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» User Guide «

CP3002-RC/CP3002-RA

3U CompactPCI Processor Board based on the Intel® Core™ i7 Processor with the Intel® QM57 Chipset

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Table of Contents

Revision History ..... *ii*
Imprint ..... *ii*
Disclaimer ..... *ii*
Table of Contents ..... *iii*
List of Tables ..... *vii*
List of Figures ..... *ix*
Proprietary Note ..... *xi*
Trademarks ..... *xi*
Environmental Protection Statement ..... *xi*
Explanation of Symbols ..... *xii*
For Your Safety ..... *xiii*
High Voltage Safety Instructions ..... *xiii*
Special Handling and Unpacking Instructions ..... *xiii*
General Instructions on Usage ..... *xiv*
Two Year Warranty ..... *xv*

1. Introduction ..... 1 - 3
1.1 Board Overview ..... 1 - 3
1.2 Board-Specific Information ..... 1 - 4
1.3 System Expansion Capabilities ..... 1 - 4
1.3.1 Serial ATA Flash Module ..... 1 - 4
1.4 Board Diagrams ..... 1 - 4
1.4.1 Functional Block Diagram ..... 1 - 5
1.4.2 CP3002-RA Front Panel ..... 1 - 6
1.4.3 Board Layout ..... 1 - 7
1.5 Technical Specification ..... 1 - 8
1.6 Standards for the CP3002-RC ..... 1 - 12
1.7 Standards for the CP3002-RA ..... 1 - 13
1.8 Related Publications ..... 1 - 14

2. Functional Description ..... 2 - 3
2.1 Processor ..... 2 - 3
2.2 Memory ..... 2 - 4

2.3 Intel® QM57 Express Chipset ....2 - 4
2.4 Timer ....2 - 5
2.5 Watchdog Timer ....2 - 5
2.6 Battery ....2 - 5
2.7 Reset ....2 - 5
2.8 FLASH Memory ....2 - 6
2.8.1 SPI FLASH for uEFI BIOS ....2 - 6
2.8.2 Serial ATA Flash Module (Optional) ....2 - 6
2.9 Trusted Platform Module 1.2 (On Request) ....2 - 6
2.10 Board Interfaces ....2 - 7
2.10.1 Front Panel LEDs ....2 - 7
2.10.2 USB Interfaces ....2 - 8
2.10.3 Integrated Graphics Controller ....2 - 9
2.10.3.1 Graphics Memory Usage ....2 - 9
2.10.4 Serial Ports ....2 - 9
2.10.5 Gigabit Ethernet Interfaces ....2 - 10
2.10.6 Serial ATA Interface ....2 - 10
2.10.7 GPI and GPO Signals ....2 - 10
2.10.8 Debug Interface ....2 - 10
2.10.9 CompactPCI Bus Interface ....2 - 11
2.10.10 CompactPCI Rear I/O Interface ....2 - 11
2.10.10.1 CompactPCI Connectors J1 and J2 ....2 - 12
2.10.10.2 CompactPCI Connector Keying ....2 - 12
2.10.10.3 CompactPCI Connectors J1 and J2 Pinouts ....2 - 13
2.10.10.4 Rear I/O Pin Description ....2 - 15
2.10.11 CompactPCI Grounding Configuration ....2 - 18

3. Installation ....3 - 3

3.1 Safety Requirements ....3 - 3
3.2 Initial Installation Procedures for the CP3002-RC .... 3 - 4
3.3 Standard Removal Procedures for the CP3002-RC ....3 - 6
3.4 Initial Installation Procedures for the CP3002-RA ....3 - 7
3.5 Standard Removal Procedures for the CP3002-RA ....3 - 8

3.6 Hot Swap Procedures ..... 3 - 8
3.7 Installation of CP3002-RC/CP3002-RA Peripheral Devices ..... 3 - 8
3.7.1 SATA Flash Module Installation ..... 3 - 10
3.7.2 Rear I/O Device Installation ..... 3 - 10
3.8 Software Installation ..... 3 - 10

