



# CMD169P4

## 5-7 GHz Driver Amplifier

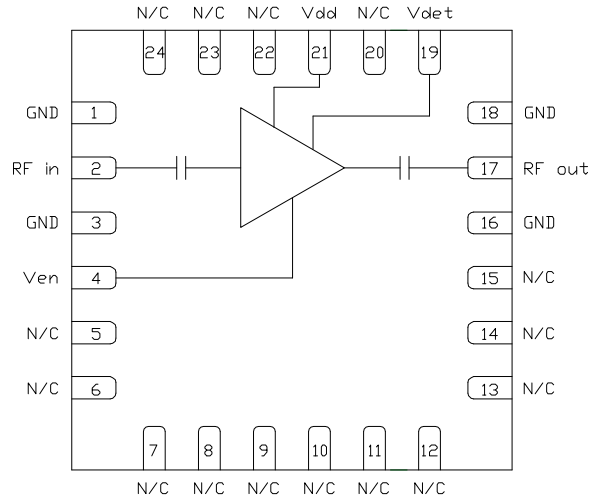
### Features

- ▶ High output power
- ▶ On-chip detector
- ▶ All positive bias
- ▶ Pb-free RoHs compliant 4x4 QFN package

### Description

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



### Electrical Performance - $V_{dd} = 7.0\text{ V}$ , $V_{en} = 3.0\text{ V}$ , $T_A = 25\text{ }^\circ\text{C}$ , $F = 6\text{ GHz}$

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 ( $V_{dd} = 7\text{ V}$ )		375		mA
Enable Current ( $V_{en} = 3\text{ V}$ )		19		mA

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### Specifications

#### Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	8.0 V
Enable Voltage, Ven	4.0 V
RF Input Power	+25 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	3.69 W
Thermal Resistance	17.6 °C/W
Operating Temperature	-40 to 85 °C
Storage Temperature	-55 to 150 °C

Operation of this device outside the maximum ratings may cause permanent damage.

#### Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Vdd	5.0	7.0	8.0	V
Idd		375		mA
Ven	0	3.0	4.0	V
Ien		19		mA

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

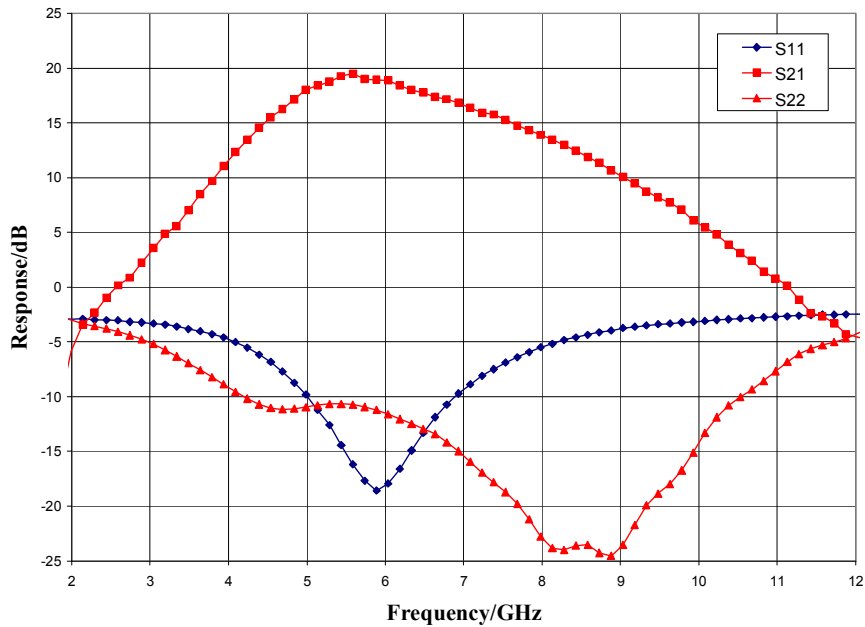
#### Electrical Specifications - V<sub>dd</sub> = 7.0 V, Ven=3.0 V T<sub>A</sub> = 25 °C

