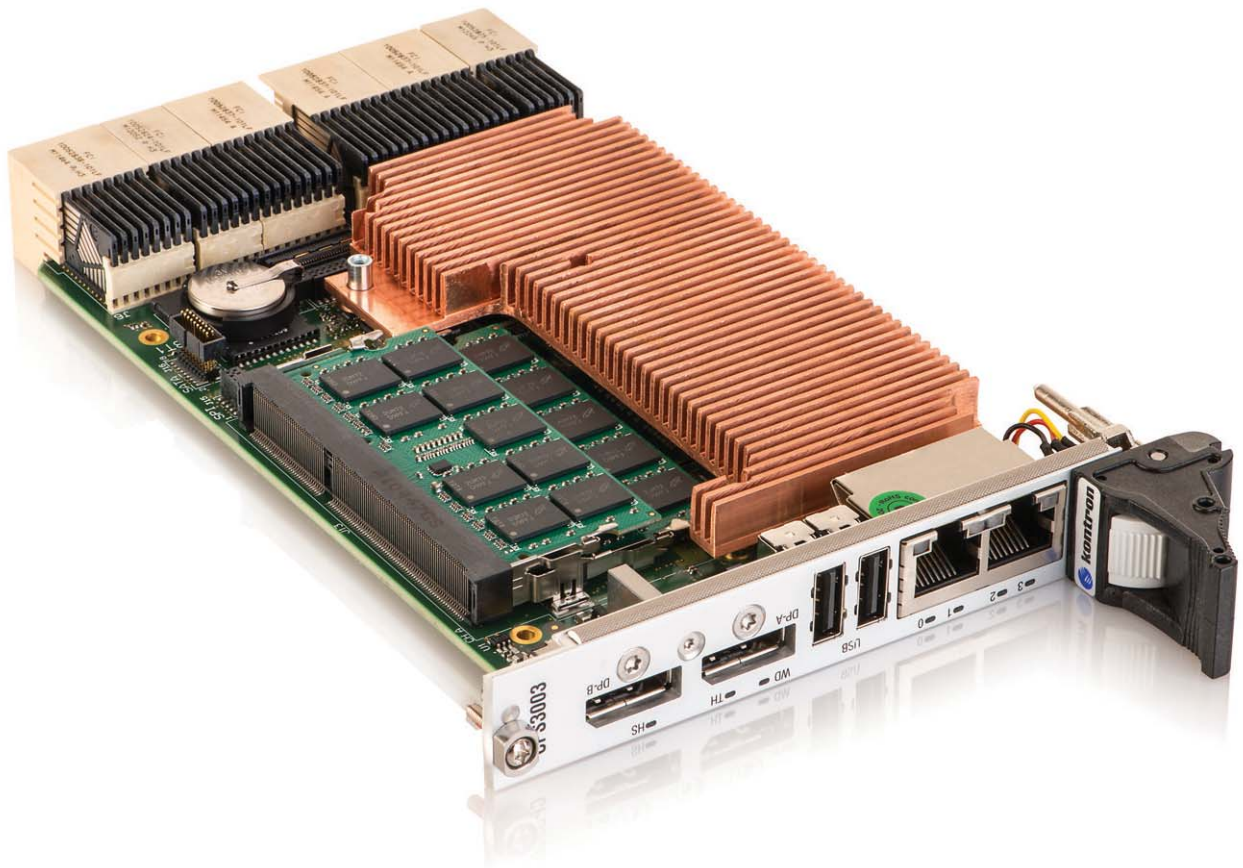


# » User Guide «



CPS3003-SA

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1.0	Initial issue	13-May-2014
2.0	Extensive changes	10-Feb-2014

## Imprint

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# 1 Introduction

## 1.1 Board Overview

CompactPCI® Serial, adopted by the PICMG® consortium in 2011, describes a new base standard. The CompactPCI Serial standard introduces a completely new connector that enables a higher signal density and supports even higher transmission frequencies of up to 12 Gb/s as well as modern point-to-point connections such as PCI Express®, SATA, Ethernet and USB on the backplane.

