CMD314

DC-10 GHz Distributed Driver Amplifier

Product Overview

The CMD314 is a wideband GaAs MMIC driver amplifier ideally suited for military, space, and communications systems that require small size and high power over a wide bandwidth. At 6 GHz, the amplifier delivers greater than 18 dB of gain with a corresponding output 1 dB compression point of +30 dBm and a noise figure of 4 dB. The CMD314 is a 50 ohm matched design and offers full passivation for increased reliability and moisture protection.

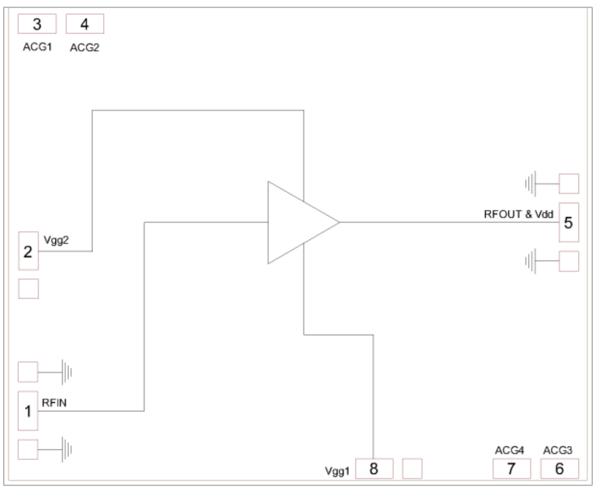
Key Features

- Wideband Performance
- High Linearity
- High Output Power
- Low Noise Figure
- HMC637 Replacement
- Small Die Size

Ordering Information

Part No.	Description
CMD314	50 pcs MOQ in gel pack

Functional Block Diagram



Electrical Performance (V_{dd} = 12.0 V, V_{gg1} = -0.16 V, V_{gg2} = 4.75 V, T_A = 25^{o} C, F = 6 GHz)

Parameter	Min	Typ	Max	Units
Frequency Range		DC - 10		GHz
Gain		18		dB
Noise Figure		4		dB
Input Return Loss		15		dB
Output Return Loss		20		dB
Output P1dB		30		dBm
Supply Current		450		mA

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, V_{dd}	13.0 V
Gate1 Voltage, V_{gg1}	-2.5 V to 0.2 V
Gate2 Voltage, V_{gg2}	7.0 V
RF Input Power	+23 dBm
Channel Temperature, Tch	175 °C
Power Dissipation, Pdiss	5.864 W
Thermal Resistance, Q_{JC}	15.34 °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}	8.0	12.0	12.5	V
I_{dd}		450		mA
V_{gg1}	-2.5	-0.16	0	V
V_{gg2}	3.75	4.75	5.75	V

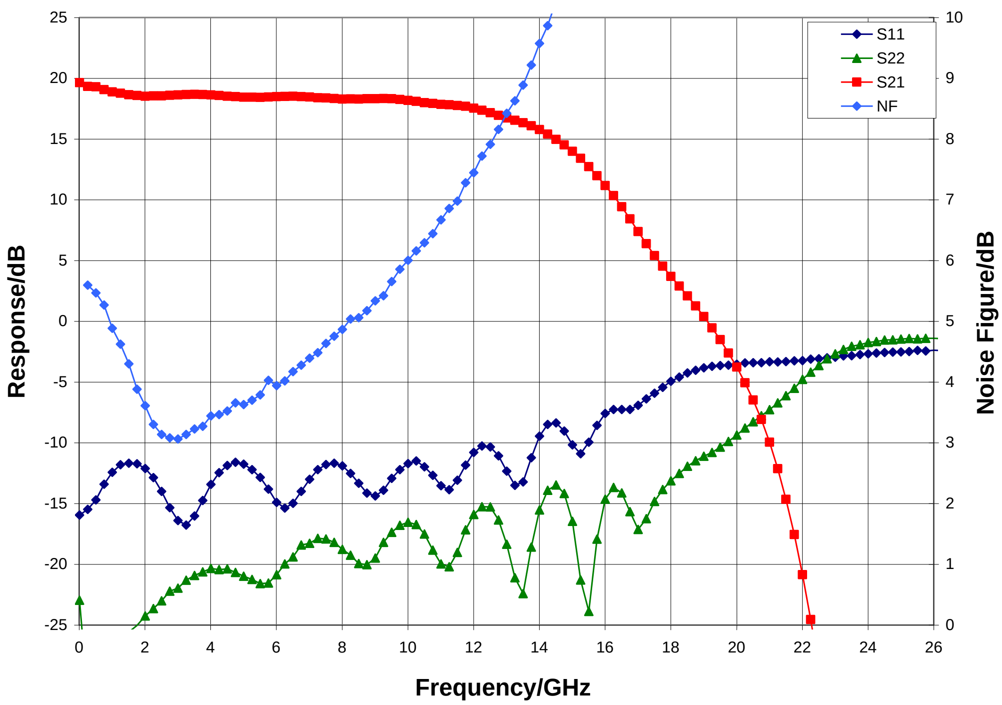
Electrical performance is measured at specific test conditions. Electrical specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications (V_{dd} = 12.0 V, T_A = 25° C)

