



RFX-8440L

PCIe RFSoc Card



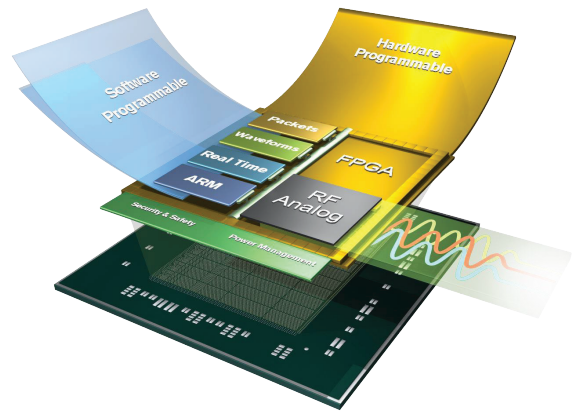
RFSoc L-Band Transceiver Card

Integrated amplification saves cost and space

The BittWare RFX-8440L card is an L-band digital direct sampling transceiver featuring the third generation AMD Zynq® UltraScale+™ RFSoc. This innovative solution uses the RFSoc's ADC for L-band direct sampling, displacing legacy down conversion approaches at and below L-Band, and displacing external amplification above L-Band. The RFX-8440L was designed as a standalone card that just happens to be in PCIe form factor. Installing the card in a ruggedized chassis would allow you to mount the RFX-8440L card near the antenna to transform antenna data into packets. Since the RFX-8440L gets all of its power via the external power connector and can be communicated with via an on-board RJ45 connector, it does not need a PCIe slot. The RFX-8440L also works in traditional server PCIe slots.

The AMD Zynq® UltraScale+™ RFSoc integrates RF-class A/D and D/A converters into the Zynq® FPGA fabric and multi-core ARM processor subsystem, creating a multi-channel data conversion and processing solution on a single chip.

With 200 Gbps of digital I/O available on the FPGA side of the RFSoc, the card supports twice the bandwidth of RFSoc implementations that depend upon PCIe for data transfer. This I/O is available through two QSFP28 ports. Customers have implemented transports using Aurora, Ethernet MAC frames, and UDP.

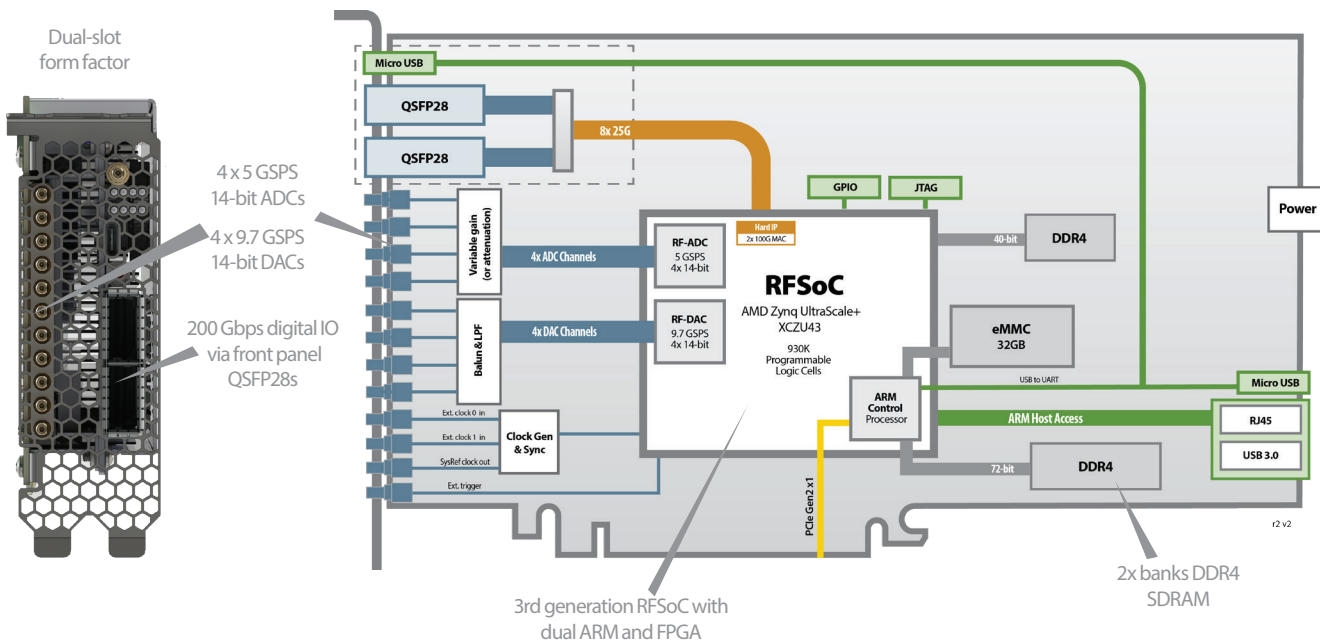


key features

Third Generation
AMD Zynq® Ultra-
Scale+™ RFSoc

Variable gain-
controlled RF
inputs

200 Gbps
Digital I/O



Clock Tree

The RFX-8440L 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. In addition, the default card configuration has a 10 MHz OCXO and a 125 MHz fixed VCXO. Some of the RFX-8440L 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.

