

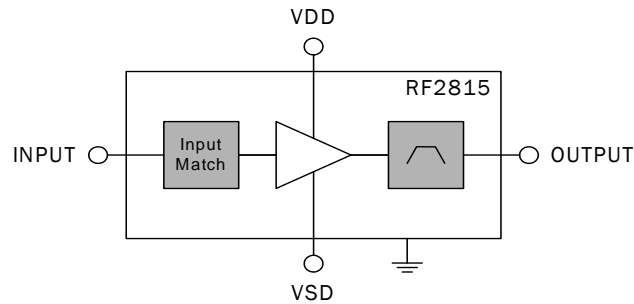


### Features

- Low Noise Figure: 0.85dB (Typ.)
- High Gain: 13.5dB
- High IIP3: +9dBm
- Operable Over Wide Supply Voltage Range: 1V to 3.6V
- CMOS Compatible Shutdown Function (<0.1uA)
- Current Tunability Via Single Resistor
- No External DC-Blocking Capacitor Required at the Output - Lowest BOM Cost and Small Solution Size
- Compact Footprint: 3.3mmx2.1mmx1.0mm

### Applications

- Cellular and Non-Cellular GPS Receivers



Functional Block Diagram

### Product Description

The RF2815 is a GPS Low Noise Amplifier with an integrated SAW filter at the output. Low noise figure, along with high gain, achieved by the RF2815 makes it ideal for GPS receivers requiring high sensitivity. This module builds upon RFMD's leading edge pHEMT process and integrates input matching and low loss high rejection SAW filter at the output. This results in high performance and a reduced solution size. The ease of implementation simplifies the receiver design.

The RF2815 is packaged in a compact 3.3mmx2.1mmx1.0mm package with low external component count required to achieve the best-in-class performance.

### Ordering Information

RF2815	GPS Low Noise Amplifier with Integrated Output SAW Filter
RF2815PCBA-410	Fully Assembled Evaluation Board

### Optimum Technology Matching® Applied

<input type="checkbox"/> GaAs HBT	<input type="checkbox"/> SiGe BiCMOS	<input checked="" type="checkbox"/> GaAs pHEMT	<input type="checkbox"/> GaN HEMT
<input type="checkbox"/> GaAs MESFET	<input type="checkbox"/> Si BiCMOS	<input type="checkbox"/> Si CMOS	<input type="checkbox"/> RF MEMS
<input type="checkbox"/> InGaP HBT	<input type="checkbox"/> SiGe HBT	<input type="checkbox"/> Si BJT	<input type="checkbox"/> LDMOS

## Absolute Maximum Ratings

Parameter	Rating	Unit
V <sub>DD</sub>	3.6	V
I <sub>DD</sub>	20	mA
Maximum Input Power - CW, V <sub>DD</sub> =2.85V, I <sub>DD</sub> =9mA	+15	dBm
P <sub>DISS</sub>	72	mW
Max Voltage on RF Output (Pin 8)	+5	V
T <sub>j</sub> (Junction Temperature)	150	°C
Storage Temperature	-65 to +150	°C
Operating Temperature	-40 to +85	°C



Caution! ESD sensitive device.

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

RoHS status based on EUDirective2002/95/EC (at time of this document revision).

