User Manual

ALN50 Motherboard



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ALN50 Motherboard

User Manual

(Version 0.5)

Version:		
NO.	Description	Issue Date:
V0.5	Initial Version	2023/06/01

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Chapter 1 Product Introduction

1.1 Brief Introduction

The ALN50 motherboard is a 4x4 small form factor motherboard based on the Intel Alder Lake N Series processor, designed to be used for Ultra-compact mini pcs and various IoT solutions.

1.2 Parameters

Intel Alder Lake-N Series:

- Intel® Processor N100, 4Cores 4Threads, Max Turbo Frequency: 3.40GHz, 6 MB Intel® Smart Cache, TDP: 6W.
- Intel® Core™ i3-N305 Processor, 8Cores 8Threads, Max Turbo Frequency: 3.80GHz, 6 MB Intel® Smart Cache, TDP: 15W

Memory: 1x SO-DIMM DDR4-3200, supports a single channel up to 32GB for maximum memory capacity.

GPU: Integrated Graphics based on CPU, display via 2x HDMI2.0b (Support HDCP2.2)

Storage: 1 x M.2 Key B slot, supports 2242/2280 SATA SSD, 1x FPC SATA3.0 interface

USB: 3x USB3.2 Gen 2, 1x USB2.0

Type C: 1xUSB-C Full-functioned (supports USB3.2 Gen 2 upstream/Display Port 1.4 Alt Mode).

Ethernet: Two RTL8125BG-CG Network Controllers on-board, Data Rate Per Port: 2.5Gbps

Audio: High-Definition Realtek Audio Codec,1xCTIA Audio Jack, supports Line-out+Mic-in.

Expansion: 1x M.2_Key E type 2230 for Wi-Fi Modules (supports PCIe/USB2/CNVi)

Other I/O: 1x FP_PWON Power button optional for remote wired control switch, 1x FPC RS232 COM header optional (Serial Port).

Board Dimension: 120mm x 120 mm

Chassis Dimension:

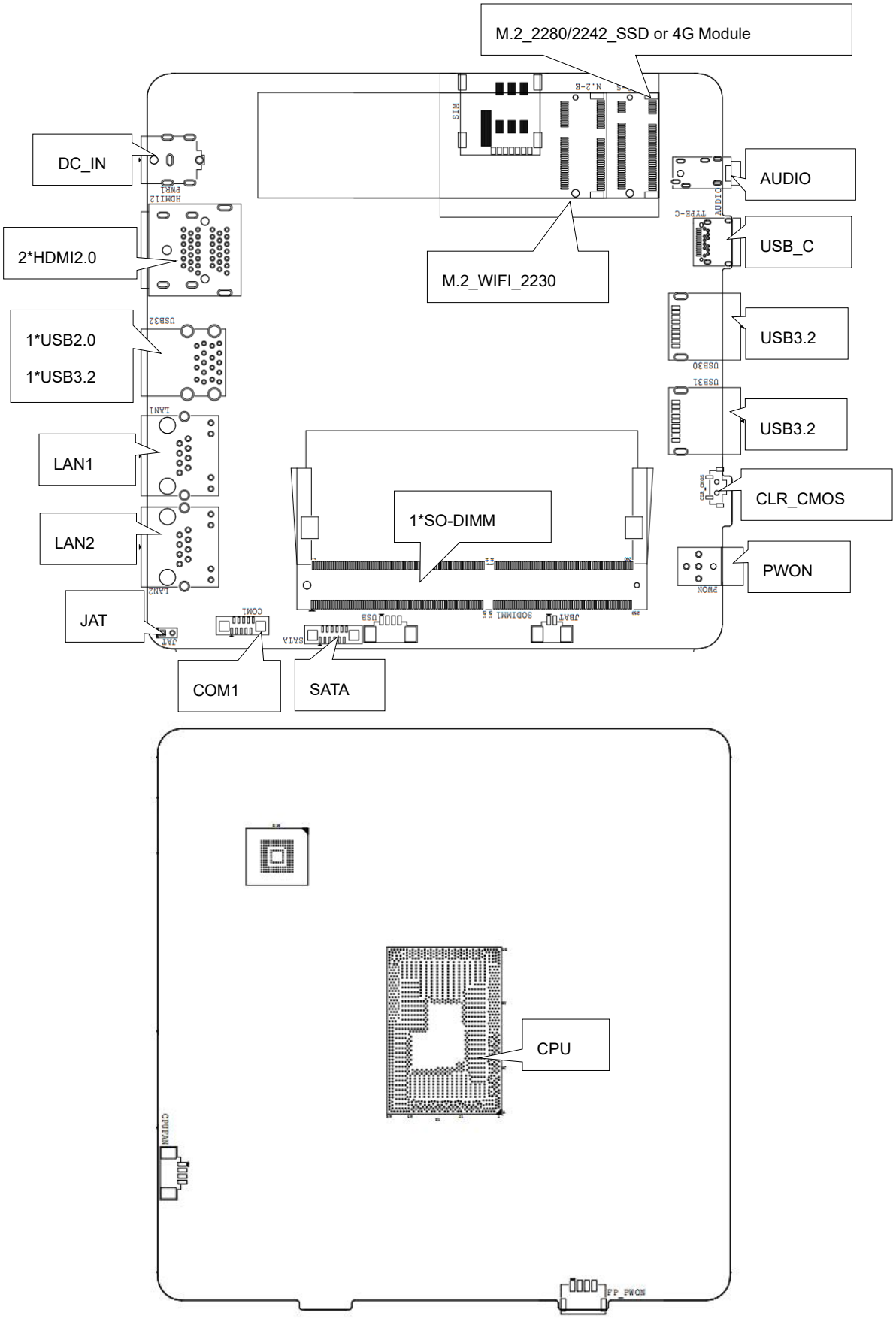
Fan/Active: 129mm x 127mm x 52.5mm

Fanless/Passive: 127mm x 127mm x 45.6mm

Power: 12V DC-in

Working Temperature: -20℃~60℃

1.3 Connector Diagram

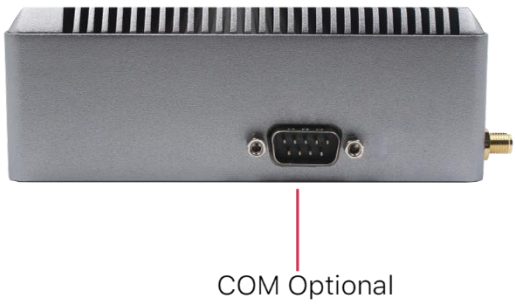


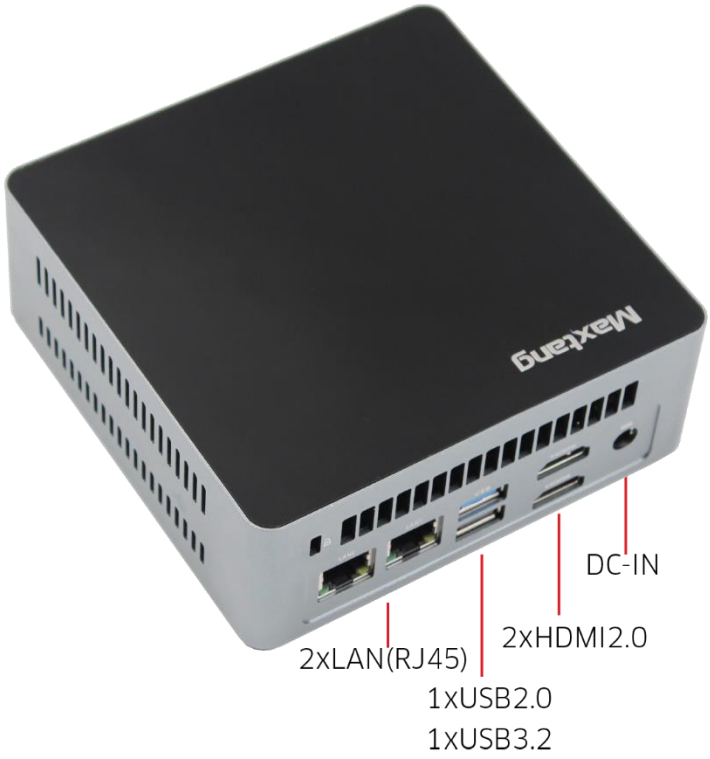
1.4 Mini PCs I/O Interface

NX-N100 Fanless Mini PC








DC-IN
2xHDMI2.0
2xLAN(RJ45)
1xUSB2.0
1xUSB3.2


Maxtang
Audio
USB-C
2xUSB3.2
Power Button

Chapter 2 Hardware

2.1 Installations

Please refer to the following steps for installations:

1. Read the user manual carefully to make sure all the adjustments on the ALN50 are correct.
2. Installing the Memory:
   - Press the ejector tab of the memory slot outwards with your fingertips.
   - Hold the memory module and align the key to the module with that on the memory slot.
   - Gently push the module into the slot until the ejector levers return completely to the closed position, holding the module in place when the module touches the bottom of the slot. To remove the module, press the ejector levers outwards to unseat the module.
3. Installing the expansion cards:
   - Locate the expansion slots and remove the screw, insert the cards into the slot at a 45-degree angle then attach the screw to the expansion cards, gently press down on it then install the screw back.
4. Connect all signal wires, cables, panel control wiring, and power supplies.
5. Start the computer and complete the setup of the BIOS program.

The board's components are integrated circuits and can easily be damaged by Electrostatic Discharge or ESD; therefore, please follow the instructions:

- Hold the board's edge when handing, and do not touch onboard pins, components, or plug sockets.
- When touching integrated circuit components (such as CPU, RAM, etc.), please wear an anti-static wrist strap/glove to avoid electrostatic discharge damage to the board or other sensitive components.
- Before installing the integrated circuits/sensitive components, place the sensitive components in anti-static bags to keep them safe from ESD.
- Please make sure the power switch is OFF before plugging the power plug.

2.2 Jumper Setting

Please configure the jumpers according to your requirements before installing the hardware.

How to identify the first header of jumpers and pins: Observe the mark beside the jumper or pins and find the header marked by “1” or bold line or triangular symbol. Or observe the rear panel and the header with a square solder pad is the first header.

2.3 Memory Slots

The board provides one SO-DIMM DDR4-3200 slot and supports single channel, up to 32GB for memory.

Notes: Make sure to hold the memory module and align the key to the module with that on the memory slot. While choosing a memory module, please make sure the module matches the board’s specifications.

2.4 Display Interfaces

The board features two HDMI2.0b interfaces (supports HDCP2.2).

2.5 Storage Interfaces (Screen Printing: SATA, M.2_S)

The board provides 1x M.2 Key_B slot, supports 2280/2242 SATA SSD or 4G module, 1x FPC SATA3.0 interface.

SATA Definition (Screen Printing: SATA)

Pin	Signal
1	GND
2	TX_N
3	TX_P
4	GND
5	RX_P
6	RX_N
7	GND
8	+5V
9	+5V
10	+5V
11	GND
12	GND

2.6 Expansion Slots (Screen Printing: M.2_E)

Screen Printing M.2_E: 1x M.2_Key E slot, type 2230 for Wi-Fi Modules (supports PCIe/USB2/CNVi)

2.7 USB Interfaces

The board supports 3x USB3.2 Gen2 and 1x USB2.0 interfaces.

2.8 Type-C Interface

The board supports 1xType-C(USB-C) Full-functioned (supports USB3.2 Gen 2 upstream/Display Port 1.4 Alt Mode).

2.9 LAN

The board features 2xRJ45 LAN interfaces with high-speed RTL8125BG-CG network controllers, data rate per ports: 2.5Gbps.

Both of the Ethernet interfaces supports network wake-up (Magic packet wake-up), and the LAN1 supports UEFI PXE network boot. To utilize UEFI PXE network boot, it is necessary to set (IPv4 PXE Support) to "Enabled" in the BIOS.

The board also provides a LAN_LED pin header, enabling the extension of the (orange) status indicator light to the chassis panel.

LED Status Indicators:

LI_LED Status (Green)	Function	ACT_LED Status (Orange)	Function
Always on	Network Connected	Flashing	Data transmission

2.10 Audio Interface

The board features a Realtek ALC897 High-Definition Audio Codec, 1xCTIA Audio Jack, supports Line-out + Mic-in.

2.11 Board Power Supply (Screen printing: PWR1)

The board supports 12V DC-IN for power supply with a DC specification of (5.5mm x 2.5mm).

2.12 Power Button (Screen printing: PWON, FP_PWON)

The board features a power button with a light indicator above (Blue LED); an optional FP_PWON remote control switch (Screen printing: FP_PWON).

Optional Function FP_PWON Remote (Wired) Control Switch (Screen Printing: FP_PWON)

Pin	Signal
1	Power Switch Signal, Low Level for Power On/Off
2	GND
3	Negative Terminal for the Power Indicator Light
4	Positive Terminal for the Power Indicator Light

2.13 CPU Fan (Screen printing: CPUFAN)

The board features one auxiliary cooling fan socket (CPU fan socket powered at 5V by default).

CPUFAN (Screen Printing: CPUFAN)

Pin	Signal
1	GND
2	VCC
3	TAC
4	CTL

2.14 CMOS Clearance/Retention (Screen printing: CLR_CMOS)

CMOS is powered by onboard button batteries. Clearing CMOS will permanently remove the previous system settings and restore the board system to original settings (factory settings).

Step 1: Turn off the PC and disconnect the power.

Step 2: Press CLR_CMOS for 15 seconds then disconnect.

Step 3: Restart the device, press the <DEL> button to enter the BIOS, load the optimal default value, save, and exit the settings.

CMOS (Screen Printing: CLR_CMOS)

Setting	Function
Close	Clear CMOS

⚠ **Please do not clear COMS when the PC is connected to power in case board damages.**

Chapter 3 BIOS Setup

3.1 Entering the BIOS

1. Turn on the computer and press <Delete> entering the BIOS
2. After the computer is turned on, keep pressing F11, select enter Setup
3. BIOS Hotkeys:

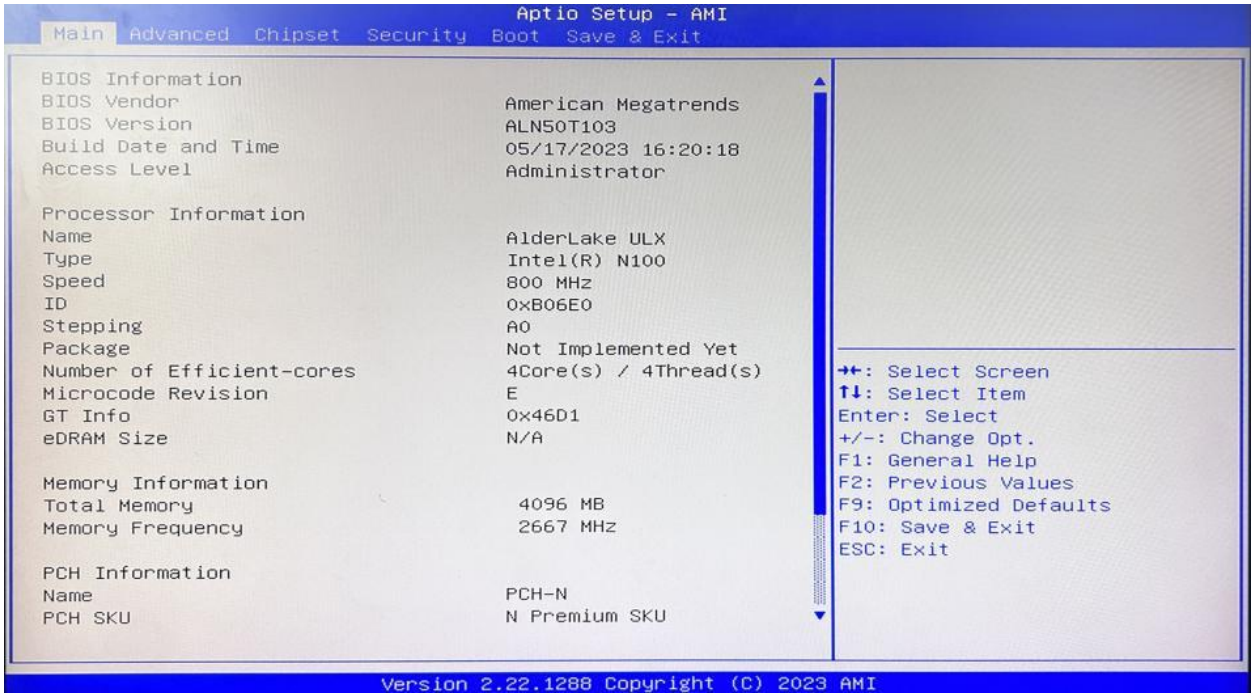
   F9: Restore to Factory setting.

