

MODEL:
WAFER-EHL-X6000

3.5" SBC supports Intel® Atom® X6000 series on-board SoC with 8GB LPDDR4x memory on board default. with DP, HDMI and iDPM slot, 2.5 GbE, USB 3.2 Gen 2, M.2, SATA 6Gb/s, COM and RoHS

User Manual

Revision

Date	Version	Changes
January 9, 2024	1.00	Initial release

Copyright

COPYRIGHT NOTICE

The information in this document is subject to change without prior notice in order to improve reliability, design and function and does not represent a commitment on the part of the manufacturer.

In no event will the manufacturer be liable for direct, indirect, special, incidental, or consequential damages arising out of the use or inability to use the product or documentation, even if advised of the possibility of such damages.

This document contains proprietary information protected by copyright. All rights are reserved. No part of this manual may be reproduced by any mechanical, electronic, or other means in any form without prior written permission of the manufacturer.

TRADEMARKS

All registered trademarks and product names mentioned herein are used for identification purposes only and may be trademarks and/or registered trademarks of their respective owners.

Manual Conventions



WARNING

Warnings appear where overlooked details may cause damage to the equipment or result in personal injury. Warnings should be taken seriously.



CAUTION

Cautionary messages should be heeded to help reduce the chance of losing data or damaging the product.



NOTE

These messages inform the reader of essential but non-critical information. These messages should be read carefully as any directions or instructions contained therein can help avoid making mistakes.

Table of Contents

1 INTRODUCTION.....	1
1.1 INTRODUCTION.....	2
1.2 FEATURES.....	2
1.3 CONNECTORS	3
1.4 DIMENSIONS.....	4
1.5 DATA FLOW	5
1.6 TECHNICAL SPECIFICATIONS	6
2 UNPACKING	8
2.1 ANTI-STATIC PRECAUTIONS	9
2.2 UNPACKING PRECAUTIONS.....	9
2.3 PACKING LIST.....	10
3 CONNECTORS	12
3.1 PERIPHERAL INTERFACE CONNECTORS.....	13
3.1.1 WAFER-EHL-X6000 Layout.....	13
3.1.2 Peripheral Interface Connectors	14
3.1.3 External Interface Panel Connectors.....	15
3.2 INTERNAL PERIPHERAL CONNECTORS	15
3.2.1 Clear CMOS Button.....	15
3.2.2 AT/ATX Power Mode Setting	17
3.2.3 Internal Audio Connector	18
3.2.4 ATX 12V Power Connector.....	19
3.2.5 RTC Battery Connector.....	19
3.2.6 Digital Input/Output Connector.....	21
3.2.7 Fan Connector	22
3.2.8 Power LED & HDD LED Connector	23
3.2.9 Power Button Connector.....	24
3.2.10 Reset Button Connector	25
3.2.11 RS-232 Serial Port Connector.....	26
3.2.12 SATA 6Gb/s Drive Connector	27

3.2.13	<i>SATA Power Connector</i>	28
3.2.14	<i>I²C Connector</i>	29
3.2.15	<i>SMBus Connector</i>	30
3.2.16	<i>Flash SPI ROM Connector</i>	31
3.2.17	<i>Internal USB 2.0 Connectors</i>	32
3.2.18	<i>M.2 A-key Slot</i>	33
3.2.19	<i>M.2 B-key Slot</i>	35
3.2.20	<i>iDPM Slot</i>	37
3.3	EXTERNAL PERIPHERAL INTERFACE CONNECTOR PANEL	39
3.3.1	<i>External 2.5GbE RJ-45 Connectors</i>	39
3.3.2	<i>External DP Connector</i>	40
3.3.3	<i>External HDMI Connectors</i>	41
3.3.4	<i>External USB 3.2 Gen 2 Connectors</i>	42
4	INSTALLATION	43
4.1	ANTI-STATIC PRECAUTIONS	44
4.2	INSTALLATION CONSIDERATIONS	45
4.3	M.2 MODULE INSTALLATION	46
4.4	CHASSIS INSTALLATION	48
4.4.1	<i>Heat Spreader</i>	48
4.5	INTERNAL PERIPHERAL DEVICE CONNECTIONS	49
4.5.1	<i>AT Power Connection</i>	49
4.5.2	<i>7.1 Channel Audio Kit Installation</i>	51
4.5.3	<i>SATA Drive Connection</i>	52
4.6	SOFTWARE DRIVERS	54
4.6.1	<i>Available Drivers</i>	54
4.6.2	<i>Driver Download</i>	54
5	BIOS	56
5.1	INTRODUCTION	57
5.1.1	<i>Starting Setup</i>	57
5.1.2	<i>Using Setup</i>	58
5.1.2.1	<i>Keyboard Navigation</i>	58
5.1.2.2	<i>Touch Navigation</i>	59
5.1.3	<i>Getting Help</i>	60

WAFER-EHL-X6000 SBC

5.1.4	<i>Unable to Reboot after Configuration Changes</i>	60
5.1.5	<i>BIOS Menu Bar</i>	60
5.2	MAIN	61
5.3	ADVANCED	64
5.3.1	<i>CPU Configuration</i>	65
5.3.2	<i>Trusted Computing</i>	69
5.3.3	<i>RTC Wake Setting</i>	70
5.3.4	<i>IT5571 Super IO Configuration</i>	71
5.3.4.1	<i>Serial Port 1 Configuration</i>	72
5.3.4.2	<i>Serial Port 2 Configuration</i>	73
5.3.5	<i>EC H/W Monitor</i>	75
5.3.5.1	<i>Smart Fan Mode Configuration</i>	76
5.3.6	<i>Serial Port Console Redirection</i>	78
5.3.6.1	<i>Console Redirection Settings</i>	79
5.3.7	<i>NVMe Configuration</i>	82
5.4	CHIPSET	83
5.4.1	<i>System Agent (SA) Configuration</i>	84
5.4.1.1	<i>Memory Configuration</i>	85
5.4.1.2	<i>Graphics Configuration</i>	86
5.4.2	<i>PCH-IO Configuration</i>	88
5.4.2.1	<i>PCI Express Configuration</i>	90
5.4.2.1.1	<i>M2_A_KEY Slot</i>	91
5.4.2.1.2	<i>M2_B_KEY Slot</i>	92
5.4.2.2	<i>SATA Configuration</i>	94
5.4.2.3	<i>HD Audio Configuration</i>	96
5.5	SECURITY	97
5.6	BOOT	98
5.6.1	<i>Boot Configuration</i>	98
5.6.2	<i>Boot Option Priorities</i>	98
5.7	SAVE & EXIT	100
A REGULATORY COMPLIANCE		102
B PRODUCT DISPOSAL		104
C BIOS OPTIONS		106

D WATCHDOG TIMER	109
E ERROR BEEP CODE.....	112
E.1 PEI BEEP CODES.....	113
E.2 DXE BEEP CODES	113
F HAZARDOUS MATERIALS DISCLOSURE.....	114
F.1 RoHS II DIRECTIVE (2015/863/EU)	115
F.2 CHINA RoHS.....	116

List of Figures

Figure 1-1: WAFER-EHL-X6000	2
Figure 1-2: Connectors	3
Figure 1-3: Dimensions (mm)	4
Figure 1-4: Data Flow Diagram	5
Figure 3-1: Connector and Jumper Locations	13
Figure 3-2: Clear CMOS Location	16
Figure 3-3: AT/ATX Power Mode Switch Locations	17
Figure 3-4: Audio Connector Location	18
Figure 3-5: ATX 12V Power Connector Location	19
Figure 3-6: Battery Connector Location	20
Figure 3-7: Digital I/O Connector Location	21
Figure 3-8: Fan Connector Location	22
Figure 3-9: Power LED & HDD LED Connector Location	23
Figure 3-10: Power Button Connector Location	24
Figure 3-11: Reset Button Connector Location	25
Figure 3-12: RS-232/422/485 Serial Port Connector Location	26
Figure 3-13: SATA 6Gb/s Drive Connectors Location	27
Figure 3-14: SATA Power Connector Location	28
Figure 3-15: I ² C Connector Location	29
Figure 3-16: SMBus Connector Location	30
Figure 3-17: Flash SPI ROM Connector Location	31
Figure 3-18: Internal USB 2.0 Connectors Locations	32
Figure 3-19: M.2 A-key Slot Location	33
Figure 3-20: M.2 B-key Slot Location	35
Figure 3-21: iDPM Slot Location	37
Figure 3-22: External Peripheral Interface Connector	39
Figure 3-23: LAN LED Location	40
Figure 3-24: External DP Connector Pinouts	40
Figure 3-25: External HDMI Connector Location	41
Figure 3-26: External USB 3.2 Gen 2 Connectors Location	42
Figure 4-1: Inserting The M.2 Module Into The Slot At An Angle	47

Figure 4-2: Securing The M.2 Module.....47

Figure 4-3: Heat Sink Retention Screws.....48

Figure 4-4: Passive Cooling Figure 4-5: Active Cooling49

Figure 4-6: Power Cable to Motherboard Connection50

Figure 4-7: Connect Power Cable to Power Supply51

Figure 4-8: 7.1 Channel Audio Kit52

Figure 4-9: SATA Drive Cable Connection.....53

Figure 4-10: IEI Resource Download Center.....54

Figure 5-1: BIOS Starting Menu57

Figure 5-2: BIOS Options and Configured USB Ports89

List of Tables

Table 1-1: Technical Specifications	7
Table 2-1: Packing List.....	10
Table 2-2: Optional Items	11
Table 3-1: Peripheral Interface Connectors	14
Table 3-2: Rear Panel Connectors	15
Table 3-3: Clear CMOS Pinouts.....	16
Table 3-4: AT/ATX Power Mode Switch Pinouts.....	17
Table 3-5: Audio Connector Pinouts	18
Table 3-6: ATX 12V Power Connector Pinouts	19
Table 3-7: Battery Connector Pinouts	20
Table 3-8: Digital I/O Connector Pinouts.....	21
Table 3-9: Fan Connector Pinouts	22
Table 3-10: Power LED & HDD LED Connector Pinouts.....	23
Table 3-11: Power Button Connector Pinouts	24
Table 3-12: Reset Button Connector Pinout	25
Table 3-13: RS-232 Serial Port Connector Pinouts	26
Table 3-14: SATA 6Gb/s Drive Connectors Pinouts.....	27
Table 3-15: SATA Power Connector Pinouts.....	28
Table 3-16: I ² C Connector Pinouts	29
Table 3-17: SMBus Connector Pinouts	30
Table 3-18: Flash SPI ROM Connector Pinouts.....	31
Table 3-19: Internal USB 2.0 Connectors Pinouts.....	32
Table 3-20: M.2 A-Key Slot Pinouts	34
Table 3-21: M. 2 B-key Slot Pinouts	36
Table 3-22: iDPM Connector Pinouts.....	38
Table 3-23: External 2.5GbE RJ-45 Connectors Pinouts	39
Table 3-24: LAN LED Pinouts	40
Table 3-25: External DisplayPort Connector Location	40
Table 3-26: External HDMI Connector Pinouts	41
Table 3-27: External USB 3.2 Gen 2 Connectors Pinouts	42
Table 5-1: BIOS Navigation Keys	58

Table 5-2: BIOS On-screen Navigation Keys59

Chapter

1

Introduction

1.1 Introduction



Figure 1-1: WAFER-EHL-X6000

The WAFER-EHL-X6000 series are 3.5" industrial motherboards equipped with Intel® Elkhart Lake Atom™ x6000 series on-board SoC, with 8GB LPDDR4x memory on board default (up to 16GB).

The WAFER-EHL-X6000 SBC includes a HDMI1.4 (up to 4096 x 2160@30Hz) connector, a DP1.4 (up to 4096 x 2160 @60Hz) connector and one IEI iDPM slot for triple independent display.

Expansion and I/O include one M.2 A-key slot for Wi-Fi or Bluetooth expansions and one M.2 B-key slot for NVME storage or 5G module. Two USB 3.2 Gen 2 connectors on the rear panel and four USB 2.0 connectors by pin header. One SATA 6Gb/s connector. Serial device connectivity is provided by two internal RS-232/422/485 connectors. Two RJ-45 2.5 GbE connectors provide the system with smooth connections to an external LAN.

1.2 Features

Some of the WAFER-EHL-X6000 motherboard features are listed below:

- 10nm Intel® Elkhart Lake Atom™ x6000 series on-board SoC
- Two Intel® I225-IT/I226-IT 2.5GbE ports
- Two USB 3.2 Gen 2, four USB 2.0, two RS-232/422/485

WAFER-EHL-X6000 SBC

- Support M.2 A key and M.2 B key slot
- Support triple independent display via HDMI, DP and IEI iDPM

1.3 Connectors

The connectors on the WAFER-EHL-X6000 are shown in the figure below.

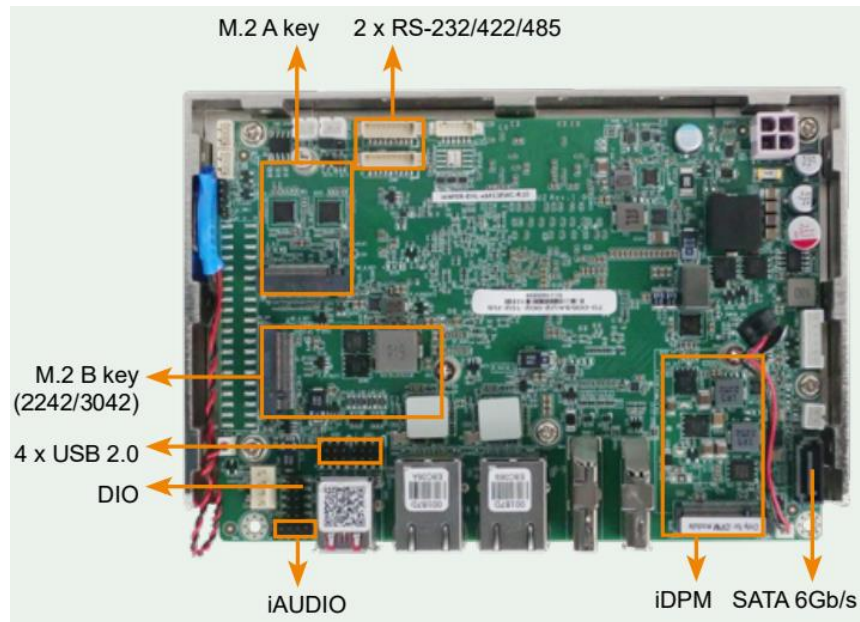


Figure 1-2: Connectors

1.4 Dimensions

The dimensions of the board are listed below:

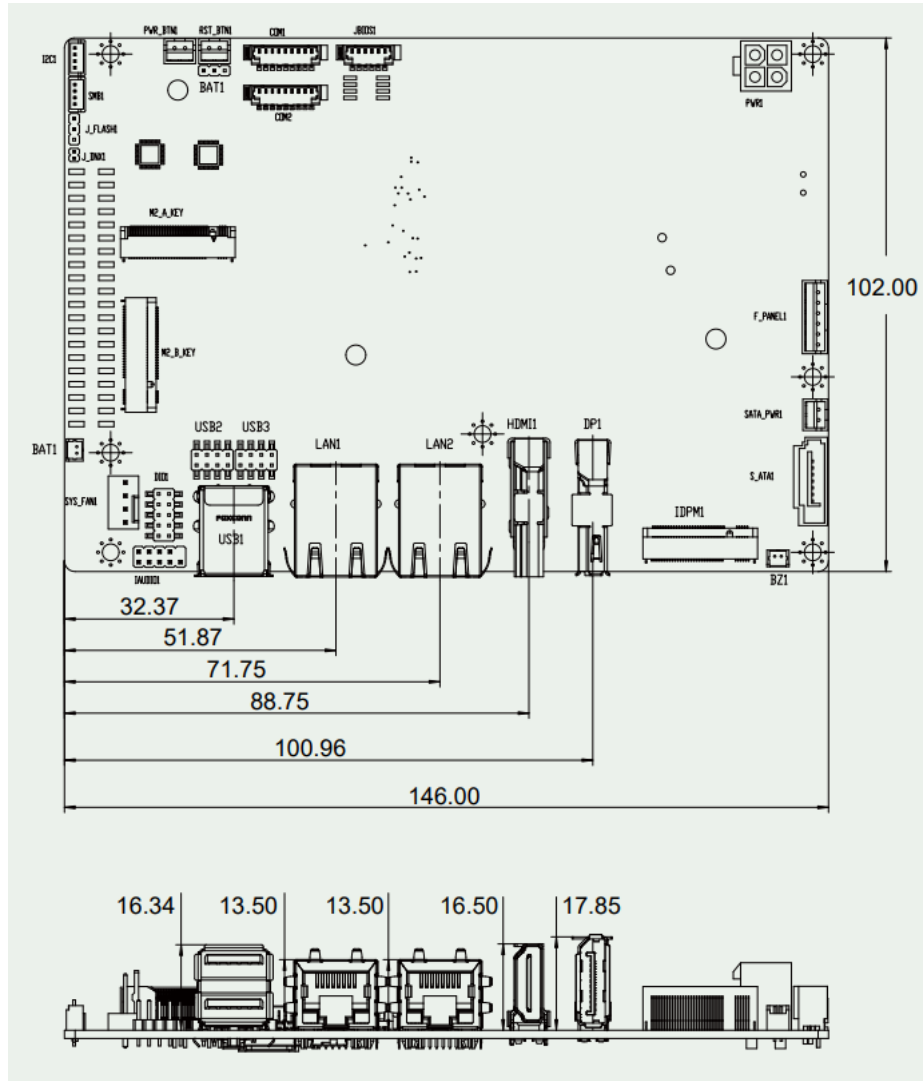


Figure 1-3: Dimensions (mm)

WAFER-EHL-X6000 SBC

1.5 Data Flow

Shows the data flow between the system chipset, the CPU and other components installed on the motherboard.

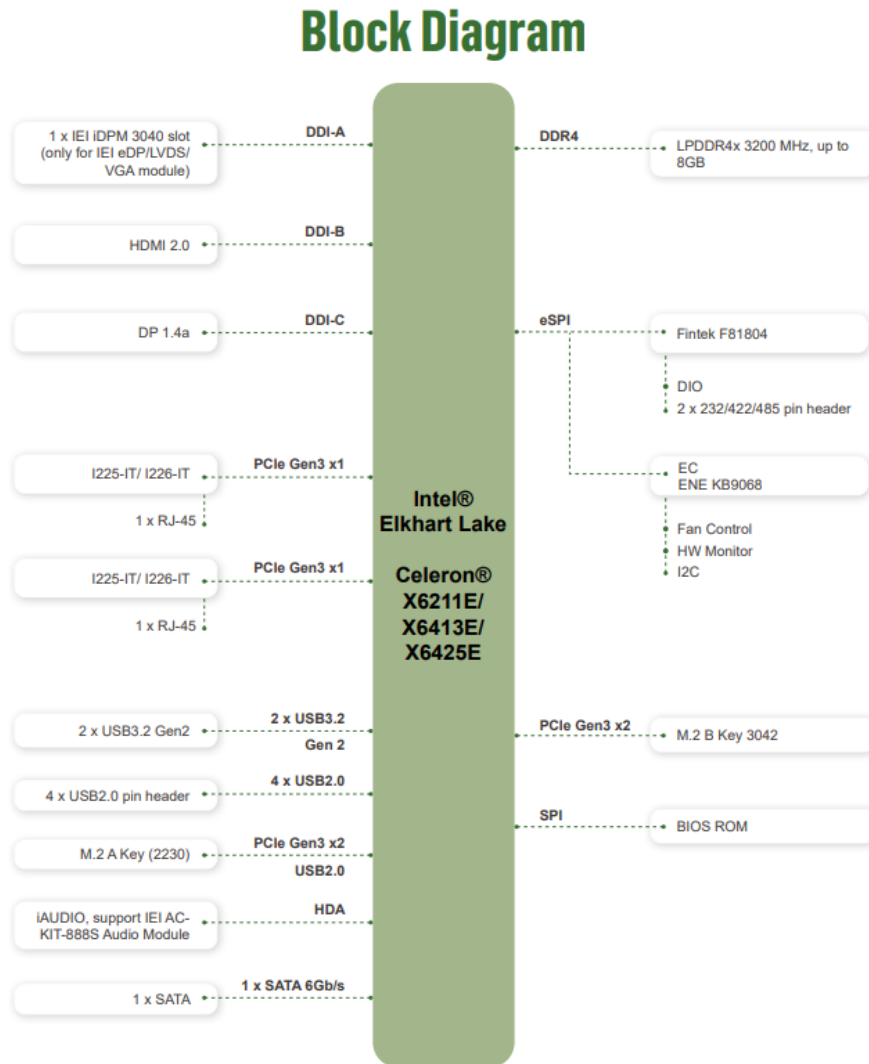


Figure 1-4: Data Flow Diagram

1.6 Technical Specifications

WAFER-EHL-X6000 technical specifications are listed below.

Specification	WAFER-EHL-X6000
SoC	Intel® Atom™ x6211E on-board SoC (up to 3.00 GHz, dual-core, 1.5M Cache, TDP=6W) Intel® Atom™ x6413E on-board SoC (up to 3.0GHz, quad-core, 1.5M Cache, TDP=9W) Intel® Atom™ x6425E on-board SoC (up to 3.0GHz, quad-core, 1.5M Cache, TDP=12W)
BIOS	AMI UEFI BIOS
Memory	On-board LPDDR4x 8GB, up to 16 GB
Graphics	Intel® UHD Graphics
Display Output	Triple Independent Displays 1 x HDMI 1.4 (up to 4096 x 2160@30Hz) 1 x DP 1.2 (up to 4096 x 2160@60Hz) 1 x IEI iDPM 3040 slot (only for IEI eDP/LVDS/VGA Module))
Ethernet	LAN1: Intel® I225-IT/ I226-IT 2.5GbE controller LAN2: Intel® I225-IT/ I226-IT 2.5GbE controller
Digital I/O	8-bit digital I/O by 10-pin (2x5) header
Embedded Controller	ITE IT5571
Watchdog Timer	Software programmable support 1~255 sec. system reset
I/O Interface	
Audio Connector	1 x iAUDIO supports IEI AC-KIT-888S Audio Kit (2x5 pin)
Ethernet	2 x RJ-45 2.5 GbE port
Serial Ports	2 x RS-232/422/485 by 9-pin (1x9 pin, P=1.25) wafer
USB Ports	2 x USB 3.2 Gen 2 on rear I/O 4 x USB 2.0 by 8-pin (2x4 pin, P=2.0) header

WAFER-EHL-X6000 SBC

Specification	WAFER-EHL-X6000
Front Panel	1 x Power LED and HDD LED connector by 6-pin (1x6) wafer 1 x Power button connector by 2-pin wafer 1 x Reset button connector by 2-pin wafer
Fan	1 x System Smart fan connector by 4-pin (1x4) wafer
SMBus/I²C	1 x I ² C connector by 4-pin (1x4) wafer 1 x SMBus connector by 4-pin (1x4) wafer
Storage	1 x SATA 6Gb/s with 5 V SATA power connectors
Expansions	1 x M.2 A Key 2230 (PCIe Gen3 x1 & USB 2.0) 1 x M.2 B Key 3042 (PCIe Gen3 x1 & USB 2.0)
Environmental and Power Specifications	
Power Supply	12 V DC input only (AT/ATX support)
Power Connector	1 x Internal power connector by 4-pin (2x2) connector
Power Consumption	12V@3.34A, 19V@2.16A, 24V@1.79A, 28V@1.52A (Intel® Atom x6211E 1.3GHz with 8GB 3200MHz DDR4 memory and EUP enabled)
Operating Temperature	-20°C ~ 85°C
Storage Temperature	-40°C ~ 85°C
Humidity	5% ~ 95%, non-condensing
Physical Specifications	
Dimensions	146mm x 102mm
Weight GW/NW	850g / 350g

Table 1-1: Technical Specifications

Chapter

2

Unpacking

WAFER-EHL-X6000 SBC

2.1 Anti-static Precautions



WARNING!

