



CMD187C4

2-20 GHz Driver Amplifier

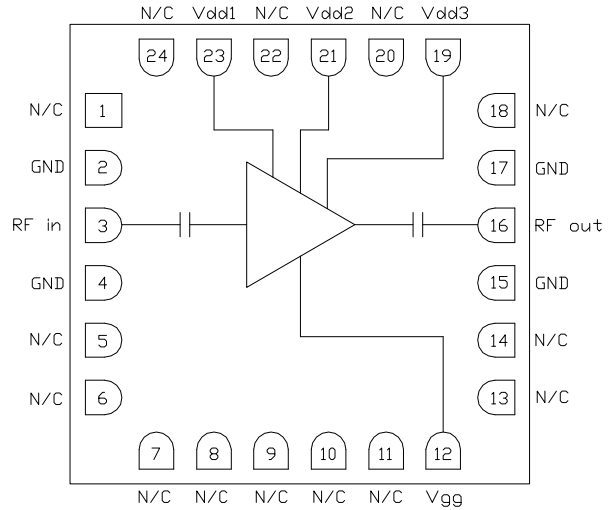
Features

- ▶ Wide bandwidth
- ▶ High linearity
- ▶ Low current consumption
- ▶ Pb-free RoHs compliant 4x4 mm SMT package

Description

The CMD187C4 is a wideband driver amplifier housed in a leadless surface mount package that is ideally suited for military, space and communications systems where small size and high linearity are needed. At 10 GHz the device delivers greater than 22 dB of gain with a corresponding output 1 dB compression point of +13 dBm and an output IP3 of 30 dBm. The CMD187C4 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching. This amplifier is the perfect alternative to higher cost hybrid amplifiers.

Functional Block Diagram



Electrical Performance - $V_{dd} = 3.0\text{ V}$, $V_{gg} = 2.0\text{ V}$, $T_A = 25\text{ }^\circ\text{C}$, $F=10\text{ GHz}$

Parameter	Min	Typ	Max	Units
Frequency Range	2 - 20			GHz
Gain		22.5		dB
Input Return Loss		22		dB
Output Return Loss		15		dB
Output P1dB		13		dBm
Output IP3		30		dBm
Supply Current		115		mA

ver 1.4 1017



CMD187C4

2-20 GHz Driver Amplifier

Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, V _{dd}	5 V
Gate Voltage, V _{gg}	3 V
RF Input Power	+20 dBm
Channel Temperature, T _{ch}	150 °C
Power Dissipation, P _{diss}	655 mW
Thermal Resistance	99 °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}	3.0	3.0	5.0	V
I _{dd}		115		mA
V _{gg}		2.0		V

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

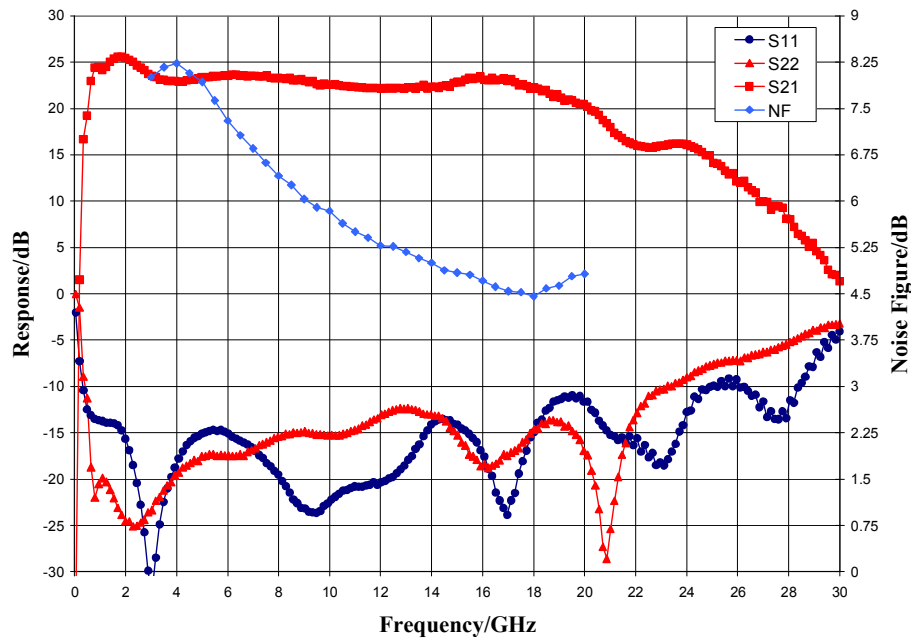
Electrical Specifications, V_{dd} = 3.0 V, V_{gg} = 2.0 V, T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	2 - 18			18 - 20			GHz
Gain	20	23	27	18	21.5	24	dB
Noise Figure		6			4.6		dB
Input Return Loss		15			11		dB
Output Return Loss		15			13		dB
Output P1dB	11	13.5		11	13.5		dBm
Output IP3		28			27		dBm
Supply Current	80	120	160	80	120	160	mA
Gain Temperature Coefficient		0.02			0.02		dB/°C
Noise Figure Temperature Coefficient		0.01			0.01		dB/°C

