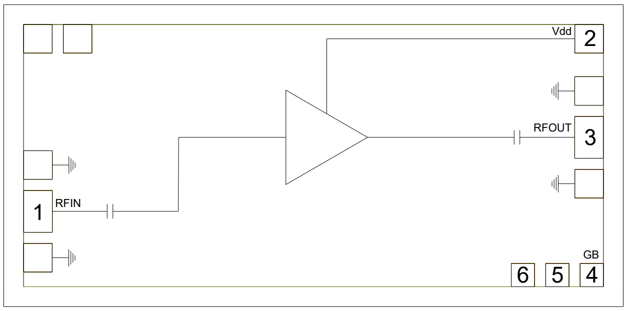
CMD238

2-20 GHz Distributed Amplifier

Features

- ► Wide bandwidth
- ► Single positive supply voltage
- ► High linearity
- ► Small die size
- ► CMM0014 replacement

Functional Block Diagram



Description

The CMD238 is a wideband GaAs MMIC distributed amplifier ideally suited for military, space and communications systems where small size and high linearity are needed over a wide bandwidth. At 10 GHz the device delivers 14 dB of gain with a corresponding output 1 dB compression point of +26 dBm and a 2nd harmonic level of -33 dBc. The CMD238 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching. The CMD238 offers full passivation for increased reliability and moisture protection.

Electrical Performance - V_{dd} = 8.0 V, T_A = 25 °C, F=10 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		2 - 20		GHz
Gain		14		dB
Noise Figure		4.5		dB
Input Return Loss		15		dB
Output Return Loss		15		dB
Output P1dB		26		dBm
Output IP3		34		dBm
2nd Harmonic Level, Pout = 11 dBm		-33		dBc
Supply Current		360		mA

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Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	10 V
RF Input Power	+20 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	3.58 W
Thermal Resistance, Θ_{JC}	18.1 °C/W
Operating Temperature	-55 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	3.0	8.0	9.0	V
Idd		360		mA

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, T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		2 - 12			12 - 20		GHz
Gain	11	14		10	13.5		dB
Noise Figure		4.5			5		dB
Input Return Loss		12			12		dB
Output Return Loss		15			9		dB
Output P1dB	23	26		20	24		dBm
Output IP3		35			32		dBm
Supply Current	260	360	460	260	360	460	mA
Gain Temperature Coefficient		0.014			0.014		dB/°C
Noise Figure Temperature Coefficient		0.012			0.012		dB/°C

