



CMD189P3

10-14 GHz Low Noise Amplifier

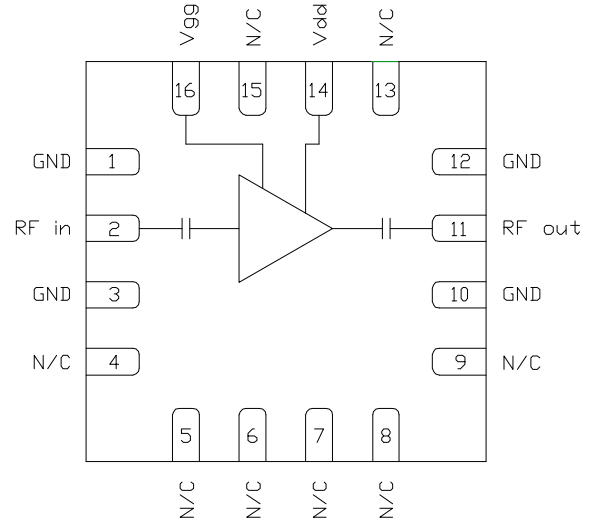
Features

- ▶ Low noise figure
- ▶ Low current consumption
- ▶ High gain
- ▶ All positive supply voltages
- ▶ Pb-free RoHs compliant 3x3 QFN package

Description

The CMD189P3 is a broadband MMIC low noise amplifier housed in a leadless 3x3 mm plastic surface mount package. The CMD189P3 is ideally suited for EW and communications systems where small size and low power consumption are needed. The device operates from 10 to 14 GHz and delivers greater than 19 dB of gain with a corresponding output 1 dB compression point of +4 dBm and noise figure of 1.4 dB. The CMD189P3 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching.

Functional Block Diagram



Electrical Performance - $V_{dd} = 1.5\text{ V}$, $V_{gg} = 1.5\text{ V}$, $T_A = 25\text{ }^\circ\text{C}$, $F = 12\text{ GHz}$

Parameter	Min	Typ	Max	Units
Frequency Range	10 - 14			GHz
Gain		19		dB
Noise Figure		1.4		dB
Input Return Loss		14		dB
Output Return Loss		22		dB
Output IP3		13		dBm
Supply Current		20		mA

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Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, V _{dd}	4.5 V
Gate Voltage, V _{gg}	3.0 V
RF Input Power	+20 dBm
Channel Temperature, T _{ch}	150 °C
Power Dissipation, P _{diss}	302 mW
Thermal Resistance	215 °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
V _{dd}	1.0	1.5	4.0	V
I _{dd}		20		mA
V _{gg}	0	1.5	2.0	V

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

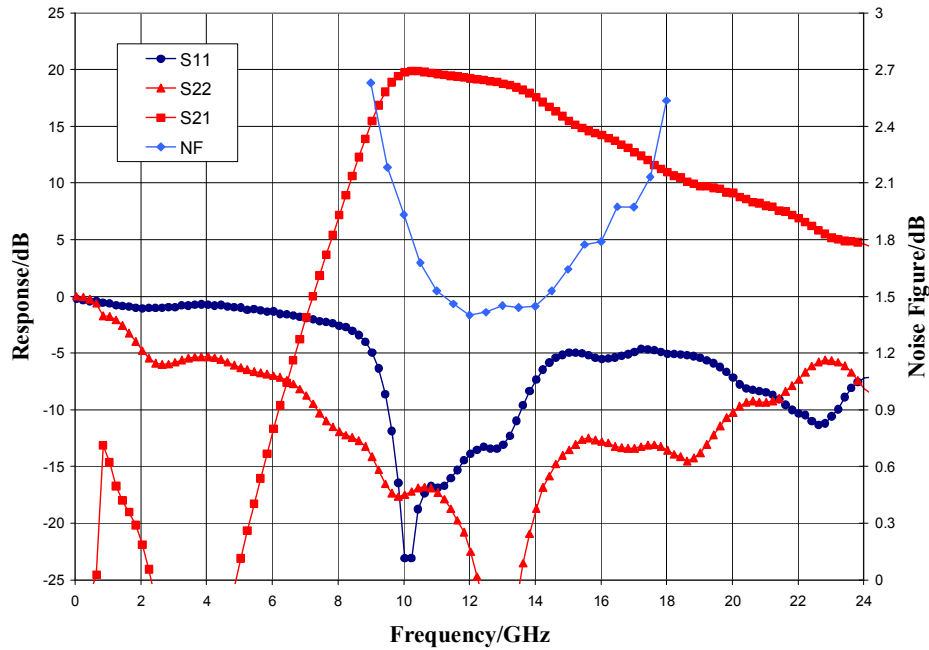
Electrical Specifications - V_{dd} = 1.5 V, V_{gg} = 1.5 V, T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	10 - 12			12 - 14			GHz
Gain	16.5	19.5	23	15	18.5	22	dB
Noise Figure		1.5	2.3		1.4	1.8	dB
Input Return Loss		17			13		dB
Output Return Loss		18			25		dB
Output P _{1dB}		3			5		dBm
Output IP ₃		13			14		dBm
Supply Current	14	20	26	14	20	26	mA
Gain Temperature Coefficient		0.014			0.014		dB/°C
Noise Figure Temperature Coefficient		0.008			0.008		dB/°C

