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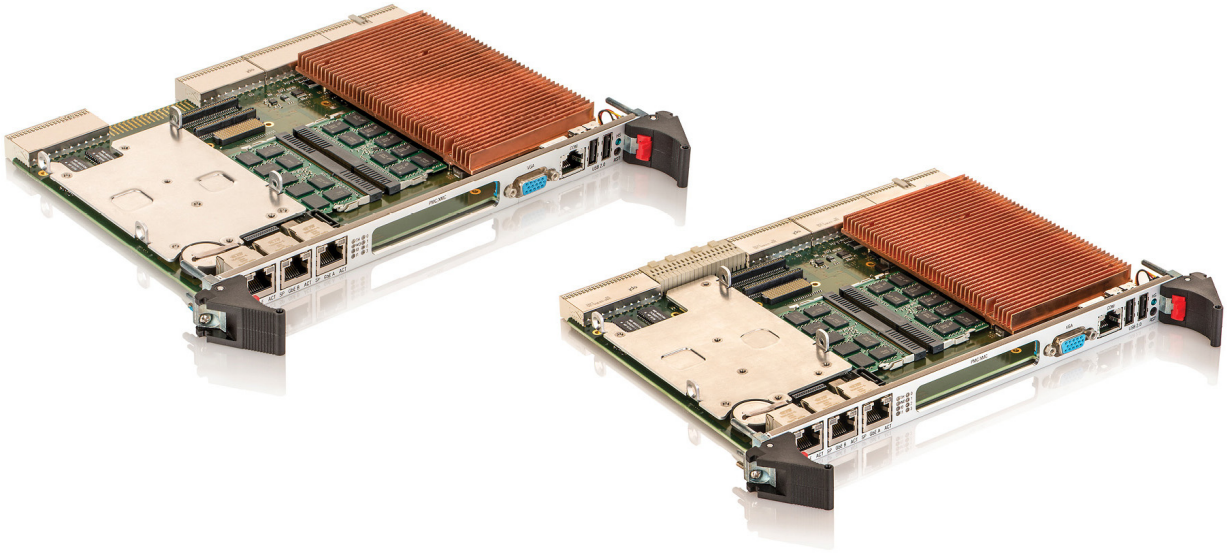
» User Guide «



CP6005(X)-SA

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1 Introduction

1.1 Board Overview

The CP6005(X)-SA is a highly integrated 6U CompactPCI® processor board based on the 4th generation Intel® Core™ i7/i5 processor in combination with the Intel® QM87 Chipset. The CP6005-SA is a fully-compliant PICMG 2.16 processor board whereas the CP6005X-SA offers additional dual 10 Gigabit Ethernet and PCI Express to the backplane.

With the powerful, 4th generation quad-core Intel® Core™ i7 and dual-core Intel® Core™ i5 processors, the CP6005(X)-SA offers extraordinary performance-per-watt values and is an ideal backbone for powerful network-intensive applications providing virtualization (VT-X, VT-D) and highest graphics performance. The new-generation graphics controller has up to 40 execution units providing OpenCL 1.2/OpenGL 4.0 and triple independent display support. Five Gigabit Ethernet channels on the CP6005-SA provide well-weighted data throughput for external and internal PICMG® 2.16-compliant Ethernet traffic. The CP6005X-SA supports two additional 10 Gigabit Ethernet ports combined with x4 PCI Express® 2.0 via a rear I/O ZDplus connector, all based on PICMG® 2.20 for high bandwidth requirements.

The Intel® Advanced Vector Extensions AVX 2.0 enhancements provide a huge performance improvement in floating-point-intensive computations, which are a key part of digital signal and image processing applications such as medical imaging and radar or sonar.

Both PICMG 2.16-compliant CP6005-SA and CP6005X-SA processor boards offer up to 16 GB dual-channel 1600 MHz DDR3L ECC memory via two SODIMM sockets providing up to 25 GB/sec data throughput. Thanks to hot swap support and IPMI (PICMG 2.9-compliant Intelligent Platform Management Interface), the CPU board meets the highest demands for the management of high-availability applications. Many of these are data and telecommunications applications also including highly sensitive security-related solutions as well as image processing systems.

The Intel® QM87 Chipset provides advanced I/O technology including USB and Serial ATA channels for an onboard 2.5-inch SATA hard disk or SSD and an industrial-grade NAND Flash SSD device—all usable in a 4HP single slot. The highly integrated CP6005(X)-SA features also an XMC site according to XMC.3 supporting x8 PCI Express® (alternatively a 32-bit/66 MHz PCI PMC site) for various market available extensions. Based on the Kontron rear I/O concept, existing rear transition modules are fully functional on the CP6005-SA, where the CP6005X-SA provides additional 10 GbE and PCI Express on the backplane for communication between CompactPCI® slots. Appropriate backplanes and systems are available.

