**BittWare**
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RFX-8440L
PCIe RFSoC Card

RFSoC L-Band Transceiver Card
Communicate with satellites that use L-Band

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. 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 directly on your 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.
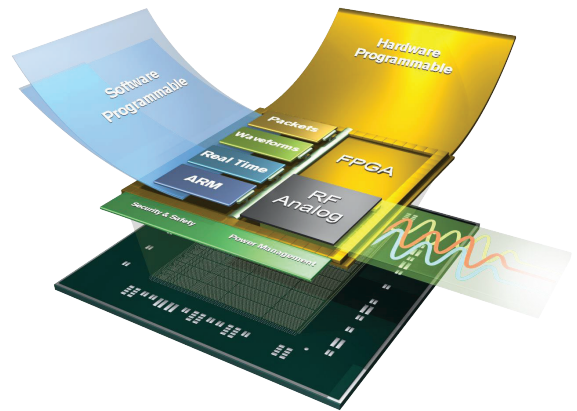
The AMD Zynq® UltraScale+™ RFSoC integrates RF-class A/D and D/A converters into the Zynq® FPGA fabric and multi-core ARM processor subsystem, creating a multi-channel data conversion and processing solution on a single chip.
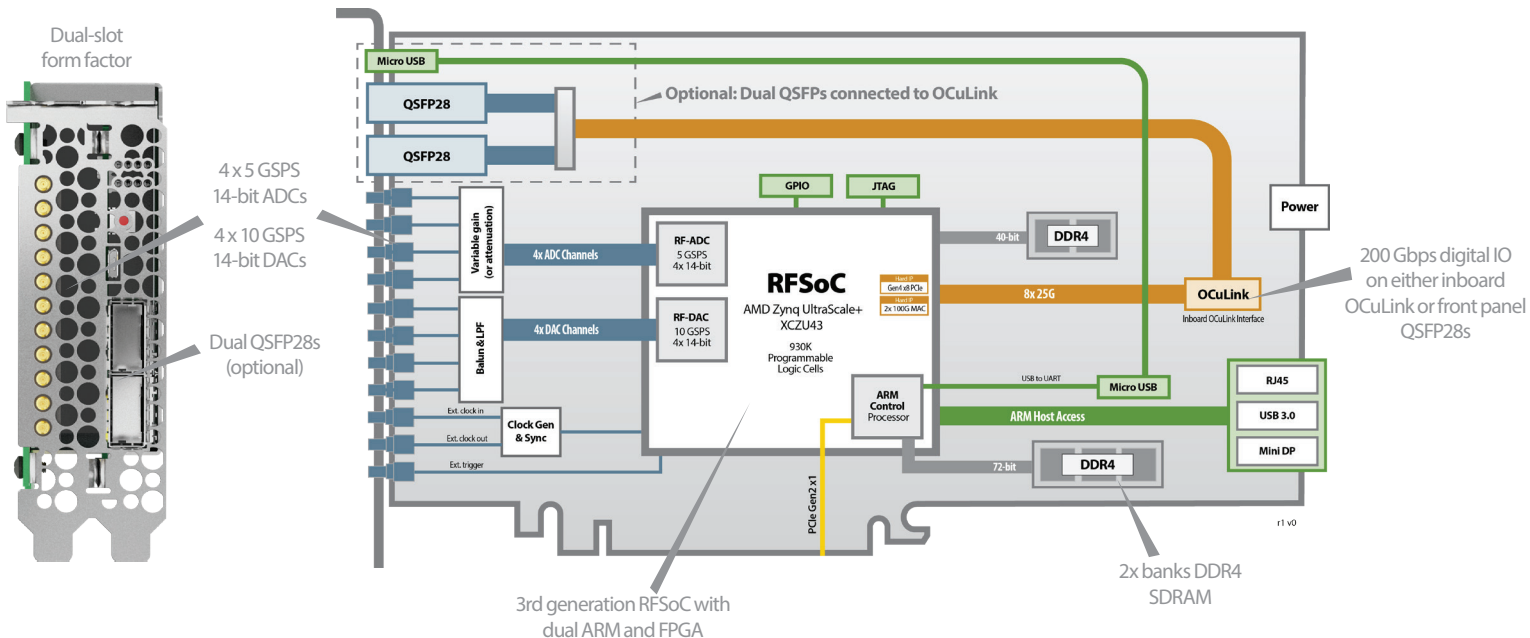
200 Gbps of digital I/O is available on the FPGA side of the RFSoC. That is twice the bandwidth of RFSoC implementations that depend upon PCIe for data transfer. This I/O is available on a single, 8x OCuLink port, a popular connector used inside a chassis. We also offer an add-on that provides the same signals through two QSFP28 cages, the most popular connector between chassis. Customers have implemented transports using Aurora, Ethernet MAC frames, and UDP.

