Quartz: Xilinx Zynq UltraScale⁺ RFSoC

High-performance, flexible RF processing solutions from development to deployment

The Quartz® family is based on the Xilinx® Zynq® UltraScale+™ RFSoC.
Quartz brings the performance and high density integration of the RFSoC to a wide range of different application spaces with a uniquely flexible design path.

Quartz products are available in standard form factors including 3U VPX, SOSA aligned 3U VPX, PCIe, as well as a SFF rugged enclosure and SFF subsystem. In addition, QuartzXM modules can be deployed on an application-specific custom carrier using the QuartzXM Carrier Design Package. Designed to work with Navigator® Design Suite tools, the combination of Quartz and Navigator offers users a streamlined path from IP ad application development to deployment.

RFSOC ADVANTAGES

The Xilinx Zynq UltraScale+ RFSoC Gen 3 integrates eight RF-class A/Ds and D/As into the Zynq FPGA fabric along with quad ARM Cortex-A53 and dual ARM Cortex-R5 processors, creating a multichannel data conversion and processing solution on a single chip.

FEATURES

Complimenting the RFSoC's on-chip resources, the Quartz products add:

- Dual 100 GigE optical interfaces for high-bandwidth data streaming
- On-board GPS receiver
- 16 GB of DDR4 SDRAM
- LVDS connections to the FPGA for custom I/O
- Sophisticated clocking for multi-channel and multi-board synchronization
- x8 PCIe Gen 3 system interface
- QuartzXM eXpress Module design for flexible development and deployment
- Factory-installed IP for waveform generation, real-time data acquisition, and more
- Air-cooled and conduction-cooled versions

Featured Products

Model 5550

8-Channel A/D & D/A Zynq UltraScale⁺ RFSoC Processor - SOSA Aligned 3U VPX

Model 8256

SOSA Aligned Development Platform featuring the Model 5553 SOSA Aligned 3U VPX board. A 1-slot development platform, Model 8257, is also available.

QuartzXM eXpress MODULE: THE CORNERSTONE OF QUARTZ PRODUCT

The Model 6003 QuartzXM eXpress Module speeds custom deployment of the Gen 3 RFSoC in SWaP-critical environments. Measuring only 2.5 by 4 inches, the eight-channel 5 GHz 14-bit A/Ds & 10 GHz 14-bit D/As QuartzXM module includes all of the circuitry needed to maximize the performance of the RFSoC. As the central core of the Quartz RFSoC products, the Model 6003 module migrates easily to other carriers with standard or custom form factors.

QuartzXM CARRIER DESIGN PACKAGE

The Model 4801 QuartzXM Design Package supports customers interested in building their own carrier for the QuartzXM modules by sharing Mercury's RFSoC design expertise. QuartzXM module documentation includes pin definitions and electrical specifications of all signals, 3D mechanical models and thermal profiles and modeling. In addition the design package includes the Model 5953 3U VPX carrier as a reference design complete with schematics, PCB design guidelines, routing rules and suggested PCB layer stackup. A design review is included to help speed successful development.

READY-TO-USE QUARTZ DEVELOPMENT PLATFORMS

The Model 8257 is a low-cost 3U VPX chassis ideal for developing applications on Mercury's Model 5950 and Model 5953 (Gen 3) Quartz RFSoC boards. The 8257 can be configured with optional rear-panel dual MPO optical connectors to support dual 100 GigE interfaces and VITA 66.4.

The Model 8256 3U VPX chassis is an ideal development platform for Mercury's SOSA aligned Models 5550 and 5553 (Gen 3) eight-channel A/D & D/A Zynq UltraScale$^+$ RFSoC 3U VPX processors.

HIGH-SPEED SYNCHRONIZER AND DISTRIBUTION BOARD

The Model 5903 high-speed synchronizer and distribution board synchronizes up to eight Quartz boards each receiving a common clock along with timing signals that can be used for synchronizing, triggering and gating functions. An on-board programmable clock generator creates the sample clock along with the required complimentary clocks.

