BECKHOFF

Computerboard CB6464

Manual | EN

06.02.2020 | Version: 0.5

1 Documentation issue status

Version	Modifications
0.1	Preliminary version
0.2	Preliminary version, change of the fan plug from 3 to 4-pin, OCT UPS, OCT LED inserted, graphics for LEDs changed, mechanical drawings updated
0.3	Interface assignment added
0.4	Isolated BAseCon plug added and symbol for pin 126 changed from DP/DVI# to DP#/DVI
0.5	Changed cover

2 Notes on the documentation

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.
It is essential that the documentation and the following notes and explanations are followed when installing and commissioning the components.
It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.
We reserve the right to revise and change the documentation at any time and without prior announcement.
No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

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3 Safety instructions

Safety regulations

Please note the following safety instructions and explanations!
Product-specific safety instructions can be found on following pages or in the areas mounting, wiring, commissioning etc.

Exclusion of liability

All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

Personnel qualification

This description is only intended for trained specialists in control, automation and drive engineering who are familiar with the applicable national standards.

Description of symbols

In this documentation the following symbols are used with an accompanying safety instruction or note. The safety instructions must be read carefully and followed without fail!

⚠ DANGER

Serious risk of injury!

Failure to follow the safety instructions associated with this symbol directly endangers the life and health of persons.

⚠ WARNING

Risk of injury!

Failure to follow the safety instructions associated with this symbol endangers the life and health of persons.

⚠ CAUTION

Personal injuries!

Failure to follow the safety instructions associated with this symbol can lead to injuries to persons.

NOTE

Damage to the environment or devices

Failure to follow the instructions associated with this symbol can lead to damage to the environment or equipment.

Tip or pointer

This symbol indicates information that contributes to better understanding.

4 Overview

4.1 Features

The CB6464 is designed as a high-performance compact board based on Intel®'s Skylake and Kabylake processors. The latest energy-saving DDR4 technology enables memory extension of up to 32 GB via SODIMM260.

As standard interfaces two DisplayPort connections, four Gigabit LAN connections and four USB 3.0 interfaces are available on the front panel. The two DisplayPorts enable the connection of an HDMI adapter for an HDMI signal. The connection of an HDMI display with adapter is possible.

Two variants are available, variant 1 being equipped with a Q170 chipset and variant 2 with an H110 chipset.

Internally both variants of the CB6464 have two M.2 (B) sockets (2280), while variant 1 additionally has a BAseCon140 connector. Various signals, which are listed in the respective chapter, are led out via the internal plug connector depending on the chipset in use.

Power is supplied via a 4-pin connector on the front panel. Input voltage is isolated 24 V.

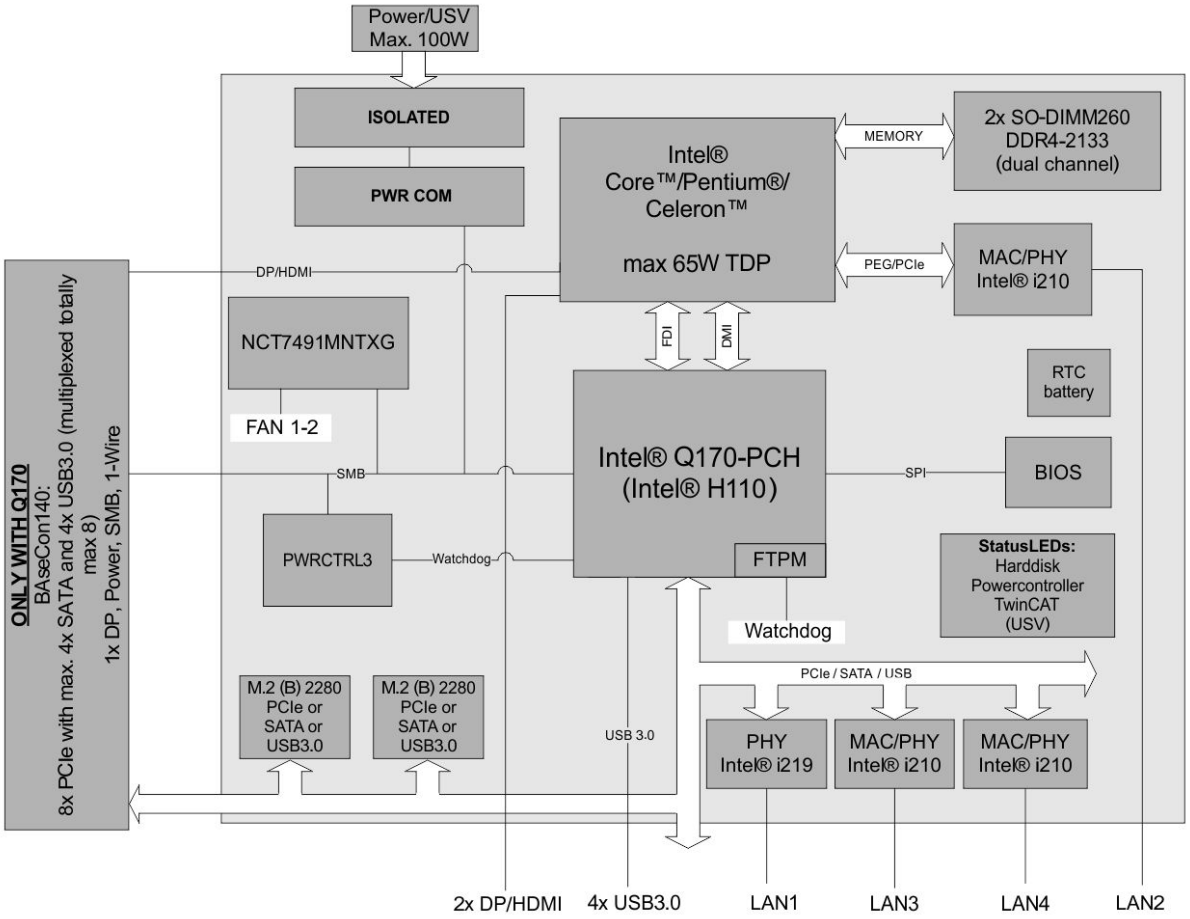


Fig. 1: Block diagram_CB6464

4.2 List of features

CB6464	120x120-Board
CPU	Intel® Core™ i3 / Core™ i5 / Core™ i7 Intel® Pentium® Intel® Celeron®
Memory	2x SO-DIMM260 1.2V DDR4-2133 Maximum memory extension 32GB
I/O on front panel	2x DisplayPort++ (connection of an HDMI adapter for a HDMI signal is possible) 4x GB LAN 4x USB3.0
Internal I/O	2x M.2 (B) sockets, signals dependant on chipset (internal chapter M.2) With Q170 only: 1x BAseCon140 (Signals internal: chapter BAseCon140)
Graphic resolution	DisplayPort: 4096x2304@60Hz HDMI1.4: 2560x1600@60Hz; 4096x2160@24Hz DVI: 1920x1200@60Hz
RTC	Exchangeable, horizontal on-board battery Optional: horizontal battery on expansion card
BIOS	AMI® Aptio V
Power supply	24V
Format	120 x 120 mm

Availability oft he processors

The list of features lists all the processors that can be ordered. Their actual availability depends on the manufacturer.

4.3 Specifications and documents

The following documents, specifications or webpages were used for the preparation of this manual or as further technical documentation respectively.

PCI-Spezification

Version 2.3 bzw. 3.0

www.pcisig.com

PCI Express® Base Specification

Version 2.0

www.pcisig.com

ACPI-Spezification

Version 3.0

www.acpi.info

ATA/ATAPI-Spezification

Version 7 Rev. 1

www.t13.org

USB-Spezifikationen

www.usb.org

SM-Bus-Spezification

Version 2.0

www.smbus.org

Intel®-chip description

Intel® Atom™ Processor E3800 Product Family datasheet

www.intel.com

Intel®-chipd description

i210 Datasheet

www.intel.com

SMSC®-chip description

SCH3114 Datasheet (NDA erforderlich)

www.smsc.com

American Megatrends®

Aptio™ Text Setup Environment (TSE) User Manual

www.ami.com

American Megatrends®

Aptio™ 4.x Status Codes

www.ami.com

5 Detailed description

5.1 Power supply

The board is supplied with an isolated input voltage of nominally 24 V, which in reality may lie between 20 V and 30 V. In normal operation the DC/DC power rail is supplied with this voltage. A UPS can also be implemented via an OCT signal (OCT = One Cable Technology).

UPS-OCT

The UPS-OCT can only be implemented with the Beckhoff CU81XX-xxxx UPS.

5.2 CPU

The processors employed are Intel® processors of the 6th (Skylake) and 7th (KabyLake) generation. Processors of both generations are characterized by a very low power consumption and offer contemoporary performance with clock rates of currently up to 3.9 GHz.

5.3 Memory

SO-DIMM260 memory modules (DDR4-2133) commonly used in notebooks are used on the CB6464 board. For technical and mechanical reasons it is possible that certain memory modules cannot be used. Ask your distributor about the recommended memory modules.

With the currently available SO-DIMM260 modules a memory extension up to 32 GB is possible depending on the product variant. When equipping both memory sockets, care must be taken that identical memory modules are used.

5.4 M.2

Expansion cards that fulfill the M.2 specification are characterized by an extremely small format and – depending on the card type – flexible dimensions.

M.2 cards can easily and simply be inserted by plugging them into the slot and fixing them with a screw.

The M.2 socket of the CB6464 supports Key B. Different signals are supported depending on the chipset in use. The table in chapter M.2 lists all the interfaces supported, depending on the chipset in use.

Driver compatibility

For optimum driver compatibility we recommend the use of a Microsoft® Windows 10 operating system.

6 External connections

6.1 Note on the use of cables

Requirement for the cabling!

The cables used must meet certain requirements for most interfaces. For example, twisted and shielded cables are necessary for a reliable USB 2.0 connection. Limitations in the maximum cable length are also no rarity. All of these interface-specific requirements are to be taken from the respective specifications and observed accordingly.

6.2 Connector Map

The plug connections on the component side of the CB6464 board are summarized in the illustration below. The function of the respective connector can be taken from the table below the illustration, as can the page of the manual on which further information about this connection can be read.

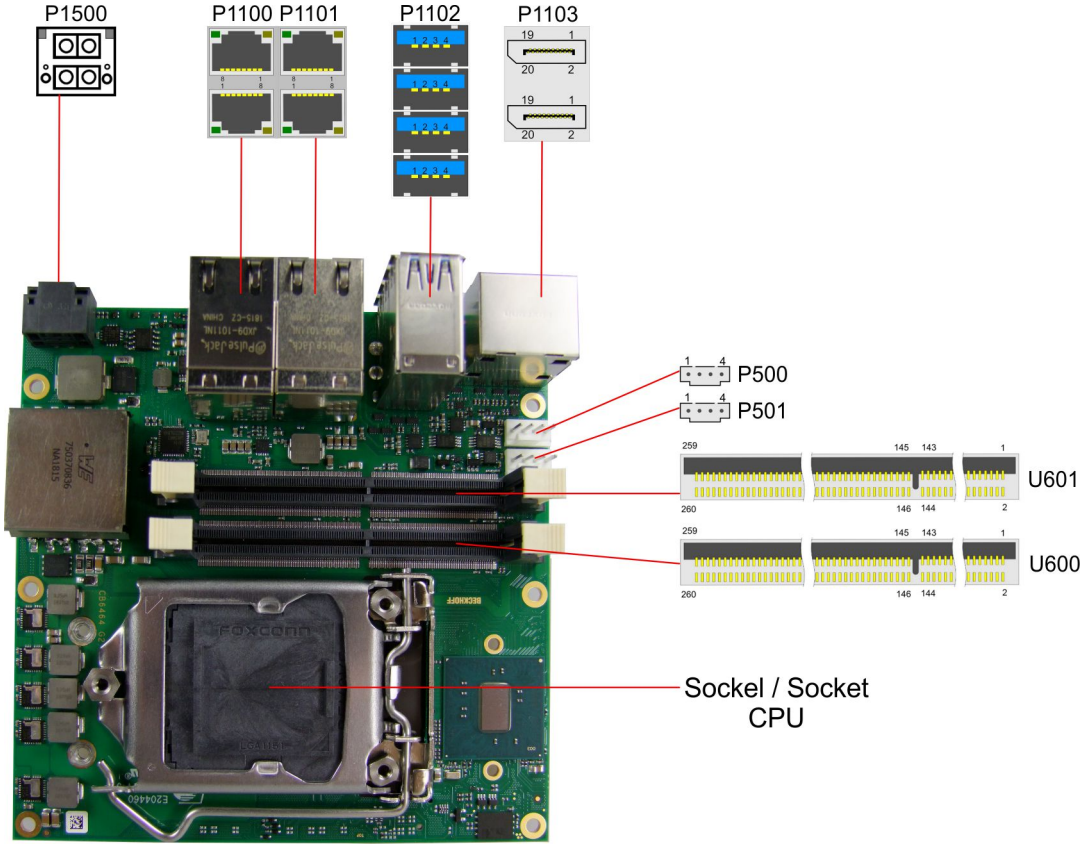


Fig. 2: Connector Map

6.3 Interface list

Number	Function (Designation)	Page
P1500	Vin (X101)	Front panel: Power supply (X101) [▶ 18]
P1100	LAN 1 (X102)	Front panel: LAN1-4 (X102-X105) [▶ 19]
P1100	LAN 2 (X103)	Front panel: LAN1-4 (X102-X105) [▶ 19]
P1101	LAN 3 (X104)	Front panel: LAN1-4 (X102-X105) [▶ 19]
P1101	LAN 4 (X105)	Front panel: LAN1-4 (X102-X105) [▶ 19]
P1102	USB3.0 (X106)	Front panel: USB 3.0 A-D (X106 - X109) [▶ 20]
P1102	USB3.0 (X107)	Front panel: USB 3.0 A-D (X106 - X109) [▶ 20]
P1102	USB3.0 (X108)	Front panel: USB 3.0 A-D (X106 - X109) [▶ 20]
P1102	USB3.0 (X109)	Front panel: USB 3.0 A-D (X106 - X109) [▶ 20]
P1103	DisplayPort (X110, X111)	Front panel: DisplayPort (X110, X110) [▶ 21]
P1200/1*	M.2 (Key B)	Internal: M.2 [▶ 22]
P1203*	BAseCon140	Internal: BAseCon140 (Q170 only) [▶ 25]
P500/501	FAN	Internal: Battery [▶ 31]
BT1200*	Battery	Internal: FAN [▶ 30]

*not depicted (see bottom of board)

The numbers in brackets correspond to the inscription of the external interfaces on the front housing of the industrial pc.

6.4 Front panel: Power supply (X101)

The connection to the power supply is implemented as a 2x2-pin housing plug (Phoenix Contact P20THR-1818504). The main supply voltage (24 V) for the module is on PIN 3. This can also be implemented as UPS-OCT (One Cable Technology), i.e. the signal for the UPS is also transmitted to the board via this cable.

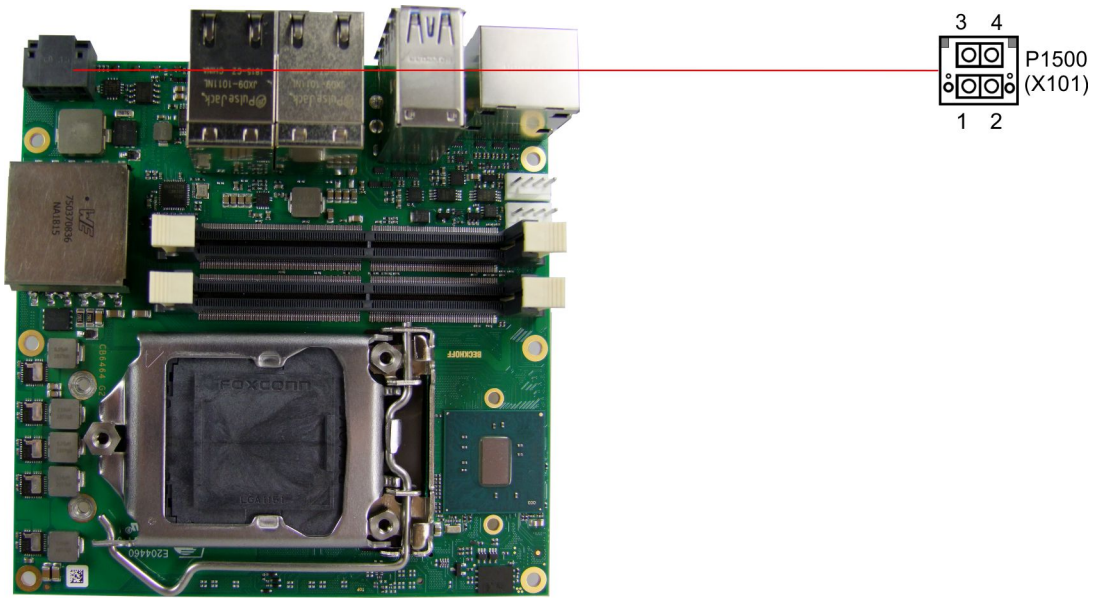


Fig. 3: CB6464 Vin

90° plug

As the plug is a 90° plug, the plug symbol in the illustration is oriented to what you see when you look at the board from the side (instead of from above).

Pin assignment of the power plug:

Description	Signal	Pin		Signal	Description
PC Start: Input for starting and shutting down the PC. Low (0 V or open contact): PC starts. High (>3 V): PC shuts down.	PC_START	1	3	Vin	24 V supply voltage UPS OCT is supported
PC Status: Output of the PC status. The voltage corresponds to the positive supply voltage and can be loaded with 1 A. Low (0 V): PC is off. High (Vin): PC is on.	PC_ACTIVE	2	4	GND	Ground

6.5 Front panel: LAN1-4 (X102-X105)

The board has four Gigabit-LAN connections, which are implemented with two standard connectors, each with two connections. Network components compatible with 10BaseT, 100BaseT and 1000BaseT can be connected to all of them. The required speed is selected automatically. Auto-Cross and Auto-Negotiate are available as well as PXE, RPL and WOL functionality. Intel® i219 (PHY) is the controller for LAN1, while Intel® i210 (MAC/PHY) is used as the controller for LAN 2 to 4.

Real-time applications

The Ethernet port connected via PCIe is usually suitable for cycle times <= 1 ms and for distributed clock applications with EtherCAT.
The Ethernet port integrated in the chipset is usually suitable for real-time Ethernet applications with cycle times > 1 ms (without distributed clocks).

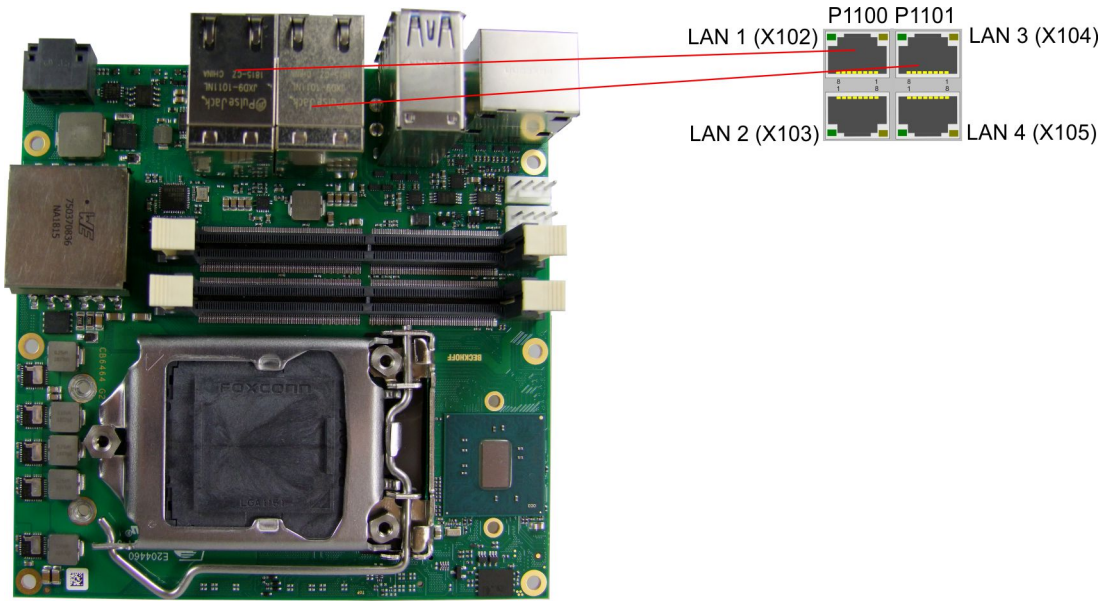


Fig. 4: CB6464 LAN

90° plug

As the plug is a 90° plug, the plug symbol in the illustration is oriented to what you see when you look at the board from the side (instead of from above).

Pin assignment of LAN connector:

Pin	Name	Description
1	LAN-0	LAN line 0 +
2	LAN-0#	LAN line 0 -
3	LAN-1	LAN line 1 +
4	LAN-2	LAN line 2 +
5	LAN-2#	LAN line 2 -
6	LAN-1#	LAN line 1 -
7	LAN-3	LAN line 3 +
8	LAN-3#	LAN line 3 -

The LEDs of the LAN interfaces indicate the activity and speed of the data transmission:

Mbit/s	Flashing during data ransmission	Steadily lit
1000	Green	Green
100	Green	Orange
10	Green	None

6.6 Front panel: USB 3.0 A-D (X106 - X109)

The CB6464 provides four USB 3.0 ports, which are implemented as combination connectors with 4 connectors.

