DFI

GM841-HPF

Gaming Embedded System

User's Manual

Copyright

Trademarks

FCC and DOC Statement on Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

Notice:

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

Table of Contents

About this Manual

This manual can be retrieved from the website.

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

Warranty

1. Warranty does not cover damages or failures that arises from misuse of the product, inability to use the product, unauthorized replacement or alteration of components and product specifications.

2. The warranty is void if the product has been subjected to physical abuse, improper installation, modification, accidents or unauthorized repair of the product.

3. Unless otherwise instructed in this user's manual, the user may not, under any circumstances, attempt to perform service, adjustments or repairs on the product, whether in or out of warranty. It must be returned to the purchase point, factory or authorized service agency for all such work.

4. We will not be liable for any indirect, special, incidental or consequential damages to the product that has been modified or altered.

About this Package

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

- 1 System Unit

Note: The items are subject to change in the developing stage.
The product and accessories in the package may not come similar to the information listed above. This may differ in accordance with the sales region or models in which it was sold. For more information about the standard package in your region, please contact your dealer or sales representative.

Static Electricity Precautions

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

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

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

Safety Precautions

- Use the correct DC / AC input voltage range. (100Vac ~ 240Vac)
- Unplug the power cord before removing the system chassis cover for installation or servicing. After installation or servicing, cover the system chassis before plugging in the power cord.
- There is danger of explosion if battery incorrectly replaced.
- Replace only with the same or equivalent specifications of batteries recommend by the manufacturer.
- Dispose of used batteries according to local ordinance.
- Keep this system away from humid environments.
- Make sure the system is placed or mounted correctly and stably to prevent the chance of dropping or falling may cause damage.
- The openings on the system shall not be blocked and shall be kept in distance from other objects to make sure of proper air ventilation to protect the system from overheating.
- Dress the cables, especially the power cord, so they will not be stepped on, in contact with high temperature surfaces, or cause any tripping hazards.
- Do not place anything on top of the power cord. Use a power cord that has been approved for use with the system and is compliant with the voltage and current ranges required by the system's electrical specifications.
- If the system is to be unused or stored for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
- If one of the following occurs, consult a service personnel:
  - The power cord or plug is damaged.
  - Liquid has penetrated the system.
  - The system has been exposed to moisture.
  - The system is not working properly.
  - The system is physically damaged.
- The unit uses a three-wire ground cable which is equipped with a third pin to ground the unit and prevent electric shock. Do not defeat the purpose of this pin. If your outlet does not support this kind of plug, contact your electrician to replace the outlet.
- Disconnect the system from the electricity outlet before cleaning. Use a damp cloth for cleaning the surface. Do not use liquid or spray detergents for cleaning.
- Before connecting, make sure that the power supply voltage is correct. The device is connected to a power outlet which should be grounded connection.

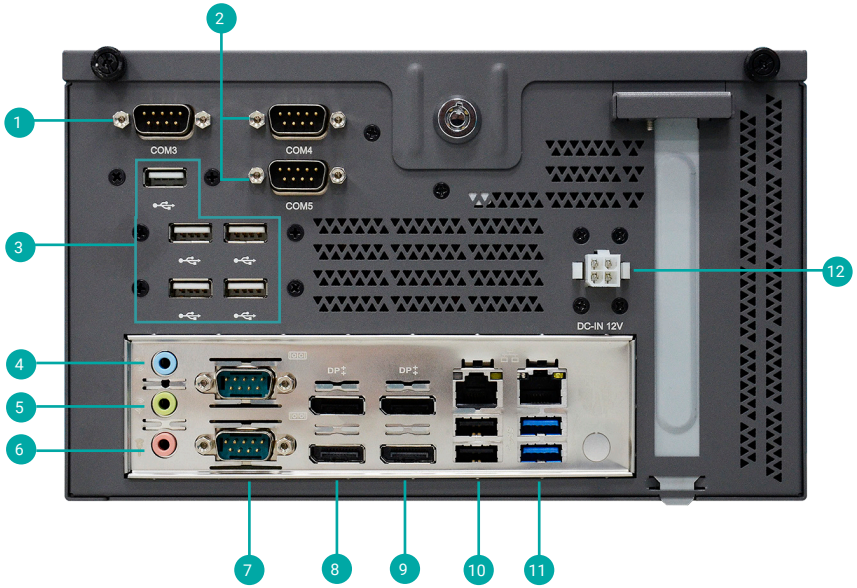
The system may burn fingers while running.