4. Configuration ..... 4 - 3
4.1 Jumper Description ..... 4 - 3
4.1.1 COMB (RS-422) Termination Jumper Settings (JP1 and JP2) ..... 4 - 3
4.1.2 uEFI BIOS Configuration Jumper Settings (JP3 and JP4) ..... 4 - 3
4.2 I/O Address Map ..... 4 - 4
4.3 CP3002-RC/CP3002-RA-Specific Registers ..... 4 - 5
4.3.1 Status Register 0 (STAT0) ..... 4 - 5
4.3.2 Status Register 1 (STAT1) ..... 4 - 6
4.3.3 Control Register 0 (CTRL0) ..... 4 - 7
4.3.4 Control Register 1 (CTRL1) ..... 4 - 7
4.3.5 Device Protection Register (DPROT) ..... 4 - 8
4.3.6 Reset Status Register (RSTAT) ..... 4 - 9
4.3.7 Board Interrupt Configuration Register (BICFG) ..... 4 - 10
4.3.8 Status Register 2 (STAT2) ..... 4 - 11
4.3.9 Board ID High Byte Register (BIDH) ..... 4 - 11
4.3.10 Board and PLD Revision Register (BREV) ..... 4 - 11
4.3.11 Geographic Addressing Register (GEOAD) ..... 4 - 12
4.3.12 Watchdog Timer Control Register (WTIM) ..... 4 - 13
4.3.13 Board ID Low Byte Register (BIDL) ..... 4 - 15
4.3.14 Debug LED Configuration Register (DLCFG) ..... 4 - 16
4.3.15 Debug LED Control Register (DLCTRL) ..... 4 - 17
4.3.16 General Purpose Output Register (GPOUT) ..... 4 - 18
4.3.17 General Purpose Input Register (GPIN) ..... 4 - 18

5. Power Considerations ..... 5 - 3
5.1 System Power ..... 5 - 3
5.1.1 CP3002-RC/CP3002-RA Baseboard ..... 5 - 3

5.1.2 Backplane .....5 - 4
5.1.3 Power Supply Units .....5 - 4
5.1.3.1 Start-Up Requirement .....5 - 4
5.1.3.2 Power-Up Sequence .....5 - 4
5.1.3.3 Regulation .....5 - 5
5.2 Power Consumption .....5 - 6
5.2.1 Power Consumption of the CP3002-RC/CP3002-RA Accessories..5 - 8
5.2.2 Power Consumption of the Gigabit Ethernet Controller .....5 - 8
5.3 Start-Up Currents of the CP3002-RC/CP3002-RA .....5 - 8

6. Thermal Considerations ..... 6 - 3
6.1 Board Internal Thermal Monitoring .....6 - 3
6.2 Processor Thermal Monitoring .....6 - 3
6.2.1 Digital Thermal Sensor (DTS) .....6 - 3
6.2.2 Adaptive Thermal Monitor .....6 - 4
6.2.3 Frequency/VID Control .....6 - 4
6.2.4 Clock Modulation .....6 - 4
6.2.5 Catastrophic Cooling Failure Sensor .....6 - 5
6.3 Chipset Thermal Monitor Feature .....6 - 5
6.4 Thermal Characteristics for the CP3002-RC .....6 - 5
6.5 External Thermal Regulation of the CP3002-RA .....6 - 7
6.5.1 Operational Limits for the CP3002-RA .....6 - 9
6.5.2 Peripherals .....6 - 9

A. SATA Flash Module ..... A - 3
A.1 Technical Specifications ..... A - 3
A.2 SATA Flash Module Layout ..... A - 4

List of Tables

1-1 CP3002-RC/CP3002-RA Main Specifications ..... 1 - 8
1-2 Standards for the CP3002-RC ..... 1 - 12
1-3 Standards for the CP3002-RA ..... 1 - 13
1-4 Related Publications ..... 1 - 14
2-1 Features of the Processor Supported on the CP3002-RC/CP3002-RA .... 2 - 4
2-2 Debug LEDs' Function ..... 2 - 7
2-3 POST Code Sequence ..... 2 - 8
2-4 POST Code Example ..... 2 - 8
2-5 CompactPCI Bus Connector J1 System Controller Slot Pinout ..... 2 - 13
2-6 Rear I/O CompactPCI Bus Connector J2 Pinout ..... 2 - 14
2-7 COMA and COMB Signal Description ..... 2 - 15
2-8 Gigabit Ethernet Signal Description ..... 2 - 16
2-9 Serial ATA Signal Description ..... 2 - 17
2-10 USB Signal Description ..... 2 - 17
2-11 VGA Signal Description ..... 2 - 17
2-12 GPI/GPO Signal Description ..... 2 - 18
2-13 Power Signal Description ..... 2 - 18
4-1 JP1 Jumper Setting for RS-422 RXD Termination (COMB) ..... 4 - 3
4-2 JP2 Jumper Setting for RS-422 TXD Termination (COMB) ..... 4 - 3
4-3 uEFI BIOS Boot Settings Jumper (JP3) ..... 4 - 3
4-4 uEFI BIOS Boot Configuration Jumper (JP4) ..... 4 - 3
4-5 I/O Address Map ..... 4 - 4
4-6 Status Register 0 (STAT0) ..... 4 - 5
4-7 Status Register 1 (STAT1) ..... 4 - 6
4-8 Control Register 0 (CTRL0) ..... 4 - 7
4-9 Control Register 1 (CTRL1) ..... 4 - 7
4-10 Device Protection Register (DPROT) ..... 4 - 8
4-11 Reset Status Register (RSTAT) ..... 4 - 9
4-12 Board Interrupt Configuration Register (BICFG) ..... 4 - 10
4-13 Status Register 2 (STAT2) ..... 4 - 11
4-14 Board ID High Byte Register (BIDH) ..... 4 - 11
4-15 Board and PLD Revision Register (BREV) ..... 4 - 11

