CMD309

5-12 GHz Low Noise Amplifier

Product Overview

The CMD309 is a broadband MMIC low noise amplifier ideally suited for microwave radios and C and X-band applications where high gain, low noise figure and low power consumption are needed. At 8 GHz the device delivers greater than 29 dB of gain with a corresponding output 1 dB compression point of +13 dBm and a noise figure of 1.3 dB. The CMD309 is a 50 ohm matched design eliminating the need for external DC blocks and RF port matching. The CMD309 offers full passivation for increased reliability and moisture protection.

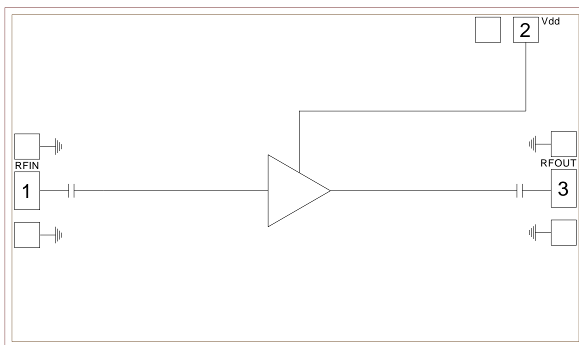
Key Features

- Low Noise Figure
- High Gain Broadband Performance
- Low Current Consumption
- Single Positive Bias
- Small Die Size

Ordering Information

Part No.	Description
CMD309	100 pcs in gel pack

Functional Block Diagram



Electrical Performance (V$_{dd}$ = 4.0 V, T$_A$ = 25° C, F = 8 GHz)

Parameter	Min	Typ	Max	Units
Frequency Range		5 - 12		GHz
Gain		29.5		dB
Noise Figure		1.3		dB
Input Return Loss		20		dB
Output Return Loss		11		dB
Output P1dB		13		dBm
Supply Current		45		mA

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, V_{dd}	5.5 V
RF Input Power	+20 dBm
Channel Temperature, Tch	150° C
Power Dissipation, Pdiss	380 mW
Thermal Resistance Q_{JC}	170° 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	4.0	5.0	V
I_{dd}		45		mA

