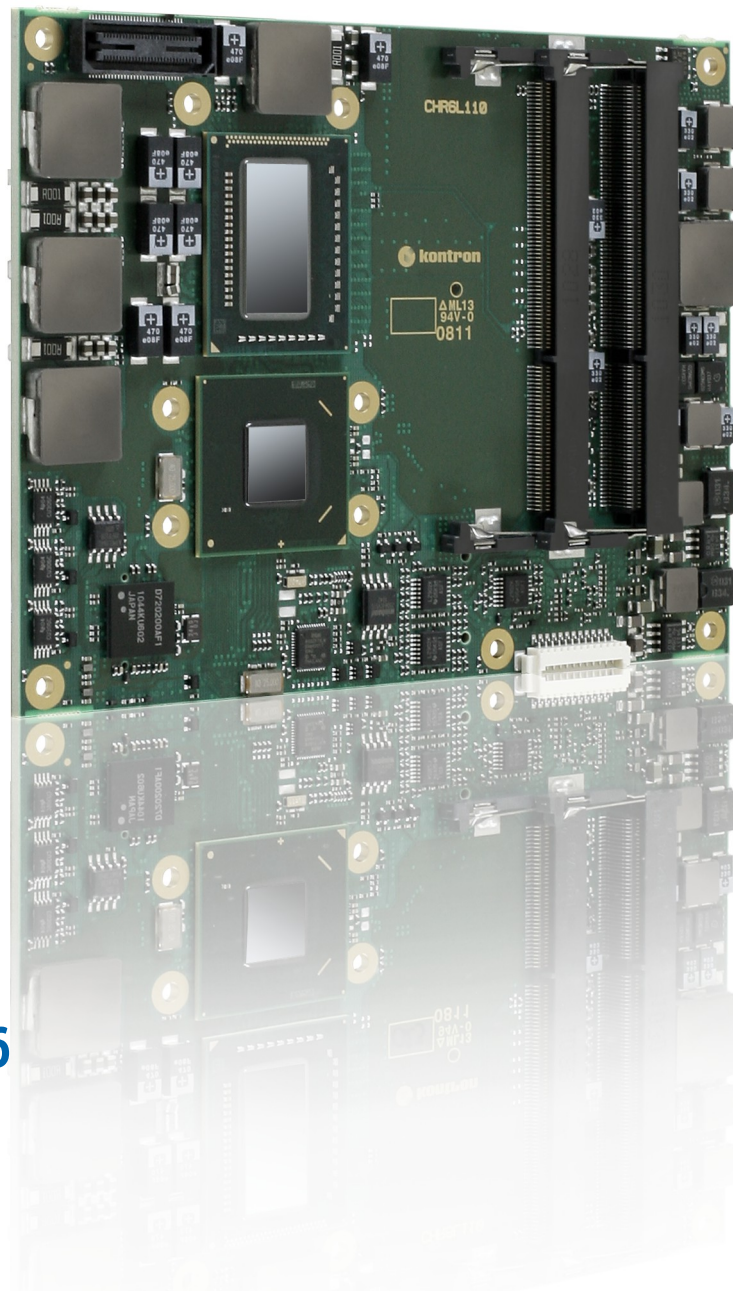


# » Kontron User's Guide «



**COMe-bSC6**

Document Revision 150



# » Table of Contents «

|       |                                                                        |    |
|-------|------------------------------------------------------------------------|----|
| 1     | <a href="#">User Information</a>                                       | 6  |
| 1.1   | <a href="#">About This Document</a>                                    | 6  |
| 1.2   | <a href="#">Copyright Notice</a>                                       | 6  |
| 1.3   | <a href="#">Trademarks</a>                                             | 6  |
| 1.4   | <a href="#">Standards</a>                                              | 6  |
| 1.5   | <a href="#">Warranty</a>                                               | 7  |
| 1.6   | <a href="#">Technical Support</a>                                      | 7  |
| 2     | <a href="#">Introduction</a>                                           | 8  |
| 2.1   | <a href="#">Product Description</a>                                    | 8  |
| 2.2   | <a href="#">Naming clarification</a>                                   | 8  |
| 2.3   | <a href="#">Understanding COM Express® Functionality</a>               | 8  |
| 2.4   | <a href="#">COM Express® Documentation</a>                             | 9  |
| 2.5   | <a href="#">COM Express® Benefits</a>                                  | 9  |
| 3     | <a href="#">Product Specification</a>                                  | 10 |
| 3.1   | <a href="#">Module definition</a>                                      | 10 |
| 3.2   | <a href="#">Functional Specification</a>                               | 11 |
| 3.3   | <a href="#">Block Diagram</a>                                          | 17 |
| 3.4   | <a href="#">Variant Matrix</a>                                         | 17 |
| 3.5   | <a href="#">Accessories</a>                                            | 18 |
| 3.6   | <a href="#">Electrical Specification</a>                               | 19 |
| 3.6.1 | <a href="#">Supply Voltage</a>                                         | 19 |
| 3.6.2 | <a href="#">Power Supply Rise Time</a>                                 | 19 |
| 3.6.3 | <a href="#">Supply Voltage Ripple</a>                                  | 19 |
| 3.6.4 | <a href="#">Power Consumption</a>                                      | 19 |
| 3.6.5 | <a href="#">ATX Mode</a>                                               | 20 |
| 3.6.6 | <a href="#">Single Supply Mode</a>                                     | 20 |
| 3.7   | <a href="#">Power Control</a>                                          | 21 |
| 3.8   | <a href="#">Environmental Specification</a>                            | 22 |
| 3.8.1 | <a href="#">Temperature Specification</a>                              | 22 |
| 3.8.2 | <a href="#">Humidity</a>                                               | 22 |
| 3.9   | <a href="#">Standards and Certifications</a>                           | 23 |
| 3.10  | <a href="#">MTBF</a>                                                   | 25 |
| 3.11  | <a href="#">Mechanical Specification</a>                               | 26 |
| 3.12  | <a href="#">Module Dimensions</a>                                      | 27 |
| 3.13  | <a href="#">Thermal Management, Heatspreader and Cooling Solutions</a> | 28 |
| 3.14  | <a href="#">Onboard Fan Connector</a>                                  | 29 |
| 4     | <a href="#">Features and Interfaces</a>                                | 30 |
| 4.1   | <a href="#">S5 Eco Mode</a>                                            | 30 |
| 4.2   | <a href="#">LPC</a>                                                    | 31 |

|       |                                                                 |    |
|-------|-----------------------------------------------------------------|----|
| 4.3   | <a href="#">Serial Peripheral Interface (SPI)</a>               | 32 |
| 4.4   | <a href="#">SPI boot</a>                                        | 32 |
| 4.5   | <a href="#">M.A.R.S.</a>                                        | 34 |
| 4.6   | <a href="#">UART</a>                                            | 35 |
| 4.7   | <a href="#">Fast I2C</a>                                        | 36 |
| 4.8   | <a href="#">GPIO - General Purpose Input and Output</a>         | 37 |
| 4.9   | <a href="#">Dual Staged Watchdog Timer</a>                      | 38 |
| 4.10  | <a href="#">Speedstep Technology</a>                            | 39 |
| 4.11  | <a href="#">C-States</a>                                        | 40 |
| 4.12  | <a href="#">Hyper Threading</a>                                 | 41 |
| 4.13  | <a href="#">VID-x</a>                                           | 42 |
| 4.14  | <a href="#">Intel® Turbo Boost Technology and AVX</a>           | 43 |
| 4.15  | <a href="#">Display Configuration</a>                           | 44 |
| 4.16  | <a href="#">Hybrid Graphics / Multi-monitor</a>                 | 48 |
| 4.17  | <a href="#">Intel® vPro™ technology</a>                         | 49 |
| 4.18  | <a href="#">ACPI Suspend Modes and Resume Events</a>            | 50 |
| 4.19  | <a href="#">USB</a>                                             | 51 |
| 5     | <a href="#">System Resources</a>                                | 52 |
| 5.1   | <a href="#">Interrupt Request (IRQ) Lines</a>                   | 52 |
| 5.2   | <a href="#">Memory Area</a>                                     | 53 |
| 5.3   | <a href="#">I/O Address Map</a>                                 | 53 |
| 5.4   | <a href="#">Peripheral Component Interconnect (PCI) Devices</a> | 54 |
| 5.5   | <a href="#">I2C Bus</a>                                         | 54 |
| 5.6   | <a href="#">JILI I2C Bus</a>                                    | 54 |
| 5.7   | <a href="#">SDVO I2C Bus</a>                                    | 54 |
| 5.8   | <a href="#">System Management (SM) Bus</a>                      | 55 |
| 6     | <a href="#">Connectors</a>                                      | 56 |
| 6.1   | <a href="#">Connector Location</a>                              | 56 |
| 7     | <a href="#">Pinout List</a>                                     | 57 |
| 7.1   | <a href="#">General Signal Description</a>                      | 57 |
| 7.2   | <a href="#">Connector X1A Row A</a>                             | 58 |
| 7.3   | <a href="#">Connector X1A Row B</a>                             | 60 |
| 7.4   | <a href="#">Connector X1B Row C</a>                             | 62 |
| 7.5   | <a href="#">Connector X1B Row D</a>                             | 64 |
| 8     | <a href="#">BIOS Operation</a>                                  | 66 |
| 8.1   | <a href="#">Determining the BIOS Version</a>                    | 66 |
| 8.2   | <a href="#">BIOS Update</a>                                     | 66 |
| 8.3   | <a href="#">Setup Guide</a>                                     | 68 |
| 8.4   | <a href="#">POST Codes</a>                                      | 68 |
| 8.4.1 | <a href="#">Start AMI® Aptio Setup Utility</a>                  | 68 |

|       |                                       |     |
|-------|---------------------------------------|-----|
| 8.5   | <a href="#">BIOS Setup</a> .....      | 70  |
| 8.5.1 | <a href="#">Main</a> .....            | 70  |
| 8.5.2 | <a href="#">Advanced</a> .....        | 72  |
| 8.5.3 | <a href="#">Chipset</a> .....         | 96  |
| 8.5.4 | <a href="#">Boot</a> .....            | 112 |
| 8.5.5 | <a href="#">Security</a> .....        | 114 |
| 8.5.6 | <a href="#">Save &amp; Exit</a> ..... | 116 |

# 1 User Information

## 1.1 About This Document

This document provides information about products from Kontron Europe GmbH and/or its subsidiaries. No warranty of suitability, purpose, or fitness is implied. While every attempt has been made to ensure that the information in this document is accurate, the information contained within is supplied “as-is” and is subject to change without notice.

For the circuits, descriptions and tables indicated, Kontron assumes no responsibility as far as patents or other rights of third parties are concerned.

## 1.2 Copyright Notice

Copyright © 2003-2014 Kontron Europe GmbH

All rights reserved. No part of this document may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), without the express written permission of Kontron Europe GmbH.

DIMM-PC®, PISA®, ETX®, ETXexpress®, microETXexpress®, X-board®, DIMM-I/O® and DIMM-BUS® are trademarks or registered trademarks of Kontron Europe GmbH. Kontron is trademark or registered trademark of Kontron AG.

## 1.3 Trademarks

The following lists the trademarks of components used in this board.

- » IBM, XT, AT, PS/2 and Personal System/2 are trademarks of International Business Machines Corp.
- » Microsoft is a registered trademark of Microsoft Corp.
- » Intel is a registered trademark of Intel Corp.
- » All other products and trademarks mentioned in this manual are trademarks of their respective owners.

## 1.4 Standards

Kontron Europe GmbH is certified to ISO 9000 standards.

## 1.5 Warranty

For this Kontron Europe GmbH product warranty for defects in material and workmanship exists as long as the warranty period, beginning with the date of shipment, lasts. During the warranty period, Kontron Europe GmbH will decide on its discretion if defective products are to be repaired or replaced.

Within the warranty period, the repair of products is free of charge as long as warranty conditions are observed.

Warranty does not apply for defects arising/resulting from improper or inadequate maintenance or handling by the buyer, unauthorized modification or misuse, as well as the operation outside of the product's environmental specifications and improper installation and maintenance.

Kontron Europe GmbH will not be responsible for any defects or damages to other products not supplied by Kontron Europe GmbH that are caused by a faulty Kontron Europe GmbH product.

## 1.6 Technical Support

Technicians and engineers from Kontron Europe GmbH and/or its subsidiaries are available for technical support. We are committed to make our product easy to use and will help you use our products in your systems.

Please consult our Website at <http://www.kontron.com/support> for the latest product documentation, utilities, drivers and support contacts. Consult our customer section <http://emdcustomersection.kontron.com> for the latest BIOS downloads, Product Change Notifications, Board Support Packages, DemoImages, 3D drawings and additional tools and software. In any case you can always contact your board supplier for technical support.

## 2 Introduction

### 2.1 Product Description

In 2011, Intel® introduced its first quad core CPU suitable for the COM Express® platform. With the quad-core CPU Core™ i7-2715QE and the dual-core CPUs Core™ i3/i5/i7, COM Express® reaches ground-breaking performance values: both for CPU and GPU rankings. With various CPUs COMe-bSC# serves your individual performance needs, starting with a 1.1 GHz version Celeron® 847E.

Kontron's COMe-bSC# is available as COM Express® basic form factor (125x95mm) for Pin-out Type 2 (COMe-bSC2) and Pin-out Type 6 (COMe-bSC6).

### 2.2 Naming clarification

COM Express® defines a Computer-On-Module, or COM, with all components necessary for a bootable host computer, packaged as a super component.

- » COMe-bXX# modules are Kontron's COM Express® modules in basic form factor (125mm x 95mm)
- » COMe-cXX# modules are Kontron's COM Express® modules in compact form factor (95mm x 95mm)
- » COMe-mXX# modules are Kontron's COM Express® modules in mini form factor (55mm x 84mm)

The product names for Kontron COM Express® Computer-on-Modules consist of a short form of the industry standard (**COMe-**), the form factor (**b**=basic, **c**=compact, **m**=mini), the capital letters for the CPU and Chipset Codenames (**XX**) and the pin-out type (**#**) followed by the CPU Name.

### 2.3 Understanding COM Express® Functionality

All Kontron COM Express® basic and compact modules contain two 220pin connectors; each of it has two rows called Row A & B on primary connector and Row C & D on secondary connector. COM Express® Computer-on-modules feature the following maximum amount of interfaces according to the PICMG module Pin-out type:

| Feature                 | Pin-Out Type 1 | Pin-Out Type 10 | Pin-Out Type 2     | Pin-Out Type 6 |
|-------------------------|----------------|-----------------|--------------------|----------------|
| HD Audio                | 1x             | 1x              | 1x                 | 1x             |
| Gbit Ethernet           | 1x             | 1x              | 1x                 | 1x             |
| Serial ATA              | 4x             | 4x              | 4x                 | 4x             |
| Parallel ATA            | -              | -               | 1x                 | -              |
| PCI                     | -              | -               | 1x                 | -              |
| PCI Express x1          | 6x             | 6x              | 6x                 | 8x             |
| PCI Express x16 (PEG)   | -              | -               | 1x                 | 1x             |
| USB Client              | 1x             | 1x              | -                  | -              |
| USB 2.0                 | 8x             | 8x              | 8x                 | 8x             |
| USB 3.0                 | -              | 2x              | -                  | 4x             |
| VGA                     | 1x             | -               | 1x                 | 1x             |
| LVDS                    | Dual Channel   | Single Channel  | Dual Channel       | Dual Channel   |
| DP++ (SDVO/DP/HDMI/DVI) | 1x optional    | 1x              | 3x shared with PEG | 3x             |
| LPC                     | 1x             | 1x              | 1x                 | 1x             |
| External SMB            | 1x             | 1x              | 1x                 | 1x             |
| External I2C            | 1x             | 1x              | 1x                 | 1x             |
| GPIO                    | 8x             | 8x              | 8x                 | 8x             |
| SDIO shared w/GPIO      | 1x optional    | 1x optional     | -                  | 1x optional    |
| UART (2-wire COM)       | -              | 2x              | -                  | 2x             |
| FAN PWM out             | -              | 1x              | -                  | 1x             |



## 2.4 COM Express® Documentation

This product manual serves as one of three principal references for a COM Express® design. It documents the specifications and features of COMe-bSC6. Additional references are available at your Kontron Support or at PICMG®:

- » The COM Express® Specification defines the COM Express® module form factor, pin-out, and signals. This document is available at the PICMG® website by filling out the order form.
- » The COM Express® Design Guide by PICMG® serves as a general guide for baseboard design, with a focus on maximum flexibility to accommodate a wide range of COM Express® modules.



Some of the information contained within this product manual applies only to certain product revisions (CE: xxx). If certain information applies to specific product revisions (CE: xxx) it will be stated. Please check the product revision of your module to see if this information is applicable.

## 2.5 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 which 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 designed to optimally fit a system's packaging.

A single baseboard design can use a range of COM Express® modules with different sizes and pin-outs. This flexibility can differentiate products at various price/performance points, or when designing future proof systems that have a built-in upgrade path. 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.

## 3 Product Specification

### 3.1 Module definition

The COM Express® basic sized Computer-on-Module COMe-bSC6 (CHR6) follows pin-out Type 6 and is compatible to PICMG specification COM.0 Rev 2.0. The COMe-bSC6 based on latest Huron River platform is available in different variants to cover the demand of different performance, price and power:

#### Commercial grade ECC modules (0°C to 60°C operating)

| Product Number  | Product Name            | Processor              | PCH  | Memory      | Graphics | PEG | TPM | USB 2.0 | USB 3.0  |
|-----------------|-------------------------|------------------------|------|-------------|----------|-----|-----|---------|----------|
| 38014-0000-21-4 | COMe-bSC6 i7-2715QE ECC | Intel® Core™ i7-2715QE | QM67 | 2x DDR3-ECC | HD3000   | YES | YES | 8x      | 2x       |
| 38014-0000-22-2 | COMe-bSC6 i7-2655LE ECC | Intel® Core™ i7-2655LE | QM67 | 2x DDR3-ECC | HD3000   | YES | YES | 8x      | 2x       |
| 38014-0000-15-2 | COMe-bSC6 i7-2610UE ECC | Intel® Core™ i7-2610UE | QM67 | 2x DDR3-ECC | HD3000   | YES | YES | 8x      | 2x       |
| 38014-0000-25-2 | COMe-bSC6 i5-2515E ECC  | Intel® Core™ i5-2515E  | QM67 | 2x DDR3-ECC | HD3000   | YES | YES | 8x      | 2x       |
| 38014-0000-21-2 | COMe-bSC6 i3-2310E ECC  | Intel® Core™ i3-2310E  | QM67 | 2x DDR3-ECC | HD3000   | YES | YES | 8x      | 2x       |
| 38014-0000-13-2 | COMe-bSC6 i3-2340UE ECC | Intel® Core™ i3-2340UE | QM67 | 2x DDR3-ECC | HD3000   | YES | YES | 8x      | 2x       |
| 38014-0000-16-1 | COMe-bSC6 B810E ECC     | Intel® Celeron® B810E  | HM65 | 2x DDR3-ECC | HD       | YES | YES | 6x      | optional |
| 38014-0000-11-1 | COMe-bSC6 847E ECC      | Intel® Celeron® 847E   | HM65 | 2x DDR3-ECC | HD       | YES | YES | 6x      | optional |
| 38014-0000-14-0 | COMe-bSC6 827E ECC      | Intel® Celeron® 827E   | HM65 | 2x DDR3-ECC | HD       | YES | YES | 6x      | optional |
| 38014-0000-10-0 | COMe-bSC6 807UE ECC     | Intel® Celeron® 807UE  | HM65 | 1x DDR3-ECC | HD       | -   | YES | 6x      | optional |

#### Commercial grade non-ECC modules (0°C to 60°C operating)

| Product Number  | Product Name    | Processor             | PCH  | Memory  | Graphics | PEG | TPM | USB 2.0 | USB 3.0 |
|-----------------|-----------------|-----------------------|------|---------|----------|-----|-----|---------|---------|
| 38023-0000-16-1 | COMe-bSC6 B810E | Intel® Celeron® B810E | HM65 | 2x DDR3 | HD       | YES | YES | 8x      | -       |
| 38023-0000-11-1 | COMe-bSC6 847E  | Intel® Celeron® 847E  | HM65 | 2x DDR3 | HD       | YES | YES | 8x      | -       |
| 38023-0000-14-0 | COMe-bSC6 827E  | Intel® Celeron® 827E  | HM65 | 2x DDR3 | HD       | YES | YES | 8x      | -       |
| 38023-0000-10-0 | COMe-bSC6 807UE | Intel® Celeron® 807UE | HM65 | 1x DDR3 | HD       | -   | YES | 8x      | -       |

#### Extended temperature ECC modules (E1, -25°C to 75°C operating)

| Product Number     | Product Name               | Processor              | PCH  | Memory      | Graphics | PEG | TPM | USB 2.0 | USB 3.0  |
|--------------------|----------------------------|------------------------|------|-------------|----------|-----|-----|---------|----------|
| 38014-0000-22-2EXT | COMe-bSC6 i7-2655LE ECC E1 | Intel® Core™ i7-2655LE | QM67 | 2x DDR3-ECC | HD3000   | YES | -   | 8x      | 2x       |
| 38014-0000-15-2EXT | COMe-bSC6 i7-2610UE ECC E1 | Intel® Core™ i7-2610UE | QM67 | 2x DDR3-ECC | HD3000   | YES | -   | 8x      | 2x       |
| 38014-0000-11-1EXT | COMe-bSC6 847E ECC E1      | Intel® Celeron® 847E   | HM65 | 2x DDR3-ECC | HD       | YES | -   | 6x      | optional |
| 38014-0000-14-0EXT | COMe-bSC6 827E ECC E1      | Intel® Celeron® 827E   | HM65 | 2x DDR3-ECC | HD       | YES | -   | 6x      | optional |
| 38014-0000-10-0EXT | COMe-bSC6 807UE ECC E1     | Intel® Celeron® 807UE  | HM65 | 1x DDR3-ECC | HD       | -   | -   | 6x      | optional |

## 3.2 Functional Specification

### Processor

The 32nm Intel® 2nd Gen Core™ i7/i5/i3/Celeron® embedded (Sandy Bridge) CPU family with 31x24mm package size (FCBGA1023 socket) supports:

- » Intel® Turbo Boost Technology 2.0
- » Intel® 64
- » Intel® Virtualization Technology (VT-x)
- » Intel® Virtualization Technology for Directed I/O (VT-d)
- » AES New Instructions (AES-NI)
- » Intel® Anti-Theft Technology
- » Intel® Hyper-Threading Technology
- » Enhanced Intel SpeedStep® Technology
- » Idle States (C-States)
- » Intel® Smart Cache
- » Thermal Monitoring Technologies
- » Intel® Fast Memory Access
- » Intel® Flex Memory Access
- » Integrated Intel® HD Graphics with Dynamic Frequency

Optional available (with customized BIOS):

- » Intel® vPRO™ Technology including:
- » Intel® Active Management Technology (AMT)
- » Intel® Trusted Execution Technology (TXT)

The integrated Intel® HD3000 Graphics supports:

- » GraphicsTechnology GT2 with 12 Execution Units
- » Intel® Quick Sync Video
- » Intel® InTru™ 3D Technology
- » Intel® Wireless Display
- » Intel® Flexible Display Interface (Intel® FDI)
- » Intel® Clear Video HD Technology
- » Dual Display

The integrated Intel® HD Graphics supports:

- » GraphicsTechnology GT1 with 6 Execution Units
- » Dual Display

| Intel®                 | Core™     | Core™     | Core™     | Core™     | Core™     | Core™     | Celeron®  | Celeron®  | Celeron®  | Celeron®  |
|------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| -                      | i7-2715QE | i7-2655LE | i7-2610UE | i5-2515E  | i3-2310E  | i3-2340UE | B810E     | 847E      | 827E      | 807UE     |
| # of Cores             | 4         | 2         | 2         | 2         | 2         | 2         | 2         | 2         | 1         | 1         |
| # of Threads           | 8         | 4         | 4         | 4         | 4         | 4         | 2         | 2         | 1         | 1         |
| Clock Speed            | 2100MHz   | 2200MHz   | 1500MHz   | 2500MHz   | 2100MHz   | 1300MHz   | 1600MHz   | 1100MHz   | 1400MHz   | 1000MHz   |
| Max Turbo Frequency    | 3000MHz   | 2900MHz   | 2400MHz   | 3100MHz   | -         | -         | -         | -         | -         | -         |
| TDP                    | 45W       | 25W       | 17W       | 35W       | 35W       | 17W       | 35W       | 17W       | 17W       | 10W       |
| C-States               | C0-C7     | C0-C7     | C0-C7     | C0-C7     | C0-C7     | C0-C7     | C0-C3     | C0-C3     | C0-C3     | C0-C3     |
| Smart Cache            | 6MB       | 4MB       | 4MB       | 3MB       | 3MB       | 3MB       | 2MB       | 2MB       | 1.5MB     | 1MB       |
| Bus/Core Ratio         | 12-21     | 8-22      | 8-15      | 8-25      | 8-21      | 8-13      | 8-16      | 8-11      | 8-14      | 8-10      |
| Min Memory Type        | DDR3-1066 | DDR3-1066 | DDR3-1066 | DDR3-1066 | DDR3-1066 | DDR3-1066 | DDR3-1066 | DDR3-1066 | DDR3-1066 | DDR3-1066 |
| Max Memory Type        | DDR3-1600 | DDR3-1333 | DDR3-1333 | DDR3-1333 | DDR3-1333 | DDR3-1333 | DDR3-1333 | DDR3-1333 | DDR3-1333 | DDR3-1333 |
| Max Memory Size        | 16GB      | 16GB      | 16GB      | 16GB      | 16GB      | 16GB      | 16GB      | 16GB      | 16GB      | 4GB       |
| # of Memory Channels   | 2         | 2         | 2         | 2         | 2         | 2         | 2         | 2         | 2         | 1         |
| Graphics Model         | HD3000    | HD3000    | HD3000    | HD3000    | HD3000    | HD3000    | HD        | HD        | HD        | HD        |
| GFX Base Frequency     | 650MHz    | 650MHz    | 350MHz    | 650MHz    | 650MHz    | 350MHz    | 650MHz    | 350MHz    | 350MHz    | 350MHz    |
| GFX Max Dynamic Frequ. | 1200MHz   | 1000MHz   | 850MHz    | 1100MHz   | 1050MHz   | 800MHz    | 1000MHz   | 800MHz    | 800MHz    | 800MHz    |
| Quick Sync Video       | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | -         | -         | -         | -         |
| InTru™ 3D              | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | -         | -         | -         | -         |
| Wireless Display       | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | -         | -         | -         | -         |
| Clear Video HD         | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | -         | -         | -         | -         |
| PCI Express Graphics   | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | -         |
| vPRO™ (optional)       | Yes       | Yes       | Yes       | Yes       | -         | -         | -         | -         | -         | -         |
| TXT (optional)         | Yes       | Yes       | Yes       | Yes       | -         | -         | -         | -         | -         | -         |
| AES-NI                 | Yes       | Yes       | Yes       | Yes       | -         | -         | -         | -         | -         | -         |
| VT-x                   | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       |
| VT-d                   | Yes       | Yes       | Yes       | Yes       | -         | -         | -         | -         | -         | -         |
| Anti-Theft             | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | -         | -         | -         | -         |



The Bus/Core Ratio shows the possible CPU Performance settings (CPU Ratio) from the max Efficiency Ratio (LFM = Lowest Frequency Mode) to the maximum non-turbo Ratio (HFM = Highest Frequency Mode). If enabled in Setup, CPU Clock is fixed to Ratio\*100MHz. This feature is not supported with updated EFI Core available with BIOS CHR6R111 or newer.

## Memory

|              |                           |
|--------------|---------------------------|
| Sockets      | 2x DDR3 SO-DIMM           |
| Memory Type  | DDR3-1066/1333 ECC/nonECC |
| Maximum Size | 2x8GB                     |
| Technology   | Dual Channel              |

## Chipset

The Intel® 6-Series Platform Controller Hub Cougar Point supports:

- » PCI Express Revision 2.0
- » PCI Express Configurations x1, x2, x4
- » Intel® Virtualization Technology for Directed I/O (VT-d)
- » Intel® Trusted Execution Technology (TXT)
- » Intel® vPro Technology
- » Intel® Active Management Technology 7.0
- » Intel® Anti-Theft Technology
- » Intel® Rapid Storage Technology

## PCH comparison

| Feature       | QM67 | HM65 |
|---------------|------|------|
| TDP           | 3.9W | 3.9W |
| VT-d          | YES  | NO   |
| TXT           | YES  | NO   |
| vPRO          | YES  | NO   |
| AMT           | YES  | NO   |
| Rapid Storage | YES  | NO   |
| SATA RAID     | YES  | NO   |



The Intel® vPro Technology including Trusted Execution Technology (TXT) and Active Management Technology (AMT) is not supported by default on COMe-bSC6. Please contact your local sales or support for custom BIOS variants supporting vPro. A test version is available on EMD Customer Section.

