AMC Kintex-7 FPGA Carrier

KEY FEATURES

- AMC FPGA carrier for FMC per VITA 57
- Xilinx Kintex-7 410T FPGA in FFG-900 package with optional P2040
- Supported by DAQ Series™ data acquisition software
- AMC Ports 4-11 are routed to FPGA per AMC.1, AMC.2 and AMC.4 (protocols such as PCIe, SRIO, XAUI, etc. are FPGA programmable)
- Single module, mid-size AMC (full-size optional)
- Clock jitter cleaner
- IPMI 2.0 compliant

AdvancedMC™

Benefits of Choosing VadaTech

- Distributed processing with local P2040 processor provides more reliability, performance and eliminates a potential single-point-of-failure in the system
- The cross-bar switch LVDS provides superior clocking results
- Design utilizes proven VadaTech subcomponents and engineering techniques
- Electrical, mechanical, software, and system-level expertise in house
- Full ecosystem of front and rear boards, enclosures, specialty modules, and test/dev products from one source
- AS9100 and ISO9001 certified company

The AMC517 is an AMC FPGA Carrier for FMC per VITA 57 and is compliant to AMC.1, AMC.2 and/or AMC.4 specification. The unit has an onboard, re-configurable FPGA which interfaces directly to the AMC FCLKA, TCLKA-D, FMC DP0-7 and all FMC LA/HA/HB pairs. The FPGA has interfaces to two 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. With a FMC site per VITA 57, each AMC517 in the system has a whole array of mezzanine options available in the marketplace.

The onboard quad-core PPC can runs at 1.2 GHz with 2 GB of DDR3, 128 GB of Boot Flash, and a 32 GB SD Card. The PPC has dual 1000Base-X Ethernet interfaces to the FPGA in addition to its local bus. The PPC and FPGA route GbE to the Port 0 and 1 via a mux selection.

See Synchronized DAQ for a description of how phase coherent acquisition can be achieved using this product.

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.
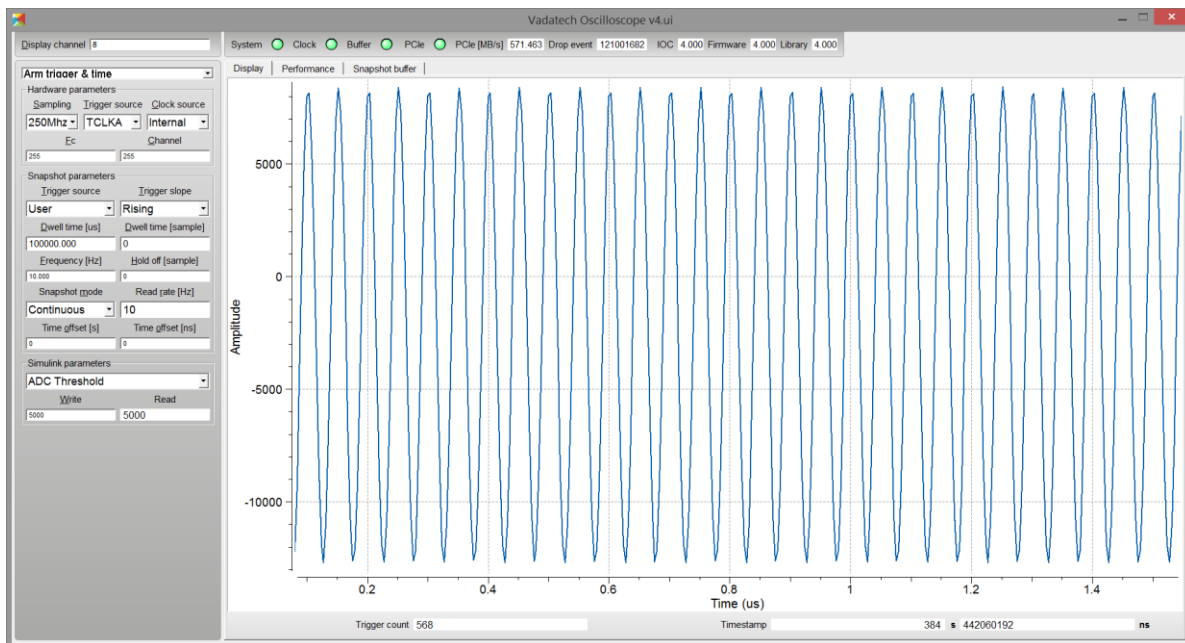

Figure 1: Typical User Interface Display

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)