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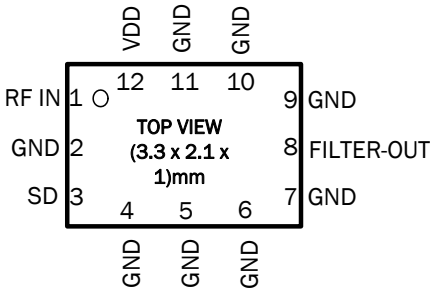
Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
<b>High Current Mode</b>					V <sub>DD</sub> = +2.85, VSD = 2.6V, I <sub>DD</sub> = 8mA, R2 = 3kΩ., Freq = 1575.42MHz. Nominal Operating Conditions (unless otherwise specified)
Gain (G)	11	13.5		dB	
Noise Figure (NF)*		0.85	1.3	dB	
Input P1dB Compressed Power (P1dB)		-2		dBm	
Input 3rd Order Intercept Point (2-tone @ fc ± 2.5Hz)		9		dBm	
Input Return Loss (S11)		-8		dB	
Output Return Loss (S22)		-13		dB	
Reverse Isolation (S12)		-24		dB	
Cell Band Rejection (Relative to 1575GHz at 827.5Hz)	50	54		dBc	
PCS Band Rejection (Relative to 1575GHz at 1885MHz)	39	42		dBc	
Supply DC Current at Shutdown (SD) Voltage VSD = 2.6V (I <sub>DD</sub> )		8	15	mA	
ISH (Shutdown Current)		0.1		uA	
<b>Low Current Mode</b>					V <sub>DD</sub> = +2.85, VSD = 1.67V, I <sub>DD</sub> = 4.5mA, R2 = 3kΩ. Freq = 1575.42MHz. Nominal Operating Conditions (unless otherwise specified)
Gain (G)		12		dB	
Noise Figure (NF)*		1		dB	
Input P1dB Compressed Power (P1dB)		0		dBm	
Input 3rd Order Intercept Point (2-tone @ fc ± 2.5Hz)		7		dBm	
Input Return Loss (S11)		-7		dB	
Output Return Loss (S22)		-11		dB	
Reverse Isolation (S12)		-24		dB	
Cell Band Rejection (Relative to 1575GHz at 827.5Hz)	50	55		dBc	
PCS Band Rejection (Relative to 1575GHz at 1885MHz)	39	42		dBc	

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
<b>Low Current Mode (cont.)</b>					$V_{DD} = +2.85$ , $V_{SD} = 1.67$ V, $I_{DD} = 4.5$ mA, $R2 = 3$ k $\Omega$ . Freq = 1575.42 MHz. Nominal Operating Conditions (unless otherwise specified)
Supply DC Current at Shutdown (SD) Voltage $V_{SD} = 1.67$ V ( $I_{DD}$ )		4.5		mA	
ISH (Shutdown Current)		0.1		$\mu$ A	
<b>Low Operating Voltages</b>	$V_{DD} = 2$ V	$V_{DD} = 1.5$ V	$V_{DD} = 1$ V		$V_{DD} = V_{SD}$ , $R2 = 1.5$ K. Freq = 1575.42 MHz. Nominal Operating Conditions (unless otherwise specified).
Gain (G)	14	12.5	11.5	dB	
Noise Figure (NF)*	0.85	0.95	1.1	dB	
Input P1dB Compressed Power (P1dB)	-2	-4	-6	dBm	
Input 3rd Order Intercept Point (2-tone @ $f_c \pm 2.5$ Hz)	10	7.5	3	dBm	
Input Return Loss (S11)	-9	-8	-7	dB	
Output Return Loss (S22)	-13.5	-12.5	-11	dB	
Reverse Isolation (S12)	-24	-24	-22	dB	
Cell Band Rejection (Relative to 1575 GHz at 827.5 Hz)	52	52	52	dBc	
PCS Band Rejection (Relative to 1575 GHz at 1885 MHz)	42	42	42	dBc	
Supply DC Current at Shutdown (SD) Voltage $V_{SD} = 2.85$ V ( $I_{DD}$ )	10.5	7.3	4	mA	
ISH (Shutdown Current)	0.1	0.1	0.1	$\mu$ A	

