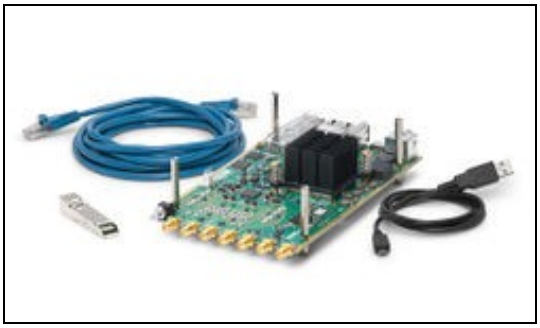
E320

Contents

The USRP E320 brings performance to embedded software defined radios by offering four times more FPGA resources compared to the USRP E31x devices. The USRP E320 also introduces improvements in streaming, synchronization, integration, fault-recovery, and remote management capability. This field deployable SDR continues to use the flexible 2x2 MIMO AD9361 transceiver from Analog Devices, which covers frequencies from 70 MHz ? 6 GHz and provides up to 56 MHz of instantaneous bandwidth.

- Xilinx Zynq 7045 SoC
  - 7 Series FPGA with 2GB DDR3 RAM
  - ARM Cortex A9 800 MHz dual-core processor
- Analog Devices AD9361 RFIC direct-conversion transceiver
- Frequency range: 70 MHz - 6 GHz
- Up to 56 MHz of instantaneous bandwidth
- 2x2 MIMO transceiver
- Up to 10 MS/s sample data transfer rate to ARM processor
- Up to 61.44 MS/s sample data transfer to host (10Gb/SFP+)
- RX, TX filter banks
- Integrated GPSDO
- 9-axis inertial measurement unit
- RF Network on Chip (RFNoC?) FPGA



development framework support
- Board-only and Full Enclosure Options

- Power Output >10dBm
- IIP3 (@ typical NF) -20dBm
- Typical Receive Noise Figure <8dB

- The maximum input power for the E320 is -15 dBm.

- Ettus Research recommends to always use the latest stable version of UHD
- UHD version on the host computer must match what is running on the E320

- Current Hardware Revision: 1
- Minimum version of UHD required: 3.14.0.0

- 173 x 100 x 36 mm

- 175 x 106 x 38 mm

- 0.16 kg

- 0.86 kg

- Board only

- Enclosure

- Board only

- Enclosure

- 0-45 °C

- -40-85 °C

- 10% to 90% non-condensing

- 5% to 95% non-condensing

- E320: File:Neon Public.pdf

- Support GPSDO NMEA Strings

You can query the lock status with the `gps_locked` sensor, as well as obtain raw NMEA sentences using the `gps_gprmc`, and `gps_gpgga` sensors. Location information can be parsed out of the `gps_gpgga` sensor by using `gpsd` or another NMEA parser.

Module Specifications

1 PPS Timing Accuracy from GPS receiver	<8ns to UTC RMS (1-Sigma) GPS Locked
Holdover Stability (1 week with GPS)	<±50us over 3 Hour Period @+25°C (No Motion, No Airflow)
1 PPS Output	3.3VDC CMOS
Serial Port	TTL Level, GPS NMEA Output with 1Hz or 5Hz update rate, Integrated into UHD
GPS Frequency	L1, C/A 1574MHz
GPS Antenna	Active (3V compatible) or Passive (0dB to +30dB gain)
GPS Receiver	65 Channels, QZSS, SBAS WAAS, EGNOS, MSAS capable Supports Position and Hold over-determined clock mode
Sensitivity	Acquisition -148dBm, Tracking -165dBm

TTFF	Cold Start: <32 sec, Warm Start: 1 sec, Hot Start: 1 sec
ADEV	10s: <7E-011 10Ks: <2E-012 (GPS Locked, 25°C, no motion, no airflow)
Warm Up Time / Stabilization Time	<10 min at +25C to 1E-09 Accuracy
Supply Voltage (Vdd)	3.3V Single-Supply, +0.2V/-0.15V
Power Consumption	<0.16W
Operating Temperature	-10°C to +70°C
Storage Temperature	-45C to 85C

Oscillator Specifications (internal)	
Frequency	20MHz
Output of lock	20MHz CMOS 3Vpp
Phase Noise crystal	-142dBc/Hz
20MHz Reference	±2E-08 After 1 Hour @ +25°C without GPS
RF Output Amplitude	3Vpp CMOS
20MHz Phase Jitter (100Hz to 10MHz)	<0.135ps rms
Frequency Stability Over Temperature (0°C to +60°C)	±0.1ppm (internal TCXO without GPS)
Warm Up Time	< 1 min at +25C
Phase Noise at 20MHz	1Hz -65 dBc/Hz 10Hz -97 dBc/Hz 100Hz -116 dBc/Hz 1kHz -136 dBc/Hz 10kHz <-148 dBc/Hz 100 kHz <-155 dBc/Hz

- Spec Sheet: http://www.jackson-labs.com/assets/uploads/main/LTE-Lite_specsheet_20MHz.pdf
- User Manual: http://www.jackson-labs.com/assets/uploads/main/LTE-Lite.pdf

The RF frontend has individually tunable receive and transmit chains. Both transmit and receive can be used in a MIMO configuration. For the MIMO case, both receive frontends share the RX LO, and both transmit frontends share the TX LO. Each LO is tunable between 50 MHz and 6 GHz.