The USB channels support the USB 3.0 specification. All necessary settings for USB can be made in the BIOS. Note that the "USB mouse and keyboard" function in the BIOS setup is only required if the operating system does not offer USB support. This function should not be selected for settings in the setup and for booting Windows with a USB mouse and keyboard connected, because this would lead to considerable performance limitations.

The individual USB interfaces can supply a current of up to 900 mA and are electronically protected.

Switch-off of the USB ports by overcurrent protection

USB ports A and B and USB ports C and D are each protected by a common overcurrent detection. In the event of overcurrent occurring on one of the ports, therefore, both commonly protected USB ports will be switched off.

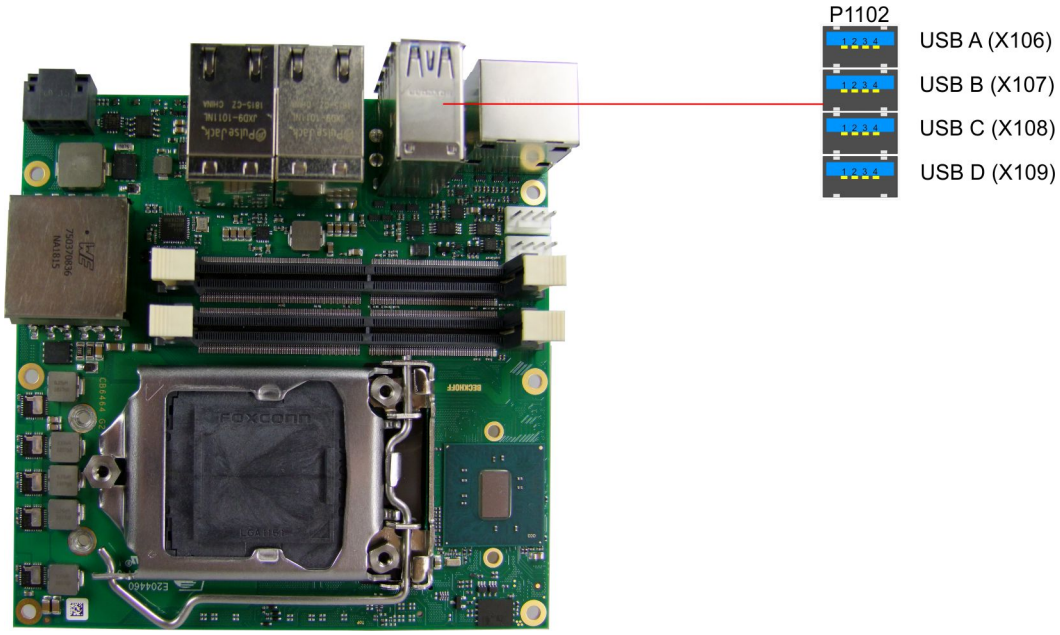


Fig. 5: CB6464 USB 3.0

90° plug

As the plug is a 90° plug, the plug symbol in the illustration is oriented to what you see when you look at the board from the side (instead of from above).

Pin assignment of USB 3.0 connector:

Pin	Signal	Description
1	VCC	5 V supply voltage
2	D-	Data - (USB 2.0)
3	D+	Data + (USB 2.0)
4	GND	Ground
5	RX-	Receive line - (USB 3.0)
6	RX+	Receive line + (USB 3.0)
7	GND	Ground
8	TX-	Transmit line - (USB 3.0)
9	TX+	Transmit line + (USB 3.0)

6.7 Front panel: DisplayPort (X110, X110)

For devices with a DisplayPort connection a corresponding standard connector (Foxconn 3VD11203-DPA1-4H) with two DisplayPort connections is available.

The interface additionally provides HDMI/DVI signals that can be used with aid of an adapter. Please consult your distributor with regard to a suitable adapter.

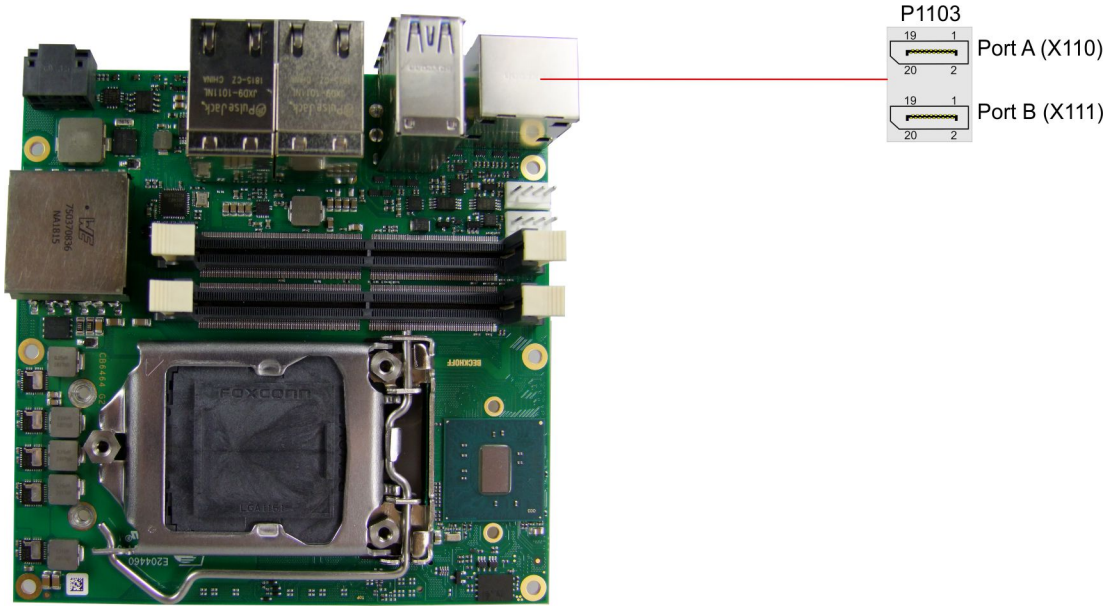


Fig. 6: CB6464 Display Port

90° plug

As the plug is a 90° plug, the plug symbol in the illustration is oriented to what you see when you look at the board from the side (instead of from above).

Pin assignment of DisplayPort plug:

Description	Signal	Pin		Signal	Description
DisplayPort Lane 0 +	L0	1	2	GND	Ground
DisplayPort Lane 0 -	L#0	3	4	L1	Line 1 plus
Ground	GND	5	6	L#1	Line 1 minus
Line 2 plus	L2	7	8	GND	Ground
Line 2 minus	L#2	9	10	L3	Line 3 plus
Ground	GND	11	12	L#3	Line 3 minus
DP / HDMI	HDMI#	13	14	GND	Ground
Auxiliary plus	AUX	15	16	GND	Ground
Auxiliary minus	AUX#	17	18	HPD	Hot Plug Detect
Ground	GND	19	20	3.3 V	3.3 V supply voltage

Switching to HDMI

DisplayPort signals are led out via the interface by default. With the use of a level shifter cable the board switches according to the DisplayPort specification 1.1 automatically to HDMI signals.

7 Internal connections

7.1 Internal: M.2

The CB6464 is equipped with two M.2 sockets, into each of which an M.2-2280 card (Key B) is inserted. Various signals are led out via the socket, depending on the chipset (see table).

Q170	H110
2x USB 3.0 (1x per socket)	2x USB 2.0 (1x per socket)
2x SATA Gen 3 (1x per socket) or 2x PCIe x1 Gen 3 (1x per socket) or 1x PCIe x1 and 1x SATA Gen 3	2x SATA Gen 3 (1x per socket)

Adapter cards with standard plug connectors are available as accessories. Please contact your distributor for this.

Pin assignment of M.2 connector:

Description	Signal	Pin		Signal	Description
Configuration pin	CONFIG_3	1	2	3.3 V1	Standby supply voltage S 3.3 V
Ground	GND	3	4	3.3 V2	Standby supply voltage S 3.3 V
Ground	GND	5	6	FCPWROFF#	Full Card Power OFF active low
USB Channel 2 Data +	USB D+	7	8	WDISABLE#	(not led out)
USB Channel 2 Data -	USB D-	9	10	GPIO9 DAS DDS LED1	(not led out)
Ground	GND	11	12	Connector Key	
Connector Key		13	14		
		15	16		
		17	18		
		19	20	GPIO5	(not led out)
Configuration pin	Config 0	21	22	GPIO6	(not led out)
(not led out)	GPIO11	23	24	GPIO7	(not led out)
(not led out)	DPR	25	26	GPIO10	(not led out)
Ground	GND	27	28	GPIO8	(not led out)
USB 3.0 Channel 5 SuperSpeed Receive -	PER1# USB3-5 SSRX# SSICRX#	29	30	UIM RST	(not led out)
USB 3.0 Channel 5 SuperSpeed Receive	PER1 USB3-5 SSRX SSICRX	31	32	UIM CLK	(not led out)
Ground	GND	33	34	UIM DATA	(not led out)
USB 3.0 Channel 5 SuperSpeed Transmit -	PET1# USB3-5 SSTX# SSICTX#	35	36	UIM PWR	(not led out)
USB 3.0 Channel 5 SuperSpeed Transmit +	PET1 USB3-5 SSTX SSICTX	37	38	DEVSLP	DeviceSleep
Ground	GND	39	40	GPIO0	(not led out)
PCIe Lane 1 Receive +	PER0# SATAB	41	42	GPIO1	(not led out)
PCIe Lane 1 Receive -	PER0 SATAB#	43	44	GPIO2	(not led out)
Ground	GND	45	46	GPIO3	(not led out)
PCIe Lane 1 Transmit -	PET0# SATAA#	47	48	GPIO4	(not led out)
PCIe Lane 1 Transmit +	PET0 SATAA	49	50	PRST#	PCIe Reset active low
Ground	GND	51	52	CLKREQ#	PCIe Clock Enable active low
PCIe Lane 1 Reference Clock -	REFCLK#	53	54	PEWAKE#	Link Reactivation active low
PCIe Lane 1 Reference Clock -	REFCLK	55	56	N/C	(not led out)
Ground	GND	57	58	N/C	(not led out)
(not led out)	ANTCTL0	59	60	COEX3	(not led out)
(not led out)	ANTCTL1	61	62	COEX2	(not led out)

Description	Signal	Pin		Signal	Description
(not led out)	ANTCTL2	63	64	COEX1	(not led out)
(not led out)	ANTCTL3	65	66	SIM DETECT	(not led out)
Power good	RESET#	67	68	SUSCLK	System clock
Configuration pin	CFG1	69	70	3.3 V	Standby supply voltage S 3.3 V
Ground	GND	71	72	3.3 V	Standby supply voltage S 3.3 V
Ground	GND	73	74	3.3 V	Standby supply voltage S 3.3 V
Configuration pin	CFG2	75			

7.2 Internal: BAseCon140 (Q170 only)

In conjunction with the Q170 chipset, the BAseCon140 connector enables the flexible extension of the IO functions of the CB6464. It provides up to eight PCIe lanes, of which a maximum of four can be multiplexed with SATA 2.0 (3G) and a maximum of four with PCIe lines, as well as a maximum of four PCIe lines with a maximum of four USB 3.0 lines (see table). In addition, DisplayPort, SSIC, SMBus and 1Wire signals are led out via the BAseCon connector. The expansion board takes care of the configuration of the IO functions. A PIC on the expansion card contains the configuration data that are communicated to the board upon connection, thus enabling an uncomplicated and self-configuring extension to the IO options.

<table>
<tr><th colspan="2">With Q170 only</th></tr>
<tr><td>Max. 4x SATA Gen 3 / max. 4x PCIe x1 Gen 3 (multiplexed)</td><td rowspan="2">Total: 8x PCIe x1
(configurable – see left)</td></tr>
<tr><td>Max. 4x USB 3.0 / max. 4x PCIe x1 Gen 3 (multiplexed)</td></tr>
<tr><td colspan="2">1x DisplayPort 1.4 / HDMI 2.0</td></tr>
</table>

Observe the current limits!

In order to avoid damaging the device, it is essential to observe the following current limits:

A maximum load of 2.8 A per pin must not be exceeded. On account of the different current consumptions of the usable processors the actual current consumption may be lower. The respective maximum values can be obtained from your distributor on inquiry.

Irrespective of the CPU in use, a maximum total load of 100 W must not be exceeded.

NOTE

Mirrored Signal at BAseCon-plug Stack Down

At the Stack Down version of the BAseCon plug (plug on the bottom-side of the board), the signals are transferred by a stack to the mating plug. On this mating plug (Stack Up) the signals are mirrored. On the stack itself there is no mirroring.

Pin assignment of BAseCon140 connector:

Description	Signal	Pin		Signal	Description
S UPS output	S UPS OUT1	2	1	S UPS IN1	S UPS input
S UPS output	S UPS OUT2	4	3	S UPS IN2	S UPS input
(not led out)	5 V1	6	5	GND	Ground
(not led out)	5 V2	8	7	GND	Ground
		ISOLATION			
S VCC	S 5 V	14	13	S 3.3 V	Standby supply voltage 3.3 V
Ground	GND	16	15	GND	Ground
PCIe Lane 1 Transmit +	PE1 TX/ SATA4 TX	18	17	SATA4 RX/ PE1 RX	PCIe Lane 1 Receive +
PCIe Lane 1 Transmit -	PE1 TX#/ SATA4 TX#	20	19	SATA4 RX #/ PE1 RX#	PCIe Lane 1 Receive -
Ground	GND	22	21	GND	Ground
PCIe Clock Lane 1 +	PECLK1	24	23	PECLK2	PCIe Clock Lane 2+
PCIe Clock Lane 1 -	PECLK1#	26	25	PECLK2#	PCIe Clock Lane 2 -
Ground	GND	28	27	GND	Ground
PCI Lane 2 Transmit +	PE2 TX/ SATA3 TX	30	29	SATA3 RX/ PE2 RX	PCIe Lane 2 Receive
PCI Lane 2 Transmit -	PE2 TX#/ SATA3 TX#	32	31	SATA3 RX #/ PE2 RX#	PCIe Lane 2 Receive -
Ground	GND	34	33	GND	Ground
PCIe Lane 3 Transmit +	PE3-TX/ SATA2-TX	36	35	SATA2 RX/ PE3 RX	PCIe Lane 3 Receive +
PCIe Lane 3 Transmit -	PE3-TX#/ SATA2-TX#	38	37	SATA2 RX#/ PE3 RX#	PCIe Lane 3 Receive -
Ground	GND	40	39	GND	Ground
PCIe Lane 3 Clock +	PECLK3	42	41	PECLK4	PCIe Clock 4 +
PCIe Lane 3 Clock 3 -	PECLK3#	44	43	PECLK4#	PCIe Clock 4 -
Ground	GND	46	45	GND	Ground
SATA Lane 2 Transmit +	PE4-TX/ SATA1-TX	48	47	SATA1 RX/ PE4 RX	SATA Lane 2 Receive +
SATA Lane 2 Transmit -	PE4-TX#/ SATA1-TX#	50	49	SATA1 RX #/ PE4 RX #	SATA Lane 2 Receive -
Ground	GND	52	51	GND	Ground
PCIe Clock Enable Lane 1 active low	PCKE1#	54	53	PCKE2#	PCIe Lane 2 Clock Enable active low
PCIe Clock Enable Lane 3 -	PCKE3#	56	55	PCKE4#	PCIe Lane 4 Clock Enable -
PCIe Reset active low	PERST#	58	57	PEWAKE#	PCIe Wake active low
SMBus Clock	SMBCLK	60	59	SMBDAT	SMBus Data
KEY					
SMBus Alert active low	SMB-Alert#	62	61	1Wire	1-Wire
PCIe Clock Enable Lane 5	PCKE5/OC4#	64	63	PCKE6#/ OC3#	PCIe Lane 6 Clock Enable 6 -
KEY					

Description	Signal	Pin		Signal	Description
PCIe Clock Enable Lane 7	PCKE7/OC2#	66	65	PCKE8#/ OC1#	USB Overcurrent active low
Ground	GND	68	67	GND	Ground
PCIe Lane 5 Transmit +	PE5-TX/ USB3-4-TX/ USBC1-TX	70	69	USBC1 RX/ USB3-4 RX/ PE5 RX	PCIe Lane 5 Receive +
PCIe Lane 5 Transmit -	PE5-TX#/ USB3-4-TX#/ USBC1_TX#	72	71	USBC1 RX#/ USB3-4 RX#/ PE5 RX#	PCIe Lane 5 Receive -
USB 2.0 Channel 4 +	USB2-4 (GND)	74	73	USB2-8 (GND)	USB 2.0 Channel 8 Data +
PCIe Clock Lane 5 +	PECLK5/USBC_SBU1 (GND)	76	75	PECLK6 (GND)	PCIe Lane 6 Clock +
PCIe Clock 5 -	PECLK5#/ USBC-SBU2 (GND)	78	77	PECLK6# (GND)	PCIe Clock Lane 6 -
USB 2.0 Channel 4 -	USB2-4# (GND)	80	79	USB2-8 D# (GND)	USB 2.0 Channel 8 Data -
PCIe Lane 6 Transmit +	PE6-TX/ USB3-3-TX/ USBC2-TX	82	81	USBC2 RX/ USB3-3 RX/ PE6 RX	PCIe Lane 6 Receive +
PCIe Lane 6 Transmit -	PE6-TX#/ USB3-3-TX#/ USBC2-TX#	84	83	USBC2 RX#/ USB3-3 RX#/ PE6 RX#	PCIe Lane 6 Receive -
Ground	GND	86	85	GND	Ground
PCIe Lane 7 Transmit +	PE7-TX/ USB3-2-TX/ SSIC-TX	88	87	SSIC RX/ USB3-2 RX/ PE7 RX	PCIe Lane 7 Receive +
PCIe Lane 7 Transmit -	PE7-TX#/ USB3-2-TX#/ SSIC-TX#	90	89	SSIC RX#/ USB3 -2 RX#/ PE7 RX#	PCIe Lane 7 Receive -
USB 2.0 Channel 3 +	USB2-2 (GND)	92	91	USB2-1 (GND)	USB 2.0 Channel 10 +
Ground	PECLK7 (GND)	94	93	PECLK8 (GND)	PCIe Lane 8 Clock +
Ground	PECLK7# (GND)	96	95	PECLK8# (GND)	PCIe Clock Lane 8 -
USB 2.0 Channel 3 -	USB2-2# (GND)	98	97	USB2-1# (GND)	USB 2.0 Channel 10 -
PCIe Lane 8 Transmit +	PE8-TX/ USB3-1-TX	100	99	USB3-1 RX/ PE8 RX	PCIe Lane 8 Receive +
PCIe Lane 8 Transmit -	PE8-TX#/ USB3-1-TX#	102	101	USB3-1 RX#/ PE8 RX#	PCIe Lane 8 Receive -
Ground	GND	104	103	GND	Ground
KEY					
SATA GP1	GPIO1/ SATAGP1	106	105	SATAGP2/ GPIO2	SATA GP 2
SATA GP3	GPIO3/ SATAGP3/ USBC-CC1	108	107	USB-CC2/ SATAGP4/ GPIO4	SATA GP4
TwinCAT LED Red	GPIO5/ TCLEDR	110	109	GPIO6/ TCLEDG	TwinCAT LED Green
TwinCAT LED Blue	GPIO7/ TCLEDB	112	111	GPIO8	(not led out)

Description	Signal	Pin		Signal	Description
SATA LED active low	SATA-LED	114	113	USBPWREN	USB Power Enable
RTC Battery	BATT	116	115	PWRFAIL	SUSV
Power Management Event active low	PME#	118	117	PWRGOOD	Power good
Power button active low	PWRBTN#	120	119	MRST#	Reset button active low
PSON	PSON	122	121	ATXPWRGD	ATX Power good
Ground	GND	124	123	GND	Ground
DisplayPort -/ HDMID	DP#/DVI	126	125	DDCC/ DPAUX	DDC Clock/ DisplayPort Aux +
DisplayPort Hot Plug Detect	DPHPD	128	127	DDCD/ DPAUX#	DDC Data/ DisplayPort Aux -
Ground	GND	130	129	GND	Ground
DisplayPort/ Lane 0 +	DPL0/ TMDSD2	132	131	TMDSD1/ DPL1	Lane 1 +/ DisplayPort +
DisplayPort/ Lane 0 -	DPL0#/ TMDSD2	134	133	TMDSD1/ DPL1#	Lane 1 -/ DisplayPort -
Ground	GND	136	135	GND	Ground
DisplayPort/ Lane 2 +	DPL2/ TMDSD0	138	137	TMDSCLK/ DPL3	Lane 3 +/ DisplayPort +
DisplayPort/ Lane 2 -	DPL2#/ TMDSD0	140	139	TMDSCLK/ DPL3#	Lane 3 -/ DisplayPort -

7.3 Internal: FAN

The module has two 4-pin fan connections. This enables fans with a supply voltage of 12 V to be connected directly to the module. A signal is also available for monitoring the fan speed.