Delivering a stable product based on Intel®'s embedded product line, the CP6005(X)-SA ensures long term availability. This eliminates the risk of unplanned design changes and unexpected expensive application modification. While minimizing deployment risks, the CP6005(X)-SA provides a broad range of software support to ease the process of product integration and maximize the competitive advantage of meeting the time-to-market window.

The board is offered with various board support packages including Windows, VxWorks and Linux operating systems. For further information concerning the operating systems available for the CP6005(X)-SA, please contact Kontron.

1.2 System Expansion Capabilities

1.2.1 PMC Module

The CP6005(X)-SA has a 3.3 V, PMC mezzanine interface configurable for 32-bit / 66 MHz PCI operation. This interface supports a wide range of PMC modules with PCI interface including all of Kontron's PMC modules and provides an easy and flexible way to configure the CP6005(X)-SA for various application requirements. For information on the PMC interface, refer to Chapter 2.7.7, "PMC Interface".

1.2.2 XMC Module

The CP6005(X)-SA has one XMC mezzanine interface for support of x1, x4 and x8 PCI Express 2.0 XMC modules providing an easy and flexible way to configure the CP6005(X)-SA for various application requirements. For information on the XMC interface, refer to Chapter 2.7.8, "XMC Interface".

1.2.3 CP6005(X)-SA-MK2.5SATA Assembly Kit

The CP6005(X)-SA comes with an optional CP6005(X)-SA-MK2.5SATA assembly kit comprised of one MMADP-SATA01 module and the necessary components needed for mounting the module on the CP6005(X)-SA. The MMADP-SATA01 module is required for connecting an onboard 2.5" SATA HDD or SSD to the CP6005(X)-SA via an onboard SATA extension connector. For further information concerning the MMADP-SATA01 module, refer to Chapter 6.

1.2.4 SATA Flash Module

The CP6005(X)-SA provides support for up to 64 GB NAND flash memory in combination with an optional SATA Flash module, which is connected to the CP6005(X)-SA via an onboard SATA extension connector. For further information concerning the SATA Flash module, refer to Chapter 7.

1.2.5 Rear I/O Module

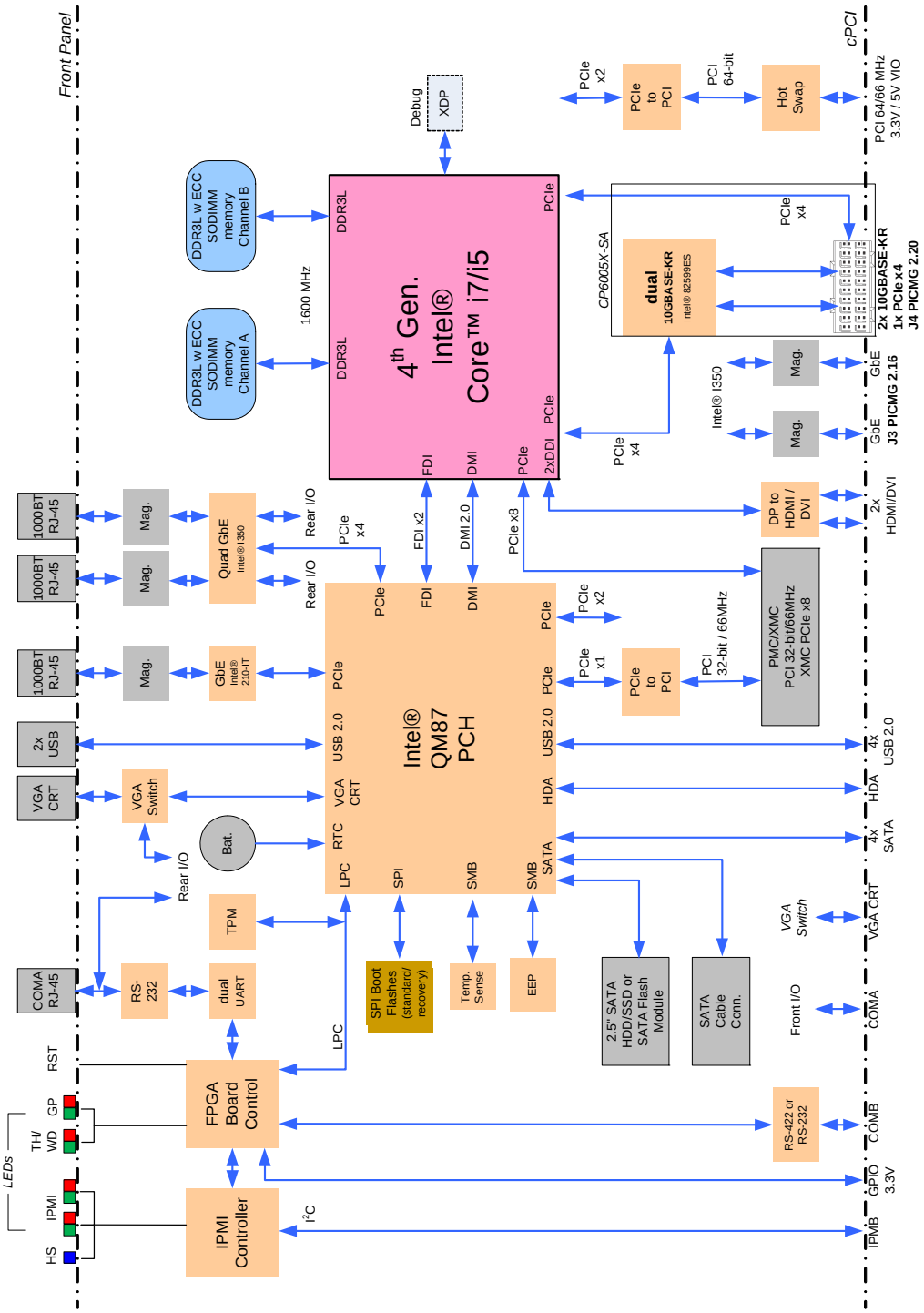
The CP6005(X)-SA provides support for one rear I/O module via the CompactPCI rear I/O connectors. For further information about the compatibility of rear I/O modules with the CP6005(X)-SA, refer to the CP6005(X)-SA datasheet.

