



MODEL:
WAFER-EHL2

3.5" SBC supports Intel® Celeron® J6412 on-board SoC with 8GB LPDDR4x memory on board default, dual display with HDMI and iDPM slot, dual 2.5 GbE, USB 3.2 Gen 2, M.2, SATA 6Gb/s, 6 COM, iAUDIO,

User Manual

Revision

Date	Version	Changes
October 27, 2023	1.00	Initial release

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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

REVISION	I
1 INTRODUCTION	1
1.1 INTRODUCTION.....	2
1.2 FEATURES.....	3
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-EHL2 Layout.....	13
3.1.2 Peripheral Interface Connectors	13
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 DNX Mode Setting Jumper	18
3.2.4 Flash Descriptor Override Setting Jumper.....	19
3.2.5 Internal Audio Connector	20
3.2.6 ATX 12V Power Connector.....	21
3.2.7 RTC Battery Connector.....	22
3.2.8 Buzzer Connector.....	23
3.2.9 Chassis status connector.....	24
3.2.10 Digital Input/Output Connector.....	25
3.2.11 Fan Connector.....	26

3.2.12 Power LED & HDD LED Connector	28
3.2.13 Power Button Connector.....	29
3.2.14 Reset Button Connector	30
3.2.15 RS-232 Serial Port Connector	31
3.2.16 RS-232/422/485 serial port connectors	32
3.2.17 SATA 6Gb/s Drive Connector	33
3.2.18 SATA Power Connector.....	34
3.2.19 I ² C Connector	35
3.2.20 SMBus Connector	36
3.2.21 Flash SPI ROM Connector	37
3.2.22 EC Debug Connector	38
3.2.23 Internal USB 2.0 Connectors.....	39
3.2.24 M.2 A-key Slot.....	40
3.2.25 M.2 B-key Slot.....	42
3.2.26 SIM Card Slot.....	44
3.3 EXTERNAL PERIPHERAL INTERFACE CONNECTOR PANEL	45
3.3.1 External 2.5GbE RJ-45 Connectors	45
3.3.2 External DP Connector.....	46
3.3.3 External HDMI Connectors.....	47
3.3.4 External USB 3.2 Gen 2 Connectors	48
4 INSTALLATION	49
4.1 ANTI-STATIC PRECAUTIONS.....	50
4.2 INSTALLATION CONSIDERATIONS.....	51
4.3 M.2 MODULE INSTALLATION.....	52
4.4 CHASSIS INSTALLATION.....	53
4.4.1 Heat Spreader	53
4.4.2 Motherboard Installation.....	55
4.5 RISER CARD INSTALLATION.....	56
4.6 INTERNAL PERIPHERAL DEVICE CONNECTIONS.....	58
4.6.1 AT Power Connection	58
4.6.2 7.1 Channel Audio Kit Installation	59
4.6.3 SATA Drive Connection	60
4.7 SOFTWARE DRIVERS.....	62
4.7.1 Available Drivers	62

WAFER-EHL2 SBC

4.7.2 Driver Download	62
5 BIOS	64
5.1 INTRODUCTION.....	65
5.1.1 Starting Setup.....	65
5.1.2 Using Setup	66
5.1.2.1 Keyboard Navigation	66
5.1.2.2 Touch Navigation	67
5.1.3 Getting Help.....	68
5.1.4 Unable to Reboot after Configuration Changes	68
5.1.5 BIOS Menu Bar.....	68
5.2 MAIN.....	69
5.3 ADVANCED.....	73
5.3.1 CPU Configuration	74
5.3.2 Trusted Computing.....	79
5.3.3 F81804 Super IO Configuration	80
5.3.3.1 Serial Port 1 Configuration	81
5.3.3.2 Serial Port 2 Configuration	82
5.3.3.3 Serial Port 3 Configuration	83
5.3.3.4 Serial Port 4 Configuration	85
5.3.3.5 Serial Port 5 Configuration	86
5.3.3.6 Serial Port 6 Configuration Menu.....	88
5.3.4 ENE KB9068 Monitor.....	90
5.3.4.1 Smart Fan Mode Configuration	91
5.3.5 Serial Port Console Redirection	92
5.3.5.1 Console Redirection Settings.....	93
5.3.6 NVMe Configuration.....	96
5.4 CHIPSET	97
5.4.1 System Agent (SA) Configuration	98
5.4.1.1 Memory Configuration	99
5.4.1.2 Graphics Configuration.....	100
5.4.2 PCH-IO Configuration	103
5.4.2.1 PCI Express Configuration	106
5.4.2.1.1 PCIe Root Port Setting.....	106
5.4.2.1.2 M2_A_KEY Slot.....	108

5.4.2.1.3 M2_B_KEY Slot.....	110
5.4.2.2 SATA Configuration.....	112
5.4.2.3 HD Audio Configuration.....	114
5.5 SECURITY.....	115
5.6 BOOT.....	116
5.6.1 Boot Configuration	116
5.6.2 Boot Option Priorities.....	117
5.7 SAVE & EXIT	118
A REGULATORY COMPLIANCE	120
B PRODUCT DISPOSAL	122
C BIOS OPTIONS	124
D WATCHDOG TIMER	128
E ERROR BEEP CODE.....	131
E.1 PEI BEEP CODES.....	132
E.2 DXE BEEP CODES	132
F HAZARDOUS MATERIALS DISCLOSURE.....	133
F.1 RoHS II DIRECTIVE (2015/863/EU)	134
F.2 CHINA RoHS.....	135

List of Figures

Figure 1-1: WAFER-EHL2.....	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: DNX Mode Setting Jumper Location	18
Figure 3-5: Flash Descriptor Override Setting Jumper Locations	19
Figure 3-6: Audio Connector Location	20
Figure 3-7: ATX 12V Power Connector Location.....	21
Figure 3-8: Battery Connector Location.....	23
Figure 3-9: Buzzer Connector Location	24
Figure 3-10 Chassis Open Connector Location	25
Figure 3-11: Digital I/O Connector Location	26
Figure 3-12: Fan Connector Location.....	27
Figure 3-13: Power LED & HDD LED Connector Location	28
Figure 3-14: Power Button Connector Location	29
Figure 3-15: Reset Button Connector Location.....	30
Figure 3-16: RS-232 Serial Port Connector Location.....	31
Figure 3-17 RS-232/422/485 Serial Port Connector Location	32
Figure 3-18: SATA 6Gb/s Drive Connectors Location	33
Figure 3-19: SATA Power Connector Location	34
Figure 3-20: I ² C Connector Location	35
Figure 3-21: SMBus Connector Location	36
Figure 3-22: Flash SPI ROM Connector Location.....	37
Figure 3-23: EC Debug Connector Location.....	38
Figure 3-24: Internal USB 2.0 Connectors Locations	39
Figure 3-25: M.2 A-key Slot Location.....	40
Figure 3-26: M.2 B-key Slot Location.....	42
Figure 3-27: SIM Card Slot Location.....	44

Figure 3-28: External Peripheral Interface Connector	45
Figure 3-29: LAN LED Location.....	46
Figure 3-30: External DP Connector Pinouts.....	47
Figure 3-31: External HDMI Connector Location.....	47
Figure 3-32: External USB 3.2 Gen 2 Connectors Location	48
Figure 4-1: Inserting The M.2 Module Into The Slot At An Angle.....	52
Figure 4-2: Securing The M.2 Module.....	53
Figure 4-3 Heat Sink Retention Screws.....	54
Figure 4-4 Passive Cooling.....	54
Figure 4-5 Active Cooling	54
Figure 4-6: DRPC-W-EHL22-R10 Figure 4-7: DRPC-W-EHL22-R10 with Extra Fan Cooling	55
Figure 4-8: Motherboard Installation Example	56
Figure 4-9:Outwards Riser Card Installation Example Figure 4-10: NWR-L2S-R10.....	56
Figure 4-11: Inwards Riser Card Installation Example Figure 4-12: NWR-R2S-R10.....	57
Figure 4-13:L-shaped Bracket Installation Example	57
Figure 4-14: Power Cable to Motherboard Connection	58
Figure 4-15: Connect Power Cable to Power Supply.....	59
Figure 4-16: 7.1 Channel Audio Kit	60
Figure 4-17: SATA Drive Cable Connection.....	61
Figure 4-18: IEI Resource Download Center.....	62
Figure 5-1: BIOS Starting Menu	65
Figure 5-2: BIOS Options and Configured USB Ports	105

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	15
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: DNX Mode setting Jumper Pinouts.....	18
Table 3-6: Flash Descriptor Override Setting Jumper Pinouts.....	19
Table 3-7: Audio Connector Pinouts	21
Table 3-8: ATX 12V Power Connector Pinouts	21
Table 3-9: Battery Connector Pinouts	23
Table 3-10: Buzzer Connector Pinouts.....	24
Table 3-11 Chassis Status Connector Pinouts.....	25
Table 3-12: Digital I/O Connector Pinouts.....	26
Table 3-13: Fan Connector Pinouts	27
Table 3-14: Power LED & HDD LED Connector Pinouts.....	28
Table 3-15: Power Button Connector Pinouts	29
Table 3-16: Reset Button Connector Pinout	30
Table 3-17: RS-232 Serial Port Connector Pinouts	31
Table 3-18 RS-232/422/485 Serial Port Connector Pinouts	32
Table 3-19: SATA 6Gb/s Drive Connectors Pinouts.....	33
Table 3-20: SATA Power Connector Pinouts.....	34
Table 3-21: I ² C Connector Pinouts	35
Table 3-22: SMBus Connector Pinouts	36
Table 3-23: Flash SPI ROM Connector Pinouts.....	37
Table 3-24: EC Debug Connector Pinouts	38
Table 3-25: Internal USB 2.0 Connectors Pinouts.....	39
Table 3-26: M.2 A-Key Slot Pinouts	41
Table 3-27: M. 2 B-key Slot Pinouts.....	43
Table 3-28: SIM Card Slot Pinouts	44

Table 3-29: External 2.5GbE RJ-45 Connectors Pinouts	45
Table 3-30: LAN LED Pinouts	46
Table 3-31: External DisplayPort Connector Location	46
Table 3-32: External HDMI Connector Pinouts	47
Table 3-33: External USB 3.2 Gen 2 Connectors Pinouts	48
Table 5-1: BIOS Navigation Keys	66
Table 5-2: BIOS On-screen Navigation Keys	67

Chapter

1

Introduction

1.1 Introduction

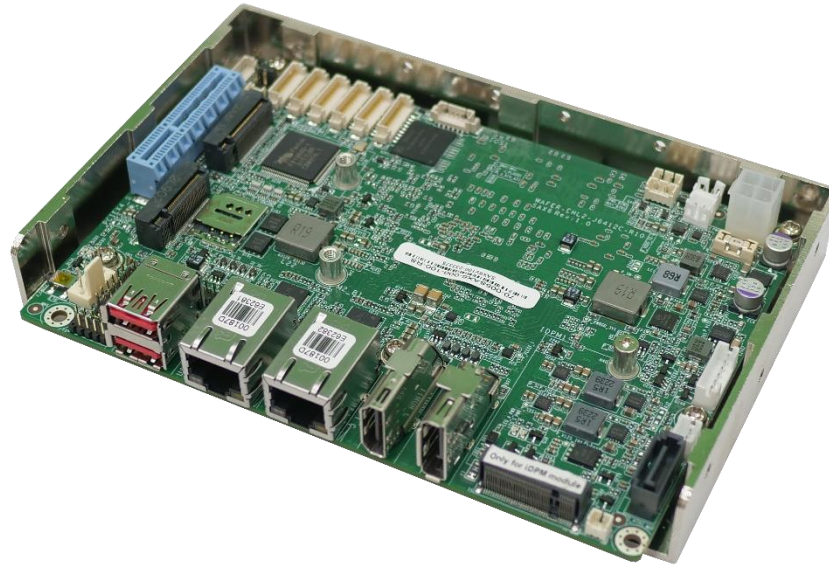


Figure 1-1: WAFER-EHL2

The WAFER-EHL2 is a 3.5" industrial motherboard equipped with an Intel® Celeron® J6412 quad-core Elkhart Lake processor supporting 4 cores, turbo up-to 2.60 GHz with 1.5M cache, and supports onboard LPDDR4x-3200MHz with 8 GB memory, up to 16GB.

The WAFER-EHL2 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, one M.2 B-key slot with SIM holder for 5G module or NVMe storage expansions and one PCIe x4 slot with x2 signal for installing riser card. Two USB 3.2 Gen 2 connectors on the rear panel, four USB 2.0 connectors by pin header and one SATA 6Gb/s connector. Serial device connectivity is provided by two internal RS-232/422/485 connectors and four RS-232 connectors. Two RJ-45 2.5GbE connectors provide the system with smooth connections to an external LAN.

WAFER-EHL2 SBC

1.2 Features

Some of the WAFER-EHL2 motherboard features are listed below:

- Intel® 10nm Celeron® J6412 On-board SoC, 4 cores and 4 threads, base frequency 2.00GHz, turbo frequency up to 2.60GHz, 1.5MB cache
- Two Intel® I225V 2.5GbE ports
- Two USB 3.2 Gen 2, four USB 2.0, two RS-232/422/485 and four RS-232
- M.2 A key, M.2 B key and PCIe x4 slot (x2 signal) expansions
- Support triple independent display via HDMI, DP and IEI iDPM

1.3 Connectors

The connectors on the WAFER-EHL2 are shown in the figure below.

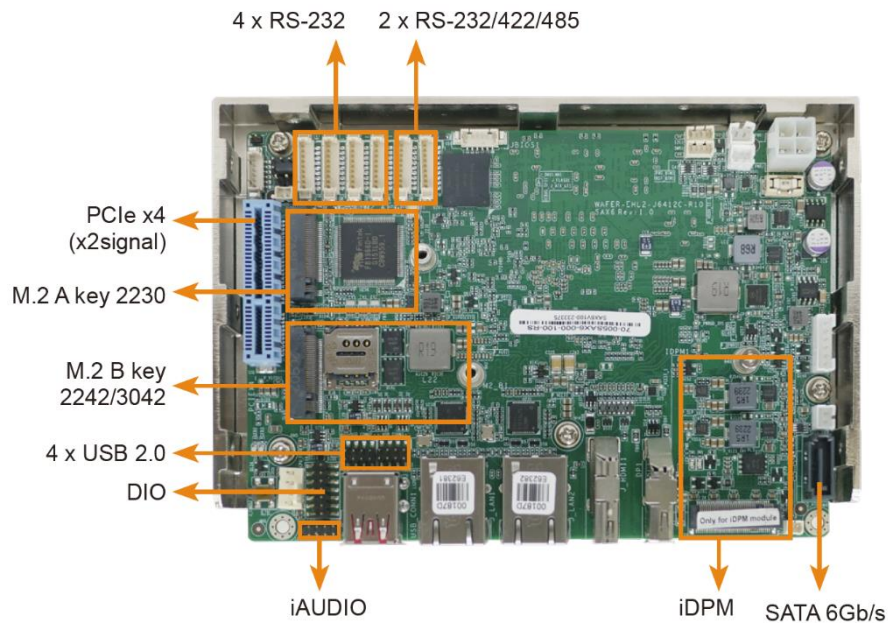


Figure 1-2: Connectors

1.4 Dimensions

The dimensions of the board are listed below:

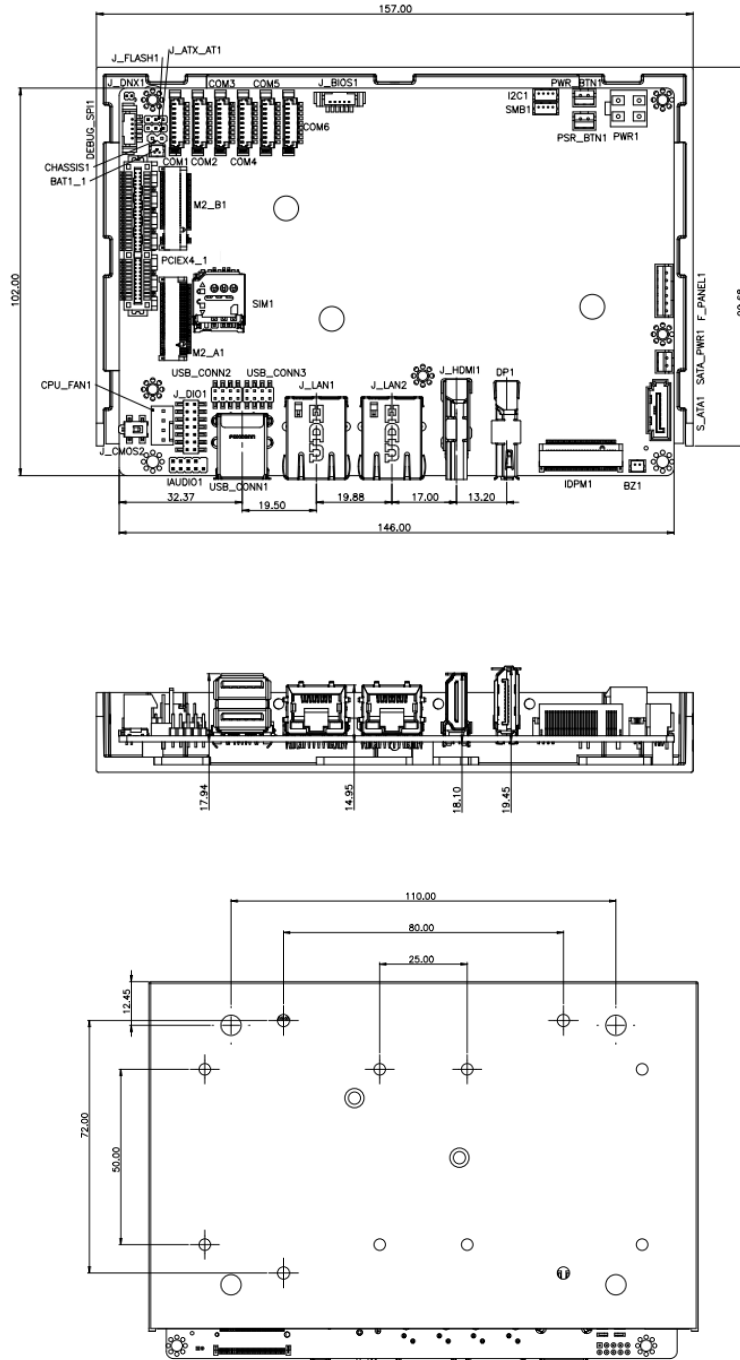


Figure 1-3: Dimensions (mm)

WAFER-EHL2 SBC

1.5 Data Flow

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

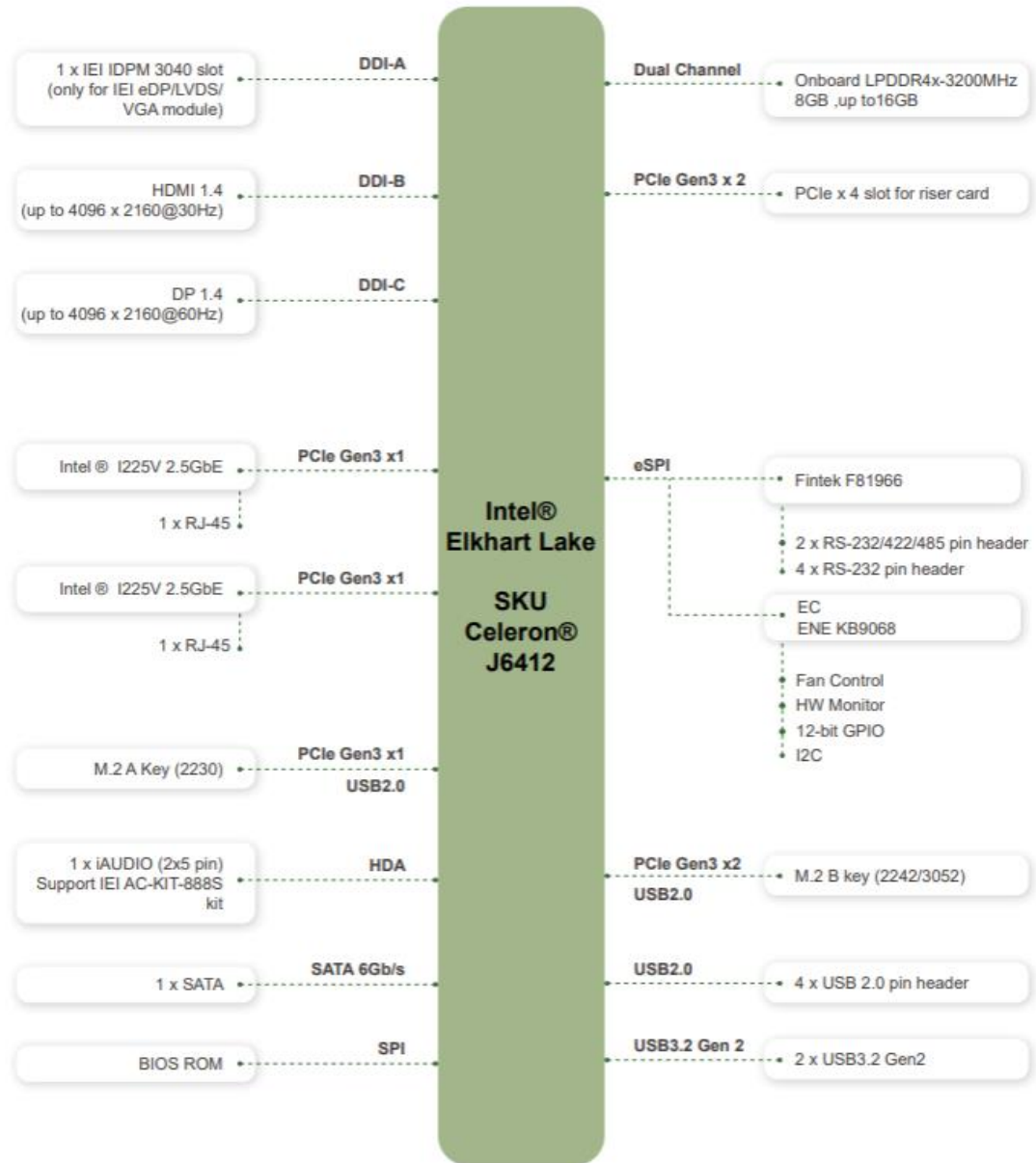


Figure 1-4: Data Flow Diagram

1.6 Technical Specifications

WAFER-EHL2 technical specifications are listed below.

Specification	WAFER-EHL2
SoC	Onboard Intel® Atom® x6000 series / Pentium® / Celeron® processor (Elkhart Lake platform) Intel® Celeron® J6412 on-board SoC (up to 2.6GHz, quad-core, 1.5M Cache, TDP=10W)
BIOS	AMI UEFI BIOS
Memory	On-board LPDDR4x 3200 MHz 8GB, up to 16 GB
Graphics	Intel® UHD Graphics
Display Output	Triple independent display 1 x HDMI 1.4a (up to 4096 x 2160 @ 30Hz) 1 x DP 1.4a (up to 4096 x 2160 @ 60Hz) 1 x IEI iDPM 3040 slot (only for IEI eDP/LVDS/VGA module)
Ethernet	LAN1: Intel® I225V 2.5GbE LAN2: Intel® I225V 2.5GbE
Digital I/O	12-bit digital I/O by 14-pin (2x7) header
Embedded Controller	ENE KB9068
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)
Serial Ports	2 x RS-232/422/485 by 9-pin (1x9 pin, P=1.25) wafer 4 x RS-232 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
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 CPU fan connector by 4-pin (1x4) wafer

WAFER-EHL2 SBC

Specification	WAFER-EHL2
I ² C	1 x I ² C connector by 4-pin (1x4) wafer
Storage	1 x SATA 6Gb/s with 5V SATA power connector onboard eMMC (optional UP TO 256G)
Expansions	1 x M.2 A Key for WIFI & BT (2230)(PCIe Gen3 x1/USB 2.0 signal) 1 x M.2 3042/2242 B key (PCIe Gen3 x2 & USB 2.0) 1 x On-board SIM card socket (hinge type) for M.2 B key 1 x PCIe Gen3 x4, PCIe Gen3 x2 signal (x2 or x1+x1)
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@3.24A (Intel® Celeron® J6412 2.0GHz with on-board 8GB 3200MHz LPDDR4 memory and EUP enabled)
Operating Temperature	0°C ~ 60°C
Storage Temperature	-30°C ~ 70°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-EHL2 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-EHL2 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-EHL2 was purchased from or contact an IEI sales representative directly by sending an email to sales@ieiworld.com.

The WAFER-EHL2 is shipped with the following components:





Quantity	Item and Part Number	Image
1	WAFER-EHL2 single board computer	
1	Power cable	
1	SATA with power cable kit	
1	Quick Installation Guide	<p><small>Mini-ITX SBC Supports Intel® Celeron® J6412 on board SBC with HDMI, DP, DPM, Dual 2 20Gb LAN, M.2, PCIe x4 Slot, SATA 6Gbps, COM, USB 2.0 Gen 1, 12V-18V and more</small></p> <p>KINO-EHL2-J6412</p> <p>Quick Installation Guide Version 1.0 July 26, 2023</p> <p>Package List</p> <p>KINO-EHL2-J6412 package includes the following items:</p> <ul style="list-style-type: none"> • 1 x KINO-EHL2-J6412 single board computer • 1 x SATA cable • 1 x I/O shielding • 1 x QIG  <p><small>©2023 Copyright by IEI Integration Corp. All rights reserved.</small></p>

Table 2-1: Packing List

WAFER-EHL2 SBC

The following are optional components which may be separately purchased:





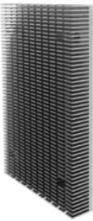
Item and Part Number	Image
Dual-port USB 2.0 cable, 210mm, P=2.0 (P/N : CB-USB02A-RS)	
RS-232 cable, 250 mm, p=1.25 (P/N : 32005-003500-200-RS)	
Audio kit, 7.1 Channel (P/N: AC-KIT-888S-R10)	
Cooler module, 157 mm x 100 mm x 20 mm, with pad and fan (P/N: CM-WAFER-WF-R10)	
Heatsink module, 157 mm x 100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

Table 2-2: Optional Items

Chapter

3

Connectors

WAFER-EHL2 SBC

3.1 Peripheral Interface Connectors

This chapter details all the jumpers and connectors.

3.1.1 WAFER-EHL2 Layout

The figures below show all the connectors and jumpers.

