CMD242K4

DC-40 GHz Distributed Amplifier

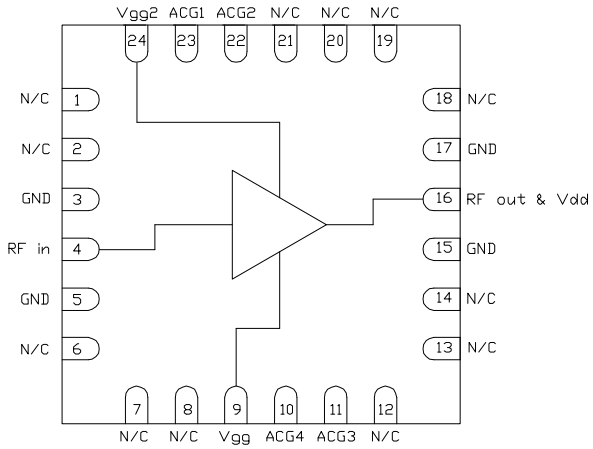
Features

- ► Ultra wideband performance
- ► Low current consumption
- ► Excellent return losses
- ► Pb-free RoHs compliant 4x4 mm SMT package

Description

The CMD242K4 is wideband GaAs MMIC distributed low noise amplifier housed in a leadless surface mount package which operates from DC to 40 GHz. The amplifier delivers greater than 10.5 dB of gain with a corresponding noise figure of 5 dB and output 1 dB compression point of 17.5 dBm at 20 GHz. The CMD242K4 is a 50 ohm matched design which eliminates the need for RF port matching.

Functional Block Diagram



Note: Vgg2 is optional for gain control

Electrical Performance - V_{dd} = 8.0 V, I_{dd} = 100 mA, T_A = 25 °C, F = 20 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		DC - 40		GHz
Gain		10.5		dB
Noise Figure		5		dB
Input Return Loss		20		dB
Output Return Loss		15		dB
Output P1dB		17.5		dBm
Output IP3		26		dBm
Supply Current		100		mA

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300 Apollo Drive Chelmsford, MA 01824 Phone (978) 467-4290 Fax (978) 467-4294
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Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	10 V
Gate Voltage, Vgg	-2.5 to 0 V
RF Input Power	+23 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	1.05 W
Thermal Resistance, Θ_{JC}	62.1 °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	5.0	8.0	8.5	V
Idd		100		mA
Vgg		-0.32		V

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

Electrical Specifications, V_{dd} = 8.0 V, V_{gg} = -0.32 V, T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	DC - 20			20 - 40			GHz
Gain	7.5	10.5		7	10.5		dB
Noise Figure		4.5			6.5		dB
Input Return Loss		20			10		dB
Output Return Loss		20			10		dB
Output P1dB	14.5	18		11.5	16		dBm
Output IP3		28			25		dBm
Supply Current	70	100	130	70	100	130	mA
Gain Temperature Coefficient		0.015			0.02		dB/°C
Noise Figure Temperature Coefficient		0.01			0.017		dB/°C