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

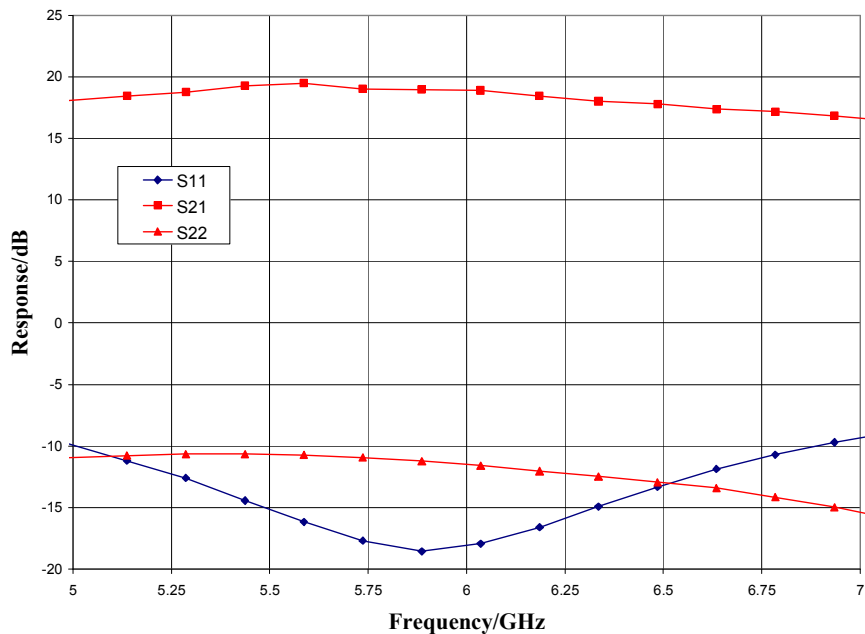
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### Typical Performance

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



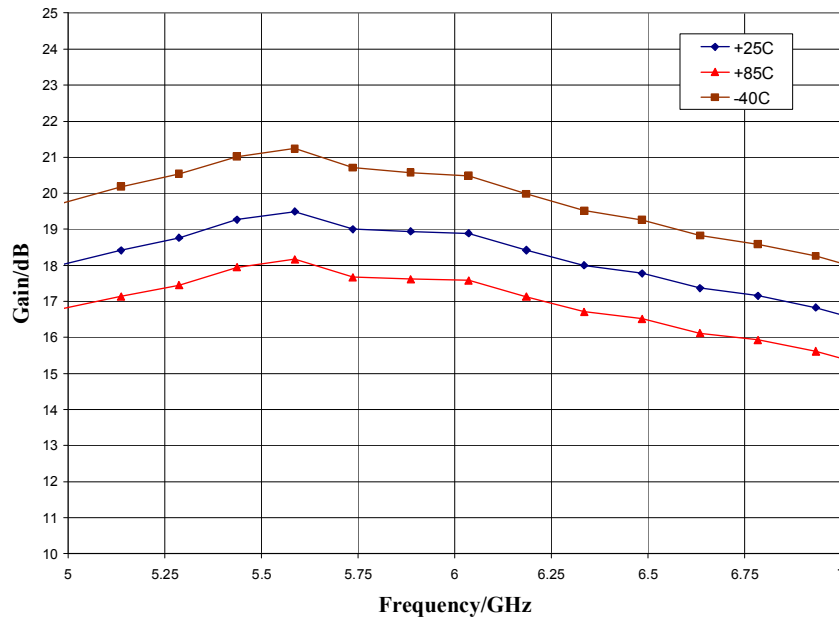
**Narrow-band Performance,  $V_{dd} = 7.0$  V,  $V_{en} = 3.0$  V,  $I_{dd} = 375$  mA,  $T_A = 25$  °C**



