![Custom MMIC]

CMD290

2-26 GHz GaN Low Noise Amplifier

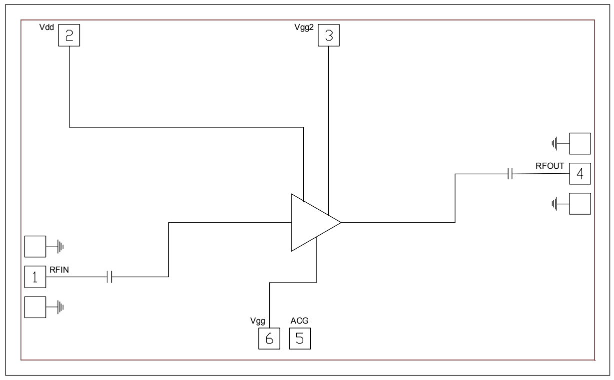
Features

- ► Ultra wideband performance
- ► Low noise figure
- ► High RF power survivablility
- ► Low current consumption
- ► Small die size

Description

The CMD290 is a wideband GaN MMIC distributed low noise amplifier die which operates from 2 to 26 GHz. The broadband device is ideally suited for applications requiring low noise figure performance and high input power survivability. The CMD290 delivers 12.5 dB of gain with a corresponding noise figure of 2.3 dB and an output 1 dB compression point of +19 dBm at 13 GHz. The CMD290 features an RF input survivability of 2 Watts. The amplifier is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching. The CMD290 offers full passivation for increased reliability and moisture protection.

Functional Block Diagram



Note: Vgg2 is optional for gain control

Electrical Performance - V_{dd} = 20 V, V_{gg} = -3 V, T_A = 25 °C, F = 13 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		2 - 26		GHz
Gain		12.5		dB
Noise Figure		2.3		dB
Input Return Loss		23		dB
Output Return Loss		23		dB
Output P1dB		19		dBm
Output IP3		27		dBm
Output IP2		29		dBm
Supply Current		100		mA

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Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	30 V
Gate Voltage, Vgg	-8 V to -1 V
RF Input Power	+33 dBm
Channel Temperature, Tch	200 °C
Power Dissipation, Pdiss	28.75 W
Thermal Resistance, Θ_{JC}	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
Vdd	10	20	28	V
Idd		100		mA
Vgg		-3		V

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

Electrical Specifications, V_{dd} = 20 V, V_{gg} = -3 V, T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		2 - 8			8 - 18			18 - 26		GHz
Gain	9	12.5		9.5	12.5		9.5	13.5		dB
Noise Figure		3.5	4.5		2.3	3.3		3.5	5.1	dB
Input Return Loss		20			15			10		dB
Output Return Loss		9			18			15		dB
Output P1dB		19.5			18			15		dBm
Output IP3		28.5			28					dBm
Output IP2		31			32					dBm
Supply Current	70	100	130	70	100	130	70	100	130	mA
Gain Temperature Coefficient		0.022			0.025			0.034		dB/°C
Noise Figure Temperature Coefficient		0.011			0.011			0.014		dB/°C

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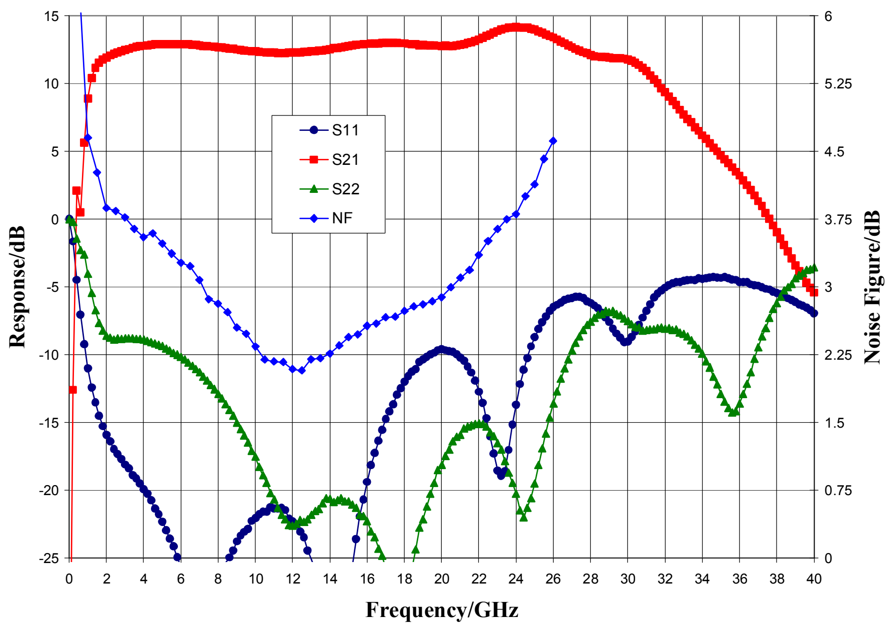
CMD290