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

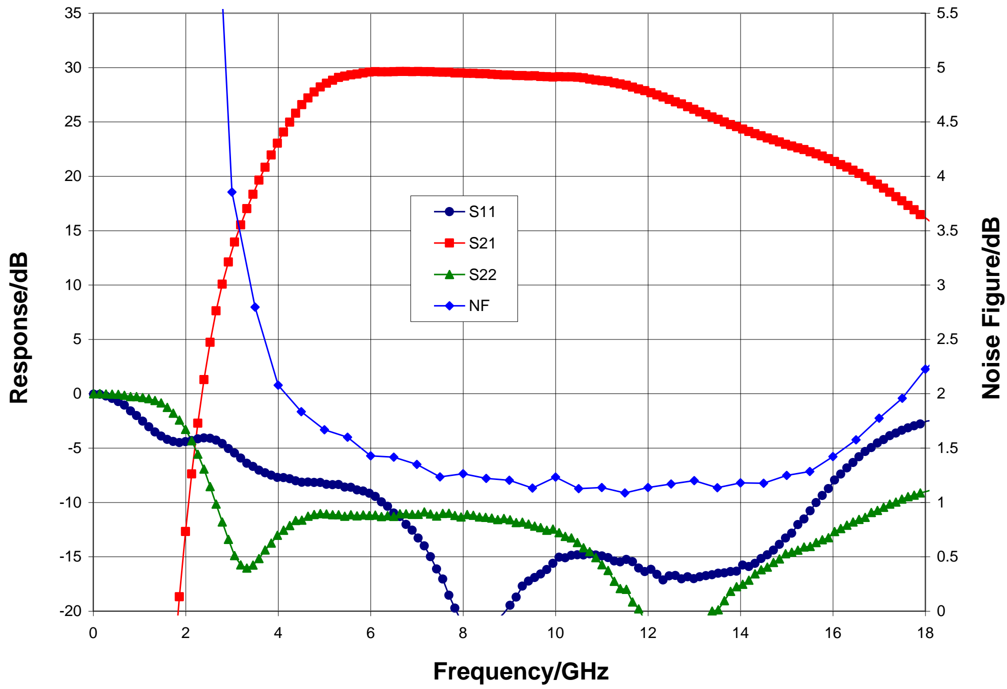
Drain Current vs. Drain Voltage

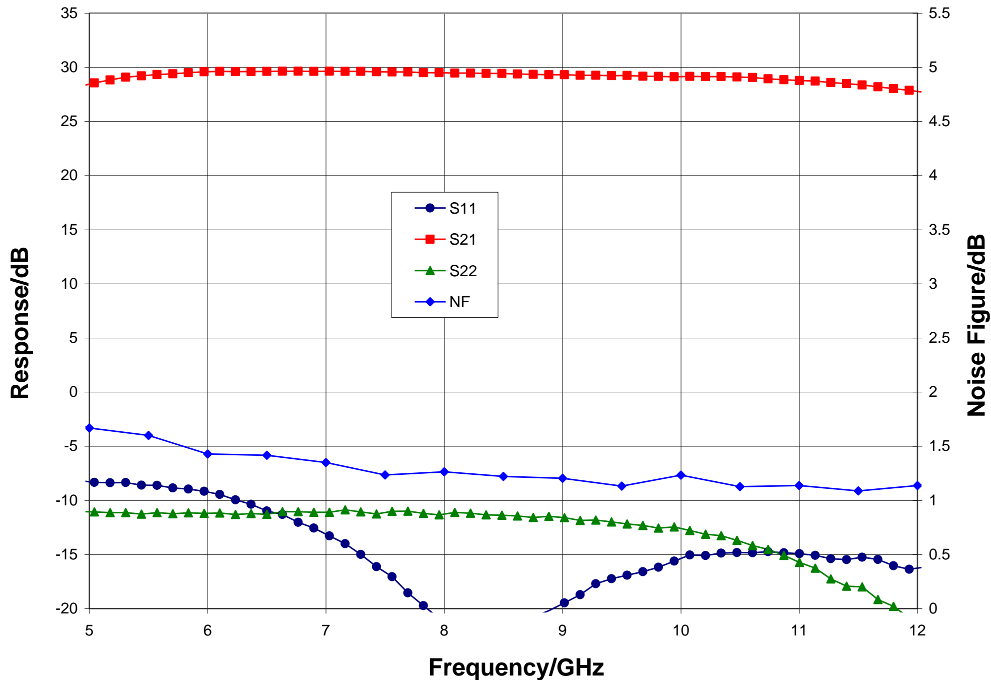
V_{dd} (V)	I_{dd} (mA)
3.0	41
4.0	45
5.0	48

Electrical Specifications (V_{dd} = 4.0 V, T_A = 25° C)

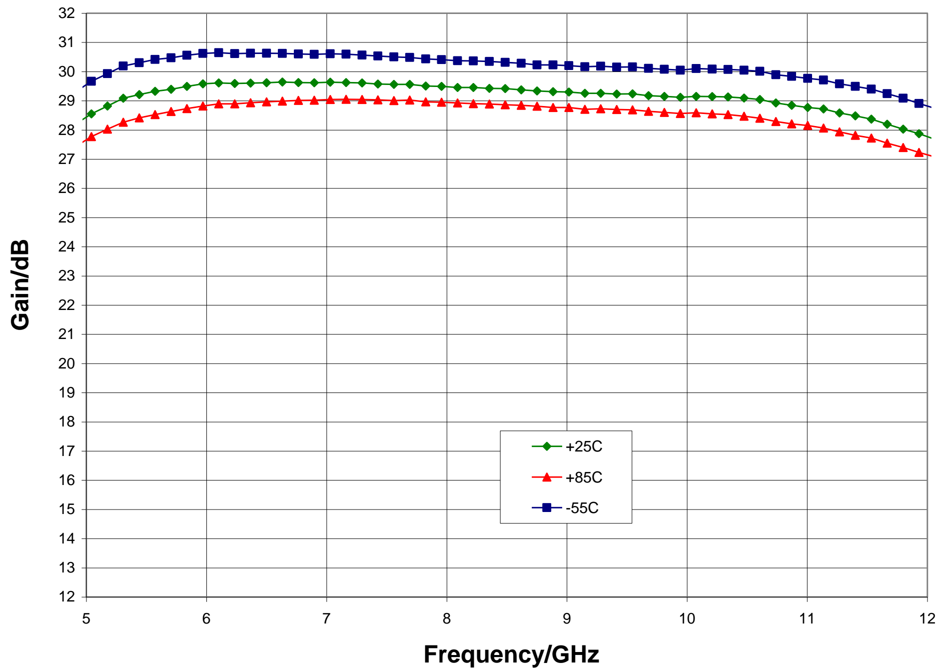
Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		6 - 9			5 - 12		GHz
Gain	26	29.5		25	29		dB
Noise Figure		1.3	1.9		1.3	2.2	dB
Input Return Loss		15			12		dB
Output Return Loss		11			11		dB
Output P1dB		13			13		dBm
Output IP3		23			23		dBm
Supply Current	30	45	60	30	45	60	mA
Gain Temperature Coefficient		0.01			0.01		dB/°C
Noise Figure Temperature Coefficient		0.006			0.006		dB/°C

