

PCI516 – PCIe FPGA Carrier for FMC, Virtex-7

PCIe FMC Carrier



KEY FEATURES

- PCIe FPGA carrier for FMC per VITA-57
- Xilinx Virtex-7 690T FPGA
- Active cooling for FPGA and FMC
- Supported by DAQ Series™ data acquisition software
- Dual x8 lanes for direct connection to neighbouring FPGA card(s)
- Dual bank of 64-bit DDR-3 memory 4 GB Total
- Single bank of 32-bit DDR memory 1 GB
- RoHS compliant

Benefits of Choosing VadaTech

- Based on the widely-used VadaTech AMC516
- Strong BSP support and example code to support system bring-up
- Wide range of compatible FMCs, including ADC, DAC and networking
- Electrical, mechanical, software, and system-level expertise in house
- Full system supply from industry leader
- AS9100 and ISO9001 certified company

The PCI516 is based on the Xilinx Virtex-7 690T, which provides 3,600 DSP slices, 52,920 Kb RAM and 690,000 logic cells. The FPGA interfaces directly to the FMC DP 0-9 and all FMC LA/HA/HB pairs, making it compatible with a wide range of industry standard VITA-57 modules. The PCI516 provides active cooling of the FPGA and FMC, making it appropriate for power-hungry applications or those requiring temperature stability for good performance.

The FPGA has interface to three DDR3 memory channels (64-bit wide and 16-bit wide). This allows for large buffer sizes to be stored during processing as well as for queuing the data to the host.

The PCI516 has x8 PCIe edge connector routed to the FPGA PCIe Gen3 hard IP block. In addition, 16 uncommitted connection pairs are routed to a dual x8 expansion connector, providing direct connectivity to a neighbouring FPGA (e.g. via Aurora, 10G/40G, SRIO, PCIe) without the need to go through the host.

REFERENCE DESIGN

VadaTech provides several Xilinx based FPGA products. The FPGA products are in two categories; FPGA boards with FMC carriers and FPGA products with high speed ADC and DACs. The FPGA products are designed in various architectures such as AMC modules, PCIe cards and 3U Open VPX.

VadaTech provides a reference design implementation for our FPGAs complete with VHDL source code, documentation and configuration binaries. The reference design focuses on the I/O ring of the FPGA to demonstrate low-level operation of the interconnections between the FPGA and other circuits on the board and/or backplane. It is geared to prove out the hardware for early prototyping, engineering/factory diagnostics and customer acceptance of the hardware, but it does not strive to implement a particular end application. The reference VHDL reduces customer time to develop custom applications, as the code can be easily adapted to meet customer's application requirements.

The reference design allows you to test and validate:

- Base and Fabric channels
- Clocks
- Data transfers
- Memory
- User defined LEDs

Xilinx provides Vivado Design Suite for developing applications on Xilinx based FPGAs. VadaTech provide reference VHDL developed using the Vivado Design Suite for testing basic hardware functionality. The reference VHDL is royalty free to use and modify on VadaTech products but customers are restricted from redistributing the reference code and use of this code for any other purpose.

The reference VHDL is shipped in one or more files based on number of ordering options. Not all ordering option have an impact on the FPGA and a new image is created for those options that have direct impact on the FPGA. Use the correct reference image to test your hardware. For more information, refer to the FPGA reference design manual for your device which can accessed from customer support site along with the reference images.

SUPPORTED SOFTWARE

- Default FPGA image stored in flash memory
- Linux BSP
- Build Scripts
- Device Driver
- Reference application projects for other ordering options

The user may need to develop their own FPGA code or adapt VadaTech reference code to meet their application requirements. The design pre-compiled images make use of hardware evaluation licenses, where necessary, instead of full license. VadaTech does not provide license for the Vivado tool or Xilinx IP cores, please contact Xilinx for more information.

Xilinx also provides System Generator tool for developing Digital Signal Processing (DSP) applications.

[Xilinx Vivado Design Suite](#), [Xilinx System Generator for DSP](#)

DATA ACQUISITION

VadaTech offers a wide range of FPGA AMCs, RTMs, FMC Carriers and FMCs that can be combined to build a Data Acquisition (DAQ) sub-system. The DAQ Series software, when used with a supported hardware configuration, provides all that is needed to configure the system, acquire data and transfer it to a host processor. It also includes a user-configurable Graphical User Interface (GUI) which includes real-time display of acquired data. The host can be within the MTCA system or, via PCI113 or PCI123, in a separate PC. Full documentation is provided to allow users to customise system behaviour or develop their own application on the AMC/FMC hardware.