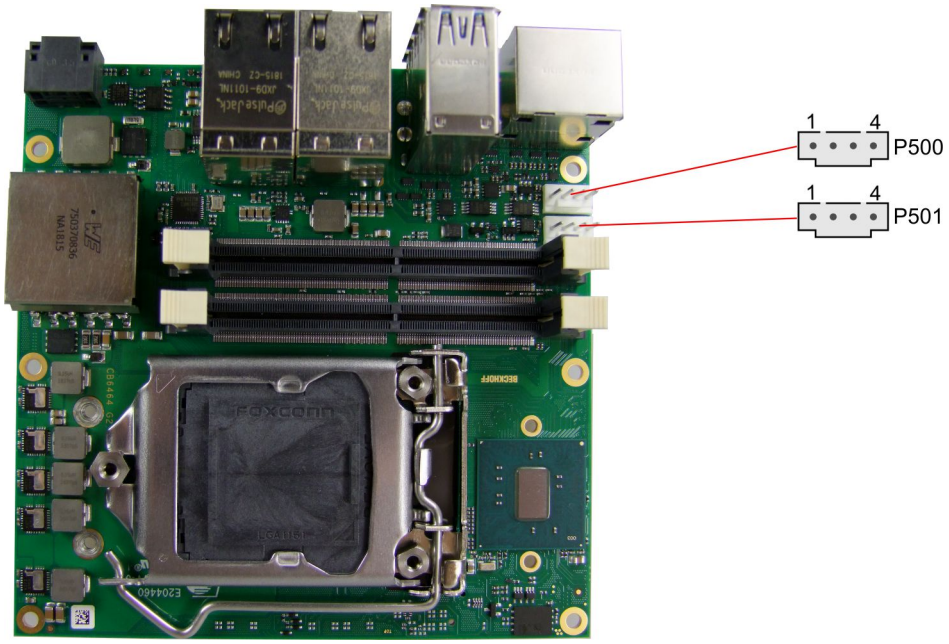


Fig. 7: CB6464 FAN

Pin assignment of fan connector:

Pin	Signal	Description
1	GND	Ground
2	12 V	Supply voltage 12 V regulated
3	TACHO	Speed monitoring
4	PWM	Speed control

7.4 Internal: Battery

The board is delivered with a CR2032 battery holder (Renata VBH2032-1) including a 3 V battery.

	UL conformity All technical measures for UL conformity are already integrated on the board. Accordingly, no additional actions are necessary for the connection of an RTC battery. The battery must be connected directly.

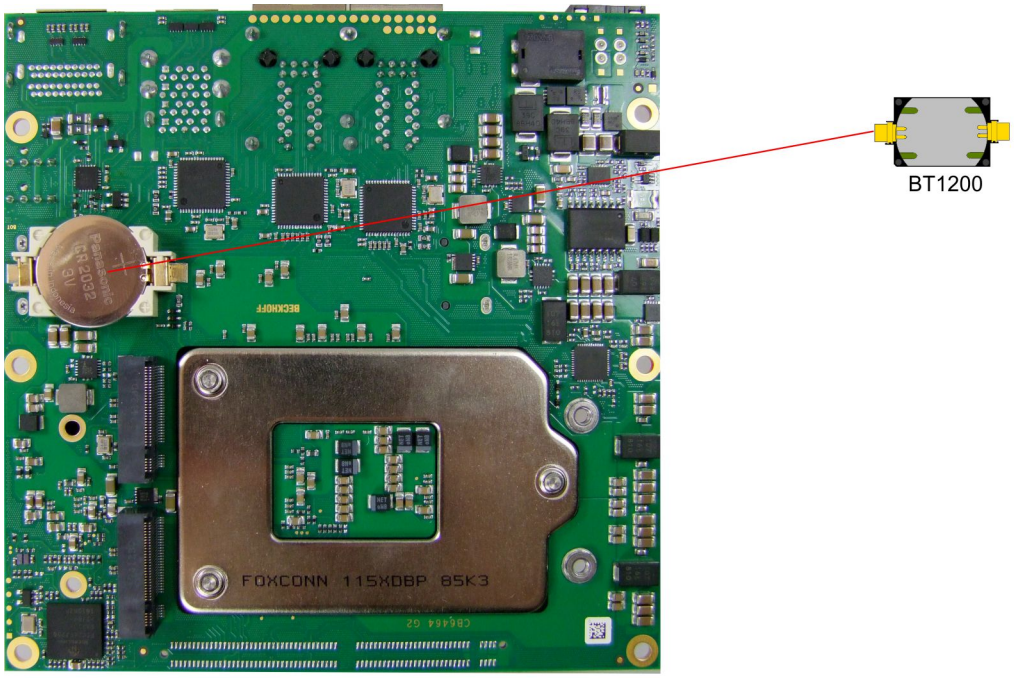


Fig. 8: CB6464 Bat

Synchronism of the RTC

The quartz of the RTC reacts to temperature fluctuations. Therefore, correct synchronism of the RTC is possible only with suitable and sufficient cooling!

8 LED's

8.1 LED: Powercontroller

There is a RGB LED on the board with which status messages of the power controller are output by means of colors and flashing intervals.

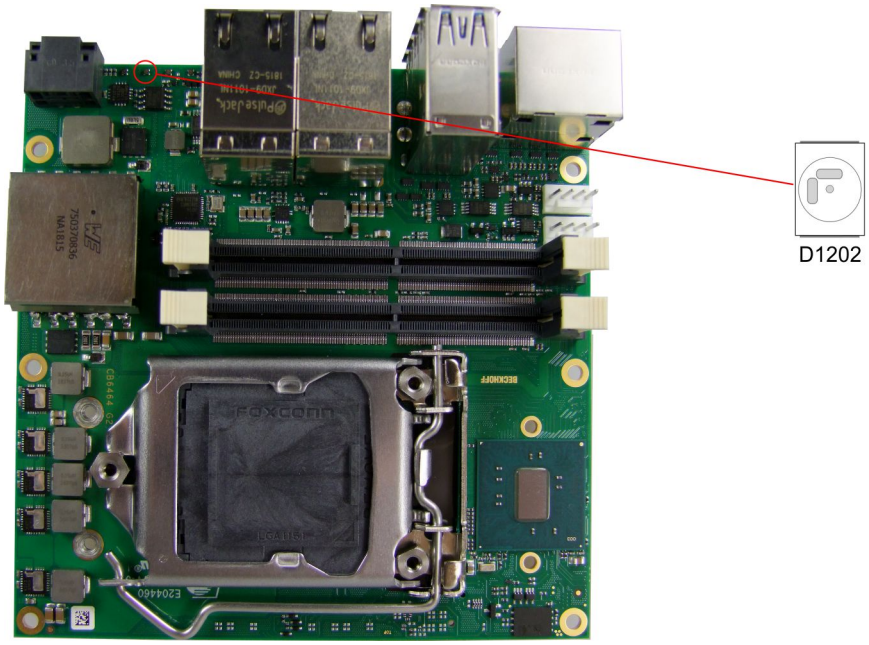


Fig. 9: CB6464 PWRCTRL-LED

Color	Interval	Meaning
None	Steadily lit	System in error state
White	Steadily lit	Power fail
Cyan	Steadily lit	Reserved
Magenta	Steadily lit	S UPS active (if existent)
Blue	Steadily lit	Reserved
Yellow	Steadily lit	S5 state
Green	Steadily lit	S0 state
Red	Steadily lit	Reset/Start
Green/yellow	Flashing	Bootloader running without error
Red/yellow	Flashing	Bootloader is starting (start sequence is being run through)
Yellow	Flashing (6s)	S4 state
Yellow	Flashing (3s)	S3 state
Magenta	Flashing (0,5s)	S UPS capacitance test (if S UPS exists)
Red/magenta	Flashing	Checksum error during the I2C transmission in the bootloader

A steadily lit red LED can indicate a hardware error.

Adaptation of the status codes

It is possible to adapt the status codes (e.g. as TwinCAT LED). To do this, the system colors can be changed with the aid of an SMB command. This change remains in force until the next restart or reset. A change of the default colors is indicated by the additional flashing of the white LED.

8.2 LED: SATA

A further RGB LED indicates the hard disk activity.

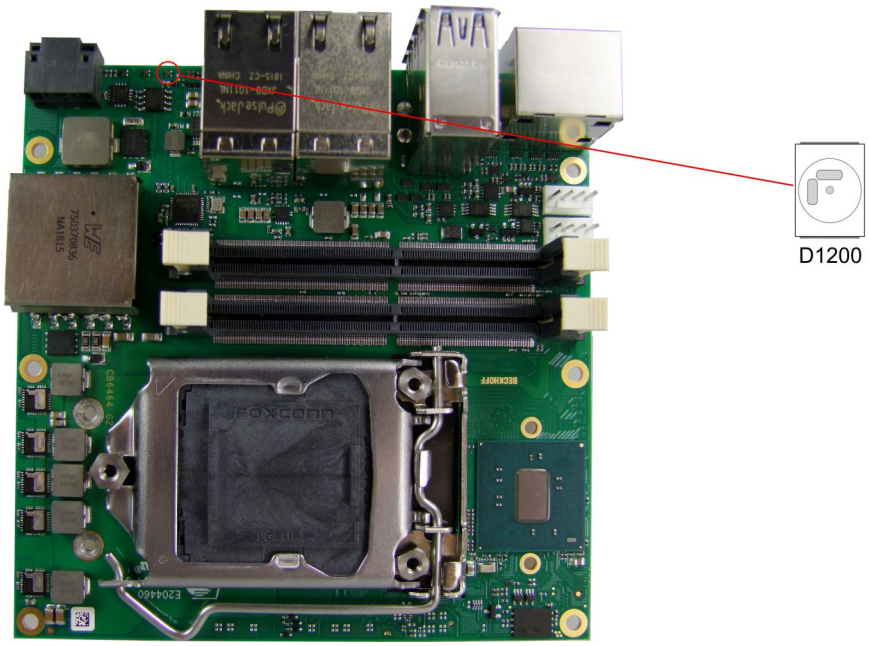


Fig. 10: CB6464 SATA-LED

Color	Interval	Meaning
Red	Flashing	Acitvity (access)

8.3 LED: TwinCAT

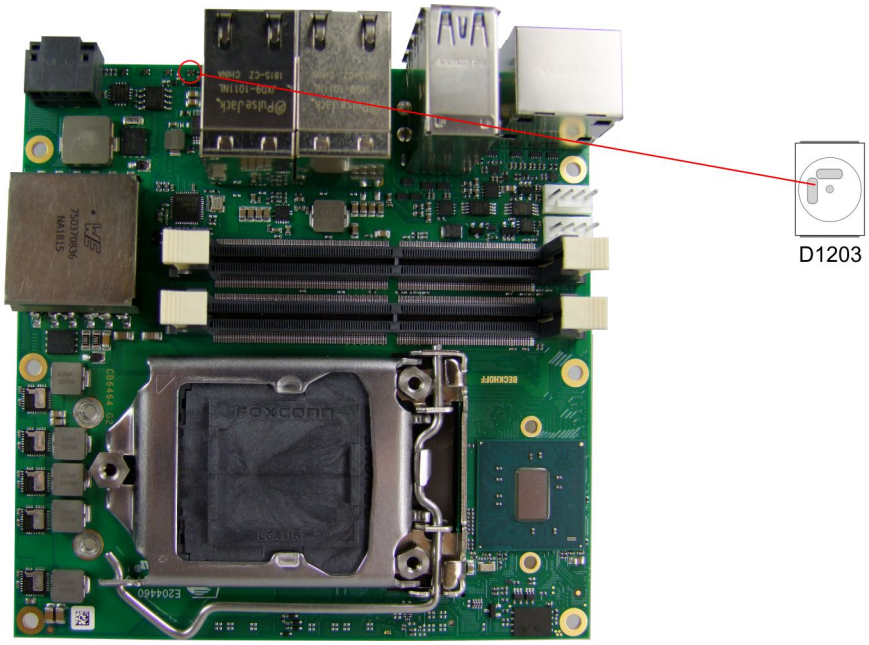


Fig. 11: CB6464 TwinCAT-LED

Color	Interval	Meaning
Green	Steadily lit	TwinCAT Run Mode
Blue	Steadily lit	TwinCAT Config Mode
Red	Steadily lit	TwinCAT stop

Adaptation of the status codes

It is possible to adapt the status codes (e.g. as TwinCAT LED). To do this, the system colors can be changed with the aid of an SMB command. This change remains in force until the next restart or reset. A change of the default colors is indicated by the additional flashing of the white LED.

8.4 LED: UPS-OCT

There is a RGB LED on the board with which the transmission quality of the UPS-OCT signals is indicated by means of colors and flashing intervals.

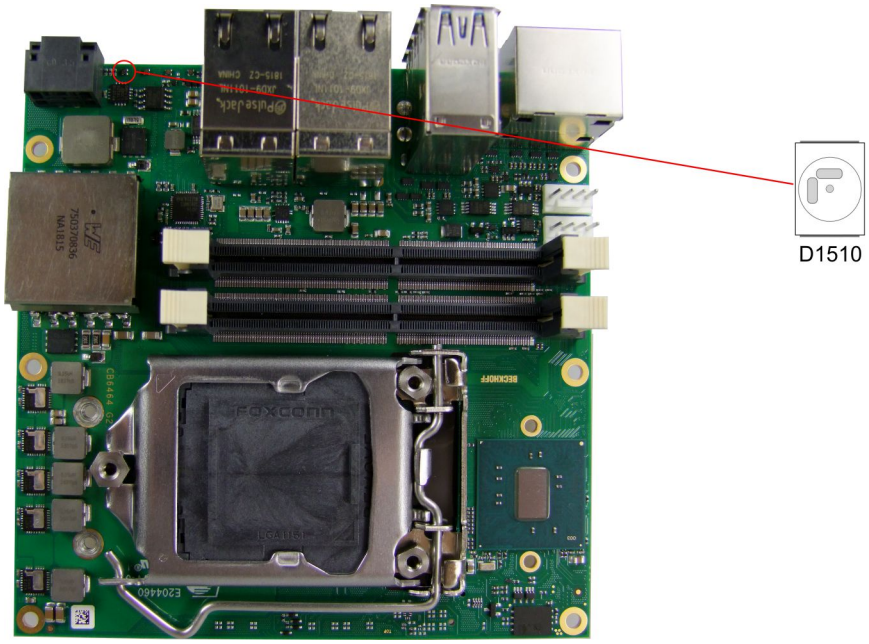


Fig. 12: CB6464 OCT-LED

Color	Interval	Meaning
None	Steadily lit	No UPS-OCT connected
Blue	Flashing	Bootloader active
Yellow	Steadily lit	Moderate signal quality
Green	Steadily lit	Good signal quality
Red	Steadily lit	Poor signal qulity

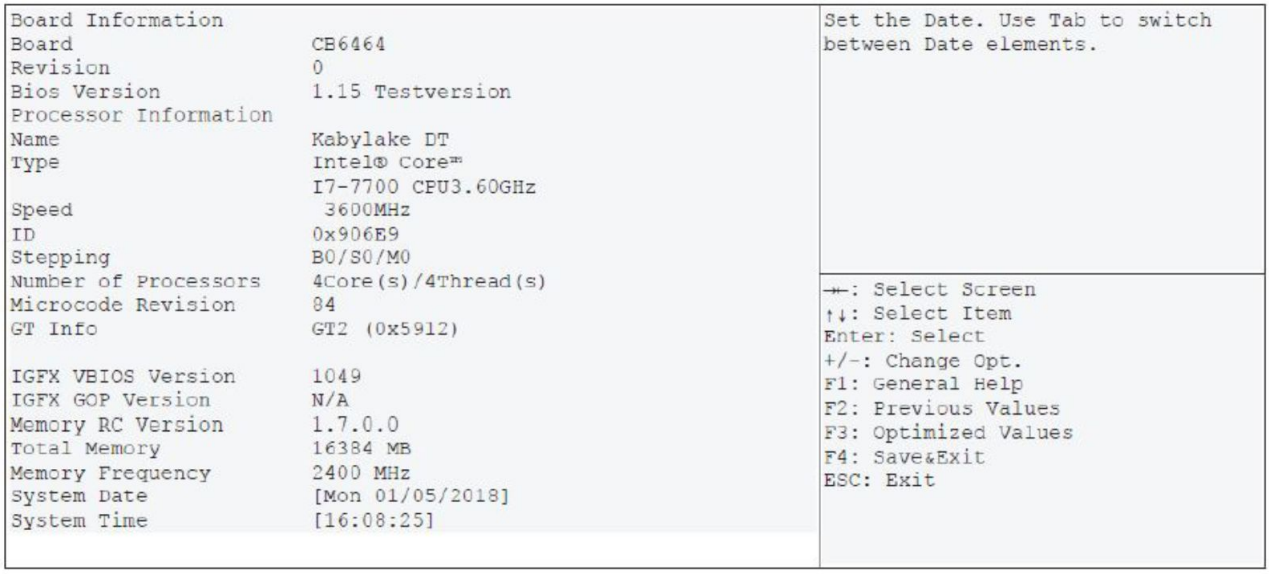
If the LED does not light up, no UPS-OCT is connected.

Adaptation of the status codes

It is possible to adapt the status codes (e.g. as UPS-OCT-LED). To do this, the system colors can be changed with the aid of an SMB command. This change remains in force until the next restart or reset.

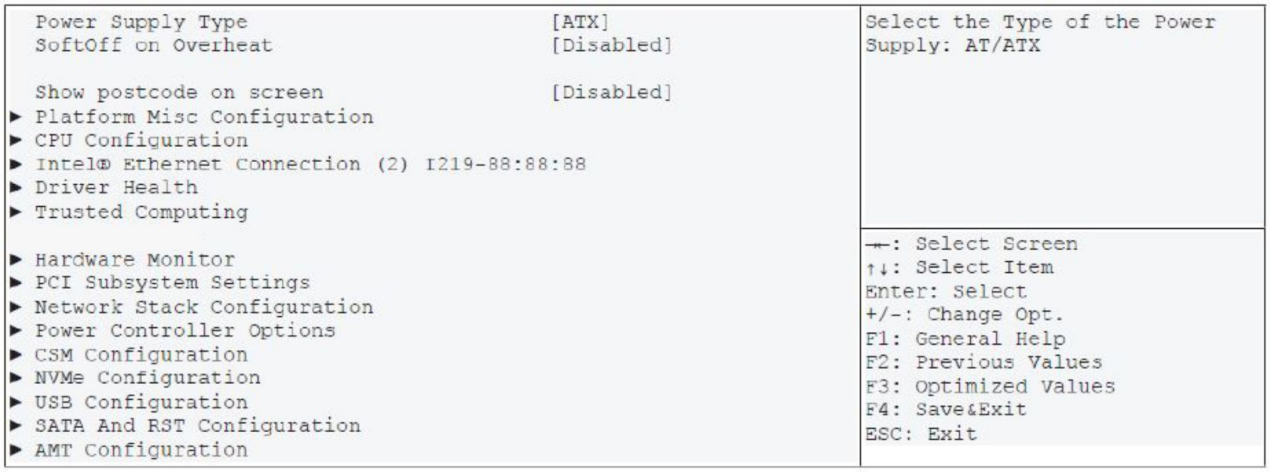
9 BIOS

9.1 Main



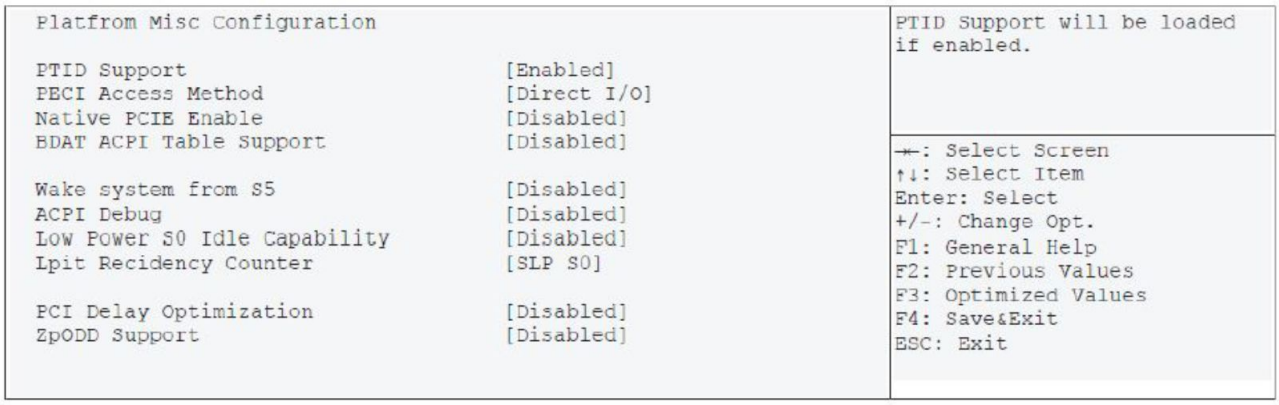
Setup-Entry	Options
Board*	None
Revision	None
Bios Version	None
Processor Information	
Name	None
Type	None
Speed	None
ID	None
Stepping	None
Number of Processors	None
Microcode Revision	None
GT Info	None
IGFX VBIOS Version	None
IGFX GOP Version	None
Memory RC Version	None
Total Memory	None
Memory Frequency	None
System Date	Here the systemdate can be changed.
System Time	Here the systemtime can be changed.
*PCH Typ	Automatic indication of variant: CB6464 V1 → Q170 CB6464 V2 → H110

