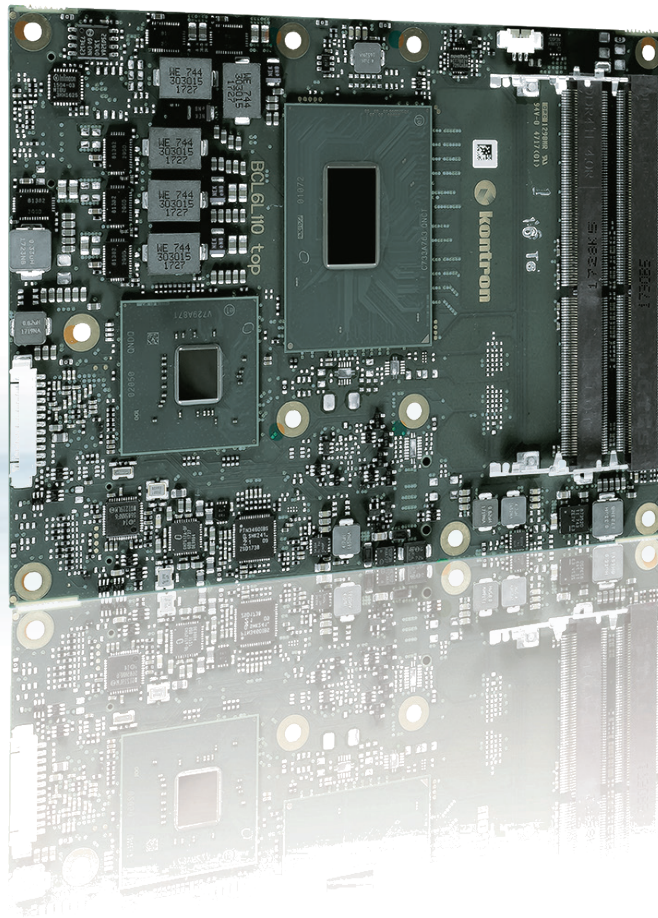




# COMe-bCL6

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 COME-BCL6

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## Revision History

| Revision | Brief Description of Changes                         | Date of Issue    | Author |
|----------|------------------------------------------------------|------------------|--------|
| 1.0      | Initial version                                      | 2018-July-30     | hjs    |
| 1.1      | PNs cooling accessories changed, added new processor | 2018-August-30   | hjs    |
| 1.2      | MTBF, EMV test modified                              | 2018-December-04 | hjs    |
| 1.3      | Pin A52/A53 changed, USB 3.1 Gen2 support            | 2019-February-04 | hjs    |
| 1.4      | BIOS Chapter screens added                           | 2019-April-08    | hjs    |

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## Symbols

The following symbols may be used in this user guide.

### **⚠ DANGER**

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

### **⚠ WARNING**

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

### **⚠ CAUTION**

CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

### **NOTICE**

NOTICE indicates a property damage message.



**Electric Shock!**

This symbol and title warn of hazards due to electrical shocks (> 60 V) when touching products or parts of them. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material.



**ESD Sensitive Device!**

This symbol and title inform that the electronic boards and their components are sensitive to static electricity. Care must therefore be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.



**HOT Surface!**

Do NOT touch! Allow to cool before servicing.



**Laser!**

This symbol inform of the risk of exposure to laser beam from an electrical device. Eye protection per manufacturer notice shall review before servicing.



This symbol indicates general information about the product and the user guide.

This symbol also indicates detail information about the specific product configuration.



This symbol precedes helpful hints and tips for daily use.

## For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform to the following guidelines.

### High Voltage Safety Instructions

As a precaution and in case of danger, the power connector must be easily accessible. The power connector is the product's main disconnect device.

#### **⚠ CAUTION**

##### **Warning**

**All operations on this product must be carried out by sufficiently skilled personnel only.**



##### **Electric Shock!**

Before installing a non hot-swappable Kontron product into a system always ensure that your mains power is switched off. This also applies to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair, and maintenance operations on this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing any work on this product.

Earth ground connection to vehicle's chassis or a central grounding point shall remain connected. The earth ground cable shall be the last cable to be disconnected or the first cable to be connected when performing installation or removal procedures on this product.

### Special Handling and Unpacking Instruction



##### **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.

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

## Lithium Battery Precautions

If your product is equipped with a lithium battery, take the following precautions when replacing the battery.

### ⚠ CAUTION

Danger of explosion if the battery is replaced incorrectly.

- ▶ Replace only with same or equivalent battery type recommended by the manufacturer.
- ▶ Dispose of used batteries according to the manufacturer's instructions.

## 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 product, that are not explicitly approved by Kontron and described in this user guide or received from Kontron Support as a special handling instruction, will void your warranty.

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

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

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the product then re-pack it in the same manner as it was delivered.

Special care is necessary when handling or unpacking the product. See Special Handling and Unpacking Instruction.

## Quality and Environmental Management

Kontron aims to deliver reliable high-end products designed and built for quality, and aims to complying with environmental laws, regulations, and other environmentally oriented requirements. For more information regarding Kontron's quality and environmental responsibilities, visit <http://www.kontron.com/about-kontron/corporate-responsibility/quality-management>.

## Disposal and Recycling

Kontron's products are manufactured to satisfy environmental protection requirements where possible. Many of the components used are capable of being recycled. Final disposal of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.

## WEEE Compliance

The Waste Electrical and Electronic Equipment (WEEE) Directive aims to:

- ▶ Reduce waste arising from electrical and electronic equipment (EEE)
- ▶ Make producers of EEE responsible for the environmental impact of their products, especially when the product become waste
- ▶ Encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE
- ▶ Improve the environmental performance of all those involved during the lifecycle of EEE



Environmental protection is a high priority with Kontron.

Kontron follows the WEEE directive

You are encouraged to return our products for proper disposal.

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# 1/ Introduction

## 1.1. Product Description

Kontron's Computer-on-Module COMe-bCL6 is a COM Express® Basic Type 6 pinout based on the Intel® 8<sup>th</sup> Generation Core™ / Xeon® E3 v7 family processors, known as Coffee Lake-H in this user guide. The COMe-bCL6 supports additional communication interfaces via a separate Chipset (CM246/QM370 PCH). Due to Intel's 14nm technology, the Coffee Lake-H offers increased efficiency and performance with TDP as low as 15 to 28 W for quad-core chips and 35 to 45 W for six cores. The Coffee Lake-H features either GT2 or GT3 Intel® HD Graphics.

Basic COMe-bCL6 features are:

- ▶ Intel® 8<sup>th</sup> Generation Core series, Xeon® E-2176 with CM246/QM370 PCH
- ▶ Up to 4x DDR4-2400 SO-DIMM with up to 64 GByte (non-ECC/ECC) (3rd/4th socket on request)
- ▶ High-speed connectivity includes 8x PCIe x1, 1x PEG x16, 1x 1 GbE
- ▶ Support for the Industrial temperature environment

## 1.2. Product Naming Clarification

COM Express® defines a Computer-On-Module, or COM, with all the components necessary for a bootable host computer, packaged as a super component. The product names for Kontron COM Express® Computer-on-Modules consist of:

- ▶ Short form of the industry standard
  - ▶ COMe-bCL6
- ▶ Module form factor
  - ▶ b=basic (125 mm x 95 mm)
  - ▶ c=compact (95 mm x 95 mm)
  - ▶ m=mini (84 mm x 55 mm)
- ▶ Processor code name
  - ▶ CL = Coffee Lake
- ▶ Pinout type
  - ▶ Type 6
- ▶ Temperature variants
  - ▶ Commercial
  - ▶ Extended (E1)
  - ▶ Industrial (E2)
  - ▶ Screened industrial (E2S) and Rapid shutdown screened industrial (R E2S)
- ▶ Processor Identifier
  - ▶ Chipset identifier (if chipset assembled)
- ▶ Memory size
  - ▶ Memory Down + DIMM memory (#GB) / eMMC SLC memory (#S)

## 1.3. COM Express® Documentation

The COM Express® Specification defines the COM Express® module form factor, pinout and signals. The COM Express document is available at the PICMG® website.

## 1.4. COM Express® Functionality

All Kontron COM Express® basic and compact modules contain two 220-pin connectors; each of which has two rows called row A & B on the primary connector and row C & D on the secondary connector. The COM Express® Computer-On-Module (COM) features the following maximum amount of interfaces according to the PCI Industrial Computer Manufacturers Group (PICMG) module pinout type.

Table 1: Pin Assignment of Type 6 and COMe-bCL6

| Feature                    | Type 6 Pinout                              | COMe-bCL6 Pinout                                                                                                                                                             |
|----------------------------|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HD Audio                   | 1x                                         | 1x                                                                                                                                                                           |
| Gb Ethernet                | 1x                                         | 1x                                                                                                                                                                           |
| Serial ATA                 | 4x                                         | 4x                                                                                                                                                                           |
| PCI Express x 1            | 8x                                         | 8x                                                                                                                                                                           |
| PCI Express x16 (PEG)      | 1x                                         | 1x                                                                                                                                                                           |
| USB                        | 4x USB 3.0 (Incl. USB 2.0)<br>+ 4x USB 2.0 | 4x USB 3.1 Gen 2 (Incl. USB 2.0)<br>+ 4x USB 2.0<br>Corresponding USB ports are configured to USB 3.1 Gen1 by default as support depends on appropriate carrier board design |
| VGA                        | 1x                                         | 1x Optional                                                                                                                                                                  |
| LVDS                       | Dual Channel                               | Dual Channel LVDS with option to overlay with embedded Display port (eDP)                                                                                                    |
| DP++ (eDP/DP/HDMI/DVI/VGA) | 3x                                         | 3x                                                                                                                                                                           |
| LPC                        | 1x                                         | 1x                                                                                                                                                                           |
| External SMB               | 1x                                         | 1x                                                                                                                                                                           |
| External I2C               | 1x                                         | 1x                                                                                                                                                                           |
| GPIO                       | 8x                                         | 8x                                                                                                                                                                           |
| SDIO shared w/GPIO         | 1x optional                                |                                                                                                                                                                              |
| UART (2-wire COM)          | 2x                                         | 2x                                                                                                                                                                           |
| FAN PWM out                | 1x                                         | 1x                                                                                                                                                                           |

## 1.5. COM Express® Benefits

COM Express® modules are very compact, highly integrated computers. All Kontron COM Express® modules feature a standardized form factor and a standardized connector layout that carry a specified set of signals. Each COM is based on the COM Express® specification. This standardization allows designers to create a single-system baseboard that can accept present and future COM Express® modules.

The baseboard designer can optimize exactly how each of these functions implements physically. Designers can place connectors precisely where needed for the application, on a baseboard optimally designed to fit a system's packaging.

A single baseboard design can use a range of COM Express® modules with different sizes and pinouts. This flexibility differentiates products at various price and performance points and provides a built-in upgrade path when designing future-proof systems. The modularity of a COM Express® solution also ensures against obsolescence when computer technology evolves. A properly designed COM Express® baseboard can work with several successive generations of COM Express® modules.

A COM Express® baseboard design has many advantages of a customized computer-board design and, additionally, delivers better obsolescence protection, heavily reduced engineering effort, and faster time to market.

## 2/ Product Specification

### 2.1. Module Variants

The COM Express® basic sized, Computer-on-Module COMe-bCL6, uses pinout Type 6 and is compatible with the PICMG specification COM.0 Rev 2.1. The COMe-bCL6 is available in different variants to cover demands in performance, price and power.

#### 2.1.1. Commercial Grade Modules (0°C to +60°C)

2.1.1. Commercial Grade Modules (0°C to +60°C) are available as a standard product number.

**Table 2: Commercial Grade Modules (0°C to +60°C)**

| Product Number  | Product Name                  | Comment                                                                                                                                 |
|-----------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 38034-0000-27-6 | COMe-bCL6 E-2176M CM246       | COM Express® basic pin-out type 6 Computer-on-Module with Intel® Xeon® E-2176M, 6x 2.7 GHz, CM246 PCH, GT2, 2x DDR4 non-ECC/ECC SO-DIMM |
| 38034-0000-26-7 | COMe-bCL6 i7-8850H QM370      | COM Express® basic pin-out type 6 Computer-on-Module with Intel® Core™ i7-8850H, 6x 2.6 GHz, QM370 PCH, GT2, 2x DDR4 non-ECC SO-DIMM    |
| 38034-0000-25-5 | COMe-bCL6 i5-8400H QM370      | COM Express® basic pin-out type 6 Computer-on-Module with Intel® Core™ i5-8400H, 4x 2.5 GHz, QM370 PCH, GT2, 2x DDR4 non-ECC SO-DIMM    |
| 38034-0000-30-3 | COMe-bCL6R E2S i3-8100H QM370 | COM Express® basic pin-out type 6 Computer-on-Module with Intel® Core™ i3-8100H, 4x3.0GHz, QM370 PCH, GT2, 2x DDR4 non-ECC SO-DIMM      |

## 2.1.2. R E2S Modules (R E2S, -40°C to +85°C)

The following table provides a list of R E2S modules available with Kontron Rapid Shutdown support and E2 temperature grade (-40°C to +85°C) by screening.



For further information regarding the screening process contact Kontron Support

**Table 3: R E2S Modules (R E2S, -40°C to +85°C)**

| Product Number  | Product Name                  | Comment                                                                                                                                                                               |
|-----------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 38035-0000-27-6 | COMe-bCL6R E2S E-2176M CM246  | COM Express® basic pin-out type 6 Computer-on-Module with Intel® Xeon® E-2176M, 6x 2.7 GHz, CM246 PCH, GT2, 2x DDR4 non-ECC/ECC SO-DIMM, Rapid Shutdown, industrial temperature grade |
| 38035-0000-26-7 | COMe-bCL6R E2S i7-8850H QM370 | COM Express® basic pin-out type 6 Computer-on-Module with Intel® Core™ i7-8850H, 6x 2.6 GHz, QM370 PCH, GT2, 2x DDR4 non-ECC SO-DIMM, Rapid Shutdown, industrial temperature grade    |
| 38035-0000-25-5 | COMe-bCL6R E2S i5-8400H QM370 | COM Express® basic pin-out type 6 Computer-on-Module with Intel® Core™ i5-8400H, 4x 2.5 GHz, QM370 PCH, GT2, 2x DDR4 non-ECC SO-DIMM, Rapid Shutdown, industrial temperature grade    |
| 38035-0000-30-3 | COMe-bCL6R E2S i3-8100H CM246 | COM Express® basic pin-out type 6 Computer-on-Module with Intel® Core™ i3-8100H, 4x3.0GHz, CM246 PCH, GT2, 2x DDR4 non-ECC/ECC SO-DIMM, Rapid Shutdown, industrial temperature grade  |

## 2.2. Accessories

The following tables provide a list of specific and general COMe-bCL6 accessories. For more information, contact your local Kontron sales representative or Kontron Inside Sales.

**Table 4: Product Specific Accessories**

| Part Number     | Heatspreader                             | Comment                             |
|-----------------|------------------------------------------|-------------------------------------|
| 38030-0000-99-0 | HSP COMe-bSL6/bKL6/bCL6 Cu-core threaded | For all CPUs and temperature grades |
| 38030-0000-99-1 | HSP COMe-bSL6/bKL6/bCL6 Cu-core through  | For all CPUs and temperature grades |

**Table 5: COMe Type 6 Specific Accessories**

| Part Number     | COMe Carrier                            | Project Code | Comment                                    |
|-----------------|-----------------------------------------|--------------|--------------------------------------------|
| 38115-0000-00-x | COM Express® Reference Carrier-i Type 6 | ADTI         | Thin-mITX Carrier with 5 mm COMe connector |
| 38114-0000-00-0 | COM Express® Reference Carrier Type 6   | ADAS         | mITX Carrier with 8 mm COMe connector      |
| 38106-0000-00-0 | COM Express® Eval Carrier Type 6        | Topanga      | ATX Carrier with 5 mm COMe                 |

|                    |                            |                     |                                               |
|--------------------|----------------------------|---------------------|-----------------------------------------------|
|                    |                            | Canyon              | connector                                     |
| <b>Part Number</b> | <b>COMe Adapter / Card</b> | <b>Project Code</b> | <b>Comment</b>                                |
| 96007-0000-00-3    | ADA-PCIe-DP                | APDP                | PCIe x16 to DP Adapter for Evaluation Carrier |
| 96007-0000-00-7    | ADA-Type6-DP3              | DV06                | (sandwich) Adapter Card for 3x DisplayPort    |
| 96006-0000-00-2    | COMe POST T6               | NFCB                | POST Code / Debug Card                        |
| 38019-0000-00-0    | ADA-COMe-Height-dual       | EERC                | Height Adapter                                |
| <b>Part Number</b> | <b>COMe Starter kit</b>    | <b>Project Code</b> | <b>Comment</b>                                |
| 38114-0000-00-5    | COMe Ref. Starter kit T6   | ADAS                | Starter kit with COMe Reference Carrier T6    |
| 38106-0000-00-5    | COMe Eval. Starter kit T6  | Topanga Canyon      | Starter kit with COMe Evaluation Carrier T6   |

Table 6: General Accessories

| Part Number        | Cooling Solutions                                    | Comments                                                                  |
|--------------------|------------------------------------------------------|---------------------------------------------------------------------------|
| 38025-0000-99-0C05 | HSK COMe-bHL6/bBL6/bSL6/-bKL6/bCL6 active (w/o HSP)  | For all CPUs and commercial temperature grade usage, to be mounted on HSP |
| 38025-0000-99-0C06 | HSK COMe-bHL6/bBL6/bSL6/-bKL6/bCL6 passive (w/o HSP) | For all CPUs and commercial temperature grade usage, to be mounted on HSP |
| Part Number        | Mounting                                             | Comments                                                                  |
| 38017-0000-00-5    | COMe Mount KIT 5 mm 1 set                            | Mounting Kit for 1 module including screws for 5 mm connectors            |
| 38017-0100-00-5    | COMe Mount KIT 5 mm 100 sets                         | Mounting Kit for 100 modules including screws for 5 mm connectors         |
| 38017-0000-00-0    | COMe Mount KIT 8 mm 1 set                            | Mounting Kit for 1 module including screws for 8 mm connectors            |
| 38017-0100-00-0    | COMe Mount KIT 8 mm 100 sets                         | Mounting Kit for 100 modules including screws for 8 mm connectors         |
| Part Number        | Display Adapter                                      | Comment                                                                   |
| 96006-0000-00-8    | ADA-DP-LVDS                                          | DP to LVDS adapter                                                        |
| 96082-0000-00-0    | KAB-ADAPT-DP-DVI                                     | DP to DVI adapter cable                                                   |
| 96083-0000-00-0    | KAB-ADAPT-DP-VGA                                     | DP to VGA adapter cable                                                   |
| 96084-0000-00-0    | KAB-ADAPT-DP-HDMI                                    | DP to HDMI adapter cable                                                  |
| Part Number        | Cables                                               | Comment                                                                   |
| 96079-0000-00-0    | KAB-HSP 200mm                                        | Cable adapter to connect FAN to module (COMe basic/compact)               |
| 96079-0000-00-2    | KAB-HSP 40 mm                                        | Cable adapter to connect FAN to module (COMe basic/compact)               |

Table 7: Memory Modules

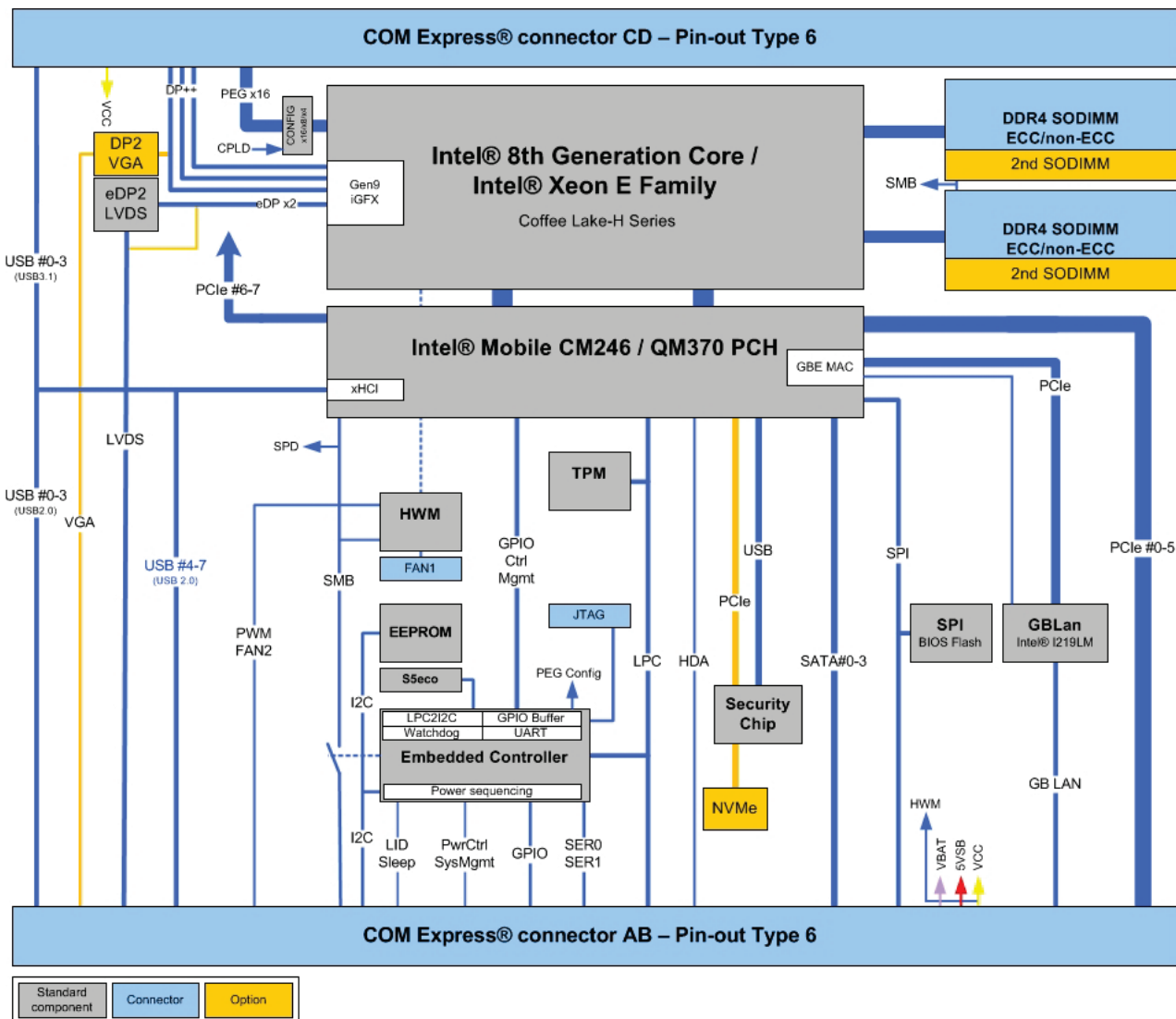
| Part Number     | Memory (validated reference types)     |                                                          |
|-----------------|----------------------------------------|----------------------------------------------------------|
| 97017-4096-24-0 | DDR4-2400 SODIMM 4 GB_COM              | DDR4-2400, 4GB, 260P, 1200MHz, PC4-2400 SODIMM           |
| 97017-8192-24-0 | DDR4-2400 SODIMM 8 GB_COM              | DDR4-2400, 8GB, 260P, 1200MHz, PC4-2400 SODIMM           |
| 97017-1600-24-0 | DDR4-2400 SODIMM 16 GB_COM             | DDR4-2400, 16GB, 260P, 1200MHz, PC4-2400 SODIMM          |
| 97017-4096-24-2 | DDR4-2400 SODIMM 4 GB E2_COM           | DDR4-2400, 4GB, E2, 260P, 1200MHz, PC4-2400 SODIMM       |
| 97017-8192-24-2 | DDR4-2400 SODIMM 8 GB E2_COM           | DDR4-2400, 8GB, E2, 260P, 1200MHz, PC4-2400 SODIMM       |
| 97017-1600-24-2 | DDR4-2400 SODIMM 16 GB E2_COM          | DDR4-2400, 16GB, E2, 260P, 1200MHz, PC4-2400 SODIMM      |
| Part Number     | Memory ECC (validated reference types) |                                                          |
| 97018-4096-24-0 | DDR4-2400 SODIMM 4 GB ECC_COM          | DDR4-2400, 4GB, ECC, 260P, 1200MHz, PC4-2400 SODIMM      |
| 97018-8192-24-0 | DDR4-2400 SODIMM 8 GB ECC_COM          | DDR4-2400, 8GB, ECC, 260P, 1200MHz, PC4-2400 SODIMM      |
| 97018-1600-24-0 | DDR4-2400 SODIMM 16 GB ECC_COM         | DDR4-2400, 16GB, ECC, 260P, 1200MHz, PC4-2400 SODIMM     |
| 97018-4096-24-2 | DDR4-2400 SODIMM 4 GB ECC E2_COM       | DDR4-2400, 4GB, ECC, E2, 260P, 1200MHz, PC4-2400 SODIMM  |
| 97018-8192-24-2 | DDR4-2400 SODIMM 8 GB ECC E2_COM       | DDR4-2400, 8GB, ECC, E2, 260P, 1200MHz, PC4-2400 SODIMM  |
| 97018-1600-24-2 | DDR4-2400 SODIMM 16 GB ECC E2_COM      | DDR4-2400, 16GB, ECC, E2, 260P, 1200MHz, PC4-2400 SODIMM |

## 2.3. Functional Specification

### 2.3.1. Block Diagram COMe-bCL6

The following figure displays the system block diagram applicable to all COMe-bCL6 modules.

