

# » Kontron User's Guide «



## COMe-bBL6

Document Revision 2.1

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# » Table of Contents «

1	<a href="#">User Information</a>	6
1.1	<a href="#">Revision History</a>	6
1.2	<a href="#">About This Document</a>	6
1.3	<a href="#">Copyright Notice</a>	6
1.4	<a href="#">Trademarks</a>	6
1.5	<a href="#">Standards</a>	6
1.6	<a href="#">Warranty</a>	7
1.7	<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>	10
2.5	<a href="#">COM Express® Benefits</a>	10
3	<a href="#">Product Specification</a>	11
3.1	<a href="#">Module definition</a>	11
3.2	<a href="#">Functional Specification</a>	13
3.3	<a href="#">Block Diagram</a>	21
3.4	<a href="#">Accessories</a>	22
3.5	<a href="#">Electrical Specification</a>	25
3.5.1	<a href="#">Supply Voltage</a>	25
3.5.2	<a href="#">Power Supply Rise Time</a>	25
3.5.3	<a href="#">Supply Voltage Ripple</a>	25
3.5.4	<a href="#">Power Consumption</a>	25
3.5.5	<a href="#">ATX Mode</a>	26
3.5.6	<a href="#">Single Supply Mode</a>	26
3.6	<a href="#">Power Control</a>	27
3.7	<a href="#">Environmental Specification</a>	28
3.7.1	<a href="#">Temperature Specification</a>	28
3.7.2	<a href="#">Humidity</a>	28
3.8	<a href="#">Standards and Certifications</a>	29
3.9	<a href="#">MTBF</a>	31
3.10	<a href="#">Mechanical Specification</a>	32
3.11	<a href="#">Module Dimensions</a>	33
3.12	<a href="#">Thermal Management, Heatspreader and Cooling Solutions</a>	34
3.13	<a href="#">Onboard Connectors</a>	35
3.13.1	<a href="#">FAN Connector J6 - PCB bottom</a>	35
3.13.2	<a href="#">CPU JTAG connector J3 - PCB bottom</a>	35
3.13.3	<a href="#">CPLD Debug connector J7 - PCB top</a>	36
4	<a href="#">Features and Interfaces</a>	37
4.1	<a href="#">S5 Eco Mode</a>	37

4.2	<a href="#">Rapid Shutdown</a> .....	38
4.3	<a href="#">LPC</a> .....	40
4.4	<a href="#">Serial Peripheral Interface (SPI)</a> .....	41
4.5	<a href="#">SPI boot</a> .....	41
4.6	<a href="#">M.A.R.S</a> .....	43
4.7	<a href="#">UART</a> .....	44
4.8	<a href="#">Fast I2C</a> .....	45
4.9	<a href="#">Dual Staged Watchdog Timer</a> .....	46
4.10	<a href="#">Intel® Fast Flash Standby™ / Rapid Start Technology™</a> .....	47
4.11	<a href="#">Speedstep Technology</a> .....	49
4.12	<a href="#">C-States</a> .....	50
4.13	<a href="#">Hyper Threading</a> .....	51
4.14	<a href="#">Dynamic FSB Frequency Switching</a> .....	52
4.15	<a href="#">VID-x</a> .....	53
4.16	<a href="#">Intel® Turbo Boost Technology and AVX</a> .....	54
4.17	<a href="#">Display Configuration</a> .....	55
4.18	<a href="#">Hybrid Graphics / Multi-monitor</a> .....	58
4.19	<a href="#">Intel® vPro™ technology</a> .....	59
4.20	<a href="#">ACPI Suspend Modes and Resume Events</a> .....	60
5	<a href="#">System Resources</a> .....	61
5.1	<a href="#">Interrupt Request (IRQ) Lines</a> .....	61
5.2	<a href="#">Memory Area</a> .....	62
5.3	<a href="#">I/O Address Map</a> .....	62
5.4	<a href="#">Peripheral Component Interconnect (PCI) Devices</a> .....	63
5.5	<a href="#">Internal I2C Bus</a> .....	63
5.6	<a href="#">External I2C Bus</a> .....	63
5.7	<a href="#">System Management (SM) Bus</a> .....	64
6	<a href="#">Connectors</a> .....	65
6.1	<a href="#">Connector Location</a> .....	65
7	<a href="#">Pinout List</a> .....	66
7.1	<a href="#">General Signal Description</a> .....	66
7.2	<a href="#">Connector X1A Row A</a> .....	67
7.3	<a href="#">Connector X1A Row B</a> .....	70
7.4	<a href="#">Connector X1B Row C</a> .....	73
7.5	<a href="#">Connector X1B Row D</a> .....	76
8	<a href="#">BIOS Operation</a> .....	79
8.1	<a href="#">Determining the BIOS Version</a> .....	79
8.2	<a href="#">BIOS Update</a> .....	79
8.3	<a href="#">POST Codes</a> .....	79
8.4	<a href="#">Setup Guide</a> .....	79

8.5	<a href="#">BIOS Setup</a> .....	81
8.5.1	<a href="#">Main</a> .....	81
8.5.2	<a href="#">Advanced</a> .....	87
8.5.3	<a href="#">Security</a> .....	123
8.5.4	<a href="#">Boot</a> .....	125
8.5.5	<a href="#">Exit</a> .....	126

# 1 User Information

## 1.1 Revision History

Version	Brief Description of Change	Date of Issue
110	Initial version	
2.0	Removed ADA-LVDS-DVI 18-bit and 24-bit accessories Updates SM bus 8-bit address information for the hardware monitor Included a Revision History table	2017-Aug-10
2.1	Updated Carrier Accessories	2020-Jul-23

## 1.2 About This Document

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

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- » Intel is a registered trademark of Intel Corp.
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## 1.5 Standards

Kontron Europe GmbH is certified to ISO 9000 standards.

## 1.6 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.

## 1.7 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

The brand new application-ready COMe-bBL6 offers increased performance density as well as graphics performance compared to its predecessors. Up to three independent displays with up to 4K resolution are supported to create stunning user experiences. Further to this, DirectX® 11.2 and OpenGL 4.3 support paves the way for compelling visuals when videos, graphics and interactive content are being displayed. By integrating the new Intel® AVX2 and OpenCL 1.2, Kontron's new Computer-on-Modules additionally not only provide an increase in floating-point performance they also possess improved parallel processing capacities. Typical application areas can be found in markets such as digital signage, professional gaming and entertainment, medical imaging and surveillance and security as well as industrial plant and machine line control on shop floor- and control room-level.

Engineers can immediately commence with evaluating these new benchmark Computer-on-Modules on all Kontron COM Express® pin-out type 6-compliant starter kits.

The Kontron COM Express® pin-out type 6 COMe-bBL6 module is available in different variants with Intel® 5th Generation Core™ i7 and Xeon® E3-1200 v4 series processors with up to 4x 2.7 GHz. The modules are designed with the Intel® Mobile QM87 chipset, host up to 16 GB DDR3L RAM and support 7 PCI Express x1 lanes and 1 PEG x16 interface which is also compatible to standard PCI Express devices. Less complex peripherals can be connected via SPI and LPC. Additional dedicated features include 3x SATA 6Gb/s ports, 1 SATA 3Gb/s port, as well as Gigabit Ethernet, 4 USB 3.0 ports, 4 USB 2.0 and 2 serial ports. The Kontron COMe-bBL6 features comprehensive display support with 3x dual mode DisplayPort++ which can also output, HDMI, DVI and DisplayPort 1.2. Industrial applications benefit from the watchdog and real-time clock. The module supports an 8.5-20V wide-range power supply. The support of smart batteries via MARS and the standardized embedded application programming interface EAPI round off the feature set and provide engineers with a comprehensive service package that eases system development as well as system programming.

For customers wanting to instantly leverage the new graphics and computing power in their existing designs based on individual carrier boards, Kontron also offers standardized migration support services to accelerate the design-in phase and thus achieve fastest field deployment.

The Kontron COM Express® basic Computer-on-Module COMe-bBL6 supports all common Windows OSs along with Linux and VxWorks.

### 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-bBL6. 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-bBL6 (BHL6 / BBL6) follows pin-out Type 6 and is compatible to PICMG specification COM.0 Rev 2.1. The COMe-bBL6 based on latest Broadwell platform is available in different variants to cover the demand of different performance, price and power:

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

Product Number	Product Name	Processor	Graphics	TDP	PCH	USB 3.0	SATA 6G	SATA 3G
38027-0000-20-4	COMe-bBL6 E3-1278L	Intel® Xeon® E3-1278L v4	GT3e	47W	QM87	4	3	1
38027-0000-18-4	COMe-bBL6 E3-1258L	Intel® Xeon® E3-1258L v4	GT2	47W	QM87	4	3	1
38027-0000-27-7	COMe-bBL6 i7-5850EQ	Intel® Core™ i7-5850EQ	GT3e	47W/37W	QM87	4	3	1
38027-0000-26-7	COMe-bBL6 i7-5700EQ	Intel® Core™ i7-5700EQ	GT2	47W/37W	QM87	4	3	1

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

The COMe-bBL6 is available for extended temperature range. General capability was tested for following options:

- » CPU: all
- » Memory: E2 DDR3L memory only 97015-xxxx-16-3
- » VCC: 12V only, no support for Wide-Range Input



Please contact your local sales or support for available variants

#### Industrial temperature grade modules (XT, -40°C to 85°C operating)

The COMe-bBL6 is available for industrial temperature range by screening:

Product Number	Product Name	Processor	Graphics	TDP	PCH	USB 3.0	SATA 6G	SATA 3G
38028-0000-20-4XT	COMe-bBL6XT E3-1278L	Intel® Xeon® E3-1278L v4	GT3e	47W	QM87	4	3	1
38028-0000-18-4XT	COMe-bBL6XT E3-1258L	Intel® Xeon® E3-1258L v4	GT2	47W	QM87	4	3	1
38028-0000-27-7XT	COMe-bBL6XT i7-5850EQ	Intel® Core™ i7-5850EQ	GT3e	47W/37W	QM87	4	3	1
38028-0000-26-7XT	COMe-bBL6XT i7-5700EQ	Intel® Core™ i7-5700EQ	GT2	47W/37W	QM87	4	3	1

- » Memory: ECC Memory support (97016-xxxx-16-3)
- » VCC: 12V only, no support for Wide-Range Input



Feel free to get in contact with our technical support for further information regarding screening process and conditions

The **RXT product line** includes modules with additional Kontron Rapid Shutdown support:

Product Number	Product Name	Processor	Graphics	TDP	PCH	USB 3.0	SATA 6G	SATA 3G
38028-0000-27-7	COMe-bBL6RXT i7-5850EQ	Intel® Core™ i7-5850EQ	GT3e	47W/37W	QM87	4	3	1
38028-0000-26-7	COMe-bBL6RXT i7-5700EQ	Intel® Core™ i7-5700EQ	GT2	47W/37W	QM87	4	3	1



Further (R)XT variants are available project based only. Please contact your local sales or support for further details and MOQ for (R)XT modules

## 3.2 Functional Specification

### Processor

The 14nm Intel® 5th Gen Core™ i7/Xeon® E3-1200 v4 embedded (Broadwell-H) CPU family with 37.5x32mm package size (BGA1364 socket) supports:

- » Intel® Turbo Boost Technology 2.0
- » Intel® 64
- » Intel® Virtualization Technology (VT-x)
- » Intel® Virtualization Technology for Directed I/O (VT-d)
- » Intel® Hyper-Threading Technology
- » Enhanced Intel SpeedStep® Technology
- » Idle States (C-States)
- » Thermal Monitoring Technologies
- » Intel® Fast Memory Access
- » Intel® Flex Memory Access
- » Integrated Intel® HD / Intel® Iris™ Pro Graphics with Dynamic Frequency

Optional available (project based with customized BIOS):

- » Intel® vPRO™ Technology including:
- » Intel® Active Management Technology (AMT)
- » Intel® Trusted Execution Technology (TXT)
- » Intel® Advanced Encryption Standard New Instructions (AES-NI)

The integrated Intel® HD (5600/P5700) / Intel® Iris™ Pro Graphics (6200/P6300) supports:

- » GraphicsTechnology GT3e with 48 Execution Units (6200/P6300)
- » GraphicsTechnology GT2 with 24 Execution Units (5600/P5700)
- » Intel® Quick Sync Video
- » Intel® InTru™ 3D Technology
- » Intel® Wireless Display
- » Intel® Flexible Display Interface (Intel® FDI)
- » Intel® Clear Video HD Technology
- » Intel® Graphics Render C-State RC6
- » Intel® Smart 2D Display Technology (S2DDT)
- » 3 simultaneous displays (Win7/8 and Linux)
- » Video Decode for AVC/H.264/VC-1/MPEG-2
- » Video Encode for AVC/H.264/MPEG-2
- » Blu-ray Playback (incl. PAVP)

## CPU Features

Intel®	Xeon®	Xeon®	Core™	Core™
-	E3-1278L v4	E3-1258L v4	i7-5850EQ	i7-5700EQ
# of Cores	4	4	4	4
# of Threads	8	8	8	8
TDP Core frequency (HFM)	<b>2000MHz</b>	<b>1800MHz</b>	<b>2700MHz</b>	<b>2600MHz</b>
Max Turbo Frequency	3300MHz	3200MHz	3400MHz	3400MHz
LFM/LPM Frequency	2000MHz	1800MHz	800MHz	800MHz
Bus/Core Ratio	20	18	8-27	8-26
TjMax	105°C	105°C	105°C	105°C
Thermal Design Power (TDP/PL1)	47W	47W	47W	47W
cTDP-Down	-	-	37W	37W
cTDP-Down Core frequency	-	-	<b>1900MHz</b>	<b>1900MHz</b>
C-States	C0-C6	C0-C6	C0-C6	C0-C6
eDRAM	128MB	-	128MB	-
Smart Cache	6MB	6MB	6MB	6MB
Memory Type	DDR3L-1600	DDR3L-1600	DDR3L-1600	DDR3L-1600
Max Memory Size	2x8GB	2x8GB	2x8GB	2x8GB
# of Memory Channels	2	2	2	2
Graphics Model	Iris Pro P6300	HD P5700	Iris Pro 6200	HD 5600
GFX Base Frequency	800MHz	700MHz	300MHz	300MHz
GFX Turbo Frequency	1000MHz	1000MHz	1000MHz	1000MHz
GFX Technology	GT3e 48EU	GT2 24EU	GT3e 48EU	GT2 24EU
Quick Sync Video	Yes	Yes	Yes	Yes
InTru™ 3D	Yes	Yes	Yes	Yes
Wireless Display	Yes	Yes	Yes	Yes
Clear Video HD	Yes	Yes	Yes	Yes
vPRO™ (optional)	Yes	Yes	Yes	Yes
TXT (optional)	Yes	Yes	Yes	Yes
AES-NI (optional)	Yes	Yes	Yes	Yes
VT-d	Yes	Yes	Yes	Yes
PCI Express Graphics x16	Gen 3.0	Gen 3.0	Gen 3.0	Gen 3.0

## Memory

Sockets	2x DDR3 SO-DIMM
Memory Type	DDR3L-1600 (ECC on RXT Ver.)
Maximum Size	2x8GB
Technology	Dual Channel

## Chipset

The 32nm Intel® 8-Series Platform Controller Hub Lynx 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 (optional)
- » Intel® Active Management Technology 9.0 (optional)
- » Intel® Anti-Theft Technology
- » Intel® Rapid Storage Technology
- » Intel® Smart Response Technology

## PCH Features

Feature	QM87
TDP	2.7W
USB 3.0 (USB 2.0 compatible)	YES (4x on COMe)
USB 2.0	YES (4x on COMe)
SATA 6Gb/s (Gen3)	YES (3x on COMe)
SATA 3Gb/s (Gen2)	YES (1x on COMe)
Wireless Display	YES
3 Displays simultaneously	YES
Rapid Storage	AHCI, RAID 0/1/5/10
VT-d	YES
vPRO™	YES with custom BIOS
AMT	YES with custom BIOS
TXT	YES with custom BIOS



The Intel® vPro Technology including Trusted Execution Technology (TXT), Active Management Technology (AMT) and Encryption AES-NI is not supported by default on COMe-bBL6. Please contact your local sales or support for custom BIOS variants supporting vPRO™.

## HighSpeed I/O Port Configuration

-	QM87 I/O	COME-bBL6 with QM87
Port1	USB3 #1	USB #0 = USB3.0
Port2	USB3 #2	USB #1 = USB3.0
Port3	USB3 #5	USB #2 = USB3.0
Port4	USB3 #6	USB #3 = USB3.0
-	USB2	USB #4-7 = USB 2.0
Port5	USB3 #3 or PCIe #1	PCIe #0
Port6	USB3 #4 or PCIe #2	PCIe #1
Port7	PCIe #3	PCIe #2
Port8	PCIe #4	PCIe #3
Port9	PCIe #5	PCIe #4
Port10	PCIe #6	PCIe #5
Port11	PCIe #7	PCIe #6
Port12	PCIe #8	LAN/PCIe #7
Port13	SATA3 #4 or PCIe #1	SATA #0 = SATA 6Gb/s
Port14	SATA3 #5 or PCIe #2	SATA #1 = SATA 6Gb/s
Port15	SATA3 #0	SATA #2 = SATA 6Gb/s
Port16	SATA3 #1	-
Port17	SATA2 #2	SATA #3 = SATA 3Gb/s
Port18	SATA2 #3	-

## Graphics Core

The integrated Intel® HD 5600/P5700 / Iris Pro 6200/P6300 (Gen8) supports:

Graphics Core Render Clock	GT2/GT3e; Base clock: 300 MHz (i7) 700/800 MHz (Xeon); GT Turbo: up to 1000 MHz
Execution Units / Pixel Pipelines	GT3e: 48EU / GT2: 24EU
Max Graphics Memory	2048MB
GFX Memory Bandwidth (GB/s)	25.6
GFX Memory Technology	DVMT
API (DirectX/OpenGL)	11.2 / 4.3 + OCL 1.2
Shader Model	5.0
Hardware accelerated Video	MPEG2, VC-1, AVC, Blu-ray (+3D)
Independent/Simultaneous Displays	3
Display Port	DP 1.2 / eDP 1.3
HDCP support	HDCP 1.4a

## Monitor output

CRT max Resolution	1920x1200
TV out:	-

## LVDS

LVDS Bits/Pixel	1x18/24, 2x18/24 with DP2LVDS
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 3.0/2.0
Digital Display Interface DDI1	DP++
Digital Display Interface DDI2	DP++
Digital Display Interface DDI3	DP++
Maximum Resolution on DDI	HDMI: 4096x2304 / DP: 3840x2160

## PEG Configuration

The x16 PCI Express Graphics Port (PEG) is compatible to standard PCI Express devices like Ethernet or RAID controllers. The COMe-bBL6 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 on PEG16 interface. The PEG lane splitting is configurable in setup:

- » 1×16 (lanes #0-15)
- » 2×8 (lanes #0-7 + #8-15)
- » 1×8 + 2×4 (lanes #0-7 + #8-11 + #12-15)



With splitted ports, Port2 (#8-15 or #8-11) and Port3 (#12-15) cannot have more lanes active as Port1 (#0-7) has

## Storage

onboard SSD	-
SD Card support	-
IDE Interface	-
Serial-ATA	up to 3x SATA 6Gb/s, 1x SATA 3Gb/s
SATA AHCI	NCQ, HotPlug, Staggered Spinup, eSATA, PortMultiplier
SATA RAID	0, 1, 5, 10



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 HDD configuration settings, connect at least two hard drives and enter the RAID Option ROM (by pressing 'CTRL'+ 'I' in Legacy Boot mode)



## Connectivity

USB 2.0	8x USB 2.0
USB 3.0	up to 4x USB 3.0
USB Client	-
PCI	-
PCI External Masters	-
PCI Express	7x PCIe x1 Gen 2.0
Max PCI Express	8x PCIe without LAN
PCI Express x2/x4 configuration	YES (Softstrap option)
Ethernet	10/100/1000 Mbit
Ethernet controller	Intel® i218-LM (Clarkville)

## PCI Express Configuration

By default, the COMe-bBL6 supports x1 PCIexpress lane configuration only (Configuration 0). Following x2/x4 configurations are available via Management Engine Softstrap Options with a customized Flash Descriptor.

