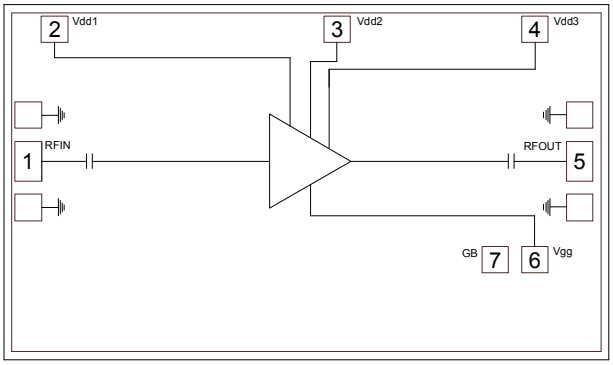
CMD295

2-20 GHz Driver Amplifier

Features

- Wide bandwidth
- High linearity
- Low current consumption
- Small die size

Functional Block Diagram



Description

The CMD295 is a wideband GaAs MMIC driver amplifier ideally suited for military, space and communications systems where small size and high linearity are needed. At 10 GHz the device delivers greater than 26 dB of gain with a corresponding output 1 dB compression point of +16 dBm and an output IP3 of 28.5 dBm. The CMD295 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching. The CMD295 offers full passivation for increased reliability and moisture protection

Electrical Performance - V_{dd} = 3.0 V, V_{gg} = 2.0V, T_A = 25 °C, F = 10 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		2 - 20		GHz
Gain		26.5		dB
Noise Figure		3.25		dB
Input Return Loss		15		dB
Output Return Loss		25		dB
Output P1dB		16		dBm
Output IP3		28.5		dBm
Supply Current		145		mA

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CMD295

2-20 GHz Driver Amplifier

Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	4 V
Gate Voltage, Vgg	3 V
RF Input Power	+20 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	681 mW
Thermal Resistance, Θ_{JC}	95 °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	2.0	3.0	4.0	V
Idd		145		mA
Vgg		2.0		V
Igg		1		mA

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

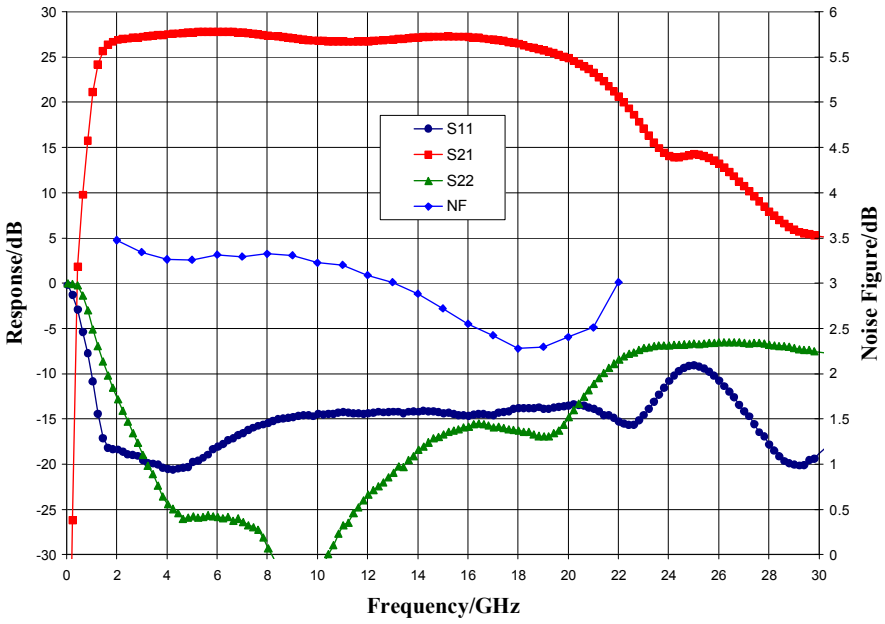
Electrical Specifications, V_{dd} = 3.0 V, V_{gg} = 2.0 V, T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	2 - 18			18 - 20			GHz
Gain	23.5	27		22	25.5		dB
Noise Figure		3.25			2.5		dB
Input Return Loss		15			13		dB
Output Return Loss		20			17		dB
Output P1dB	13	16.5		14	17		dBm
Output IP3		28			28.5		dBm
Supply Current	95	145	190	95	145	190	mA
Gain Temperature Coefficient		0.015			0.015		dB/°C
Noise Figure Temperature Coefficient		0.01			0.01		dB/°C

