



# RAP310

microATX Industrial Motherboard  
User's Manual

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## Trademarks

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## FCC and DOC Statement on Class B

This equipment has been tested and found to comply with the limits for a Class B 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 residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio TV technician for help.

## Notice:

1. The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
2. Shielded interface cables must be used in order to comply with the emission limits.

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## About this Manual

This manual can be downloaded from the website.

The manual is subject to change and update without notice, and may be based on editions that do not resemble your actual products. Please visit our website or contact our sales representatives for the latest editions.

## Warranty

1. Warranty does not cover damages or failures that occur from misuse of the product, inability to use the product, unauthorized replacement or alteration of components and product specifications.
2. The warranty is void if the product has been subjected to physical abuse, improper installation, modification, accidents or unauthorized repair of the product.
3. Unless otherwise instructed in this user's manual, the user may not, under any circumstances, attempt to perform service, adjustments or repairs on the product, whether in or out of warranty. It must be returned to the purchase point, factory or authorized service agency for all such work.
4. We will not be liable for any indirect, special, incidental or consequential damages to the product that has been modified or altered.

## Static Electricity Precautions

It is quite easy to inadvertently damage your PC, system board, components or devices even before installing them in your system unit. Static electrical discharge can damage computer components without causing any signs of physical damage. You must take extra care in handling them to ensure against electrostatic build-up.

1. To prevent electrostatic build-up, leave the system board in its anti-static bag until you are ready to install it.
2. Wear an antistatic wrist strap.
3. Do all preparation work on a static-free surface.
4. Hold the device only by its edges. Be careful not to touch any of the components, contacts or connections.
5. Avoid touching the pins or contacts on all modules and connectors. Hold modules or connectors by their ends.



### Important:

Electrostatic discharge (ESD) can damage your processor, disk drive and other components. Perform the upgrade instruction procedures described at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

## Safety Measures

- To avoid damage to the system, use the correct AC input voltage range.
- To reduce the risk of electric shock, unplug the power cord before removing the system chassis cover for installation or servicing. After installation or servicing, cover the system chassis before plugging the power cord.

## About the Package

The package contains the following items. If any of these items are missing or damaged, please contact your dealer or sales representative for assistance.

- 1 RAP310-B650 motherboard
- 1 COM port cable (Length: 300mm, 2 x COM ports)
- 1 Serial ATA data cable (Length: 500mm)
- 1 I/O shield

The board and accessories in the package may not come similar to the information listed above. This may differ in accordance with the sales region or models in which it was sold. For more information about the standard package in your region, please contact your dealer or sales representative.

## Before Using the System Board

When installing the system board in a new system, you will need at least the following internal components.

- Memory module
- Storage device such as a hard disk drive.
- Power supply

External system peripherals may also be required for navigation and display, including at least a keyboard, a mouse and a video display monitor.

## Chapter 1 - Introduction

### ► Specifications

|           |                 |  |
|-----------|-----------------|--|
| SYSTEM    | Processor       | AMD® Ryzen™ 9000/7000/EPYC 4005 Series AM5 Socket Processors, TDP support up to 65W<br>Ryzen™ 7 9700X (8 Cores, 32M Cache, up to 5.5 GHz); 65W (life cycle only to Q1' 29)<br>Ryzen™ 5 9600X (6 Cores, 32M Cache, up to 5.4 GHz); 65W (life cycle only to Q1' 29)<br>Ryzen™ 9 PRO 7945 (12 Cores, 64M Cache, up to 5.4 GHz); 65W<br>Ryzen™ 7 PRO 7745 (8 Cores, 32M Cache, up to 5.3 GHz); 65W<br>Ryzen™ 5 PRO 7645 (6 Cores, 32M Cache, up to 5.1 GHz); 65W<br>EPYC™ 4545P (16 Cores, 64M Cache, up to 5.4 GHz); 65W<br>EPYC™ 4465P (12 Cores, 64M Cache, up to 5.4 GHz); 65W<br>EPYC™ 4345P (8 Cores, 32M Cache, up to 5.5 GHz); 65W<br>EPYC™ 4245P (6 Cores, 32M Cache, up to 5.4 GHz); 65W |
|           | Chipset         | AMD B650   |
|           | Memory          | Four 288-pin UDIMM up to 128GB (Non-ECC)<br>Dual Channel DDR5 5200 MHz<br><b>*Speed Support List: Please refer to page.8</b>   |
|           | BIOS            | AMI SPI 256Mbit  |
|           | GRAPHICS        | Controller   |
|           | Feature         | 1WGP @2.2GHz max   |
|           | Display         | 1 x VGA, resolution up to 1920x1200 @ 60Hz<br>1 x DP++, resolution up to 3840x2160 @ 60Hz<br>1 x HDMI 2.0, resolution up to 4096x2160 @ 60Hz   |
|           | Triple Displays | 1 VGA + 1 DP++ + 1 HDMI 2.0  |
| EXPANSION | Interface       | 2 x PCIe x16 (Gen 4, x16 or x8+x8)<br>Support PCIe1/PCIe3 : single at x16(PCIe1)<br>Support PCIe1/PCIe3 : dual at x8(PCIe1)/x8(PCIe3)<br>Support PCIe1 : Riser card x16 or x8/x8 selected by Jumper<br>2 x PCIe x4 (Gen 4)<br><br>1 x M.2 2230 E key (PCIe/USB 2.0/Intel CNVi/Discrete Wifi 6E support)<br>1 x M.2 2242/2260/2280 M key (PCIe x4 Gen4 NVMe support)  |
|           |                 |  |
| REAR I/O  | Ethernet        | 2 x 2.5GbE (RJ-45)   |
|           | Serial          | 1 x RS-232   |
|           | USB             | 6 x USB 3.2 Gen 2<br>2 x USB 2.0   |
|           | Display         | 1 x DP++<br>1 x HDMI<br>1 x VGA  |
|           | Audio           | 1 x Line-out<br>1 x Mic-in<br>1 x Line-in (opt. by request, MOQ required)  |

|                              |                         |   |
|------------------------------|-------------------------|---|
| AUDIO                        | Audio Codec             | Realtek ALC888  |
| ETHERNET                     | Controller              | 2 x Intel® I226-V   |
| INTERNAL I/O                 | Serial                  | 1 x RS-232/422/485<br>2 x RS-232  |
|                              | USB                     | 2 x USB 3.2 Gen1<br>4 x USB 2.0 (colay vertical Type A)   |
|                              | Audio                   | 1 x Front Audio Header<br>1 x S/PDIF  |
|                              | SATA                    | 4 x SATA 3.0<br>(RAID 0/1/5/10)   |
|                              | DIO                     | 1 x 8-bit DIO   |
|                              | PS/2                    | 1 x PS/2  |
|                              | SMBus/ I <sup>2</sup> C | 1 x SMBus/ I <sup>2</sup> C   |
| WATCHDOG TIMER               | Output & Interval       | System Reset, Programmable via Software from 1 to 255 Seconds   |
| SECURITY                     | TPM                     | Nuvoton TPM 2.0   |
| POWER                        | Type                    | ATX   |
|                              | Connector               | 8-pin ATX 12V power<br>24-pin ATX power   |
|                              | Consumption             | Typical: Ryzen 9 PRO 7945: 3.3V @ 0.14A (0.462W); 5V @ 0.96A (4.8W); 12V @ 0.66A (7.92W)<br>Max.: Ryzen 9 PRO 7945: 3.3V @ 1.14A (3.762W); 5V @ 3.4A (17W); 12V @ 8.94A (107.28W) |
|                              | RTC Battery             | CR2032 Coin Cell  |
| OS SUPPORT                   | Microsoft               | Windows 10<br>Windows 11 Enterprise   |
|                              | Linux                   | Ubuntu 22.04  |
| ENVIRONMENT                  | Temperature             | Operating: -5 to 65°C<br>Storage: -40 to 85°C   |
|                              | Humidity                | Operating: 5 to 95% RH<br>Storage: 5 to 95% RH  |
|                              | MTBF                    | 481,630 hrs @ 25°C; 277,744 hrs @ 45°C; 177,053 hrs @ 60°C; 130,262 hrs @ 70°C<br>Calculation Model: Telcordia Issue 4<br>Environment: GB, GC - Ground Benign, Controlled         |
| MECHANISM                    | Dimensions              | microATX Form Factor: 244mm (9.6") x 244mm (9.6")   |
|                              | Height                  | PCB: 1.6mm<br>Top Side: 38mm Bottom Side: 3mm   |
| STANDARDS AND CERTIFICATIONS | Certifications          | CE, FCC Class B, RoHS   |

► Speed Support List

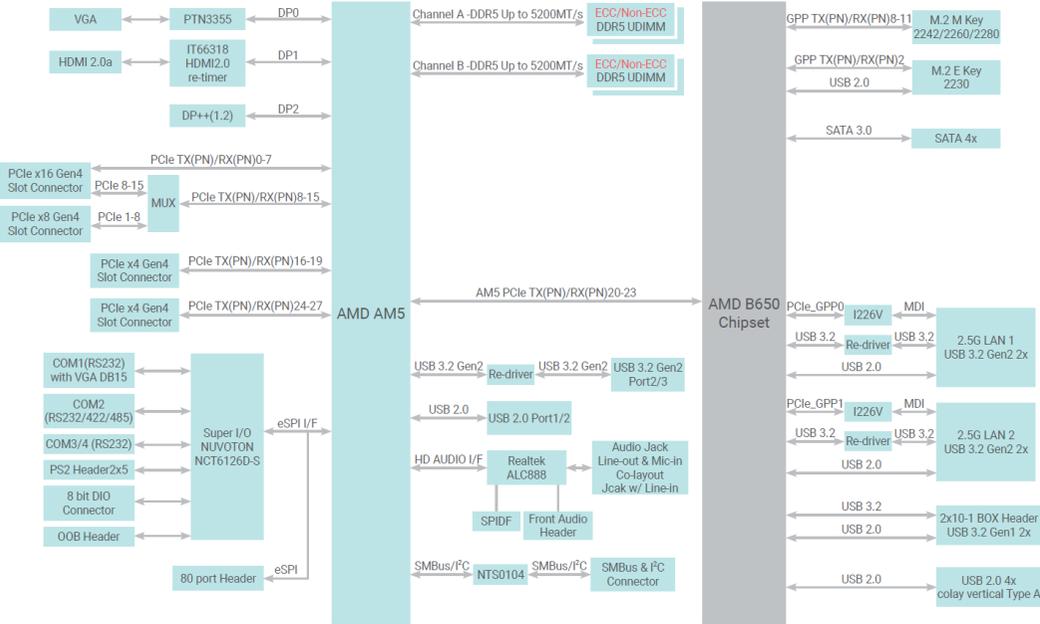
| DIMMs | RANK  | POR        | CHA   |       | CHB   |       |
|-------|-------|------------|-------|-------|-------|-------|
|       |       |            | DIMM1 | DIMM2 | DIMM3 | DIMM4 |
| 1DIMM | 1R/2R | No support | V     |       |       |       |
| 1DIMM | 1R/2R | 5200MHz    |       | V     |       |       |
| 1DIMM | 1R/2R | No support |       |       | V     |       |
| 1DIMM | 1R/2R | 5200MHz    |       |       |       | V     |
| 2DIMM | 1R/2R | No support | V     |       | V     |       |
| 2DIMM | 1R/2R | 5200MHz    |       | V     |       | V     |
| 2DIMM | 1R/2R | 3600MHz    | V     | V     |       |       |
| 2DIMM | 1R/2R | 3600MHz    |       |       | V     | V     |
| 4DIMM | 1R/2R | 3600MHz    | V     | V     | V     | V     |



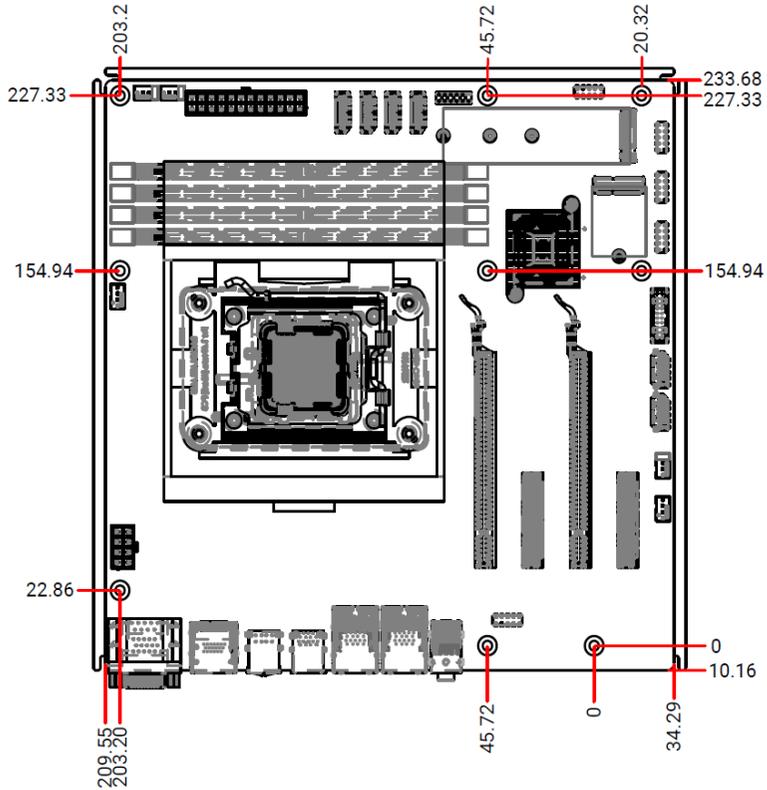
**Important:**

Electrostatic discharge (ESD) can damage your board, processor, disk drives, add-in boards, and other components. Perform installation procedures at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

