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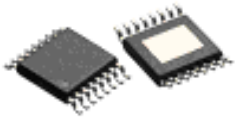
Preliminary

SRQ-2116Z

700MHz to 3800MHZ DIRECT QUADRATURE DEMODULATOR



RFMD Green, RoHS Compliant, Pb-Free
Package: TSSOP, 16-Pin, 5.0mmx6.4mmx1.0mm

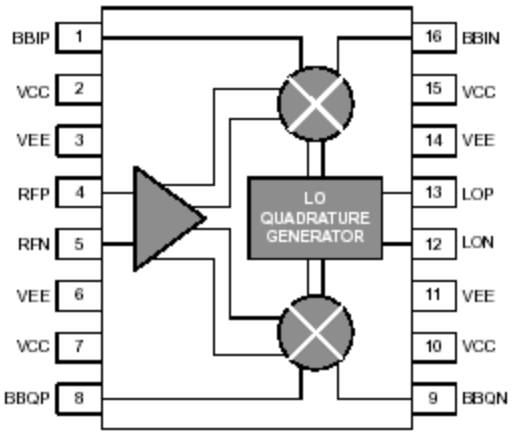
Product Description

The SRQ-2116Z is a high linearity, silicon germanium direct demodulator designed for direct conversion and low IF base-station receivers. This device features high second and third order intermodulation suppression, high LO-RF isolation, and excellent quadrature accuracy.

The SRQ-2116Z outputs are directly coupled, are capable of driving loads as low as 50Ω, and can drive reactive loads without additional components such as damping resistors. This device is packaged in a RoHS compliant and Green 16-pin TSSOP with matte tin finish. The package includes an exposed paddle for improved thermal and RF ground.

Optimum Technology Matching® Applied

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



Features

- High LO-RF Suppression
- Excellent Quadrature Accuracy
- High Input IP2, IP3

Applications

- Digital and Spread Spectrum Communication Systems
- WiMax, PCS, DCS, 3G Transceivers
- Power Amplifier Correction Circuitry

Parameter		700MHz to 1000MHz			1700MHz to 2000MHz			2000MHz to 2300MHz			2300MHz to 2700MHz			3300MHz to 3800MHz		
	Unit	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.
RF Input																
RF Frequency Range	MHz	700		1000	1700		2000	2000		2300	2300		2700	3300		3800
Return Loss	dB		12			12			12			12			12	
Gain	dB		13			8			7			6			2	
Input IP3	dBm		10			16			16			16			16	
Input IP2	dBm		44			52			54			56			60	
Input P1dB	dBm		-2			+3			+4			+3			+3	
Noise Figure	dB		10			15			16			17			20	
LO-RF Suppression	dB		90			80			80			70			70	
RF Common Mode Voltage	V		1.9			1.9			1.9			1.9			1.9	
LO Input																
LO Frequency Range	MHz	700		1000	1700		2000	2000		2300	2300		2700	3300		3800
LO Input Level	dBm	-3	0	+3	-3	0	+3	-3	0	+3	-3	0	+3	-3	0	+3
Return Loss	dB		12			12			12			12			12	
LO Common-Mode Voltage	V		1.9			1.9			1.9			1.9			1.9	

Test Conditions (for all product specification tables unless otherwise noted): V_{CC} (pins 2, 10, 15)=+5V, T_A=+25°C, RF Input=-25dBm @ Mid-Band of Frequency Range, LO Input=0dBm @ RF Frequency+10MHz

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Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage (VCC)	5.5	VDC
LO RF Input (LOP, LON, RFP, RFN)	+10	dBm
Operating Temperature	-40 to +85	°C
Storage Temperature	-65 to +150	°C

Operation of this device beyond any one of these limits may cause permanent damage. For reliable continuous operation, the device voltage and current must not exceed the maximum operating values specified in the table on page one.

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 EU Directive 2002/95/EC (at time of this document revision).

Parameter		700MHz to 1000MHz			1700MHz to 2000MHz			2000MHz to 2300MHz			2300MHz to 2700MHz			3300MHz to 3800MHz		
	Unit	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.
I/Q Output																
I/Q Output Frequency Range	MHz	DC		80	DC		80	DC		80	DC		80	DC		80
Amplitude Balance	dB		0.1			0.2			0.2			0.1			0.1	
Phase Balance (Relative to 90°)	Deg		0.5			0.7			0.8			0.1			0.9	
Output Impedance	Ohms		50			50			50			50			50	
Load Impedance	Ohms	50			50			50			50			50		
I/Q Common-Mode Voltage	V		1.9			1.9			1.9			1.9			1.9	
Misc.																
Supply Voltage	V	4.75	5.0	5.25	4.75	5.0	5.25	4.75	5.0	5.25	4.75	5.0	5.25	4.75	5.0	5.25
Supply Current	mA		160			160			160			160			160	
Thermal Resistance	°C/W		28			28			28			28			28	
Application Circuit		SRQ-2116EVB-1			SRQ-2116EVB-2			SRQ-2116EVB-3			SRQ-2116EVB-4			SRQ-2116EVB-5		

Test Conditions (for all product specification tables unless otherwise noted): V_{CC} (pins 2, 10, 15) = +5V, T_A = +25°C, RF Input = -25dBm @ Mid-Band of Frequency Range, LO Input = 0dBm @ RF Frequency + 10MHz

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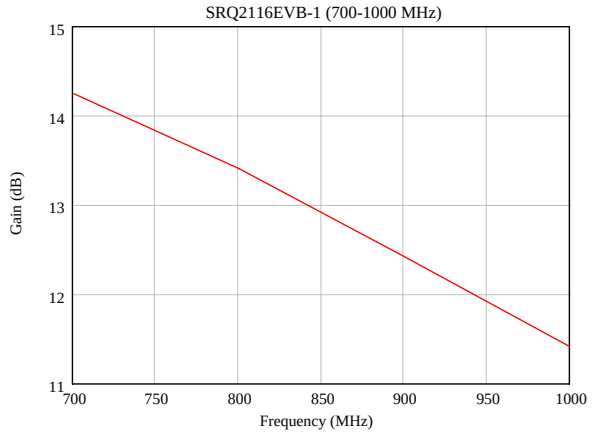
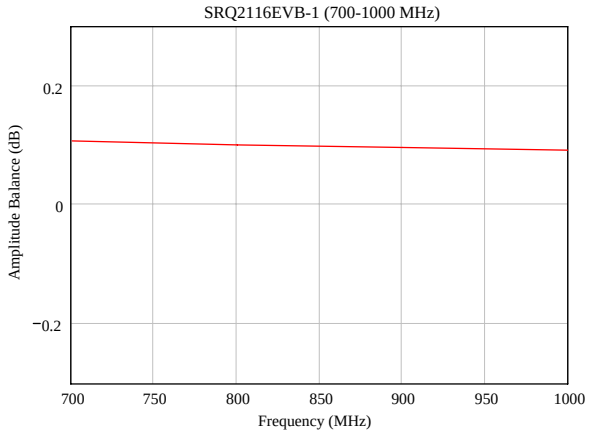
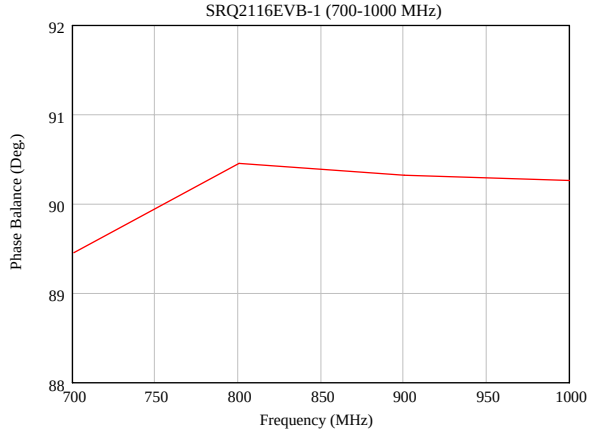
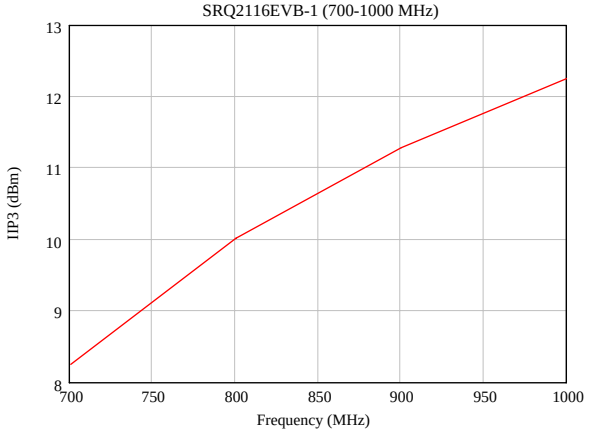
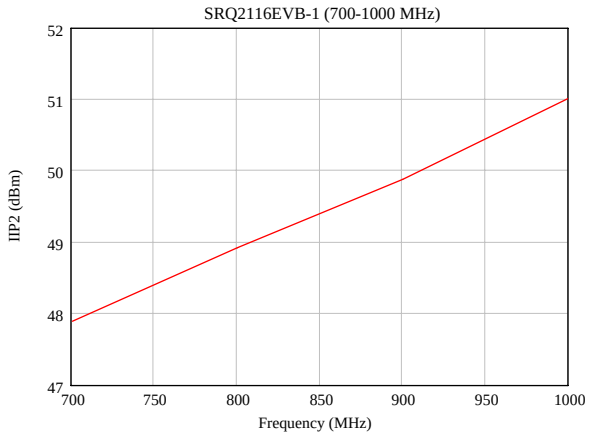
700MHz to 1000MHz Typical Device Performance