9.2 Advanced Menu



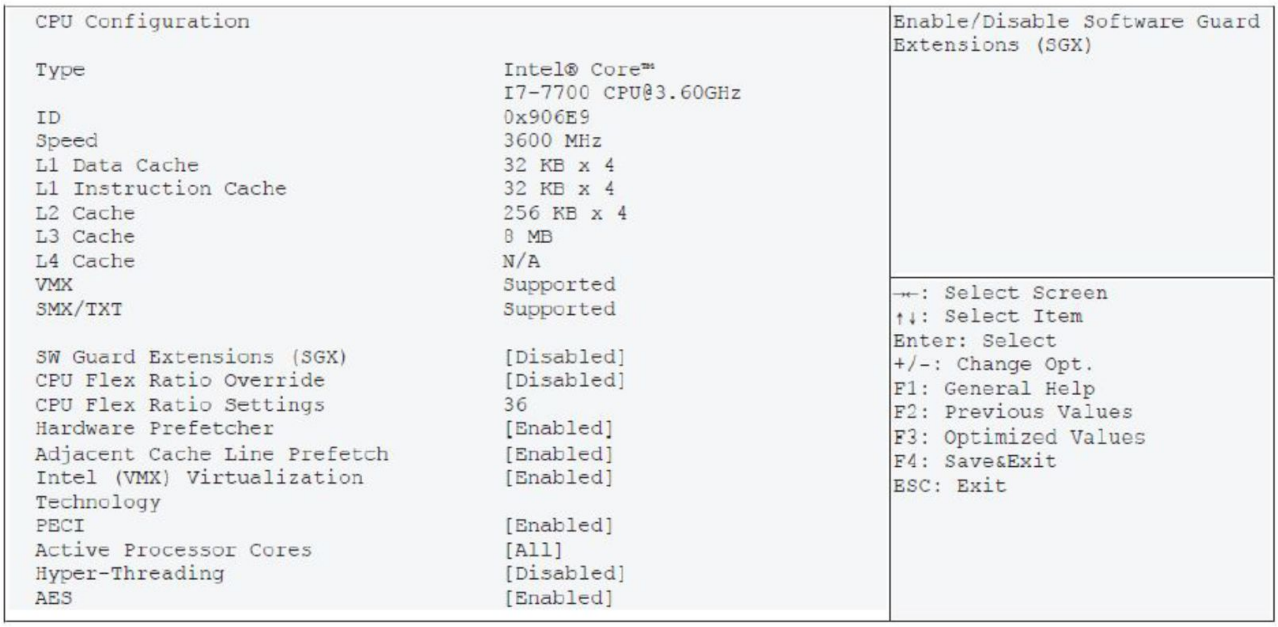
Setup-Entry	Options
Power-Supply Type	ATX / AT
SoftOff on Overheat	Disabled / Enabled / Enabled (Emulate PwrBtn)
Show postcode on screen	Disabled / Enabled
Platform Misc Configuation	Submenu see: Platform Misc Configuration [▶ 38]
CPU Configuration	Submenu see: CPU Configuration [▶ 39]
Intel® Ethernet Connection (2)	Submenu see: Intel Ethernet Connection [▶ 40]
Driver Health	Submenu see: Driver Health [▶ 41]
Trusted Computing	Submenu see: Trusted Computing [▶ 42]
Hardware Monitor	Submenu see: Hardware Monitor [▶ 42]
PCI Subsystem Settings	Submenu see: PCI Subsystem Settings [▶ 43]
Network Stack Configuration	Submenu see: Network Stack Configuration [▶ 44]
Power Controller Options	Submenu see: Power Controller Options [▶ 45]
CSM Configuration	Submenu see: CSM Configuration [▶ 46]
NVME Configuration	Submenu see: NVMe Configuration [▶ 47]
USB Configuration	Submenu see: USB Configuration [▶ 47]
SATA and RST Configuration	Submenu see: SATA und RST Configuration [▶ 48]
AMT Configuration	Submenu see: AMT Configuration [▶ 50]

9.3 Platform Misc Configuration



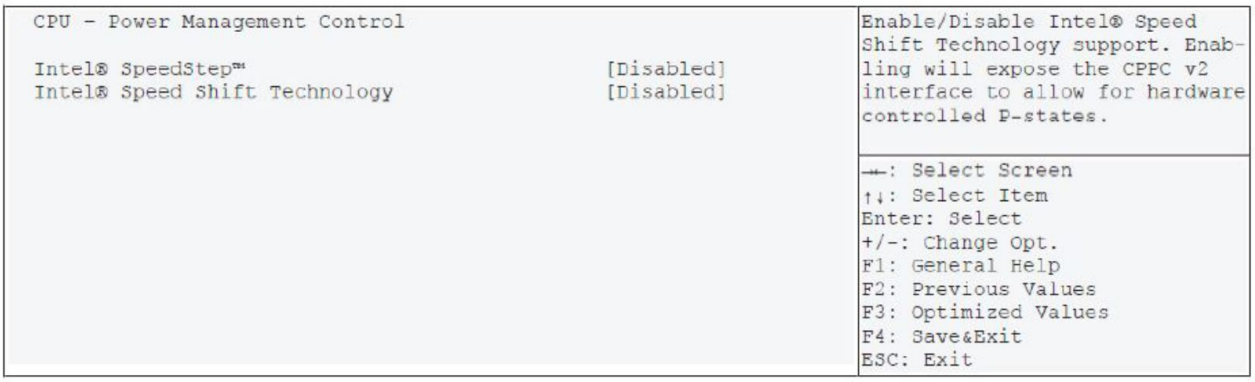
Bios-Entry	Options
Platform Misc Configuration	
PTID Support	Disabled / Enabled
PECI Access Method	Direct I/O / ACPI
Native PCIE Enable	Disabled / Enabled
BDAT ACPI Table Support	Disabled / Enabled
Wake system from S5	Disabled / Enabled
ACPI Debug	Disabled / Enabled
Low Power S0 Idle Capability	Disabled / Enabled
Lpit Recidency Counter	SLP S0 / C10
PCI Delay Optimization	Disabled / Enabled
ZpODD Support	Disabled / Enabled

9.4 CPU Configuration



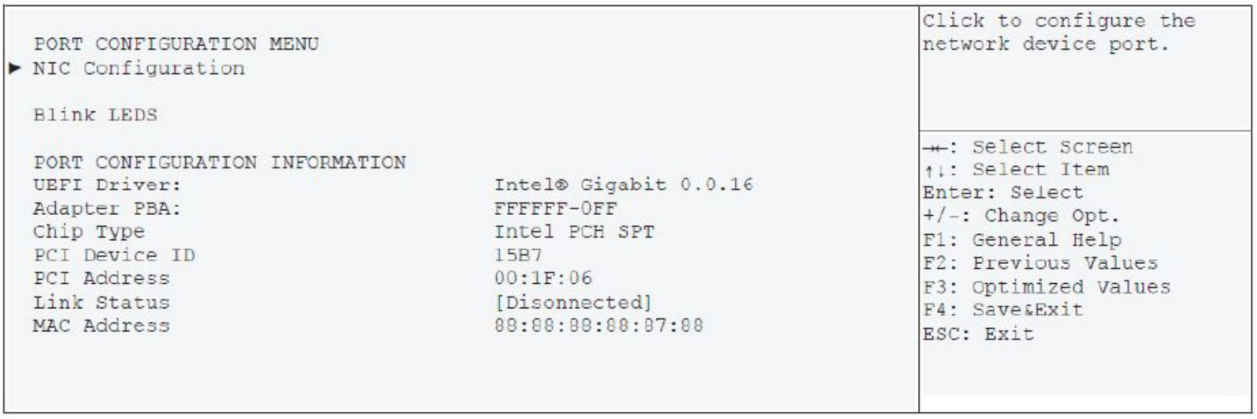
Bios-Entry	Options
CPU Configuration	
Type	None
ID	None
Speed	None
L1 Data Cache	None
L1 Instruction Set	None
L2 Cache	None
L3 Cache	None
L4 Cache	None
VMX	None
SMX/TXT	None
SW Guard Extensions (SGX)	Software Controllers / Enabled / Disabled
CPU Flex Ratio Override	Disabled / Enabled
CPU Flex Ratio Settings	None
Hardware Prefetcher	Disabled / Enabled
Adjacent Cache Line Prefetch	Disabled / Enabled
Intel (VMX) Virtualization Technology	Disabled / Enabled
PECI	Disabled / Enabled
Active Processor Cores	All / 1 / 2 / 3
Hyper-Threading	Disabled / Enabled
AES	Disabled / Enabled
Intel Trusted Execution Technology	Disabled / Enabled
Alias Check Request	Disabled / Enabled
DPR Memory Size (MB)	0..255
Reset AUX Content	Disabled / Enabled
CPU-Power Managemant Control	Submenu see: CPU Power Management Control [▶ 40]

9.5 CPU Power Management Control



Bios-Entry	Options
CPU-Power Mangement Control	
Intel® SpeedStep	Disabled / Enabled
Intel® Speed Shift Technology	Enabled / Disabled

9.6 Intel Ethernet Connection

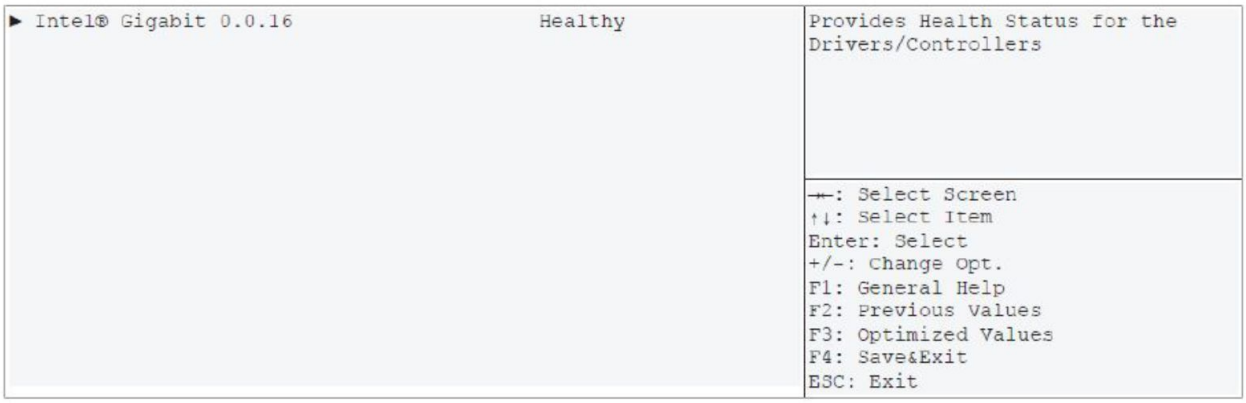


Bios-Entry	Options
Port Configuration	
NIC Configuration	Submenu see: NIC Configuration [▶ 41]
Blink LEDs	
Port Configuration Information	
UEFI Driver	None
Adapter PBA	None
Chip Type	None
PCI DEcice ID	None
PCI Address	None
Link Status	None
MAC Address	None

9.7 NIC Configuration

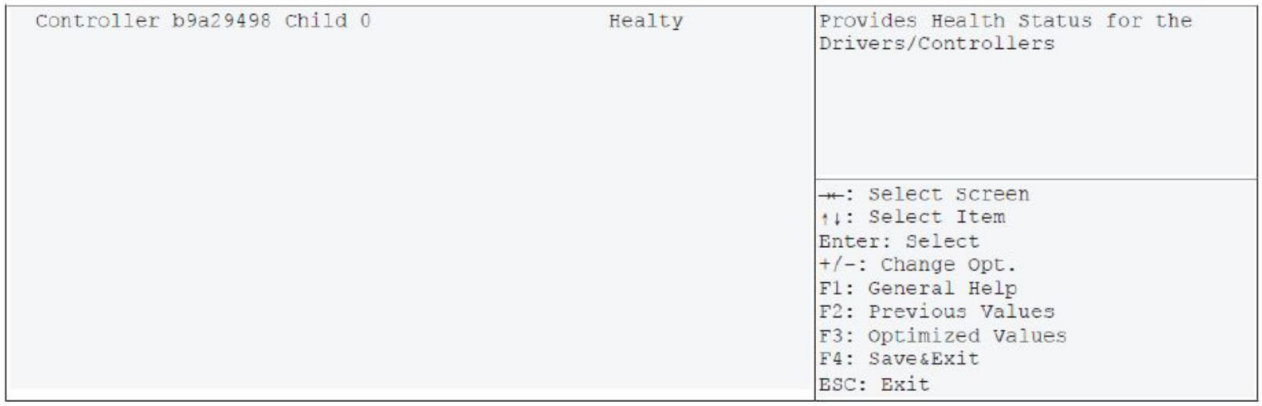
Bios-Entry	Options
Link Speed	Auto Negotiated / 10 Mbps Half / 10 Mbps Full / 100 Mbps Half / 100 Mbps Full
Wake On LAN	Disabled / Enabled

9.8 Driver Health



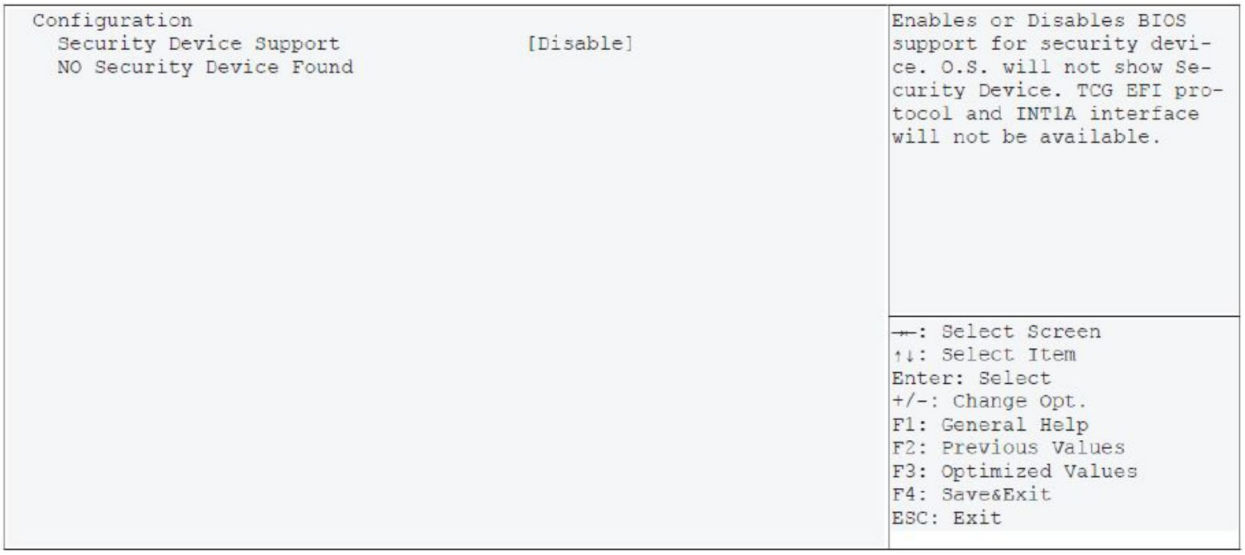
Bios-Entry	Options
Intel® Gigabit 0.0.16	Submenu see: Intel Gigabit [▶ 41]

9.9 Intel Gigabit



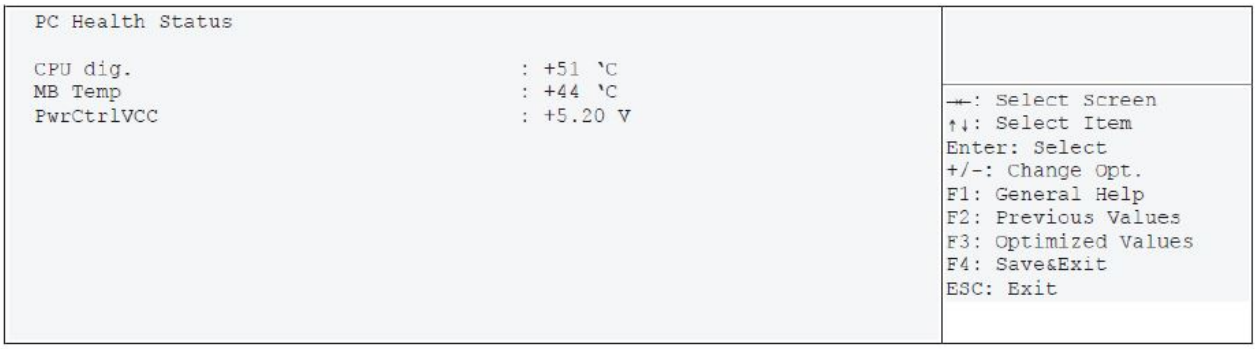
Bios-Entry	Options
Controller (xxx)	None

9.10 Trusted Computing



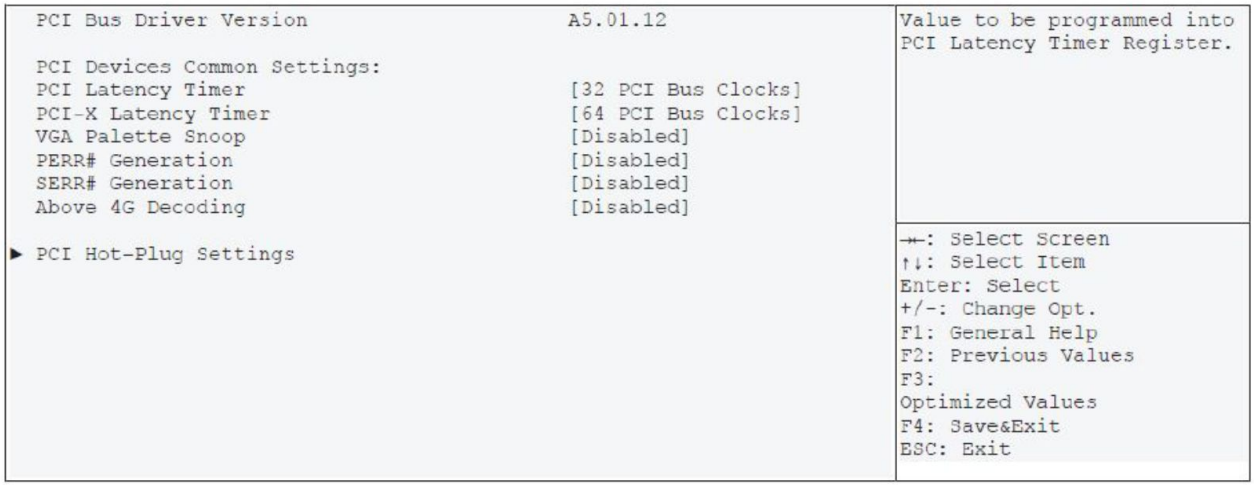
Bios-Entry	Options
Configuration	
Security Device Support	Disable / Enable

9.11 Hardware Monitor



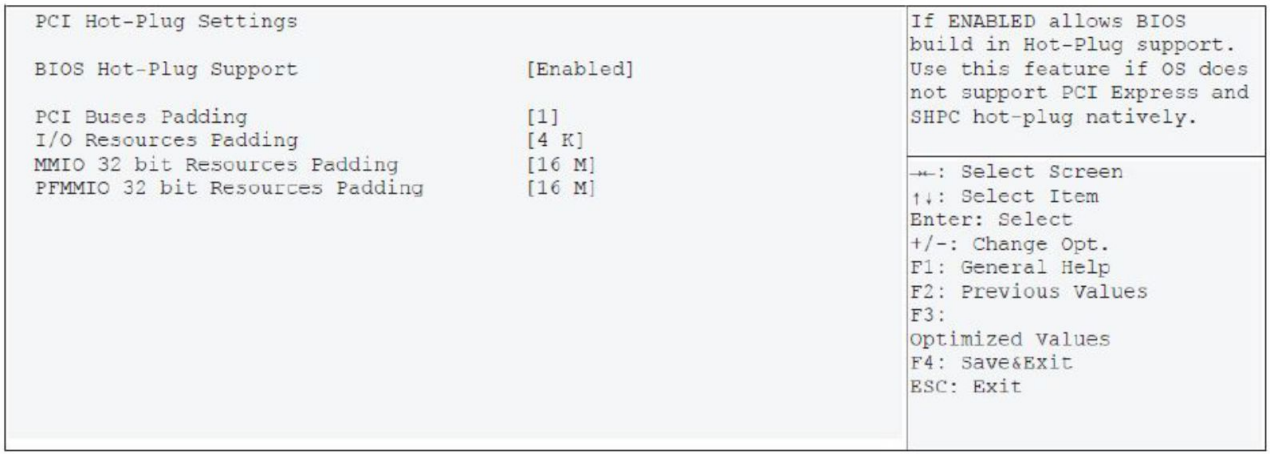
Bios-Entry	Options
PC Health Status	
CPU dig.	None
1.00V	None
VCCCORE	None
5V	None
12V	None
Memory VD	None
3.3V	None
Fan 1	None
Fan 2	None
MB Temp	None
Memory Temp	None
PwCtrlTemp	None

