

Key Features

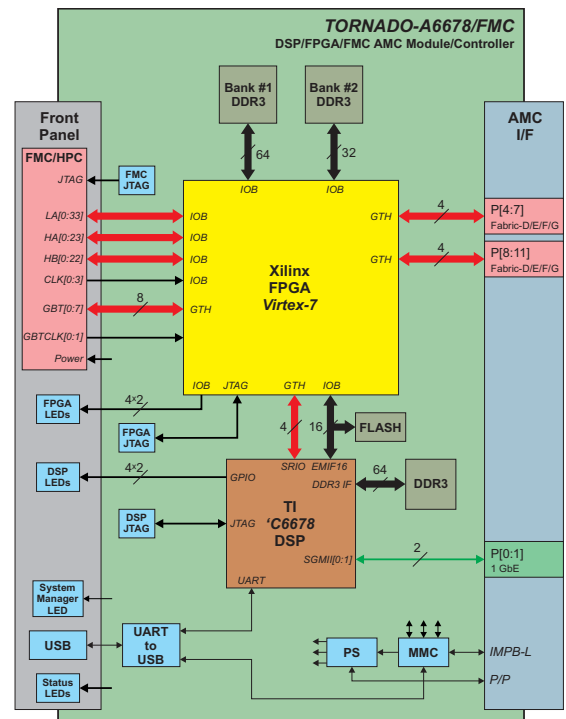
- Ultra-high performance AMC-module with multi-core DSP, high-capacity FPGA and FMC site for modular MicroTCA® and AdvancedTCA® systems and stand-alone embedded applications
- High-speed AMC interface (10GbE, 40GbE, Serial RapidIO, PCIe)
- High-speed multi-channel DSP-to-FPGA communication
- FMC HPC site for user application adopted I/O (AD/DA, SFP+, QSFP+, SDR, RF, etc.)
- Remote control from PC and in-chassis AMC-to-AMC communication via 1GbE ports
- TASDK® tools for application development and system control
- Meets PICMG® 3.0 Rev.3.0, MicroTCA.0 R1.0, AMC.0 R2.0, IPMI 1.5, VITA® 57.1-2008 specifications
- Installs into MicroTCA® chassis and AdvancedTCA® mainboards
- Stand-alone operation from +12V power supply for embedded applications



TORNADO-A6678/FMC AMC Module (M/S)

Details

- 8-core Texas Instruments TMS320C6678 DSP (1.25GHz 320GMAC/160GFLOPS)
- Xilinx Virtex-7 FPGA (XC7VX330T, XC7VX415T, XC7VX690T)
- VITA® 57.1 FMC HPC site (160 I/O, 8 GBTs)
- AMC Fabric-D/E/F/G 4-7 and 8-11 ports from FPGA for high-speed real-time data transfer using 10GbE, 10GBASE-BX4, 40GBASE-CX4, 4x Serial RapidIO (39.4Gbps), 4x PCIe (32Gbps) protocols
- AMC 1GbE Fabric-A 0 and 1 ports from DSP for AMC remote control and in-chassis AMC-to-AMC communication
- DSP-to-FPGA communication via four 5Gbps Serial RapidIO ports (40Gbps bidirectional bandwidth), EMIF-16 and DSP GPIO/IRQ
- Up to 8GB on-board DDR3 DSP memory
- 1Gb FLASH for DSP bootloader, system monitor, applications, data arrays and FPGA bitstreams with file system support
- Two banks of on-board FPGA DDR memory (x64 and x32)
- DSP and MMC UART ports for remote control and management
- Front-panel DSP and FPGA controlled LEDs
- JTAG ports for DSP, FPGA and FMC site
- TAMMC® MMC-kernel with high-speed monitoring of on-board power supplies and temperatures for reliable module operation



TORNADO-A6678/FMC Block Diagram

Development Tools

- TI Code Composer Studio tools and MicroLAB Systems MIRAGE-NC2/NE1 JTAG emulators for TI DSP
- Xilinx ISE/Vivado tools and IP for FPGA
- MicroLAB Systems TORNADO-Axxx SDK (TASDK®) tools with high-level API function libraries, bootloader and system monitor for development of user DSP and PC applications and system control
- DSP and FPGA demo projects for tests and user application basis

Applications

- Telecommunication
- RF and SDR
- Cell telephony
- Image processing
- Radars and astrophysics
- Industrial, instrumentation and medical



Mini TORNADO-mTCA® DSP/FPGA modular system with TORNADO-A6678/FMC DSP/FPGA/FMC M/S AMC-module and T/AX-DSPX network AMC-module in dual-slot MicroTCA® mini chassis with passive backplane

Technical Specifications (*TORNADO-A6678/FMC rev.1A*)

DSP

- Texas Instruments TMS320C6678 Fixed/Floating-point DSP, 8-cores, 1.25GHz (320GMAC/160GFLOPS).
- 128M/256M/512M/1Gx64 (1GB/2GB/4GB/8GB) 1333MTPS on-board DDR3 memory (specified on ordering).
- On-board 64Mx16 (1Gb) NOR FLASH and 64Kx8 (512Kb) SEEPROM.
- 4x 5Gbps Serial Rapid ports (connected to FPGA).
- 2x 1GbE SGMII ports (connected to AMC I/F ports 0 and 1).
- 115kBaud UART port (available via USB port at front panel).
- EMIF-16 16D/24A I/F (used for access to FLASH, FPGA configuration, FPGA access, etc).
- DSP Bootmodes: None/Debug, EMIF/FLASH, Ethernet.
- Debug port: JTAG (14-pin, LVTTL 3V-5V).