## Graphics Core

The integrated Intel® HD/HD3000 (Gen6) supports:

|                                   |                                                             |
|-----------------------------------|-------------------------------------------------------------|
| Graphics Core Render Clock        | GT1 /GT2, Base clock: 350/650 MHz, GT Turbo: up to 1200 MHz |
| Execution Units / Pixel Pipelines | GT2: 12EU / GT1: 6EU                                        |
| Max Graphics Memory               | 1720MB                                                      |
| GFX Memory Bandwidth (GB/s)       | 21.3                                                        |
| GFX Memory Technology             | DVMT 5.0                                                    |
| API (DirectX/OpenGL)              | 10.1 / 3.0                                                  |
| Shader Model                      | 4.0                                                         |
| Hardware accelerated Video        | MPEG2, VC-1, AVC, Blu-ray (+3D)                             |
| Independent/Simultaneous Displays | 2                                                           |
| Display Port                      | DP 1.1a / eDP                                               |
| HDCP support                      | HDCP 1.4                                                    |

## Monitor output

|                    |           |
|--------------------|-----------|
| CRT max Resolution | 2048x1536 |
| TV out:            | -         |

## LVDS

|                                |                      |
|--------------------------------|----------------------|
| LVDS Bits/Pixel                | 1x18/24, 2x18/24     |
| LVDS Bits/Pixel with dithering | -                    |
| LVDS max Resolution:           | 1920x1200            |
| PWM Backlight Control:         | YES                  |
| Supported Panel Data:          | JILI2/JILI3/EDID/DID |

## Display Interfaces

|                                |                                |
|--------------------------------|--------------------------------|
| Discrete Graphics              | 1x PEG 2.0 (not on Cel. 807UE) |
| Digital Display Interface DDI1 | DP++/SDVOB                     |
| Digital Display Interface DDI2 | DP++                           |
| Digital Display Interface DDI3 | DP++/eDP                       |
| Maximum Resolution on DDI      | 2560x1600                      |

## PEG Configuration

The x16 PCI Express Graphics Port (PEG) is compatible to standard PCI Express devices like Ethernet or RAID controllers. The COMe-bSC6 supports following PEG Port configuration when used as PCI Express Interface:

- » 1×16
- » 1×8
- » 1×4
- » 1×2
- » 1×1

The internal PCI Express controller can be re-configured to support up to 3 PCIe ports. The following port configurations are available via hardware strap options (customized article):

- » 2×8 (lanes #0-7 + #8-15)
- » 1×8 + 2×4 (lanes #0-7 + #8-11 + #12-15)

## Storage

|                 |                                                       |
|-----------------|-------------------------------------------------------|
| onboard SSD     | -                                                     |
| SD Card support | -                                                     |
| IDE Interface   | -                                                     |
| Serial-ATA      | 2x SATA 6Gb/s, 2x SATA 3Gb/s                          |
| SATA AHCI       | NCQ, HotPlug, Staggered Spinup, eSATA, PortMultiplier |
| SATA RAID       | 0, 1, 5, 10, MATRIX (QM67 only)                       |



If SATA AHCI or RAID is disabled in setup, the SATA Interface only supports 3Gb/s transfer rate and Staggered Spin-Up. To configure a RAID enable RAID support in BIOS Chipset/SATA settings, connect at least two hard drives and enter the RAID Option ROM by pressing 'CTRL'+ 'I'

## Connectivity

|                                 |                            |
|---------------------------------|----------------------------|
| USB 2.0                         | up to 8x USB 2.0           |
| USB 3.0                         | up to 2x USB 3.0           |
| USB Client                      | -                          |
| PCI                             | -                          |
| PCI External Masters            | -                          |
| PCI Express                     | 6x PCIe x1 Gen2            |
| Max PCI Express                 | 7x PCIe without USB 3.0    |
| PCI Express x2/x4 configuration | YES (Softstrap option)     |
| Ethernet                        | 10/100/1000 Mbit           |
| Ethernet controller             | Intel® 82579LM (Lewistown) |



- Due to internal chipset configuration the Cougar Point only supports up to 4 USB Hubs
- On Type6 modules with USB3.0 legacy support is disabled in POST for the USB 3.0 Ports 0/1

## PCI Express Configuration

The COMe-bSC6 only supports x1 PCIe lane configuration by default. Following x2/x4 configurations are available via Management Engine Softstrap Options with a customized BIOS version.

| PCIe           | Port #0 | Port #1 | Port #2 | Port #3 | Port #4 | Port #5* | Port #6* | Port #7* |
|----------------|---------|---------|---------|---------|---------|----------|----------|----------|
| Configuration0 | x1      | x1      | x1      | x1      | x1      | -        | -        | -        |
| Configuration1 | x2      |         | x1      | x1      | x1      | x1       | x1       | x1       |
| Configuration2 | x2      |         | x2      |         | x1      | x1       | x1       | x1       |
| Configuration3 | x2      |         | x2      |         | x2      |          | x1       | x1       |
| Configuration4 | x2      |         | x2      |         | x2      |          | x2       |          |
| Configuration5 | x4      |         |         |         | x1      | x1       | x1       | x1       |
| Configuration6 | x4      |         |         |         | x2      |          | x1       | x1       |
| Configuration7 | x4      |         |         |         | x2      |          | x2       |          |
| Configuration8 | x4      |         |         |         | x4      |          |          |          |



- \*PCIe Port #6 is only available on variants without Renesas USB 3.0 Controller and Port #7 is available without Ethernet Controller
- Configuration0 (default) and Configuration5 (modified FlashDescriptor) are provided in BIOS download package available on EMD Customer Section

## Ethernet

The Intel® 82579LM (Lewisville) ethernet supports:

- » Jumbo Frames
- » MACsec IEEE 802.1 AE
- » Time Sync Protocol Indicator
- » WOL (Wake On LAN)
- » PXE (Preboot eXecution Environment)

## Misc Interfaces and Features

|                          |                                    |
|--------------------------|------------------------------------|
| Supported BIOS Size/Type | 8MB SPI                            |
| Audio                    | HD Audio + DisplayPort dual stream |
| Onboard Hardware Monitor | Analog Devices ADT7490             |
| Trusted Platform Module  | Infineon TPM 1.2 SLB9635TT         |
| Miscellaneous            | 2x UART / PWM FAN                  |

## Kontron Features

|                                     |                               |
|-------------------------------------|-------------------------------|
| External I2C Bus                    | Fast I2C, MultiMaster capable |
| M.A.R.S. support                    | YES                           |
| Embedded API                        | KEAPI1 / KEAPI2               |
| Custom BIOS Settings / Flash Backup | YES                           |
| Watchdog support                    | Dual Staged                   |

## Additional features

- » All solid capacitors (POSCAP). No tantalum capacitors used.
- » Optimized RTC Battery monitoring to secure highest longevity
- » Real fast I2C with transfer rates up to 40kB/s.
- » Discharge logic on all onboard voltages for highest reliability

## Power Features

|                       |                         |
|-----------------------|-------------------------|
| Singly Supply Support | YES                     |
| Supply Voltage        | 8.5V - 18V (20V@nonECC) |
| ACPI                  | ACPI 4.0                |
| S-States              | S0, S3, S4, S5          |
| S5 Eco Mode           | YES                     |
| Misc Power Management | DPST 6.0                |

## Power Consumption and Performance

|                             |               |
|-----------------------------|---------------|
| Full Load Power Consumption | 10 - 73W      |
| Kontron Performance Index   | 11571 - 63719 |
| Kontron Performance/Watt    | 878 - 1612    |

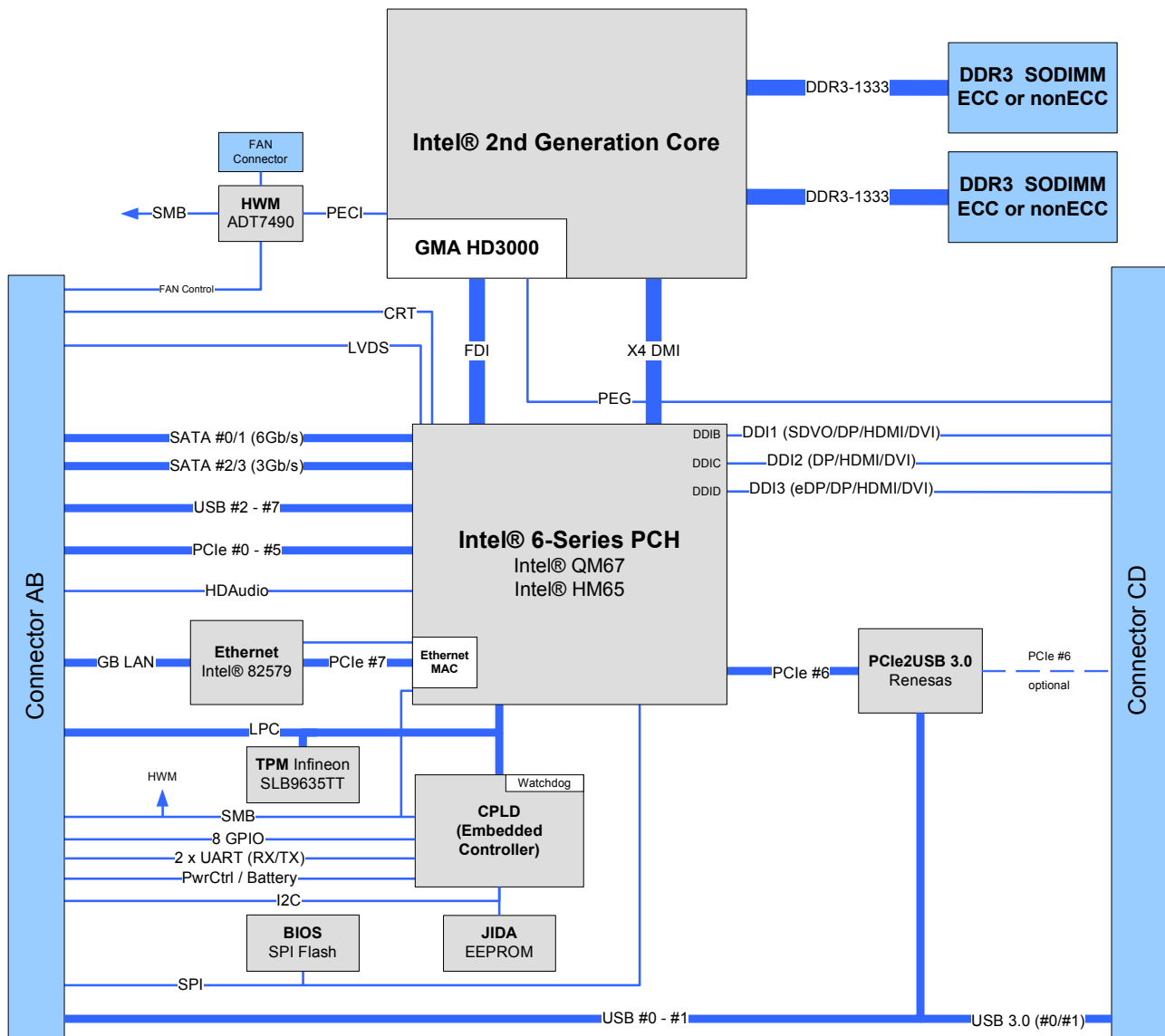
\*Measured Values. Please note the maximum Power Consumption with activated Turbo Mode in chapter Turbo 2.0



Detailed Power Consumption measurements in all states and benchmarks for CPU, Graphics and Memory performance are available in Application Note [KEMAP054](#) at [EMD Customer Section](#).



### 3.3 Block Diagram



### 3.4 Variant Matrix

The COMe-bSC6 is available with different PCB and featureset. The following table shows major differences of available standard modules:

| Product Name        | COMe-bSC6 ECC      | COMe-bSC6 ECC E1   | COMe-bSC6        |
|---------------------|--------------------|--------------------|------------------|
| Part.No.            | 38014-xxxx-xx-x    | 38014-xxxx-xx-xEXT | 38023-xxxx-xx-x  |
| Temperature Grade   | commercial         | extended           | commercial       |
| PCB/Project Code    | CHR6               | CHR6               | CCR6             |
| BIOS/UEFI           | CHR6Rxxx           | CHR6Rxxx           | CHR6Rxxx         |
| HW Revision         | CE 1.x.x           | CE 1.x.x           | CE 1.x.x         |
| DDR3 Memory         | ECC                | ECC                | non-ECC          |
| USB #6/#7 Support   | with QM67 PCH only | with QM67 PCH only | Yes              |
| USB 3.0 Support     | Yes                | Yes                | No               |
| eDP Support on DDI3 | No                 | No                 | Yes              |
| TPM                 | Infineon FW 1.02   | No                 | Infineon FW 3.17 |
| HWM                 | ADT7490            | ADT7490            | NCT7802Y         |

## 3.5 Accessories

### Product specific accessories

| Product Number     | Heatspreader and Cooling Solutions            | Comment                                                       |
|--------------------|-----------------------------------------------|---------------------------------------------------------------|
| 38013-0000-99-0    | HSP COMe-bSC/IP thread                        | For CPUs up to 25W TDP and commercial temperature grade usage |
| 38013-0000-99-1    | HSP COMe-bSC/IP through                       | For CPUs up to 25W TDP and commercial temperature grade usage |
| 38013-0000-99-2    | HSP COMe-bSC/IP heatpipe thread               | For all CPUs and temperature grades                           |
| 38013-0000-99-3    | HSP COMe-bSC/IP heatpipe through              | For all CPUs and temperature grades                           |
| 38013-0000-99-0C05 | HSK COMe-bSC/IP active setscrew thread        | For all CPUs and commercial temperature grade usage           |
| 38013-0000-99-1C05 | HSK COMe-bSC/IP active setscrew through hole  | For all CPUs and commercial temperature grade usage           |
| 38013-0000-99-0C06 | HSK COMe-bSC/IP passive setscrew thread       | For all CPUs and commercial temperature grade usage           |
| 38013-0000-99-1C06 | HSK COMe-bSC/IP passive setscrew through hole | For all CPUs and commercial temperature grade usage           |

### General accessories

| Part Number     | COMe pin-out Type 6 compatible accessories | Project Code                                                            | Comment                                       |
|-----------------|--------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------|
| 38114-0000-00-0 | COM Express® Reference Carrier Type 6      | ADAS                                                                    | mITX Carrier with 8mm COMe connector          |
| 38106-0000-00-0 | COM Express® Eval Carrier Type 6           | Topanga Canyon                                                          | ATX Carrier with 5mm COMe connector           |
| 96007-0000-00-3 | ADA-PCIe-DP                                | APDP                                                                    | PCIe x16 to DP Adapter for Evaluation Carrier |
| 96007-0000-00-7 | ADA-Type6-DP3                              | DVO6                                                                    | (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                                |
| 38106-0000-00-S | COMe Eval Starterkit T6                    | Topanga Canyon                                                          | Starterkit with COMe Evaluation Carrier T6    |
| 38114-0000-00-S | COMe Ref. Starterkit T6                    | ADAS                                                                    | Starterkit with COMe Reference Carrier T6     |
| Part Number     | Mounting                                   | Comment                                                                 |                                               |
| 38017-0000-00-5 | COMe Mount KIT 5mm 1set                    | Mounting Kit for 1 module including screws for 5mm connectors           |                                               |
| 38017-0100-00-5 | COMe Mount KIT 5mm 100sets                 | Mounting Kit for 100 modules including screws for 5mm connectors        |                                               |
| 38017-0000-00-0 | COMe Mount KIT 8mm 1set                    | Mounting Kit for 1 module including screws for 8mm connectors           |                                               |
| 38017-0100-00-0 | COMe Mount Kit 8mm 100sets                 | Mounting Kit for 100 modules including screws for 8mm connectors        |                                               |
| Part Number     | Cooling Solutions                          | Comment                                                                 |                                               |
| 36099-0000-99-0 | COMe Active Uni Cooler                     | for CPUs up to 20W TDP, to be mounted on HSP                            |                                               |
| 36099-0000-99-1 | COMe Passive Uni Cooler                    | for CPUs up to 10W TDP, to be mounted on HSP                            |                                               |
| Part Number     | Display Adapter                            | Comment                                                                 |                                               |
| 9-5000-0352     | ADA-LVDS-DVI 18bit                         | LVDS to DVI converter                                                   |                                               |
| 9-5000-0353     | ADA-LVDS-DVI 24bit                         | LVDS to DVI converter                                                   |                                               |
| 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 40mm                               | Cable adapter to connect FAN to module (COMe basic/compact)             |                                               |
| Part Number     | Miscellaneous                              | Comment                                                                 |                                               |
| 18029-0000-00-0 | MARS Smart Battery Kit                     | Starterkit Kontron Mobile Application platform for Rechargeable Systems |                                               |

### For COMe-bSC6 ECC (38014-xxxx-xx-x)

| Part Number     | DDR3 ECC SODIMM, commercial temperature grade |
|-----------------|-----------------------------------------------|
| 97016-1024-16-0 | DDR3-1600 SODIMM 1GB ECC                      |
| 97016-2048-16-0 | DDR3-1600 SODIMM 2GB ECC                      |
| 97016-4096-16-0 | DDR3-1600 SODIMM 4GB ECC                      |
| 97016-8192-16-0 | DDR3-1600 SODIMM 8GB ECC                      |
| Part Number     | DDR3 ECC SODIMM, industrial temperature grade |
| 97016-1024-16-2 | DDR3-1600 SODIMM 1GB ECC E2                   |
| 97016-2048-16-2 | DDR3-1600 SODIMM 2GB ECC E2                   |
| 97016-4096-16-2 | DDR3-1600 SODIMM 4GB ECC E2                   |
| 97016-8192-16-2 | DDR3-1600 SODIMM 8GB ECC E2                   |

### For COMe-bSC6 non-ECC (38023-xxxx-xx-x)

| Part Number     | DDR3 SODIMM, commercial temperature grade |
|-----------------|-------------------------------------------|
| 97015-1024-16-0 | DDR3-1600 SODIMM 1GB                      |
| 97015-2048-16-0 | DDR3-1600 SODIMM 2GB                      |
| 97015-4096-16-0 | DDR3-1600 SODIMM 4GB                      |
| 97015-8192-16-0 | DDR3-1600 SODIMM 8GB                      |
| Part Number     | DDR3 SODIMM, industrial temperature grade |
| 97015-1024-16-2 | DDR3-1600 SODIMM 1GB E2                   |
| 97015-2048-16-2 | DDR3-1600 SODIMM 2GB E2                   |
| 97015-4096-16-2 | DDR3-1600 SODIMM 4GB E2                   |
| 97015-8192-16-2 | DDR3-1600 SODIMM 8GB E2                   |

## 3.6 Electrical Specification

### 3.6.1 Supply Voltage

Following supply voltage is specified at the COM Express® connector:

|          |                         |
|----------|-------------------------|
| VCC:     | 8.5V - 18V (20V@nonECC) |
| Standby: | 5V DC +/- 5%            |
| RTC:     | 2.5V - 3.47V            |



- 5V Standby voltage is not mandatory for operation.
- Extended Temperature (E1) variants are validated for 12V supply only

### 3.6.2 Power Supply Rise Time

- » The input voltages shall rise from  $\leq 10\%$  of nominal to within the regulation ranges within 0.1ms to 20ms.
- » There must be a smooth and continuous ramp of each DC input voltage from 10% to 90% of its final set-point following the ATX specification

### 3.6.3 Supply Voltage Ripple

- » Maximum 100 mV peak to peak 0 – 20 MHz

### 3.6.4 Power Consumption

The maximum Power Consumption of the different COMe-bSC6 variants is 10 - 73W (100% CPU load on all cores; 90°C CPU temperature). Further information with detailed measurements are available in Application Note KEMAP054 available on [EMD Customer Section](#). Information there is available after registration.

### 3.6.5 ATX Mode

By connecting an ATX power supply with VCC and 5VSB, PWR\_OK is set to low level and VCC is off. Press the Power Button to enable the ATX PSU setting PWR\_OK to high level and powering on VCC. The ATX PSU is controlled by the PS\_ON# signal which is generated by SUS\_S3# via inversion. VCC can be 8.5V - 18V (20V@nonECC) in ATX Mode. On Computer-on-Modules supporting a wide range input down to 4.75V the input voltage shall always be higher than 5V Standby (VCC > 5VSB).

| 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       |

### 3.6.6 Single Supply Mode

In single supply mode (or automatic power on after power loss) without 5V Standby the module will start automatically when VCC power is connected and Power Good input is open or at high level (internal PU to 3.3V). PS\_ON# is not used in this mode and VCC can be 8.5V - 18V (20V@nonECC).

To power on the module from S5 state press the power button or reconnect VCC. Suspend/Standby States are not supported in Single Supply Mode.

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



Signals marked with “x” are not important for the specific power state. There is no difference if connected or open.

All ground pins have to be tied to the ground plane of the carrier board.

## 3.7 Power Control

### Power Supply

The COMe-bSC6 supports a power input from 8.5V - 18V (20V@nonECC). The supply voltage is applied through the VCC pins (VCC) of the module connector.

### Power Button (PWRBTN#)

The power button (Pin B12) is available through the module connector described in the pinout list. To start the module via Power Button the PWRBTN# signal must be at least 50ms ( $50\text{ms} \leq t < 4\text{s}$ , typical 400ms) at low level (Power Button Event).

Pressing the power button for at least 4seconds will turn off power to the module (Power Button Override).

### Power Good (PWR\_OK)

The COMe-bSC6 provides an external input for a power-good signal (Pin B24). The implementation of this subsystem complies with the COM Express® Specification. PWR\_OK is internally pulled up to 3.3V and must be high level to power on the module.

### Reset Button (SYS\_RESET#)

The reset button (Pin B49) is available through the module connector described in the pinout list. The module will stay in reset as long as SYS\_RESET# is grounded. If available, the BIOS setting for "Reset Behavior" must be set to "Power Cycle".



Modules with Intel® Chipset and active Management Engine do not allow to hold the module in Reset out of S0 for a long time. At about 10s holding the reset button the ME will reboot the module automatically

### SM-Bus Alert (SMB\_ALERT#)

With an external battery manager present and SMB\_ALERT# (Pin B15) connected the module always powers on even if BIOS switch "After Power Fail" is set to "Stay Off".

## 3.8 Environmental Specification

### 3.8.1 Temperature Specification

Kontron defines following temperature grades for Computer-on-Modules in general. Please see chapter 'Product Specification' for available temperature grades for the COMe-bSC6

| Temperature Specification                 | Operating      | Non-operating  | Validated Input Voltage      |
|-------------------------------------------|----------------|----------------|------------------------------|
| Commercial grade                          | 0°C to +60°C   | -30°C to +85°C | VCC: 8.5V - 18V (20V@nonECC) |
| Extended Temperature (E1)                 | -25°C to +75°C | -30°C to +85°C | VCC: 12V                     |
| Industrial grade by <b>Screening</b> (XT) | -40°C to +85°C | -40°C to +85°C | VCC: 12V                     |
| Industrial grade by <b>Design</b> (E2)    | -40°C to +85°C | -40°C to +85°C | VCC: 8.5V - 18V (20V@nonECC) |

#### Operating with Kontron heatspreader plate assembly

The operating temperature defines two requirements:

- » the maximum ambient temperature with ambient being the air surrounding the module.
- » the maximum measurable temperature on any spot on the heatspreader's surface

#### Test specification:

| Temperature Grade                         | 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 <b>Screening</b> (XT) | at 85°C HSP temperature the CPU @ 50% load is allowed to start throttling for thermal protection    |
| Industrial grade by <b>Design</b> (E2)    | at 85°C HSP temperature the CPU @ 50% load is allowed to start throttling for thermal protection    |

#### Operating without Kontron heatspreader plate assembly

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

### 3.8.2 Humidity

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

## 3.9 Standards and Certifications

### RoHS II

The **COMe-bSC6** is compliant to the directive 2011/65/EU on the Restriction of the use of certain Hazardous Substances (RoHS II) in electrical and electronic equipment



### Component Recognition UL 60950-1

The **COM Express® basic** form factor Computer-on-Modules are Recognized by Underwriters Laboratories Inc. Representative samples of this component have been evaluated by UL and meet applicable UL requirements.

UL Listings:

» [NWGQ2.E304278](#)

» [NWGQ8.E304278](#)



### WEEE Directive

WEEE Directive 2002/96/EC is not applicable for Computer-on-Modules.

### Conformal Coating

Conformal Coating is available for Kontron Computer-on-Modules and for validated SO-DIMM memory modules. Please contact your local sales or support for further details.

## Shock & Vibration

The **COM Express® basic** form factor Computer-on-Modules successfully passed shock and vibration tests according to

- » IEC/EN 60068-2-6 (Non operating Vibration, sinusoidal, 10Hz-4000Hz, +/-0.15mm, 2g)
- » IEC/EN 60068-2-27 (Non operating Shock Test, half-sinusoidal, 11ms, 15g)

## EMC

Validated in Kontron reference housing for EMC the **COMe-bSC6** follows the requirements for electromagnetic compatibility standards

- » EN55022



### 3.10 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 calculation method used is "Telcordia Issue 2 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.

Other environmental stresses (extreme altitude, vibration, salt water exposure, etc) lower MTBF values.

System MTBF (hours): 225998 @ 40°C (w/PCB)

453913 @ 40°C (w/o PCB)



Fans usually shipped with Kontron Europe GmbH products have 50,000-hour typical operating life. 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 figures and need 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.

## 3.11 Mechanical Specification

### Dimension

» 95.0 mm x 125.0 mm

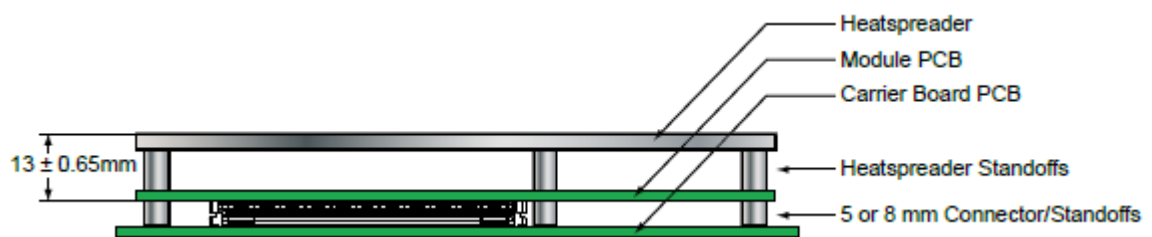
» Height approx. 12mm (0.4")



CAD drawings are available at [EMD CustomerSection](#)

### Height

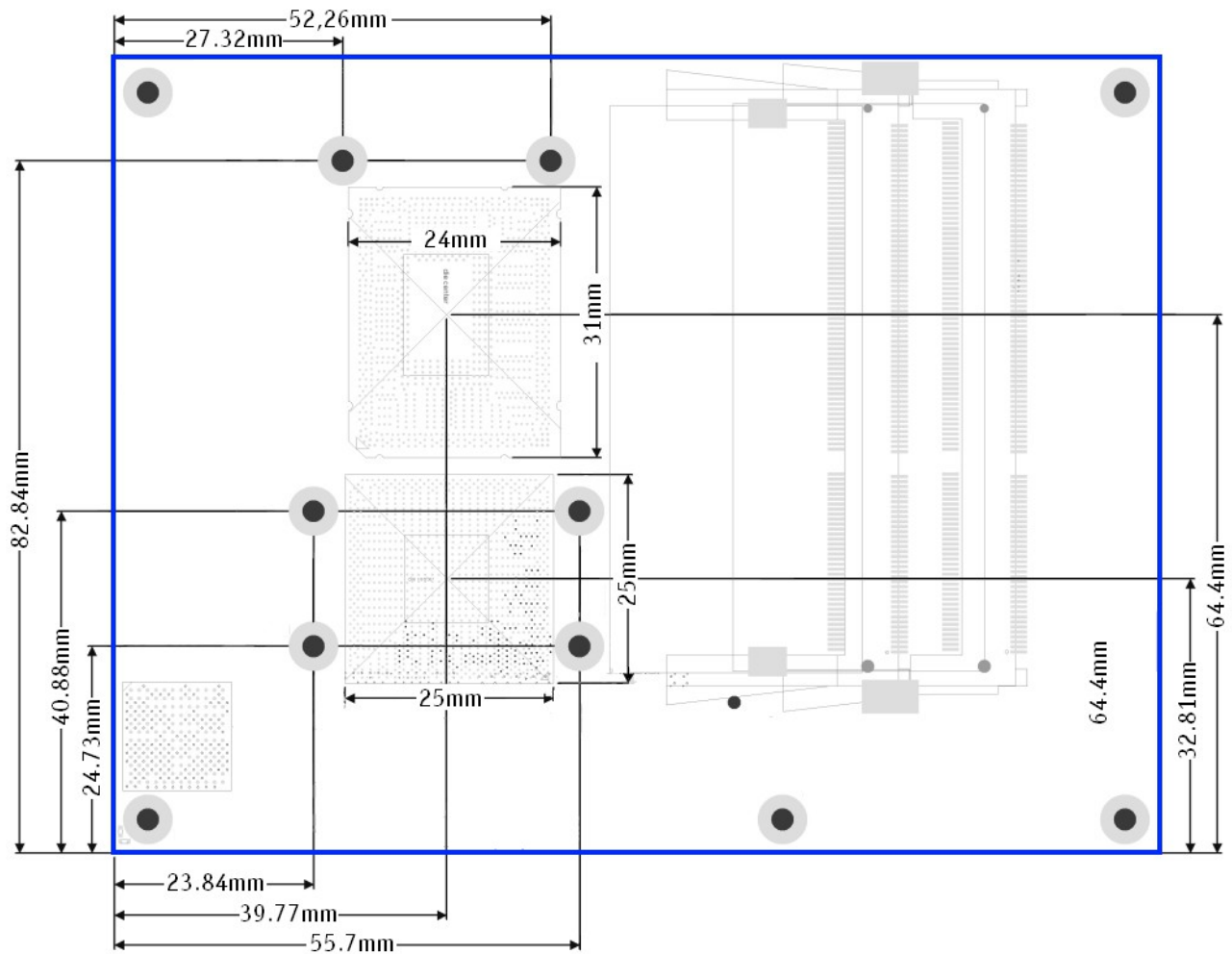
The COM Express® specification defines a module height of 13mm from module PCB bottom to heatspreader top:



Cooling solutions provided from Kontron Europe GmbH for basic sized Computer-on-Modules are 27mm in height from module bottom to Heatsink top.

Universal Cooling solutions to be mounted on the HSP (36099-0000-00-x) are 14.3mm in height for an overall height of 27.3mm from module bottom to Heatsink top.

### 3.12 Module Dimensions



### 3.13 Thermal Management, Heatspreader and Cooling Solutions

A heatspreader plate assembly is available from Kontron Europe GmbH for the COMe-bSC6. The heatspreader plate on top of this assembly is NOT a heat sink. It works as a COM Express®-standard thermal interface to 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 and heatspreader plate temperature on any spot of the heatspreader's surface according the module specifications:

- » 60°C for commercial grade modules
- » 75°C for extended temperature grade modules (E1)
- » 85°C for industrial temperature grade modules (E2/XT)

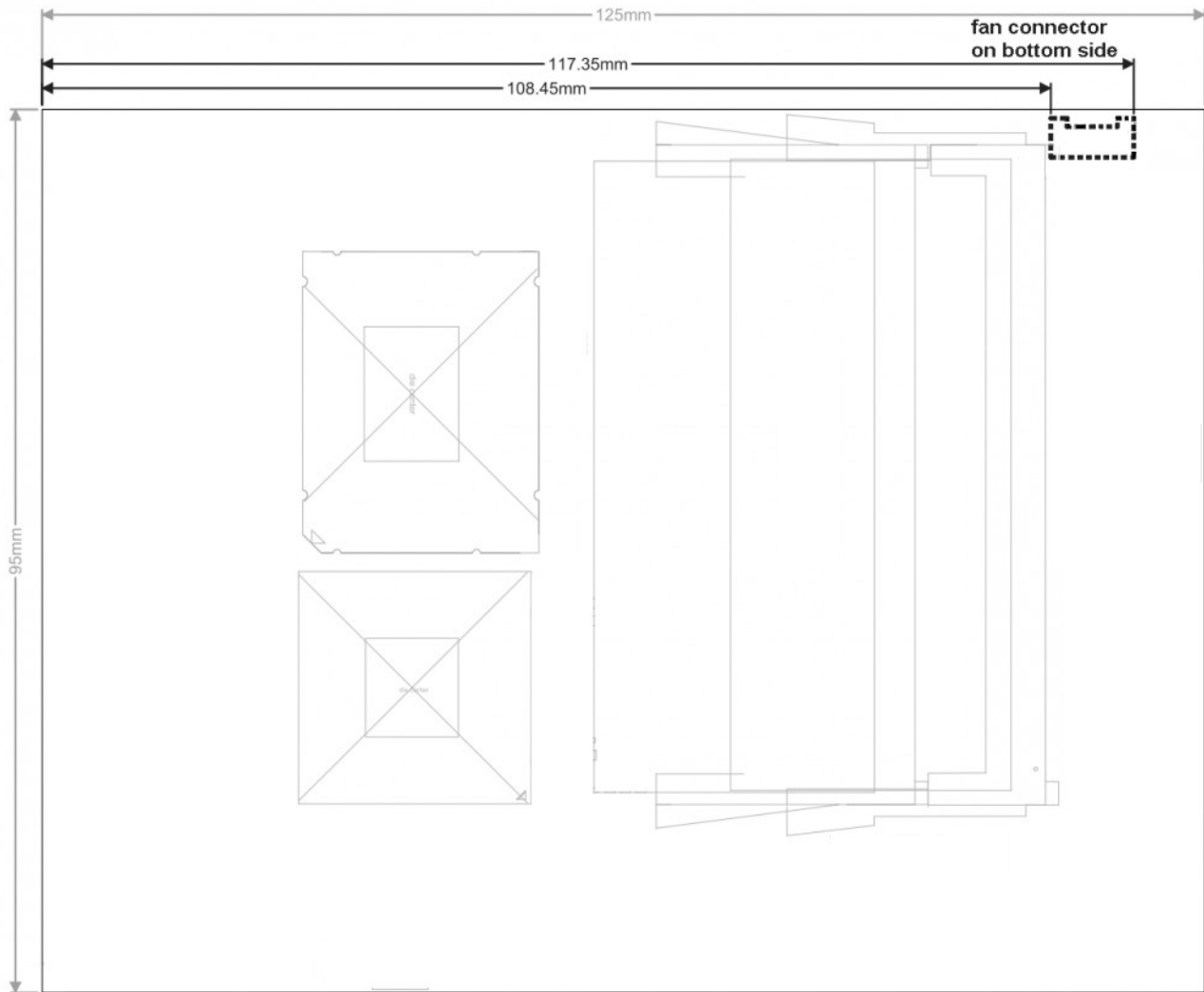
The aluminum slugs and thermal pads or the heat-pipe on the underside of the heatspreader assembly implement thermal interfaces between the heatspreader plate and the major heat-generating components on the COMe-bSC6. About 80 percent of the power dissipated within the module is conducted to the heatspreader plate and can be removed by the cooling solution.

You can use many thermal-management solutions with the 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 Europe GmbH for the COMe-bSC6 are usually designed to cover the power and thermal dissipation for a commercial grade temperature range used in a housing with proper air flow.

Documentation and CAD drawings of COMe-bSC6 heatspreader and cooling solutions are provided at <http://emdcustomersection.kontron.com>.

### 3.14 Onboard Fan Connector

#### Location of the FAN Connector



#### Specification of the FAN Connector:

- » Part number (Molex) J8: 53261-0371
- » Mates with: 51021-0300
- » Crimp terminals: 50079-8100

#### Pin assignment

- » Pin1: Tacho, Pin2: VCC, Pin3: GND

#### Electrical characteristic

| Module Input Voltage    | 8.5 - 13V | 13 - 18V |
|-------------------------|-----------|----------|
| FAN Output Voltage      | 8.5 - 13V | 13V      |
| Max. FAN Output Current | 350mA     | 200mA    |



To connect a standard FAN with 3pin connector to the module please use adaptor cable KAB-HSP 200mm (96079-0000-00-0) or KAB-HSP 40mm (96079-0000-00-2)

## 4 Features and Interfaces

### 4.1 S5 Eco Mode

Kontron's new high-efficient power-off state S5 Eco enables lowest power-consumption in soft-off state – less than 1 mA compared to the regular S5 state this means a reduction by at least factor 200!

In the "normal" S5 mode the board is supplied by 5V\_Stb and needs usually up to 300mA just to stay off. This mode allows to be switched on by power button, RTC event and WakeOnLan, even when it is not necessary. The new S5 Eco mode reduces the current enormous.

The S5 Eco Mode can be enabled in BIOS Setup, when the BIOS supports this feature.

Following prerequisites and consequences occur when S5 Eco Mode is enabled

- » The power button must be pressed at least for 200ms to switch on.
- » Wake via Power button only.
- » "Power On After Power Fail"/"State after G3": only "stay off" is possible

## 4.2 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, which typically combines legacy-device support into a single IC. The implementation of this subsystem complies with the COM Express® Specification. Implementation information is provided in the COM Express® Design Guide maintained by PICMG. Please refer to the official PICMG documentation for additional information.