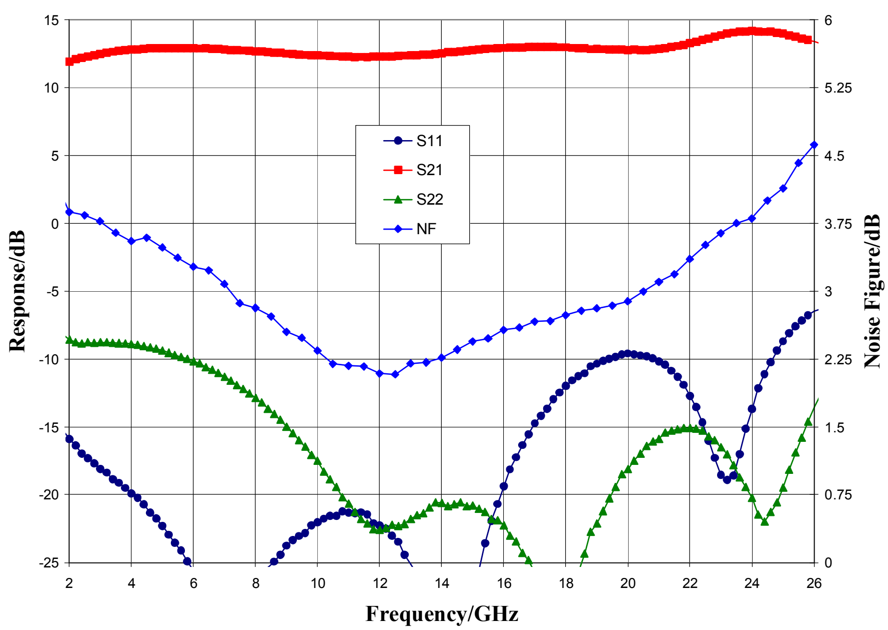
2-26 GHz GaN Low Noise Amplifier

Typical Performance

Broadband Performance, V_{dd} = 20 V, V_{gg} = -3 V, I_{dd} = 100 mA, T_A = 25 ^oC



Narrow-band Performance, V_{dd} = 20 V, V_{gg} = -3 V, I_{dd} = 100 mA, T_A = 25 ^oC



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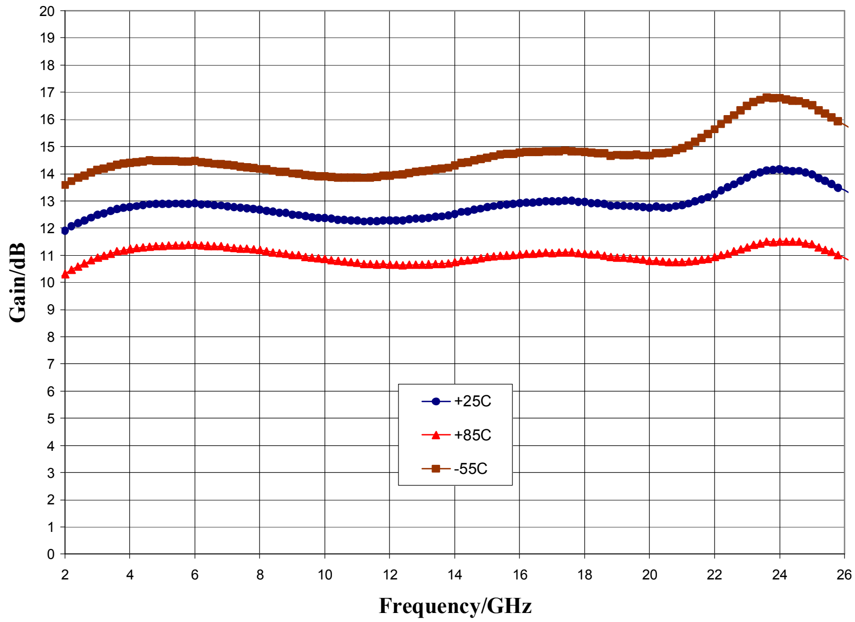
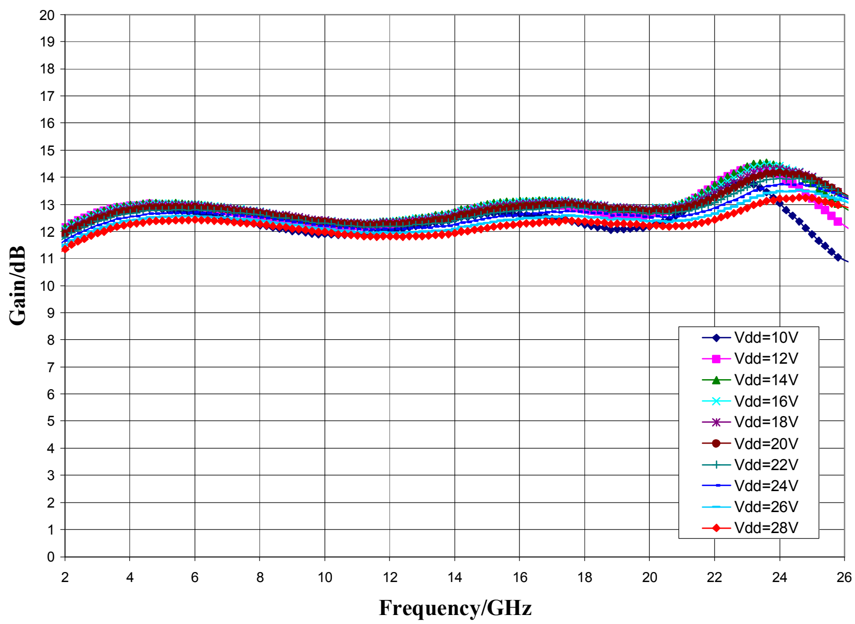
Typical Performance