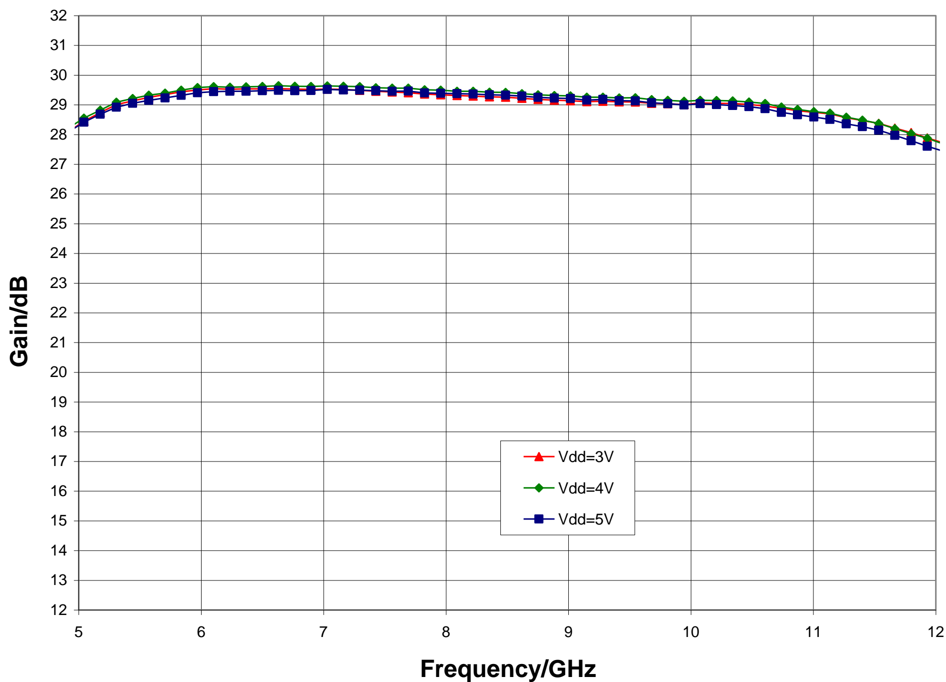
Typical Performance





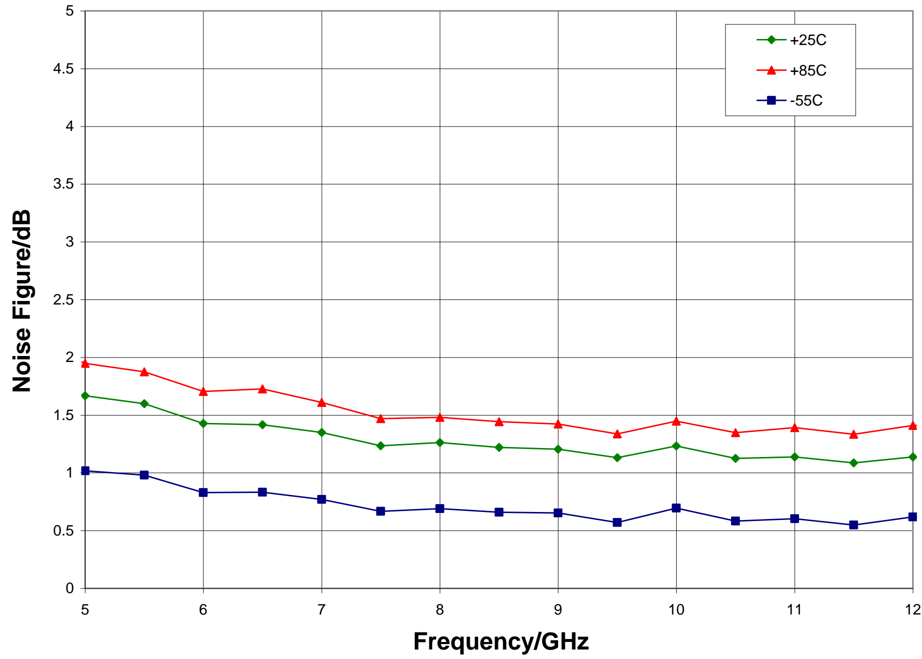
Typical Performance



