» User Guide «

AM5030

Double Full-size AMC Module based on the Intel® Xeon® LC5518 Processor with the Intel® 3420 Chipset

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Please refer also to the section “High Voltage Safety Instructions” on the following page.



Warning, ESD Sensitive Device!

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Please read also the section “Special Handling and Unpacking Instructions” on the following page.



Warning!

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Note ...

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Special Handling and Unpacking Instructions



ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Warning!



This product has gold conductive fingers which are susceptible to contamination. Take care not to touch the gold conductive fingers of the AMC Card-edge connector when handling the board.

Failure to comply with the instruction above may cause damage to the board or result in improper system operation.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the board is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the board.

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In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the device, which are not explicitly approved by Kontron and described in this manual or received from Kontron's Technical Support as a special handling instruction, will void your warranty.

This device should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This applies also to the operational temperature range of the specific board version, which must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, please follow only the instructions supplied by the present manual.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the board, please re-pack it as nearly as possible in the manner in which it was delivered.

Special care is necessary when handling or unpacking the product. Please consult the special handling and unpacking instruction on the previous page of this manual.

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Chapter 1

Introduction

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1. Introduction

1.1 Board Overview

The AM5030 is a highly integrated CPU board implemented as a Double, Full-size Advanced Mezzanine Card (AMC) module. The design is based on the Intel® Xeon® LC5518 quad-core server processor combined with the Intel® 3420 server-class chipset.

The board supports the Intel® Xeon® LC5518 quad-core server processor with 1.73 GHz in 45 nm technology with 8 MB L3 cache and three DDR3 channels in a 1366-land LGA package. Up to three memory modules can be installed in three DIMM sockets (one per channel).

The board can be equipped with unbuffered or registered very low profile (VLP) DIMM modules with Error Checking and Correcting (ECC) running at 1066 MHz. Each memory socket can be equipped with a memory module up to 8 GB resulting in a maximum size of 24 GB DDR3 SDRAM memory. Optionally, the AM5030 further provides up to 32 GB NAND Flash memory via a dedicated SATA Flash module extension connector.

One dual 10 Gigabit Ethernet controller and one quad Gigabit Ethernet controller directly connected to the processor ensure maximum data throughput.

The AM5030 has full hot swap capability, which enables the board to be replaced, monitored and controlled without having to shut down the MicroTCA system. A dedicated Module Management Controller (MMC) is used to manage the board and support a defined subset of Intelligent Platform Management Interface (IPMI) commands and PICMG (AMC) command extensions, which enables operators to detect and eliminate faults faster at module level. This includes monitoring several onboard temperature conditions, board voltages and the power supply status, managing hot swap operations, rebooting the board, etc. All in all, IPMI enhances the board's availability and reliability while reducing the operating costs and the mean-time-to-repair.

The AM5030 supports two USB 2.0 host interfaces, one standard RS-232 COM port, two Gigabit Ethernet ports, and one VGA port to the front as well as a variety of high-speed interconnect topologies to the system, such as Dual Gigabit SerDes connection and Dual SATA storage interface in the Common Options Region, one x4 PCI Express 2.0 interface and a XAUI port in the Fat Pipes Region as well as Dual Serial ATA storage interface, a second XAUI port and a Debug port in the Extended Options Region. A bidirectional FCLKA PCI Express clock configuration is provided within the AMC interconnection.

The AM5030 provides safety and security features via a Trusted Platform Module (TPM) 1.2 on request.

Optimized for high-performance, packet-based telecom systems, the AM5030 is targeted towards, but not limited to the telecom market application such as radio network controllers, media streaming, traffic processing, database management and routing. The AM5030 also fits into all applications situated in industrial environments, including I/O intensive applications. The careful design and the selection of high temperature resistant components ensure a high product availability. This, together with a high level of scalability, reliability, and stability, make this state-of-the-art product a perfect core technology for long-life embedded applications.

The board is offered with various Board Support Packages including Windows and Linux operating systems. For further information concerning the operating systems available for the AM5030, please contact Kontron.

1.2 Board-Specific Information

Due to the outstanding features of the AM5030, such as superior processing power and flexible interconnect topologies, this AMC board provides a highly scalable solution not only for a wide range of telecom and data network applications, but also for several highly integrated industrial environment applications with solid mechanical interfacing.