The CPS3003-SA is a highly integrated 3U CompactPCI Serial CPU board based on Intel®'s 3<sup>rd</sup> Generation Core™ i7 technology in combination with the mobile Intel® QM77 Express Chipset. The CPU board comes with a multi-core CPU package scalable from the dual-core ULV 1.7 GHz Intel® Core™ i7-3517UE up to the quad-core 2.1 GHz i7-3612QE processor. The powerful PCH Intel® QM77 provides a variety of interfaces either routed to front, onboard or the CompactPCI Serial connectors. Memory-demanding applications can make use of up to 16 GB, 1600 MHz DDR3 SDRAM with Error Checking and Correction (ECC). As another security feature, the CPS3003-SA provides a Trusted Platform Module (TPM) which offers hardware-based encryption mechanisms to create, seal or store keys and other important system data.

For graphics intensive applications, the CPS3003-SA offers an excellent graphics performance with integrated DirectX®11, OpenGL 3.1 and OpenCL 1.1 support as well as three independent graphics outputs.

The CPS3003-SA comes with a comprehensive I/O feature set supporting the latest high-speed interfaces such as USB 3.0, SATA 6Gb/s or PCI Express® 3.0. Communication interfaces available on the front panel are two DisplayPort, two USB 2.0 and two Gigabit Ethernet ports. Serial interfaces available on the CompactPCI Serial connectors P1 to P5 are eight USB ports, four SATA interfaces and 17x PCI Express® links. Additional interfaces available on the P6 CompactPCI Serial rear I/O connector are two Gigabit Ethernet interfaces, two USB ports, one DisplayPort and two serial ports.

By adding one of the four extension modules – Smart Extension Module, SATA Flash Module, CPS3003-EXTIO or CPS3003-BRIDGE - the CPS3003-SA's I/O and storage capabilities will be further extended.

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 CP3003-SA, please contact Kontron.

## 1.2 System Expansion Capabilities

### 1.2.1 CPS3003-EXTIO Extension Module (8 HP)

The CPS3003-EXTIO module for the 8 HP CPS3003-SA version provides one USB 3.0 port, one COM port, and one CFast socket on the front panel. For further information on the CPS3003-EXTIO extension module, refer to Chapter 6.

### 1.2.2 CPS3003-BRIDGE Extension Module (9 HP)

The CPS3003-BRIDGE module for the 9 HP CPS3003-SA version provides one USB 3.0 port, one COM port, and one CFast socket on the front panel. In addition, the CPS3003-BRIDGE module is equipped with a PCI Express-to-PCI bridge which converts PCI Express signals into PCI signals and makes them available on the CompactPCI interface. For further information on the CPS3003-BRIDGE extension module, refer to Chapter 7.

### 1.2.3 CPS-RI03-01 Rear Transition Module

The CPS-RI03-01 rear transition module provides comprehensive rear I/O functionality, such as one DisplayPort, two COM ports, two Gigabit Ethernet ports, one USB 3.0 port, and one USB 2.0 port. For further information on the CPS-RI03-01 rear transition module, refer to Chapter 8.

### 1.2.4 Smart Extension Module

The Smart Extension Module can be used with the 4 HP CPS3003-SA and expands the onboard I/O capability providing one additional SATA cable connector as well as one USB 2.0 connector thereby facilitating the connection to system-internal USB and SATA devices. For further information on the Smart Extension Module, refer to Chapter 9.

