

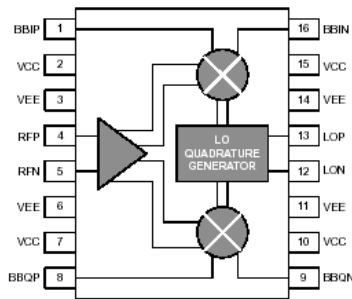


Product Description

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 and are capable of driving loads as low as 50 Ohms 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.

Functional Block Diagram



Test Conditions

(for all product specification tables unless otherwise noted)

V _{CC} (pins 2,10,15)	+5V
T _A	+25°C
RF Input	-25 dBm @ Mid-Band of Frequency Range
LO Input	0 dBm @ RF Frequency + 10 MHz

Product Specifications – RF Input

Parameters	Units	700-1000 MHz			1700-2000 MHz			2000-2300 MHz			2300-2700 MHz			3300-3800 MHz		
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.
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			+3.0			+4.0			+3.0			+3.0	
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	

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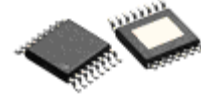
Preliminary Data Sheet

SRQ-2116Z



700 - 3800 MHz

Direct Quadrature Demodulator



16 pin TSSOP with Exposed Ground Pad

Package Footprint: 0.197 x 0.252 inches, (5.0 x 6.4 mm)

Package Height: 0.039 inches (1.0 mm)

Product Features

- High LO-RF Suppression
- Excellent Quadrature accuracy
- Hi Input IP2, IP3

Applications

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



Preliminary Data Sheet

SRQ-2116Z Direct Quadrature Demodulator

Product Specifications – LO Input

Parameters	Units	700-1000 MHz			1700-2000 MHz			2000-2300 MHz			2300-2700 MHz			3300-3800 MHz		
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.
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	

Product Specifications – I/Q Output

Parameters	Units	700-1000 MHz			1700-2000 MHz			2000-2300 MHz			2300-2700 MHz			3300-3800 MHz		
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.
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.)	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					
I/Q Common-Mode Voltage	V		1.9			1.9			1.9			1.9			1.9	

Product Specifications – Miscellaneous

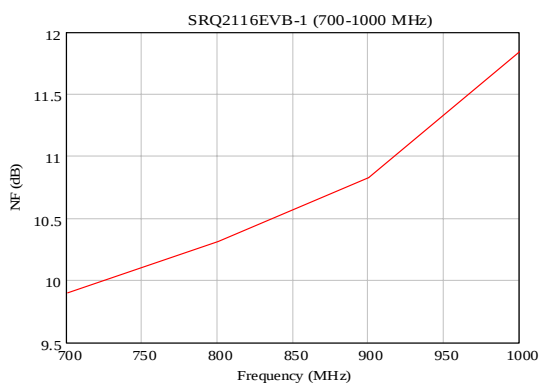
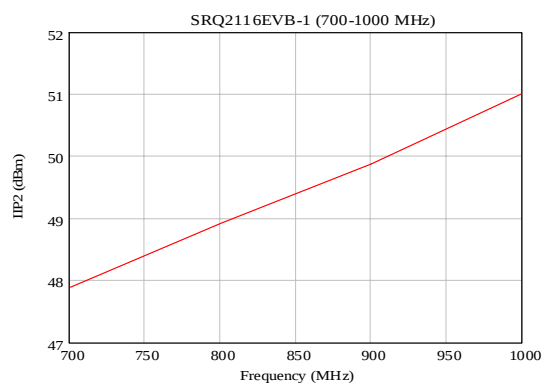
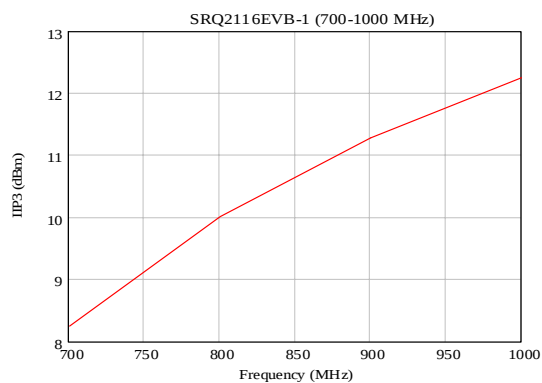
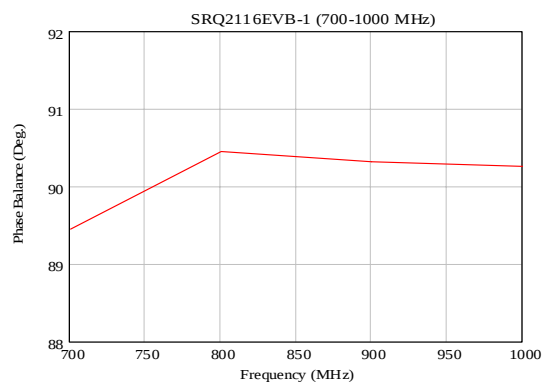
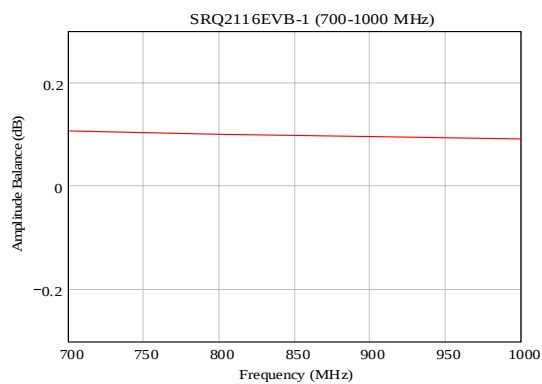
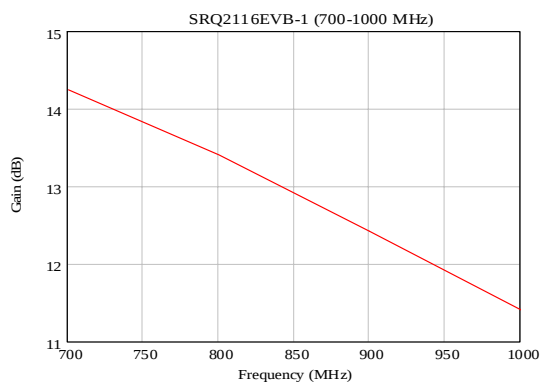
Parameters	Units	700-1000 MHz			1700-2000 MHz			2000-2300 MHz			2300-2700 MHz			3300-3800 MHz		
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.
Supply Voltage	V	4.75	5.0	5.25	4.75	5.0	5.25	4.75	5.0	5.25	4.75	5.0	5.25	4.75	5.0	5.25
Supply Current	mA		160			160			160			160			160	
Thermal Resistance	°C/W		28			28			28			28			28	
Application Circuit		SRQ-2116ZEVB-1			SRQ-2116ZEVB-2			SRQ-2116ZEVB-3			SRQ-2116ZEVB-4			SRQ-2116ZEVB-5		

