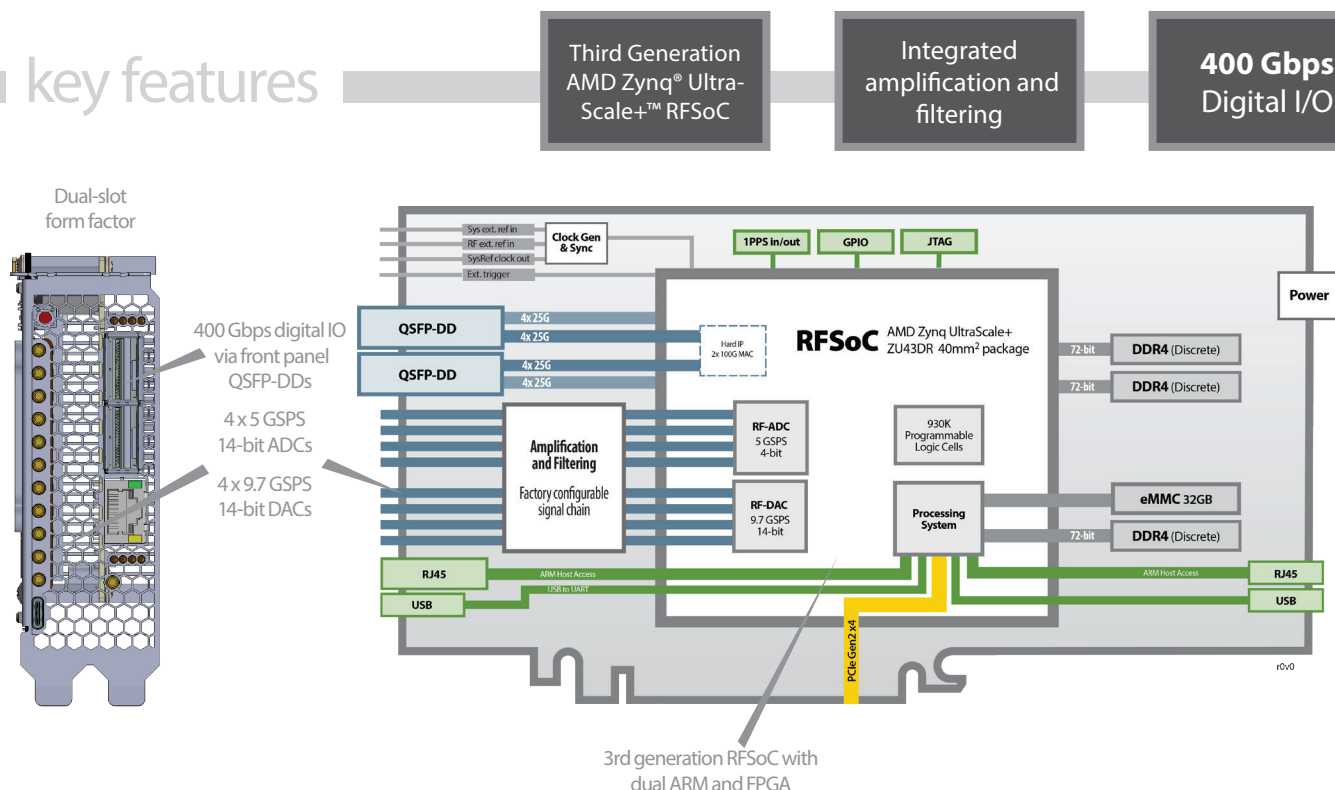
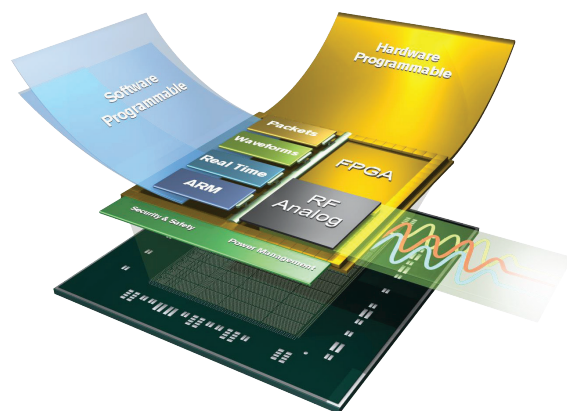