Wait for 30 minutes to handle electronic parts after power off.

Chapter 1 - Introduction

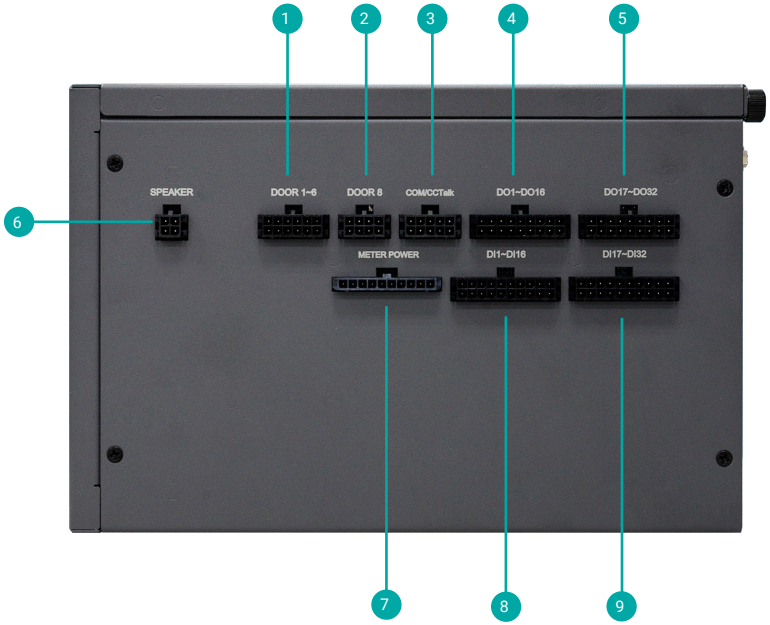
▶ Overview

Rear View



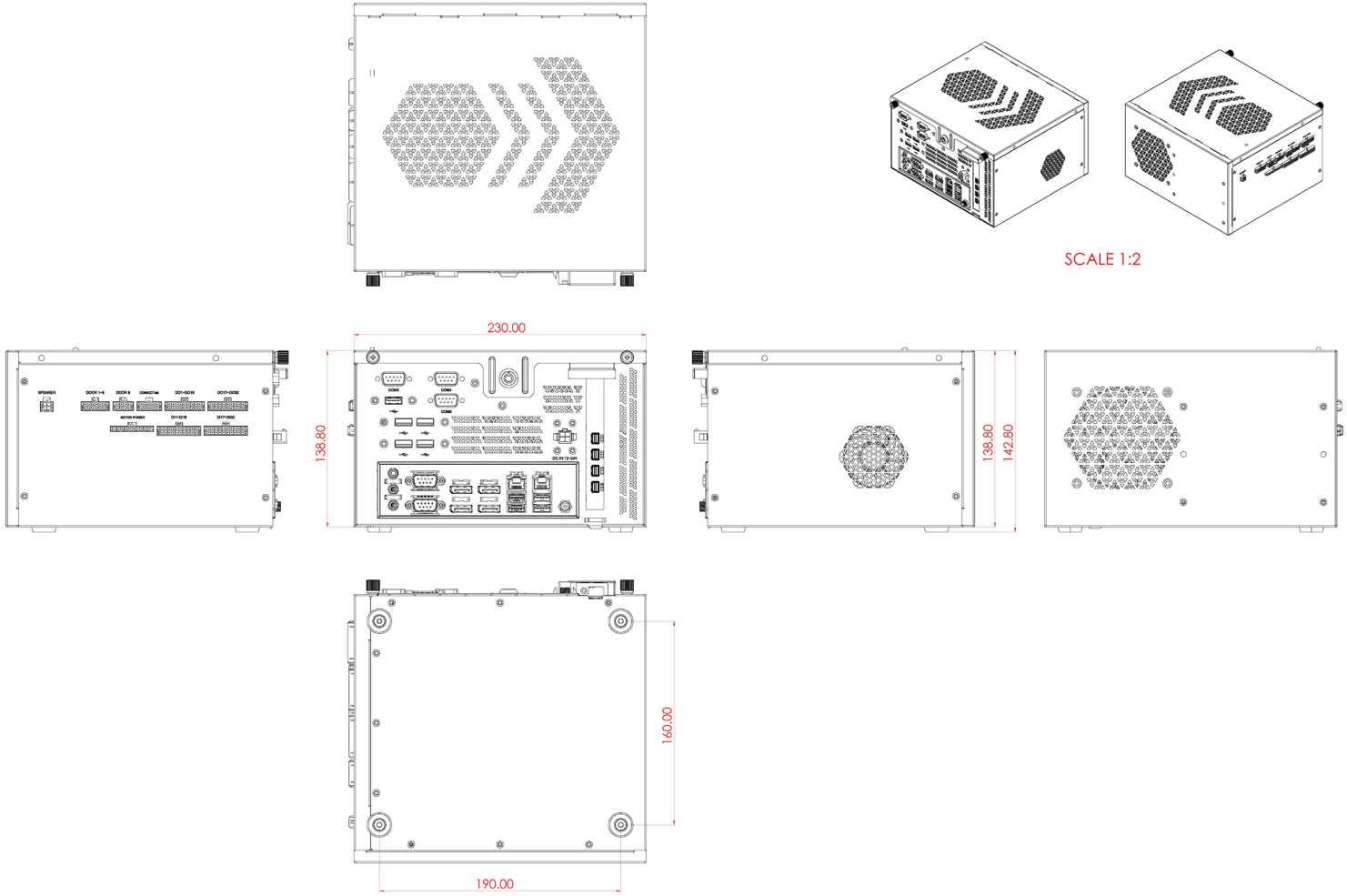
1	COM3
2	▲COM4 ▼COM5
3	USB2.0
4	Line-in
5	Line-out
6	MIC-in
7	▲COM1 ▼COM2
8	▲DP1 ▼DP2
9	▲DP3 ▼DP4
10	▲2.5G LAN2 ▼USB2.0
11	▲2.5G LAN1 ▼USB3.2 Gen2
12	12V~24V DC IN (4-pin)