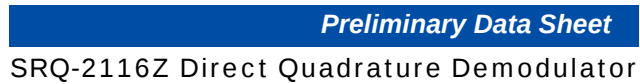


Preliminary Data Sheet

SRQ-2116Z Direct Quadrature Demodulator

700 - 1000 MHz Typical Device Performance





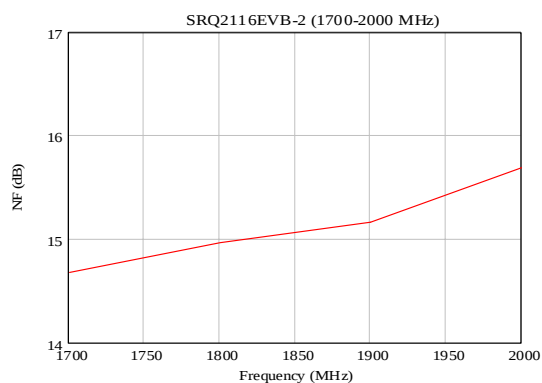
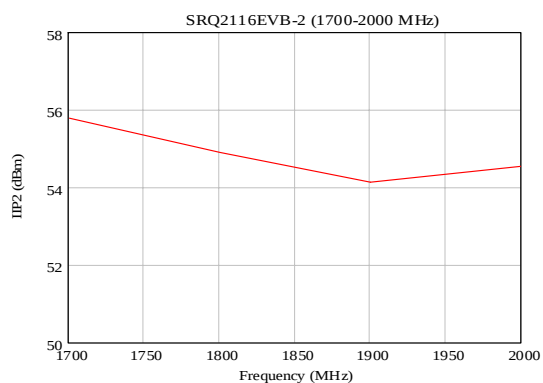
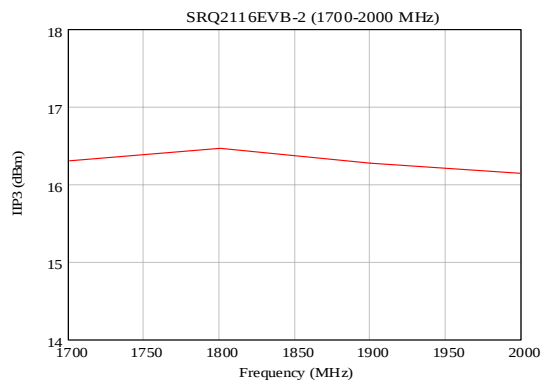
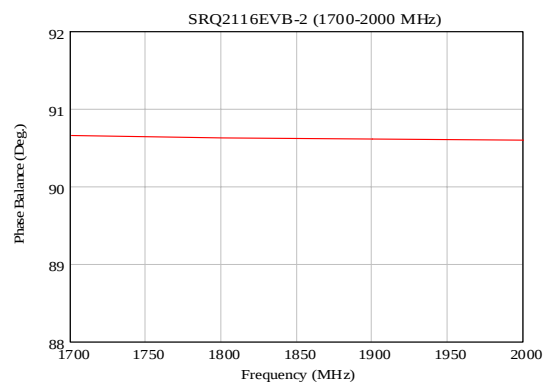
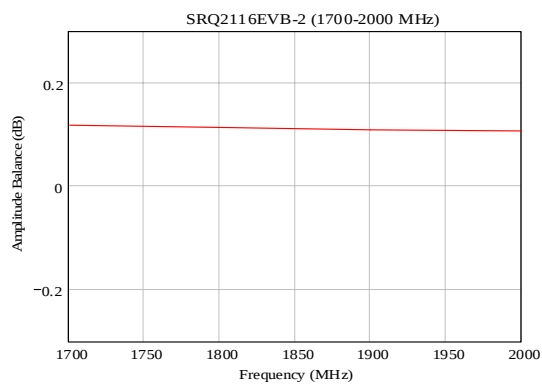
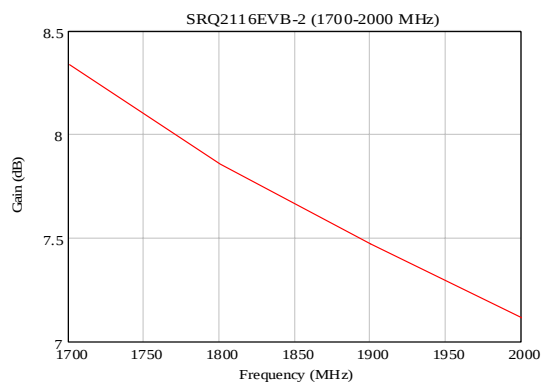
The graph displays the Noise Figure (dB) on the y-axis (ranging from 7 to 12) against the supply voltage V_{cc} (V) on the x-axis (ranging from 4.7 to 5.2). Three data series are plotted for different temperatures: -40 Deg. C (red solid line), +25 Deg. C (blue dashed line), and +85 Deg. C (green dash-dot line). All three series show a positive correlation between V_{cc} and Noise Figure, with the +85 Deg. C series consistently having the highest noise figure and the -40 Deg. C series having the lowest.

