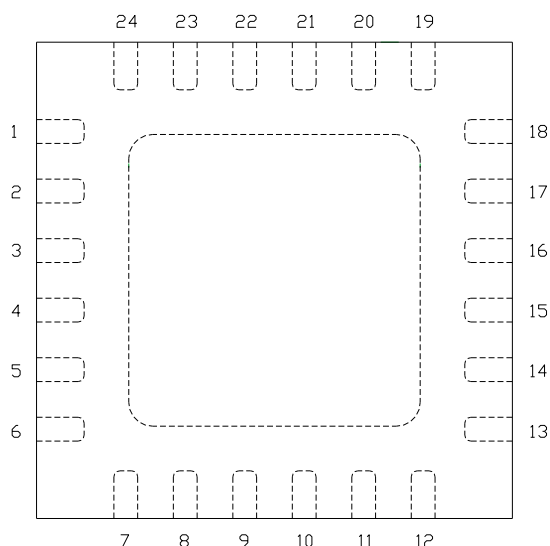
Qorvo recommends that the user develop the land pattern that will provide the best design for proper solder reflow and device attach for their specific application. Please review Qorvo Application Note AN 105 for a recommended land pattern approach.

### Recommended Solder Reflow Profile

Qorvo recommends screen printing with belt furnace reflow to ensure proper solder reflow and device attach. Please review Qorvo Application Note AN 102 for a recommended solder reflow profile.

## Pin Description

### Pin Diagram

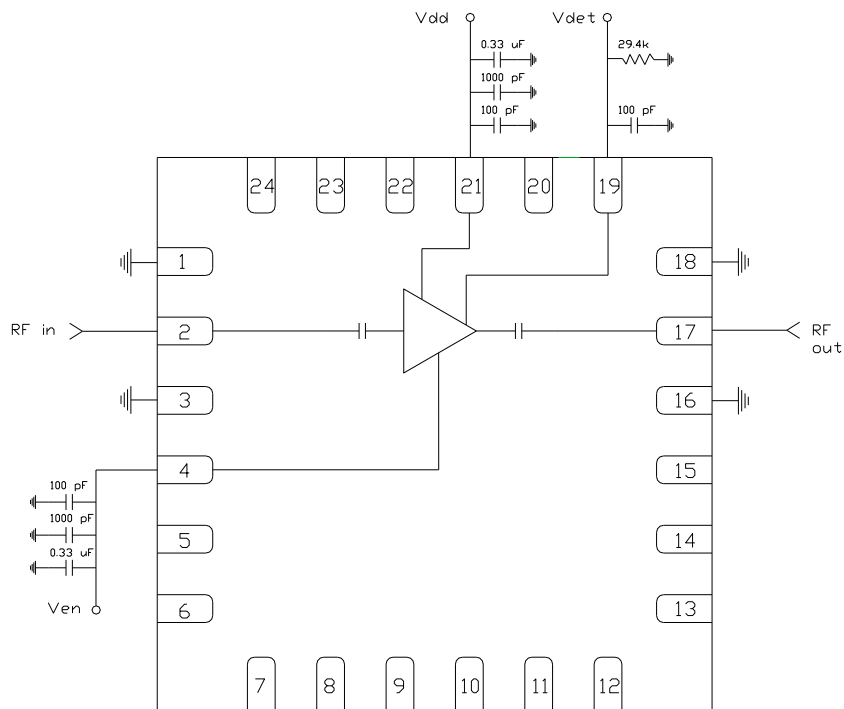


### Functional Description

Pad	Function	Description	Schematic
2	RF in	DC blocked and 50 ohm matched	
4	V <sub>en</sub>	Power supply voltage Decoupling and bypass caps required	
17	RF out	DC blocked and 50 ohm matched	
19	V <sub>det</sub>	Detector Voltage	
21	V <sub>dd</sub>	Power supply voltage Decoupling and bypass caps required	
1, 3, 16, 18, and die paddle	Ground	Connect to RF / DC ground	

## Applications Information

### Application Circuit



### Biasing and Operation

The CMD169P4 is biased with a positive drain supply and positive enable supply.

