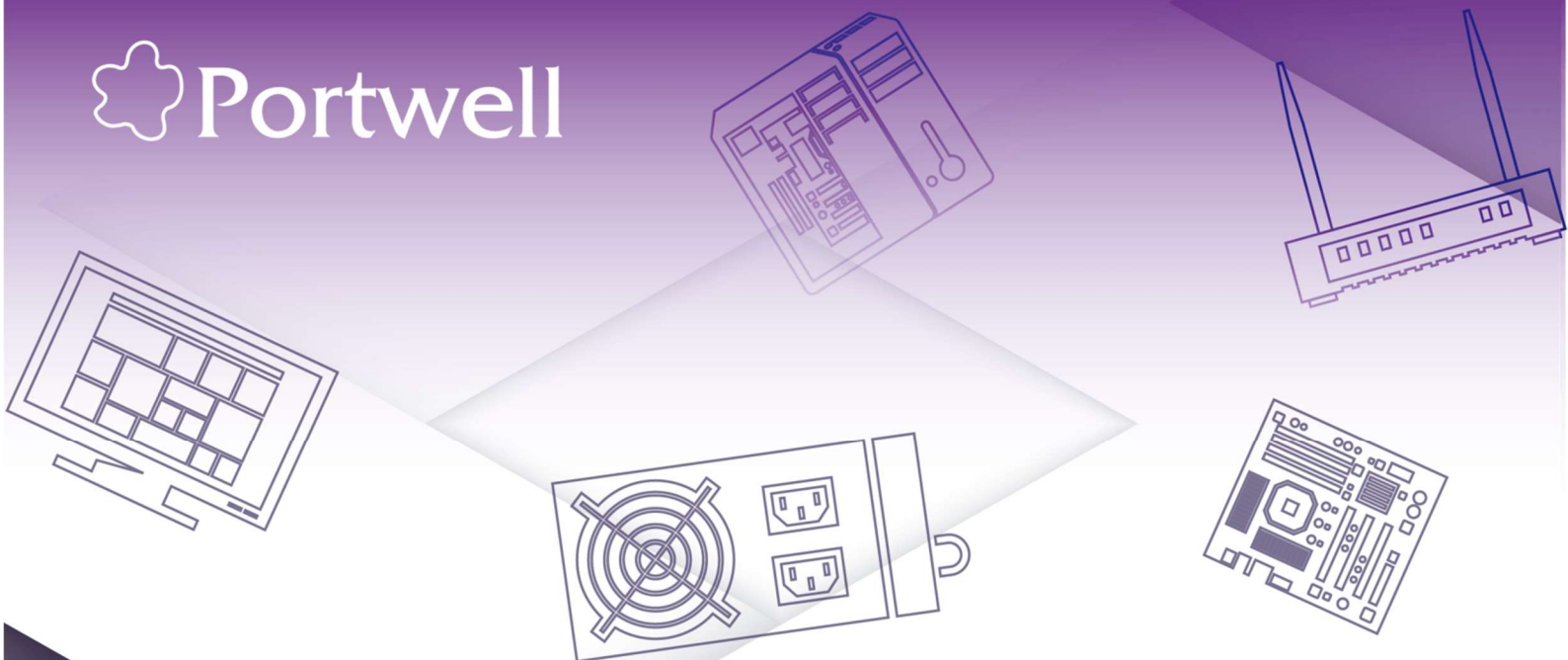




# RUBY-D813-H610E-D5

Industrial Board

## User Manual

Version R1.0

# Copyright

The documentation and the software included with this product are copyrighted 2025 by Portwell. All rights are reserved. Portwell reserves the right to make improvements to the products described in this manual at any time without notice. No part of this manual may be reproduced, copied, translated, or transmitted in any form or by any means without the prior written permission of Portwell. The information provided in this manual is intended to be accurate and reliable. However, Portwell assumes no responsibility for its use, nor for any infringements of the rights of third parties that may result from its use.

# Revision History

|      |                           |
|------|---------------------------|
| R1.0 | Official release Rev. 1.0 |
|      |                           |
|      |                           |
|      |                           |
|      |                           |

# Table of Contents

|                                           |           |
|-------------------------------------------|-----------|
| <b>1. Introduction</b>                    | <b>5</b>  |
| <b>2. Specifications</b>                  | <b>7</b>  |
| 2.1 Supported Operating Systems           | 9         |
| 2.2 Mechanical Dimensions                 | 10        |
| 2.3 Power Consumption                     | 10        |
| 2.4 Environmental Specifications          | 11        |
| <b>3 Block Diagram</b>                    | <b>12</b> |
| <b>4 Hardware Configuration</b>           | <b>14</b> |
| 4.1 Jumpers and Connectors                | 15        |
| 4.2 Jumper Settings                       | 16        |
| 4.3 Connector Settings                    | 18        |
| <b>5 Sample Code</b>                      | <b>27</b> |
| 5.1 Watch Dog Timer                       | 28        |
| 5.2 GPIO Signal                           | 30        |
| <b>6 BIOS Setup Items</b>                 | <b>45</b> |
| 6.1 Entering Setup -- Launch System Setup | 46        |
| 6.2 Main                                  | 47        |
| 6.3 Advanced                              | 48        |
| 6.3.1 PCH-FW Configuration                | 49        |
| 6.3.2 Trusted Computing                   | 50        |
| 6.3.3 CPU Configuration                   | 51        |
| 6.3.4 Graphics Configuration              | 52        |
| 6.3.5 PCI Express Configuration           | 56        |
| 6.3.6 CSM Configuration                   | 57        |
| 6.3.7 Super I/O Configuration             | 64        |
| 6.3.8 Serial Console Redirection          | 67        |
| 6.3.9 SATA Configuration                  | 75        |
| 6.3.10 Network Stack Configuration        | 78        |
| 6.3.11 USB Configuration                  | 79        |
| 6.3.12 NVMe Configuration                 | 80        |
| 6.3.13 Onboard Device Configuration       | 81        |
| 6.3.14 Miscellaneous                      | 83        |
| 6.3.15 APM Configuration                  | 84        |
| 6.3.16 EZ flash                           | 86        |
| 6.3.17 Watchdog Timer                     | 86        |
| 6.4 Hardware Monitor                      | 48        |
| 6.5 Security                              | 48        |
| 6.6 Boot                                  | 48        |
| 6.7                                       |           |

|         |                                           |     |
|---------|-------------------------------------------|-----|
| 6.7.8   | EZ-Flash .....                            | 88  |
| 6.3.1 G | Preserve BIOS option method .....         | 8G  |
| 7       | System Resources.....                     | 107 |
| 7.1     | Intel PCH .....                           | 107 |
| 7.2     | Main Memory.....                          | 107 |
| 7.3     | Installing the Single Board Computer..... | 107 |
| 8       | Troubleshooting.....                      | 110 |
| 8.1     | Hardware Quick Installation.....          | 110 |
| 8.2     | BIOS Setting.....                         | 111 |
| 8.3     | FAQ.....                                  | 113 |
| G       | Portwell Software Service.....            | 115 |

# Chapter 1

## Overview

### 1 Introduction

# 1. Introduction

The RUBY-D813-H610E-D5 supports Intel® Alder Lake/Raptor Lake/Raptor Lake Refresh -S Core™ i9 / i7 / i5 / i3, Pentium® and Celeron® Processors, LGA1700, utilizes the ATX form factor. It supports two DDR5 U-DIMMs up to 96GB capacity, one M.2 M key socket. Graphic with GfX Gen 12, HD graphics 730 / 770, support four independent displays via DisplayPort, HDMI, and VGA. Additionally, it features two 1GbE ports, four USB3.2 ports and four USB 2.0 ports.

The RUBY-D813-H610E-D5 series is versatile, compact, powerful, making it ideal for diverse applications such as industrial automation, robotic control systems, automated test equipment, medical equipment, gateways, digital signage, and more.

# Chapter 2

- 2 Specifications
- 2.1 Supported Operating Systems
- 2.2 Mechanical Dimension
- 2.3 Power Consumption

## 2. Specifications

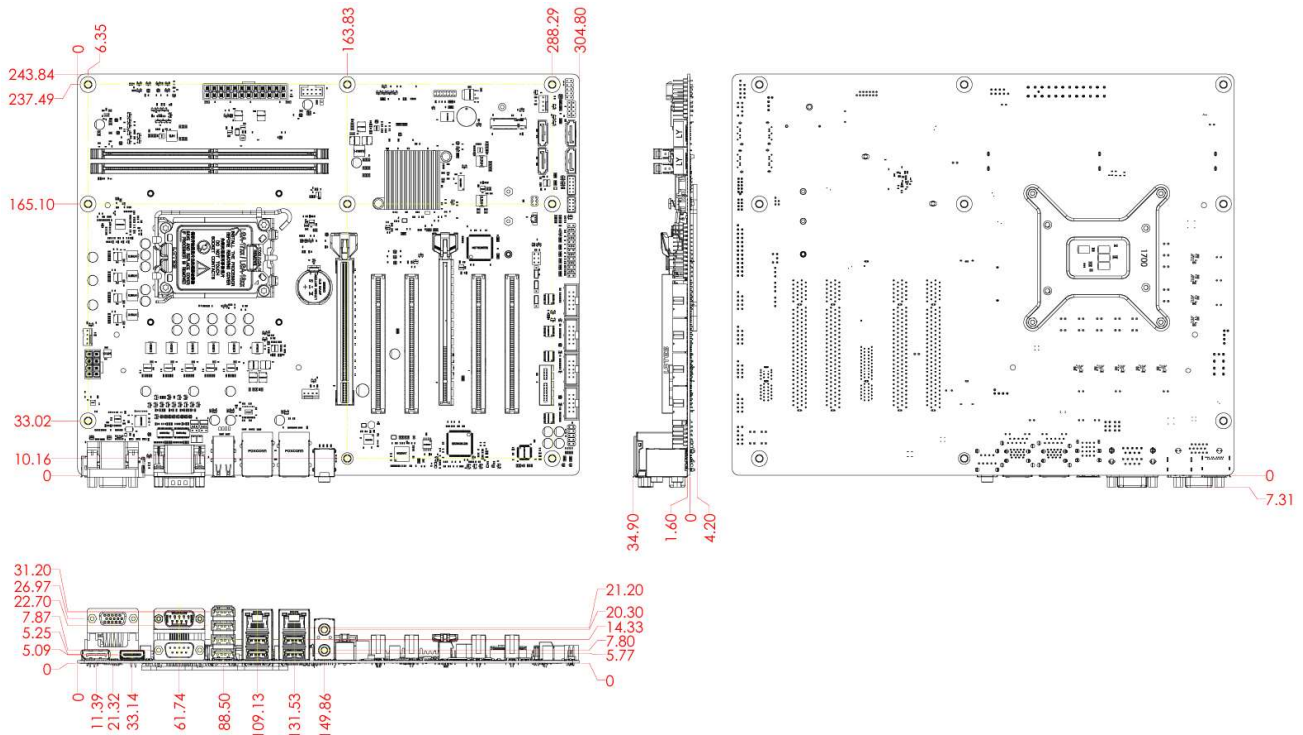
|                                             |                                                                                                                                                                                                                                                               |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Main Processor                              | Intel® Alder Lake/Raptor Lake/Raptor Lake Refresh -S Core™ i9 / i7 / i5 / i3,Pentium® and Celeron® Processors                                                                                                                                                 |
| Chipset                                     | Intel® H610E Chipset                                                                                                                                                                                                                                          |
| System BIOS                                 | AMI UEFI BIOS                                                                                                                                                                                                                                                 |
| Main Memory                                 | 2x non-ECC DDR5 5600MT/s U-DIMM up to 96GB                                                                                                                                                                                                                    |
| Graphics                                    | Controller: Intel® GfX Gen 12, HD graphics 730 /770<br>LVDS: Supports one LVDS up to resolution 1920 x 1200<br>DP: Supports one Display port up to resolution of 4096 x 2160<br>HDMI: Supports one HDMI port up to resolution of 4096 x 2160                  |
| Expansion Interface                         | 1 x PCIe Gen5 x16 slot<br>1 x PCIe 3.0 x16 slot (x4 mode)<br>1 x PCIe 3.0 x1 slot<br>4 x PCI slots<br>1 x M.2 Socket 3 with M key, type 2242/2260/2280 (SATA/PCIe x1 mode)                                                                                    |
| SATA Interface                              | Four SATA ports(SATA 6Gb/s)                                                                                                                                                                                                                                   |
| Input/Output                                | COM Ports: Six Ports _ 2x RS-232/422/485 on rear I/O &4x RS-232 on board header<br>USB Port:4(2 x USB 3.2 Gen2, 2 x USB 3.2 Gen1) and 4x USB2.0 ports on REAR I/O, 1 x Header Support Additional 2 x USB2.0 Connectors<br>Audio Interface: Line-In / Line-Out |
| Ethernet                                    | Supports one 10/100/1000 Mbps Ethernet port (s) via PCI Express x1 bus<br>Supports one 10/100/1000 Mbps Ethernet port (s) via PCI Express x1 bus                                                                                                              |
| High Drive GPIO                             | One pin-header for GPIO(8bit GPIO )                                                                                                                                                                                                                           |
| Mechanical and environmental specifications | Operating temperature: 0 ~ 60° C<br>Storage temperature:-20 ~ 80° C<br>Humidity: 5 ~ 95% non-condensing<br>Power supply voltage: ATX<br>Board size: 304.8mm x 243.8 mm                                                                                        |
| Certification                               | CE/FCC                                                                                                                                                                                                                                                        |

## 2.1 Supported Operating Systems

The RUBY-D813-H610E supports the following operating systems.

- Windows® 11 IoT Enterprise LTSC
- Windows® 10 ( 64bit )
- Windows® 10 IoT Enterprise
- Ubuntu
- RedHat Enterprise
- Fedora Workstation
- OpenSUSE

## 2.2 Mechanical Dimensions



## 2.3 Power Consumption

|                |                                                                      |
|----------------|----------------------------------------------------------------------|
| CPU Type       | Intel® Core™ i7-12700E CPU @ 4.8GHz                                  |
| SBC BIOS       | Portwell, Inc. RUBY-D813-H610EBIOS (1.00.00.02)                      |
| Memory         | InnodiskDIMM DDR4 2666 16GB                                          |
| VGA Card       | Onboard Intel® UHD Graphics 770                                      |
| VGA Driver     | Intel® UHD Graphics 770 ver: 30.0.101.1371                           |
| LAN Card       | Onboard Intel® Ethernet Connection I219V                             |
| LAN Driver     | Intel® Ethernet Connection I219V Version: 12.19.1.37                 |
| LAN Card #2    | Onboard Intel® I210AT Gigabit Network Connection                     |
| LAN Driver #2  | Intel® I210AT Gigabit Network Connection Version: 12.18.12.1         |
| Audio Card     | Onboard Realtek ALC897 High Definition Audio                         |
| Audio Driver   | Realtek ALC897 High Definition Audio Version: 6.0.9285.1             |
| Chipset Driver | Intel® Alder lake-S Chipset Device Software Version: 10.1.18950.8298 |
| USB 3.0 Driver | Intel® USB 3.0 eXtensible Host Controller Adaptation Driver          |
| SATA HDD       | Intel SSD 256G                                                       |
| Power Supply   | FSP460-60PFB 460W                                                    |

## Power Consumption

| Item                | Power ON       | Full Loading 10Min | Full Loading 30Min |
|---------------------|----------------|--------------------|--------------------|
| CPU +12V            | 0.98A          | 2.05A              | 1.98A              |
| System +12V         | 0.83A          | 1.48A              | 1.26A              |
| System +3.3V        | 0.55A          | 0.65A              | 0.69A              |
| System +5V          | 1.11A          | 1.37A              | 1.34A              |
| System+ Device +12V | 0.97A          | 1.81A              | 1.56A              |
| System+ Device +5V  | 1.87A          |                    |                    |
| USB2.0 Loading Test | 4.98 V/ 570 mA |                    |                    |

## 2.4 Environmental Specifications

Storage Temperature: -40~85° C

Operation Temperature: 0~60° C

Storage Humidity: 5~95%, non-condensing

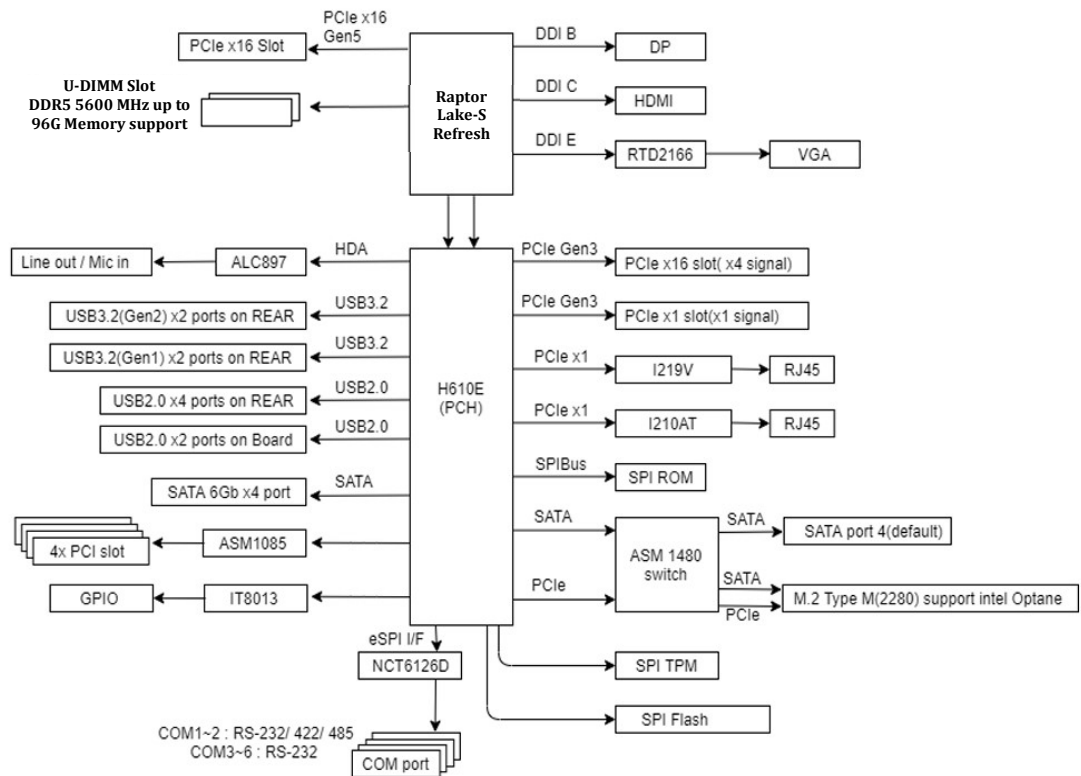
Operation Humidity: 5~95%, non-condensing

# Chapter 3

## 3 Block Diagram

RUBY-D814-Q870 user manual

## 3 Block Diagram



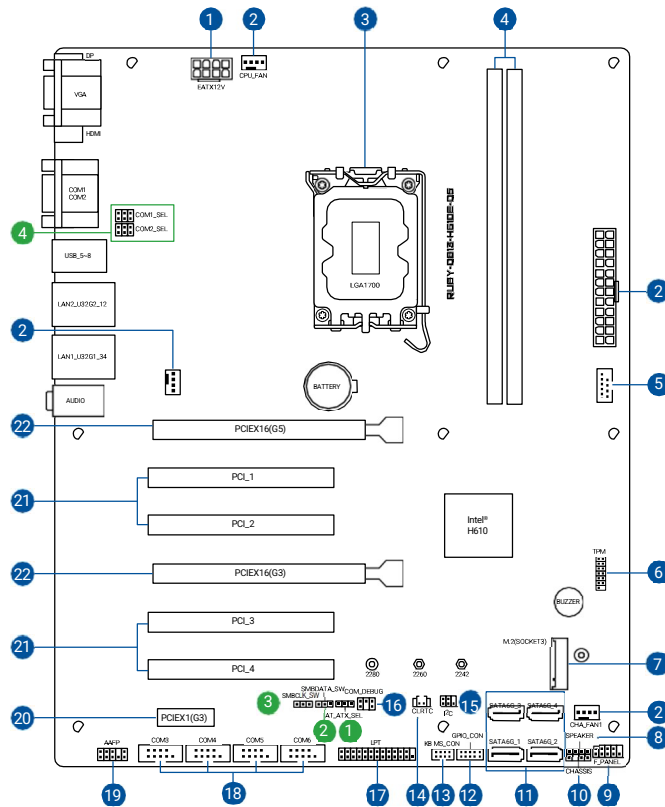
# Chapter 4

- 4 Hardware Configuration
- 4.1 Jumpers and Connectors
- 4.2 Jumper Settings
- 4.3 Connector Settings

# 4 Hardware Configuration

## 4.1 Jumpers and Connectors

Figure 1, RUBY-D814-Q870 Top View



## 4.2 Jumper Settings

For users to customize RUBY-D813-H610E-D5's features. In the following sections, Short means covering a jumper cap over jumper pins; Open or N/C (Not Connected) means removing a jumper cap from jumper pins. Users can refer to Figure 1 for the Jumper allocations.

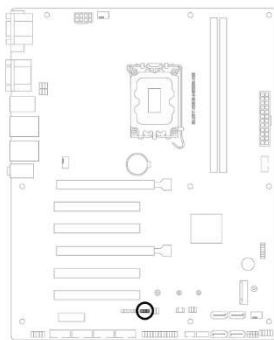
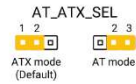
### Jumper Table

The jumper settings are schematically depicted in this manual as follows:

### Jump Function List:

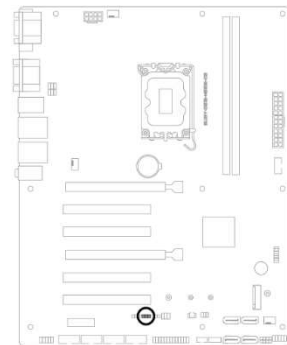
| Jump | Function                         | Remark |
|------|----------------------------------|--------|
| 1    | AT/ATX Mode selection jumper     | 2-pin  |
| 2    | 3-pin SMBDATA_SW                 | 3-pin  |
| 3    | 3-pin SMBCLK_SW                  | 3-pin  |
| 4    | COM RING/+5V/+12V ( COM1/2_SEL ) | 6-pin  |

#### 1: AT/ATX Mode selection jumper (3-pin AT\_ATX\_SEL)



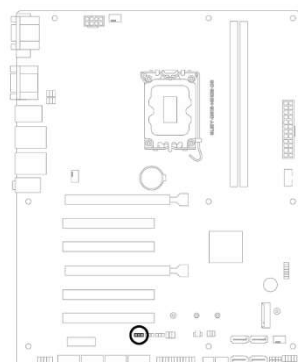
| PIN No.       | Signal Description |
|---------------|--------------------|
| 1-2 (default) | ATX ★              |
| 2-3           | AT                 |

#### 2: 3-pin SMBDATA\_SW



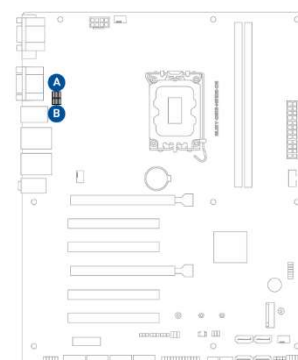
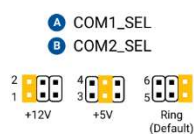
| PIN No.       | Signal Description          |
|---------------|-----------------------------|
| 1-2           | PCIe SMBus connection open  |
| 2-3 (default) | PCIe SMBus connection close |

#### 3: 3-pin SMBCLK\_SW



| PIN No.       | Signal Description           |
|---------------|------------------------------|
| 1-2           | PCIe SMBCLK connection open  |
| 2-3 (default) | PCIe SMBCLK connection close |

#### 4: PANEL Voltage Selection



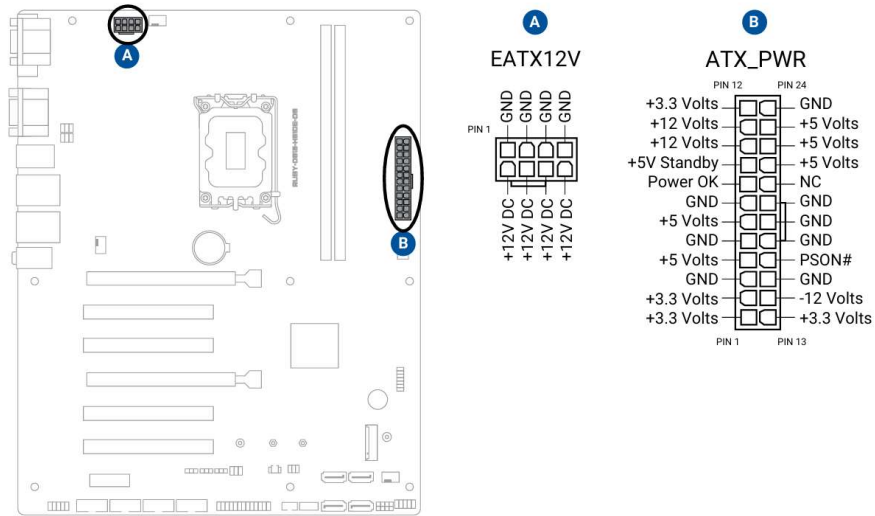
| PIN No.       | Signal Description |
|---------------|--------------------|
| 1-2           | +12V               |
| 3-4           | +5V                |
| 5-6 (default) | Ring               |