Gain vs. Temperature, V_{dd} = 20 V, V_{gg} = -3 V



Gain vs. V_{dd}, V_{gg} = -3 V, T_A = 25 °C



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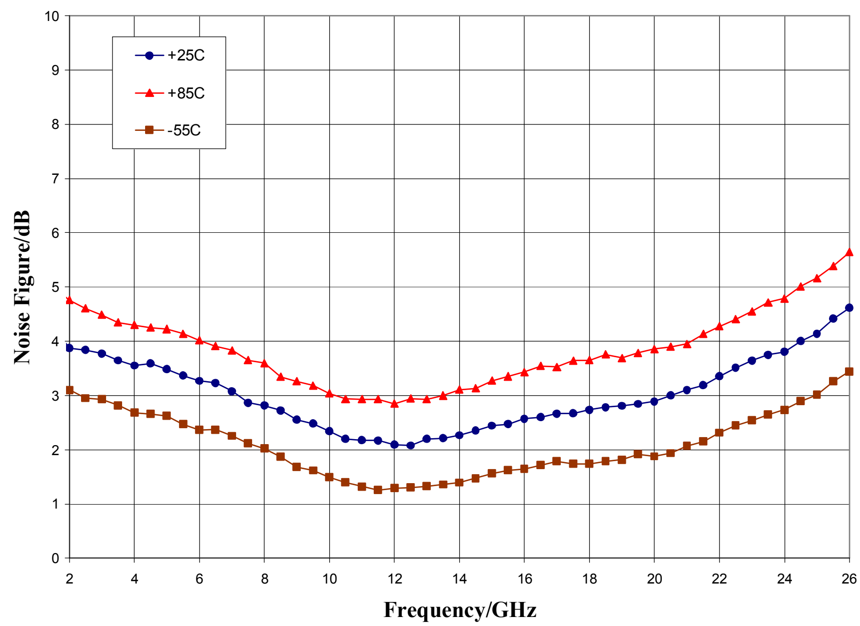
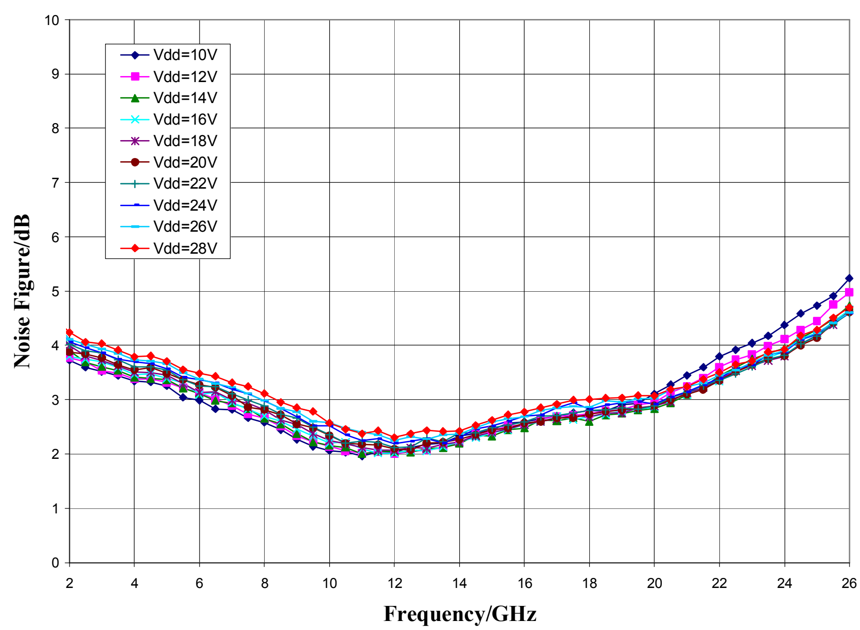
Typical Performance