All frontends have individual analog gain controls. The receive frontends have 76 dB of available gain; and the transmit frontends have 89.8 dB of available gain. Gain settings are application specific, but it is recommended that users consider using at least half of the available gain to get reasonable dynamic range.

- RJ45 (1 GbE)
- SFP+ (1/10 GbE, Aurora)
- Type A USB Host
- Micro-USB (serial console, JTAG)
- GPIO
- Integrated GPSDO
- 9-axis IMU

- **PWR:** Power button
- **RF A Group**
  - **TX/RX LED:** Indicates that data is streaming on the TX/RX channel on frontend side A
  - **RX2 LED:** Indicates that data is streaming on the RX2 channel on frontend side A
- **RF B Group**
  - **TX/RX LED:** Indicates that data is streaming on the TX/RX channel on frontend B
  - **RX2 LED:** Indicates that data is streaming on the RX2 channel on frontend B
- **PPS IN:** Input port for external PPS signal
- **REF IN:** Input port for external 10 MHz signal

- **GPS ANT:** Connection for the GPS antenna

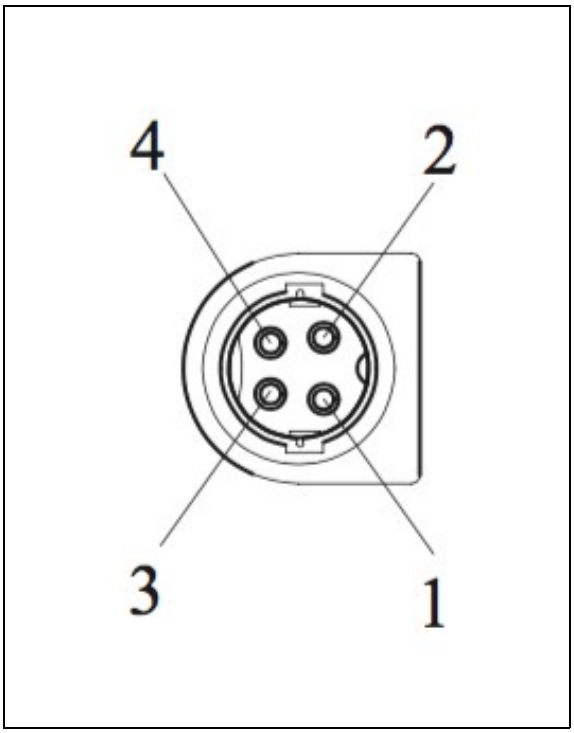
- **POWER:** 10-14v DC Power connector
- **GPIO:** Mini-HDMI connector for GPIO
- **USB:** USB 2.0 Port
- **1G ETH:** RJ45 port for remote management
- **SFP+:** SFP+ connection for sample streaming
- **CONSOLE JTAG:** Micro USB connection for serial UART/JTAG console

Model: PDP-40 by CUI Inc.

Power plug connectors for custom power harnesses can be purchased here:
https://www.digikey.com/products/en?KeyWords=CP-7340-ND&WT.z_cid=sp_102_buynow

Assembly instructions: Media:pdp-40.pdf

- Pins #1 / #2: 12v
- Pins #3 / #4: Ground



Ettus Research currently offers direct-connect, copper cabling accessories for the USRP E320. However, it is also possible to use multi-mode fiber instead of copper connections for these devices. In this section, we will provide general guidance on the types of fiber adapters and cables that can be used with these products.

The USRP E320 USRP is compatible with most brands of SFP+ fiber adapters. In some cases, other equipment in the systems such as 1/10 Gigabit Ethernet switches are only compatible with specific brands of SFP+ adapters and cables. As a general rule, we recommend checking compatibility with the switches and network cards in your system before purchasing an adapter.

Ettus Research does test the USRP E320 USRP devices with our 10 Gigabit Ethernet Connectivity Kit and a Blade Networks G8124 1/10 GigE switch. Here are is a list of known-good cables and adapters.

Ettus Research has only tested multi-mode fiber accessories.

- Approved Optics BN-CKM-SP-SR-A
- Elpeus 10GbE SFP+ AOC Cable, 3 meters

Many new motherboards come equipped with an onboard 10Gb RJ45 NIC. It is possible to use a SFP+ to RJ45 adapter and operate at 10Gb speeds using a Cat6/7 Ethernet cables.

Ettus Research has tested the adapters linked below.

- 10Gtek SFP+ to RJ45 Copper Module
- ProLabs 10G-SFPP-T-C

As of December 1st, 2010 all Ettus Research products are RoHS compliant unless otherwise noted. More information can be found at http://ettus.com/legal/rohs-information

Management Methods for Controlling Pollution Caused by Electronic Information Products Regulation

Chinese Customers

National Instruments is in compliance with the Chinese policy on the Restriction of Hazardous Substances (RoHS) used in Electronic Information Products. For more information about the National Instruments China RoHS compliance, visit ni.com/environment/rohs_china.

Found on the NI Product Certifications lookup tool here.