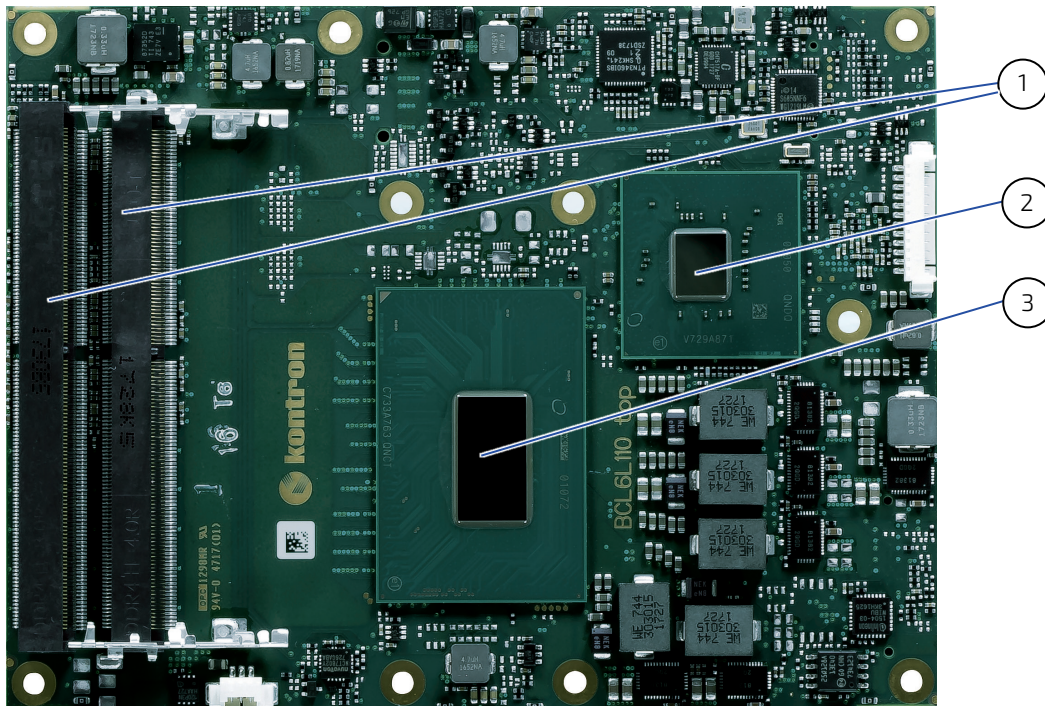
Figure 1: Block Diagram COMe-bCL6



## 2.3.2. Front and Bottom View

### 2.3.2.1. Front View

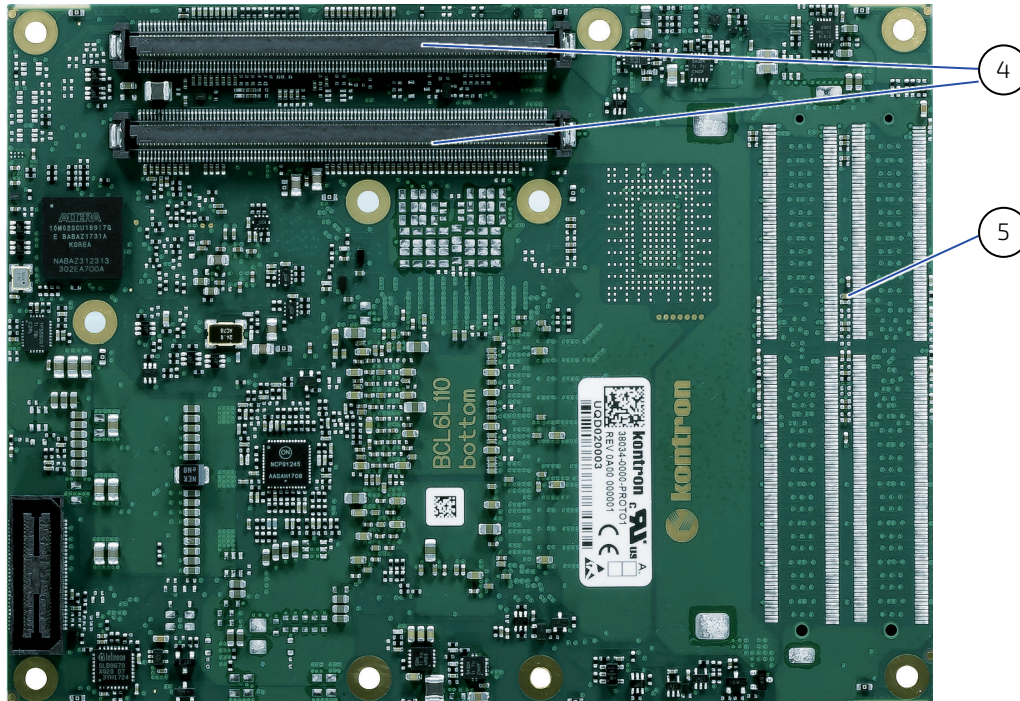
Figure 2: Front View COMe-bCL6



1. 2x SO-DIMM slots
2. PCH
3. Processor

### 2.3.2.2. Bottom View

Figure 3: Bottom View COMe-bCL6



- 4. 2x COMe interfaces X1A and X1B
- 5. Place for additional SO-DIMM slots

## 2.3.3. Technical Data

Table 8: Technical Data

| Function             | Definition                                                                                                                                                                                                                                                           |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Compliance           | COM Express® basic, Pin-out Type 6                                                                                                                                                                                                                                   |
| Dimensions (H X W)   | 125 x 95 mm                                                                                                                                                                                                                                                          |
| CPU                  | Intel® Xeon® E-2176M, 6x 2.7 GHz (4.4 GHz), GT2, 45/35 W Intel® Core™ i7-8850H, 6x 2.6 GHz (4.3 GHz), GT2, 45/35 W Intel® Core™ i5-8400H, 4x 2.5 GHz (4.2 GHz), GT2, 45/35 W, Intel 8th Generation Core/Xeon Series, Codename: Coffee Lake-H (Halo) Package: BGA1440 |
| Chipset              | Intel Cannon Lake-H PCH Package BGA874                                                                                                                                                                                                                               |
| Main Memory          | Channel 1: Up to 2x SO-DIMMs DDR4, max 16GB per DIMM 2133/2400/2660 <sup>1</sup> MHz non-ECC/ECC<br>Channel 2: Up to 2x SO-DIMMs <sup>2</sup> DDR4, max 16GB per DIMM 2133/2400/2660 <sup>1</sup> MHz non-ECC/ECC                                                    |
| Graphics Controller  | Intel® Hd Graphics 630                                                                                                                                                                                                                                               |
| Graphic Interfaces   | 3x DP, LVDS (Dual Channel 18/24bit), VGA and eDP optional                                                                                                                                                                                                            |
| Ethernet Controller  | Intel® I219LM                                                                                                                                                                                                                                                        |
| Ethernet             | 10/100/1000 MBit Ethernet                                                                                                                                                                                                                                            |
| Hard Disk            | 4x SATA 6Gb/s                                                                                                                                                                                                                                                        |
| Flash Onboard        | Up to 1 TByte NVMe SSD (on request)                                                                                                                                                                                                                                  |
| PCI Express® Support | 8x PCIe x1, 1x PEG x16                                                                                                                                                                                                                                               |
| USB                  | 4x USB 3.1 (incl. USB 2.0) + 4x USB 2.0, up to 8x USB 2.0                                                                                                                                                                                                            |
| Serial               | 2x serial interfaces (RX/TX Only)                                                                                                                                                                                                                                    |
| Audio                | Intel® High Definition Audio                                                                                                                                                                                                                                         |
| Common Features      | SPI, LPC, SMBus, Fast I <sup>2</sup> C, Staged Watchdog, RTC                                                                                                                                                                                                         |
| BIOS                 | AMI Aptio V                                                                                                                                                                                                                                                          |
| Power Management     | ACPI 6.0                                                                                                                                                                                                                                                             |
| Power Supply         | 8.5 V to 20 V Wide Range, Single Supply Power                                                                                                                                                                                                                        |
| Special Features     | POSCAP capacitors, Trusted Platform Module TPM 2.0, Security Chip, 4k Resolutions, Flexible PEG Lane Configuration by Setup Option, Rapid shutdown (R E2S variants)                                                                                                  |
| Operating System     | Windows® 10, Linux, VxWorks                                                                                                                                                                                                                                          |
| Temperature          | Commercial Grade Temperature: -0 °C to +60 °C operating, -30 °C to +85 °C non-operating<br>Industrial Temperature: -40 °C To +85 °C operating, -40 °C to +85 °C non-operating                                                                                        |

## 2.3.4. Processor

The Intel® 8<sup>th</sup> Generation Core™ series Coffee Lake-H product family uses the 14 nm process technology, with 42 mm x 28 mm package size and BG1440 socket.

In general, the Intel® Coffee Lake-H series of processors supports the following technologies:

- ▶ Intel® Optane™ Memory Supported
- ▶ Intel® Turbo Boost Technology 2.0
- ▶ Intel® vPro™ Technology
- ▶ Intel® Hyper-Threading Technology
- ▶ Intel® Virtualization Technology (VT-x)
- ▶ Intel® Virtualization Technology for Directed I/O (VT-d)
- ▶ Intel® VT-x with Extended Page Tables (EPT)
- ▶ Intel® TSX-NI
- ▶ Intel® 64
- ▶ Instruction Set 64-bit
- ▶ Instruction Set Extensions Intel® SSE4.1, Intel® SSE4.2, Intel® AVX2
- ▶ Idle States
- ▶ Enhanced Intel SpeedStep® Technology
- ▶ Thermal Monitoring Technologies
- ▶ Intel® Identity Protection Technology

### Security & Reliability

- ▶ Intel® AES New Instructions (on request)
- ▶ Secure Key
- ▶ Intel® Software Guard Extensions (Intel® SGX)
- ▶ Intel® Memory Protection Extensions (Intel® MPX)
- ▶ Intel® OS Guard
- ▶ Intel® Trusted Execution Technology
- ▶ Execute Disable Bit
- ▶ Intel® Boot Guard

The following table lists the Intel® 8<sup>th</sup> Generation Core™ series, Coffee Lake-H processor specifications.

**Table 9: Specifications of the COMe-bCL6 Processor Variants**

| Processor      | Cores/Threads | Frequency<br>nom./Turbo | L3-Cache | TDP/T <sub>Junction</sub> | Graphics         |
|----------------|---------------|-------------------------|----------|---------------------------|------------------|
| Core™ i3-8100H | 4/4           | 3 GHz                   | 6 MByte  | 45 W/100°C                | UHD-Graphics 630 |
| Core i5-8400H  | 4/8           | 2.5/4.2 GHz             | 9 MByte  | 45 W/100°C                | UHD-Graphics 630 |
| Core i7-8850H  | 6/12          | 2.6/4.3 GHz             | 9 MByte  | 45 W/100°C                | UHD-Graphics 630 |
| Xeon® E-2176M  | 6/12          | 2.7/4.4 GHz             | 12 MByte | 45 W/100°C                | UHD-Graphics 630 |

### 2.3.5. Chipset

The COMe-bCL6 is a two-chip solution implementing the Coffee Lake-H CPU and CM246, QM370 and HM370 Platform Controller Hub.

#### 2.3.5.1. Platform Controller Hub (PCH)

The following table lists the PCH QM370 and CM246 PCH features.

**Table 10: PCH QM370 and CM246 Features**

| Feature                                   | QM370      | CM246 |
|-------------------------------------------|------------|-------|
| Max USB 3.1 Gen2 (10 Gb/s)/Gen 1 (5 Gb/s) | 4          | 4     |
| Displays                                  | 3          | 3     |
| PCIe lanes                                | 8          | 8     |
| PCIe Configurations                       | x1, x2, x4 |       |
| Smart Surround                            | yes        | yes   |
| vPRO Technology                           | yes        |       |
| TDP                                       | 3 W        | 3 W   |
| ECC memory support                        | no         | yes   |

### 2.3.6. System Memory

The COMe-bCL6 supports a dual DDR4 memory interface with one SO-DIMM socket per channel. The sockets support the following system memory features.

**Table 11: System Memory**

| Feature            | Remark                                                                                                                                                                                                      |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Socket             | 2x SO-DIMM DDR4                                                                                                                                                                                             |
| Memory Type        | standard: 1x SO-DIMMs DDR4, max 16 GB per DIMM 2133/2400/2660 <sup>1</sup> MHz non-ECC/ECC<br>extended: Up to 4x SO-DIMMs <sup>2</sup> DDR4, max 16 GB per DIMM 2133/2400/2660 <sup>1</sup> MHz non-ECC/ECC |
| Memory Module Size | 4 GB, 8 GB and 16 GB                                                                                                                                                                                        |
| Bandwidth          | 34.1 Gb/s at 2133 MT/s                                                                                                                                                                                      |

Note 1: Memory Speed of 2660 MHz is only supported on 1 DPC (DIMM Per Channel) configurations

Note 2: Second SO-DIMM (bottom side of module) on Channel 2 exceeds the maximum height for COM Express Modules. Special care has to be taken for the Carrier Board design.

### 2.3.7. Hardware Monitor (HWM)

The Nuvoton NCT7802Y is a hardware monitoring IC, capable of monitor critical system parameters including power supply voltages, fan speeds, and temperatures. The SM-Bus Address is 5C.

### 2.3.8. Trusted Platform Module (TPM)

The SLB 9670 is a Trusted Platform Module and is based on advanced hardware security technology. This TPM implementation has achieved CC EAL4+ certification and serves as a basis for other TPM products and firmware upgrades. The Infineon SLB9670 (TPM 2.0) is connected to BOOT SPI0.

### 2.3.9. SPI BIOS Memory

The Dual 16 MB SPI Flashes is connected to PCH's BOOT SPI0. Failsafe Operation (automatic switchover) can be implemented on request.

### 2.3.10. Onboard FAN connector

The analog output voltage on this connector is generated via a discrete linear voltage regulator from the PWM signal of the HWM. It is clipped at 12 V (+/- 10 %) across the whole input range of the module to prevent FAN damage at higher voltages.

The maximum supply current to the fan connected to the on-module fan connector is 350 mA if the input voltage is below 13.0 V and is further limited to 150 mA if the input voltage to the module is between 13.0 V and 20.0 V.

**Table 12: Onboard FAN connector**

| Connector Pin | Description  |
|---------------|--------------|
| 1             | FAN_TACH_IN# |
| 2             | V_FAN        |

| Connector Pin | Description |
|---------------|-------------|
| 3             | GND         |
| 4             | V_FAN       |
| 5             | V_FAN       |

### 2.3.11. Rapid Shutdown

The optional function Rapid Shutdown is based on External pulse triggers VR shutdown and discharge of all on-module rails within a specified amount of time.

### 2.3.12. General Purpose PCI Express 3.0

Table 13: General Purpose PCI Express 3.0

| COMe connector | PCH HSIO Port | PCH I/O Function | Lane Config |    | Intel RST/Optane |
|----------------|---------------|------------------|-------------|----|------------------|
| PCIE0          | 26            | PCIE21           | x1          | x4 | YES              |
| PCIE1          | 27            | PCIE22           | x1          |    |                  |
| PCIE2          | 28            | PCIE23           | x1          |    |                  |
| PCIE3          | 29            | PCIE24           | x1          |    |                  |
| PCIE4          | 18            | PCIE13           | x1          | x4 | NO               |
| PCIE5          | 19            | PCIE14           | x1          |    |                  |
| PCIE6          | 20            | PCIE15           | x1          |    |                  |
| PCIE7          | 21            | PCIE16           | x1          |    |                  |

### 2.3.13. PCI Express Graphics 3.0 (PEG)

Table 14: PCI Express Graphics 3.0

| COMe Lane | 1x16 (Default) | 1x16 Reversed | 2x8 | 2x8 Reversed | 1x8+2x4 | 1x8+2x4 Reversed |
|-----------|----------------|---------------|-----|--------------|---------|------------------|
| PEG0      | 0              | 15            | 0   | 7            | 0       | 3                |
| PEG1      | 1              | 14            | 1   | 6            | 1       | 2                |
| PEG2      | 2              | 13            | 2   | 5            | 2       | 1                |
| PEG3      | 3              | 12            | 3   | 4            | 3       | 0                |
| PEG4      | 4              | 11            | 4   | 3            | 4       | 3                |
| PEG5      | 5              | 10            | 5   | 2            | 5       | 2                |
| PEG6      | 6              | 9             | 6   | 1            | 6       | 1                |
| PEG7      | 7              | 8             | 7   | 0            | 7       | 0                |
| PEG8      | 8              | 7             | 0   | 7            | 0       | 7                |
| PEG9      | 9              | 6             | 1   | 6            | 1       | 6                |
| PEG10     | 10             | 5             | 2   | 5            | 2       | 5                |
| PEG11     | 11             | 4             | 3   | 4            | 3       | 4                |
| PEG12     | 12             | 3             | 4   | 3            | 0       | 3                |
| PEG13     | 13             | 2             | 5   | 2            | 1       | 2                |
| PEG14     | 14             | 1             | 6   | 1            | 2       | 1                |
| PEG15     | 15             | 0             | 7   | 0            | 3       | 0                |

### 2.3.14. Universal Serial Bus (USB)

The device offers up to

- ▶ 8x USB 2.0 or
- ▶ 4x USB 3.1 with up to 10 Gbit/s.

For every USB 3.1 port, one USB2 and one USB31 lane has to be bonded. Therefore the number of available USB 2.0 ports decreases with every used 3.1 port.

Table 15: Universal Serial Bus (USB)

| COMe USB2 | COMe USB3 | PCH USB2 | PCH USB31 |
|-----------|-----------|----------|-----------|
| USB0      | USB_SS0   | USB2_1   | USB31_1   |
| USB1      | USB_SS1   | USB2_2   | USB31_2   |
| USB2      | USB_SS2   | USB2_3   | USB31_3   |
| USB3      | USB_SS3   | USB2_4   | USB31_4   |
| USB4      | -         | USB2_5   | -         |
| USB5      | -         | USB2_6   | -         |
| USB6      | -         | USB2_7   | -         |
| USB7      | -         | USB2_8   | -         |

Note: Intel starts counting USB Ports with 1 while COMe Specification starts counting with 0

Table 16: USB Overcurrent

| COMe connector | PCH       |
|----------------|-----------|
| USB_OC_0_1#    | USB2_OC0# |
| USB_OC_2_3#    | USB2_OC1# |
| USB_OC_4_5#    | USB2_OC2# |
| USB_OC_6_7#    | USB2_OC3# |

### 2.3.15. Serial ATA 3.0

Table 17: Serial ATA 3.0

| COMe Port | HSIO Port |
|-----------|-----------|
| SATA0     | 16        |
| SATA1     | 17        |
| SATA2     | 22        |
| SATA3     | 23        |

## 2.3.16. Gigabit Ethernet

Intel Jacksonville I219LM Ethernet Connection (PHY only) is connected to PCH HSIO Port 10 (PCIe #5).

Ethernet connectivity is achieved via a single-port integrated physical layer (PHY) supporting Ethernet Media Dependent Interfaces [0-3]. One 10/100/1000 Mbit Ethernet LAN port is available on high-speed I/O port 11.

**Table 18: Supported Ethernet Features**

|                            |                                       |
|----------------------------|---------------------------------------|
| <b>Ethernet</b>            | 10 Base-T/100 Base-TX and 1000 Base-T |
| <b>Ethernet Controller</b> | Intel® i219LM                         |

Additional features of the Ethernet controller are:

- ▶ Intel® vPRO™
- ▶ Energy Efficient Ethernet (IEEE 802.3az)
- ▶ Intel® SIPP Server Operating System Support
- ▶ Jumbo frames (up to 9 kB)
- ▶ Reduced power consumption during normal operation
- ▶ Integrated Intel® Auto Connect Battery Saver (ACBS)



If the LAN-Cable is disconnected, the ULP (Ultra Low Power) driver featured in Windows 10 can cause undefined LED behavior. To disable ULP use the "Intel ULPenable-Utility 1.3". For more information refer to the EMD Customer Section or contact Kontron Support.

## 2.3.17. Graphic Interfaces

Up to four independent Digital Display Interfaces can be used simultaneously and in combination, to implement an independent or cloned display configuration.

- ▶ 3x DP 1.2 with Audio
- ▶ 1x eDP 1.4 or LVDS
- ▶ Optional VGA via a DP 2VGA converter

**Table 19: Digital Display Interfaces Overview**

| CPU Port | COMe Port            |              |
|----------|----------------------|--------------|
| DDI1     | DDI1 (DP++) w. Audio |              |
| DDI2     | DDI2 (DP++) w. Audio |              |
| DDI3     | DDI3 (DP++) w. Audio | VGA (option) |
| eDP      | LVDS                 | eDP (option) |

### 2.3.17.1. Display Resolution

The following table lists the maximum display resolutions at a set frequency and bit per pixel (bpp) for the supported display interfaces.

| Display Interfaces | Maximum Resolution          |
|--------------------|-----------------------------|
| eDP                | 4096 x 2304 (60 Hz, 24 bpp) |

| Display Interfaces     | Maximum Resolution          |
|------------------------|-----------------------------|
| DP++                   | 4096 x 2304 (60 Hz, 24 bpp) |
| HDMI 1.4 ( native)     | 4096 x 2160 (24 Hz, 24 bpp) |
| HDMI 2.0 (via LS-Pcon) | 4096 x 2160 (60 Hz, 24 bpp) |
| VGA                    | 1920 x 1200 (60 Hz, 24 bpp) |



At 4K/UHD resolution, a DisplayPort redriver on the carrier is recommended to increase the link margin.

### 2.3.18. Video Graphics Array (VGA)

Implemented by Chrontel CH7517 DisplayPort to VGA bridge chip.

- ▶ Input: 2 DisplayPort Lanes from CPU DDI3.
- ▶ Output: VGA Video + VGA DDC

### 2.3.19. High Definition (HD) Audio

Table 20: HDA Features

| COMe Connector | PCH          |
|----------------|--------------|
| HDA_RST#       | HDA_RST#     |
| HDA_SYNC       | HDA_SYNC     |
| HDA_BITCLK     | HDA_BCLK     |
| HDA_SDOUT      | HDA_SDO      |
| HDA_SDIN[0:1]  | HDA_SDI[0:1] |
| HDA_SDIN2      | NC           |

### 2.3.20. Inter-Integrated Circuit (I2C)-Bus

Two I2C Buses generated by. I2C is used for attaching lower-speed peripheral ICs to processors and microcontrollers in short-distance, intra-board communication.

### 2.3.21. Power Supply Control Settings

The power supply control settings are set in the BIOS and enable the module to shut down, rest and wake from standby properly.

Table 21: Implemented Power Supply Control Settings

| Function               | Pin     | Definition                                                                                                                                                                                                                                                                                 |
|------------------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power Button (PWRBTN#) | Pin B12 | To start the module using the power button, the PWRBTN# signal must be at least 50 ms ( $50\text{ ms} \leq t < 4\text{ s}$ , typical 400 ms) at low level (Power Button Event). Pressing the power button for at least four seconds turns off power to the module (Power Button Override). |
| Power Good             | Pin     | PWR_OK is internally pulled up to 3.3 V and must be at the high level to power                                                                                                                                                                                                             |

| Function                     | Pin        | Definition                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (PWR_OK)                     | B24        | on the module. This can be driven low to hold the module from powering up as long as needed. The carrier needs to release the signal when ready.<br>Low level prevents the module from entering the S0 state. A falling edge during S0 will cause a direct switch to S5 (Power Failure).                                                                                          |
| Reset Button<br>(SYS_RESET#) | Pin<br>B49 | When the SYS_RESET# pin is detected active (falling edge triggered), it allows the processor to perform a "graceful" reset, by waiting up to 25 ms for the SMBus to go idle before forcing a reset, even though activity is still occurring. Once the reset is asserted, it remains asserted for 5 ms to 6 ms regardless of whether the SYS_RESET# input remains asserted or not. |
| SM-Bus Alert<br>(SMB_ALERT#) | Pin<br>B15 | With an external battery manager present and SMB_ALERT #connected, the module always powers on even if the BIOS switch "After Power Fail" is set to "Stay Off".                                                                                                                                                                                                                   |

### 2.3.22. General Purpose IOs (GPIOs)

In addition to COMe spec, all GPIOs can also be configured as output and all GPOs as inputs.

### 2.3.23. Fan Control

Table 22: Fan Signals

| COMe Signal | HWM Pin |
|-------------|---------|
| FAN_PWMOUT  | FANCTL2 |
| FAN_TACHIN  | FANIN2  |

### 2.3.24. UART Serial Ports

Table 23: UART Signals

| COMe Signal | EC/kCPLD function |
|-------------|-------------------|
| SER0_TX     | po_uart_tx[0]     |
| SER0_RX     | po_uart_rx[0]     |
| SER1_TX     | po_uart_tx[1]     |
| SER1_RX     | po_uart_rx[1]     |

## 2.3.25. BIOS/Software Features

Table 24: BIOS and Software Features

| Feature            | Remark                                                                                                                                                                                                                                                                                                                      |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supported BIOS EFI | AMI Aptio V UEFI                                                                                                                                                                                                                                                                                                            |
| Software           | Demo Utility for KeAPI usage (DMCM tools)<br>EFI Utilities for customer to log and process module information (DMCM tools)<br>BIOS/EFI Flash utility for EFI Shell, Windows, Linux<br>BIOS/EFI Utility to configure PCIe mapping<br>BIOS/EFI Utility for customers to implement Bootlogo & customize NVRAM (Setup settings) |
| OS Support         | Windows 10 (IOT) Enterprise x64 (incl. Accelerator Driver for Intel Optane Support)<br>Linux x64 (Yocto based) incl. PLD Driver & Live-CD<br>VxWorks 7.x x64                                                                                                                                                                |

## 2.3.26. COMe Features

The following table lists supported COMe specification features. For more information, see the COMe specification.

Table 25: COMe Specification Features

| Feature       | Remark                           |
|---------------|----------------------------------|
| SPI           | Boot from an external SPI        |
| LPC           | Supported                        |
| UART          | 2x UART (RX/TX)                  |
| LID Signals   | Supported                        |
| Sleep Signals | Supported                        |
| SMBus         | Supported                        |
| Audio         | HD Audio for external HAD codecs |

## 2.3.27. Kontron Features

The following table lists specific Kontron features.

Table 26: Kontron Features

| Feature                             | Remark                        |
|-------------------------------------|-------------------------------|
| External I2C Bus                    | Fast I2C, MultiMaster capable |
| M.A.R.S. Support                    | Supported                     |
| Embedded API                        | KEAPI3                        |
| Custom BIOS Settings / Flash Backup | Supported                     |
| Watchdog Support                    | Triple Staged                 |

## 2.4. Electrical Specification

### 2.4.1. Power Supply Voltage

The supply voltage is applied through the VCC pins (VCC) of the module connector. The COMe-bCL6 supports a power supply input from 8.5 V to 20 V and operation in both single supply and ATX power supply mode.

Table 27: Power Supply Specifications

| Feature                    | Remark                                         |
|----------------------------|------------------------------------------------|
| Supply Voltage Range (VCC) | 8.5 V to 20 V for commercial temperature range |
| Supply Voltage (VCC)       | 12 V for EXT/E2S variants                      |
| Standby Voltage            | 5 V DC +/- 5 %                                 |
| RTC                        | 2.5 V to 3.47 V                                |



5 V Standby voltage is not mandatory for operation.  
Extended temperature variants are validated for 12 V supply only.

### 2.4.2. Power Supply Rise Time

The input voltage rise time is 0.1 ms to 20 ms from input voltage  $\leq 10\%$  to nominal VCC. To comply with the ATX specification there must be a smooth and continuous ramp of each DC input voltage from 10 % to 90 % of the DC input voltage final set point.

### 2.4.3. Power Supply Voltage Ripple

The maximum power supply voltage ripple is 200 mV peak-to-peak at 0 MHz to 20 MHz.

### 2.4.4. Power Consumption

Table 28: Single Supply Current Consumption @ 12 V with AVX2 Load

| Processor | State        | RMS    | Peak   |
|-----------|--------------|--------|--------|
| E-2176M   | Turbo Boost  | 13.0 A | 18.8 A |
|           | Steady State | 6.0 A  | 7.3 A  |
| i5-8400H  | Turbo Boost  | 10.0 A | 14.2 A |
|           | Steady State | 6.0 A  | 7.7 A  |
| i7-8850H  | Turbo Boost  | 11.6 A | 18.0 A |
|           | Steady State | 5.8 A  | 7.4 A  |



For Information on detailed power consumption measurements in all states and benchmarks for CPU, graphics and memory performance, see Application Note at EMD Customer Section.