Noise Figure vs. Temperature, V_{dd} = 20 V, V_{gg} = -3 V



Noise Figure vs. V_{dd}, V_{gg} = -3 V, T_A = 25 °C



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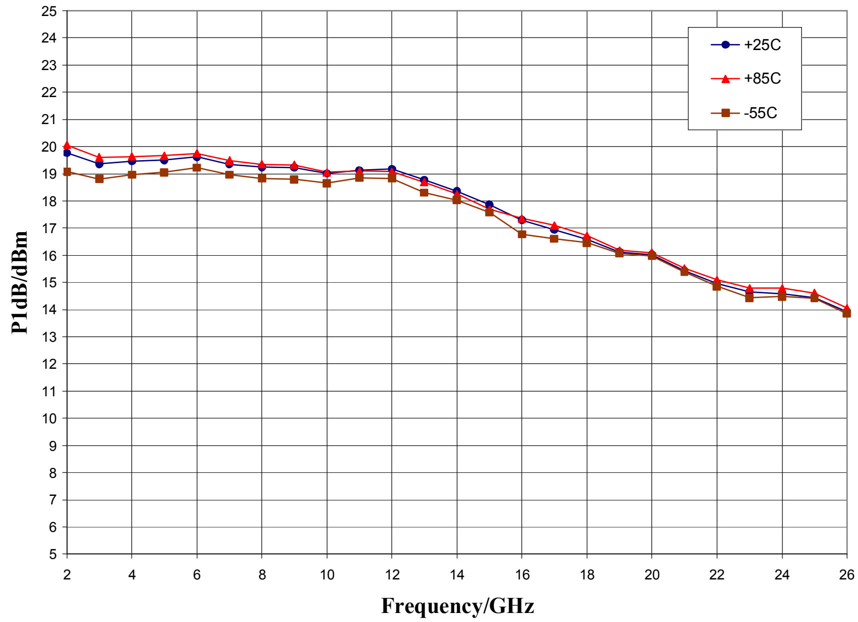
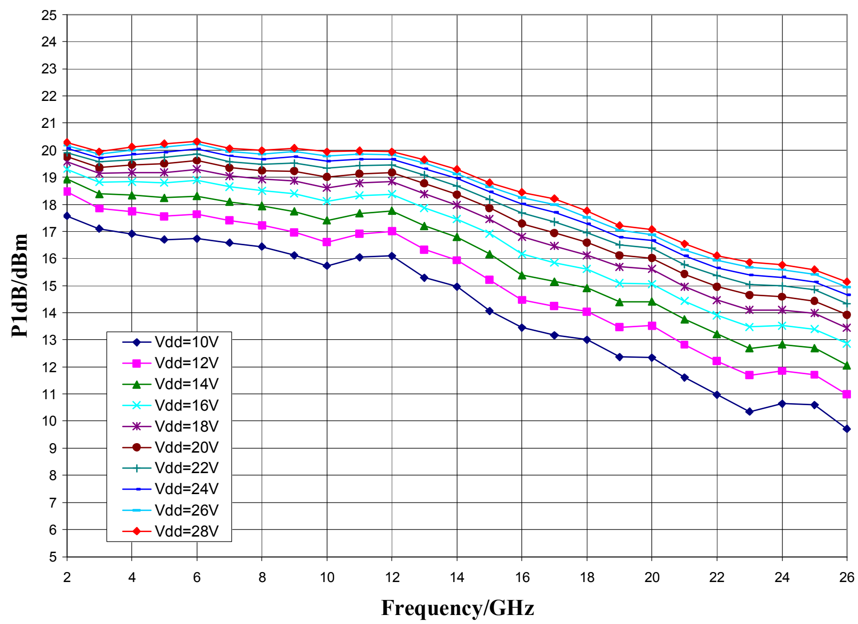
Typical Performance

P1dB vs. Temperature, V_{dd} = 20 V, V_{gg} = -3 V



P1dB vs. V_{dd}, V_{gg} = -3 V, T_A = 25 °C



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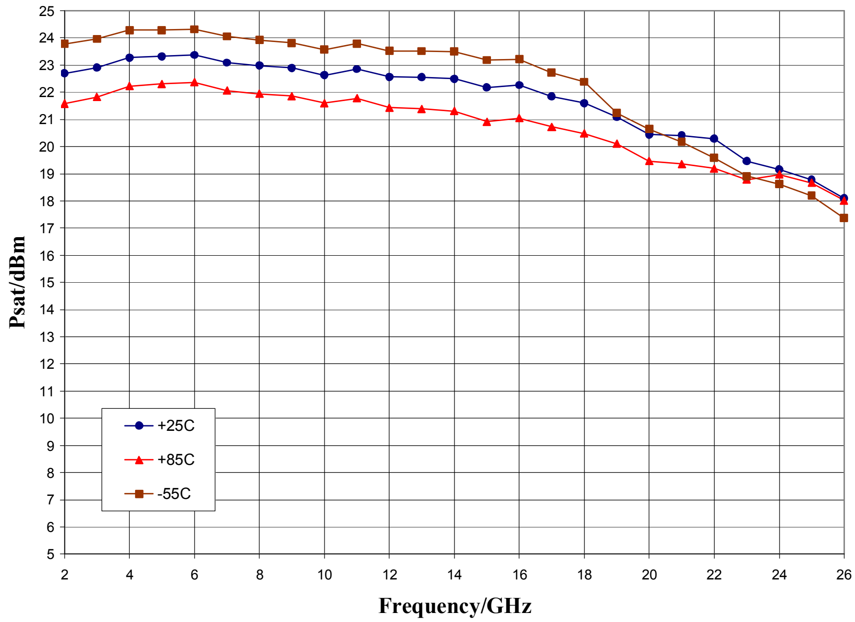
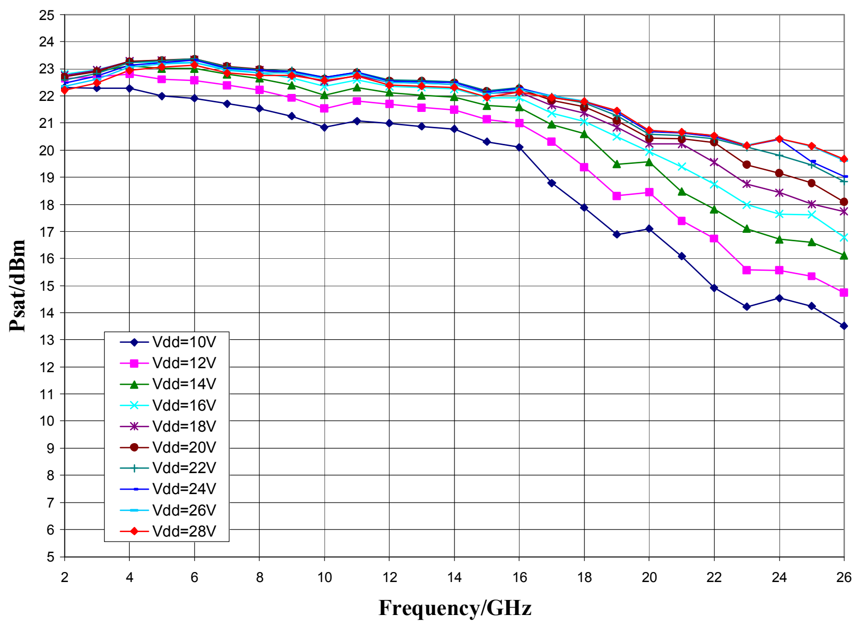
Typical Performance