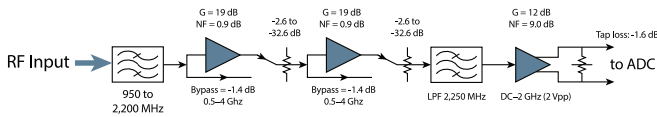
Included IP

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 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.

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

Analog Front End

The configuration for the analog front end targets L-band (1GHz to 2GHz) and includes several signal conditioning components including variable gain.



Board Specifications

FPGA	<ul style="list-style-type: none">AMD Zynq UltraScale+ RFSoc<ul style="list-style-type: none">XCZU43 in an E1156 packageCore speed grade -2
Analog	<ul style="list-style-type: none">L-Band 1GHz - 2GHz: Includes several signal conditioning components including variable gain4 x 5 GSPS 14-bit ADCs: -64 to +38 dB4 x 9.7 GSPS 14-bit DACs: 32 dB of output power control inside the FPGAProgrammable clocksExternal reference and triggersSSMC style connectors
On-board flash	<ul style="list-style-type: none">Flash memory for booting FPGAFlash memory for ARM bootloader and OS image32GB eMMC for ARM disk
External memory	<ul style="list-style-type: none">Processing system: 16GB, 64-bit DDR4-2100 with ECCProgrammable logic: 10GB, single bank 40-bit DDR4-2400, no ECC
External digital interfaces	<ul style="list-style-type: none">Processing system<ul style="list-style-type: none">PCIe Gen2 x1RJ45 EthernetUSB UART, USB 3.0Programmable logic:<ul style="list-style-type: none">Up to 200 Gb/s available via front panel 2x QSFP28AMD Hard IP support for dual 100GbE

Sales Part Numbers

RFX-8440-0011	RFX-8440L card with L-band RF front end and QSFP28 mezzanine
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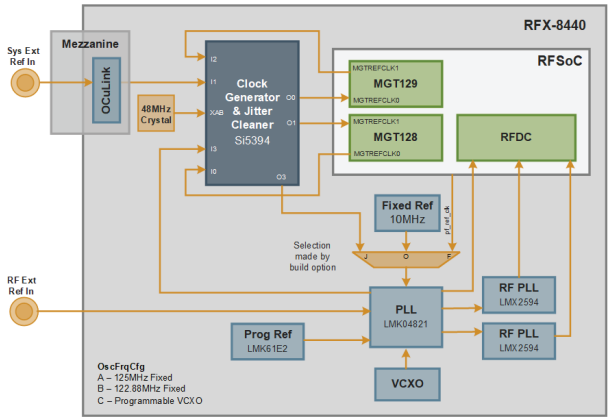
More detailed analog specifications are available upon request, and a full characterization report is available under NDA.

To learn more, visit www.BittWare.com

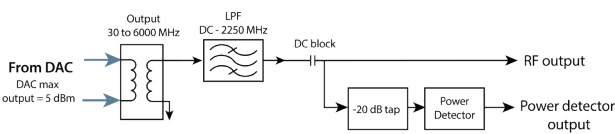
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Transmit Side



Cooling	<ul style="list-style-type: none">Standard: double-width passive heatsinkContact BittWare for other cooling options
Electrical	<ul style="list-style-type: none">On-board power derived from 6-pin AUX connectorPower dissipation is application dependentTypical max power consumption 50W
Environmental	<ul style="list-style-type: none">Operating temperature: 5°C to 35°C
Quality	<ul style="list-style-type: none">Manufactured to IPC-A-610 Class 2RoHS compliantCE, FCC, UKCA & ICES approvals
Form factor	<ul style="list-style-type: none">¾-length, standard-height PCIe dual-slot card (x16 mechanical)Supports standalone operationRFX-8440 can be ordered as a TeraBox™ integrated server platform

Development Tools

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

- RFX-8440L L-Band Transceiver
- Data capture and relay example - Full source code
- 1-year hardware warranty