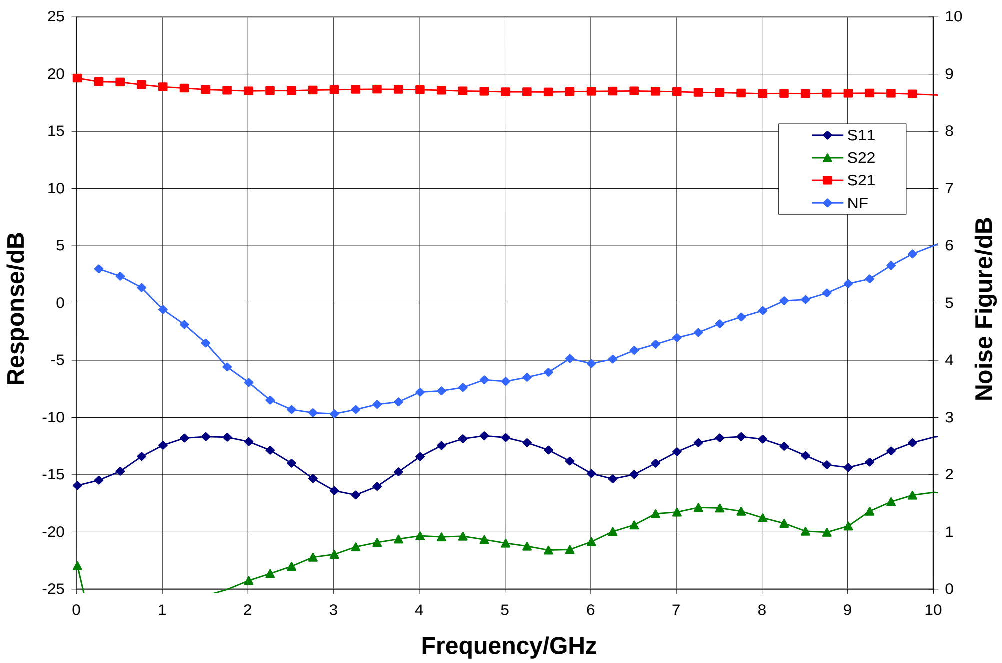
Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		2 - 6			6 - 10		GHz
Gain	16	18		16	18		dB
Noise Figure		4			6		dB
Input Return Loss		12			12		dB
Output Return Loss		20			17		dB
Output P1dB	28.5	30		27.5	29		dBm
Output IP3		34			30		dBm
Supply Current	375	450	485	375	450	485	mA
Gain Temperature Coefficient		0.02			0.025		dB/°C
Noise Figure Temperature Coefficient		0.012			0.012		dB/°C

Typical Performance

Broadband Performance, V_{dd} = 12.0 V, V_{gg1} = -0.16 V, V_{gg2} = 4.75 V, I_{dd} = 450 mA, T_A = 25° C