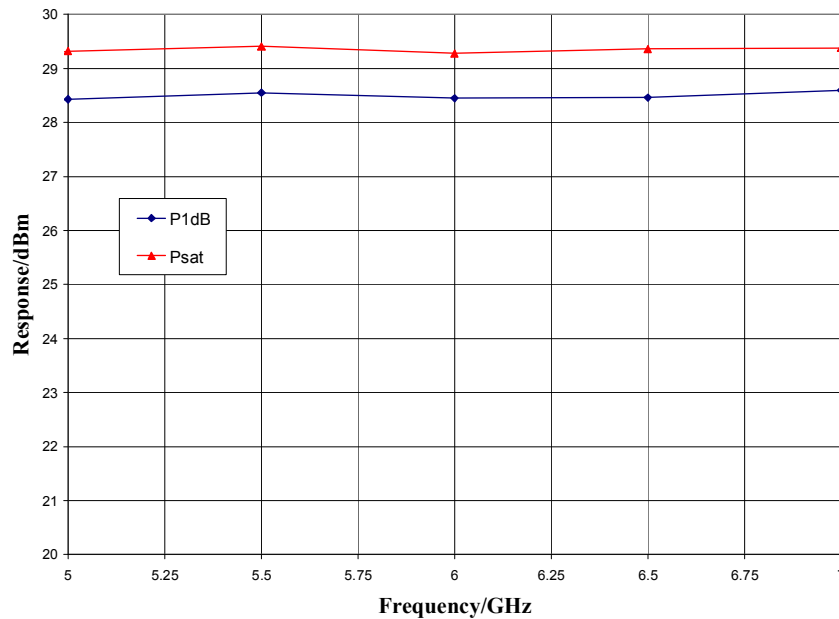
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### Typical Performance

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



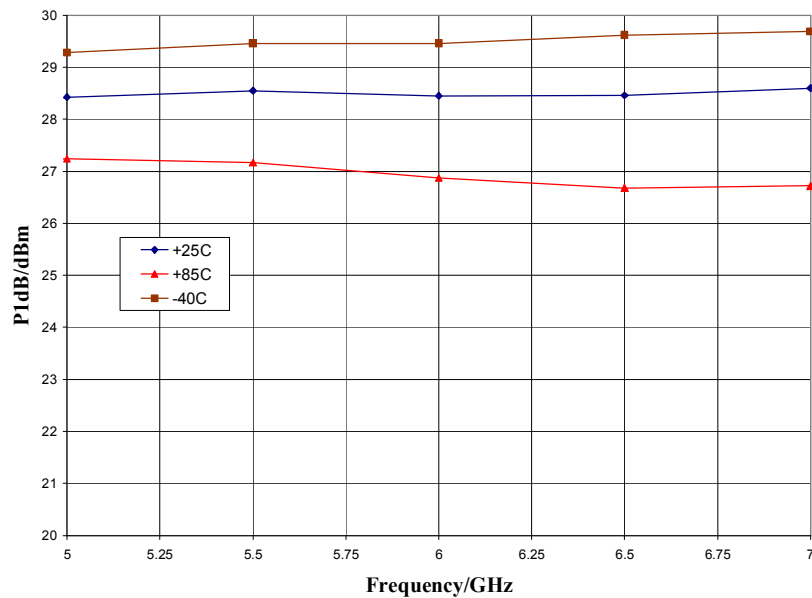
Output Power,  $V_{dd} = 7.0\text{ V}$ ,  $V_{en} = 3.0\text{ V}$ ,  $T_A = 25\text{ }^\circ\text{C}$