RFX 880

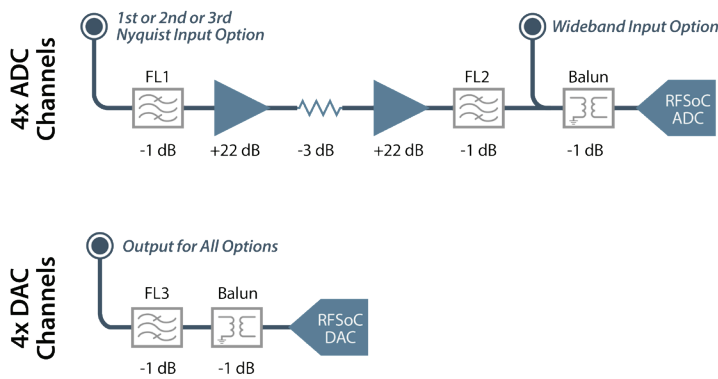
RFSoc Ethernet Card

ADC Front End Options

The RFSoc chip at 5 GSPS offers a 2.5 GHz bandwidth at up to 6 GHz. Aliasing challenges require filtering in the path. The RFX 880's "Wideband" configuration targets customers willing to provide all filtering and amplification external to the card. The RFX 880 also offers build options for on-card filtering and amplification with filters available for Nyquist 1, 2 and most of 3. BittWare also offers the RFX 881 with a mixer and LO for up and down conversion up to 35 GHz.

How the ADC/DAC Configuration Options Work

Each card is factory-configured for one set of 4x input and 4x output options



Included IP

BittWare RFX cards ship with an application that converts between analog data and timestamped, VITA-49.2 packets. It works in both ADC and DAC directions. The application also transfers raw data between the RFSoc and the ARM memory or eMMC. The RFSoc's ARM Processing System runs Linux and acts as a control plane. More specifically, BittWare has integrated card management functions through customized Linux drivers. BittWare has also ported AMD's RF Tool application, a socket library that configures an RFSoc chip. Above both Linux and the RF Tool, BittWare provides its own RFUtils commands and examples. RFUtils can generate synthetic waveforms as well as load and stream waveforms from files. All of this is fully supported by BittWare, and we provide source code.

The RFX 880 application passes packets in Ethernet frames through two 100 GbE ports and uses Aurora protocol for the other two ports.

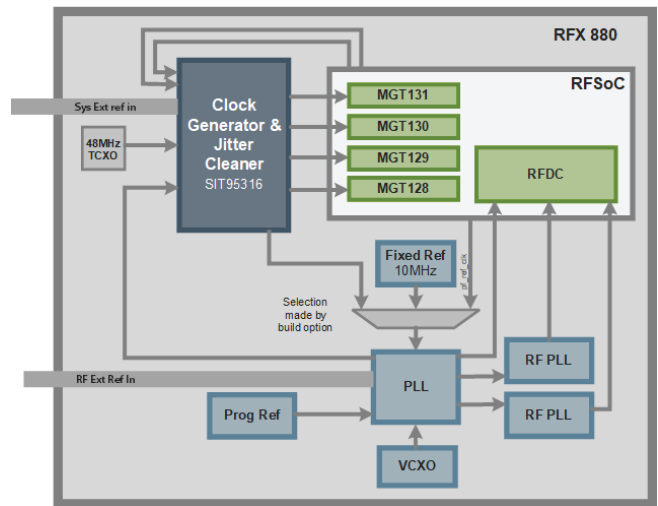
BittWare also supplies an unsupported port of AMD's RF Analyzer which we use to help characterize our cards.

Analog Characterization Data

BittWare fully tests and documents the analog characteristics of each RFX 880 configuration, whether wideband or amplified. That data is available for each significant printed circuit board (PCB) revision, roughly one month after a new PCB passes through manufacturing. The reports are available to customers through developer.bittware.com.

Clock Tree

The RFX 880 card offers a very flexible clock tree. It can accommodate reference clock inputs from Synchronous Ethernet, eCPRI, CPRI, as well as reference clocks fed in directly over coax cables. The default card configuration also has a 10 MHz OCXO and a 125 MHz fixed VCXO. Some of the RFX 880 clock tree flexibility is established through build options when the card is manufactured. BittWare will configure optimized cards for each customer, with a minimum quantity requirement in each order.



Chassis Options

BittWare offers a WaveBox Gamma chassis that holds up to three RFX 880 cards in 1U. There is no motherboard inside. Alternatively, if you want to control the RFX 880 over PCIe, BittWare offers its WaveBox Sigma chassis. Both versions of WaveBox require an RFX 880 that isn't as wide as a standard, dual-slot PCIe card. If you wish to provide your own chassis, you can order the RFX 880 built a little wider to fit into a generic server's PCIe backplane.



