CMD162K4

26-34 GHz Low Noise Amplifier

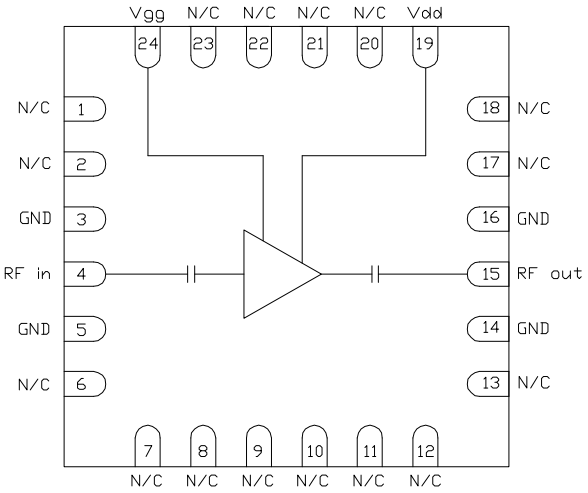
Features

- ► Ultra low noise performance
- ► High gain
- ► Low power consumption
- ► Pb-free RoHs compliant 4x4 mm SMT package

Description

The CMD162K4 is a highly efficient GaAs MMIC low noise amplifier housed in a leadless surface mount package. The amplifier is ideally suited for EW and communications systems where small size and low power consumption are needed. The device is optimized for 30 GHz and delivers greater than 21 dB of gain with a corresponding output 1 dB compression point of +7 dBm and noise figure of 2 dB. The CMD162K4 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} = 2.0 V, V_{gg} = 2.0 V, T_A = 25 °C, F = 30 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		26 - 34		GHz
Gain		21		dB
Noise Figure		2		dB
Input Return Loss		16		dB
Output Return Loss		9		dB
Output P1dB		7		dBm
Supply Current		25		mA

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Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	4.5 V
Gate Voltage, Vgg	3.0 V
RF Input Power	+20 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	360 mW
Thermal Resistance Θ_{JC}	180 °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
Vdd	1.0	2.0	4.0	V
Idd		25		mA
Vgg	0	2.0	3.0	V
Igg		4.6		mA

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

Electrical Specifications, V_{dd} = 2.0 V, V_{gg} = 2.0 V, T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	26 - 30			30 - 34			GHz
Gain	18.5	22	27	14	19	25	dB
Noise Figure		2	2.3		2.2	2.8	dB
Input Return Loss		12			10		dB
Output Return Loss		14			7		dB
Output P1dB		5			8		dBm
Output IP3		16			16		dBm
Supply Current	17	25	33	17	25	33	mA
Gain Temperature Coefficient		0.02			0.02		dB/°C
Noise Figure Temperature Coefficient		0.009			0.009		dB/°C