V_{cc} (V)	Noise Figure (dB) at -40 Deg. C	Noise Figure (dB) at +25 Deg. C	Noise Figure (dB) at +85 Deg. C
4.75	7.8	9.2	10.9
4.80	7.85	9.3	10.95
4.90	7.95	9.45	11.05
5.00	8.05	9.6	11.15
5.10	8.1	9.7	11.2
5.20	8.15	9.75	11.25
5.25	8.2	9.8	11.3

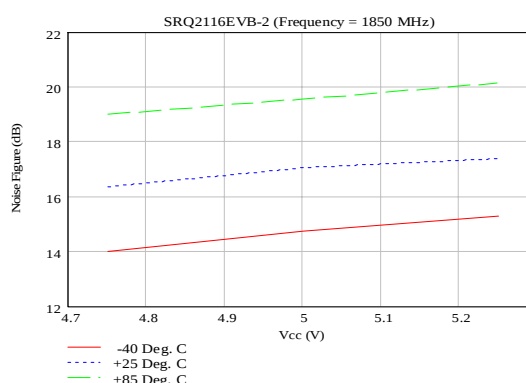
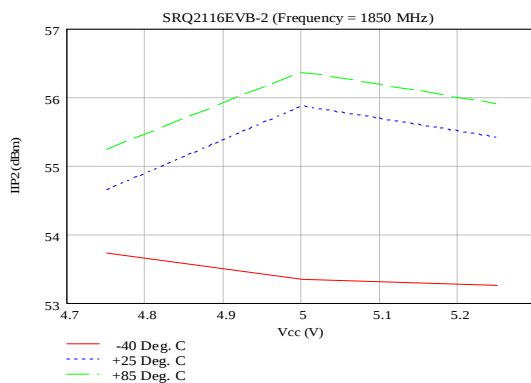
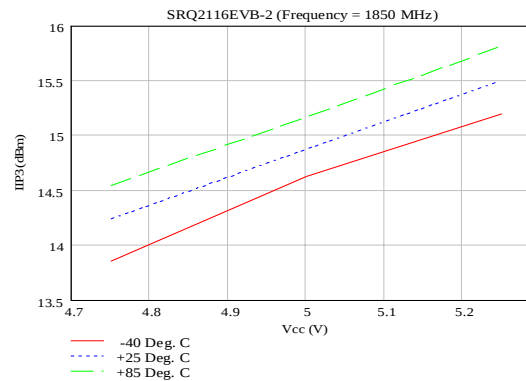
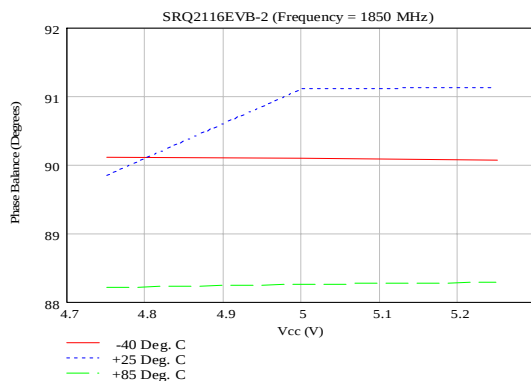
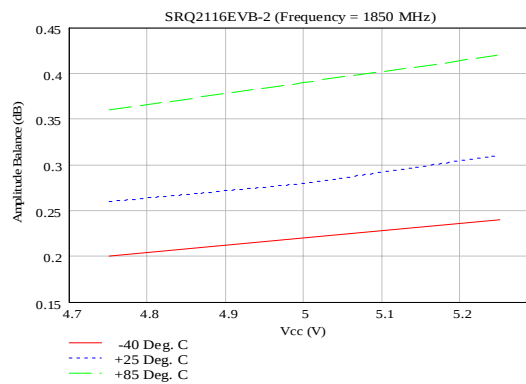
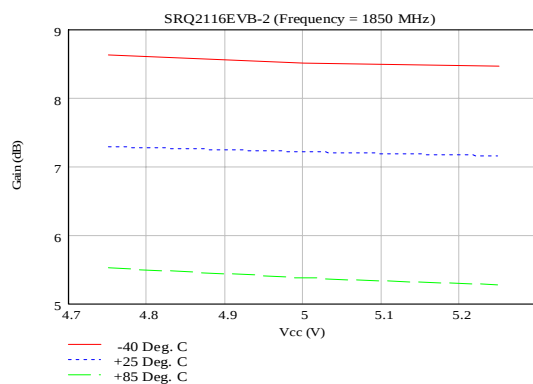


SRQ-2116Z Direct Quadrature Demodulator

1700 - 2000 MHz Typical Device Performance



1700 - 2000 MHz Typical Device Performance (cont.)