   F10: Save and Exit.

   ESC: Exit

3.2 Main Setup (BIOS info, Date, Time）

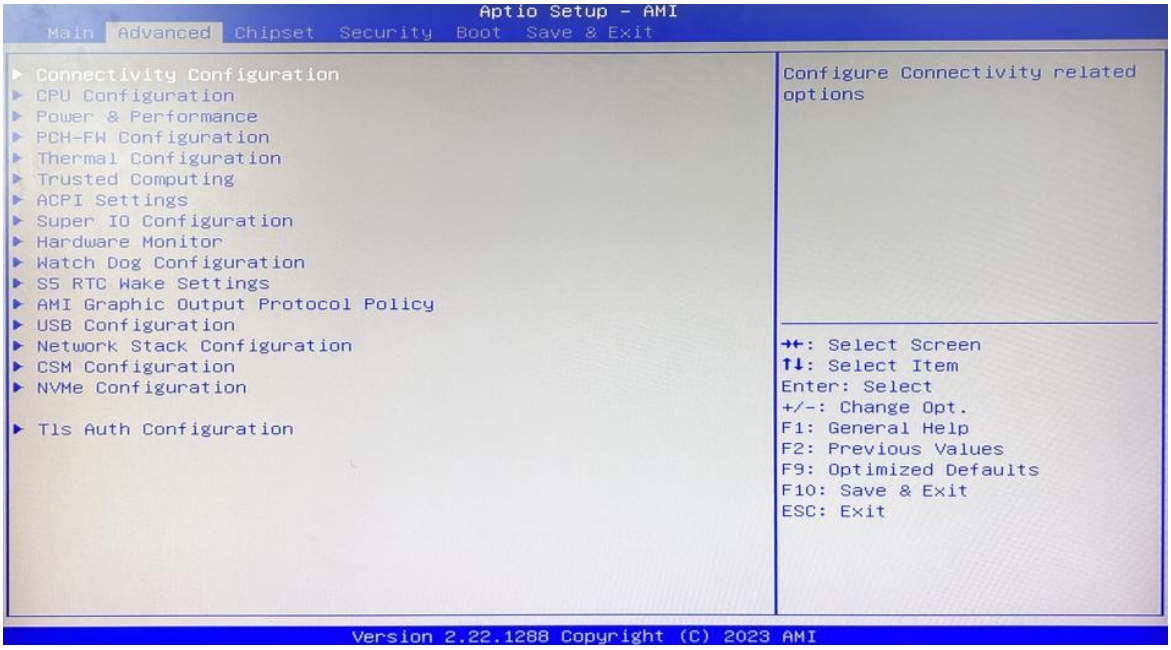
When you enter the BIOS Setup utility the first things you will encounter is the Main Setup screen. Shown below is the Main BIOS Setup screen. You can always return to the Main setup by selecting the Main tab.



System Date: Sets the date. MM/DD/YY format.

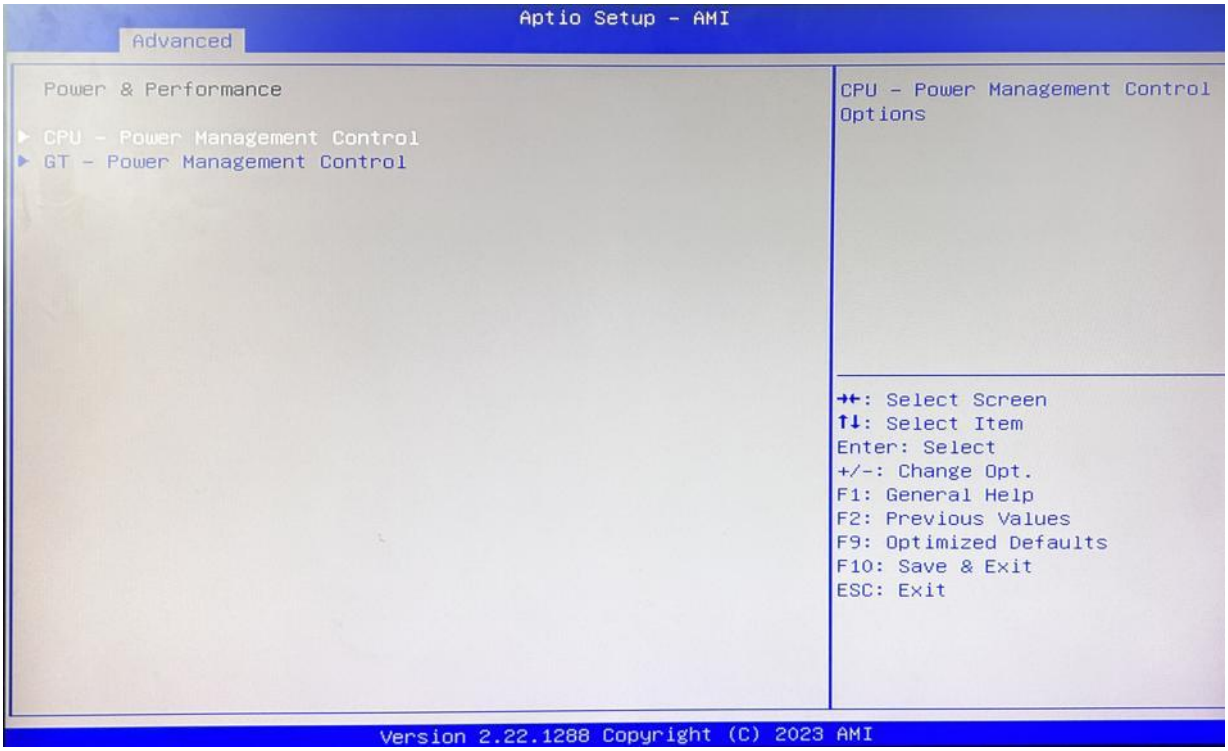
System Time: Set the time. HH:MM: SS format.

3.3 Advanced Settings



Select any of the items in the left frame of the screen. The advanced sections allow you to configure, improve and set up system features according to the preference of the CPU Configuration. All Advanced BIOS Setup options are described as follows.

