B205mini

Contents

The USRP Bus Series provides a fully integrated, single board, Universal Software Radio Peripheral platform with continuous frequency coverage from 70 MHz ? 6 GHz. Designed for low-cost experimentation, it combines a fully integrated direct conversion transceiver providing up to 56MHz of real-time bandwidth, an open and reprogrammable Spartan6 FPGA, and fast and convenient bus-powered SuperSpeed USB 3.0 connectivity.

- Xilinx Spartan 6 XC6SLX75 FPGA
- Analog Devices AD9364 RFIC direct-conversion transceiver
- Frequency range: 70 MHz - 6 GHz
- Up to 56 MHz of instantaneous bandwidth
- Full duplex, SISO (1 Tx & 1 Rx)
- Fast and convenient bus-powered USB 3.0 connectivity
- Optional Board Mounted GPSDO

- Xilinx Spartan 6 XC6SLX150 FPGA
- Analog Devices AD9361 RFIC direct-conversion transceiver
- Frequency range: 70 MHz - 6 GHz
- Up to 56 MHz of instantaneous bandwidth (61.44MS/s quadrature)
- Full duplex, MIMO (2 Tx & 2 Rx)
- Fast and convenient bus-powered USB 3.0 connectivity
- Optional Board Mounted GPSDO

- Xilinx Spartan-6 XC6SLX75 FPGA
- Analog Devices AD9364 RFIC direct-conversion transceiver
- Frequency range: 70 MHz - 6 GHz
- Up to 56 MHz of instantaneous bandwidth
- Full duplex, SISO (1 Tx & 1 Rx)
- Fast and convenient bus-powered USB 3.0 connectivity

- Industrial-grade Xilinx Spartan-6 XC6SLX75 FPGA
- Analog Devices AD9364 RFIC direct-conversion transceiver
- Frequency range: 70 MHz - 6 GHz
- Up to 56 MHz of instantaneous bandwidth
- Full duplex, SISO (1 Tx & 1 Rx)
- Fast and convenient bus-powered USB 3.0 connectivity

- Industrial-grade Xilinx Spartan-6 XC6SLX150 FPGA
- Analog Devices AD9364 RFIC direct-conversion transceiver
- Frequency range: 70 MHz - 6 GHz
- Up to 56 MHz of instantaneous bandwidth
- Full duplex, SISO (1 Tx & 1 Rx)
- Fast and convenient bus-powered USB 3.0 connectivity

- SSB/LO Suppression -35/50 dBc
- Phase Noise 3.5 GHz 1.0 deg RMS
- Phase Noise 6 GHz 1.5 deg RMS
- Power Output >10dBm
- IIP3 (@ typ NF) -20dBm
- Typical Noise Figure <8dB

- B200mini/B205mini 5.0 x 8.4 cm
- B200/B210 9.7 x 15.5 x 1.5 cm

- B200mini 0-40 °C
- B200mini-i 0-45 °C
- B205mini-i 0-45 °C
- B200 0-40 °C
- B210 0-40 °C

B200mini Schematics

B210 Schematics

- Transceiver - Analog Devices AD9364
- Transceiver - Analog Devices AD9361
- FPGA - Xilinx Spartan-6 Product Page
- FPGA - XC6SLX75 / XC6SLX150
- VXTCXO - B200mini VXTCXO
- GPSDO - M9107
- Frequency Synthesizer - ADF4001
- FX3: SuperSpeed USB Controller - CYUSB3014
- Antenna Switch - SKY13317
- Balun - BD3150L50100A00
- Amplifier - PGA?102+

- B200mini 24.0 g
- B200/B210 350 g

- B200mini Media:B200mini_drawing.png
- B200 [ADD]
- B210 [ADD]

- Full Steel Enclosure
- Compatible with green USRP B200 and B210 devices (revision 6 or later)
- Front and rear K-Slots for anti-theft protection

USRP B Series Enclosure

Slice Logic Utilization

	Used	Total	Percent
Number of Slice Registers	12007	93296	12%
Number of Slice LUTs	17149	46648	36%
Number used as Logic	14889	46648	31%
Number used as Memory	2260	11072	20%
Number used as RAM	336		
Number used as SRL	1924		

Slice Logic Distribution

Used	Total	Percent

Number with an unused Flip Flop	8325	20332	40%
Number with an unused LUT	3183	20332	15%
Number of fully used LUT-FF pairs	8824	20332	43%
Number of LUT Flip Flop pairs used	20332		
Number of unique control sets	301		

IO Utilization

	Used	Total	Percent
Number of bonded IOBs	156	280	55%
IOB Flip Flops/Latches	138		
Number of IOs	172		

Specific Feature Utilization

	Used	Total	Percent
Number of Block RAM/FIFO	144	172	83%
Number of BUFG/BUFGCTRLs	5	16	31%
Number of DSP48A1s	16	132	12%
Number using Block RAM only	144		