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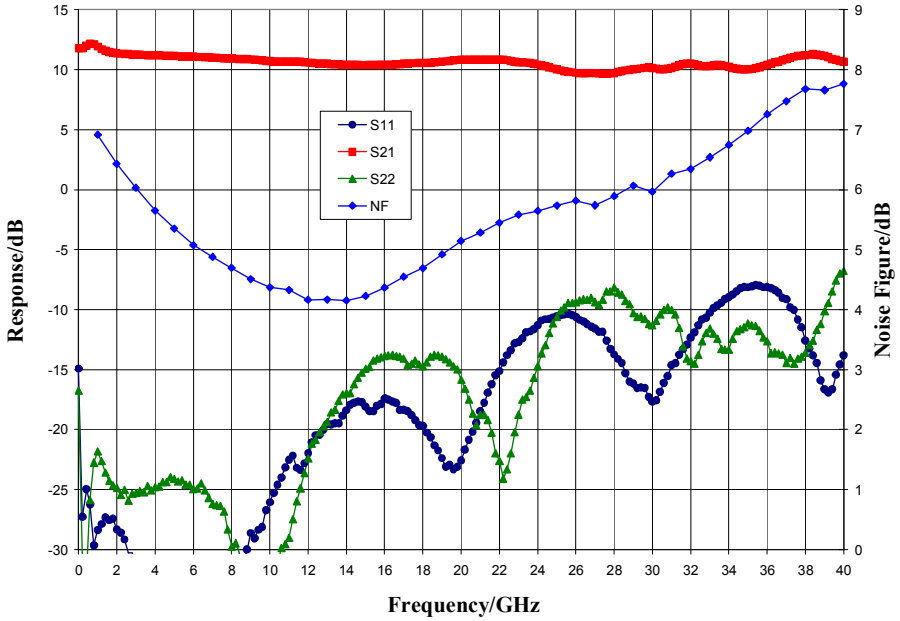
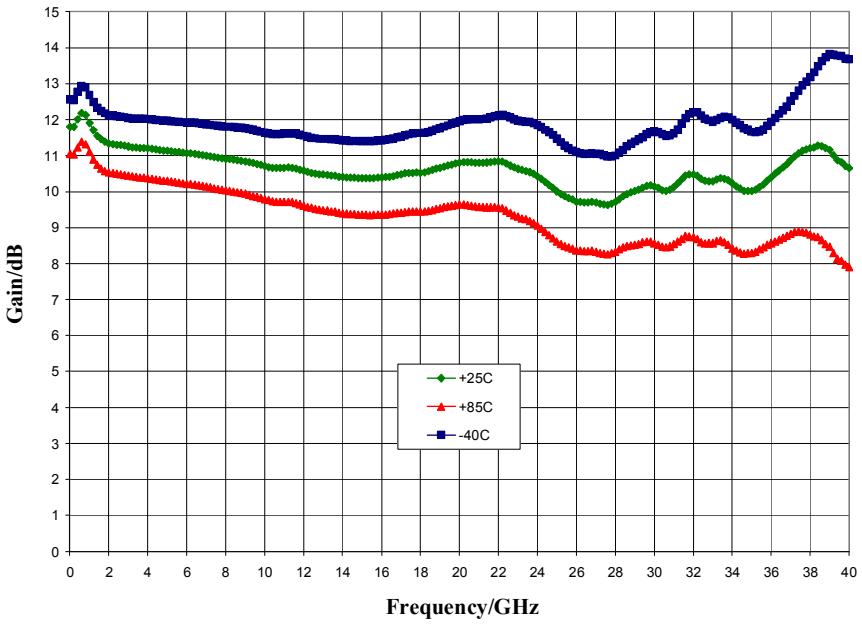
Typical Performance

Broadband Performance, V_{dd} = 8 V, I_{dd} = 100 mA, T_A = 25 °C



Gain vs. Temperature, V_{dd} = 8 V



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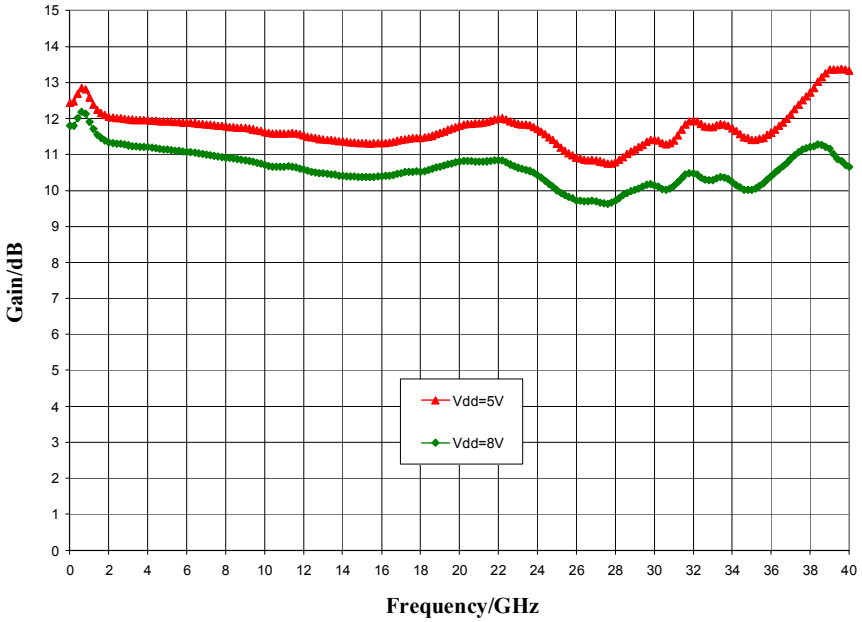
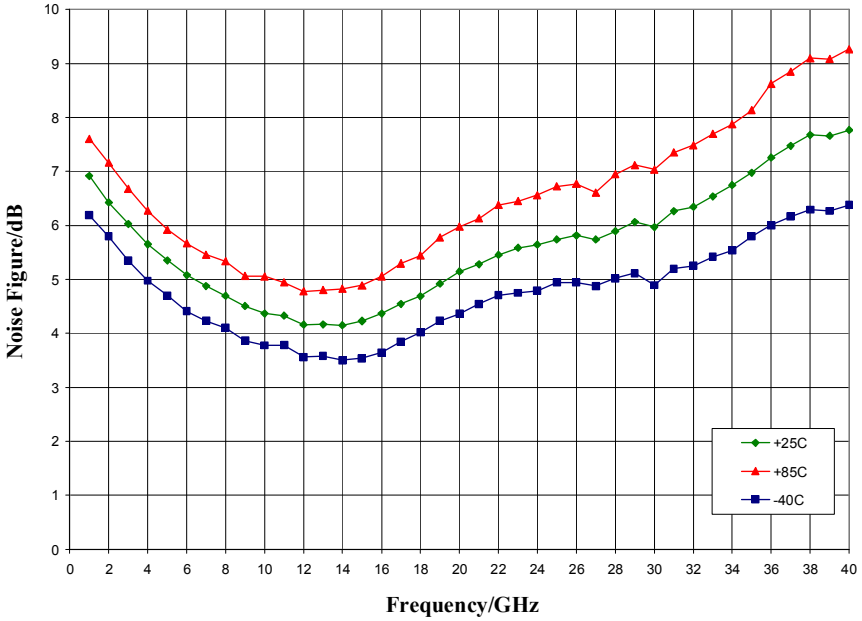
Typical Performance