The LPC bus does not support DMA (Direct Memory Access) and a clock buffer is required when more than one device is used on LPC. 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 following external baseboard LPC Super I/O controller features for the **Winbond/Nuvoton 5V 83627HF/G and 3.3V 83627DHG-P**:

| 83627HF/G  | Phoenix BIOS | AMI CORE8 | AMI / Phoenix EFI |
|------------|--------------|-----------|-------------------|
| PS/2       | YES          | YES       | YES               |
| COM1/COM2  | YES          | YES       | YES               |
| LPT        | YES          | YES       | YES               |
| HWM        | YES          | YES       | NO                |
| Floppy     | NO           | NO        | NO                |
| GPIO       | NO           | NO        | NO                |
| 83627DHG-P | Phoenix BIOS | AMI CORE8 | AMI / Phoenix EFI |
| PS/2       | YES          | YES       | YES               |
| COM1/COM2  | YES          | YES       | YES               |
| LPT        | YES          | YES       | YES               |
| HWM        | NO           | NO        | NO                |
| Floppy     | NO           | NO        | NO                |
| GPIO       | NO           | NO        | NO                |

Features marked as not supported do not exclude OS support (e.g. HWM can be accessed via SMB). For any other LPC Super I/O additional BIOS implementations are necessary. Please contact your local sales or support for further details.

## 4.3 Serial Peripheral Interface (SPI)

The Serial Peripheral Interface Bus or SPI bus is a synchronous serial data link standard named by Motorola that operates in full duplex mode. 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. Sometimes SPI is 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 external BIOS on the baseboard.

## 4.4 SPI boot

The COMe-bSC6 supports boot from an external SPI Flash. It can be configured by pin A34 (BIOS\_DIS#0) and pin B88 (BIOS\_DIS#1) in following configuration:

| BIOS_DIS0# | BIOS_DIS1# | Function                                                     |
|------------|------------|--------------------------------------------------------------|
| open       | open       | Boot on-module BIOS                                          |
| GND        | open       | Boot baseboard LPC FWH                                       |
| open       | GND        | Baseboard SPI = Boot Device 1, on-module SPI = Boot Device 2 |
| GND        | GND        | Baseboard SPI = Boot Device 2, on-module SPI = Boot Device 1 |



By default only SPI Boot Device 1 is used in configuration 3 & 4. Both SPI Boot Devices are used by splitting the BIOS with modified descriptor table in customized versions only

### Recommended SPI boot flash types for 8-SOIC package

| Size   | Manufacturer  | Part Number                    | Device ID |
|--------|---------------|--------------------------------|-----------|
| 16Mbit | Atmel         | AT26DF161                      | 0x1F4600  |
| 16Mbit | Atmel         | AT26DF161A                     | 0x1F4601  |
| 16Mbit | Atmel         | AT25DF161                      | 0x1F4602  |
| 16Mbit | Atmel         | AT25DQ161                      | 0x1F8600  |
| 16Mbit | Macronix      | MX25L1605A(D)(36E)(06E)        | 0xC22015  |
| 16Mbit | Macronix      | MX25L1635D                     | 0xC22415  |
| 16Mbit | SST/Microchip | SST25VF016B                    | 0xBF2541  |
| 16Mbit | Winbond       | W25X16BV                       | 0xEF3015  |
| 16Mbit | Winbond       | W25Q16BV(CV)                   | 0xEF4015  |
| Size   | Manufacturer  | Part Number                    | Device ID |
| 32Mbit | Atmel         | AT25/26DF321                   | 0x1F4700  |
| 32Mbit | Atmel         | AT25DF321A                     | 0x1F4701  |
| 32Mbit | Macronix      | MX25L3205A(D)(06E)             | 0xC22016  |
| 32Mbit | Macronix      | MX25L3225D(35D)(36D)           | 0xC25E16  |
| 32Mbit | SST/Microchip | SST25VF032B                    | 0xBF254A  |
| 32Mbit | Winbond       | W25X32BV                       | 0xEF3016  |
| 32Mbit | Winbond       | W25Q32BV,                      | 0xEF4016  |
| Size   | Manufacturer  | Part Number                    | Device ID |
| 64Mbit | Atmel         | AT25DF641(A)                   | 0x1F4800  |
| 64Mbit | Atmel         | AT25DQ641                      | 0x1F8800  |
| 64Mbit | Macronix      | MX25L6405D(45E)(36E)(06E)(73E) | 0xC22017  |
| 64Mbit | Macronix      | MX25L6455E                     | 0xC22617  |
| 64Mbit | Macronix      | MX25U6435F                     | 0xC22537  |
| 64Mbit | SST/Microchip | SST25VF064C                    | 0xBF254B  |
| 64Mbit | Winbond       | W25X64BV                       | 0xEF3017  |
| 64Mbit | Winbond       | W25Q64BV(CV)(FV)               | 0xEF4017  |
| 64Mbit | Winbond       | W25Q64DW                       | 0XEF6017  |
| 64Mbit | Winbond       | W25Q64FW                       | 0XEF6017  |



## Using an external SPI flash

To program an external SPI flash follow these steps:

- » Connect a SPI flash with correct size (similar to BIOS ROM file size) to the module SPI interface
- » Open pin A34 and B88 to boot from the module BIOS
- » Boot the module to DOS/EFI-Shell with access to the BIOS image and Firmware Update Utility provided on EMD Customer Section
- » Connect pin B88 (BIOS\_DIS1#) to ground to enable the external SPI flash
- » Execute Flash.bat/Flash.efi to program the complete BIOS image to the external SPI flash
- » reboot

Your module will now boot from the external SPI flash when BIOS\_DIS1# is grounded.

## External SPI flash on Modules with Intel® ME

If booting from the external (baseboard mounted) SPI flash then exchanging the COM Express® module for another one of the same type will cause the Intel® Management Engine to fail during next start. This is by design of the ME because it bounds itself to the very module it has been flashed to. In the case of an external SPI flash this is the module present at flash time.

To avoid this issue please make sure to conduct a complete flash of the external SPI flash device after changing the COMexpress module for another one. If disconnecting and reconnecting the same module again this step is not necessary.

## 4.5 M.A.R.S.

The Smart Battery implementation for Kontron Computer-on-Modules called **M**obile **A**pplication for **R**echargeable **S**ystems is a BIOS extension for external Smart Battery Manager or Charger. It includes support for 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.

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  |

## 4.6 UART

The COMe-bSC6 supports up to two Serial RX/TX only Ports defined in COM Express® specification on Pins A98/A99 for UART0 and Pins A101/A102 for UART1. The implementation of the UART is compatible to 16450 and is supported by default from most operating systems. Resources are subordinated to other UARTS e.g. from external LPC Super I/O.

### UART features:

- » 450 to 115.2k Baud (except 56000)
- » 5, 6, 7 or 8bit characters
- » 1 or 2 Stop bit generation
- » Even, odd or no-parity generation/detection
- » Complete status reporting capabilities
- » Line break generation and detection
- » Full prioritized interrupt system control
- » No FIFO
- » One additional shift register for transmit and one for receive
- » No Flow Control
- » No FCR register due to unavailability of FIFO
- » MCR and MSR registers only implemented in loopback mode for compatibility with existing drivers and APIs
- » Initialized per default to COM3 3F8h/IRQ4 and COM4 2F8/IRQ3 without external SIO
- » Initialized per default to COM3 3E8h/IRQ5 and COM4 2E8/IRQ10 with external SIO present

The UART clock is generated by the 33MHz LPC clock which results in an accuracy of 0.5% on all UART timings



- Due to the protection circuitry required according COM Express® specification the transfer speed can only be guaranteed for 9600 Baud. Please contact your local sales or support for customized versions without protection circuitry

- Legacy console redirection via onboard serial ports may be restricted in terms of serial input stream. Since they're only emulating a 16450 device (w/o FIFO) an input stream generated by a program may lose characters. Inputs from a keyboard via terminal program will be safe.

## 4.7 Fast I2C

The COMe-bSC6 supports a CPLD implemented LPC to I2C bridge using the WISHBONE I2C Master Core provided from [opencores.org](http://opencores.org). The I2C Interface supports transfer rates up to 40kB/s and can be configured in Setup

Specification for external I2C:

- » Speed up to 400kHz
- » Compatible to Philips I2C bus standard
- » Multi-Master capable
- » Clock stretching support and wait state generation
- » Interrupt or bit-polling driven byte-by-byte data-transfers
- » Arbitration lost interrupt with automatic transfer cancellation
- » Start/Stop signal generation/detection
- » Bus busy detection
- » 7bit and 10bit addressing

## 4.8 GPIO - General Purpose Input and Output

The COMe-bSC6 offers 4 General Purpose Input (GPI) pins and 4 General Purpose Output (GPO) pins. On a 3.3V level digital in- and outputs are available.

| Signal | Pin | Description              |
|--------|-----|--------------------------|
| GPI0   | A54 | General Purpose Input 0  |
| GPI1   | A63 | General Purpose Input 1  |
| GPI2   | A67 | General Purpose Input 2  |
| GPI3   | A85 | General Purpose Input 3  |
| GPO0   | A93 | General Purpose Output 0 |
| GPO1   | B54 | General Purpose Output 1 |
| GPO2   | B57 | General Purpose Output 2 |
| GPO3   | B63 | General Purpose Output 3 |

### Configuration



The GPI and GPO pins can be configured via JIDA32/K-Station. Please refer to the JIDA32/K-Station manual in the driver download packet on our [customer section](#).

## 4.9 Dual Staged Watchdog Timer

### Basics

A watchdog timer (or computer operating properly (COP) timer) is a computer hardware or software timer that triggers a system reset or other corrective action if the main program, due to some fault condition, such as a hang, neglects to regularly service the watchdog (writing a “service pulse” to it, also referred to as “kicking the dog”, “petting the dog”, “feeding the watchdog” or “triggering the watchdog”). The intention is to bring the system back from the nonresponsive state into normal operation.

The COMe-bSC6 offers a watchdog which works with two stages that can be programmed independently and used one by one.

### Time-out events

|                        |                                                                                                                                                                                                                               |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reset</b>           | A reset will restart the module and starts POST and operating system new.                                                                                                                                                     |
| <b>NMI</b>             | A non-maskable interrupt (NMI) is a computer processor interrupt that cannot be ignored by standard interrupt masking techniques in the system. It is typically used to signal attention for non-recoverable hardware errors. |
| <b>SCI</b>             | A system control interrupt (SCI) is a OS-visible interrupt to be handled by the OS using AML code                                                                                                                             |
| <b>Delay</b>           | Might be necessary when an operating system must be started and the time for the first trigger pulse must extended. (Only available in the first stage)                                                                       |
| <b>WDT Signal only</b> | This setting triggers the WDT Pin on baseboard connector (COM Express® Pin B27) only                                                                                                                                          |
| <b>Cascade:</b>        | Does nothing, but enables the 2nd stage after the entered time-out.                                                                                                                                                           |

### WDT Signal

B27 on COM Express® Connector offers a signal that can be asserted when a watchdog timer has not been triggered within time. It can be configured to any of the 2 stages. Deassertion of the signal is automatically done after reset. If deassertion during runtime is necessary please ask your Kontron technical support for further help.

## 4.10 Speedstep Technology

The Intel® processors offer the Intel® Enhanced SpeedStep™ technology that automatically switches between maximum performance mode and battery-optimized mode, depending on the needs of the application being run. It enables you to adapt high performance computing on your applications. When powered by a battery or running in idle mode, the processor drops to lower frequencies (by changing the CPU ratios) and voltage, conserving battery life while maintaining a high level of performance. The frequency is set back automatically to the high frequency, allowing you to customize performance.

In order to use the Intel® Enhanced SpeedStep™ technology the operating system must support SpeedStep™ technology.

By deactivating the SpeedStep feature in the BIOS, manual control/modification of CPU performance is possible. Setup the CPU Performance State in the BIOS Setup or use 3rd party software to control CPU Performance States.

## 4.11 C-States

New generation platforms include power saving features like SuperLFM, EIST (P-States) or C-States in O/S idle mode.

Activated C-States are able to dramatically decrease power consumption in idle mode by reducing the Core Voltage or switching of parts of the CPU Core, the Core Clocks or the CPU Cache.

Following C-States are defined:

| C-State | Description           | Function                                                         |
|---------|-----------------------|------------------------------------------------------------------|
| C0      | Operating             | CPU fully turned on                                              |
| C1      | Halt State            | Stops CPU main internal clocks via software                      |
| C1E     | Enhanced Halt         | Similar to C1, additionally reduces CPU voltage                  |
| C2      | Stop Grant            | Stops CPU internal and external clocks via hardware              |
| C2E     | Extended Stop Grant   | Similar to C2, additionally reduces CPU voltage                  |
| C3      | Deep Sleep            | Stops all CPU internal and external clocks                       |
| C3E     | Extended Stop Grant   | Similar to C3, additionally reduces CPU voltage                  |
| C4      | Deeper Sleep          | Reduces CPU voltage                                              |
| C4E     | Enhanced Deeper Sleep | Reduces CPU voltage even more and turns off the memory cache     |
| C6      | Deep Power Down       | Reduces the CPU internal voltage to any value, including 0V      |
| C7      | Deep Power Down       | Similar to C6, additionally LLC (LastLevelCache) is switched off |

C-States are usually enabled by default for low power consumption, but active C-States may influence performance sensitive applications or real-time systems.

» Active C6-State may influence data transfer on external Serial Ports

» Active C7-State may cause lower CPU and Graphics performance

It's recommended to disable C-States / Enhanced C-States in BIOS Setup if any problems occur.



## 4.12 Hyper Threading

Hyper Threading (officially termed Hyper Threading Technology or HTT) is an Intel®-proprietary technology used to improve parallelization of computations performed on PC's. Hyper-Threading works by duplicating certain sections of the processor—those that store the architectural state but not duplicating the main execution resources. This allows a Hyper-Threading equipped processor to pretend to be two “logical” processors to the host operating system, allowing the operating system to schedule two threads or processes simultaneously. Hyper Threading Technology support always relies on the Operating System.

## 4.13 VID-x

The processor implements the VID-x feature for improved control of core voltage levels when the processor enters a reduced power consumption state. VID-x applies only when the processor is in the Intel Dynamic Acceleration Technology performance state and one or more cores are in low-power state (i.e., CC3/CC4/CC6). VID-x provides the ability for the processor to request core voltage level reductions greater than one VID tick. The amount of VID tick reduction is fixed and only occurs while the processor is in Intel Dynamic Acceleration Technology mode. This improved voltage regulator efficiency during periods of reduced power consumption allows for leakage current reduction which results in platform power savings and extended battery life.

When in Intel Dynamic Acceleration Technology mode, it is possible for both cores to be active under certain internal conditions. In such a scenario the processor may draw an Instantaneous current (ICC\_CORE\_INST) for a short duration of  $t_{INST}$ ; however, the average ICC current will be lesser than or equal to ICCDES current specification.

## 4.14 Intel® Turbo Boost Technology and AVX

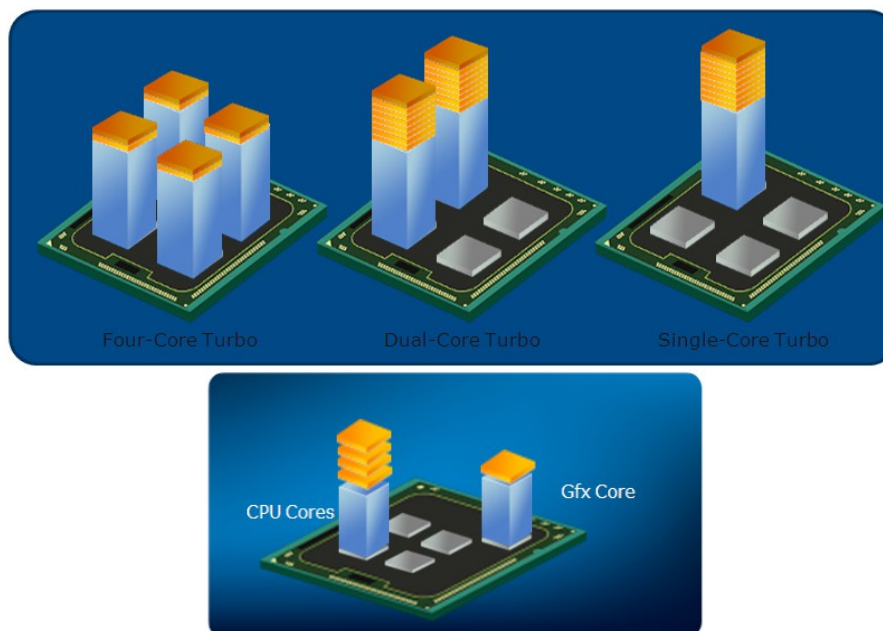
For applications that are particularly power-hungry, the new processors provide enhanced Intel® Turbo Boost technology. This automatically shifts processor cores and processor graphics resources to accelerate performance, tailoring a workload to give users an immediate performance boost for their applications whenever needed. Another innovation is the enhancement to the 256-bit instruction set, known as Intel® Advanced Vector Extensions (AVX). AVX delivers improved performance, rich functionality and the ability to manage, rearrange and sort data in a better way. The new instruction set accelerates floating-point intensive applications such as “number crunchers” or digital processing of images, videos and audio data.

### Intel® Turbo Boost Technology 2.0

Intel has optimized Intel® Turbo Boost Technology to provide even more performance when needed on the latest-generation Intel® microarchitecture. Intel® Turbo Boost Technology 2.0 automatically allows processor cores to run faster than the base operating frequency if it's operating below power, current, and temperature specification limits. Intel Turbo Boost Technology 2.0 is activated when the Operating System (OS) requests the highest processor performance state (P0).

The maximum frequency of Intel Turbo Boost Technology 2.0 is dependent on the number of active cores. The amount of time the processor spends in the Intel Turbo Boost Technology 2.0 state depends on the workload and operating environment. Any of the following can set the upper limit of Intel Turbo Boost Technology 2.0 on a given workload:

- » Number of active cores
- » Estimated current consumption
- » Estimated power consumption
- » Processor temperature



When the processor is operating below these limits and the user's workload demands additional performance, the processor frequency will dynamically increase until the upper limit of frequency is reached. Intel Turbo Boost Technology 2.0 has multiple algorithms operating in parallel to manage current, power, and temperature to maximize performance and energy efficiency. Note: Intel Turbo Boost Technology 2.0 allows the processor to operate at a power level that is higher than its rated upper power limit (TDP) for short durations to maximize performance.

## 4.15 Display Configuration

The chapter describes possible display configurations and supported features for the integrated Intel® HD/HD3000 (Gen6) graphics.

### Dual Display Configurations in O/S

| Display   | N/A | CRT | LVDS fix | LVDS DID | LVDS2DVI | DP/eDP | DP2DVI | DP2HDMI | DP2CRT | SDVO2LVDS | SDVO2DVI | SDVO2CRT |
|-----------|-----|-----|----------|----------|----------|--------|--------|---------|--------|-----------|----------|----------|
| N/A       | -   | S   | S        | S        | S        | S      | S      | S       | S      | S         | S        | S        |
| CRT       | S   | -   | A        | A        | A        | A      | A      | A       | A      | A         | A        | A        |
| LVDS fix  | S   | A   | -        | -        | -        | A      | A      | A       | A      | A*        | A        | A        |
| LVDS DID  | S   | A   | -        | -        | -        | A      | A      | A       | A      | A*        | A        | A        |
| LVDS2DVI  | S   | A   | -        | -        | -        | A      | A      | A       | A      | A*        | A        | A        |
| DP        | S   | A   | A        | A        | A        | A      | A      | A       | A      | A         | A        | A        |
| DP2DVI    | S   | A   | A        | A        | A        | A      | A      | A       | A      | A         | A        | A        |
| DP2HDMI   | S   | A   | A        | A        | A        | A      | A      | A       | A      | A         | A        | A        |
| DP2CRT    | S   | A   | A        | A        | A        | A      | A      | A       | A      | A         | A        | A        |
| eDP       | -   | -   | -        | -        | -        | -      | -      | -       | -      | -         | -        | -        |
| SDVO2LVDS | S   | A   | A*       | A*       | A*       | A      | A      | A       | A      | -         | -        | -        |
| SDVO2DVI  | S   | A   | A        | A        | A        | A      | A      | A       | A      | -         | -        | -        |
| SDVO2CRT  | S   | A   | A        | A        | A        | A      | A      | A       | A      | -         | -        | -        |

SDVO2DVI: only supported if BIOS DDI1 is enabled and set to SDVO - DVI 1.0 or SDVO - DVI-I

SDVO2CRT: only supported if BIOS DDI1 is enabled and set to SDVO - DVI-I

- » S = Single Display
- » A = All Modes (Single Display, Clone Mode, Extended Desktop)
- » A\* = All Modes, but requires a customized BIOS
- » - = Not supported
- » N/A = Display not attached

### Dual Display configurations in Setup and POST

| Display   | N/A | CRT  | LVDS fix | LVDS DID | LVDS2DVI | DP/eDP | DP2DVI | DP2HDMI | DP2CRT | SDVO2LVDS | SDVO2DVI | SDVO2CRT |
|-----------|-----|------|----------|----------|----------|--------|--------|---------|--------|-----------|----------|----------|
| N/A       | -   | S    | S        | S        | S        | S      | S      | S       | S      | S         | S        | -        |
| CRT       | S   | -    | C        | C*       | Twin     | C      | C      | C       | C      | C         | C        | -        |
| LVDS fix  | S   | C    | -        | -        | -        | C      | C      | C       | C      | C*1       | C        | -        |
| LVDS DID  | S   | C*   | -        | -        | -        | C*     | C*     | C*      | C*     | C*1       | C*       | -        |
| LVDS2DVI  | S   | Twin | -        | -        | -        | C      | C      | C       | C      | C*1       | C        | -        |
| DP        | S   | C    | C        | C*       | C        | C      | C      | C       | C      | C*        | C*       | -        |
| DP2DVI    | S   | C    | C        | C*       | C        | C      | C      | C       | C      | C*        | C*       | -        |
| DP2HDMI   | S   | C    | C        | C*       | C        | C      | C      | C       | C      | C*        | C*       | -        |
| DP2CRT    | S   | C    | C        | C*       | C        | C      | C      | C       | C      | C*        | C*       | -        |
| eDP       | -   | -    | -        | -        | -        | -      | -      | -       | -      | -         | -        | -        |
| SDVO2LVDS | S   | C    | C*1      | C*1      | C*1      | C*     | C*     | C*      | C*     | -         | -        | -        |
| SDVO2DVI  | S   | C    | C        | C*       | C        | C*     | C*     | C*      | C*     | -         | -        | -        |
| SDVO2CRT  | -   | -    | -        | -        | -        | -      | -      | -       | -      | -         | -        | -        |

SDVO2DVI: only supported if BIOS DDI1 is enabled and set to SDVO - DVI 1.0 or SDVO - DVI-I

- » S = Single Display
- » C = Clone Mode
- » C\* = Clone Mode, requires manual display configuration in setup. With Auto detection LVDS only is supported
- » C\*1 = Clone Mode, but requires a customized BIOS
- » Twin = Twin Mode with 2 Displays on Display Pipe 1.
- » - = Not supported
- » N/A = Display not attached



In Clone Mode Display Pipe 2 only shows VESA Modes in POST, Setup and EFI Shell. DOS, Windows boot or the Windows Installation is using VGA Mode which is not supported by Display Pipe 2. With CRT and LVDS with EDID (e.g. LVDS2DVI Adapter) the Twin Mode is active without VESA mode restrictions

## eDP - embedded Display Port

Intel® 6 & 7-Series Chipset based Computer-on-modules support the embedded Display Port shared on Digital Display Interface DDI3. To enable the eDP, LVDS must be switched off by hardware strap option. This feature is implemented in COMe-bSC2 (starting with hardware revision CE 2.x.x) and COMe-bIP2/6 by external strap option on the carrier board. The General Purpose Input GPI3 (COM Express Pin A85) is pulled-up with 10k0hm on the module. Leaving GPI3 open on the baseboard enables LVDS (default configuration). To enable the eDP instead of LVDS, GPI3 must be pulled-down with a resistor  $\leq 1k0hm$  or tied directly to GND during boot-up.



The GPIO should not be used during boot-up until CB\_RESET# becomes inactive

## Digital Display Interface Features

The integrated Intel® HD/HD3000 (Gen6) graphics supports:

- » High-bandwidth Digital Content Protection (HDCP) on HDMI and DisplayPort with up to 2 HDCP streams simultaneously
- » One active Protected Audio and Video Path (PAVP) session on HDMI or DisplayPort
- » Dual Stream DP/HDMI Audio if activated in BIOS (See BIOS Chapter HDAudio Configuration) and O/S (HDMI codec DDI enabled)
- » DP/HDMI/DVI Hot-plug (low-active)

## Supported Audio Formats on HDMI and DisplayPort

| Audio Formats                      | HDMI | DisplayPort                        |
|------------------------------------|------|------------------------------------|
| AC-3 Dolby Digital                 | YES  | NO                                 |
| Dolby Digital Plus                 | YES  | NO                                 |
| DTS-HD                             | YES  | NO                                 |
| LPCM, 192kHz/24bit, 8 channel      | YES  | YES (Up to 2 channel 96kHz, 24bit) |
| Dolby True HD, DTS HD Master Audio | YES  | NO                                 |

## DDI Design Consideration

- » For sufficient signal quality baseboard designs with long signal lanes or impedance leaps may require an Equalizer or Redriver for the digital display interfaces
- » DDI hot-plug detection is high active
- » SDVO can be used for external conversion to VGA, LVDS, TV-out and requires additional hardware on your baseboard
- » DisplayPort can be used directly or with external adapters for HDMI, DVI or VGA
- » HDMI or DVI usage on a baseboard requires a level shifter



Find more details for DDI usage as DisplayPort, HDMI or DVI with schematic examples available on <http://emdcustomersection.kontron.com>

## DVI-I Design Topology

DVI-I is supported on PCH Digital Display Port B (COM DDI1) only. The implementation involves routing VGA and DVI-D signals to DVI-I connector:

- » VGA port RGB signals should be routed to Analog RGB pins on the DVI-I connector
- » DVI Data and Clock signals on PCH Digital Display Port B should be routed to TMDS Data 0, 1 and 2 pins and TMDS Clock pin of DVI-I connector respectively
- » DVI HPD signals should be routed to the HPD pin of the DVI-I connector
- » DVI DDC Clock and Data signals on PCH Digital Display Port B should be routed to the DDC Clock and Data pins of the DVI-I connector.

## 4.16 Hybrid Graphics / Multi-monitor

The COMe-bSC6 supports Hybrid Multi-monitor function which is one form of Intel's Hybrid Graphics where integrated graphics (in Chipset or CPU) is available to operate simultaneously with external PEG; PCIe or PCI graphics. This feature enables concurrent function of Intel's integrated Graphics Processing Unit (GPU/iGFX) along with a discrete GPU solution, allowing for operability of greater than two independently-driven displays. The O/S will handle control of the multiple GPU display adapters appropriately. For example, WindowsXP supports The Microsoft Windows XP Display Driver Model (XPDM) which allows loading and support of multiple graphics drivers. Windows 7 continues that legacy XPDM support but also adds WDDM v1.1 which, like XPDM, allows for simultaneous multiple graphics drivers (Windows Vista WDDM v1.0 did not allow this capability). Operating system applications will be adapter-unaware through use of the O/S GUI APIs and will utilize the adapter associated with the primary display, regardless of which display the image is located on.



Some applications may be adapter-aware, e.g., full-screen applications and system applications like the compositor. A number of software tools designed to assist multi-monitor use are available from third parties. One example is the UltraMon\* utility for multi-monitor systems, which helps with the position of applications, assists desktop wallpapers and screen savers in multi-monitor configurations.

Hybrid Multi-monitor mode is recommended to be accomplished using a discrete third-party PCI Express graphics card either into the PEG slot of the platform or into an available PCI Express slot routed off of the I/O subsection of the chipset.

### Requirements

- » Baseboard supporting PEG (alternatively PCIe or PCI)
- » Module BIOS which allows switching between iGFX and discrete GPU (iGFX must be set to primary boot display)
- » O/S supporting heterogeneous display adapters (Linux / WindowsXP / Windows 7)

### Setup a Multi-monitor system

- » Start without the discrete GPU seated in the system
- » Select IGD as Primary Boot Display in BIOS Setup
- » Boot into O/S and install drivers requested for the integrated GPU
- » Shut down the system and insert the discrete GPU
- » Boot into O/S and install drivers requested for the discrete GPU (if necessary in Safe mode)
- » Set the Windows Display properties as referenced below (example: WindowsXP)



In most cases the graphical user interfaces (e.g. ATI Catalyst Control Center) for both GPUs may not run properly. It's recommended to use O/S implemented Display Properties like in screenshot above



Detailed documentation is available in Intel Paper [323214](#)



## 4.17 Intel® vPro™ technology

Kontron and Intel® are addressing the security and manageability challenges facing embedded systems today with the implementation of Intel® vPro™ technology to enable: » System integrity » Secure isolation » Remote systems management

First, system integrity is the ability to identify whether the system hardware or system software has been modified without authorization. When a system's integrity is known, the system can be thought of as a trusted system. Second, secure isolation is the ability to use platform hardware to separate processes, resources, and data on the system such that they cannot interact with each other in unintended ways. By providing hardware-assisted isolation, there is limitless security, privacy, and cost savings that can be realized through consolidation and workload isolation. Finally, remote systems management is the ability to troubleshoot, perform power management or system verification through secure channels. Significant cost savings and efficiencies can be realized through remote management allowing for increased system up time and the ability to manage or diagnose a system, even when powered down.

Intel® vPro™ technology itself is special functionality designed into both, the processor and the chipset. The three technologies that comprise Intel® vPro™ technology are: Intel Virtualization Technology (Intel® VT), Intel Trusted Execution Technology (Intel® TXT) and Intel Active Management Technology (Intel® AMT).

Intel® VT provides hardware-based assists making secure isolation more efficient and decreases the virtualization footprint, lowering the effective attack surface of a solution. This hardware-based technology can help to protect applications and information by running multiple operating systems (OSs) in isolation on the same physical system. A virtual guest OS can be created in an entirely separate space on the physical system to run specialized or critical applications. Virtual environments leverage Intel® VT for memory, CPU, and Directed I/O virtualization. Intel® TXT provides the ability to use hardware-based mechanisms to verify system integrity during the boot process. It also provides system memory scrubbing that protects against soft reset attacks. Virtualized environments take advantage of Intel® TXT launch environment verification to establish a dynamic root of trust providing added security to hypervisor or virtual machine monitor (VMM).

Mechanisms employed by Intel® AMT include domain authentication, session keys, persistent data storage in the Intel® AMT hardware, and access control lists. Only firmware images that are digitally signed by Intel are permitted to load and execute. This set of hardware-based features is targeted for businesses and allows remote access to the system, whether wired or wireless, for management and security tasks. Because of the special hardware capabilities provided by Intel® AMT, out of band access is available even when the OS is not functional or system power is off.



