High-End Processor AMC based on 3rd Generation Intel® Core™ i7 Technology

» Outstanding Performance
  3rd Generation Intel® Core™ i7 with 2.1 GHz Quad Core Performance

» Impressive Capacity
  Up to 8 GB ECC Memory DDR3 1600 MHz
  Up to 64 GB NAND Flash

» Comprehensive Connectivity
  4x GbE, 4x SATA, 2x PCIe x4, Graphics or COM and more
**AM4022**

**Small, Fast, Robust**

» **Performance**

The AM4022 is a highly integrated CPU board implemented as a Single Mid-size or Full-size Advanced Mezzanine Card (AMC) for ATCA and MicroTCA applications. The design is based on the 3rd Generation Intel® Core™ i7 processor platform combined with the mobile Intel® QM77 Express Chipset. The board supports the Intel® Core™ i7-3612QE (2.1 GHz Quad Core) and the Intel® Core™ i7-3555LE (2.5GHz Dual Core) processors in 22 nm technology in a BGA package. Other processors are available on request. The processor and the memory are soldered on the AM4022 which results in higher Mean Time Between Failures (MTBF) and a significant improvement in cooling.

» **Throughput**

The AM4022 includes up to 8 GB, dual-channel Double Data Rate (DDR3) memory with Error Checking and Correcting (ECC) running at 1600 MHz. The graphics and memory controller is integrated in the processor. One quad Gigabit Ethernet controller directly connected to the processor ensures maximum data throughput between processor and memory. The AM4022 can be equipped optionally with an up to 64 GB NAND Flash memory module which can be screwed on the AM4022.

» **Connectivity**

Supporting the PICMG sub-specifications AMC.1/2/3 the AM4022 ensures a comprehensive set of interconnecting capabilities. The AM4022 is available with two front panel versions, one with a high-resolution DisplayPort and one with a COM port. Further interfaces include one USB 2.0 host interface and two Gigabit Ethernet ports to the front as well as a variety of high-speed interconnect topologies to the system, such as Dual Gigabit SERDES connection and Dual Serial ATA storage interface in the Common Options Region, two x4 or one x8 PCI Express in the Fat Pipes Region, and various interfaces in the Extended Options Region available on request– among them SATA, USB, DisplayPort.

» **Reliability**

The careful design and selection of high temperature resistant components together with the elaborated heat sink construction ensures a high product reliability. A front panel design according MicroTCA.1 (on request) provides shock & vibration resistance in demanding environmental conditions.
## Technical Information

### Form Factor
- Single mid-size or full-size (on request) AMC module

### CPU and PCH
- **Processor**
  - The AM4022 supports the following microprocessors:
    - Intel® Core™ i7-3612QE (SV) processor with ECC,
      - 2.1 GHz, 6 MB L3 cache
    - Intel® Core™ i7-3555LE (LV) processor with ECC,
      - 2.5 GHz, 4 MB L3 cache
  - Note: other processor versions available on project request
  - Further processor features:
    - Up to four physical execution cores
    - Intel® Hyper-Threading Technology (Intel® HT Technology)
    - Intel® 64 Architecture
    - Intel® Turbo Boost Technology
    - Intel® Intelligent Power Sharing (IPS)
    - One x16 PCI Express port operating at up to 8.0 GT/s

- **Cache Structure:**
  - 64 kB L1 cache for each core
  - 32 kB instruction cache
  - 32 kB data cache
  - 256 kB L2 shared instruction/data cache for each core
  - Up to 6 MB L3 shared instruction/data cache shared between all cores

### Platform Controller Hub
- Mobile Intel® 3rd Generation PCH; QM77 Express Chipset
- Used interfaces:
  - 3x USB 2.0, 1x USB 3.0
  - 2x SATA 6Gbit/s, 2x SATA 3Gbit/s
  - 2x DisplayPort
  - RTC, interrupt controller and timers

### Memory
- **System Memory**
  - Dual channel DDR3 memory, up to 8 GB DDR3 SDRAM memory with ECC, running at 1600 MHz
- **NAND Flash**
  - Up to 64 GB SLC NAND Flash on a dedicated SATA NAND Flash module
- **Flash (BIOS)**
  - Two redundant 8 MB SPI Flash chips (2 x 8 MB) for uEFI BIOS controlled by the MMC
- **EEPROM**
  - Serial EEPROM (24LC64) 64 kbit

### Onboard Controllers
- **VGA**
  - Built-in Intel® 3D Graphics accelerator for enhanced graphics performance:
    - Supports resolutions up to 2560 x 1600 pixels @ 60 Hz
    - DisplayPort: hot plug support
    - Dynamic Video Memory Technology
  - When the AM4022 is populated with a COM port on the front panel, the Graphics controller is disabled.