Some of the AM5030's outstanding features are:

- Intel® Xeon® LC5518 quad-core server processor, 1.73 GHz, 8 MB L3 cache
- Intel® 3420 server-class chipset
- Up to 24 GB, triple-channel DDR3 SDRAM memory with ECC running at 1066 MHz
- AMC interconnection:
  - Two Gigabit Ethernet SerDes ports in the Common Options Region
  - Two SATA storage ports in the Common Options Region
  - One x4 PCI Express port in the Fat Pipes Region
  - One XAUI port in the Fat Pipes Region
  - Two SATA storage ports in the Extended Options Region
  - One serial port in the Extended Options Region
  - One debug port in the Extended Options Region
  - One XAUI port in the Extended Options Region
  - Bidirectional PCI Express reference clock, FCLKA
- Full hot swap support
- One Intel® 82580EB Quad Gigabit Ethernet controller
- One Intel® 82599EB Dual 10 Gigabit Ethernet controller
- One VGA controller with integrated 16 MB DDR memory, SM750
- Onboard extension connector for a dedicated SATA Flash module with up to 32 GB NAND Flash memory
- Two USB 2.0 host ports on Front I/O
- One VGA port on the front panel
- One Serial port on Front I/O (RS-232)
- Two Gigabit Ethernet ports on Front I/O
- TCG 1.2-compliant Trusted Platform Module (TPM), on request
- Two redundant SPI Flash chips for uEFI BIOS (2 x 8 MB)
- Battery backed-up real-time clock (RTC)
- Dedicated IPMI Module Management Controller with redundant Firmware Flash (2 x 512 kB)
- Watchdog Timer
- JTAG interface for debugging and manufacturing
- One Thermal LED
- One Watchdog LED
- Four bicolor User-Specific LEDs (providing debugging and POST code information, etc.)
- Two onboard DIP switches (for selecting the uEFI BIOS bank, overwriting E-Keying, etc.)
- Standard temperature range: 0°C to + 45°C
- Thermal management
- Passive heat sink solution for forced airflow cooling
- Double, Full-size AMC module
- AMI Aptio®, a uEFI-compliant platform firmware
- Designed to be compliant with the following PICMG specifications:
  - PICMG AMC.0 R2.0 Advanced Mezzanine Card Base Specification
  - PICMG AMC.1 R2.0 PCI Express on AdvancedMC
  - PICMG AMC.2 R1.0 Ethernet Advanced Mezzanine Card Specification

- PICMG AMC.3 R1.0 Advanced Mezzanine Card Specification for Storage
- PICMG MTCA.0 R1.0 Micro Telecommunications Computing Architecture Base Specification
- PICMG MTCA.1 R1.0 Air Cooled Rugged MicroTCA Specification

- Designed to be compliant with the following SCOPE technical document:
  - SCOPE AMC Port Map Gap-Analysis v1.0

1.3 System Relevant Information

The following system-relevant information is general in nature but should still be considered when developing applications using the AM5030.

Table 1-1: System Relevant Information

SUBJECT	INFORMATION

Hardware Requirements	The AM5030 can be installed on dedicated MicroTCA backplanes with the following AMC Card-edge connector port mapping:
	• Common Options Region ports 0-1:
	  • Two Gigabit Ethernet SerDes ports
	• Common Options Region ports 2-3:
	  • Two Serial ATA ports
	• Fat Pipes Region ports 4-7:
	  • One x4 PCI Express 2.0 port
	• Fat Pipes Region ports 8-11:
	  • One XAUI port
	• Extended Options Region port 12-13:
	  • Two Serial ATA ports
	• Extended Options Region port 14:
	  • One Debug port
	• Extended Options Region port 15:
	  • One Serial port
	• Extended Options Region port 17-20:
	  • One XAUI port
	• Clock:
	  • Bidirectional PCI Express reference clock, FCLKA
	For further information on the AMC interconnection, refer to Chapter 2.11, “AMC Interconnection”.

PCI Express Configuration	The AM5030 only supports the PCI Express root complex configuration.
Operating Systems	The board is offered with various Board Support Packages including Windows and Linux operating systems. For further information concerning the operating systems available for the AM5030, please contact Kontron.