9.12 PCI Subsystem Settings



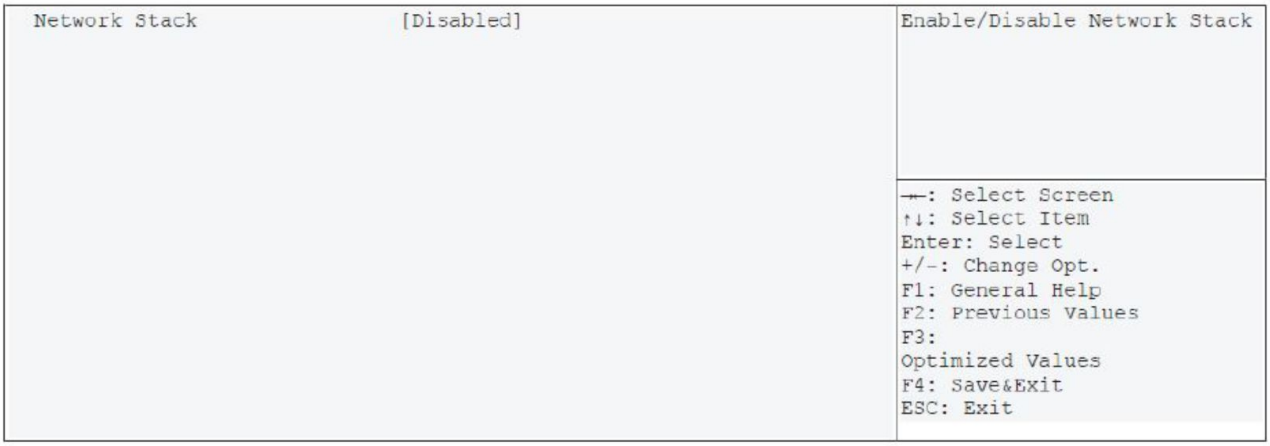
Bios-Entry	Options
PCI Bus Driver Version	None
PCI Device Common Settings:	
PCI Latency Timer	32 / 64 / 96 / 128 / 160 /192 / 224 / 248 / PCI Bus Clocks
PCI-X Latency Timer	32 / 64 / 96 / 128 / 160 /192 / 224 / 248 / PCI Bus Clocks
VGA Palette Snoop	Disabled / Enabled
PERR# Generation	Disabled / Enabled
SERR# Generation	Disabled / Enabled
Above 4G Decoding	Disabled / Enabled
PCI Hot-Plug Settings	Submenu see: PCI Hot-Plug Settings [▶ 43]

9.13 PCI Hot-Plug Settings



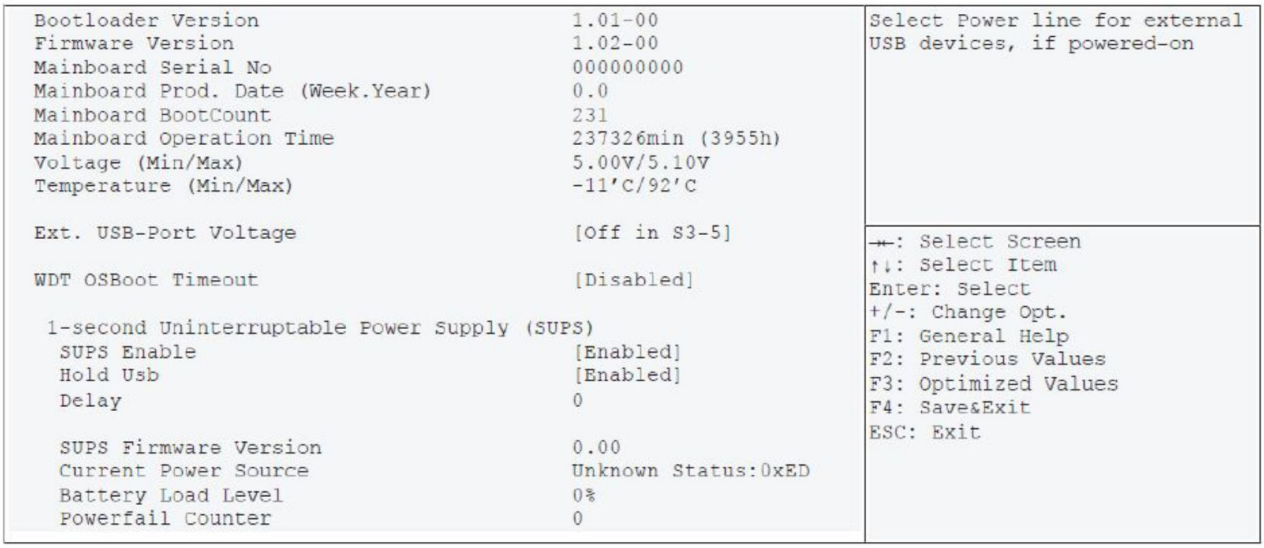
Bios-Entry	Options
PCI Hot-Plug Settings	
BIOS Hot-Plug Support	Enabled / Disabled
PCI Buses Padding	Disabled / 1 / 2 / 3 / 4 / 5
I/O Resources Padding	Disabled / 4 K / 8 K / 16 K / 32 K
MMIO 32 bit Resources Padding	Disabled / 1 M / 2 M / 4 M / 8 M / 16 M / 32 M / 64 M / 128 M
PFMMIO 32 bit Resources Padding	Disabled / 1 M / 2 M / 4 M / 8 M / 16 M / 32 M / 64 M / 128 M

9.14 Network Stack Configuration



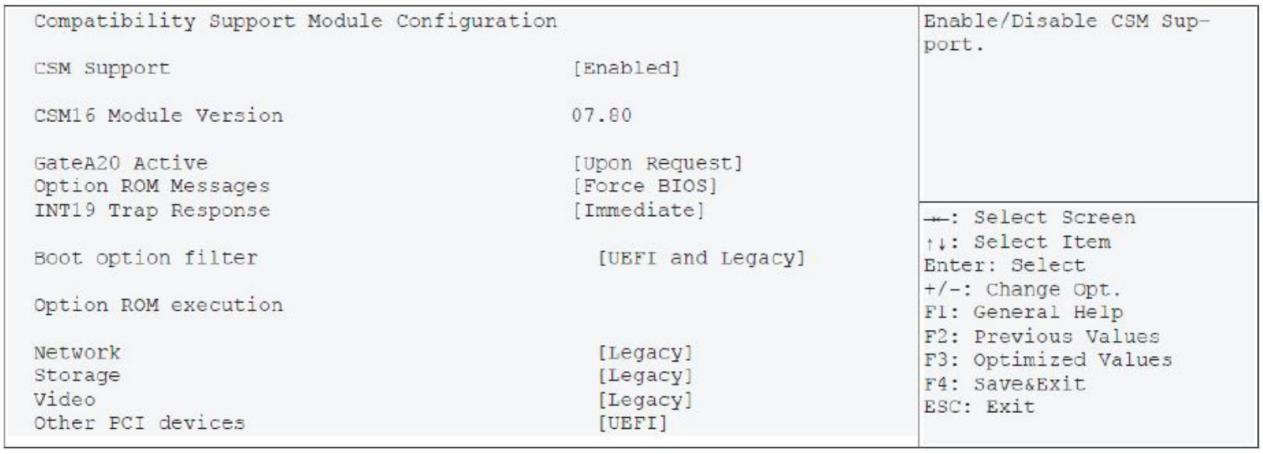
Bios-Entry	Options
Network Stack	Disabled / Enabled
Ipv4 PXE Support	Disabled / Enabled
Ipv4 http Support	Disabled / Enabled
Ipv6 PXE Support	Disabled / Enabled
IPV6 http Support	Disabled / Enabled
IP6 Configuration	Automatic / Manual
PXE boot wait time	0..5
Media detect count	0..50

9.15 Power Controller Options



Bios-Entry	Options
Bootloader Version	None
Firmaware Version	None
Mainboard Serial No	None
Mainboard Prod. Date (Week.Year)	None
Mainboard BootCount	None
Mainboard Operation Time	None
Voltage /Min/Max)	None
Temperature (Min/Max)	None
Ext. USB-Port Voltage	Off in S3-5 / by SCVV
WDT OSBoot Timeout	Disabled / 45 / 60 / ../255 Seconds
1-second Uninteruruptable Power Supply (SUPS)	
SUPS	Disabled / Enabled
Hold USB	Disabled / Enabled
Delay	0..255
SUPS Firmware Version	None
Current Power Source	None
Battery Load Level	None
Powerfail Counter	None

9.16 CSM Configuration



Bios-Entry	Options
Compatibility Support Module Configuration	
CSM Support	Enabled / Disabled
CSM16 Module Version	None
GateA20 Active	Upon Request / Always
Option ROM Messages	Force BIOS / Keep Current
INT19 Trap Response	Immediate / Postponed
Boot option filter	UEFI and Legacy / Legacy only / UEFI only
Option ROM execution	
Network	Do not launch / UEFI / Legacy
Storage	Do not launch / UEFI / Legacy
Video	Do not launch / UEFI / Legacy
Other PCI devices	Do not launch / UEFI / Legacy

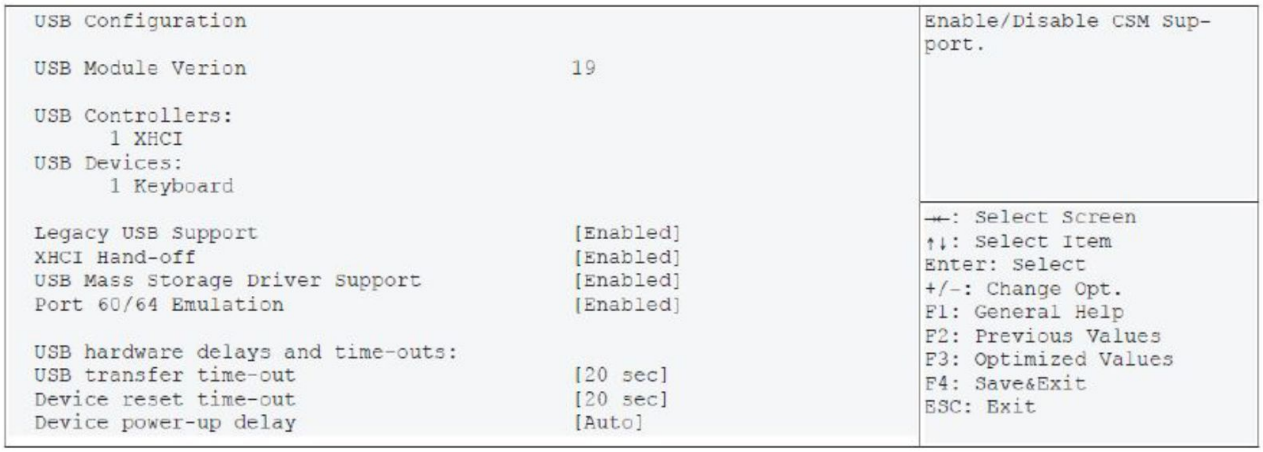
9.17 NVMe Configuration

Bios-Entry	Options
NVMe controller and Drive Information	
[Device list]	None

NOTE

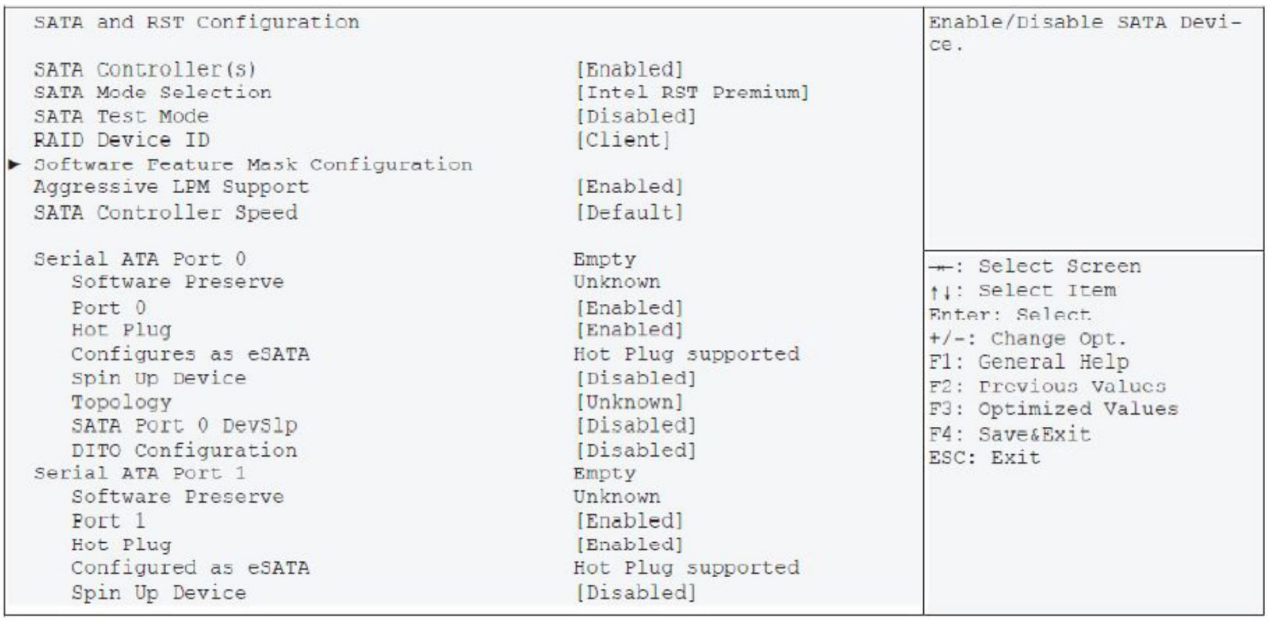
NVMe Raid 0/1 is not supported.

9.18 USB Configuration



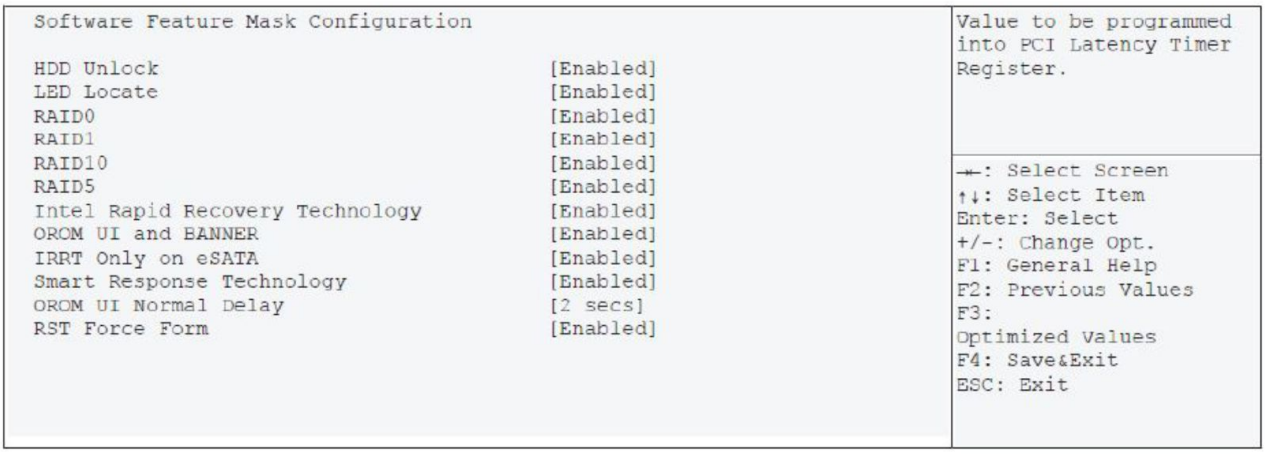
Bios-Entry	Options
USB Configuration	
USB Module Version	None
USB Controllers	None
USB Devices	None
Legacy USB Support	Enabled / Disabled / Auto
XHCI Hand-off	Enabled / Disabled
USB Mass Storage Driver Support	Enabled / Disabled
Port 60/64 Emulation	Disabled / Enabled
USB hardware delays and time-outs	
USB transfer time-out	1 / 5 / 10 / 20 sec
Device reset time-out	10 / 20 / 30 / 40 sec
Device power-up delay	Auto/ Manual

9.19 SATA und RST Configuration



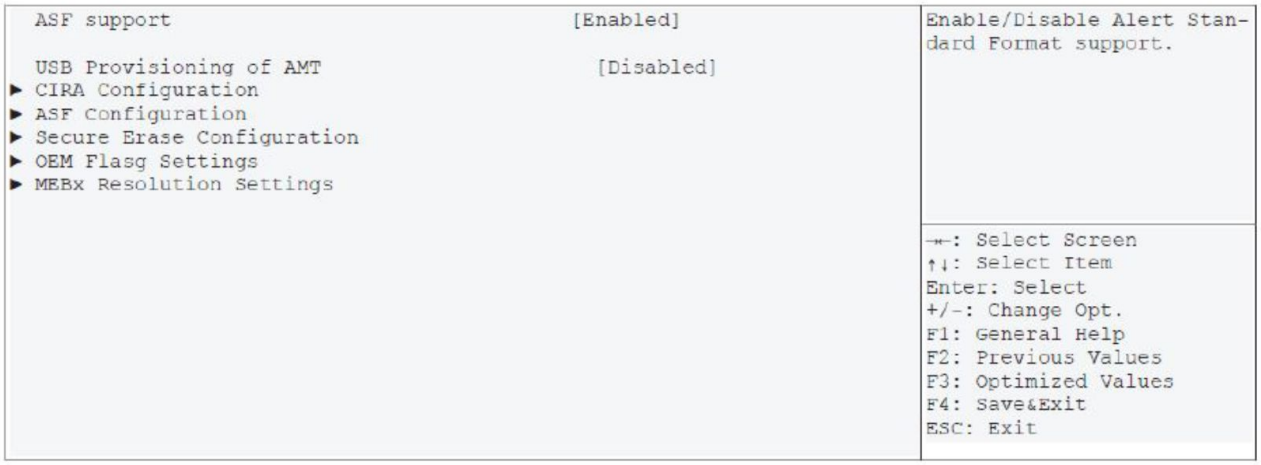
Bios-Entry	Options
SATA And RST Configuration	
SATA Controller(s)	Enabled / Disabled
SATA Mode Selection	AHCI / Intel RST Premium
SATA Test Mode	Enabled / Disabled
RAID Device ID	Client / Alternate
Software Feature Mask Configuration	Submenu see: Software Feature Mask Configuration [▶ 49]
Aggressive LPM Support	Disabled / Enabled
SATA Controller Speed	Default / Gen1 / Gen2 / Gen3
Serial ATA Port X	None
Software Preserve	None
Port X	Disabled / Enabled
Hot Plug	Disabled / Enabled
Cinfigured as eSATA	None
Spin Up Device	Disabled / Enabled
Topology	Unknown / ISATA / Direct Connect / FLEX / M2
SATA Port X Dev Slp	Disabled / Enabled
DITO Configuration	Disabled / Enabled

9.20 Software Feature Mask Configuration



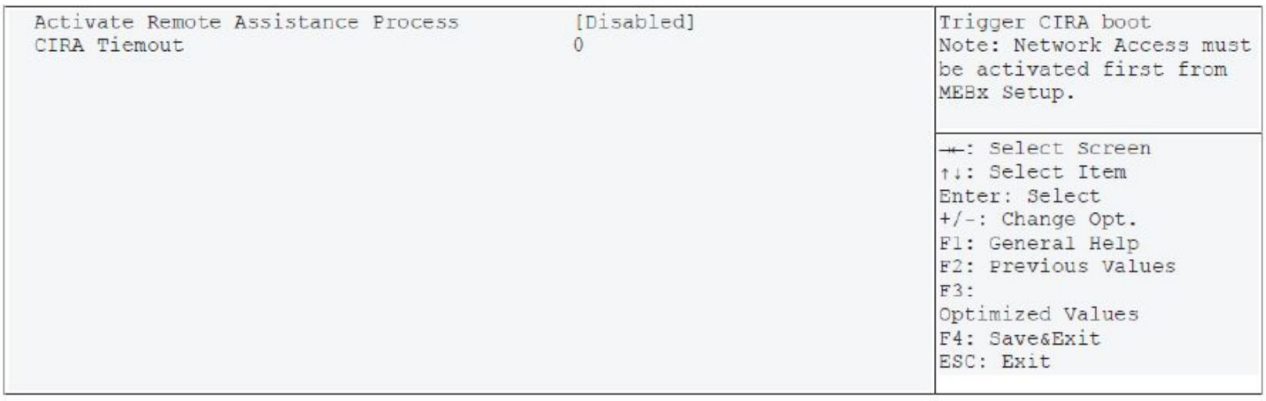
Bios-Entry	Options
Software Feature Mask Configuratione	
HDD Unlock	Disabled / Enabled
LED Locate	Disabled / Enabled
RAID0	Enabled / Disabled
RAID1	Enabled / Disabled
RAID10	Enabled / Disabled
Raid5	Enabled / Disabled
Intel Rapid Recovery Technology	Enabled / Disabled
OROM UI and BANNER	Enabled / Disabled
IRRT Only on eSATA	Enabled / Disabled
Smart Response Technology	Enabled / Disabled
OROM UI Normal Delay	2 secs / 4 secs / 6 secs / 8 secs
RTS Force Form	Enabled / Disabled

