

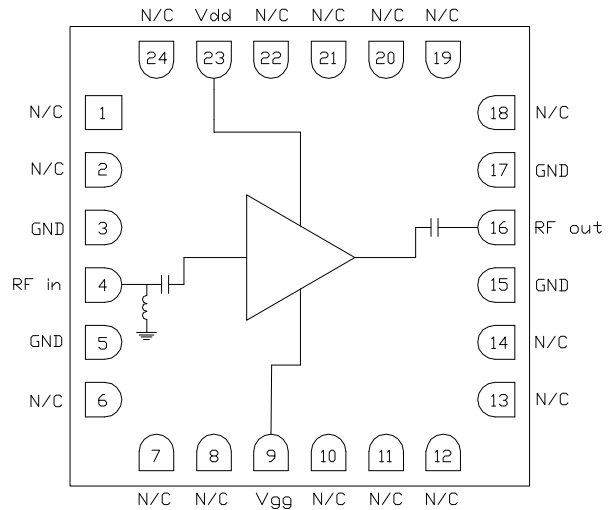
### Features

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

### Description

The CMD246C4 is a wideband GaAs MMIC low phase noise amplifier housed in a leadless surface mount package that is ideally suited for military, space and communications systems. At 16 GHz the device delivers 17 dB of gain, a saturated output power of +18 dBm and a noise figure of 5 dB. Also with an input signal of 10 GHz the amplifier provides low phase noise performance of -165 dBc/Hz at 10 kHz offset. The CMD246C4 is a 50 ohm matched design which eliminates the need for RF port matching.

### Functional Block Diagram



### Electrical Performance – $V_{dd} = 5.0\text{ V}$ , $V_{gg} = 3.0\text{ V}$ , $T_A = 25\text{ }^\circ\text{C}$ , $F = 16\text{ GHz}$

Parameter	Min	Typ	Max	Units
Frequency Range	8 – 22			GHz
Gain		17		dB
Input Return Loss		10		dB
Output Return Loss		12		dB
Noise Figure		5		dB
Output P1dB		13		dBm
Saturated Output Power		19		dBm
Phase Noise @ 10 kHz Offset		-165		dBc/Hz
Supply Current		48		mA

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# CMD246C4

## 8-22 GHz Low Phase Noise Amplifier

### Specifications

#### Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, V <sub>dd</sub>	8.0 V
Gate Voltage, V <sub>gg</sub>	5.0 V
RF Input Power	+15 dBm
Channel Temperature, T <sub>ch</sub>	150 °C
Power Dissipation, P <sub>diss</sub>	422 mW
Thermal Resistance	154 °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 <sub>dd</sub>	3.0	5.0	7.0	V
I <sub>dd</sub>		48		mA
V <sub>gg</sub>	0	3.0	4.0	V