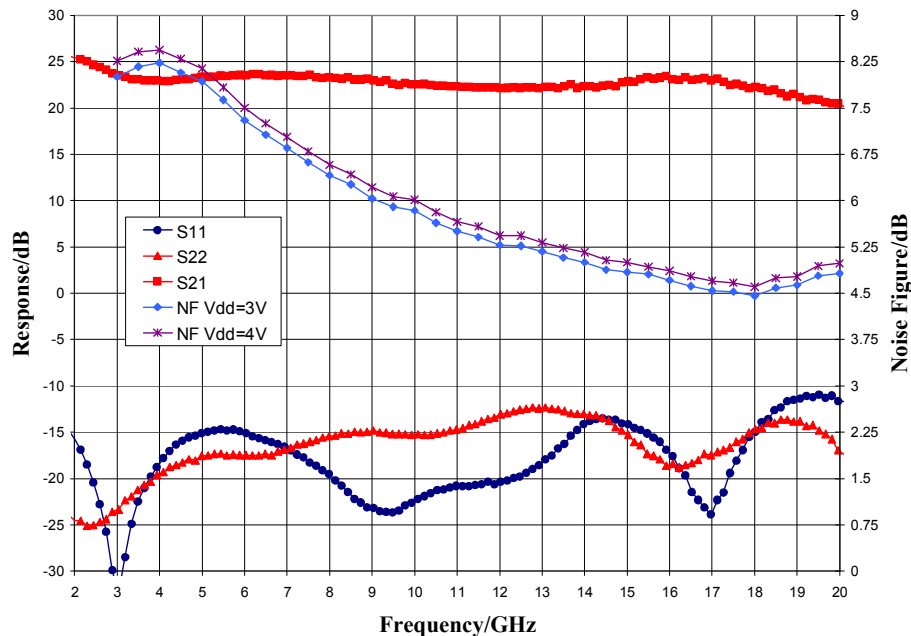
ver 1.4 1017

Typical Performance

Broadband Performance, $V_{dd} = 3.0\text{ V}$, $V_{gg} = 2.0\text{ V}$, $I_{dd} = 115\text{ mA}$, $T_A = 25\text{ }^\circ\text{C}$



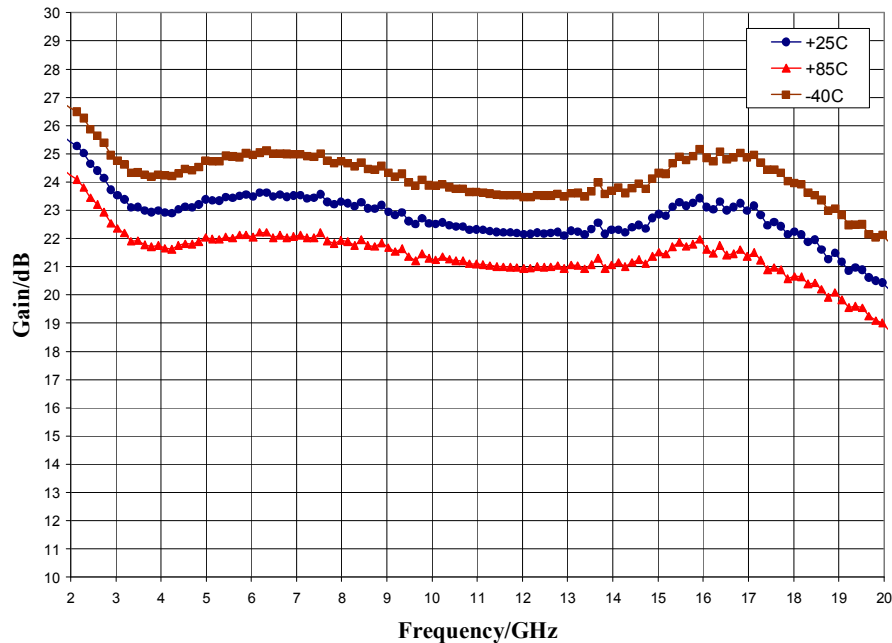
Narrow-band Performance, $V_{dd} = 3.0\text{ V}$, $V_{gg} = 2.0\text{ V}$, $I_{dd} = 115\text{ mA}$, $T_A = 25\text{ }^\circ\text{C}$



