



# CMD246C4

## 8-22 GHz Low Phase Noise Amplifier

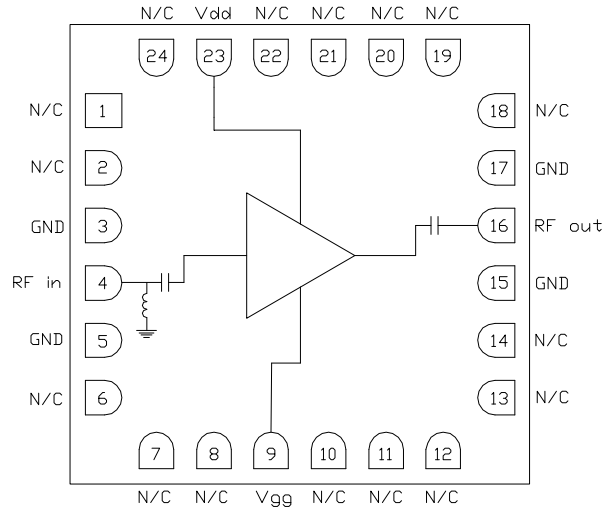
### Features

- ▶ 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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### 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	-55 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.

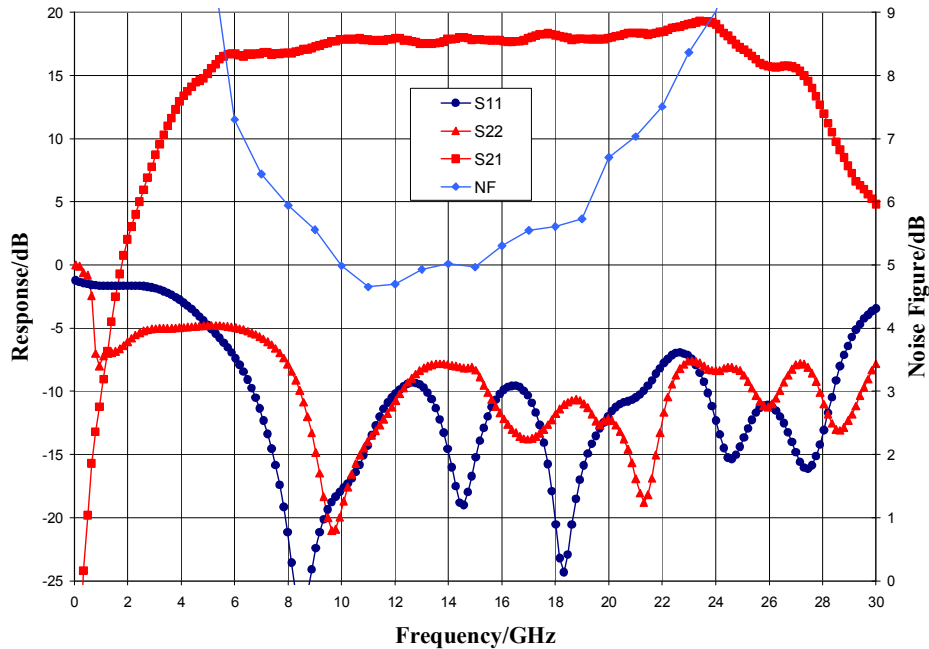
#### Electrical Specifications, V<sub>dd</sub> = 5.0 V, V<sub>gg</sub> = 3.0 V, T<sub>A</sub> = 25 °C

