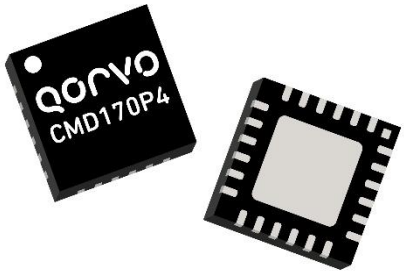
CMD170P4

7.5-9 GHz Driver Amplifier

Product Overview

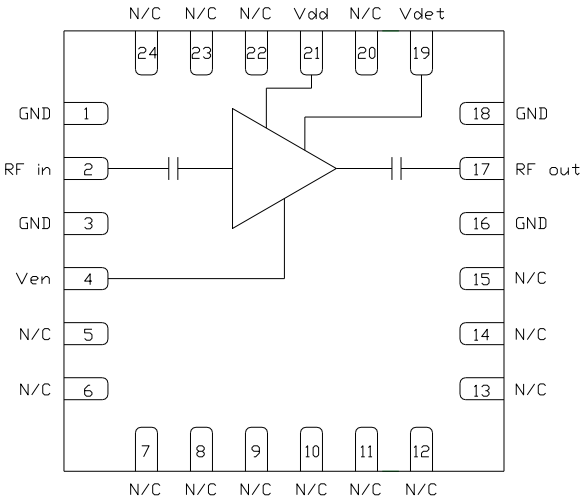
The CMD170P4 is a GaAs MMIC driver amplifier housed in a leadless 4x4 mm plastic surface mount package. The CMD170P4 is ideally suited for complex communications systems where small size and high linearity are needed. At 8 GHz the device delivers 30 dB of gain with a corresponding output 1 dB compression 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

Functional Block Diagram



Ordering Information

Part No.	Description
CMD170P4	7.5-9 GHz Driver Amplifier, 100 Piece 7” Reel
CMD170P4-EVB	Evaluation Board

Electrical Performance (V_{dd} = 7.0 V, V_{en} = 3.0 V, T_A = 25 °C, F = 8 GHz)

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_{dd} = 7 V)		365		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	+20 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	3.62 W
Thermal Resistance, θ_{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

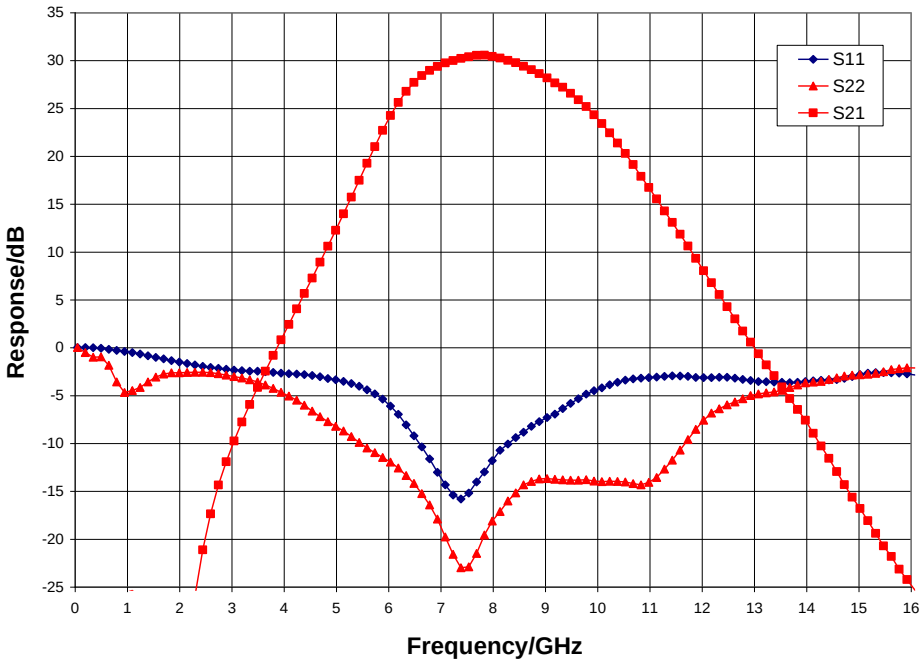
Electrical performance is measured at specific test conditions. Electrical specifications are not guaranteed over all recommended operating conditions.