4-16 Geographic Addressing Register (GEOAD) ..... 4 - 12
4-17 Watchdog Timer Control Register (WTIM) ..... 4 - 14
4-18 Board ID Low Byte Register (BIDL) ..... 4 - 15
4-19 Debug LED Configuration Register (DLCFG) ..... 4 - 16
4-20 Debug LED Control Register (LCTRL) ..... 4 - 17
4-21 General Purpose Output Register (GPOUT) ..... 4 - 18
4-22 General Purpose Input Register (GPIN) ..... 4 - 18
5-1 Maximum Input Power Voltage Limits ..... 5 - 3
5-2 DC Operational Input Voltage Ranges ..... 5 - 3
5-3 CP3002-RC/-RA in EFI Shell ..... 5 - 7
5-4 CP3002-RC/-RA with Win. XP and Processor and Graphics in Idle State.. 5 - 7
5-5 CP3002-RC/-RA with Win. XP and Typ. Proc. and Graph. Contr. Workload 5 - 7
5-6 CP3002-RC/-RA with Win. XP and Max. Processor and Graph. Workload 5 - 7
5-7 Power Consumption of CP3002-RC/CP3002-RA Accessories ..... 5 - 8
5-8 Power Consumption of the Gigabit Ethernet Controller ..... 5 - 8
5-9 Start-Up Currents of the CP3002-RC/CP3002-RA ..... 5 - 8
6-1 Maximum Reference Point Temperature at 105°C CPU Die Temperature 6 - 6
A-1 SATA Flash Module Specifications ..... A - 3

List of Figures

1-1 CP3002-RC/CP3002-RA Functional Block Diagram ..... 1 - 5
1-2 CP3002-RA Front Panel ..... 1 - 6
1-3 CP3002-RC/CP3002-RA Board Layout – Top View ..... 1 - 7
1-4 CP3002-RC/CP3002-RA Board Layout – Bottom View ..... 1 - 7
2-1 CPCI Connectors J1/J2 ..... 2 - 12
3-1 CP3002-RC with SATA Flash Module ..... 3 - 9
3-2 CP3002-RA with SATA Flash Module ..... 3 - 9
6-1 Position of the Reference Points on the CP3002-RC ..... 6 - 6
6-2 CP3002-RA with i7-620LE, 2.0 GHz ..... 6 - 9
A-1 SATA Flash Module Layout (Bottom View) ..... A - 4

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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.

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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 CP3002-RC/CP3002-RA is a highly integrated 3U CompactPCI system controller board based on the multi-chip Intel® Core™ i7 processor combined with the mobile Intel® QM57 Express chipset.

The board supports the Intel® Core™ i7-620LE processor in 32 nm technology with 64 kB L1 cache, 256 kB L2 cache and 4 MB L3 cache in a BGA package with 2.0 GHz frequency. The processor and the memory are soldered on the CP3002-RC/CP3002-RA which results in higher Mean Time Between Failures (MTBF) and a significant improvement in cooling.

The CP3002-RC/CP3002-RA includes up to 8 GB, dual-channel Double Data Rate (DDR3) memory with Error Checking and Correcting (ECC) running at 1066 MHz. The graphics controller and the memory controller are integrated in the processor.

The CP3002-RC/CP3002-RA provides support for up to 32 GB SATA NAND Flash memory (SSD).

The board also includes one Quad Gigabit Ethernet controller, Intel® 82580EB, utilizing a x4 lane PCI Express interconnection to the processor and providing four 10Base-T/100Base-TX/1000Base-T Ethernet interfaces to the rear I/O.

