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TECHNOLOGIES / SYSTEMS

RFSoc PCIe Board Serves Broad Array of Wireless Applications

The PCIe board, which sports eight wideband ADCs and DACs, employs Pentek's Quartz architecture and Xilinx's Zynq UltraScale+ RFSoc FPGA.

Bringing RFSoc performance to PC platforms with a complete system on a board, Pentek's new Quartz 7050 is an 8-channel DAC and ADC on a PCIe double-wide board. The model 7050 is based on the Xilinx Zynq UltraScale+ RFSoc, a single-chip, adaptable radio platform, making it very popular for 5G and LTE wireless, SIGINT and COMINT, EW countermeasures, radar-on-a-chip, test and measurement, satellite communications, and LiDAR applications.

The Model 7050 design places the RFSoc as the cornerstone of the architecture. All control and data paths are accessible by the RFSoc's programmable logic and processing system. A full suite of Pentek-developed IP and software functions utilize this architecture to provide data capture, timing, and interface solutions for many of the most common application requirements.



Pentek's Quartz architecture embodies a streamlined approach to FPGA boards, simplifying the design to reduce power and cost, while still providing some of the highest performance FPGA resources available today. Designed to work with Pentek's Navigator Design Suite tools, the combination of Quartz and Navigator offers users an efficient path to developing and deploying software and FPGA IP for data and signal processing.

Xilinx's Zynq UltraScale+ RFSoc Processor integrates eight RF-class DACs and ADCs into the Zynq FPGA fabric and quad Arm Cortex-A53 and dual Arm Cortex-R5 processors, creating a multichannel data-conversion and processing solution on a single chip. Complementing the RFSoc's on-chip resources, the Quartz board architecture adds:

- 16 GB of DDR4 SDRAM
- Sophisticated clocking for single-board and multi-board synchronization
- High-signal integrity connectors for RF inputs and outputs
- x8 PCIe Gen 3 interface
- An 8-lane, 28-Gb/s optical interface with industry-standard MPO connectors for supporting Gigabit serial protocols
- 12 LVDS general-purpose I/O pairs for specialized interfaces
- On-board GPS receiver
- Speeds development and deployment for QuartzXM eXpress Module designs
- Factory-installed application IP

The Model 7050 is pre-loaded with a suite of Pentek IP modules to provide data capture and processing solutions for many common

applications. Modules include DMA engines, DDR4 memory controllers, test signal and metadata generators, data packing, and flow control. The board comes pre-installed with IP for a triggered radar chirp generator, triggered radar range gate engine, wideband real-time transient capture, flexible multimode data acquisition, and extended decimation. The Model 7050 can be used out-of-the-box with the built-in functions requiring no FPGA development.

The front end accepts analog IF or RF inputs on eight panel-mounted MMCX connectors with transformer-coupling to eight 4-Gsample/s, 12-bit ADCs delivering either real or complex DDC samples. With additional IP-based decimation filters, the overall DDC decimation is programmable from 2 to 128. The eight DACs accept baseband real or complex data streams from the FPGA's programmable logic. Each 6.4-Gsample/s, 14-bit DAC includes a digital upconverter with independent tuning and interpolations of 1x, 2x, 4x, and 8x. Each DAC output is transformer-coupled to an MMCX connector.

Pentek's Navigator Design Suite includes the Navigator FDK (FPGA Design Kit) for custom IP and the Navigator BSP (Board Support Package) for creating host software applications. The former 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 complete documentation included. 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 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 work efficiently using high-level API functions or gain full access to the underlying libraries including source code. Pentek provides numerous examples to assist in the development of new applications.

The PCIe SPARK development systems are ready for immediate operation with software and hardware installed. In many applications, the SPARK development PC can become the final deployed application platform.

Designed for air-cooled environments, the Model 7050 board starts at \$28,495. Options for optical interface, GPS support, and memory are available. The Navigator BSP is \$2,500 and the Navigator FDK is \$3,500 and includes free lifetime support.

Pentek, www.pentek.com

<https://www.mwrf.com/technologies/systems/article/21137741/rfsoc-pcie-board-serves-broad-array-of-wireless-applications>