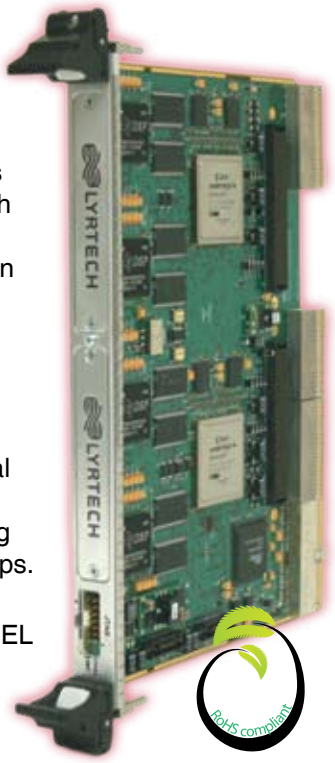
LYRTECH
Infinite possibilities...

SignalMaster Quad

cPCI advanced development platform



The SignalMaster Quad is specifically designed to help develop and test DSP algorithms through its combination of FPGAs and DSPs. It comes with a complete board software development kit to reach development goals quickly and efficiently. It is also possible to use the platform to simultaneously design and test in a real-time environment through the board's integration to the model-based design software tools for Simulink.

At a glance

- 6U, cPCI, four-DSP, two-FPGA, combined architecture
- Two LYRIO+ very-high-speed expansion sites
- 128 MB external SDRAM per DSP and per FPGA
- Six, 8-Gbps, onboard RapidCHANNEL links
- Model-based design flow support

The SignalMaster Quad is designed around two clusters of one Virtex-4 LX FPGA and two TMS320C6416 DSPs. Each cluster can yield up to 16,000 MIPS/MMACS of digital signal processing power and 48 GMACS of FPGA-based digital signal processing power—unrivalled might at your fingertips.

The FPGA–DSP clusters of the SignalMaster Quad are connected to each other through high-bandwidth, inter-FPGA RapidCHANNEL RX/TX buses capable of sustained, full-duplex, 8-Gbps raw data exchanges. The FPGAs of the clusters can also communicate with other Lyrtech modules through their ultrahigh-bandwidth LYRIO+ interfaces. They are capable of minimum sustained, full-duplex raw data exchanges of 12 Gbps.

Stellar processing power

The 152,064 logic cells and 96 XtremeDSP slices of the Virtex-4 LX160 FPGA make meeting the highest processing needs surprisingly easy. The Virtex-4 has some of the most advanced logic, highest performance and density, and greatest memory capacity on the market. It also delivers twice the density and performance, yet only consumes half the power needed by most other FPGA families.

One of the best fixed-point performances on the market

Texas Instruments Design House Network

The TMS320C6416 generation of DSPs delivers the highest performance of any fixed-point DSP in the TMS320C6000 DSP family. The C6416 is designed around the high-performance, advanced VelociTI.2 very-long-instruction-word architecture, making it perfectly suited for multichannel and multifunction applications.

Integrated to System Generator for DSP and Real-Time Workshop

The SignalMaster Quad is fully integrated to System Generator for DSP from Xilinx, which allows using high-level abstractions that can be automatically compiled into the FPGA without losing any performance over designs implemented with VHDL.

The SignalMaster Quad can also boast of its integration to Real-Time Workshop, software that generates and executes stand-alone C code for the platform's DSPs, used in developing and testing algorithms modeled in Simulink.

Multipurpose board

The SignalMaster Quad is designed for a wide range of specific development needs. It is designed to mate with a variety of add-ons that target different applications such as wireless, video, and other applications with a need for DSP–FPGA processing farms and high-speed links.

The SignalMaster Quad's design and software integration also make it possible to perform hardware-in-the-loop and real-time simulations of FPGA designs and share processing loads across several DSPs, which make it perfect for large, intensive data crunching wireless and video applications.

Adding DRC modules (with its 8-Gbps, full-duplex RapidCHANNEL links) to the SignalMaster Quad opens the way to interconnecting SignalMaster Quads or combining them with VHS-ADCs and VHS-DACs in the same cPCI chassis.