Intel® TXT and Intel® AMT are disabled by default. Please contact your local sales or support for BIOS versions with full vPro™ support

## 4.18 ACPI Suspend Modes and Resume Events

The COMe-bSC6 supports the S-states S0, S3, S4, S5. S5eco Support: YES

**The following events resume the system from S3:**

- » USB Keyboard (1)
- » USB Mouse (1)
- » Power Button
- » WakeOnLan (2)

**The following events resume the system from S4:**

- » Power Button
- » WakeOnLan (2)

**The following events resume the system from S5:**

- » Power Button
- » WakeOnLan (2)

**The following events resume the system from S5Eco:**

- » Power Button

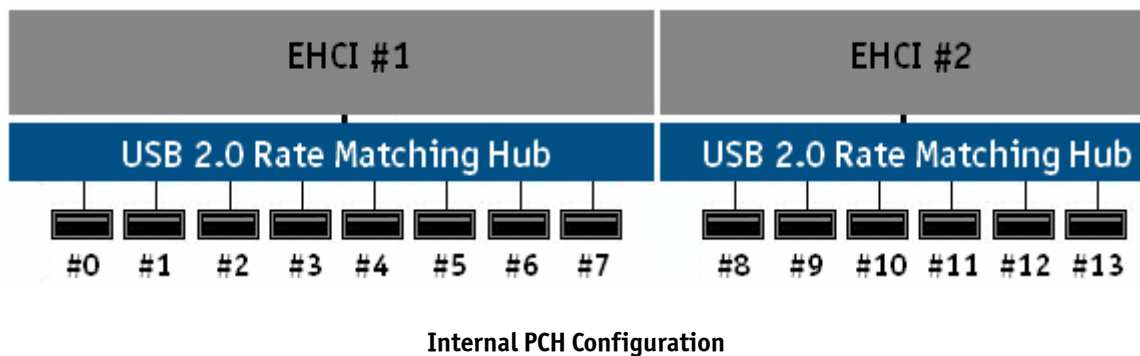


- (1) OS must support wake up via USB devices and baseboard must power the USB Port with StBy-Voltage
- (2) Depending on the Used Ethernet MAC/Phy WakeOnLan must be enabled in BIOS setup and driver options

## 4.19 USB

The COMe-bSC6 is available in different variants affecting the USB routing:

| COM        | COMe-bSC6 ECC w/QM67 | COMe-bSC6 ECC with HM65 | COMe-bSC6        |
|------------|----------------------|-------------------------|------------------|
| Part.No.   | 38014-xxxx-xx-x      | 38014-xxxx-xx-x         | 38023-xxxx-xx-x  |
| COMe USB#0 | USB0 from EHCI1      | USB0 from EHCI1         | USB0 from EHCI1  |
| COMe USB#1 | USB1 from EHCI1      | USB1 from EHCI1         | USB1 from EHCI1  |
| COMe USB#2 | USB2 from EHCI1      | USB2 from EHCI1         | USB2 from EHCI1  |
| COMe USB#3 | USB3 from EHCI1      | USB3 from EHCI1         | USB3 from EHCI1  |
| COMe USB#4 | USB4 from EHCI1      | USB4 from EHCI1         | USB8 from EHCI2  |
| COMe USB#5 | USB5 from EHCI1      | USB5 from EHCI1         | USB9 from EHCI2  |
| COMe USB#6 | USB6 from EHCI1      | not available           | USB10 from EHCI2 |
| COMe USB#7 | USB7 from EHCI1      | not available           | USB11 from EHCI2 |



Due to the internal chipset configuration the Cougar Point only supports up to 4 external USB Hubs. The HM65 variant does not support USB6 and USB7 from EHCI#1

## 5 System Resources

### 5.1 Interrupt Request (IRQ) Lines

| IRQ # | Used For   | Available | Comment                                                         |
|-------|------------|-----------|-----------------------------------------------------------------|
| 0     | Timer0     | No        | -                                                               |
| 1     | Keyboard   | No        | -                                                               |
| 2     | Cascade    | No        | -                                                               |
| 3     | COM2       | No        | Type2: External SIO COM2, Type6: onboard COM2                   |
| 4     | COM1       | No        | Type2: External SIO COM1, Type6: onboard COM1                   |
| 5     | COM3       | Note(4)   | Type2: not used, Type6: External SIO COM1                       |
| 6     | -          | Yes       | -                                                               |
| 7     | SIO LPT    | No        | -                                                               |
| 8     | RTC        | No        | -                                                               |
| 9     | ACPI       | No        | -                                                               |
| 10    | COM4       | Note(4)   | Type2: not used, Type6: External SIO COM2                       |
| 11    | SMBus      | No        | -                                                               |
| 12    | PS/2 Mouse | No        | -                                                               |
| 13    | FPU        | No        | -                                                               |
| 14    | -          | Yes       | -                                                               |
| 15    | -          | Yes       | -                                                               |
| 16    | LNK A      | No        | PCIe RP 0 + PCIe RP 4 + USB EHCI#1 + Intel ME + I.G.D.; Note(3) |
| 17    | LNK B      | No        | PCIe2Pata (Type2 only) + PCIe RP 1 + PCIe RP 5; Note(3)         |
| 18    | LNK C      | No        | PCIe2PCI (Type2 only) + PCIe RP 2 + PCIe RP 6; Note(3)          |
| 19    | LNK D      | No        | PCIe RP 3 + SATA AHCI; Note(3)                                  |
| 20    | LNK E      | No        | Note(3)                                                         |
| 21    | LNK F      | No        | Note(3)                                                         |
| 22    | LNK G      | No        | Note(3)                                                         |
| 23    | LNK H      | No        | USB EHCI#2                                                      |

(1) If the “Used For” device is disabled in setup, the corresponding interrupt is available for other device.



(2) Not available if ACPI is used

(3) ACPI OS decides on particular IRQ usage

(4) Depends on system configuration (onboard COM Port support and external SIO presence)

## 5.2 Memory Area

The first 640 kB of DRAM are used as main memory. Using DOS, you can address 1 MB of memory directly. Memory area above 1 MB (high memory, extended memory) is accessed under DOS via special drivers such as HIMEM.SYS and EMM386.EXE, which are part of the operating system. Please refer to the operating system documentation or special textbooks for information about HIMEM.SYS and EMM386.EXE. Other operating systems (Linux or Windows versions) allow you to address the full memory area directly.

| Upper Memory         | Used for          | Available | Comment                                         |
|----------------------|-------------------|-----------|-------------------------------------------------|
| A0000h – BFFFFh      | VGA Memory        | No        | Mainly used by graphic controller               |
| C0000h – CFFFFh      | VGA BIOS          | No        | Used by onboard VGA ROM                         |
| D0000h – DFFFFh      | -                 | Yes       | Free for shadow RAM in standard configurations. |
| E0000h – FFFFFh      | System BIOS       | No        | Fixed                                           |
| 20000000h-201FFFFh   | IGFX              | No        | Fixed                                           |
| 40000000h-401FFFFh   | IGFX              | No        | Fixed                                           |
| E0000000h-FAFFFFFFh  | PCIe Config Space | No        | Fixed                                           |
| FED00000h-FED003FFh  | HPET              | No        | Fixed                                           |
| FED10000h-FED17FFFh  | MCH               | No        | Fixed                                           |
| FED18000h-FED18FFFh  | DMI               | No        | Fixed                                           |
| FED19000h-FED19FFFh  | EPBA              | No        | Fixed                                           |
| FED1C000h-FED1FFFFh  | RCBA              | No        | Fixed                                           |
| FED20000h-FED3FFFFh  | TXT               | No        | Fixed                                           |
| FED40000h-FED44FFFh  | TPM               | No        | Fixed                                           |
| FED45000h-FED8FFFFh  | TPM               | No        | Fixed                                           |
| FED90000h-FED93FFFh  | VT-d              | No        | Fixed                                           |
| FEEO0000h-FEEFFFFFFh | IOxAPIC           | No        | Fixed                                           |
| FF000000h-FFFFFFFFh  | BIOS Flash        | No        | Fixed                                           |

## 5.3 I/O Address Map

The I/O-port addresses of the 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 available.

| I/O Address | Used for               | Available | Comment |
|-------------|------------------------|-----------|---------|
| 0000 - 001F | System Ressources      | No        | Fixed   |
| 0020 - 003F | Interrupt Controller 1 | No        | Fixed   |
| 002E - 002F | Ext. SIO               | No        | Fixed   |
| 0040 - 005F | Timer, Counter         | No        | Fixed   |
| 004E - 004F | TPM                    | No        | Fixed   |
| 0060 - 006F | Keyboard controller    | No        | Fixed   |
| 0070 - 007F | RTC and CMOS Registers | No        | Fixed   |
| 0080        | BIOS Postcode          | No        | Fixed   |
| 0081 - 009F | DMA Controller         | No        | Fixed   |
| 00A0 - 00BF | Interrupt Controller   | No        | Fixed   |
| 00C0 - 00DF | DMA Controller         | No        | Fixed   |
| 00F0 - 00FF | Math Coprocessor       | No        | Fixed   |
| 0290 - 029F | Ext. SIO               | No        | Fixed   |
| 03B0 - 03DF | VGA                    | No        | Fixed   |
| 0400 - 047F | Chipset                | No        | Fixed   |
| 04D0 - 04D1 | Chipset                | No        | Fixed   |
| 0500 - 057F | Chipset                | No        | Fixed   |
| 0680 - 069F | Chipset                | No        | Fixed   |
| 0A80 - 0A81 | CPLD                   | No        | Fixed   |
| 0B78 - 0B7F | Chipset                | No        | Fixed   |
| 0CF8 - 0CFF | Chipset                | No        | Fixed   |

## 5.4 Peripheral Component Interconnect (PCI) Devices

All devices follow the Peripheral Component Interconnect 2.3 (PCI 2.3) respectively the PCI Express Base 1.0a specification. The BIOS and OS control memory and I/O resources. Please see the PCI 2.3 specification for details.

| PCI Device       | B:D:F  | PCI IRQ | Interface | Comment |
|------------------|--------|---------|-----------|---------|
| Host Bridge      | 0:0:0  | None    | internal  | Chipset |
| P.E.G. Root Port | 0:1:0  | LNK A   | internal  | Chipset |
| Video Controller | 0:2:0  | LNK A   | internal  | Chipset |
| XHCI             | 0:20:0 | LNK A   | internal  | Chipset |
| ME               | 0:22:0 | LNK A   | internal  | Chipset |
| GbE              | 0:25:0 | LNK E   | PCIe      | Chipset |
| HDA              | 0:27:0 | LNK G   | PCIe      | Chipset |
| PCIe Port 0      | 0:28:0 | LNK A   | internal  | Chipset |
| PCIe Port 0 Slot | -      | A/B/C/D | PCIe      | Port 0  |
| PCIe Port 1      | 0:28:1 | LNK A   | internal  | Chipset |
| PCIe Port 1 Slot | -      | B/C/D/A | PCIe      | Port 1  |
| PCIe Port 2      | 0:28:2 | LNK A   | internal  | Chipset |
| PCIe Port 2 Slot | -      | C/D/A/B | PCIe      | Port 2  |
| PCIe Port 3      | 0:28:3 | LNK A   | internal  | Chipset |
| PCIe Port 3 Slot | -      | D/A/B/A | PCIe      | Port 3  |
| PCIe Port 4      | 0:28:4 | LNK A   | internal  | Chipset |
| PCIe Port 4 Slot | -      | A/B/C/D | PCIe      | Port 4  |
| PCIe Port 5      | 0:28:5 | LNK A   | internal  | Chipset |
| PCIe Port 5 Slot | -      | B/C/D/A | PCIe      | Port 5  |
| PCIe Port 6      | 0:28:6 | LNK A   | internal  | Chipset |
| PCIe Port 6 Slot | -      | C/D/A/B | PCIe      | Port 6  |
| PCIe Port 7      | 0:28:7 | LNK A   | internal  | Chipset |
| EHCI             | 0:29:0 | LNK H   | internal  | Chipset |
| LPC Bridge       | 0:31:0 | -       | internal  | Chipset |
| SATA             | 0:31:2 | LNK D   | internal  | Chipset |
| SMBus            | 0:31:3 | LNK C   | internal  | Chipset |
| PCIe2PATA        | X:00:0 | LNK A   | PCIe      | Slot 5  |
| PCIe2PCI         | Y:00:0 | LNK A   | PCIe      | Slot 6  |

## 5.5 I2C Bus

| I2C Address | Used For    | Available | Comment                          |
|-------------|-------------|-----------|----------------------------------|
| 58h         | S5 Eco      | No        | S5 Eco Resistor                  |
| A0h         | JIDA-EEPROM | No        | Module EEPROM                    |
| AEh         | FRU-EEPROM  | No        | Recommended for Baseboard EEPROM |

## 5.6 JILI I2C Bus

| I2C Address | Used For    | Available | Comment              |
|-------------|-------------|-----------|----------------------|
| A0h         | JILI-EEPROM | No        | EEPROM for JILI Data |

## 5.7 SDVO I2C Bus

| I2C Address | Used For | Available | Comment |
|-------------|----------|-----------|---------|
| -           | -        | -         | -       |

## 5.8 System Management (SM) Bus

The 8-bit SMBus addresses uses the LSB (Bit 0) for the direction. Bit0 = 0 defines the write address, Bit0 = 1 defines the read address for the device. The 8-bit addresses listed below shows the write address for all devices. 7-bit SMBus addresses shows the device address without Bit0.

| 8-bit Address | 7-bit Address | Device                        | Comment                                                            | SMBus |
|---------------|---------------|-------------------------------|--------------------------------------------------------------------|-------|
| 12h           | 0x09          | SMART_CHARGER                 | Not to be used with any SM bus device except a charger             | SMB   |
| 14h           | 0x0A          | SMART_SELECTOR                | Not to be used with any SM bus device except a selector or manager | SMB   |
| 16h           | 0x0B          | SMART_BATTERY                 | Not to be used with any SM bus device except a battery             | SMB   |
| 30h           | 0x18          | DDR3 Thermal Sensor Chan. A   | Do not use under any circumstances                                 | SMB   |
| 34h           | 0x1A          | DDR3 Thermal Sensor Chan. B   | Do not use under any circumstances                                 | SMB   |
| 58h           | 0x2C          | HWM NCT7802Y (non ECC Design) | Do not use under any circumstances                                 | SMB   |
| 5Ch           | 0x2E          | HWM ADT7490 (ECC Design)      | Do not use under any circumstances                                 | SMB   |
| A0h           | 0x50          | DDR3 channel A SPD            | Do not use under any circumstances                                 | SMB   |
| A4h           | 0x52          | DDR3 channel B SPD            | Do not use under any circumstances                                 | SMB   |
| C8h           | 0x64          | Ethernet 82579                | Do not use under any circumstances                                 | SML0  |

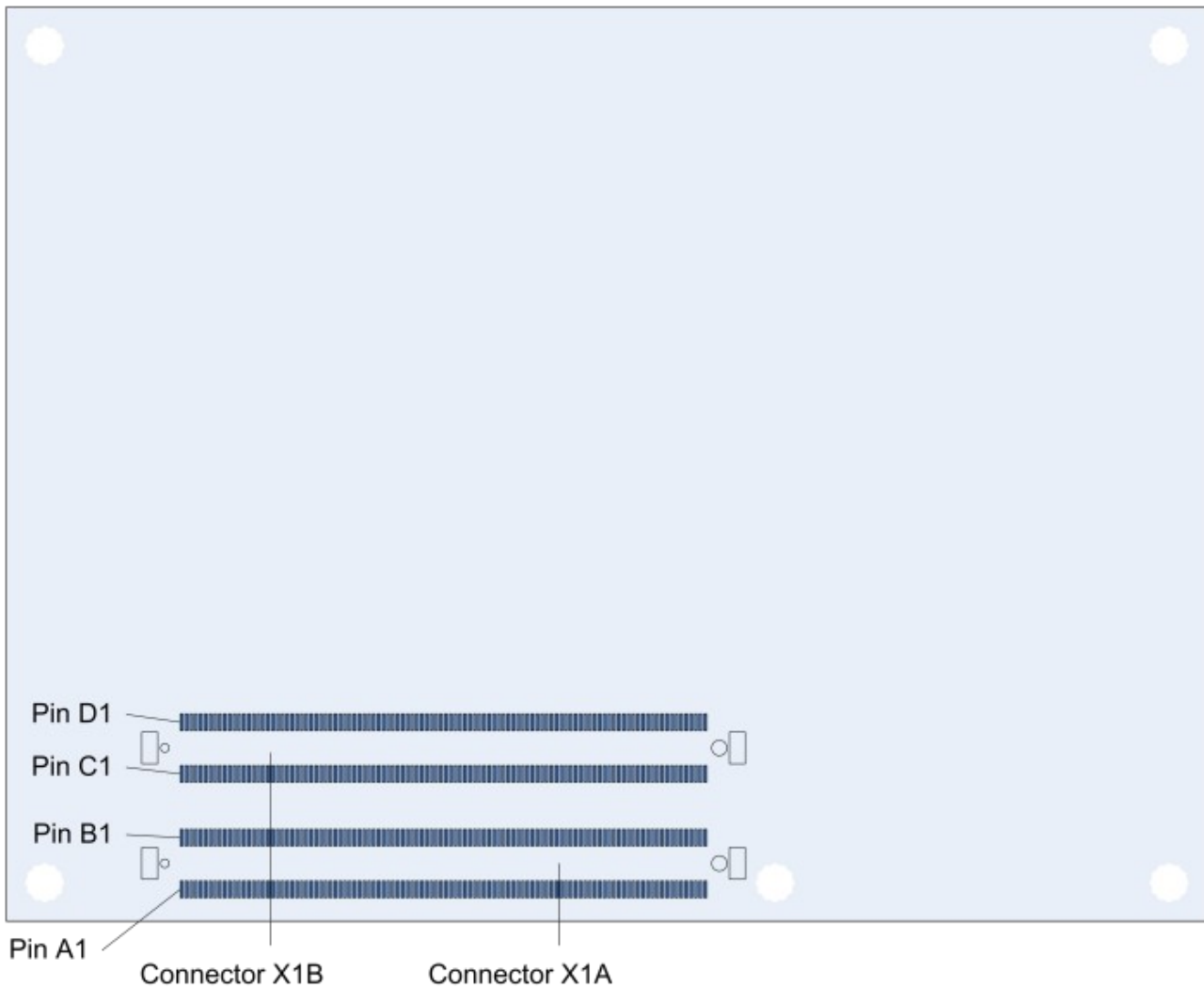


A JIDA Bus No. like in former Modules cannot be provided because the EAPI driver implementation enumerates the I2C busses dynamically. Please follow the initialisation process like it is provided in the EAPI specification.

## 6 Connectors

The pin-outs for Interface Connectors X1A and X1B are documented for convenient reference. Please see the COM Express® Specification and COM Express® Design Guide for detailed, design-level information.

### 6.1 Connector Location





## 7 Pinout List

### 7.1 General Signal Description

| Type    | Description                            |
|---------|----------------------------------------|
| I/O-3,3 | Bi-directional 3,3 V I/O-Signal        |
| I/O-5T  | Bi-dir. 3,3V I/O (5V Tolerance)        |
| I/O-5   | Bi-directional 5V I/O-Signal           |
| I-3,3   | 3,3V Input                             |
| I/OD    | Bi-directional Input/Output Open Drain |
| I-5T    | 3,3V Input (5V Tolerance)              |
| OA      | Output Analog                          |
| OD      | Output Open Drain                      |
| O-1,8   | 1,8V Output                            |
| O-3,3   | 3,3V Output                            |
| O-5     | 5V Output                              |
| DP-I/O  | Differential Pair Input/Output         |
| DP-I    | Differential Pair Input                |
| DP-O    | Differential Pair Output               |
| PU      | Pull-Up Resistor                       |
| PD      | Pull-Down Resistor                     |
| PWR     | Power Connection                       |



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

## 7.2 Connector X1A Row A

| Pin | Signal         | Description                            | Type    | Termination       | Comment                                          |
|-----|----------------|----------------------------------------|---------|-------------------|--------------------------------------------------|
| A1  | GND            | Power Ground                           | PWR     | -                 | -                                                |
| A2  | GBE0_MDI3-     | GBE0_MDI3_N / Ethernet Receive Data -  | DP-I    | -                 | -                                                |
| A3  | GBE0_MDI3+     | GBE0_MDI3_P / Ethernet Receive Data -  | DP-I    | -                 | -                                                |
| A4  | GBE0_LINK100#  | GBE0_LINK100# / Ethernet Speed LED     | 0-3,3   | -                 | -                                                |
| A5  | GBE0_LINK1000# | GBE0_LINK1000# / Ethernet Speed LED    | 0-3,3   | -                 | -                                                |
| A6  | GBE0_MDI2-     | GBE0_MDI2_N / Ethernet Receive Data -  | DP-I    | -                 | -                                                |
| A7  | GBE0_MDI2+     | GBE0_MDI2_P / Ethernet Receive Data -  | DP-I    | -                 | -                                                |
| A8  | GBE0_LINK#     | GBE0_LINK# / LAN Link LED              | OD      | -                 | -                                                |
| A9  | GBE0_MDI1-     | GBE0_MDI1_N / Ethernet Receive Data -  | DP-I    | -                 | -                                                |
| A10 | GBE0_MDI1+     | GBE0_MDI1_P / Ethernet Receive Data +  | DP-I    | -                 | -                                                |
| A11 | GND            | Power Ground                           | PWR     | -                 | -                                                |
| A12 | GBE0_MDI0-     | GBE0_MDI0_N / Ethernet Transmit Data - | DP-0    | -                 | -                                                |
| A13 | GBE0_MDI0+     | GBE0_MDI0_P / Ethernet Transmit Data + | DP-0    | -                 | -                                                |
| A14 | GBE0_CTREF     | GBE0_CTREF                             | 0-1,8   | -                 | n. c. on module, because not needed with 82579LM |
| A15 | SUS_S3#        | PM_SLP_S3_EXT#                         | 0-3,3   | PD 10k            | -                                                |
| A16 | SATA0_TX+      | SATA_TX0_P / SATA 0 Transmit Data +    | DP-0    | -                 | -                                                |
| A17 | SATA0_TX-      | SATA_TX0_N / SATA 0 Transmit Data -    | DP-0    | -                 | -                                                |
| A18 | SUS_S4#        | PM_SLP_S4#                             | 0-3,3   | -                 | -                                                |
| A19 | SATA0_RX+      | SATA_RX0_P / SATA 0 Receive Data +     | DP-I    | -                 | -                                                |
| A20 | SATA0_RX-      | SATA_RX0_N / SATA 0 Receive Data -     | DP-I    | -                 | -                                                |
| A21 | GND            | Power Ground                           | PWR     | -                 | -                                                |
| A22 | SATA2_TX+      | SATA_TX2_P / SATA 2 Transmit Data +    | DP-0    | -                 | -                                                |
| A23 | SATA2_TX-      | SATA_TX2_N / SATA 2 Transmit Data -    | DP-0    | -                 | -                                                |
| A24 | SUS_S5#        | PM_SLP_S5#                             | 0-3,3   | -                 | -                                                |
| A25 | SATA2_RX+      | SATA_RX2_P / SATA 2 Receive Data +     | DP-I    | -                 | -                                                |
| A26 | SATA2_RX-      | SATA_RX2_N / SATA 2 Receive Data -     | DP-I    | -                 | -                                                |
| A27 | BATLOW#        | PM_BATLOW# / Battery Low               | I-3,3   | PU 8k25 3,3V (S5) | -                                                |
| A28 | ATA_ACT#       | ATA_LED# / SATA LED                    | OD-3,3  | -                 | -                                                |
| A29 | AC/HDA_SYNC    | HDA_SYNC / HD Audio Sync               | 0-3,3   | PD 1MEG           | -                                                |
| A30 | AC/HDA_RST#    | HDA_RST# / HD Audio Reset              | 0-3,3   | -                 | -                                                |
| A31 | GND            | Power Ground                           | PWR     | -                 | -                                                |
| A32 | AC/HDA_BITCLK  | HDA_BITCLK / HD Audio Clock            | 0-3,3   | -                 | -                                                |
| A33 | AC/HDA_SDOUT   | HDA_SDOUT / HD Audio Data              | 0-3,3   | -                 | int. PD 20k in PCH                               |
| A34 | BIOS_DIS0#     | BIOS_DIS0#                             | I-3,3   | -                 | -                                                |
| A35 | THRMTRIP#      | EXT_THRMTRIP#                          | 0-3,3   | PU 10k 3,3V (S0)  | -                                                |
| A36 | USB6-          | USB6_N / USB Data - Port6              | DP-I/O  | -                 | int. PD 20k in PCH / 5V tolerant                 |
| A37 | USB6+          | USB6_P / USB Data + Port6              | DP-I/O  | -                 | int. PD 20k in PCH / 5V tolerant                 |
| A38 | USB_6_7_OC#    | USB_67_OC# / USB OverCurrent Port 6/7  | I-3,3   | PU 10k 3,3V (S5)  | -                                                |
| A39 | USB4- U        | SB4_N / USB Data - Port4               | DP-I/O  | -                 | int. PD 20k in PCH / 5V tolerant                 |
| A40 | USB4+          | USB4_P / USB Data + Port4              | DP-I/O  | -                 | int. PD 20k in PCH / 5V tolerant                 |
| A41 | GND            | Power Ground                           | PWR     | -                 | -                                                |
| A42 | USB2-          | USB2_N / USB Data - Port2              | DP-I/O  | -                 | int. PD 20k in PCH / 5V tolerant                 |
| A43 | USB2+          | USB2_P / USB Data + Port2              | DP-I/O  | -                 | int. PD 20k in PCH / 5V tolerant                 |
| A44 | USB_2_3_OC#    | USB_23_OC# / USB OverCurrent Port 2/3  | I-3,3   | PU 10k 3,3V (S5)  | -                                                |
| A45 | USB0-          | USB0_N / USB Data - Port0              | DP-I/O  | -                 | -                                                |
| A46 | USB0+          | USB0_P / USB Data + Port0              | DP-I/O  | -                 | -                                                |
| A47 | VCC_RTC        | V_BAT                                  | PWR 3V  | -                 | -                                                |
| A48 | EXCD0_PERST#   | EXCD0_PERST# / Express card reset      | 0-3,3   | -                 | -                                                |
| A49 | EXCD0_CPPE#    | EXCD0_CPPE# / capable c. request       | I-3,3   | PU 8k25 3,3V (S0) | -                                                |
| A50 | LPC_SERIRQ     | LPC_SERIRQ / Serial Interrupt Request  | I/O-3,3 | PU 10k 3,3V (S0)  | -                                                |
| A51 | GND            | Power Ground                           | PWR     | -                 | -                                                |
| A52 | PCIE_TX5+      | opt. PCI Express lane 5 + Transmit     | DP-0    | -                 | -                                                |
| A53 | PCIE_TX5-      | opt. PCI Express lane 5 - Transmit     | DP-0    | -                 | -                                                |
| A54 | GPIO           | EXT_GPIO / General Purpose Input 0     | I-3,3   | PU 10k 3,3V (S0)  | -                                                |
| A55 | PCIE_TX4+      | PCI Express lane 4 + Transmit          | DP-0    | -                 | -                                                |
| A56 | PCIE_TX4-      | PCI Express lane 4 - Transmit          | DP-0    | -                 | -                                                |
| A57 | GND            | Power Ground                           | PWR     | -                 | -                                                |
| A58 | PCIE_TX3+      | PCI Express lane 3 + Transmit          | DP-0    | -                 | -                                                |
| A59 | PCIE_TX3-      | PCI Express lane 3 - Transmit          | DP-0    | -                 | -                                                |
| A60 | GND            | Power Ground                           | PWR     | -                 | -                                                |
| A61 | PCIE_TX2+      | PCI Express lane 2 + Transmit          | DP-0    | -                 | -                                                |
| A62 | PCIE_TX2-      | PCI Express lane 2 - Transmit          | DP-0    | -                 | -                                                |
| A63 | GPI1           | EXT_GPI1 / General Purpose Input 1     | I-3,3   | PU 10k 3,3V (S0)  | -                                                |
| A64 | PCIE_TX1+      | PCI Express lane 1 + Transmit          | DP-0    | -                 | -                                                |

|      |                |                                         |             |                   |                                         |
|------|----------------|-----------------------------------------|-------------|-------------------|-----------------------------------------|
| A65  | PCIE_TX1-      | PCI Express lane 1 - Transmit           | DP-0        | -                 | -                                       |
| A66  | GND            | Power Ground                            | PWR         | -                 | -                                       |
| A67  | GPI2           | EXT_GPI2 / General Purpose Input 2      | I-3,3       | PU 10k 3,3V (S0)  | -                                       |
| A68  | PCIE_TX0+      | PCI Express lane 0 + Transmit           | DP-0        | -                 | -                                       |
| A69  | PCIE_TX0-      | PCI Express lane 0 - Transmit           | DP-0        | -                 | -                                       |
| A70  | GND            | Power Ground                            | PWR         | -                 | -                                       |
| A71  | LVDS_A0+       | LVDS_A_DATA0_P / LVDS Channel A Data0+  | DP-0        | -                 | -                                       |
| A72  | LVDS_A0-       | LVDS_A_DATA0_N / LVDS Channel A Data0-  | DP-0        | -                 | -                                       |
| A73  | LVDS_A1+       | LVDS_A_DATA1_P / LVDS Channel A Data1+  | DP-0        | -                 | -                                       |
| A74  | LVDS_A1-       | LVDS_A_DATA1_N / LVDS Channel A Data1-  | DP-0        | -                 | -                                       |
| A75  | LVDS_A2+       | LVDS_A_DATA2_P / LVDS Channel A Data2+  | DP-0        | -                 | -                                       |
| A76  | LVDS_A2-       | LVDS_A_DATA2_N / LVDS Channel A Data2 - | DP-0        | -                 | -                                       |
| A77  | LVDS_VDD_EN    | LVDS_VDD_EN / LVDS Panel Power Control  | 0-3,3       | PD 100k           | -                                       |
| A78  | LVDS_A3+       | LVDS_A_DATA3_P / LVDS Channel A Data3+  | DP-0        | -                 | -                                       |
| A79  | LVDS_A3-       | LVDS_A_DATA3_N / LVDS Channel A Data3-  | DP-0        | -                 | -                                       |
| A80  | GND            | Power Ground                            | PWR         | -                 | -                                       |
| A81  | LVDS_A_CLK+    | LVDS_A_CLK_P / LVDS Channel A Clock+    | DP-0        | -                 | -                                       |
| A82  | LVDS_A_CLK-    | LVDS_A_CLK_N / LVDS Channel A Clock-    | DP-0        | -                 | -                                       |
| A83  | LVDS_I2C_CLK   | LVDS_DDC_CLK / JILI I2C Clock           | I/O-3,3     | PU 2k21 3,3V (S0) | -                                       |
| A84  | LVDS_I2C_DAT   | LVDS_DDC_DATA / JILI I2C Data           | I/O-3,3     | PU 2k21 3,3V (S0) | -                                       |
| A85  | GPI3           | EXT_GPI3 / General Purpose Input 3      | I-3,3       | PU 10k 3,3V (S0)  | -                                       |
| A86  | RSVD           | n.c.                                    | Nc          | -                 | -                                       |
| A87  | RSVD           | n.c.                                    | Nc          | -                 | -                                       |
| A88  | PCIE0_CLK_REF+ | CLK_PCIE_CON_P                          | DP-0        | -                 | -                                       |
| A89  | PCIE0_CLK_REF- | CLK_PCIE_CON_N                          | DP-0        | -                 | -                                       |
| A90  | GND            | Power Ground                            | PWR         | -                 | -                                       |
| A91  | SPI_POWER      | V3.3_SPI_POWER                          | 0-3,3       | -                 | power supply pin for external SPI flash |
| A92  | SPI_MISO       | SPI_S0 / SPI slave output               | I-3,3       | -                 | int. PU 20k in PCH                      |
| A93  | GP00           | EXT_GP00 / General Purpose Output 0     | 0-3,3       | PD 10k            | -                                       |
| A94  | SPI_CLK        | SPI_CLK / SPI clock                     | 0-3,3       | -                 | -                                       |
| A95  | SPI_MOSI       | SPI_SI / SPI slave input                | 0-3,3       | -                 | int. PD 20k in PCH                      |
| A96  | TPM_PP         | TPM Physical Presence                   | I-3,3       | -                 | int. PD in TPM                          |
| A97  | TYPE10#        | n.c. for type 2 module                  | Nc          | -                 | -                                       |
| A98  | SER0_TX        | serial port 0 TXD                       | 0-3,3       | -                 | -                                       |
| A99  | SER0_RX        | serial port 0 RXD                       | I-3,3       | PU 47K 3,3V (S0)  | -                                       |
| A100 | GND            | Power Ground                            | PWR         | -                 | -                                       |
| A101 | SER1_TX        | serial port 1 TXD                       | 0-3,3       | -                 | -                                       |
| A102 | SER1_RX        | serial port 1 RXD                       | I-3,3       | PU 47K 3,3V (S0)  | -                                       |
| A103 | LID#           | LID switch input                        | I-3,3       | PU 47K 3,3V (S5)  | -                                       |
| A104 | VCC_12V        | main input voltage (8.5-18V)            | PWR 8.5-18V | -                 | -                                       |
| A105 | VCC_12V        | main input voltage (8.5-18V)            | PWR 8.5-18V | -                 | -                                       |
| A106 | VCC_12V        | main input voltage (8.5-18V)            | PWR 8.5-18V | -                 | -                                       |
| A107 | VCC_12V        | main input voltage (8.5-18V)            | PWR 8.5-18V | -                 | -                                       |
| A108 | VCC_12V        | main input voltage (8.5-18V)            | PWR 8.5-18V | -                 | -                                       |
| A109 | VCC_12V        | main input voltage (8.5-18V)            | PWR 8.5-18V | -                 | -                                       |
| A110 | GND            | Power Ground                            | PWR         | -                 | -                                       |

