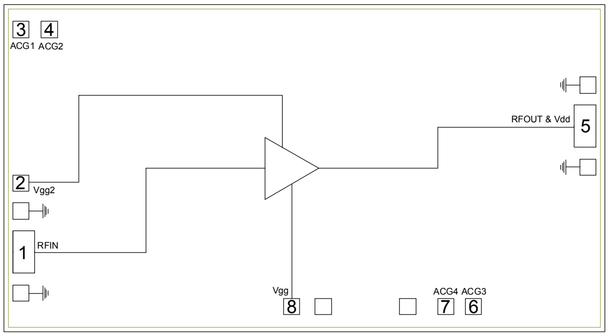
CMD244

DC-24 GHz Distributed Driver Amplifier

Features

- ► Ultra wideband performance
- ► Positive gain slope
- ► High output power
- ► Low noise figure
- ► Small die size

Functional Block Diagram



Note: Vgg2 is optional for gain control

Description

The CMD244 is wideband GaAs MMIC distributed amplifier die which operates from DC to 24 GHz. The amplifier delivers 18 dB of gain with a corresponding output 1 dB compression point of +25 dBm and noise figure of 2.5 dB at 10 GHz. The CMD244 is a 50 ohm matched design which eliminates the need for RF port matching. The CMD244 offers full passivation for increased reliability and moisture protection. This amplifier is the perfect alternative to higher cost hybrid amplifiers.

Electrical Performance - V_{dd} = 8.0 V, V_{gg} = -1.0 V, T_A = 25 °C, F=10 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		DC - 24		GHz
Gain		18		dB
Noise Figure		2.5		dB
Input Return Loss		18		dB
Output Return Loss		18		dB
Output P1dB		25		dBm
Supply Current		185		mA

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Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	10 V
Gate Voltage, Vgg	-4 to 0 V
RF Input Power	+15 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	2.4 W
Thermal Resistance	26.82 °C/W
Operating Temperature	-55 to 85 °C
Storage Temperature	-55 to 150 °C

Operation of this device outside the maximum ratings may cause permanent damage.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Vdd	5.0	8.0	8.5	V
Idd		185		mA
Vgg	-4.0	-1.0	0	V
Igg		-1.6		mA

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

Electrical Specifications, V_{dd} = 8.0 V, V_{gg} = -1.0 V, T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		DC - 10			10 - 24		GHz
Gain	14.5	17.5		15	18.5		dB
Noise Figure		3			4		dB
Input Return Loss		18			15		dB
Output Return Loss		25			15		dB
Output P1dB	22	25		18	23		dBm
Output IP3		33			31		dBm
Supply Current	130	185	270	130	185	270	mA
Gain Temperature Coefficient		0.010			0.015		dB/°C
Noise Figure Temperature Coefficient		0.01			0.010		dB/°C

