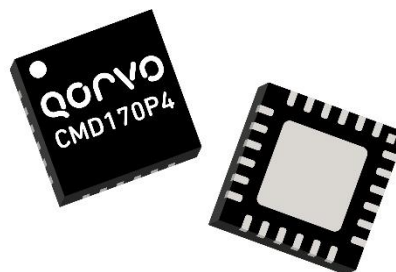


The CMD170P4 is a GaAs MMIC driver amplifier housed in a leadless 4x4 mm plastic surface mount package. The CMD170P4 is ideally suited for complex communications systems where small size and high linearity are needed. At 8 GHz the device delivers 30 dB of gain with a corresponding output 1 dB compression point of greater than +28 dBm. The CMD170P4 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching. The CMD170P4 is also equipped with an on-chip detector for applications where power leveling is required.



## Key Features

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

The schematic diagram illustrates the RF front end circuit for the 802.11b/g/n module. The circuit is implemented within a package footprint with pins 1 through 24. The RF input (RF in) is connected to pin 2, which is part of a matching network consisting of an inductor and a capacitor. The output of this network is connected to the input of a low-noise amplifier (LNA), represented by a triangle symbol. The LNA is powered by Vdd (pin 21) and Vdet (pin 19). The output of the LNA is connected to another matching network (inductor and capacitor) leading to the RF output (RF out) at pin 17. The circuit is also connected to ground (GND) at pins 1, 3, 6, 16, and 18. Other pins are labeled as N/C (Not Connected): pins 24, 23, 22, 20, 15, 14, 13, 12, 11, 10, 9, 8, 7, 5, and 4.

CMD170P4	100 pcs on 7" reel
CMD170P4-EVB	Evaluation Board

Parameter	Min	Typ	Max	Units
Frequency Range		7.5 - 9		GHz
Gain		30		dB
Input Return Loss		12		dB
Output Return Loss		17		dB
Output P1dB		28.3		dBm
Supply Current (V <sub>dd</sub> = 7 V)		365		mA
Enable Current (V <sub>en</sub> = 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	+20 dBm
Channel Temperature, $T_{ch}$	150° C
Power Dissipation, $P_{diss}$	3.62 W
Thermal Resistance, $Q_{JC}$	17.9° 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
$I_{dd}$		365		mA
$V_{en}$	0	3.0	4.0	V
$I_{en}$		19		mA

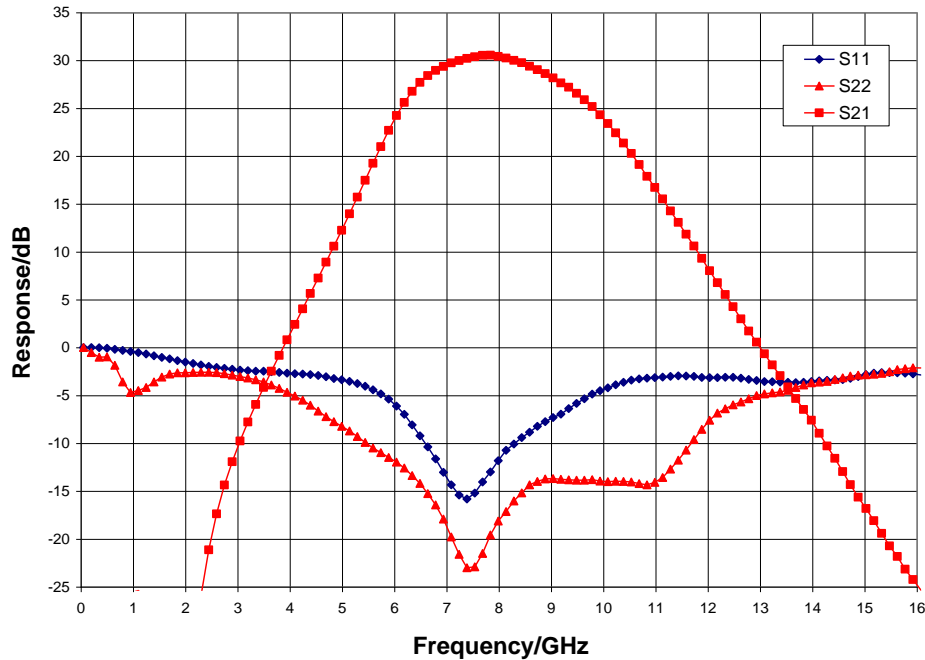
Electrical performance is measured at specific test conditions.  
 Electrical specifications are not guaranteed over all recommended operating conditions.