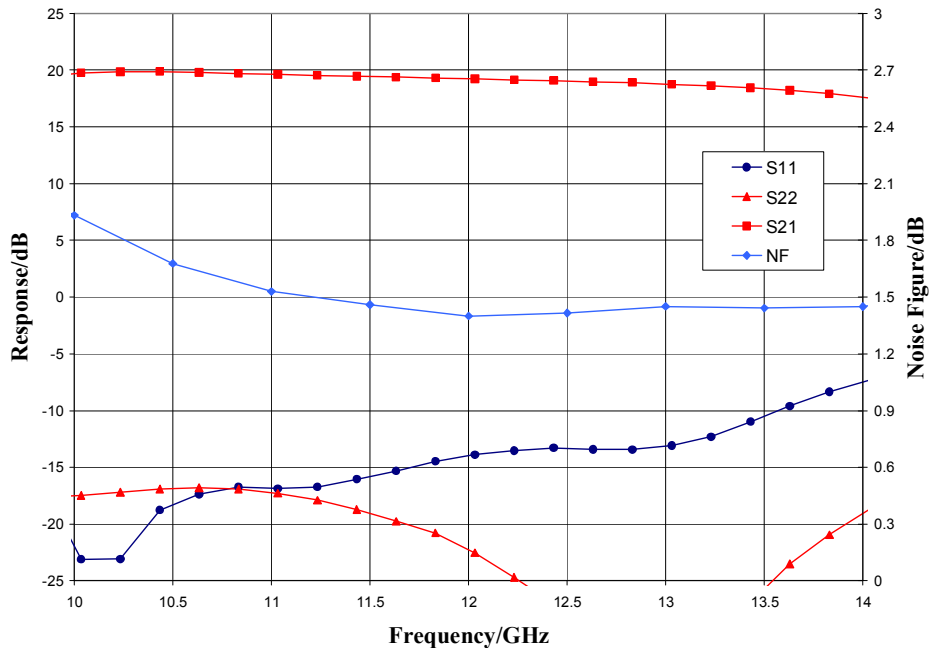
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Typical Performance

Broadband Performance, $V_{dd} = 1.5\text{ V}$, $V_{gg} = 1.5\text{ V}$, $I_{dd} = 20\text{ mA}$, $T_A = 25\text{ }^\circ\text{C}$



