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BKHD-2049NP-6L-15 Motherboard User Manual

VER 1.0

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Safety Guide

To ensure optimal performance of BKHD products, please read the user manual in its entirety. Before checking product-specific details, we kindly ask that you carefully read these safety instructions.

Product Version Identification

You can find the version of this motherboard on the motherboard itself, marked as "REV: X.X". X.X represents numbers, for example, "REV: 1.0" means the motherboard version is 1.0. When updating the motherboard's BIOS, drivers, or referring to other technical data, please pay attention to the product version marking.

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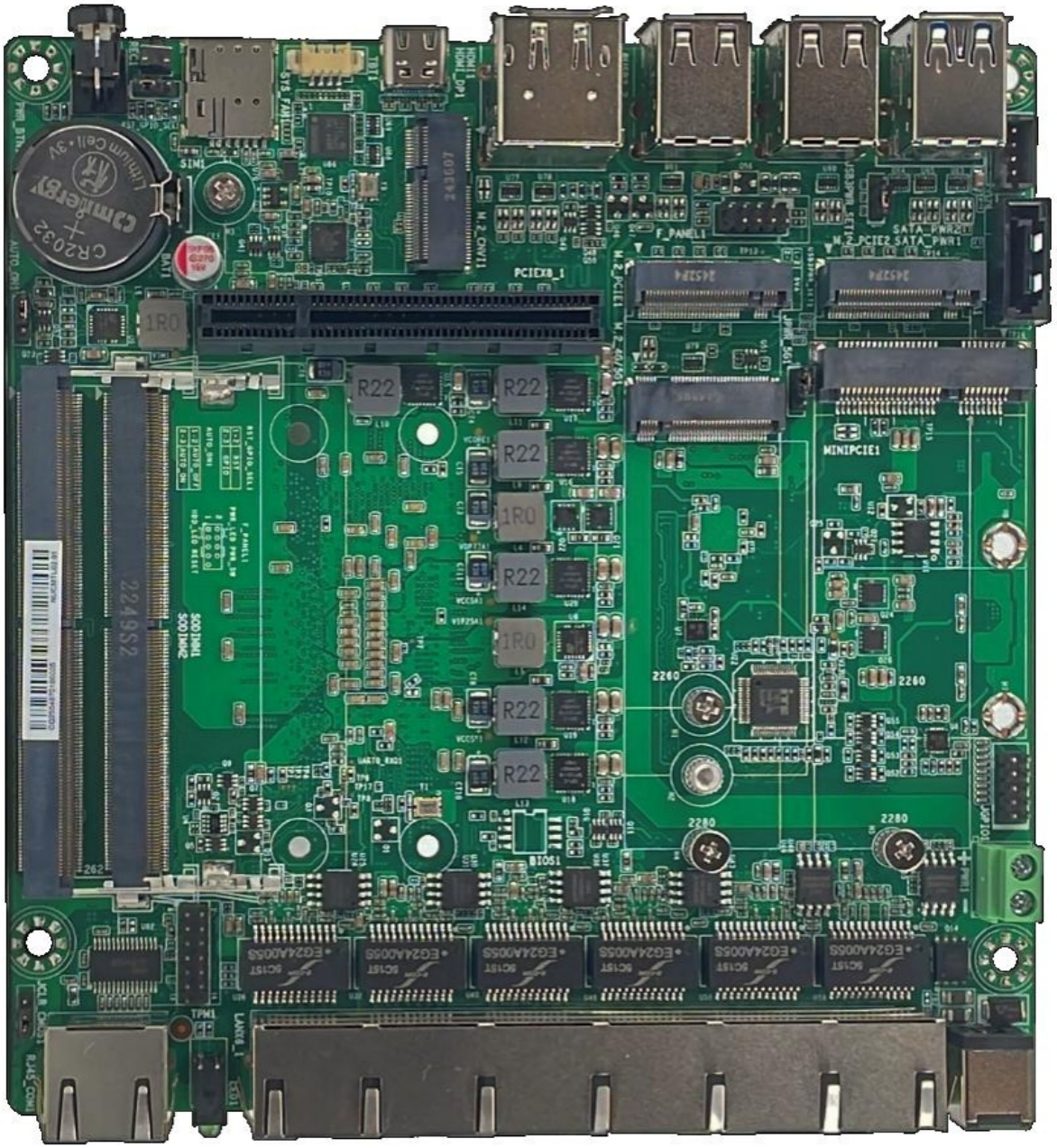
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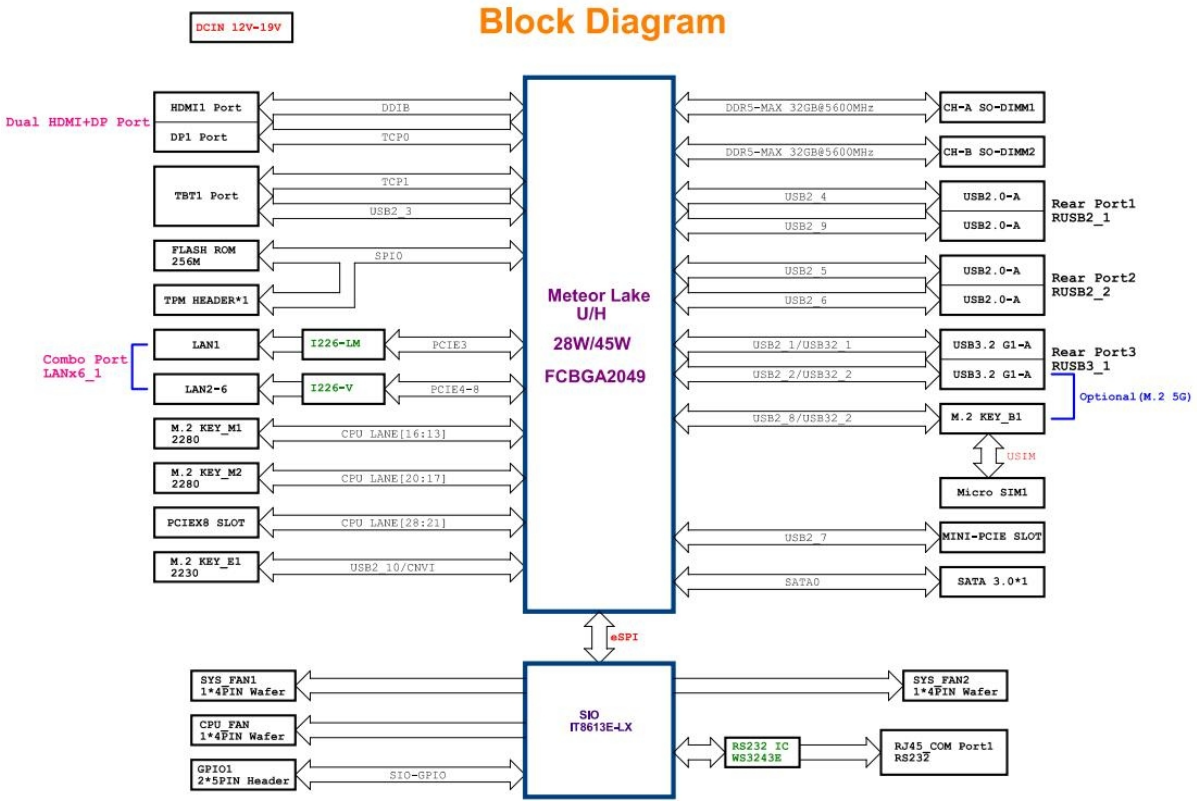
Product Images

Please be advised that products manufactured in different batches may exhibit slight variations in appearance. To ensure the most accurate representation, please refer to the actual received goods.



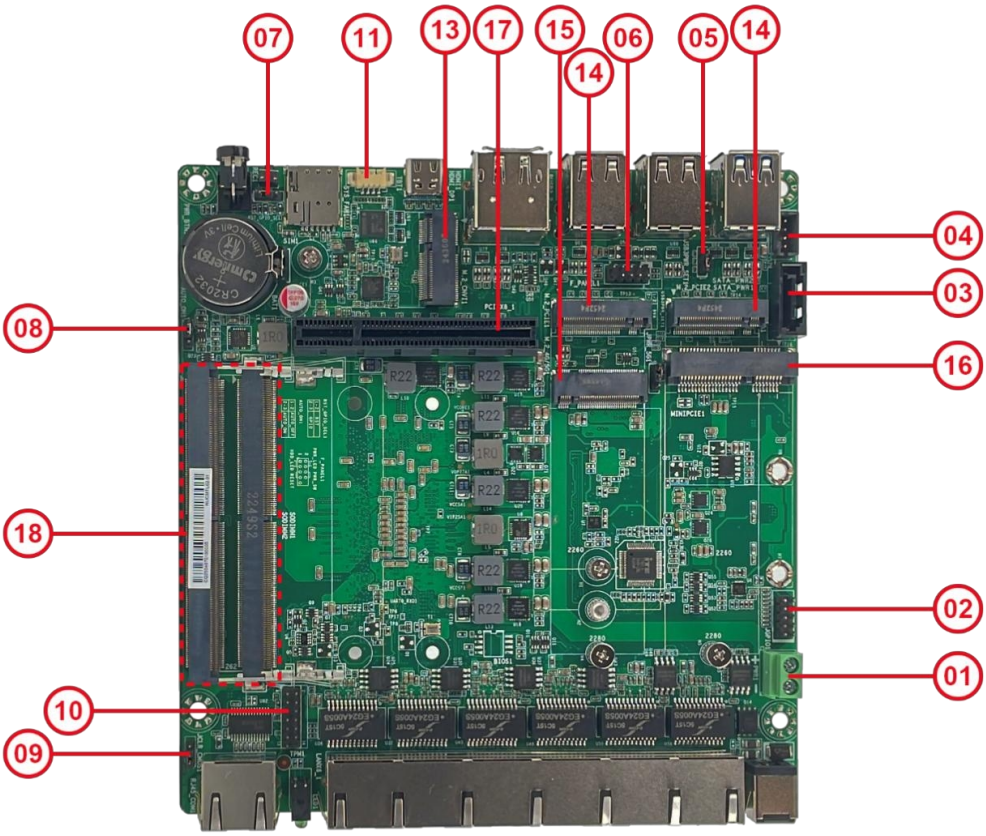
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Block Diagram

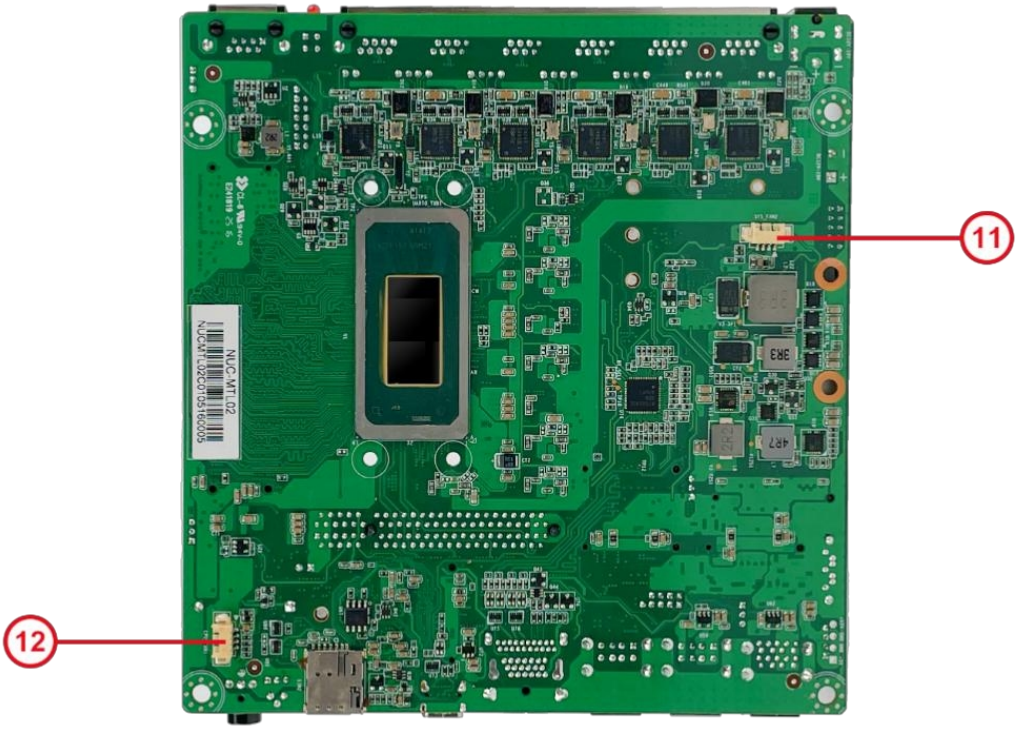


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Motherboard Layout



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Number	Item	Describe
1	PWR1	Phoenix Terminal for DC19V Power Supply
2	JGPIO	Onboard GPIO (General-Purpose Input/Output) pins
3	SATA	SATA HDD/SSD Data Connectors
4	SATA_PWR	SATA HDD/SSD Power Socket
5	JUSB3PWR_SET1	Setting the USB 3.0 Port powered jumper
6	F_PANEL	Motherboard function pin, used to connect chassis button
7	RST_GPIO_SEL1	Setting the Jumpers for the Panel Buttons
8	AUTO_ON	Jumper to enable or disable Auto Power-On
9	CLR_CMOS	CMOS jumper, used to clear BIOS settings
10	TPM	TPM pin, used for external TPM module
11	SYS_FAN 1/2	System fan, used to install chassis fan

