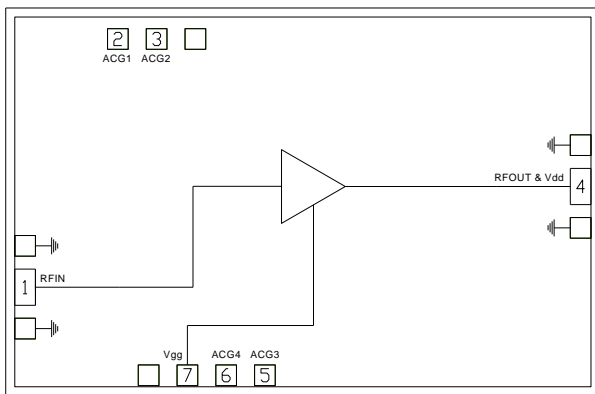


### Product Overview

The CMD275 is a wideband GaAs MMIC low phase noise amplifier die that is ideally suited for military, space and communications systems. At 10 GHz the device delivers 16 dB of gain, a saturated output power of +20.5 dBm and a noise figure of 5.5 dB. Also with an input signal of 10 GHz the amplifier provides low phase noise performance of -165 dBc/Hz at 10 kHz offset. The CMD275 is a 50 ohm matched design which eliminates the need for RF port matching.

### Functional Block Diagram



### Key Features

- Ultra Wideband Performance
- Low Phase Noise
- Low Current Consumption
- Small Die Size

### Ordering Information

Part No.	Description
CMD275	Gel Pack Qty=25, MOQ=50

### Electrical Performance ( $V_{dd} = 5.0\text{ V}$ , $V_{gg} = 3.0\text{ V}$ , $T_A = 25^\circ\text{ C}$ , $F = 10\text{ GHz}$ )

Parameter	Min	Typ	Max	Units
Frequency Range		2 - 20		GHz
Gain		16		dB
Input Return Loss		18		dB
Output Return Loss		20		dB
Noise Figure		5.5		dB
Output P1dB		18		dBm
Saturated Output Power		20.5		dBm
Phase Noise @ 10 kHz Offset		-165		dBc/Hz
Supply Current		74		mA

## Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, $V_{dd}$	7.5 V
Gate Voltage, $V_{gg}$	3.5 V
RF Input Power	+20 dBm
Channel Temperature, $T_{ch}$	150° C
Power Dissipation, $P_{diss}$	495 mW
Thermal Resistance $Q_{jC}$	131° 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
$V_{dd}$	4.0	5.0	7.0	V
$I_{dd}$		74		mA
$V_{gg}$		3.0		V
$I_{gg}$		3.7		mA

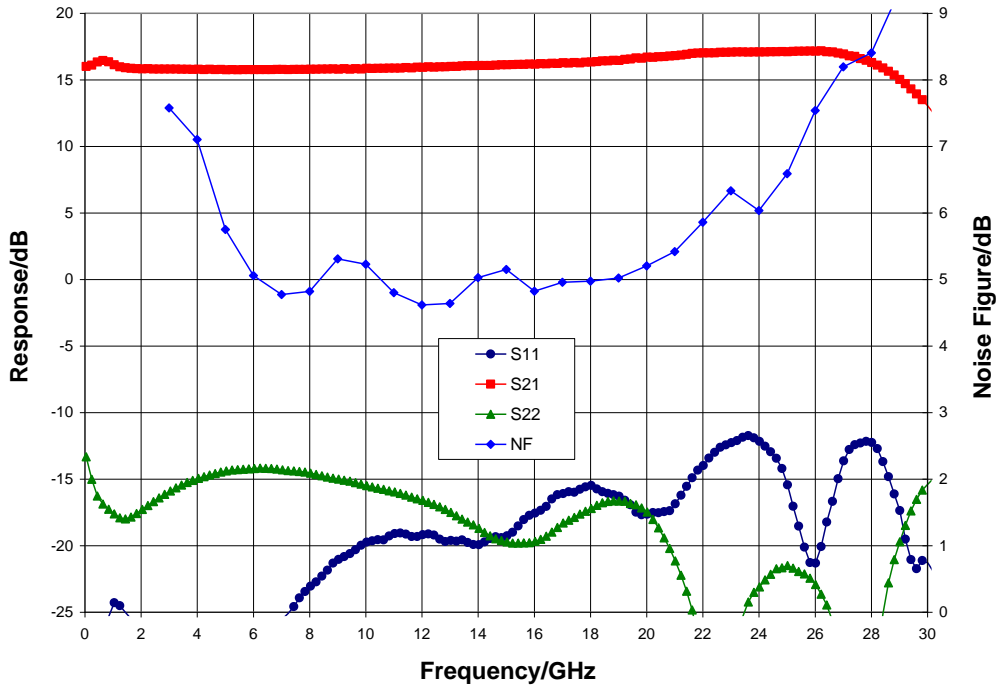
Electrical performance is measured at specific test conditions. Electrical specifications are not guaranteed over all recommended operating conditions.