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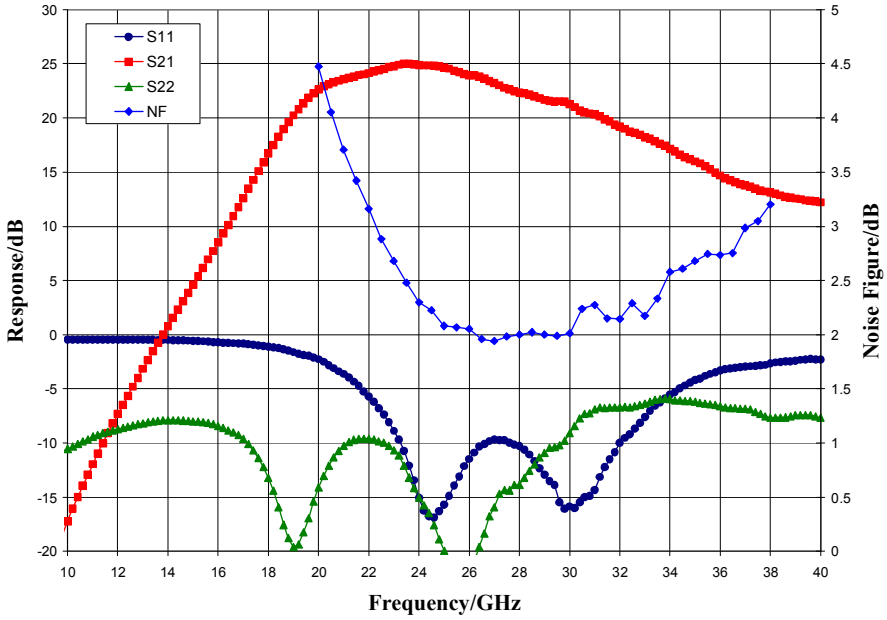
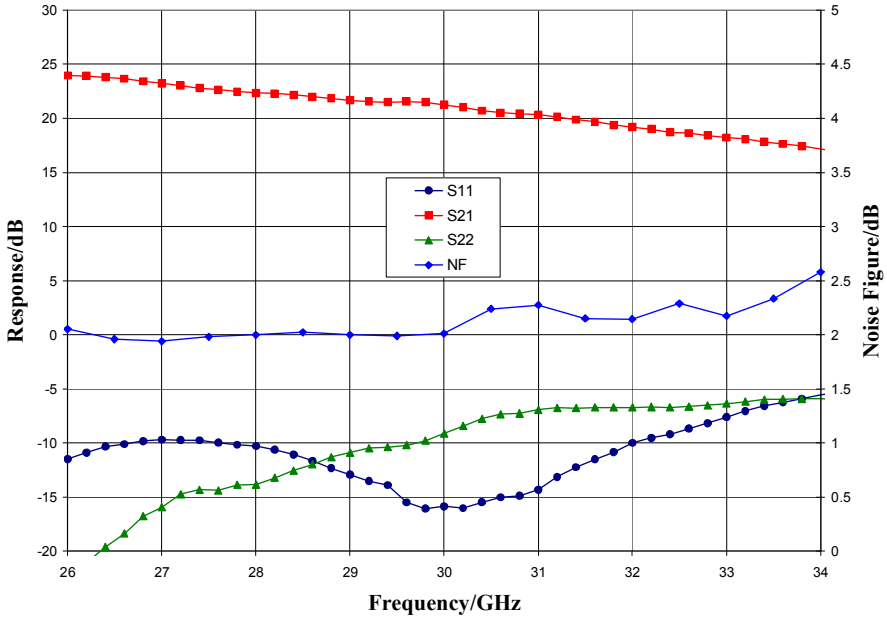
Typical Performance

Broadband Performance, V_{dd} = 2.0 V, V_{gg} = 2.0 V, I_{dd} = 25mA, T_A = 25 °C



Narrow-band Performance, V_{dd} = 2.0 V, V_{gg} = 2.0 V, I_{dd} = 25 mA, T_A = 25 °C