► Block Diagram

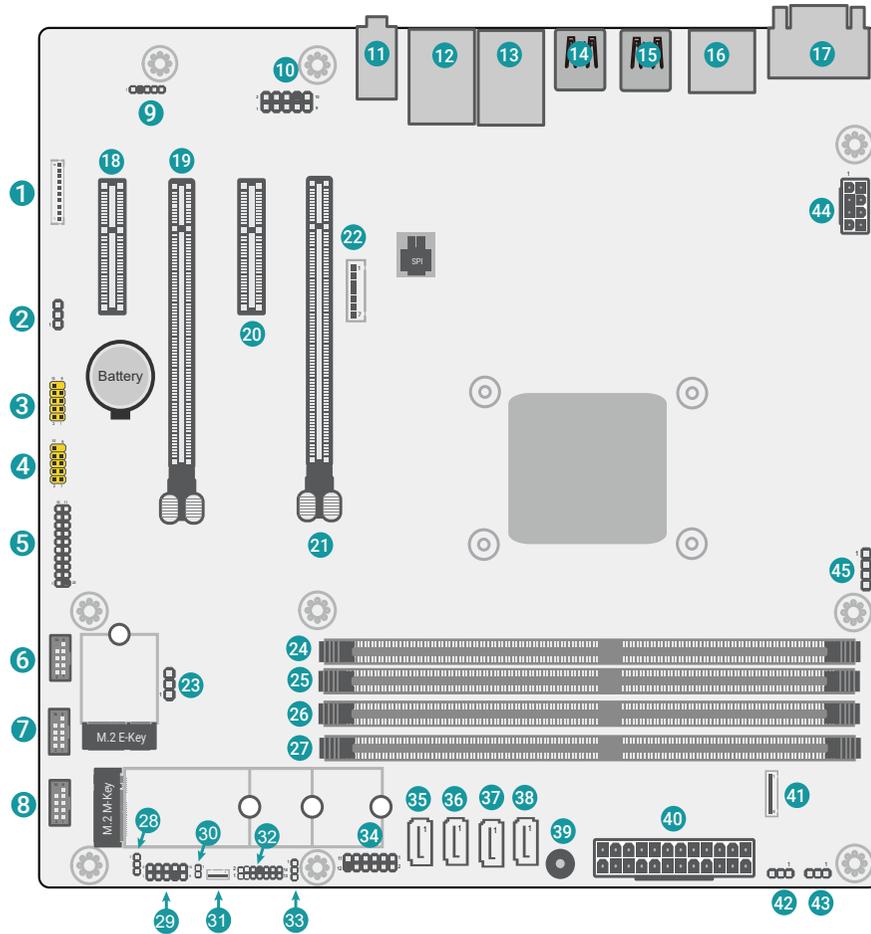


► Dimension



## Chapter 2 - Hardware Installation

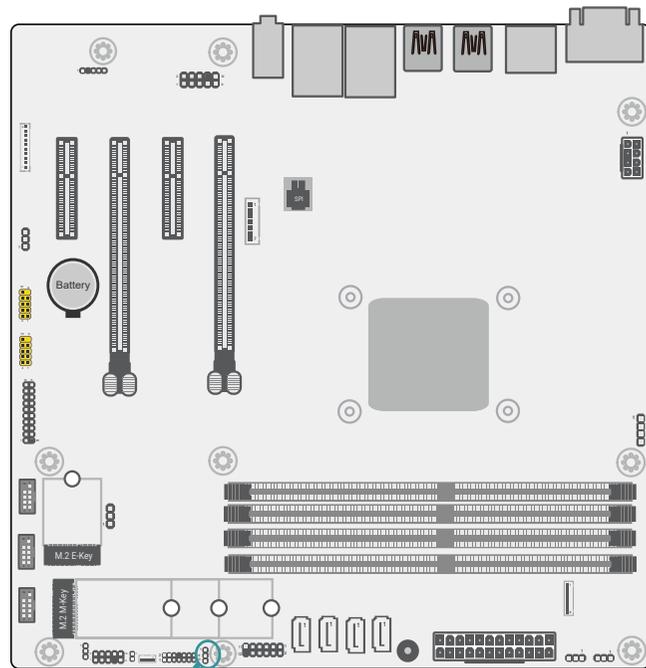
### ► Board Layout



|    |                                  |    |                    |    |                  |
|----|----------------------------------|----|--------------------|----|------------------|
| 1  | DIO                              | 19 | PCIE3              | 38 | SATA0            |
| 2  | System Fan3                      | 20 | PCIE2              | 39 | Buzzer           |
| 3  | USB2_12/13                       | 21 | PCIE1              | 40 | ATX Power        |
| 4  | USB2_10/11                       | 22 | OOB SPIROM Update  | 41 | SMBus+I2C Header |
| 5  | USB3_6/7                         | 23 | M.2 E Power Select | 42 | System Fan1      |
| 6  | COM2                             | 24 | DIMM1              | 43 | System Fan2      |
| 7  | COM3                             | 25 | DIMM2              | 44 | +12V Power       |
| 8  | COM4                             | 26 | DIMM3              | 45 | CPU Fan          |
| 9  | SPDIF                            | 27 | DIMM4              |    |                  |
| 10 | Front Audio                      | 28 | M.2 M Power Select |    |                  |
| 11 | ▲MIC-In<br>▼Line-Out<br>▼Line-In | 29 | PS2                |    |                  |
| 12 | ▲LAN2<br>▼USB2_4/5<br>▼USB3_4/5  | 30 | Case Open          |    |                  |
| 13 | ▲LAN1<br>▼USB2_2/3<br>▼USB3_2/3  | 31 | OOB I2C            |    |                  |
| 14 | USB3.2 Gen2                      | 32 | ESPI Header        |    |                  |
| 15 | USB2.0                           | 33 | AT/ATX Mode Select |    |                  |
| 16 | ▲DP++<br>▼HDMI                   | 34 | Front Panel        |    |                  |
| 17 | ▲COM1<br>▼VGA                    | 35 | SATA3              |    |                  |
| 18 | PCIE4                            | 36 | SATA2              |    |                  |
|    |                                  | 37 | SATA1              |    |                  |

► Jumper Settings

AT/ATX Mode Select (JP2)

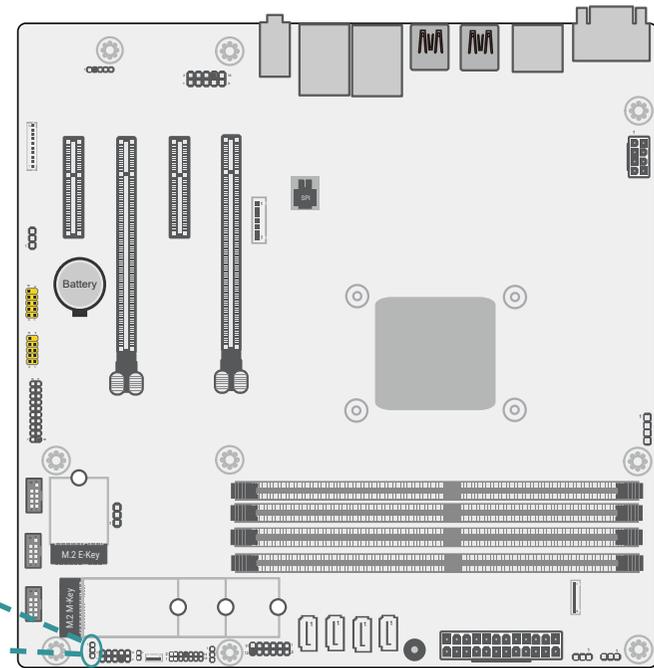


■ 1-2 On: AT mode (default)



■ 2-3 On: ATX mode

M.2 M Power Select (JP3)

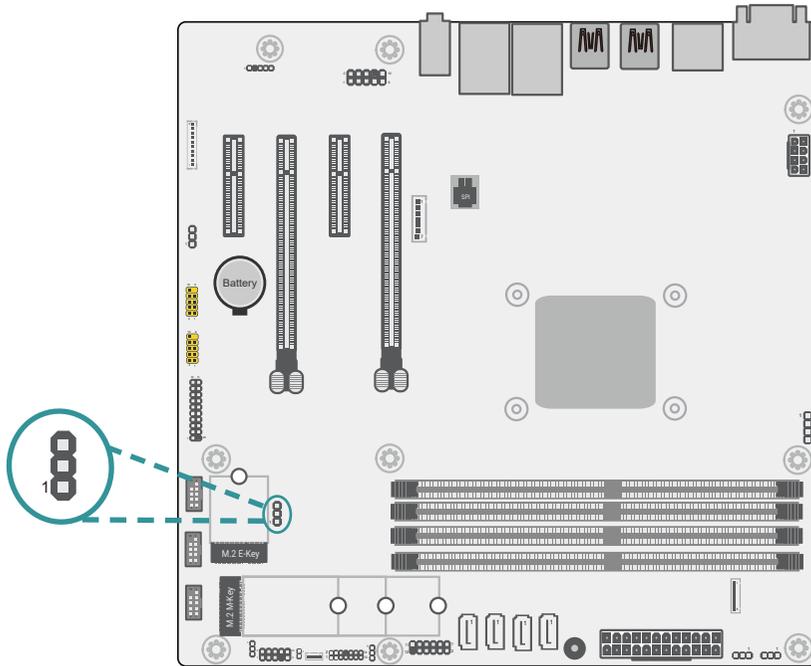


■ 1-2 On: 3.3V\_RUN (default)



■ 2-3 On: 3.3V\_ALW

### M.2 E Power Select (JP4)



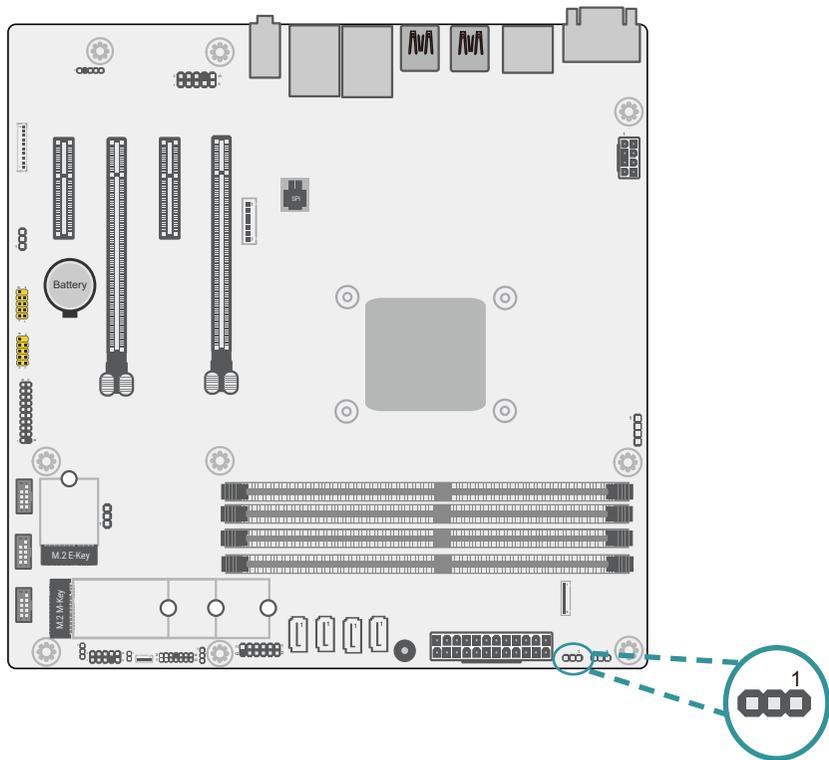
■ 1-2 On: 3.3V\_RUN (default)



■ 2-3 On: 3.3V\_ALW

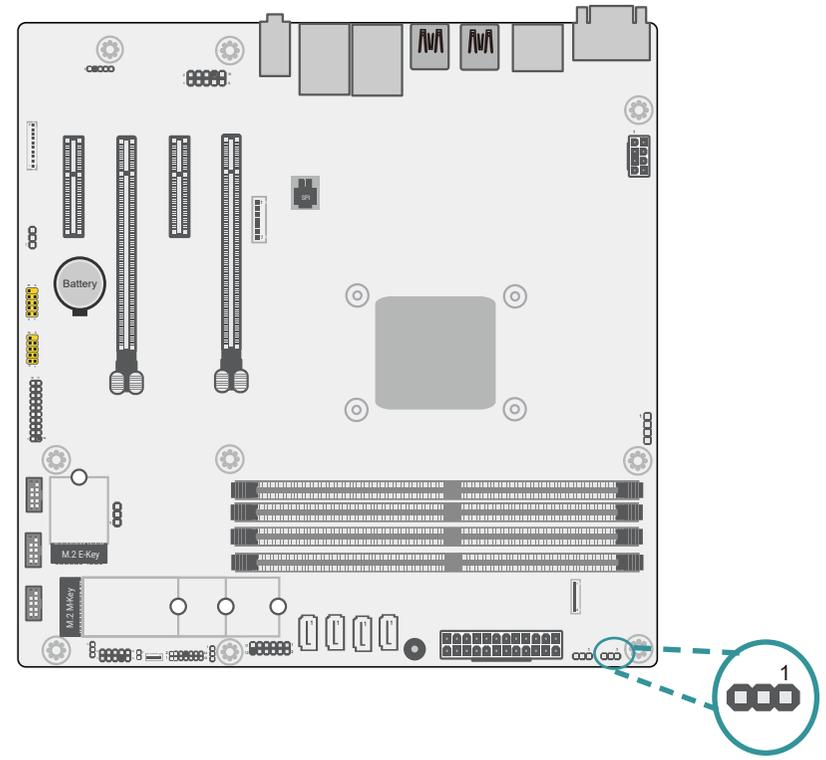
► Pin Assignment

System Fan1 (J11)



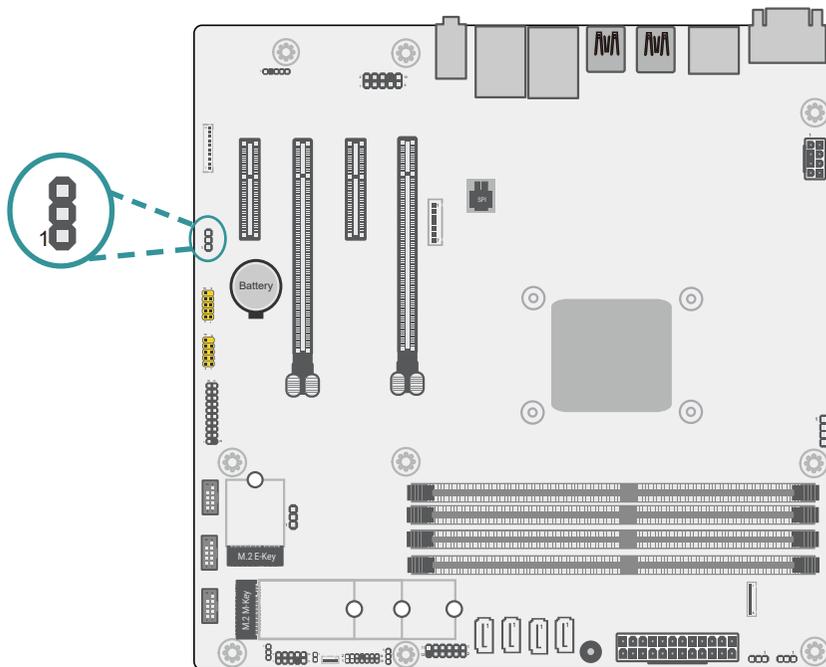
| Pin | Assignment |
|-----|------------|
| 1   | GND        |
| 2   | PWM        |
| 3   | TACH       |

System Fan2 (J12)



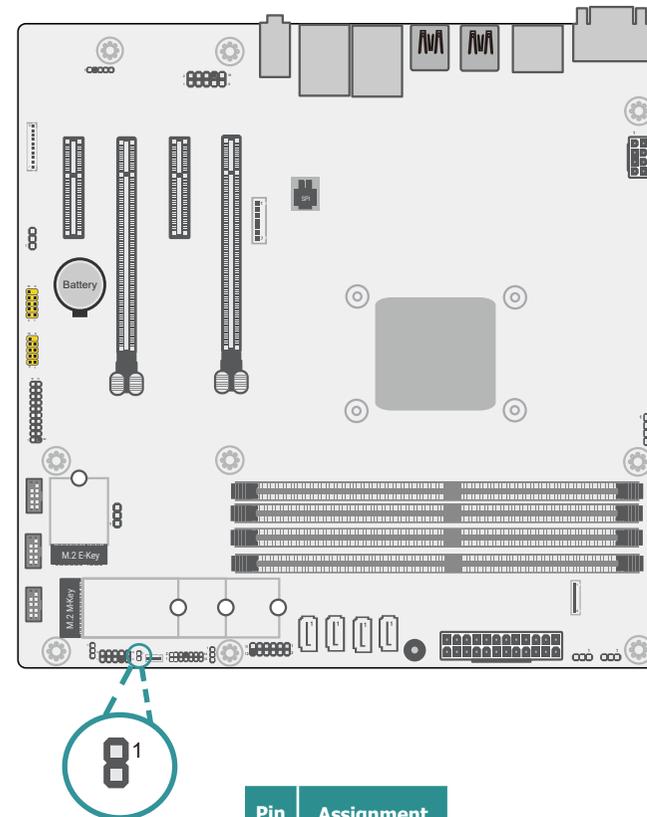
| Pin | Assignment |
|-----|------------|
| 1   | GND        |
| 2   | PWM        |
| 3   | TACH       |

