CMD284

DC-22 GHz Distributed Amplifier

Product Overview

The CMD284 is wideband GaAs MMIC distributed amplifier die which operates from DC to 22 GHz. The amplifier delivers 17 dB of gain with a corresponding output 1 dB compression point of +19 dBm and noise figure of 2.5 dB at 10 GHz. The CMD284 is a 50 ohm matched design which eliminates the need for RF port matching. The CMD284 offers full passivation for increased reliability and moisture protection.

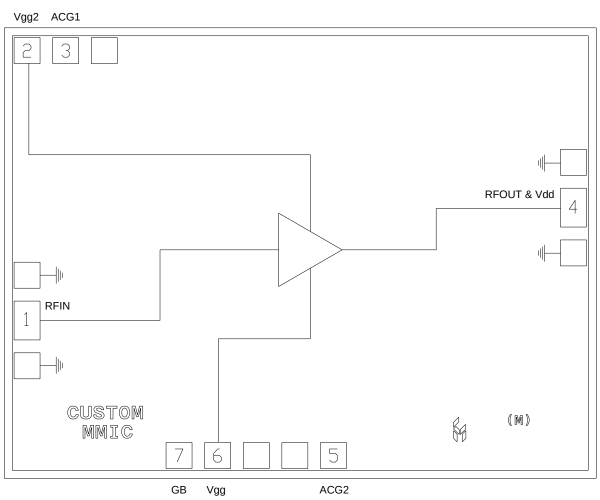
Key Features

- Ultra Wideband Performance
- Low Noise Figure
- Low Current Consumption
- Small Die Size: 2300 um x 1750 um

Ordering Information

Part No.	Description
CMD284	DC-22 GHz Distributed Amplifier, 100 Piece Gel Pack

Functional Block Diagram



Note: V_{gg2} is optional for gain control

Electrical Performance (V_{dd} = 8.0 V, V_{gg} = 3.0 V, T_A = 25 ^oC, F = 10 GHz)

Parameter	Min	Typ	Max	Units
Frequency Range		DC - 22		GHz
Gain		17		dB
Noise Figure		2.5		dB
Input Return Loss		20		dB
Output Return Loss		20		dB
Output P1dB		19		dBm
Output IP3		28		dBm
Supply Current		108		mA

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, V_{dd}	9 V
Gate Voltage, V_{gg}	4.5 V
RF Input Power	+20 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	1.45 W
Thermal Resistance, θ_{JC}	44.9 °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}	5.0	8.0	8.5	V
I_{dd}		108		mA
V_{gg}	0	3.0	4.0	V
I_{gg}		1.2		mA

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

Drain Current vs. Drain Voltage

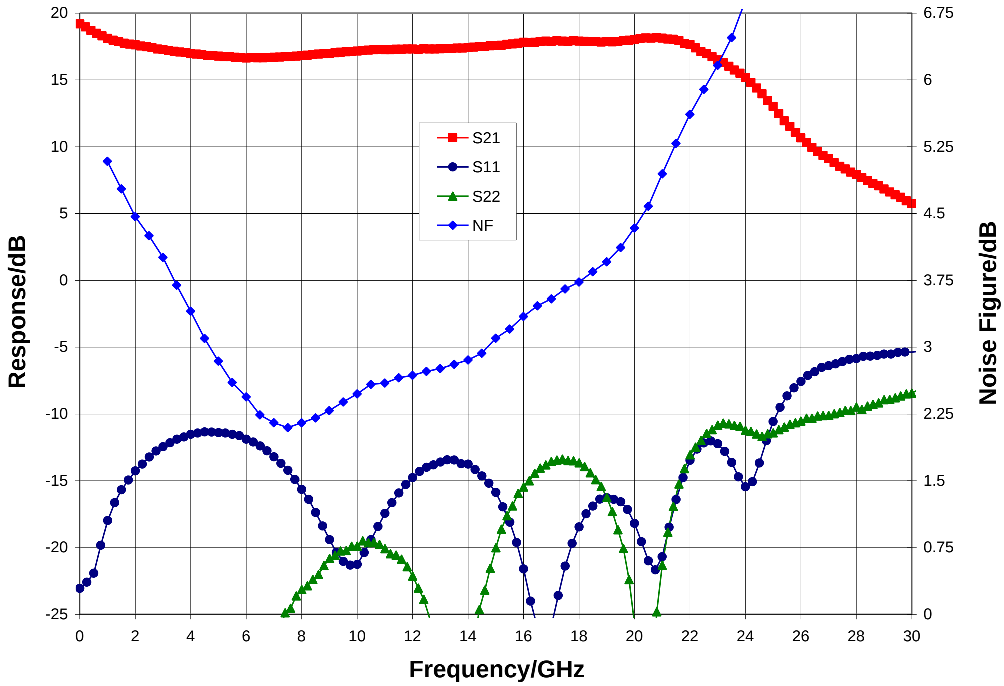
V_{dd} (V)	I_{dd} (mA)
5.0	95
8.0	108

Electrical Specifications (V_{dd} = 8.0 V, V_{gg} = 3.0 V, T_A = 25 °C)