## Electrical Specifications ( $V_{dd} = 5.0$ V, $V_{gg} = 3.0$ V, $T_A = 25^\circ$ C)

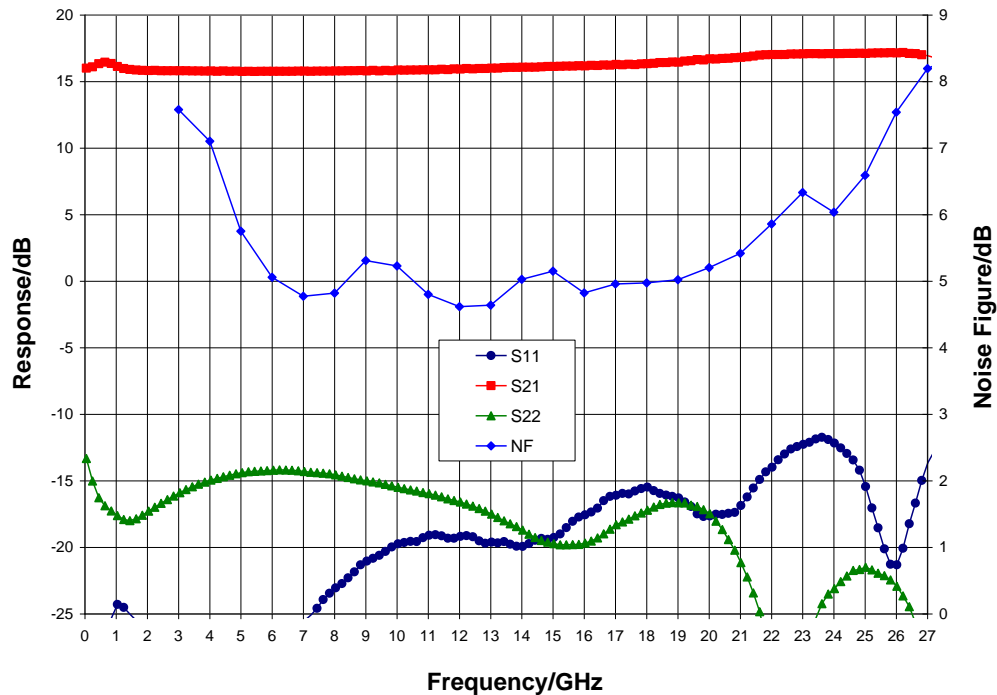
Parameter	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	DC - 10			10 - 20			20 - 26			GHz
Gain	13	15.5		13	16		13.5	17		dB
Noise Figure		6			5			6		dB
Input Return Loss		13			15			10		dB
Output Return Loss		18			18			13		dB
Output P1dB	15.5	18.5		13	17		11	15		dBm
Saturated Output Power		21			19			17.5		dBm
Output IP3		29			28.5			25		dBm
Phase Noise @ 10 kHz Offset		-165			-165			-165		dBc/Hz
Supply Current	52	74	110	52	74	110	52	74	110	mA

Typical Performance

Broadband Performance,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$ ,  $I_{dd} = 74\text{ mA}$ ,  $T_A = 25^\circ\text{ C}$