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

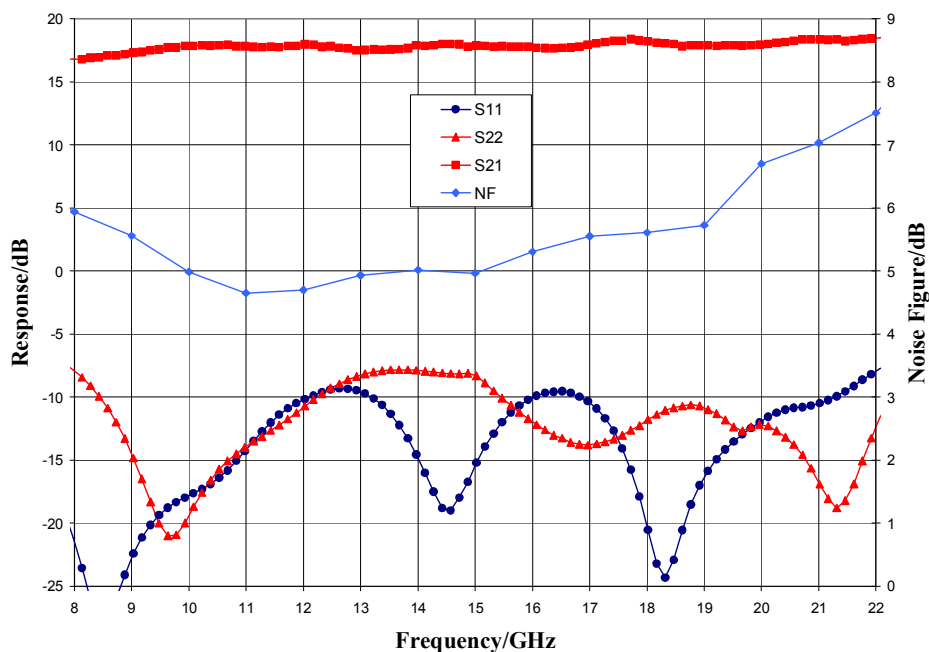
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### Typical Performance

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



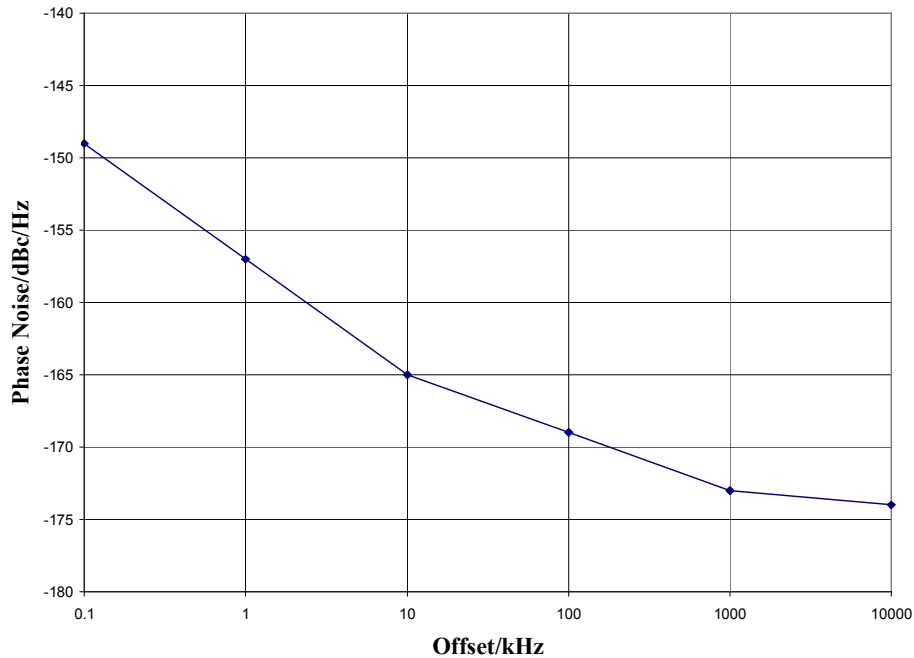
**Narrow-band Performance,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$ ,  $I_{dd} = 48\text{ mA}$ ,  $T_A = 25\text{ }^\circ\text{C}$**