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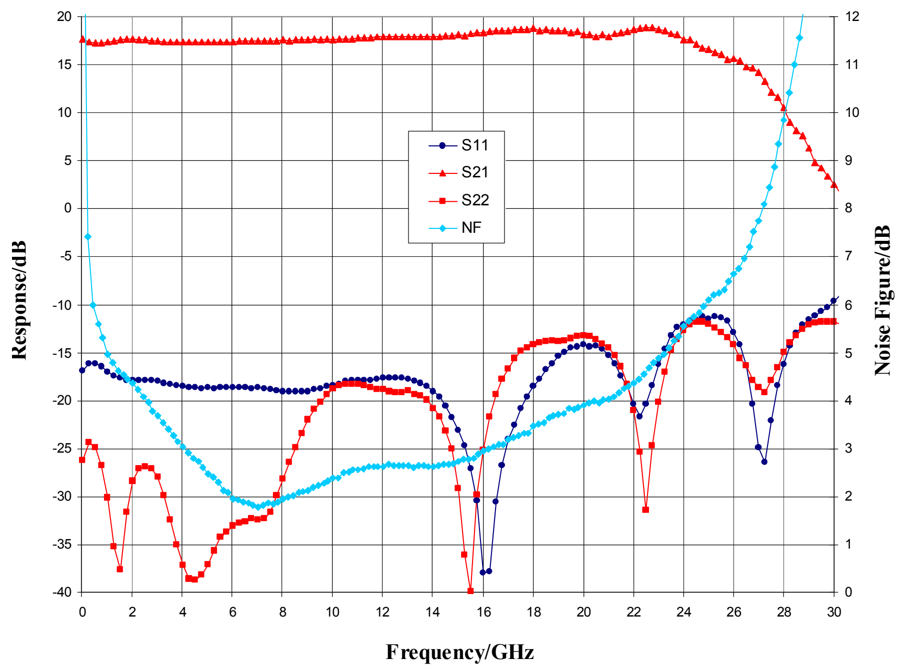
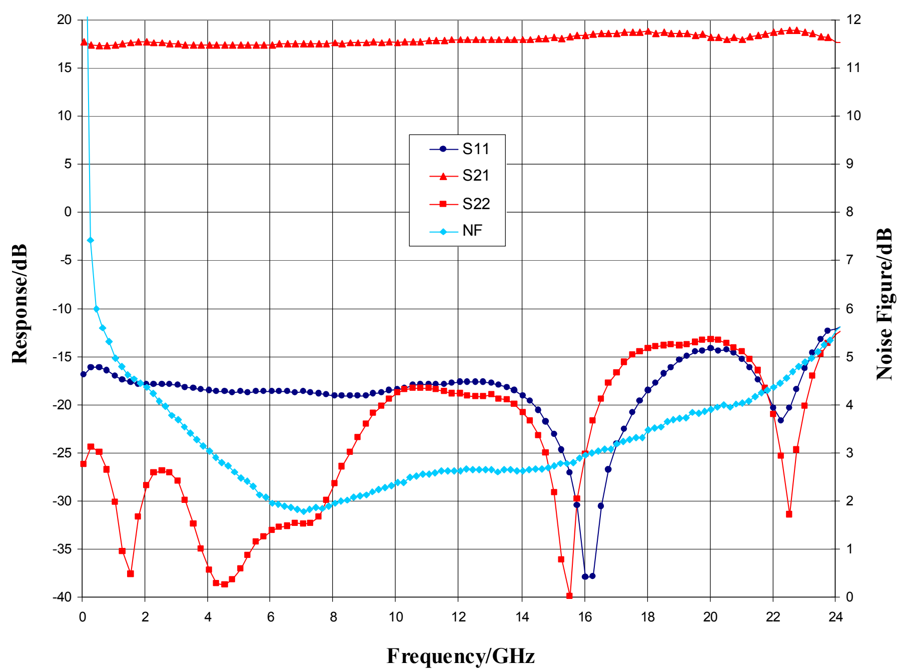
Typical Performance

Broadband Performance, V_{dd} = 8.0 V, V_{gg} = -1.0 V, I_{dd} = 185 mA, T_A = 25 °C



Narrow-band Performance, V_{dd} = 8.0 V, V_{gg} = -1.0 V, I_{dd} = 185 mA, T_A = 25 °C