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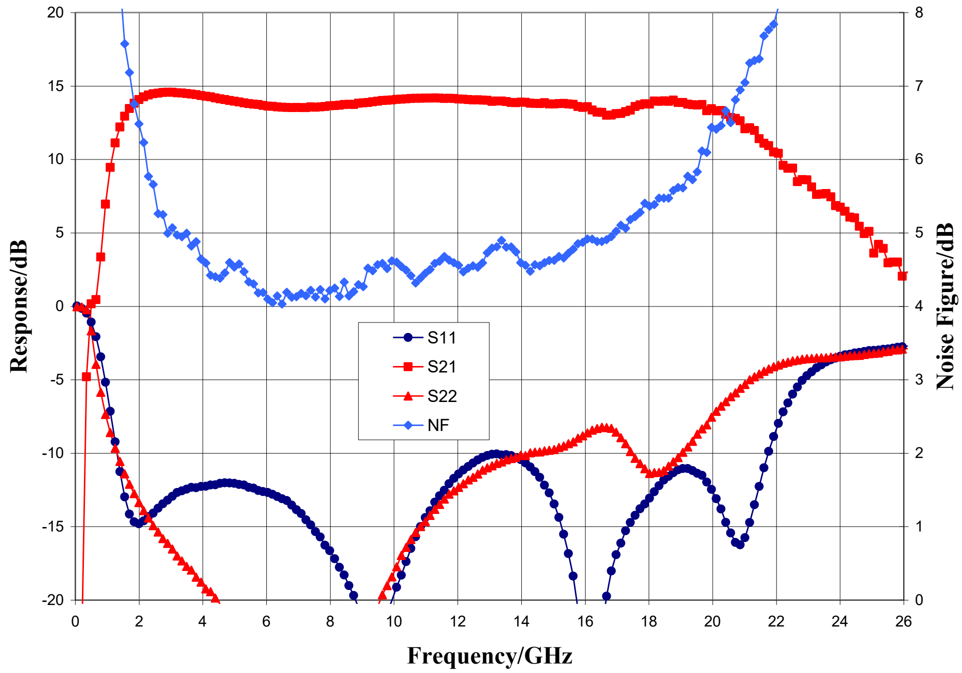
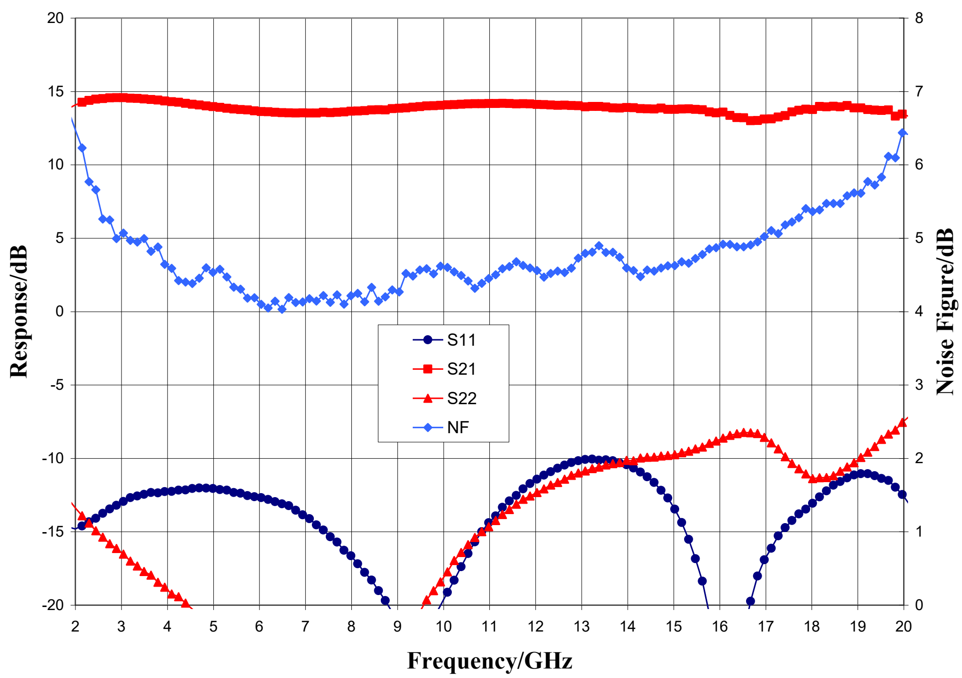
Typical Performance