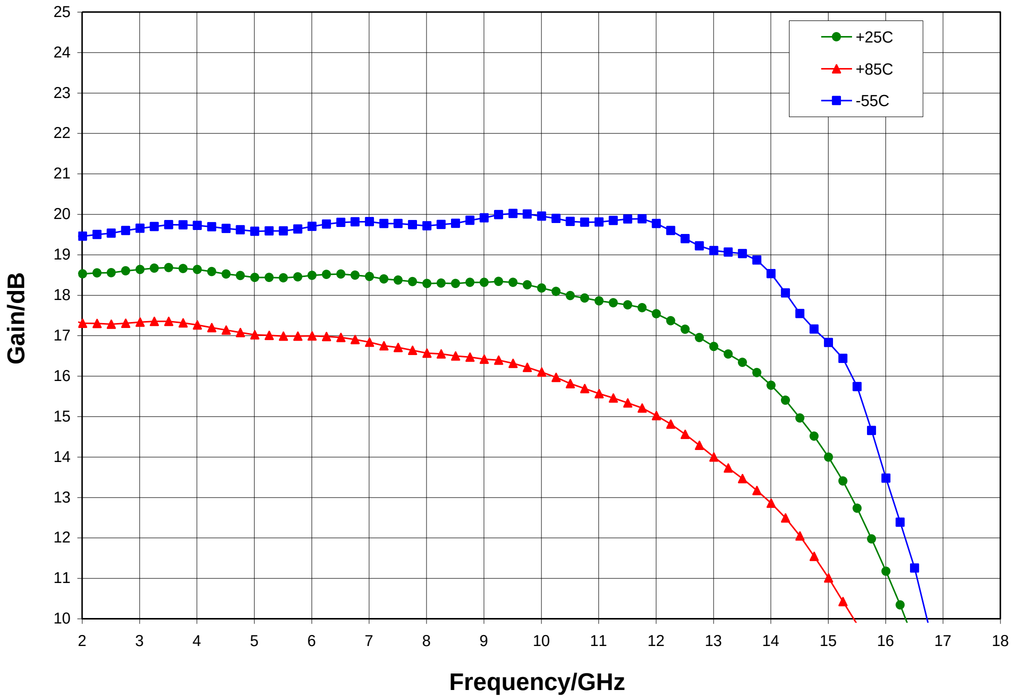


Narrow-band Performance, V_{dd} = 12.0 V, V_{gg1} = -0.16 V, V_{gg2} = 4.75 V, I_{dd} = 450 mA, T_A = 25° C

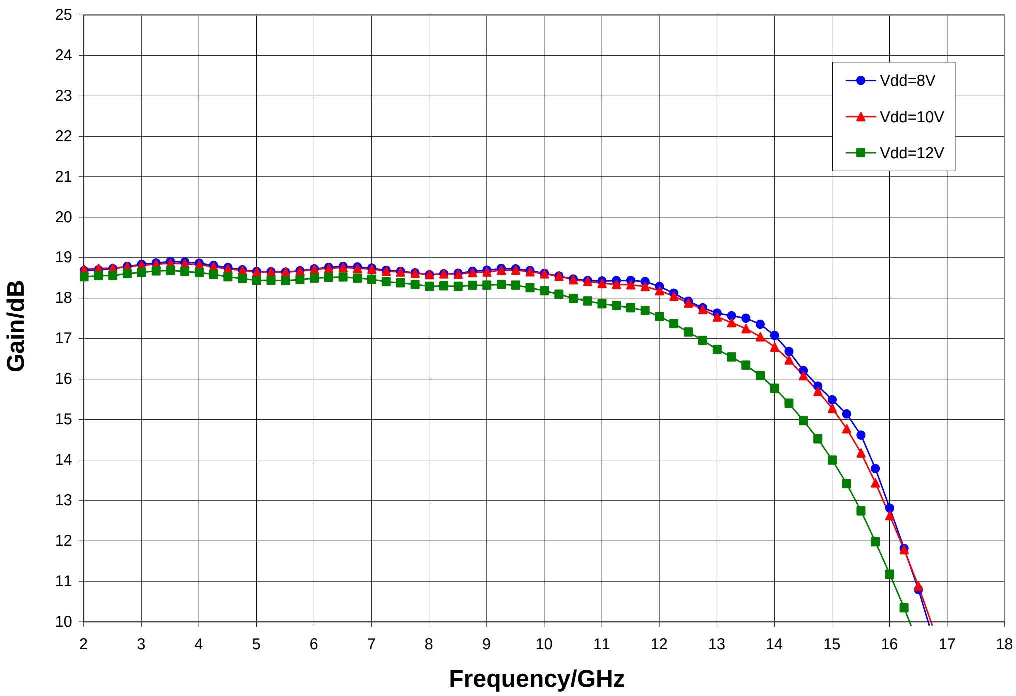


Typical Performance

Gain vs. Temperature, V_{dd} = 12.0 V, V_{gg1} = -0.16 V, V_{gg2} = 4.75 V, I_{dd} = 450 mA, T_A = 25° C