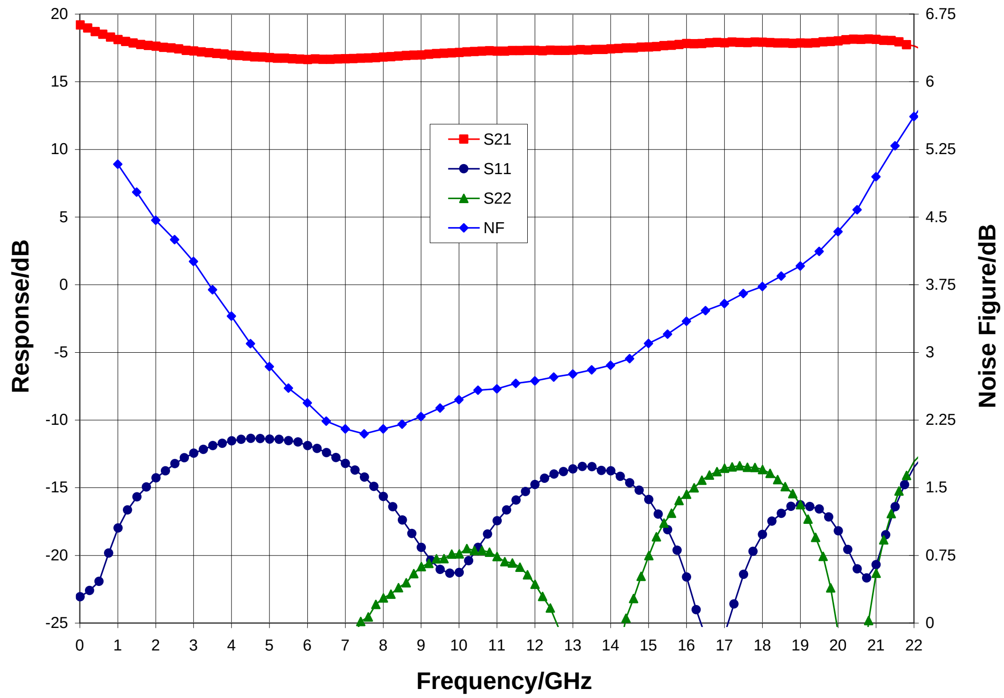
Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range		DC - 10			10 - 22		GHz
Gain	13.5	17		14	17.5		dB
Noise Figure		3			3.5		dB
Input Return Loss		13			15		dB
Output Return Loss		25			15		dB
Output P1dB	15	18.5		14	18		dBm
Output IP3		29			26		dBm
Supply Current	75	108	140	75	108	140	mA
Gain Temperature Coefficient		0.011			0.018		dB/°C
Noise Figure Temperature Coefficient		0.008			0.012		dB/°C