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

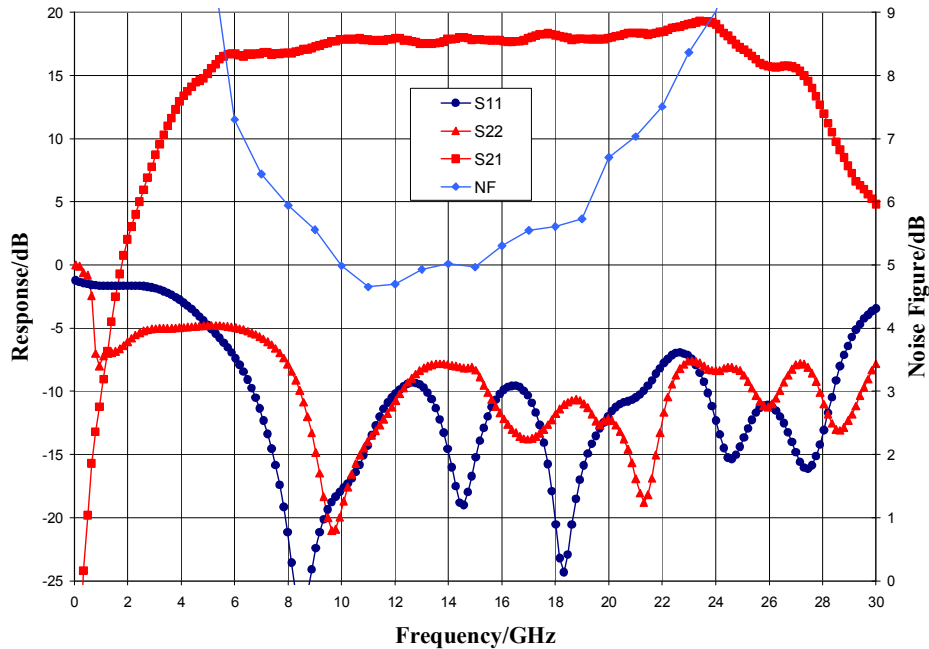
#### Electrical Specifications – V<sub>dd</sub> = 5.0 V, V<sub>gg</sub> = 3.0 V, T<sub>A</sub> = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	8 – 16			16 – 22			GHz
Gain	14	17	21	14	18	21	dB
Noise Figure		5			6		dB
Input Return Loss		10			10		dB
Output Return Loss		8			12		dB
Output P <sub>1dB</sub>	10	17		6	12		dBm
Saturated Output Power		20			15		dBm
Output IP <sub>3</sub>		25			24		dBm
Phase Noise @ 10 kHz Offset		-165			-165		dBc/Hz
Supply Current	33	48	63	33	48	63	mA

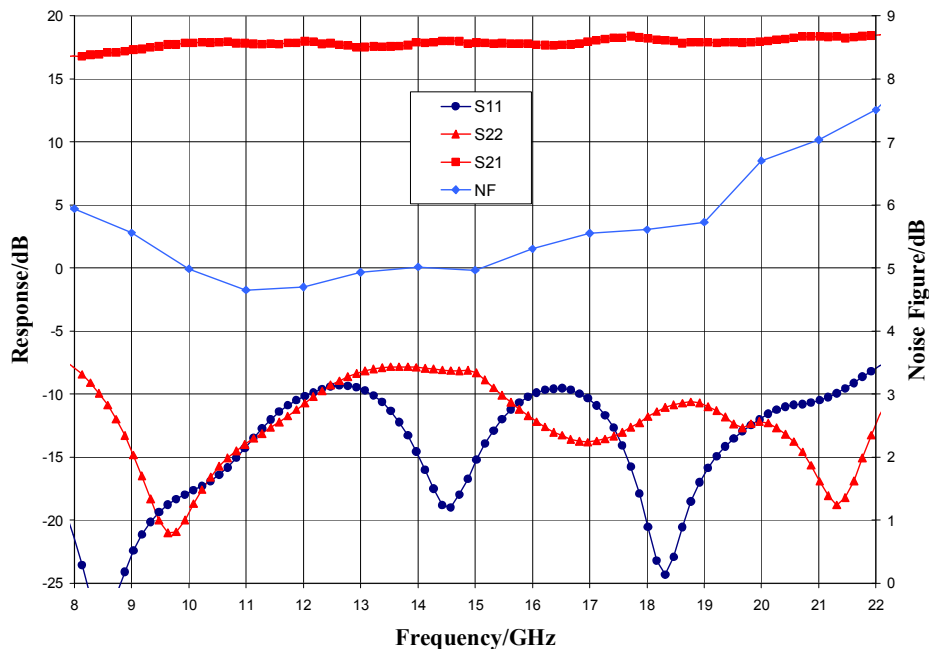
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### Typical Performance

**Broadband Performance,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$ ,  $I_{dd} = 48\text{ mA}$ ,  $T_A = 25\text{ }^\circ\text{C}$**