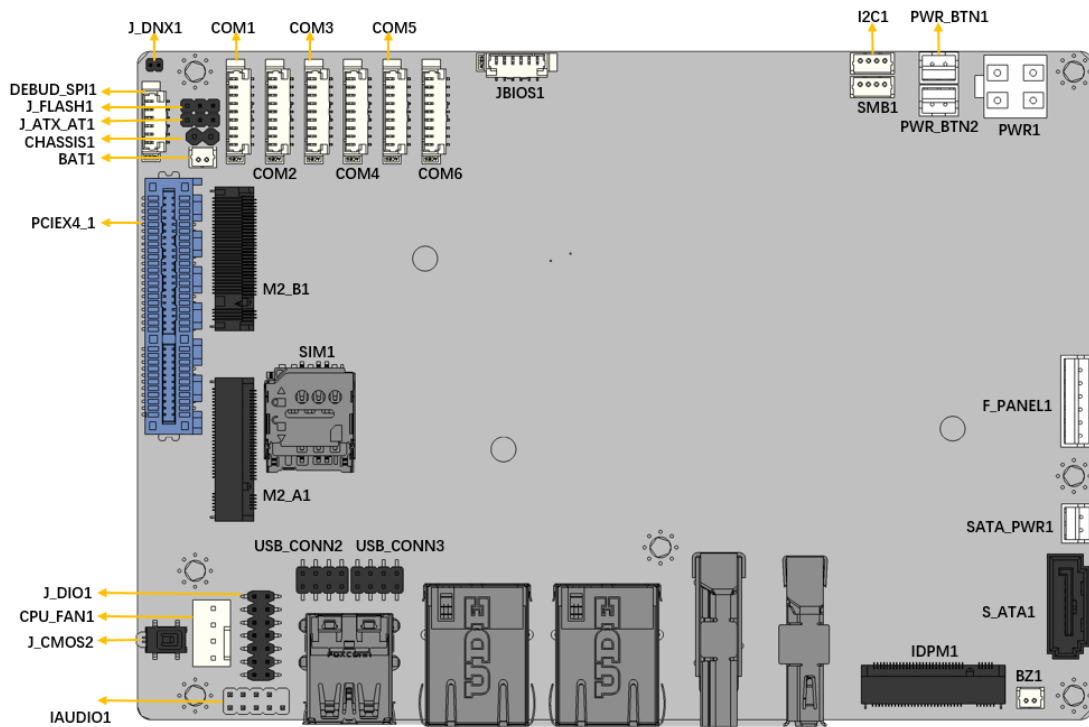


Figure 3-1: Connector and Jumper Locations

3.1.2 Peripheral Interface Connectors

The table below lists all the connectors on the board.

Connector	Type	Label
Clear CMOS button	Button	J_CMOS2

AT/ATX power mode setting	3-pin header	J_ATX_AT1
DNX mode setting jumper	2-pin header	J_DNX1
Flash descriptor override setting jumper	3-pin header	J_FLASH1
Audio connector for IEI AC-KIT-888S kit	10-pin header	IAUDIO
ATX 12V power connector	4-pin Molex	PWR1
Battery connector	2-pin wafer	BAT1
Buzzer connector	2-pin wafer	BZ1
Chassis status connector	2-pin header	CHASSIS1
Digital I/O connector	14-pin header	J_DIO1
Fan connector	4-pin header	CPU_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 serial port connectors	9-pin wafer	COM1, COM2, COM3,COM4
RS-232/422/485 serial port connectors	9-pin wafer	COM5,COM6
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
EC debug connector	6-pin wafer	DEBUG_SPI1
Internal USB 2.0 connector	8-pin header	USB_CONN2, USB_CONN3
M.2 A-key slot	M.2 A-key slot	M2_A1
M.2 B-key slot	M.2 B-key slot	M2_B1
PCIe x4 slot (x2 signal)	PCIe slot for riser card	PCIEX4_1

WAFER-EHL2 SBC

SIM slot (solder side)	7-pin SIM holder	SIM1
IEI iDPM slot	M.2 B-key slot	IDPM1

Table 3-1: Peripheral Interface Connectors

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	J_LAN1, J_LAN2
External USB 3.2 Gen 2x1 Type-A connector	USB 3.2 Gen 2 Type-A	USB_CONN1
External DisplayPort connector	DP	DP1
External dual HDMI connector	HDMI	J_HDMI1

Table 3-2: Rear Panel Connectors

3.2 Internal Peripheral Connectors

The section describes all of the connectors on the WAFER-EHL2.

3.2.1 Clear CMOS Button

CN Label: J_CMOS2

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.

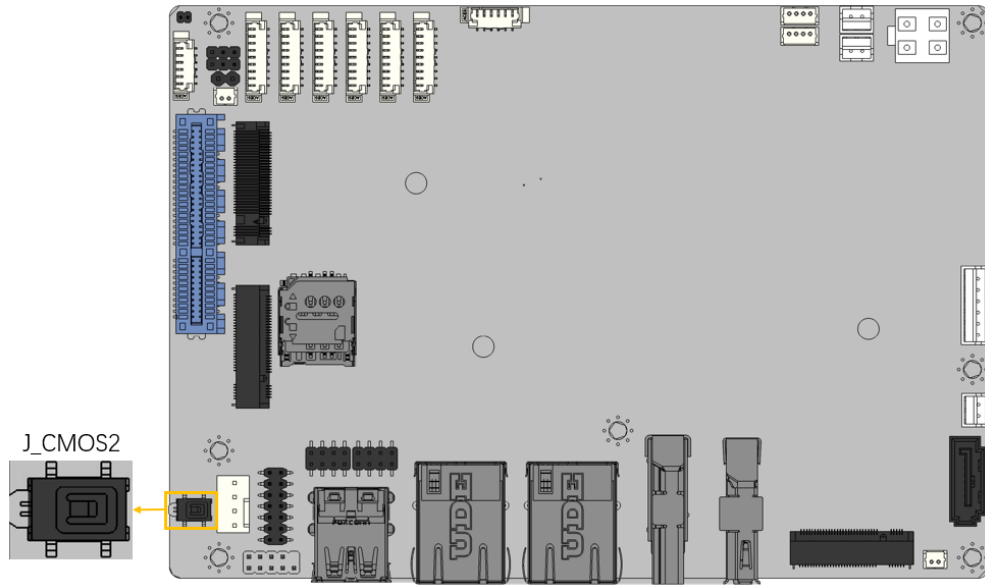


Figure 3-2: Clear CMOS Location

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

Table 3-3: Clear CMOS Pinouts

WAFER-EHL2 SBC

3.2.2 AT/ATX Power Mode Setting

- CN Label:** J_ATX_AT1
- CN Type:** 3-pin header
- 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.

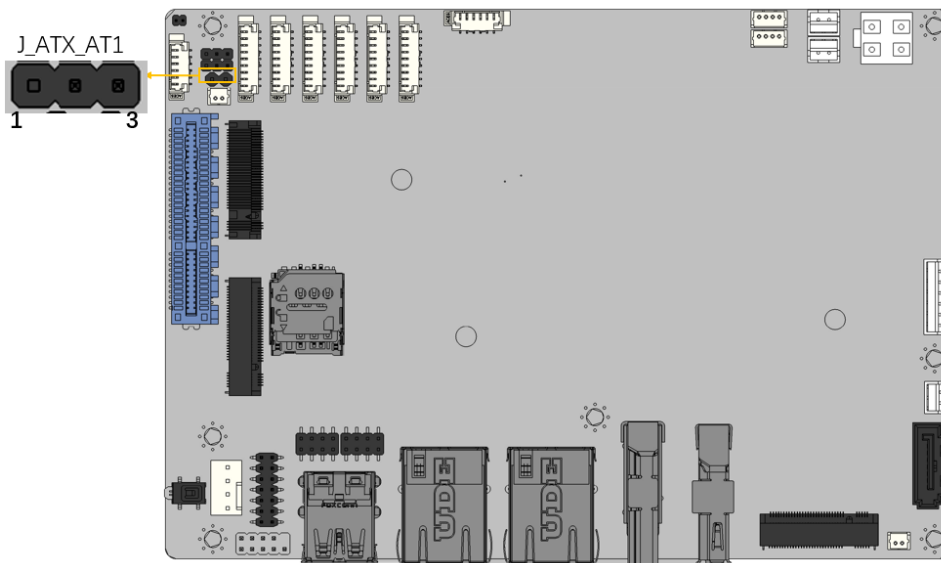


Figure 3-3: AT/ATX Power Mode Switch Locations

PIN NO.	DESCRIPTION
Short 1 - 2	ATX Power Mode (default)
Short 2 - 3	AT Power Mode

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

3.2.3 DNX Mode Setting Jumper

- CN Label:** J_DNX1
- CN Type:** 2-pin header, P=1.27mm
- CN Location:** See **Figure 3-4**
- CN Pinouts:** See **Table 3-5**

The J_DNX1 connector is used to set DNX mode.

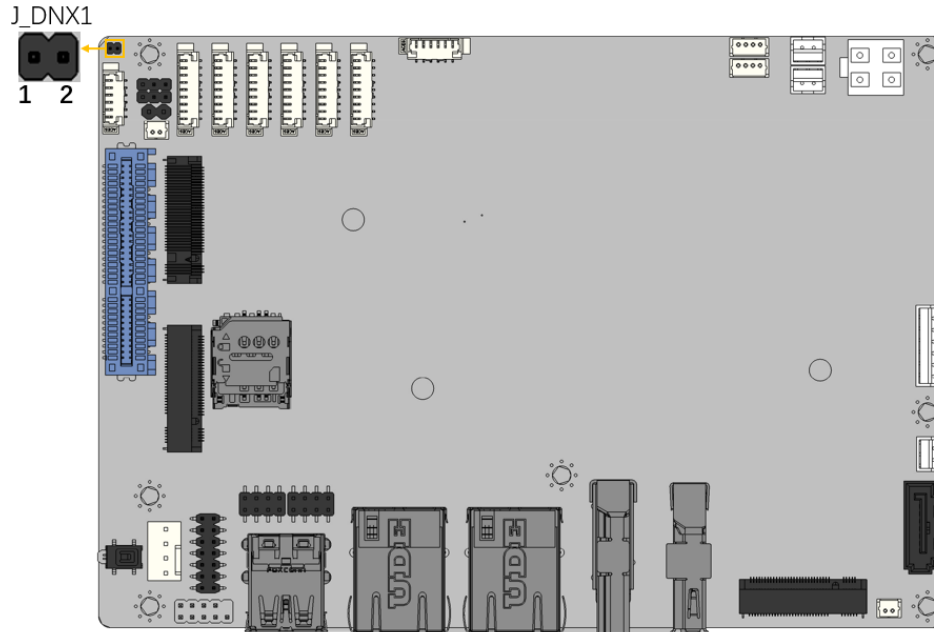


Figure 3-4: DNX Mode Setting Jumper Location

PIN NO.	DESCRIPTION
Open	Normal (default)
Short	Enable DNX Boot

Table 3-5: DNX Mode setting Jumper Pinouts

WAFER-EHL2 SBC

3.2.4 Flash Descriptor Override Setting Jumper

- CN Label:** J_FLASH1
- CN Type:** 3-pin header,P=2.00mm
- CN Location:** See Figure 3-5
- CN Pinouts:** See Table 3-6

The J_FLASH1 connector is used for Flash Descriptor Security Override .

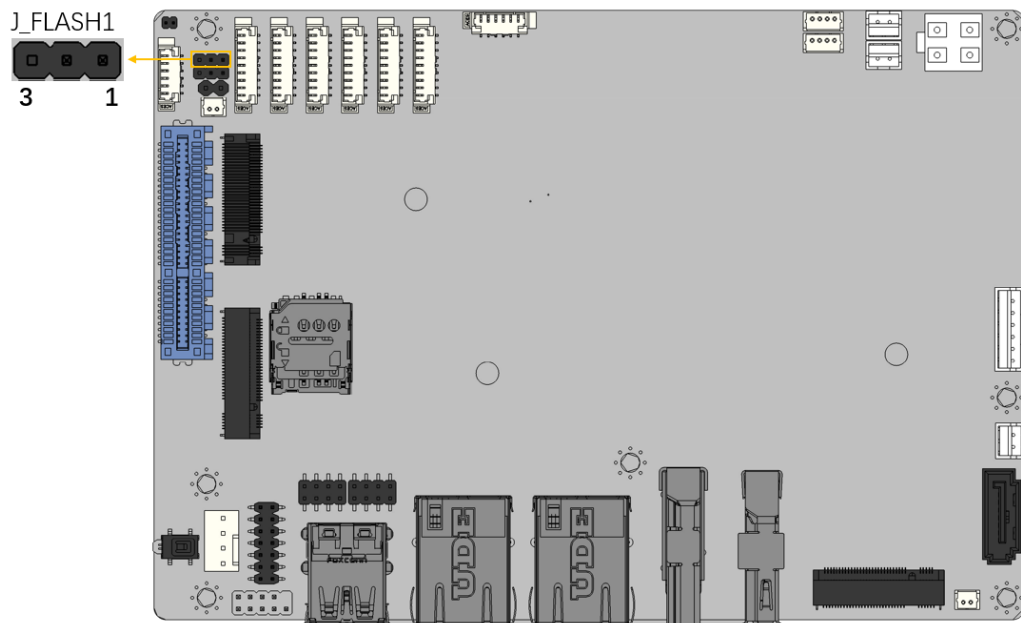


Figure 3-5: Flash Descriptor Override Setting Jumper Locations

PIN NO.	DESCRIPTION
Short 1 - 2	Disable (default)
Short 2 - 3	Enable

Table 3-6: Flash Descriptor Override Setting Jumper Pinouts

To update the ME firmware, please follow the steps below.

- Step 1:** Before turning on the system power, short the Flash Descriptor Security Override jumper.

- Step 2:** Update the BIOS and ME firmware, and then turn off the system power.
- Step 3:** Remove the metal clip on the Flash Descriptor Security Override jumper to its default setting.
- Step 4:** Restart the system. The system will reboot 2 ~ 3 times to complete the ME firmware update.

3.2.5 Internal Audio Connector

- CN Label:** IAUDIO1
- CN Type:** 10-pin header, p=2.00 mm
- CN Location:** See **Figure 3-6**
- CN Pinouts:** See **Table 3-7**

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.

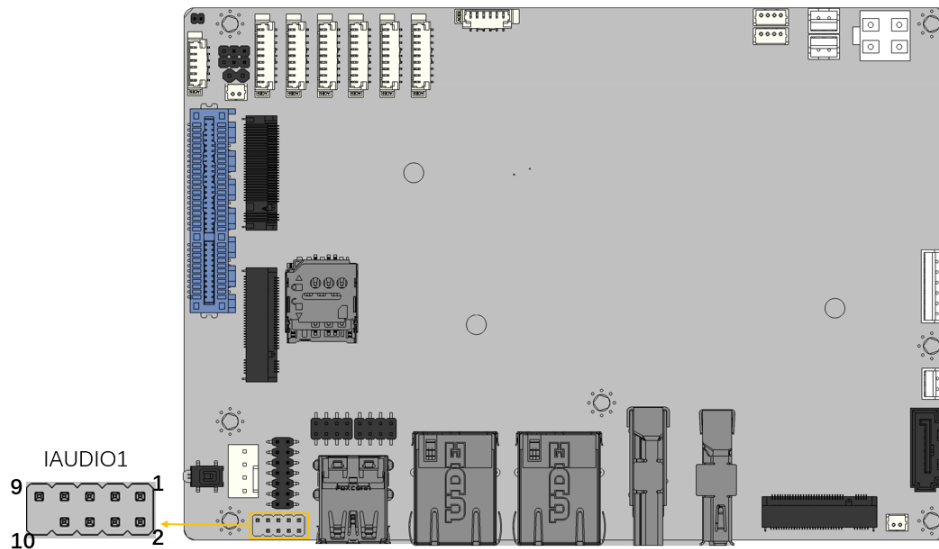


Figure 3-6: Audio Connector Location

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 3-7: Audio Connector Pinouts

3.2.6 ATX 12V Power Connector

- CN Label:** PWR1
- CN Type:** 4-pin Molex, p=4.2 mm
- CN Location:** See **Figure 3-7**
- CN Pinouts:** See **Table 3-8**

The connector supports the +12V power supply.

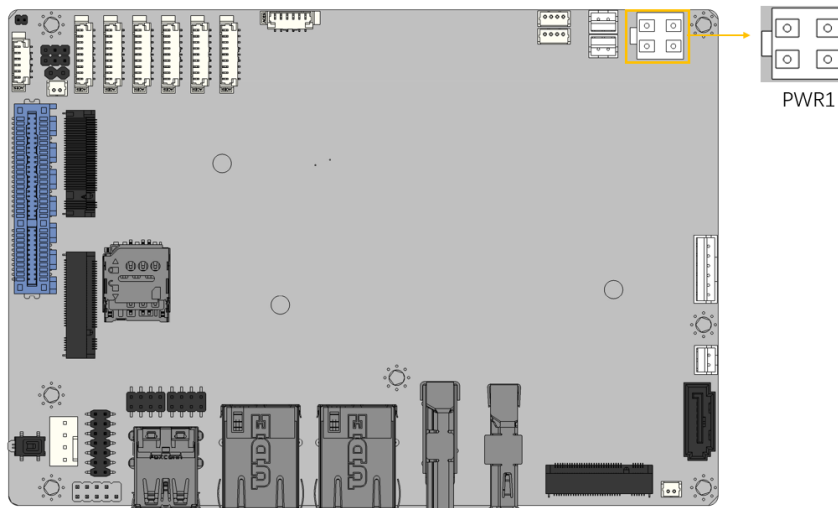


Figure 3-7: ATX 12V Power Connector Location

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

Table 3-8: ATX 12V Power Connector Pinouts

3.2.7 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-EHL2 is installed.

CN Label:	BAT1
CN Type:	2-pin wafer, p=1.25 mm
CN Location:	See Figure 3-8
CN Pinouts:	See Table 3-9

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.

WAFER-EHL2 SBC

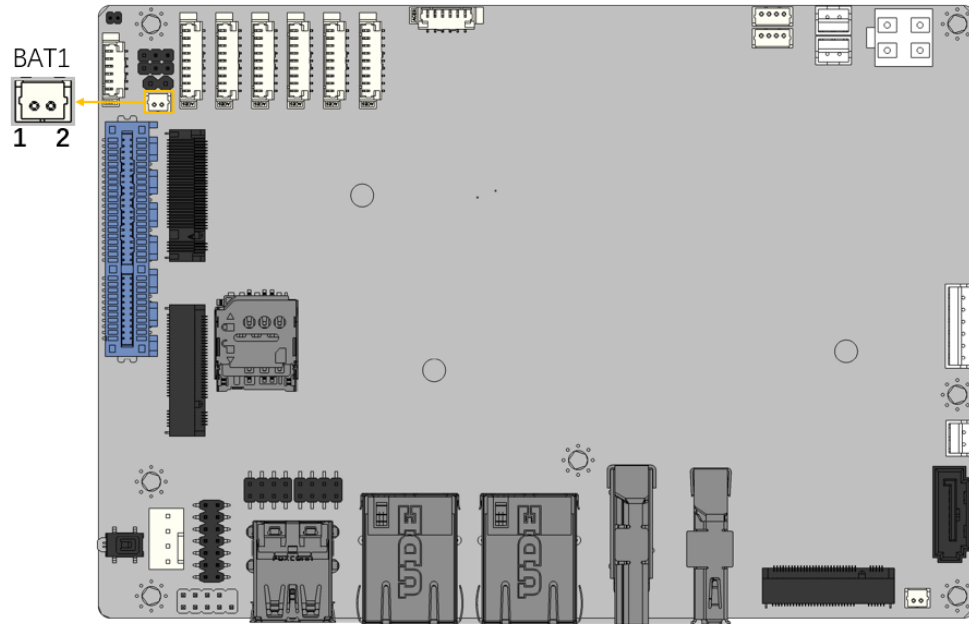


Figure 3-8: Battery Connector Location

Pin	Description
1	VBATT
2	GND

Table 3-9: Battery Connector Pinouts

3.2.8 Buzzer Connector

- CN Label:** BZ1
- CN Type:** 2-pin wafer, p=1.25 mm
- CN Location:** See **Figure 3-9**
- CN Pinouts:** See **Table 3-10**

The buzzer conector is connected with the buzzer to give a beep warning when the motherboard goes wrong.

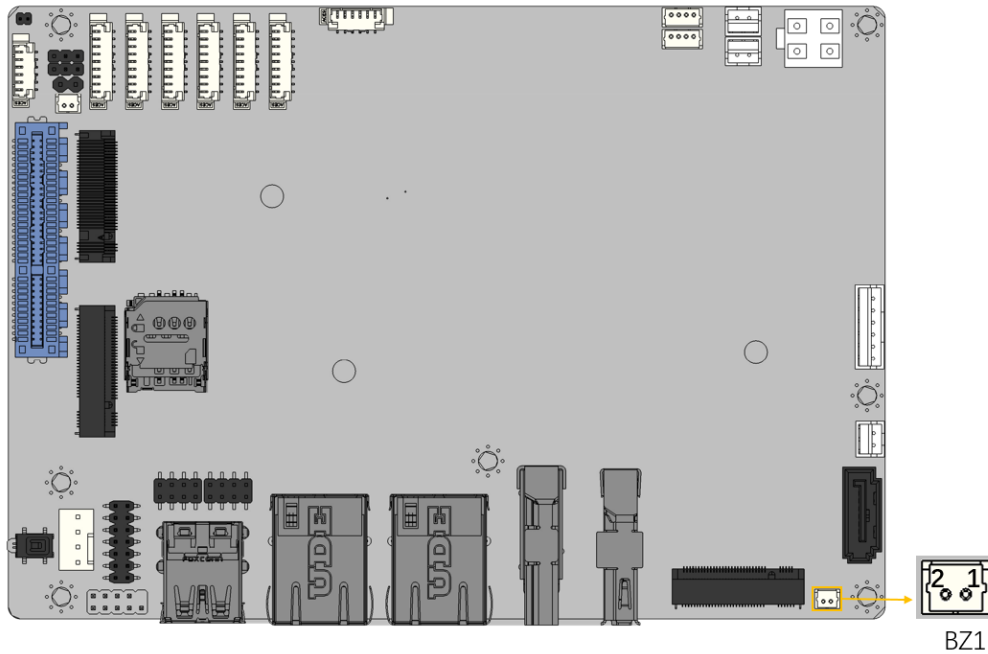


Figure 3-9: Buzzer Connector Location

Pin	Description
1	+5V
2	PC_BEEP

Table 3-10: Buzzer Connector Pinouts

3.2.9 Chassis status connector

- CN Label:** CHASSIS1
- CN Type:** 2-pin header, p=2.0 mm
- CN Location:** See **Figure 3-10**
- CN Pinouts:** See **Table 3-11**

The chassis intrusion connector is for a chassis intrusion detection sensor or switch that detects if a chassis component is removed or replaced

WAFER-EHL2 SBC

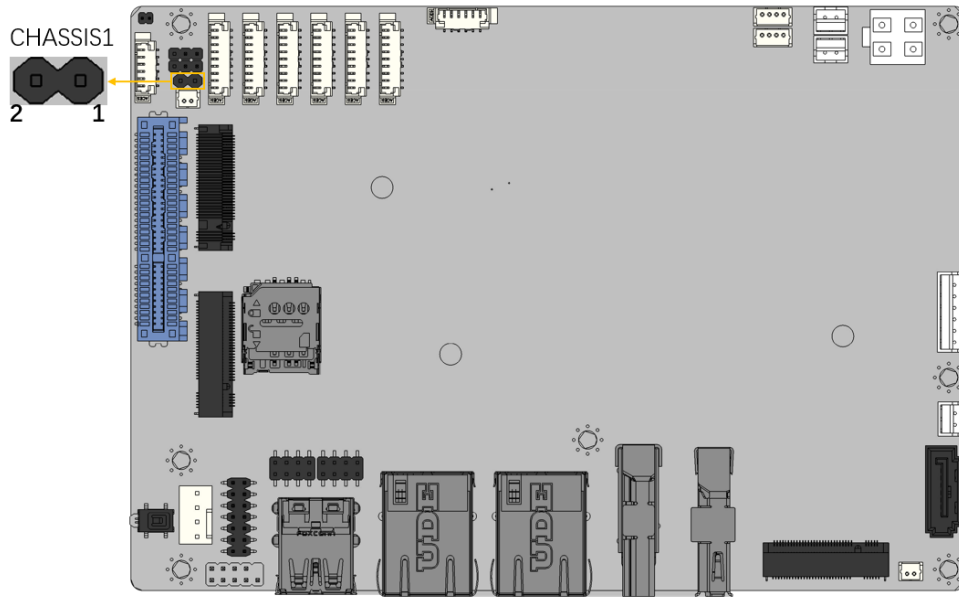


Figure 3-10 Chassis Open Connector Location

Pin	Description	Pin	Description
1	Chassis Open	2	GND

Table 3-11 Chassis Status Connector Pinouts

3.2.10 Digital Input/Output Connector

- CN Label:** J_DIO1
- CN Type:** 14-pin wafer, p=2.0 mm
- CN Location:** See **Figure 3-11**
- CN Pinouts:** See **Table 3-12**

The 12-bit digital I/O connector provides programmable input and output for external devices.

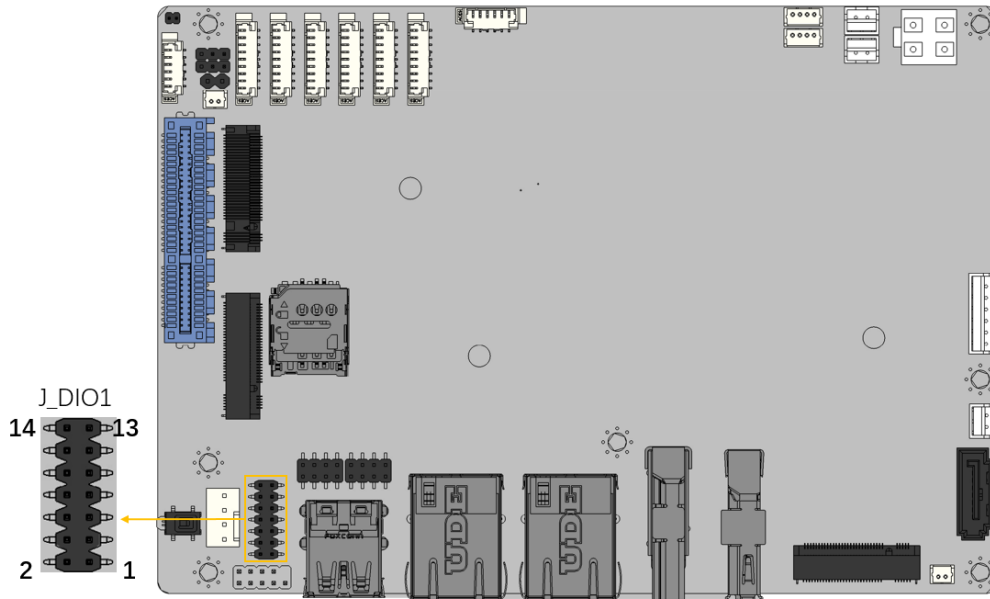


Figure 3-11: Digital I/O Connector Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	2	VCC
3	DOUT5	4	DOUT4
5	DOUT3	6	DOUT2
7	DOUT1	8	DOUT0
9	DIN5	10	DIN4
11	DIN3	12	DIN2
13	DIN1	14	DIN0

Table 3-12: Digital I/O Connector Pinouts

3.2.11 Fan Connector

- CN Label:** CPU_FAN1
- CN Type:** 4-pin wafer, p=2.54 mm
- CN Location:** See **Figure 3-12**
- CN Pinouts:** See **Table 3-13**

The fan connector attaches to a smart cooling fan.