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12	CPU_FAN1	For CPU fan power supply
13	M.2_CNVi	M.2 Key-E slot, Used to install WiFi/BT modules for CNVI protocol
14	M.2_PCIe	M.2 Key-M Storage SSD interface
15	M.2_4G/5G	M.2 Key-B slot, Used to install modules for USB protocol
16	Mini PCIe	Mini PCIe slot, Used to install modules for USB protocol
17	PCIe x8	Used to install expansion cards for PCIe x8/x4/x2/x1 slot
18	SODIMM 1/2	DDR5 SO-DIMM memory slot (RAM)



Item	Describe
RJ45 COM	RJ45 port for COM RS232 standard
PWR/HDD LED	LED Indicator (Power: Green; Hard disk: Red)
RJ45 Connectors	RJ45 Ethernet port for LAN/WAN
	Link LED: Green and solid, indicating the network is connected Active LED: Orange flashing, indicating data transmission
DC_IN	Jack DC 5.5/2.5mm Power connector, 19V

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Item	Describe
USB 3.0	Double-layer USB-Type-A 3.2 port (10Gbps)
USB 2.0	Double-layer USB-Type-A 2.0 port
DP_HDMI	DP and HDMI display ports
USB Type-C	Thunderbolt 40Gbps
SYS_FAN	4-pin System Fan
SIM 1/2	Micro SIM card slot
REC_BTN	Reset Button, can be switched to GPIO via jumper.
PWR_BTN	Power Button to turn the device ON or OFF

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Product Profile

The 2049NP-6L-15-MB sets a new benchmark for compact industrial motherboards, integrating extreme interface density, powerful Intel Ultra H-series processors with AI acceleration, and unprecedented expansion flexibility into a compact form factor. Designed for 24/7 operation and equipped with enterprise-grade remote management (vPro) and reliability features (watchdog timer, automatic power supply), it is the ideal hardware platform for building next-generation networking, security, edge computing, and industrial automation systems that demand extreme edge performance, connectivity, and resiliency.

Main features:

Unparalleled Port Connectivity: 6 x 2.5GbE ports: Industry-leading port density for high-bandwidth networking, servers, or security applications. Supports link aggregation and segmentation. Supports vPro processor (LAN1): Enables enterprise-class remote out-of-band management (KVM, power control, troubleshooting). Supports Wake-on-LAN (S4/S5) and PXE boot for network deployments. 1 x RJ45 COM port (RS232) for industrial equipment integration.

Flexible Processing: Supports Intel Ultra H-series CPUs: Optional Ultra 5 125H / Ultra 7 125H / Ultra 9 185H provide balanced performance for high-end computing needs. Integrated Intel Arc Graphics: Supports media acceleration and multiple display interfaces (DP + HDMI) for signage, kiosks, and human-machine interfaces (HMIs). Integrated Intel AI Boost NPU dedicated hardware enables efficient, low-latency AI inference at the edge.

Industrial-grade reliability and management: Powerful power handling capabilities, with 19V DC input via a DC Jack or Phoenix connector, suitable for industrial power supplies and PoE splitters. Support for ACPI-compliant power management ensures automatic system startup upon AC power restoration, ensuring system stability. A TPM header ensures hardware security.

Highly scalable storage and expansion: Fast storage with two PCIe 4.0 M.2 Key-M SSDs and one SATA 6Gb/s port. Ideal for operating systems, applications, and data/cache drives. Future-proof expansion with one PCIe 5.0 x8 slot (supporting high-bandwidth add-in cards such as GPUs, FPGA accelerators, or NICs). Also included are one mPCIe slot, M.2 Key-B (for USB signal expansion cards, such as LTE/Wi-Fi), and M.2 Key-E (for Intel CNVi Wi-Fi/Bluetooth). Onboard GPIO headers are available for sensor integration.

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Motherboard Specifications

Processor	Product Collection	Intel Core Ultra processors (Series 1)
	Sockets Supported	FCBGA2049
Memory specifications	Memory Type	Dual Channel DDR5 SO-DIMM
	Maximum Capacity	96GB
	Maximum Frequency	5600 MT/s
Storage specifications	SATA	1*SATA 6Gb/s
	M.2	2*M.2 Key-M 2280 (PCIe Gen4 x4)
Network features	Ethernet	6*2.5GbE
	Controller	1*Intel I226LM/5*Intel I226V
Extension interface	mPCIe	1*mPCIe (USB2.0 Signal)
	PCIe	1*PCIe x8 (Gen5)
	M.2	1*M.2 Key-B 3052 (USB2.0/3.0 Signal)
		1*M.2 Key-E 2230 (CNVi Signal)
Display functions	Port	1*DP/1*HD
	Chip	Integrated Intel Arc graphics
NPU functions	Intel AI Boost	OpenVINO, WindowsML, DirectML, ONNX RT
I/O Chip	IT8613	Handling CPU/SYS Fan data/GPIO/COM ports
Backplane I/O	USB	4*USB-A 2.0/2*USB-A 3.2
	Type-C	1*Thunderbolt (40Gbit/s)
	Display	1*DP/1*HD
	COM	1*RJ45 COM-RS232
	LAN	6*RJ45
	Power Supply	1*Jack DC 5.5/2.5mm
	SIM	2*Micro SIM card slots
	Fan	1*SYS_FAN
Onboard I/O	SATA	1*SATA Data connector/1*SATA Power socket
	Pins	1*F_PANEL
		1*GPIO
		1*TPM
	Fan	1*CPU_FAN/1*SYS_FAN
Power supply mode	DC	Jack DC or Phoenix Terminal (19V)
Motherboard size	Specification	150*145 (mm)
Work Environment	Temperature	0℃~60℃;
	Humidity	0%~95% (Relative humidity, no condensation)

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Motherboard Installation

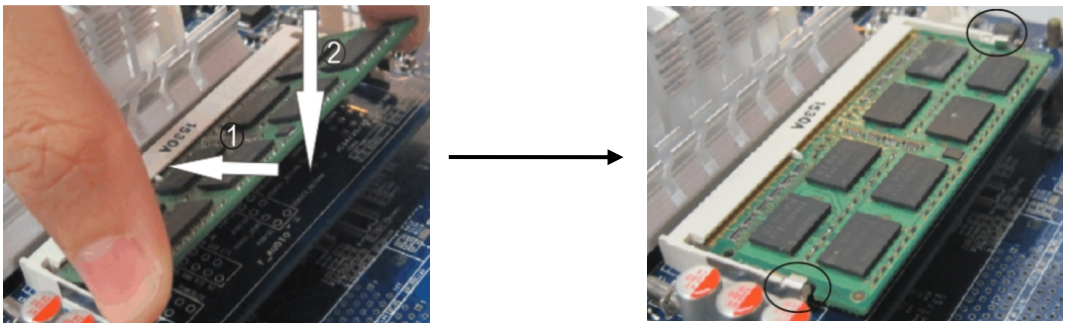
Safety Note

- Please do not remove the serial number and agent warranty sticker from the motherboard prior to installation. Doing so may affect the product's warranty recognition standard.
- Prior to installing or removing the motherboard or other hardware devices, please ensure that the power is turned off and the power cord is unplugged from the socket.
- When installing additional hardware devices on the motherboard interfaces, please ensure that the connectors and sockets are securely fastened.
- When handling the motherboard, please avoid contact with the metal wiring components to prevent the risk of short circuits.
- It is recommended that an anti-static wrist strap be worn when handling the motherboard, central processing unit (CPU), or memory. In the absence of an anti-static wrist strap, it is advisable to ensure that your hands are dry and to touch a metal object first in order to eliminate static electricity.
- Before installing the motherboard, we kindly request that place it on an antistatic mat or in an antistatic bag.
- Make sure the power adapter is turned off before unplugging the motherboard power connector.
- Before turning on the power, make sure the voltage of the adapter is within the standard voltage range.
- Before turning on the power, make sure all hardware device cables and power cords are properly connected.
- Do not allow the fixing screws to collide with the circuits or parts on the motherboard to avoid damage or malfunction of the motherboard.
- Make sure there are no loose screws or metal parts on the motherboard or inside the computer case before using the unit.
- Please secure the computer host in a stable location before starting the device.
- To prevent system failure, do not place the unit in an environment where the temperature is excessive.
- Turning on the power before installation is complete may damage the motherboard, other equipment, or yourself.
- If you are unfamiliar with how to perform the installation, or if you have any technical problems using this product, please contact a professional technician.

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Memory Installation

The motherboard provides DDR5 SODIMM memory slot.



Before installing memory:

1. Please confirm that the memory you purchased is compatible with the specifications supported by this motherboard.

2. Before installing or removing the memory, please make sure that the power of the computer is turned off to avoid damage.

3. The memory design has a foolproof mark. If you insert the memory in the wrong direction, the memory cannot be installed. Please change the direction.

When installing memory:

1. Before installing or removing memory, please turn off the power and unplug the power cord.

2. Carefully hold the two ends of the Memory Stick and do not touch the metal contacts on the Memory Stick.

3. Align the metal contacts of the memory with the memory slot, making sure that the concave hole is aligned with the convex point of the upper slot.

4. Insert the memory into the slot at an angle of 30 degrees, then press the Memory Stick down until you hear a "click," indicating that the memory has been successfully installed and is ready to use. (Note: Do not press the Memory Stick too hard to avoid damaging the memory).

5. To remove the Memory Stick, push out the tabs at both ends of the memory slot simultaneously, and then remove the Memory Stick.

To remove the memory:

Use two fingers to push the latches at either end of the slot outward, the memory will pop up, then remove the memory.

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Jumper Setting

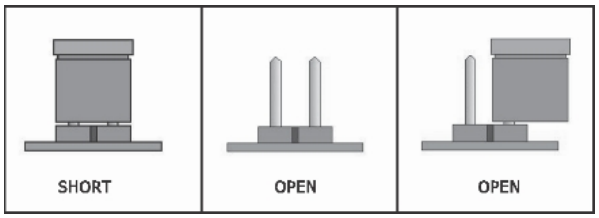
Before installing the hardware device, you can set the corresponding jumpers according to your needs based on the following table.

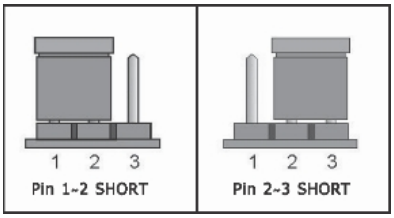
To identify the first pin of a jumper or connector

Look at the marking next to the jumper or connector. The triangle symbol "▲" or "1" or a bold line indicates the first pin; check the pad on the back of the motherboard. The square pad is the first pin. When connecting the connector to the device, be careful to distinguish the first pin. Mixing the pins will damage the motherboard.

2-pin headers: Insert a jumper cap into both pins turns them off (short).

3-pin headers: Insert a jumper cap into pins 1-2 or pins 2-3 to off (short) them.





Restore on AC Power Loss (AUTO_ON)

Image	Status	Setting
3 1	1-2	Normal (Default)
	2-3	Enable Automatic Power On

SW Button Function Select Jumper (RST_GPIO_SEL)

Image	Status	Setting
3 1	1-2	RST (Default)
	2-3	GPIO

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Clear CMOS Jumper (CLR_CMOS)

Image	Status	Setting
	1-2	Normal (Default)
	2-3	Data Clearance

USB 3.0 Port Power Select Jumper (JUSB3PWR_SET1)

Image	Status	Setting
	1-2	+5V Standard (Default)
	2-3	+5V Analog

4G/5G Function Selection Jumper (JPWR_5G)

Image	Status	Setting
	1-2	4G (Default)
	2-3	5G

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Motherboard Pin Definition

SATA Data

The motherboard provides 7-pin SATA data socket

Image	PIN	Definition	PIN	Definition
	1	GND	2	SATA_TX+
	3	SATA_TX-	4	GND
	5	SATA_RX-	6	SATA_RX+
	7	GND	-	

SATA PWR

The motherboard provides 4-pin SATA power socket

Image	PIN	Definition
	1	+5V
	2	GND
	3	GND
	4	+12V

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Front Panel Connectors (F_PANEL)

The motherboard provides F_PANEL pins (2*5-pin, 2.54 mm pitch, 10th pin is empty)

Image	PIN	Definition	PIN	Definition
	1	HDD_LED+	2	PWR_LED+
	3	HDD_LED-	4	PWR_LED-
	5	GND	6	PWR_BTN
	7	Reset_BTN	8	GND
	9	GND		

HDD LED (Pins 1, 3 - Pin 1 is Positive/Anode)

Function: Blinks during hard drive read/write activities to indicate disk operation.