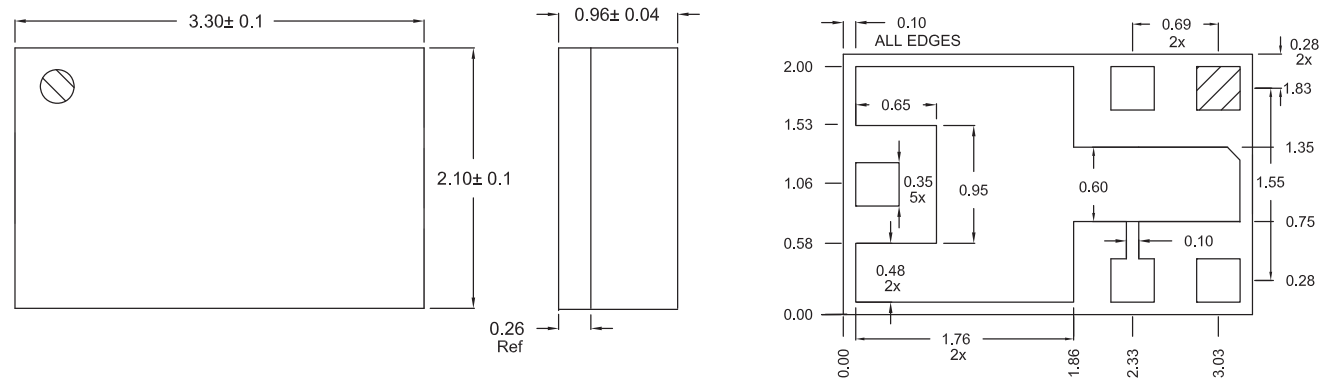
Notes: \*Noise Figure data has not been de-embedded.

Pin	Function	Description
1	RF IN	RF input.
2	GND	Ground.
3	SD	Shutdown.
4	GND	Ground.
5	GND	Ground.
6	GND	Ground.
7	GND	Ground.
8	FILTER OUT	RF output.
9	GND	Ground.
10	GND	Ground.
11	GND	Ground.
12	VDD	Supply.

Pin Out

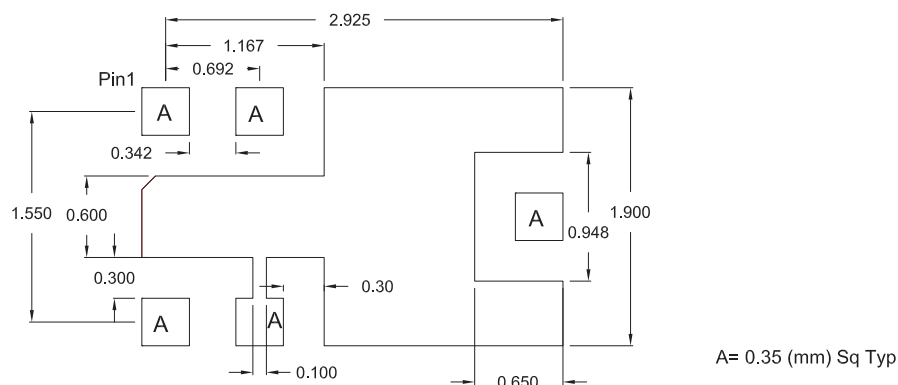


Package Drawing

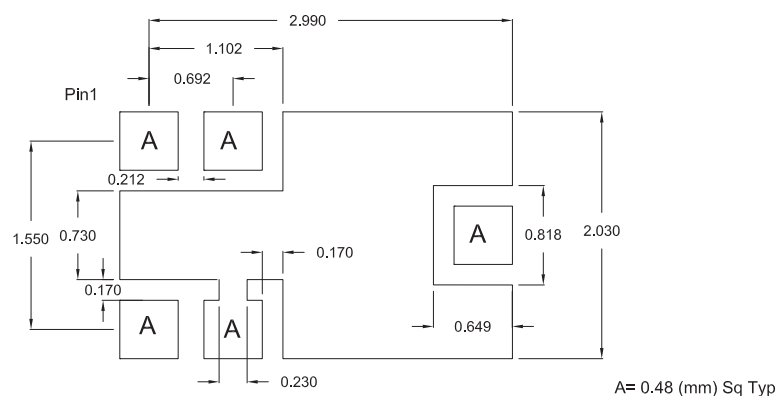


NOTES:  
1. SHADED AREAS REPRESENT PIN 1 LOCATION.

