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RF2815

GPS LOW NOISE AMPLIFIER WITH INTEGRATED OUTPUT SAW FILTER

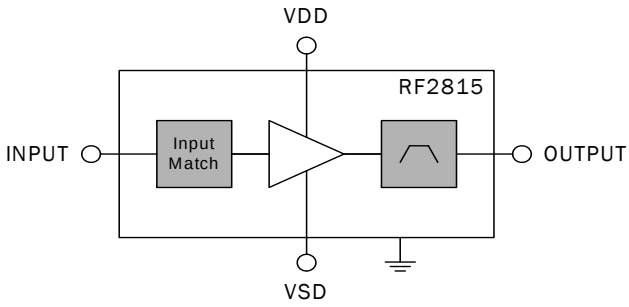
Package: Module, 3.3x2.1x1.0

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 recievers 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 reciever design.

The RF2185 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

☐ GaAs HBT	☐ SiGe BiCMOS	☑ GaAs pHEMT	☐ GaN HEMT
☐ GaAs MESFET	☐ Si BiCMOS	☐ Si CMOS	☐ RF MEMS
☐ InGaP HBT	☐ SiGe HBT	☐ Si BJT	☐ LDMOS

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Absolute Maximum Ratings

Parameter	Rating	Unit
V_{DD}	3.6	V
I_{DD}	20	mA
Maximum Input Power - CW, V_{DD}=2.85V, I_{DD}=9mA	+15	dBm
P_{DISS}	72	mW
Max Voltage on RF Output (Pin 8)	+5	V
T_J (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).

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
High Current Mode					V_{DD}=+2.85, VSD=2.6V, I_{DD}=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_{DD})		8	15	mA	
ISH (Shutdown Current)		0.1		uA	
Low Current Mode					V_{DD}=+2.85, VSD=1.67V, I_{DD}=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	

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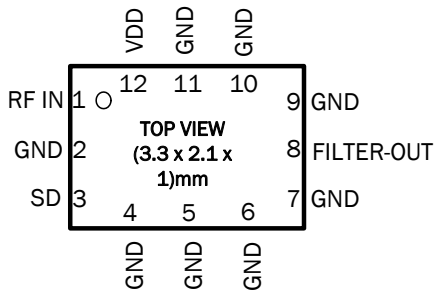
Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Low Current Mode (cont.)					V_{DD}=+2.85, VSD=1.67V, I_{DD}=4.5mA, R2=3kΩ. Freq=1575.42MHz. Nominal Operating Conditions (unless otherwise specified)
Supply DC Current at Shutdown (SD) Voltage VSD=1.67V (I_{DD})		4.5		mA	
ISH (Shutdown Current)		0.1		uA	
Low Operating Voltages	VDD=2V	VDD=1.5V	VDD=1V		VDD=VSD, R2=1.5K. Freq=1575.42MHz. 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 @ fc±2.5Hz)	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 1575GHz at 827.5Hz	52	52	52	dBc	
PCS Band Rejection (Relative to 1575GHz at 1885MHz)	42	42	42	dBc	
Supply DC Current at Shutdown (SD) Voltage VSD=2.85V (I_{DD})	10.5	7.3	4	mA	
ISH (Shutdown Current)	0.1	0.1	0.1	uA	

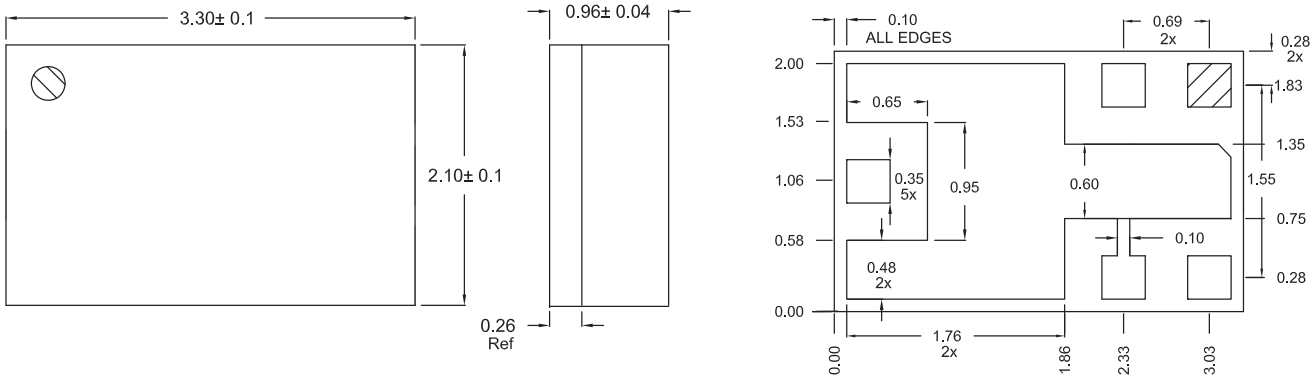
Notes: *Noise Figure data has not been de-embedded.