Power LED (Pins 2, 4 - Pin 2 is Positive/Anode)

Function: Remains solid on when the system is powered on, and turns off when the system is powered down.

Reset Button (Pins 5, 7)

Function: Connects to the chassis reset switch. Pressing this button reboots the system in the event of a system crash or freeze.

Power Button (Pins 6, 8)

Function: Connects to the chassis power switch to power the system on or off.

Serial Port (COM)

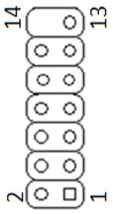
The motherboard provides RJ45 COM port

Image	PIN	Definition	PIN	Definition
	1	RTS#	2	DTR#
	3	TXD	4	N/A
	5	GND	6	RXD
	7	DSR#	8	CTS#

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Trusted Platform Module (JTPM)

The motherboard provides JTPM pins (2*7-pin, 2.00mm pitch)

Image	PIN	Definition	PIN	Definition
	1	VCC	2	S_SPI_TPM_IRQ#
	3	S_PLTRST#	4	S_SPI_TPM_CS2#
	5	F2_SPI_CS1#_R	6	F_BOIS_WP#_R
	7	+3V_SPI	8	GND
	9	F_SPI_CSO#_R	10	T_SPI_CLK
	11	T_SPI_MISO	12	T_SPI_MOSI
	13	F_SPI_HOLD#_R	14	NC

Cooling Fan Connectors (SYS_FAN 1/2 / CPU_FAN)

The motherboard provides CPU/SYS_FAN pins (1*4-pin, 1.25mm pitch)

Image	PIN	Definition
	1	Ground
	2	+12V
	3	Sense
	4	Control

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Phoenix Power Connector (PWR1)

The motherboard provides one 1x2-pin Phoenix connector supporting 12V~19V power input and output.

Note: This connector shares the same power circuit as the DC Jack and cannot be used simultaneously. Do NOT apply power to the motherboard via both the Phoenix connector and the DC Jack at the same time.

Image	PIN	Definition	PIN	Definition
	+	12V~19V	-	GND

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BIOS User Guide

BIOS Description

This motherboard uses AMI BIOS. BIOS stands for (Basic Input Output System). It is a set of programs stored on a ROM (Read Only Memory) chip on the computer's motherboard. It stores the computer's most important basic I/O programs, the power-on self-test program, and the system startup program. It can read and write specific information about system settings from the CMOS. Its primary function is to provide the most basic and immediate hardware settings and control for the computer.

When you turn on your computer, the BIOS is the first program to run. It has the following main functions:

- The Power-On Self-Test (POST) checks whether the computer is functioning properly.
- It initializes and tests some external devices and loads your operating system.
- It provides the lowest-level, most basic control of your computer hardware.
- You manage your computer through the SETUP function in the BIOS.

The BIOS data is stored in a CMOS/R RAM chip on the motherboard, maintained by a 3.3V button battery. It contains important system information and the BIOS Setup program for setting system parameters. When the system is operating normally, the BIOS does not need to be modified. However, if the CMOS data is lost due to other reasons, the BIOS must be reset.

Note:

Incorrect BIOS settings can directly damage the computer hardware and even burn out the motherboard. Those unfamiliar with the system are advised to modify the settings with caution. Because the motherboard BIOS is constantly being updated, the BIOS information in this manual is for reference only. We cannot guarantee that the BIOS information in this manual will be consistent with the actual BIOS information on the motherboard.

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BIOS Settings

When the computer powers on or reboots, the following prompt will appear on the POST screen: Press "DEL" to enter BIOS Setup.



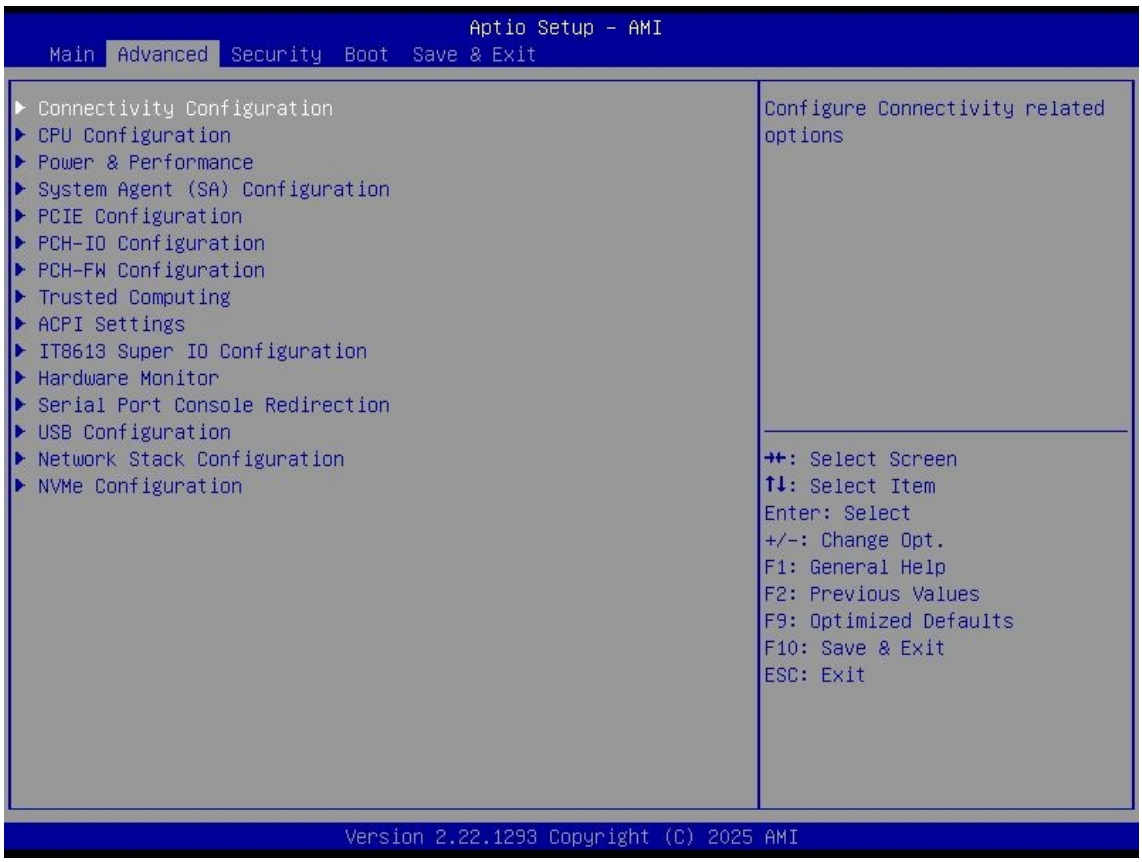
If the prompt disappears before you can respond, you may restart the system to try again by using one of the following methods:Press <Ctrl> + <Alt> + <Del> simultaneously.Press the Reset button on the chassis.Power off the system and turn it on again.

Keyboard keys	Functional Description
← / →	Move the Left and Right arrows to select the screen.
↑ / ↓	Move the Up and Down arrows to select the item.
+ / -	Increase/Decrease value or Change selection
<Enter>	Select, Confirm this option or Enter the submenu
<ESC>	Return to Main page, or End the setup process from Main page
<F1>	Show related Help instructions
<F2>	Restore previous settings
<F9>	Load the optimized settings (BIOS defaults)
<F10>	Save the changed settings and reboot

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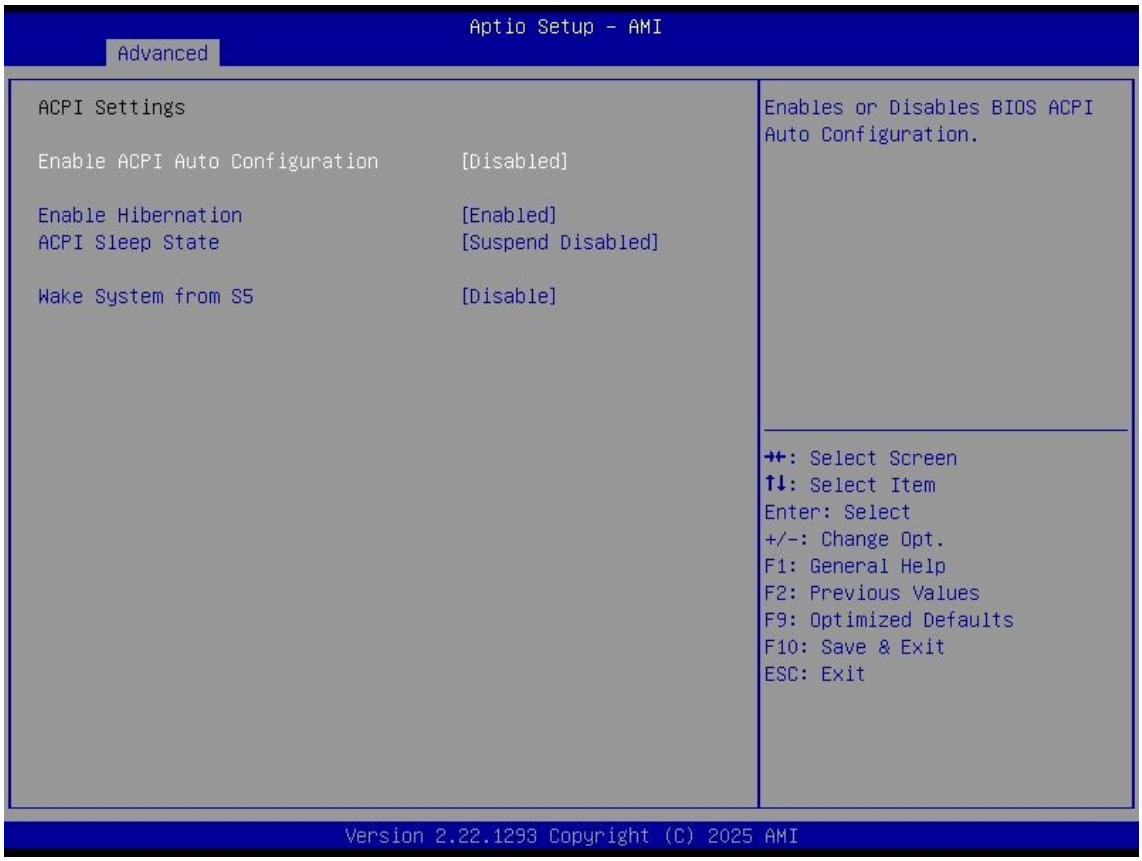
BIOS Information

