

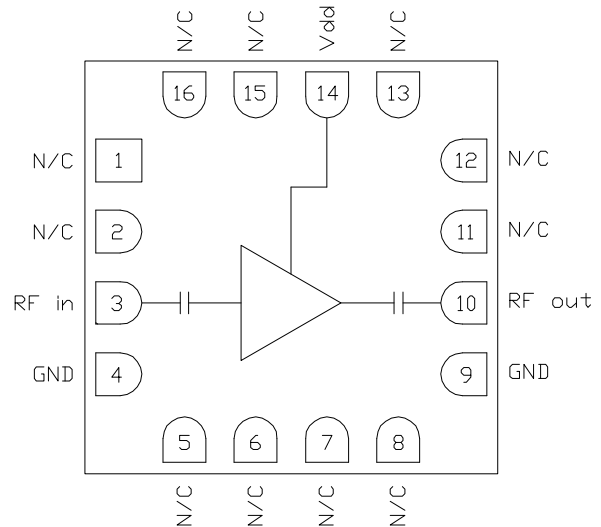
Features

- ▶ Low noise figure
- ▶ High gain broadband performance
- ▶ Single supply voltage
- ▶ Pb-free RoHs compliant 3x3 QFN package

Description

The CMD194C3 is a broadband MMIC low noise amplifier housed in a leadless 3x3 mm plastic surface mount package. The CMD194C3 is ideally suited for EW and communications systems where small size and low power consumption are needed. The broadband device delivers greater than 20 dB of gain with a corresponding output 1 dB compression point of +15 dBm and a noise figure of 2 dB. The CMD194C3 is a 50 ohm matched design eliminating the need for external DC blocks and RF port matching.

Functional Block Diagram



Electrical Performance - $V_{dd} = 4.0\text{ V}$, $T_A = 25\text{ }^\circ\text{C}$, $F = 13\text{ GHz}$

Parameter	Min	Typ	Max	Units
Frequency Range	6 - 20			GHz
Gain		20		dB
Noise Figure		2		dB
Input Return Loss		11		dB
Output Return Loss		20		dB
Output P1dB		15.5		dBm
Supply Current		120		mA

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CMD194C3

6-20 GHz Low Noise Amplifier

Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	5.5 V
RF Input Power	+20 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	866 mW
Thermal Resistance	75 °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	2.0	4.0	5.0	V
Idd		120		mA

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

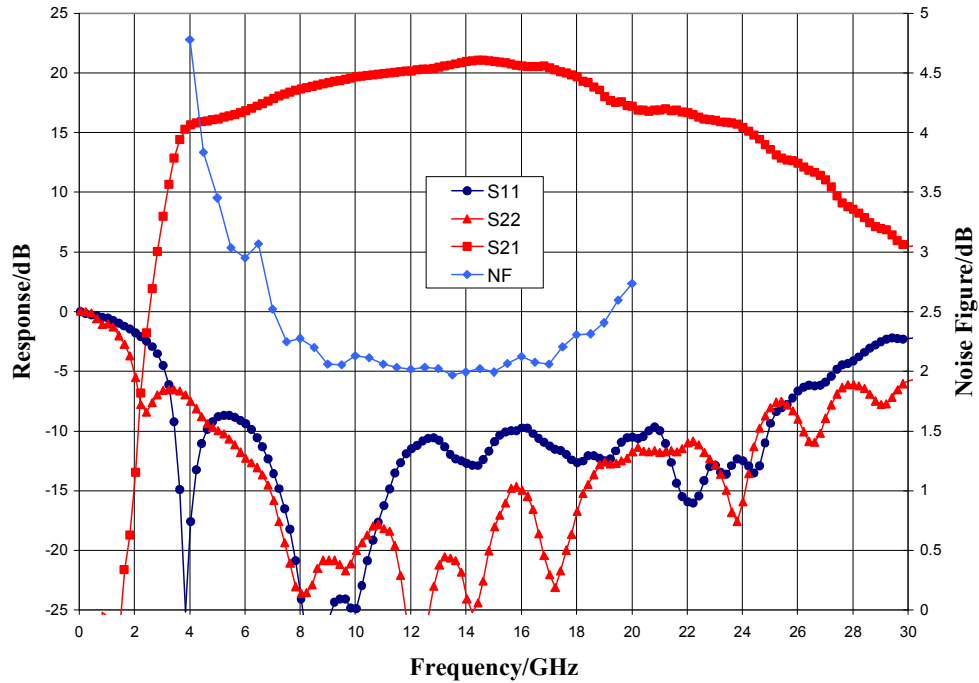
Electrical Specifications - V_{dd} = 4.0 V, T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	6 - 20			9 - 17			GHz
Gain	14	20	24	16	20	24	dB
Noise Figure		2.1	3.5		2.1	2.5	dB
Input Return Loss		12			12		dB
Output Return Loss		15			18		dB
Output P1dB		15			15		dBm
Output IP3		26			26		dBm
Supply Current	90	120	150	90	120	150	mA
Gain Temperature Coefficient		0.014			0.014		dB/°C
Noise Figure Temperature Coefficient		0.01			0.01		dB/°C