Table 29: Power Supply and Management

| Criteria            | Description                                                                                                                                                                                                                            |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Suspend Modes       | S0 Normal Operation<br>S3 Suspend to RAM<br>S4 Suspend to Disk (OS Hibernate mode)<br>S5 Soft Off<br>S5eco Mode (optional as untested feat.)                                                                                           |
| Single Supply       | Wide range input 8.5-20 V (for commercial temperature range)<br>12 V only (for EXT/E2S variants)                                                                                                                                       |
| ATX Mode            | 12 V VCC + 5 VSB<br>5 VSB not mandatory for operation                                                                                                                                                                                  |
| Power Supply Limits | Voltage Ripple maximum 200 mV peak to peak at 0-20 MHz<br>0.1 to 20 ms rise time from input voltage $\leq 10\%$ to nominal VCC<br>2 A max inrush current peak on 5 VSB<br>Inrush current peak limit. G3/S5 to S0 acc. SFX Design Guide |
| Power Features      | Module shall power on automatically in single supply operation when VCC is connected (with correct BIOS settings)<br>Kontron Rapid Shutdown feature (for R E2S variants)                                                               |
| LID and Sleep       | LID and Sleep signal for external Sleep button and LID switch                                                                                                                                                                          |

## 2.4.5. Power Management

Power management options are available within the BIOS setup.

**Table 30: Power Management Options**

| Feature                        | Remark                       |
|--------------------------------|------------------------------|
| ACPI Settings                  | ACPI 6.0                     |
| Miscellaneous Power Management | Supported in BIOS setup menu |

Within the BIOS setup If VCC power is removed, 5 V  $\pm$  5 % can be applied to the V\_5V\_STBY pins to support the following suspend-states:

- ▶ Suspend to RAM (S3)
- ▶ Suspend-to-disk / Hibernate (S4)
- ▶ Soft-off state (S5)

The Wake-Up event (S0) requires VCC power, as the board is running.

## 2.4.6. Power Supply Control Settings

The following table provides a description of the COMe-bCL6's power supply control settings.

**Table 31: Power Supply Control Settings**

| Feature                   | Pin | Remark                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power Button (PWRBTN#)    | B12 | To start the module using the power button, the PWRBTN# signal must be at least 50 ms ( $50\text{ ms} \leq t < 4\text{ s}$ , typical 400 ms) at low level (Power Button Event). Pressing the power button for at least four seconds turns off power to the module (Power Button Override).                                                                                        |
| Power Good (PWR_OK)       | B24 | PWR_OK is internally pulled up to 3.3 V and must be at the high level to power on the module. This can be driven low to hold the module from powering up as long as needed. The carrier needs to release the signal when ready.<br><br>Low level prevents the COM3-module from entering the S0 state. A falling edge during S0 will cause a direct switch to S5 (Power Failure).  |
| Reset Button (SYS_RESET#) | B49 | When the SYS_RESET# pin is detected active (falling edge triggered), it allows the processor to perform a "graceful" reset, by waiting up to 25 ms for the SMBus to go idle before forcing a reset, even though activity is still occurring. Once the reset is asserted, it remains asserted for 5 ms to 6 ms regardless of whether the SYS_RESET# input remains asserted or not. |
| SM-Bus Alert (SMB_ALERT#) | B15 | With an external battery manager present and SMB_ALERT #connected, the module always powers on even if the BIOS switch "After Power Fail" is set to "Stay Off".                                                                                                                                                                                                                   |

## 2.4.7. Power Supply Modes

### 2.4.7.1. ATX Mode

By connecting an ATX power supply with VCC and 5 VSB, PWR\_OK is set to low and VCC is off. Pressing the power button sets the ATX PSU setting PWR\_OK to high and powers VCC. The PS\_ON# signal generated by SUS\_S3# (A15) indicates that the system is in Suspend to RAM state. An inverted copy of SUS\_S3# on the carrier board may be used to enable non-standby power on a typical ATX supply.

The input voltage must always be higher than 5 V Standby (VCC > 5 VSB) on Computer-on-Modules supporting a wide input voltage range down to 4.75 V.

**Table 32: ATX Mode Settings**

| State   | PWRBTN#      | PWR_OK     | V5_StdBy | PS_ON#     | VCC       |
|---------|--------------|------------|----------|------------|-----------|
| G3      | x            | x          | 0V       | x          | 0V        |
| S5      | high         | low        | 5V       | high       | 0V        |
| S5 → S0 | PWRBTN Event | low → high | 5V       | high → low | 0 V → VCC |
| S0      | high         | high       | 5V       | low        | VCC       |

(x) – Defines that there is no difference if connected or open.

### 2.4.7.2. Single Supply Mode

In single supply mode, without 5V standby the module starts automatically when VCC power is connected and Power Good input is open or at high level (internal PU to 3.3 V). PS\_ON# is not used in this mode and VCC can be 8.5 V to 20 V.

To power on the module from the S5 state, press the power button or reconnect VCC. Suspend/Standby states are not supported in single supply mode.

**Table 33: Single Supply Mode Settings**

| State   | PWRBTN#      | PWR_OK      | V5_StdBy | VCC              |
|---------|--------------|-------------|----------|------------------|
| G3      | 0V/x         | 0V/x        | 0V/x     | 0V/x             |
| G3 → S0 | high         | open / high | open     | connecting VCC   |
| S5      | high         | open / high | open     | VCC              |
| S5 → S0 | PWRBTN event | open / high | open     | reconnecting VCC |

(x) – Defines that there is no difference if connected or open.




---

All ground pins must be connected to the carrier board's ground plane.

---

## 2.5. Thermal Management

### 2.5.1. Heatspreader and Cooling Solutions

A heatspreader plate assembly is available from Kontron for the COMe-bCL6. The heatspreader plate on top of this assembly is NOT a heat sink. The heatspreader works as a COM Express® standard thermal interface to be use with a heat sink or external cooling devices.

External cooling must be provided to maintain the heatspreader plate at proper operating temperatures. Under worst-case conditions, the cooling mechanism must maintain an ambient air temperature and the heatspreader plate's surface temperature must remain under the maximum temperature range.

You can use many thermal-management solutions with heatspreader plates, including active and passive approaches.

The optimum cooling solution varies, depending on the COM Express® application and environmental conditions. Active or passive cooling solutions provided from Kontron for the COMe-bCL6 are usually designed to cover the power and thermal dissipation for a commercial temperature range used in housing with proper airflow.

### 2.5.2. Operating with Kontron Heatspreader Plate (HSP) Assembly

The operating temperature defines two requirements:

- ▶ Maximum ambient temperature with ambient being the air surrounding the module
- ▶ Maximum measurable temperature on any spot on the heatspreader's surface

The heatspreader is tested for the following temperature specifications.

**Table 34: Heatspreader Test Temperature Specifications**

| Temperature Specification           | Validation requirements                                                                             |
|-------------------------------------|-----------------------------------------------------------------------------------------------------|
| Commercial Grade                    | at 60°C HSP temperature the CPU @ 100% load needs to run at nominal frequency                       |
| Extended Temperature (E1)           | at 75°C HSP temperature the CPU @ 75% load is allowed to start speedstepping for thermal protection |
| Industrial Grade by screening (E2S) | at 85°C HSP temperature the CPU @ 50% load is allowed to start throttling for thermal protection    |

### 2.5.3. Operating without Kontron Heatspreader Plate Assembly

The operating temperature is the maximum measurable temperature on any spot on the module's surface.

### 2.5.4. On-board Fan Connector

The modules 3-pin fan connector powers, controls and monitors a fan for chassis ventilation.

Fan connector specification:

- ▶ Part number (Molex) J3: 53261-0371
- ▶ Mates with: 51021-0300
- ▶ Crimp terminals: 50079-8100

**Table 35: 3-Pin Fan Connector Pin Assignment:**

| Pin | Signal       | Description                                                | Type |
|-----|--------------|------------------------------------------------------------|------|
| 1   | Fan_Tach_IN# | Input voltage                                              | I    |
| 2   | V_FAN        | Limited to a max. 12 V (±10%) across the whole input range | PWR  |

| Pin | Signal | Description | Type |
|-----|--------|-------------|------|
| 3   | GND    | Power GND   | PWR  |

To connect a standard 3-pin connector fan to the module, use one of the following adaptor cables:

- ▶ KAB-HSP 200 mm (PN 96079-0000-00-0)
- ▶ KAB-HSP 40 mm (PN 96079-0000-00-2)

If the input voltage is below 13 V, the maximum supply current to the on-module fan connector is 350 mA. The maximum supply current is limited to 150 mA if the input voltage is between 13 V and 20 V.

### NOTICE

Always check the fan specification according to the limitations of the output current.

Table 36: Electrical Characteristics of the Fan Connector

| Fan Power Supply     | Input Voltage Range | Input Voltage Range |
|----------------------|---------------------|---------------------|
| Module Input Voltage | 4.75 V to 13 V      | 13 V to 20 V        |
| Fan Output Voltage   | 4.75 V to 13 V      | 12 V (+/- 10%)      |
| Fan Output Current   | 350 mA maximum      | 150 mA              |

To connect a standard 3-pin connector fan to the module, use one of the following adaptor cables:

- ▶ KAB-HSP 200 mm (PN 96079-0000-00-0)
- ▶ KAB-HSP 40 mm (PN 96079-0000-00-2)

## 2.6. Environmental Specification

### 2.6.1. Temperature

Kontron defines the following temperature grades for Computer-on-Modules. For more information on the available temperature grades for the COMe-bCL6, see Chapter 2.1 Module Variants.

Table 37: Temperature Grade Specifications

| Temperature Grades                     | Operating                     | Storage<br>(Non-operating) | Validated Input<br>Voltage |
|----------------------------------------|-------------------------------|----------------------------|----------------------------|
| Extended Temperature (E1)              | -25°C to +75°C                | -30°C to +85°C             | VCC: 12 V                  |
| Industrial Grade by Screening<br>(E2S) | -40°C to +85°C<br>(or custom) | -40°C to +85°C             | VCC: 12 V                  |

### 2.6.2. Humidity

Table 38: Humidity Specifications

| Humidity                                                 |
|----------------------------------------------------------|
| 93% at 40°C non-condensing (according to IEC 60068-2-78) |

## 2.7. Standards and Certifications

The COMe-bCL6 complies with the following standards and certifications. All Peripheral interfaces intended for connection to external equipment are ESD/EMI protected.

**Table 39: Standards and Certifications**

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Emission (EMC)</b>   | <p>EN55032:2015 Class B<br/>Information technology equipment, radio disturbance characteristics- limits and methods of measurement</p> <p>IEC 61000-6-3 :2006 + A1:2010 + AC: 2011 / EN 61000-6-3 :2007 + A1:2011 + AC:2012<br/>EMC generic emissions standard for residential commercial and light industrial environments</p>                                                                                                                                                                                                                                                                  |
| <b>Immunity (EMI)</b>   | <p>IEC / EN 61000-6-2 : 2005<br/>EMC generic standards immunity for industrial environments<br/>Includes the following tests:</p> <p>IEC / EN 61000-4-2 - Electrostatic discharge immunity ESD<br/>IEC / EN 61000-4-3 - Radiated field immunity<br/>IEC / EN 61000-4-4 - Electrical fast transient/burst (EFT) burst<br/>IEC / EN 61000-4-5 - Surge immunity test<br/>IEC / EN 61000-4-6 - Immunity to conducted disturbances<br/>IEC / EN 61000-4-8 - Power frequency magnetic field Immunity<br/>IEC / EN 61000-4-11 - Voltage dips, short interruptions, &amp; voltage variation immunity</p> |
| <b>Safety</b>           | <p>EN 62368-1:2014<br/>Safety for audio/video and information technology equipment</p> <p>UL 60950-1 / CSA 60950-1<br/>Information Technology Equipment Including Electrical Business Equipment</p> <ul style="list-style-type: none"> <li>▶ NWGQ2.E304278</li> <li>▶ NWGQ8.E304278</li> </ul>                                                                                                                                                                                                                                                                                                   |
| <b>Shock</b>            | <p>IEC / EN 60068-2-27<br/>Non-operating shock test – (half-sinusoidal, 11 ms, 15 g)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Vibration</b>        | <p>IEC / EN 60068-2-6<br/>Non-operating vibration – (sinusoidal, 10 Hz – 4000 Hz, +/- 0.15 mm, 2 g)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Theoretical MTBF</b> | <p>560342 h @ 40°C<br/>Reliability report article number 68006-0000-58-9</p> <p>For more details, see Chapter 2.8 MTBF.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>(RoHS II)</b>        | <p>2011/65/EU<br/>Compliant with the directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment</p>                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## 2.8. MTBF

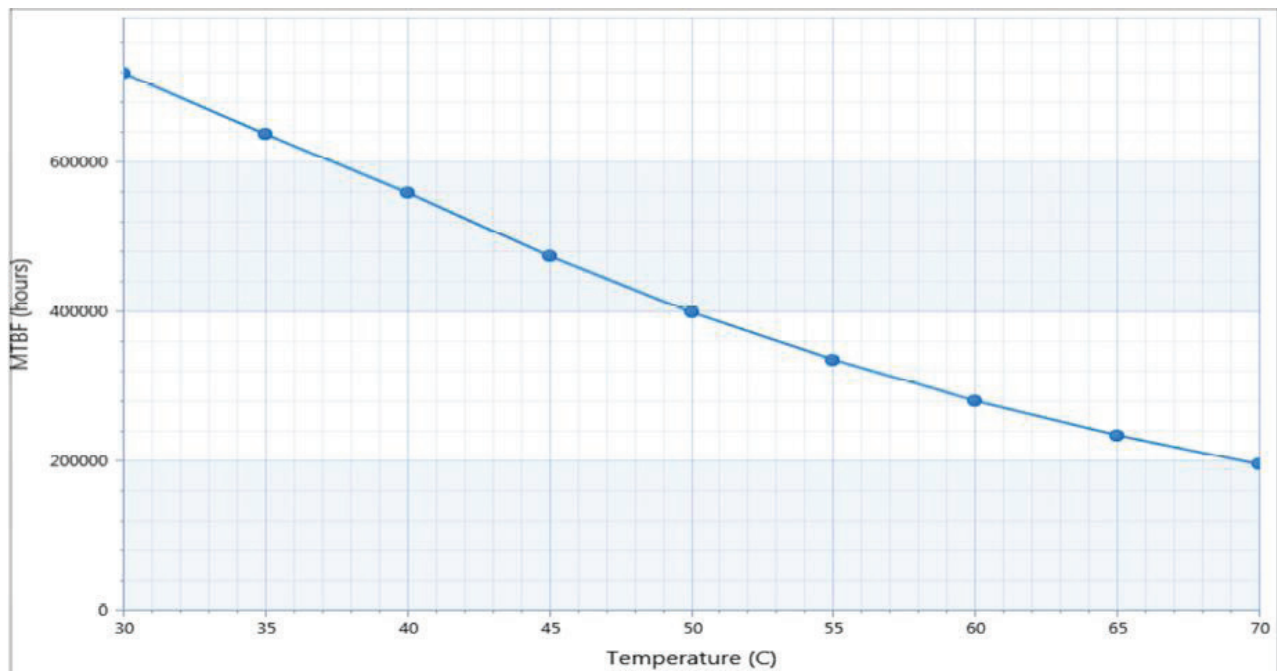
The following MTBF (Mean Time Before Failure) values were calculated using a combination of manufacturer's test data, if the data was available, and the Telcordia (Bellcore) issue 2 calculation for the remaining parts.

The Telcordia calculation used is "Method 1 Case 3" in a ground benign, controlled environment (GB,GC). This particular method takes into account varying temperature and stress data and the system is assumed to have not been burned in.

Figure 2 below shows MTBF de-rating for the E1 temperature range in an office or telecommunications environment. Other environmental stresses (such as extreme altitude, vibration, salt-water exposure) lower MTBF values.

System MTBF (hours) = 467598 h @ 40°C (Reliability report article number 68006-0000-58-9)

Figure 40: MTBF Temperature de-Rating



The above estimates assume no fan, but a passive heat sinking arrangement. Estimated RTC battery life (as opposed to battery failures) is not accounted for in the above figure and needs to be considered separately. Battery life depends on both temperature and operating conditions. When the Kontron unit has external power, the only battery drain is from leakage paths.

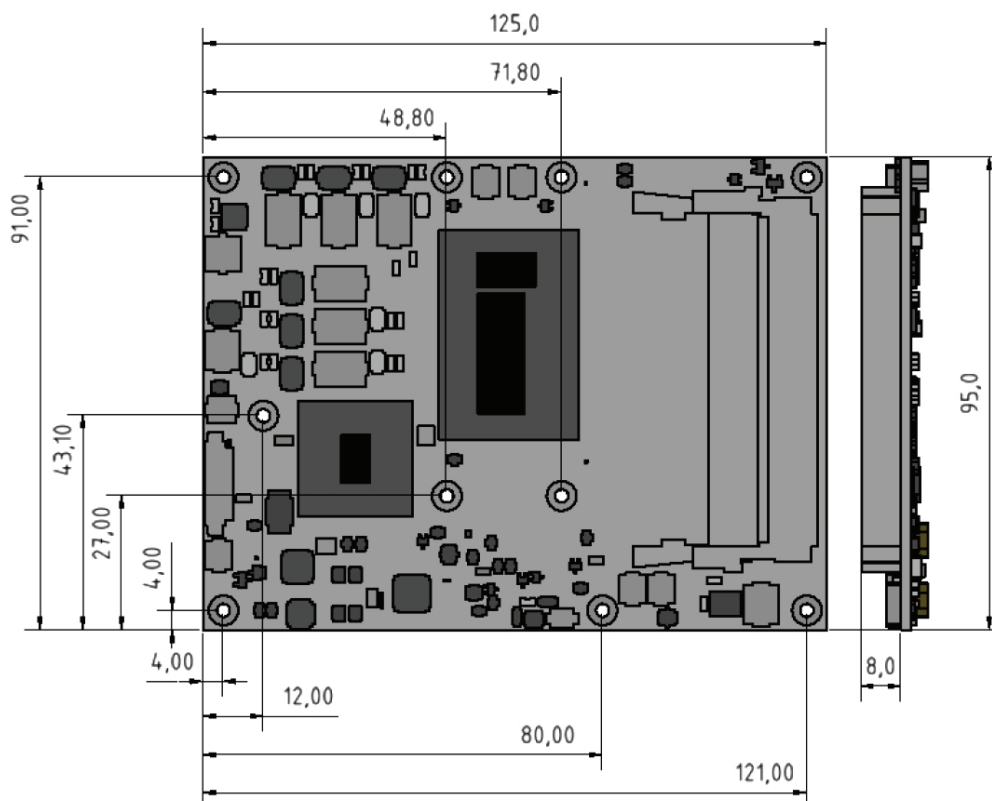
## 2.9. Mechanical Specification

### 2.9.1. Dimensions

The dimensions of the module are:

- ▶ 95.0 mm x 125.0 mm (3.75 " x 4.92 ")

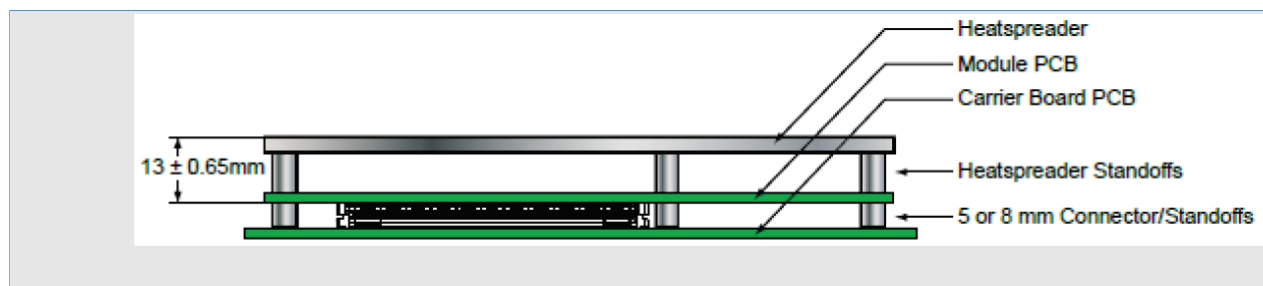
Figure 4: Module Dimensions



### 2.9.2. Height

The COM Express® specification defines a module height of approximately 13 mm from module PCB bottom to heatspreader top, as shown in the figure below.

Figure 5: Module Height



Cooling solutions provided by Kontron for basic sized Computer-on-Modules are 27 mm in height from module bottom to heatsink top. Universal Cooling solutions to be mounted on the heatspreader are 14.3 mm in height for an overall height of 27.3 mm from module bottom to heatsink top.

## 3/ Features and Interfaces

### 3.1. LPC

The Low Pin Count (LPC) Interface signals are connected to the LPC Bus bridge located in the CPU or chipset. The LPC low speed interface can be used for peripheral circuits such as an external Super I/O Controller that typically combines legacy-device support into a single IC. The implementation of this subsystem complies with the COM Express® Specification. The COM Express® Design Guide maintained by PICMG provides implementation information or refer to the official PICMG documentation for more information.

The LPC bus does not support DMA (Direct Memory Access). When more than one device is used on LPC, a zero delay clock buffer is required. This leads to limitations for ISA bus and SIO (standard I/O(s) like floppy or LPT interfaces) implementations.

All Kontron COM Express® Computer-on-Modules imply BIOS support for the following external baseboard LPC Super I/O controller features for the Winbond/Nuvoton 83627DHG-P.

**Table 41: Supported BIOS Features**

| 3.3V 83627DHG-P | AMI EFI APTIO V |
|-----------------|-----------------|
| PS/2            | Not specified   |
| COM1/COM2       | Supported       |
| LPT             | Supported       |
| HWM             | Not supported   |
| Floppy          | Not supported   |
| GPIO            | Not supported   |

Features marked as not supported do not exclude OS support (e.g., HWM is accessible via SMB). If any other LPC Super I/O additional BIOS implementations are necessary, contact Kontron Support.

### 3.2. Serial Peripheral Interface (SPI)

The Serial Peripheral Interface Bus (SPI bus) is a synchronous serial data link standard. Devices communicate in master/slave mode, where the master device initiates the data frame. Multiple slave devices are allowed with individual slave select (chip select) lines. SPI is sometimes called a four-wire serial bus, contrasting with three, two and one-wire serial buses.



The SPI interface can only be used with a SPI flash device to boot from the external BIOS on the baseboard.

#### 3.2.1. SPI boot

The COMe-bCL6 supports boot from a 16 MB 3V serial external SPI Flash. Pin A34 (BIOS\_DIS0#) and pin B88 (BIOS\_DIS1#) configure the SPI Flash as follows:

**Table 42: SPI Boot Pin Configuration**

| Configuration | BIOS_DIS0# | BIOS_DIS1# | Function              |
|---------------|------------|------------|-----------------------|
| 1             | open       | open       | Boot on module BIOS   |
| 2             | GND        | open       | Not supported         |
| 3             | open       | GND        | Boot on baseboard SPI |
| 4             | GND        | GND        | Not supported         |



BIOS does not support being split between two chips. Booting takes place either from the module SPI or from the baseboard SPI.

The following table provides a list of supported SPI Boot Flash types for the 8-SOIC package.

**Table 43: Supported SPI Boot Flash Types for 8-SOIC Package**

| Size  | Manufacturer | Part Number | Device ID |
|-------|--------------|-------------|-----------|
| 16 MB | Maxim        | MX25L12835F | 0x20      |
| 16 MB | Winbond      | W25Q128FV   | 0x40      |
| 16 MB | Micron       | N25Q128A    | 0xBA      |
| 16 MB | ISSI         | IS25LP128   | 0x60      |

### 3.2.2. Using an External SPI Flash

Initially, boot on the EFI Shell with an USB key containing the binary used to flash the SPI, plugged in on the system.

Depending on which SPI you would like to flash, you will need to use the (BIOS\_DIS1) jumper located on the carrier Topanga Canyon Type 6 ( J27).

To flash the carrier or module Flash chip:

1. Connect a SPI flash with the correct size (similar to BIOS binary (\*.BIN) file size) to the carrier SPI interface.
2. Open pin A34 (BIOS\_DIS0#) and pin B88 (BIOS\_DIS1#) to boot from the module BIOS.
3. Turn on the system and make sure your USB is connected then start the setup. (See Chapter 6.1 Starting the uEFI BIOS).
4. Check that the following entries are set to their default setting:

**Advanced > PCH FW Configuration > Firmware update configuration > ME FW Image Re-Flash > Disabled**

**Advanced > PCH FW Configuration > Firmware update configuration > Local FW Update > Enabled**

Then, change the setup option:

**Chipset > PCH-IO Configuration > BIOS Security Configuration > BIOS Lock > Disabled**

5. Save and exit setup.
6. Reboot system into EFI shell.
7. Connect pin B88 (BIOS\_DIS1#) to ground to enable the external SPI flash.
8. From the EFI shell, enter the name of the partition of your USB Key in this example; Hit F50: then enter.
9. Type `fpt -SAVEMAC -F BCL6R<xxx>.bin`
10. Wait until the program ends properly and then power cycle the whole system.

The system is now updated.



Depending on the state of the external SPI flash, the program may display up to two warning messages printed in red. Do not stop the process at this point! After a few seconds of timeout, flashing proceeds. For more information, refer to the [EMD Customer Section](#).

### 3.2.3. External SPI flash on Modules with Intel® ME – in the PRD

If booting from the external (baseboard mounted) SPI flash then exchanging the COM Express® module for another module of the same type will cause the Intel® Management Engine (ME) to fail during the next start. This is due to the design of the ME that bounds itself to every module to which it was previously flashed. In the case of an external SPI flash, this is the module present at flash time.

To avoid this issue, conduct a complete flash of the external SPI flash device after changing the COM Express® module for another module. If disconnecting and reconnecting the same module again, this step is not necessary.

### 3.2.4. External BIOS ROM Support/SPI

Boot SPI0 is routed to COMe connector. BOM option allows general purpose SPI (GSPI0) to be connected to COMe instead. COMe-bCL6 supports on-module and off-module boot from SPI. For additional safety, a second on-module SPI flash can be populated on the board on customer request.

## 3.3. M.A.R.S.

The smart battery implementation for Kontron Computer-on-Modules called Mobile Application for Rechargeable Systems (M.A.R.S.) is a BIOS extension for an external smart battery manager or charger. M.A.R.S. includes support for a SMBus charger/selector (e.g. Linear Technology LTC1760 Dual Smart Battery System Manager) and provides ACPI compatibility to report battery information to the operating system.

**Table 44: Reserved SM-Bus Addresses for Smart Battery Solutions on the Carrier**

| 8-bit Address | 7-bit Address | Device         |
|---------------|---------------|----------------|
| 12h           | 0x09          | SMART_CHARGER  |
| 14h           | 0x0A          | SMART_SELECTOR |
| 16h           | 0x0B          | SMART_BATTERY  |

## 3.4. Fast I2C

Fast I2C supports transfer between components on the same board. The COMe-bCL6 features an on-board I2C controller connected to the LPC Bus.

