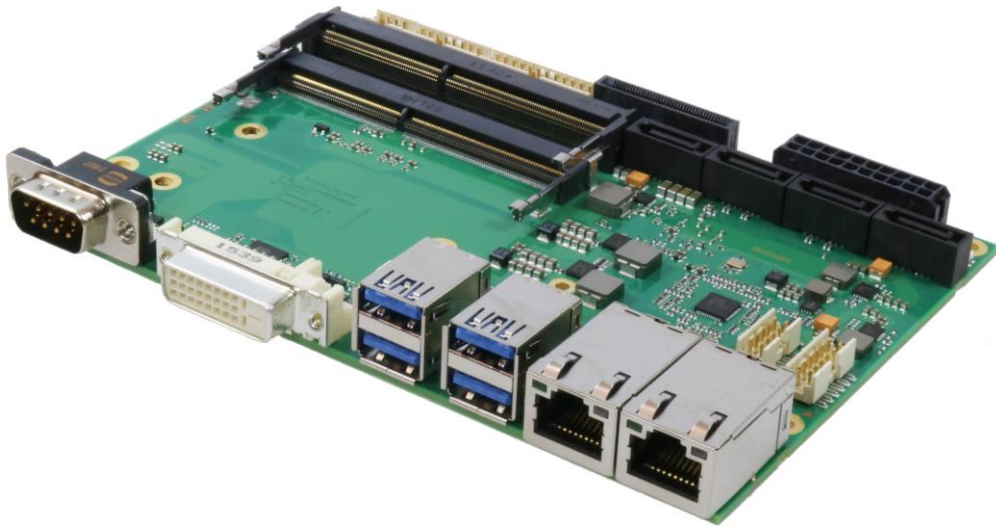


# BECKHOFF

# CB3064-XXXX

## Manual

Rev. 1.0



KabyLake



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## 0 Document History

Version	Changes
0.1	first pre-release
1.0	First released version

All company names, brand names, and product names referred to in this manual are registered or unregistered trademarks of their respective holders and are, as such, protected by national and international law.

# 1 Introduction

## 1.1 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.

### 1.1.1 Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.

For that reason the documentation is not in every case checked for consistency with performance data, standards or other characteristics.

None of the statements of this manual represents a guarantee (Garantie) in the meaning of § 443 BGB of the German Civil Code or a statement about the contractually expected fitness for a particular purpose in the meaning of § 434 par. 1 sentence 1 BGB.

In the event that it contains technical or editorial errors, we retain the right to make alterations at any time and without warning.

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.

### 1.1.2 Trademarks

Beckhoff®, TwinCAT®, EtherCAT®, Safety over EtherCAT®, TwinSAFE®, XFC® and XTS® are registered trademarks and licensed by Beckhoff Automation GmbH.

Other designations used in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owners.

### 1.1.3 Patent Pending

The EtherCAT Technology is covered, including but not limited to the following patent applications and patents:

EP1590927, EP1789857, DE 102004044764, DE 102007017835

with corresponding applications or registrations in various other countries.

The TwinCAT Technology is covered, including but not limited to the following patent applications and patents:

EP0851348, US6167425 with corresponding applications or registrations in various other countries..

EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

### 1.1.4 Copyright

© Beckhoff Automation GmbH & Co. KG, Germany.

The reproduction, distribution and utilization of this document as well as the communication of its contents to others without express authorization are prohibited.

Offenders will be held liable for the payment of damages. All rights reserved in the event of the grant of a patent, utility model or design.

## 1.2 Safety Instructions

Consider the following safety instructions and descriptions!

Product specific safety instructions are to be found on the following pages or in the areas mounting, wiring, commissioning etc.





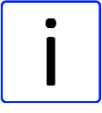
### 1.2.1 Disclaimer

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.



### 1.2.2 Description of Safety Symbols

The following safety symbols are used in this documentation. You have to read the safety symbols carefully and adhere them strictly!

 <b>DANGER</b>	<p><b>Acute risk of injury!</b></p> <p>If you do not adhere the safety advise adjoining this symbol, there is immediate danger to life and health of individuals!</p>
 <b>WARNING</b>	<p><b>Risk of injury!</b></p> <p>If you do not adhere the safety advise adjoining this symbol, there is danger to life and health of individuals!</p>
 <b>CAUTION</b>	<p><b>Hazard to devices and environment</b></p> <p>If you do not adhere the safety advise adjoining this symbol, there is obvious hazard to individuals!</p>
 <b>Attention</b>	<p><b>Hazard to devices and environment</b></p> <p>If you do not adhere the notice adjoining this symbol, there is obvious hazard to materials and environment.</p>
 <b>Notice</b>	<p><b>Note or pointer</b></p> <p>This symbol indicates information that contributes to better understanding.</p>

### 1.3 FCC Approvals for the United States of America

FCC: Federal Communications Commission Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### 1.4 FCC Approval for Canada

FCC: Canadian Notice

This equipment does not exceed the Class A limits for radiated emissions as described in the Radio Interference Regulations of the Canadian Department of Communications.

## 1.5 Essential Safety Measures

### 1.5.1 Operator's Obligation to Exercise Diligence

The operator must ensure that

- the product is only used for its intended purpose
- the product is only operated in sound condition and in working order
- the instruction manual is in good condition and complete, and always available for reference at the location where the products are used
- the product is only used by suitably qualified and authorised personnel
- the personnel is instructed regularly about relevant occupational safety and environmental protection aspects
- the operating personnel is familiar with the operating manual and in particular the safety notes contained herein

### 1.5.2 National Regulations Depending on the Machine Type

Depending on the type of machine and plant in which the product is used, national regulations governing the controllers of such machines will apply, and must be observed by the operator. These regulations cover, amongst other things, the intervals between inspections of the controller. The operator must initiate such inspections in good time.

### 1.5.3 Operator Requirements

- Read the operating instructions

All users of the product must have read the operating instructions for the system they work with.

- System know-how

All users must be familiar with all accessible functions of the product.

## 1.6 Functional Range

The descriptions contained in the present documentation represent a detailed and extensive product description. As far as the described motherboard was acquired as an integral component of an Industrial PC from Beckhoff Automation GmbH & Co. KG, this product description shall be applied only in limited scope. Only the contractually agreed specifications of the corresponding Industrial PC from Beckhoff Automation GmbH & Co. KG shall be relevant. Due to several models of Industrial PCs, variations in the component placement of the motherboards are possible. Support and service benefits for the built-in motherboard will be rendered by Beckhoff Automation GmbH & Co. KG exclusively as specified in the product description (inclusive operation system) of the particular Industrial PC.

## 2 Overview

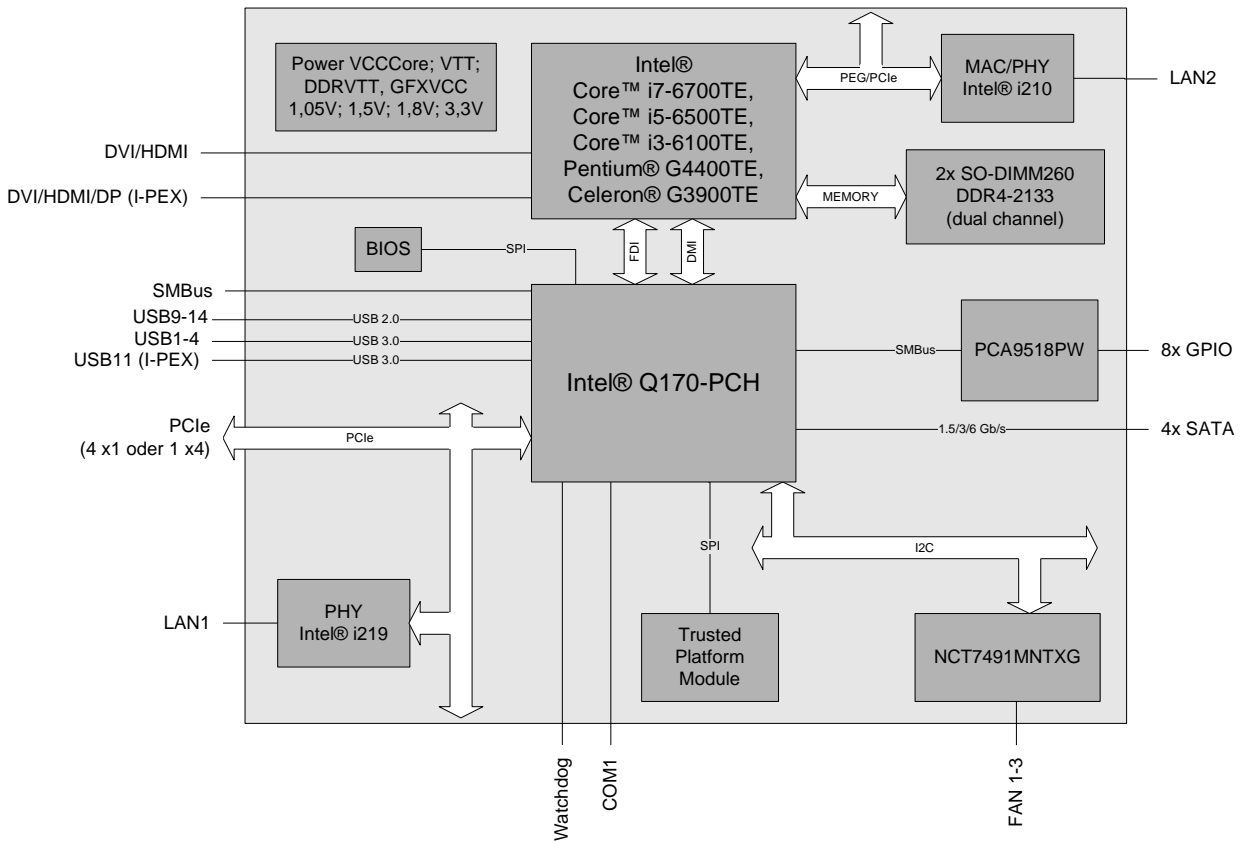
### 2.1 Features

The CB3064 is a highly complex 3,5-inch board which incorporates complete motherboard functionality.

The motherboard is based on Intel®'s Q170 chipset and equipped with an Intel® Core™, Pentium™ or Celeron™ processor of the Skylake-S family.

Such processors are optimized for real-time systems with a low power consumption, while at the same time providing state-of-the-art computing performance and a huge I/O flexibility.

Modern low voltage DDR4 technology provides top-notch memory performance, accomodating up to 32 GByte of RAM (DDR4-2133) via SO-DIMM260. It also provides a PCI-Express bus (via a 2x40-pin custom connector, configurable as one x4 or four x1) and additional peripheral devices such as a serial interface, two Gigabit Ethernet interfaces (LAN), four SATA channels (offering up to 6Gb/s), eleven USB channels, DVI/HDMI, and DisplayPort available on a 30-pin I-PEX connector.



## 2.2 Feature List

<b>CB3064</b>	<b>3,5"-Board</b>	
<b>CPU</b>		Intel® Core™ i7-6700TE (8M, 4 Cores, 35W TDP)
		Intel® Core™ i5-6500TE (6M, 4 Cores, 35W TDP)
		Intel® Core™ i3-6100TE (3M, 2 Cores, 35W TDP)
		Intel® Pentium™ G4400TE (3M, 2 Cores, 35W TDP)
		Intel® Celeron™ G3900TE (2M, 2 Cores, 35W TDP)
<b>Chipset</b>	Intel® Q170	
<b>Memory</b>	2 sockets, each with DDR4@2133MHz à 16GB, SODIMM260	
<b>I/O</b>	External	1x DVI-D (DVI or HDMI 1.4)
		4x USB3.0
		2x GBit-LAN, Intel® i219 and i210
		1x COM
	Internal	1x I-PEX (HDMI1.4 or DP1.2 and USB3.0)
		4x SATA 3.0, RAID 0/1/5/10
		1x PCIe Gen3 (1x PCIe x4 or 4x PCIe x1)
		6x USB2.0
		8x GPIO
	<b>Graphics</b>	HDMI / DP: 3840 x 2160
DVI: 1920 x 1200		
<b>RTC</b>	external CMOS battery	
<b>BIOS</b>	AMI® Aptio V	
<b>Power Supply</b>	5V / 5V / 3,3V / 12V	
<b>Format</b>	102 mm x 147 mm	



**Notice**

The feature list specifies all suitable CPUs. Their actual availability is manufacturer-specific.

## 2.3 Specifications and Documents

In making this manual and for further reading of technical documentation, the following documents, specifications and web-pages were used and are recommended.

- PCI specification  
Version 2.3 bzw. 3.0  
[www.pcisig.com](http://www.pcisig.com)
- PCI Express® Base Specification  
Version 2.0  
[www.pcisig.com](http://www.pcisig.com)
- ACPI specification  
Version 3.0  
[www.acpi.info](http://www.acpi.info)
- ATA/ATAPI specification  
Version 7 Rev. 1  
[www.t13.org](http://www.t13.org)
- USB specification  
[www.usb.org](http://www.usb.org)
- SM-Bus specification  
Version 2.0  
[www.smbus.org](http://www.smbus.org)
- Intel® chip description  
Intel® Atom™ Processor E3800 Product Family datasheet  
[www.intel.com](http://www.intel.com)
- Intel® chip description  
i210 datasheet  
[www.intel.com](http://www.intel.com)
- NCT7491MNTXG  
NCT7491 chip description  
[www.onsemi.com](http://www.onsemi.com)
- American Megatrends®  
Aptio™ Text Setup Environment (TSE) User Manual  
[www.ami.com](http://www.ami.com)
- American Megatrends®  
Aptio™ 5.x Status Codes  
[www.ami.com](http://www.ami.com)


## 3 Detailed Description

### 3.1 Power Input

The connector for power supply is a 2x10-pin connector.


The 12V voltage supply is needed for employment of PCI-Express cards and FAN connectors. COM RXD and TXD also can be used for PSU, e.g. the UPS functionality.

Communication is carried out via SMBus signaling (SMB\_CLK/SMB\_DAT).

 <b>Attention</b>	<p><b>Only for use with Beckhoff-certified PSU!</b></p> <p>The CB3064 is designated for use with the Beckhoff PSU CA2000-0021 only.</p>
---	---

### 3.2 SUPS

Optionally the CB3064 can be equipped with a plug-in SUPS, which can keep the board alive over a short period of time in case of power failure or voltage fluctuation. The exact amount of time is hard to predict as it also depends on factors such as the SUPS' capacitors and the boards' power consumption etc. The capacitors size is only limited by the required space.

 <b>Caution</b>	<p><b>Do not use accumulator and S-UPS simultaneously!</b></p> <p>The CB3064 can be used either with an accumulator or with an S-UPS module. To avoid loss of data in case of a power fail, both components may not be used simultaneously!</p>
--	---

### 3.3 CPU


The motherboard is based on Intel®'s Q170 chipset and employs an Intel® Core™, Pentium™ or Celeron™ processor of the Skylake-S family.

Such processors are optimized for real-time systems with a low power consumption, while at the same time providing state-of-the-art computing performance and a huge I/O flexibility. The CPUs feature a very low power consumption and, depending on the variant, up to 2.7GHz processor base frequency. They also offer many features known from the desktop range such as SSE4.1/4.2, loadable microcode etc. The employed Intel®-CPUs operate in an extended range of thermal conditions and therefore are capable for use in industrial systems.

### 3.4 Memory

Conventional SO-DIMM260 memory modules, as familiar from notebook computers, are used to equip the board with memory. For technical and mechanical reasons it is possible that particular memory modules cannot be employed. Please ask your distributor for recommended memory modules. With currently available SO-DIMM260 modules a memory extension up to 32 GByte is possible (DDR4-2133).

If both memory sockets are in use, notice that you must use identical memory modules. All timing parameters for different memory modules are automatically set by BIOS.

 <b>Notice</b>	<p><b>Driver Compatibility</b></p> <p>For optimal driver compatibility we recommend the use of a Microsoft® Windows® 8 operating system.</p>
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## 4 Connectors

This section describes all the connectors found on the CB3064.



### Notice

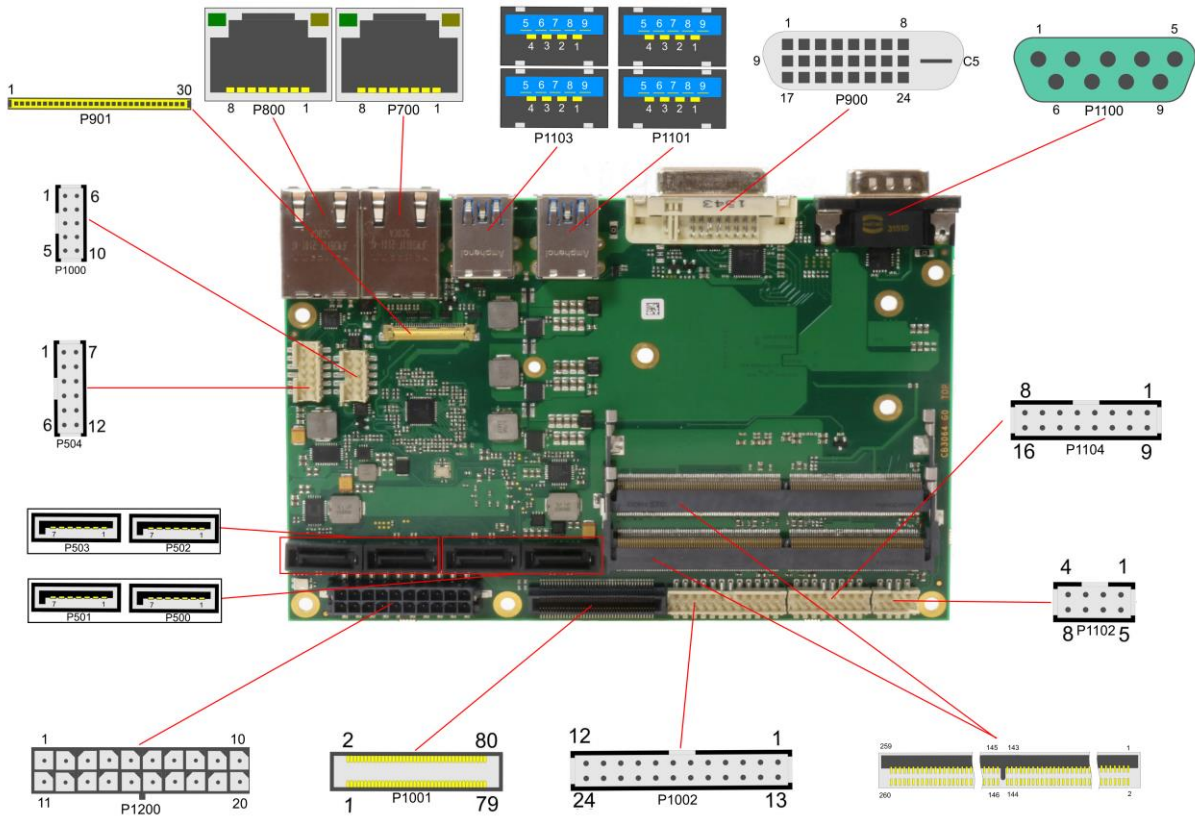
#### **Please consider the requirements on the cabling!**

For most interfaces, the cables must meet certain requirements. For instance, USB 2.0 requires twisted and shielded cables to reliably maintain full speed data rates. Restrictions on maximum cable length are also in place for many high speed interfaces and for power supply. Please refer to the respective specifications and use suitable cables at all times.



### 4.1 Connector Map

Please use the connector map below for quick reference. Only connectors on the component side are shown. For more information on each connector refer to the table below.