Static electricity can destroy certain electronics. Make sure to follow the ESD precautions to prevent damage to the product, and injury to the user.

Make sure to adhere to the following guidelines:

- ***Wear an anti-static wristband:*** Wearing an anti-static wristband can prevent electrostatic discharge.
- ***Self-grounding:*** Touch a grounded conductor every few minutes to discharge any excess static buildup.
- ***Use an anti-static pad:*** When configuring any circuit board, place it on an anti-static mat.
- ***Only handle the edges of the PCB:*** Don't touch the surface of the motherboard. Hold the motherboard by the edges when handling.

2.2 Unpacking Precautions

When the WAFER-EHL-X6000 is unpacked, please do the following:

- Follow the antistatic guidelines above.
- Make sure the packing box is facing upwards when opening.
- Make sure all the packing list items are present.

2.3 Packing List



NOTE:

If any of the components listed in the checklist below are missing, do not proceed with the installation. Contact the IEI reseller or vendor the WAFER-EHL-X6000 was purchased from or contact an IEI sales representative directly by sending an email to sales@ieiworld.com.

The WAFER-EHL-X6000 is shipped with the following components:






Quantity	Item and Part Number	Image
1	WAFER-EHL-X6000 single board computer	
1	Power cable	
1	SATA with power cable kit	
1	Quick Installation Guide	 <p> <small> © 2011 IEI Integration Corp. All rights reserved. (P00001) 0000 WAFER-EHL-X6000 SBC WAFER-EHL-X6000 SBC WAFER-EHL-X6000 SBC </small> </p> <p> WAFER-ADL-X6000 Quick Installation Guide Version 1.0 June 15, 2011 </p> <p> <small> Package List WAFER-ADL-X6000 SBC 1 x WAFER-EHL-X6000 SBC 1 x Power cable 1 x SATA cable 1 x CD </small> </p> 

Table 2-1: Packing List

WAFER-EHL-X6000 SBC

The following are optional components which may be separately purchased:




Item and Part Number	Image
Dual-port USB 2.0 cable, 210mm, P=2.0 (P/N : CB-USB02A-RS)	
RS-232/422/485 cable, 250 mm, p=1.25 (P/N : 32005-003500-200-RS)	
Audio kit, 7.1 Channel (P/N: AC-KIT-888S-R10)	
Cooler module, 157 mm x 100 mm x 20 mm, with pad and fan (P/N: CM-WAFER-WF-R10)	
Heatsink module, 157 mm x 100 mm x 20 mm, with pad (P/N: CM-WAFER-WOF-R10)	

Table 2-2: Optional Items

Chapter

3

Connectors

WAFER-EHL-X6000 SBC

3.1 Peripheral Interface Connectors

This chapter details all the jumpers and connectors.

3.1.1 WAFER-EHL-X6000 Layout

The figures below show all the connectors and jumpers.

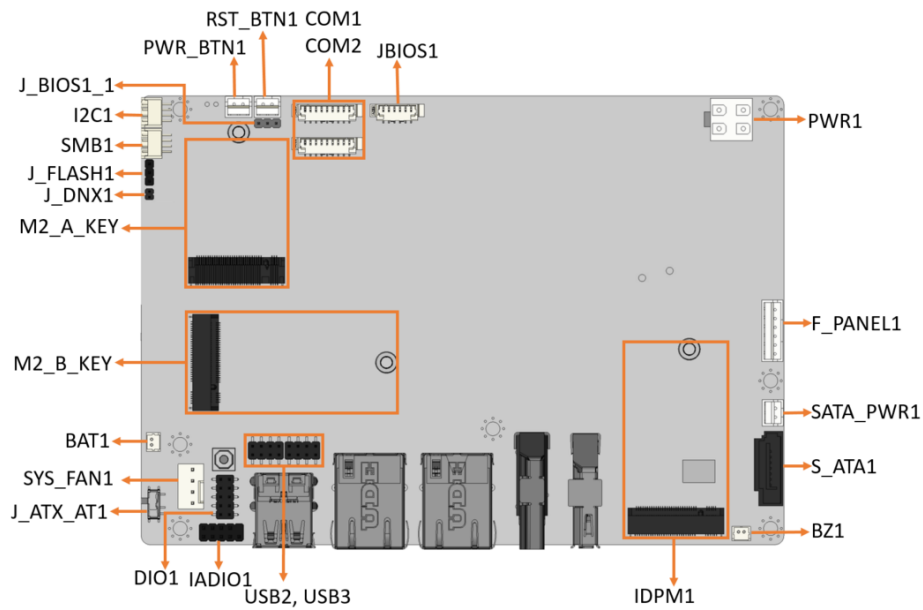


Figure 3-1: Connector and Jumper Locations

3.1.2 Peripheral Interface Connectors

The table below lists all the connectors on the board.

Connector	Type	Label
Clear CMOS button	Button	J_CMOS1
AT/ATX power mode setting	Switch	J_ATX_AT1
Audio connector for IEI AC-KIT-888S kit	10-pin header	IAUDIO1
ATX 12V power connector	4-pin Molex	PWR1
Battery connector	2-pin wafer	BAT1
Digital I/O connector	14-pin header	DIO1
Fan connector	4-pin header	SYS_FAN1
Power LED & HDD LED connector	6-pin wafer	F_PANEL1
Power button connector	2-pin wafer	PWR_BTN1
Reset button connector	2-pin wafer	RST_BTN1
RS-232/422/485 serial port connectors	9-pin wafer	COM1, COM2
SATA 6Gb/s connectors	7-pin SATA connector	S_ATA1
SATA power connector	2-pin wafer	SATA_PWR1
I2C connector	4-pin wafer	I2C1
SMBus connector	4-pin wafer	SMB1
Flash SPI ROM connector	6-pin wafer	JBIOS1
Internal USB 2.0 connector	8-pin header	USB_CN2
M.2 A-key slot	M.2 A-key slot	M2_A_KEY
M.2 B-key slot	M.2 B-key slot	M2_B_KEY
IEI iDPM slot	iDPM slot	IDPM1

Table 3-1: Peripheral Interface Connectors

WAFER-EHL-X6000 SBC**3.1.3 External Interface Panel Connectors**

The table below lists the connectors on the external I/O panel.

Connector	Type	Label
External 2.5GbE RJ-45 connectors	RJ45	LAN1, LAN2
External USB 3.2 Gen 2x1 Type-A connector	USB 3.2 Gen 2 Type-A	USB1
External DisplayPort connector	DP	DP1
External dual HDMI connector	HDMI	HDMI1

Table 3-2: Rear Panel Connectors

3.2 Internal Peripheral Connectors

The section describes all of the connectors on the WAFER-EHL-X6000.

3.2.1 Clear CMOS Button

CN Label:	J_CMOS1
CN Type:	Button
CN Location:	See Figure 3-2
CN Pinouts:	See Table 3-3

To clear the CMOS Setup (for example if you have forgotten the password, you should clear the CMOS and then reset the password), you should disconnect the RTC battery and press the button for about 3 seconds. This will set back to normal operation mode.

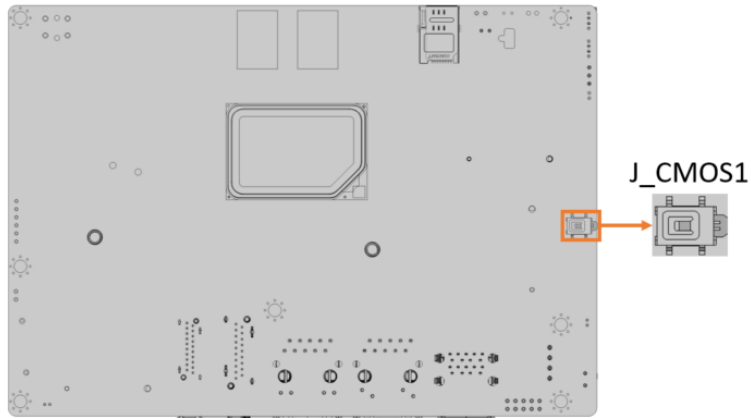


Figure 3-2: Clear CMOS Location

PIN NO.	DESCRIPTION
NC (default)	Keep CMOS Setup (Normal Operation)
Press button	Clear CMOS Setup

Table 3-3: Clear CMOS Pinouts

WAFER-EHL-X6000 SBC

3.2.2 AT/ATX Power Mode Setting

- CN Label:** J_ATX_AT1
- CN Type:** Switch
- CN Location:** See **Figure 3-3**
- CN Pinouts:** See **Table 3-4**

The AT/ATX power mode selection is made through the AT/ATX power mode switch which is shown in Figure3-3.

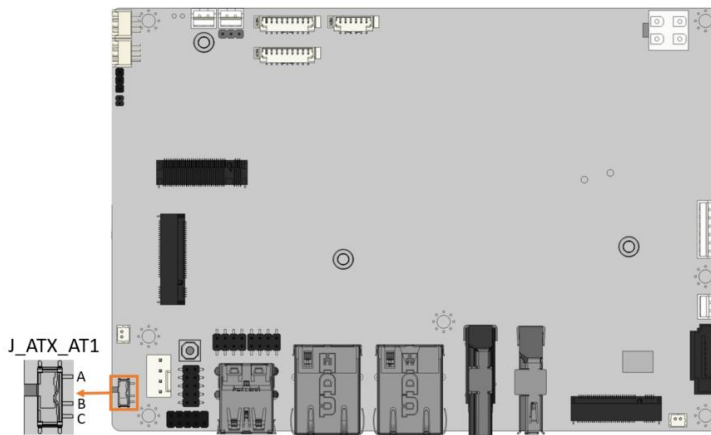


Figure 3-3: AT/ATX Power Mode Switch Locations

PIN NO.	DESCRIPTION
Short A - B	ATX Power Mode (default)
Short B - C	AT Power Mode

Table 3-4: AT/ATX Power Mode Switch Pinouts

3.2.3 Internal Audio Connector

- CN Label:** IAUDIO1
- CN Type:** 10-pin header, p=2.00 mm
- CN Location:** See **Figure 3-4**
- CN Pinouts:** See **Table 3-5**

The audio connector is connected to external audio devices (AC-KIT-888S-R10) including speakers and microphones for the input and output of audio signals to and from the system.

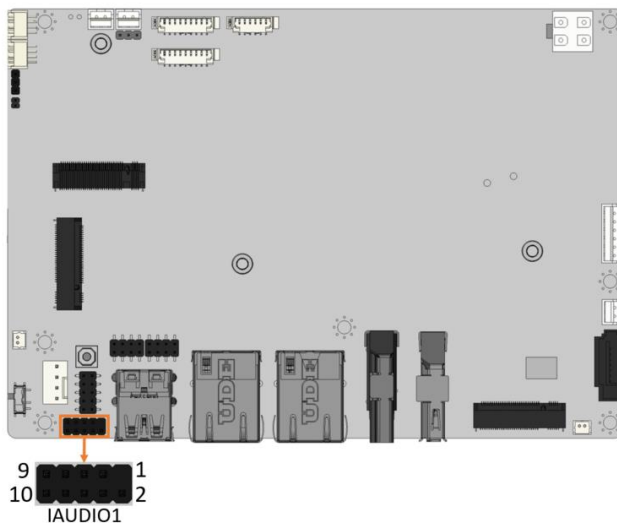


Figure 3-4: Audio Connector Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	HDA_SYNC	2	HDA_CLK
3	HDA_SDOUT	4	HDA_SPKR
5	HDA_SDIN	6	HDA_RST#
7	+5V	8	GND
9	+12V	10	GND

Table 3-5: Audio Connector Pinouts

WAFER-EHL-X6000 SBC

3.2.4 ATX 12V Power Connector

- CN Label:** PWR1
- CN Type:** 4-pin Molex, p=4.2 mm
- CN Location:** See **Figure 3-5**
- CN Pinouts:** See **Table 3-6**

The connector supports the +12V power supply.

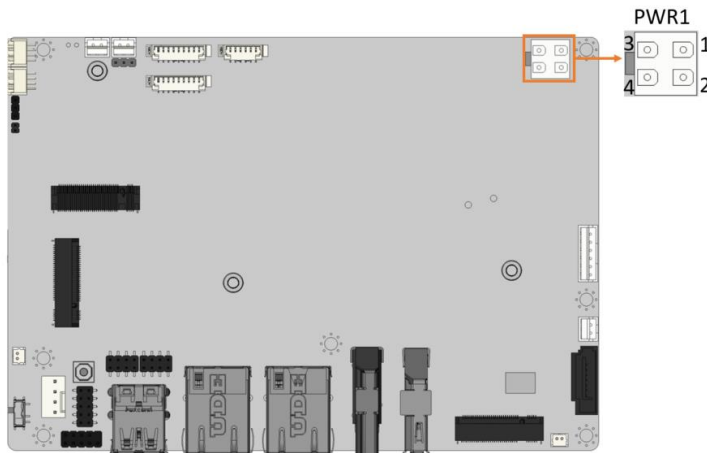


Figure 3-5: ATX 12V Power Connector Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	2	GND
3	+12V	4	+12V

Table 3-6: ATX 12V Power Connector Pinouts

3.2.5 RTC Battery Connector



CAUTION:

Risk of explosion if battery is replaced by an incorrect type. Only certified engineers should replace the on-board battery.

Dispose of used batteries according to instructions and local regulations.



NOTE:

It is recommended to attach the RTC battery onto the system chassis in which the WAFER-EHL-X6000 is installed.

- CN Label:** **BAT1**
- CN Type:** 2-pin wafer, p=1.25 mm
- CN Location:** See **Figure 3-6**
- CN Pinouts:** See **Table 3-7**

The battery connector is connected to the system battery. The battery provides power to the system clock to retain the time when power is turned off.

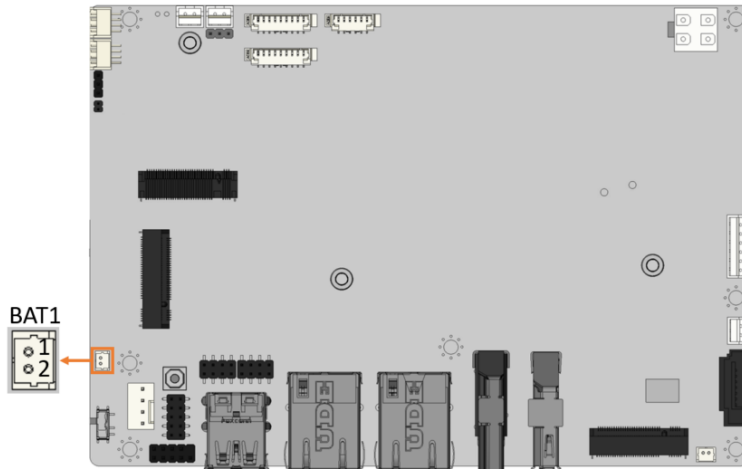


Figure 3-6: Battery Connector Location

Pin	Description
1	VBATT
2	GND

Table 3-7: Battery Connector Pinouts

WAFER-EHL-X6000 SBC

3.2.6 Digital Input/Output Connector

- CN Label:** DIO1
- CN Type:** 10-pin wafer, p=2.0 mm
- CN Location:** See **Figure 3-7**
- CN Pinouts:** See **Table 3-8**

The 8-bit digital I/O connector provides programmable input and output for external devices.

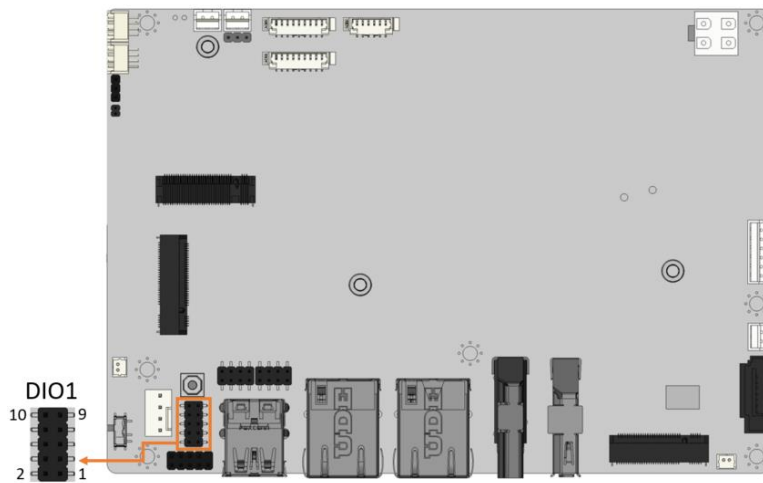


Figure 3-7: Digital I/O Connector Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	2	VCC
3	DOUT3	4	DOUT2
5	DOUT1	6	DOUT0
7	DIN3	8	DIN2
9	DIN1	10	DIN0

Table 3-8: Digital I/O Connector Pinouts

3.2.7 Fan Connector

- CN Label:** CPU_FAN1
- CN Type:** 4-pin wafer, p=2.54 mm
- CN Location:** See **Figure 3-8**
- CN Pinouts:** See **Table 3-9**

The fan connector attaches to a smart cooling fan.

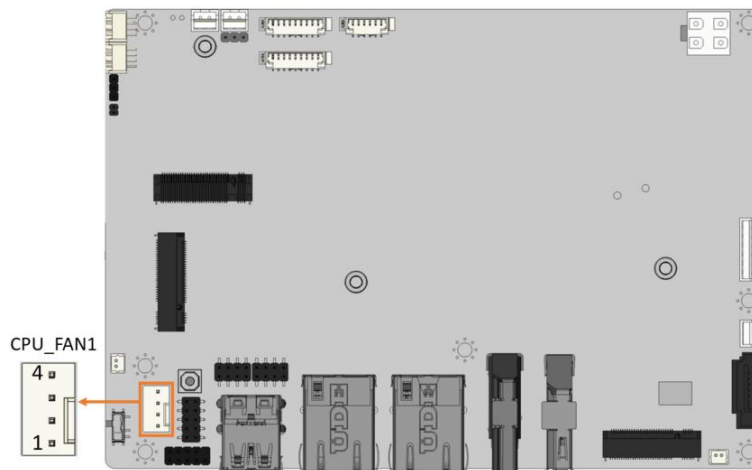


Figure 3-8: Fan Connector Location

Pin	Description	Pin	Description
1	GND	2	+12V
3	FANIO	4	PWM

Table 3-9: Fan Connector Pinouts

WAFER-EHL-X6000 SBC

3.2.8 Power LED & HDD LED Connector

- CN Label:** F_PANEL1
- CN Type:** 6-pin wafer, p=2.00 mm
- CN Location:** See **Figure 3-9**
- CN Pinouts:** See **Table 3-10**

The front panel connector connects to the power LED indicator and HDD LED indicator on the system front panel.

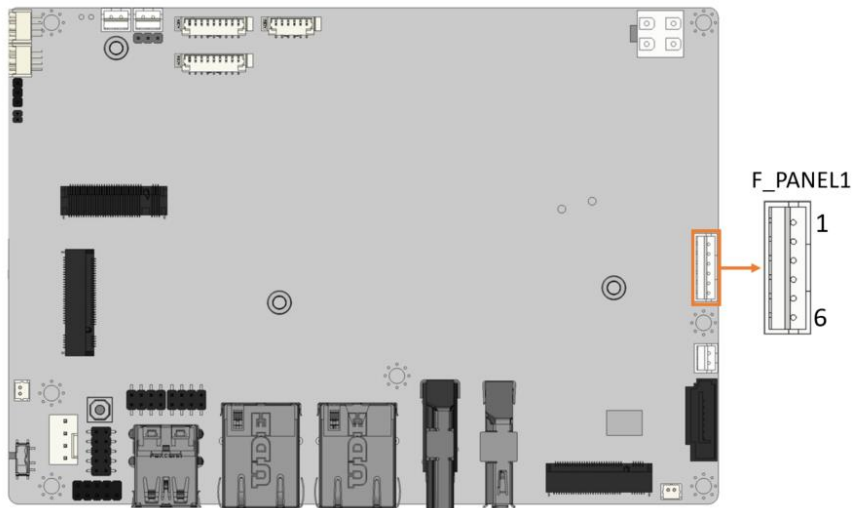


Figure 3-9: Power LED & HDD LED Connector Location

Pin	Description	Pin	Description
1	+5V	2	GND
3	PWR_LED+	4	PWR_LED-
5	HDD_LED+	6	HDD_LED-

Table 3-10: Power LED & HDD LED Connector Pinouts

3.2.9 Power Button Connector

- CN Label:** PWR_BTN1
- CN Type:** 2-pin wafer, p=2.00 mm
- CN Location:** See **Figure 3-10**
- CN Pinouts:** See **Table 3-11**

The power button connector is connected to a power switch on the system chassis to enable users to turn the system on and off.

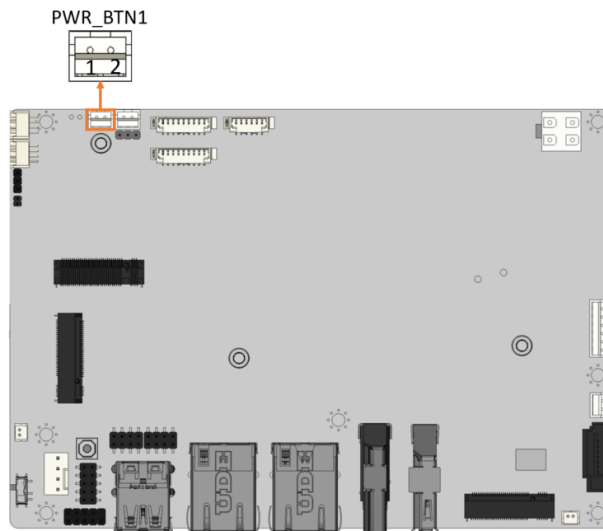


Figure 3-10: Power Button Connector Location

Pin	Description
1	PWR_BTN+
2	PWR_BTN-

Table 3-11: Power Button Connector Pinouts

WAFER-EHL-X6000 SBC

3.2.10 Reset Button Connector

- CN Label:** RST_BTN1
- CN Type:** 2-pin wafer, p=2.00 mm
- CN Location:** See **Figure 3-11**
- CN Pinouts:** See **Table 3-12**

The reset button connector is connected to a reset switch on the system chassis to enable users to reboot the system when the system is turned on.

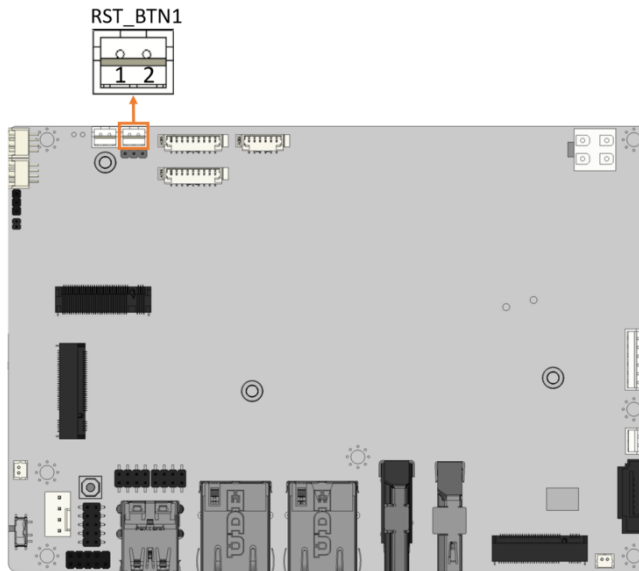


Figure 3-11: Reset Button Connector Location

Pin	Description
1	RESET+
2	RESET-

Table 3-12: Reset Button Connector Pinout

3.2.11 RS-232 Serial Port Connector

- CN Label:** COM1, COM2
- CN Type:** 9-pin wafer, p=1.25 mm
- CN Location:** See Figure 3-12
- CN Pinouts:** See Table 3-13

The serial connector provides RS-232/422/485 connection.