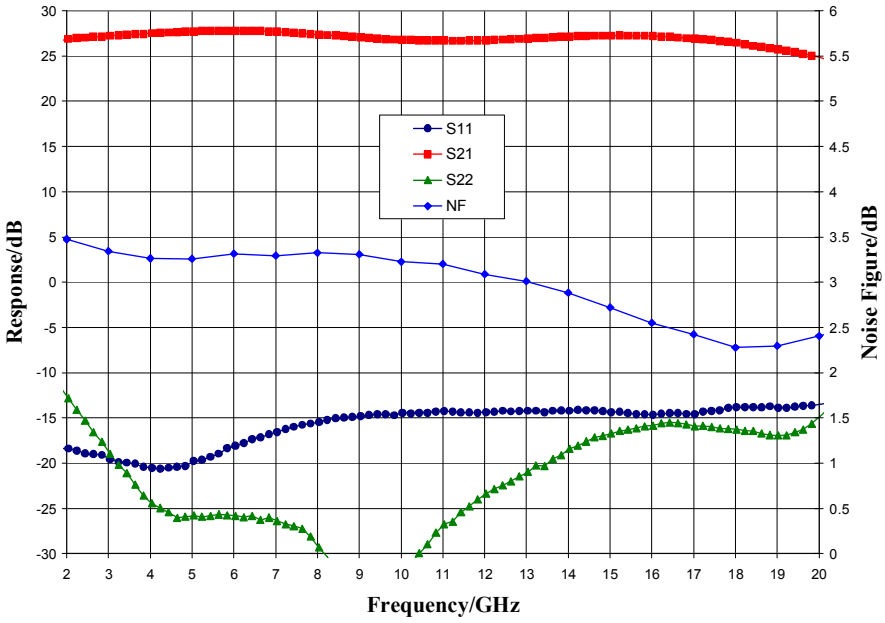
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Typical Performance

Broadband Performance, V_{dd} = 3.0 V, V_{gg} = 2.0 V, I_{dd} = 145 mA, T_A = 25 °C



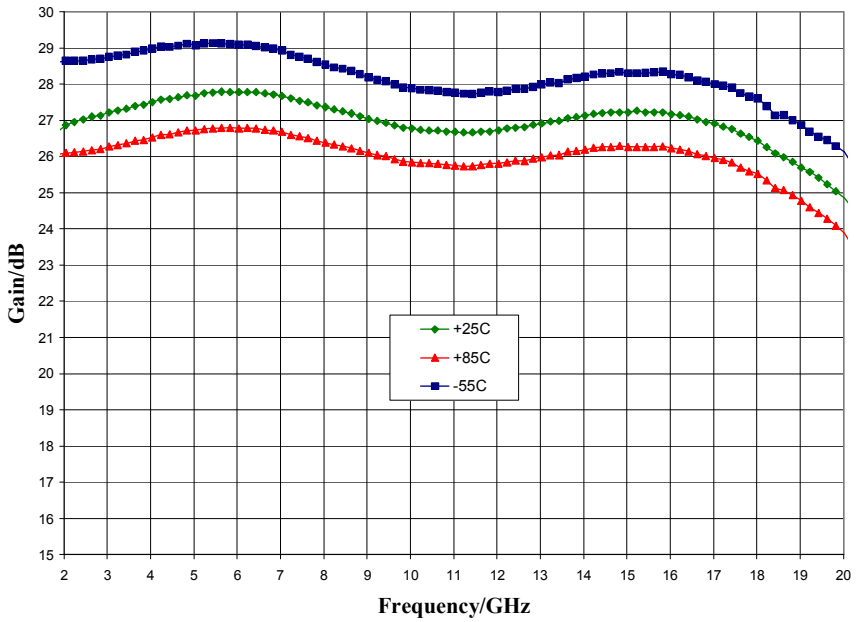
Narrow-band Performance, V_{dd} = 3.0 V, V_{gg} = 2.0 V, I_{dd} = 145 mA, T_A = 25 °C



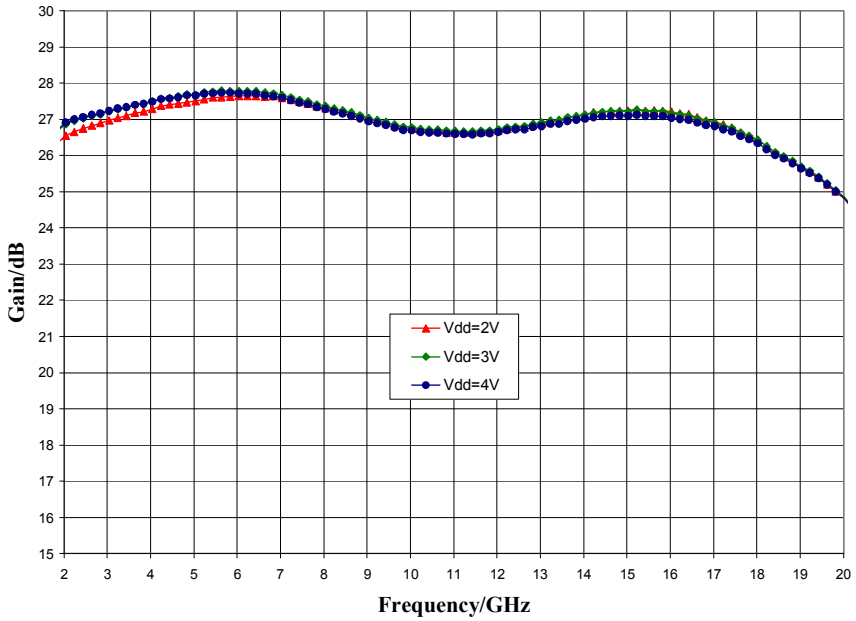
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Typical Performance