The I2C controller supports:

- ▶ Multimaster transfers
- ▶ Clock stretching
- ▶ Collision detection
- ▶ Interruption on completion of an operation

## 3.5. UART

The UART implements an interface for serial communications and supports up to two serial RX/TX ports defined in the COM Express® specification on pin A98 (SER0\_TX) and pin A99 (SER0\_RX) for UART0, and pin A101 (SER1\_TX) and pin A102 (SER1\_RX) for UART1. The UART controller is fully 16550A compatible.

UART features are:

- ▶ On-Chip bit rate ( baud rate) generator
- ▶ No handshake lines
- ▶ Interrupt function to the host
- ▶ FIFO buffer for incoming and outgoing data

## 3.6. Triple Staged Watchdog Timer (WDT)

### 3.6.1. Basics

A watchdog timer or (computer operating properly (COP) timer) is a computer hardware or software timer. If there is a fault condition in the main program, the watchdog triggers a system reset or other corrective actions. The intention is to bring the system back from the nonresponsive state to normal operation.

Possible fault conditions are a hang, or neglecting to service the watchdog regularly. Such as writing a "service pulse" to it, also referred to as "kicking the dog", "petting the dog", "feeding the watchdog" or "triggering the watchdog".

The COMe-bCL6 offers a watchdog that works with three stages that can be programmed independently and used stage by stage.

**Table 45: Triple Stage Watchdog Timer- Time-out Events**

|       |                           |                                                                                                                                                                                                                                                                                |
|-------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0000b | No action                 | The stage is off and will be skipped.                                                                                                                                                                                                                                          |
| 0001b | Reset                     | A reset restarts the module and starts a new POST and operating system.                                                                                                                                                                                                        |
| 0010b | NMI                       | A non-maskable interrupt (NMI) is a computer processor interrupt that cannot be ignored by standard interrupt masking techniques in the system. It is used typically to signal attention for non-recoverable hardware errors.                                                  |
| 0011b | SMI                       | A system management interrupt (SMI) makes the processor entering the system management mode (SMM). As such, specific BIOS code handles the interrupt. The current BIOS handler for the watchdog SMI currently does nothing. For special requirements, contact Kontron Support. |
| 0100b | SCI                       | A system control interrupt (SCI) is a OS-visible interrupt to be handled by the OS using AML code.                                                                                                                                                                             |
| 0101b | Delay -> No action*       | Might be necessary when an operating system must be started and the time for the first trigger pulse must be extended. Only available in the first stage.                                                                                                                      |
| 1000b | WDT Only                  | This setting triggers the WDT Pin on the baseboard connector (COM Express® pin B27) only.                                                                                                                                                                                      |
| 1001b | Reset + WDT               |                                                                                                                                                                                                                                                                                |
| 1010b | NMI + WDT                 |                                                                                                                                                                                                                                                                                |
| 1011b | SMI + WDT                 |                                                                                                                                                                                                                                                                                |
| 1100b | SCI + WDT                 |                                                                                                                                                                                                                                                                                |
| 1101b | DELAY + WDT -> No action* |                                                                                                                                                                                                                                                                                |

### 3.6.2. WDT Signal

Watchdog time-out event (pin B27) on COM Express® connector offers a signal that can be asserted when a watchdog timer has not been triggered with a set time. The WDT signal is configurable to any of the three stages. After reset, the signal is automatically deactivated. If deactivation is necessary during runtime, Contact Kontron Support for further help.

### 3.7. Real Time Clock (RTC)

The RTC keeps track of the current time accurately. The RTC's low power consumption means that the RTC can be powered from an alternate source of power enabling the RTC to continue to keep time while the primary source of power is off or unavailable. The COMe-bCL6's RTC battery voltage range is 2.5 V to 3.3 V.

### 3.8. Kontron Security Solution APPROTECT

Kontron APPROTECT is a combined hardware and software solution that includes an embedded hardware security chip on and a software framework to provide full protection for your application. The security solution is connected to PCH USB2 Port 9. The COMe-bCL6 includes an integrated security module connected to USB2 Port 9, supporting the following features:

- ▶ Copy protection
- ▶ IP protection
- ▶ License model enforcement

If required, customers can customize the solution to meet specific needs. For more information, contact Kontron Support.

## 4/ System Resources

### 4.1. Memory Area

The following table specifies the memory address range and COMe-bCL6 memory usage.

**Table 46: Designated memory Locations**

| Address Range (hex) | Size        | Project Usage                           |
|---------------------|-------------|-----------------------------------------|
| Address range (hex) | Size        | Project usage                           |
| 00000000-0009FBFF   | 639 KB      | DOS- (Real mode-) memory                |
| 0009FC00-0009FFFF   | 1 KB        | Extended BDA                            |
| 000A0000-000BFFFF   | 128 KB      | Display memory (legacy)                 |
| 000C0000-000CBFFF   | 48 KB       | VGA BIOS (legacy)                       |
| 000CC000-000DFFFF   | 80 KB       | Option ROM or XMS (legacy)              |
| 000E0000-000EFFFF   | 64 KB       | System BIOS extended space (legacy)     |
| 000F0000-000FFFFF   | 64 KB       | System BIOS base segment (legacy)       |
|                     |             |                                         |
| 00100000-76FFFFFF   | 118 MB      | System memory (Low DRAM)                |
|                     |             |                                         |
| 77000000-77FFFFFF   | 1 MB        | SMM region                              |
| 78000000-7FFFFFFF   | 8 MB        | VGA memory                              |
| 80000000-FFF00000   | 2 GB – 1 MB | PCI memory, other extensions (Low MMIO) |
| TOLUD               |             |                                         |
| E0000000-EFFFFFFF   | 256 MB      | PCIe Configuration space                |
| F0000000-FEBFFFFF   | 236 MB      | DMI interface (subtractive decoding)    |
|                     |             |                                         |
| FEC00000-FEC7FFFF   | 500 KB      | IOxAPIC                                 |
| FEC80000-FECFFFFFF  | 500 KB      | Local (CPU) APIC                        |
|                     |             |                                         |
| FED0x000-FED0x3FF   | 1 KB        | HPET (x=0,1,2,3); x is BIOS defined     |
| FED40000-FED47FFF   | 32 KB       | TPM and Trusted Mobile KBC              |
| FED4C000-FED4FFFF   | 16 KB       | PCH internal                            |
| FED50000-FED5FFFF   | 64 KB       | Intel ME                                |
| FED70000-FED74FFF   | 20 KB       | Internal security device                |
| FEE00000-FEEFFFFFF  | 1 MB        | MSI interrupts                          |
| FEF00000-FFDFFFFF   | 15 MB       | DMI interface (subtractive decoding)    |
| FFE00000-FFFFFFFF   | 2 MB        | High BIOS / Boot vector                 |
|                     |             |                                         |
| 10000000-17FFFFFF   | 2 GB        | System memory (High DRAM)               |
| 180000000-F00000000 | 58 GB       | High MMIO                               |

## 4.2. I/O Address Map

The I/O port addresses of the COMe-bCL6 are functionally identical to a standard PC/AT. All addresses not mentioned in this table should be available. We recommend that you do not use I/O addresses below 0100h with additional hardware for compatibility reasons, even if the I/O address is available.

**Table 47: Designated I/O Port Addresses**

| I/O Address Range                                                                           | General Usage                           | Project Usage                                                                                                     |
|---------------------------------------------------------------------------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| 000-01F                                                                                     | DMA-Controller (Master) (ex 8237)       | 000h-008h DMA-Controller 009h-00Eh reserved<br>00Fh-018h DMA-Controller 019h-01Eh reserved<br>01Fh DMA-Controller |
| 020-021,<br>024-025,<br>028-029,<br>02C-02D,<br>030-031,<br>034-035,<br>038-039,<br>03C-03D | Interrupt-Controller (Master)(ex 8259)  | Interrupt-Controller                                                                                              |
| 02E-02F                                                                                     | SuperIO (Winbond)                       | External SuperIO (Winbond)                                                                                        |
| 040-043,<br>050-053                                                                         | Programmable Interrupt Timer (ex 8254)  | 040h-042h Timer/Counter 043h reserved<br>040h-042h Timer/Counter 053h reserved                                    |
|                                                                                             |                                         |                                                                                                                   |
| 04E-04F                                                                                     | 2 <sup>nd</sup> SuperIO (Winbond etc)   | None                                                                                                              |
| 060, 064                                                                                    | KBD Interface-Controller (ex 8042)      | Microcontroller                                                                                                   |
| 061, 063,<br>065, 067                                                                       | NMI Controller                          | 061h NMI Controller                                                                                               |
| 062, 066                                                                                    | Embedded Microcontroller                | Microcontroller                                                                                                   |
| 070-073                                                                                     | RTC CMOS / NMI mask + RTC extended CMOS | 070h reserved<br>071h-077h RTC CMOS / NMI mask                                                                    |
| 080                                                                                         | Debug port                              | Debug port                                                                                                        |
| 081-091                                                                                     | DMA controller, LPC, PCI, or PCIe       | DMA controller, LPC, PCI, or PCIe                                                                                 |
| 092                                                                                         | Reset-Generator                         | Reset-Generator                                                                                                   |
| 093-09F                                                                                     | DMA controller                          | DMA controller                                                                                                    |
| 0A0-0A1,<br>0A4-0A5,<br>0A8-0A9,<br>0AC-0AD,<br>0B0-0B1,<br>0B4-0B5,<br>0B8-0B9,<br>0BC-0BD | Interrupt-Controller (Slave) (ex 8259)  | Interrupt-Controller                                                                                              |
| 0B2-0B3                                                                                     | APM control                             | Power management                                                                                                  |
| 0C0-0DF                                                                                     | DMA-Controller (Slave) (ex 8237)        | 0C0h-0D1h DMA controller 0D2h-0DDh reserved<br>0DEh-0DFh DMA controller                                           |
| 0F0-0FF                                                                                     | FPU (N/A)                               | #FERR / Interrupt controller                                                                                      |
| 170-177                                                                                     | HDD-Controller IDE1 Master              | SATA controller, PCI, or PCIe                                                                                     |
| 1F0-1F7                                                                                     | HDD-Controller IDE0 Master              | SATA controller, PCI, or PCIe                                                                                     |

| I/O Address Range | General Usage                      | Project Usage                                                  |
|-------------------|------------------------------------|----------------------------------------------------------------|
| 200-207           | Gameport Low                       | Gameport Low                                                   |
| 208-20F           | Gameport High                      | Gameport High                                                  |
| 220-22F           | Soundblaster®                      | Not used                                                       |
| 279               | ISA PnP                            | Not used                                                       |
| 278-27F           | Parallel port LPT2                 | Not used                                                       |
| 295-296           | Hardware monitor (Winbond default) | Hardware monitor on base board if SuperIO present (optional)   |
| 2B0-2BF           | EGA                                | Not used                                                       |
| 2D0-2DF           | EGA                                | Not used                                                       |
| 2E8-2EF           | Serial port COM 4                  | Serial port COM4 (optional)                                    |
| 2F8-2FF           | Serial port COM 2                  | Serial port COM2                                               |
| 300-301           | MIDI                               | Not used                                                       |
| 300-31F           | System specific peripherals        | Not used                                                       |
| 370-377           | Floppy disk controller             | Optionally used by external (baseboard) SuperIO (370h to 371h) |
| 376-377           | HDD-Controller IDE1 Slave          | SATA controller, PCI, or PCIe                                  |
| 378-37F           | Parallel port LPT 1                | LPT1 (if SuperIO present)                                      |
| 3B0-3BB           | VGA                                | VGA (optional)                                                 |
| 3BC-3BF           | Parallel port LPT3                 | Not used                                                       |
| 3C0-3CF           | VGA/EGA                            | VGA/EGA                                                        |
| 3D0-3DF           | CGA                                | VGA (optional)                                                 |
| 3E0-3E1           | PCMCIA ExCA interface              | Not used                                                       |
| 3E8-3EF           | Serial port COM3                   | Serial port COM3 (optional)                                    |
| 3F0-3F7           | Floppy Disk Controller             | Not used                                                       |
| 3F6-3F7           | HDD controller IDE0 Slave          | SATA controller, PCI, or PCIe                                  |
| 3F8-3FF           | Serial Port COM1                   | Serial port COM1                                               |
|                   |                                    |                                                                |
| 4D0-4D1           | Interrupt-Controller (Slave)       | Interrupt-Controller (Slave)                                   |
|                   |                                    |                                                                |
| A80-A81           | Kontron CPLD                       | Kontron CPLD control+data port                                 |
| CF8               | PCI configuration address          | PCI configuration address                                      |
| CF9               | Reset control                      | Reset control                                                  |
| CFC-CFF           | PCI configuration data             | PCI configuration data                                         |



Other PCI device I/O addresses are allocated dynamically and not listed here. For more information on how to determine I/O address usage, refer to the OS documentation.

### 4.3. Legacy Interrupt (IRQ) lines

The following table specifies the Interrupt lines and the device connected to the Interrupt line. It also states which Interrupt lines are available for new devices.

**Table 48: List of Interrupt Requests**

| IRQ | General Usage            | Project Usage             |
|-----|--------------------------|---------------------------|
| 0   | Timer                    | Timer                     |
| 1   | Keyboard                 | Keyboard (SuperIO)        |
| 2   | Redirected secondary PIC | Redirected secondary PIC  |
| 3   | COM2                     | COM2                      |
| 4   | COM1                     | COM1                      |
| 5   | LPT2/PCI devices         | One of COM3+4             |
| 6   | FDD                      | One of COM3+4 or not used |
| 7   | LPT1                     | LPT1 or one of COM3+4     |
| 8   | RTC                      | RTC                       |
| 9   | SCI / PCI devices        | Free for PCI devices      |
| 10  | PCI devices              | Free for PCI devices      |
| 11  | PCI devices              | Free for PCI devices      |
| 12  | PS/2 mouse               | Free for PCI devices      |
| 13  | FPU                      | FPU                       |
| 14  | IDE0                     | Not used                  |
| 15  | IDE1                     | Not used                  |

### 4.4. Peripheral Component Interconnect (PCI) Devices

All devices follow the Peripheral Component Interconnect 2.3 (PCI 2.3) and PCI Express Base 1.0a specification. The BIOS and Operating Software (OS) control the memory and I/O resources. For more information, refer to the PCI 2.3 specification.

### 4.5. I2C Bus

The following table provides details of the devices connected the I2C Bus and the I2C address

**Table 49: I2C Bus Port Addresses**

| I2C Address | Used For    | Available | Comment                          |
|-------------|-------------|-----------|----------------------------------|
| 58h         |             | No        | Internally reserved              |
| A0h         | JIDA-EEPROM | No        | Module EEPROM                    |
| AEnh        | FRU-EEPROM  | No        | Recommended for Baseboard EEPROM |

## 4.6. System Management (SM) Bus

The 8-bit SMBus address uses the LSB (Bit 0) for the direction of the device.

- ▶ Bit0 = 0 defines the write address
- ▶ Bit0 = 1 defines the read address

The 8-bit address listed below shows the write address for all devices. The 7-bit SMBus address shows the device address without bit0.

**Table 50: Designated I/O Port Addresses**

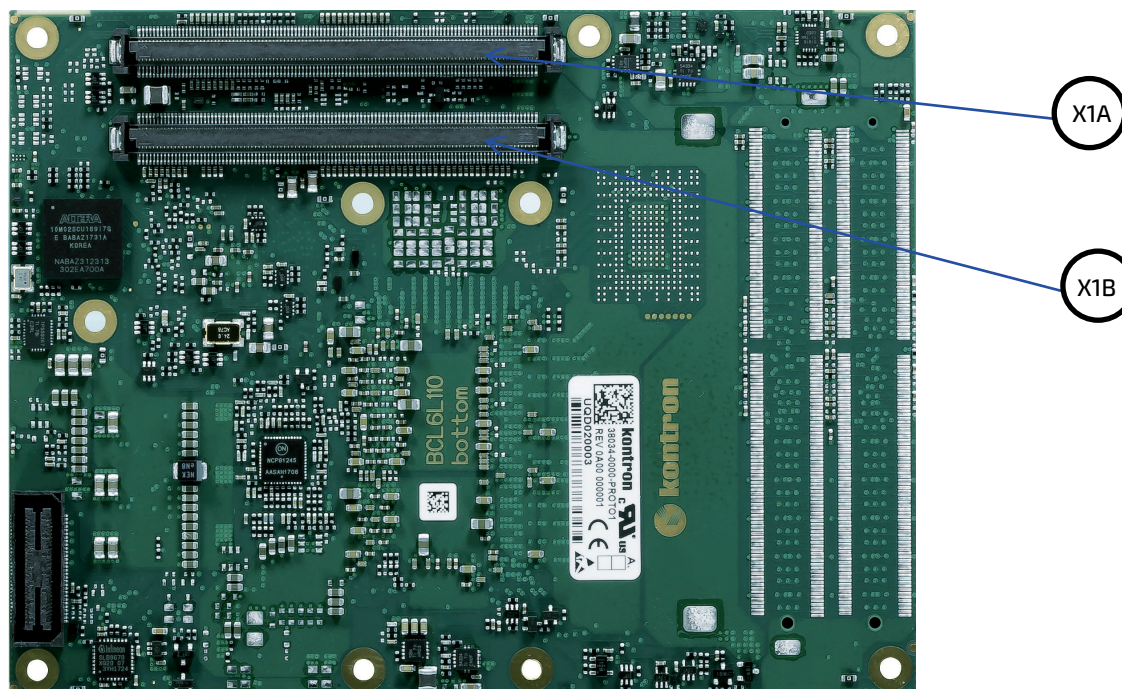
| 8-bit Address | 7-bit Address | Device                           | Comment                                | SMBus |
|---------------|---------------|----------------------------------|----------------------------------------|-------|
| 5Ch           | 2Eh           | HWM NCT7802Y                     | Do not use under any circumstances     | SMB   |
| A0h           | 50h           | SPD DDR Channel 1 (SO-DIMM)      |                                        | SMB   |
| A4h           | 52h           | SPD DDR Channel 2 (SO-DIMM)      |                                        | SMB   |
| 30h           | 18h           | SO-DIMM Thermal Sensor           | If available on the used memory-module | SMB   |
| 34h           | 1Ah           | SO-DIMM Thermal Sensor channel 2 | If available on the used memory-module | SMB   |

## 5/ Interface Connectors X1A and X1B

The COMe-bCL6 is a COM Express® basic module containing two 220-pin connectors; each with two rows called row A & B on primary connector and row C & D on secondary connector.

The following figure is a view of the bottom of the module showing the position of interface connectors X1A and X1B.

Figure 6: X1A and X1B COMe Interface Connectors



### 5.1. X1A and X1B Signals

For a description of the terms used in the X1A and X1B pin assignment tables, see the General Signals Description table below or Appendix A, List of Acronyms. If a more detailed pin assignment description is required, refer to the PICMG specification COMe Rev 3.0 Type 6 standard.



The information provided under type, module terminations and comments is complimentary to the COM.0 Rev 3.0 Type 6 standard. For more information, contact Kontron Support.

Table 51: General Signal Description

| Type    | Description                       | Type   | Description                    |
|---------|-----------------------------------|--------|--------------------------------|
| NC      | Not Connected (on this product)   | 0-1,8  | 1.8 V Output                   |
| I/O-3,3 | Bi-directional 3.3 V I/O-Signal   | 0-3,3  | 3.3 V Output                   |
| I/O-5T  | Bi-dir. 3.3 V I/O (5 V Tolerance) | 0-5    | 5 V Output                     |
| I/O-5   | Bi-directional 5V I/O-Signal      | DP-I/O | Differential Pair Input/Output |
| I-3,3   | 3.3 V Input                       | DP-I   | Differential Pair Input        |

| Type | Description                            | Type    | Description                      |
|------|----------------------------------------|---------|----------------------------------|
| I/OD | Bi-directional Input/Output Open Drain | DP-O    | Differential Pair Output         |
| I-5T | 3.3 V Input (5 V Tolerance)            | PU      | Pull-Up Resistor                 |
| OA   | Output Analog                          | PWR     | Power Connection                 |
| OD   | Output Open Drain                      | + and - | Differential Pair Differentiator |

## NOTICE

To protect external power lines of peripheral devices, make sure that: the wires have the right diameter to withstand the maximum available current.

The enclosure of the peripheral device fulfills the fire-protection requirements of IEC/EN60950.

## 5.2. X1A and X1B Pin Assignment

For more information regarding the pinout of connector X1A (Row A and Row B) and connector X1B (Row C and Row D), see the tables listed below:

- ▶ Table 52: Connector X1A Row A 1 - A 110
- ▶ Table 53: Connector X1A Row B 1 - B 110
- ▶ Table 54: Connector X1B Row C1 - C 110
- ▶ Table 55: Connector X1B Row D 1 - D 110

### 5.2.1. Connector X1A Row A

The following table lists the pins for connector X1A row A.

**Table 52: Connector X1A Row A Pinout List**

| Pin | COME Signal    | Description                                                                                                                                                                                 | Type    | Termination | Comment               |
|-----|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------------|-----------------------|
| A1  | GND            | Power Ground                                                                                                                                                                                | PWR GND |             |                       |
| A2  | GBE0_MDI3-     | Ethernet Media Dependent Interface 3                                                                                                                                                        | DP-I/O  |             |                       |
| A3  | GBE0_MDI3+     |                                                                                                                                                                                             |         |             |                       |
| A4  | GBE0_LINK100#  | Ethernet speed LED indicator                                                                                                                                                                | OD      |             |                       |
| A5  | GBE0_LINK1000# |                                                                                                                                                                                             |         |             |                       |
| A6  | GBE0_MDI2-     | Ethernet Media Dependent Interface 2                                                                                                                                                        | DP-I/O  |             |                       |
| A7  | GBE0_MDI2+     |                                                                                                                                                                                             |         |             |                       |
| A8  | GBE0_LINK#     | LAN link LED indicator                                                                                                                                                                      | OD      |             |                       |
| A9  | GBE0_MDI1-     | Ethernet Media Dependent Interface 1                                                                                                                                                        | DP-I/O  |             |                       |
| A10 | GBE0_MDI1+     |                                                                                                                                                                                             |         |             |                       |
| A11 | GND            | Power Ground                                                                                                                                                                                | PWR GND |             |                       |
| A12 | GBE0_MDI0-     | Ethernet Media Dependent Interface 0                                                                                                                                                        | DP-I/O  |             |                       |
| A13 | GBE0_MDI0+     |                                                                                                                                                                                             |         |             |                       |
| A14 | GBE0_CTREF     | Reference voltage for Carrier Board Ethernet magnetics center tab. The reference voltage is determined by the requirements of the module PHY and may be as low as 0 V and as high as 3.3 V. | 0       |             | 1 uF capacitor to GND |
| A15 | SUS_S3#        | Indicates system is in Suspend to RAM (or deeper) state. An inverted copy of SUS_S3# on Carrier Board may be used to enable non-standby power on a typical ATX supply.                      | 0-3.3   | PD 10 kΩ    |                       |
| A16 | SATA0_TX+      | SATA transmit data pair 0                                                                                                                                                                   | DP-O    |             |                       |

| Pin | COMe Signal  | Description                                                                     | Type     | Termination                   | Comment                                                                                                                                       |
|-----|--------------|---------------------------------------------------------------------------------|----------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| A17 | SATA0_TX-    |                                                                                 |          |                               |                                                                                                                                               |
| A18 | SUS_S4#      | Indicates system is in Suspend to Disk (or deeper) state.                       | O-3.3    | PD 10 kΩ                      |                                                                                                                                               |
| A19 | SATA0_RX+    | SATA receive data pair 0                                                        | DP-I     |                               |                                                                                                                                               |
| A20 | SATA0_RX-    |                                                                                 |          |                               |                                                                                                                                               |
| A21 | GND          | Power Ground                                                                    | PWR GND  |                               |                                                                                                                                               |
| A22 | SATA2_TX+    | SATA transmit data pair 2                                                       | DP-O     |                               |                                                                                                                                               |
| A23 | SATA2_TX-    |                                                                                 |          |                               |                                                                                                                                               |
| A24 | SUS_S5#      | Indicates system is in Soft Off state                                           | O-3.3    |                               |                                                                                                                                               |
| A25 | SATA2_RX+    | SATA receive data pair 2                                                        | DP-I     |                               |                                                                                                                                               |
| A26 | SATA2_RX-    |                                                                                 |          |                               |                                                                                                                                               |
| A27 | BATLOW#      | Provides a battery-low signal to the Module to indicate external battery is low | I-3.3    | PU 10 kΩ, 3.3V (S5)           | Assertion prevents wake from S3-S5 state                                                                                                      |
| A28 | ATA_ACT#     | Serial ATA activity LED indicator                                               | OD-3.3   | PU 10 kΩ, 3.3V (S0)           | Can sink 15 mA                                                                                                                                |
| A29 | HDA_SYNC     | HD Audio Sync                                                                   | O-3.3    | PD 20 kΩ in PCH               |                                                                                                                                               |
| A30 | HDA_RST#     | HD Audio Reset                                                                  |          |                               |                                                                                                                                               |
| A31 | GND          | Power Ground                                                                    | PWR GND  |                               |                                                                                                                                               |
| A32 | HDA_CLK      | HD Audio Bit Clock Output                                                       | O-3.3    | PD 20 kΩ in PCH               |                                                                                                                                               |
| A33 | HDA_SDOOUT   | HD Audio Serial Data Out                                                        |          |                               |                                                                                                                                               |
| A34 | BIOS_DIS0#   | BIOS selection straps to determine the BIOS boot device                         | I-3.3    | PU 10 kΩ, 3.3 V (S5)          | The Carrier should only float these or pull them low. Refer to SPI boot                                                                       |
| A35 | THRMTRIP#    | Thermal Trip Indicates CPU has entered thermal shutdown                         | O-3.3    | PU 10 kΩ, 3.3 V (S0)          | Thermal trip event transition to S5 indicator                                                                                                 |
| A36 | USB6-        | USB 2.0 data differential pair port 6                                           | DP-I/O   | PD 14.25 kΩ to 24.8 kΩ in PCH |                                                                                                                                               |
| A37 | USB6+        |                                                                                 |          |                               |                                                                                                                                               |
| A38 | USB_6_7_OC#  | USB overcurrent indicator port 6/7                                              | I-3.3    | PU 10 kΩ, 3.3 V (S5)          |                                                                                                                                               |
| A39 | USB4-        | USB 2.0 data differential pair port 4                                           | DP-I/O   | PD 14.25 kΩ to 24.8 kΩ in PCH |                                                                                                                                               |
| A40 | USB4+        |                                                                                 |          |                               |                                                                                                                                               |
| A41 | GND          | Power Ground                                                                    | PWR GND  |                               |                                                                                                                                               |
| A42 | USB2-        | USB 2.0 data differential pair port 2                                           | DP-I/O   | PD 14.25 kΩ to 24.8 kΩ in PCH |                                                                                                                                               |
| A43 | USB2+        |                                                                                 |          |                               |                                                                                                                                               |
| A44 | USB_2_3_OC#  | USB overcurrent indicator port 2/3                                              | I-3.3    | PU 10 kΩ 3.3 V (S5)           | An open drain driver from a USB current monitor on the Carrier Board may drive this line low. Do not pull this line high on the Carrier Board |
| A45 | USB0-        | USB 2.0 data differential pairs port 0                                          | DP-I/O   | PD 14.25 kΩ to 24.8 kΩ in PCH |                                                                                                                                               |
| A46 | USB0+        |                                                                                 |          |                               |                                                                                                                                               |
| A47 | VCC_RTC      | Real Time Clock (RTC) circuit power input                                       | PWR 3V   |                               | Voltage range 2.8 V to 3.47 V                                                                                                                 |
| A48 | EXCD0_PERST# | ExpressCard reset port 0                                                        | O-3.3    | PD 10 kΩ                      |                                                                                                                                               |
| A49 | EXCD0_CPPE#  | ExpressCard capable card request port 0                                         | I-3.3    | PU 10 kΩ 3.3 V (S0)           |                                                                                                                                               |
| A50 | LPC_SERIRQ   | Serial interrupt request                                                        | I/OD-3.3 | PU 8.2 kΩ, 3.3 V (S0)         |                                                                                                                                               |
| A51 | GND          | Power Ground                                                                    | PWR GND  |                               |                                                                                                                                               |
| A52 | PCIE_TX5+    | PCI Express transmit lane 5                                                     | DP-O     |                               |                                                                                                                                               |
| A53 | PCIE_TX5-    |                                                                                 |          |                               |                                                                                                                                               |
| A54 | GPIO         | General purpose input 0                                                         | I-3.3    | PU 100 kΩ, 3.3 V (S0)         |                                                                                                                                               |
| A55 | PCIE_TX4+    | PCI Express transmit lane 4                                                     | DP-O     |                               |                                                                                                                                               |