Gain vs. V_{dd}, I_{dd} = 100 mA, T_A = 25 °C



Noise Figure vs. Temperature, V_{dd} = 8 V



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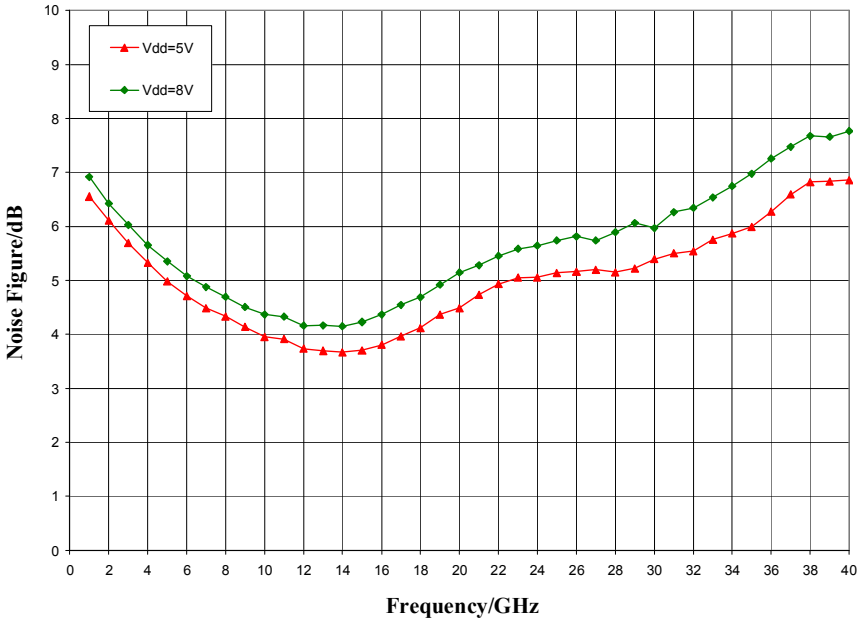
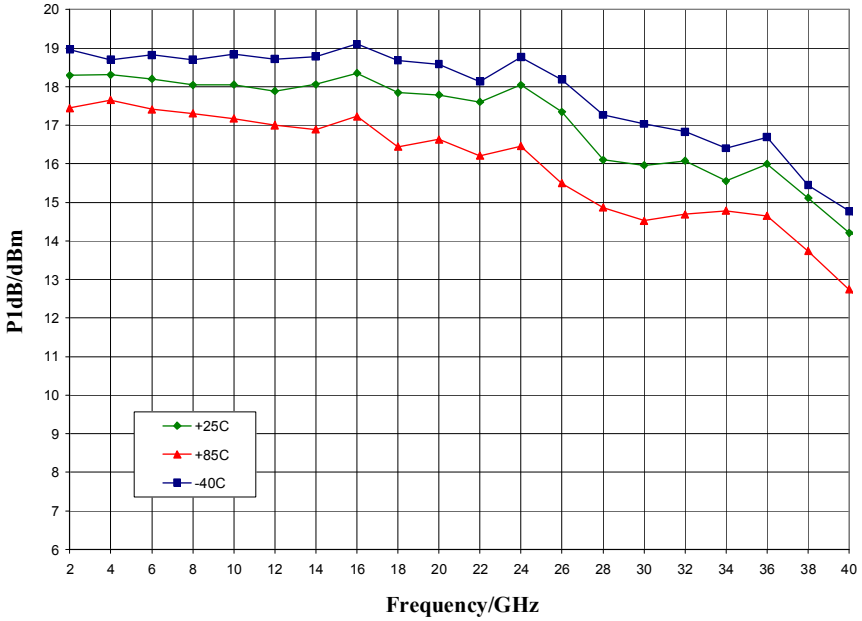
Typical Performance

