

# AMC523

Dual DAC 16-bit @ 250 MSPS,  
Kintex-7, MTCA.4



AMC523

## Key Features

- Dual DAC 16-bit @ 250 MSPS utilizing MAX5878 device (user programmable for lower sampling rate)
- Xilinx Kintex-7 FPGA XC7K410T in FFG900 package
- Supported by DAQ Series™ data acquisition software
- 2 GB of DDR3 memory
- Internal clock or precision external clock from RTM/backplane/front panel clocks
- Trig in/out configurable by software (external trigger via front or port 17)
- x8 PCIe (or dual x4)
- AMC FCLKA, TCLKA, TCLKB, TCLKC and TCLKD are routed
- Quad SFP+ (up to 6.6 Gbps)
- JTAG selectable front and backplane

## Benefits

- High performance dual channel DAC with Kintex-7 FPGA
- Comprehensive driver support
- Electrical, mechanical, software, and system-level expertise in house
- Full system supply from industry leader
- AS9100 and ISO9001 certified company

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# AMC523

The AMC523 is a dual DAC (Digital to Analog Converter) module compliant to the MicroTCA.4 specification. The unit has an on-board, re-configurable FPGA which interfaces directly to the GbE and PCIe bus. It also has 12 channels ADC digital LVDS routed to the FPGA from the MRT523 RTM (sold separately).

The FPGA has an interface to the DDR3 memory. This allows for large buffer sizes to be stored during processing as well as for queuing the data to the host.

The AMC523 allows for flexible external clocking as well as internal clocking. The module has a Trig In/Out signal that is sourced from the front panel or port 17. Each input/output goes to the Rear Transition Module (RTM) connector that complies with MTCA.4. Each of the ADC/DAC single ended inputs are converted to differential signals. Dual GbE is available across ports 0 and 1.

The FPGA interfaces to the front panel via quad SFP+, I/O headers, JTAG, CLK In/Trig In/Out, and LEDs. An RS-232 port is also available from the FPGA if the customer desires to implement a soft-processor in the FPGA and utilize a serial console.