## 4.3 Connector Settings

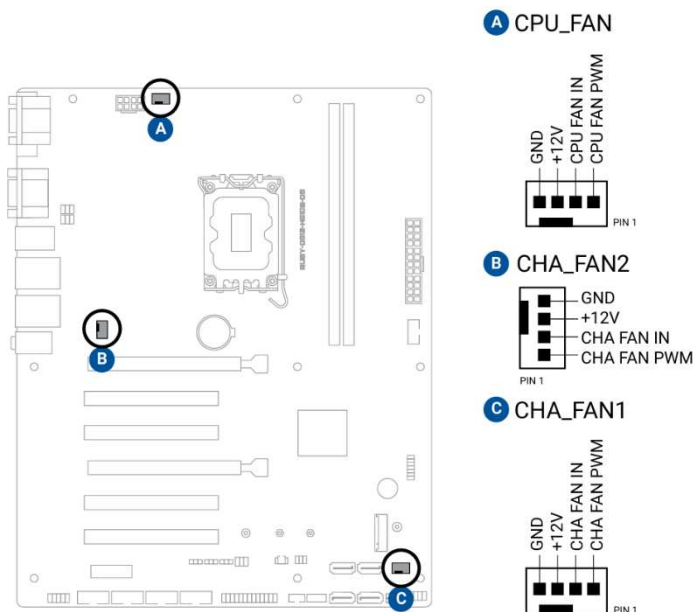
Connector Function List:

| Conn | Function                         | Remark          |
|------|----------------------------------|-----------------|
| 1    | ATX Power connectors             | 24-pin, 2x4-pin |
| 2    | CPU and Chassis Fan headers      | 4-pin           |
| 3    | Intel® LGA1700 CPU socket        |                 |
| 4    | DDR5 U-DIMM slots                |                 |
| 5    | USB 2.0 header                   | 10-1 pin        |
| 6    | TPM header                       | 14-1 pin        |
| 7    | M.2 socket ( socket 3 )          |                 |
| 8    | Internal Speaker header          | 4-1 pin         |
| 9    | System Panel header              | 10-1 pin        |
| 10   | Chassis Intrusion header         | 4-1 pin         |
| 11   | SATA 6.0 Gb/s connector          | 7-pin           |
| 12   | GPIO header                      | 6-1 pin         |
| 13   | PS/2 Keyboard & Mouse header     | 8-pin           |
| 14   | Clear RTC RAM                    | 2- pin          |
| 15   | I2C header                       | 6-1 pin         |
| 16   | COM Debug header                 | 5-1 pin         |
| 17   | LPT header                       | 26-1 pin        |
| 18   | COM Port headers ( COM3 – COM6 ) | 10-1 pin        |
| 19   | Front Panel Audio header         | 10-1 pin        |
| 20   | PCIe 3.0 x1 slot                 |                 |
| 21   | PCI slot                         |                 |
| 22   | PCIe 5.0/3.0 x16 slot            |                 |

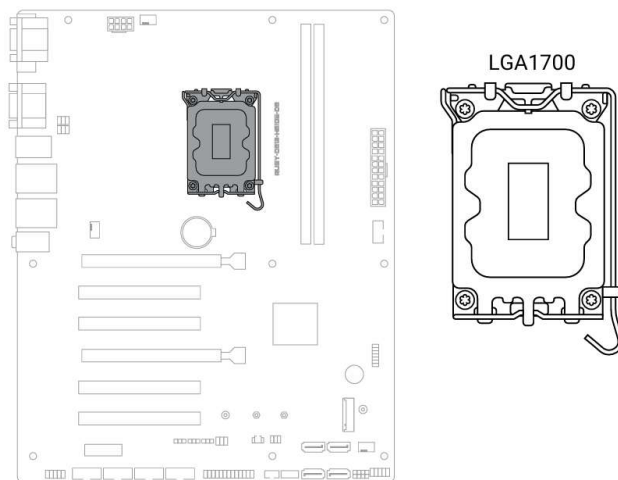
1 ATX Power connectors (24-pin ATXPWR、2x4-pin EATX12V)



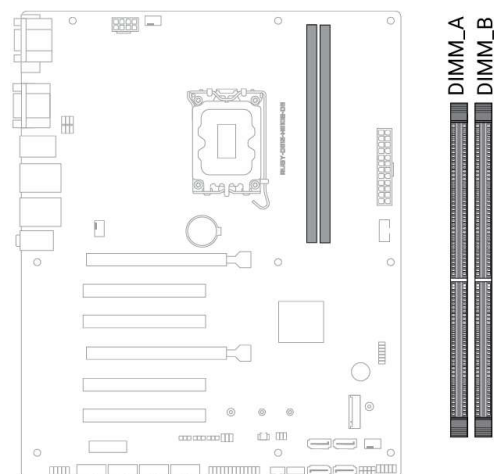
2 CPU and Chassis Fan headers (4-pin CPU\_FAN, 4-pin CHA\_FAN)



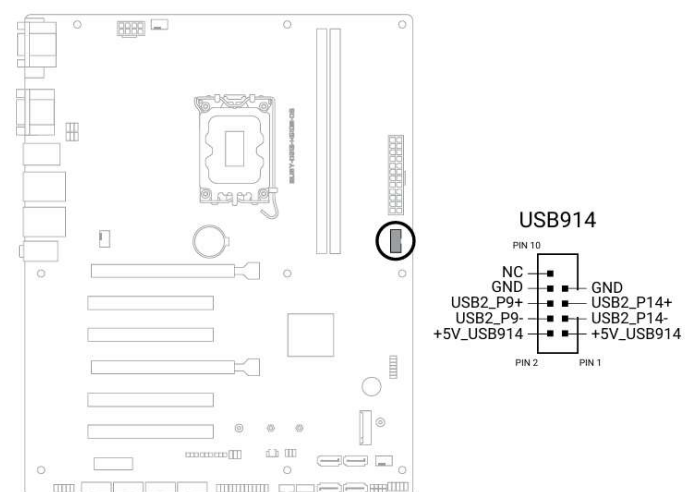
### 3 Intel® LGA1700 CPU socket



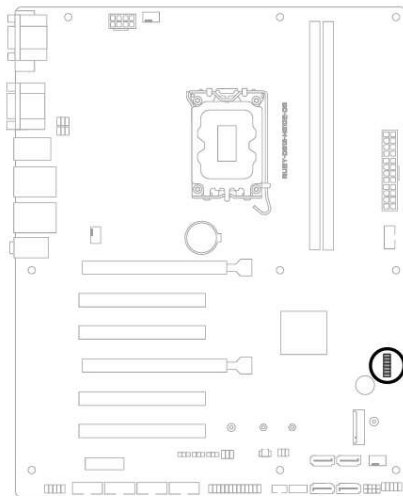
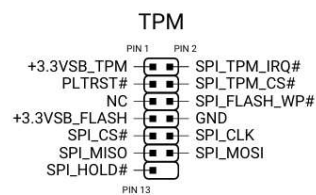
### 4 DDR5 U-DIMM slots



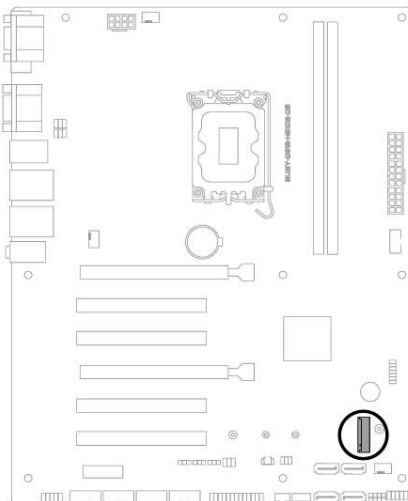
### 5 USB 2.0 header (10-pin USB914)



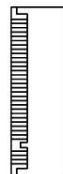
## 6 TPM header (14-1pin TPM)



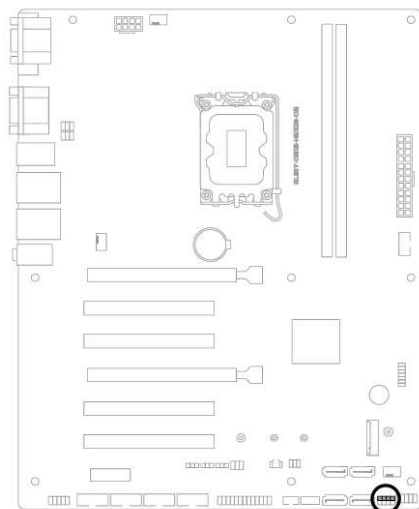
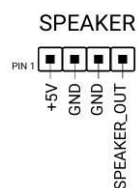
## 7 M.2 socket ( socket 3 )



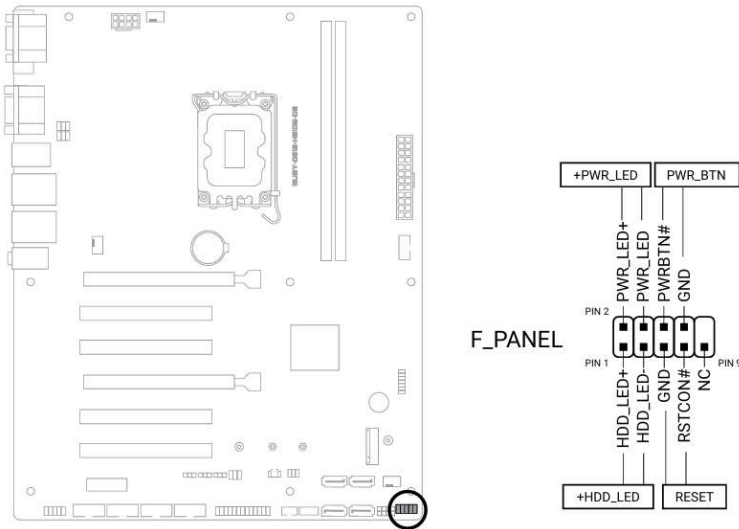
M.2(SOCKET3)



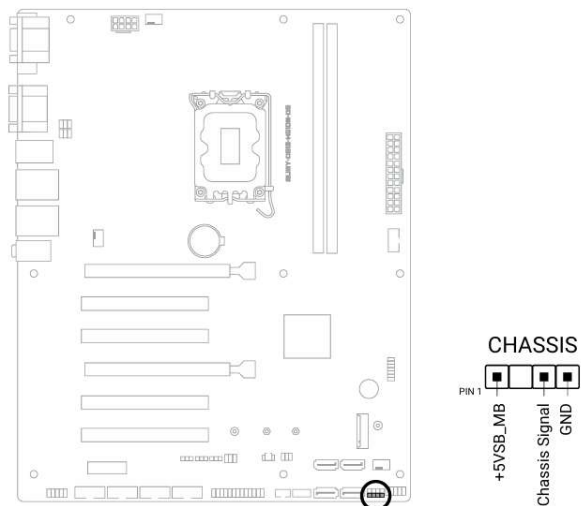
## 8 Internal Speaker header (4-pin SPEAKER)



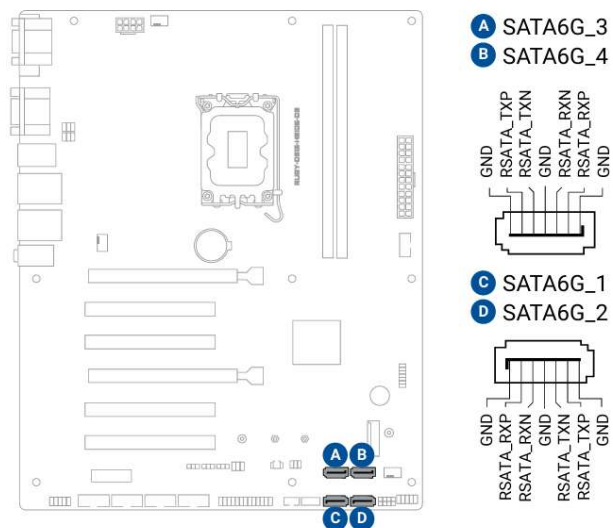
## 9 System Panel header (10-1 pin F\_PANEL)



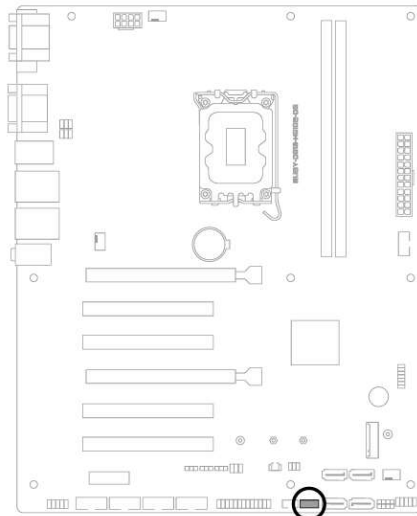
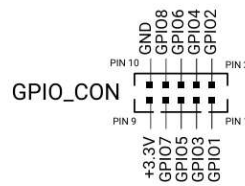
## 10 Chassis Intrusion header (4-1 pin CHASSIS)



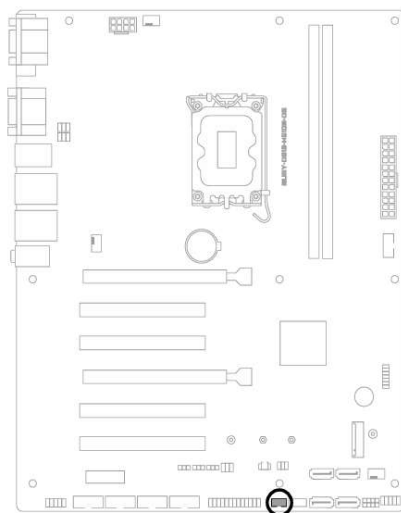
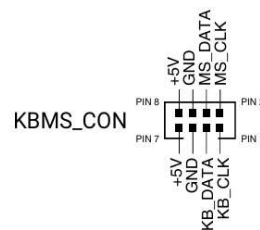
## 11 SATA 6.0 Gb/s connector (7-pin SATA6G\_1-4)



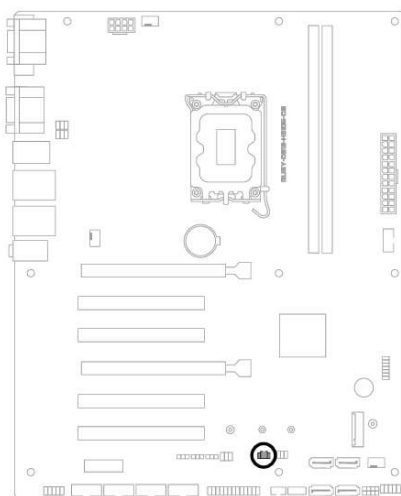
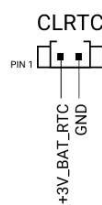
## 12 GPIO header (GPIO\_CON)



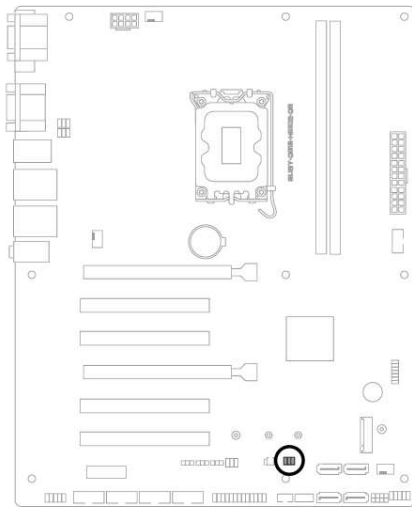
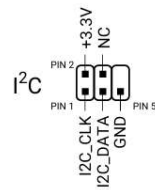
## 13 PS/2 Keyboard & Mouse header (8-pin KBMS\_CON)



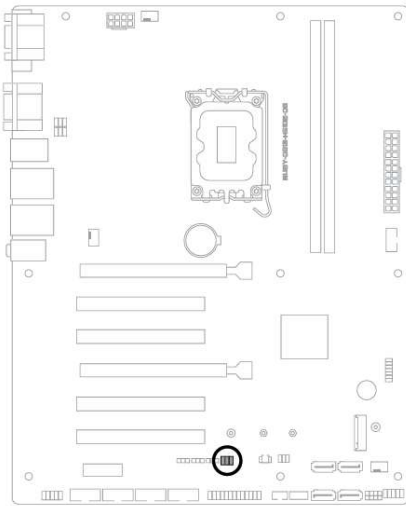
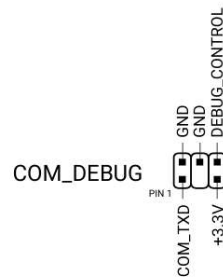
## 14 Clear RTC RAM (2-pin CLRTC)



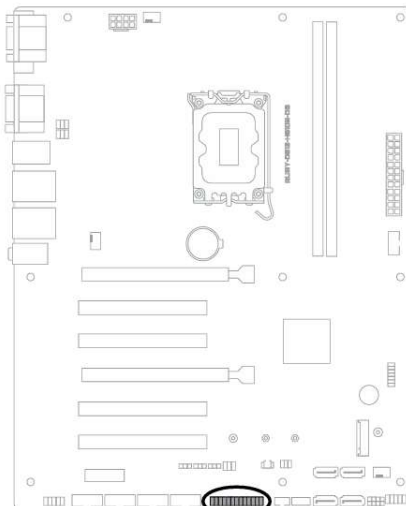
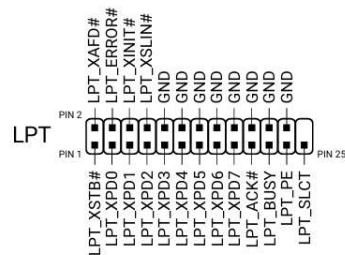
## 15 I2C header



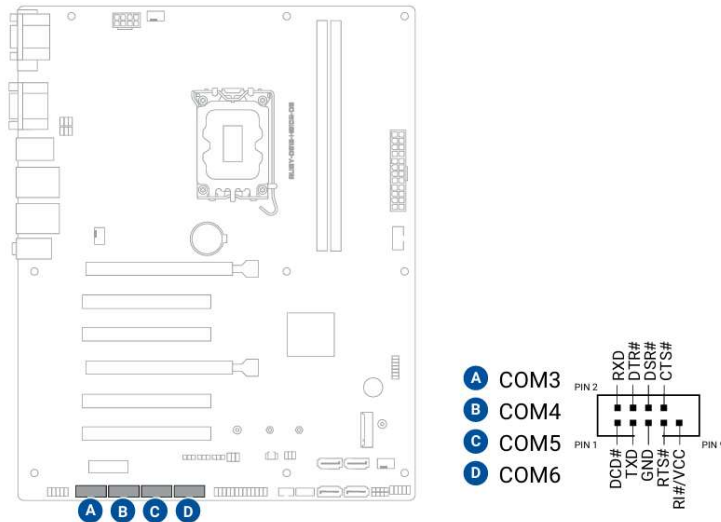
## 16 COM Debug header (5-1 pin COM\_DEBUG)



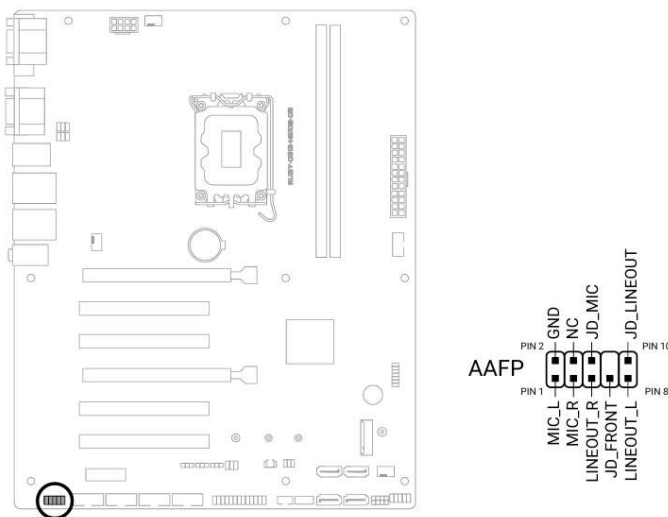
## 17 LPT header (26-1 pin LPT)



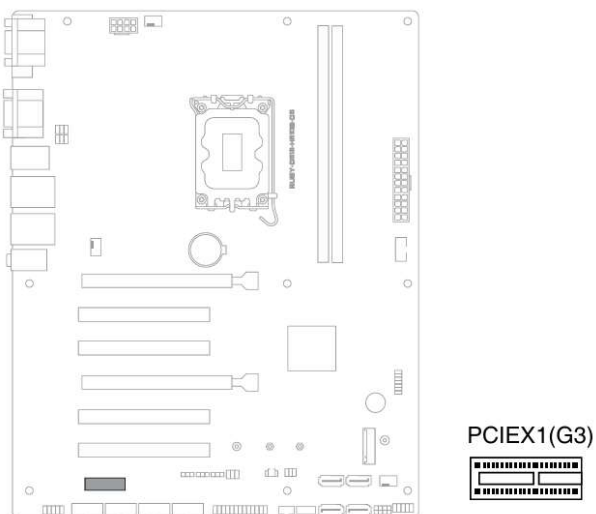
## 18 COM Port headers ( 10-pin COM3 – COM6 )



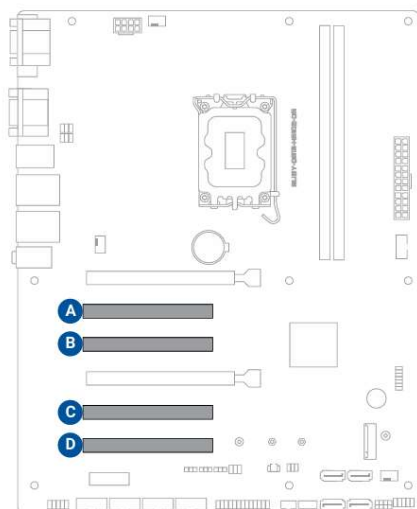
## 19 Front Panel Audio header (10-1 pin AAFP)



## 20 PCIe 3.0 x1 slot



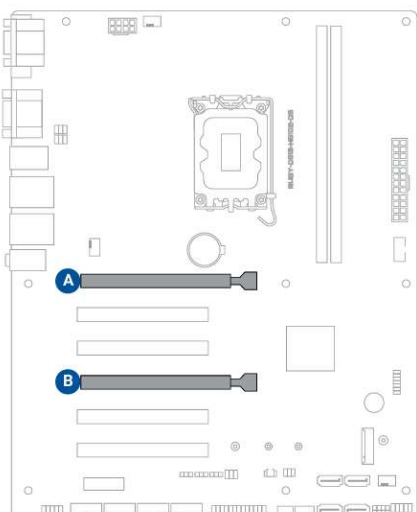
## 21 PCI slot



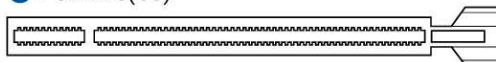
- A PCI\_1
- B PCI\_2
- C PCI\_3
- D PCI\_4



## 22 PCIe 5.0/3.0 x16 slot



- A PCIe16(G5)
- B PCIe16(G3)



# Chapter 5

## Overview

- 5 Sample Code
- 5.1 Watch Dog Signal
- 5.2 Signal GPIO Signal

## 5 Sample Code

### 5.1 Watch Dog Signal

WDT setting

SIO\_INDEX\_PORT is 0x2E SIO\_DATA\_PORT is 0x2F

#### 1. Set WDT Time Unit

```
Outportb(SIO_INDEX_PORT, 0x87); // Unlock SIO Outportb(SIO_INDEX_PORT, 0x87); // Unlock SIO
```

```
Outportb(SIO_INDEX_PORT, 0x07); Outportb(SIO_DATA_PORT, 0x08);
```

```
Outportb(SIO_INDEX_PORT, 0xF0); //select WDT setting
```

```
val = Inportb(SIO_DATA_PORT) // Read current WDT setting
```

```
val = val | 0x08; // minute mode, val = val & 0xF7 if second mode Outportb(SIO_INDEX_PORT, 0xF0); //select WDT setting Outportb(SIO_DATA_PORT, val); // Write back WDT setting
```

```
Outportb(SIO_INDEX_PORT, 0xAA); // Lock SIO
```

#### 2. Set WDT Time

```
Outportb(SIO_INDEX_PORT, 0x87); // Unlock SIO Outportb(SIO_INDEX_PORT, 0x87); // Unlock SIO
```

```
Outportb(SIO_INDEX_PORT, 0x07); Outportb(SIO_DATA_PORT, 0x08);
```

```
Outportb(SIO_INDEX_PORT, 0xF1); //select time value
```

```
Outportb(SIO_DATA_PORT, Time); // Write WDT time, value 1 to 255
```

```
Outportb(SIO_INDEX_PORT, 0xAA); // Lock SIO
```

### 3. Enable WDT

```
Outportb(SIO_INDEX_PORT, 0x87); // Unlock SIO Outportb(SIO_INDEX_PORT, 0x87); // Unlock SIO
```

```
Outportb(SIO_INDEX_PORT, 0x07); // select device Outportb(SIO_DATA_PORT, 0x08); // device 8 Outportb(SIO_INDEX_PORT, 0x30); //select WDT status port val = Inportb(SIO_DATA_PORT) // Read current WDT status
```

```
val = val | 0x01; // Enable WDT Timer
```

```
Outportb(SIO_INDEX_PORT, 0x30); //select WDT status port Outportb(SIO_DATA_PORT, val); // Write back WDT status
```

```
Outportb(SIO_INDEX_PORT, 0xAA); // Lock SIO
```

### 4. Disable WDT

```
Outportb(SIO_INDEX_PORT, 0x87); // Unlock SIO Outportb(SIO_INDEX_PORT, 0x87); // Unlock SIO
```

```
Outportb(SIO_INDEX_PORT, 0x07); Outportb(SIO_DATA_PORT, 0x08); Outportb(SIO_INDEX_PORT, 0xF1); //select time value Outportb(SIO_DATA_PORT, 0x00); // Clear WDT time, it means WDT Time-Out disable Outportb(SIO_INDEX_PORT, 0x30); //select WDT status port
```

```
val = Inportb(SIO_DATA_PORT) // Read current WDT status val = val & 0xFE; // Disable WDT Timer Outportb(SIO_INDEX_PORT, 0x30); //select WDT status port Outportb(SIO_DATA_PORT, val); // Write back WDT status
```

```
Outportb(SIO_INDEX_PORT, 0xAA); // Lock SIO
```

### 5. RUBY-D813-H610E SIO not support WDT Reset Flag judgement.

## 5.2 GPIO Signal

### GPIO Setting

SIO\_INDEX\_PORT is 0x2E SIO\_DATA\_PORT is 0x2F

```
Set GPIOn to GPI or GPO Outportb(SIO_INDEX_PORT, 0x87); // Unlock SIO
Outportb(SIO_INDEX_PORT, 0x87); // Unlock SIO
```

```
Outportb(SIO_INDEX_PORT, 0x07); Outportb(SIO_DATA_PORT, 0x07);
```

```
Outportb(SIO_INDEX_PORT, 0x30); val = Inportb(SIO_DATA_PORT)
val = val | 0x10; Outportb(SIO_INDEX_PORT, 0x30);
Outportb(SIO_DATA_PORT, val); // Active GPIO
```

```
Outportb(SIO_INDEX_PORT, 0xF0);
val = Inportb(SIO_DATA_PORT) // Read current value
val = val | (0x01 << GPIOn); // GPO, val = val & ~(0x01 << GPIOn); if GPI, GPIOn is value 0 to 7
```

```
Outportb(SIO_INDEX_PORT, 0xF0); Outportb(SIO_DATA_PORT, val);
```

```
Outportb(SIO_INDEX_PORT, 0xAA); // Lock SIO
```

```
Get GPIOn GPI value Outportb(SIO_INDEX_PORT, 0x87); // Unlock SIO
Outportb(SIO_INDEX_PORT, 0x87); // Unlock SIO
```

```
Outportb(SIO_INDEX_PORT, 0x07); Outportb(SIO_DATA_PORT, 0x07);
```

```
Outportb(SIO_INDEX_PORT, 0x30); val = Inportb(SIO_DATA_PORT)
val = val | 0x10; Outportb(SIO_INDEX_PORT, 0x30);
Outportb(SIO_DATA_PORT, val); // Active GPIO
```

```
Outportb(SIO_INDEX_PORT, 0xF1);
val = Inportb(SIO_DATA_PORT) // Read current value Outportb(SIO_INDEX_PORT, 0xAA); //
Lock SIO
```

```
if (val & (0x01 << GPIO_n)) // Determine if GPIO_n is High or Low; GPIO_n is value 0 to 7
```

```
else
```

```
return HIGH; //GPI High return LOW; //GPI Low
```

```
Set GPIO_n GPO value Outportb(SIO_INDEX_PORT, 0x87); // Unlock SIO
```

```
Outportb(SIO_INDEX_PORT, 0x87); // Unlock SIO
```

```
Outportb(SIO_INDEX_PORT, 0x07); Outportb(SIO_DATA_PORT, 0x07);
```

```
Outportb(SIO_INDEX_PORT, 0x30); val = Inportb(SIO_DATA_PORT)
```

```
val = val | 0x10; Outportb(SIO_INDEX_PORT, 0x30);
```

```
Outportb(SIO_DATA_PORT, val); // Active GPIO
```

```
Outportb(SIO_INDEX_PORT, 0xF1);
```

```
val = Inportb(SIO_DATA_PORT) // Read current value
```

```
val = val | (0x01 << GPIO_n); // GPO LOW, val = val & ~(0x01 << GPIO_n); if GPO High, GPIO_n is  
value 0 to 7 Outportb(SIO_INDEX_PORT, 0xF1);
```

```
Outportb(SIO_DATA_PORT, val); Outportb(SIO_INDEX_PORT, 0xAA); // Lock SIO
```

# Chapter 6

- 6 BIOS Setup Items
- 6.1 Entering Setup -- Launch System Setup
- 6.2 Main
- 6.3 Configuration

## 6 BIOS Setup Items

The following section describes the BIOS setup program. The BIOS setup program can be used to view and change the BIOS settings for the module. Only experienced users should change the default BIOS settings.