Noise Figure vs. V_{dd}, I_{dd} = 100 mA, T_A = 25 °C



P1dB vs. Temperature, V_{dd} = 8 V



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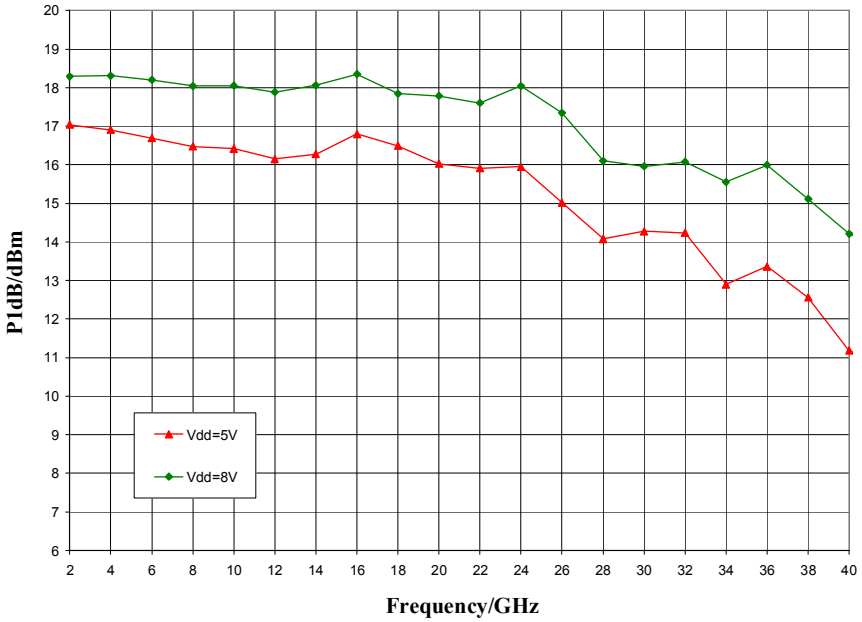
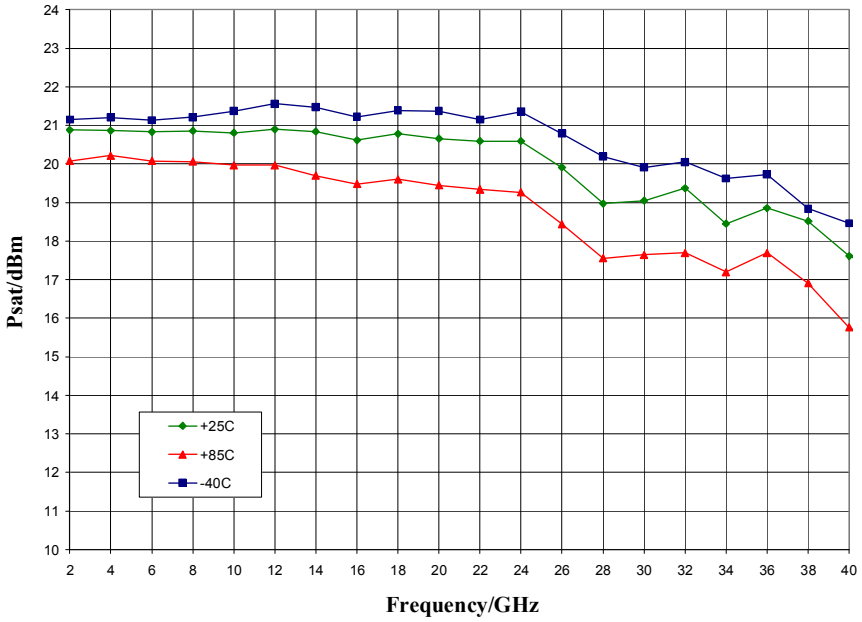
Typical Performance