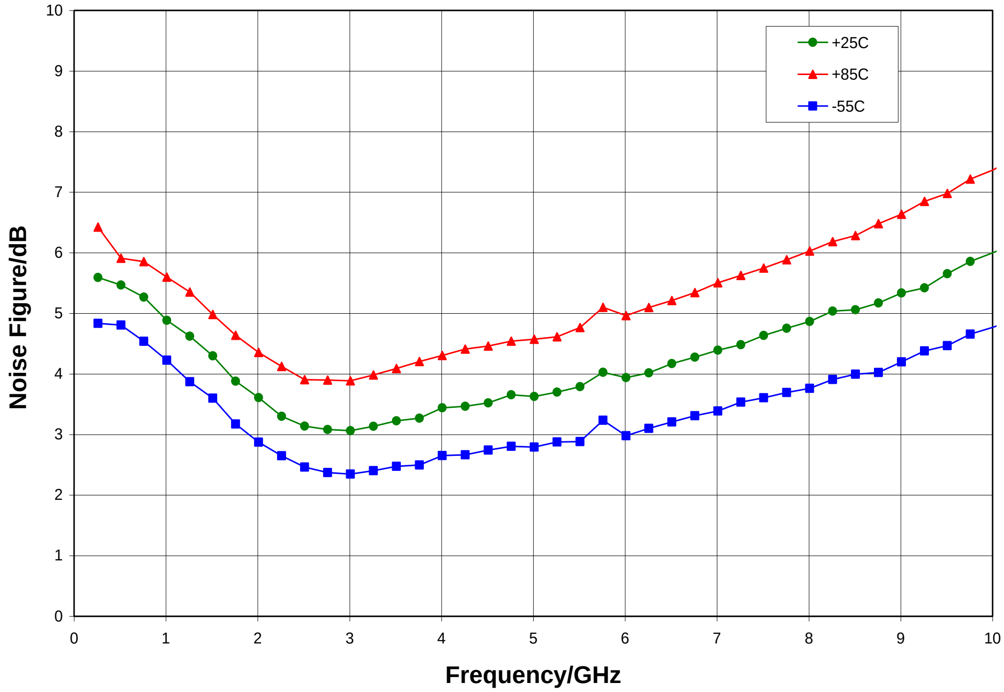


Gain vs. Supply Voltage, V_{gg1} = -0.16 V, V_{gg2} = 4.75 V, I_{dd} = 450 mA, T_A = 25° C

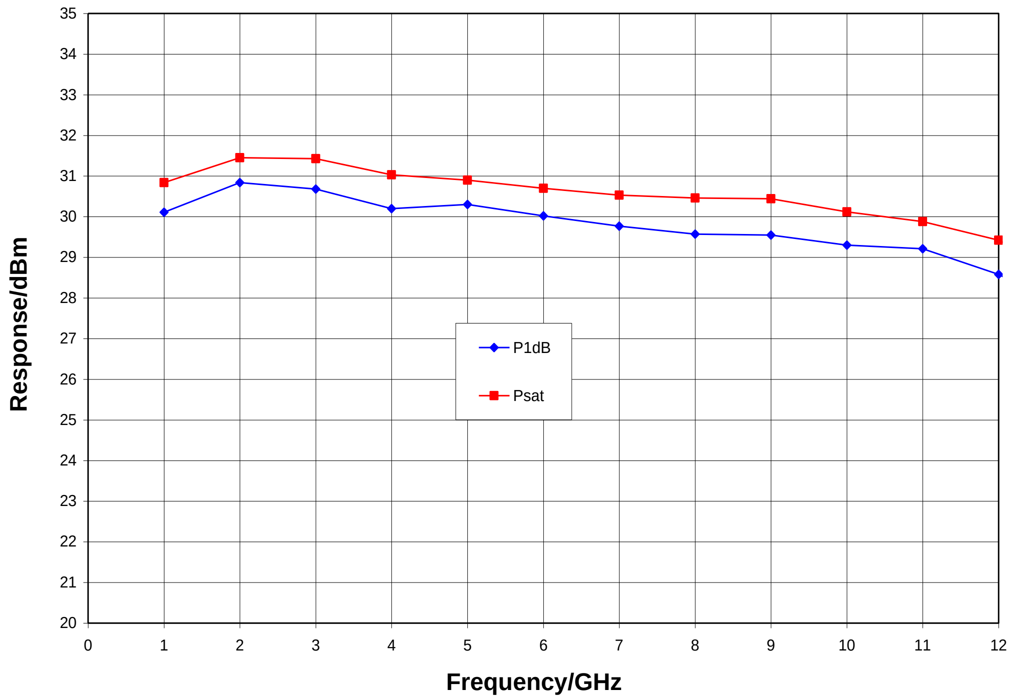


Typical Performance

Noise Figure vs. Temperature, V_{dd} = 12.0 V, V_{gg1} = -0.16 V, V_{gg2} = 4.75 V, I_{dd} = 450 mA, T_A = 25° C