## 7.3 Connector X1A Row B

| Pin | Signal           | Description                                 | Type    | Termination         | Comment                                             |
|-----|------------------|---------------------------------------------|---------|---------------------|-----------------------------------------------------|
| B1  | GND              | Power Ground PWR                            | -       | -                   | -                                                   |
| B2  | GBEO_ACT         | GBEO_ACT# / Ethernet Activity LED           | OD      | -                   | -                                                   |
| B3  | LPC_FRAME#       | LPC_FRAME# / LPC Frame Indicator            | 0-3,3   | -                   | -                                                   |
| B4  | LPC_AD0          | LPC_AD0 / LPC Address & DATA Bus            | I/O-3,3 | -                   | int. PU 20k in PCH                                  |
| B5  | LPC_AD1          | LPC_AD1 / LPC Address & DATA Bus            | I/O-3,3 | -                   | int. PU 20k in PCH                                  |
| B6  | LPC_AD2          | LPC_AD2 / LPC Address & DATA Bus            | I/O-3,3 | -                   | int. PU 20k in PCH                                  |
| B7  | LPC_AD3          | LPC_AD3 / LPC Address & DATA Bus            | I/O-3,3 | -                   | int. PU 20k in PCH                                  |
| B8  | LPC_DRQ0#        | LPC_DRQ0# / LPC Request 0                   | I-3,3   | PU 2k 3,3V (S0)     | int. PU 20k in PCH                                  |
| B9  | LPC_DRQ1#        | LPC_DRQ1# / LPC Request 1                   | I-3,3   | PU 2k 3,3V (S0)     | int. PU 20k in PCH                                  |
| B10 | LPC_CLK          | CLK_LPC_33M_EXT / 33MHz LPC clock           | 0-3,3   | -                   | -                                                   |
| B11 | GND              | Power Ground                                | PWR     | -                   | -                                                   |
| B12 | PWRBTN#          | EXT_PWRBTN# / Power Button                  | I-3,3   | PU 20k 3,3V (S5eco) | -                                                   |
| B13 | SMB_CLK SMB_CLK_ | EXT / SMBUS Clock                           | 0-3,3   | PU 3k3 3,3V (S5)    | -                                                   |
| B14 | SMB_DAT          | SMB_DATA_EXT / SMBUS Data                   | I/O-3,3 | PU 3k3 3,3V (S5)    | -                                                   |
| B15 | SMB_ALERT#       | SMB_ALERT# / SMBUS Interrupt                | I/O-3,3 | PU 1k0 3,3V (S5)    | -                                                   |
| B16 | SATA1_TX+        | SATA_TX1_P / SATA 1 Transmit Data +         | DP-0    | -                   | -                                                   |
| B17 | SATA1_TX-        | SATA_TX1_N / SATA 1 Transmit Data -         | DP-0    | -                   | -                                                   |
| B18 | SUS_STAT#        | PM_SUS_STAT#                                | 0-3,3   | -                   | -                                                   |
| B19 | SATA1_RX+        | SATA_RX1_P / SATA 1 Receive Data +          | DP-I    | -                   | -                                                   |
| B20 | SATA1_RX-        | SATA_RX1_N / SATA 1 Receive Data -          | DP-I    | -                   | -                                                   |
| B21 | GND              | Power Ground                                | PWR     | -                   | -                                                   |
| B22 | SATA3_TX+        | SATA_TX3_P / SATA 3 Transmit Data +         | DP-0    | -                   | -                                                   |
| B23 | SATA3_TX-        | SATA_TX3_N / SATA 3 Transmit Data -         | DP-0    | -                   | -                                                   |
| B24 | PWR_OK           | EXT_PWR_OK / Power OK                       | I-3,3   | PU 511k 3,3V        | pullup voltage depends on ATX or single supply mode |
| B25 | SATA3_RX+        | SATA_RX3_P / SATA 3 Receive Data +          | DP-I    | -                   | -                                                   |
| B26 | SATA3_RX-        | SATA_RX3_N / SATA 3 Receive Data -          | DP-I    | -                   | -                                                   |
| B27 | WDT              | WDT / Watch Dog Timer                       | 0-3,3   | -                   | -                                                   |
| B28 | AC/HDA_SDIN2     | HDA_SDIN2_ICH/ HD Audio Serial Input Data 2 | I-3,3   | -                   | int. PD 20k in PCH                                  |
| B29 | AC/HDA_SDIN1     | HDA_SDIN1_ICH/ HD Audio Serial Input Data 1 | I-3,3   | -                   | int. PD 20k in PCH                                  |
| B30 | AC/HDA_SDIN0     | HDA_SDIN0_ICH/ HD Audio Serial Input Data 0 | I-3,3   | -                   | int. PD 20k in PCH                                  |
| B31 | GND              | Power Ground                                | PWR     | -                   | -                                                   |
| B32 | SPKR             | HDA_SPKR / Speaker                          | 0-3,3   | -                   | int. PD 20k in PCH                                  |
| B33 | I2C_CLK          | I2C_CLK_EXT / I2C clock                     | 0-3,3   | PU 2k21 3,3V (S5)   | -                                                   |
| B34 | I2C_DAT          | I2C_DATA_EXT / I2C data                     | I/O-3,3 | PU 2k21 3,3V (S5)   | -                                                   |
| B35 | THRM#            | PM_THRM# / Over Temperature                 | I-3,3   | PU 10k 3,3V (S0)    | -                                                   |
| B36 | USB7-            | USB7_N / USB Data - Port7                   | DP-I/O  | -                   | int. PD 20k in PCH / 5V tolerant                    |
| B37 | USB7+            | USB7_P / USB Data + Port7                   | DP-I/O  | -                   | int. PD 20k in PCH / 5V tolerant                    |
| B38 | USB_4_5_OC#      | USB_45_OC# / USB OverCurrent Port 4/5       | I-3,3   | PU 10k 3,3V (S5)    | -                                                   |
| B39 | USB5-            | USB5_N / USB Data - Port5                   | DP-I/O  | -                   | int. PD 20k in PCH / 5V tolerant                    |
| B40 | USB5+            | USB5_P / USB Data + Port5                   | DP-I/O  | -                   | int. PD 20k in PCH / 5V tolerant                    |
| B41 | GND              | Power Ground                                | PWR     | -                   | -                                                   |
| B42 | USB3-            | USB3_N / USB Data - Port3                   | DP-I/O  | -                   | int. PD 20k in PCH / 5V tolerant                    |
| B43 | USB3+            | USB3_P / USB Data + Port3                   | DP-I/O  | -                   | int. PD 20k in PCH / 5V tolerant                    |
| B44 | USB_0_1_OC#      | USB_01_OC# / USB OverCurrent Port 0/1       | I-3,3   | PU 10k 3,3V (S5)    | -                                                   |
| B45 | USB1-            | USB1_N / USB Data - Port1                   | DP-I/O  | -                   | -                                                   |
| B46 | USB1+            | USB1_P / USB Data + Port1                   | DP-I/O  | -                   | -                                                   |
| B47 | EXCD1_PERST#     | EXCD1_PERST# / Express card reset           | 0-3,3   | -                   | -                                                   |
| B48 | EXCD1_CPPE#      | EXCD1_CPPE# / capable c. request            | I-3,3   | PU 8k25 3,3V (S0)   | -                                                   |
| B49 | SYS_RESET#       | EXT_SYS_RESET# / Reset Input                | I-3,3   | PU 10k 3,3V (S5)    | -                                                   |
| B50 | CB_RESET#        | CB_RESET# / Carrier board Reset             | 0-3,3   | -                   | -                                                   |
| B51 | GND              | Power Ground                                | PWR     | -                   | -                                                   |
| B52 | PCIE_RX5+        | opt. PCI Express lane 5 + receive           | DP-I    | -                   | -                                                   |
| B53 | PCIE_RX5-        | opt. PCI Express lane 5 - receive           | DP-I    | -                   | -                                                   |
| B54 | GP01             | EXT_GP01 / General Purpose Output 1         | 0-3,3   | PD 10k              | -                                                   |
| B55 | PCIE_RX4+        | PCI Express lane 4 + receive                | DP-I    | -                   | -                                                   |
| B56 | PCIE_RX4-        | PCI Express lane 4 - receive                | DP-I    | -                   | -                                                   |
| B57 | GP02             | EXT_GP02 / General Purpose Output 2         | 0-3,3   | PD 10k              | -                                                   |
| B58 | PCIE_RX3+        | PCI Express lane 3 + receive                | DP-I    | -                   | -                                                   |
| B59 | PCIE_RX3-        | PCI Express lane 3 - receive                | DP-I    | -                   | -                                                   |
| B60 | GND              | Power Ground                                | PWR     | -                   | -                                                   |
| B61 | PCIE_RX2+        | PCI Express lane 2 + receive                | DP-I    | -                   | -                                                   |
| B62 | PCIE_RX2-        | PCI Express lane 2 - receive                | DP-I    | -                   | -                                                   |
| B63 | GP03             | EXT_GP03 / General Purpose Output 3         | 0-3,3   | PD 10k              | -                                                   |
| B64 | PCIE_RX1+        | PCI Express lane 1 + receive                | DP-I    | -                   | -                                                   |

|      |                |                                              |             |                  |   |
|------|----------------|----------------------------------------------|-------------|------------------|---|
| B65  | PCIE_RX1-      | PCI Express lane 1 - receive                 | DP-I        | -                | - |
| B66  | WAKE0#         | PCIE_WAKE#                                   | I/O-3,3     | PU 10k 3,3V (S5) | - |
| B67  | WAKE1#         | WAKE1#                                       | I-3,3       | PU 10k 3,3V (S5) | - |
| B68  | PCIE_RX0+      | PCI Express lane 0 + receive                 | DP-I        | -                | - |
| B69  | PCIE_RX0-      | PCI Express lane 0 - receive                 | DP-I        | -                | - |
| B70  | GND            | Power Ground                                 | PWR         | -                | - |
| B71  | LVDS_B0+       | LVDS_B_DATA0_P / LVDS Channel B Data0+       | DP-0        | -                | - |
| B72  | LVDS_B0-       | LVDS_B_DATA0_N / LVDS Channel B Data0-       | DP-0        | -                | - |
| B73  | LVDS_B1+       | LVDS_B_DATA1_P / LVDS Channel B Data1+       | DP-0        | -                | - |
| B74  | LVDS_B1-       | LVDS_B_DATA1_N / LVDS Channel B Data1-       | DP-0        | -                | - |
| B75  | LVDS_B2+       | LVDS_B_DATA2_P / LVDS Channel B Data2+       | DP-0        | -                | - |
| B76  | LVDS_B2-       | LVDS_B_DATA2_N / LVDS Channel B Data2 -      | DP-0        | -                | - |
| B77  | LVDS_B3+       | LVDS_B_DATA3_P / LVDS Channel B Data3+       | DP-0        | -                | - |
| B78  | LVDS_B3-       | LVDS_B_DATA3_N / LVDS Channel B Data3-       | DP-0        | -                | - |
| B79  | LVDS_BKLT_EN   | LVDS_BKLT_CTRL / Panel Backlight ON          | O-3,3       | PD 100k          | - |
| B80  | GND            | Power Ground                                 | PWR         | -                | - |
| B81  | LVDS_B_CLK+    | LVDS_B_CLK_P / LVDS Channel B Clock+         | DP-0        | -                | - |
| B82  | LVDS_B_CLK-    | LVDS_B_CLK_N / LVDS Channel B Clock-         | DP-0        | -                | - |
| B83  | LVDS_BKLT_CTRL | LVDS_BKLT_CTRL / Backlight Brightness Contr. | O-3,3       | -                | - |
| B84  | VCC_5V_SBY     | +V_STBY_ETX / 5V Standby                     | PWR 5V (S5) | -                | - |
| B85  | VCC_5V_SBY     | +V_STBY_ETX / 5V Standby                     | PWR 5V (S5) | -                | - |
| B86  | VCC_5V_SBY     | +V_STBY_ETX / 5V Standby                     | PWR 5V (S5) | -                | - |
| B87  | VCC_5V_SBY     | +V_STBY_ETX / 5V Standby                     | PWR 5V (S5) | -                | - |
| B88  | BIOS_DIS1#     | BIOS_DIS1#                                   | I-3,3       | -                | - |
| B89  | VGA_RED        | CRT_RED / Analog Video RGB-RED               | OA          | PD 150R          | - |
| B90  | GND            | Power Ground                                 | PWR         | -                | - |
| B91  | VGA_GRN        | CRT_GREEN / Analog Video RGB-GREEN           | OA          | PD 150R          | - |
| B92  | VGA_BLU        | CRT_BLUE / Analog Video RGB-BLUE             | OA          | PD 150R          | - |
| B93  | VGA_HSYNC      | CRT_HSYNC / Analog Video H-Sync              | O-3,3       | -                | - |
| B94  | VGA_VSYNC      | CRT_VSYNC / Analog Video V-Sync              | O-3,3       | -                | - |
| B95  | VGA_I2C_CLK    | CRT_DDC_CLK / Display Data Channel Clock     | I/O-5       | PU 2k21 5V (S0)  | - |
| B96  | VGA_I2C_DAT    | CRT_DDC_DATA / Display Data Channel Data     | I/O-5       | PU 2k21 5V (S0)  | - |
| B97  | SPI_CS#        | SPI_CS# / SPI chip select                    | O-3,3       | -                | - |
| B98  | RSVD           | n. c.                                        | nc          | -                | - |
| B99  | RSVD           | n. c.                                        | nc          | -                | - |
| B100 | GND            | Power Ground                                 | PWR         | -                | - |
| B101 | FAN_PWMOUT     | Fan PWM Output                               | O-3,3       | -                | - |
| B102 | FAN_TACHIN     | Fan Tach Input                               | I-3,3       | PU 47K 3,3V (S0) | - |
| B103 | SLEEP#         | Sleep Button Input                           | I-3,3       | PU 47K 3,3V (S5) | - |
| B104 | VCC_12V        | main input voltage (8.5-18V)                 | PWR 8.5-18V | -                | - |
| B105 | VCC_12V        | main input voltage (8.5-18V)                 | PWR 8.5-18V | -                | - |
| B106 | VCC_12V        | main input voltage (8.5-18V)                 | PWR 8.5-18V | -                | - |
| B107 | VCC_12V        | main input voltage (8.5-18V)                 | PWR 8.5-18V | -                | - |
| B108 | VCC_12V        | main input voltage (8.5-18V)                 | PWR 8.5-18V | -                | - |
| B109 | VCC_12V        | main input voltage (8.5-18V)                 | PWR 8.5-18V | -                | - |
| B110 | GND            | Power Ground                                 | PWR         | -                | - |

## 7.4 Connector X1B Row C

| Pin | Signal            | Description                       | Type    | Termination | Comment                                                |
|-----|-------------------|-----------------------------------|---------|-------------|--------------------------------------------------------|
| C1  | GND               | Power Ground                      | PWR     | -           | -                                                      |
| C2  | GND               | Power Ground                      | PWR     | -           | -                                                      |
| C3  | USB_SSRX0-        | USB Super Speed Receive - (0)     | DP-I    | -           | -                                                      |
| C4  | USB_SSRX0+        | USB Super Speed Receive + (0)     | DP-I    | -           | -                                                      |
| C5  | GND               | Power Ground                      | PWR     | -           | -                                                      |
| C6  | USB_SSRX1-        | USB Super Speed Receive - (1)     | DP-I    | -           | -                                                      |
| C7  | USB_SSRX1+        | USB Super Speed Receive + (1)     | DP-I    | -           | -                                                      |
| C8  | GND               | Power Ground                      | PWR     | -           | -                                                      |
| C9  | USB_SSRX2-        | n.c.                              | Nc      | -           | -                                                      |
| C10 | USB_SSRX2+        | n.c.                              | Nc      | -           | -                                                      |
| C11 | GND               | Power Ground                      | PWR     | -           | -                                                      |
| C12 | USB_SSRX3-        | n.c.                              | Nc      | -           | -                                                      |
| C13 | USB_SSRX3+        | n.c.                              | Nc      | -           | -                                                      |
| C14 | GND               | Power Ground                      | PWR     | -           | -                                                      |
| C15 | DDI1_PAIR6+       | DDI1 Pair 6 +                     | DP-I    | -           | -                                                      |
| C16 | DDI1_PAIR6-       | DDI1 Pair 6 -                     | DP-I    | -           | -                                                      |
| C17 | RSVD              | n.c.                              | Nc      | -           | -                                                      |
| C18 | RSVD              | n.c.                              | Nc      | -           | -                                                      |
| C19 | PCIE_RX6+         | opt. PCI Express lane 6 + Receive | Nc      | -           | just available if PCIe2USB30 controller is not stuffed |
| C20 | PCIE_RX6-         | opt. PCI Express lane 6 - Receive | Nc      | -           | just available if PCIe2USB30 controller is not stuffed |
| C21 | GND               | Power Ground                      | PWR     | -           | -                                                      |
| C22 | PCIE_RX7+         | opt. PCI Express lane 7 + Receive | Nc      | -           | just available if LAN controller is not stuffed        |
| C23 | PCIE_RX7-         | opt. PCI Express lane 7 - Receive | Nc      | -           | just available if LAN controller is not stuffed        |
| C24 | DDI1_HPD          | DDI1 Hotplug Detect               | I-3,3   | PD 100k     | -                                                      |
| C25 | DDI1_PAIR4+       | DDI1 Pair 4 +                     | DP-I    | -           | -                                                      |
| C26 | DDI1_PAIR4-       | DDI1 Pair 4 -                     | DP-I    | -           | -                                                      |
| C27 | RSVD              | n.c.                              | Nc      | -           | -                                                      |
| C28 | RSVD              | n.c.                              | Nc      | -           | -                                                      |
| C29 | DDI1_PAIR5+       | DDI1 Pair 5 +                     | DP-I    | -           | -                                                      |
| C30 | DDI1_PAIR5-       | DDI1 Pair 5 -                     | DP-I    | -           | -                                                      |
| C31 | GND               | Power Ground                      | PWR     | -           | -                                                      |
| C32 | DDI2_CTRLCLK_AUX+ | DDI2 CTRLCLK/AUX+                 | I/O-3,3 | -           | -                                                      |
| C33 | DDI2_CTRLCLK_AUX- | DDI2 CTRLCLK/AUX-                 | I/O-3,3 | -           | -                                                      |
| C34 | DDI2_DDC_AUX_SEL  | DDI2 DDC/AUX select               | I-3,3   | PD 1M       | -                                                      |
| C35 | RSVD              | n.c.                              | Nc      | -           | -                                                      |
| C36 | DDI3_CTRLCLK_AUX+ | DDI3 CTRLCLK/AUX+                 | I/O-3,3 | -           | -                                                      |
| C37 | DDI3_CTRLCLK_AUX- | DDI3 CTRLCLK/AUX-                 | I/O-3,3 | -           | -                                                      |
| C38 | DDI3_DDC_AUX_SEL  | DDI3 DDC/AUX select               | I-3,3   | PD 1M       | -                                                      |
| C39 | DDI3_PAIR0+       | DDI3 Pair 0 +                     | DP-0    | -           | -                                                      |
| C40 | DDI3_PAIR0-       | DDI3 Pair 0 -                     | DP-0    | -           | -                                                      |
| C41 | GND               | Power Ground                      | PWR     | -           | -                                                      |
| C42 | DDI3_PAIR1+       | DDI3 Pair 1 +                     | DP-0    | -           | -                                                      |
| C43 | DDI3_PAIR1-       | DDI3 Pair 1 -                     | DP-0    | -           | -                                                      |
| C44 | DDI3_HPD          | DDI3 Hotplug Detect               | I-3,3   | PD 100k     | -                                                      |
| C45 | RSVD              | n.c.                              | Nc      | -           | -                                                      |
| C46 | DDI3_PAIR2+       | DDI3 Pair 2 +                     | DP-0    | -           | -                                                      |
| C47 | DDI3_PAIR2-       | DDI3 Pair 2 -                     | DP-0    | -           | -                                                      |
| C48 | RSVD              | n.c.                              | Nc      | -           | -                                                      |
| C49 | DDI3_PAIR3+       | DDI3 Pair 3 +                     | DP-0    | -           | -                                                      |
| C50 | DDI3_PAIR3-       | DDI3 Pair 3 -                     | DP-0    | -           | -                                                      |
| C51 | GND               | Power Ground                      | PWR     | -           | -                                                      |
| C52 | PEG_RX0+          | PCIexpress Graphics receive + (0) | DP-I    | -           | -                                                      |
| C53 | PEG_RX0-          | PCIexpress Graphics receive - (0) | DP-I    | -           | -                                                      |
| C54 | TYPE0#            | n.c. for type 6 module            | nc      | -           | -                                                      |
| C55 | PEG_RX1+          | PCIexpress Graphics receive + (1) | DP-I    | -           | -                                                      |
| C56 | PEG_RX1-          | PCIexpress Graphics receive - (1) | DP-I    | -           | -                                                      |
| C57 | TYPE1#            | n.c. for type 6 module            | nc      | -           | -                                                      |
| C58 | PEG_RX2+          | PCIexpress Graphics receive + (2) | DP-I    | -           | -                                                      |
| C59 | PEG_RX2-          | PCIexpress Graphics receive - (2) | DP-I    | -           | -                                                      |
| C60 | GND               | Power Ground                      | PWR     | -           | -                                                      |
| C61 | PEG_RX3+          | PCIexpress Graphics receive + (3) | DP-I    | -           | -                                                      |
| C62 | PEG_RX3-          | PCIexpress Graphics receive - (3) | DP-I    | -           | -                                                      |
| C63 | RSVD              | n.c.                              | nc      | -           | -                                                      |
| C64 | RSVD              | n.c.                              | nc      | -           | -                                                      |

|      |           |                                    |             |   |   |
|------|-----------|------------------------------------|-------------|---|---|
| C65  | PEG_RX4+  | PCIexpress Graphics receive + (4)  | DP-I        | - | - |
| C66  | PEG_RX4-  | PCIexpress Graphics receive - (4)  | DP-I        | - | - |
| C67  | RSVD      | n.c.                               | nc          | - | - |
| C68  | PEG_RX5+  | PCIexpress Graphics receive + (5)  | DP-I        | - | - |
| C69  | PEG_RX5-  | PCIexpress Graphics receive - (5)  | DP-I        | - | - |
| C70  | GND       | Power Ground                       | PWR         | - | - |
| C71  | PEG_RX6+  | PCIexpress Graphics receive + (6)  | DP-I        | - | - |
| C72  | PEG_RX6-  | PCIexpress Graphics receive - (6)  | DP-I        | - | - |
| C73  | GND       | Power Ground                       | PWR         | - | - |
| C74  | PEG_RX7+  | PCIexpress Graphics receive + (7)  | DP-I        | - | - |
| C75  | PEG_RX7-  | PCIexpress Graphics receive - (7)  | DP-I        | - | - |
| C76  | GND       | Power Ground                       | PWR         | - | - |
| C77  | RSVD      | n.c.                               | nc          | - | - |
| C78  | PEG_RX8+  | PCIexpress Graphics receive + (8)  | DP-I        | - | - |
| C79  | PEG_RX8-  | PCIexpress Graphics receive - (8)  | DP-I        | - | - |
| C80  | GND       | Power Ground                       | PWR         | - | - |
| C81  | PEG_RX9+  | PCIexpress Graphics receive + (9)  | DP-I        | - | - |
| C82  | PEG_RX9-  | PCIexpress Graphics receive - (9)  | DP-I        | - | - |
| C83  | RSVD      | n.c.                               | nc          | - | - |
| C84  | GND       | Power Ground                       | PWR         | - | - |
| C85  | PEG_RX10+ | PCIexpress Graphics receive + (10) | DP-I        | - | - |
| C86  | PEG_RX10- | PCIexpress Graphics receive - (10) | DP-I        | - | - |
| C87  | GND       | Power Ground                       | PWR         | - | - |
| C88  | PEG_RX11+ | PCIexpress Graphics receive + (11) | DP-I        | - | - |
| C89  | PEG_RX11- | PCIexpress Graphics receive - (11) | DP-I        | - | - |
| C90  | GND       | Power Ground                       | PWR         | - | - |
| C91  | PEG_RX12+ | PCIexpress Graphics receive + (12) | DP-I        | - | - |
| C92  | PEG_RX12- | PCIexpress Graphics receive - (12) | DP-I        | - | - |
| C93  | GND       | Power Ground                       | PWR         | - | - |
| C94  | PEG_RX13+ | PCIexpress Graphics receive + (13) | DP-I        | - | - |
| C95  | PEG_RX13- | PCIexpress Graphics receive - (13) | DP-I        | - | - |
| C96  | GND       | Power Ground                       | PWR         | - | - |
| C97  | RSVD      | DPD_CTRL_CLK                       | I/O-3,3     | - | - |
| C98  | PEG_RX14+ | PCIexpress Graphics receive + (14) | DP-I        | - | - |
| C99  | PEG_RX14- | PCIexpress Graphics receive - (14) | DP-I        | - | - |
| C100 | GND       | Power Ground                       | PWR         | - | - |
| C101 | PEG_RX15+ | PCIexpress Graphics receive + (15) | DP-I        | - | - |
| C102 | PEG_RX15- | PCIexpress Graphics receive - (15) | DP-I        | - | - |
| C103 | GND       | Power Ground                       | PWR         | - | - |
| C104 | VCC_12V   | main input voltage (8.5-18V)       | PWR 8.5-18V | - | - |
| C105 | VCC_12V   | main input voltage (8.5-18V)       | PWR 8.5-18V | - | - |
| C106 | VCC_12V   | main input voltage (8.5-18V)       | PWR 8.5-18V | - | - |
| C107 | VCC_12V   | main input voltage (8.5-18V)       | PWR 8.5-18V | - | - |
| C108 | VCC_12V   | main input voltage (8.5-18V)       | PWR 8.5-18V | - | - |
| C109 | VCC_12V   | main input voltage (8.5-18V)       | PWR 8.5-18V | - | - |
| C110 | GND       | Power Ground                       | PWR         | - | - |

## 7.5 Connector X1B Row D

| Pin | Signal            | Description                        | Type    | Termination | Comment                                                |
|-----|-------------------|------------------------------------|---------|-------------|--------------------------------------------------------|
| D1  | GND               | Power Ground                       | PWR     | -           | -                                                      |
| D2  | GND               | Power Ground                       | PWR     | -           | -                                                      |
| D3  | USB_SSTX0-        | USB Super Speed Transmit - (0)     | DP-0    | -           | -                                                      |
| D4  | USB_SSTX0+        | USB Super Speed Transmit + (0)     | DP-0    | -           | -                                                      |
| D5  | GND               | Power Ground                       | PWR     | -           | -                                                      |
| D6  | USB_SSTX1-        | USB Super Speed Transmit - (1)     | DP-0    | -           | -                                                      |
| D7  | USB_SSTX1+        | USB Super Speed Transmit + (1)     | DP-0    | -           | -                                                      |
| D8  | GND               | Power Ground                       | PWR     | -           | -                                                      |
| D9  | USB_SSTX2-        | n.c.                               | Nc      | -           | -                                                      |
| D10 | USB_SSTX2+        | n.c.                               | Nc      | -           | -                                                      |
| D11 | GND               | Power Ground                       | PWR     | -           | -                                                      |
| D12 | USB_SSTX3-        | n.c.                               | Nc      | -           | -                                                      |
| D13 | USB_SSTX3+        | n.c.                               | Nc      | -           | -                                                      |
| D14 | GND               | Power Ground                       | PWR     | -           | -                                                      |
| D15 | DDI1_CTRLCLK_AUX+ | DDI1 CTRLCLK/AUX+                  | I/O-3,3 | -           | -                                                      |
| D16 | DDI1_CTRLCLK_AUX- | DDI1 CTRLCLK/AUX-                  | I/O-3,3 | -           | -                                                      |
| D17 | RSVD              | n.c.                               | Nc      | -           | -                                                      |
| D18 | RSVD              | n.c.                               | Nc      | -           | -                                                      |
| D19 | PCIE_TX6+         | opt. PCI Express lane 6 + Transmit | Nc      | -           | just available if PCIe2USB30 controller is not stuffed |
| D20 | PCIE_TX6-         | opt. PCI Express lane 6 - Transmit | Nc      | -           | just available if PCIe2USB30 controller is not stuffed |
| D21 | GND               | Power Ground                       | PWR     | -           | -                                                      |
| D22 | PCIE_TX7+         | opt. PCI Express lane 7 + Transmit | Nc      | -           | just available if LAN controller is not stuffed        |
| D23 | PCIE_TX7-         | opt. PCI Express lane 7 - Transmit | Nc      | -           | just available if LAN controller is not stuffed        |
| D24 | RSVD              | n.c.                               | Nc      | -           | -                                                      |
| D25 | RSVD              | n.c.                               | Nc      | -           | -                                                      |
| D26 | DDI1_PAIR0+       | DDI1 Pair 0 +                      | DP-0    | -           | -                                                      |
| D27 | DDI1_PAIR0-       | DDI1 Pair 0 -                      | DP-0    | -           | -                                                      |
| D28 | RSVD              | n.c.                               | Nc      | -           | -                                                      |
| D29 | DDI1_PAIR1+       | DDI1 Pair 1 +                      | DP-0    | -           | -                                                      |
| D30 | DDI1_PAIR1-       | DDI1 Pair 1 -                      | DP-0    | -           | -                                                      |
| D31 | GND               | Power Ground                       | PWR     | -           | -                                                      |
| D32 | DDI1_PAIR2+       | DDI1 Pair 2 +                      | DP-0    | -           | -                                                      |
| D33 | DDI1_PAIR2-       | DDI1 Pair 2 -                      | DP-0    | -           | -                                                      |
| D34 | DDI1_DDC_AUX_SEL  | DDI1 DDC/AUX select                | I-3,3   | PD 1M       | -                                                      |
| D35 | RSVD              | n.c.                               | Nc      | -           | -                                                      |
| D36 | DDI1_PAIR3+       | DDI1 Pair 3 +                      | DP-0    | -           | -                                                      |
| D37 | DDI1_PAIR3-       | DDI1 Pair 3 -                      | DP-0    | -           | -                                                      |
| D38 | RSVD              | n.c.                               | Nc      | -           | -                                                      |
| D39 | DDI2_PAIR0+       | DDI2 Pair 0 +                      | DP-0    | -           | -                                                      |
| D40 | DDI2_PAIR0-       | DDI2 Pair 0 -                      | DP-0    | -           | -                                                      |
| D41 | GND               | Power Ground                       | PWR     | -           | -                                                      |
| D42 | DDI2_PAIR1+       | DDI2 Pair 1 +                      | DP-0    | -           | -                                                      |
| D43 | DDI2_PAIR1-       | DDI2 Pair 1 -                      | DP-0    | -           | -                                                      |
| D44 | DDI2_HPD          | DDI2 Hotplug Detect                | I-3,3   | PD 100k     | -                                                      |
| D45 | RSVD              | n.c.                               | Nc      | -           | -                                                      |
| D46 | DDI2_PAIR2+       | DDI2 Pair 2 +                      | DP-0    | -           | -                                                      |
| D47 | DDI2_PAIR2-       | DDI2 Pair 2 -                      | DP-0    | -           | -                                                      |
| D48 | RSVD              | n.c.                               | Nc      | -           | -                                                      |
| D49 | DDI2_PAIR3+       | DDI2 Pair 3 +                      | DP-0    | -           | -                                                      |
| D50 | DDI2_PAIR3-       | DDI2 Pair 3 -                      | DP-0    | -           | -                                                      |
| D51 | GND               | Power Ground                       | PWR     | -           | -                                                      |
| D52 | PEG_TX0+          | PCIexpress Graphics Transmit + (0) | DP-0    | -           | -                                                      |
| D53 | PEG_TX0-          | PCIexpress Graphics Transmit - (0) | DP-0    | -           | -                                                      |
| D54 | PEG_LANE_RV#      | PCIexpress Graphics Lane Reversal  | I-3,3   | -           | -                                                      |
| D55 | PEG_TX1+          | PCIexpress Graphics Transmit + (1) | DP-0    | -           | -                                                      |
| D56 | PEG_TX1-          | PCIexpress Graphics Transmit - (1) | DP-0    | -           | -                                                      |
| D57 | TYPE2#            | GND for type 6 module              | PWR     | -           | -                                                      |
| D58 | PEG_TX2+          | PCIexpress Graphics Transmit + (2) | DP-0    | -           | -                                                      |
| D59 | PEG_TX2-          | PCIexpress Graphics Transmit - (2) | DP-0    | -           | -                                                      |
| D60 | GND               | Power Ground                       | PWR     | -           | -                                                      |
| D61 | PEG_TX3+          | PCIexpress Graphics Transmit + (3) | DP-0    | -           | -                                                      |
| D62 | PEG_TX3-          | PCIexpress Graphics Transmit - (3) | DP-0    | -           | -                                                      |
| D63 | RSVD              | DPC_CTRL_CLK                       | I/O-3,3 | -           | -                                                      |
| D64 | RSVD              | DPC_CTRL_DATA                      | I/O-3,3 | -           | int. PD 20k in PCH                                     |



|      |           |                                     |             |   |                    |
|------|-----------|-------------------------------------|-------------|---|--------------------|
| D65  | PEG_TX4+  | PCIexpress Graphics Transmit + (4)  | DP-0        | - | -                  |
| D66  | PEG_TX4-  | PCIexpress Graphics Transmit - (4)  | DP-0        | - | -                  |
| D67  | GND       | Power Ground                        | PWR         | - | -                  |
| D68  | PEG_TX5+  | PCIexpress Graphics Transmit + (5)  | DP-0        | - | -                  |
| D69  | PEG_TX5-  | PCIexpress Graphics Transmit - (5)  | DP-0        | - | -                  |
| D70  | GND       | Power Ground                        | PWR         | - | -                  |
| D71  | PEG_TX6+  | PCIexpress Graphics Transmit + (6)  | DP-0        | - | -                  |
| D72  | PEG_TX6-  | PCIexpress Graphics Transmit - (6)  | DP-0        | - | -                  |
| D73  | GND       | Power Ground                        | PWR         | - | -                  |
| D74  | PEG_TX7+  | PCIexpress Graphics Transmit + (7)  | DP-0        | - | -                  |
| D75  | PEG_TX7-  | PCIexpress Graphics Transmit - (7)  | DP-0        | - | -                  |
| D76  | GND       | Power Ground                        | PWR         | - | -                  |
| D77  | RSVD      | n.c.                                | Nc          | - | -                  |
| D78  | PEG_TX8+  | PCIexpress Graphics Transmit + (8)  | DP-0        | - | -                  |
| D79  | PEG_TX8-  | PCIexpress Graphics Transmit - (8)  | DP-0        | - | -                  |
| D80  | GND       | Power Ground                        | PWR         | - | -                  |
| D81  | PEG_TX9+  | PCIexpress Graphics Transmit + (9)  | DP-0        | - | -                  |
| D82  | PEG_TX9-  | PCIexpress Graphics Transmit - (9)  | DP-0        | - | -                  |
| D83  | RSVD      | DPD_CTRL_DATA                       | I/O-3,3     | - | int. PD 20k in PCH |
| D84  | GND       | Power Ground                        | PWR         | - | -                  |
| D85  | PEG_TX10+ | PCIexpress Graphics Transmit + (10) | DP-0        | - | -                  |
| D86  | PEG_TX10- | PCIexpress Graphics Transmit - (10) | DP-0        | - | -                  |
| D87  | GND       | Power Ground                        | PWR         | - | -                  |
| D88  | PEG_TX11+ | PCIexpress Graphics Transmit + (11) | DP-0        | - | -                  |
| D89  | PEG_TX11- | PCIexpress Graphics Transmit - (11) | DP-0        | - | -                  |
| D90  | GND       | Power Ground                        | PWR         | - | -                  |
| D91  | PEG_TX12+ | PCIexpress Graphics Transmit + (12) | DP-0        | - | -                  |
| D92  | PEG_TX12- | PCIexpress Graphics Transmit - (12) | DP-0        | - | -                  |
| D93  | GND       | Power Ground                        | PWR         | - | -                  |
| D94  | PEG_TX13+ | PCIexpress Graphics Transmit + (13) | DP-0        | - | -                  |
| D95  | PEG_TX13- | PCIexpress Graphics Transmit - (13) | DP-0        | - | -                  |
| D96  | GND       | Power Ground                        | PWR         | - | -                  |
| D97  | RSVD      | n.c.                                | Nc          | - | -                  |
| D98  | PEG_TX14+ | PCIexpress Graphics Transmit + (14) | DP-0        | - | -                  |
| D99  | PEG_TX14- | PCIexpress Graphics Transmit - (14) | DP-0        | - | -                  |
| D100 | GND       | Power Ground                        | PWR         | - | -                  |
| D101 | PEG_TX15+ | PCIexpress Graphics Transmit + (15) | DP-0        | - | -                  |
| D102 | PEG_TX15- | PCIexpress Graphics Transmit - (15) | DP-0        | - | -                  |
| D103 | GND       | Power Ground                        | PWR         | - | -                  |
| D104 | VCC_12V   | main input voltage (8.5-18V)        | PWR 8.5-18V | - | -                  |
| D105 | VCC_12V   | main input voltage (8.5-18V)        | PWR 8.5-18V | - | -                  |
| D106 | VCC_12V   | main input voltage (8.5-18V)        | PWR 8.5-18V | - | -                  |
| D107 | VCC_12V   | main input voltage (8.5-18V)        | PWR 8.5-18V | - | -                  |
| D108 | VCC_12V   | main input voltage (8.5-18V)        | PWR 8.5-18V | - | -                  |
| D109 | VCC_12V   | main input voltage (8.5-18V)        | PWR 8.5-18V | - | -                  |
| D110 | GND       | Power Ground                        | PWR         | - | -                  |



The termination resistors in these tables are already mounted on the module. Refer to the design guide for information about additional termination resistors.