Slice Logic Utilization

	Used	Total	Percent
Number of Slice Registers	21608	184304	11%
Number of Slice LUTs	30782	92152	33%
Number used as Logic	27069	92152	29%
Number used as Memory	3713	21680	17%
Number used as RAM	480		

Number used as SRL	3233		

Slice Logic Distribution

	Used	Total	Percent
Number with an unused Flip Flop	15225	36833	41%
Number with an unused LUT	6051	36833	16%
Number of fully used LUT-FF pairs	15557	36833	42%
Number of LUT Flip Flop pairs used	36833		
Number of unique control sets	461		

IO Utilization

	Used	Total	Percent
Number of bonded IOBs	156	338	46%
IOB Flip Flops/Latches	154		
Number of IOs	172		

Specific Feature Utilization

	Used	Total	Percent
Number of Block RAM/FIFO	186	268	69%
Number of BUFG/BUFGCTRLs	5	16	31%
Number of DSP48A1s	32	180	17%
Number using Block RAM only	186		

B200/B210/B200mini - USB 3.0

FPGA Resources

UHD Stable Binaries

UHD Source Code on Github

This is a list of frequently asked questions on the USRP B200/B210/B200mini. If you have questions that are not answered in this document, please contact us - info@ettus.com.

Will the USRP B200/B210 work with USB 2.0?

Yes, both the USRP B200 and USRP B210 will fall back to the USB 2.0 standard if a USB 3.0 port is not available. There are several things to consider. First, the USB 2.0 data rates are slower. Depending on the USB controller, operating system, and other factors, you may achieve a sample rate up to 8

MS/s with USB 2.0. Also, you may not be able to bus-power the USRP B200/B210 in USB 2.0 mode.

What samples rates should I expect with USB 3.0? USB 2.0?

USB 3.0 is a new standard, and there seems to be wide variation in throughput across various USB 3.0 controllers. Ettus Research maintains a list of benchmarks for various operating systems and USB 3.0 controllers.

When can I power the USRP B200/B210/B200mini off the USB bus?

The experience may vary across various controllers. Generally speaking, bus-power is ideal for SISO operation. If you are using both channels of a USRP B210 we recommend an external power supply. We provide a power supply with the USRP B210.

MIMO operation with the USRP B210 is not recommended when using the USRP B210 on bus-power.

You should not attempt to run the device on bus-power if a GPS-disciplined oscillator is installed.

How much power does the USRP consume?

The table below shows power consumption (Watts) of a USRP B210 run with a 6V power supply. Figures on a 5V supply (USB power), or with a USRP B200 will be moderately lower. The sample rates shown are aggregate sample rates on the USB 3.0 interface.

	5 Msps	15.36 Msps	30.72 Msps	56 Msps	61.44 Msps
1 RX	1.92	2.112	2.184	2.508	
2 RX	2.148	2.436	2.508	2.64	
1 TX	2.184	2.34	2.352	2.22	
2 TX	2.76	2.88	2.904	2.64	
Full Duplex (1x1)	2.508	2.736	2.796	3.168	
2x2 MIMO	3.252	3.588	3.672	4.11	4.092

Can I build a multi-unit system with the USRP B200/B210?

It is possible to synchronize multiple USRP B200/B210 devices using the 10 MHz/1 PPS inputs and an external distribution system like to the OctoClock-G. However, USB 3.0/2.0 performance varies dramatically when multiple devices are streaming through the same controller. Generally, we recommend using the USRP N200/N210 if you need to build a high-channel count system.

Can I access the source code for the USRP B200/B210?

Yes. The USRP B200/B210 is supported by the USRP Hardware DriverTM software. You can find the driver and FPGA source code for the USRP B200/B210, and all other USRP models, in the UHD git repository:

http://files.ettus.com/manual/page_build_guide.html

What operating systems does the USRP B200/B210 work on?

The USRP B200/B210 is supported on Linux, MAC and Windows.

Does the USRP B200/B210 work with GNU Radio?

Yes. The USRP B200/B210 work with our GNU Radio plugin - gr-uhd.

Does the USRP B200/B210 work with MATLAB and Simulink?

Yes. You need to install the Communications System Toolbox Support Package for USRP Radio.

Does the USRP B200/B210 work with OpenBTS?

Yes. This is a third-party application and you can find instructions here: OpenBTS - Build, Install, Run.

For support, please sign up and contact the OpenBTS mailing list.

What tools do I need to program the FPGA?

The USRP B200 and USRP B210 include a Spartan 6 XC6SLX75 and XC6S150, respectively. The USRP B200 can be programmed with the free version of Xilinx tools, while the larger FPGA on the USRP B210 requires a licensed seat.

Can I use a GPSDO with the USRP B200/B210?

Ettus Research offers a Board-Mounted GPS-Disciplined OCXO and a Board-Mounted GPS-Disciplined TCXO, which are compatible with the USRP B200/B210. These provide a high-accuracy XO, which can be disciplined to the global GPS standard. Please note: When the GPSDO OCXO model is integrated on the USRP B200/B210, the device should be powered with an external supply instead of USB bus power. The TCXO version can be USB bus powered.