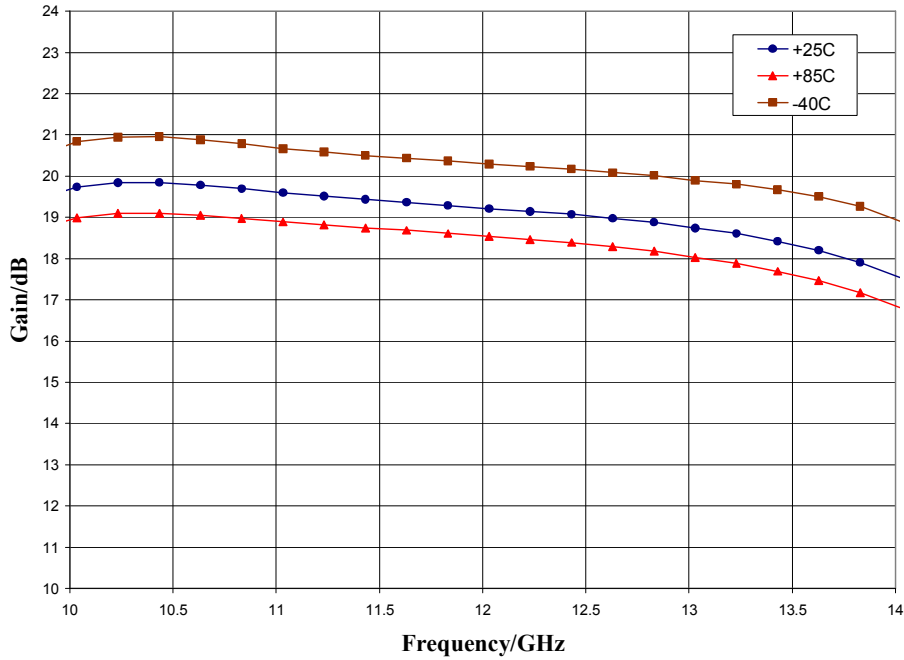
Narrow-band Performance, $V_{dd} = 1.5\text{ V}$, $V_{gg} = 1.5\text{ V}$, $I_{dd} = 20\text{ mA}$, $T_A = 25$



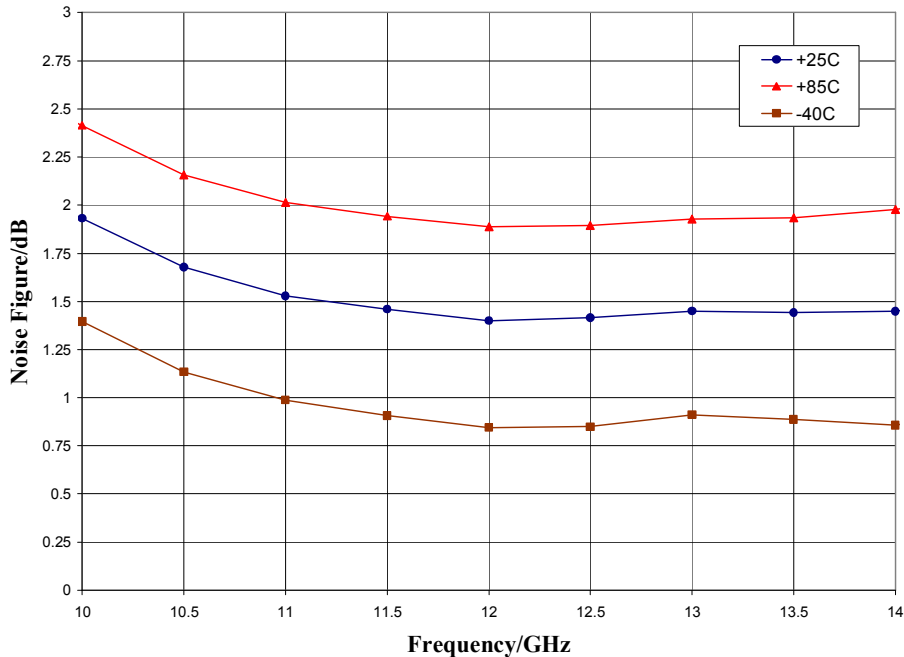
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Typical Performance

