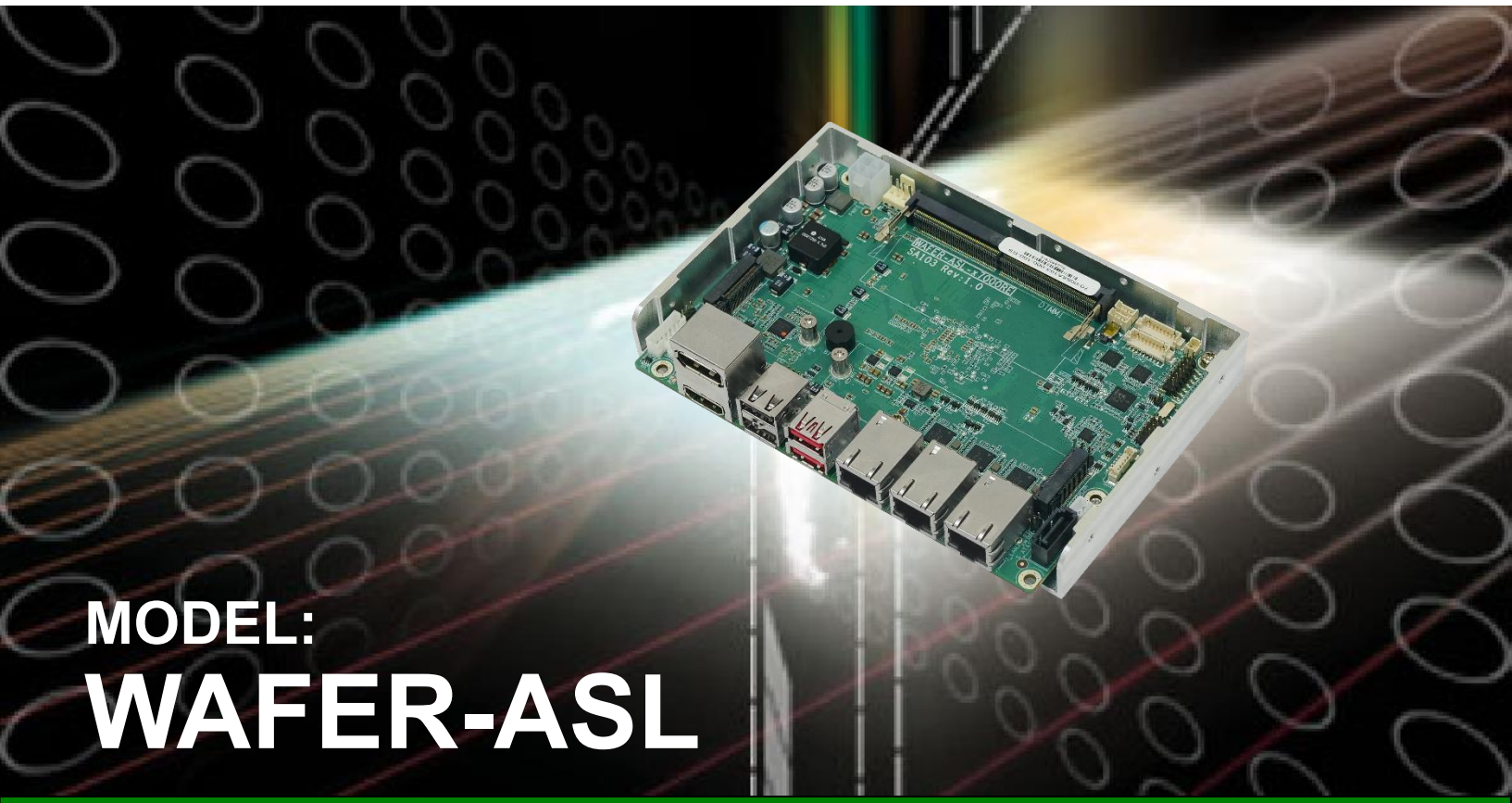
IEI Integration Corp.



MODEL:

WAFER-ASL

3.5" SBC Supports Intel® Atom™ X7000 RE Series On-Board SoC, One DDR5 SO-DIMM, HDMI, DisplayPort, Three 2.5GbE LAN, M.2 A Key and M.2 M Key, USB 3.2 Gen 2, SATA 6Gb/s, COM and RoHS

User Manual

Rev. 1.00 - March 7, 2025

RoHS Lead Free

Revision

Date	Version	Changes
March 7, 2025	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.

HOT SURFACE

This symbol indicates a hot surface that should not be touched without taking care.

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1

Introduction

1.1 Introduction

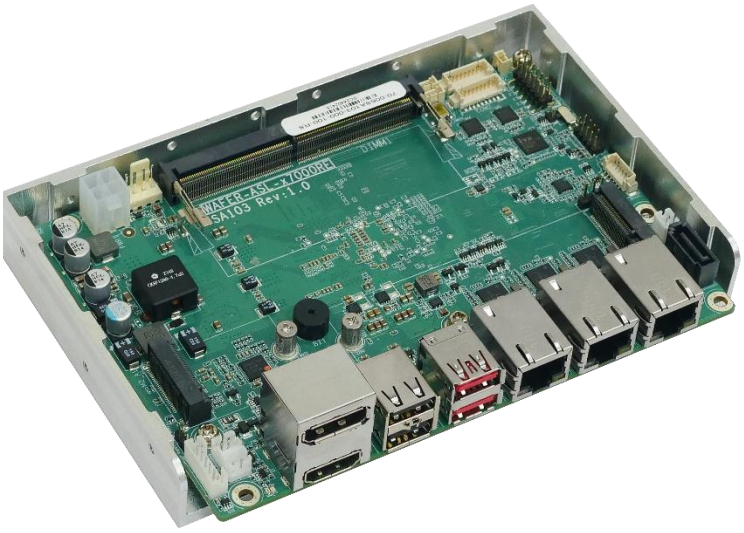


Figure 1-1: WAFER-ASL

The WAFER-ASL is a 3.5" industrial motherboard equipped with an Intel® Atom™ X7000 RE series on-board SoC, and supports one 262-pin 4800 MHz DDR5 SO-DIMM up to 16GB.

The WAFER-ASL provides three 2.5GbE LAN interfaces via Intel® I226-IT Ethernet controllers. It also includes one HDMI 2.0 (up to 4096 x 2160 @60Hz) and one DisplayPort 1.4 (up to 4096 x 2160 @60Hz) for dual independent display outputs.

The WAFER-ASL offers extensive expansion and I/O options, including one M.2 2230 A-key slot for Wi-Fi and Bluetooth modules, one M.2 2280 M-key slot, two USB 3.2 Gen 2 connectors, two USB 2.0 connectors, two USB 2.0 internal pin headers, and one SATA 6Gb/s connector. Serial device connectivity is provided by two internal RS-232/422/485 connectors.

Moreover, its wide voltage input (+12V~28V) and operating temperature (-40ºC~85ºC) design ensures reliable performance across different application scenarios.

1.2 Features

The main features of the WAFER-ASL motherboard are listed below:

- Intel® Atom™ X7000 RE series on-board SoC
- One 262-pin 4800 MHz DDR5 SO-DIMM up to 16GB
- Three 2.5GbE LAN interfaces via Intel® I226-IT
- Dual independent display outputs via one HDMI 2.0 (up to 4096 x 2160 @60Hz) and one DisplayPort 1.4 (up to 4096 x 2160 @60Hz)
- High speed I/O interfaces with two USB 3.2 Gen 2 and one SATA 6Gb/s
- Two USB 2.0 connectors, two USB 2.0 pin headers, and two RS-232/422/485 pin headers
- Support M.2 A key and M.2 M key
- RoHS compliant

1.3 Connectors

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

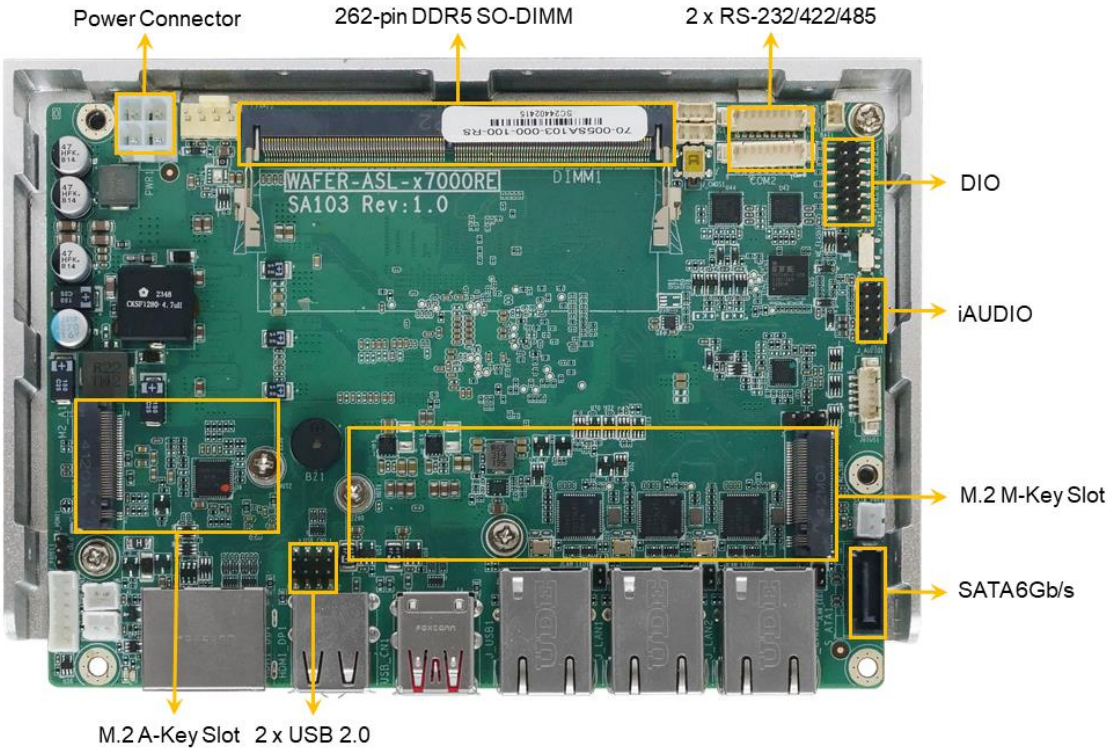


Figure 1-2: Connectors (1/2)

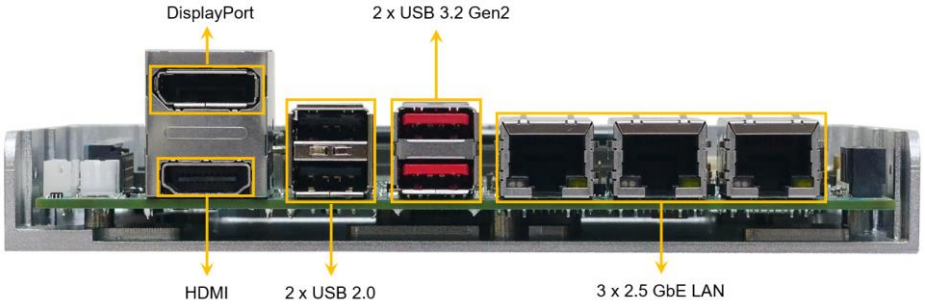


Figure 1-3: Connectors (2/2)

1.4 Dimensions

The dimensions of the board are listed below:

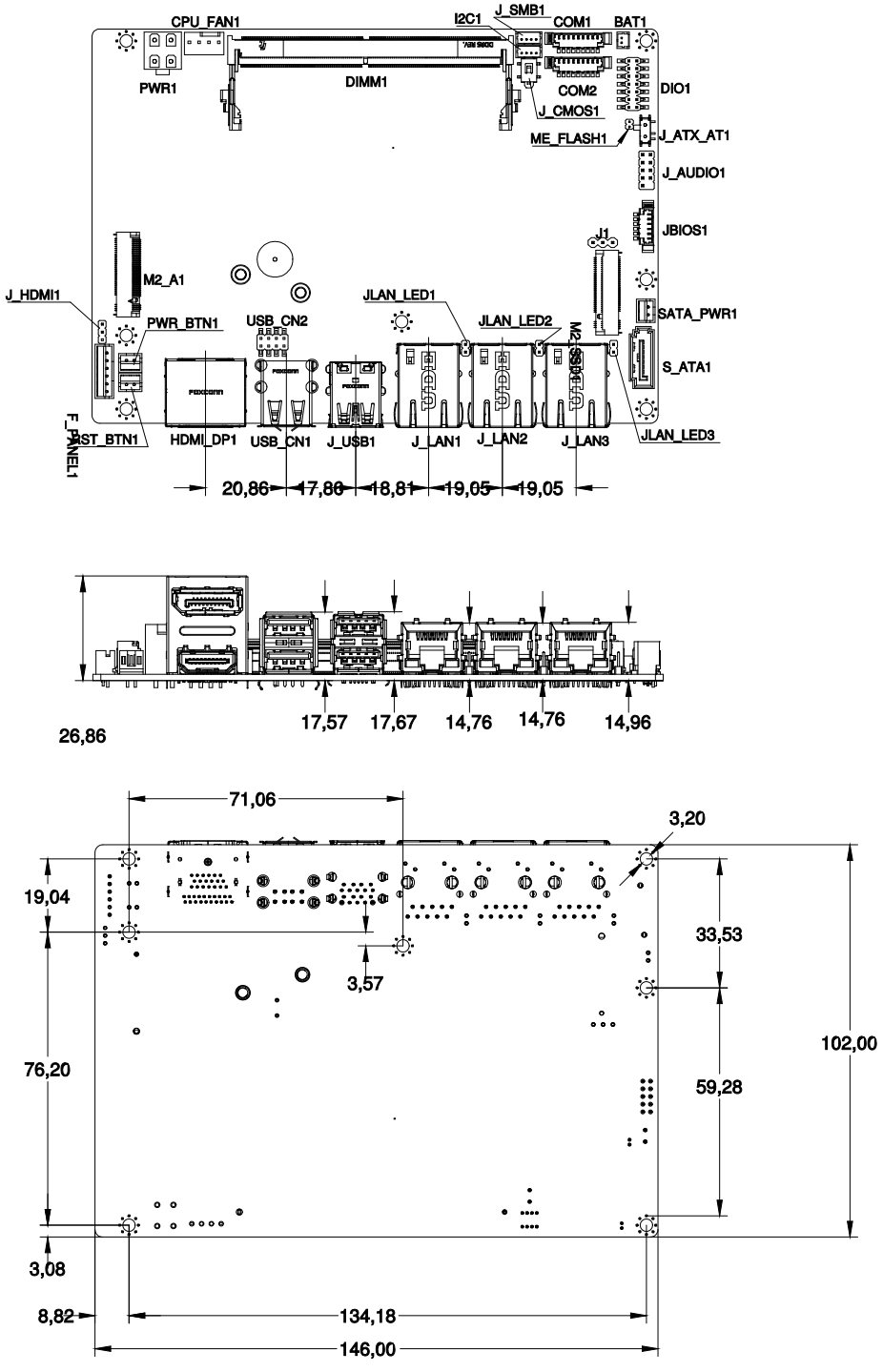


Figure 1-4: Dimensions (mm)

1.5 Data Flow

Figure 1-5 shows the data flow between the CPU and other components installed on the motherboard.

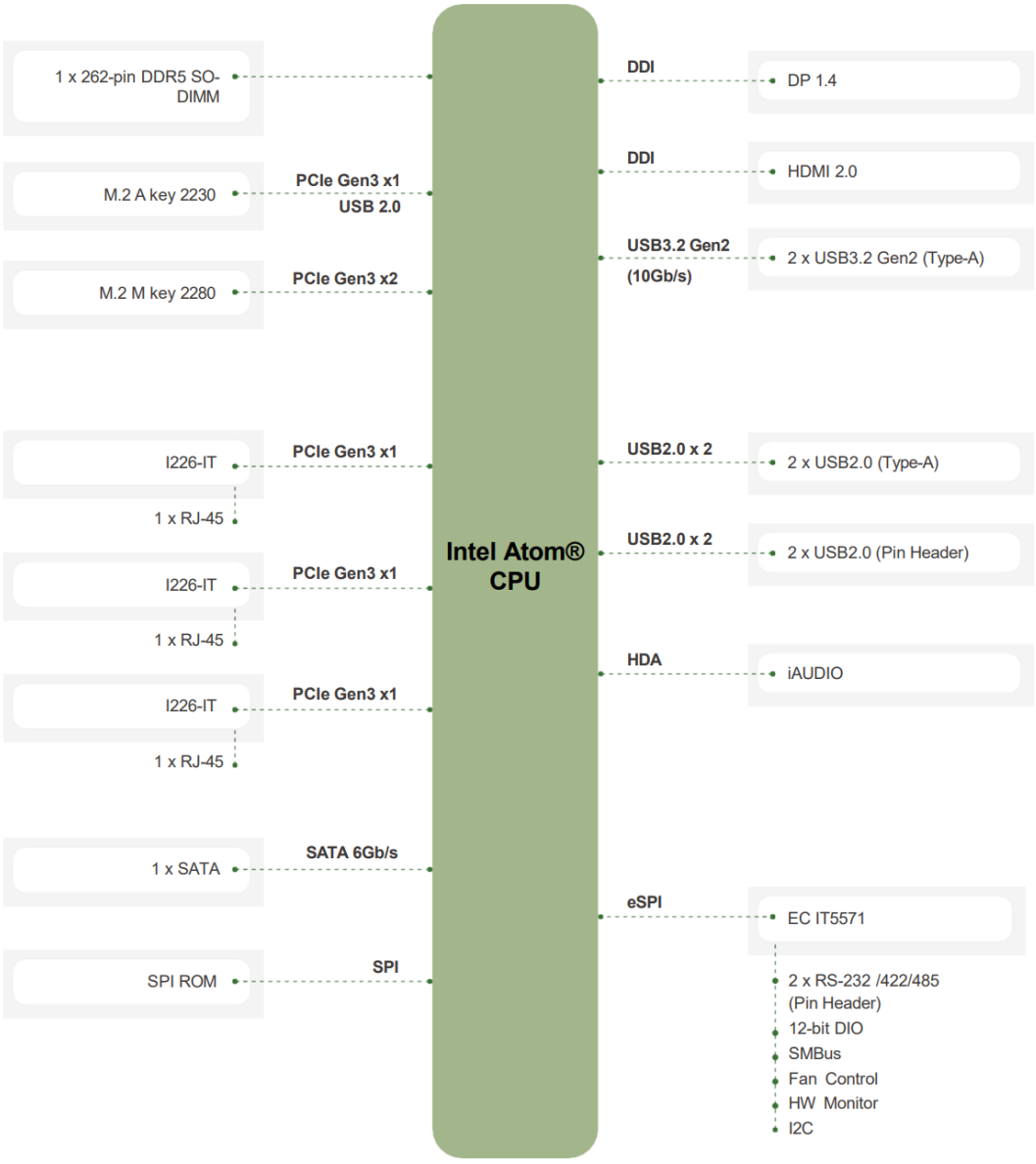


Figure 1-5: Data Flow Diagram

1.6 Technical Specifications

The technical specifications of the WAFER-ASL are listed below.

Model	WAFER-ASL
SoC	Intel Atom® x7000 series on-board SoC Intel Atom® x7433RE processor Intel Atom® x7835RE processor
BIOS	AMI UEFI BIOS
Memory	262-pin 4800 MHz DDR5 SO-DIMM, up to 16GB
Graphics	Gen 12 UHD Graphics
Display Outputs	Dual independent display 1 x HDMI 2.0 (up to 4096 x 2160 @60Hz) 1 x DP 1.4 (up to 4096 x 2160 @60Hz)
Ethernet Controllers	Intel® I226-IT Ethernet controllers
Digital I/O	1 x 12-bit digital I/O (2 x 7 pin)
Watchdog Timer	Software programmable support 1~255 sec. system reset
Expansion	1 x M.2 2230 A-key slot (PCIe Gen3 x1 & USB 2.0) 1 x M.2 2280 M-key slot (PCIe Gen3 x2)
TPM	Support Intel PTT (TPM 2.0)
I/O Interface	
Ethernet	Three RJ-45 2.5GbE ports
Audio Connector	1 x iAUDIO (2 x 5 pin) Supports 7.1 channel HD audio by IEI AC-KIT-888S audio kit
Serial Ports	2 x RS-232/422/485 (1 x 9 pin)
USB Ports	2 x External USB 3.2 Gen 2 connector 2 x External USB 2.0 connector 2 x USB 2.0 (2 x 4 pin header)
Front Panel	1 x Power LED & HDD LED (1 x 6 pin) 1 x Power button (1 x 2 pin) 1 x Reset button (1 x 2 pin)

Model	WAFER-ASL
Fan	1 x CPU fan connector (1 x 4 pin)
SMBus/I²C	1 x SMBus (1 x 4 pin) 1 x I²C (1 x 4 pin)
Storage	1 x SATA 6Gb/s with 5V SATA power connector
Environmental and Power Specifications	
Power Supply	+12V ~ 28V DC input power (AT/ATX mode) 1 x Internal power connector (2 x 2 pin)
Power Consumption	12V@2.007A; 19V@1.273A; 24V@1.025A; 28V@0.913A (Intel Atom® x7433RE with 8GB DDR5 4800MHz memory, Eup mode disabled)
Operating Temperature	-40°C ~ 85°C
Storage Temperature	-40°C ~ 85°C
Humidity	5% ~ 95%, non-condensing
Safety & EMC	CE/FCC compliant
Physical Specifications	
Dimensions	146 mm x 102 mm
Weight (Gross/Net)	850 g / 350 g

Table 1-1: Technical Specifications

Chapter

2

Unpacking

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-ASL 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 vendor your WAFER-ASL was purchased from or IEI sales representatives directly by sending an email to sales@ieiworld.com.

The WAFER-ASL is shipped with the following components:

Quantity	Item and Part Number	Image
1	WAFER-ASL single board computer	
1	SATA with power cable kit	
1	Power cable	

Table 2-1: Packing List

2.4 Optional Items

The following are optional components which may be separately purchased:

Item and Part Number	Image
Dual-port USB 2.0 cable, 300 mm, p=2.0 mm (**P/N** : 32001-008600-200-RS)	
RS-232/422/485 cable, 250 mm, p=1.25 mm (**P/N** : 32205-008000-100-RS)	
Realtek ALC888S 7.1 Channel HD Audio peripheral board (**P/N**: AC-KIT-888S-R10)	
Cooler module with pad and fan, 157 mm x 100 mm x 20 mm (**P/N**: CM-WAFER-WF-R10)	
Heatsink module with pad, 157 mm x 100 mm x 20 mm (**P/N**: CM-WAFER-WOF-R10)	

Table 2-2: Optional Items

Chapter

3

Installation

3.1 Anti-static Precautions

WARNING:

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

Electrostatic discharge (ESD) can cause serious damage to electronic components, including the WAFER-ASL. Dry climates are especially susceptible to ESD. It is therefore critical that whenever the WAFER-ASL 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-ASL, place it on an anti-static pad. This reduces the possibility of ESD damaging the WAFER-ASL.
- Only handle the edges of the PCB: When handling the PCB, hold the PCB by the edges.