**Note:** If a Smart Extension Module is installed on the CPS3003-SA, the board width exceeds 4 HP.

### 1.2.5 SATA Flash Module

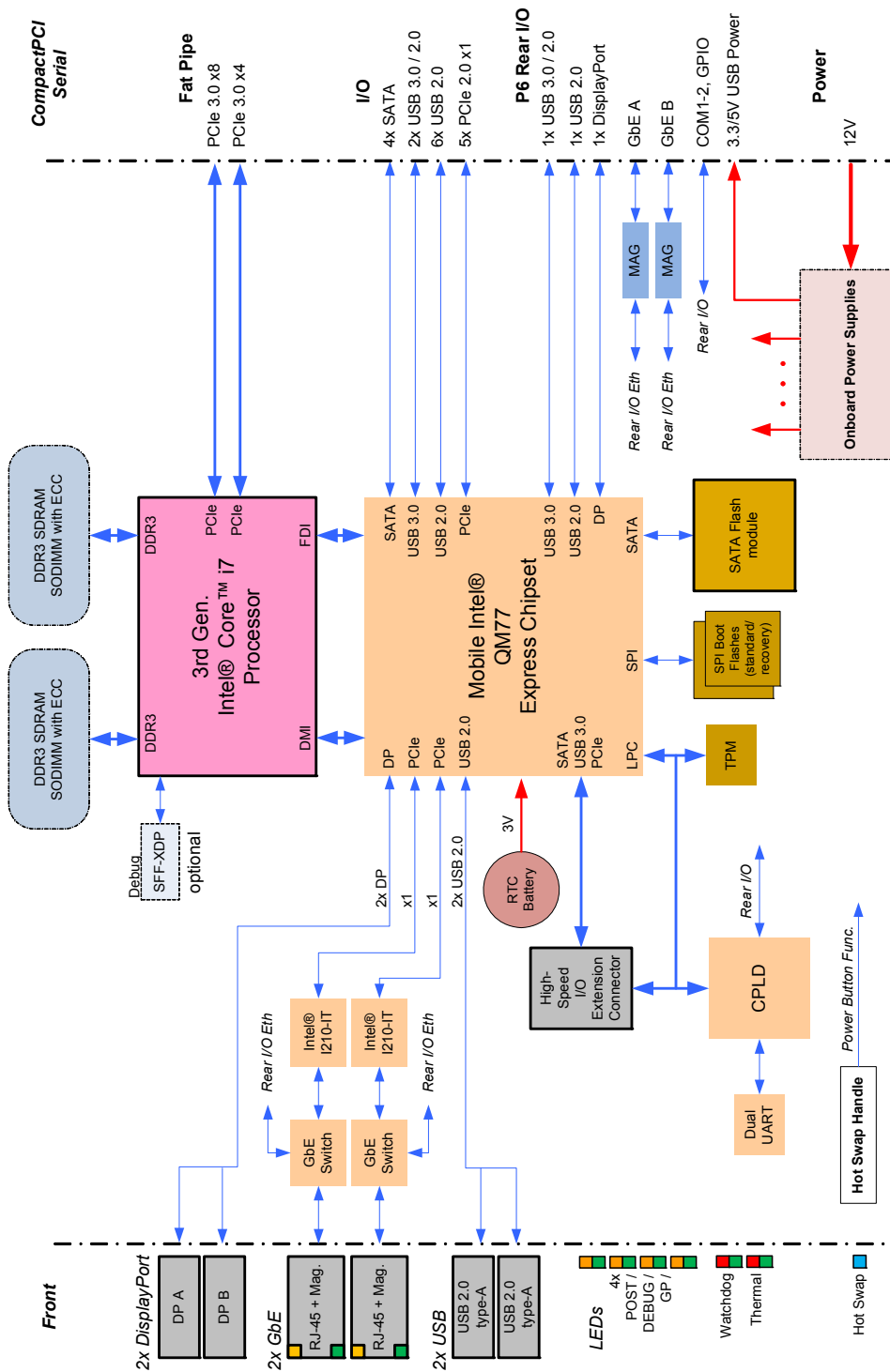
The SATA Flash module can be used with the 4 HP CPS3003-SA and provides up to 32 GB of SLC NAND flash memory. For further information on the SATA Flash module, refer to Chapter 10.

## 1.3 Board Diagrams

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

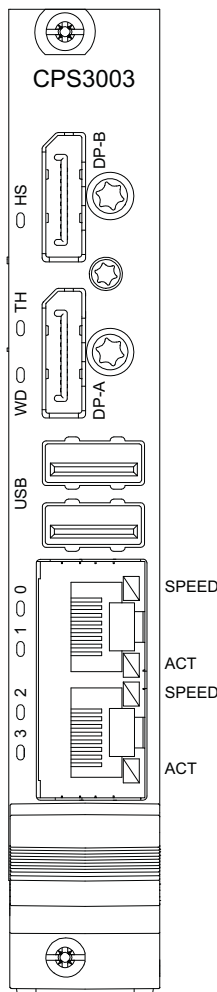
### 1.3.1 Functional Block Diagram

Figure 1: CPS3003-SA Functional Block Diagram



### 1.3.2 Front Panel

Figure 2: 4 HP CPS3003-SA Front Panel



#### System Status LEDs

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

#### General Purpose LEDs

LED3..0 (red/green/red+green): 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):	100BASE-T Ethernet Speed
SPEED (green):	100BASE-TX Ethernet Speed
SPEED (off) + ACT on:	10BASE-T Ethernet Speed

**Note:** For information regarding the front panel of the 8 HP CPS3003-SA with a CPS3003-EXTIO extension module, refer to Chapter 6.