Ref.-No.	Function	Page
P500/1/2/3	"SATA Interfaces"	p. 29
P504	"GPIO"	p. 33
P700/800	"LAN"	p. 28
P900	"DVI"	p. 22
P901	"DVI/HDMI/DisplayPort and USB3.0"	p. 23
P1000	"Fan Connectors"	p. 34
P1001	"PCI-Express",	p. 31
P1002	"System"	p. 35
P1100	"Serial Interface COM1"	p. 30
P1101/3	"USB 3-6"	p. 25
P1102/4	"USB2.0 (internal)"	p. 26
P1200	"Power Input"	p. 15

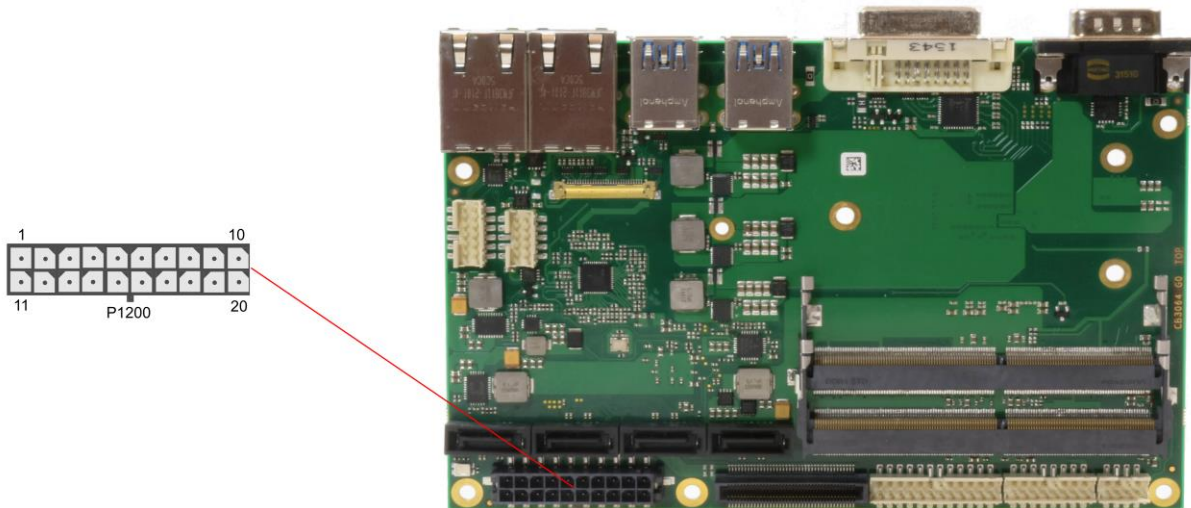
## 4.2 Power Input

The connector for power supply is a 2x10-pin connector.

The 12V voltage supply is needed for employment of PCI-Express cards and FAN connectors. COM RXD and TXD also can be used for PSU, e.g. the UPS functionality.

Communication is carried out via SMBus signaling (SMB\_CLK/SMB\_DAT).

Manufacturer	Description	Mating Connector
Molex	43045-2019	z.B. 43025-2000

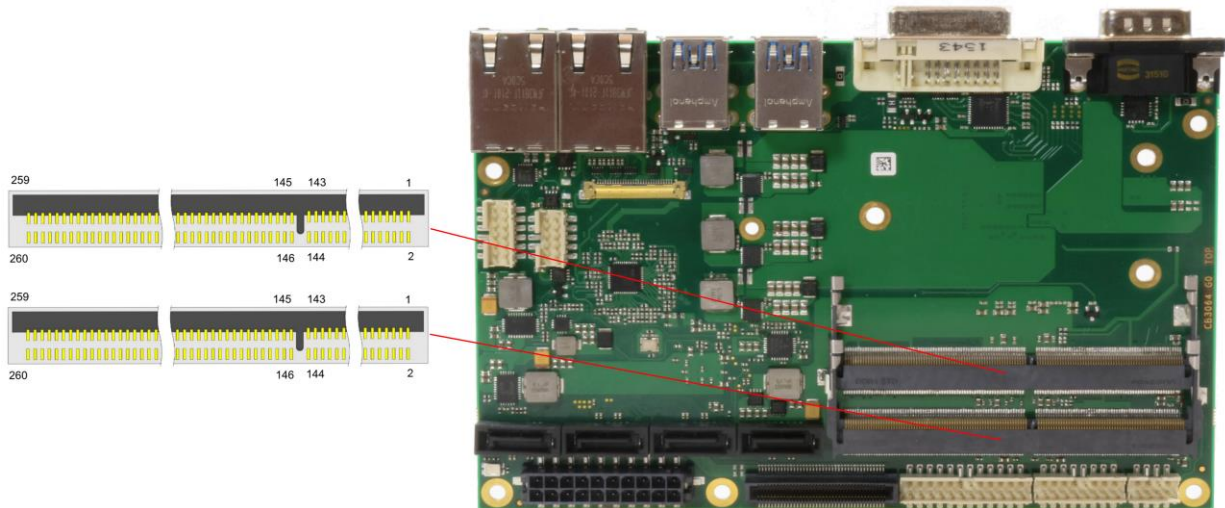


Description	Name	Pin	Name	Description	
SMBus clock signal/ COM transmit data	SMB_CLK/ COM.TXD	1	11	SMB_DAT/ COM.RXD	SMBus data / COM receive data
'Power Supply On'- enables/disables the output voltages: Ground = voltages ON Open Drain = voltages OFF	PS_ON	2	12	ATXPWRGOOD	'ATX Powergood': Low(0V) = voltage not ok Open Drain = voltage ok
Powerbutton output to turn on/off the connected computer	ATXPWRBTN#	3	13	SVCC	S5V / 5A
12V / 8A	12V	4	14	12V	12V / 8A
ground	GND	5	15	GND	ground
ground	GND	6	16	GND	ground
5V / 17A	VCC	7	17	VCC	5V / 17A
5V / 17A	VCC	8	18	VCC	5V / 17A
SUSV activity: Low (0V) = SUPS inactive High (3.3V) = SUPS active	SUSV	9	19	GND	ground
3.3V / 10A	3.3V	10	20	3.3V	3.3V / 10A

### 4.3 Memory

The CB3064 is equipped with two SO-DIMM260 sockets for DDR4-2133-RAM. For technical and mechanical reasons it is possible that particular memory modules cannot be employed. Please ask your distributor for recommended memory modules

With currently available memory modules a memory extension up to 32 GByte is possible. All timing parameters for different memory modules are automatically set by BIOS.



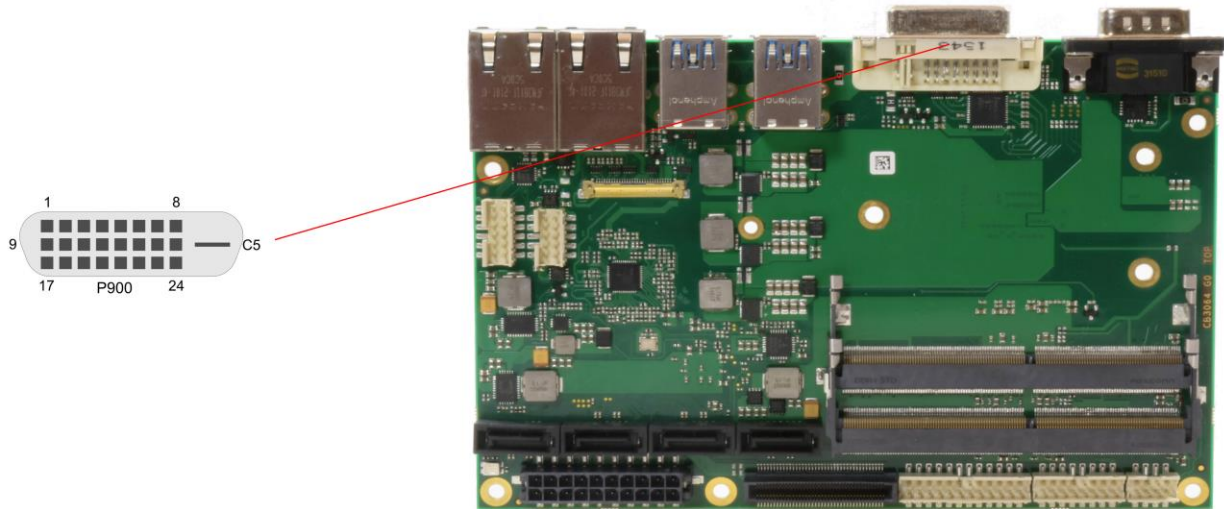
Description	Name	Pin	Pin	Name	Description
Ground	GND	1	2	GND	Ground
Data lane 5	DQ5	3	4	DQ4	Data lane 4
Ground	GND	5	6	GND	Ground
Data lane 1	DQ1	7	8	DQ0	Data lane 0
Ground	GND	9	10	GND	Ground
Data Strobe 0 -	DQS0_c	11	12	NC	Reserved
Data Strobe 0 +	DQS0_t	13	14	GND	Ground
Ground	GND	15	16	DQ6	Data lane 6
Data lane 7	DQ7	17	18	GND	Ground
Ground	GND	19	20	DQ2	Data lane 2
Data lane 3	DQ3	21	22	GND	Ground
Ground	GND	23	24	DQ12	Data lane 12
Data lane 13	DQ13	25	26	GND	Ground
Ground	GND	27	28	DQ8	Data lane 8
Data lane 9	DQ9	29	30	GND	Ground
Ground	GND	31	32	DQS1_c	Data Strobe 1 -
Reserved	NC	33	34	DQS1_t	Data Strobe 1 +
Ground	GND	35	36	GND	Ground
Data lane 15	DQ15	37	38	DQ14	Data lane 14
Ground	GND	39	40	GND	Ground
Data lane 10	DQ10	41	42	DQ11	Data lane 11
Ground	GND	43	44	GND	Ground
Data lane 21	DQ21	45	46	DQ20	Data lane 20
Ground	GND	47	48	GND	Ground
Data lane 17	DQ17	49	50	DQ16	Data lane 16
Ground	GND	51	52	GND	Ground

Description	Name	Pin		Name	Description
Data Strobe 2 -	DQS2_c	53	54	NC	Reserved
Data Strobe 2 +	DQS2_t	55	56	GND	Ground
Ground	GND	57	58	DQ22	Data lane 22
Data lane 23	DQ23	59	60	GND	Ground
Ground	GND	61	62	DQ18	Data lane 18
Data lane 19	DQ19	63	64	GND	Ground
Ground	GND	65	66	DQ28	Data lane 28
Data lane 29	DQ29	67	68	GND	Ground
Ground	GND	69	70	DQ24	Data lane 24
Data lane 25	DQ25	71	72	GND	Ground
Ground	GND	73	74	DQS3_c	Data Strobe 3 -
Reserved	NC	75	76	DQS3_t	Data Strobe 3 +
Ground	GND	77	78	GND	Ground
Data lane 30	DQ30	79	80	DQ31	Data lane 31
Ground	GND	81	82	GND	Ground
Data lane 26	DQ26	83	84	DQ27	Data lane 27
Ground	GND	85	86	GND	Ground
Reserved	NC	87	88	NC	Reserved
Ground	GND	89	90	GND	Ground
Reserved	NC	91	92	NC	Reserved
Ground	GND	93	94	GND	Ground
Data Strobe 8 -	DQS8_c	95	96	NC	Reserved
Data Strobe 8 +	DQS8_t	97	98	GND	Ground
Ground	GND	99	100	NC	Reserved
Reserved	NC	101	102	GND	Ground
Ground	GND	103	104	NC	Reserved
Reserved	NC	105	106	GND	Ground
Ground	GND	107	108	RESET_n	Reset
Clock Enable 0	CKE0	109	110	CKE1	Clock Enable 1
Power supply 1,2V	VCC	111	112	VCC	Power supply 1,2V
Bank Group Input 1	BG1	113	114	ACT_n	Activation Command Input
Bank Group Input 0	BG0	115	116	ALERT_n	Alert
Power supply 1,2V	VCC	117	118	VCC	Power supply 1,2V
Address lane 12	A12	119	120	A11	Address lane 11
Address lane 9	A9	121	122	A7	Address lane 7
Power supply 1,2V	VCC	123	124	VCC	Power supply 1,2V
Address lane 8	A8	125	126	A5	Address lane 5
Address lane 6	A6	127	128	A4	Address lane 4
Power supply 1,2V	VCC	129	130	VCC	Power supply 1,2V
Address lane 3	A3	131	132	A2	Address lane 2
Address lane 1	A1	133	134	EVENT_n	Event
Power supply 1,2V	VCC	135	136	VCC	Power supply 1,2V
Clock-Signal 0 +	CK0_t	137	138	CK1_t	Clock 1 +
Clock-Signal 0 -	CK0_c	139	140	CK1_c	Clock 1 -
Power supply 1,2V	VCC	141	142	VCC	Power supply 1,2V
Even parity check	Parity	143	144	A0	Address lane 0
SDRAM Bank 2	BA1	145	146	A10/AP	Address lane 10/Autoprecharge
Power supply 1,2V	VCC	147	148	VCC	Power supply 1,2V
Chip Select 0	CS0_n	149	150	BA0	Bank Address 0
Address lane 14/Write Enable	A14/WE_n	151	152	A16/RAS_n	Address lane 16/Row Address Strobe
Power supply 1,2V	VCC	153	154	VCC	Power supply 1,2V
On Die Termination 0	ODT0	155	156	A15/CAS_n	Address lane 15/Column Address Strobe

Description	Name	Pin		Name	Description
Chip Select 1	CS1_n	157	158	A13	Address lane 13
Power supply 1,2V	VCC	159	160	VCC	Power supply 1,2V
On Die Termination 1	ODT1	161	162	NC	Reserved
Power supply 1,2V	VCC	163	164	VREFCA	Reference voltage
Reserved	NC	165	166	SA2	SPD address 2
Ground	GND	167	168	GND	Ground
Data lane 37	DQ37	169	170	DQ36	Data lane 36
Ground	GND	171	172	GND	Ground
Data lane 33	DQ33	173	174	DQ32	Data lane 32
Ground	GND	175	176	GND	Ground
Data Strobe 4 -	DQS4_c	177	178	NC	Reserved
Data Strobe 4 +	DQS4_t	179	180	GND	Ground
Ground	GND	181	182	DQ39	Data lane 39
Data lane 38	DQ38	183	184	GND	Ground
Ground	GND	185	186	DQ35	Data lane 35
Data lane 34	DQ34	187	188	GND	Ground
Ground	GND	189	190	DQ45	Data lane 45
Data lane 44	DQ44	191	192	GND	Ground
Ground	GND	193	194	DQ41	Data lane 41
Data lane 40	DQ40	195	196	GND	Ground
Ground	GND	197	198	DQS5_c	Data Strobe 5 -
Reserved	NC	199	200	DQS5_t	Data Strobe 5 +
Ground	GND	201	202	GND	Ground
Data lane 46	DQ46	203	204	DQ47	Data lane 47
Ground	GND	205	206	GND	Ground
Data lane 42	DQ42	207	208	DQ43	Data lane 43
Ground	GND	209	210	GND	Ground
Data lane 52	DQ52	211	212	DQ53	Data lane 53
Ground	GND	213	214	GND	Ground
Data lane 49	DQ49	215	216	DQ48	Data lane 48
Ground	GND	217	218	GND	Ground
Data Strobe 6 -	DQS6_c	219	220	NC	Reserved
Data Strobe 6 +	DQS6_t	221	222	GND	Ground
Ground	GND	223	224	DQ54	Data lane 54
Data lane 55	DQ55	225	226	GND	Ground
Ground	GND	227	228	DQ50	Data lane 50
Data lane 51	DQ51	229	230	GND	Ground
Ground	GND	231	232	DQ60	Data lane 60
Data lane 61	DQ61	233	234	GND	Ground
Ground	GND	235	236	DQ57	Data lane 57
Data lane 56	DQ56	237	238	GND	Ground
Masse	GND	239	240	DQS7_c	Data Strobe 7 -
Reserved	NC	241	242	DQS7_t	Data Strobe 7 +
Ground	GND	243	244	GND	Ground
Data lane 62	DQ62	245	246	DQ63	Data lane 63
Ground	GND	247	248	GND	Ground
Data lane 58	DQ58	249	250	DQ59	Data lane 59
Ground	GND	251	252	GND	Ground
SMBus Clock	SCL	253	254	SDA	SMBus Data
I <sup>2</sup> C Power for SPD EEPROM	VCCSPD	255	256	SA0	SPD address 0
DRAM Activating Power	VPP	257	258	VTT	Termination voltage
DRAM Activating Power	VPP	259	260	SA1	SPD address 1

## 4.4 DVI

The CB3064 is connected to an external display via a DVI-D connector. Only digital displays are supported.



Pinout DVI-D:

Pin	Name	Description
1	TMDSDAT2#	DVI data 2 -
2	TMDSDAT2	DVI data 2 +
3	GND	ground
4	N/C	reserved
5	N/C	reserved
6	DDC CLK	DDC clock (DVI/VGA)
7	DDC DAT	DDC data (DVI/VGA)
8	N/C	reserved
9	TMDSDAT1#	DVI data 1 -
10	TMDSDAT1	DVI data 1 +
11	GND	ground
12	N/C	reserved
13	N/C	reserved
14	VCC	5 volt supply
15	GND	ground
16	HP_DETECT	hot plug detect
17	TMDSDAT0#	DVI data 0 -
18	TMDSDAT0	DVI data 0 +
19	GND	ground
20	N/C	reserved
21	N/C	reserved
22	GND	ground
23	TMDS CLK	DVI clock +
24	TMDS CLK#	DVI clock -
C1	N/C	reserved
C2	N/C	reserved
C3	N/C	reserved
C4	N/C	reserved
C5	GND	ground

### 4.5 DVI/HDMI/DisplayPort and USB3.0

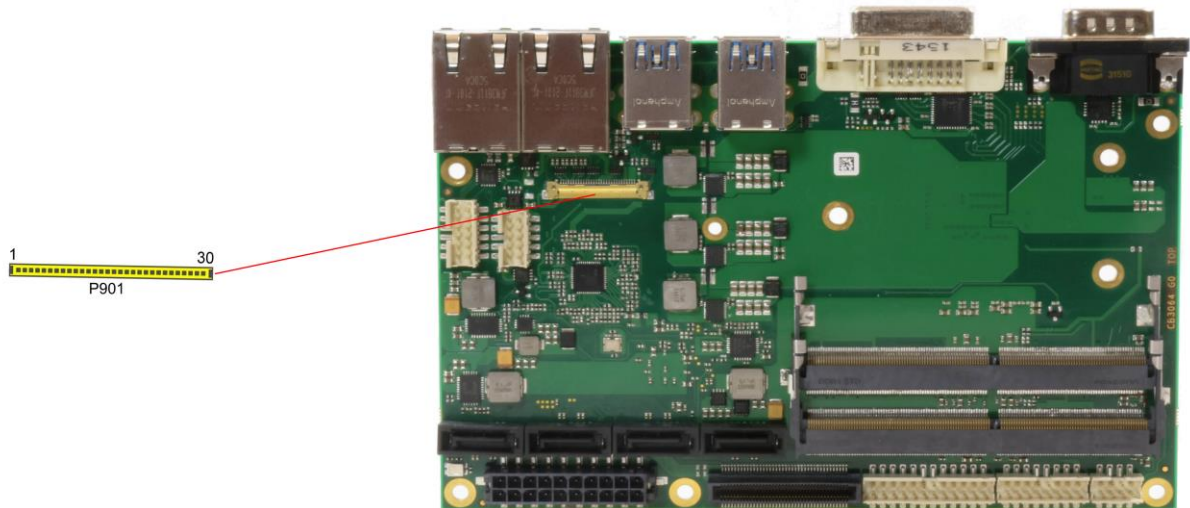
The CB3064 provides a second DVI interface which is realized as a 30-pin flat cable header. Analog VGA is not available on this connector. However, an HDMI device or DisplayPort device can be connected. This custom connector also carries an additional USB interface. The USB interface supports USB 3.0. It provides up to 900 mA current and is protected by an electronically resettable fuse.

When cabling, please make sure that receive lines are always connected to the transmit lines and vice versa.

Maximum current is 2 amperes for VCC combined (0.5A per contact), and 1 ampere for 3.3V (0.5A per contact).

Please note that a custom cable design is required.