3.2 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-ASL, WAFER-ASL 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-ASL 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-ASL 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-ASL off:
  - When working with the WAFER-ASL, 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-ASL **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.

3.3 SO-DIMM Installation

To install an SO-DIMM, please follow the steps below and refer to **Figure 3-1**.

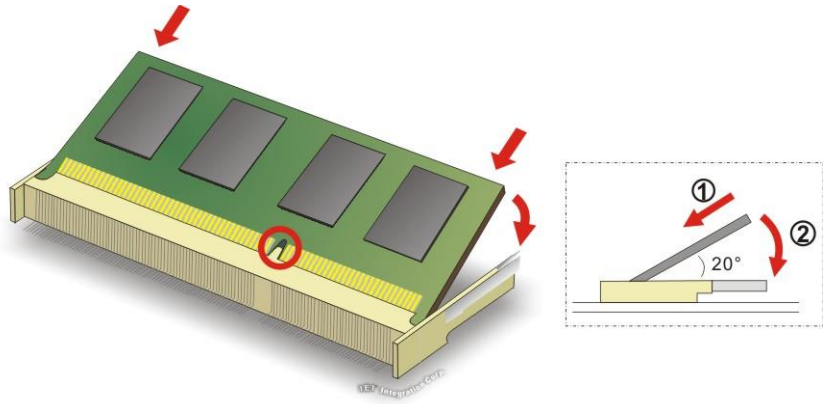


Figure 3-1: SO-DIMM Installation

Step 1: **Locate the SO-DIMM socket**. Place the board on an anti-static mat.

Step 2: **Align the SO-DIMM with the socket**. Align the notch on the memory with the notch on the memory socket.

Step 3: **Insert the SO-DIMM**. Push the memory in at a 20º angle (see **Figure 3-1**).

Step 4: **Seat the SO-DIMM**. Gently push downwards and the arms clip into place (see **Figure 3-1**).

3.4 M.2 Module Installation

To install an M.2 module, please follow the steps below.

Step 1: Locate the M.2 module slot. See **Chapter 4**.

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 20º (**Figure 3-2**).

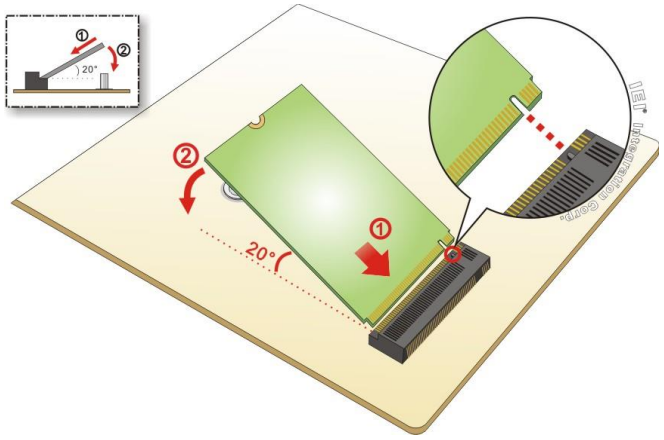


Figure 3-2: Inserting the M.2 Module into the Slot at an Angle

Step 4: Secure the M.2 module with the previously removed retention screw (**Figure 3-3**).

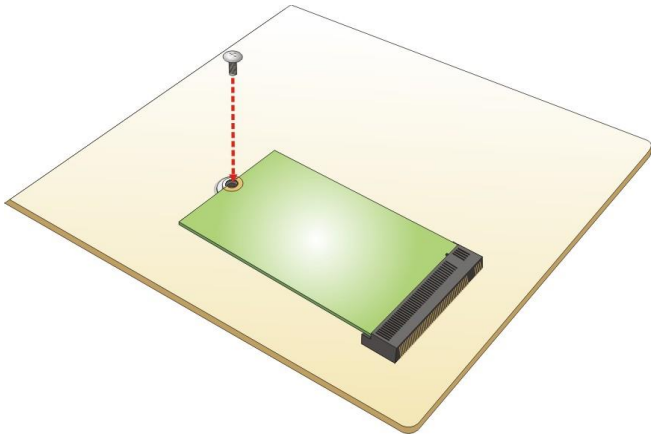


Figure 3-3: Securing the M.2 Module

3.5 Chassis Installation

3.5.1 Heat Spreader

WARNING:

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

When the WAFER-ASL 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.

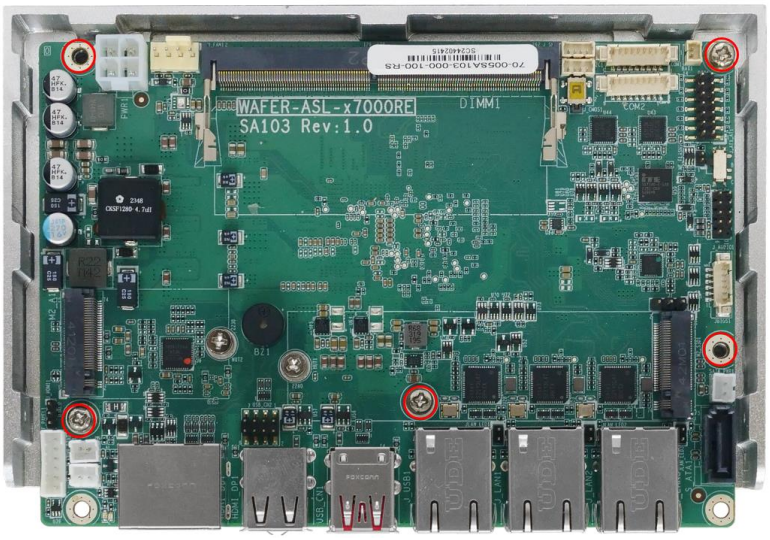


Figure 3-4: Heat Sink Retention Screws

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 0ºC–60ºC operating temperature using active cooling (P/N: CM-WAFER-WF-R10, see **Figure 3-5**), and in 0ºC–45ºC operating temperature using passive cooling (P/N: CM-WAFER-WOF-R10, see **Figure 3-6**).

Figure 3-5: Active Cooling

Figure 3-6: Passive Cooling

NOTE:

To ensure stable motherboard operation within a wide temperature range of -40ºC ~ 85ºC, customers can customize thermal solutions from IEI or design their own.

3.6 Internal Peripheral Device Connections

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

3.6.1 AT Power Connection

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

Step 1: **Locate the power connector**. See Section **4.2.1**.

Step 2: **Connect the power cable to the motherboard**. Connect the 4-pin (2 x 2) Molex type power cable connector to the power connector on the motherboard. See **Figure 3-7.**

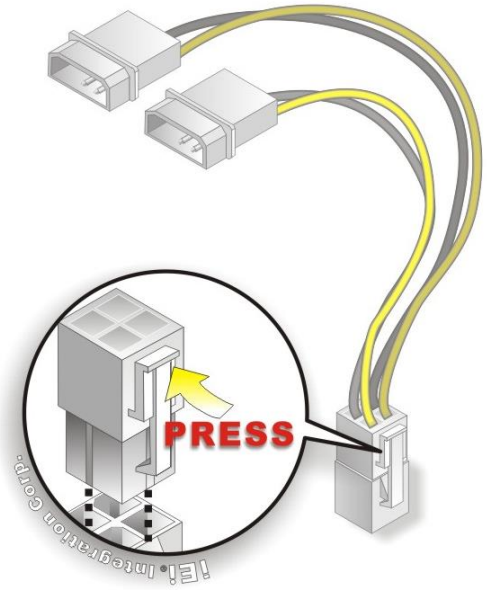


Figure 3-7: Power Cable to Motherboard Connection

Step 3: **Connect power cable to power supply**. Connect one of the 4-pin (1x4) Molex type power cable connectors to an AT power supply. See **Figure 3-8.**

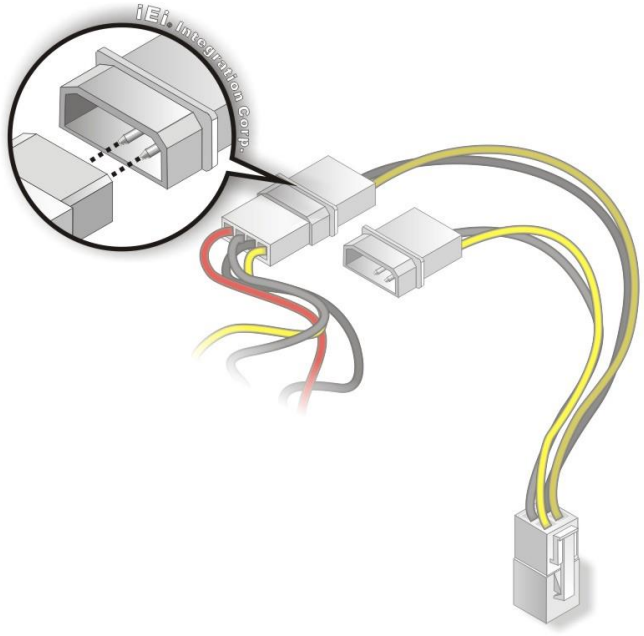


Figure 3-8: Connect Power Cable to Power Supply

3.6.2 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 distributors, resellers or vendors, or contact an IEI sales representative directly.

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.

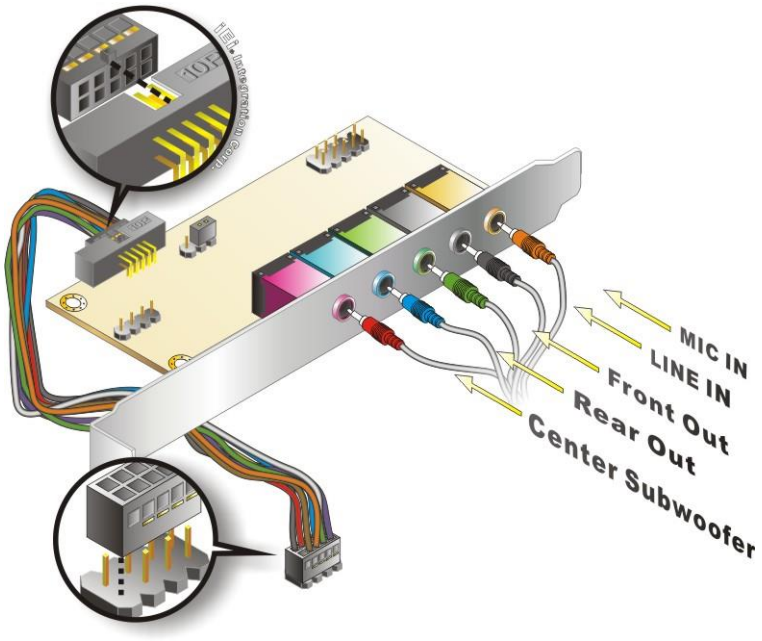


Figure 3-9: 7.1 Channel Audio Kit

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.

3.6.3 SATA Drive Connection

The WAFER-ASL 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 4**.

Step 2: **Insert the cable connector**. Insert the cable connector into the on-board SATA drive connector and the SATA power connector. See **Figure 3-10**.

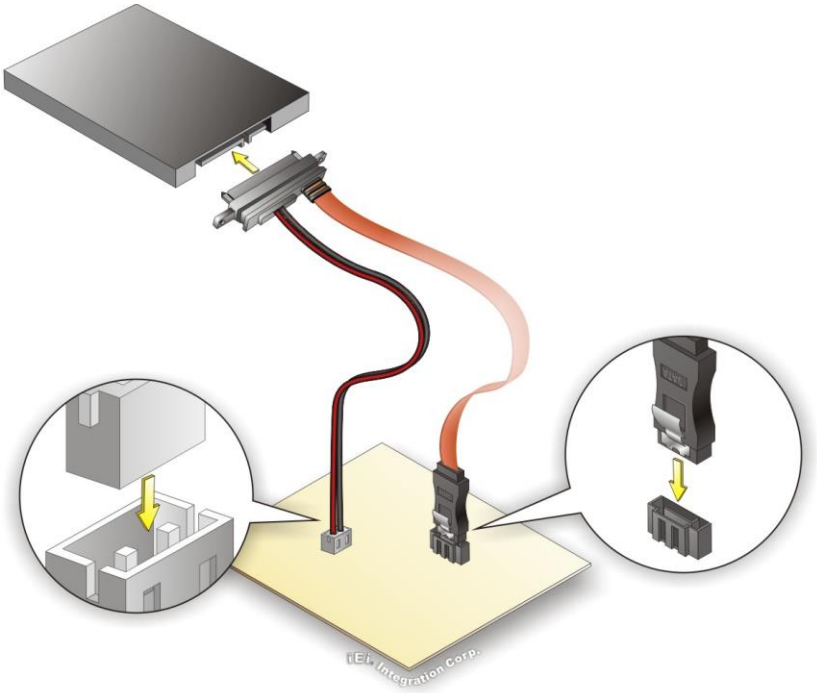


Figure 3-10: SATA Drive Cable Connection

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. See **Figure 3-10**.

Step 4: To remove the SATA cable from the SATA connector, press the clip on the connector at the end of the cable.

3.7 Software Drivers

3.7.1 Available Drivers

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

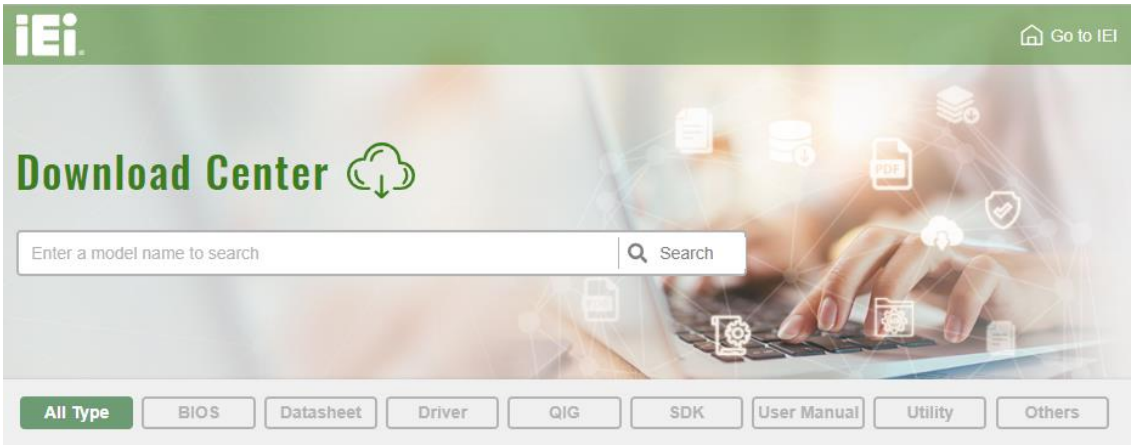
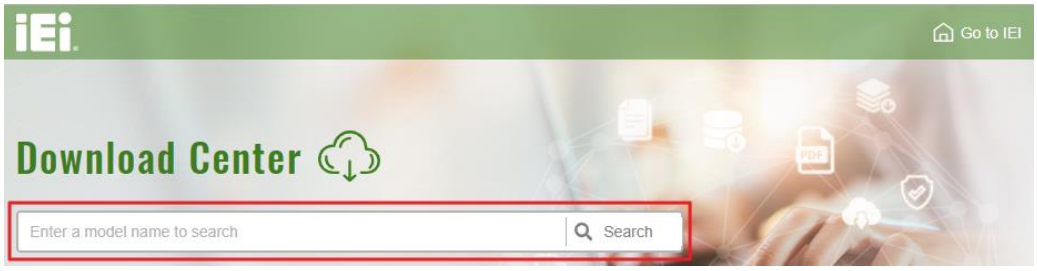


Figure 3-11: IEI Resource Download Center

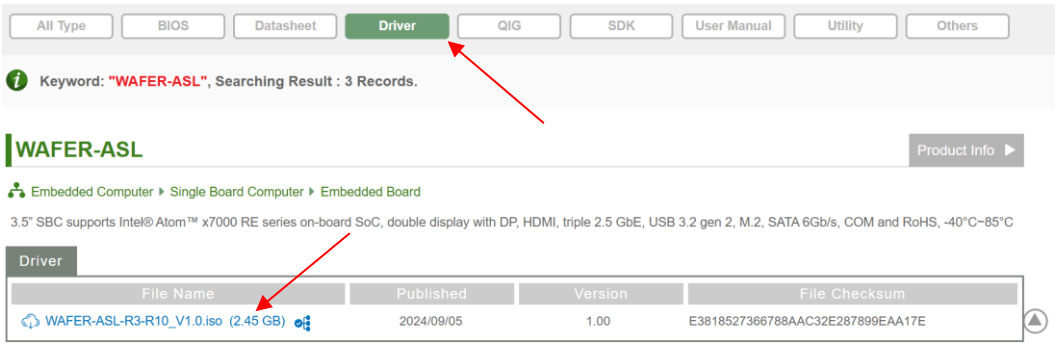
3.7.2 Driver Download

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

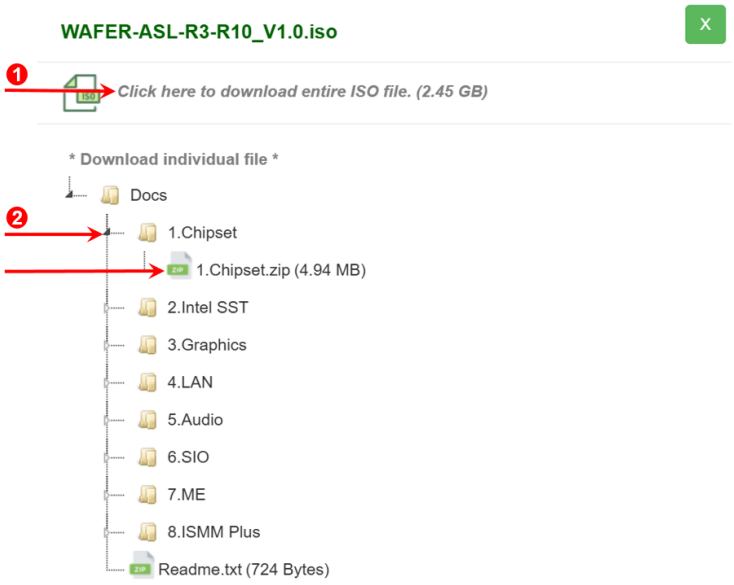
Step 1: Go to https://download.ieiworld.com. Type WAFER-ASL and press Enter.



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



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).



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. On Windows 7 system, an additional tool (such as Virtual CD-ROM Control Panel from Microsoft) is needed to mount the file.

Chapter

4

Connectors

4.1 Peripheral Interface Connectors

The WAFER-ASL series comes with a number of peripheral interface connectors and configuration jumpers. The connector locations are shown in **Figure 4-1**. The connector pinouts for these connectors are listed in the following sections.

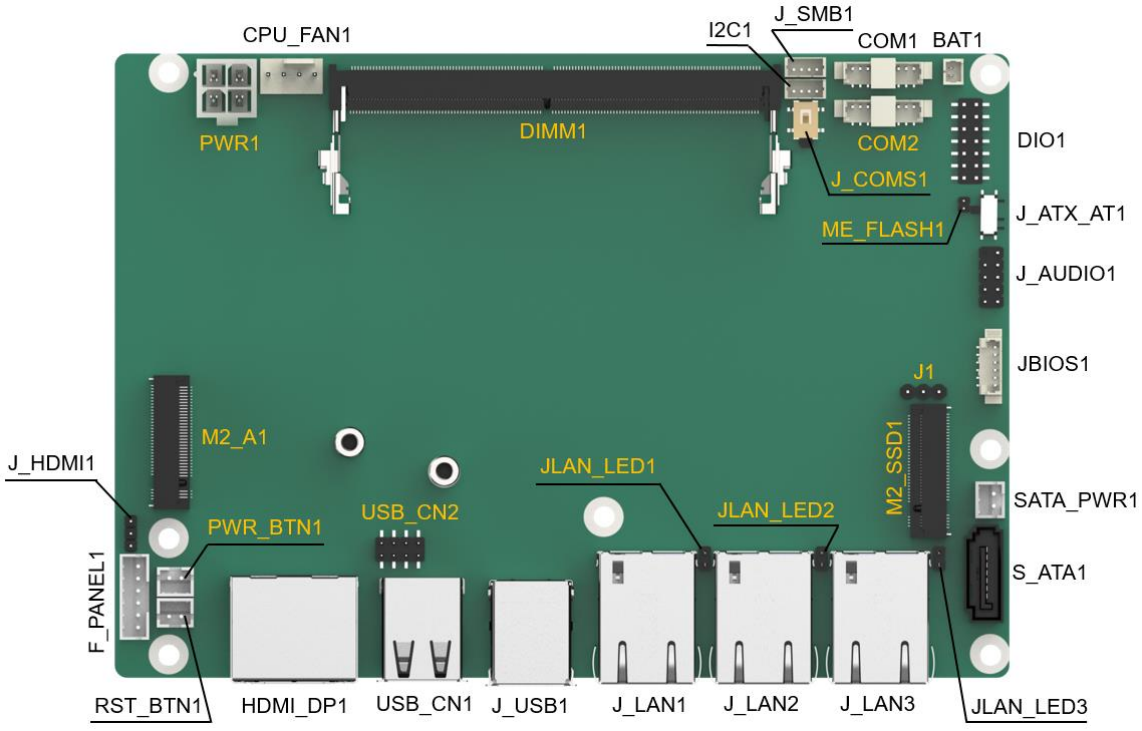


Figure 4-1: Connector and Jumper Locations

4.2 Internal Peripheral Connectors

The table below lists all the internal connectors on the board.

Connector	Type	Label
Power input connector	4-pin Molex connector	PWR1
CPU fan connector	4-pin wafer	CPU_FAN1
DDR5 SO-DIMM socket	262-pin SO-DIMM socket	DIMM1
SMBus connector	4-pin wafer	J_SMB1

Connector	Type	Label
I²C connector	4-pin wafer	I2C1
Clear CMOS button	Tact switch	J_CMOS1
RS-232/422/485 serial ports	9-pin wafer	COM1, COM2
RTC battery connector	2-pin wafer	BAT1
Digital I/O connector	14-pin header	DIO1
Flash descriptor security override jumper	2-pin header	ME_FLASH1
AT/ATX power mode setting	Slide switch	J_ATX_AT1
Audio connector	10-pin header	J_AUDIO1
Flash SPI ROM connector	6-pin wafer	JBIOS1
M.2 M key-slot	M.2 M-key slot	M2_SSD1
SATA power connector	2-pin wafer	SATA_PWR1
SATA 6Gb/s connector	7-pin SATA connector	S_ATA1
LAN LED connectors	2-pin header	JLAN_LED1, JLAN_LED2, JLAN_LED3
USB 2.0 connector	8-pin header	USB_CN2
Power button connector	2-pin wafer	PWR_BTN1
Reset button connector	2-pin wafer	RST_BTN1
Front panel connector	6-pin wafer	F_PANEL1
M.2 A key-slot	M.2 A-key slot	M2_A1

Table 4-1: Internal Peripheral Connectors

4.2.1 Power Input Connector

CN Label: **PWR1**

CN Type: 4-pin Molex connector, p=4.2 mm

CN Location: See **Figure 4-2**

CN Pinouts: See **Table 4-2**

The connector supports the +12V~28V power supply.