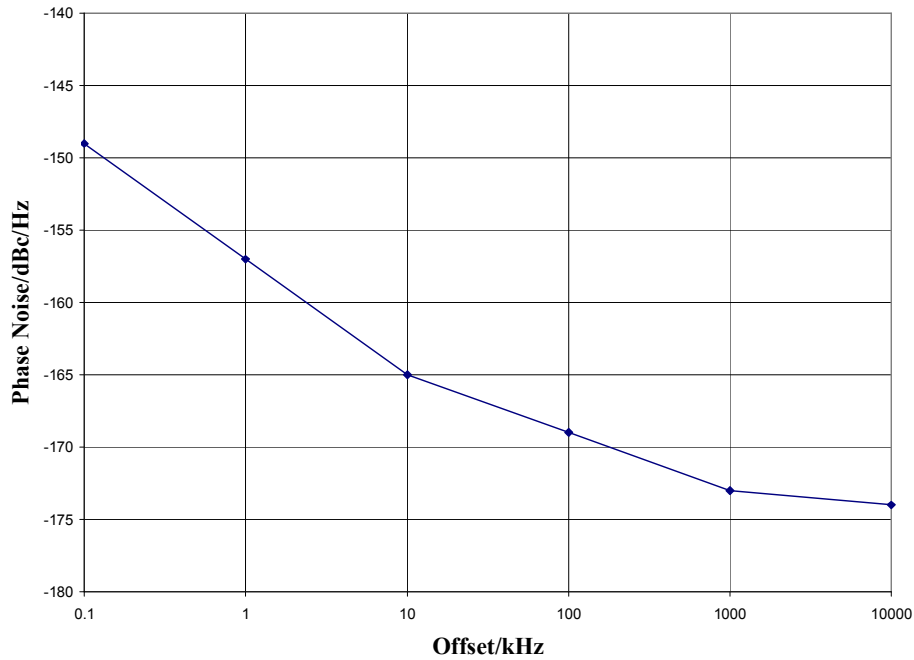
**Narrow-band Performance,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$ ,  $I_{dd} = 48\text{ mA}$ ,  $T_A = 25\text{ }^\circ\text{C}$**



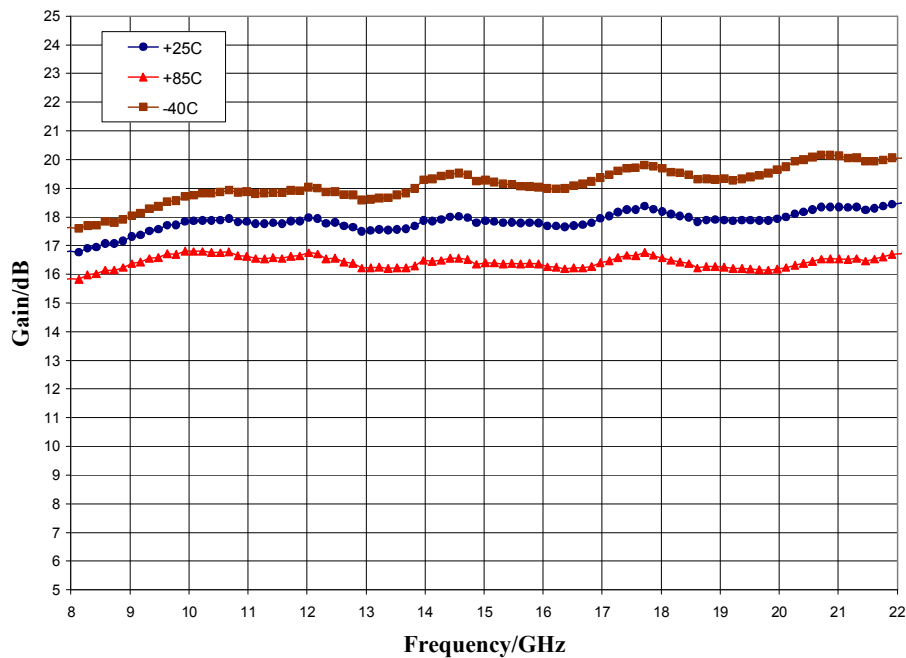
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### Typical Performance

Additive Phase Noise @  $P_{sat}$ ,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$ ,  $T_A = 25\text{ }^\circ\text{C}$