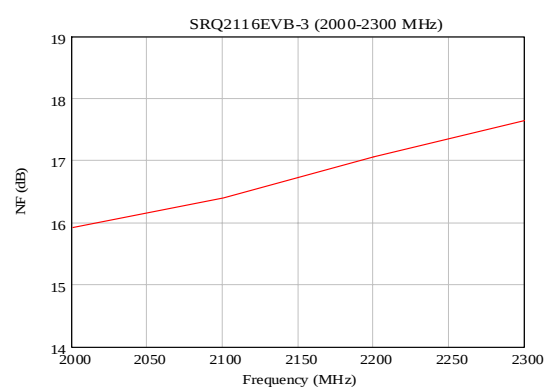
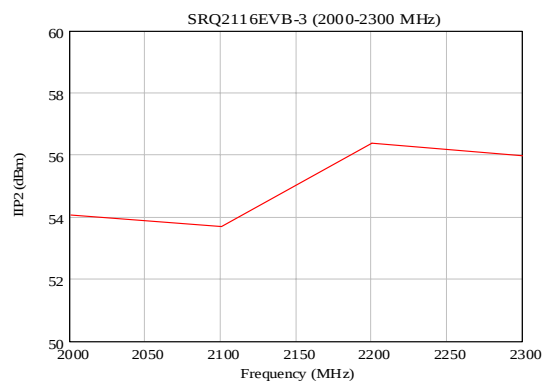
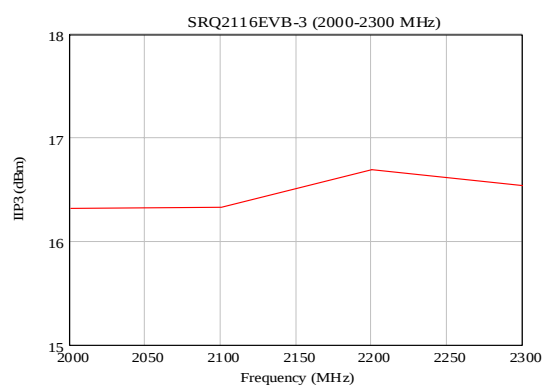
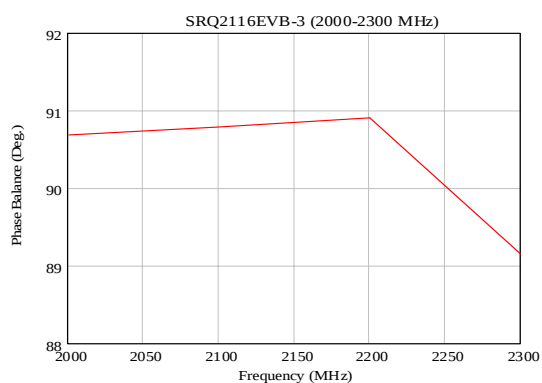
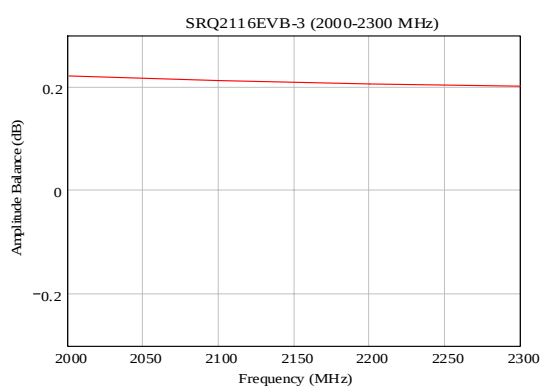
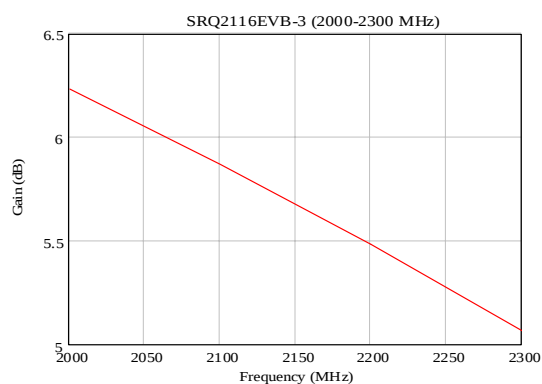




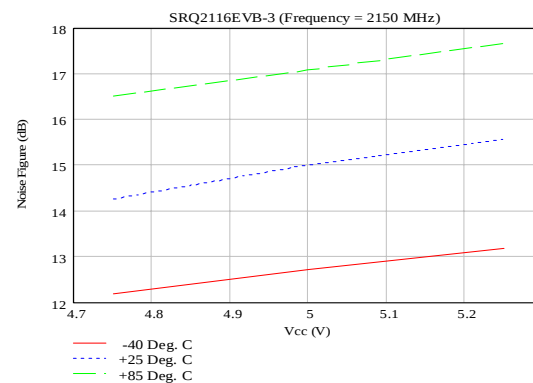
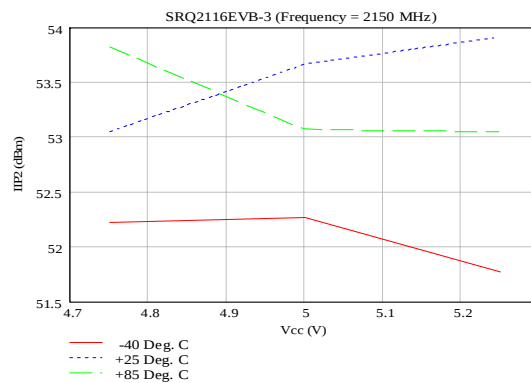
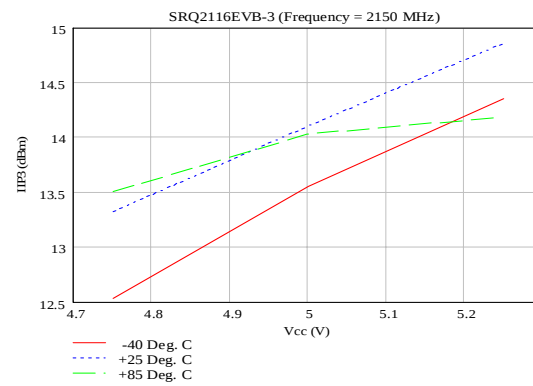
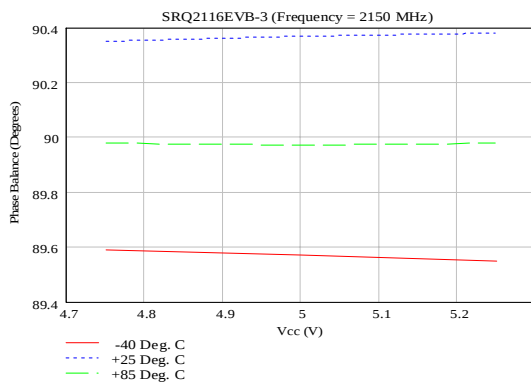
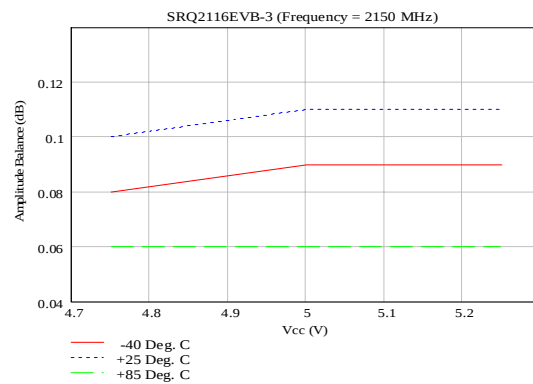
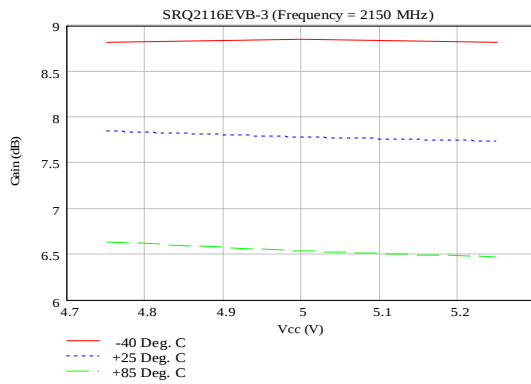
Preliminary Data Sheet