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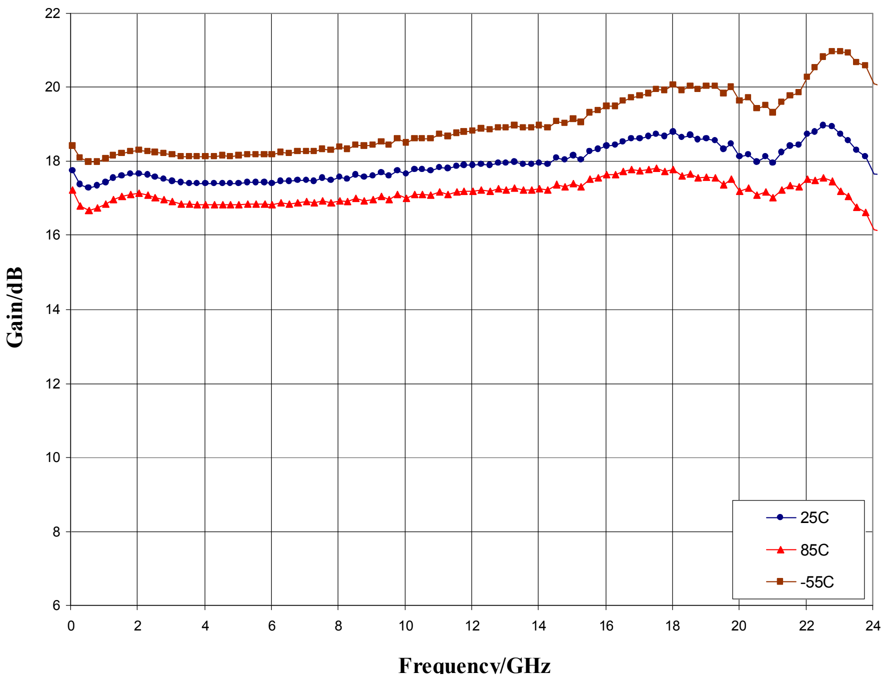
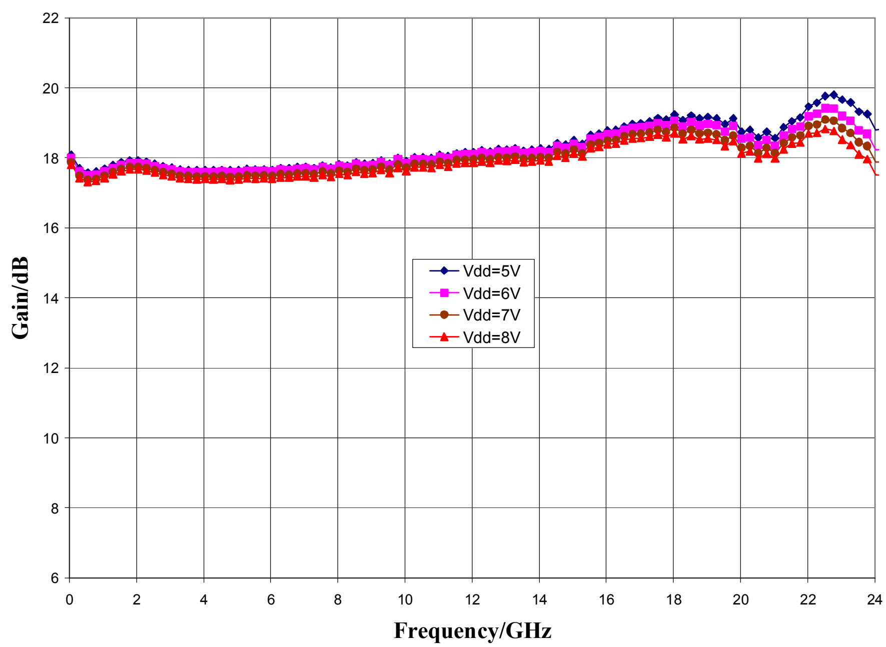
Typical Performance

Gain vs. Temperature, V_{dd} = 8.0 V, V_{gg} = -1.0 V



Gain vs. Supply Voltage, T_A = 25 °C



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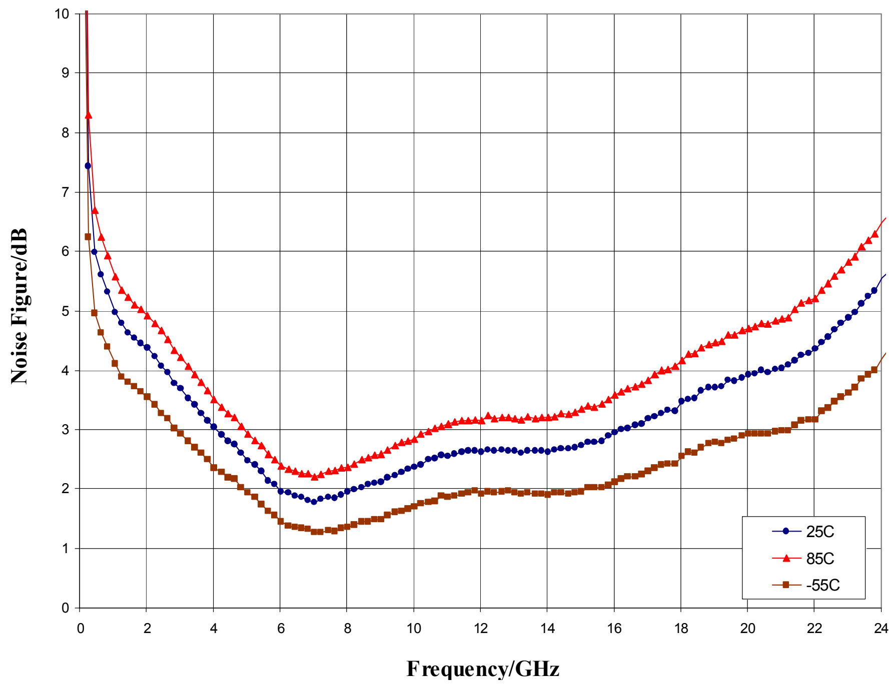
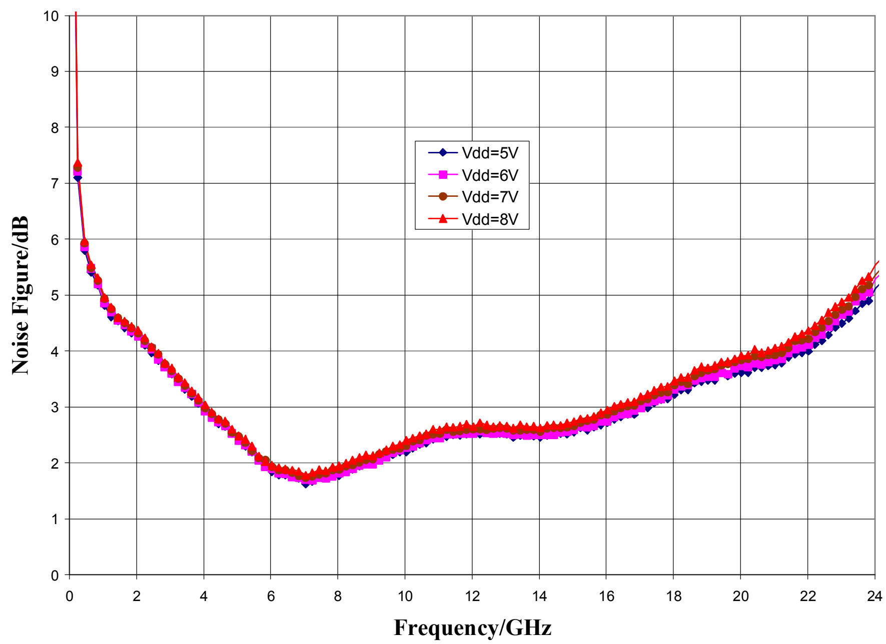
Typical Performance