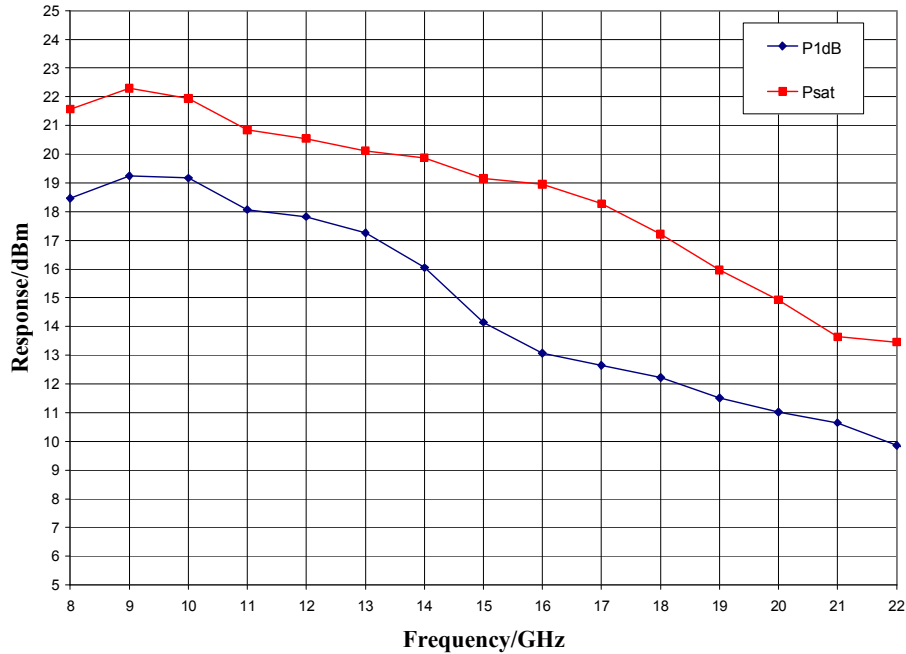
Gain vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$



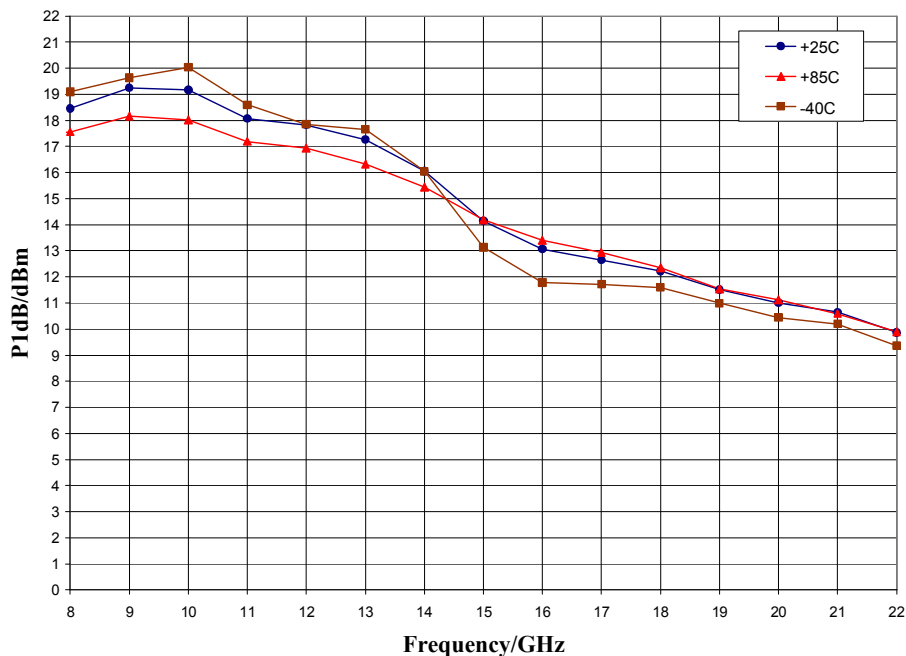
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### Typical Performance

Output Power,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$ ,  $T_A = 25\text{ }^\circ\text{C}$