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

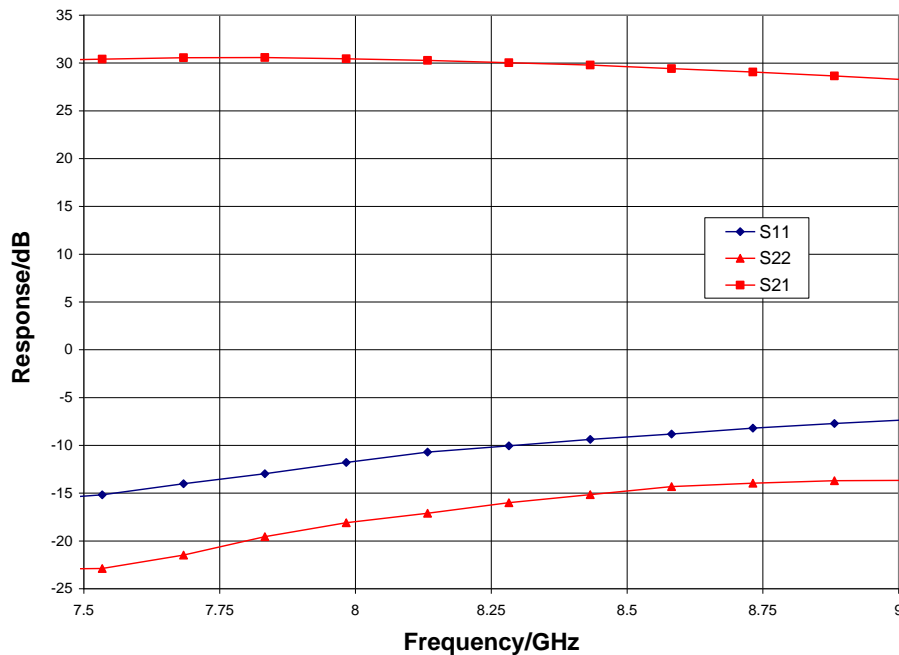
Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		7.5 - 9			7.9 - 8.4		GHz
Gain	26	30	33	27	30	33	dB
Input Return Loss		10			10		dB
Output Return Loss		16			16		dB
Output P1dB	26.5	28		27	28.3		dBm
Output IP3		34			34		dBm
Supply Current	335	365	420	335	365	420	mA
Enable Current		19			19		mA
Gain Temperature Coefficient		0.03			0.03		dB/°C