WAFER-EHL2 SBC

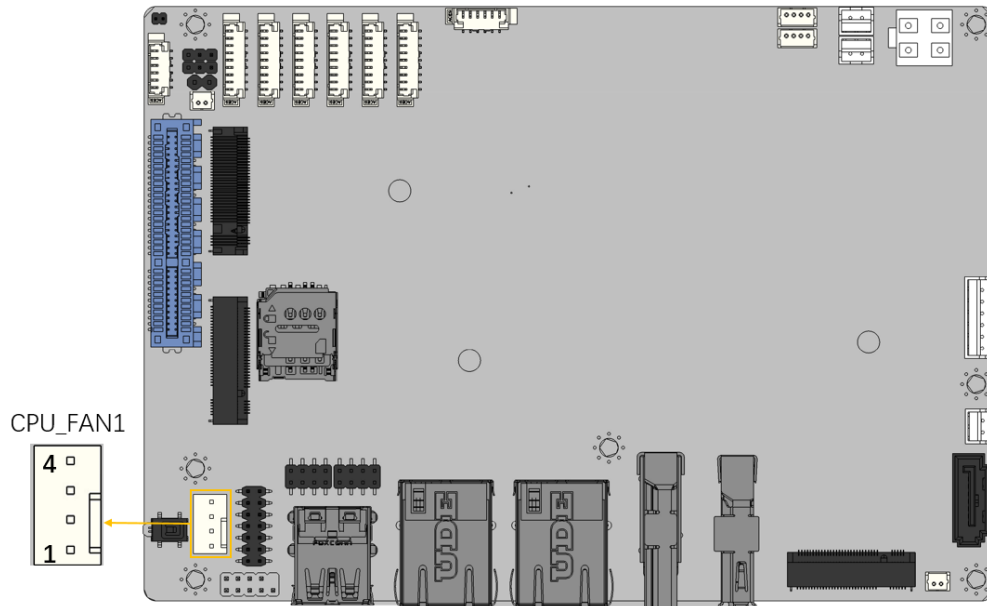


Figure 3-12: Fan Connector Location

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

Table 3-13: Fan Connector Pinouts

3.2.12 Power LED & HDD LED Connector

- CN Label:** F_PANEL1
- CN Type:** 6-pin wafer, p=2.00 mm
- CN Location:** See **Figure 3-13**
- CN Pinouts:** See **Table 3-14**

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

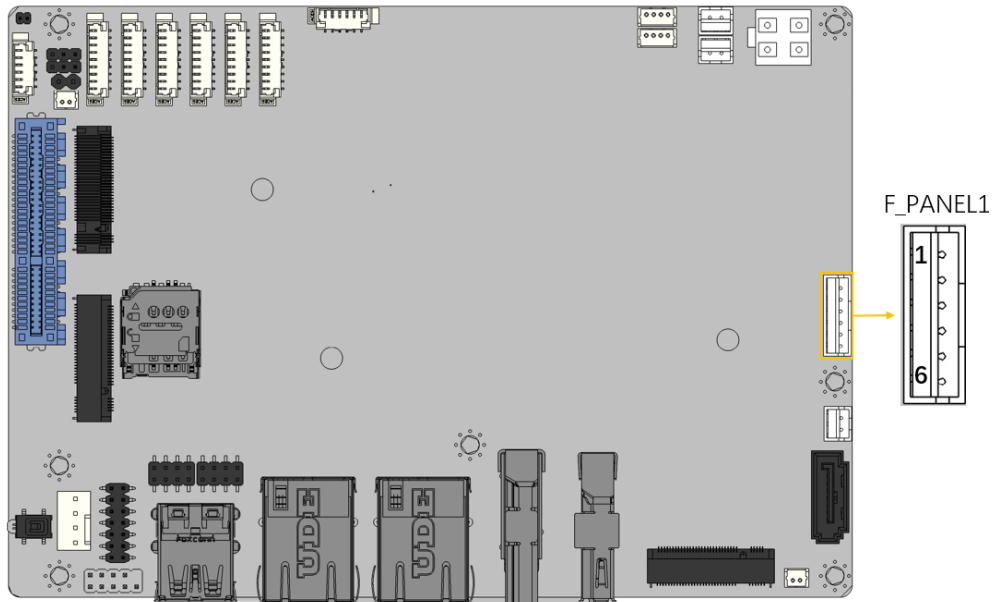


Figure 3-13: Power LED & HDD LED Connector Location

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

Table 3-14: Power LED & HDD LED Connector Pinouts

WAFER-EHL2 SBC

3.2.13 Power Button Connector

- CN Label:** PWR_BTN1
- CN Type:** 2-pin wafer, p=2.00 mm
- CN Location:** See **Figure 3-14**
- CN Pinouts:** See **Table 3-15**

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

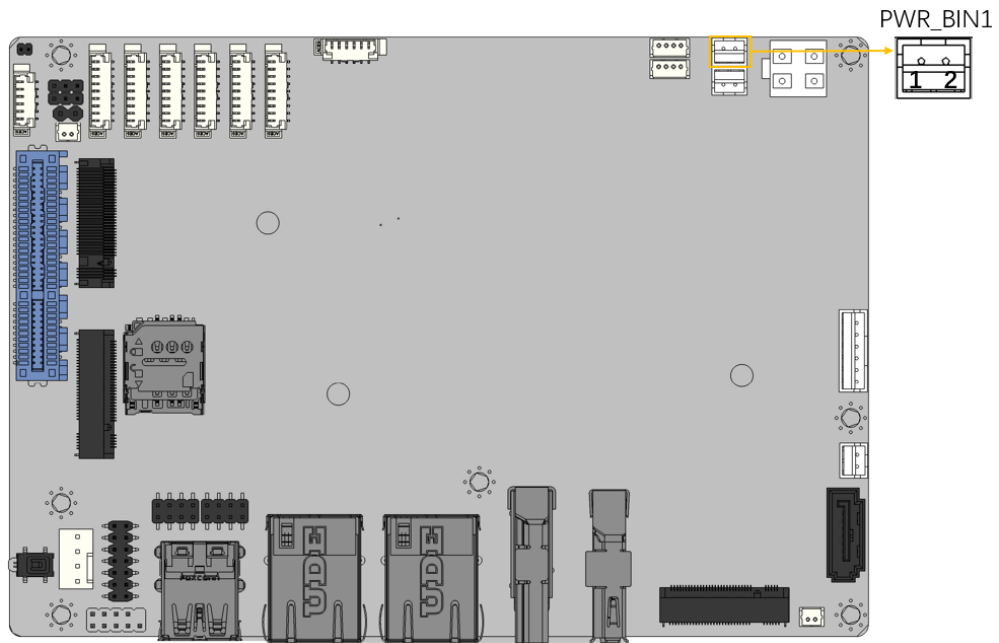


Figure 3-14: Power Button Connector Location

Pin	Description
1	PWR_BTN+
2	PWR_BTN-

Table 3-15: Power Button Connector Pinouts

3.2.14 Reset Button Connector

- CN Label:** RST_BTN1
- CN Type:** 2-pin wafer, p=2.00 mm
- CN Location:** See **Figure 3-15**
- CN Pinouts:** See **Table 3-16**

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.

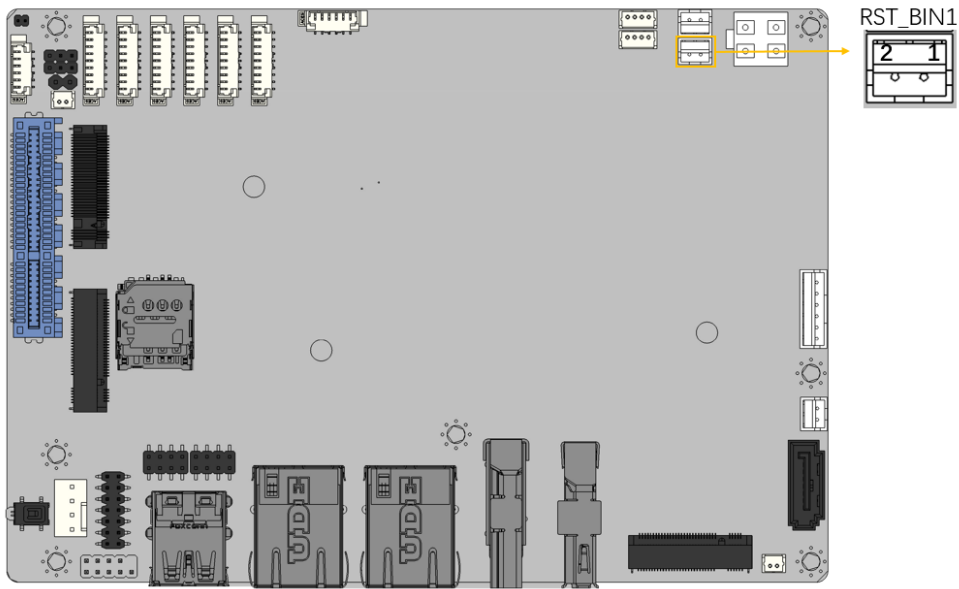


Figure 3-15: Reset Button Connector Location

Pin	Description
1	RESET+
2	RESET-

Table 3-16: Reset Button Connector Pinout

WAFER-EHL2 SBC

3.2.15 RS-232 Serial Port Connector

CN Label: COM1, COM2, COM3, COM4

CN Type: 9-pin wafer, p=1.25 mm

CN Location: See Figure 3-16

CN Pinouts: See Table 3-17

The serial connector provides RS-232 connection.

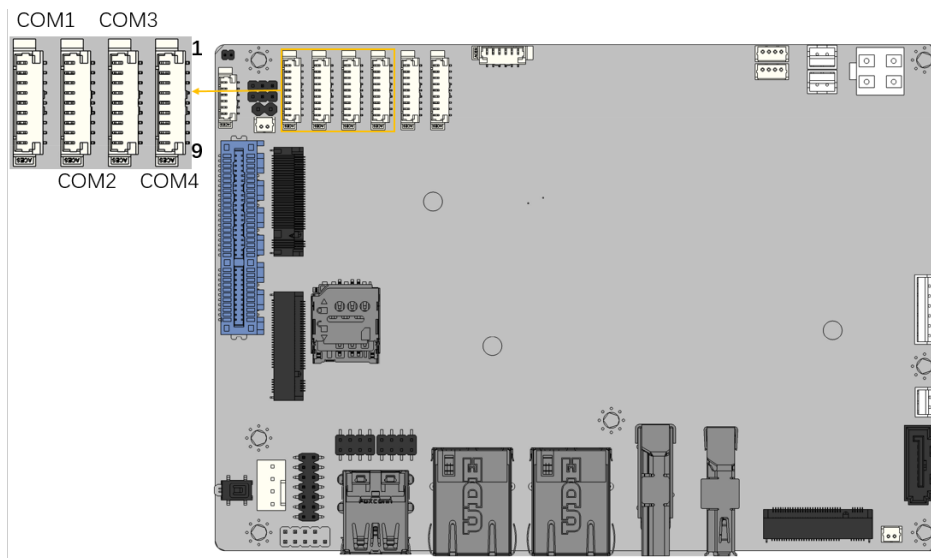


Figure 3-16: RS-232 Serial Port Connector Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	DCD	2	DSR
3	RXD	4	RTS
5	TXD	6	CTS
7	DTR	8	RI
9	GND		

Table 3-17: RS-232 Serial Port Connector Pinouts

3.2.16 RS-232/422/485 serial port connectors

- CN Label:** COM5,COM6
- CN Type:** 9-pin wafer, p=1.25 mm
- CN Location:** See
- CN Pinouts:** See Table 3-18

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

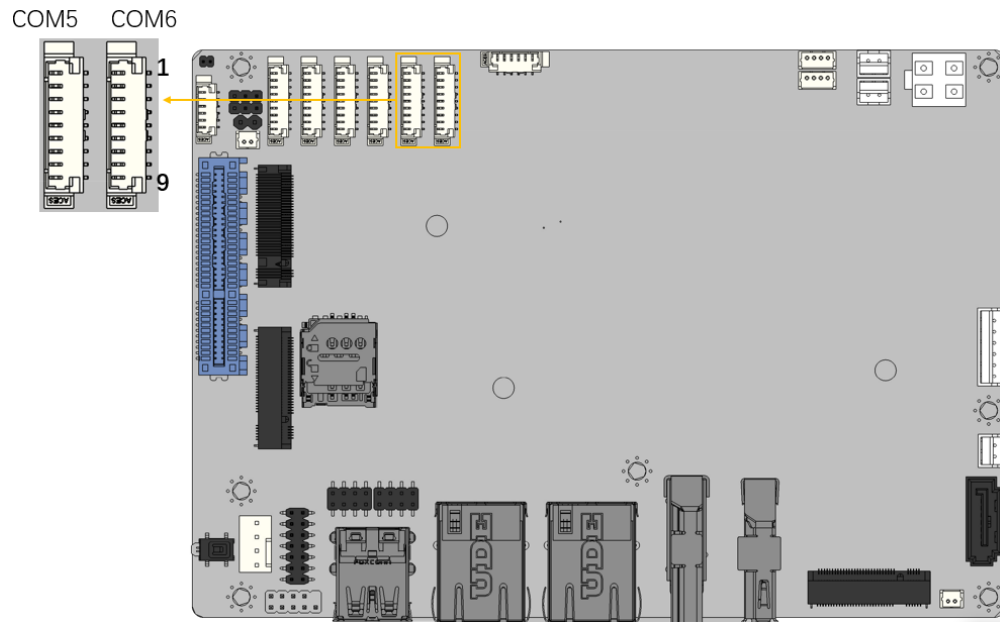


Figure 3-17 RS-232/422/485 Serial Port Connector Location

	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 3-18 RS-232/422/485 Serial Port Connector Pinouts

WAFER-EHL2 SBC

3.2.17 SATA 6Gb/s Drive Connector

- CN Label:** S_ATA1
- CN Type:** 7-pin SATA connector
- CN Location:** See **Figure 3-18**
- CN Pinouts:** See **Table 3-19**

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.

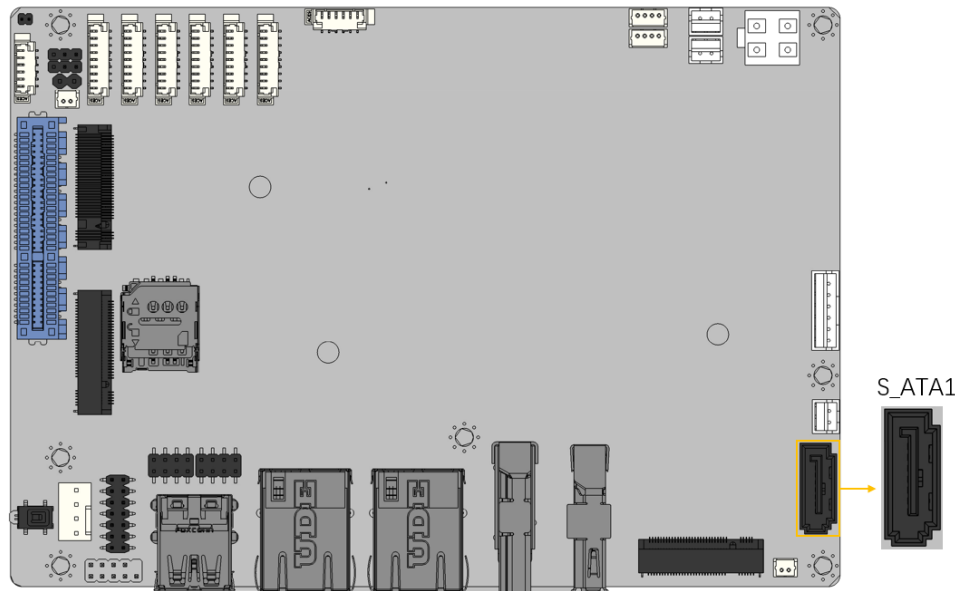


Figure 3-18: SATA 6Gb/s Drive Connectors Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	GND	5	SATA_RX-
2	SATA_TX+	6	SATA RX+
3	SATA_TX-	7	GND
4	GND	8	N/C

Table 3-19: SATA 6Gb/s Drive Connectors Pinouts

3.2.18 SATA Power Connector

- CN Label:** SATA_PWR1
- CN Type:** 2-pin wafer, p=2.00 mm
- CN Location:** See **Figure 3-19**
- CN Pinouts:** See **Table 3-20**

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

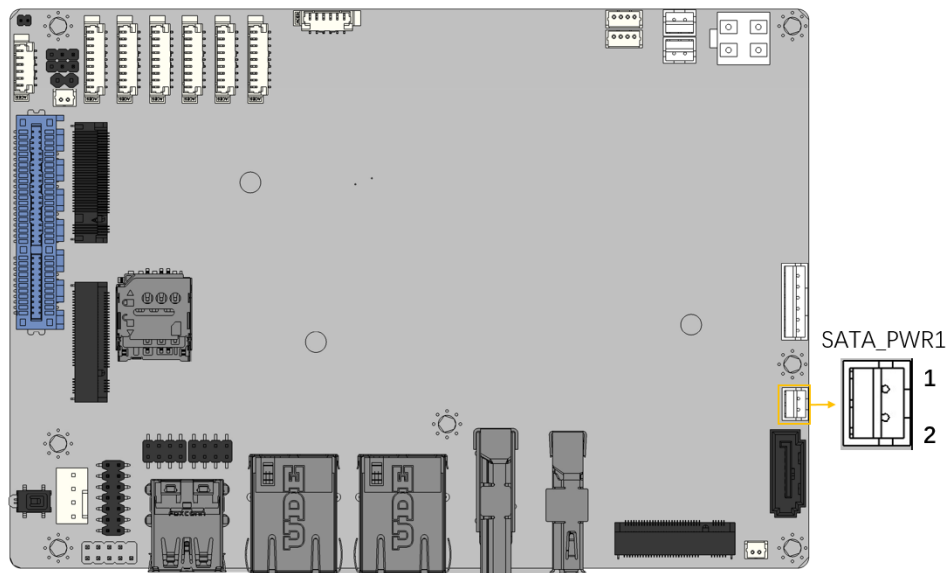


Figure 3-19: SATA Power Connector Location

Pin	Description
1	+5V
2	GND

Table 3-20: SATA Power Connector Pinouts

WAFER-EHL2 SBC

3.2.19 I²C Connector

- CN Label:** I2C1
- CN Type:** 4-pin wafer, p=1.25 mm
- CN Location:** See **Figure 3-20**
- CN Pinouts:** See **Table 3-21**

The I²C connector is used to connect I²C-bus devices to the mainboard.

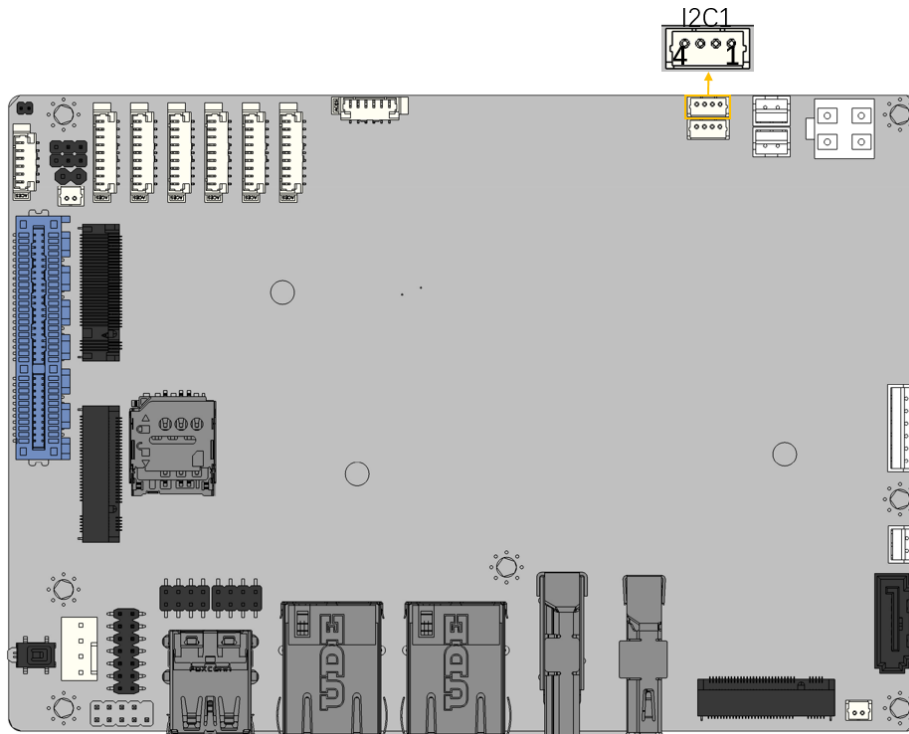


Figure 3-20: I²C Connector Location

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

Table 3-21: I²C Connector Pinouts

3.2.20 SMBus Connector

- CN Label:** SMB1
- CN Type:** 4-pin wafer, p=1.25 mm
- CN Location:** See **Figure 3-21**
- CN Pinouts:** See **Table 3-22**

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.

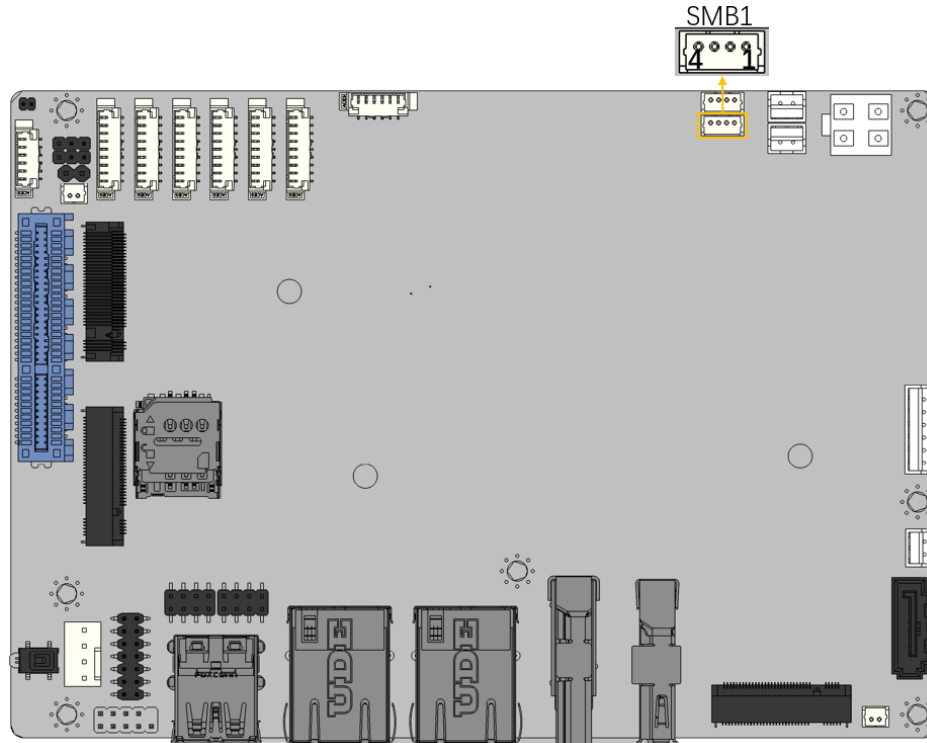


Figure 3-21: SMBus Connector Location

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

Table 3-22: SMBus Connector Pinouts

WAFER-EHL2 SBC

3.2.21 Flash SPI ROM Connector

- CN Label:** JBIOS1
- CN Type:** 6-pin wafer, p=1.25 mm
- CN Location:** See **Figure 3-22**
- CN Pinouts:** See **Table 3-23**

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

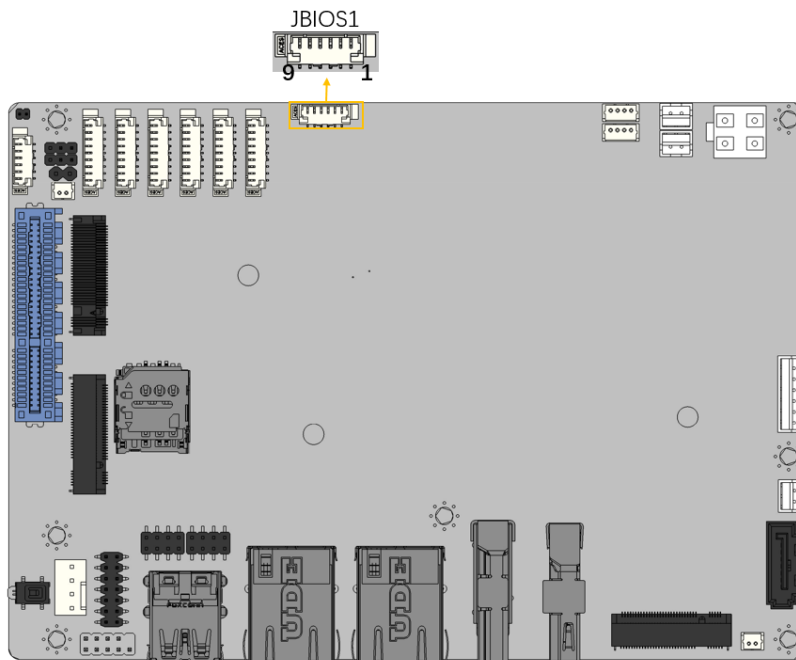


Figure 3-22: Flash SPI ROM Connector Location

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

Table 3-23: Flash SPI ROM Connector Pinouts

3.2.22 EC Debug Connector

- CN Label:** **DEBUG_SPI1**
- CN Type:** 6-pin header, p=1.25 mm
- CN Location:** See **Figure 3-23**
- CN Pinouts:** See **Table 3-24**

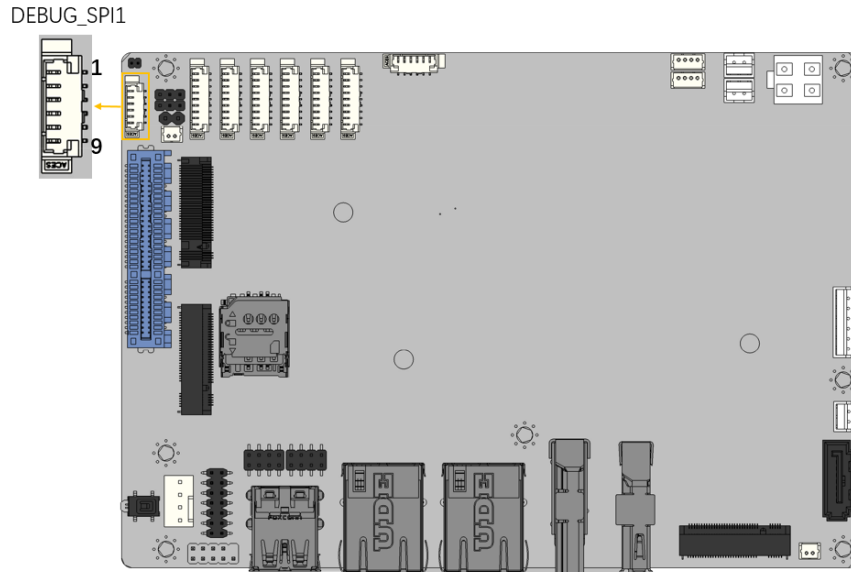


Figure 3-23: EC Debug Connector Location

Pin	Description	Pin	Description
1	NC	2	EDICK
3	EDICS	4	EDIDI
5	EDIDO	6	GND

Table 3-24:EC Debug Connector Pinouts

WAFER-EHL2 SBC

3.2.23 Internal USB 2.0 Connectors

CN Label: USB_CONN2,USB_CONN3

CN Type: 8-pin header, p=2.00 mm

CN Location: See **Figure 3-24**

CN Pinouts: See **Table 3-25**

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

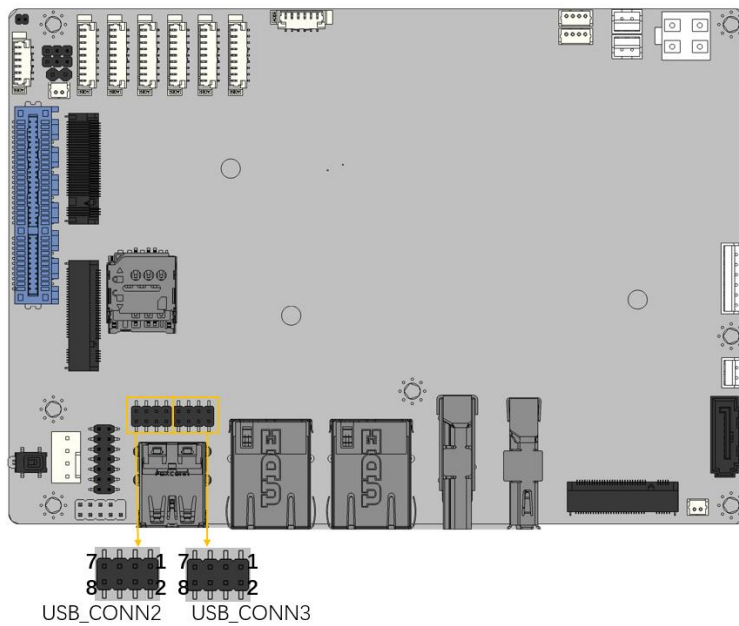


Figure 3-24: Internal USB 2.0 Connectors Locations

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 3-25: Internal USB 2.0 Connectors Pinouts

3.2.24 M.2 A-key Slot

- CN Label:** M2_A1
- CN Type:** M.2 A-key slot
- CN Location:** See Figure 3-25
- CN Pinouts:** See Table 3-26

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.