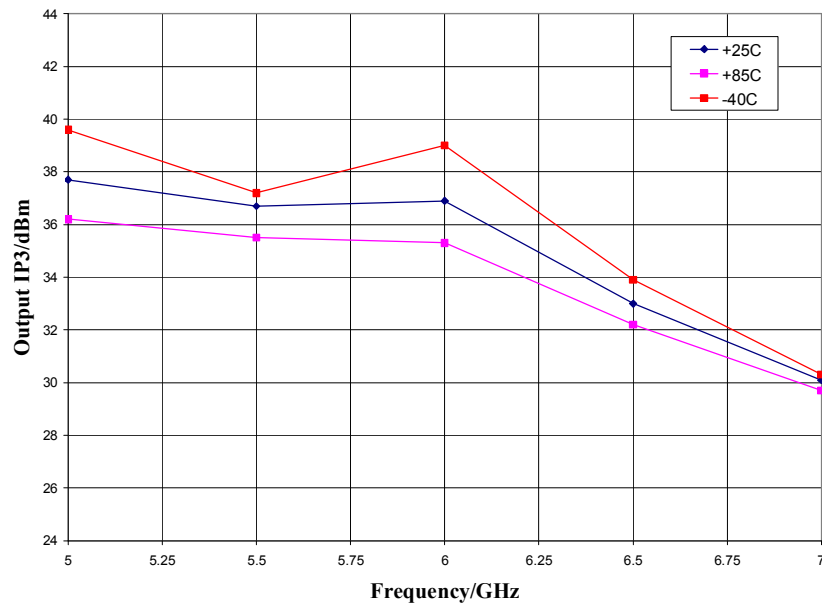
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### Typical Performance

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



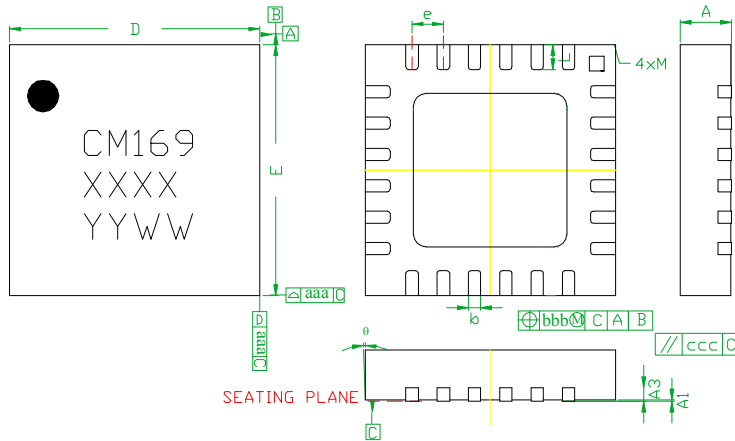
**Output IP3 vs. Temperature,  $V_{dd} = 7.0\text{ V}$ ,  $V_{en} = 3.0\text{ V}$**