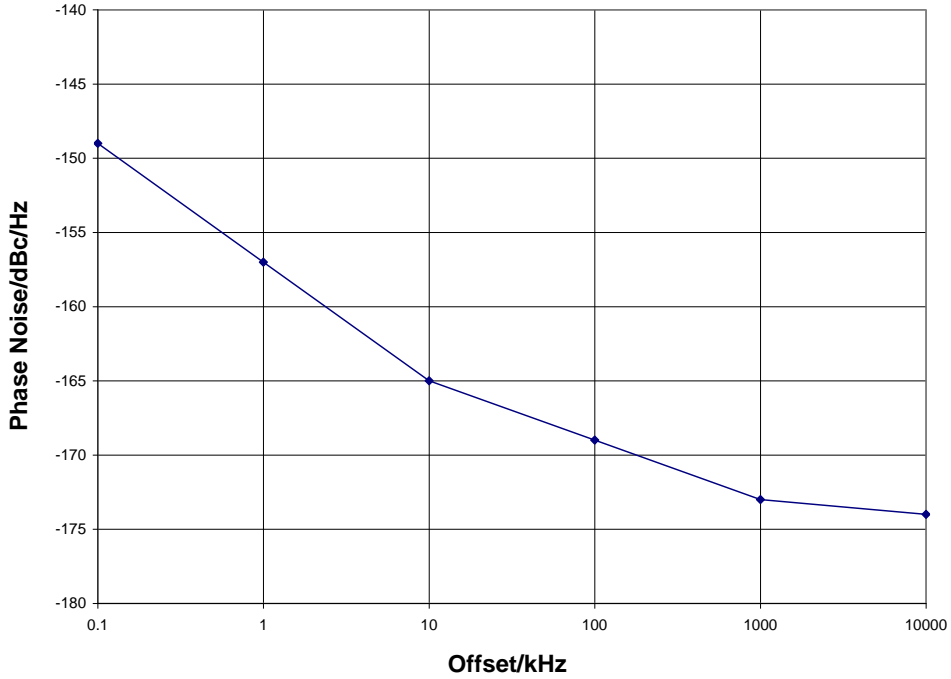


Narrow-band Performance,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$ ,  $I_{dd} = 74\text{ mA}$ ,  $T_A = 25^\circ\text{ C}$

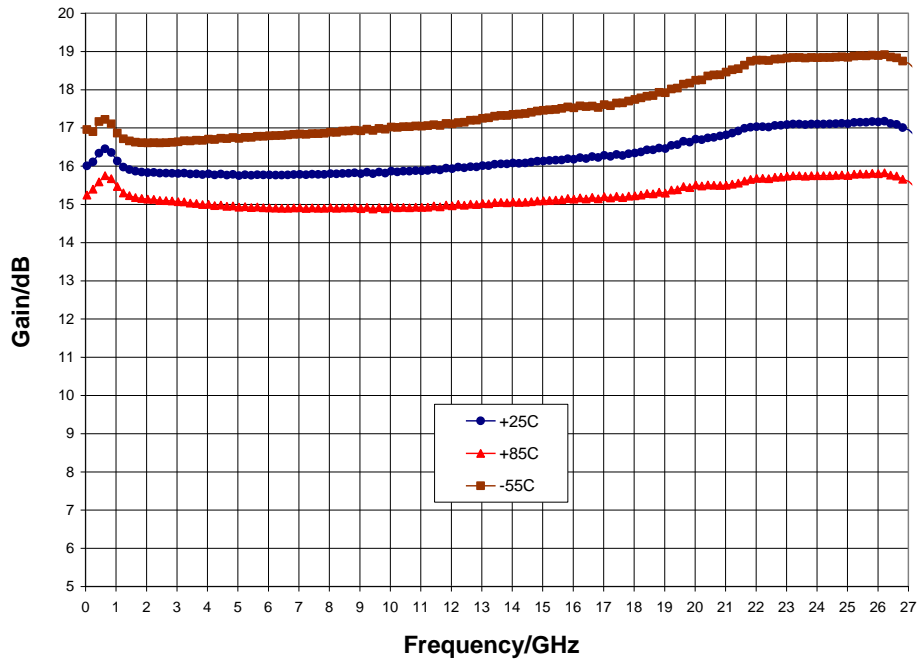


Typical Performance

Additive Phase Noise @ P<sub>sat</sub>, V<sub>dd</sub> = 5.0 V, V<sub>gg</sub> = 3.0 V, T<sub>A</sub> = 25° C