SRQ-2116Z Direct Quadrature Demodulator

2000 - 2300 MHz Typical Device Performance



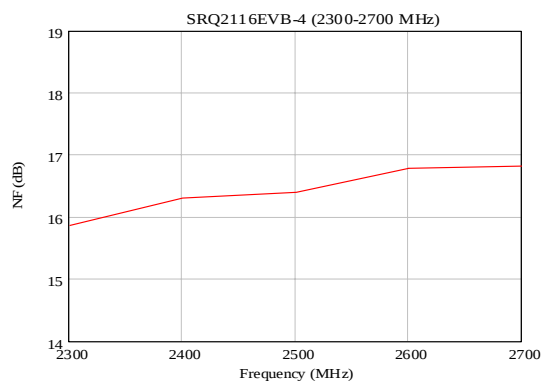
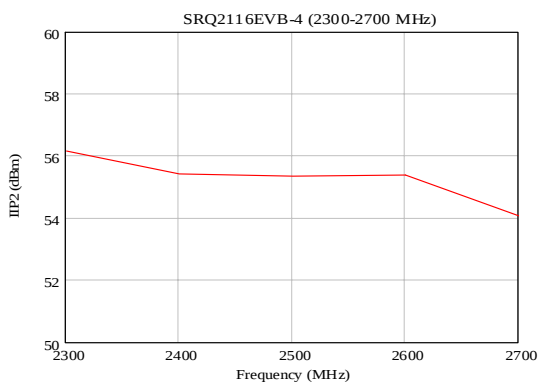
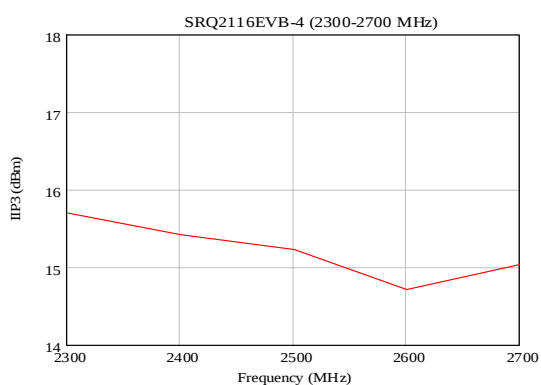
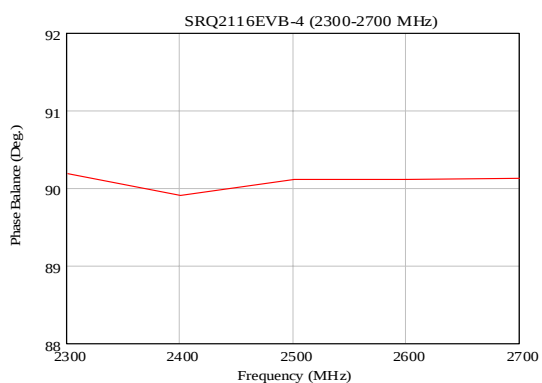
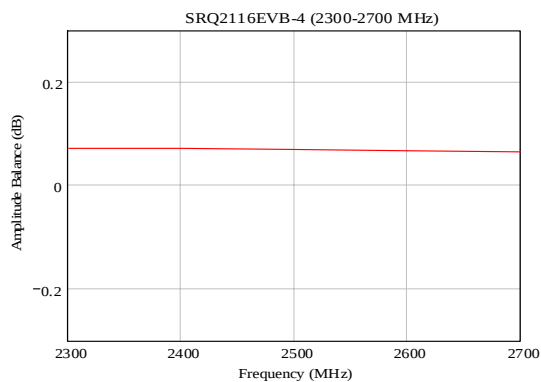
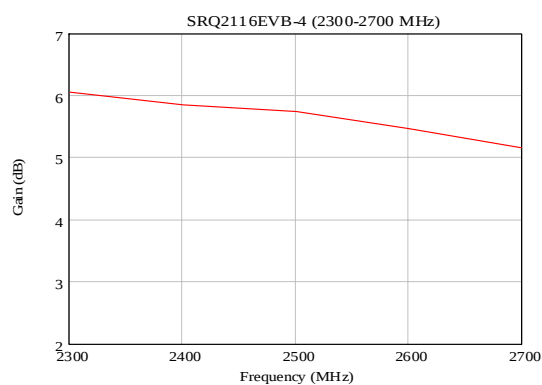
2000 - 2300 MHz Typical Device Performance (cont.)