System Fan3 (J13)



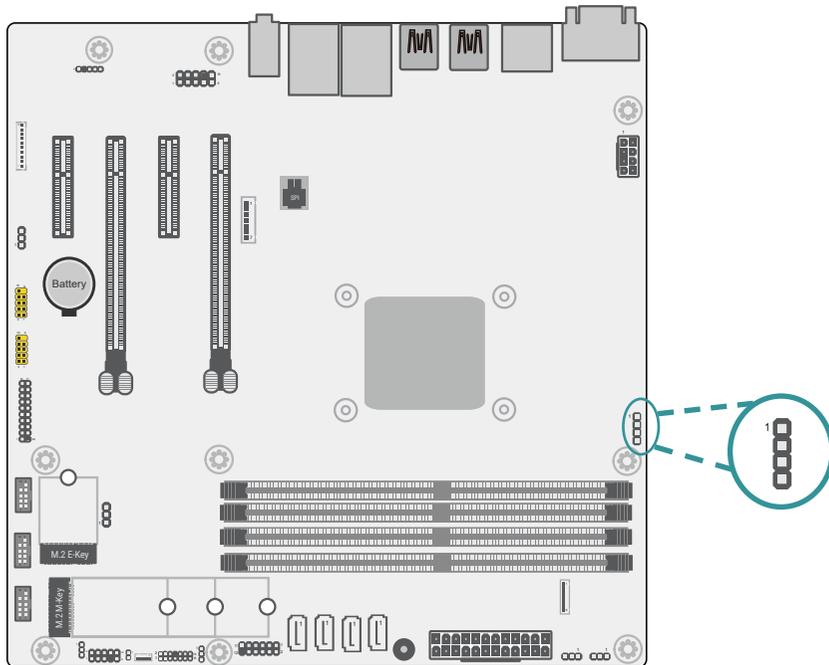
| Pin | Assignment |
|-----|------------|
| 1   | GND        |
| 2   | PWM        |
| 3   | TACH       |

Case Open (SOJ1)



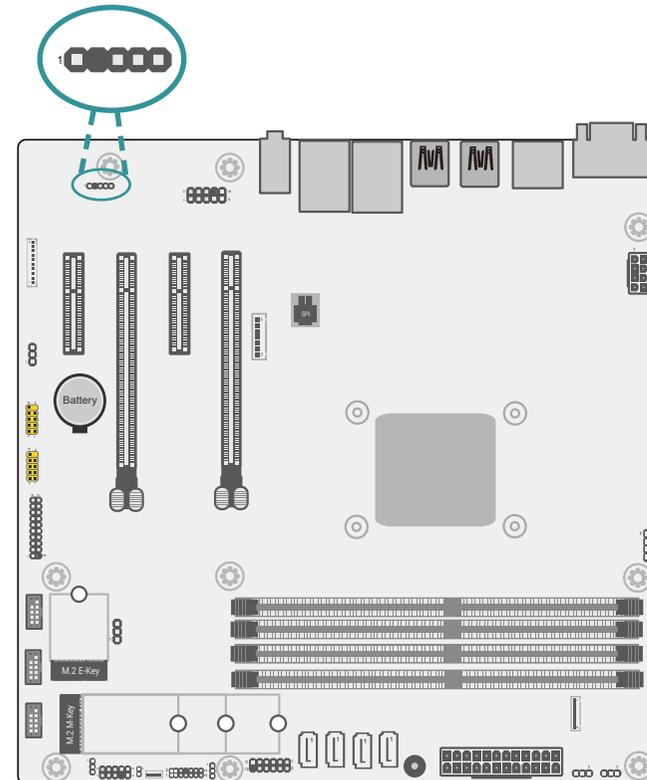
| Pin | Assignment |
|-----|------------|
| 1   | Case Open# |
| 2   | GND        |

CPU Fan (J9)



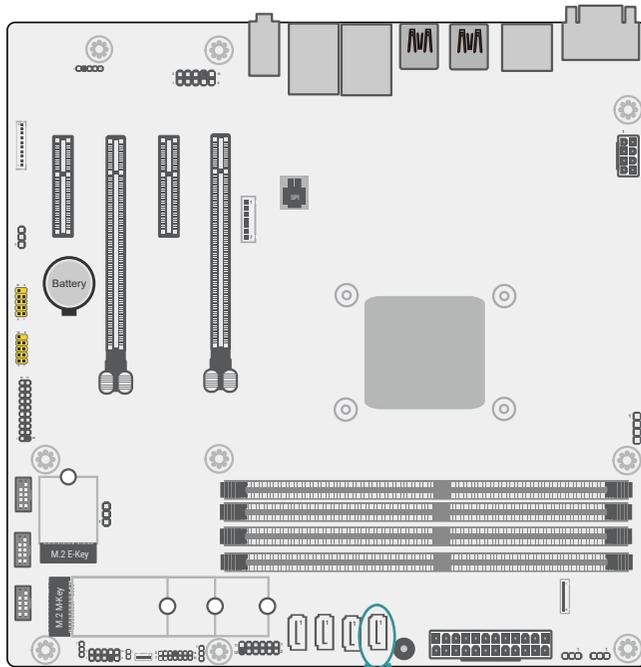
| Pin | Assignment |
|-----|------------|
| 1   | GND        |
| 2   | 12V        |
| 3   | RPM        |
| 4   | CTRL       |

S/PDIF (AUJ1)



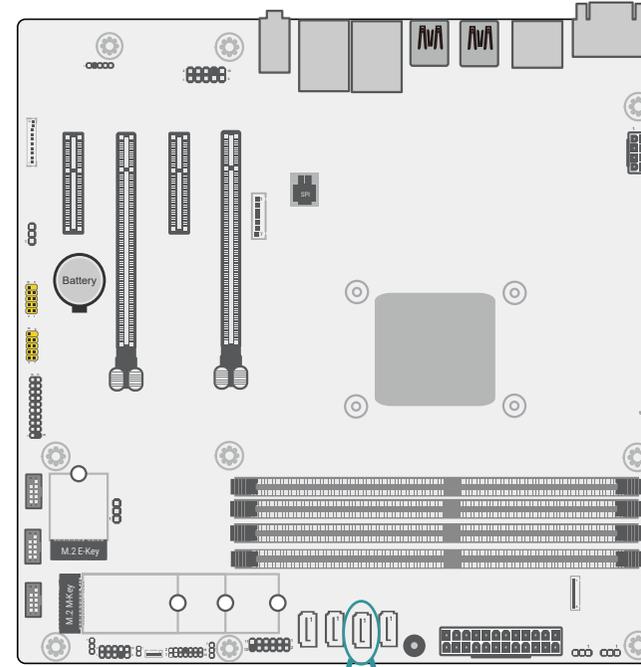
| Pin | Assignment |
|-----|------------|
| 1   | A5V        |
| 2   | ---        |
| 3   | SPOUT      |
| 4   | GND        |
| 5   | SPIN       |

SATA0 (J3)



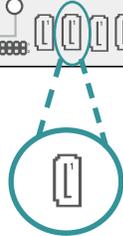
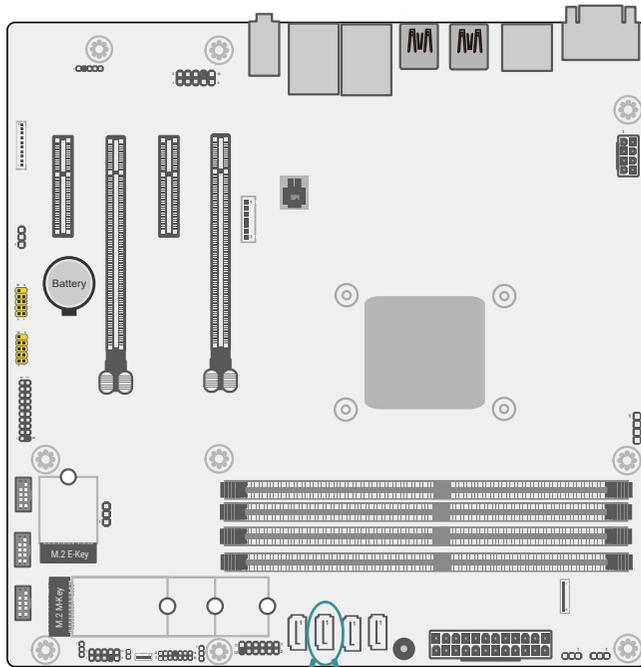
| Pin | Assignment |
|-----|------------|
| 1   | GND        |
| 2   | TX+        |
| 3   | TX-        |
| 4   | GND        |
| 5   | RX-        |
| 6   | RX+        |
| 7   | GND        |

SATA1 (J4)



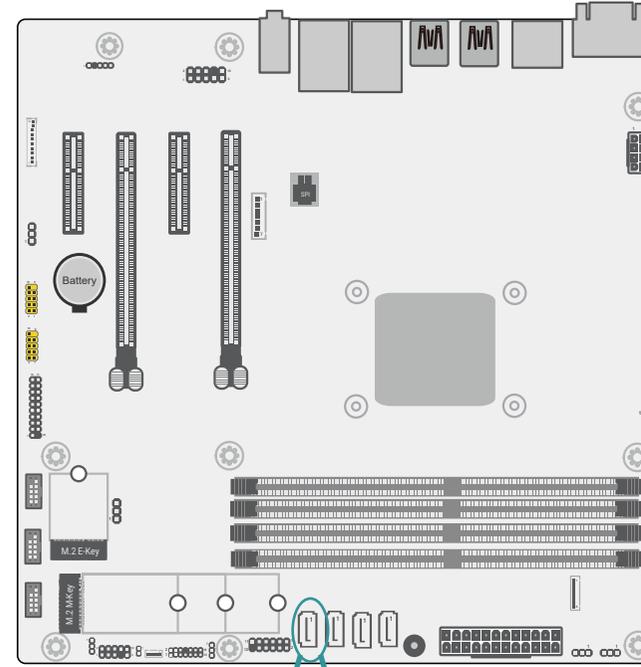
| Pin | Assignment |
|-----|------------|
| 1   | GND        |
| 2   | TX+        |
| 3   | TX-        |
| 4   | GND        |
| 5   | RX-        |
| 6   | RX+        |
| 7   | GND        |

SATA2 (J5)



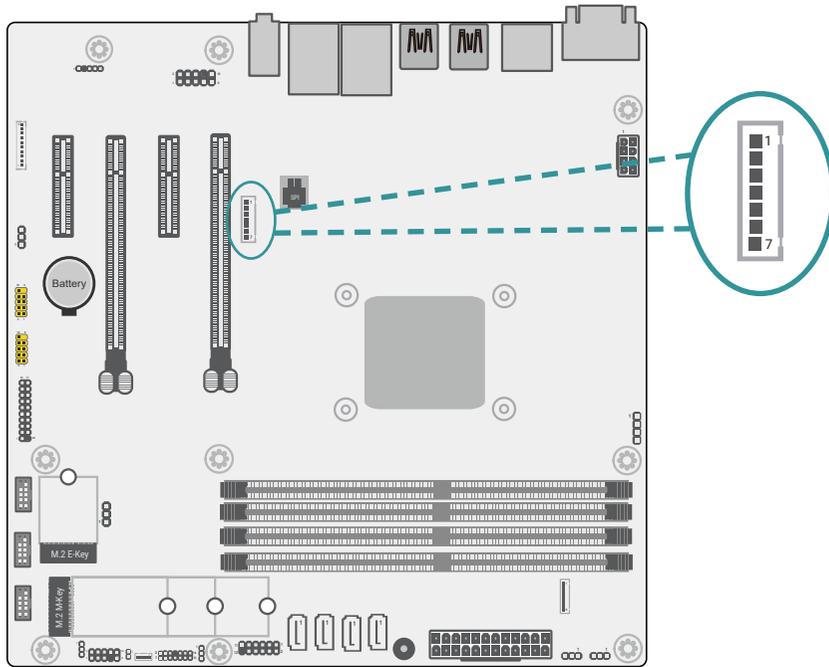
| Pin | Assignment |
|-----|------------|
| 1   | GND        |
| 2   | TX+        |
| 3   | TX-        |
| 4   | GND        |
| 5   | RX-        |
| 6   | RX+        |
| 7   | GND        |

SATA3 (J6)



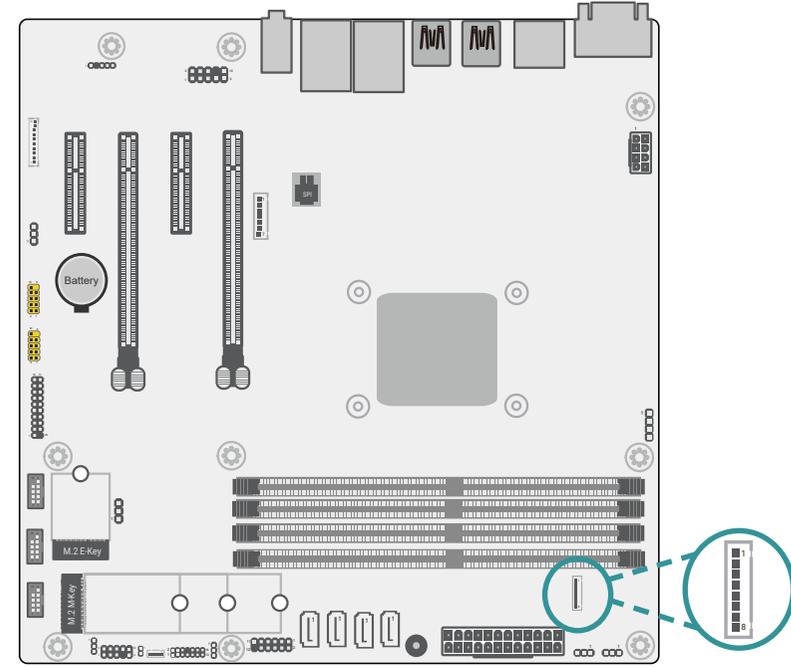
| Pin | Assignment |
|-----|------------|
| 1   | GND        |
| 2   | TX+        |
| 3   | TX-        |
| 4   | GND        |
| 5   | RX-        |
| 6   | RX+        |
| 7   | GND        |

### OOB SPIROM Update (J1)



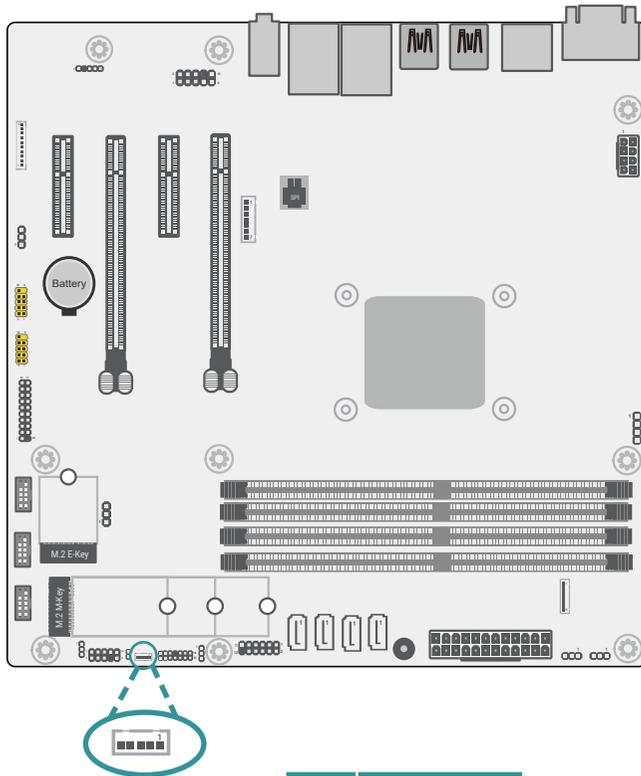
| Pin | Assignment |
|-----|------------|
| 1   | GPI_SPI_SW |
| 2   | SPI_SO-R   |
| 3   | SPI_SI-R   |
| 4   | SPI_CLK-R  |
| 5   | SPI_CS0-   |
| 6   | GND        |
| 7   | 1.8V_ALW   |