Broadband Performance, V_{dd} = 8.0 V, I_{dd} = 360 mA, T_A = 25 °C



Narrow-band Performance, V_{dd} = 8.0 V, I_{dd} = 360 mA, T_A = 25 °C



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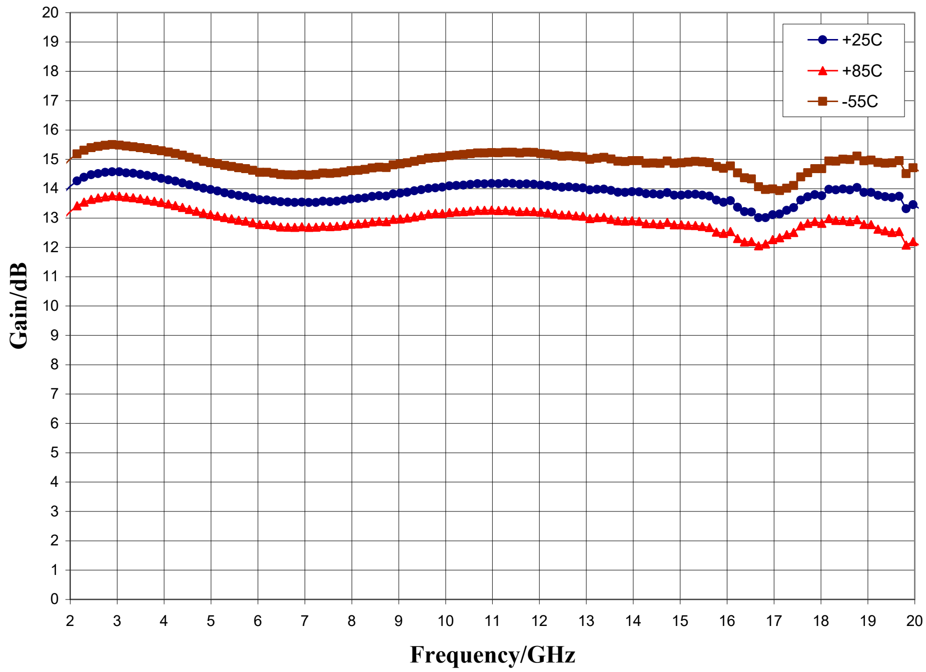
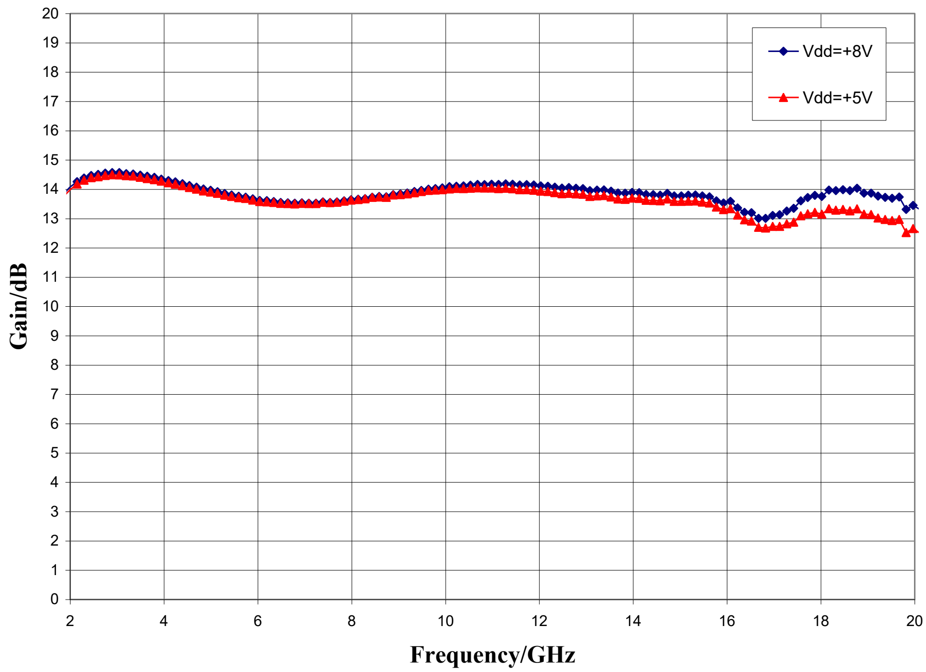
Typical Performance