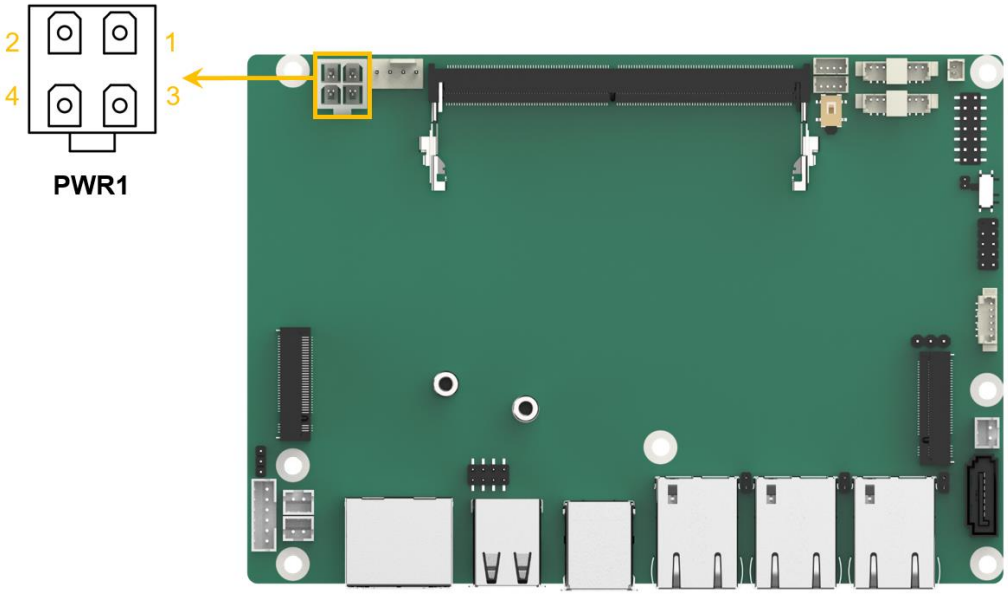


Figure 4-2: Power Input Connector Location

Pin	Description	Pin	Description
1	GND	2	GND
3	+12V~28VIN	4	+12V~28VIN

Table 4-2: Power Input Connector Pinouts

4.2.2 CPU Fan Connector

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

The fan connector attaches to a smart cooling fan.

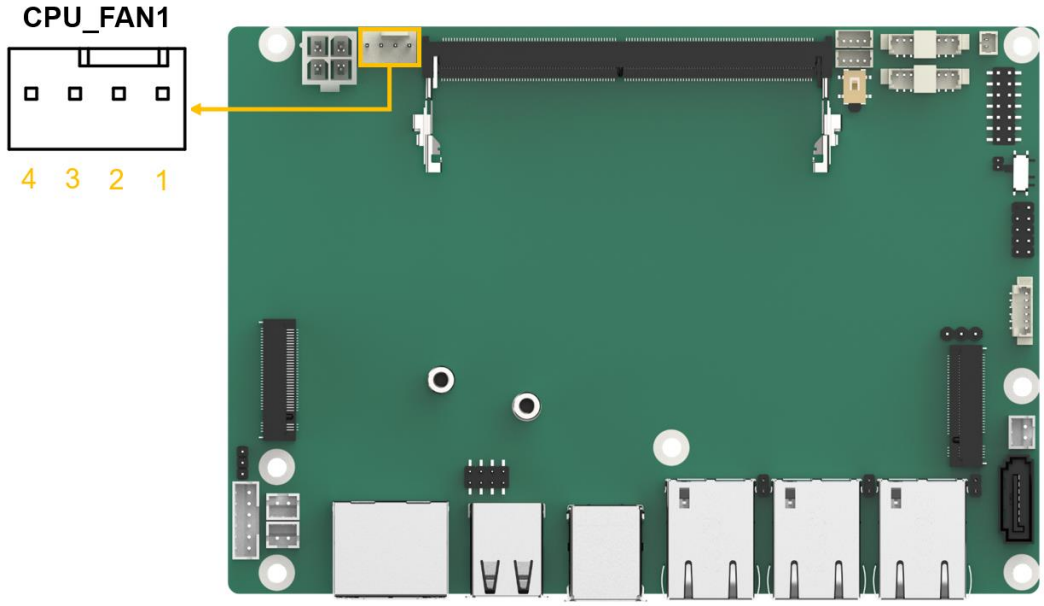


Figure 4-3: CPU Fan Connector Location

Pin	Description	Pin	Description
1	GND	2	+12V
3	FANIN	4	PWM (+5V)

Table 4-3: CPU Fan Connector Pinouts

4.2.3 DDR5 SO-DIMM Socket

CN Label: **DIMM1**

CN Type: 262-pin SO-DIMM socket

CN Location: See **Figure 4-4**

The SO-DIMM socket is for a DDR5 SO-DIMM memory module.

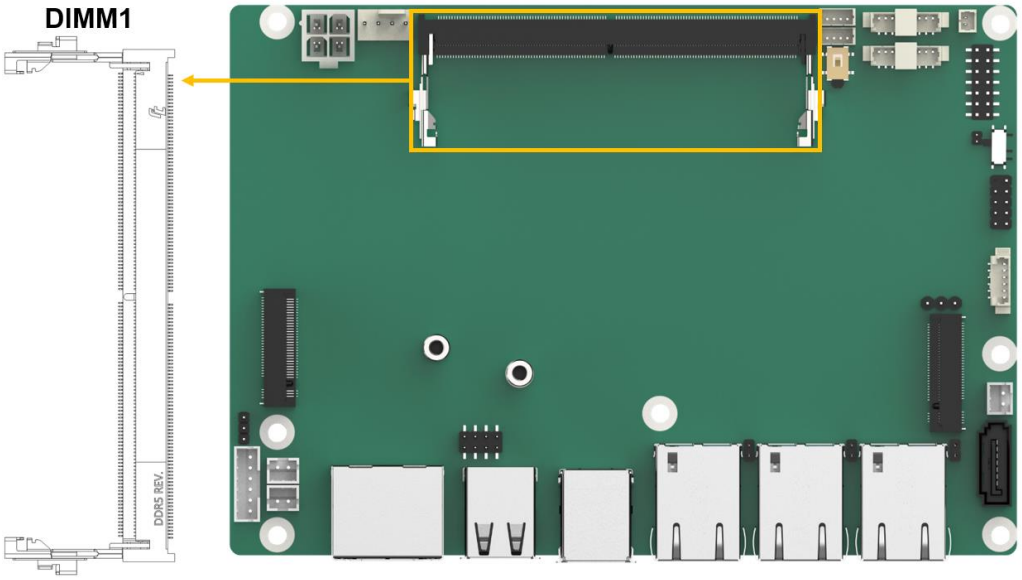


Figure 4-4: DDR5 SO-DIMM Socket Location

4.2.4 SMBus Connector

CN Label: **J_SMB1**

CN Type: 4-pin wafer, p=1.25 mm

CN Location: See **Figure 4-5**

CN Pinouts: See **Table 4-4**

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

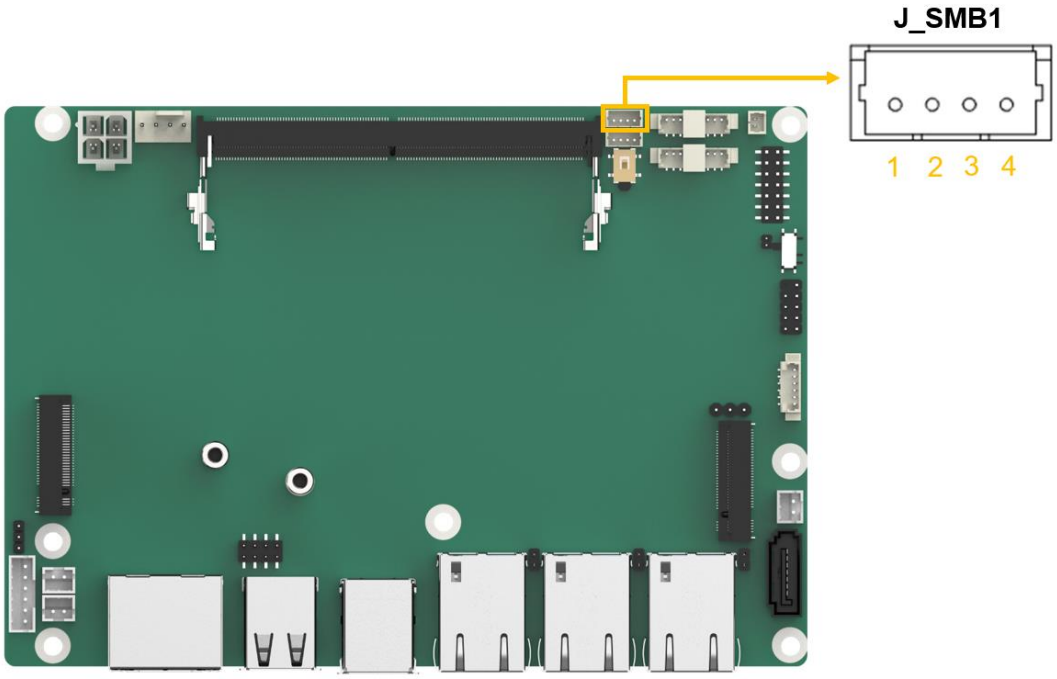


Figure 4-5: SMBus Connector Location

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

Table 4-4: SMBus Connector Pinouts

4.2.5 I²C Connector

CN Label: **I2C1**

CN Type: 4-pin wafer, p=1.25 mm

CN Location: See **Figure 4-6**

CN Pinouts: See **Table 4-5**

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

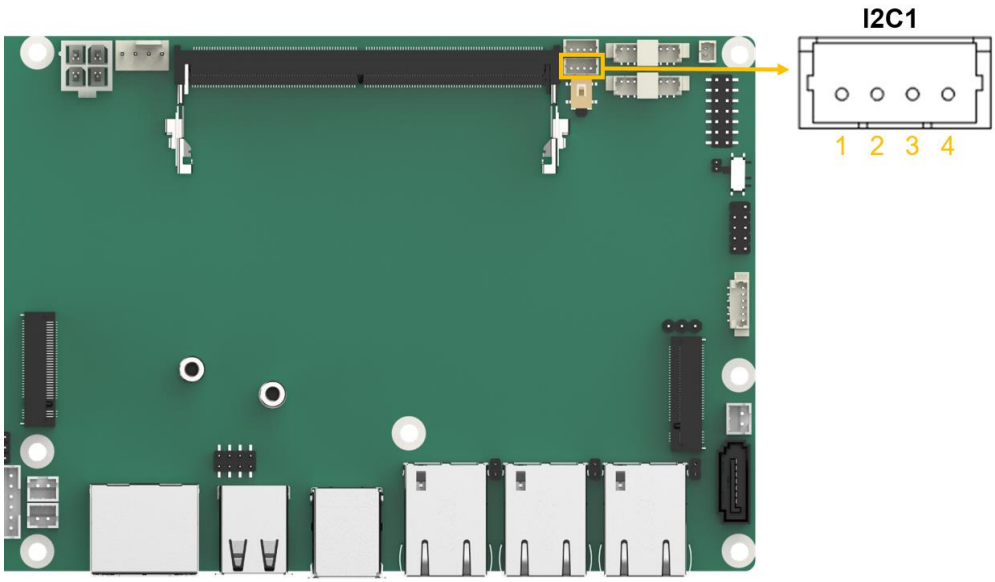


Figure 4-6: I²C Connector Location

Pin	Description
1	GND
2	EC_SMCLK0
3	EC_SMDAT0
4	+5V

Table 4-5: I² C Connector Pinouts

4.2.6 Clear CMOS Button

CN Label: **J_CMOS1**

CN Type: Tact switch

CN Location: See **Figure 4-7**

CN Pinouts: See **Table 4-6**

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.

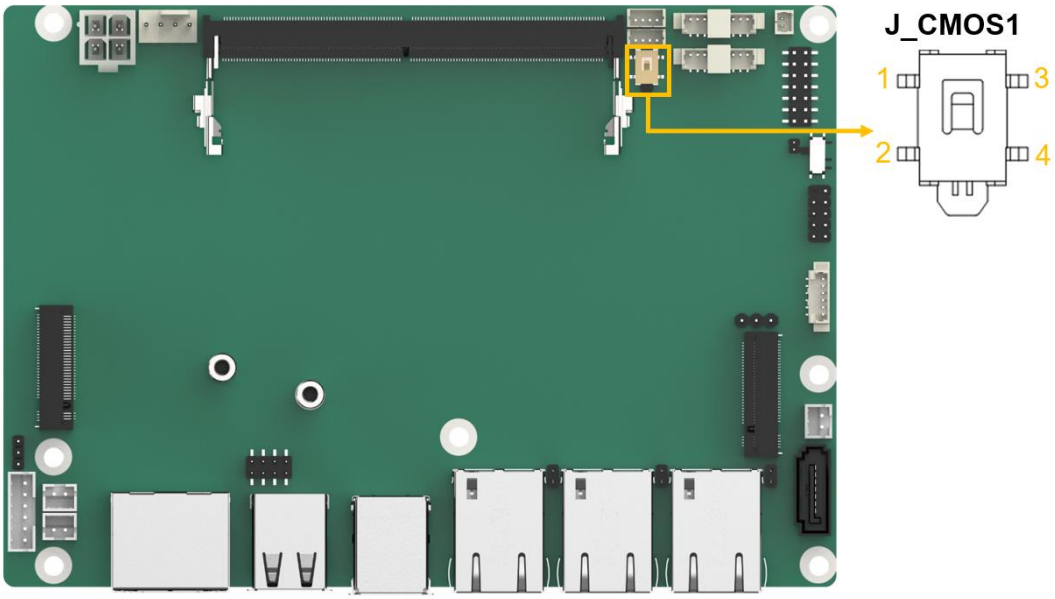


Figure 4-7: Clear CMOS Location

Status	Description
NC	Keep CMOS Setup (Normal Operation)
Press	Clear CMOS Setup

Table 4-6: Clear CMOS Pinouts

4.2.7 RS-232/422/485 Serial Ports

CN Label:	**COM1, COM2**
CN Type:	9-pin wafer, p=1.25 mm
CN Location:	See **Figure 4-8**
CN Pinouts:	See **Table 4-7**

The serial ports provide RS-232/422/485 connections.

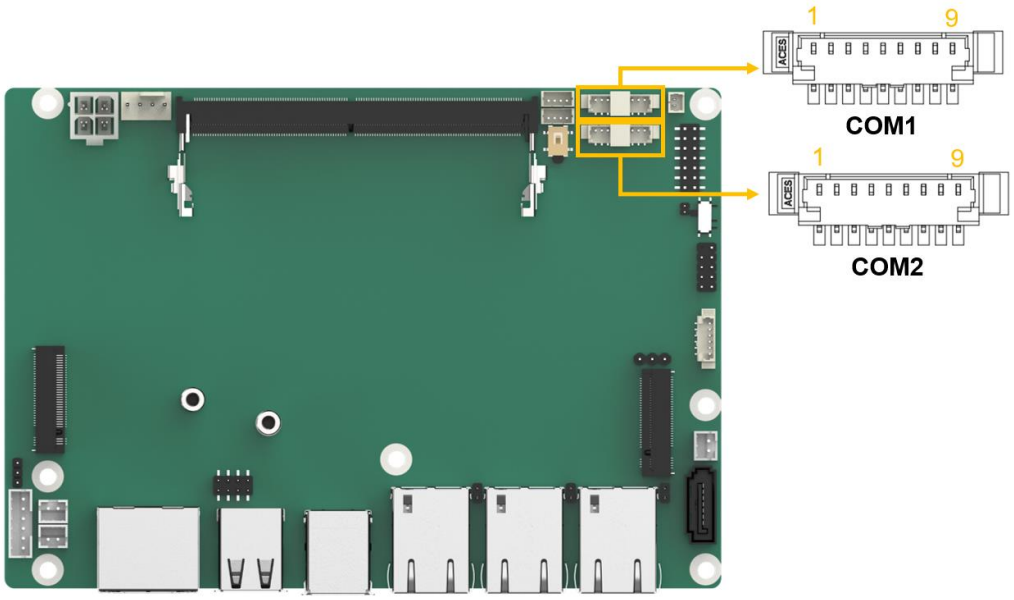


Figure 4-8: RS-232/422/485 Serial Ports Location

Pin	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 4-7: RS-232/422/485 Serial Ports Pinouts

4.2.8 RTC Battery Connector

CAUTION:

Explosion risks may occur if the battery is replaced with 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 real-time clock (RTC) battery onto the system chassis in which the WAFER-ASL is installed.

CN Label:	**BAT1**
CN Type:	2-pin wafer, p=1.25 mm
CN Location:	See **Figure 4-9**
CN Pinouts:	See **Table 4-8**

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

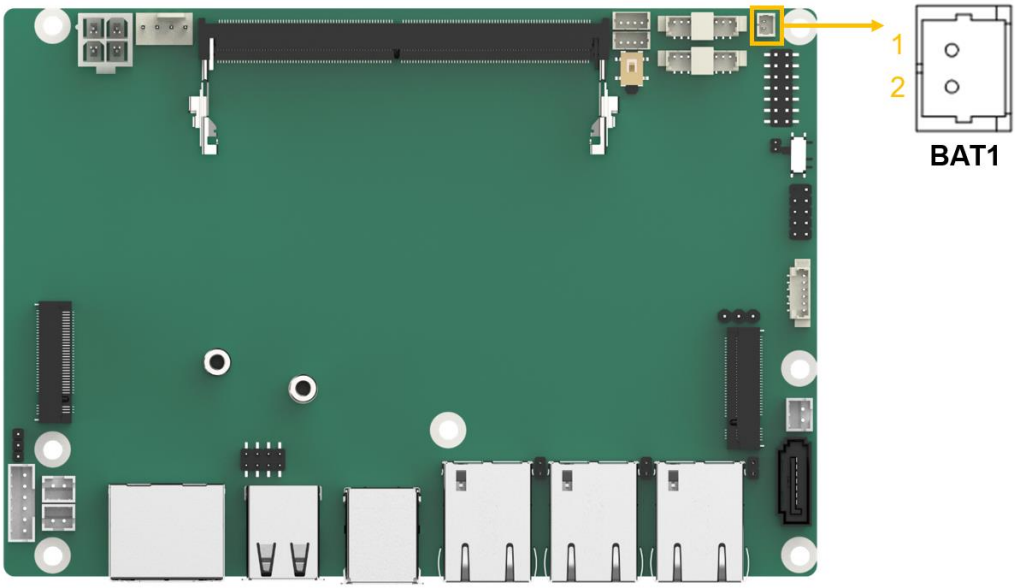


Figure 4-9: RTC Battery Connector Location

Pin	Description
1	VBATT
2	GND

Table 4-8: RTC Battery Connector Pinouts

4.2.9 Digital Input /Output Connector

CN Label: **DIO1**

CN Type: 14-pin header, p=2.0 mm

CN Location: See **Figure 4-10**

CN Pinouts: See **Table 4-9**

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

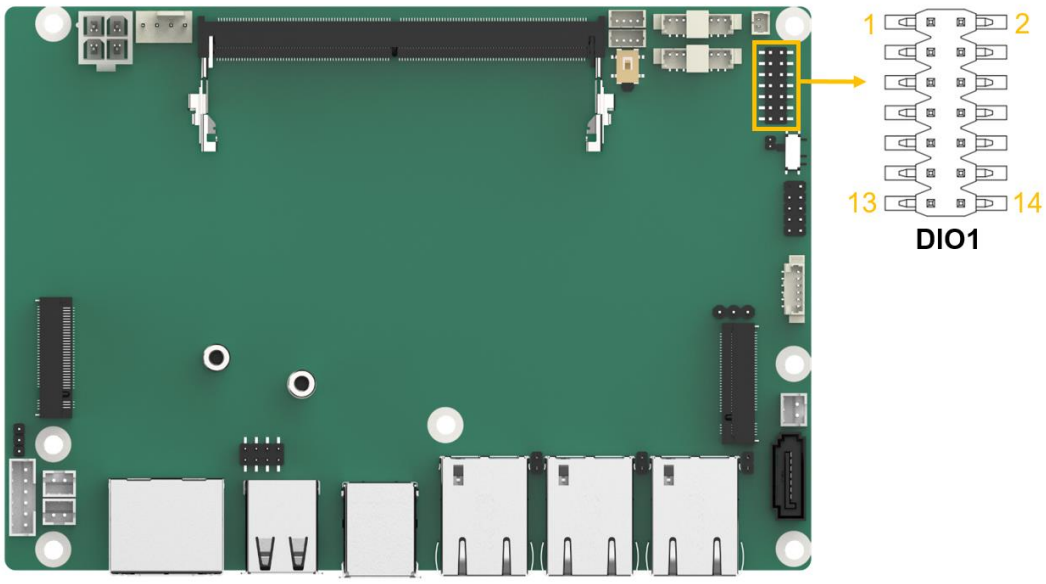


Figure 4-10: Digital I/O Connector Location

Pin	Description	Pin	Description
1	GND	2	VCC
3	Output 5	4	Output 4
5	Output 3	6	Output 2
7	Output 1	8	Output 0
9	Input 5	10	Input 4
11	Input 3	12	Input 2
13	Input 1	14	Input 0

Table 4-9: Digital I/O Connector Pinouts

4.2.10 Flash Descriptor Security Override Jumper

CN Label:	**ME_FLASH1**
CN Type:	2-pin header, p=1.27 mm
CN Location:	See **Figure 4-11**
CN Pinouts:	See **Table 4-10**

The ME_FLASH1 connector is used for flash descriptor security override.

