CMD233

2-20 GHz Distributed Low Noise Amplifier

Product Overview

The CMD233 is a wideband GaAs MMIC low noise amplifier ideally suited for military, space and communications systems where small size and low noise figure are needed over a wide bandwidth. At 10 GHz the device delivers greater than 9 dB of gain with a corresponding noise figure of 4.5 dB and an output 1 dB compression point of +20.5 dBm. The CMD233 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching. The CMD233 offers full passivation for increased reliability and moisture protection.

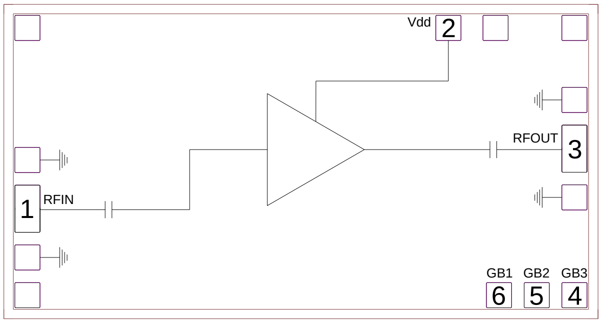
Key Features

- Wide Bandwidth
- Single Positive Supply Voltage
- Low Noise Figure
- Small Die Size: 1890 um x 1000 um
- CMM4000 Replacement

Ordering Information

Part No.	Description
CMD233	2-20 GHz Distributed Low Noise Amplifier, 100 Piece WP Sample

Functional Block Diagram



Electrical Performance (V$_{dd}$ = 5.0 V, T$_A$ = 25 ^{o}C, F = 10 GHz)

Parameter	Min	Typ	Max	Units
Frequency Range		2 - 18		GHz
Gain		9		dB
Noise Figure		4.5		dB
Input Return Loss		10		dB
Output Return Loss		20		dB
Output P1dB		20.5		dBm
Supply Current		120		mA

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, V_{dd}	7 V
RF Input Power	+23 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	808 mW
Thermal Resistance, θ_{JC}	80.4 °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
V_{dd}	3.0	5.0	6.0	V
I_{dd}		120		mA

Electrical performance is measured at specific test conditions.

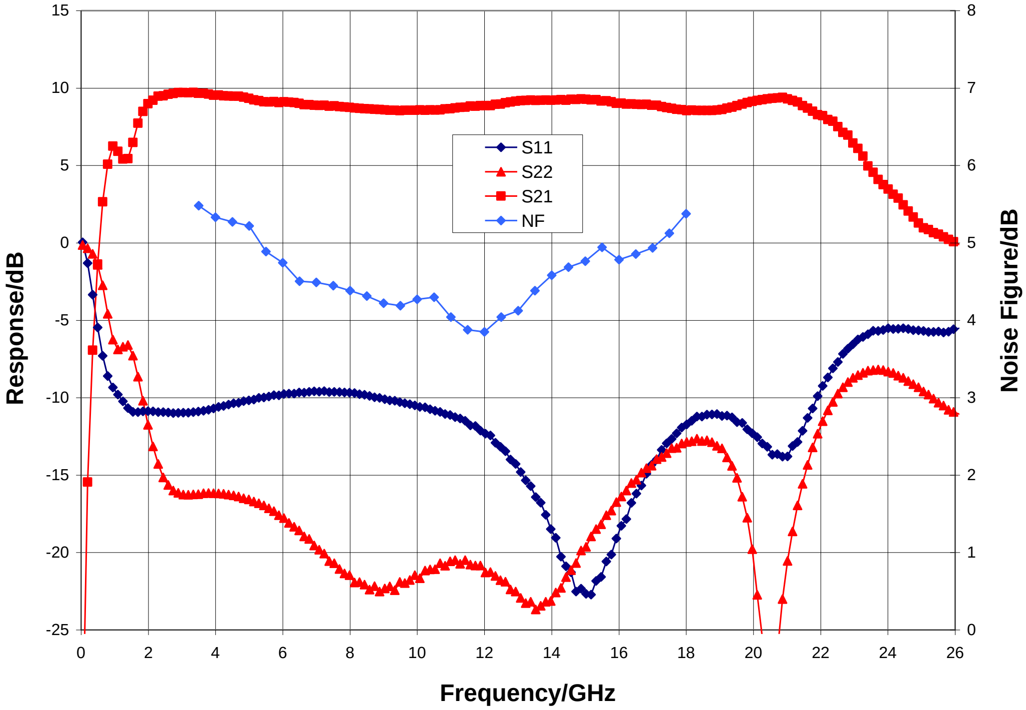
Electrical specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications (V_{dd} = 5.0 V, T_A = 25 ºC)