Gain vs. Temperature, V_{dd} = 8.0 V



Gain vs. Supply Voltage, T_A = 25 °C



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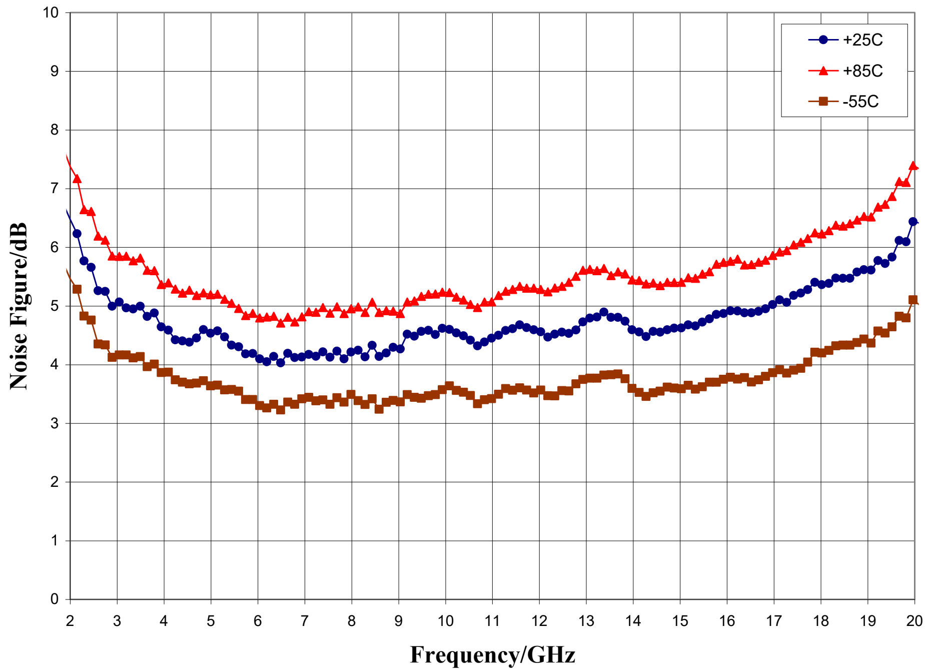
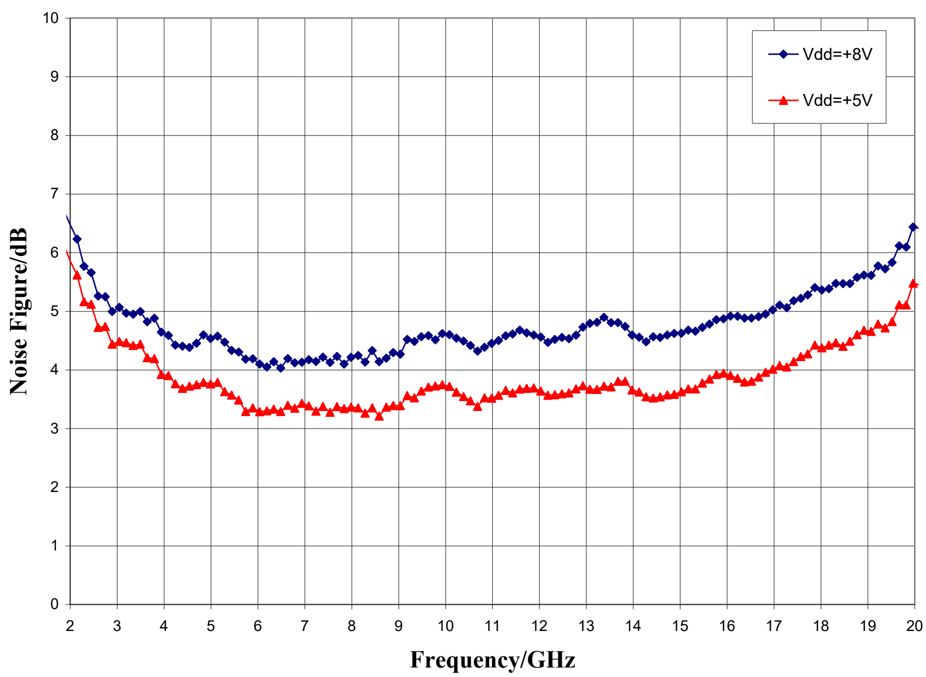
Typical Performance