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### Mechanical Information

#### Package Information and Dimensions

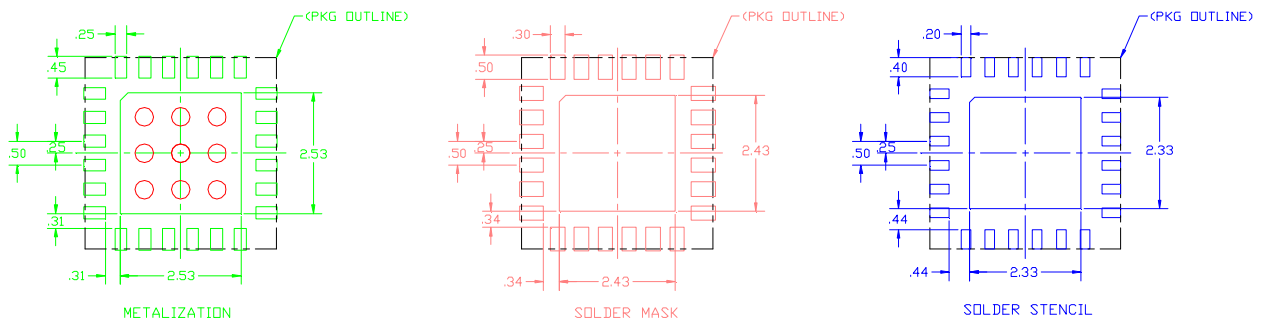


SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	0.80	0.90	1.00
A1	0	0.02	0.05
A3	---	0.25REF.	---
b	0.18	0.23	0.30
D	3.85	4.00	4.15
D1	---	2.45BSC	---
E	3.85	4.00	4.15
E1	---	2.45BSC	---
e	---	0.50BSC	---
L	0.30	0.40	0.50
ø	0	---	12
aaa	---	0.25	---
bbb	---	0.10	---
ccc	---	0.10	---
M	---	---	0.05

NOTES:

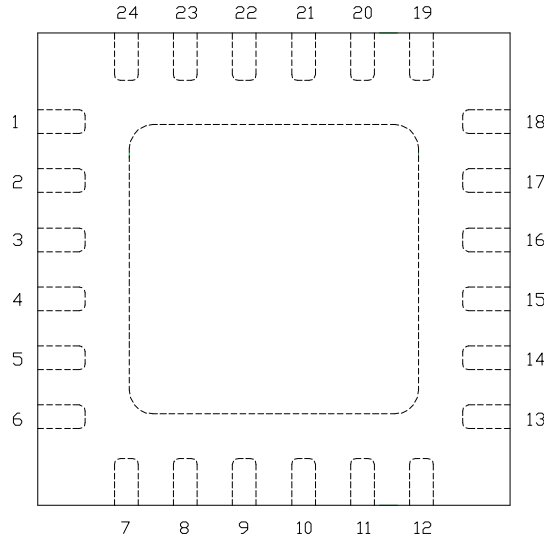
1. DIMENSIONS ARE IN MILLIMETERS
2. RoHS COMPLIANT MOLD COMPOUND
3. LEADFRAME MATERIAL: COPPER ALLOY
4. LEAD FINISH: 100% MATTE Sn
5. INDICATED DIMENSION/TOLERANCE APPLIES TO LEADS AND EXPOSED PAD