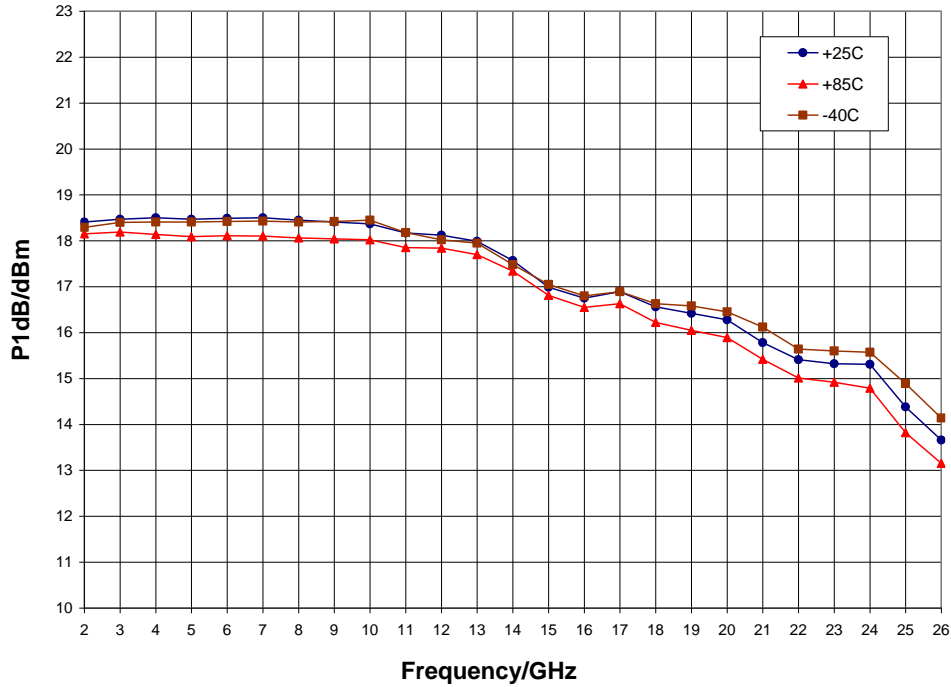


Gain vs. Temperature, V<sub>dd</sub> = 5.0 V, V<sub>gg</sub> = 3.0 V

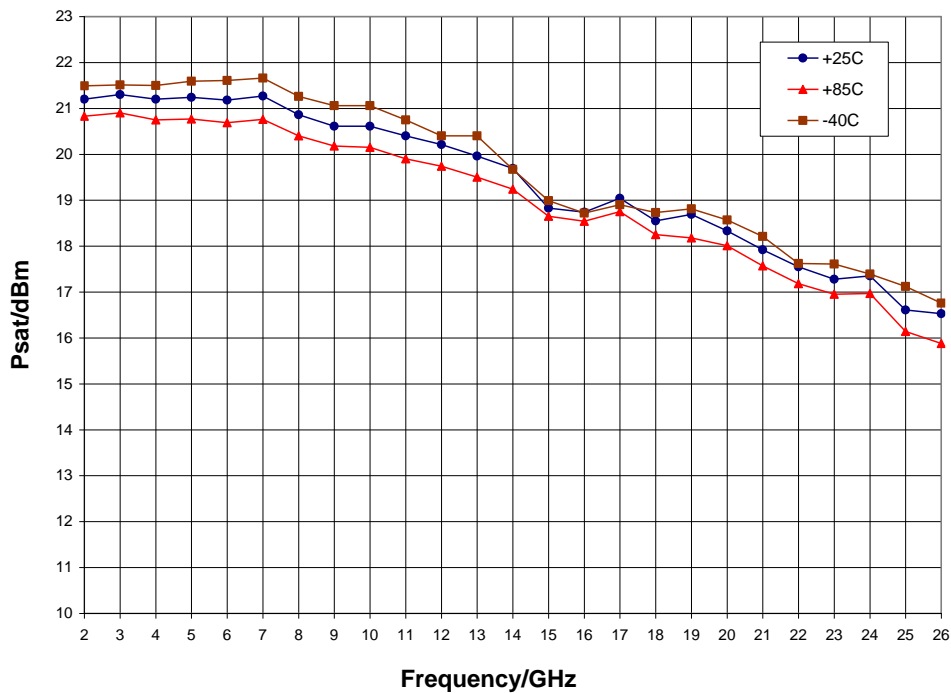


Typical Performance