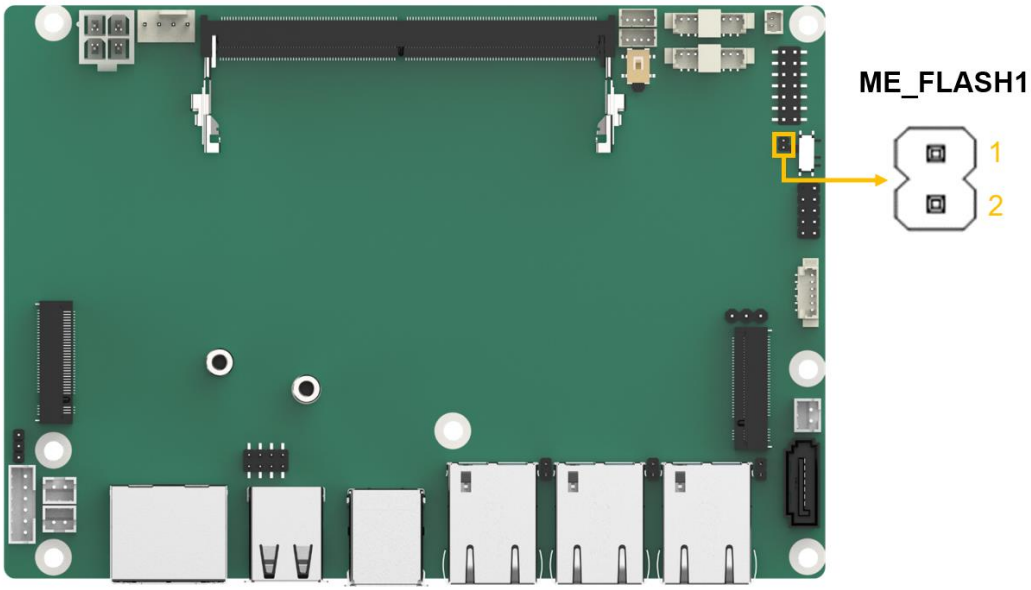


Figure 4-11: Flash Descriptor Security Override Jumper Location

Pin	Description
1	+VCCPGPPIR_3P3_1P8
2	HDA_SDO

Table 4-10: Flash Descriptor Security Override 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.

4.2.11 AT/ATX Power Mode Switch

CN Label: **J_ATX_AT1**

CN Type: Slide switch

CN Location: See **Figure 4-12**

CN Pinouts: See **Table 4-11**

The AT/ATX power mode selection is made through the AT/ATX power mode switch.

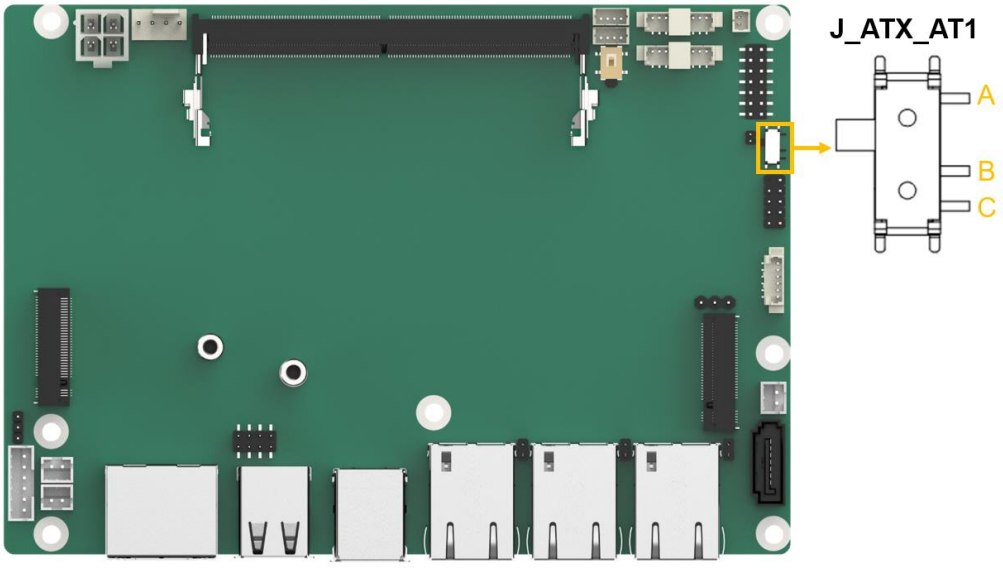


Figure 4-12: AT/ATX Power Mode Switch Locations

Pin	Description
Short A - B	ATX power mode (default)
Short B - C	AT power mode

Table 4-11: AT/ATX Power Mode Switch Pinouts

4.2.12 Audio Connector

CN Label:	**J_AUDIO1**
CN Type:	10-pin header, p=2.00 mm
CN Location:	See **Figure 4-13**
CN Pinouts:	See **Table 4-12**

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

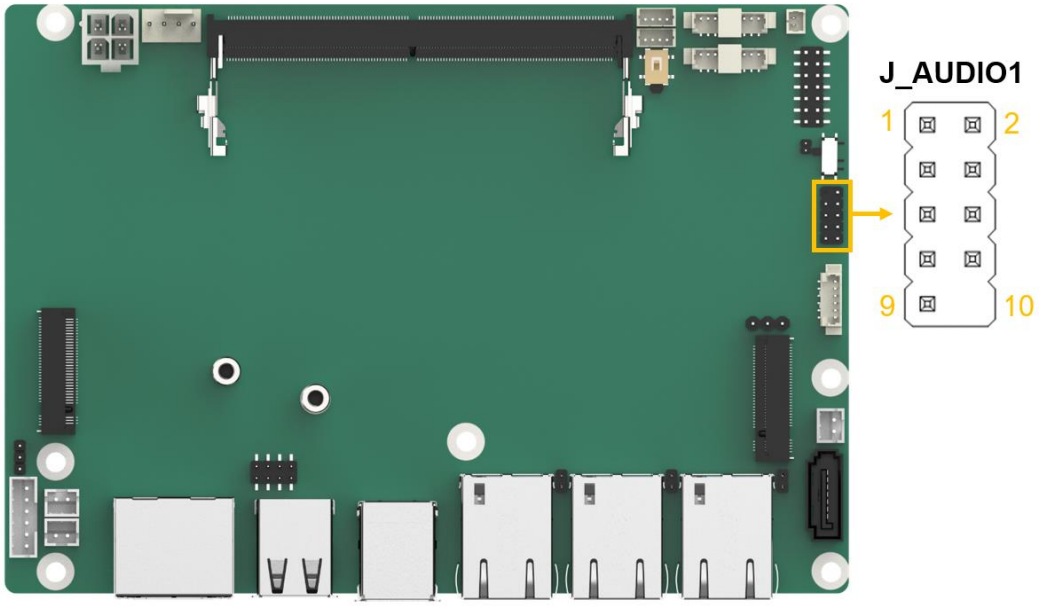


Figure 4-13: Audio Connector Location

Pin	Description	Pin	Description
1	HDA_SYNC_R	2	HDA_BCLK_R
3	HDA_SDO_R	4	HDA_PCBEEPC
5	HDA_SDI_0_R	6	HDA_RST_R
7	+5V	8	GND
9	+12V	10	GND

Table 4-12: Audio Connector Pinouts

4.2.13 Flash SPI ROM Connector

CN Label:	**JBIOS1**
CN Type:	6-pin wafer, p=1.25 mm
CN Location:	See **Figure 4-14**
CN Pinouts:	See **Table 4-13**

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

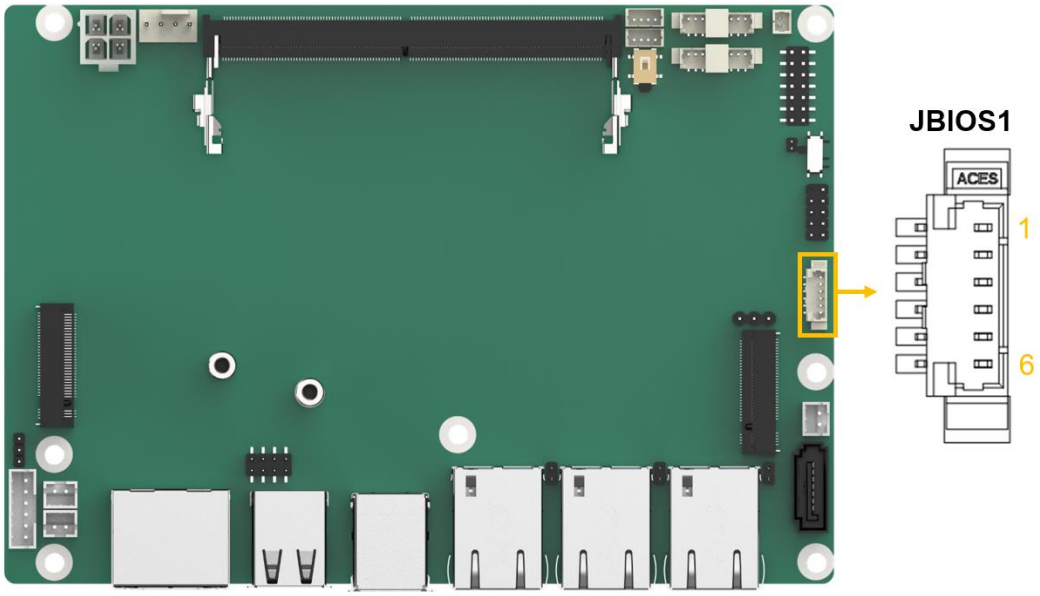


Figure 4-14: Flash SPI ROM Connector Location

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

Table 4-13: Flash SPI ROM Connector Pinouts

4.2.14 M.2 M-Key Slot

CN Label: **M2_SSD1**

CN Type: M.2 M-key slot

CN Location: See **Figure 4-15**

CN Pinouts: See **Table 4-14**

The M.2 2280 M-key slot with PCIe Gen3 x2 signals can accept a NVMe storage device.

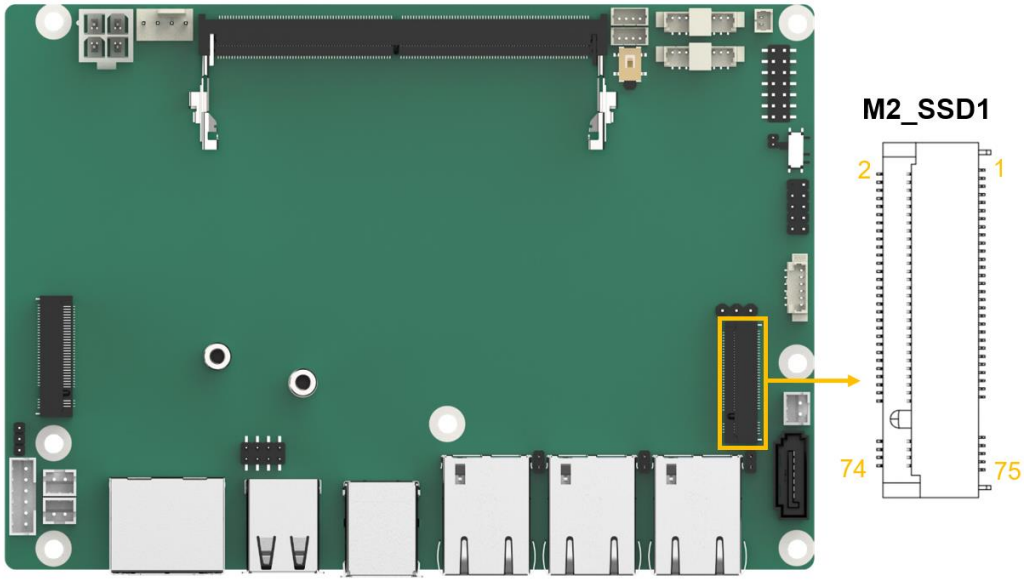


Figure 4-15: M.2 M-Key Slot Location

Pin	Description	Pin	Description
1	GND	2	+3.3V
3	GND	4	+3.3V
5	NC	6	N/C
7	NC	8	N/C
9	GND	10	NGFF1_ACT_N
11	NC	12	+3.3V
13	NC	14	+3.3V
15	GND	16	+3.3V
17	NC	18	+3.3V
19	NC	20	N/C

Pin	Description	Pin	Description
21	GND	22	N/C
23	NC	24	N/C
25	NC	26	N/C
27	GND	28	N/C
29	PCIE_P4_RX_DN	30	N/C
31	PCIE_P4_RX_DP	32	N/C
33	GND	34	N/C
35	PCIE_P4_TX_DN	36	N/C
37	PCIE_P4_TX_DP	38	M2_SATA_SSD_SLP
39	GND	40	N/C
41	PCIE_P3_RX_DN	42	N/C
43	PCIE_P3_RX_DP	44	N/C
45	GND	46	N/C
47	PCIE_P3_TX_DN	48	N/C
49	PCIE_P3_TX_DP	50	BUF_PLT_RST_N
51	GND	52	NC
53	PCIE_CLKN2	54	NC
55	PCIE_CLKP2	56	N/C
57	GND	58	N/C
59	N/C	60	N/C
61	N/C	62	N/C
63	N/C	64	N/C
65	N/C	66	N/C
67	N/C	68	NC
69	N/C	70	+3.3V
71	GND	72	+3.3V
73	GND	74	+3.3V
75	GND		

Table 4-14: M.2 M-Key Slot Pinouts

4.2.15 SATA Power Connector

CN Label:	**SATA_PWR1**
CN Type:	2-pin wafer, p=2.00 mm
CN Location:	See **Figure 4-16**
CN Pinouts:	See **Table 4-15**

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

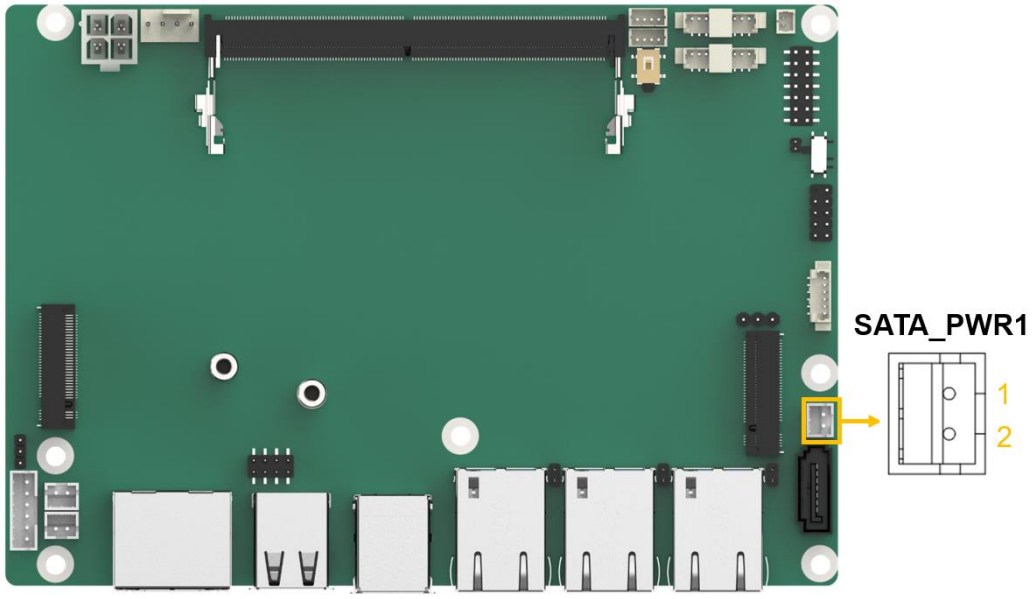


Figure 4-16: SATA Power Connector Location

Pin	Description
1	VCC5V
2	GND

Table 4-15: SATA Power Connector Pinouts

4.2.16 SATA 6Gb/s Connector

CN Label:	**S_ATA1**
CN Type:	7-pin SATA connector, p=1.27 mm
CN Location:	See **Figure 4-17**
CN Pinouts:	See **Table 4-16**

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

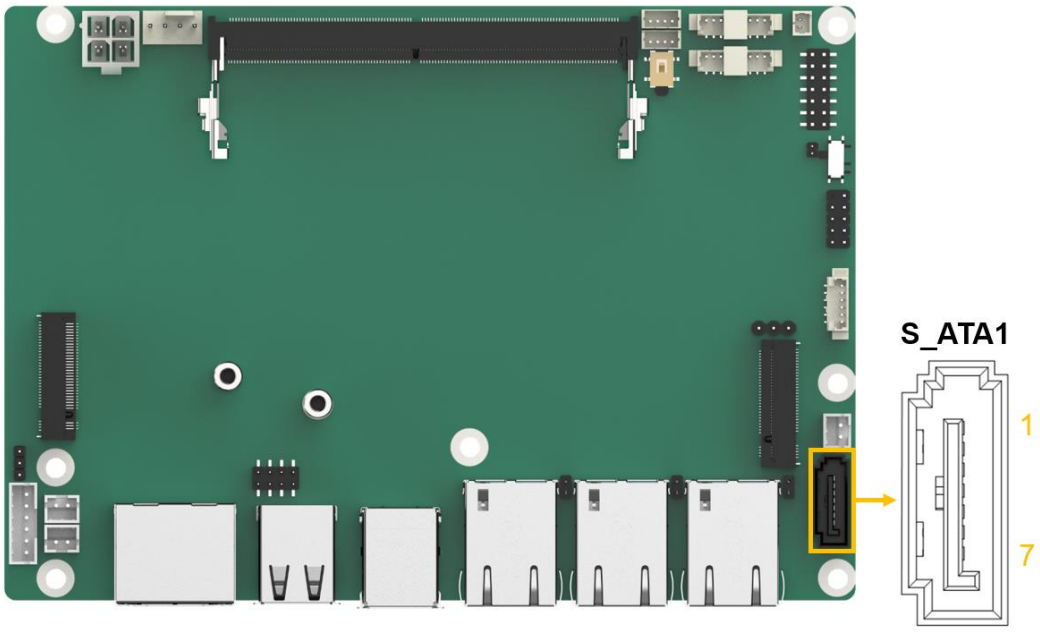


Figure 4-17: SATA 6Gb/s Connector Location

Pin	Description	Pin	Description
1	GND	5	SATA_RX-
2	SATA_TX+	6	SATA RX+
3	SATA_TX-	7	GND
4	GND		

Table 4-16: SATA 6Gb/s Connector Pinouts

4.2.17 LAN LED Connectors

CN Label:	**JLAN_LED1, JLAN_LED2, JLAN_LED3**
CN Type:	2-pin header, p=2.00 mm
CN Location:	See **Figure 4-18**
CN Pinouts:	See **Table 4-17**

The LAN LED connectors are used to connect to the LAN LED indicators on the chassis to indicate the link activities of the three LAN ports.

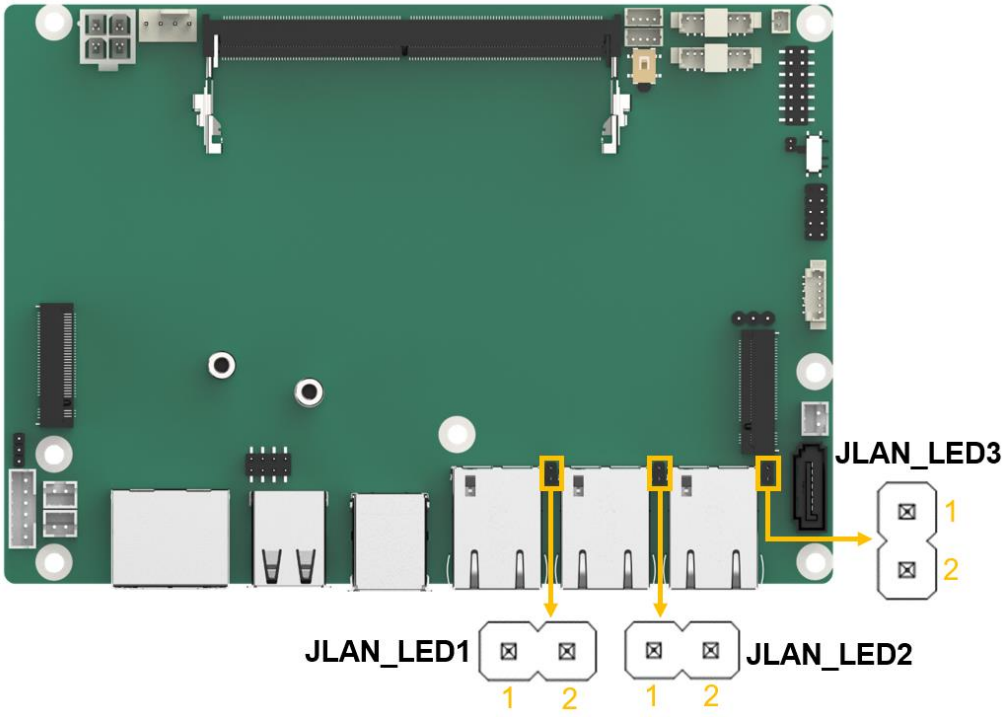


Figure 4-18: LAN LED Connector Locations

Pin	Description
1	+3.3V
2	I225_LINK_ACT_N

Table 4-17: LAN LED Connector Pinouts

4.2.18 Internal USB 2.0 Connector

CN Label:	**USB_CN2**
CN Type:	8-pin header, p=2.00 mm
CN Location:	See **Figure 4-19**
CN Pinouts:	See **Table 4-18**

The internal USB 2.0 connector provides two USB 2.0 ports via a dual-port USB cable.