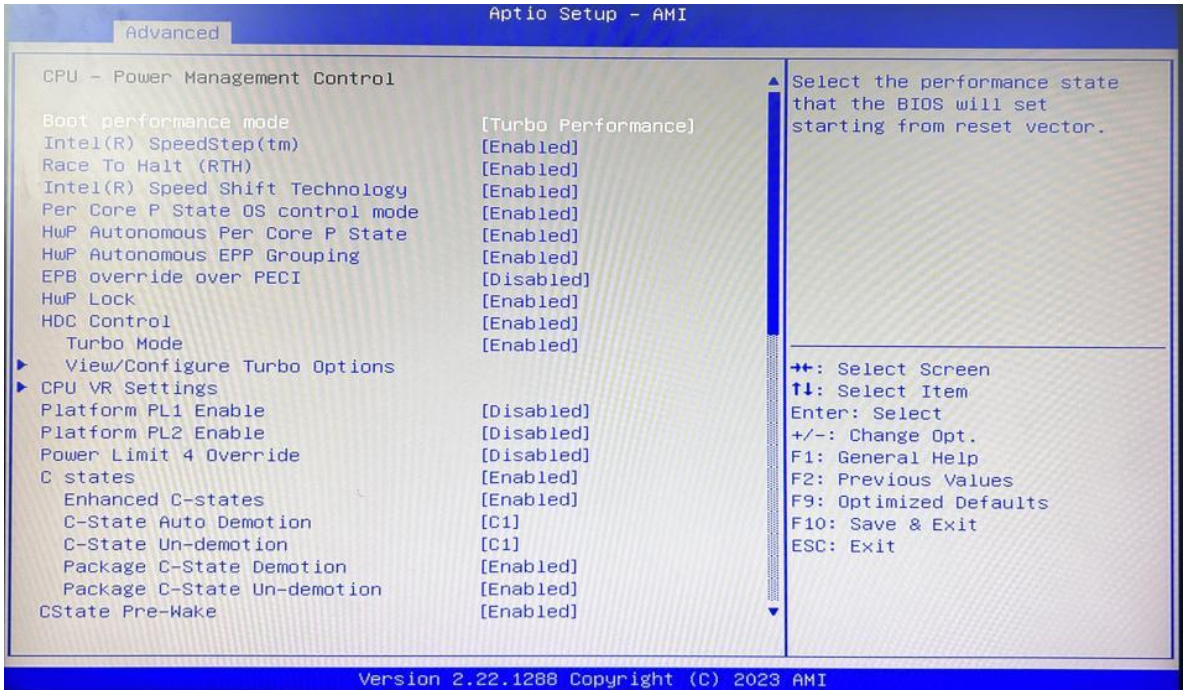
3.3.1 Power & Performance



CPU-Power Management Control

GT-Power Management Control

3.3.2 CPU-Power Management Control



Intel® Speedstep®(TM):

Enhanced Intel SpeedStep® Technology enables the operating system to control multiple frequencies and voltage points for optimal performance and power efficiency.

Intel® Speed Shift Technology:

An energy-efficient frequency control method by the hardware rather than relying on OS control. Processor decision is based on the different system constraints for example Workload demand, and thermal limits while taking into consideration the minimum and maximum levels and activity window of performance requested by the operating system. Default enabled.

Turbo Mode

The Turbo mode refers to Nehalem's "Integrated Power Gate" power management technology, which allows running off some cores and adding power to the others so that they run at a higher frequency. The capacity of the entire CPU remains unchanged, and the efficiency of the CPU is optimized. Default enabled.

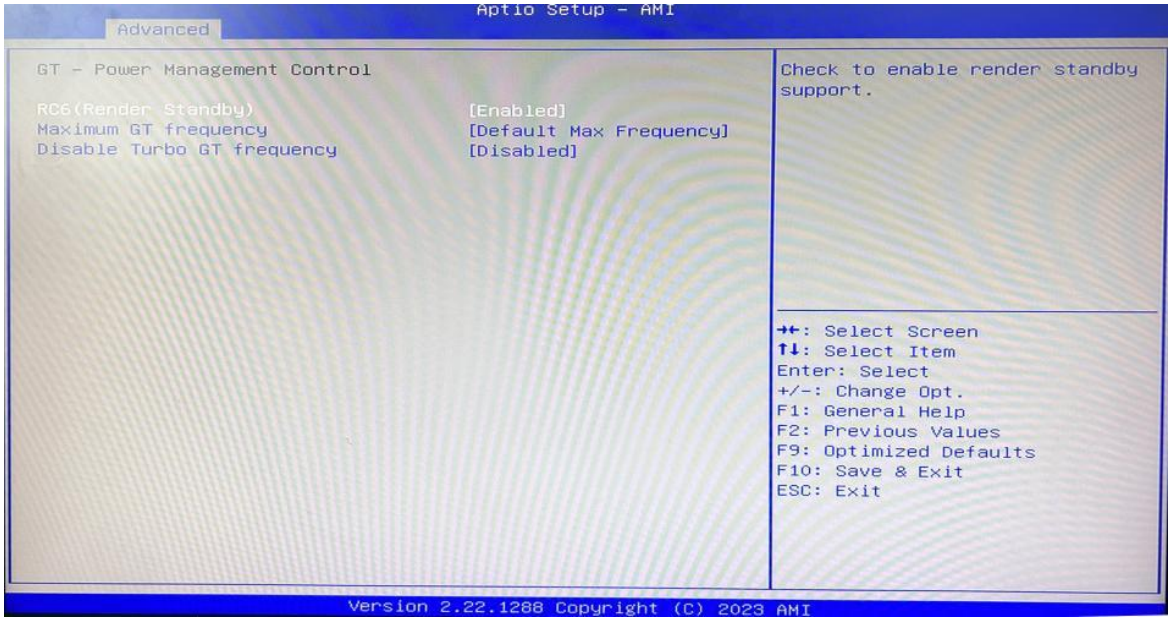
C states

Idle States (C-states) are used to save power when the processor is idle. C0 is the operational state, meaning that the CPU is doing useful work 100% load. C1 is the first idle state, C2 the second, and so on, where more power-saving actions are taken for numerically higher C-states. C1 to C3 cuts off the clock inside the CPU, and C4 to C6 reduces the CPU voltage. Default enabled.

Enhanced C states

C1 to C3 cuts the clock inside the CPU. C4 and C6 mode reduces CPU voltage. Features two way "Enhanced" mode, enable by default.

3.3.3 GT-Power Management Control



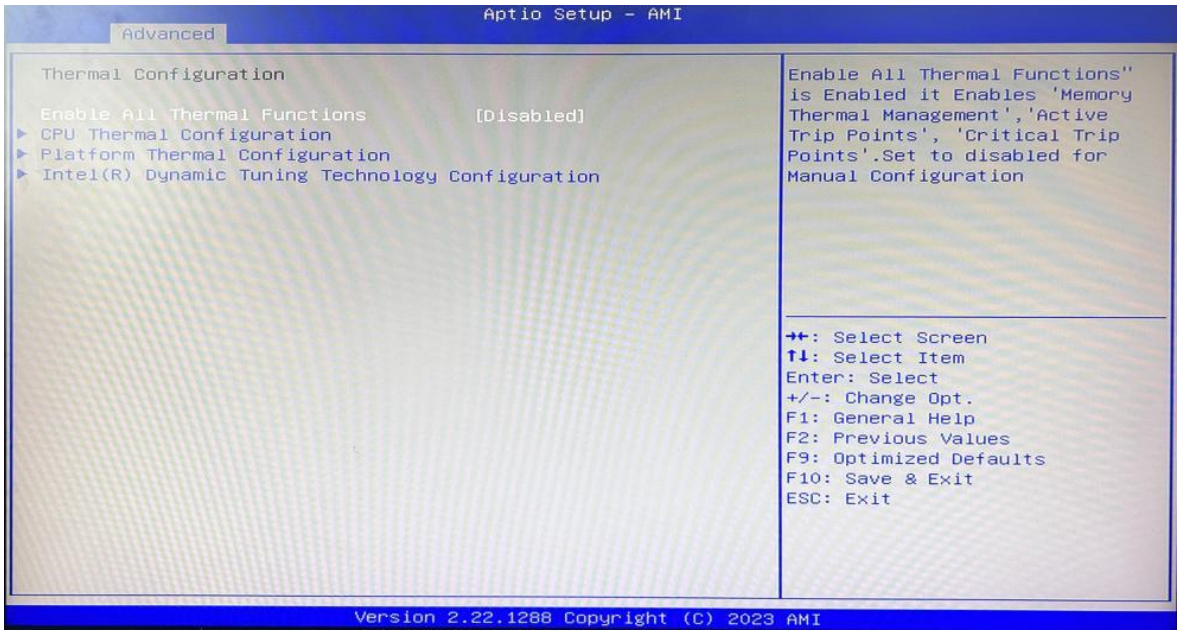
Maximum GT frequency：

Maximum GT Frequency, Default max frequency.

Disable Turbo GT frequency：

Disable Turbo GT Frequency mode, Default disabled.