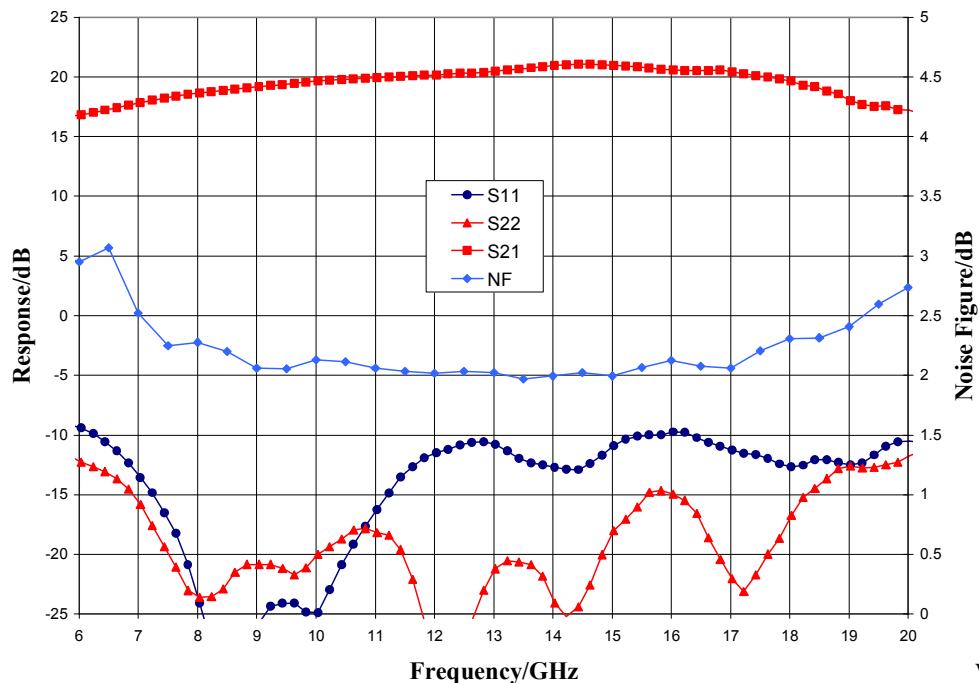
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Typical Performance