Noise Figure vs. Temperature, V_{dd} = 8.0 V, V_{gg} = -1.0 V



Noise Figure vs. Supply Voltage, T_A = 25 ^{o}C



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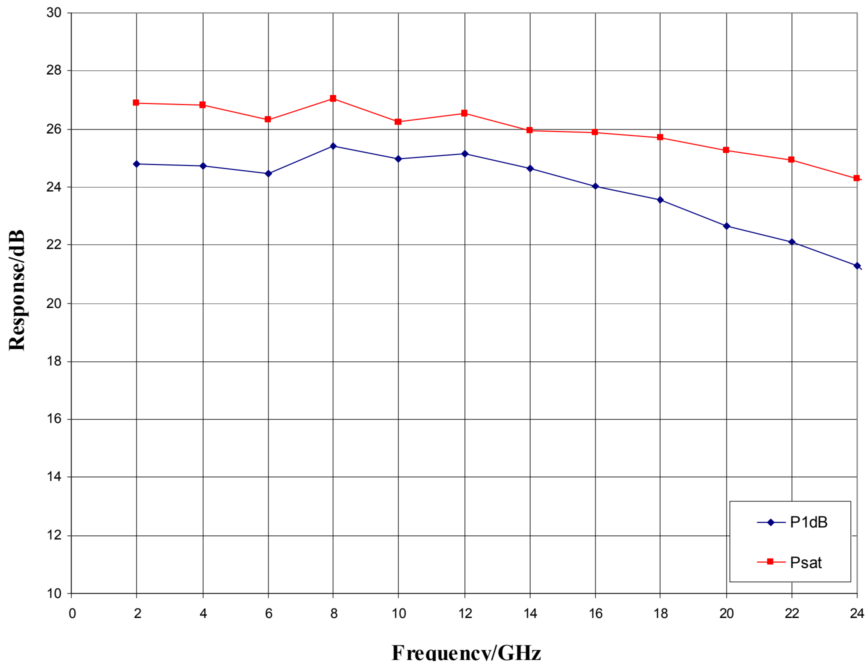
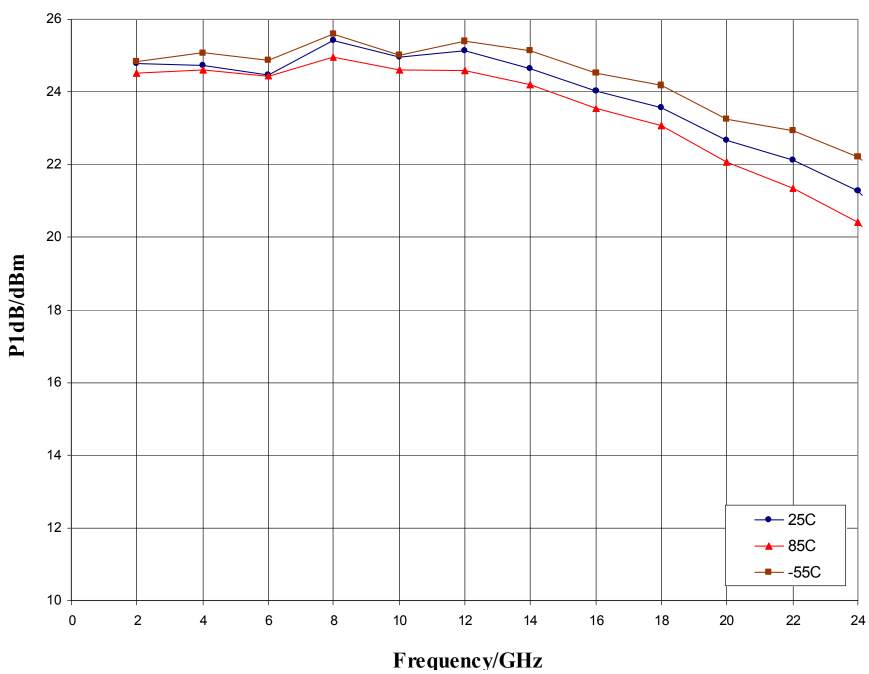
Typical Performance