Gain vs. Temperature, V_{dd} = 3.0 V, V_{gg} = 2.0 V



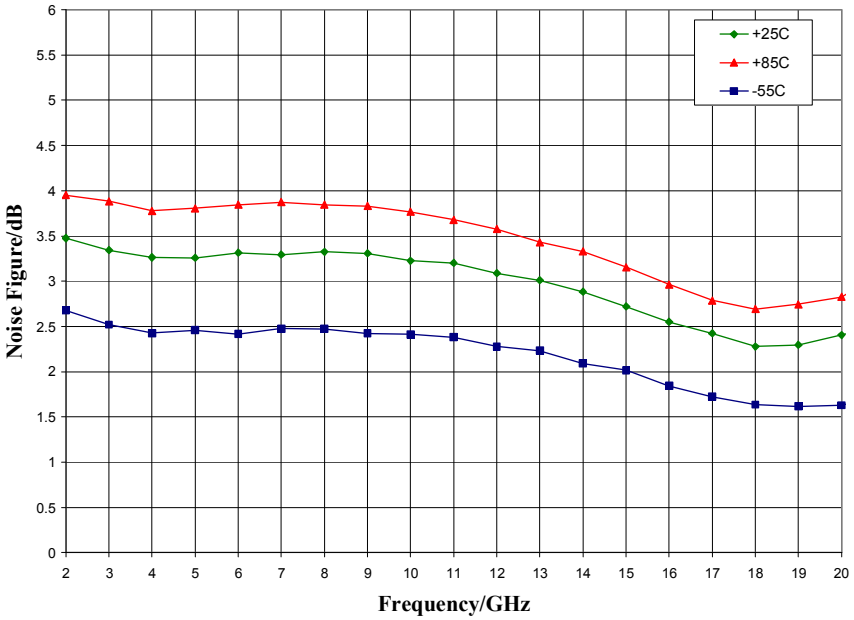
Gain vs. V_{dd}, V_{gg} = 2.0 V, T_A = 25 °C



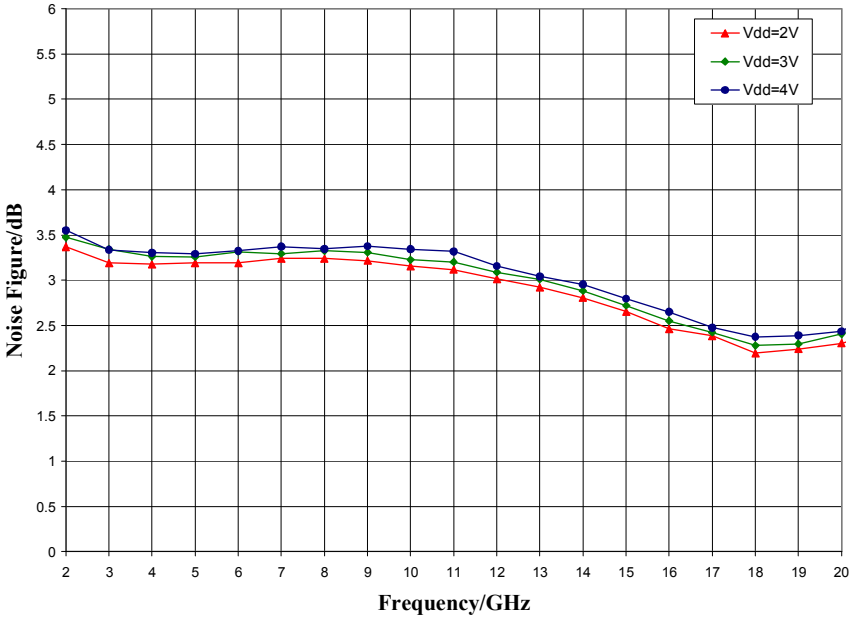
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Typical Performance