Noise Figure vs. Temperature, V_{dd} = 8.0 V



Noise Figure vs. Supply Voltage, T_A = 25 ^oC



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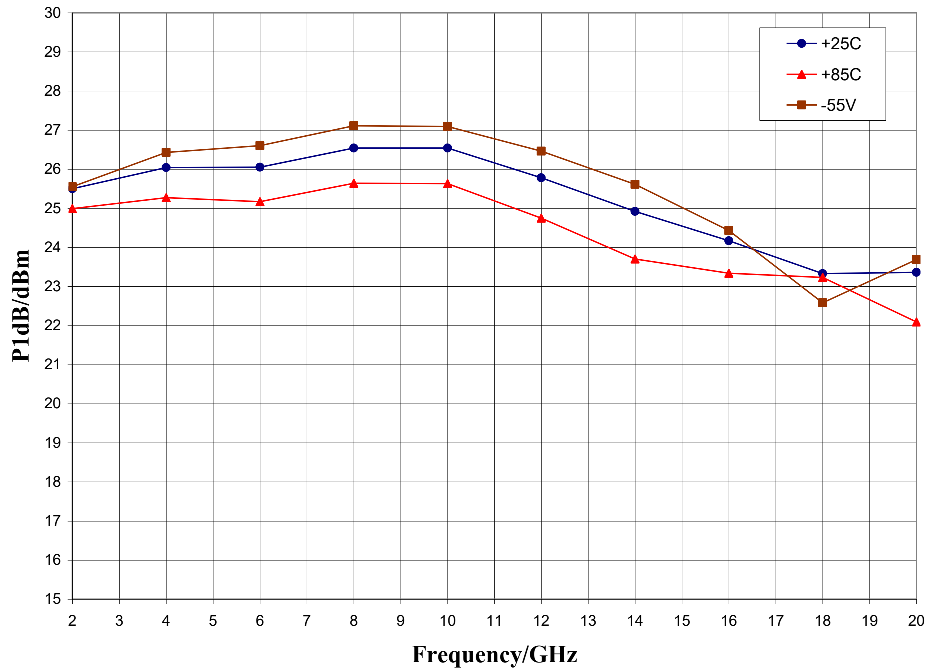
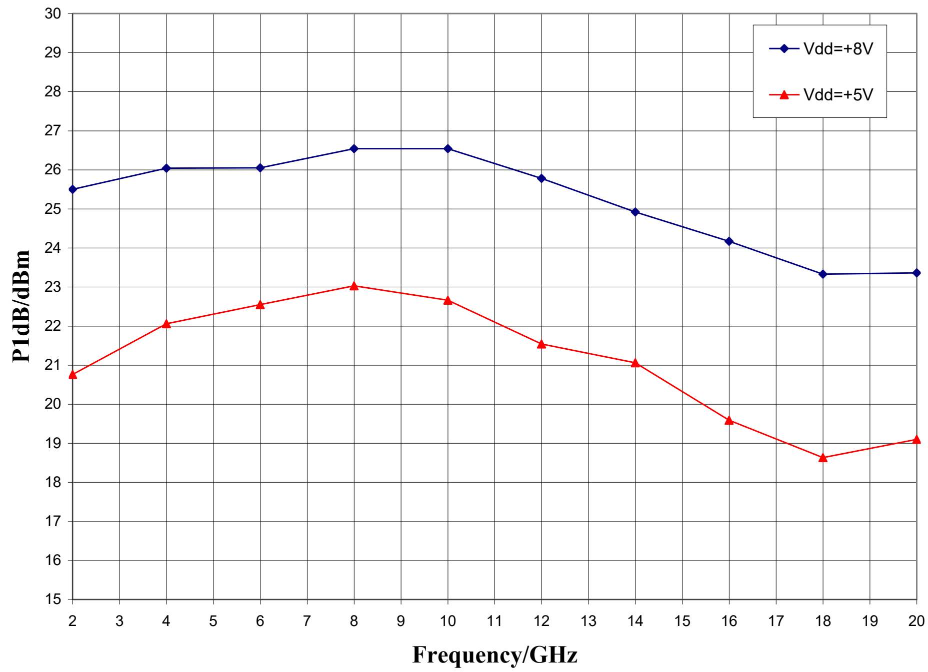
Typical Performance