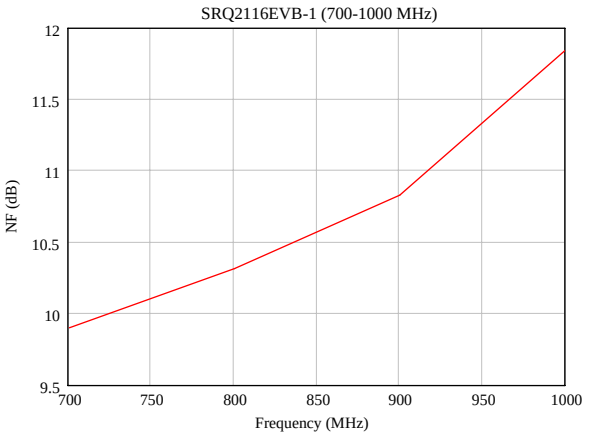




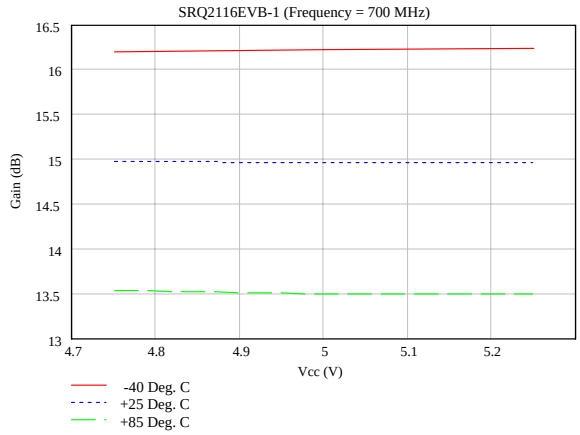


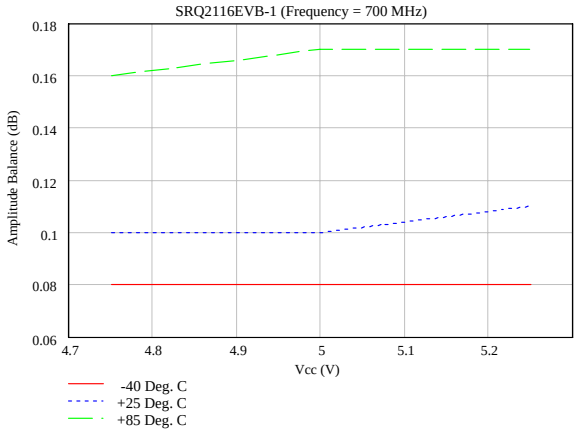


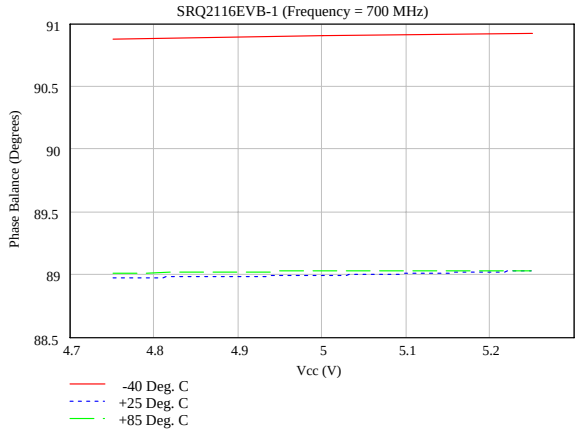


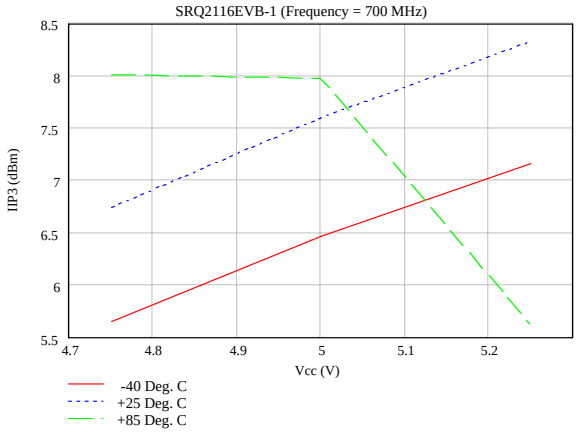


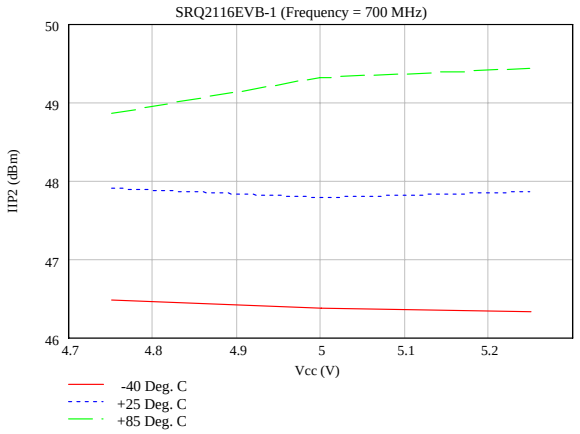
700MHz to 1000MHz Typical Device Performance (cont.)