Manufacturer	Description	Mating Connector
I-PEX	20455-030E-12	custom design



Pinout 30pin connector DVI/HDMI/DisplayPort:

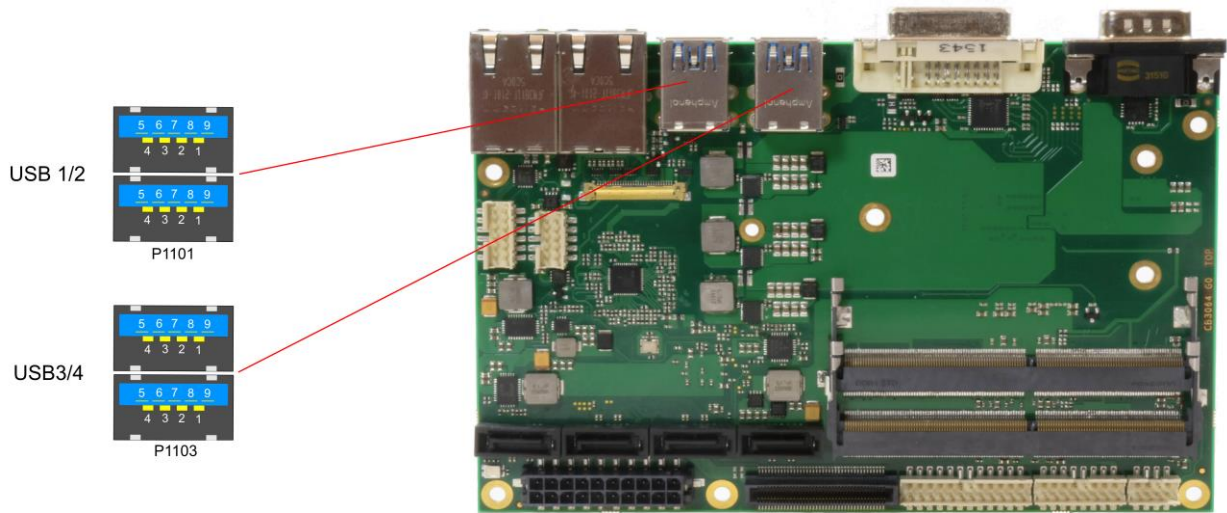
Pin	Name	Description
1	TMDS0#/DP2#	DVI Data 0 - / DP Lane 2 -
2	TMDS0/DP2	DVI Data 0 + / DP Lane 2 +
3	TMDS1#/DP1#	DVI Data 1 - / DP Lane 1 -
4	TMDS1/DP1	DVI Data 1 + / DP Lane 1 +
5	TMDS2#/DP0#	DVI Data 2 - / DP Lane 0 -
6	TMDS2/DP0	DVI Data 2 + / DP Lane 0 +
7	TMDSCLK#/DP3#	DVI Clock - / DP Lane 3 -
8	TMDSCLK/DP3	DVI Clock + / DP Lane 3 +
9	N/C	reserved
10	SEL_DVI/DP#	DVI-DisplayPort Select
11	DDCK/DPAUX	EDID Clock / DP Aux +
12	DDDA/DPAUX#	EDID Data / DP Aux -
13	VCC	5V supply
14	GND	ground
15	HPD	hot plug detect
16	USBVCC	5V supply for USB
17	USBVCC	5V supply for USB

Pin	Name	Description
18	N/C	reserved
19	N/C	reserved
20	SSRX#	Super Speed receiver -
21	SSRX	Super Speed receiver +
22	USB#	USB -
23	USB	USB +
24	SSTX#	Super Speed transmitter -
25	SSTX	Super Speed transmitter
26	3.3V	3.3V supply
27	3.3V	3.3V supply
28	VCC	5V supply
29	VCC	5V supply
30	VCC	5V supply



### 4.6 USB 3-6

USB channel 1 to 4 are made available via standard USB connectors. The USB channels support USB 3.0. You may note that the setting of USB keyboard or USB mouse support in the BIOS-setup is only necessary and advisable, if the OS offers no USB-support. BIOS-setup can be changed with a USB keyboard without enabling USB keyboard support. Running Windows with these features enabled may lead to significant performance or functionality limitations. Every USB interface provides up to 900 mA current and is protected by an electronically resettable fuse.



Pinout USB3.0 connector for channel X:

Pin	Name	Description
1	VCC	5 volt for USBX
2	USB#	Minus channel USBX
3	USBX	Plus channel USBX
4	GND	ground
5	StdA_SSRX-	SuperSpeed Receiver -
6	StdA_SSRX+	SuperSpeed Receiver +
7	GND	ground
8	StdA_SSTX-	SuperSpeed Transmitter -
9	StdA_SSTX+	SuperSpeed Transmitter +

### 4.7 USB2.0 (internal)

The USB channel 9 to 14 are made available via two connectors.

Channel 9 to 12 are provided via a 2x8-pin connector, channel 13 and 14 are provided via a 2x4-pin connector.

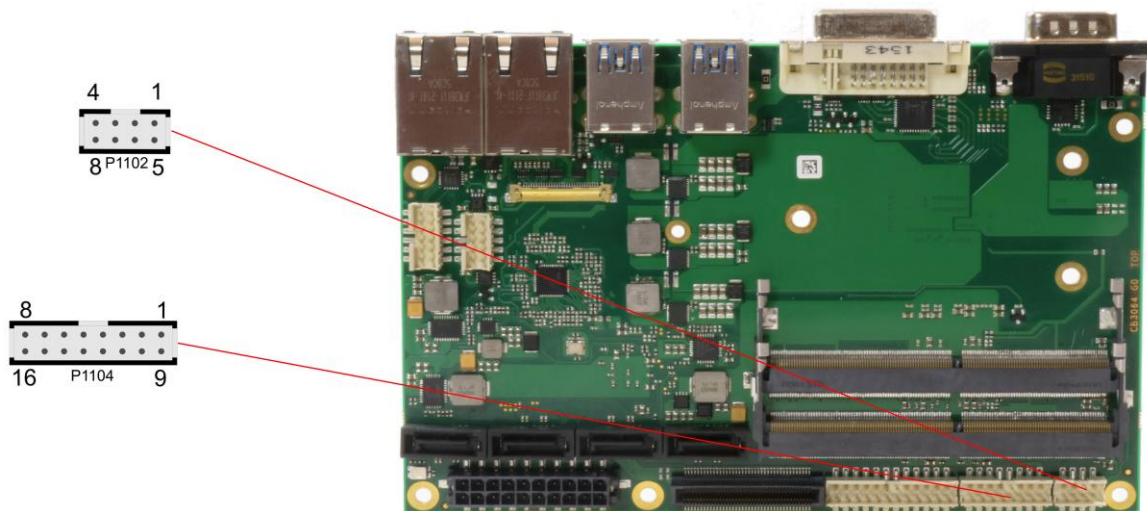
The USB channels support USB 2.0. You may note that the setting of USB keyboard or USB mouse support in the BIOS-setup is only necessary and advisable, if the OS offers no USB-support. BIOS-setup can be changed with a USB keyboard without enabling USB keyboard support. Running Windows with these features enabled may lead to significant performance or functionality limitations.

Every USB interface provides up to 500 mA current and is protected by an electronically resettable fuse.

Manufacturer	Description	Mating Connector
FCI	98424-G52-08LF	90311-008LF

2x8-pin connector:

Manufacturer	Description	Mating Connector
Amphenol FCI	98424-G52-16LF	e.g. 89947-716LF



Pinout 2x8-pin USB connector:

Description	Name	Pin	Name	Description
5V for USB9	VCC	1	9	VCC
Minus data channel USB9	USB9-	2	10	USB10-
Plus data channel USB9	USB9+	3	11	USB10+
Ground	GND	4	12	GND
Ground	GND	5	13	GND
Plus data channel USB12	USB12+	6	14	USB11+
Minus data channel USB12	USB12-	7	15	USB11-
5V for USB12	VCC	8	16	VCC


Pinout 2x4-pin USB connector:

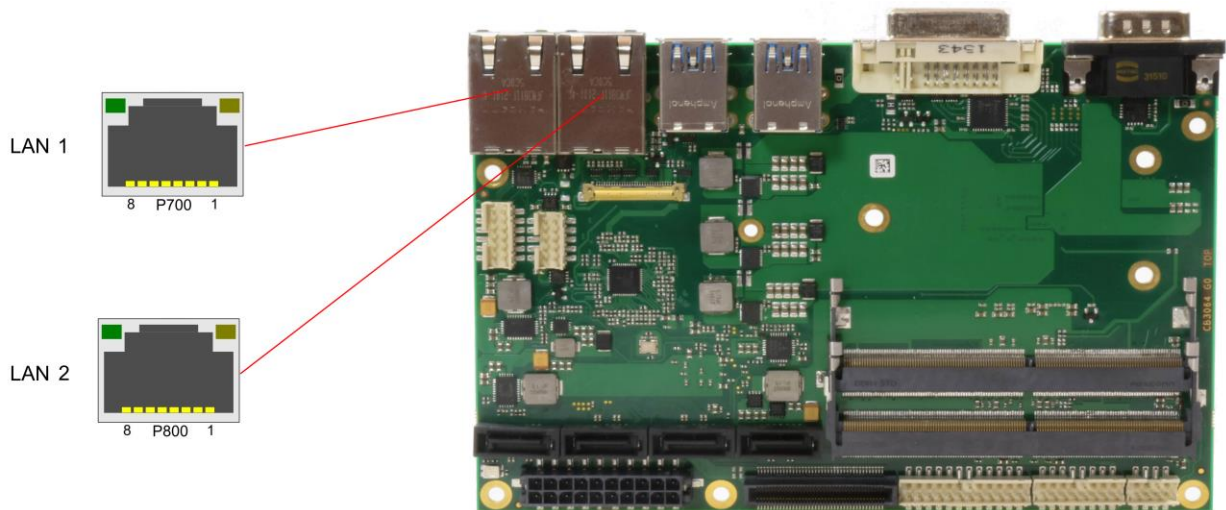
Description	Name	Pin	Name	Description
5V for USB13	VCC	1	5	VCC
Minus data channel USB13	USB13-	2	6	USB14-

Description	Name	Pin		Name	Description
Plus data channel USB13	USB13+	3	7	USB14+	Plus data channel USB14
Ground	GND	4	8	GND	Ground

### 4.8 LAN

The module has two LAN interfaces. All interfaces support 10BaseT, 100BaseT, and 1000BaseT compatible net components with automatic bandwidth selection. Controller chip are Intel®'s i219 (PHY, LAN1) and i210 (MAC/PHY, LAN2). Auto-cross and auto-negotiate functionality is available as is PXE and WOL.

 <b>Notice</b>	For realtime applications, the external controller (MAC/PHY) is to prefer.
--	--

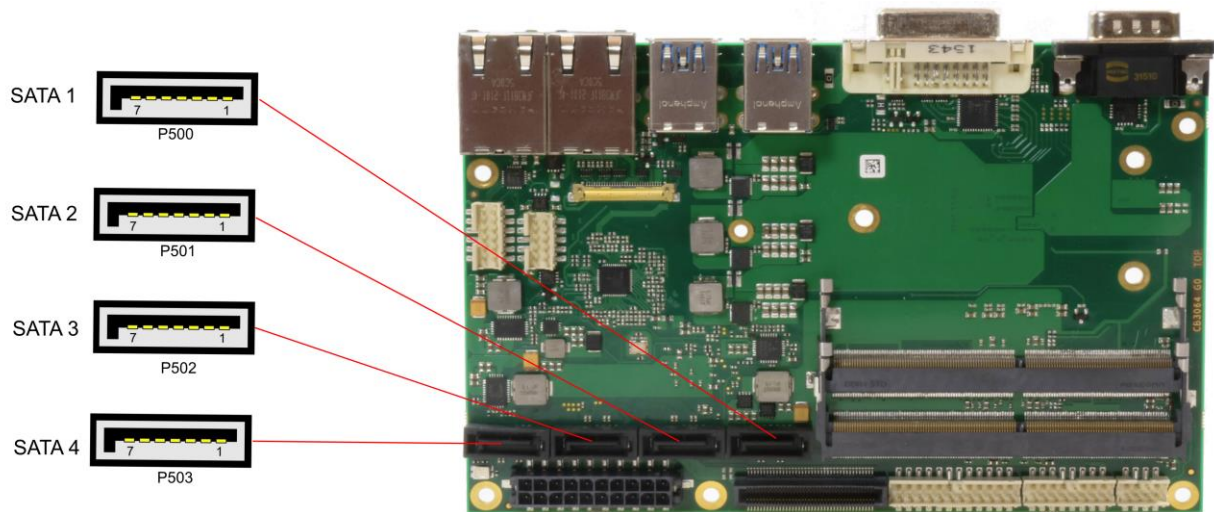


Pinout LAN 10/100/1000:

Pin	Name	Description
1	LAN-0	LAN channel 0 plus
2	LAN-0#	LAN channel 0 minus
3	LAN-1	LAN channel 1 plus
4	LAN-2	LAN channel 2 plus
5	LAN-2#	LAN channel 2 minus
6	LAN-1#	LAN channel 1 minus
7	LAN-3	LAN channel 3 plus
8	LAN-3#	LAN channel 3 minus

## 4.9 SATA Interfaces

The CB3064 provides four SATA interfaces which allows transfer rates of up to 6 Gb/s. The interface is made available via a standard SATA connector and supports RAID 0/1/5/10. The required settings are made in the BIOS setup.



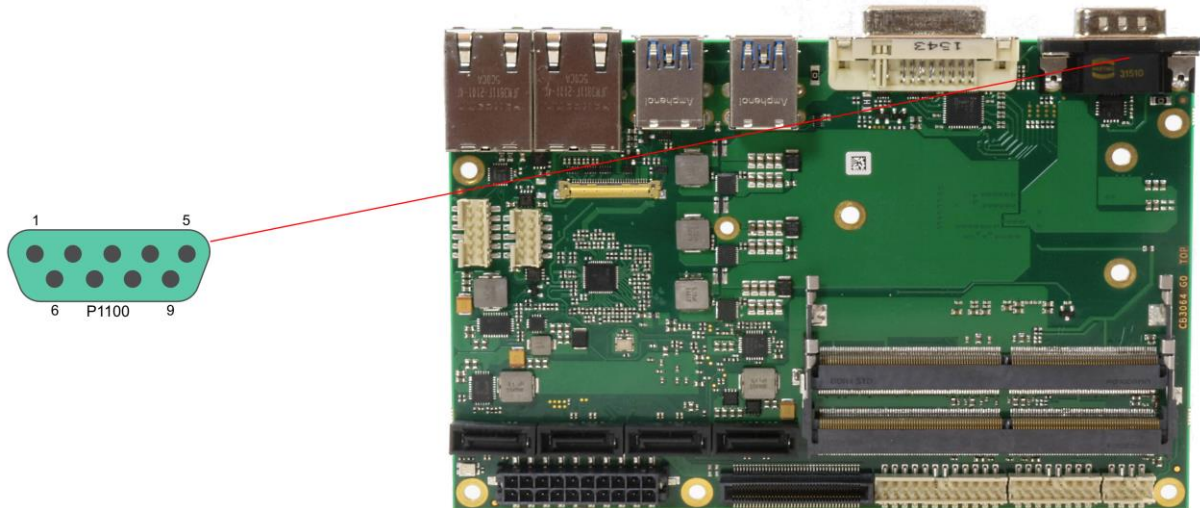
Pinout SATA:

Pin	Name	Description
1	GND	ground
2	SATATX	SATA transmit +
3	SATATX#	SATA transmit -
4	GND	ground
5	SATARX	SATA receive -
6	SATARX#	SATA receive +
7	GND	ground

## 4.10 Serial Interface COM1

The serial interface COM1 is made available via a 9-pin standard DSUB-connector (male). RS232 standard signals are provided.

The port address and the interrupt are set via the BIOS setup.

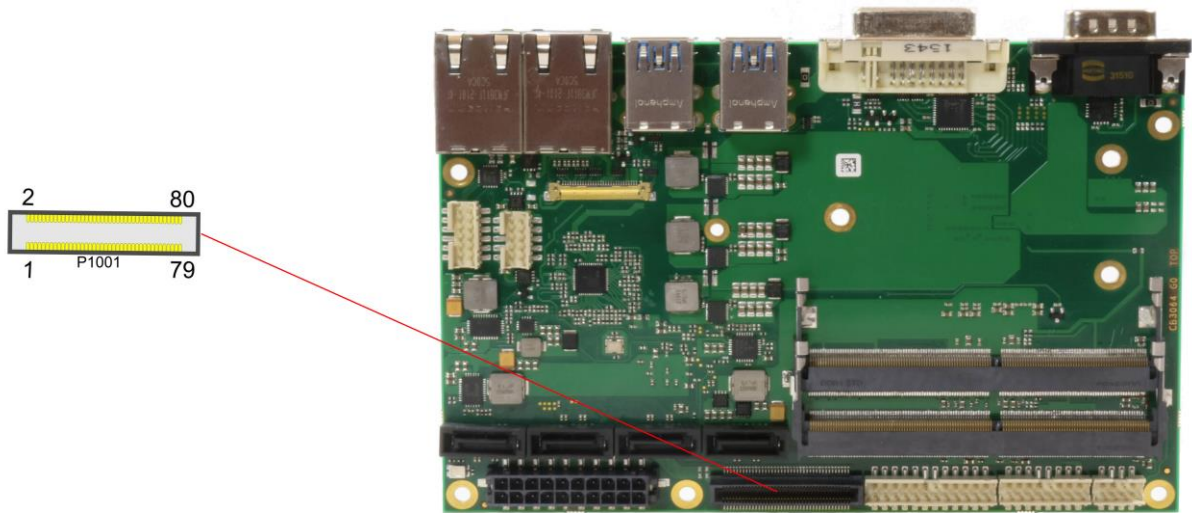


Pinout serial port (DSUB connector):

Description	Name	Pin	Name	Description	
data carrier detect	DCD	1	6	DSR	data set ready
receive data	RXD	2	7	RTS	request to send
transmit data	TXD	3	8	CTS	clear to send
data terminal ready	DTR	4	9	RI	ring indicator
ground	GND	5			

### 4.11 PCI-Express

The CB3064 offers a 2x40pin custom connector for the PCI-Express bus. You can connect one PCIe x4 device here. Alternatively, up to four PCIe x1 devices can be connected. Adapter cards featuring standard PCIe sockets or a PCIe Mini Card connector are available. Please contact your sales representative for these cards.



Pinout 2x40-pin connector:

Description	Name	Pin	Pin	Name	Description
3.3 volt supply	3.3V	1	2	12V	12 volt supply
3.3 volt supply	S3.3V	3	4	SMBCLK1	SMB Clock Slot 1
PCIe Reset	PLTPCIE#	5	6	SMBDAT1	SMB Dat Slot 1
Link Reactivation	PEWAKE#	7	8	GND	ground
ground	GND	9	10	PECLK0	PCIe Clock 0 +
Transmit Lane 1 +	PET1	11	12	PECLK0#	PCIe Clock 0 -
Transmit Lane 1 -	PET1#	13	14	GND	ground
ground	GND	15	16	PER1	Receive Lane 1 +
Clock Enable 1	PE1CLKEN#	17	18	PER1#	Receive Lane 1 -
ground	GND	19	20	GND	ground
3.3 volt supply	3.3V	21	22	12V	12 volt supply
3.3 volt standby power supply	S3.3V	23	24	N/C	reserved
reserved	N/C	25	26	N/C	reserved
reserved	N/C	27	28	GND	ground
ground	GND	29	30	N/C	reserved
reserved	N/C	31	32	N/C	reserved
reserved	N/C	33	34	GND	ground
ground	GND	35	36	N/C	reserved
reserved	N/C	37	38	N/C	reserved
ground	GND	39	40	GND	ground
3.3 volt supply	3.3V	41	42	12V	12 volt supply
3.3 volt power supply	S3.3V	43	44	N/C	reserved
reserved	N/C	45	46	N/C	reserved
reserved	N/C	47	48	GND	ground
ground	GND	49	50	N/C	reserved
reserved	N/C	51	52	N/C	reserved
reserved	N/C	53	54	GND	ground

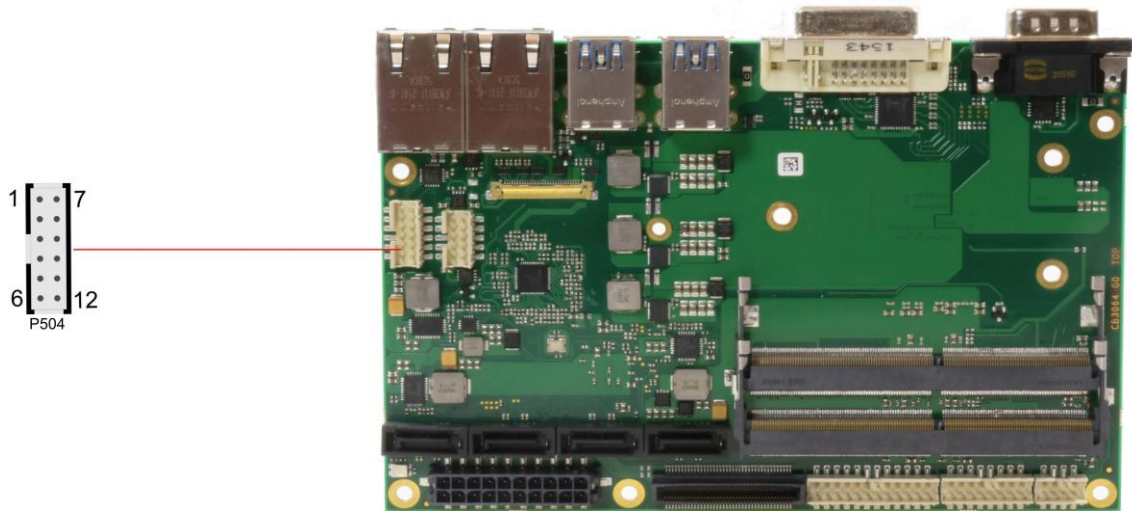
Description	Name	Pin		Name	Description
ground	GND	55	56	N/C	reserved
reserved	N/C	57	58	N/C	reserved
ground	GND	59	60	GND	ground
3.3 volt supply	3.3V	61	62	12V	12 supply
3.3 volt supply	S3.3V	63	64	N/C	reserved
reserved	N/C	65	66	N/C	reserved
reserved	N/C	67	68	GND	ground
ground	GND	69	70	N/C	reserved
reserved	N/C	71	72	N/C	reserved
reserved	N/C	73	74	GND	ground
ground	GND	75	76	N/C	reserved
reserved	N/C	77	78	N/C	reserved
reserved	N/C	79	80	GND	ground



## 4.12 GPIO

The General Purpose Input/Output interface is made available through a 2x6-pin connector. To make use of this interface the GPIO chip (PCA9535BS) must be programmed accordingly. Please refer to your distributor for information on available software support.