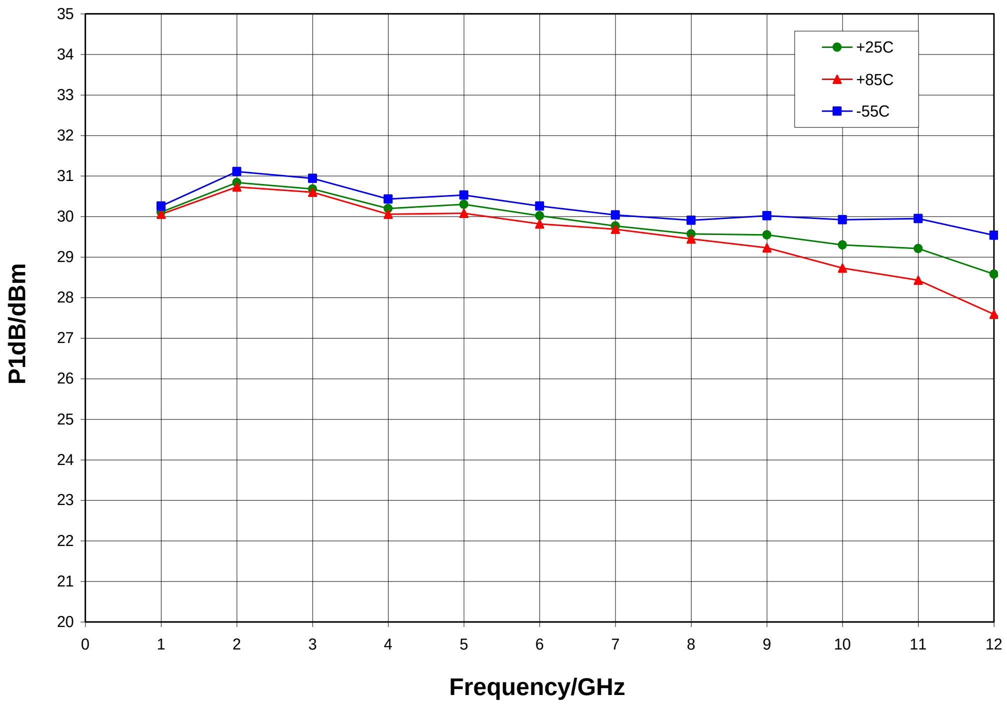


Output Power, V_{dd} = 12.0 V, V_{gg1} = -0.16 V, V_{gg2} = 4.75 V, I_{dd} = 450 mA, T_A = 25° C

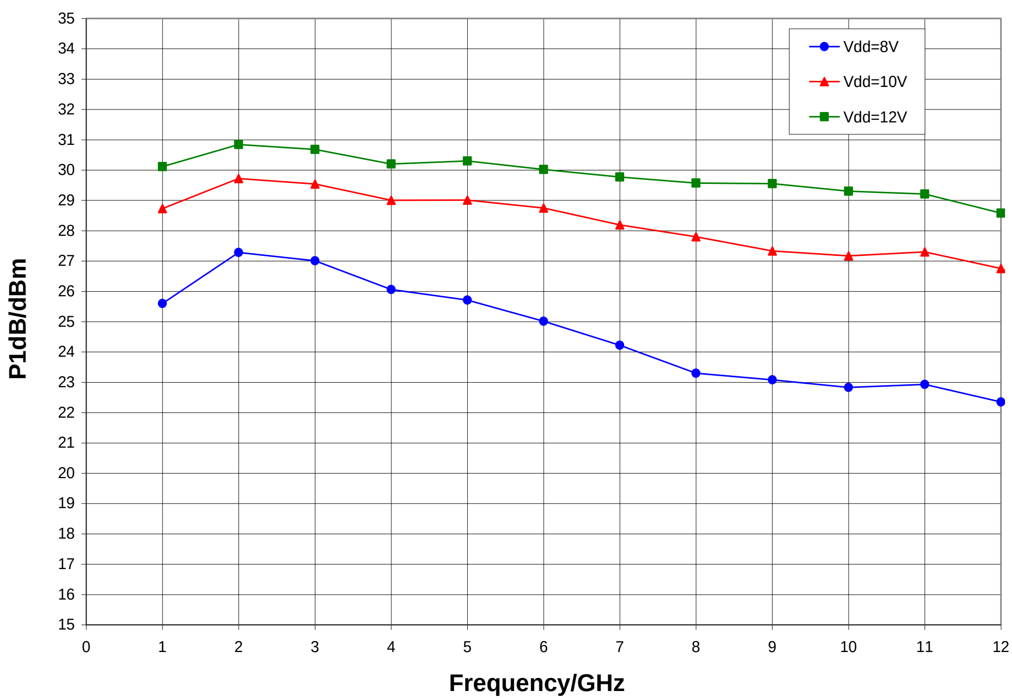


Typical Performance

P1dB vs. Temperature, V_{dd} = 12.0 V, V_{gg1} = -0.16 V, V_{gg2} = 4.75 V, I_{dd} = 450 mA, T_A = 25° C