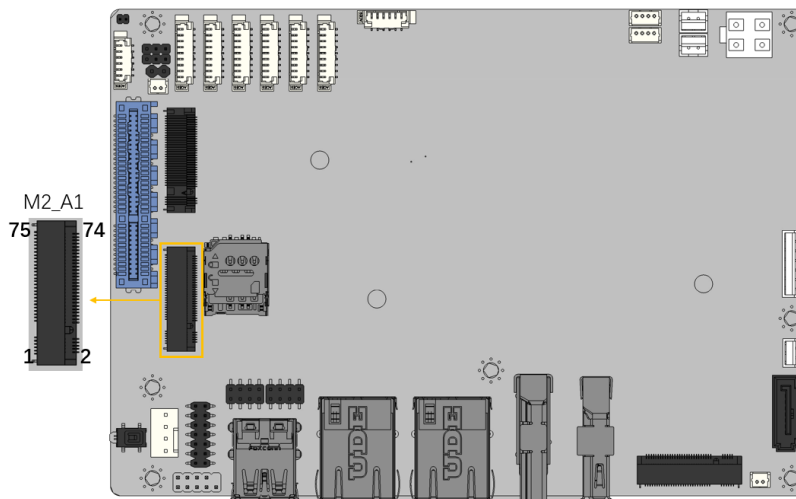


Figure 3-25: M.2 A-key Slot Location

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

WAFER-EHL2 SBC

Pin	Description	Pin	Description
23	GND	24	GND
25	NC	26	NC
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 3-26: M.2 A-Key Slot Pinouts

3.2.25 M.2 B-key Slot

- CN Label:** M2_B1
- CN Type:** M.2 B-key slot
- CN Location:** See **Figure 3-26**
- CN Pinouts:** See **Table 3-27**

The M.2 B key (3042/2242) slot with PCIe Gen3 x2 and USB 2.0 signal supports NVMe storage or 5G module with SIM holder

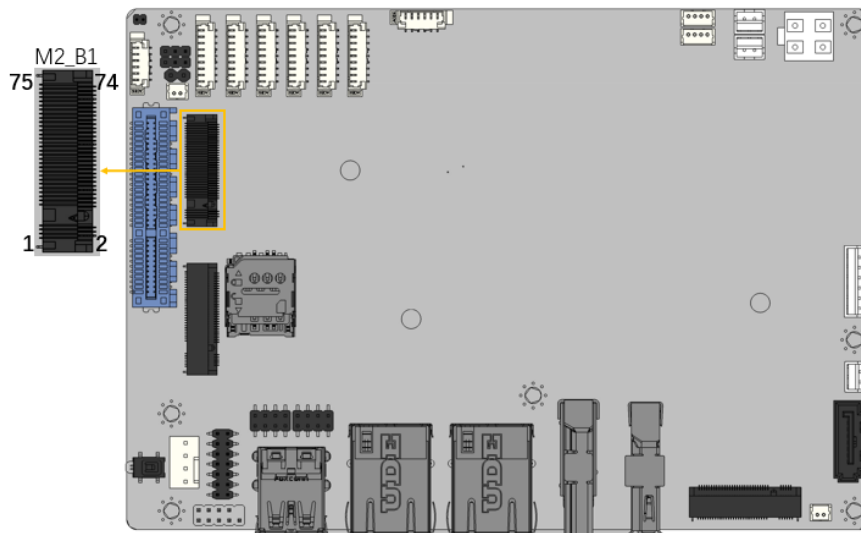


Figure 3-26: M.2 B-key Slot Location

PIN NO.	DESCRIPTION	PIN NO.	DESCRIPTION
1	WWAN_CONFIG3	2	+3.3V_WWAN
3	GND	4	+3.3V_WWAN
5	GND	6	WWAN_FCP_OFF
7	USB_D+	8	WWAN_DISABLE
9	USB_D-	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	PSE_I2S1_SCLK

WAFER-EHL2 SBC

21	WWAN_CONFIG0	22	PSE_I2S1_TXD
23	PCIE_WAKE#	24	PSE_I2S1_RXD
25	SAR_DPR_WWAN	26	GNSS_DISABLE_N
27	GND	28	NC
29	PCIE_RXN5	30	WWAN_UIM_RST
31	PCIE_RXP5	32	WWAN_UIM_CLK
33	GND	34	WWAN_UIM_DATA
35	PCIE_TXN5	36	UIM_PWR
37	PCIE_TXP5	38	SSD_DEVSLP
39	GND	40	NC
41	PCIE_RXN4	42	NC
43	PCIE_RXP4	44	NC
45	GND	46	NC
47	PCIE_TXN4	48	NC
49	PCIE_TXP4	50	WWAN_PERST#
51	GND	52	N/C
53	CLK_M2_B_N	54	WWAN_WAKE#
55	CLK_M2_B_P	56	NC
57	GND	58	NC
59	NC	60	NC
61	NC	62	NC
63	NC	64	NC
65	NC	66	WWAN_SIM1_DET
67	WWAN_RST	68	WWAN_SUSCLK
69	DET_OS-PCIE/ GND-SATA	70	+3.3V
71	GND	72	+3.3V
73	GND	74	+3.3V
75	WWAN_CONFIG2		

Table 3-27: M. 2 B-key Slot Pinouts

3.2.26 SIM Card Slot

- CN Label:** SIM1
- CN Type:** 7-pin SIM holder
- CN Location:** See **Figure 3-27**
- CN Pinouts:** See **Table 3-28**

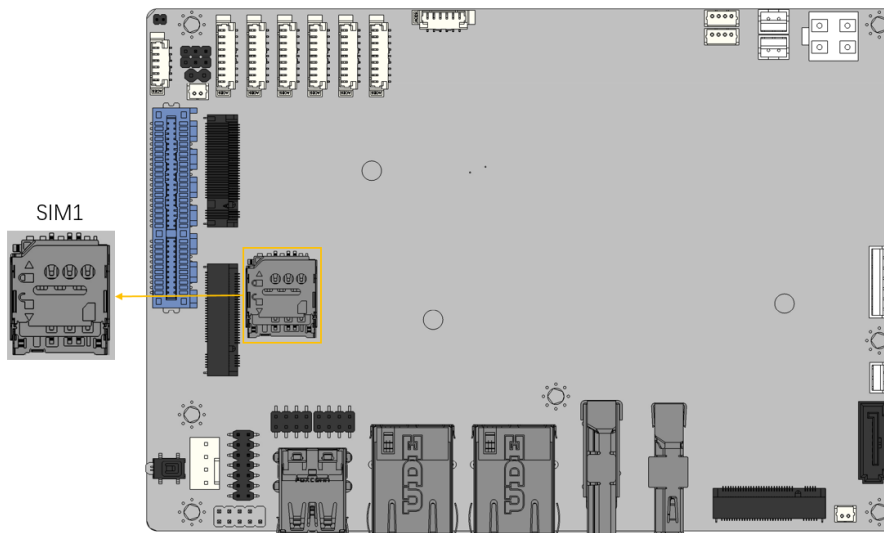


Figure 3-27: SIM Card Slot Location

PIN NO.	DESCRIPTION
C1	SIM_VCC
C2	SIM_RST
C3	SIM_Clock
C5	GND
C6	NC
C7	SIM_DATA

Table 3-28: SIM Card Slot Pinouts

3.3 External Peripheral Interface Connector Panel

Figure 3-28 shows the WAFER-EHL2 external peripheral interface connector (EPIC) panel.

The EPIC panel consists of the following:

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

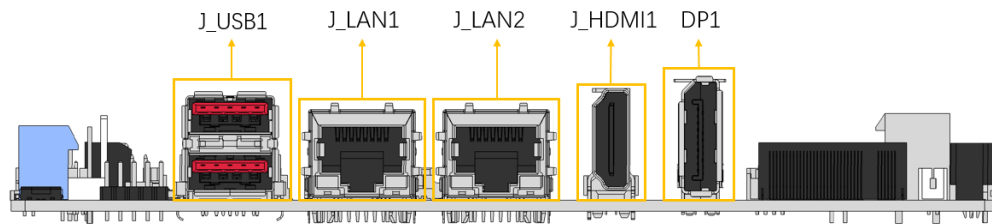


Figure 3-28: External Peripheral Interface Connector

3.3.1 External 2.5GbE RJ-45 Connectors

CN Label: J_LAN1, J_LAN2

CN Type: RJ-45

CN Location: See Figure 3-28

CN Pinouts: See Table 3-29

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 3-29: External 2.5GbE RJ-45 Connectors Pinouts

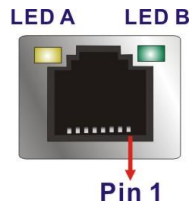


Figure 3-29: LAN LED Location

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 3-30: LAN LED Pinouts

3.3.2 External DP Connector

- CN Label:** DP1
- CN Type:** External DP connector
- CN Location:** See **Figure 3-30**
- CN Pinouts:** See **Table 3-31**

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 3-31: External DisplayPort Connector Location

WAFER-EHL2 SBC

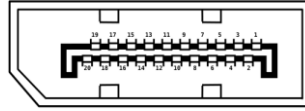


Figure 3-30: External DP Connector Pinouts

3.3.3 External HDMI Connectors

- CN Label:** J_HDMI1
- CN Type:** HDMI connector
- CN Location:** See Figure 3-31
- CN Pinouts:** See Table 3-32

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 3-32: External HDMI Connector Pinouts

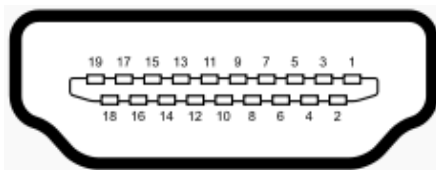


Figure 3-31: External HDMI Connector Location

3.3.4 External USB 3.2 Gen 2 Connectors

- CN Label:** USB_CONN1
- CN Type:** USB 3.2 Gen 2 port Type-A
- CN Location:** See **Figure 3-32**
- CN Pinouts:** See **Table 3-33**

The WAFER-EHL2 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.

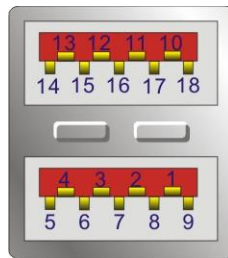


Figure 3-32: External USB 3.2 Gen 2 Connectors Location

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 3-33: 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-EHL2 may result in permanent damage to the WAFER-EHL2 and severe injury to the user.

Electrostatic discharge (ESD) can cause serious damage to electronic components, including the WAFER-EHL2. Dry climates are especially susceptible to ESD. It is therefore critical that whenever the WAFER-EHL2 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-EHL2, place it on an anti-static pad. This reduces the possibility of ESD damaging the WAFER-EHL2.
- ***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-EHL2, WAFER-EHL2 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-EHL2 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-EHL2 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-EHL2 off:
 - When working with the WAFER-EHL2, 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-EHL2 **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

The WAFER-EHL2 provide two ways to install the M.2 expansion card. One is using screw, and the other is using the retainer. Please follow the steps below.

Mode One:Using screw

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**).

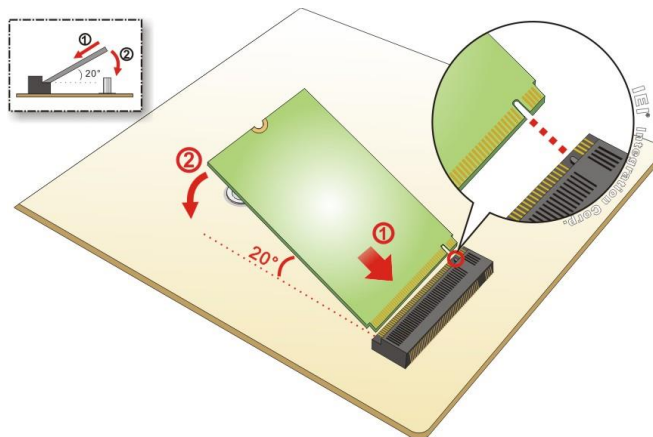


Figure 4-1: Inserting The M.2 Module Into The Slot At An Angle

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

WAFER-EHL2 SBC

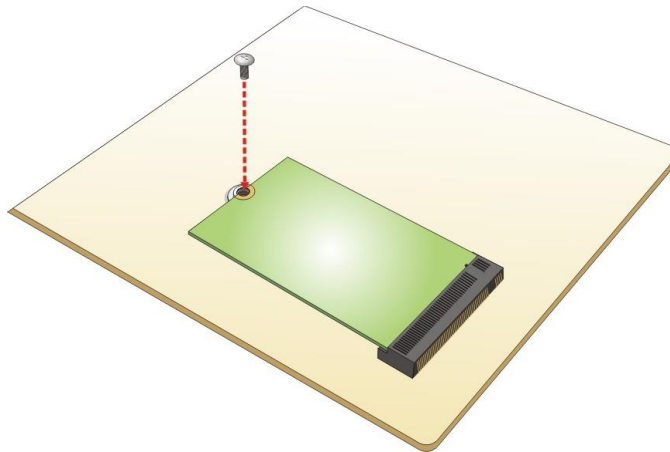


Figure 4-2: Securing The M.2 Module

4.4 Chassis Installation

4.4.1 Heat Spreader



WARNING:

The heat spreader installed on the WAFER-EHL2 can only serve as a heat conductor, which needs additional heat dissipation mechanism to achieve suitable thermal condition. DO NOT put the WAFER-EHL2 with the heat spreader directly on a surface that cannot dissipate system heat, and never run the WAFER-EHL2 without the heat spreader secured to the board.

When the WAFER-EHL2 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.

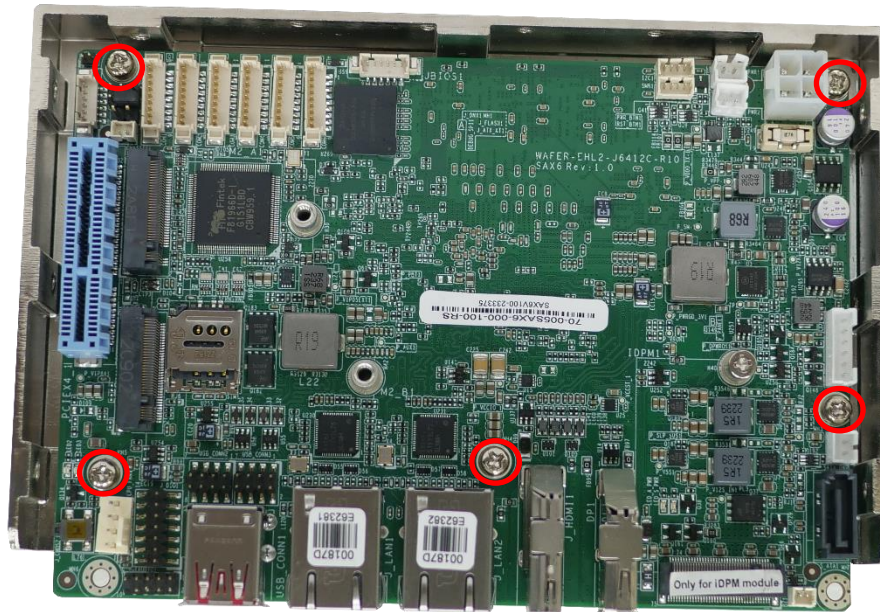


Figure 4-3 Heat Sink Retention Screws

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

WAFER-EHL2 SBC

4.4.2 Motherboard Installation

IEI recommend you to choose the DRPC-W-EHL2 for the WAFER-EHL2 installation. The DRPC-W-EHL2 is a compact embedded chassis designed for 3.5" single board computers. With its two-dimensional heat conduction and low wind resistance design on the surfaced, no extra thermal solution is needed to form the heat dissipation part. Users can get higher hardness, and benefit from the reduced production cost resulting from shortening manufacturing time. Furthermore, the height of aluminum extrusion can therefore be downsized to make the product light weight.



Figure 4-6: DRPC-W-EHL22-R10 Cooling



Figure 4-7: DRPC-W-EHL22-R10 with Extra Fan Cooling

The WAFER-EHL2 is also well designed to fit into other chassis in the market. Each side of the heat spreader has several screw holes allowing the WAFER-EHL2 to be mounted into a chassis or a heat sink enclosure (please refer to Figure 1-3 for the detailed dimensions). The user has to design or select a chassis or a heat sink enclosure that has screw holes matching up with the holes on the heat spreader for installing the WAFER-EHL2. The following diagram shows an example of motherboard installation.



Figure 4-8: Motherboard Installation Example

4.5 Riser Card Installation

The WAFER-EHL2 features a PCIe x4 (x2 signal) slot, which is a new design of the WAFER motherboard to expand functionality. By installing an IEI-developed riser card into the PCIe slot, the x2 signal is divided into two x1 slots, offering great configuration flexibility and expandability. Two types of riser cards with different orientation are available, one with slots facing outwards and the other with slots facing inwards.

The outwards-facing riser card (P/N: NWR-L2S-R10), although lower in height, is able to provide better spacing to ensure expansion cards to run at a low temperature. It is ideal for the chassis that is wide enough for the expansion card to be placed.

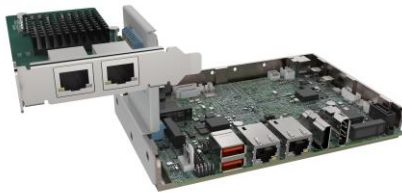


Figure 4-9:Outwards Riser Card Installation Example Figure 4-10: NWR-L2S-R10

The inwards-facing riser card (P/N: NWR-R2S-R10) is designed with higher height to keep a

WAFER-EHL2 SBC

decent space between the expansion cards and the motherboard. This can help improve the airflow and heat transfer within the system. It is suitable for installation where space is limited.

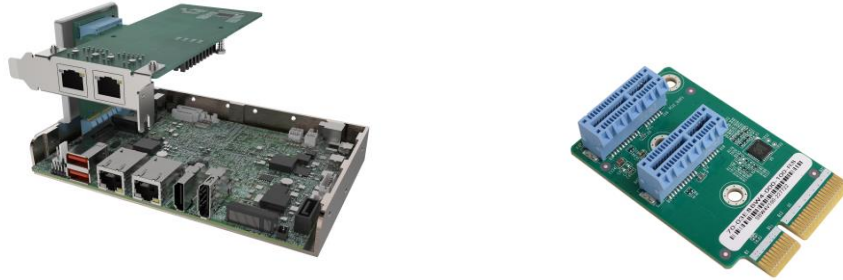


Figure 4-11: Inwards Riser Card Installation Example **Figure 4-12: NWR-R2S-R10**

Both of the riser cards can be firmly secured to enhance stability by using the L-shaped bracket, in which screw holes are perfectly matched with those on the side of the heat spreader to make it simple and easy to install. See Figure 4-13.

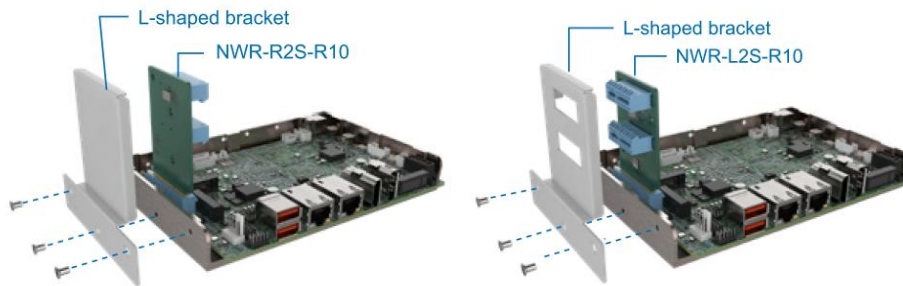


Figure 4-13:L-shaped Bracket Installation Example

4.6 Internal Peripheral Device Connections

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

4.6.1 AT Power Connection

Follow the instructions below to connect the WAFER-EHL2 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-EHL2.

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 4-14

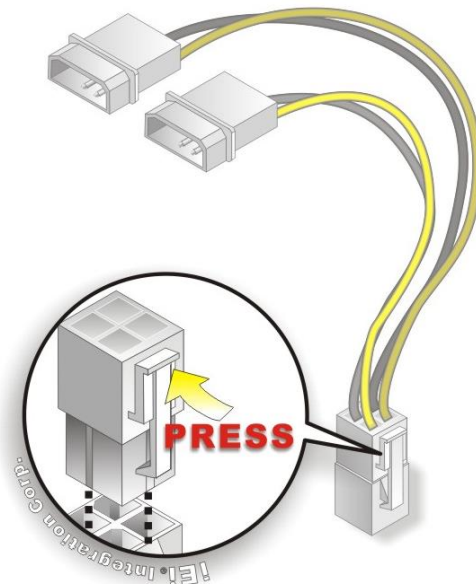


Figure 4-14: Power Cable to Motherboard Connection

WAFER-EHL2 SBC

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 4-15**

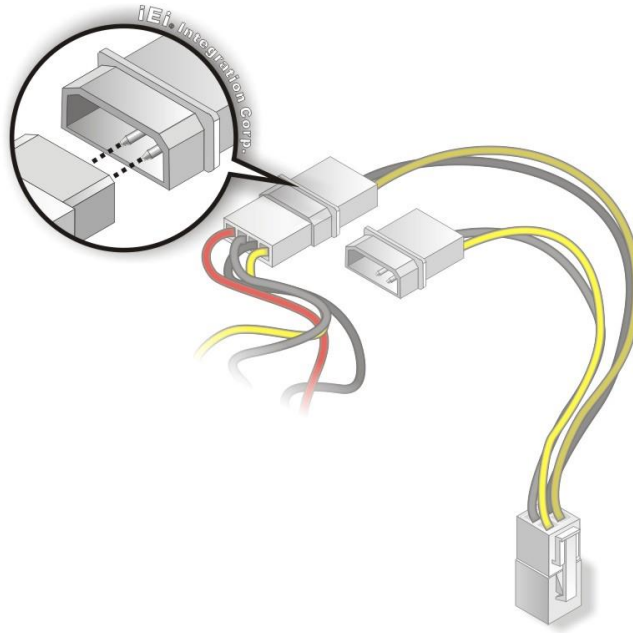


Figure 4-15: Connect Power Cable to Power Supply

4.6.2 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.

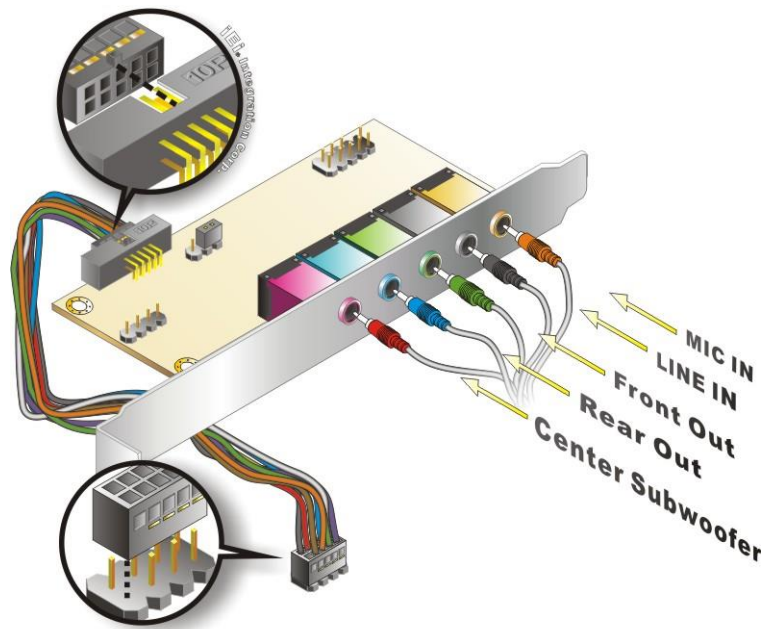


Figure 4-16: 7.1 Channel Audio Kit

- 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.

4.6.3 SATA Drive Connection

The WAFER-EHL2 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 4-17**.

WAFER-EHL2 SBC

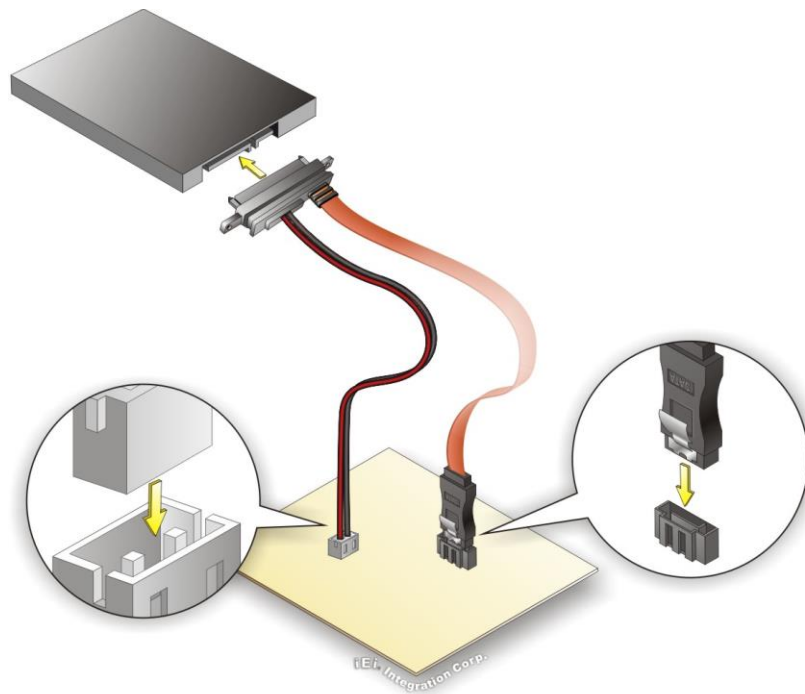


Figure 4-17: SATA Drive Cable Connection

- 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.