Manufacturer	Description	Mating Connector
FCI	FCI 98424-G52-12LF	FCI 90311-012LF



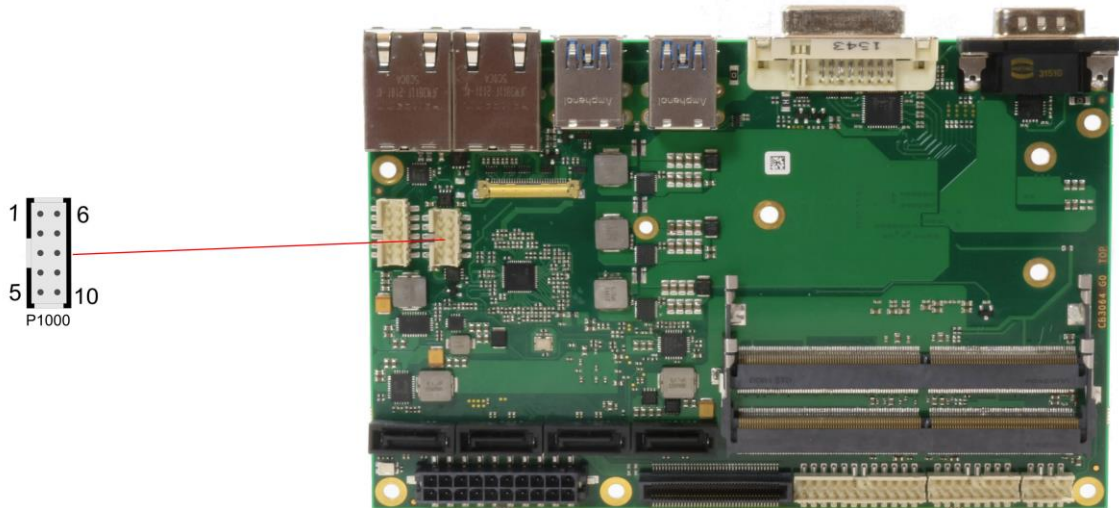
Pinout GPIO connector:

Description	Name	Pin	Name	Description
5 volt supply	VCC	1	7	VCC
GP input/output 10	GPIO10	2	8	GPIO14
GP input/output 11	GPIO11	3	9	GPIO15
GP input/output 12	GPIO12	4	10	GPIO16
GP input/output 13	GPIO13	5	11	GPIO17
ground	GND	6	12	GND

## 4.13 Fan Connectors

Three external fans (12V) can be connected to the board using a 2x5-pin connector. Monitoring signals are available. For the monitoring to work the fans must provide a corresponding speed signal.

Manufacturer	Description	Mating Connector
FCI	98424-G52-10LF	90311-010LF



Pinout 2x5-pin connector:

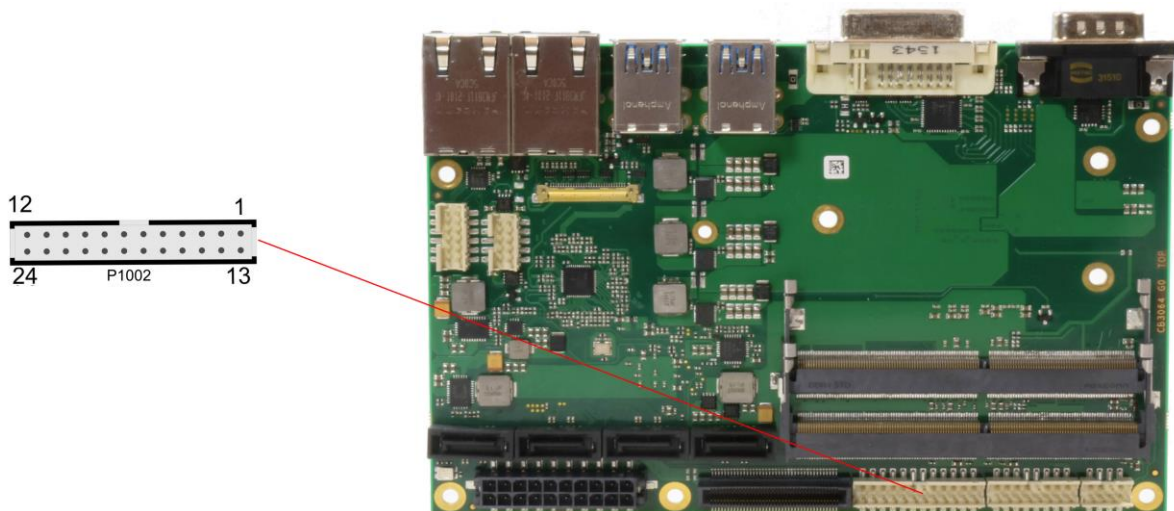
Description	Name	Pin	Name	Description	
FAN 1 ON	FANON1	1	6	FANON2	FAN 2 ON
12V	12V	2	7	12V	12V
FAN1 control	FANCTRL1	3	8	FANCTRL2	Fan 2 control
12V	12V	4	9	FANCTRL3	Fan 3 control
FAN 3 ON	FANON3	5	10	GND	ground

## 4.14 System

A number of signals for system control and for SMBus communication are provided through a 2x12-pin connector. This connector combines signals for power button, speaker, and several LEDs such as a suspend LED, and three additional LEDs which are driven by GPIOs. Of these three GPIO-LEDs, LED1 and LED2 are already provided with a series resistor. SMBus capable devices can also be connected.

2x12-pin connector:

Manufacturer	Description	Mating Connector
Amphenol FCI	98424-G52-24LF	e.g. 89947-124LF















Pinout 2x12-pin connector:

Description	Name	Pin	Name	Description
Ground	GND	1	13	3.3V
Reset to ground	RSTBTN#	2	14	PWRBTN#
LED suspend / ACPI	S-LED	3	15	S3.3V
LED harddisk	SATALED	4	16	GPIOLED3
LED GPIO device 1	GPIOLED1	5	17	BATT
LED GPIO device 2	GPIOLED2	6	18	SMBALERT#
SMB clock	SMBCLKEX	7	19	SMBDATEXT
Speaker	SPEAKER	8	20	SVCC
Not connected	N/C	9	21	N/C
Ground	GND	10	22	VCC
Ground	GND	11	23	VCC
Ground	GND	12	24	VCC

## 5 State LEDs

### 5.1 RGB LED

The CB3064 has a tricolor LED, which signals status messages by using different colors and flash intervals.

Color	Interval		Meaning
non	solid		Invalid system state
White	once		Powerfail
Cyan	solid		Reserved
Magenta	solid		SUPS active
Blue	solid		Reserved
Yellow	solid		S5 state
Green	solid		S0 state
Red	solid		Reset/Start
Green/Yellow	flashing		Bootloader operates normal
Red/Yellow	flashing		Bootloader starting (running starting sequence)
Yellow	flashing (6s)		S4 state
Yellow	flashing (3s)		S3 state
Magenta	flashing (0,5s)		SUPS test of capacity
Red/Magenta	flashing		Bootloader: checksum error at I2C transmission



#### Notice

#### Permanently red LED

If the board appears to be in Reset (Red LED lit) then this could also indicate a PCI104-Express "stacking error". Such an error could occur when the stack contains a peripheral card which has the wrong type of connector (PCI104-Express Type 1 instead of Type 2 or vice versa).

## 6 BIOS Settings

### 6.1 General Remarks

In each setup page, standard values for all setup entries can be loaded. Previously saved settings are loaded by pressing F2 and factory defaults are loaded with F3. Both F2 and F3, and also F4 ("Save & Exit") always affect the whole set of setup entries.

Setup entries starting with a „►" sign represent submenus. Navigation between entries is done using the arrow keys on the keyboard, with the <Enter> key being used to select an entry, which either opens up a dialog box or opens a whole new submenu of setup entries.

Each setup entry has a short help text associated with it. This is displayed in the upper right hand corner of the screen.



#### Notice

BIOS features and setup options are subject to change without notice. The settings displayed in the screenshots on the following pages are meant to be examples only. They do not represent the recommended settings or the default settings. Determination of the appropriate settings is dependent upon the particular application scenario in which the board is used.

## 6.2 Main

Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.  
 MAIN Advanced Chipset Security Boot Save & Exit

<pre> Board Information Board                CB3064 Revision             2 Bios Version         1.01  Processor Information Name                 SkyLake DT Type                 Intel(R) Core(TM)                     i5-6400 CPU @ 2.70GHz Speed                2700 MHz ID                   0x506E3 Stepping             R0/S0/N0 Number of Processors 4Core(s) / 4 Thread(s) Microcode Revision   A6 GT Info              GT2 (0x1912)  IGFX VBIOS Version   1049 IGFX GOP Version     N/A Memory RC Version    2.0.0.6 Total Memory         4096 MB Memory Frequency     2133 MHz  System Date          [Wed 05/07/2017] System Time          [13:25:06] </pre>	<pre> Set the Date. Use Tab to switch between Data elements.  ----- ←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit </pre>
---	--

Version 2.18.1263. Copyright (C) 2017 American Megatrends, Inc.

- ✓ **Board**  
Options: none
- ✓ **Revision**  
Options: none
- ✓ **Bios Version**  
Options: none
- ✓ **Processor Information**  
Options: none
- ✓ **Name**  
Options: none
- ✓ **Type**  
Options: none
- ✓ **Speed**  
Options: none
- ✓ **ID**  
Options: none
- ✓ **Stepping**  
Options: none
- ✓ **Number of Processors**  
Options: none
- ✓ **Microcode Revision**  
Options: none

- ✓ **GT Info**  
Options: none
- ✓ **IGFX VBIOS Version**  
Options: none
- ✓ **IGFX GOP Version**  
Options: none
- ✓ **Memory RC Version**  
Options: none
- ✓ **Total Memory**  
Options: none
- ✓ **Memory Frequency**  
Options: none
- ✓ **System Date**  
Options: The system date can be adjusted here.
- ✓ **System Time**  
Options: The system time can be adjusted here.

### 6.3 Advanced

Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.  
 ADVANCED

Power-Supply Type [ATX] SoftOff on Overheat [Disabled] ▶ Platform Misc Configuration ▶ CPU Configuration ▶ Intel(R) I210 Gigabit Network Connection - 00:01:05:2C:0B:3F ▶ Intel(R) Ethernet Connection (2) I219-LM - 00:01:05:2C:0B:3E ▶ Driver Health ▶ Trusted Computing ▶ ACPI Settings ▶ Hardware Monitor ▶ Serial Port Console Redirection ▶ PCI Subsystem Settings ▶ Network Stack Configuration ▶ Power Controller Options ▶ CSM Configuration ▶ NVMe Configuration ▶ USB Configuration ▶ SATA and RST Configuration ▶ AMT Configuration	Trusted Computing Settings          ←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
---	---

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- ✓ **Power-Supply Type**  
Options: ATX / AT
- ✓ **SoftOff on Overheat**  
Options: Disabled / Enabled
- ✓ **Platform Misc Configuration**  
Sub menu: see "Platform Misc Configuration Configuration" (page 42)
- ✓ **CPU Configuration**  
Sub menu: see "CPU Configuration" (page 46)
- ✓ **Intel(R) I210 Gigabit Network Connection**  
Sub menu: see "Intel(R) I210 Gigabit Network Connection" (page 51)
- ✓ **Intel(R) Ethernet Connection (2) I219-LM**  
Sub menu: see "Intel(R) Ethernet Connection I219-LM" (page 53)
- ✓ **Driver Health**  
Sub menu: see "Driver Health" (page 54)
- ✓ **Trusted Computing**  
Sub menu: see "Trusted Computing" (page 57)
- ✓ **ACPI Settings**  
Sub menu: see "ACPI Settings" (page 58)
- ✓ **H/W Monitor**  
Sub menu: see "H/W Monitor" (page 59)
- ✓ **Serial Port Console Redirection**  
Sub menu: see "Serial Port Console Redirection" (page 61)



- ✓ **PCI Subsystem Settings**  
Sub menu: see "PCI Subsystem Settings" (page 62)
- ✓ **Network Stack Configuration**  
Sub menu: see "Network Stack Configuration" (page 64)
- ✓ **Power Controller Options**  
Sub menu: see "Power Controller Options" (page 65)
- ✓ **CSM Configuration**  
Sub menu: see "Compatibility Support Module Configuration" (page 67)
- ✓ **NVMe Configuration**  
Sub menu: see "NVMe Controller and Drive Information" (page 68)
- ✓ **USB Configuration**  
Sub menu: see "USB Configuration" (page 69)
- ✓ **SATA and RST Configuration**  
Sub menu: see "SATA and RST Configuration" (page 70)
- ✓ **AMT Configuration**  
Sub menu: see "AMT Configuration" (page 74)

### 6.3.1 Platform Misc Configuration Configuration

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Advanced

Platform Misc Configuration		PTID Support will be loaded if enabled.
PTID Support	[Enabled]	
PECI Access Method	[Direct I/O]	
Native PCIE Enable	[Enabled]	
Native ASPM	[Disabled]	
BDAT ACPI Table Support	[Disabled]	
Wake system from S5	[Enabled]	
Wake up hour	0	
Wake up minute	0	
Wake up second	0	
ACPI Debug	[Enabled]	
Acpi Memory Buffer Address	N/A	→: Select Screen
Low Power S0 Idle Capability	[Enabled]	↑↓: Select Item
10sec Power Button OVR	[Disabled]	Enter: Select
EC Notification	[Enabled]	+/-: Change Opt.
EC CS Debug Light	[Disabled]	F1: General Help
EC Low Power Mode	[Disabled]	F2: Previous Values
Sensor Standby	[Disabled]	F3: Optimized Defaults
CS PL1 Limit	[Enabled]	F4: Save & Exit
CS PL1 Value	4500	ESC: Exit
▶ PEP Constraints Configuration		
Lpit Recidency Counter	[SLP S0]	

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- ✓ **PTID Support**  
Options: Disabled / Enabled
- ✓ **PECI Access Method**  
Options: Direct I/O / ACPI
- ✓ **Native PCIE Enable**  
Options: Disabled / Enabled
- ✓ **Native ASPM**  
Options: Disabled / Enabled
- ✓ **BDAT ACPI Table Support**  
Options: Disabled / Enabled
- ✓ **Wake system from S5**  
Options: Disabled / Enabled
- ✓ **Wake up hour**  
Options: 0..23
- ✓ **Wake up minute**  
Options: 0..59
- ✓ **Wake up second**  
Options: 0..59
- ✓ **ACPI Debug**  
Options: Disabled / Enabled
- ✓ **ACPI Memory Buffer Address**  
Options: none

- ✓ **ACPI Low Power S0 Idle Capability**  
Options: Disabled / Enabled
- ✓ **10sec Power Button OVR**  
Options: Disabled / Enabled
- ✓ **EC Notification**  
Options: Disabled / Enabled
- ✓ **EC CS Debug Light**  
Options: Disabled / Enabled
- ✓ **EC Low Power Mode**  
Options: Disabled / Enabled
- ✓ **Sensor Standby**  
Options: Disabled / Enabled
- ✓ **CS PL1 Limit**  
Options: Disabled / Enabled
- ✓ **PEP Constraints Configuration**  
Sub menu: see "PEP Constraints Configuration" (page 44)
- ✓ **Lpit Recidency Counter**  
Options: SLP S0 / C10
- ✓ **PCI Delay Optimization**  
Options: Disabled / Enabled
- ✓ **ZpODD Support**  
Options: Disabled / Enabled

### 6.3.1.1 PEP Constraints Configuration

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Advanced

PEP Constraints Configuration	Add CPU in PEP mitigation list
PEP CPU [Enabled]	
PEP Graphics [Disabled]	
PEP ISP [Disabled]	
PEP SATA [Storage Controller]	
PEP UART [Enabled]	
PEP I2C0 [Enabled]	
PEP I2C1 [Enabled]	
PEP I2C2 [Enabled]	
PEP I2C3 [Enabled]	
PEP I2C4 [Enabled]	
PEP I2C5 [Enabled]	
PEP SPI [Enabled]	
PEP XHCI [Enabled]	
PEP Audio [Enabled]	
PEP EMMC [Enabled]	
PEP SDXC [Enabled]	
	←: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **SPEP CPU**  
Options: Disabled / Enabled
- ✓ **PEP Graphics**  
Options: Disabled / Enabled
- ✓ **PEP ISP**  
Options: Disabled / Enabled
- ✓ **PEP SATA**  
Options: No Constraint / Storage Controller
- ✓ **PEP UART**  
Options: Disabled / Enabled
- ✓ **PEP I2C0**  
Options: Disabled / Enabled
- ✓ **PEP I2C1**  
Options: Disabled / Enabled
- ✓ **PEP I2C2**  
Options: Disabled / Enabled
- ✓ **PEP I2C3**  
Options: Disabled / Enabled
- ✓ **PEP I2C4**  
Options: Disabled / Enabled
- ✓ **PEP I2C5**  
Options: Disabled / Enabled

- ✓ **PEP SPI**  
Options: Disabled / Enabled
- ✓ **PEP XHCI**  
Options: Disabled / Enabled
- ✓ **PEP Audio**  
Options: Disabled / Enabled
- ✓ **PEP EMMC**  
Options: Disabled / Enabled
- ✓ **PEP SDXC**  
Options: Disabled / Enabled

### 6.3.2 CPU Configuration

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Advanced

CPU Configuration		▲ Enable/Disable Software Guard Extensions (SGX)
Type	Intel(R) Core(TM) i5-6400 CPU @ 2.70GHz	▼
ID	0x506E3	
Speed	2700 MHz	
L1 Data Cache	32 KB x 4	
L1 Instruction Cache	32 KB x 4	
L2 Cache	256 KB x 4	
L3 Cache	6 MB	
L4 Cache	N/A	
VMX	Supported	
SMX/TXT	Not Supported	
SW Guard Extensions (SGX)	[Enabled]	→: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Select Owner EPOCH input type	[No Change in Owner EPOCHs]	
PRMRR Size	[128MB]	
CPU Flex Ratio Override	[Disabled]	
CPU Flex Ratio Settings	27	
Hardware Prefetcher	[Enabled]	
Adjacent Cache Line Prefetch	[Enabled]	
Intel (VMX) Virtualization Technology	[Enabled]	
PECI	[Enabled]	