PCIe	Port #0	Port #1	Port #2	Port #3	Port #4	Port #5	Port #6	Port #7*
Configuration 0	x1	x1	x1	x1	x1	x1	x1	x1
Configuration 1	x2		x1	x1	x1	x1	x1	x1
Configuration 2	x2		x2		x1	x1	x1	x1
Configuration 3	x2		x2		x2		x1	x1
Configuration 4	x2		x2		x2		x2	
Configuration 5	x4				x1	x1	x1	x1
Configuration 6	x4				x2		x1	x1
Configuration 7	x4				x2		x2	
Configuration 8	x4				x4			



- \*PCIe Port #7 is available without Ethernet Controller only
- Configuration 0 is the default setting
- Configuration 3 & Configuration 5 are available in UEFI download package on EMD Customer Section

## Ethernet

The Intel® i218-LM (Clarkville) ethernet supports:

- » Jumbo Frames - 9K
- » MACsec IEEE 802.1 AE
- » Time Sync Protocol Indicator
- » WOL (Wake On LAN)
- » PXE (Preboot eXecution Environment)
- » IEEE1588

## Misc Interfaces and Features

Supported BIOS Size/Type	16MB SPI
Audio	HD Audio + DisplayPort dual stream
Onboard Hardware Monitor	Nuvoton NCT7802Y
Trusted Platform Module	Atmel AT97SC3204-U2A1A-10
Miscellaneous	2x UART / PWM FAN / eDP optional

## Kontron Features

External I2C Bus	Fast I2C, MultiMaster capable
Smart Battery (M.A.R.S.) support	YES
Embedded API	KEAPI3
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 - 20V
ACPI	ACPI 4.0
S-States	S0, S3, S4, S5
S5 Eco Mode	YES
Misc Power Management	cTDP @ 37W (i7)

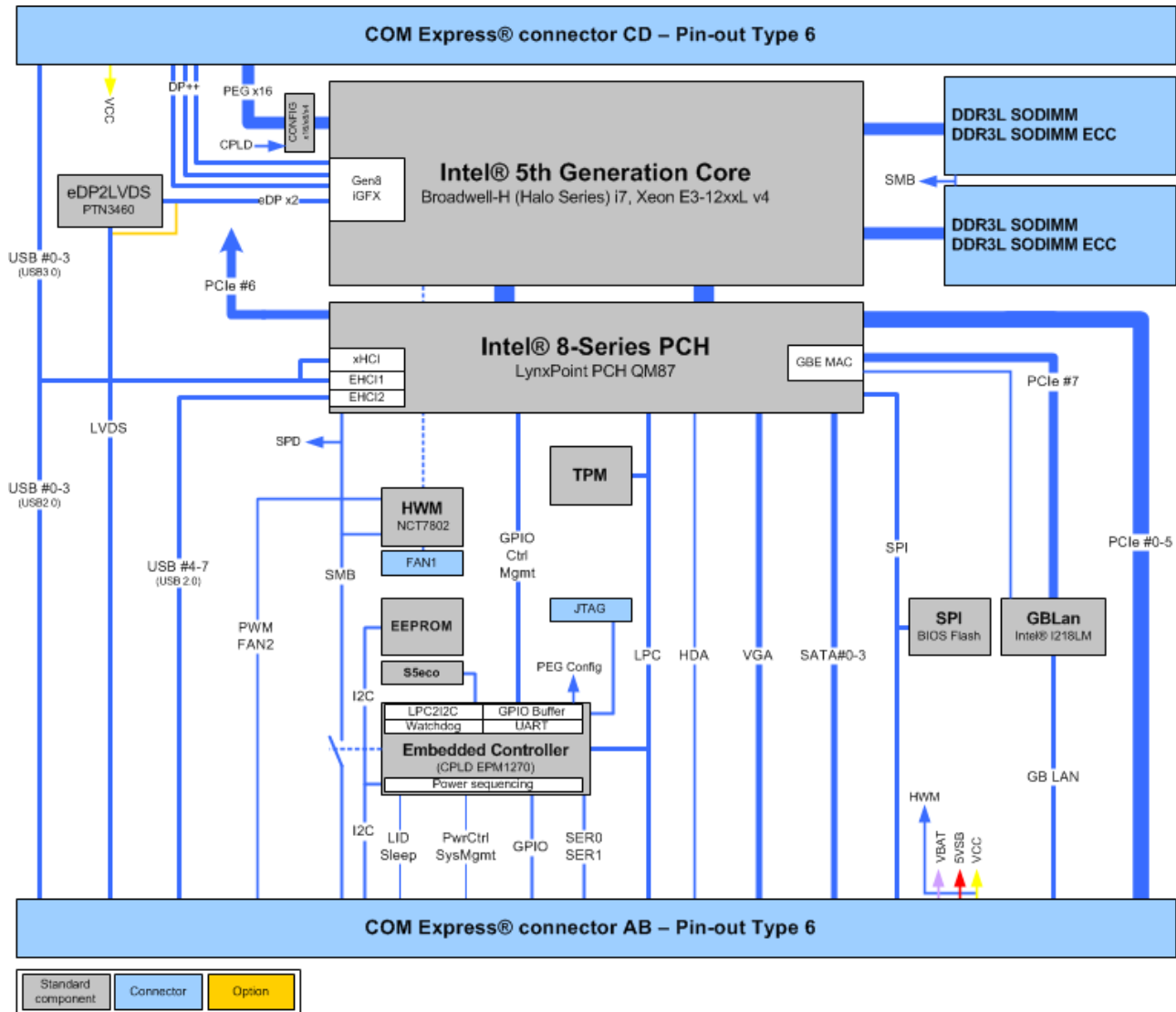
## Power Consumption and Performance

Full Load Power Consumption	tbd
Kontron Performance Index	tbd
Kontron Performance/Watt	tbd



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

### 3.3 Block Diagram



## 3.4 Accessories

### Product specific accessories

Product Number	Heatspreader and Cooling Solutions	Comment
38025-0000-99-0	HSP COMe-bHL6/bBL6 Cu-core thread	For all CPUs and temperature grades
38025-0000-99-2	HSP COMe-bHL6/bBL6 heatpipe thread	For all CPUs and temperature grades
38025-0000-99-3	HSP COMe-bHL6/bBL6 heatpipe through	For all CPUs and temperature grades
38025-0000-99-0C05	HSK COMe-bHL6/bBL6 active (w/o HSP)	For all CPUs and commercial temperature grade usage
38025-0000-99-0C06	HSK COMe-bHL6/bBL6 passive (w/o HSP)	For all CPUs and commercial temperature grade usage

### General accessories

Part Number	COMe pin-out Type 6 compatible accessories	Project Code	Comment
38115-0000-00-x	COM Express® Reference Carrier-i Type 6	ADTI	Thin-mITX Carrier with 5mm COMe connector
38116-0000-00-5	COM Express® Eval Carrier2 Type 6	ADT6	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	DV06	(sandwich) Adapter Card for 3x DisplayPort
96006-0000-00-2	COMe POST T6	NFCB	POST Code / Debug Card
38019-0000-00-0	ADA-COMe-Height-dual	EERC	Height Adapter
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	Display Adapter	Comment	
96006-0000-00-8	ADA-DP-LVDS	DP to LVDS adapter	
96082-0000-00-0	KAB-ADAPT-DP-DVI	DP to DVI adapter cable	
96083-0000-00-0	KAB-ADAPT-DP-VGA	DP to VGA adapter cable	
96084-0000-00-0	KAB-ADAPT-DP-HDMI	DP to HDMI adapter cable	
Part Number	Cables	Comment	
96079-0000-00-0	KAB-HSP 200mm	Cable adapter to connect FAN to module (COMe basic/compact)	
96079-0000-00-2	KAB-HSP 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-bBL6 standard (38027-xxxx-xx-x)

Part Number	DDR3L SODIMM, commercial temperature grade
97015-1024-16-1	DDR3L-1600 SODIMM 1GB
97015-2048-16-1	DDR3L-1600 SODIMM 2GB
97015-4096-16-1	DDR3L-1600 SODIMM 4GB
97015-8192-16-1	DDR3L-1600 SODIMM 8GB
97015-1600-16-1	DDR3L-1600 SODIMM 16GB
Part Number	DDR3L SODIMM, industrial temperature grade
97015-1024-16-3	DDR3L-1600 SODIMM 1GB E2
97015-2048-16-3	DDR3L-1600 SODIMM 2GB E2
97015-4096-16-3	DDR3L-1600 SODIMM 4GB E2
97015-8192-16-3	DDR3L-1600 SODIMM 8GB E2

### For COMe-bBL6RXT (38028-xxxx-xx-x)

Part Number	DDR3L ECC SODIMM, commercial temperature grade
97016-1024-16-1	DDR3L-1600 SODIMM 1GB ECC
97016-2048-16-1	DDR3L-1600 SODIMM 2GB ECC
97016-4096-16-1	DDR3L-1600 SODIMM 4GB ECC
97016-8192-16-1	DDR3L-1600 SODIMM 8GB ECC
97016-1600-16-1	DDR3L-1600 SODIMM 16GB ECC
Part Number	DDR3L ECC SODIMM, industrial temperature grade
97016-1024-16-3	DDR3L-1600 SODIMM 1GB ECC E2
97016-2048-16-3	DDR3L-1600 SODIMM 2GB ECC E2
97016-4096-16-3	DDR3L-1600 SODIMM 4GB ECC E2
97016-8192-16-3	DDR3L-1600 SODIMM 8GB ECC E2

## 3.5 Electrical Specification

### 3.5.1 Supply Voltage

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

VCC:	8.5V - 20V
Standby:	5V DC +/- 5%
RTC:	2.5V - 3.47V



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

### 3.5.2 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

### 3.5.3 Supply Voltage Ripple

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

### 3.5.4 Power Consumption

The maximum Power Consumption of the different COMe-bBL6 variants is tbd (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.

### 3.5.5 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 - 20V 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

### 3.5.6 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 - 20V.

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.

## 3.6 Power Control

### Power Supply

The COMe-bBL6 supports a power input from 8.5V - 20V. 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-bBL6 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”.

## 3.7 Environmental Specification

### 3.7.1 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-bBL6

Temperature Specification	Operating	Non-operating	Validated Input Voltage
Commercial grade	0°C to +60°C	-30°C to +85°C	VCC: 8.5V - 20V
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 - 20V

#### 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.

### 3.7.2 Humidity

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



## 3.8 Standards and Certifications

### RoHS II

The **COMe-bBL6** 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-bBL6** follows the requirements for electromagnetic compatibility standards

- » EN55022

### 3.9 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):

38027-0000-27-7: 585250 @ 40°C (w/o PCB)

38028-0000-27-7: 505825 @ 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.

## 3.10 Mechanical Specification

### Dimension

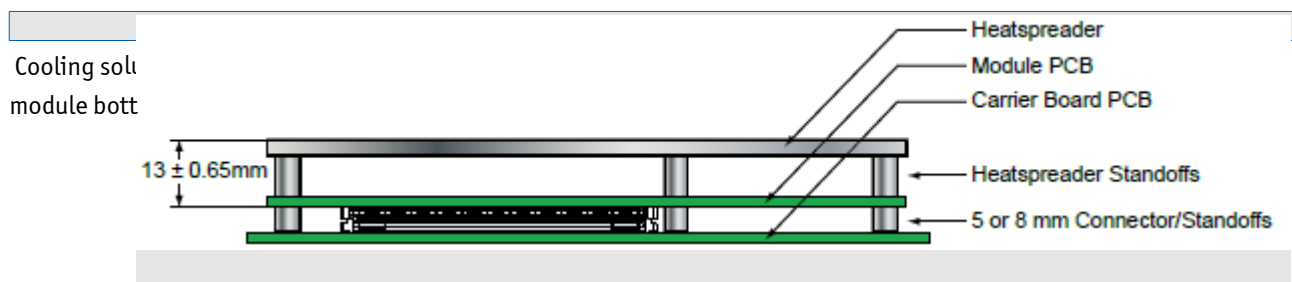
- » 95.0 mm x 125.0 mm
- » Height approx. 12mm (0.4")



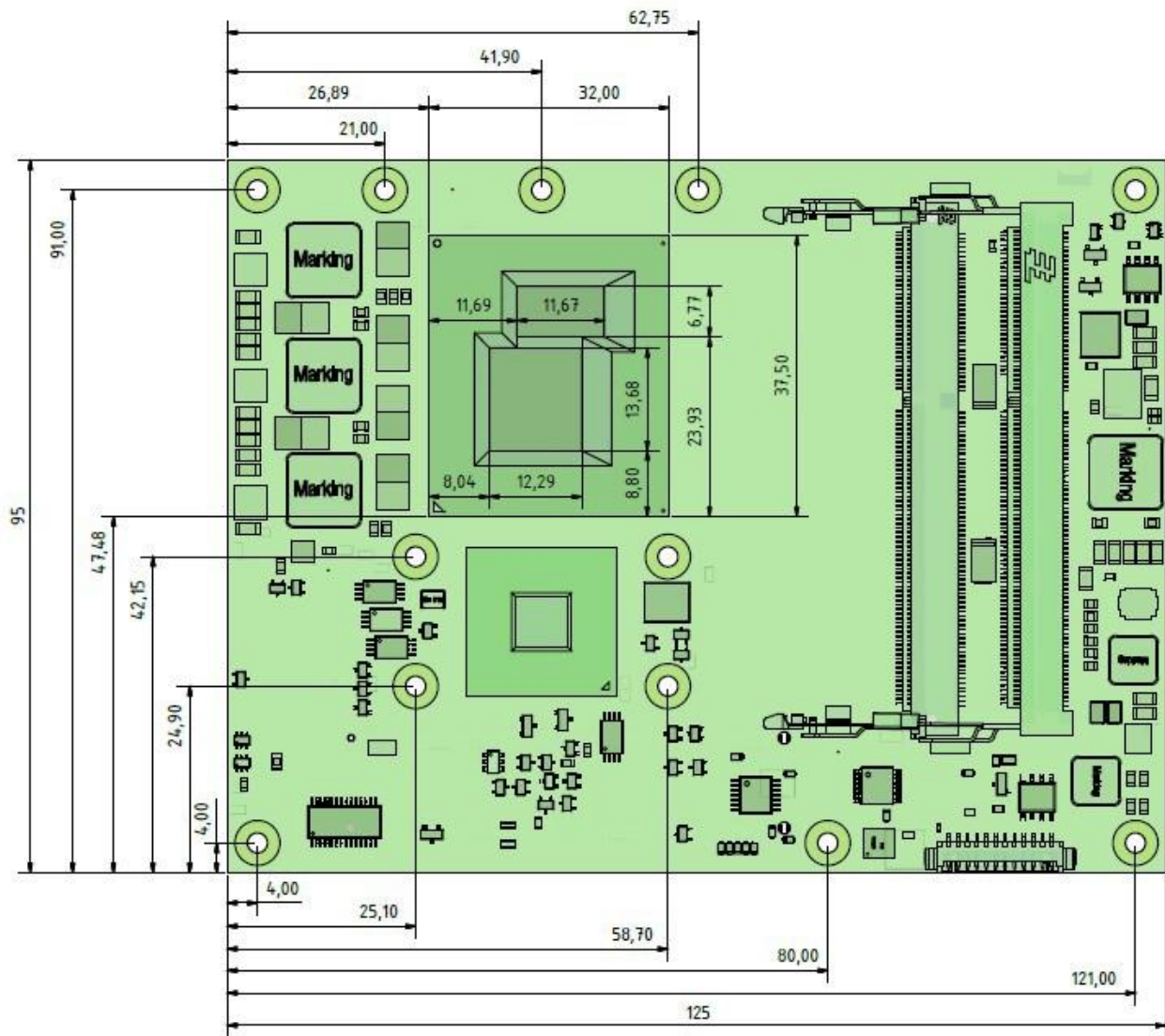
CAD drawings are available at [EMD CustomerSection](#)

### Height

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



### 3.11 Module Dimensions



## 3.12 Thermal Management, Heatspreader and Cooling Solutions

A heatspreader plate assembly is available from Kontron Europe GmbH for the COMe-bBL6. 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-bBL6. About 80 percent of the power dissipated within the module is conducted to the heatspreader plate and can be removed by the cooling solution.

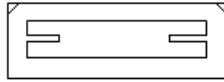
You can use many thermal-management solutions with the heatspreader plates, including active and passive approaches. The optimum cooling solution varies, depending on the COM Express® application and environmental conditions. Active or passive cooling solutions provided from Kontron Europe GmbH for the COMe-bBL6 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-bBL6 heatspreader and cooling solutions are provided at <http://emdcustomersection.kontron.com>.

### 3.13 Onboard Connectors



J6 - FAN



J3 - XDP ( CPU JTAG)

J2 - COM Express® CD connector

J1 - COM Express® AB connector

#### 3.13.1 FAN Connector J6 - PCB bottom

##### Specification

- » 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 - 20V
FAN Output Voltage	8.5 - 13V	13V
Max. FAN Output Current	350mA	150mA



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)

### **3.13.2 CPU JTAG connector J3 - PCB bottom**

The XDP connector is for internal use only. Do not use under any circumstances

### **3.13.3 CPLD Debug connector J7 - PCB top**

The CPLD Debug and programming connector is for internal use only. Do not use under any circumstances

## 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 Rapid Shutdown

### Overview

For “R” or the “RXT” version of the COMe-bBL6, Kontron has implemented a rapid shutdown function. It works as follows:

1) An active-high shutdown signal is asserted by the COM Express carrier board via pin C67 of the COM Express connector. The characteristics of the shutdown signal are as follows:

- » Amplitude 5.0V +/- 5%
- » Source impedance  $\leq 50$  ohms
- » Rise time  $\leq 1\mu\text{s}$
- » Duration  $\geq 20\mu\text{s}$

The assertion of this signal causes all power regulators to be disabled and the internal power supply rails to be discharged by crowbar circuits. The shutdown circuitry provides internal energy storage that maintains crowbar activation for at least 2mS following the de-assertion of the shutdown signal. The circuit also incorporates a weak input pulldown resistor so that the RXT module will operate normally in systems where the rapid shutdown functionality is not used and pin C67 of the COM Express is left unconnected.

2) Simultaneously with the leading edge of shutdown, the 12V (main) input power to the RXT module is removed and these input power pins are externally clamped to ground through a crowbar circuit located on the COM Express carrier board. This external clamping circuit must maintain a maximum resistance of approximately 1 ohm and be activated for a minimum of 2mS.

3) Simultaneously with the leading edge of shutdown, the 5V (standby) input power to the RXT module is removed, if present. External clamping on these pins is not necessary.

### Crowbar implementation details

As a tool for designing the internal crowbars, Kontron developed tallied the total capacitance present on each of the internal power rails, and calculates the required discharge resistance in order to achieve the desired voltage decay time constant. The principal design criteria are that each supply rail must decay to 37% of initial value (equivalent to 1RC) within 250uS, and to below 1.5V within 2mS. Analysis shows that the power rails fall into four general classes. Each class of power rails has a corresponding discharge strategy.

1) Power Input Rails: The main 12V power input rail incorporates about 300uF of distributed capacitance. This rail must be discharged by an external crowbar located on the carrier board, which must provide a shunt resistance of approximately 1 ohm. The peak power dissipation in this crowbar resistance will be relatively high (on the order of 150W when the crowbar is activated), but will diminish very rapidly as the input capacitors discharge.

2) Low Voltage, High Power Rails: Each of these 5 “major” internal supply rails has an output voltage in the 1.0V to 1.5V range, and each rail has between 1500uF and 3300uF of output capacitance. The required discharge resistances for these rails are in the range of 0.1 to 0.2 ohm, and peak discharge currents are in the range of 8 to 16A.

The discharge circuit for each rail is implemented with a “pulse withstanding” thick-film SMT resistor in series with a low-RDSon MOSFET. The resistor peak powers are in the 8W to 20W range; depending on PCB layout considerations either a single resistor or multiple smaller resistors may be used to achieve sufficient pulse handling capability.

Because of the relatively high currents in the discharge paths, these crowbar circuits require wide copper traces and careful component placement adjacent to the output components of the corresponding power supplies.

3) Low Voltage, Low Power Rails: These rails have voltages of 1.8V or less and capacitances under 1000uF, with peak discharge currents  $< 3\text{A}$ . The discharge circuits for these rails are also implemented with resistor(s) and a low-RDSon

MOSFET. In some cases, the peak pulse power dissipation in the resistor(s) is low enough that specialty “pulse withstanding” resistors are not required.

4) Medium Voltage Rails: These 3.3V and 5V rails typically have relatively small output capacitances and peak discharge currents  $<1\text{A}$ . The discharge circuits for these rails are typically implemented with conventional resistor(s) and a low- $R_{DSon}$  MOSFET.

### Shutdown input circuit details

The shutdown input pin to the RXT module is coupled through a series Schottky diode and a small series resistor to the gates of all crowbar MOSFETs, connected in parallel. All crowbar MOSFETs are N-channel “logic level” parts that have are specified for operation at  $V_{gs} = 4.5\text{V}$ . Three additional components are connected in parallel between the MOSFET gates and ground:

- » A capacitor that provides energy storage to keep the MOSFETs conducting for several mS after the shutdown signal is de-asserted.
- » A high-value resistor that provides a discharge path for the capacitor as well as a pulldown resistance (to insure that the shutdown circuits remain inactive if the shutdown pin is left floating).
- » A 6.2V zener diode that protects the MOSFET gates from damage due to input ESD or input overdrive.