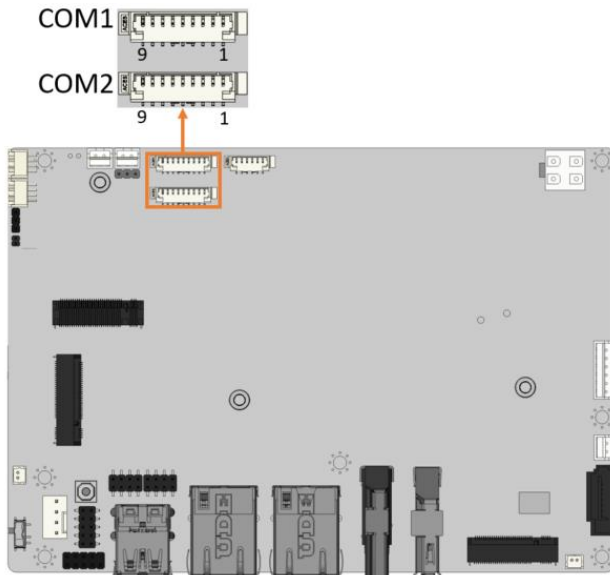


Figure 3-12: RS-232/422/485 Serial Port Connector Location

PIN NO.	RS-232	RS-422	RS-485
1	DCD	TXD422-	TXD485-
2	RXD	TXD422+	TXD485+
3	TXD	RXD422+	
4	DTR	RXD422-	
5	GND		
6	DSR		
7	RTS		
8	CTS		
9	RI		

Table 3-13: RS-232 Serial Port Connector Pinouts

WAFER-EHL-X6000 SBC

3.2.12 SATA 6Gb/s Drive Connector

- CN Label:** S_ATA1
- CN Type:** 7-pin SATA connector
- CN Location:** See **Figure 3-13**
- CN Pinouts:** See **Table 3-14**

The SATA 6Gb/s drive connector is connected to a SATA 6Gb/s drive. The SATA 6Gb/s drive transfers data at speeds as high as 6Gb/s.

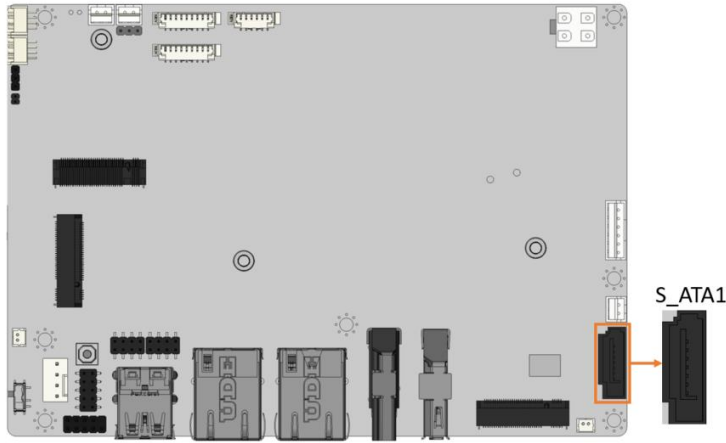


Figure 3-13: SATA 6Gb/s Drive Connectors Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	5	SATA_RX-
2	SATA_TX+	6	SATA RX+
3	SATA_TX-	7	GND
4	GND		

Table 3-14: SATA 6Gb/s Drive Connectors Pinouts

3.2.13 SATA Power Connector

- CN Label:** SATA_PWR1
- CN Type:** 2-pin wafer, p=2.00 mm
- CN Location:** See **Figure 3-14**
- CN Pinouts:** See **Table 3-15**

The SATA power connector provides +5 V power output to the SATA connector.

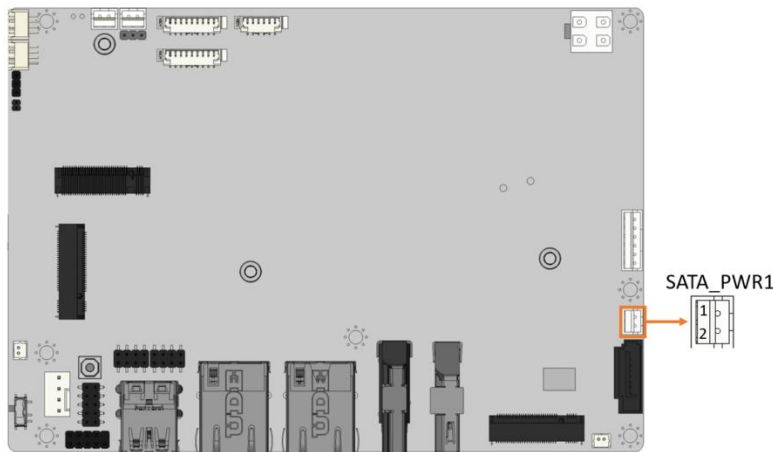


Figure 3-14: SATA Power Connector Location

Pin	Description
1	+5V
2	GND

Table 3-15: SATA Power Connector Pinouts

WAFER-EHL-X6000 SBC

3.2.14 I²C Connector

- CN Label:** I2C1
- CN Type:** 4-pin wafer, p=1.25 mm
- CN Location:** See **Figure 3-15**
- CN Pinouts:** See **Table 3-16**

The SMBus (System Management Bus) connector provides low-speed system management communications.

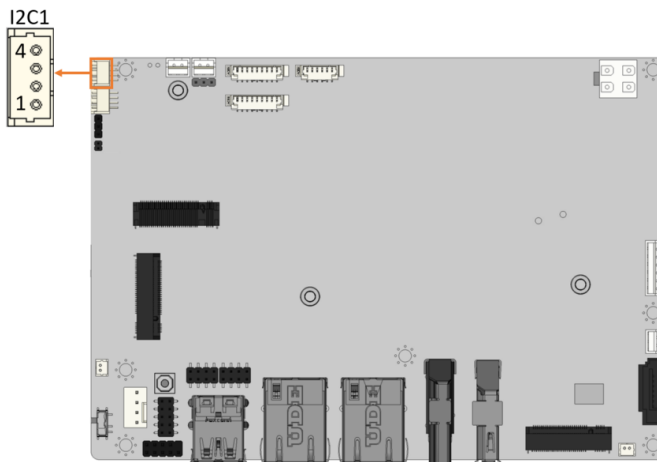


Figure 3-15: I²C Connector Location

Pin	Description
1	GND
2	I2C_DATA
3	I2C_CLK
4	+5V

Table 3-16: I²C Connector Pinouts

3.2.15 SMBus Connector

- CN Label:** SMB1
- CN Type:** 4-pin wafer, p=1.25 mm
- CN Location:** See **Figure 3-16**
- CN Pinouts:** See **Table 3-17**

The SMBus is a two-wire bus used for communication with low bandwidth devices on a motherboard such as power related chips and temperature sensors.

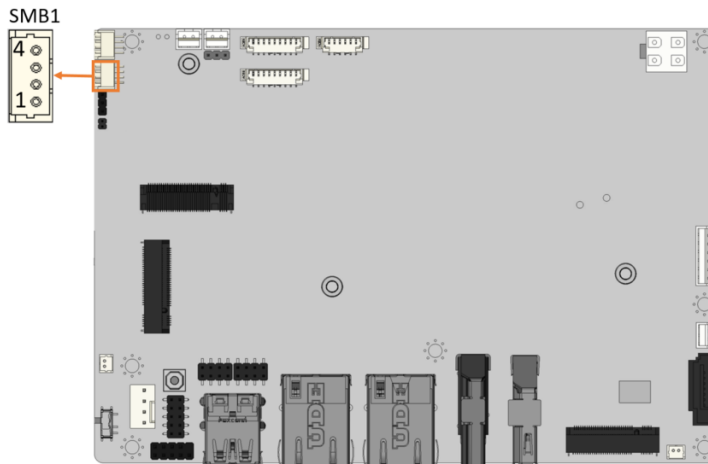


Figure 3-16: SMBus Connector Location

Pin	Description
1	GND
2	SMB_DATA
3	SMB_CLK
4	+5V

Table 3-17: SMBus Connector Pinouts

WAFER-EHL-X6000 SBC

3.2.16 Flash SPI ROM Connector

- CN Label:** JBIOS1
- CN Type:** 6-pin wafer, p=1.25 mm
- CN Location:** See **Figure 3-17**
- CN Pinouts:** See **Table 3-18**

The 6-pin Flash SPI ROM connector is used to flash the BIOS.

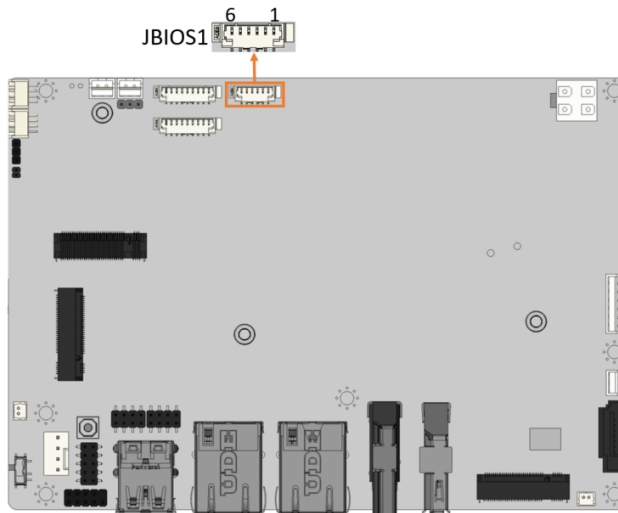


Figure 3-17: Flash SPI ROM Connector Location

Pin	Description
1	+3.3V
2	SPI_CS#
3	SPI SO
4	SPI CLK
5	SPI SI
6	GND

Table 3-18: Flash SPI ROM Connector Pinouts

3.2.17 Internal USB 2.0 Connectors

- CN Label:** USB2, USB3
- CN Type:** 8-pin header, p=2.00 mm
- CN Location:** See **Figure 3-18**
- CN Pinouts:** See **Table 3-19**

Each USB connector provides two USB 2.0 ports by dual-port USB cable.

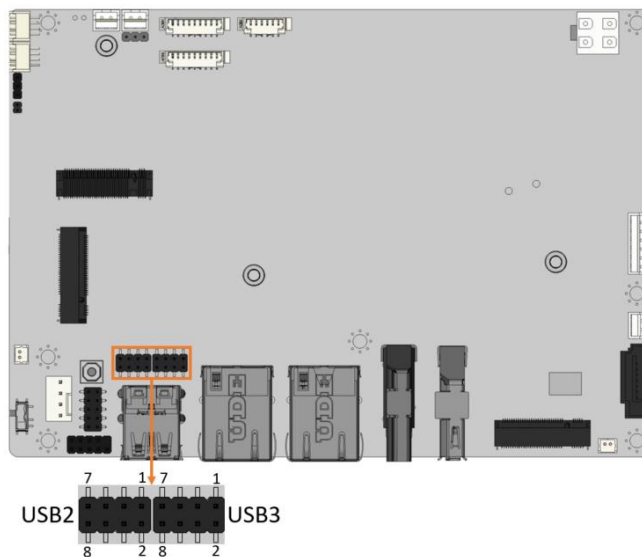


Figure 3-18: Internal USB 2.0 Connectors Locations

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	VCC	2	GND
3	USB DATA-	4	USB DATA+
5	USB DATA+	6	USB DATA-
7	GND	8	VCC

Table 3-19: Internal USB 2.0 Connectors Pinouts

WAFER-EHL-X6000 SBC

3.2.18 M.2 A-key Slot

- CN Label:** M2_A_KEY
- CN Type:** M.2 A-key slot
- CN Location:** See **Figure 3-19**
- CN Pinouts:** See **Table 3-20**

The M.2 slot is keyed in the A position and accepts 2230 size of M.2 modules. The M.2 slot supports PCIe Gen3 x1 and USB 2.0 signals.

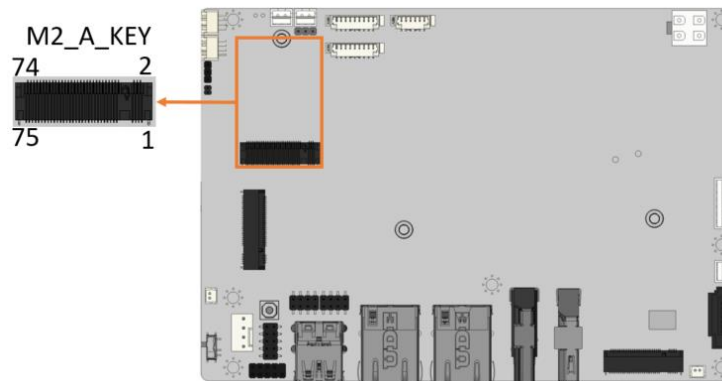


Figure 3-19: M.2 A-key Slot Location

Pin	Description	Pin	Description
1	GND	2	+V3.3A
3	USB+	4	+V3.3A
5	USB-	6	NC
7	GND	8	Module Key
9	Module Key	10	Module Key
11	Module Key	12	Module Key
13	Module Key	14	Module Key
15	Module Key	16	NC
17	NC	18	GND
19	NC	20	NC
21	NC	22	NC
23	GND	24	GND
25	NC	26	NC

Pin	Description	Pin	Description
27	NC	28	NC
29	GND	30	GND
31	NC	32	NC
33	GND	34	NC
35	PCIE_TX6+	36	GND
37	PCIE_TX6-	38	NC
39	GND	40	NC
41	PCIE_RX6+	42	NC
43	PCIE_RX6-	44	NC
45	GND	46	NC
47	CLK_M2_A+	48	NC
49	CLK_M2_A-	50	BTWIFI_SUS_CLK
51	GND	52	WLAN_PERST#
53	NC	54	+V3.3A_WLAN
55	+V3.3A_WLAN	56	+V3.3A_WLAN
57	GND	58	NC
59	NC	60	NC
61	NC	62	NC
63	GND	64	NC
65	NC	66	NC
67	NC	68	NC
69	GND	70	PEWAKE#
71	NC	72	+V3.3A
73	NC	74	+V3.3A
75	GND		

Table 3-20: M.2 A-Key Slot Pinouts

WAFER-EHL-X6000 SBC

3.2.19 M.2 B-key Slot

- CN Label:** M2_B_KEY
- CN Type:** M.2 B-key slot
- CN Location:** See **Figure 3-20**
- CN Pinouts:** See **Table 3-21**

The M.2 B key 2242/3042 slot with PCIe Gen3 x2 and USB2.0 signal supports NVMe storage

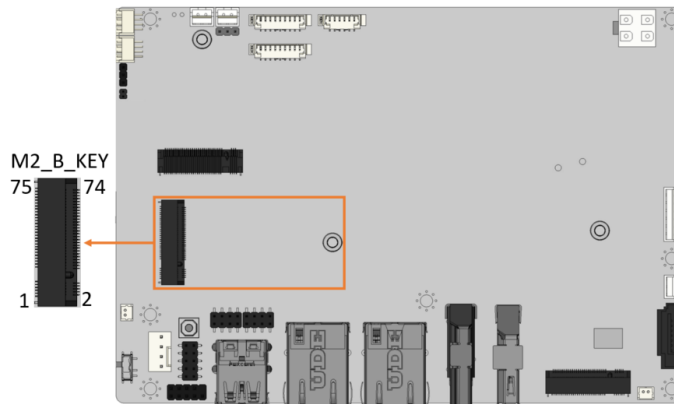


Figure 3-20: M.2 B-key Slot Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	2	+V3.3
3	GND	4	+V3.3
5	GND	6	WWAN_FCP_OFF_N
7	USB2_DP	8	WWAN_DISABLE_N
9	USB2_DN	10	NC
11	GND	12	Module Key
13	Module Key	14	Module Key
15	Module Key	16	Module Key
17	Module Key	18	Module Key
19	Module Key	20	NC
21	NC	22	NC
23	NC	24	NC
25	NC	26	NC

27	GND	28	NC
29	PCIE_1_RX_DN	30	NC
31	PCIE_1_RX_DP	32	NC
33	GND	34	NC
35	PCIE_1_TX_DN	36	NC
37	PCIE_1_TX_DP	38	SSD_DEVSLP
39	GND	40	NC
41	PCIE_0_RX_DN	42	NC
43	PCIE_0_RX_DP	44	NC
45	GND	46	NC
47	PCIE_0_TX_DN	48	NC
49	PCIE_0_TX_DP	50	PLT_RST_N
51	GND	52	NC
53	PCIE_CLK_DN	54	PCIE_WAKE#
55	PCIE_CLK_DP	56	NC
57	GND	58	NC
59	NC	60	NC
61	NC	62	NC
63	NC	64	NC
65	NC	66	SUSCLK
67	NC	68	NC
69	NC	70	+V3.3
71	GND	72	+V3.3
73	GND	74	+V3.3
75	GND		

Table 3-21: M. 2 B-key Slot Pinouts

WAFER-EHL-X6000 SBC

3.2.20 iDPM Slot

- CN Label:** IDPM1
- CN Type:** iDPM slot
- CN Location:** See Figure 3-21
- CN Pinouts:** See Table 3-22

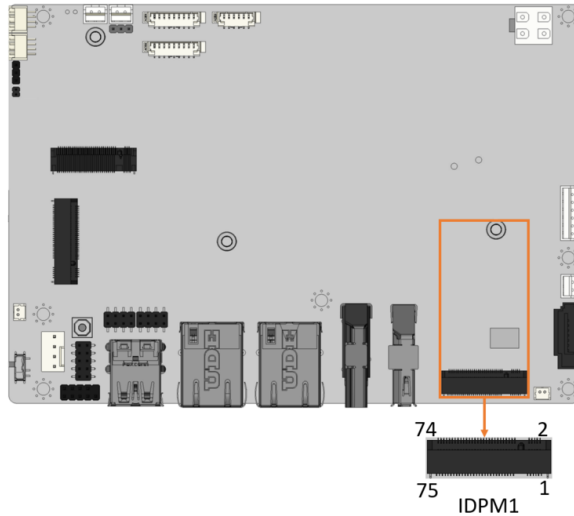


Figure 3-21: iDPM Slot Location

Pin	Description	Pin	Description
1	GND	2	+3.3V
3	GND	4	+3.3V
5	GND	6	+3.3V
7	GND	8	+3.3V
9	GND	10	+3.3V
11	+5V	12	Module Key
13	Module Key	14	Module Key
15	Module Key	16	Module Key
17	Module Key	18	Module Key
19	Module Key	20	+3.3VS
21	DISPLAY_DETECT_P IN21	22	+3.3VS
23	DISPLAY_DETECT_P IN23	24	+3.3VS

Pin	Description	Pin	Description
25	GND	26	+3.3VS
27	GND	28	GND
29	EDP_TX3_DN	30	+12VS
31	EDP_TX3_DP	32	+12VS
33	GND	34	+12VS
35	EDP_TX2_DN	36	+12VS
37	EDP_TX2_DP	38	GND
39	GND	40	SMB_CLK
41	EDP_TX1_DN	42	SMB_DATA
43	EDP_TX1_DP	44	GND
45	GND	46	EC_BKLT_CTRL
47	EDP_TX0_DN	48	EDP1_BKLT_CTRL
49	EDP_TX0_DP	50	EDP1_BKLT_EN
51	GND	52	EDP1_VDD_EN #
53	EDP_AUX_DN	54	EDP_HPD_R
55	EDP_AUX_DP	56	BUF_PLT_RST#
57	GND	58	LVDS_EN
59	GND	60	+V5S
61	GND	62	+V5S
63	GND	64	+V5S
65	GND	66	+V5S
67	GND	68	+12VA
69	GND	70	+12VA
71	GND	72	+12VA
73	GND	74	+12VA
75	GND		

Table 3-22: iDPM Connector Pinouts

WAFER-EHL-X6000 SBC

3.3 External Peripheral Interface Connector Panel

Figure 3-22 shows the WAFER-EHL-X6000 external peripheral interface connector (EPIC) panel. The EPIC panel consists of the following:

- 1x HDMI connector
- 1 x DP connector
- 2 x 2.5 GbE RJ-45 connectors
- 2x USB 3.2 Gen 2 connectors

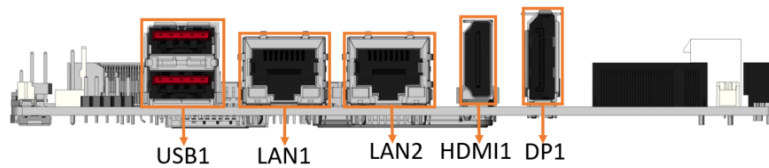


Figure 3-22: External Peripheral Interface Connector

3.3.1 External 2.5GbE RJ-45 Connectors

- CN Label:** LAN1, LAN2
CN Type: RJ-45
CN Location: See Figure 3-22
CN Pinouts: See Table 3-23

The LAN connector connects to a local network.

Pin	Description	Pin	Description
1	MDI0P	5	MDI2P
2	MDI0N	6	MDI2N
3	MDI1P	7	MDI3P
4	MDI1N	8	MDI3N

Table 3-23: External 2.5GbE RJ-45 Connectors Pinouts

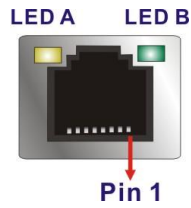


Figure 3-23: LAN LED Location

LED	Description	LED	Description
A	on: linked blinking: data is being sent/received	B	off: 100 Mb/s orange: 1000 Mb/s green: 2500 Mb/s

Table 3-24: LAN LED Pinouts

3.3.2 External DP Connector

- CN Label:** DP1
- CN Type:** External DP connector
- CN Location:** See **Figure 3-24**
- CN Pinouts:** See **Table 3-25**

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	DATA_0P	11	GND
2	GND	12	DATA_3N
3	DATA_0N	13	CONFIG1
4	DATA_1P	14	CONFIG2
5	GND	15	AUX_P
6	DATA_1N	16	GND
7	DATA_2P	17	AUX_N
8	GND	18	DP HPD
9	DATA_2N	19	GND
10	DATA_3P	20	DP PWR

Table 3-25: External DisplayPort Connector Location

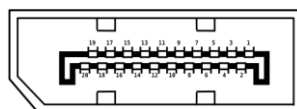


Figure 3-24: External DP Connector Pinouts

WAFER-EHL-X6000 SBC

3.3.3 External HDMI Connectors

- CN Label:** HDMI1
- CN Type:** HDMI connector
- CN Location:** See **Figure 3-25**
- CN Pinouts:** See **Table 3-26**

The HDMI connectors can connect to HDMI devices.

Pin	Description	Pin	Description
1	HDMI2_DATA2	2	GND
3	HDMI2_DATA2#	4	HDMI2_DATA1
5	GND	6	HDMI2_DATA1#
7	HDMI2_DATA0	8	GND
9	HDMI2_DATA0#	10	HDMI2_CLK
11	GND	12	HDMI2_CLK#
13	N/C	14	N/C
15	HDMI2_SCL	16	HDM2I_SDA
17	GND	18	+5V
19	HDMI2_HPD		

Table 3-26: External HDMI Connector Pinouts

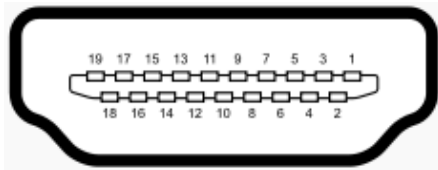


Figure 3-25: External HDMI Connector Location

3.3.4 External USB 3.2 Gen 2 Connectors

- CN Label:** USB1
- CN Type:** USB 3.2 Gen 2 port Type-A
- CN Location:** See **Figure 3-26**
- CN Pinouts:** See **Table 3-27**

The WAFER-EHL-X6000 has two external USB 3.2 Gen 2 ports. The USB connector can be connected to a USB 2.0 or USB 3.2 device. The pinouts of USB 3.2 Gen 2 connectors are shown below.