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.

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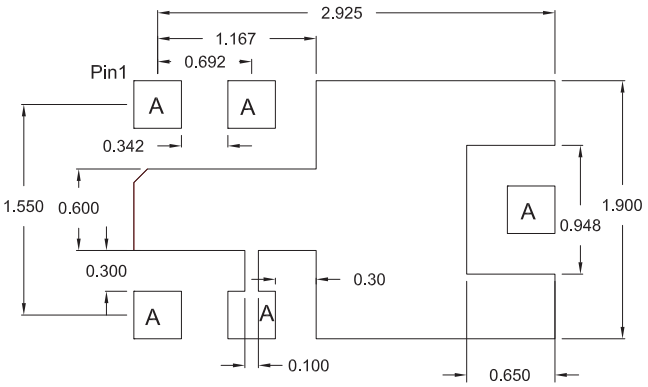
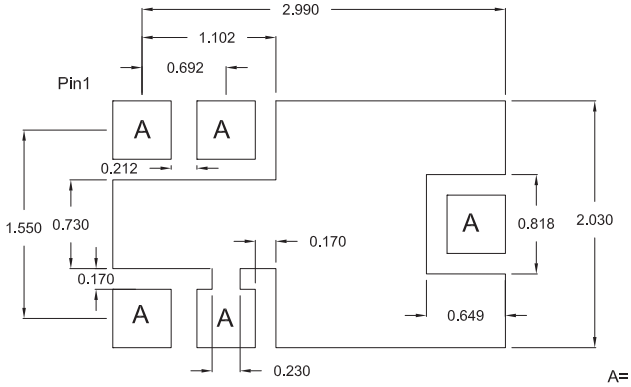
PCB Metal Land Pattern



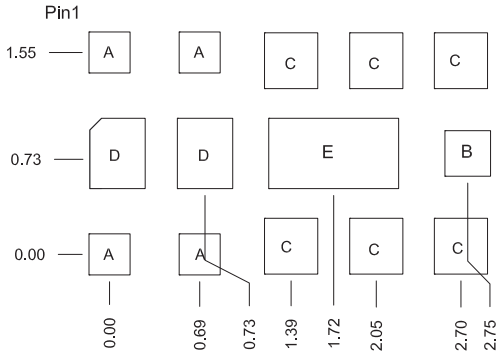
A= 0.35 (mm) Sq Typ

PCB Solder Mask Pattern



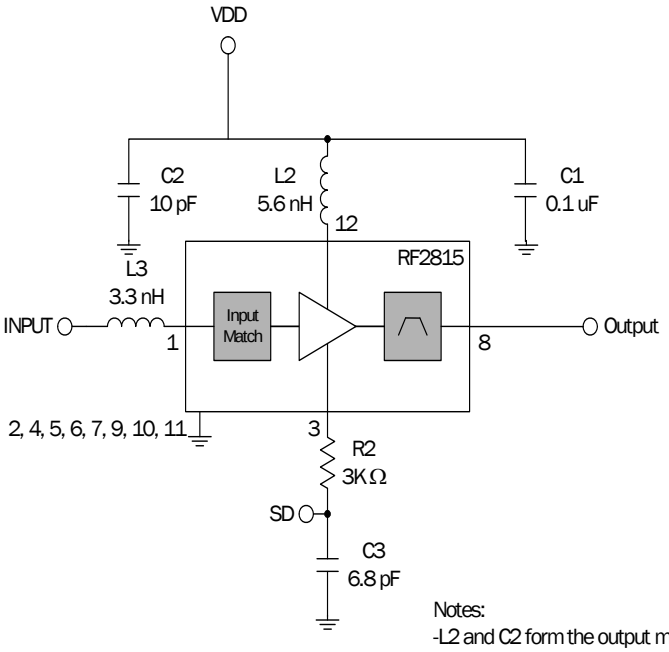
A= 0.48 (mm) Sq Typ

PCB Stencil Pattern



A= 0.31 (mm) Sq Typ
B= 0.35 (mm) Sq Typ
C= 0.41 (mm) Sq Typ
D= 0.42 x 0.54 (mm) Typ
E= 1.00 x 0.54 (mm)

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.