Advanced Settings



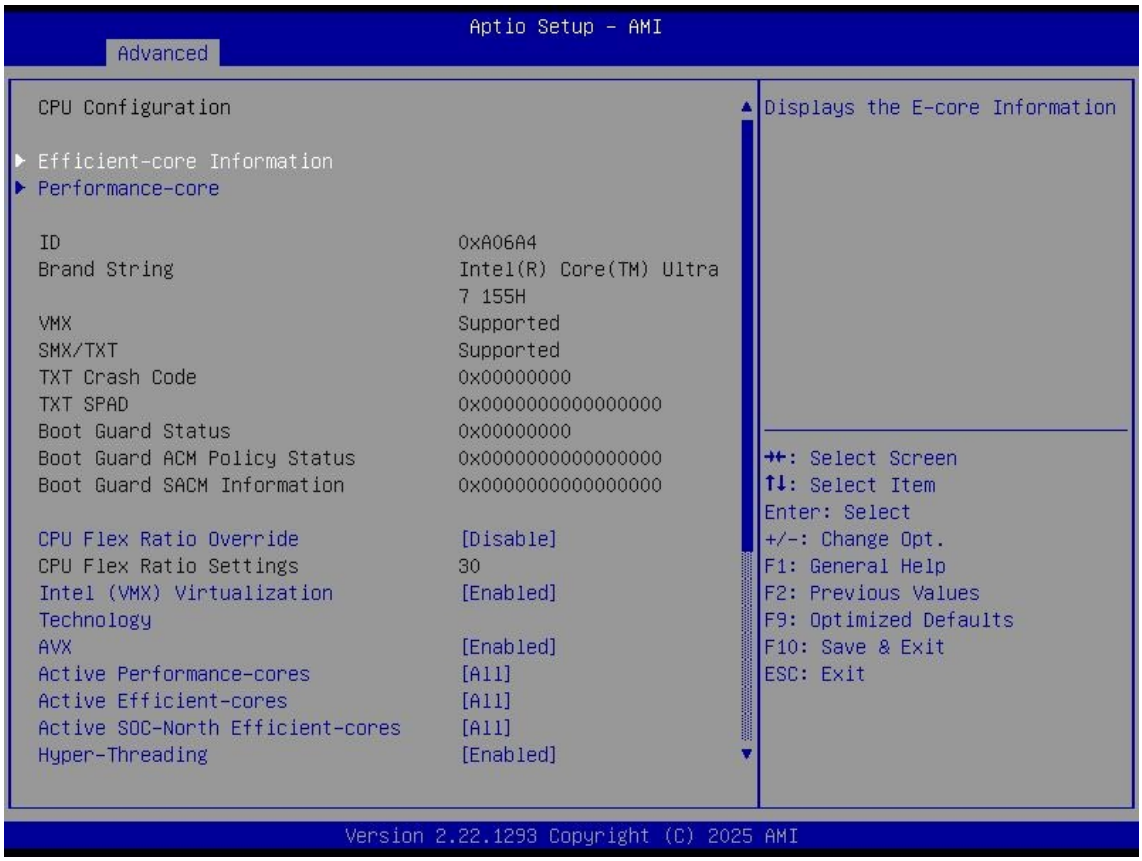
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ACPI Settings



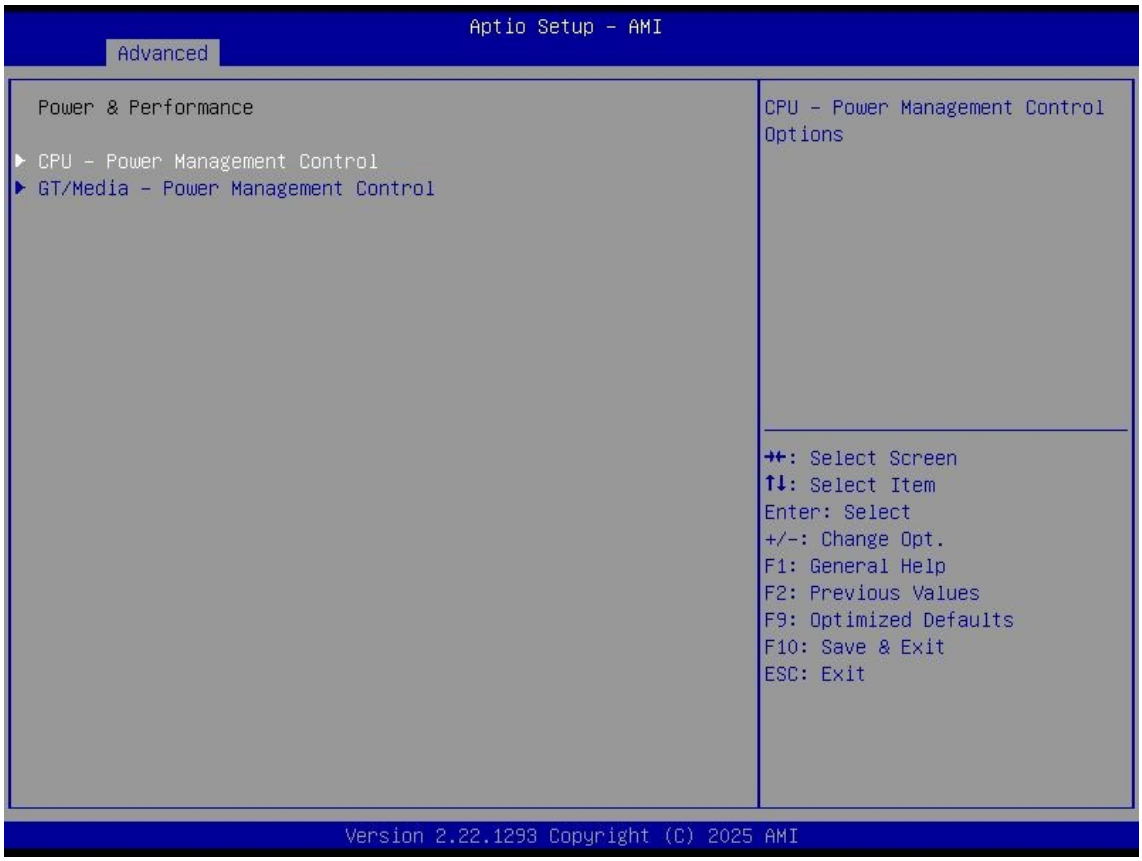
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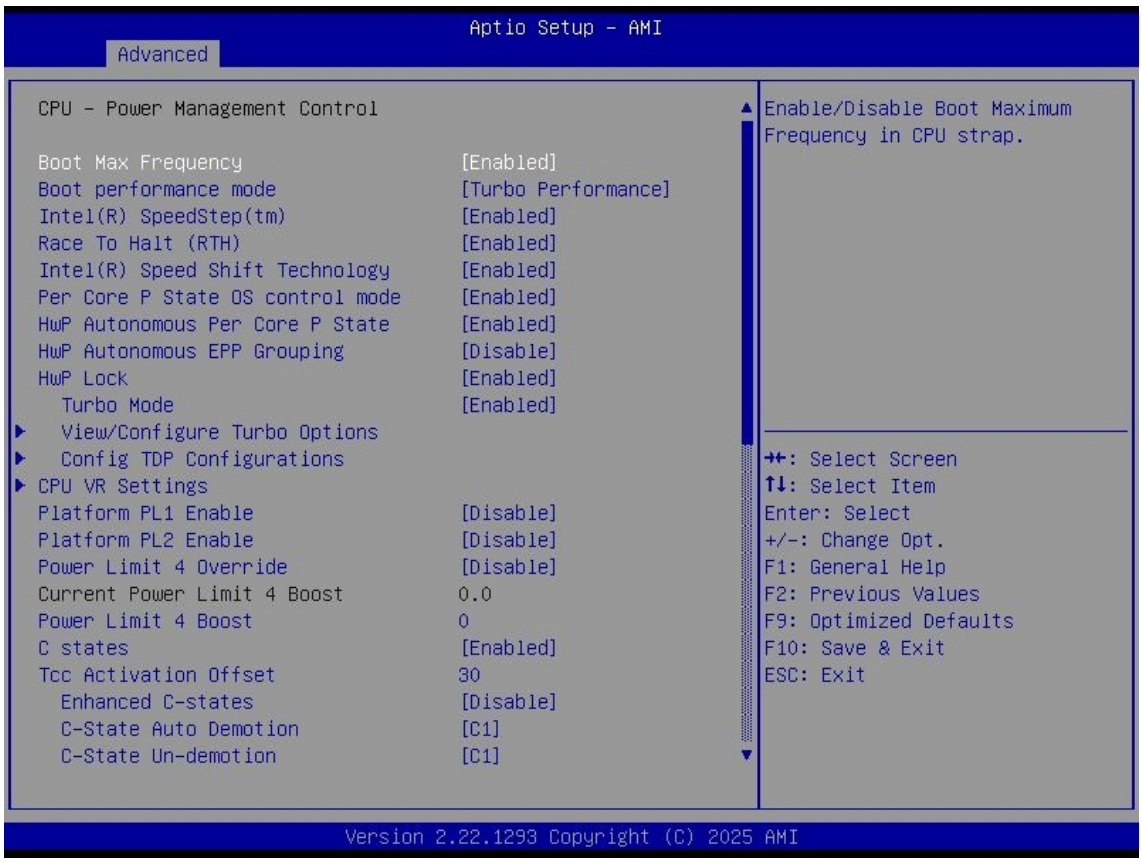
CPU Configuration



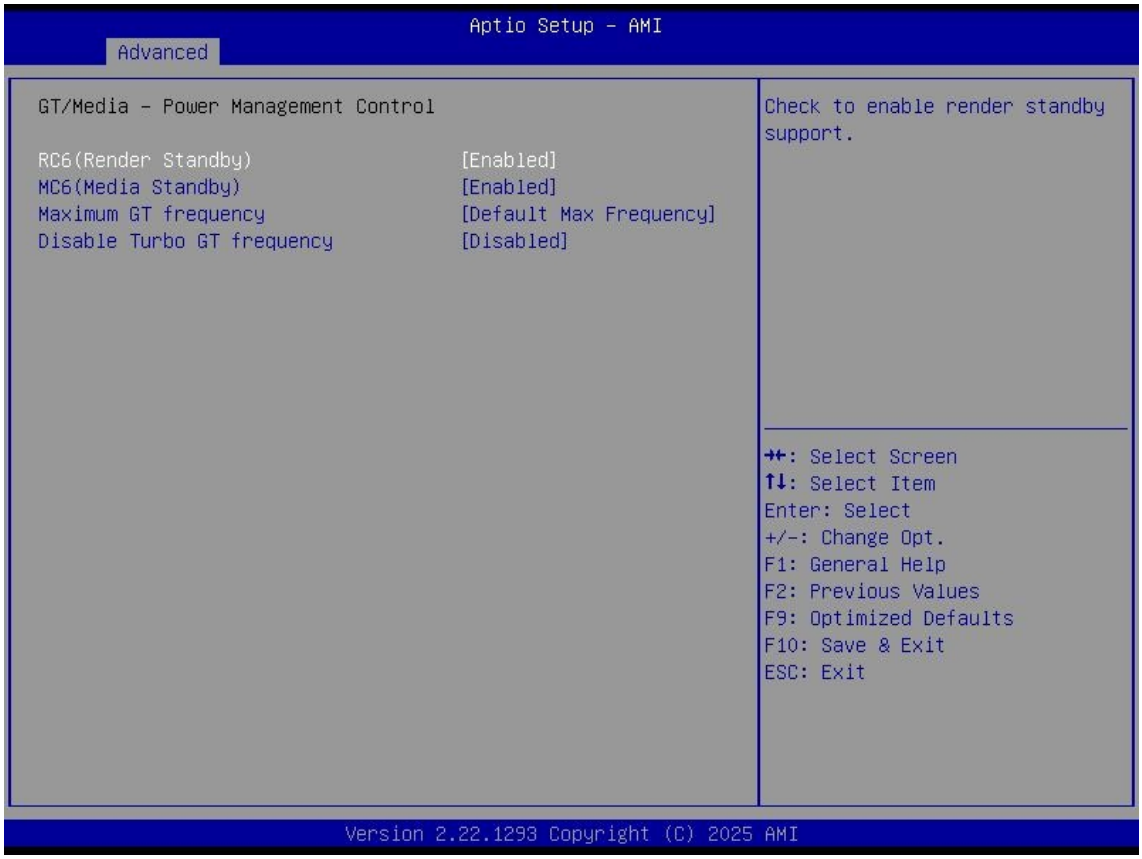
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Power & Performance