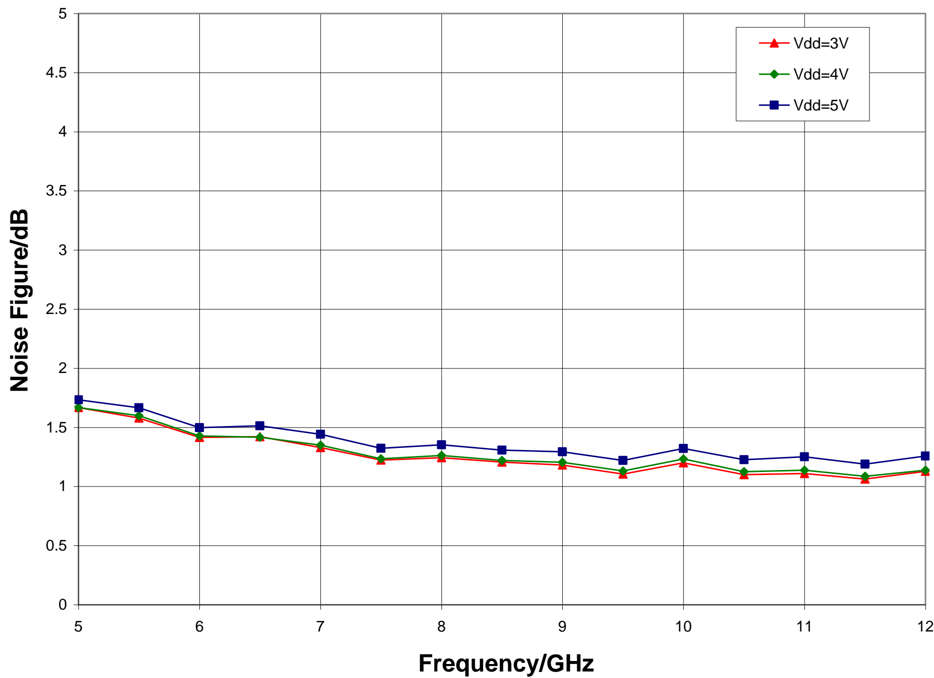


Typical Performance

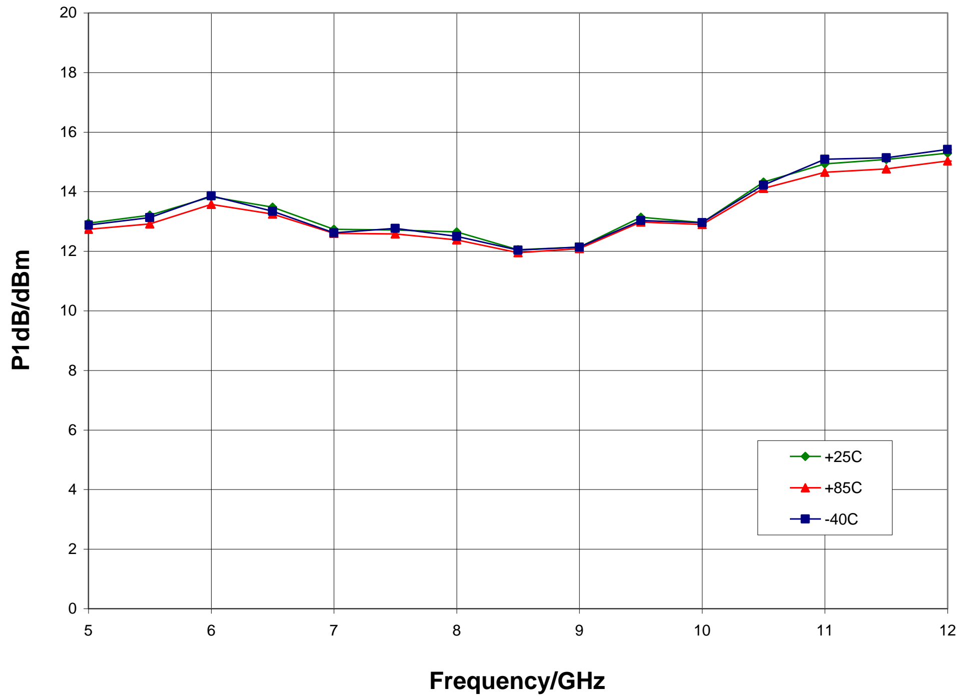
Noise Figure vs. Temperature, V_{dd} = 4.0 V