## 8 BIOS Operation

The module is equipped with AMI® Aptio, which is located in an onboard SPI serial flash memory.

### 8.1 Determining the BIOS Version

The AMI® Aptio version is displayed in the main menu of the setup utility.

- » BIOS Vendor: American Megatrends
- » Core Version: x.x.x.x
- » BIOS Date: mm/dd/yyyy hh:mm:ss
- » BIOS Version: CHR6RXXX

### 8.2 BIOS Update

Kontron provides continuous BIOS updates for Computer-on-Modules. The updates are provided for download on <http://emdcustomersection.kontron.com> with a detailed change description within the according Product Change Notification (PCN). Please register for EMD Customer Section to get access to BIOS downloads and PCN service.

Modules with BIOS Region/Setup only inside the flash can be updated with AFU utilities (usually 1-3MB BIOS binary file size) directly. Modules with Intel® Management Engine, Ethernet, Flash Descriptor and other options additionally to the BIOS Region (usually 4-8MB BIOS binary file size) requires a different update process with Intel Flash Utility FPT and a wrapper to backup and restore configurations and the MAC address. Therefore it is strongly recommended to use the batch file inside the BIOS download package available on EMD Customer Section.

» Boot the module to DOS/EFI Shell with access to the BIOS image and Firmware Update Utility provided on EMD Customer Section

- » Execute Flash.bat in DOS or Flash.nsh in EFI Shell



Any modification of the update process may damage your module!

## Backup the BIOS / Create a BIOS with custom defaults:

- » Change your BIOS settings according your needs
- » Save and Exit Setup with option "Save as User Defaults". Your customized settings are now stored inside the flash in a second area additional to the manufacturer defaults
- » Boot the module to DOS or EFI Shell with access to the update utilities
- » Extract the BIOS region including your custom defaults with **afuefix64.efi CBIOS.bin /0** in EFI Shell or **afudos.exe CBIOS.rom /0** in DOS

Now you can clone the BIOS with your customized default settings to other modules or external SPI flashes with above mention AFU utilites. On modules with Management Engine and Ethernet inside the Flash the same BIOS core version should already be programmed on the target.



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

## 8.3 Setup Guide

The Aptio Setup Utility changes system behavior by modifying the Firmware configuration. The setup program uses a number of menus to make changes and turn features on or off.

Functional keystrokes in POST:

| Key | Function    |
|-----|-------------|
| DEL | Enter Setup |
| F2  | Enter Setup |
| F7  | Boot Menu   |

## 8.4 POST Codes

Important POST codes during boot-up

|    |            |
|----|------------|
| AB | BIOS Setup |
| AD | EFI Shell  |
| AE | Windows    |

### 8.4.1 Start AMI® Aptio Setup Utility

To start the AMI® BIOS setup utility, press <DEL> or <F2> when the following string appears during bootup.

**Press <DEL> to enter Setup**

The Info Menu then appears.

The Setup Screen is composed of several sections:

| Setup Screen              | Location          | Function                               |
|---------------------------|-------------------|----------------------------------------|
| Menu Bar                  | Top               | Lists and selects all top level menus. |
| Legend Bar                | Right side Bottom | Lists setup navigation keys.           |
| Item Specific Help Window | Right side Top    | Help for selected item.                |
| Menu Window               | Left Center       | Selection fields for current menu.     |

### Menu Bar

The menu bar at the top of the window lists different menus. Use the left/right arrow keys to make a selection.

### Legend Bar

Use the keys listed in the legend bar on the bottom to make your selections or exit the current menu. The table below describes the legend keys and their alternates.

| Key              | Function                                        |
|------------------|-------------------------------------------------|
| ← or → Arrow key | Select a menu.                                  |
| ↑ or ↓ Arrow key | Select fields in current menu.                  |
| <Home> or <End>  | Move cursor to top or bottom of current window. |
| <PgUp> or <PgDn> | Move cursor to next or previous page.           |
| +/-              | Change Option                                   |
| <Enter>          | Execute command or select submenu.              |
| <F1>             | General Help window.                            |
| <F2>             | Previous Values                                 |
| <F3>             | Load the optimized default configuration.       |
| <F4>             | Save and exit.                                  |
| <Esc>            | Exit menu.                                      |

### Selecting an Item

Use the ↑ or ↓ key to move the cursor to the field you want. Then use the + and – keys to select a value for that field. The Save Value commands in the Exit menu save the values displayed in all the menus.

### Displaying Submenus

Use the ← or → key to move the cursor to the submenu you want. Then press <Enter>. A pointer (►) marks all submenus.

### Item Specific Help Window

The Help window on the right side of each menu displays the Help text for the selected item. It updates as you move the cursor to each field.

### General Help Window

Pressing <F1> on a menu brings up the General Help window that describes the legend keys and their alternates. Press <Esc> to exit the General Help window.

8.5 BIOS Setup

8.5.1 Main

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

Main

Advanced

Chipset

Boot

Security

Save & Exit

BIOS Information

BIOS Vendor  
Core Version  
Compliance  
Project Version  
Build Date and Time

American Megatrends  
4.6.5.1  
UEFI 2.1; PI 0.9  
CHR6R111 x64  
03/30/2012 10:29:04

Platform Information

System Language  
System Date  
System Time  
Access Level

[English]  
[Thu 01/01/2009]  
[00:24:10]  
Administrator

Platform Information

><: Select Screen  
↑↓: Select Item  
Enter: Select  
+/-: Change Opt.  
F1: General Help  
F2: Previous Values  
F3: Optimized Defaults  
F4: Save & Exit  
ESC: Exit

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature         | Options      | Description                                             |
|-----------------|--------------|---------------------------------------------------------|
| System Language | English      | Choose the system default language                      |
| System Date     | [mm/dd/yyyy] | Set the Date. Use 'Tab' to switch between Date elements |
| System Time     | [hh:mm:ss]   | Set the Time. Use 'Tab' to switch between Time elements |

## Platform Information

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

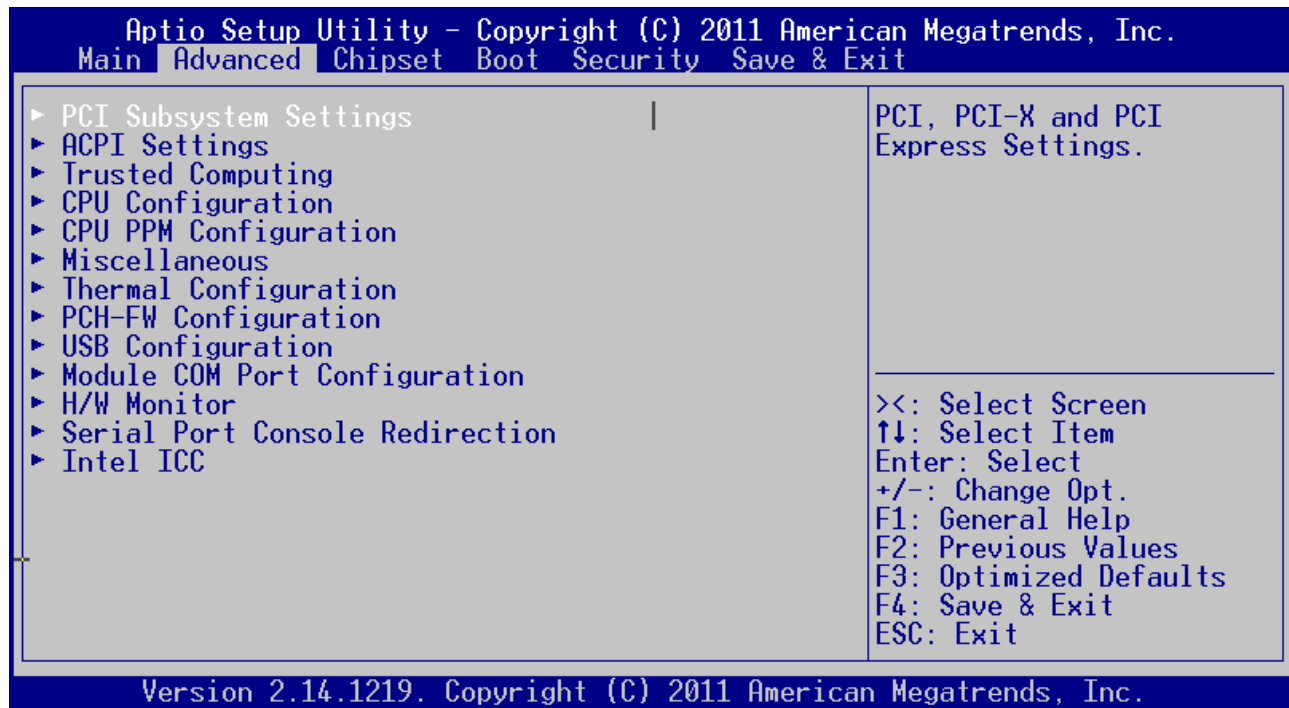
**Main**

| Module Information |                     |
|--------------------|---------------------|
| Product Name       | C0Me-bSC6 i7-2655LE |
| Revision           | 1.2.0               |
| Serial #           | DJD0R0042           |
| MAC Address        | 00:E0:4B:3B:60:C8   |
| CPLD Rev           | CHR6P105            |
| Boot counter       | 53                  |

><: Select Screen  
↑↓: Select Item  
Enter: Select  
+/-: Change Opt.  
F1: General Help  
F2: Previous Values  
F3: Optimized Defaults  
F4: Save & Exit  
ESC: Exit

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

## 8.5.2 Advanced





## PCI Subsystem Settings

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

Advanced

|                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PCI Bus Driver Vers.    V 2.05.01     <br>PCI Option ROM Handling<br>PCI ROM Priority        [EFI Compatible ROM]<br>PCI Common Settings<br>PCI Latency Timer       [32 PCI Bus Clocks]<br>VGA Palette Snoop      [Disabled]<br>PERR# Generation       [Disabled]<br>SERR# Generation       [Disabled] | In case of multiple Option ROMs (Legacy and EFI Compatible), specifies what PCI Option ROM to launch.<br><br><hr/> ><: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature           | Options                                 | Description                                                                                          |
|-------------------|-----------------------------------------|------------------------------------------------------------------------------------------------------|
| PCI ROM Priority  | Legacy ROM<br><b>EFI Compatible ROM</b> | In case of multiple Option ROMs (Legacy and EFI Compatible), specifies what PCI Option ROM to launch |
| PCI Latency Timer | 32 ... 248 PCI Bus Clocks               | Value to be programmed into PCI Latency Timer Register                                               |
| VGA Palette Snoop | <b>Disabled</b><br>Enabled              | Enables or Disables VGA Palette Registers Snooping                                                   |
| PERR# Generation  | <b>Disabled</b><br>Enabled              | Enables or Disables PCI Device to Generate PERR#                                                     |
| SERR# Generation  | <b>Disabled</b><br>Enabled              | Enables or Disables PCI Device to Generate SERR#                                                     |

## ACPI Settings

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

Advanced

|                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>ACPI Settings</b></p> <p>Enable ACPI Auto Conf    [Disabled]</p> <p>Enable Hibernation        [Enabled]</p> <p>ACPI Sleep State         [S3 (Suspend to RAM)]</p> <p>Lock Legacy Resources    [Disabled]</p> | <p>Enables or Disables BIOS ACPI Auto Configuration.</p> <hr/> <p>&gt;&lt;: Select Screen<br/>         ↑↓: Select Item<br/>         Enter: Select<br/>         +/-: Change Opt.<br/>         F1: General Help<br/>         F2: Previous Values<br/>         F3: Optimized Defaults<br/>         F4: Save &amp; Exit<br/>         ESC: Exit</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature                        | Options                             | Description                                                                                  |
|--------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------|
| Enable ACPI Auto Configuration | <b>Disabled</b><br>Enabled          | Enables or Disables BIOS ACPI Auto Configuration                                             |
| Enable Hibernation             | Disabled<br><b>Enabled</b>          | Enables or Disables System ability to Hibernate (OS/S4 Sleep State)                          |
| ACPI Sleep State               | Suspend Disabled<br><b>S3 (StR)</b> | Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed |
| Lock Legacy Ressources         | <b>Disabled</b><br>Enabled          | Enables or Disables Lock of Legacy Ressources                                                |

## Trusted Computing

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

Advanced

|                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Configuration</b></p> <p>TPM SUPPORT [Disable]</p> <p>Current Status Information</p> | <p>Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.</p> <hr/> <p>&gt;&lt;: Select Screen<br/>         ↑↓: Select Item<br/>         Enter: Select<br/>         +/-: Change Opt.<br/>         F1: General Help<br/>         F2: Previous Values<br/>         F3: Optimized Defaults<br/>         F4: Save &amp; Exit<br/>         ESC: Exit</p> |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature           | Options                                                                     | Description                                                                                                                         |
|-------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| TPM Support       | <b>Disable</b><br>Enable                                                    | Enables or Disables TPM support. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available     |
| TPM State         | <b>Disabled</b><br>Enabled                                                  | Enable/Disable Security Device. Note: Your Computer will reboot during restart in order to change Sate of the Device                |
| Pending Operation | <b>None</b><br>Enable Take Ownership<br>Disable Take Ownership<br>TPM Clear | Schedule an Operation for the Security Device. Note: Your Computer will reboot during restart in order to change Sate of the Device |

## CPU Configuration

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

Advanced

| CPU Configuration                                                                                                                                                              | Socket specific CPU Information |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| ▶ Socket 0 CPU Information                                                                                                                                                     |                                 |
| CPU Speed<br>64-bit                                                                                                                                                            | 2200 MHz<br>Supported           |
| Hyper-threading                                                                                                                                                                | [Enabled]                       |
| Active Proc Cores                                                                                                                                                              | [All]                           |
| Execute Disable Bit                                                                                                                                                            | [Enabled]                       |
| Hardware Prefetcher                                                                                                                                                            | [Enabled]                       |
| Adj. Cache Line Pref.                                                                                                                                                          | [Enabled]                       |
| Intel Virtualization                                                                                                                                                           | [Enabled]_                      |
| ><: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |                                 |

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature                         | Options                    | Description                                                                                            |
|---------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------|
| Hyper-Threading                 | Disabled<br><b>Enabled</b> | Enables/Disables the Intel® Hyper Threading Technology HTT supported by Core i7/i5                     |
| Active Proc Cores               | <b>All</b><br>1<br>2<br>3  | Number of cores to enable in each processors package                                                   |
| Execute Disable Bit             | Disabled<br><b>Enabled</b> | XD can prevent certain classes of malicious buffer overflow attacks when combined with a supporting OS |
| Hardware Prefetcher             | Disabled<br><b>Enabled</b> | Turn on/off the MLC streamer prefetcher                                                                |
| Adj. Cache Line Pref.           | Disabled<br><b>Enabled</b> | Turn on/off prefetching of adjacent cache lines                                                        |
| Intel Virtualization Technology | Disabled<br><b>Enabled</b> | When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology |

## CPU Information

**Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.**

**Advanced**

| Socket 0 CPU Information                  |            |
|-------------------------------------------|------------|
| Intel(R) Core(TM) i7-2655LE CPU @ 2.20GHz |            |
| CPU Signature                             | 206a7      |
| Microcode Patch                           | 1b         |
| Max CPU Speed                             | 2200 MHz   |
| Min CPU Speed                             | 800 MHz    |
| Processor Cores                           | 2          |
| Intel HT Technology                       | Supported  |
| Intel VT-x Technology                     | Supported  |
| L1 Data Cache                             | 32 kB x 2  |
| L1 Code Cache                             | 32 kB x 2  |
| L2 Cache                                  | 256 kB x 2 |
| L3 Cache                                  | 4096 kB    |

><: Select Screen  
 ↑↓: Select Item  
 Enter: Select  
 +/-: Change Opt.  
 F1: General Help  
 F2: Previous Values  
 F3: Optimized Defaults  
 F4: Save & Exit  
 ESC: Exit

**Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.**

## CPU PPM Configuration

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

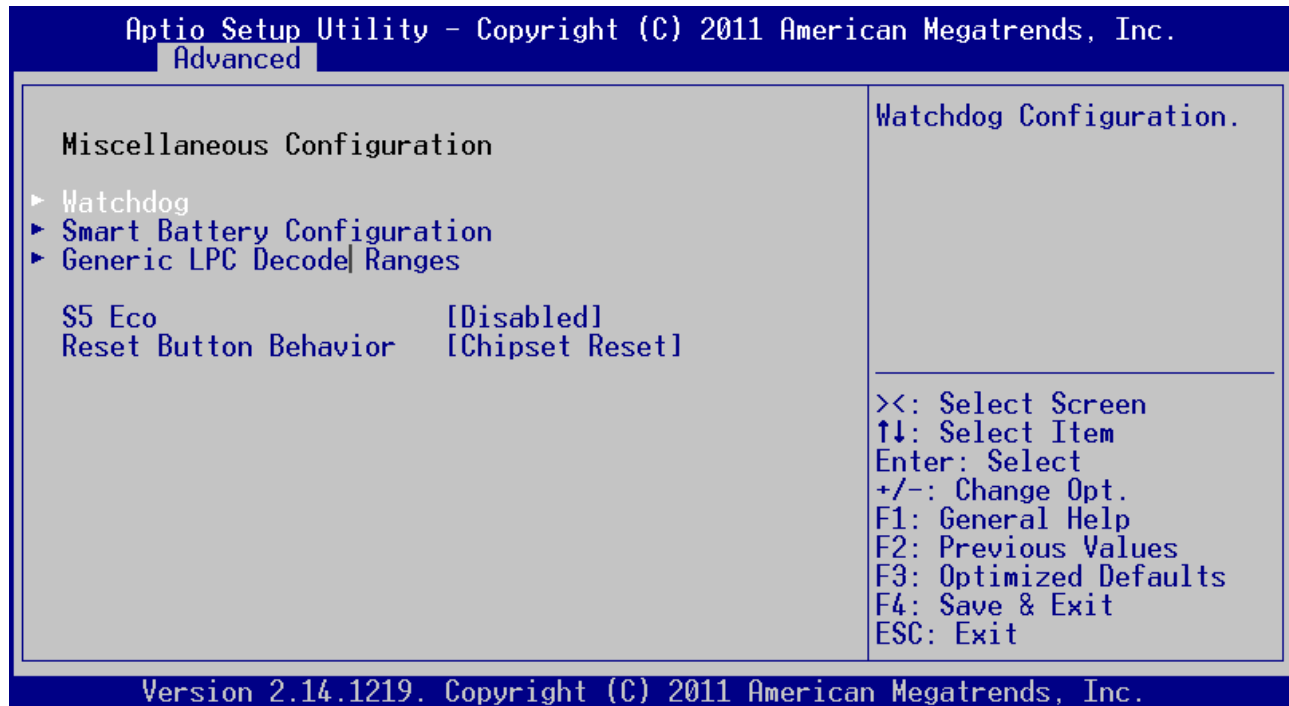
Advanced

| CPU PPM Configuration |           | Enable/Disable CPU DTS SMI<br>If disabled, ACPI can't provide current temperature and passive cooling is not possible!                                                         |
|-----------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CPU DTS               | [Enabled] | ><: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |
| EIST                  | [Enabled] |                                                                                                                                                                                |
| Turbo Mode            | [Enabled] |                                                                                                                                                                                |
| CPU C3 Report         | [Enabled] |                                                                                                                                                                                |
| CPU C6 report         | [Enabled] |                                                                                                                                                                                |
| CPU C7 report         | [Enabled] |                                                                                                                                                                                |
| Long duration pwr lim | 0         |                                                                                                                                                                                |
| Long duration time    | 28        |                                                                                                                                                                                |
| Short duration power  | 0         |                                                                                                                                                                                |
| TCC active offset     | 0         |                                                                                                                                                                                |

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

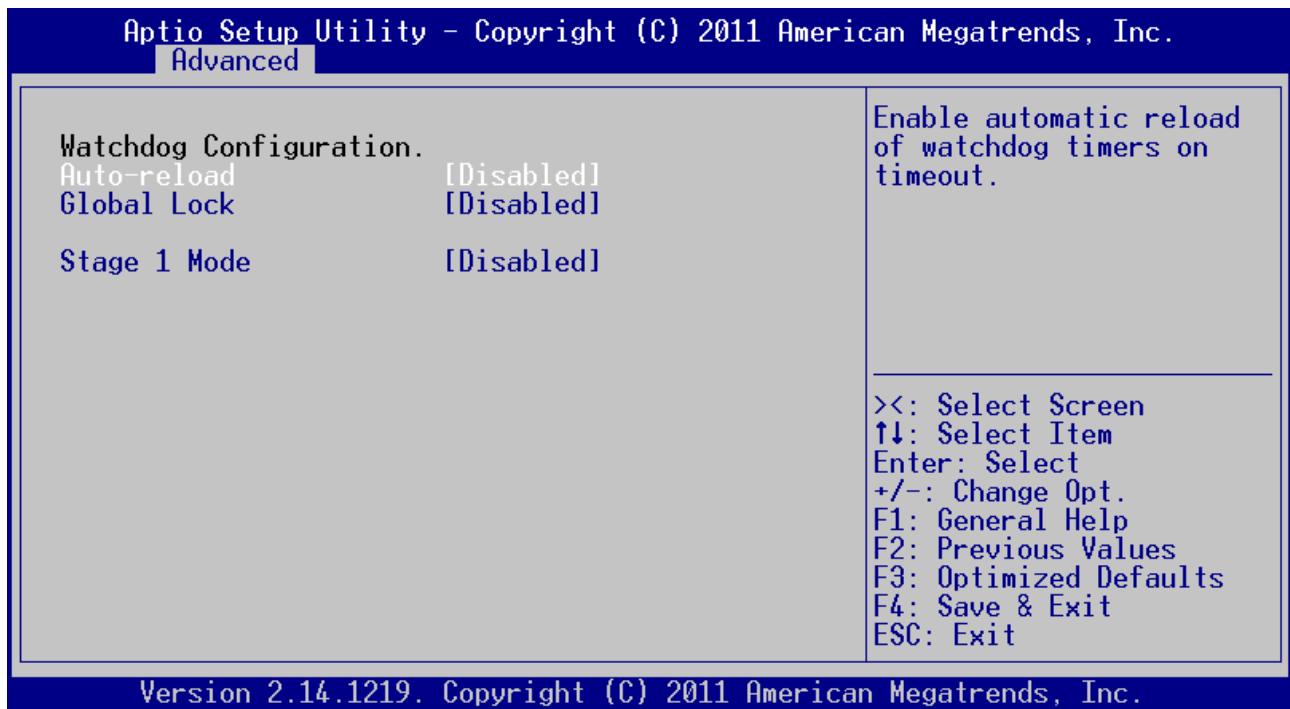
| Feature                    | Options                    | Description                                                                                                         |
|----------------------------|----------------------------|---------------------------------------------------------------------------------------------------------------------|
| CPU DTS                    | Disabled<br><b>Enabled</b> | Enable/Disable CPU DTS SMI. If disabled, ACPI can't provide current temperature and passive cooling is not possible |
| EIST                       | Disabled<br><b>Enabled</b> | Enable/Disable the Intel Speedstep Technology                                                                       |
| Turbo Mode                 | Disabled<br><b>Enabled</b> | Enables/Disables the Intel Processor Turbo Mode 2.0                                                                 |
| CPU C3 Report              | Disabled<br><b>Enabled</b> | Enable/Disable CPU C3 (ACPI C2) report to OS                                                                        |
| CPU C6 Report              | Disabled<br><b>Enabled</b> | Enable/Disable CPU C6 (ACPI C3) report to OS                                                                        |
| CPU C7 Report              | Disabled<br><b>Enabled</b> | Enable/Disable CPU C7 (ACPI C3) report to OS                                                                        |
| Long duration pwr lim      | <b>0</b>                   | Long duration power limit in Watts, 0 meanse: use factory defaults                                                  |
| Long duration time         | <b>28</b>                  | Time window which the long duration power is maintained                                                             |
| Short duration power limit | <b>0</b>                   | Short duration power limit in Watts, 0 meanse: use factory defaults                                                 |
| TCC active offset          | <b>0</b>                   | Offset from the factory TCC activation temperature                                                                  |

## Miscellaneous



| Feature               | Options                      | Description                                                                                                                                                |
|-----------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S5 Eco                | Disabled<br>Enabled          | Reduce supply current in Soft Off State S5 to less than 1mA. If enabled, power button is the only wakeup source in S5. See chapter S5 Eco for more details |
| Reset Button Behavior | Chipset Reset<br>Power Cycle | Select the behavior of Reset Button. Select Power Cycle to hold the module in reset while reset button is pressed                                          |

## Watchdog



| Feature             | Options                                                            | Description                                                                                          |
|---------------------|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Auto-reload         | <b>Disabled</b><br>Enabled                                         | Enable automatic reload of watchdog timers on timeout                                                |
| Global Lock         | <b>Disabled</b><br>Enabled                                         | If set to enabled, all Watchdog registers (except WD_KICK) become read only until the board is reset |
| Stage 1 Mode        | <b>Disabled</b><br>Reset<br>NMI<br>SCI<br>Delay<br>WDT Signal only | Select Action for first Watchdog stage                                                               |
| - Assert WDT Signal | <b>Disabled</b><br>Enabled                                         | Enable/Disable assertion of WDT signal to baseboard on stage timeout                                 |
| - Stage 1 Timeout   | 1s<br>5s<br>10s<br><b>30s</b><br>1m<br>3m<br>10m<br>30m            | Select Timeout value for first watchdog stage                                                        |
| Stage 2 Mode        | <b>Disabled</b><br>Reset<br>NMI<br>SCI<br>WDT Signal only          | Select Action for second Watchdog stage                                                              |
| - Assert WDT Signal | <b>Disabled</b><br>Enabled                                         | Enable/Disable assertion of WDT signal to baseboard on stage timeout                                 |
| - Stage 2 Timeout   | 1s<br>5s<br>10s<br><b>30s</b><br>1m<br>3m<br>10m<br>30m            | Select Timeout value for second watchdog stage                                                       |



## Smart Battery Configuration

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

Advanced

|                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Smart Battery Configuration</b><br><br>M.A.R.S. [Auto]<br>System Type : Manager<br>Power Source : On Battery<br>Connected Batteries : 0<br><br>▶ Battery #1 (slot empty)<br>▶ Battery #2 (slot empty)<br>▶ Battery #3 (slot empty)<br>▶ Battery #4 (slot empty) | Preset M.A.R.S. Smart Battery System mode. System must be restarted to reflect mode changes.<br><br><hr/> ><: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature  | Options                                       | Description                                                                                 |
|----------|-----------------------------------------------|---------------------------------------------------------------------------------------------|
| M.A.R.S. | Disabled<br><b>AUTO</b><br>Charger<br>Manager | Preset M.A.R.S. Smart Battery System mode. System must be restarted to reflect mode changes |

## Battery Information

| Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.                                                                                                             |       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Advanced                                                                                                                                                                       |       |
| Battery #1 (slot empty)                                                                                                                                                        |       |
| State                                                                                                                                                                          | : N/A |
| Manufacturer                                                                                                                                                                   | : N/A |
| Serial Number                                                                                                                                                                  | : N/A |
| Device Name                                                                                                                                                                    | : N/A |
| Chemistry                                                                                                                                                                      | : N/A |
| Rel. State of Charge                                                                                                                                                           | : N/A |
| Cycle Count                                                                                                                                                                    | : N/A |
| Date Of Manufacturing                                                                                                                                                          | : N/A |
| Charge Time                                                                                                                                                                    | : N/A |
| Discharge Time                                                                                                                                                                 | : N/A |
| Temperature                                                                                                                                                                    | : N/A |
| Device Capacity                                                                                                                                                                | : N/A |
| Last Full Capacity                                                                                                                                                             | : N/A |
| Battery Voltage                                                                                                                                                                | : N/A |
| Current On Terminals                                                                                                                                                           | : N/A |
| ><: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |       |
| Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.                                                                                                                |       |

## Generic LPC Decode Ranges

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

Advanced

|                                                                            |                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Generic LPC Decode Ranges</p> <p>Generic LPC Decode 1    [Disabled]</p> | <p>Enable generic LPC decode range.</p> <hr/> <p>&gt;&lt;: Select Screen<br/>         ↑↓: Select Item<br/>         Enter: Select<br/>         +/-: Change Opt.<br/>         F1: General Help<br/>         F2: Previous Values<br/>         F3: Optimized Defaults<br/>         F4: Save &amp; Exit<br/>         ESC: Exit</p> |
|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature              | Options             | Description                                                                                   |
|----------------------|---------------------|-----------------------------------------------------------------------------------------------|
| Generic LPC Decode 1 | Disabled<br>Enabled | Enable generic LPC decode range                                                               |
| - Base Address       | 0100h               | Base address of the generic decode range. Valid between 0100h - FFF0h. Must be 8-byte aligned |
| - Length             | 0008h               | Length of the generic decode range. Valid between 0800h - 0100h. Must be multiple of 8.       |
| Generic LPC Decode 2 | Disabled<br>Enabled | Enable generic LPC decode range                                                               |
| - Base Address       | 0100h               | Base address of the generic decode range. Valid between 0100h - FFF0h. Must be 8-byte aligned |
| - Length             | 0008h               | Length of the generic decode range. Valid between 0800h - 0100h. Must be multiple of 8.       |

## Thermal Configuration

**Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.**

**Advanced**

| Platform Thermal Configuration |        |
|--------------------------------|--------|
| Critical Trip Point            | [POR]  |
| ActTPnt Low Temp               | [55 C] |
| ActTPnt Low Fan Speed          | 70     |
| ActTPnt High Temp              | [79 C] |
| Passive Trip Point             | [95 C] |
| Passive TC1 Value              | 1      |
| Passive TC2 Value              | 5      |
| Passive TSP Value              | 10     |

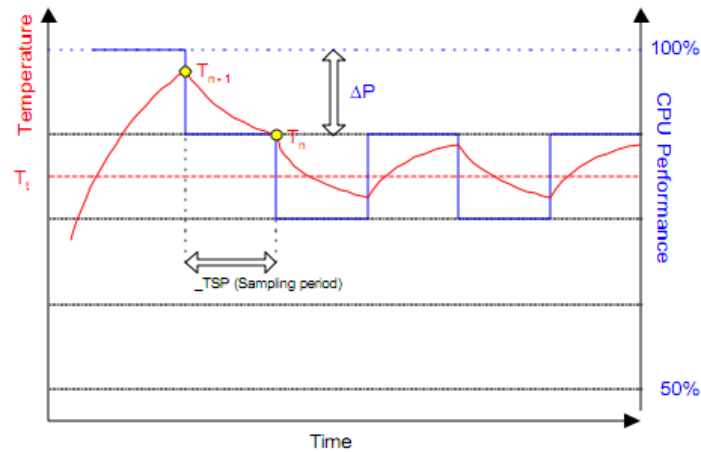
This value controls the temperature of the ACPI Critical Trip Point - the point in which the OS will shut the system off. NOTE: 100C is the Plan Of Record (POR) for all Intel mobile processors.