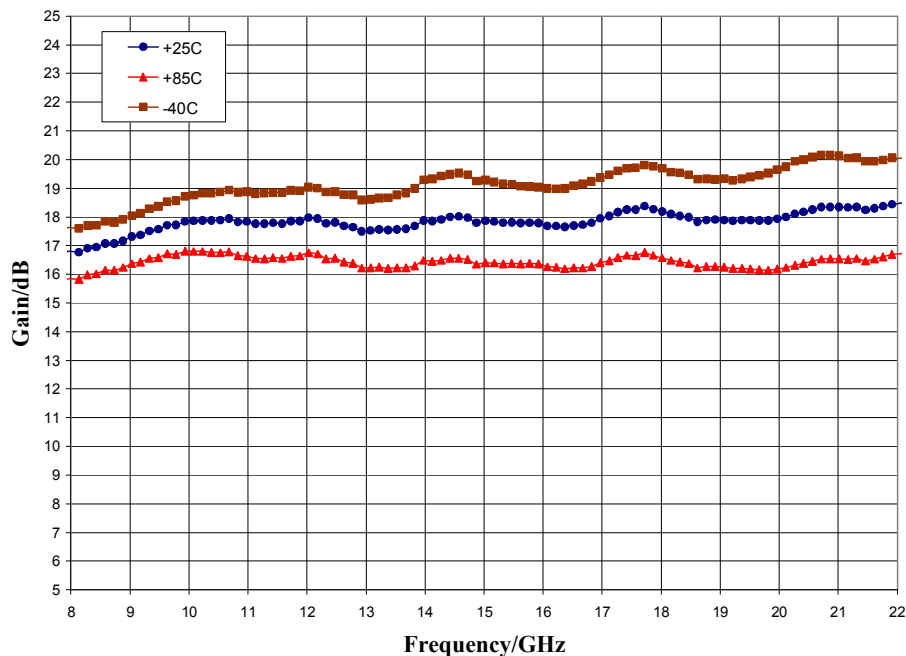
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### Typical Performance

**Additive Phase Noise @ P<sub>sat</sub>, V<sub>dd</sub> = 5.0 V, V<sub>gg</sub> = 3.0 V, T<sub>A</sub> = 25 °C**



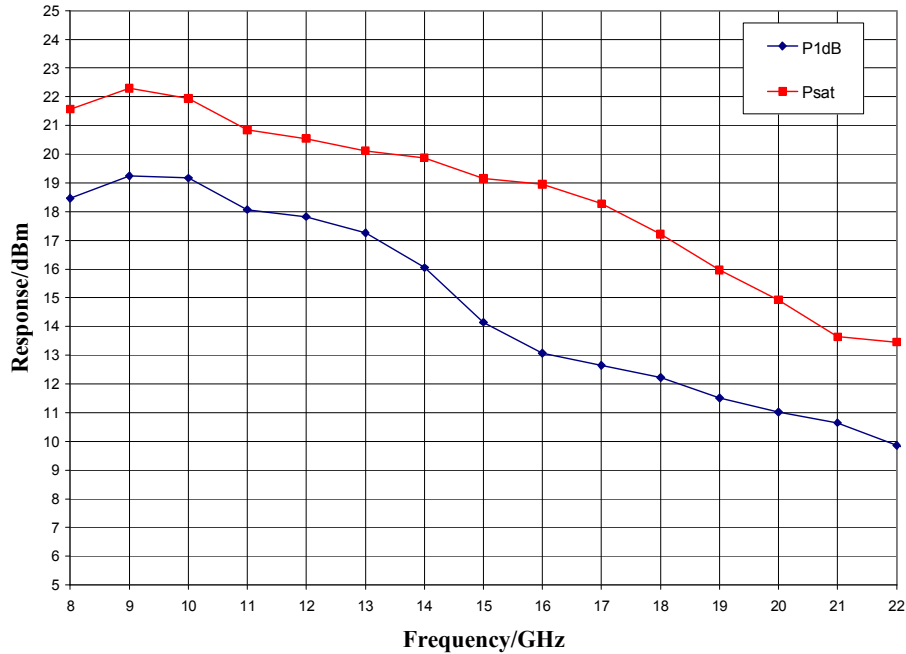
**Gain vs. Temperature, V<sub>dd</sub> = 5.0 V, V<sub>gg</sub> = 3.0 V**



