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USRP™ N310

Simplifying SDR Deployment

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Product Overview

The USRP N310 is a networked software defined radio that provides reliability and fault-tolerance for deployment in large scale and distributed wireless systems. This SDR is one of the highest channel density devices available, using dual AD9371 RFIC transceivers from Analog Devices to provide 4 RX and 4 TX channels in a half-wide RU form factor. Each channel provides up to 100 MHz of instantaneous bandwidth, and covers an extended frequency range from 10 MHz to 6 GHz. The baseband processor uses the Xilinx Zynq-7100 SoC to deliver a large user programmable FPGA for real-time and low latency processing and a dual-core ARM CPU for stand-alone operation. Support for, 1 GbE, 10 GbE, and Aurora interfaces over dual SPF+ ports enables high throughput IQ streaming to a host PC or FPGA co-processor. A flexible synchronization architecture with support for clock reference, PPS time reference, external LO input, and GPSDO enables implementation of high channel count MIMO systems. The USRP N310 also introduces a new generation of USRP software that simplifies control and management of multiple devices over the network with the unique capability to remotely administrate tasks such as debugging, updating software, rebooting, resetting to factory state, host PC/ARM debugging, and monitoring system health.

Applications

Wireless Testbeds

High channel density provides a cost effective way of building large, scalable MIMO testbeds for a variety of advanced wireless research topics. The remote management features reduce the effort to deploy in server rooms or across buildings and test sites.

Remote Radio Heads

The RF front end is highly suitable for prototyping cellular basestation/UE applications. The USRP N310 can also be deployed as small cells to serve dense networks such as urban centers and stadiums.

Features

RF Capabilities
- 4 TX, 4 RX
- Filter banks
- 10 MHz to 6 GHz
- Up to 100 MHz bandwidth per channel

Baseband Processing
- Xilinx Zynq 7100
  - Dual-core ARM Cortex-A9 800 MHz with 1 GB DDR3 RAM

Software
- UHD version 3.11.0.0 or later
- RFNoC
- GNU Radio
- C/C++
- Python

Synchronization
- Clock ref
- PPS time ref
- Trig/PPS out
- GPSDO included
- Ext. TX, RX LO input

Peripherals
- 2 SFP+ (1/10 GbE, Aurora)
- RJ45 (1 GbE)
- 1 Type A USB Host
- 1 Micro-USB (serial console, JTAG)

Power
- 12 V, 7 A DC

Form Factor
- Half-wide RU (357.1 x 211.1 x 43.7 mm)
- 3.13 kg

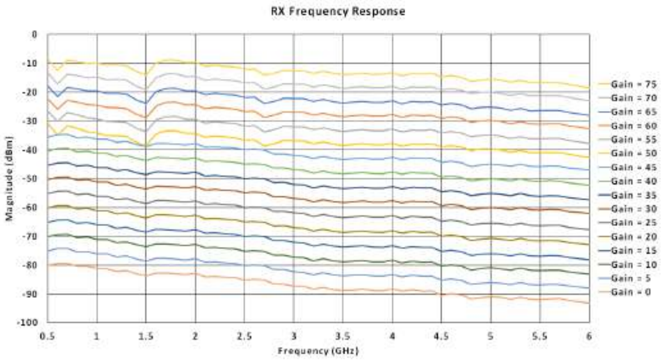
Specifications[1]

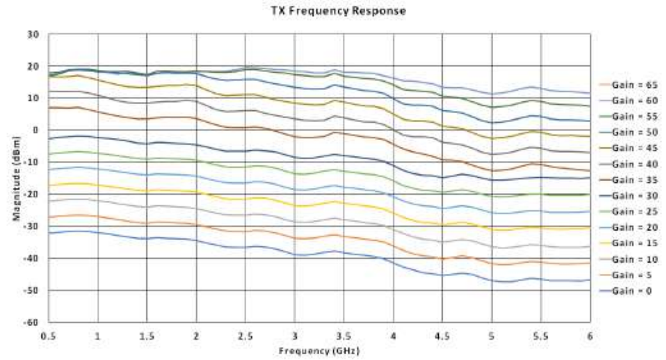
Specification	Typical	Unit
Receiver[2]		
Number of Channels - Independently Tuned - LO Sharing Pairs	4 2 2	– – –
Gain Range[3]	-40 – 30	dB
Gain Step	1	dB
Max Input Power	-15	dBm
Filter Banks	10 – 430 430 – 600 600 – 1050 1050 – 1600 1600 – 2100 2100 – 2700 2700 – 6000	MHz MHz MHz MHz MHz MHz MHz
External LO Frequency Range[4]	0.6 – 8	GHz
TX/RX Switching Time[5]	140	µs
Transmitter[2]		
Number of Channels - Independently Tuned - LO Sharing Pairs	4 2 2	– – –
Gain Range[3] 10 MHz – 300 MHz 300 MHz – 6 GHz	 -30 – 25 -30 – 20	 dB dB
Gain Step	1	dB
Filter Banks	10 – 300 300 – 723.17 723.17 – 1623.17 1623.17 – 3323.17 3323.17 – 6000	MHz MHz MHz MHz MHz
External LO Frequency Range[4]	0.6 – 8	GHz
TX/RX Switching Time[5]	140	µs