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

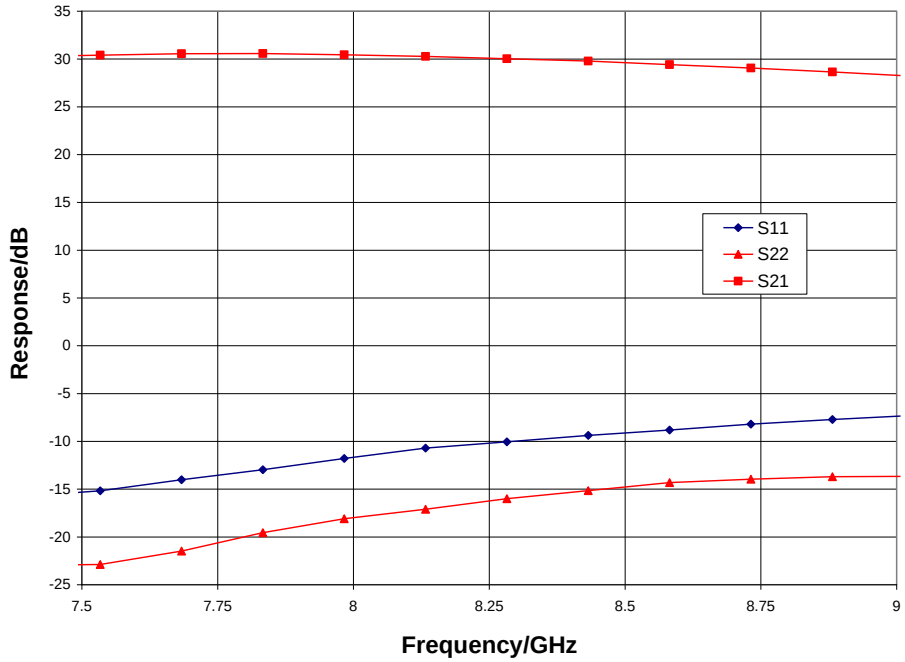
Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		7.5 - 9			7.9 - 8.4		GHz
Gain	26	30	33	27	30	33	dB
Input Return Loss		10			10		dB
Output Return Loss		16			16		dB
Output P1dB	26.5	28		27	28.3		dBm
Output IP3		34			34		dBm
Supply Current	335	365	395	335	365	395	mA
Enable Current		19			19		mA
Gain Temperature Coefficient		0.03			0.03		dB/°C

Typical Performance

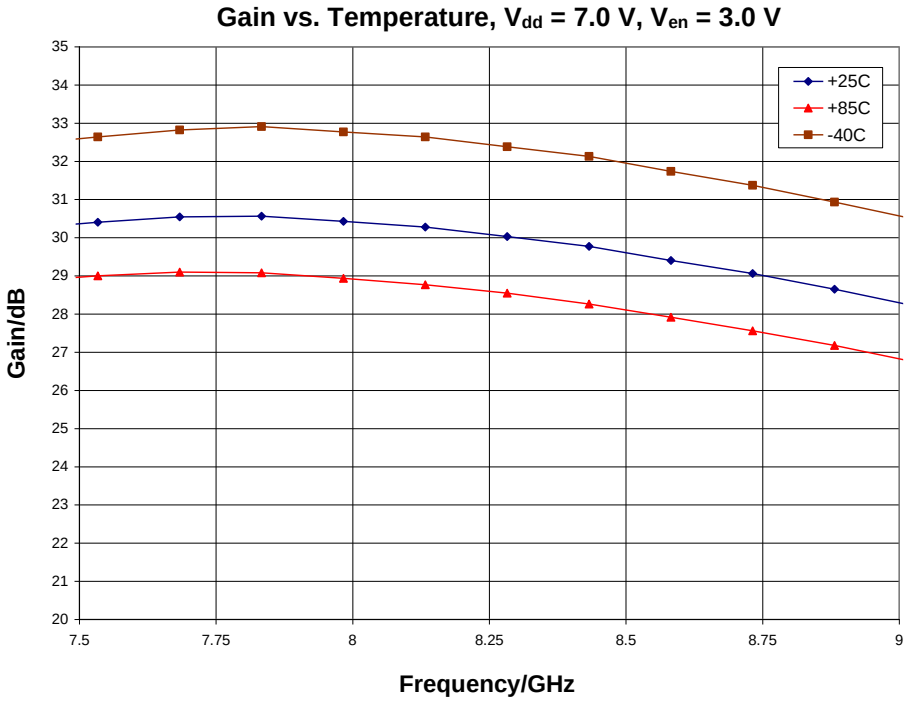
Broadband Performance, V_{dd} = 7.0 V, V_{en} = 3.0 V, I_{dd} = 365 mA, T_A = 25 °C