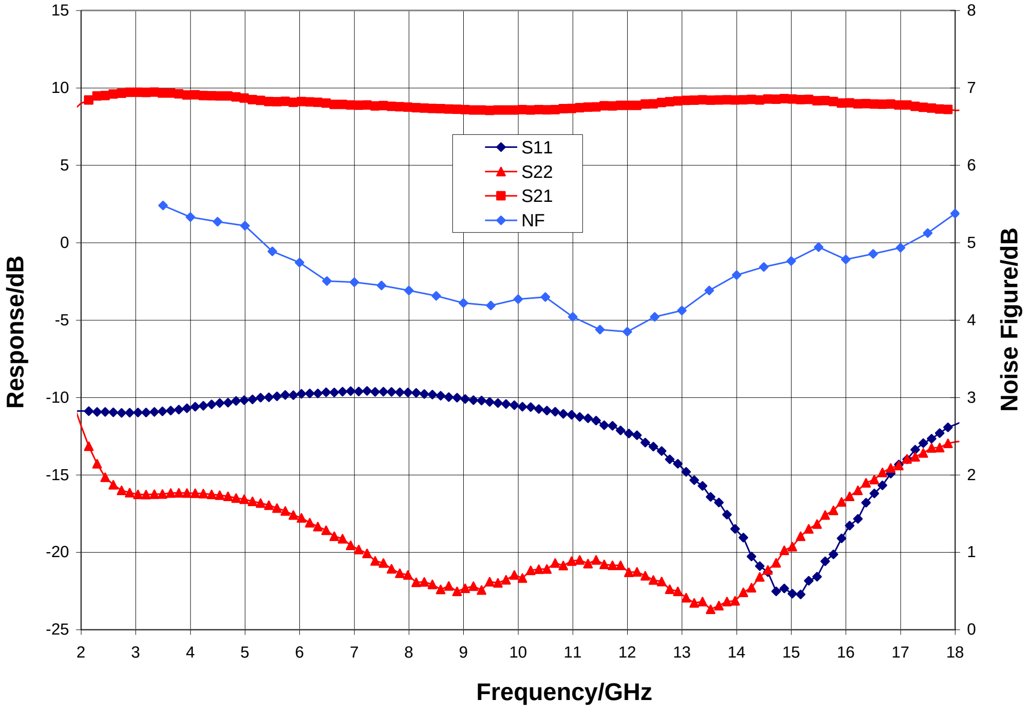
Parameter	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		2 - 6			6 - 14			14 - 18		GHz
Gain	7	9.5	12	6.5	8.5	11.5	6.5	9	11.5	dB
Noise Figure		5.5	6.5		4.5	5.5		5	6.5	dB
Input Return Loss		10			12			15		dB
Output Return Loss		16			20			15		dB
Output P1dB		21			20.5			20.5		dBm
Output IP3		25.5			24			22		dBm
Supply Current	85	120	155	85	120	155	85	120	155	mA
Gain Temperature Coefficient		0.02			0.02			0.02		dB/°C
Noise Figure Temperature Coefficient		0.01			0.01			0.01		dB/°C

Typical Performance

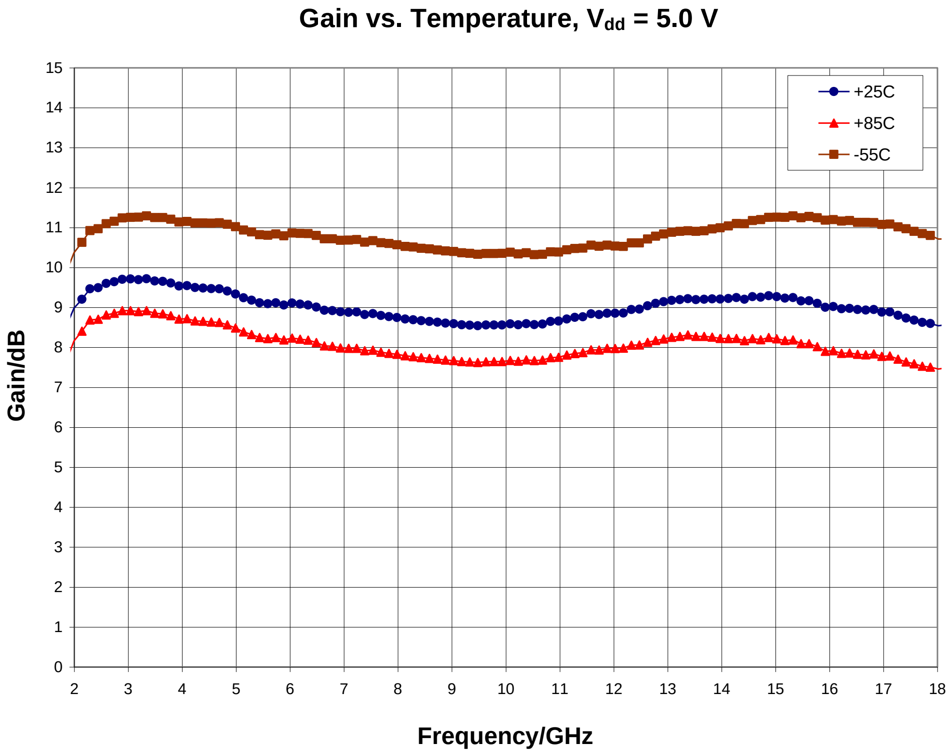
Broadband Performance, V_{dd} = 5.0 V, I_{dd} = 120 mA, T_A = 25 °C