P1dB vs. V_{dd}, T_A = 25 °C



Psat vs. Temperature, V_{dd} = 8 V



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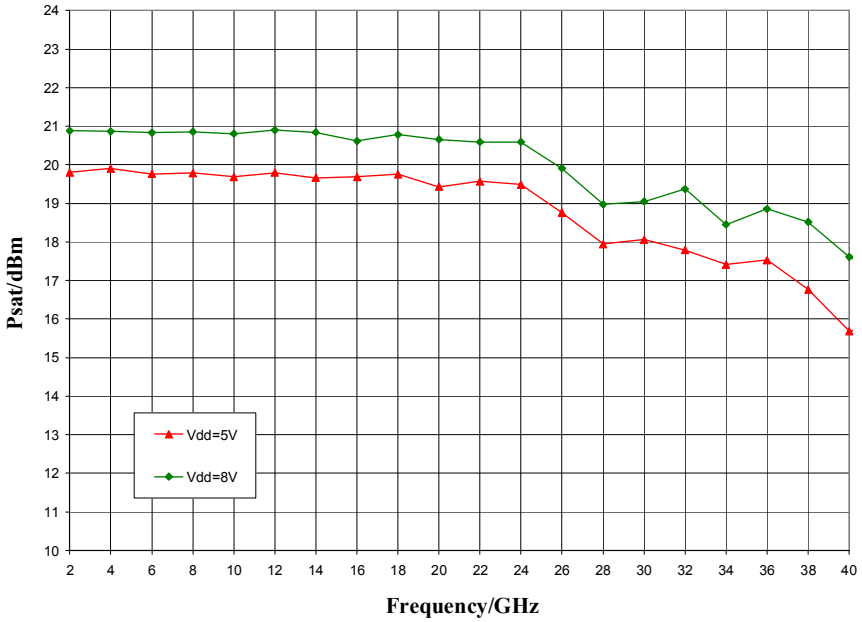
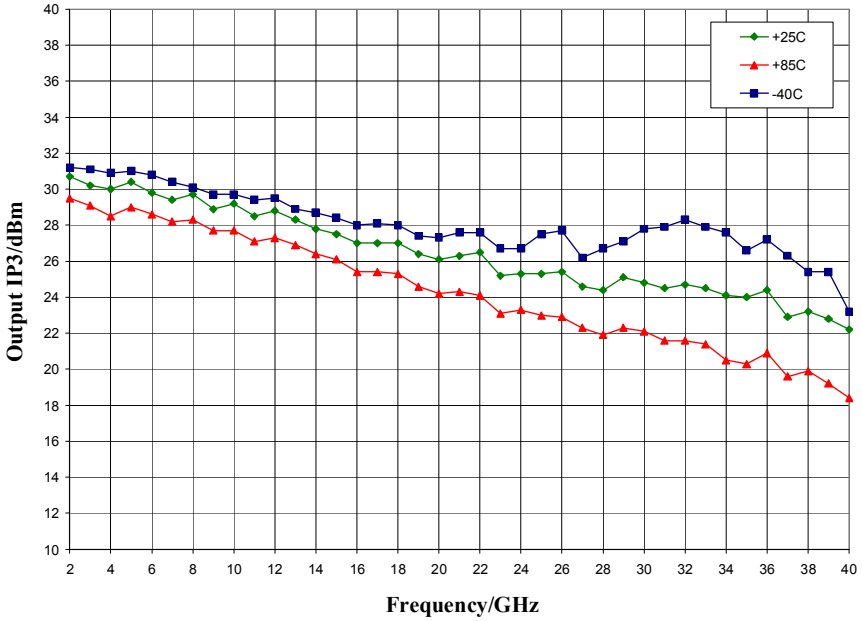
Typical Performance