Broadband Performance, $V_{dd} = 4.0$ V, $I_{dd} = 120$ mA, $T_A = 25$ °C



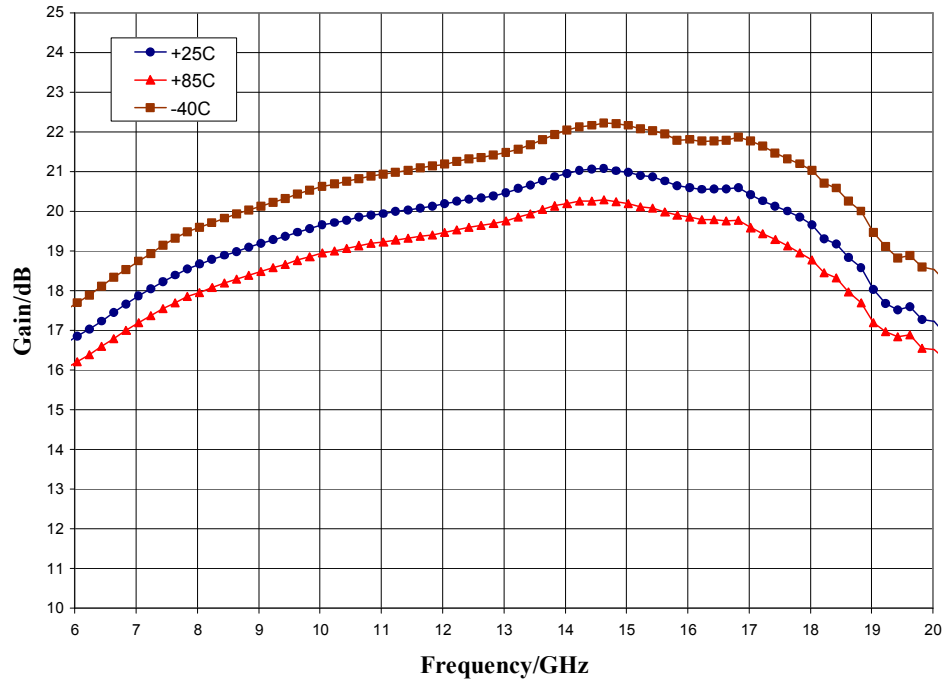
Narrow-band Performance, $V_{dd} = 4.0$ V, $I_{dd} = 120$ mA, $T_A = 25$ °C



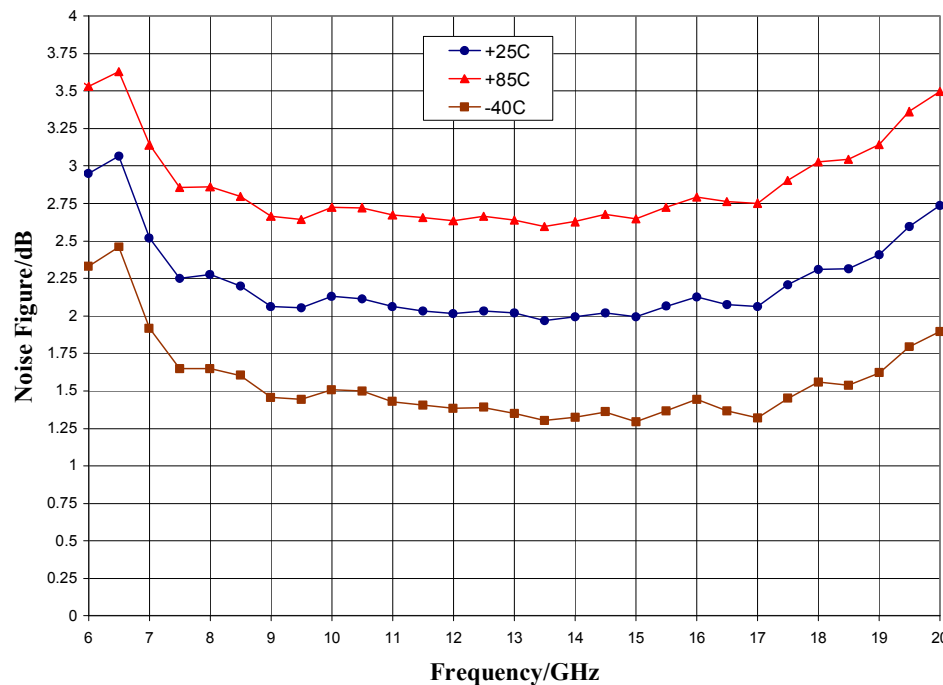
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Typical Performance