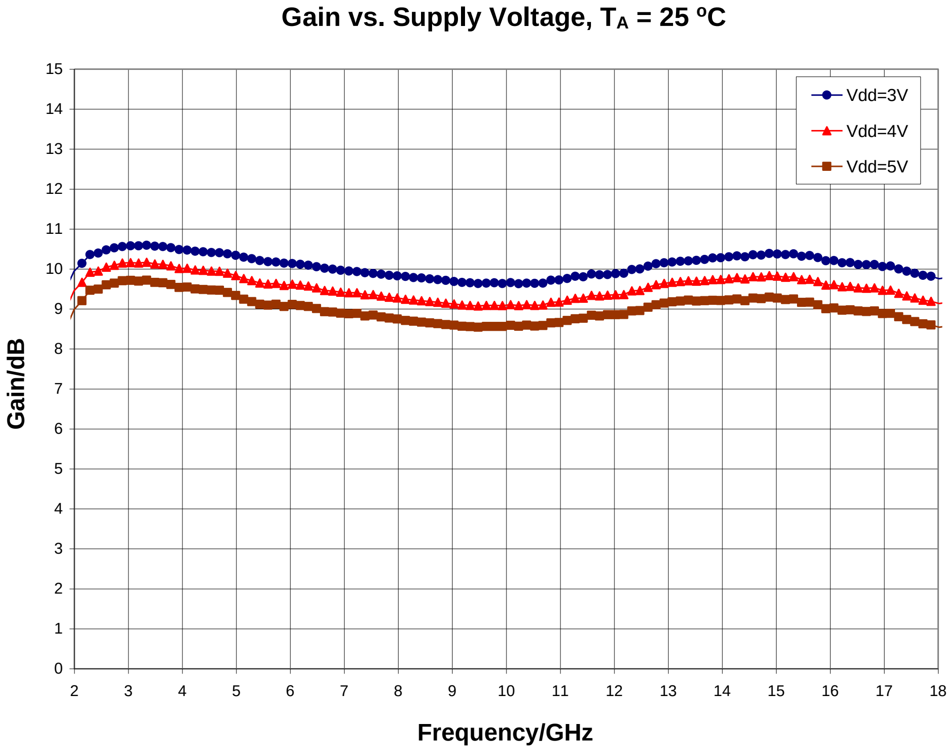


Narrow-band Performance, V_{dd} = 5.0 V, I_{dd} = 120 mA, T_A = 25 °C



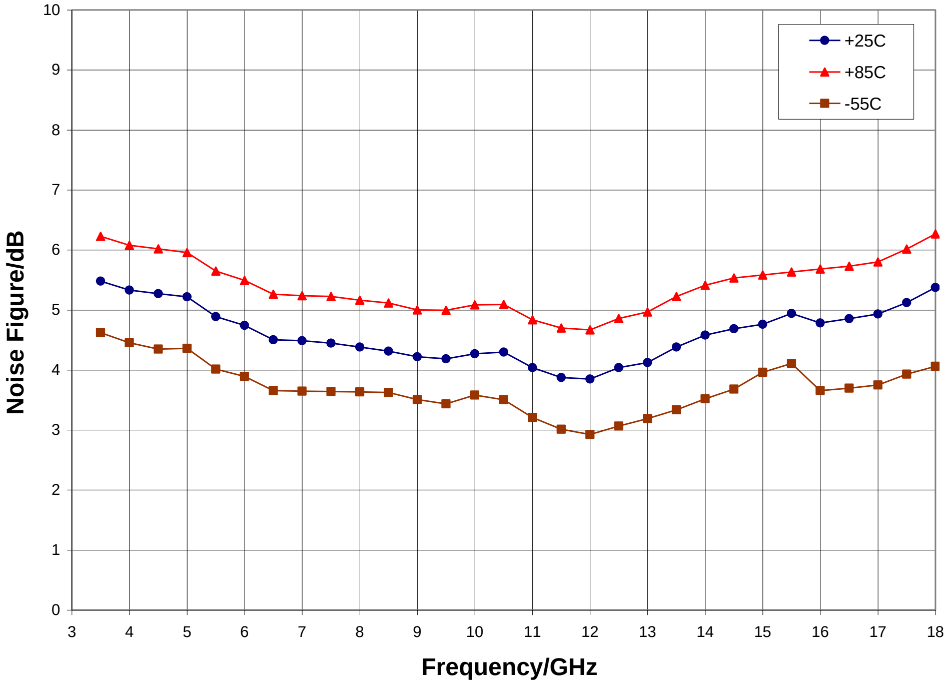
Typical Performance