Specification	Typical	Unit
Conversion[2] and Clock Performance		
Sample Rates	122.88, 125, 153.6	MS/s
ADC Resolution	16	bits
DAC Resolution	14	bits
Min. Frequency Step 122.88 MS/s 125 MS/s 153.6 MS/s	 7.32 7.45 9.15	 Hz Hz Hz
GPSDO Frequency Stability Unlocked[6]	0.1	ppm
GPSDO PPS Accuracy to UTC[6]	< 8	ns
GPSDO Holdover Stability[6]	< +/-50 3 25	µs hours °C
Power		
DC Input	12, 7	V, A
Power Consumption	50 – 80	W
Physical		
Dimensions	357 x 211 x 43.7	mm
Weight	3.13	kg
Environmental		
Operating Temperature Range	0 – 50	°C
Storage Temperature Range	-40 – 70	°C
Operating Shock (Tested in accordance with IEC 60068-2-27. Meets MIL-PRF-28800F Class 2 limits.)	30 half-sine 11	g peak ms pulse
Operating Random Vibration (Tested in accordance with IEC 60068-2-64.)	5 – 500 0.3	Hz g rms
Non-Operating Random Vibration (Tested in accordance with IEC 60068-2-64. Non-operating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)	5 – 500 2.4	Hz g rms

[1] All specifications are subject to change without notice. This equipment information is only for product description and is not covered by warranty. Characteristic specifications are unwarranted values that are representative of an average unit operating at room temperature.
[2] Additional transceiver and converter specifications can be found on the AD9371 data sheet. http://www.analog.com/media/en/technical-documentation/data-sheets/AD9371.pdf
[3] RX and TX path gain does not correlate to UHD gain settings. The received signal amplitude and output power resulting from the gain setting varies over the frequency band and among devices.
[4] When using external LO sources, the operating frequency range is limited to 300 MHz to 4 GHz. The external LO frequency must be twice the operating frequency. Phase coherency is not repeatable after retune or reinitialization of the RF front-end. Phase recalibration is required after these operations.
[5] Switching time is based on non-deterministic software control of the AD9371 transceiver. UHD modifications will be made to directly control the switch component at the TX/RX ports for faster performance.
[6] Clock and timing specifications are based on information from component vendors and are not measured. Visit the USRP N310 hardware resources page: https://kb.ettus.com/N300/N310

Specifications[1]





RX Noise Figure[7]		
Frequency (GHz)	TX/RX port (dB)	RX2 port (dB)
1.8	6.8	5.8
2.4	7.5	6.5
4.4	7.0	5.5
5.8	6.4	6.4

Frequency (GHz)	Maximum Output Power (dBm)[8]
0.01 – 0.5	16
0. 5 – 1	18
1 – 4	18
4 – 6	12

Frequency (GHz)	RX Third Order Intermodulation Distortion (dBc)
0. 5 – 3	< -80
3 – 4	< -74
4 – 6	< -81

Frequency (GHz)	TX Output Third-Order Intercept (OIP3) (dBm)
0. 01 – 2	> 30
2 – 4	> 20
4 – 6	> 10

TX RX Phase Noise (dBc/Hz)				
Frequency Offset	1.0 GHz	2.0 GHz	3.0 GHz	5.5 GHz
10 kHz	-103	-97	-92	-85
100 kHz	-105	-99	-98	-87
1 MHz	-133	-128	-125	-116

[7] Noise figure is measured at maximum gain state on the receive signal path.
[8] Maximum output power is achieved when all transmit amplifiers are enabled.

About Ettus Research

Ettus Research™, a National Instruments brand, is the world's leading supplier of software defined radio platforms, including the USRP™ (Universal Software Radio Peripheral) family of products. The USRP platform supports multiple development environments on an expansive portfolio of high performance RF hardware, and enables algorithm design, exploration, prototyping, and deployment of next generation wireless technologies across a wide variety of applications spanning DC to 6 GHz such as cognitive radio, spectrum monitoring and analysis, remote sensing, advanced wireless prototyping, mobile radio, public safety, broadcast TV, satellite communication, and navigation.

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