Output Power, V_{dd} = 8.0 V, V_{gg} = -1.0 V, T_A = 25 °C



P1dB vs. Temperature, V_{dd} = 8.0 V, V_{gg} = -1.0 V



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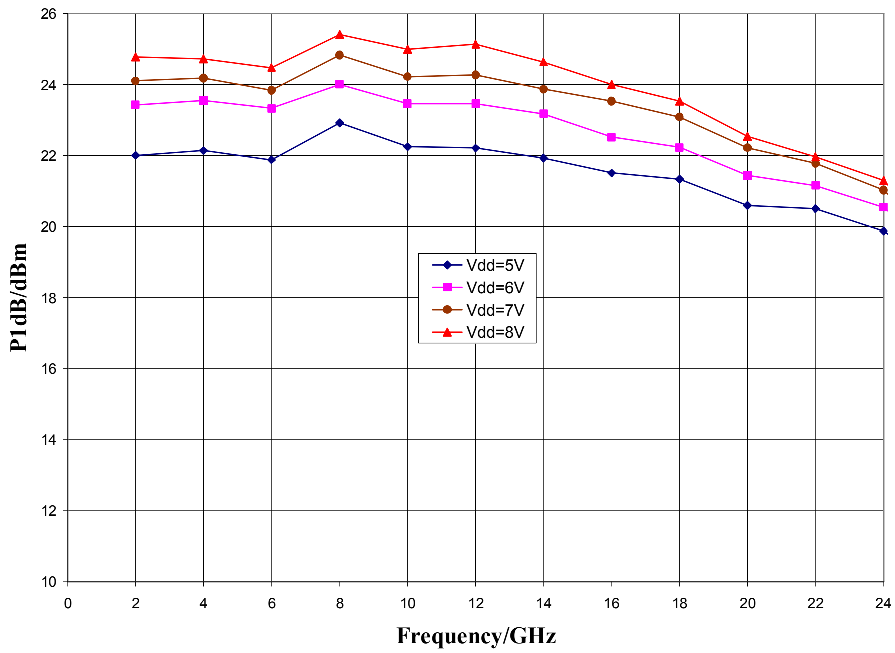
Typical Performance