## Typical Performance

**Broadband Performance,  $V_{dd} = 7.0$  V,  $V_{en} = 3.0$  V,  $I_{dd} = 365$  mA,  $T_A = 25^\circ$  C**

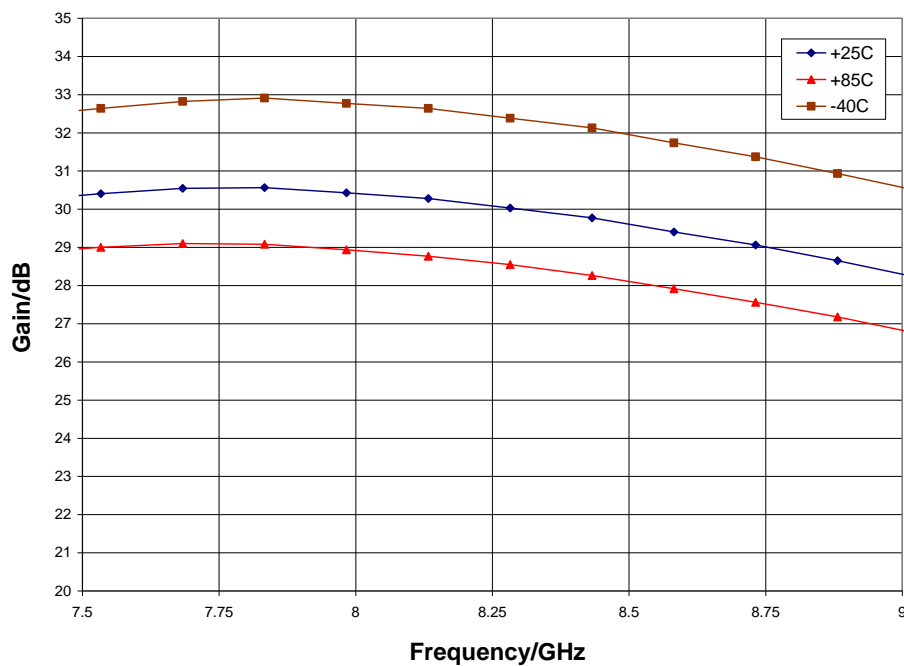


**Narrow-band Performance,  $V_{dd} = 7.0$  V,  $V_{en} = 3.0$  V,  $I_{dd} = 365$  mA,  $T_A = 25^\circ$  C**

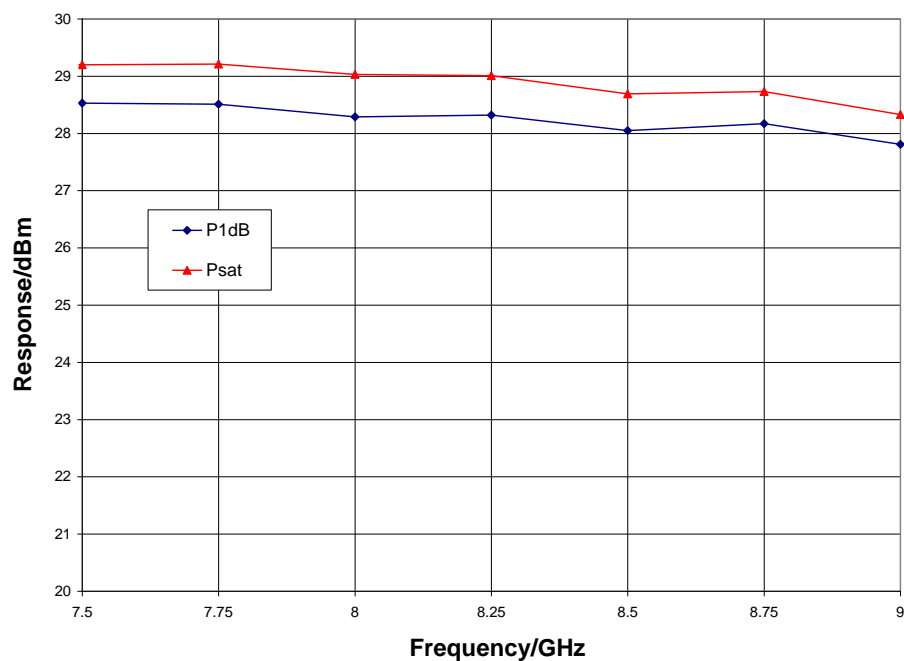


## Typical Performance

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

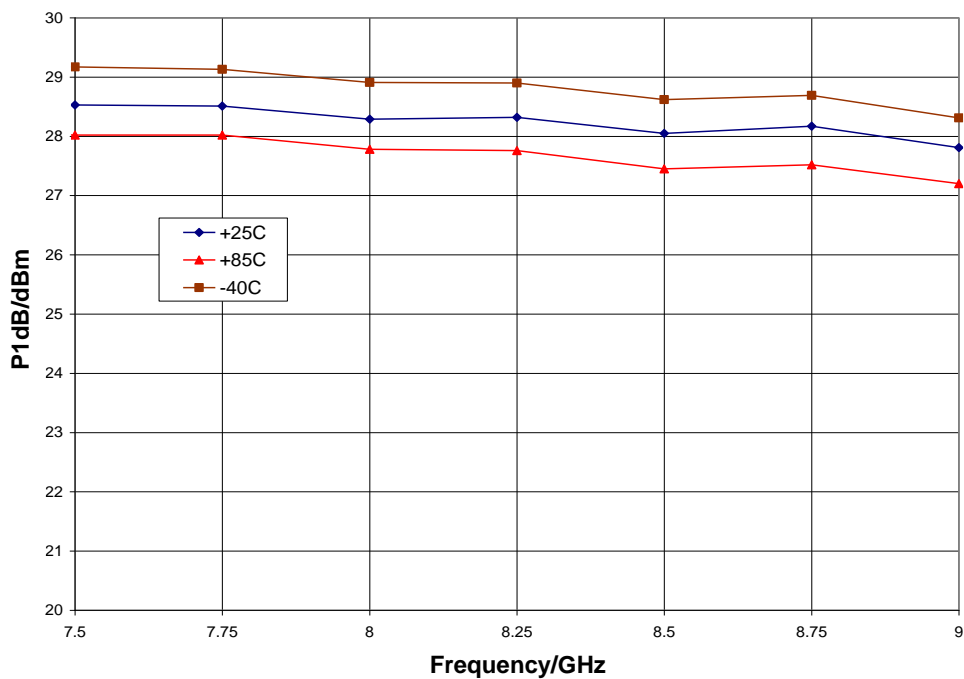


Output Power,  $V_{dd} = 7.0\text{ V}$ ,  $V_{en} = 3.0\text{ V}$ ,  $T_A = 25^\circ\text{C}$