## 6.1 Entering Setup -- Launch System Setup

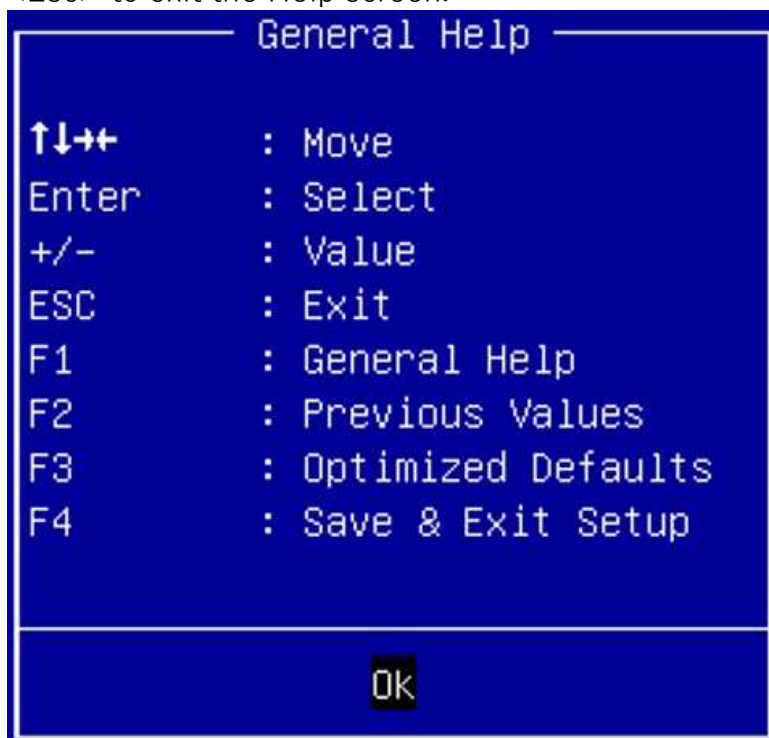
Power on the computer and the system will start POST (Power On Self Test) process. When the message below appears on the screen, press <Del> key will enter BIOS setup screen.

Press <Del> to enter SETUP

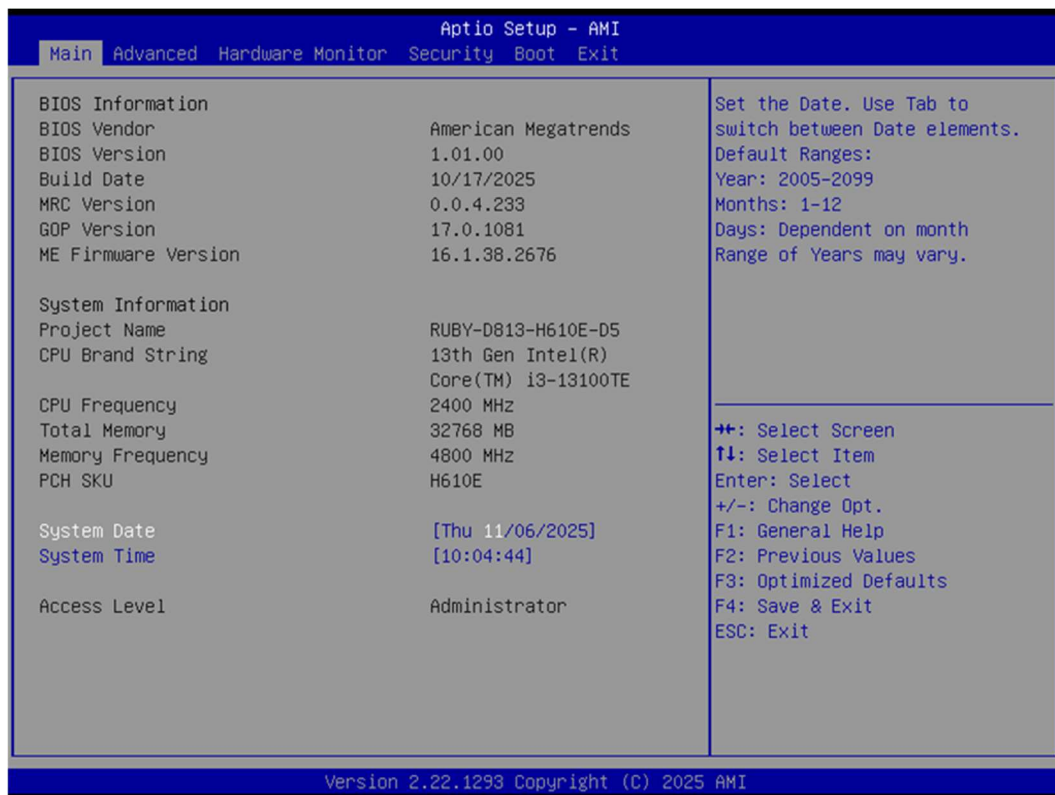
If the message disappears before responding and still wish to enter Setup, please restart the system by turning it OFF and On or pressing the RESET button. It can be also restarted by pressing <Ctrl>, <Alt>, and <Delete> keys on keyboard simultaneously.

Press <F1> to Run General Help or Resume

The BIOS setup program provides a General Help screen. The menu can be easily called up from any menu by pressing <F1>. The Help screen lists all the possible keys to use and the selections for the highlighted item. Press <Esc> to exit the Help screen.

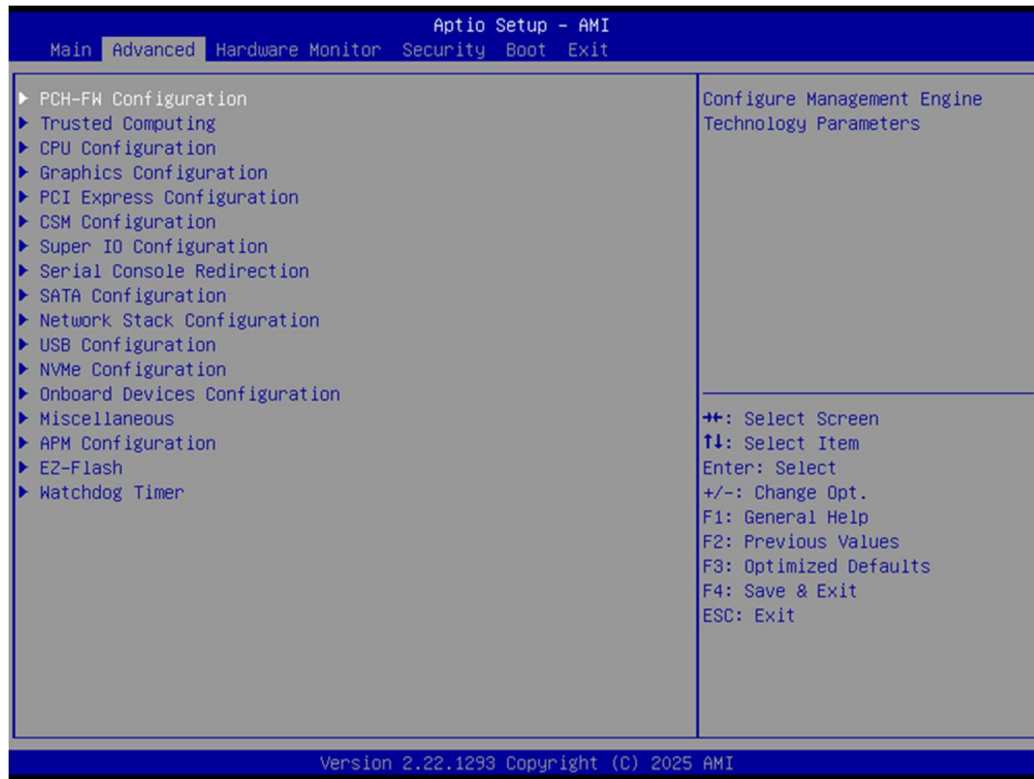


## 6.2 Main



| Feature     | Description                                                                                                                                                              | Options |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| System Date | Set the Date. Use Tab to switch between Date elements.<br>Default Ranges:<br>Year: 2005 – 2099<br>Months: 1 – 12<br>Days: Dependent on month<br>Range of Years may vary. |         |
| System Time | Set the Time. Use Tab to switch between Time elements.                                                                                                                   |         |

## 6.3 Advanced

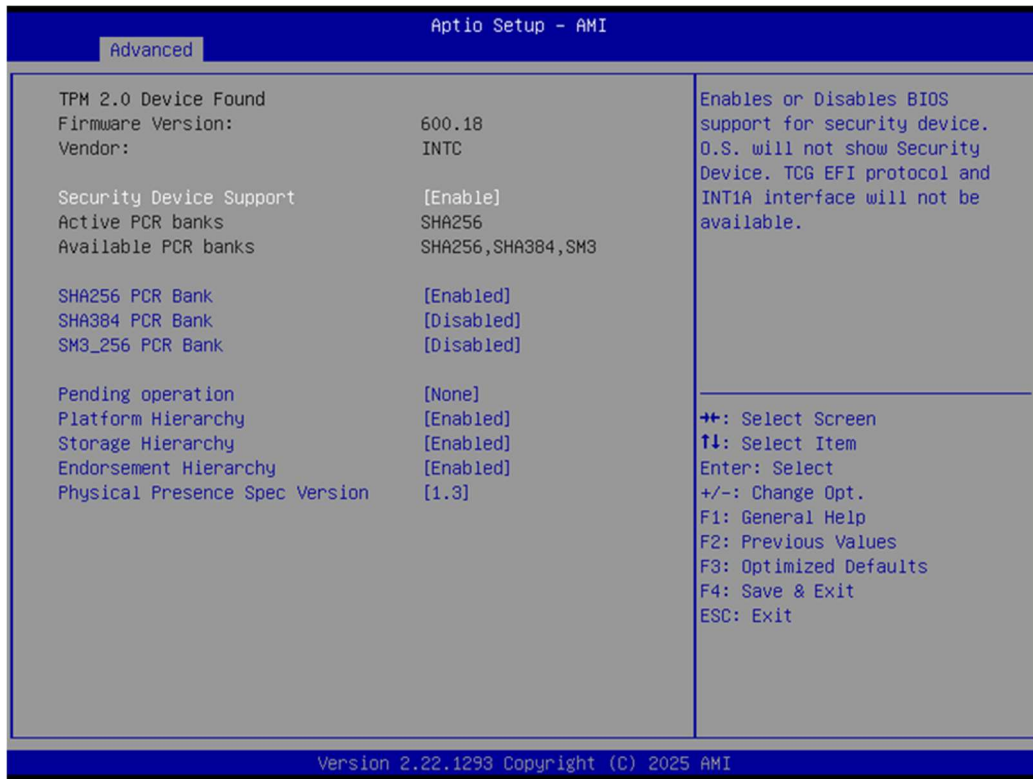


## 6.3.1 PCH-FW Configuration



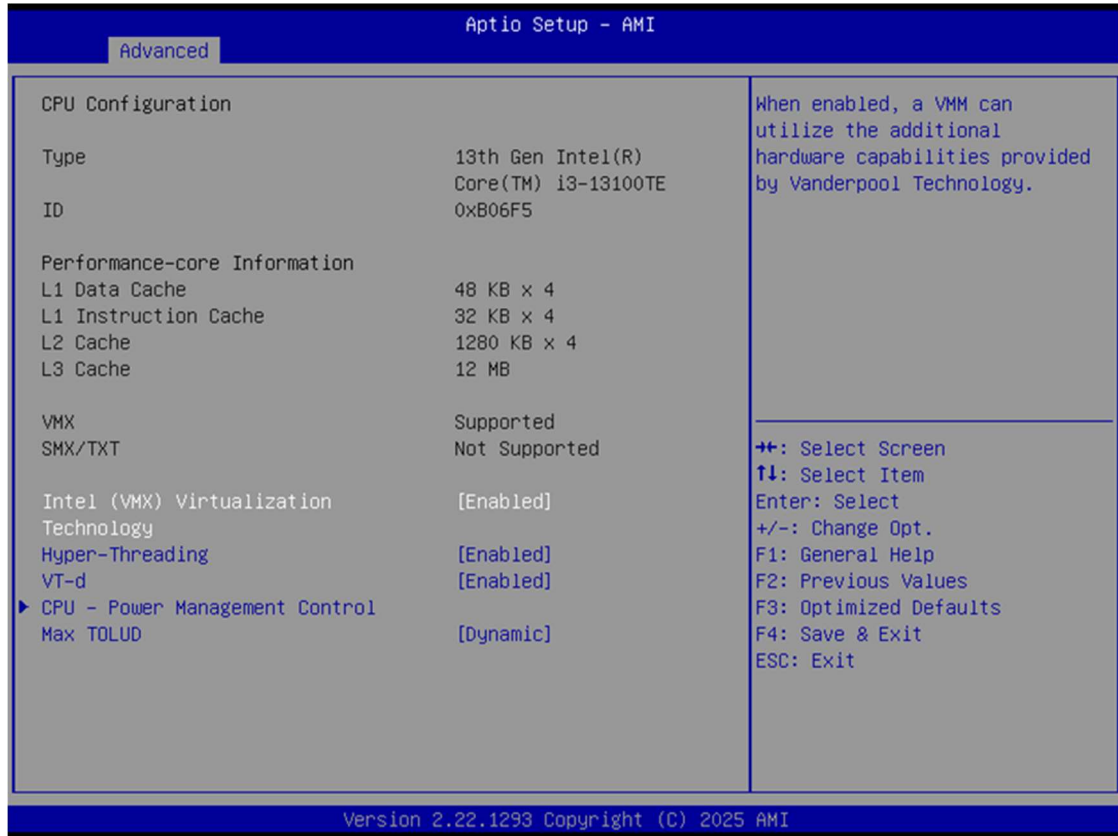
| Feature              | Description                                                                                                                                                                 | Options    |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| TPM Device Selection | Selection TPM Device: PTT or dTPM. PTT – Enabled PTT in SkuMgr dTPM 1.2 – Disabled PTT in SkuMgr Warning! PTT/dTPM. Will be disabled and all data saved on it will be lost. | ★dTPM, PTT |

## 6.3.2 Trusted Computing



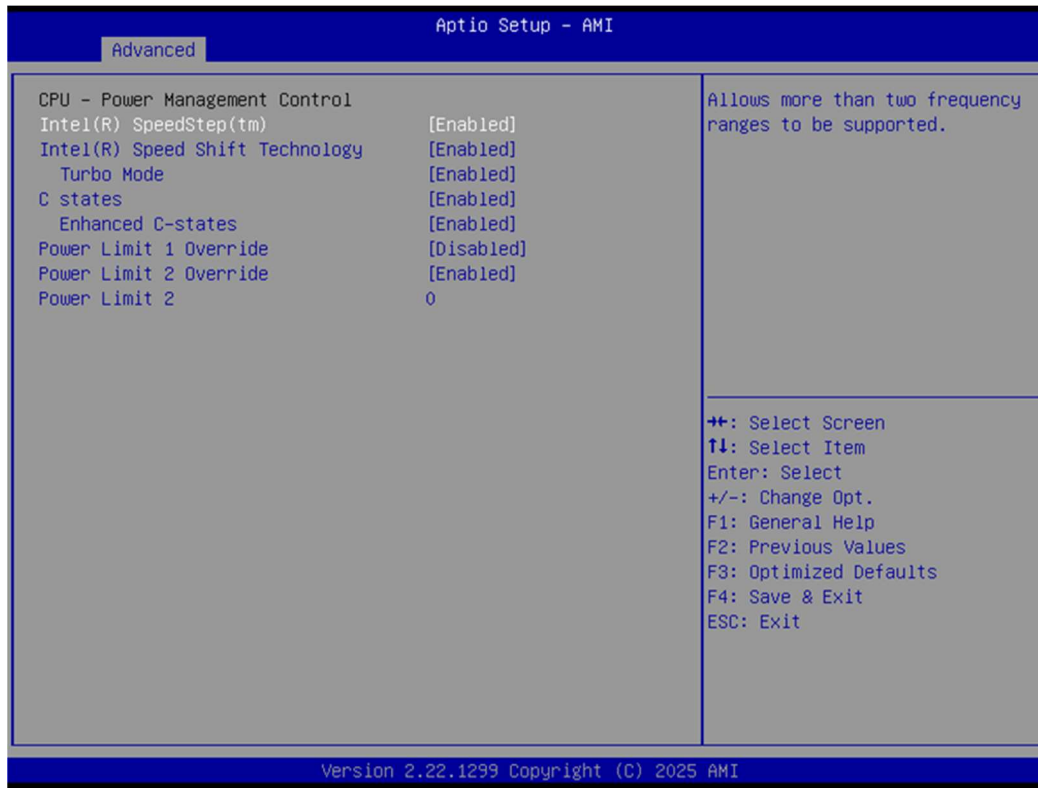
| Feature                        | Description                                                                                                                                           | Options            |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| TPM Device Selection [PTT]     |                                                                                                                                                       |                    |
| Security Device Support        | Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available. | ★Enabled, Disabled |
| SHA256 PCR Bank                | Enables or Disables SHA256 PCR Bank.                                                                                                                  | ★Enabled, Disabled |
| SHA384 PCR Bank                | Enables or Disables SHA384 PCR Bank.                                                                                                                  | Enabled, ★Disabled |
| SM3_256 PCR Bank               | Enables or Disables SM3_256 PCR Bank                                                                                                                  | Enabled, ★Disabled |
| Pending operation              | Schedule an Operation for the Security Device. Note: Your Computer will reboot during restart in order to change State of Security Device.            | ★None, TPM Clear   |
| Platform Hierarchy             | Enables or Disables Platform Hierarchy.                                                                                                               | ★Enabled, Disabled |
| Storage Hierarchy              | Enables or Disables Storage Hierarchy.                                                                                                                | ★Enabled, Disabled |
| Endorsement Hierarchy          | Enables or Disables Endorsement Hierarchy.                                                                                                            | ★Enabled, Disabled |
| Physical Presence Spec Version | Select to Tell O.S. to Support PPI Spec Version 1.2 or 1.3. Note some HCK tests might not support 1.3.                                                | 1.2, ★1.3          |

## 6.3.3 CPU Configuration



| Feature                              | Description                                                                                                                              | Options                                                                  |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Intel (VMX)Virtualization Technology | When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.                                  | ★Enabled, Disabled                                                       |
| Hyper-Threading                      | Enable or Disable Hyper-Threading Technology..                                                                                           | ★Enabled, Disabled                                                       |
| VT-d                                 | VT-d capability                                                                                                                          | ★Enabled, Disabled                                                       |
| Max TOLUD                            | Maximum Value of TOLUD. Dynamic assignment would adjust TOLUD automatically based on largest MMIO length of installed graphic controller | ★Dynamic, 0.75 GB, 1 GB, 1.25 GB, 1.5 GB, 1.75 GB, 2 GB, 2.25 GB, 2.5 GB |

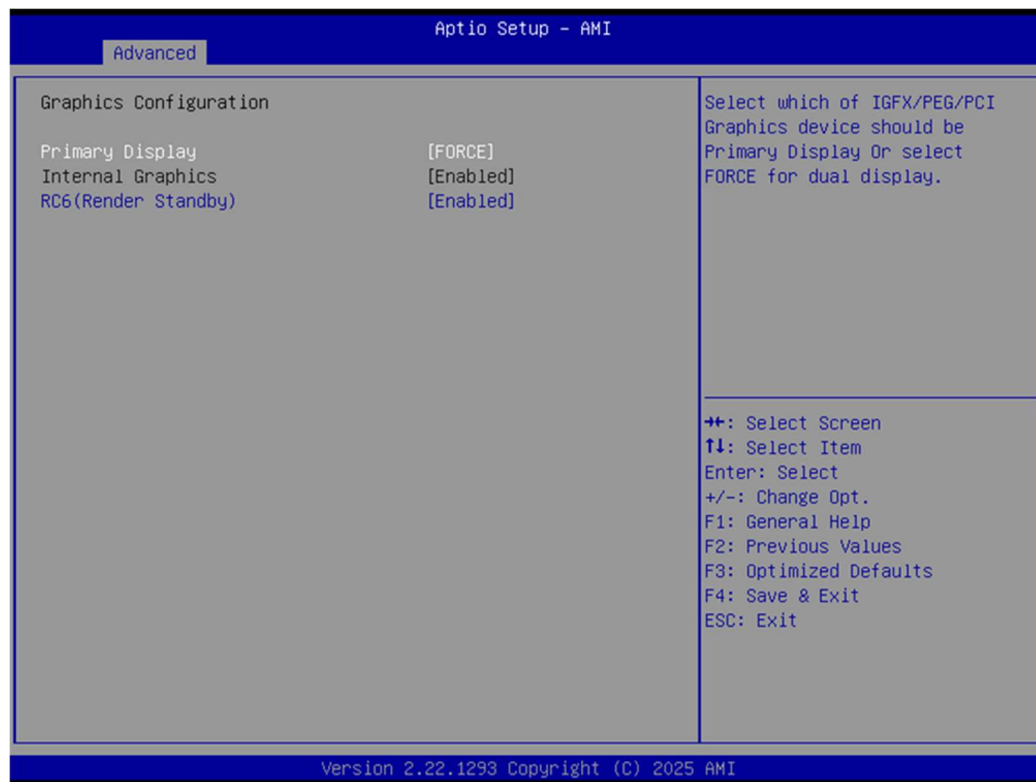
## CPU – Power Management Control



| Feature                         | Description                                                                                                                                              | Options            |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Intel(R) SpeedStep(tm)          | Allows more than two frequency ranges to be supported.                                                                                                   | ★Enabled, Disabled |
| Intel(R) Speed Shift Technology | Enable/Disable Intel(R) Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states.            | ★Enabled, Disabled |
| Turbo Mode                      | Enable/Disable processor Turbo Mode. (requires EMTTM enabled too) AUTO means enabled.                                                                    | ★Enabled, Disabled |
| C states                        | Enable/Disable CPU Power Management. Allows CPU to go to C states when it's not 100% utilized.                                                           | ★Enabled, Disabled |
| Enhanced C-states               | Enable/Disable C1E. When enabled, CPU will switch to minimum speed when all cores enter C-State.                                                         | ★Enabled, Disabled |
| Power Limit 1 Override          | Enable/Disable Power Limit 1 override. If this option is disabled, BIOS will program the default values for power Limit 1 and Power Limit 1 Time Window. | Enabled, ★Disabled |