><: Select Screen  
 ↑↓: Select Item  
 Enter: Select  
 +/-: Change Opt.  
 F1: General Help  
 F2: Previous Values  
 F3: Optimized Defaults  
 F4: Save & Exit  
 ESC: Exit

**Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.**

| Feature                | Options                                                | Description                                                                                                                                                                                       |
|------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Critical Trip Point    | <b>POR</b><br>15°C<br>...<br>119°C                     | This value controls the temperature of the ACPI Critical Trip Point - the point in which the OS will shut the system off. Note: 100°C is the Plan Of Record (POR) for all Intel mobile processors |
| ActTPnt Low Temp       | Disabled<br>15°C<br>...<br><b>55°C</b><br>...<br>95°C  | This value controls the temperature of the ACPI Active Trip Point - the point in which the OS will turn the processor fan on Active Trip Point Low Fan Speed.                                     |
| ActTPnt Low Fan Speed  | <b>70</b>                                              | Active Trip Point Low Fan Speed in percentage. Value must be between 33% - 100%. This is the speed at which fan will run when Active Trip Point Low is crossed.                                   |
| Active Trip Point High | Disabled<br>15°C<br>...<br><b>79°C</b><br>...<br>95°C  | This value controls the temperature of the ACPI Active High Trip Point - the point in which the OS will turn the processor fan on Active Trip Point High Fan Speed.                               |
| Passive Trip Point     | Disabled<br>15°C<br>...<br><b>95°C</b><br>...<br>119°C | This value controls the temperature of the ACPI Passive Trip Point - the point in which the OS will begin throttling the processor                                                                |
| - Passive TC1 Value    | <b>1</b>                                               | This value sets the TC1 value for the ACPI Passive Cooling Formula. Range 1 - 16                                                                                                                  |
| - Passive TC2 Value    | <b>5</b>                                               | This value sets the TC2 value for the ACPI Passive Cooling Formula. Range 1 - 16                                                                                                                  |
| - Passive TSP Value    | <b>10</b>                                              | This item sets the TSP value for the ACPI Passive Cooling Formula. It represents in tenth of a second how often the OS will read the temperature when passive cooling is enabled. Range 2 - 32    |

Passive Cooling



The ACPI OS assesses the optimum CPU performance change necessary to lower the temperature using the following equation

$$\Delta P[\%] = TC1(T_n - T_{n-1}) + TC2(T_n - T_t)$$

$\Delta P$  is the performance delta,  $T_t$  is the target temperature = passive cooling trip point. The two coefficients  $TC1$  and  $TC2$  and the sampling period  $TSP$  are hardware dependent constants the end user must supply. It's up to the end user to set the cooling preference of the system by setting the appropriate trip points in the BIOS setup.



See chapter 12 of the ACPI specification ([www.acpi.info](http://www.acpi.info)) for more details

## PCH-FW Configuration

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

Advanced

|                  |             |
|------------------|-------------|
| ME FW Version    | 7.1.20.1119 |
| ME Firmware Mode | Normal Mode |
| ME Firmware SKU  | 1.5MB       |

><: Select Screen  
↑↓: Select Item  
Enter: Select  
+/-: Change Opt.  
F1: General Help  
F2: Previous Values  
F3: Optimized Defaults  
F4: Save & Exit  
ESC: Exit

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

## USB Configuration

**Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.**

**Advanced**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>USB Configuration</b></p> <p>USB Devices:<br/>1 Drive, 1 Keyboard, 1 Mouse, 2 Hubs</p> <p>Legacy USB Support      [Enabled]<br/>         USB3.0 Support          [Disabled]<br/>         XHCI Hand-off            [Enabled]<br/>         EHCI Hand-off            [Disabled]<br/>         USB Beep                 [Disabled]</p> <p>USB hardware delays a<br/>         USB transfer time-out    [20 sec]<br/>         Device reset time-out    [20 sec]<br/>         Device power-up delay    [Auto]</p> <p>Mass Storage Devices:<br/>         JetFlashTranscend 32G    [Auto]</p> | <p>Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.</p> <hr/> <p>&gt;&lt;: Select Screen<br/>         ↑↓: Select Item<br/>         Enter: Select<br/>         +/-: Change Opt.<br/>         F1: General Help<br/>         F2: Previous Values<br/>         F3: Optimized Defaults<br/>         F4: Save &amp; Exit<br/>         ESC: Exit</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

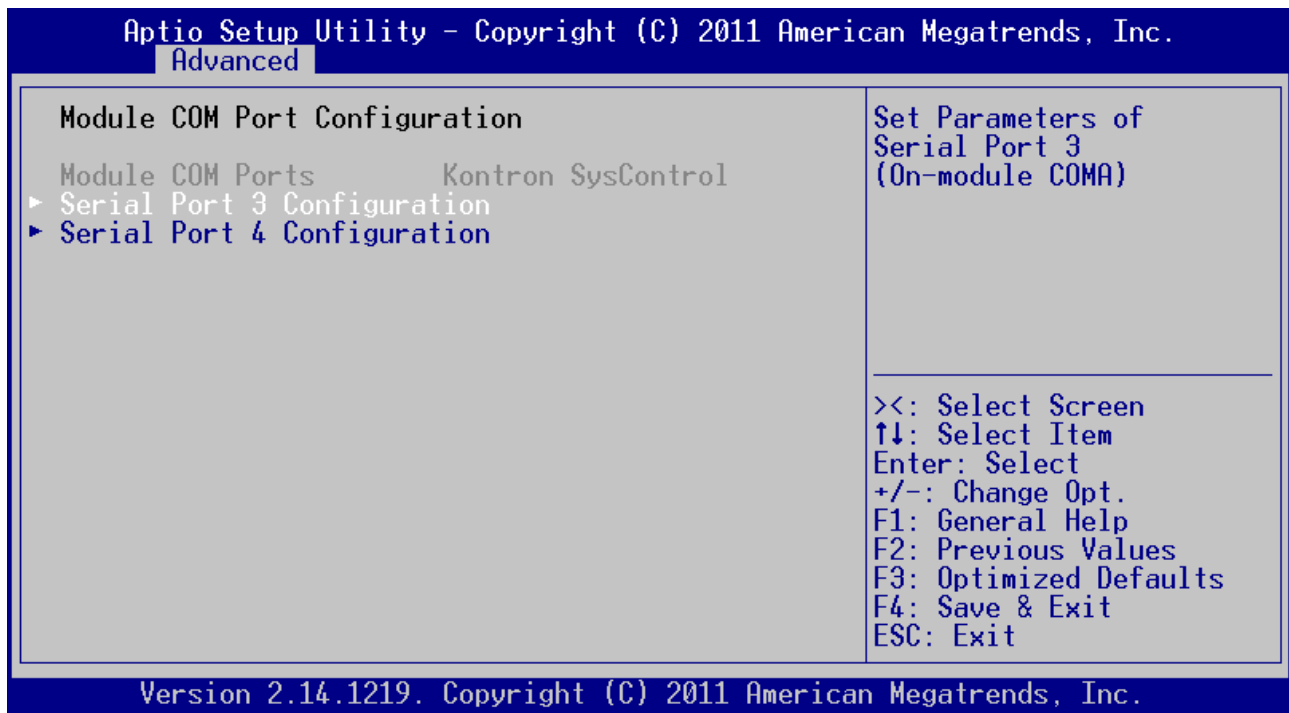
**Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.**

| Feature                          | Options                          | Description                                                                                                                                                                                               |
|----------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Legacy USB Support               | Enabled<br>Disabled<br>AUTO      | Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.                                |
| USB3.0 Support                   | Enabled<br>Disabled              | Enable/Disable USB3.0 (XHCI) Controller support. On Type 2 board only supported by external PCIe Card                                                                                                     |
| - XHCI Hand-off                  | Enabled<br>Disabled              | This is a workaround for OSes without XHCI hand-off Support. The XHCI ownership change should be claimed by XHCI driver                                                                                   |
| EHCI Hand-off                    | Enabled<br>Disabled              | This is a workaround for OSes without EHCI hand-off Support. The EHCI ownership change should be claimed by EHCI driver                                                                                   |
| USB Beep                         | Enabled<br>Disabled              | Send speaker beep for device attach / detach                                                                                                                                                              |
| USB transfer time-out            | 1sec<br>5sec<br>10sec<br>20sec   | The time-out value for Control, Bulk and Interrupt transfers                                                                                                                                              |
| Device reset time-out            | 10sec<br>20sec<br>30sec<br>40sec | USB mass storage device Start Unit command time-out                                                                                                                                                       |
| Device power-up delay            | AUTO<br>Manual                   | Maximum time the device will take before it properly reports itself to the Host controller. 'AUTO' uses default value: for a Root port it is 100ms, for a Hub port the delay is taken from Hub descriptor |
| Device power-up delay in seconds | 5                                | Delay range is 1...40 seconds, in one second increments                                                                                                                                                   |

-pagebreak



## Module COM Port Configuration



## Serial Port 3 Configuration

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

Advanced

|                             |                      |                                                                                                                                                                                |
|-----------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Serial Port 3 Configuration |                      | Enable or disable module based Serial Port (COMx)                                                                                                                              |
| Serial Port                 | [Enabled]            |                                                                                                                                                                                |
| Device Settings             | IO=3F8h; IRQ=4;      |                                                                                                                                                                                |
| Device Mode                 | [Normal Speed Model] |                                                                                                                                                                                |
|                             |                      | ><: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature     | Options             | Description                                 |
|-------------|---------------------|---------------------------------------------|
| Serial Port | Disabled<br>Enabled | Enable or Disable COMe Serial Port 0 (COM3) |

## Serial Port 4 Configuration

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

Advanced

|                             |                      |                                                                                                                                                                                |
|-----------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Serial Port 4 Configuration |                      | Enable or disable module based Serial Port (COMx)                                                                                                                              |
| Serial Port                 | [Enabled]            |                                                                                                                                                                                |
| Device Settings             | I0=2F8h; IRQ=3;      |                                                                                                                                                                                |
| Device Mode                 | [Normal Speed Model] |                                                                                                                                                                                |
|                             |                      | ><: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature     | Options             | Description                                 |
|-------------|---------------------|---------------------------------------------|
| Serial Port | Disabled<br>Enabled | Enable or Disable COMe Serial Port 1 (COM4) |

## H/W Monitor

Hardware Monitor measurements and configuration for the onboard Analog Devices ADT7490.

**Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.**

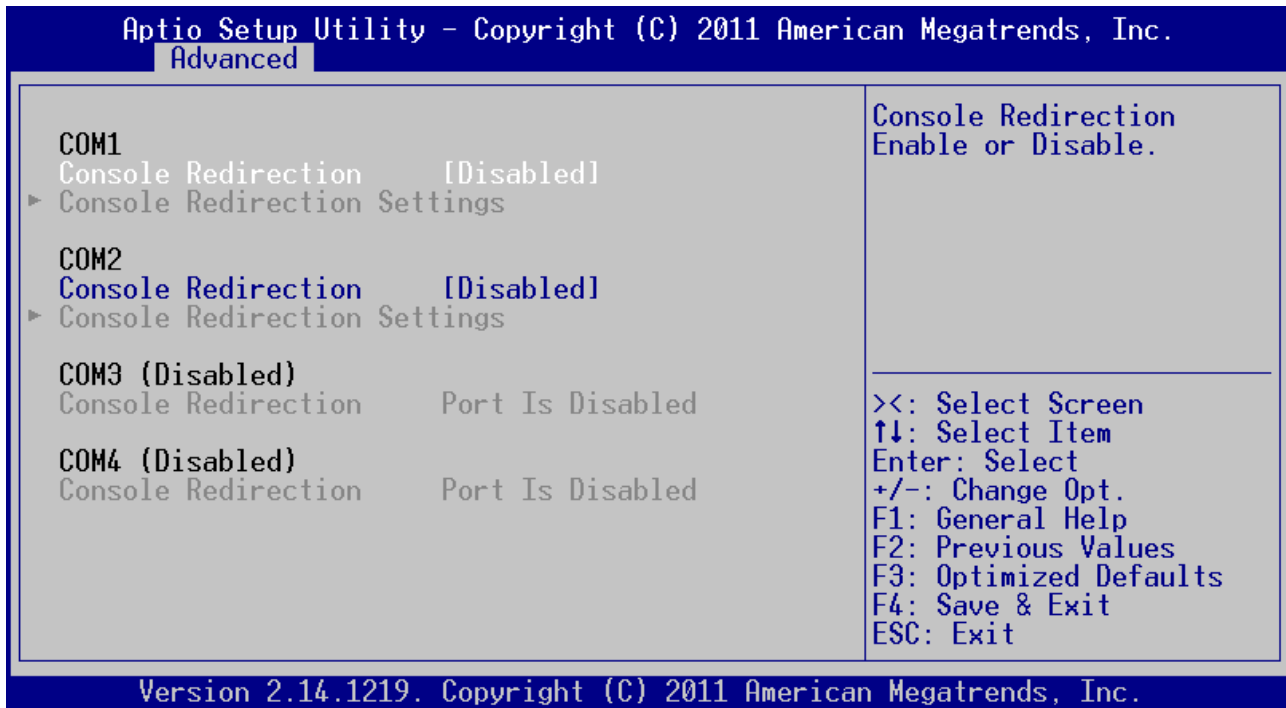
**Advanced**

|                            |            |                                                                                                                                                                                |
|----------------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>H/W Monitor ADT7490</b> |            | Number of pulses the fan produces during one revolution.<br>Range: 1-4                                                                                                         |
| DTS                        | : 59 C     | ><: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |
| CPU                        | : 56 C     |                                                                                                                                                                                |
| PCH                        | : 50 C     |                                                                                                                                                                                |
| ADT                        | : 54 C     |                                                                                                                                                                                |
| CPU Fan Pulse              | <b>2</b>   |                                                                                                                                                                                |
| CPU Fan                    | : 2180 RPM |                                                                                                                                                                                |
| External Fan Pulse         | <b>2</b>   |                                                                                                                                                                                |
| External Fan               | : N/A      |                                                                                                                                                                                |
| Battery                    | : 3.56 V   |                                                                                                                                                                                |
| 5.0V Standby               | : 5.19 V   |                                                                                                                                                                                |
| Widerange Vcc              | : 12.02 V  |                                                                                                                                                                                |

**Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.**

| Feature            | Value/Options    | Description                                                                 |
|--------------------|------------------|-----------------------------------------------------------------------------|
| DTS                | xx°C             | Shows the calculated temperature of Tcasemax - Digital Thermal Sensor       |
| CPU                | xx°C             | Shows the measured temperature of the CPU Diode with onboard HWM            |
| PCH                | xx°C             | Shows the internal Platform Controller Hub temperature                      |
| ADT                | xx°C             | Shows the internal hardwaremonitor temperature                              |
| CPU Fan Pulse      | 1<br>2<br>3<br>4 | Select the number of pulses the CPU fan produces during one revolution      |
| CPU FAN            | xxxx rpm         | Shows the fan speed of onboard FAN connector                                |
| External Fan Pulse | 1<br>2<br>3<br>4 | Select the number of pulses the external fan produces during one revolution |
| External FAN       | xxxx rpm         | Shows the fan speed of COMe FAN                                             |
| Battery            | x.xx V           | Shows the RTC Battery Voltage                                               |
| 5.0V Standby       | x.xx V           | Shows the 5V Standby Voltage                                                |
| Widerange Vcc      | x.xx V           | Shows the Module Main Input Voltage                                         |

## Serial Port Console Redirection



| Feature             | Options             | Description                                         |
|---------------------|---------------------|-----------------------------------------------------|
| Console Redirection | Disabled<br>Enabled | Enable/Disable Serial Port COM0 Console Redirection |
| Console Redirection | Disabled<br>Enabled | Enable/Disable Serial Port COM1 Console Redirection |
| Console Redirection | Disabled<br>Enabled | Enable/Disable Serial Port COM2 Console Redirection |
| Console Redirection | Disabled<br>Enabled | Enable/Disable Serial Port COM3 Console Redirection |



Serial Port Console Redirection is not allowed to activate at more than one port simultaneously

## COM Port allocation

| Console Redirection Port | Module Interface without external SIO | Module Interface with external SIO present |
|--------------------------|---------------------------------------|--------------------------------------------|
| COM0                     | Onboard Serial Port 0 (SER0)          | External SIO COM1                          |
| COM1                     | Onboard Serial Port 1 (SER1)          | External SIO COM2                          |
| COM2                     | not available                         | Onboard Serial Port 0 (SER0)               |
| COM3                     | not available                         | Onboard Serial Port 1 (SER1)               |

## Console Redirection Settings

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

Advanced

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>COM1</b><br/>Console Redirection Settings</p> <p>Terminal Type            [ANSI]<br/>         Bits per second        [115200]<br/>         Data Bits                [8]<br/>         Parity                    [None]<br/>         Stop Bits                [1]<br/>         Flow Control            [None]<br/>         VT-UTF8 Combo Key Sup [Enabled]<br/>         Recorder Mode          [Disabled]<br/>         Resolution 100x31      [Disabled]<br/>         Legacy OS Redirection [80x24]</p> | <p>Emulation: ANSI:<br/>         Extended ASCII char set.<br/>         VT100: ASCII char set.<br/>         VT100+: Extends VT100 to support color, function keys, etc.<br/>         VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more</p> <hr/> <p>&gt;&lt;: Select Screen<br/>         ↑↓: Select Item<br/>         Enter: Select<br/>         +/-: Change Opt.<br/>         F1: General Help<br/>         F2: Previous Values<br/>         F3: Optimized Defaults<br/>         F4: Save &amp; Exit<br/>         ESC: Exit</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature                          | Options                                          | Description                                                                                                                                                                                                                                                                                                                        |
|----------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Terminal Type                    | VT100<br>VT100+<br>VT_UTF8<br><b>ANSI</b>        | VT100: ASCII char set.<br>VT100+: Extends VT100 to support color, function keys, etc.<br>VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes<br>ANSI: Extended ASCII char set.                                                                                                                                   |
| Bits per second                  | 9600<br>19200<br>38400<br>57600<br><b>115200</b> | Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds                                                                                                                                                                                                  |
| Data Bits                        | 7<br><b>8</b>                                    | Data Bits                                                                                                                                                                                                                                                                                                                          |
| Parity                           | <b>None</b><br>Even<br>Odd<br>Mark<br>Space      | A parity bit can be sent with the data bits to detect some transmission errors. Even: parity bit is 0 if the num of 1's in the data bits is even. Odd: parity bit is 0 if num of 1's in the data bits is odd. Mark: parity bit is always 1. Space: Parity bit is always 0. Mark and Space Parity do not allow for error detection. |
| Stop Bits                        | <b>1</b><br>2                                    | Stop Bits indicate the end of a serial data packet. (A Start bit indicates the beginning). The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit.                                                                                                                                   |
| Flow Control                     | <b>None</b><br>Hardware RTS/CTS                  | Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a 'stop' signal can be sent to stop the data flow. Once the buffers are empty, a 'start' signal can be sent to restart the flow. Hardware flow control uses two wires to send start/stop signals                    |
| Recorder Mode                    | <b>Disabled</b><br>Enabled                       | With this mode enabled only text will be sent. This is to capture terminal data.                                                                                                                                                                                                                                                   |
| Resolution 100x31                | <b>Disabled</b><br>Enabled                       | Enables or disables extended terminal resolution                                                                                                                                                                                                                                                                                   |
| Legacy OS Redirection Resolution | <b>80x24</b><br>80x25                            | On Legacy OS, the Number of Rows and Columns supported redirection                                                                                                                                                                                                                                                                 |

## Intel ICC

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

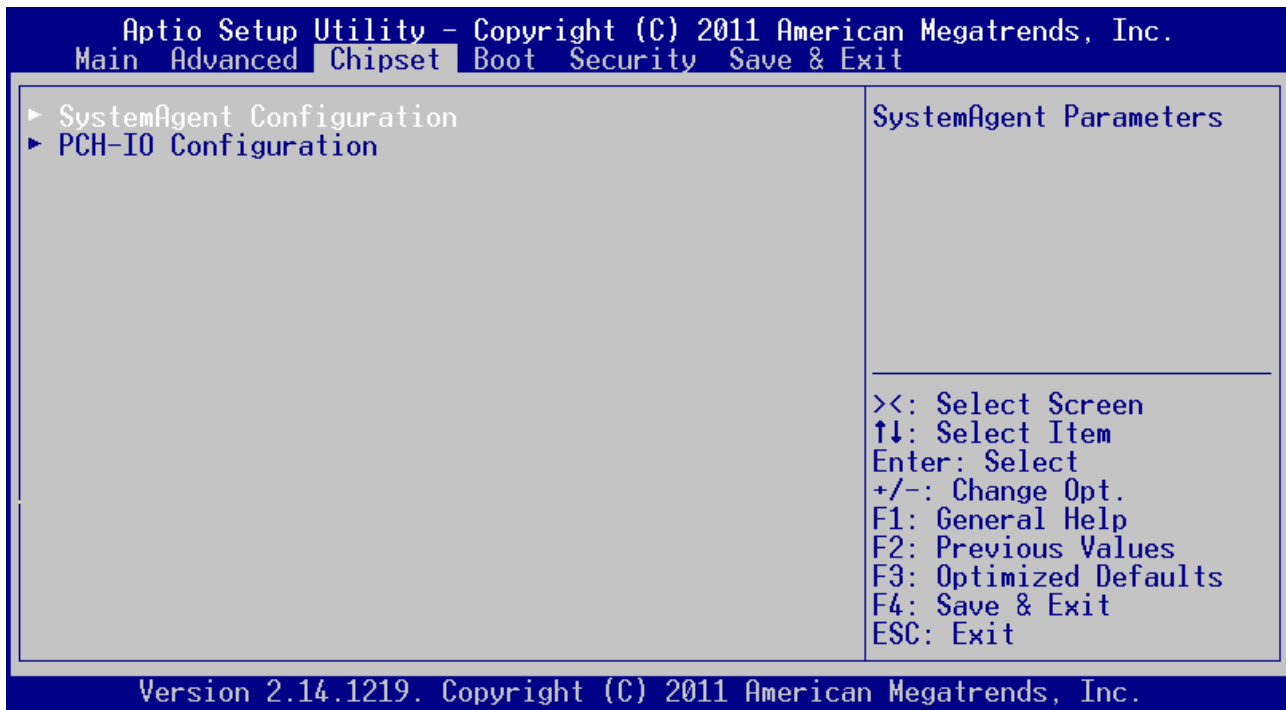
Advanced

|                      |               |                                                                                                                                                                                        |
|----------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Use Wdog Tmr w/ ICC  | [Disabled]    | Enable Watchdog Timer operation for ICC. If enabled, Watchdog Timer will be started after ICC-related changes. This timer detects platform instability caused by wrong clock settings. |
| Lock ICC registers   | [Static only] |                                                                                                                                                                                        |
| Clock Manipulation   |               | ><: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit         |
| ICC Overclocking Lib | N/A           |                                                                                                                                                                                        |

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

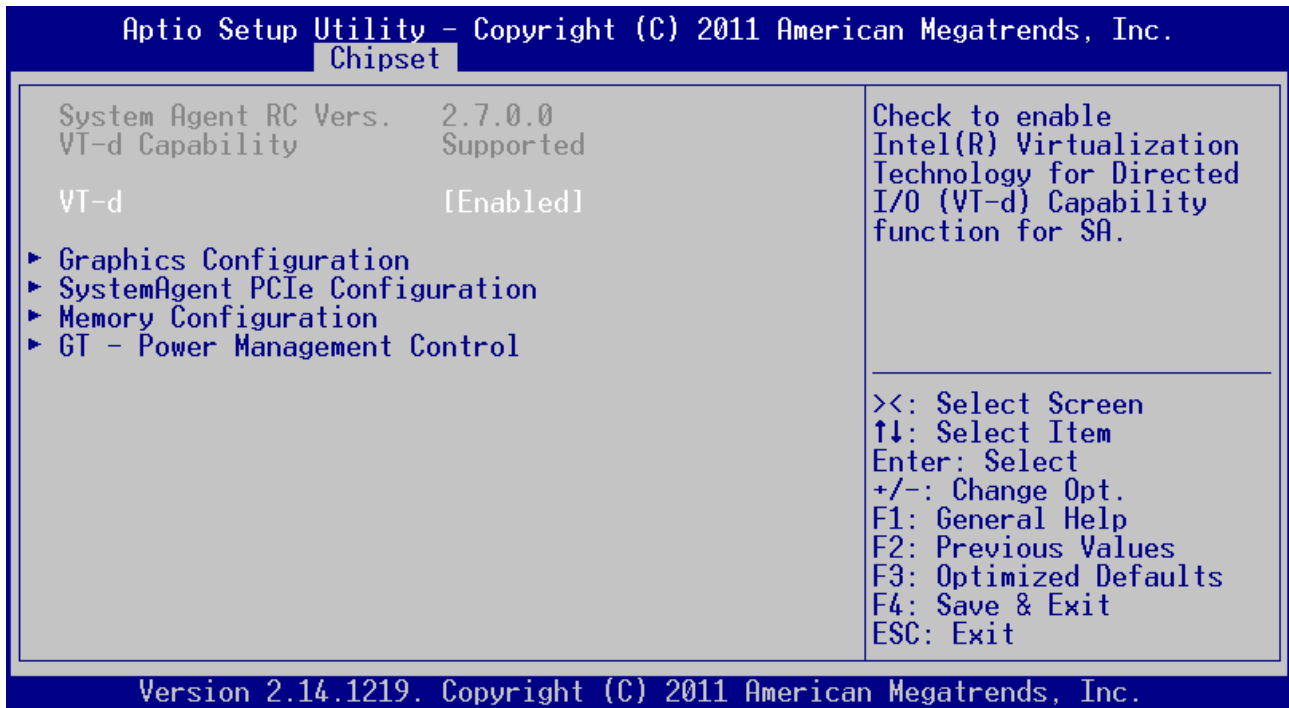
| Feature               | Options                      | Description                                                                                                                                                                           |
|-----------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Use Wdog Timer w/ ICC | Disabled<br>Enabled          | Enable Watchdog Timer operation for ICC. If enabled, Watchdog Timer will be started after ICC-related changes. This timer detects platform instability caused by wrong clock settings |
| Lock ICC registers    | Static only<br>All registers | All registers: all ICC registers will be locked. Static only: only static ICC registers will be locked.                                                                               |

### 8.5.3 Chipset





## SystemAgent Configuration



| Feature | Options             | Description                                                                                         |
|---------|---------------------|-----------------------------------------------------------------------------------------------------|
| VT-d    | Disabled<br>Enabled | Check to enable Intel® Virtualization Technology for Directed I/O (VT-d) Capability function for SA |

## Graphics Configuration

```

Apio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
Chipset

Graphics Configuration
IGFX VBIOS Version      2111
IGfx Frequency          650 MHz
Gfx Turbo IMON Curr     31

Primary Display          [Auto]
Internal Graphics        [Auto]
Load IGFX VBIOS          [Enabled]
GTT Size                  [2MB]
Aperture Size             [256MB]
DVMT Pre-Allocated       [64M]

► LCD Control

Graphics turbo IMON
current values
supported (14-31)

><: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit_

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

```

| Feature             | Options                                | Description                                                                                     |
|---------------------|----------------------------------------|-------------------------------------------------------------------------------------------------|
| Gfx Turbo IMON Curr | <b>31</b>                              | Graphics turbo IMON current values supported (14-31)                                            |
| Primary Display     | <b>Auto</b><br>IGFX<br>PEG<br>PCI      | Select which of IGFX/PEG/PCI Graphics device should be Primary Display                          |
| Internal Graphics   | <b>Auto</b><br>Disabled<br>Enabled     | Keep IGFX enabled based on the setup options                                                    |
| Load IGFX VBIOS     | Disabled<br><b>Enabled</b>             | Enable or disable CSM load IGFX VBIOS                                                           |
| GTT Size            | 1MB<br><b>2MB</b>                      | Select the GTT Size                                                                             |
| Aperture Size       | 128MB<br><b>256MB</b>                  | Select the Aperture Size                                                                        |
| DVMT Pre-Allocated  | 0M<br>...<br><b>64M</b><br>...<br>512M | Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics device |

## LCD Control

**Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.**

**Chipset**

|                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>LCD Control</b></p> <p>Prim IGFX Boot Disp      [AUTO]</p> <p>Panel Color Depth        [18 Bit]</p> <p>Backlight Control        [I2C]</p> <p>Backlight Value          128</p> <p>SDVO Device              [Disabled]</p> | <p>Select the Integrated Graphics Video Device which will be activated during POST. This has no effect if external graphics devices are present.</p> <hr/> <p>&gt;&lt;: Select Screen<br/>         ↑↓: Select Item<br/>         Enter: Select<br/>         +/-: Change Opt.<br/>         F1: General Help<br/>         F2: Previous Values<br/>         F3: Optimized Defaults<br/>         F4: Save &amp; Exit<br/>         ESC: Exit_</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.**

| Feature              | Options                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Description                                                                                                                                  |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Prim IGFX Boot Disp  | <b>Auto</b><br>CRT<br>LVDS<br>EFP 1<br>EFP 2<br>EFP 3                                                                                                                                                                                                                                                                                                                                                                                                   | Select the Integrated Graphics Video Device which will be activated during POST. This has no effect if external graphics devices are present |
| Sec IGFX Boot Disp   | <b>Disabled</b><br>CRT<br>LVDS<br>EFP 1<br>EFP 2<br>EFP 3                                                                                                                                                                                                                                                                                                                                                                                               | Select Secondary Integrated Graphics Display Device                                                                                          |
| Int. LVDS Panel Type | <b>AUTO</b><br>VGA 640×480 1×18<br>WVGA 800×480 1×18<br>SVGA 800×600 1×18<br>XGA 1024×768 1×18<br>XGA 1024×768 1×24<br>WXGA 1280×768 1×24<br>WXGA 1280×768 1×24<br>WXGA 1280×800 1×18<br>WXGA 1366×768 1×24<br>WXGA+ 1440×900 2×18<br>WXGA+ 1440×900 2×24<br>SXGA 1280×1024 2×18<br>SXGA 1280×1024 2×24<br>WSXGA+ 1680×1050 2×18<br>WSXGA+ 1680×1050 2×24<br>UXGA 1600×1200 2×18<br>UXGA 1600×1200 2×24<br>WUXGA 1920×1200 2×18<br>WUXGA 1920×1200 2×24 | Select LCD panel used by Internal Graphics Device by selecting the appropriate setup item                                                    |
| Panel Color Depth    | <b>18 Bit</b><br>24 Bit                                                                                                                                                                                                                                                                                                                                                                                                                                 | For internal LVDS EDID detection, select the Panel Color Depth                                                                               |
| Backlight Control    | None/External<br>PWM<br>PWM Inverted<br>I2C                                                                                                                                                                                                                                                                                                                                                                                                             | Backlight Control Setting                                                                                                                    |
| Backlight Value      | <b>128</b>                                                                                                                                                                                                                                                                                                                                                                                                                                              | Set LCD backlight brightness (0-255)                                                                                                         |
| SDVO Device          | <b>Disabled</b><br>SDVO - DVI 1.0<br>SDVO - DVI-I<br>SDVO - LVDS                                                                                                                                                                                                                                                                                                                                                                                        | Selects the SDVO Device                                                                                                                      |



For SDVO2DVI solutions select 'SDVO - DVI 1.0' or 'SDVO - DVI-I'. For SDVO2CRT select 'SDVO - DVI-I'.