Gain vs. Temperature, $V_{dd} = 4.0$ V



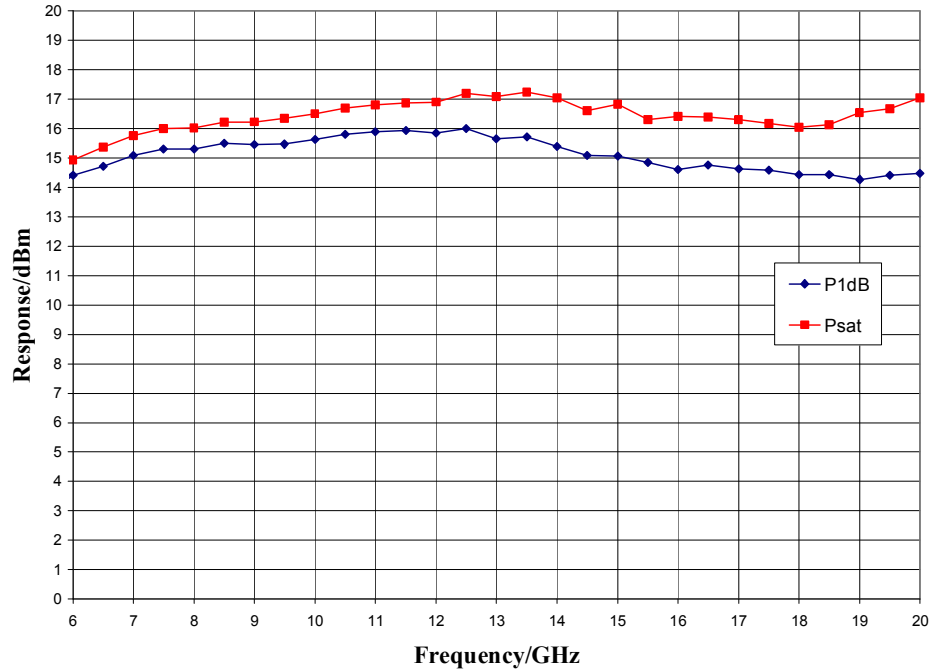
Noise Figure vs. Temperature, $V_{dd} = 4.0$ V



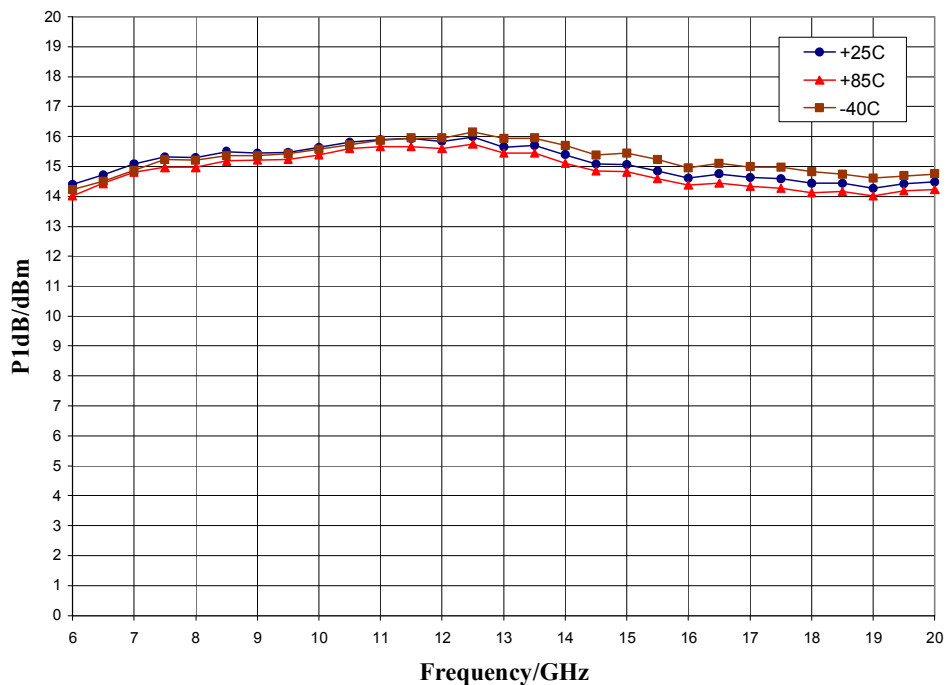
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Typical Performance