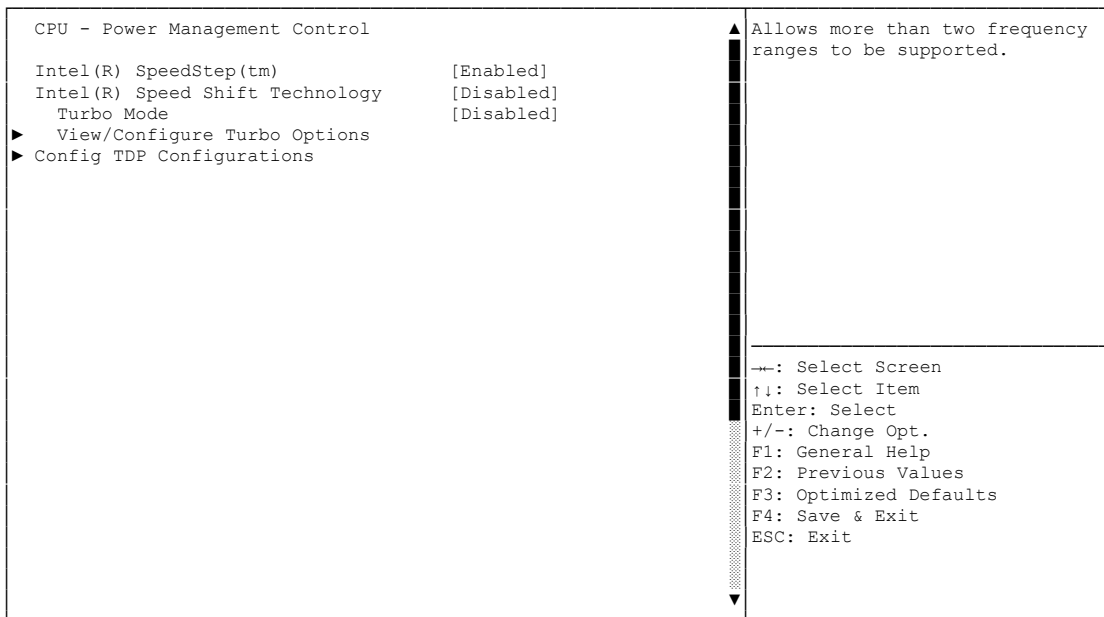
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- ✓ **Type**  
Options: none
- ✓ **ID**  
Options: none
- ✓ **Speed**  
Options: none
- ✓ **L1 Data Cache**  
Options: none
- ✓ **L1 Instruction Cache**  
Options: none
- ✓ **L2 Cache**  
Options: none
- ✓ **L3 Cache**  
Options: none
- ✓ **L4 Cache**  
Options: none
- ✓ **VMX**  
Options: none
- ✓ **SMX/TXT**  
Options: none
- ✓ **SW Guard Extensions (SGX)**  
Options: Software Controlled / Enabled / Disabled

- ✓ **Select Owner EPOCH input type**  
Options: No Change in Owner EPOCHs / Change to New Random Owner EPOCHs / Manual User Defined Owner EPOCHs
  
- ✓ **PRMRR Size**  
Options: INVALID PRMRR / 32MB / 64MB / 128MB
  
- ✓ **CPU Flex Ratio Override**  
Options: Disabled / Enabled
  
- ✓ **CPU Flex Ratio Settings**  
Options: 0..63
  
- ✓ **Hardware Prefetcher**  
Options: Disabled / Enabled
  
- ✓ **Adjacent Cache Line Prefetch**  
Options: Disabled / Enabled
  
- ✓ **Intel Virtualization Technology**  
Options: Enabled / Disabled
  
- ✓ **PECI**  
Options: Enabled / Disabled
  
- ✓ **Active Processor Cores**  
Options: All
  
- ✓ **Hyper-threading**  
Options: Enabled / Disabled
  
- ✓ **CPU AES**  
Options: Disabled / Enabled
  
- ✓ **CPU - Power Management Control**  
Sub menu: see "CPU - Power Management Control" (page 48)

### 6.3.2.1 CPU - Power Management Control

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Advanced



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- ✓ **Intel(R) SpeedStep(tm)**  
Options: Disabled / Enabled
- ✓ **Intel(R) Speed Shift Technology**  
Options: Disabled / Enabled
- ✓ **Turbo Mode**  
Options: Disabled / Enabled
- ✓ **View/Configure Turbo Options**  
Sub menu: see "View/Configure Turbo Options" (page 49)
- ✓ **Config TDP Configurations**  
Sub menu: see "Config TDP Configurations" (page 50)



6.3.2.1.1 View/Configure Turbo Options

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Advanced

<p>Current Turbo Settings</p> <p>Max Turbo Power Limit 4095.875</p> <p>Min Turbo Power Limit 0.0</p> <p>Package TDP Limit 65.0</p> <p>Power Limit 1 65.0</p> <p>Power Limit 2 0.0</p> <p>1-core Turbo Ratio 33</p> <p>2-core Turbo Ratio 33</p> <p>Energy Efficient P-state [Enabled]</p> <p>Package Power Limit MSR Lock [Disabled]</p> <p>Energy Efficient Turbo [Disabled]</p>	<p>Enable/Disable Energy Efficient P-state feature. When set to 0, will disable access to ENERGY_PERFORMANCE_BIAS MSR and CPUID Function 6 ECX[3] will read 0 indicating no support for Energy Efficient policy setting. When set to 1 will enable access to ENERGY_PERFORMANCE_BIAS MSR</p> <hr/> <p>←: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</p>
---	--

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- ✓ **Max Turbo Power Limit**  
Options: none
- ✓ **Min Turbo Power Limit**  
Options: none
- ✓ **Package TDP Limit**  
Options: none
- ✓ **Power Limit 1**  
Options: none
- ✓ **Power Limit 2**  
Options: none
- ✓ **x-core Turbo Ratio**  
Options: none
- ✓ **Energy Efficient P-state**  
Options: Enabled / Disabled
- ✓ **Package Power Limit MSR Lock**  
Options: Disabled / Enabled
- ✓ **Energy Efficient Turbo**  
Options: Enabled / Disabled

**6.3.2.1.2 Config TDP Configurations**

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Advanced

<p>Config TDP Configurations</p> <p>Configurable TDP Boot Mode [Nominal]          Configurable TDP Lock [Disabled]          CTDP BIOS control [Disabled]</p>	<p>Enable/Disable Energy Efficient P-state feature. When set to 0, will disable access to ENERGY_PERFORMANCE_BIAS MSR and CPUID Function 6 ECX[3] will read 0 indicating no support for Energy Efficient policy setting. When set to 1 will enable access to ENERGY_PERFORMANCE_BIAS MSR</p> <hr/> <p>←: Select Screen          ↑: Select Item          Enter: Select          +/-: Change Opt.          F1: General Help          F2: Previous Values          F3: Optimized Defaults          F4: Save &amp; Exit          ESC: Exit</p>
--	--

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- ✓ **Configurable TDP Boot Mode**  
Options: Nominal / Down / Deactivate
- ✓ **Configurable TDP Lock**  
Options: Enabled / Disabled
- ✓ **Configurable CTDP BIOS control**  
Options: Enabled / Disabled

### 6.3.3 Intel(R) I210 Gigabit Network Connection

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Advanced

<p>▶ NIC Configuration</p> <p>Blink LEDs 0</p> <p>UEFI Driver Intel(R) PRO/1000 7.3.20 PCI-E</p> <p>Adapter PBA 000300-000</p> <p>Device Name Intel(R) I210 Gigabit Network Connection</p> <p>Chip Type Intel i210</p> <p>PCI Device ID 1533</p> <p>PCI Address 05:00:00</p> <p>Link Status [Disconnected]</p> <p>MAC Address 00:01:05:2C:0B:3F</p> <p>Virtual MAC Address 00:00:00:00:00:00</p>		<p>Click to configure the network device port.</p> <hr/> <p>←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</p>
--	--	---

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- ✓ **NIC Configuration**  
Sub menu: see "NIC Configuration" (page 52)
- ✓ **Blink LEDs**  
Options: none
- ✓ **UEFI Driver**  
Options: none
- ✓ **Adapter PBA**  
Options: none
- ✓ **Device Name**  
Options: none
- ✓ **Chip Type**  
Options: none
- ✓ **PCI Device ID**  
Options: none
- ✓ **PCI Address**  
Options: none
- ✓ **Link Status**  
Options: none
- ✓ **MAC Address**  
Options: none
- ✓ **Virtual MAC Address**  
Options: none

6.3.3.1 NIC Configuration

Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.  
Advanced

Link Speed Wake On LAN	[Auto Neg] [Enabled]	Specifies the port speed used for the selected boot protocol.
		←: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **Link Speed**  
Options: Auto Negotiated / 10Mbps Half / 10Mbps full / 100Mbps Half / 100Mbps Full
- ✓ **Wake On LAN**  
Options: Enabled / Disabled

### 6.3.4 Intel(R) Ethernet Connection I219-LM

Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.  
Advanced

<pre> PORT CONFIGURATION MENU ▶ NIC Configuration  Blink LEDs                      0  PORT CONFIGURATION INFORMATION UEFI Driver:                    Intel(R) Gigabit 0.0.166 Adapter PBA:                    FFFFFFF-0FF Chip Type                       Intel PCH SPT PCI Device ID                   15B7 PCI Address                     00:1F:06 Link Status                     [Disconnected] MAC Address                     00:01:05:2C:0B:3E                 </pre>	<p>Click to configure the network device port.</p> <hr/> <pre> →: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit                 </pre>
---	---

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- ✓ **NIC Configuration**  
Sub menu: see "NIC Configuration" (page 52)
- ✓ **Blink LEDs**  
Options: none
- ✓ **UEFI Driver**  
Options: none
- ✓ **Adapter PBA**  
Options: none
- ✓ **Chip Type**  
Options: none
- ✓ **PCI Device ID**  
Options: none
- ✓ **PCI Address**  
Options: none
- ✓ **Link Status**  
Options: none
- ✓ **MAC Address**  
Options: none

### 6.3.5 Driver Health

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Advanced

▶ Intel(R) Gigabit 0.0.16	Healthy	Provides Health Status for the Drivers/Controllers
▶ Intel(R) PRO/1000 7.3.20 PCI-E	Healthy	
		←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **Intel(R) Gigabit 0.0.16**  
Sub menu: see "Intel(R) Gigabit 0.0.16" (page 54)
- ✓ **Intel(R) PRO/1000 7.3.20 PCI-E**  
Sub menu: see "Intel(R) PRO/1000 7.3.20" (page 56)

**6.3.5.1 Intel(R) Gigabit 0.0.16**

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Advanced

<p>Controller 899de498 Child 0                      Healthy</p>	<p>Provides Health Status for the Drivers/Controllers</p> <hr/> <p>←: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</p>
---	---

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- ✓ **Controller 899dd918 Child 0 Healthy**  
Options: none

## 6.3.5.2 Intel(R) PRO/1000 7.3.20

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Advanced

<pre>Controller 899de498 Child 0           Healthy Intel(R) I210 Gigabit Network Connection Healthy</pre>	<pre>Provides Health Status for the Drivers/Controllers  ----- ←: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre>
---	---

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- ✓ **Controller 899de498 Child 0 Healthy**  
Options: none
- ✓ **Intel(R) I210 Gigabit Network Connection**  
Options: none



### 6.3.6 Trusted Computing

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Advanced

<p>Configuration Security Device Support [Enable] NO Security Device Found</p>	<p>Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.</p> <hr/> <p>→: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</p>
--	---

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- ✓ **Security Device Support**  
Options: Enable / Disable

### 6.3.7 ACPI Settings

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Advanced

ACPI Settings		Enables or Disables BIOS ACPI Auto Configuration.
Enable ACPI Auto Configuration	[Disabled]	
Enable Hibernation	[Enabled]	
ACPI Sleep State	[S1 (CPU Stop Clock)]	
Lock Legacy Resources	[Disabled]	
		←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **Enable ACPI Auto Configuration**  
Options: Enabled / Disabled
- ✓ **Enable Hibernation**  
Options: Enabled / Disabled
- ✓ **ACPI Sleep State**  
Options: Suspend Disabled / S1 (CPU Stop Clock)
- ✓ **Lock Legacy Resources**  
Options: Enabled / Disabled

### 6.3.8 H/W Monitor

Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.  
Advanced

PC Health Status		
CPU dig.	: +60 'C	
1.00V	: +1.04 V	
VCCCORE	: +0.79 V	
5V	: +4.94 V	
12V	: +12.18V	
Memory VDD	: +1.24 V	
3.3V	: +3.38 V	
FAN 1	: N/A	
FAN 2	: N/A	
FAN 3	: N/A	
MB Temp	: +53 'C	
Memory Temp	: +65 'C	
PwrCtrlTemp	: +55 'C	
PwrCtrlVCC	: +5.00 V	
		←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **CPU dig.**  
Options: none
- ✓ **1.05V**  
Options: none
- ✓ **VCCCORE**  
Options: none
- ✓ **5V**  
Options: none
- ✓ **12V**  
Options: none
- ✓ **VBATT**  
Options: none
- ✓ **3.3V**  
Options: none
- ✓ **SIO Temp**  
Options: none
- ✓ **1.00V**  
Options: none
- ✓ **Memory VDD**  
Options: none
- ✓ **FAN 1**  
Options: none

- ✓ **FAN 2**  
Options: none
- ✓ **FAN 3**  
Options: none
- ✓ **MB Temp**  
Options: none
- ✓ **Memory Temp**  
Options: none
- ✓ **PwrCtrlTemp**  
Options: none
- ✓ **PwrCtrlVCC**  
Options: none

### 6.3.9 Serial Port Console Redirection

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Advanced

COM0 Console Redirection                      Port Is Disabled ▶ Console Redirection Settings	
COM1 Console Redirection                      Port Is Disabled ▶ Console Redirection Settings	
COM2 Console Redirection                      Port Is Disabled ▶ Console Redirection Settings	
COM3 Console Redirection                      [Disabled] ▶ Console Redirection Settings	
COM4 (Pci Bus0,Dev0,Func0) (Disabled) Console Redirection                      Port Is Disabled	
	←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **Console Redirection**  
Options: Enabled / Disabled
- ✓ **Console Redirection Settings**  
Options: none

### 6.3.10 PCI Subsystem Settings

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Advanced

PCI Bus Driver Version	A5.01.12	Value to be programmed into PCI Latency Timer Register.
PCI Devices Common Settings:		
PCI Latency Timer	[32 PCI Bus Clocks]	
PCI-X Latency Timer	[64 PCI Bus Clocks]	
VGA Palette Snoop	[Disabled]	
PERR# Generation	[Disabled]	
SERR# Generation	[Disabled]	
Above 4G Decoding	[Disabled]	
▶ PCI Hot-Plug Settings		
		←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **PCI Latency Timer**  
Options: 32, 64,...224, 248 PCI Bus Clocks
- ✓ **PCI-X Latency Timer**  
Options: 32, 64,...224, 248 PCI Bus Clocks
- ✓ **VGA Palette Snoop**  
Options: Disabled / Enabled
- ✓ **PERR# Generation**  
Options: Disabled / Enabled
- ✓ **SERR# Generation**  
Options: Disabled / Enabled
- ✓ **Above 4G Decoding**  
Options: Enabled / Disabled
- ✓ **PCI Hot-Plug Settings**  
Sub menu: see "PCI Hot-Plug Settings" (page 63)

6.3.10.1 PCI Hot-Plug Settings

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Advanced

<p>PCI Hot-Plug Settings</p> <p>BIOS Hot-Plug Support [Enabled]</p> <p>PCI Buses Padding [1]</p> <p>I/O Resources Padding [4 K]</p> <p>MMIO 32 bit Resources Padding [16 M]</p> <p>PFMMIO 32 bit Resources Padding [16 M]</p>	<p>If ENABLED allows BIOS build in Hot-Plug supported Ordering</p> <hr/> <p>←: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</p>
---	--

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

### 6.3.11 Network Stack Configuration

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Advanced

Network Stack	[Enabled]	Enable/Disable UEFI Network Stack
IPv4 PXE Support	[Disabled]	
IPv4 HTTP Support	[Disabled]	
IPv6 PXE Support	[Disabled]	
IPv6 HTTP Support	[Disabled]	
IPv6 Configuration Policy	[Automatic]	
PXE boot wait time	0	
Media detect count	1	
		→: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **Network stack**  
Options: Disabled / Enabled
- ✓ **IPv4 PXE Support**  
Options: Disabled / Enabled
- ✓ **IPv4 HTTP Support**  
Options: Disabled / Enabled
- ✓ **IPv6 PXE Support**  
Options: Disabled / Enabled
- ✓ **IPv6 HTTP Support**  
Options: Disabled / Enabled
- ✓ **IPv6 Configuration Policy**  
Options: Automatic / Manual
- ✓ **PXE boot wait time**  
Options: 0..5
- ✓ **Media detect count**  
Options: 0..50



### 6.3.12 Power Controller Options

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Advanced

Bootloader Version Firmware Version Mainboard Serial No Mainboard Prod. Date (Week.Year) Mainboard BootCount Mainboard Operation Time Voltage (Min/Max) Temperature (Min/Max)  ext. USB-Port Voltage int. USB-Port Voltage  WDT OSBoot Timeout	1.00-31 1.01-00 15559716370007 51.16 322 86041min (1434h) 4.60V / 5.20V -35'C / 99'C  [Off in S3-5] [Off in S3-5]  [Disabled]	Select Power line for external USB devices, if powered-down     ←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
--	---	---

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- ✓ **Bootloader Version**  
Options: none
- ✓ **Firmware Version**  
Options: none
- ✓ **Mainboard Serial No**  
Options: none
- ✓ **Mainboard Prod. Date (Week.Year)**  
Options: none
- ✓ **Mainboard Boot Count**  
Options: none
- ✓ **Mainboard Operation Time**  
Options: none
- ✓ **Voltage (Min/Max)**  
Options: none
- ✓ **Temperature (Min/Max)**  
Options: none
- ✓ **ext. USB-Port Voltage**  
Options: Off in S3-5 / by SVCC
- ✓ **int. USB-Port Voltage**  
Options: Off in S3-5 / by SVCC
- ✓ **WatchDogTimer Mode**  
Options: Normal Mode / Compatibility Mode

✓ **WDT OSBoot Timeout**

Options: Disabled / 45 Seconds ... 255 Seconds

### 6.3.13 Compatibility Support Module Configuration

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Advanced

Compatibility Support Module Configuration		Determines OpROM execution policy for devices other than Network, Storage, or Video
CSM Support	[Enabled]	
CSM16 Module Version	07.80	
GateA20 Active	[Upon Request]	
Option ROM Messages	[Force BIOS]	
INT19 Trap Response	[Immediate]	
Boot option filter	[UEFI and Legacy]	
Option ROM execution		
Network	[Legacy]	←: Select Screen
Storage	[Legacy]	↑↓: Select Item
Video	[Legacy]	Enter: Select
Other PCI devices	[UEFI]	+/-: Change Opt.
		F1: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		ESC: Exit

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- ✓ **CSM Support**  
Options: Disabled / Enabled
- ✓ **CSM16 Module Version**  
Options: none
- ✓ **GateA20 Active**  
Options: Upon Request / Always
- ✓ **Option ROM Messages**  
Options: Force BIOS / Keep Current
- ✓ **INT9 Trap Response**  
Options: Immediate / Postponed
- ✓ **Boot option filter**  
Options: UEFI and Legacy / Legacy only / UEFI only
- ✓ **Network**  
Options: Do not launch / UEFI only / Legacy only
- ✓ **Storage**  
Options: Do not launch / UEFI only / Legacy only
- ✓ **Video**  
Options: Do not launch / UEFI only / Legacy only
- ✓ **Other PCI devices**  
Options: Do not launch / UEFI / Legacy

### 6.3.14 NVMe Controller and Drive Information

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Advanced

<p>NVMe controller and Drive information</p> <p>No NVMe Device Found</p>	<hr/> <p>←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</p>
--	--

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✓ **NVMe controller and Drive information**

Options: none

### 6.3.15 USB Configuration

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Advanced

<pre> USB Configuration USB Module Version          19 USB Controllers:   1 XHCI USB Devices:   1 Keyboard  Legacy USB Support          [Enabled] XHCI Hand-off               [Enabled] USB Mass Storage Driver Support [Enabled] Port 60/64 Emulation       [Enabled]  USB hardware delays and time-outs: USB transfer time-out      [20 sec] Device reset time-out     [20 sec] Device power-up delay     [Manual] Device power-up delay in seconds 5         </pre>	<p>Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.</p> <hr/> <pre> -&gt;: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit         </pre>
--	--