1.3 Board Diagrams

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

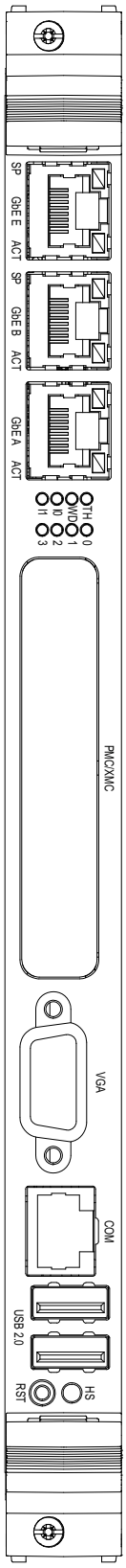
1.3.1 Functional Block Diagram

Figure 1: CP6005(X)-SA Functional Block Diagram



1.3.2 Front Panel

Figure 2: 4 HP CP6005(X)-SA Front Panel



IPMI LEDs

I0/I1 (red/green): Indicate the software status of the IPMI controller

System Status LEDs

HS (blue): Hot Swap Status
TH (red/green): Temperature Status
WD (green): Watchdog Status

General Purpose LEDs

LED3–0 (red/green/amber): General Purpose / POST Code

Note: If the General Purpose LEDs 3–0 are lit red during boot-up, a failure is indicated before the uEFI BIOS has started.

Integral Ethernet LEDs

ACT (green): Ethernet Link/Activity
SPEED (orange): 1000BASE-T Ethernet Speed
SPEED (green): 100BASE-TX Ethernet Speed
SPEED (off) + ACT (on): 10BASE-T Ethernet Speed

1.3.3 Board Layout

Figure 3: 4 HP CP6005-SA Board Layout (Top View)