4.7 Software Drivers

4.7.1 Available Drivers

All the drivers for the WAFER-EHL2 are available on IEI Resource Download Center (<https://download.ieiworld.com>). Type WAFER-EHL2 and press Enter to find all the relevant software, utilities, and documentation.

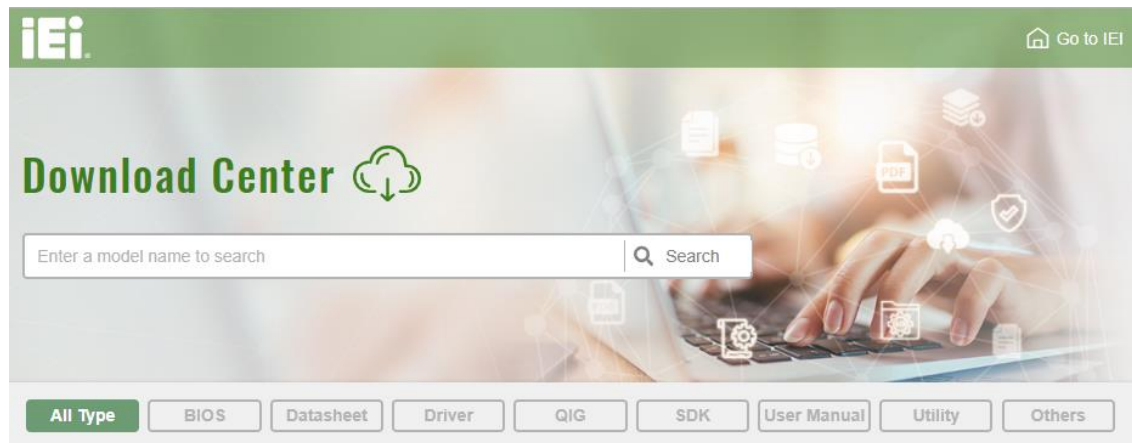
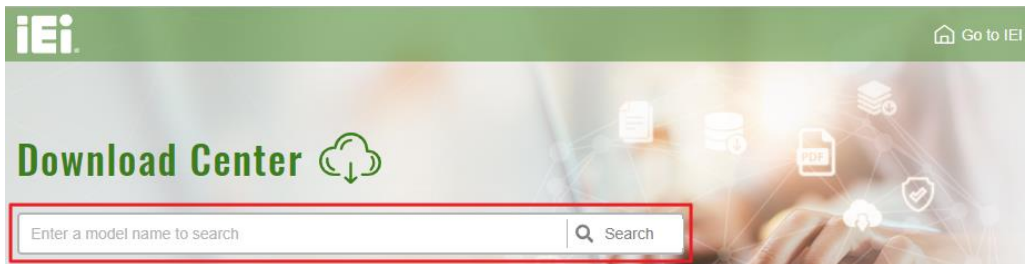


Figure 4-18: IEI Resource Download Center

4.7.2 Driver Download

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

Step 1: Go to <https://download.ieiworld.com>. Type WAFER-EHL2 and press Enter.



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

WAFER-EHL2 SBC

[All Type](#)
[BIOS](#)
[Datasheet](#)
[Driver](#)
[QIG](#)
[SDK](#)
[User Manual](#)
[Utility](#)
[Others](#)

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

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

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

* Download individual file *

- 1. Chipset
- 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-EHL2 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 **F2** 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 **F2** 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.

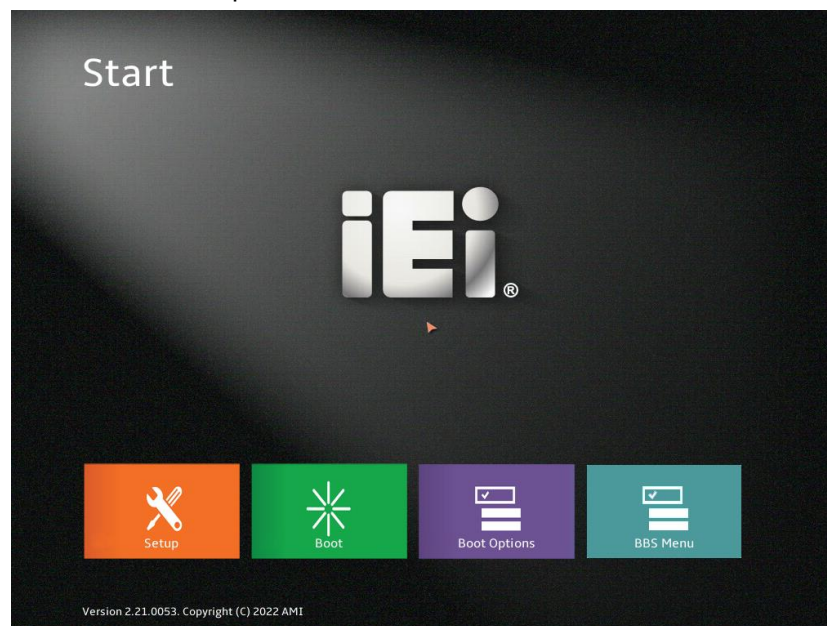


Figure 5-1: BIOS Starting Menu

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**.

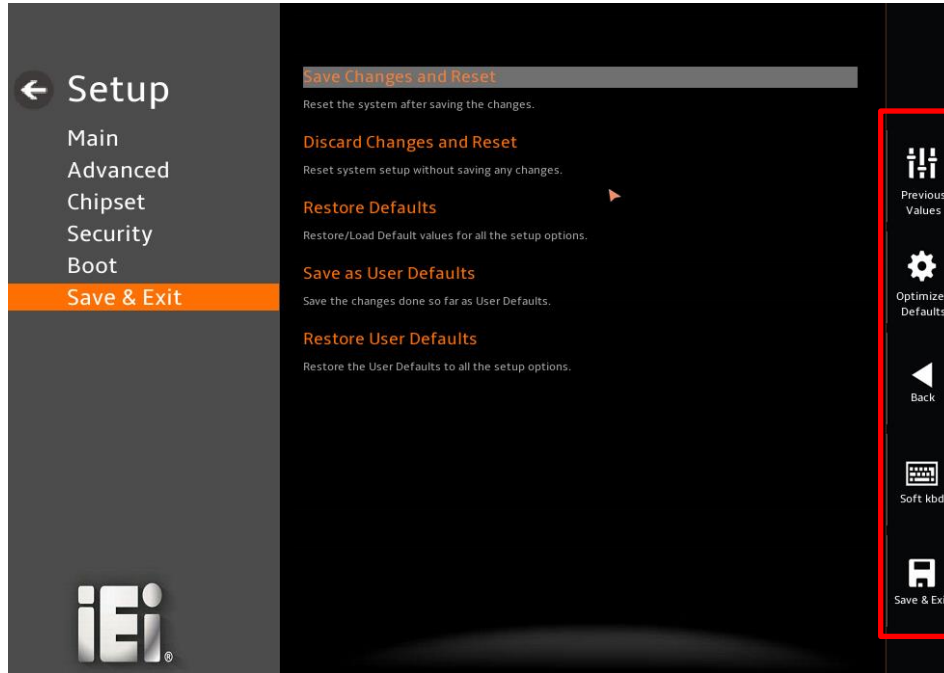
Key	Function
Up arrow	Move to previous item
Down arrow	Move to next item
Left arrow	Move to the item on the left hand side
Right arrow	Move to the item on the right hand side
+	Increase the numeric value or make changes
-	Decrease the numeric value or make changes
Page Up	Move to the previous page
Page 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-EHL2 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:

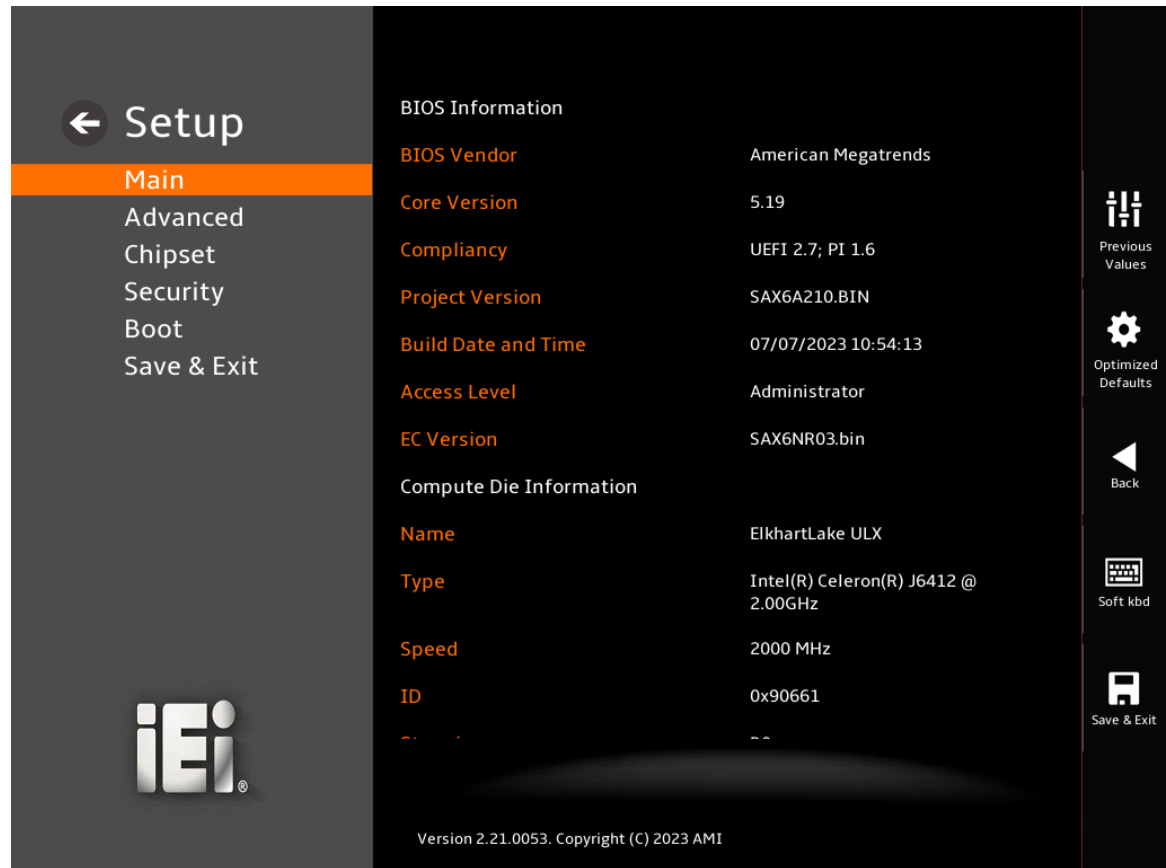
- Main – Changes the basic system configuration.
- Advanced – Changes the advanced system settings.
- Chipset – Changes the chipset settings.
- Security – Sets User and Supervisor Passwords.
- Boot – Changes the system boot configuration.
- Save & Exit – Selects exit options and loads default settings

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

WAFER-EHL2 SBC

5.2 Main

The **Main** BIOS menu (**BIOS Menu 1 & BIOS Menu 2 & BIOS Menu 3**) appears when the **BIOS Setup** program is entered. The **Main** menu gives an overview of the basic system information.



BIOS Menu 1: Main(1/3)

The screenshot shows the BIOS Setup Main menu. On the left is a navigation sidebar with 'Setup' at the top and 'Main' selected. The main area displays system information for an Intel(R) Celeron(R) J6412 @ 2.00GHz processor. The right sidebar contains navigation icons: Previous Values, Optimized Defaults, Back, Soft kbd, and Save & Exit. The iEi logo is in the bottom left of the main area, and the version '2.21.0053' is at the bottom.

Type	Intel(R) Celeron(R) J6412 @ 2.00GHz
Speed	2000 MHz
ID	0x90661
Stepping	B0
Package	Not Implemented Yet
Number of Processors	4Core(s) / 4Thread(s)
Microcode Revision	17
GT Info	GT2 (0x4555)
IGFX GOP Version	18.0.1034
Memory RC Version	0.0.4.104
Total Memory	8192 MB
Memory Data Rate	3200 MTPS
PCH Information	

Version 2.21.0053. Copyright (C) 2023 AMI

BIOS Menu 2 : Main(2/3)

WAFER-EHL2 SBC

The screenshot shows the BIOS Setup interface. On the left is a navigation menu with 'Main' highlighted. The main area displays system information:

Total Memory	8192 MB
Memory Data Rate	3200 MTPS
PCH Information	
Name	EHL PCH
PCH SKU	MCC SKU 0
Stepping	B1
ME FW Version	15.40.16.2485
ME Firmware SKU	Consumer SKU
PMC FW Version	154.1.10.1027
System Date	09/07/2048
<small>Set the Date. Use Tab to switch between Date elements. Default Ranges: Year: 2005-2099 Months: 1-12 Days: Dependent on month Range of Years may vary.</small>	
System Time	09:09:29
<small>Set the Time. Use Tab to switch between Time elements.</small>	

At the bottom, it says 'Version 2.21.0053. Copyright (C) 2023 AMI'. On the right side, there are navigation icons: Previous Values, Optimized Defaults, Back, Soft kbd, and Save & Exit.

BIOS Menu 3 : Main(3/3)

→ 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:

- **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.

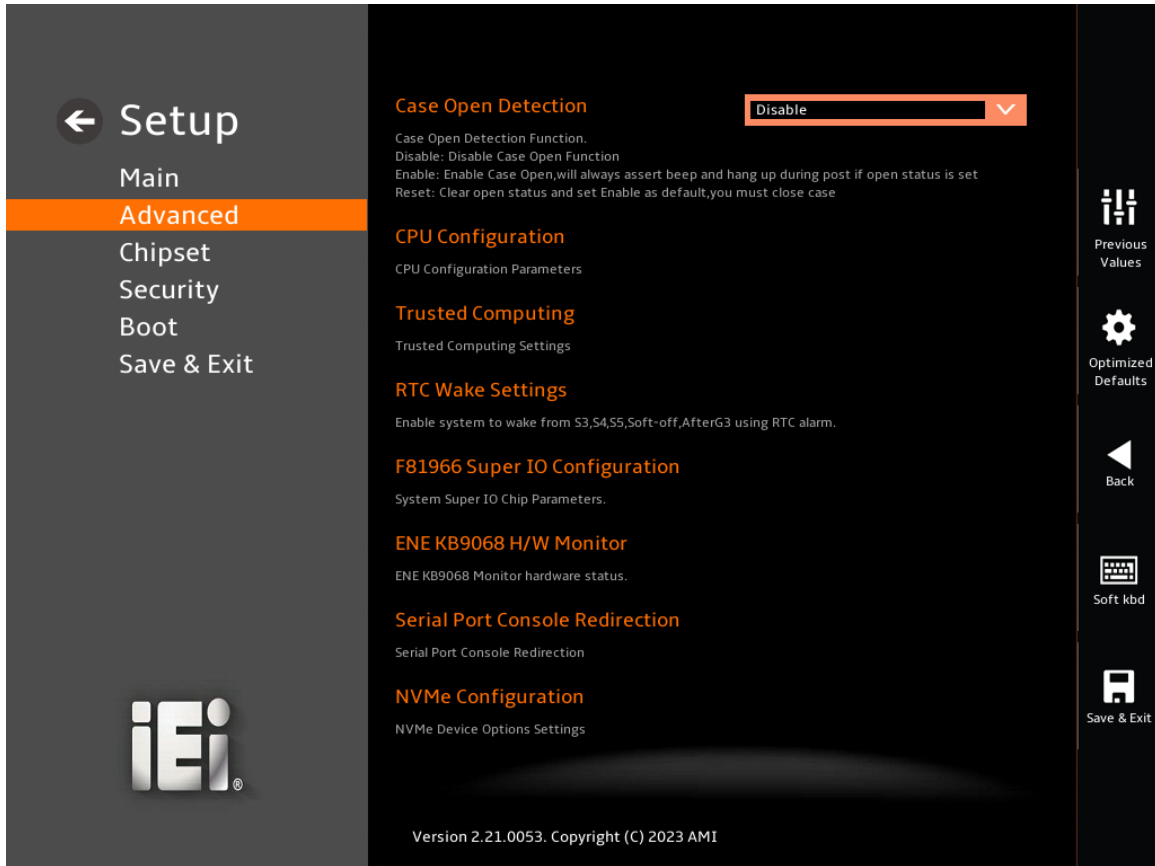
5.3 Advanced

Use the **Advanced** menu (**BIOS Menu 4**) 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 4 : Advanced

5.3.1 CPU Configuration

Use the **CPU Configuration** menu (**BIOS Menu 5 & BIOS Menu 6 & BIOS Menu 7**) to view detailed CPU specifications or enable the Intel Virtualization Technology.



BIOS Menu 5 : CPU Configuration (1/3)

WAFER-EHL2 SBC

Setup

- Main
- Advanced**
- Chipset
- Security
- Boot
- Save & Exit

Intel (VMX) Virtualization Technology Enabled

When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

Active Processor Cores All

Number of cores to enable in each processor package.

EIST Enabled

Allows more than two frequency ranges to be supported.

C states Disabled

Enable/Disable CPU Power Management. Allows CPU to go to C states when it's not 100% utilized.

Tcc Activation Offset 0

Offset from factory 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

Enable/Disable processor Turbo Mode (requires EMTTM enabled too). AUTO means enabled.

Power Limit 1 0

Power Limit 1 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 Max and Min Power Limits (specified by PACKAGE_POWER_SKU_MSR). Other SKUs: This value must be between Min Power Limit and TDP Limit. If value is 0, BIOS will program TDP value.

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- Previous Values
- Optimized Defaults
- Back
- Soft kbd
- Save & Exit

BIOS Menu 6 : CPU Configuration (2/3)



BIOS Menu 7 : CPU Configuration (3/3)

➔ **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.

WAFER-EHL2 SBC

- ➔ 1 Enable one core in the processor package.
- ➔ 2 Enable two cores in the processor package.
- ➔ 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 [Enabled]

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 Max and Min 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 Milli 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-EHL2 SBC

5.3.2 Trusted Computing

Use the **Trusted Computing** menu (**BIOS Menu 8**) to configure settings related to the Trusted Computing Group (TCG) Trusted Platform Module (TPM).



BIOS Menu 8 : 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.

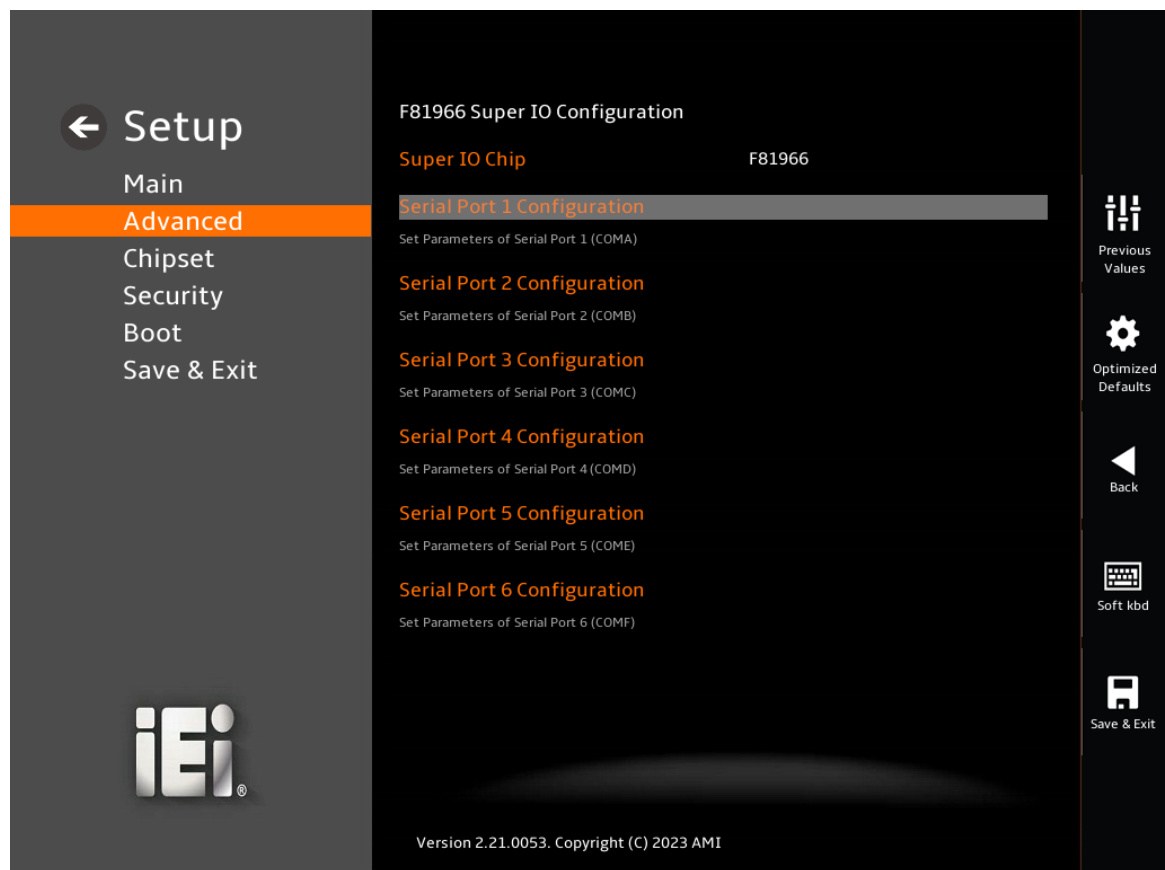
→ Pending Operation [None]

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 F81804 Super IO Configuration

Use the **F81804 Super IO Configuration** menu (**BIOS Menu 9**) to set or change the configurations for the serial ports.

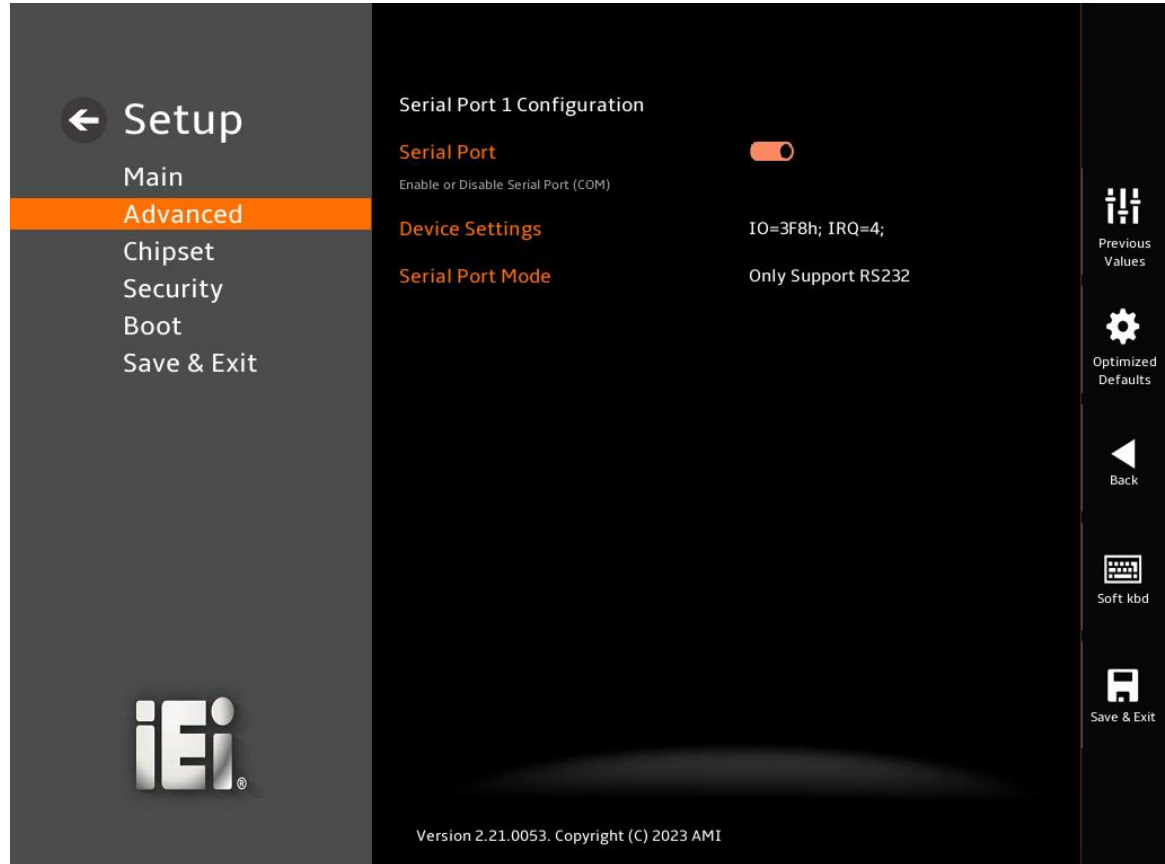


BIOS Menu 9 : F81966 Super IO Configuration

WAFER-EHL2 SBC

5.3.3.1 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.