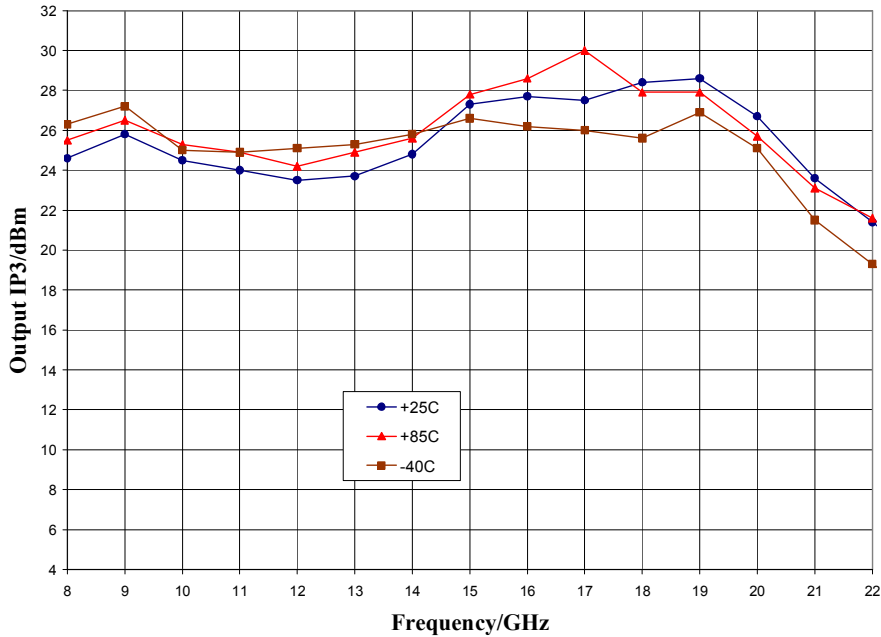
P1dB vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$



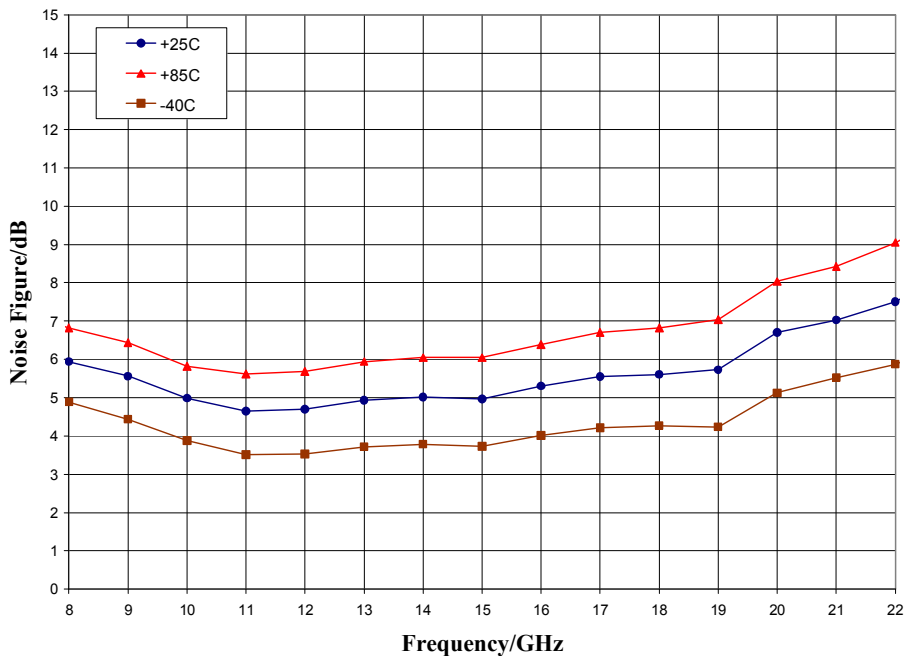
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### Typical Performance