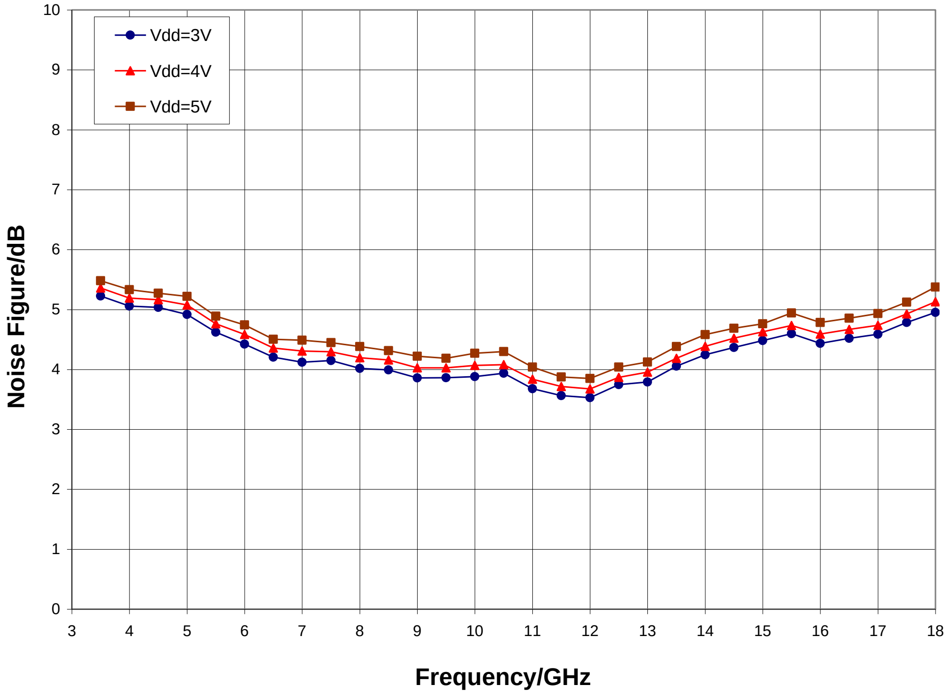


Typical Performance

Noise Figure vs. Temperature, V_{dd} = 5.0 V

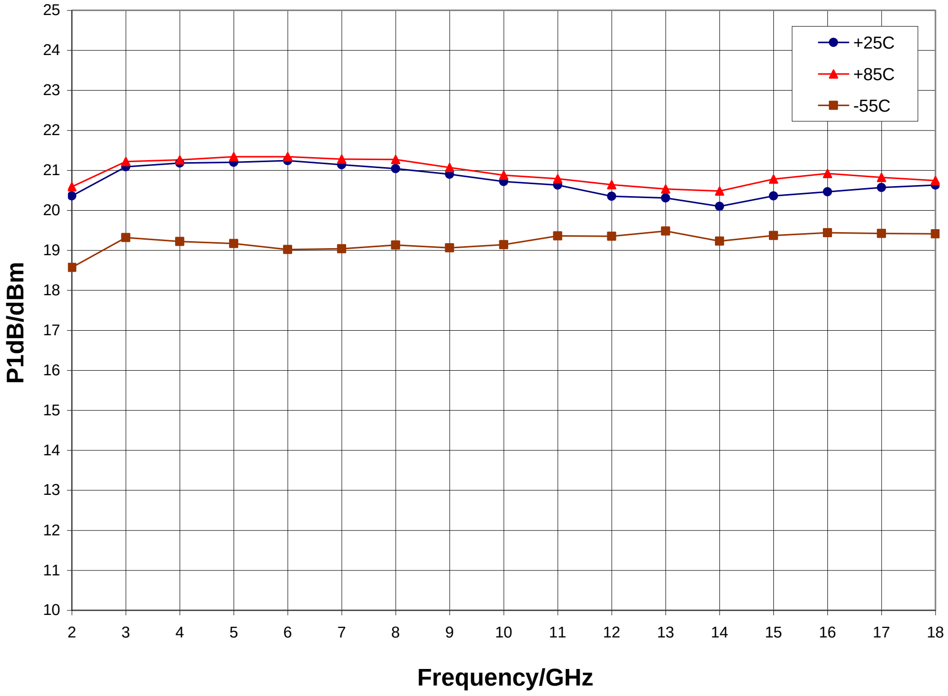


Noise Figure vs. Supply Voltage, T_A = 25 °C