Typical Performance

Broadband Performance, V_{dd} = 8.0 V, V_{gg} = 3.0 V, T_A = 25 ºC

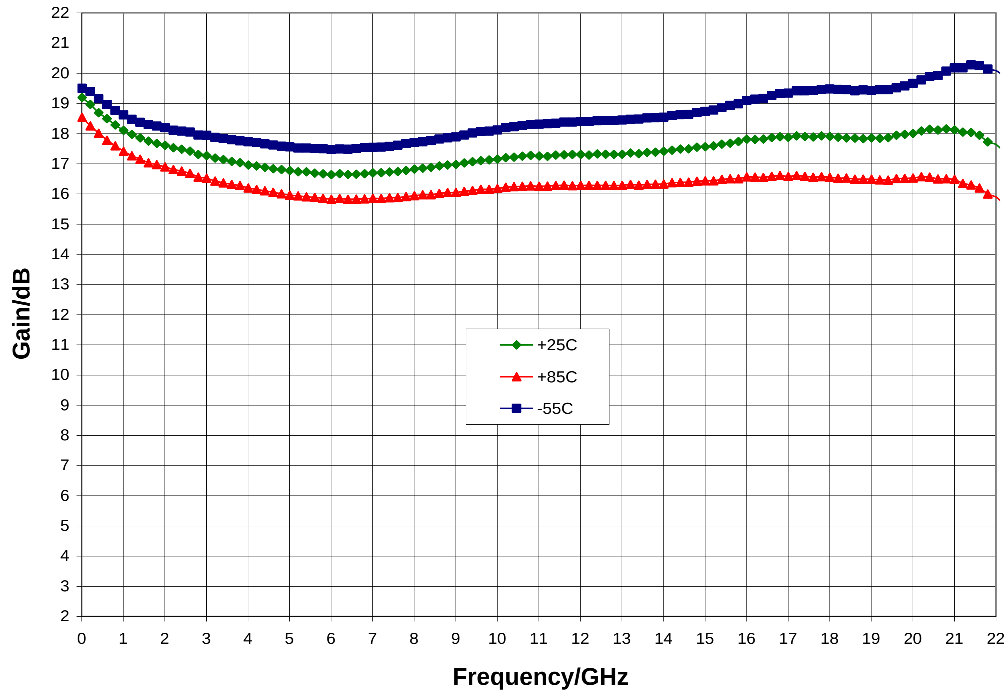


Narrow-band Performance, V_{dd} = 8.0 V, V_{gg} = 3.0 V, T_A = 25 ºC

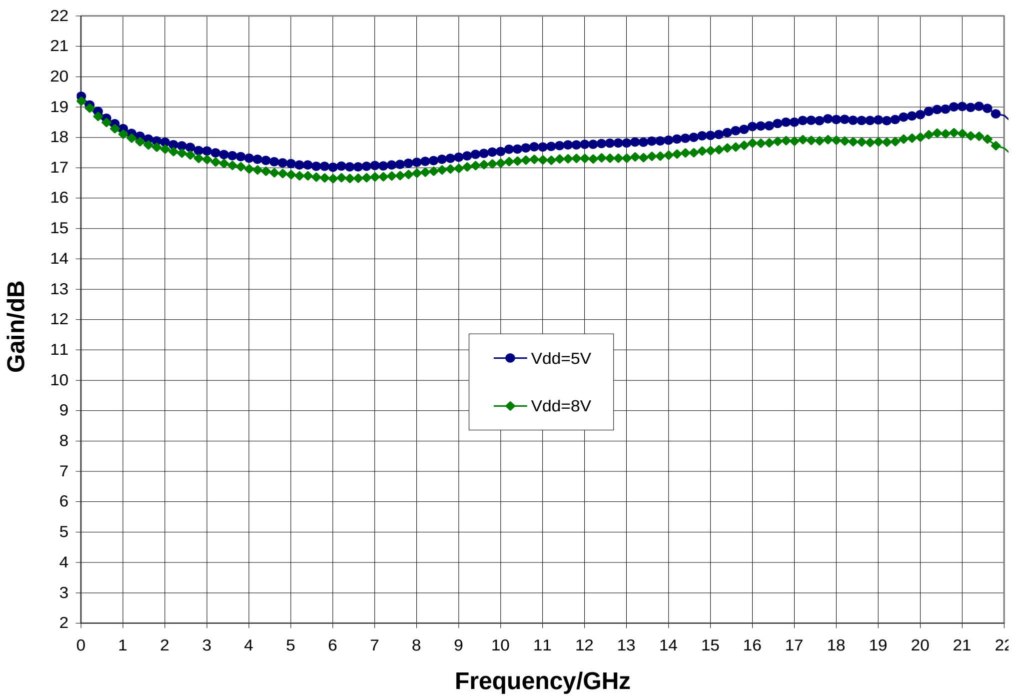


Typical Performance

Gain vs. Temperature, V_{dd} = 8.0 V, V_{gg} = 3.0 V