Psat vs. Temperature, V_{dd} = 20 V, V_{gg} = -3 V



Psat vs. V_{dd}, V_{gg} = -3 V, T_A = 25 °C



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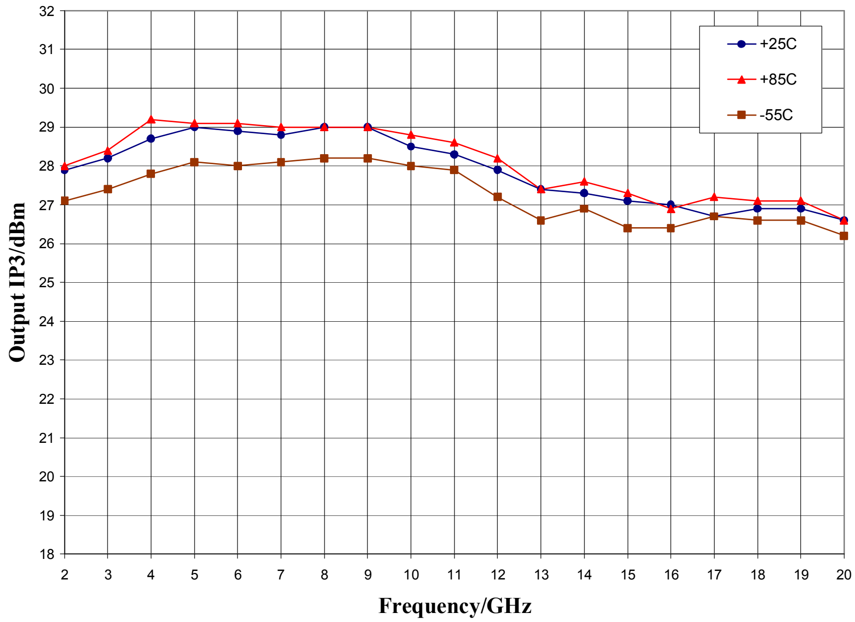
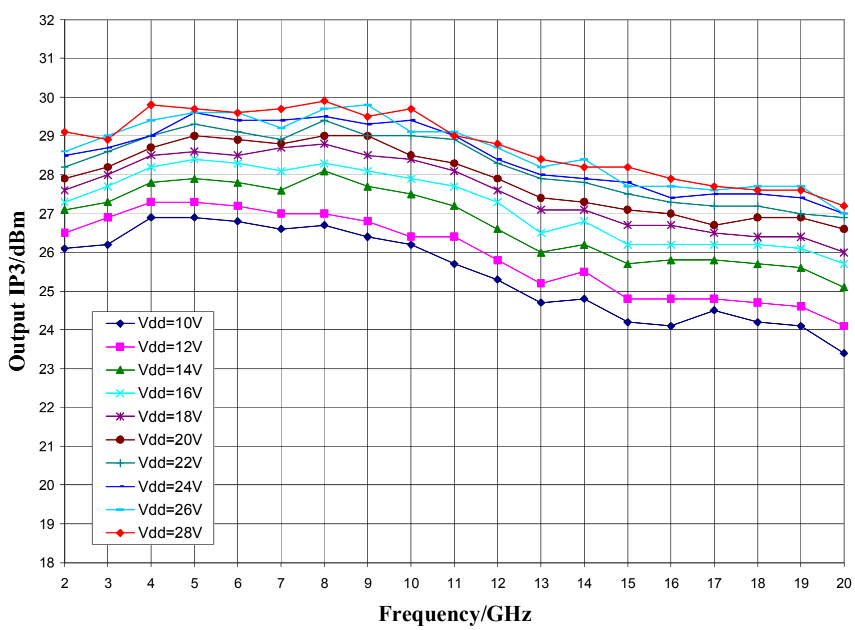
Typical Performance