In order to insure that the crowbars do not “fight” active switching regulators while the input capacitors are being discharged, the shutdown circuit rapidly crowbars the 5V rail, with a time constant  $<10\mu\text{s}$ . The 5V rail powers most of the remaining switching regulators, and as its voltage falls below about 4V those regulators enter under-voltage lockout mode and cease to operate. Additionally, by using the UVLO mechanism in the design of the RXT module, Kontron minimizes the risk of inadvertently affecting the standard power sequencing logic for such RXT modules. Two of the switching regulators do not require the 5V supply for operation, and in those two cases it will be necessary to clamp the enable inputs to ground when shutdown begins.

## 4.3 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 Core 8	Phoenix Tiano	AMI Aptio 4	AMI Aptio V
PS/2	YES	YES	YES	YES	NO
COM1/COM2	YES	YES	YES	YES	YES
LPT	YES	YES	YES	YES	YES
HWM	YES	YES	NO	NO	NO
Floppy	NO	NO	NO	NO	NO
GPIO	NO	NO	NO	NO	NO
83627DHG-P	Phoenix BIOS	AMI Core 8	Phoenix Tiano	AMI Aptio 4	AMI Aptio V
PS/2	YES	YES	YES	YES	NO
COM1/COM2	YES	YES	YES	YES	YES
LPT	YES	YES	YES	YES	YES
HWM	NO	NO	NO	NO	NO
Floppy	NO	NO	NO	NO	NO
GPIO	NO	NO	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.

## 4.4 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.

## 4.5 SPI boot

The COMe-bBL6 supports boot from an external SPI Flash. It can be configured by pin A34 (BIOS\_DIS#0) and pin B88 (BIOS\_DIS1#) 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
128Mbit	Macronix	MX25L12835FM2I-10G	0xC22018
128Mbit	Micron	N25Q128A13ESE40E/F	0x20BA18
128Mbit	Winbond	W25Q128FVSG	0xEF4018

### 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.

## 4.6 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

## 4.7 UART

The COMe-bBL6 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.

## 4.8 Fast I2C

The COMe-bBL6 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



## 4.9 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-bBL6 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 Intel® Fast Flash Standby™ / Rapid Start Technology™

The target of Intel® Fast Flash Standby™ (iFFS) (also known as Intel® Rapid Start Technology™ iRST) is to get a wake-up time from S4 comparable to S3. Normally S4 is caused by OS which stores it's information to the hard disk and does then a normal shutdown. S4 resume takes quite long as the system does a normal BIOS POST and OS restores it's information from the hard disk.

iFFS does it in a different way. The Operating System initiates an S3 and stores it's information in memory. After that BIOS copies this OS information from DRAM to SSD and does a sleep state similar to S4 with nearly zero power. If system is resumed by power button, BIOS restores memory content from SSD to the DRAM and does an S3 resume which is much faster.

### Requirements

- » SATA Solid State Disk in AHCI mode
- » Free disk space on the SSD with at least the DRAM size
- » Operating System with disk partition tool to allocate the hibernation partition (e.g. Windows 7/8)
- » BIOS supporting iFFS feature

### How to setup once the operating system is installed

- » Prepare a free disk space on your onboard or external SSD with at least the size of DRAM
- » Open *cmd.exe* in Administrator Mode and type *diskpart.exe* to open the Windows disk partition tool
- » DISKPART> list disk
- » DISKPART> select disk X (X is disk number where you want to create the store partition. Refer to results from "list disk" for exact disk number)
- » DISKPART> create partition primary
- » DISKPART> detail disk
- » DISKPART> select Volume X (X is Volume of your store partition. Refer to results from "detail disk" for exact volume number)
- » DISKPART> set id=84 override (ID 84 marks the partition as hibernate partition)
- » DISKPART> exit
- » Now there should be a Hibernate Partition visible in your disk management
- » Reboot and enable iFFS in BIOS

### Usage

- » Activate Lid / move system to Sleep/Standby (→S3)
- » After configured period of time in Setup the system powers on automatically and information in DRAM moves to non-volatile memory (Default is '*immediately*')
  - » System switches off again to iFFS (→comparable to S4, Power Supply can now be disconnected)
  - » When System is powered on, information moved back to DRAM (No display output during copy process)
  - » System resumes same as Sleep/Standby S3

### Note

- » Depending on the platform iFFS enabled may disable the hibernate function in Windows automatically

## Benefits

- » System transitions from S3 to S4 automatically
- » Up to 6x battery life compared to Standby
- » Resume time reduced up to 75%



Measured resume times from Power-on to Win7 Log-on Screen on COMe-mCT10:

- » 2.5" SATA II HDD 5400rpm: Hibernate: 22s, iFFs on onboard NANDrive: 17s
- » 2.5" SATA III SSD: Hibernate: 18s, iFFS on SSD: 10s

## 4.11 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.

## 4.12 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.

## 4.13 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.

## 4.14 Dynamic FSB Frequency Switching

Dynamic FSB frequency switching effectively reduces the internal bus clock frequency by half to further decrease the minimum processor operating frequency from the Enhanced Intel SpeedStep Technology performance states and achieve the Super Low Frequency Mode (Super LFM). This feature is supported at FSB frequencies of 1066 MHz, 800 MHz and 667 MHz and does not entail a change in the external bus signal (BCLK) frequency. Instead, both the processor and GMCH internally lower their BCLK reference frequency to 50% of the externally visible frequency. Both the processor and GMCH maintain a virtual BCLK signal (VBCLK) that is aligned to the external BCLK but at half the frequency.

After a downward shift, it would appear externally as if the bus is running with a 133-MHz base clock in all aspects, except that the actual external BCLK remains at 266 MHz. See Figure 3 for details. The transition into Super LFM, a “down-shift,” is done following a handshake between the processor and GMCH. A similar handshake is used to indicate an “up-shift,” a change back to normal operating mode. Please ensure this feature is enabled and supported in the BIOS.

## 4.15 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 tINST; however, the average ICC current will be lesser than or equal to ICCDES current specification.



## 4.16 Intel® Turbo Boost Technology and AVX

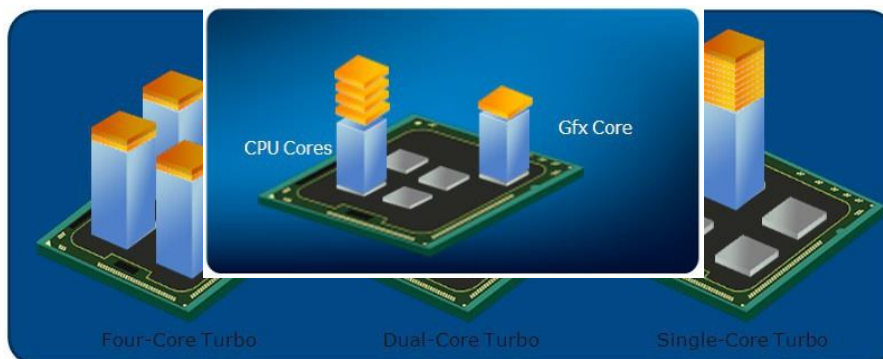
For applications that are particularly power-hungry, the new processors provide enhanced Intel® Turbo Boost technology. This automatically shifts processor cores and processor graphics resources to accelerate performance, tailoring a workload to give users an immediate performance boost for their applications 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.

## 4.17 Display Configuration

### Maximum supported Resolutions in Single Display Configuration

Port	Max Resolution
DP	4096×2304@60Hz, 24bpp
HDMI	4096×2304@24Hz, 24bpp 2560×1600@60Hz, 24bpp
DVI	1920×1200@60Hz, 24bpp
VGA	1920×1200@60Hz, 24bpp
LVDS	1920×1200@60Hz
eDP (x2)	1920×1200@60Hz

### Maximum supported Pixel Clock

Port	Max Pixel Clock
DP	605 MHz
HDMI	300 MHz
DVI	165 MHz
VGA	180 MHz

### DDI supported resolutions in 3 Display Configurations

Display1	Display2	Display3	Max.Res Display 1	Max.Res Display 2	Max.Res Display 3
DP	DP	DP	3840×2160@60Hz	3840×2160@60Hz	3840×2160@60Hz
HDMI	HDMI	DP	4096×2304@24Hz 2560×1600@60Hz	4096×2304@24Hz 2560×1600@60Hz	3840×2160@60Hz
DVI	DVI	DP	1920×1200@60Hz	1920×1200@60Hz	3840×2160@60Hz
VGA	DP	HDMI	1920×1200@60Hz	3840×2160@60Hz	4096×2304@24Hz 2560×1600@60Hz
LVDS/eDP	DP	HDMI	1920×1200@60Hz	3840×2160@60Hz	4096×2304@24Hz 2560×1600@60Hz
LVDS/eDP	DP	DP	1920×1200@60Hz	3840×2160@60Hz	3840×2160@60Hz
LVDS/eDP	HDMI	HDMI	1920×1200@60Hz	4096×2304@24Hz 2560×1600@60Hz	4096×2304@24Hz 2560×1600@60Hz

### Link Data Rate

The maximum supported Display Ports resolutions are dependent on the Link Data Rate and the used Lane Count:

Link Data Rate	1 Lane	2 Lanes	4 Lanes
RBR	1024×600	1400×1050	2240×1400
HBR	1280×960	1920×1200	2880×1800
HBR2	1920×1200	2880×1800	3840×2160

### 3 independent Display Support

The COMe-bBL6 supports up to 3 independent displays in Windows 7/8 and Linux by using the following rules:

- » Max of 2 HDMI
- » Max of 2 DVI
- » Max of 1 HDMI and 1DVI
- » Any 3 DisplayPort
- » One VGA

## Digital Display Interface Features

The integrated Intel® HD 5600/P5700 / Iris Pro 6200/P6300 (Gen8) 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
- » DP/HDMI/DVI Hot-plug (low-active)

## Supported Audio Formats on HDMI and DisplayPort

Audio Formats	HDMI	DisplayPort
AC-3 Dolby Digital	YES	YES
Dolby Digital Plus	YES	YES
DTS-HD	YES	YES
LPCM, 192kHz/24bit, 8 channel	YES	YES
Dolby True HD, DTS HD Master Audio	YES	YES

## DDI Design Consideration

- » For sufficient signal quality baseboard designs with long signal lanes or impedance leaps may require an Equalizer or Re-driver for the digital display interfaces
- » DDI hot-plug detection is high active
- » 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.

## 4.18 Hybrid Graphics / Multi-monitor

The COMe-bBL6 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](#)

## 4.19 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 not supported by default. Please contact your local sales or support for custom BIOS variants supporting vPro™

## 4.20 ACPI Suspend Modes and Resume Events

The COMe-bBL6 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

## 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	onboard UART2
4	COM1	No	onboard UART1
5	SIO LPT	Note(4)	external SIO LPT
6	COM3	Note(4)	external SIO COM1
7	COM4	Note(4)	external SIO COM2
8	RTC	No	-
9	ACPI	No	-
10	-	Yes	-
11	-	Yes	-
12	PS/2 Mouse	Note(4)	external SIO
13	FPU	No	-
14	-	Yes	-
15	-	Yes	-
16	LNK A	No	P.E.G + I.G.D + SA Audio + XHCI + Intel ME + USB EHCI2 + PCIe RP 0 + PCIe RP 4; Note(3)
17	LNK B	No	PCIe RP 1 + PCIe RP 5; Note(3)
18	LNK C	No	PCIe RP 2 + PCIe RP 6 + SMBus; Note(3)
19	LNK D	No	PCIe RP 3 + SATA; Note(3)
20	LNK E	No	Onboard LAN; Note(3)
21	LNK F	No	Note(3)
22	LNK G	No	PCH HDA; Note(3)
23	LNK H	No	USB EHCI#1



(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-FEAFFFFh	PCIe Config Space	No	Fixed
FEC00000 - FECFFFF	Local APIC/IOAPIC(s)	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	MSI area	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 Resources	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
03B0 - 03DF	VGA	No	Fixed
0400 - 047F	Chipset	No	Fixed
04D0 - 04D1	Chipset	No	Fixed
0800 - 087F	Chipset	No	Fixed
0A00 - 0A0F	LPC	Yes	Routed to LPC
0A80 - 0A8F	CPLD	No	Fixed
0A90 - 0AFF	LPC	Yes	Routed to LPC
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
SA Audio	0:3:0	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	internal	Chipset
EHCI2	0:26:0	LNK A	internal	Chipset
PCH 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
EHCI1	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

## 5.5 Internal I2C Bus

I2C Address	Used For	Available	Comment
58h	S5 Eco	No	S5 Eco Resistor
A0h	JILI-EEPROM	No	external LVDS EEPROM for JILI Data
C0h	LVDS bridge	No	DP to LVDS Bridge

## 5.6 External I2C Bus

I2C Address	Used For	Available	Comment
A0h	JIDA-EEPROM	No	Module EEPROM
A Eh	FRU-EEPROM	No	Recommended for Baseboard EEPROM

## 5.7 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	Hardware Monitor	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 I218-LM	Do not use under any circumstances	SML0

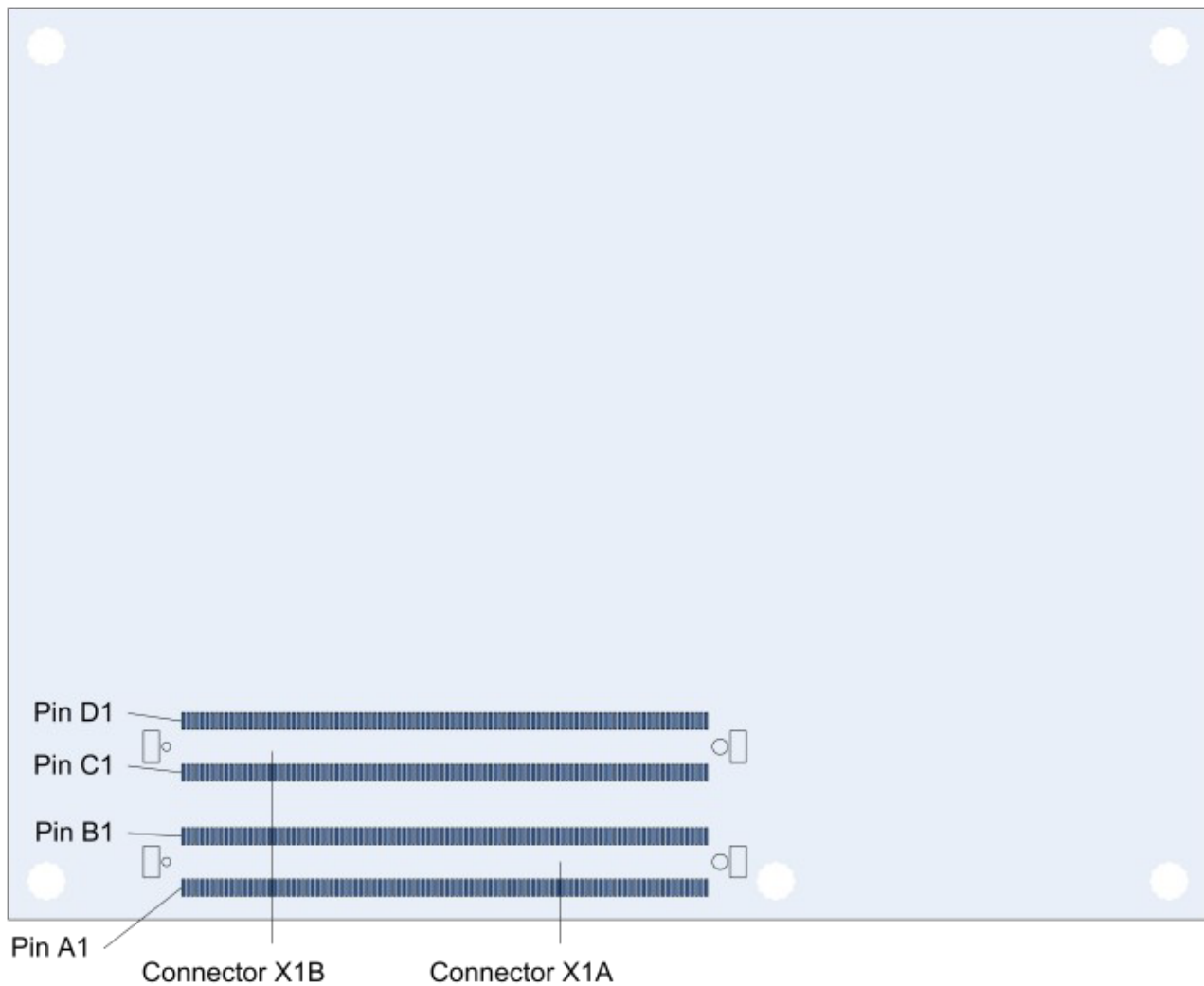


A JIDA Bus No. like in former Modules cannot be provided because the EAPI driver implementation enumerates the I2C busses dynamically. Please follow the initialization process like it is provided in the EAPI specification.

## 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 GND	-	-
A2	GBEO_MDI3-	Ethernet Media Dependent Interface 3 -	DP-I/O	-	-
A3	GBEO_MDI3+	Ethernet Media Dependent Interface 3 +	DP-I/O	-	-
A4	GBEO_LINK100#	Ethernet 100 Mbit Link Indicator	OD	-	-
A5	GBEO_LINK1000#	Ethernet 1000 Mbit Link Indicator	OD	-	-
A6	GBEO_MDI2-	Ethernet Media Dependent Interface 2 -	DP-I/O	-	-
A7	GBEO_MDI2+	Ethernet Media Dependent Interface 2 +	DP-I/O	-	-
A8	GBEO_LINK#	Ethernet Link Indicator	OD	-	-
A9	GBEO_MDI1-	Ethernet Media Dependent Interface 1 -	DP-I/O	-	-
A10	GBEO_MDI1+	Ethernet Media Dependent Interface 1 +	DP-I/O	-	-
A11	GND	Power Ground	PWR GND	-	-
A12	GBEO_MDI0-	Ethernet Media Dependent Interface 0 -	DP-I/O	-	-
A13	GBEO_MDI0+	Ethernet Media Dependent Interface 0 +	DP-I/O	-	-
A14	GBEO_CTREF	Center Tab Reference Voltage	0	-	1µF capacitor to GND
A15	SUS_S3#	Suspend To RAM (or deeper) Indicator	0-3.3	PD 10k	-
A16	SATA0_TX+	SATA 0 Transmit Pair +	DP-0	-	-
A17	SATA0_TX-	SATA 0 Transmit Pair -	DP-0	-	-
A18	SUS_S4#	Suspend To Disk (or deeper) Indicator	0-3.3	-	-
A19	SATA0_RX+	SATA 0 Receive Pair +	DP-I	-	-
A20	SATA0_RX-	SATA 0 Receive Pair -	DP-I	-	-
A21	GND	Power Ground	PWR GND	-	-
A22	SATA2_TX+	SATA 2 Transmit Pair +	DP-0	-	-
A23	SATA2_TX-	SATA 2 Transmit Pair -	DP-0	-	-
A24	SUS_S5#	Soft Off Indicator	0-3.3	-	-
A25	SATA2_RX+	SATA 2 Receive Pair +	DP-I	-	-
A26	SATA2_RX-	SATA 2 Receive Pair -	DP-I	-	-
A27	BATLOW#	Battery Low	I-3.3	PU 10k 3.3V (S5)	assertion will prevent wake from S3-S5 state
A28	(S)ATA_ACT#	Serial ATA LED	OD-3.3	PU 10k 3.3V (S0)	can pull down 3mA
A29	AC/HDA_SYnc	HD Audio Sync	0-3.3	PD 15k in PCH	resistor value can range from 9k0hm to 50k0hm
A30	AC/HDA_RST#	HD Audio Reset	0-3.3	-	-
A31	GND	Power Ground	PWR GND	-	-
A32	AC/HDA_BITCLK	HD Audio Bit Clock Output	0-3.3	-	-
A33	AC/HDA_SDOUT	HD Audio Serial Data Out	0-3.3	PD 15k in PCH	resistor value can range from 9k0hm to 50k0hm
A34	BIOS_DIS0#	BIOS Selection Strap 0	I-3.3	PU 10k 3.3V (SPI)	PU might be powered during suspend
A35	THRMTRIP#	Thermal Trip	0-3.3	PU 10k 3.3V (S0)	do not use for overtemperatur detection (because this signal is a S0 signal, it's not possible to see if module shuts down regular or caused by CPU overtemperatur)
A36	USB6-	USB 2.0 Data Pair Port 6 -	DP-I/O	PD 15k in PCH	resistor value can range from 14k0hm to 25k0hm
A37	USB6+	USB 2.0 Data Pair Port 6 +	DP-I/O	PD 15k in PCH	resistor value can range from 14k0hm to 25k0hm
A38	USB_6_7_OC#	USB Overcurrent Indicator Port 6/7	I-3.3	PU 10k 3.3V (S5)	-
A39	USB4-	USB 2.0 Data Pair Port 4 -	DP-I/O	PD 15k in PCH	resistor value can range from 14k0hm to 25k0hm
A40	USB4+	USB 2.0 Data Pair Port 4 +	DP-I/O	PD 15k in PCH	resistor value can range from 14k0hm to 25k0hm
A41	GND	Power Ground	PWR GND	-	-
A42	USB2-	USB 2.0 Data Pair Port 2 -	DP-I/O	PD 15k in PCH	resistor value can range from 14k0hm to 25k0hm
A43	USB2+	USB 2.0 Data Pair Port 2 +	DP-I/O	PD 15k in PCH	resistor value can range from 14k0hm to 25k0hm
A44	USB_2_3_OC#	USB Overcurrent Indicator Port 2/3	I-3.3	PU 10k 3.3V (S5)	-
A45	USB0-	USB 2.0 Data Pair Port 0 -	DP-I/O	PD 15k in PCH	resistor value can range from 14k0hm to 25k0hm
A46	USB0+	USB 2.0 Data Pair Port 0 +	DP-I/O	PD 15k in PCH	resistor value can range from 14k0hm to 25k0hm
A47	VCC_RTC	Real-Time Clock Circuit Power Input	PWR 3V	-	-
A48	EXCD0_PERST#	Express Card Reset Port 0	0-3.3	-	-
A49	EXCD0_CPPE#	Express Card Capable Card Request Port 0	I-3.3	PU 10k 3.3V (S0)	-
A50	LPC_SERIRQ	Serial Interrupt Request	I/OD-3.3	PU 8k25 3.3V (S0)	-
A51	GND	Power Ground	PWR GND	-	-
A52	PCIE_TX5+	PCI Express Lane 5 Transmit +	DP-0	-	-
A53	PCIE_TX5-	PCI Express Lane 5 Transmit -	DP-0	-	-
A54	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 GND	-	-
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 GND	-	-
A61	PCIE_TX2+	PCI Express Lane 2 Transmit +	DP-0	-	-
A62	PCIE_TX2-	PCI Express Lane 2 Transmit -	DP-0	-	-