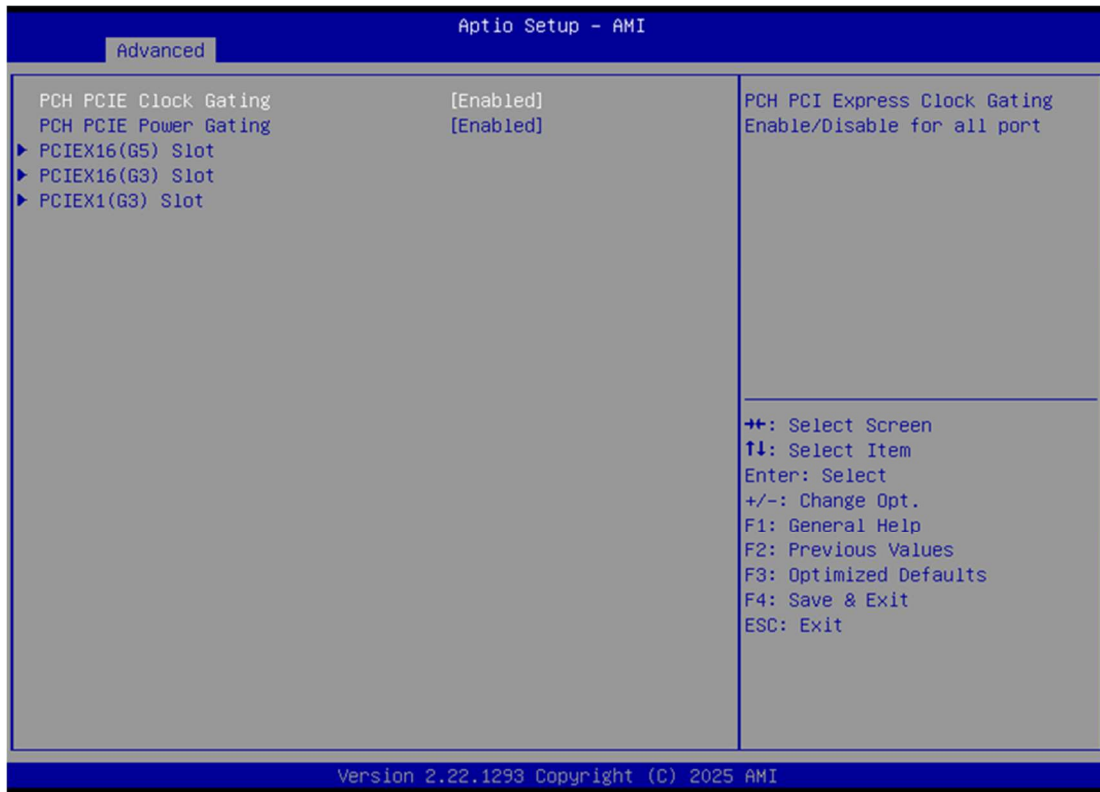
| Feature                          | Description                                                                                                                                                                                                                                                                                                                                  | Options            |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Power Limit 1 Override [Enabled] |                                                                                                                                                                                                                                                                                                                                              |                    |
| Power Limit 1                    | Power Limit 1 in Millie Watt's. BIOS will round to the nearest 1/8W when programming. 0 = no custom override. For 12.50W, enter 12500. Over clocking SKU: Value must be between Max and Min Power Limits. (Specified by PACKAGE_POWER_SKU_MSR). Other SKUs: This value must be between Min Power Limit and Processor Base Power (TDP) Limit. | ★0                 |
| Power Limit 2 Override           | Enable/Disable Power Limit 2 override. If this option is disabled, BIOS will program the default values for Power Limit 2.                                                                                                                                                                                                                   | ★Enabled, Disabled |
| Power Limit 2                    | Power Limit 2 value in Millie Watt's. BIOS will round to the nearest 1/8W when programming. If the value is 0, BIOS will program this value as 1.25*Processor Base Power (TDP). For 12.50w, enter 12500. Processor applies control policies such that the package power does not exceed this limit.                                          | ★0                 |

## 6.3.4 Graphics Configuration



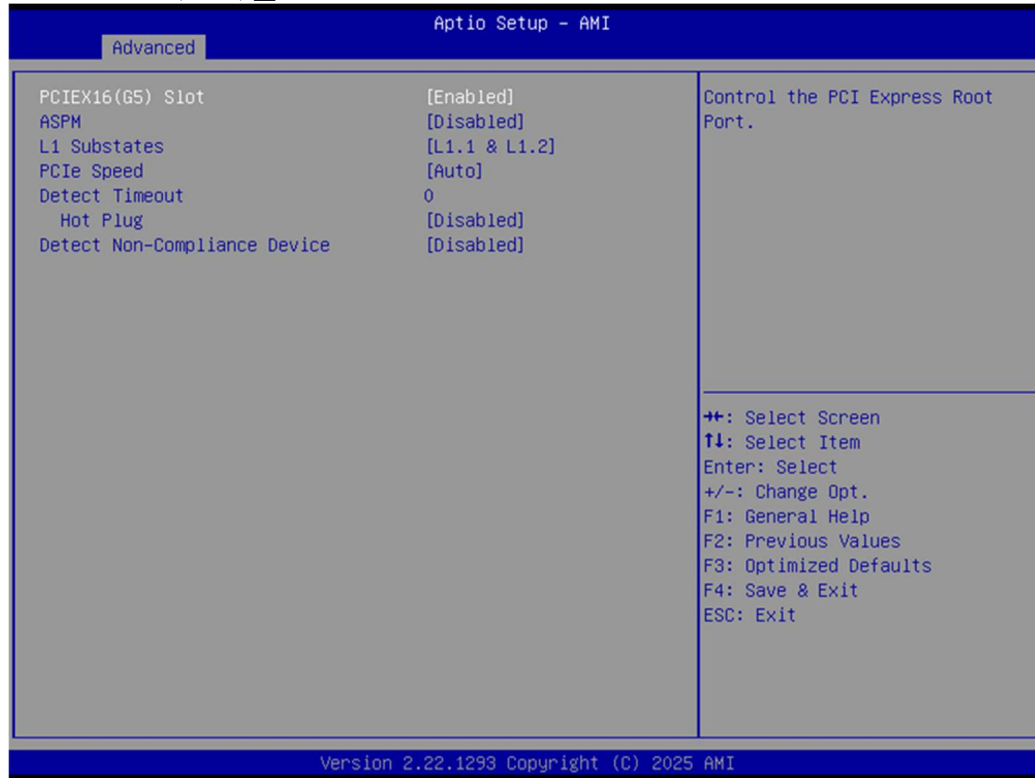
| Feature                | Description                                                                                              | Options                               |
|------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------|
| Primary Display        | Select which of IGFX/PEG/PCI Graphics device should be Primary Display or select FORCE for dual display. | ★FORCE, Auto, IGFX, PEG Slot, PCH PCI |
| Primary Display [IGFX] |                                                                                                          |                                       |
| Internal Graphics      | Keep IGFX enabled based on the setup options.                                                            | ★Enabled, Disabled                    |
| RC6(Render Standby)    | Check to enable render standby support.                                                                  | ★Enabled, Disabled                    |

## 6.3.5 PCI Express Configuration



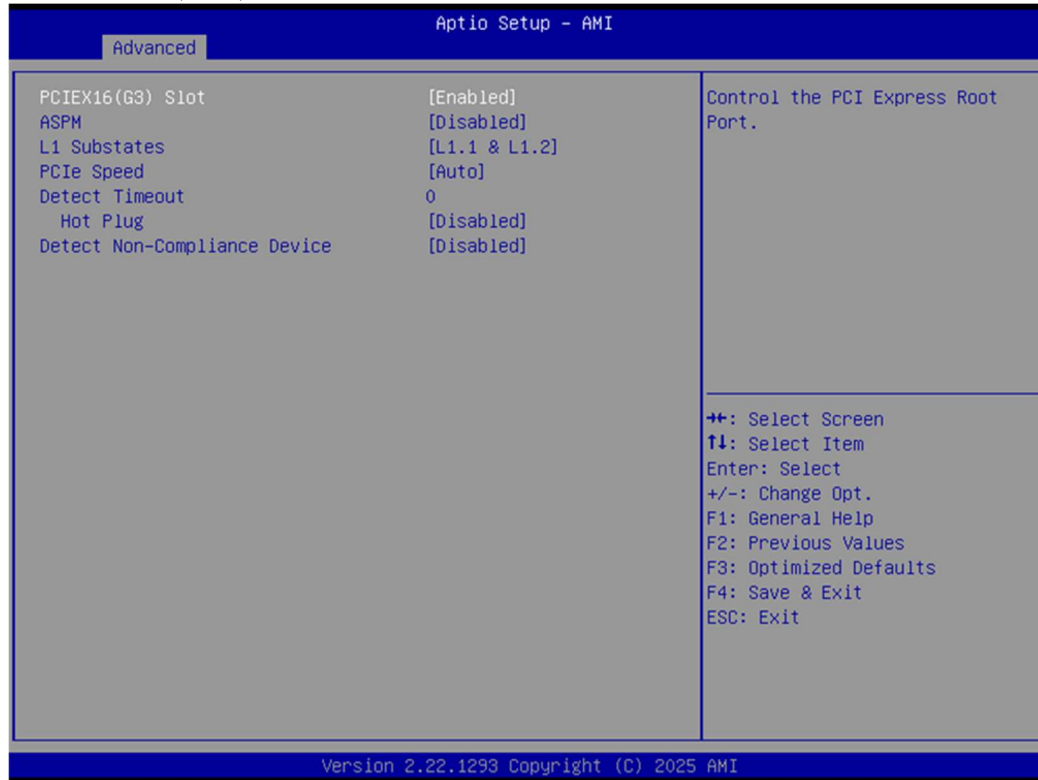
| Feature               | Description                                              | Options            |
|-----------------------|----------------------------------------------------------|--------------------|
| PCH PCIE Clock Gating | PCH PCI Express Clock Gating Enable/Disable for all port | ★Enabled, Disabled |
| PCH PCIE Power Gating | PCH PCI Express Power Gating Enable/Disable for all port | ★Enabled, Disabled |
| PCIEx16 (G5) Slot     | PCI Express Configuration settings.                      |                    |
| PCIEx16 (G3) Slot     | Control the PCI Express Root Port.                       |                    |
| PCIEx1 (G3) Slot      | Control the PCI Express Root Port.                       |                    |

## PCIEx16(G5)\_1 Slot

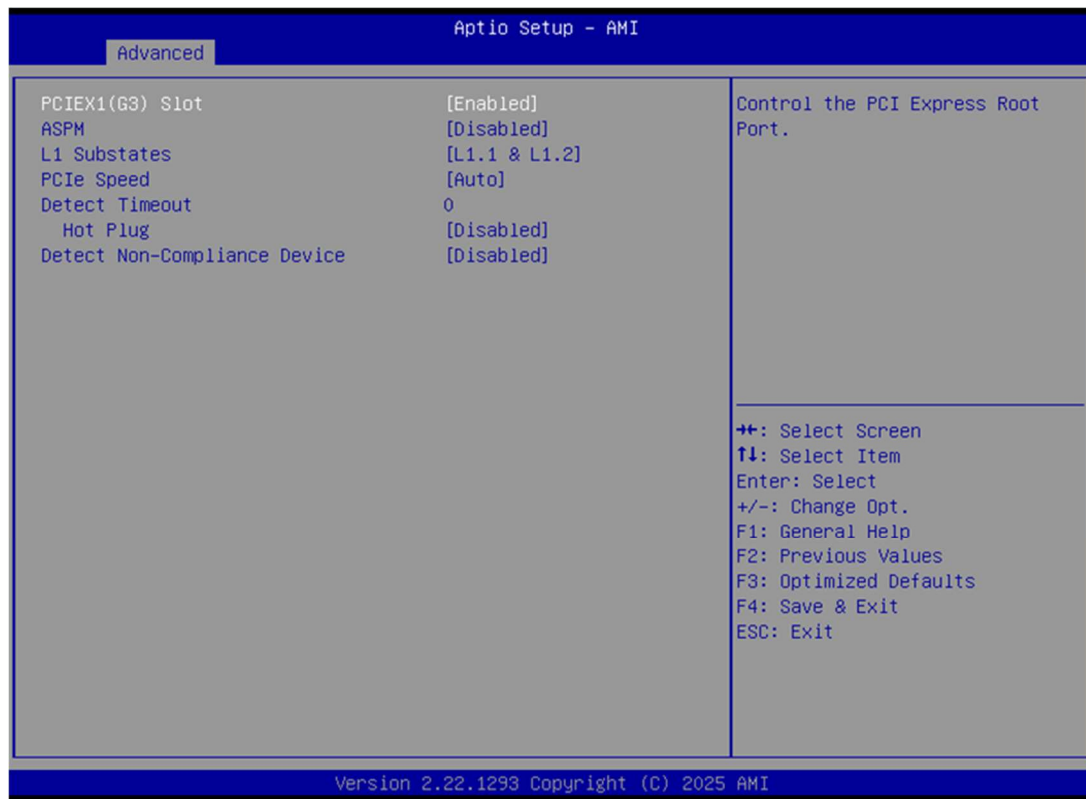


| Feature                      | Description                                                                                                                                  | Options                             |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| PCIEx16 (G5) Slot            | Control the PCI Express Root Port.                                                                                                           | ★Enabled, Disabled                  |
| ASPM                         | Set the ASPM Level:<br>Force L0s – Force all links to L0s State<br>AUTO-BIOS auto configure<br>DISABLE – Disables ASPM                       | ★Disabled, L0s, L1, L0sL1           |
| L1 Substates                 | PCI Express L1 Substates settings. L1SS cannot be enabled when CLKREQMSG is disabled                                                         | ★L1.1 & L1.2, Disabled, L1.1        |
| PCIe Speed                   | Configure PCIe speed                                                                                                                         | ★Auto, Gen1, Gen2, Gen3, Gen4, Gen5 |
| Detect Timeout               | The number of milliseconds reference code will wait for enabled ports before assuming there is no device and potentially disabling the port. | ★0                                  |
| Hot Plug                     | PCI Express Hot Plug Enable/Disable                                                                                                          | Enabled, ★Disabled                  |
| Detect Non-compliance Device | Enable when using Compliance Load Board                                                                                                      | Enabled, ★Disabled                  |

## PCIEx16(G3) Slot

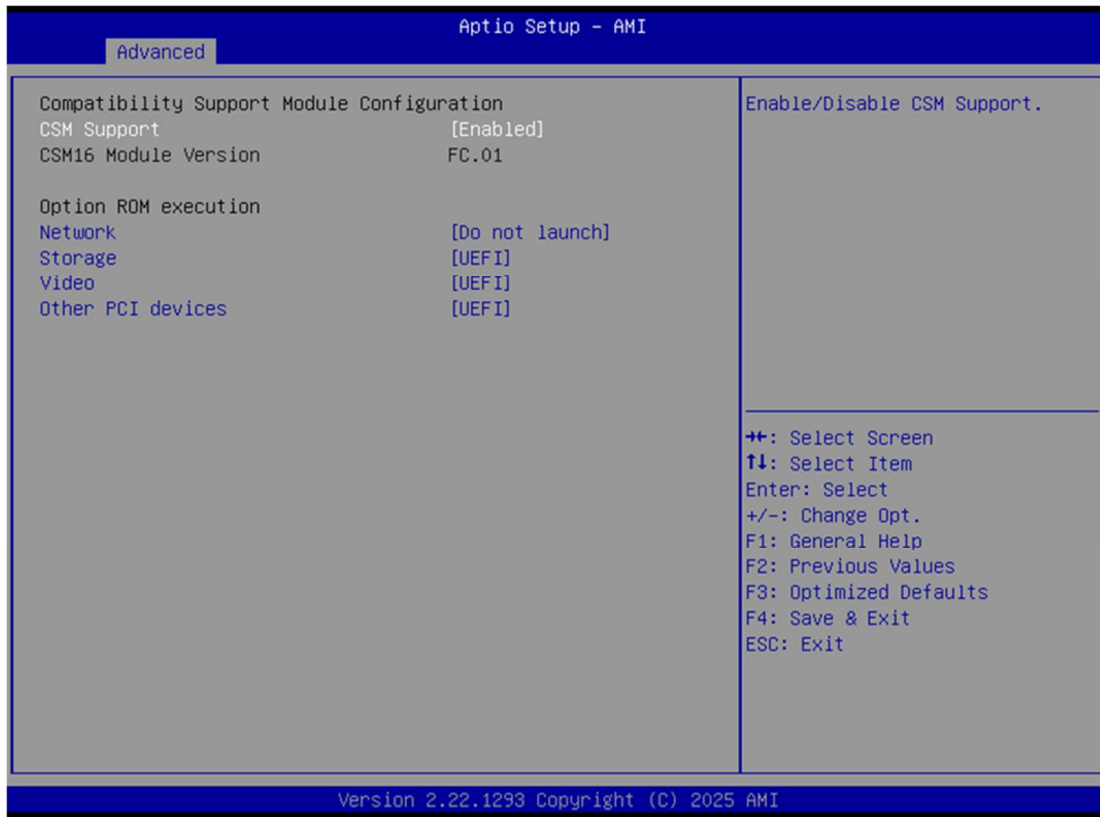


| Feature                      | Description                                                                                                                                  | Options                         |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| PCIEx16 (G3) Slot            | Control the PCI Express Root Port.                                                                                                           | ★Enabled, Disabled              |
| ASPM                         | Set the ASPM Level:<br>Force L0s – Force all links to L0s State<br>AUTO-BIOS auto configure<br>DISABLE – Disables ASPM                       | ★Disabled, L1, Auto             |
| L1 Substates                 | PCI Express L1 Substates settings.                                                                                                           | ★L1.1 & L1.2,<br>Disabled, L1.1 |
| PCIe Speed                   | Configure PCIe speed                                                                                                                         | ★Auto, Gen1, Gen2,<br>Gen3      |
| Detect Timeout               | The number of milliseconds reference code will wait for enabled ports before assuming there is no device and potentially disabling the port. | ★0                              |
| Hot Plug                     | PCI Express Hot Plug Enable/Disable                                                                                                          | Enabled, ★Disabled              |
| Detect Non-compliance Device | Enable when using Compliance Load Board                                                                                                      | Enabled, ★Disabled              |



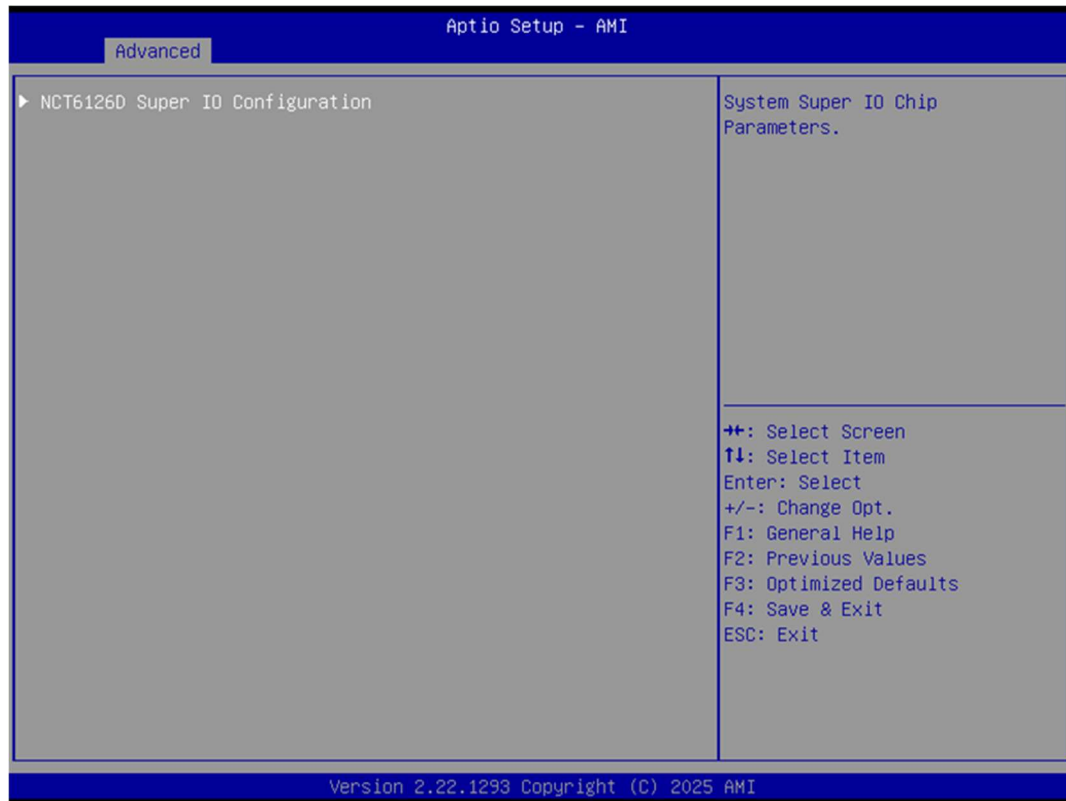
| Feature                      | Description                                                                                                                                  | Options                         |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| PCIEx1 (G3) Slot             | Control the PCI Express Root Port.                                                                                                           | ★Enabled, Disabled              |
| ASPM                         | Set the ASPM Level:<br>Force L0s – Force all links to L0s State<br>AUTO-BIOS auto configure<br>DISABLE – Disables ASPM                       | ★Disabled, L1, Auto             |
| L1 Substates                 | PCI Express L1 Substates settings.                                                                                                           | ★L1.1 & L1.2,<br>Disabled, L1.1 |
| PCIe Speed                   | Configure PCIe speed                                                                                                                         | ★Auto, Gen1, Gen2,<br>Gen3      |
| Detect Timeout               | The number of milliseconds reference code will wait for enabled ports before assuming there is no device and potentially disabling the port. | ★0                              |
| Hot Plug                     | PCI Express Hot Plug Enable/Disable                                                                                                          | Enabled, ★Disabled              |
| Detect Non-compliance Device | Enable when using Compliance Load Board                                                                                                      | Enabled, ★Disabled              |

## 6.3.6 CSM Configuration

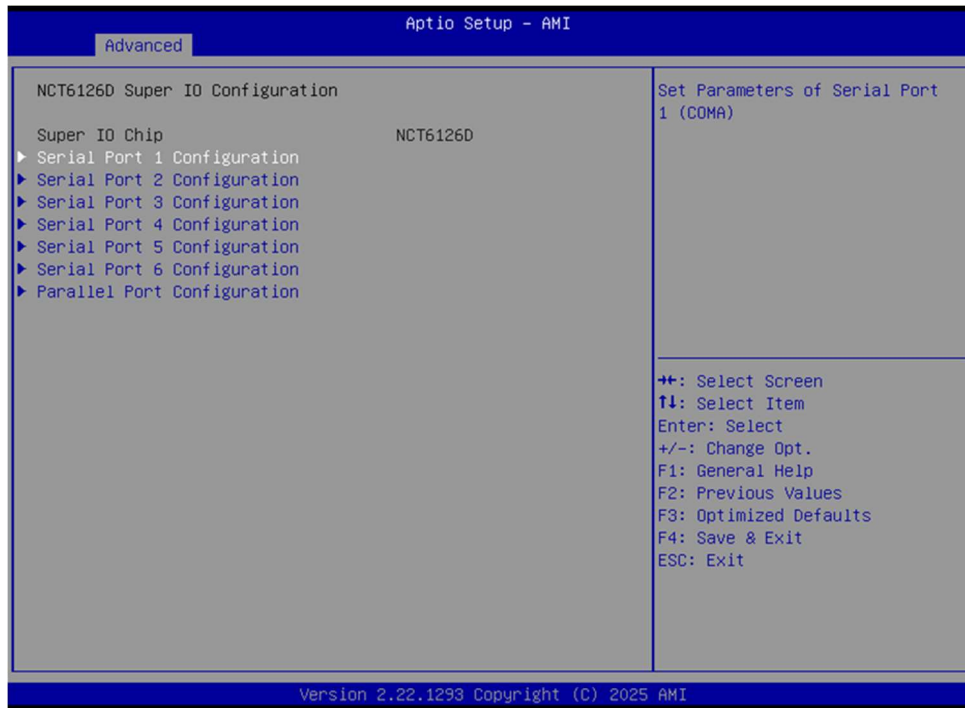


| Feature               | Description                                                                         | Options                      |
|-----------------------|-------------------------------------------------------------------------------------|------------------------------|
| CSM Support           |                                                                                     | Enabled, ★Disabled           |
| CSM Support [Enabled] |                                                                                     |                              |
| Network               | Controls the execution of UEFI and Legacy Network OpROM                             | ★Do not launch, UEFI, Legacy |
| Storage               | Controls the execution of UEFI and Legacy Storage OpROM                             | Do not launch, ★UEFI, Legacy |
| Video                 | Controls the execution of UEFI and Legacy Video OpROM                               | Do not launch, ★UEFI, Legacy |
| Other PCI Devices     | Determines OpROM execution policy for devices other than Network, Storage, or Video | Do not launch, ★UEFI, Legacy |

## 6.3.7 Super IO Configuration



## NCT61260D Super IO Configuration



| Feature                     | Description                                | Options |
|-----------------------------|--------------------------------------------|---------|
| Serial Port 1 Configuration | Set Parameters of Serial Port 1 (COMA)     |         |
| Serial Port 2 Configuration | Set Parameters of Serial Port 2 (COMB)     |         |
| Serial Port 3 Configuration | Set Parameters of Serial Port 3 (COMC)     |         |
| Serial Port 4 Configuration | Set Parameters of Serial Port 4 (COMD)     |         |
| Serial Port 5 Configuration | Set Parameters of Serial Port 5 (COME)     |         |
| Serial Port 6 Configuration | Set Parameters of Serial Port 6 (COMF)     |         |
| Parallel Port Configuration | Set Parameters of Parallel Port (LPT/LPTE) |         |