| Pin | COMe Signal    | Description                                                                    | Type    | Termination                                   | Comment                                                                                        |
|-----|----------------|--------------------------------------------------------------------------------|---------|-----------------------------------------------|------------------------------------------------------------------------------------------------|
| A56 | PCIE_TX4-      |                                                                                |         |                                               |                                                                                                |
| A57 | GND            | Power Ground                                                                   | PWR GND |                                               |                                                                                                |
| A58 | PCIE_TX3+      | PCI Express transmit lane 3                                                    | DP-0    |                                               |                                                                                                |
| A59 | PCIE_TX3-      |                                                                                |         |                                               |                                                                                                |
| A60 | GND            | Power Ground                                                                   | PWR GND |                                               |                                                                                                |
| A61 | PCIE_TX2+      | PCI Express transmit lane 2                                                    | DP-0    |                                               |                                                                                                |
| A62 | PCIE_TX2-      |                                                                                |         |                                               |                                                                                                |
| A63 | GPI1           | General purpose input 1                                                        | I-3.3   | PU 100 k $\Omega$ , 3.3 V (S0)                |                                                                                                |
| A64 | PCIE_TX1+      | PCI Express transmit lane 1                                                    | DP-0    |                                               |                                                                                                |
| A65 | PCIE_TX1-      |                                                                                |         |                                               |                                                                                                |
| A66 | GND            | Power Ground                                                                   | PWR GND |                                               |                                                                                                |
| A67 | GPI2           | General purpose input 2                                                        | I-3.3   | PU 100 k $\Omega$ , 3.3 V (S0)                |                                                                                                |
| A68 | PCIE_TX0+      | PCI Express transmit lane 0                                                    | DP-0    |                                               |                                                                                                |
| A69 | PCIE_TX0-      |                                                                                |         |                                               |                                                                                                |
| A70 | GND            | Power Ground                                                                   | PWR GND |                                               |                                                                                                |
| A71 | LVDS_A0+       | LVDS channel A DAT0 or EDP Lane 2 transmit                                     | DP-0    |                                               |                                                                                                |
| A72 | LVDS_A0-       |                                                                                |         |                                               |                                                                                                |
| A73 | LVDS_A1+       | LVDS channel A DAT1 or EDP Lane 1 transmit                                     | DP-0    |                                               |                                                                                                |
| A74 | LVDS_A1-       |                                                                                |         |                                               |                                                                                                |
| A75 | LVDS_A2+       | LVDS channel A DAT2 or EDP Lane 0 transmit                                     | DP-0    |                                               |                                                                                                |
| A76 | LVDS_A2-       |                                                                                |         |                                               |                                                                                                |
| A77 | LVDS_VDD_EN    | LVDS or EDP panel power control                                                | O-3.3   | PD 100 k $\Omega$                             |                                                                                                |
| A78 | LVDS_A3+       | LVDS channel A DAT3                                                            | DP-0    |                                               |                                                                                                |
| A79 | LVDS_A3-       |                                                                                |         |                                               |                                                                                                |
| A80 | GND            | Power Ground                                                                   | PWR GND |                                               |                                                                                                |
| A81 | LVDS_A_CLK+    | LVDS channel A clock or EDP lane 3 transmit                                    | DP-0    |                                               | Clock 20 MHz to 80 MHz                                                                         |
| A82 | LVDS_A_CLK-    |                                                                                |         |                                               |                                                                                                |
| A83 | LVDS_I2C_CLK   | I2C Clock for LVDS display use or eDP AUX +                                    | I/O-3.3 | PU 2.2 k $\Omega$ , 3.3 V (S0)                |                                                                                                |
| A84 | LVDS_I2C_DAT   | I2C Data line for LVDS display use or eDP AUX -                                | I/O-3.3 | PU 2.2 k $\Omega$ , 3.3 V (S0)                |                                                                                                |
| A85 | GPI3           | General Purpose Input 3                                                        | I-3.3   | PU 100 k $\Omega$ 3.3 V (S0)                  |                                                                                                |
| A86 | RSVD           | Reserved for future use                                                        | NC      |                                               |                                                                                                |
| A87 | eDP_HPD        | Detection of Hot Plug / Unplug                                                 | I-3.3   | PD 400 k $\Omega$ LVDS / 100 k $\Omega$ EDP   |                                                                                                |
| A88 | PCIE0_CLK_REF+ | Reference PCI Express clock for all PCI Express and PCI Express graphics lanes | DP-0    |                                               | 100 MHz                                                                                        |
| A89 | PCIE0_CLK_REF- |                                                                                |         |                                               |                                                                                                |
| A90 | GND            | Power Ground                                                                   | PWR GND |                                               |                                                                                                |
| A91 | SPI_POWER      | 3.3 V power output for external SPI Flash                                      | O-3.3   |                                               | 100 mA maximum<br>Only use to power SPI devices on Carrier Board                               |
| A92 | SPI_MISO       | SPI Master IN Slave Out<br>(Data in to module from carrier SPI)                | I-3.3   | PU 15 k $\Omega$ to 40 k $\Omega$ in PCH      | All SPI signals tri-stated until reset deasserted                                              |
| A93 | GPO0           | General Purpose Output 0                                                       | O-3.3   | PD 100k $\Omega$                              |                                                                                                |
| A94 | SPI_CLK        | SPI clock<br>(Clock from Module to Carrier SPI)                                | O-3.3   | PU 15 k $\Omega$ to 40 k $\Omega$ in PCH (S5) | All SPI signals tri-stated with 20 K $\Omega$ CPU internal weak pull-up until reset deasserted |
| A95 | SPI_MOSI       | SPI Master Out Slave In<br>(Data out from Module to Carrier SPI)               | O-3.3   |                                               |                                                                                                |
| A96 | TPM_PP         | TPM Physical Presence                                                          | I-3.3   | PD 10k $\Omega$                               | TPM does not use this functionality                                                            |

| Pin  | COME Signal | Description                                                 | Type                | Termination                   | Comment                                                                                         |
|------|-------------|-------------------------------------------------------------|---------------------|-------------------------------|-------------------------------------------------------------------------------------------------|
| A97  | TYPE10#     | Indicates to Carrier Board that type 10 Module is installed | NC                  |                               |                                                                                                 |
| A98  | SER0_TX     | Serial port 0 TXD                                           | 0-3.3               |                               | 20 V protection circuit implemented on-module, PD on carrier boards needed for proper operation |
| A99  | SER0_RX     | Serial port 0 RXD                                           | I-5T                | PU 47 k $\Omega$ , 3.3 V (S0) | 20 V protection circuit implemented on-module                                                   |
| A100 | GND         | Power Ground                                                | PWR GND             |                               |                                                                                                 |
| A101 | SER1_TX     | Serial port 1 TXD                                           | 0-3.3               |                               | 20 V protection circuit implemented on-module, PD on carrier boards needed for proper operation |
| A102 | SER1_RX     | Serial port 1 RXD                                           | I-5T                | PU 47 k $\Omega$ , 3.3 V (S0) | 20 V protection circuit implemented on-module                                                   |
| A103 | LID#        | LID switch input                                            | I-3.3               | PU 47 K $\Omega$ , 3.3 V (S5) |                                                                                                 |
| A104 | VCC_12V     | Main input voltage (8.5 V-20V)                              | PWR<br>8.5 V - 20 V |                               |                                                                                                 |
| A105 | VCC_12V     |                                                             |                     |                               |                                                                                                 |
| A106 | VCC_12V     |                                                             |                     |                               |                                                                                                 |
| A107 | VCC_12V     |                                                             |                     |                               |                                                                                                 |
| A108 | VCC_12V     |                                                             |                     |                               |                                                                                                 |
| A109 | VCC_12V     |                                                             |                     |                               |                                                                                                 |
| A110 | GND         | Power Ground                                                | PWR GND             |                               |                                                                                                 |

+ and - Differential pair differentiator

## 5.2.2. Connector X1A Row B

The following table lists the pins for connector X1A row B.

Table 53: Connector X1A Row B Pinout List

| Pin | COME Signal | Description                                                      | Type    | Termination                                   | Comment                                                                                                                             |
|-----|-------------|------------------------------------------------------------------|---------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| B1  | GND         | Power Ground                                                     | PWR GND |                                               |                                                                                                                                     |
| B2  | GBE0_ACT#   | Ethernet Controller activity LED indicator                       | OD      |                                               |                                                                                                                                     |
| B3  | LPC_FRAME#  | Indicates the start of an LPC cycle                              | 0-3.3   |                                               |                                                                                                                                     |
| B4  | LPC_AD0     | LPC multiplexed command, address and data #                      | I/O-3.3 | PU 15 k $\Omega$ to 40 k $\Omega$ in PCH (S5) |                                                                                                                                     |
| B5  | LPC_AD1     |                                                                  |         |                                               |                                                                                                                                     |
| B6  | LPC_AD2     |                                                                  |         |                                               |                                                                                                                                     |
| B7  | LPC_AD3     |                                                                  |         |                                               |                                                                                                                                     |
| B8  | LPC_DRQ0#   | LPC serial DMA/Master request #                                  | NC      |                                               |                                                                                                                                     |
| B9  | LPC_DRQ1#   |                                                                  |         |                                               |                                                                                                                                     |
| B10 | LPC_CLK     | LPC 24 MHz clock output                                          | 0-3.3   | PD 20 k $\Omega$ in PCH                       | 24 MHz                                                                                                                              |
| B11 | GND         | Power Ground                                                     | PWR GND |                                               |                                                                                                                                     |
| B12 | PWRBTN#     | Power Button - a falling edge creates a power button event       | I-3.3   | PU 10 k $\Omega$ , 3.3 V                      | Power button events can be used to bring a system out of S5 soft-off and other suspend states, as well as powering the system down. |
| B13 | SMB_CLK     | SMBus clock line                                                 | 0-3.3   | PU 2.56 k $\Omega$ , 3.3 V (S5)               |                                                                                                                                     |
| B14 | SMB_DAT     | SMBus bidirectional data line                                    | I/O-3.3 | PU 2.56 k $\Omega$ , 3.3 V (S5)               |                                                                                                                                     |
| B15 | SMB_ALERT#  | SMBus alert can be used to generate a SMI# or to wake the system | I/O-3.3 | PU 2.2 k $\Omega$ , 3.3 V (S5)                |                                                                                                                                     |

| Pin | COMe Signal  | Description                                                                              | Type    | Termination                                   | Comment                                       |
|-----|--------------|------------------------------------------------------------------------------------------|---------|-----------------------------------------------|-----------------------------------------------|
| B16 | SATA1_TX+    | SATA 1 transmit data pair                                                                | DP-O    |                                               |                                               |
| B17 | SATA1_TX-    |                                                                                          |         |                                               |                                               |
| B18 | SUS_STAT#    | Indicates imminent suspend operation; used to notify LPC devices.                        | O-3.3   |                                               |                                               |
| B19 | SATA1_RX+    | SATA 1 receive data pair                                                                 | DP-I    |                                               |                                               |
| B20 | SATA1_RX-    |                                                                                          |         |                                               |                                               |
| B21 | GND          | Power Ground                                                                             | PWR GND |                                               |                                               |
| B22 | SATA3_TX+    | SATA 3 transmit data pair                                                                | DP-O    |                                               |                                               |
| B23 | SATA3_TX-    |                                                                                          |         |                                               |                                               |
| B24 | PWR_OK       | Power OK from main power supply.                                                         | I-5T    | PU 61 k $\Omega$ , 3.3 V                      | 20 V protection circuit implemented on module |
| B25 | SATA3_RX+    | SATA 3 receive data pair                                                                 | DP-I    |                                               |                                               |
| B26 | SATA3_RX-    |                                                                                          |         |                                               |                                               |
| B27 | WDT          | Indicates a watchdog time-out event has occurred                                         | O-3.3   | PD 10 k $\Omega$                              |                                               |
| B28 | HDA_SDIN2    | Audio Codec serial data input 2                                                          | NC      |                                               | Not supported                                 |
| B29 | HDA_SDIN1    | Audio Codec serial data input 1                                                          | I-3.3   | PD 20 k $\Omega$ in PCH                       |                                               |
| B30 | HDA_SDIN0    | Audio Codec serial data input 0                                                          |         |                                               |                                               |
| B31 | GND          | Power Ground                                                                             | PWR GND |                                               |                                               |
| B32 | SPKR         | Speaker output provides the PC beep signal and is mainly intended for debugging purposes | O-3.3   | PD 20 k $\Omega$ in PCH                       | PD is enabled until reset is deasserted       |
| B33 | I2C_CLK      | I2C port clock output                                                                    | O-3.3   | PU 2.21 k $\Omega$ , 3.3 V (S5)               |                                               |
| B34 | I2C_DAT      | I2C port data I/O line                                                                   | I/O-3.3 | PU 2.21 k $\Omega$ , 3.3 V (S5)               |                                               |
| B35 | THRM#        | Input from off-Module temp sensor indicating an over-temp situation                      | I-3.3   | PU 10 k $\Omega$ to 3.3 V (S0)                | No function implemented                       |
| B36 | USB7-        | USB 2.0 differential data pairs port 7                                                   | DP-I/O  | PD 14.25 k $\Omega$ to 24.8 k $\Omega$ in PCH |                                               |
| B37 | USB7+        |                                                                                          |         |                                               |                                               |
| B38 | USB_4_5_OC#  | USB overcurrent indicator port 4/5                                                       | I-3.3   | PU 10 k $\Omega$ , 3.3 V (S5)                 |                                               |
| B39 | USB5-        | USB 2.0 differential data pairs port 5                                                   | DP-I/O  | PD 14.25 k $\Omega$ to 24.8 k $\Omega$ in PCH |                                               |
| B40 | USB5+        |                                                                                          |         |                                               |                                               |
| B41 | GND          | Power Ground                                                                             | PWR GND |                                               |                                               |
| B42 | USB3-        | USB 2.0 differential data pairs port 3                                                   | DP-I/O  | PD 14.25 k $\Omega$ to 24.8 k $\Omega$ in PCH |                                               |
| B43 | USB3+        |                                                                                          |         |                                               |                                               |
| B44 | USB_0_1_OC#  | USB overcurrent indicator port 0/1                                                       | I-3.3   | PU 10 k $\Omega$ , 3.3 V (S5)                 |                                               |
| B45 | USB1-        | USB 2.0 differential data pairs port 1                                                   | DP-I/O  | PD 14.25 k $\Omega$ to 24.8 k $\Omega$ in PCH |                                               |
| B46 | USB1+        |                                                                                          |         |                                               |                                               |
| B47 | EXCD1_PERST# | Express Card expansion, reset port 1                                                     | O-3.3   | PD 10 k $\Omega$                              |                                               |
| B48 | EXCD1_CPPE#  | Express Card expansion, capable card request port 1                                      | I-3.3   | PU 10 k $\Omega$ , 3.3 V (S0)                 |                                               |
| B49 | SYS_RESET#   | Reset button input                                                                       | I-3.3   | PU 10 k $\Omega$ , 3.3 V (S5)                 |                                               |
| B50 | CB_RESET#    | Reset output from Module to Carrier Board                                                | O-3.3   | PU 10 k $\Omega$ , 3.3 V (S5)                 |                                               |
| B51 | GND          | Power Ground                                                                             | PWR GND |                                               |                                               |
| B52 | PCIE_RX5+    | PCI Express receive lane 5                                                               | DP-I    |                                               |                                               |
| B53 | PCIE_RX5-    |                                                                                          |         |                                               |                                               |
| B54 | GPO1         | General Purpose Output 1                                                                 | O-3.3   | PD 100 k $\Omega$                             |                                               |
| B55 | PCIE_RX4+    | PCI Express receive lane 4                                                               | DP-I    |                                               |                                               |
| B56 | PCIE_RX4-    |                                                                                          |         |                                               |                                               |
| B57 | GPO2         | General Purpose Output 2                                                                 | O-3.3   | PD 100 k $\Omega$                             |                                               |
| B58 | PCIE_RX3+    | PCI Express receive lane 3                                                               | DP-I    |                                               |                                               |
| B59 | PCIE_RX3-    |                                                                                          |         |                                               |                                               |

| Pin  | COMe Signal    | Description                                                                              | Type         | Termination                    | Comment                                                                                        |
|------|----------------|------------------------------------------------------------------------------------------|--------------|--------------------------------|------------------------------------------------------------------------------------------------|
| B60  | GND            | Power Ground                                                                             | PWR          |                                |                                                                                                |
| B61  | PCIE_RX2+      | PCI Express receive lane 2                                                               | DP-I         |                                |                                                                                                |
| B62  | PCIE_RX2-      |                                                                                          |              |                                |                                                                                                |
| B63  | GPO3           | General Purpose Output 3                                                                 | O-3.3        | PD 100 k $\Omega$              |                                                                                                |
| B64  | PCIE_RX1+      | PCI Express receive lane 1                                                               | DP-I         |                                |                                                                                                |
| B65  | PCIE_RX1-      |                                                                                          |              |                                |                                                                                                |
| B66  | WAKE0#         | PCI Express Wake Event wake up signal                                                    | I-3.3        | PU 10 k $\Omega$ , 3.3 V (S5)  |                                                                                                |
| B67  | WAKE1#         | General purpose Wake Event wake up signal, to implement wake-up on PS2 keyboard or mouse | I-3.3        | PU 10 k $\Omega$ , 3.3 V (S5)  |                                                                                                |
| B68  | PCIE_RX0+      | PCI Express receive lane 0                                                               | DP-I         |                                |                                                                                                |
| B69  | PCIE_RX0-      |                                                                                          |              |                                |                                                                                                |
| B70  | GND            | Power Ground                                                                             | PWR GND      |                                |                                                                                                |
| B71  | LVDS_B0+       | LVDS channel B data pair 0                                                               | DP-O         |                                |                                                                                                |
| B72  | LVDS_B0-       |                                                                                          |              |                                |                                                                                                |
| B73  | LVDS_B1+       | LVDS channel B data pair 1                                                               | DP-O         |                                |                                                                                                |
| B74  | LVDS_B1-       |                                                                                          |              |                                |                                                                                                |
| B75  | LVDS_B2+       | LVDS channel B data pair 2                                                               | DP-O         |                                |                                                                                                |
| B76  | LVDS_B2-       |                                                                                          |              |                                |                                                                                                |
| B77  | LVDS_B3+       | LVDS channel B data pair 3                                                               | DP-O         |                                |                                                                                                |
| B78  | LVDS_B3-       |                                                                                          |              |                                |                                                                                                |
| B79  | LVDS/BKLT_EN   | LVDS or EDP panel backlight enable (ON)                                                  | O-3.3        | PD 100 k $\Omega$              |                                                                                                |
| B80  | GND            | Power Ground                                                                             | PWR GND      |                                |                                                                                                |
| B81  | LVDS_B_CLK+    | LVDS Channel B Clock                                                                     | DP-O         |                                | 20 MHz -80 MHz                                                                                 |
| B82  | LVDS_B_CLK-    |                                                                                          |              |                                |                                                                                                |
| B83  | LVDS_BKLT_CTRL | LVDS or EDP panel backlight brightness control                                           | O-3.3        |                                |                                                                                                |
| B84  | VCC_5V_SBY     | 5V Standby                                                                               | PWR 5 V (S5) |                                | Optional, not necessary in single supply mode                                                  |
| B85  | VCC_5V_SBY     |                                                                                          |              |                                |                                                                                                |
| B86  | VCC_5V_SBY     |                                                                                          |              |                                |                                                                                                |
| B87  | VCC_5V_SBY     |                                                                                          |              |                                |                                                                                                |
| B88  | BIOS_DIS1#     | BIOS selection strap to determine BIOS boot device                                       | I-3.3        | PU 10 k $\Omega$ , 3.3 V (S0)  | PU might be powered during suspend                                                             |
| B89  | VGA_RED        | CRT Red / Analog Video RGB- RED                                                          | OA           | PD 150 $\Omega$                | Only on VGA option                                                                             |
| B90  | GND            | Power Ground                                                                             | PWR GND      |                                |                                                                                                |
| B91  | VGA_GREEN      | VGA Green / Analog Video RGB-Green                                                       | OA           | PD 150 $\Omega$                | Only on VGA option                                                                             |
| B92  | VGA_BLUE       | VGA Blue / Analog Video RGB-Blue                                                         | OA           | PD 150 $\Omega$                |                                                                                                |
| B93  | VGA_HSYNC      | Analog horizontal sync output to VGA monitor                                             | O-3.3        |                                |                                                                                                |
| B94  | VGA_VSYNC      | Analog vertical sync output to VGA monitor                                               | O-3.3        |                                |                                                                                                |
| B95  | VGA_DDC_CLK    | Display Data Channel (DDC) clock line                                                    | I/O-5        | PU 2.4 k $\Omega$ , 3.3 V (S0) |                                                                                                |
| B96  | VGA_DDC_DATA   | Display Data Channel (DDC) data line                                                     | I/O-5        | PU 2.4 k $\Omega$ , 3.3 V (S0) |                                                                                                |
| B97  | SPI_CS#        | Chip select for carrier board SPI                                                        | O-3.3        |                                |                                                                                                |
| B98  | RSVD           | Reserved for future use                                                                  | NC           |                                |                                                                                                |
| B99  | RSVD           |                                                                                          |              |                                |                                                                                                |
| B100 | GND            | Power Ground                                                                             | PWR GND      |                                |                                                                                                |
| B101 | FAN_PWMOUT     | Fan speed control by PWM Output                                                          | O-3.3        |                                | 20 V protection circuit implemented on module, PD on carrier board needed for proper operation |
| B102 | FAN_TACHIN     | Fan tachometer input for fan with a two-pulse output                                     | I-3.3        | PU 47 k $\Omega$ , 3.3 V (S0)  | 20 V protection circuit implemented on module                                                  |

| Pin  | COME Signal | Description                                                                                          | Type                | Termination          | Comment |
|------|-------------|------------------------------------------------------------------------------------------------------|---------------------|----------------------|---------|
| B103 | SLEEP#      | Sleep button signal used by ACPI operating system to bring system to sleep state or wake it up again | I-3.3               | PU 47 kΩ, 3.3 V (S5) |         |
| B104 | VCC_12V     | Main input voltage (8.5 V-20 V)                                                                      | PWR<br>8.5 V - 20 V |                      |         |
| B105 | VCC_12V     |                                                                                                      |                     |                      |         |
| B106 | VCC_12V     |                                                                                                      |                     |                      |         |
| B107 | VCC_12V     |                                                                                                      |                     |                      |         |
| B108 | VCC_12V     |                                                                                                      |                     |                      |         |
| B109 | VCC_12V     |                                                                                                      |                     |                      |         |
| B110 | GND         | Power Ground                                                                                         | PWR GND             |                      |         |

+ and - Differential pair differentiator

### 5.2.3. Connector X1B Row C

The following table lists the pins for connector X1B row C.

