» User Guide «

CP305

3U CompactPCI Processor Board based on the Intel® Atom™ Processor N270 with the Mobile Intel® 945GSE Express Chipset

Doc. ID: 1035-7168, Rev. 2.0
February 11, 2011

Revision History

Publication Title:	CP305: 3U CompactPCI Processor Board based on the Intel® Atom™ Processor N270 with the Mobile Intel® 945GSE Express Chipset
Doc. ID:	1035-7168

Rev.	Brief Description of Changes	Date of Issue
1.0	Initial issue	29-Sep-2009
2.0	Added description for the CP305-TR Module	11-Feb-2011

Imprint

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

Warning, ESD Sensitive Device!

This symbol and title inform that 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.

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

Warning!

This symbol and title emphasize points which, if not fully understood and taken into consideration by the reader, may endanger your health and/or result in damage to your material.

Note ...

This symbol and title emphasize aspects the reader should read through carefully for his or her own advantage.

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High Voltage Safety Instructions

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Special Handling and Unpacking Instructions

ESD Sensitive Device!

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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.

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General Instructions on Usage

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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If the customer's eligibility for warranty has not been voided, in the event of any claim, he may return the product at the earliest possible convenience to the original place of purchase, together with a copy of the original document of purchase, a full description of the application the product is used on and a description of the defect. Pack the product in such a way as to ensure safe transportation (see our safety instructions).

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Chapter 1

Introduction

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1. Introduction

1.1 Board Overview

The CP305 is a highly integrated, 3U, 4 HP or 8 HP, lead-free CompactPCI system controller board. It has been designed to support the Intel® Atom™ Processor N270 with 1.6 GHz frequency and 533 MHz Front Side Bus (FSB) in 437 µFCBGA8 packaging.

The CP305 utilizes the Mobile Intel® 945GSE Express Graphics Memory Controller Hub (945GSE Express GMCH) and the ICH7-M I/O Controller Hub.

The board includes up to 2 GB of soldered Double Data Rate 2 (DDR2) memory operating at 533 MHz.

The 4HP CP305 comes with an onboard SATA port, two Gigabit Ethernet ports (Intel® 82574L), two USB 2.0 ports on the front panel, and a built-in Intel 3D Graphics accelerator for enhanced graphics performance with a VGA analog display interface. A CompactFlash socket for type I and type II CompactFlash cards is provided via the CP305-CF piggy-back module of the CP305. Several onboard connectors provide flexible 8HP expandability.

The board supports one 32-bit/33 MHz CompactPCI interface acting as system master CPU only.

The optional CP305-HDD module has been designed to make various legacy PC I/O ports available as well as DVI and USB interfacing. It includes one COM port, a PS/2 keyboard and mouse port, a 2.5" onboard hard disk SATA interface, a PATA IDE connector (i.e. for a CD/DVD drive), two USB 2.0 ports, and a DVI-D interface.

Designed for stability and packaged in a rugged format, the board fits into all applications situated in industrial environments, including I/O intensive applications where only one slot is available for the CPU, making it a perfect core technology for long-life applications. Components which have high temperature tolerance have been selected from embedded technology programs, and therefore offer long-term availability.

There are various operating systems available for the CP305. For detailed information, please contact Kontron.

1.2 Board-Specific Information

The CP305 is a CompactPCI single-board computer based on Intel's Atom™ Processor technology and is specifically designed for use in highly integrated platforms with solid mechanical interfacing for a wide range of industrial environment applications.

Some of the CP305's outstanding features are:

- Intel® Atom™ Processor N270:
  - 1.6 GHz core frequency
  - 533 MHz FSB
  - 437-pin µFCBGA8 package
  - 56 kB L1 and 512 kB L2 cache on-die, running at CPU speed
- 945GSE and 82801GM (ICH7-M) chipset
- Up to 2 GB DDR2 SDRAM memory running at 533 MHz
- Integrated 3D high-performance VGA controller
- Analog display support of up to 2048 x 1536 pixels at 75 Hz
- DVI-D option (with 8HP version)
- Two Gigabit Ethernet interfaces (82574L)
- Two Serial ATA (SATA) interfaces switchable to rear I/O
- One IDE Ultra ATA/100 interface
- Onboard Compact Flash socket for type I and type II CompactFlash cards (True IDE with DMA) on CP305-CF module for 4HP version and CP305-HDD module for 8HP version
- Six USB ports
  - Two Front USB 2.0
  - Two further Front USB 2.0 on the 8HP version
  - Two Rear I/O USB 2.0
- Compatible with CompactPCI Specification PICMG 2.0. Rev. 3.0
- 1 MB onboard FWH for BIOS
- Hardware Monitor (Super I/O SCH3112)
- Watchdog timer
- Real-time clock
- Two COM ports on Rear I/O (with an optional single port on the front I/O on 8HP version)
- I/O extension connectors (SATA, SDVO, USB, PS/2, LPC, IDE, COM, as well as Monitor and Control signals)
- 4HP or 8HP, 3U CompactPCI
- Reset push button switch (with 8HP version)
- Several Rear I/O configurations
- Jumperless board configuration
- Power-up sequencing and in-rush current optimized design
- Passive heat sink solution
- AMI BIOS

1.3 Optional Modules

1.3.1 CP305-HDD Module

The CP305-HDD module for the 8 HP CP305 version provides legacy PC I/O ports. It includes one digital DVI port, two USB 2.0 ports, one COM port, a PS/2 keyboard and mouse port, one IDE connector, and one CompactFlash socket. A SATA hard disk interface is also available for mounting a 2.5” hard disk drive.

For further information concerning the CP305-HDD module, refer to Appendix A.

1.3.2 CP305-TR Module

The Kontron CP305-TR module for the 8 HP CP305 version has been designed for use in mobile- and transportation-oriented applications where robust, mechanically secured connections are required. It includes two Fast Ethernet ports via M12, D-coded connectors, two USB 2.0 service ports via M8, A-coded connectors and three GPO LEDs on the front panel as well as two onboard COM ports, one onboard GPIO port, one CompactFlash socket, two onboard SATA ports for connection to external SATA devices and one CompactPCI connector for connecting the CP305-TR to the backplane.

For further information concerning the CP305-TR module, refer to Appendix B

1.3.3 CP-RIO3-04 Rear I/O Module

The CP-RIO3-04 rear I/O module has been designed for use with the CP305 board from Kontron and provides comprehensive rear I/O functionality.

For further information concerning the CP-RIO3-04 rear I/O module, refer to Appendix C.

1.4 System Relevant Information

The following system relevant information is general in nature but should still be considered when developing applications using the CP305.