## Serial Port 1 Configuration

The screenshot shows the Aptio Setup - AMI BIOS interface. At the top, there's a blue header bar with "Aptio Setup - AMI" in white. Below it, a tab labeled "Advanced" is selected. The main area has a dark background with light-colored text. On the left, under "Serial Port 1 Configuration", three items are listed: "Serial Port" set to "[Enabled]", "Device Settings" set to "IO=3F8h; IRQ=4;", and "COM1 Control" set to "[RS232]". On the right, under "Enable or Disable Serial Port (COM)", there are two options: "Serial Port Enabled" (highlighted) and "Serial Port Disabled". A legend at the bottom right lists navigation keys: "+/-: Select Screen", "↑↓: Select Item", "Enter: Select", "+/-: Change Opt.", "F1: General Help", "F2: Previous Values", "F3: Optimized Defaults", "F4: Save & Exit", and "ESC: Exit".

| Serial Port 1 Configuration |                 | Enable or Disable Serial Port (COM)                                                                |
|-----------------------------|-----------------|----------------------------------------------------------------------------------------------------|
| Serial Port                 | [Enabled]       | <input checked="" type="radio"/> Serial Port Enabled<br><input type="radio"/> Serial Port Disabled |
| Device Settings             | IO=3F8h; IRQ=4; |                                                                                                    |
| COM1 Control                | [RS232]         |                                                                                                    |

Legend:

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

| Feature      | Description                             | Options              |
|--------------|-----------------------------------------|----------------------|
| Serial Port  | Enable or Disable Serial Port (COM)     | ★Enabled, Disabled   |
| COM1 Control | Select COM1 mode. RS232, RS422 or RS485 | ★RS232, RS422, RS485 |

## Serial Port 2 Configuration

The screenshot shows the 'Advanced' tab of the 'Aptio Setup - AMI' BIOS. The 'Serial Port 2 Configuration' screen is active. It displays the following settings:

- Serial Port: [Enabled]
- Device Settings: IO=2F8h; IRQ=3;
- COM2 Control: [RS232]

A legend on the right side of the screen provides navigation instructions:

- F10: Select Screen
- F11: Select Item
- Enter: Select
- +/-: Change Opt.
- F1: General Help
- F2: Previous Values
- F3: Optimized Defaults
- F4: Save & Exit
- ESC: Exit

| Feature      | Description                             | Options              |
|--------------|-----------------------------------------|----------------------|
| Serial Port  | Enable or Disable Serial Port (COM)     | ★Enabled, Disabled   |
| COM2 Control | Select COM2 mode. RS232, RS422 or RS485 | ★RS232, RS422, RS485 |

## Serial Port 3 Configuration

Aptio Setup - AMI

Advanced

Serial Port 3 Configuration

Serial Port [Enabled]

Device Settings IO=3E8h; IRQ=7;

Enable or Disable Serial Port (COM)

---

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

Version 2.22.1293 Copyright (C) 2025 AMI

| Feature     | Description                         | Options            |
|-------------|-------------------------------------|--------------------|
| Serial Port | Enable or Disable Serial Port (COM) | ★Enabled, Disabled |

## Serial Port 4 Configuration

Aptio Setup - AMI

Advanced

Serial Port 4 Configuration

Serial Port [Enabled]

Device Settings IO=2E8h; IRQ=6;

Enable or Disable Serial Port (COM)

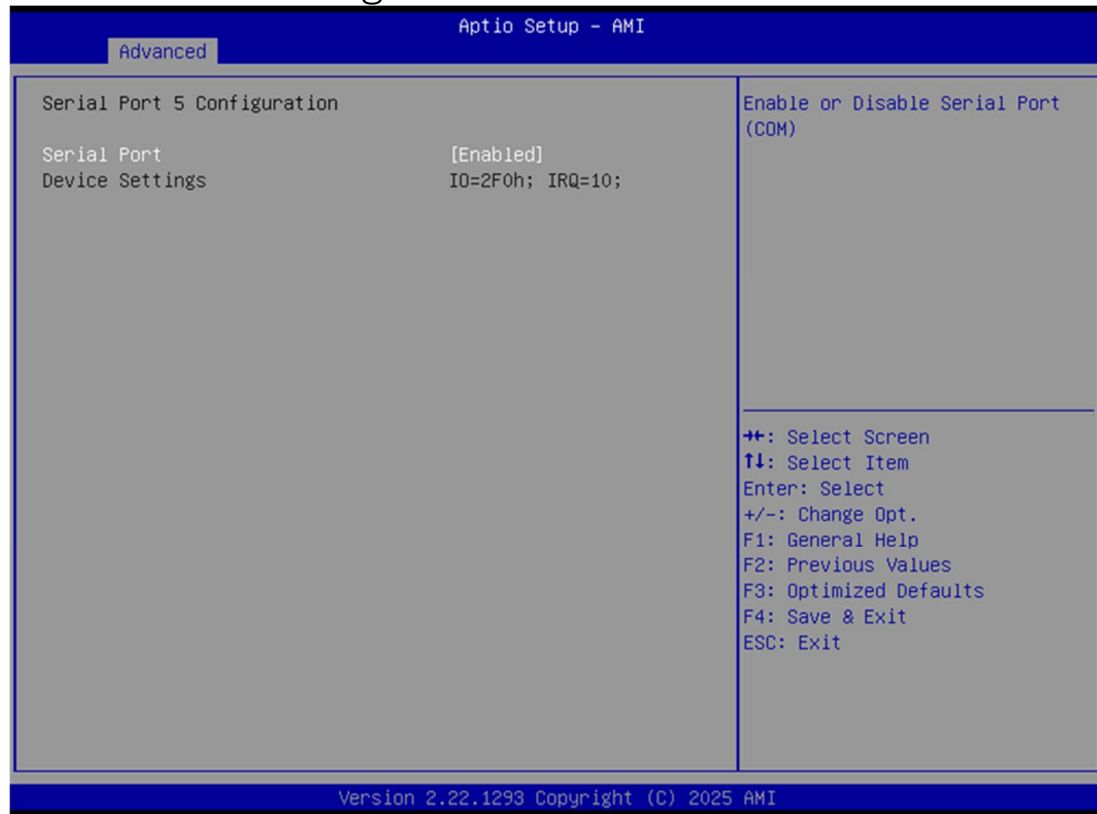
---

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

Version 2.22.1293 Copyright (C) 2025 AMI

| Feature     | Description                         | Options            |
|-------------|-------------------------------------|--------------------|
| Serial Port | Enable or Disable Serial Port (COM) | ★Enabled, Disabled |

## Serial Port 5 Configuration



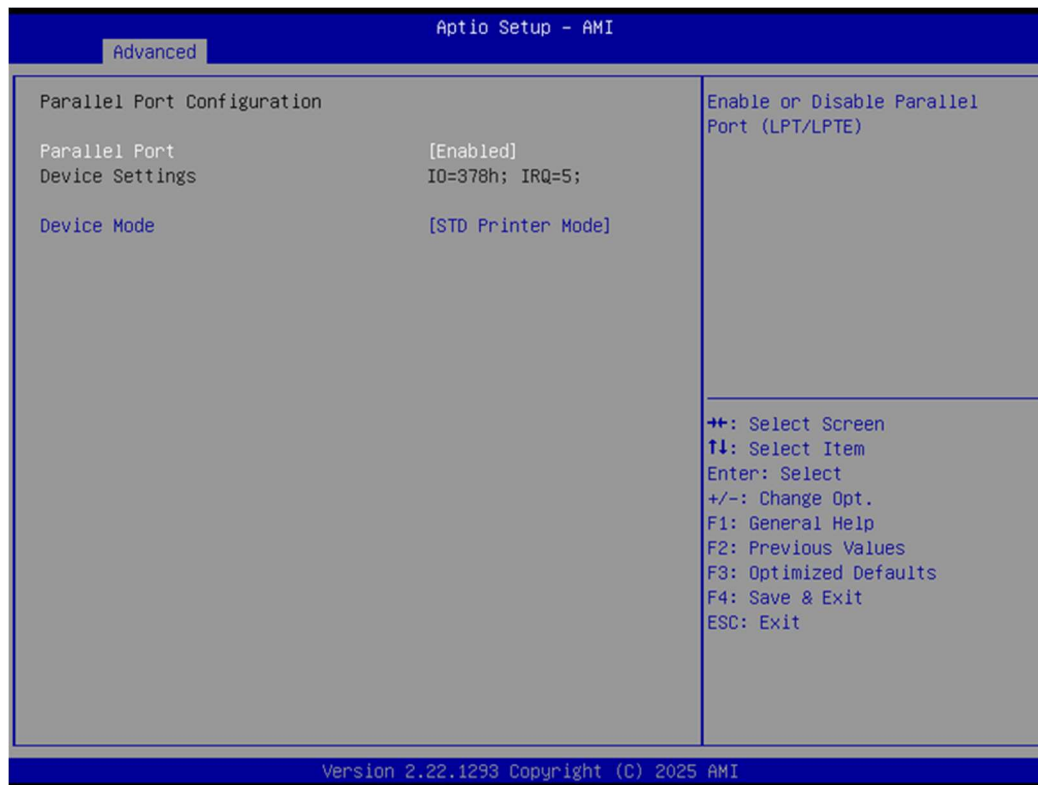
| Feature     | Description                         | Options            |
|-------------|-------------------------------------|--------------------|
| Serial Port | Enable or Disable Serial Port (COM) | ★Enabled, Disabled |

## Serial Port 6 Configuration



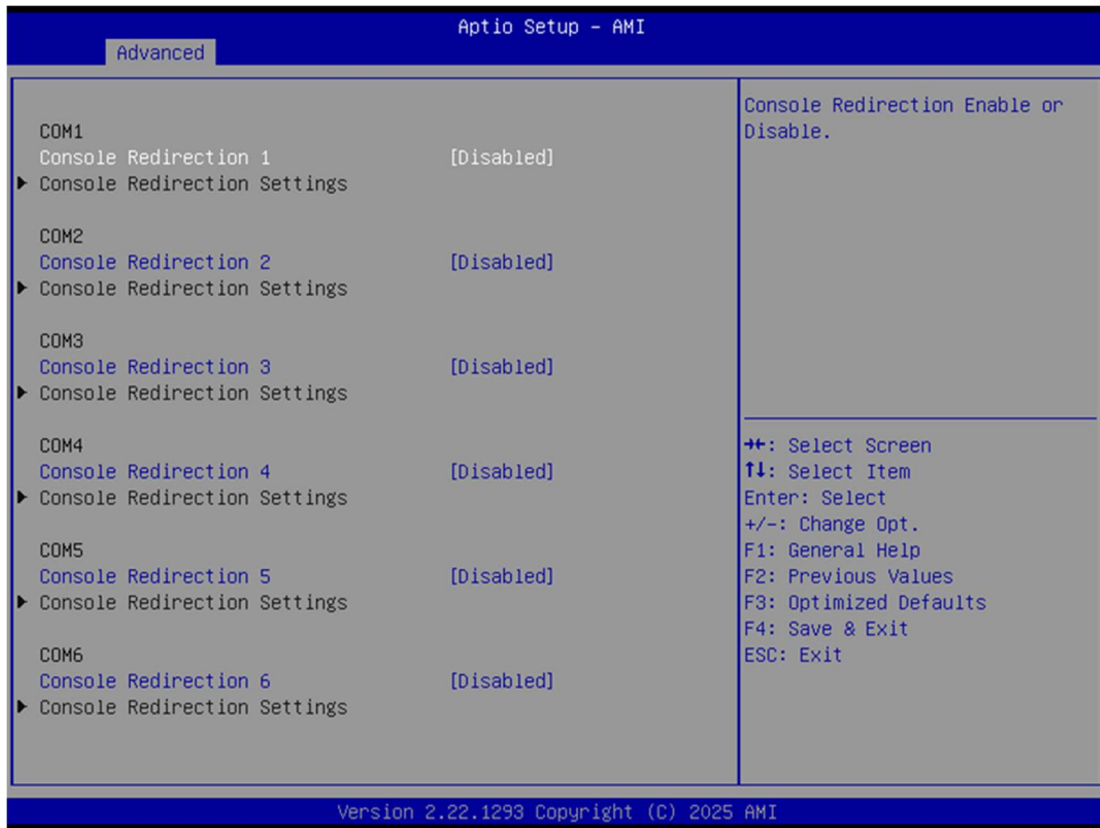
| Feature     | Description                         | Options            |
|-------------|-------------------------------------|--------------------|
| Serial Port | Enable or Disable Serial Port (COM) | ★Enabled, Disabled |

## Parallel Port Configuration



| Feature       | Description                                | Options                                                                                                                                     |
|---------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Parallel Port | Enable or Disable Parallel Port (LPT/LPTE) | ★Enabled, Disabled                                                                                                                          |
| Device Mode   | Change the Printer Port mode.              | ★STD Printer Mode,<br>SPP Mode,<br>EPP-1.9 and SPP Mode<br>EPP-1.7 and SPP Mode<br>ECP Mode<br>ECP and EPP-1.9 Mode<br>ECP and EPP-1.7 Mode |

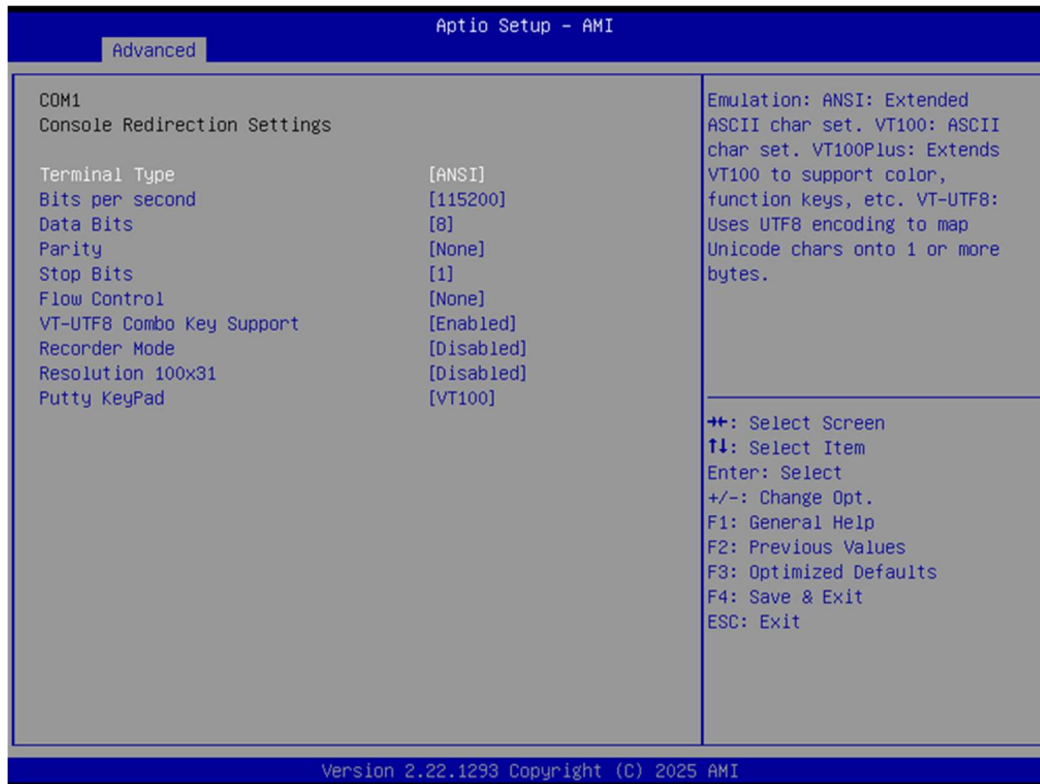
## 6.3.8 Serial Console Redirection



| Feature                             | Description                                                                                                                                                                  | Options            |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Console Redirection 1               | Console Redirection Enable or Disable.                                                                                                                                       | Enabled, ★Disabled |
| Console Redirection 2               | Console Redirection Enable or Disable.                                                                                                                                       | Enabled, ★Disabled |
| Console Redirection 3               | Console Redirection Enable or Disable.                                                                                                                                       | Enabled, ★Disabled |
| Console Redirection 4               | Console Redirection Enable or Disable.                                                                                                                                       | Enabled, ★Disabled |
| Console Redirection 5               | Console Redirection Enable or Disable.                                                                                                                                       | Enabled, ★Disabled |
| Console Redirection 6               | Console Redirection Enable or Disable.                                                                                                                                       | Enabled, ★Disabled |
| Console Redirection 1 ~ 6 [Enabled] |                                                                                                                                                                              |                    |
| Console Redirection Settings        | The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings. |                    |

## COM1 – COM6 Console Redirection Settings

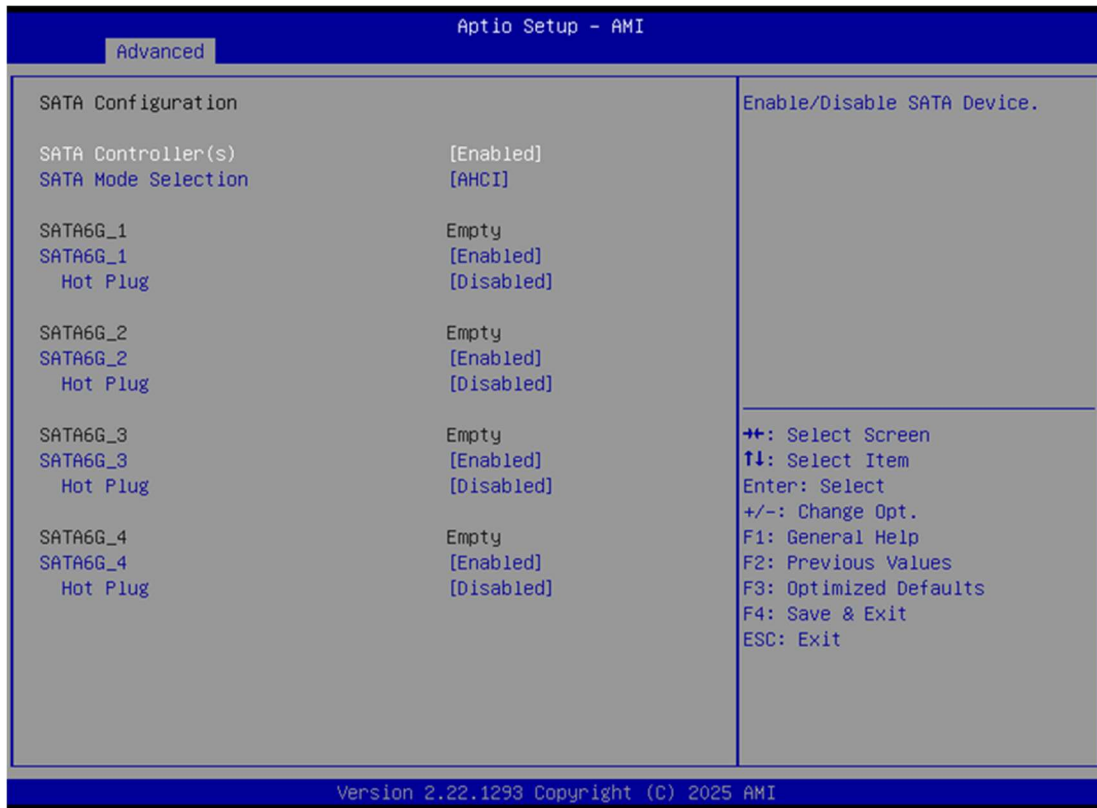
The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.



| Feature         | Description                                                                                                                                                                                            | Options                                                    |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Terminal Type   | Emulation: ANSI: Extended ASCII char set. VT100: ASCII char set. VT100Plus: Extends VT100 to support color, function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes. | ★ANSI, VT100, VT100Plus, VT-UTF8                           |
| Bits per second | Selects Serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.                                                                     | ★115200, 9600, 19200, 38400, 57600, 230400, 460800, 921600 |
| Data bits       | Data bits                                                                                                                                                                                              | ★8, 7                                                      |

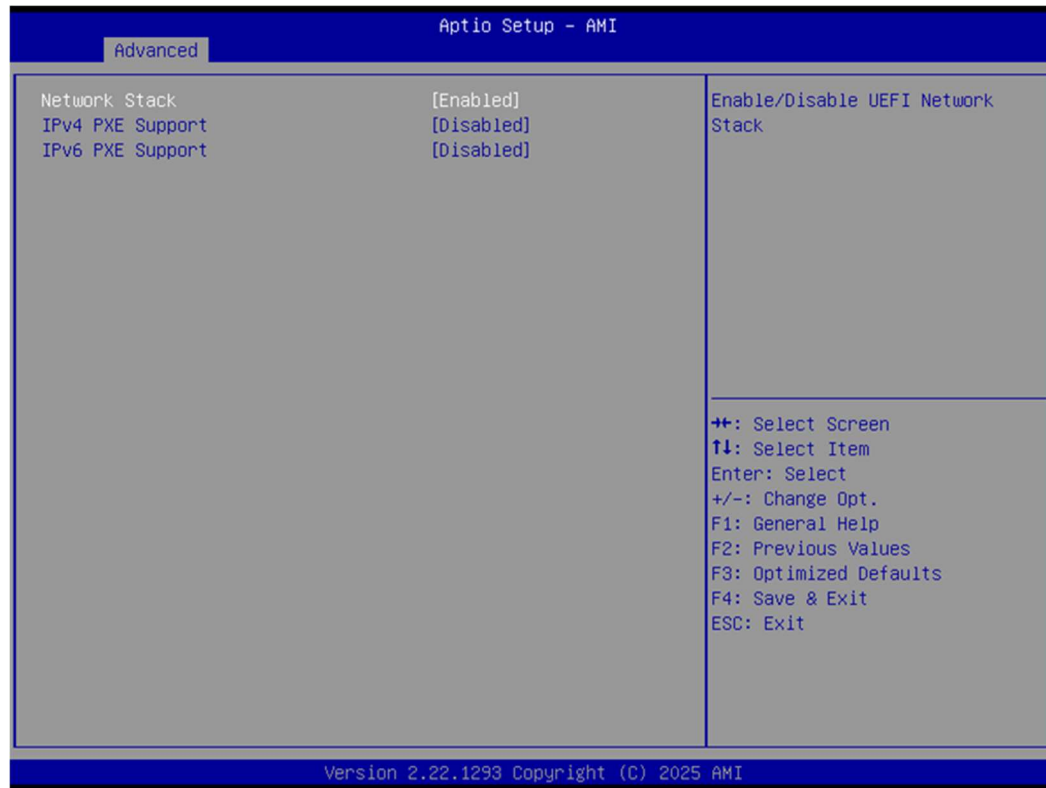
| Feature                   | Description                                                                                                                                                                                                                                                                                                                                                                    | Options                                  |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Parity                    | A parity bit can be sent with the data bits to detect some transmission errors. Even: parity bit is 0 if the num of 1's in the data bits is even. Odd: parity bit is 0 if num of 1's in the data bits is odd. Mark: parity bit is always 1. Space: parity bit is always 0. Mark and Space Parity do not allow for error detection. They can be used as an additional data bit. | ★None, Even, Odd, Mark, Space            |
| Stop Bits                 | Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning). The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit.                                                                                                                                                                               | ★1, 2                                    |
| Flow Control              | Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a 'stop' signal can be sent to stop the data flow. Once the buffers are empty, a 'start' signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals.                                                              | ★None, Hardware RTS/CTS                  |
| VT-UTF8 Combo Key Support | Enable VT-UTF8 Combination Key Support for ANSI/VT100 terminals                                                                                                                                                                                                                                                                                                                | ★Enabled, Disabled                       |
| Recorder Mode             | With this mode enabled only text will be sent. This is to capture Terminal data.                                                                                                                                                                                                                                                                                               | Enabled, ★Disabled                       |
| Resolution 100x31         | Enables or disables extended terminal resolution                                                                                                                                                                                                                                                                                                                               | Enabled, ★Disabled                       |
| Putty KeyPad              | Select FunctionKey and KeyPad on Putty.                                                                                                                                                                                                                                                                                                                                        | ★VT100, LINUX, XTERMR6, SCO, ESCN, VT400 |

## 6.3.9 SATA Configuration



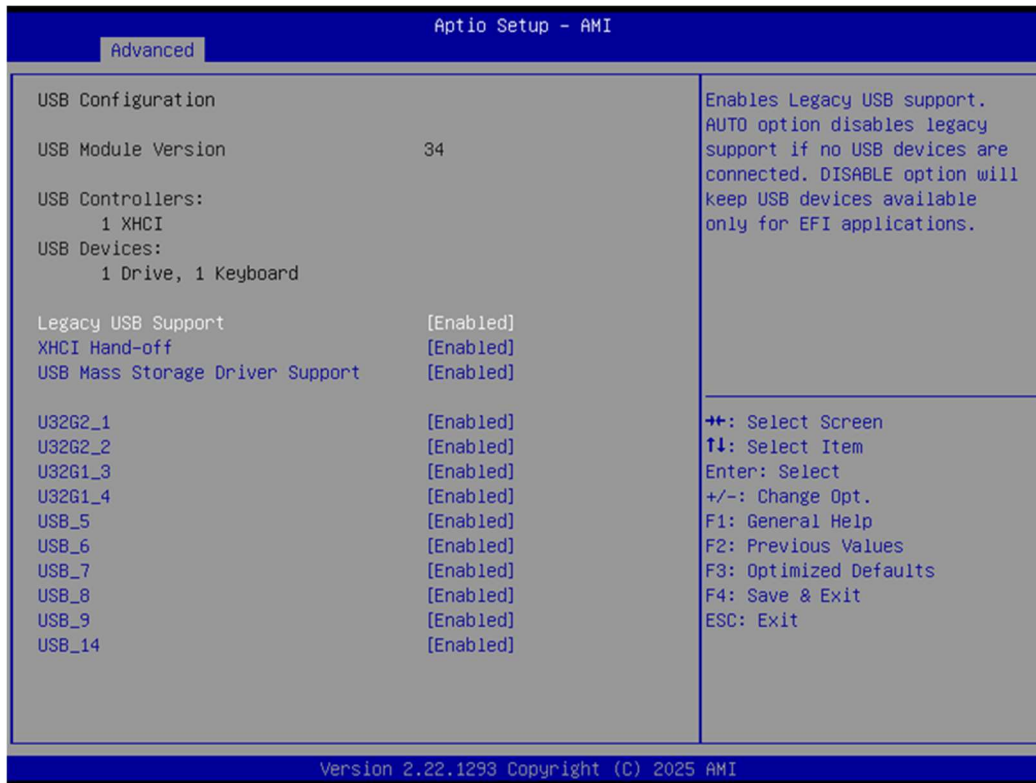
| Feature             | Description                                | Options            |
|---------------------|--------------------------------------------|--------------------|
| SATA Controller(s)  | Enable/Disable SATA Device.                | ★Enabled, Disabled |
| SATA Mode Selection | Determines how SATA controller(s) operate. | ★AHCI              |
| SATA6G_1            | Enable or Disable SATA Port                | ★Enabled, Disabled |
| Hot Plug            | Designates this port as Hot Pluggable.     | Enabled, ★Disabled |
| SATA6G_2            | Enable or Disable SATA Port                | ★Enabled, Disabled |
| Hot Plug            | Designates this port as Hot Pluggable.     | Enabled, ★Disabled |
| SATA6G_3            | Enable or Disable SATA Port                | ★Enabled, Disabled |
| Hot Plug            | Designates this port as Hot Pluggable.     | Enabled, ★Disabled |
| SATA6G_4            | Enable or Disable SATA Port                | ★Enabled, Disabled |
| Hot Plug            | Designates this port as Hot Pluggable.     | Enabled, ★Disabled |