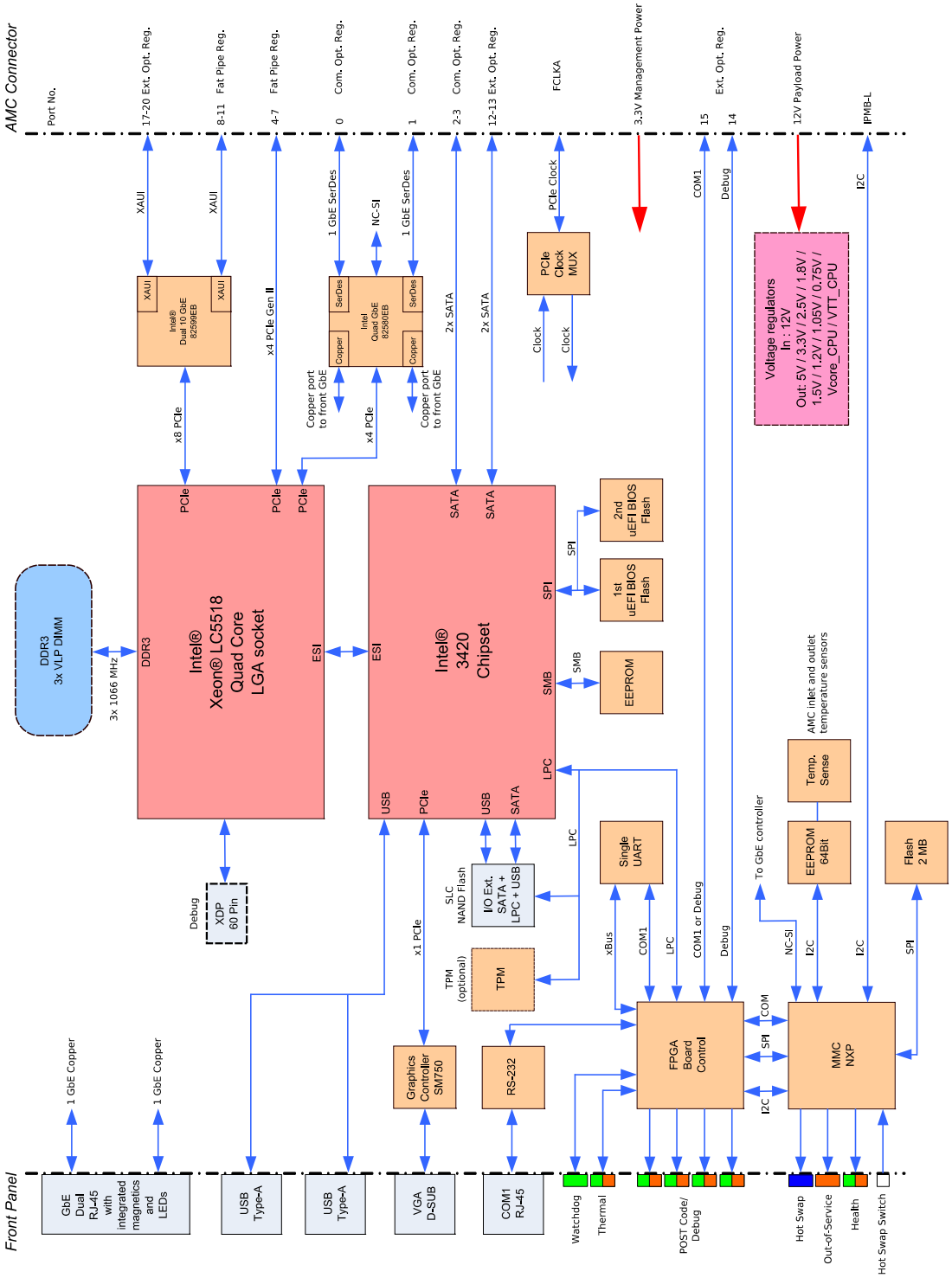
1.4 Board Diagrams

The following diagrams provide additional information concerning board functionality and component layout.