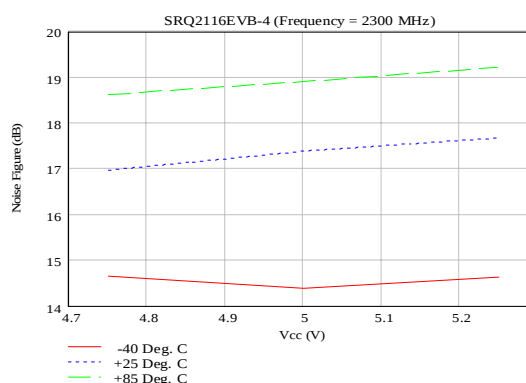
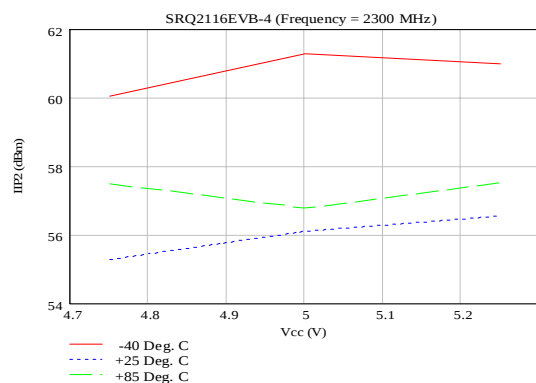
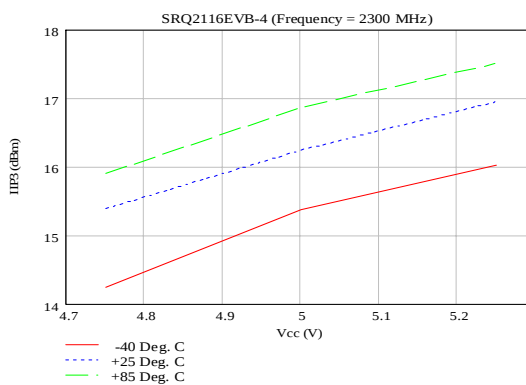
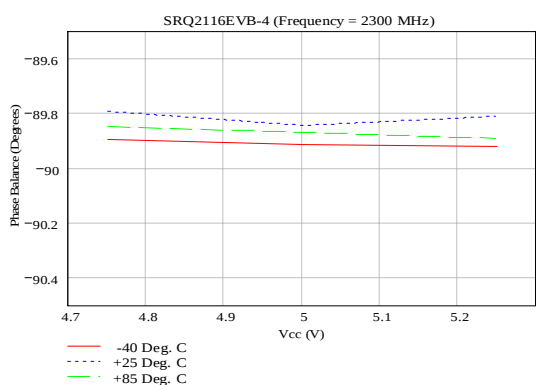
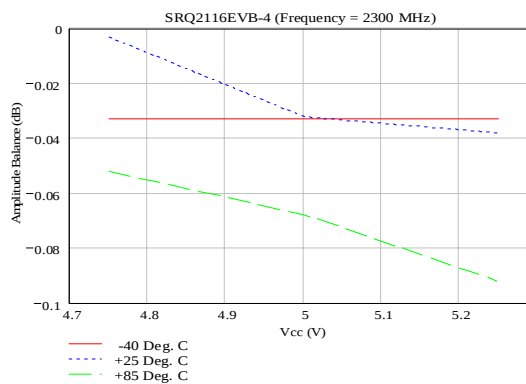
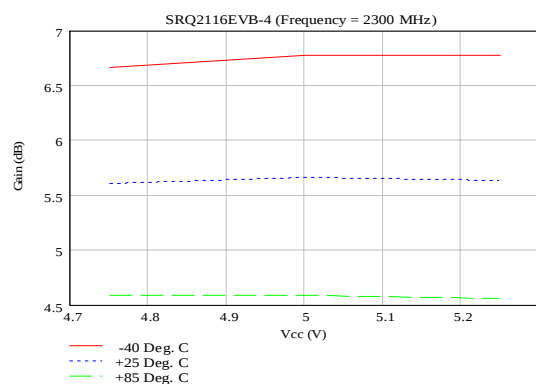


SRQ-2116Z Direct Quadrature Demodulator

2300 - 2700 MHz Typical Device Performance



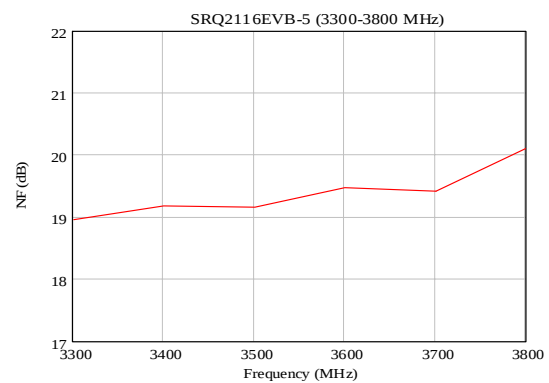
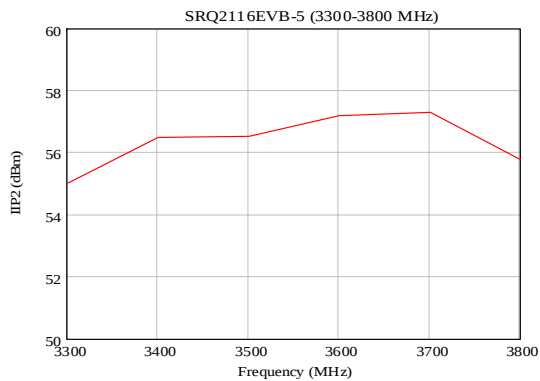
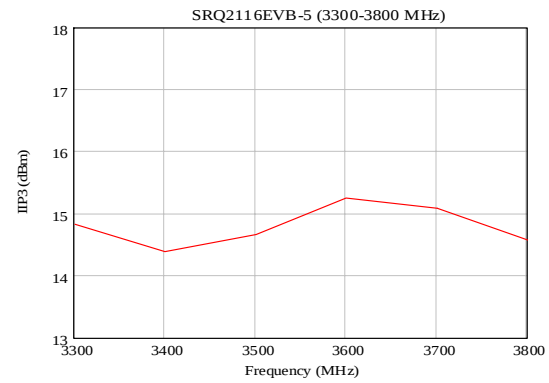
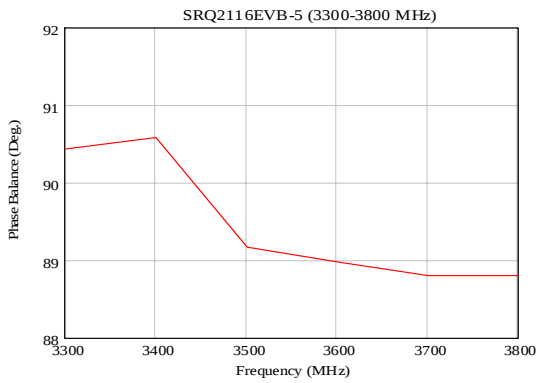
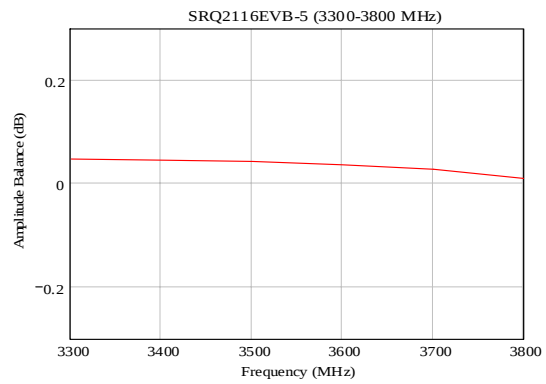
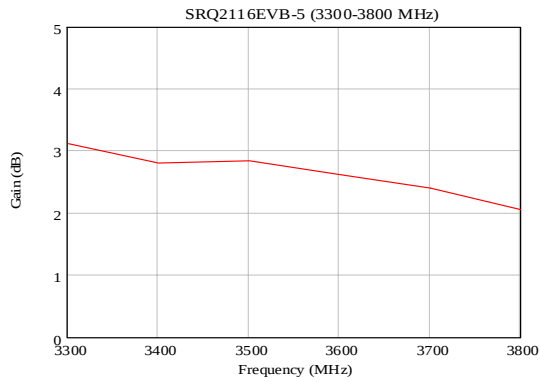
2300 - 2700 MHz Typical Device Performance (cont.)