Output IP3 vs. Temperature, V_{dd} = 20 V, V_{gg} = -3 V



Output IP3 vs. V_{dd}, V_{gg} = -3 V, T_A = 25 °C



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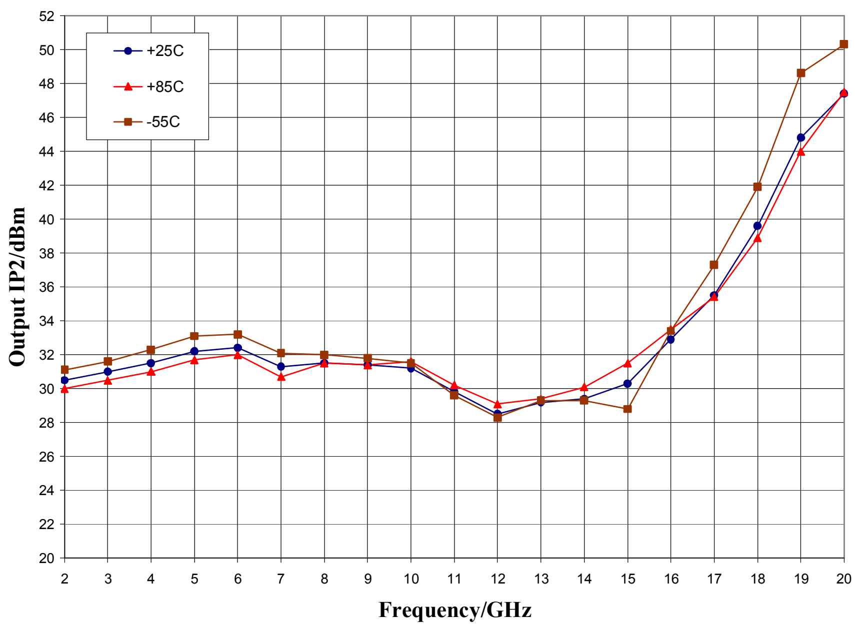
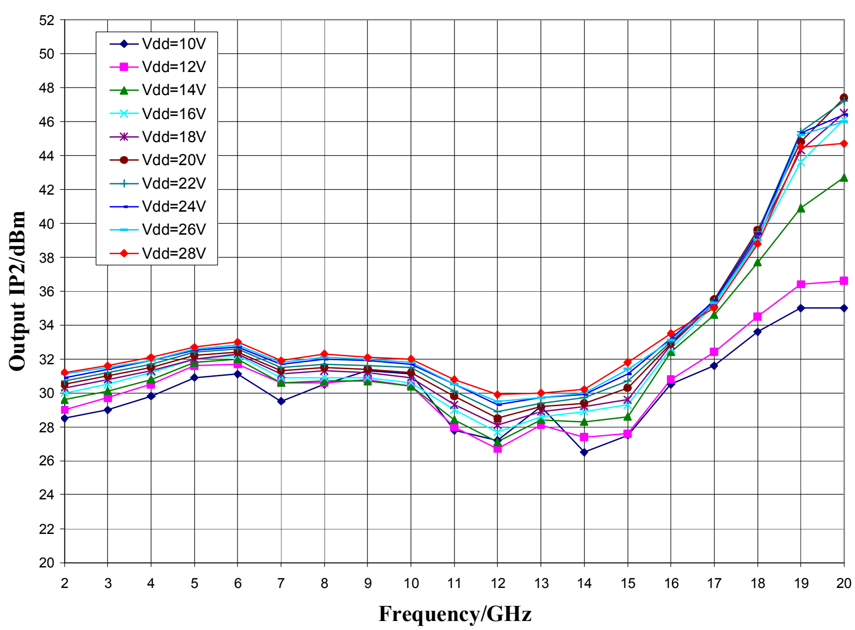
Typical Performance

Output IP2 vs. Temperature, V_{dd} = 20 V, V_{gg} = -3 V



Output IP2 vs. V_{dd}, V_{gg} = -3 V, T_A = 25 °C



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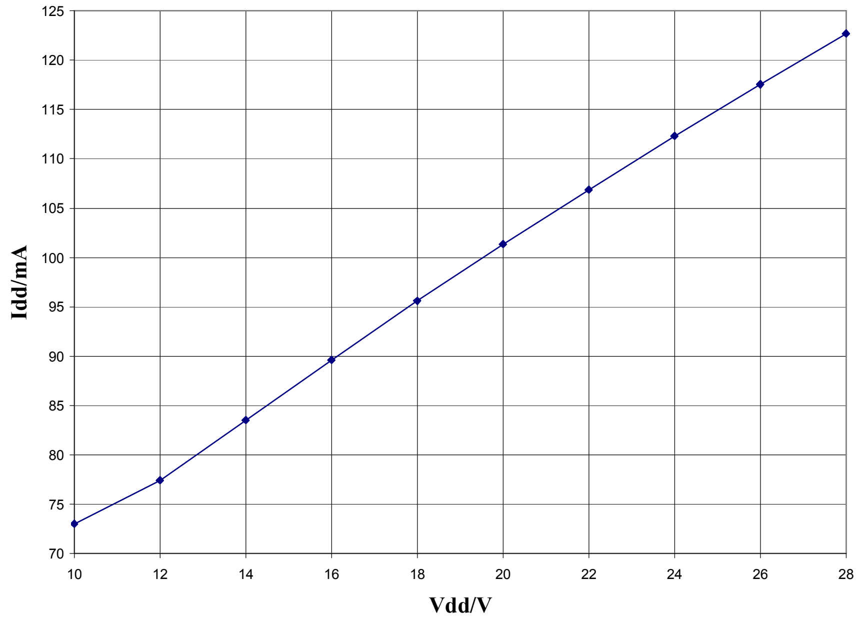
Typical Performance