The CP3002-RC/CP3002-RA comes with three Serial ATA interfaces with RAID support, one for the SATA Flash module, and two on the rear I/O as well as one high-resolution graphics interface (VGA). In addition, two USB 2.0 ports are available on the rear I/O. Further interfaces include two serial ports on the rear I/O, one RS-232 port and one RS-422/RS-232 port.

The board supports a configurable 32-bit, 33/66 MHz PCI CompactPCI interface.

The CP3002-RC/CP3002-RA further provides safety and security features via a Trusted Platform Module (TPM) 1.2 on request.

The CP3002-RC is conductive-cooled, has an extended operating temperature range and is ruggedized for high shock and vibration environments. The board is also available as a rugged, air-cooled version, CP3002-RA, providing a heat sink optimized for forced air cooling and a front panel.

Designed for stability, the board fits into 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 with high temperature tolerance have been selected from embedded technology programs, and therefore offer long-term availability.

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 CP3002-RC/CP3002-RA, please contact Kontron.

1.2 Board-Specific Information

The CP3002-RC/CP3002-RA is a CompactPCI single-board computer based on the Intel® Core™ i7 processor and specifically designed for use in highly integrated platforms with solid mechanical interfacing for a wide range of industrial environment applications.

Some of the CP3002-RC/CP3002-RA's outstanding features are:

- Support for the Intel® Core™ i7-620LE (LV) processor, 2.0 GHz
- Intel® QM57 Express chipset
- Up to 8 GB, dual-channel, DDR3 SDRAM memory with ECC running at 1066 MHz
- Integrated 3D high-performance graphics controller with one high-resolution graphics interfaces (VGA)
- 32-bit, 33/66 MHz PCI CompactPCI interface for support of up to four peripheral slots (4x REQ/GNT signals)
- One Quad Gigabit Ethernet controller, Intel® 82580EB, providing four 10Base-T/100Base-TX/1000Base-T Ethernet interfaces on the rear I/O
- Three Serial ATA interfaces with SATA RAID 0/1/5 support:
  - One onboard Serial ATA interface
  - Two Serial ATA interfaces on the rear I/O
- Socket for one Serial ATA Flash module (SSD)
- Two USB 2.0 ports on the rear I/O
- Two serial ports on the rear I/O:
  - One RS-232 serial port
  - One RS-422/RS-232 serial port
- TCG 1.2 compliant Trusted Platform Module (TPM), on request
- Two SPI Flash chips for redundant uEFI BIOS
- Watchdog timer
- Five general purpose inputs (GPI) and three general purpose outputs (GPO) on rear I/O
- Real-time clock (RTC)
- 4HP, 3U CompactPCI
- Rugged, conductive-cooled version with heat spreader or rugged, air-cooled version with heat sink for forced airflow cooling
- Rear I/O on the CompactPCI connector J2
- AMI Aptio®, a uEFI-compliant platform firmware