P1dB vs. Supply Voltage, $T_A = 25\ ^oC$



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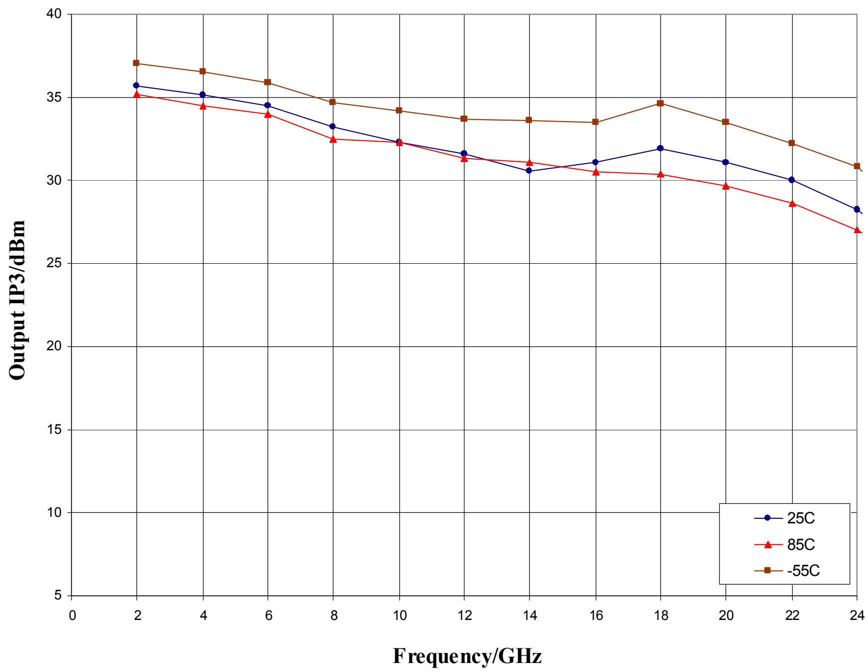
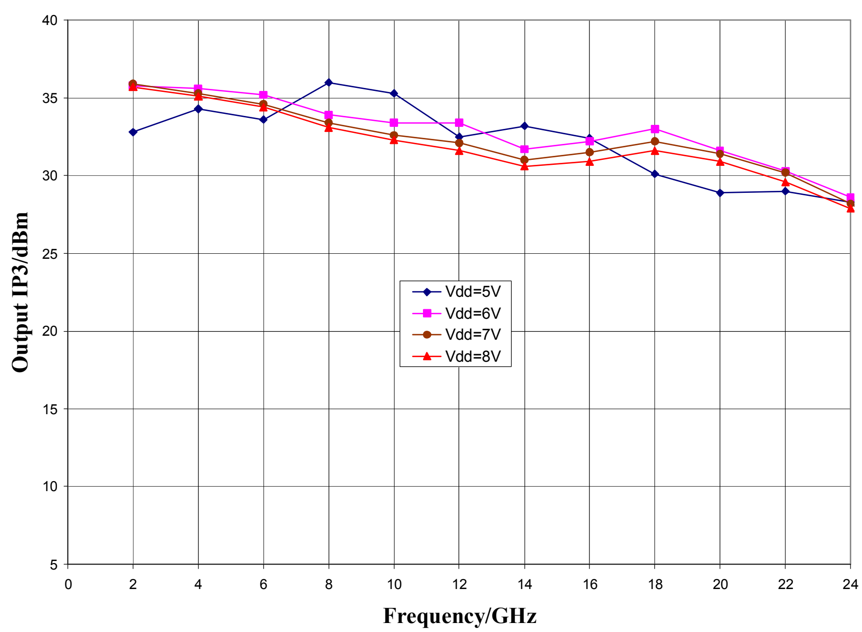
Typical Performance