## SystemAgent PCIe Configuration

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

**Chipset**

| SystemAgent PCIe Configuration |                         | Configure PEG0 B0:D1:F0 Gen1-Gen2 |
|--------------------------------|-------------------------|-----------------------------------|
| PEG0                           | Not Present             |                                   |
| PEG0 - Gen X                   | [Gen1]                  |                                   |
| PEG1                           | Not Present             |                                   |
| PEG1 - Gen X                   | [Gen1]                  |                                   |
| PEG2                           | Not Present             |                                   |
| PEG2 - Gen X                   | [Gen1]                  |                                   |
| PEG3                           | Not Present             |                                   |
| PEG3 - Gen X                   | [Gen1]                  |                                   |
| Enable PEG                     | [Enabled]               | ><: Select Screen                 |
| PEG ASPM                       | [ASPM L0sL1]            | ↑↓: Select Item                   |
| ASPM L0s                       | [Both Root and Endp...] | Enter: Select                     |
| De-emphasis Control            | [-3.5 dB]_              | +/-: Change Opt.                  |
|                                |                         | F1: General Help                  |
|                                |                         | F2: Previous Values               |
|                                |                         | F3: Optimized Defaults            |
|                                |                         | F4: Save & Exit                   |
|                                |                         | ESC: Exit                         |

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature             | Options                                                                     | Description                                                                                           |
|---------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| PEG0 - Gen X        | Auto<br><b>Gen1</b><br>Gen2                                                 | Configure PEG0 B0:D1:F0 Gen1-Gen2                                                                     |
| PEG1 - Gen X        | Auto<br><b>Gen1</b><br>Gen2                                                 | Configure PEG1 B0:D1:F1 Gen1-Gen2                                                                     |
| PEG2 - Gen X        | Auto<br><b>Gen1</b><br>Gen2                                                 | Configure PEG2 B0:D1:F2 Gen1-Gen2                                                                     |
| PEG3 - Gen X        | Auto<br><b>Gen1</b><br>Gen2                                                 | Configure PEG3 B0:D6:F0 Gen1-Gen2                                                                     |
| Enable PEG          | <b>Enabled</b><br>Disabled<br>HW Select                                     | Enable the PEG slot. If available, the option 'HW Select' checks the PEG_Enable# signal               |
| PEG ASPM            | Disabled<br>Auto<br>ASPM L0s<br>ASPM L1<br><b>ASPM L0sL1</b>                | Control ASPM support for the PEG Device. This has no effect if PEG is not the currently active device |
| ASPM L0s            | Root Port Only<br>Endpoint Port Only<br><b>Both Root and Endpoint Ports</b> | Enable PCIe ASPM L0s                                                                                  |
| De-emphasis Control | -6 dB<br><b>-3.5 dB</b>                                                     | Configure the De-emphasis control on PEG                                                              |

## Memory Configuration

**Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.**

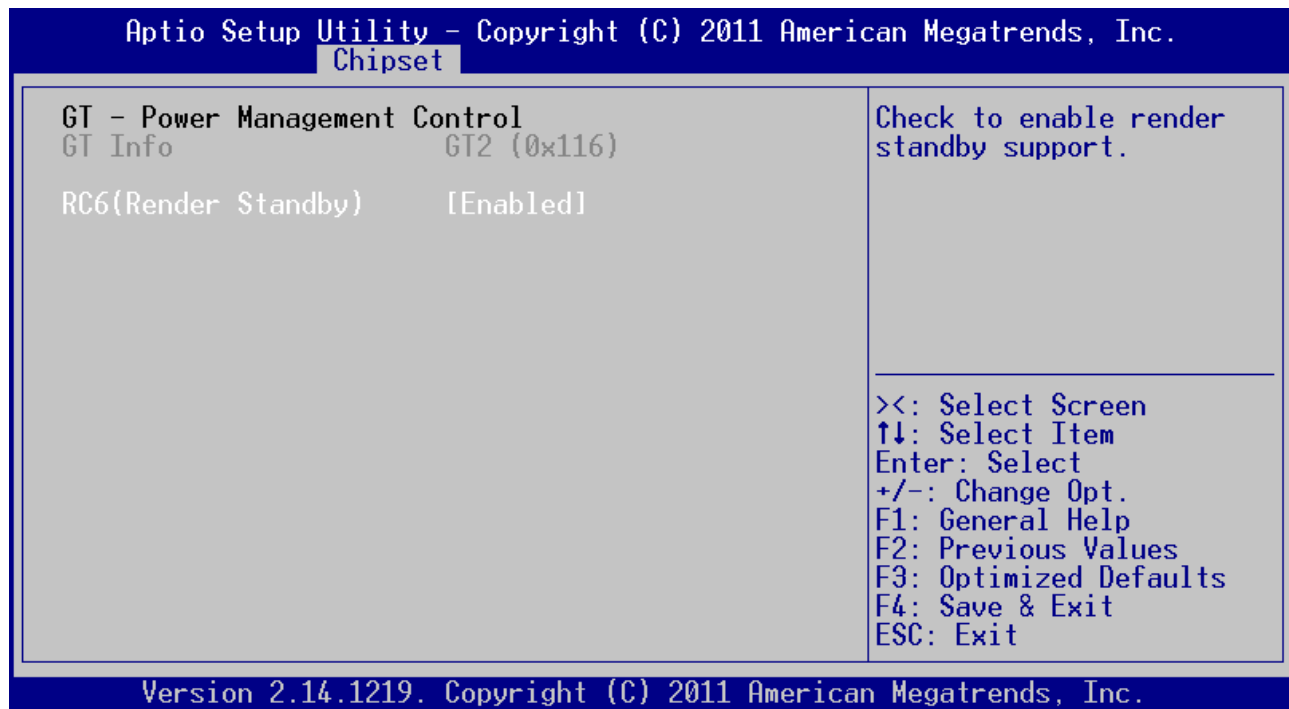
**Chipset**

| Memory Information |                        | ▲<br>Select DIMM timing<br>profile that should be<br>used.<br><br>><: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |
|--------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Memory RC Version  | 1.2.2.0                |                                                                                                                                                                                                                                                  |
| Memory Frequency   | 1333 Mhz               |                                                                                                                                                                                                                                                  |
| Total Memory       | 2048 MB (DDR3)         |                                                                                                                                                                                                                                                  |
| DIMM#0             | 2048 MB (DDR3)         |                                                                                                                                                                                                                                                  |
| DIMM#1             | Not Present            |                                                                                                                                                                                                                                                  |
| DIMM#2             | Not Present            |                                                                                                                                                                                                                                                  |
| DIMM#3             | Not Present            |                                                                                                                                                                                                                                                  |
| CAS Latency (tCL)  | 9                      |                                                                                                                                                                                                                                                  |
| Minimum delay time |                        |                                                                                                                                                                                                                                                  |
| tRCDmin            | 9                      |                                                                                                                                                                                                                                                  |
| tRPmin             | 9                      |                                                                                                                                                                                                                                                  |
| tRASmin            | 24                     |                                                                                                                                                                                                                                                  |
| DIMM profile       | [Default DIMM profile] |                                                                                                                                                                                                                                                  |
| Memory Frequency   | [Auto]                 |                                                                                                                                                                                                                                                  |
| ECC Support        | [Enabled]              |                                                                                                                                                                                                                                                  |
| Max TOLUD          | [Dynamic]              |                                                                                                                                                                                                                                                  |
| MRC Fast Boot      | [Enabled]              |                                                                                                                                                                                                                                                  |
| Memory Remap       | [Enabled]              |                                                                                                                                                                                                                                                  |

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature          | Options                                                       | Description                                                                                                                                                                                      |
|------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DIMM Profile     | <b>Default DIMM profile</b><br>XMP profile 1<br>XMP Profile 2 | Select DIMM timing profile that should be used                                                                                                                                                   |
| Memory Frequency | <b>Auto</b><br>1067<br>1333<br>1600<br>1867<br>2133           | Maximum Memory Frequency Selections in MHz                                                                                                                                                       |
| ECC Support      | Disabled<br><b>Enabled</b>                                    | Enable/disable DDR3 ECC Support                                                                                                                                                                  |
| Max TOLUD        | <b>Dynamic</b><br>1 - 3.5GB                                   | Maximum Value of TOLUD. Dynamic assignment would adjust TOLUD automatically based on largest MMIO length of installed graphic controller. Manual TOLUD setting from 1GB to 3.5GB in 0.25GB steps |
| MRC FastBoot     | Disabled<br><b>Enabled</b>                                    | Enable/Disable MRC FastBoot                                                                                                                                                                      |
| Memory Remap     | Disabled<br><b>Enabled</b>                                    | Enable/Disable Memory Remap above 4GB                                                                                                                                                            |

## GT - Power Management Control



| Feature              | Options             | Description                            |
|----------------------|---------------------|----------------------------------------|
| RC6 (Render Standby) | Disabled<br>Enabled | Check to enable render standby support |

## PCH-IO Configuration

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

**Chipset**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Intel PCH RC Version     1.2.2.0<br/>         Intel PCH SKU Name     QM67<br/>         Intel PCH Rev ID        05/B3</p> <p>▶ LAN Configuration<br/>         ▶ SATA Configuration<br/>         ▶ HDA Configuration<br/>         ▶ USB Configuration<br/>         ▶ PCI Express Configuration</p> <p>Launch Storage OpROM     [Enabled]<br/>         CLKRUN# Logic           [Enabled]<br/>         High Precision Timer     [Enabled]<br/>         Restore AC Power Loss   [Power On]</p> | <p>LAN Configuration settings</p> <hr/> <p>&gt;&lt;: Select Screen<br/>         ↑↓: Select Item<br/>         Enter: Select<br/>         +/-: Change Opt.<br/>         F1: General Help<br/>         F2: Previous Values<br/>         F3: Optimized Defaults<br/>         F4: Save &amp; Exit<br/>         ESC: Exit</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature               | Options                      | Description                                                                   |
|-----------------------|------------------------------|-------------------------------------------------------------------------------|
| Launch Storage OpROM  | Disabled<br><b>Enabled</b>   | Enable or Disable Boot Option for Legacy Mass Storage Devices with Option ROM |
| CLKRUN# logic         | Disabled<br><b>Enabled</b>   | Enable the CLKRUN# logic to stop the PCI clocks                               |
| High Precision Timer  | Disabled<br><b>Enabled</b>   | Enable or Disable the High Precision Event Timer                              |
| Restore AC Power Loss | Power Off<br><b>Power On</b> | Select AC power state when power is re-applied after a power failure          |



## LAN Configuration

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

**Chipset**

|                                                       |                                       |                                                                                                                                                                                                                                          |
|-------------------------------------------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PCH LAN Controller<br>Launch PXE OpROM<br>Wake on LAN | [Enabled]<br>[Disabled]<br>[Disabled] | Enable or disable onboard NIC.<br><br><br><br><br><br><br>><: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |
|-------------------------------------------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature            | Options             | Description                                           |
|--------------------|---------------------|-------------------------------------------------------|
| PCH LAN Controller | Enabled<br>Disabled | Enable/Disable onboard NIC                            |
| Launch PXE OpROM   | Disabled<br>Enabled | Enable/Disable Boot Option for Legacy Network Devices |
| Wake on LAN        | Disabled<br>Enabled | Enable/Disable integrated LAN to wake the system      |

## SATA Configuration

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

Chipset

|                        |                       |                                                                                                                                                                                |
|------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SATA Controller(s)     | [Enabled]             | ▲ Enable or disable SATA Device.                                                                                                                                               |
| SATA Mode Selection    | [AHCI]                |                                                                                                                                                                                |
| SATA Test Mode         | [Disabled]            |                                                                                                                                                                                |
| Delay of the OROM UI   | [2 SEC]               |                                                                                                                                                                                |
| Aggressive LPM Support | [Enabled]             |                                                                                                                                                                                |
| Serial ATA Port 0      | HDT722516DLA38 (164.6 | ><: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |
| Software Preserve      | SUPPORTED             |                                                                                                                                                                                |
| Port 0                 | [Enabled]             |                                                                                                                                                                                |
| Hot Plug               | [Disabled]            |                                                                                                                                                                                |
| External SATA          | [Disabled]            |                                                                                                                                                                                |
| SATA Device Type       | [Hard Disk Driver]    |                                                                                                                                                                                |
| Spin Up Device         | [Disabled]            |                                                                                                                                                                                |
| Serial ATA Port 1      | Empty                 |                                                                                                                                                                                |
| Software Preserve      | Unknown               |                                                                                                                                                                                |
| Port 1                 | [Enabled]             |                                                                                                                                                                                |
| Hot Plug               | [Disabled]            |                                                                                                                                                                                |
| External SATA          | [Disabled]            |                                                                                                                                                                                |
| SATA Device Type       | [Hard Disk Driver]    | ▼                                                                                                                                                                              |

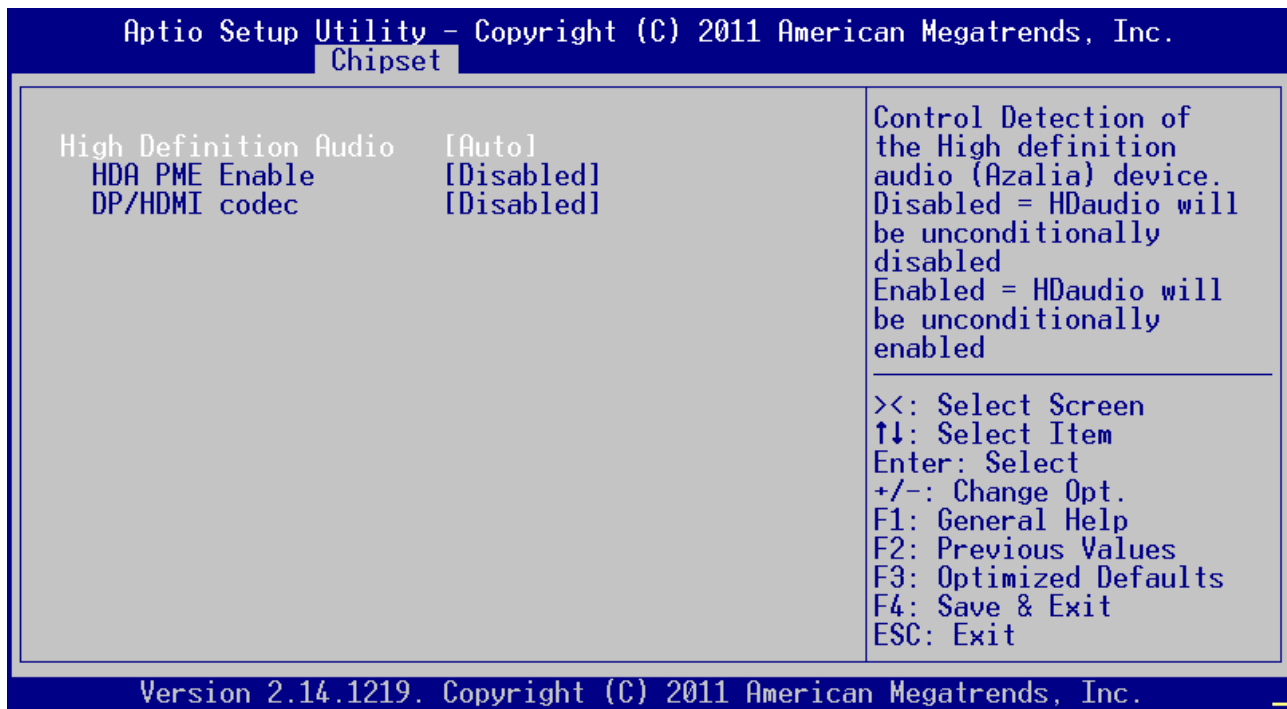
Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature                            | Options                                 | Description                                                            |
|------------------------------------|-----------------------------------------|------------------------------------------------------------------------|
| SATA Controller                    | <b>Enabled</b><br>Disabled              | Enable/Disable SATA Device                                             |
| SATA Mode Selection                | IDE<br><b>AHCI</b><br>RAID              | Determines how SATA controller(s) operate                              |
| SATA Test mode                     | <b>Disabled</b><br>Enabled              | Enable or disable Test Mode                                            |
| Delay of the OROM UI Splash Screen | <b>2 SEC</b><br>4 SEC<br>6 SEC<br>8 SEC | This specify the delay of the OROM UI Splash Screen in a normal status |
| Aggressive LPM Support             | Disabled<br><b>Enabled</b>              | Enable PCH to aggressively enter link power state                      |

### Serial ATA Port 0/1/2/3 Configuration

| Feature                              | Options                                     | Description                                                                                                                                                                       |
|--------------------------------------|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PORT 0<br>PORT 1<br>PORT 2<br>PORT 3 | <b>Enabled</b><br>Disabled                  | Enable or Disable SATA Port                                                                                                                                                       |
| Hot Plug                             | <b>Disabled</b><br>Enabled                  | Designates this port as Hot Pluggable                                                                                                                                             |
| External SATA                        | <b>Disabled</b><br>Enabled                  | Enable/Disable eSATA Support                                                                                                                                                      |
| SATA Device Type                     | <b>Hard Disk Drive</b><br>Solid State Drive | Identify the SATA port is connected to Solid State Driver or Hard Disk Drive                                                                                                      |
| Spin Up Device                       | <b>Disabled</b><br>Enabled                  | If enabled for any of the ports Staggered Spin Up will be performed and only the drives which have this option enabled will spin up at boot. Otherwise all drives spin up at boot |

## HDA Configuration



| Feature               | Options                            | Description                                                                                                                                                                                                                           |
|-----------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| High Definition Audio | Disabled<br>Enabled<br><b>Auto</b> | Control Detection of the High definition audio (Azalia) device. Disabled = HDAudio will be unconditionally disabled. Enabled = HDAudio will be unconditionally enabled. Auto = HDAudio will be enabled if present, disabled otherwise |
| HDA PME Enable        | <b>Disabled</b><br>Enabled         | Enable/Disable Power Management capability of Audio Controller                                                                                                                                                                        |
| DP/HDMI Codec         | <b>Disabled</b><br>Enabled         | Enable/Disable internal DisplayPort/HDMI audio codec                                                                                                                                                                                  |
| HDMI codec DDI1       | <b>Disabled</b><br>Enabled         | Enable/Disable internal HDMI codec for DDI1                                                                                                                                                                                           |
| HDMI codec DDI2       | <b>Disabled</b><br>Enabled         | Enable/Disable internal HDMI codec for DDI2                                                                                                                                                                                           |
| HDMI codec DDI3       | <b>Disabled</b><br>Enabled         | Enable/Disable internal HDMI codec for DDI3                                                                                                                                                                                           |



Enable "DisplayPort/HDMI Codec" to activate DisplayPort Audio. Enabling "HDMI Codec DDIx" activates Audio on each HDMI Port but the DDI works as HDMI Port only and cannot be used as DisplayPort

## USB Configuration

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.

Chipset

|                      |            |                                                                                       |
|----------------------|------------|---------------------------------------------------------------------------------------|
| EHCI1                | [Enabled]  | Control the USB EHCI (USB 2.0) functions. One EHCI controller must always be enabled. |
| EHCI2                | [Enabled]  |                                                                                       |
| USB Per-Port Control | [Disabled] |                                                                                       |

><: Select Screen  
 ↑↓: Select Item  
 Enter: Select  
 +/-: Change Opt.  
 F1: General Help  
 F2: Previous Values  
 F3: Optimized Defaults  
 F4: Save & Exit  
 ESC: Exit

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature                                                                                                              | Options                    | Description                                                                          |
|----------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------|
| EHCI1                                                                                                                | <b>Enabled</b><br>Disabled | Control the USB EHCI (USB 2.0) functions. One EHCI controller must always be enabled |
| EHCI2                                                                                                                | <b>Enabled</b><br>Disabled | Control the USB EHCI (USB 2.0) functions. One EHCI controller must always be enabled |
| USB Per-Port Control                                                                                                 | <b>Disabled</b><br>Enabled | Control each of the USB ports (0-9) disabling                                        |
| USB Port #0<br>USB Port #1<br>USB Port #2<br>USB Port #3<br>USB Port #4<br>USB Port #5<br>USB Port #6<br>USB Port #7 | Disabled<br><b>Enabled</b> | Control each of the USB ports (0-9) disabling                                        |

## PCI Express Configuration

Aptio Setup Utility – Copyright (C) 2011 American Megatrends, Inc.

**Chipset**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PCIe Clock Gating            [Enabled]<br>DMI Link ASPM Control       [L0sL1]<br>DMI Link Ext Synch           [Disabled]<br>Subtractive Decode           [Disabled]<br><br>PCI ExpressCard 0            [Disabled]<br>PCI ExpressCard 1           [Disabled]<br><br>▶ PCI Express Root Port 0<br>▶ PCI Express Root Port 1<br>▶ PCI Express Root Port 2<br>▶ PCI Express Root Port 3<br>▶ PCI Express Root Port 4<br>▶ PCI Express Root Port 5<br>PCIE Port 6 is assign<br>PCIE Port 7 is assign | Enable or disable PCI Express Clock Gating for each root port.<br><br><br><br><br><br><br><br><br><br>><: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

| Feature                                | Options                                                                     | Description                                                                        |
|----------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| PCIe Clock Gating                      | Disabled<br><b>Enabled</b>                                                  | Enable or Disable PCI Express Clock Gating for each root port                      |
| DMI Link ASPM Control                  | Disabled<br>L0s<br>L1<br><b>L0sL1</b>                                       | Controls Active State Power Management on both NB side and SB side of the DMI Link |
| DMI Link Ext Synch                     | <b>Disabled</b><br>Enabled                                                  | Controls Extended Synch on SB side of the DMI Link                                 |
| PCI ExpressCard 0<br>PCI ExpressCard 1 | Port 0<br>Port 1<br>Port 2<br>Port 3<br>Port 4<br>Port 5<br><b>Disabled</b> | Controls PCIe Port for ExpressCard support                                         |

## PCI Express Root Port 0/1/2/3/4/5

**Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.**

**Chipset**

|                                                                                                                                                                                            |                                                                                                                                                                                |                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PCIe Root Port 0<br>ASPM Support<br>URR<br>FER<br>NFER<br>CER<br>CTO<br>SEFE<br>SENF<br>SECE<br>PME SCI<br>Hot Plug<br>PCIe Speed<br>Extra Bus Reserved<br>Reserved Memory<br>Reserved I/O | [Enabled]<br>[Disabled]<br>[Disabled]<br>[Disabled]<br>[Disabled]<br>[Disabled]<br>[Disabled]<br>[Disabled]<br>[Disabled]<br>[Enabled]<br>[Disabled]<br>[Gen1]<br>0<br>10<br>4 | Control the PCI Express Root Port.<br><br><br><br><br><br><br><br><br><br><br><br><br><br>><: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit_ |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.**

| Feature               | Options                                       | Description                                                                  |
|-----------------------|-----------------------------------------------|------------------------------------------------------------------------------|
| PCI Express Root Port | Disabled<br><b>Enabled</b>                    | Control the PCI Express Root Port                                            |
| Automatic ASPM        | <b>Disabled</b><br>L0s<br>L1<br>L0sL1<br>Auto | Automatically enable ASPM based on reported capabilities and known issues    |
| URR                   | <b>Disabled</b><br>Enabled                    | Enable or Disable PCI Express Unsupported Request Reporting                  |
| FER                   | <b>Disabled</b><br>Enabled                    | Enable or Disable PCI Express Device Fatal Error Reporting                   |
| NFER                  | <b>Disabled</b><br>Enabled                    | Enable or Disable PCI Express Device Non-Fatal Error Reporting               |
| CER                   | <b>Disabled</b><br>Enabled                    | Enable or Disable PCI Express Device Correctable Error Reporting             |
| CTO                   | <b>Disabled</b><br>Enabled                    | Enable or Disable PCI Express Completion Timer Timeout                       |
| SEFE                  | <b>Disabled</b><br>Enabled                    | Enable or Disable Root PCI Express System Error on Fatal Error               |
| SENF                  | <b>Disabled</b><br>Enabled                    | Enable or Disable Root PCI Express System Error on Non-Fatal Error           |
| SECE                  | <b>Disabled</b><br>Enabled                    | Enable or Disable Root PCI Express System Error on Correctable Error         |
| PME SCI               | Disabled<br><b>Enabled</b>                    | Enable or Disable PCI Express PME SCI                                        |
| Hot Plug              | <b>Disabled</b><br>Enabled                    | Enable or Disable PCI Express Hot Plug                                       |
| PCIe Speed            | Auto<br><b>Gen1</b><br>Gen2                   | Configure PCIe Speed                                                         |
| Extra Bus Reserved    | <b>0</b>                                      | Extra Bus Reserved (0-7) for bridges behind this Root Bridge                 |
| Reserved Memory       | <b>10</b>                                     | Reserved Memory and Prefetchable Memory (1-20 MB) Range for this Root Bridge |
| Reserved I/O          | <b>4</b>                                      | Reserved I/O (4k/8k/12k/16k/20k) Range for this Root Bridge                  |

## 8.5.4 Boot

**Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.**  
**Main Advanced Chipset Boot Security Save & Exit**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Boot Configuration</b><br>Setup Prompt Timeout <b>1</b><br>Bootup NumLock State <b>[On]</b><br><br>Quiet Boot <b>[Disabled]</b><br>New HDD Priority <b>[Low]</b><br><br>CSM16 Module Version <b>07.65</b><br><br>GateA20 Active <b>[Upon Request]</b><br>Option ROM Messages <b>[Force BIOS]</b><br>Interrupt 19 Capture <b>[Disabled]</b><br><br><b>Boot Option Priorities</b><br>Boot Option #1 <b>[P0: HDT722516DLA38...]</b><br>Boot Option #2 <b>[JetFlashTranscend ...]</b><br>Boot Option #3 <b>[UEFI: JetFlashTran...]</b><br>Boot Option #4 <b>[UEFI: Built-in EFI...]</b> |  | Number in tenths of seconds to wait for setup activation key, i.e. a value of 50 means 5 seconds. 65535(0xFFFF) means indefinite waiting. 0 means no wait (not recommended).<br><br>><: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F3: Optimized Defaults<br>F4: Save & Exit<br>ESC: Exit_ |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.**

| Feature                                                   | Options                           | Description                                                                                                                                               |
|-----------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Setup Prompt Timeout                                      | <b>1</b>                          | Number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting. 0 means no wait (not recommended)                            |
| Bootup NumLock State                                      | <b>On</b><br>Off                  | Select the keyboard NumLock state                                                                                                                         |
| Quiet Boot                                                | <b>Disabled</b><br>Enabled        | Enables/Disables Quiet Boot option (Boot logo)                                                                                                            |
| New HDD Priority                                          | <b>Low</b><br>High                | Boot priority for new connected HDD                                                                                                                       |
| GateA20 Active                                            | <b>Upon Request</b><br>Always     | Upon Request: GA20 can be disabled using BIOS services. Always: do not allow disabling GA20; this option is useful when any RT code is executed above 1MB |
| Option ROM Messages                                       | <b>Force BIOS</b><br>Keep Current | Set display mode for Option ROM                                                                                                                           |
| Interrupt 19 Capture                                      | <b>Disabled</b><br>Enabled        | Enabled: Allows Option ROMs to trap INT19                                                                                                                 |
| Boot Option #1<br>Boot Option #2<br>Boot Option #3<br>... | <b>Boot Device</b><br>Disabled    | Set the system boot order by device group                                                                                                                 |
| Hard Drive BBS Priorities                                 | -                                 | Set the order of the legacy devices in this group                                                                                                         |
| CD/DVD ROM Drive BBS Priorities                           | -                                 | Set the order of the legacy devices in this group                                                                                                         |
| Floppy Drive BBS Priorities                               | -                                 | Set the order of the legacy devices in this group                                                                                                         |



## Boot Option Priority

By default, AMI APTIO uses following boot priority if at least one device of a group is connected:

- » Boot Option #1: Prio 1 Hard Disk
- » Boot Option #2: Built-in EFI Shell
- » Boot Option #3: Prio 1 HDD UEFI boot option
- » Boot Option #4: Prio 1 CD/DVD ROM Drive
- » Boot Option #5: Prio 1 Floppy UEFI boot option
- » Boot Option #6: Prio 1 Floppy Drive

## HDD and CD/DVD-ROM group internal drive priority

The internal device priority for Hard Disks and Optical drives is:

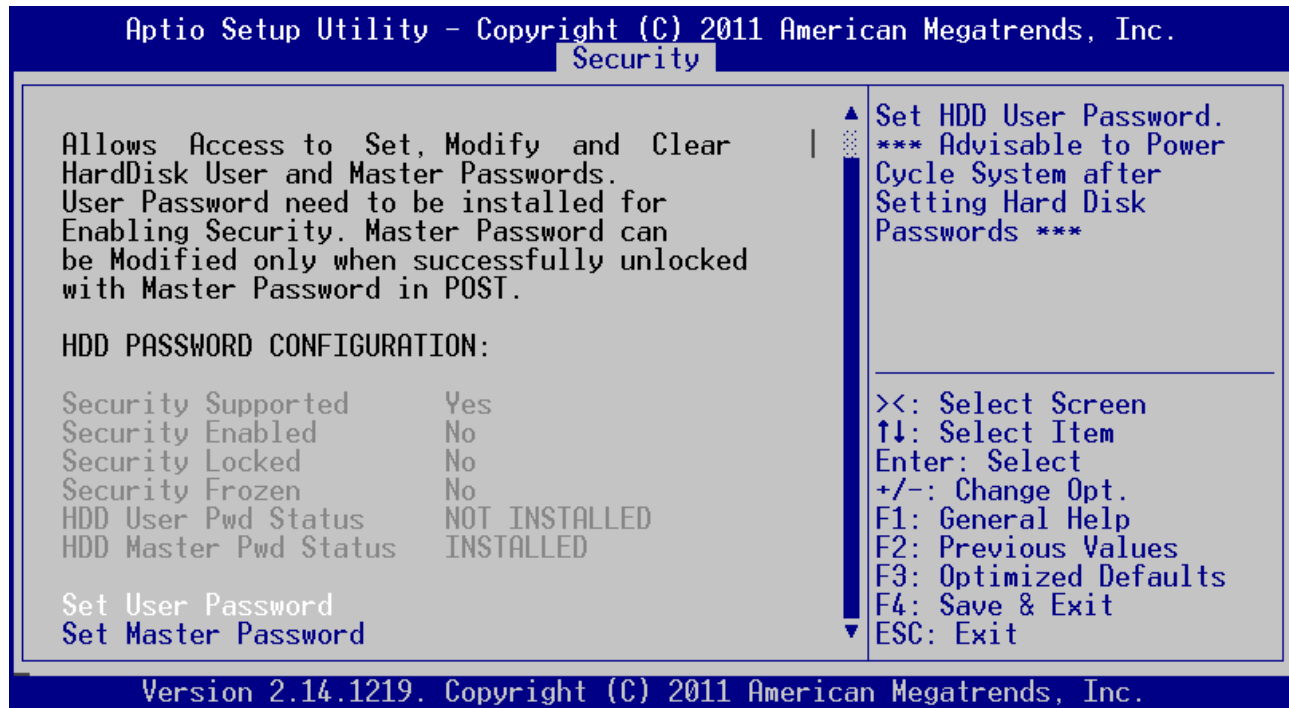
- » 1. SATA #0-3
- » 2. PATA
- » 3. USB

## 8.5.5 Security



| Feature                    | Options | Description                                     |
|----------------------------|---------|-------------------------------------------------|
| Set Administrator Password | -       | Set the Administrator Password for Setup Access |
| User Password              | -       | Set User Password                               |
| HDDx                       | -       | Set HDD Password                                |

## Set HDD Password



| Feature             | Options | Description                                                                                |
|---------------------|---------|--------------------------------------------------------------------------------------------|
| Set User Password   | -       | Set HDD User Password. Advisable to Power Cycle System after Setting Hard Disk Passwords   |
| Set Master Password | -       | Set HDD Master Password. Advisable to Power Cycle System after Setting Hard Disk Passwords |

### 8.5.6 Save & Exit

```

Aptio Setup Utility - Copyright (C) 2011 American Megatrends, Inc.
Main Advanced Chipset Boot Security Save & Exit

Save Changes and Exit
Discard Changes and Exit
Save Changes and Reset
Discard Changes and Reset

Save Options
Save Changes
Discard Changes

Restore Defaults
Save as User Defaults
Restore User Defaults

Boot Override
P0: HDT722516DLA380
JetFlashTranscend 32GB 8.07
UEFI: JetFlashTranscend 32GB 8.07
UEFI: Built-in EFI Shell

Exit system setup after
saving the changes.

><: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit

Version 2.14.1219. Copyright (C) 2011 American Megatrends, Inc.

```

| Feature                   | Options                  | Description                                             |
|---------------------------|--------------------------|---------------------------------------------------------|
| Save Changes and Exit     | -                        | Exit system setup after saving the changes              |
| Discard Changes and Exit  | -                        | Exit system setup without saving any changes            |
| Save Changes and Reset    | -                        | Reset system after saving the changes                   |
| Discard Changes and Reset | -                        | Reset system without saving any changes                 |
| Save Changes              | -                        | Save changes made so far to any of the setup options    |
| Discard Changes           | -                        | Discard changes made so far to any of the setup options |
| Restore Defaults          | -                        | Restore/Load Default values for all the setup options   |
| Save as User Defaults     | -                        | Save the changes made so far as User Defaults           |
| Restore User Defaults     | -                        | Restore the User Defaults to all the setup options      |
| Boot Override             | List of all boot options | Boot directly from selected device                      |

## Corporate Offices

|                                                                                                                                                                                                                         |                                                                                                                                                                                           |                                                                                                                                                                                                                          |                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>Europe, Middle East &amp; Africa</b><br>Oskar-von-Miller-Str. 1<br>85386 Eching/Munich<br>Germany<br>Tel.: +49 (0)8165/ 77 777<br>Fax: +49 (0)8165/ 77 219<br><a href="mailto:info@kontron.com">info@kontron.com</a> | <b>North America</b><br>14118 Stowe Drive<br>Poway, CA 92064-7147<br>USA<br>Tel.: +1 888 294 4558<br>Fax: +1 858 677 0898<br><a href="mailto:info@us.kontron.com">info@us.kontron.com</a> | <b>Asia Pacific</b><br>17 Building, Block #1, ABP.<br>188 Southern West 4th Ring<br>Beijing 100070, P.R.China<br>Tel.: + 86 10 63751188<br>Fax: + 86 10 83682438<br><a href="mailto:info@kontron.cn">info@kontron.cn</a> |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|