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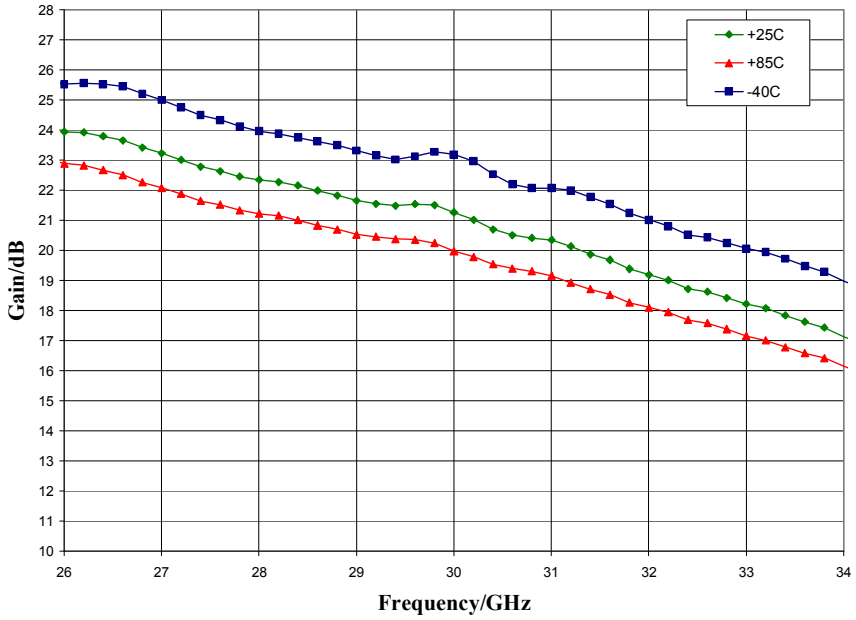
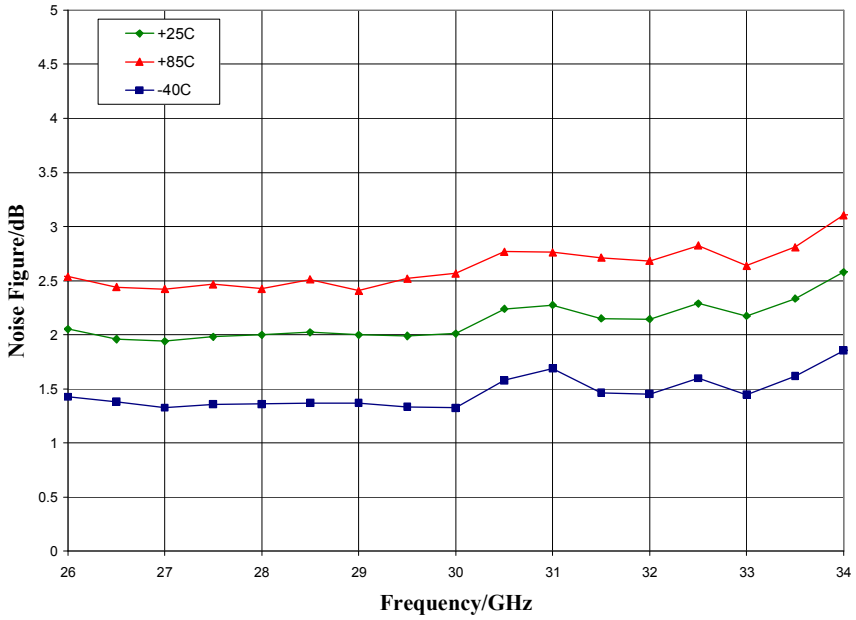
Typical Performance

Gain vs. Temperature, V_{dd} = 2.0 V, V_{gg} = 2.0 V



Noise Figure vs. Temperature, V_{dd} = 2.0 V, V_{gg} = 2.0 V



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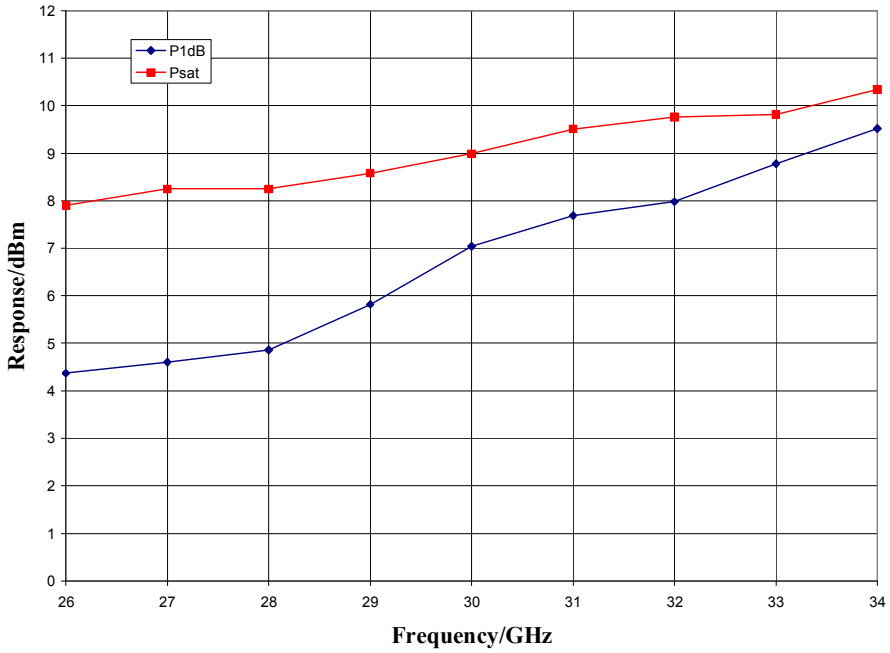
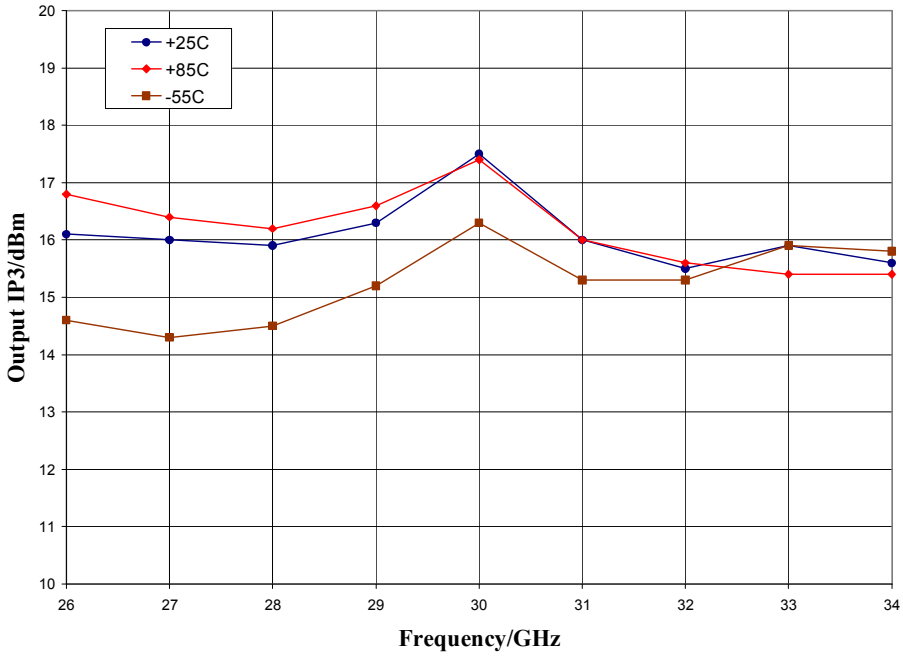
Typical Performance