Applications

The following are a few applications where the SignalMaster Quad truly shines:

- FPGA/DSP-based development
- Real-time digital signal processing
- Telecommunications and telephony
- Wireless communications
- Base station prototyping
- Video processing
- DSP co-processing

Features

The SignalMaster Quad offers the following features:

- Two Xilinx Virtex-4 LX FPGAs that offer unsurpassed capabilities and high-performance logic.
- Four Texas Instruments TMS320C6416 DSPs for unparalleled processing power.
- 128 MB SDRAM per DSP and 128 MB DDR SDRAM per FPGA allow heavier loads on the DSPs and FPGAs (such as when buffering video data).
- Two inter-FPGA RapidCHANNEL connections for 8-Gbps, full-duplex communications between the FPGAs.
- Two LYRIO+ interfaces and BP RTM I/Os that allow connecting a broad range of Lyrtech I/O add-on modules to the SignalMaster Quad, including:
  - The RapidCHANNEL/FPDP DRC add-on module with one TX and one RX RapidCHANNEL ports capable of 8 Gbps and two configurable RX/TX, 400-MBps FPDP-I/II ports.
  - The ADACMaster III, a 125-MSPS ADC and 500-MSPS DAC module.
  - The Camera Link module with one base-mode RX and TX ports.
  - The RAVe module with one analog composite video and S-Video (NTSC/PAL/SECAM) inputs, one DVI output, and a stereo audio 16-bit codec.
- An array of tools that allow designing complex algorithms for the SignalMaster Quad as block models with the popular MATLAB and Simulink programs.
- The SignalMaster Quad is also compatible with some of the most powerful integrated development environments on the market—Code Composer Studio and ISE Foundation.

Software development tools

The SignalMaster Quad also comes with the following board support packages:

SignalMaster Quad BSDK

The board software development kit (BSDK) for the SignalMaster Quad allows targeting the onboard FPGAs through ISE Foundation projects and is accompanied by FPGA core documentation. The BSDK also allows targeting the onboard DSP through Code Composer Studio projects that use the BSDK's DSP board support library APIs. Furthermore, the BSDK includes a host API and programs that allow communicating with the SignalMaster Quad's DSPs and FPGAs. Finally, the BSDK includes a complete set of hardware functional examples that demonstrate how to use the onboard I/Os and interfaces, as well as add-on modules such as the DRC module.

SignalMaster Quad MBDK (optional)

The optional SignalMaster Quad model-based design kit (MBDK) allows generating code for the onboard DSPs and FPGAs from Simulink. The MBDK also makes it possible to use external communication channels to visualize the data in DSP memory during a real-time execution. Modifying model parameters on the fly and performing FPGA hardware-in-the-loop co-simulations are also a breeze with Simulink. The MBDK also comes with a complete set of functional examples that demonstrate how to use the onboard I/Os and interfaces, as well add-on modules in a model-based design environment.

Diamond (optional)

Diamond from 3L enhances single-processor tools with a proven and simple multiprocessor model offering a level of abstraction that leads to efficient, coherent, reliable, and flexible systems. For details about this software solution, click here.

Hardware options

The SignalMaster Quad has the following optional hardware packages:

Light

This package features two LX80 Virtex-4 FPGAs and four, 1-GHz C6416 DSPs.

Intermediate

This package features two LX100 Virtex-4 FPGAs and four, 1-GHz C6416 DSPs.