NAVIGATOR DESIGN SUITE FOR STREAMLINED IP DEVELOPMENT

Navigator Design Suite includes: Navigator FDK (FPGA Design Kit) for custom IP and Navigator BSP (Board Support Package) for creating host software applications.

The Navigator FDK includes the board's entire FPGA design as a block diagram that can be graphically edited in Xilinx's Vivado tool suite, with full source code and documentation.

Developers can integrate their IP along with the factory-installed functions or use the Navigator kit to replace the IP with their own. The Navigator FDK Library is fully AXI-4 compliant, providing a well-defined interface for developing custom IP or integrating IP from other sources.

The Navigator BSP supports Xilinx's PetaLinux on the ARM processors. Users can work efficiently using high-level API functions, or gain full access to the underlying libraries including source code. Mercury provides numerous examples to assist in the development of new applications.

Whether the QuartzXM is deployed on a Mercury carrier or a custom carrier, developers will find the included IP cores and examples an ideal foundation for building custom applications.

Model 6003

8-Channel A/D & D/A Zynq UltraScale$^+$ RFSoC Gen 3 Processor - QuartzXM eXpress Module

Model 7053

8-Channel A/D & D/A Zynq UltraScale$^+$ RFSoC Gen 3 Processor - PCIe

Model 6353S

8-Channel A/D & D/A Zynq UltraScale$^+$ RFSoC Gen 3 Processor - SFF Subsystem

EXAMPLE APPLICATION 1: HIGH BANDWIDTH DATA STREAMING

The RFSoC's eight 5 GSPS A/Ds are capable of producing an aggregate data rate of 80 GBytes/sec when all channels are enabled. While capturing this much raw data is not feasible, the A/D's built-in digital downconverters can reduce this data throughput in many applications to a rate reasonable for the data-streaming and storage components downstream in the system.

In some applications, capturing the raw, full-bandwidth data is crucial. The 6353's dual 100 GigE UDP engine provides a high-bandwidth path for moving data off of the board. Along with the built-in data acquisition IP with the A/Ds running at 4 GSPS, the 6353 can stream two full bandwidth A/D data streams over optical cable to a downstream storage or processing subsystem. Other converter speeds and bandwidths are possible with user installed IP.

The 6353's built-in IP functions also provide paths for capturing data in the DDR4 SDRAM memory for retrieval by the ARM processing system or the FPGA programmable logic and for sending data over the ARM's 1 GigE interface.

Model 6353

8-Channel A/D & D/A Zynq UltraScale+ RFSoC Gen 3 Processor - SFF Enclosure

Model 6353 block diagram
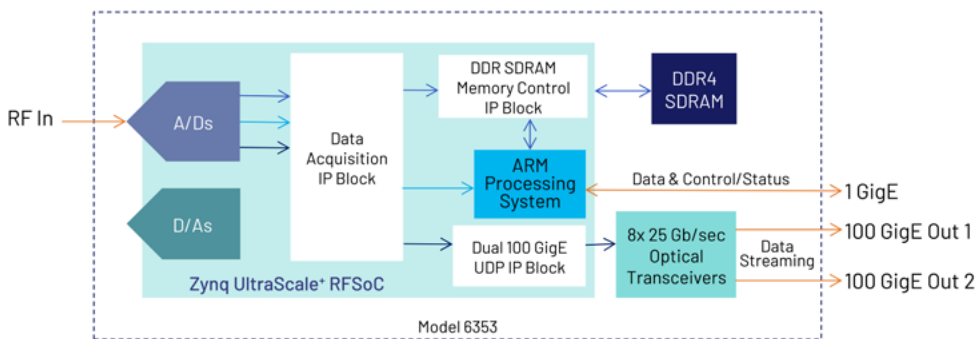
EXAMPLE APPLICATION 2: WAVEFORM GENERATOR

The 5950's IP supports multiple D/A signal source options. A simple loopback path allows samples received by the A/Ds to be output through the D/As. A CW signal generator produces a sine output with programmable frequency. A chirp generator, ideal for radar applications, outputs sweep signals with programmable frequency, ramp, phase offset, and length. The generators also include flexible trigger options with both internal and external triggering.