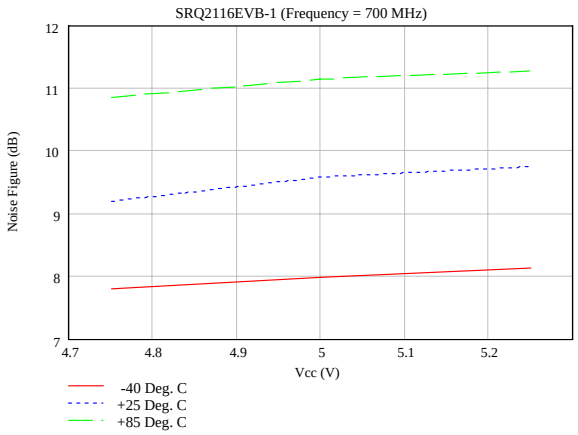












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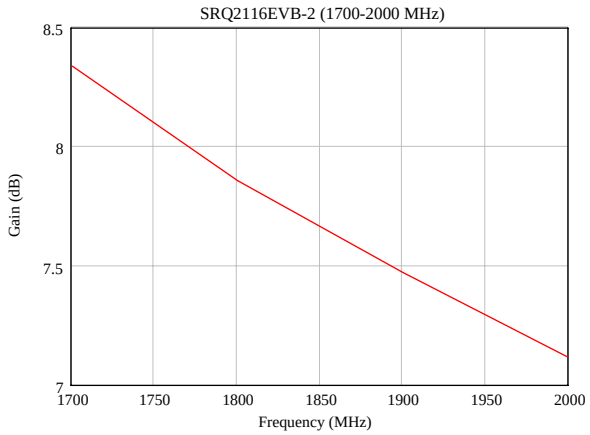
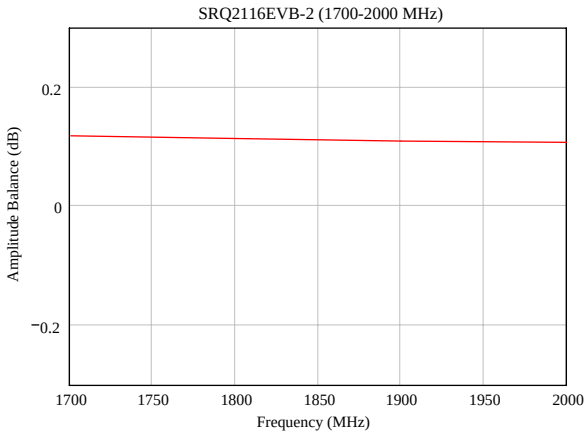
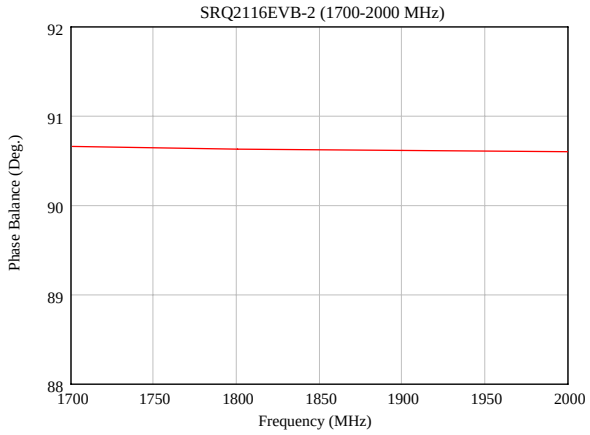
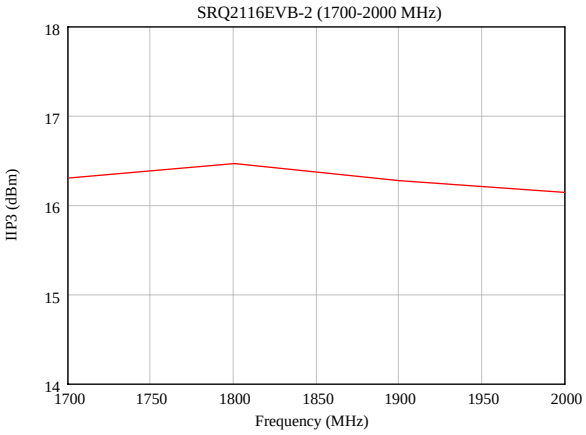
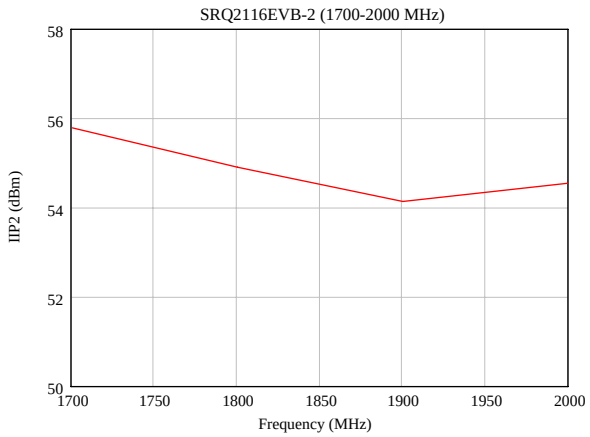
1700MHz to 2000MHz Typical Device Performance

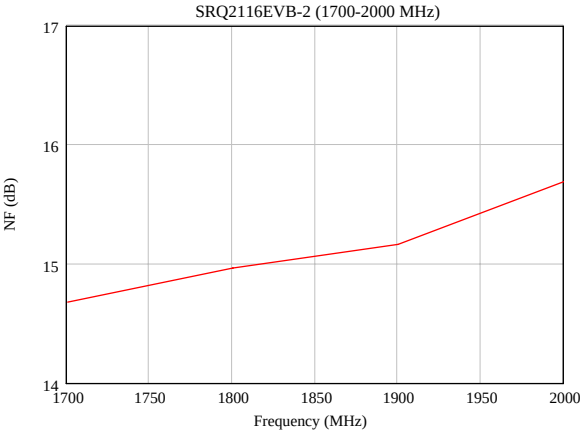




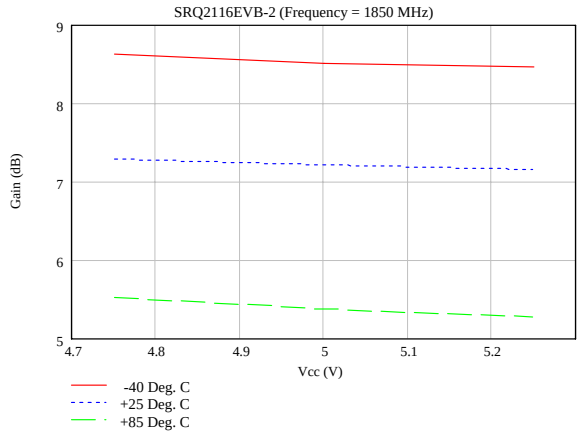


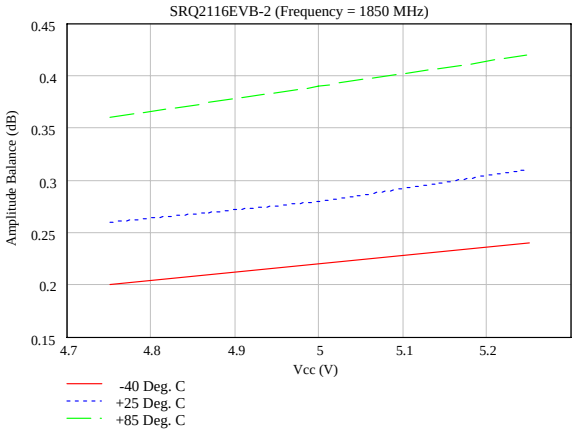


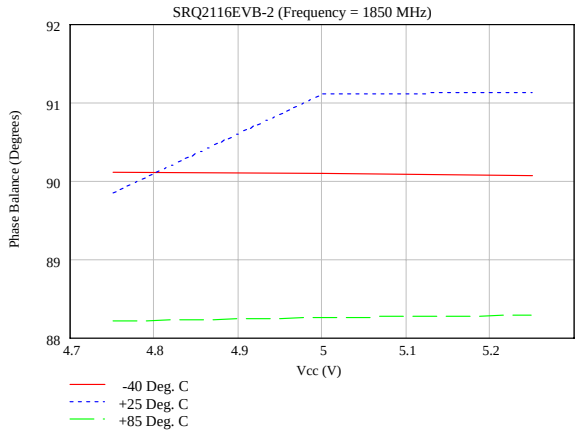


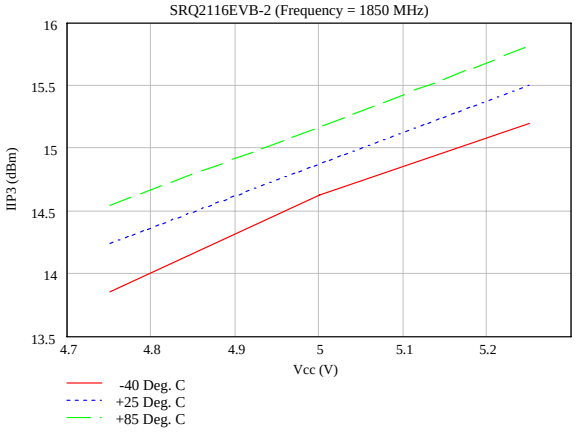


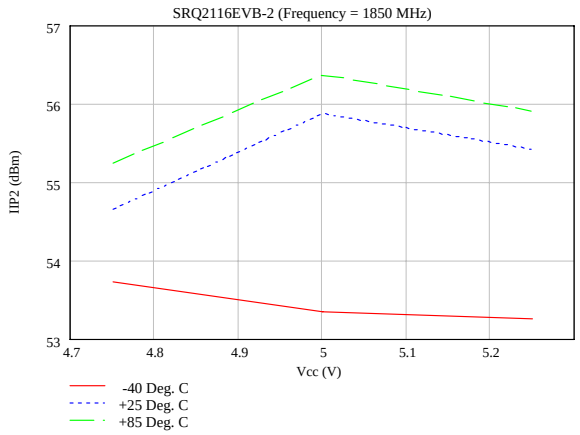
1700MHz to 2000MHz Typical Device Performance (cont.)