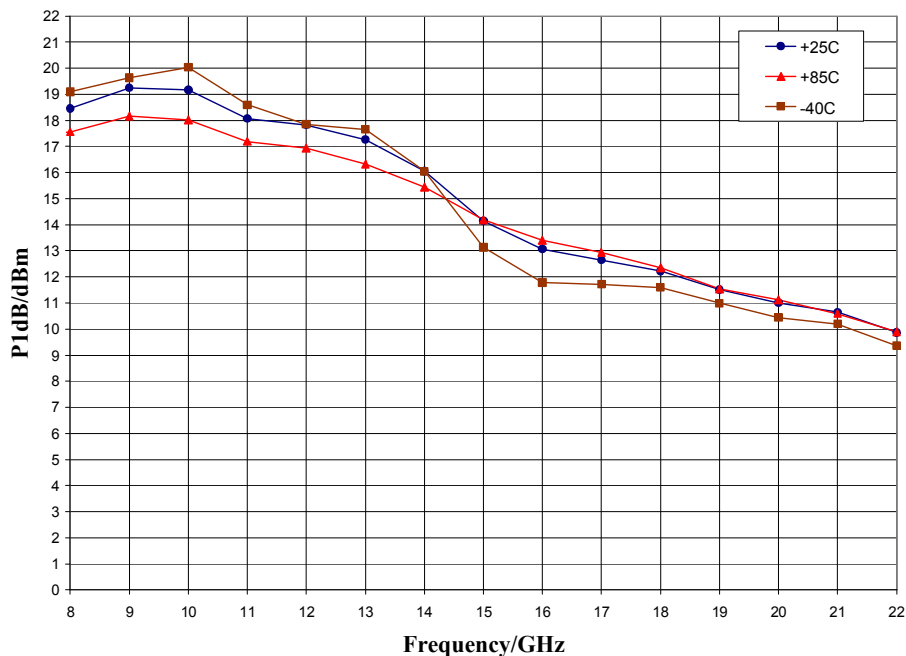
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### Typical Performance

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



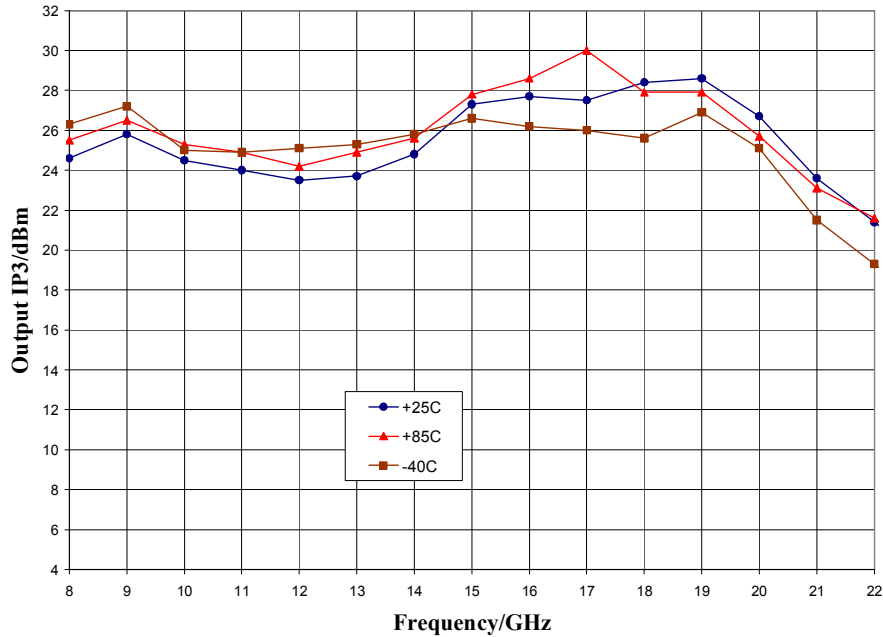
P1dB vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$