Table 1-1: System Relevant Information

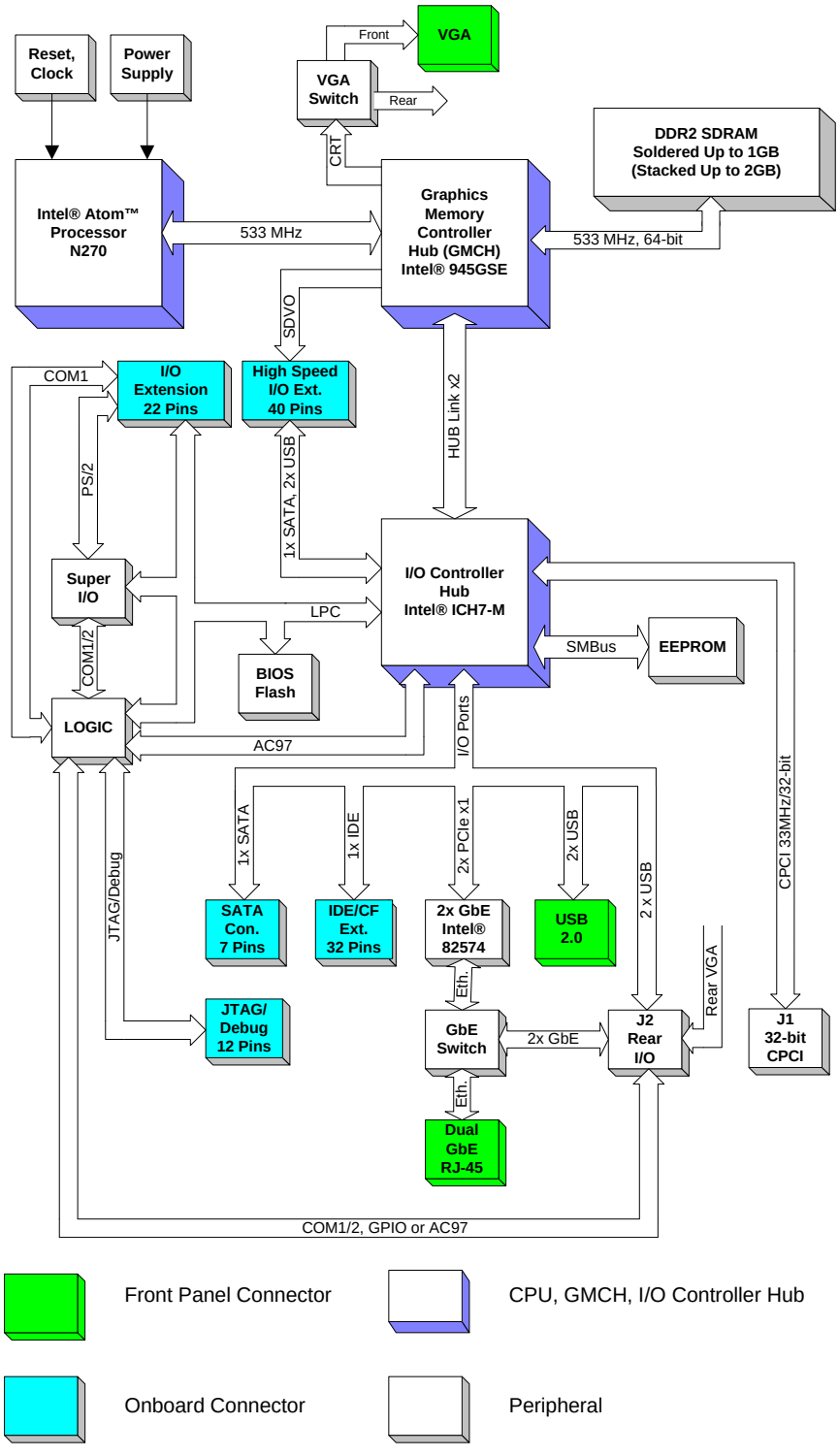
SUBJECT	INFORMATION
System Configuration	The CP305 system controller board can support up to 7 peripheral boards with 32-bit and 33 MHz.
Master/Slave Functionality	The CP305 can operate only as a master board.
Board Location in the System	The CP305 board must be installed in a system slot of a CompactPCI backplane.
Hot Swap Compatibility	The CP305 supports the addition or removal of other boards whilst in a powered-up state. Individual clocks for each slot and ENUM signal handling are in compliance with the PICMG 2.1 Hot Swap specification.
Hardware Requirements	The CP305 can be installed in any CompactPCI 3U rack.
Operating Systems	There are various operating systems available for the CP305. For detailed information, please contact Kontron.

1.5 Board Diagrams

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

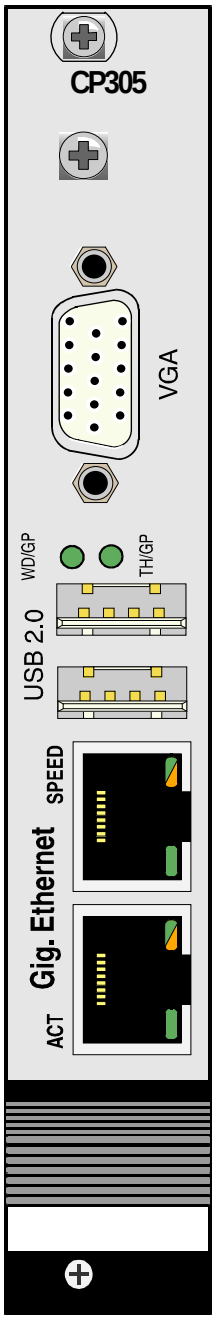
1.5.1 Functional Block Diagram

Figure 1-1: CP305 Functional Block Diagram



1.5.2 Front Panel

Figure 1-2: CP305 4HP Front Panel



LEGEND:

CP305: 4HP version

General Purpose LEDs:

WD/GP (green): Watchdog or General Purpose; when lit during power-on, it indicates a PCI reset is active.