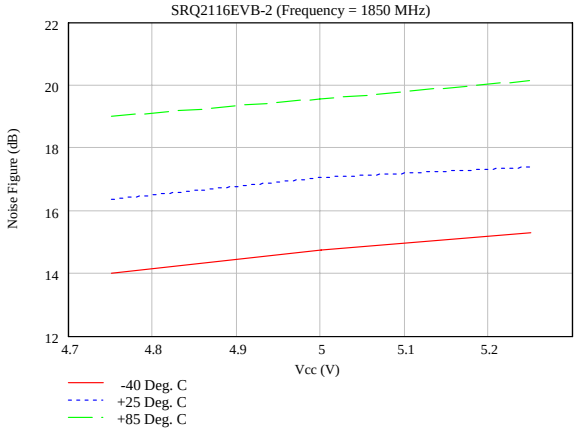












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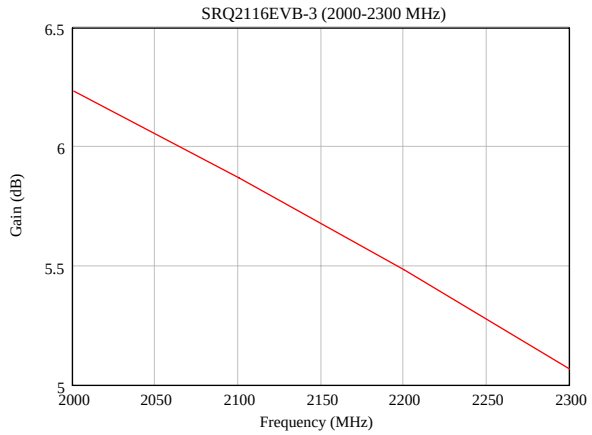
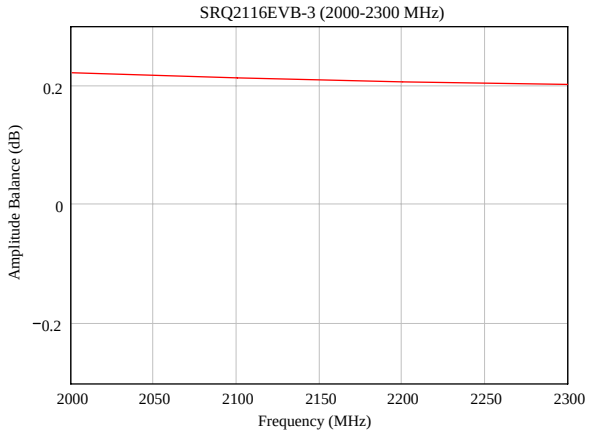
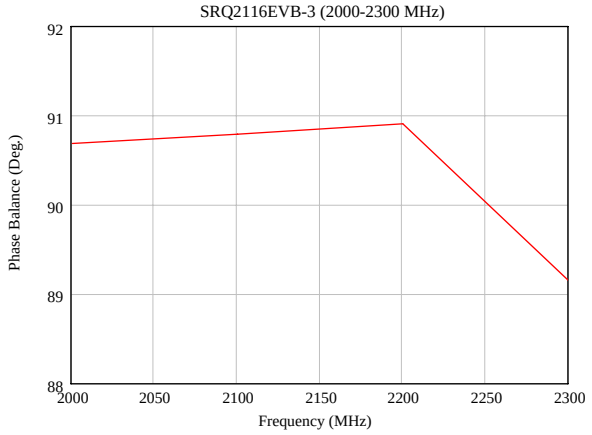
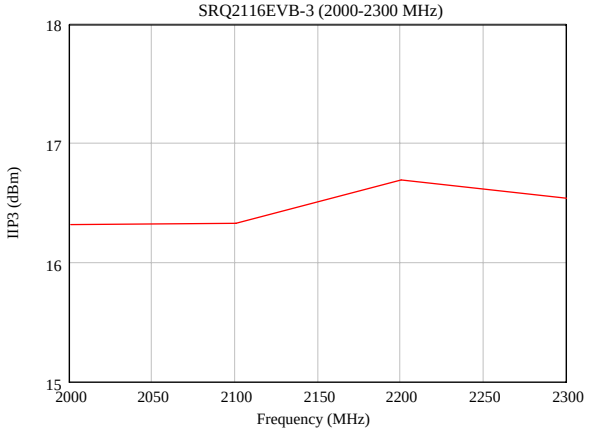
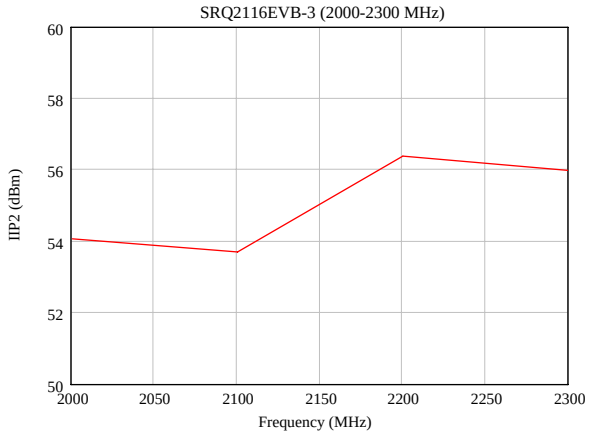
2000MHz to 2300MHz Typical Device Performance

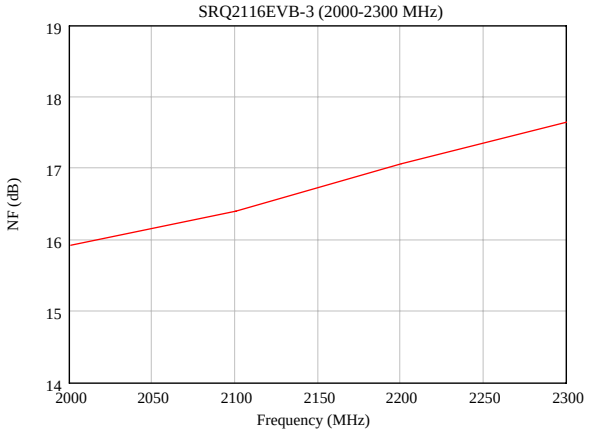




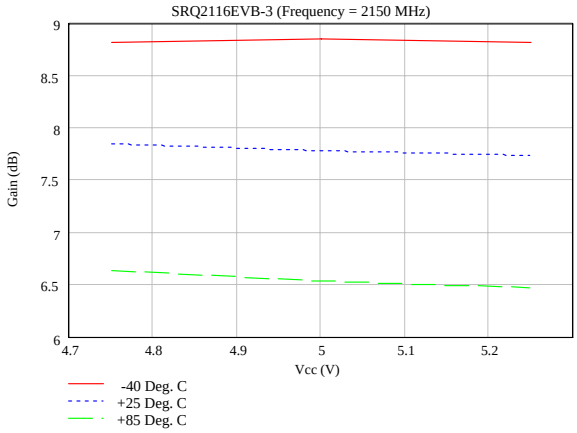


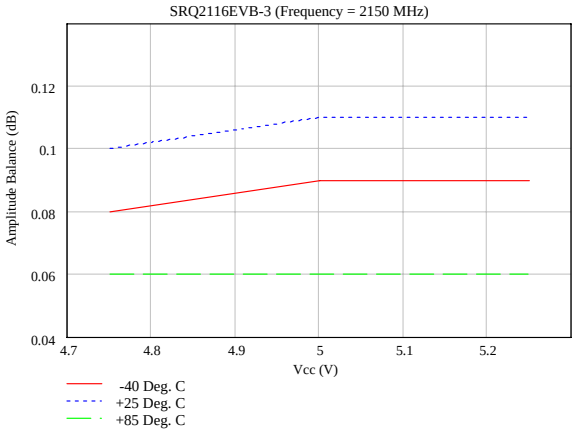


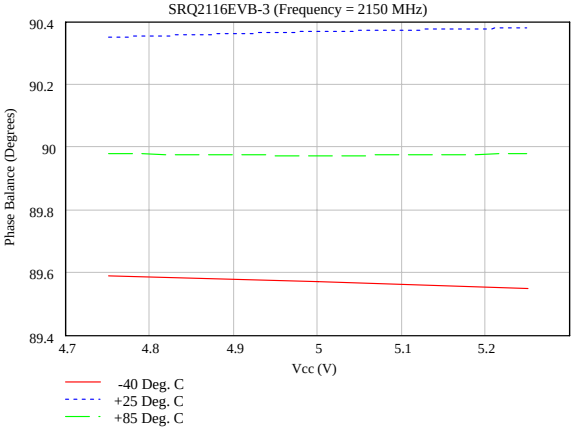


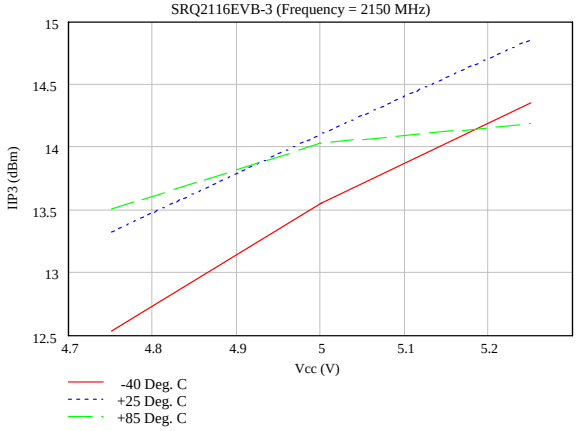


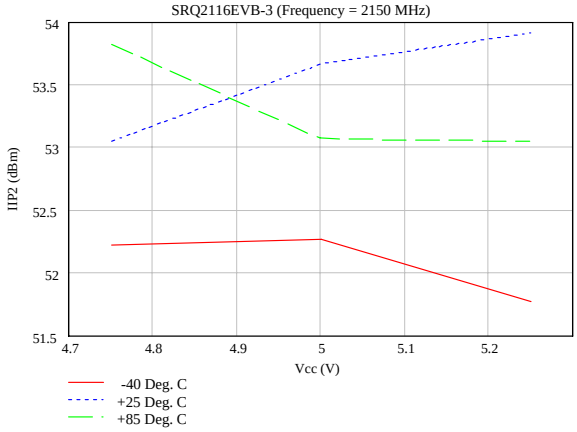
2000MHz to 2300MHz Typical Device Performance (cont.)