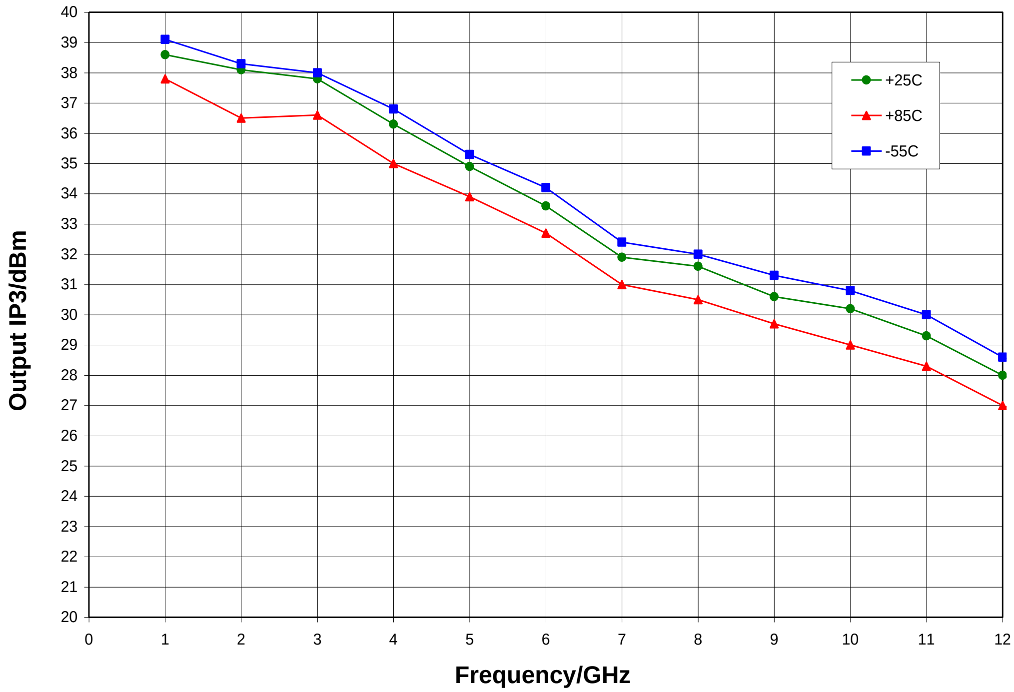


P1dB vs. Supply Voltage, V_{gg1} = -0.16 V, V_{gg2} = 4.75 V, I_{dd} = 450 mA, T_A = 25° C

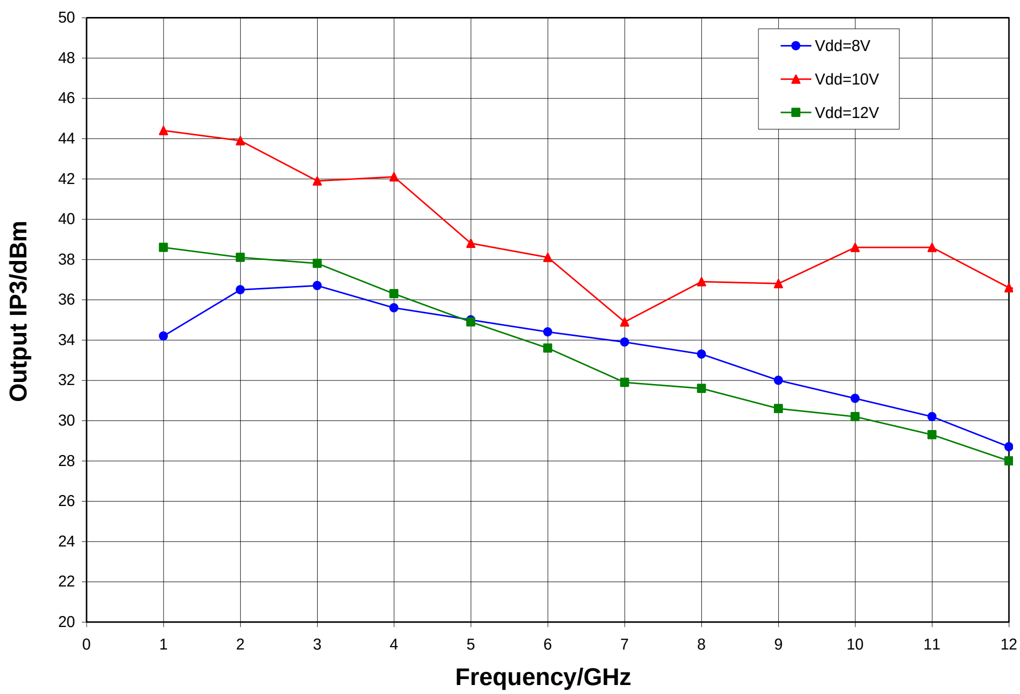


Typical Performance

Output IP3 vs. Temperature, V_{dd} = 12.0 V, V_{gg1} = -0.16 V, V_{gg2} = 4.75 V, I_{dd} = 450 mA, T_A = 25°C