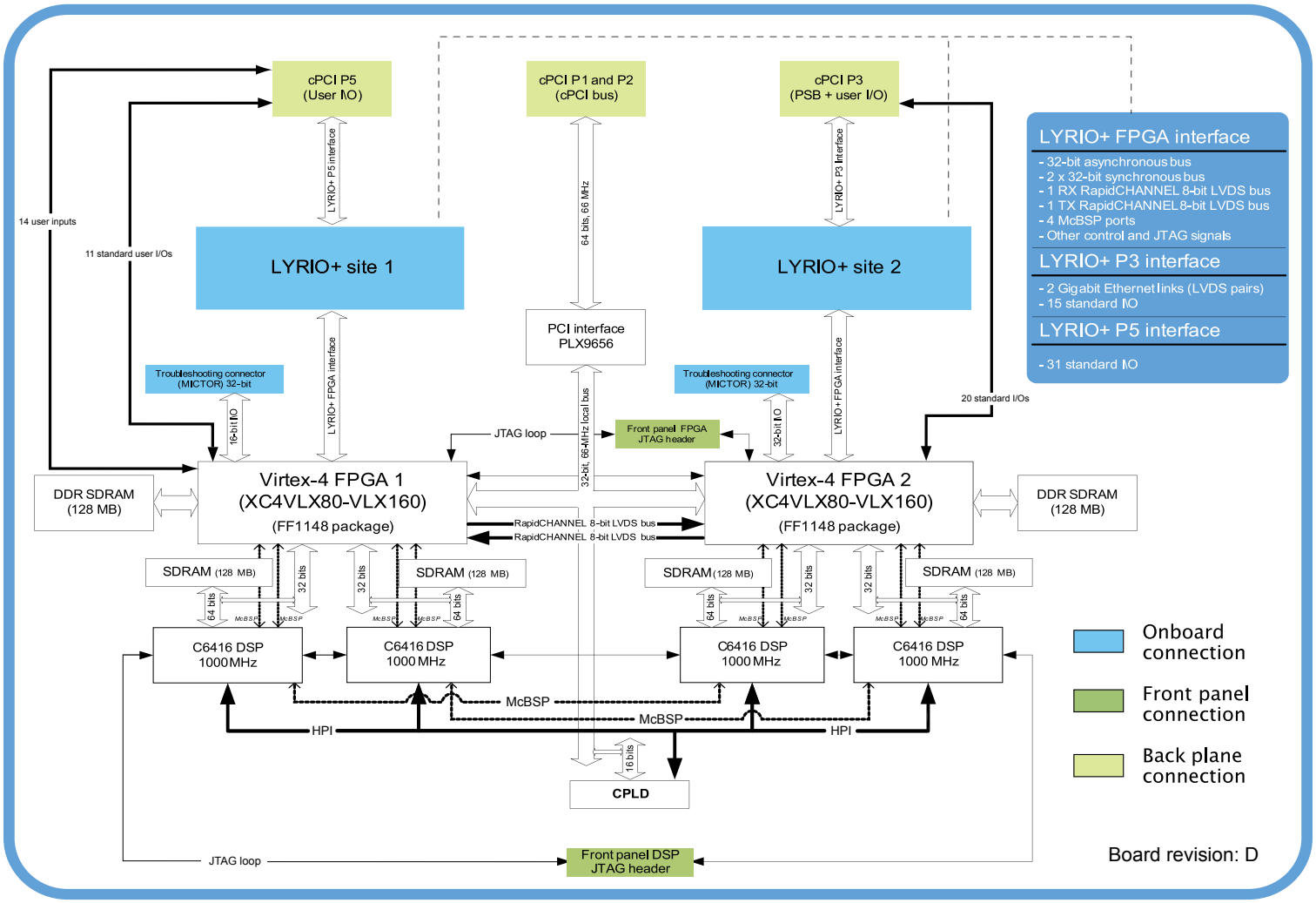
Advanced

This package features two LX160 Virtex-4 FPGAs and four, 1-GHz C6416 DSPs.

Specifications

Texas Instruments TMS320C6416 DSP	• 1 GHz maximum (8000 MIPS peak) • 128 MB external SDRAM per DSP
Xilinx LX Virtex-4 FPGA	• 152,064 logic cells maximum • 96 XtremDSP slices maximum • 128 MB external DDR SDRAM per FPGA
RapidCHANNEL	• 8-Gbps inter-FPGA bus (2×, RX ×1 and TX ×1) • 8-Gbps bus to and from LYRIO+ interface of each FPGA (×2, RX ×1 and TX ×1) *For details about the specifications of this Lyrtech interface, contact* info@lyrtech.com.
Troubleshooting ports	• Front panel JTAG connector to all DSPs (×1) • Front panel JTAG connector to all FPGAs (×1) • Onboard GPIO troubleshooting port (mictors, ATC2-compatible) (×2) • FPGA 1: 32 bits • FPGA 2: 32 bits
Memory	• 128-MB SDRAM per DSP • 128-MB DDR SDRAM per FPGA
Backplane connections	• User I/O pin on P5 direct to FPGA 1 (×25) • User I/O pin on P3 direct to FPGA 2 (×20) • User I/O pin on P5 to LYRIO+ site 1 (×31) • User I/O pin on P3 to LYRIO+ site 2 (×15) • Gigabit Ethernet link PICMG 2.16 on P3 to LYRIO+ site 2 (×2)
Mezzanine communications interface	• LYRIO+ (×2), minimum 12 Gbps, full-duplex *For details about the specifications of this Lyrtech mezzanine communications interface, contact* info@lyrtech.com.
cPCI interface	• cPCI bus: 32 bits or 64 bits, 66 MHz or 33 MHz • cPCI local bus: 32 bits, 66 MHz

Block diagram



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With over 25 years of experience delivering advanced digital signal processing solutions to companies worldwide, Lyrtech serves customers across the Americas, Asia, and Europe. Lyrtech offers a full range of DSP–FPGA development platforms, as well as product development services. Lyrtech works in partnership with such industry leaders as Texas Instruments, The MathWorks, and Xilinx to deliver unsurpassed quality and support to its large OEM customer base, which includes many prestigious names of the consumer electronics, telecommunications, aerospace, and defense fields. In a world where digital signal processing technology is vital to network and wireless communications, audio and video processing, as well as electronic systems in all fields of technology, Lyrtech is an ideal partner.

Lyrtech products are constantly being improved; therefore, Lyrtech reserves itself the right to modify the information herein at any time and without notice.

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