Noise Figure vs. Temperature, V_{dd} = 3.0 V, V_{gg} = 2.0 V



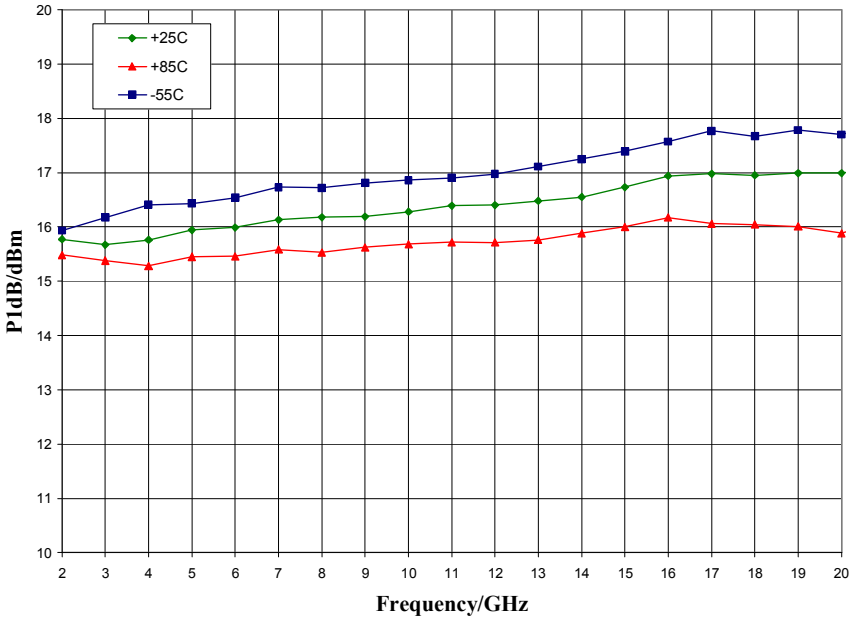
Noise Figure vs. V_{dd}, V_{gg} = 2.0 V, T_A = 25 °C



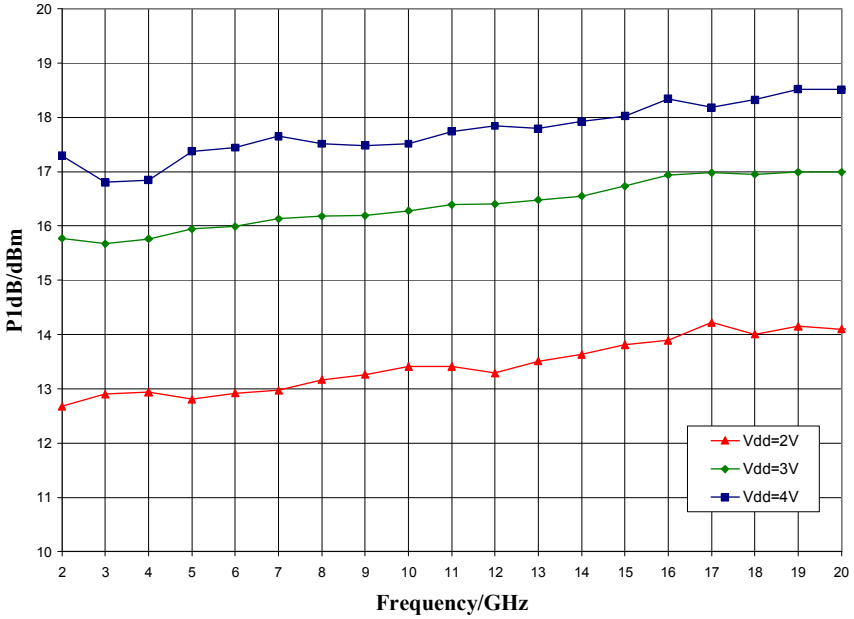
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Typical Performance

P1dB vs. Temperature, V_{dd} = 3.0 V, V_{gg} = 2.0 V



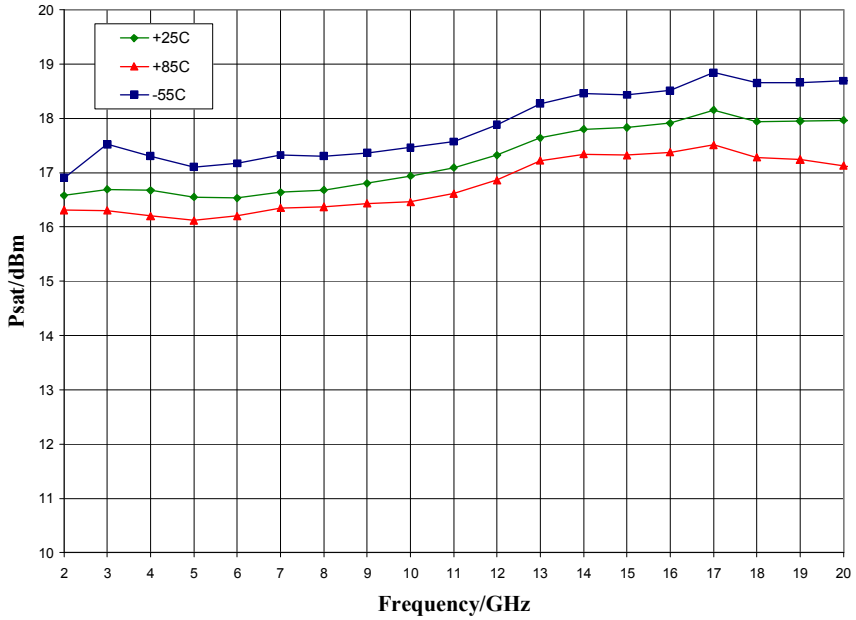
P1dB vs. V_{dd}, V_{gg} = 2.0 V, T_A = 25 °C