Table 54: Connector X1B Row C Pinout List

| Pin | COME Signal | Description                                               | Type    | Termination | Comment |
|-----|-------------|-----------------------------------------------------------|---------|-------------|---------|
| C1  | GND         | Power Ground                                              | PWR GND |             |         |
| C2  | GND         |                                                           |         |             |         |
| C3  | USB_SSRX0-  | Additional receive signal for SuperSpeed+ USB data pair 0 | DP-I    |             |         |
| C4  | USB_SSRX0+  |                                                           |         |             |         |
| C5  | GND         | Power Ground                                              | PWR GND |             |         |
| C6  | USB_SSRX1-  | Additional receive signal for SuperSpeed+ USB data pair 1 | DP-I    |             |         |
| C7  | USB_SSRX1+  |                                                           |         |             |         |
| C8  | GND         | Power Ground                                              | PWR GND |             |         |
| C9  | USB_SSRX2-  | Additional receive signal for SuperSpeed+ USB data pair 2 | DP-I    |             |         |
| C10 | USB_SSRX2+  |                                                           |         |             |         |
| C11 | GND         | Power Ground                                              | PWR GND |             |         |
| C12 | USB_SSRX3-  | Additional receive signal for SuperSpeed+ USB data pair 3 | DP-I    |             |         |
| C13 | USB_SSRX3+  |                                                           |         |             |         |
| C14 | GND         | Power Ground                                              | PWR GND |             |         |
| C15 | DDI1_PAIR6+ | NC                                                        | NC      |             |         |
| C16 | DDI1_PAIR6- |                                                           |         |             |         |
| C17 | RSVD        | Reserved for future use                                   | NC      |             |         |
| C18 | RSVD        |                                                           |         |             |         |
| C19 | PCIE_RX6+   | PCI Express receive lane pair 6                           | DP-I    |             |         |
| C20 | PCIE_RX6-   |                                                           |         |             |         |
| C21 | GND         | Power Ground                                              | PWR GND |             |         |
| C22 | PCIE_RX7+   | PCI Express receive lane pair 7                           | DP-I    |             |         |
| C23 | PCIE_RX7-   |                                                           |         |             |         |
| C24 | DDI1_HPD    | DDI Hotplug Detect                                        | I-3.3   | PD 100 kΩ   |         |
| C25 | DDI1_PAIR4+ | NC                                                        | NC      |             |         |
| C26 | DDI1_PAIR4- |                                                           |         |             |         |
| C27 | RSVD        | Reserved for future use                                   | NC      |             |         |
| C28 | RSVD        |                                                           |         |             |         |
| C29 | DDI1_PAIR5+ | NC                                                        | NC      |             |         |
| C30 | DDI1_PAIR5- |                                                           |         |             |         |
| C31 | GND         | Power Ground                                              | PWR GND |             |         |

| Pin | COMe Signal       | Description                                         | Type    | Termination                    | Comment                        |
|-----|-------------------|-----------------------------------------------------|---------|--------------------------------|--------------------------------|
| C32 | DDI2_CTRLCLK_AUX+ | DDI2 Clock                                          | I/O-3.3 | PD 100 k $\Omega$              |                                |
| C33 | DDI2_CTRLCLK_AUX- | DDI2 Date                                           | I/O-3.3 | PD 100 k $\Omega$ , 3.3 V (S0) |                                |
| C34 | DDI2_DDC_AUX_SEL  | DDI2 Select                                         | I-3.3   | PD 1 M $\Omega$                |                                |
| C35 | RSVD              | Reserved for future use                             | NC      |                                |                                |
| C36 | DDI3_CTRLCLK_AUX+ | DDI3 Clock                                          | I/O-3.3 | PD 100 k $\Omega$              |                                |
| C37 | DDI3_CTRLCLK_AUX- | DDI3 Date                                           | I/O-3.3 | PU 100 k $\Omega$ , 3.3 V (S0) |                                |
| C38 | DDI3_DDC_AUX_SEL  | DDI3 Select                                         | I-3.3   | PD 1 M $\Omega$                |                                |
| C39 | DDI3_PAIR0+       | DDI3 data pair 0                                    | DP-0    |                                |                                |
| C40 | DDI3_PAIR0-       |                                                     |         |                                |                                |
| C41 | GND               | Power Ground                                        | PWR GND |                                |                                |
| C42 | DDI3_PAIR1+       | DDI3 data pair 1                                    | DP-0    |                                |                                |
| C43 | DDI3_PAIR1-       |                                                     |         |                                |                                |
| C44 | DDI3_HPD          | DDI Hotplug Detect                                  | I-3.3   | PD 100 k $\Omega$              |                                |
| C45 | RSVD              | Reserved for future use                             | NC      |                                |                                |
| C46 | DDI3_PAIR2+       | DDI3 data pair 2                                    | DP-0    |                                |                                |
| C47 | DDI3_PAIR2-       |                                                     |         |                                |                                |
| C48 | RSVD              | Reserved for future use                             | NC      |                                |                                |
| C49 | DDI3_PAIR3+       | DDI3 data pair 3                                    | DP-0    |                                |                                |
| C50 | DDI3_PAIR3-       |                                                     |         |                                |                                |
| C51 | GND               | Power Ground                                        | PWR GND |                                |                                |
| C52 | PEG_RX0+          | PCI Express Graphics (PEG) receive lane 0           | DP-I    |                                |                                |
| C53 | PEG_RX0-          |                                                     |         |                                |                                |
| C54 | TYPE0#            | Indicates the pinout type, not connected for type 6 | NC      |                                | NC for type 6 module           |
| C55 | PEG_RX1+          | PCI Express Graphics (PEG) receive lane 1           | DP-I    |                                |                                |
| C56 | PEG_RX1-          |                                                     |         |                                |                                |
| C57 | TYPE1#            | Indicates the pinout type, not connected type 6     | NC      |                                | NC for type 6 module           |
| C58 | PEG_RX2+          | PCI Express Graphics (PEG) receive lane 2           | DP-I    |                                |                                |
| C59 | PEG_RX2-          |                                                     |         |                                |                                |
| C60 | GND               | Power Ground                                        | PWR GND |                                |                                |
| C61 | PEG_RX3+          | PCI Express Graphics (PEG) receive lane 3           | DP-I    |                                |                                |
| C62 | PEG_RX3-          |                                                     |         |                                |                                |
| C63 | RSVD              | Reserved for future use                             | NC      |                                |                                |
| C64 | RSVD              |                                                     |         |                                |                                |
| C65 | PEG_RX4+          | PCI Express Graphics (PEG) receive lane 4           | DP-I    |                                |                                |
| C66 | PEG_RX4-          |                                                     |         |                                |                                |
| C67 | RSDN              | Rapid Shutdown Trigger Input                        | I-5     |                                | Used for rapid shutdown option |
| C68 | PEG_RX5+          | PCI Express Graphics (PEG) receive lane 5           | DP-I    |                                |                                |
| C69 | PEG_RX5-          |                                                     |         |                                |                                |
| C70 | GND               | Power Ground                                        | PWR GND |                                |                                |
| C71 | PEG_RX6+          | PCI Express Graphics (PEG) receive lane 6           | DP-I    |                                |                                |
| C72 | PEG_RX6-          |                                                     |         |                                |                                |
| C73 | GND               | Power Ground                                        | PWR GND |                                |                                |
| C74 | PEG_RX7+          | PCI Express Graphics (PEG) receive lane 7           | DP-I    |                                |                                |
| C75 | PEG_RX7-          |                                                     |         |                                |                                |
| C76 | GND               | Power Ground                                        | PWR GND |                                |                                |
| C77 | RSVD              | Reserved for future use                             | NC      |                                |                                |
| C78 | PEG_RX8+          | PCI Express Graphics (PEG) receive lane 8           | DP-I    |                                |                                |

| Pin  | COME Signal | Description                                | Type                | Termination | Comment |
|------|-------------|--------------------------------------------|---------------------|-------------|---------|
| C79  | PEG_RX8-    |                                            |                     |             |         |
| C80  | GND         | Power Ground                               | PWR GND             |             |         |
| C81  | PEG_RX9+    | PCI Express Graphics(PEG) receive lane 9   | DP-I                |             |         |
| C82  | PEG_RX9-    |                                            |                     |             |         |
| C83  | RSVD        | Reserved for future use                    | NC                  |             |         |
| C84  | GND         | Power Ground                               | PWR GND             |             |         |
| C85  | PEG_RX10+   | PCI Express Graphics (PEG) receive lane 10 | DP-I                |             |         |
| C86  | PEG_RX10-   |                                            |                     |             |         |
| C87  | GND         | Power Ground                               | PWR GND             |             |         |
| C88  | PEG_RX11+   | PCI Express Graphics (PEG) receive lane 11 | DP-I                |             |         |
| C89  | PEG_RX11-   |                                            |                     |             |         |
| C90  | GND         | Power Ground                               | PWR GND             |             |         |
| C91  | PEG_RX12+   | PCI Express Graphics (PEG) receive lane 12 | DP-I                |             |         |
| C92  | PEG_RX12-   |                                            |                     |             |         |
| C93  | GND         | Power Ground                               | PWR GND             |             |         |
| C94  | PEG_RX13+   | PCI Express Graphics (PEG) receive lane 13 | DP-I                |             |         |
| C95  | PEG_RX13-   |                                            |                     |             |         |
| C96  | GND         | Power Ground                               | PWR GND             |             |         |
| C97  | RSVD        | Reserved for future use                    | NC                  |             |         |
| C98  | PEG_RX14+   | PCI Express Graphics (PEG) receive lane 14 | DP-I                |             |         |
| C99  | PEG_RX14-   |                                            |                     |             |         |
| C100 | GND         | Power Ground                               | PWR GND             |             |         |
| C101 | PEG_RX15+   | PCI Express Graphics(PEG) receive lane 15  | DP-I                |             |         |
| C102 | PEG_RX15-   |                                            |                     |             |         |
| C103 | GND         | Power Ground                               | PWR GND             |             |         |
| C104 | VCC_12V     | Main input voltage (4.75 V-20 V)           | PWR<br>4.75 V- 20 V |             |         |
| C105 | VCC_12V     |                                            |                     |             |         |
| C106 | VCC_12V     |                                            |                     |             |         |
| C107 | VCC_12V     |                                            |                     |             |         |
| C108 | VCC_12V     |                                            |                     |             |         |
| C109 | VCC_12V     |                                            |                     |             |         |
| C110 | GND         | Power Ground                               | PWR GND             |             |         |

+ and - Differential pair differentiator

## 5.2.4. Connector X1B Row D

The following table lists the pins for connector X1B row D.

**Table 55: Connector X1B Row D Pinout List**

| Pin | COME Signal        | Description                                               | Type    | Termination                    | Comment |
|-----|--------------------|-----------------------------------------------------------|---------|--------------------------------|---------|
| D1  | GND                | Power Ground                                              | PWR GND |                                |         |
| D2  | GND                |                                                           |         |                                |         |
| D3  | USB_SSTX0-         | Additional transmit signal for SuperSpeed USB data path 0 | DP-0    |                                |         |
| D4  | USB_SSTX0+         |                                                           |         |                                |         |
| D5  | GND                | Power Ground                                              | PWR GND |                                |         |
| D6  | USB_SSTX1-         | Additional transmit signal for SuperSpeed USB data path 1 | DP-0    |                                |         |
| D7  | USB_SSTX1+         |                                                           |         |                                |         |
| D8  | GND                | Power Ground                                              | PWR GND |                                |         |
| D9  | USB_SSTX2-         | Additional transmit signal for SuperSpeed USB data path 2 | DP-0    |                                |         |
| D10 | USB_SSTX2+         |                                                           |         |                                |         |
| D11 | GND                | Power Ground                                              | PWR GND |                                |         |
| D12 | USB_SSTX3-         | Additional transmit signal for SuperSpeed USB data path 3 | DP-0    |                                |         |
| D13 | USB_SSTX3+         |                                                           |         |                                |         |
| D14 | GND                | Power Ground                                              | PWR GND |                                |         |
| D15 | DDI1_CTRLCLK_AUX+  | DDI1 Clock                                                | I/O-3.3 | PD 100 k $\Omega$              |         |
| D16 | DDI1_CTRLDATA_AUX- | DDI1 Data                                                 | I/O-3.3 | PU 100 k $\Omega$ , 3.3 V (50) |         |
| D17 | RSVD               | Reserved for future use                                   | NC      |                                |         |
| D18 | RSVD               |                                                           |         |                                |         |
| D19 | PCIE_TX6+          | PCI Express transmit lane pair 6                          | DP-0    |                                |         |
| D20 | PCIE_TX6-          |                                                           |         |                                |         |
| D21 | GND                | Power Ground                                              | PWR GND |                                |         |
| D22 | PCIE_TX7+          | PCI Express transmit lane pair 7                          | DP-0    |                                |         |
| D23 | PCIE_TX7-          |                                                           |         |                                |         |
| D24 | RSVD               | Reserved for future use                                   | NC      |                                |         |
| D25 | RSVD               |                                                           |         |                                |         |
| D26 | DDI1_PAIR0+        | DDI1 pair 0                                               | DP-0    |                                |         |
| D27 | DDI1_PAIR0-        |                                                           |         |                                |         |
| D28 | RSVD               | Reserved for future use                                   | NC      |                                |         |
| D29 | DDI1_PAIR1+        | DDI1 pair 1                                               | DP-0    |                                |         |
| D30 | DDI1_PAIR1-        |                                                           |         |                                |         |
| D31 | GND                | Power Ground                                              | PWR GND |                                |         |
| D32 | DDI1_PAIR2+        | DDI1 pair 2                                               | DP-0    |                                |         |
| D33 | DDI1_PAIR2-        |                                                           |         |                                |         |
| D34 | DDI1_DDC_AUX_SEL   | DDI1 select                                               | I-3.3   | PD 1 M $\Omega$                |         |
| D35 | RSVD               | Reserved for future use                                   | NC      |                                |         |
| D36 | DDI1_PAIR3+        | DDI1 pair 3                                               | DP-0    |                                |         |
| D37 | DDI1_PAIR3-        |                                                           |         |                                |         |
| D38 | RSVD               | Reserved for future use                                   | NC      |                                |         |
| D39 | DDI2_PAIR0+        | DDI2 pair 0                                               | DP-0    |                                |         |
| D40 | DDI2_PAIR0-        |                                                           |         |                                |         |
| D41 | GND                | Power Ground                                              | PWR GND |                                |         |
| D42 | DDI2_PAIR1+        | DDI2 pair 1                                               | DP-0    |                                |         |
| D43 | DDI2_PAIR1-        |                                                           |         |                                |         |
| D44 | DDI2_HPD           | DDI2 Hotplug Detect                                       | I-3.3   | PD 100 k $\Omega$              |         |
| D45 | RSVD               | Reserved for future use                                   | NC      |                                |         |

| Pin | COMe Signal  | Description                                 | Type    | Termination | Comment               |
|-----|--------------|---------------------------------------------|---------|-------------|-----------------------|
| D46 | DDI2_PAIR2+  | DDI2 pair 2                                 | DP-0    |             |                       |
| D47 | DDI2_PAIR2-  |                                             |         |             |                       |
| D48 | RSVD         | Reserved for future use                     | NC      |             |                       |
| D49 | DDI2_PAIR3+  | DDI2 pair 3                                 | DP-0    |             |                       |
| D50 | DDI2_PAIR3-  |                                             |         |             |                       |
| D51 | GND          | Power Ground                                | PWR GND |             |                       |
| D52 | PEG_TX0+     | PCI Express Graphics (PEG) transmit lane 0  | DP-0    |             |                       |
| D53 | PEG_TX0-     |                                             |         |             |                       |
| D54 | PEG_LANE_RV# | PCI Express Graphics (PEG) Lane Reversal    | NC      |             |                       |
| D55 | PEG_TX1+     | PCI Express Graphics (PEG) transmit lane 1  | DP-0    |             |                       |
| D56 | PEG_TX1-     |                                             |         |             |                       |
| D57 | TYPE2#       | Ground for Type 6 modules                   | PWR     |             | GND for Type 6 module |
| D58 | PEG_TX2+     | PCI Express Graphics (PEG) transmit lane 2  | DP-0    |             |                       |
| D59 | PEG_TX2-     |                                             |         |             |                       |
| D60 | GND          | Power Ground                                | PWR GND |             |                       |
| D61 | PEG_TX3+     | PCI Express Graphics (PEG) transmit lane 3  | DP-0    |             |                       |
| D62 | PEG_TX3-     |                                             |         |             |                       |
| D63 | RSVD         | Reserved for future use                     | NC      |             |                       |
| D64 | RSVD         |                                             |         |             |                       |
| D65 | PEG_TX4+     | PCI Express Graphics (PEG) transmit lane 4  | DP-0    |             |                       |
| D66 | PEG_TX4-     |                                             |         |             |                       |
| D67 | GND          | Power Ground                                | PWR GND |             |                       |
| D68 | PEG_TX5+     | PCI Express Graphics (PEG) transmit lane 5  | DP-0    |             |                       |
| D69 | PEG_TX5-     |                                             |         |             |                       |
| D70 | GND          | Power Ground                                | PWR GND |             |                       |
| D71 | PEG_TX6+     | PCI Express Graphics (PEG) transmit lane 6  | DP-0    |             |                       |
| D72 | PEG_TX6-     |                                             |         |             |                       |
| D73 | GND          | Power Ground                                | PWR GND |             |                       |
| D74 | PEG_TX7+     | PCI Express Graphics (PEG) transmit lane 7  | DP-0    |             |                       |
| D75 | PEG_TX7-     |                                             |         |             |                       |
| D76 | GND          | Power Ground                                | PWR GND |             |                       |
| D77 | RSVD         | Reserved for future use                     | NC      |             |                       |
| D78 | PEG_TX8+     | PCI Express Graphics (PEG) transmit lane 8  | DP-0    |             |                       |
| D79 | PEG_TX8-     |                                             |         |             |                       |
| D80 | GND          | Power Ground                                | PWR GND |             |                       |
| D81 | PEG_TX9+     | PCI Express Graphics (PEG) transmit lane 9  | DP-0    |             |                       |
| D82 | PEG_TX9-     |                                             |         |             |                       |
| D83 | RSVD         | Reserved for future use                     | NC      |             |                       |
| D84 | GND          | Power Ground                                | PWR GND |             |                       |
| D85 | PEG_TX10+    | PCI Express Graphics (PEG) transmit lane 10 | DP-0    |             |                       |
| D86 | PEG_TX10-    |                                             |         |             |                       |
| D87 | GND          | Power Ground                                | PWR GND |             |                       |
| D88 | PEG_TX11+    | PCI Express Graphics (PEG) transmit lane 11 | DP-0    |             |                       |
| D89 | PEG_TX11-    |                                             |         |             |                       |
| D90 | GND          | Power Ground                                | PWR GND |             |                       |
| D91 | PEG_TX12+    | PCI Express Graphics (PEG) transmit lane 12 | DP-0    |             |                       |
| D92 | PEG_TX12-    |                                             |         |             |                       |
| D93 | GND          | Power Ground                                | PWR GND |             |                       |
| D94 | PEG_TX13+    | PCI Express Graphics (PEG) transmit lane 13 | DP-0    |             |                       |
| D95 | PEG_TX13-    |                                             |         |             |                       |
| D96 | GND          | Power Ground                                | PWR GND |             |                       |

| Pin  | COME Signal | Description                                 | Type             | Termination | Comment |
|------|-------------|---------------------------------------------|------------------|-------------|---------|
| D97  | RSVD        | Reserved for future use                     | NC               |             |         |
| D98  | PEG_TX14+   | PCI Express Graphics (PEG) transmit lane 14 | DP-O             |             |         |
| D99  | PEG_TX14-   |                                             |                  |             |         |
| D100 | GND         | Power Ground                                | PWR GND          |             |         |
| D101 | PEG_TX15+   | PCI Express Graphics (PEG) transmit lane 15 | DP-O             |             |         |
| D102 | PEG_TX15-   |                                             |                  |             |         |
| D103 | GND         | Power Ground                                | PWR GND          |             |         |
| D104 | VCC_12V     | Main input voltage (8.5 V - 20 V)           | PWR<br>8.5 V-20V |             |         |
| D105 | VCC_12V     |                                             |                  |             |         |
| D106 | VCC_12V     |                                             |                  |             |         |
| D107 | VCC_12V     |                                             |                  |             |         |
| D108 | VCC_12V     |                                             |                  |             |         |
| D109 | VCC_12V     |                                             |                  |             |         |
| D110 | GND         | Power Ground                                | PWR GND          |             |         |

+ and - Differential pair differentiator

## 6/ uEFI BIOS

### 6.1. Starting the uEFI BIOS

The COMe-bCL6 is provided with a Kontron-customized, pre-installed and configured version of AMI Aptio® V uEFI BIOS based on the Unified Extensible Firmware Interface (uEFI) specification and the Intel® Platform Innovation Framework for EFI. This uEFI BIOS provides a variety of new and enhanced functions specifically tailored to the hardware features of the COMe-bCL6.



The BIOS version covered in this document might not be the latest version. The latest version might have certain differences to the BIOS options and features described in this chapter.



Register for the EMD Customer Section to get access to BIOS downloads and PCN service.

The uEFI BIOS comes with a Setup program that provides quick and easy access to the individual function settings for control or modification of the uEFI BIOS configuration. The Setup program allows for access to various menus that provide functions or access to sub-menus with further specific functions of their own.

To start the uEFI BIOS Setup program, follow the steps below:

1. Power on the board.
2. Wait until the first characters appear on the screen (POST messages or splash screen).
3. Press the <DEL> key.
4. If the uEFI BIOS is password-protected, a request for password will appear. Enter either the User Password or the Supervisor Password (see Chapter 0), press <RETURN>, and proceed with step 5.
5. A Setup menu appears.

The COMe-bCL6 uEFI BIOS Setup program uses a hot key navigation system. The hot key legend bar is located at the bottom of the Setup screens. The following table provides a list of navigation hot keys available in the legend bar.

**Table 56: Navigation Hot Keys Available in the Legend Bar**

| Sub-screen | Description                                                                                                                                   |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <F1>       | <F1> key invokes the General Help window                                                                                                      |
| <->        | <Minus> key selects the next lower value within a field                                                                                       |
| <+>        | <Plus> key selects the next higher value within a field                                                                                       |
| <F2>       | <F2> key loads previous values                                                                                                                |
| <F3>       | <F3> key loads optimized defaults                                                                                                             |
| <F4>       | <F4> key Saves and Exits                                                                                                                      |
| <→> or <←> | <Left/Right> arrows selects major Setup menus on menu bar, for example, Main or Advanced                                                      |
| <↑> or <↓> | <Up/Down> arrows select fields in the current menu, for example, Setup function or sub-screen                                                 |
| <ESC>      | <ESC> key exits a major Setup menu and enters the Exit Setup menu<br>Pressing the <ESC> key in a sub-menu displays the next higher menu level |
| <RETURN>   | <RETURN> key executes a command or selects a submenu                                                                                          |

## 6.2. Setup Menus

The Setup utility features menus listed in the selection bar at the top of the screen:

- ▶ Main
- ▶ Advanced
- ▶ Chipset
- ▶ Security
- ▶ Boot
- ▶ Save & Exit

The left and right arrow keys select the Setup menus. The currently active menu and the currently active uEFI BIOS Setup item are highlighted in white.

Each Setup menu provides two main frames. The left frame displays all available functions. Configurable functions are displayed in blue. Functions displayed in grey provide information about the status or the operational configuration. The right frame displays an Item Specific Help window providing an explanation of the respective function.

## 6.2.1. Main Setup Menu

On entering the uEFI BIOS the Setup program displays the Main Setup menu. This screen lists the Main Setup menu sub-screens and provides basic system information as well as functions for setting the system language, time and date.

Figure 7: Main Setup Menu

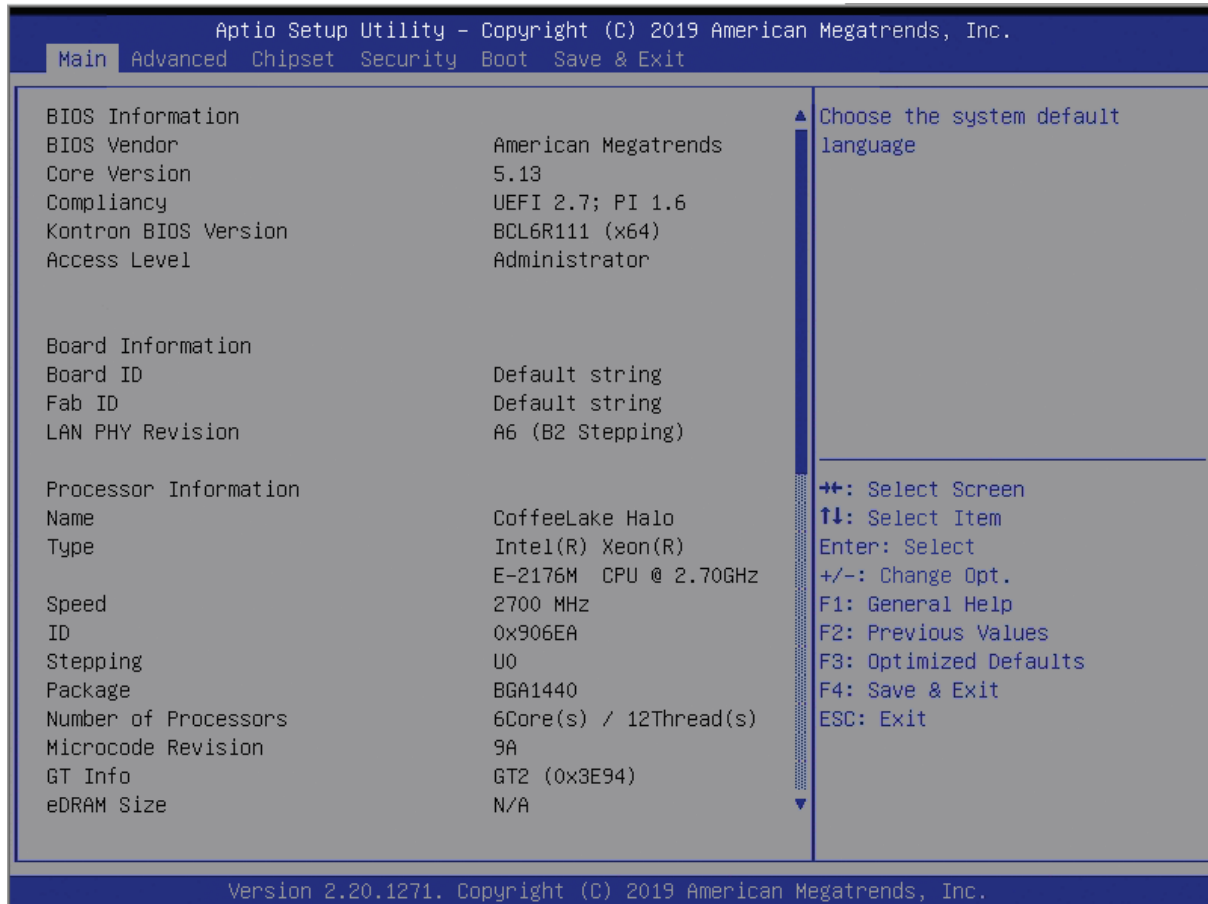


Table 57: Main Setup Menu Sub-screens and Functions

| Sub-screen            | Description                                                                                                                                                 |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BIOS Information      | Read only field<br>Displays information about the BIOS system<br>Vendor, Core version, Compliancy, Kontron BIOS Version, and Access level                   |
| Board Information     | Read only field<br>Board/Fab ID, LAN PHY Revision                                                                                                           |
| Processor Information | Read only field<br>Displays information about the CPU<br>Name, Type, Speed, Processor ID, Stepping, Number of Processors, Microcode Version, and GT Info, , |
| Memory Version        | Read only field<br>Displays information about eDRAM Size, IGFX VBIOS/IGFX GOP/Memory RC Version, Total memory and Memory Frequency                          |

| Sub-screen      | Description                                                                                            |
|-----------------|--------------------------------------------------------------------------------------------------------|
| PCH Information | Read only field<br>Displays information about the PCH<br>Name, PCH SKU, Stepping, and LAN PHY Revision |
| ME FW           | Read only field<br>ME Firmware Version, ME Firmware Consumer SKU                                       |
| System language | Selects System language                                                                                |
| System Date     | Displays System Date                                                                                   |
| System Time     | Displays System Time                                                                                   |

## 6.2.2. Advanced Setup Menu

The Advanced Setup menu provides sub-screens and second level sub-screens with functions, for advanced configuration and Kontron specific configurations.

### NOTICE

Setting items, on this screen, to incorrect values may cause system malfunctions.