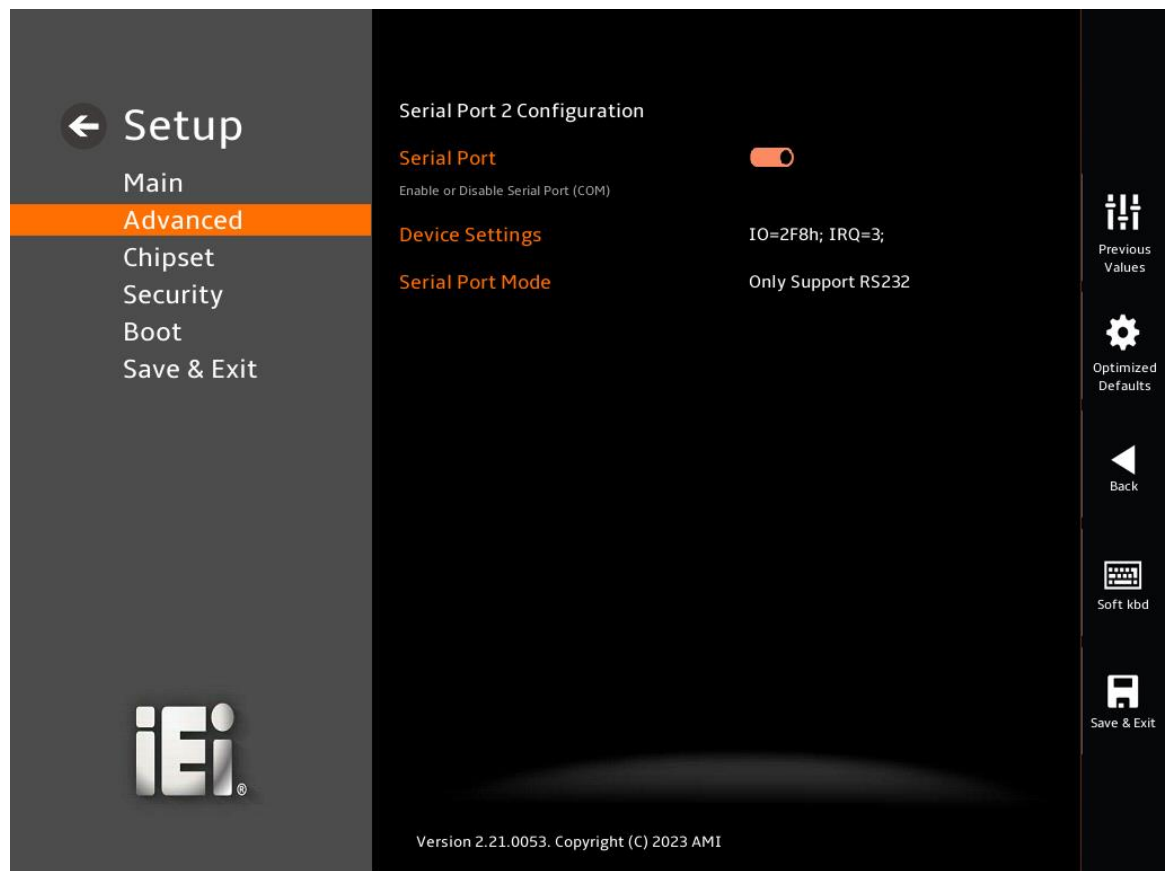
- **IO=3F8h;** Serial Port I/O port address is 3F8h and the interrupt address is IRQ4
- IRQ=4**

→ **Serial Port Mode**

The Serial Port Mode only support RS-232.

5.3.3.2 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

WAFER-EHL2 SBC

➔ **Enabled** **DEFAULT** Enable the serial port

➔ **Device Settings**

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

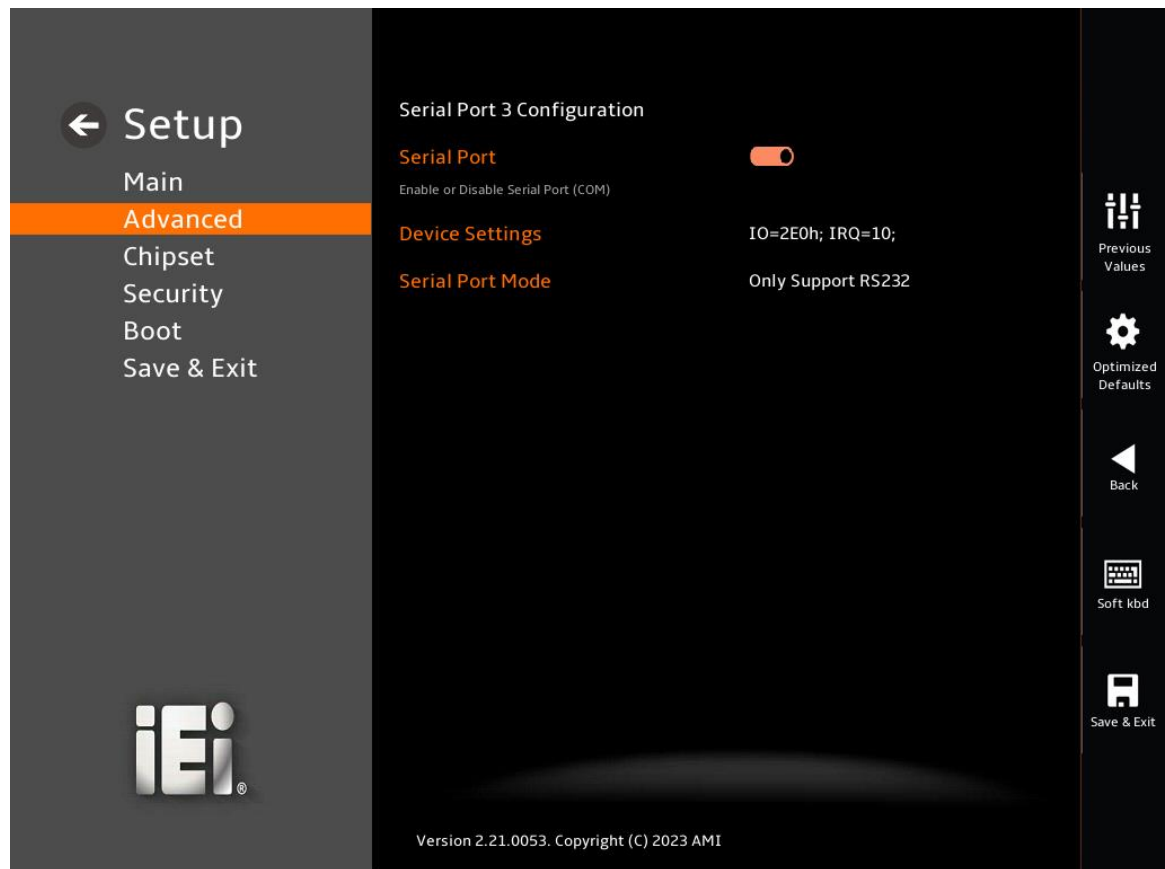
➔ **IO=2F8h;** Serial Port I/O port address is 2F8h and the interrupt
IRQ=3 address is IRQ3

➔ **Device Mode**

The Serial Port Mode only support RS-232.

5.3.3.3 Serial Port 3 Configuration

Use the **Serial Port 3 Configuration** menu (**BIOS Menu 12**) to configure the serial port.



BIOS Menu 12 : Serial Port 3 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=2E0h;** Serial Port I/O port address is 2E0h and the interrupt
IRQ=10 address is IRQ10

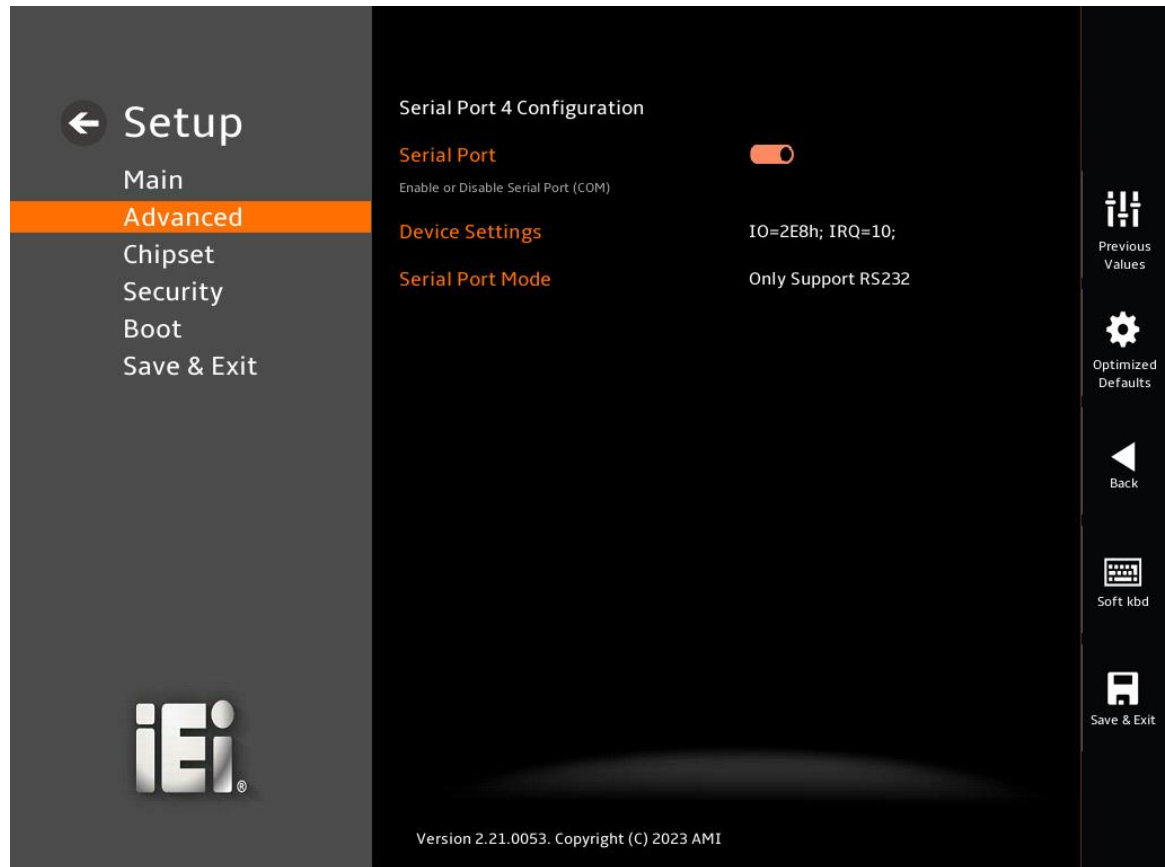
→ **Device Mode**

The Serial Port Mode only support RS-232.

WAFER-EHL2 SBC

5.3.3.4 Serial Port 4 Configuration

Use the **Serial Port 4 Configuration** menu (**BIOS Menu 13**) to configure the serial port.



BIOS Menu 13 : Serial Port 4 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=2E8h;**
IRQ=10

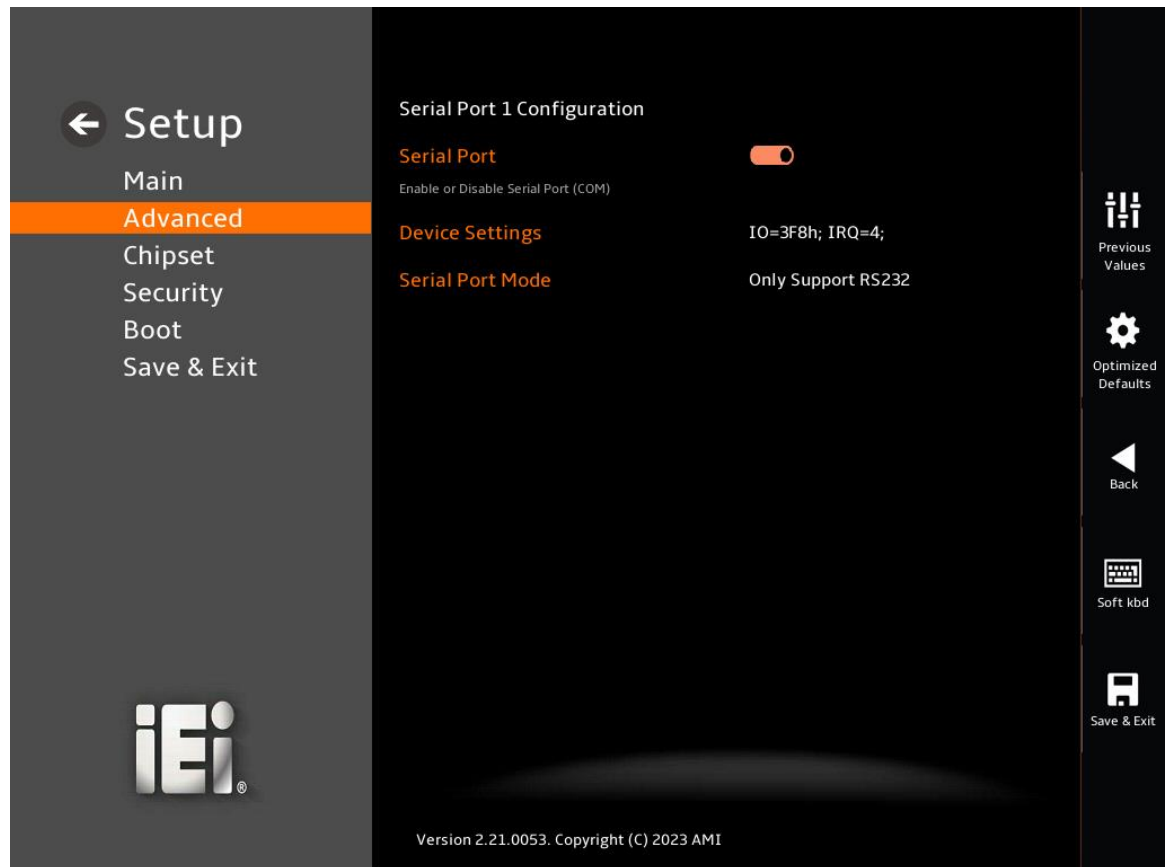
Serial Port I/O port address is 2E8h and the interrupt address is IRQ10

➔ **Device Mode**

The Serial Port Mode only support RS-232.

5.3.3.5 Serial Port 5 Configuration

Use the **Serial Port 5 Configuration** menu (**BIOS Menu 14**) to configure the serial port.



BIOS Menu 14 : Serial Port 5 Configuration Menu

➔ **Serial Port [Enabled]**

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

WAFER-EHL2 SBC

→ **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.

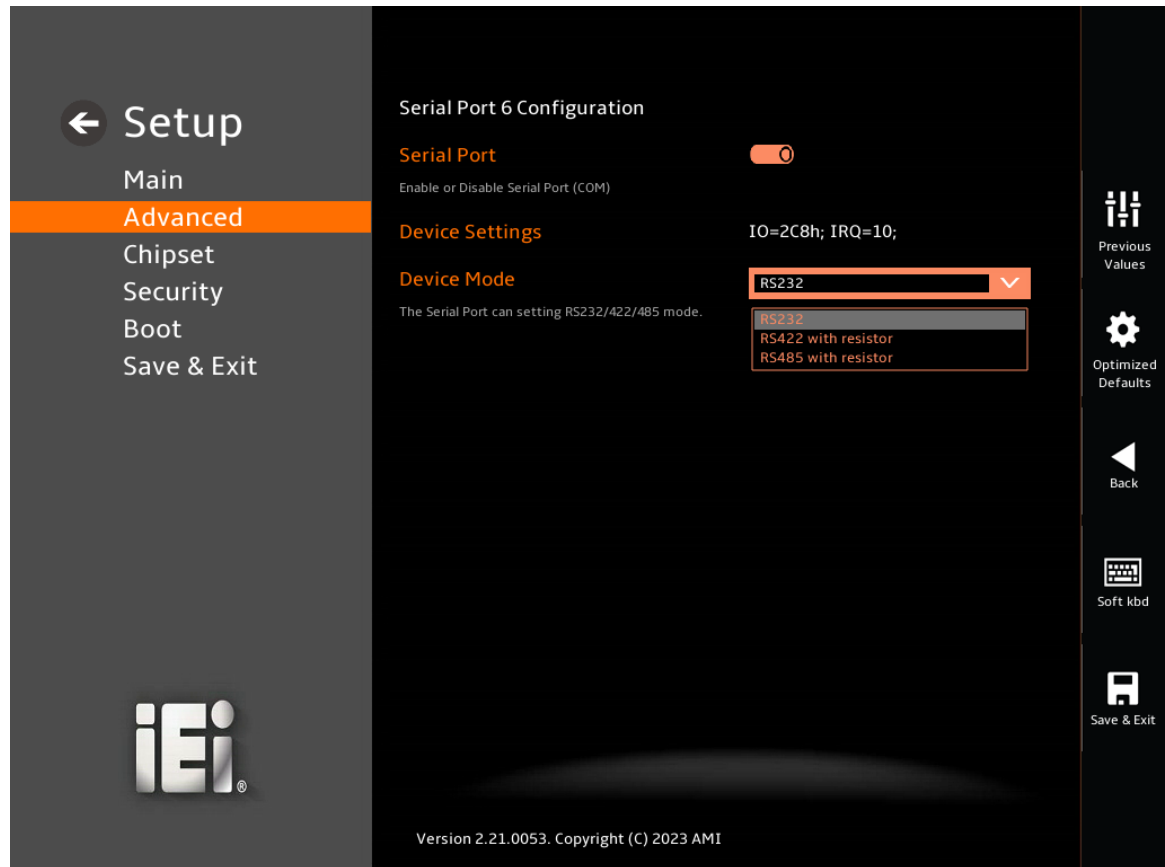
→ **IO=3F8h;** Serial Port I/O port address is 3F8h and the interrupt
IRQ=4 address is IRQ4

→ **Device Mode**

The Serial Port Mode only support RS-232.

5.3.3.6 Serial Port 6 Configuration Menu

Use the **Serial Port 6 Configuration** menu (**BIOS Menu 15**) to configure the serial port.



BIOS Menu 15 : Serial Port 6 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.

WAFER-EHL2 SBC

→ **IO=3F8h;**
IRQ=10

Serial Port I/O port address is 3F8h and the interrupt address is IRQ10

→ **Device Mode**

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

→ **RS232**

The serial port mode is RS-232

RS422 with Register

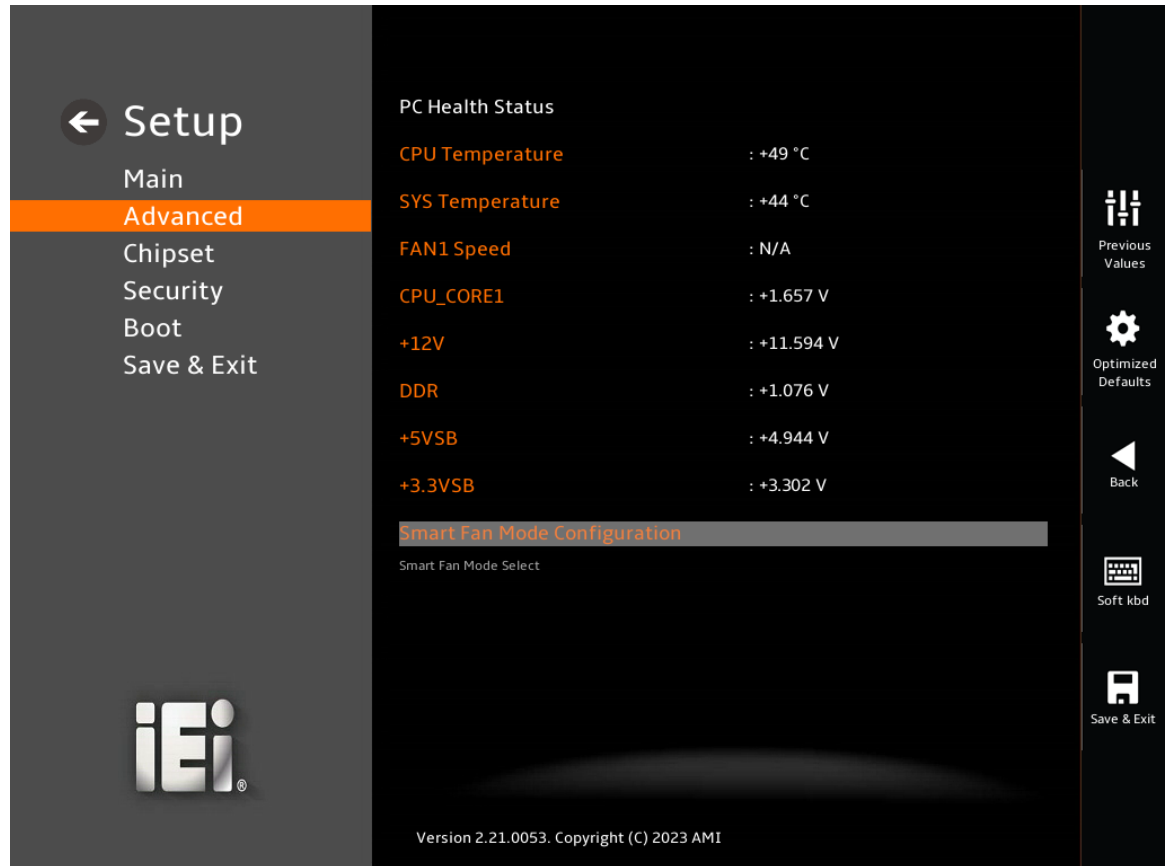
The serial port mode is RS-422

RS485 with Register

The serial port mode is RS-485

5.3.4 ENE KB9068 Monitor

The ENE KB9068 Monitor menu (**BIOS Menu 16**) 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 16 : ENE KB9068 Monitor

→ PC Health Status

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

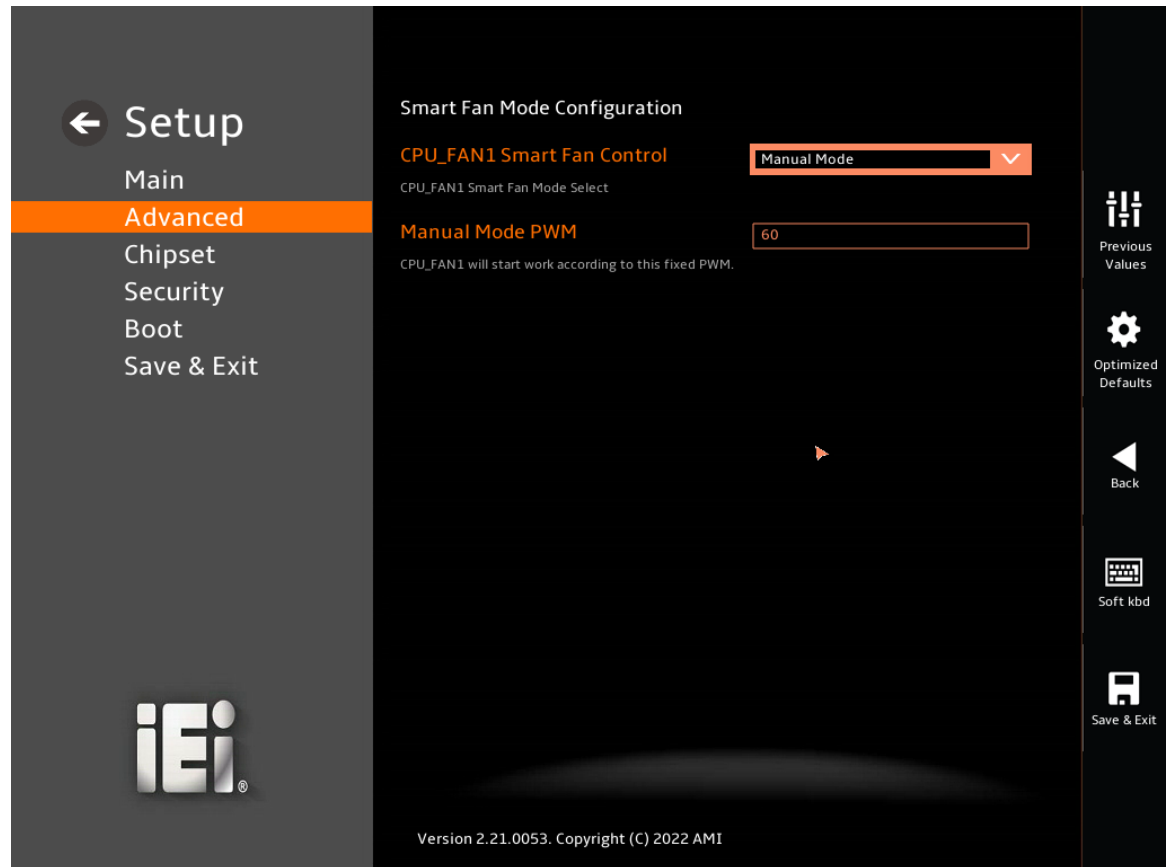
- System Temperatures:
 - CPU Temperature
 - System Temperature
- Fan Speeds:

WAFER-EHL2 SBC

- Fan1 Speed
- Voltages:
 - CPU_CORE
 - +12V
 - DDR
 - +5VSB
 - +3.3VSB

5.3.4.1 Smart Fan Mode Configuration

Use the **Smart Fan Mode Configuration** submenu (**BIOS Menu 17**) to configure the CPU/system fan start/off temperature and control mode.



BIOS Menu 17 : Smart Fan Mode Configuration

➔ **Smart Fan Control [Auto Mode]**

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

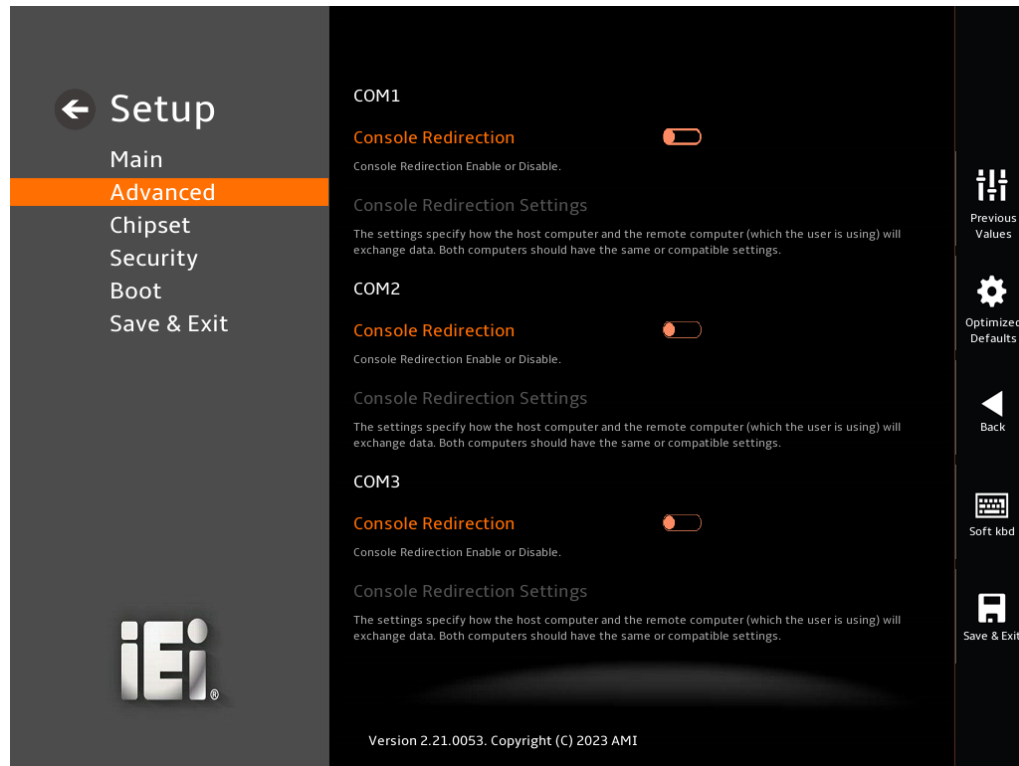
- ➔ **Manual Mode** The fan spins at the speed set in Manual Mode settings.
- ➔ **Auto Mode** **DEFAULT** The fan adjusts its speed using Auto Mode settings.

➔ **CPU_FAN1 Start PWM**

Use the **CPU_FAN1 Start PWM** option to set the PWM start value. Use the + or – key to change the value or enter a decimal number between 1 and 100.