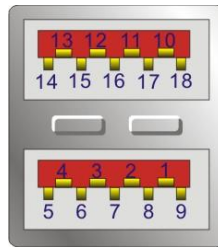


Figure 3-26: External USB 3.2 Gen 2 Connectors Location

Pin	Description	Pin	Description
1	VCC	10	VCC
2	USB_DATA0-	11	USB_DATA1-
3	USB_DATA0+	12	USB_DATA1+
4	GND	13	GND
5	USB3_RX0-	14	USB3_RX1-
6	USB3_RX0+	15	USB3_RX1+
7	GND	16	GND
8	USB3_TX0-	17	USB3_TX1-
9	USB3_TX0+	18	USB3_TX1+

Table 3-27: External USB 3.2 Gen 2 Connectors Pinouts

Chapter

4

Installation

4.1 Anti-static Precautions



WARNING:

Failure to take ESD precautions during the installation of the WAFER-EHL-X6000 may result in permanent damage to the WAFER-EHL-X6000 and severe injury to the user.

Electrostatic discharge (ESD) can cause serious damage to electronic components, including the WAFER-EHL-X6000. Dry climates are especially susceptible to ESD. It is

WAFER-EHL-X6000 SBC

therefore critical that whenever the WAFER-EHL-X6000 or any other electrical component is handled, the following anti-static precautions are strictly adhered to.

- **Wear an anti-static wristband:** Wearing a simple anti-static wristband can help to prevent ESD from damaging the board.
- **Self-grounding** Before handling the board, touch any grounded conducting material. During the time the board is handled, frequently touch any conducting materials that are connected to the ground.
- **Use an anti-static pad:** When configuring the WAFER-EHL-X6000, place it on an anti-static pad. This reduces the possibility of ESD damaging the WAFER-EHL-X6000.
- **Only handle the edges of the PCB:** When handling the PCB, hold the PCB by the edges.

4.2 Installation Considerations



NOTE:

The following installation notices and installation considerations should be read and understood before installation. All installation notices must be strictly adhered to. Failing to adhere to these precautions may lead to severe damage and injury to the person performing the installation.



WARNING:

The installation instructions described in this manual should be carefully followed in order to prevent damage to the WAFER-EHL-X6000, WAFER-EHL-X6000 components and injury to the user.

Before and during the installation please **DO** the following:

- Read the user manual:

- The user manual provides a complete description of the WAFER-EHL-X6000 installation instructions and configuration options.
- Wear an electrostatic discharge cuff (ESD):
 - Electronic components are easily damaged by ESD. Wearing an ESD cuff removes ESD from the body and helps prevent ESD damage.
- Place the WAFER-EHL-X6000 on an antistatic pad:
 - When installing or configuring the motherboard, place it on an antistatic pad. This helps to prevent potential ESD damage.
- Turn all power to the WAFER-EHL-X6000 off:
 - When working with the WAFER-EHL-X6000, make sure that it is disconnected from all power supplies and that no electricity is being fed into the system.

Before and during the installation of the WAFER-EHL-X6000 **DO NOT:**

- Remove any of the stickers on the PCB board. These stickers are required for warranty validation.
- Use the product before verifying all the cables and power connectors are properly connected.
- Allow screws to come in contact with the PCB circuit, connector pins, or its components.

4.3 M.2 Module Installation

To install the M.2 expansion card, Please follow the steps below.

Step 1: Locate the M.2 module slot. See **Chapter 3**.

Step 2: Remove the retention screw secured on the motherboard.

Step 3: Line up the notch on the module with the notch on the slot. Slide the M.2 module into the socket at an angle of about 20° (**Figure 4-1**).

WAFER-EHL-X6000 SBC

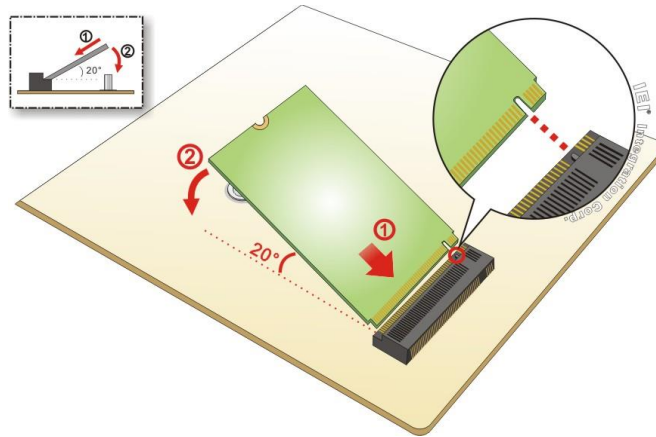


Figure 4-1: Inserting The M.2 Module Into The Slot At An Angle

Step 4: Secure the M.2 module with the previously removed retention screw (Figure 4-2).

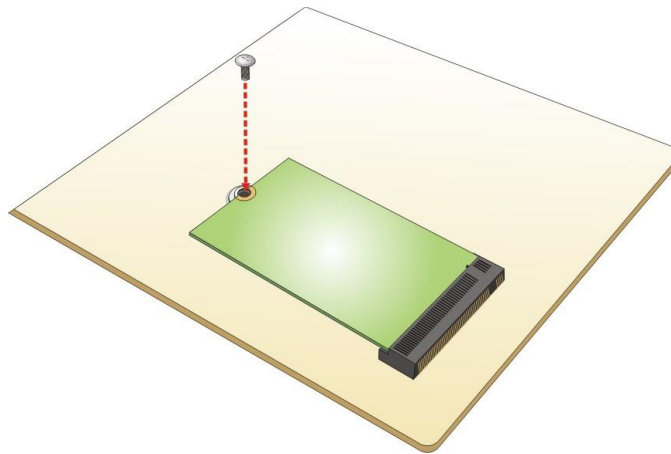


Figure 4-2: Securing The M.2 Module

4.4 Chassis Installation

4.4.1 Heat Spreader

**WARNING:**

The heat spreader installed on the WAFER-EHL-X6000 can only serve as a heat conductor, which needs additional heat dissipation mechanism to achieve suitable thermal condition. DO NOT put the WAFER-EHL-X6000 with the heat spreader directly on a surface that cannot dissipate system heat, and never run the WAFER-EHL-X6000 without the heat spreader secured to the board.

When the WAFER-EHL-X6000 is shipped, it is secured to a heat spreader with five retention screws. The heat spreader must have a direct contact with a heat dissipation surface to ensure stable operation. In addition, a thin layer of thermal paste has to be applied onto the heat dissipation surface where it contacts the heat spreader.



Figure 4-3: Heat Sink Retention Screws

WAFER-EHL-X6000 SBC

IEI also provides two thermal solutions for customers to choose.

IEI has developed a highly efficient thermal solution for the 3.5" motherboard - IEI Heat Conduction Casing (IHCC). With its well-design structure, the IHCC can effectively improve heat transfer performance and cut time-to-market. It completely joints with the heat spreader for better CPU heat transfer in 0°C–60°C operating temperature using active cooling (P/N: CM-WAFER-WOF-R10, see **Figure 4-4**), and in 0°C–45°C operating temperature using passive cooling (P/N: CM-WAFER-WOF-R10 see **Figure 4-5**).



Figure 4-4: Passive Cooling



Figure 4-5: Active Cooling

4.5 Internal Peripheral Device Connections

This section outlines the installation of peripheral devices to the on-board connectors

4.5.1 AT Power Connection

Follow the instructions below to connect the WAFER-EHL-X6000 to an AT power supply.



WARNING:

Disconnect the power supply power cord from its AC power source to prevent a sudden power surge to the WAFER-EHL-X6000.

Step 1: **Locate the power cable.** The power cable is shown in the packing list in Chapter 2.

Step 2: Connect the power cable to the motherboard. Connect the 4-pin (2x2) Molex type power cable connector to the power connector on the motherboard. See

Figure 4-6

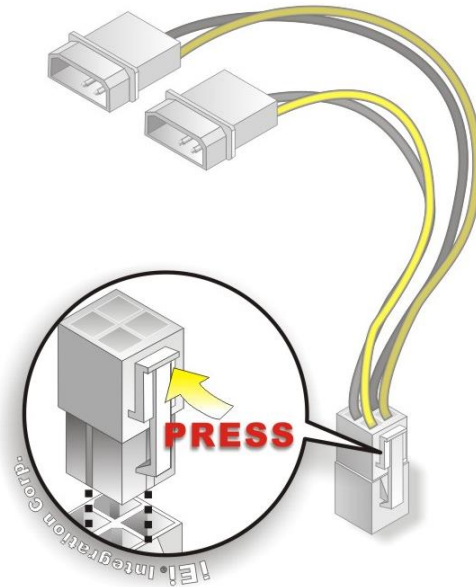


Figure 4-6: Power Cable to Motherboard Connection

Step 3: Connect power cable to power supply. Connect one of the 4-pin (1x4) Molex type power cable connectors to an AT power supply. See **Figure 4-7**

WAFER-EHL-X6000 SBC

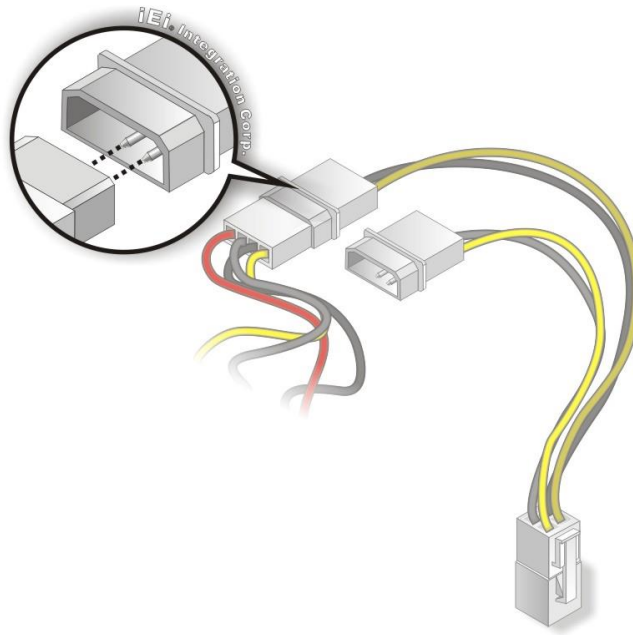


Figure 4-7: Connect Power Cable to Power Supply

4.5.2 7.1 Channel Audio Kit Installation

**NOTE:**

This item must be ordered separately, and connects to the audio connector. For further information please contact the nearest distributor, reseller or vendor or contact an IEI sales representative directly.

The audio kit attaches to the audio connector. The audio kit provides 7.1 channel audio. To install the audio kit, please refer to the steps below:

- Step 1: Connect the cable to the audio kit.** Connect the included cable to the audio kit. Make sure pin 1 aligns with the marked pin.
- Step 2: Connect the cable to the board.** Connect the other end of the cable to the board. Make sure to line up the marked pin 1.

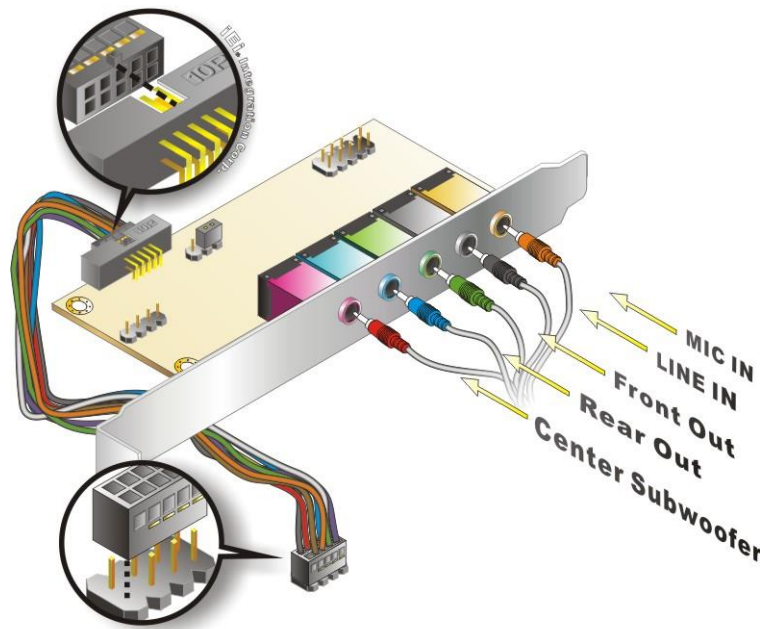


Figure 4-8: 7.1 Channel Audio Kit

- Step 3:** **Mount the audio kit onto the chassis.** Once the audio kit is connected to the board, secure the audio kit bracket to the system chassis.
- Step 4:** **Connect the audio devices.** Connect speakers and external audio sources to the audio jacks on the audio kit.
- Step 5:** **Install the driver.** Install the 7.1 channel audio driver included with the board.

4.5.3 SATA Drive Connection

The WAFER-EHL-X6000 is shipped with a SATA drive cable. To connect the SATA drive to the connector, please follow the steps below.

- Step 1:** **Locate the SATA connector and the SATA power connector.** The locations of the connectors are shown in **Chapter 3**.
- Step 2:** **Insert the cable connector.** Insert the cable connector into the on-board SATA drive connector and the SATA power connector. See **Figure 4-9**.

WAFER-EHL-X6000 SBC

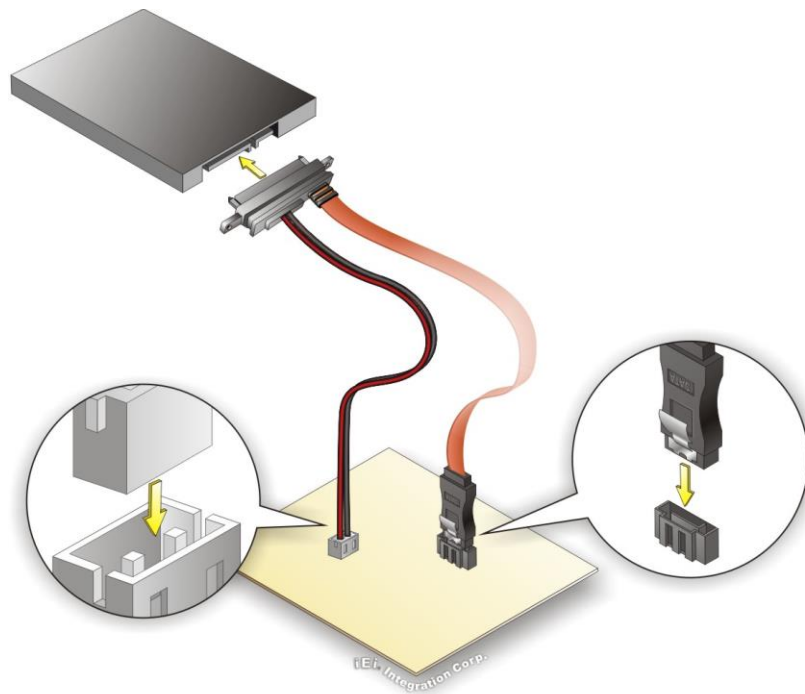


Figure 4-9: SATA Drive Cable Connection

- Step 3:** **Connect the cable to the SATA disk.** Connect the connector on the other end of the cable to the connector at the back of the SATA drive.
- Step 4:** To remove the SATA cable from the SATA connector, press the clip on the connector at the end of the cable.

4.6 Software Drivers

4.6.1 Available Drivers

All the drivers for the WAFER-EHL-X6000 are available on IEI Resource Download Center (<https://download.ieiworld.com>). Type WAFER-EHL-X6000 and press Enter to find all the relevant software, utilities, and documentation.

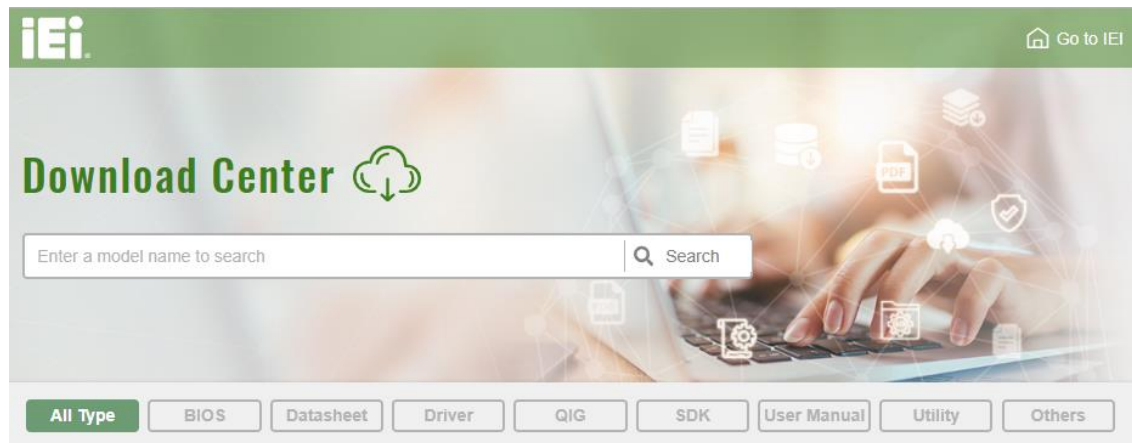
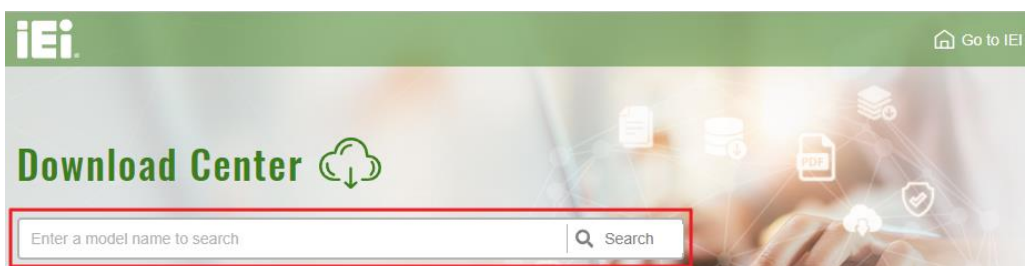


Figure 4-10: IEI Resource Download Center

4.6.2 Driver Download

To download drivers from IEI Resource Download Center, follow the steps below.

Step 1: Go to <https://download.ieiworld.com>. Type WAFER-EHL-X6000 and press Enter.



Step 2: All product-related software, utilities, and documentation will be listed. You can choose **Driver** to filter the result.

WAFER-EHL-X6000 SBC

All Type BIOS Datasheet **Driver** QIG SDK User Manual Utility Others

i Keyword: "WAFER-ULT5", Searching Result : 6 Records.

WAFER-ULT5 Product Info ▶

Embedded Computer ▶ Single Board Computer ▶ Embedded Board

3.5" SBC supports Intel® 8th Generation Whiskey Lake processor with DDR4 SO-DIMM, Triple display with dual HDMI 1.4, LVDS, Triple GbE, USB 3.1 Gen2, M.2 A key, mPCIe with mSATA support, SATA 6Gb/s, COM and RoHS

Driver

File Name	Published	Version	File Checksum
WAFER-ULT5-R10_V1.1.iso (1.97 GB)	2020/07/07	1.10	475FD74C87A309D22A0265218DD3B37E

Step 3: Click the driver file name on the page and you will be prompted with the following window. You can download the entire ISO file (❶), or click the small arrow to find an individual driver and click the file name to download (❷).

WAFER-ULT5-R10_V1.1.iso X

❶ Click here to download entire ISO file. (1.97 GB)

* Download individual file *

❷ Docs

- 1. Chipset
- 10.1.18019.8144.zip (3.26 MB)
- 2. VGA
- 3. LAN
- 4. Audio
- 5. ME
- 6. RST
- 7. SIO
- 8. Manual
- Thumbs.db (19.5 KB)



NOTE:

To install software from the downloaded ISO image file in Windows 8, 8.1 or 10, double-click the ISO file to mount it as a virtual drive to view its content.

Chapter

5

BIOS

WAFER-EHL-X6000 SBC

5.1 Introduction

The BIOS is programmed onto the BIOS chip. The BIOS setup program allows changes to certain system settings. This chapter outlines the options that can be changed.



NOTE:

Some of the BIOS options may vary throughout the life cycle of the product and are subject to change without prior notice.

5.1.1 Starting Setup

The UEFI BIOS is activated when the computer is turned on. The setup program can be activated in one of two ways.

1. **Using keyboard:** Press the **DEL** or **F7** as soon as the system is turned on.
2. **Using touchscreen:** Press the **Setup** button on the upper right corner of the BIOS Starting Menu.

If the message disappears before the **DEL** or **F7** key is pressed, restart the computer and try again, then the BIOS Starting Menu will appear. Select "Setup" and press Enter to get into the BIOS Setup.

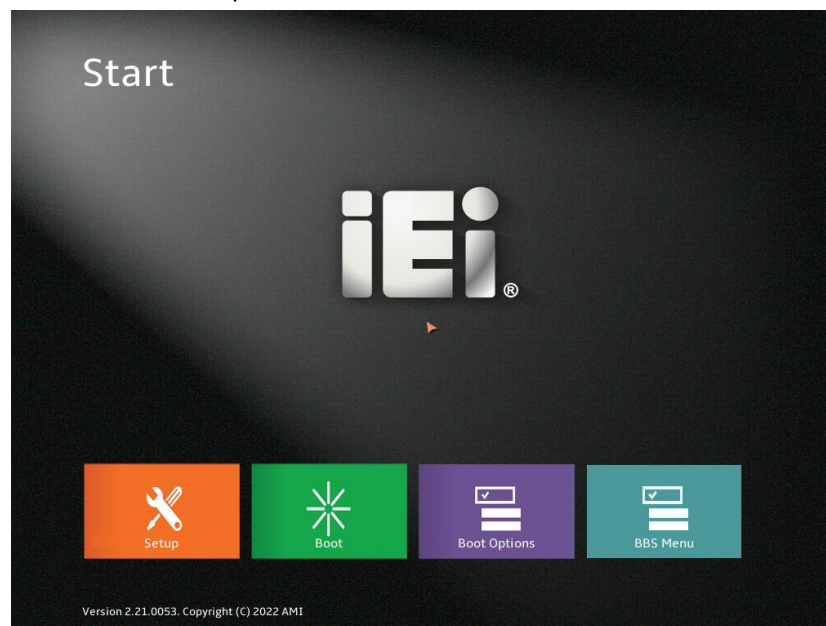


Figure 5-1: BIOS Starting Menu

5.1.2 Using Setup

The BIOS Setup menu can be navigated by using a keyboard or a touchscreen.

5.1.2.1 Keyboard Navigation

For keyboard navigation, use the navigation keys shown in **Table 5-1**.