3.3.4 Thermal Configuration



Enable All Thermal Functions

CPU Thermal Configuration:

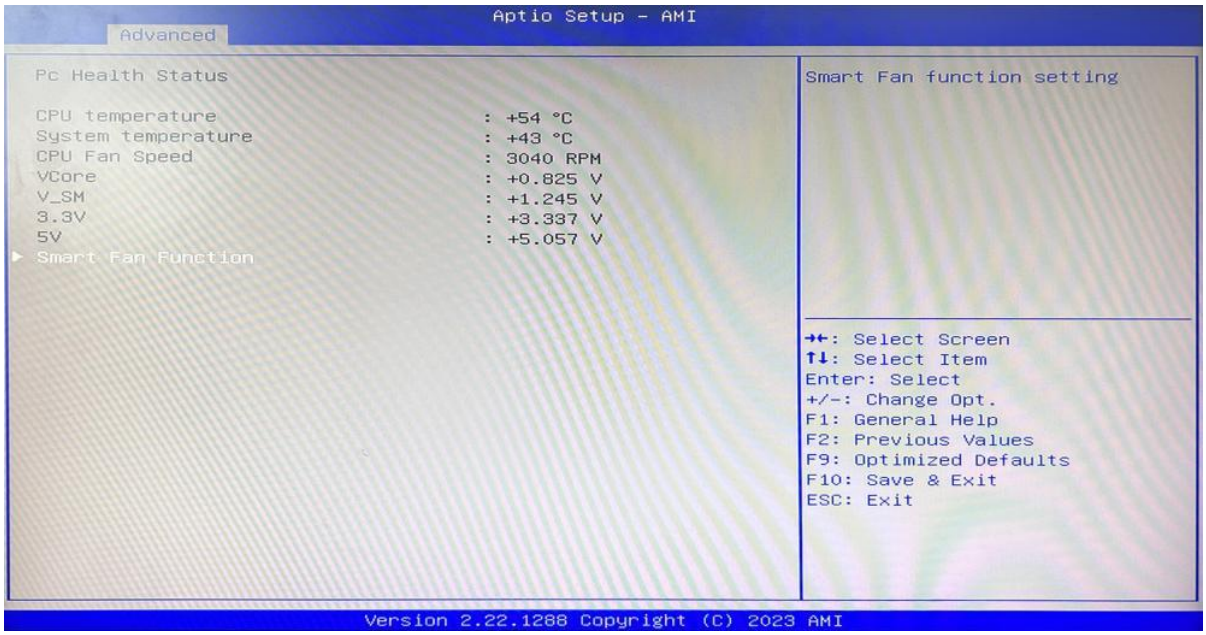
Unlocks the temperature setting, the “Tcc Activation Offset” is the temperature adjustment option, the

highest temperature is 105°C. Change the temperature by minus the number of degrees you wish to change. For example, minus 0(105-0) to set the temperature at 105°C, minus 20(105-20) to set the temperature at 85°C. (Please note the maximum supported temperature for the processor can be found on ark.intel.com.)

Platform Thermal Configuration

DPTF Configuration

3.3.5 Hardware Monitor



PC Health Status

The PC health status displays CPU temperature, system temperature, fan speed, and other relevant voltage values. The above parameters have a certain range, and the system cannot run beyond these ranges.

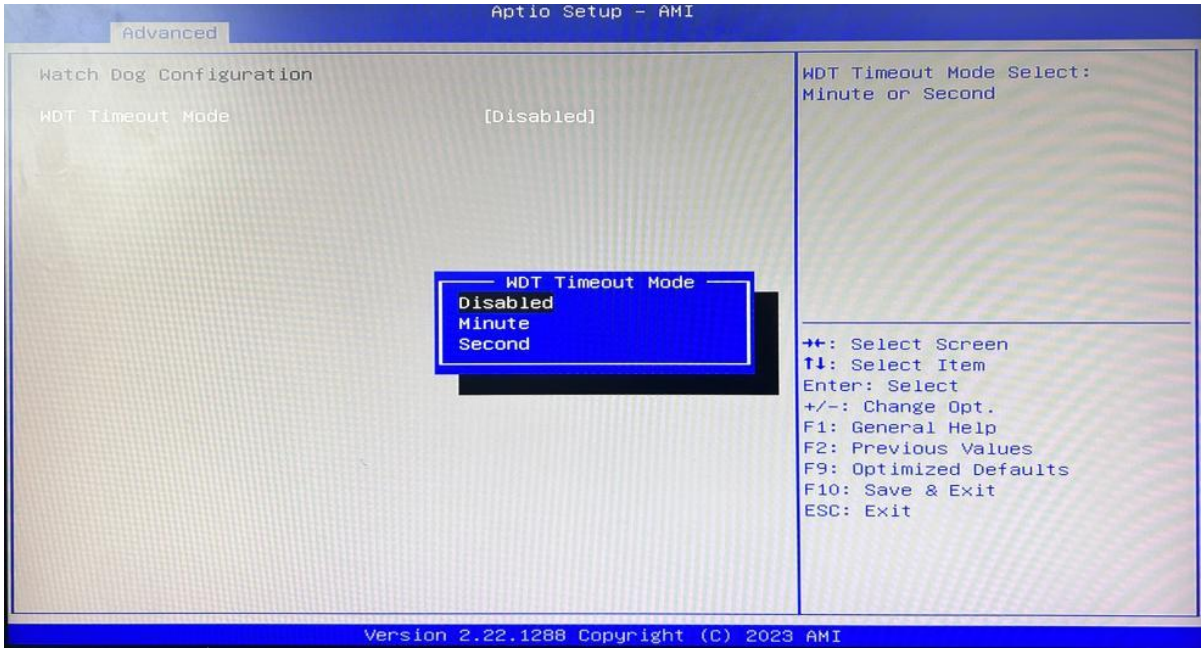
- CPU Temperature
- System Temperature
- CPU Fan Speed
- VCore: Core Voltage
- VDDQ: RAM Voltage
- +3.3V: 3.3V
- +5V: 5V
- Smart Fan Function:

  Automatic Mode

  Full on Mode

  Manual Mode

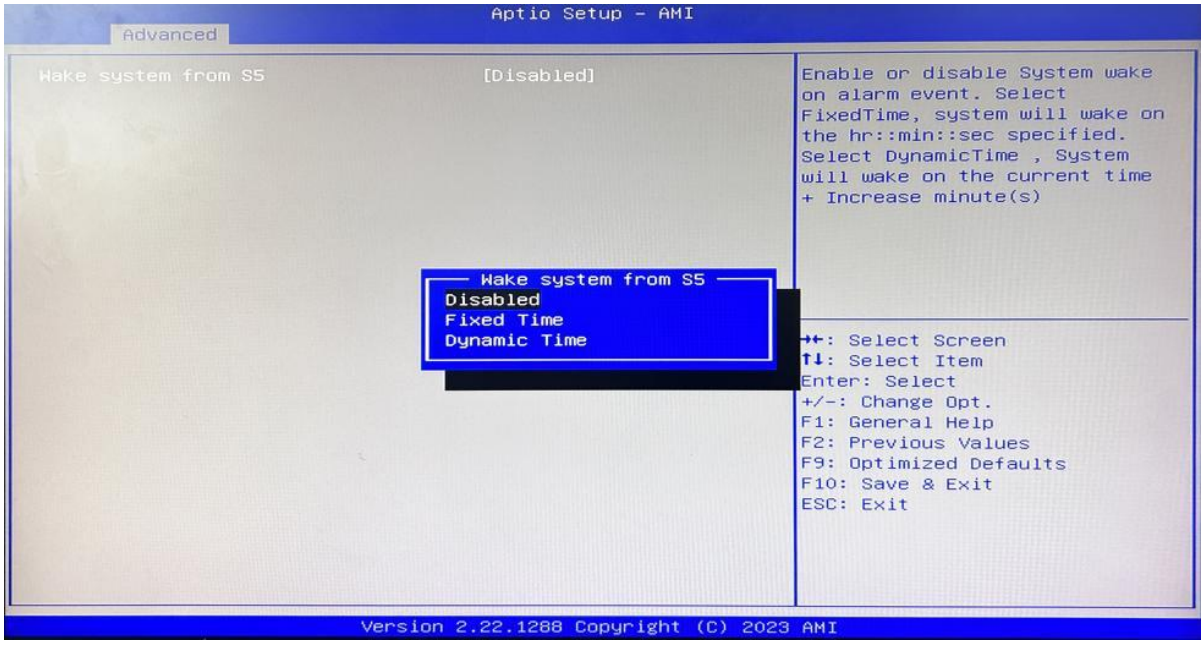
3.3.6 Watch Dog Configuration



Watch Dog Configuration

WDT Timeout Mode select: Minute or Second

3.3.7 S5 RTC Wake Settings

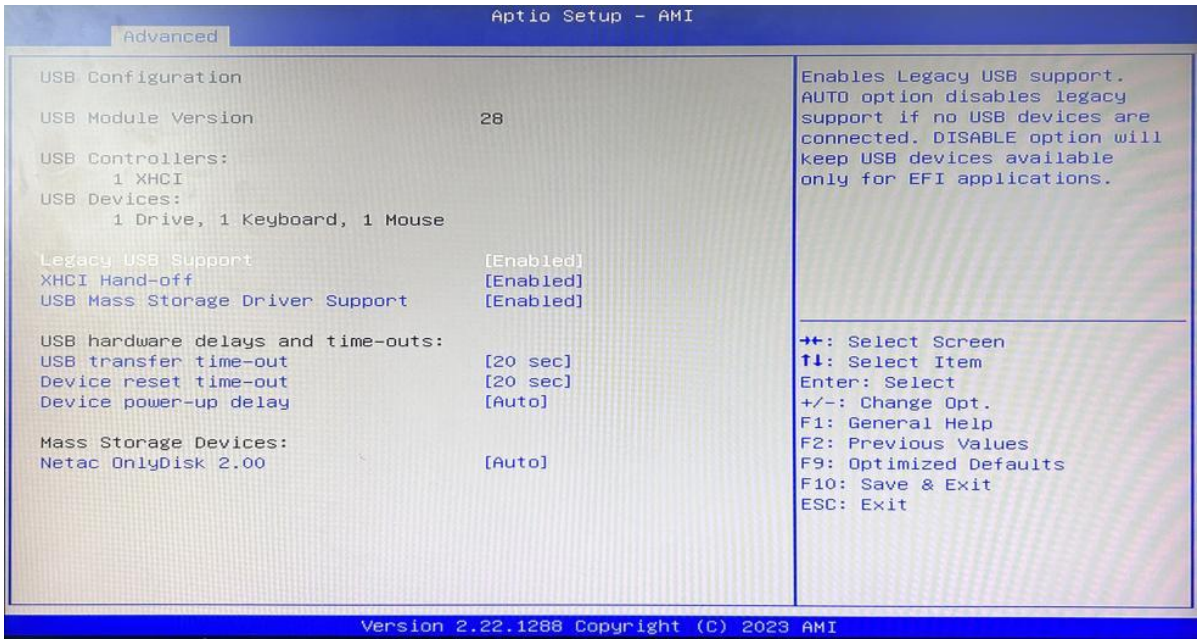


Wake system From S5: timing boot settings, disabled by default.

Fixed Time: Select Fixed Time and the system will wake on the Hr: Min: Sec specified.

Dynamic Time: Select Dynamic Time and the system will wake on a dynamic time.

3.3.8 USB Configuration



Legacy USB Support

Enable Legacy USB support. Disables legacy support if no USB devices are connected. Select enable will keep USB devices available under UEFI's support.

XHCI Hand-off

A workaround for OS without XHCI hand-off support. The XHCI ownership change should be claimed by the USB XCHI driver.

USB Mass Storage Driver Support

Enable(default) or disable USB Mass Storage Driver Support.

USB transfer time-out

Time-out value for control, bulk, and interrupt transfers, default time:20 second.

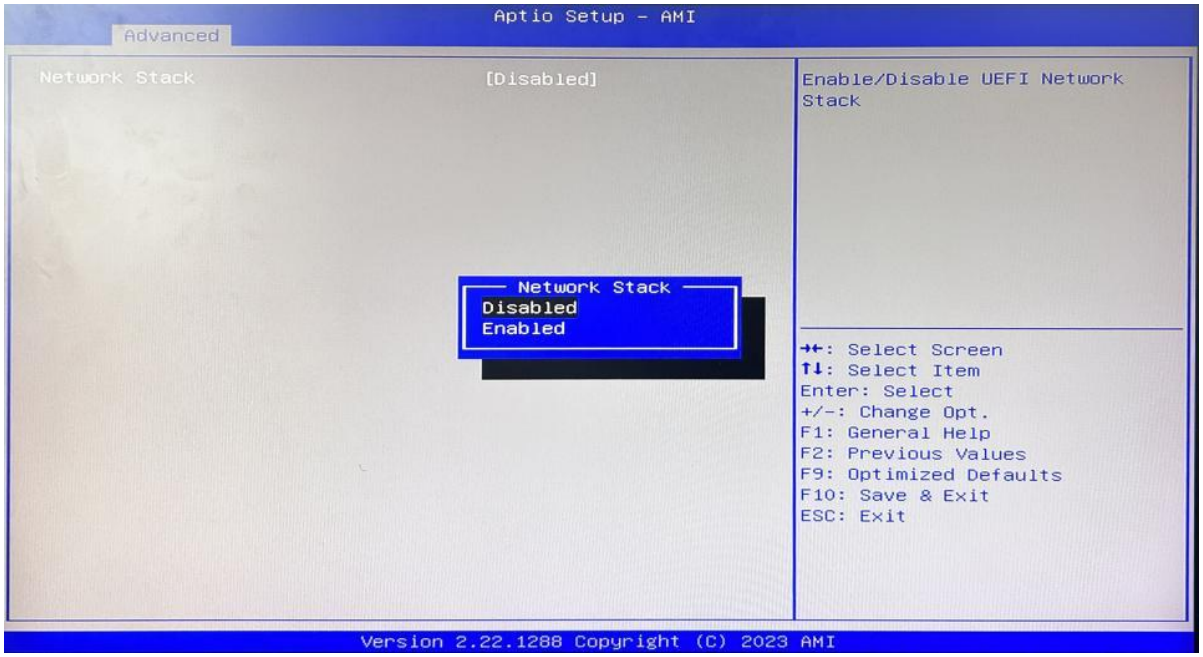
Device reset time-out

USB mass storage device start unit command time-out, default time:20 second.

Device Power-up Delay

Maximum time the device will take before it properly reports itself to the host controller.

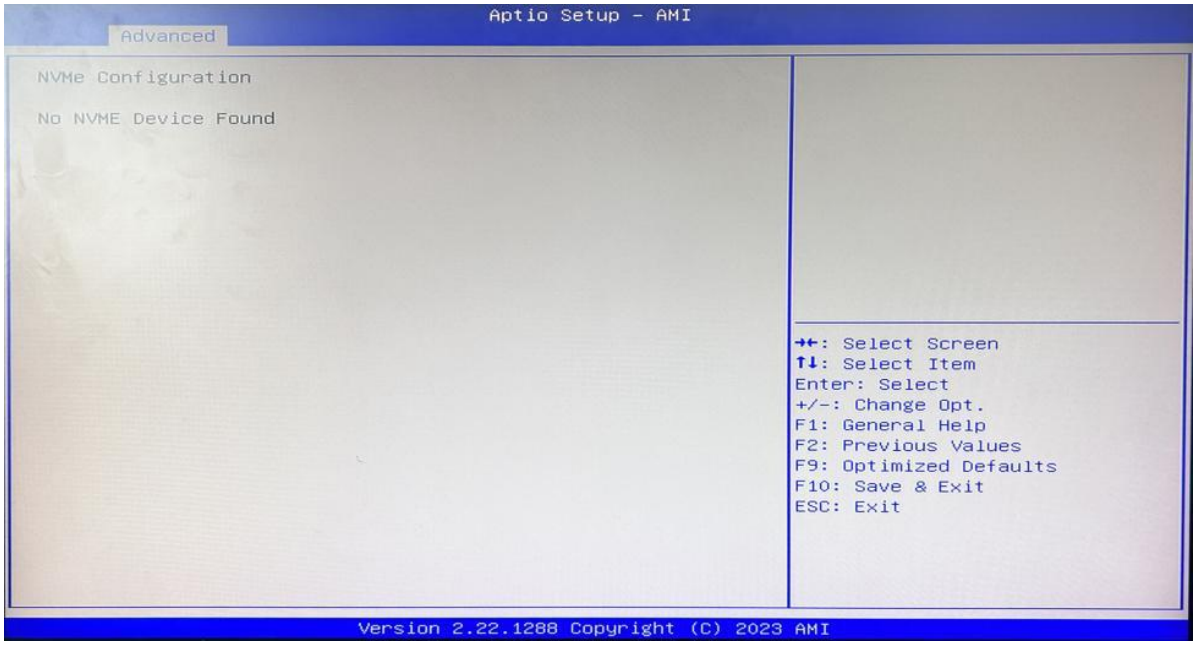
3.3.9 Network Stack Configuration



Network Stack

PXE Network boot setting, disabled by default.