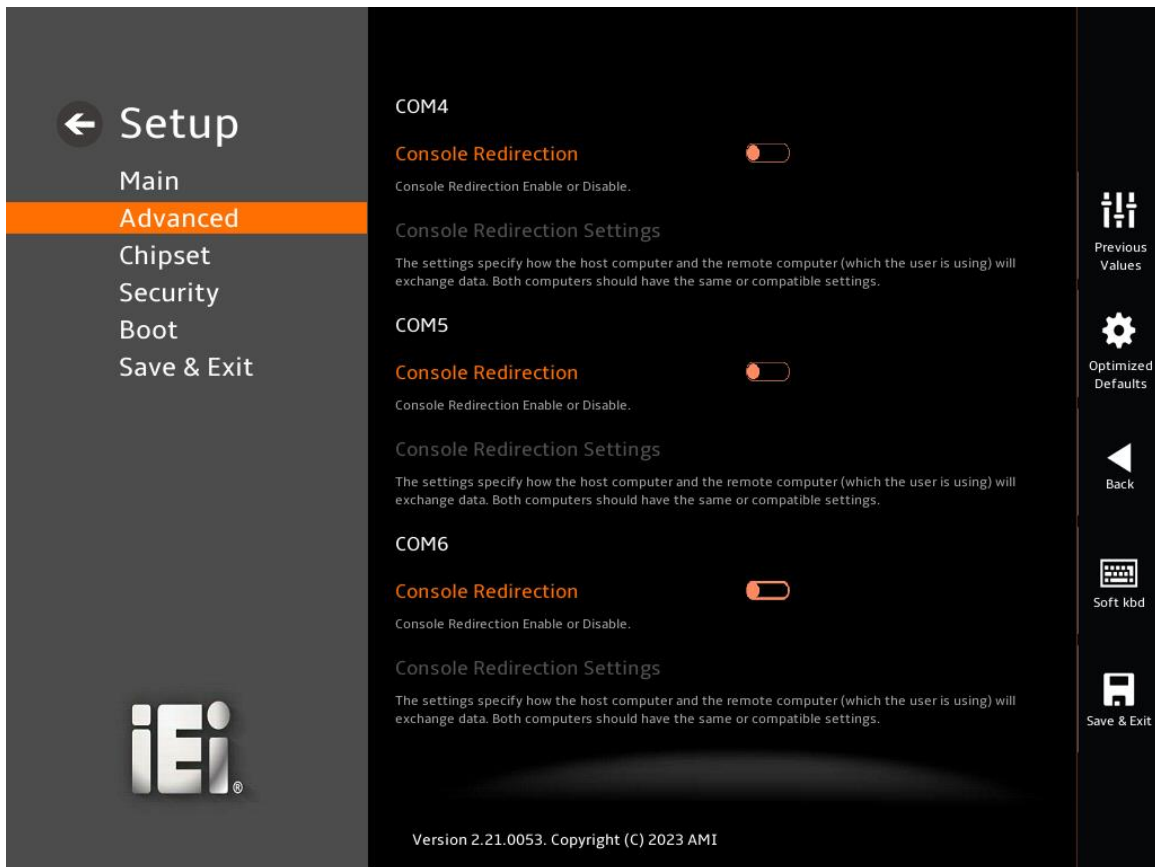
5.3.5 Serial Port Console Redirection

The **Serial Port Console Redirection** menu (**BIOS Menu 18 & BIOS Menu 19**) 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 18 : Serial Port Console Redirection (1/2)

WAFER-EHL2 SBC



BIOS Menu 19 : Serial Port Console Redirection (2/2)

→ 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.

5.3.5.1 Console Redirection Settings

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

WAFER-EHL2 SBC

- **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.

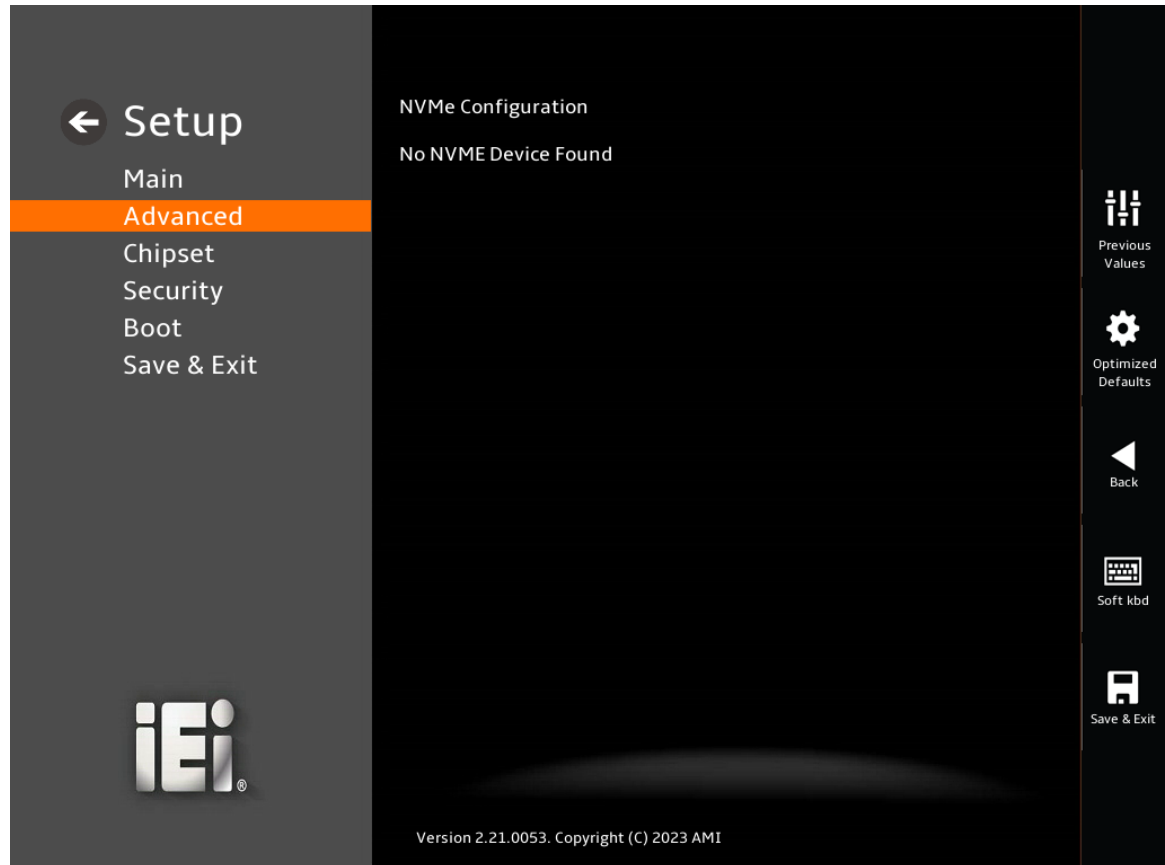
→ Stop Bits [1]

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.

5.3.6 NVMe Configuration

Use the **NVMe Configuration (BIOS Menu 21)** menu to display the NVMe controller and device information.



BIOS Menu 21: NVMe Configuration

WAFER-EHL2 SBC

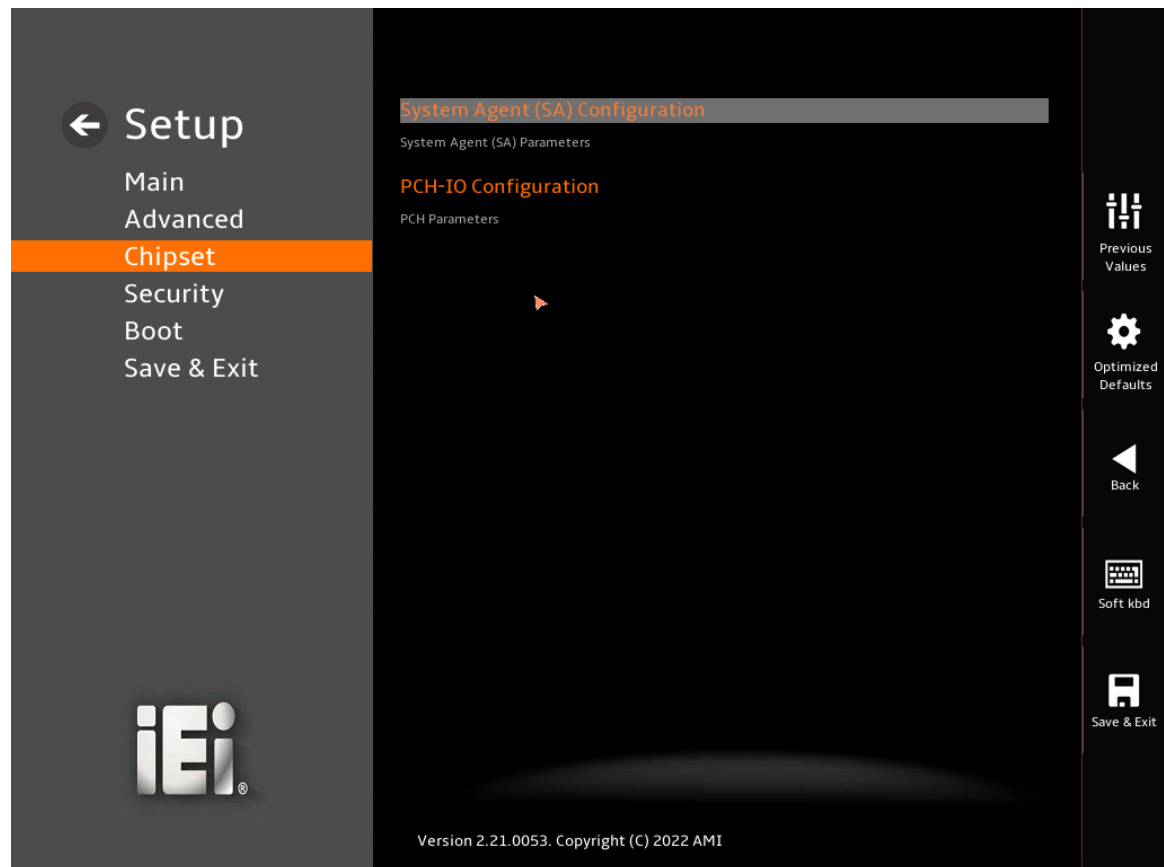
5.4 Chipset

Use the **Chipset** menu (**BIOS Menu 22**) to access the PCH IO and System Agent (SA) configuration menus.



WARNING!

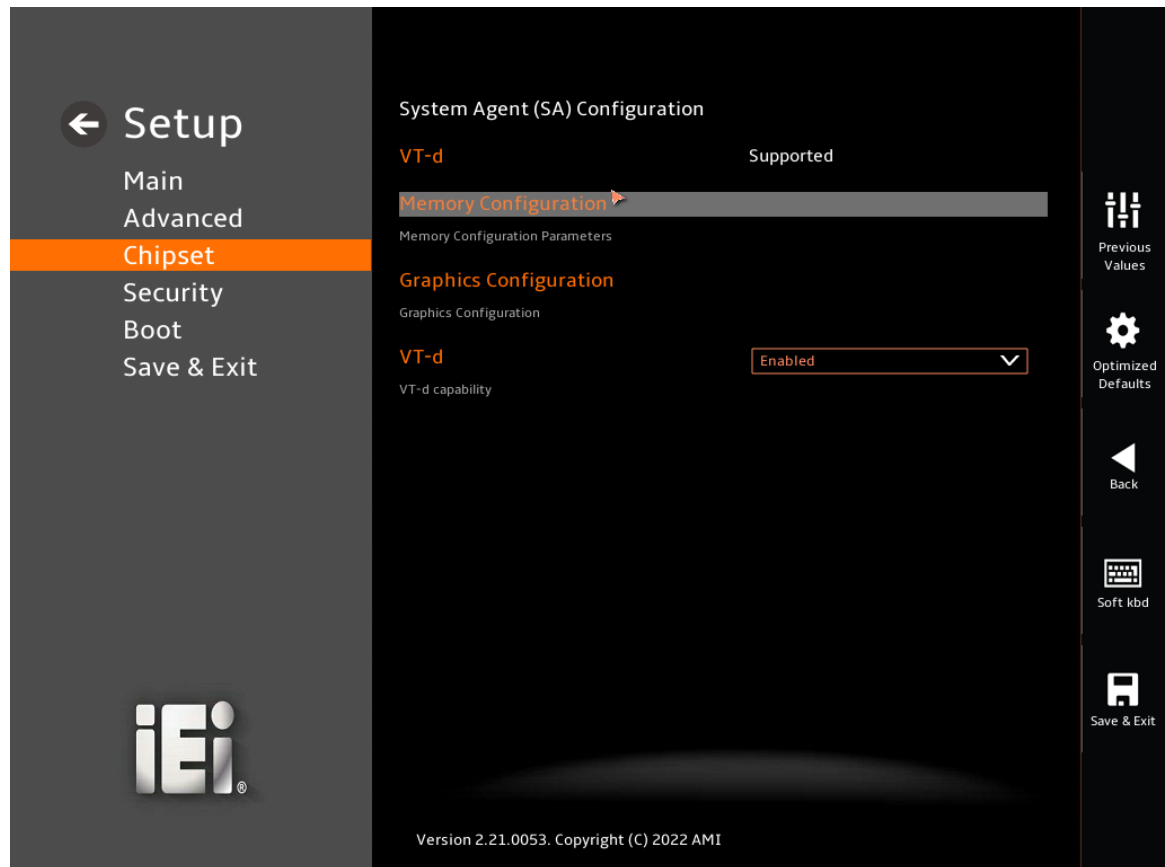
Setting the wrong values for the Chipset BIOS selections in the Chipset BIOS menu may cause the system to malfunction.



BIOS Menu 22: Chipset

5.4.1 System Agent (SA) Configuration

Use the **System Agent (SA) Configuration** menu (**BIOS Menu 23**) to configure the System Agent (SA) parameters.



BIOS Menu 23: System Agent (SA) Configuration

➔ **VT-d [Enabled]**

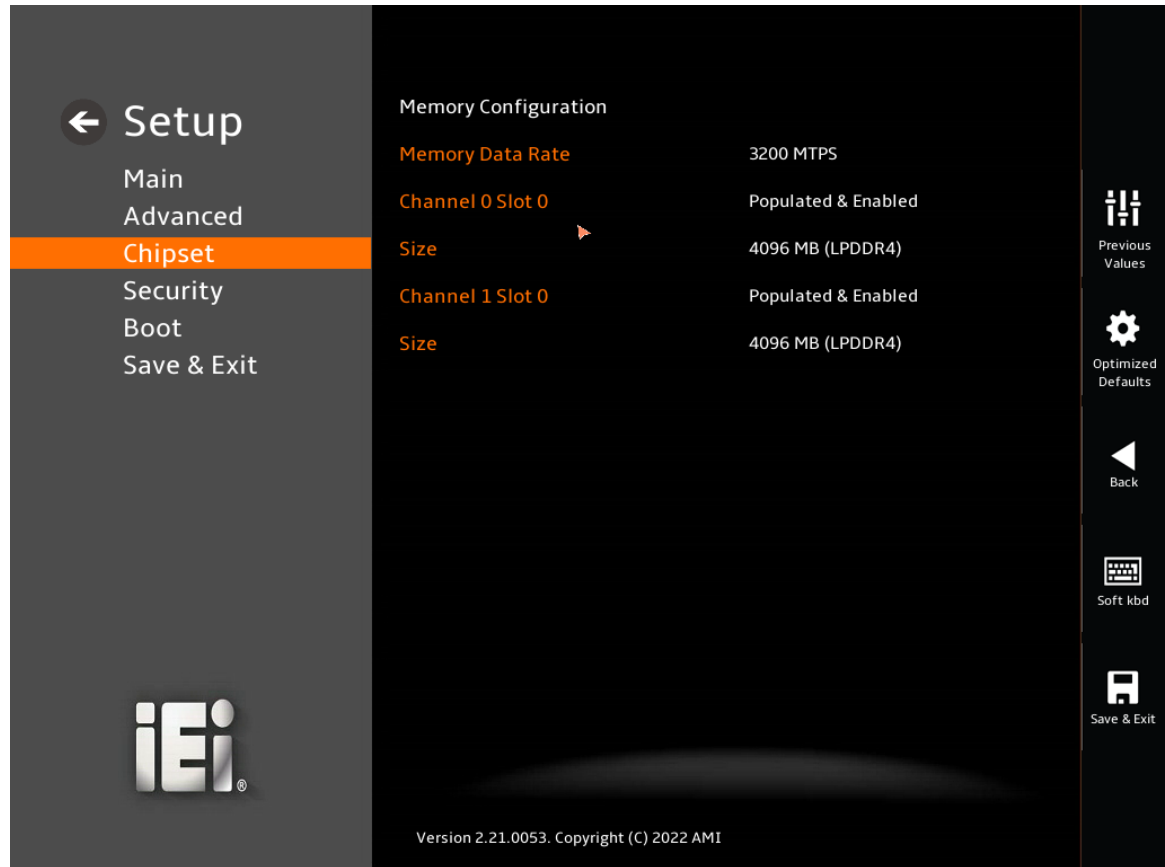
Use the **VT-d** option to enable or disable the VT-d capability.

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

WAFER-EHL2 SBC

5.4.1.1 Memory Configuration

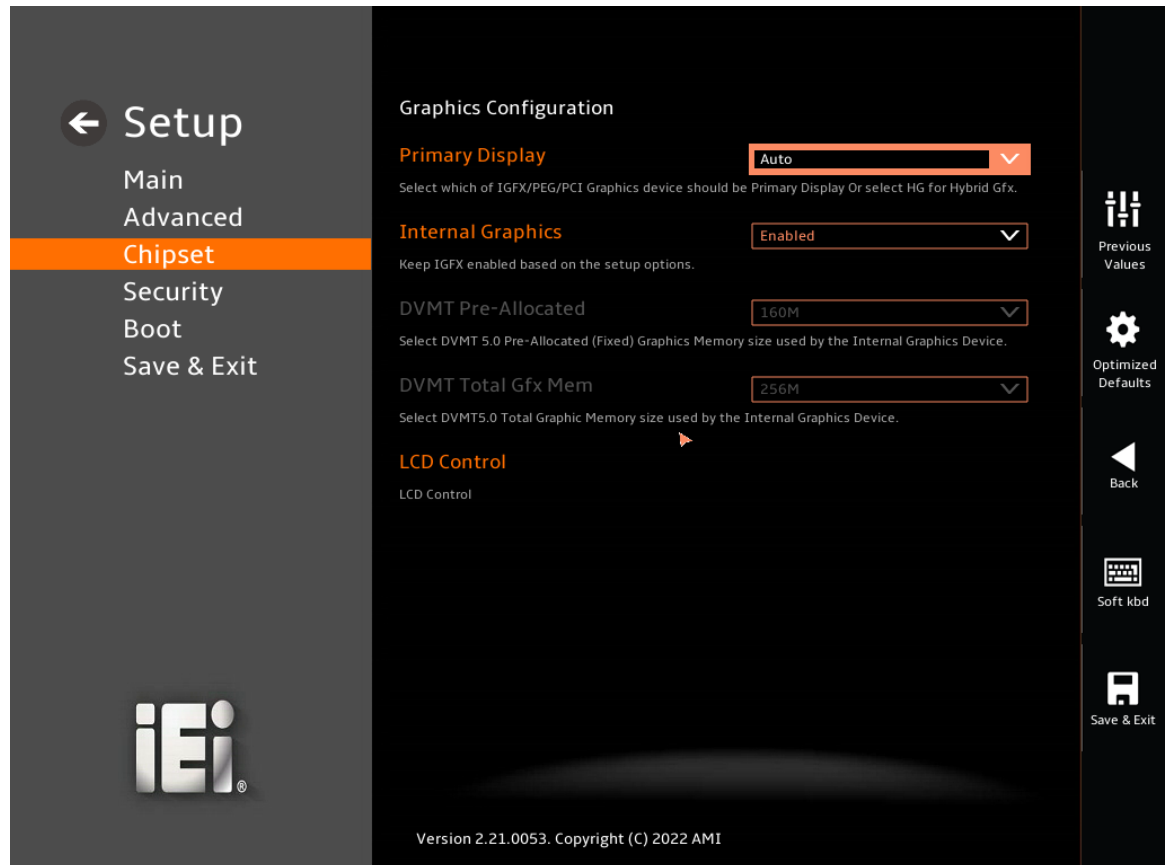
Use the **Memory Configuration** submenu (**BIOS Menu 24**) to view memory information.



BIOS Menu 24: Memory Configuration

5.4.1.2 Graphics Configuration

Use the **Graphics Configuration (BIOS Menu 25)** menu to configure the video device connected to the system.



BIOS Menu 25: Graphics Configuration

→ Primary Display [Auto]

Use the **Primary Display** option to select the primary graphics controller the system uses.

The following options are available:

- Auto **Default**
- IGFX
- PEG
- PCI

WAFER-EHL2 SBC

→ Internal Graphics [Enabled]

Use the **Internal Graphics** option to configure whether to keep IGFX enabled. If user wants to support dual display by internal graphics and external graphics, this Internal Graphics option should be set to Enabled and the above Primary Display option should be set to IGFX.

- | | | | |
|---|-----------------|----------------|----------------|
| → | Auto | | Auto mode |
| → | Disabled | | Disables IGFX. |
| → | Enabled | Default | Enables IGFX. |

→ 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:

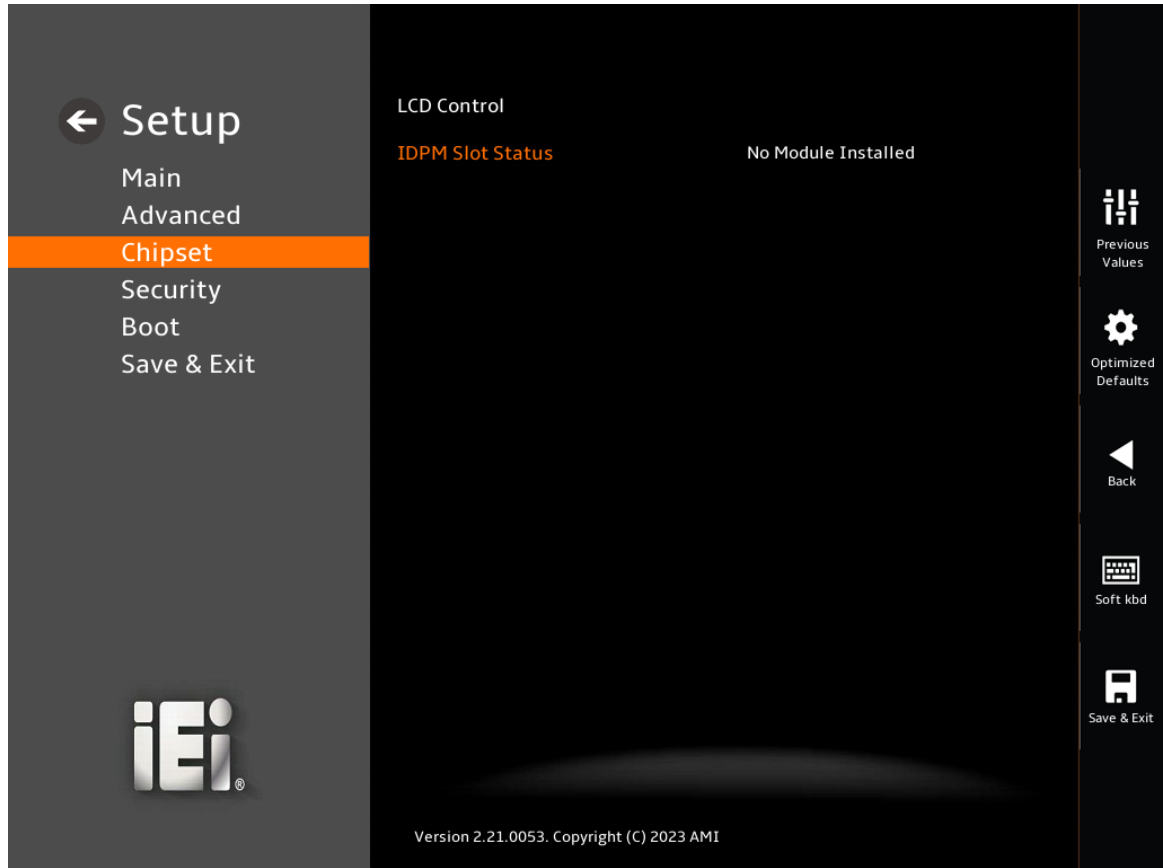
- | | | |
|---|------|----------------|
| ▪ | 80M | |
| ▪ | 160M | Default |

→ DVMT Total Gfx Mem [256M]

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 |

→ LCD Control



BIOS Menu 26 : LCD Control

→ **iDPM Slot Control[Auto Detect Module(EDP/LVDS/VGA)]**

Use the iDPM Slot Control option to select iDPM module or auto detect for iDPM LVDS/EDP/VGA Module.

- **Auto Detect** **DEFAULT** Auto detect for iDPM LVDS/EDP/VGA Module.
Module(EDP /LVDS/VGA)

- **iDPM-VBO** Select iDPM-VBO Module
Module

- **iDPM-MIPI** Select iDPM-MIPI Module
Module

WAFER-EHL2 SBC

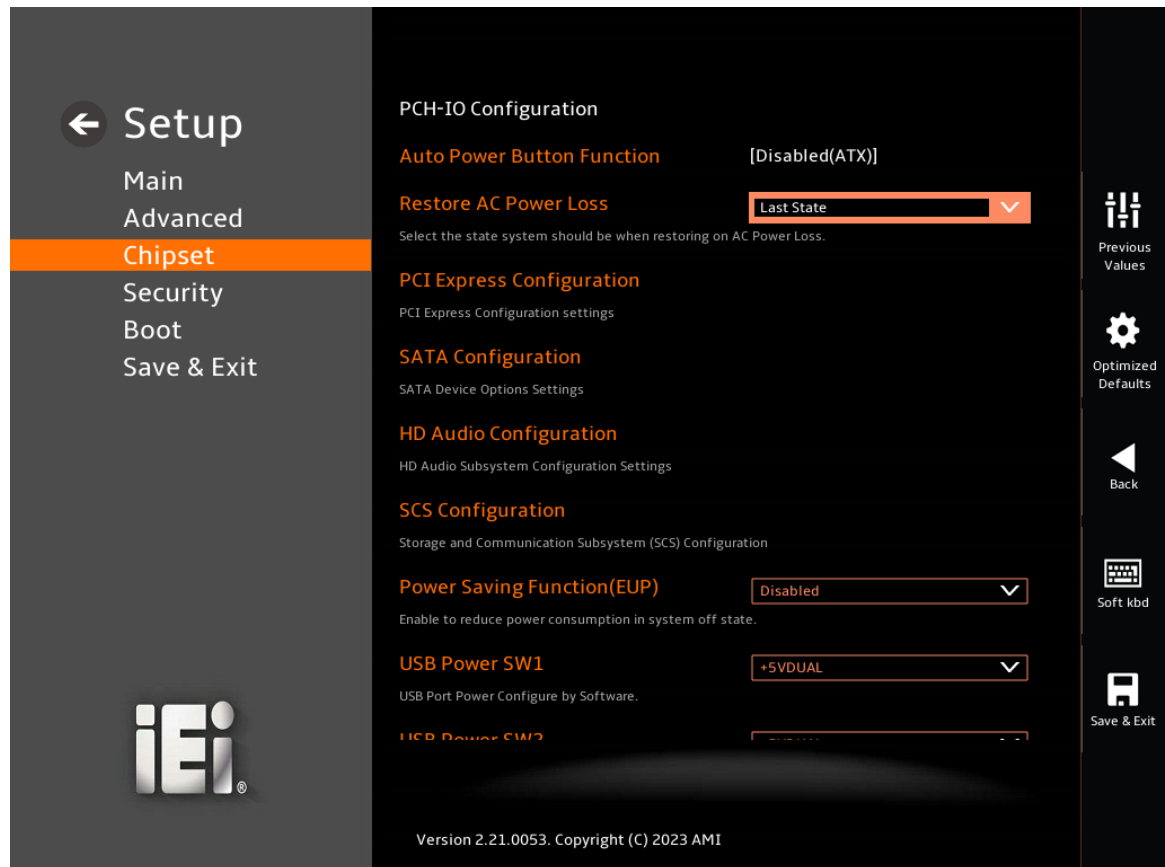
→ LVDS Backlight PWM mode[Invert]

Use the LVDS Backlight PWM Mode option to specify a PWM mode for LVDS backlight control.