A63	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 GND	-	-
A67	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 GND	-	-
A71	LVDS_A0+	LVDS Channel A Data0 +	DP-0	-	-
A72	LVDS_A0-	LVDS Channel A Data0 -	DP-0	-	-
A73	LVDS_A1+	LVDS Channel A Data1 +	DP-0	-	configuration as eDP_TX1+ in customised article version possible
A74	LVDS_A1-	LVDS Channel A Data1 -	DP-0	-	configuration as eDP_TX1- in customised article version possible
A75	LVDS_A2+	LVDS Channel A Data2 +	DP-0	-	configuration as eDP_TX0+ in customised article version possible
A76	LVDS_A2-	LVDS Channel A Data2 -	DP-0	-	configuration as eDP_TX0- in customised article version possible
A77	LVDS_VDD_EN	LVDS Panel Power Control	O-3.3	PD 100k	configuration as eDP_VDD_EN in customised article version possible
A78	LVDS_A3+	LVDS Channel A Data3 +	DP-0	-	-
A79	LVDS_A3-	LVDS Channel A Data3 -	DP-0	-	-
A80	GND	Power Ground	PWR GND	-	-
A81	LVDS_A_CLK+	LVDS Channel A Clock +	DP-0	-	-
A82	LVDS_A_CLK-	LVDS Channel A Clock -	DP-0	-	-
A83	LVDS_I2C_CLK	LVDS Data Channel Clock	I/O-3.3	PU 2k21 3.3V (S0)	configuration as eDP_AUX+ in customised article version possible
A84	LVDS_I2C_DAT	LVDS Data Channel Data	I/O-3.3	PU 2k21 3.3V (S0)	configuration as eDP_AUX- in customised article version possible
A85	GPI3	General Purpose Input 3	I-3.3	PU 10k 3.3V (S0)	-
A86	RSVD	Reserved for future use	nc	-	-
A87	RSVD	Reserved for future use	nc	-	configuration as eDP_HPD in customised article version possible
A88	PCIE_CLK_REF+	Reference PCI Express Clock +	DP-0	-	-
A89	PCIE_CLK_REF-	Reference PCI Express Clock -	DP-0	-	-
A90	GND	Power Ground	PWR GND	-	-
A91	SPI_POWER	3.3V Power Output Pin for external SPI flash	O-3.3	-	might be powered during suspend
A92	SPI_MISO	SPI Master IN Slave OUT	I-3.3	PU 20k in PCH (SPI)	resistor value can range from 15k0hm to 40k0hm and might be powered during suspend
A93	GP00	General Purpose Output 0	O-3.3	PD 10k	-
A94	SPI_CLK	SPI Clock	O-3.3	-	-
A95	SPI_MOSI	SPI Master Out Slave In	O-3.3	PD 20k in PCH	resistor value can range from 15k0hm to 40k0hm
A96	TPM_PP	TPM Physical Presence	I-3.3	PD 100k	-
A97	TYPE10#	No Connect for type 6 modules	nc	-	-
A98	SER0_TX	Serial Port 0 TXD	O-3.3	-	20V protection circuit implemented on module, PD on carrier board needed for proper operation
A99	SER0_RX	Serial Port 0 RXD	I-5T	PU 47k 3.3V (S0)	20V protection circuit implemented on module
A100	GND	Power Ground	PWR GND	-	-
A101	SER1_TX	Serial Port 1 TXD	O-3.3	-	20V protection circuit implemented on module, PD on carrier board needed for proper operation
A102	SER1_RX	Serial Port 1 RXD	I-5T	PU 47k 3.3V (S0)	20V protection circuit implemented on module
A103	LID#	LID Switch Input	I-3.3	PU 47k 3.3V (S5)	20V protection circuit implemented on module
A104	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
A105	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
A106	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
A107	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
A108	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
A109	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
A110	GND	Power Ground	PWR GND	-	-

## 7.3 Connector X1A Row B

Pin	Signal	Description	Type	Termination	Comment
B1	GND	Power Ground	PWR GND	-	-
B2	GBEO_ACT	Ethernet Activity LED	OD	-	-
B3	LPC_FRAME#	LPC Frame Indicator	0-3.3	-	-
B4	LPC_AD0	LPC Multiplexed Command, Address & Data 0	I/O-3.3	PU 20k in PCH (S0)	resistor value can range from 15k0hm to 40k0hm
B5	LPC_AD1	LPC Multiplexed Command, Address & Data 1	I/O-3.3	PU 20k in PCH (S0)	resistor value can range from 15k0hm to 40k0hm
B6	LPC_AD2	LPC Multiplexed Command, Address & Data 2	I/O-3.3	PU 20k in PCH (S0)	resistor value can range from 15k0hm to 40k0hm
B7	LPC_AD3	LPC Multiplexed Command, Address & Data 3	I/O-3.3	PU 20k in PCH (S0)	resistor value can range from 15k0hm to 40k0hm
B8	LPC_DRQ0#	LPC Serial DMA/Master Request 0	I-3.3	PU 20k in PCH (S0)	resistor value can range from 15k0hm to 40k0hm
B9	LPC_DRQ1#	LPC Serial DMA/Master Request 1	I-3.3	PU 20k in PCH (S0)	resistor value can range from 15k0hm to 40k0hm
B10	LPC_CLK	33MHz LPC clock	0-3.3	-	-
B11	GND	Power Ground	PWR GND	-	-
B12	PWRBTN#	Power Button	I-3.3	PU 10k 3.3V (S5eco)	-
B13	SMB_CK	SMBUS Clock	0-3.3	PU 3k3 3.3V (S5)	-
B14	SMB_DAT	SMBUS Data	I/O-3.3	PU 3k3 3.3V (S5)	-
B15	SMB_ALERT#	SMBUS Alert	I/O-3.3	PU 10k0 3.3V (S5)	-
B16	SATA1_TX+	SATA 1 Transmit Pair +	DP-0	-	-
B17	SATA1_TX-	SATA 1 Transmit Pair -	DP-0	-	-
B18	SUS_STAT#	Suspend Status	0-3.3	-	-
B19	SATA1_RX+	SATA 1 Receive Pair +	DP-I	-	-
B20	SATA1_RX-	SATA 1 Receive Pair -	DP-I	-	-
B21	GND	Power Ground	PWR GND	-	-
B22	SATA3_TX+	SATA 3 Transmit Pair +	DP-0	-	-
B23	SATA3_TX-	SATA 3 Transmit Pair -	DP-0	-	-
B24	PWR_OK	Power OK	I-5T	PU 511k 3.3V	pullup voltage depends on ATX or single supply mode / 5V tolerant
B25	SATA3_RX+	SATA 3 Receive Pair +	DP-I	-	-
B26	SATA3_RX-	SATA 3 Receive Pair -	DP-I	-	-
B27	WDT	Watch Dog Time-Out event	0-3.3	-	-
B28	AC/HDA_SDIN2	HD Audio Serial Data In 2	I-3.3	PD 15k in PCH	resistor value can range from 9k0hm to 50k0hm
B29	AC/HDA_SDIN1	HD Audio Serial Data In 1	I-3.3	PD 15k in PCH	resistor value can range from 9k0hm to 50k0hm
B30	AC/HDA_SDIN0	HD Audio Serial Data In 0	I-3.3	PD 15k in PCH	resistor value can range from 9k0hm to 50k0hm
B31	GND	Power Ground	PWR GND	-	-
B32	SPKR	Speaker	0-3.3	PD 20k in PCH (S0)	resistor value can range from 15k0hm to 40k0hm, PCH strap function
B33	I2C_CK	I2C Clock	0-3.3	PU 2k21 3.3V (S5)	-
B34	I2C_DAT	I2C Data	I/O-3.3	PU 2k21 3.3V (S5)	-
B35	THRM#	Over Temperature Input	I-3.3	PU 10k 3.3V (S0)	no function implemented
B36	USB7-	USB 2.0 Data Pair Port 7 -	DP-I/O	PD 15K in PCH	resistor value can range from 14k0hm to 25k0hm
B37	USB7+	USB 2.0 Data Pair Port 7 +	DP-I/O	PD 15K in PCH	resistor value can range from 14k0hm to 25k0hm
B38	USB_4_5_OC#	USB Overcurrent Indicator Port 4/5	I-3.3	PU 10k 3.3V (S5)	-
B39	USB5-	USB 2.0 Data Pair Port 5 -	DP-I/O	PD 15K in PCH	resistor value can range from 14k0hm to 25k0hm
B40	USB5+	USB 2.0 Data Pair Port 5 +	DP-I/O	PD 15K in PCH	resistor value can range from 14k0hm to 25k0hm
B41	GND	Power Ground	PWR GND	-	-
B42	USB3-	USB 2.0 Data Pair Port 3 -	DP-I/O	PD 15K in PCH	resistor value can range from 14k0hm to 25k0hm
B43	USB3+	USB 2.0 Data Pair Port 3 +	DP-I/O	PD 15K in PCH	resistor value can range from 14k0hm to 25k0hm
B44	USB_0_1_OC#	USB Overcurrent Indicator Port 0/1	I-3.3	PU 10k 3.3V (S5)	-
B45	USB1-	USB 2.0 Data Pair Port 1 -	DP-I/O	PD 15K in PCH	resistor value can range from 14k0hm to 25k0hm
B46	USB1+	USB 2.0 Data Pair Port 1 +	DP-I/O	PD 15K in PCH	resistor value can range from 14k0hm to 25k0hm
B47	EXCD1_PERST#	Express Card Reset Port 1	0-3.3	-	-
B48	EXCD1_CPPE#	Express Card Capable Card Request Port 1	I-3.3	PU 10k 3.3V (S0)	-
B49	SYS_RESET#	Reset Button Input	I-3.3	PU 10k 3.3V (S5)	-
B50	CB_RESET#	Carrier Board Reset	0-3.3	-	-
B51	GND	Power Ground	PWR GND	-	-
B52	PCIE_RX5+	PCI Express Lane 5 Receive +	DP-I	-	-
B53	PCIE_RX5-	PCI Express Lane 5 Receive -	DP-I	-	-
B54	GPO1	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	GPO2	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 GND	-	-
B61	PCIE_RX2+	PCI Express Lane 2 Receive +	DP-I	-	-
B62	PCIE_RX2-	PCI Express Lane 2 Receive -	DP-I	-	-



B63	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#	PCI Express Wake Event	I-3.3	PU 10k 3.3V (S5)	-
B67	WAKE1#	General Purpose Wake Event	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 GND	-	-
B71	LVDS_B0+	LVDS Channel B Data0 +	DP-0	-	-
B72	LVDS_B0-	LVDS Channel B Data0 -	DP-0	-	-
B73	LVDS_B1+	LVDS Channel B Data1 +	DP-0	-	-
B74	LVDS_B1-	LVDS Channel B Data1 -	DP-0	-	-
B75	LVDS_B2+	LVDS Channel B Data2 +	DP-0	-	-
B76	LVDS_B2-	LVDS Channel B Data2 -	DP-0	-	-
B77	LVDS_B3+	LVDS Channel B Data3 +	DP-0	-	-
B78	LVDS_B3-	LVDS Channel B Data3 -	DP-0	-	-
B79	LVDS_BKLT_EN	Panel Backlight On	0-3.3	PD 100k	configuration as eDP_BKLT_EN in customised article version possible
B80	GND	Power Ground	PWR GND	-	-
B81	LVDS_B_CLK+	LVDS Channel B Clock +	DP-0	-	-
B82	LVDS_B_CLK-	LVDS Channel B Clock -	DP-0	-	-
B83	LVDS_BKLT_CTRL	Backlight Brightness Control	0-3.3	-	-
B84	VCC_5V_SBY	5V Standby	PWR 5V (S5)	-	optional (not necessary in single supply mode)
B85	VCC_5V_SBY	5V Standby	PWR 5V (S5)	-	optional (not necessary in single supply mode)
B86	VCC_5V_SBY	5V Standby	PWR 5V (S5)	-	optional (not necessary in single supply mode)
B87	VCC_5V_SBY	5V Standby	PWR 5V (S5)	-	optional (not necessary in single supply mode)
B88	BIOS_DIS1#	BIOS Selection Strap 1	I-3.3	PU 10k 3.3V (SPI)	PU might be powered during suspend
B89	VGA_RED	Red Analog Video Output	OA	PD 150R	-
B90	GND	Power Ground	PWR GND	-	-
B91	VGA_GRN	Green Analog Video Output	OA	PD 150R	-
B92	VGA_BLU	Blue Analog Video Output	OA	PD 150R	-
B93	VGA_HSYnc	VGA Horizontal Synchronisation	0-3.3	-	-
B94	VGA_VSYnc	VGA Vertical Synchronization	0-3.3	-	-
B95	VGA_I2C_CLK	VGA Data Channel Clock	I/O-3.3	PU 1k1 3.3V (S0)	-
B96	VGA_I2C_DAT	VGA Data Channel Data	I/O-3.3	PU 1k1 3.3V (S0)	-
B97	SPI_CS#	SPI Chip Select	0-3.3	-	-
B98	RSVD	Reserved for future use	nc	-	-
B99	RSVD	Reserved for future use	nc	-	-
B100	GND	Power Ground	PWR GND	-	-
B101	FAN_PWMOUT	Fan PWM Output	0-3.3	-	20V protection circuit implemented on module, PD on carrier board needed for proper operation
B102	FAN_TACHIN	Fan Tach Input	I-3.3	PU 47k 3.3V (S0)	20V protection circuit implemented on module
B103	SLEEP#	Sleep Button Input	I-3.3	PU 47k 3.3V (S5)	20V protection circuit implemented on module
B104	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
B105	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
B106	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
B107	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
B108	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
B109	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
B110	GND	Power Ground	PWR GND	-	-

## 7.4 Connector X1B Row C

Pin	Signal	Description	Type	Termination	Comment
C1	GND	Power Ground	PWR GND	-	-
C2	GND	Power Ground	PWR GND	-	-
C3	USB_SSRX0-	USB Super Speed Receive Port 0 -	DP-I	-	-
C4	USB_SSRX0+	USB Super Speed Receive Port 0 +	DP-I	-	-
C5	GND	Power Ground	PWR GND	-	-
C6	USB_SSRX1-	USB Super Speed Receive Port 1 -	DP-I	-	-
C7	USB_SSRX1+	USB Super Speed Receive Port 1 +	DP-I	-	-
C8	GND	Power Ground	PWR GND	-	-
C9	USB_SSRX2-	USB Super Speed Receive Port 2 -	DP-I	-	-
C10	USB_SSRX2+	USB Super Speed Receive Port 2 +	DP-I	-	-
C11	GND	Power Ground	PWR GND	-	-
C12	USB_SSRX3-	USB Super Speed Receive Port 3 -	DP-I	-	-
C13	USB_SSRX3+	USB Super Speed Receive Port 3 +	DP-I	-	-
C14	GND	Power Ground	PWR GND	-	-
C15	DDI1_PAIR6+	DDI1 Pair 6 +	DP-I	-	-
C16	DDI1_PAIR6-	DDI1 Pair 6 -	DP-I	-	-
C17	RSVD	Reserved for future use	nc	-	-
C18	RSVD	Reserved for future use	nc	-	-
C19	PCIE_RX6+	PCI Express Lane 6 Receive +	DP-I	-	-
C20	PCIE_RX6-	PCI Express Lane 6 Receive -	DP-I	-	-
C21	GND	Power Ground	PWR GND	-	-
C22	PCIE_RX7+	No Connect (opt. PCI Express Lane 7 Receive +)	nc (opt. DP-I)	-	configuration as PCIE_RX7+ in customised article version without LAN controller possible
C23	PCIE_RX7-	No Connect (opt. PCI Express Lane 7 Receive -)	nc (opt. DP-I)	-	configuration as PCIE_RX7- in customised article version without LAN controller possible
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	Reserved for future use	nc	-	-
C28	RSVD	Reserved for future use	nc	-	-
C29	DDI1_PAIR5+	DDI1 Pair 5 +	DP-I	-	-
C30	DDI1_PAIR5-	DDI1 Pair 5 -	DP-I	-	-
C31	GND	Power Ground	PWR GND	-	-
C32	DDI2_CTRLCLK_AUX+	Multiplexed DDI2 Data Channel Clock & AUX +	I/O-3.3	PD 100k	2k21 PU (S0) when DDI2_DDC_AUX_SEL is high
C33	DDI2_CTRLCLK_AUX-	Multiplexed DDI2 Data Channel Clock & AUX -	I/O-3.3	PU 100k (S0)	2k21 PU (S0) when DDI2_DDC_AUX_SEL is high
C34	DDI2_DDC_AUX_SEL	DDI2 DDC/AUX Select	I-3.3	PD 1M	-
C35	RSVD	Reserved for future use	nc	-	-
C36	DDI3_CTRLCLK_AUX+	Multiplexed DDI3 Data Channel Clock & AUX +	I/O-3.3	PD 100k	2k21 PU (S0) when DDI3_DDC_AUX_SEL is high
C37	DDI3_CTRLCLK_AUX-	Multiplexed DDI3 Data Channel Clock & AUX -	I/O-3.3	PU 100k (S0)	2k21 PU (S0) when DDI3_DDC_AUX_SEL is high
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 GND	-	-
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	Reserved for future use	nc	-	-
C46	DDI3_PAIR2+	DDI3 Pair 2 +	DP-0	-	-
C47	DDI3_PAIR2-	DDI3 Pair 2 -	DP-0	-	-
C48	RSVD	Reserved for future use	nc	-	-
C49	DDI3_PAIR3+	DDI3 Pair 3 +	DP-0	-	-
C50	DDI3_PAIR3-	DDI3 Pair 3 -	DP-0	-	-
C51	GND	Power Ground	PWR GND	-	-
C52	PEG_RX0+	PCI Express Graphics Lane 0 Receive +	DP-I	-	-
C53	PEG_RX0-	PCI Express Graphics Lane 0 Receive -	DP-I	-	-
C54	TYPE0#	No Connect for type 6 module	nc	-	-
C55	PEG_RX1+	PCI Express Graphics Lane 1 Receive +	DP-I	-	-
C56	PEG_RX1-	PCI Express Graphics Lane 1 Receive -	DP-I	-	-
C57	TYPE1#	No Connect for type 6 module	nc	-	-
C58	PEG_RX2+	PCI Express Graphics Lane 2 Receive +	DP-I	-	-
C59	PEG_RX2-	PCI Express Graphics Lane 2 Receive -	DP-I	-	-
C60	GND	Power Ground	PWR GND	-	-
C61	PEG_RX3+	PCI Express Graphics Lane 3 Receive +	DP-I	-	-
C62	PEG_RX3-	PCI Express Graphics Lane 3 Receive -	DP-I	-	-