1.4.1 Functional Block Diagram

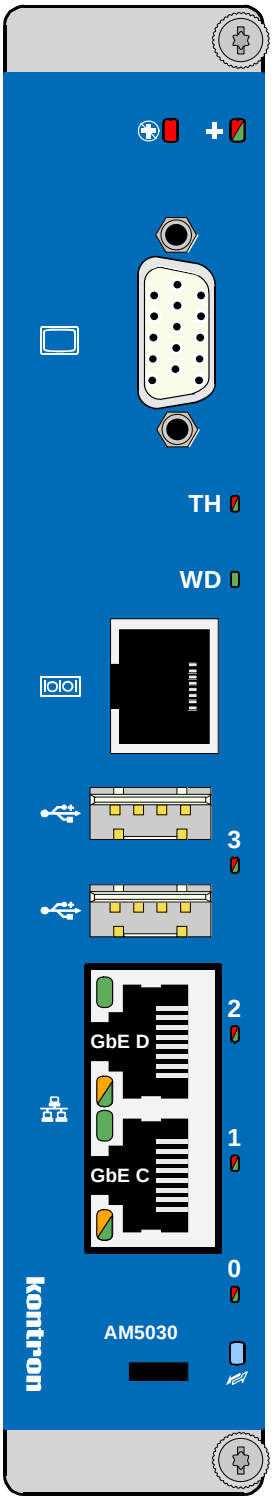
The following figure shows the block diagram of the AM5030.

Figure 1-1: AM5030 Functional Block Diagram



1.4.2 Front Panel

Figure 1-2: AM5030 Front Panel



Module Management LEDs

- LED1 (red): Out-of-Service LED
- LED2 (red/green): Health LED
- HS LED (blue): Hot Swap LED

User-Specific LEDs

- ULED3 (red/green): AMC Ethernet port A link signal status, AMC port 0 (green), POST (green), General Purpose (red/green/red+green)
- ULED2 (red/green): AMC Ethernet port B link signal status, AMC port 1 (green), POST (green), General Purpose (red/green/red+green)
- ULED1 (red/green): 10 GbE (XAUI) port A link status, AMC ports 8-11 (green), POST (green), General Purpose (red/green/red+green)
- ULED0 (red/green): 10 GbE (XAUI) port B link status, AMC ports 17-20 (green), POST (green), General Purpose (red/green/red+green)

Connectors

- VGA Connector
- Serial Connector
- USB Connector
- Ethernet Connector

Ethernet Status LEDs

- ACT (green): Ethernet Link/Activity
- SPEED (green/orange): Ethernet Speed
- SPEED ON (orange): 1000 Mbit
- SPEED ON (green): 100 Mbit
- SPEED OFF: 10 Mbit

Watchdog and Thermal Status LEDs

- TH LED (red/green): Thermal status
- WD LED (green): Watchdog status

Note ...

If the ULED 0..3 are lit red during boot-up, a failure is indicated before the uEFI BIOS has started. For further information, please contact Kontron.

1.4.3 Board Layout

Figure 1-3: AM5030 Board Layout (Top View)