### SMBus Header (J37)



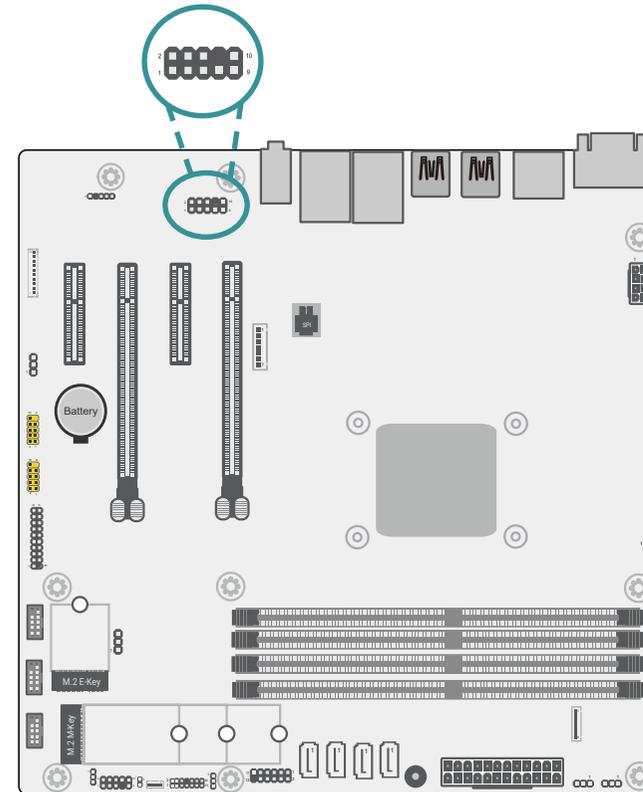
| Pin | Assignment | Pin | Assignment |
|-----|------------|-----|------------|
| 1   | 3.3V_ALW   | 2   | GND        |
| 3   | SMB_CLK    | 4   | SMB_DATA   |
| 5   | SMB_INT    | 6   | I2C_CLK    |
| 7   | I2C_SDA    | 8   | I2C_INT    |

OOB I2C Header (J7)



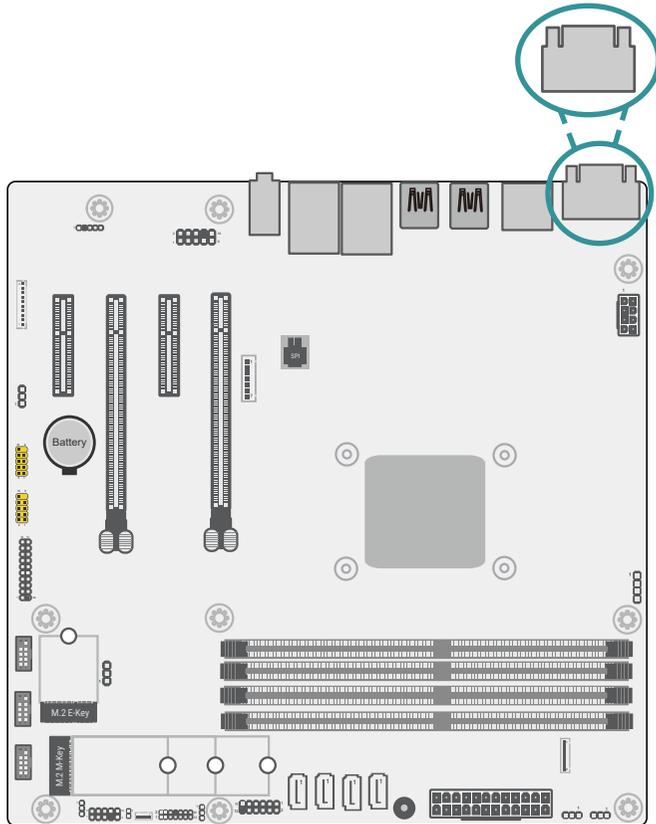
| Pin | Assignment |
|-----|------------|
| 1   | NC         |
| 2   | GND        |
| 3   | SIO_SCL    |
| 4   | SIO_SDA    |
| 5   | NC         |

Front Audio (AUJ2)



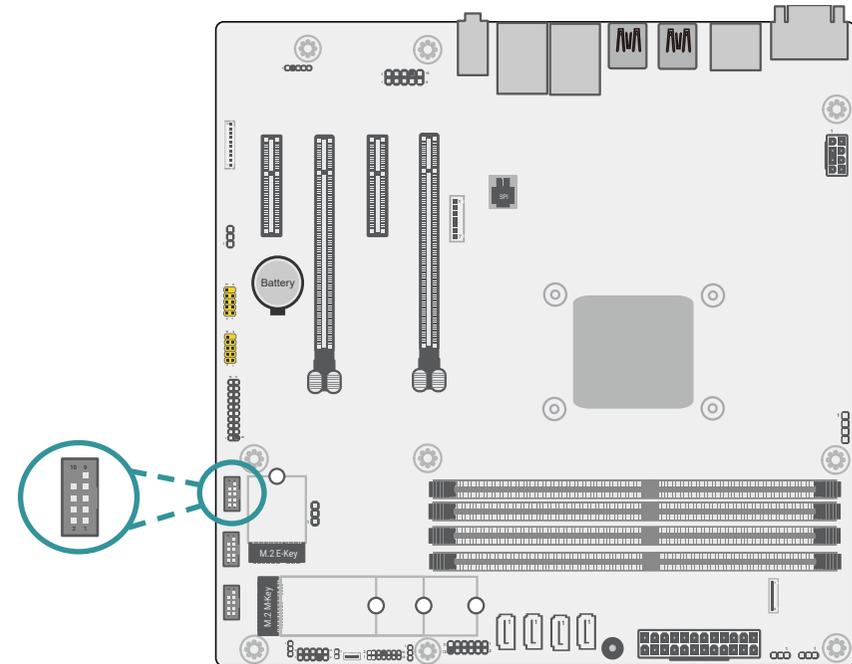
| Pin | Assignment | Pin | Assignment |
|-----|------------|-----|------------|
| 1   | MIC2_L     | 2   | GND        |
| 3   | MIC2_R     | 4   | NC         |
| 5   | LINE2_R    | 6   | MIC2_JD    |
| 7   | GND        | 8   | ---        |
| 9   | LINE2_L    | 10  | LINE2_JD   |

COM1 (DPCN3)



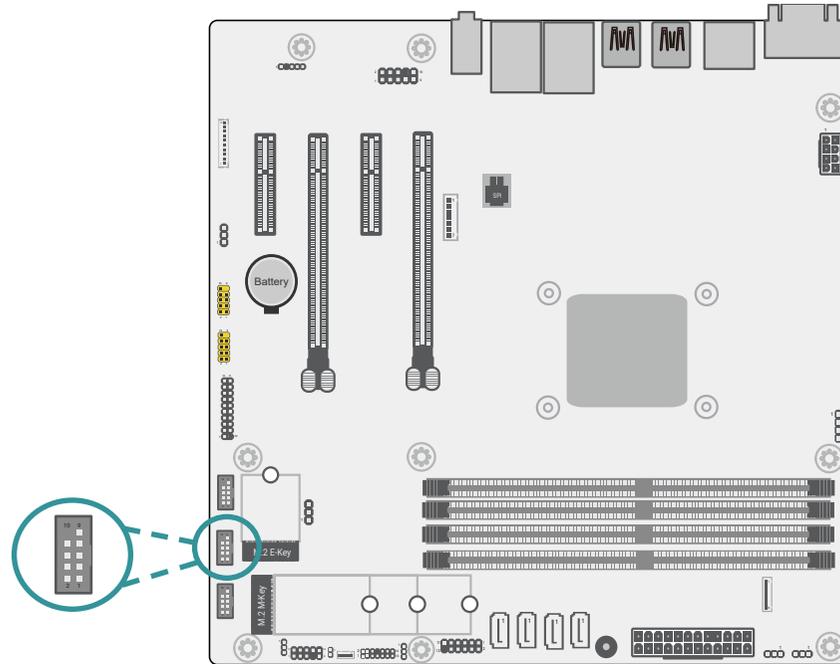
| Pin | Assignment | Pin | Assignment |
|-----|------------|-----|------------|
| 1   | MDCD-      | 2   | MSIN-      |
| 3   | MSO-       | 4   | MDTR-      |
| 5   | GND        | 6   | MDSR-      |
| 7   | MRTS-      | 8   | MCTS-      |
| 9   | MRI-       | 10  | ----       |

COM2 (TSJ1)



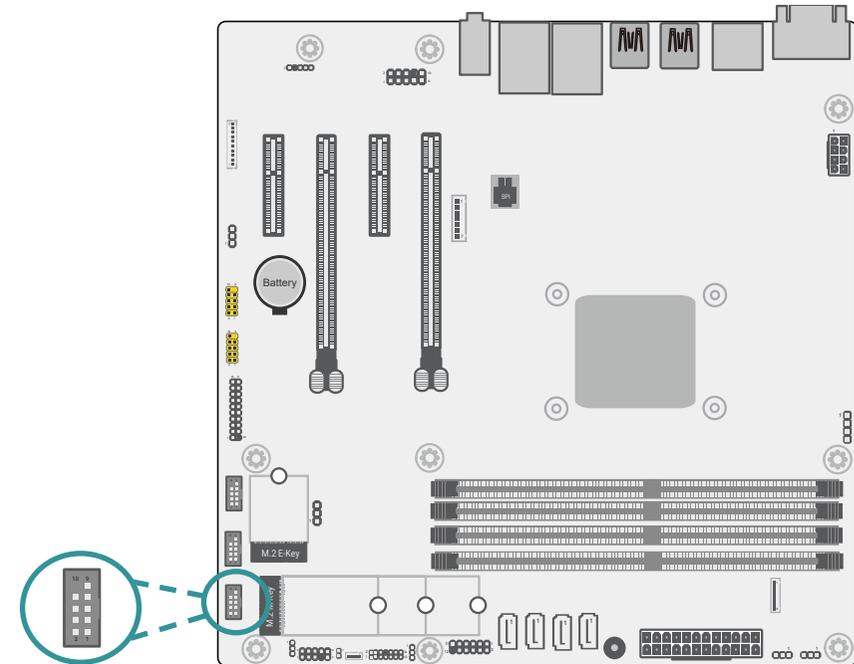
| Pin | Assignment                 | Pin | Assignment                 |
|-----|----------------------------|-----|----------------------------|
| 1   | MDCD-/RS422_RX+ / RS485_D+ | 2   | MSIN-/RS422_RX- / RS485_D- |
| 3   | MSO-/RS422_TX+             | 4   | MDTR-/RS422_TX-            |
| 5   | GND                        | 6   | MDSR-                      |
| 7   | MRTS-                      | 8   | MCTS-                      |
| 9   | MRI-                       | 10  | ----                       |

COM3 (TSJ2)



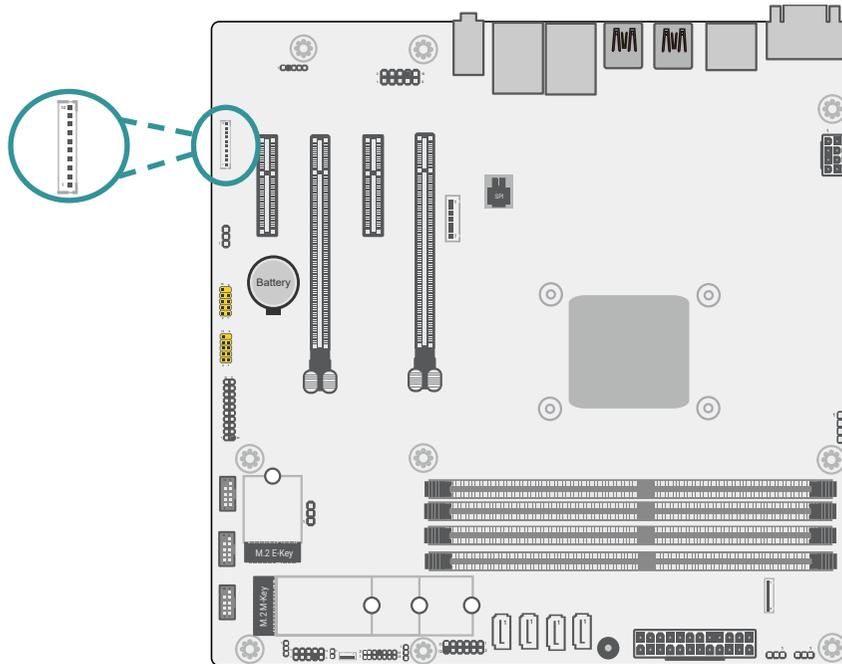
| Pin | Assignment | Pin | Assignment |
|-----|------------|-----|------------|
| 1   | MDCD-      | 2   | MSIN-      |
| 3   | MSO-       | 4   | MDTR-      |
| 5   | GND        | 6   | MDSR-      |
| 7   | MRTS-      | 8   | MCTS-      |
| 9   | MRI-       | 10  | ----       |

COM4 (TSJ3)



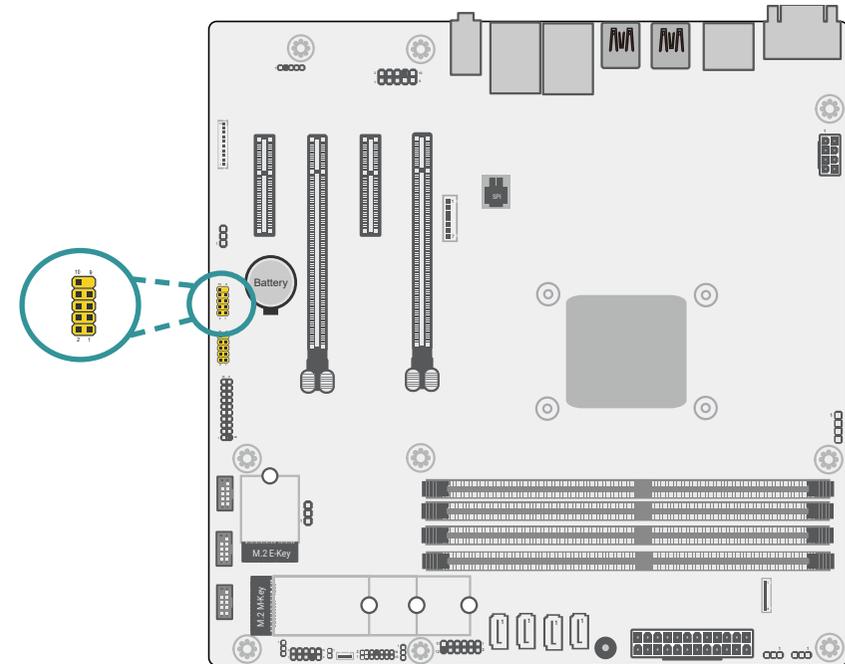
| Pin | Assignment | Pin | Assignment |
|-----|------------|-----|------------|
| 1   | MDCD-      | 2   | MSIN-      |
| 3   | MSO-       | 4   | MDTR-      |
| 5   | GND        | 6   | MDSR-      |
| 7   | MRTS-      | 8   | MCTS-      |
| 9   | MRI-       | 10  | ----       |