Gain vs. Temperature, $V_{dd} = 1.5\text{ V}$, $V_{gg} = 1.5\text{ V}$



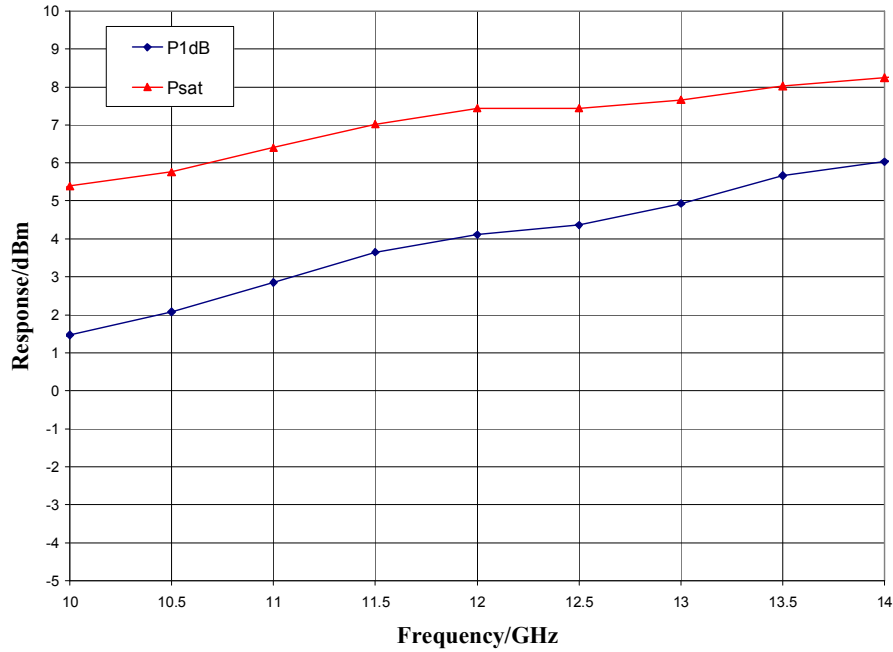
Noise Figure vs. Temperature, $V_{dd} = 1.5\text{ V}$, $V_{gg} = 1.5\text{ V}$



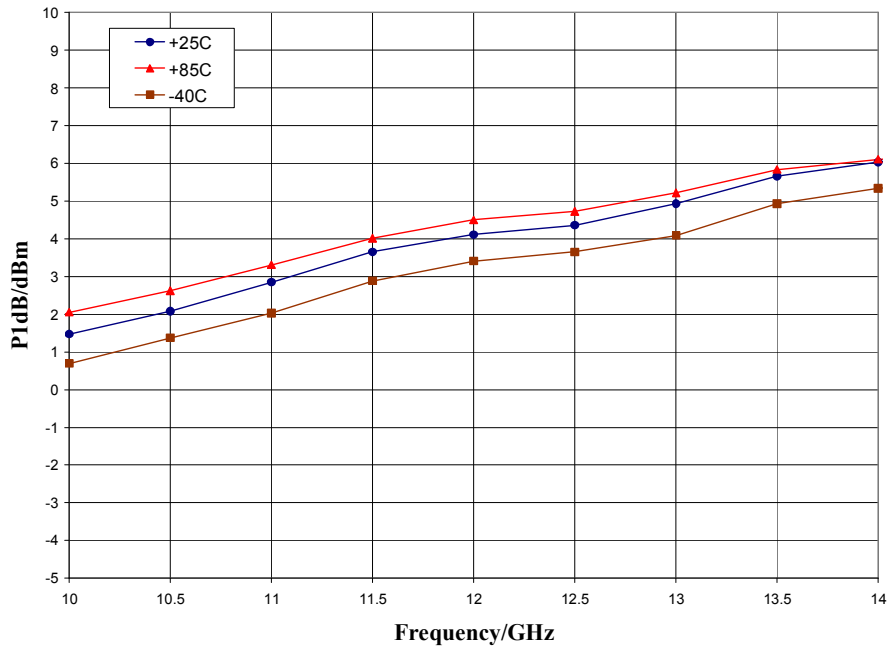
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Typical Performance

Output Power, $V_{dd} = 1.5\text{ V}$, $V_{gg} = 1.5\text{ V}$, $T_A = 25\text{ }^\circ\text{C}$