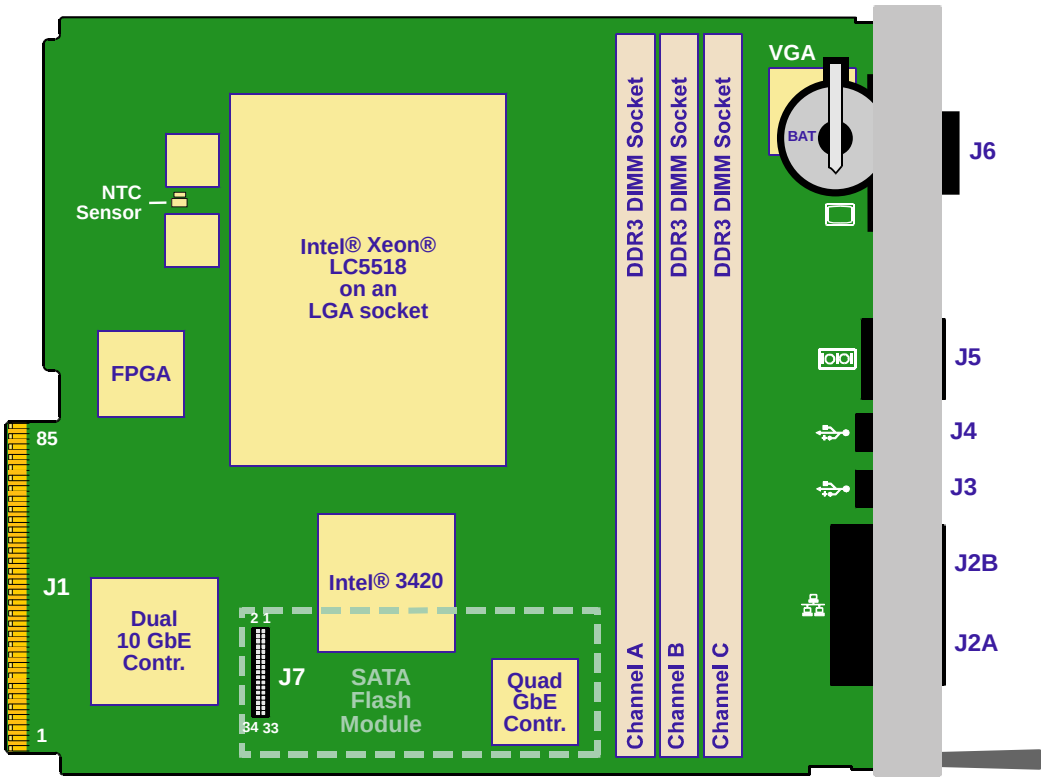
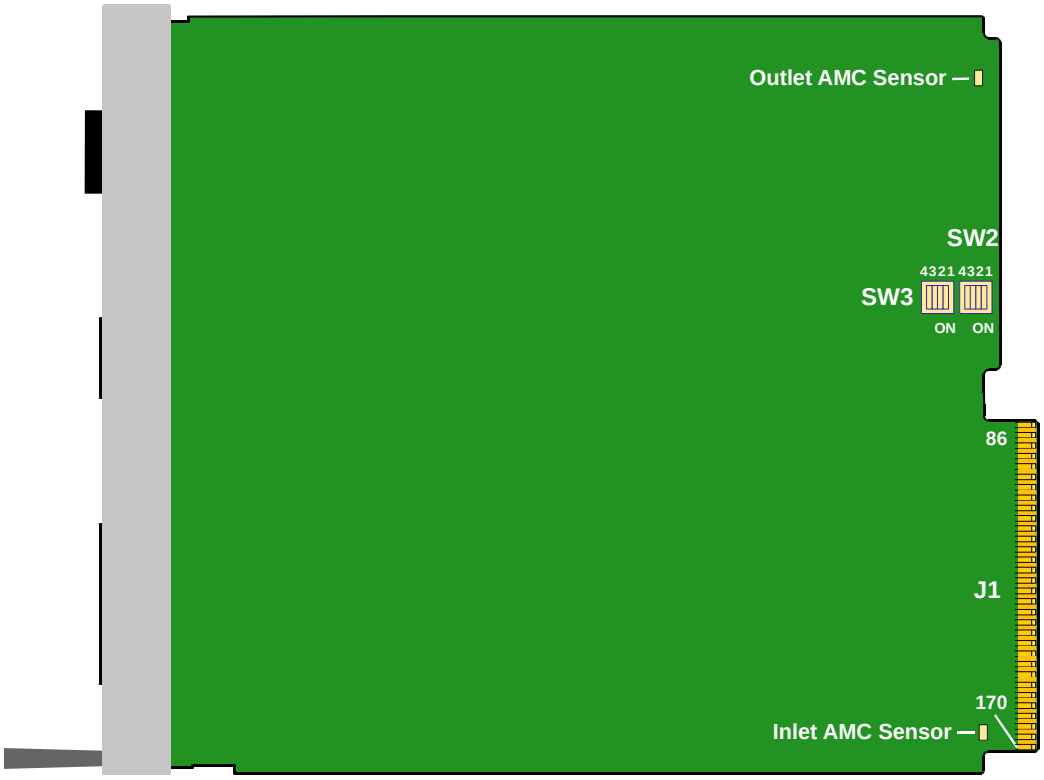


Figure 1-4: AM5030 Board Layout (Bottom View)