C63	RSVD	Reserved for future use	nc	-	-
C64	RSVD	Reserved for future use	nc	-	-
C65	PEG_RX4+	PCI Express Graphics Lane 4 Receive +	DP-I	-	-
C66	PEG_RX4-	PCI Express Graphics Lane 4 Receive -	DP-I	-	-
C67	RSVD	Reserved for future use	nc	-	-
C68	PEG_RX5+	PCI Express Graphics Lane 5 Receive +	DP-I	-	-
C69	PEG_RX5-	PCI Express Graphics Lane 5 Receive -	DP-I	-	-
C70	GND	Power Ground	PWR GND	-	-
C71	PEG_RX6+	PCI Express Graphics Lane 6 Receive +	DP-I	-	-
C72	PEG_RX6-	PCI Express Graphics Lane 6 Receive -	DP-I	-	-
C73	GND	Power Ground	PWR GND	-	-
C74	PEG_RX7+	PCI Express Graphics Lane 7 Receive +	DP-I	-	-
C75	PEG_RX7-	PCI Express Graphics Lane 7 Receive -	DP-I	-	-
C76	GND	Power Ground	PWR GND	-	-
C77	RSVD	Reserved for future use	nc	-	-
C78	PEG_RX8+	PCI Express Graphics Lane 8 Receive +	DP-I	-	-
C79	PEG_RX8-	PCI Express Graphics Lane 8 Receive -	DP-I	-	-
C80	GND	Power Ground	PWR GND	-	-
C81	PEG_RX9+	PCI Express Graphics Lane 9 Receive +	DP-I	-	-
C82	PEG_RX9-	PCI Express Graphics Lane 9 Receive -	DP-I	-	-
C83	RSVD	Reserved for future use	nc	-	-
C84	GND	Power Ground	PWR GND	-	-
C85	PEG_RX10+	PCI Express Graphics Lane 10 Receive +	DP-I	-	-
C86	PEG_RX10-	PCI Express Graphics Lane 10 Receive -	DP-I	-	-
C87	GND	Power Ground	PWR GND	-	-
C88	PEG_RX11+	PCI Express Graphics Lane 11 Receive +	DP-I	-	-
C89	PEG_RX11-	PCI Express Graphics Lane 11 Receive -	DP-I	-	-
C90	GND	Power Ground	PWR GND	-	-
C91	PEG_RX12+	PCI Express Graphics Lane 12 Receive +	DP-I	-	-
C92	PEG_RX12-	PCI Express Graphics Lane 12 Receive -	DP-I	-	-
C93	GND	Power Ground	PWR GND	-	-
C94	PEG_RX13+	PCI Express Graphics Lane 13 Receive +	DP-I	-	-
C95	PEG_RX13-	PCI Express Graphics Lane 13 Receive -	DP-I	-	-
C96	GND	Power Ground	PWR GND	-	-
C97	RSVD	Reserved for future use	nc	-	-
C98	PEG_RX14+	PCI Express Graphics Lane 14 Receive +	DP-I	-	-
C99	PEG_RX14-	PCI Express Graphics Lane 14 Receive -	DP-I	-	-
C100	GND	Power Ground	PWR GND	-	-
C101	PEG_RX15+	PCI Express Graphics Lane 15 Receive +	DP-I	-	-
C102	PEG_RX15-	PCI Express Graphics Lane 15 Receive -	DP-I	-	-
C103	GND	Power Ground	PWR GND	-	-
C104	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
C105	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
C106	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
C107	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
C108	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
C109	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
C110	GND	Power Ground	PWR GND	-	-

## 7.5 Connector X1B Row D

Pin	Signal	Description	Type	Termination	Comment
D1	GND	Power Ground	PWR GND	-	-
D2	GND	Power Ground	PWR GND	-	-
D3	USB_SSTX0-	USB Super Speed Transmit Port 0 -	DP-0	-	-
D4	USB_SSTX0+	USB Super Speed Transmit Port 0 +	DP-0	-	-
D5	GND	Power Ground	PWR GND	-	-
D6	USB_SSTX1-	USB Super Speed Transmit Port 1 -	DP-0	-	-
D7	USB_SSTX1+	USB Super Speed Transmit Port 1 +	DP-0	-	-
D8	GND	Power Ground	PWR GND	-	-
D9	USB_SSTX2-	USB Super Speed Transmit Port 2 -	DP-0	-	-
D10	USB_SSTX2+	USB Super Speed Transmit Port 2 +	DP-0	-	-
D11	GND	Power Ground	PWR GND	-	-
D12	USB_SSTX3-	USB Super Speed Transmit Port 3 -	DP-0	-	-
D13	USB_SSTX3+	USB Super Speed Transmit Port 3 +	DP-0	-	-
D14	GND	Power Ground	PWR GND	-	-
D15	DDI1_CTRLCLK_AUX+	Multiplexed DDI1 Data Channel Clock & AUX +	I/O-3.3	PD 100k	2k21 PU (S0) when DDI1_DDC_AUX_SEL is high
D16	DDI1_CTRLCLK_AUX-	Multiplexed DDI1 Data Channel Clock & AUX -	I/O-3.3	PU 100k (S0)	2k21 PU (S0) when DDI1_DDC_AUX_SEL is high
D17	RSVD	Reserved for future use	nc	-	-
D18	RSVD	Reserved for future use	nc	-	-
D19	PCIE_TX6+	PCI Express Lane 6 Transmit +	DP-0	-	-
D20	PCIE_TX6-	PCI Express Lane 6 Transmit -	DP-0	-	-
D21	GND	Power Ground	PWR GND	-	-
D22	PCIE_TX7+	No Connect (opt. PCI Express Lane 7 Transmit +)	nc (opt. DP-0)	-	configuration as PCIE_RX7+ in customised article version without LAN controller possible
D23	PCIE_TX7-	No Connect (opt. PCI Express Lane 7 Transmit -)	nc (opt. DP-0)	-	configuration as PCIE_RX7- in customised article version without LAN controller possible
D24	RSVD	Reserved for future use	nc	-	-
D25	RSVD	Reserved for future use	nc	-	-
D26	DDI1_PAIR0+	DDI1 Pair 0 +	DP-0	-	-
D27	DDI1_PAIR0-	DDI1 Pair 0 -	DP-0	-	-
D28	RSVD	Reserved for future use	nc	-	-
D29	DDI1_PAIR1+	DDI1 Pair 1 +	DP-0	-	-
D30	DDI1_PAIR1-	DDI1 Pair 1 -	DP-0	-	-
D31	GND	Power Ground	PWR GND	-	-
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	Reserved for future use	nc	-	-
D36	DDI1_PAIR3+	DDI1 Pair 3 +	DP-0	-	-
D37	DDI1_PAIR3-	DDI1 Pair 3 -	DP-0	-	-
D38	RSVD	Reserved for future use	PWR GND	-	pin might change to Not Connect (nc) in later product revision
D39	DDI2_PAIR0+	DDI2 Pair 0 +	DP-0	-	-
D40	DDI2_PAIR0-	DDI2 Pair 0 -	DP-0	-	-
D41	GND	Power Ground	PWR GND	-	-
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	Reserved for future use	nc	-	-
D46	DDI2_PAIR2+	DDI2 Pair 2 +	DP-0	-	-
D47	DDI2_PAIR2-	DDI2 Pair 2 -	DP-0	-	-
D48	RSVD	Reserved for future use	nc	-	-
D49	DDI2_PAIR3+	DDI2 Pair 3 +	DP-0	-	-
D50	DDI2_PAIR3-	DDI2 Pair 3 -	DP-0	-	-
D51	GND	Power Ground	PWR GND	-	-
D52	PEG_TX0+	PCI Express Graphics Lane 0 Transmit +	DP-0	-	-
D53	PEG_TX0-	PCI Express Graphics Lane 0 Transmit -	DP-0	-	-
D54	PEG_Lane_RV#	PCI Express Graphics Lane Reversal	I-3.3	PU 10k 3.3V (S0)	-
D55	PEG_TX1+	PCI Express Graphics Lane 1 Transmit +	DP-0	-	-
D56	PEG_TX1-	PCI Express Graphics Lane 1 Transmit -	DP-0	-	-
D57	TYPE2#	GND for type 6 module	O-PWR	-	-
D58	PEG_TX2+	PCI Express Graphics Lane 2 Transmit +	DP-0	-	-
D59	PEG_TX2-	PCI Express Graphics Lane 2 Transmit -	DP-0	-	-
D60	GND	Power Ground	PWR GND	-	-
D61	PEG_TX3+	PCI Express Graphics Lane 3 Transmit +	DP-0	-	-
D62	PEG_TX3-	PCI Express Graphics Lane 3 Transmit -	DP-0	-	-

D63	RSVD	Reserved for future use	nc	-	-
D64	RSVD	Reserved for future use	nc	-	-
D65	PEG_TX4+	PCI Express Graphics Lane 4 Transmit +	DP-0	-	-
D66	PEG_TX4-	PCI Express Graphics Lane 4 Transmit -	DP-0	-	-
D67	GND	Power Ground	PWR GND	-	-
D68	PEG_TX5+	PCI Express Graphics Lane 5 Transmit +	DP-0	-	-
D69	PEG_TX5-	PCI Express Graphics Lane 5 Transmit -	DP-0	-	-
D70	GND	Power Ground	PWR GND	-	-
D71	PEG_TX6+	PCI Express Graphics Lane 6 Transmit +	DP-0	-	-
D72	PEG_TX6-	PCI Express Graphics Lane 6 Transmit -	DP-0	-	-
D73	GND	Power Ground	PWR GND	-	-
D74	PEG_TX7+	PCI Express Graphics Lane 7 Transmit +	DP-0	-	-
D75	PEG_TX7-	PCI Express Graphics Lane 7 Transmit -	DP-0	-	-
D76	GND	Power Ground	PWR GND	-	-
D77	RSVD	Reserved for future use	nc	-	-
D78	PEG_TX8+	PCI Express Graphics Lane 8 Transmit +	DP-0	-	-
D79	PEG_TX8-	PCI Express Graphics Lane 8 Transmit -	DP-0	-	-
D80	GND	Power Ground	PWR GND	-	-
D81	PEG_TX9+	PCI Express Graphics Lane 9 Transmit +	DP-0	-	-
D82	PEG_TX9-	PCI Express Graphics Lane 9 Transmit -	DP-0	-	-
D83	RSVD	Reserved for future use	nc	-	-
D84	GND	Power Ground	PWR GND	-	-
D85	PEG_TX10+	PCI Express Graphics Lane 10 Transmit +	DP-0	-	-
D86	PEG_TX10-	PCI Express Graphics Lane 10 Transmit -	DP-0	-	-
D87	GND	Power Ground	PWR GND	-	-
D88	PEG_TX11+	PCI Express Graphics Lane 11 Transmit +	DP-0	-	-
D89	PEG_TX11-	PCI Express Graphics Lane 11 Transmit -	DP-0	-	-
D90	GND	Power Ground	PWR GND	-	-
D91	PEG_TX12+	PCI Express Graphics Lane 12 Transmit +	DP-0	-	-
D92	PEG_TX12-	PCI Express Graphics Lane 12 Transmit -	DP-0	-	-
D93	GND	Power Ground	PWR GND	-	-
D94	PEG_TX13+	PCI Express Graphics Lane 13 Transmit +	DP-0	-	-
D95	PEG_TX13-	PCI Express Graphics Lane 13 Transmit -	DP-0	-	-
D96	GND	Power Ground	PWR GND	-	-
D97	RSVD	Reserved for future use	nc	-	-
D98	PEG_TX14+	PCI Express Graphics Lane 14 Transmit +	DP-0	-	-
D99	PEG_TX14-	PCI Express Graphics Lane 14 Transmit -	DP-0	-	-
D100	GND	Power Ground	PWR GND	-	-
D101	PEG_TX15+	PCI Express Graphics Lane 15 Transmit +	DP-0	-	-
D102	PEG_TX15-	PCI Express Graphics Lane 15 Transmit -	DP-0	-	-
D103	GND	Power Ground	PWR GND	-	-
D104	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
D105	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
D106	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
D107	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
D108	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
D109	VCC_12V	Main Input Voltage (8.5-20V)	PWR 8.5-20V	-	-
D110	GND	Power Ground	PWR GND	-	-



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 BIOS (Basic Input and Output System) or UEFI (Unified Extensible Firmware Interface) records hardware parameters of the system in the CMOS on the Computer-on-Module. It's major functions include execution of the POST (Power-On-Self-Test) during system start-up, saving system parameters and loading the operating system. The BIOS includes a BIOS Setup program that allows to modify system configuration settings. The module is equipped with Phoenix SecureCore, which is located in an onboard SPI serial flash memory.

### 8.1 Determining the BIOS Version

To determine the BIOS version currently used on the Computer-on-Modules please check System Information Page inside Setup

### 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 detailed change descriptions 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 4-16MB 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!

### 8.3 POST Codes

Important POST codes during boot-up

8B	Booted to DOS
68	Booted to Setup / EFI Shell
00	Booted to Windows

### 8.4 Setup Guide

The 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:

[F2]	Enter Setup
[F5]	Boot Menu
[ESC] + [2]	Enter Setup via Remote Keyboard in Console Redirection Mode (depending on console Settings F2 may not be supported)

Functional keystrokes in Setup:

[F1]	Help
[F9]	Load default settings
[F10]	Save and Exit

## 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.
+/- or F5/F6	Change Option
<Enter>	Execute command or select submenu.

## 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.

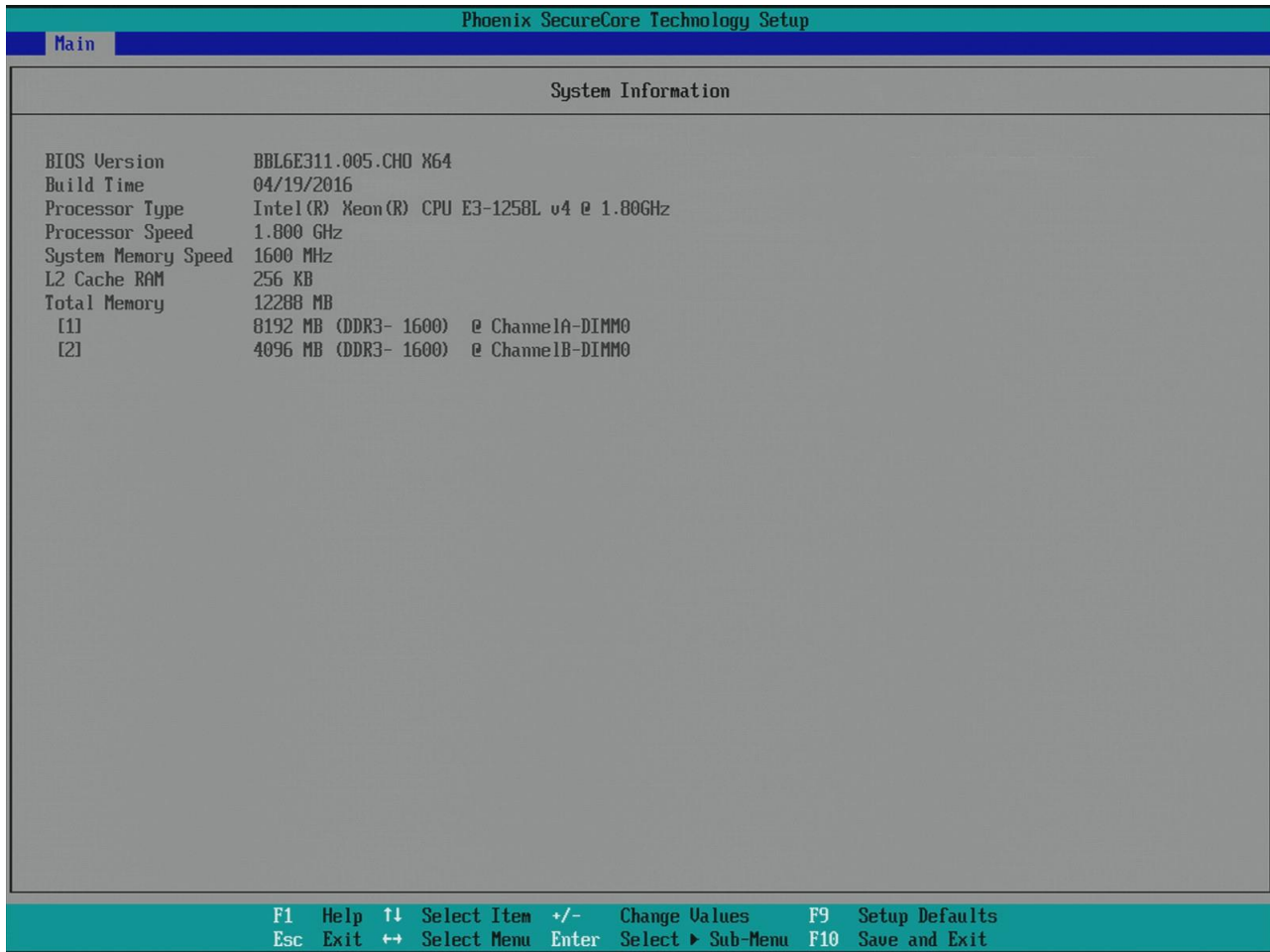
## 8.5 BIOS Setup

### 8.5.1 Main

Phoenix SecureCore Technology Setup			
Main	Advanced	Security	Boot Exit
System Date [01/01/2015] System Time [00:36:45] ▶ System Information ▶ Boot Features ▶ Network Stack ▶ Platform Information			Item Specific Help  View or set system date.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ▶ Sub-Menu F10 Save and Exit			
Feature	Options	Description	
System Date	[mm/dd/yyyy]	View or set system date. Use 'Tab' to switch between date elements	
System Time	[hh:mm:ss]	View or set system time. Use 'Tab' to switch between time elements	
System Information	-	Display »System Information«	
Boot Features	-	Select »Boot Features«	
Network Stack	-	Submenu »Network Stack«	
Platform Information	-	Submenu »Platform Information«	



## System Information



In this submenu system-related information, such as

- » BIOS Version
- » Build Time
- » Processor Type
- » Processor Speed
- » System Memory Speed
- » L2 Cache RAM
- » Total Memory
- » ChannelA-DIMM0
- » ChannelB-DIMM0

are listed.