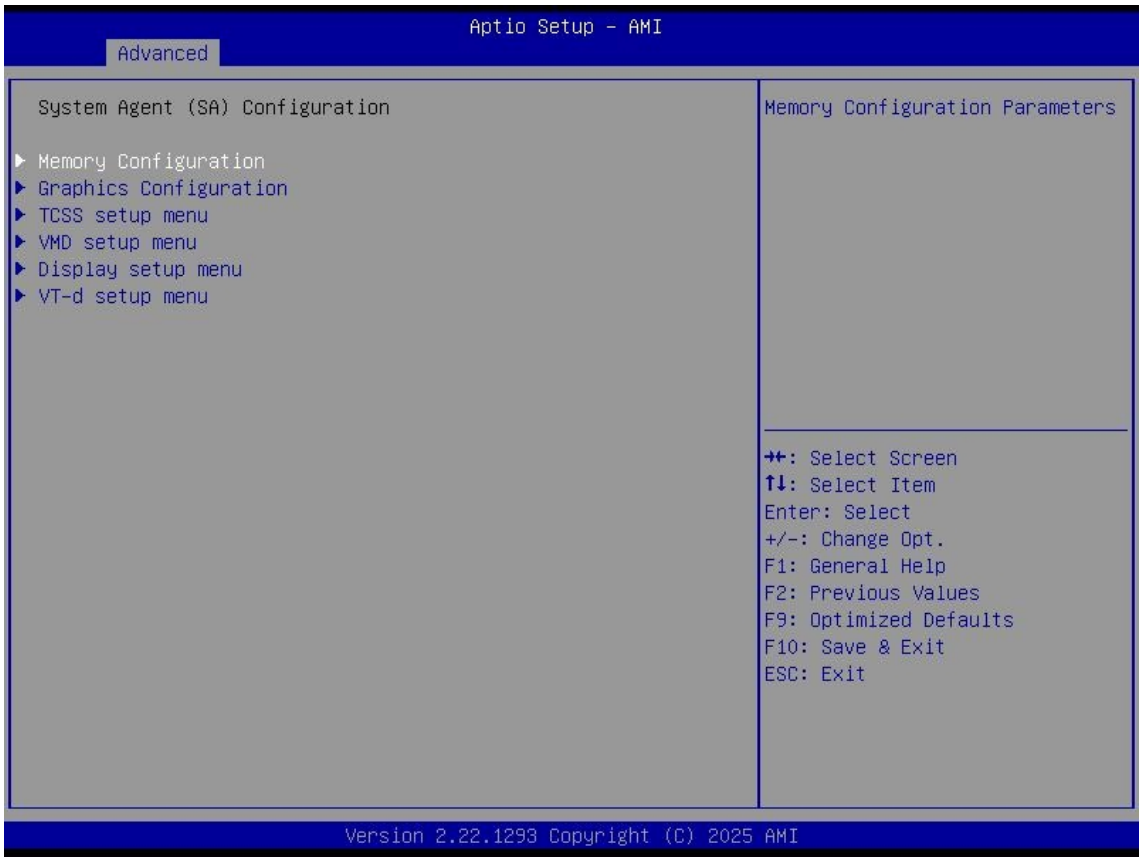


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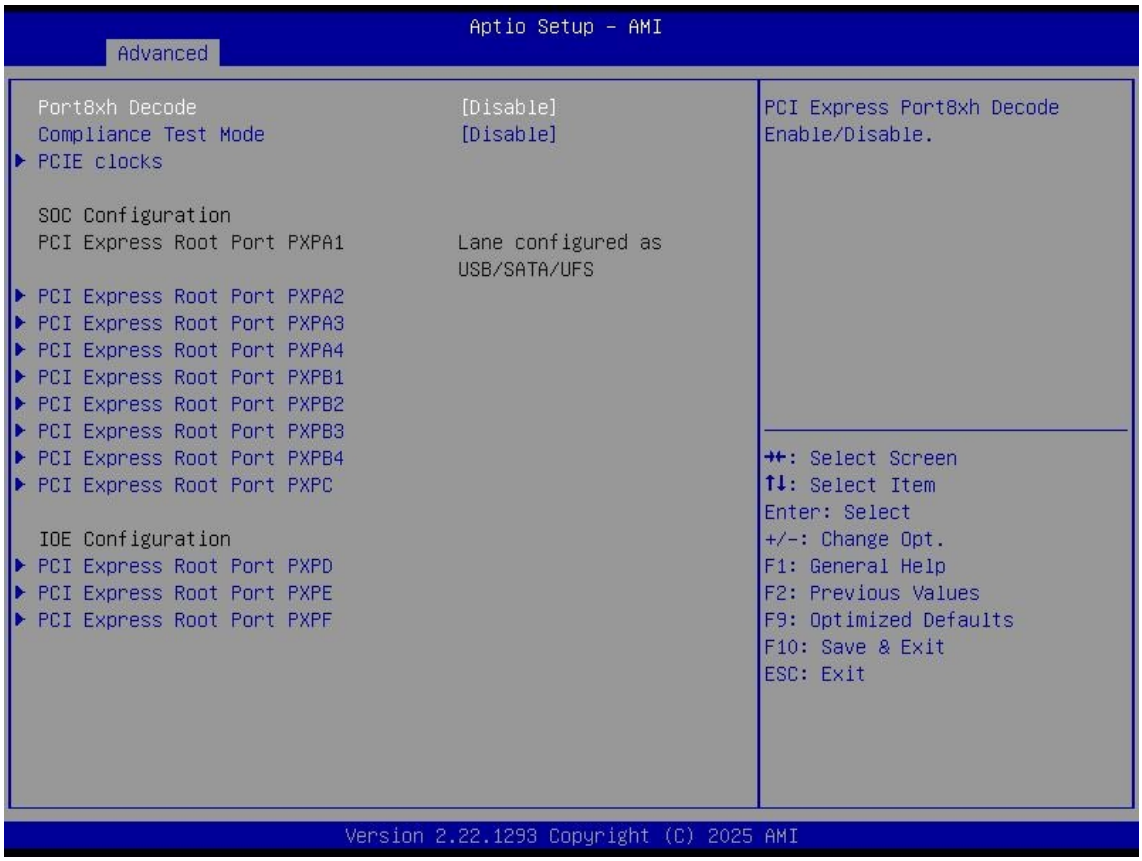
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System Agent (SA) Configuration



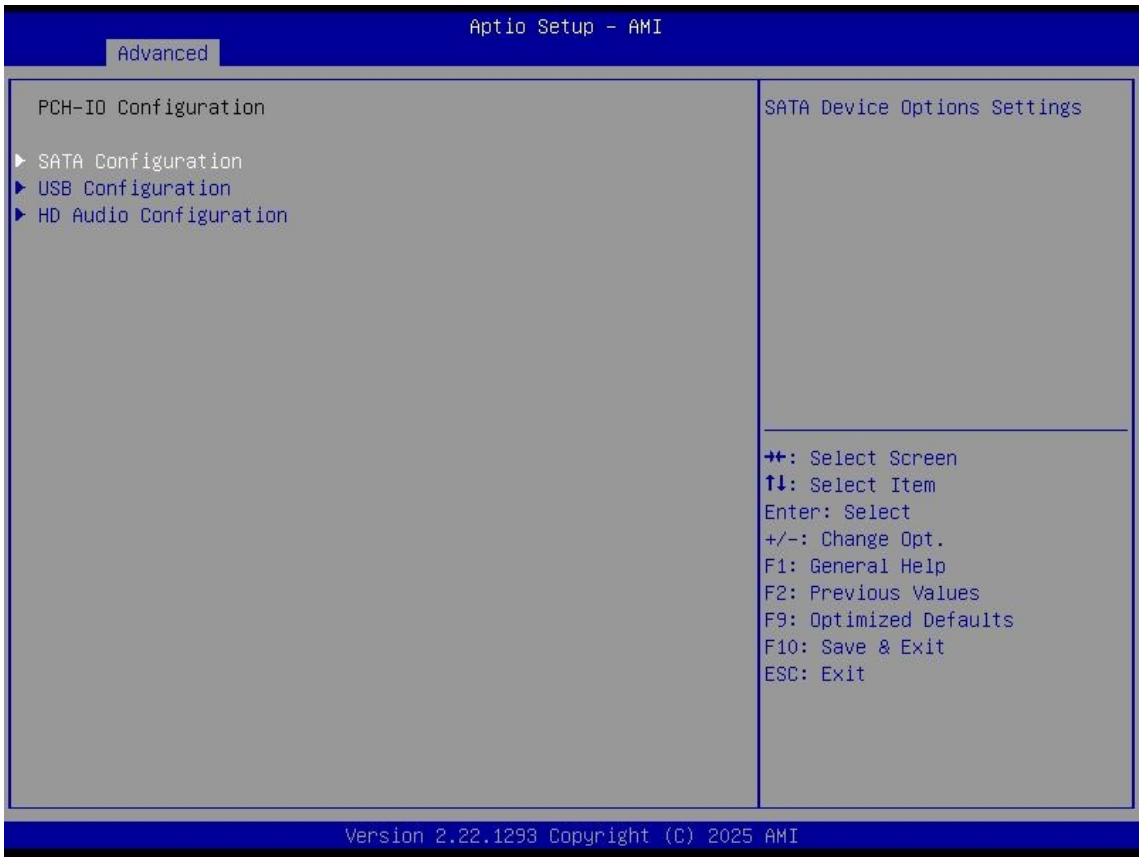
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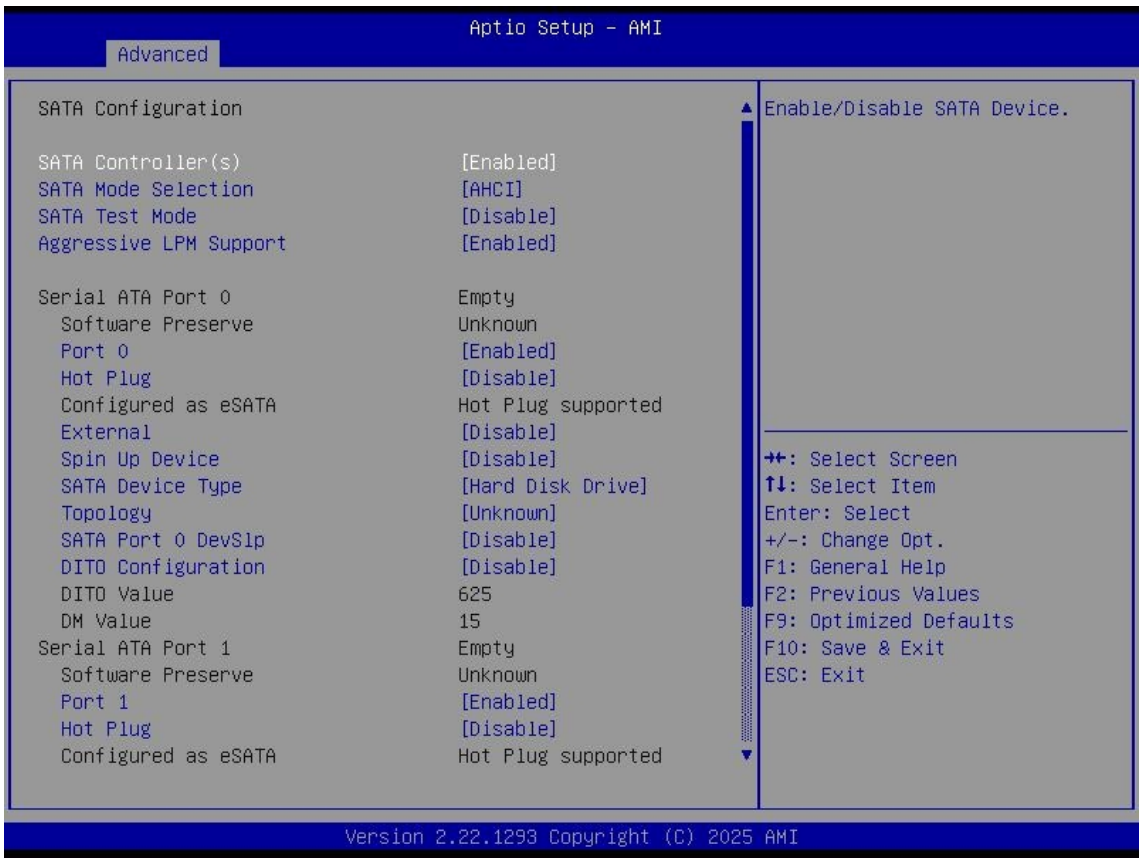
PCIE Configuration