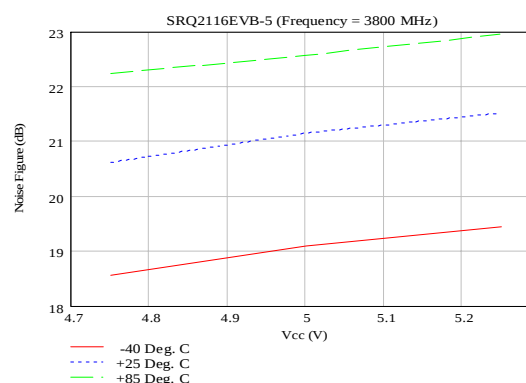
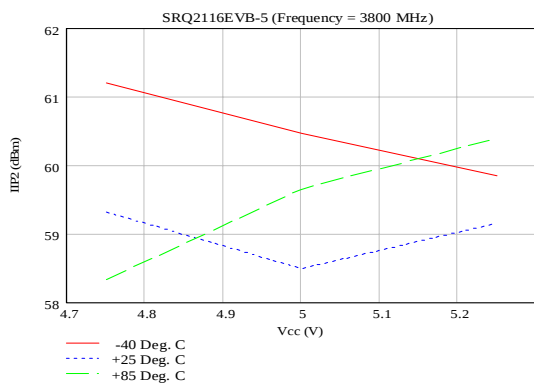
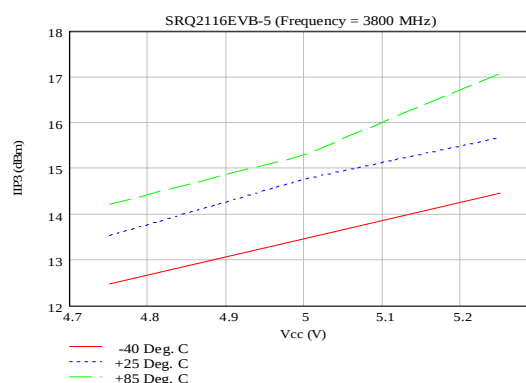
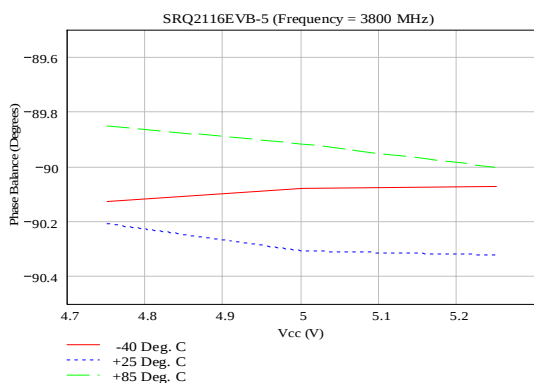
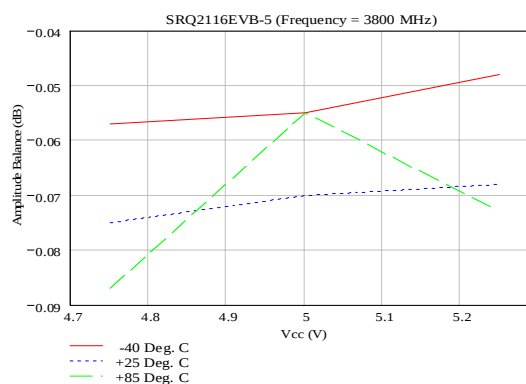
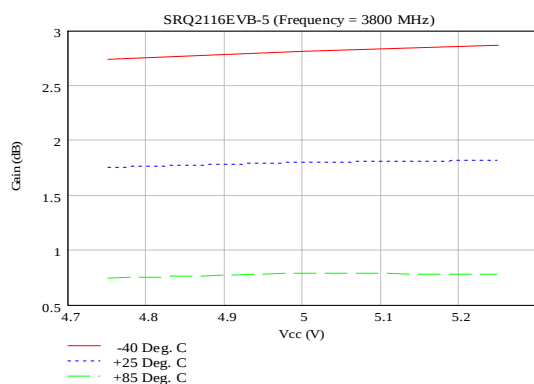


SRQ-2116Z Direct Quadrature Demodulator

3300 - 3800 MHz Typical Device Performance



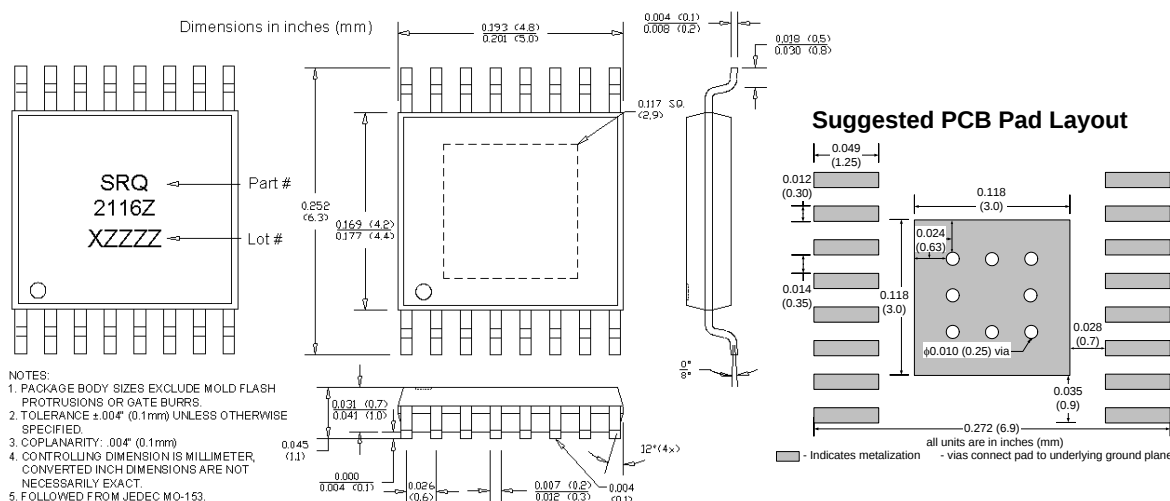
3300 - 3800 MHz Typical Device Performance (cont.)





