**TORNADO-AZ/FMC**

AMC-module with Zynq-7000 AP SoC FPGA and FMC site

**Key Features**

- AMC-module with Zynq-7000 SoC and FMC site for modular MicroTCA® and AdvancedTCA® DSP systems and embedded applications
- Installs into MicroTCA® chassis and AdvancedTCA® mainboards
- FMC site for user adopted I/O using FMC sub-module (AD/DA, RF, etc.)
- In-chassis AMC-to-AMC high-speed real-time data transfer via AMC ports
- Remote control from host PC and Android® devices
- In-chassis AMC-to-AMC control communication
- Unified TASDK® tools for applications development and system control
- Complies PICMG® 3.0 Rev.3.0, MicroTCA.0 R1.0, AMC.0 R2.0, IPMI 1.5, VITA® 57.1-2010 specifications
- Stand-alone operation from +12V power for embedded applications

**Details**

- Xilinx Zynq-7000 (XC7Z035, XC7Z045, XC7Z100) Kintex AP SoC FPGA with two ARM® cores (PS), high-density logic (PL) and transceivers pool
- VITA® 57.1 FMC HPC site for FMC submodule (160 I/O, 8 GBTs) with a variety of activation modes
- AMC Fabric-DEFG ports 4-7/8-11 for real-time data transfer using 10GbE, 10GBase-BX4 (XAUI), 40GBase-KX4, 4x Serial RapidIO (50Gbps), 4x/6x PCIe (32Gbps/64Gbps) protocols
- AMC Fabric-A 1GbE ports 0-1 from PS for remote device control and in-chassis AMC-to-AMC control communication
- DDR3 memory for PS and PL
- PS NOR FLASH memory for applications, data arrays and PL bitstreams
- Nonvolatile MRAM memory for critical PS application data
- Front panel MicroSD card slot for applications and data
- Front-panel PS and PL controlled LEDs
- MMC controller with proprietry TAMMC® MMC-kernel from MicroLAB Systems, power-temperature monitoring, status indication and more for reliable device operation and protection
- PS and MMC UART ports for remote control and management
- JTAG ports for FPGA and FMC site

**Development Tools**

- Unified TASDK® tools for TORNADO AMC modules with high-level API for quick development of PS applications, PL bitstreams and host Windows, Linux and Android® remote control applications
- Linux, FreeRTOS and "bare-metal" PS software environments
- PS and PL demos for device test and user projects startup
- Xilinx Vivado tools, IP and JTAG emulator to compile and debug PS applications and PL bitstreams

**Applications**

- Telecommunication and cell telephony
- RF and SDR
- Image processing
- DSP systems
- Radars and astrophysics
- Industrial, instrumentation and medical
Technical Specifications (TORNADO-AZ/FMC rev.1B)

FPGA
  Options to specify during ordering: FPGA type, speed grade (‘-1’/’-2’/-’3’), temperature index (’C’/’E’/’T’).
- Default FPGA: XC7Z035-1FFG900C (for commercial temperature range), XC7Z100-2FFG900I (for industrial temperature range).
- Two on-board DDR3 memory banks (specified during ordering):
  - Zynq/PS DDR3: 128B/256Mx32 (512MB/1GB) (mandatory)
  - Zynq/PL DDR3: 128B/256M/512M/1Gx64 (1GB/2GB/4GB/8GB, 1600MTPS) (optional)
- Zynq/PS QSPI NOR FLASH memory 256Mx8 (2Gb).
- Zynq/PS QSPI NRAM memory 128Kx8 (1Mb) (optional, specified during ordering).
- MicroSD card interface (32GB max capacity) (optional, specified during ordering).
- Zynq/PS UART (available via front panel USB port).
- Zynq/PL external Zynq/PL XGPIO[0:7] (LVTTLV 3V) with individual direction control (optional, specified during ordering).
- Zynq/PL bitstream loading modes: from Zynq/PS applications, via JTAG.
- Zynq/PL bitstream decryption key battery (optional, specified during ordering). User replaceable every 4 years.
- Debug port: Xilinx JTAG (14-pin, LVTTLV 3V) via adapter cable.

FMC site interface
- Complies VITA 57.1-2008 (R2010) specification.
- AMC interface type: HPC, LPC.
- Number of I/O: 160 (LA[0:33], HA[0:23], HB[0:21]), front-panel LED indicators for power and temperature status of AMC module and for FMC submodule status.
- Remote MMC console via MMC UART 115kbaud and Zynq/PS UART (115kbaud).

AMC interface
- Complies PICMG® AMC.0 R2.0, MicroTCA.0 R1.0 specifications.
- AMC Fabric-DEFG ports 4-7 and 8-11 (AMC.2 Ethernet, AMC.4 Serial RapidIO, AMC.1 PCIe).
- AMC status LEDs: BLUE LED, AMC LED1 (“Power” function, Red/Green), AMC LED2 (“**” function, Yellow/Green).
- AMC-Fabric-A ports 0-1 (AMC.2 1GbE).
- AMC module management controller
- Firmware based on proprietary TAMMC® high-performance MMC-kernel from MicroLAB Systems.
- Complies IPMI 1.5, IPMB CPS v1.0, PICMG® 3.0 rev.3.0, MicroTCA.0 R1.0, AMC.0 R2.0 and VITA® 57.1-2008 specifications.
- High-speed monitoring of payload power and all backend power supplies.
- Full-precision temperature monitoring for PCB, FPGA and FMC submodule area.
- Activation and status monitoring of FMC submodule.
- LED indicators for power and temperature status of AMC module and for FMC submodule status.
- Remote MMC console via AMC UART 115kbaud port.

Physical
- Dimensions (is specified on ordering):
  - Single width Mid-size (M/S) AMC-module (181 x 74 x 19 mm) (default).
  - Single width Full-size (F/S) AMC-module (181 x 74 x 29 mm) (optional).
- Weight 0.35 kg.

Power and temperature
- AMC +12V P/P payload power or external +12V power for stand-alone/embedded applications:
  - without FMC mezzanine submodule installed: +12V @ 0.8A (min) (9W), 1.8A (typ) (22W), 4.5A (max) (55W).
  - with max power FPGA mezzanine submodule installed: +12V @ 2.6A (typ) (34W), 6.2A (max) (74W).
- AMC M/P management power: +3.3V @50mA (typ).
- Operating temperature (ambient): 0°C…+55°C (FPGA with ’C’/’E’ temperature grades), -40°C…+55°C (FPGA with ’T’ temperature grade).
- Storage temperature (ambient): -40°C…+80°C.

Ordering information
TAZFMC1B/XTZT1002D/D1/F2/5E12/M128/A01/SD/LD2/LI/FC/FB/SA/MS
TORNADO-AZ/FMC rev.1B AMC-module, Xilinx Zynq-7000 XC7Z100-2FFG900I (XZ1002), 1GB (256Mx32) Zynq/PS DDR3 memory (D1), 2Gb (256Mx8) Zynq/PS QSPI FLASH memory (F2), 512Kb (64Kx8) Zynq/PS I2C EEPROM memory (E512), 128Kx8 Zynq/PS nonvolatile QSPI NRAM memory (M128), 1GbE PHY for AMC ports 0 and 1 (A01), front-panel MicroSD card slot (SD), 2Gb (256Mx64) Zynq/PL DDR3 memory bank #1 (LD2), 8-bit external Zynq/PL XGPIO interface (L), FMC site interface (FC), Zynq/PL bitstream decryption key battery (FB), stand-alone/embedded operation mode support (SA), single-width mid-size (M/S) AMC-module dimension (MS), standard 10mm FMC mezzanine module stacking.