TH/GP (green): Overtemperature Status or General Purpose; when lit during power-on, it indicates a power failure.

Note ...

If the WD/GP LED and the TH/GP LED keep flashing during BIOS initialization, a POST code is indicated.

For further information on the blinking intervals of the WD/GP LED and the TH/GP LED refer to section 2.3.1 General Purpose LED Output.

Integral Ethernet 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

Note ...

For detailed information on the 8HP CP305 version, refer to Appendix A, CP305-HDD module.

1.5.3 Board Layout

Figure 1-3: 4 HP CP305 Board Layout (Top View)

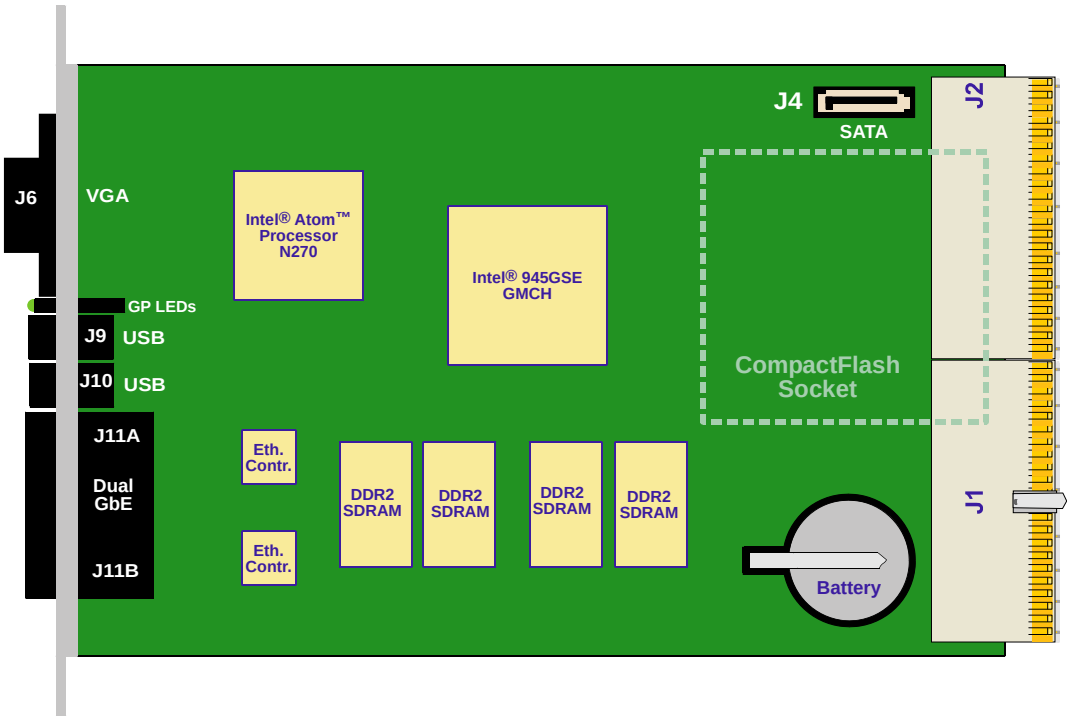
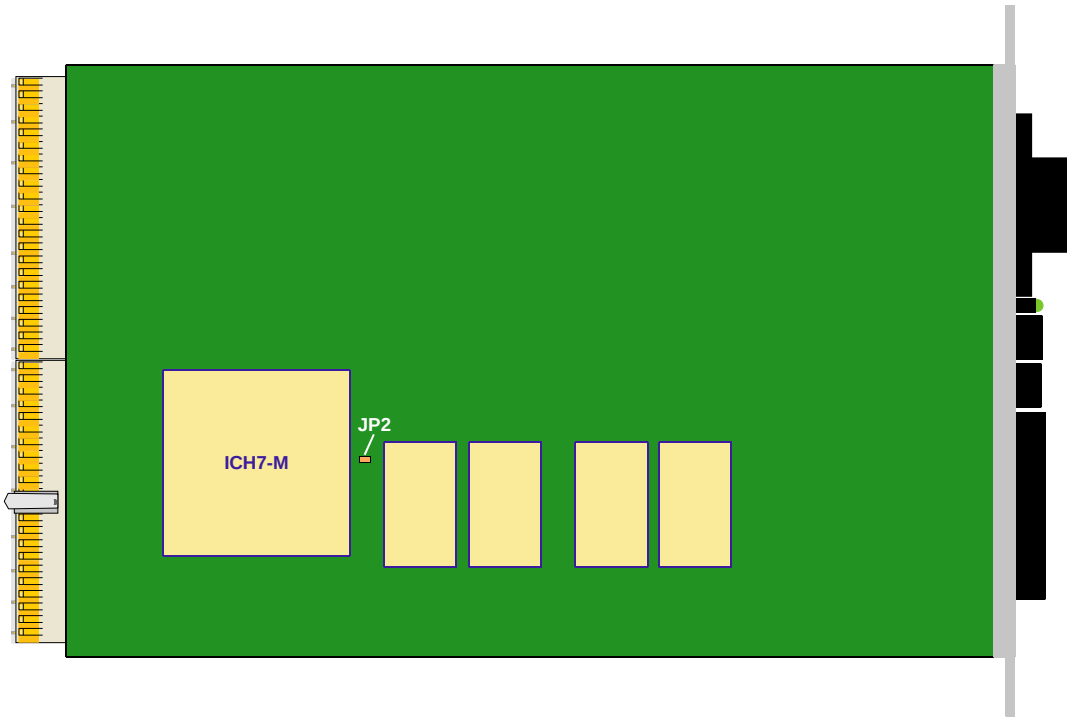