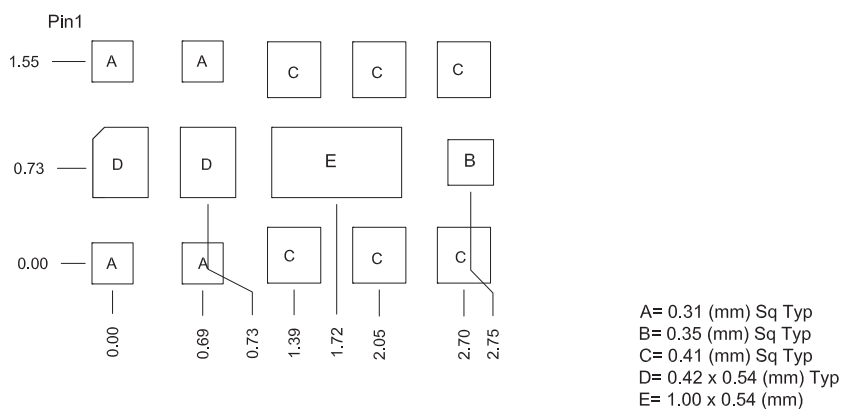
## PCB Metal Land Pattern



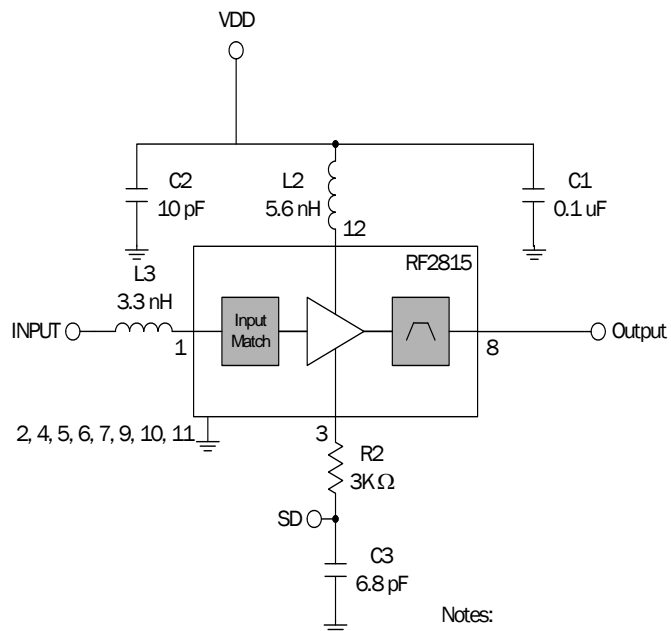
## PCB Solder Mask Pattern



## PCB Stencil Pattern



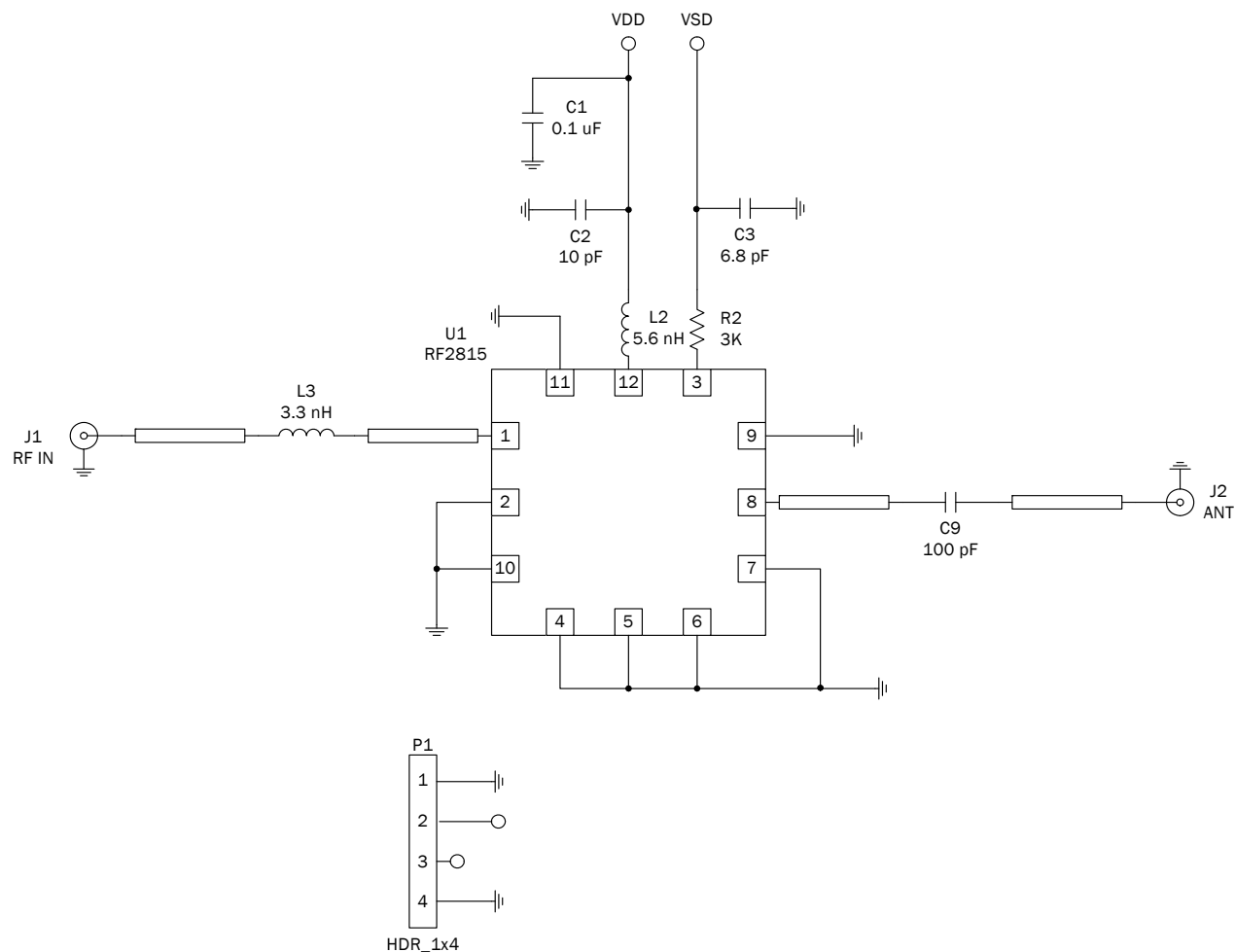
## Application Schematic



### Notes:

- L2 and C2 form the output matching network.
- C1 and C3 are decoupling capacitors and may or may not be required in the application (depending on the routing).
- L3 forms the input match.