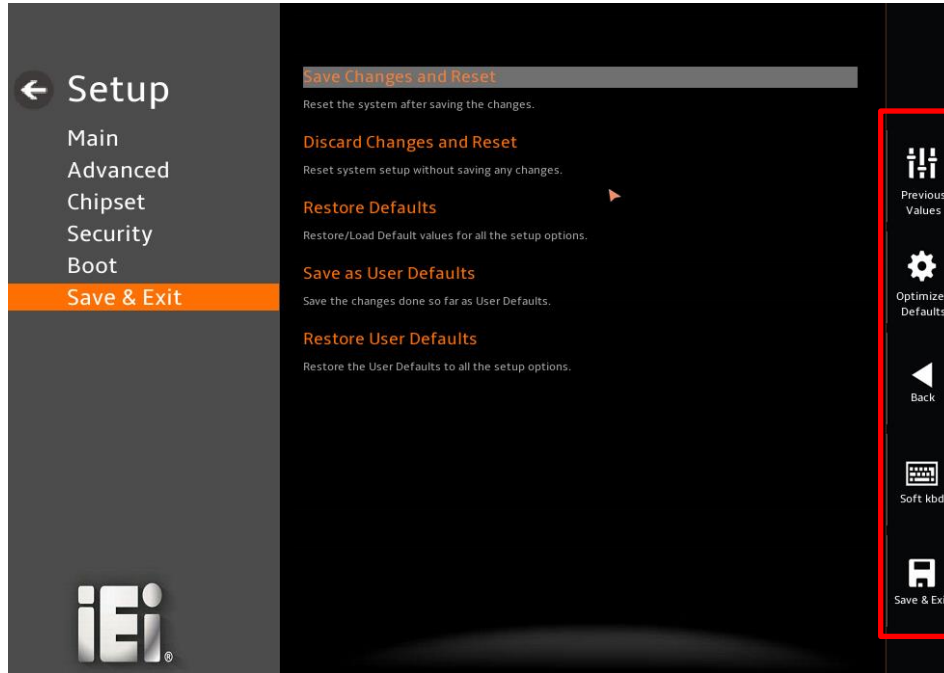
Key	Function
Up arrow	Move to previous item
Down arrow	Move to next item
Left arrow	Move to the item on the left hand side
Right arrow	Move to the item on the right hand side
+	Increase the numeric value or make changes
-	Decrease the numeric value or make changes
Page Up	Move to the previous page
Page Dn	Move to the next page
Esc	Main Menu – Quit and not save changes into CMOS Status Page Setup Menu and Option Page Setup Menu -- Exit current page and return to Main Menu
F1	General help, only for Status Page Setup Menu and Option Page Setup Menu
F2	Load previous values
F3	Load optimized defaults
F4	Save changes and Exit BIOS
<K>	Scroll help area upwards
<M>	Scroll help area downwards

Table 5-1: BIOS Navigation Keys

WAFER-EHL-X6000 SBC

5.1.2.2 Touch Navigation

For touchscreen navigation, use the on-screen navigation keys shown below.



On-screen Button	Function
Previous Values	Load the last value you set.
Optimized Defaults	Load the factory default values in order to achieve the best performance.
Back	Return to the previous menu.
Soft kbd	Display the on-screen keyboard.
Save & Exit	Save the changes made to the BIOS options and reset the system.

Table 5-2: BIOS On-screen Navigation Keys

5.1.3 Getting Help

When **F1** is pressed a small help window describing the appropriate keys to use and the possible selections for the highlighted item appears. To exit the Help Window, press the **Esc** key.

5.1.4 Unable to Reboot after Configuration Changes

If the computer cannot boot after changes to the system configuration is made, CMOS defaults. Use the clear CMOS button described in **Chapter 4**.

5.1.5 BIOS Menu Bar

The **menu bar** on top of the BIOS screen has the following main items:

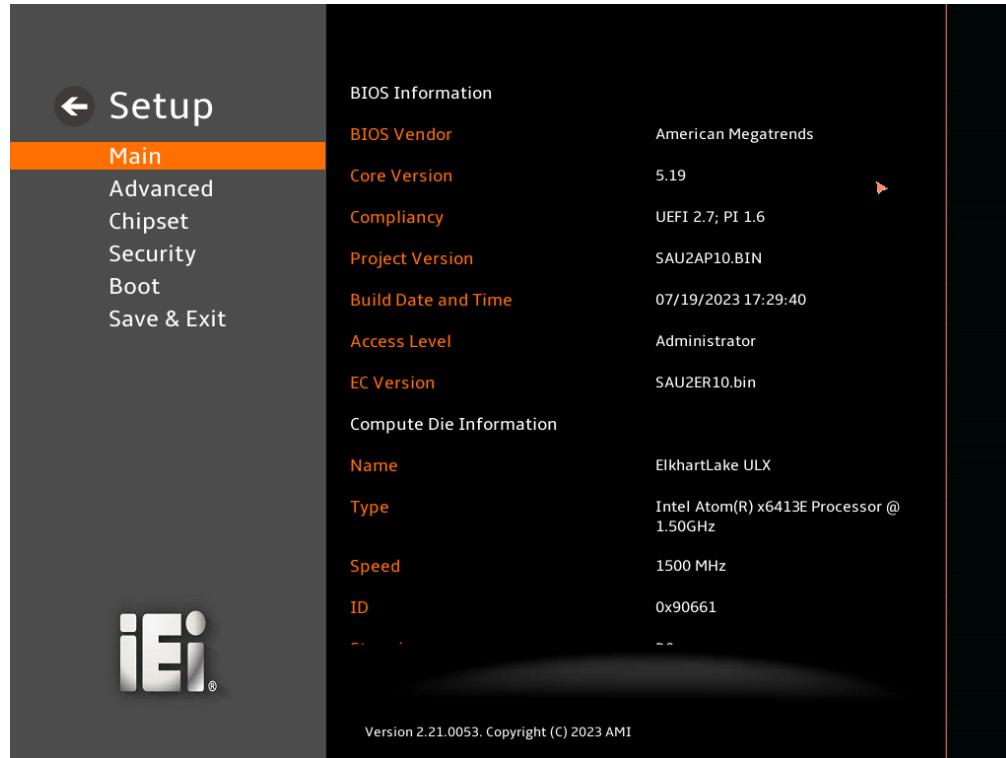
- Main – Changes the basic system configuration.
- Advanced – Changes the advanced system settings.
- Chipset – Changes the chipset settings.
- Security – Sets User and Supervisor Passwords.
- Boot – Changes the system boot configuration.
- Save & Exit – Selects exit options and loads default settings

The following sections completely describe the configuration options found in the menu items at the top of the BIOS screen and listed above.

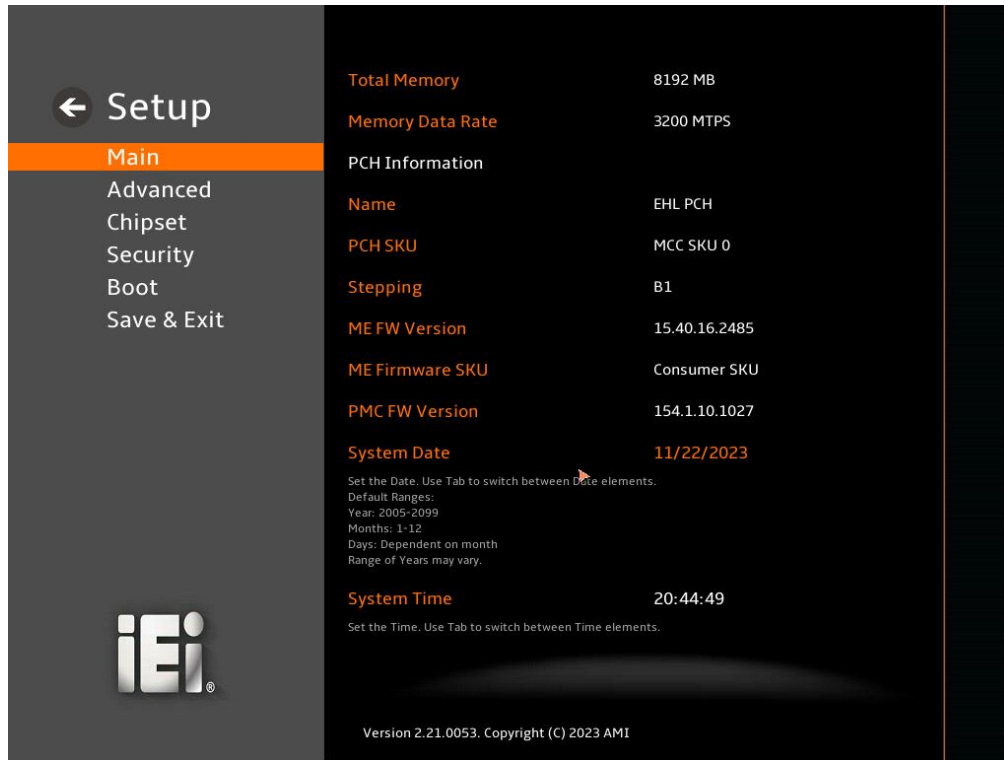
WAFER-EHL-X6000 SBC

5.2 Main

The **Main** BIOS menu (**BIOS Menu 1 & BIOS Menu 2**) appears when the **BIOS Setup** program is entered. The **Main** menu gives an overview of the basic system information.



BIOS Menu 1: Main (1/2)



BIOS Menu 2: Main (2/2)

➔ BIOS Information

The **BIOS Information** lists a brief summary of the BIOS. The fields in **BIOS Information** cannot be changed. The items shown in the system overview include:

- **BIOS Vendor:** Installed BIOS vendor
- **Core Version:** Current BIOS version
- **Compliance:** Current UEFI & PI version
- **Project Version:** the board version
- **Build Date and Time:** Date the current BIOS version was made
- **EC Version:** Current EC version
- BIOS Information

➔ Compute Die Information

The **Compute Die Information** lists a brief summary of the Processor. The fields in **Compute Die Information** cannot be changed. The items shown in the system overview include:

WAFER-EHL-X6000 SBC

- **Name:** Displays the Processor Details
- **Type:** Displays the Processor Type
- **Speed:** Displays the Processor Speed
- **ID:** Displays the Processor ID
- **Stepping:** Displays the Processor Stepping
- **Number of Processors:** Displays number of CPU cores
- **Microcode Revision:** CPU Microcode Revision
- **Total Memory:** Total Memory in the System
- **Memory Data Rate:** Displays the Data Rate of Memory

→ PCH Information

The **PCH Information** lists a brief summary of the PCH. The fields in **PCH Information** cannot be changed. The items shown in the system overview include:

- **Name:** Displays the PCH Name
- **Stepping:** Displays the PCH Stepping
- **ME FW Version:** Displays the ME Firmware Version
- **ME Firmware SKU:** Displays the ME Firmware SKU

The System Overview field also has two user configurable fields:

→ System Date [xx/xx/xx]

Use the **System Date** option to set the system date. Manually enter the day, month and year.

→ System Time [xx:xx:xx]

Use the **System Time** option to set the system time. Manually enter the hours, minutes and seconds.

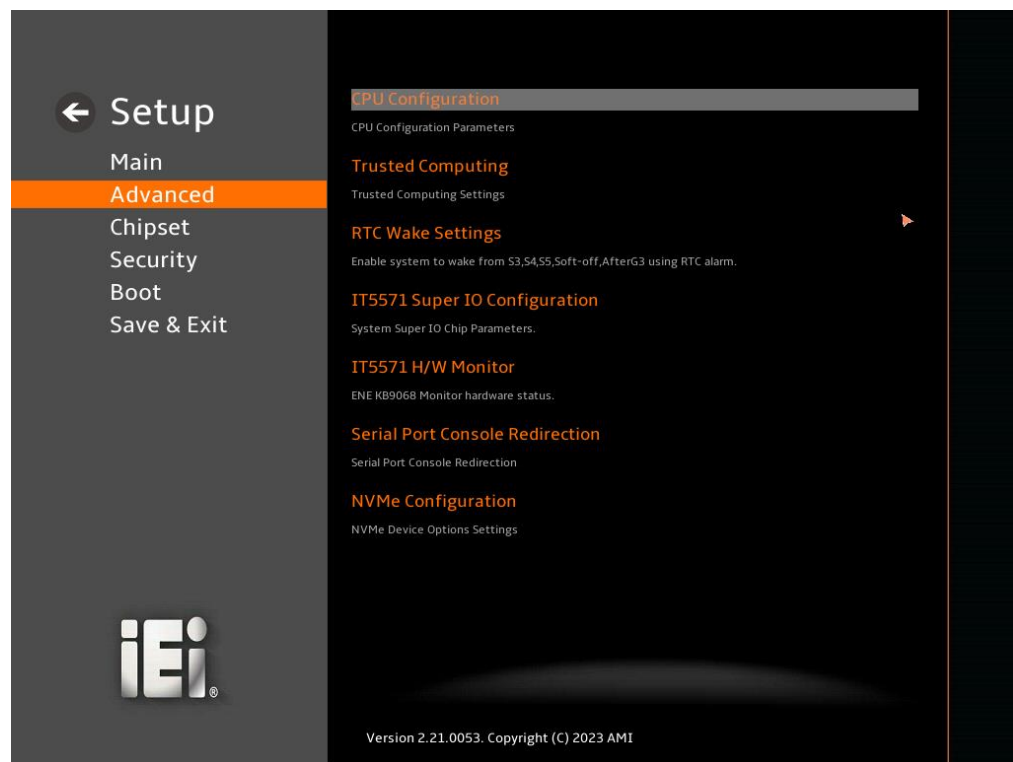
5.3 Advanced

Use the **Advanced** menu (**BIOS Menu 3**) to configure the CPU and peripheral devices through the following sub-menus:



WARNING!

Setting the wrong values in the sections below may cause the system to malfunction. Make sure that the settings made are compatible with the hardware.

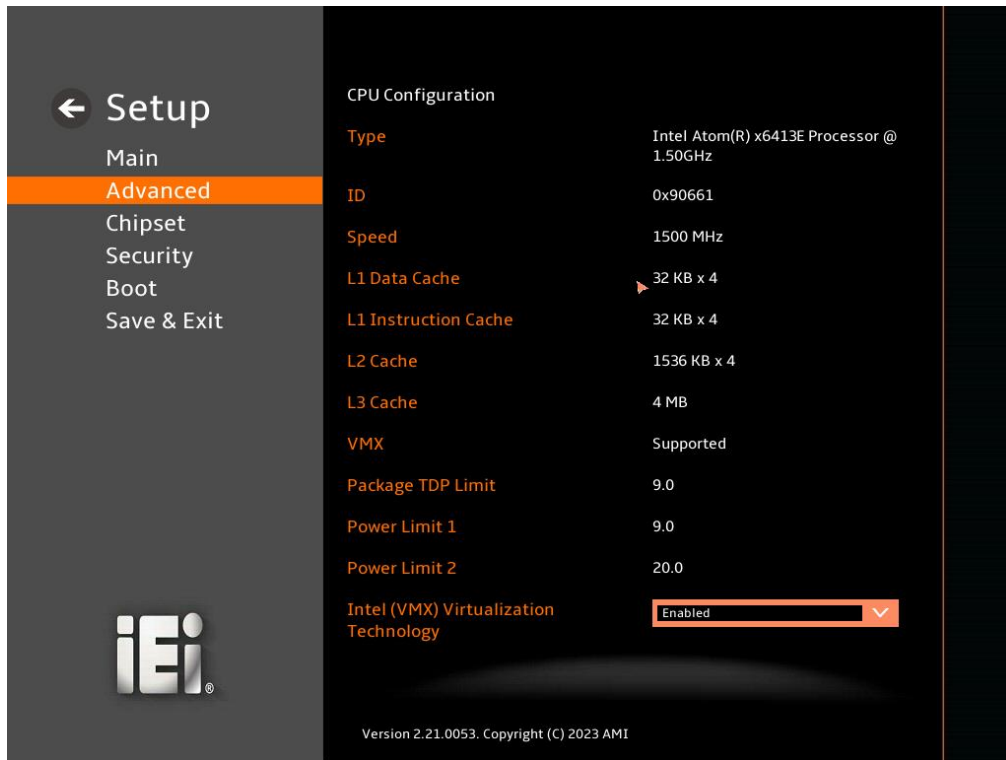


BIOS Menu 3: Advanced

WAFER-EHL-X6000 SBC

5.3.1 CPU Configuration

Use the **CPU Configuration** menu (**BIOS Menu 4 & BIOS Menu 5**) to view detailed CPU specifications or enable the Intel Virtualization Technology.



BIOS Menu 4: CPU Configuration (1/2)



BIOS Menu 5: CPU Configuration (2/2)

➔ **Intel (VMX) Virtualization Technology [Enabled]**

Use the **Intel (VMX) Virtualization Technology** option to enable or disable virtualization on the system. When combined with third party software, Intel® Virtualization technology allows several OSs to run on the same system at the same time.

- ➔ **Disabled** Disables Intel Virtualization Technology.
- ➔ **Enabled** **DEFAULT** Enables Intel Virtualization Technology.

➔ **Active Processor Cores [All]**

Use the **Active Processor Cores** BIOS option to enable numbers of cores in the processor package.

- ➔ **All** **DEFAULT** Enable all cores in the processor package.
- ➔ **1** Enable one core in the processor package.
- ➔ **2** Enable two cores in the processor package.

WAFER-EHL-X6000 SBC

→ **3** Enable three cores in the processor package.

→ **EIST [Enable]**

Use the **EIST** option to enable more than two frequency ranges to be supported.

→ **Disabled** Disables more than two frequency ranges

→ **Enabled** **DEFAULT** Enables more than two frequency ranges

→ **C states [Disabled]**

Use the **C states** option to enable or disable the CPU Power Management.

→ **Disabled** **DEFAULT** Disables CPU to go to C states when it's not 100% utilized.

→ **Enabled** Enables CPU to go to C states when it's not 100% utilized.

→ **Tcc Activation Offset [0]**

Use the **Tcc Activation** option to set Tcc activation temperature at which the Thermal Control Circuit must be activated. Tcc will be activated at: Tcc Activation Temp-Tcc Activation Offset. Tcc Activation Offset range is 0 to 63.

→ **Turbo Mode [Enabled]**

Use the **Turbo Mode** option to enable or disable Turbo Mode which requires Intel Speed Step or Intel Speed Shift to be available and enabled.

→ **Disabled** Disables Turbo Mode Technology

→ **Enabled** **DEFAULT** Enables Turbo Mode Technology

→ **Power Limit 1**

Use the **Power Limit 1** to set Power Limit in Milli Watts. BIOS will round to the nearest 1/8W when programming. 0 = no custom override. For 12.50W, enter 12500. Overclocking SKU: Value must be between Min and Max Power Limits. Other SKUs: This value must be between Min Power limit and TDP Limit. If value is 0, BIOS will program TDP value.

→ **Power Limit 1 Time Window**

Power Limit 1 Time Window value in second. The value may vary from 0 to 128.0, 0 = default value (28 sec for mobile and 8 sec for desktop). Defines time window which TDP value should be maintained.

→ **Power Limit 2**

Use the **Power Limit 2** to set Power Limit in Max Watts. BIOS will round to the nearest 1/8W when programming. If the value is 0, BIOS will program this value as $1.25 * TDP$. For 12.50W, enter 12500. Processor applies control policies such that the package power does not exceed this limit.

WAFER-EHL-X6000 SBC

5.3.2 Trusted Computing

Use the **Trusted Computing** menu (**BIOS Menu 6**) to configure settings related to the Trusted Computing Group (TCG) Trusted Platform Module (TPM).



BIOS Menu 6: Trusted Computing

➔ **TPM Support [Enable]**

Use the **TPM Support** option to configure support for the TPM.

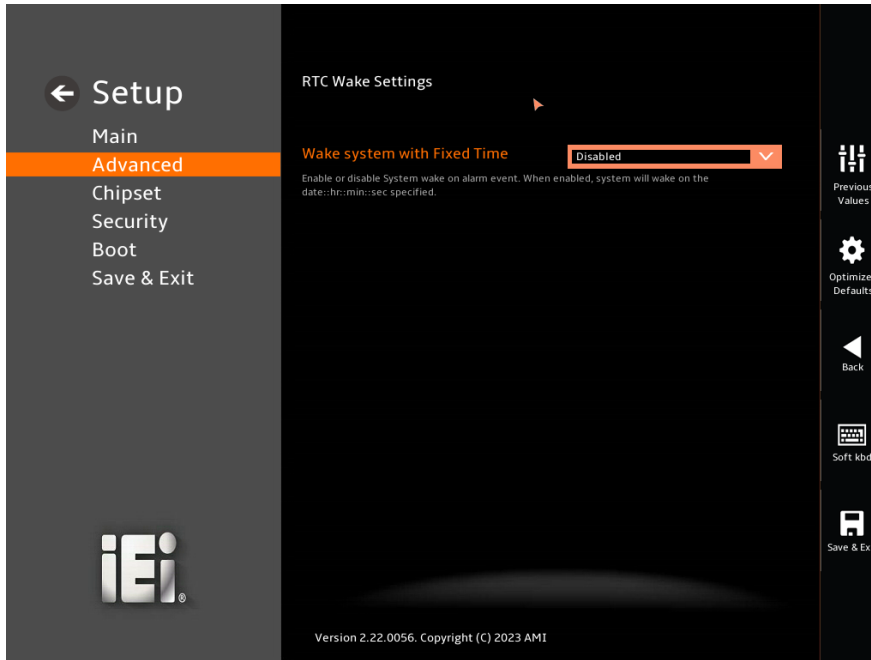
- ➔ **Disable** TPM support is disabled.
- ➔ **Enable** **DEFAULT** TPM support is enabled.

➔ **Pending Operation [None]**

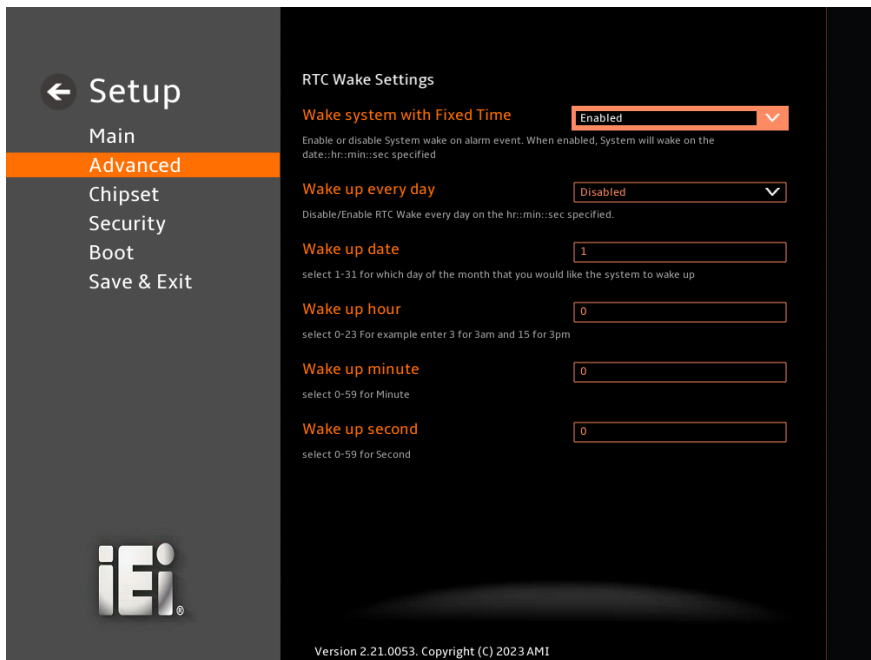
Use the **Pending Operation** option to schedule an operation for the security device.