Drain Current vs. Drain Voltage, V_{gg} = -3 V, T_A = 25 ^oC



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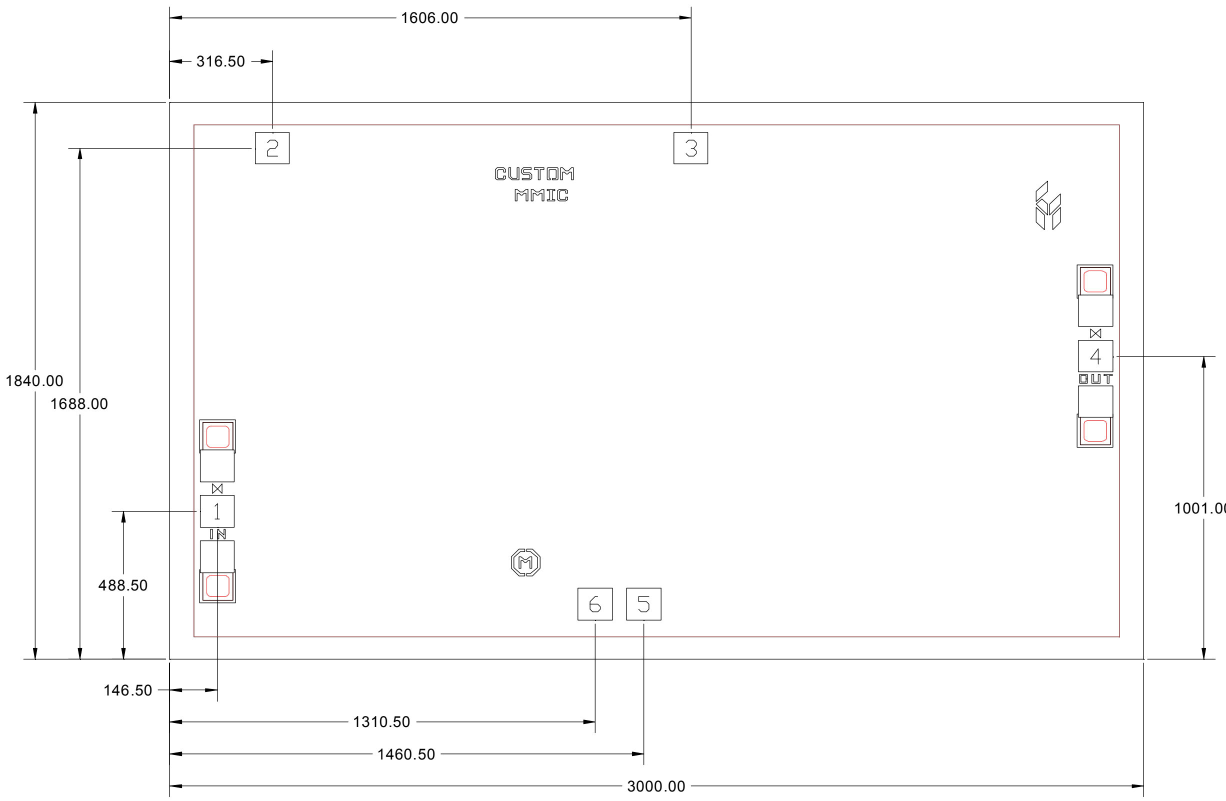
Mechanical Information

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, 5, 6) are 100 x 100 microns
6. RF bond pads (1, 4) are 100 x 100 microns

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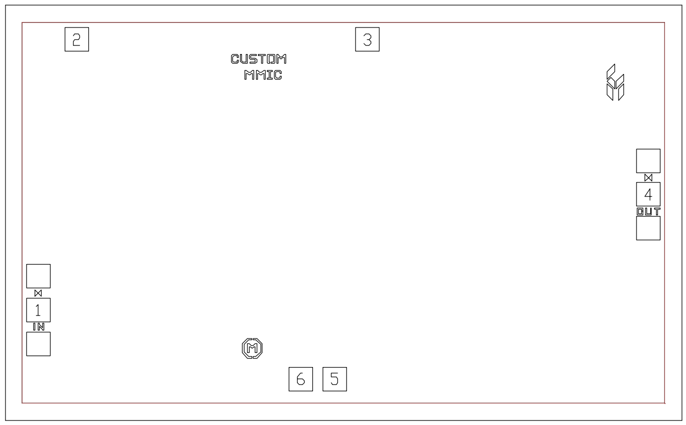
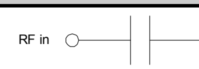
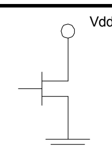
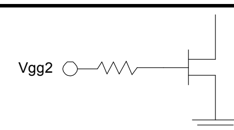
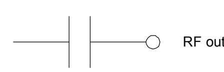
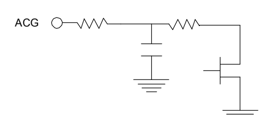
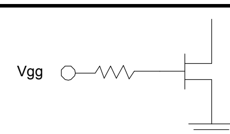
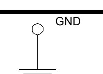
Pad Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	RF in	DC blocked and 50 ohm matched	
2	Vdd	Power supply voltage Decoupling and bypass caps required	
3	Vgg2	Optional supply voltage for gain control. Decoupling and bypass caps required. Pin must be left open if unused.	
4	RF out	DC blocked and 50 ohm matched	
5	ACG	Low Frequency Termination Attach bypass capacitor per application circuit	
6	Vgg	Power supply voltage Decoupling and bypass caps required	
Backside	Ground	Connect to RF / DC ground	