1.3 System Expansion Capabilities

1.3.1 Serial ATA Flash Module

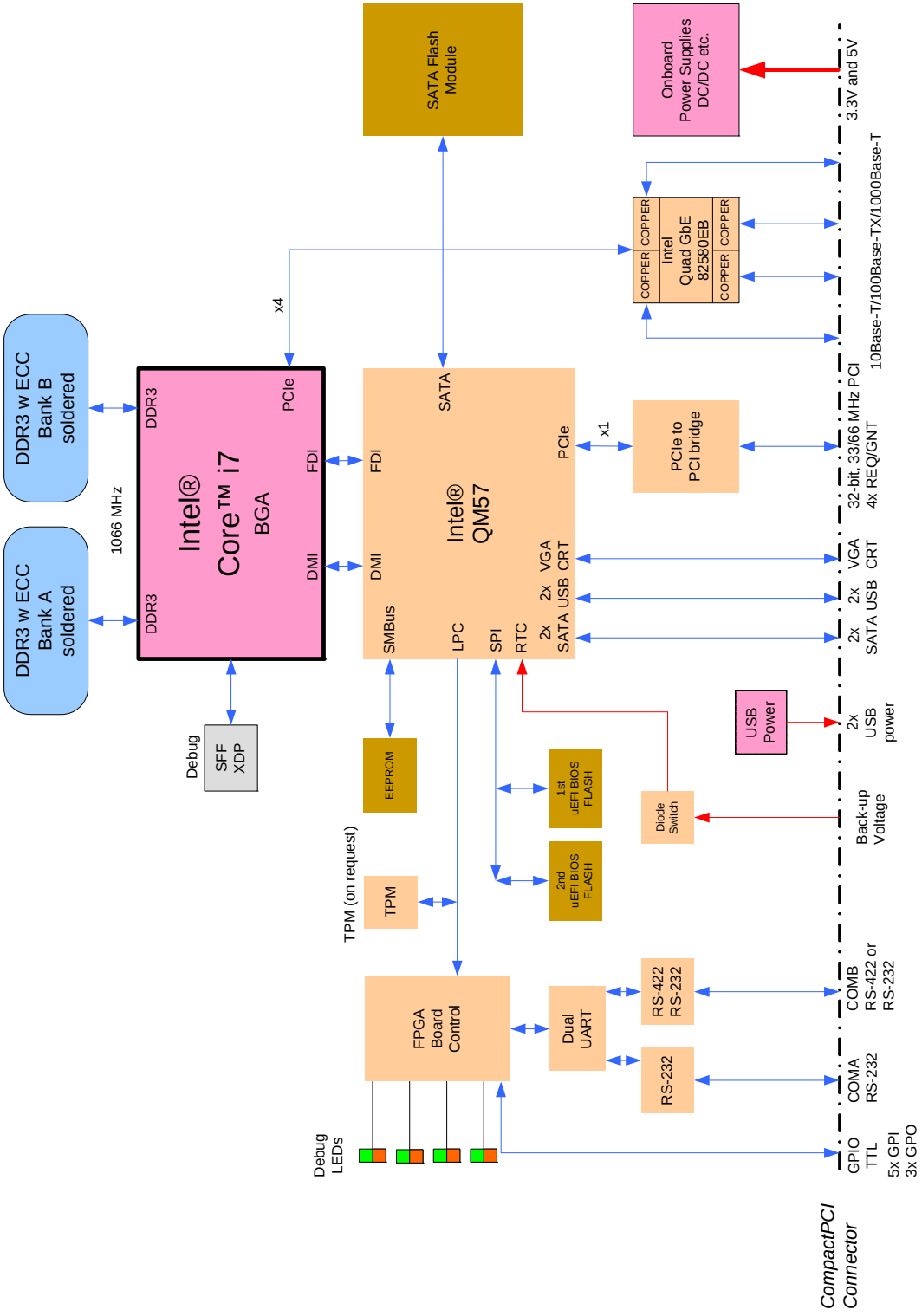
The CP3002-RC/CP3002-RA provides support for up to 32 GB of Serial ATA Flash memory in combination with an optional Serial ATA Flash module, which is connected to an onboard extension connector. For further information concerning the Serial ATA Flash module, please refer to Appendix A.

1.4 Board Diagrams

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

1.4.1 Functional Block Diagram

Figure 1-1: CP3002-RC/CP3002-RA Functional Block Diagram



1.4.2 CP3002-RA Front Panel

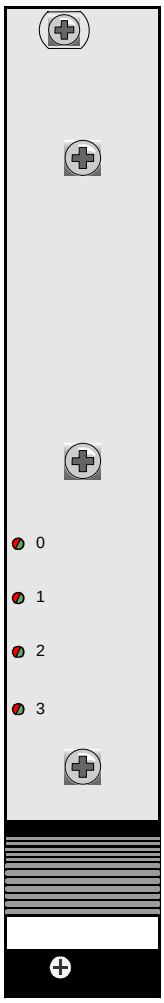


Figure 1-2: CP3002-RA Front Panel

Legend:

Debug LEDs:

DLED0 (red/green):	Debug LED 0 + POST
DLED1 (red/green):	Debug LED 1 + POST
DLED2 (red/green):	Debug LED 2 + POST
DLED3 (red/green):	Debug LED 3 + POST