Output Power, V_{dd} = 2.0 V, V_{gg} = 2.0 V I_{dd} = 25 mA, T_A = 25 °C



Output IP3 vs. Temperature, V_{dd} = 2.0 V, V_{gg} = 2.0 V



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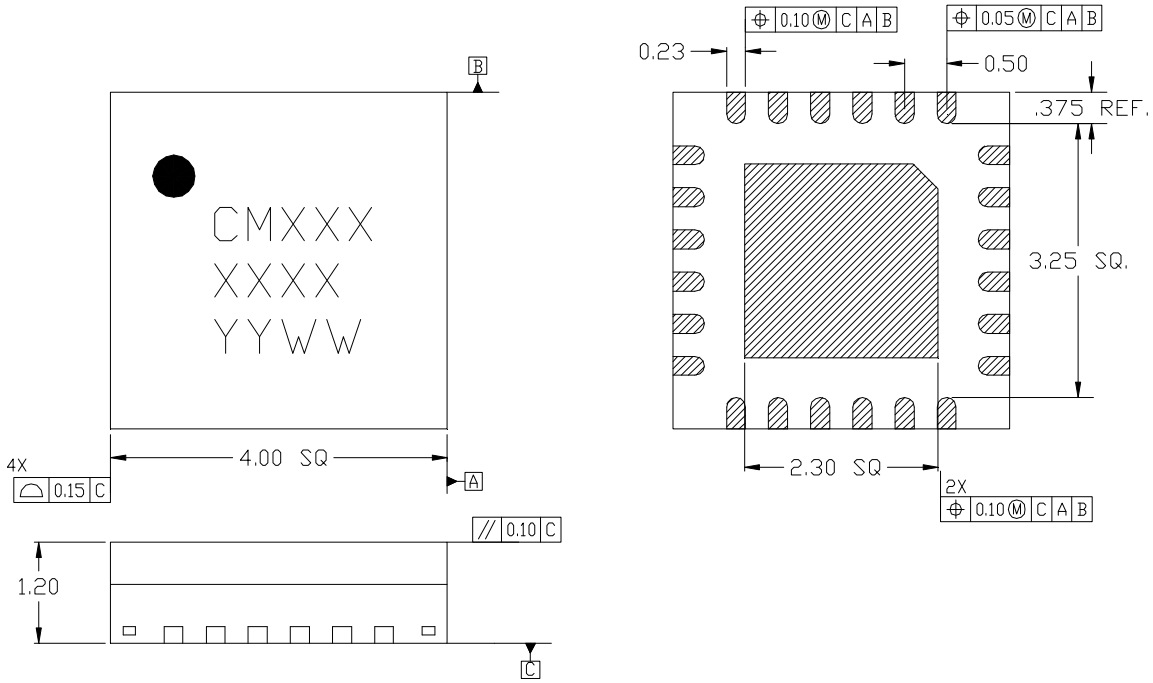
Mechanical Information