- ➔ **None** **DEFAULT** TPM information is previous.S
- ➔ **TPM Clear** TPM information is cleared

5.3.3 RTC Wake Setting



BIOS Menu 7: RTC Wake Setting (1/2)



BIOS Menu 8: RTC Wake Settings (2/2)

WAFER-EHL-X6000 SBC

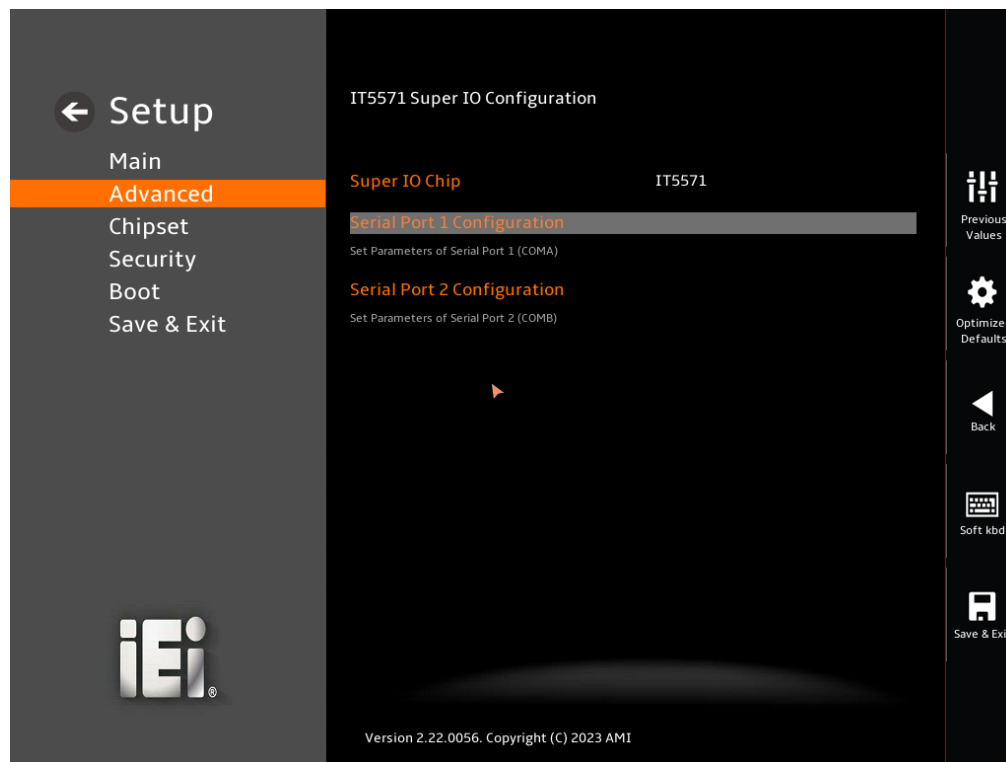
→ Wake system with Fixed Time [Disable]

Use the **Wake system with Fixed Time** option to enable or disable System wake on alarm event. When enable, system will wake on the date.

- **Disable** **DEFAULT** Disable System wake on alarm event
- **Enable** Enable System wake on alarm event

5.3.4 IT5571 Super IO Configuration

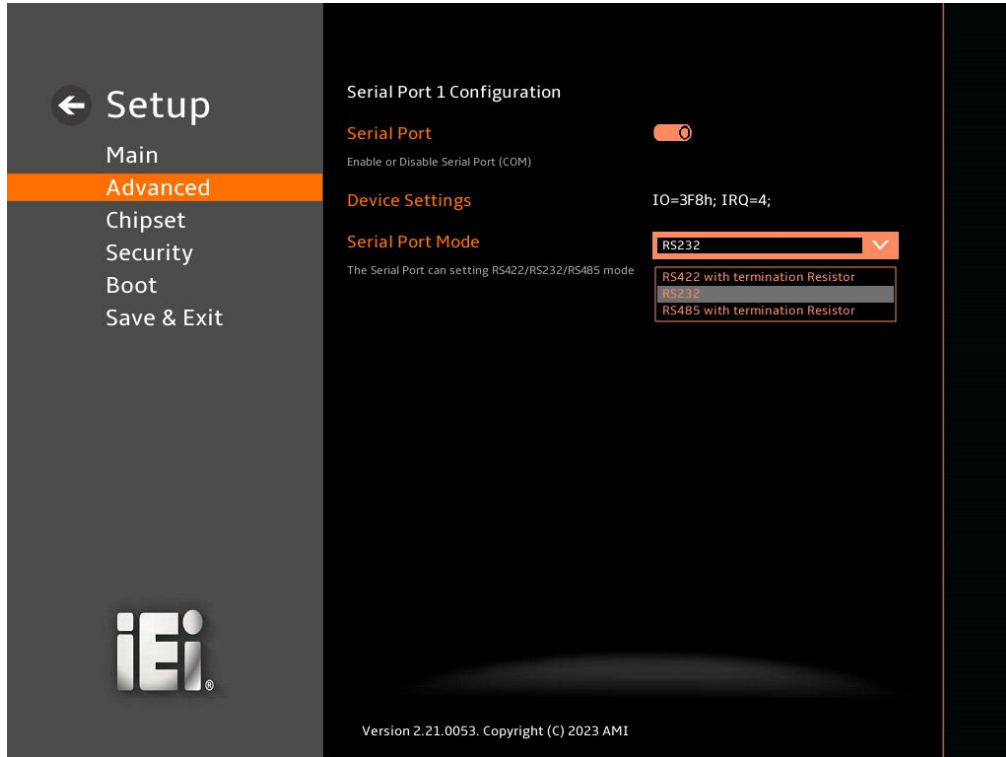
Use the **IT5571 Super IO Configuration** menu (**BIOS Menu 9**) to set or change the configurations for the serial ports.



BIOS Menu 9: IT5571 Super IO Configuration

5.3.4.1 Serial Port 1 Configuration

Use the **Serial Port 1 Configuration** menu (**BIOS Menu 10**) to configure the serial port.



BIOS Menu 10: Serial Port 1 Configuration Menu

➔ Serial Port [Enabled]

Use the **Serial Port** option to enable or disable the serial port.

- ➔ **Disabled** Disable the serial port
- ➔ **Enabled** **DEFAULT** Enable the serial port

➔ Device Settings

The **Device Settings** option shows the serial port IO port address and interrupt address.

- ➔ **IO=3F8h;** Serial Port I/O port address is 3F8h and the interrupt
IRQ=4 address is IRQ4

WAFER-EHL-X6000 SBC

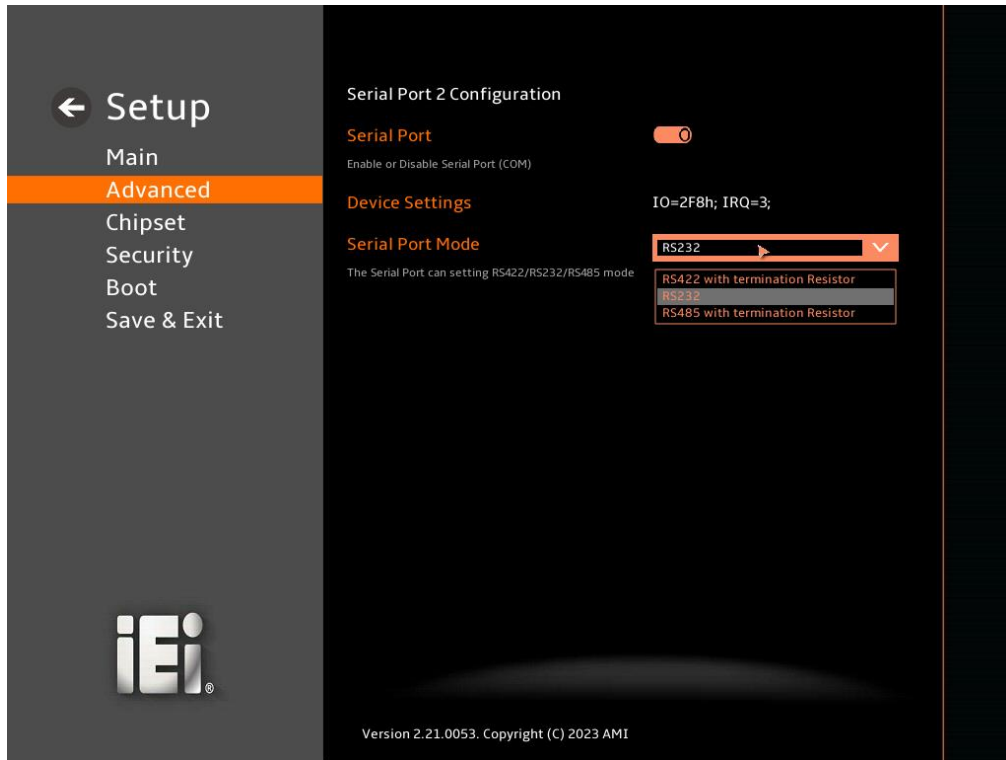
→ Device Mode

Use the **Device Mode** option to change the serial port mode.

- **RS232** **DEFAULT** The serial port mode is RS-232
- RS422 with Register** The serial port mode is RS-422
- RS485 with Register** The serial port mode is RS-485

5.3.4.2 Serial Port 2 Configuration

Use the **Serial Port 2 Configuration** menu (**BIOS Menu 11**) to configure the serial port.



BIOS Menu 11: Serial Port 2 Configuration Menu

→ Serial Port [Enabled]

Use the **Serial Port** option to enable or disable the serial port.

- **Disabled** Disable the serial port
- **Enabled** **DEFAULT** Enable the serial port

→ **Device Settings**

The **Device Settings** option shows the serial port IO port address and interrupt address.

- **IO=2F8h;** Serial Port I/O port address is 2F8h and the interrupt
IRQ=3 address is IRQ3

→ **Device Mode**

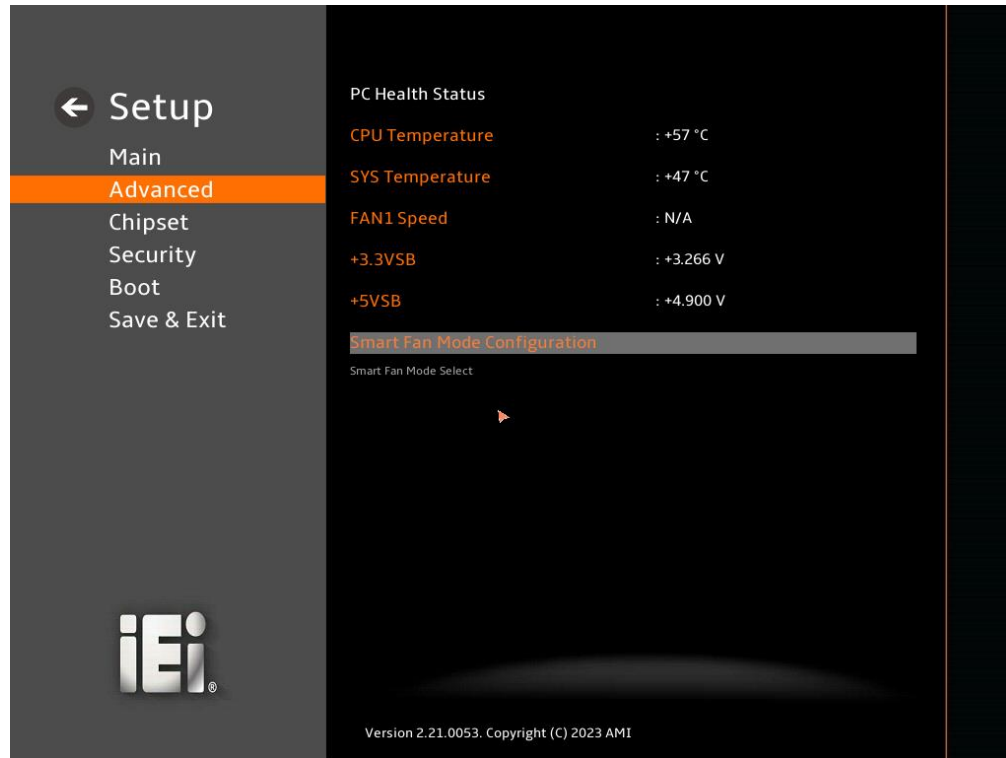
Use the **Device Mode** option to change the serial port mode.

- **RS232** **DEFAULT** The serial port mode is RS-232
RS422 with Register The serial port mode is RS-422
RS485 with Register The serial port mode is RS-485

WAFER-EHL-X6000 SBC

5.3.5 EC H/W Monitor

The EC H/W Monitor menu (**BIOS Menu 12**) contains the smart fan mode configuration submenu and shows the state of H/W real-time operating temperature, fan speeds and system voltages.



BIOS Menu 12: IT5571 Monitor

→ PC Health Status

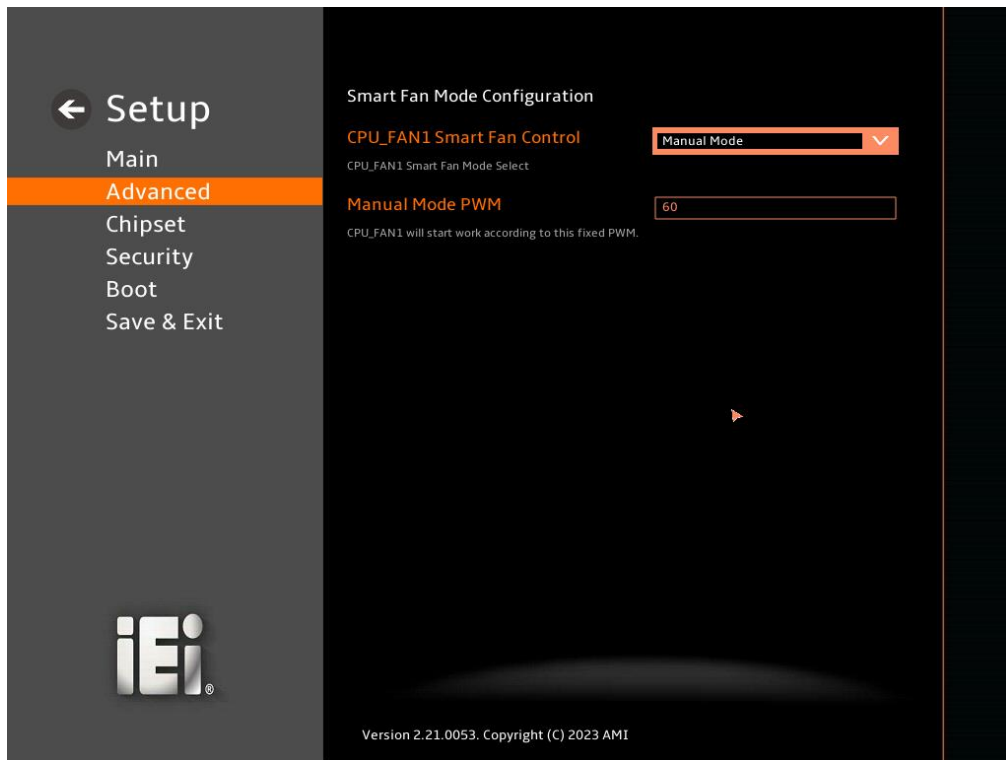
The following system parameters and values are shown. The system parameters that are monitored are:

- System Temperatures:
 - CPU Temperature
 - System Temperature
- Fan Speeds:
 - Fan1 Speed
- Voltages:
 - CPU_CORE

- +12V
- DDR
- +5VSB
- +3.3VSB

5.3.5.1 Smart Fan Mode Configuration

Use the **Smart Fan Mode Configuration** submenu (**BIOS Menu 13**) to configure the CPU/system fan start/off temperature and control mode.



BIOS Menu 13: Smart Fan Mode Configuration

➔ CPU_FAN1 Smart Fan Control [Manual Mode]

Use the **CPU_FAN1 Smart Fan Control** option to configure the CPU Smart Fan.

- ➔ **Manual Mode** **DEFAULT** The fan spins at the speed set in Manual Mode settings.

WAFER-EHL-X6000 SBC

→ Auto Mode

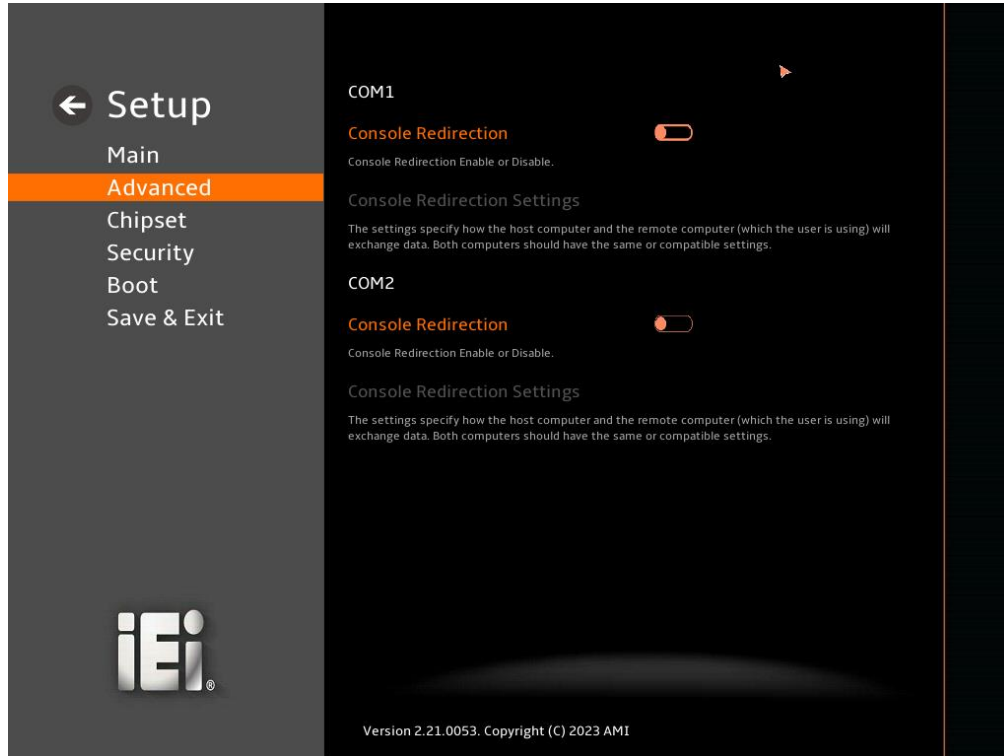
The fan adjusts its speed using Auto Mode settings.

→ Manual Mode PWM

CPU_FAN1 will start work according to this fixed PWM. To set a value, Use the + or – key to change the value or enter a decimal number between 1 and 100.

5.3.6 Serial Port Console Redirection

The **Serial Port Console Redirection** menu (**BIOS Menu 14**) allows the console redirection options to be configured. Console Redirection allows users to maintain a system remotely by re-directing keyboard input and text output through the serial port.



BIOS Menu 14: Serial Port Console Redirection

➔ **Console Redirection [Disabled]**

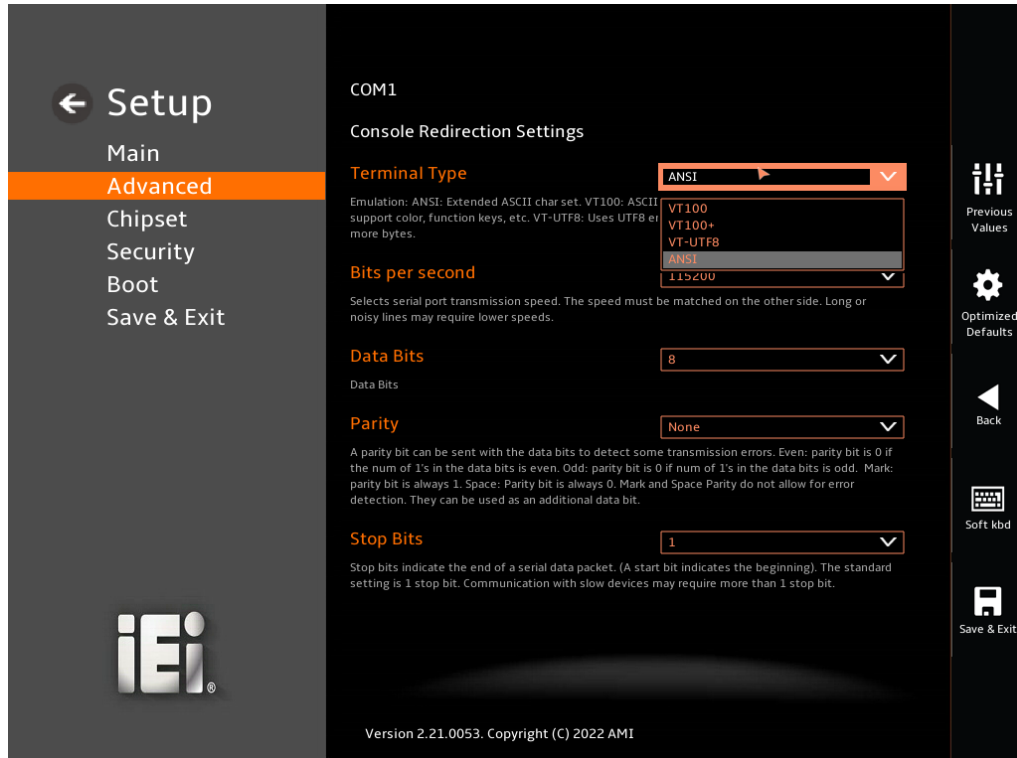
Use **Console Redirection** option to enable or disable the console redirection function.

- ➔ **Disabled** **DEFAULT** Disabled the console redirection function
- ➔ **Enabled** Enabled the console redirection function

The **Console Redirection Settings** submenu will be available when the **Console Redirection** option is enabled.

5.3.6.1 Console Redirection Settings

The following options are available in the **Console Redirection Settings** submenu (**BIOS Menu 15**) when the **COM Console Redirection** (for COM1 to COM6) option is enabled.



BIOS Menu 15: COM Console Redirection Settings

➔ Terminal Type [ANSI]

Use the **Terminal Type** option to specify the remote terminal type.

- ➔ **VT100** The target terminal type is VT100
- ➔ **VT100+** The target terminal type is VT100+
- ➔ **VT-UTF8** The target terminal type is VT-UTF8
- ➔ **ANSI** **DEFAULT** The target terminal type is ANSI

→ Bits per second [115200]

Use the **Bits per second** option to specify the serial port transmission speed. The speed must match on the other side. Long or noisy lines may require lower speeds.

- | | | | |
|---|--------|---------|--|
| → | 9600 | | Sets the serial port transmission speed at 9600. |
| → | 19200 | | Sets the serial port transmission speed at 19200. |
| → | 38400 | | Sets the serial port transmission speed at 38400. |
| → | 57600 | | Sets the serial port transmission speed at 57600. |
| → | 115200 | DEFAULT | Sets the serial port transmission speed at 115200. |

→ Data Bits [8]

Use the **Data Bits** option to specify the number of data bits.

- | | | | |
|---|---|---------|--------------------------|
| → | 7 | | Sets the data bits at 7. |
| → | 8 | DEFAULT | Sets the data bits at 8. |

→ Parity [None]

Use the **Parity** option to specify the parity bit that can be sent with the data bits for detecting the transmission errors.