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- ✓ **USB Module Version**  
Options: none
- ✓ **USB Devices**  
Options: none
- ✓ **USB Controllers**  
Options: none
- ✓ **Legacy USB Support**  
Options: Enabled / Disabled / Auto
- ✓ **XHCI Hand-off**  
Options: Enabled / Disabled
- ✓ **USB Mass Storage Driver Support**  
Options: Disabled / Enabled
- ✓ **Port 60/64 Emulation**  
Options: Disabled / Enabled
- ✓ **USB transfer time-out**  
Options: 5 sec / 10 sec / 20 sec
- ✓ **USB transfer time-out**  
Options: 10 sec / 20 sec / 30 sec / 40 sec
- ✓ **Device power-up delay**  
Options: Auto / Manual
- ✓ **Device power-up delay in seconds**  
Options: 1..40

### 6.3.16 SATA and RST Configuration

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Advanced

SATA And RST Configuration		▲ Enable or disable SATA Device.
SATA Controller(s)	[Enabled]	
SATA Mode Selection	[Intel RST Premium]	
SATA Test Mode	[Disabled]	
RAID Device ID	[Client]	
▶ Software Feature Mask Configuration		
Aggressive LPM Support	[Enabled]	
SATA Controller Speed	[Default]	
Serial ATA Port 0	Empty	
Software Preserve	Unknown	
Port 0	[Enabled]	
Hot Plug	[Enabled]	
Configured as eSATA	Hot Plug supported	→: Select Screen
Spin Up Device	[Disabled]	↑↓: Select Item n
SATA Device Type	[Hard Disk Drive]	Enter: Select
Topology	[Unknown]	+/-: Change Opt.
SATA Port 0 DevSlp	[Disabled]	F1: General Help
DITO Configuration	[Disabled]	F2: Previous Values
DITO Value	625	F3: Optimized Defaults
DM Value	15	F4: Save & Exit
Serial ATA Port 1	Empty	ESC: Exit
Software Preserve	Unknown	
Port 1	[Enabled]	

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- ✓ **SATA Controller(s)**  
Options: Enabled / Disabled
- ✓ **SATA Mode Selection**  
Options: IDE / AHCI / RAID
- ✓ **SATA Test Mode**  
Options: Enabled / Disabled
- ✓ **RAID Device ID**  
Options: Client / Alternate
- ✓ **Software Feature Mask Configuration**  
Sub menu: see "Software Feature Mask Configuration" (page 72)
- ✓ **Aggressive LPM Support**  
Options: Enabled / Disabled
- ✓ **SATA Controller Speed**  
Options: Default / Gen1 / Gen2 / Gen3
- ✓ **Serial ATA Port X**  
Options: none
- ✓ **Software Preserve**  
Options: none
- ✓ **Port X**  
Options: Enabled / Disabled
- ✓ **Hot Plug**  
Options: Enabled / Disabled

- ✓ **Configured as eSATA**  
Options: none
- ✓ **Spin Up Device**  
Options: Enabled / Disabled
- ✓ **SATA Device Type**  
Options: Hard Disk Drive / Solid State Drive
- ✓ **Topology**  
Options: Unknown / ISATA / Direct Connect / Flex / M2
- ✓ **SATA Port X DevSlp**  
Options: Disabled / Enabled
- ✓ **DITO Configuration**  
Options: Disabled / Enabled
- ✓ **DITO Value**  
Options: 0..1023
- ✓ **DM Value**  
Options: 0..15

### 6.3.16.1 Software Feature Mask Configuration

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Advanced

<pre> Software Feature Mask Configuration  HDD Unlock                [Enabled] LED Locate                [Enabled] RAID0                     [Enabled] RAID1                     [Enabled] RAID10                    [Enabled] RAID5                     [Enabled] Intel Rapid Recovery Technolgy [Enabled] OROM UI and BANNER        [Enabled] IRRT Only on eSATA        [Enabled] Smart Response Technology [Enabled] OROM UI Normal Delay      [2 secs] RST Force Form            [Enabled] </pre>	<pre> If enabled, indicates that the HDD password unlock in the OS is enabled.  ----- ←: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit </pre>
---	---

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- ✓ **HDD Unlock**  
Options: Enabled / Disabled
- ✓ **LED Locate**  
Options: Enabled / Disabled
- ✓ **RAID0**  
Options: Enabled / Disabled
- ✓ **RAID1**  
Options: Enabled / Disabled
- ✓ **RAID10**  
Options: Enabled / Disabled
- ✓ **RAID5**  
Options: Enabled / Disabled
- ✓ **Intel Rapid Recovery Technology**  
Options: Enabled / Disabled
- ✓ **OROM UI and BANNER**  
Options: Enabled / Disabled
- ✓ **IRRT Only on eSATA**  
Options: Enabled / Disabled
- ✓ **Smart Response Technology**  
Options: Enabled / Disabled
- ✓ **OROM UI Normal Delay**  
Options: 2 / 4 / 6 / 8 Seconds



✓ **RST Force Form**

Options: Enabled / Disabled

### 6.3.17 AMT Configuration

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Advanced

ASF Support	[Enabled]	Enable/Disable of AMT USB Provisioning.
USB Provisioning of AMT	[Disabled]	
▶ CIRA Configuration		
▶ ASF Configuration		
▶ Secure Erase Configuration		
▶ OEM Flags Settings		
▶ MEBx Resolution Settings		
		←: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **ASF Support**  
Options: Enabled / Disabled
- ✓ **AMT Provisioning of AMT**  
Options: Enabled / Disabled
- ✓ **CIRA Configuration**  
Sub menu: see "CIRA Configuration" (page 74)
- ✓ **ASF Configuration**  
Sub menu: see "ASF Configuration" (page 76)
- ✓ **Secure Erase Configuration**  
Sub menu: see "Secure Erase Configuration" (page 77)
- ✓ **OEM Flags Settings**  
Sub menu: see "OEM Flags Configuration" (page 78)
- ✓ **MEBx Resolution Settings**  
Sub menu: see "MEBx Resolution Settings" (page 79)

### 6.3.17.1 CIRA Configuration

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Advanced

<p>Activate Remote Assistance Process [Disabled] CIRA Timeout 0</p>	<p>Enable/Disable of AMT USB Provisioning.</p> <hr/> <p>←→: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</p>
---	--

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- ✓ **Activate Remote Assistance Process**  
Options: Enabled / Disabled
- ✓ **CIRA Timeout**  
Options: 0..255

### 6.3.17.2 ASF Configuration

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Advanced

PET Progress	[Enabled]	Enable/Disable of AMT USB Provisioning.
WatchDog	[Disabled]	
OS Timer	0	
BIOS Timer	0	
		←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **PET Progress**  
Options: Enabled / Disabled
- ✓ **WatchDog**  
Options: Enabled / Disabled
- ✓ **OS Timer**  
Options: 0..65535
- ✓ **BIOS Timer**  
Options: 0..65535

### 6.3.17.3 Secure Erase Configuration

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Advanced

Secure Erase Mode Force Secure Erase	[Simulated] [Disabled]	Change Secure Erase module behavior: Simulated: Performs SE flow without erasing SSD Real: Erase SSD.  <hr/> ←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
---	---------------------------	--

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- ✓ **Secure Erase mode**  
Options: Simulated / Real
- ✓ **Force Secure Erase**  
Options: Disabled / Enabled

**6.3.17.4 OEM Flags Configuration**

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Advanced

MEBx hotkey Pressed	[Simulated]	Change Secure Erase module behavior: Simulated: Performs SE flow without erasing SSD Real: Erase SSD.
MEBx Selection Screen	[Disabled]	
Hide Unconfigure ME Confirmation Prompt	[Disabled]	
MEBx OEM Debug Menu Enable	[Disabled]	
Unconfigure ME	[Disabled]	
		←: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **MEBx Selection**  
Options: Disabled / Enabled
- ✓ **MEBx Selection Screen**  
Options: Disabled / Enabled
- ✓ **Hide Unconfigure ME Confirmation Prompt**  
Options: Disabled / Enabled
- ✓ **MEBx OEM Debug Menu Enable**  
Options: Disabled / Enabled
- ✓ **Unconfigure ME**  
Options: Disabled / Enabled

**6.3.17.5 MEBx Resolution Settings**

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Advanced

Non-UI Mode Resolution	[Auto]	Change Secure Erase module behavior: Simulated: Performs SE flow without erasing SSD Real: Erase SSD.
UI Mode Resolution	[Auto]	
Graphics Mode Resolution	[Auto]	
		←→: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **Non-UI Mode Resolution**  
Options: Auto / 80x25 / 100x31
- ✓ **UI Mode Resolution**  
Options: Auto / 80x25 / 100x31
- ✓ **Graphics Mode Resolution**  
Options: Auto / 640x480 / 800x600 / 1024x768

## 6.4 Chipset

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CHIPSET

<ul style="list-style-type: none"> <li>▶ System Agent (SA) Configuration</li> <li>▶ PCH-IO Configuration</li> </ul>	<p>System Agent (SA) Parameters</p> <hr/> <p>←→: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</p>
---	---

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- ✓ **System Agent (SA) Configuration**  
Sub menu: see "System Agent (SA) Configuration" (page 81)
- ✓ **PCH-IO Configuration**  
Sub menu: see "PCH-IO Configuration" (page 86)



### 6.4.1 System Agent (SA) Configuration

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Chipset

<p>System Agent (SA) Configuration</p> <p>SA PCIe Code Version            1.7.0.0 VT-d                                Supported</p> <p>▶ Graphics Configuration</p> <p>VT-d                                [Enabled] CHAP Device (B0:D7:F0)            [Disabled] Thermal Device (B0:D4:F0)        [Disabled] GMM Device (B0:D8:F0)            [Enabled] CRID Support                        [Disabled] Above 4GB MMIO BIOS assignment [Disabled]</p>	<p>Graphics Configuration</p> <hr/> <p>←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</p>
---	--

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- ✓ **Graphics Configuration**  
Sub menu: see "Graphics Configuration" (page 82)
- ✓ **VT-d**  
Options: Disabled / Enabled
- ✓ **CHAP Device (B0:D7:F0)**  
Options: Disabled / Enabled
- ✓ **Thermal Device (B0:D4:F0)**  
Options: Disabled / Enabled
- ✓ **GMM Device (B0:D8:F0)**  
Options: Disabled / Enabled
- ✓ **CRID Support**  
Options: Disabled / Enabled
- ✓ **Above 4GB MMIO BIOS assignment**  
Options: Disabled / Enabled

### 6.4.1.1 Graphics Configuration

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Chipset

<pre> Graphics Configuration  Graphics Turbo IMON Current      31 Skip Scanning of External Gfx Card [Disabled]  Primary Display                  [Auto] Select PCIE Card                 [Auto] ▶ External Gfx Card Primary Display Configuration Internal Graphics                [Auto] GTT Size                         [8MB] Aperture Size                    [256MB] DVMT Pre-Allocated               [32M] DVMT Total Gfx Mem               [256M] Gfx Low Power Mode               [Enabled] VDD Enable                       [Enabled] HDCP Support                     [Enabled]   Algorithm                      [One-time] PM Support                       [Enabled] PAVP Enable                      [Enabled] Cdynmax Clamping Enable          [Enabled] Cd Clock Frequency               [675 Mhz] IUER Button Enable               [Disabled] ▶ LCD Control </pre>	<pre> Graphics turbo IMON current values supported (14-31)  ---: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit </pre>
---	--

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- ✓ **Graphics Turbo IMON Current**  
Options: 14...31
- ✓ **Skip scanning of external Gfx Card**  
Options: Disabled / Enabled
- ✓ **Primary Display**  
Options: Auto / IGFX / PEG / PCI
- ✓ **Select PCIE Card**  
Options: Auto / Elk Creek 4 / PEG Eval
- ✓ **External Gfx Card Primary Display Configuration**  
Sub menu: see "External Gfx Card Primary Display Configuration" (page 84)
- ✓ **Internal Graphics**  
Options: Auto / Disabled / Enabled
- ✓ **GTT Size**  
Options: 1MB / 2MB
- ✓ **Aperture Size**  
Options: 128MB / 256MB / 512MB
- ✓ **DVMT Pre-Allocated**  
Options: 32M / 64M ... 480M / 512M / 1024M
- ✓ **DVMT Total Gfx Mem**  
Options: 128M / 256M / MAX
- ✓ **Gfx Low Power Mode**  
Options: Disabled / Enabled

- ✓ **VDD Enable**  
Options: Disabled / Enabled
- ✓ **HDCP Support**  
Options: Disabled / Enabled
- ✓ **Algorithm**  
Options: One-time / Periodic
- ✓ **PM Support**  
Options: Disabled / Enabled
- ✓ **PAVP Enable**  
Options: Disabled / Enabled
- ✓ **Cdynmax Clamping Enable**  
Options: Disabled / Enabled
- ✓ **Cd Clock Frequency**  
Options: 337.5 Mhz / 450 Mhz / 540 Mhz / 675 Mhz
- ✓ **IUER Button Enable**  
Options: Enabled / Disabled
- ✓ **LCD Control**  
Sub menu: see "LCD Control" (page 85)

**6.4.1.1.1 External Gfx Card Primary Display Configuration**

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Chipset

<p>External Gfx Card Primary Display Configuration</p> <p>Primary PEG [Auto] Primary PCIE [Auto]</p>	<p>Select PEG0/PEG1/PEG2/PEG3 Graphics device should be Primary PEG.</p> <hr/> <p>←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</p>
--	---

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- ✓ **Primary PEG**  
Options: Auto / PEG11 / PEG 12
- ✓ **Primary PCIE**  
Options: Auto / PCIE1 / PCIE2 / ... / PCIE7

**6.4.1.1.2 LCD Control**

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Chipset

LCD Control		Select the Video Device which will be activated during POST. This has no effect if external graphics present. Secondary boot display selection will appear based on your selection. VGA modes will be supported only on primary display
Primary IGFX Boot Display	[VBIOS Default]	
LCD Panel Type	[VBIOS Default]	
Panel Scaling	[Auto]	
Backlight Control	[PWM Normal]	
Active LFP	[eDP Port-A]	
Panel Color Depth	[18 Bit]	
Backlight Brightness	255	
		←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **Primary IGFX Boot Display**  
Options: VBIOS Default / EFP / EFP3 / EFP2
- ✓ **Secondary IGFX Boot Display**  
Options: Disabled / EFP / EFP3 / EFP2 / EFP4
- ✓ **LCD Panel Type**  
Options: VBIOS Default / 640x480 LVDS ...1366x768 LVDS
- ✓ **Panel Scaling**  
Options: Auto / Off / Force Scaling
- ✓ **Backlight Control**  
Options: PWM Inverted / PWM Normal
- ✓ **Active LFP**  
Options: No eDP / eDP Port-A
- ✓ **Panel Color Depth**  
Options: 18 Bit / 24 Bit
- ✓ **Backlight Brightness**  
Options: 0..255

## 6.4.2 PCH-IO Configuration

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Chipset

<p>PCH-IO Configuration</p> <ul style="list-style-type: none"> <li>▶ PCI Express Configuration</li> <li>▶ USB Configuration</li> <li>▶ HD Audio Configuration</li> <li>▶ SerialIO Configuration</li> </ul> <p>PCH LAN Controller [Enabled]          DeepSx Power Policies [Disabled]          LAN Wake From DeepSx [Enabled]          Wake on LAN [Enabled]              SLP_LAN# Low on DC Power [Enabled]          Second LAN Controller [Enabled]          CLKRUN# logic [Enabled]          State After G3 [S0 State]          Compatible Revision ID [Disabled]          PCH Cross Throttling [Enabled]          Pcie Pll SSC [Auto]</p>	<p>PCI Express Configuration settings</p> <hr/> <p>←: Select Screen          ↑: Select Item          Enter: Select          +/-: Change Opt.          F1: General Help          F2: Previous Values          F3: Optimized Defaults          F4: Save &amp; Exit          ESC: Exit</p>
--	---

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- ✓ **PCI Express Configuration**  
Sub menu: see "PCI Express Configuration" (page 88)
- ✓ **USB Configuration**  
Sub menu: see "USB Configuration" (page 94)
- ✓ **HD Audio Configuration**  
Sub menu: see "HD Audio Configuration" (page 95)
- ✓ **PCH LAN Controller**  
Options: Disabled / Enabled
- ✓ **Wake on LAN**  
Options: Disabled / Enabled
- ✓ **SLP\_LAN# Low on DC Power**  
Options: Disabled / Enabled
- ✓ **Second LAN Controller**  
Options: Disabled / Enabled
- ✓ **DeepSx Policies**  
Options: Disabled / Enabled in S4-S5
- ✓ **LAN Wake From DeepSx**  
Options: Disabled / Enabled
- ✓ **Wake on LAN**  
Options: Disabled / Enabled
- ✓ **SLP\_LAN# Low on DC Power**  
Options: Disabled / Enabled

- ✓ **Second LAN Controller**  
Options: Disabled / Enabled
- ✓ **LAN2 MAC address**  
Options: none
- ✓ **CLKRUN# Logic**  
Options: Disabled / Enabled
- ✓ **State After G3**  
Options: S0 State / S5 State
- ✓ **Compatible Revision ID**  
Options: Disabled / Enabled
- ✓ **PCH Cross Throttling**  
Options: Disabled / Enabled
- ✓ **PCIe PII SSC**  
Options: Auto / 0.0% / 0.1% / 0.2% / ... / 2.0%

### 6.4.2.1 PCI Express Configuration

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Chipset

<pre> PCI Express Configuration  PCI Express Clock Gating           [Enabled] Legacy IO Low Latency              [Disabled] Peer Memory Write Enable           [Disabled] Compliance Test Mode              [Disabled] PCIe-USB Glitch W/A ▶ PCI Express Gen3 Eq Lanes  PCIE Port 5 is assigned to LAN PCIE Port 6 is assigned to LAN2 ▶ PCI Express Root Port 9 ▶ PCI Express Root Port 10 ▶ PCI Express Root Port 11 ▶ PCI Express Root Port 12 </pre>	<pre> PCI Express Clock Gating Enabled/Disable for each root port.  ---: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit </pre>
--	--

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- ✓ **PCI Express Clock Gating**  
Options: Disabled / Enabled
- ✓ **Peer Memory Write Enable**  
Options: Disabled / Enabled
- ✓ **Compliance Test Mode**  
Options: Disabled / Enabled
- ✓ **PCIe-USB Glitch W/A**  
Options: Disabled / Enabled
- ✓ **PCI Express Gen3 Eq Lanes**  
Sub menu: see "PCI Express Gen3 Eq Lanes" (page 89)
- ✓ **PCI Express Root Port X**  
Sub menu: see "PCI Express Root Port" (page 90)



6.4.2.1.1 PCI Express Gen3 Eq Lanes

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Chipset

PCIE1	Cm	0
PCIE1	Cp	63
PCIE2	Cm	6
PCIE2	Cp	2
PCIE3	Cm	6
PCIE3	Cp	2
PCIE4	Cm	6
PCIE4	Cp	2
PCIE5	Cm	6
PCIE5	Cp	2
PCIE6	Cm	6
PCIE6	Cp	2
PCIE7	Cm	6
PCIE7	Cp	2
PCIE8	Cm	6
PCIE8	Cp	2
PCIE9	Cm	6
PCIE9	Cp	2
PCIE10	Cm	6
PCIE10	Cp	2
PCIE11	Cm	6
PCIE11	Cp	2
PCIE12	Cm	6
PCIE12	Cp	2
PCIE13	Cm	6

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

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- ✓ **PCIEX Cm**  
Options: 0..63
- ✓ **PCIEX Cp**  
Options: 0..63

## 6.4.2.1.2 PCI Express Root Port

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Chipset

PCI Express Root Port 1	[Enabled]	▲ Control the PCI Express Root Port.  ▼
Topology	[Unknown]	
ASPM	[Disabled]	
L1 Substates	[Disabled]	
Gen3 Eq Phase3 Method	[Software Search]	
UPTP	5	
DPTP	7	
ACS	[Enabled]	
URR	[Disabled]	
FER	[Disabled]	
NFER	[Disabled]	
CER	[Disabled]	
CTO	[Disabled]	
SEFE	[Disabled]	
SENF	[Disabled]	
SECE	[Disabled]	
PME SCI	[Enabled]	
Hot Plug	[Disabled]	
Advanced Error Reporting	[Enabled]	
PCIe Speed	[Auto]	
Transmitter Half Swing	[Disabled]	
Detect Timeout	0	
Extra Bus Reserved	0	
Reserved Memory	10	
Reserved I/O	4	