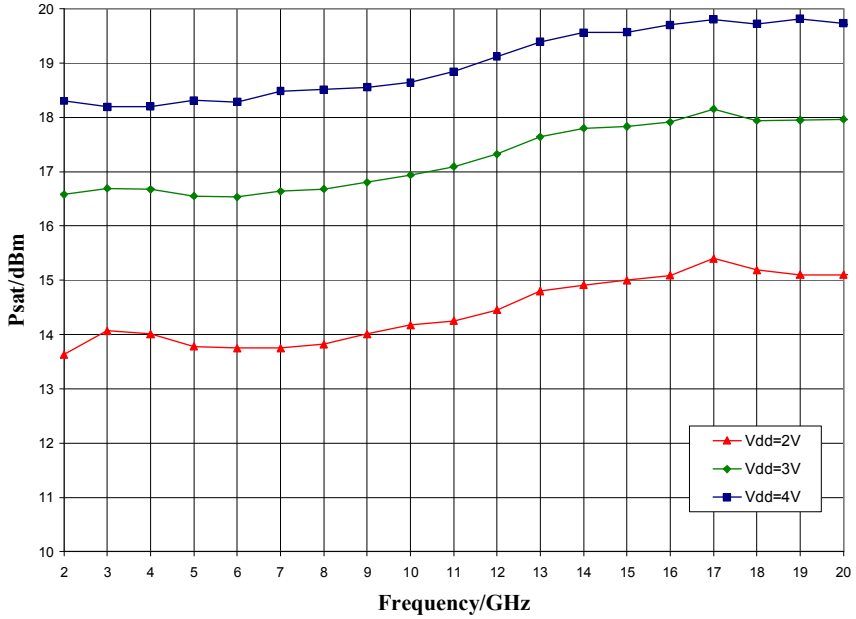
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Typical Performance

Psat vs. Temperature, V_{dd} = 3.0 V, V_{gg} = 2.0 V



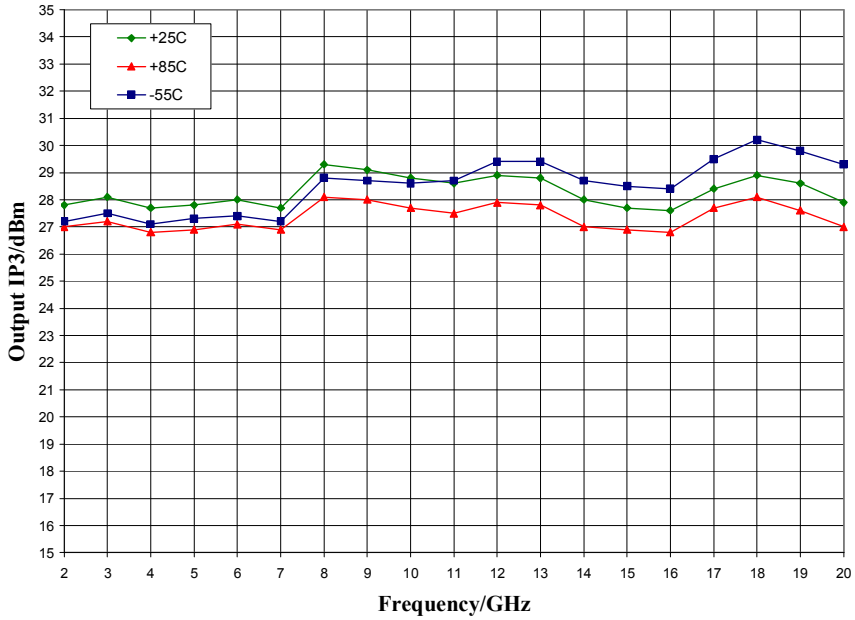
Psat vs. V_{dd}, V_{gg} = 2.0 V, T_A = 25 °C