Turn ON procedure:

1. Apply drain voltage  $V_{dd}$  and set to +7 V
2. Apply enable voltage  $V_{en}$  and set to +3 V

Turn OFF procedure:

1. Turn off enable voltage  $V_{en}$
2. Turn off drain voltage  $V_{dd}$

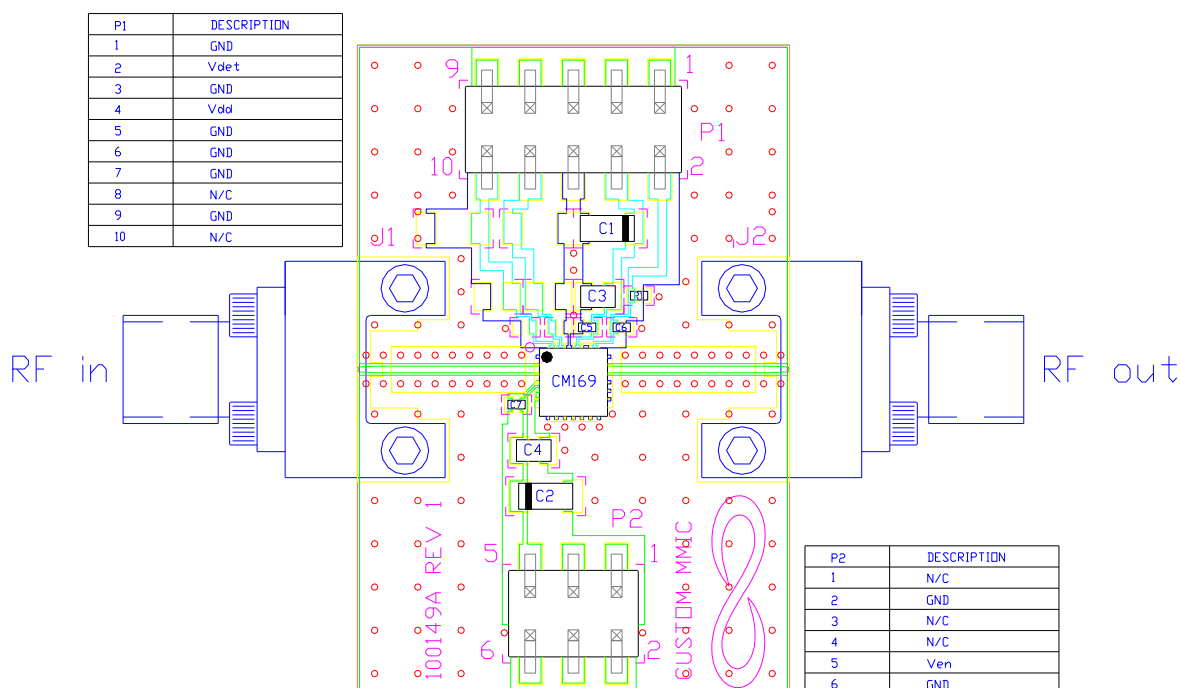
RF power can be applied at any time.

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



## Applications Information

### Evaluation Board



### Bill of Material

Designator	Value	Description
J1, J2		SMA End Launch Connector
P1		10 Pin DC Header
P2		6 Pin DC Header
C1, C2	0.33 $\mu$ F	Capacitor, Tantalum
C3, C4	1000 pF	Capacitor, 0603
C5 - C7	100 pF	Capacitor, 0402
R1	29.4 k $\Omega$	Resistor, 0402
U1		CMD169P4 Driver Amplifier
PCB		100149A Evaluation PCB

## Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1A	ESDA / JEDEC JS-001-2012
MSL – Moisture Sensitivity Level	Level 1	JEDEC standard IPC/JEDEC J-STD-020



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)

## 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.

© 2022 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.