9.21 AMT Configuration



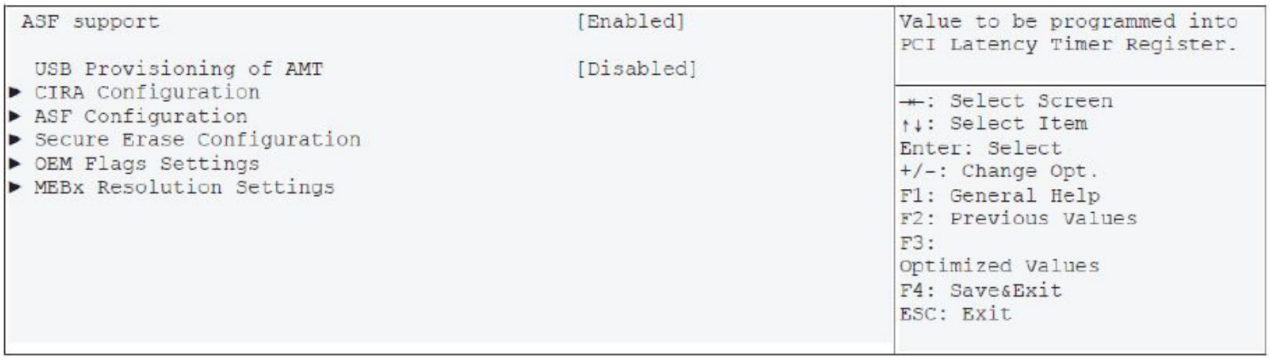
Bios-Entry	Options
ASF Support	Disabled / Enabled
USB Provisioning of AMT	Disabled / Enabled
CIRA Configuration	Untermenü siehe : CIRA Configuration [▶ 50]
ASF Configuration	Untermenü siehe: ASF Configuration [▶ 51]
Secure Erase Configuration	Untermenü siehe: Secure Erase Configuration [▶ 51]
OEM Flags Settings	Untermenü siehe: OEM Flags Settings [▶ 52]
MEBx Resolution Settings	Untermenü siehe: MEBx Resolution Settings [▶ 53]

9.22 CIRA Configuration



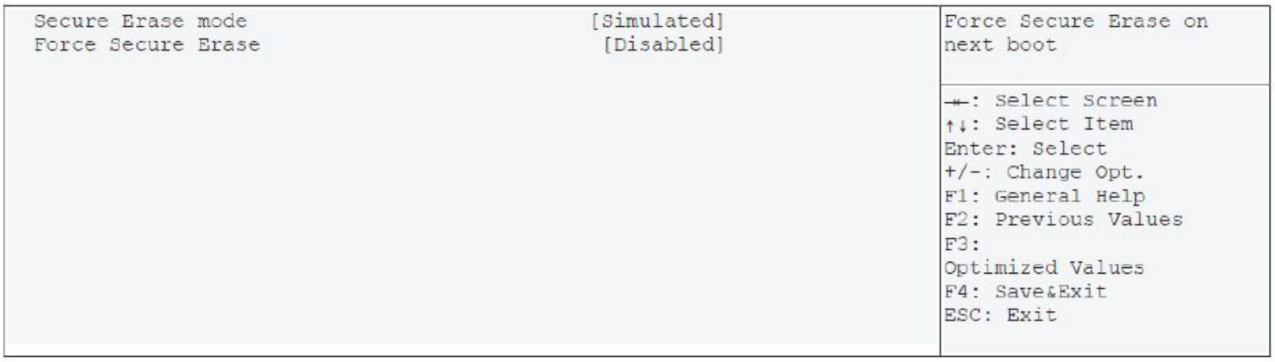
Bios-Entry	Options
Activate Remote Assistance Process	Disabled / Enabled
CIRA Timeout	0..255

9.23 ASF Configuration



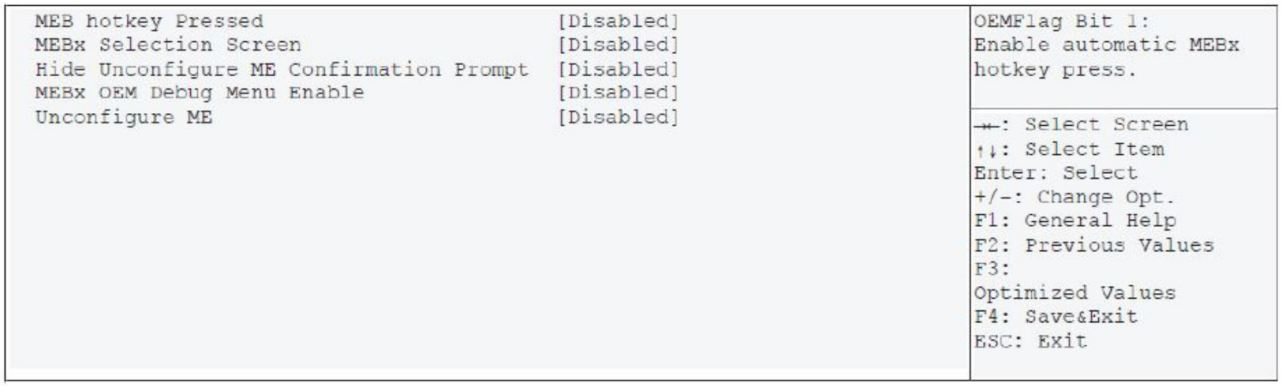
Bios-Entry	Options
PEt Progress	Disabled / Enabled
WatchDog	Disabled / Enabled
OS Timer	0..65535
BIOS Timer	0..65535

9.24 Secure Erase Configuration



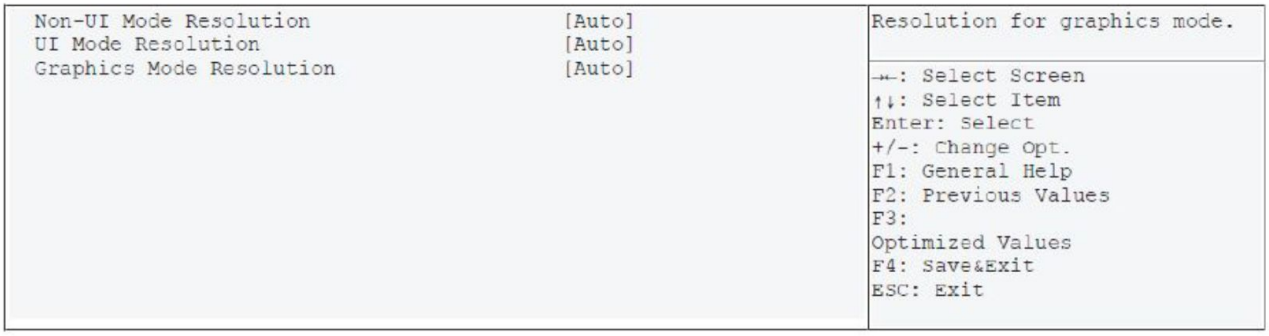
Bios-Entry	Options
Secure Erase Mode	Simulated / Real
Force Secure Erase	Disabled / Enabled

9.25 OEM Flags Settings



Bios-Entry	Options
MBEx hotkey pressed	Disabled / Enabled
MBEx Selection Screen	Disabled / Enabled
Hide Unconfigure ME Confirmation Prompt	Disabled / Enabled
MBEx OEM Debug Menu Enable	Disabled / Enabled
Unconfigure ME	Disabled / Enabled

9.26 MEBx Resolution Settings

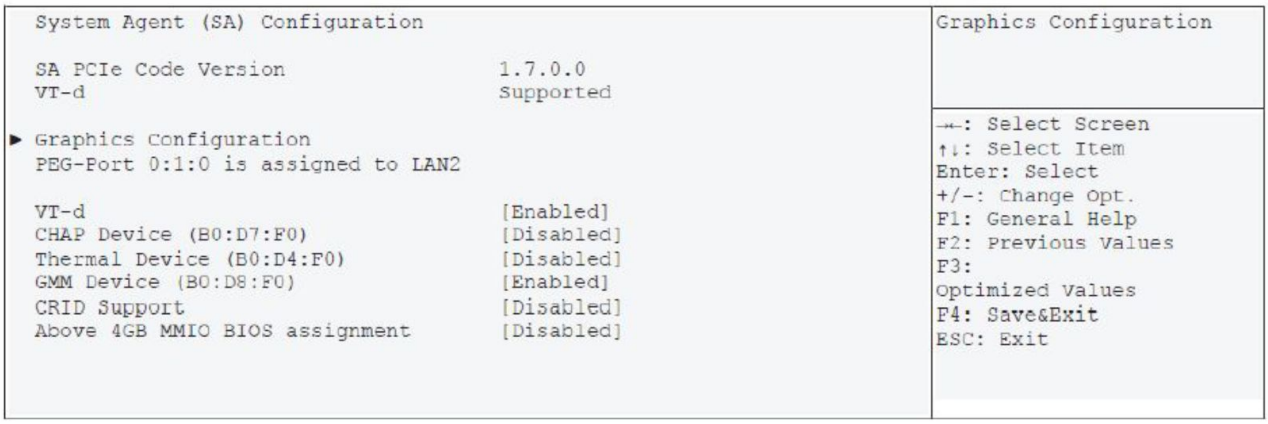


Bios-Entry	Options
Non-UI Resolution	Auto / 80x25 / 100x31
UI Mode Resolution	Auto / 80x25 / 100 x 31
Graphics Mode Resolution	Auto / 640x 480 / 800x600 / 1024 x 768

9.27 Chipset

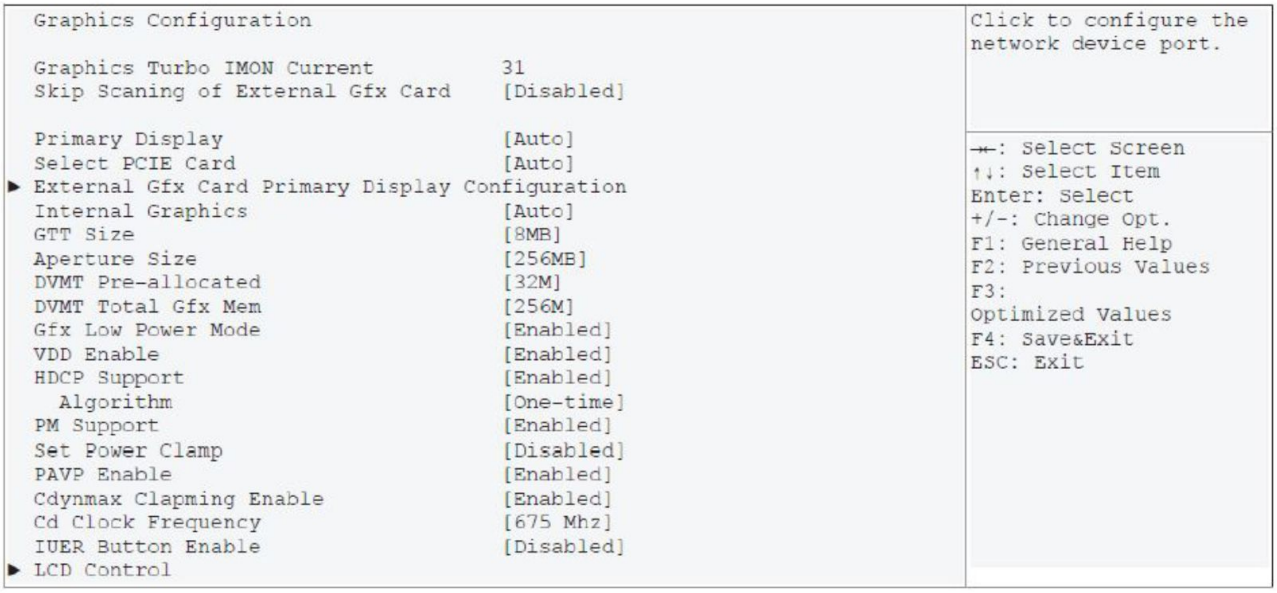
Setup-Entry	Options
System Agent (SA) Configuration	Submenu see: System Agent (SA) Configuration [▶ 54]
PCH-IO Configuration	Submenu see: PCH-IO Configuration [▶ 57]

9.28 System Agent (SA) Configuration



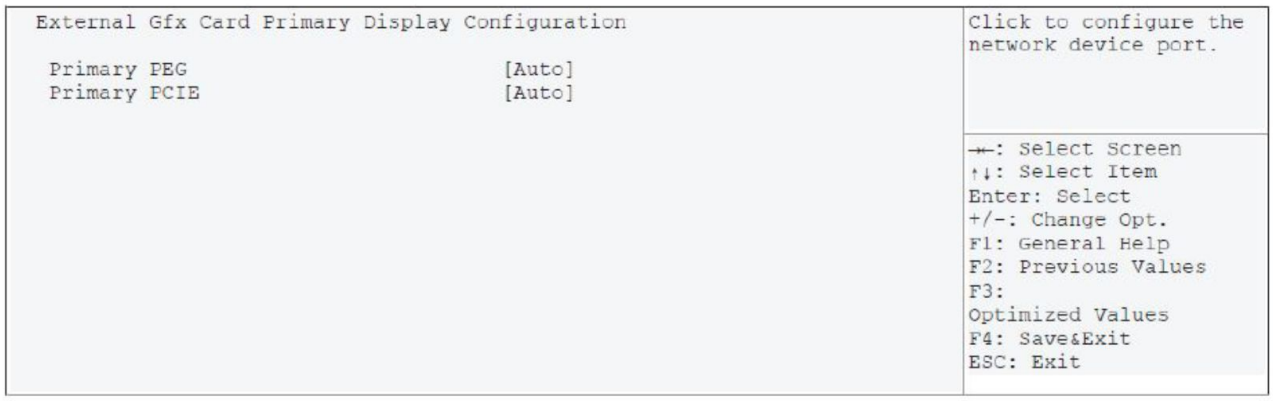
Bios-Entry	Options
System Agent (SA) Configuration	
SA PCIe Code Version	None
VT-d	None
Graphics Configuration	Submenu see: Graphics Configuration [▶ 55]
(PEG-Port X assignemt)	None
VT-d	Disabled / Enabled
Chap Device	Disabled / Enabled
Thermal Device	Disabled / Enabled
GMM Device	Disabled / Enabled
CRID Support	Disabled / Enabled

9.29 Graphics Configuration



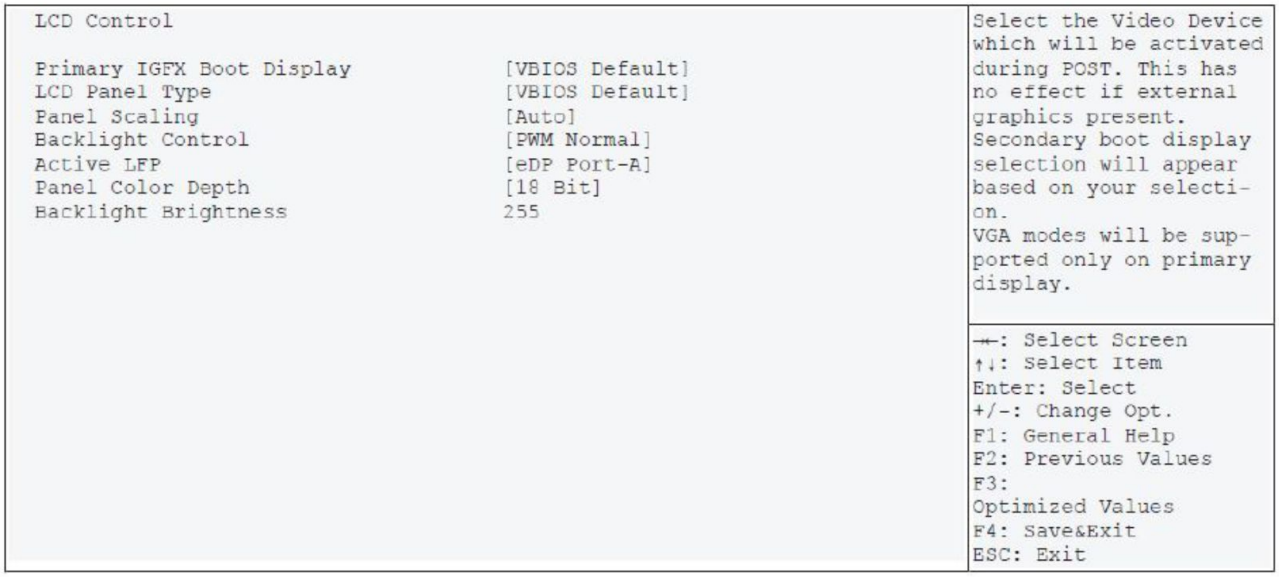
Bios-Entry	Options
Graphics Configuration	
Skip Scanning of External Gfx Card	Disabled / Enabled
Primary Display	Auto / IGFX / PEG / PCI / SG
Select PCIE Card	Auto / Elk Creek 4 / PEG Eval
External Gfx Card Primary Display Configuration	Submenu see: External Gfx Card Primary Display Configuration [▶ 56]
Internal Graphics	Auto / Disabled / Enabled
GTT Size	2 MB / 4 MB / 8 MB
Aperture Size	128MB /256MB / 512MB / 1024MB / 2048MB
DVMT Pre-allocated	32M / 64M / 4M / 8m / 12M / 16M / 20M / 24M / 28M / 32M / 36M / 40M / .. / 60M
DVMT Total Gfx Mem	256M / 128M / MAX
Gfx Low Power Mode	Enabled / Disabled
VDD Enable	Enabled / Disabled
HDCP Support	Enabled / Disabled
Algorithm	One-time / Periodic
PM Support	Enabled / Disabled
Set Power Clamp	Disabled / Enabled
PAVP Enable	Enabled / Disabled
Cdynmax Clamping Enable	Enabled / Disabled
Cd Clock Frequency	337.5 Mhz / 450 Mhz / 540 Mhz / 675 Mhz
IUER Button Enable	Disabled / Enabled
LCD Control	Submenu see: LCD Control [▶ 56]

9.30 External Gfx Card Primary Display Configuration



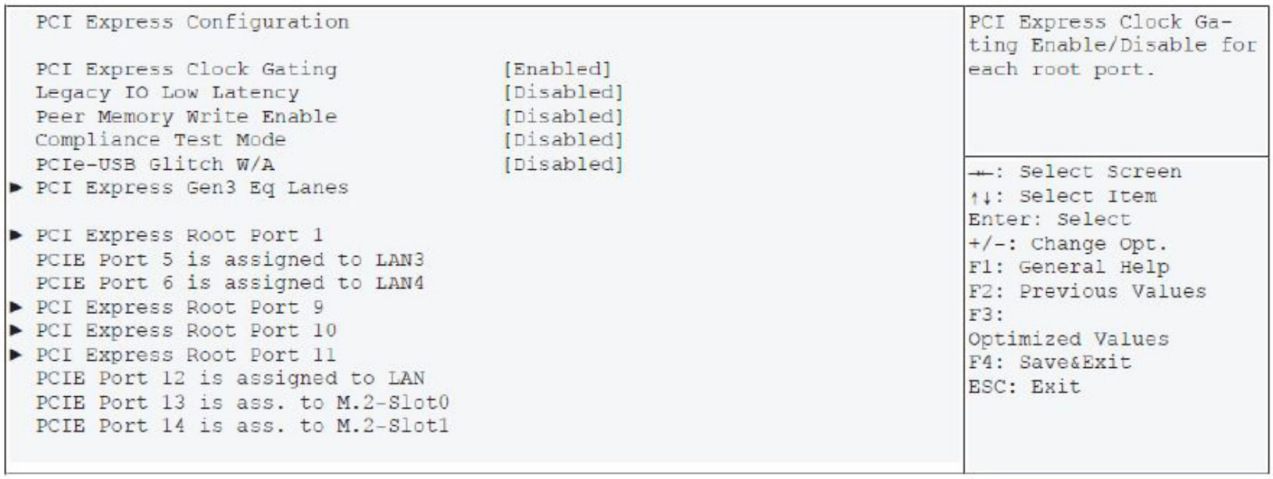
Bios-Entry	Options
External Gfx Card Primary Display Configuration	
Primary PEG	Auto / PEG11 /PEG12
Primary PCIE	Auto / PCIE1 / PCIE2 / PCIE3 / … / PCIE19

9.31 LCD Control



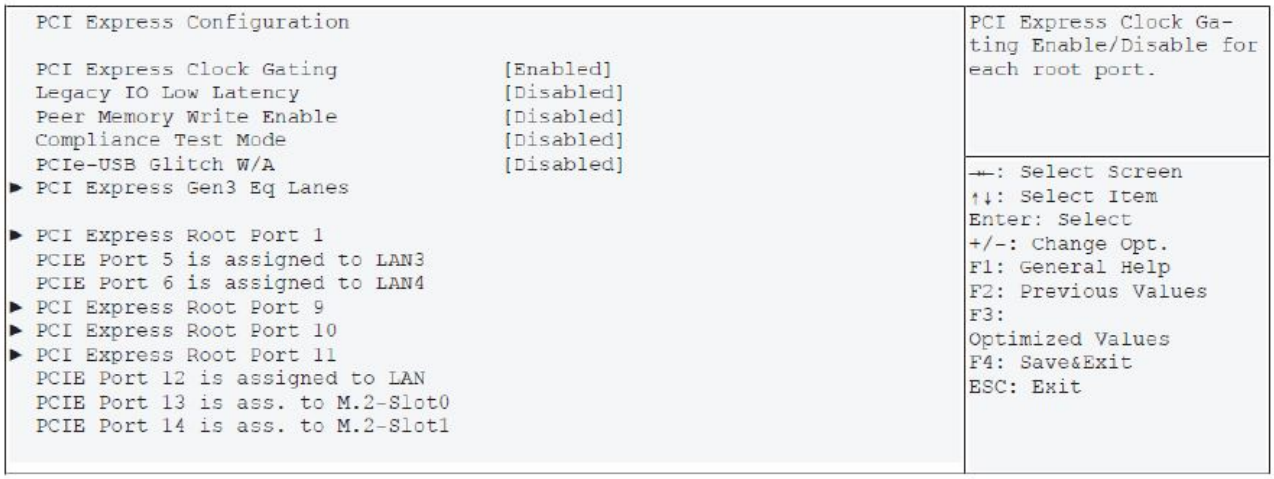
Bios-Entry	Options
LCD Control	
Primary IGFX	VBIOS Default / EFP (/ EFP2 / EFP3
LCD Panel Type	VBIOS Default / 640x480 LVDS / 800x600 LVDS / 1024x768 LVDS / 1280x1024 LVDS / 1400x1050 LVDS1 / 1400x1050 LVDS2 / 1600x1200 LVDS / 1280x768 LVDS / 1680x1050 LVDS / 1920x1200 LVDS / 1600x900 LVDS / 1280x800 LVDS / 1280x600 LVDS / 2048x1536 LVDS / 1366x768 LVDS
Panel Scaling	Auto / Off / Force Scaling
Backlight Control	PWM Inverted / PWM Normal
Active LFP	Noe DP / eDP Port-A
Panel Color Depth	18 Bit / 24 Bit
Backlight Brightness	0..255