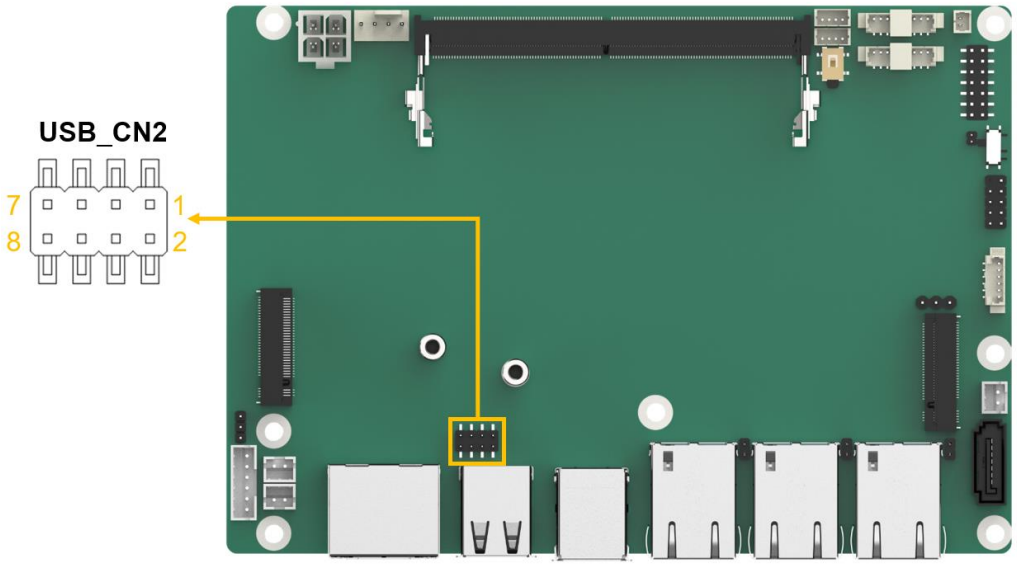


Figure 4-19: Internal USB 2.0 Connector Locations

Pin	Description	Pin	Description
1	+5V	2	USB_D6N
3	USB_D6P	4	GND
5	+5V	6	USB_D5N
7	USB_D5P	8	GND

Table 4-18: Internal USB 2.0 Connectors Pinouts

4.2.19 Power Button Connector

CN Label: **PWR_BTN1**

CN Type: 2-pin wafer, p=2.00 mm

CN Location: See **Figure 4-20**

CN Pinouts: See **Table 4-19**

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

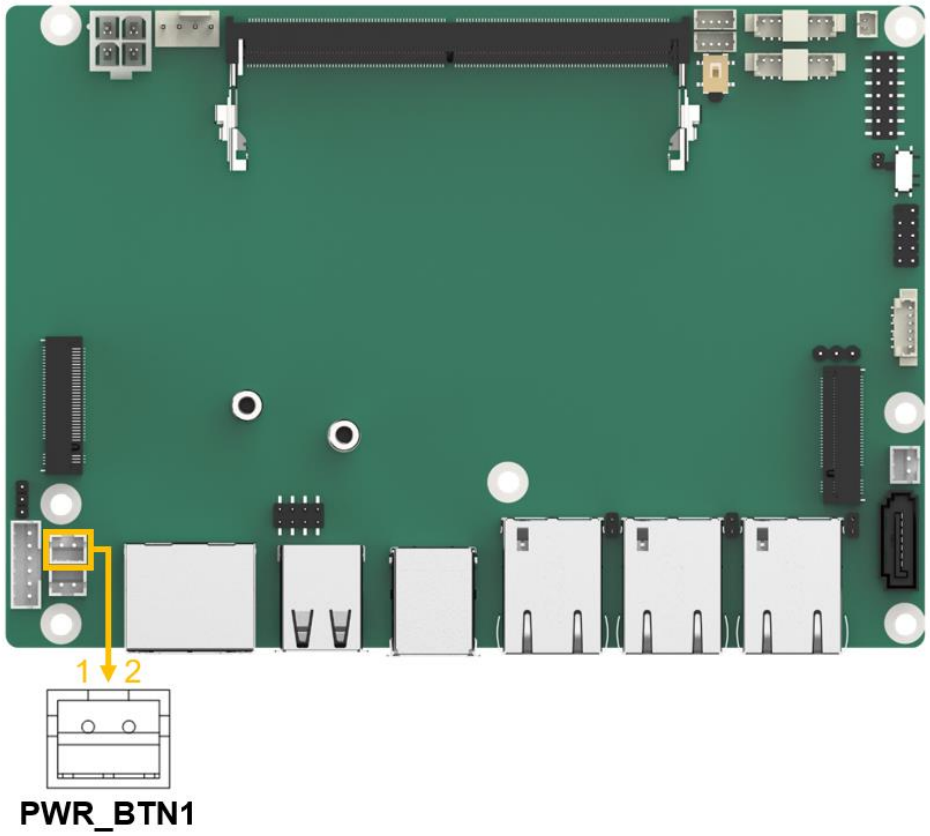


Figure 4-20: Power Button Connector Location

Pin	Description
1	PWR_BTN_N
2	GND

Table 4-19: Power Button Connector Pinouts

4.2.20 Reset Button Connector

CN Label: **RST_BTN1**

CN Type: 2-pin wafer, p=2.00 mm

CN Location: See **Figure 4-21**

CN Pinouts: See **Table 4-20**

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.

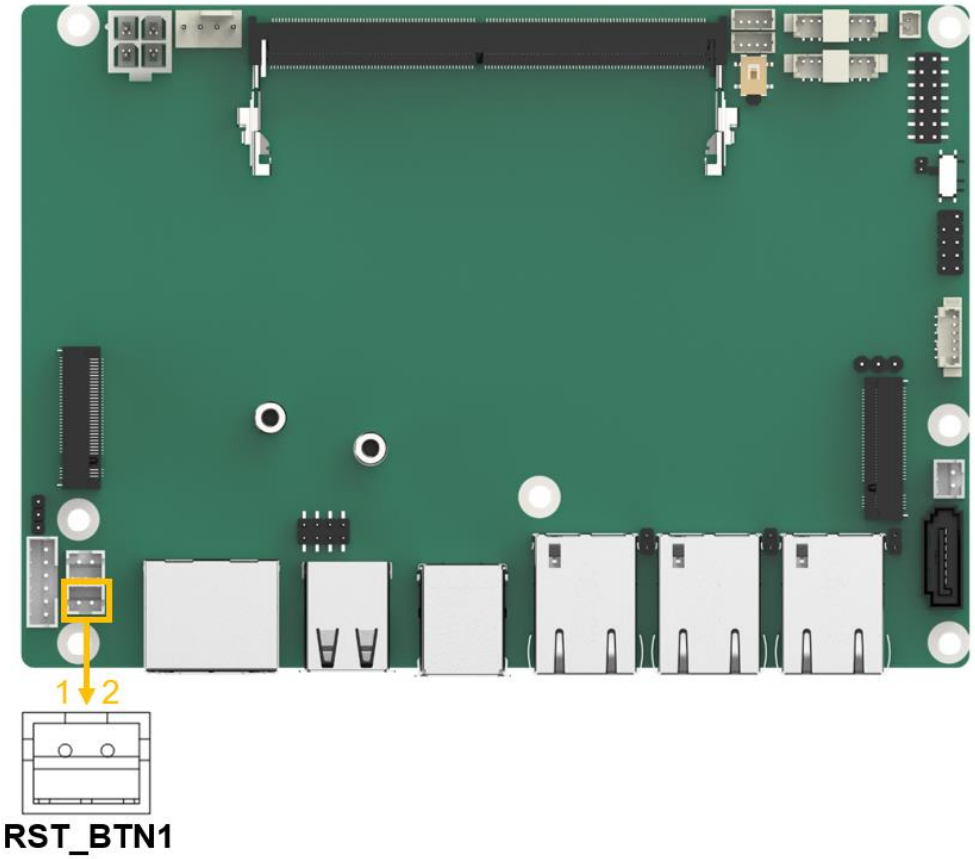


Figure 4-21: Reset Button Connector Location

Pin	Description
1	SYS_RESET_N
2	GND

Table 4-20: Reset Button Connector Pinouts

4.2.21 Front Panel Connector

CN Label:	**F_PANEL1**
CN Type:	6-pin wafer, p=2.00 mm
CN Location:	See **Figure 4-22**
CN Pinouts:	See **Table 4-21**

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

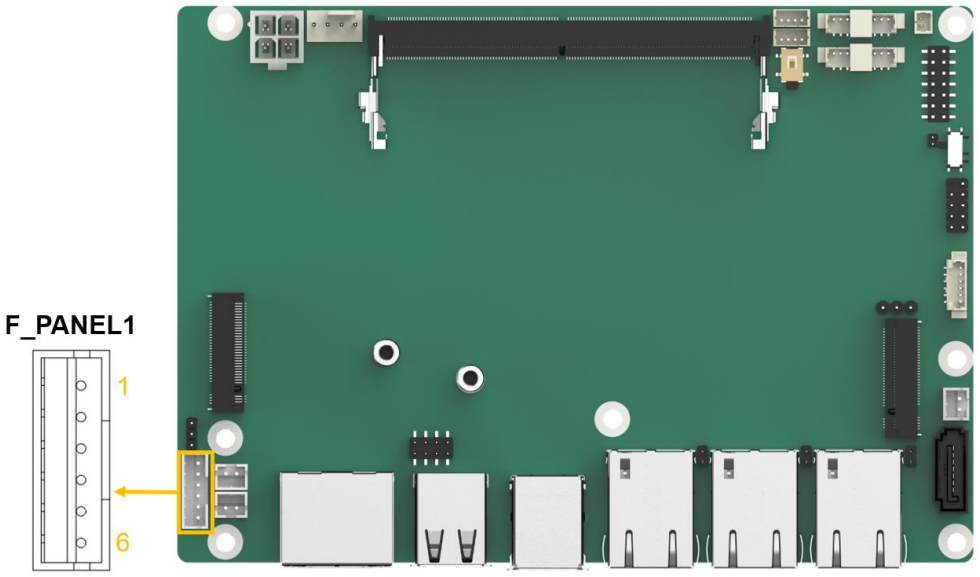


Figure 4-22: Front Panel Connector Location

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

Table 4-21: Front Panel Connector Pinouts

4.2.22 M.2 A-Key Slot

CN Label: **M2_A1**

CN Type: M.2 A-key slot

CN Location: See **Figure 4-23**

CN Pinouts: See **Table 4-22**

The M.2 2230 A-key slot supporting PCIe Gen3 x1 and USB 2.0 signals can accept a Wi-Fi and Bluetooth module.

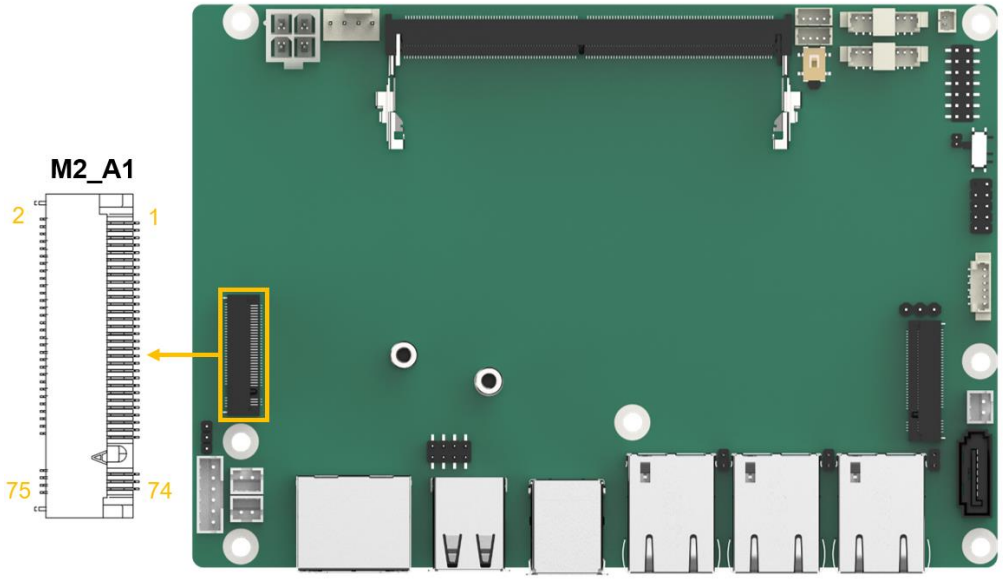


Figure 4-23: M.2 2230 A-Key Slot Location

Pin	Description	Pin	Description
1	GND	2	+3.3V
3	USB2_P7_DP	4	+3.3V
5	USB2_P7_DN	6	N/C
7	NC	8	N/C
9	GND	10	N/C
11	NC	12	N/C
13	NC	14	N/C
15	GND	16	N/C
17	NC	18	GND

Pin	Description	Pin	Description
19	NC	20	N/C
21	GND	22	N/C
23	NC	24	N/C
25	NC	26	N/C
27	GND	28	N/C
29	N/C	30	GND
31	N/C	32	N/C
33	GND	34	N/C
35	PCIE_P7_TX_DP	36	GND
37	PCIE_P7_TX_DN	38	GND
39	GND	40	N/C
41	PCIE_P7_RX_DP	42	N/C
43	PCIE_P7_RX_DN	44	N/C
45	GND	46	N/C
47	PCIE_CLKP0	48	N/C
49	PCIE_CLKN0	50	N/C
51	GND	52	BUF_PLT_RST_N
53	N/C	54	BT_RF_KILL_N
55	PCIE_WAKE_N	56	WIFI_RF_KILL_N
57	GND	58	N/C
59	N/C	60	N/C
61	N/C	62	N/C
63	N/C	64	N/C
65	N/C	66	N/C
67	N/C	68	NC
69	N/C	70	+3.3V
71	GND	72	+3.3V
73	GND	74	+3.3V
75	GND		

Table 4-22: M.2 A-Key Slot Pinouts

4.3 External Interface Panel Connectors

Figure 4-24 shows the WAFER-ASL's external peripheral interface connector (EPIC) panel. The EPIC panel consists of the following:

- 1 x DP connector
- 1 x HDMI connector
- 2 x USB 2.0 connector
- 2 x USB 3.2 Gen 2 connector
- 3 x 2.5GbE RJ-45 connector

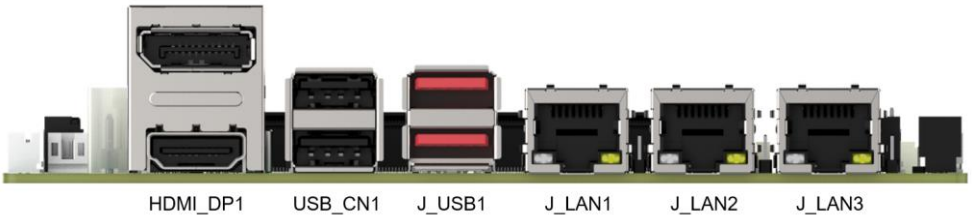


Figure 4-24: External Peripheral Interface Connectors

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

Connector	Type	Label
DP and HDMI combo connector	DisplayPort, HDMI	HDMI_DP1
USB 2.0 connectors	USB 2.0 Type-A	USB_CN1
USB 3.2 Gen 2 connectors	USB 3.2 Gen 2 Type-A	J_USB1
2.5GbE RJ-45 connectors	RJ45	J_LAN1, J_LAN2, J_LAN3

Table 4-23: External Peripheral Interface Connectors

4.3.1 DP and HDMI Combo Connector

CN Label: **HDMI_DP1**

CN Type: DisplayPort, HDMI

CN Location: See **Figure 4-25** and **Figure 4-26**

CN Pinouts: See **Table 4-24** and **Table 4-25**

The DP connector connects to a display device with DisplayPort interface.

Pin	Description	Pin	Description
1	LANE0P	11	GND
2	GND	12	LANE3N
3	LANE0N	13	AUX_CTRL_DET_C
4	LANE1P	14	GND
5	GND	15	AUXP
6	LANE1N	16	GND
7	LANE2P	17	AUXN
8	GND	18	HPD
9	LANE2N	19	GND
10	LANE3P	20	+3.3V

Table 4-24: DP Connector Pinouts

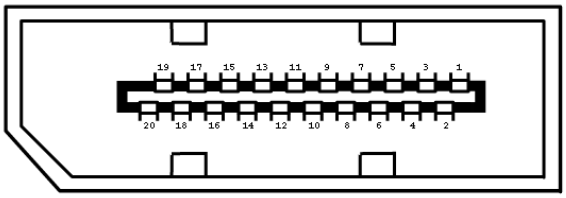


Figure 4-25: DP Connector

The HDMI connector can connect to an HDMI device.

Pin	Description	Pin	Description
1	HDMI_DATA2	2	GND
3	HDMI_DATA2#	4	HDMI_DATA1
5	GND	6	HDMI_DATA1#
7	HDMI_DATA0	8	GND
9	HDMI_DATA0#	10	HDMI_CLK
11	GND	12	HDMI_CLK#
13	N/C	14	N/C
15	HDMI_SCL	16	HDMI_SDA
17	GND	18	+5V
19	HDMI_HPD		

Table 4-25: HDMI Connector Pinouts

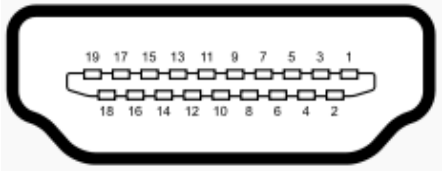


Figure 4-26: HDMI Connector

4.3.2 External USB 2.0 Connectors

CN Label: **USB_CN1**

CN Type: USB 2.0 Type-A

CN Location: See **Figure 4-27**

CN Pinouts: See **Table 4-26**

The WAFER-ASL has two external USB 2.0 ports. The USB connector can be connected to a USB 2.0 device.

Figure 4-27: External USB 2.0 Connectors Location

Pin	Description	Pin	Description
1	VCC	5	VCC
2	USB_DATA-	6	USB_DATA-
3	USB_DATA+	7	USB_ DATA+
4	GND	8	GND

Table 4-26: External USB 2.0 Connectors Pinouts

4.3.1 External USB 3.2 Gen 2 Connectors

CN Label: **J_USB1**

CN Type: USB 3.2 Gen 2 Type-A

CN Location: See **Figure 4-28**

CN Pinouts: See **Table 4-27**

The WAFER-ASL 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.

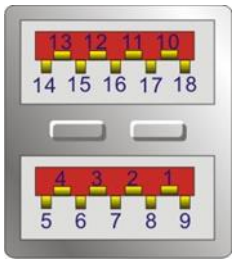


Figure 4-28: External USB 3.2 Gen 2 Connectors Location

Pin	Description	Pin	Description
1	VCC	10	VCC
2	USB_DATA-	11	USB_DATA-
3	USB_DATA+	12	USB_ DATA+
4	GND	13	GND
5	USB3_RX-	14	USB3_RX-
6	USB3_RX+	15	USB3_ RX+
7	GND	16	GND
8	USB3_TX-	17	USB3_TX-
9	USB3_TX+	18	USB3_TX+

Table 4-27: External USB 3.2 Gen 2 Connectors Pinouts

4.3.2 External 2.5GbE RJ-45 Connectors

CN Label: **J_LAN1, J_LAN2, J_LAN3**

CN Type: RJ-45

CN Pinouts: See **Table 4-28**

The WAFER-ASL is equipped with three built-in 1000/2500Mbps Ethernet controllers. Users can connect them to your LAN through the RJ45 LAN connectors.

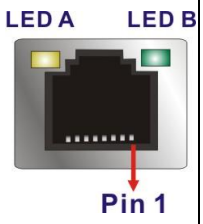
Pin	Description	Pin	Description	
1	MDIA0+	5	MDIA2-	
2	MDIA0-	6	MDIA1-	
3	MDIA1+	7	MDIA3+	
4	MDIA2+	8	MDIA3-	
LED	**Description**	**LED**	**Description**	
A	Off: No link Yellow: Linked Blinking: TX/RX activity	B	Off:10 Mbps connection Green:1000 Mbps connection Orange:2.5 Gbps connection	

Table 4-28: External 2.5GbE RJ-45 Connectors

Chapter

5

BIOS

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.

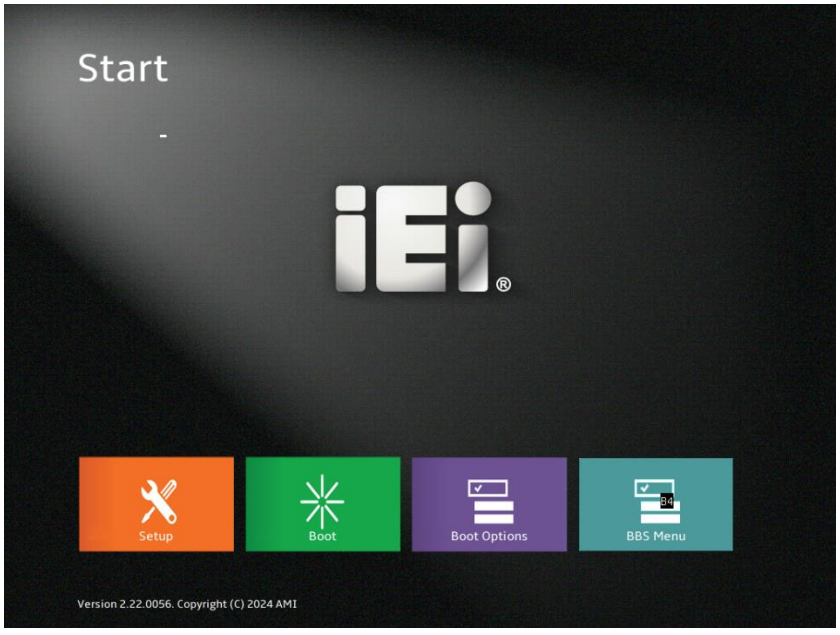


Figure 5-1: BIOS Starting Menu

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

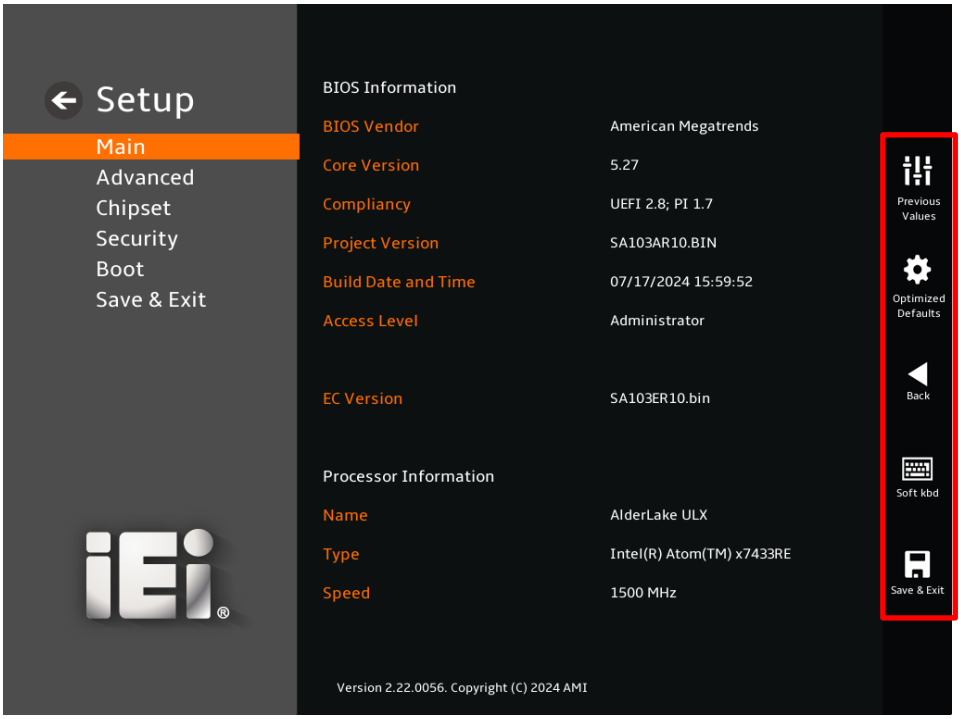
For keyboard navigation, use the navigation keys shown in **Table 5-1**.