P1dB vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$

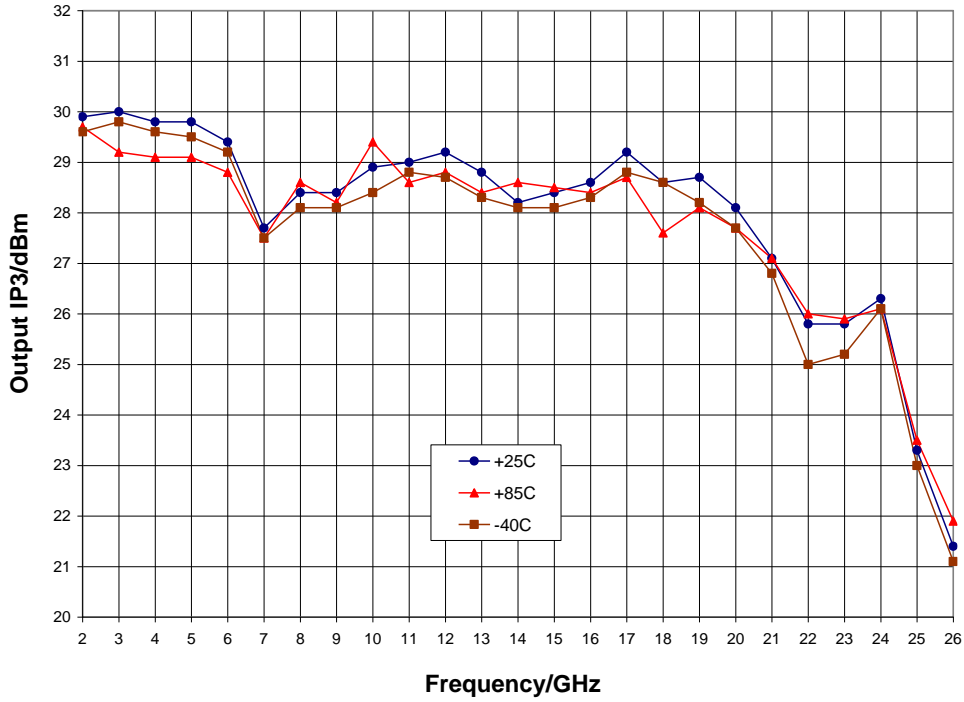


Psat vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$

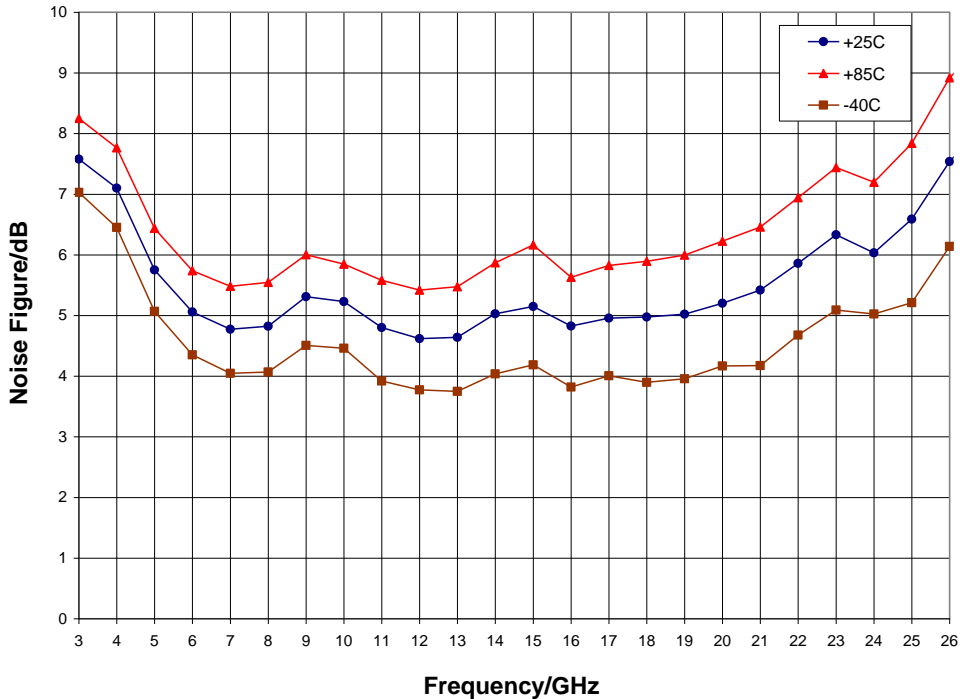


Typical Performance