9.32 PCH-IO Configuration



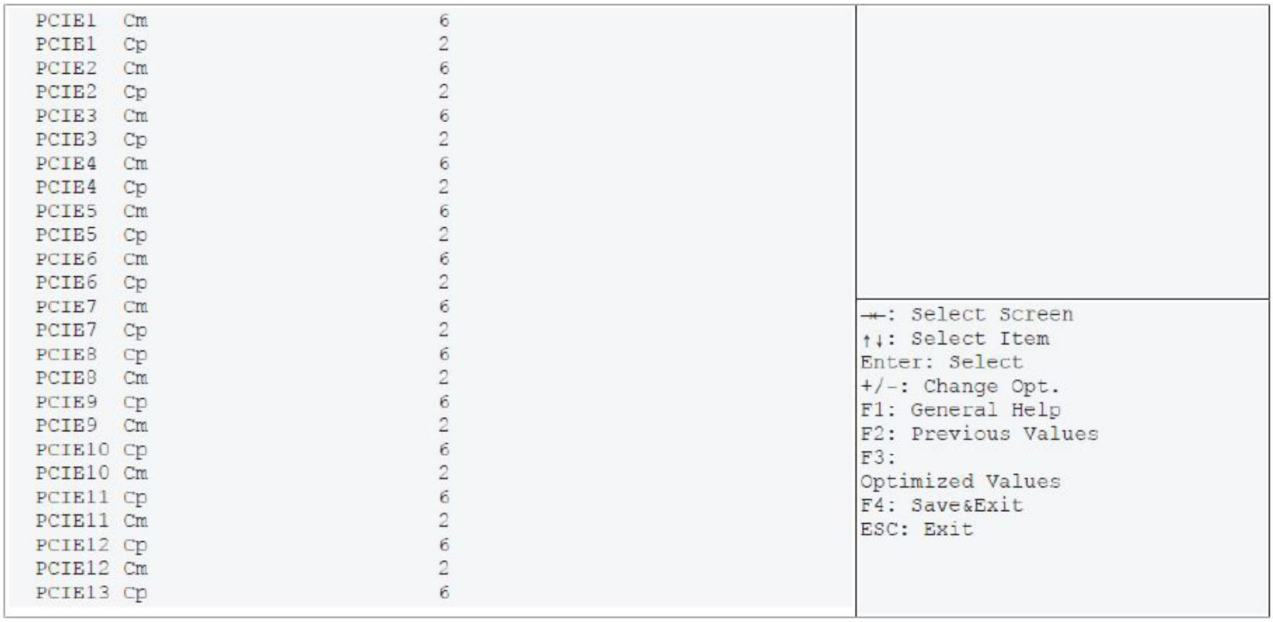
Bios-Entry	Options
PCH-IO Configuration	
PCI Express Configuration	Submenu see: PCI Express Configuration [▶ 58]
USB Configuration	Submenu see: USB Configuration [▶ 60]
HD Audio Configuration	Submenu see: HD Audio Configuration [▶ 61]
PCH LAN Controller	Enabled / Disabled bei V1, always Enabled bei V2
Wake on LAN	Enabled / Disabled
Second LAN Controller	Enabled / Disabled
Third LAN Controller	Enabled / Disabled
Forth LAN Controller	Enabled / Disabled
M.2-Slot X	None
CLKRUN#logic	Enabled / Disabled
State After G3	S0 State / S5 State
Compatible Revision ID	Enabled / Disabled

9.33 PCI Express Configuration



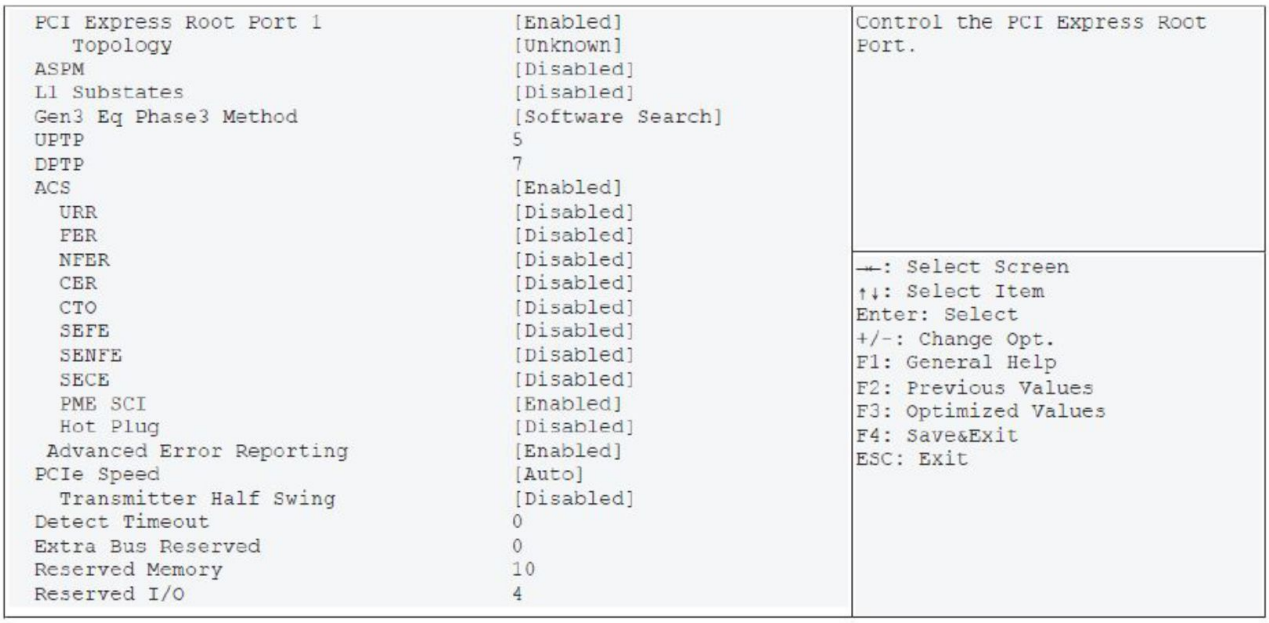
Bios-Entry	Options
PCI Express Configuration	
PCI Express Clock Gating	Disabled / Enabled
Lagacy IO Low Latency	Disabled / Enabled
Peer Memory Write Enable	Disabled / Enabled
Compliance Test Mode	Disabled / Enabled
PCIe-USB Glitch W/A	Disabled / Enabled
PCI Express Gen3 Eq Lanes	Submenu see: PCI Express Gen3 Eq Lanes [▶ 58]
PCI Express Root Port X	Submenu see: PCI Express Root Port X [▶ 59]
[PCIE Port assignments]	None

9.34 PCI Express Gen3 Eq Lanes



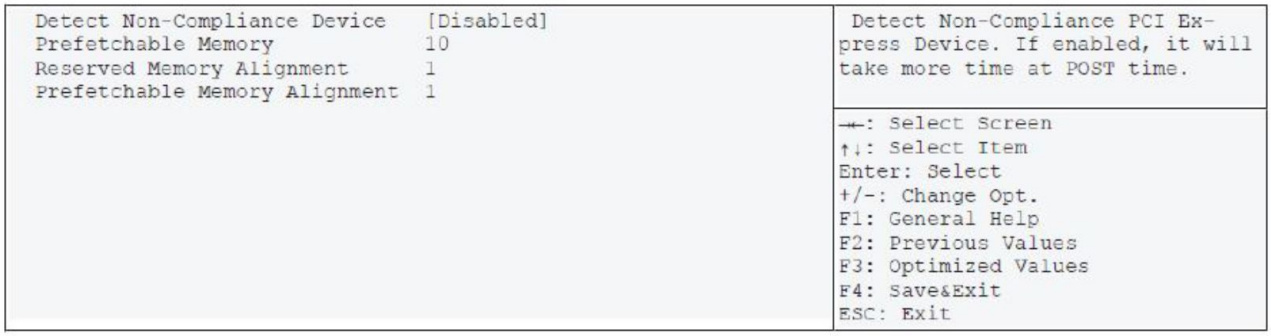
Bios-Entry	Options
PCIEX Cm	0..63
PCIEX Cp	0..63

9.35 PCI Express Root Port X



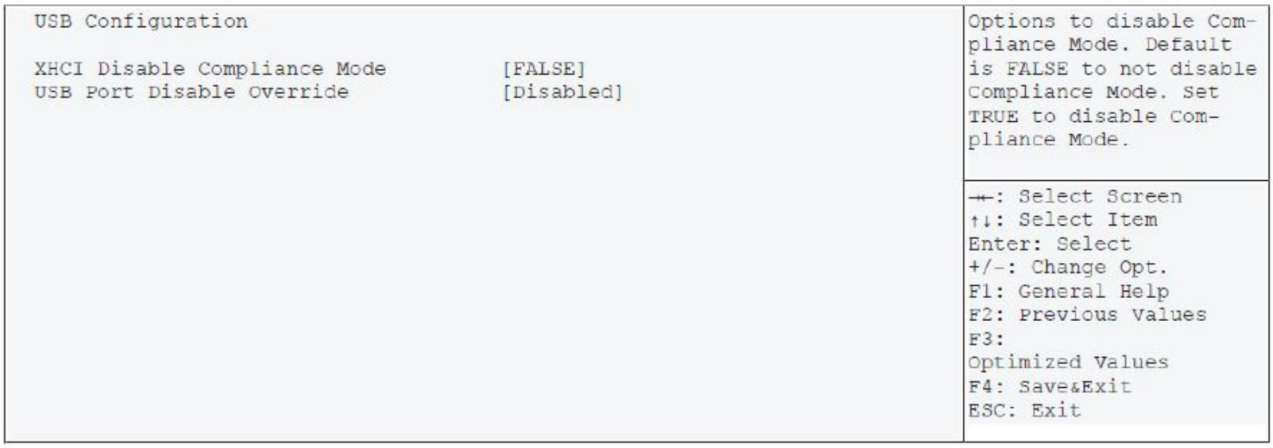
Bios-Entry	Options
PCI Express Root Port 1	Disabled / Enabled
Topolgy	Unknown / x1 / x4 / Sata Express / M2
ASPM	L0sL1 / L1 L0s / Disabled / Auto
L1 Substates	Disabled / L1.1 & L1.2 / L1.1 / L1.2
Gen3 Eq Phase3 Method	Hardware / Static Coeff. / Software Search
UDTP	0..10
DPTP	0..10
ACS	Disabled / Enabled
URR	Disabled / Enabled
FER	Disabled / Enabled
NFER	Disabled / Enabled
CER	Disabled / Enabled
CTO	Disabled / Enabled
SEFE	Disabled / Enabled
SENFE	Disabled / Enabled
SECE	Disabled / Enabled
PME SCI	Disabled / Enabled
Hot Plug	Disabled / Enabled
Advanced Error Reporting	Disabled / Enabled
PCIe Speed	Auto / Gen1 / Gen2 / Gen3
Transmitter Half Swing	Disabled / Enabled
Detect Timeout	0..65535
Extra Bus Reserved	0..7
Reserved I/O	4K / 8K / 12K / 16K / 20K
PCH PCIe LTR Configuration	
PCH PCIE1 LTR	Disabled / Enabled
Snoop Latency Override	Disabled / Manual / Auto
Snoop Latency Value	0..1023
Snoop Latency Multipler	1 ns / 32 ns / 1024 ns / 32768 ns / 1048576 ns / 33554432 ns
Non Snoop Latency Override	Disabled / Manual / Auto

9.36 Extra Options



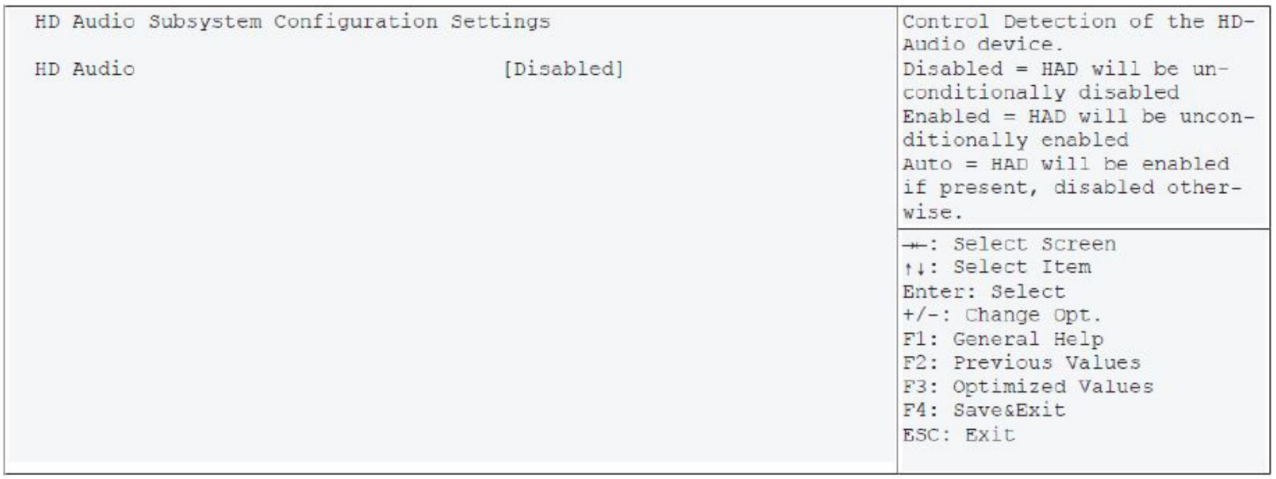
Bios-Entry	Options
Detect Non-Compliance Device	Disabled / Enabled
Prefetchable Memory	1..20
Reserved Memory Alignment	1..31
Prefetchable Menmory Alignment	1..31

9.37 USB Configuration



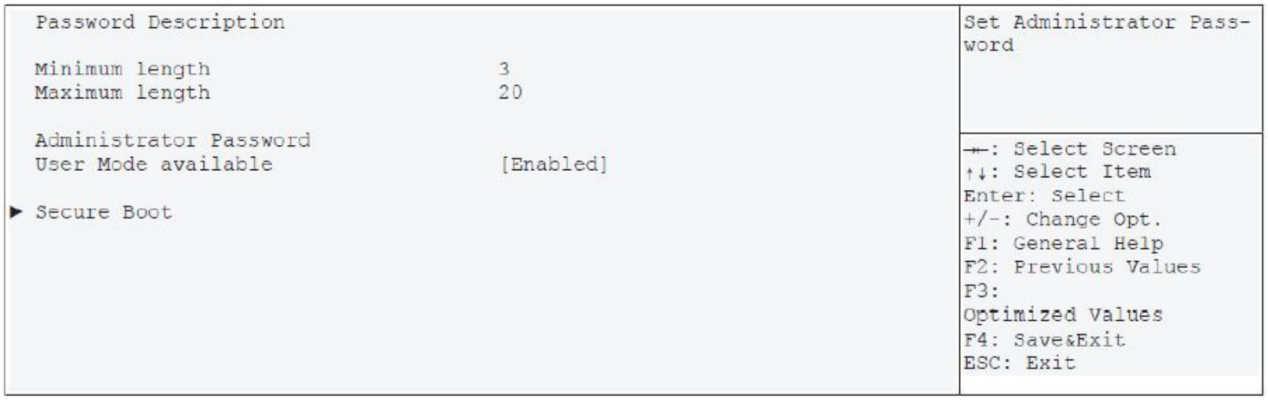
Bios-Entry	Options
USB Configuration	
XHCI Diable Comliance Mode	False / True
USB Port Disable Override	Disabled / Select Per-Pin
USB SS Physical Connector #X	Disabled / Enabled

9.38 HD Audio Configuration



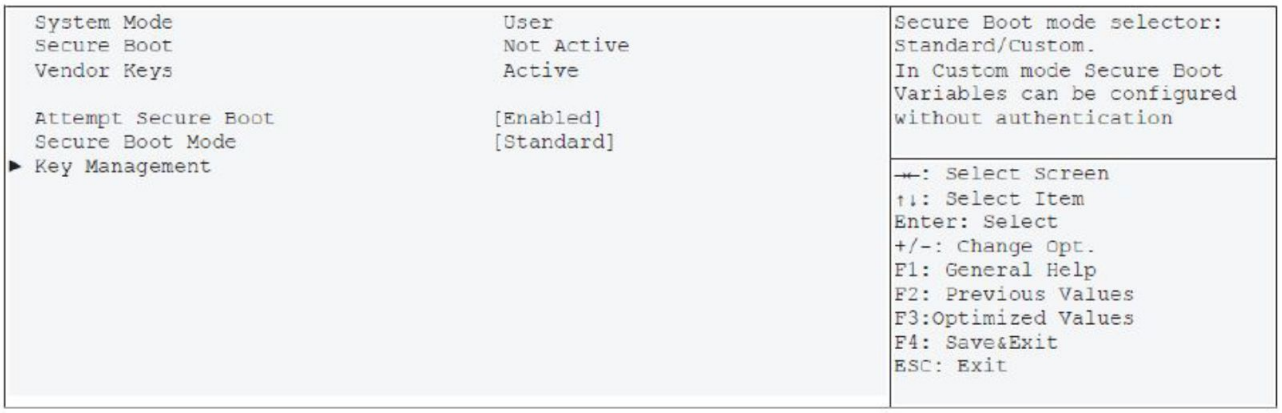
Bios-Entry	Options
HD Audio System Configuration Settings	
HD Audio	Disabled / Enabled / Auto

9.39 Security



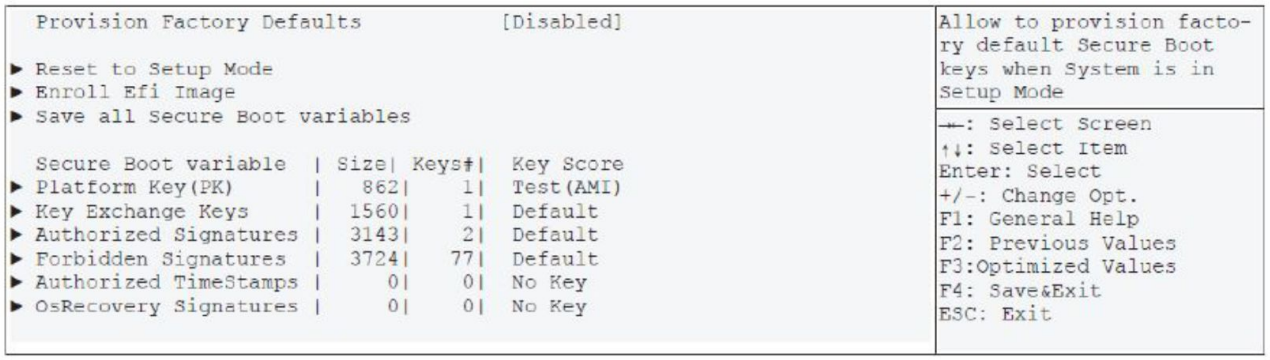
Setup-Entry	Options
Password Description	
Minimum length	None
Maximum length	None
Administrator Password	Here an administrator password can be set.
User Mode	Enabled / Disabled
Secure Boot	Submenu see: Secure Boot [▶ 62]