Psat vs. V_{dd}, T_A = 25 °C



Output IP3 vs. Temperature, V_{dd} = 8 V



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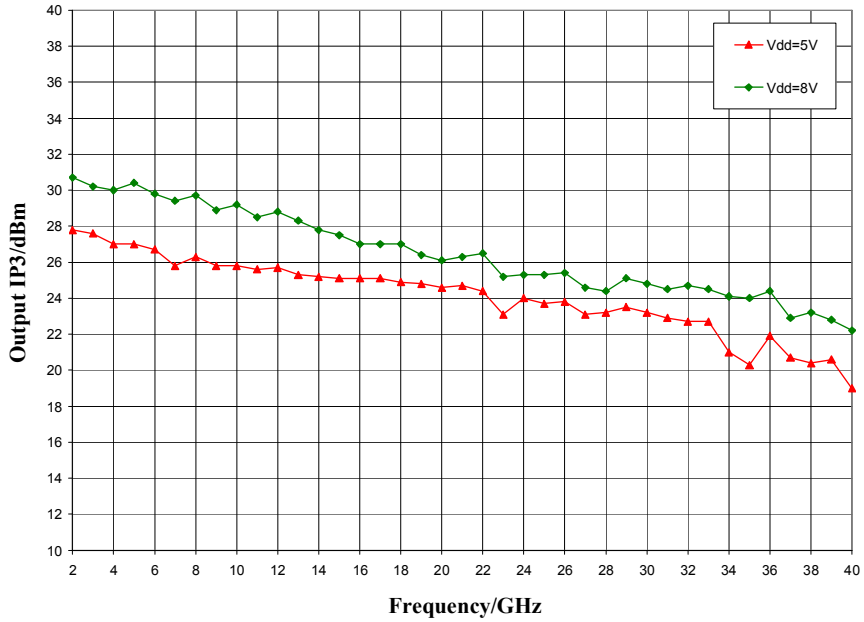
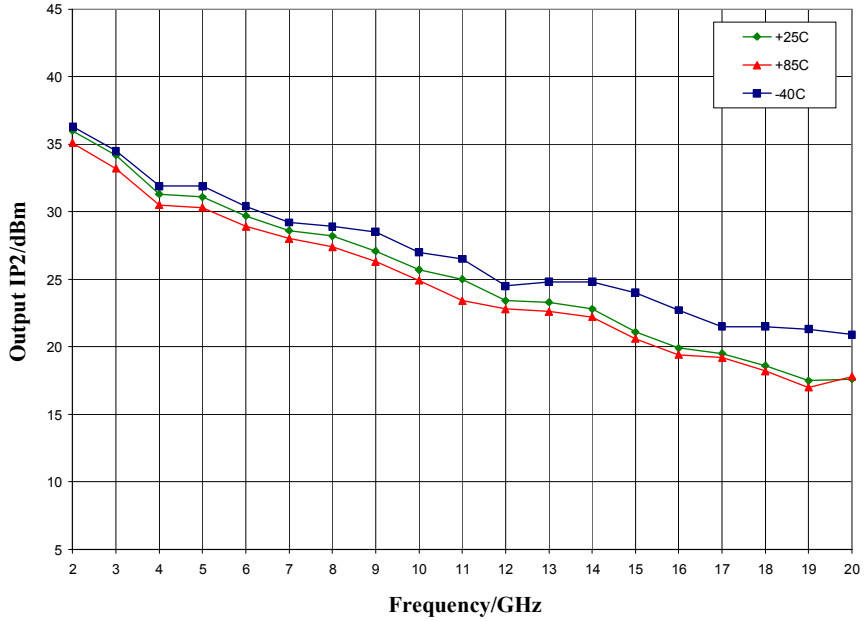
Typical Performance

Output IP3 vs. V_{dd}, I_{dd} = 100 mA, T_A = 25 °C



Output IP2 vs. Temperature, V_{dd} = 8 V



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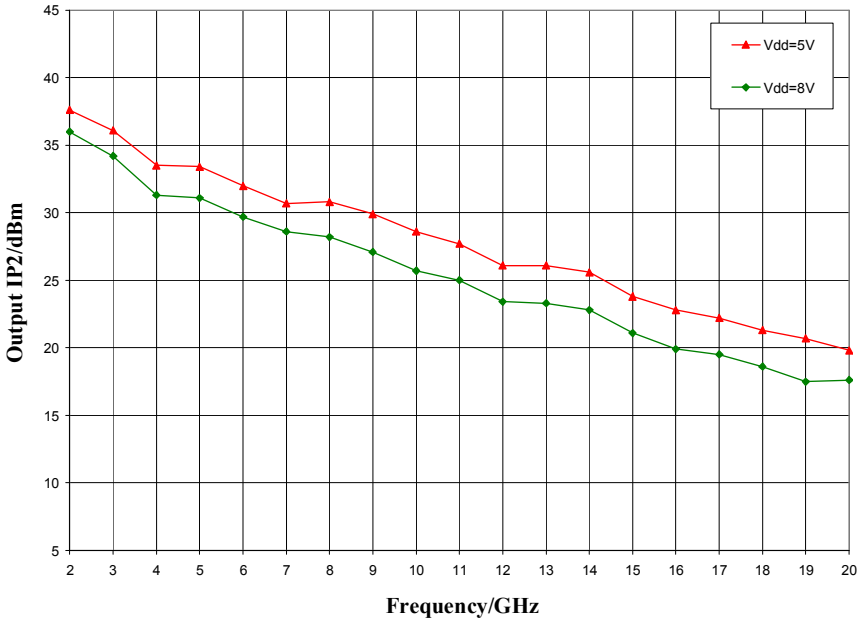
Typical Performance