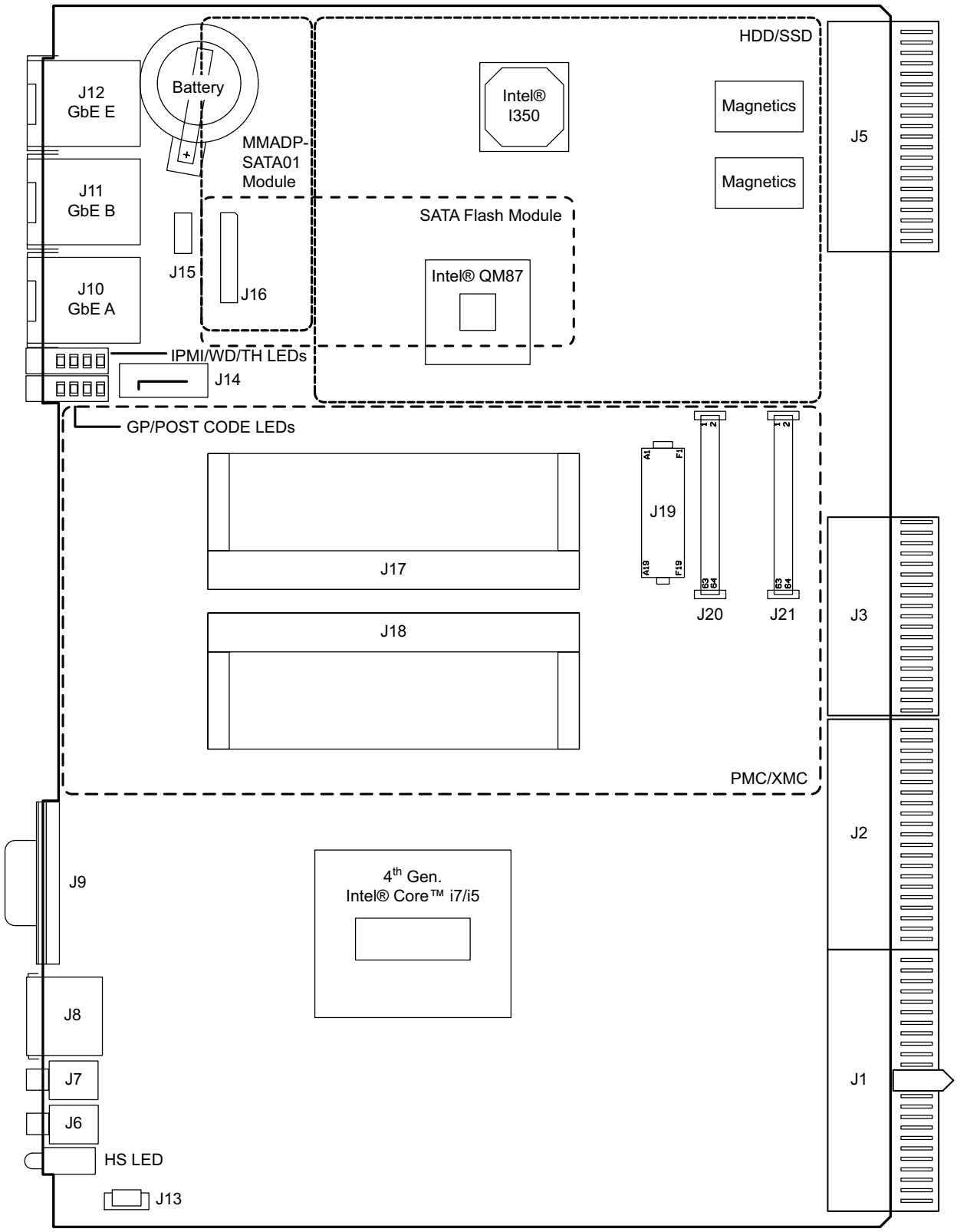


Figure 4: 4 HP CP6005X-SA Board Layout (Top View)