Preliminary Data Sheet

Package Dimensions (TSSOP-16 E-Pad Package) SRQ-2116Z Direct Quadrature Demodulator



Pin Out Description

Pin #	Function	Description	Additional Comments
1	BBIP	I-channel baseband output, positive terminal	Nominal DC bias voltage is 1.9V (biased internally)
2	VCC	Positive supply (+5V)	
3	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.
6	VEE	Ground	
7	VCC	Positive supply (+5V)	
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)
10	VCC	Positive supply (+5V)	
11	VEE	Ground	
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.
14	VEE	Ground	
15	VCC	Positive supply (+5V)	
16	BBIN	I-channel baseband output, negative terminal	Nominal DC bias voltage is 1.9V (biased internally)

Absolute Maximum Ratings

Parameters	Value	Unit
Supply Voltage (VCC)	5.5	V _{DC}
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.

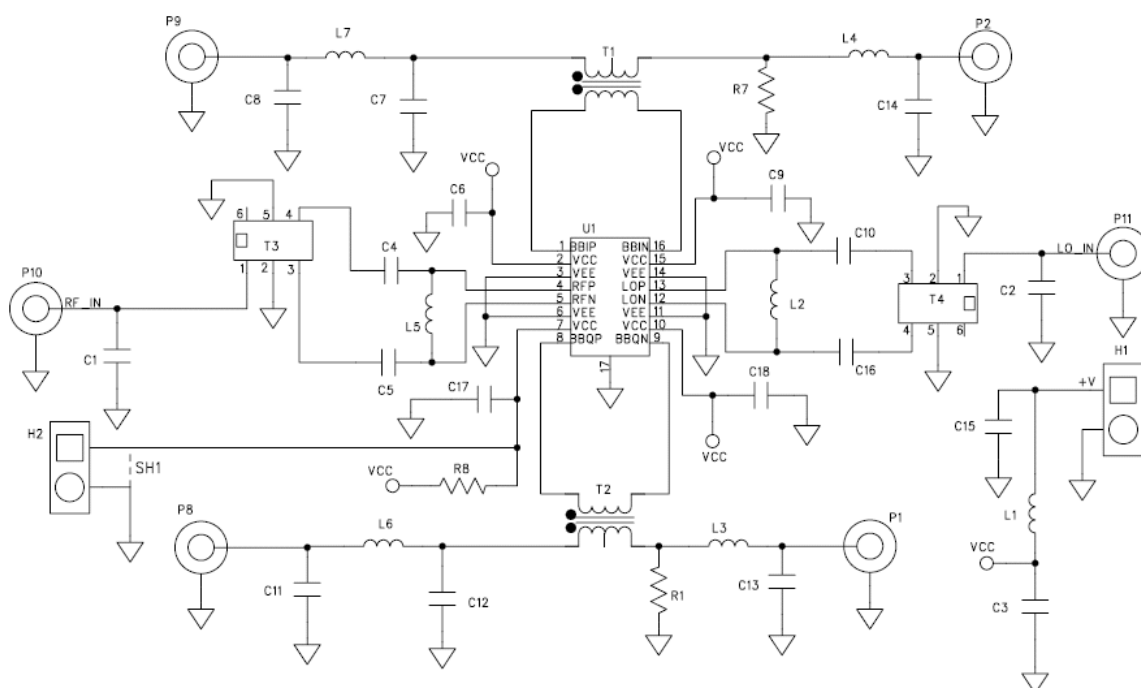
Part Number Ordering Information

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



Caution: ESD Sensitive

Appropriate precaution in handling, packaging and testing devices must be observed.



SRQ-2116ZEV1 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	GRM36COG330B050AQ	Capacitor, 0402 footprint, COG dielectric, 5% tolerance
C6, C9, C17, C18, C10, C16	47 pF	6	Murata	GRM36COG560J050AQ	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	GRM36COG0R5C050AQ	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



Preliminary Data Sheet

SRQ-2116Z Direct Quadrature Demodulator

SRQ-2116ZEVB-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, $\pm 10\%$ tolerance
L2	33 nH	1	Toko	LL1005F33NK	Inductor, 0402 footprint, $\pm 10\%$ tolerance
R1, R7, R8, L7, L6	0 ohm	5	KOA Spear	RM73Z1JT	Resistor, 0603 footprint, $\pm 5\%$ tolerance
C4, C5, C10, C16	3.3 pF	4	Murata	GRM36COG3R3B050AQ	Capacitor, 0402 footprint, COG dielectric, 0.1 pF tolerance
C6, C9, C17, C18	6.8 pF	4	Murata	GRM36COG6R8C050AQ	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	GRM36COG0R5C050AQ	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-2116ZEVB-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, $\pm 10\%$ tolerance
R1, R7, R8, L7, L6	0 ohm	5	KOA Spear	RM73Z1JT	Resistor, 0603 footprint, $\pm 5\%$ tolerance
C4, C5, C10, C16	2.2 pF	4	Murata	GRM36COG2R2B050AQ	Capacitor, 0402 footprint, COG dielectric, 0.1 pF tolerance
C6, C9, C17, C18	4.7 pF	4	Murata	GRM36COG4R7C050AQ	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



Preliminary Data Sheet

SRQ-2116Z Direct Quadrature Demodulator

SRQ-2116ZEV-4 Bill of Materials (2300 – 2700 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	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	GRM36COG1R5B050AQ	Capacitor, 0402 footprint, COG dielectric, 0.1 pF tolerance
C6, C9, C17, C18	5.6 pF	4	Murata	GRM36COG5R6C050AQ	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-2116EV-5 Bill of Materials (3300 – 3800 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	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	GRM36COG010B050AQ	Capacitor, 0402 footprint, COG dielectric, 0.1 pF tolerance
C6, C9, C17, C18	4.7 pF	4	Murata	GRM36COG4R7C050AQ	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