key features

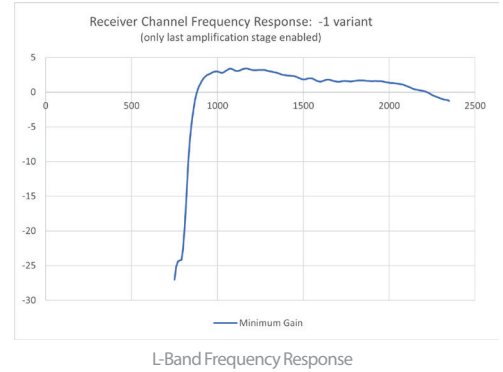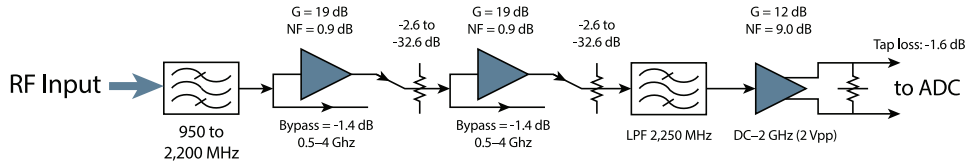| Third Generation AMD Zynq® Ultra-Scale+™ RFSoC | Variable gain-controlled RF inputs | **200 Gbps** Digital I/O |

Dual-slot form factor

4 x 5 GSPS 14-bit ADCs

4 x 10 GSPS 14-bit DACs

Dual QSFP28s (optional)

3rd generation RFSoC with dual ARM and FPGA

2x banks DDR4 SDRAM

200 Gbps digital IO on either inboard OCuLink or front panel QSFP28s
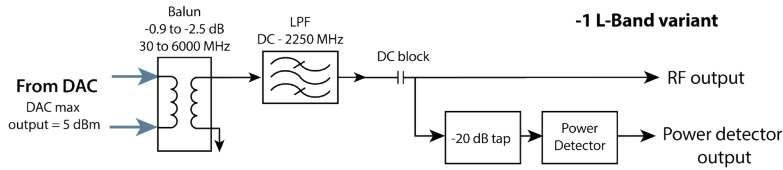
r1 v0

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.

RF Input → [950 to 2,200 MHz] → [G = 19 dB, NF = 0.9 dB, Bypass = -1.4 dB, 0.5–4 Ghz] → [-2.6 to -32.6 dB] → [G = 19 dB, NF = 0.9 dB, Bypass = -1.4 dB, 0.5–4 Ghz] → [-2.6 to -32.6 dB] → [LPF 2,250 MHz] → [G = 12 dB, NF = 9.0 dB, DC–2 GHz (2 Vpp)] → Tap loss: -1.6 dB → to ADC

Receiver Channel Frequency Response: -1 variant
(only last amplification stage enabled)

— Minimum Gain

L-Band Frequency Response

Transmit Side

-1 L-Band variant

From DAC → [Balun -0.9 to -2.5 dB 30 to 6000 MHz] → [LPF DC - 2250 MHz] → DC block → RF output

DAC max output = 5 dBm

[-20 dB tap] → [Power Detector] → Power detector output

Board Specifications

FPGA	• AMD Zynq UltraScale+ RFSoC
	   • XCZU43 in an E1156 package
	   • Core speed grade -2

Analog	• L-Band 1GHz - 2GHz: Includes several signal conditioning components including variable gain • 4 x 5 GSPS 14-bit ADCs: -40 to 0 dBm (default) • 4 x 10 GSPS 14-bit DACs: -40 to 0 dBm (default) • Programmable clocks • External reference and triggers • SSMC style connectors
On-board flash	• Flash memory for booting FPGA • Flash memory for ARM bootloader and OS image
External memory	• 16GB DDR4 processing system (ARM) memory with ECC • 8GB DDR4 programmable logic memory with ECC

External digital interfaces	• Processing system
	   • PCIe Gen2 x1
	   • RJ45 Ethernet
	   • USB UART, USB 3.0
	   • Mini DisplayPort
	 • Programmable logic:
	   • Up to 200 Gb/s available via:
	     • Option 1: inboard OCuLink
	     • Option 2: Front panel 2x QSFP28
	   • AMD Hard IP support for dual 100GbE and PCIe Gen4

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	• Operating temperature: 5°C to 35°C
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 • RFX-8440 can be ordered as a TeraBox™ integrated server platform

Development Tools

FPGA development	BittWare provides a basic data capture and replay example utilizing the major interfaces of the product. AMD Vivado development tools are fully supported for development of custom designs.

Deliverables

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

Sales Part Numbers

RFX-8440-0010	RFX-8440L card with L-band RF front end
RFX-8440-0011	RFX-8440L card with L-band RF front end with QSFP28 mezzanine

To learn more, visit **www.BittWare.com**

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