**Output IP3 vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$**

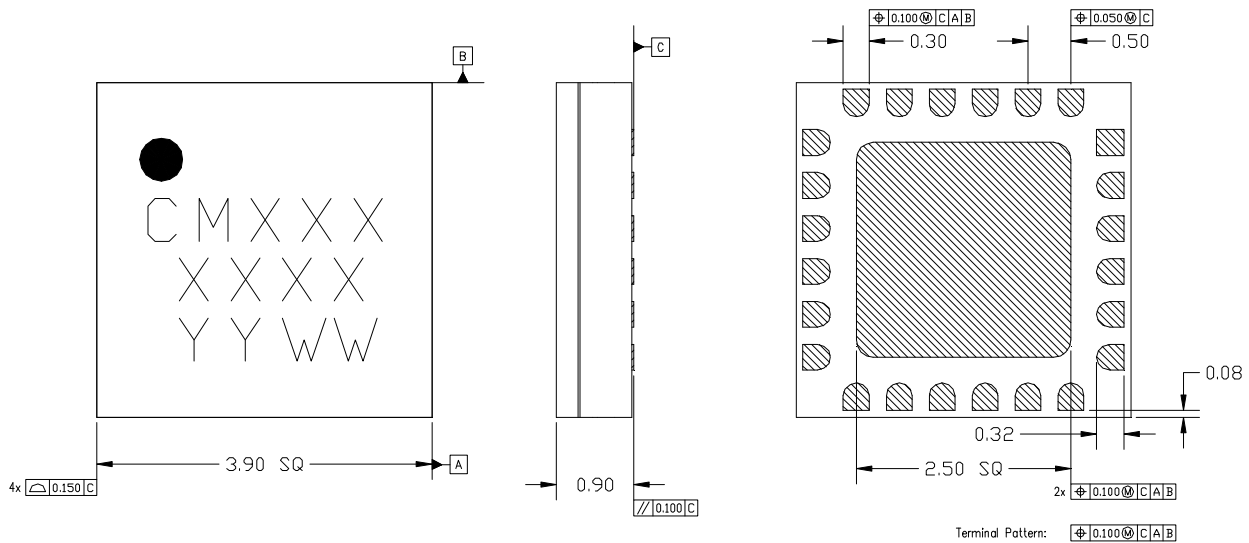


**Noise Figure vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$**



### 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

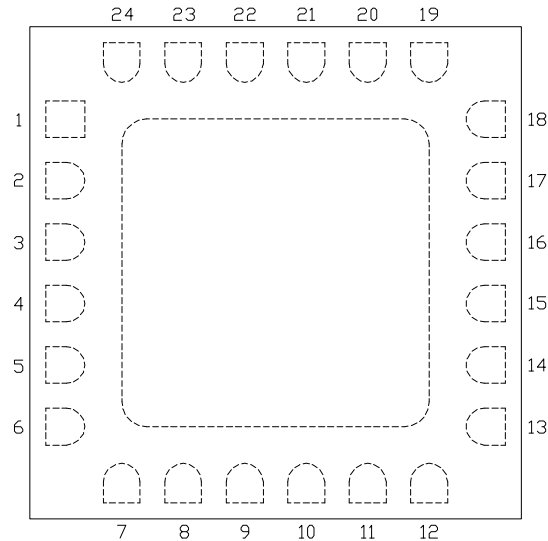
Custom MMIC Design Services recommends that the user develop the land pattern that will provide the best design for proper solder reflow and device attach for their specific application. Please review Custom MMIC Application Note AN 105 for a recommended land pattern approach.

#### Recommended Solder Reflow Profile


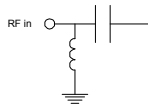
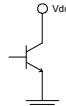
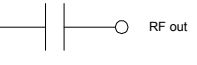
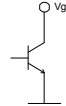
Custom MMIC Design Services recommends screen printing with belt furnace reflow to ensure proper solder reflow and device attach. Please review Custom MMIC Application Note AN 102 for a recommended solder reflow profile.