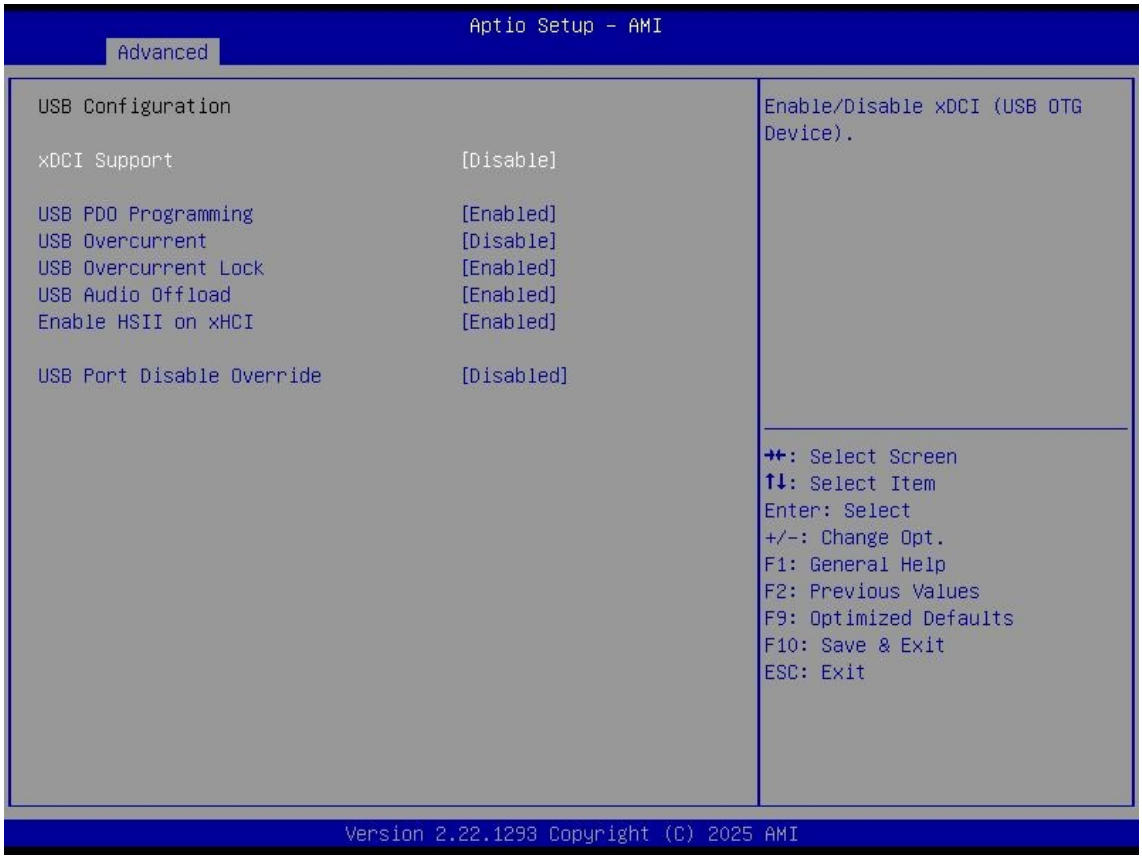
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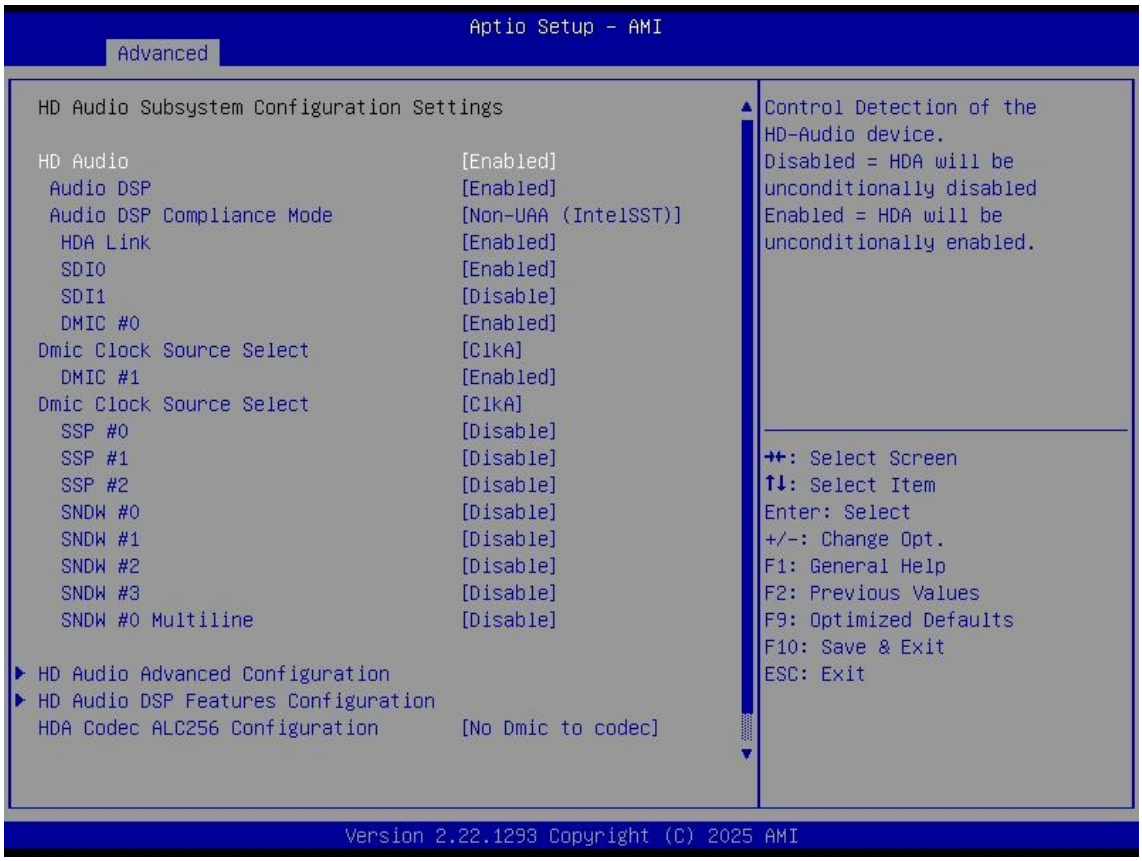
PCH-IO Configuration





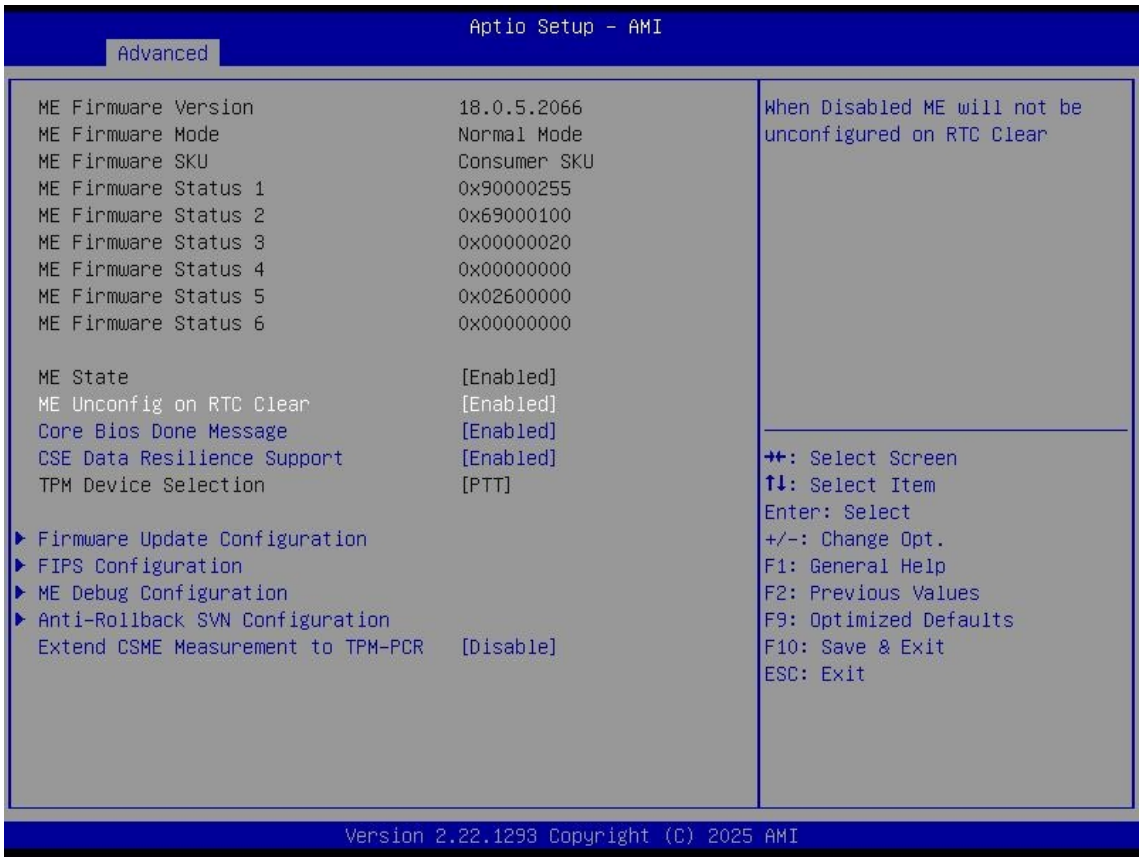
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PCH-FW Configuration



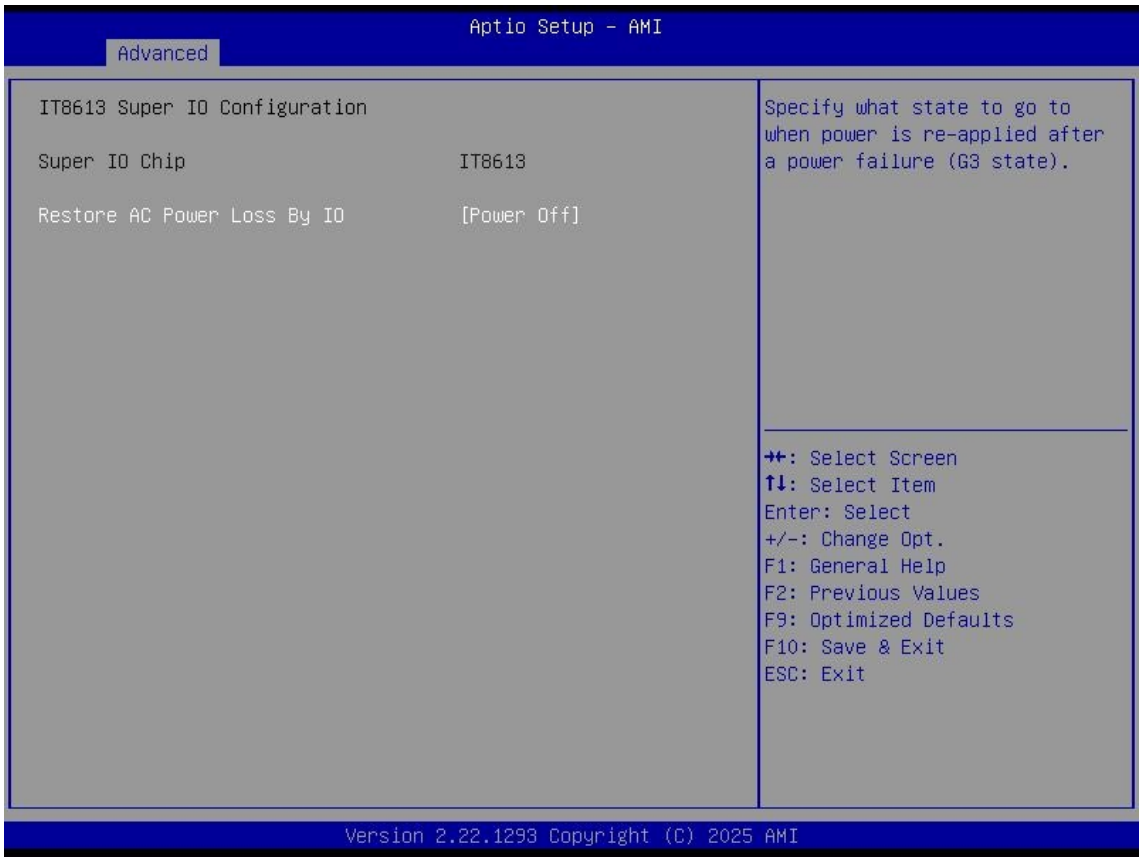
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Trusted Computing



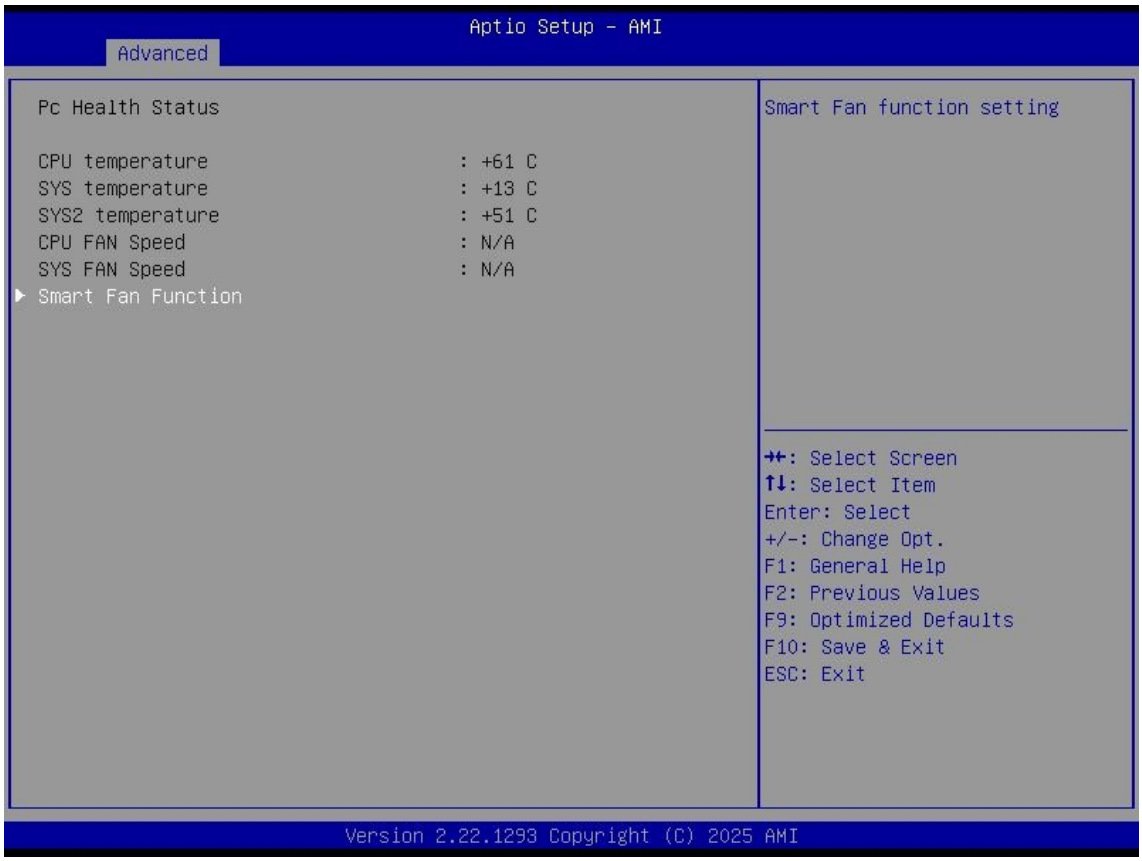
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IT8613 Super IO Configuration