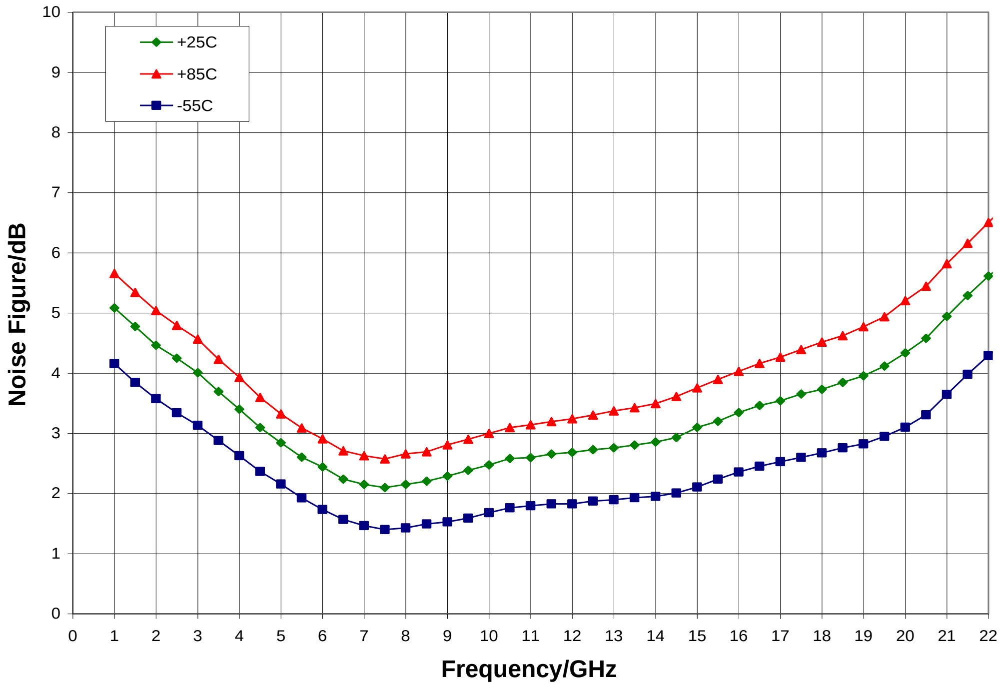


Gain vs. V_{dd}, V_{gg} = 3.0 V, T_A = 25 °C

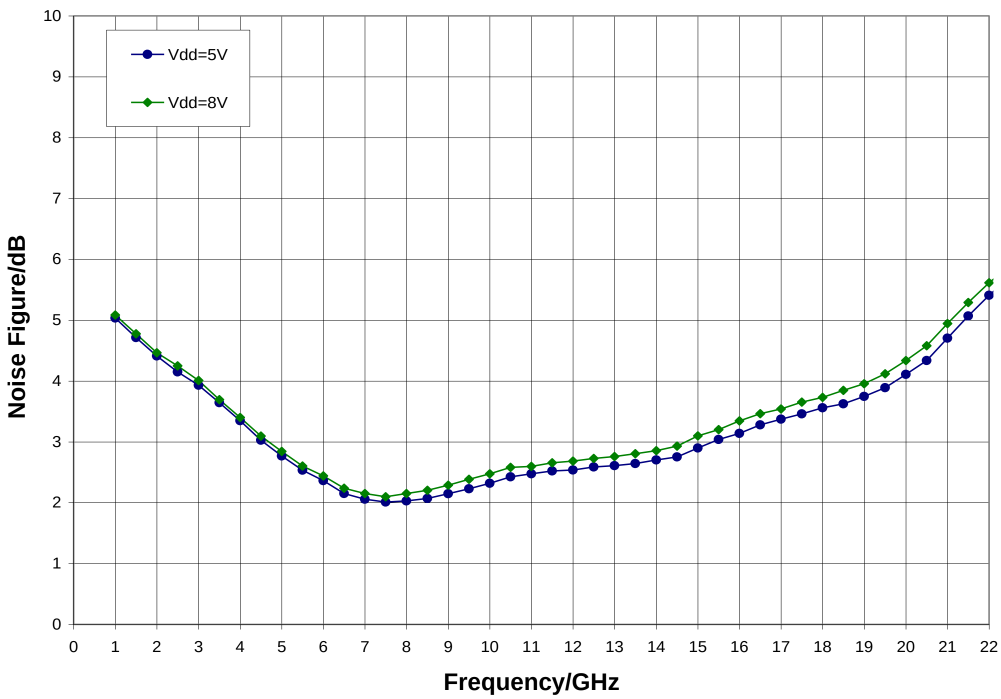


Typical Performance

Noise Figure vs. Temperature, V_{dd} = 8.0 V, V_{gg} = 3.0 V

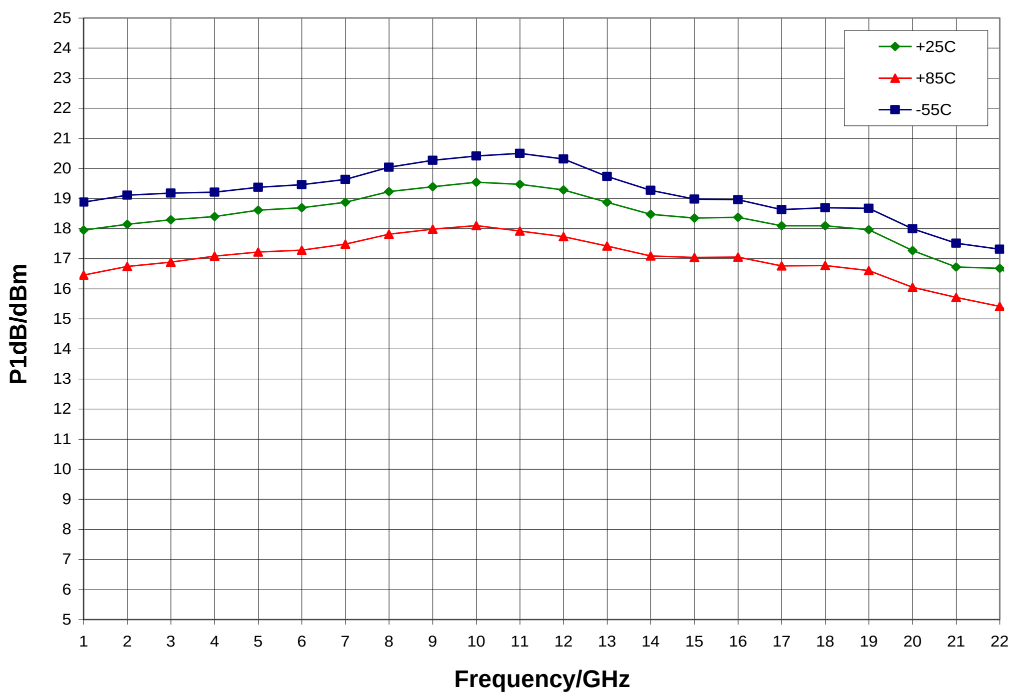


Noise Figure vs. V_{dd}, V_{gg} = 3.0 V, T_A = 25 °C

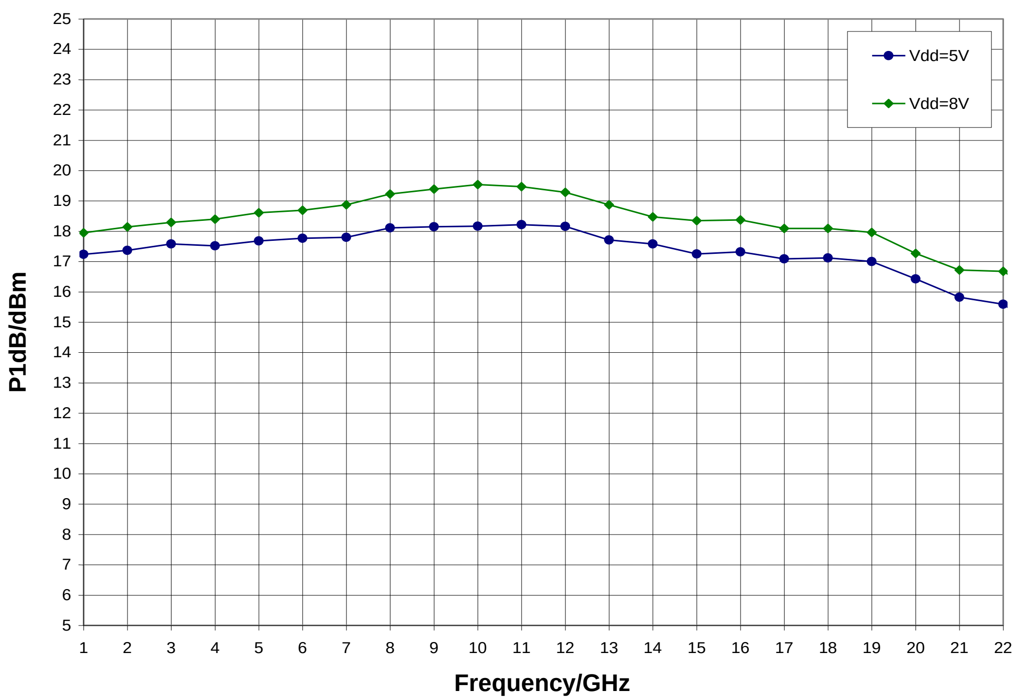