### Pin Description

#### Pin Diagram



#### Functional Description

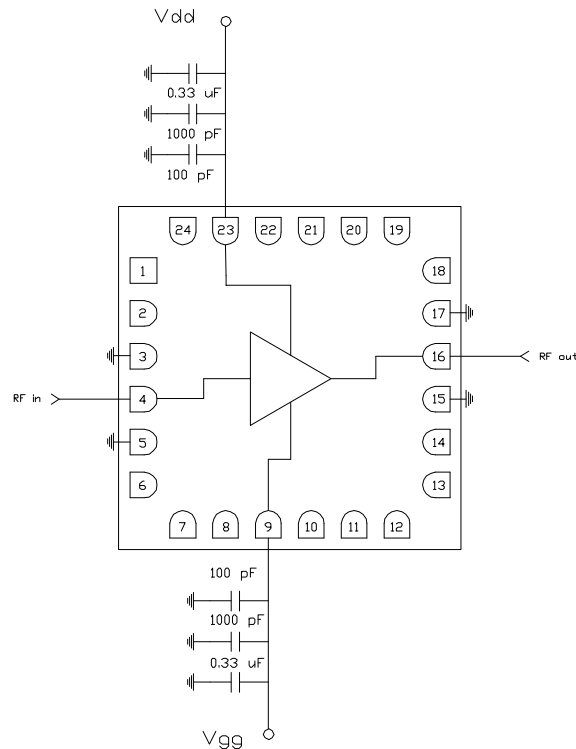
Pad	Function	Description	Schematic
1, 2, 6-8, 10-14, 18-22, 24	N/C	No connection required. These pins may be connected to RF/DC ground.	
3, 5, 15, 17 and die paddle	Ground	Connect to RF / DC ground	
4	RF in	DC coupled and 50 ohm matched	
23	Vdd	Power supply voltage Decoupling and bypass caps required	
16	RF out	DC blocked and 50 ohm matched	
9	Vgg	Power supply voltage Decoupling and bypass caps required	

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### Applications Information

#### Application Circuit



#### Biasing and Operation

The CMD246C4 is biased with a positive drain supply and positive gate supply. Performance is optimized when the drain voltage is set to +5.0 V. The recommended gate voltage is +3.0 V.

Turn ON procedure:

1. Apply drain voltage  $V_{dd}$  and set to +5 V
2. Apply gate voltage  $V_{gg}$  and set to +3 V

Turn OFF procedure:

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

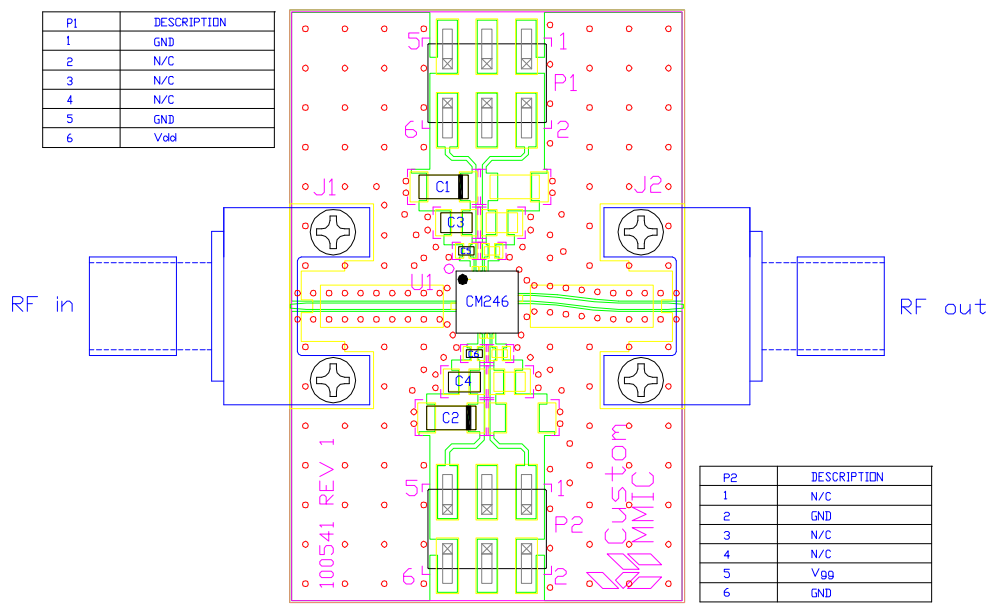
**GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.**

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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.



#### Bill of Material

Designator	Value	Description
J1, J2		SMA End Launch Connector
P1, P2		6 Pin Header
C1, C2	0.33 $\mu$ F	Capacitor, Tantalum
C3, C4	1000 pF	Capacitor, 0603
C5, C6	100 pF	Capacitor, 0402
U1		CMD246C4 Driver Amplifier
PCB		100541 Evaluation PCB