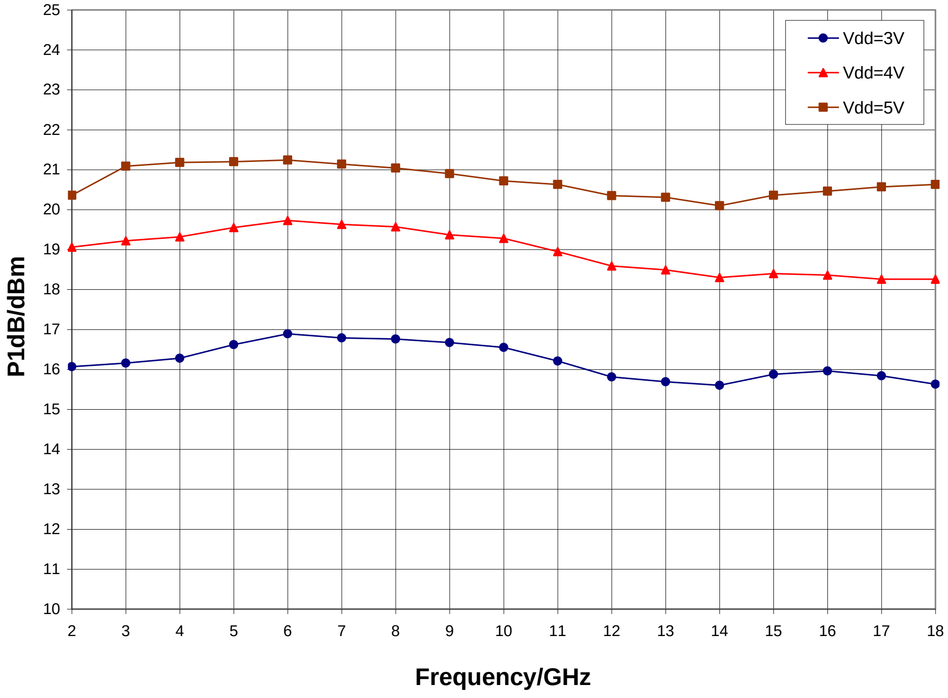


Typical Performance

P1dB vs. Temperature, V_{dd} = 5.0 V

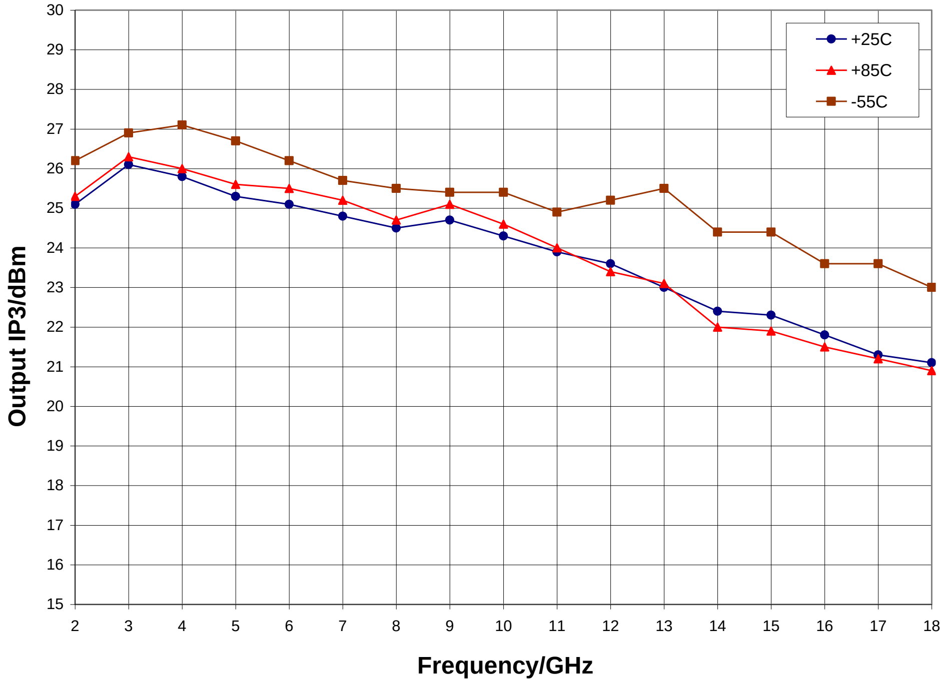