Figure 1: AMC523

# Block Diagram

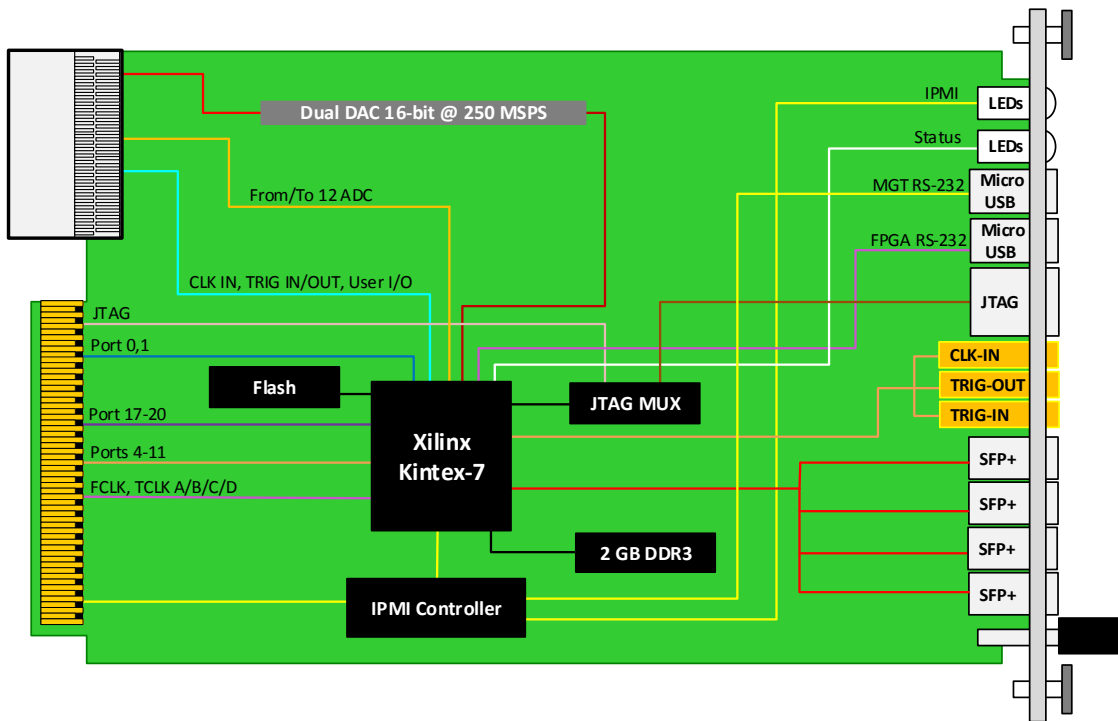


Figure 2: AMC523 Functional Block Diagram

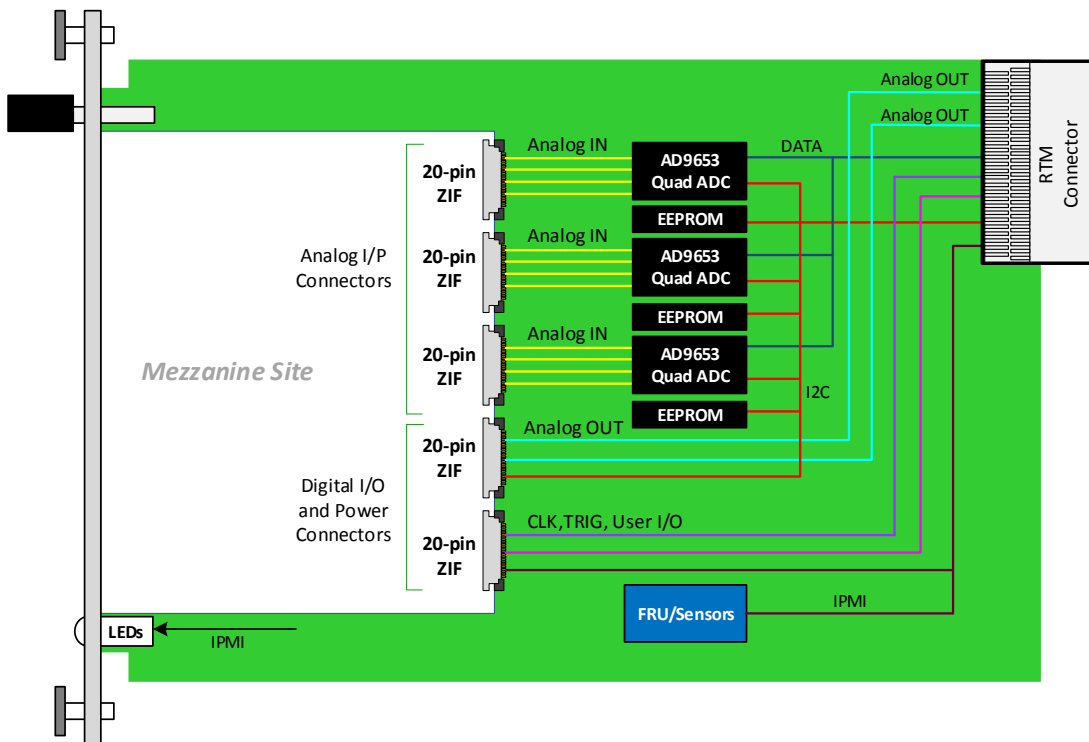


Figure 3: MRT523 Functional Block Diagram (Sold Separately)

# 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 4), 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.

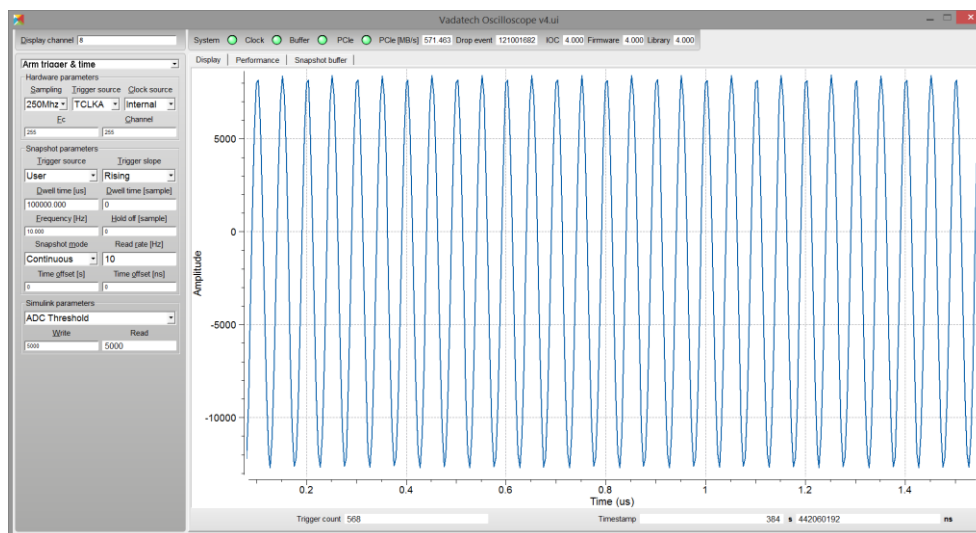


Figure 4: Typical Graphic User Interface Display

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 be 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](#).