1.5 Technical Specification

Table 1-2: AM5030 Main Specifications

AM5030		SPECIFICATIONS
Processor and Memory	CPU	The AM5030 supports the following microprocessor: • Intel® Xeon® LC5518 quad-core server processor, 1.73 GHz, 8 MB L3 cache, on a 1366-ball LGA socket Further processor features: • Four execution cores • Simultaneous Multithreading Technology (SMT); 2 threads/core • Intel® 64 Architecture • Intel® Turbo Boost Technology • Intel® Virtualization Technology (Intel® VT) • System Memory interface with optimized support for triple-channel DDR3 SDRAM memory at 1066 MHz with ECC • Enterprise Southbridge Interface (ESI) to the Intel® 3420 chipset • One x16 PCI Express 2.0 port operating at 5.0 GT/s or 2.5 GT/s Please contact Kontron for further information concerning the suitability of other Intel processors for use with the AM5030.

	Memory	Main Memory:
		• Up to 24 GB triple-channel, unbuffered or registered DDR3 SDRAM memory with ECC running at 1066 MHz (VLP DIMM modules)
		Cache structure:
		• 64 kB L1 cache for each core
		  • 32 kB for instruction cache
		  • 32 kB for data cache
		• 256 kB L2 shared instruction/data cache with ECC for each core
		• 8 MB L3 shared instruction/data cache with ECC shared between all cores
		FLASH Memory:
		• Two redundant SPI Flash chips (2 x 8 MB) for uEFI BIOS controlled by the MMC
		Mass Storage Device:
		• Up to 32 GB NAND Flash via an onboard SATA Flash module, optionally available
		Serial EEPROM with 64 kbit

Chipset	Intel® 3420	Intel® 3420 chipset: • Eight x1 PCI Express 2.0 ports operating at 2.5 GT/s (only one PCI Express port is used on the AM5030) • SATA host controller with six ports, 3 Gbit/s data transfer rate and RAID 0/1/5/10 support • USB 2.0 host interface with up to 12 USB ports available (only two USB 2.0 ports are used on the AM5030) • SPI Flash interface support • Low Pin Count (LPC) interface • PCI interface, 32-bit/33 MHz (not used on the AM5030) • Power management logic support • Enhanced DMA controller, interrupt controller, and timer functions • System Management Bus (SMBus) compatible with most I²C™ devices • ESI interface to the processor • Integrated RTC

Table 1-2: AM5030 Main Specifications (Continued)

AM5030		SPECIFICATIONS
Onboard Controllers	Gigabit Ethernet	Intel® 82580EB Quad Gigabit Ethernet PCI Express bus controller with advanced management features such as serial redirection over LAN: • Two interfaces routed to front I/O connectors • Two interfaces routed to the AMC connector
	10 Gigabit Ethernet	Intel® 82599EB Dual 10 Gigabit Ethernet PCI Express bus controller: • Two XAUI interfaces routed to the AMC connector
	VGA	SM750 PCI Express graphics controller • Supports resolutions of up to 1920 x 1440 pixels • On-chip 16 MB DDR memory
	Serial	One 16550-compatible UART routed either to the front I/O (RS-232 signaling) or the AMC connector (3.3V TTL level)
AMC Interconnection	Gigabit Ethernet	Common Options Region ports 0-1: • Two Gigabit Ethernet SerDes ports
	Serial ATA	Common Options Region ports 2-3: • Two Serial ATA ports Extended Options Region ports 12-13: • Two Serial ATA ports
	PCI Express	Fat Pipes Region ports 4-7: • One x4 PCI Express 2.0 port operating at 5.0 GT/s or 2.5 GT/s
	XAUI	Fat Pipes Region ports 8-11: • One XAUI-A port Extended Options Region ports 17-20: • One XAUI-B port
	Debug	Extended Options Region port 14: • One Debug port
	Serial	Extended Options Region port 15: • One Serial port
	Clock	Clock: • Bidirectional PCI express reference clock (FCLKA)
Connectors	Front Panel Connectors	• Two USB 2.0 ports on 4-pin, type A connectors • One Serial port (COM1) with RS-232 signal level on RJ-45 connector • Two Gigabit Ethernet ports on RJ-45 connectors • One VGA interface on a D-Sub connector
	Onboard Connectors	• One SATA extension connector
	AMC Card-edge Connector	• One 170-pin AMC Card-edge connector
Switch	DIP Switches	Two four-position DIP switches for board configuration

Table 1-2: AM5030 Main Specifications (Continued)