Output Power, $V_{dd} = 4.0\text{ V}$, $I_{dd} = 120\text{ mA}$, $T_A = 25\text{ }^\circ\text{C}$



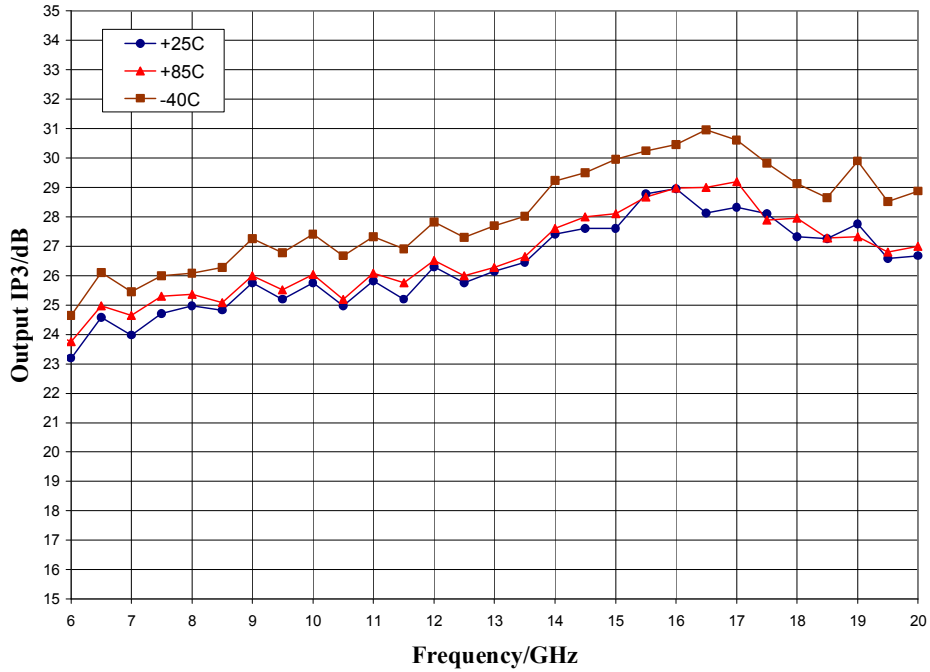
P1dB vs. Temperature, $V_{dd} = 4.0\text{ V}$