# Specifications

Architecture	
<b>Physical</b>	<b>Dimensions</b> Double module, mid-size (full-size optional)
<b>Type</b>	<b>AMC DAC</b> Dual DAC
	<b>Resolution</b> 16-bit resolution per port
	<b>CLK/TRIG</b> Internal/External clock with TRIG IN/OUT
	<b>Memory</b> 2 GB of DDR3, Flash
Standards	
<b>MTCA</b>	<b>Type</b> MTCA.4 with RTM support
<b>AMC</b>	<b>Type</b> AMC.1 and AMC.2
<b>Module Management</b>	<b>IPMI</b> IPMI v2.0
<b>PCIe</b>	<b>Lanes</b> Dual x4 or single x8 via FPGA to AMC
<b>Ethernet</b>	<b>GbE</b> 1000-BaseBX
Configuration	
<b>Power</b>	<b>AMC523</b> ~15 W application specific (up to 40 W)
<b>Environmental</b>	<b>Temperature</b> See ordering options and <a href="#">environmental spec sheet</a> Storage Temperature: -40° to +85°C
	<b>Vibration</b> 1G, 5 to 500 Hz on each axis
	<b>Shock</b> 30Gs on each axis
	<b>Relative Humidity</b> 5 to 95% non-condensing
<b>Front Panel</b>	<b>Interface Connectors</b> Micro USBs for MGT RS-232 and FPGA RS-232 FPGA JTAG port TRIG In/Out, Clock In 4 SFP+
	<b>LEDs</b> IPMI management control, FPGA 8 user defined LEDs 16 Status, 16 PCIe signal detect
	<b>Mechanical</b> Hot swap ejector handle
<b>Software Support</b>	<b>Operating System</b> Independent
Other	
<b>MTBF</b>	MIL Hand book 217-F@ TBD hrs
<b>Certifications</b>	Designed to meet FCC, CE and UL certifications, where applicable
<b>Standards</b>	VadaTech is certified to both the ISO9001:2000 and AS9100B:2004 standards
<b>Warranty</b>	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

## AMC523 – 00C-DEF-G0J

	<b>D = FPGA</b> 1 = Reserved 2 = Reserved 3 = Reserved 4 = XC7K410T 5 = Reserved	<b>G = SFP+ TXCVRS</b> 0 = No TXCVRS 1 = GbE LC/SX (850 nm) 2 = GbE LC/LX (1310 nm) 3 = Copper 1000 Mbit (Ethernet only) 4 = 10 GbE/SX 5 = 10 GbE/LR
	<b>E = FPGA Speed</b> 1 = Reserved (Low speed grade not available) 2 = High 3 = Highest**	
<b>C = Front Panel</b> 1 = Reserved 2 = Reserved 3 = Reserved 4 = Reserved 5 = Mid-size, MTCA.4 (captive screw) 6 = Full-size, MTCA.4 (captive screw)	<b>F = PCIe Fabric</b> 0 = No PCIe 1 = PCIe on ports 4-7 2 = PCIe on ports 8-11 3 = PCIe on ports 4-11	<b>J = Temperature Range and Coating</b> 0 = Commercial (–5° to +55° C), No coating 1 = Commercial (–5° to +55° C), Humiseal 1A33 Polyurethane 2 = Commercial (–5° to +55° C), Humiseal 1B31 Acrylic 3 = Industrial (–20° to +70° C), No coating 4 = Industrial (–20° to +70° C), Humiseal 1A33 Polyurethane 5 = Industrial (–20° to +70° C), Humiseal 1B31 Acrylic 6 = Extended (–40° to +85° C), Humiseal 1A33 Polyurethane* 7 = Extended (–40° to +85° C), Humiseal 1B31 Acrylic*

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

\*\*Minimum order quantity required

## Related Products

AMC725



- Double module, mid-size per AMC.0 and MTCA.4
- Intel® Xeon E3 processor options with PCH
- DVI graphics (SM750 w/16 MB DDR), up to 1920x1440 resolution

MRT523



- MicroTCA.4 RTM for the AMC523
- Twelve channel ADC 16-bit @ 125 MSPS utilizing AD9653 device routed to AMC523
- Two analog outputs from AMC523's DACs Mezzanine

VT811



- MTCA System Platform 19" x 8U x 14.9" deep (with handles 16.23" deep)
- Full redundancy with dual MicroTCA Carrier Hub (MCH), dual Cooling Units and quad Power Modules
- Up to twelve AMCs: 12 front mid-size double module slots and RTM slots

# Contact

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- Constant innovation
- Open systems expertise

## We commit to our customers

- Partnerships power innovation
- Collaborative approach
- Mutual success

## We deliver complexity

- Complete signal chain
- System management
- Configurable solutions

## We manufacture in-house

- Agile production
- Accelerated deployment
- AS9100 accredited



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