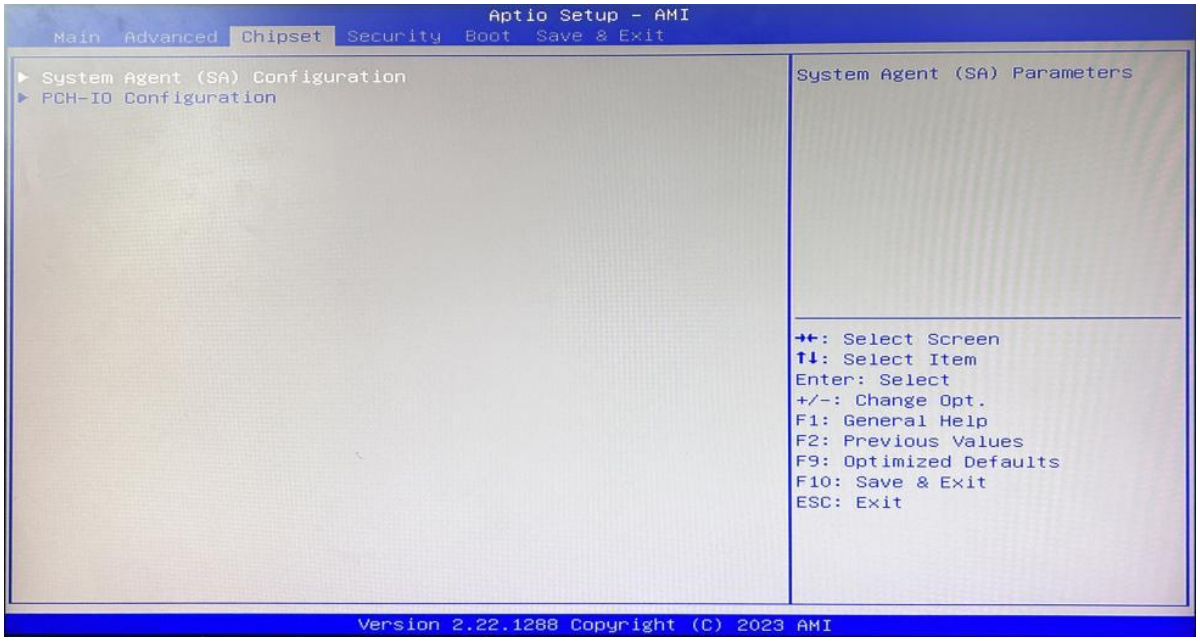
3.3.10 NVME Configuration



The capacity and model of the SSD will be displayed under the option after the NVMe protocol SSD has been installed.

3.4 Chipset

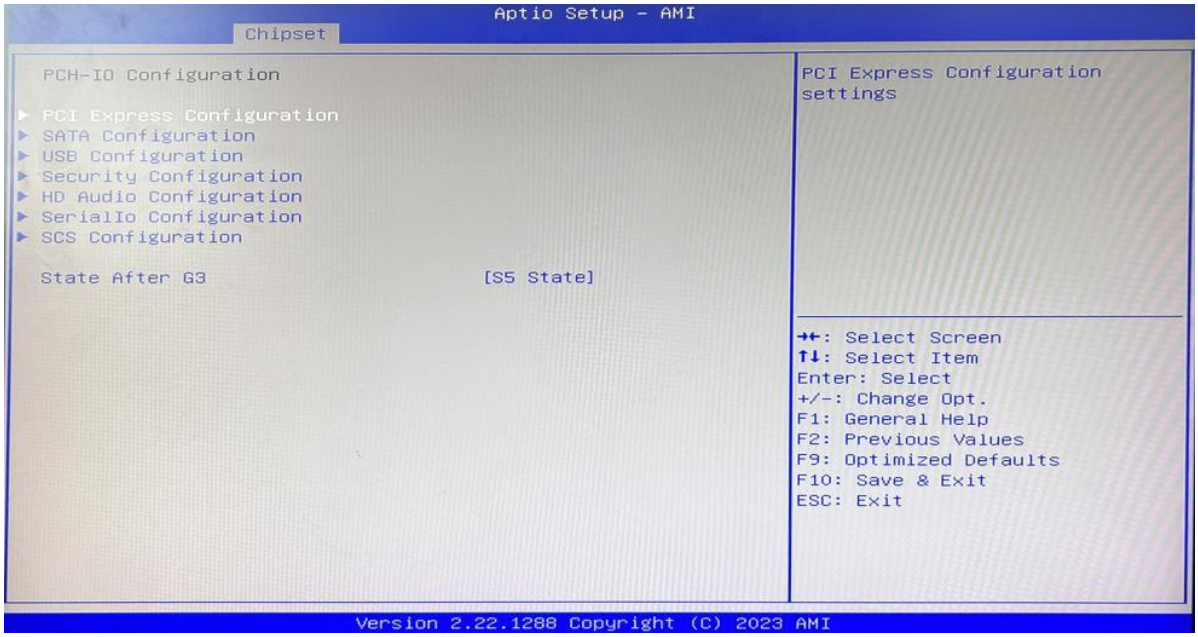
Select the chipset tab from the setup screen to enter the chipset BIOS Setup screen.



System Agent (SA) Configuration: Northbridge configuration options, including video memory, display devices, and other options.

PCH-IO Configuration: Southbridge configuration options, including hard disk, sound card equipment, and other options

3.4.1 PCH-IO Configuration



PCI Express Configuration

SATA Configuration

USB Configuration

Security Configuration

HD Audio Configuration

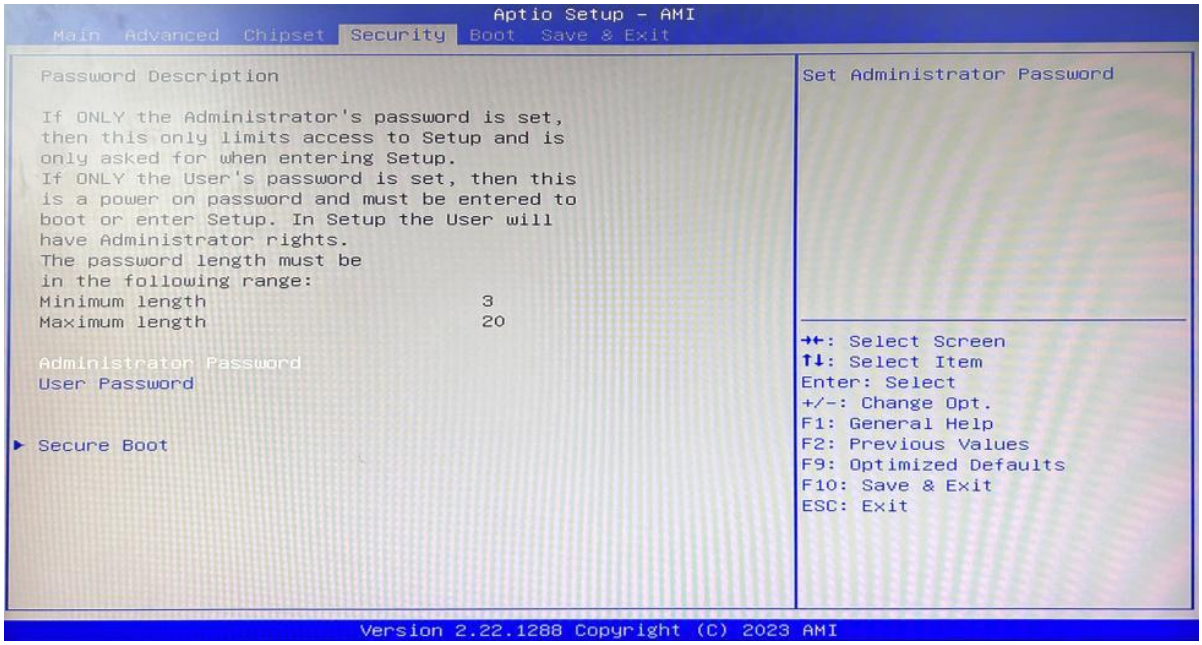
SCS Configuration

State After G3:

S0 State

S5 State

3.5 Security

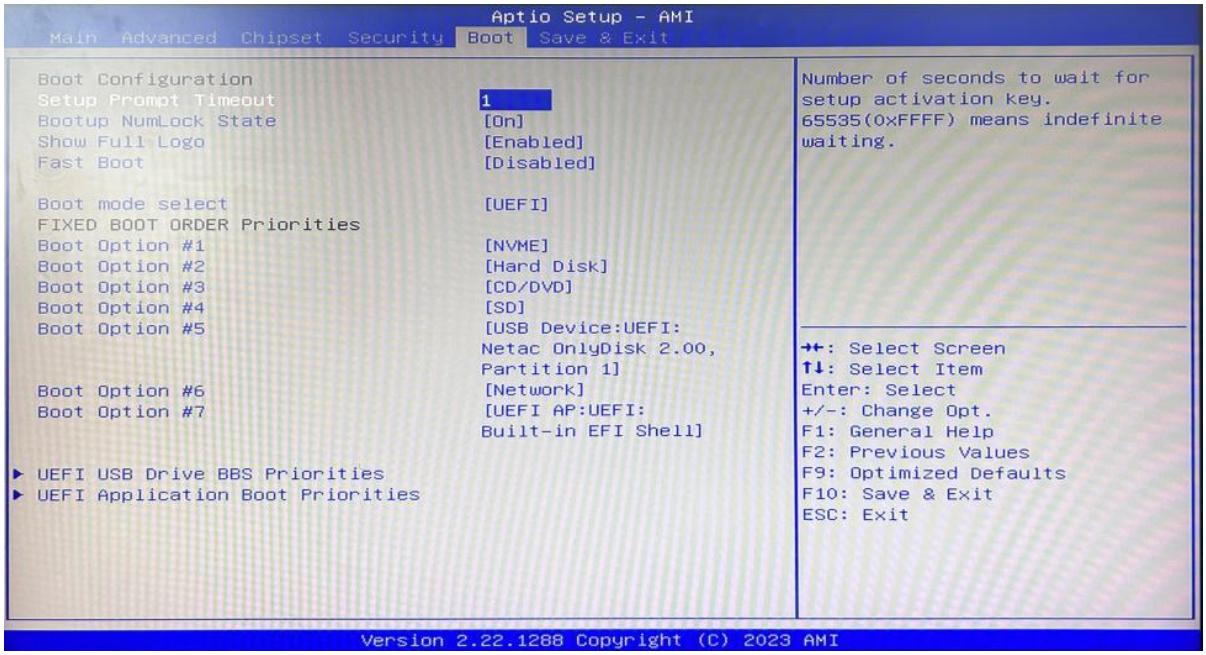


Administrator Password: Set the Administrator Password.

User Password: Set User Password.

Secure Boot: Secure boot

3.6 Boot



Setup Prompt Timeout:

Number of seconds that the firmware will wait before initiating the original default boot selection. A value of 0 indicates that the default boot selection is to be initiated immediately on boot. A value of 65535(0xFFFF) indicates that firmware will wait for user input before booting. This means the default boot selection is not automatically started by the firmware.

Bootup NumLock State:

Select the keyboard NumLock state

Show Full Logo:

Enabled/Disabled Displays customized boot logo.

Boot Option #1~#7:

Set the system boot order from Number 1 to Number 7.

UEFI Hard Disk Drive BBS Priorities:

UEFI hard drive boot priorities setting.

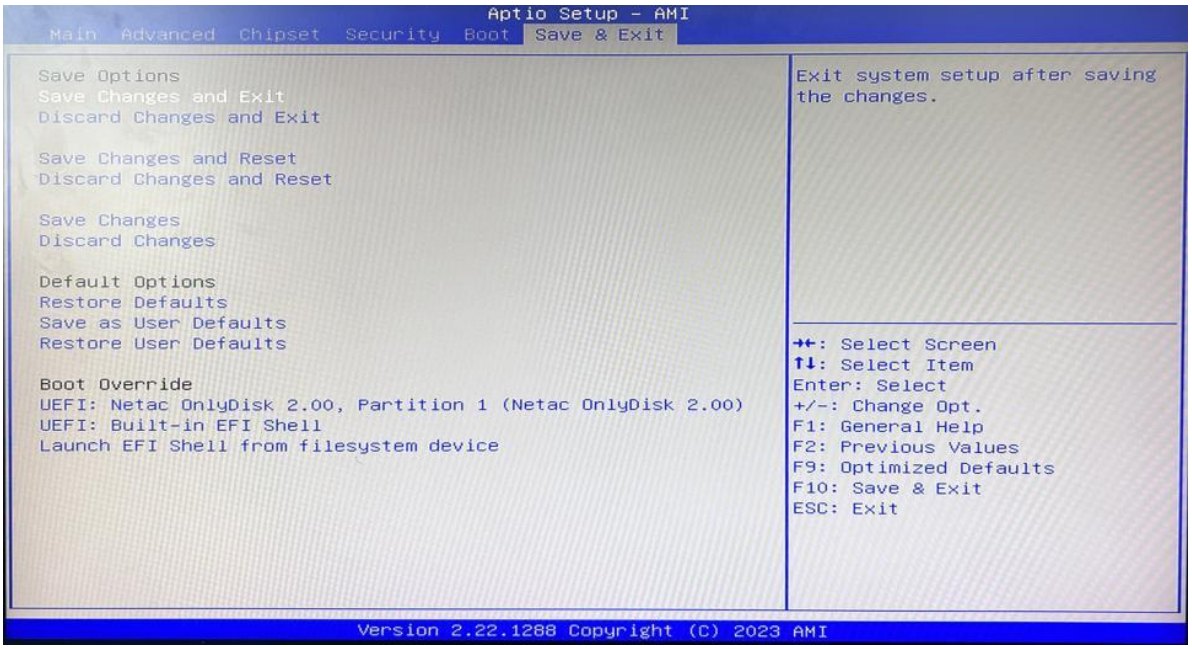
UEFI USB Drive BBS Priorities:

UEFI USB device boot priorities setting.

UEFI Application boot Priorities:

UEFI application boot priority.

3.7 Save & Exit



Save Changes and Exit:

Exit the system setup after saving the changes and continue to start the computer.

Discard Changes and Exit:

Exit the system setup without saving any changes and continue to start the computer.

Save Changes and Reset:

Reset the system after saving the changes.

Discard changes and Reset:

Reset the system without saving any changes.

Save Changes:

Save changes done so far to any of the options.

Discard Changes:

Discard changes done so far to any of the options.

Restore Defaults:

Restore/load default values for all the options.

Save as User Defaults:

Save the changes done so far as the user defaults.

Restore User Defaults:

Restore the user defaults to all the options.

Boot Override:

Boot device selection can override your boot priority. Select the specified boot device such as SATA, USB Flash Disk, EFI Shell, PXE, etc., and boot directly. Or press F11 boot by selecting the specified boot device.