Figure 8: Advanced Setup Menu

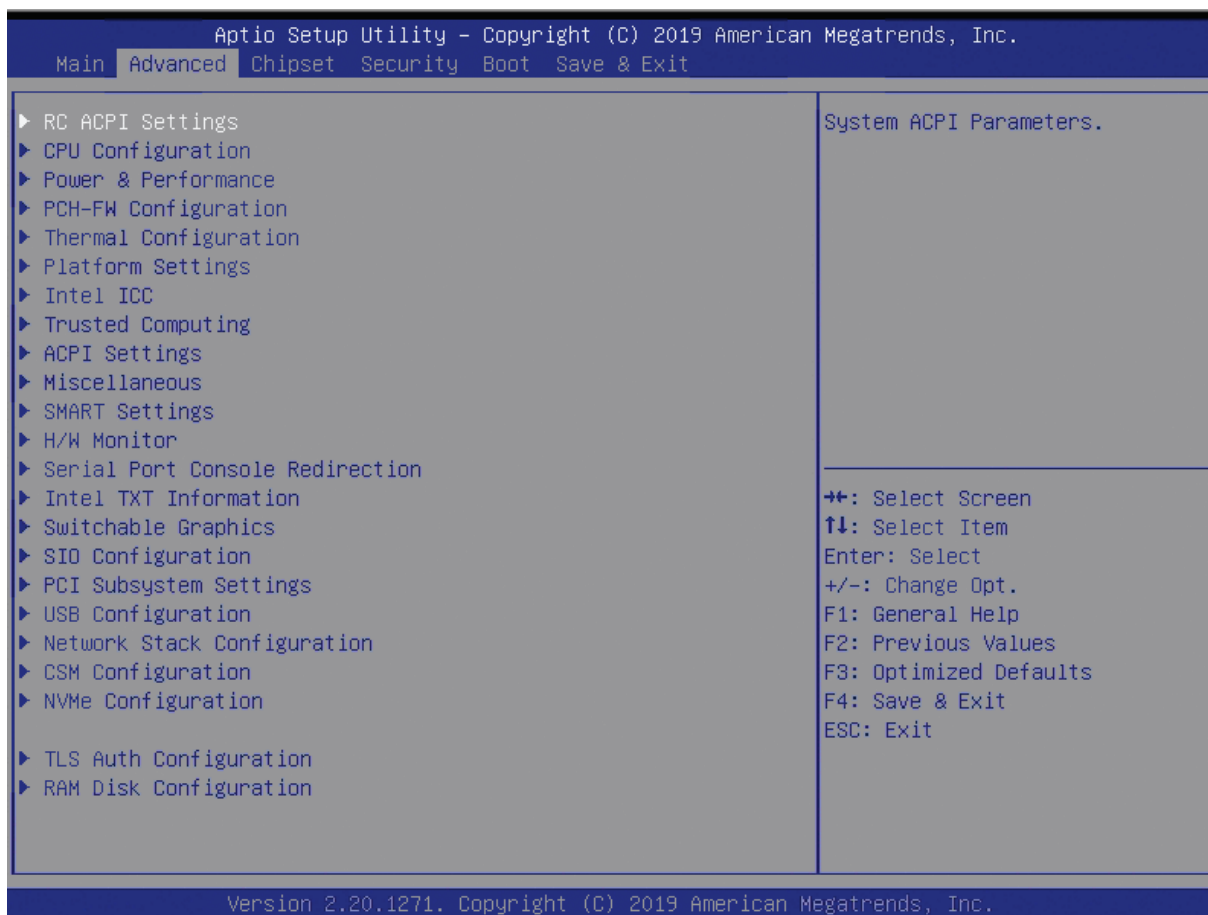


Table 58: Advanced Setup menu Sub-screens and Functions

| Sub-Screen | Function                     | Second level Sub-Screen / Description |
|------------|------------------------------|---------------------------------------|
| RC ACPI    | PTID Support                 | <b>Enable/Disable</b>                 |
|            | PECI Access Method           | Direct I/O                            |
|            | Native PCIe Enable           | <b>Enable/Disable</b>                 |
|            | Native ASPM                  | Auto                                  |
|            | Wake System from S5          | Enable/ <b>Disable</b>                |
|            | ACPI Debug                   | Enable/ <b>Disable</b>                |
|            | Low Power S0 Idle Capability | Enable/ <b>Disable</b>                |
|            | PCI Delay Optimization       | Enable/ <b>Disable</b>                |

| Sub-Screen            | Function                        | Second level Sub-Screen / Description |                              |
|-----------------------|---------------------------------|---------------------------------------|------------------------------|
| CPU Configuration     | MSI enabled                     | <b>Enable/Disable</b>                 |                              |
|                       | C6DRAM                          | <b>Enable/Disable</b>                 |                              |
|                       | Software Guard Extensions (SGX) | Software Controlled                   |                              |
|                       | Select Owner EPOCH input type   | No Change in Owner EPOCHs             |                              |
|                       | CPU Flex Ratio Override         | Enable/ <b>Disable</b>                |                              |
|                       | Intel Virtual Technology>       | <b>Enable/Disable</b>                 |                              |
|                       | Active Processor Cores>         | All                                   |                              |
|                       | Hyper Threading>                | <b>Enable/Disable</b>                 |                              |
| Power & Performance   | CPU Power Management Control    | Boot Performance Mode                 | Max Non-Turbo Performance    |
|                       |                                 | Intel SpeedStep                       | <b>Enable/Disable</b>        |
|                       |                                 | Intel Speed ShiftTechnology           | <b>Enable/Disable</b>        |
|                       |                                 | Turbo Mode                            | <b>Enable/Disable</b>        |
|                       |                                 | View/Configure Turbo Options          |                              |
|                       |                                 | Config TDP Configurations             |                              |
|                       |                                 | Platform PL1 Enable                   | Enable/ <b>Disable</b>       |
|                       |                                 | Platform PL2 Enable                   | Enable/ <b>Disable</b>       |
|                       |                                 | Platform PL4 Override                 | <b>Enable/Disable</b>        |
|                       |                                 | Platform PL4 Power                    | 0                            |
|                       |                                 | Platform PL4 Lock                     | <b>Enable/Disable</b>        |
|                       |                                 | C states                              | <b>Enable/Disable</b>        |
|                       |                                 | Package C State List                  | <b>Auto</b>                  |
|                       | GT Power Management Control     | RC6 (Render Standby)                  | <b>Enable/Disable</b>        |
|                       |                                 | Maximum GT frequency                  | <b>Default Max Frequency</b> |
|                       |                                 | Disable Turbo GT frequency            | Enable/ <b>Disable</b>       |
| PCH-FW Configuration  | ME State                        | <b>Enable/Disable</b>                 |                              |
|                       | Firmware Update Configuration   | ME FW Image Re-Flash                  | Enable/ <b>Disable</b>       |
|                       |                                 | Local FW Update                       | <b>Enable/Disable</b>        |
|                       | PTT Configuration               | TPM Device Selection                  | dTPM/ <b>PTT</b>             |
| Thermal Configuration | CPU Thermal Configuration       | DTS SMM                               | Enable/ <b>Disable</b>       |
|                       |                                 | TCC Activation Offset                 | 0                            |
|                       |                                 | Disable PROCHOT# Output               | <b>Enable/Disable</b>        |
|                       | Platform Thermal Configuration  | Automatic Thermal Reporting           | Enable/ <b>Disable</b>       |
|                       |                                 | Critical Trip Point                   | 119 C (POR)                  |
|                       |                                 | Passive Trip Point                    | 95 C                         |
|                       |                                 | Passive TC1 value                     | 1                            |
|                       |                                 | Passive TC2 value                     | 5                            |
|                       |                                 | Passive TSP value                     | 10                           |

| Sub-Screen        | Function                        | Second level Sub-Screen / Description         |                        |
|-------------------|---------------------------------|-----------------------------------------------|------------------------|
|                   |                                 | Passive Trip Points                           | Enable/ <b>Disable</b> |
|                   |                                 | Critical Trip Point                           | <b>Enable</b> /Disable |
| Platform Settings | System Time and Alarm Source    | <b>ACPI Time and Alarm Device</b> /Legacy RTC |                        |
| Intel ICC         | ICC/OC Watchdog Timer           | Enable/ <b>Disable</b>                        |                        |
|                   | ICC Profile                     | 0                                             |                        |
|                   | ICC PLL Shutdown                | <b>Enable</b> /Disable                        |                        |
| Trusted Computing | Security Device Support         | <b>Enable</b> /Disable                        |                        |
|                   | SHA-1 PCR Bank                  | <b>Enable</b> /Disable                        |                        |
|                   | SHA256 PCR Bank                 | <b>Enable</b> /Disable                        |                        |
|                   | Pending Operation               | <b>None</b>                                   |                        |
|                   | Platform Hierarchy              | <b>Enable</b> /Disable                        |                        |
|                   | Storage Hierarchy               | <b>Enable</b> /Disable                        |                        |
|                   | Endorsement Hierarchy           | <b>Enable</b> /Disable                        |                        |
|                   | TPM 2.0 UEFI Spec Version       | <b>TCG_2</b>                                  |                        |
|                   | Physical Presence Spec Version  | <b>1.3</b>                                    |                        |
|                   | Device Select                   | <b>Auto</b>                                   |                        |
| ACPI settings     | Enable ACPI Auto Configuration> | Enable/ <b>disable</b>                        |                        |
|                   | Enable Hibernation>             | <b>Enable</b> /disable                        |                        |
|                   | ACPI Sleep State                | S3                                            |                        |
|                   | Lock Legacy Resources>          | Enable/ <b>disable</b>                        |                        |
|                   | S3 Video Repost>                | Enable/ <b>disable</b>                        |                        |
| Miscellaneous     | Generic LPC Decode Ranges       | Generic LPC Decode 1                          | Enable/ <b>Disable</b> |
|                   | Watchdog                        | Auto-Reload                                   | Enable/ <b>Disable</b> |
|                   |                                 | Global Lock                                   | Enable/ <b>Disable</b> |
|                   |                                 | Stage 1 Mode                                  | Enable/ <b>Disable</b> |
|                   | Reset Button Behavior           | Chipset Reset                                 |                        |
|                   | I2C Speed                       | 200                                           |                        |
|                   | Onboard I2C Mode                | Multimaster                                   |                        |
|                   | Lid Switch Mode                 | Enable/ <b>Disable</b>                        |                        |
|                   | Sleep Button Mode               | Enable/ <b>Disable</b>                        |                        |
|                   | ACPI temperature polling        | <b>Enable</b> /Disable                        |                        |
|                   | T200 temperature polling        | 30                                            |                        |

| Sub-Screen                      | Function                        | Second level Sub-Screen / Description           |
|---------------------------------|---------------------------------|-------------------------------------------------|
|                                 | Control COMe GPIOs in BIOS      | Enable/ <b>Disable</b>                          |
|                                 | GPIO IRQ-/ I2C IRQ OS assigned  | <b>Enable</b> /Disable                          |
| SMART Settings                  | SMART Self Test                 | Enable/ <b>Disable</b>                          |
| H/W Monitor                     | CPU Fan: Fan Control            | Auto                                            |
|                                 | Fan Pulse                       | 2                                               |
|                                 | Fan Trip Point                  | 50                                              |
|                                 | Trip Point Speed                | 50                                              |
|                                 | Reference Temperature           | CPU Temperature                                 |
|                                 | External Fan: Fan Control       | Auto                                            |
|                                 | Fan Pulse                       | 2                                               |
|                                 | Fan Trip Point                  | 50                                              |
|                                 | Trip Point Speed                | 50                                              |
|                                 | Reference Temperature           | CPU Temperature                                 |
| Serial Port Console Redirection | COM0 Console Redirection        | Enable/ <b>Disable</b>                          |
|                                 | COM1 Console Redirection        | Enable/ <b>Disable</b>                          |
|                                 | Legacy Console Redirection      | Redirection COM Port [ <b>COM0</b> ]            |
|                                 |                                 | Resolution [ <b>80x24</b> ]                     |
|                                 |                                 | Redirection After POST [ <b>Always Enable</b> ] |
|                                 | Console Redirection             | Enable/ <b>Disable</b>                          |
| Intel TXT Inf.                  |                                 |                                                 |
| Switch. Graphics                |                                 |                                                 |
| SIO Configuration               | Serial Port 0                   |                                                 |
|                                 | Serial Port 1                   |                                                 |
| PCI Subsystem Settings          | BME DMA Mitigation              | Enable/ <b>Disable</b>                          |
| USB Configuration               | Legacy USB Support              | <b>Enable</b> /Disable                          |
|                                 | XHCI Hand-Off                   | <b>Enable</b> /Disable                          |
|                                 | USB Mass Storage Driver Support | <b>Enable</b> /Disable                          |
|                                 | USB transfer time-out           | 20 sec                                          |
|                                 | Device reset time-out           | 20 sec                                          |
|                                 | Device power-up delay           | Auto                                            |
| Network Stack                   | Network Stack                   | Enable/ <b>Disable</b>                          |
| CSM Configuration               | CSM Support                     | Enable/ <b>Disable</b>                          |
| NVMe Configuration              |                                 |                                                 |

| Sub-Screen             | Function                  | Second level Sub-Screen / Description |
|------------------------|---------------------------|---------------------------------------|
| TLS Auth Configuration | Server CA Configuration   | Enroll Cert/Delete Cert               |
|                        | Client Cert Configuration |                                       |
| RAM Disk Configuration | Disk Memory Type          | <b>Boot Service Data</b> /Reserved    |
|                        | Create raw                |                                       |
|                        | Create from file          |                                       |
|                        | Remove selected RAM disks |                                       |

**NOTICE****Additional Watchdog Information**

The COMe-bCL6 provides a two-staged watchdog with:

Programmable stages to trigger different actions - If one stage is disabled, then the next stage is also disabled.

Common actions for a watchdog trigger events 'Delay', 'Reset' and 'Watchdog signal only'

CPLD code allows for triggering NMI or SCI. This needs programming of a predefined action inside the BIOS and therefore can only be used in a customized BIOS solution.

Timeouts that can be set to eight different fixed values between 1 second and 30 minutes.

**NOTICE****Additional Information: External Fan**

An external fan can be connected to baseboard. The external fan's control lines are routed via the COMe connector.

**⚠ WARNING**

---

**Additional SIO Information**

Logical Devices state on the left side of the control reflects the current logical device state. Changes made during the setup session are shown after restarting the system.

The SIO Configuration menu enables all available serial interfaces to be configured. The module-based serial interfaces always appear as COM1 and COM2. COM 1 and COM 2 can be treated as 16550-compatible legacy COM interfaces at the standard I/O addresses and are based in the on-module CPLD. Note: Hardware flow control is not supported.

Optionally, If the baseboard contains an activated SuperIO of the type Winbond 83627, then its serial interfaces are added to the system as COM3 and COM4. COM3 and COM4 IRQ and I/O addresses are configurable in this menu, too.

Although the chipset internal COMs are not supported due to technical constraints their driver must be installed. Installing the driver does not mean that these serial interfaces are useable.

---

**NOTICE**

---

**Additional CSM Information**

Compatibility Support Module (CSM) configuration is important for legacy operating systems

By default, CSM is disabled for modern OS such as Windows 8, 10 and Linux.

If a legacy OS is used or a Windows or Linux system is run in legacy mode then this menu allows for detailed option settings.

Note, a change in settings only come into effect after the next restart. Therefore, to be able to use the actualized settings, it is recommended to save and exit setup and re-enter.

The 'Optional ROM Execution' settings require special care. Any OS using an INT10 based display output needs the 'Video' option set to 'Legacy', in the same way that PXE boot needs 'Network' 'Optional ROM' to be set to 'Legacy'.

---

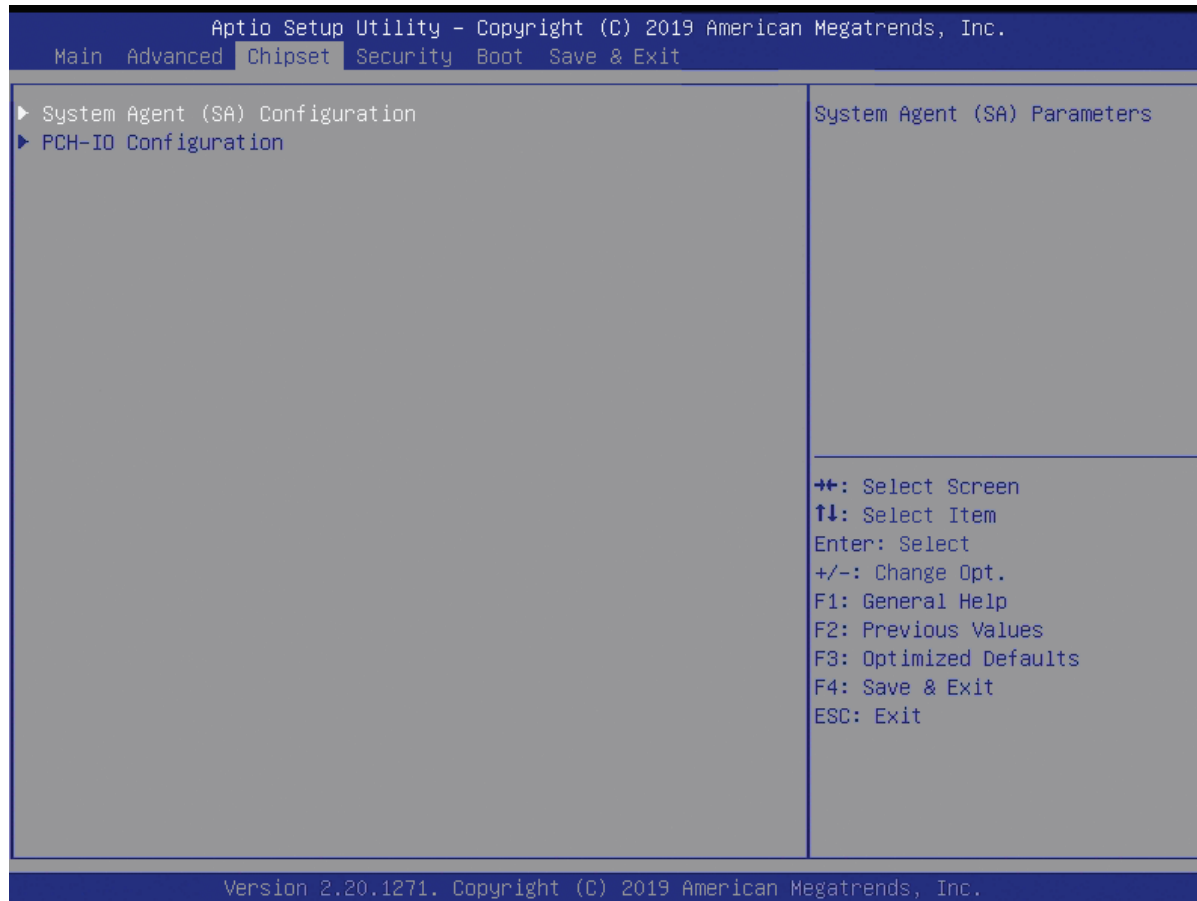
### 6.2.3. Chipset Setup Menu

On entering the Chipset Setup menu, the screen lists two sub-screen options:

- ▶ System Agent
- ▶ PCH-IO

Entering the System Agent Configuration and PCH-IO Configuration sub-screens provides basic system information and possible functions for these configurations.

Figure 9: Chipset Setup Menu



### 6.2.3.1. Chipset: System Agent Configuration

Table 59: Chipset: System Agent Configuration Sub-screens and Functions

| Function               | Second level Sub-Screen / Description           |                             |
|------------------------|-------------------------------------------------|-----------------------------|
| Memory Configuration   | Memory Test on Warm Boot                        | Enable/Disable              |
|                        | Maximum Memory Frequency                        | Auto                        |
|                        | Max TOLUD                                       | Dynamic                     |
| Graphics Configuration | Skip Scanning Slots for External Gfx Card       | Enable/Disable              |
|                        | Primary Display                                 | Auto                        |
|                        | Select PCIE Card                                | Auto                        |
|                        | External Gfx Card Primary Display Configuration |                             |
|                        | Internal Graphics                               | Auto                        |
|                        | GTT Size                                        | 8 MB                        |
|                        | Aperture Size                                   | 256 MB                      |
|                        | DVMT Pre-Allocated                              | 32 M                        |
|                        | DVMT Total Gfx Mem                              | 256 M                       |
|                        | IGD Configuration                               | IGD Boot Type               |
|                        |                                                 | Auto                        |
|                        |                                                 | LFD Panel Type              |
|                        |                                                 | LVDS                        |
|                        |                                                 | Backlight Control           |
|                        |                                                 | PWM                         |
|                        |                                                 | PWM Frequency               |
|                        |                                                 | 200 Hz                      |
|                        |                                                 | Backlight Value             |
|                        |                                                 | 128                         |
|                        |                                                 | LVDS Clock Center Spreading |
|                        |                                                 | no Spreading                |
|                        |                                                 | EFP1 Type                   |
|                        |                                                 | DP with HDMI/DVI            |
| PEG Port Configuration | Enable Root Port                                | Auto                        |
|                        | Max Link Speed                                  | Auto                        |
|                        | PEG0 Slot Power Limit Value                     | 75                          |

| Function                 | Second level Sub-Screen / Description |                                                         |
|--------------------------|---------------------------------------|---------------------------------------------------------|
|                          | PEG0 Slot Power Limit Scale           | 1.0x                                                    |
|                          | PEG0 Physical Slot Number             | 1                                                       |
|                          | PEG Port Feature Configuration        | Detect Non Compliance Device [Enable/ <b>Disable</b> ]  |
|                          |                                       | PCIe Spread Spectrum Clocking [ <b>Enable</b> /Disable] |
| PEG Width Configuration  | PEG Width Configuration               | 1x16                                                    |
| Stop Grant Configuration | Auto                                  |                                                         |
| VT-d                     | <b>Enable</b> /Disable                |                                                         |

### NOTICE

#### Additional Information for LCD Control

The bCL6 allows three different displays to be connected where one display is LVDS and the others are DisplayPort/HDMI/DVI connectors on the baseboard.

If connected to a display LVDS is always the first in the row of active devices. By using different methods such as EDID data (V1.3 or 1.4), DiID (DisplayID) or Kontron's JILI data, it is possible, in most cases, to show a valid picture on a newly connected LVDS panel. However, in special cases the panel size can be chosen manually from a list.

If the 'Auto' setting does not match the needs then it is also possible to manually determine which display to use. In this case, there is a setting for first display and secondary display. If one of them is LFP, then LFP options are also available.

## 6.2.3.2. Chipset > PCH-IO Configuration

Table 60: Chipset Set > PCH-IO Configuration Sub-screens and Functions

| Function                  | Second level Sub-Screen / Description |                        |                        |
|---------------------------|---------------------------------------|------------------------|------------------------|
| PCI Express Configuration | Port8xh Decode                        | Enable/ <b>Disable</b> |                        |
|                           | PCI-USB Glitch W/A                    | Enable/ <b>Disable</b> |                        |
|                           | PCIe Root Port 9 (opt. NVMe)          | PCI Expr. Root Port 9  | <b>Enable</b> /Disable |
|                           |                                       | Connection Type        | Slot                   |
|                           |                                       | ASPM8                  | Auto                   |
|                           |                                       | PME SCI                | <b>Enable</b> /Disable |
|                           |                                       | Hot Plug               | Enable/ <b>Disable</b> |
|                           |                                       | PCIe Speed             | Auto                   |
|                           |                                       | Detect Timeout         | 0                      |
|                           |                                       | Extra Bus Reserved     | 0                      |
|                           |                                       | Reserved Memory        | 10                     |
|                           |                                       | Reserved I/O           | 4                      |

| Function                         | Second level Sub-Screen / Description                                                                                                                                                                                                                                                |                                                    |                        |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------------|
|                                  | PCIe Root Port 13 (COMe Lane 4)<br>PCIe Root Port 14 (COMe Lane 5)<br>PCIe Root Port 15 (COMe Lane 6)<br>PCIe Root Port 16 (COMe Lane 7)<br>PCIe Root Port 21 (COMe Lane 0)<br>PCIe Root Port 22 (COMe Lane 1)<br>PCIe Root Port 23 (COMe Lane 2)<br>PCIe Root Port 24 (COMe Lane 3) | PCI Expr. Root Port 13, 14, 15, 16, 21, 22, 23, 24 | <b>Enable/Disable</b>  |
|                                  |                                                                                                                                                                                                                                                                                      | Connection Type                                    | Slot                   |
|                                  |                                                                                                                                                                                                                                                                                      | ASPM8                                              | Auto                   |
|                                  |                                                                                                                                                                                                                                                                                      | PME SCI                                            | <b>Enable/Disable</b>  |
|                                  |                                                                                                                                                                                                                                                                                      | Hot Plug                                           | Enable/ <b>Disable</b> |
|                                  |                                                                                                                                                                                                                                                                                      | PCIe Speed                                         | Auto                   |
|                                  |                                                                                                                                                                                                                                                                                      | Detect Timeout                                     | 0                      |
|                                  |                                                                                                                                                                                                                                                                                      | Extra Bus Reserved                                 | 0                      |
|                                  |                                                                                                                                                                                                                                                                                      | Reserved Memory                                    | 10                     |
|                                  |                                                                                                                                                                                                                                                                                      | Reserved I/O                                       | 4                      |
| SATA and RST Configuration       | SATA Controller                                                                                                                                                                                                                                                                      | <b>Enable/Disable</b>                              |                        |
|                                  | SATA Mode Selection                                                                                                                                                                                                                                                                  | AHCI                                               |                        |
|                                  | Software Feature Mask Configuration                                                                                                                                                                                                                                                  | HDD Unlock                                         | <b>Enable/Disable</b>  |
|                                  |                                                                                                                                                                                                                                                                                      | LED Locate                                         | <b>Enable/Disable</b>  |
|                                  | Serial ATA Port 0, 1, 2, 3                                                                                                                                                                                                                                                           | Port 0, 1, 2, 3                                    | <b>Enable/Disable</b>  |
|                                  |                                                                                                                                                                                                                                                                                      | External                                           | Enable/ <b>Disable</b> |
|                                  |                                                                                                                                                                                                                                                                                      | Spin Up Device                                     | Enable/ <b>Disable</b> |
|                                  |                                                                                                                                                                                                                                                                                      | SATA Device Type                                   | Hard Disk Drive        |
| USB Configuration                | xDCI Support                                                                                                                                                                                                                                                                         | Enable/ <b>Disable</b>                             |                        |
|                                  | USB Overcurrent                                                                                                                                                                                                                                                                      | <b>Enable/Disable</b>                              |                        |
|                                  | USB Overcurrent Lock                                                                                                                                                                                                                                                                 | <b>Enable/Disable</b>                              |                        |
|                                  | USB Port Disable Override                                                                                                                                                                                                                                                            | Enable/ <b>Disable</b>                             |                        |
| Security Configuration           | RTC Memory Lock                                                                                                                                                                                                                                                                      | <b>Enable/Disable</b>                              |                        |
|                                  | BIOS Lock                                                                                                                                                                                                                                                                            | <b>Enable/Disable</b>                              |                        |
|                                  | Force unlock on all GPIO pads                                                                                                                                                                                                                                                        | Enable/ <b>Disable</b>                             |                        |
| HD Audio Subsystem Configuration | HD Audio                                                                                                                                                                                                                                                                             | <b>Enable/Disable</b>                              |                        |
| SerialIO Configuration           | SPIO Controller                                                                                                                                                                                                                                                                      | Enable/ <b>Disable</b>                             |                        |
| PCH LAN Controller               | <b>Enable/Disable</b>                                                                                                                                                                                                                                                                |                                                    |                        |
| Wake on LAN                      | <b>Enable/Disable</b>                                                                                                                                                                                                                                                                |                                                    |                        |
| Serial IRQ Mode>                 | Continuous                                                                                                                                                                                                                                                                           |                                                    |                        |
| State after G3                   | S0 State                                                                                                                                                                                                                                                                             |                                                    |                        |

| Function                      | Second level Sub-Screen / Description |  |  |
|-------------------------------|---------------------------------------|--|--|
| Port 80h Redirection          | LPC Bus                               |  |  |
| Enhance Port 80h LPC Decoding | Enable/ <b>Disable</b>                |  |  |
| Enable TCO Timer              | Enable/ <b>Disable</b>                |  |  |
| PCIe P11 SSC                  | [Auto, 0.0%, ...]                     |  |  |
| SPD Write Disable             | True                                  |  |  |

## NOTICE

### Additional Information for PCI port

The PCIe menu refers to the different PCIe lanes using their chipset based numbers. For every lane, the number used on the COMe connector is mentioned. Take care to select the PCIe lane you require as numbering varies strongly.