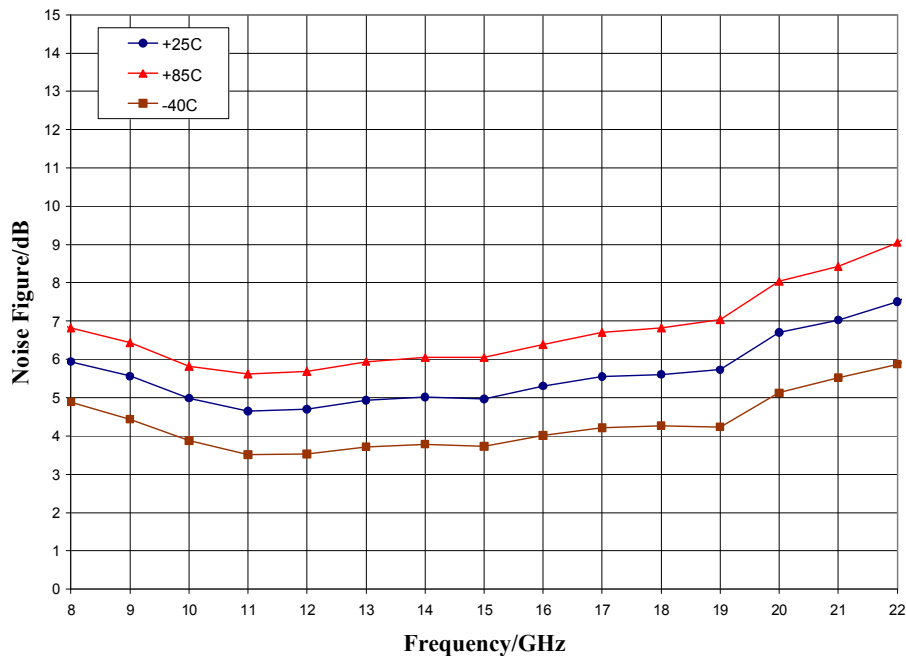
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### Typical Performance