P1dB vs. Temperature, V_{dd} = 8.0 V



P1dB vs. Supply Voltage, T_A = 25 ^{o}C



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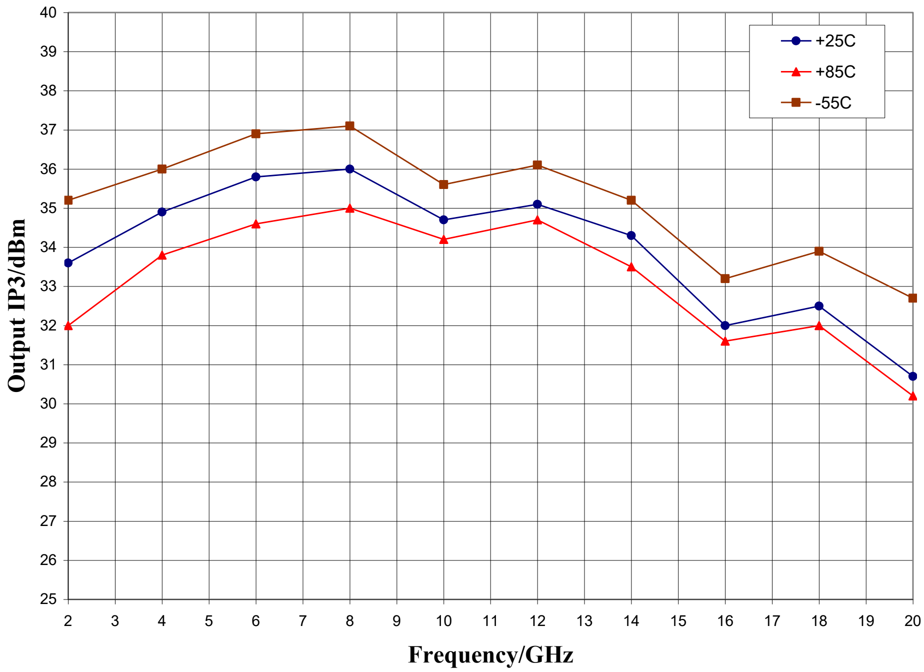
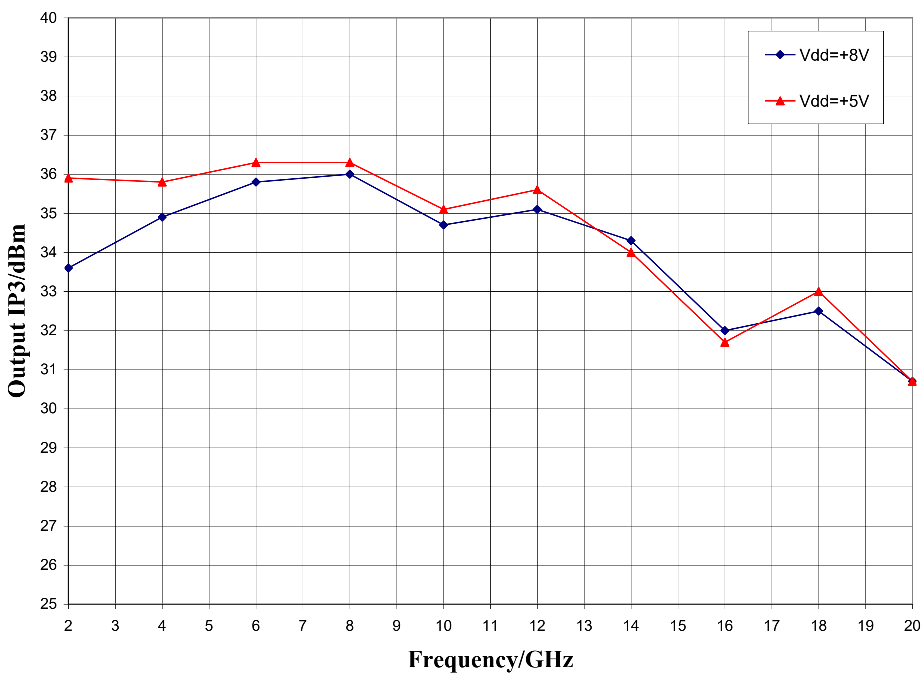
Typical Performance