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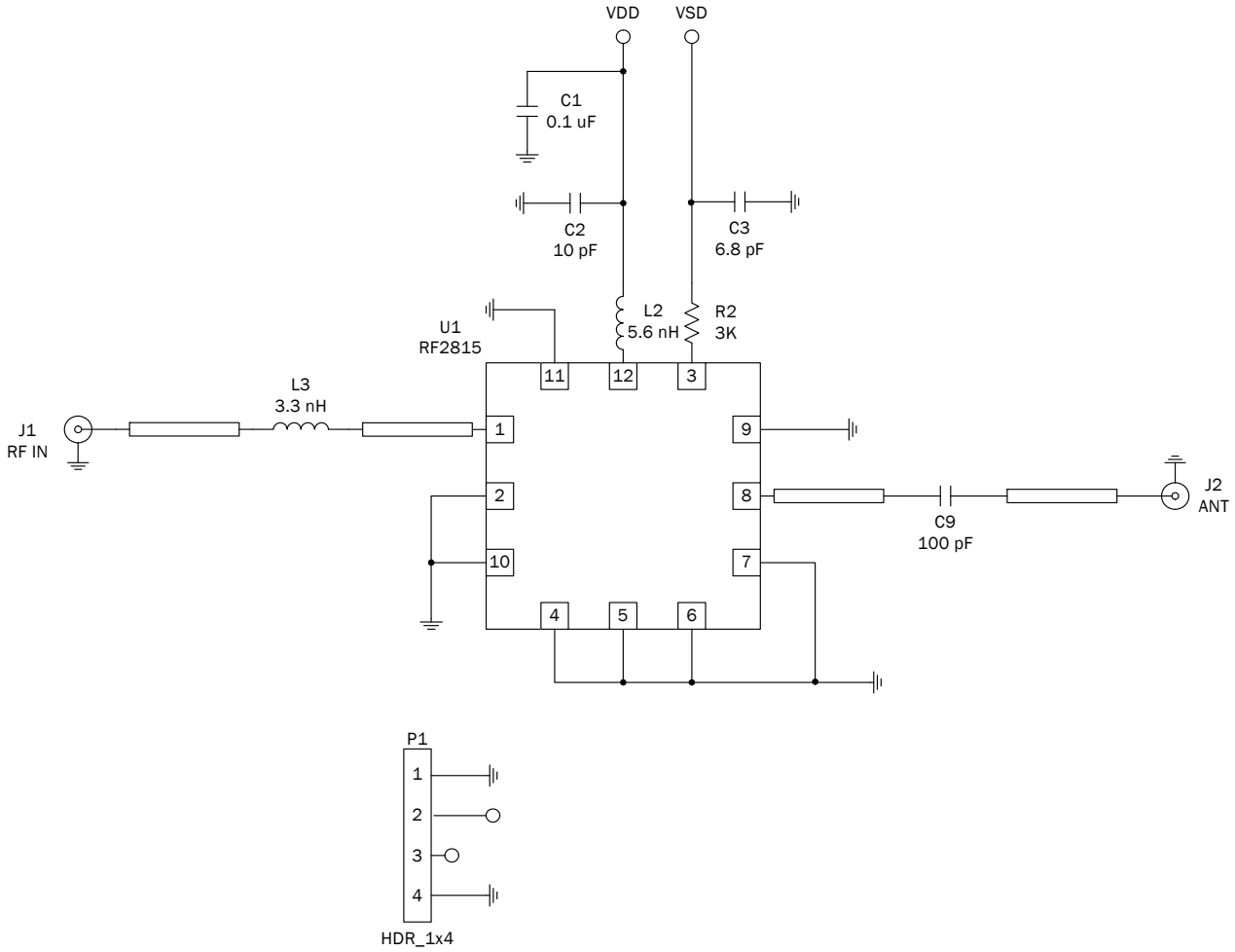
Evaluation Board Schematic