## Evaluation Board Schematic

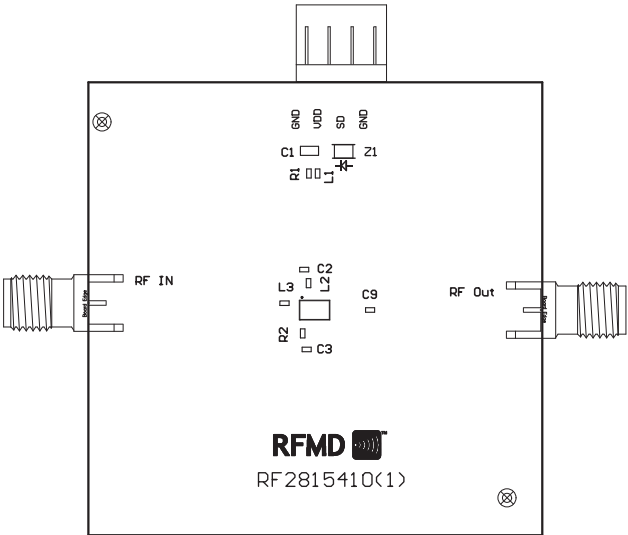


### BOM (for Eval Board)

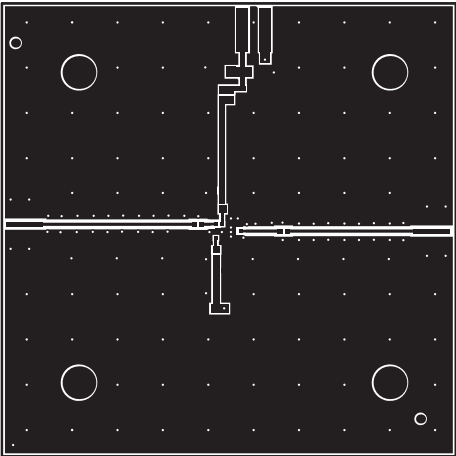
Ref Designator	Value
L2	5.6nH inductor
L3	3.3nH inductor
C1	0.1uF capacitor
C2	10pF capacitor
C3	6.8pF capacitor
R2	3K
C9	100pF

Note: C9 is not needed in the actual application as RF2815 has an integrated DC Blocking capacitor at the output.