1.4.3 Board Layout

Figure 1-3: CP3002-RC/CP3002-RA Board Layout – Top View

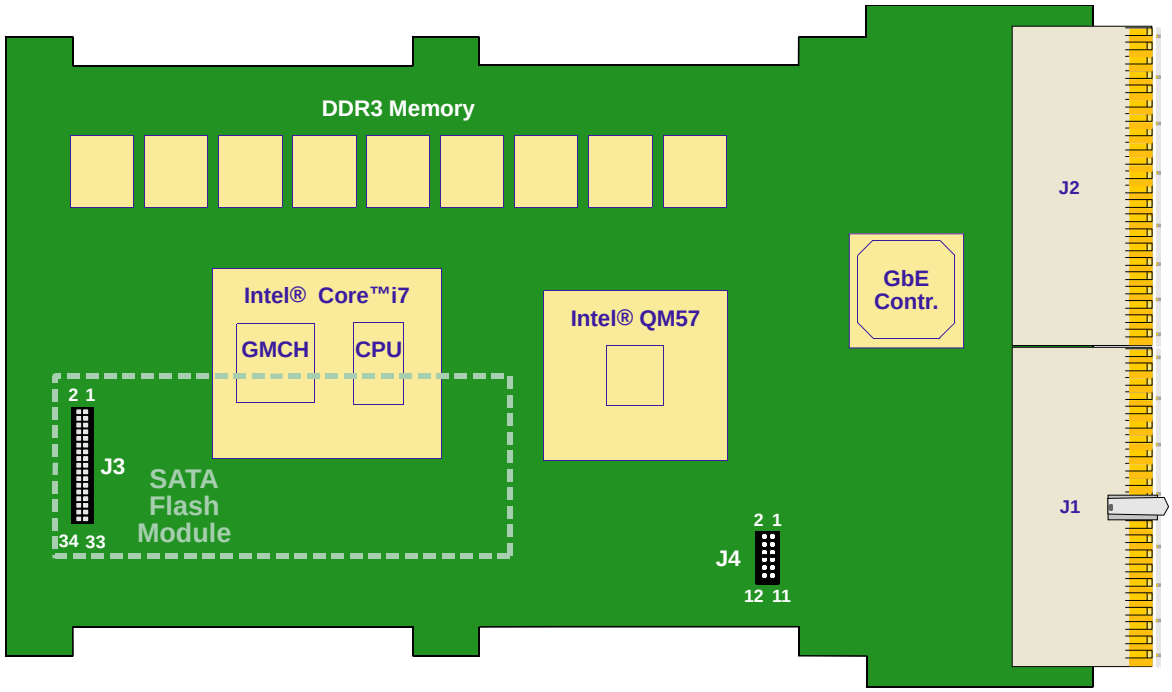
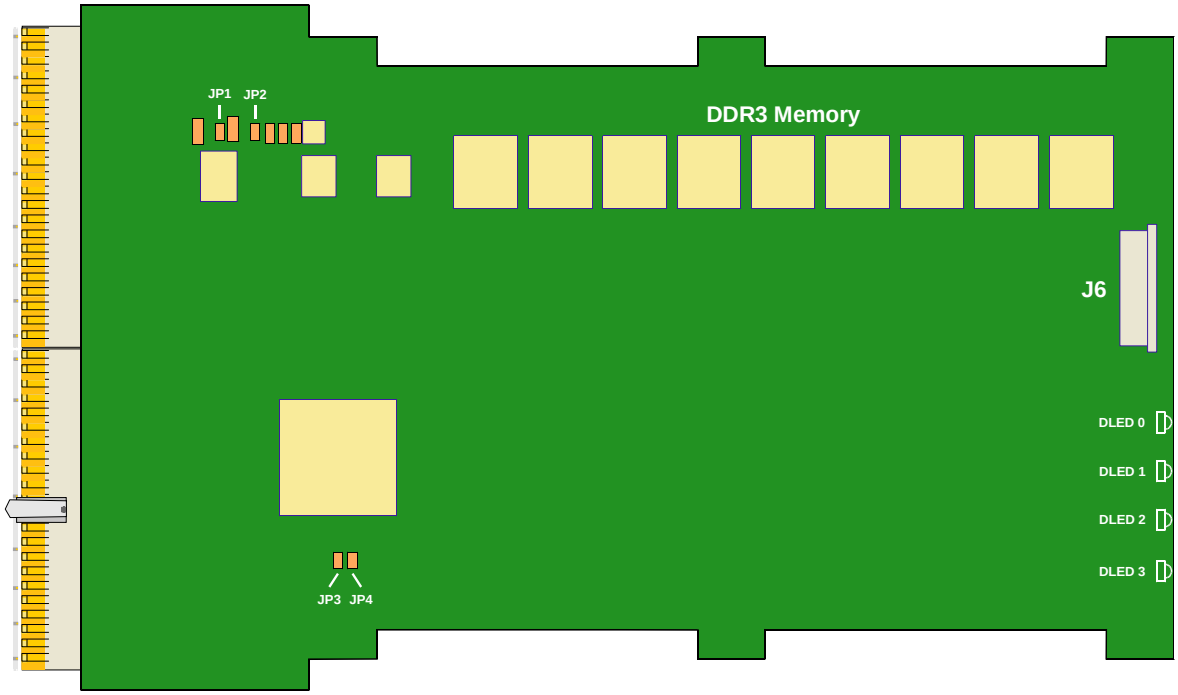