Figure 1-4: 4 HP CP305 Board Layout (Bottom View)



1.6 Technical Specification

Table 1-2: CP305 4HP Version Main Specifications

CP305		SPECIFICATIONS

Processor and Memory	CPU	The CP305 supports the following microprocessor:
		• Intel® Atom™ Processor N270:
		  • 1.6 GHz core frequency
		  • 533 MHz FSB
		  • 437-pin µFCBGA8 package
		  • 56 kB L1 and 512 kB L2 cache on-die, running at CPU speed

	Memory	Main Memory:
		• Up to 2 GB Single-Channel soldered DDR2 SDRAM memory
		• 533 MHz memory bus
		• Error Checking and Correction (ECC) not provided
		Cache structure:
		• 56 kB L1 on-die full speed processor cache
		  • 32 kB for instruction cache
		  • 24 kB for data cache
		• 512 kB L2 on-die full speed processor cache
		FLASH Memory:
		• 1 MB FLASH for BIOS
		Memory Extension:
		• CompactFlash socket for type I and type II CompactFlash cards (true IDE mode)
		Serial EEPROM:
		• 24LC64 (64 kbit)

Chipset	Intel® 945GSE Express GMCH	Mobile Intel® 945GSE Express Graphics Memory Controller Hub (945GSE Express GMCH): • Support for a single Intel® Atom™ Processor N270 • 64-bit AGTL/AGTL+ based System Bus interface with 533 MHz • System Memory interface with optimized support for single-channel DDR2 SDRAM memory at 533 MHz without ECC • Integrated 2D and 3D Graphics Engines • Integrated 400 MHz RAMDAC
	Intel® ICH7-M	82801GM I/O Controller Hub (ICH7-M) • PCI Rev. 2.3 compliant with support for 32-bit/33 MHz PCI operations • Power management logic support • Enhanced DMA controller, interrupt controller, and timer functions • Integrated IDE controller Ultra ATA/100/66/33 and PIO mode • USB 2.0 host interface with up to six USB ports available on the CP305 • SATA Host Controller with two ports, 1.5 Gbit/s transfer rate • Two of the four x1 PCI Express ports are used for Gigabit Ethernet • System Management Bus (SMBus) compatible with most I²C™ devices • Low Pin Count (LPC) interface • Firmware Hub (FWH) interface support

Table 1-2: CP305 4HP Version Main Specifications (Continued)