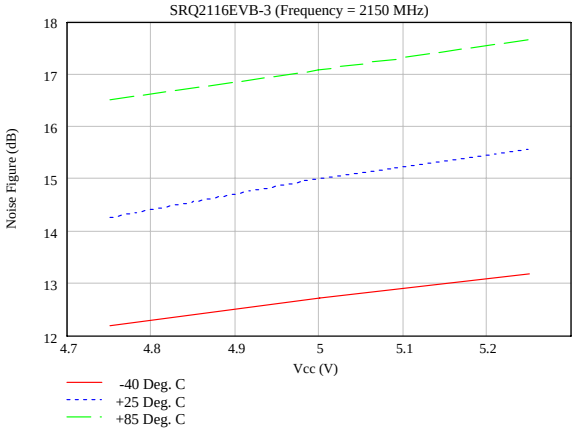












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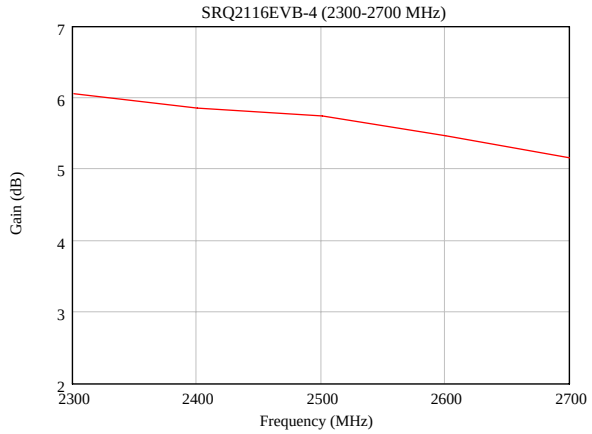
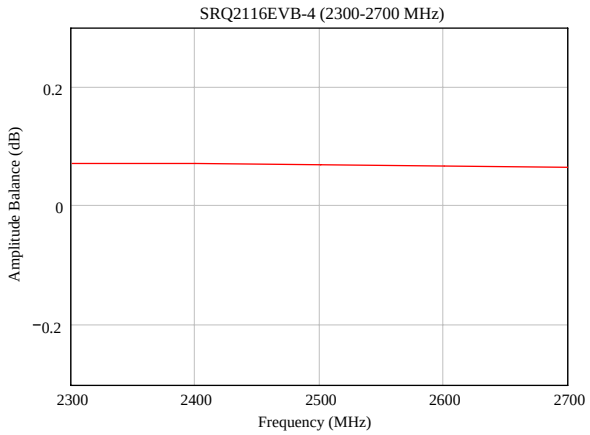
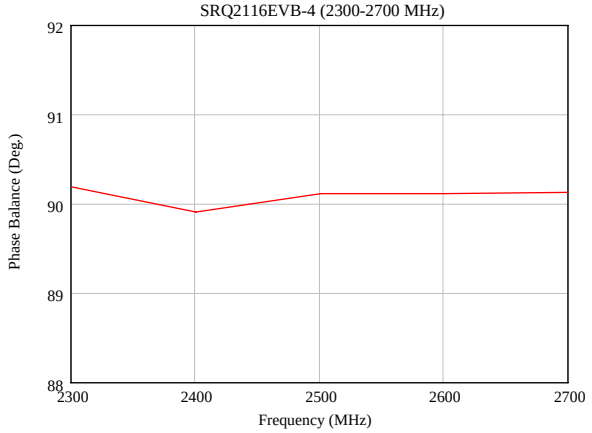
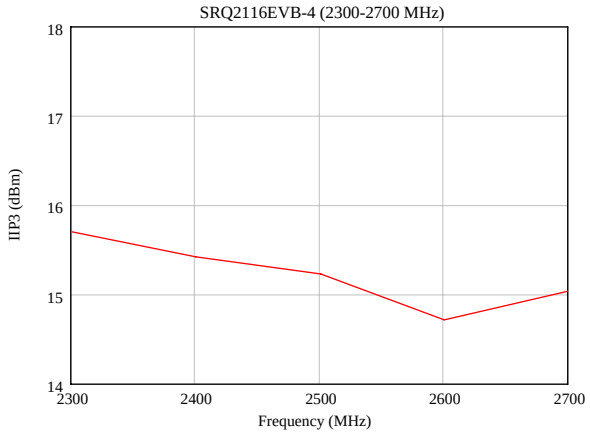
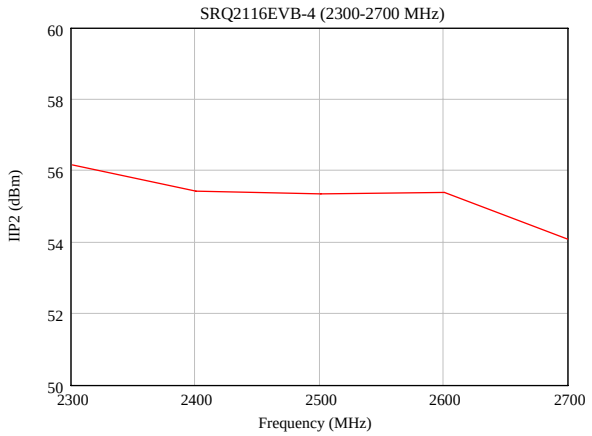
2300MHz to 2700MHz Typical Device Performance