P1dB vs. Supply Voltage, T_A = 25 °C

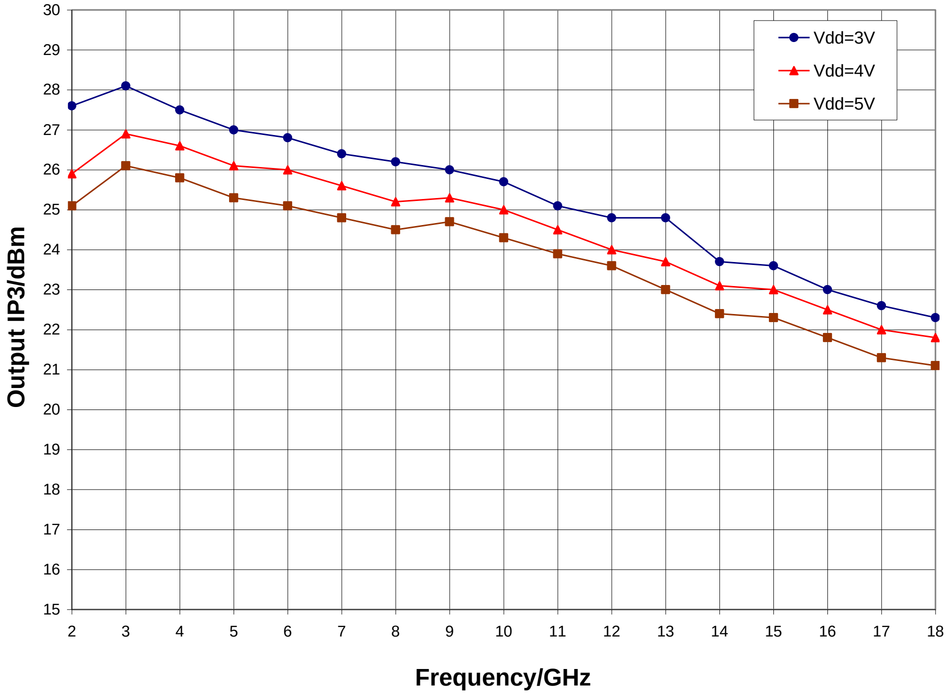


Typical Performance

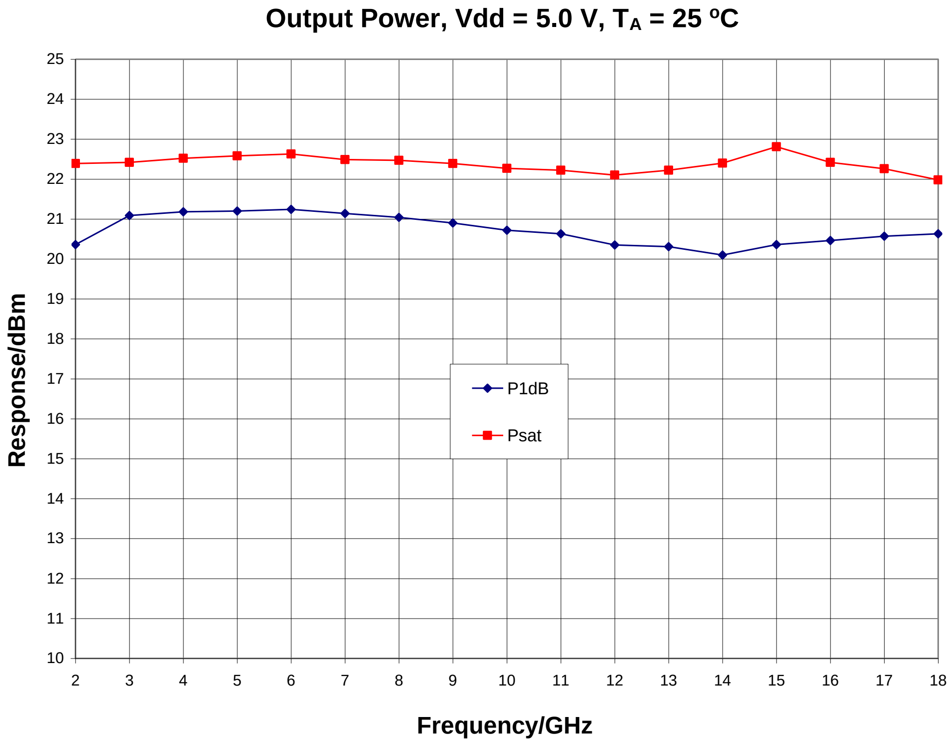
Output IP3 vs. Temperature, V_{dd} = 5.0 V