CP305		SPECIFICATIONS
Interfaces	CompactPCI	Compliant with CompactPCI Specification PICMG® 2.0 R 3.0 • System master operation • 32-bit / 33 MHz master interface • 3.3 V or 5 V (universal PCI interface)
	Rear I/O	The following interfaces are routed to the Rear I/O connector J2: • COM1 and COM2 (3.3V TTL signaling) • 2 x USB 2.0 • VGA (analog) • 2x Gigabit Ethernet • 2x SATA • System Management signals • General Purpose signals
	Hot Swap	The CP305 is not hot-swappable but supports the addition and removal of other boards whilst in a powered-up state. Individual clocks for each slot and Enum signal handling are in compliance with the PICMG 2.1 Hot Swap Specification.
	VGA	Built-in Intel 3D Graphics accelerator for enhanced graphics performance. • Supports resolutions of up to 2048 x 1536 at a 75 Hz refresh rate • Hardware motion compensation for software MPEG2 decoding • Dynamic Video Memory Technology (DVMT3.0)
	Gigabit Ethernet	Two 10 Base-T/100 Base-TX/1000 Base-T Gigabit Ethernet interfaces based on the Intel® 82574L Ethernet PCI Express bus controller individually switchable to front or read I/O • Dual RJ-45 connector on the front panel • Automatic mode recognition (Auto-Negotiation) • Automatic cabling configuration recognition (Auto MDI, MDI-X) Cabling requirement: Category 5, UTP, four-pair cabling
	USB	Six USB ports supporting UHCI and EHCI: • Two USB 2.0 connectors on the front panel • Two USB 2.0 connectors on the front panel of the 8 HP version • Two USB 2.0 connectors on the rear I/O interface
	Serial	Two UARTs, 16C550 compatible. • COM1 available either on the front panel of the 8 HP version or on the Rear I/O • COM2 available on Rear I/O only
	Keyboard and Mouse	Keyboard and Mouse are supported • USB keyboard support on 4HP and 8HP • PS/2 only with CP305-HDD module (8HP)

Table 1-2: CP305 4HP Version Main Specifications (Continued)

CP305		SPECIFICATIONS

Interfaces	Mass Storage	SATA: Integrated Serial ATA Host Controllers
		• Two switchable SATA ports, either:
		  • One onboard SATA port and one SATA port on the CP305-HDD module (8HP) for 2.5” HDD, or
		  • Two SATA ports available on Rear I/O
		• Data transfer rate up to 1.5 Gbit/s
		IDE Ultra ATA/100/66/33 and PIO
		• CompactFlash (either on 4 HP or on 8HP)
		• 40-pin, 2.54 mm, male pinrow connector available on CP305-HDD module (8HP)
		CompactFlash:
		• CompactFlash socket for type I and type II CompactFlash cards (DMA capable true IDE mode)
		• The CompactFlash is always configured as IDE master
		• Supports type I and II CompactFlash cards
		40-pin Standard Connector (only with CP305-HDD module):
		• If a CompactFlash card is inserted, the drive must be configured as slave (CF is always IDE master).

	I/O extension interfaces	I/O extension interfaces: • SATA • 2x USB2.0 • SDVO • LPC devices • PS/2 • COM1 • Monitor and Control signals
Sockets	Front Panel Connectors	• VGA: 15-pin D-Sub connector • USB: two 4-pin connectors • Ethernet: two RJ-45 connectors
	Onboard Connectors	• One 7-pin, L-form standard SATA connector • I/O extension connectors • CompactPCI Connector J1 and J2 • CompactFlash socket for type I, II (on the CP305-CF module)

Table 1-2: CP305 4HP Version Main Specifications (Continued)