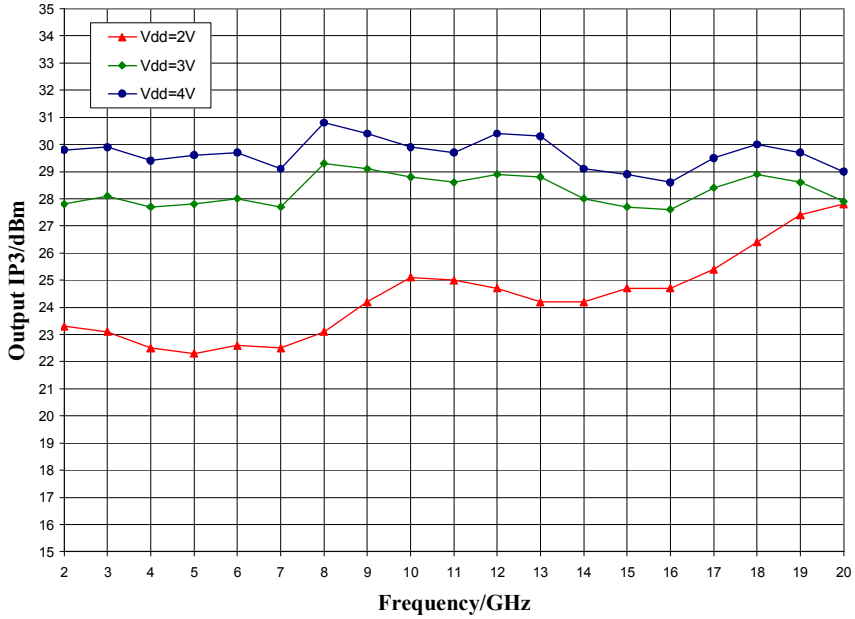
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Typical Performance

Output IP3 vs. Temperature, V_{dd} = 3.0 V, V_{gg} = 2.0 V



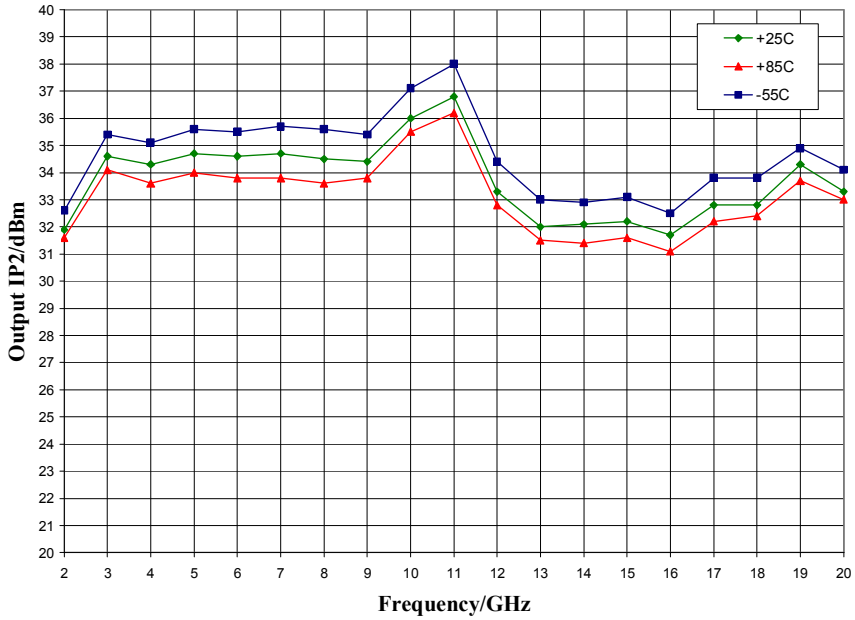
Output IP3 vs. V_{dd}, V_{gg} = 2.0 V, T_A = 25 °C



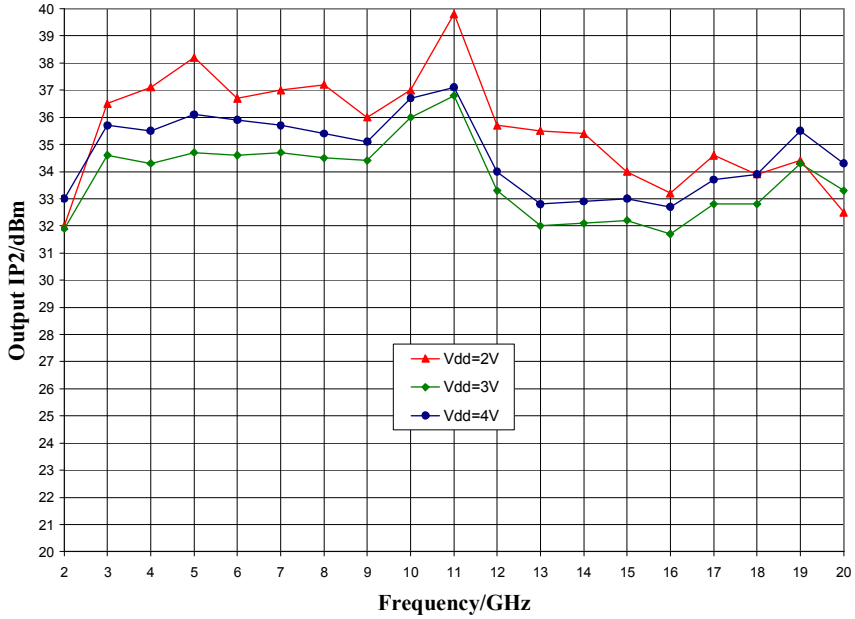
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Typical Performance