For information regarding the front panel of the 9 HP CPS3003-SA with a CPS3003-BRIDGE extension module, refer to Chapter 7.

### 1.3.3 Board Layout

Figure 3: 4 HP CPS3003-SA Board Layout (Top View)

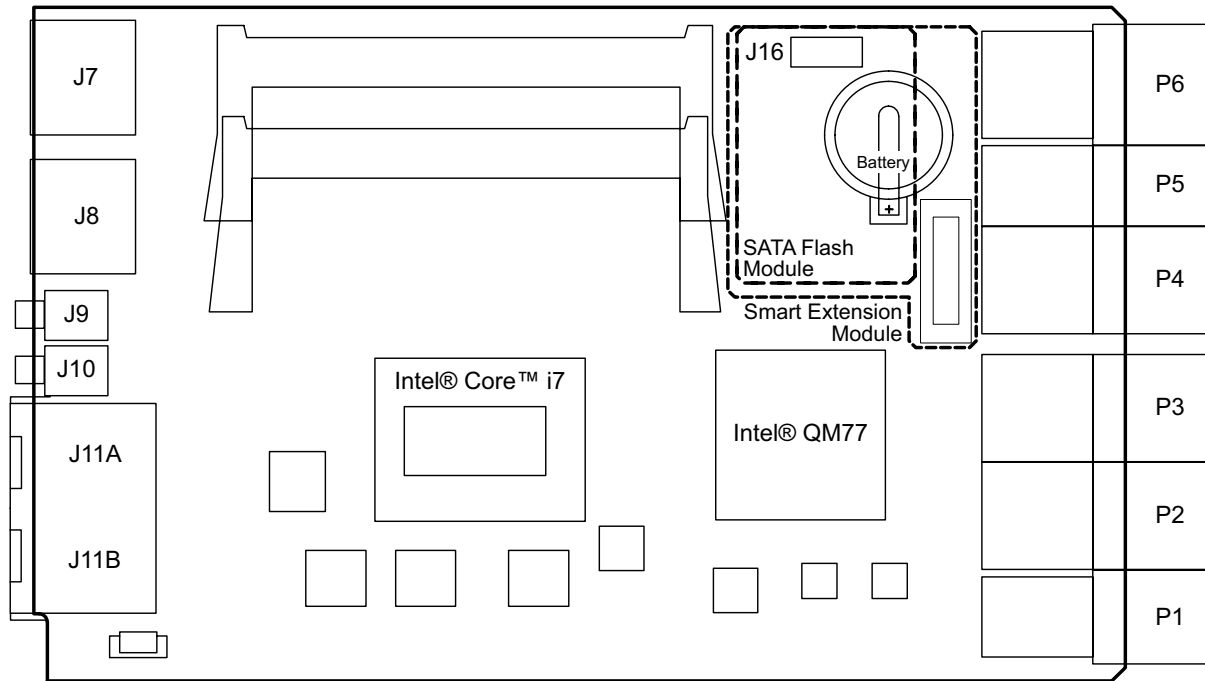
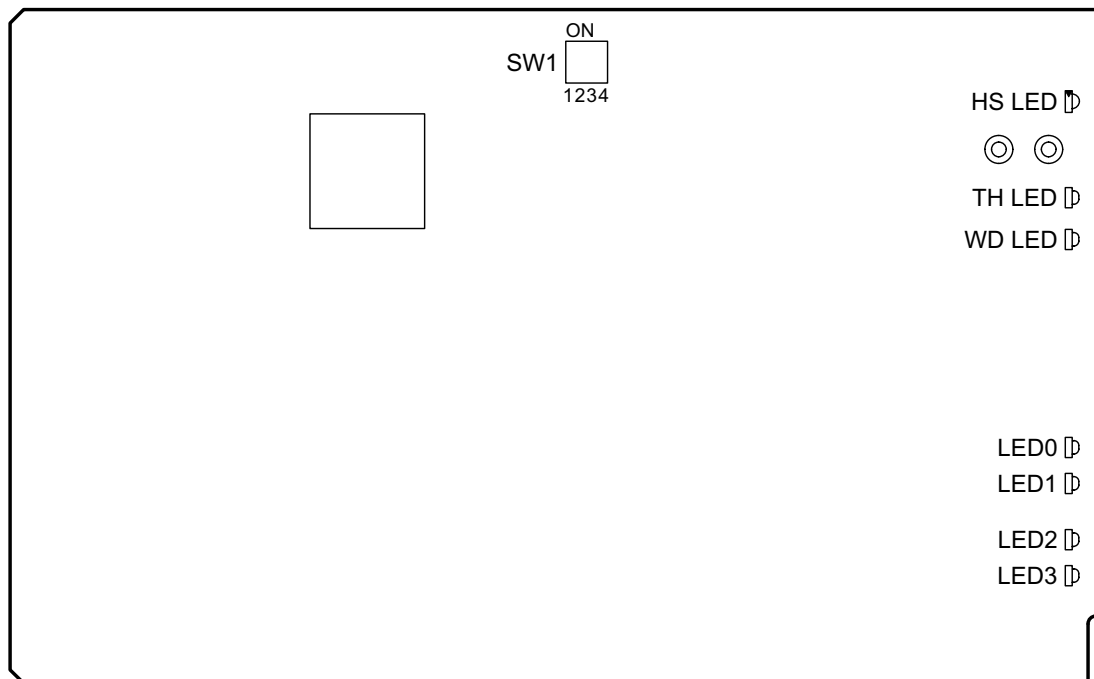