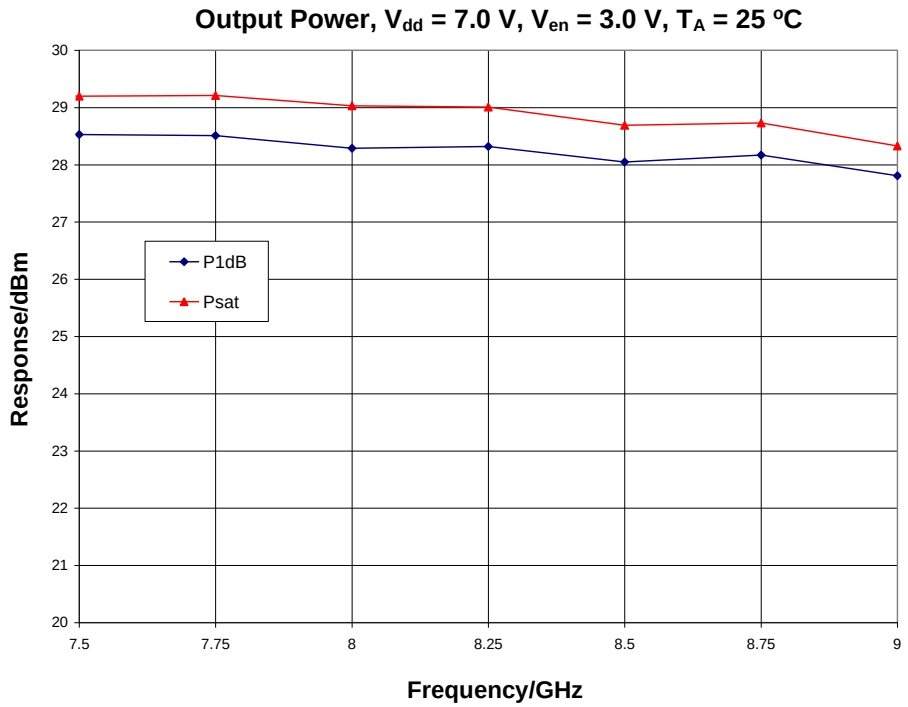


Narrow-band Performance, V_{dd} = 7.0 V, V_{en} = 3.0 V, I_{dd} = 365 mA, T_A = 25 °C