Side View



1	Door1~6
2	Door8 & I2C
3	COM/CC-Talk
4	DO1 ~ DO16
5	DO17~DO32
6	Speaker
7	Meter Power
8	DI1 ~ DI16
9	DI17~DI32

▶ Dimensions



▶ Key Features

Powerful Computing Processor:
AMD® Ryzen™ Embedded 8000 Hawk Point Series up to 54W

High Performance AI:
AMD® Ryzen™ Embedded 8000 Hawk Point APUs (38 TOPs Total)

Superior Graphic Engine:
Support 4 DP++ (up to 4096x2160@60Hz)

Design for Gaming System:
· Retain NVRAM Data for 5 Years during AC off
· 8 Intrusion Detection, 32 x DIDO, 8 x Meter, iButton x1, cctalk x4, Stereo 6W+6W Audio AMP Output

Reliable Data Security:
Jurisdiction BIOS, RSA & Hash Verification

▶ Specifications

SYSTEM	Processor	AMD® Ryzen™ Embedded 8000 Series Processors, TDP up to 54W AMD® Ryzen™ Embedded 8845HS, 8C/16T, 8MB Cache, 3.8GHz (5.1GHz), 45W (35-54W) AMD® Ryzen™ Embedded 8645HS, 6C/12T, 6MB Cache, 4.3GHz (5.0GHz), 45W (35-54W) AMD® Ryzen™ Embedded 8840U, 8C/16T, 8MB Cache, 3.3GHz (5.1GHz), 28W (15-30W) AMD® Ryzen™ Embedded 8640U, 6C/12T, 6MB Cache, 3.5GHz (4.9GHz), 28W (15-30W)
	Memory	Dual-channel SODIMM up to 64GB Dual-channel DDR5 5600/5200/4800MHz, with ECC support
	BIOS	AMI SPI 256Mbit
GRAPHICS	Controller	RDNA3 graphics with up to 6 WGPs (Work Group processors)
	Feature	OpenGL 4.6, DirectX 12, OpenCL 2.1 HW Decode: AVC/H.264, MPEG2, VC1/WMV9, JPEG/MJPEG, HEVC/H265, VP8, VP9, AV1 HW Encode: MPEG2, AVC/H264, JPEG, HEVC/H265, VP8, VP9, AV1
	Display	4 x DP++ DP1.2: resolution up to 4096x2304 @ 60Hz
	Quad Displays	4 DP++
STORAGE	Interface	2 x SATA 3.0 1 x 2.5” SSD Bay
EXPANSION	Interface	1 x PCIE Gen4 x16 slot (x8 Gen4) 1 x M.2 M Key 2280 (SATA 3.0/ PCIe Gen3x4) SATA3(opt) selected by BIOS
AUDIO	Audio Codec	Realtek ALC888S
ETHERNET	Controller	2 x i226-V (10/100/1000/2500 MHz)
LED	Indicators	1 x Power LED 1 x HDD LED
WATCHDOG TIMER	Output & Interval	System Reset, Programmable via Software from 1 to 255 Seconds
POWER	Type	12V~24V DC IN
	Connector	DC-in Jack or Right Angle Connector (4-pin)
SECURITY	TPM	TPM 2.0
OS SUPPORT	Microsoft	Windows 10 IoT Enterprise LTSC(64-bit) Windows 11 22H2 GAC
	Linux	Linux Ubuntu 22.04
	Software	Supplied with gaming function SDK

I/O	Ethernet	2 x 2.5GHz RJ45
	Serial	1 x DB-9 (RS-232/422/485) 1 x DB-9 (RS-232) 1 x DB-9 (TX/RX, TTL-5V) 2 x DB-9 (TX/RX, CCTalk) 2 x Microfit (TX/RX, 2 ccTalk) (Provide the hardware circuit design for the SAS 9-bit interface.)
	USB	2 x USB 3.2 Gen2 7 x USB 2.0
	Display	4 x DP++
	Audio	1 Audio Jack (Line-in/Line-out/Mic-in) Stereo 6W+6W Class D Audio AMP Output S/PDIF Out
	Cooling	1 x 8cm System Fan, with replaceable air filter
GAMING	Intrusion Detection	8 x Intrusion detection Operates With and Without AC Power Logs Date/ Time of latest 64 events Coin Battery backup to Retain Data for 5 years during AC off
	NVRAM	Supports up to 16Mbyte Coin Battery backup to Retain Data for 5 years during AC off Support Battery voltage monitoring & Warning
	DI/DO	32-bit Digital Input 32-bit OC output (29-bit x 500mA, disconnect detection up to 8 meters; 3-bit x 3A)
	iButton	Support iButton 1-wire protocol
ENVIRONMENT	Operating Temperature	0 to 45°C
	Storage Temperature	-20 to 85°C
	Relative Humidity	5 to 90% RH
MECHANISM	Mounting	Wall mount
	Dimensions (W x H x D)	230 x 140 x 210 mm
	Weight	2.9 kg

STANDARDS AND CERTIFICATIONS	Shock	**Operating:** IEC 60068-2-27 Test Ea: Shock test Half-sine, 3G @ 11ms, 18 Shock ±X, ±Y, ±Z (each axis 3 times) **Non-Operation:** IEC 60068-2-27 Test Ea: Shock test Half-sine, 5G @ 11ms, 18 Shock ±X, ±Y, ±Z (each axis 3 times)
	Vibration	**Operating:** IEC 60068-2-64 Test Fh: Vibration Board-Band Random Test Random,1Grms @ 5~500 Hz, 30min. **Non-Operation:** IEC 60068-2-6 Test Fc: Vibration Sinusoidal Test Sweep sine, 2Grms @ 10~500Hz, 30min.
	Certifciation	CE, FCC class A (ongoing)