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

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- ✓ **PCI Express Root Port x**  
Options: Disabled / Enabled
- ✓ **Topology**  
Options: Unknown / x1 / x4 / SATA Express / M2
- ✓ **ASPM Support**  
Options: Disabled / L0s / L1 / L0sL1 / Auto
- ✓ **L1 Substates**  
Options: Disabled / L1.1 / L1.2 / L1.1 & L1.2
- ✓ **Gen3 Eq Phase3 Method**  
Options: Hardware / Static Coeff. / Software Search
- ✓ **UPTP**  
Options: 0..10
- ✓ **DPTP**  
Options: 0..10
- ✓ **ACS**  
Options: Enabled / Disabled
- ✓ **URR**  
Options: Enabled / Disabled
- ✓ **FER**  
Options: Enabled / Disabled
- ✓ **NFER**  
Options: Enabled / Disabled

- 
- ✓ **CER**  
Options: Enabled / Disabled
  - ✓ **CTO**  
Options: Enabled / Disabled
  - ✓ **SEFE**  
Options: Enabled / Disabled
  - ✓ **SENF**  
Options: Enabled / Disabled
  - ✓ **SECE**  
Options: Enabled / Disabled
  - ✓ **PME SCI**  
Options: Enabled / Disabled
  - ✓ **Hot Plug**  
Options: Enabled / Disabled
  - ✓ **Advanced Error Reporting**  
Options: Enabled / Disabled
  - ✓ **PCIe Speed**  
Options: Auto / Gen1 / Gen2
  - ✓ **Transmitter Half Swing**  
Options: Disabled / Enabled
  - ✓ **Detect Timeout**  
Options: 0..65535
  - ✓ **Extra Bus Reserved**  
Options: 0...7
  - ✓ **Reserved Memory**  
Options: 1...20
  - ✓ **Prefetchable Memory**  
Options: 1...20
  - ✓ **Reserved I/O**  
Options: 4 / 8 / 12 / 16 / 20
  - ✓ **PCIe PCIE1 LTR**  
Options: Disabled / Enabled
  - ✓ **Snoop Latency Override**  
Options: Disabled / Manual / Auto
  - ✓ **Snoop Latency Value**  
Options: 0..1023
  - ✓ **Snoop Latency Multiplier**  
Options: 1 / 32 / 1024 / 32768 / 1048576 / 33554432 ns
  - ✓ **Non Snoop Latency Override**  
Options: Disabled / Manual / Auto

- 
- ✓ **Non Snoop Latency Value**  
Options: 0..1023
  
  - ✓ **Non Snoop Latency Multiplier**  
Options: 1 / 32 / 1024 / 32768 / 1048576 / 33554432 ns
  
  - ✓ **Force LTR Override**  
Options: Disabled / Enabled
  
  - ✓ **PCIE1 LTR Lock**  
Options: Disabled / Enabled
  
  - ✓ **PCIE1 CLKREQ Mapping Override**  
Options: Default / No CLKREQ / Custom Number
  
  - ✓ **CLKREQ Number**  
Options: 0..15
  
  - ✓ **Extra Options**  
Sub menu: see "Extra Options" (page 93)

### 6.4.2.1.2.1 Extra Options

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Chipset

Detect Non-Compliance Device	[Enabled]	▲	Detect Non-Compliance PCIoot Express Device. If enable, it will take more time at POST time.
Prefetchable Memory	[Unknown]		
Reserved Memory Alignment	[Disabled]		
Prefetchable Memory Alignment	[Disabled]		
			▼
			←: Select Screen
			↑: Select Item
			Enter: Select
			+/-: Change Opt.
			F1: General Help
			F2: Previous Values
			F3: Optimized Defaults
			F4: Save & Exit
			ESC: Exit

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- ✓ **Detect Non-Compliance Device**  
Options: Disabled / Enabled
- ✓ **Prefetchable Memory**  
Options: 1..20
- ✓ **Reserved memory Alignment**  
Options: 1..31
- ✓ **Prefetchable Memory Alignment**  
Options: 1..31

### 6.4.2.2 USB Configuration

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Chipset

USB Configuration		
XHCI Disable Compliance Mode	[FALSE]	Options to disable Compliance Mode. Default is FALSE to not disable Compliance Mode. Set TRUE to disable Compliance Mode.
USB Port Disable Override	[Select Per-Pin]	
USB SS Physical Connector #0	[Enabled]	
USB SS Physical Connector #1	[Enabled]	
USB SS Physical Connector #2	[Enabled]	
USB SS Physical Connector #3	[Enabled]	
USB SS Physical Connector #4	[Enabled]	
USB SS Physical Connector #0	[Enabled]	
USB HS Physical Connector #1	[Enabled]	
USB HS Physical Connector #2	[Enabled]	
USB HS Physical Connector #3	[Enabled]	
USB HS Physical Connector #4	[Enabled]	
USB HS Physical Connector #5	[Enabled]	
USB HS Physical Connector #6	[Enabled]	
USB HS Physical Connector #7	[Enabled]	
USB HS Physical Connector #8	[Enabled]	
USB HS Physical Connector #9	[Enabled]	
USB HS Physical Connector #10	[Enabled]	
USB HS Physical Connector #11	[Enabled]	
USB HS Physical Connector #12	[Enabled]	
USB HS Physical Connector #13	[Enabled]	

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

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- ✓ **XHCI Disable Compliance Mode**  
Options: FALSE / TRUE
- ✓ **xDCI Support**  
Options: Disabled / Enabled
- ✓ **USB Port Disable Override**  
Options: Disabled / Select Per-Pin
- ✓ **USB SS Physical Connector #x**  
Options: Disabled / Disabled
- ✓ **USB HS Physical Connector #x**  
Options: Disabled / Disabled
- ✓ **USB Precondition**  
Options: Disabled / Enabled

### 6.4.2.3 HD Audio Configuration

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Chipset

<pre> HD Audio Subsystem Configuration Settings HD Audio                                [Disabled] </pre>	<pre> Control Detection of the HA-Audio device. Disabled = HDA will be unconditionally disabled Enabled = HDA will be unconditionally enabled Auto = HDA will be enabled if present, disabled otherwise.  ----- ←: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit </pre>
---	---

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- ✓ **HD Audio**  
Options: Disabled / Enabled / Auto
- ✓ **HDA-Link Codec Select**  
Options: Platform Onboard / External Kit
- ✓ **iDisplay Audio Disconnect**  
Options: Disabled / Enabled
- ✓ **PME Enable**  
Options: Disabled / Enabled

### 6.4.2.4 Serial IO Configuration

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Chipset

<pre> SerialIo Configuration I2C1 Controller          [Disabled] I2C2 Controller          [Disabled] I2C3 Controller          [Disabled] SPI0 Controller          [Disabled] SPI1 Controller          [Disabled] UART0 Controller         [Enabled] UART1 Controller         [Enabled] UART2 Controller         [Enabled] GPIO Controller          [Enabled]  ▶ Serial IO UART0 Settings ▶ Serial IO UART1 Settings ▶ Serial IO UART2 Settings ▶ Serial IO GPIO Settings  UART Test Device         [Disabled] Additional Serial IO devices [Disabled] ▶ SerialIO timing parameters UCSI/UCMC device         [Disabled] </pre>	<pre> Enables/Disables SerialIo Controller The following devices depend on each other: I2C0 and I2C1,2,3 UART0 and UART1, SPI0,1 UART2 and I2C4,5  ---: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit </pre>
---	---

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- ✓ **I2C1 Controller**  
Options: Disabled / Enabled
- ✓ **I2C2 Controller**  
Options: Disabled / Enabled
- ✓ **I2C3 Controller**  
Options: Disabled / Enabled
- ✓ **SPI0 Controller**  
Options: Disabled / Enabled
- ✓ **SPI1 Controller**  
Options: Disabled / Enabled
- ✓ **UART0 Controller**  
Options: Disabled / Enabled
- ✓ **UART1 Controller**  
Options: Disabled / Enabled
- ✓ **UART2 Controller**  
Options: Disabled / Enabled
- ✓ **GPIO Controller**  
Options: Disabled / Enabled
- ✓ **Serial IO UART0 Settings**  
Sub menu: see "Serial IO UART0 Settings" (page 98)
- ✓ **Serial IO UART1 Settings**  
Sub menu: see "Serial IO UART1 Settings" (page 99)



- ✓ **Serial IO UART2 Settings**  
Sub menu: see "Serial IO UART2 Settings" (page 100)
- ✓ **Serial IO GPIO Settings**  
Sub menu: see "GPIO Configuration" (page 101)
- ✓ **UART Test Device**  
Options: Disabled / Enabled - UART0 / Enabled - UART1 / Enabled - UART2
- ✓ **Additional Serial IO devices**  
Options: Disabled / Enabled
- ✓ **Serial IO timing parameters**  
Sub menu: see "Serial IO Timing Parameters" (page 102)
- ✓ **UCSI/UCMC device**  
Options: Disabled / Enabled

### 6.4.2.4.1 Serial IO UART0 Settings

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Chipset

Serial IO UART0 Settings		Enables/Disables the Vendor Sensor
Bluetooth Device	[Broadcom BCM 43241]	
BT Interrupt Mode	[GPIO Interrupt]	
Wireless Charging Mode	[WC Disabled]	
Hardware Flow Control	[Enabled]	
		←: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **Bluetooth Device**  
Options: Disabled / Intel Snowfield Peak / Broadcom BCM 43241
- ✓ **BT Interrupt Mode**  
Options: GPIO Interrupt / APIC Interrupt
- ✓ **Wireless Charging Mode**  
Options: WC Disabled / WC Enabled
- ✓ **Hardware Flow Control**  
Options: Disabled / Enabled

**6.4.2.4.2 Serial IO UART1 Settings**

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Chipset

<pre>Serial IO UART1 Settings GNSS moved 2 menu levels up Hardware Flow Control           [Enabled]</pre>	<pre>When enabled configures additional 2 GPIO pads for use as RTS/CTS signals for UART  ----- ←→: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre>
---	---

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- ✓ **Hardware Flow Control**  
Options: Disabled / Enabled

**6.4.2.4.3 Serial IO UART2 Settings**

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Chipset

<p>Serial IO UART2 Settings</p> <p>Hardware Flow Control                    [Enabled]</p>	<p>When enabled configures additional 2 GPIO pads for use as RTS/CTS signals for UART</p> <hr/> <p>←→: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</p>
---	---

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- ✓ **Hardware Flow Control**  
Options: Disabled / Enabled

**6.4.2.4.4 GPIO Configuration**

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Chipset

<p>GPIO Configuration GPIO IRQ Route [IRQ14]</p>	<p>Route all GPIOs to one of the IRQ.</p> <hr/> <p>←: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</p>
--	---

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- ✓ **GPIO IRQ Route**  
Options: IRQ14 / IRQ15

### 6.4.2.4.5 Serial IO Timing Parameters

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Chipset

SerialIO timing parameters	[Enabled]	SerialIO timing parameters (test only)
StandardSpeed SCL High for I2C1	528	
StandardSpeed SCL Low for I2C1	640	
StandardSpeed SDA Hold for I2C1	30	
FastSpeed SCL High for I2C1	128	
FastSpeed SCL Low for I2C1	160	
FastSpeed SDA Hold for I2C1	30	
FastSpeedPlus SCL High for I2C1	48	
FastSpeedPlus SCL Low for I2C1	64	
FastSpeedPlus SDA Hold for I2C1	30	
D0->D3 idle timeout for I2C1 (screen off)	200	
D0->D3 idle timeout for I2C1 (screen on)	2000	
D0->D3 idle timeout for SPI1 (screen off)	200	
D0->D3 idle timeout for SPI1 (screen on)	2000	
D0->D3 idle timeout for UART1 (screen off)	200	
D0->D3 idle timeout for UART1 (screen on)	200	
		←: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **SerialIO timing parameters**  
Options: Disabled / Enabled
- ✓ **StandardSpeed SCL High for I2C1**  
Options: 0..65535
- ✓ **StandardSpeed SCL Low for I2C1**  
Options: 0..65535
- ✓ **StandardSpeed SDA Hold for I2C1**  
Options: 0..65535
- ✓ **FastSpeed SCL High for I2C1**  
Options: 0..65535
- ✓ **FastSpeed SCL Low for I2C1**  
Options: 0..65535
- ✓ **FastSpeed SDA Hold for I2C1**  
Options: 0..65535
- ✓ **FastSpeedPlus SCL High for I2C1**  
Options: 0..65535
- ✓ **FastSpeedPlus SCL Low for I2C1**  
Options: 0..65535
- ✓ **FastSpeedPlus SDA Hold for I2C1**  
Options: 0..65535
- ✓ **D0->D3 idle timeout for I2C1 (screen off)**  
Options: 0..10000

- ✓ **D0->D3 idle timeout for I2C1 (screen on)**  
Options: 0..10000
- ✓ **D0->D3 idle timeout for SPI1 (screen off)**  
Options: 0..10000
- ✓ **D0->D3 idle timeout for SPI1 (screen on)**  
Options: 0..10000
- ✓ **D0->D3 idle timeout for UART1 (screen off)**  
Options: 0..10000
- ✓ **D0->D3 idle timeout for UART1 (screen on)**  
Options: 0..10000

## 6.5 Security

Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.  
Security

Password Description  Minimum length                                       3 Maximum length                                       20  Administrator Password ▶ Secure Boot menu	Set Administrator Password. When set, this password has to be entered to enter setup.   <hr/> ←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
---	---

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- ✓ **Administrator Password**  
Options: Press [Enter]
- ✓ **Secure Boot menu**  
Sub menu: see "Secure Boot Menu" (page 105)



## 6.5.1 Secure Boot Menu

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Security

System Mode	Setup	Secure Boot activated when Platform Key(PK) is enrolled, System mode is User/Deployed, and CSM function is disabled.
Secure Boot	Not Active	
Vendor Key	Not Active	
Attempt Secure Boot	[Enabled]	←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Secure Boot Mode	[Standard]	
▶ Key Management		

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- ✓ **Secure Boot Support**  
Options: Disabled / Enabled
- ✓ **Secure Boot Mode**  
Options: Standard / Custom
- ✓ **Key Management**  
Sub menu: see "Key Management" (page 106)

6.5.1.1 Key Management

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Security

<p>Provision Factory Default [Disabled]</p> <ul style="list-style-type: none"> <li>▶ Install Factory Default keys</li> <li>▶ Enroll Efi Image</li> <li>▶ Save all Secure Boot variables</li> </ul> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Secure Boot variable</th> <th style="text-align: left;">Size</th> <th style="text-align: left;">Keys#</th> <th style="text-align: left;">Key Source</th> </tr> </thead> <tbody> <tr> <td>▶ Platform Key(PK)</td> <td>0</td> <td>0</td> <td>No Key</td> </tr> <tr> <td>▶ Key Exchange Keys</td> <td>0</td> <td>0</td> <td>No Key</td> </tr> <tr> <td>▶ Authorized Signatures</td> <td>0</td> <td>0</td> <td>No Key</td> </tr> <tr> <td>▶ Forbidden Signatures</td> <td>0</td> <td>0</td> <td>No Key</td> </tr> <tr> <td>▶ Authorized TimeStamps</td> <td>0</td> <td>0</td> <td>No Key</td> </tr> <tr> <td>▶ OsRecovery Signatures</td> <td>0</td> <td>0</td> <td>No Key</td> </tr> </tbody> </table>	Secure Boot variable	Size	Keys#	Key Source	▶ Platform Key(PK)	0	0	No Key	▶ Key Exchange Keys	0	0	No Key	▶ Authorized Signatures	0	0	No Key	▶ Forbidden Signatures	0	0	No Key	▶ Authorized TimeStamps	0	0	No Key	▶ OsRecovery Signatures	0	0	No Key	<p>Allow to provision factory default Secure Boot keys when System is in Setup Mode</p> <hr/> <p>←: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</p>
Secure Boot variable	Size	Keys#	Key Source																										
▶ Platform Key(PK)	0	0	No Key																										
▶ Key Exchange Keys	0	0	No Key																										
▶ Authorized Signatures	0	0	No Key																										
▶ Forbidden Signatures	0	0	No Key																										
▶ Authorized TimeStamps	0	0	No Key																										
▶ OsRecovery Signatures	0	0	No Key																										

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- ✓ **Install Factory Defaults**  
Options: Press [Enter]
- ✓ **Enroll Efi Image**  
Options: Press [Enter]
- ✓ **Save All Secure Boot Variables**  
Options: Press [Enter]
- ✓ **Platform Key(PK)**  
Options: Set New Key
- ✓ **Key Exchange Keys**  
Options: Set New Key / Append Key
- ✓ **Authorized Signatures**  
Options: Set New Key / Append Key
- ✓ **Forbidden Signatures**  
Options: Set New Key / Append Key
- ✓ **Authorized TimeStamps**  
Options: Set New Key / Append Key
- ✓ **OsRecovery Signatures**  
Options: Set New / Append

## 6.6 Boot

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BOOT

Boot Configuration Setup Prompt Timeout                    5 Bootup NumLock State                    [On] Full Screen Logo                         [Enabled] Fast Boot                                 [Enabled] SATA Support                            [All Sata Devices] VGA Support                             [EFI Driver] USB Support                             [Partial Initial] PS2 Support                            [Enabled] NetWork Stack Driver Support         [Disabled] Redirection Support                    [Disabled]  New Boot Option Policy                 [Default] StartUpDelay for UEFI shell            5 Boot mode select                        [Legacy]  FIXED BOOT ORDER Priorities Boot Option #1                         [CFast/SSD] Boot Option #2                         [Hard Disk] Boot Option #3                         [CD/DVD] Boot Option #4                         [Service Stick] Boot Option #5                         [USB Stick] Boot Option #6                         [USB Floppy] Boot Option #7                         [USB Hard Disk] Boot Option #8                         [USB CD/DVD]	▲ Number of 1/10 sec. to wait for setup activation key. 0 means no wait.  ---: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit ▼
---	--

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- ✓ **Setup Prompt Timeout**  
Options: 0...65535 [x 1/10 sec.]
- ✓ **Bootup NumLock State**  
Options: On / Off
- ✓ **Full Screen Logo**  
Options: Disabled / Enabled
- ✓ **Fast Boot**  
Options: Disabled / Enabled
- ✓ **SATA Support**  
Options: Last Boot HDD Only / All Sata Devices / HDD Only
- ✓ **VGA Support**  
Options: Auto / EFI Driver
- ✓ **USB Support**  
Options: Disabled / Full Initial / Partial Initial
- ✓ **PS2 Devices Support**  
Options: Disabled / Enabled
- ✓ **NetWork Stack Driver Support**  
Options: Disabled / Enabled
- ✓ **Redirection Support**  
Options: Disabled / Enabled
- ✓ **New Boot Option Policy**  
Options: Default / Place First / Place Last

- 
- ✓ **StartUpDelay for UEFI shell**  
Options: 0..255
  - ✓ **Boot mode select**  
Options: Legacy / UEFI / DUAL
  - ✓ **Fixed Boot Order Priorities**  
Options: Review or change the sequence of available boot devices
  - ✓ **Advanced Fixed Boot Order Parameters**  
Sub menu: see "Fixed Boot Order Priority" (page 109)

### 6.6.1 Fixed Boot Order Priority

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 BOOT

Max. CFast/SSD capacity (GB)	200	Capacity limit for boot group CFast/SSD in GB
Max. USB Stick capacity /GB)	64	
		←: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

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- ✓ **Max. CFast/SSD capacity (GB)**  
Options: 1..16384
- ✓ **Max. USB Stick capacity (GB)**  
Options: 1..16384

## 6.7 Save & Exit

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SAVE & EXIT

<p>Save Changes and Reset Discard Changes and Reset</p> <p>Restore Optimized Defaults</p> <p>Boot Override IBA CL Slot 00FE v0105</p>	<p>Reset the system after saving the changes.</p> <hr/> <p>←→: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</p>
---	---

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- ✓ **Save Changes and Reset**  
Options: Press [Enter]
- ✓ **Discard Changes and Reset**  
Options: Press [Enter]
- ✓ **Restore Defaults**  
Options: Press [Enter]
- ✓ **Save as User Defaults**  
Options: Press [Enter]
- ✓ **Restore User Defaults**  
Options: Press [Enter]
- ✓ **Boot Override**  
Options: Press [Enter]
- ✓ **IBA GE Slot 00C8 v1381**  
Options: none

## 6.8 BIOS Update

If a BIOS update needs to be done, the program "DecdFlash" as well as a bootable medium which contains the newest BIOS version is used for this. It is important, that the program is started from a DOS environment without a virtual memory manager, for example "EMM386.EXE". In case such a memory manager is loaded, the program will stop with an error message.