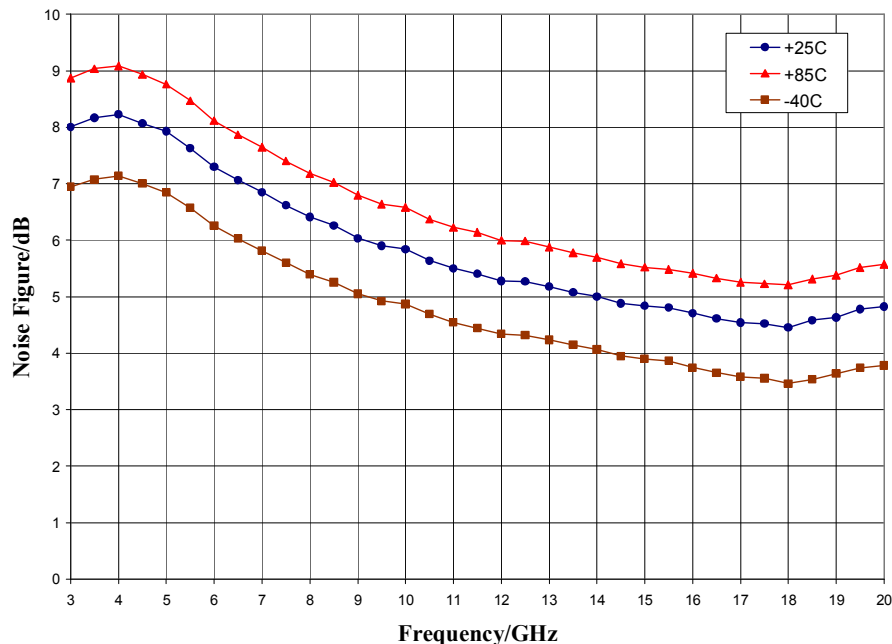
ver 1.4 1017

Typical Performance

Gain vs. Temperature, $V_{dd} = 3.0\text{ V}$, $V_{gg} = 2.0\text{ V}$



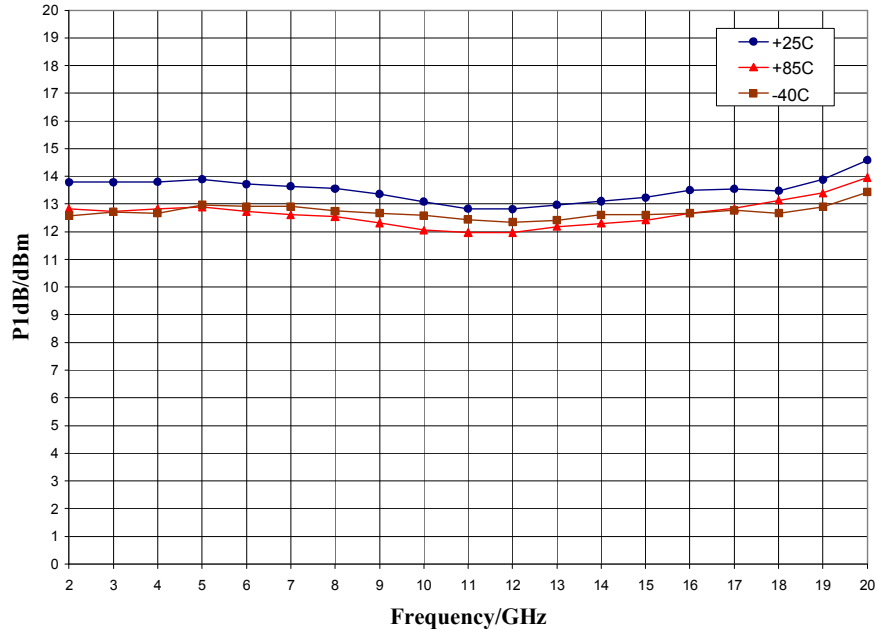
Noise Figure vs. Temperature, $V_{dd} = 3.0\text{ V}$, $V_{gg} = 2.0\text{ V}$