Figure 4: 4 HP CPS3003-SA Board Layout (Bottom View)



## 1.4 Technical Specification

**Table 1: CPS3003-SA Main Specifications**

FEATURES		SPECIFICATIONS
Processor & Chipset	CPU	The CPS3003-SA supports the following 3 <sup>rd</sup> generation processors: <ul style="list-style-type: none"> <li>» Quad-core Intel® Core™ i7-3612QE (SV), 2.1 GHz, 6 MB L3 cache</li> <li>» Dual-core Intel® Core™ i7-3555LE (LV), 2.5 GHz, 4 MB L3 cache</li> <li>» Dual-core Intel® Core™ i7-3517UE (ULV), 1.7 GHz, 4 MB L3 cache</li> </ul>
	Graphics Controller	High-performance 3D graphics controller integrated in the processor
	PCH	Mobile Intel® QM77 Express 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 8 MB SPI boot flash chips for two separate uEFI BIOS images Up to 32 GB SLC NAND flash via an onboard SATA Flash module (SSD)
	EEPROM	EEPROM with 64 kbit
Interfaces	CompactPCI Serial	CompactPCI Serial interface: <ul style="list-style-type: none"> <li>» Compliant with PICMG® CPCI-S.0 R 1.0 CompactPCI® Serial Specification</li> <li>» Support for the following interfaces:               <ul style="list-style-type: none"> <li>» 7x PCI Express® (1 x8 PCI Express 3.0 on fat pipe, 1 x4 PCI Express 3.0 on fat pipe and 5 x1 PCI Express 2.0)</li> <li>» 4 x SATA (2 x SATA 6 Gb/s, 2 x SATA 3 Gb/s)</li> <li>» 2 x USB 3.0 / 2.0</li> <li>» 6 x USB 2.0</li> <li>» 2 x Gigabit Ethernet</li> </ul> </li> <li>» 12 V power supply</li> <li>» Hot swap capability</li> <li>» Capability of operation both in system slot and in peripheral slot</li> </ul> When installed in a peripheral slot, all interfaces except for the Ethernet interfaces and rear I/O interfaces are isolated from the CompactPCI Serial interface.
	CompactPCI Serial Rear I/O	The following interfaces are routed to the CompactPCI Serial rear I/O connector P6: <ul style="list-style-type: none"> <li>» COMA and COMB, or COMA and GPIO (all ports have 3.3V LVTTTL signaling)</li> <li>» 1 x USB 2.0</li> <li>» 1 x USB 3.0 / 2.0</li> <li>» DisplayPort</li> <li>» 2x Gigabit Ethernet</li> <li>» System control signals</li> <li>» Input for RTC backup</li> </ul>
	Gigabit Ethernet	Two 10 Base-T/100 Base-TX/1000 Base-T Gigabit Ethernet interfaces based on two Intel® I210-IT Ethernet controllers. Both interfaces are individually switchable to front I/O or rear I/O and provide Wake-on-LAN support.