Output IP3 vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$

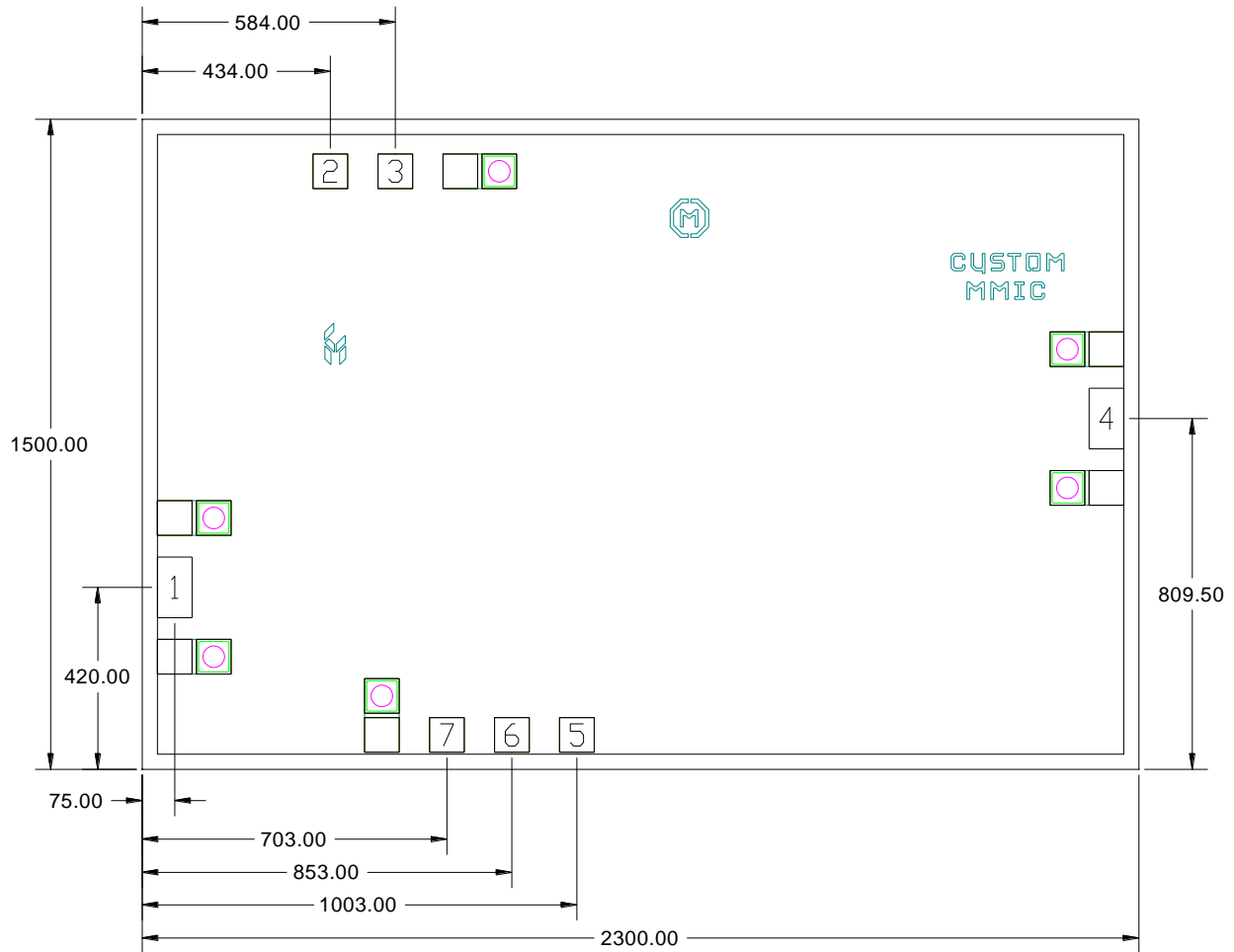


Noise Figure vs. Temperature,  $V_{dd} = 5.0\text{ V}$ ,  $V_{gg} = 3.0\text{ V}$