Figure 1-4: CP3002-RC/CP3002-RA Board Layout – Bottom View



1.5 Technical Specification

Table 1-1: CP3002-RC/CP3002-RA Main Specifications

FEATURES		SPECIFICATIONS
Processor and Memory	CPU	The CP3002-RC/CP3002-RA supports the following microprocessor: • Intel® Core™ i7-620LE (LV) processor, 2.0 GHz, 4 MB L3 cache Further processor features: • Two execution cores • Intel® Hyper-Threading Technology (Intel® HT Technology) • Intel® 64 Architecture • Intel® Turbo Boost Technology • Intel® Intelligent Power Sharing (IPS) • System Memory interface with optimized support for dual-channel DDR3 SDRAM memory at 1066 MHz with ECC • Integrated 2D and 3D Graphics Engines • DMI and FDI interfaces to the Intel® QM57 chipset • Two x8 PCI Express 2.0 ports operating at 2.5 GT/s Please contact Kontron for further information concerning the suitability of other Intel processors for use with the CP3002-RC/CP3002-RA.

	Memory	Main Memory:
		• Up to 8 GB, dual-channel DDR3 SDRAM memory with ECC running at 1066 MHz
		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
		• 4 MB L3 shared instruction/data cache shared between both cores
		FLASH Memory:
		• Two redundant SPI Flash chips (2 x 8 MB) for uEFI BIOS
		• Up to 32 GB NAND Flash via an onboard Serial ATA Flash module (SSD)
		Serial EEPROM with 64 kbit

Chipset	Intel® QM57	Mobile Intel® QM57 Express Chipset: • Two x4 or eight x1 PCI Express 2.0 ports operating at 2.5 GT/s (only one x4 PCI Express port is used) • SATA host controller with six ports, 3 Gbit/s data transfer rate and RAID 0/1/5/10 support (only three ports are used, thus only RAID 0/1/5 support is available on the board) • USB 2.0 host interface with up to 14 USB ports available (only two ports are used) • SPI Flash interface support • Low Pin Count (LPC) interface • PCI interface, 32-bit/33 MHz (not used) • Power management logic support • Enhanced DMA controller, interrupt controller, and timer functions • System Management Bus (SMBus) compatible with most I²C™ devices • DMI and FDI interfaces to the processor • High Definition Audio (HDA) interface (not used) • Analog display port • Three digital display ports (not used) • Integrated RTC

Table 1-1: CP3002-RC/CP3002-RA Main Specifications (Continued)

FEATURES		SPECIFICATIONS
Integrated Controller	Graphics controller	High-performance 3D graphics controller integrated in the processor: • Supports resolutions up to 2048 x 1536 pixels @ 60 Hz • Dynamic Video Memory Technology (DVMT)
Interfaces	CompactPCI	Compliant with CompactPCI Specification PICMG 2.0 R 3.0: • System controller operation • 32-bit, 33/66 MHz PCI master interface with dedicated PCIe-to-PCI bridge • 3.3 V or 5 V signaling levels (universal signaling support) • Support for up to four peripheral slots (4x REQ/GNT signals)  *Note ...* To operate the CP3002-RC/CP3002-RA, 3U CompactPCI back-plane with maximum five slots and rear I/O support on the system slot is required.
	Rear I/O	The following interfaces are routed to the rear I/O CompactPCI connector J2: • 1 x COMA (RS-232 signaling) • 1 x COMB (RS-422/RS-232 signaling) • 2 x USB 2.0 • 1 x VGA analog port • 4 x 10 Base-T/100 Base-TX/1000 Base-T Gigabit Ethernet interfaces • 2 x SATA • 5 x GPIs and 3x GPOs (LVTTL signaling) • Back-up voltage (3.3 V)
Interfaces	Gigabit Ethernet	Up to four 10 Base-T/100 Base-TX/1000 Base-T Gigabit Ethernet interfaces based on the Intel® 82580EB Quad Gigabit Ethernet controller: • Four ports on the rear I/O • Automatic mode recognition (Auto-Negotiation) • Automatic cabling configuration recognition (Auto-MDI/X)
	USB	Two USB 2.0 ports on the rear I/O interface
	Serial	Two 16C550-compatible UARTs (RS-232/RS-422 signaling): • One RS-232 port on the rear I/O, COMA • One RS-422/RS-232 port on the rear I/O, COMB
	Serial ATA	Serial ATA Host Controllers integrated in the Intel® QM57 chipset: • Provide support for three SATA ports, one onboard and two on rear I/O • Data transfer rates up to 300 MB/s • High-performance RAID 0/1/5 functionality on all SATA ports
Sockets	Onboard Connectors	• One 34-pin extension connector, J3, for SATA Flash module (SSD) • JTAG connector, J4 • XDP-SFF (debug) connector, J6 • CompactPCI Connectors J1 and J2
LEDs	Debug LEDs	Debug LEDs: • DLED0-3 (red/green): Onboard LEDs for debugging purposes The DLEDs are located on the rear side of the board. On the CP3002-RA, the DLEDs are visible on the front panel.