## 6.3.10 Network Stack Configuration



| Feature                 | Description                                                                                     | Options            |
|-------------------------|-------------------------------------------------------------------------------------------------|--------------------|
| Network Stack           | Enable/Disable UEFI Network Stack                                                               | ★Disabled, Enabled |
| Network Stack [Enabled] |                                                                                                 |                    |
| IPv4 PXE Support        | Enable/Disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available. | ★Disabled, Enabled |
| IPv6 PXE Support        | Enable/Disable IPv6 PXE boot support. If disabled, IPv6 PXE boot support will not be available. | ★Disabled, Enabled |

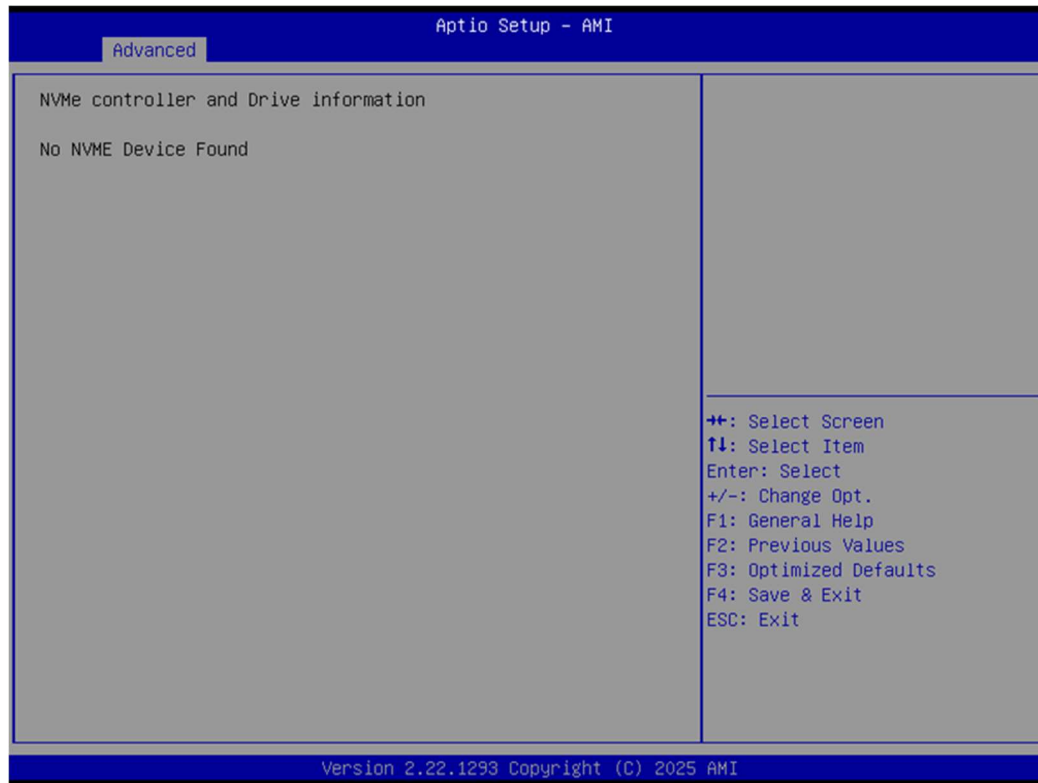
## 6.3.11 USB Configuration



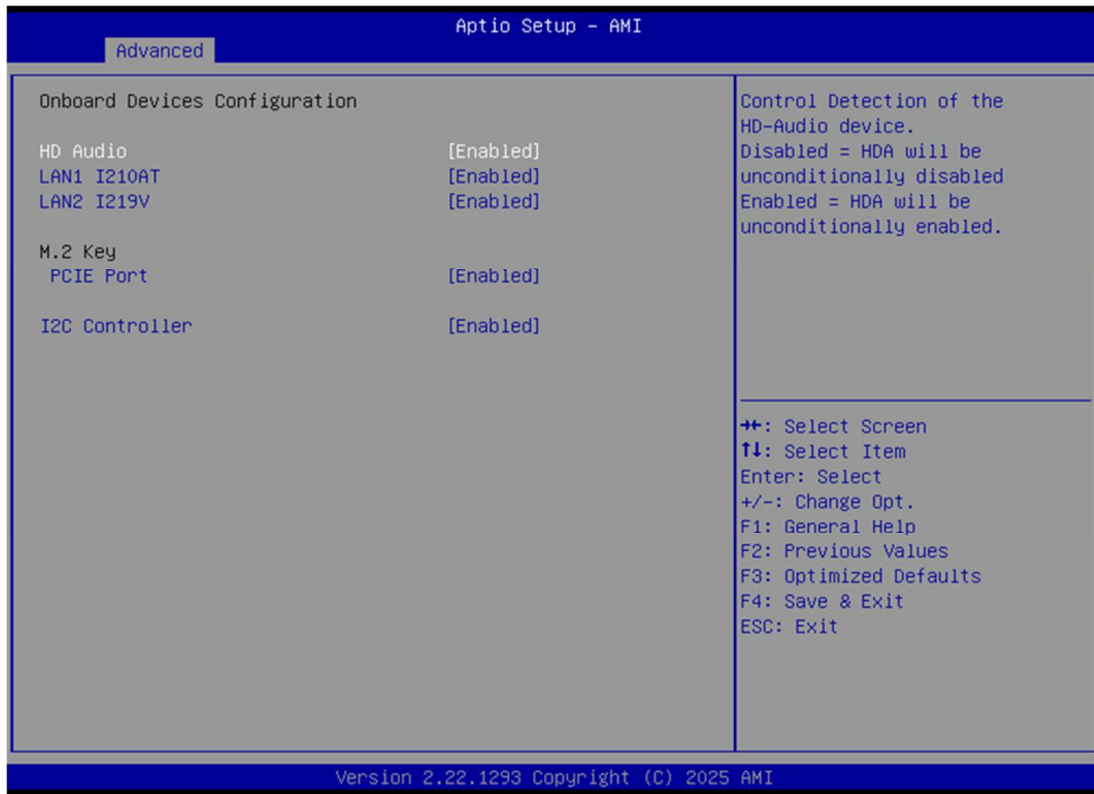
| Feature                         | Description                                                                                                                                                                | Options                  |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Legacy USB Support              | Enables Legacy USB Support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications. | ★Enabled, Disabled, Auto |
| XHCI Hand-off                   | This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.                                                   | ★Enabled, Disabled       |
| USB Mass Storage Driver Support | Enable/Disable USB Mass Storage Driver Support.                                                                                                                            | ★Enabled, Disabled       |
| U32G2_1                         | Enabled/Disabled this USB Physical connector (physical port). Once disabled, any USB devices plug into the connector will not be detected by BIOS or OS.                   | ★Enabled, Disabled       |
| U32G2_2                         | Enabled/Disabled this USB Physical connector (physical port). Once disabled, any USB devices plug into the connector will not be detected by BIOS or OS.                   | ★Enabled, Disabled       |

| Feature | Description                                                                                                                                              | Options            |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| U32G1_3 | Enabled/Disabled this USB Physical connector (physical port). Once disabled, any USB devices plug into the connector will not be detected by BIOS or OS. | ★Enabled, Disabled |
| U32G1_4 | Enabled/Disabled this USB Physical connector (physical port). Once disabled, any USB devices plug into the connector will not be detected by BIOS or OS. | ★Enabled, Disabled |
| USB_5   | Enabled/Disabled this USB Physical connector (physical port). Once disabled, any USB devices plug into the connector will not be detected by BIOS or OS. | ★Enabled, Disabled |
| USB_6   | Enabled/Disabled this USB Physical connector (physical port). Once disabled, any USB devices plug into the connector will not be detected by BIOS or OS. | ★Enabled, Disabled |
| USB_7   | Enabled/Disabled this USB Physical connector (physical port). Once disabled, any USB devices plug into the connector will not be detected by BIOS or OS. | ★Enabled, Disabled |
| USB_8   | Enabled/Disabled this USB Physical connector (physical port). Once disabled, any USB devices plug into the connector will not be detected by BIOS or OS. | ★Enabled, Disabled |
| USB_9   | Enabled/Disabled this USB Physical connector (physical port). Once disabled, any USB devices plug into the connector will not be detected by BIOS or OS. | ★Enabled, Disabled |
| USB_14  | Enabled/Disabled this USB Physical connector (physical port). Once disabled, any USB devices plug into the connector will not be detected by BIOS or OS. | ★Enabled, Disabled |

## 6.3.12 NVMe Configuration

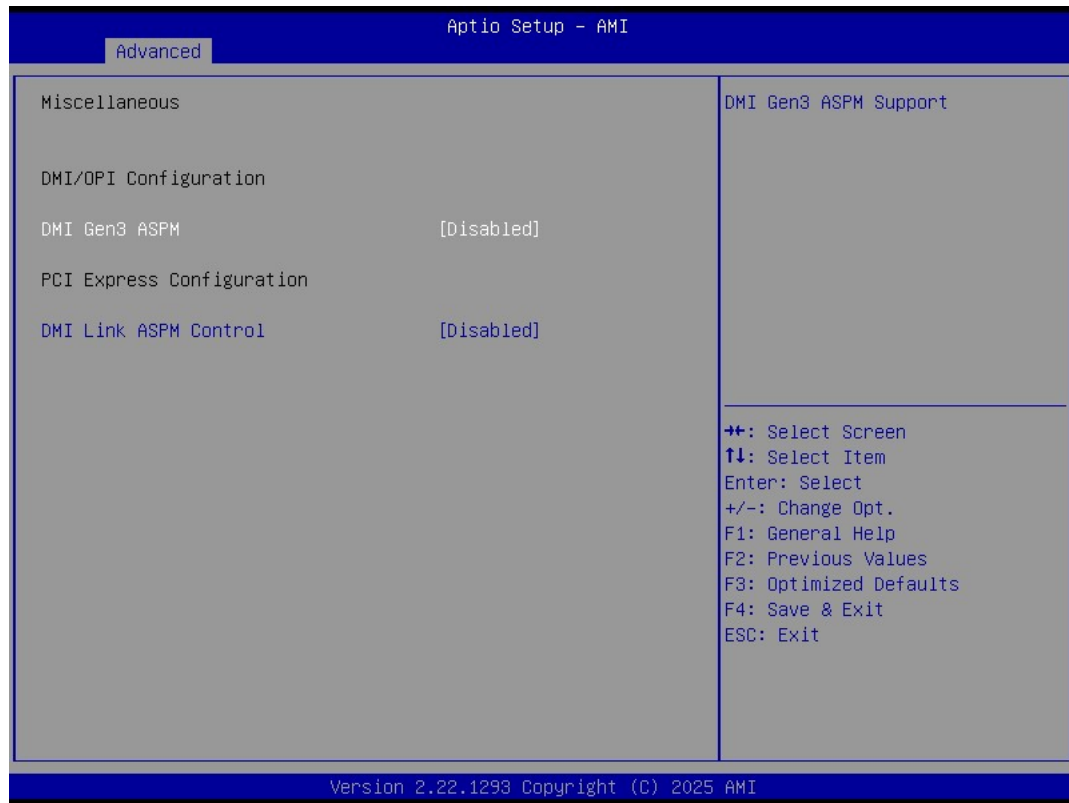


## 6.3.13 Onboard Device Configuration



| Feature        | Description                                                                                                                                     | Options            |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| HD Audio       | Control Detection of the HD-Audio device.<br>Disabled = HDA will be unconditionally disabled.<br>Enabled = HDA will be unconditionally enabled. | ★Enabled, Disabled |
| LAN1 I210AT    | Enable/Disable LAN1                                                                                                                             | ★Enabled, Disabled |
| LAN2 I219V     | Enable/Disable LAN2                                                                                                                             | ★Enabled, Disabled |
| M.2 Key        |                                                                                                                                                 |                    |
| PCIE Port      | Enable/Disable M.2 PCIE Port                                                                                                                    | ★Enabled, Disabled |
| I2C Controller | Enable/Disable I2C Controller                                                                                                                   | ★Enabled, Disabled |

## 6.3.14 Miscellaneous



| Feature                   | Description                                                   | Options                                        |
|---------------------------|---------------------------------------------------------------|------------------------------------------------|
| DMI/OPI Configuration     |                                                               |                                                |
| DMI Gen3 ASPM             | DMI Gen3 ASPM Support                                         | ★Disabled, Auto, ASPM L0s, ASPM L1, ASPM L0sL1 |
| PCI Express Configuration |                                                               |                                                |
| DMI Link ASPM Control     | The Control of Active State Power Management of the DMI Link. | ★Disabled, L1, Auto                            |

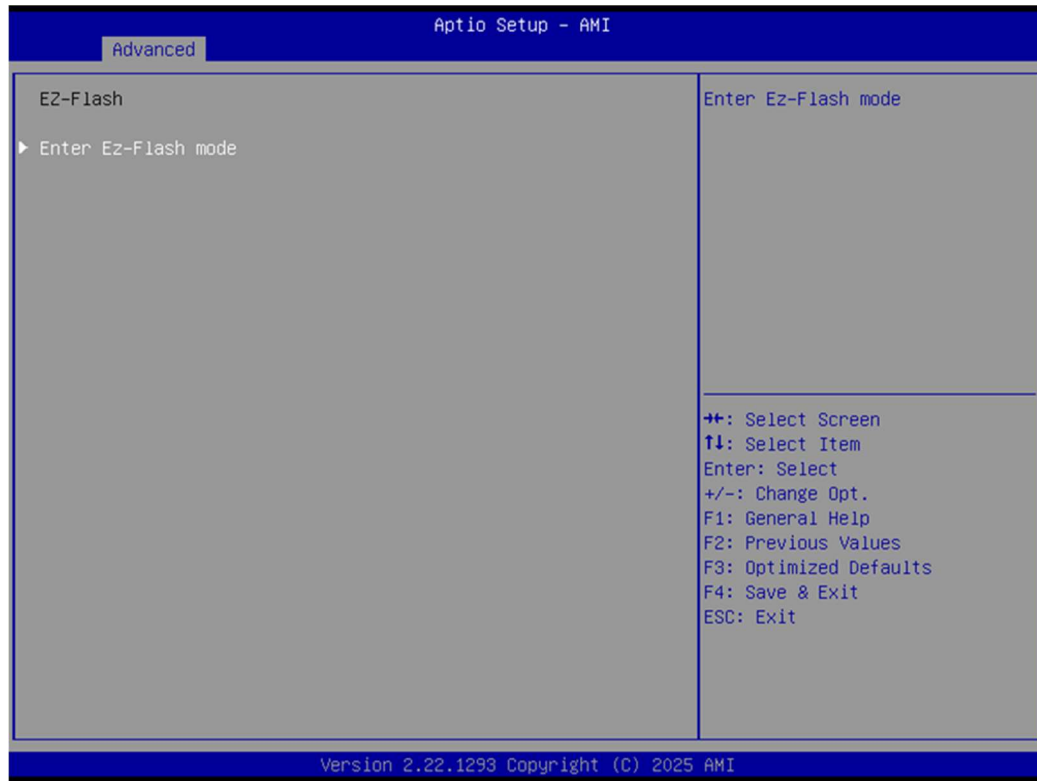
## 6.3.15 APM Configuration



| Feature               | Description                                                                                                                                                                                                    | Options                                                                       |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| ErP Ready             | Allow BIOS to switch off some power at S4/S5 to get the system ready for ErP requirement. When set to Enabled, all other PME options will be switched off.                                                     | ★Disabled, Enabled                                                            |
| Restore AC Power Loss | Select AC power state when power is re-applied after a power failure.                                                                                                                                          | ★S5 State, S0 State                                                           |
| Power On By PCIE      | Enable or disable the Wake-on-LAN function of the onboard LAN controller or other installed PCIE LAN devices.                                                                                                  | ★Disabled, Enabled                                                            |
| Power On By PS2       | Enable/disable resume from S5 Via PS2                                                                                                                                                                          | ★Disabled, Enabled                                                            |
| Power On By Ring      | Power On By Ring                                                                                                                                                                                               | ★Disabled, Enabled                                                            |
| Power On By RTC       | Select whether to enable Wake Up on Alarm, to turn on your system on a special day of the month, special day of the week or daily.<br>NOTE: Values in these fields may be overwritten by the operating system. | ★Disabled,<br>Single event,<br>Daily event,<br>Weekly event,<br>Monthly event |

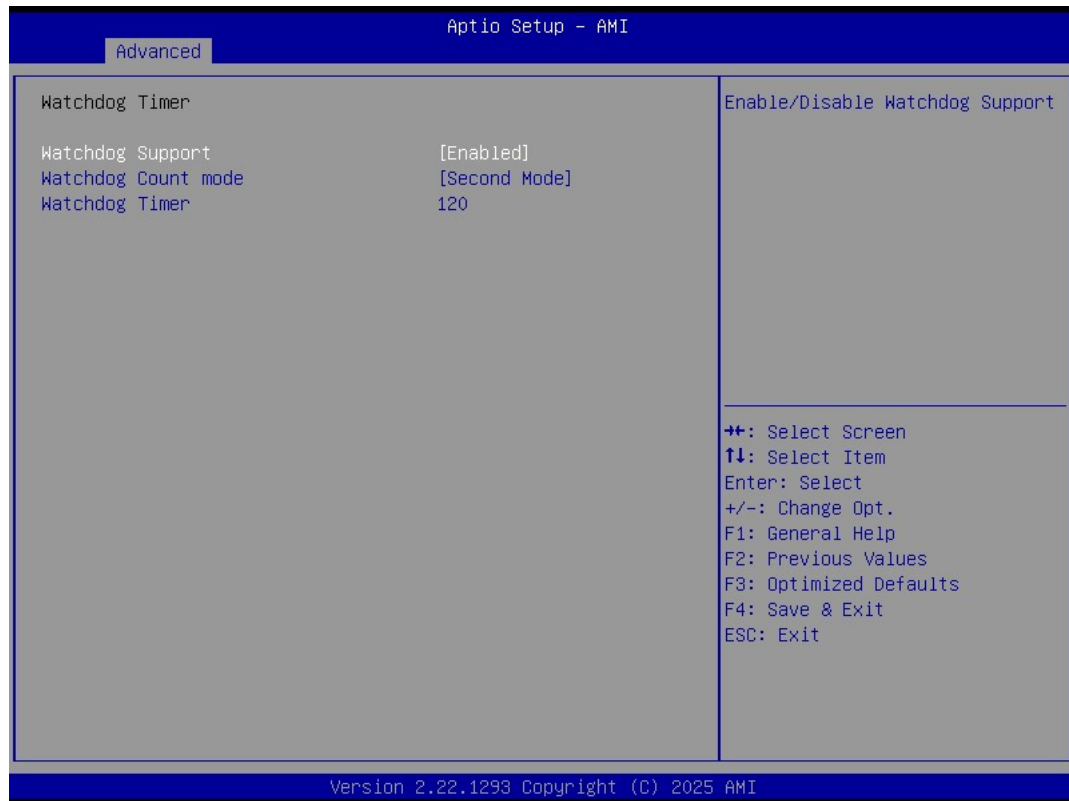
| Feature                         | Description                                               | Options                                                                           |
|---------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------|
| Power On By RTC [Single event]  |                                                           |                                                                                   |
| Wake up hour                    | Select 0-23 For example enter 3 for 3am and 15 for 3pm    | ★0                                                                                |
| Wake up minute                  | Select 0-59 for Minute                                    | ★0                                                                                |
| Wake up second                  | Select 0-59 for Second                                    | ★0                                                                                |
| Power On By RTC [Daily event]   |                                                           |                                                                                   |
| Wake up hour                    | Select 0-23 For example enter 3 for 3am and 15 for 3pm    | ★0                                                                                |
| Wake up minute                  | Select 0-59 for Minute                                    | ★0                                                                                |
| Wake up second                  | Select 0-59 for Second                                    | ★0                                                                                |
| Power On By RTC [Weekly event]  |                                                           |                                                                                   |
| Alarm day of Week               | Select the day of the week when the system is to wake up. | ★Sunday,<br>Monday,<br>Tuesday,<br>Wednesday,<br>Thursday,<br>Friday,<br>Saturday |
| Wake up hour                    | Select 0-23 For example enter 3 for 3am and 15 for 3pm    | ★0                                                                                |
| Wake up minute                  | Select 0-59 for Minute                                    | ★0                                                                                |
| Wake up second                  | Select 0-59 for Second                                    | ★0                                                                                |
| Power On By RTC [Monthly event] |                                                           |                                                                                   |
| Day of the Month                | RTC Alarm Date (Days)                                     | ★15                                                                               |
| Wake up hour                    | Select 0-23 For example enter 3 for 3am and 15 for 3pm    | ★0                                                                                |
| Wake up minute                  | Select 0-59 for Minute                                    | ★0                                                                                |
| Wake up second                  | Select 0-59 for Second                                    | ★0                                                                                |

## 6.3.16 EZ-Flash



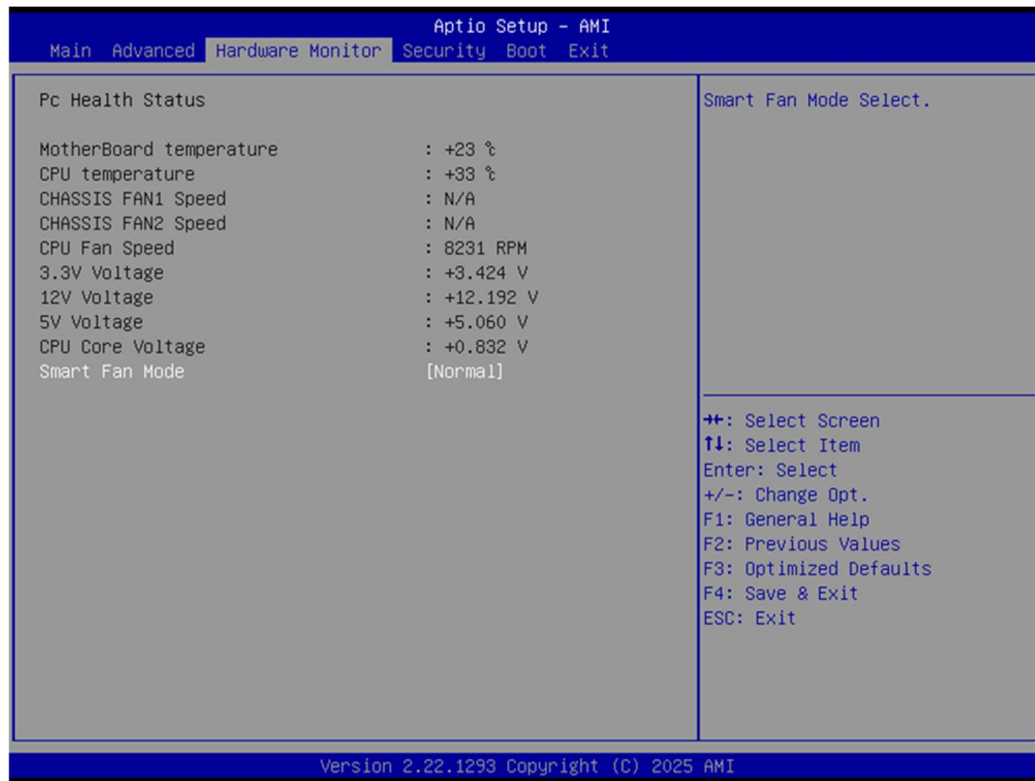
| Feature             | Description                                                       | Options |
|---------------------|-------------------------------------------------------------------|---------|
| Enter Ez-Flash mode | In this mode, select a BIOS update file from your drive to update |         |