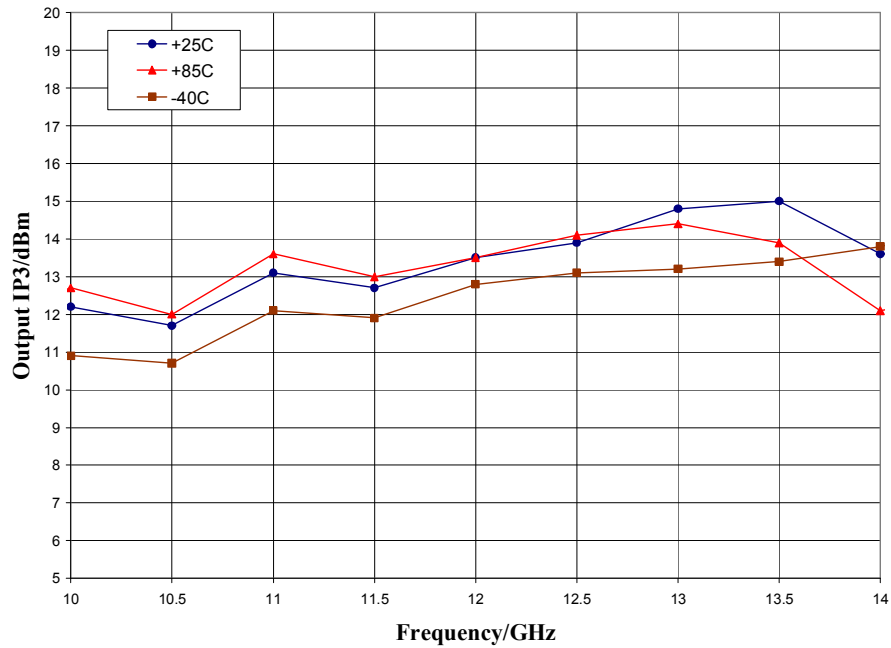
P1dB vs. Temperature, $V_{dd} = 1.5\text{ V}$, $V_{gg} = 1.5\text{ V}$



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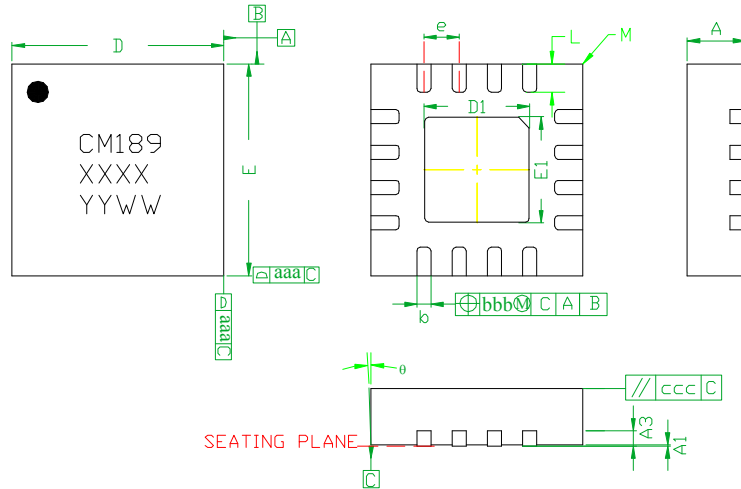
Typical Performance

Output IP3 vs. Temperature, $V_{dd} = 1.5\text{ V}$, $V_{gg} = 1.5\text{ V}$



Mechanical Information

Package Information and Dimensions

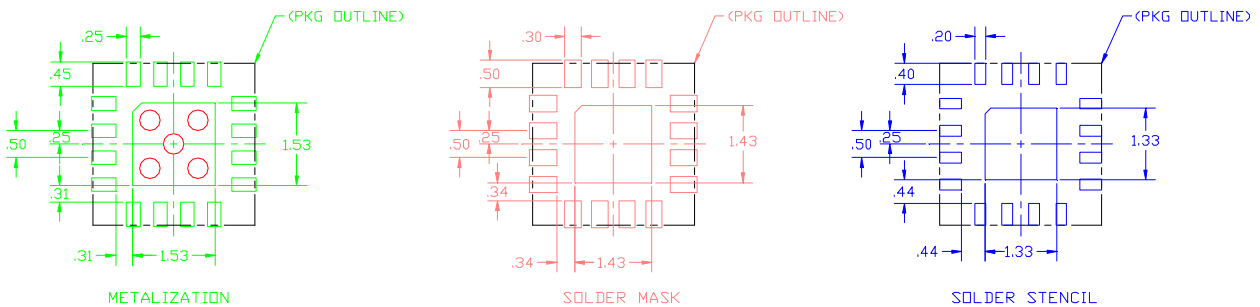


SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	0.80	0.90	1.00
A1	0	0.02	0.05
A3	—	0.25REF.	—
b	0.17	0.23	0.30
D	2.85	3.00	3.15
D1	1.5	1.6	1.7
E	2.85	3.00	3.15
E1	1.5	1.6	1.7
e	—	0.50BSC	—
L	0.30	0.40	0.50
o	0	—	12
aaa	—	0.25	—
bbb	—	0.10	—
ccc	—	0.10	—
M	—	—	0.05