CP305		SPECIFICATIONS
HW Monitoring	LEDs	System status: • WD/GP: green: Watchdog or General Purpose; when remains lit during power-on, it indicates PCI reset is active. • TH/GP: green: Overtemperature Status or General Purpose; when remains lit during power-on, it indicates a power failure. Gigabit Ethernet status: • ACT: green: Network/Link Activity • SPEED: green/orange: Network Speed
	Watchdog	Software-configurable Watchdog operating in the following modes: • Timer-only mode • Reset mode • IRQ mode • Dual-stage mode
	Thermal Management	CPU overtemperature protection is provided by: • Internal processor temperature control unit • CPU shut down via thermal monitor • Specially designed heat sink
	System Monitor	Hardware monitor integrated in the SCH3112 for the supervision of: • Several system power voltages • One fan speed input • One fan PWM output • Board temperature
Software	Software BIOS	AMI BIOS with 1 MB Flash memory with the following features: • QuickBoot • QuietBoot • BootBlock • LAN boot capability for diskless systems (standard PXE) • Boot from USB floppy disk drive • BIOS legacy support for USB keyboards • Plug and Play capability • BIOS parameters are saved in the EEPROM • Board serial number is saved within the EEPROM • PC Health Monitoring
	Operating Systems	There are various operating systems available for the CP305. For detailed information, please contact Kontron.

Table 1-2: CP305 4HP Version Main Specifications (Continued)

CP305		SPECIFICATIONS
General	Mechanical	3U, 4HP, CompactPCI compliant form factor
	Power Consumption	typ. 10 W For further information, refer to Chapter 5.
	Temperature Range	Operational: 0°C to +60°C Standard -40°C to +80°C Extended (without hard disk and in the appropriate system environment) Storage: -55°C to +85°C Without hard disk and without battery -40°C to +65°C With hard disk and without battery ***Note ...*** When a battery is installed, refer to the operational specifications of the battery as this determines the storage temperature of the CP305 (See "Battery" below). ***Note ...*** When additional components are installed, refer to their operational specifications as this will influence the board's operational and storage temperature.
	Climatic Humidity	93% RH at 40°C, non-condensing (acc. to IEC 60068-2-78)
	Dimensions	100 mm x 160 mm
	Board Weight	320 grams (4HP variants with heat sink, with front panel but without mezzanine boards)
	Battery	3.0V lithium battery for RTC with battery socket. Recommended type: CR2025 Temperature ranges: Operational (load): -20°C to +70°C typical (refer to the battery manufacturer's specifications for exact range) Storage (no load): -55°C to +70°C typical (no discharge)

Note ...

For a description of the additional 8HP version interfaces, refer to the Technical Specifications table in Appendix A, CP305-HDD module.

1.7 Kontron Software Support

Kontron is one of the few CompactPCI and VME vendors providing inhouse support for most of the industry-proven real-time operating systems that are currently available. Due to its close relationship with the software manufacturers, Kontron is able to produce and support BSPs and drivers for the latest operating system revisions thereby taking advantage of the changes in technology.

1.8 Standards

This Kontron product complies with the requirements of the following standards.

Table 1-3: 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	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.

Users 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 permanent damage, especially when the board is powered up again.

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

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

Table 1-4: Additional Standards for Boards with Ruggedized Service

TYPE	ASPECT	STANDARD	REMARKS
Environmental	Vibration (Sinusoidal)	IEC60068-2-6	Ruggedized version test parameters: • 10-300 (Hz) frequency range • 5 (g) acceleration • 1 (oct/min) sweep rate • 10 cycles/axis • 3 axis
	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

Furthermore, boards providing ruggedized service and conformal coating comply with the following standards as well.

Table 1-5: Add. Standards for Boards with Ruggedized Service and Conformal Coating

TYPE	ASPECT	STANDARD	REMARKS
Railway	Electromagnetic Compatibility (EMC)	EN50155	--
		EN50121-3-2	--
	Temperature	EN50155	Class T2
	Shock and Vibration	EN50155	--
		EN60373	Class 1B
	Climatic Humidity	EN50155	--

1.9 Related Publications

The following publications contain information relating to this product.

Table 1-6: Related Publications

PRODUCT	PUBLICATION
CompactPCI Systems and Boards	CompactPCI Specification PICMG 2.0, Rev. 3.0 CompactPCI Hot Swap Specification PICMG 2.1 Rev. 2.0
	Kontron's CompactPCI System Manual, ID 19954
CompactFlash Cards	CF+ and CompactFlash Specification Revision 2.0
Serial ATA	Serial ATA 1.0a Specification