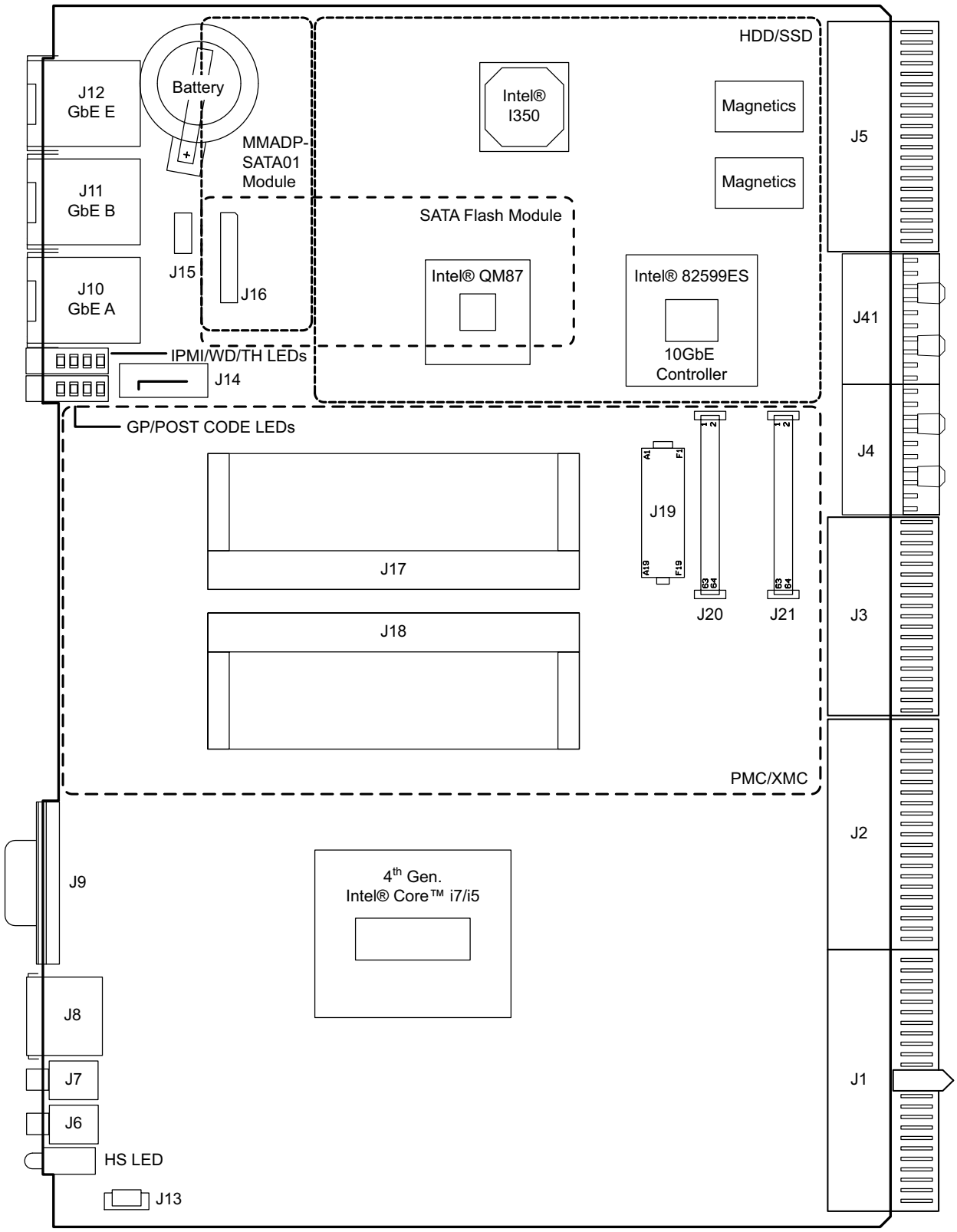
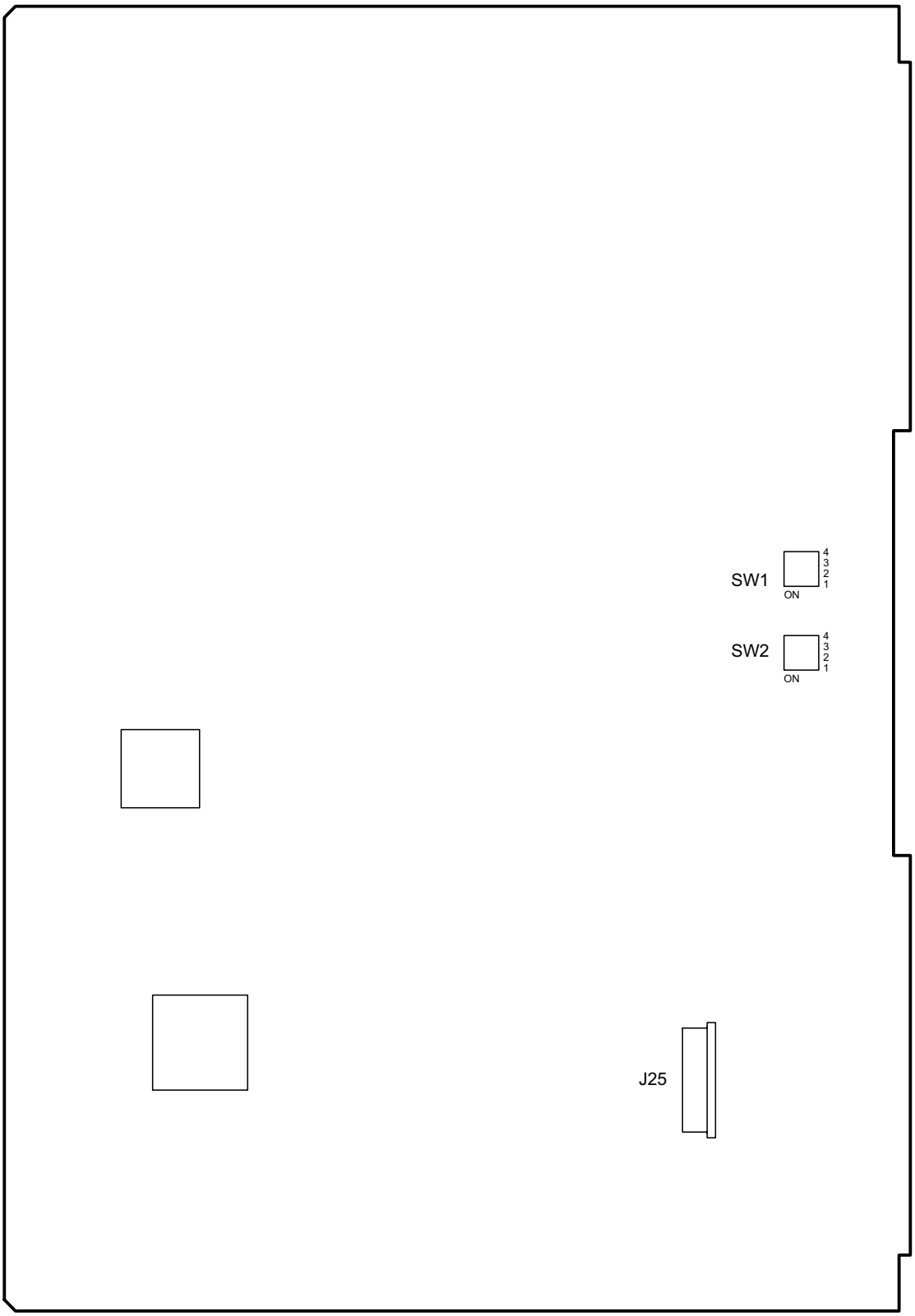