9.40 Secure Boot



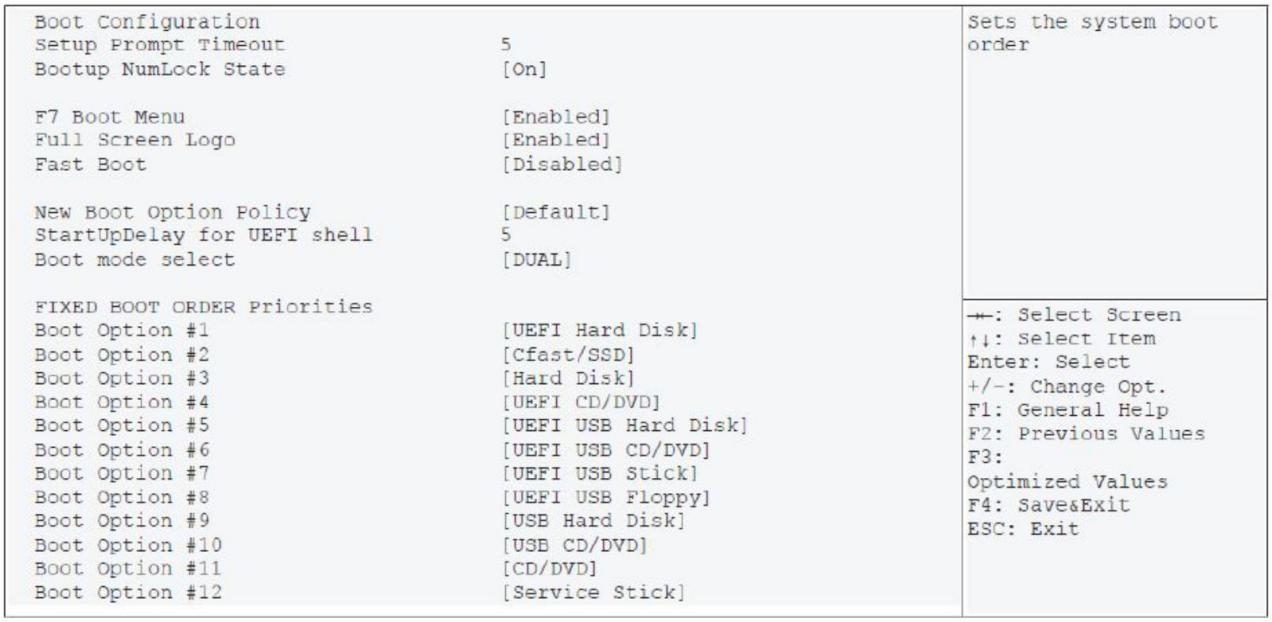
Bios-Entry	Options
System Mode	None
Secure Boot	None
Vendor Keys	None
Attempt Secure Boot	Disabled / Enabled
Secure Boot Mode	Standard / Custom
Key Management	Submenu see: Key Management [▶ 62]

9.41 Key Management



Bios-Entry	Options
Provision Factory Defaults	Disabled / Enabled
Reset to Setup Mode	Press entry key
Enroll Efi Image	Press entry key
Save all Secure Boot variables	Press entry key
PlatformKey(PK)	Press entry key
Key Exchange Keys	Press entry key
Authorized Signatures	Press entry key
Forbidden Signatures	Press entry key
Authorized TimeStamps	Press entry key
OsRecovery Signatures	Press entry key

9.42 Boot

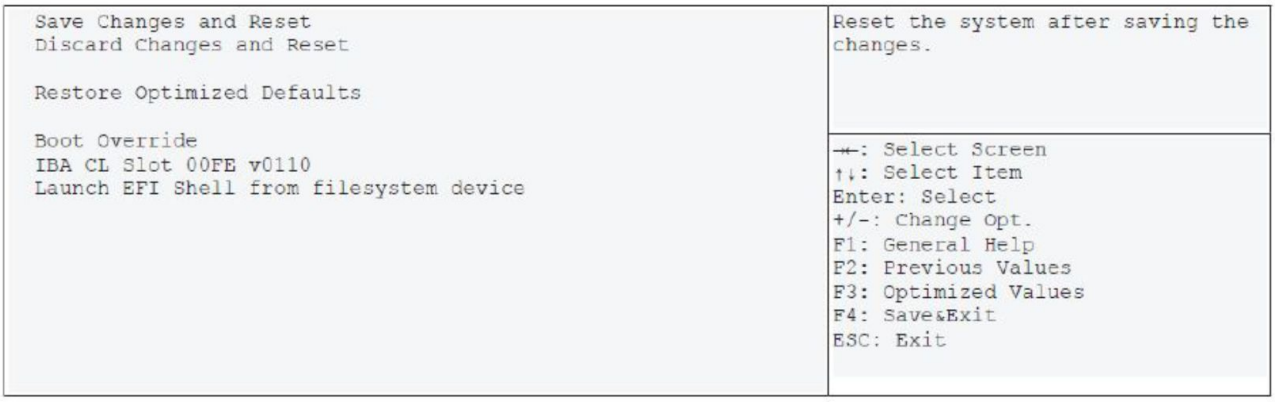


Bios-Entry	Options
Boot Configuration	
Setup Prompt Timeout	0..65535
Bootup NumLok State	On / Off
F7 Boot Menu	Disabled / Enabled
Full Screen Logo	Disabled / Enabled
Fast Boot	Disabled / Enabled
New Boot Option Policy	Default / Place First / Place Last
StartUpDElay for UEFI shell	0..255
Boot mode select	Legacy / UEFI / Dual
Fixed Boot Order Priorities	
Boot Option #1-19	Here the range of boot media to be used can be set.
Advanced Fixed Boot Order Parameters	Submenu see: Fixed Boot Order Parameters [▶ 64]

9.43 Fixed Boot Order Parameters

Bios-Entry	Options
Max. CFast/SSD capacity	1..16384
Max. USB Stick capacity (GB)	1..16384

9.44 Save & Exit



Bios-Entry	Options
Save Changes and Reset	
Discard Changes and Reset	Press entry key
Restore Optimized Defaults	Press entry key
Boot Override	
IBA CL slot 00FE v0110	Press entry key
Launch EFI Shell from filesystem device	Press entry key

10 Mechanical drawings

Dimensional notation

All dimensions are in mil (1 mil = 0.0254 mm). Data in square brackets are in mm.

10.1 PCB: Holes

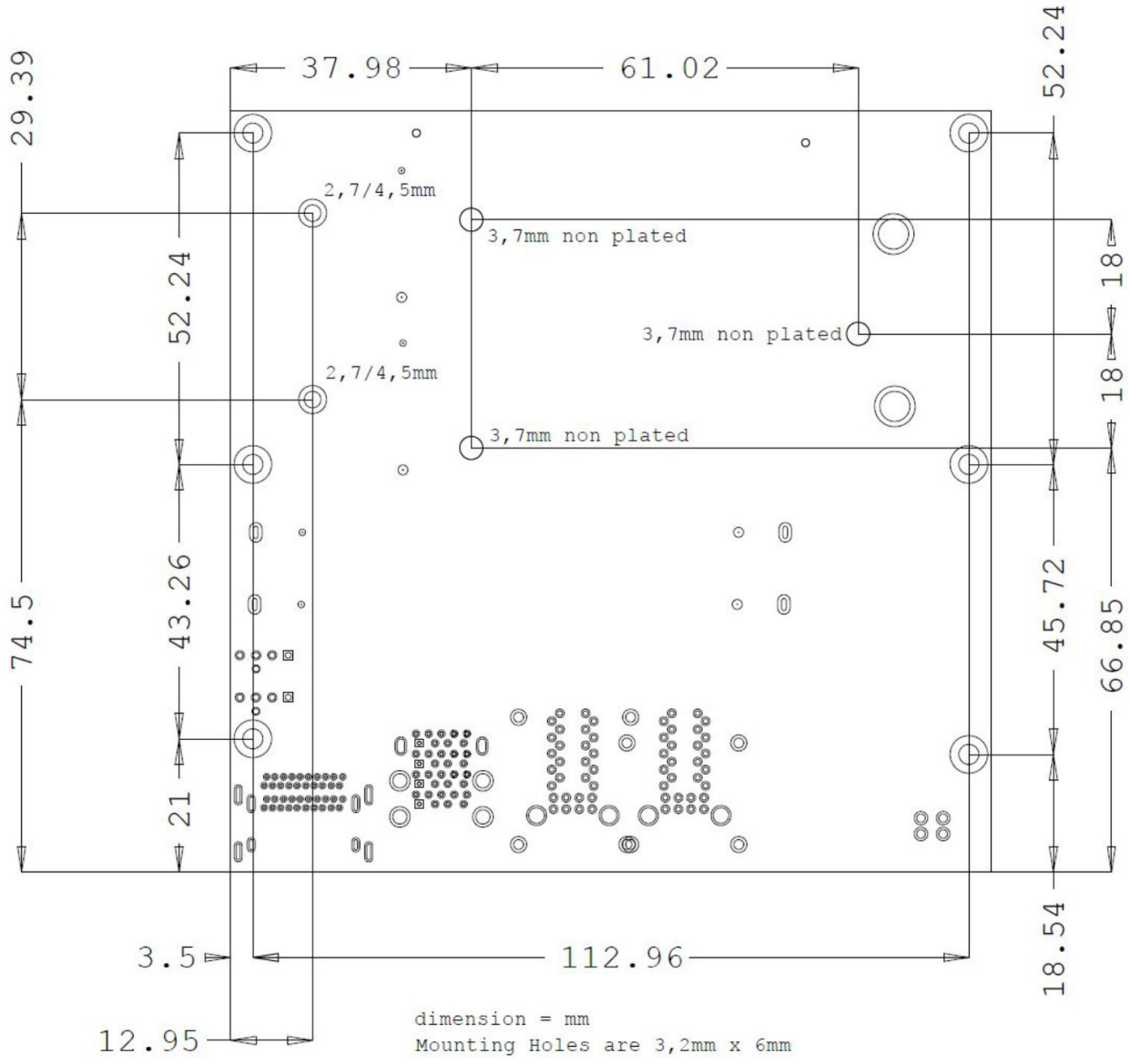


Fig. 13: MZ MH CB6464_G3

10.2 PCB: Pin 1 distances

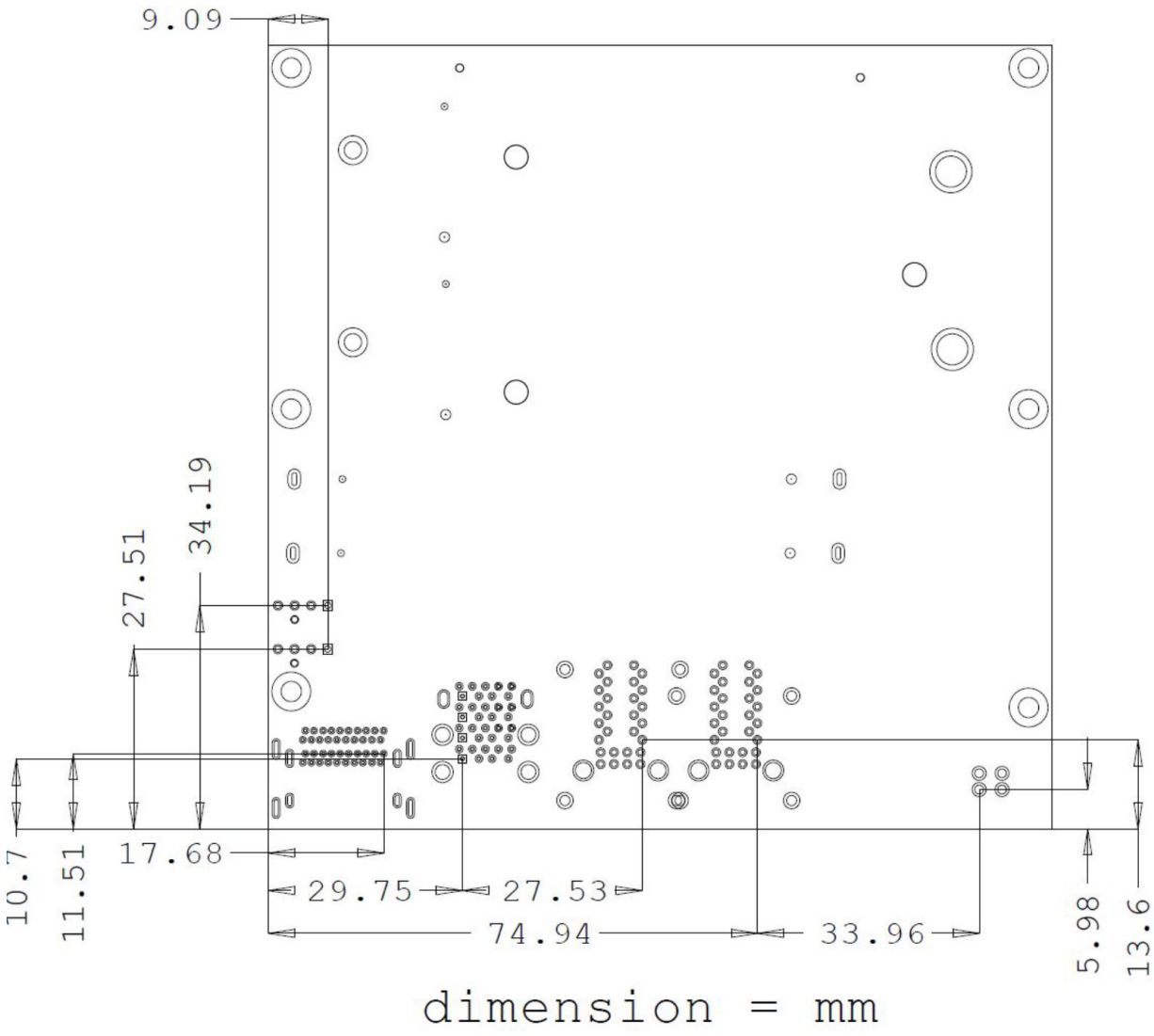


Fig. 14: MZ Pin1 CB6464_G3

10.3 PCB: Dimensions

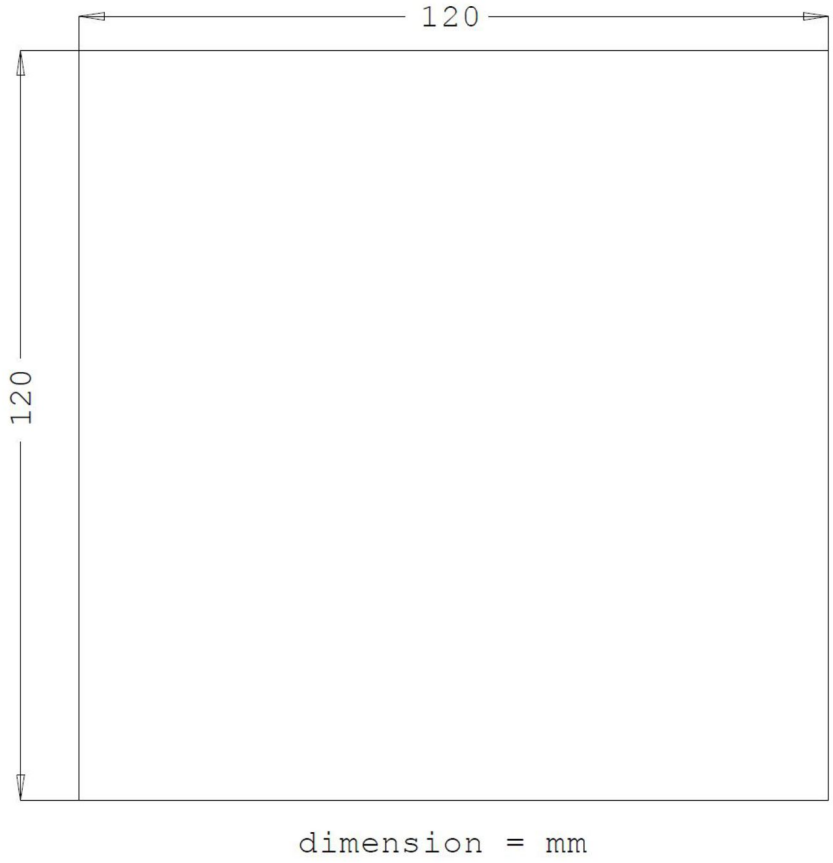


Fig. 15: MZ CB6464_G3

11 Technical data

11.1 Electrical data

Power supply	
Board	24 V (+/- 5%)
RTC	>= 3 µm

Power consumption	
RTC	<= 10 µm

11.2 Environmental conditions

Temperature range	
Operating	0 °C up to +60 °C (more extended temperture range on request)
Storage	-25 °C up to +85 °C
Dispatch	-25 °C up to +85 °C, for wrapped boards

Temperature changes	
Operating	0.5 °C per minute, 7.5 °C in 30 minutes
Storage	1.0 °C per minute
Dispatch	1.0 °C per minute, for wrapped boards

Relative air humidity	
Operating	5% up to 85% (non-condensing)
Storage	5% up to 95% (non-condensing
Dispatch	5% up to 100% (non-condesing), for wrapped boards

Impact	
Operating	150 m/², 6 ms
Storage	400 m/s², 6 ms
Dispatch	400 m/s², 6 ms, for wrapped boards

Vibration	
Operating	10 up to 58 Hz, 0.075 mm amplitude
Storage	5 up to 9 Hz, 3.5 mm amplitude 9 up to 500 Hz, 10 m/s²
Dispatch	5 up to 9 Hz, 3.5 mm amplitude 9 up to 500 Hz, 10 m/s², for wrapped boards

Note on impact and vibration resistance

The specifications for impact and vibration resistance refer only to the motherboard itself without heat sink, memory module, cabling, etc.

11.3 Technical specifications

The board is specified for an ambient temperature range of 0 °C to +60 °C (extended temperature range on enquiry). In addition, care must be taken that the temperature of the processor die does not exceed 100 °C. A suitable cooling concept must be implemented for this that is oriented to the maximum power consumption of the processor/chipset. Please note: also that any existing controllers are included in the cooling concept. The power consumption of these modules may be of the same order of magnitude as the power consumption of the processor.

The board is prepared with suitable holes for the use of modern cooling solutions. We have a series of compatible cooling components in our range. Your distributor will be glad to advise you on choosing suitable solutions.

NOTE

Prevent the maximum die temperature being exceeded!

It is the end customer's responsibility to ensure that the die temperature of the processor does not exceed 100 °C! Continuous overheating can destroy the board!

If the temperature exceeds 100 °C, the ambient temperature needs to be reduced. Ensure sufficient air circulation if necessary.

12 Support and Service

12.1 Beckhoff Support

Beckhoff Support offers you comprehensive technical assistance, helping you not only with the application of individual Beckhoff products, but also with other, wide-ranging services:

- world-wide support
- design, programming and commissioning of complex automation systems
- extensive training program for Beckhoff system components.

Hotline: +49(0)5246/963-157

Fax: +49(0)5246/963-9157

E-mail: support@beckhoff.com

12.2 Beckhoff Service

The Beckhoff Service Center supports you in all matters of after-sales service:

- on-site service
- repair service
- spare parts service
- hotline service

Hotline: +49(0)5246/963-460

Fax: +49(0)5246/963-479

E-mail: service@beckhoff.com

12.3 Beckhoff headquarters

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Web: www.beckhoff.de

Further Support and Service addresses can be found on our website at http://www.beckhoff.de.

You will also find further documentation for Beckhoff components there.

13 Appendix I: Post Codes

During the boot phase, the BIOS generates a series of status messages (so-called "POST Codes"), which can be output with the help of a suitable reading device (POST Code card). The meanings of the POST Codes are explained in the document "Aptio™ 5.x Status Codes" from American Megatrends®, which is available from the website http://www.ami.com. In addition, the following OEM POST Codes are output:

Code	Description
87h	BIOS-API started
88h	PCA9535 started
89h	PWRCTRL firmware started

14 Appendix II: Resources

14.1 Interrupt

The resources used are independent of the setup setting. The listed interrupts and their use are given by the AT compatibility. If interrupts have to be exclusively available on the ISA side, they must be reserved through the BIOS setup. Exclusivity is neither given nor possible on the PCI side.

Address	Function
IRQ0	Timer
IRQ1	
IRQ2	
IRQ3	
IRQ4	
IRQ5	
IRQ6	
IRQ7	
IRQ8	RTC
IRQ9	
IRQ10	
IRQ11	
IRQ12	
IRQ13	FPU
IRQ14	
IRQ15	

14.2 PCI Devices

The PCI devices listed here all exist on the board, including those that are detected and configured by the BIOS. Due to the BIOS setup settings it may be the case that various PCI devices or functions of devices are not activated. If devices are deactivated, the bus numbers of other devices may change as a result.

INT	REQ	Bus	Dev.	Fct.	Controller / Slot
-	-	0	0	0	Host Bridge ID 191F
	-	0	1	0	PCI Bridge (0-1) x1(x16) ID1901
A	-	0	2	0	VGA Controller ID1912
A	-	0	08	0	System Peripheral ID1911
A	-	0	20	0	XHCI Controller IDA12F
A	-	0	20	2	Other DPIO Module ID1311
A	-	0	22	0	Serial Other IDA13A
A	-	0	23	0	SATA (AHCI 1.0) IDA102
A	-	0	28	0	PCI Bridge (0-2) x1 (x1) IDA114
B	-	0	28	0	PCI Bridge (0-3) x1 (x1) IDA115
	-	0	31	0	ISA Bridge IDA143
	-	0	31	2	Memory Controller IDA121
	-	0	31	4	SMBus Controller IDA123
B	-	0	31	6	Ethernet Controller ID15B7
A	-	1	00	0	Ethernet Controller x1 (x1) ID1531
		2	00	0	Ethernet Controller x1 (x1) ID1531
		3	00	0	Ethernet Controller x1 (x1) ID1531

14.3 SMB-Devices

The following table lists the reserved SM-Bus device addresses in 8-bit notation.

NOTE

These address ranges may not be used by external devices even if the component assigned in the table doesn't exist on the motherboard.

Address	Function
34-35	API access to power supply unit
36-39	Reserved
5C-5D	NCT7491
60-6F	Reserved for DDR4
70-73	POST Code output
88-89	Slave address defined by BIOS
92-93	I210 default
A0-A7	Reserved for DDR4
B0-B3	Power controller (access via BIOS-API)
B8-BB	Power controller (access via BIOS-API)

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