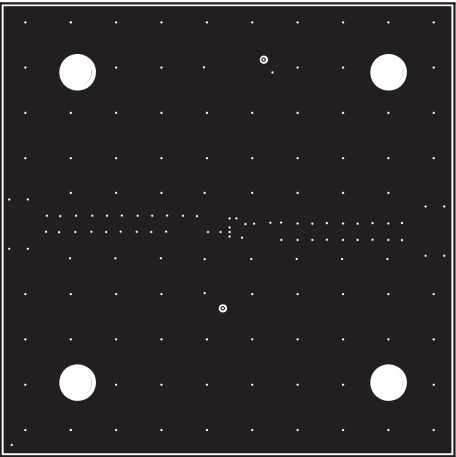
Evaluation Board Layout



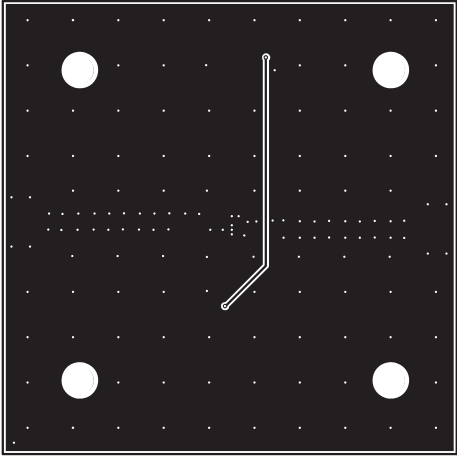
Assembly



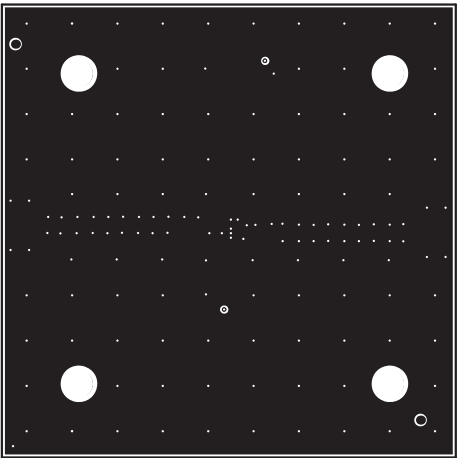
Top



In 1



In 2



Back

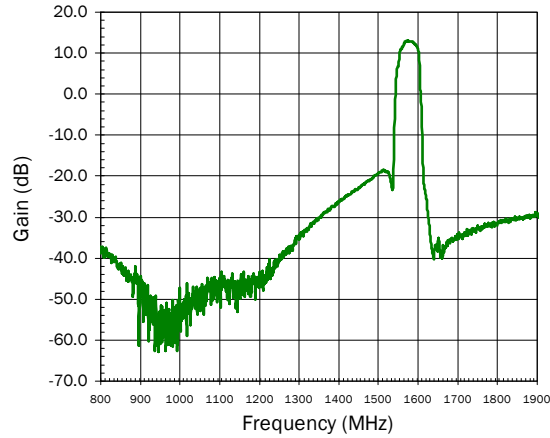


## Typical Performance Data on Evaluation Board

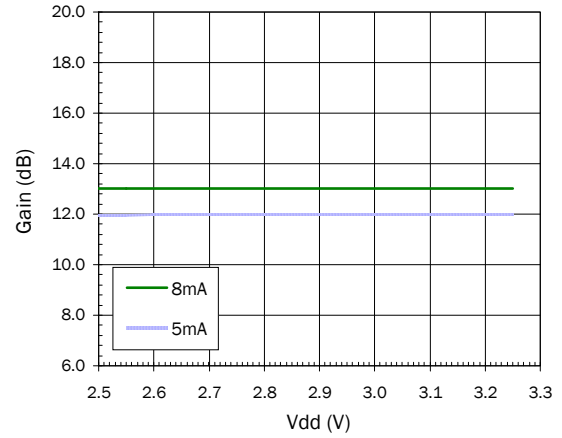
Fixture losses have not been de-embedded (Temp=25°C,  $V_{DD}=2.85V$ ,  $R_2=3k\Omega$ )

### Gain vs. Frequency

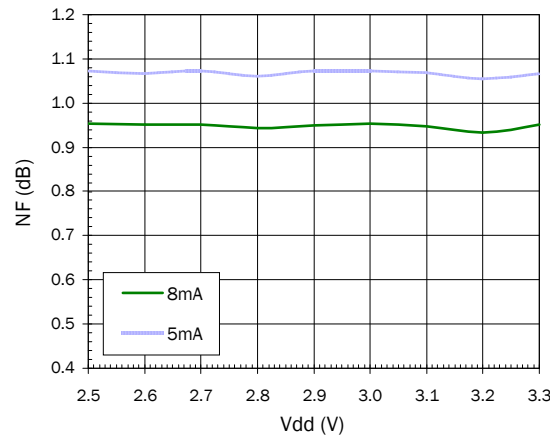
(Temp=25°C,  $V_{DD}=2.85V$ ,  $V_{SD}=2.6V$ ,  $I_{DD}=8mA$ )



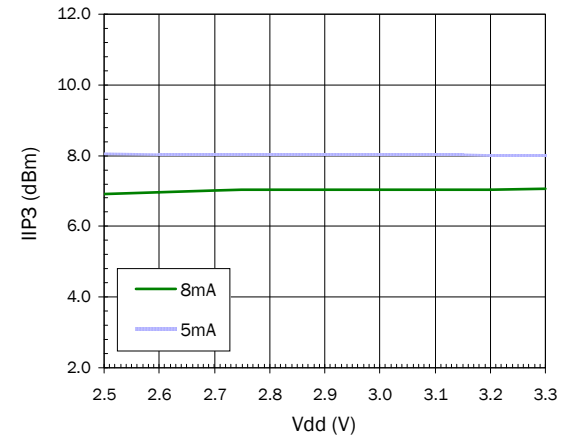
### Gain vs. Vdd vs. Idd



### NF vs. Vdd vs. Idd



### IIP3 vs. Vdd vs. Idd



### IP1dB vs. Vdd vs. Idd