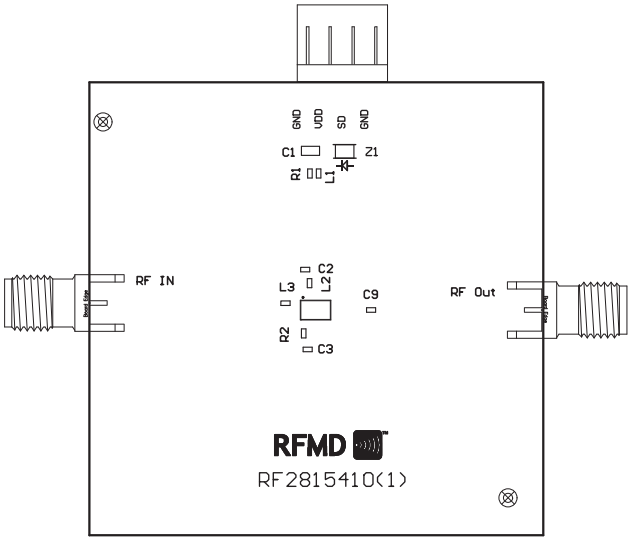


BOM (for Eval Board)

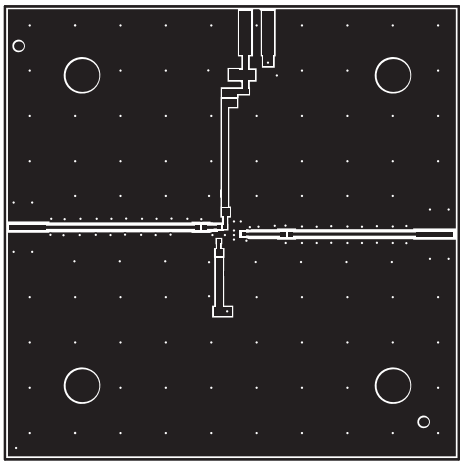
Ref Designator	Value
L2	5.6nH inductor
L3	3.3nH inductor
C1	0.1uF capacitor
C2	10pF capacitor
C3	6.8pF capacitor
R2	3K
C9	100pF