AM5030		SPECIFICATIONS
LEDs	Module Management LEDs	• LED1 (red): Out-of-Service LED • LED2 (red/green): Health LED • HS LED (blue): The hot swap indicator provides basic feedback to the user on the hot swap state of the module. The HS LED states are *off*, *short blink*, *long blink*, and *on*.
	User-Specific LEDs	• ULED3 (red/green): AMC Ethernet port A link signal status: AMC port 0 (green), POST (green), General Purpose (red/green/red+green) • ULED2 (red/green): AMC Ethernet port B link signal status: AMC port 1 (green), POST (green), General Purpose (red/green/red+green) • ULED1 (red/green): 10 GbE (XAUI) port A link status: AMC ports 17-20 (green), POST (green), General Purpose (red/green/red+green) • ULED0 (red/green): 10 GbE (XAUI) port B link status: AMC ports 8-11 (green), POST (green), General Purpose (red/green/red+green)
	Thermal LED	• TH LED (red/green): Thermal Status
	Watchdog LED	• WD LED (green): Watchdog Status
Timer	Watchdog Timer	• Software-configurable, two-stage Watchdog with programmable timeout ranging from 125 ms to 4096 s in 16 steps • Serves for generating IRQ or hardware reset
	System Timer	• The Intel® 3420 chipset contains three 8254-style counters which have fixed uses • In addition to the three 8254-style counters, the Intel® 3420 chipset includes eight individual high-precision event timers that may be used by the operating system. They are implemented as a single counter each with its own comparator and value register. • Real-time clock with battery backup

Table 1-2: AM5030 Main Specifications (Continued)

AM5030		SPECIFICATIONS
IPMI	Module Management Controller	• NXP® LPC2368 ARM7 microcontroller with redundant 512 kB Firmware Flash and automatic roll-back strategy • The MMC carries out IPMI commands such as monitoring several on-board temperature conditions, board voltages and the power supply status, and managing hot swap operations. • The MMC is accessible via a local IPMB (IPMB-L) and one host Keyboard Style Interface (KCS).
	Hot Swap	The AM5030 has full hot swap capability.

	Thermal Management	Processor and board overtemperature protection is provided by:
		• Temperature sensors integrated in the Intel® Xeon® LC5518 processor
		  • Four Digital Thermal Sensors (DTS) for the processor cores
		  • One digital temperature sensor for monitoring the uncore module
		  • One digital temperature sensor for monitoring the IIO module
		  • Catastrophic Cooling Failure Sensor (THERMTRIP#)
		• One temperature sensor integrated in the Intel® 3420 chipset for monitoring the chipset
		• Two onboard temperature sensors for monitoring the board temperature
		• NTC thermal resistor for monitoring the temperature in the CPU core voltage power area
		• Specially designed heat sink

Security	TPM	Trusted Platform Module (TPM) 1.2 for enhanced hardware- and software-based data and system security (on request)

Table 1-2: AM5030 Main Specifications (Continued)

AM5030		SPECIFICATIONS
General	Power Consumption	Refer to Chapter 5, “Power Considerations” for information related to the power consumption of the AM5030.
	Temperature Range	Operational: 0°C to +45°C for long-term operation -5°C to +55°C for short-term operation Storage: -40°C to +70°C Without battery or any additional components  *Note ...* When a battery is installed, refer to the operational specifications of the battery as this will most likely have an influence on the storage temperature of the AM5030 (See "Battery" below).  *Note ...* When additional components are installed, refer to their operational specifications as this will influence the operational and storage temperature of the AM5030.
	Mechanical	Double, Full-size module
	Dimensions	180.6 mm x 148.5 mm x 28.95 mm
	Board Weight	AM5030 with heat sink but without SATA Flash module and without DDR3 memory modules: 528 g DDR3 VLP DIMM module: 12 - 28 g, depending on module type
	JTAG	One JTAG interface connected to the AMC Card-edge connector for debugging and manufacturing purposes
	Battery	The AM5030 is provided with a battery socket for a 3.0V lithium battery for the RTC. Recommended type: CR2025 Temperature ranges: Operational: -20°C to +70°C typical (refer to the battery manufacturer’s specifications for exact range) Storage: -55°C to +70°C typical (no discharge)

Table 1-2: AM5030 Main Specifications (Continued)