## 6.3.17 Watchdog Timer



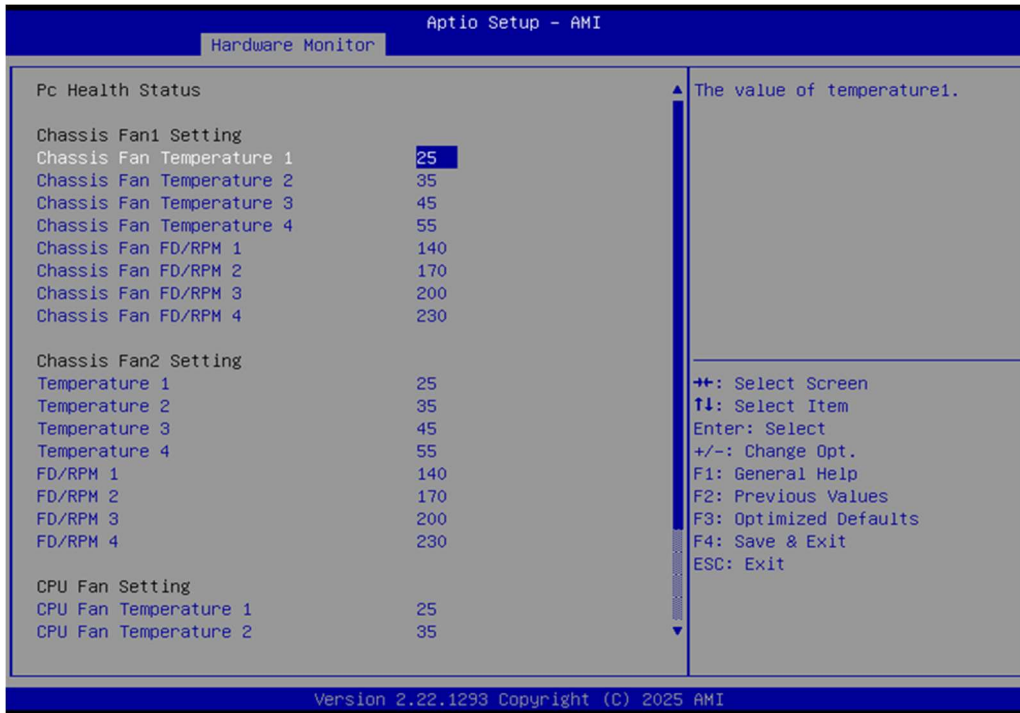
| Feature             | Description                        | Options                      |
|---------------------|------------------------------------|------------------------------|
| Watchdog Support    | Enabled /Disabled Watchdog Support | ★Enabled, Disabled           |
| Watchdog Count Mode | Select Watchdog Timer I count mode | ★Second Mode,<br>Minute Mode |
| Watchdog Timer      | Watchdog Timer I Time-out value.   | ★120                         |

## 6.4 Hardware Monitor



| Feature                      | Description                | Options                              |
|------------------------------|----------------------------|--------------------------------------|
| Smart Fan Mode               | Smart Fan Mode select.     | ★Normal,<br>Disabled,<br>Manual Mode |
| Smart Fan Mode [Manual Mode] |                            |                                      |
| Smart Fan Function           | Smart Fan Function Setting |                                      |

## Chassis Fan 1 Settin

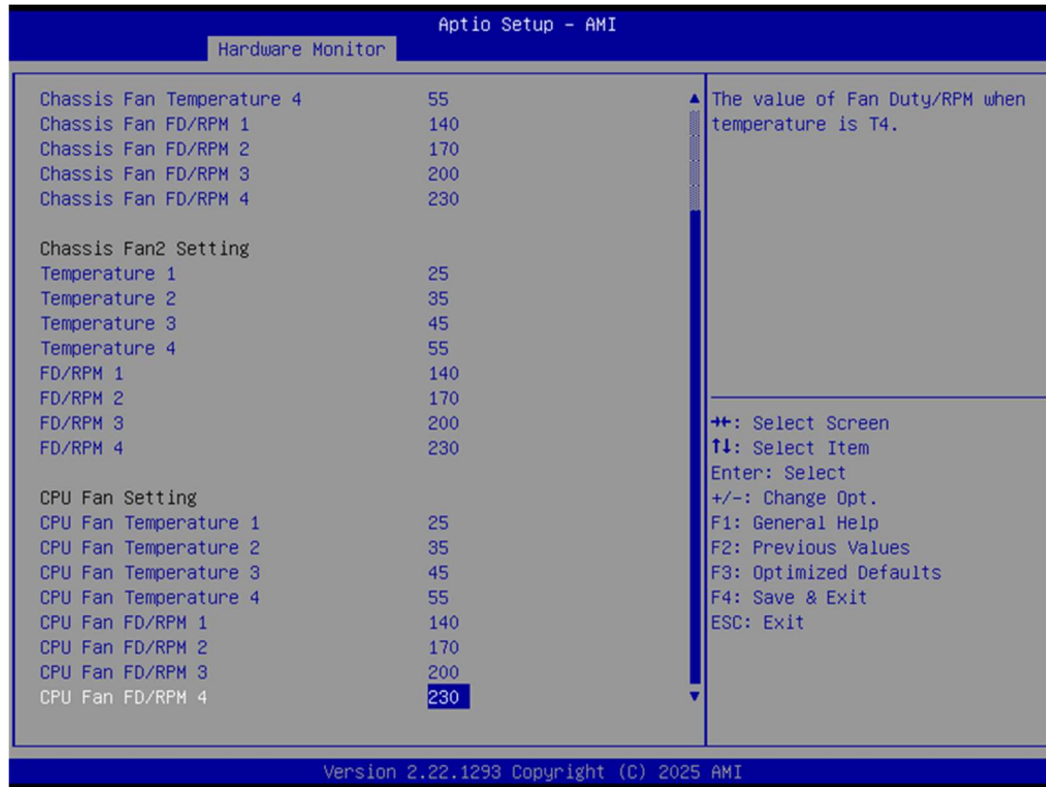


| Feature                   | Description                                       | Options |
|---------------------------|---------------------------------------------------|---------|
| Chassis Fan Temperature 1 | The value of temperature1.                        | ★25     |
| Chassis Fan Temperature 2 | The value of temperature2.                        | ★35     |
| Chassis Fan Temperature 3 | The value of temperature3.                        | ★45     |
| Chassis Fan Temperature 4 | The value of temperature4.                        | ★55     |
| Chassis Fan FD/RPM 1      | The value of Fan Duty/RPM when temperature is T1. | ★140    |
| Chassis Fan FD/RPM 2      | The value of Fan Duty/RPM when temperature is T2. | ★170    |
| Chassis Fan FD/RPM 3      | The value of Fan Duty/RPM when temperature is T3. | ★200    |
| Chassis Fan FD/RPM 4      | The value of Fan Duty/RPM when temperature is T4. | ★230    |

## Chassis Fan 2 Setting

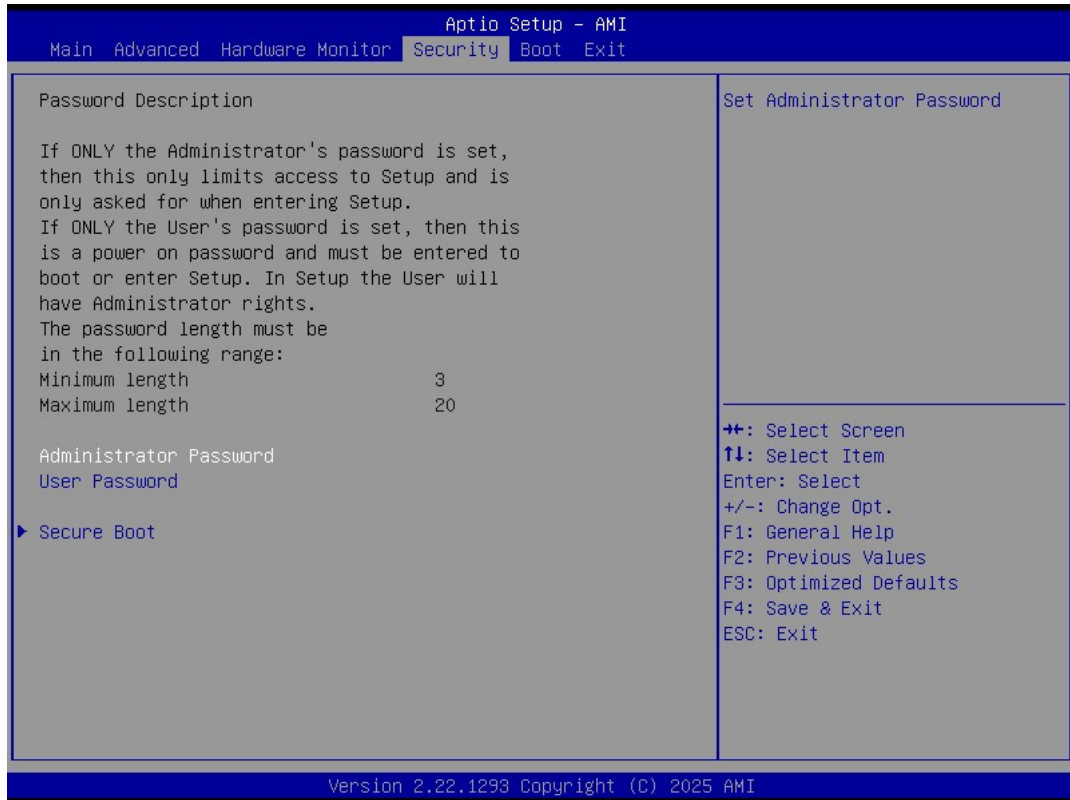
| Feature       | Description                                       | Options |
|---------------|---------------------------------------------------|---------|
| Temperature 1 | The value of temperature1.                        | ★25     |
| Temperature 2 | The value of temperature2.                        | ★35     |
| Temperature 3 | The value of temperature3.                        | ★45     |
| Temperature 4 | The value of temperature4.                        | ★55     |
| FD/RPM 1      | The value of Fan Duty/RPM when temperature is T1. | ★140    |
| FD/RPM 2      | The value of Fan Duty/RPM when temperature is T2. | ★170    |
| FD/RPM 3      | The value of Fan Duty/RPM when temperature is T3. | ★200    |
| FD/RPM 4      | The value of Fan Duty/RPM when temperature is T4. | ★230    |

## CPU Fan Setting



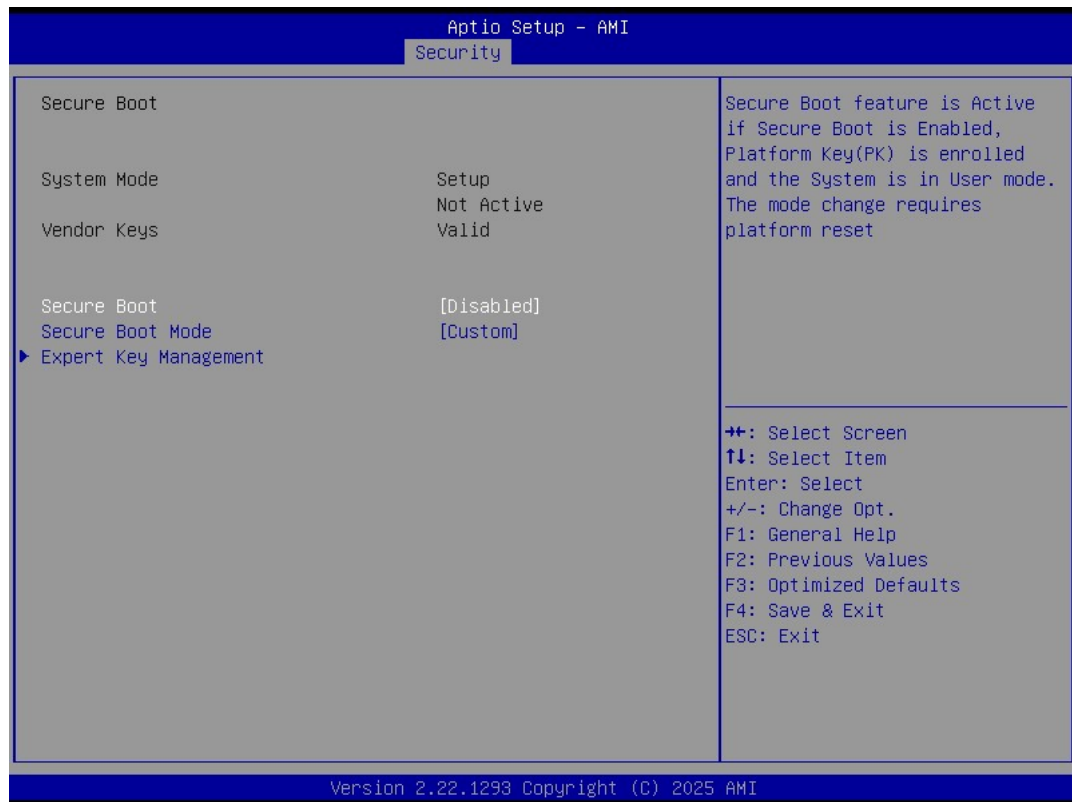
| Feature               | Description                                       | Options |
|-----------------------|---------------------------------------------------|---------|
| CPU Fan Temperature 1 | The value of temperature1.                        | ★25     |
| CPU Fan Temperature 2 | The value of temperature2.                        | ★35     |
| CPU Fan Temperature 3 | The value of temperature3.                        | ★45     |
| CPU Fan Temperature 4 | The value of temperature4.                        | ★55     |
| CPU Fan FD/RPM 1      | The value of Fan Duty/RPM when temperature is T1. | ★140    |
| CPU Fan FD/RPM 2      | The value of Fan Duty/RPM when temperature is T2. | ★170    |
| CPU Fan FD/RPM 3      | The value of Fan Duty/RPM when temperature is T3. | ★200    |
| CPU Fan FD/RPM 4      | The value of Fan Duty/RPM when temperature is T4. | ★230    |

## 6.5 Security



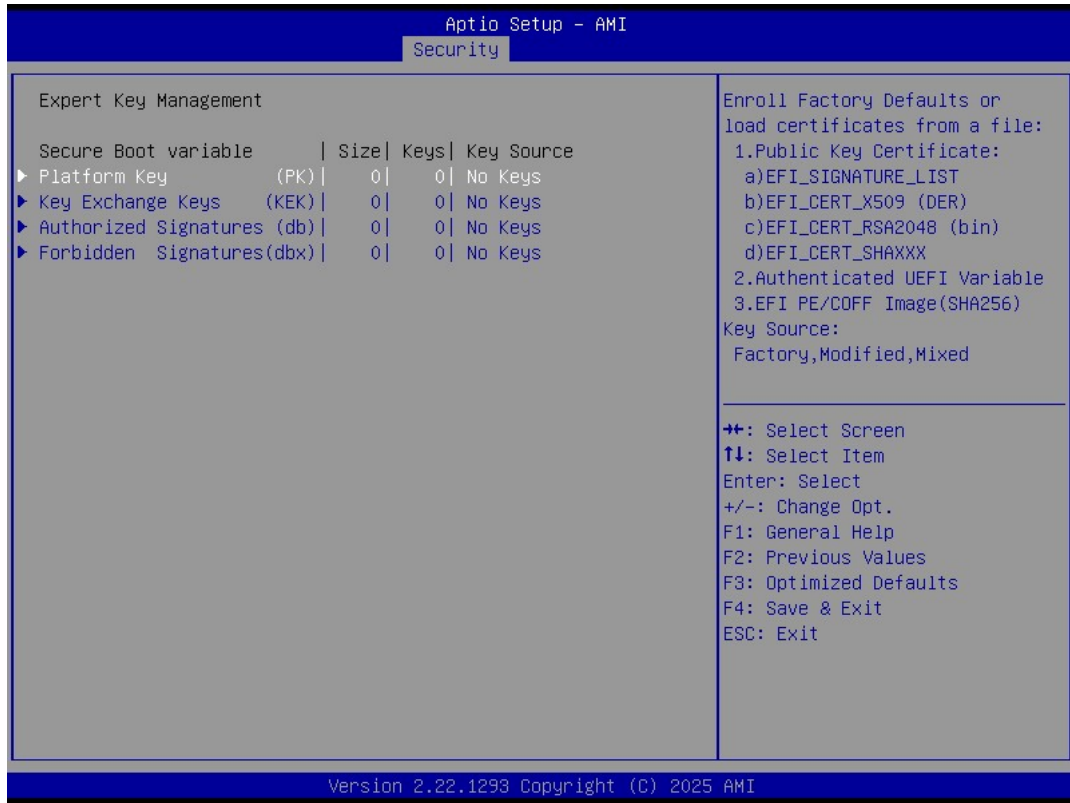
| vc                     | Description                | Options |
|------------------------|----------------------------|---------|
| Administrator Password | Set Administrator password |         |
| User Password          | Set User Password          |         |
| Secure Boot            | Secure Boot configuration  |         |

## Secure Boot



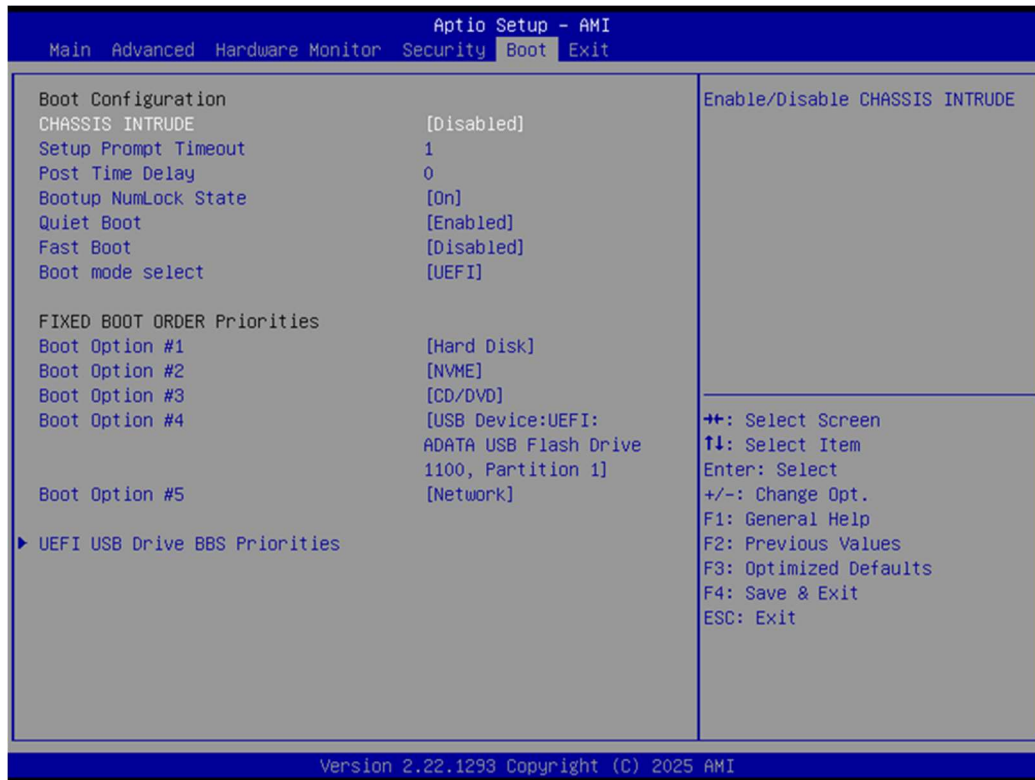
| Feature               | Description                                                                                                                                                              | Options            |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Secure Boot           | Secure Boot feature is Active if Secure Boot is Enabled, Platform Key (PK) is enrolled and the System is in User mode. The mode change requires platform reset           | ★Disabled, Enabled |
| Secure Boot Mode      | Secure Boot Mode options: Standard or Custom.<br>In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full authentication | Standard, ★Custom  |
| Expert Key Management | Enables expert users to modify Secure Boot Policy variables without variable authentication                                                                              |                    |

## Expert Key Management



| Feature                   | Description                                                                                                                                                                                                                                                                                        | Options            |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Platform Key(PK)          | Enroll Factory Defaults or load certificates from a file:<br>1.Public Key Certificate:<br>a)EFI_SIGNATURE_LIST<br>b) EFI_CERT_X509 (DER)<br>c) EFI_CERT_RSA2048 (bin)<br>d)EFI_CERT_SHAXXX<br>2.Authenticated UEFI Variable<br>3.EFI PE/COFF Image(SHA256)<br>Key Source: Factory, Modified, Mixed | Update,            |
| Key Exchange Keys(KEK)    |                                                                                                                                                                                                                                                                                                    | Update,<br>Append, |
| Authorized Signatures(db) |                                                                                                                                                                                                                                                                                                    | Update,<br>Append, |
| Forbidden Signatures(dbx) |                                                                                                                                                                                                                                                                                                    | Update,<br>Append, |

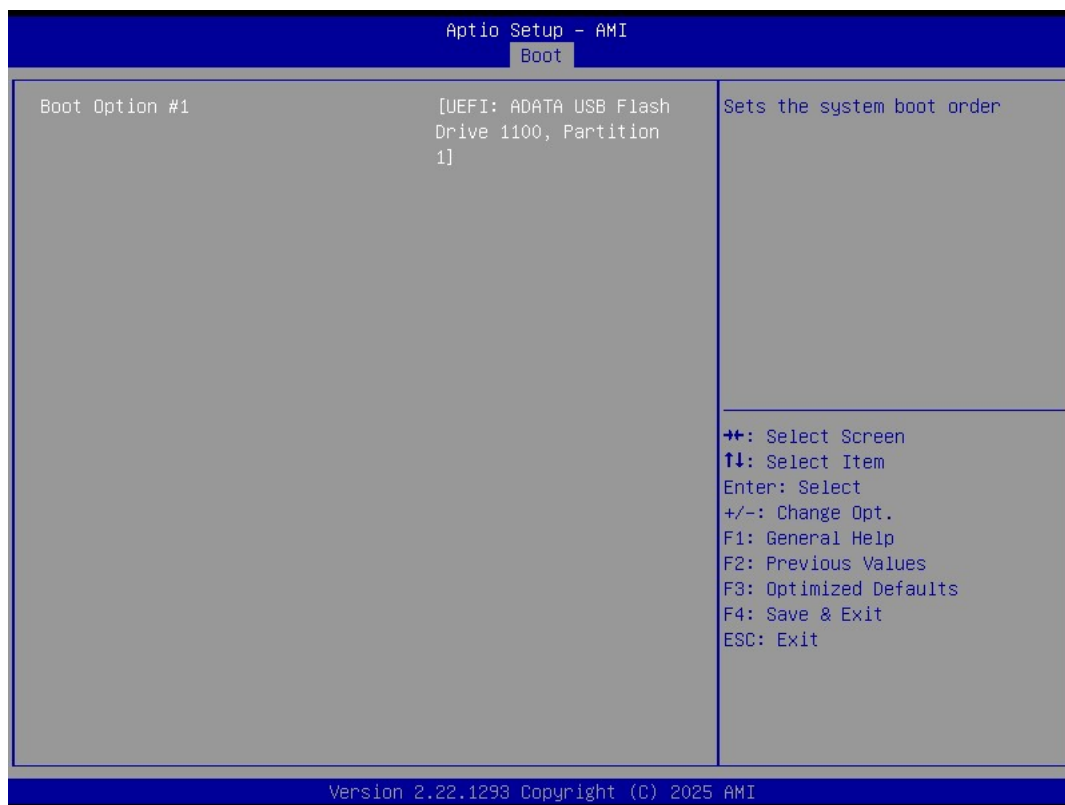
## 6.6 Boot



| Feature              | Description                                                                                                                                         | Options                                                |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| CHASSIS INTRUDE      | Enable/Disable CHASSIS INTRUDE                                                                                                                      | ★Disabled, Enabled                                     |
| Setup Prompt Timeout | Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.                                                         | ★1                                                     |
| Post Time Delay      | Delay for specific situation needs. For example, HDD spin up time (Delay time = value x 500ms)                                                      | ★0                                                     |
| Bootup NumLock State | Select the keyboard NumLock state                                                                                                                   | ★On, Off                                               |
| Quiet Boot           | Enables or disables Quiet Boot option                                                                                                               | Disabled, ★Enabled                                     |
| Fast Boot            | Enables or disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options. | ★Disabled, Enabled                                     |
| Boot mode select     | Select boot mode LEGACY/UEFI                                                                                                                        | ★UEFI, LEGACY                                          |
| Boot Option #1 ~ #5  | Sets the system boot order                                                                                                                          | ★Hard Disk, NVME, CD/DVD, Network USB Device, Disabled |

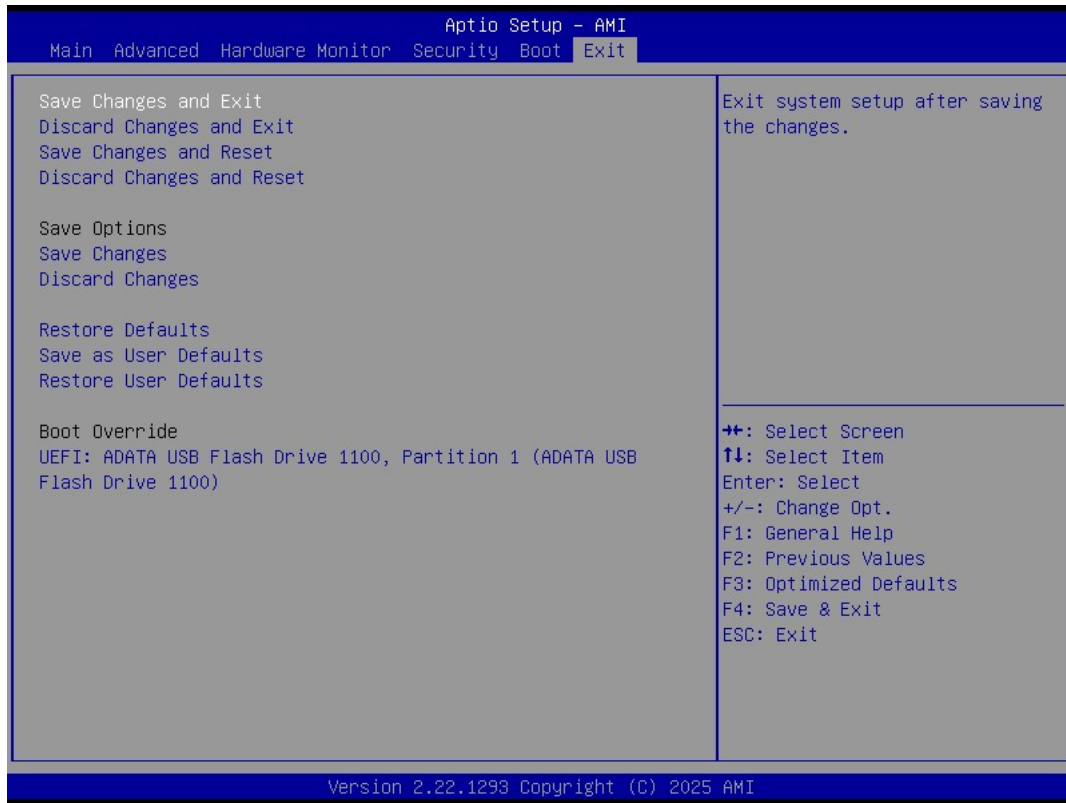
## UEFI USB Drive BBS Priorities

Specifies the Boot Device Priority sequence from available UEFI USB Drivers.