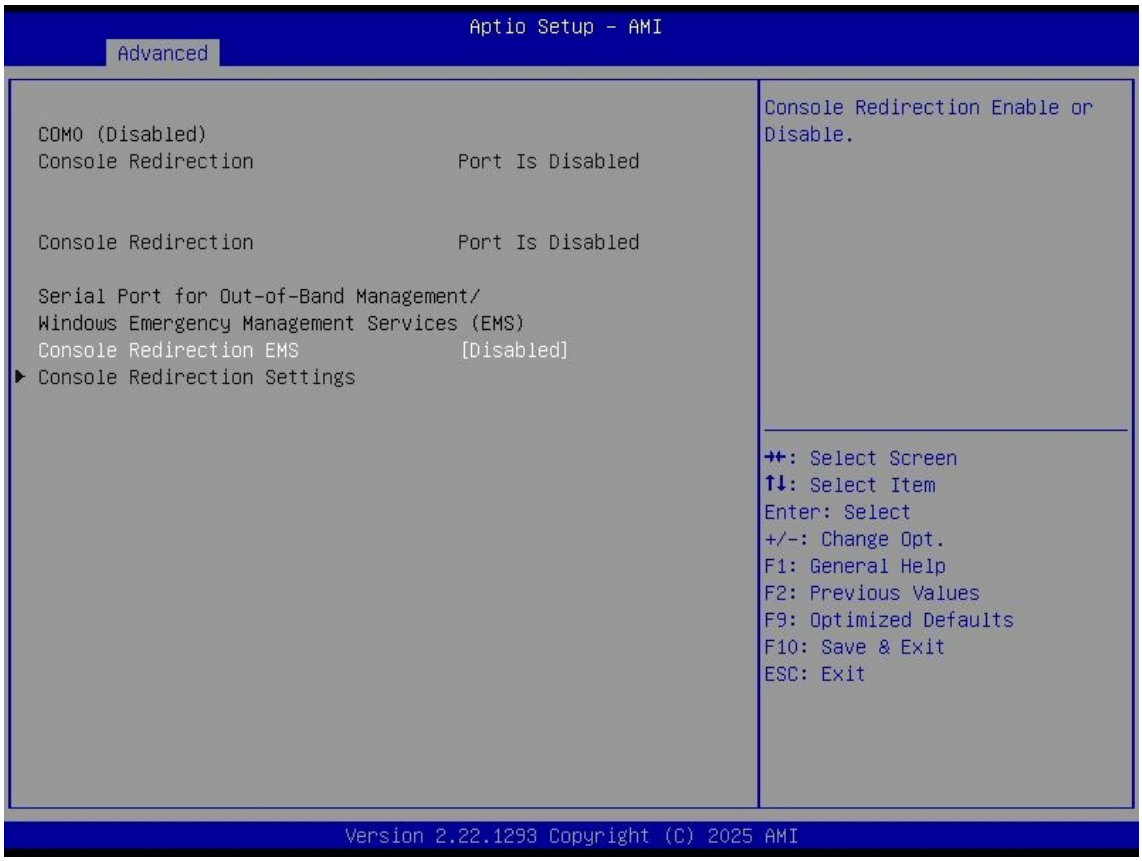
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Hardware Monitor



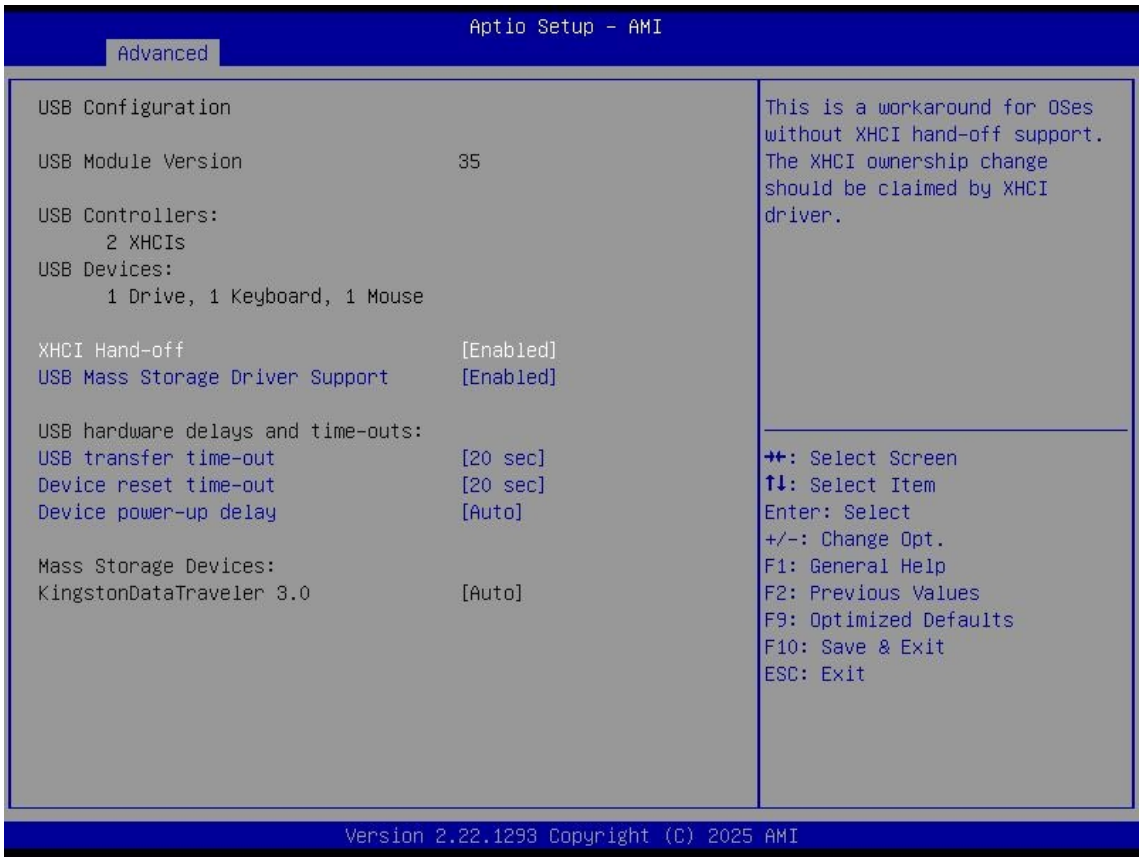
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Serial Port Console Redirection



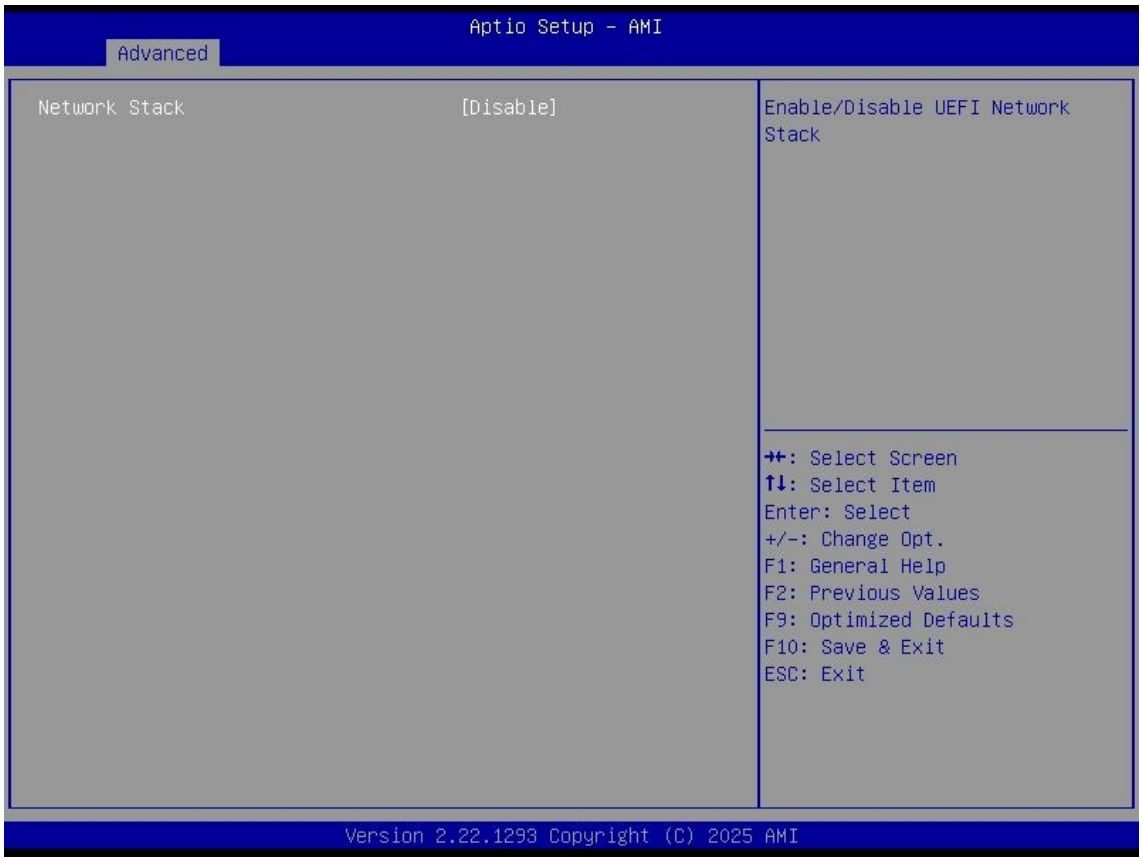
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USB Configuration



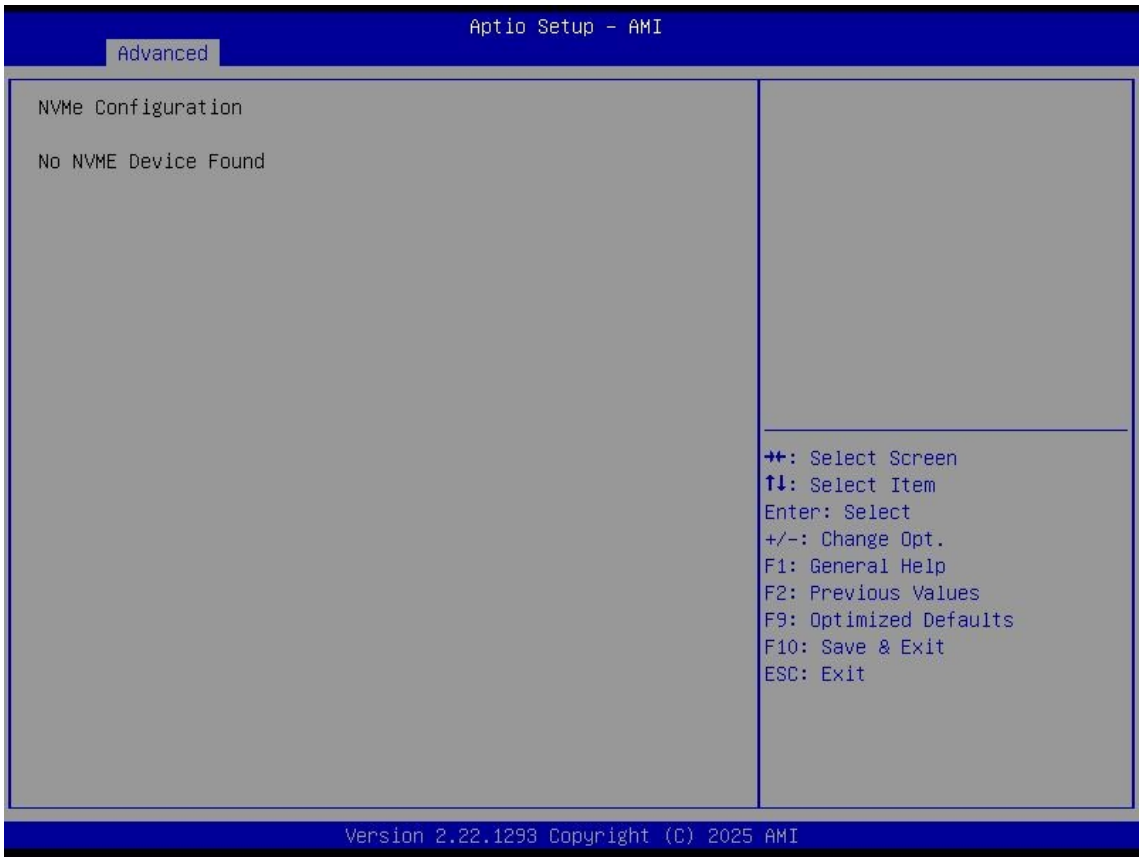
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Network Configuration