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

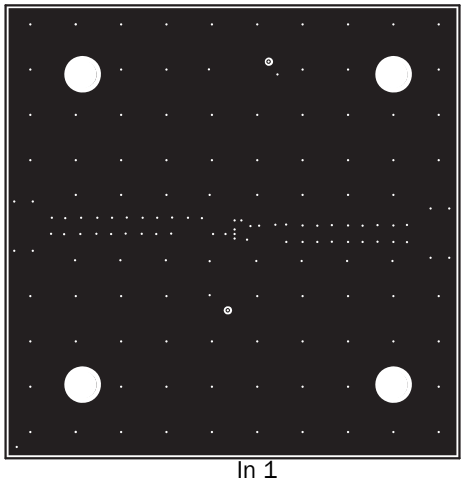
Evaluation Board Layout



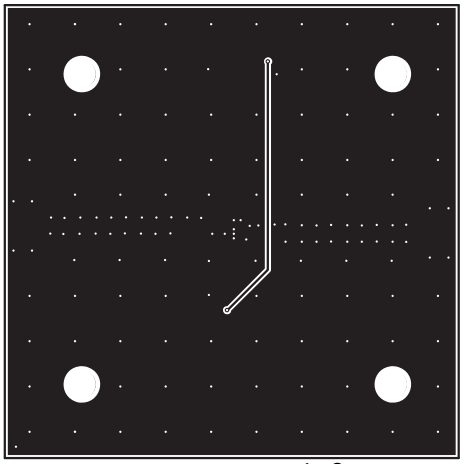
Assembly



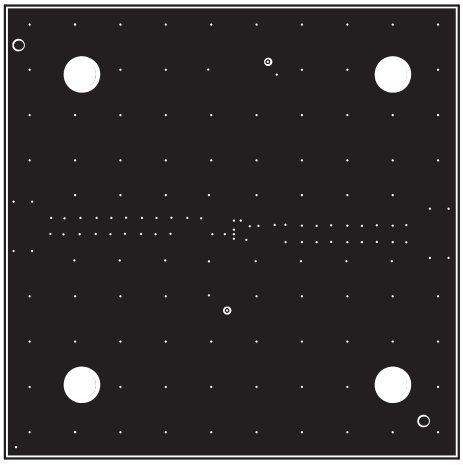
Top



In 1



In 2



Back

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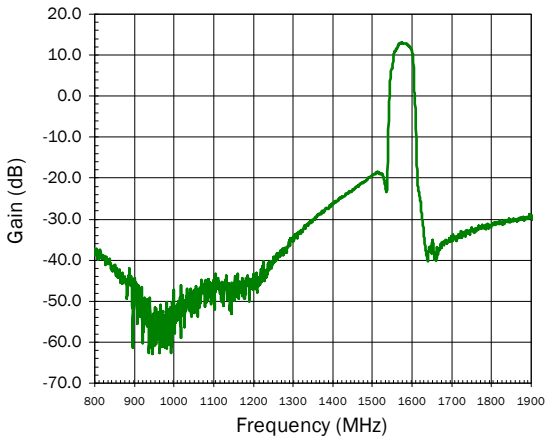
Typical Performance Data on Evaluation Board

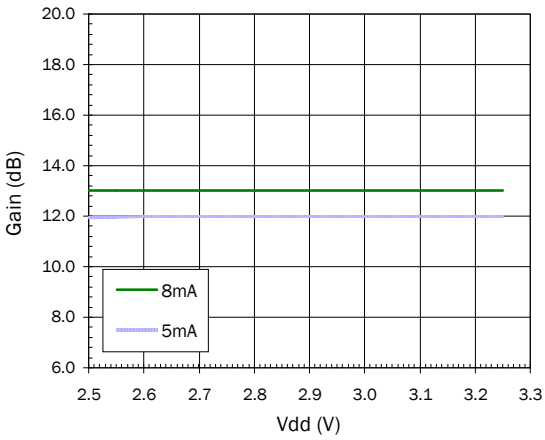
Fixture losses have not been de-embedded (Temp=25°C, V_{DD}=2.85V, R2=3kΩ)

Gain vs. Frequency

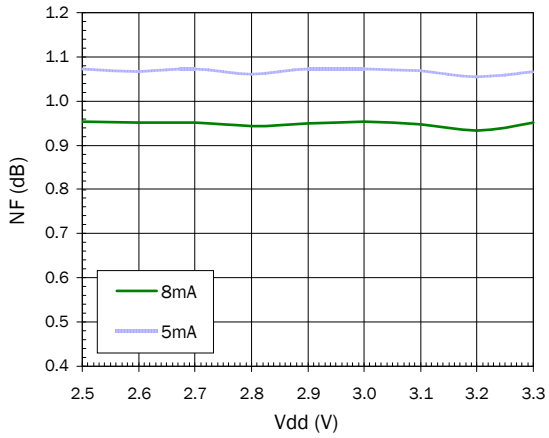
(Temp=25°C, Vdd=2.85V, Vsd = 2.6V, Idd = 8mA)



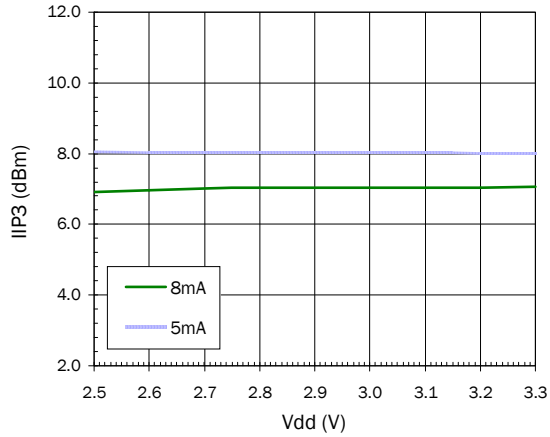
Gain vs. Vdd vs. Idd



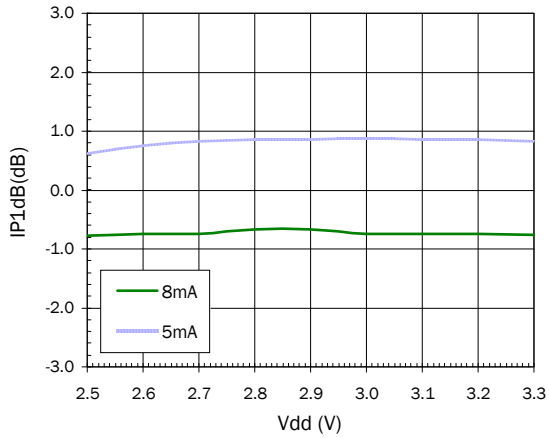
NF vs. Vdd vs. Idd



IIP3 vs. Vdd vs. Idd



IP1dB vs. Vdd vs. Idd



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