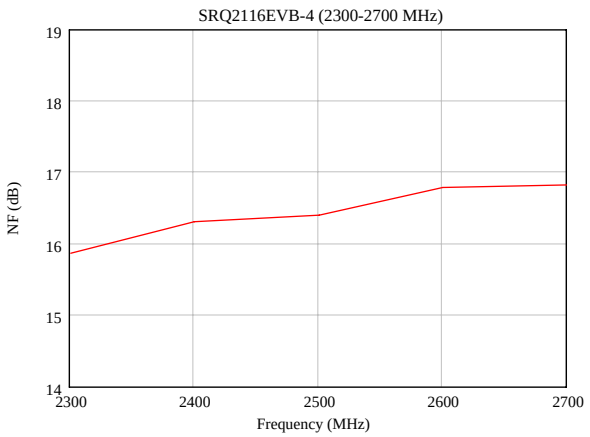




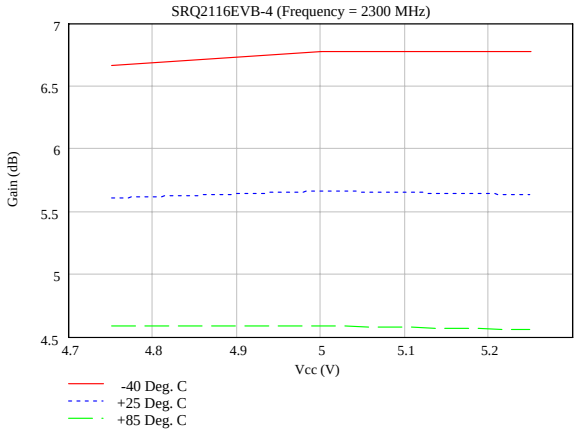


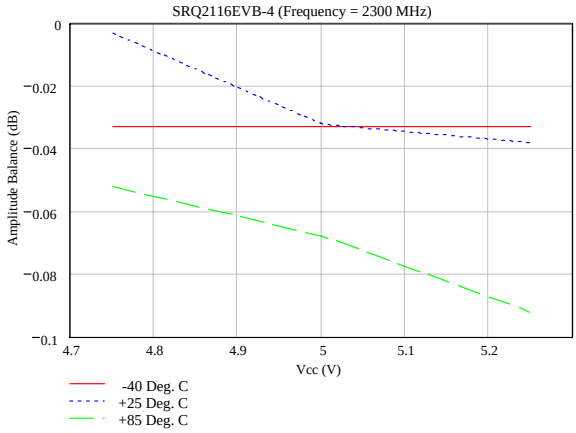


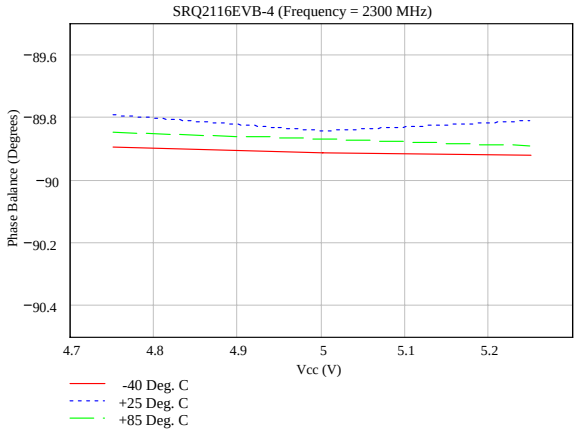


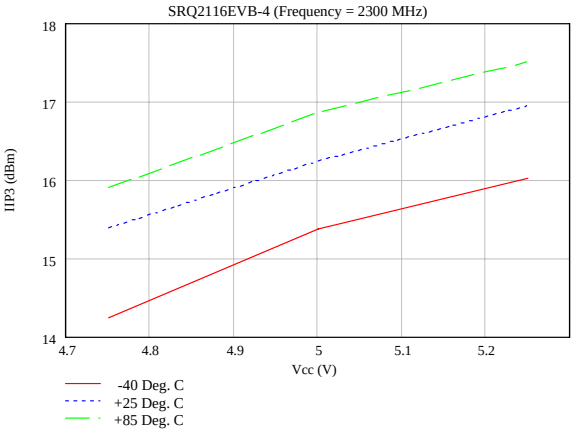


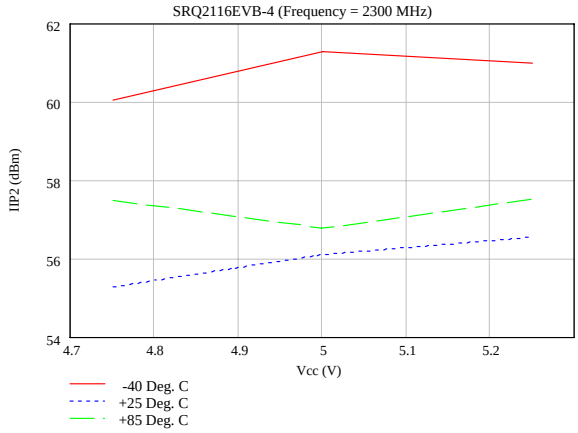
2300MHz to 2700MHz Typical Device Performance (cont.)

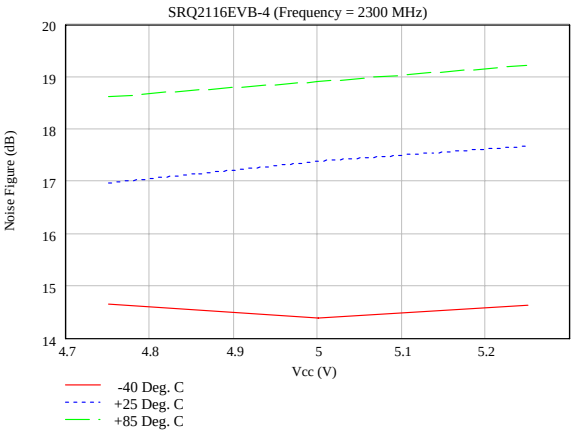












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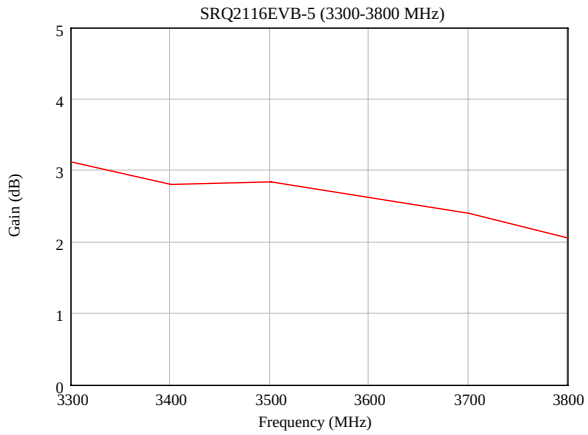
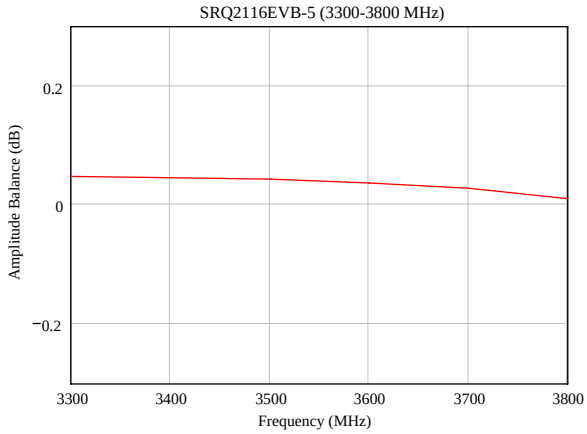
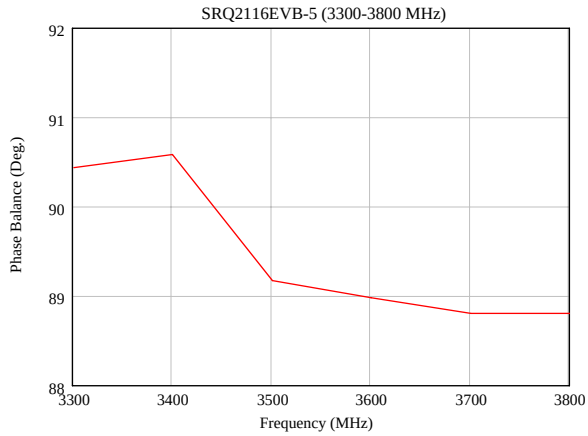
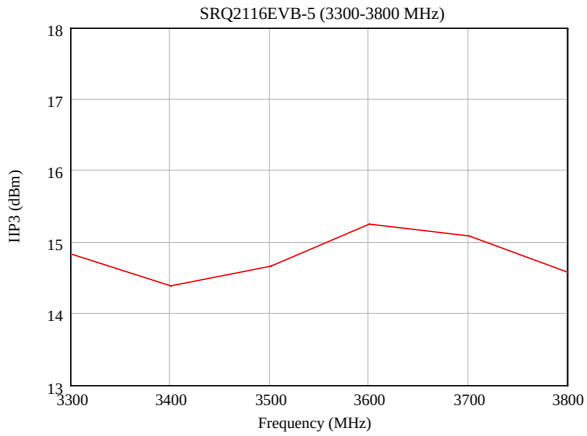
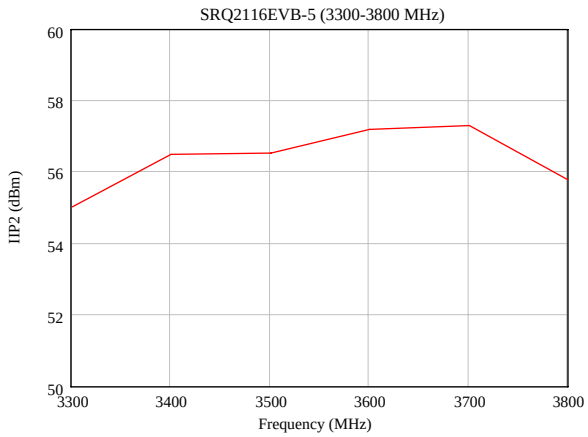
3300MHz to 3800MHz Typical Device Performance