Chapter 2 - Hardware Installations

▶ Removing the Chassis Cover

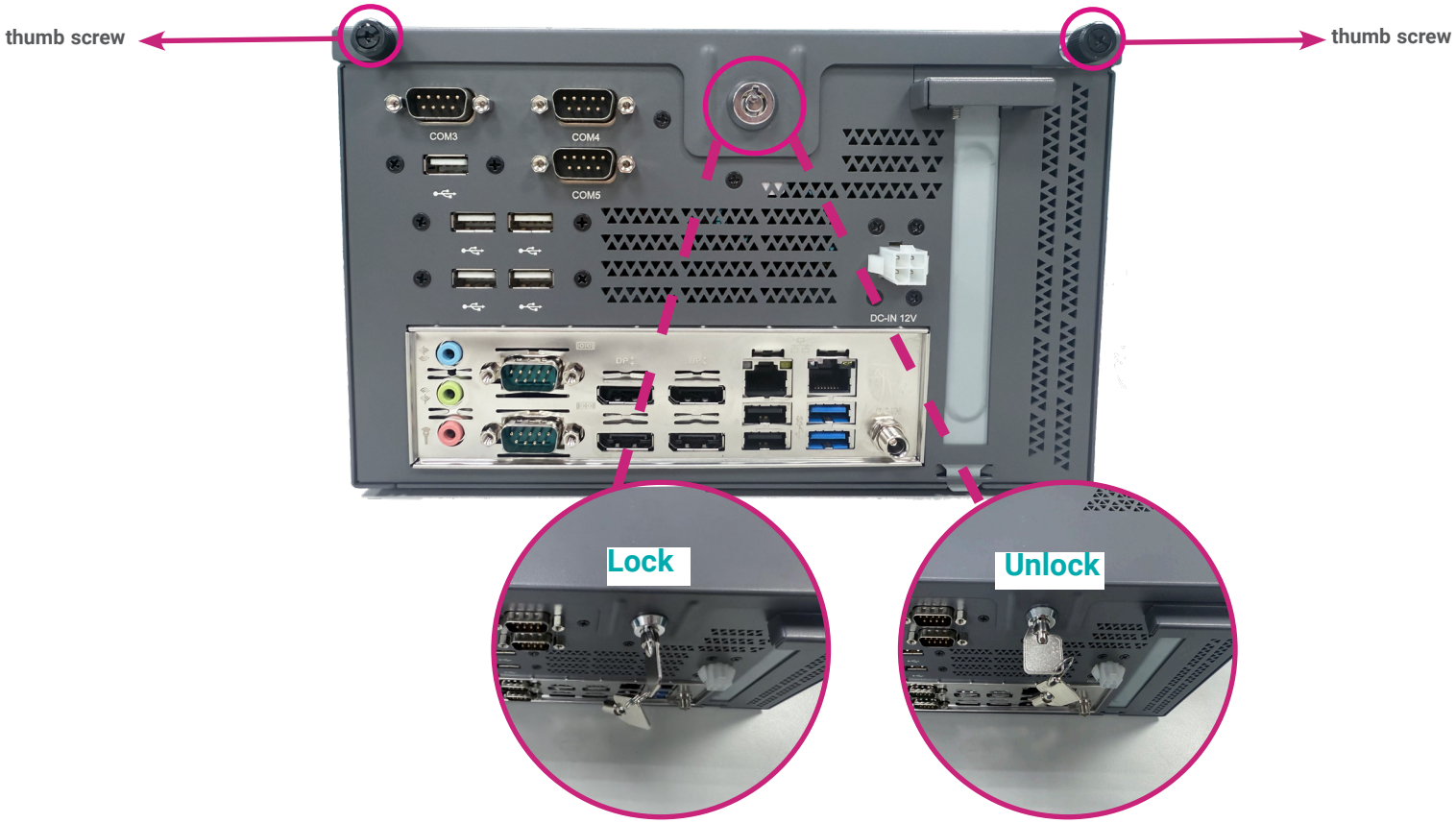
Please observe the following guidelines and follow the instructions to open the system.

1. Make sure the system and all other peripheral devices connected to it have been powered off.

2. Disconnect all power cords and cables.

Step 1:

Use the key to unlock the chassis.
The 2 thumb screws on the left/right side of the system are used to secure the cover to the chassis. Loosen the thumb screws by turning them counterclockwise.



Step 2:
Slide the cover to open the system.