Output IP3 vs. Temperature, V_{dd} = 8.0 V



Output IP3 vs. Supply Voltage, T_A = 25 °C



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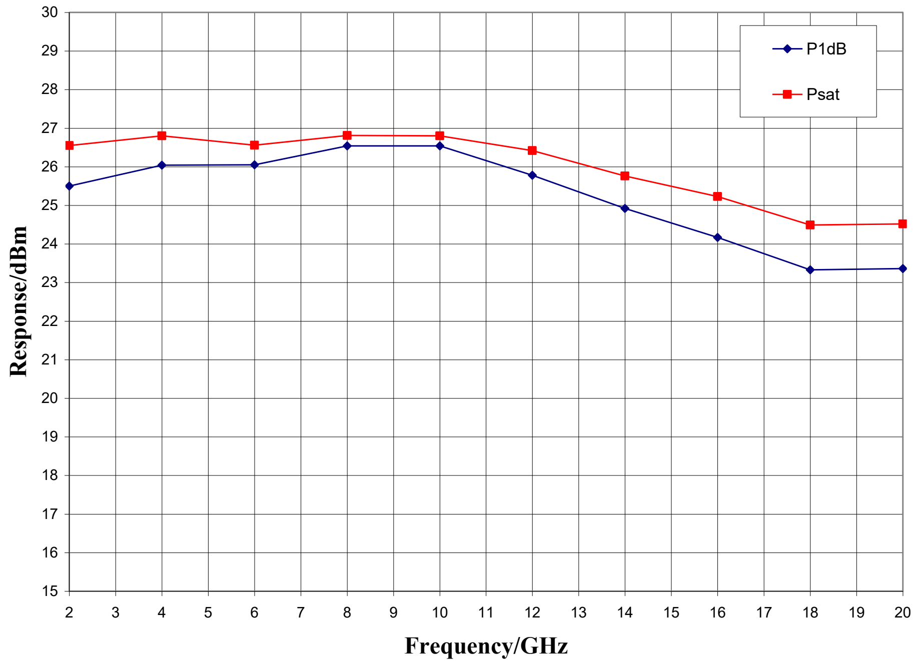
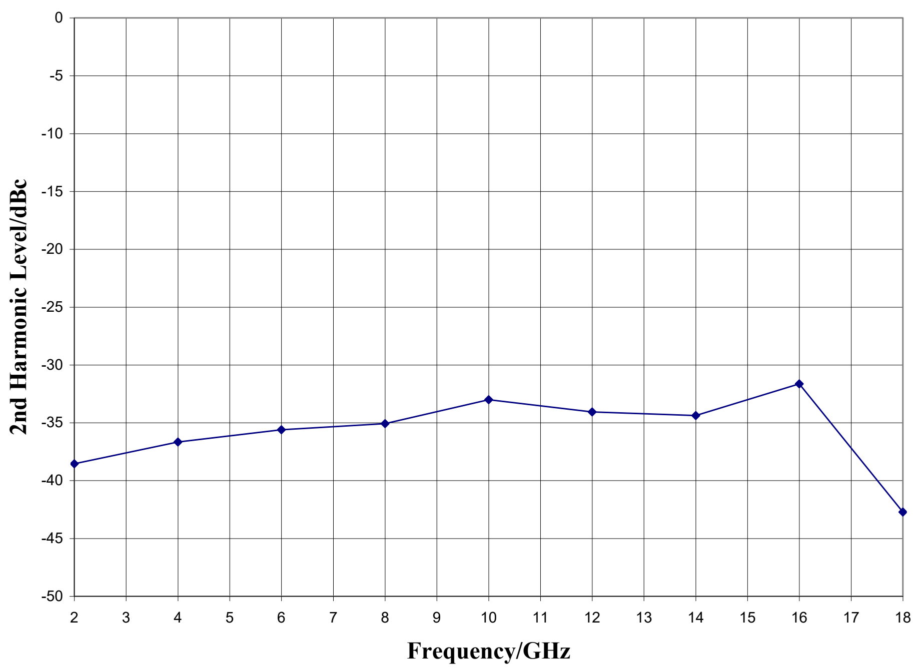
Typical Performance

Output Power, V_{dd} = 8.0 V, T_A = 25 °C



2nd Harmonic Level, V_{dd} = 8.0 V, Pout = 11 dBm, T_A = 25 °C



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Mechanical Information

Die Outline (all dimensions in microns)

Notes:
1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 85 microns thick
5. DC bond pads (2, 4, 5, 6) are 100 x 100 microns
6. RF bond pads (1, 3) are 100 x 150 microns