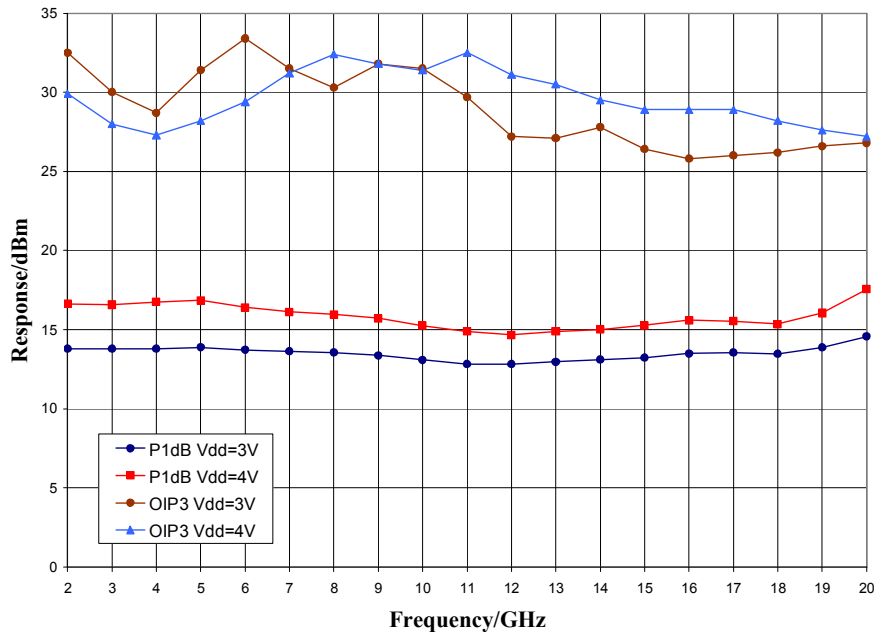
ver 1.4 1017

Typical Performance

P1dB vs. Temperature, $V_{dd} = 3.0\text{ V}$, $V_{gg} = 2.0\text{ V}$



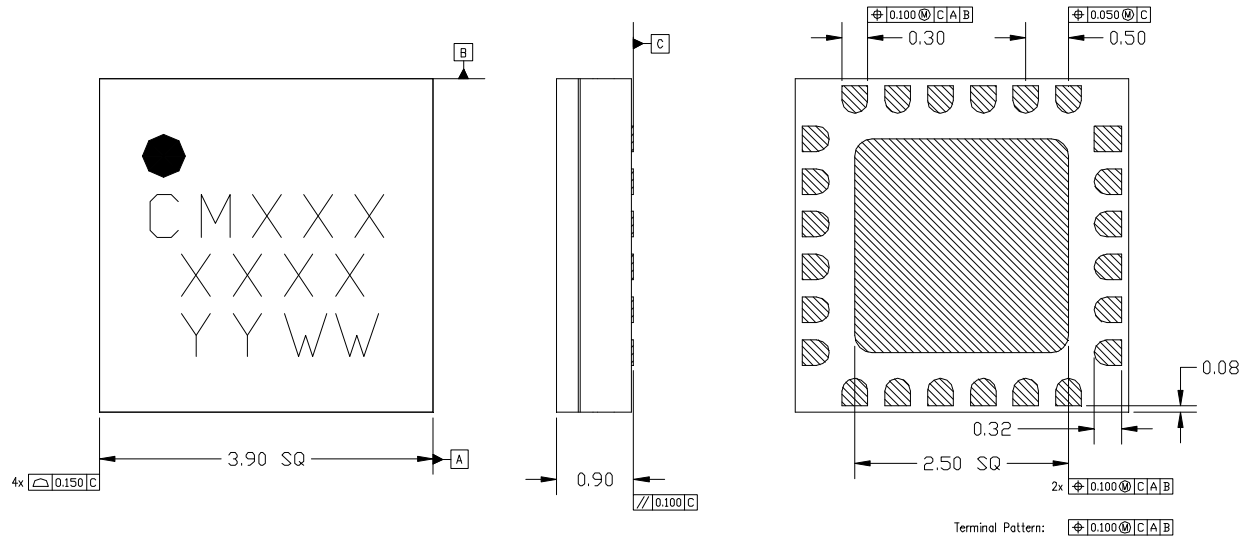
P1dB & Output IP3, $V_{dd}=3\text{V}, 4\text{V}$, $V_{gg} = 2.0\text{ V}$