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

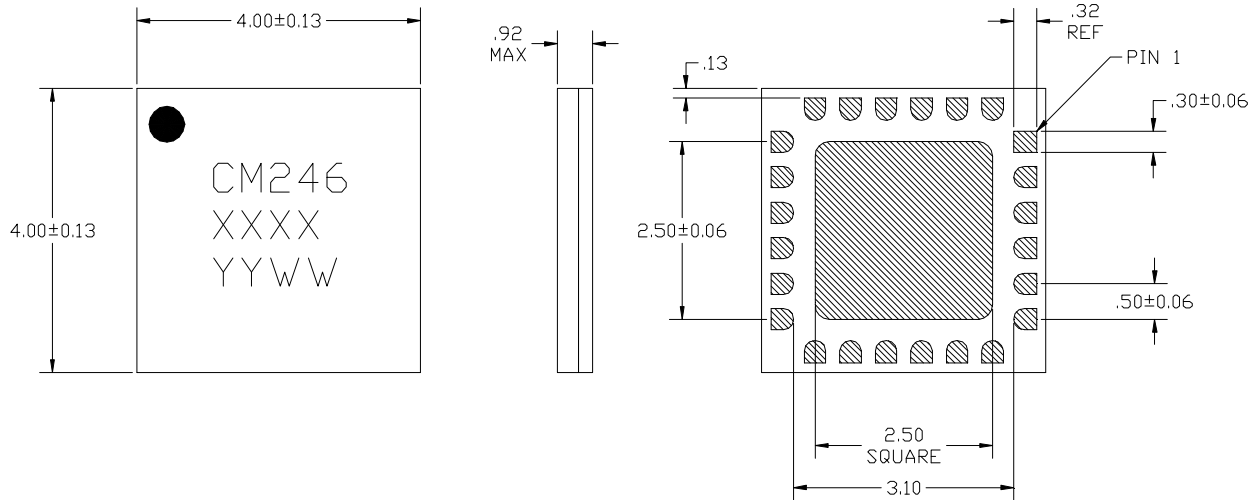


**Noise Figure vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$**



### Mechanical Information

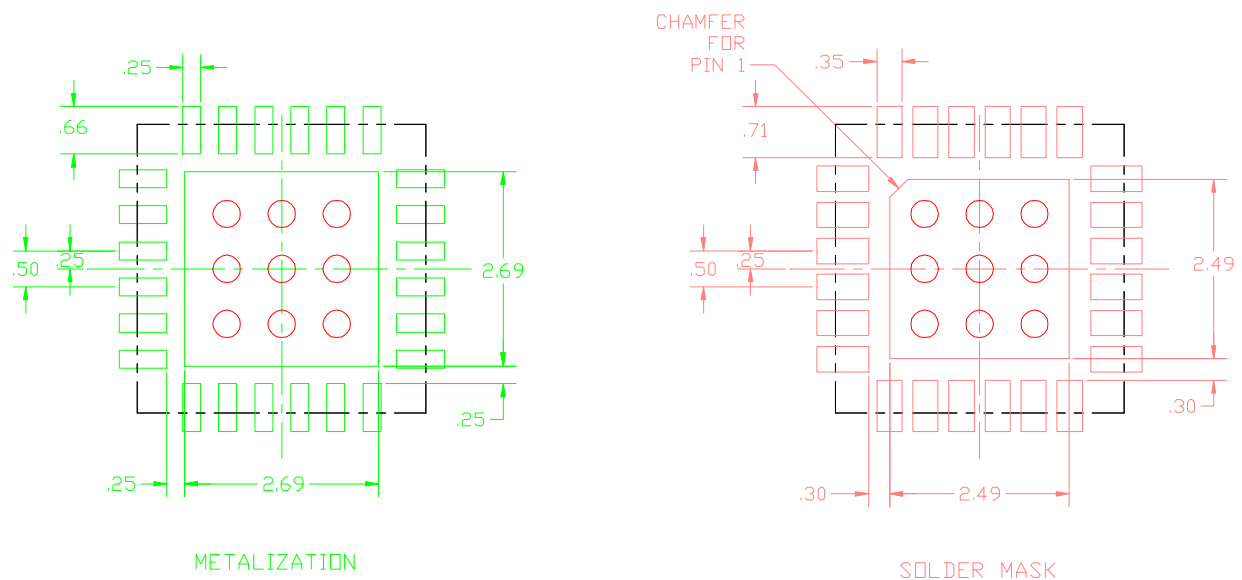
#### Package Information and Dimensions



**NOTES:**

1. DIMENSIONS ARE IN MILLIMETERS
2. MATERIAL: BLACK ALUMINA
3. LEAD FINISH: 30-80 MICROINCHES GOLD OVER 50 MICROINCHES NICKEL.
4. ALTERNATE PIN #1 IDENTIFIER IS SINGLE SQUARE PAD.

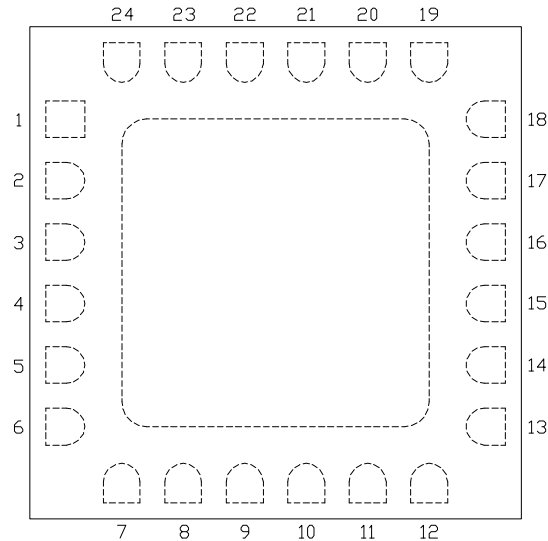
#### Recommended PCB Land Pattern




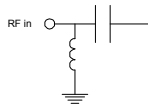
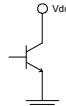
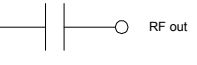
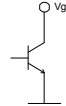
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### Pin Description