FPGA

- Xilinx Virtex-7: XC7VX330T-[2/3]FFG1157[C/I], XC7VX415T-[2/3]FFG1157[C/I], XC7VX690T-[2/3]FFG1157[C/I].
Options to specify on ordering: FPGA type, speed grade, temperature index.
Default FPGA is XC7VX415T-2FFG1157C.
- Two on-board FPGA DDR3 memory banks (specified on ordering):
 - Bank #1: 128M/256M/512M/1Gx64 (1GB/2GB/4GB/8GB)
 - Bank #1: 128M/256M/512M/1Gx32 (512MB/1GB/2GB/4GB)
- FPGA bitstream loading modes: from DSP applications, via JTAG.
- FPGA bitstream decryption key battery (optional, user replaceable) (specified on ordering).
- Debug port: JTAG (14-pin, LVTTL 2.5V-5V).

FMP site

- Meets VITA 57.1-2008 specification.
- FMC mezzanine module width: single.
- FMC mezzanine module stacking: 10mm (default), 8.5mm (optional).
- FMC interface: HPC, LPC.
- Number of I/O: 160 (LA[0:33], HA[0:23], HB[0:21]).
- Number of I/O clocks: 4 (CLK_M2C[0:3]).
- I/O logic levels (Vadj): 1.2V, 1.5V, 1.8V (set automatically on FMC site initialization).
- Number of GBT transceivers: 8 (GBT[0:7]).
- GBT performance: 10.3Gbps (for FPGA with '-2' speed grade), 12.5Gbps (for FPGA with '-3' speed grade).
- Maximum FMC mezzanine module power consumption: 1A@+12V, 2A@+3.3V, 4A@Vadj, 50mA@+3.3V_AUX.
- Maximum FPGA FMC interface power consumption: 0.3A@VIO_B_M2C, 1mA@VREF_A_M2C, 1mA@VREF_B_M2C.

Front-panel

- A "window" for front bezel of FMC mezzanine module.
- DSP controlled LEDs: 4 (bi-color).
- FPGA controlled LEDs: 4 (bi-color and tri-color).
- AMC LEDs: BLUE LED, AMC LED1 ("Power", red/green), AMC LED2 ("t", yellow/green).
- DSP Bootloader & System Manager Status LED (yellow/green/blue).
- FPGA configuration status LED (green/red).
- FMC site status LED (green/red/blue).
- Micro-USB port with MMC UART (115kBaud) and DSP UART (115kBaud).

AMC I/F

- Meets PICMG@ AMC.0 R2.0, MicroTCA.0 R1.0 specifications.
- FPGA ports: AMC Fabric-D/E/F/G ports 4-7 and 8-11 (AMC.2 10GbE/40GbE Ethernet, AMC.4 Serial RapidIO, AMC.1 PCIe).
- DSP ports: AMC-Fabric-A ports 0, 1 (AMC.2 1GbE).
- MMC ports: IPMB-L port

MMC (AMC module management controller)

- F/W: high-performance [TAMMC](#) MMC-kernel from MicroLAB Systems.
- Meets IPMI 1.5, IPMB CPS v1.0, PICMG@ 3.0 rev.3.0, MicroTCA.0 R1.0, AMC.0 R2.0 specifications.
- High-speed monitoring of payload power and all backend power supplies (voltage and current), tolerance control.
- Multi-point PCB and components temperature monitoring.
- Power and temperature status indication: via bi-color front-panel AMC LEDs and on-board LEDs.
- Remote MMC console via MMC UART 115kbaud port.

Physical

- Dimensions (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 module installed: +12V @ 2.5A (typ) (30W), 4A (max) (48W).
 - with max power FMC mezzanine module installed: +12V @ 3.4A (typ) (41W), 4.9A (max) (59W).
- AMC M/P management power: +3.3V @50mA (typ).
- Operating temperature (ambient): without forced cooling: 0°C...+45°C; with forced cooling: 0°C...+65°C.
- Storage temperature (ambient): -40°C...+80°C.

Ordering information

TA6678FMC/X415T2/D1.25G/DD2G/DF1G/DE512K/F1D2G/F2D1G/FC/FB/SA/MS

TORNADO-A6678/FMC AMC-module, Xilinx Virtex-7 XC7VX415T-2FFG1157C FPGA (**X415T2**), 1.25GHz DSP clock frequency (**D1.25G**), 2GB (256Mx64) DSP DDR3 memory (**DD2G**), 1Gb (64Mx16) DSP FLASH memory (**DF1G**), 512Kb (64Kx8) DSP SEEPROM memory (**DE512K**), 2GB (256Mx64) FPGA DDR3 memory bank #1 (**F1D2G**), 1GB (256Mx32) FPGA DDR3 memory bank #2 (**F2D1G**), FMC/HPC connector installed (**FC**), FPGA bitstream decryption key battery (**FB**), stand-alone mode support (**SA**), single-width mid-size (M/S) AMC-module dimension (**MS**), standard 10mm FMC mezzanine module stacking.