Output IP3 vs. Temperature, V_{dd} = 8.0 V, V_{gg} = -1.0 V



Output IP3 vs. Supply Voltage, T_A = 25 ^{o}C



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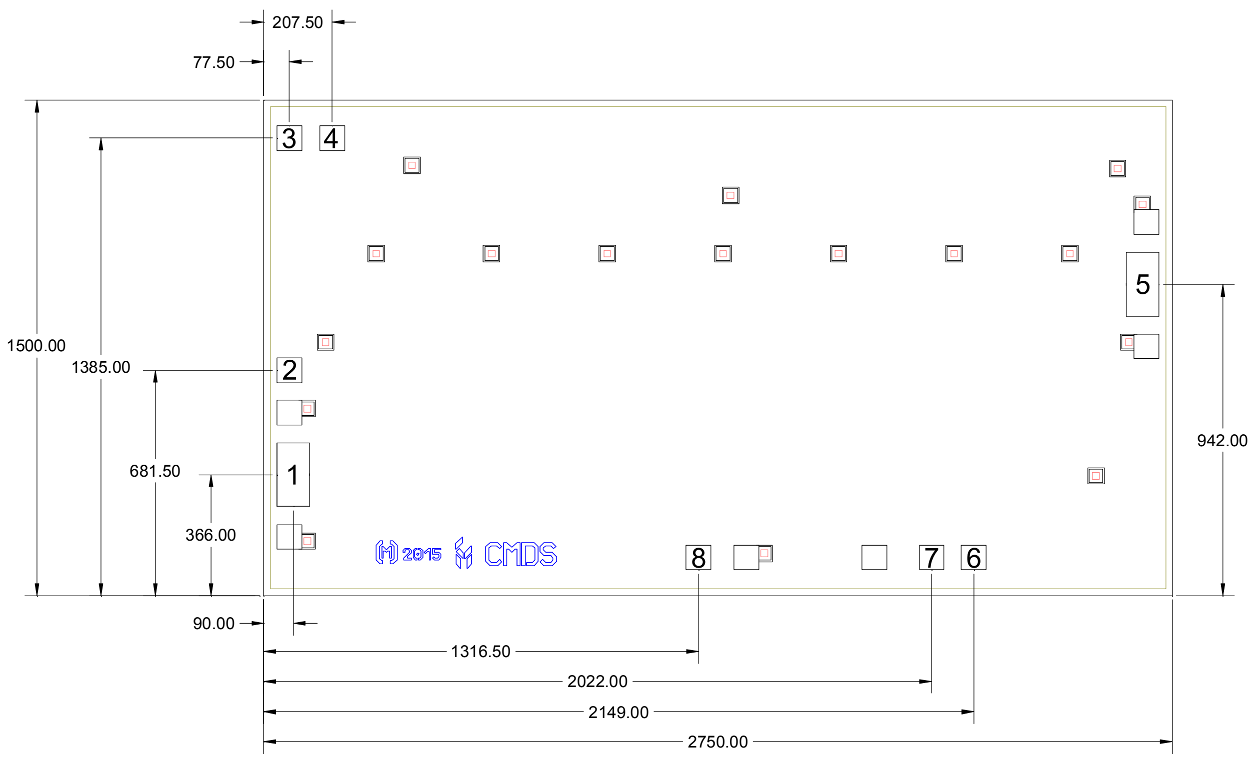
Mechanical Information

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 70 microns thick
5. DC bond pads are 75 microns square
6. RF bond pads are 100 x 193 microns

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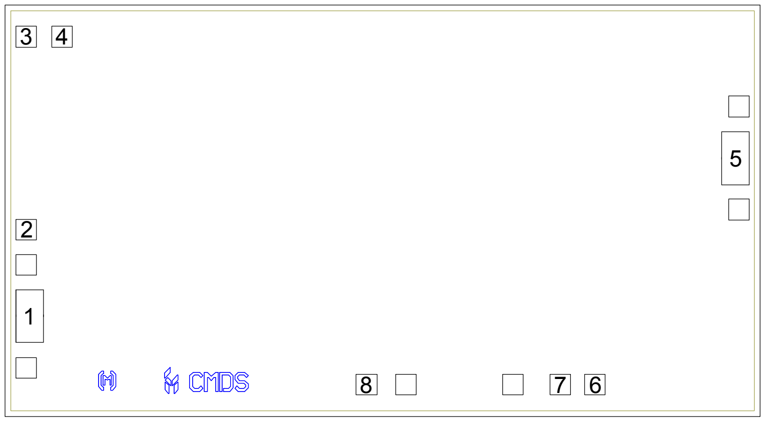
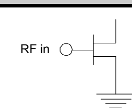
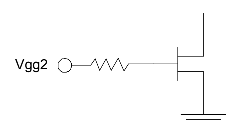
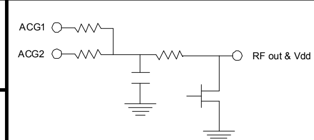
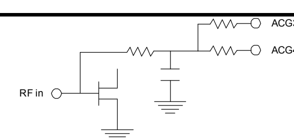
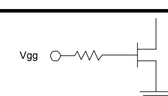
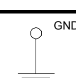
Pad Description

Pad Diagram



Functional Description

3Pad	Function	Description	Schematic
1	RF in	50 ohm matched input	
2	Vgg2	Optional supply voltage for gain control Decoupling and bypass caps required Leave open if not in use	
3, 4	ACG1, 2	Low frequency termination. Attach bypass capacitor per application circuit	
5	RF out & Vdd	Power supply voltage and 50 ohm matched output	
6, 7	ACG3, 4	Low frequency termination. Attach bypass capacitor per application circuit	
8	Vgg	Power supply voltage Decoupling and bypass caps required	
Backside	Ground	Connect to RF / DC ground	