AM5030		SPECIFICATIONS
Software	BIOS	AMI Aptio®, AMI's next-generation BIOS firmware based on the uEFI Specification and the Intel Platform Innovation Framework for EFI. • Serial console redirection via the Serial port or LAN • LAN boot capability for diskless systems (standard PXE) • Redundant image; automatic fail-safe recovery in case of a damaged image • Non-volatile storage of setting in the SPI Flash (battery only required for the RTC) • Compatibility Support Module (CSM) providing legacy BIOS compatibility based on AMIBIOS8 • Command shell for diagnostics and configuration • EFI shell commands executable from mass storage device in a Pre-OS environment (open interface) • MMC support in the command shell
	Software IPMI	Module Management Controller Firmware providing the following features: • The MMC is accessible via IPMB-L and one KCS interface with interrupt support • The MMC Firmware can be updated in field through all supported on-board interfaces using the function "fwum..." of the open-source tool "ipmitool". For further information on the ipmitool refer to the sourceforge.net web site. • Two MMC Flash banks with automatic roll-back capability in case of an upgrade Firmware failure • Board supervision and control extensions such as board reset, power and Firmware Hub Flash control, and boot order configuration
	Operating Systems	The board is offered with various Board Support Packages including Windows and Linux operating systems. For further information concerning the operating systems available for the AM5030, please contact Kontron.

1.6 Standards

The AM5030 complies with the requirements of the following standards.

Table 1-3: Standards

COMPLIANCE	TYPE	STANDARD	REMARKS
CE	Emission	EN55022 EN61000-6-3 EN300386	--
	Immission	EN55024 EN61000-6-2 EN300386	--
	Electrical Safety	EN60950-1	--
Mechanical	Mechanical Dimensions	IEEE 1101.10	--
Environmental and Health Aspects	Vibration (sinusoidal)	TBD	--
	Vibration (sinusoidal, transportation)	TBD	--
	Shock (operating)	TBD	--
	Climatic Humidity	IEC60068-2-78	93% RH at 40°C, non-condensing (see note below)
	WEEE	Directive 2002/96/EC	Waste electrical and electronic equipment
	RoHS	Directive 2002/95/EC	Restriction of the use of certain hazardous substances in electrical and electronic equipment



Note ...

Kontron performs comprehensive environmental testing of its products in accordance with applicable standards.

Customers desiring to perform further environmental testing of Kontron products must contact Kontron for assistance prior to performing any such testing. This is necessary, as it is possible that environmental testing can be destructive when not performed in accordance with the applicable specifications.

In particular, for example, boards **without conformal coating** must not be exposed to a change of temperature exceeding 1K/minute, averaged over a period of not more than five minutes. Otherwise, condensation may cause irreversible damage, especially when the board is powered up again.

Kontron does not accept any responsibility for damage to products resulting from destructive environmental testing.

1.7 Related Publications

The following publications contain information relating to this product.

Table 1-4: Related Publications

PRODUCT	PUBLICATION
MicroTCA	PICMG® MTCA.0 R1.0, Micro Telecommunications Computing Architecture Base Specification, July 6, 2006 PICMG MTCA.1 R1.0, Air Cooled Rugged MicroTCA Specification, March 19, 2009
AMC	PICMG® AMC.0 R2.0, Advanced Mezzanine Card Base Specification, Nov. 15, 2006 PICMG® AMC.1 R2.0, PCI Express on AdvancedMC, Oct. 8, 2008 PICMG® AMC.2 R1.0, Ethernet Advanced Mezzanine Card Specification, March 1, 2007 PICMG® AMC.3 R1.0, Advanced Mezzanine Card Specification for Storage, Aug. 25, 2005
SCOPE	SCOPE AMC Port Map Gap-Analysis v1.0
IPMI	IPMI - Intelligent Platform Management Interface Specification, v2.0 Document Revision 1.0, February 12, 2004 IPMI - Platform Management FRU Information Storage Definition, V1.0 Document Revision 1.1, September 27, 1999
PCI Express	PCI Express Base Specification Revision 2.0
Serial ATA	Serial ATA 2.5 Specification
Platform Firmware	Unified Extensible Firmware Interface (uEFI) specification, version 2.1
All Kontron products	Product Safety and Implementation Guide, ID 1021-9142