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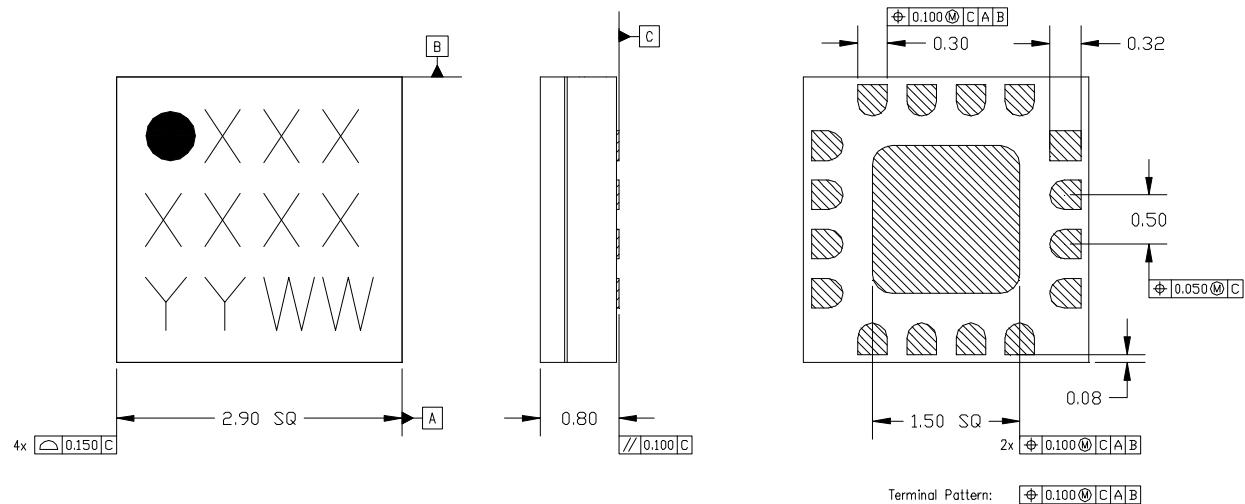
Typical Performance

Output IP3 vs. Temperature, Vdd=4.0V



Mechanical Information

Package Information and Dimensions



NOTES:

1. ALL DIMENSIONS SHOWN IN mm.
2. MATERIAL: BLACK ALUMINA
3. LEAD FINISH:
 - 3.1. Ni: 8.89 μ m MAX, 1.27 μ m MIN
 - 3.2. Pd: 0.17 μ m MAX, 0.07 μ m MIN
 - 3.3. Au: 0.254 μ m MAX, 0.03 μ m MIN
4. MARKING
 - 4.1. LINE 1: PART NUMBER
 - 4.1.1. EXAMPLE: CMD196C3 SHALL BE MARKED AS 196
 - 4.2. LINE 2: LOT NUMBER
 - 4.3. LINE 3: DATE CODE - LAST 2 DIGITS OF THE YEAR OF MANUFACTURE FOLLOWED BY A 2 DIGIT WEEK CODE
5. ALTERNATE PIN #1 IDENTIFIER IS A SINGLE SQUARE PAD
6. ALTERNATE DIE PADDLE MAY HAVE CHAMFERED CORNERS

Recommended PCB Land Pattern

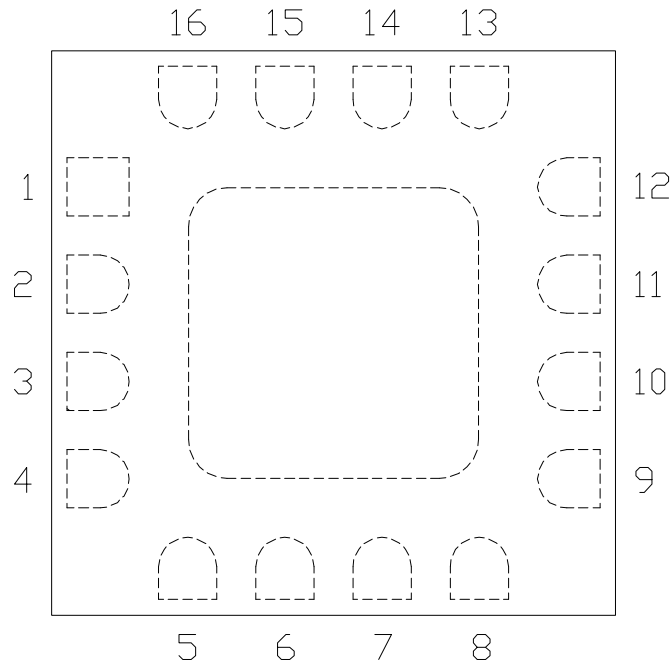
Custom MMIC Design Services recommends that the user develop the land pattern that will provide the best design for proper solder reflow and device attach for their specific application. Please review Custom MMIC Application Note AN 105 for a recommended land pattern approach.