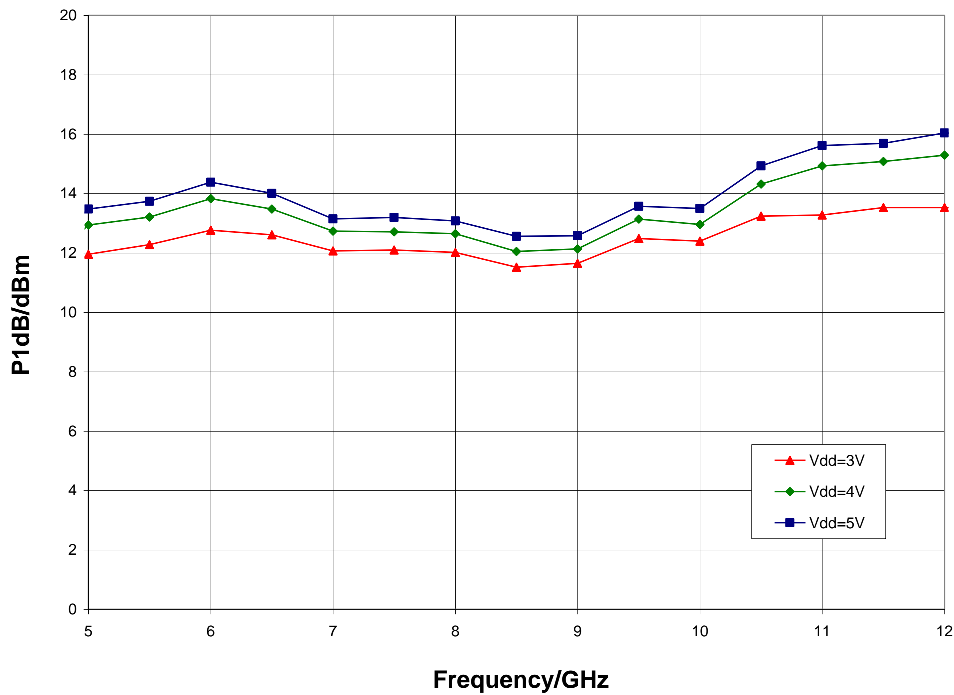


Noise Figure vs. V_{dd}, T_A = 25° C



Typical Performance





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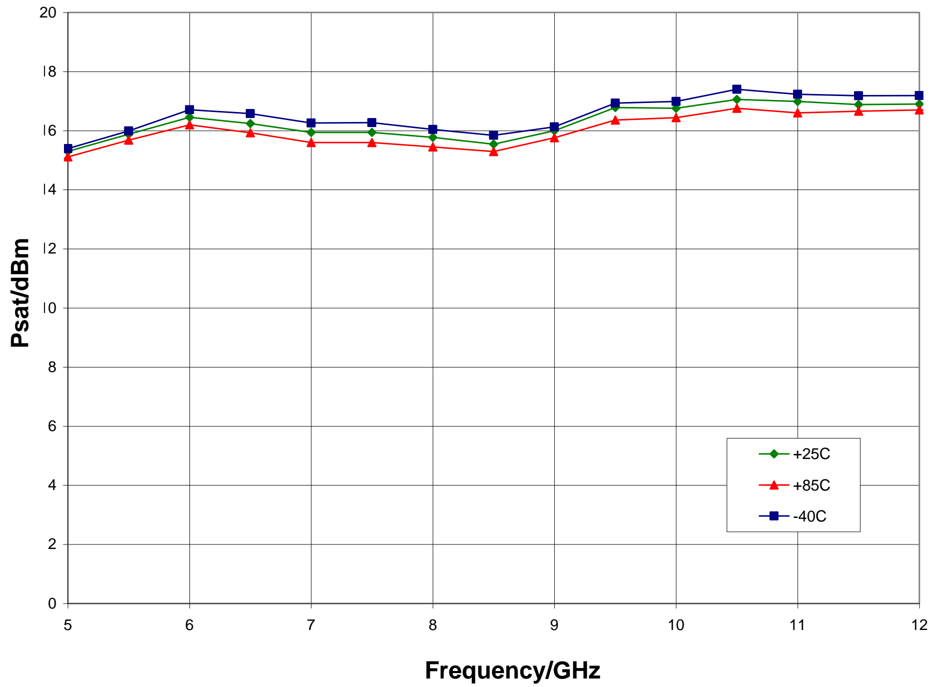