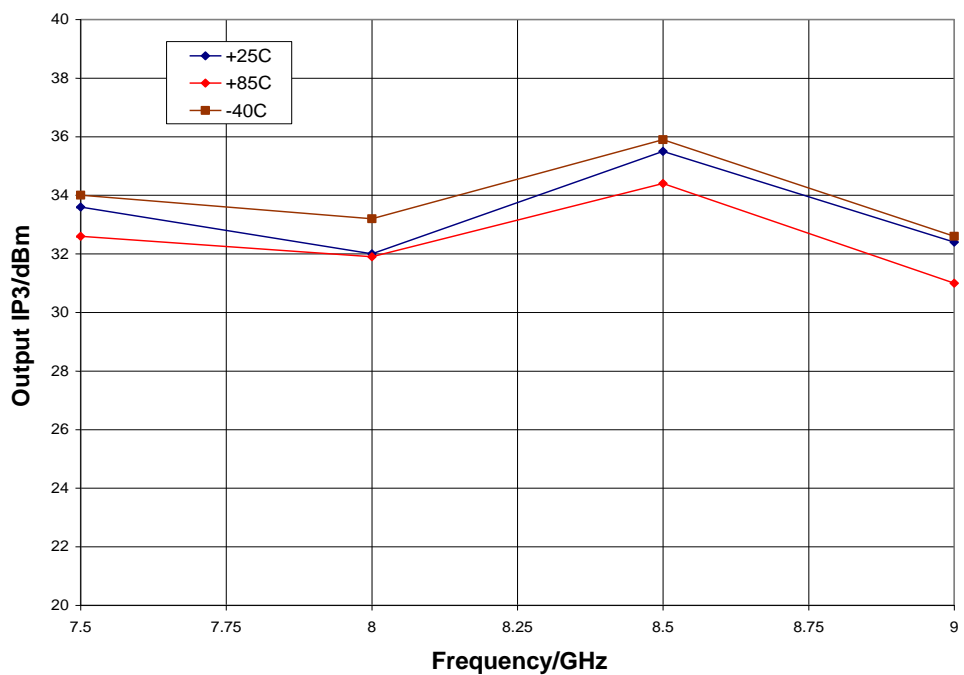


## Typical Performance

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

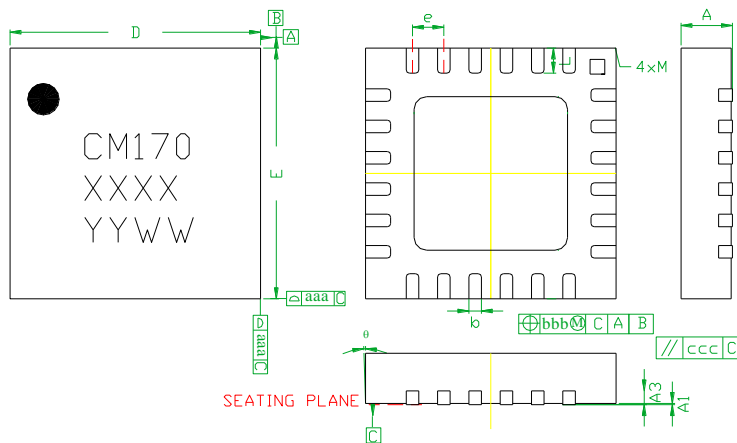


Output IP3 vs. Temperature,  $V_{dd} = 7.0\text{ V}$ ,  $V_{en} = 3.0\text{ V}$



## 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
ø	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

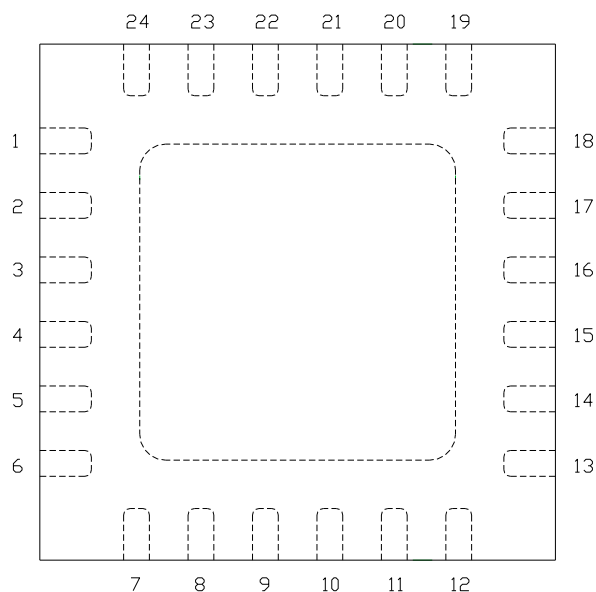
Qorvo recommends that the user develop the land pattern that will provide the best design for proper solder reflow and device attach for their specific application. Please