Recommended Solder Reflow Profile

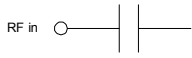
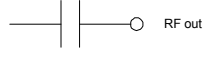
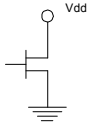

Custom MMIC Design Services recommends screen printing with belt furnace reflow to ensure proper solder reflow and device attach. Please review Custom MMIC Application Note AN 102 for a recommended solder reflow profile.

Pin Description

Pin Diagram



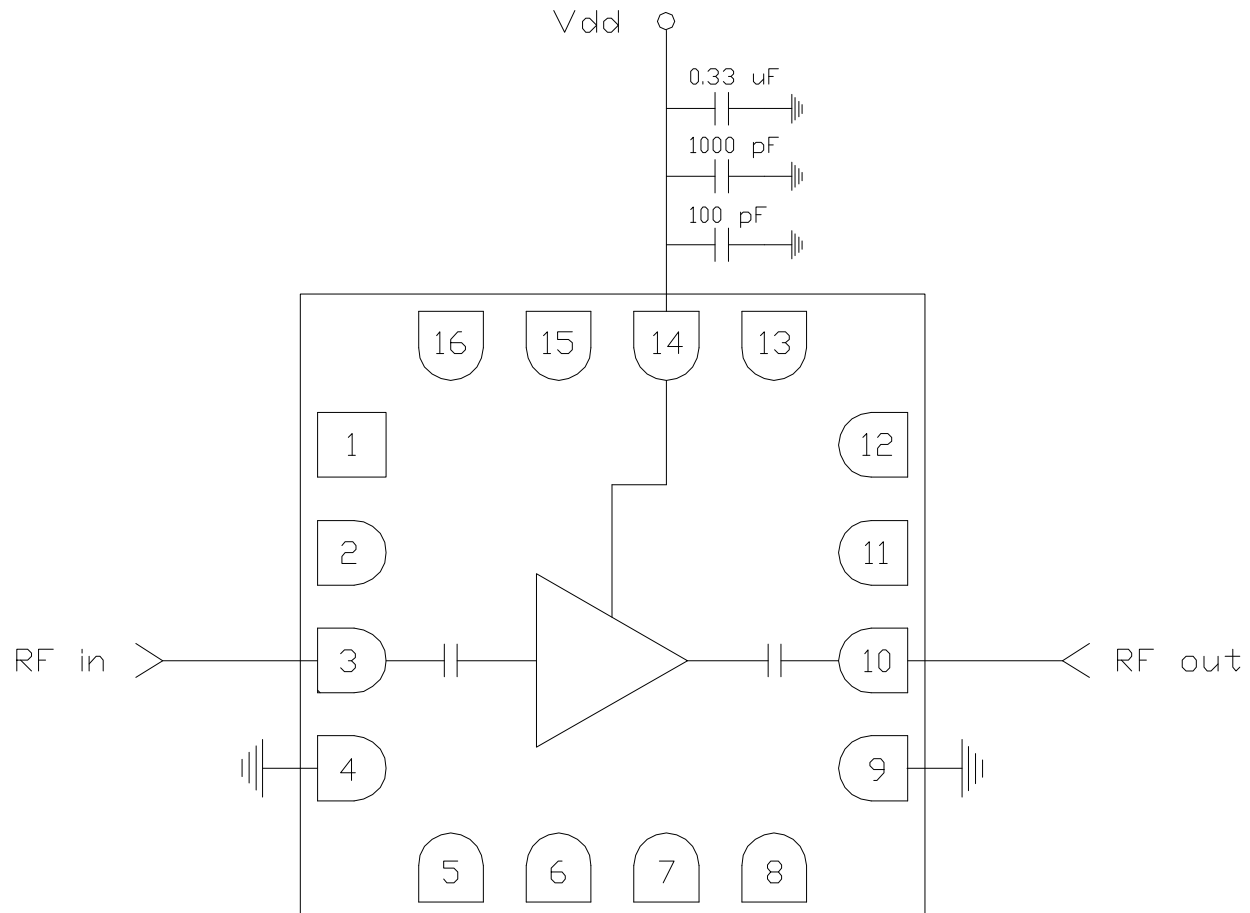
Functional Description

Pin	Function	Description	Schematic
1, 2, 5-8, 11-13, 15, 16	N/C	No connection required. These pins may be connected to RF/DC ground.	
3	RF in	DC blocked and 50 ohm matched	
10	RF out	DC blocked and 50 ohm matched	