DIO (J15)



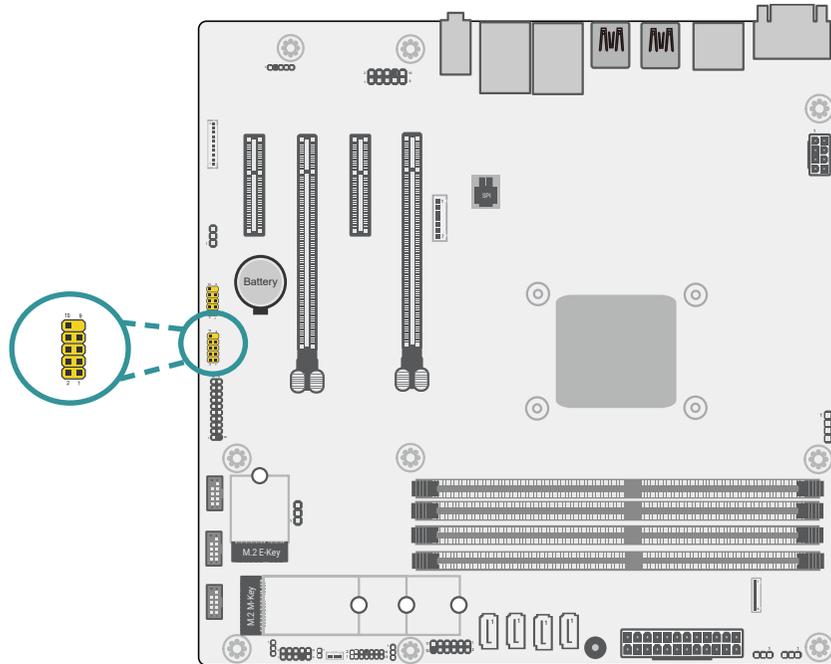
| Pin | Assignment |
|-----|------------|
| 1   | DI_3       |
| 2   | DI_2       |
| 3   | DI_1       |
| 4   | DI_0       |
| 5   | DO_3       |
| 6   | DO_2       |
| 7   | DO_1       |
| 8   | DO_0       |
| 9   | +5V_ALW    |
| 10  | GND        |

USB2\_12/13 (UBJ2)



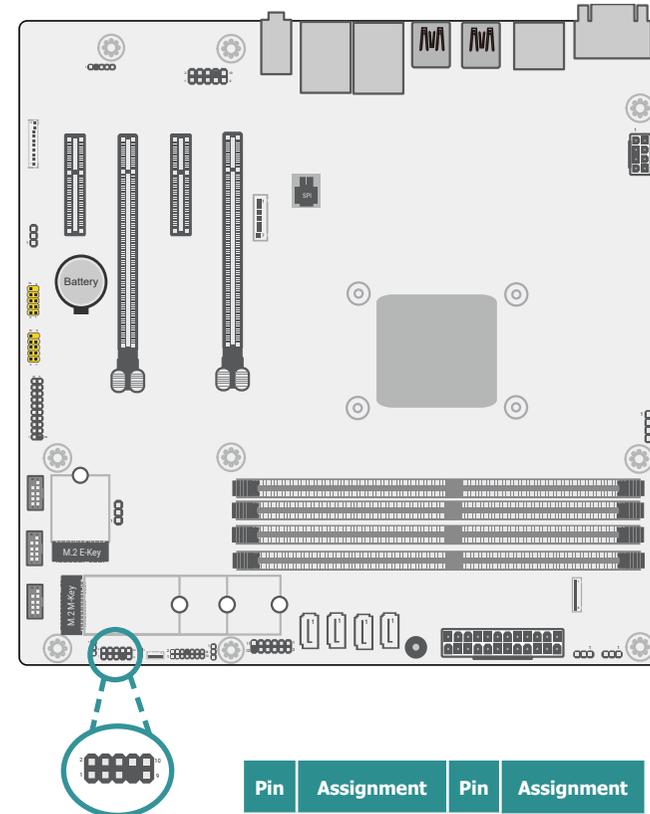
| Pin | Assignment | Pin | Assignment |
|-----|------------|-----|------------|
| 1   | SBV6       | 2   | SBV6       |
| 3   | USBP_C_3N  | 4   | USBP_C_6N  |
| 5   | USBP_C_3P  | 6   | USBP_C_6P  |
| 7   | GND        | 8   | GND        |
| 9   | ----       | 10  | NC         |

USB2\_10/11 (UBJ3)



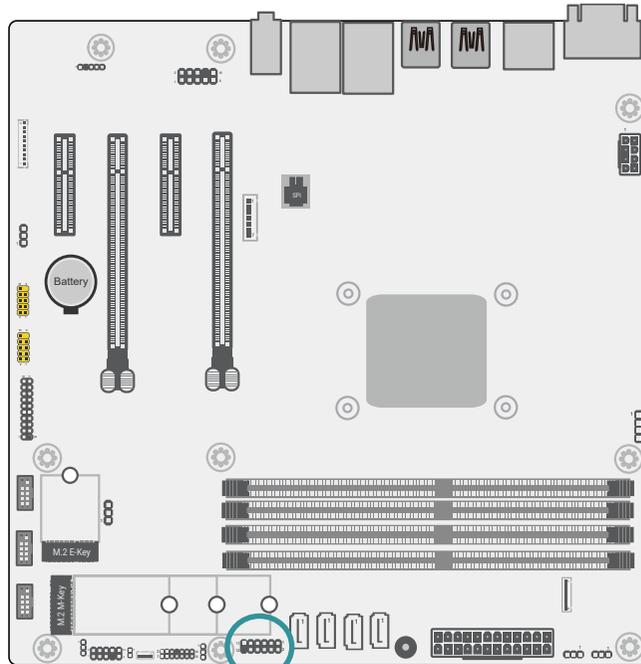
| Pin | Assignment | Pin | Assignment |
|-----|------------|-----|------------|
| 1   | SBV6       | 2   | SBV6       |
| 3   | USBP_C_7N  | 4   | USBP_C_10N |
| 5   | USBP_C_7P  | 6   | USBP_C_10P |
| 7   | GND        | 8   | GND        |
| 9   | ----       | 10  | NC         |

PS2 Header (SOJ3)

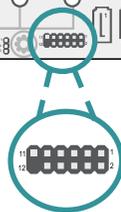


| Pin | Assignment | Pin | Assignment |
|-----|------------|-----|------------|
| 1   | PS2_KCLK   | 2   | PS2_MCLK   |
| 3   | PS2_KDAT   | 4   | PS2_MDAT   |
| 5   | GND        | 6   | GND        |
| 7   | ----       | 8   | GND        |
| 9   | BVCC       | 10  | BVCC       |

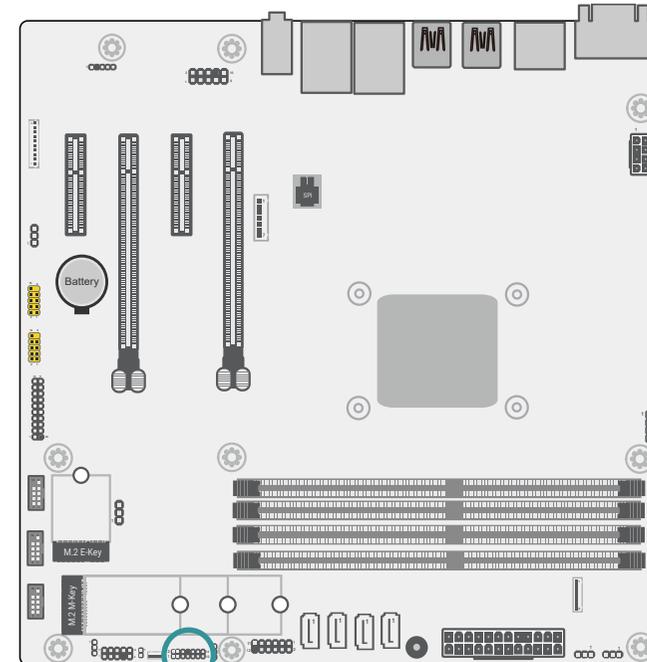
Front Panel (J8)



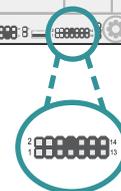
| Pin | Assignment | Pin | Assignment |
|-----|------------|-----|------------|
| 1   | NC         | 2   | 3V3SB      |
| 3   | 3V3_RUN    | 4   | 3V3SB      |
| 5   | HDD_LED    | 6   | SUS_LED    |
| 7   | GND        | 8   | GND        |
| 9   | SYS_RST-   | 10  | PWR_BTN-   |
| 11  | NC         | 12  | ---        |



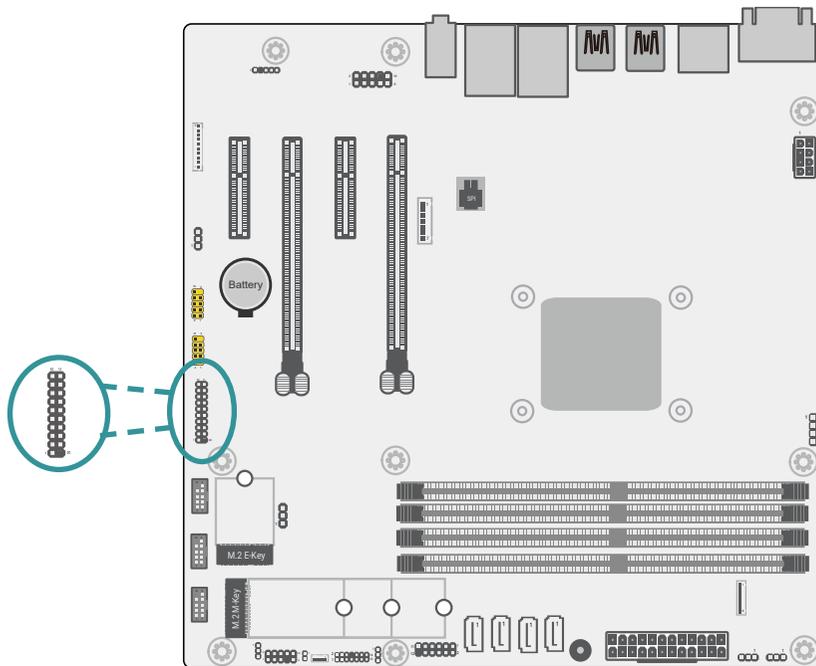
eSPI Header (J14)



| Pin | Assignment  | Pin | Assignment |
|-----|-------------|-----|------------|
| 1   | 3V3SB       | 2   | ESPI_CLK   |
| 3   | ESPI_RESET# | 4   | GND        |
| 5   | ESPI_ALT#   | 6   | UART_TX    |
| 7   | ESPI_D0     | 8   | ---        |
| 9   | ESPI_D1     | 10  | ESPI_CS    |
| 11  | ESPI_D2     | 12  | UART_RX    |
| 13  | ESPI_D3     | 14  | 3V3SB      |

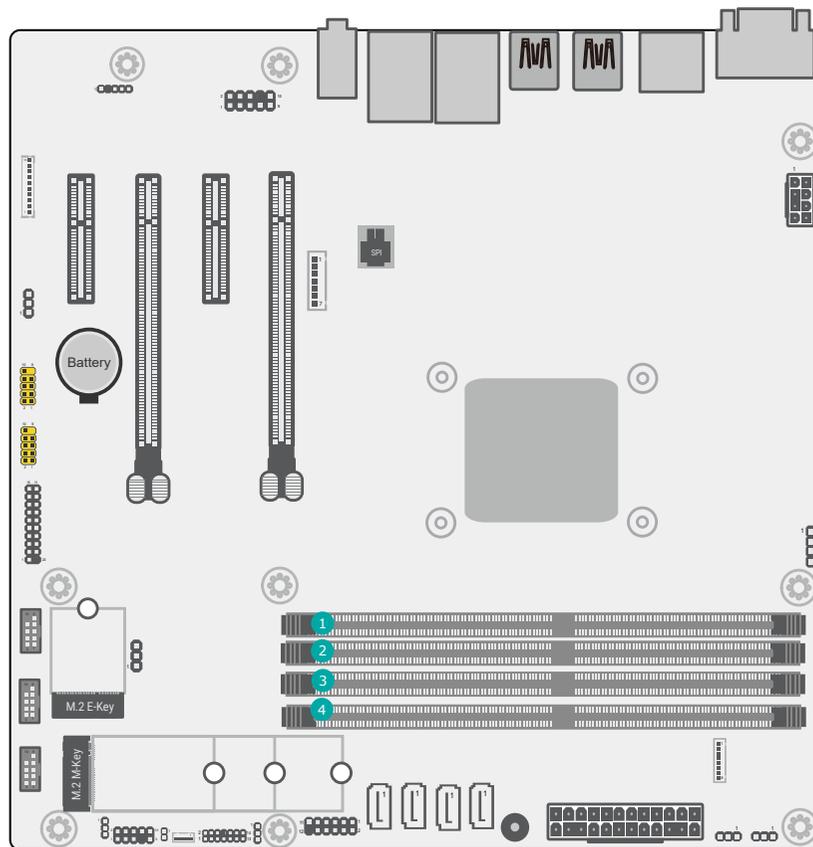


USB\_6/7 , USB2\_6/7 (UBJ1)



| Pin | Assignment  | Pin | Assignment  |
|-----|-------------|-----|-------------|
| 1   | SBV3        | 11  | USBP_C_9P   |
| 2   | USB3_RX5_DN | 12  | USBP_C_9N   |
| 3   | USB3_RX5_DP | 13  | GND         |
| 4   | GND         | 14  | USB3_TX4_DP |
| 5   | USB3_TX5_DN | 15  | USB3_TX4_DN |
| 6   | USB3_TX5_DP | 16  | GND         |
| 7   | GND         | 17  | USB3_RX4_DP |
| 8   | USBP_C_8N   | 18  | USB3_RX4_DN |
| 9   | USBP_C_8P   | 19  | SBV3        |
| 10  | NC          | 20  | ---         |

► System Memory



- 1 DIMM1

---

- 2 DIMM2

---

- 3 DIMM3

---

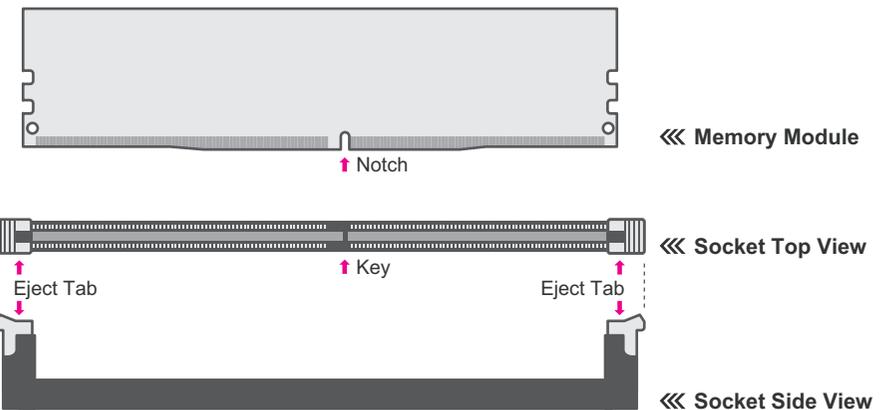
- 4 DIMM4

---

Installing the DIMM Module

Before installing the memory module, please make sure that the following safety cautions are well-attended.

1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.
3. Locate the DIMM socket on the system board
4. Make sure the notch on memory card is aligned to the key on the socket.