Table 1: CPS3003-SA Main Specifications (Continued)

FEATURES		SPECIFICATIONS
Interfaces	USB	Up to 13 USB ports: <ul style="list-style-type: none"> <li>» 6 x USB 2.0 on the CompactPCI Serial interface</li> <li>» 2 x USB 3.0 / 2.0 on the CompactPCI Serial interface</li> <li>» 2 x USB 2.0 ports on the front I/O</li> <li>» 1 x USB 2.0 port on the rear I/O interface</li> <li>» 1 x USB 3.0 / 2.0 port on the rear I/O interface</li> <li>» 1 x USB 3.0 / 2.0 port on the CPS3003-EXTIO/CPS3003-BRIDGE extension module</li> </ul>
	Serial	Two 16C550-compatible UARTs: <ul style="list-style-type: none"> <li>» COMA available on the CPS3003-EXTIO/CPS3003-BRIDGE extension module or on rear I/O</li> <li>» COMB or GPIO available on the rear I/O only</li> </ul>
	SATA	Six SATA ports: <ul style="list-style-type: none"> <li>» 2 x SATA 3 Gb/s onboard</li> <li>» 2 x SATA 6 Gb/s on the CompactPCI Serial interface</li> <li>» 2 x SATA 3 Gb/s on the CompactPCI Serial interface</li> </ul> High-performance RAID 0/1/5/10 functionality on all SATA ports
	I/O Extension Interfaces	I/O extension to 8 HP board version via the CPS3003-EXTIO module: <ul style="list-style-type: none"> <li>» CFast (SATA 3 Gb/s)</li> <li>» USB 3.0</li> <li>» COMA (RS-232)</li> <li>» Reset button</li> <li>» SATA activity LED</li> </ul> I/O extension to 9 HP board version via the CPS3003-BRIDGE module: <ul style="list-style-type: none"> <li>» CFast (SATA 3 Gb/s)</li> <li>» USB 3.0</li> <li>» COMA (RS-232)</li> <li>» Reset button</li> <li>» SATA activity LED</li> <li>» CompactPCI interface</li> </ul> I/O extension of CPS3003-SA via the Smart Extension Module: <ul style="list-style-type: none"> <li>» SATA 3 Gb/s</li> <li>» USB 2.0</li> <li>» When installed 4HP width is exceeded</li> </ul>
Sockets	Front Panel Connectors	DP: two DisplayPort connectors, J7 and J8 USB: two 4-pin, type A connectors, J9 and J10 Ethernet: dual RJ-45 connector, J11A/B
	Onboard Connectors	<ul style="list-style-type: none"> <li>» CompactPCI Serial connectors P1 to P6</li> <li>» 18-pin extension connector for the SATA flash module (SSD), J16</li> <li>» Two 204-pin DDR3 SODIMM sockets</li> <li>» 60-pin, high-speed I/O extension connector</li> </ul>



Table 1: CPS3003-SA Main Specifications (Continued)