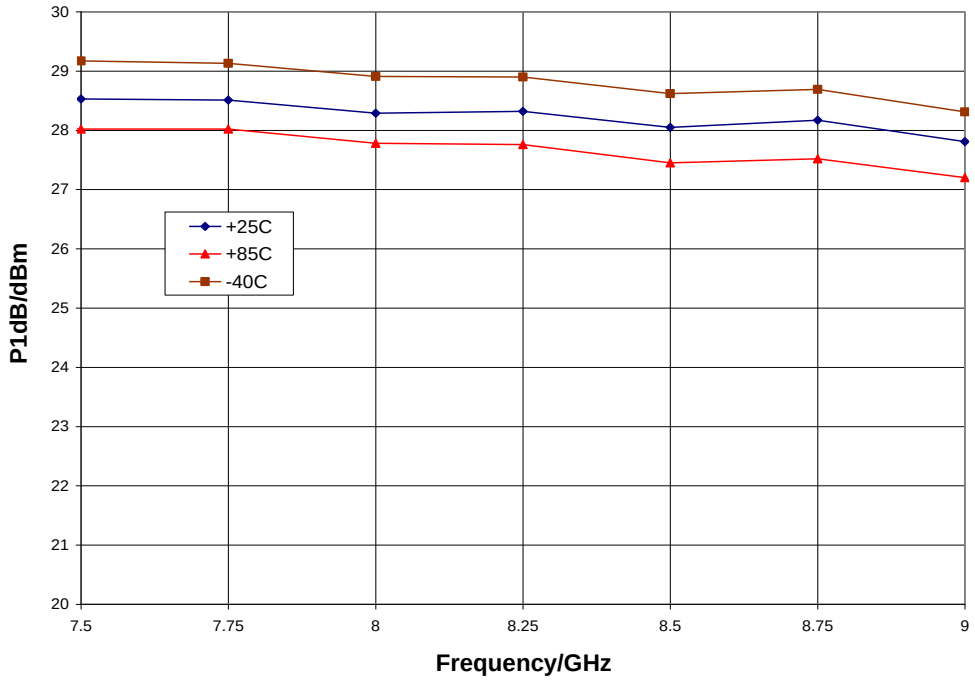
Typical Performance



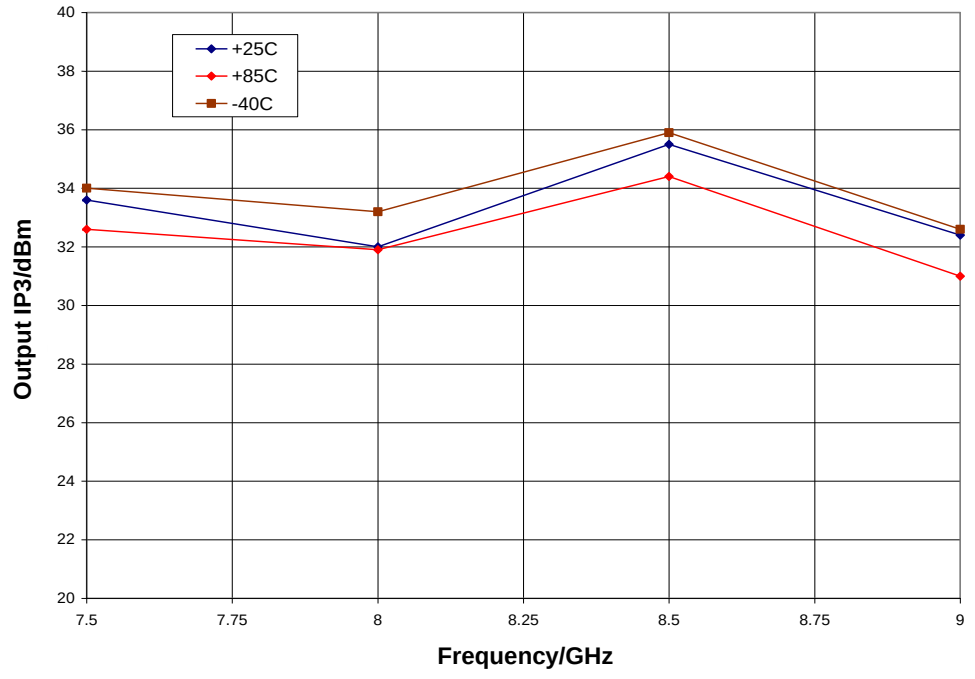


Typical Performance

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

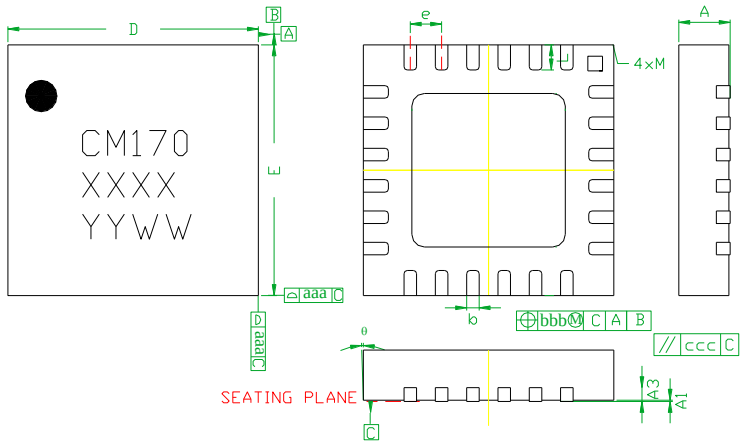


Output IP3 vs. Temperature, V_{dd} = 7.0 V, V_{en} = 3.0 V



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
θ	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