NOTES:

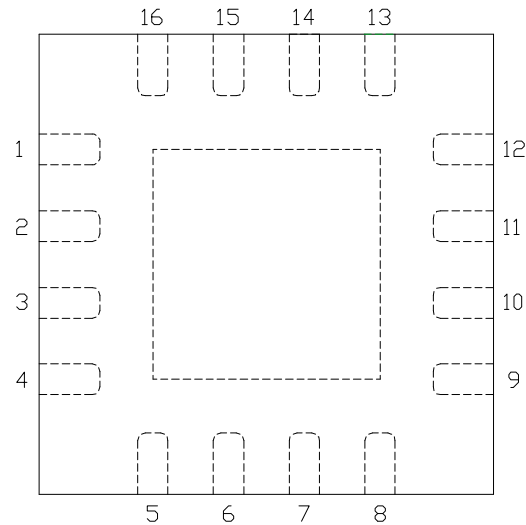
1. DIMENSIONS ARE IN MILLIMETERS
2. RoHS COMPLIANT MOLD COMPOUND
3. LEADFRAME MATERIAL: COPPER ALLOY
4. LEAD FINISH: 100% MATTE Sn
5. INDICATED DIMENSION/TOLERANCE APPLIES TO LEADS AND EXPOSED PAD

Recommended PCB Land Pattern



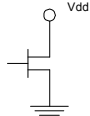
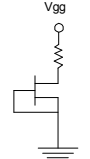



Pin Description

Pin Diagram



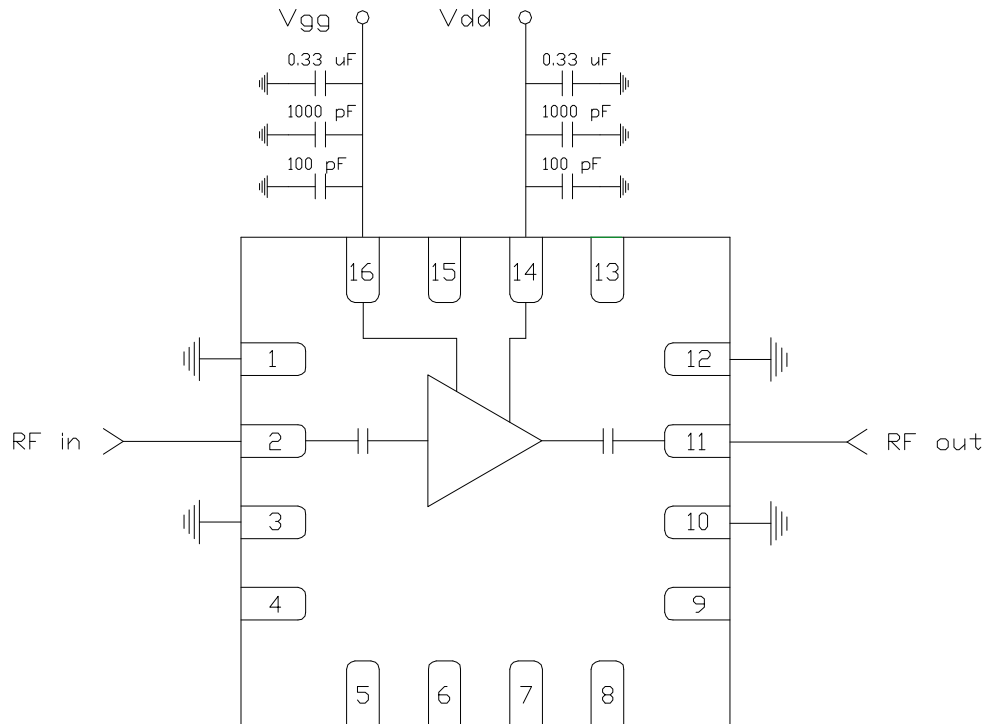
Functional Description

Pin	Function	Description	Schematic
2	RF in	DC blocked and 50 ohm matched	
4-9,13,15	N/C	No connection required. These pins may be connected to RF/DC ground	
11	RF out	DC blocked and 50 ohm matched	
14	Vdd	Power supply voltage Decoupling and bypass caps required	
16	Vgg	Power supply voltage Decoupling and bypass caps required	
1,3,10,12 and die paddle	Ground	Connect to RF / DC ground	

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Applications Information

Application Circuit



Biasing and Operation

The CMD189P3 is biased with a positive drain supply and positive gate supply. Performance is optimized when the drain and gate voltage are set to +1.5V.