Mechanical Information

Die Outline (all dimensions in microns)

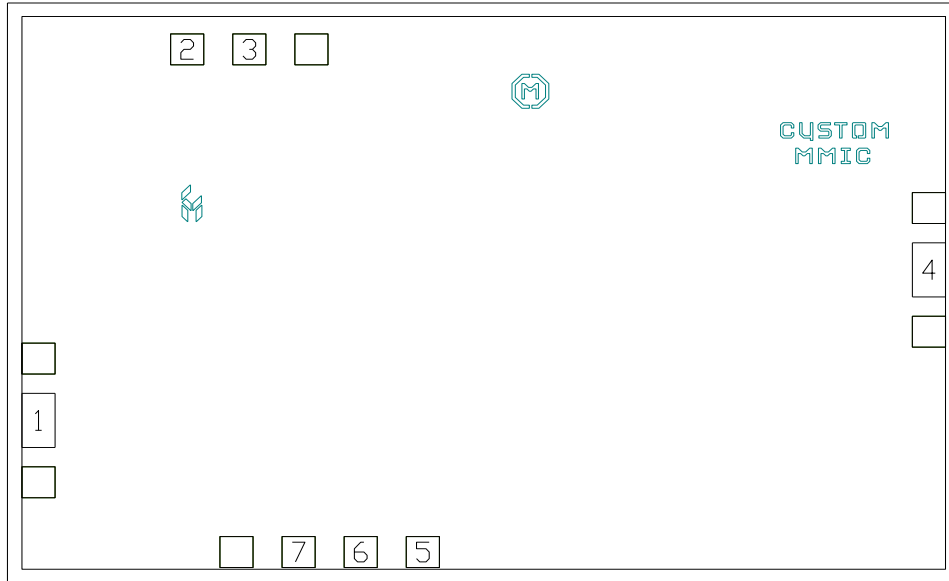


Notes:

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 80 x 80 microns
6. RF bond pads (1, 4) are 80 x 140 microns

## Pin Description

### Pad Diagram



### Functional Description

Pin	Function	Description	Schematic
1	RF in	50 ohm matched input	
2, 3	ACG1, 2	Low frequency termination Attach bypass capacitors per application circuit	
4	RF out & V <sub>dd</sub>	Power supply voltage and 50 ohm matched output	
5, 6	ACG3, 4	Low frequency termination Attach bypass capacitors per application circuit	
7	V <sub>gg</sub>	Power supply voltage Decoupling and bypass caps required	
Backside	Ground	Connect to RF / DC ground	