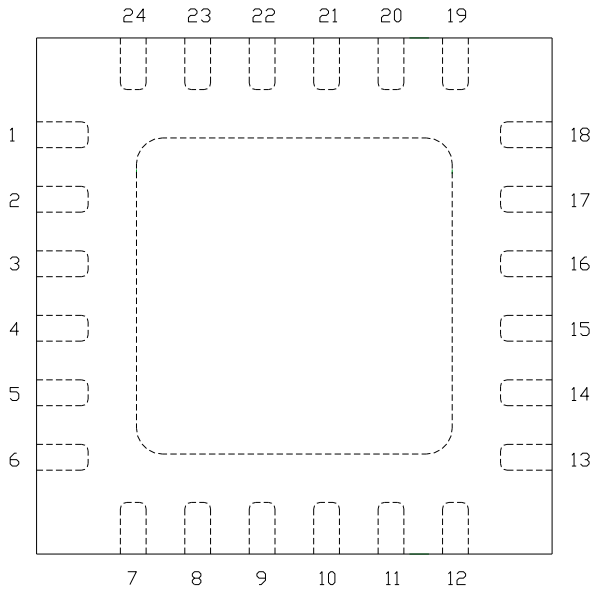
Qorvo recommends that the user develop the land pattern that will provide the best design for proper solder reflow and device attach for their specific application. Please review Qorvo Application Note AN 105 for a recommended land pattern approach.

Recommended Solder Reflow Profile

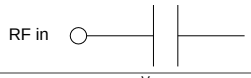
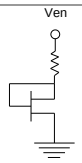
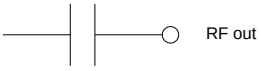
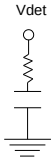
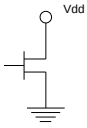
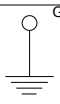
Qorvo recommends screen printing with belt furnace reflow to ensure proper solder reflow and device attach. Please review Qorvo Application Note AN 102 for a recommended solder reflow profile.

Pin Description

Pin Diagram

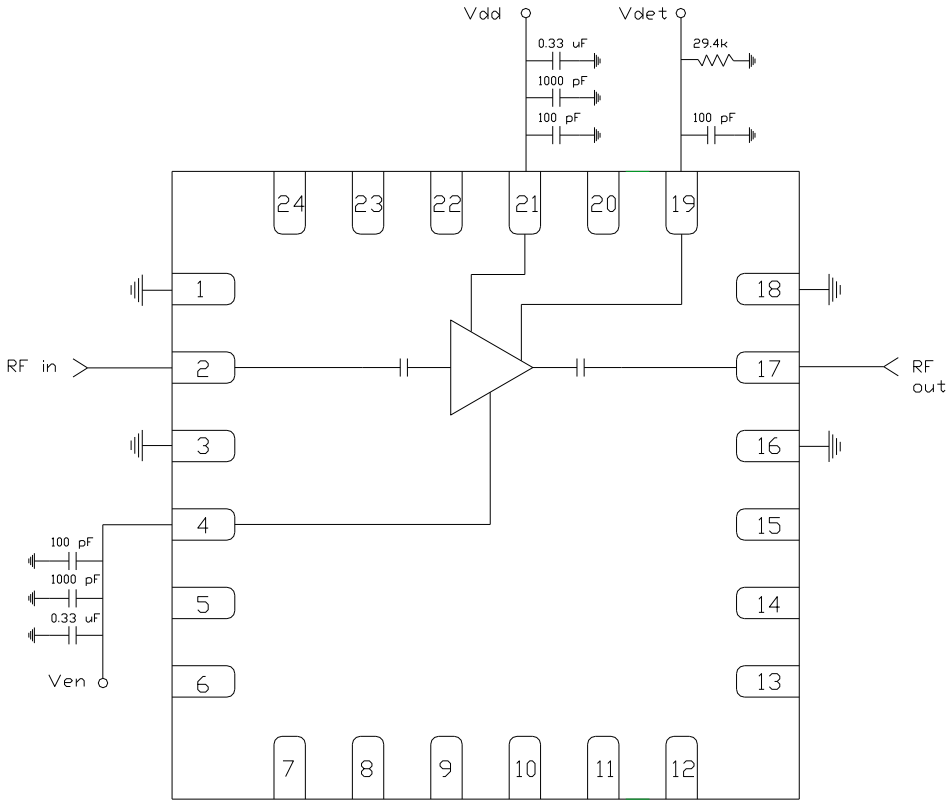


Functional Description

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:

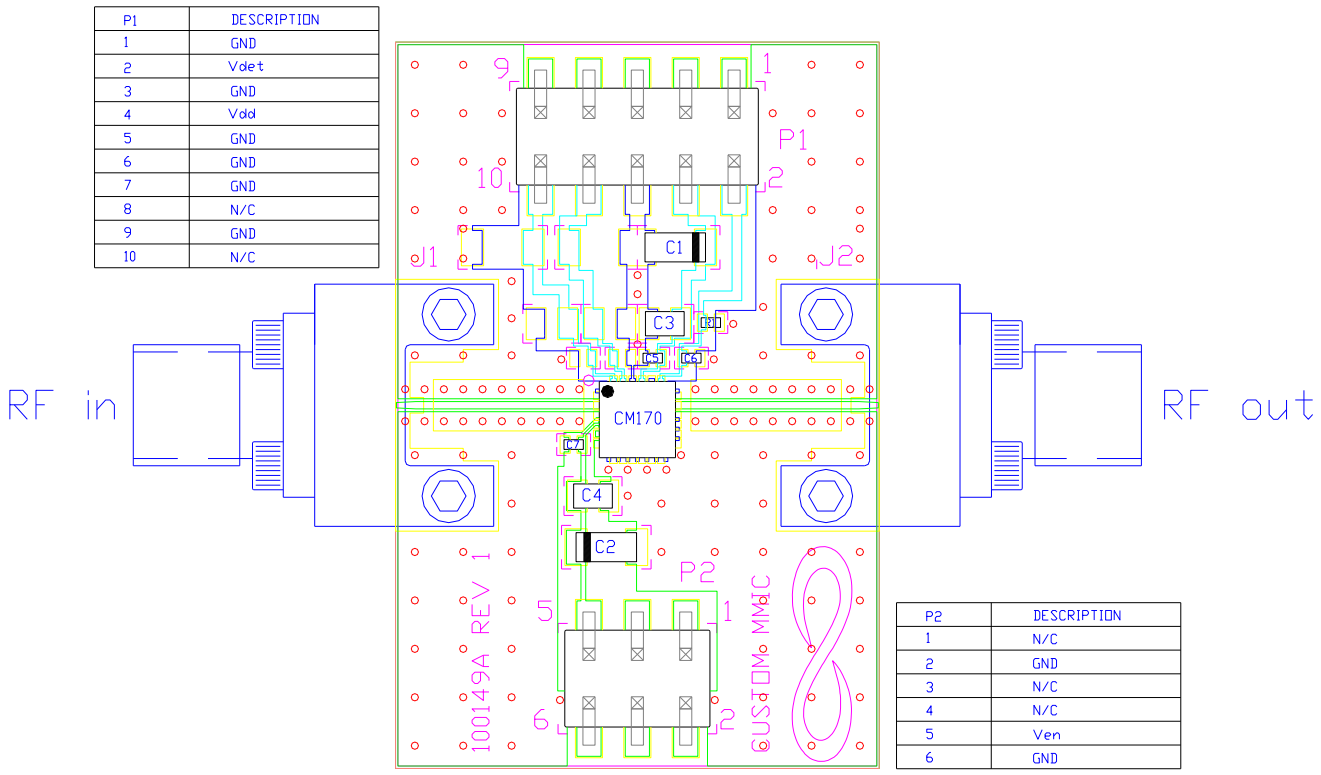
1. Turn off enable voltage V_{en}
2. Turn off drain voltage V_{dd}

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 µF	Capacitor, Tantalum
C3, C4	1000 pF	Capacitor, 0603
C5 - C7	100 pF	Capacitor, 0402
R1	29.4 kΩ	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 ($C_{15}H_{12}Br_4O_2$) Free
- SVHC Free
- Halogen Free
- PFOS Free

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

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Email: customer.support@qorvo.com

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