



# USRP™ E313

## Rugged and Weatherproof

## USRP E313

### Product Overview

The USRP E313 is a rugged and weatherproof SDR designed for outdoor deployment. Containing an embedded USRP E310 inside an IP67-rated enclosure, the USRP E313 provides ingress protection against dust and water with extensive testing to ensure operation under demanding environmental conditions. The USRP E313 also conveniently supports Power over Ethernet with surge and lightning protection. This stand-alone SDR features the flexible 2x2 MIMO AD9361 transceiver from Analog Devices, which provides up to 56 MHz of bandwidth and spans frequencies from 70 MHz – 6 GHz to cover multiple bands of interest. RF filter banks in both the transmitter and receiver front-end enhances selectivity. The baseband processor uses the Xilinx Zynq 7020 SoC to deliver FPGA accelerated computations combined with stand-alone operation enabled by a dual-core ARM CPU. An integrated GPS receiver for position awareness and time-based synchronization enables geolocation applications. In addition, a host USB port expands storage, I/O, and communication options with off-the-shelf devices. The USRP Embedded Series platform uses the OpenEmbedded framework to create custom Linux distributions tailored to application specific needs. The default operating system is pre-installed with the USRP Hardware Driver™ (UHD) software and a variety of third-party development tools such as GNU Radio. Support for the RF Network on Chip (RFNoC™) FPGA development framework enables deterministic computations for real-time and wideband signal processing. Users can rapidly prototype and reliably deploy designs for embedded applications intended for the unpredictable outdoors.

### Applications

#### Spectrum Monitoring and Analysis

RF filter banks enhance the selectivity of the transceiver to accurately distinguish a broad range of spectral signals. The user-programmable FPGA enables deterministic computations for real-time spectrum analysis.



### Features

#### RF Capabilities

- 2 RX, 2 TX
- Filter banks
- 70 MHz to 6 GHz frequency range
- Up to 56 MHz of bandwidth

#### Baseband Processing

- Xilinx Zynq 7020
  - ARM Cortex A9 866 MHz dual-core
  - 7 Series FPGA
- 1 GB DDR3 RAM for ARM processor
- 512 MB DDR3 RAM for FPGA logic
- Up to 10 MS/s sample data transfer rate to ARM processor

#### Software

- UHD version 3.9.2 or later
- RFNoC
- GNU Radio
- C/C++
- Python

#### Synchronization

- PPS time reference

#### Power

- External DC power supply
- PoE with surge protection

#### Peripherals

- 10/100/1000 BASE-T Ethernet
- Integrated GPS receiver
- Stereo audio out, mono mic in
- Host USB
- 9-axis IMU