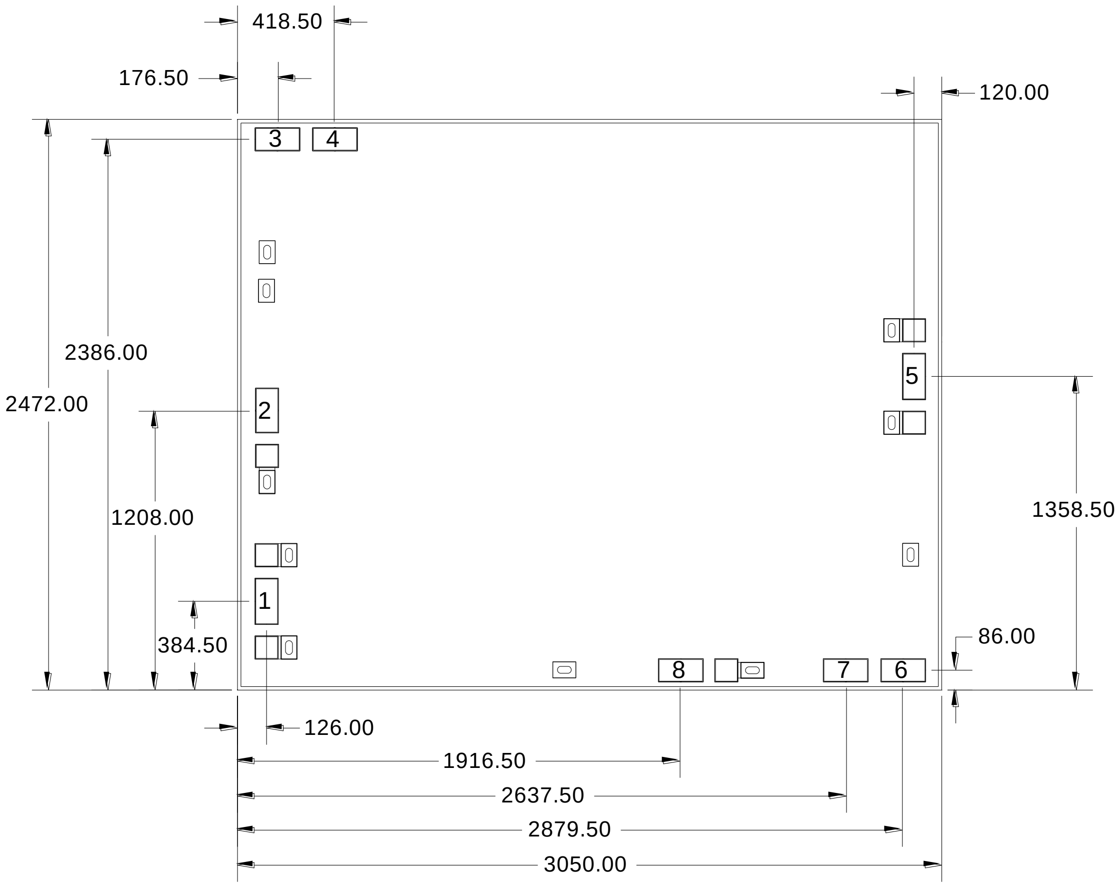


Output IP3 vs. Supply Voltage, V_{gg1} = -0.16 V, V_{gg2} = 4.75 V, I_{dd} = 450 mA, T_A = 25°C



Mechanical Information

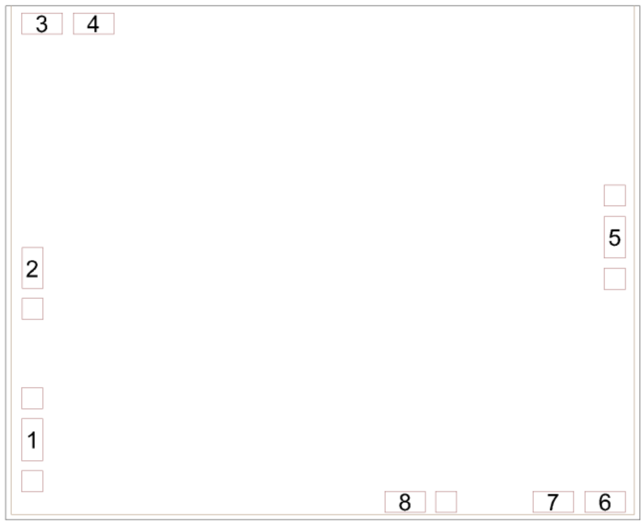
Die Outline (all dimensions in microns)



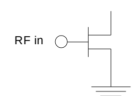
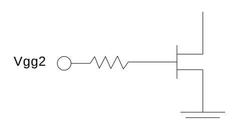
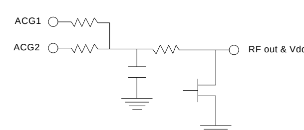
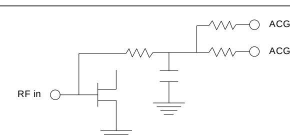
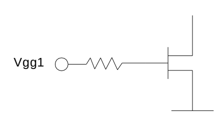
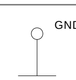
Notes:
1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 100 microns thick
5. GND bond pads are 100 x 100 microns
6. DC & RF bond pads (1 - 8) are 100 x 200 microns

Pad Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	RF in	50 ohm matched input	
2	V_{gg2}	Power supply voltage Decoupling and bypass caps required	
3, 4	ACG1, 2	Low frequency termination Attach bypass capacitor per application circuit	
5	RF out & V_{dd}	Power supply voltage and 50 ohm matched output	
6, 7	ACG3, 4	Low frequency termination Attach bypass capacitor per application circuit	
8	V_{gg1}	Power supply voltage Decoupling and bypass caps required	
Backside	Ground	Connect to RF / DC ground	