Typical Performance

P1dB vs. Temperature, V_{dd} = 8.0 V, V_{gg} = 3.0 V

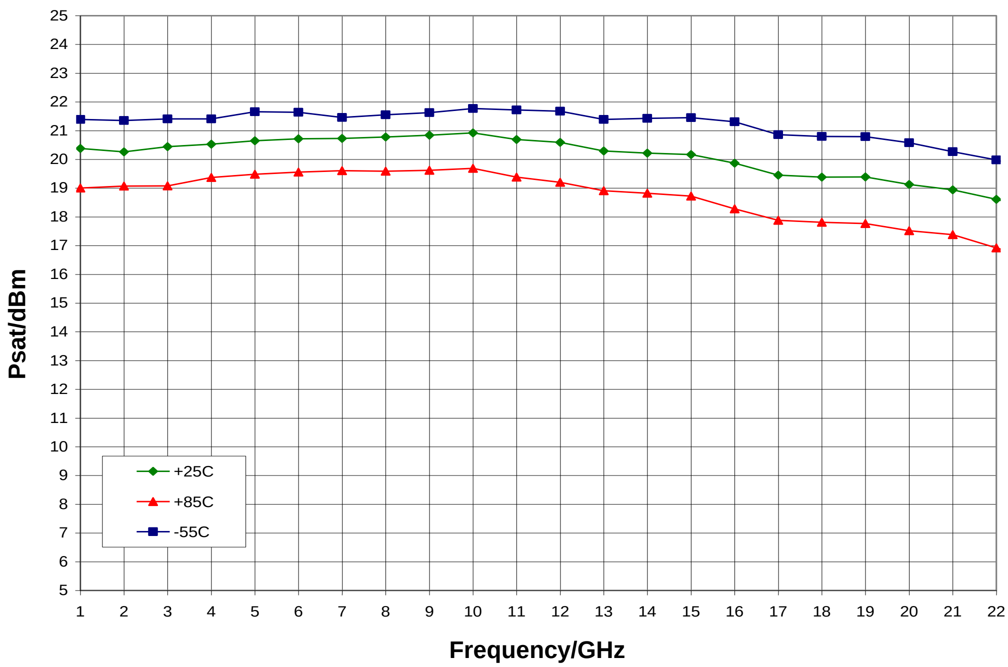


P1dB vs. V_{dd}, V_{gg} = 3.0 V, T_A = 25 °C

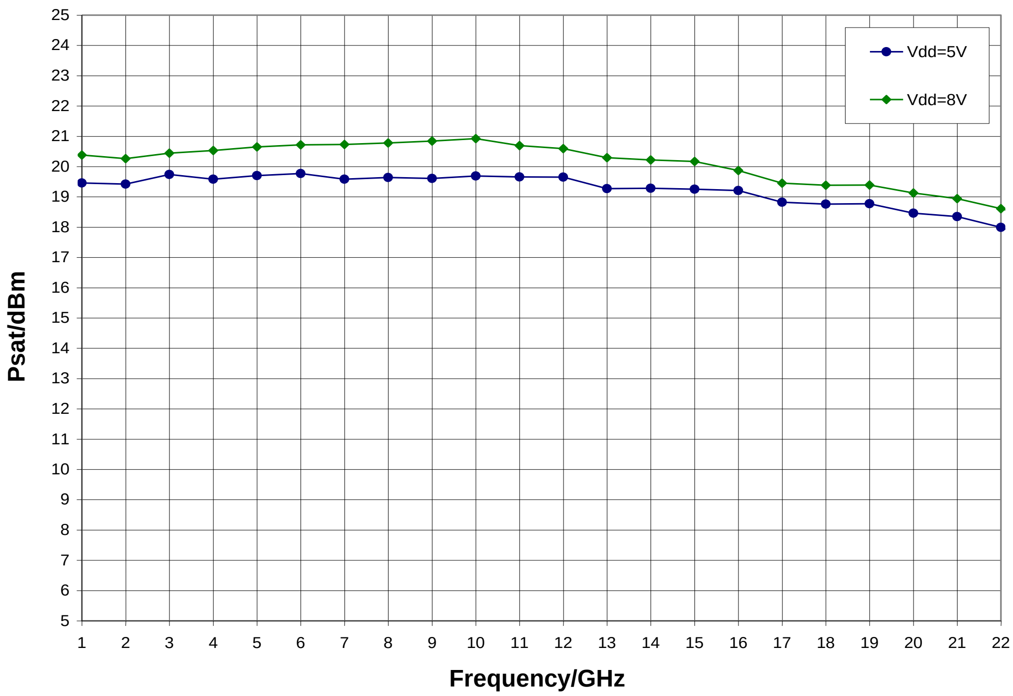


Typical Performance

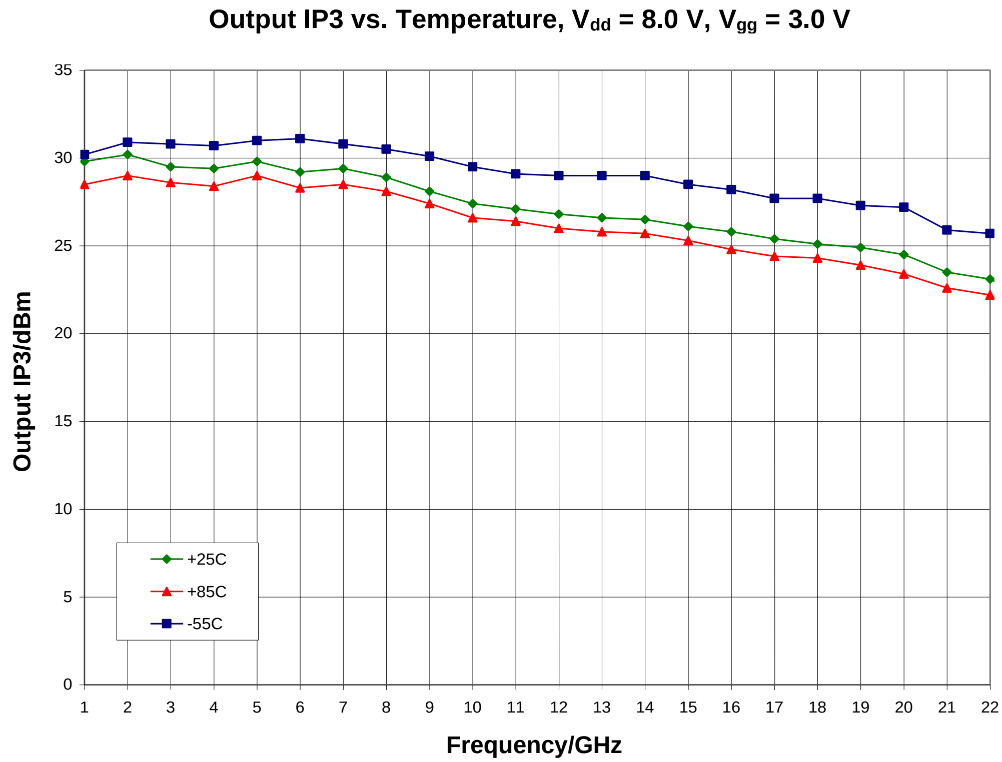
Psat vs. Temperature, V_{dd} = 8.0 V, V_{gg} = 3.0 V