Output IP2 vs. V_{dd}, I_{dd} = 100 mA, T_A = 25 °C



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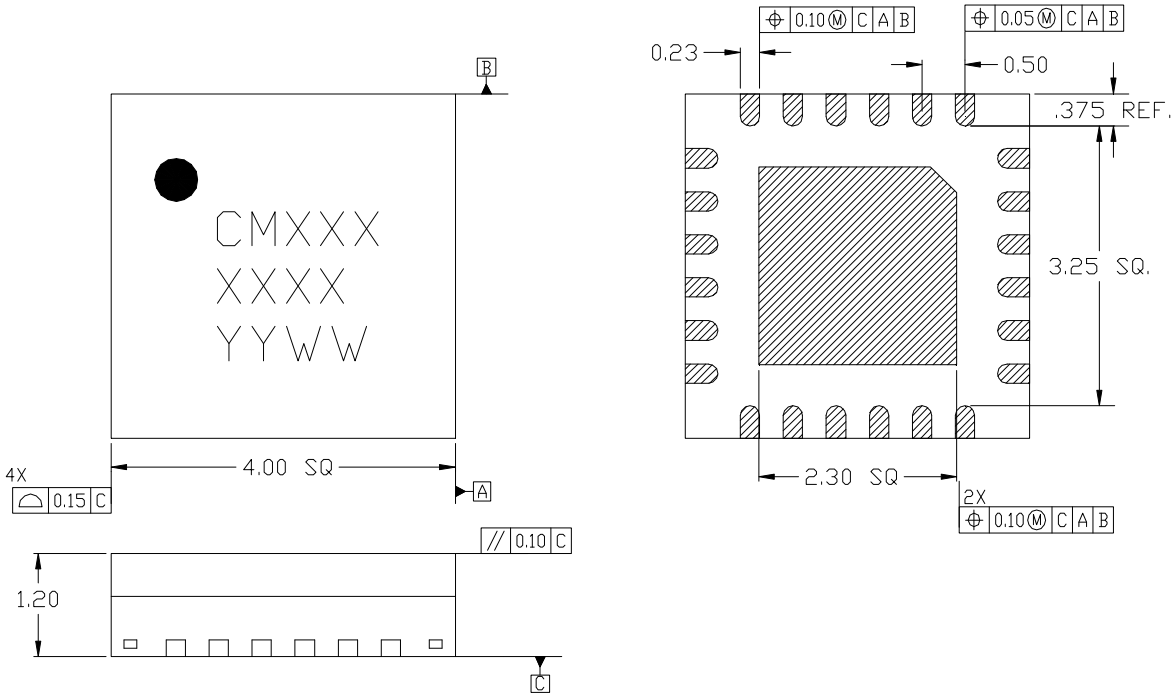
Mechanical Information

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: 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 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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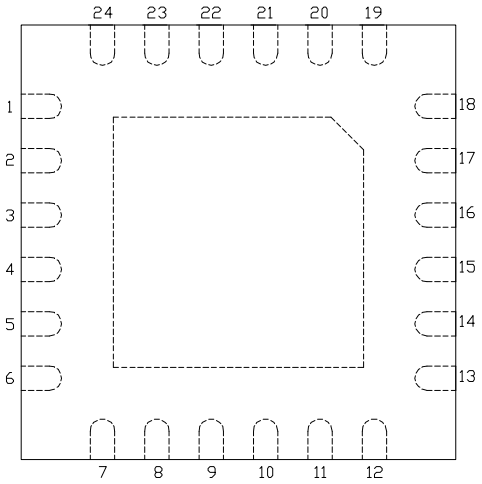
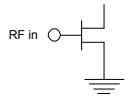
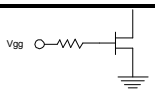
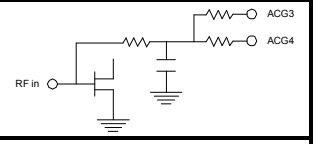
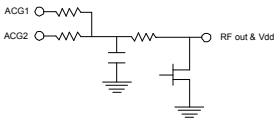
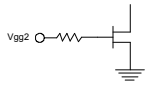
Pin Description

Pin Diagram



Functional Description

Pad	Function	Description	Schematic
1, 2, 6-8, 12-14, 18-21	N/C	No connection required. These pins may be connected to RF/DC ground	
4	RF in	50 ohm matched input	
9	Vgg	Power supply voltage Decoupling and bypass caps required	
10, 11	ACG4, 3	Low frequency termination. Attach bypass capacitor per application circuit	
22, 23	ACG2, 1	Low frequency termination. Attach bypass capacitor per application circuit	
16	RF out & Vdd	Power supply voltage and 50 ohm matched output	
24	Vgg2	Optional power supply voltage Decoupling and bypass caps required Pin must be left open if unused	
3, 5, 15, 17 and die paddle	Ground	Connect to RF / DC ground	