Output IP3 vs. Supply Voltage, T_A = 25 ºC

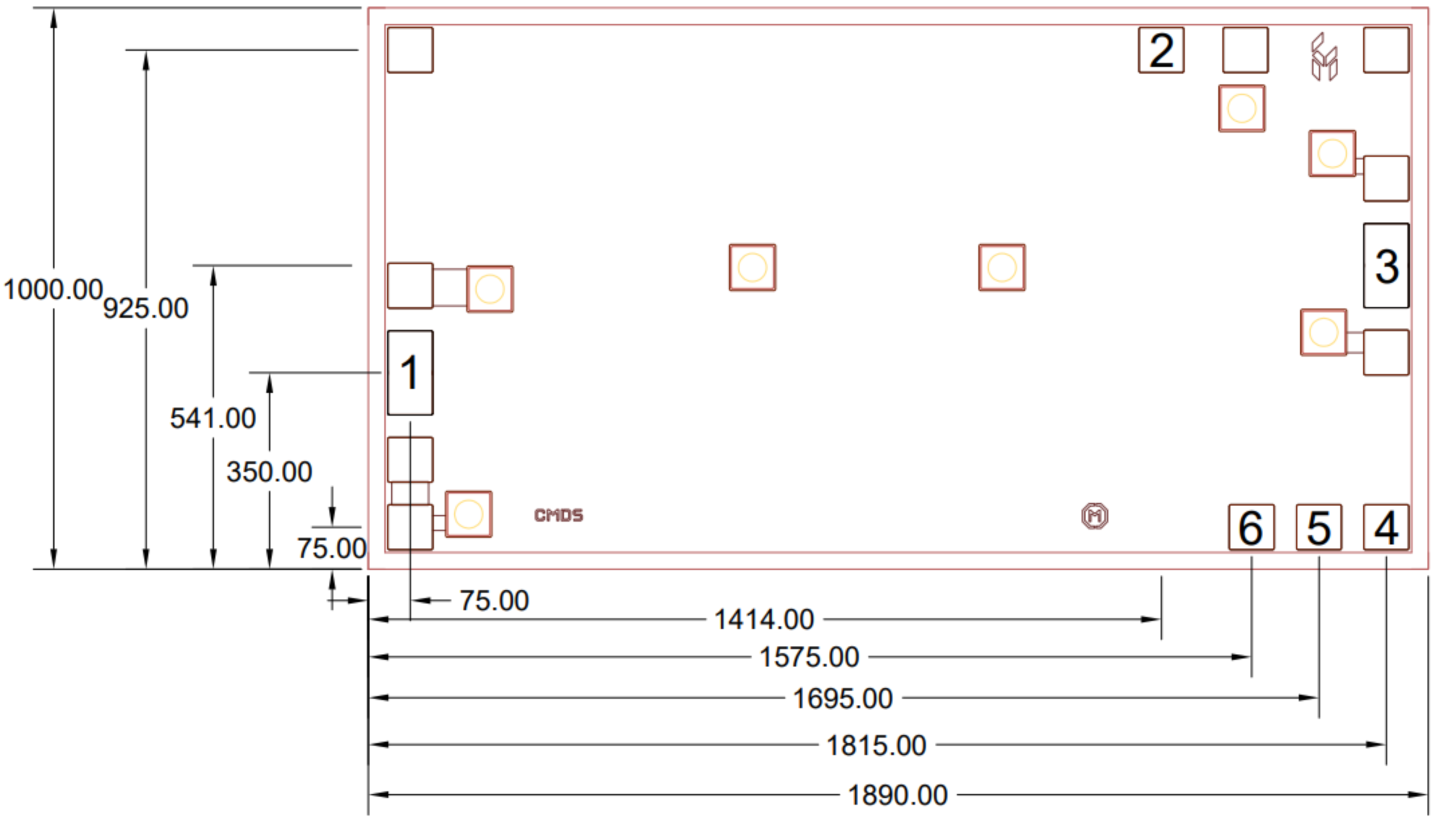


Typical Performance



Mechanical Information

Die Outline (all dimensions in microns)