Turn ON procedure:

1. Apply drain voltage Vdd and set to +1.5V
2. Apply gate voltage Vgg and set to +1.5V

Turn OFF procedure:

1. Turn off gate voltage Vgg
2. Turn off drain voltage Vdd

RF power can be applied at any time.

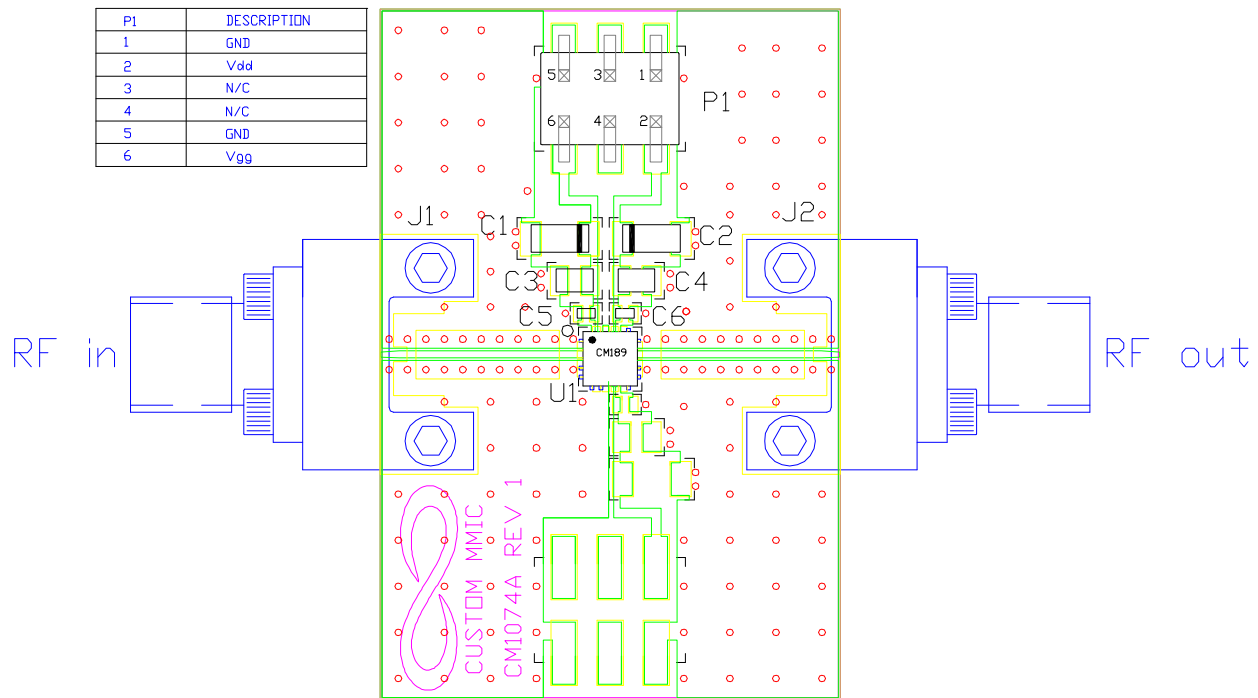
GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.

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Applications Information

Evaluation Board

The circuit board shown has been developed for optimized assembly at CMDS. A sufficient number of via holes should be used to connect the top and bottom ground planes. As surface mount processes vary, careful process development is recommended.



Bill of Material

Designator	Value	Description
J1, J2		SMA End Launch Connector
P1		6 Pin Header
C1, C2	0.33 μ F	Capacitor, Tantalum
C3, C4	1000 pF	Capacitor, 0603
C5, C6	100 pF	Capacitor, 0402
U1		CMD189P3 Low Noise Amplifier
PCB		CM1074A Evaluation PCB

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