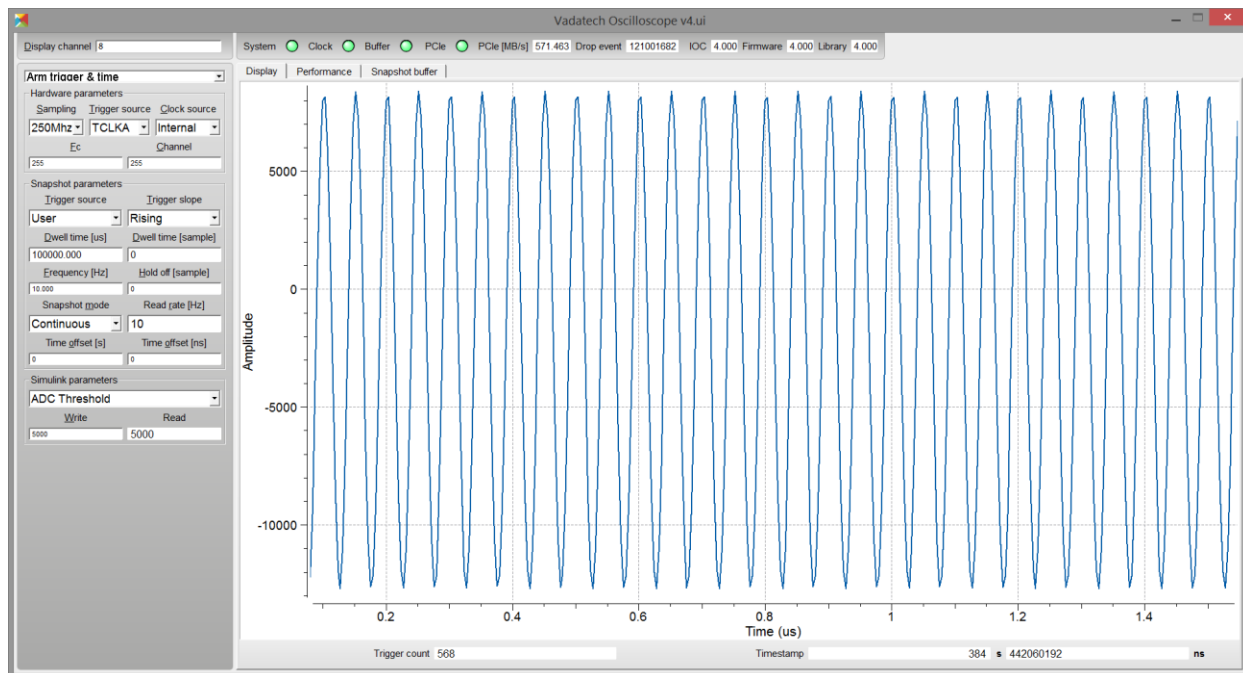


Figure 1: Typical User Interface Display

The DAQ includes data acquisition software that allows users to get up and running quickly and easily, while providing a high level of performance and allowing the user to extend functionality by adding their own FPGA code. Please contact VadaTech sales for the latest information on supported combinations of VadaTech hardware. (Note that the DAQ Series software is not currently supported for 3rd party hardware).

The DAQ Series software provides ability to easily implement system modelling and automatic code generation from Simulink® and MATLAB® (The Mathworks, Inc.) into Vivado FPGA project via System Generator® (Xilinx). This allows the programmer to interface with the hardware, program the FPGA at high level and benefit from:

- Vivado integration
- DSP modelling
- Bit and cycle accurate floating and fixed-point implementation
- Automatic code generation of VHDL or Verilog from Simulink
- Hardware co-simulation

Components provided in the DAQ software include:

- System libraries to configure clocking and triggers
- Sequencer to configure the acquisition (duration, start, stop)
- High-performance DMA firmware for acquiring ADC outputs and transferring to host processor
- Linux driver for host processor (e.g. AMC72x)
- EPICS channel access client API
- Pre-configured GUI (based on Qt Creator)

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This software set allows the user to acquire, transfer and display data without the need for any user programming of the hardware. Status information is included in the GUI display, to ease integration and debugging activity.

The data acquisition software provided as part of the DAQ can be used as-delivered without the user needing to develop any FPGA code.

Note that VHDL source code is not provided for the DMA engine and memory block (provided as Netlists).

Full source code is provided for the libraries, sequencer, Linux driver and GUI, allowing users to easily customize or brand to their own requirements.

COMPATIBLE FMC

VadaTech offers VITA-57 compatible FMCs providing ADC, DAC, RF transceivers and network interfaces. These FMCs are widely deployed in commercial and mil/aero form factors. Please contact VadaTech Sales for more information.