Output IP2 vs. Temperature, V_{dd} = 3.0 V, V_{gg} = 2.0 V



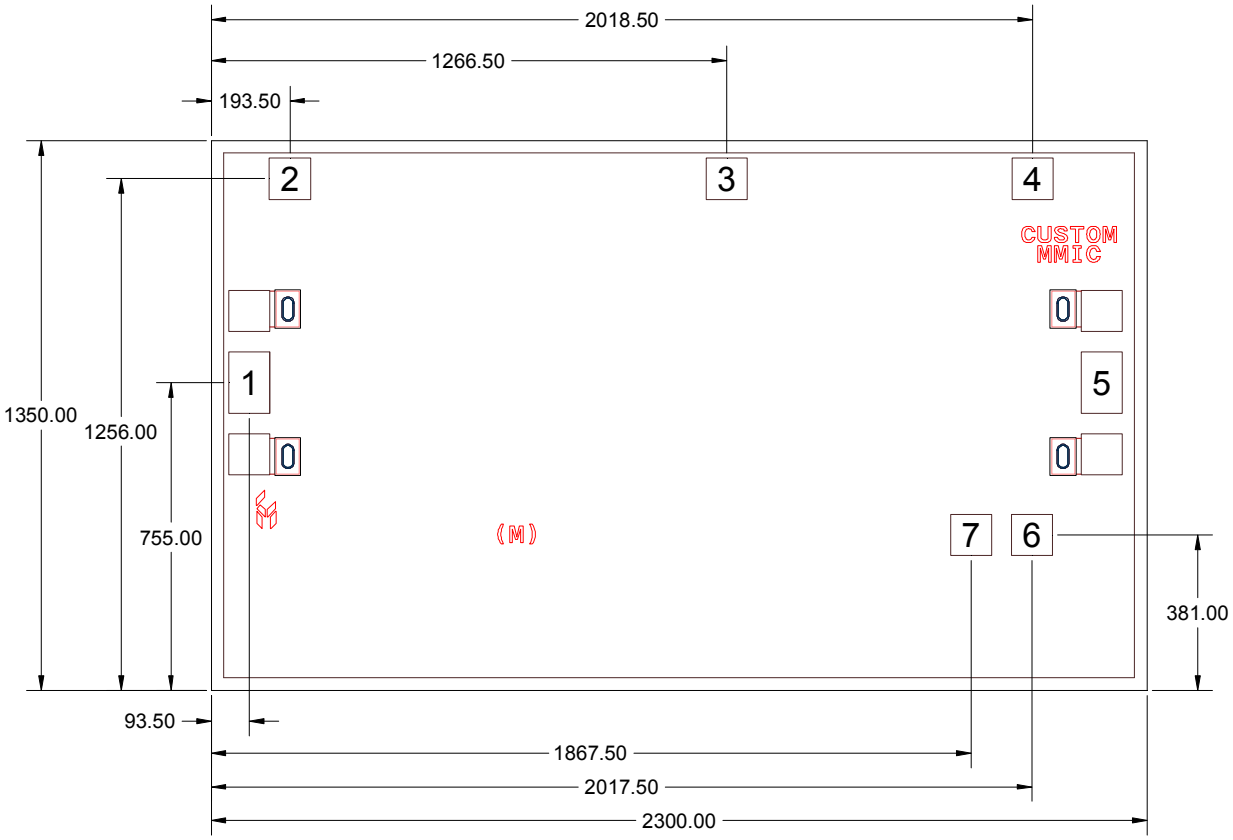
Output IP2 vs. V_{dd}, V_{gg} = 2.0 V, T_A = 25 °C



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Mechanical Information

Die Outline (all dimensions in microns)

