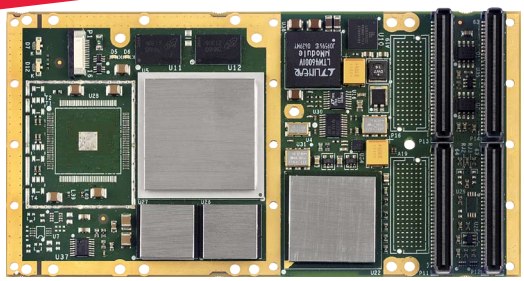
Data Sheet

ADX000

Xilinx® Virtex®-5 FPGA Processor XMC/PMC



Applications

- Electronic Warfare (EW)
- Electronic Counter Measures (ECM)
- Spectral Analysis
- RADAR

Features

- Xilinx® Virtex®-5 SX95T FPGA (user programmable)
- Dual banks of QDR2 SRAM and DDR2 SDRAM memories
- XMC/PMC form factor
- Air- or conduction-cooled rugged versions
- Windows®, VxWorks® and Linux® support

Benefits

- Lower power solution
- Industry standard form factor
- PCI Express® (PCIe) provides high throughput to baseboard

Overview

The ADX000 is a second generation XMC module with the same design base as the AD1520 and AD3000 and follows on from previous Xilinx Virtex-5 PMC module designs.

Resources on the PMC/XMC module are optimized to support the processing of digitized data and the Xilinx Virtex-5 SXT or LX110T FPGA is used to control the data flow and provide the off-board interfaces to either PCI-X or the multi-GB/s serial I/O used for the XMC interface.

FPGA Processing

The ADX000 is an FPGA based data processing module. The majority of the Virtex-5 FPGA resources are available for user programmable processing and are supported by SRAM and SDRAM memories. Some applications that are ideally suited for FPGA based processing include Digital Down Conversion (DDC), Fast Fourier Transforms (FFTs) and digital filters.

Xilinx Virtex-5 FPGA

The ADX000 can be fitted with either a Xilinx Virtex-5 SX95T or LX110T FPGA (contact factory for availability of other FPGA variants) allowing the ADX000 to be optimized to provide the largest amount of DSP capabilities or maximum amount of logic gates.

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The FPGA is configured at power up from FLASH with a default image, a recovery image or an image the customer generates. In addition to FLASH configuration, new images can be downloaded from the host via the PCI or PCIe interface. Software is provided to load new images into either FLASH or SRAM. Bit streams stored in SRAM benefit from faster downloads while bypassing non-volatile storage - useful for secure applications.

Multiple SDRAM & SRAM Banks

The ADX000 features both external SRAM and SDRAM connected to the FPGA. These can be used for buffering data or for general purpose processing support.

The two 128MB DDR2 SDRAM banks on the ADX000 can be used in parallel to buffer digitized data. Each bank is 16-bits wide and clocked at up to 250MHz for a net storage rate of up to 1GB/s per bank.

QDR2 SRAM provides higher bandwidth external memory. Two 2M x 36-bit banks are fitted on the ADX000 and clocked at 200MHz for a net throughput of up to 2GB/s per bank.

PCI/PCI-X, PCIe & Multi-GB/s I/O

The ADX000 includes a PCI/PCI-X interface, supporting up to 133MHz operation, and a PCIe interface. These interfaces provide multi-channel DMA support.

The PCIe interface uses the Virtex-5 FPGA's RocketIO™ GTP transceivers and an embedded end-point controller, which is a hard IP block within the Virtex-5 FPGA. This built-in PCIe endpoint block supports x4 or x8 lane communications at 2.5GB/s according to the PCIe standard, but can be bypassed to support other protocols like sFPDP or Serial RapidIO® (SRIO). Overall, the Virtex-5 FPGA provides sixteen, full duplex high-speed serial communication links through RocketIO GTP transceivers. These links are evenly split between two XMC (VITA 42) connectors, with each link capable of operation at up to 3.2GB/s (using an SX95T FPGA) and can be driven as independent data streams or bonded to create 'fat pipes' for fewer, but higher bandwidth, data streams.

Rugged Build Options

A range of environmental requirements are addressed by the ADX000: air-cooled benign, air-cooled extended temperature, air-cooled rugged and conduction-cooled. For conduction-cooled applications, the host board must be able to incorporate front panel I/O connections. Depending on the application, a suitable heatsink may be required for conduction-cooled builds.

FusionXF Software/HDL Support

Curtiss-Wright Controls Embedded Computing's FusionXF development kit includes software, HDL and utilities with examples and infrastructure for using the ADX000 on one of Curtiss-Wright Controls' processor based or other Xilinx Virtex-5 and Virtex-4 FPGA-based products. FusionXF includes a C-API and sophisticated DMA support.

One of the core elements to the FusionXF development kit is a framework for adding in new IP functionality or capabilities to the FPGA. With support for high-speed DMA capabilities and documented interfaces for the integration of custom IP, FusionXF makes HDL development easier and integration more straightforward.

Example software/HDL illustrates how to interface to on-board devices such as QDR SRAM and DDR SDRAM. Under software running on the host, data can be moved to and from the ADX000's memories using FusionXF's high performance DMA capabilities.

Software utilities are provided for configuring the FPGA. These include FLASH programming and commands to configure the FPGA from a given image in FLASH or SRAM. The FPGA may also be configured via a ChipScope™ Pro/JTAG interface. Host operating systems supported by the FusionXF suite includes Windows, VxWorks and Linux. Although the ADX000 is aimed at applications requiring both high-speed digitization and user programmable FPGA processing, a full acquisition-only example image is provided. This allows the ADX000 to be used 'out-of-the-box' without having to develop FPGA code. This image can be loaded from the FLASH file system and supports full bandwidth data acquisition, external trigger modes and high-speed DMA driven PCI-X/PCIe channels to the host processor. This example can be modified to include a user application, making the ADX000 quick and easy to use.