Figure 5: 4 HP CP6005(X)-SA Board Layout (Bottom View)



1.4 Technical Specification

Table 1: CP6005(X)-SA Main Specifications

FEATURES		SPECIFICATIONS
Processor & Chipset	CPU & Graphics Controller	The CP6005(X)-SA supports the following 4th generation processors: » Quad-core Intel® Core™ i7-4860EQ (SV), 1.8 GHz, 6 MB L3 cache, GT3e, Intel® Iris™ Pro Graphics 5200 » Quad-core Intel® Core™ i7-4700EQ (SV), 2.4 GHz, 6 MB L3 cache, GT2, Intel® HD Graphics 4600 » Dual-core Intel® Core™ i5-4400E (SV), 2.7 GHz, 3 MB L3 cache, GT2, Intel® HD Graphics 4600
	PCH	Intel® QM87 Chipset
Memory	Main Memory	Up to 16 GB, dual-channel DDR3 SDRAM memory with ECC running at 1600 MHz on two SODIMM sockets
	Flash Memory	Two 16 MB SPI boot flash chips for two separate uEFI BIOS images Up to 64 GB SLC NAND flash via an onboard SATA Flash module (SSD)
	EEPROM	EEPROM with 64 kbit
Interfaces	CompactPCI	CompactPCI interface: » Compliant with CompactPCI Specification PICMG 2.0 R 3.0: » System controller operation » 64-bit / 66 MHz PCI or PCI-X master interface with dedicated PCIe-to-PCI-X bridge » 3.3V or 5V signaling levels (universal signaling support) » Compliant with the Packet Switching Specification PICMG 2.16. The CP6005(X)-SA supports System Master hot swap functionality and application-dependent hot swap functionality when used in a peripheral slot. When used as a System Master, the CP6005(X)-SA supports individual clocks for each slot and the ENUM signal handling is in compliance with the PICMG 2.1 Hot Swap Specification. When installed in a peripheral slot, the CP6005(X)-SA is isolated from the CompactPCI bus. It receives power from the backplane and supports rear I/O and, if the system supports it, packet switching (in this case up to two channels of Gigabit Ethernet).
	Standard Rear I/O	The following interfaces are routed to the rear I/O connectors J3 and J5. COMA (RS-232 signaling) and COMB (RS-232 signaling); no buffer on the rear I/O module is necessary » 4 x USB 2.0 » 1 x CRT VGA, 2 x HDMI/DVI » 1 x HDA » 2 x Gigabit Ethernet (compliant with PICMG 2.16, R 1.0) » 4 x SATA 3 Gb/s » 4 x GPIs and 4 GPOs (LVTTL signaling) » System write protection

Table 1: CP6005(X)-SA Main Specifications (Continued)