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

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

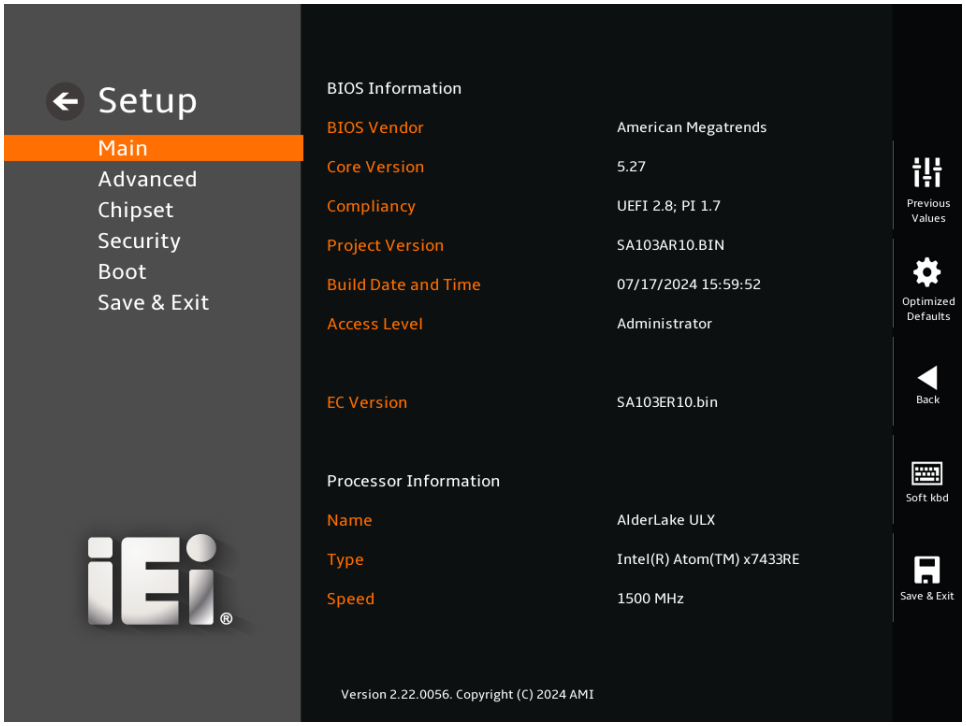
The **menu bar** on top of the BIOS screen has the following main items:

- Main – Changes the basic system configuration.
- Advanced – Changes the advanced system settings.
- Chipset – Changes the chipset settings.
- Security – Set 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.

5.2 Main

The Main BIOS menu (**BIOS Menu 1**, **BIOS Menu 2** and **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)

BIOS Menu 2: Main (2/3)

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
- **Compliancy:** Current UEFI & PI version
- **Project Version:** The board version
- **Build Date and Time:** Date the current BIOS version was made
- **Access Level:** Current access administrator
- **EC Version:** Current EC version

➔ Processor Information

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

- **Name:** Displays the processor name
- **Type:** Displays the processor type
- **Speed:** Displays the processor speed
- **ID:** Displays the processor ID
- **Stepping:** Displays the processor stepping
- **Number of Efficient-cores**: The number of E-cores in the processor
- **Microcode Revision:** CPU microcode revision
- **IGFX GOP Version**: The firmware version of integrated graphics
- **Total Memory:** Total memory in the system
- **Memory Frequency:** Displays frequency 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
- **PCH SKU：** Displays the PCH SKU
- **Stepping:** Displays the PCH stepping
- **ME FW Version:** Displays the ME firmware version
- **ME Firmware SKU:** Displays the ME firmware SKU
- **System Date:** Displays the system date

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]**

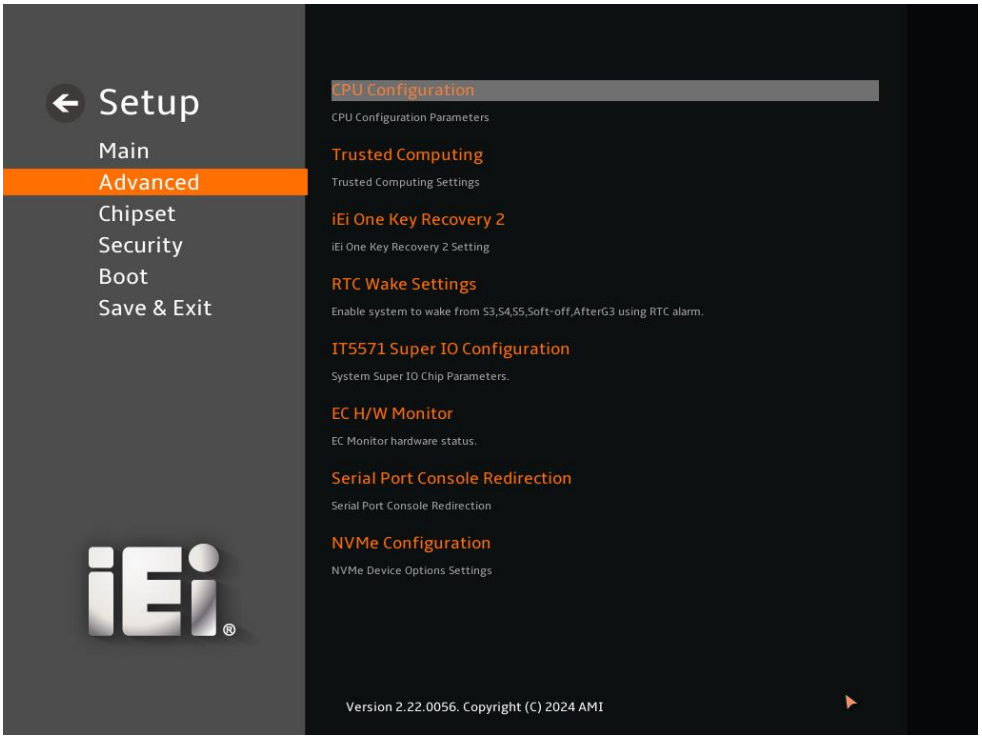
Use the **System Time** option to set the system time. Manually enter the hours, minutes and seconds.

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 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**) to view detailed CPU specifications or enable the Intel Virtualization Technology.

BIOS Menu 5: CPU Configuration (1/2)

BIOS Menu 6: CPU Configuration (2/2)

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

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

➔	**Disabled**		Disable Intel Virtualization Technology.
➔	**Enabled**	**DEFAULT**	Enable Intel Virtualization Technology.

➔ **Active Efficient Cores [All]**

Use the **Active Efficient Cores** BIOS option to enable the number of E-cores in the processor package.

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

➔ **3** Enable three E-cores in the processor package.

➔ **Intel(R) SpeedStep(tm) [Enabled]**

Use the **Intel(R) SpeedStep(tm)** option to enable or disable the Intel® SpeedStep Technology which allows more than two frequency ranges to be supported.

➔ **Disabled** Disable Intel® SpeedStep Technology

➔ **Enabled** **DEFAULT** Enable Intel® SpeedStep Technology

➔ **C states [Disabled]**

Use the **C states** option to enable or disable CPU power management which allows CPU to go to C states when it is not 100% utilized.

➔ **Disabled** **DEFAULT** Disable CPU power management

➔ **Enabled** Enable CPU power management

➔ **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** Disable Turbo Mode Technology

➔ **Enabled** **DEFAULT** Enable Turbo Mode Technology

➔ **Power Limit 1 [0]**

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. For overclocking SKU, value must be between max and min power limits. For 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 [0]**

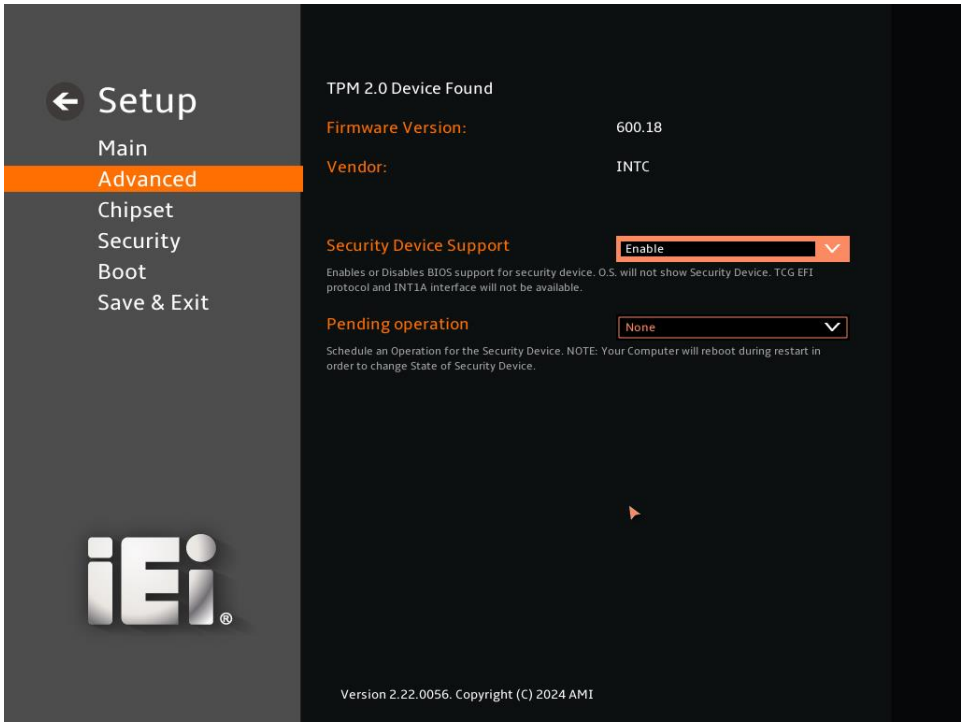
Use the **Power Limit 1 Time Window** option to select the PL1 time duration. The value may vary from 0 to 128. 0 is the default value.

➔ **Power Limit 2 [0]**

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.

5.3.2 Trusted Computing

Use the **Trusted Computing** menu (**BIOS Menu 7**) to configure settings related to the Trusted Computing Group (TCG) and Trusted Platform Module (TPM).



BIOS Menu 7: Trusted Computing

➔ **Security Device Support [Enable]**

Use the **Security Device 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 retains its previous information.

➔ **TPM Clear** TPM information is cleared.

5.3.1 iEi One Key Recovery 2

BIOS Menu 8: iEi One Key Recovery2 Configuration

➔ **Auto Recovery Function [Disabled]**

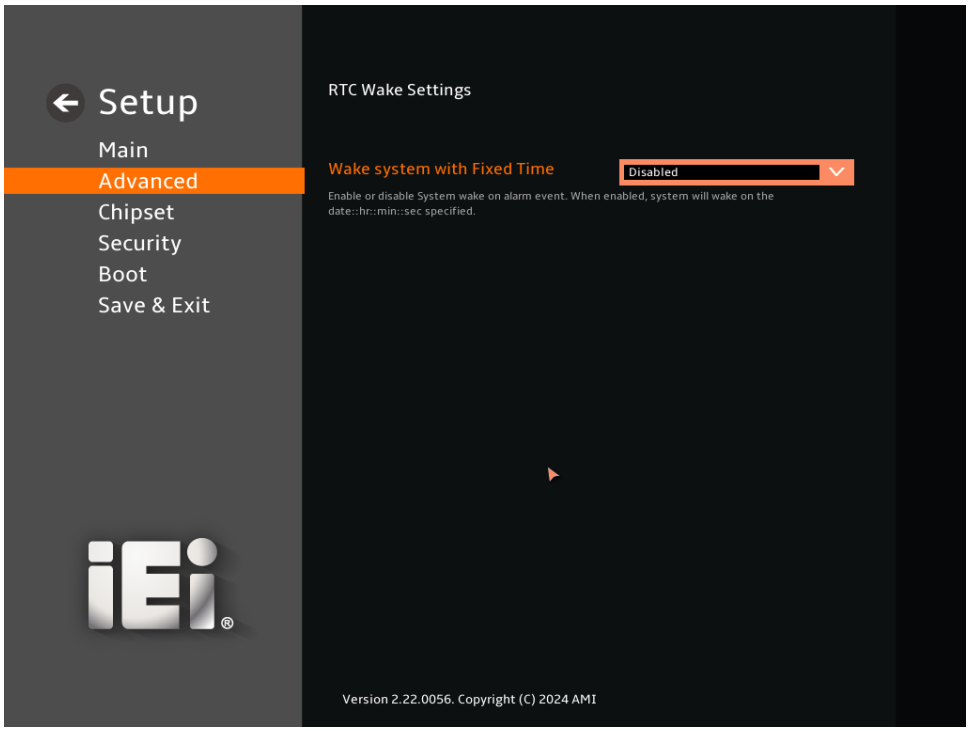
Use the **Auto Recovery Function** option to configure watch dog function.

➔ **Disabled** **DEFAULT** Auto recovery support is disabled.

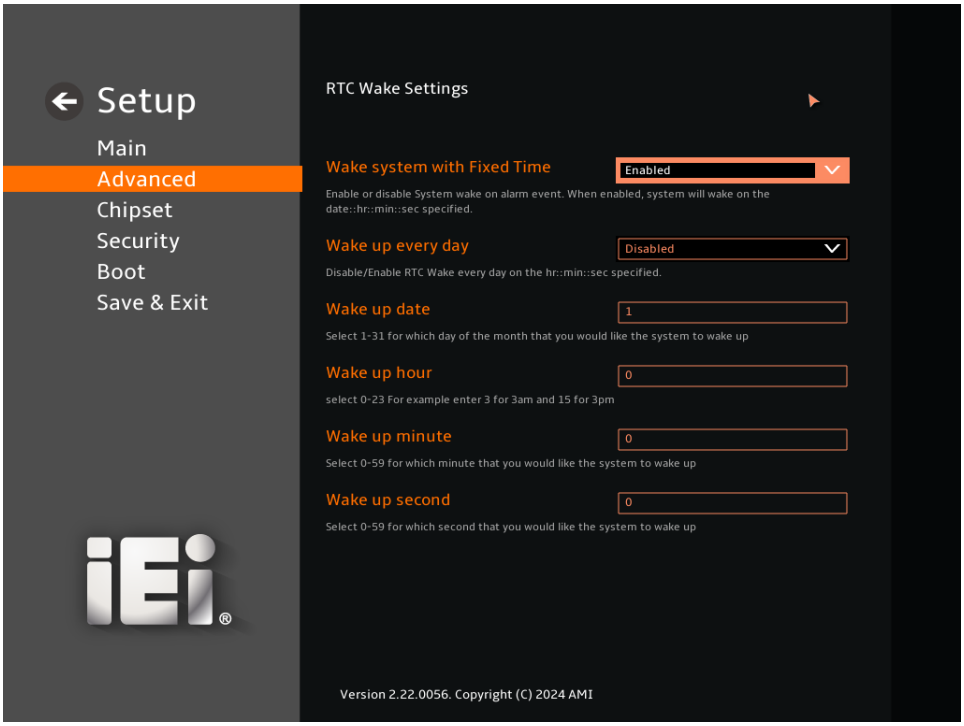
➔ **Enabled** Auto recovery support is enabled.

5.3.2 RTC Wake Settings

Use the RTC Wake Settings menu (**BIOS Menu 9 & BIOS Menu 10**) to enable or disable system wake on alarm event. When enabled, system will wake on the "date:hour:minute:second" specified.



BIOS Menu 9:RTC Wake Settings



BIOS Menu 10: Wake system with Fixed Time [Enabled]

➔ **Wake system with Fixed Time [Disabled]**

Use the **Wake system with the Fixed Time** option to enable or disable the system wake on alarm event.

➔ **Disabled** **DEFAULT** The RTC cannot generate a wake event.

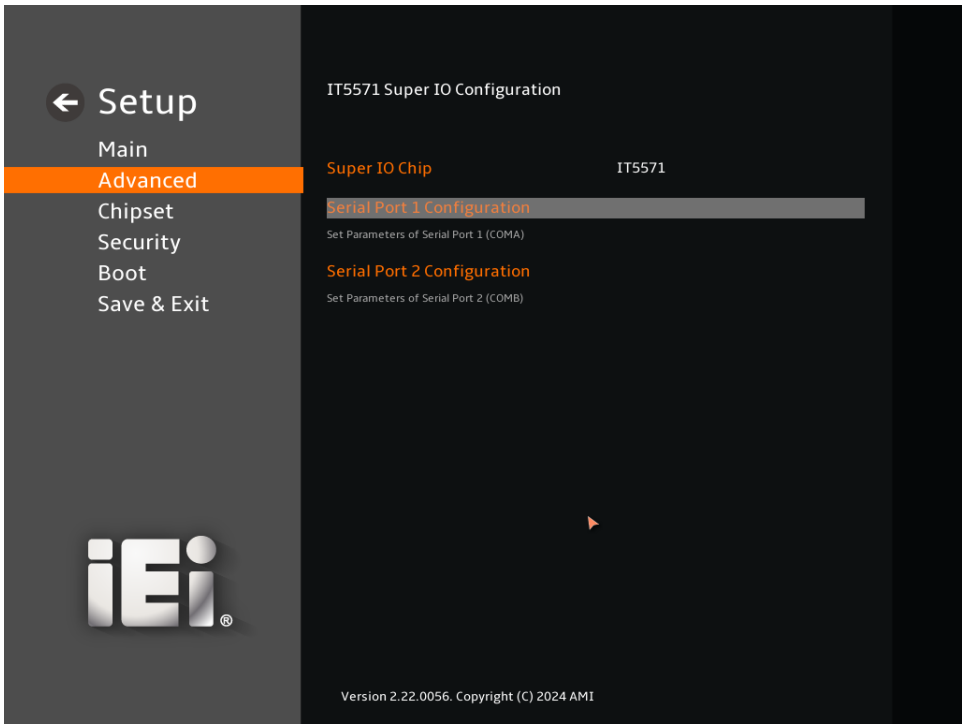
➔ **Enabled** If selected, the **Wake up every day** option appears, allowing users to enable the system to wake up every day at the specified time. Besides, the following options appear with values that can be selected:

- Wake up date
- Wake up hour
- Wake up minute
- Wake up second

After setting the alarm, the computer turns itself on from a suspended state when the alarm goes off.

5.3.3 IT5571 Super IO Configuration

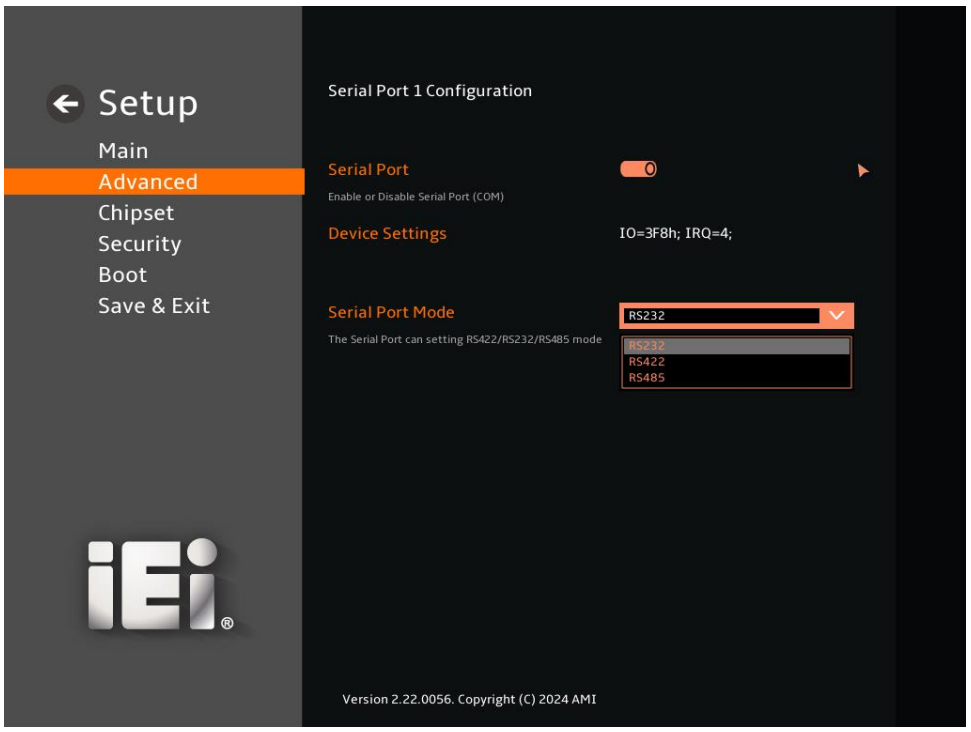
Use the **IT5571 Super IO Configuration** menu (**BIOS Menu 11**) to set or change the configurations for the serial ports.



BIOS Menu 11: IT5571 Super IO Configuration

5.3.3.1 Serial Port 1 Configuration

Use the **Serial Port 1 Configuration** menu (**BIOS Menu 12**) to configure the serial port.



BIOS Menu 12: 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's address and interrupt address.

➔ **IO=3F8h; IRQ=4**	The serial port address is 3F8h and the interrupt address is IRQ4

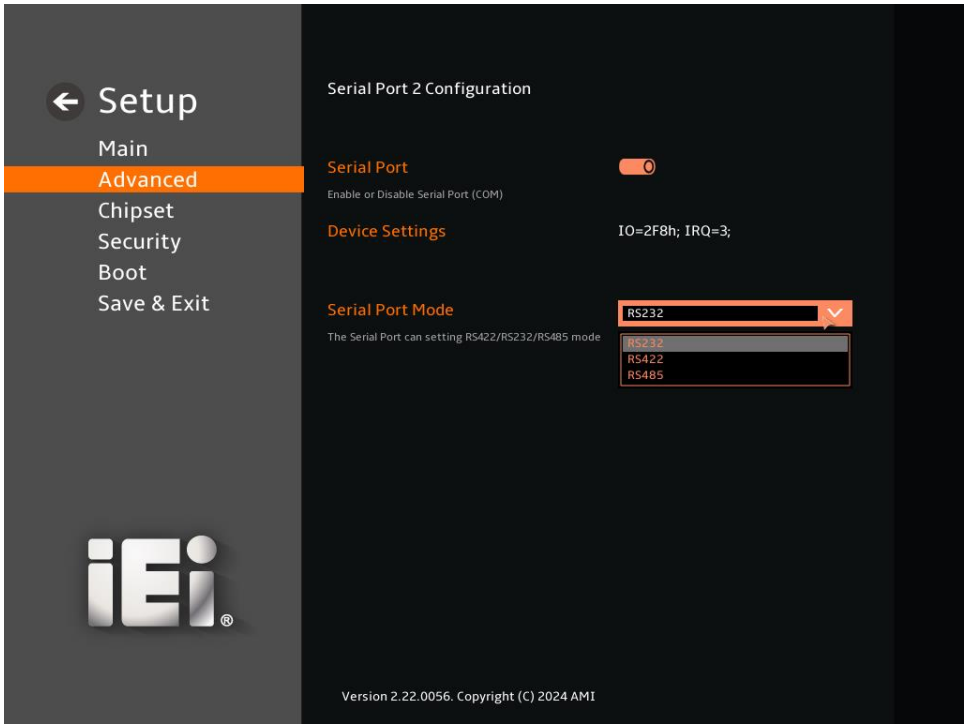
➔ **Device Mode [RS232]**

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

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

5.3.3.2 Serial Port 2 Configuration

Use the **Serial Port 2 Configuration** menu (**BIOS Menu 13**) to configure the serial port.



BIOS Menu 13: Serial Port 2 Configuration Menu

➔ **Serial Port [Enabled]**

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

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

➔ **Device Settings**

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

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

➔ **Device Mode [RS232]**

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

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

5.3.4 EC IT5571 H/W Monitor

The **EC IT5571 H/W Monitor** menu (**BIOS Menu 14**) shows the state of H/W real-time operating temperature, fan speed and system voltages, and contains the system thermal control and the smart fan mode configuration submenus.