Figure 2: ADX000 Block Diagram

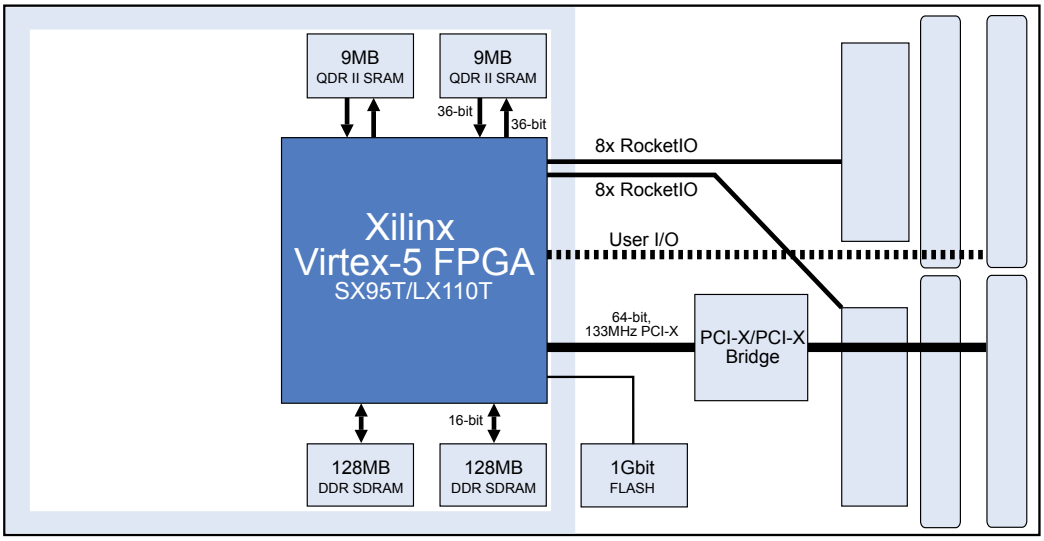

Table 1: Specifications

FPGA	
Device	Xilinx Virtex-5 LX110T or SX95T (speed grade 2)
DDR2 SDRAM	2 banks of 64M x 16-bit (2 banks of 128MB)
QDR2 SRAM	2 banks of 2M x 36-bit (2 banks of 9MB)
FLASH	1Gbit (FPGA boot/configuration including rescue image)
PCI	
PCI Compliance	32/64-bit PCI 33/66MHz, PCI-X 66/100/133MHz, Master/slave/DMA, Interrupt support
XMC	
XMC P15	8x RocketIO @ 3.125GB/s or 8x PCIe
XMC P16	8x RocketIO @ 3.125GB/s
Software/HDL Code	
Host Drivers	Windows, VxWorks 6.x, Linux
Utilities	FLASH programming, diagnostics
Software/HDL Code	Memory interfaces, PCI-X, PCIe
Miscellaneous	
Weight	Commercial air-cooled 110g Rugged air-cooled 147g Conduction-cooled 138g



Table 2:
Environmental Specifications

		Commercial	Rugged		
			Air-cooled	Conduction-cooled	Conduction-cooled
			Level 100[1]	Level 100[1]	Level 200[1]
Temperature	Operational (at sea level)	0°C to +55°C (15 CFM air flow)[2]	-40°C to +70°C (20 CFM air flow)[2]	-40°C to +70°C (Card Edge Temp)[3]	-40°C to +85°C (Card Edge Temp)[3]
	Non-Operational	-40°C to +85°C	-50°C to +100°C	-50°C to +100°C	-50°C to +100°C
Vibration	Operational (Random)	-	0.04g2/Hz	0.1g2/Hz	0.1 g2/Hz
Shock	Operational	-	30g peak, 11ms half sine	40g peak, 11ms half sine	40g peak, 11ms half sine
Humidity	Operational	5-95% non-condensing	Up to 95%	Up to 95%	Up to 100% non-condensing
Altitude[4]	Operational	-	-1,500 to 60,000ft	-1,500 to 60,000ft	-1,500 to 60,000ft
Conformal Coating[5]		No	Yes	Yes	Yes

Notes
1. Availability of the ruggedization levels are subject to qualifications for each product.
2. For operation at altitudes above sea level, the minimum volume flow rate should be adjusted to provide the same mass flow rate as would be provided at sea level. Additional airflow might be required if the card is mounted together with, or next to, cards that dissipate excessive amounts of heat. Some higher-powered products may require additional airflow.
3. The contacting surface on the rack/enclosure must be at a lower temperature to account for the thermal resistance between the plug-in unit and rack/enclosure.
4. Depending on the technology used, the risk for Single Event Upsets will increase with altitude.
5. Coated with Humiseal 1B31 or 1B73EPA. (ref. http://humiseal.com for details)

*While the ADX000 is designed to meet these environmental requirements, formal qualification testing has not been performed to these levels. Please contact your local sales representative to discuss your program specific requirements.

Warranty

This product has a one year warranty.

Contact Information

To find your appropriate sales representative, please visit:

Website: www.cwcembedded.com/sales

Email: sales@cwcembedded.com

Technical Support

For technical support, please visit:

Website: www.cwcembedded.com/support1

Email: support1@cwcembedded.com

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