## Boot Features

Phoenix SecureCore Technology Setup		
Main		
Boot Features		Item Specific Help
NumLock: [On] Timeout [ 1] CSM Support [Yes] Quick Boot [Disabled] Dark Boot [Disabled] Diagnostic Splash Screen [Disabled] Diagnostic Summary Screen [Disabled] BIOS Level USB [Enabled] USB Legacy [Enabled] Console Redirection [Disabled] Allow Hotkey in S4 resume [Enabled] UEFI Boot [Enabled] On Shell Exit [Try next] Legacy Boot [Enabled] Boot in Legacy Video Mode [Disabled] Load OPROM [On Demand]		Selects Power-on state for NumLock.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		
Feature	Options	Description
NumLock	On Off	Selects Power-on state for NumLock
Timeout	1	Number of seconds that P.O.S.T will wait for the user input before booting
CSM Support	Yes No	Compatibility Support Module that provide backward compatibility services for legacy BIOS services, like int10/int13, dependent OS
Quick Boot	Disabled Enabled	Enable/Disable Quick Boot
Dark Boot	Disabled Enabled	Enable/Disable Dark Boot
Diagnostic Splash Screen	Disabled Enabled	Enable/Disable the Diagnostic Splash Screen during boot
Diagnostic Summary Screen	Disabled Enabled	Display the Diagnostic Summary Screen during boot
BIOS Level USB	Enabled Disabled	Enable/Disable all BIOS support for USB in order to reduce boot time. Note that this will prevent using a USB keyboard in setup or a USB biometric scanner such as a fingerprint reader to control access to setup, but does not prevent the operating system from supporting such hardware
USB Legacy	Enabled Disabled	Enable/Disable USB BIOS SMM support for mouse, keyboard, mass storage etc, in legacy operating systems such as DOS
Console Redirection	Disabled Enabled	Enable/Disable Universal Console Redirection
- Console Port	All Onboard COM1 Onboard COM2 SIO COM1 SIO COM2	Select Port for console redirection. Note: The respective port has to be enabled in setup!
- Terminal Type	ANSI VT100 VT100+ UTF8	Set terminal type of UCR

- Baudrate	9600 19200 38400 57600 <b>115200</b>	Set baudrate of UCR
- Flow Control	<b>None</b> RTS/CTS XON/XOFF	Set flow control method for UCR. None = No flow control, RTS/CTS = Hardware flow control, XON/XOFF = Software flow control
- Continue C.R. after POST	<b>Enabled</b> Disabled	Enables Console Redirection after OS has loaded
Allow Hotkey in S4 resume	<b>Enabled</b> Disabled	Enable hotkey detection when system resuming from Hibernate state
UEFI Boot	<b>Enabled</b> Disabled	Enable the UEFI boot
On Shell Exit	<b>Try next</b> Launch Setup Launch Boot Menu	Select behavior after exit from shell
Legacy Boot	<b>Enabled</b> Disabled	Enable the Legacy boot
Boot in Legacy Video Mode	<b>Disabled</b> Enabled	Enable to force the display adapter to switch the video mode to Text Mode 3 at the end of BIOS POST for non-UEFI boot mode (Legacy Boot). Some legacy software, such as DUET, requires that the BIOS explicitly enter text video mode prior to boot
Load OPROM	<b>On Demand</b> All	Load all OPROMs or on demand according to the boot device

Network Stack

Phoenix SecureCore Technology Setup

Main

Network Stack		Item Specific Help
Network Stack	[Enabled]	Enable/Disable UEFI Network Stack
IPv4	[Enabled]	
UEFI PXE Boot Priority	[IPv4 First]	

F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults  
Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit

Feature	Options	Description
Network Stack	Enabled Disabled	Enable/Disable UEFI Network Stack
IPv4	Enabled Disabled	Enable/Disable IPv4
UEFI PXE Boot Priority	IPv4 first	Select PXE Boot Priority (IPv4 only)

## Platform Information

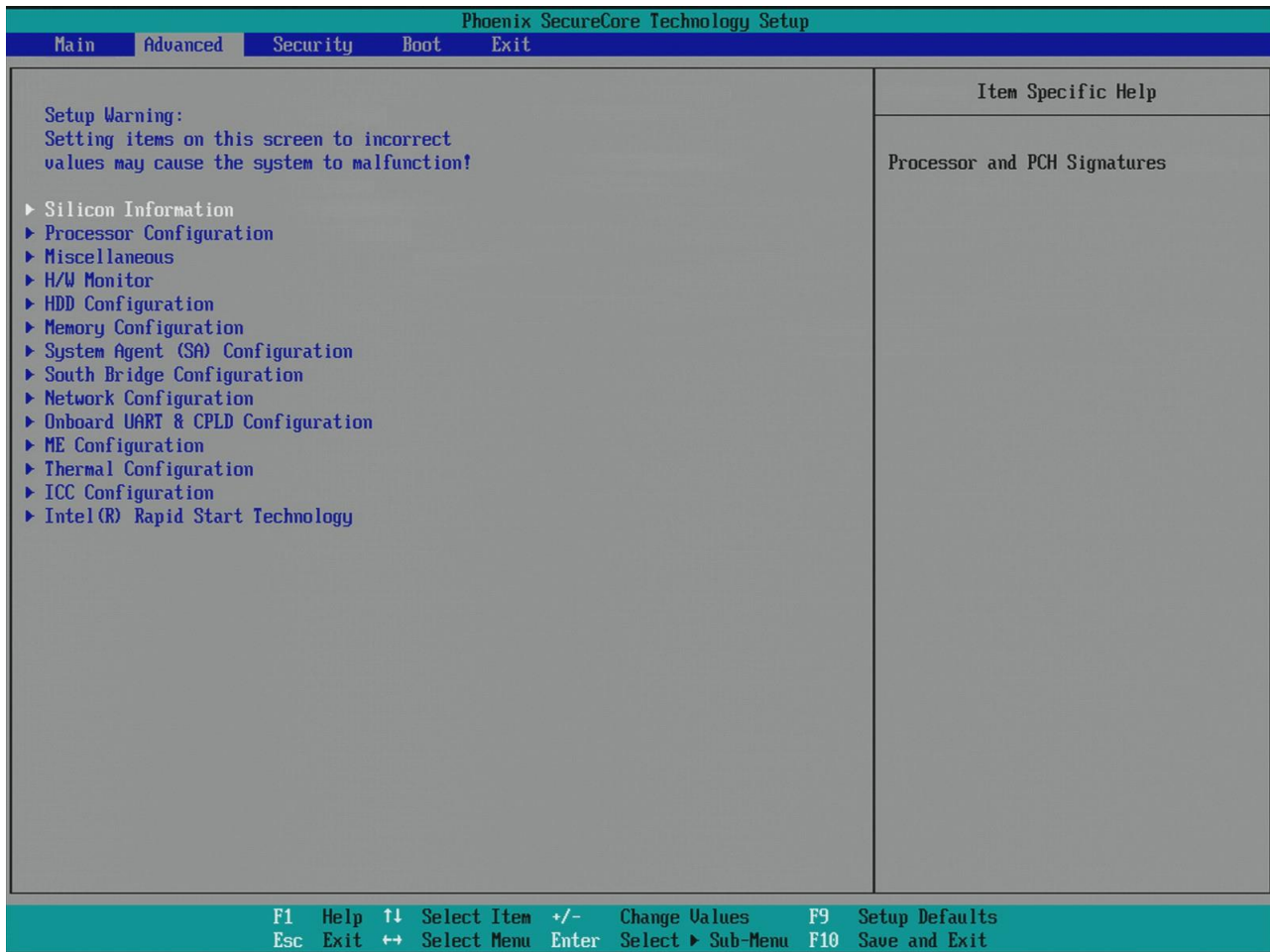
Phoenix SecureCore Technology Setup	
Main	
Platform Information	Item Specific Help
Module Information Product Name COMe-bBL6RXT Revision 1.0.0 Serial # NLD1A0004 MAC Address 00:E0:4B:54:A0:45 CPLD Rev P107.002E Release Boot Counter 177	Platform Information
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit	

In this submenu platform-related information, such as

- » Product Name
- » Revision
- » Serial #
- » MAC Address
- » CPLD Rev
- » Boot Counter

are listed.

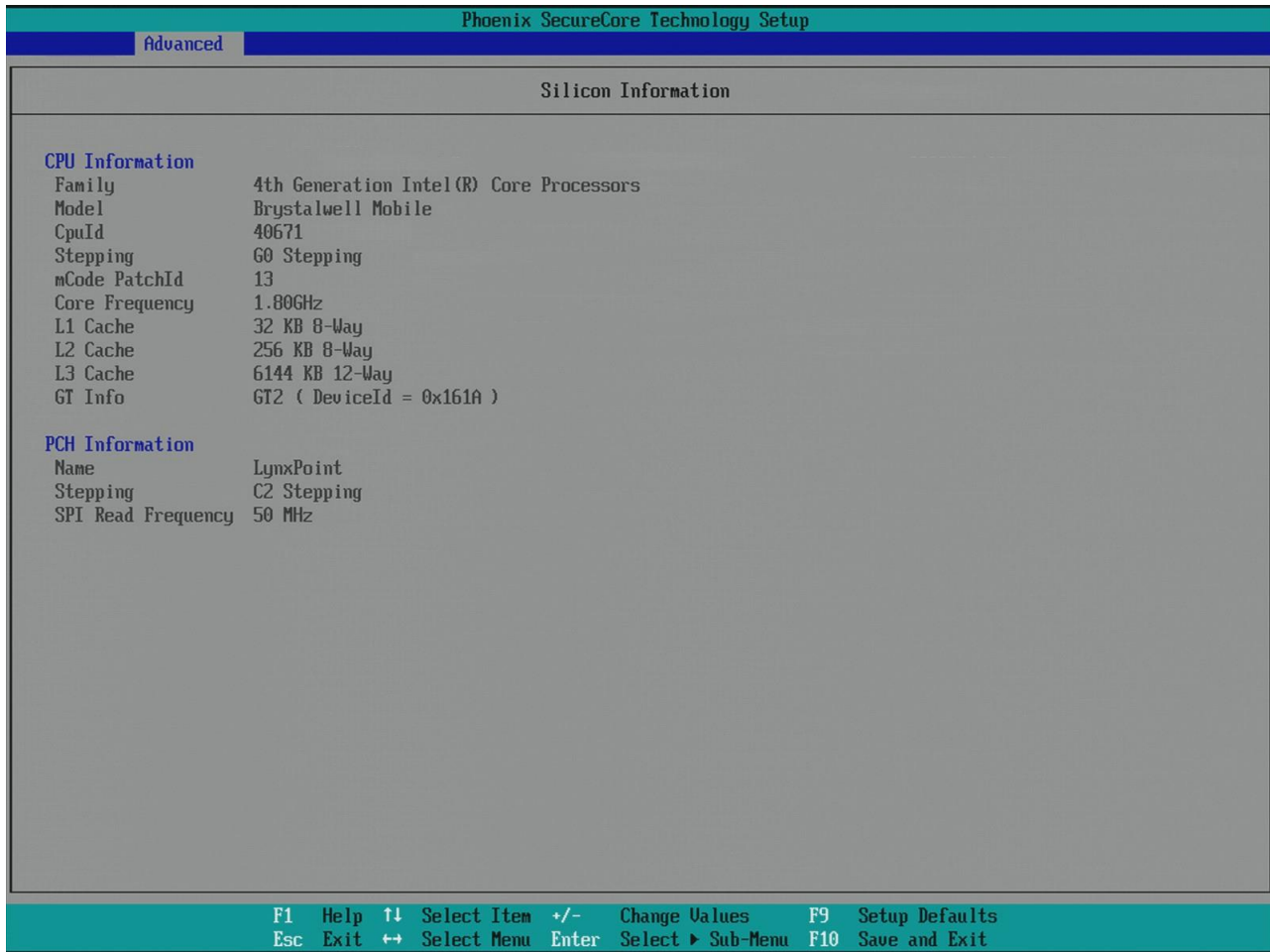
## 8.5.2 Advanced



Setup Warning: Setting items on this screen to incorrect values may cause the system to malfunction!

Feature	Options	Description
Silicon Information	-	Submenu »Silicon Information« for processor and PCH signatures
Processor Configuration	-	Set »Processor Configuration«
Miscellaneous	-	»Miscellaneous« Configuration
H/W Monitor	-	»H/W Monitor« status
HDD Configuration	-	Set »HDD Configuration«
Memory Configuration	-	Display/Change »Memory Configuration«
System Agent (SA) Configuration	-	Display/Change »System Agent (SA) Configuration«
South Bridge Configuration	-	Set »South Bridge Configuration«
Network Configuration	-	Submenu »Network Configuration« for PCH internal LAN
Onboard UART & CPLD Configuration	-	Set »Onboard UART & CPLD Configuration«
ME Configuration	-	Submenu »ME Configuration«
Thermal Configuration	-	Submenu »Thermal Configuration«
ICC Configuration	-	Submenu »ICC Configuration«
Intel® Rapid Start Technology	-	»Intel® Rapid Start Technology« configuration

## Silicon Information



In this submenu further information regarding the populated CPU and PCH, such as

- » CPU Family
- » CPU Model
- » CPU ID
- » CPU Stepping
- » PatchID
- » Core Frequency
- » L1 Cache
- » L2 Cache
- » L3 Cache
- » GT Info
- » PCH Name
- » PCH Stepping
- » SPI Read Frequency

are listed.

## Processor Configuration

Phoenix SecureCore Technology Setup		
Advanced		
Processor Configuration		Item Specific Help
Active Processor Cores <b>[All]</b> Intel(R) HT Technology [Enabled] CPU Flex Ratio Override [Disabled] Enabled XD [Enabled] Intel(R) Virtualization Technology [Enabled] ▶ Processor Power Management		Number of cores to enable in each processor package.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ▶ Sub-Menu F10 Save and Exit		
Feature	Options	Description
Active Processor Cores	All 1 2 3	Number of cores to enable in each processor package
Intel® HT Technology	Enabled Disabled	When Disabled only one thread per enabled core is enabled
CPU Flex Ratio Override	Disabled Enabled	Enable/Disable CPU Flex Ratio Programming. If Disabled, CPU frequency is set to maximum Ratio automatically
- CPU Flex Ratio Settings	26	This value must be between Max Efficiency Ratio (LFM / Low Frequency Mode) and Maximum non-turbo ratio set by Hardware (HFM / High Frequency Mode). See CPU Featureset in chapter Specifications for possible Bus/Core Ratio Settings. The active nominal CPU frequency is Ratio*100MHz
Enabled XD	Enabled Disabled	Enables/Disables 'Execute Disable functionality', also known as Data Execution Prevention (DEP)
Intel® Virtualization Technology	Enabled Disabled	When enabled, a VMM can utilize the additional hardware capabilities
Processor Power Management	-	»Processor Power Management« configuration



## Processor Power Management

Phoenix SecureCore Technology Setup		
Advanced		
Processor Power Management		Item Specific Help
Intel(R) SpeedStep(tm)	[Enabled]	Enable processor performance states (P-States) .
Boot Performance Mode	[Max Performance]	
Turbo Mode	[Enabled]	
Turbo Mode Power Limit Lock	[Disabled]	
Long Power Limit	[ 0]	
Long Power Limit Time	[ 0]	
Short Power Limit	[ 0]	
Short Duration Turbo Mode	[Enabled]	
Power Limit 3	[ 0]	
Power Limit 3 Time	[ 0]	
Power Limit 3 Duty Cycle	[ 0]	
Energy Efficient Enable	[Enabled]	
C-States	[Enabled]	
Extend C-States	[Enabled]	
C3-State	[Enabled]	
C6-State	[Enabled]	
C6 Latency	[Short]	
C7-State	[C7s]	
C7 Latency	[Long]	
C-State Auto Demotion	[C1 and C3]	
C-State Undemotion	[C1 and C3]	
Package C State Demotion	[Disabled]	
Package C State Undemotion	[Disabled]	
C State Pre-Wake	[Enabled]	
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ▶ Sub-Menu F10 Save and Exit		
Feature	Options	Description
Intel® SpeedStep(TM)	Enabled Disabled	Enable/Disable processor performance states (P-States)
Boot Performance Mode	Max Performance Max Battery Auto	Select the performance state that the BIOS sets before OS hand-off
Turbo Mode	Enabled Disabled	Enable processor Turbo Mode. EMTM must also be enabled
- Turbo Mode Power Limit Lock	Disabled Enabled	Enable/Disable Locking of turbo settings. When enabled, Turbo_Power_Limit MSR will be locked and a reset will be required to unlock the register
- Long Power Limit	0	Turbo Mode Long Duration Power Limit (also known as Power Limit PL1) in Watts. The value may vary from 0 to Fused Value. If the value is 0, the fused value will be programmed. A value greater than fused TDP value will not be programmed
- Long Power Limit Time	0	Long Duration Time Windows (also known as Power Limit PL1 Time) value in seconds. The value may vary from 0 to 56. Indicates the time window over which TDP value should be maintained. If the value is 0, the fused value will be programmed
- Short Power Limit	0	Turbo Mode Short Duration Power Limit (also known as Power Limit PL2) in Watts. The value may vary from 0 to Fused Value. If the value is 0, the fused value will be programmed. A value greater than fused TDP value will not be programmed
- Short Duration Turbo Mode	Enabled Disabled	Enable/Disable Short Duration Turbo Mode for processor
- Power Limit 3	0	Power Limit 3 in Watts. The value may vary from 0 to Fused Value. If the value is 0, the fused value will be programmed. A value greater than fused TDP value will not be programmed
- Power Limit 3 Time	0	Power Limit 3 Time value in seconds. The value may vary from 3 to 64. Indicates the time window over which Power Limit 3 value should be maintained. If the value is 0, the fused value will be programmed
- Power Limit 3 Duty Cycle	0	Duty Cycle in percentage that the CPU is required to maintain the Power Limit 3 time

- Energy Efficient Enable	<b>Enabled</b> Disabled	Enable/Disable Energy Efficient for processor
Configure TDP Boot Mode	<b>Nominal</b> Down Up Disabled	Configure TDP Mode (cTDP). Disabled option will skip all cTDP boot configurations but dynamic cTDP can still work
Lock TDP Settings	<b>Disabled</b> Enabled	Lock TDP in MSR_CONFIG_TDP_CONTROL
C-States	<b>Enabled</b> Disabled	Enable processor idle power saving states
- Extend C-States	<b>Enabled</b> Disabled	Enable C-State transitions to occur in combination with P-States
- C3-State	<b>Enabled</b> Disabled	Enable processor idle power saving C3 state
- C6-State	<b>Enabled</b> Disabled	Enable processor idle power saving C6 state
- C6 Latency	<b>Short</b> Long	Configure Short/Long latency
- C7-State	Disabled C7 <b>C7s</b>	Enable processor idle power saving C7 state
- C7-Latency	Short <b>Long</b>	Configure Short/Long latency
- C-State Auto Demotion	Disabled C1 C3 <b>C1 and C3</b>	Configure C-State Auto Demotion
- C-State UnDemotion	Disabled C1 C3 <b>C1 and C3</b>	Configure C-State UnDemotion
- Package C-State Demotion	<b>Disabled</b> Enabled	Enable/Disable Package C-State Demotion
- Package C-State UnDemotion	<b>Disabled</b> Enabled	Enable/Disable Package C-State UnDemotion
- C-State Pre-Wake	<b>Enabled</b> Disabled	Enable/Disable C-State Pre-Wake

## Miscellaneous

Phoenix SecureCore Technology Setup		
Advanced		
Miscellaneous	Item Specific Help	
Miscellaneous Configuration ► Watchdog ► Generic LPC Decode Ranges  I2C Speed [100] S5 Eco [Disabled] Smart Battery Configuration [Disabled] Reset Button Behavior [Chipset Reset] Lid Switch [Enabled] Sleep Button [Enabled]		Watchdog Configuration.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		
Feature	Options	Description
Watchdog	-	»Watchdog« configuration
Generic LPC Decode Ranges	-	Define »Generic LPC Decode Ranges«
I2C Speed	100	Select I2C Bus Speed in kHz from 1kHz to 400kHz
S5 Eco	Disabled Enabled	Enable/Disable Kontron S5 Eco mode. Reduces supply current in Soft Off (S5) to less than 1mA. If enabled, power button is the only wake-up source in S5! See chapter S5 Eco for further details
Smart Battery Configuration	Disabled Auto Charger Manager	Configure Smart Battery System Support (e.g. Kontron M.A.R.S.)
Reset Button Behavior	Chipset Reset Power Cycle	Select the system behavior on reset button event
Lid Switch	Enabled Disabled	Show/Hide Lid switch inside ACPI OS
Sleep Button	Enabled Disabled	Show/Hide Sleep button inside ACPI OS

## Watchdog

Phoenix SecureCore Technology Setup		
Advanced		
Watchdog		Item Specific Help
Watchdog Configuration. Auto-reload [Disabled] Global Lock [Disabled] Stage 1 Mode [Disabled]		Enable automatic reload of watchdog timers on timeout.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		
Feature	Options	Description
Auto-reload	Disabled Enabled	Enable automatic reload of watchdog timers on timeout
Global Lock	Disabled Enabled	If set to enabled, all Watchdog registers (except WD_KICK) become read only until the board is reset
Stage 1 Mode	Disabled Reset NMI SCI WDT Signal only	Select Action for this Watchdog stage
- Assert WDT Signal	Enabled Disabled	Enable/Disable assertion of WDT signal to baseboard on stage timeout
- Stage 1 Timeout	1s 5s 10s 30s 1m 3m 10m 30m	Select Timeout value for this watchdog stage
Stage 2 Mode	Disabled Reset NMI SCI WDT Signal only	Select Action for this Watchdog stage
- Assert WDT Signal	Enabled Disabled	Enable/Disable assertion of WDT signal to baseboard on stage timeout
- Stage 2 Timeout	1s 5s 10s 30s 1m 3m 10m 30m	Select Timeout value for this watchdog stage

## Generic LPC Decode Ranges

Phoenix SecureCore Technology Setup		
Advanced		
Generic LPC Decode Ranges		Item Specific Help
Generic LPC Decode Ranges		Enable generic LPC decode range.
Generic LPC Decode 1 Disabled		
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		
Feature	Options	Description
Generic LPC Decode 1	Disabled 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 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 3	Disabled 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.