DecdFlash is a program which provides automatic BIOS updates on any AMI-BIOS boards. All files need to be copied from the .zip-file in another directory.

The system may not be interrupted during the flash process, otherwise the update is stopped and the BIOS is destroyed afterwards.

The program should be started as follows:

```
DecdFlsh BIOS-Filename
```

After checking the name of the BIOS file and its length the BIOS will be programmed.

The flashing takes nearly 75 seconds. The firmware will get updated automatically.



### Attention

#### **A faulty BIOS update process may cause damages on the board!**

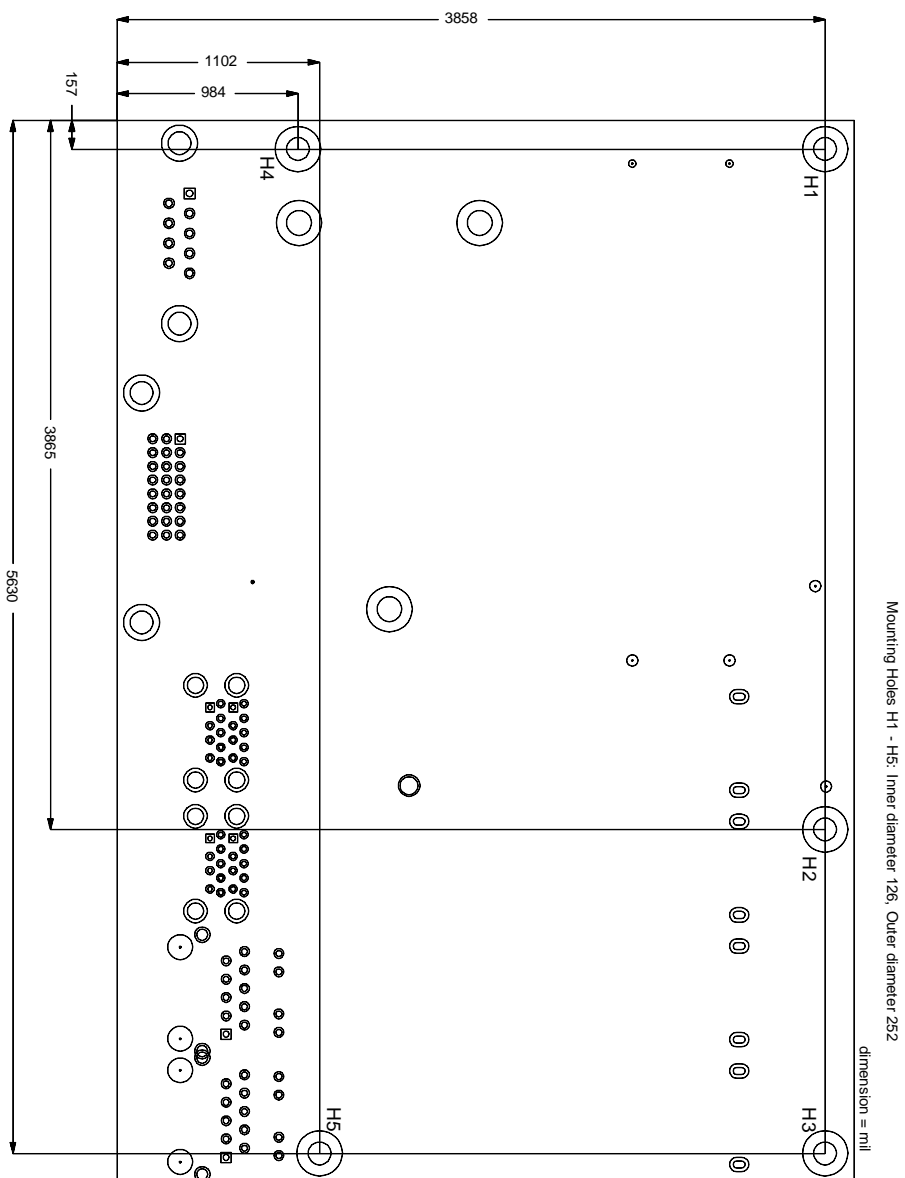
Updating the BIOS in an improper way can render the board unusable. Therefore, you should only update the BIOS if you really need the changes/corrections which come with the new BIOS version.

Before you proceed to update the BIOS you need to make absolutely sure that you have the right BIOS file which was issued for the exact board and exact board revision that you wish to update. If you try to update the BIOS using the wrong file the board will not start up again.

# 7 Mechanical Drawings

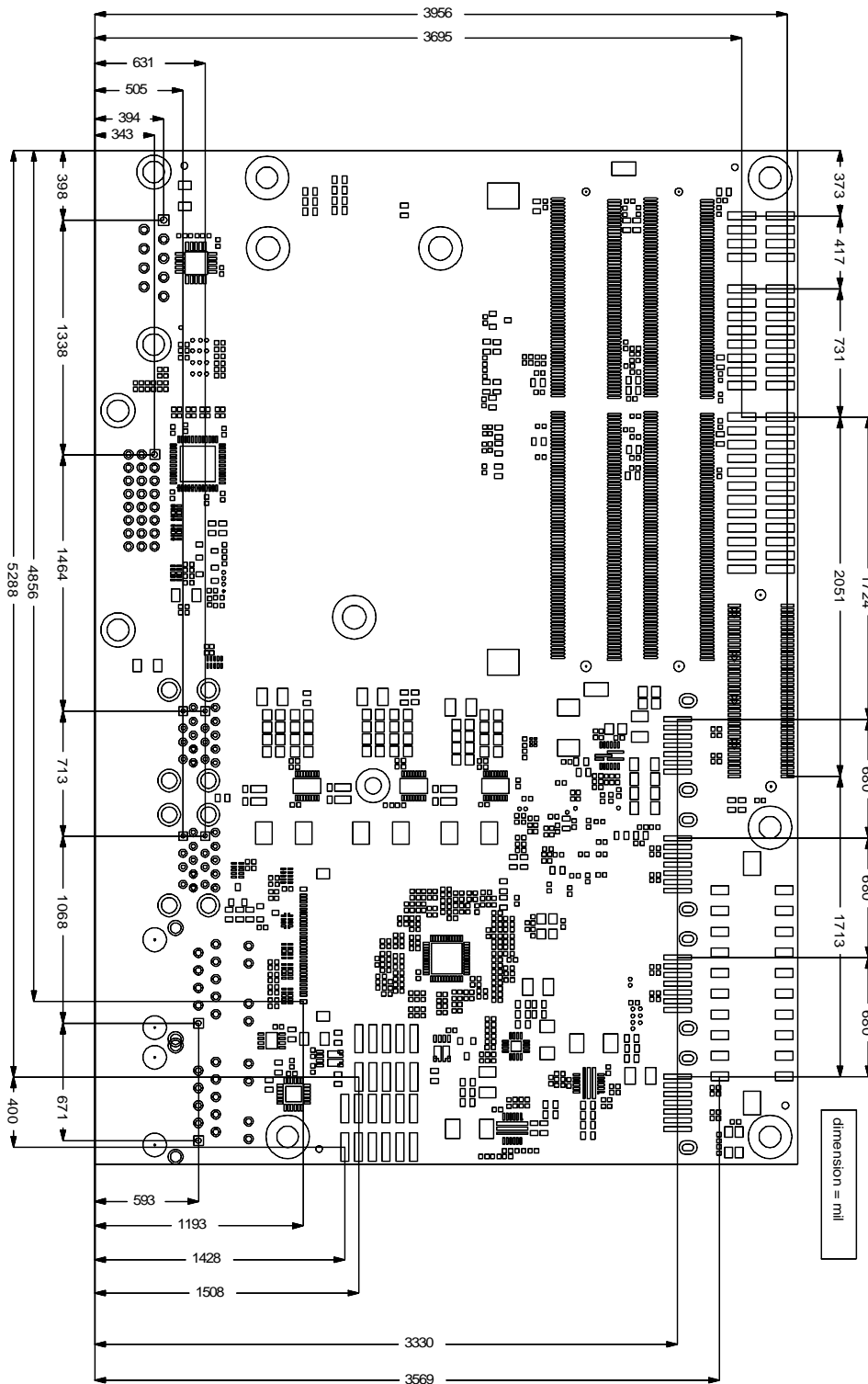
	All dimensions are in mil (1 mil = 0,0254 mm).
<b>Notice</b>	

## 7.1 PCB: Mounting Holes

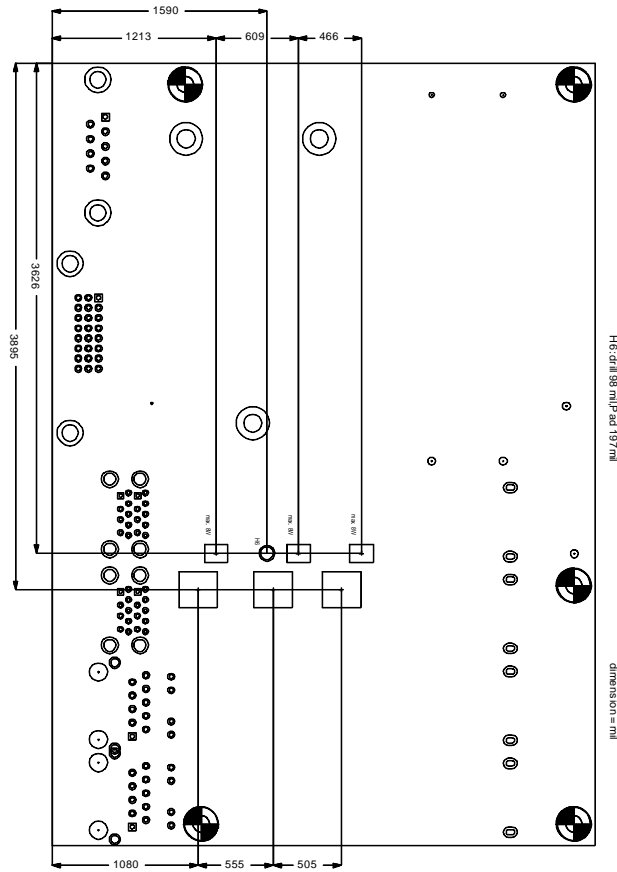




## 7.2 PCB: Pin 1 Dimensions

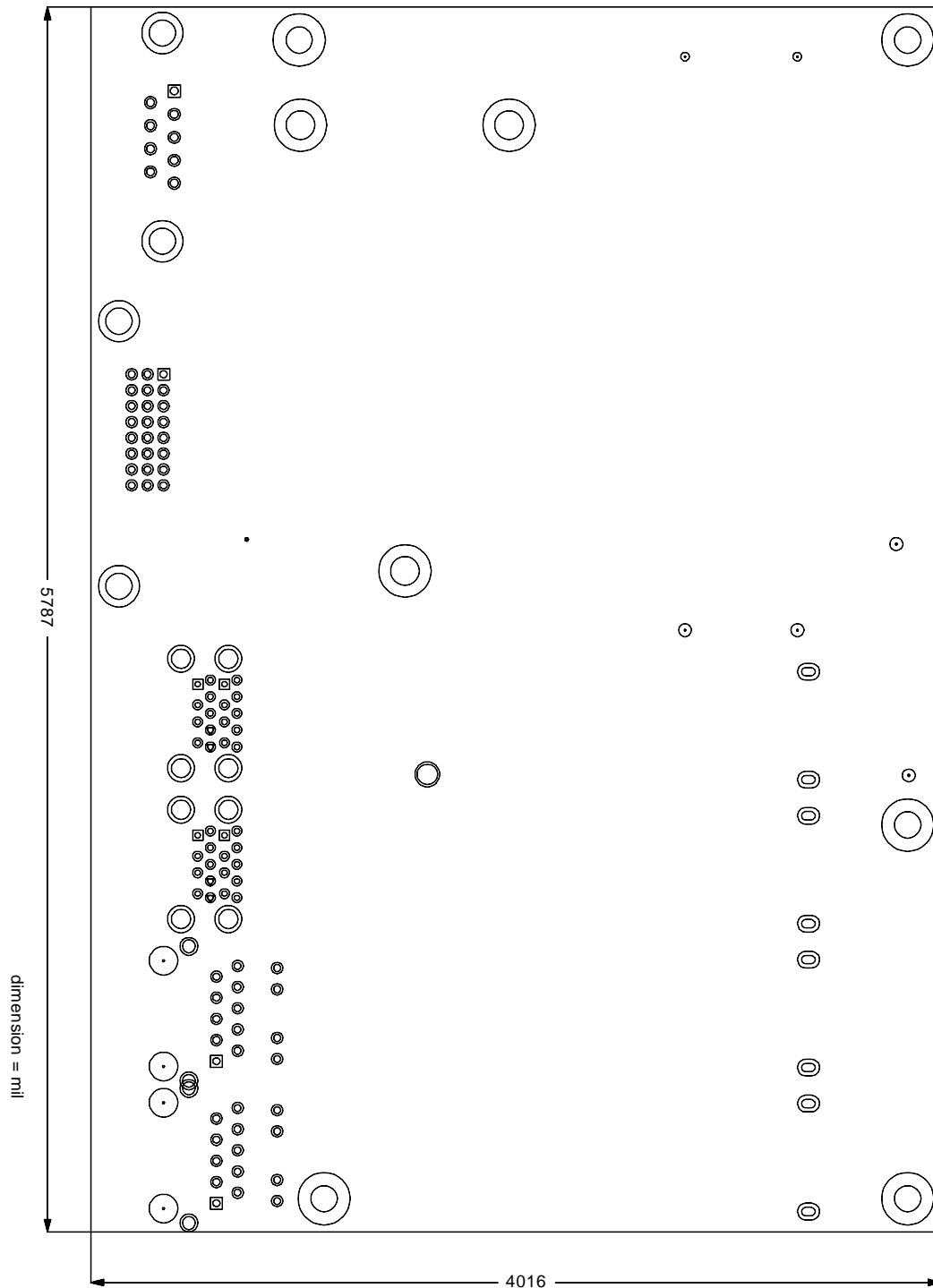


### 7.3 PCB: DIE Center



- Solid Line = Cooling Area
- ..... Dotted Line = Chip outline
- + Center Point Cooling Area
- ⊕ Electrical isolated cooling required
- ⊞ Chip-DIE cooling
- ⊗ Mounting Hole

### 7.4 PCB: Outlines



## 8 Technical Data

### 8.1 Electrical Data

#### Power Supply:

Board: 5 Volt +/- 5% (5 Volt Suspend / 12 Volt Fan)  
 RTC: >= 3 Volt

#### Electric Power Consumption:

RTC: <= 10 $\mu$ A

### 8.2 Environmental Conditions

#### Temperature Range:

Operating: 0°C to +60°C (extended temperature on request)  
 Storage: -25°C up to +85°C  
 Shipping: -25°C up to +85°C, for packaged boards

#### Temperature Changes:

Operating: 0.5°C per minute, 7.5°C per 30 minutes  
 Storage: 1.0°C per minute  
 Shipping: 1.0°C per minute, for packaged boards

#### Relative Humidity:

Operating: 5% up to 85% (non condensing)  
 Storage: 5% up to 95% (non condensing)  
 Shipping: 5% up to 100% (non condensing), for packaged boards

#### Shock:

Operating: 150m/s<sup>2</sup>, 6ms  
 Storage: 400m/s<sup>2</sup>, 6ms  
 Shipping: 400m/s<sup>2</sup>, 6ms, for packaged boards

#### Vibration:

Operating: 10 up to 58Hz, 0.075mm amplitude  
 58 up to 500Hz, 10m/s<sup>2</sup>  
 Storage: 5 up to 9Hz, 3.5mm amplitude  
 9 up to 500Hz, 10m/s<sup>2</sup>  
 Shipping: 5 up to 9Hz, 3.5mm amplitude  
 9 up to 500Hz, 10m/s<sup>2</sup>, for packaged boards



#### Notice

#### Shock and vibration

Shock and vibration figures pertain to the motherboard alone and do not include additional components such as heat sinks, memory modules, cables etc.

### 8.3 Thermal Specifications

The board is specified to operate in an environmental temperature range from 0°C to +60°C (extended temperature on request). Maximum die temperature is 100°C. To keep the processor under this threshold an appropriate cooling solution needs to be applied. This solution has to take typical and maximum power consumption into account. The maximum power consumption may be twice as high and should be used as a basis for the cooling concept. Additional controllers may also affect the cooling concept. The power consumption of such components may be comparable to the consumption of the processor.

The board design includes thermal solution mounting points that will provide the best possible thermal interface between die and solution. Since we take thermal solutions seriously we have several advanced, aggressive cooling solutions in our product portfolio. Please contact your sales representative to order or discuss your thermal solution needs.



**CAUTION**

#### **Do not exceed the maximum Die temperature!**

The end customer has the responsibility to ensure that the die temperature of the processor does not exceed 100°C. Permanent overheating may destroy the board!

In case the temperature exceeds 100°C the environmental temperature must be reduced. Under certain circumstances sufficient air circulation must be provided.

## 9 Support and Service

Beckhoff and their partners around the world offer comprehensive support and service, making available fast and competent assistance with all questions related to Beckhoff products and system solutions.

### 9.1 Beckhoff's Branch Offices and Representatives

Please contact your Beckhoff branch office or representative for local support and service on Beckhoff products.

The addresses of Beckhoff's branch offices and representatives around the world can be found on her internet pages: <http://www.beckhoff.com>

You will also find further documentation for Beckhoff components there.

### 9.2 Beckhoff Support

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

- support
- design, programming and commissioning of complex automation systems
- and extensive training programs for Beckhoff system components

hotline: +49(0)5246/963-157  
fax: +49(0)5246/963-9157  
e-mail: [support@beckhoff.com](mailto:support@beckhoff.com)

### 9.3 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

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### 9.4 Beckhoff Headquarters

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## I Annex: Post-Codes

During boot, the BIOS generates a sequence of status codes (so-called "POST codes"), which can be viewed using a special output device (POST code card). The meaning of these codes is described in the document "Aptio™ 4.x Status Codes" by American Megatrends®, which can be downloaded from their website <http://www.ami.com>. The following additional OEM POST codes are generated:

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



## II Annex: Resources

### Interrupt

The used resources depend on setup settings.

The listed interrupts and their use are given through AT compatibility.

If interrupts must exclusively be available on the ISA side, they have to be reserved through the BIOS setup. The exclusivity is not given and not possible on the PCI side.

Adress	Function
IRQ0	Timer
IRQ1	PS/2 Keyboard
IRQ2 (8)	
IRQ3	
IRQ4	
IRQ5	
IRQ6	
IRQ7	
IRQ8	RTC
IRQ9	
IRQ10	
IRQ11	
IRQ12	Microsoft PS/2
IRQ13	FPU
IRQ14	Intel® Serial GPIO Host Controller - INT345D
IRQ15	

### PCI Devices

All listed PCI devices exist on the board. Some PCI devices or functions of devices may be disabled in the BIOS setup. Once a device is disabled other devices may get PCI bus numbers different from the ones listed in the table.

AD	INTA	REQ	Bus	Dev.	Fkt.	Kontroller / Slot
	-	-	0	0	0	Host Bridge ID191F
	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	22	3	Serial (16550) IDA13D
	A	-	0	23	0	SATA (AHCI 1.0) IDA102
	A	-	0	28	0	PCI Bridge (0-1)x0 (x4) IDA110
	B	-	0	28	5	PCI Bridge (0-2)x1 (x1) IDA115
		-	0	30	0	Other DPIO Module IDA127
		-	0	31	0	ISA Bridge IDA146
		-	0	31	2	Memory Controller IDA121
		-	0	31	4	SMBus Controller IDA123
	B	-	0	31	6	Ethernet Controller ID15B7
	A	-	2	00	0	Ethernet Controller x1 (x1)

## Resources: SMB-Devices

The following table contains all reserved SM-Bus device addresses in 8-bit notation. Note that external devices must not use any of these addresses even if the component mentioned in the table is not present on the motherboard.

Address	Function
34-35	API access to PSU
36-39	Reserved
40-41	GPIO
5C-5D	NCT7491
60-6F	Reserved for DDR4
70-73	POST-Code output
88-89	BIOS-defined slave address
92-93	i210 default
A0-A7	Reserved for DDR4
B0-B3	Power-Controller (access by BIOS-API)
B8-BB	Power-Controller (access by BIOS-API)