The system board supports the following memory interface.

**Single Channel (SC)**

Data will be accessed in chunks of 64 bits from the memory channels. DIMMs are on the same channel. DIMMs in a channel can be identical or completely different. However, we highly recommend using identical DIMMs. Not all slots need to be populated.

**Dual Channel (DC)**

Data will be accessed in chunks of 128 bits from the memory channels. Dual channel provides better system performance because it doubles the data transfer rate.

Please follow the steps below to install the memory card into the socket.

**Step 1:**

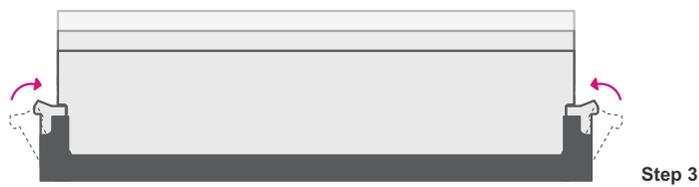
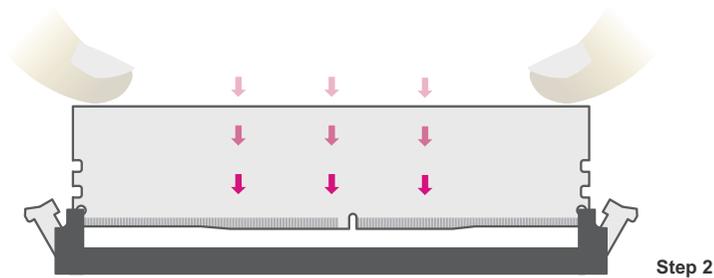
Press the eject tabs at both ends of the socket outward and downward to release them from the locked position.

**Step 2:**

Insert the memory card into the slot while making sure the notch and the key are aligned. Press the card down firmly with fingers while applying and maintaining even pressure on both ends.

**Step 3:**

The tabs snap automatically to the edges of the card and lock the card in place.



Removing the DIMM Module

Please follow the steps below to remove the memory card from the socket.

**Step 1:**

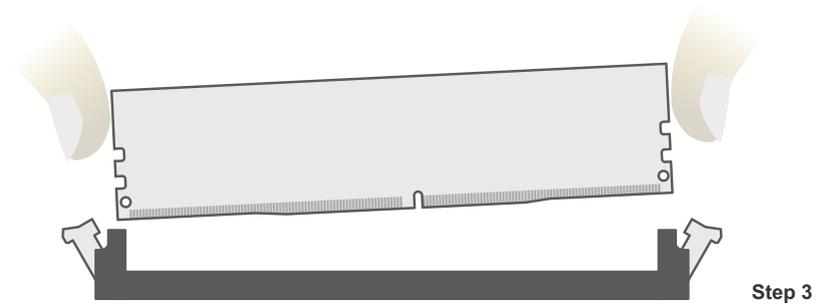
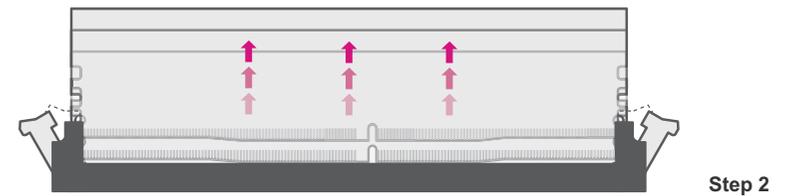
Press the eject tabs at both ends of the socket outward and downward to release them from the locked position.

**Step 2:**

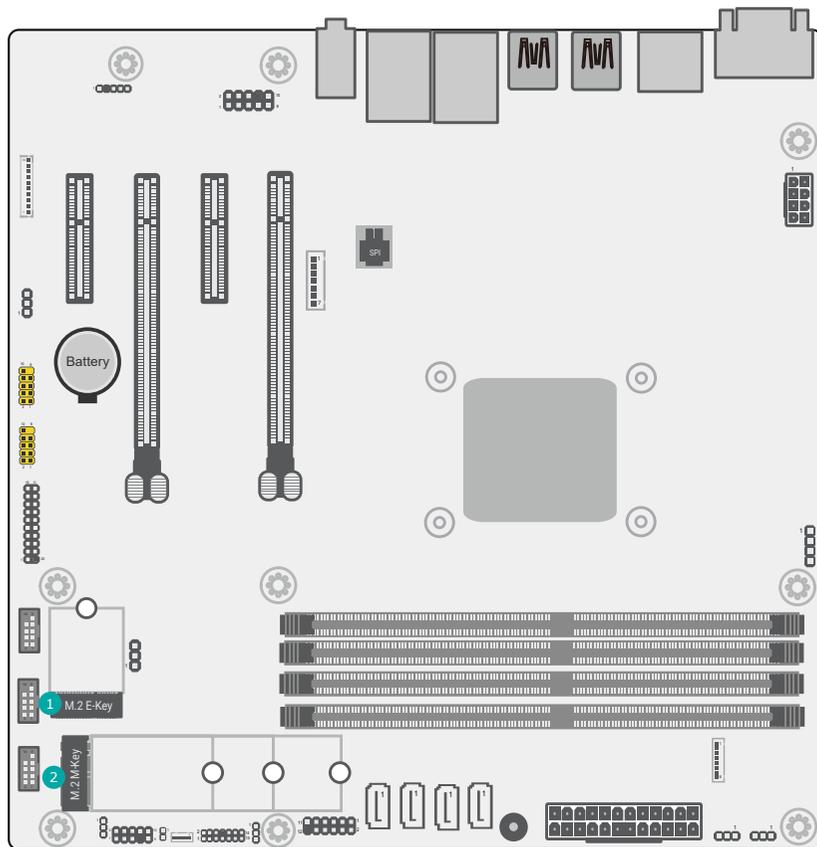
The memory card ejects from the slot automatically.

**Step 3:**

Hold the card by its edges and remove it from the slot.



► Expansion Slots

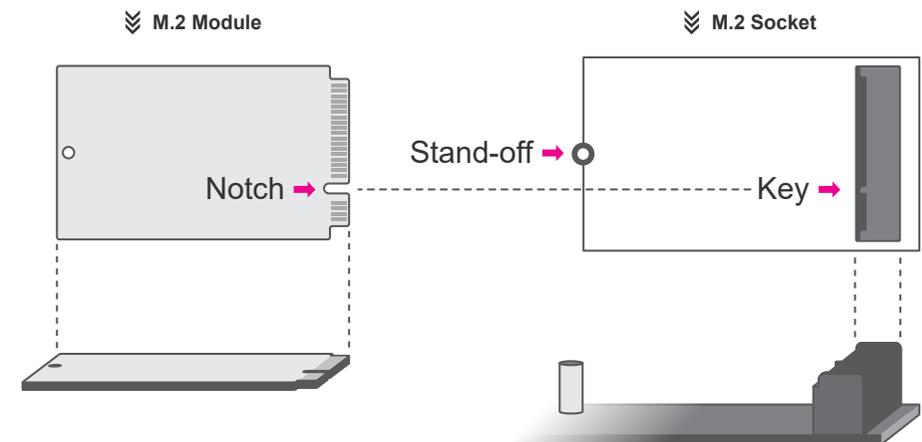


- 1 M.2 E-Key
- 2 M.2 M-Key

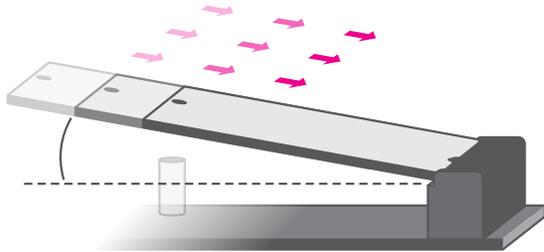
Installing the M.2 Module

Before installing the M.2 module into the M.2 socket, please make sure that the following safety cautions are well-attended.

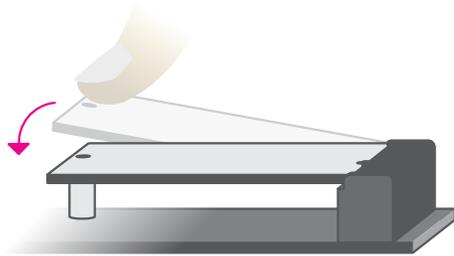
1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.
3. Locate the M.2 socket on the system board
4. Make sure the notch on card is aligned to the key on the socket.
5. Make sure the standoff screw is removed from the standoff.



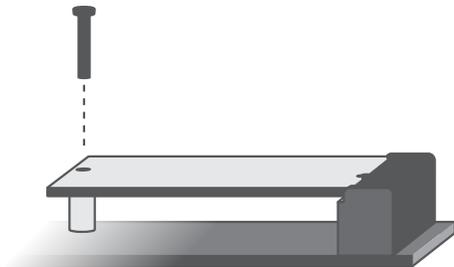
Please follow the steps below to install the card into the socket.



**Step 1:**  
Insert the card into the socket at an angle while making sure the notch and key are perfectly aligned.



**Step 2:**  
Press the end of the card far from the socket down until against the stand-off.



**Step 3:**  
Screw tight the card onto the stand-off with a screw driver and a stand-off screw until the gap between the card and the stand-off closes up. The card should be lying parallel to the board when it's correctly mounted.

## Chapter 3 - BIOS Settings

### ► Overview

The BIOS is a program that takes care of the basic level of communication between the CPU and peripherals. It contains codes for various advanced features found in this system board. The BIOS allows you to configure the system and save the configuration in a battery-backed CMOS so that the data retains even when the power is off. In general, the information stored in the CMOS RAM of the EEPROM will stay unchanged unless a configuration change has been made such as a hard drive replaced or a device added. It is possible that the CMOS battery will fail causing CMOS data loss. If this happens, you need to install a new CMOS battery and reconfigure the BIOS settings.



#### Note:

The BIOS is constantly updated to improve the performance of the system board; therefore the BIOS screens in this chapter may not appear the same as the actual one. These screens are for reference purpose only.

#### Default Configuration

Most of the configuration settings are either predefined according to the Load Optimal Defaults settings which are stored in the BIOS or are automatically detected and configured without requiring any actions. There are a few settings that you may need to change depending on your system configuration.

#### Entering the BIOS Setup Utility

The BIOS Setup Utility can only be operated from the keyboard and all commands are keyboard commands. The commands are available at the right side of each setup screen.

The BIOS Setup Utility does not require an operating system to run. After you power up the system, the BIOS message appears on the screen and the memory count begins. After the memory test, the message "Press DEL to run setup" will appear on the screen. If the message disappears before you respond, restart the system or press the "Reset" button. You may also restart the system by pressing the <Ctrl> <Alt> and <Del> keys simultaneously.

#### Legends

| Keys               | Function   |
|--------------------|--|
| Right / Left arrow | Move the highlight left or right to select a menu                      |
| Up / Down arrow    | Move the highlight up or down between submenus or fields               |
| <Enter>            | Enter the highlighted submenu  |
| + (plus key)/F6    | Scroll forward through the values or options of the highlighted field  |
| - (minus key)/F5   | Scroll backward through the values or options of the highlighted field |
| <F1>               | Display general help   |
| <F2>               | Display previous values  |
| <F7>               | Popup Boot Device List   |
| <F9>               | Optimized defaults   |
| <F10>              | Save and Exit  |
| <Esc>              | Return to previous menu  |

#### Scroll Bar

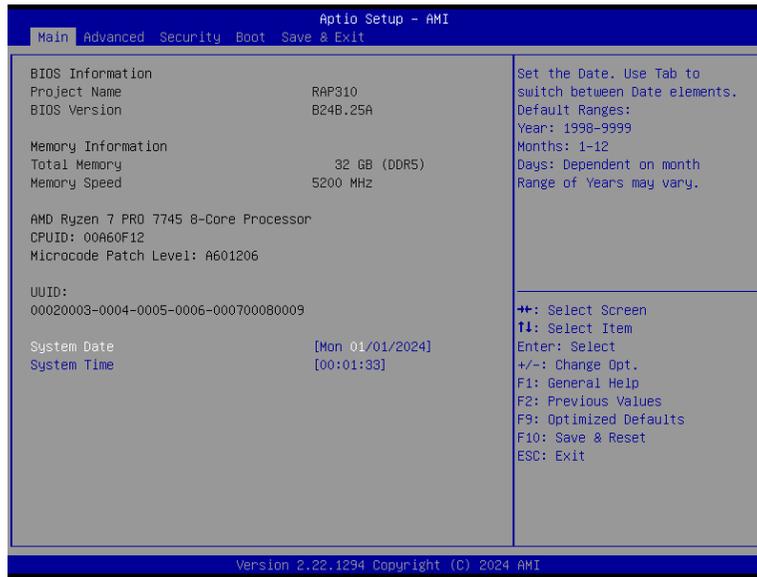
When a scroll bar appears to the right of the setup screen, it indicates that there are more available fields not shown on the screen. Use the up and down arrow keys to scroll through all the available fields.

#### Submenu

When "►" appears on the left of a particular field, it indicates that a submenu which contains additional options are available for that field. To display the submenu, move the highlight to that field and press <Enter>.

► Main

The Main menu is the first screen that you will see when you enter the BIOS Setup Utility.



**System Date**

The date format is <month>, <date>, <year>. Press "Tab" to switch to the next field and press "-" or "+" to modify the value.

**System Time**

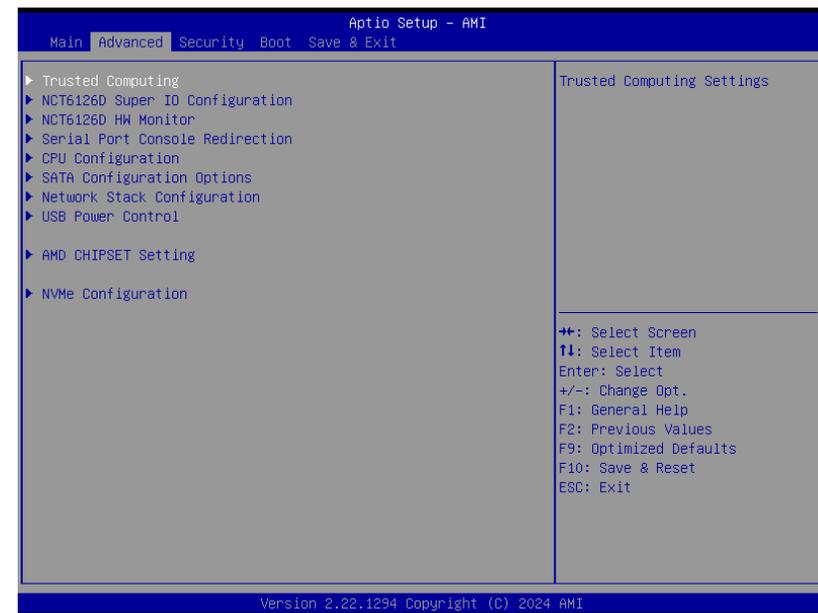
The time format is <hour>, <minute>, <second>. The time is based on the 24-hour military-time clock. For example, 1 p.m. is 13:00:00. Hour displays hours from 00 to 23. Minute displays minutes from 00 to 59. Second displays seconds from 00 to 59.

► Advanced

The Advanced menu allows you to configure your system for basic operation. Some entries are defaults required by the system board, while others, if enabled, will improve the performance of your system or let you set some features according to your preference.