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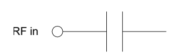
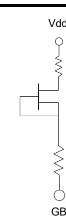
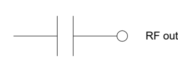
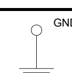
Pad Description

Pad Diagram

Functional Description

Pad	Function	Description	Schematic
1	RF in	DC blocked and 50 ohm matched	
2	Vdd	Power supply voltage. Coil, decoupling and bypass caps required	
4	GB	Connect to DC ground	
3	RF out	DC blocked and 50 ohm matched	
5, 6	N/C	No connection required	
Backside	Ground	Connect to RF / DC ground	

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Applications Information

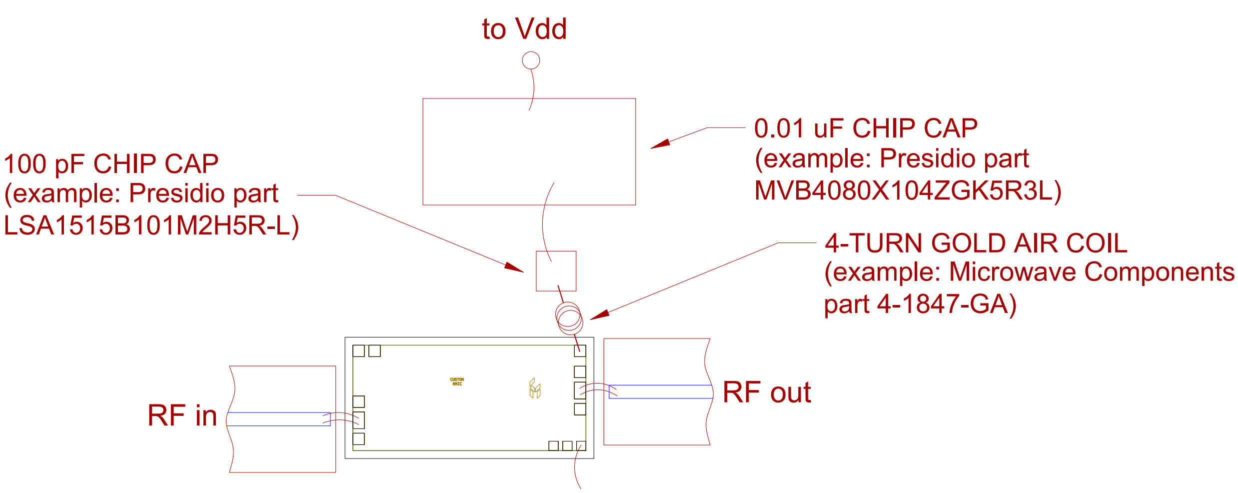
Assembly Guidelines

The backside of the CMD238 is RF ground. Die attach shall be accomplished with electrically and thermally conductive epoxy only. Eutectic attach is not recommended. Standard assembly procedures should be followed for high frequency devices. The top surface of the semiconductor should be made planar to the adjacent RF transmission lines, and the RF decoupling capacitors placed in close proximity to the DC connections on chip.

RF connections should be made as short as possible to reduce the inductive effect of the bond wire. Use of a 0.8 mil thermosonic wedge bonding is highly recommended as the loop height will be minimized. The RF input and output require a double bond wire as shown.

The semiconductor is 85 um thick and should be handled by the sides of the die or with a custom collet. Do not make contact directly with the die surface as this will damage the monolithic circuitry. Handle with care.

Assembly Diagram



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

Biasing and Operation

The CMD238 is biased with a single positive drain supply. Performance is optimized when the drain voltage is set to +8.0 V.

Turn ON procedure:

1.Apply drain voltage V_{dd} and set to +8 V

Turn OFF procedure:

1.Turn off drain voltage V_{dd}

RF power can be applied at any time.

Optional Bias Control

Ground bonds (GB) may be added to pads 5 and 6 to obtain lower drain current. See table below for approximate values.

Pad 6	Pad 5	Pad 4	Idd (mA)
GB	N/C	N/C	200
N/C	GB	N/C	280
N/C	GB	GB	250
N/C	N/C	GB	360

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