## H/W Monitor

Phoenix SecureCore Technology Setup		
Advanced		
H/W Monitor NCT7802Y		Item Specific Help
Temperature Measurement CPU Temperature [ +28 C] PCH Temperature [ +31 C] Module Temperature [ +30 C]  Fan Measurement CPU Fan [ N/A ] Fan Pulse [2] Fan Control [Auto] Fan Trip Point [45] Trip Point Speed [ 50] Reference Temperature [CPU Temperature]  External Fan [ N/A ] Fan Pulse [2] Fan Control [Auto] Fan Trip Point [45] Trip Point Speed [ 50] Reference Temperature [CPU Temperature]  Voltage Measurement Widerange Ucc [ +11.59 V] 5.0V Standby [ < 1.5 V ] Batt volt at COMe pin [ +3.12 V]		Number of pulses the fan produces during one revolution. Range: 1-4
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		
Feature	Value/Options	Description
CPU Temperature	xx°C	Measured temperature of the CPU Diode with onboard HWM
PCH Temperature	xx°C	Internal Platform Controller Hub temperature
Module Temperature	xx°C	Internal hardware-monitor temperature
CPU Fan	xxxx rpm	Fan speed of onboard fan connector
Fan Pulse	2	Number of pulses the fan produces during one revolution. Range 1-4
Fan Control	Disabled Manual <b>Auto</b>	Set fan control mode. 'Disable' will totally stop the fan
- Fan Trip Point	45	Temperature where fan accelerates. Range 20 - 80°C
- Trip Point Speed	50	Fan speed at trip point in %. Minimum value is 30. Fan always runs at 100% at Tjmax - 10°C
- Reference Temperature	<b>CPU Temperature</b> PCH Temperature Module Temperature	Determines the temperature source which is used for automatic fan control
- Fan Speed	70	Manual fan speed in %. Minimum value is 30 (in Manual mode only)
External Fan	xxxx rpm	Fan speed of external COMe fan
Fan Pulse	2	Number of pulses the external fan produces during one revolution. Range 1-4
Fan Control	Disabled Manual <b>Auto</b>	Set fan control mode. 'Disable' will totally stop the fan
- Fan Trip Point	45	Temperature where fan accelerates. Range 20 - 80°C
- Trip Point Speed	50	Fan speed at trip point in %. Minimum value is 30. Fan always runs at 100% at Tjmax - 10°C
- Reference Temperature	<b>CPU Temperature</b> PCH Temperature Module Temperature	Determines the temperature source which is used for automatic fan control
- Fan Speed	70	Manual fan speed in %. Minimum value is 30 (in Manual mode only)

Widerange Vcc	x.xx V	Module Main Input Voltage
5.0V Standby	x.xx V	5V Standby Voltage input
Batt volt at COMe pin	x.xx V	RTC Battery Voltage input measured at COMe connector

## HDD Configuration

Phoenix SecureCore Technology Setup		
Advanced		
HDD Configuration		Item Specific Help
<div>SATA Device<div>Enabled</div></div> <div>SATA Speed Limit<div>Gen2</div></div> <div>Interface Combination<div>AHCI</div></div> <div>Aggressive Link Power<div>Enabled</div></div> <div>► Software Feature Mask Configuration</div> <div>ComExpress SATA 0<div>Not Installed or the port is disabled</div></div> <div>Port Enable<div>Enabled</div></div> <div>Hot Plug<div>Disabled</div></div> <div>SATA Device Type<div>Hard Disk Drive</div></div> <div>ComExpress SATA 1<div>Not Installed or the port is disabled</div></div> <div>Port Enable<div>Enabled</div></div> <div>Hot Plug<div>Disabled</div></div> <div>SATA Device Type<div>Hard Disk Drive</div></div> <div>ComExpress SATA 2<div>Not Installed or the port is disabled</div></div> <div>Port Enable<div>Enabled</div></div> <div>Hot Plug<div>Disabled</div></div> <div>SATA Device Type<div>Hard Disk Drive</div></div> <div>ComExpress SATA 3<div>Not Installed or the port is disabled</div></div> <div>Port Enable<div>Enabled</div></div> <div>Hot Plug<div>Disabled</div></div> <div>SATA Device Type<div>Hard Disk Drive</div></div>		<div>Enable/Disable SATA Device.</div>
<div>F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults</div> <div>Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit</div>		
Feature	Options	Description
SATA Device	Enabled Disabled	Enable/Disable SATA Device
SATA Speed Limit	Auto Gen1 Gen2	Limit SATA speed to 1.5Gb/s or 3.0Gb/s
Interface Combination	IDE AHCI RAID	Select the SATA controllers operation mode
Aggressive Link Power	Disabled Enabled	If enabled, turns on Aggressive Link Power Management on all HDD ports
Software Feature Mask Configuration	-	Submenu »Software Feature Mask Configuration«
Port Enable	Enabled Disabled	Enable/Disable this SATA port (COMe SATA #0-3)
Hot Plug	Disabled Enabled	Designate this port as Hot Pluggable. Requires hardware support
SATA Device Type	Hard Disk Drive Solid State Drive	Select if this SATA port is connected to Hard Disk Drive or Solid State Drive



## Software Feature Mask Configuration

Phoenix SecureCore Technology Setup			
Advanced			
HDD Configuration		Item Specific Help	
HDD Unlock <b>[Enabled]</b> LED Locate <b>[Enabled]</b>		If enabled, indicates that the HDD password unlock in the OS is enabled.	
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit			
Feature	Options	Description	
HDD Unlock	Enabled Disabled	If enabled, indicates that the HDD password unlock in the OS is enabled	
LED Locate	Enabled Disabled	If enabled, indicates that the LED/SGPIO hardware is attached and ping to locate feature is enabled on the OS	

## Memory Configuration

Phoenix SecureCore Technology Setup		
Advanced		
Memory Configuration		Item Specific Help
<p>ECC BIOS Support present.</p> <p>Memory Frequency Limiter [Auto]  Max TOLUD [Dynamic]  NMode Support [Auto]  Channel A DIMM Control [Enabled]  Channel B DIMM Control [Enabled]  Memory Remap [Enabled]  MRC FastBoot [Enabled]</p>		Maximum Memory Frequency Selections in Mhz.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		
Feature	Options	Description
Memory Frequency Limiter	<b>Auto</b> 1067 1333 1600 1867 2133 2400 2667	Select maximum memory frequency in MHz
Max TOLUD	<b>Dynamic</b> 1 GB ... 3.25GB	Maximum Value of TOLUD. Dynamic assignment would adjust TOLUD automatically based on largest MMIO length of installed graphic controller
NMode Support	<b>Auto</b> 1N Mode 2N Mode	Select the memory supported Command Rate (N-Mode)
Channel A DIMM Control	<b>Enabled</b> Disabled	Enable/Disable DIMMs on channel A
Channel B DIMM Control	<b>Enabled</b> Disabled	Enable/Disable DIMMs on channel B
Memory Remap	<b>Enabled</b> Disabled	Enable/Disable Memory Remap above 4GB
MRC FastBoot	<b>Enabled</b> Disabled	Enable/Disable MRC FastBoot. Generally, this option only takes effect when doing cold boots/resets
DIMM Profile	<b>Default profile</b> Custom profile XMP profile 1 XMP profile 2	Select SPD XMP profile, if supported by DIMM

## System Agent (SA) Configuration

Phoenix SecureCore Technology Setup		
Advanced		
System Agent (SA) Configuration		Item Specific Help
▶ Intel(R) VT for Directed I/O (VT-d) ▶ Graphics Configuration ▶ PEG Port Configuration  Cpu Audio Device (D0:D3:F0) [Enabled]		Press Enter to bring up the Intel(R) VT for Directed I/O (VT-d) Configuration menu.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ▶ Sub-Menu F10 Save and Exit		
Feature	Options	Description
Intel® VT for Directed I/O (VT-d)	-	Submenu »Intel® VT for Directed I/O (VT-d)«
Graphics Configuration	-	Submenu »Graphics Configuration«
PEG Port Configuration	-	Submenu »PEG Port Configuration«
CPU Audio Device (D0:D3:F0)	Enabled Disabled	Enable/Disable CPU Audio Device

Intel® VT for Directed I/O (VT-d)

Phoenix SecureCore Technology Setup

Advanced

Intel(R) VT for Directed I/O (VT-d)	Item Specific Help
Intel(R) VT for Directed I/O (VT-d) <b>Enabled</b>	Enable/Disable Intel(R) Virtualization Technology for Directed I/O (VT-d) by reporting the I/O device assignment to VMM through DMAR ACPI Tables.

F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults  
Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit

Feature	Options	Description
Intel® VT for Directed I/O (VT-d)	<b>Enabled</b> Disabled	Enable/Disable Intel Virtualization Technology for Directed I/O (VT-d) by reporting the I/O device assignment to VMM through DMAR ACPI Tables

## Graphics Configuration

Phoenix SecureCore Technology Setup			
Advanced			
Graphics Configuration		Item Specific Help	
Graphics Turbo IMON Current <b>[31]</b>  Primary Display Selection [Auto] Internal Graphics [Auto] GTT Size [2MB] Aperture Size [128MB] DVMT Pre-Allocated [32MB] DVMT Total Gfx Mem [256MB] Gfx Low Power Mode [Disabled]  ▶ IGD Configuration		Graphics Turbo IMON Current value supported (14-31)	
F1 Help ↑↓ Select Item +/- Change Values F9 Esc Exit ↔ Select Menu Enter Select ▶ Sub-Menu F10 Setup Defaults Save and Exit			
Feature	Options	Description	
Graphics Turbo IMON Current	<b>31</b>	Graphics turbo IMON current value supported (14-31)	
Primary Display Selection	IGD PEG PCI <b>Auto</b>	Select primary display device	
Internal Graphics	Disabled Enabled <b>Auto</b>	Enable/Disable the Internal Graphics Device. This has no effect if external graphics are present	
GTT Size	1MB <b>2MB</b>	Select GTT Memory Size of IGD	
Aperture Size	128MB <b>256MB</b> 512MB	Select Graphics Aperture Size	
DVMT Pre-Allocated	<b>32MB</b> 64MB 128MB	Select Pre-Allocated Graphics Memory size used by the Internal Graphics Device. This has no effect if external graphics are present	
DVMT Total Gfx Mem	128MB <b>256MB</b> Max	Select DVMT5.0 Graphics Memory Size. This has no effect if external graphics are present	
Gfx Low Power Mode	<b>Disabled</b> Enabled	Enable/Disable Gfx Low Power Mode	
IGD Configuration	-	Submenu »IGD Configuration«	

## IGD Configuration

Phoenix SecureCore Technology Setup			
Advanced			
IGD Configuration		Item Specific Help	
IGD managed by: Legacy Video BIOS [103B]  IGD - Boot Type [Auto]  Backlight Control [PWM] Intel Smooth Brightness Control [Enabled] PWM Frequency [200 Hz] Backlight Value [128]  eDP Panel Type [LVDS] LVDS Clock Center Spreading [No Spreading]  EFP1 Type [DP with HDMI/DVI] EFP2 Type [DP with HDMI/DVI] EFP3 Type [DP with HDMI/DVI]  Mode Persistence [Disabled]		Select the Video Device activated during POST. This has no effect if external graphics are present.	
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit			
Feature	Options	Description	
IGD - Boot Type	<b>Auto</b> CRT EFP LFP EFP3 EFP2	Select Video Device which will be activated during POST. This has no effect if external graphics are present	
IGD - Secondary Boot Type	<b>Disabled</b> CRT EFP LFP EFP3 EFP2	Select the second Video Device which will be activated during POST	
LFP Type	<b>AUTO</b> VGA 640×480 1×18 WVGA 800×480 1×18 SVGA 800×600 1×18 XGA 1024×768 1×18 XGA 1024×768 1×24 WXGA 1280×768 1×24 WXGA 1280×800 1×18 WXGA 1366×768 1×24 WSVGA 1024×600 1×18 WSVGA 1024×600 1×24 WXGA+ 1440×900 2×18 WXGA+ 1440×900 2×24 SXGA 1280×1024 2×18 SXGA 1280×1024 2×24 WSXGA+ 1680×1050 2×18 WSXGA+ 1680×1050 2×24 UXGA 1600×1200 2×18 UXGA 1600×1200 2×24 WUXGA 1920×1200 2×18 WUXGA 1920×1200 2×24 FHD 1920×1080 2×18 FHD 1920×1080 2×24 Custom PAID	Select LFP used by Internal Graphics Device by selecting the appropriate setup item	

Backlight Control	None/External <b>PWM</b> PWM Inverted I2C I2C Inverted	Backlight Control Setting
Intel Smooth Brightness Control	<b>Enabled</b> Disabled	If enabled, PWM values will be overridden by OS Power Options
PWM Frequency	<b>200 Hz</b> 400 Hz 1 kHz 2 kHz 4 kHz 8 kHz 20 kHz 40 kHz	Set LCD backlight PWM frequency
Backlight Value	<b>128</b>	Set LCD backlight brightness (0-255)
eDP Panel Type	<b>LVDS</b> eDP	Select Panel Type connected to eDP Port (eDP only available with customized hardware)
LVDS Clock Center Spreading	<b>No Spreading</b> 0.5% 1.0% 1.5% 2.0% 2.5%	Select LVDS clock frequency center spreading depth
EFP1 Type EFP2 Type EFP3 Type	DisplayPort Only <b>DP with HDMI/DVI</b> DP with DVI HDMI/DVI DVI Only	Integrated HDMI/DisplayPort Configuration with External Connectors
Mode Persistence	<b>Disabled</b> Enabled	Enable/Disable Mode Persistence

## PEG Port Configuration

Phoenix SecureCore Technology Setup		
Advanced		
PEG Port Configuration		Item Specific Help
PEG Configuration	[1x16]	Set PEG Configuration to 1x16, 2x8, 1x8+2x4
PEG0 - Gen X	[Auto]	
Run-time C7 Allowed	[Disabled]	
Always Enable PEG	[Disabled]	
PEG ASPM	[Auto]	
Program PCIe ASPM later than OpROM	[Disabled]	
De-emphasis Control	[-3.5 dB]	
Swing Control	[Full]	
PEG Sample Calibrate	[Disabled]	
Gen3 Equalization	[Enabled]	
PEG Gen3 Equalization Phase2	[Disabled]	
Gen3 Root Port Preset	[ 8]	
Gen3 Endpoint Preset	[ 7]	
Gen3 Endpoint Hint	[ 2]	
Gen3 Eq Preset Search	[Enabled]	
Always re-search Gen3 Eq Preset	[Disabled]	
Allow PREST# GPIO Usage	[Disabled]	
Preset Search Dwell Time	[ 1000]	
Timing Start Margin	[ 15]	
Voltage Start Margin	[ 20]	
Error Target	[ 1]	
PEG RxCEM Loopback Mode	[Disabled]	
PEG Gen3 RxCTLE Control	[ 8]	
Generate BDAT PEG Margin Data	[Disabled]	
F1 Help ↑ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		
Feature	Options	Description
PEG Configuration	1x16 2x8 1x8 + 2x4	Set PEG Configuration to 1x16, 2x8 or 1x8 + 2x4
PEG0 - Gen X	Auto Gen1 Gen2 Gen3	Configure PEG0 B0:D1:F0 Speed
Run-time C7 Allowed	Disabled Enabled	Enable/Disable entry to C7 state (Run-time control). Don't enable this feature until you have all the appropriate Save/Restore Controller/Endpoint state
Always Enable PEG	Disabled Enabled	Enabled: PEG is always on. Disabled: PEG is only enabled with connected PCIe device
PEG ASPM	Disabled L0s L1 L0s and L1 Auto	Control ASPM support for the PEG Device
Program PCIe ASPM later than OpROM	Disabled Enabled	Select whether the PCIe ASPM will be programmed before (disabled) or after (enabled) OpROM
De-emphasis Control	-6 dB -3.5 dB	Configure the De-emphasis control on PEG
Swing Control	Reduced Half Full	Perform PEG Swing Control
PEG Sample Calibrate	Disabled Enabled Auto	Enable/Disable PEG Sample Calibrate
Gen3 Equalization	Enabled Disabled	Perform PEG Gen3 Equalization steps
PEG Gen3 Equalization Phase2	Disabled Enabled	Enable/Disable PEG Gen3 Equalization Phase2
Gen3 Root Port Preset	8	Root port preset value for Gen3 Equalization
Gen3 Endpoint Preset	7	Endpoint preset value for Gen3 Equalization
Gen3 Endpoint Hint	2	Endpoint Hint value for Gen3 Equalization



Gen3 Eq Preset Search	<b>Enabled</b> Disabled	Perform PEG Gen3 SW Preset Search algorithm
Always re-search Gen3 Eq Preset	<b>Disabled</b> Enabled	Always re-search PEG Gen3 Preset, even it has been done once
Allow PREST# GPIO Usage	<b>Disabled</b> Enabled	Enable/Disable GPIO-based resets to PEG endpoint(s) during margin search, if needed
Preset Search Dwell Time	<b>1000</b>	PEG Gen3 Preset Search dwell time in (ms)
Timing Start Margin	<b>15</b>	The starting value (4 ... 255) for the backward margin search
Voltage Start Margin	<b>20</b>	The starting value (4 ... 255) for the backward margin search
Error Target	<b>1</b>	The margin search error target value (1 ... 65535)
PEG RxCEM Loopback Mode	<b>Disabled</b> Enabled	Enable/Disable PEG RxCEM Loopback Mode
PEG Gen3 RxCTLE Control	<b>8</b>	PEG Gen3 RxCTLE setting for Bundle0 (Lane0, Lane1)
Generate BDAT PEG Margin Data	<b>Disabled</b> Enabled	Enable to generate BDAT PCIe margin tables

## South Bridge Configuration

Phoenix SecureCore Technology Setup		
Advanced		
South Bridge Configuration		Item Specific Help
SMBUS Device <b>[Enabled]</b> State After G3      [State S0] ▶ SB PCI Express Config ▶ SB USB Config ▶ SB HD Audio Config		Enable/Disable SMBUS Device.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ▶ Sub-Menu F10 Save and Exit		
Feature	Options	Description
SMBUS Device	Enabled Disabled	Enable/Disable SMBUS Device
State After G3	State S5 State S0 Last State	Specify what state to switch to when power is re-applied after a power failure (G3 state). S5 = Stay Off, S0 = switch on
SB PCI Express Config	-	Submenu »SB PCI Express Config«
SB USB Config	-	Submenu »SB USB Config«
SB HD Audio Config	-	Submenu »SB HD Audio Config«

## SB PCI Express Config

Phoenix SecureCore Technology Setup		
Advanced		
SB PCI Express Config		Item Specific Help
PCI Express Root Port Clock Gating <b>[Enabled]</b> DMI Link ASPM Control <b>[LOS]</b> DMI Link Extended Synch Control <b>[Disabled]</b> PCI Express port assigned to LAN 8  ▶ PCI Express Port 1 Config ▶ PCI Express Port 2 Config ▶ PCI Express Port 3 Config ▶ PCI Express Port 4 Config ▶ PCI Express Port 5 Config ▶ PCI Express Port 6 Config ▶ PCI Express Port 7 Config  PCI ExpressCard 0 <b>[Disabled]</b> PCI ExpressCard 1 <b>[Disabled]</b>		Enabled or Disabled PCI Express Root Port Clock Gating.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ▶ Sub-Menu F10 Save and Exit		
Feature	Options	Description
PCIe Root Port Clock Gating	<b>Enabled</b> Disabled	Enable/Disable PCI Express Root Port Clock Gating
DMI Link ASPM Control	Disabled <b>LOS</b> L1 LOS And L1 Auto	Control Active State Power Management of the DMI Link
DMI Link Extended Synch Control	<b>Disabled</b> Enabled	Control Extended Synch on SB side of the DMI Link
<b>PCI Express Port 1/2/3/4/5/6/7 Config</b>	-	Submenus for »PCI Express Port 1/2/3/4/5/6/7 Config«
PCI ExpressCard 0 PCI ExpressCard 1	Port 1 Port 2 Port 3 Port 4 Port 5 Port 6 Port 7 Port 8 <b>Disabled</b>	Controls PCIe Port for ExpressCard support. Please also enable Hot Plug capability of corresponding Port in PCI Express Config submenu

## PCI Express Root Port 1/2/3/4/5/6/7

Phoenix SecureCore Technology Setup		
Advanced		
PCI Express Root Port 1		Item Specific Help
PCI Express Root Port 1 [Enabled] PCIe Speed [Auto] ASPM [Disabled] HOT PLUG [Disabled] URR [Disabled] FER [Disabled] NFER [Disabled] CER [Disabled] SEFE [Disabled] SENFE [Disabled] SECE [Disabled] PME Interrupt [Disabled] PME SCI [Enabled]		Control the PCI Express Root Port.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		
Feature	Options	Description
PCI Express Root Port #	Enabled Disabled	Control the PCI Express Root Port
PCIe Speed	Auto Gen1 Gen2	Select PCIe Speed to Gen1 or Gen2
ASPM	Disabled LOS L1 LOS And L1 Auto	Control PCIe Active State Power Management settings
L1 Substates	Disabled L1.1 L1.2 L1.1 & L1.2	PCI Express L1 Substates setting
HOT PLUG	Disabled Enabled	Enable/Disable PCI Express Hot Plug
URR	Disabled Enabled	Enable/Disable PCI Express Unsupported Request Reporting
FER	Disabled Enabled	Enable/Disable PCI Express Device Fatal Error Reporting
NFER	Disabled Enabled	Enable/Disable PCI Express Device Non-Fatal Error Reporting
CER	Disabled Enabled	Enable/Disable PCI Express Device Correctable Error Reporting
SEFE	Disabled Enabled	Enable/Disable PCI Express System Error on Fatal Error
SENFE	Disabled Enabled	Enable/Disable PCI Express System Error on Non-Fatal Error
SECE	Disabled Enabled	Enable/Disable PCI Express System Error on Correctable Error
PME Interrupt	Disabled Enabled	Enable/Disable PCI Express PME Interrupt
PME SCI	Enabled Disabled	Enable/Disable PCI Express PME SCI

## SB USB Config

Phoenix SecureCore Technology Setup		
Advanced		
SB USB Configuration		Item Specific Help
USB Precondition <b>[Enabled]</b> xHCI Mode <b>[Auto]</b> USB Per-Port Disable Control <b>[Disabled]</b>		Precondition work on USB host controller and root ports for faster enumeration.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		
Feature	Options	Description
USB Precondition	Enabled Disabled	Precondition work on USB host controller and root ports for faster enumeration
xHCI Mode	Disabled Enabled <b>Auto</b> Smart Auto	Mode of operation of xHCI controller
EHCI1	Enabled Disabled	Control the USB EHCI (USB2.0) functions for COMe Ports #0-3
EHCI2	Enabled Disabled	Control the USB EHCI (USB2.0) functions for COMe Ports #4-7
USB Per-Port Disable Control	Disabled Enabled	Control each of the USB ports
- USB Port #0 Enable/Disable - USB Port #1 Enable/Disable - USB Port #2 Enable/Disable - USB Port #3 Enable/Disable - USB Port #4 Enable/Disable - USB Port #5 Enable/Disable - USB Port #6 Enable/Disable - USB Port #7 Enable/Disable	Enabled Disabled	Enable/Disable USB port

SB HD Audio Config

Phoenix SecureCore Technology Setup

Advanced

SB HD Audio Configuration

HD Audio **Auto**

Item Specific Help

Control Detection of the HD Audio device.