BLOCK DIAGRAM

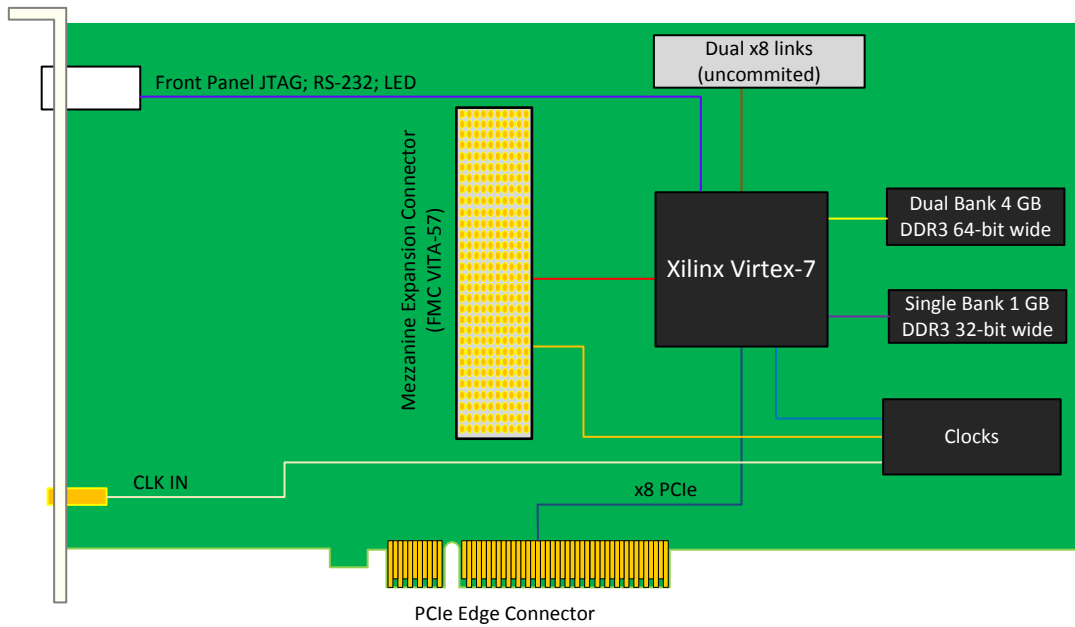


Figure 2: PCI516 Functional Block Diagram

FRONT PANEL

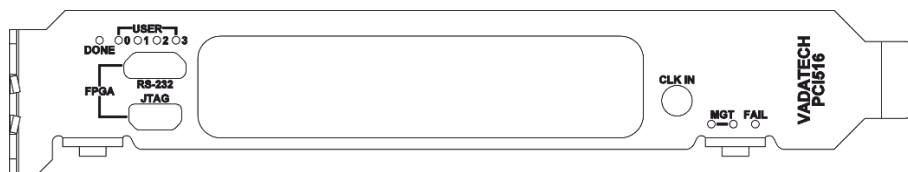


Figure 3: PCI516 Front Panel

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SPECIFICATIONS

Architecture		
Physical	Dimensions	Single Module
		Width: 4.36" (110.74 mm) Depth 12.283" (311.98 mm)
Type	PCI Carrier	PCI FPGA Carrier for FMC
Standards		
PCIe	Lanes	x8
Configuration		
Power	PCI516	~35 W without the FMC (Application specific)
Environmental	Temperature	Operating Temperature: -5° to 45°C
		Storage Temperature: -40° to +85°C
	Vibration	Operating 9.8 m/s ² (1.0 G), 5 to 500Hz
	Shock	30Gs on each axis
	Relative Humidity	5 to 95 per cent, non-condensing
Front Panel	Interface	Front Panel FMC
		FPGA JTAG via micro HDMI
		FPGA RS-232 via micro USB
		CLK IN from SSMC
	LEDs	Four Status and Four User defined
Software Support	Operating System	N/A
Conformal Coating		Humiseal 1A33 Polyurethane (Optional)
		Humiseal 1B31 Acrylic (Optional)
Other		
MTBF	MIL Hand book 217-F @ TBD Hrs	
Certifications	Designed to meet FCC, CE and UL certifications where applicable	
Standards	VadaTech is certified to both the ISO9001:2000 and AS9100B:2004 standards	
Warranty	Two (2) years	

INTEGRATION SERVICES AND APPLICATION-READY PLATFORMS

VadaTech offers a full range of ATCA and μ TCA products including chassis platforms, shelf managers, AMC modules, carriers, Rear Transition Modules (RTM), Power Modules, and more. This allows customers to source complete systems from an industry-leader provider with confidence of interoperability. The company also offers integration services as well as pre-configured Application-Ready Platforms. Please contact VadaTech Sales for more information.

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ORDERING OPTIONS

PCI516 – 000 – 0E0 – GHJ

E = FPGA Speed

- 1 = Low
- 2 = High
- 3 = Highest

G = Clock Holdover Stability

- 0 = Standard (XO)
- 1 = Stratum-3 (TCXO)

H = Temperature Range

- 0 = Commercial (–5° to +45° C)
- 1 = Industrial (–20° to +60° C)

J = Conformal Coating

- 0 = None
- 1 = Humiseal 1A33 Polyurethane
- 2 = Humiseal 1B31 Acrylic

RELATED PRODUCTS



AMC516
Virtex-7, FPGA Carrier



FMC213 Quad ADC 16-bit 250 MSPS,
DAC 14-bit 5.7 GSPS



FMC225
4 GSPS ADC, 5.7 GSPS DAC

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