AMC517 – Kintex-7 FPGA Carrier for FMC, AMC

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.
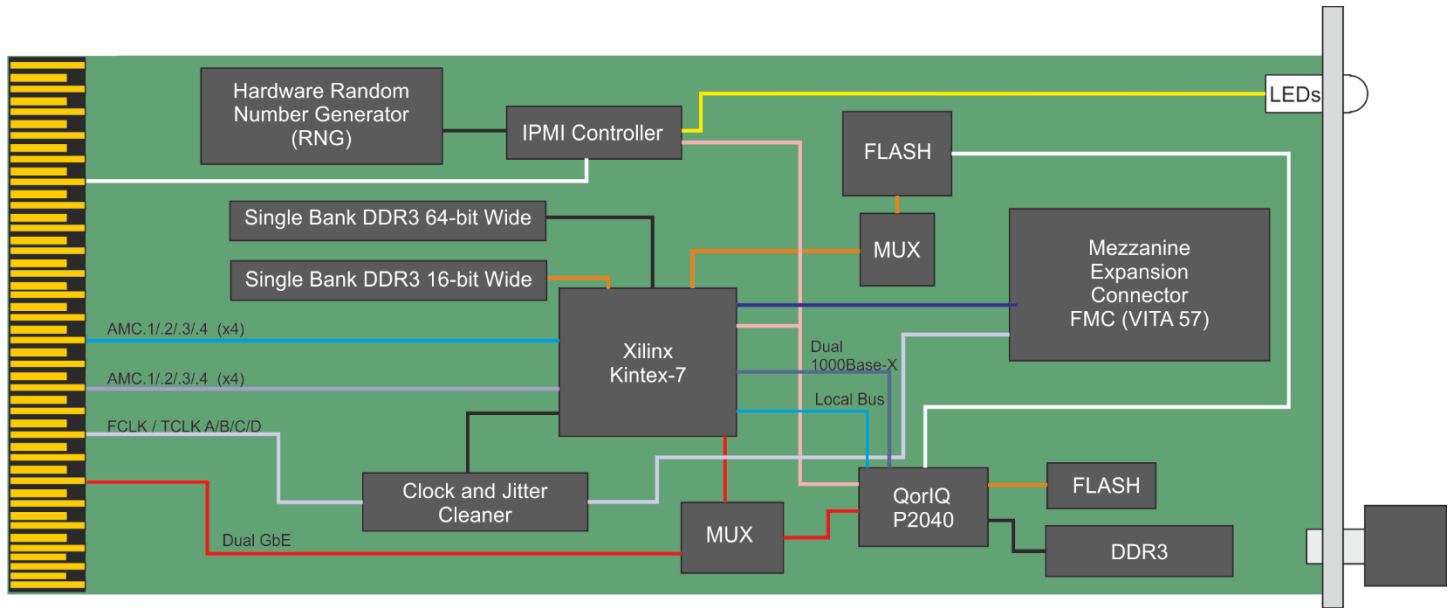
BLOCK DIAGRAM

Figure 2: AMC517 Functional Block Diagram

FRONT PANEL

Figure 3: Front Panel

SPECIFICATIONS

Architecture		
Physical	Dimensions	Single module, mid-size
		Width: 2.89" (73.5 mm)
		Depth 7.11" (180.6 mm)
Type	AMC FPGA Carrier	Xilinx FPGA Kintex-7 Device
		Optional onboard CPU
		Single FMC slot
		Two banks of DDR3 (64-bit and 16-bit)

Standards		
AMC	Type	AMC.1, AMC.2, and AMC.4 (FPGA programmable)
Module Management	IPMI	IPMI v2.0
PCIe	Lanes	Dual x4 via FPGA to AMC
SRIO	Lanes	Dual x4 via FPGA to AMC
Ethernet	10 GbE and GbE	Dual 10GbE via FPGA and Dual 1000-BaseBX from PPC

Configuration		
Power	AMC517	Carrier is ~16W (without mezzanine) application specific
Environmental	Temperature	Operating Temperature: -5° to 55°C (air flow > 400LFM) industrial and extended versions also available (See environmental spec sheet)
		Storage Temperature: –40° to +85°C
	Vibration	Operating 9.8 m/s^2 (1.0G), 5 to 500 Hz
	Shock	30Gs on each axis
	Relative Humidity	5 to 95% non-condensing
Front Panel	Interface Connectors	Front panel FMC
	LEDs	IPMI management control
		4 user defined LEDs
	Mechanical	Hot-swap ejector handle
Software Support	Operating System	Linux, VxWorks and Windows

Other	
MTFB	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 ISO9001:2015 and AS9100D standards
Warranty	Two (2) years, see VadaTech Terms and Conditions

INTEGRATION SERVICES AND APPLICATION-READY PLATFORMS

VadaTech has a full ecosystem of ATCA and MTCA products including chassis platforms, shelf managers, AMC modules, Switch and Payload Boards, Rear Transition Modules (RTM), Power Modules, and more. The company also offers integration services as well as pre-configured Application-Ready Platforms. Please contact VadaTech Sales for more information.

Trademarks and Disclaimer

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ORDERING OPTIONS

AMC517 – ABC – DEF – GHJ

A = FPGA DDR3 Memory
0 = None
1 = Reserved
2 = 2 GB + 512 MB

B = QorIQ CPU Subsystem
0 = None (FPGA loaded via Flash)
1 = P2040

C = Front Panel Size
1 = Reserved
2 = Mid-size
3 = Full-size

D = FPGA
0 = Reserved
1 = Reserved
2 = XC7K410T

E = FPGA Speed
1 = Low**
2 = High
3 = Highest**

F = PCIe Option
0 = No PCIe
1 = PCIe on Ports 4–7
2 = PCIe on Ports 8–11
3 = PCIe on Ports 4–11

G = Clock Holdover Stability
0 = Standard (XO)
1 = Stratum-3 (TCXO)

H = Temperature Range
0 = Commercial (–5° to +55°C)
1 = Industrial (–20° to +70°C)
2 = Extended (–40° to +85°C)*

J = Conformal Coating
0 = No coating
1 = Humiseal 1A33 Polyurethane
2 = Humiseal 1B31 Acrylic

Notes:
*Edge of module for conduction-cooled boards.
**Minimum number of unit buy is required for this option.

COMMON CONFIGURATIONS

AMC517-212-220-000

RELATED PRODUCTS

VT899 Cube Chassis

FMC223 High Speed FMC for DAC

UTC020 1000W Power Module

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