Table 1-1: CP3002-RC/CP3002-RA Main Specifications (Continued)

	FEATURES	SPECIFICATIONS
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® QM57 chipset contains three 8254-style counters which have fixed uses • In addition to the three 8254-style counters, the Intel® QM57 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.

System Management	Thermal Management	CPU and board overtemperature protection is provided by:
		• Temperature sensors integrated in Intel® Core™ i7 processor:
		  • Two temperature sensors for monitoring the processor cores
		  • One temperature sensor for monitoring the graphics controller and the memory controller
		• One temperature sensor integrated in the Intel® QM57 chipset for monitoring the chipset
		• Specially designed heat sinks

Security	TPM	Trusted Platform Module (TPM) 1.2 for enhanced hardware- and software-based data and system security (on request)
Software	uEFI BIOS	AMI Aptio®, AMI's next-generation BIOS firmware based on the uEFI Specification and the Intel Platform Innovation Framework for EFI. • 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)
	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 CP3002-RC/CP3002-RA, please contact Kontron.

Table 1-1: CP3002-RC/CP3002-RA Main Specifications (Continued)

FEATURES		SPECIFICATIONS
General	Mechanical	3U, 4HP, CompactPCI-compliant form factor
	Power Consumption	See Chapter 5 for details.
	Temperature Ranges	Operational: -40°C to +85°C Extended without TPM (CP3002-RC) -40°C to +75°C Extended without TPM (CP3002-RA) -25°C to +70°C Extended with TPM Storage: -55°C to +85°C Without additional components  *Note ...* When additional components are installed, refer to their operational specifications as this will influence the operational and storage temperature of the CP3002-RC/CP3002-RA.
	Back-up Voltage	A back-up voltage input for the RTC can be connected via the rear I/O connector J2.
	Climatic Humidity	93% RH at 40 °C, non-condensing (acc. to IEC 60068-2-78)
	Dimensions	100 mm x 160 mm
	Board Weight	CP3002-RC: 342 g (with heat sink but without mezzanine card) CP3002-RA 403 g (with heat sink but without mezzanine card)

1.6 Standards for the CP3002-RC

The CP3002-RC complies with the requirements of the following standards:

Table 1-2: Standards for the CP3002-RC

TYPE	ASPECT	STANDARD	REMARKS
CE	Emission	EN55022 EN61000-6-3	--
	Immission	EN55024 EN61000-6-2	--
	Electrical Safety	EN60950-1	--
Mechanical	Mechanical Dimensions	VITA 30.1	--
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
	Random Vibration (Broadband)	VITA 47 (Class V3)	TBD
	Single Shock	VITA 47 (Class V3)	TBD
	Temperature	VITA 47, CC3 VITA 47, CC4	TBD



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 Standards for the CP3002-RA

The CP3002-RA complies with the requirements of the following standards:

Table 1-3: Standards for the CP3002-RA

TYPE	ASPECT	STANDARD	REMARKS
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
	Vibration (Sinusoidal)	IEC60068-2-6	TBD
	Single Shock	IEC60068-2-27	TBD
	Permanent Shock	IEC60068-2-29	TBD



Note ...

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1.8 Related Publications

The following publications contain information relating to the CP3002-RC/CP3002-RA.

Table 1-4: Related Publications

PRODUCT	PUBLICATION
CompactPCI Systems and Boards	CompactPCI Specification PICMG 2.0, Rev. 3.0
	Kontron CompactPCI Backplane Manual, ID 24229
Platform Firmware	Unified Extensible Firmware Interface (uEFI) Specification, Version 2.1
All Kontron products	Product Safety and Implementation Guide, ID 1021-9142
Kontron	CP3002-RC/CP3002-RA uEFI BIOS User Guide, ID 1042-8946

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