Package Information and Dimensions



NOTES:
1. ALL DIMENSIONS SHOWN IN mm.
2. MATERIAL: RoHs COMPLIANT MOLD COMPOUND
3. LEAD FINISH: ELECTROLESS Ni, ELECTROLESS Pd, IMMERSION Au (ENEPIG) per IPC-4556
4. MARKING
   4.1. LINE 1: PART NUMBER
      4.1.1. EXAMPLE: CMD162K4 SHALL BE MARKED AS CM162
   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 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 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.

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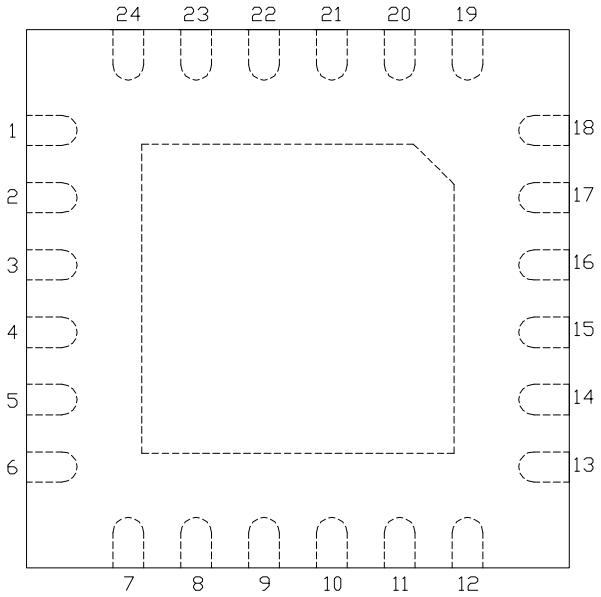
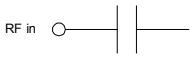
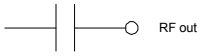
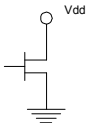
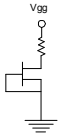
Pin Description

Pin Diagram



Functional Description

Pin	Function	Description	Schematic
1, 2, 6-13, 17, 18, 20-23	N/C	No connection required. These pins may be connected to RF/DC ground	
3, 5, 14, 16 and die paddle	Ground	Connect to RF/DC ground	
4	RF in	DC blocked and 50 ohm matched	
15	RF out	DC blocked and 50 ohm matched	
19	Vdd	Power supply voltage Decoupling and bypass caps required	
24	Vgg	Power supply voltage Decoupling and bypass caps required	

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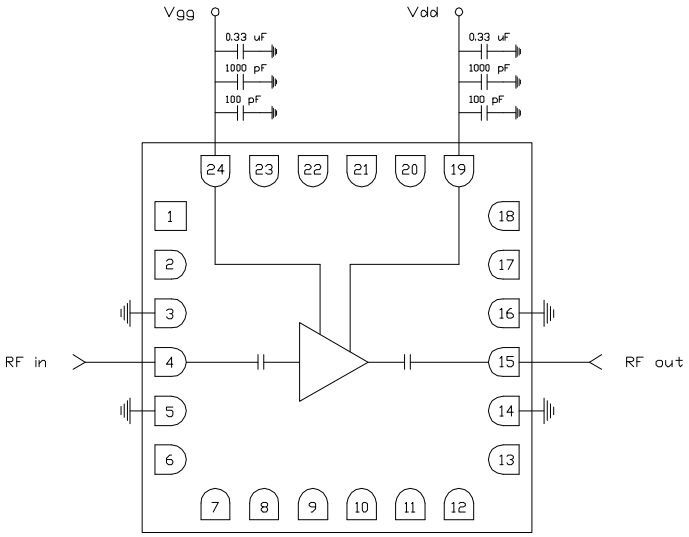
Applications Information

Application Circuit



Biasing and Operation

The CMD162K4 is biased with a positive drain supply and positive gate supply. Performance is optimized when the drain voltage is set to +2.0 V, though it may be set to a minimum of +1.0 V and a maximum of +4.0 V. The recommended gate voltage is +2.0 V.