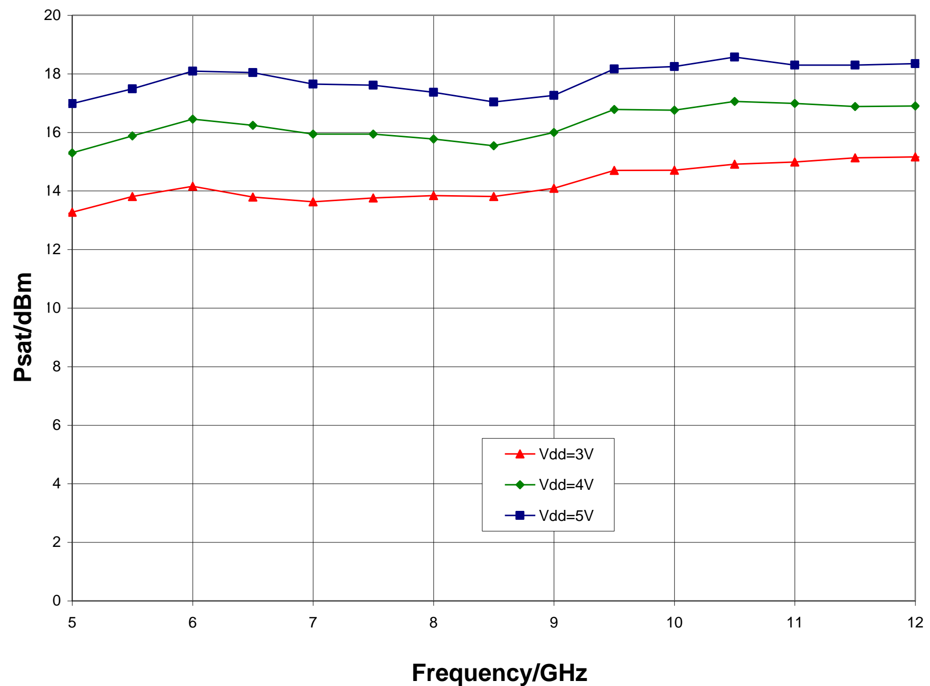

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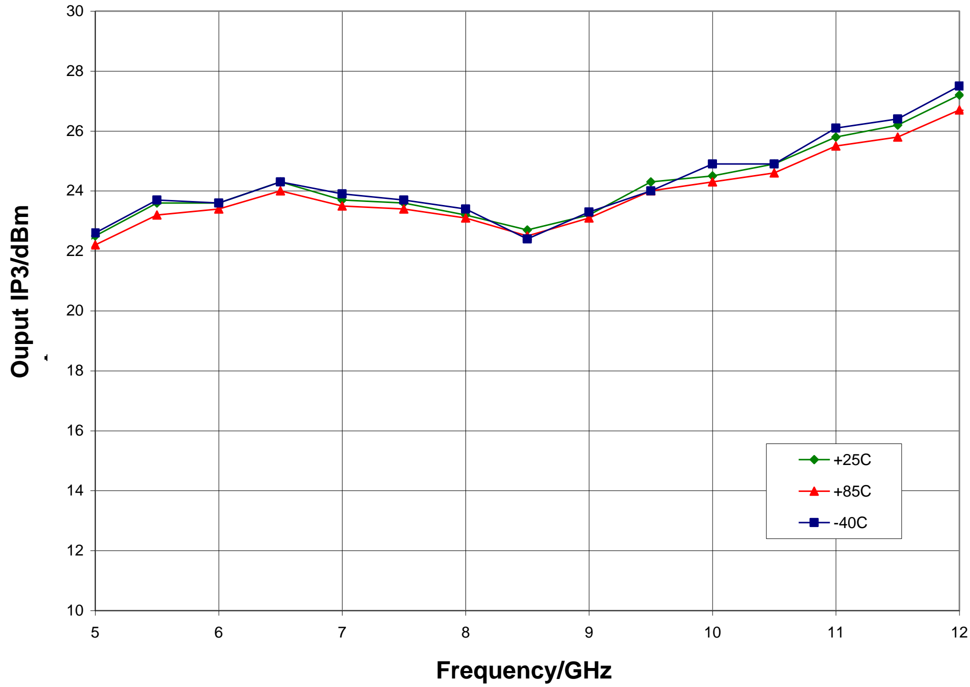