Applications Information

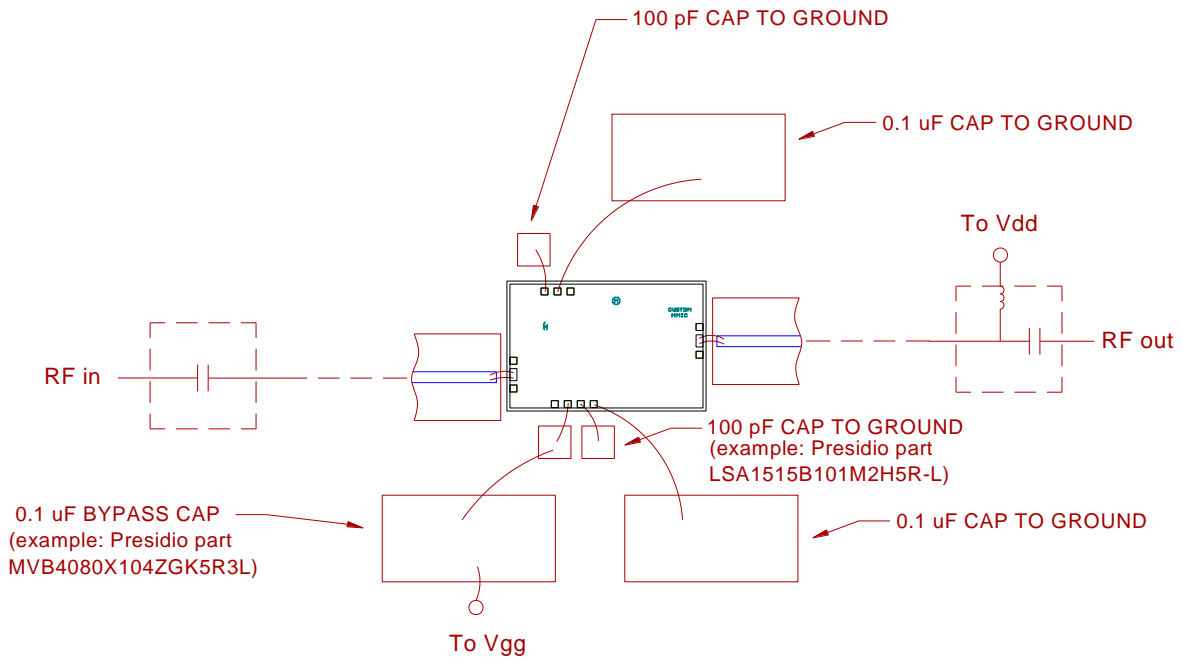
Assembly Guidelines

The backside of the CMD275 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.

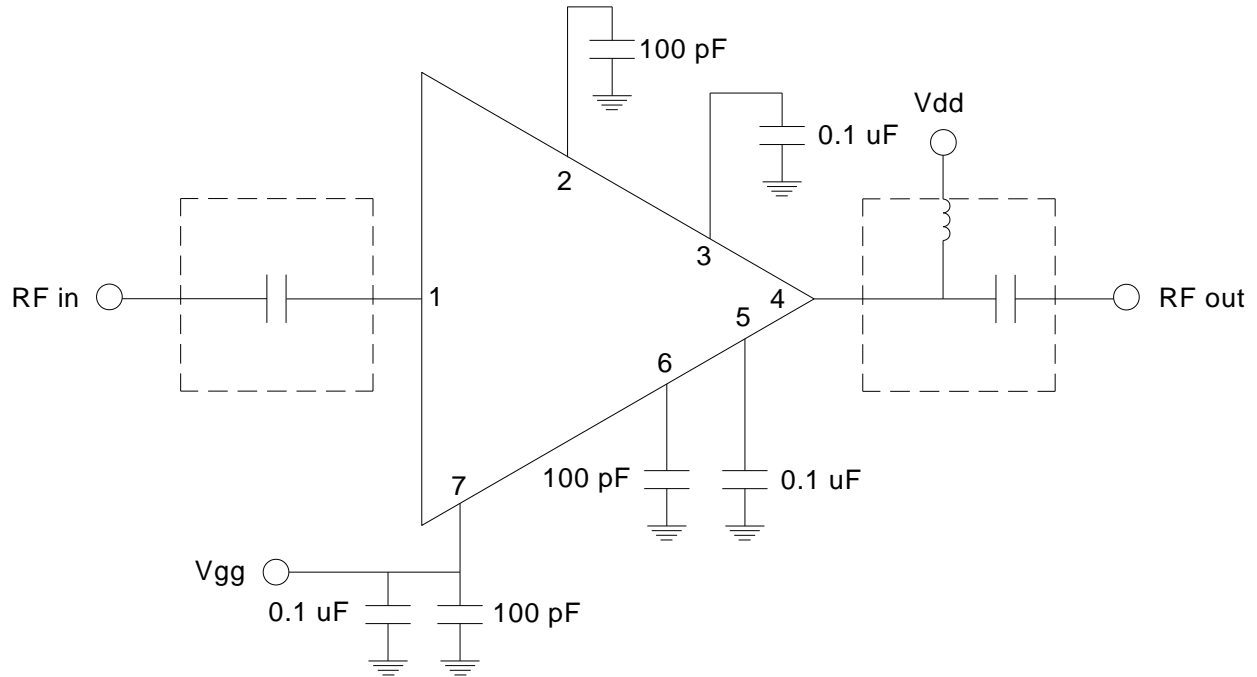
Assembly Diagram



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

Applications Information

Application Circuit



Biasing and Operation

The CMD275 is biased with a positive drain supply and positive gate supply. Performance is optimized when the drain voltage is set to +5.0 V. The recommended gate voltage is +3.0 V. The preferred biasing procedure is as follows:

Turn ON procedure:

1. Apply drain voltage  $V_{dd}$  and set to +5 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 CMD275 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.

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