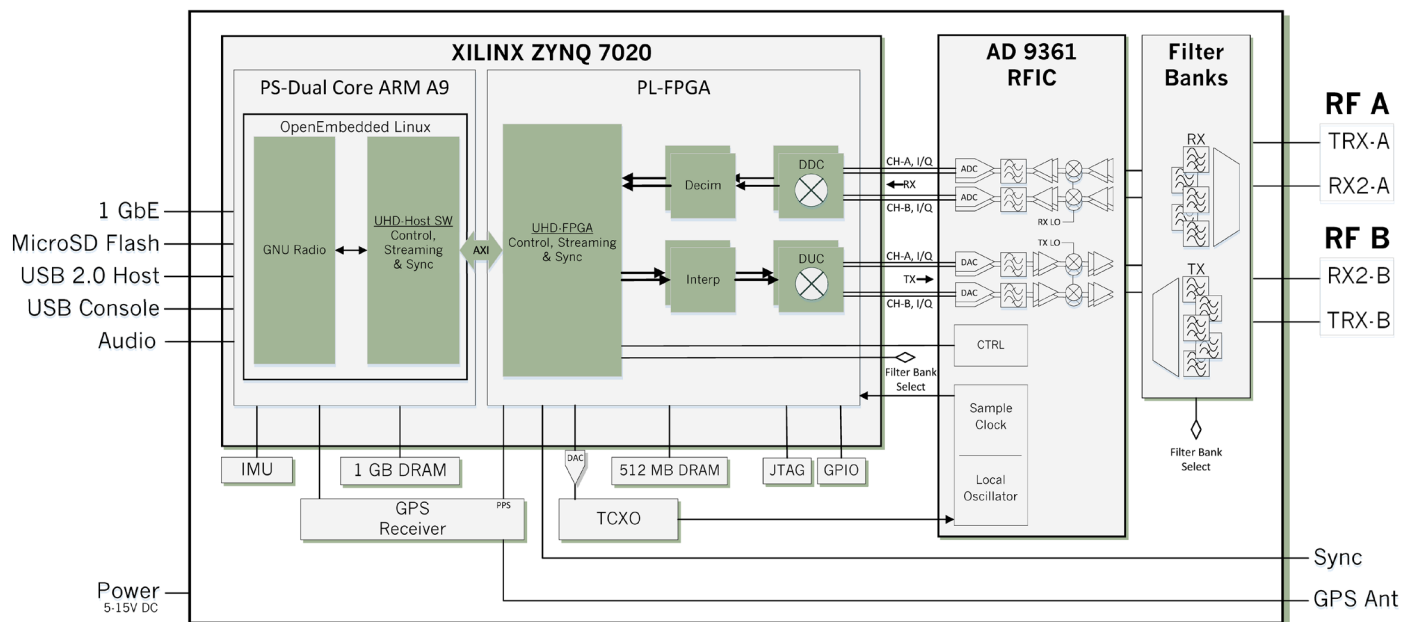
#### Form Factor

- 186 x 280 x 106 mm
- 1.8 kg

# Specifications<sup>1</sup>

| Specification  | Typical         | Unit  |
|--|-----------------|-------|
| <b>RF Performance<sup>2</sup></b>                    |                 |       |
| IIP3 (at typical NF)                                 | -20             | dBm   |
| Power Output   | > 10            | dBm   |
| Receive Noise Figure                                 | < 8             | dB    |
| <b>Conversion Performance and Clocks<sup>2</sup></b> |                 |       |
| ADC Sample Rate (Max.)                               | 61.44           | MS/s  |
| ADC Resolution                                       | 12              | bits  |
| DAC Sample Rate (Max.)                               | 61.44           | MS/s  |
| DAC Resolution                                       | 12              | bits  |
| Host Sample Rate (16b)                               | 61.44           | MS/s  |
| Frequency Accuracy                                   | ±2.0            | ppm   |
| <b>Power</b>   |                 |       |
| DC Input   | 5 – 19          | V     |
| Power Consumption                                    | < 18            | W     |
| PoE Transient Over-Voltage Rating                    | 500             | V rms |
| <b>Physical</b>                                      |                 |       |
| Dimensions (excluding mounting bracket)              | 186 x 280 x 106 | mm    |
| Weight   | 1.8             | kg    |

| Specification                       | Typical               | Unit                   |
|-------------------------------------|-----------------------|------------------------|
| <b>Ingress Protection (IP Code)</b> |                       |                        |
| Against Foreign Objects             | 6                     | –                      |
| Against Water                       | 7                     | –                      |
| <b>Temperature</b>                  |                       |                        |
| Operating                           | -40 – 71              | °C                     |
| Non-Operating                       | -40 – 85              | °C                     |
| <b>Humidity (Non-Condensing)</b>    |                       |                        |
| Operating                           | 10 – 90               | %                      |
| Non-Operating                       | 5 – 95                | %                      |
| <b>Shock and Vibration</b>          |                       |                        |
| Operating Mechanical Shock          | 30<br>half-sine<br>11 | g peak<br><br>ms pulse |
| Operating Random Vibration          | 5 – 500<br>0.3        | Hz<br>g rms            |
| Non-Operating Random Vibration      | 5 – 500<br>2.4        | Hz<br>g rms            |
| <b>Altitude</b>                     |                       |                        |
| Operating                           | 2000                  | m                      |