review Qorvo Application Note AN 105 for a recommended land pattern approach.

### 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

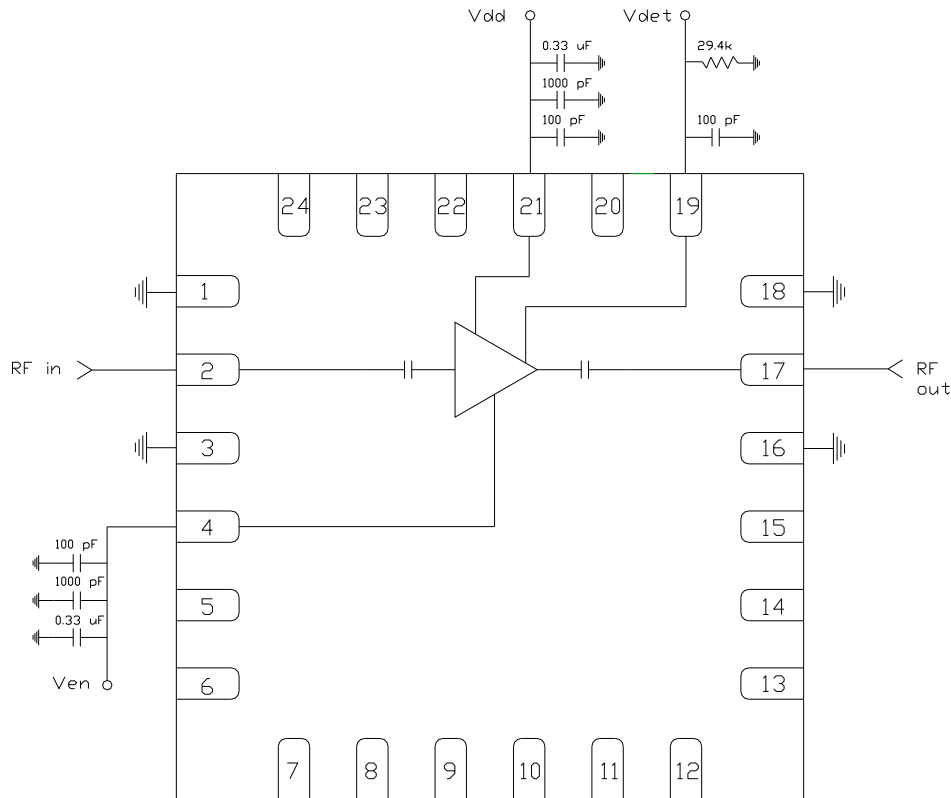


### Functional Description

Pad	Function	Description	Schematic
2	RF in	DC blocked and 50 ohm matched	
4	$V_{en}$	Power supply enable voltage Decoupling and bypass caps required	
17	RF out	DC blocked and 50 ohm matched	
19	$V_{det}$	Detector voltage	
21	$V_{dd}$	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 CMD170P4 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:

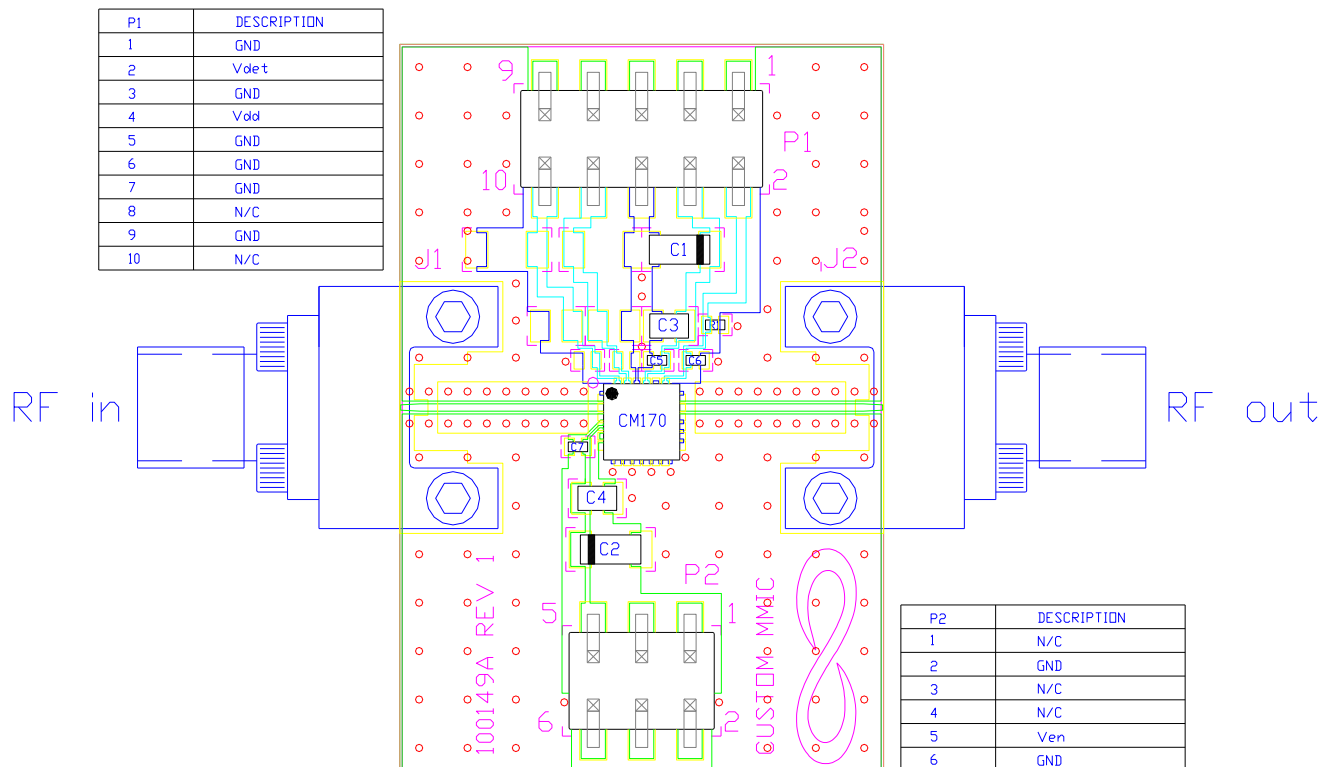
1. Turn off enable voltage  $V_{en}$
2. Turn off drain voltage  $V_{dd}$

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		CMD170P4 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	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
- PFOS Free
- Halogen 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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