**Important:**  
Setting incorrect field values may cause the system to malfunction.



▶ **Advanced**

**Trusted Computing**



**Security Device Support**

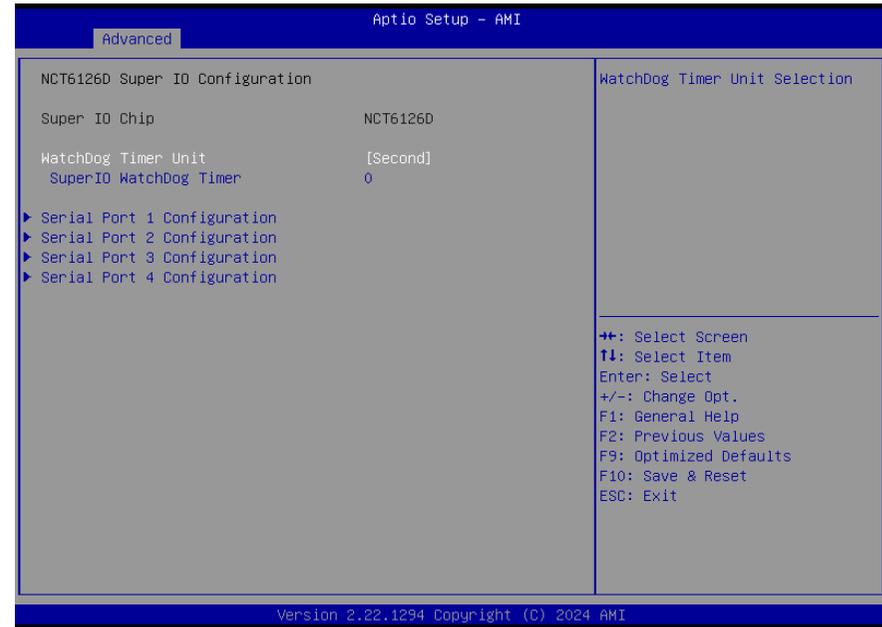
This field is used to enable or disable BIOS support for the security device such as an TPM 2.0 to achieve hardware-level security via cryptographic keys.

**Pending operation**

To clear the existing TPM encryption, select "TPM Clear" and restart the system. This field is not available when "Security Device Support" is disabled.

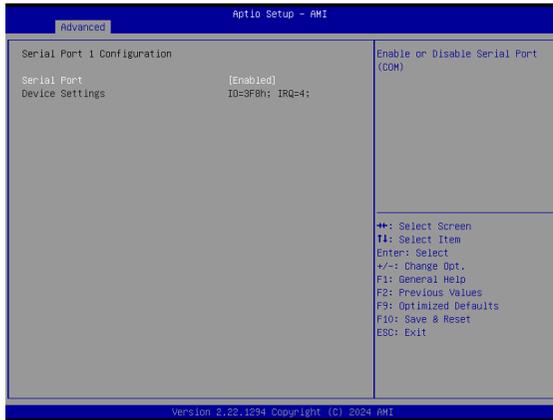
▶ **Advanced**

**NCT6126D Super IO Configuration**



▶ Advanced

NCT6126D Super IO Configuration ▶ Serial Port 1, 2 Configuration



**Serial Port**

Enable or disable serial port.

▶ Advanced

NCT6126D Super IO Configuration ▶ Serial Port 3, 4 Configuration

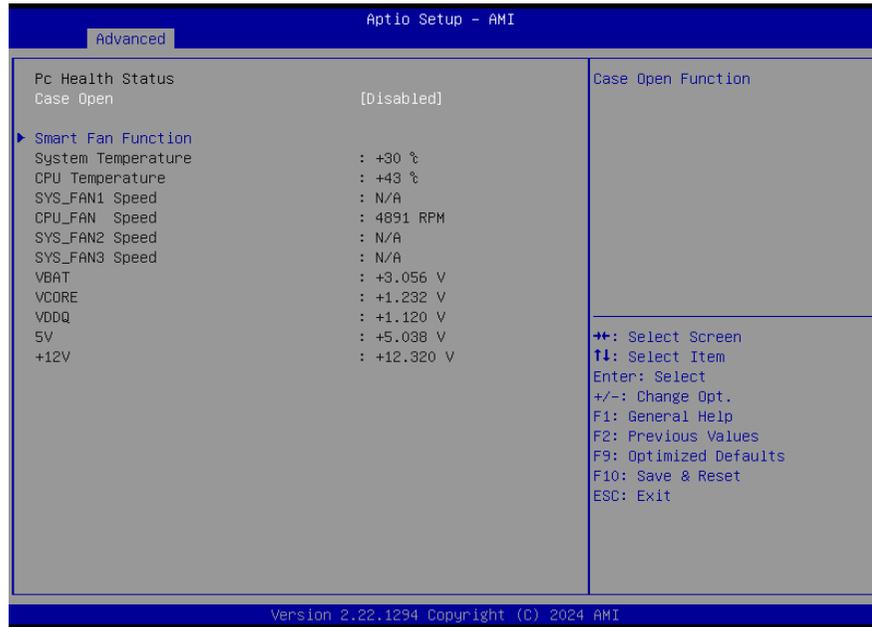


**Serial Port**

Enable or disable serial port.

► **Advanced**

**NCT6126D HW Monitor**



This section displays the system's health information, i.e. voltage readings, CPU and system temperatures, and fan speed readings

**Smart Fan Function**

Smart Fan Function Setting.

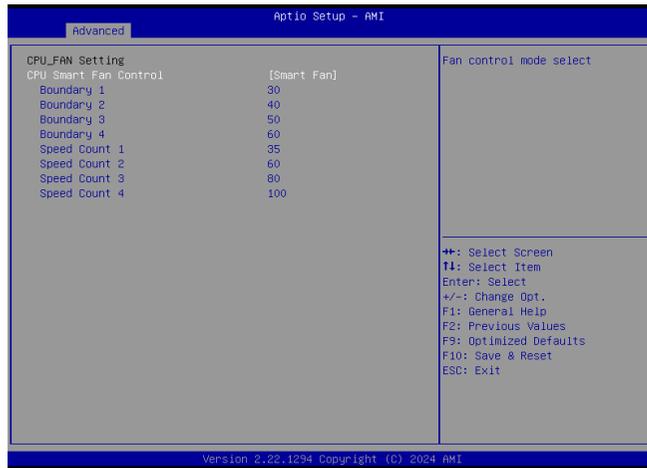
► **Advanced**

**NCT6126D HW Monitor ► Smart FAN Function**



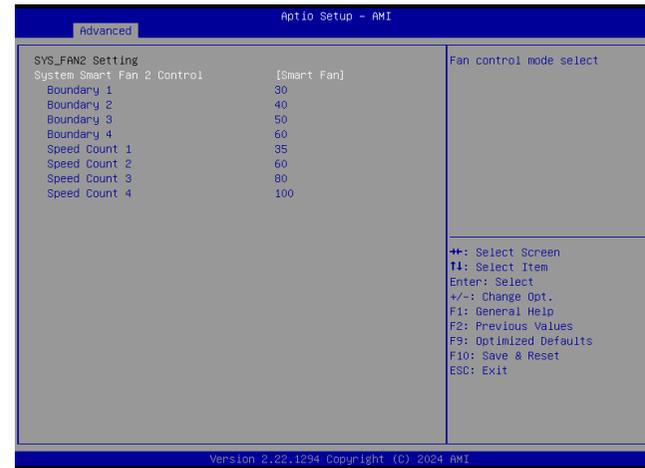
▶ Advanced

NCT6126D HW Monitor ▶ Smart FAN Function ▶ CPU FAN Setting

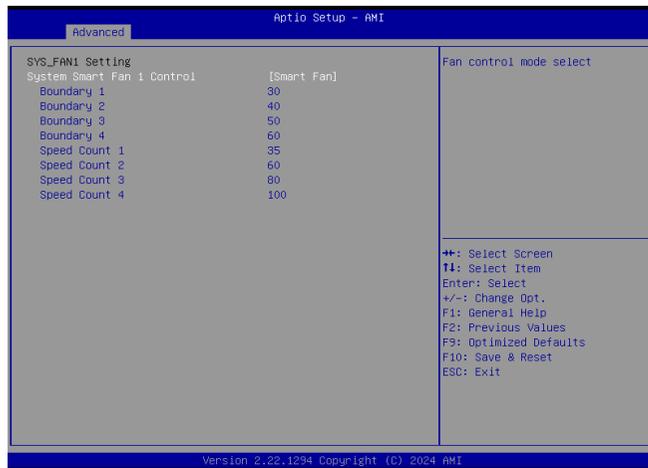


▶ Advanced

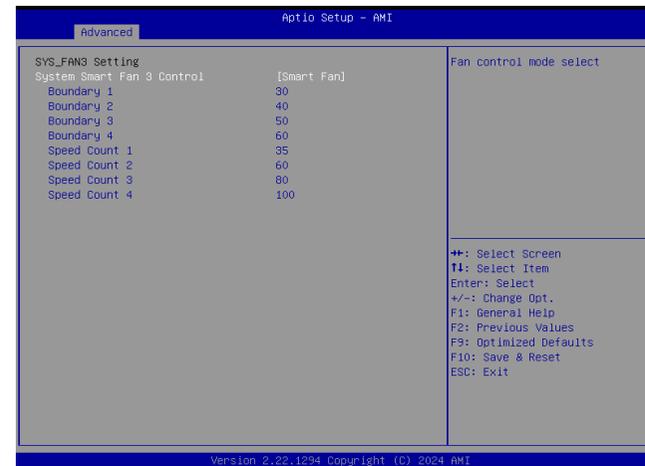
NCT6126D HW Monitor ▶ Smart FAN Function ▶ SYS\_FAN 2 Setting



NCT6126D HW Monitor ▶ Smart FAN Function ▶ SYS\_FAN1 Setting



NCT6126D HW Monitor ▶ Smart FAN Function ▶ SYS\_FAN 3 Setting



Smart Fan is a fan speed moderation strategy dependent on the current system temperature. When the system temperature goes higher than the Boundary setting, the fan speed will be turned up to the setting of the Fan Speed Count that bears the same index as the Boundary field.

▼ **SYS Smart Fan/CPU Smart Fan Control = [Enabled]**

**Boundary 1 to Boundary 4**

Set the boundary temperatures that determine the fan speeds accordingly, the value ranging from 0-127 °C. For example, when the system temperature reaches Boundary 1 setting, the fan speed will be turned up to the designated speed of the Fan Speed Count 1 field.

**Fan Speed Count 1 to Fan Speed Count 4**

Set the fan speed, the value ranging from 1-100%, 100% being full speed. The fans will operate according to the specified boundary temperatures above-mentioned.

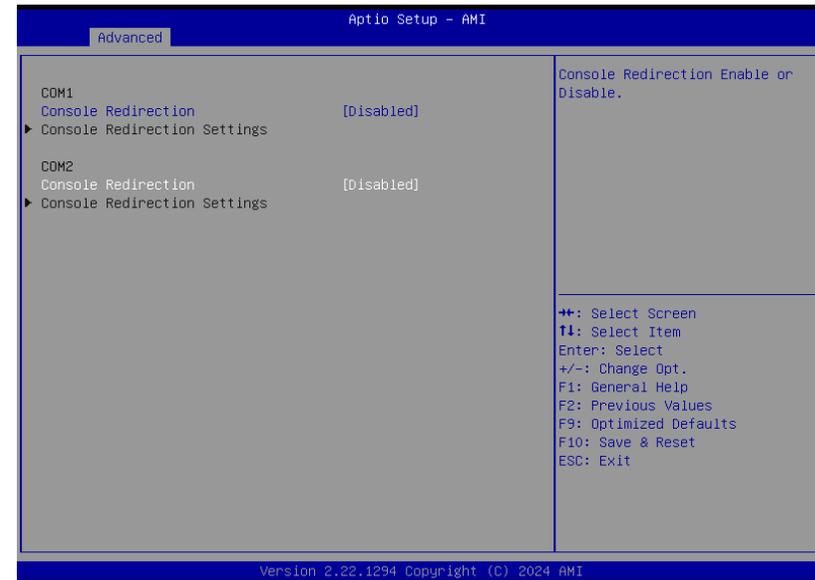
▼ **SYS Smart Fan/CPU Smart Fan Control = [Disabled]**

**Fix Fan Speed Count**

Set the fan speed, the value ranging from 1-100%, 100% being full speed. The fans will always operate at the specified speed regardless of gauged temperatures.

► **Advanced**

**Serial Port Console Redirection**



**Console Redirection**

By enabling Console Redirection of a COM port, the sub-menu of console redirection settings will become available for configuration as detailed in the following.

► Advanced

Serial Port Console Redirection ► Console Redirection Settings



Configure the serial settings of the current COM port.

**Terminal Type**

Select terminal type: VT100, VT100+, VT-UTF8 or ANSI.

**Bits per second**

Select serial port transmission speed: 9600, 19200, 38400, 57600 or 115200.

**Data Bits**

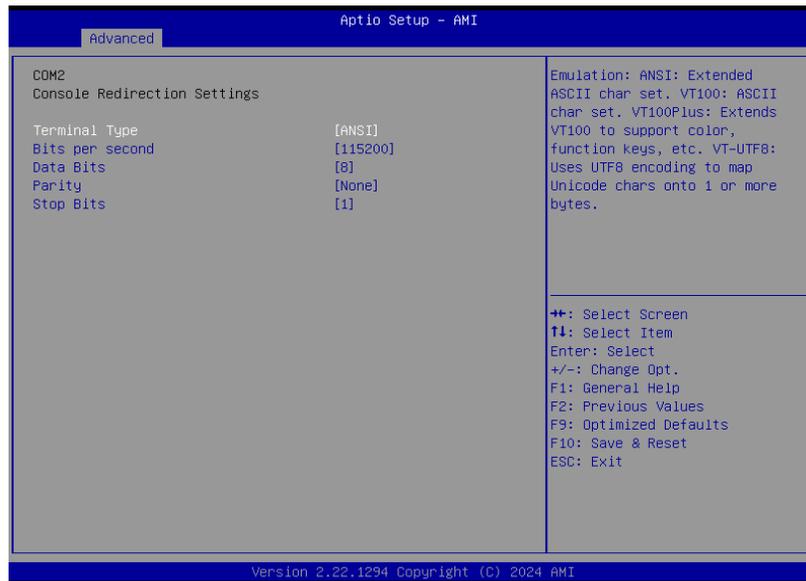
Select data bits: 7 bits or 8 bits.

**Parity**

Select parity bits: None, Even, Odd, Mark or Space.

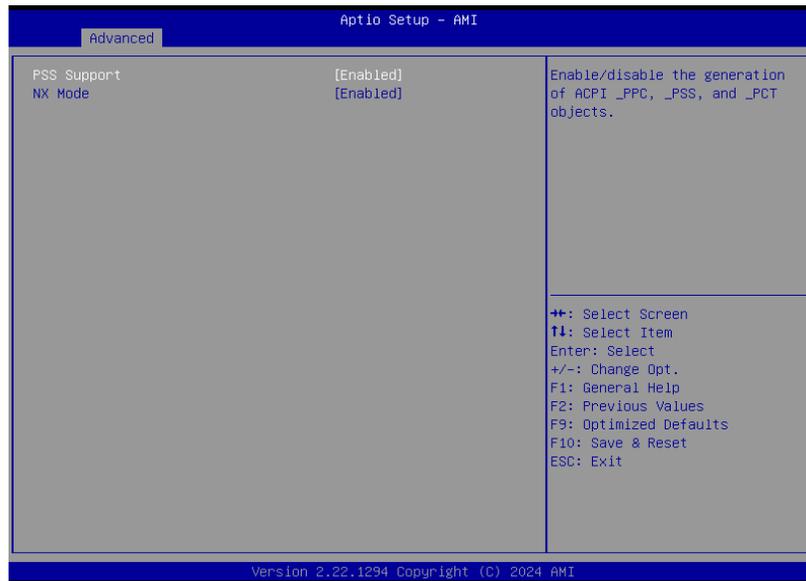
**Stop Bits**

Select stop bits: 1 bit or 2 bits.