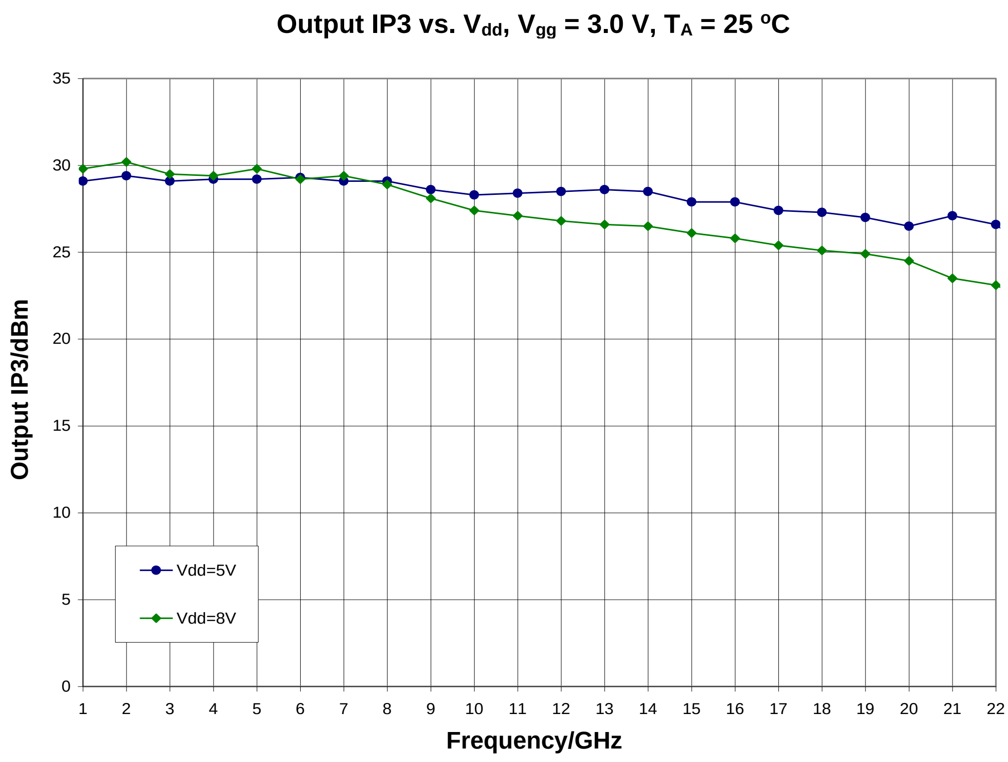


Psat vs. V_{dd}, V_{gg} = 3.0 V, T_A = 25 ºC



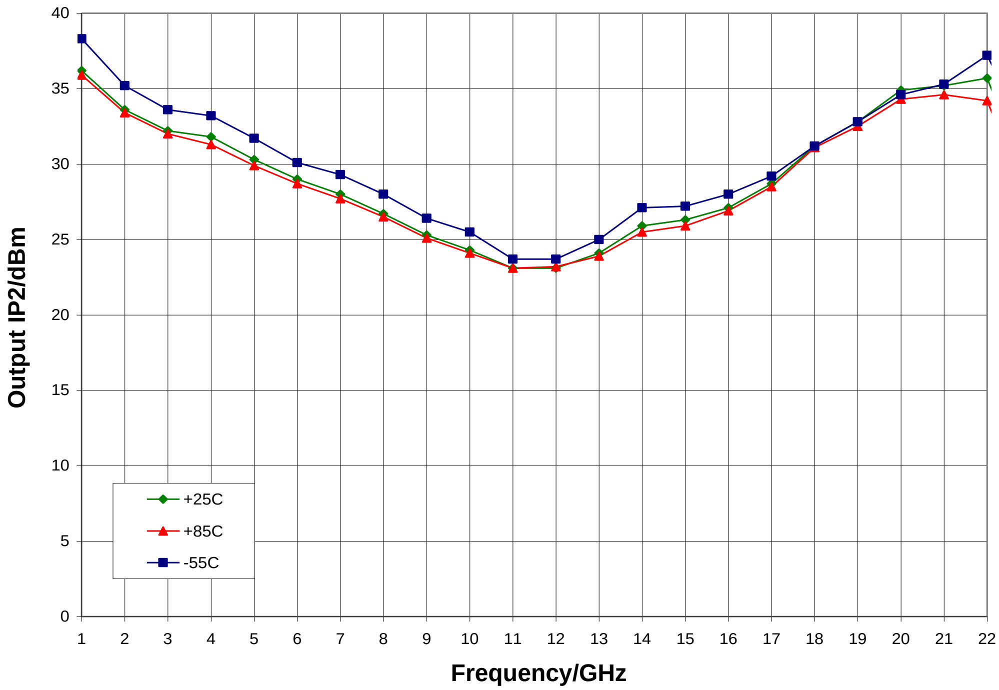
Typical Performance



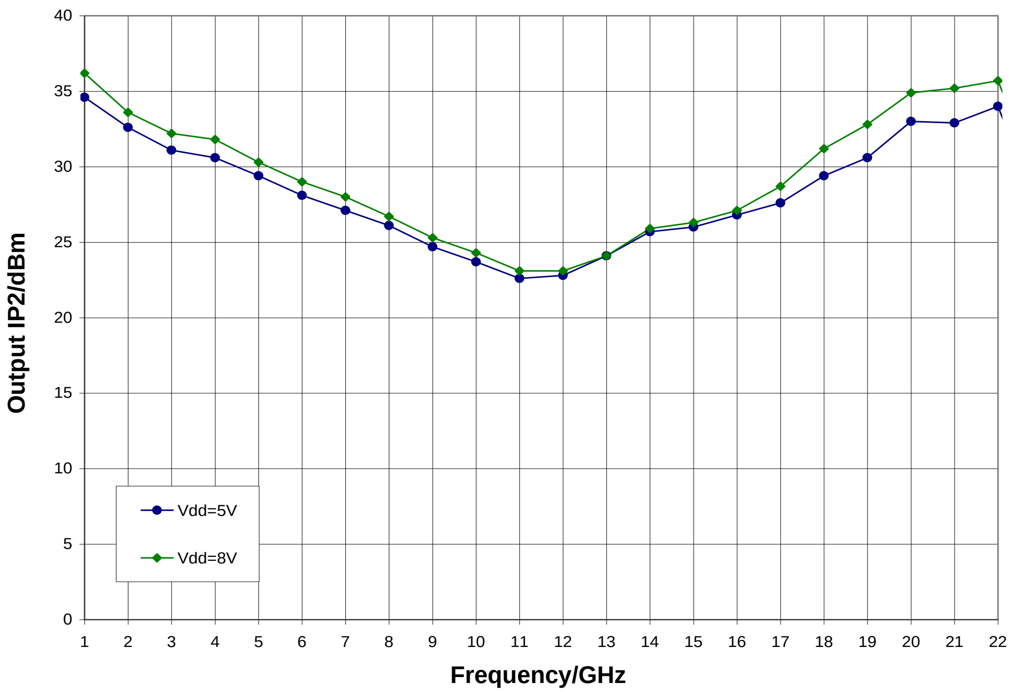


Typical Performance

Output IP2 vs. Temperature, V_{dd} = 8.0 V, V_{gg} = 3.0 V

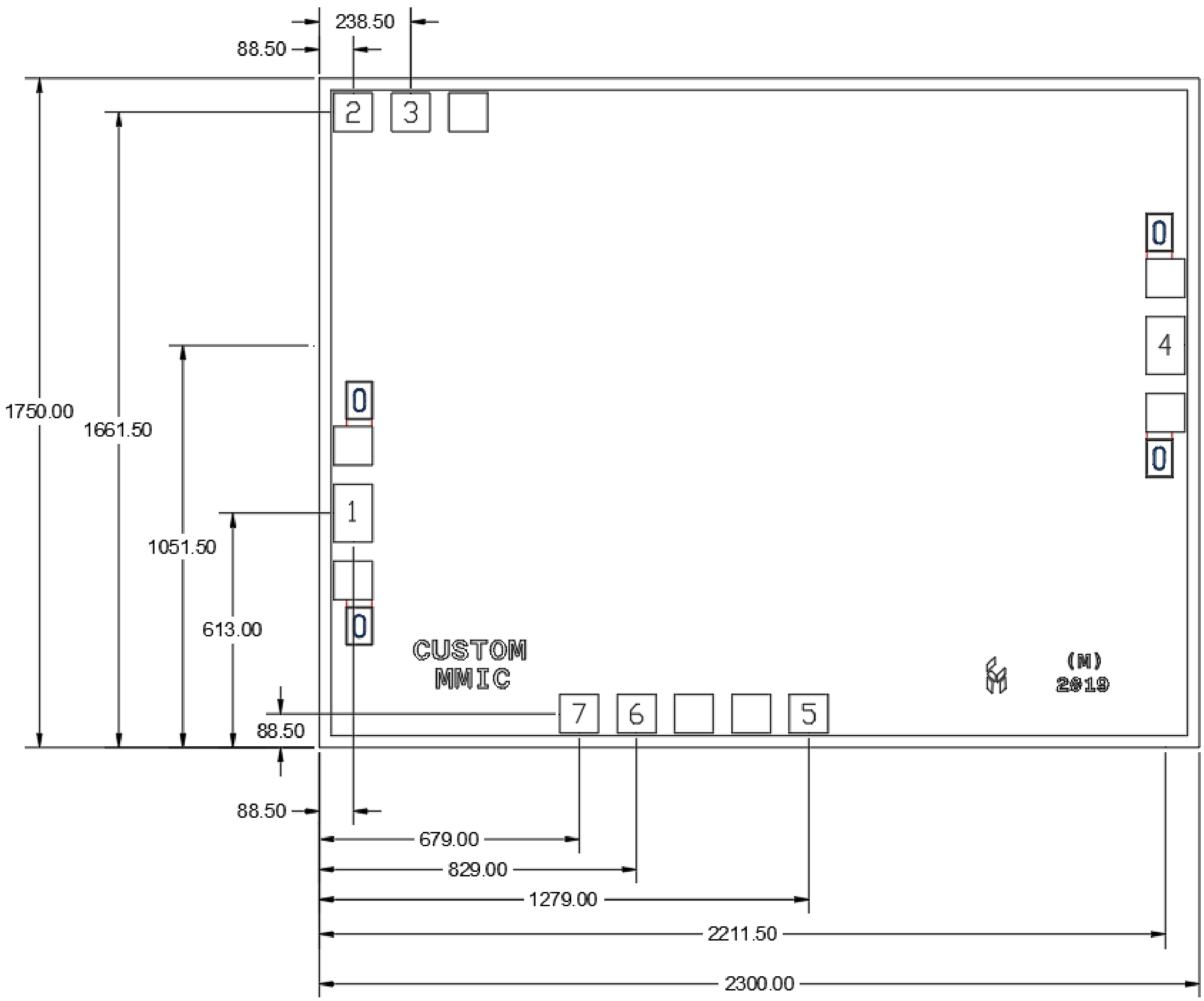


Output IP2 vs. V_{dd}, V_{gg} = 3.0 V, T_A = 25 ºC



Mechanical Information

Die Outline (all dimensions in microns)

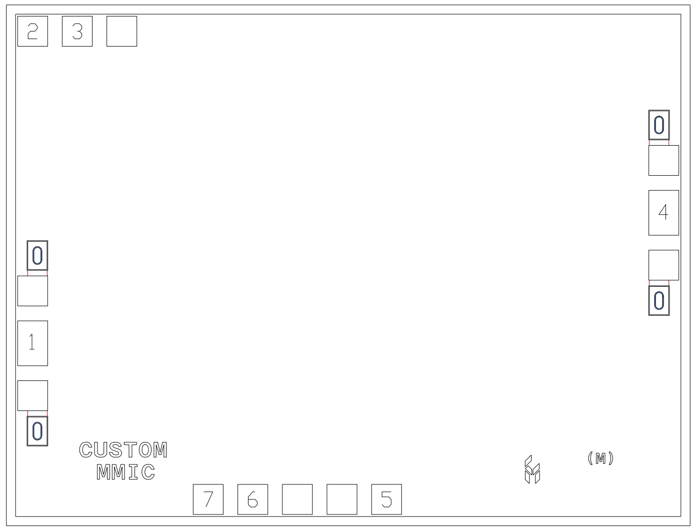


Notes:

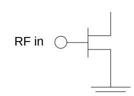
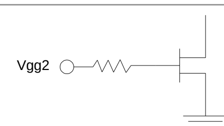
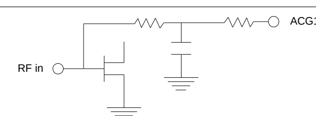
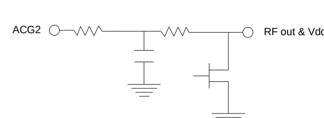
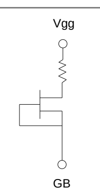
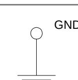
1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 100 microns thick
5. DC bond pads (2, 3, 5, 6, 7) are 100 x 100 microns
6. RF bond pads (1, 4) are 100 x 150 microns

Pad Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	RF in	50 ohm matched input	
2	V_{gg2}	Optional supply voltage for gain control Decoupling and bypass caps required Pad must be left open if unused	
3	ACG1	Low frequency termination Attach bypass capacitor per application circuit	
4	RF out & V_{dd}	Power supply voltage and 50 ohm matched output	
5	ACG2	Low frequency termination Attach bypass capacitor per application circuit	
6	V_{gg}	Power supply voltage Decoupling and bypass caps required	
7	GB	Connect to DC ground	
Backside	Ground	Connect to RF / DC ground	