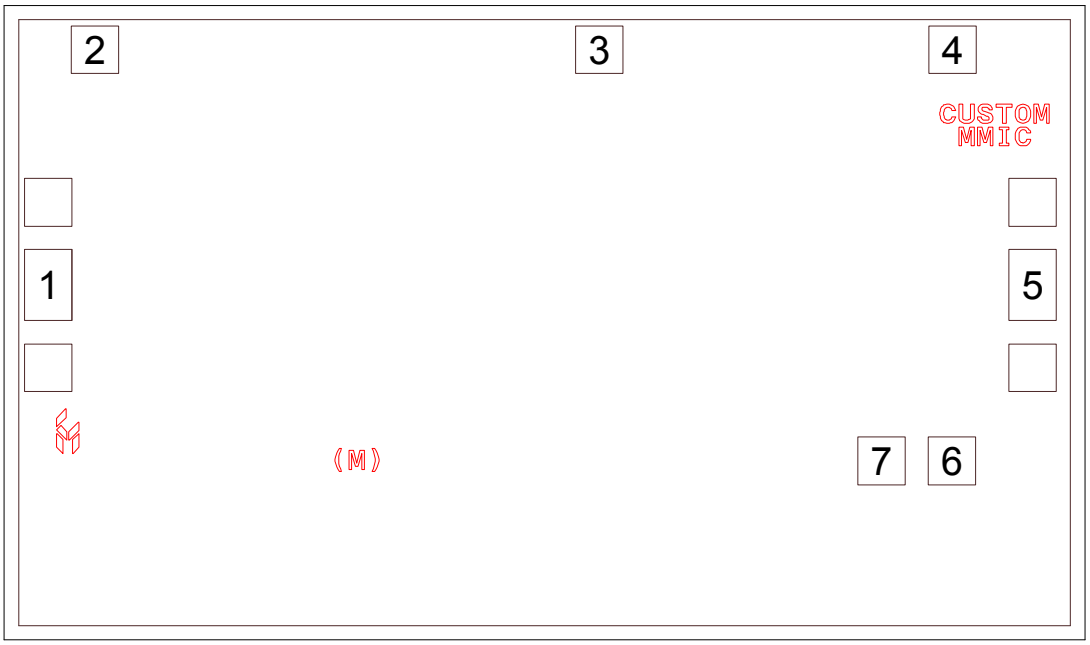


Notes:
1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 100 microns thick
5. DC bond pads (2, 3, 4, 6, 7) are 100 x 100 microns
6. RF bond pads (1, 5) are 100 x 150 microns

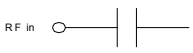
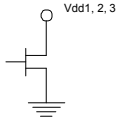
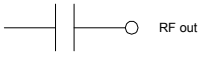
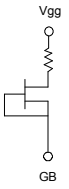
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Pad Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	RF in	DC blocked and 50 ohm matched	
2, 3, 4	Vdd1, 2, 3	Power supply voltage Decoupling and bypass caps required	
5	RF out	DC blocked and 50 ohm matched	
6	Vgg	Power supply voltage Decoupling and bypass caps required	
7	GB	Connect to DC ground	
Backside	Ground	Connect to RF / DC ground	

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Applications Information

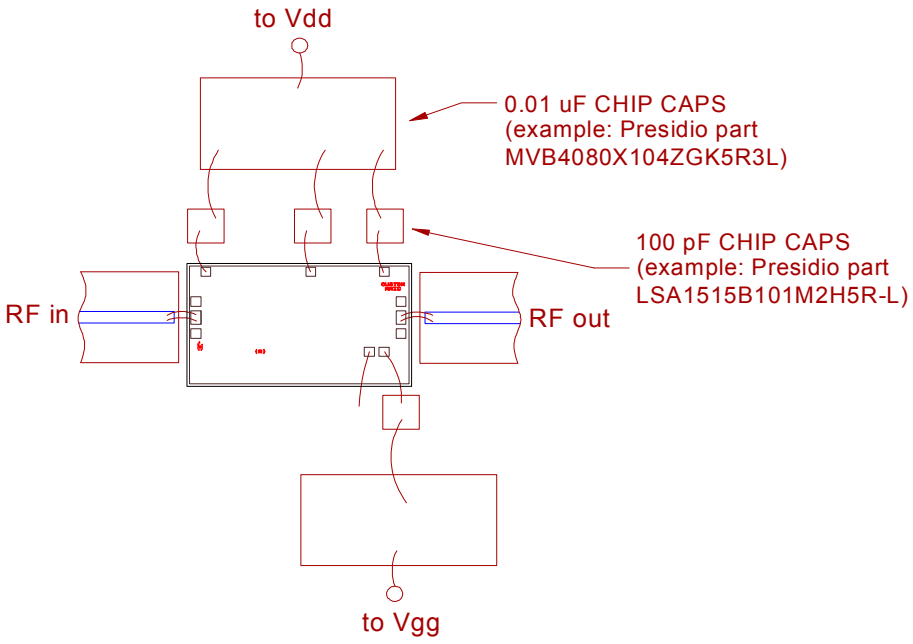
Assembly Guidelines

The backside of the CMD295 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 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.

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Applications Information

Biasing and Operation

The CMD295 is biased with a positive drain supply and positive gate supply. Performance is optimized when the drain voltage is set to +3.0 V. The recommended gate voltage is +2.0 V.

Turn ON procedure:

1.Apply drain voltage V_{dd} and set to +3 V
2.Apply gate voltage V_{gg} and set to +2 V

Turn OFF procedure:

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

The preferred biasing procedure has been proven to be robust and should be used whenever possible. However, the CMD295 does allow for simultaneous biasing (applying Vdd and Vgg at the same time).

Refer to Application Note 103: Amplifier Biasing Techniques for instructions.

For either approach, RF power can be applied at any time.

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