Turn ON procedure:

1.Apply drain voltage V_{dd} and set to +2 V
2.Apply gate voltage V_{gg} and set to +2 V

Turn OFF procedure:

1.Turn off gate voltage V_{gg}
2.Turn off drain voltage V_{dd}

The preferred biasing procedure has been proven to be robust and should be used whenever possible. However, the CMD162K4 does allow for simultaneous biasing (applying Vdd and Vgg at the same time).

Refer to Application Note 103: Amplifier Biasing Techniques for instructions.

For either approach, 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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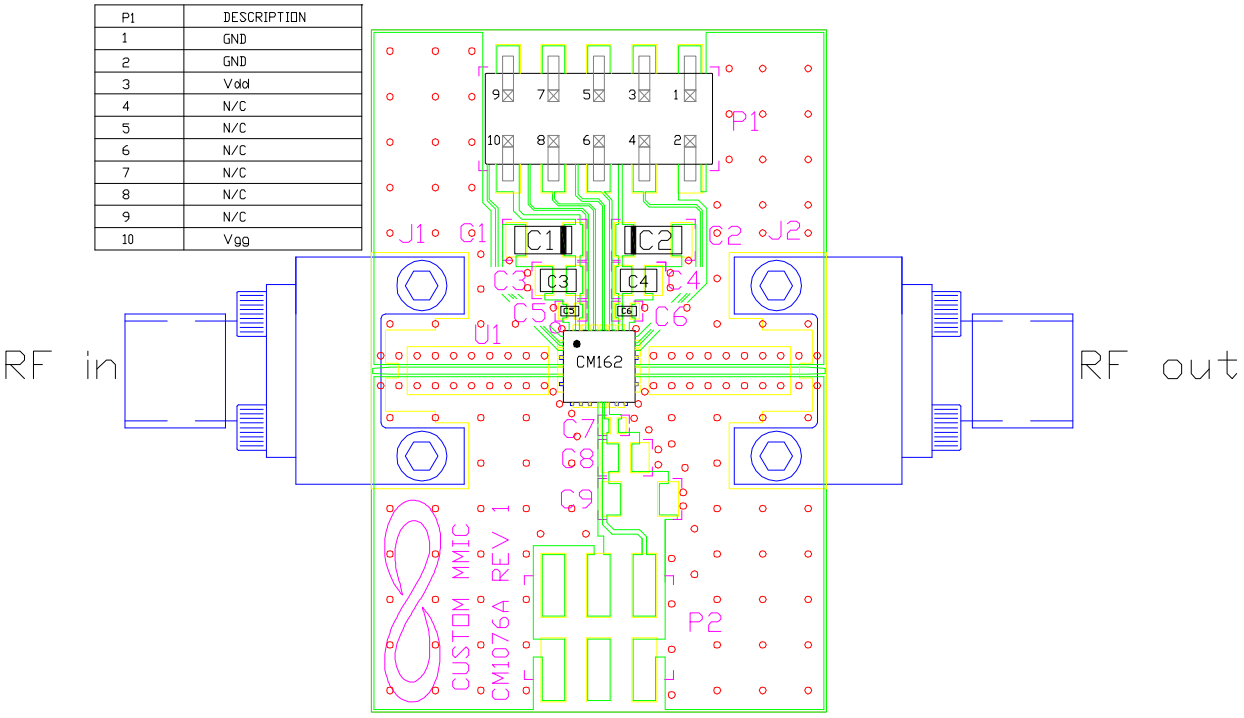
Applications Information

Evaluation Board

The circuit board shown has been developed for optimized assembly at Custom MMIC. 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.

P1	DESCRIPTION
1	GND
2	GND
3	Vdd
4	N/C
5	N/C
6	N/C
7	N/C
8	N/C
9	N/C
10	Vgg



Bill of Material

Designator	Value	Description
J1, J2		SMA End Launch Connector
P1		10 Pin Header
C1, C2	0.33 µF	Capacitor, Tantalum
C3,C4	1000 pF	Capacitor, 0603
C5, C6	100 pF	Capacitor, 0402
U1		CMD162K4 Low Noise Amplifier
PCB		102532 Evaluation PCB

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