Applications Information

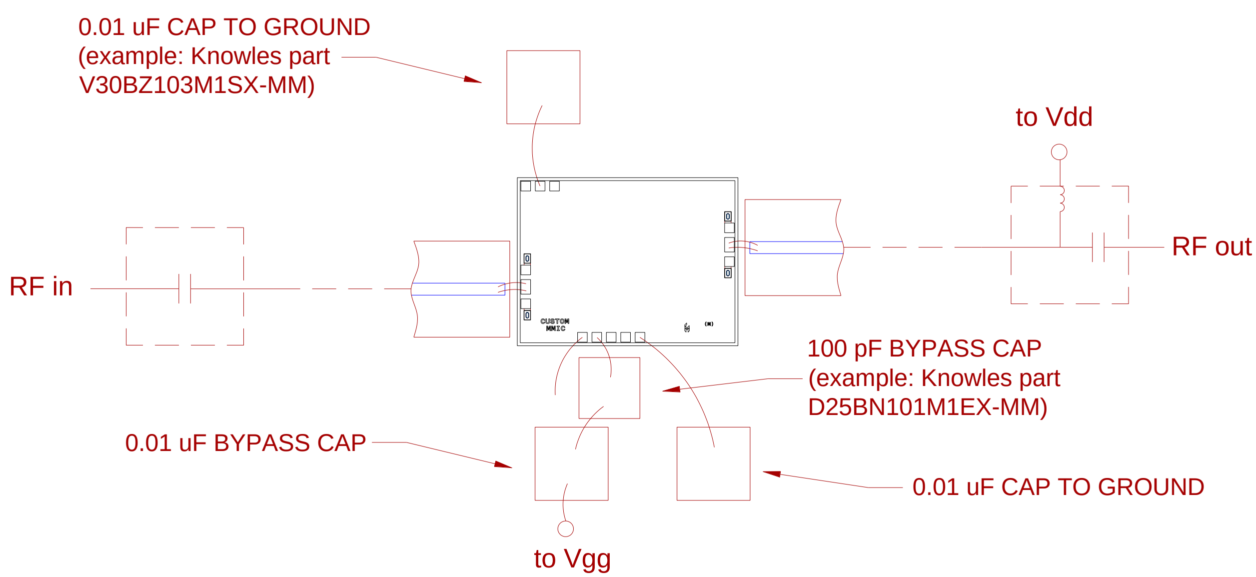
Assembly Guidelines

The backside of the CMD284 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.

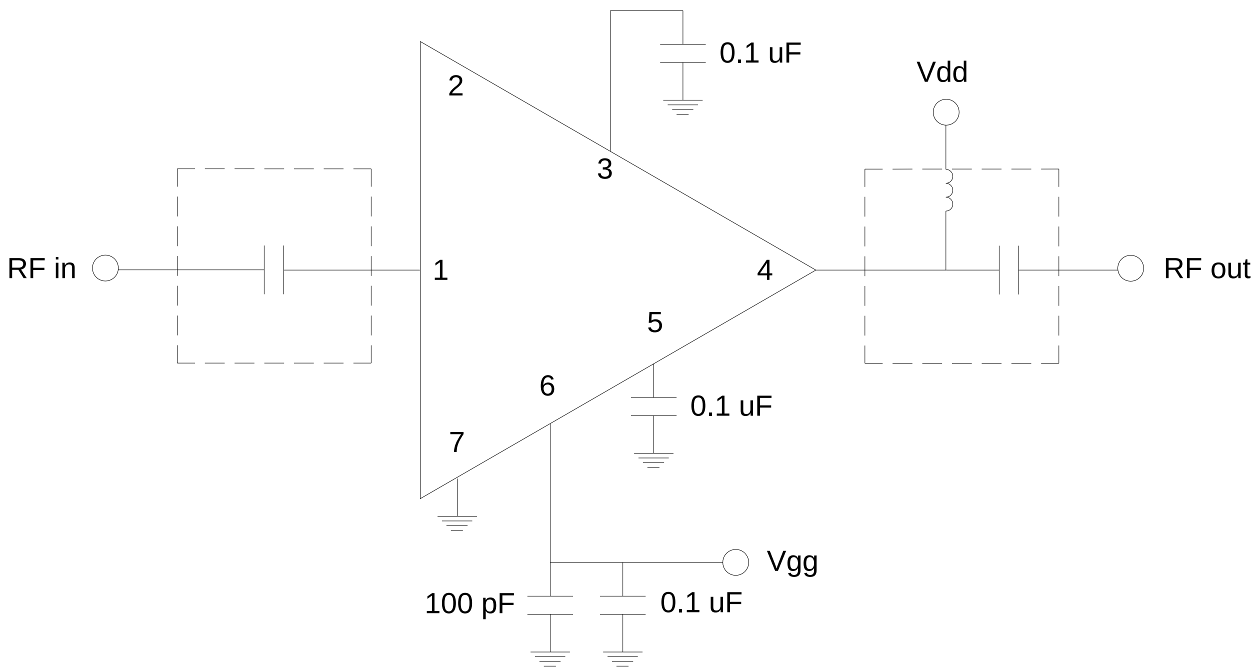
Assembly Diagram



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

Applications Information

Application Circuit



Note: Drain voltage (V_{dd}) must be applied through a broadband bias tee or external bias network.

Biasing and Operation

The CMD284 is biased with a positive drain supply and positive gate supply. Performance is optimized when the drain voltage is set to +8.0 V. The recommended gate voltage is +3.0 V.

Turn ON procedure:

1. Apply drain voltage V_{dd} and set to +8 V
2. Apply gate voltage V_{gg} and set to +3 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 CMD284 does allow for simultaneous biasing (applying V_{dd} and V_{gg} at the same time).

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

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1A	ESDA / JEDEC JS-001-2012

Caution!
ESD-Sensitive Device

RoHS Compliance

This part is compliant with 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead Free
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- SVHC Free
- Halogen Free
- PFOS Free

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

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