Model 5950

8-Channel A/D & D/A Zynq UltraScale+ RFSoC Processor - 3U VPX


Model 5950 block diagram
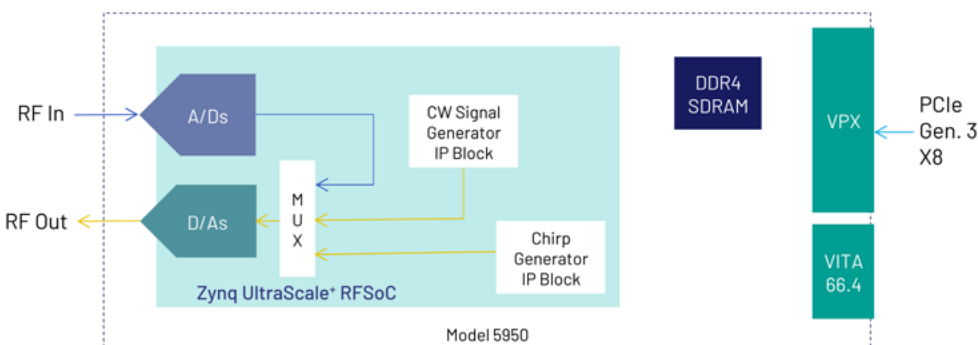
EXAMPLE APPLICATION 3: MULTIMODE DATA ACQUISITION SYSTEM

In some applications, multiple data acquisition modes may need to be operated at the same time. A required dataflow could be full-bandwidth streaming of a single A/D channel over 100 GigE to a data recorder while another channel of A/D data is stored as snapshots in the board's DDR4 SDRAM and read by the ARM processor while yet other A/D channels are down converted using the A/D's built-in DDCs and streamed over PCIe. The 5953 provides these modes with built-in IP supporting complex data-streaming scenarios without the need for creating custom IP.

Model 5953
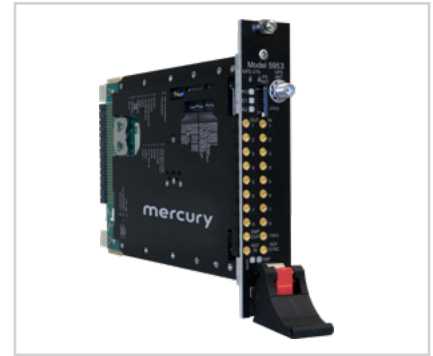
8-Channel A/D & D/A Zynq UltraScale⁺
RFSoC Gen 3 Processor - 3U VPX

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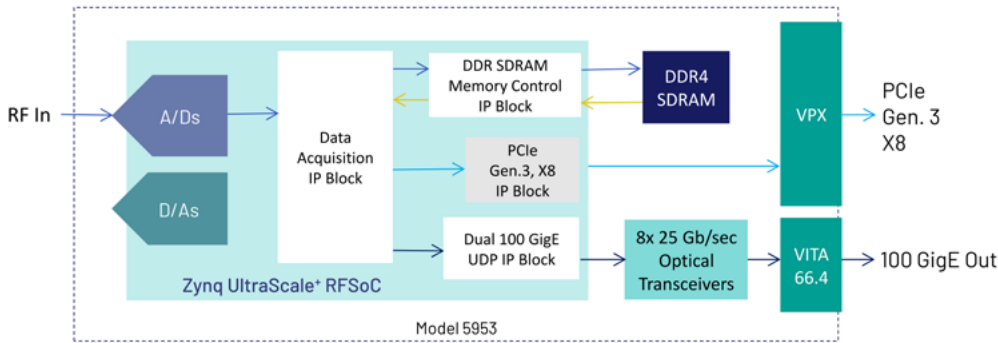
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