| Feature              | Description                                                                                                                                         | Options                                                |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| CHASSIS INTRUDE      | Enable/Disable CHASSIS INTRUDE                                                                                                                      | ★Disabled, Enabled                                     |
| Setup Prompt Timeout | Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.                                                         | ★1                                                     |
| Post Time Delay      | Delay for specific situation reeds. For example, HDD spin up time (Delay time = value x 500ms)                                                      | ★0                                                     |
| Bootup NumLock State | Select the keyboard NumLock state                                                                                                                   | ★On, Off                                               |
| Quiet Boot           | Enables or disables Quiet Boot option                                                                                                               | Disabled, ★Enabled                                     |
| Fast Boot            | Enables or disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options. | ★Disabled, Enabled                                     |
| Boot mode select     | Select boot mode LEGACY/UEFI                                                                                                                        | ★UEFI, LEGACY                                          |
| Boot Option #1 ~ #5  | Sets the system boot order                                                                                                                          | ★Hard Disk, NVME, CD/DVD, Network USB Device, Disabled |

## 6.7 Exit

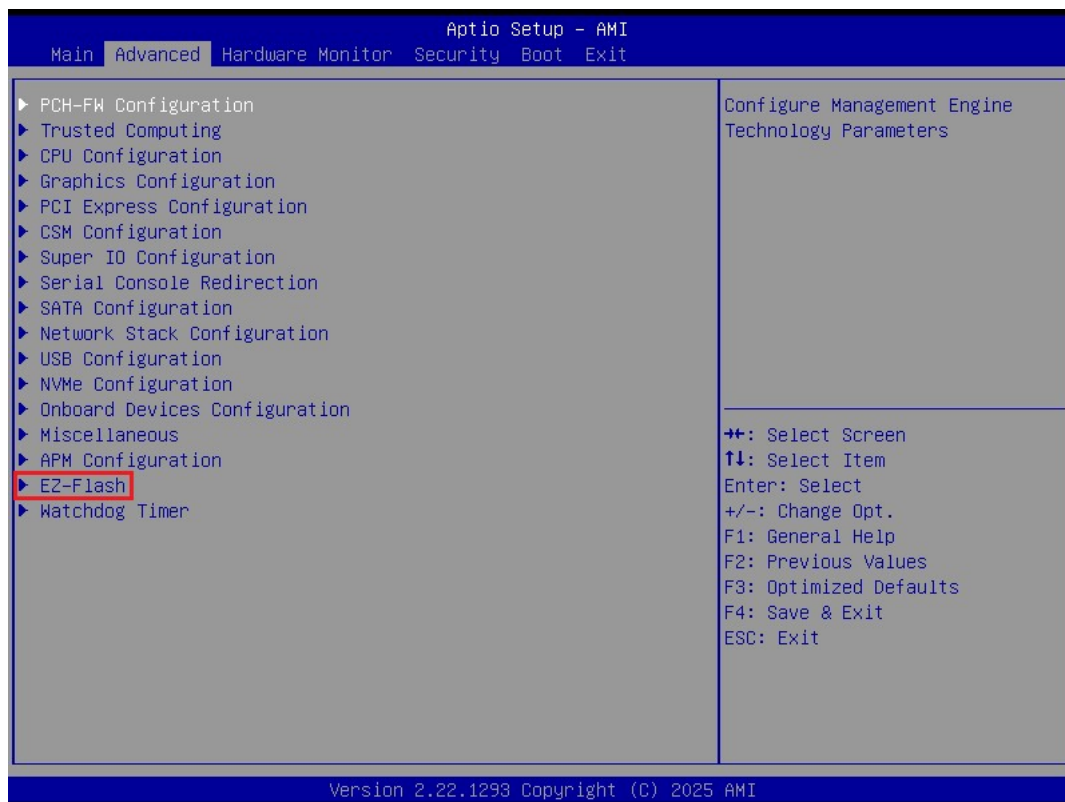


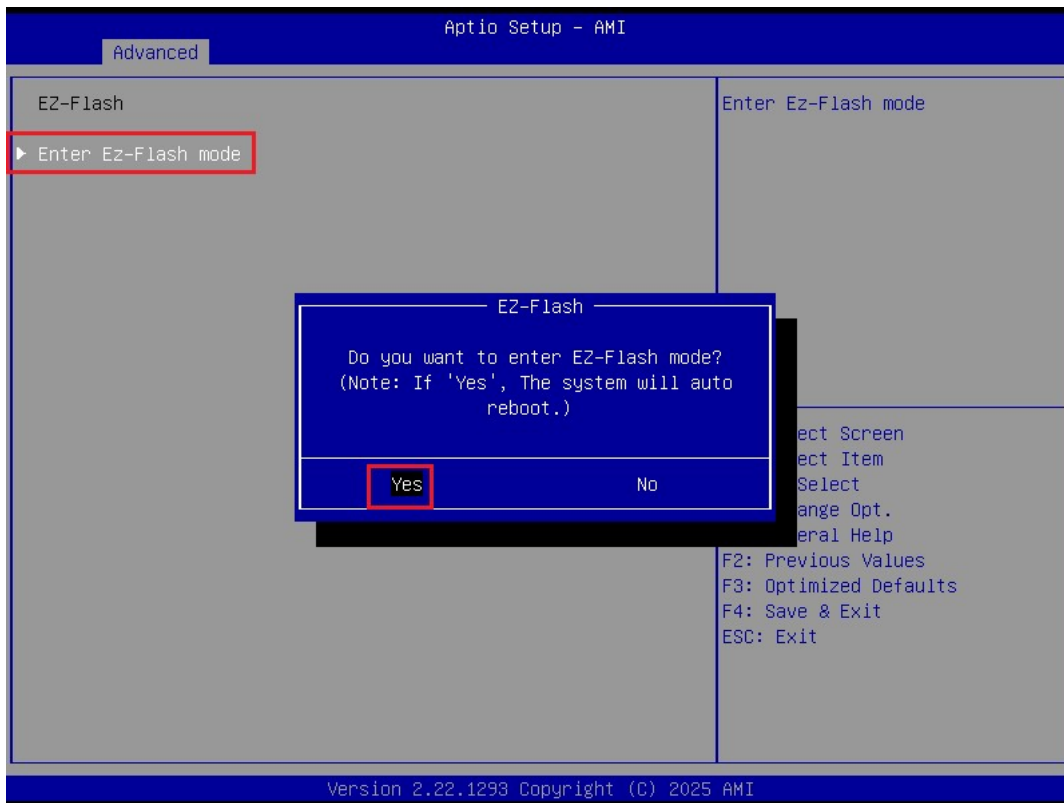
| Feature                   | Description                                              | Options |
|---------------------------|----------------------------------------------------------|---------|
| Save Changes and Exit     | Exit system setup after saving the changes.              |         |
| Discard Changes and Exit  | Exit system setup without saving any changes.            |         |
| Save Changes and Reset    | Reset the system after saving the changes.               |         |
| Discard Changes and Reset | Rest system setup without saving any changes.            |         |
| Save Changes              | Save Changes done so far to any of the setup options.    |         |
| Discard Changes           | Discard Changes done so far to any of the setup options. |         |
| Restore Defaults          | Restore/Load Default values for all the setup options.   |         |
| Save as User Defaults     | Save the changes done so far as User Defaults.           |         |
| Restore User Defaults     | Restore the User Defaults to all the setup options.      |         |

Question: How to update the BIOS file of RUBY-D813-H610E-D5?

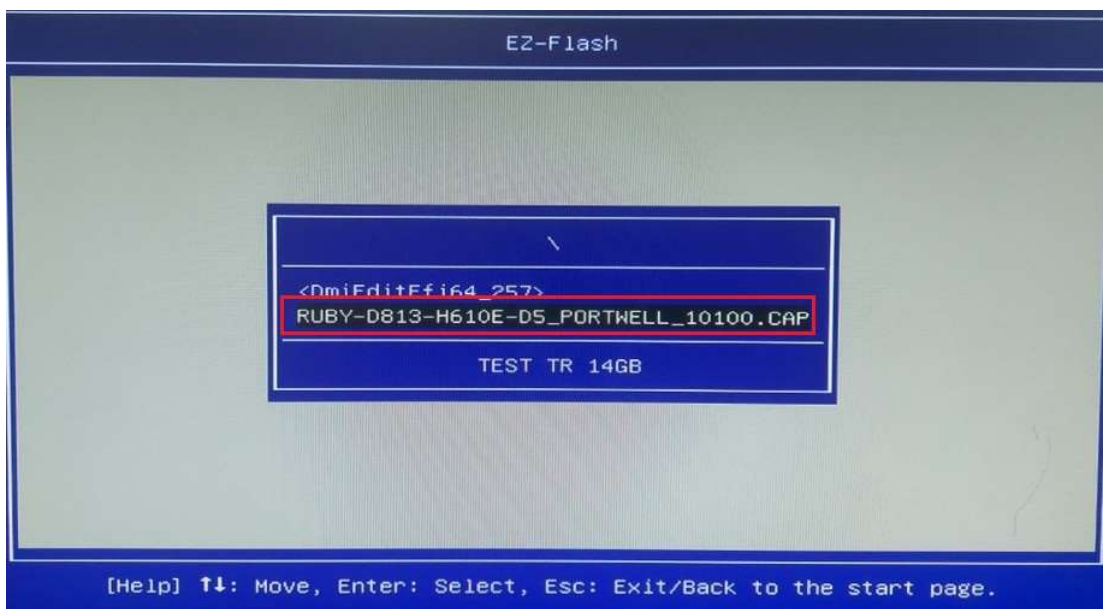
Answer:

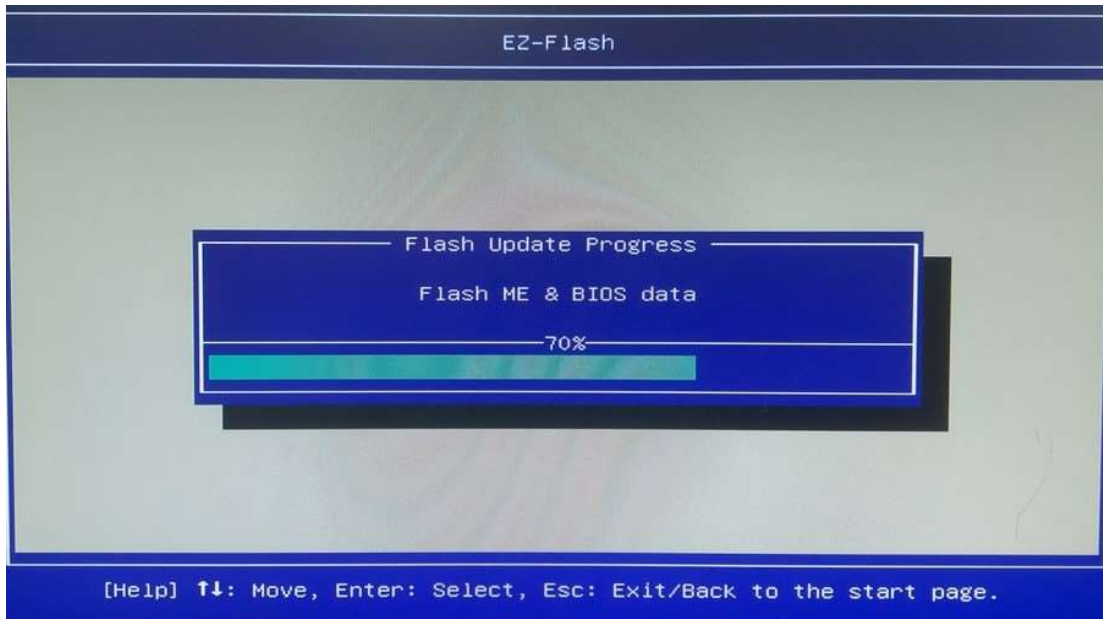
1. Please visit web site of Portwell download center as below hyperlink  
<https://www.portwell.com.tw/support-center/download-center/>
2. Select “Search download” and type the keyword “RUBY-D813-H610E-D5”.
3. Find the “BIOS “page and download the ROM file and unzip file to USB flash drive (FAT 32 formats).
4. Boot into BIOS and switch to “Advanced” page then select”EZ-Flash”.





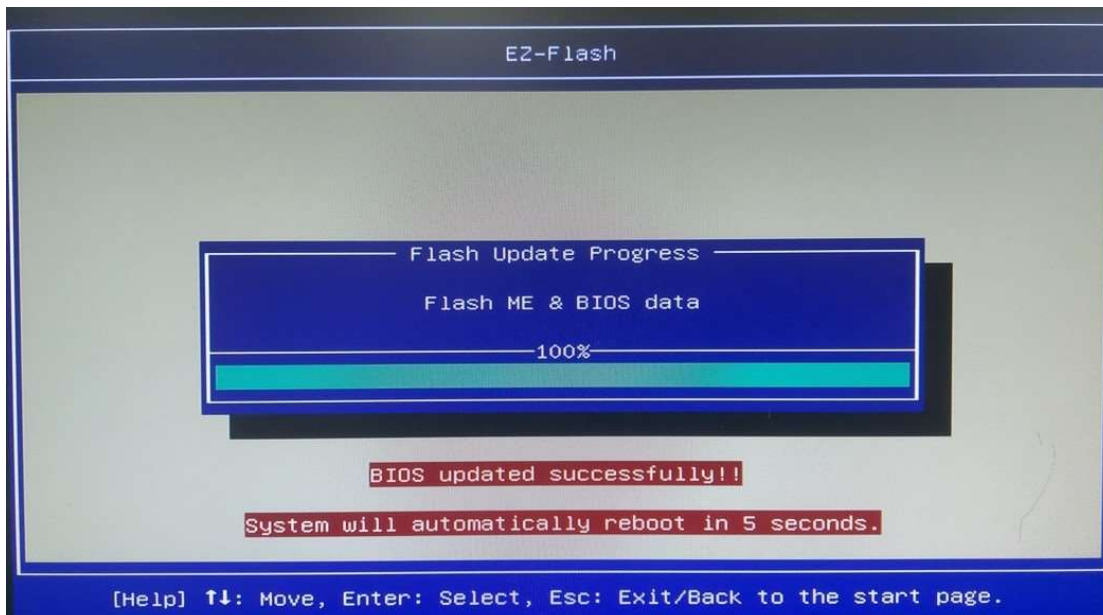
5. Enter EZ-Flash mode, Select the USB Drive and Click the BIOS file then start updating BIOS.





6. When you see the “**BIOS updated successfully**” message, which means the BIOS update processes finished.

Please cut the AC power off and **wait for 10 seconds** before powering on.



# Chapter 7

## Overview

- 7 System Resources
- 7.1 Intel® Alder/ Amston Lake SoC
- 7.2 Main Memory
- 7.3 Installing the Single Board Computer

## 7 System Resources

### 7.1 Intel PCH

Intel® Q870 Chipset

### 7.2 Main Memory

RUBY-D814-Q870 provides 4 Dual Channel DDR5 U-DIMMs sockets which support the maximum memory can be up to 192GB. Memory clock and related settings can be detected by BIOS via SPD interface.

Watch out the contact and lock integrity of memory module with socket, it will impact on the system reliability. Follow normal procedures to install memory modules into memory socket. Before locking, make sure that all modules have been fully inserted into the card slots.

### 7.3 Installing the Single Board Computer

To install your RUBY-D814-Q870 into the standard chassis or proprietary environment, please perform the following:

Step 1: Check all jumpers setting on proper position

Step 2: Install and configure CPU, CPU cooler and memory module on right position

Step 3: Place RUBY-D814-Q870 into the dedicated position in the system

Step 4: Attach cables to existing peripheral devices and secure it

#### **WARNING**

Please ensure that the motherboard is properly inserted and fixed by the mechanism.

**Note:**

Please find drivers in the RUBY-D814-Q870 of Portwell's download center. The driver supports Windows 10/11.

# Chapter 8

- 8 Troubleshooting
- 8.1 Hardware Quick Installation
- 8.2 BIOS Setting
- 8.3 FAQ

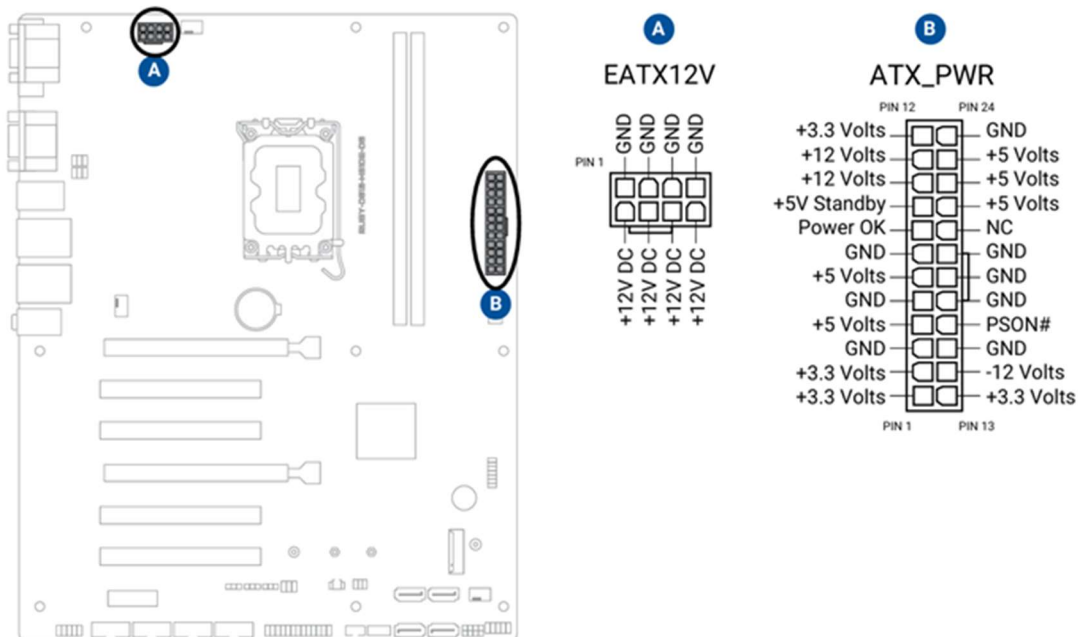
## 8 Troubleshooting

This chapter provides a few useful tips to quickly get RUBY-D814-Q870 running with success. As basic hardware installation has been addressed in Chapter 2, this chapter will focus on system integration issues, in terms of BIOS setting, and OS diagnostics.

### 8.1 Hardware Quick Installation

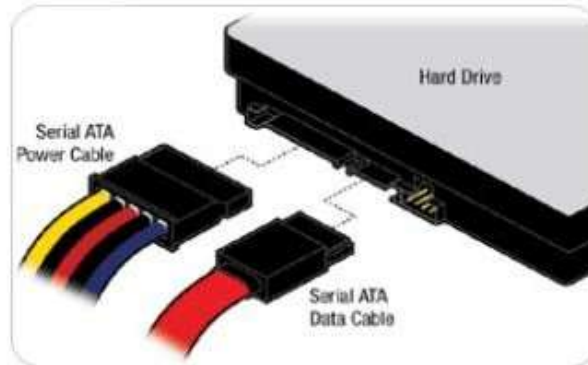
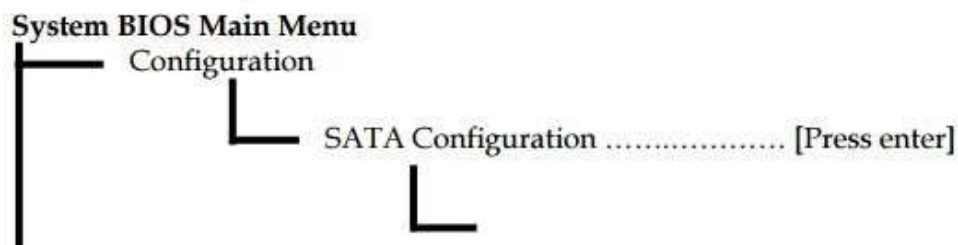
#### **ATX Power Setting**

Correctly orient the ATX power supply plugs into these connectors and push down firmly until the connectors completely fit.



## Serial ATA

### Serial ATA Hard Disk Setting for SATA Speed Selection



**SATA Speed Selection [Auto, Gen1, Gen2, Gen3]**

## 8.2 BIOS Setting

It is assumed that users have correctly adopted modules and connected all the devices cables required before turning on ATX power.

DDR5 UDIMM Memory, keyboard, mouse, SATA hard disk, VGA connector, device power cables, ATX accessories are good examples that deserve attention. With no assurance of properly and correctly accommodating these modules and devices, it is very possible to encounter system failures that result in malfunction of any device.

To make sure that you have a successful start with RUBY-D813-H610E-D5, it is recommended, when going with the boot-up sequence, to hit “DEL” and” ESC” key and enter the BIOS setup menu to tune up a stable BIOS configuration so that you can

wake up your system far well.

### **Loading the default optimal setting**

When prompted with the main setup menu, please scroll down to **“RestoreDefaults”**, press **“Enter”** and select **“Yes”** to load default optimal BIOS setup. This will force your BIOS setting back to the initial factory configurations. It is recommended to do this so you can be sure the system is running with the BIOS setting that Portwell has highly endorsed. As a matter of fact, users can load the default BIOS setting at any time when system appears to be unstable in boot up sequence.

## 8.3 FAQ

### Information & Support

**Question: I forgot my password for system BIOS, what am I supposed to do?**

**Answer:** You can switch off your power supply then find the RTC battery on the RUBY-D813-H610E-D5. Then remove the RTC battery and wait 5 seconds to clean your password then to switch on your power supply.

**Question: How to update the BIOS file of RUBY-D814-Q870?**

Answer:

1. Please visit web site of Portwell download center as below hyperlink  
<https://download.portwell.tw/>
2. Select “Search download” and type the keyword “RUBY-D813-H610E-D5”.
3. Find the “BIOS “page and download the ROM file and flash utility.
4. Unzip file to bootable USB flash drive which can boot to shell mode. Then execute the “update.efi”. It will start to update BIOS.
5. When you see the “FPT Operation Passed” message, which means the BIOS update processes finished. Please cut the AC power off and wait for 10 seconds before powering on.
6. If you have other additional technical information or requests which are not covered in this manual, please fill in the technical request form as below hyperlink.

<https://www.portwell.com.tw/support-center/technical-request/>

We will do our best to provide a suggestion or solution for you.

# Chapter 9

## 9 Portwell Software Service

RUBY-D814-Q870 user manual

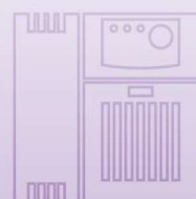
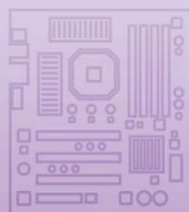
## 9 Portwell Software Service

Portwell Evaluation Tool (PET)

The Portwell Evaluation Tool (PET) is an API which Portwell's customers can access the GPIO, I2C, SMBus, etc under Windows and Linux OS. For more information, please contact Portwell.



Please verify specifications before quoting. This guide is intended for reference purposes only. All product specifications are subject to change without notice. No part of this publication may be reproduced in any form or by any means, such as electronically, by photocopying, recording, or otherwise, without prior written permission from the publisher. All brand and product names are trademarks or registered trademarks of their respective companies.



#### Portwell, Inc. Headquarters

No. 242, Bo'Ai St., Shu-Lin Dist,  
New Taipei City 238, Taiwan  
Tel: +886-2-7731-8888  
Fax: +886-2-7731-9888  
E-mail: [info@portwell.com.tw](mailto:info@portwell.com.tw)  
[www.portwell.com.tw](http://www.portwell.com.tw)

#### American Portwell

(Fremont, CA)  
Tel: +1-510-403-3399  
E-mail: [info@portwell.com](mailto:info@portwell.com)  
[www.portwell.com](http://www.portwell.com)

#### Portwell UK Ltd.

Tel: +44(0)1235-750-760  
E-mail: [info@portwell.eu](mailto:info@portwell.eu)  
[www.portwell.eu](http://www.portwell.eu)

#### Portwell Japan, Inc.

(Tokyo)  
Tel: +81-3-6902-9225  
E-mail: [info@portwell.co.jp](mailto:info@portwell.co.jp)  
[www.portwell.co.jp](http://www.portwell.co.jp)

#### Portwell Japan, Inc.

(Osaka)  
Tel: +81-6-4807-7721  
E-mail: [info@portwell.co.jp](mailto:info@portwell.co.jp)  
[www.portwell.co.jp](http://www.portwell.co.jp)

#### European Portwell

Tel: +31-252-620790  
E-mail: [info@portwell.eu](mailto:info@portwell.eu)  
[www.portwell.eu](http://www.portwell.eu)

#### KIOSK Embedded Systems GmbH

Tel: +49-8152-3962-500  
E-mail: [info@portwell.eu](mailto:info@portwell.eu)  
[www.portwell.de](http://www.portwell.de)

#### Shanghai Portwell

Tel: +86-21-5771-2505  
E-mail: [info@portwell.com.cn](mailto:info@portwell.com.cn)  
[www.portwell.com.cn](http://www.portwell.com.cn)

#### Portwell Korea, Inc.

Tel: +82-31-450-3043  
E-mail: [info@portwell.co.kr](mailto:info@portwell.co.kr)  
[www.portwell.co.kr](http://www.portwell.co.kr)

#### Portwell India Technology Private Limited

Tel: +91-80-4168-4255  
E-mail: [enquiry@portwell.in](mailto:enquiry@portwell.in)  
[www.portwell.in](http://www.portwell.in)