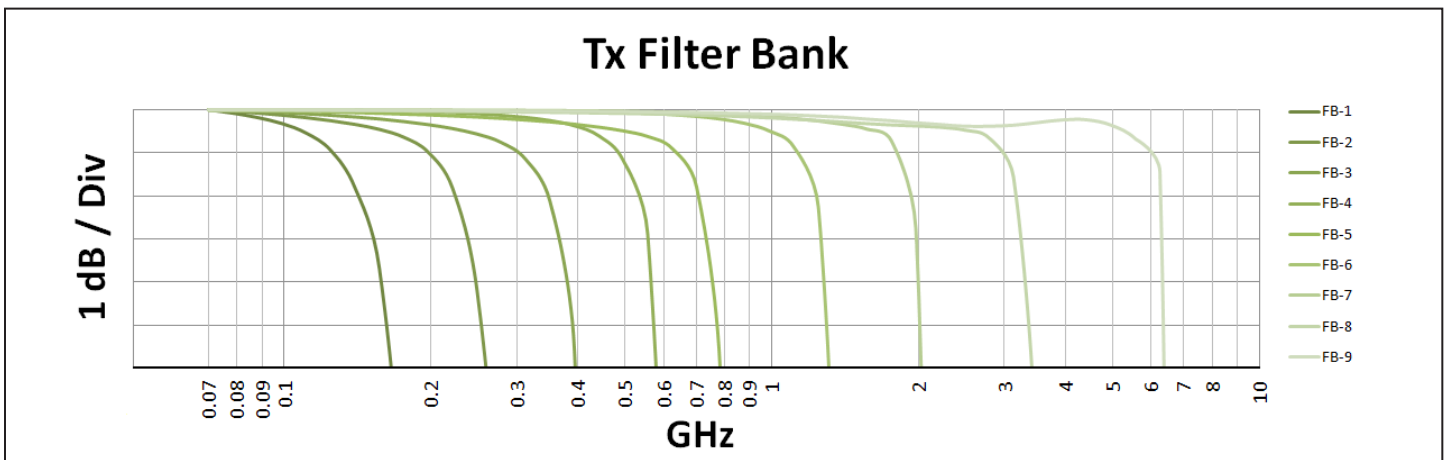
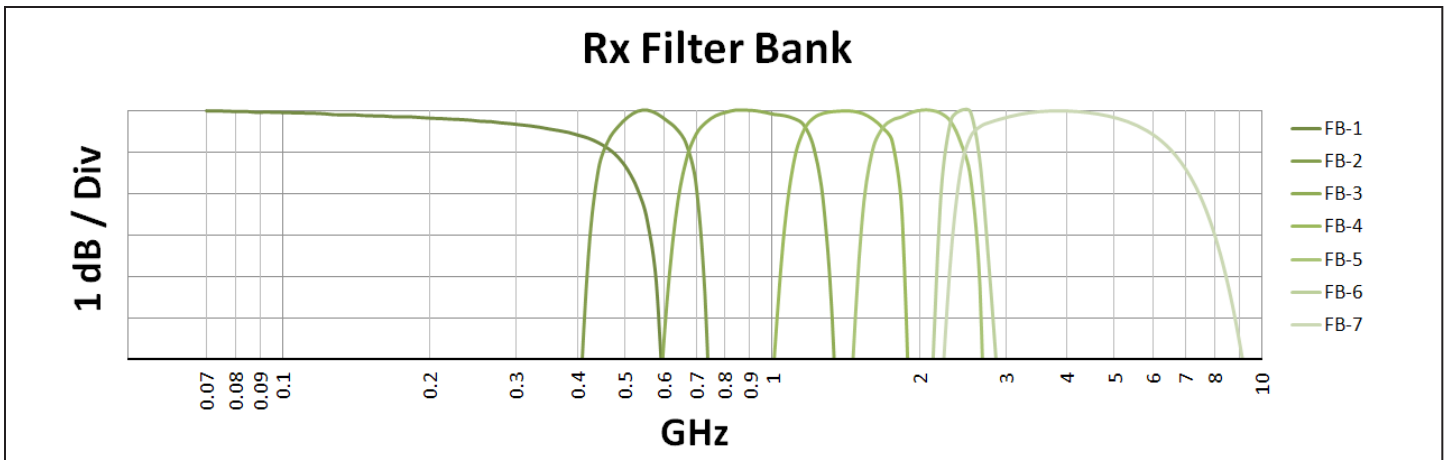
<sup>1</sup> All specifications are subject to change without notice.

<sup>2</sup> Additional RF and digitizer specifications can be found on the ADI 9361 data sheet. <http://www.analog.com/media/en/technical-documentation/data-sheets/AD9361.pdf>

# Specifications

## RF Filter Bank Performance<sup>3</sup>

The USRP E313 contains both RX and TX filter banks. Filters are dynamically chosen based on user frequency selection. The RX filters reduce interference from out-of-band signals, while the TX filters suppress harmonics.



<sup>3</sup> Normalized values based on component characteristics.

## About Ettus Research

Ettus Research™, a National Instruments company, 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.