F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults

Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit

Feature	Options	Description
HD Audio	<b>Auto</b> Disabled	Control Detection of the HD Audio Device

## Network Configuration

Phoenix SecureCore Technology Setup		
Advanced		
Network Configuration		Item Specific Help
PCH Internal LAN [Enabled] LAN OPROM Selection [Enabled] Wake on PCH LAN [Enabled] ASF Support [Enabled]		Enable/Disable PCH Internal LAN.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		
Feature	Options	Description
PCH Internal LAN	Enabled Disabled	Enable/Disable PCH internal LAN
LAN OPROM Selection	Disabled Enabled Addon only Both Onboard only	This is used to select LAN OPROM for quick boot minimal configuration
Wake on PCH LAN	Enabled Disabled	Enable/Disable PCH internal Wake on LAN capability
ASF Support	Enabled Disabled	Enable/Disable Alert Specification Format

## Onboard UART &amp; CPLD Configuration

Phoenix SecureCore Technology Setup		
Advanced		
Onboard UART & CPLD configuration		Item Specific Help
Serial Port 0 <b>[Enabled]</b> Base Address <b>[3F8]</b> IRQ <b>[4]</b>  Serial Port 1 <b>[Enabled]</b> Base Address <b>[2F8]</b> IRQ <b>[3]</b>  GPIO IRQ <b>[Disabled]</b> I2C IRQ <b>[Disabled]</b>		Enable/Disable Serial Port.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		
Feature	Options	Description
Serial Port 0	<b>Enabled</b> Disabled	Enable/Disable Serial Port (COM) 0
Base Address	<b>3F8</b> 2F8 3E8 2E8	Configure Serial Port Base Address
IRQ	<b>3</b> 4 5 6 7 12	Configure Serial Port IRQ
Serial Port 1	<b>Enabled</b> Disabled	Enable/Disable Serial Port (COM) 1
Base Address	3F8 <b>2F8</b> 3E8 2E8	Configure Serial Port Base Address
IRQ	<b>3</b> 4 5 6 7 12	Configure Serial Port IRQ
GPIO IRQ	<b>Disabled</b> 14 15	Configure IRQ for GPIO pins
I2C IRQ	<b>Disabled</b> 14 15	Configure IRQ for I2C controller



## LPC SIO Configuration

This setup option is only available with LPC SuperI/O Nuvoton 83627 present on the carrier board. By default the COMe-bBL6 supports the legacy interfaces of a 5V 83627HF(J) or 3.3V 83627DHG-P on external LPC. The SIO hardware monitor is not supported in setup.

Feature	Options	Description
Serial Port 0	<b>Disabled</b> Enabled	Enable/Disable SIO Serial Port
- Base Address	3F8 2F8 <b>3E8</b> 2E8	Configure Serial Port Base Address
- IRQ	3 4 5 <b>6</b> 7 12	Configure Serial Port IRQ
Serial Port 1	<b>Disabled</b> Enabled	Enable/Disable SIO Serial Port
- Base Address	3F8 2F8 3E8 <b>2E8</b>	Configure Serial Port Base Address
- IRQ	3 4 5 6 <b>7</b> 12	Configure Serial Port IRQ
SIO Parallel Port	<b>Disabled</b> Enabled	Enable/Disable SIO Parallel Port
- Device Mode	<b>Standard Parallel Port</b> EPP ECP & EPP 1.9 ECP & EPP 1.7	Configure Parallel Port Mode
- Base Address	<b>378</b> 278 3BC	Configure Parallel Port Base Address

ME Configuration

Phoenix SecureCore Technology Setup	
Advanced	
ME Configuration	Item Specific Help
ME FW Version 9.1.37.1002 ME Firmware Intel(R)ME 1.5MB firmware Intel(R) ME [Enabled]	Configure Management Engine Technology Parameters
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit	

In this submenu ME-related information, such as

- » ME FW Version
- » ME Firmware

are listed.

Thermal Configuration

Phoenix SecureCore Technology Setup		
Advanced		
Thermal Configuration		Item Specific Help
<div>▶ CPU Thermal Configuration</div> <div>▶ Platform Thermal Configuration</div>		CPU Thermal Configuration Submenu.
<div>F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults</div> <div>Esc Exit ↔ Select Menu Enter Select ▶ Sub-Menu F10 Save and Exit</div>		
Feature	Options	Description
CPU Thermal Configuration	-	Submenu »CPU Thermal Configuration«
Platform Thermal Configuration	-	Submenu »Platform Thermal Configuration«

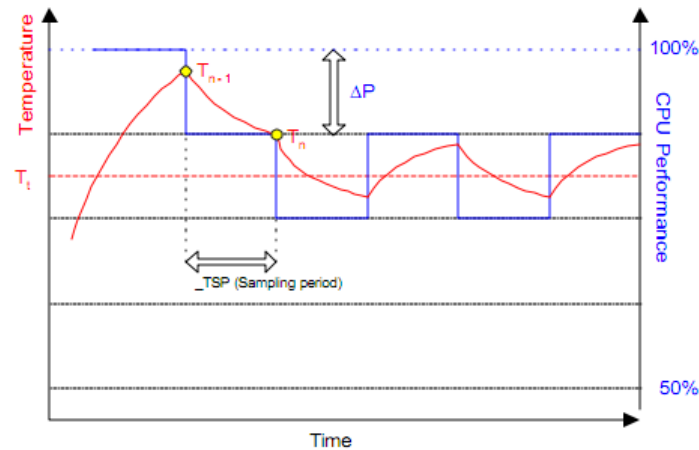
## CPU Thermal Configuration

Phoenix SecureCore Technology Setup		
Advanced		
CPU Thermal Configuration		Item Specific Help
Bi-directional PROCHOT# <b>[Enabled]</b> PROCHOT# OUT <b>[Disabled]</b> PROCHOT Response <b>[Disabled]</b> DTS <b>[Enabled]</b>		When a processor thermal sensor trips (either core), the PROCHOT# is driven. If bi-direction is enabled, external agents can drive PROCHOT# to throttle the processor.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		
Feature	Options	Description
Thermal Monitor	<b>Enabled</b> Disabled	Enable/Disable processor Thermal Monitor thermal control. Requires GV3
Bi-directional PROCHOT#	<b>Enabled</b> Disabled	When a processor thermal sensor trips (either core), the PROCHOT# is driven. If bi-direction is enabled, external agents can drive PROCHOT# to throttle the processor
PROCHOT# OUT	<b>Disabled</b> Enabled	If Bi-directional PROCHOT# is enabled, PROCHOT# OUT can be disabled selectively
PROCHOT# Response	<b>Disabled</b> Enabled	Enable/Disable PROCHOT Response
DTS	<b>Enabled</b> Disabled	Enable CPU Digital Thermal Sensor function. DTS has to be enabled for ACPI Critical Shutdown and Passive Cooling

## Platform Thermal Configuration

Phoenix SecureCore Technology Setup		
Advanced		
Platform Thermal Configuration		Item Specific Help
Critical Trip Point [POR] Passive Trip Point [90 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 where the OS shuts the system off. NOTE: 100C is the Plan of Record (POR) for all Intel mobile processors.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		
Feature	Options	Description
Critical Trip Point	<b>POR</b> 55°C ... 95°C Disabled	This value controls the temperature of the ACPI Critical Trip Point - the point where the OS shuts the system off. Note: 100°C is the Plan Of Record (POR) for all Intel mobile processors
Passive Trip Point	55°C ... <b>90°C</b> 95°C Disabled	This value controls the temperature of the ACPI Passive Trip Point - the point where the OS begins 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 reads 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

## ICC Configuration

Phoenix SecureCore Technology Setup		
Advanced		
ICC Configuration		Item Specific Help
ICC Profile [ 0 ] Use Watchdog Timer for ICC [Disabled] Lock ICC registers [Static only] Clock Manipulation [ICC Success] Apply ICC settings after reboot [None] ICC Overclocking Library [9.0.0.1209] ▶ Clock 3		ICC Profile Selection
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ▶ Sub-Menu F10 Save and Exit		
Feature	Options	Description
ICC Profile	0	Select ICC Profile. Range 0 - 15
Use Watchdog Timer for ICC	Disabled Enabled	Enable Watchdog Timer operation for ICC. If enabled, Watchdog Timer will be started after ICC related changed. This timer detects platform instability caused by wrong clock settings
Lock ICC registers	Static only All registers	Static only: Only static ICC registers will be locked All registers: All ICC registers will be locked
Apply ICC settings after reboot	None Permanently after reboot	None: Change will not apply Permanently: Changes will be applied permanently, starting after the next reboot. Use it to provide changes that are verified and safe
Clock 3	-	Integrated »Clock 3« Control options

Clock 3

Phoenix SecureCore Technology Setup

Advanced

Clock 3

BCLK, DMI, PEG, PCIe  
PCI33, SATA, USB3

Current frequency [100.0 MHz ]  
Current SSC mode [down]  
Maximum supported SSC % [0.50 ]  
Current SSC % [0.50 ]  
New SSC spread percent [0.01%] **50**

Item Specific Help

Clock spectrum spread in 0.01% increments. Determines spectrum deviation away from base frequency. Allowed range is limited by Max supported SSC%. Changes will not be applied unless 'Apply settings' is pressed.

F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults  
Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit

Feature	Options	Description
New SSC spread percent	50	Clock spectrum spread in 0.01% increments. Determines spectrum deviation away from base frequency. Allowed range is limited by Max supported SSC%



## Intel® Rapid Start Technology

Phoenix SecureCore Technology Setup		
Advanced		
Intel(R) Rapid Start Technology		Item Specific Help
Intel(R) Rapid Start Technology Support <b>Disabled</b>		Intel(R) Rapid Start Technology Technology.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		
Feature	Options	Description
Intel® Rapid Start Technology Support	<b>Disabled</b> Enabled	Enable/Disable Intel® Rapid Start Technology
- Entry on S3 RTC wake	<b>Enabled</b> Disabled	Intel® Rapid Start Technology invocation upon S3 RTC wake
- Entry after	Immediately 1 minute 2 minutes 5 minutes <b>10 minutes</b> 15 minutes 30 minutes 1 hour 2 hours	RTC wake timer at S3 entry
- Display Save Restore	<b>Disabled</b> Enabled	Display Save Restore configuration
- Intel® Rapid Start Technology Partition	-	Indicates a valid partition for Rapid Start Support

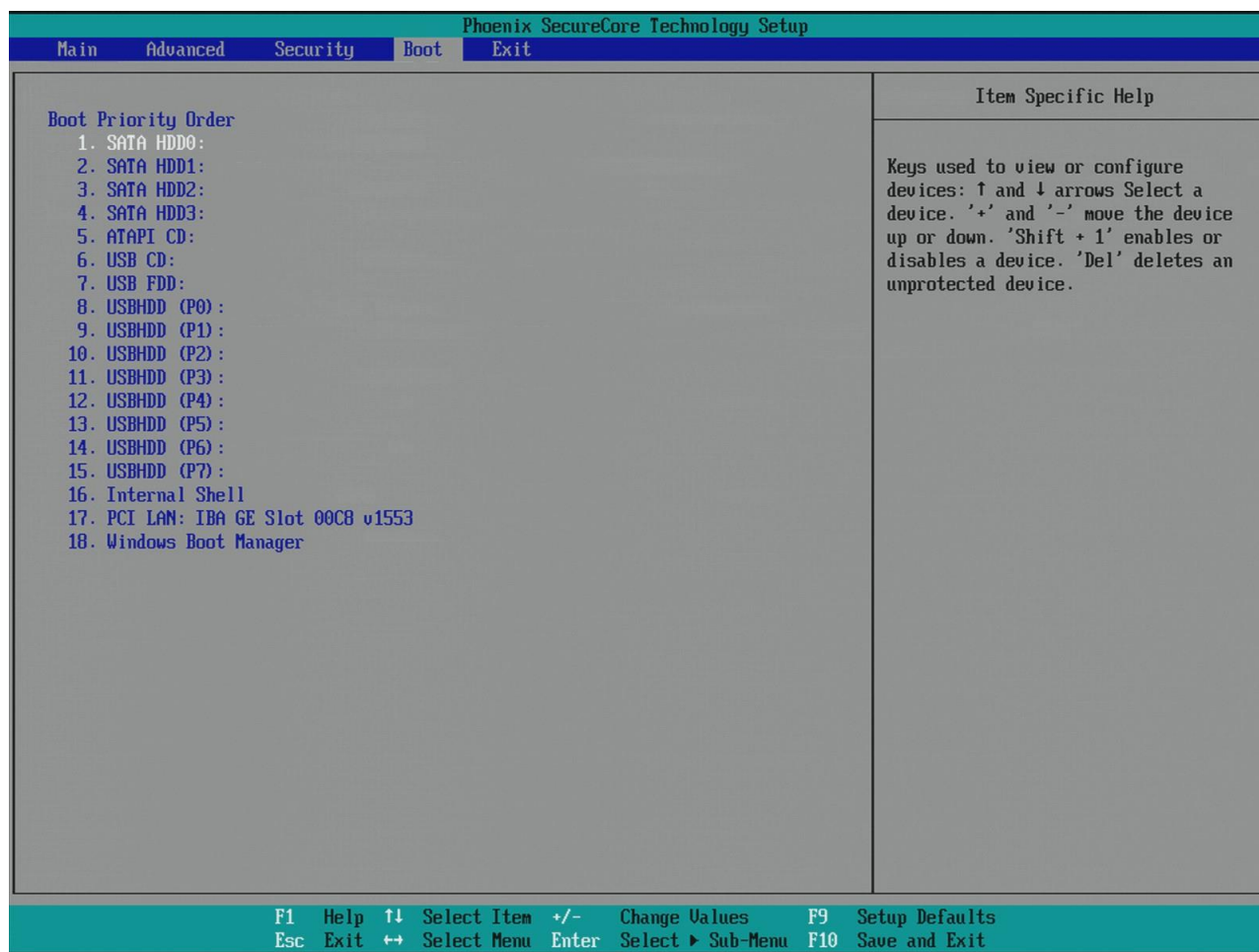
### 8.5.3 Security

Phoenix SecureCore Technology Setup			
Main	Advanced	Security	Boot Exit
Supervisor Password is: Cleared User Password is: Cleared  Set Supervisor Password [Enter] Supervisor Hint String [                      ]  Set User Password [Enter] User Hint String [                      ]  Min. password length [ 1 ]  Authenticate User on Boot [Disabled]  HDD Security Status No HDD detected  Trusted Platform Module (TPM) TPM Support [Enabled] ▶ TPM Configuration			Item Specific Help  Set or clear the Supervisor account's password.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ▶ Sub-Menu F10 Save and Exit			
Feature	Options		Description
Set Supervisor Password	Enter		Set or clear the Supervisor account's password
Supervisor Hint String	-		Press Enter to type Supervisor Hint String
Min. password length	1		Set the minimum number of characters for password (1-20)
TPM Support	Enabled Disabled		This is used to decide whether TPM support should be enabled or disabled
TPM Configuration	-		Submenu »TPM Configuration«

## TPM Configuration

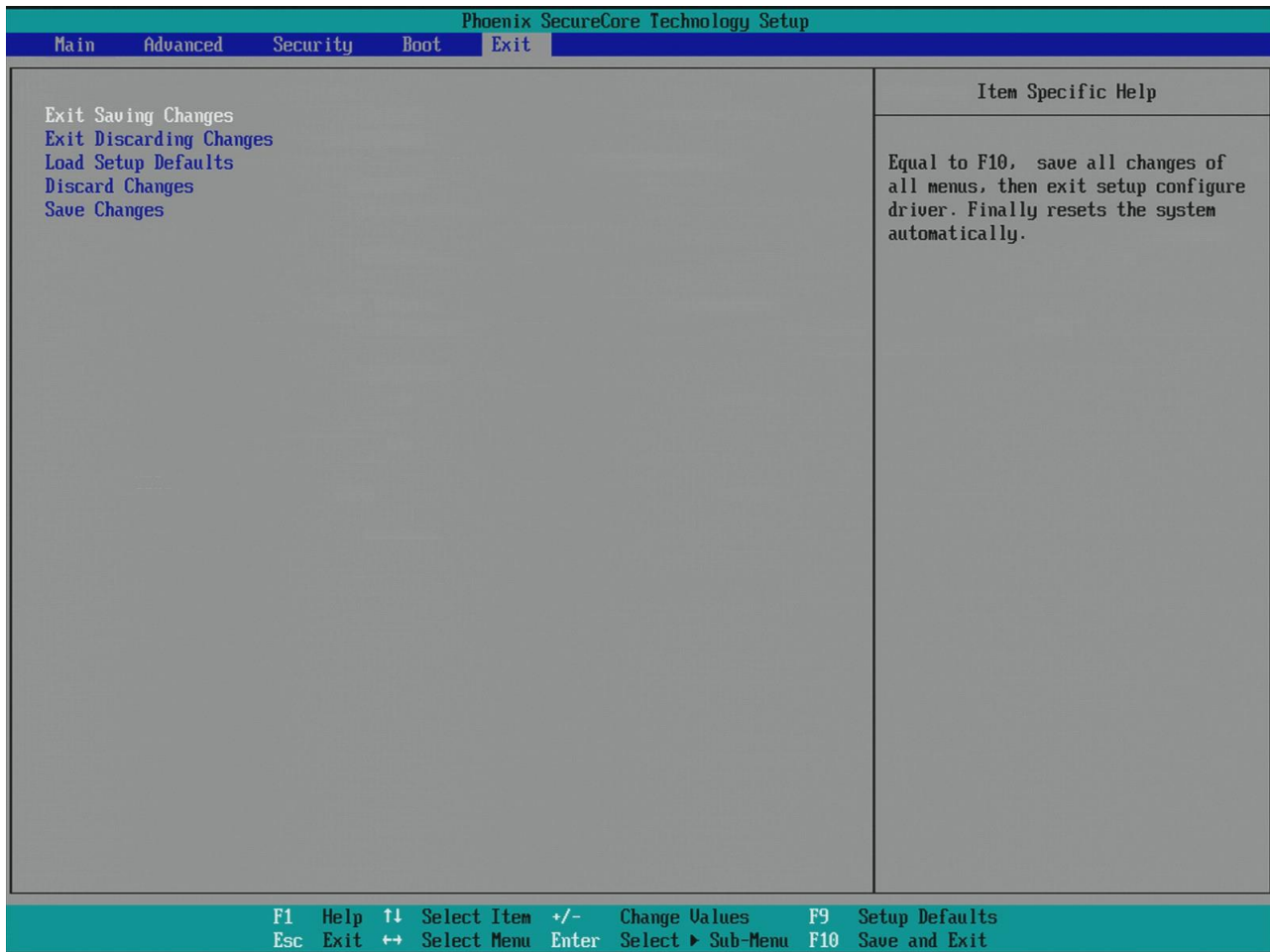
Phoenix SecureCore Technology Setup		
Security		
TPM Configuration		Item Specific Help
Current TPM State [Enabled and Activated] TPM Action [No Change] Omit Boot Measurements [Disabled]		Enact TPM Action. Note: Most TPM actions require TPM to be Enabled to take effect.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ↔ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		
Feature	Options	Description
TPM Action	<b>No Change</b> Enable Disable Activate Deactivate Clear Enable and Activate Disable and Deactivate Set Owner Install, with state=True Set Owner Install, with state=False Enable, Activate, and Set Owner Install with state=True Disable, Deactivate, and Set Owner Install with state=False Clear, Enable, and Activate Require PP for provisioning Do not require PP for provisioning Require PP for clear Do not require PP for clear Enable, Activate, and clear Enable, Activate, Clear, Enable, and Activate	Enact TPM Action
Omit Boot Measurements	<b>Disabled</b> Enabled	Enabling this option causes the system to omit recording boot device attempts in PCR[4]

## 8.5.4 Boot



In this menu the Boot Priority Order is viewed and can be configured.

## 8.5.5 Exit



In the Exit menu the following actions can be accomplished:

- » Exit Saving Changes
- » Exit Discarding Changes
- » Load Setup Defaults
- » Discard Changes
- » Save Changes.

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