ver 1.4 1017

Mechanical Information

Package Information and Dimensions



- NOTES:
1. ALL DIMENSIONS SHOWN IN mm.
 2. MATERIAL: BLACK ALUMINA
 3. LEAD FINISH:
 - 3.1. Ni: 8.89um MAX, 1.27um MIN
 - 3.2. Pd: 0.17um MAX, 0.07um MIN
 - 3.3. Au: 0.254um MAX, 0.03um MIN
 4. MARKING
 - 4.1. LINE 1: PART NUMBER
4.1.1. EXAMPLE: CMD191C4 SHALL BE MARKED AS CM191
 - 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

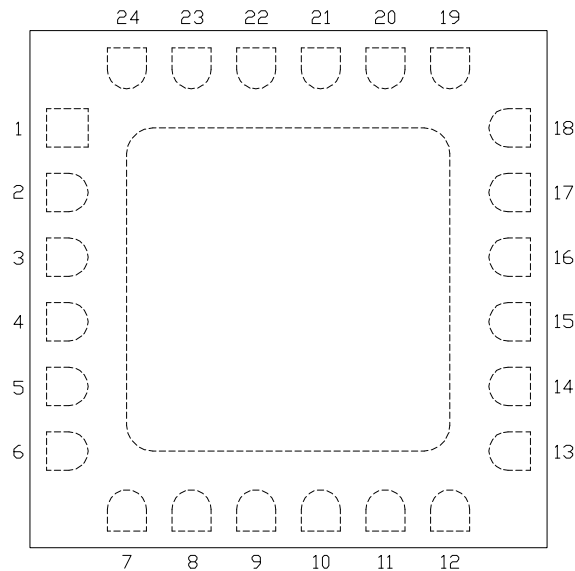
Custom MMIC Design Services recommends that the user develop the land pattern that will provide the best design for proper solder reflow and device attach for their specific application. Please review Custom MMIC Application Note AN 105 for a recommended land pattern approach.

Recommended Solder Reflow Profile



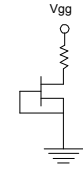

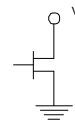
Custom MMIC Design Services recommends screen printing with belt furnace reflow to ensure proper solder reflow and device attach. Please review Custom MMIC Application Note AN 102 for a recommended solder reflow profile.

