AMC518

Zynq-7000 FPGA Carrier for FMC, AMC

AMC518

Key Features

- AMC FPGA carrier for FMC per VITA 57
- Xilinx Zynq-7000 FPGA in FFG-900 package (XC7Z100 or XC7Z045) with embedded ARM®
- 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)
- AMC FCLKA, TCLKA, TCLKB, TCLKC and TCLKD are routed

Benefits

- Zynq processor in AMC provides an integrated CPU with the FPGA
- Dual banks of DDR3 memory allows large buffer sizes and queuing during processing for CPU/FPGA
- Design utilizes proven VadaTech subcomponents and engineering techniques
- Electrical, mechanical, software, and system-level expertise in house
- Full system supply from industry leader
- AS9100 and ISO9001 certified company

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The AMC518 is an AMC FPGA Carrier for FMC per VITA 57. The AMC518 is compliant to the AMC.1, AMC.2 and/or AMC.4 specification. The unit has an on-board, 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 an interface to a single DDR3 memory channel (64-bit wide). This allows for large buffer sizes to be stored during processing as well as for queuing the data to the host. The CPU has a separate single bank of DDR3 (32-bit wide).

With an FMC site per VITA 57, each AMC518 in the system has a whole array of mezzanine options available in the marketplace.

Figure 1: AMC518

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 (Figure 2), which incorporates 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 customize system behavior or develop their own application on the AMC/FMC hardware.

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).

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)

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.
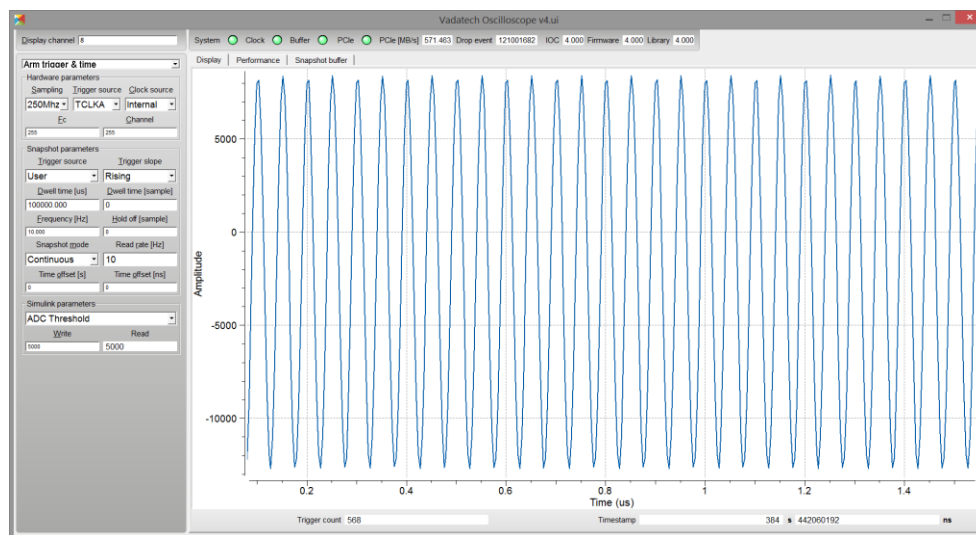

Figure 2: Typical Graphic User Interface Display

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

Full source code is provided for the libraries, sequencer, DMA, Linux driver and GUI, allowing users to easily customize or brand to their own requirements at the exception of a low level PCIe IP from Xilinx provided only as Netlist (this low-level block doesn't require modification/customization from integrators or end-users).

Reference Design

VadaTech provides an extensive range of 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 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 designed 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 the following functionality (where supported by the hardware):

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

Xilinx provides Vivado Design Suite for developing applications on Xilinx based FPGAs. VadaTech provides reference VHDL developed using the Vivado Design Suite for testing basic hardware functionality. The reference VHDL is provided royalty free to use and modify on VadaTech products, so can be used within applications at no additional cost. However, customers are restricted from redistributing the reference code and from use of this code for any other purpose (e.g. it should not be used on non-VadaTech hardware).

The reference VHDL is shipped in one or more files based on a number of ordering options. Not all ordering options have an impact on the FPGA and a new FPGA 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 supplied pre-compiled images may make use of hardware evaluation licenses, where necessary, instead of full licenses. This is because VadaTech does not provide licenses for the Vivado tool or Xilinx IP cores, so please contact Xilinx where these are required.

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

See the following links:

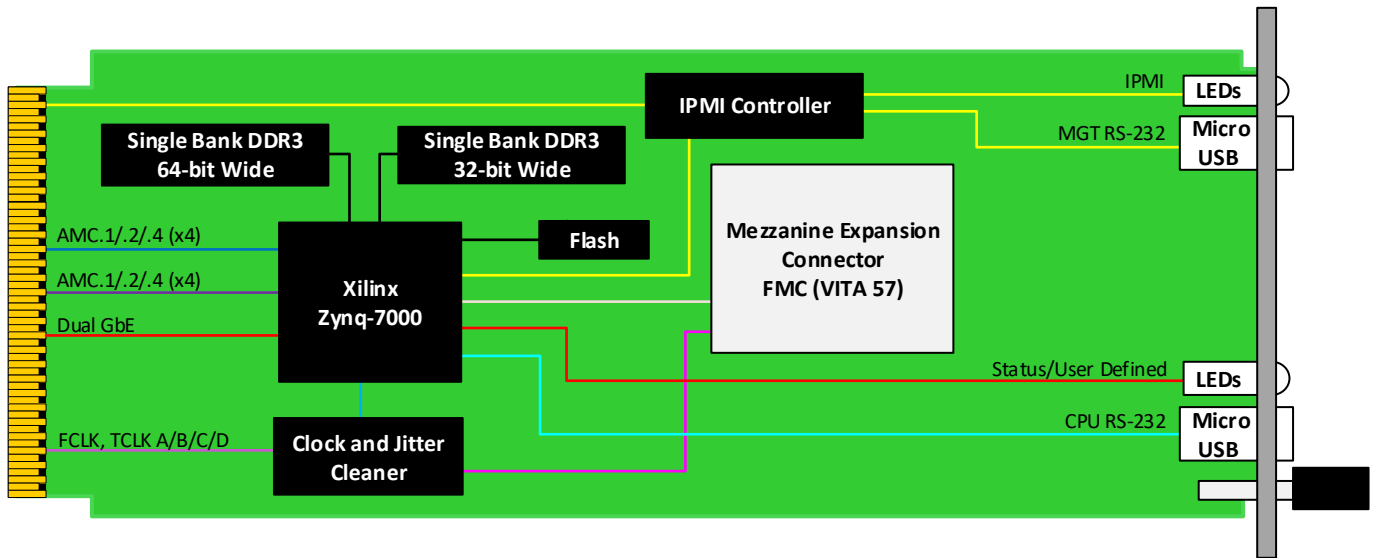[Xilinx Vivado Design Suite](), [Xilinx System Generator for DSP]().

Block Diagram

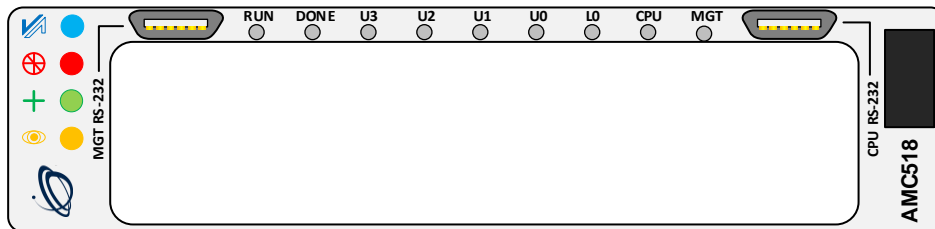*Figure 3: AMC518 Functional Block Diagram*

Front Panel

Figure 4: AMC518 Front Panel

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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 Zynq-7000 Device
		SoC CPU included in FPGA package
		Single FMC slot
		Two banks of DDR3 (FPGA 64-bit, CPU 32-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	**10GbE and GbE**	Dual 10GbE and Dual 1000-BaseBX from Zynq FPGA

Configuration		
Power	**AMC518**	Carrier is ~10W (without mezzanine) application specific
Environmental	**Temperature**	See ordering options and environmental spec sheet
		Storage Temperature: –40° to +85°C
	Altitude	40,000 ft non-operating
	Vibration	Operating 9.8 m/s2 (1G), 5-500 Hz
	Shock	Operating 30Gs each axis
	Relative Humidity	5 to 95% non-condensing
Front Panel	**Interface Connectors**	Front Panel FMC
		2x Micro USB for MGT RS-232 and CPU RS-232
	LEDs	IPMI, activity and user defined
	Mechanical	Hot swap ejector handle
Software Support	**Operating System**	Linux, VxWorks and Windows

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 has a full ecosystem of OpenVPX, ATCA and MTCA products including chassis platforms, shelf managers, AMC modules, Switch and Payload Boards, Rear Transition Modules (RTMs), 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.

Ordering Options

AMC518 – A0C-DEF-GHJ

A = FPGA DDR3 Memory	D = FPGA	G = Clock Holdover Stability
0 = No Memory 1 = Reserved 2 = 1 GB	0 = Reserved 1 = XC7Z045 2 = XC7Z100	0 = Standard (XO) 1 = Stratum-3 (TCXO)
	E = FPGA Speed	**H = Temperature Range**
	1 = Low 2 = High 3 = Highest	0 = Commercial (–5° to +55°C) 1 = Industrial (–20° to +70°C) 2 = Extended (–40° to +85°C)*
C = Front Panel Size	**F = PCIe Option**	**J = Conformal Coating**
1 = Reserved 2 = Mid-size 3 = Full-size 4 = Extended (8HP) 5 = Half-size, MTCA.1/.4 6 = Mid-size, MTCA.1/.4 7 = Full-size, MTCA.1/.4 8 = Extended (8HP), MTCA.1/.4	0 = No PCIe 1 = PCIe on Ports 4-7 2 = PCIe on Ports 8-11 3 = PCIe on Ports 4-11	0 = No coating 1 = Humiseal 1A33 Polyurethane 2 = Humiseal 1B31 Acrylic

Notes: *Conduction cooled temperature is at edge of module. Consult factory for availability.

For operational reasons VadaTech reserves the right to supply a higher speed FPGA device than specified on any particular order/delivery at no additional cost, unless the customer has entered into a Revision Lock agreement with respect to this product.

Related Products

FMC223

- FPGA Mezzanine Card (FMC) per VITA 57
- Single module DAC 14-bit @ 2.5 GSPS (AD9739)
- 2 Vpp differential Analog output swing

UTC020

- Single module, full-size per AMC.0
- 32-bit RISC processor
- Hot swappable with support for power module redundancy

VT899

- MTCA System Platform 5" x 7U x 9" deep (with handles 10" deep)
- Up to six AMCs: 6 full-size single-width or 3 full-size double width
- Radial I2C bus to each AMC

Contact

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