WaveBox

Exceeding the RFSoc Specification

AMD tests each RFSoc chip to 6 GHz. However, BittWare's characterization reports show that the full third Nyquist, up to 7.5 GHz performs well with an additional 3 dB of gain roll-off from 6 to 7.5 GHz in the ADC. The roll-off between 6 and 7.5 GHz is acceptable for many applications.

AMD also offers RFSoc chips screened for faster rates. AMD SCD 5814 increases the DAC from 9.8 GSPS to 10 GSPS. In addition, The ZU58DR, a limited distribution version of the ZU48DR, can run the ADCs at 5.4GSPS. These and other options are available for minimum order quantities and at different price points and business terms, passed through from AMD.

RFX 880

RFSoc Ethernet Card

Board Specifications

RFSoc	- AMD Zynq UltraScale+ RFSoc - XCZU43 in a G1517 package - Core speed grade -2
Processing Subsystem (PS)	- Application Processing Unit Quad-core Arm Cortex-A53 MPCore at 1.2 GHz - Real-Time Processing Unit Dual-core Arm Cortex-R5F MPCore at 525 MHz
Analog	4x 5 GSPS 14-bit ADCs Wideband build option provides +0 to -27 dB gain from 50 MHz to 6 GHz (or 7.5 GHz) with no filtration 1st Nyquist (L-Band) build option provides +41 to -29 dB on all 4 channels, constrained between 400 MHz and 2.5 GHz by filters FL1 and FL2 2nd and 3rd Nyquist filters are also available on amplified channels as a special order - Max input power -22 dBm on the amplified version and +15 dBm on the wideband 4x 9.7 GSPS 14-bit DACs - Range of +3 to -24 dBm (high power end of this range is a function of frequency) - Constrained by a 4.8 GHz LPF (FL3) - Balun used in both ADC and DAC channels begins its frequency roll-off at 6 GHz - Programmable clocks - External reference and triggers - Push-on SMPM connectors with optional SMA pigtails
On-board flash	- PS connects to a pair of 2Gb QSPI parts configured in "Dual Parallel" mode. The PS boots from the QSPI to configure itself, then pulls the logic bitstream from the QSPI and configures the PL 32GB eMMC for ARM disk
External memory	- Processing system: 16GB, 64-bit DDR4-2400 with ECC - Programmable logic: 32GB, 2x banks 64-bit DDR4-2666 with ECC (our example uses it as 36GB no ECC, 72-bit)
External digital interfaces	- Processing system - PCIe Gen2 x4 - Dual RJ45 Ethernet, one on the front panel, second inside the chassis - Single USB for UART and JTAG, dual connectors. One on the front panel, second inside the chassis. - Programmable logic: - Up to 400 Gb/s available via front panel 2x QSFP-DD - AMD Hard IP support for dual 100GbE

Cooling	- Standard: double-width passive heatsink - Contact BittWare for other cooling options
Electrical	- On-board power derived from 6-pin AUX connector - Power dissipation is application dependent - Typical max power consumption 50W
Environmental	Designed to operate between +5C and +40C chassis air inlet temperature, noncondensing (air temperature inside the chassis between +5C and +60C)
Quality	- Manufactured to IPC-A-610 Class 2 - RoHS compliant - CE, FCC, UKCA & ICES approvals
Form factor	¾-length, standard-height PCIe dual-slot card (x16 mechanical) - Supports standalone operation - BittWare's WaveBox Gamma chassis was specifically designed to house RFX 880 cards

Development Tools

Firmware development	Bittware provides interface software support for an example bitstream that fully configures the RFSoc chip using a scripting language running on the RFSoc's ARM. AMD Vivado development tools are fully supported for development of custom designs.
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Deliverables

- RFX 880 RFSoc Transceiver
- Data capture and relay example - Full source code
- 1-year hardware warranty

Sales Part Numbers

For **initial evaluation**, we urge customers to buy an RFX 880 integrated into a WaveBox Gamma chassis.

RFX-880-0003	RFX 880 Wideband card for standard PCIe chassis
RFX-880-0004	RFX 880 Wideband card for Wavebox
RFX-880-0005	RFX 880 1st Nyquist amplified card for Wavebox

Interested in purchasing? We offer direct sales at BittWare.com, or you can check stock with our distributors at BittWare.com/rfx880.

To learn more, visit www.BittWare.com

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