- **Gigabit Ethernet**
  - 1x Intel® 8255 Quad Gigabit Ethernet PCI Express 2.0 bus controller
  - Two interfaces routed to front I/O connectors

- **UART**
  - Two interfaces routed to the AMC connector

- **TPM**
  - Infineon SBL9635TT TPM 1.2 controller (on request)

- **MMC**
  - NXP LPC2368 controller with on-chip 512 kB Flash and 56 kB RAM

- **Watchdog**
  - FPGA-based, software-configurable, two-stage Watchdog with programmable timeout ranging from 125ms to 4096s in 16 steps

### System Interconnection
- **AMC ports**
  - AMC port 0-1: 2x 1000BASE-BX (SerDes)
  - AMC port 2-3: 2x SATA 6Gbit/s
  - AMC port 4-11: 2x 4 or 1x 8 PCI Express
  - AMC port 12: 1x SATA 6Gbit/s
  - AMC port 13: 1x USB 3.0
  - Note: AMC port 12 to 20 connectivity available on project request

- **FCLKA**
  - PCI Express clock configuration configurable: disabled/enabled to AMC connector

### Front Panel Interfaces
- **DisplayPort (Option1)**
  - 1x DisplayPort on standard 20-pin DisplayPort connector (mutual exclusive with Serial Port)

- **Serial Port (Option 2)**
  - 1x RS232 UART interface on 10-pin mini connector (mutual exclusive with DisplayPort)

- **Gigabit Ethernet**
  - 2x 1000BASE-TX on RJ45 connector

- **USB**
  - 1x USB 2.0 port on 5-pin, type A Mini-USB connector

- **LEDs**
  - 3x Module Management LEDs, Four User-Specific LEDs, Ethernet LEDs

### Onboard Interfaces
- **Debug Interface**
  - JTAG port for processor emulation probe connection; Serial POST Code (LVTTL) interface on the AMC port 14

  The I/O extension holds the following interfaces: SATA, LPC interface and some power and control signals, battery input

### Compliancy
- **ATCA**
  - 12 V payload power, 3.3 V management power

- **MicroTCA**
  - PICMG MTCa.0 Micro Telecommunications Comp. Architecture R1.0; PCI Express: PCI Express Base Specification Revision 1.0a

- **AMC**
  - PICMG AMC.0: Advanced Mezzanine Card Specification R2.0
  - PICMG AMC.1: PCI Express and Advanced Switching R1.0

- **IPMI**
  - IPMI Intelligent Platform Management Interface Spec. V2.0
  - IPMI - Platform Management FRU Information Definition V1.0

- **SATA**
  - Serial ATA: Serial ATA 2.5 Specification

- **CE**
  - EN55022, EN55024, EN61000-6-2/-6-3, EN300386, EN60950-1

- **Vibration/Shock**
  - IEC60068-2-6 / IEC60068-2-77

- **WEEE**
  - Directive 2002/96/EC

- **RoHS**
  - Directive 2002/95/EC
## Technical Information (continued)

### General

| Dimensions without retention screws on front panel: | Mid-size: 181.5 x 73.5 x 18.96 mm | Full-size: 181.5 x 73.5 x 28.95 mm |
| Board Weight | Mid-size with heat sink and without SATA Flash module: 247 grams | Full-size with heat sink and without SATA Flash module: 310 grams |
| MTBF | 205712 h acc. Belcore Issue 6, Ground Benign, Controlled, 30°C |

#### Power Supply

| Power Consumption | i7-3612QE 2.1 GHz with COM-Port with DP-Port |
| typ: | 31 W 31 W |
| max: | 44 W 50 W |
| i7-3555LE 2.5 GHz with COM-Port with DP-Port |
| typ: | 24 W 24 W |
| max: | 30 W 41 W |

### Environmental

| Temperature range | -5°C to +55°C (standard, depending on processor version and airflow in the system) |
| | -40°C to +70°C (extended, depending on processor version and airflow in the system) |
| | -40°C to +70°C (storage), passive module heat sink, forced system airflow |
| Humidity | Operational: 5%-90% (non-condensing), Non-Operating: 5%-95% (non-condensing) |

### Software

| BIOS | AMI uEFI BIOS |
| IPMI | MMC (Module Management Controller) implementation compliant to PICMG AMC.0, Kontron own IP |
| Linux | Red Hat Enterprise 6; Red Hat Fedora 17, free download from Kontron web |
| Windows | Windows 7 64-bit; Windows 2008 Server R2, free download from Kontron web |
| WindRiver Linux | PNE 4.x |

### Ordering Information

#### Article Description

**Processor Modules**

- **AM4022-SA-2.5D-4-M-COM**: Intel® Core™ i7-3555LE, 2.5GHz, 4GB soldered Memory, Mid-size, 2xGbE, USB, COM, no onboard SATA-Flash
- **AM4022-SA-2.5D-4-M-DP**: Intel® Core™ i7-3555LE, 2.5GHz, 4GB soldered Memory, Mid-size, 2xGbE, USB, DisplayPort, no onboard SATA-Flash
- **AM4022-SA-2.1Q-8-M-COM**: Intel® Core™ i7-3612QE, 2.1GHz, 8GB soldered Memory, Mid-size, 2xGbE, USB, COM, no onboard SATA-Flash
- **AM4022-SA-2.1Q-8-M-DP**: Intel® Core™ i7-3612QE, 2.1GHz, 8GB soldered Memory, Mid-size, 2xGbE, USB, DisplayPort, no onboard SATA-Flash
- **AM4022-SA-2.1Q-8-M-DP-S32**: Intel® Core™ i7-3612QE, 2.1GHz, 8GB soldered Memory, Mid-size, 2xGbE, USB, DisplayPort, 32GB onboard SATA-Flash

**Software**

- **VXW-BSP-AM4022-V6.9.2**: VxWorks 6.9.2 Board Support Package for AM4022

**Accessories**

- **CABLE-MINI-USB-TA**: Adapter cable: MiniUSB-A to USB-A-Jack, 15 cm
- **CABLE-GRAPHIC-DP-TO-DVI**: Adapter cable: DisplayPort to DVI, 19 cm
- **CABLE-serial-10-pin-mini-to-9-pin-dsub**: Adapter cable: 10-pin Hirose to 9-pin DSub

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**Note**: For other configuration options please contact your local sales support.