	FEATURES	SPECIFICATIONS
Interfaces	High-Speed Serial Rear I/O Interconnection (CP6005X-SA)	The following interfaces are provided on the rear I/O via two ZDplus high-speed connectors, J4 and J41 (PICMG 2.20): » Two 10GBASE-KR interfaces » One x4 PCI Express 2.0 operating at 5 GT/s as a root complex controller only The port mapping of the high-speed serial rear I/O interconnection on the CP6005(X)-SA is capable of supporting two 10GBASE-KR/40GBASE-KR4 interfaces, one x8 PCI Express 3.0 operating at 8 GT/s, and two SATA 6 Gb/s ports. However, the current implementation provides support for only two 10GBASE-KR and one x4 PCI Express 2.0 operating at 5 GT/s.
	10 Gigabit Ethernet (CP6005X-SA)	Two 10GBASE-KR interfaces for high-speed serial rear I/O interconnection based on the Intel® 82599ES dual-port 10 Gigabit Ethernet controller
	Gigabit Ethernet	Five 10 Base-T/100 Base-TX/1000 Base-T Gigabit Ethernet interfaces based on one Intel® I210-IT Gigabit Ethernet controller and one Intel® I350 quad-port Gigabit Ethernet controller: » Three RJ-45 connectors on the front panel » Two ports on the rear I/O (PICMG 2.16)
	USB	Six USB ports supporting UHCI (USB 1.1) and EHCI (USB 2.0): » Two type A USB 2.0 connectors on the front panel » Four USB 2.0 ports on the rear I/O interface
	Serial	Two 16C550-compatible UARTs: » One RS-232 port on the front panel and routed to rear I/O, COMA » One RS-232 port on the rear I/O, COMB
	XMC	XMC interface: » One onboard XMC connector for connecting a standard XMC module » Up to x8 PCI Express 2.0 ports operating at 5 GT/s (up to x8 PCI Express 3.0 operating at 8 GT/s on request)
	SATA	» Two SATA 6 Gb/s interfaces for: » Up to 64 GB flash memory via an onboard SATA Flash module, or » Onboard 2.5" HDD / SSD is supported in combination with the MMADP-SATA01 module » One standard SATA 6 Gb/s interface for the standard SATA connector » Four SATA 3 Gb/s ports accessible via rear I/O » High-performance RAID 0/1/5/10 functionality on all SATA ports
Sockets	Front Panel Connectors	» VGA: one 15-pin, D-Sub connector, J9 » USB: two 4-pin, type A connectors, J6 and J7 » Ethernet: three 8-pin, RJ-45 connectors, J10, J11 and J12 » Serial port: one 8-pin, RJ-45 connector, J8 (COMA) » XMC front panel bezel cutout

Table 1: CP6005(X)-SA Main Specifications (Continued)

FEATURES		SPECIFICATIONS
Sockets	Onboard Connectors	» One XMC connector, J19 (P15) » Two SATA connectors » One 7-pin, standard SATA connector, J14 » One 34-pin, SATA extension connector, J16 » One JTAG connector, J15 » One XDP-SFF (debug) connector, J25 » Four CompactPCI connectors J1, J2, J3 and J5 » Two ZDplus high-speed serial rear I/O connectors, J4 and J41 (PICMG 2.20) (CP6005X-SA) » Two 204-pin DDR3L SODIMM sockets, J17 and J18
LEDs	Front Panel LEDs	IPMI LEDs: » IO/I1 (red/green): Software status of the IPMI controller System Status LEDs: » WD (green): Watchdog status » TH (red/green): Temperature status » HS (blue): Hot swap status General Purpose LEDs: » LED3–0 (red/green/amber): General purpose / POST code Ethernet LEDs: » ACT (green): Network link / activity » SPEED (green/orange): Network speed
Switches	DIP Switches	Two onboard DIP switches, SW1 and SW2 for board configuration on the rear side of the board
	Reset Switch	One hardware reset switch on the front panel
	Hot Swap Switch	One switch for hot swap purposes integrated in the front panel in accordance with PICMG 2.1 Rev. 2.0
Timer	Real-Time Clock	Real-time clock with 256 Byte CMOS RAM; battery-backup available
	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® QM87 Chipset contains three 8254-style counters with fixed uses. In addition to the three 8254-style counters, the Intel® QM87 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.
IPMI	IPMI Controller	NXP® ARM7 microcontroller with 512 kB firmware flash and automatic rollback strategy The IPMI controller carries out IPMI commands such as monitoring several onboard temperature conditions, board voltages and the power supply status, and managing hot swap operations. The IPMI controller is accessible via two IPMBs, one host Keyboard Controller Style (KCS) Interface and up to four Gigabit Ethernet Interfaces (IOL).

Table 1: CP6005(X)-SA Main Specifications (Continued)

FEATURES		SPECIFICATIONS
Thermal	Thermal Management	CPU and board overtemperature protection is provided by: » Temperature sensors integrated in the 4th gen. Intel® Core™ i7/i5 processor: » One temperature sensor for monitoring each processor core » One temperature sensor for monitoring the graphics core » One temperature sensor for monitoring the package die temperature » One temperature sensor integrated in the Intel® QM87 Chipset for monitoring the chipset » One onboard temperature sensor for monitoring the board temperature » Specially designed heat sink
Security	TPM	Trusted Platform Module (TPM) 1.2 for enhanced hardware- and software-based data and system security
Software	uEFI BIOS	Phoenix SecureCore Tiano™ (SCT) BIOS firmware based on the uEFI Specification and the Intel Platform Innovation Framework for EFI: » LAN boot capability for diskless systems (standard PXE) » Automatic fail-safe recovery in case of a damaged image » Non-volatile storage of setting in the SPI boot flash (battery only required for the RTC) » Compatibility Support Module (CSM) providing legacy BIOS compatibility based on Phoenix SCT3 » Command shell for diagnostics and configuration » uEFI Shell commands executable from mass storage device in a pre-OS environment (open interface)
	IPMI Firmware	IPMI firmware providing the following features: » Keyboard Controller Style (KCS) interface » Dual-port IPMB interface for out-of-band management and sensor monitoring » IPMI over LAN (IOL) and Serial over LAN (SOL) support » Sensor Device functionality with configurable thresholds for monitoring board voltages, CPU state, board reset, etc. » FRU Inventory functionality » System Event Log (SEL), Event Receiver functionalities » Sensor Data Record Repository (SDRR) functionality » IPMI Watchdog functionality (power-cycle, reset) » Board monitoring and control extensions: » Graceful shutdown support » uEFI BIOS fail-over control: selection of the SPI boot flash (standard/recovery) » Field-upgradeable IPMI firmware: » via the KCS, IPMB or IOL interfaces » Download of firmware does not break the currently running firmware or payload activities » Two flash banks with rollback capability: manual rollback or automatic in case of upgrade failure
	Operating Systems	There are various operating systems available for the CP6005(X)-SA. For further information, please contact Kontron.