The standard layout for PCIe consists of 8 PCIe 1x lanes.

Other layouts may be programmed by flashing a different descriptor to the Intel firmware on the BIOS SPI flash. Contact Kontron Support if you require different PCIe layout with your project.

## 6.2.4. Security Setup Menu

The Security Setup menu provides information about the passwords and functions for specifying the security settings. The passwords are case-sensitive.

Figure 10: Security Setup Menu

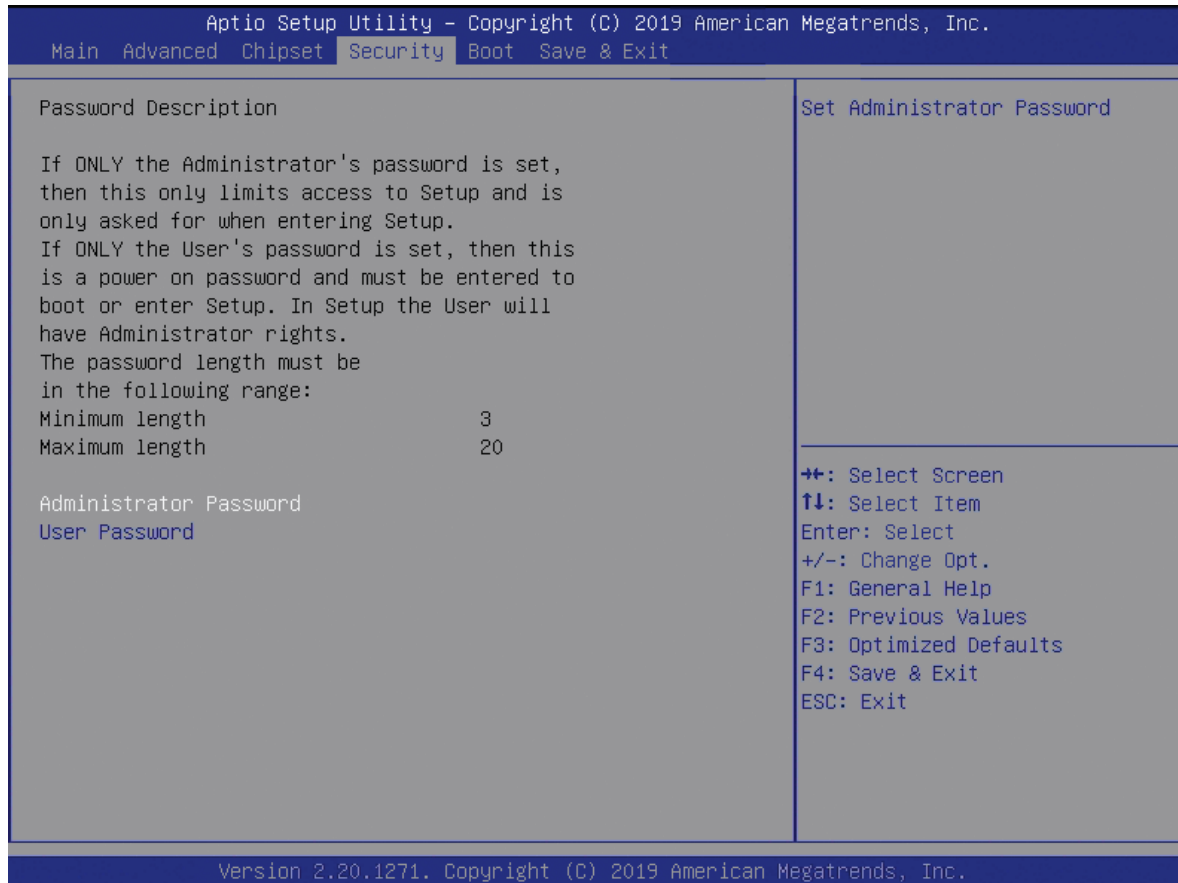


Table 61: Security Setup Menu Functions

| Function               | Description                 |
|------------------------|-----------------------------|
| Administrator Password | Sets administrator password |
| User Password          | Sets user password          |



If only the administrator's password is set, then only access to setup is limited. The password is only entered when entering setup.

If only the user's password is set, then the password is a power on password and must be entered to boot or enter setup. Within the setup menu the user has administrator rights.

Password length requirements are maximum length 20 and minimum length 3.

### 6.2.4.1. Remember the Password

It is highly recommended to keep a record of all passwords in a safe place. Forgotten passwords results in the user being locked out of the system.

If the system cannot be booted because the User Password or the Supervisor Password are not known, see Chapter 7.5 Firmware Update for information about clearing the uEFI BIOS settings, or contact Kontron Support for further assistance.



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**HDD security passwords cannot be cleared using the above method.**

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## 6.2.5. Boot Setup Menu

The Boot Setup menu lists dynamically generated boot device priority order.

Figure 11: Boot Setup Menu

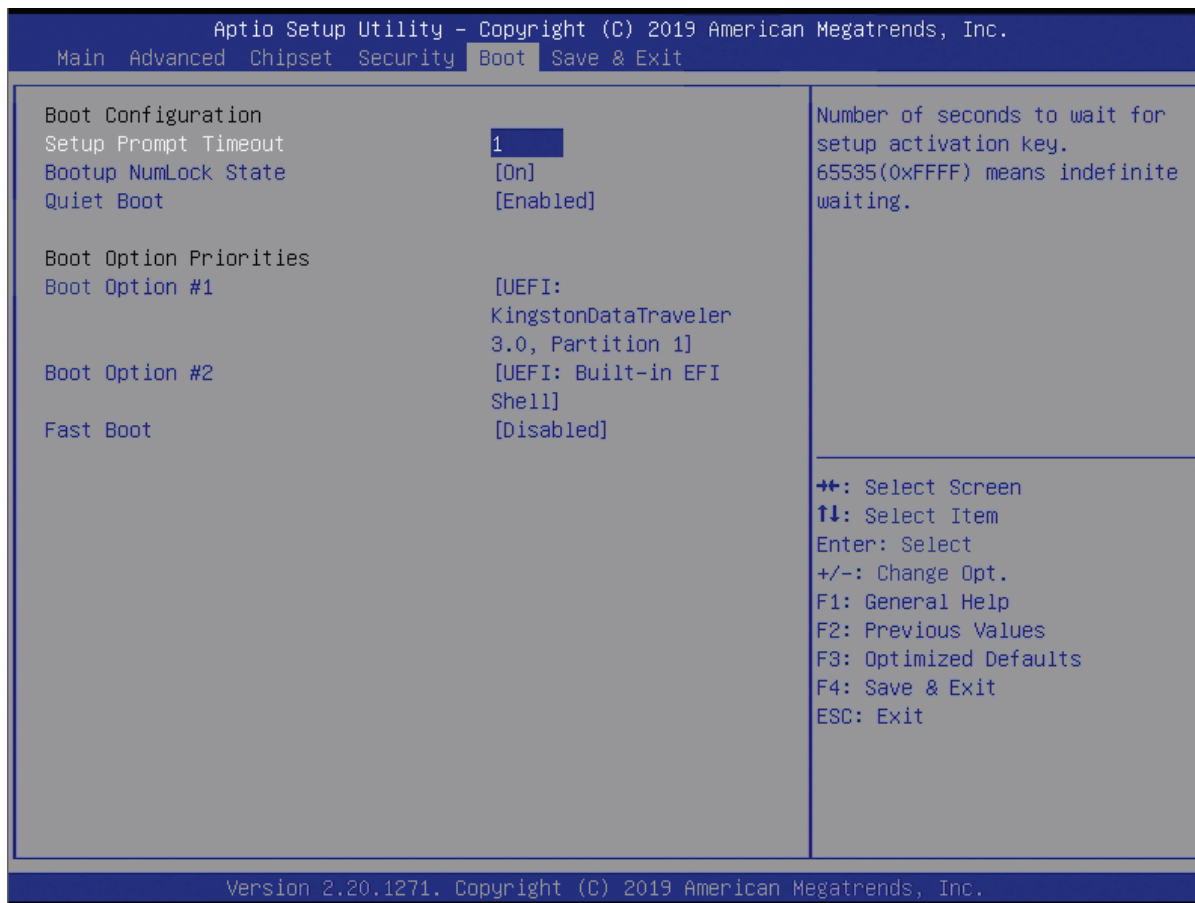


Table 62: Boot Setup Menu Functions

| Function               | Description                                                                                                                                             |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Setup Prompt Timeout   | Displays number of seconds that the firmware waits before initiating the original default boot selection                                                |
| Bootup NumLock State   | Selects keyboard NumLock state                                                                                                                          |
| Quiet Boot             | Enables\disables Quiet Boot                                                                                                                             |
| Boot Option #1         | Sets the system boot order                                                                                                                              |
| Fast Boot              | Enables/disables boot with initialization of a minimal set of devices required to launch active boot option<br>This has no effect for BBS boot options. |
| New Boot Option Policy | Controls placement of newly detected UEFI boot options                                                                                                  |

## 6.2.6. Save and Exit Setup Menu

The Save and Exit Setup menu provides functions for handling changes made to the uEFI BIOS settings and exiting of the Setup program.

Figure 12: Save and Exit Setup Menu

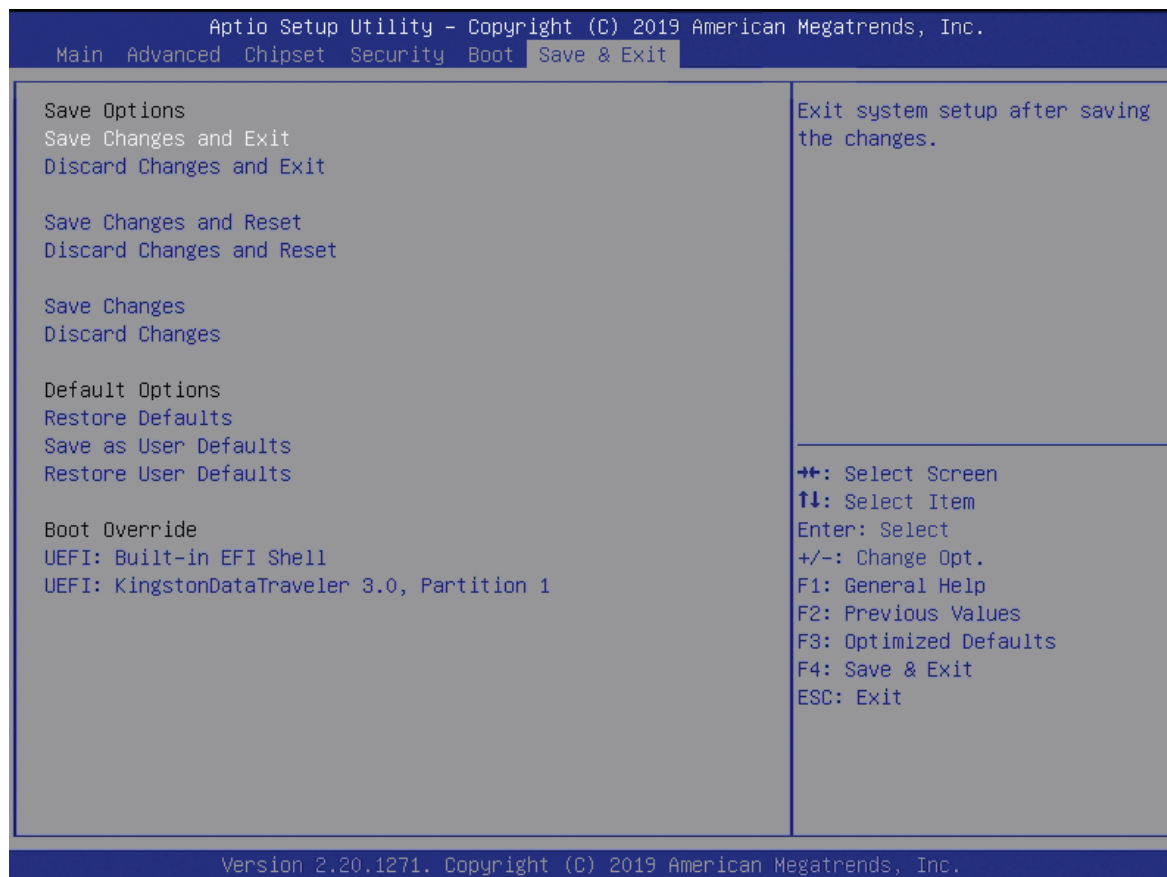


Table 63: Save and Exit Setup Menu Functions

| Function                         | Description                                                                                        |
|----------------------------------|----------------------------------------------------------------------------------------------------|
| Save Changes and Exit>           | Exits system after saving changes                                                                  |
| Discard Changes and Exit>        | Exits system setup without saving changes                                                          |
| Save Changes and Reset>          | Resets system after saving changes                                                                 |
| Discard Changes and Reset>       | Resets system setup without saving changes                                                         |
| Save Changes>                    | Saves changes made so far for any setup options                                                    |
| Discard Changes>                 | Discards changes made so far for any setup options                                                 |
| Restore Defaults>                | Restores/loads standard default values for all setup options                                       |
| Save as User Defaults>           | Saves changes made so far as user defaults                                                         |
| Restore User Defaults>           | Restores user defaults to all setup options                                                        |
| UEFI: Built-in EFI shell>        | Attempts to launch the built in EFI Shell                                                          |
| UEFI: KingstonDataTraveler 3.0 > | Attempts to launch EFI Shell application (Shell.efi) from one of the available file system devices |

## 6.3. The uEFI Shell

The Kontron uEFI BIOS features a built-in and enhanced version of the uEFI Shell. For a detailed description of the available standard shell scripting, refer to the EFI Shell User Guide. For a detailed description of the available standard shell commands, refer to the EFI Shell Command Manual. Both documents can be downloaded from the EFI and Framework Open Source Community homepage (<http://sourceforge.net/projects/efi-shell/files/documents/>).



AMI Aptio update utilities for DOS, EFI Shell and Windows are available at AMI.com:  
<http://www.ami.com/support/downloads/amiflash.zip>.



Kontron uEFI BIOS does not provide all shell commands described in the EFI Shell Command Manual.

### 6.3.1. Basic Operation of the uEFI Shell

The uEFI Shell forms an entry into the uEFI boot order and is the first boot option by default.

#### 6.3.1.1. Entering the uEFI Shell

To enter the uEFI Shell, follow the steps below:

1. Power on the board.
2. Press the <F7> key (instead of <DEL>) to display a choice of boot devices.
3. Choose 'UEFI: Built-in EFI shell'.

```
UEFI Interactive Shell v2.2
EDKII / Kontron add-on v0.1
UEFI v2.70 (American Megatrends, 0x0005000D)
Mapping table:
  FS0:      Alias(s):HD0f0b;BLK1:
            PciRoot(0x0)/Pci(0x14,0x0)/USB(0x5,0x0)/HD(1,MBR,0x0008131B,0x1,0x6C7ff)
  BLK0:      Alias(s):
            PciRoot(0x0)/Pci(0x14,0x0)/USB(0x5,0x0)
```

4. Press the ESC key within 5 seconds to skip startup.nsh, and any other key to continue.
5. The output produced by the device-mapping table can vary depending on the board's configuration.
6. If the ESC key is pressed before the 5 second timeout elapses, the shell prompt is shown:

```
Shell>
```

#### 6.3.1.2. Exiting the uEFI Shell

To exit the uEFI Shell, follow one of the steps below:

1. Use the **exit** uEFI Shell command to select the boot device, in the Boot menu, for the OS to boot from.
2. Reset the board using the **reset** uEFI Shell command.

## 6.4. uEFI Shell Scripting

### 6.4.1. Startup Scripting

If the ESC key is not pressed and the timeout has run out then the uEFI Shell tries to execute some startup scripts automatically. It searches for scripts and executes them in the following order:

1. Initially searches for Kontron flash-stored startup script.
2. If there is no Kontron flash-stored startup script present then the uEFI-specified **startup.nsh** script is used. This script must be located on the root of any of the attached FAT formatted disk drive.
3. If none of the startup scripts are present or the startup script terminates then the default boot order is continued.

### 6.4.2. Create a Startup Script

Startup scripts can be created using the uEFI Shell built-in editor **edit** or under any OS with a plain text editor of your choice. To create a startup shell script, simply save the script on the root of any FAT-formatted drive attached to the system. To copy the startup script to the flash, use the **kBootScript** uEFI Shell command.

In case there is no mass storage device attached, the startup script can be generated in a RAM disk and stored in the SPI boot flash using the **kRamdisk** uEFI Shell command.

### 6.4.3. Examples of Startup Scripts

#### 6.4.3.1. Execute Shell Script on Other Harddrive

This example (**startup.nsh**) executes the shell script named **bootme.nsh** located in the root of the first detected disc drive (**fs0**).

```
fs0:
bootme.nsh
```

## 6.5. Firmware Update

Firmware updates are typically delivered as a ZIP archive containing only the firmware images. The content of the archive with the directory structure must be copied onto a data storage device with FAT partition.

### 6.5.1.1. Updating Procedure

BIOS can be updated with the Intel tool fpt.efi using the procedure below:

1. Copy these files to an USB stick.

flash.nsh (if available)

fpt.efi

fparts.txt

bCL6r<xxx>.bin (where xxx stands for the version #)

2. Start the system into setup (see Chapter 6.1).

3. Change the BIOS option:

**Chipset > PCH-IO Configuration > BIOS Security Configuration > BIOS Lock > Disabled**

4. Save and Exit the BIOS setup.

5. On the next start, boot into shell (see Chapter 6.5.1.1).

6. Change to the drive representing the USB stick

```
fsx: (x = 0,1,2,etc. represents the USB stick)
```

and then change to the directory where you copied the flash tool.

```
cd <your_directory>
```

7. Start flash.nsh (if available) OR enter

```
fpt -SAVEMAC -F BCL6R<xxx>.bin
```

8. Wait until flashing is successful and then power cycle the board.



**Do not switch off the power during the flash process! Doing so leaves your module unrecoverable.**



**Changes under point 3 are only effective during the first boot after the changes were applied. If you fail to flash during the next boot then you might have to repeat steps under 3.**



**Do not forget to apply -SAVEMAC. If SAVEMAC is not applied then your system will lose its system MAC address. If the MAC address is accidentally deleted, contact Kontron Support.**

## 7/ Technical Support

For technical support contact our Support department:

- ▶ E-mail: support@kontron.com
- ▶ Phone: +49-821-4086-888

Make sure you have the following information available when you call:

- ▶ Product ID Number (PN),
- ▶ Serial Number (SN)




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The serial number can be found on the Type Label, located on the product's rear side.  
For more information see, Chapter Fehler! Verweisquelle konnte nicht gefunden werden.  
Fehler! Verweisquelle konnte nicht gefunden werden..

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Be ready to explain the nature of your problem to the service technician.

### 7.1. Warranty

Due to their limited service life, parts that by their nature are subject to a particularly high degree of wear (wearing parts) are excluded from the warranty beyond that provided by law. This applies to the CMOS battery, for example.




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If there is a protection label on your product, then the warranty is lost if the product is opened.

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### 7.2. Returning Defective Merchandise

All equipment returned to Kontron must have a Return of Material Authorization (RMA) number assigned exclusively by Kontron. Kontron cannot be held responsible for any loss or damage caused to the equipment received without an RMA number. The buyer accepts responsibility for all freight charges for the return of goods to Kontron's designated facility. Kontron will pay the return freight charges back to the buyer's location in the event that the equipment is repaired or replaced within the stipulated warranty period. Follow these steps before returning any product to Kontron.

1. Visit the RMA Information website:  
<http://www.kontron.com/support-and-services/support/rma-information>

Download the RMA Request sheet for **Kontron Europe GmbH** and fill out the form. Take care to include a short detailed description of the observed problem or failure and to include the product identification Information (Name of product, Product number and Serial number). If a delivery includes more than one product, fill out the above information in the RMA Request form for each product.

2. Send the completed RMA-Request form to the fax or email address given below at Kontron Europe GmbH. Kontron will provide an RMA-Number.

Kontron Europe GmbH  
RMA Support  
Phone: +49 (0) 821 4086-0

Fax: +49 (0) 821 4086 111  
Email: [service@kontron.com](mailto:service@kontron.com)

3. The goods for repair must be packed properly for shipping, considering shock and ESD protection.



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**Goods returned to Kontron Europe GmbH in non-proper packaging will be considered as customer caused faults and cannot be accepted as warranty repairs.**

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4. Include the RMA-Number with the shipping paperwork and send the product to the delivery address provided in the RMA form or received from Kontron RMA Support.

## Appendix A: List of Acronyms

|                        |                                                                       |
|------------------------|-----------------------------------------------------------------------|
| <b>API</b>             | Application Programming Interface                                     |
| <b>BIOS</b>            | Basic Input Output System                                             |
| <b>BMC</b>             | Base Management Controller                                            |
| <b>BSP</b>             | Board Support Package                                                 |
| <b>CAN</b>             | Controller-area network                                               |
| <b>Carrier Board</b>   | Application specific circuit board that accepts a COM Express® module |
| <b>COM</b>             | Computer-on-Module                                                    |
| <b>Compact Module</b>  | COM Express® 95x95 Module form factor                                 |
| <b>CNTG</b>            | Computer Network Transaction Group                                    |
| <b>DDC</b>             | Display Data Control                                                  |
| <b>DDI</b>             | Digital Display Interface –                                           |
| <b>DIMM</b>            | Dual In-line Memory Module                                            |
| <b>Display Port</b>    | DisplayPort (digital display interface standard)                      |
| <b>DMA</b>             | Direct Memory Access                                                  |
| <b>DRAM</b>            | Dynamic Random Access Memory                                          |
| <b>DVI</b>             | Digital Visual Interface.                                             |
| <b>EAPI</b>            | Embedded Application Programming Interface                            |
| <b>ECC</b>             | Error Checking and Correction                                         |
| <b>EEPROM</b>          | Electrically Erasable Programmable Read-Only Memory                   |
| <b>eDP</b>             | Embedded Display Port                                                 |
| <b>EMC</b>             | Electromagnetic Compatibility (EMC)                                   |
| <b>ESD</b>             | Electro Sensitive Device                                              |
| <b>Extended Module</b> | COM Express® 155mm x 110mm Module form factor.                        |
| <b>FIFO</b>            | First In First Out                                                    |
| <b>FRU</b>             | Field Replaceable Unit                                                |
| <b>Gb</b>              | Gigabit                                                               |
| <b>GBE</b>             | Gigabit Ethernet                                                      |
| <b>GPI</b>             | General Purpose Input                                                 |
| <b>GPIO</b>            | General Purpose Input Output                                          |
| <b>GPO</b>             | General Purpose Output                                                |
| <b>GPU</b>             | Graphics Processing Unit                                              |
| <b>HBR2</b>            | High Bitrate 2                                                        |
| <b>HDA</b>             | High Definition Audio (HD Audio)                                      |
| <b>HD/HDD</b>          | Hard Disk /Drive                                                      |
| <b>HDMI</b>            | High Definition Multimedia Interface                                  |
| <b>HPM</b>             | PICMG Hardware Platform Management specification family               |

|                     |                                                                             |
|---------------------|-----------------------------------------------------------------------------|
| <b>I2C</b>          | Inter integrated Circuit Communications                                     |
| <b>IOL</b>          | IPMI-Over-LAN                                                               |
| <b>IOT</b>          | Internet of Things                                                          |
| <b>IPMI</b>         | Intelligent Platform Management Interface                                   |
| <b>KCS</b>          | Keyboard Controller Style                                                   |
| <b>KVM</b>          | Keyboard Video Mouse                                                        |
| <b>LAN</b>          | Local Area Network                                                          |
| <b>LPC</b>          | Low Pin-Count Interface:                                                    |
| <b>LVDS</b>         | Low Voltage Differential Signaling –                                        |
| <b>M.A.R.S.</b>     | Mobile Application for Rechargeable Systems                                 |
| <b>MEI</b>          | Management Engine Interface                                                 |
| <b>Mini Module</b>  | COM Express® 84x55mm Module form factor                                     |
| <b>MTBF</b>         | Mean Time Before Failure                                                    |
| <b>NA</b>           | Not Available                                                               |
| <b>NC</b>           | Not connected                                                               |
| <b>NCSI</b>         | Network Communications Services Interface                                   |
| <b>PCI</b>          | Peripheral Component Interface                                              |
| <b>PCIe</b>         | PCI-Express                                                                 |
| <b>PECI</b>         | Platform Environment Control Interface                                      |
| <b>PEG</b>          | PCI Express Graphics                                                        |
| <b>PICMG®</b>       | PCI Industrial Computer Manufacturers Group                                 |
| <b>PHY</b>          | Ethernet controller physical layer device                                   |
| <b>Pin-out Type</b> | COM Express® definitions for signals on COM Express® Module connector pins. |
| <b>PSU</b>          | Power Supply Unit                                                           |
| <b>RMS</b>          | Root Mean Square                                                            |
| <b>RTC</b>          | Real Time Clock                                                             |
| <b>SAS</b>          | Serial Attached SCSI – high speed serial version of SCSI                    |
| <b>SATA</b>         | Serial AT Attachment:                                                       |
| <b>SCSI</b>         | Small Computer System Interface                                             |
| <b>SEL</b>          | System Event Log                                                            |
| <b>ShMC</b>         | Shelf Management Controller                                                 |
| <b>SMBus</b>        | System Management Bus                                                       |
| <b>SOIC</b>         | Small Outline Integrated Circuit                                            |
| <b>SOL</b>          | Serial Over LAN                                                             |
| <b>SPI</b>          | Serial Peripheral Interface                                                 |
| <b>SSH</b>          | Secure Shell                                                                |

|             |                                                        |
|-------------|--------------------------------------------------------|
| <b>TPM</b>  | Trusted Platform Module                                |
| <b>UART</b> | Universal Asynchronous Receiver Transmitter            |
| <b>UEFI</b> | Unified Extensible Firmware Interface                  |
| <b>UHD</b>  | Ultra High Definition                                  |
| <b>USB</b>  | Universal Serial Bus                                   |
| <b>VGA</b>  | Video Graphics Adapter                                 |
| <b>VLP</b>  | Very Low Profile                                       |
| <b>WDT</b>  | Watch Dog Timer                                        |
| <b>WEEE</b> | Waste Electrical and Electronic Equipment ( directive) |



#### About Kontron

Kontron is a global leader in Embedded Computing Technology (ECT). As a part of technology group S&T, Kontron offers a combined portfolio of secure hardware, middleware and services for Internet of Things (IoT) and Industry 4.0 applications. With its standard products and tailor-made solutions based on highly reliable state-of-the-art embedded technologies, Kontron provides secure and innovative applications for a variety of industries. As a result, customers benefit from accelerated time-to-market, reduced total cost of ownership, product longevity and the best fully integrated applications overall. For more information, please visit: <http://www.kontron.com/>



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