BIOS Menu 14: EC IT5571 H/W Monitor

➔ **PC Health Status**

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

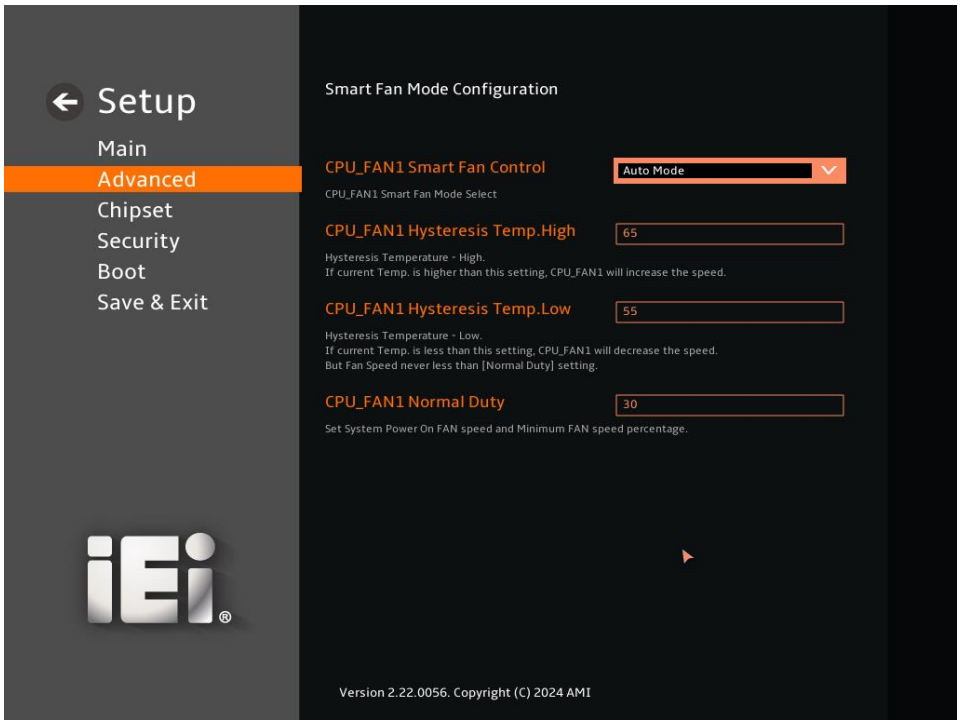
- System Temperatures:
  - CPU Temperature
- Fan Speeds:
  - Fan1 Speed
- Voltages:
  - V5S
  - +V12S
  - +V3P3S

➔ **Tcc Activation Offset [0]**

This setting adjusts the offset from the factory-defined Thermal Control Circuit (TCC) activation temperature, determining when the TCC should activate. The activation temperature is calculated as: TCC Activation Temperature = Factory Set Temperature - TCC Activation Offset. The offset range is between 0 and 63.

5.3.4.1 Smart Fan Mode Configuration

Use the **Smart Fan Mode Configuration** submenu (**BIOS Menu 15**) to configure the CPU fan speed based on the temperature.



BIOS Menu 15: Smart Fan Mode Configuration

➔ **CPU_FAN1 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 specified in manual mode settings.
➔ **Auto Mode**	**DEFAULT**	The fan adjusts its speed as per auto mode settings.

➔ **CPU_FAN1 Hysteresis Temp.High [65]**

If the current CPU temperature is higher than this setting, CPU_FAN1 will increase the speed.

➔ **CPU_FAN1 Hysteresis Temp.Low [55]**

If the current CPU temperature is lower than this setting, CPU_FAN1 will decrease the speed. But the fan speed is never less than the [Normal Duty] value.

➔ **CPU_FAN1 Normal Duty [30]**

Use the **CPU_FAN1 Normal Duty** option to set the minimum fan speed percentage and the fan speed when the system is powered on.

5.3.5 Serial Port Console Redirection

The **Serial Port Console Redirection** menu (**BIOS Menu 16**) 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 16:Serial Port Console Redirection

➔ **Console Redirection [Disabled]**

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

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

5.3.5.1 Console Redirection Settings

The following options are available in the **Console Redirection Settings** submenu (**BIOS Menu 17**) when the **COM Console Redirection** option is enabled.

BIOS Menu 17: COM Console Redirection Settings

➔ **Terminal Type [ANSI]**

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

➔	**VT100**	The target terminal type is VT100
➔	**VT100Plus**	The target terminal type is VT100Plus

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

➔ **Bits per second [115200]**

Use the **Bits per second** option to specify the serial port transmission speed. The speed must match the value set in the remote terminal. Long or noisy lines may require lower speeds.

➔ **9600**		Set the serial port transmission speed at 9600.
➔ **19200**		Set the serial port transmission speed at 19200.
➔ **57600**		Set the serial port transmission speed at 57600.
➔ **115200**	**DEFAULT**	Set the serial port transmission speed at 115200.

➔ **Data Bits [8]**

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

➔ **7**		Set the data bits at 7.
➔ **8**	**DEFAULT**	Set 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. T This option does not allow for error detection.

➔ **Stop Bits [1]**

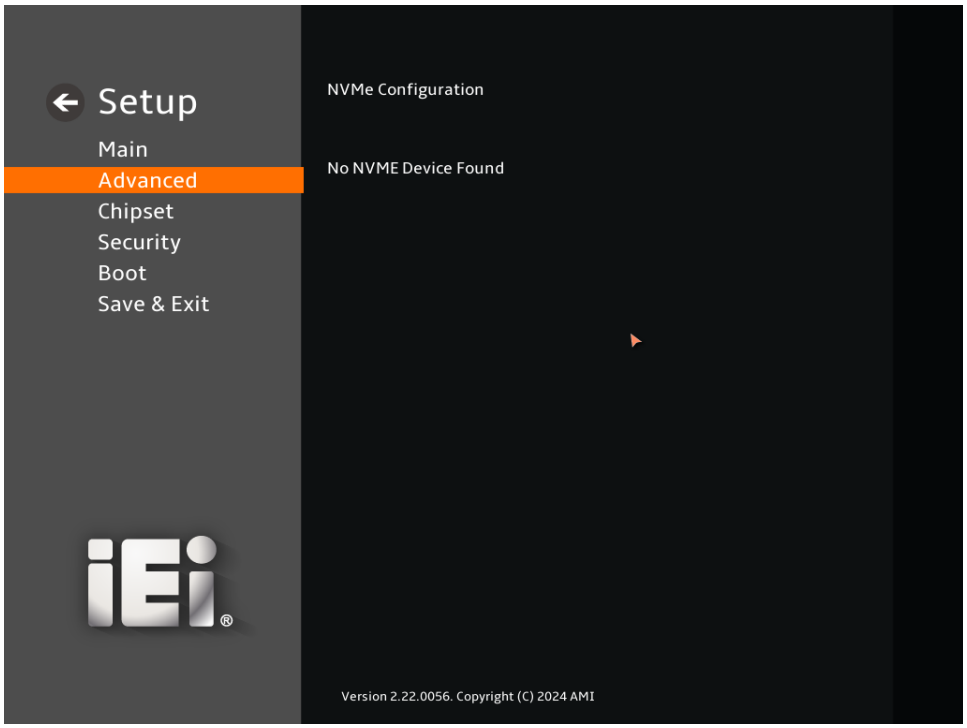
Use the **Stop Bits** option to specify the number of stop bits used to indicate the end of a serial data packet. Communication with slow devices may require more than 1 stop bit.

➔ **1** **DEFAULT** Set the number of stop bits to 1.

➔ **2** Set the number of stop bits to 2.

5.3.6 NVMe Configuration

Use the **NVMe Configuration** (**BIOS Menu 18**) menu to display the NVMe controller and device information.



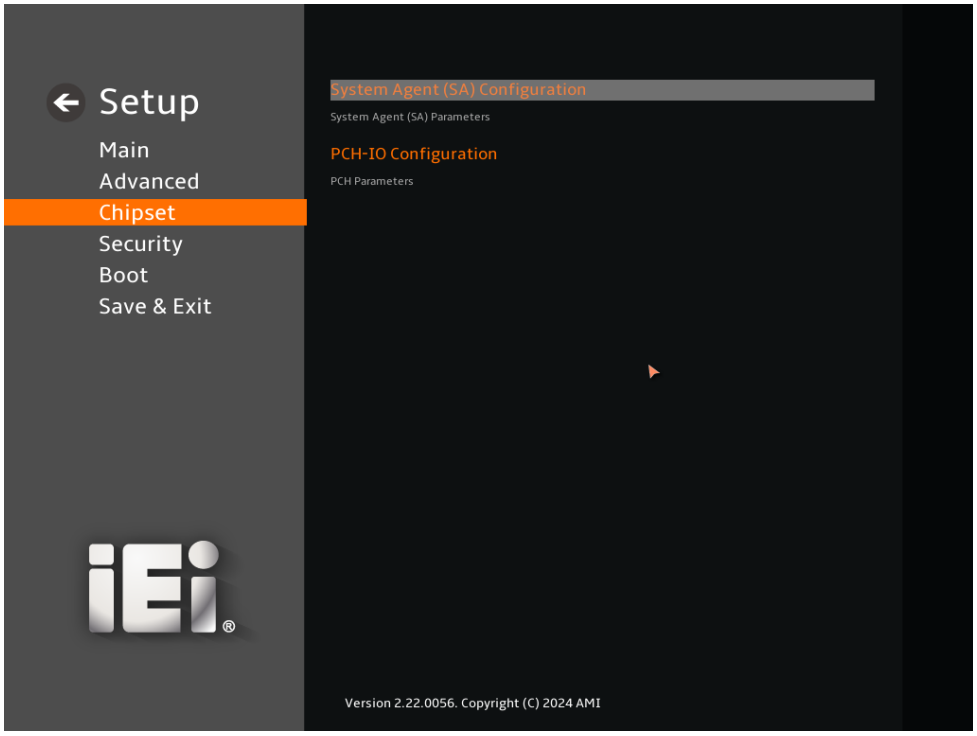
BIOS Menu 18: NVMe Configuration

5.4 Chipset

Use the **Chipset** menu (**BIOS Menu 19**) to access the PCH-IO and System Agent (SA) configuration menus.

WARNING!

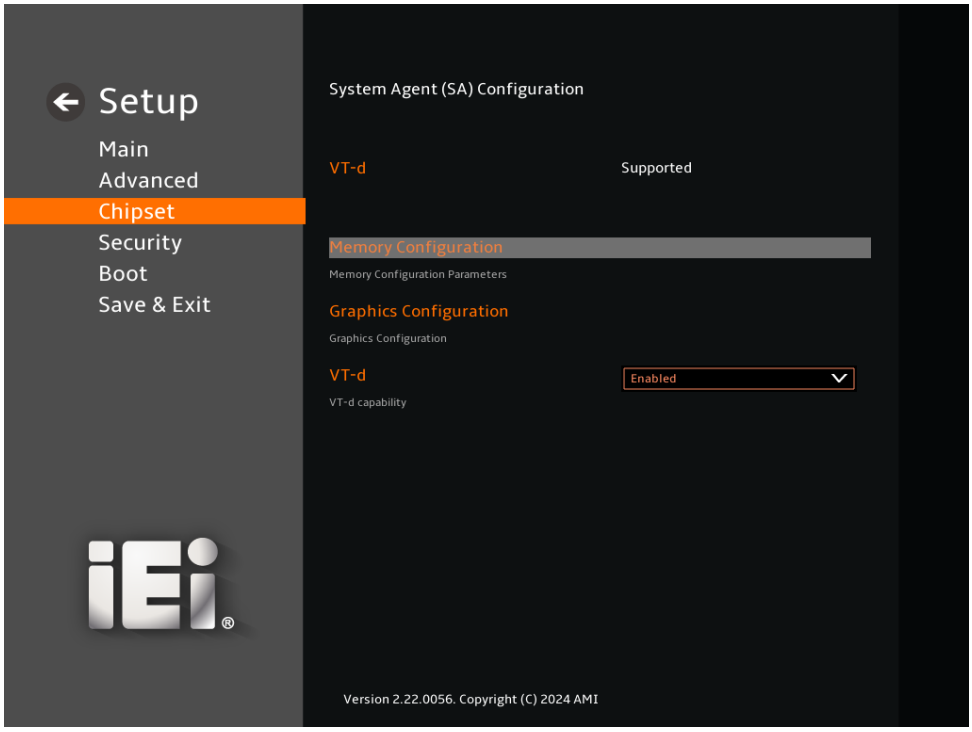
Setting the wrong values for the Chipset BIOS selections in the Chipset BIOS menu may cause the system to malfunction.



BIOS Menu 19: Chipset

5.4.1 System Agent (SA) Configuration

Use the **System Agent (SA) Configuration** menu (**BIOS Menu 20**) to configure the System Agent (SA) parameters.



BIOS Menu 20: System Agent (SA) Configuration

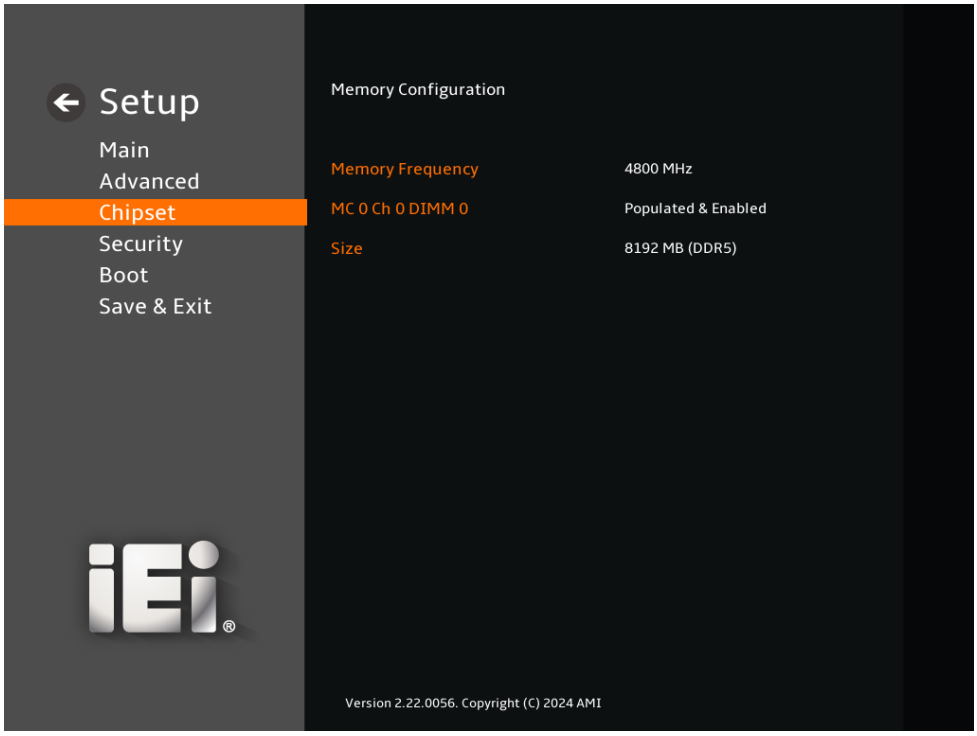
➔ **VT-d [Enabled]**

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

5.4.1.1 Memory Configuration

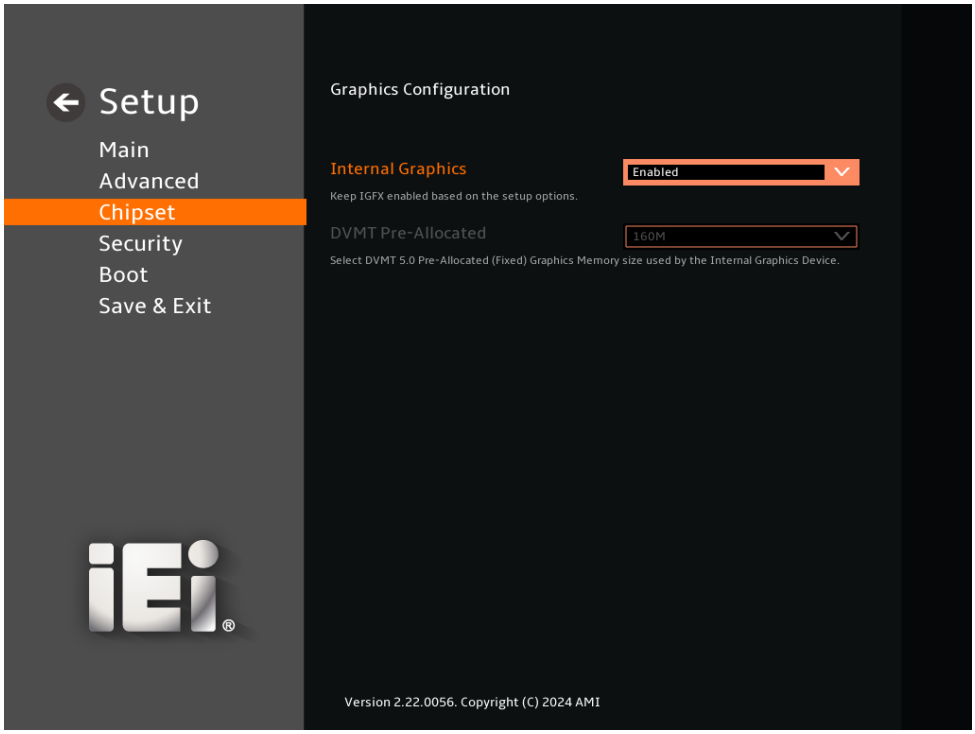
Use the **Memory Configuration** submenu (**BIOS Menu 21**) to view memory information.



BIOS Menu 21: Memory Configuration

5.4.1.2 Graphics Configuration

Use the **Graphics Configuration** (**BIOS Menu 22**) menu to configure the system's graphics.



BIOS Menu 22: Graphics Configuration

➔ **Internal Graphics [Enabled]**

Use the **Internal Graphics** option to configure whether to keep IGFX enabled.

➔ **Auto**		Auto mode
➔ **Disabled**		Disable IGFX.
➔ **Enabled**	**Default**	Enable IGFX.

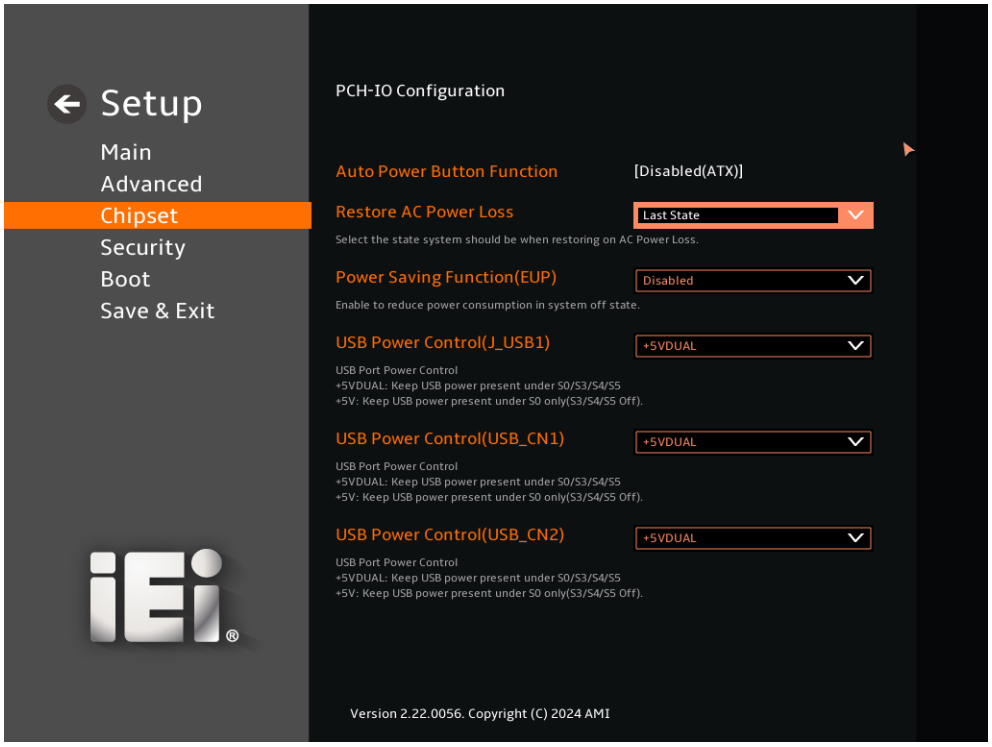
➔ **DVMT Pre-Allocated [160M]**

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:

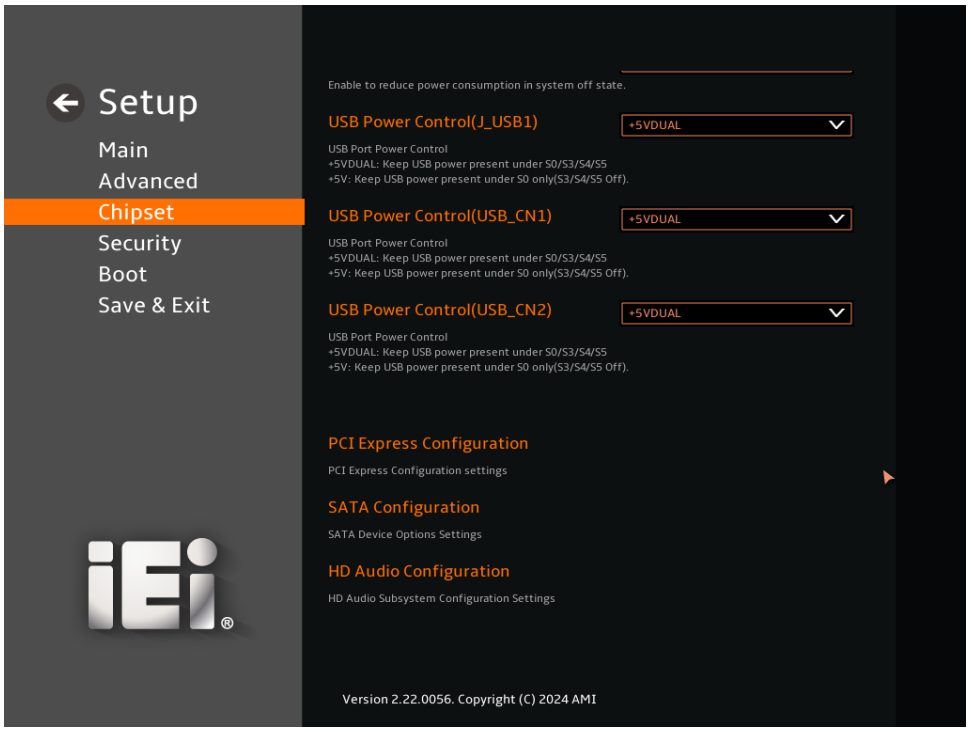
- 80M
- 160M **Default**

5.4.2 PCH-IO Configuration

Use the **PCH-IO Configuration** menu (**BIOS Menu 23** & **BIOS Menu 24**) to configure the PCH parameters.