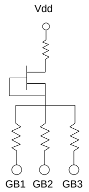
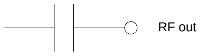
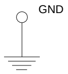
Notes:

1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 100 microns thick
5. DC bond pads (2, 4, 5, 6) are 80 x 80 microns
6. RF bond pads (1, 3) are 80 x 150 microns

Pad Description

Pad Diagram

Functional Description

Pad	Function	Description	Schematic
1	RF in	DC blocked and 50 ohm matched	
2	V_{dd}	Power supply voltage Decoupling and bypass caps required	
4, 5, 6	GB3, 2, 1	Connect to DC ground	
3	RF out	DC blocked and 50 ohm matched	
Backside	Ground	Connect to RF / DC ground	

Applications Information

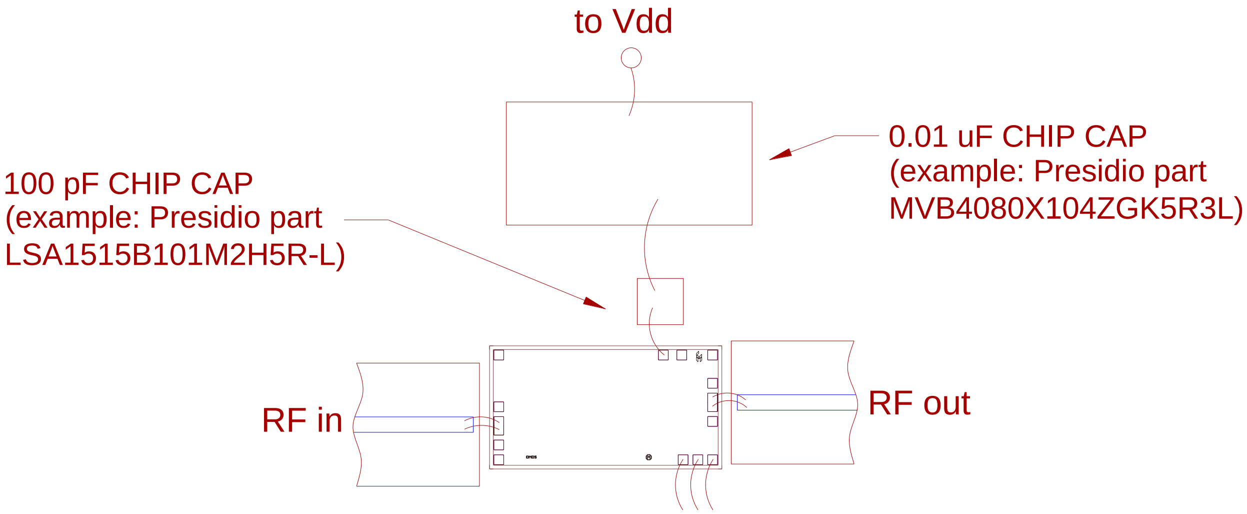
Assembly Guidelines

The backside of the CMD233 is RF ground. Die attach may be accomplished with either electrically and thermally conductive epoxy or eutectic attach. 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 single bond wire as shown.

The semiconductor is 100 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.**

Applications Information

Biasing and Operation

The CMD233 is biased with a single positive drain supply. Performance is optimized when the drain voltage is set to +5.0 V.

Turn ON procedure:

1. Apply drain voltage V_{dd} and set to +5 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 / removed from pads 4, 5 and 6 to obtain lower drain current. See table below for approximate values

Pad 6	Pad 5	Pad 4	I_{dd} (mA)
N/C	N/C	N/C	0
N/C	N/C	GB	53
N/C	GB	N/C	37
N/C	GB	GB	73
GB	N/C	N/C	97
GB	N/C	GB	113
GB	GB	N/C	107
GB	GB	GB	120

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1A	ESDA / JEDEC JS-001-2012

Caution!
ESD-Sensitive Device

RoHS Compliance

This part is compliant with 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead Free
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_{4}0_{2}$) Free
- SVHC Free
- Halogen Free
- PFOS Free

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

Web: **www.qorvo.com**
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