#### Recommended PCB Land Pattern


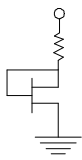

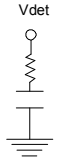




### Pin Description

#### Pin Diagram



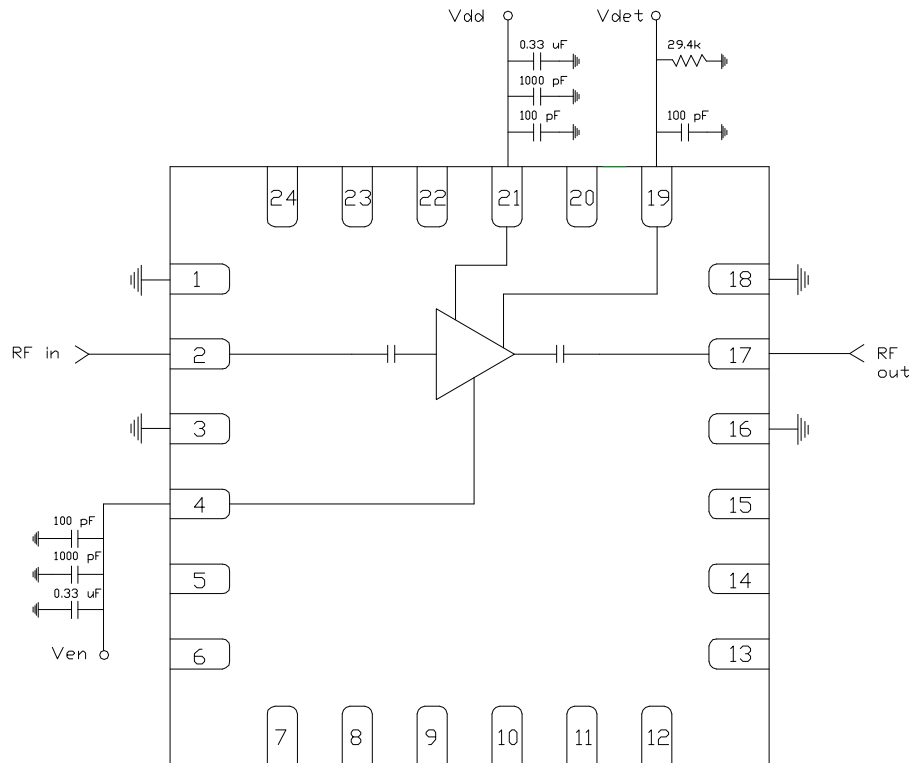
#### Functional Description

Pad	Function	Description	Schematic
2	RF in	DC blocked and 50 ohm matched	
4	Ven	Power supply enable voltage Decoupling and bypass caps required	
17	RF out	DC blocked and 50 ohm matched	
19	Vdet	Detector voltage	
21	Vdd	Power supply voltage Decoupling and bypass caps required	
1,3,16,18 and die paddle	Ground	Connect to RF / DC ground	

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### 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.

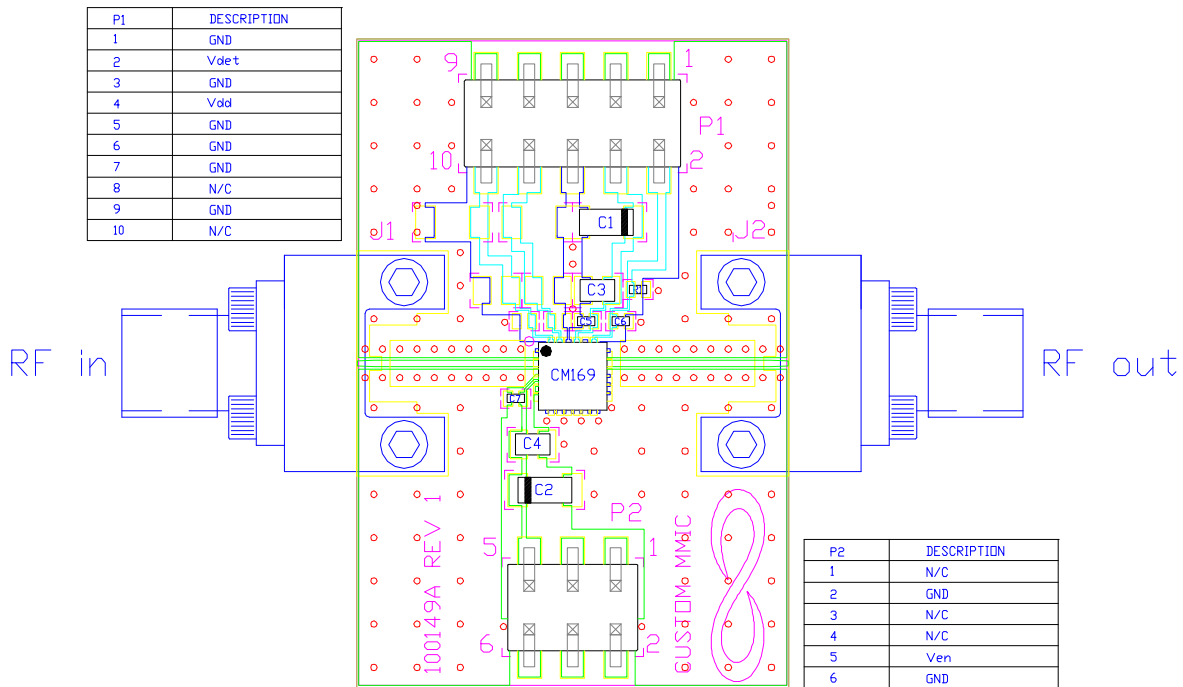
**GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.**

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### 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

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