14	Vdd	Power supply voltage Decoupling and bypass caps required	
4, 9 and die paddle	Ground	Connect to RF / DC ground	

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Applications Information

Application Circuit



Biasing and Operation

The CMD194C3 is biased with a single 4.0 V positive drain supply.

RF power can be applied at any time.

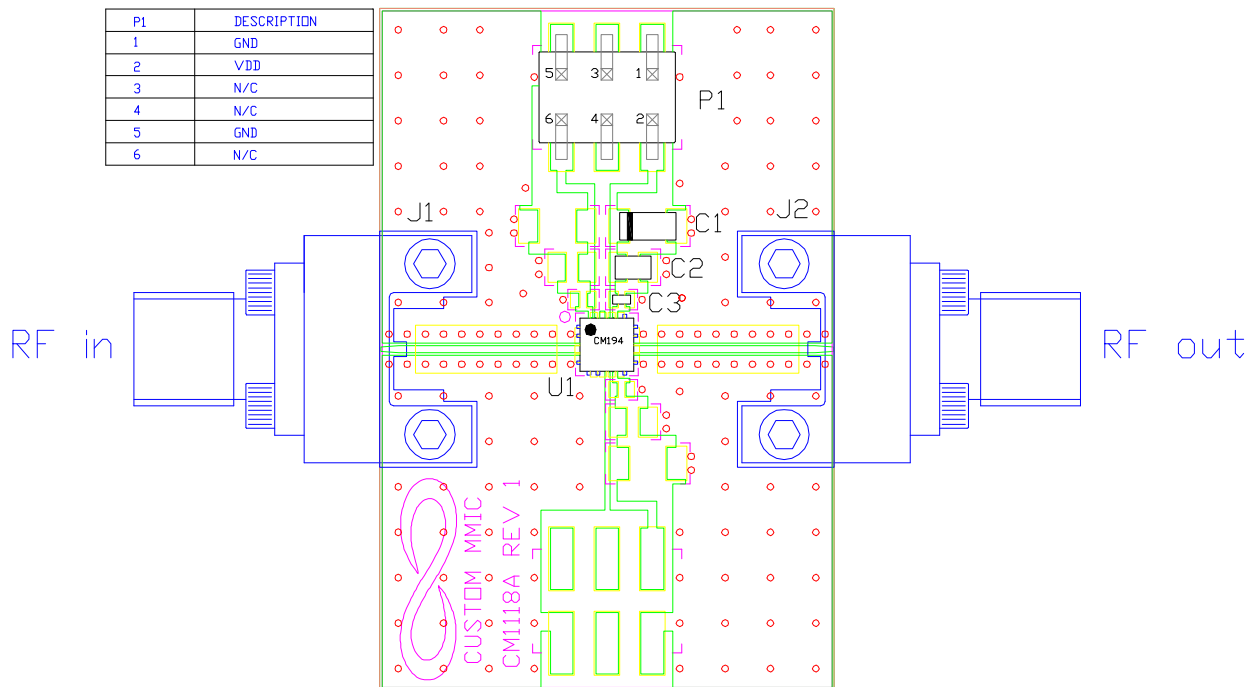
GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.

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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	0.33 μ F	Capacitor, Tantalum
C2	1000 pF	Capacitor, 0603
C3	100 pF	Capacitor, 0402
U1		CMD194C3 Low Noise Amplifier
PCB		CM1118A Evaluation PCB

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