Table 1: CP6005(X)-SA Main Specifications (Continued)

FEATURES		SPECIFICATIONS
General	Power Consumption	See Chapter 4 for details.
	Temperature Range	Operational: 0°C to +60°C Standard -40°C to +70°C Extended Storage: -40°C to +85°C Without hard disk and without battery
	Battery	3.0 V lithium battery for RTC with battery socket Battery type: UL-approved CR2025 Temperature ranges: Operational (load): -20°C to +70°C typical (refer to the battery manufacturer's specifications for exact range) Storage (no load): -40°C to +70°C typical
	Climatic Humidity	93% RH at 40 °C, non-condensing (acc. to IEC 60068-2-78)
	Dimensions	233.35 mm x 160 mm 6U, 4 HP, CompactPCI Serial-compliant form factor
	Board Weight	CP6005-SA with heat sink: 778 grams CP6005X-SA with heat sink: 796 grams The above-mentioned board weight refers to the CP6005(X)-SA without extension modules such as the SATA Flash module or the MMADP-SATA01 module.

1.5 Standards

This product complies with the requirements of the following standards.

Table 2: Standards

TYPE	ASPECT	STANDARD
CE	Emission	EN55022, EN61000-6-3
	Immission	EN55024, EN61000-6-2
	Electrical Safety	EN60950-1
Mechanical	Mechanical Dimensions	IEEE 1101.10
Environmental	Climatic Humidity	IEC60068-2-78 (see note below)
	WEEE	Directive 2002/96/EC Waste electrical and electronic equipment
	RoHS 2	Directive 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment

In addition, boards ordered with the ruggedized service comply with the following standards as well.

Table 3: Additional Standards for Boards Ordered with Ruggedized Service

TYPE	ASPECT	STANDARD	REMARKS
Environmental	Vibration (Sinusoidal)	IEC60068-2-6	Ruggedized version test parameters: 10-300 (Hz) frequency range 2 (g) acceleration 1 (oct/min) sweep rate 10 cycles/axis 3 axes
	Single Shock	IEC60068-2-27	Ruggedized version test parameters: 30 (g) acceleration 9 (ms) shock duration half sine 3 number of shocks per direction (total: 18) 6 directions 5 (s) recovery time
	Permanent Shock	IEC60068-2-29	Ruggedized version test parameters: 15 (g) acceleration 11 (ms) shock duration half sine 500 number of shocks per direction 6 directions 5 (s) recovery time

Note: Customers desiring to perform further environmental testing of the CP6005(X)-SA must contact Kontron for assistance prior to performing any such testing.

Boards **without conformal coating** must not be exposed to a change of temperature which can lead to condensation. 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.

1.6 Related Publications

The following publications contain information relating to this product.

Table 4: Related Publications

PRODUCT	PUBLICATION
CompactPCI Systems	PICMG 2.0, Rev. 3.0 CompactPCI Specification PICMG 2.16, Rev. 1.0 CompactPCI Packet Switching Backplane Specification PICMG 2.20, Rev. 1.0 CompactPCI Packet Serial Mesh Backplane Specification PICMG 2.9, Rev. 1.0 CompactPCI System Management Specification PICMG 2.1, Rev. 2.0 CompactPCI Hot Swap Specification
	IPMI - Intelligent Platform Management Interface Specification v2.0
	Kontron CompactPCI Backplane Manual, ID 24229
XMC Module	ANSI/VITA 42.0-200x XMC Switched Mezzanine Card Auxiliary Standard ANSI/VITA 42.3-2006 XMC PCI Express Protocol Layer Standard IEEE 1386-2001, IEEE Standard for a Common Mezzanine Card (CMC) Family
Platform Firmware	Unified Extensible Firmware Interface (uEFI) Specification, Version 2.1
All Kontron products	Product Safety and Implementation Guide, ID 1021-9142