BIOS Menu 23:PCH-IO Configuration (1/2)



BIOS Menu 24:PCH-IO Configuration (2/2)

➔ **Auto Power Button Function [Disabled (ATX)]**

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

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

➔ **Restore AC Power Loss [Last State]**

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

➔ **Power Off**	The system remains turned off.
➔ **Power On**	The system turns on.

➔ **Last State** **DEFAULT** The system returns to its previous state. If it was on, it turns itself on. If 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 Control [+5VDUAL]**

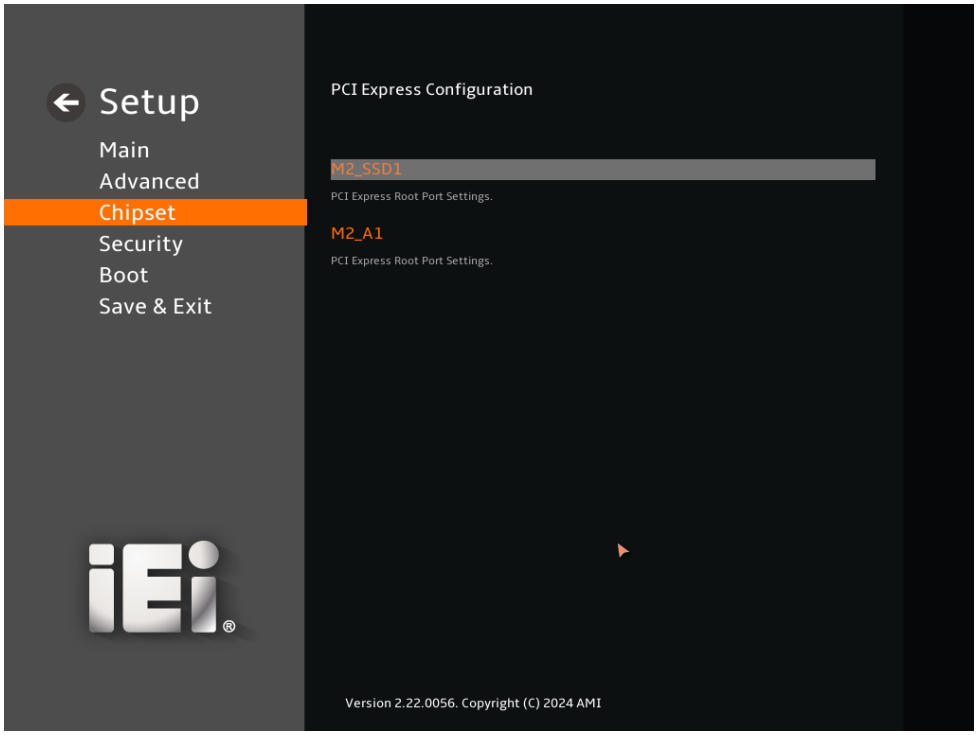
Use the **USB Power state option** to control the USB power state.

➔ **+5VDUAL** **DEFAULT** USB Power is on. USB power is on in all power states: S0 (Working), S3 (Sleep), S4 (Hibernate), and S5 (Soft Off).

➔ **+5** USB power is only available in the S0 state.

5.4.2.1 PCI Express Configuration

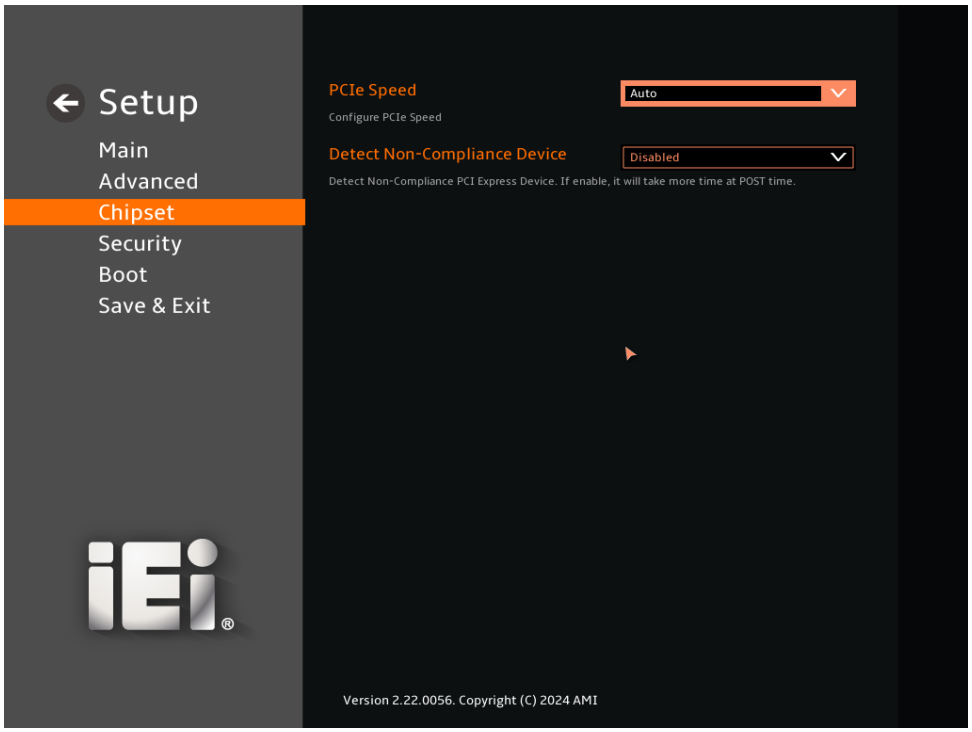
Use the **PCI Express Configuration** submenus (**BIOS Menu 25**) to configure the PCI Express slots.



BIOS Menu 25: PCI Express Configuration

5.4.2.1.1 PCIe Root Port Setting

Use the **M2_SSD1** and **M2_A1** submenus (**BIOS Menu 26**) to configure the PCIe root port settings.



BIOS Menu 26: PCIe Slot Configuration Submenu

➔ **PCIe Speed [Auto]**

Use the **PCIe Speed** option to specify the PCIe 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]**

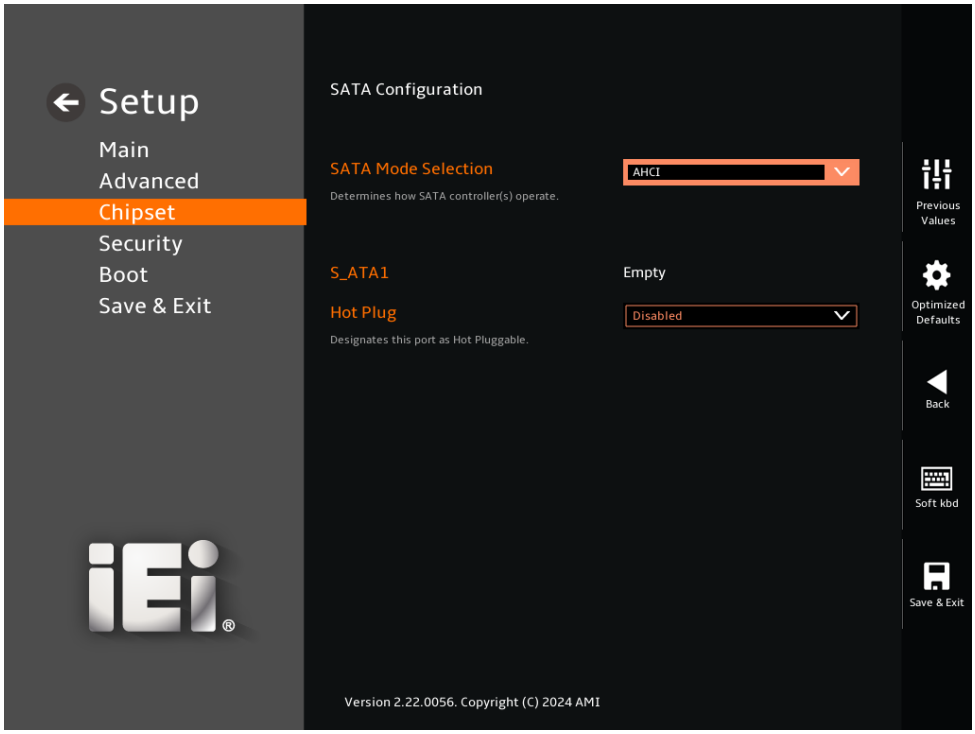
Use the **Detect Non-Compliance Device** option to enable or disable detection of non-compliance PCI Express device connected to the PCIe port.

➔ **Disabled**	**DEFAULT**	Do not detect if a non-compliance PCIe device is connected to the PCIe port.

➔ **Enabled** Detect if a non-compliance PCIe device is connected to the PCIe port.

5.4.2.2 SATA Configuration

Use the **SATA Configuration** menu (**BIOS Menu 27**) to configure the SATA devices installed in the system.



BIOS Menu 27: SATA Configuration

➔ **SATA Mode Selection [AHCI]**

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

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

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

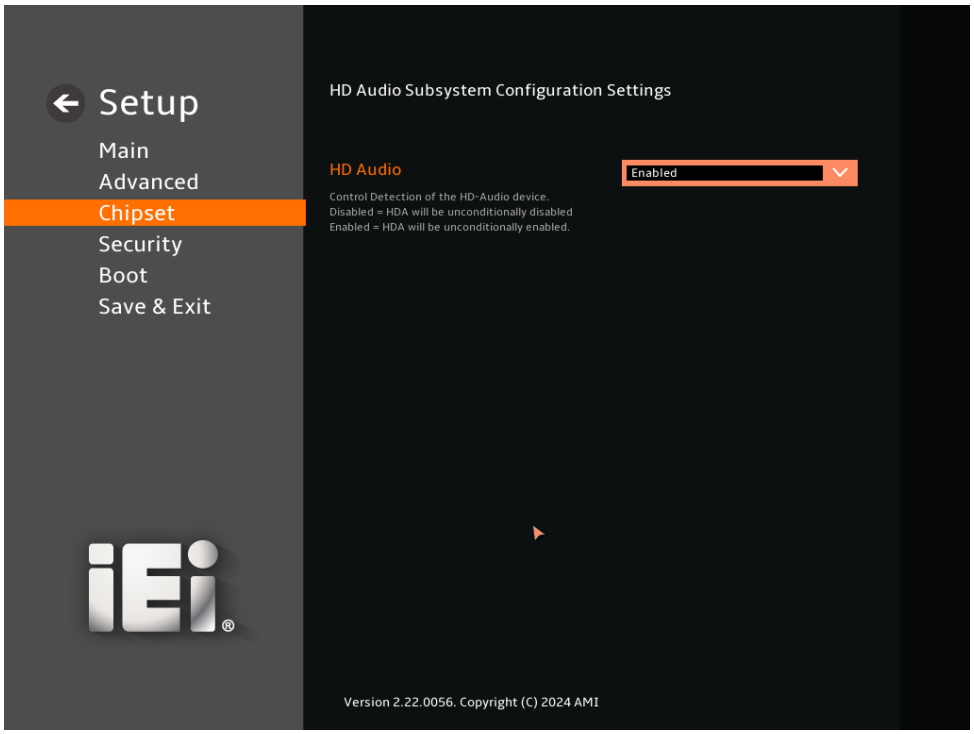
➔ **Hot Plug [Disabled]**

Use the **Hot Plug** option to designate the correspondent port as hot-pluggable.

➔	**Disabled**	**DEFAULT**	Disable the hot-pluggable function of the SATA port.
➔	**Enabled**		Designate the SATA port as hot-pluggable.

5.4.2.3 HD Audio Configuration

Use the **HD Audio Configuration** menu (**BIOS Menu 28**) to configure the PCH HD Audio settings.



BIOS Menu 28: HD Audio Configuration

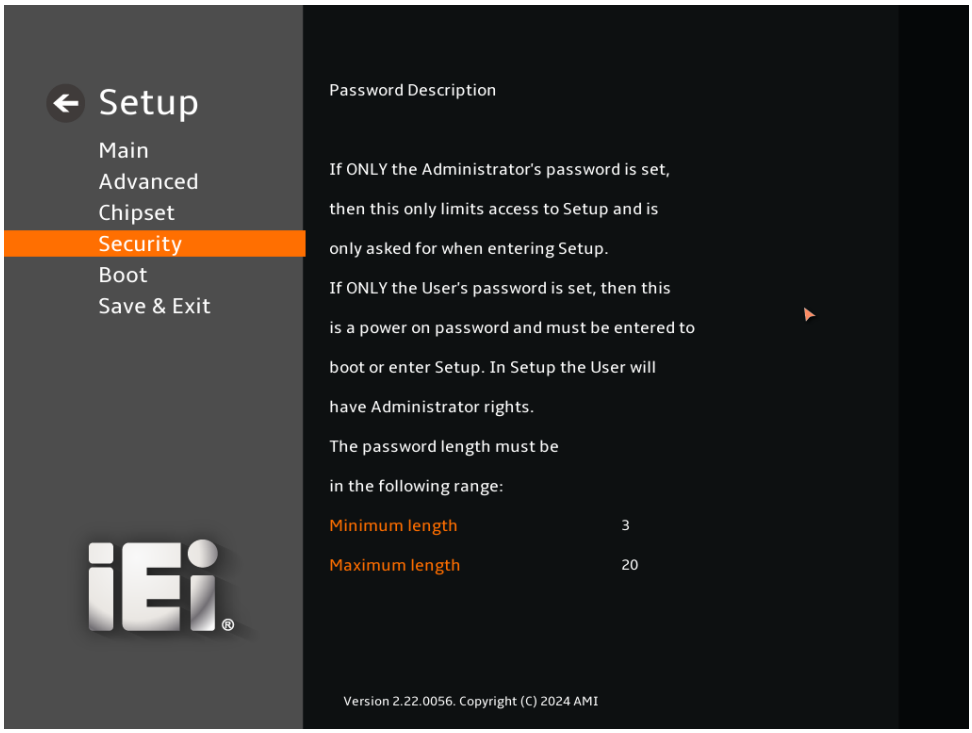
➔ **HD Audio [Enabled]**

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

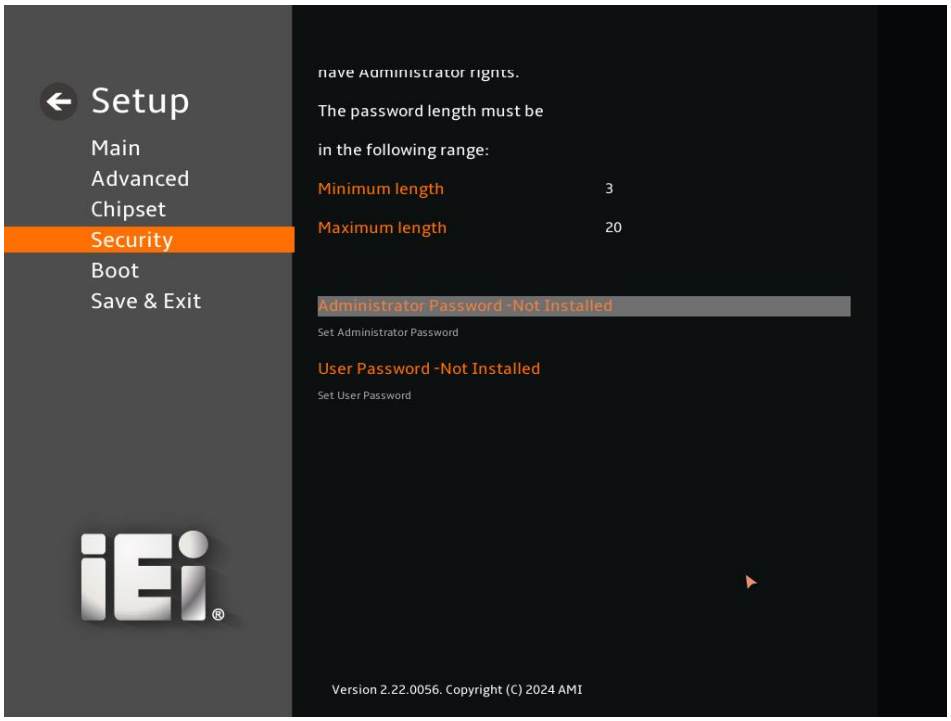
➔	**Disabled**		The onboard High Definition Audio controller is disabled.
➔	**Enabled**	**DEFAULT**	The onboard High Definition Audio controller is enabled.

5.5 Security

Use the **Security** menu (**BIOS Menu 29**) to set system and user passwords.



BIOS Menu 29: Security (1/2)



BIOS Menu 30: Security (2/2)

➔ **Administrator Password**

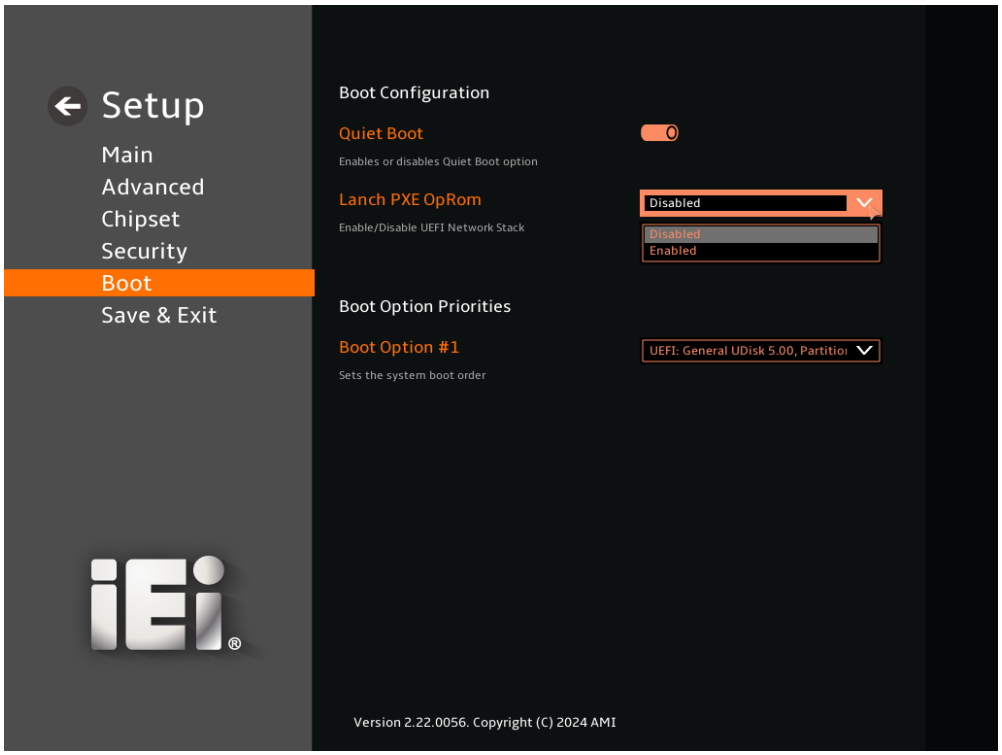
Use the **Administrator Password** to set or change the administrator password.

➔ **User Password**

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

5.6 Boot

Use the **Boot** menu (**BIOS Menu 31**) to configure system boot options.



BIOS Menu 31: 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

➔ **Launch PXE OpROM [Disabled]**

Use the **Launch PXE OpROM** option to enable or disable boot option for legacy network devices.

➔ **Disabled** **DEFAULT** Ignore all PXE Option ROMs

➔ **Enabled** Load PXE Option ROMs.

5.6.2 Boot Option Priorities

Use the Boot Option # N to choose the system boots from the peripherals you selected. The following boot option is listed as an example.

➔ **Boot Option #1**

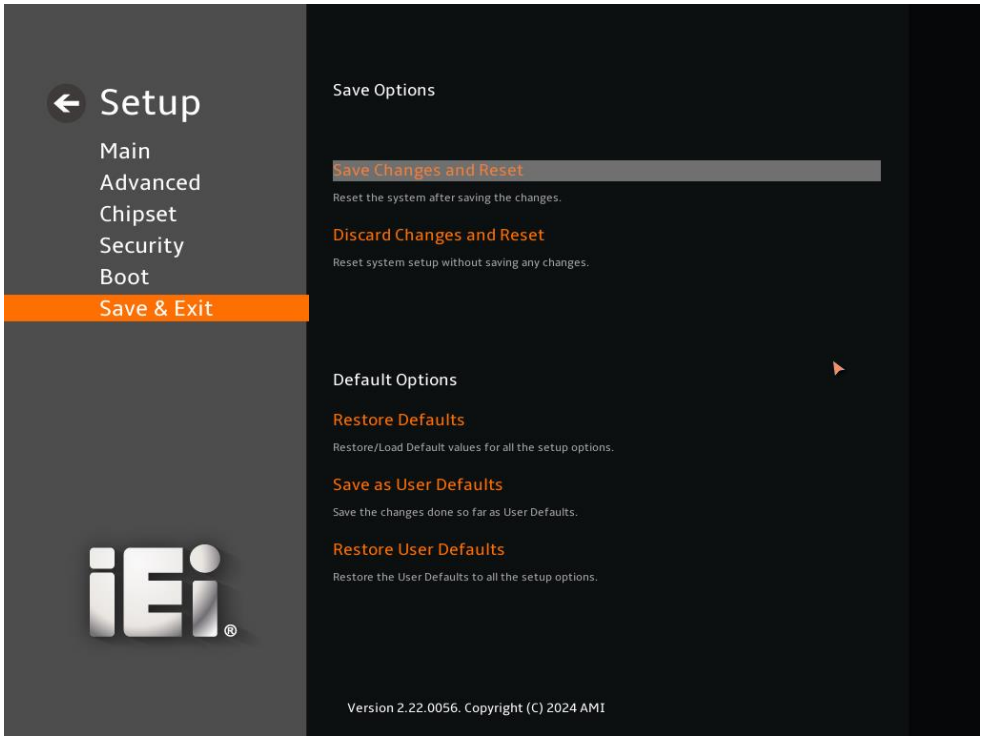
Set the system boot order **USB Partition 1** as the top priority.

➔ **UEFI: USB, Partition 1**

➔ **Disabled**

5.7 Save & Exit

Use the **Save & Exit** menu (**BIOS Menu 32**) to load default BIOS values, optimal failsafe values and to save configuration changes.



BIOS Menu 32: Save & Exit

➔ **Save Changes and Reset**

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

➔ **Discard Changes and Reset**

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

➔ **Restore Defaults**

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

➔ **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

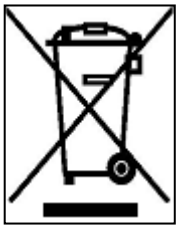
Product Disposal

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

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

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:	Set 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	DXEIPL 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 Directive (2015/863/EU)

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

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.

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.

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	O	O	O	O	O	O
印刷电路板	O	O	O	O	O	O
金属螺帽	O	O	O	O	O	O
电缆组装	O	O	O	O	O	O
风扇组装	O	O	O	O	O	O
电力供应组装	O	O	O	O	O	O
电池	O	O	O	O	O	O

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。

Appendix

D