- | | | | |
|---|-------|---------|---|
| → | None | DEFAULT | No parity bit is sent with the data bits. |
| → | Even | | The parity bit is 0 if the number of ones in the data bits is even. |
| → | Odd | | The parity bit is 0 if the number of ones in the data bits is odd. |
| → | Mark | | The parity bit is always 1. This option does not allow for error detection. |
| → | Space | | The parity bit is always 0. This option does not allow for error detection. |

WAFER-EHL-X6000 SBC

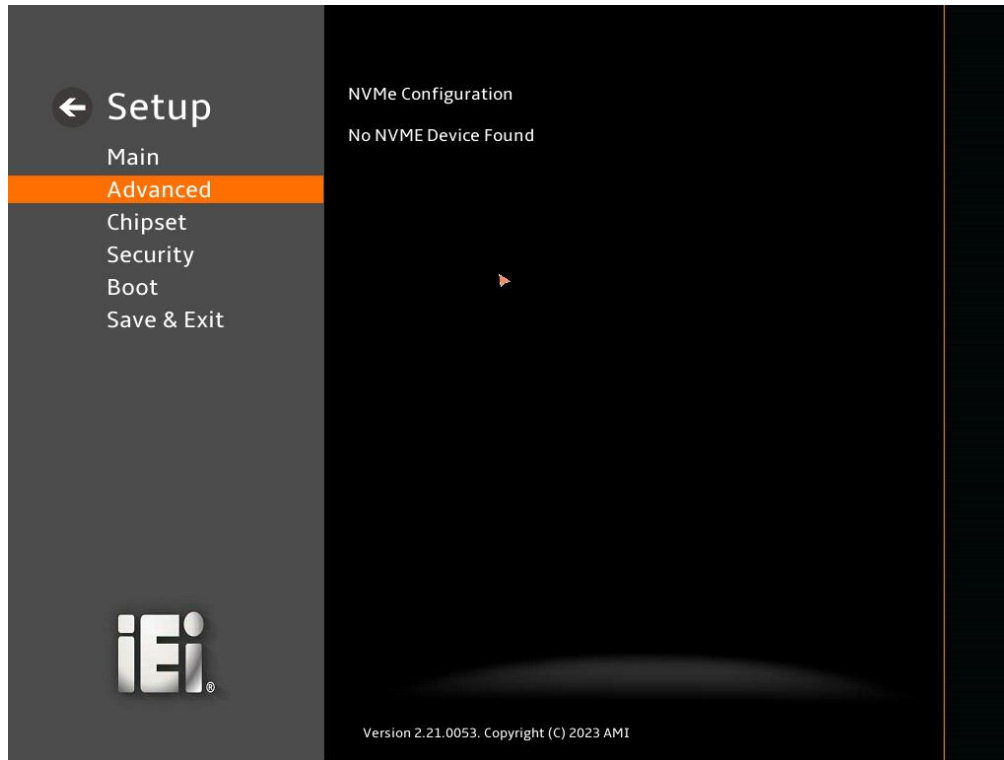
→ Stop Bits [1]

Use the **Stop Bits** option to specify the number of stop bits used to indicate the end of a serial data packet. Communication with slow devices may require more than 1 stop bit.

- | | | |
|-----|---------|------------------------------------|
| → 1 | DEFAULT | Sets the number of stop bits at 1. |
| → 2 | | Sets the number of stop bits at 2. |

5.3.7 NVMe Configuration

Use the **NVMe Configuration (BIOS Menu 16)** menu to display the NVMe controller and device information.



BIOS Menu 16: NVMe Configuration

WAFER-EHL-X6000 SBC

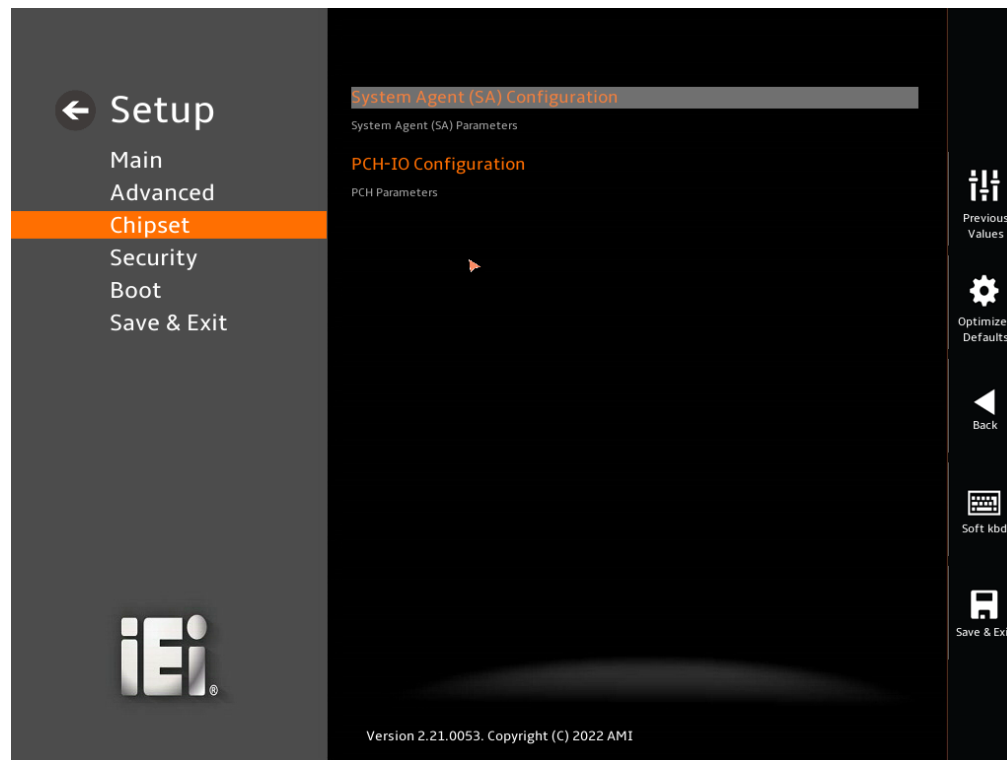
5.4 Chipset

Use the **Chipset** menu (**BIOS Menu 17**) to access the PCH IO and System Agent (SA) configuration menus.



WARNING!

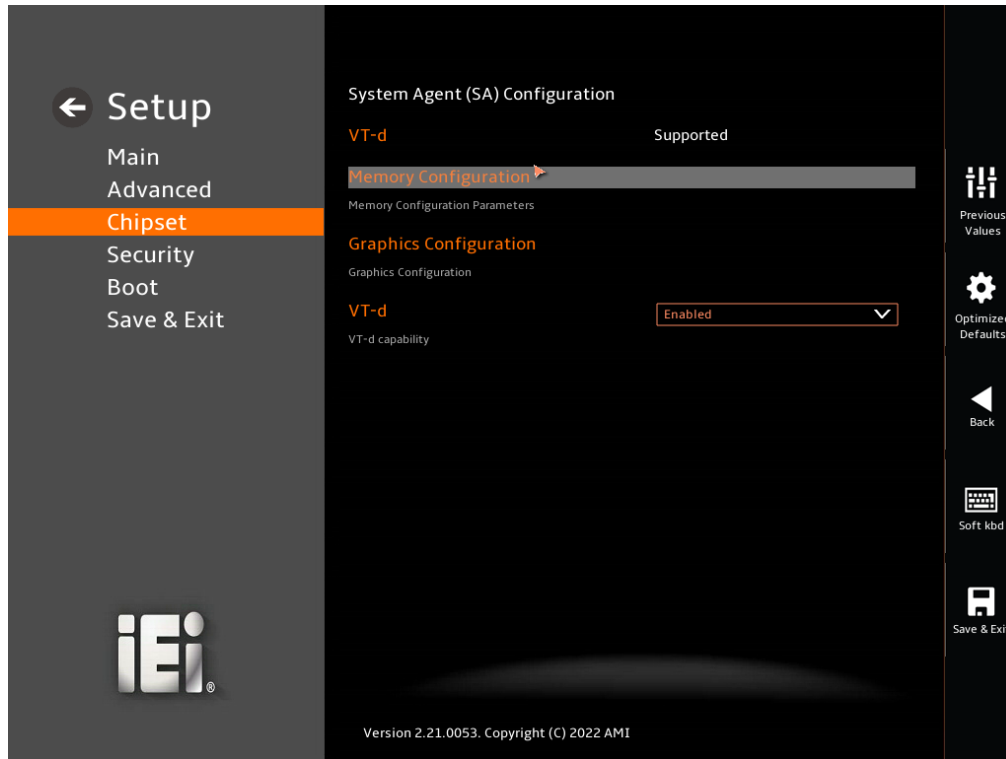
Setting the wrong values for the Chipset BIOS selections in the Chipset BIOS menu may cause the system to malfunction.



BIOS Menu 17: Chipset

5.4.1 System Agent (SA) Configuration

Use the **System Agent (SA) Configuration** menu (**BIOS Menu 18**) to configure the System Agent (SA) parameters.



BIOS Menu 18: System Agent (SA) Configuration

➔ **VT-d [Enabled]**

Use the **VT-d** option to enable or disable the VT-d capability.

- ➔ **Disabled** Disable the VT-d capability
- ➔ **Enabled** **DEFAULT** Enable the VT-d capability

WAFER-EHL-X6000 SBC

5.4.1.1 Memory Configuration

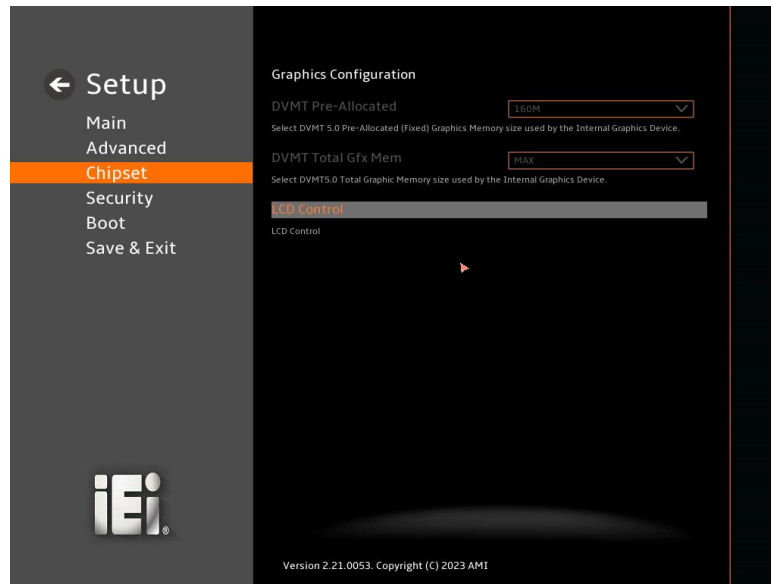
Use the **Memory Configuration** submenu (**BIOS Menu 19**) to view memory information.



BIOS Menu 19: Memory Configuration

5.4.1.2 Graphics Configuration

Use the **Graphics Configuration (BIOS Menu 20)** menu to configure the video device connected to the system.



BIOS Menu 20: Graphics Configuration

→ DVMT Pre-Allocated [160M]

Use the **DVMT Pre-Allocated** option to set the amount of system memory allocated to the integrated graphics processor when the system boots. The system memory allocated can then only be used as graphics memory, and is no longer available to applications or the operating system. Configuration options are listed below:

- 80M
- 160M **Default**

→ DVMT Total Gfx Mem [MAX]

Use the **DVMT Total Gfx Mem** option to select DVMT5.0 total graphic memory size used by the internal graphic device. The following options are available:

- 128M
- 256M
- MAX **Default**

WAFER-EHL-X6000 SBC

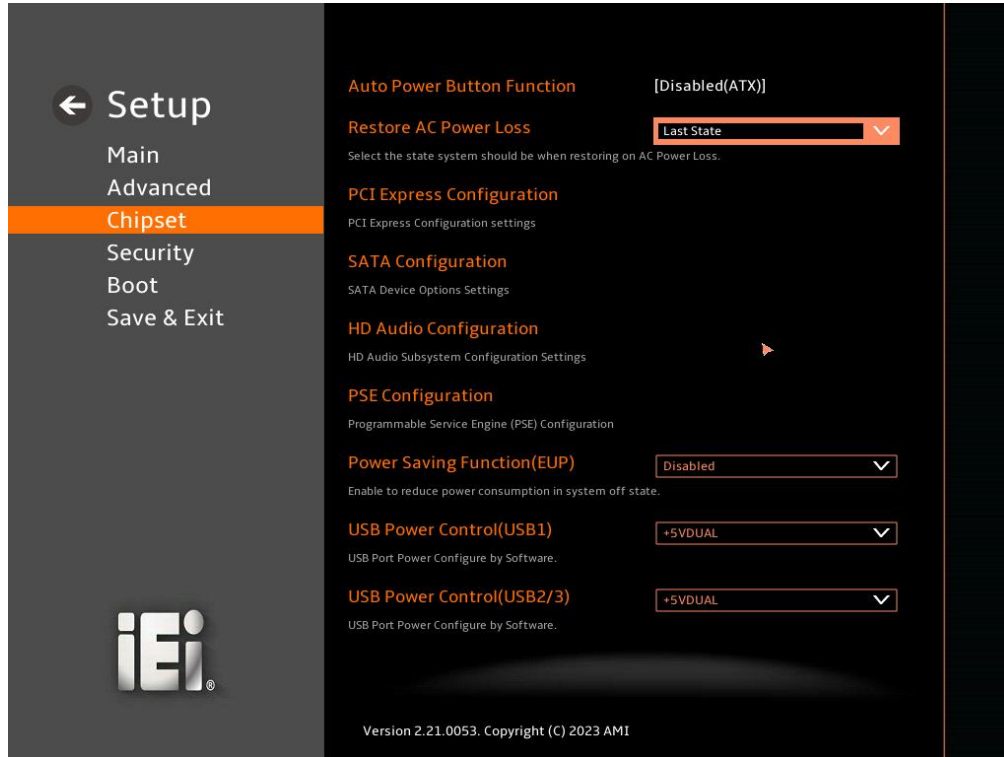
→ LCD Control



BIOS Menu 21: LCD Control

5.4.2 PCH-IO Configuration

Use the **PCH-IO Configuration** menu to configure the PCH parameters.



BIOS Menu 22: PCH-IO Configuration

➔ Auto Power Button Function [Disabled(ATX)]

Use the **Auto Power Button Function** BIOS option to show the power mode state. Use the **J_ATX_AT1** to switch the AT/ATX power mode.

➔ Restore AC Power Loss [Last State]

Use the **Restore AC Power Loss** BIOS option to specify what state the system returns to if there is a sudden loss of power to the system when the power mode is ATX.

- ➔ **Power Off** The system remains turned off
- ➔ **Power On** The system turns on
- ➔ **Last State** **DEFAULT** The system returns to its previous state. If it was on, it turns itself on. If it was off, it remains off.

WAFER-EHL-X6000 SBC

→ Power Saving Function(EUP) [Disabled]

Use the **Power Saving Function(EUP)** BIOS option to enable or disable the power saving function.

- **Disabled** **DEFAULT** Power saving function is disabled.
- **Enabled** Power saving function is enabled. It will reduce power consumption when the system is off.

→ USB Power Control (USB1) [+5V DUAL]

Use the **USB Power Control** BIOS option to configure the USB power source for the corresponding USB connectors (**Figure 5-2**).

- **+5V DUAL** **DEFAULT** Sets the USB power source to +5V dual
- **+5V** Sets the USB power source to +5V

→ USB Power Control (USB2/3) [+5V DUAL]

Use the **USB Power Control** BIOS option to configure the USB power source for the corresponding USB connectors (**Figure 5-2**).

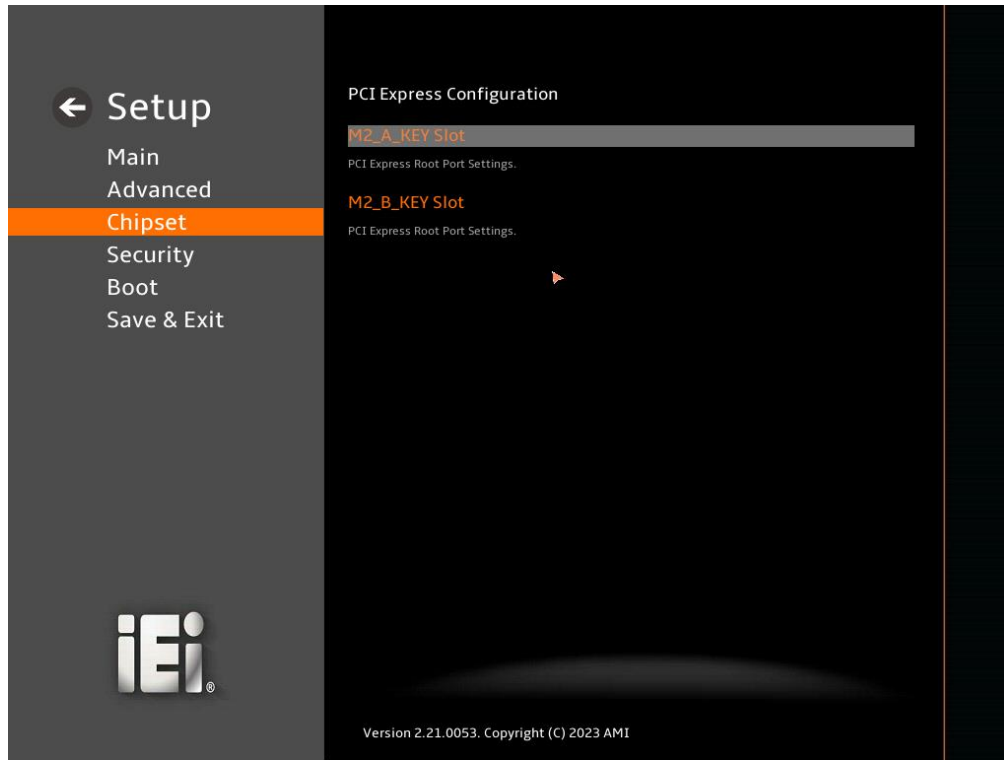
- **+5V DUAL** **DEFAULT** Sets the USB power source to +5V dual
- **+5V** Sets the USB power source to +5V

BIOS Options	Configured USB Ports
USB Power Control (USB1)	USB1 (external USB 3.2 Gen 2 ports)
USB Power Control (USB2/3)	USB2/3 (internal USB 2.0 ports)

Figure 5-2: BIOS Options and Configured USB Ports

5.4.2.1 PCI Express Configuration

Use the **PCI Express Configuration** submenu (**BIOS Menu 23**) to configure the PCI Express slots.

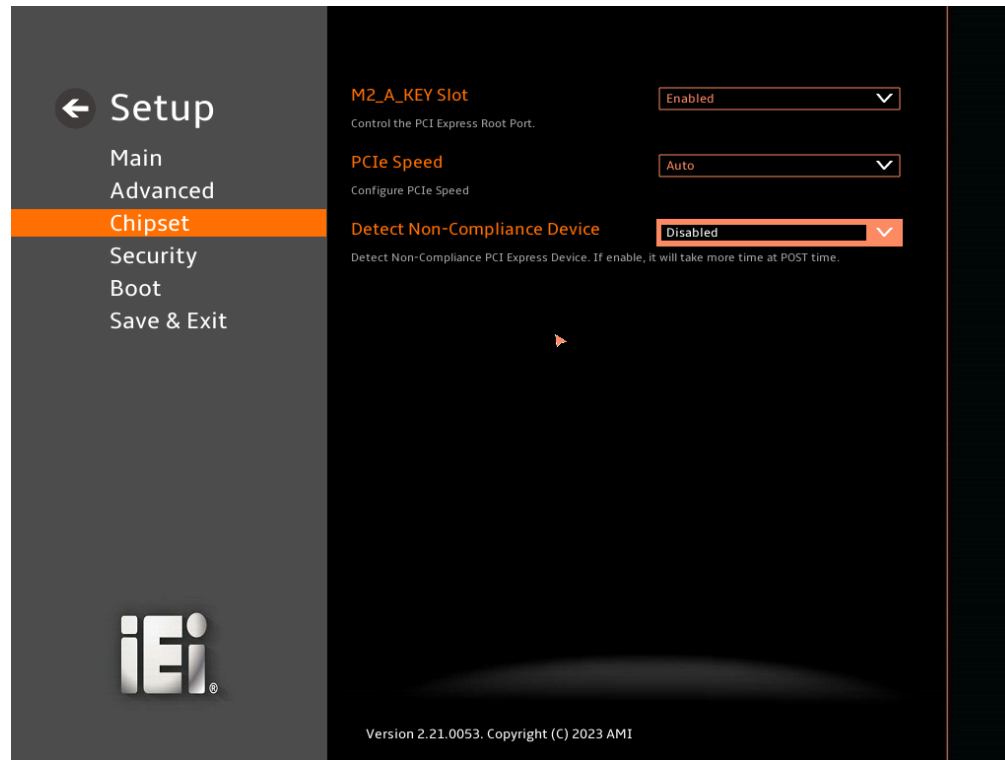


BIOS Menu 23: PCI Express Configuration

WAFER-EHL-X6000 SBC

5.4.2.1.1 M2_A_KEY Slot

Use the **M2_A_KEY Slot** menu (**BIOS Menu 24**) to change and/or set the configuration of the SATA devices installed in the system.



BIOS Menu 24: M.2 A KEY

→ PCIe Speed [Auto]

Use the **PCIe Speed** option to specify the PCI Express port speed. Configuration options are listed below.

- | | | | |
|---|-------------|----------------|-------------------------------|
| → | Auto | DEFAULT | Auto mode. |
| → | Gen1 | | Configure PCIe Speed to Gen1. |
| → | Gen2 | | Configure PCIe Speed to Gen2. |
| → | Gen3 | | Configure PCIe Speed to Gen3. |

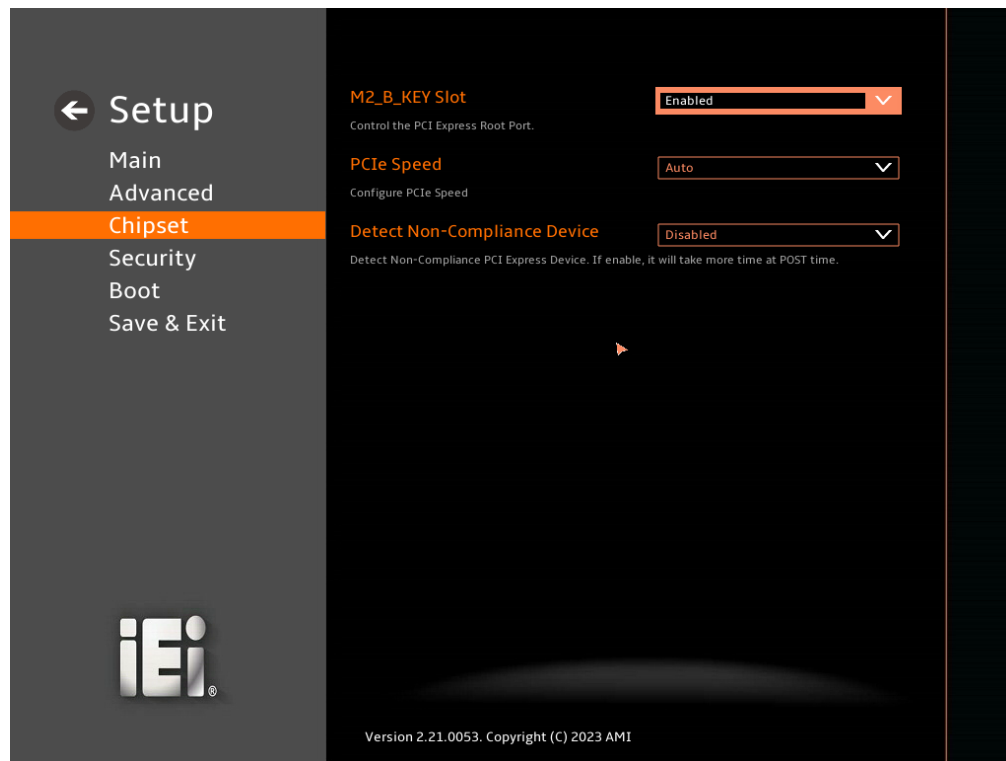
➔ **Detect Non-Compliance Device [Disabled]**

Use the **Detect Non-Compliance Device** option to configure whether to detect if a non-compliance PCI Express device is connected to the PCI Express port.

- ➔ **Disabled** **DEFAULT** Do not detect if a non-compliance PCI Express device is connected to the PCI Express port.
- ➔ **Enabled** Detect if a non-compliance PCI Express device is connected to the PCI Express port.

5.4.2.1.2 M2_B_KEY Slot

Use the **M2_B_KEY** menu (**BIOS Menu 25**) to change and/or set the configuration of the SATA devices installed in the system.