FEATURES		SPECIFICATIONS
LEDs / Switches	Front Panel LEDs	<p>System Status LEDs:</p> <ul style="list-style-type: none"> <li>» HS (blue): Hot Swap Status</li> <li>» TH (red/green): Temperature Status</li> <li>» WD (green): Watchdog Status</li> </ul> <p>General Purpose LEDs:</p> <ul style="list-style-type: none"> <li>» LED3..0 (red/green/red+green): General Purpose / POST Code</li> </ul> <p>Ethernet LEDs:</p> <ul style="list-style-type: none"> <li>» ACT (green): Network / Link Activity</li> <li>» SPEED (green/orange): Network Speed</li> </ul>
	DIP Switch	One DIP switch, SW1, for board configuration
Timer	Real Time Clock	Real-time clock with 256 Byte CMOS RAM; battery-backup available
	Watchdog Timer	<p>Software-configurable, two-stage Watchdog with programmable timeout ranging from 125 ms to 4096 s in 16 steps</p> <p>Serves for generating IRQ or hardware reset</p>
Sys. Management	Thermal Management	<p>CPU and board overtemperature protection is provided by:</p> <ul style="list-style-type: none"> <li>» Up to four Digital Thermal Sensors (DTS), one for each core</li> <li>» One Digital Thermal Sensor (DTS) for the processor graphics controller</li> <li>» One temperature sensor integrated in the Intel® QM77 Chipset for monitoring the chipset</li> <li>» Specially designed heat sinks</li> </ul>
Security	TPM	Trusted Platform Module (TPM) 1.2 for enhanced hardware- and software-based data and system security
Software	uEFI BIOS	<p>AMI Aptio® BIOS firmware based on the uEFI Specification and the Intel Platform Innovation Framework for EFI:</p> <ul style="list-style-type: none"> <li>» LAN boot capability for diskless systems (standard PXE)</li> <li>» Redundant image; recovery possible in case of a damaged image</li> <li>» Non-volatile storage of setting in the SPI boot flash (battery only required for the RTC)</li> <li>» Compatibility Support Module (CSM) providing legacy BIOS compatibility based on AMIBIOS8</li> <li>» Command shell for diagnostics and configuration</li> <li>» uEFI Shell commands executable from mass storage device in a Pre-OS environment (open interface)</li> </ul>
	Operating Systems	There are various operating systems available for the CPS3003-SA. For further information, please contact Kontron.

**Table 1: CPS3003-SA Main Specifications (Continued)**

FEATURES		SPECIFICATIONS
General	Power Consumption	See Chapter 4 for details.
	Temperature Range	Operational: 0°C to +60°C Standard (depending on processor version and air-flow in the system) -40°C to +85°C Extended (with Intel® Core™ i7-3517UE, 1.7 GHz ULV processor only) Storage: -40°C to +85°C Without hard disk and without battery
	Battery	3.0V lithium battery for RTC; Battery type: UL-approved CR1632 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	100 mm x 160 mm 3U, 4 HP, CompactPCI Serial-compliant form factor
	Board Weight	4 HP CPS3003-SA with: » Intel® Core™ i7-3612QE (SV), 2.1 GHz, copper heat sink: 530 grams » Intel® Core™ i7-3555LE (LV), 2.5 GHz, aluminum heat sink: 330 grams » Intel® Core™ i7-3517UE (ULV), 1.7 GHz, aluminum heat sink: 330 grams The above-mentioned board weight refers to the 4 HP CPS3003-SA without extension modules such as SATA Flash module or Smart Extension Module.

**Note:** For a description of the additional interfaces available on the 8 HP and 9 HP board versions, refer to Chapter 6, CPS3003-EXTIO Extension Module, and Chapter 7, CPS3003-BRIDGE Extension Module, respectively.

## 1.5 Standards

This product complies with the requirements of the following standards.

**Table 2: Standards**

TYPE	ASPECT	STANDARD
CE	Emission	EN55022, EN50121-3-2, EN61000-6-3
	Immission	EN55024, EN50121-3-2, EN61000-6-2
	Electrical Safety	EN60950-1
Mechanical	Mechanical Dimensions	IEEE 1101.10
Environmental	Climatic Humidity	IEC60068-2-78
	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 IEC61131-2	Ruggedized version test parameters: 9-150 (Hz) frequency range 1 (g) acceleration 1 (oct/min) sweep rate 10 cycles/axis 3 axis
	Single Shock	IEC60068-2-27 IEC61131-2	Ruggedized version test parameters: 15 (g) acceleration 11 (ms) shock duration half sine 3 number of shocks per direction (total: 18) 6 directions 5 (s) recovery time

**Note:** Customers desiring to perform further environmental testing of the CPS3003-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 Serial Systems	PICMG® CPCI-S.0 R 1.0 CompactPCI® Serial Specification
CompactPCI Systems	PICMG® 2.0, Rev. 3.0 CompactPCI® Specification
CFast	CFast Specification Revision 1.1
Platform Firmware	Unified Extensible Firmware Interface (UEFI) specification, version 2.3.1
All Kontron products	Product Safety and Implementation Guide, ID 1021-9142