#### Pin Diagram



#### Functional Description

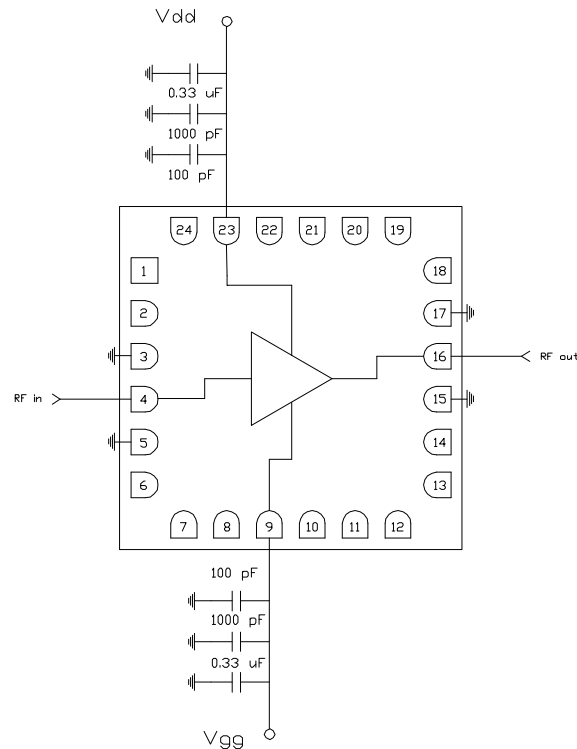
Pad	Function	Description	Schematic
1, 2, 6-8, 10-14, 18-22, 24	N/C	No connection required. These pins may be connected to RF/DC ground.	
3, 5, 15, 17 and die paddle	Ground	Connect to RF / DC ground	
4	RF in	DC coupled and 50 ohm matched	
23	Vdd	Power supply voltage Decoupling and bypass caps required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

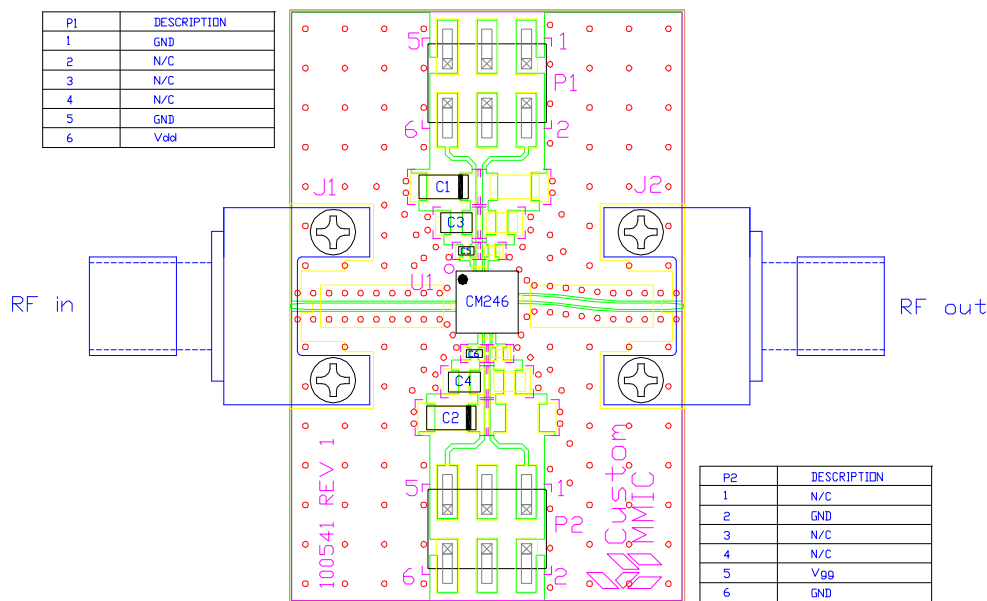
**GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.**

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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