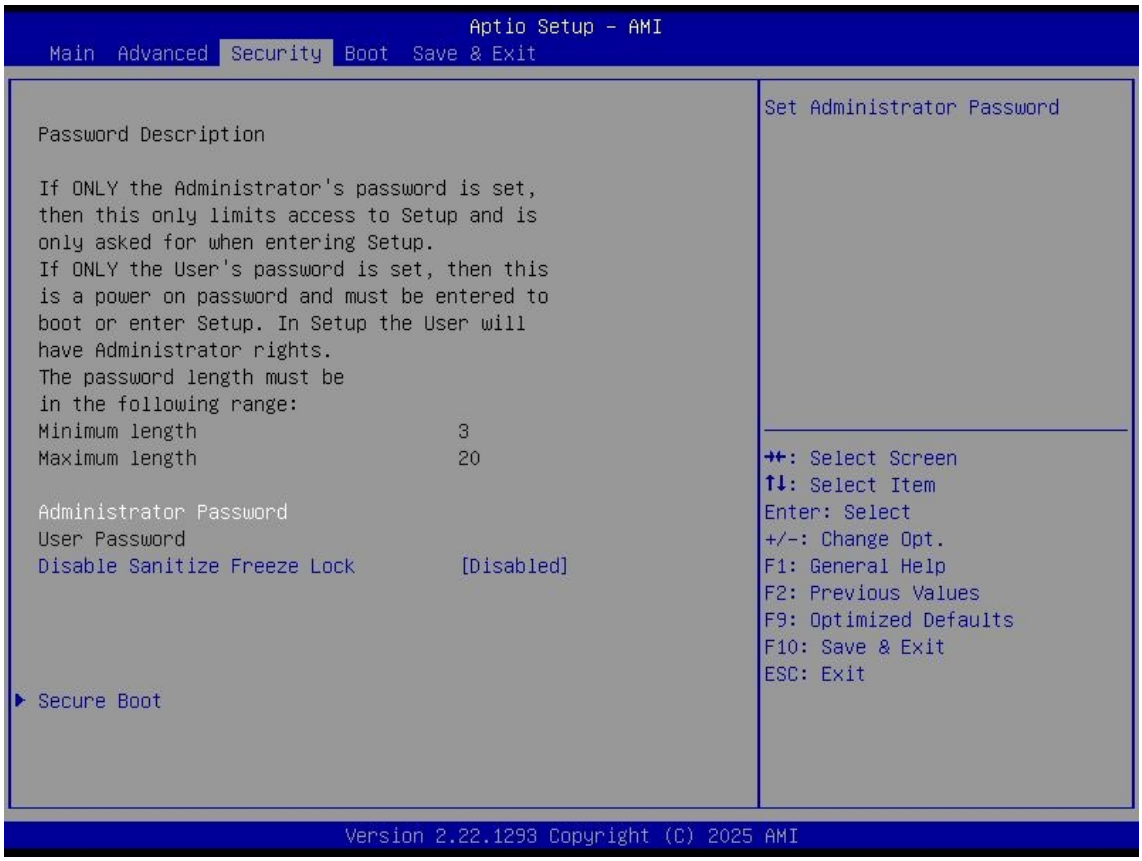
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Nvme Configuration



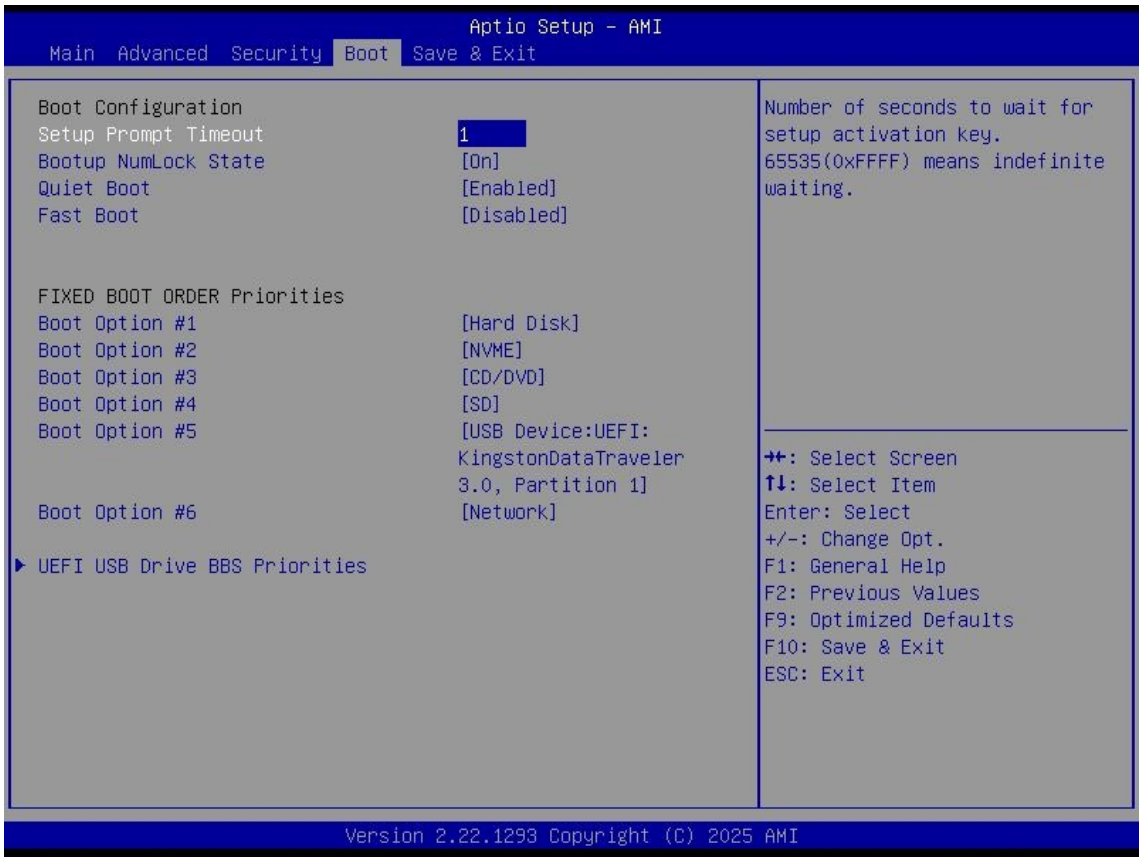
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Security



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Boot Settings



[Setup Prompt Timeout]

This option is used to set the length of time the POST interface stays on.

[Bootup Numlock State]

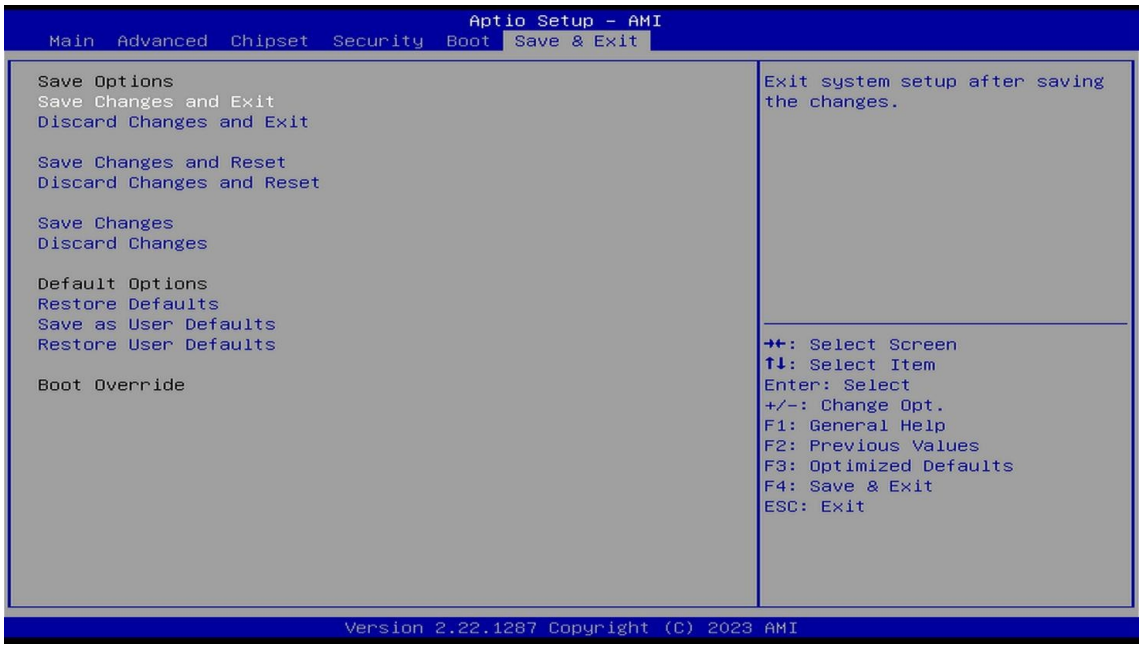
This option is used to set the state of Numlock after the system starts. When set to On, NumLock will be turned on after the system starts, and the numeric keys on the keypad will be valid. When set to Off, Numlock will be turned off after the system starts, and the direction keys on the keypad will be valid.

[Fast boot]

This option is used to set fast boot. Options: Disabled, Enabled

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Save&Exit Settings



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Common fault analysis and solutions

We have compiled some frequently asked questions for your reference. Please check https://bkminipc.com/frequently-asked-questions-and-answers/

Error	Inspection Method
Unable to start after power on	Make sure the power cord is properly connected. Make sure that the power supply you are using meets the power supply requirements of the motherboard. Try to reinsert the Memory Stick. Try to replace the Memory Stick. Try to clear the CMOS of the main board. Please confirm if there is an external expansion card and if it is normal after removing the external card.
Unable to display after power on	Make sure the monitor is turned on. Make sure the monitor and host power cables are properly connected. Make sure the monitor and host cables are properly connected. Check to see if the monitor is in "Sleep" mode. Try changing the monitor interface or replacing the monitor.
BIOS Setup cannot be saved	Check that the CMOS battery is installed Try to replace the CMOS battery (CR2032) Adjust the time and date in BIOS setup
Unable to find a bootable device	Make sure the drive's power and data cables are properly connected. Make sure the operating system is installed on the drive. Make sure the hard drive is not physically damaged.
Blue screen or freeze when logging on to the system	Check if the Memory Stick and External Card are loose. Try removing the newly installed hardware and uninstalling the newly installed driver or software. Try replacing the memory with a different specification.
Slow entry into the operating system	Check if the CPU cooling fan is running normally. Check if the remaining space of the system partition is insufficient. Use software to check for bad sectors on the hard drive.
System restarts automatically	Confirm that the CPU cooling fan is rotating normally. Confirm that the switch/reset button has not been accidentally touched. Confirm that the Memory Stick and external card are loose. Confirm that the power supply has sufficient load capacity, try to replace the power supply Check if the system is infected with viruses.
Unable to detect USB device	Confirm that the USB device requires separate power. Confirm that the USB interface has poor contact. Confirm that the USB controller is enabled in the BIOS setup.

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Useful Links

Submit your suggestions and ideas in the community	https://www.reddit.com/r/bkminipc/	
Watch our new product demos	https://www.youtube.com/@BKHD-PCs	
Corporate News and Cooperation	https://www.linkedin.com/company/beikong/	
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