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Applications Information

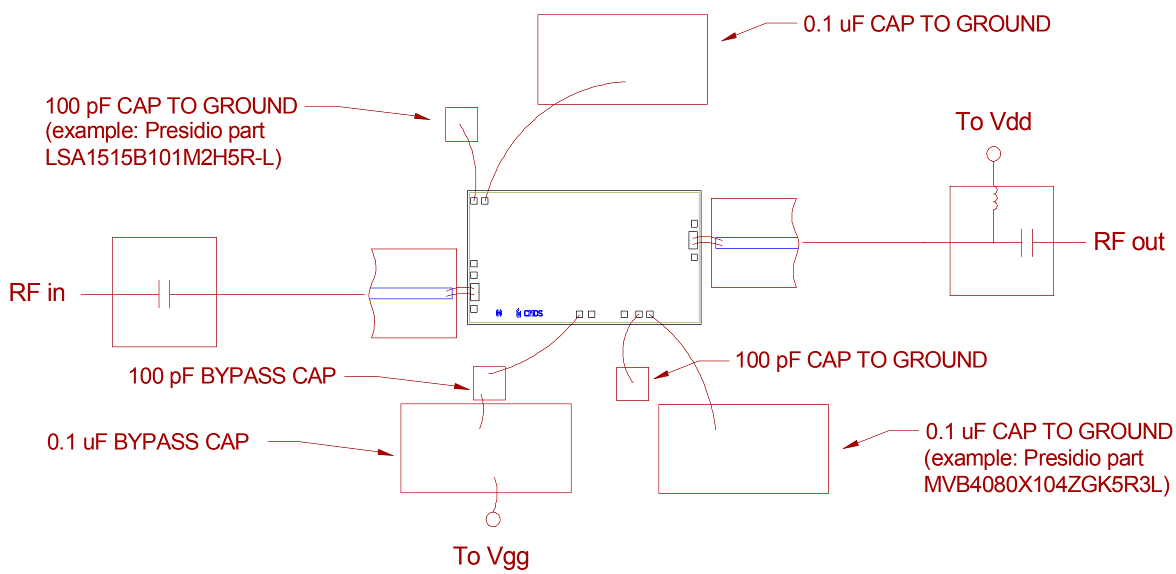
Assembly Guidelines

The backside of the CMD244 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 70 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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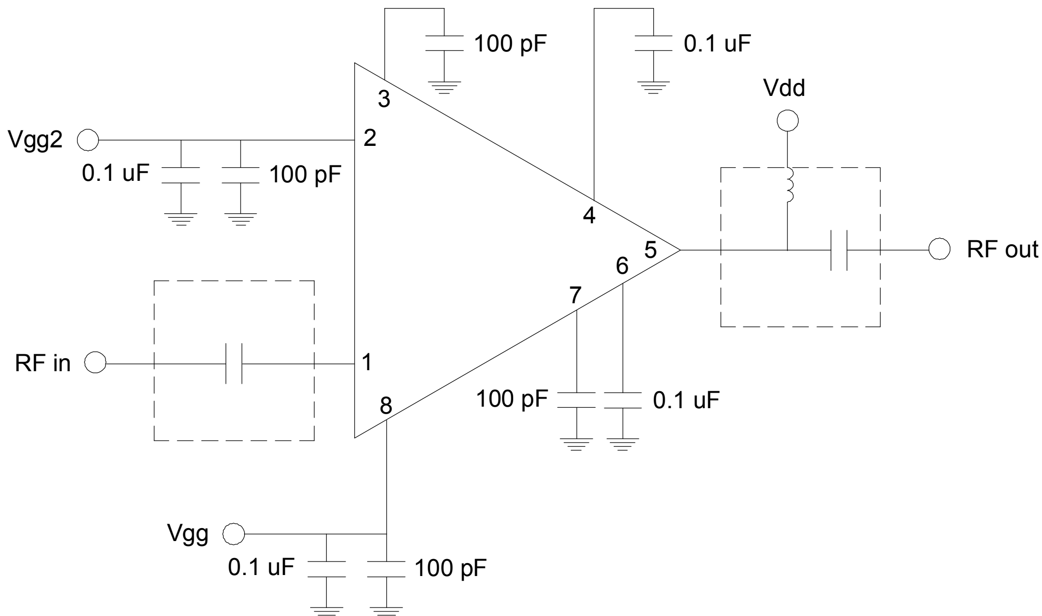
Applications Information

Application Circuit



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

Biasing and Operation

The CMD244 is biased with a positive drain supply and negative gate supply. Performance is optimized when the drain voltage is set to +8.0 V. The recommended gate voltage is -1.0 V.

Turn ON procedure:

1.Apply gate voltage V_{gg} and set to -1 V
2.Apply drain voltage V_{dd} and set to +8 V

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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