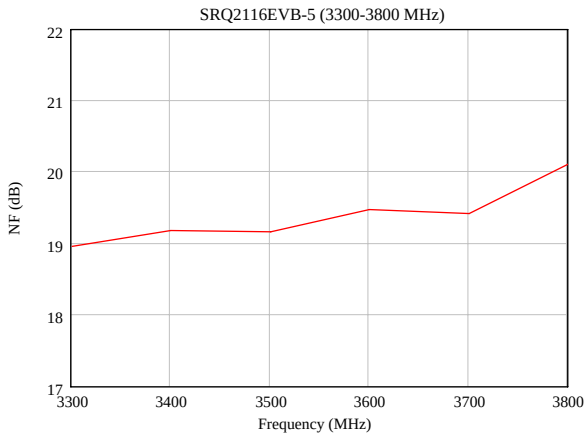




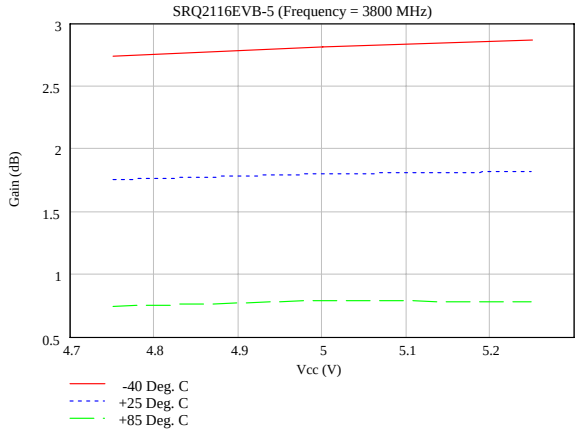


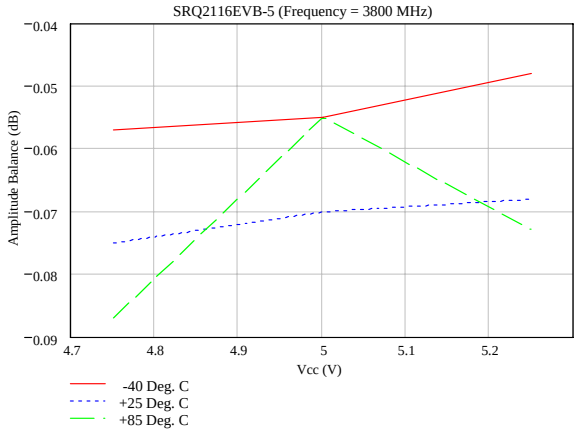


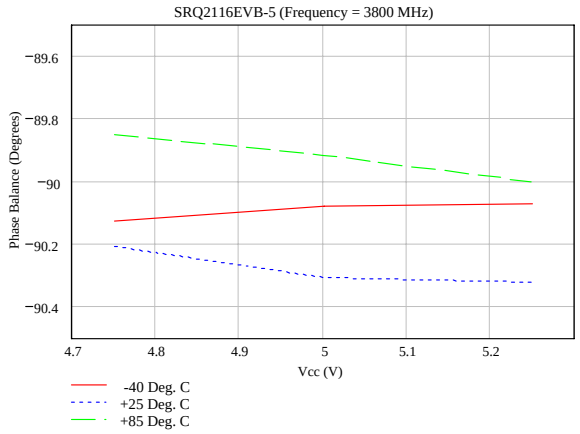


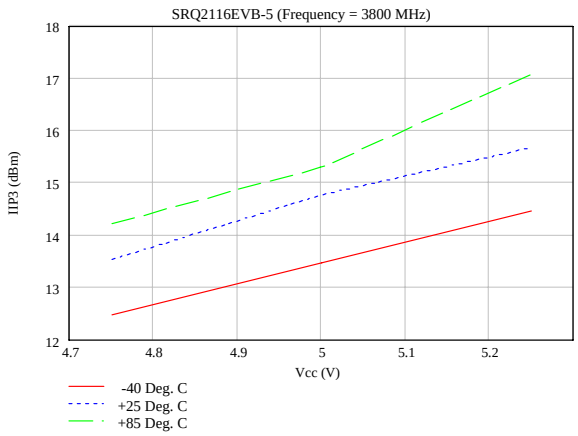


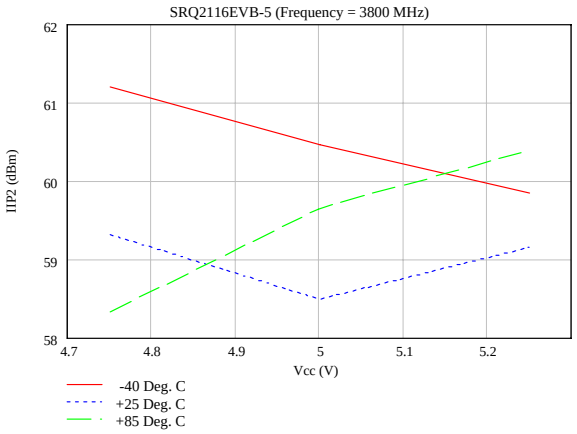
3300MHz to 3800MHz Typical Device Performance (cont.)

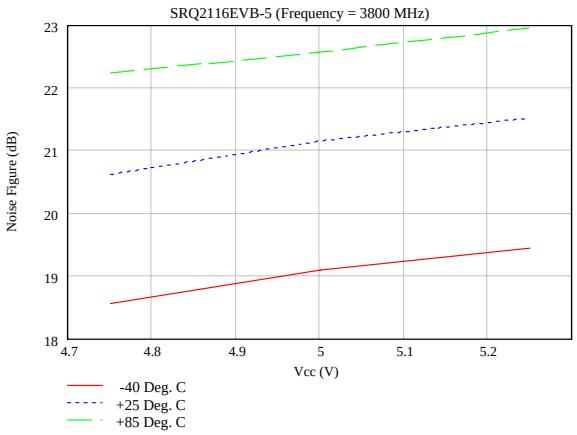












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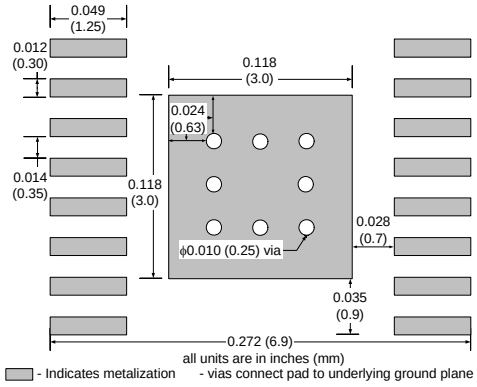
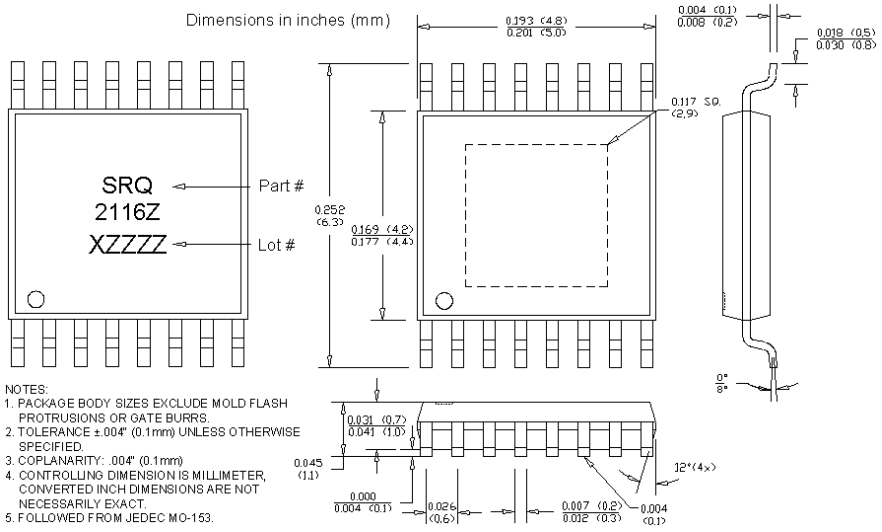
Pin	Function	Description
1	BBIP	I-channel baseband output, positive terminal. Nominal DC bias voltage is 1.9V (biased internally).
2, 7, 10, 15	VCC	Positive supply (+5V).
3, 6, 11, 14	VEE	Ground.
4	RFP	RF input, positive terminal. Nominal DC voltage is 1.9V. Input should be AC-coupled.
5	RFN	RF input, negative terminal. Nominal DC voltage is 1.9V. Input should be AC-coupled.
8	BBQP	Q-channel baseband output, positive terminal. Nominal DC bias voltage is 1.9V (biased internally).
9	BBQN	Q-channel baseband output, negative terminal. Nominal DC bias voltage is 1.9V (biased internally).
12	LON	LO input, negative terminal. Nominal DC voltage is 1.9V. Input should be AC-coupled.
13	LOP	LO input, positive terminal. Nominal DC voltage is 1.9V. Input should be AC-coupled.
16	BBIN	I-channel baseband output, negative terminal. Nominal DC bias voltage is 1.9V (biased internally).

Suggested PCB Pad Layout

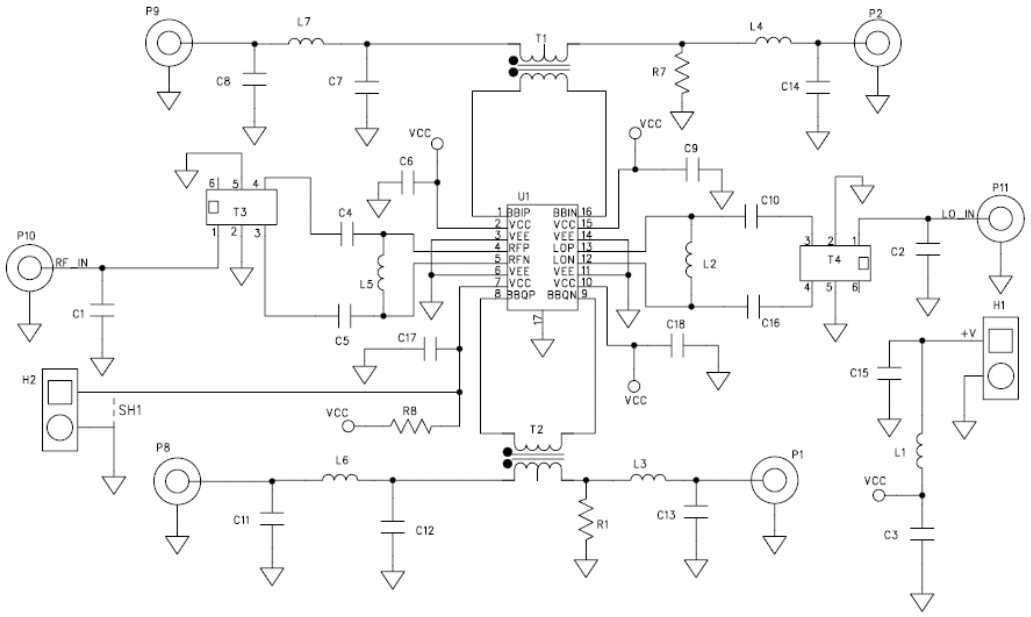


Package Drawing

Dimensions in inches (millimeters)
Refer to drawing posted at www.rfmd.com for tolerances.