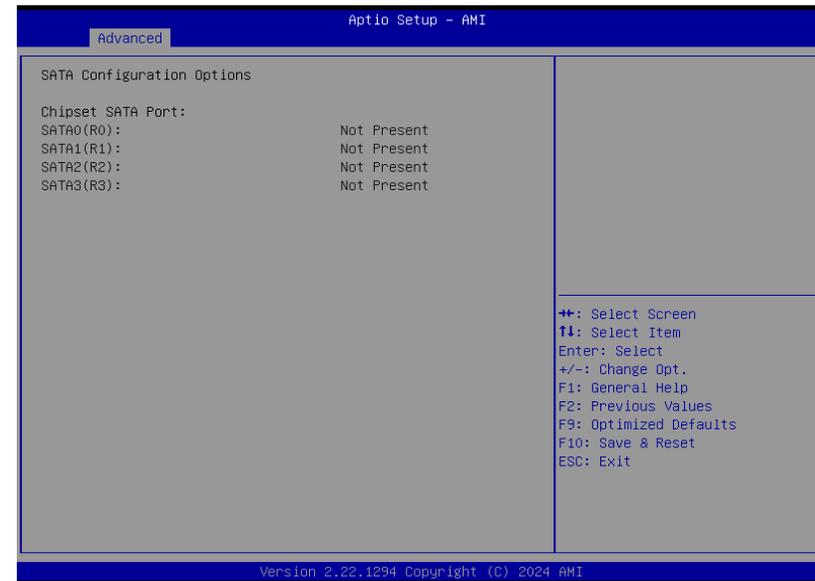
▶ Advanced

CPU Configuration



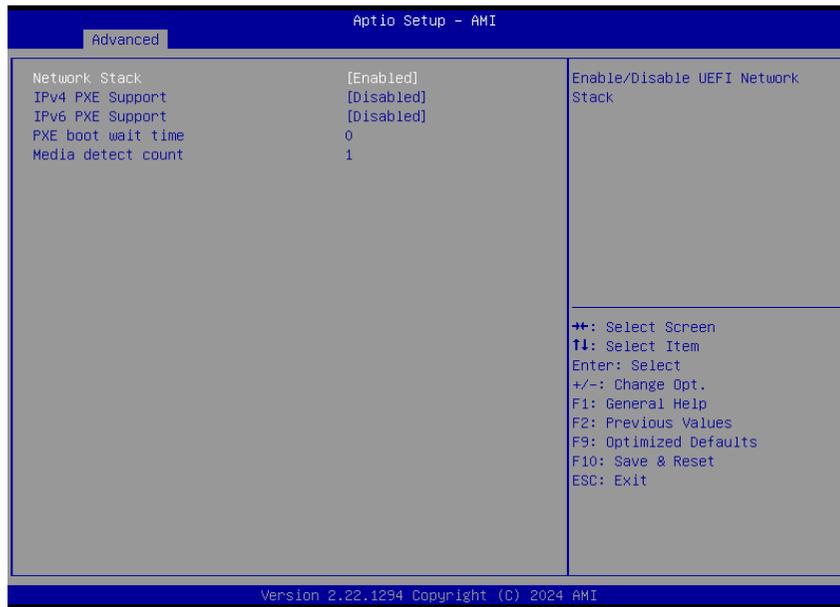
▶ Advanced

SATA Configuration Options



▶ Advanced

### Network Stack Configuration



#### Network Stack

Enable or disable UEFI network stack. The following fields will appear when this field is enabled.

#### Ipv4 PXE Support

Enable or disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available.

#### Ipv6 PXE Support

Enable or disable IPv6 PXE boot support. If disabled, IPv6 PXE boot support will not be available.

#### PXE boot wait time

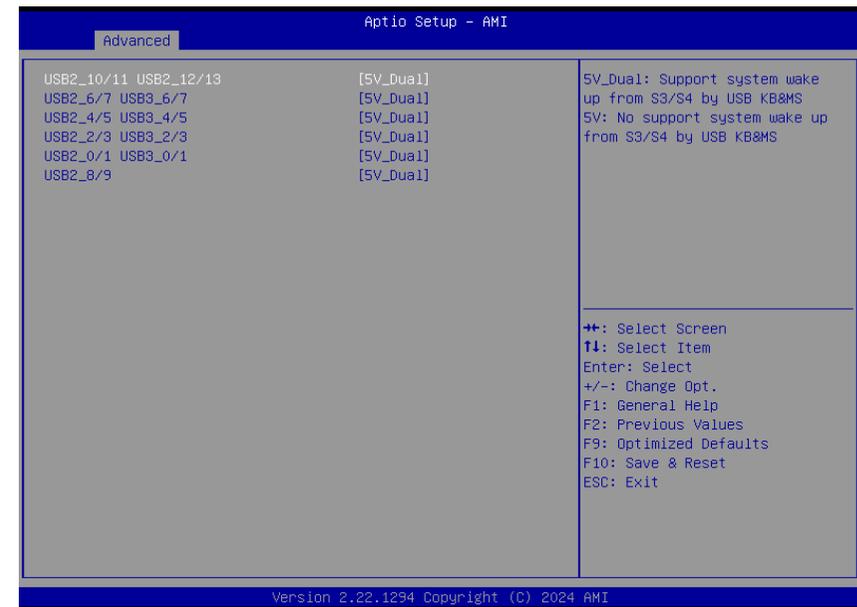
Set the wait time in seconds to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the value.

#### Media detect count

Set the number of times the presence of media will be checked. Use either +/- or numeric keys to set the value.

▶ Advanced

### USB Power Control



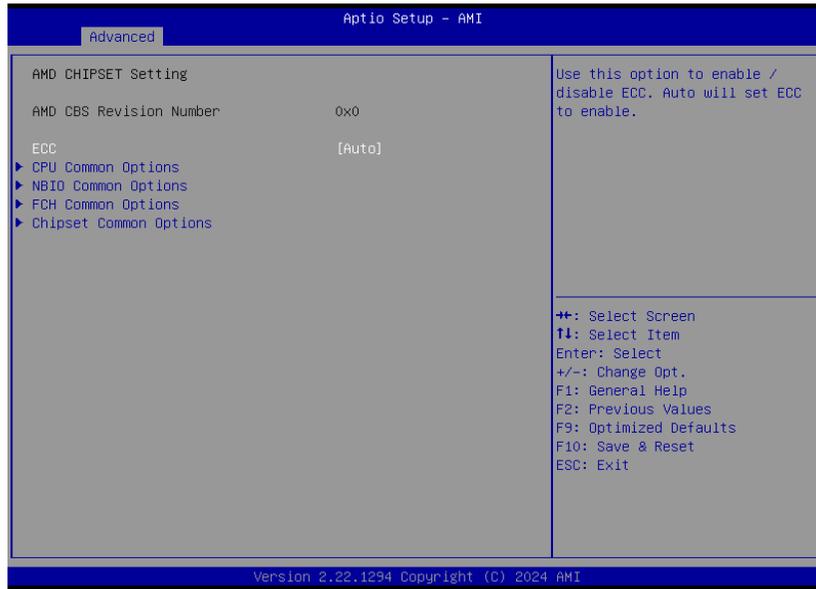
#### Server CA Configuration

**5\_Dual:** Support system wake up from S3/S4 by USB KB&MS

**5V:** No support system wake up from S3/S4 by USB KB&MS

▶ **Advanced**

**AMD CHIPSET Setting**

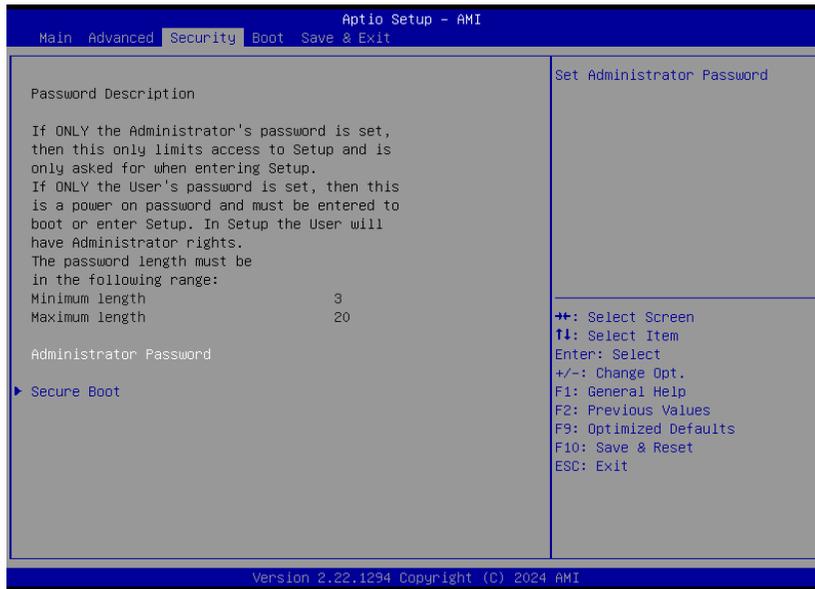


▶ **Advanced**

**NvMe Configuration**



► Security



**Administrator Password**

Set the administrator password. To clear the password, input nothing and press enter when a new password is asked. Administrator Password will be required when entering the BIOS.

**User Password**

Set the user password. To clear the password, input nothing and press enter when a new password is asked. User Password will be required when powering up the system.

► Security

Secure Boot



**Secure Boot**

The Secure Boot store a database of certificates in the firmware and only allows the OSEs with authorized signatures to boot on the system. To activate Secure Boot, please make sure that "Secure Boot" is "[Enabled]", Platform Key (PK) is enrolled, "System Mode" is "User", and CSM is disabled. After enabling/disabling Secure Boot, please save the configuration and restart the system. When configured and activated correctly, the Secure Boot status will be "Active".

**Secure Boot Mode**

Select the secure boot mode – Standard or Custom. When set to Custom, the following fields will be configurable for the user to manually modify the key database.

**Restore Factory Keys**

Force system to User Mode. Load OEM-defined factory defaults of keys and databases onto the Secure Boot. Press Enter and a prompt will show up for you to confirm.

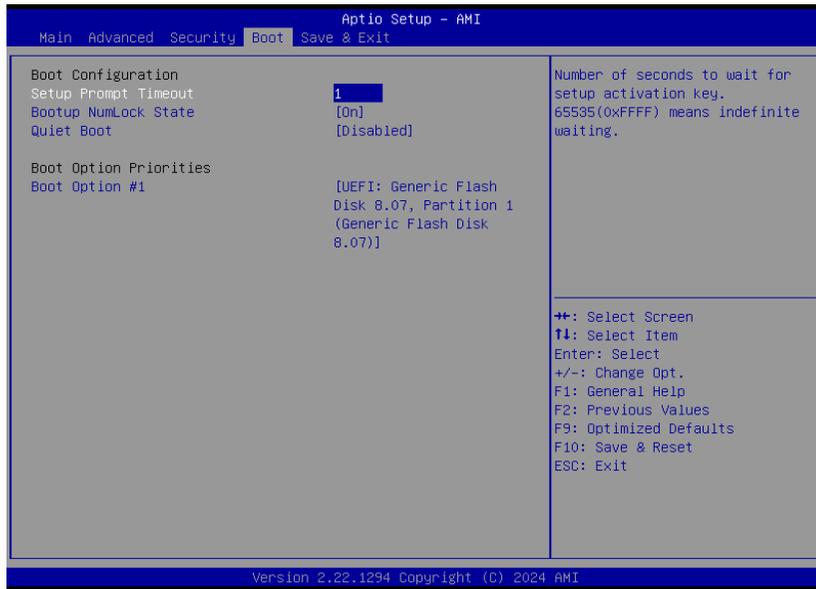
**Reset To Setup Mode**

Clear the database from the NVRAM, including all the keys and signatures installed in the Key Management menu. Press Enter and a prompt will show up for you to confirm.

**Expert Key Management**

Enables expert users to modify Secure Boot Policy variables without full authentication.

► **Boot**



**Setup Prompt Timeout**

Set the number of seconds to wait for the setup activation key. 65535 (0xFFFF) denotes indefinite waiting.

**Bootup NumLock State**

Select the keyboard NumLock state: On or Off.

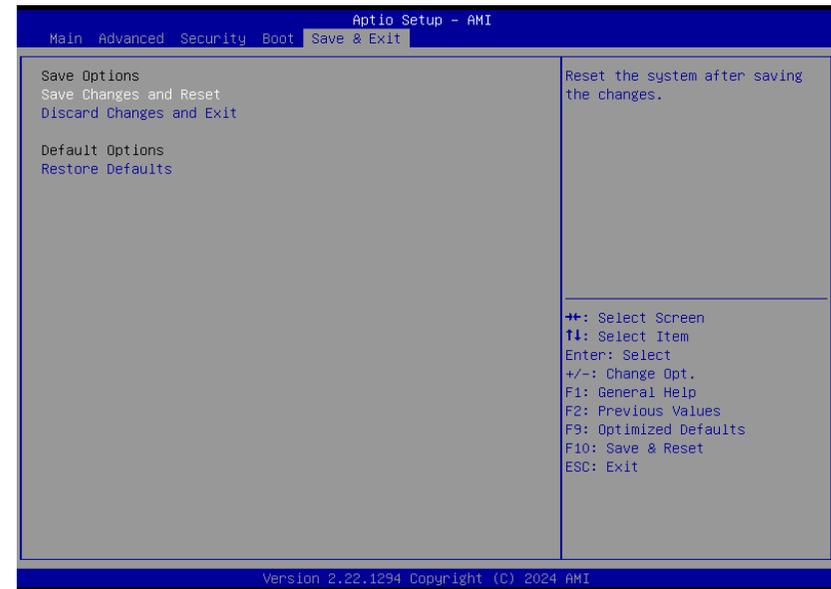
**Quiet Boot**

This section is used to enable or disable quiet boot option.

**Boot Option Priorities**

Rearrange the system boot order of available boot devices.

► **Save & Exit**



**Save Changes and Reset**

To save the changes, select this field and then press <Enter>. A dialog box will appear. Select Yes to reset the system after saving all changes made.

**Discard Changes and Exit**

To discard the changes, select this field and then press <Enter>. A dialog box will appear.

**Restore Defaults**

To restore and load the optimized default values, select this field and then press <Enter>. A dialog box will appear. Select Yes to restore the default values of all the setup options.

## ► Updating the BIOS

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To update the BIOS, you will need the new BIOS file and a flash utility. Please contact technical support or your sales representative for the files and specific instructions about how to update BIOS with the flash utility.

## ► Notice: BIOS SPI ROM

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1. The Intel® Management Engine has already been integrated into this system board. Due to the safety concerns, the BIOS (SPI ROM) chip cannot be removed from this system board and used on another system board of the same model.
2. The BIOS (SPI ROM) on this system board must be the original equipment from the factory and cannot be used to replace one which has been utilized on other system boards.
3. If you do not follow the methods above, the Intel® Management Engine will not be updated and will cease to be effective.



**Note:**

- a. You can take advantage of flash tools to update the default configuration of the BIOS (SPI ROM) to the latest version anytime.
- b. When the BIOS IC needs to be replaced, you have to populate it properly onto the system board after the EEPROM programmer has been burned and follow the technical person's instructions to confirm that the MAC address should be burned or not.
- c. After updating unique MAC Address from manufacturing, NVM will be protected immediately after power cycle. Users cannot update NVM or MAC address.