BIOS Menu 25: M.2 M KEY

➔ **PCIe Speed [Auto]**

Use the **PCIe Speed** option to specify the PCI Express port speed. Configuration options are listed below.

WAFER-EHL-X6000 SBC

- | | | | |
|---|-------------|----------------|-------------------------------|
| ➔ | Auto | DEFAULT | Auto mode. |
| ➔ | Gen1 | | Configure PCIe Speed to Gen1. |
| ➔ | Gen2 | | Configure PCIe Speed to Gen2. |
| ➔ | Gen3 | | Configure PCIe Speed to Gen3. |

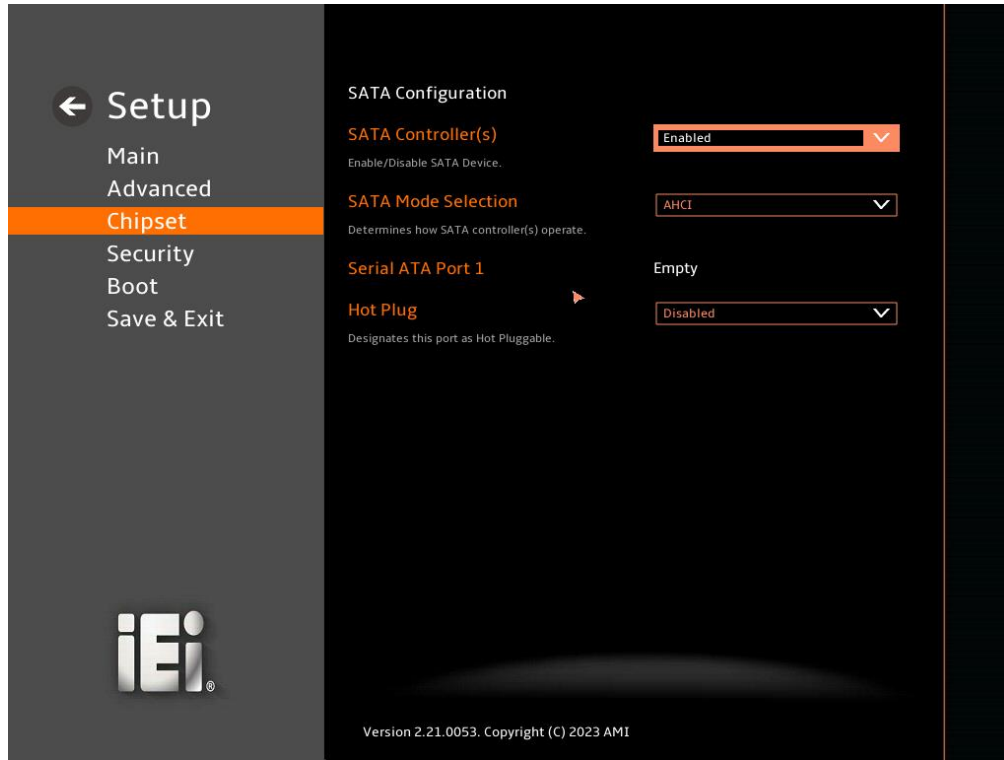
➔ Detect Non-Compliance Device [Disabled]

Use the **Detect Non-Compliance Device** option to configure whether to detect if a non-compliance PCI Express device is connected to the PCI Express port.

- | | | | |
|---|-----------------|----------------|--|
| ➔ | Disabled | DEFAULT | Do not detect if a non-compliance PCI Express device is connected to the PCI Express port. |
| ➔ | Enabled | | Detect if a non-compliance PCI Express device is connected to the PCI Express port. |

5.4.2.2 SATA Configuration

Use the **SATA Configuration** menu (**BIOS Menu 26**) to change and/or set the configuration of the SATA devices installed in the system.



BIOS Menu 26: SATA Configuration

➔ SATA Controller(s) [Enabled]

Use the **SATA Controller(s)** option to configure the SATA controller(s).

- ➔ **Enabled** **DEFAULT** Enables the on-board SATA controller(s).
- ➔ **Disabled** Disables the on-board SATA controller(s).

➔ SATA Mode Selection [AHCI]

Use the **SATA Mode Selection** option to determine how the SATA devices operate.

- ➔ **AHCI** **DEFAULT** Configures SATA devices as AHCI device.

WAFER-EHL-X6000 SBC

→ **Intel RST
Premium
With Intel
Optane
System
Acceleration**

Configures SATA devices to the Intel RST Premium With Intel Optane System Acceleration mode.

→ **Hot Plug [Disabled]**

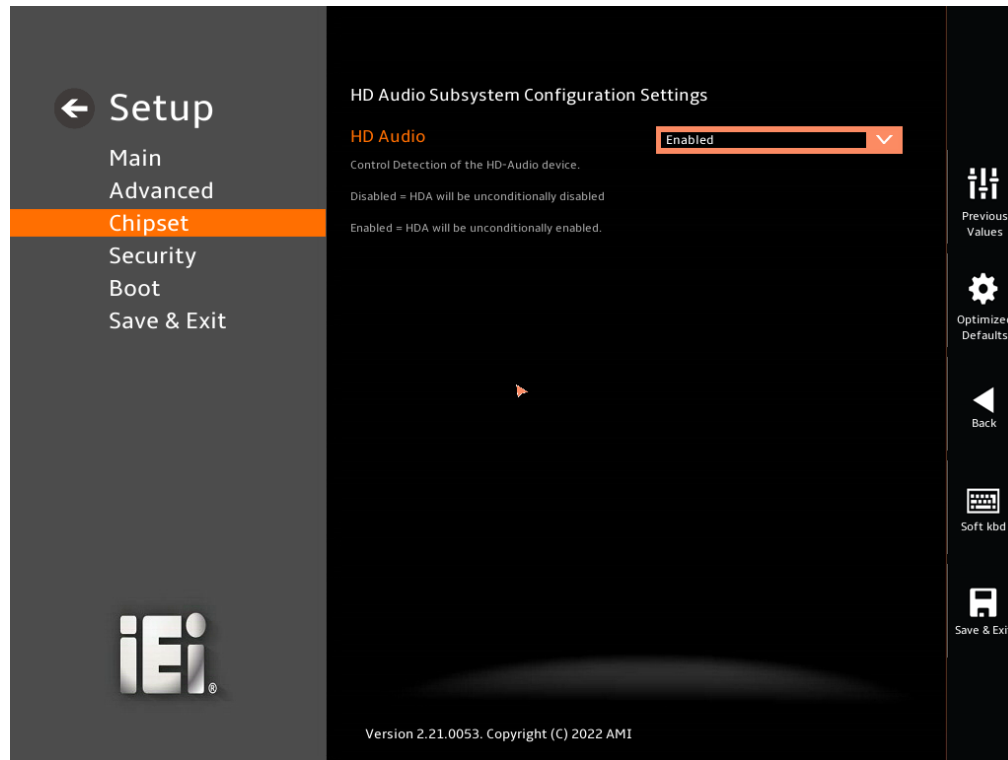
Use the **Hot Plug** option (for S_ATA1 and M2_SSD1) to designate the correspondent port as hot-pluggable.

→ **Disabled** **DEFAULT** Disables the hot-pluggable function of the SATA/M.2 M key port.

→ **Enabled** Designates the SATA/M.2 M key port as hot-pluggable.

5.4.2.3 HD Audio Configuration

Use the **HD Audio Configuration** menu (**BIOS Menu 27**) to configure the PCH Azalia settings.



BIOS Menu 27: HD Audio Configuration

→ HD Audio [Auto]

Use the **HD Audio** option to enable or disable the High Definition Audio controller.

- **Disabled** The onboard High Definition Audio controller is disabled.
- **Enabled** **DEFAULT** The onboard High Definition Audio controller is enabled.

WAFER-EHL-X6000 SBC

5.5 Security

Use the **Security** menu (**BIOS Menu 28**) to set system and user passwords.



BIOS Menu 28: Security

→ Administrator Password

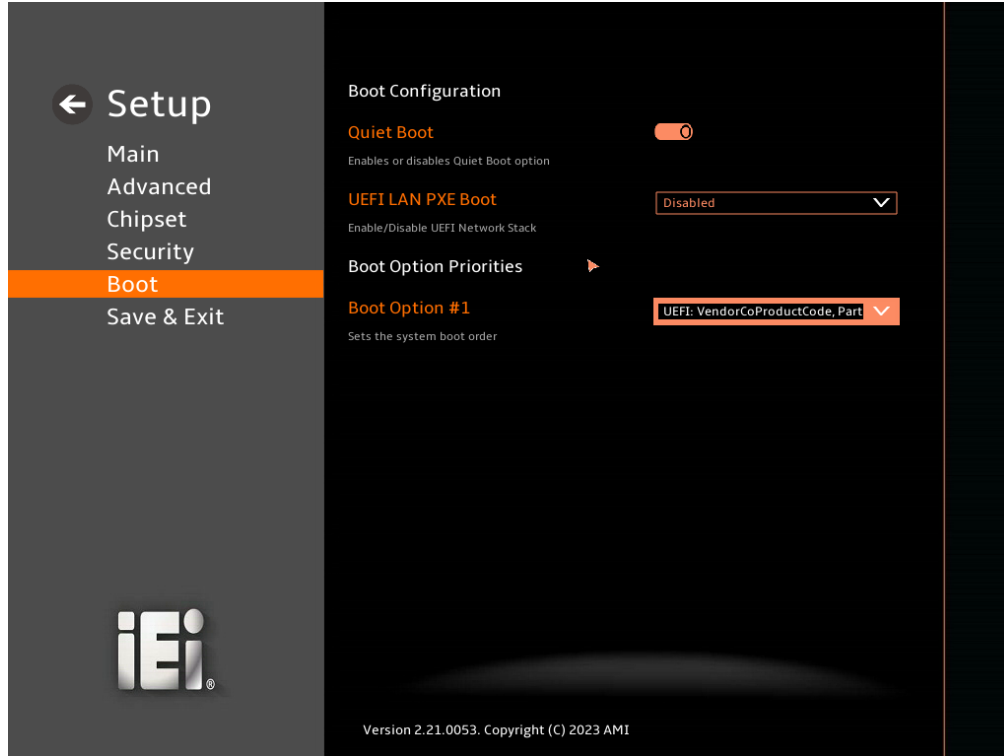
Use the **Administrator Password** to set or change a administrator password.

→ User Password

Use the **User Password** to set or change a user password.

5.6 Boot

Use the **Boot** menu (**BIOS Menu 29**) to configure system boot options.



BIOS Menu 29: Boot

5.6.1 Boot Configuration

→ Quiet Boot [Enabled]

Use the **Quiet Boot** BIOS option to select the screen display when the system boots.

- **Disabled** Normal POST messages displayed
- **Enabled** **DEFAULT** OEM Logo displayed instead of POST messages

5.6.2 Boot Option Priorities

Use the Boot Option # N to choose the system boots from the peripherals you selected

The following Boot Options are listed as an example.

WAFER-EHL-X6000 SBC

→ Boot Option #1

Sets the system boot order **ADATA SP580** as the first priority.

- **Windows Boot Manager (P1: ADATA SSD SP580 240GB)**
- **Disabled**

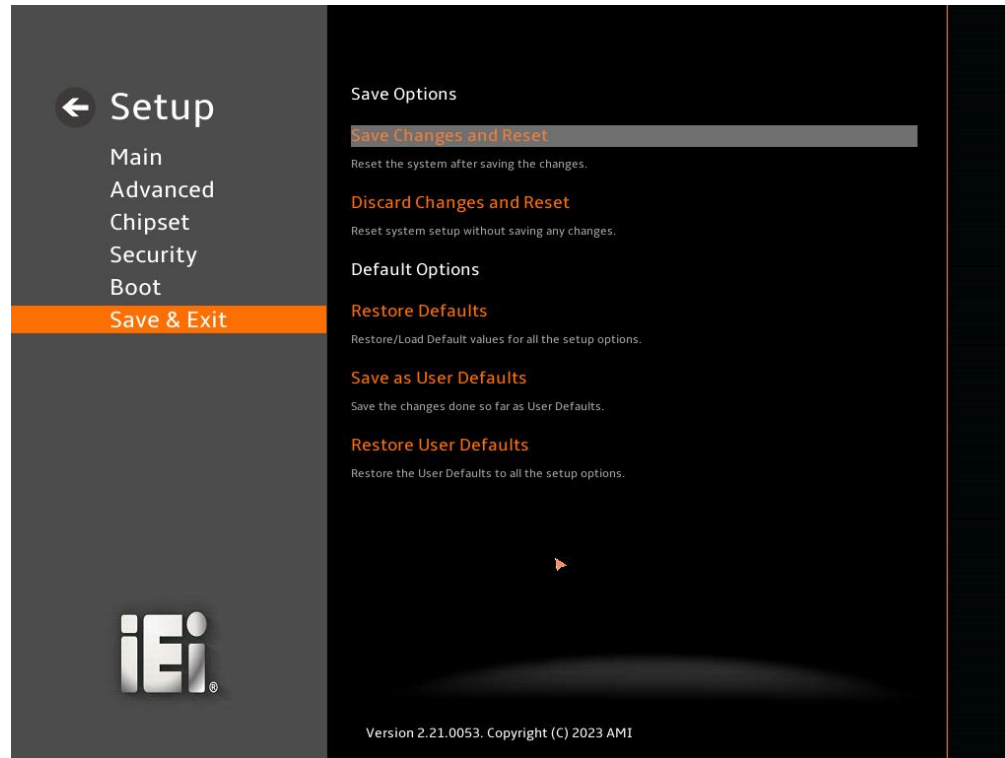
→ Boot Option #2

Sets the system boot order **USB Partition 1** as the second priority.

- **UEFI: USB, Partition 1**
- **Disabled**

5.7 Save & Exit

Use the **Save & Exit** menu (**BIOS Menu 30**) to load default BIOS values, optimal failsafe values and to save configuration changes.



BIOS Menu 30: Save & Exit

→ Save Changes and Reset

Use the **Save Changes and Reset** option to save the changes made to the BIOS options and reset the system.

→ Discard Changes and Reset

Use the **Discard Changes and Reset** option to exit the system without saving the changes made to the BIOS configuration setup program.

→ Restore Defaults

Use the **Restore Defaults** option to load the optimal default values for each of the parameters on the Setup menus. **F3 key can be used for this operation.**

WAFER-EHL-X6000 SBC

→ Save as User Defaults

Use the **Save as User Defaults** option to save the changes done so far as user defaults.

→ Restore User Defaults

Use the **Restore User Defaults** option to restore the user defaults to all the setup options.

Appendix

A

Regulatory Compliance

DECLARATION OF CONFORMITY



This equipment has been tested and found to comply with specifications for CE marking. If the user modifies and/or installs other devices in the equipment, the CE conformity declaration may no longer apply.

FCC WARNING



This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

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.

Appendix

B

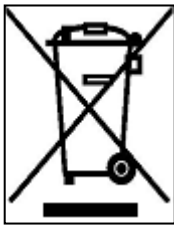
Product Disposal

WAFER-EHL-X6000 SBC**CAUTION:**

Risk of explosion if battery is replaced by an incorrect type. Only certified engineers should replace the on-board battery.

Dispose of used batteries according to instructions and local regulations.

- Outside the European Union–If you wish to dispose of used electrical and electronic products outside the European Union, please contact your local authority so as to comply with the correct disposal method.
- Within the European Union–The device that produces less waste and is easier to recycle is classified as electronic device in terms of the European Directive 2012/19/EU (WEEE), and must not be disposed of as domestic garbage.



EU-wide legislation, as implemented in each Member State, requires that waste electrical and electronic products carrying the mark (left) must be disposed of separately from normal household waste. This includes monitors and electrical accessories, such as signal cables or power cords. When you need to dispose of your device, please follow the guidance of your local authority, or ask the shop where you purchased the product. The mark on electrical and electronic products only applies to the current European Union Member States.

Please follow the national guidelines for electrical and electronic product disposal.

Appendix

C

BIOS Options

WAFER-EHL-X6000 SBC

Below is a list of BIOS configuration options in the BIOS chapter.

➔ BIOS Information	62
➔ Compute Die Information	62
➔ PCH Information.....	63
➔ System Date [xx/xx/xx]	63
➔ System Time [xx:xx:xx]	63
➔ Intel (VMX) Virtualization Technology [Enabled]	66
➔ Active Processor Cores [All]	66
➔ EIST [Enable]	67
➔ C states [Disabled].....	67
➔ Tcc Activation Offset [0].....	67
➔ Turbo Mode [Enabled]	67
➔ Power Limit 1	67
➔ Power Limit 1 Time Window	68
➔ Power Limit 2.....	68
➔ TPM Support [Enable]	69
➔ Pending Operation [None]	69
➔ Wake system with Fixed Time [Disable].....	71
➔ Serial Port [Enabled].....	72
➔ Device Settings	72
➔ Device Mode	73
➔ Serial Port [Enabled].....	73
➔ Device Settings	74
➔ Device Mode	74
➔ PC Health Status	75
➔ CPU_FAN1 Smart Fan Control [Manual Mode]	76
➔ Manual Mode PWM	77
➔ Console Redirection [Disabled].....	78
➔ Terminal Type [ANSI].....	79
➔ Bits per second [115200].....	80
➔ Data Bits [8]	80
➔ Parity [None].....	80
➔ Stop Bits [1]	81
➔ VT-d [Enabled].....	84

→ DVMT Pre-Allocated [160M]	86
→ DVMT Total Gfx Mem [MAX].....	86
→ LCD Control	87
→ Auto Power Button Function [Disabled(ATX)]	88
→ Restore AC Power Loss [Last State]	88
→ Power Saving Function(EUP) [Disabled]	89
→ USB Power Control (USB1) [+5V DUAL].....	89
→ USB Power Control (USB2/3) [+5V DUAL].....	89
→ PCIe Speed [Auto].....	91
→ Detect Non-Compliance Device [Disabled]	92
→ PCIe Speed [Auto].....	92
→ Detect Non-Compliance Device [Disabled]	93
→ SATA Controller(s) [Enabled]	94
→ SATA Mode Selection [AHCI].....	94
→ Hot Plug [Disabled]	95
→ HD Audio [Auto].....	96
→ Administrator Password	97
→ User Password	97
→ Quiet Boot [Enabled]	98
→ Boot Option #1	99
→ Boot Option #2	99
→ Save Changes and Reset	100
→ Discard Changes and Reset	100
→ Restore Defaults	100
→ Save as User Defaults	101
→ Restore User Defaults	101

Appendix

D

Watchdog Timer



NOTE:

The following discussion applies to DOS environment. Contact IEI support or visit the IEI website for specific drivers for other operating systems.

The Watchdog Timer is provided to ensure that standalone systems can always recover from catastrophic conditions that cause the CPU to crash. This condition may have occurred by external EMIs or a software bug. When the CPU stops working correctly, Watchdog Timer either performs a hardware reset (cold boot) or a Non-Maskable Interrupt (NMI) to bring the system back to a known state.

A BIOS function call (INT 15H) is used to control the Watchdog Timer.

INT 15H:

AH – 6FH Sub-function:	
AL – 2:	Sets the Watchdog Timer’s period.
BL:	Time-out value (Its unit-second is dependent on the item “Watchdog Timer unit select” in CMOS setup).

Table D-1: AH-6FH Sub-function

Call sub-function 2 to set the time-out period of Watchdog Timer first. If the time-out value is not zero, the Watchdog Timer starts counting down. When the timer value reaches zero, the system resets. To ensure that this reset condition does not occur, calling sub-function 2 must periodically refresh the Watchdog Timer. However, the watchdog timer is disabled if the time-out value is set to zero.

A tolerance of at least 10% must be maintained to avoid unknown routines within the operating system (DOS), such as disk I/O that can be very time-consuming.

WAFER-EHL-X6000 SBC



NOTE:

When exiting a program it is necessary to disable the Watchdog Timer, otherwise the system resets.

EXAMPLE PROGRAM:

; INITIAL TIMER PERIOD COUNTER

;

W_LOOP:

;

```

MOV     AX, 6F02H      ;setting the time-out value
MOV     BL, 30         ;time-out value is 48 seconds
INT     15H

```

;

; ADD THE APPLICATION PROGRAM HERE

;

```

CMP     EXIT_AP, 1     ;is the application over?
JNE     W_LOOP        ;No, restart the application

```

```

MOV     AX, 6F02H      ;disable Watchdog Timer
MOV     BL, 0         ;
INT     15H

```

;

; EXIT ;

Appendix

E

Error Beep Code

WAFER-EHL-X6000 SBC

E.1 PEI Beep Codes

Number of Beeps	Description
4	Memory not Installed
1	Memory was installed twice (InstallPeiMemory routine in PEI Core called twice)
2	Recovery started
3	DXE IPL was not found
3	DXE Core Firmware Volume was not found
4	Recovery failed
4	S3 Resume failed
7	Reset PPI is not available

E.2 DXE Beep Codes

Number of Beeps	Description
1	Invalid password
4	Some of the Architectural Protocols are not available
5	No Console Output Devices are found
5	No Console Input Devices are found
6	Flash update is failed
7	Reset protocol is not available
8	Platform PCI resource requirements cannot be met



NOTE:

If you have any question, please contact IEI for further assistance.

Appendix

F

Hazardous Materials Disclosure

WAFER-EHL-X6000 SBC

F.1 RoHS II Directive (2015/863/EU)

The details provided in this appendix are to ensure that the product is compliant with the RoHS II Directive (2015/863/EU). The table below acknowledges the presences of small quantities of certain substances in the product, and is applicable to RoHS II Directive (2015/863/EU).

Please refer to the following table.

Part Name	Toxic or Hazardous Substances and Elements									
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (CR(VI))	Polybrominated Biphenyls	Polybrominated Diphenyl Ethers	Bis(2-ethylhexyl) phthalate	Butyl benzyl phthalate (BBP)	Dibutyl phthalate (DBP)	Diisobutyl phthalate (DIBP)
Housing	O	O	O	O	O	O	O	O	O	O
Printed Circuit Board	O	O	O	O	O	O	O	O	O	O
Metal Fasteners	O	O	O	O	O	O	O	O	O	O
Cable Assembly	O	O	O	O	O	O	O	O	O	O
Fan Assembly	O	O	O	O	O	O	O	O	O	O
Power Supply Assemblies	O	O	O	O	O	O	O	O	O	O
Battery	O	O	O	O	O	O	O	O	O	O
<p>O: This toxic or hazardous substance is contained in all of the homogeneous materials for the part is below the limit requirement in Directive (EU) 2015/863.</p> <p>X: This toxic or hazardous substance is contained in at least one of the homogeneous materials for this part is above the limit requirement in Directive (EU) 2015/863.</p>										

F.2 China RoHS

此附件旨在确保本产品符合中国 RoHS 标准。以下表格标示此产品中某有毒物质的含量符合中国 RoHS 标准规定的限量要求。

本产品上会附有“环境友好使用期限”的标签，此期限是估算这些物质“不会有泄漏或突变”的年限。本产品可能包含有较短的环境友好使用期限的可替换元件，像是电池或灯管，这些元件将会单独标示出来。

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (CR(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
壳体	○	○	○	○	○	○
印刷电路板	○	○	○	○	○	○
金属螺帽	○	○	○	○	○	○
电缆组装	○	○	○	○	○	○
风扇组装	○	○	○	○	○	○
电力供应组装	○	○	○	○	○	○
电池	○	○	○	○	○	○

O: 表示该有毒有害物质在该部件所有物质材料中的含量均在 SJ/T11364-2014 與 GB/T26572-2011 标准规定的限量要求以下。

X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11364-2014 與 GB/T26572-2011 标准规定的限量要求。