Application Schematic



SRQ-2116ZEVB-1 Bill of Materials (700 – 1000 MHz Evaluation Board)

Component Designator	Value	Qty	Vendor	Part Number	Description
U1	N/A	1	SMDI	SRQ-2116Z	SiGe Direct Quadrature Demodulator
PCB	N/A	1	SMDI	125372A1	Printed Circuit Board
P1, P2, P8, P9, P10, P11	N/A	6	Johnson Components	142-0701-851	SMA connector, end launch with tab, for .062" thick board
H1	N/A	1	AMP	640453-2	2-pin header, right angle
T1, T2	1:1	2	Mini-Circuits	ADT1-6T	Baseband Transformer
T3, T4	1:1	2	Johanson	0900BL15C050	900 MHz Balun
L1	1uH	1	Panasonic	ELJ-FA1R0KF2	Inductor, 1210 footprint, ±10% tolerance
R1, R7, R8, L7, L6	0 ohm	5	KOA Spear	RM73Z1JT	Resistor, 0603 footprint, ±5% tolerance
C4, C5	33 pF	2	Murata	GRM36C0G330B050AQ	Capacitor, 0402 footprint, COG dielectric, 5% tolerance
C6, C9, C17, C18, C10, C16	47 pF	6	Murata	GRM36C0G560J050AQ	Capacitor, 0402 footprint, COG dielectric, 5% tolerance
C3, C15	2.2 uF	2	Venkel	C1206Y5V160-225ZNE	Capacitor, 1206 footprint, Y5V dielectric, 16V rating
C1, C2	0.5 pF	2	Murata	GRM36C0G0R5C050AQ	Capacitor, 0402 footprint, COG dielectric, 0.1 pF tolerance
C7, C8, C11, C12, C13, C14, L2, L3, L4, L5, H2	N/A	13			Components not populated

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SRQ-2116EVB-2 Bill of Materials (1700 - 2000 MHz Evaluation Board)

Component Designator	Value	Qty	Vendor	Part Number	Description
U1	N/A	1	SMDI	SRQ-2116Z	SiGe Direct Quadrature Demodulator
PCB	N/A	1	SMDI	125372A1	Printed Circuit Board
P1, P2, P8, P9, P10, P11	N/A	6	Johnson Components	142-0701-851	SMA connector, end launch with tab, for .062" thick board
H1	N/A	1	AMP	640453-2	2-pin header, right angle
T1, T2	1:1	2	Mini-Circuits	ADT1-6T	Baseband Transformer
T3, T4	1:1	2	Johanson	1850BL15B050	1850 MHz Balun
L1	1uH	1	Panasonic	ELJ-FA1R0KF2	Inductor, 1210 footprint, ±10% tolerance
L2	33 nH	1	Toko	LL1005F33NK	Inductor, 0402 footprint, ±10% tolerance
R1, R7, R8, L7, L6	0 ohm	5	KOA Spear	RM73Z1JT	Resistor, 0603 footprint, ±5% tolerance
C4, C5, C10, C16	3.3 pF	4	Murata	GRM36C0G3R3B050AQ	Capacitor, 0402 footprint, COG dielectric, 0.1 pF tolerance
C6, C9, C17, C18	6.8 pF	4	Murata	GRM36C0G6R8C050AQ	Capacitor, 0402 footprint, COG dielectric, 0.25 pF tolerance
C3, C15	2.2 uF	2	Venkel	C1206Y5V160-225ZNE	Capacitor, 1206 footprint, Y5V dielectric, 16V rating
C1, C2	0.5 pF	2	Murata	GRM36C0G0R5C050AQ	Capacitor, 0402 footprint, COG dielectric, 0.1 pF tolerance
C7, C8, C11, C12, C13, C14, L2, L3, L4, L5, H2	N/A	13			Components not populated

SRQ-2116EVB-3 Bill of Materials (2000 - 2300 MHz Evaluation Board)

Component Designator	Value	Qty	Vendor	Part Number	Description
U1	N/A	1	SMDI	SRQ-2116Z	SiGe Direct Quadrature Demodulator
PCB	N/A	1	SMDI	125372A1	Printed Circuit Board
P1, P2, P8, P9, P10, P11	N/A	6	Johnson Components	142-0701-851	SMA connector, end launch with tab, for .062" thick board
H1	N/A	1	AMP	640453-2	2-pin header, right angle
T1, T2	1:1	2	Mini-Circuits	ADT1-6T	Baseband Transformer
T3, T4	1:1	2	Panasonic	2BD2060	1850 MHz Balun
L1	1uH	1	Panasonic	ELJ-FA1R0KF2	Inductor, 1210 footprint, ±10% tolerance
R1, R7, R8, L7, L6	0 ohm	5	KOA Spear	RM73Z1JT	Resistor, 0603 footprint, ±5% tolerance
C4, C5, C10, C16	2.2 pF	4	Murata	GRM36C0G2R2B050AQ	Capacitor, 0402 footprint, COG dielectric, 0.1 pF tolerance
C6, C9, C17, C18	4.7 pF	4	Murata	GRM36C0G4R7C050AQ	Capacitor, 0402 footprint, COG dielectric, 0.25 pF tolerance
C3, C15	2.2 uF	2	Venkel	C1206Y5V160-225ZNE	Capacitor, 1206 footprint, Y5V dielectric, 16V rating
C1, C2, C7, C8, C11, C12, C13, C14, L2, L3, L4, L5, H2	N/A	13			Components not populated

SRQ-2116EVB-4 Bill of Materials (2300 - 2700MHz Evaluation Board)

Component Designator	Value	Qty	Vendor	Part Number	Description
U1	N/A	1	SMDI	SRQ-2116Z	SiGe Direct Quadrature Demodulator
PCB	N/A	1	SMDI	125372A1	Printed Circuit Board
P1, P2, P8, P9, P10, P11	N/A	6	Johnson Components	142-0701-851	SMA connector, end launch with tab, for .062" thick board
H1	N/A	1	AMP	640453-2	2-pin header, right angle
T1, T2	1:1	2	Mini-Circuits	ADT1-6T	Baseband Transformer
T3, T4	1:1	2	Johanson	2450BL15B050	2.45 GHz Balun
L1	1uH	1	Panasonic	ELJ-FA1R0KF2	Inductor, 1210 footprint, ±10% tolerance
R1, R7, R8, L7, L6	0 ohm	5	KOA Spear	RM73Z1JT	Resistor, 0603 footprint, ±5% tolerance
C4, C5, C10, C16	1.5 pF	4	Murata	GRM36C0G1R5B050AQ	Capacitor, 0402 footprint, C0G dielectric, 0.1 pF tolerance
C6, C9, C17, C18	5.6 pF	4	Murata	GRM36C0G5R6C050AQ	Capacitor, 0402 footprint, C0G dielectric, 0.25 pF tolerance
C3, C15	2.2 uF	2	Venkel	C1206Y5V160-225ZNE	Capacitor, 1206 footprint, Y5V dielectric, 16V rating
C1, C2, C7, C8, C11, C12, C13, C14, L2, L3, L4, L5, H2	N/A	13			Components not populated

SRQ-2116EVB-5 Bill of Materials (3300 - 3800MHz Evaluation Board)

Component Designator	Value	Qty	Vendor	Part Number	Description
U1	N/A	1	SMDI	SRQ-2116Z	SiGe Direct Quadrature Demodulator
PCB	N/A	1	SMDI	125372A1	Printed Circuit Board
P1, P2, P8, P9, P10, P11	N/A	6	Johnson Components	142-0701-851	SMA connector, end launch with tab, for .062" thick board
H1	N/A	1	AMP	640453-2	2-pin header, right angle
T1, T2	1:1	2	Mini-Circuits	ADT1-6T	Baseband Transformer
T3, T4	1:1	2	Johanson	3700BL15B050	3.7 GHz Balun
L1	1uH	1	Panasonic	ELJ-FA1R0KF2	Inductor, 1210 footprint, ±10% tolerance
R1, R7, R8, L7, L6	0 ohm	5	KOA Spear	RM73Z1JT	Resistor, 0603 footprint, ±5% tolerance
C4, C5, C10, C16	1.0 pF	4	Murata	GRM36C0G010B050AQ	Capacitor, 0402 footprint, C0G dielectric, 0.1 pF tolerance
C6, C9, C17, C18	4.7 pF	4	Murata	GRM36C0G4R7C050AQ	Capacitor, 0402 footprint, C0G dielectric, 0.25 pF tolerance
C3, C15	2.2 uF	2	Venkel	C1206Y5V160-225ZNE	Capacitor, 1206 footprint, Y5V dielectric, 16V rating
C1, C2, C7, C8, C11, C12, C13, C14, L2, L3, L4, L5, H2	N/A	13			Components not populated

Ordering Information

Part Number	Reel Size	Devices/Reel
SRQ-2116Z	7"	1000

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