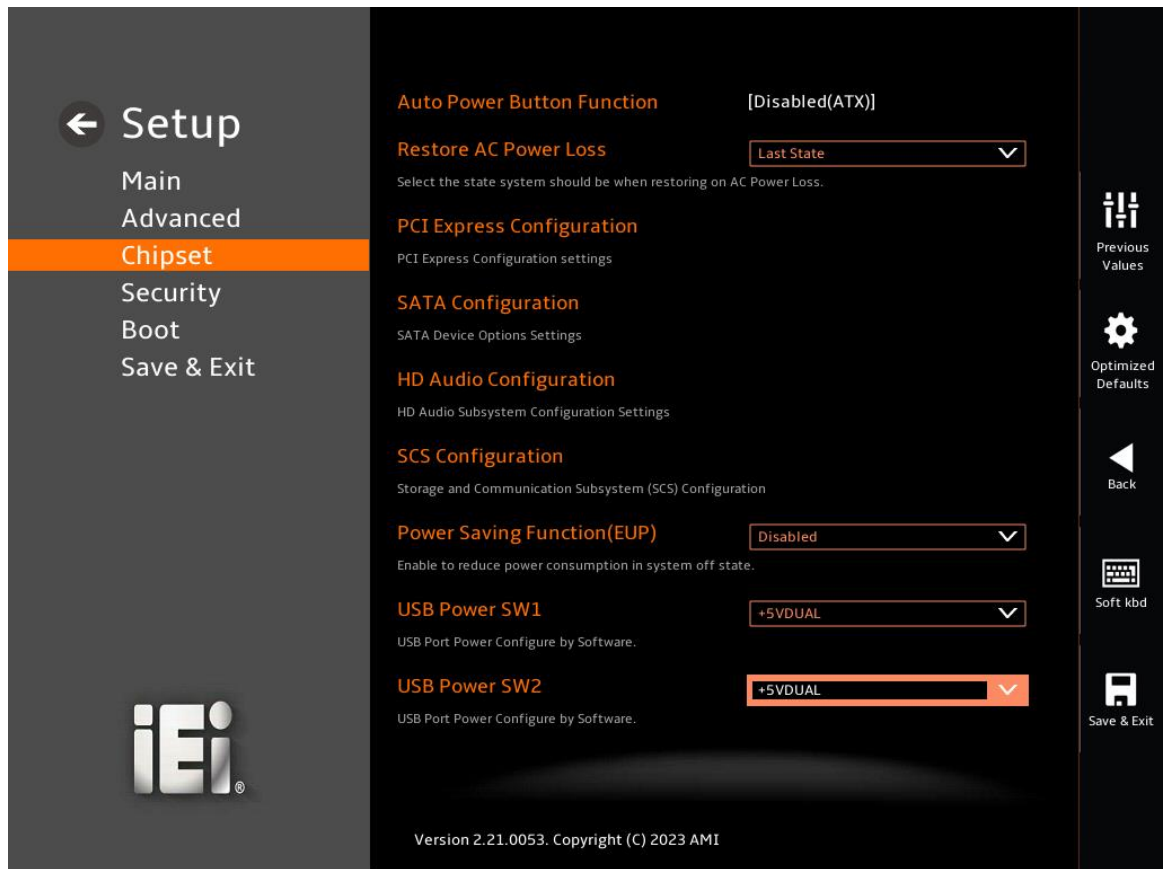
- **Invert** **DEFAULT** Set to invert LVDS Backlight.
- **Normal** Set to normal LVDS Backlight.

5.4.2 PCH-IO Configuration

Use the **PCH-IO Configuration** menu (**BIOS Menu 27 & BIOS Menu 28**) to configure the PCH parameters.



BIOS Menu 27 : PCH-IO Configuration (1/2)



BIOS Menu 28 : PCH-IO Configuration (2/2)

➔ **Auto Power Button Function [Enabled(AT)]**

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.

- ➔ **Enabled (AT)** The system power mode is AT.
- ➔ **Disabled (ATX)** The system power mode is ATX.

➔ **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

WAFER-EHL2 SBC

➔ **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.

➔ **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 SW1 [+5V DUAL]**

Use the **USB Power SW1** 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 SW2 [+5V DUAL]**

Use the **USB Power SW2** 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

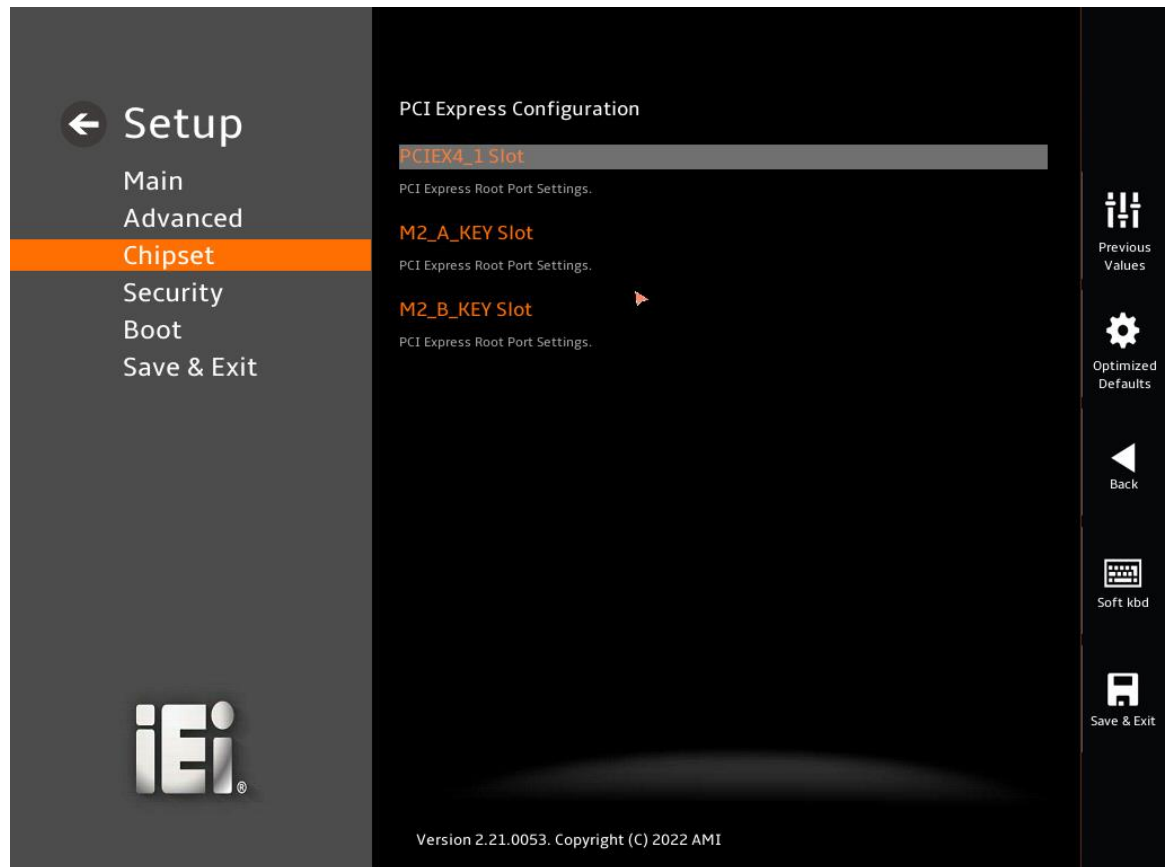
➔ **+5V** Sets the USB power source to +5V

BIOS Options	Configured USB Ports
USB Power SW1	USB_CONN1 (external USB 3.2 Gen 2 ports)
USB Power SW2	USB_CONN2 (internal USB 2.0 ports)
	USB_CONN3 (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 29**) to configure the PCI Express slots.



BIOS Menu 29: PCI Express Configuration

5.4.2.1.1 PCIe Root Port Setting

Use the **PCIEX4_1**, **M2_B_KEY Slot**, **M2_A_KEY Slot** submenu (**BIOS Menu 30**) to configure the PCI Root Port Setting.



BIOS Menu 30: PCIe Slot Configuration Submenu

→ 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. |

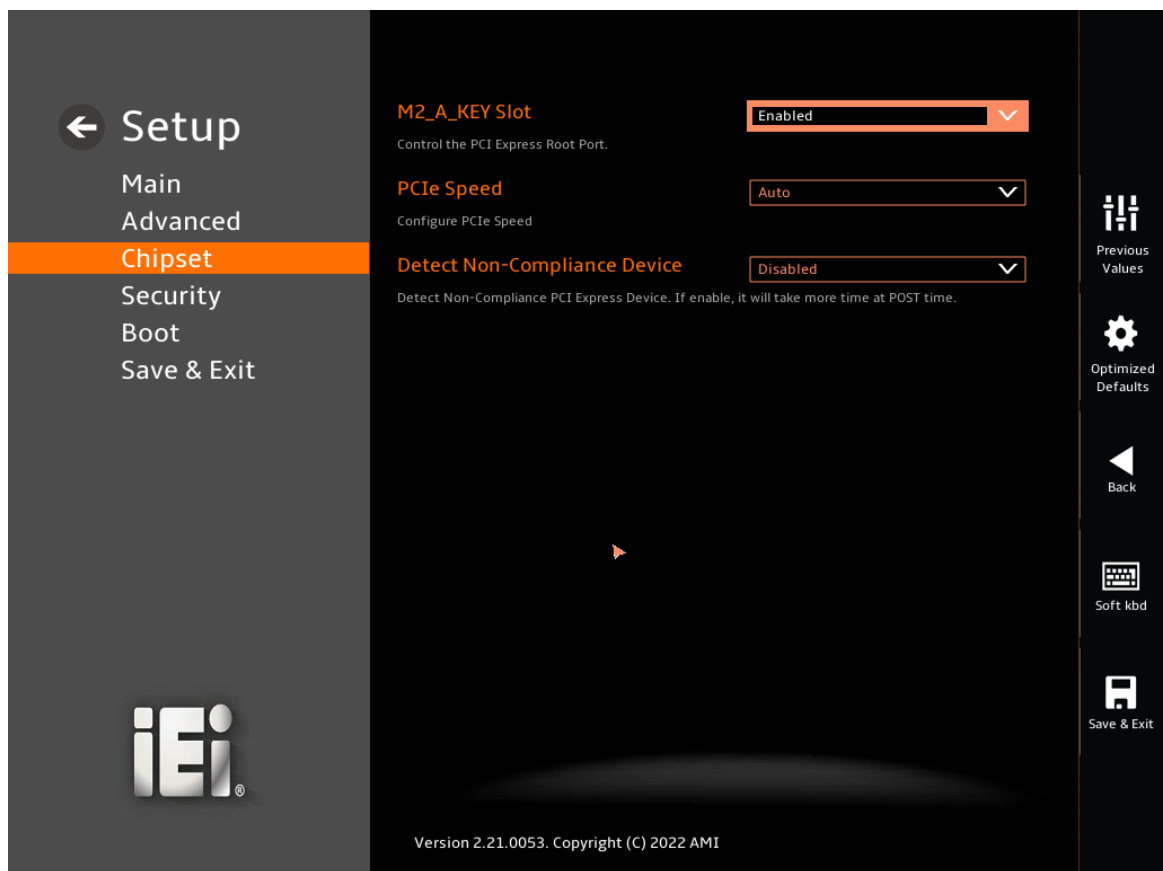
→ Detect Non-Compliance Device [Disabled]

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_A_KEY Slot

Use the **M2_A_KEY** menu (**BIOS Menu 31**) to change and/or set the configuration of the SATA devices installed in the system.



BIOS Menu 31: M2_A_KEY

- ➔ **PCIe Speed [Auto]**

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

WAFER-EHL2 SBC

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

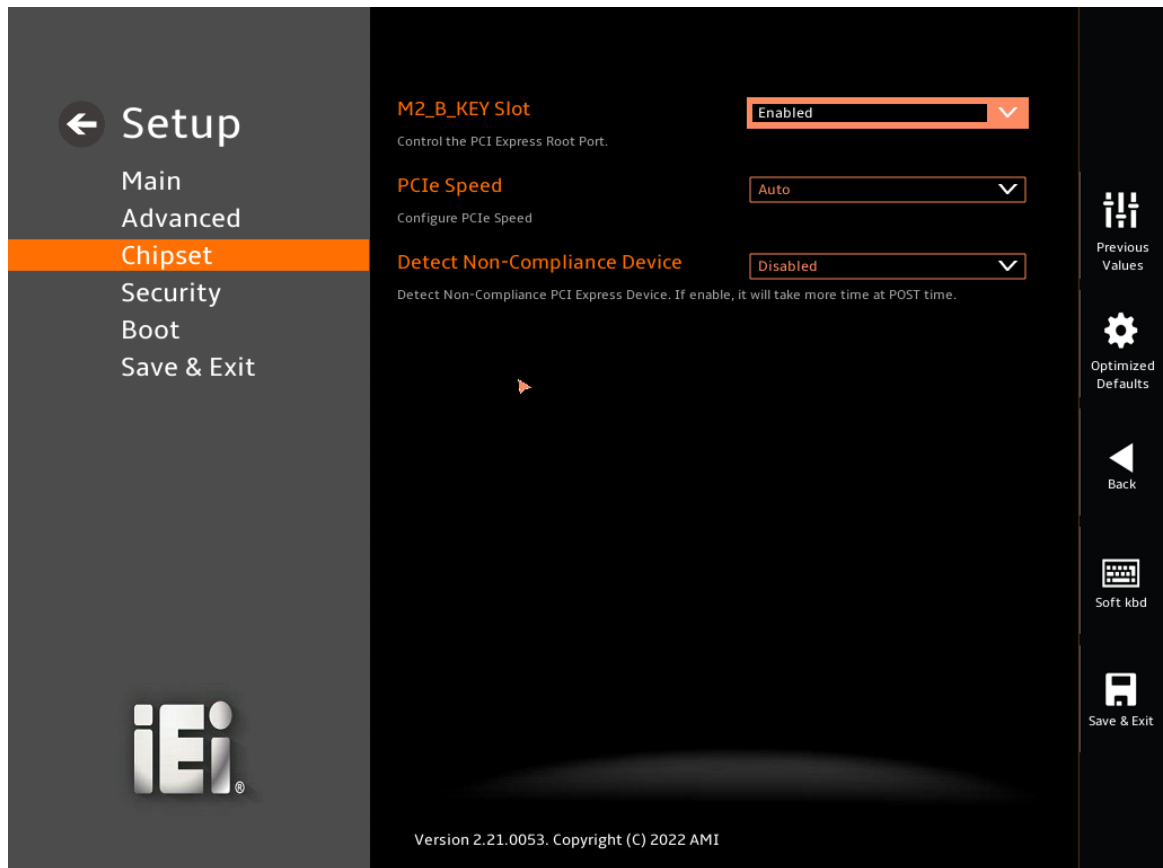
➔ Detect Non-Compliance Device [Disabled]

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. |

5.4.2.1.3 M2_B_KEY Slot

Use the **M2_B_KEY** menu (**BIOS Menu 32**) to change and/or set the configuration of the SATA devices installed in the system.



BIOS Menu 32: M2_B_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. |

WAFER-EHL2 SBC

→ 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 33**) to change and/or set the configuration of the SATA devices installed in the system.



BIOS Menu 33: 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.

WAFER-EHL2 SBC

- **AHCI** **DEFAULT** Configures SATA devices as AHCI device.
- **Intel RST Premium With Intel Optane System Acceleration** Configures SATA devices to the Intel RST Premium With Intel Optane System Acceleration mode.

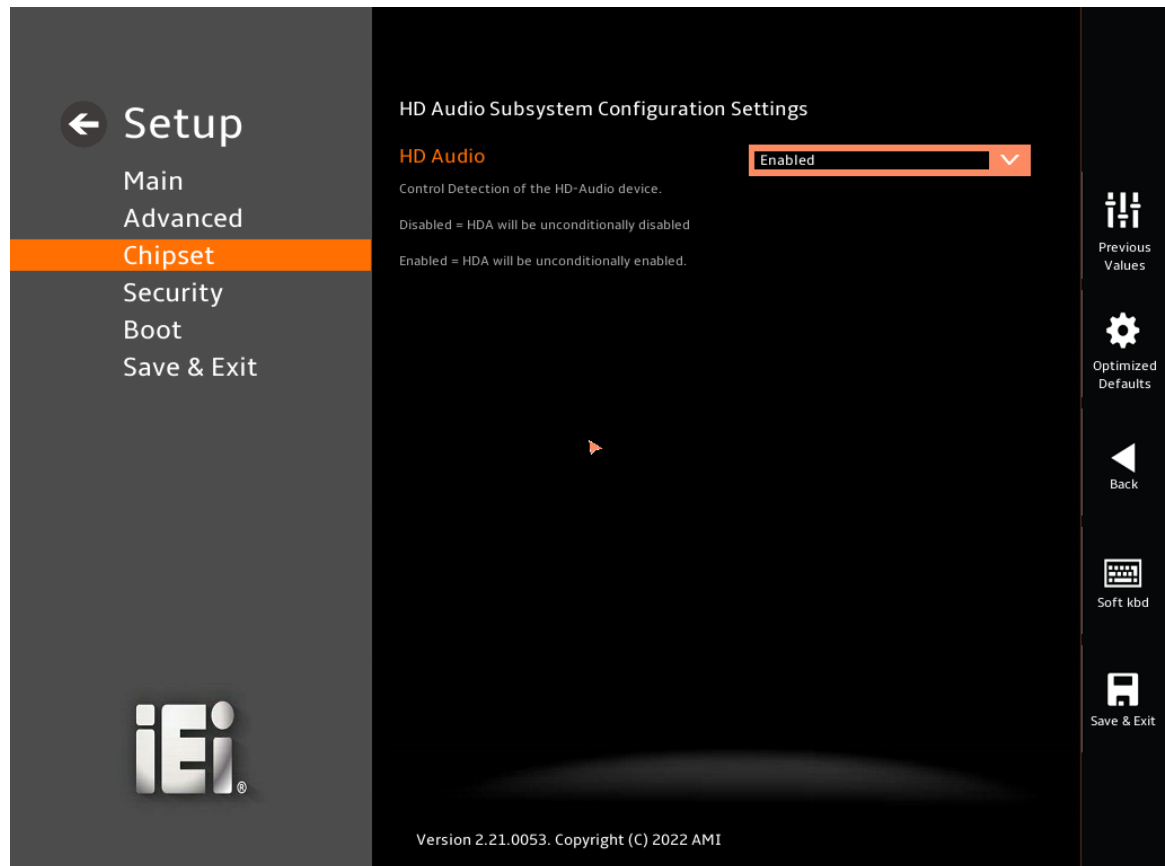
→ Hot Plug [Disabled]

Use the **Hot Plug** option (for S_ATA1 to S_ATA4 and M2_M1) to designate the correspondent port as hot-pluggable.

- **Disabled** **DEFAULT** Disables the hot-pluggable function of the SATA port.
- **Enabled** Designates the SATA port as hot-pluggable.

5.4.2.3 HD Audio Configuration

Use the **HD Audio Configuration** menu (BIOS Menu 34) to configure the PCH Azalia settings.



BIOS Menu 34: 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.

5.5 Security

Use the **Security** menu (**BIOS Menu 35**) to set system and user passwords.



BIOS Menu 35: Security

→ Administrator Password

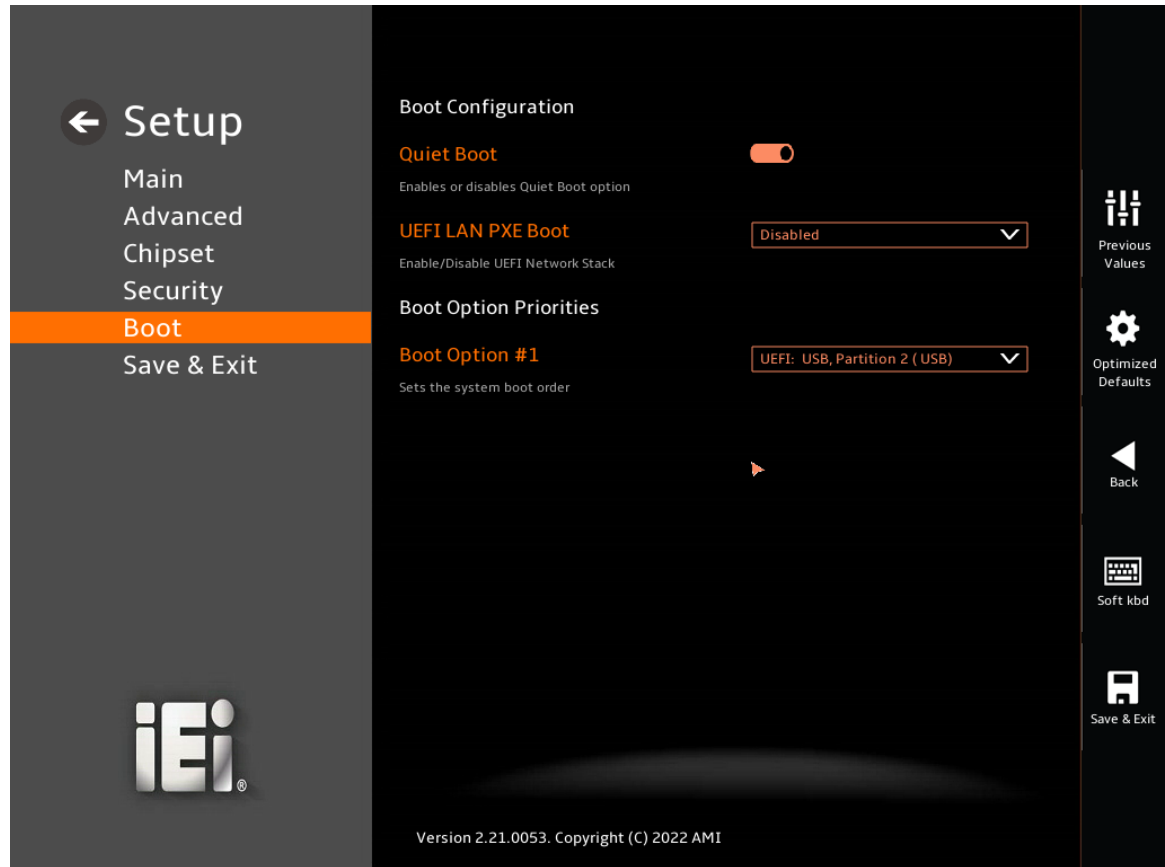
Use the **Administrator Password** to set or change a administrator password.

→ User Password

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

5.6 Boot

Use the **Boot** menu (**BIOS Menu 36**) to configure system boot options.



BIOS Menu 36: 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

WAFER-EHL2 SBC

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.

→ **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 37**) to load default BIOS values, optimal failsafe values and to save configuration changes.



BIOS Menu 37: 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.

WAFER-EHL2 SBC

→ 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.**

→ 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-EHL2 SBC

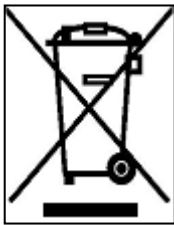


CAUTION:

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-EHL2 SBC

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

➔ BIOS Information	71
➔ Compute Die Information	72
➔ PCH Information.....	72
➔ System Date [xx/xx/xx]	72
➔ System Time [xx:xx:xx]	72
➔ Intel (VMX) Virtualization Technology [Enabled]	76
➔ Active Processor Cores [All]	76
➔ EIST [Enable]	77
➔ C states [Disabled].....	77
➔ Tcc Activation Offset [Enabled].....	77
➔ Turbo Mode [Enabled]	77
➔ Power Limit 1	78
➔ Power Limit 1 Time Window	78
➔ Power Limit 2.....	78
➔ TPM Support [Enable]	79
➔ Pending Operation [None]	79
➔ Serial Port [Enabled].....	81
➔ Device Settings	81
➔ Serial Port Mode.....	82
➔ Serial Port [Enabled].....	82
➔ Device Settings	83
➔ Device Mode	83
➔ Serial Port [Enabled].....	84
➔ Device Settings	84
➔ Device Mode	84
➔ Serial Port [Enabled].....	85
➔ Device Settings	85
➔ Device Mode	86
➔ Serial Port [Enabled].....	86
➔ Device Settings	87
➔ Device Mode	87
➔ Serial Port [Enabled].....	88
➔ Device Settings	88

→ Device Mode	89
→ PC Health Status	90
→ Smart Fan Control [Auto Mode].....	92
→ CPU_FAN1 Start PWM	92
→ Console Redirection [Disabled].....	93
→ Terminal Type [ANSI].....	94
→ Bits per second [115200].....	94
→ Data Bits [8]	95
→ Parity [None].....	95
→ Stop Bits [1]	95
→ VT-d [Enabled].....	98
→ Primary Display [Auto]	100
→ Internal Graphics [Enabled]	101
→ DVMT Pre-Allocated [160M]	101
→ DVMT Total Gfx Mem [256M].....	101
→ LCD Control	102
→ iDPM Slot Control[Auto Detect Module(EDP/LVDS/VGA)].....	102
→ LVDS Backlight PWM mode[Invert]	103
→ Auto Power Button Function [Enabled(AT)]	104
→ Restore AC Power Loss [Last State]	104
→ Power Saving Function(EUP) [Disabled]	105
→ USB Power SW1 [+5V DUAL]	105
→ USB Power SW2 [+5V DUAL]	105
→ PCIe Speed [Auto].....	107
→ Detect Non-Compliance Device [Disabled]	107
→ PCIe Speed [Auto].....	108
→ Detect Non-Compliance Device [Disabled]	109
→ PCIe Speed [Auto].....	110
→ Detect Non-Compliance Device [Disabled]	111
→ SATA Controller(s) [Enabled]	112
→ SATA Mode Selection [AHCI].....	112
→ Hot Plug [Disabled]	113
→ HD Audio [Auto]	114
→ Administrator Password	115
→ User Password	115

WAFER-EHL2 SBC

➔ Quiet Boot [Enabled]	116
➔ Boot Option #1	117
➔ Boot Option #2	117
➔ Save Changes and Reset	118
➔ Discard Changes and Reset	118
➔ Restore Defaults	119
➔ Save as User Defaults	119
➔ Restore User Defaults	119

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.

**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

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

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>										

WAFER-EHL2 SBC

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。