Pin Description

Pin Diagram



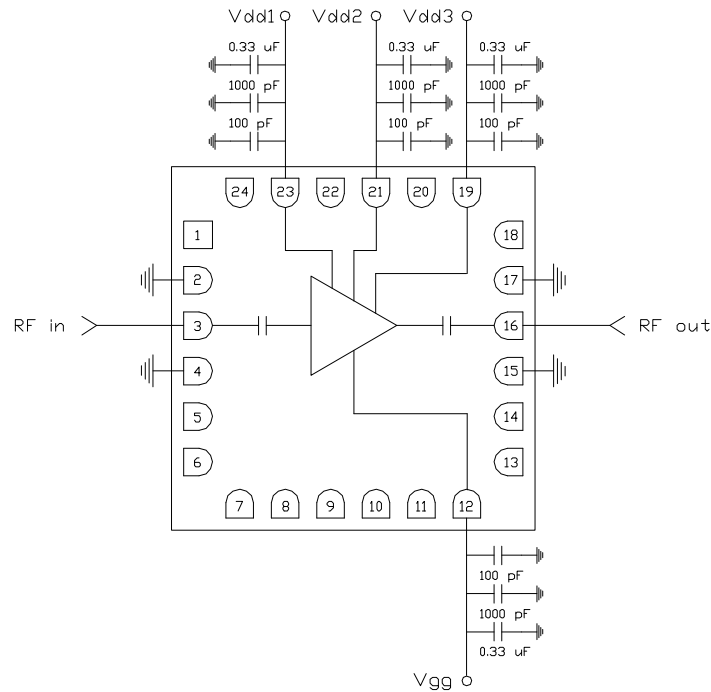
Functional Description

Pad	Function	Description	Schematic
1, 5-11, 13, 14, 18, 20, 22, 24	N/C	No connection required. These pins may be connected to RF/DC ground.	
2, 4, 15, 17 and die paddle	Ground	Connect to RF / DC ground	
3	RF in	DC blocked and 50 ohm matched	
12	V _{gg}	Power supply voltage Decoupling and bypass caps required	
16	RF out	DC blocked and 50 ohm matched	
23, 21, 19	V _{dd1, 2, 3}	Power supply voltage Decoupling and bypass caps required	

ver 1.4 1017

Applications Information

Application Circuit



Biasing and Operation

The CMD187C4 is biased with a positive drain supply and positive gate supply. Performance is optimized when the drain voltage is set to +3.0 V. The recommended gate voltage is +2.0 V.

Turn ON procedure:

1. Apply drain voltages $V_{dd1,2,3}$ and set to +3 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 voltages $V_{dd1,2,3}$

RF power can be applied at any time.

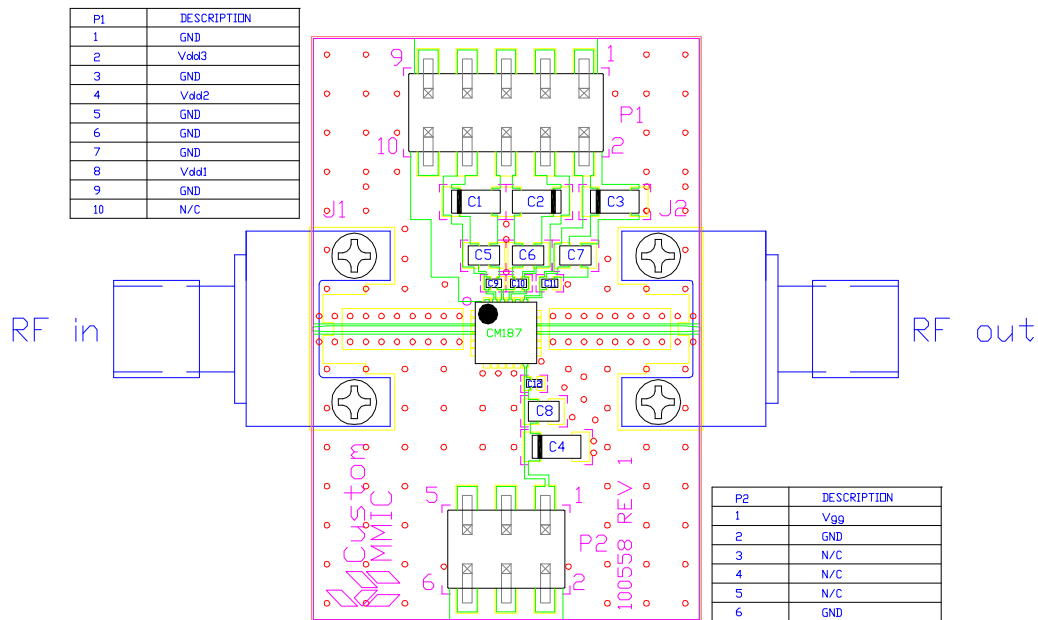
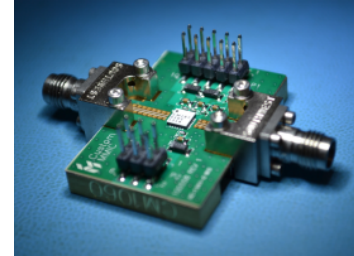
GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.

ver 1.4 1017

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		10 Pin Header
P2		6 Pin Header
C1 - C4	0.33 μ F	Capacitor, Tantalum
C5 - C8	1000 pF	Capacitor, 0603
C9 - C12	100 pF	Capacitor, 0402
U1		CMD187C4 Driver Amplifier
PCB		100558 Evaluation PCB

Please note, All information contained in this data sheet is subject to change without notice.

ver 1.4 1017