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Applications Information

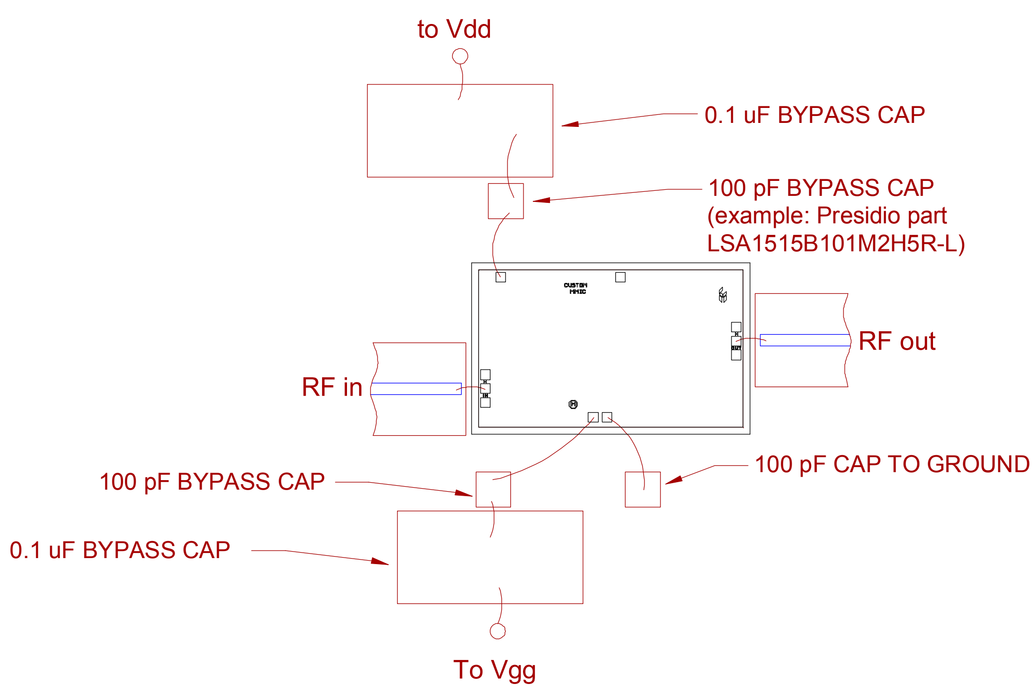
Assembly Guidelines

The backside of the CMD290 is RF ground. Die attach should be accomplished with 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 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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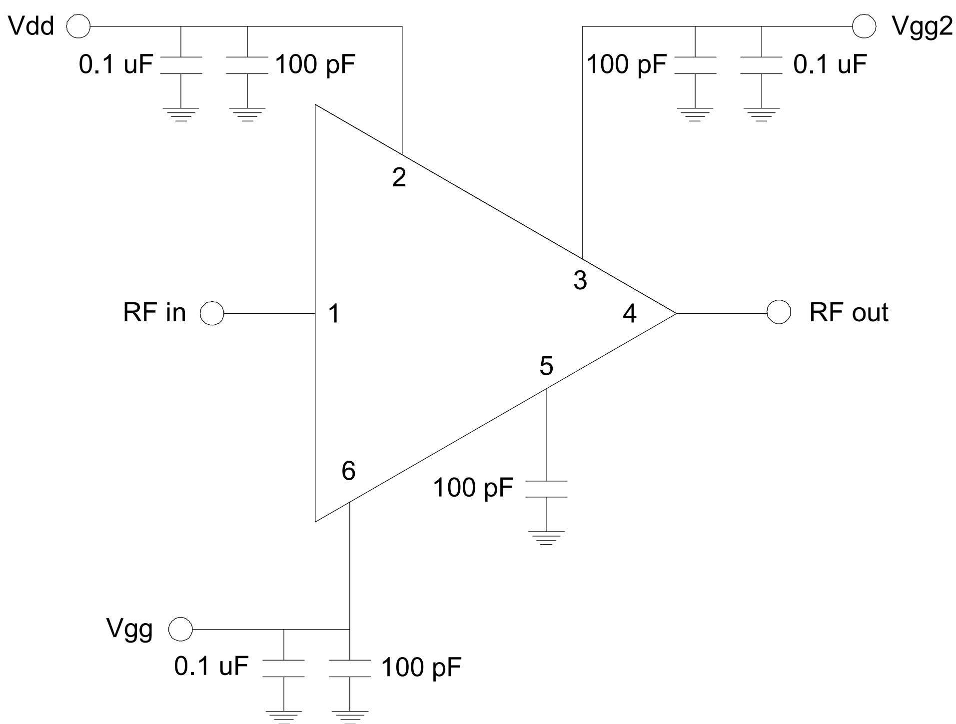
Applications Information

Application Circuit



Biasing and Operation

The CMD290 is biased with a positive drain supply and a negative gate supply. Performance is optimized when the drain voltage is set to +20 V, though it may be set between +10 V and +28 V. The nominal gate voltage is -3 V.

Turn ON procedure:

1.Apply gate voltage V_{gg} and set to -5 V
2.Apply drain voltage V_{dd} and set to +20 V
3.Increase V_{gg} (less negative) to achieve a drain current of 100 mA

Turn OFF procedure:

1.Turn off drain voltage V_{dd}
2.Turn off gate voltage V_{gg}
RF power can be applied at any time.

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