Applications Information

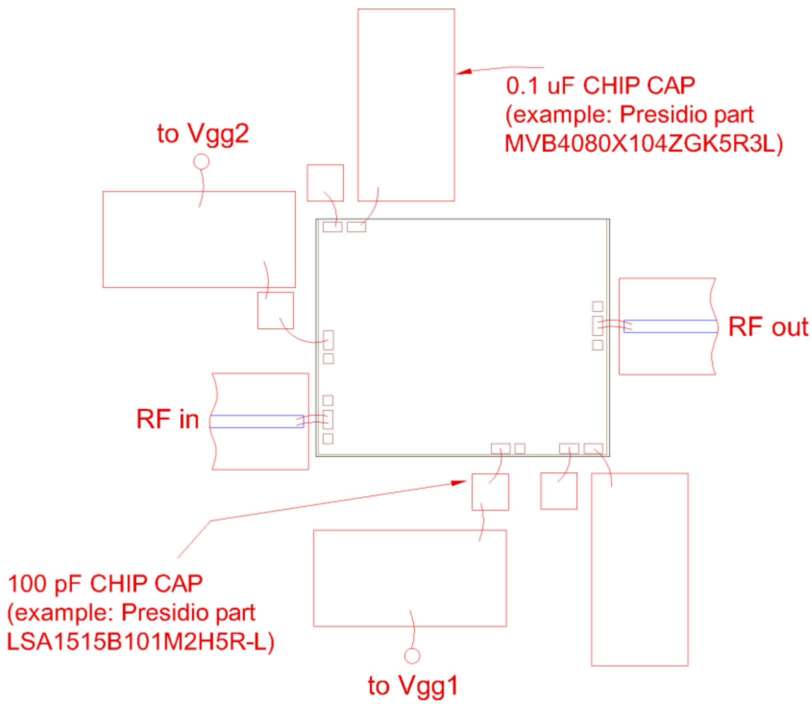
Assembly Guidelines

The backside of the CMD314 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.

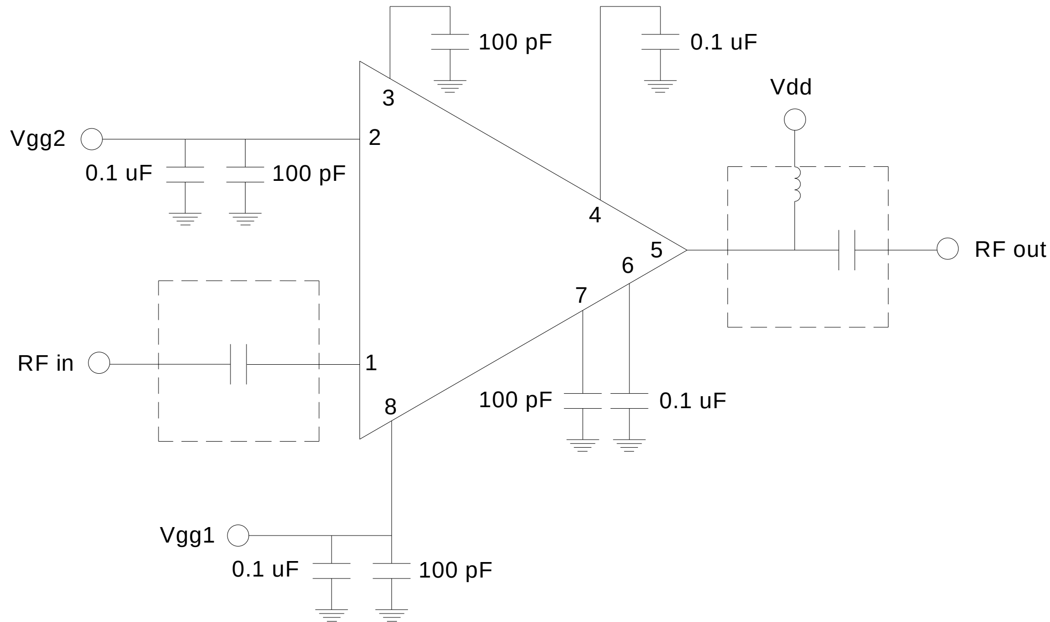
Assembly Diagram



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

Applications Information

Application Circuit



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

Biasing and Operation

The CMD314 is biased with a positive drain supply, a negative V_{gg1} supply, and a positive V_{gg2} supply. Performance is optimized when the drain voltage is set +8 to +12 V. The recommended V_{gg1} and V_{gg2} voltages are -0.16 V and +4.75 V, respectively.

Turn ON procedure (NOTE: V_{gg1} MUST be turned on first):

1. Apply gate voltage V_{gg1} and set to -0.16 V
2. Apply drain voltage V_{dd} and set to +12 V
3. Apply gate voltage V_{gg2} and set to +4.75 V

Turn OFF procedure (NOTE: V_{gg1} MUST be turned off last):

1. Turn off gate voltage V_{gg2}
2. Turn off drain voltage V_{dd}
3. Turn off gate voltage V_{gg1}

RF power can be applied at any time.