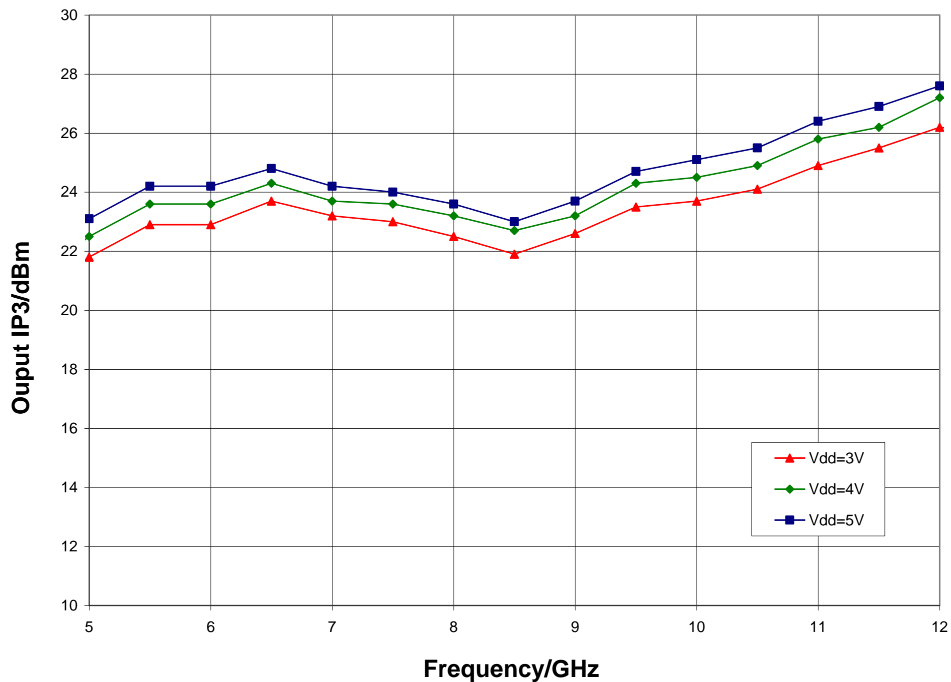
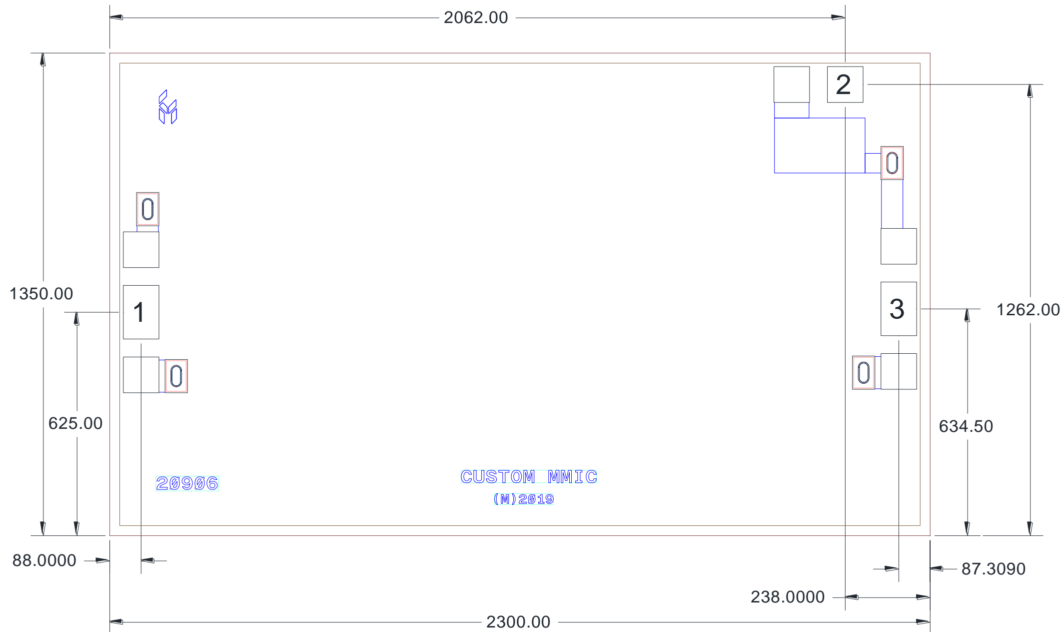




Mechanical Information

Die Outline (all dimensions in microns)