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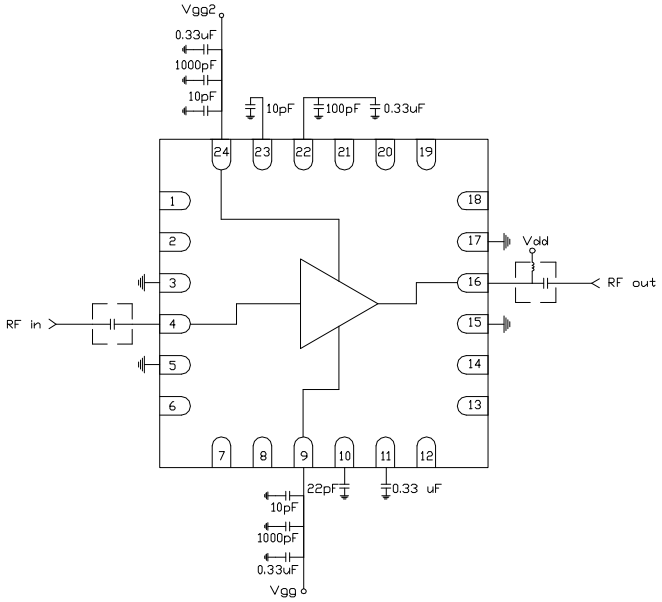
Applications Information

Application Circuit



Note: Drain voltage (Vdd) must be applied through a broadband bias tee or external bias network. External DC block is required on RF input.

Biasing and Operation

The CMD242K4 is biased with a positive drain supply and a negative gate supply. Performance is optimized when the drain voltage is set to +8 V. The nominal gate voltage is -0.32 V.

Turn ON procedure:

1.Apply gate voltage V_{gg} and set to -2V
2.Apply drain voltage V_{dd} and set to +8 V
3.Increase V_{gg} (less negative) to achieve a drain current of 100 mA

Turn OFF procedure:

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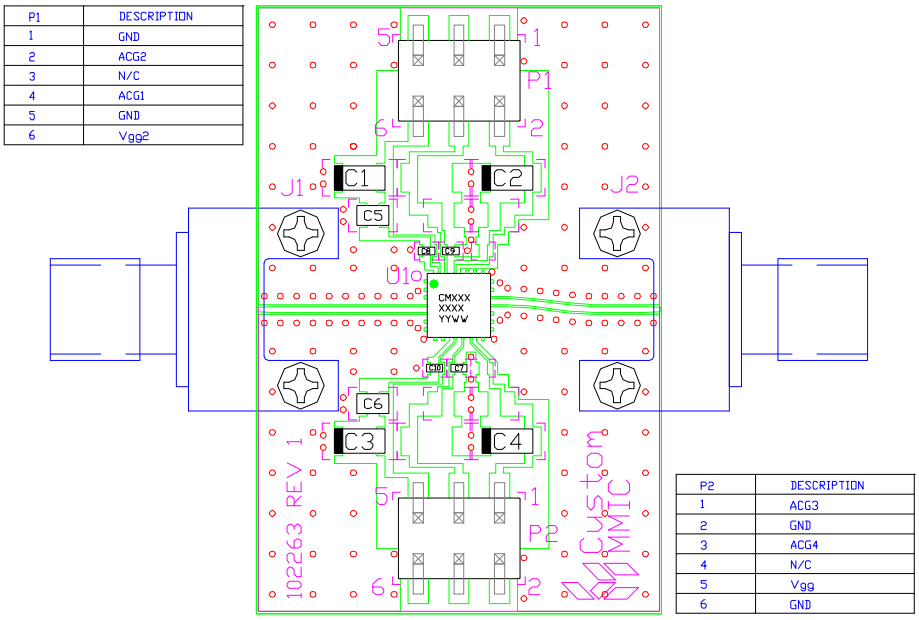
Applications Information

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.



Bill of Material

Designator	Value	Description
J1, J2		2.4 mm End Launch Connector
P1, P2		6 Pin Header
C1 - C4	0.33 µF	Capacitor, Tantalum
C5, C6	1000 pF	Capacitor, 0603
C7 - C10	100 pF	Capacitor, 0402
U1		CMD242K4 Driver Amplifier
PCB		102263 Evaluation PCB

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