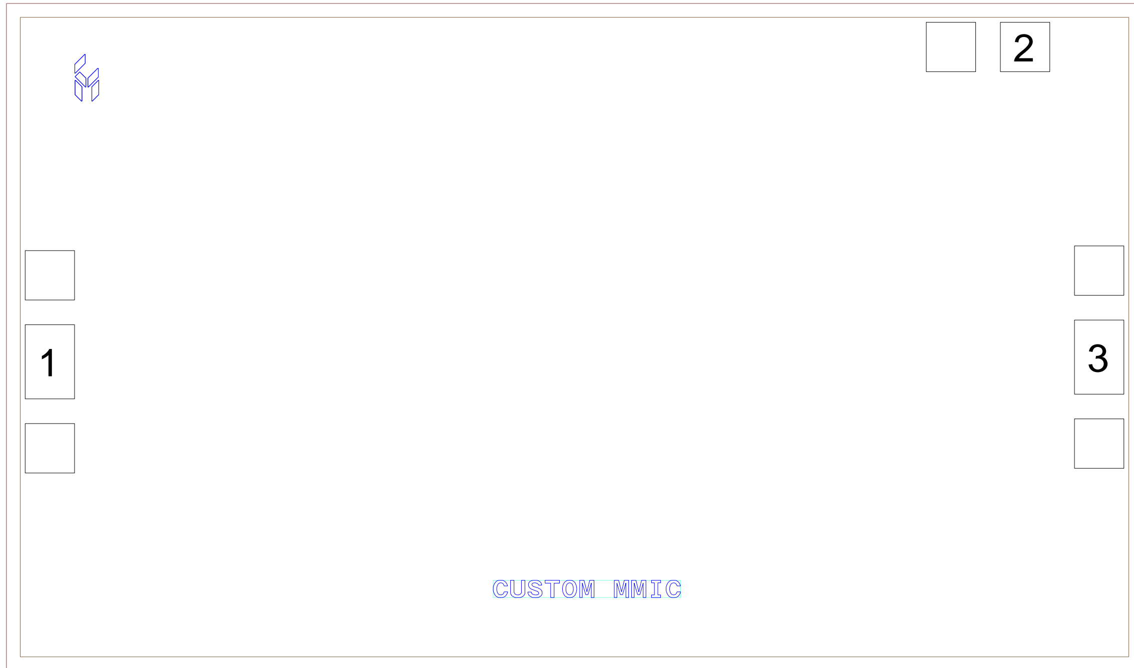


Notes:

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

Pad Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	RF in	DC blocked and 50 ohm matched	RF in
2	V_{dd}	Power supply voltage Decoupling and bypass caps require	Vdd
3	RF out	DC blocked and 50 ohm matched	RF out
Backside	Ground	Connect to RF / DC ground	GND

Applications Information

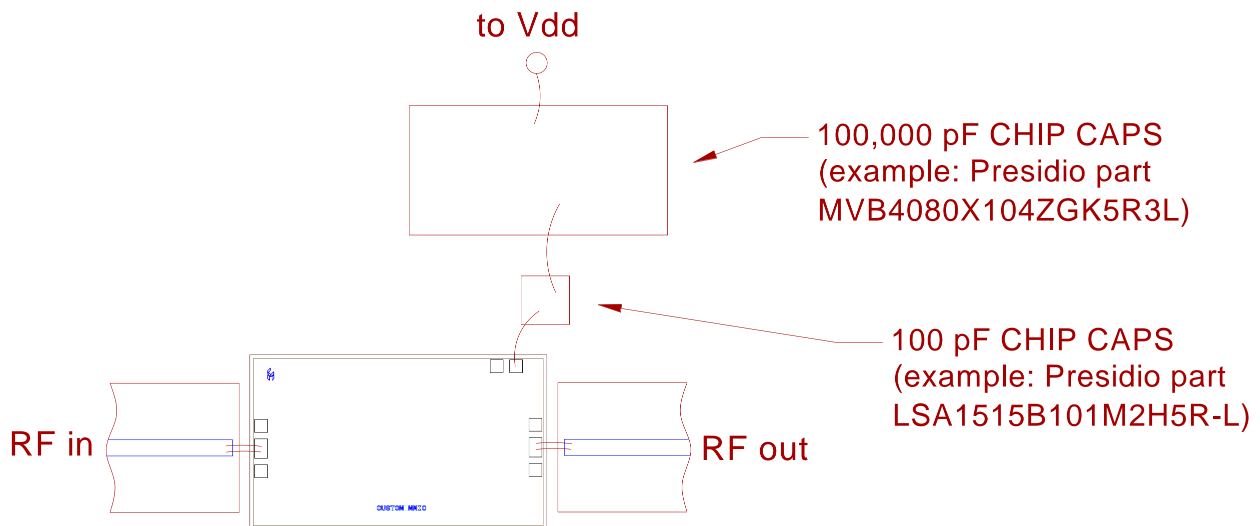
Assembly Guidelines

The backside of the CMD309 is RF ground. Die attach should 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 100um 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 CMD309 is biased with a single positive drain supply. Performance is optimized when the drain voltage is set to +4.0 V, though it may be set to a minimum of +3.0 V and a maximum of +5.0 V.

Turn ON procedure:

1. Apply drain voltage V_{dd} and set to +4 V

Turn OFF procedure:

1. Turn off drain voltage V_{dd}

RF power can be applied at any time.