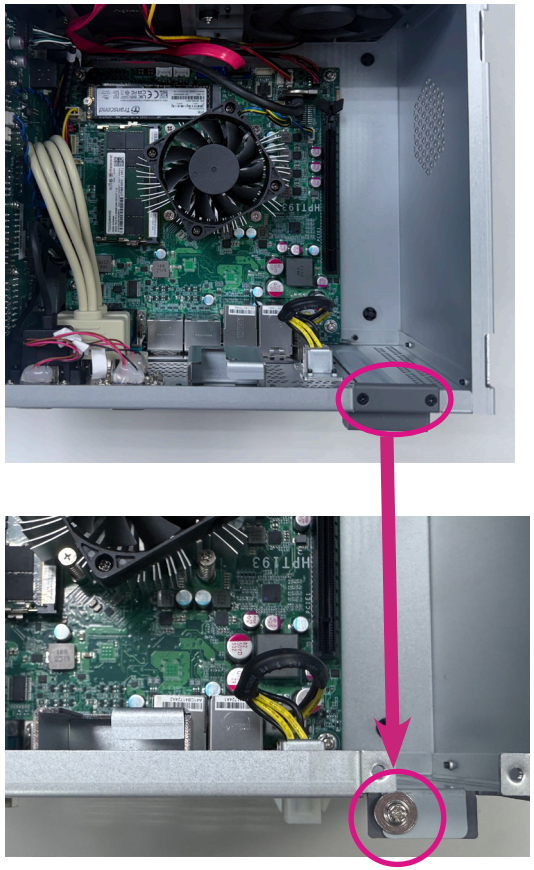
▶ Installing a PCIe Expansion Card

Please observe the following guidelines and follow the instructions to install a PCIe expansion card.

1. Make sure the system and all other peripheral devices connected to it have been powered off.

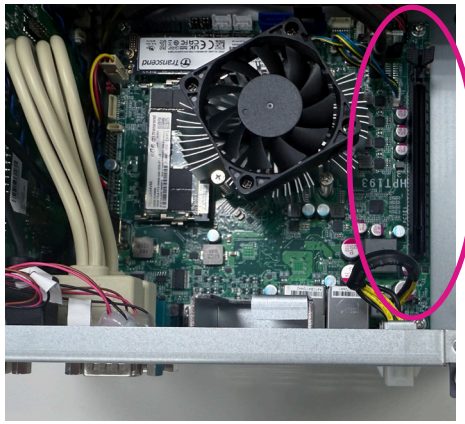
2. Disconnect all power cords and cables.

Step 1:
PCIe slot inside the system is used to install expansion cards.
Please unlock the screws circled in red to remove the metal bracket. And then unlock the screw from a slot bracket.



Step 2:

For those screws, please keep them in a safe place for later use.

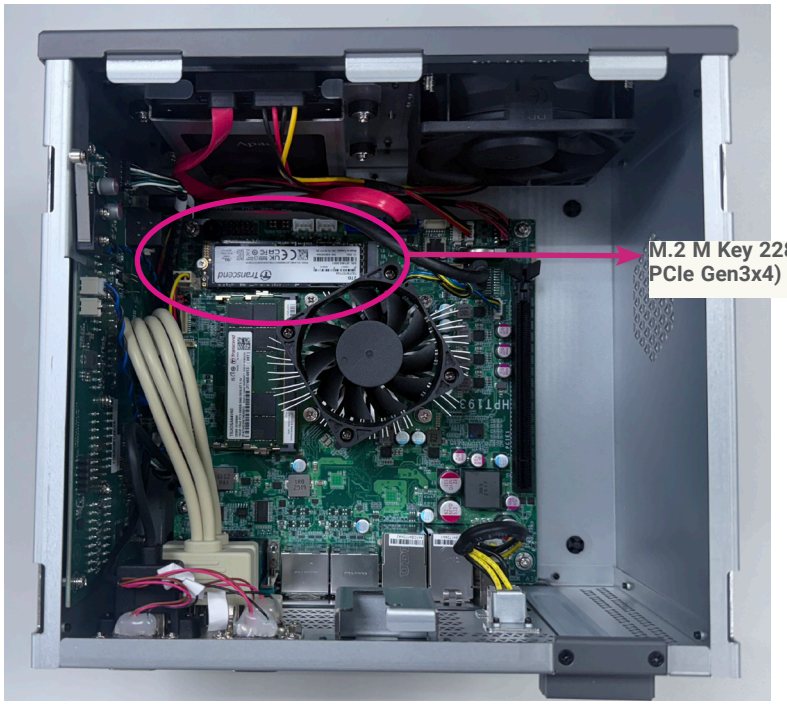


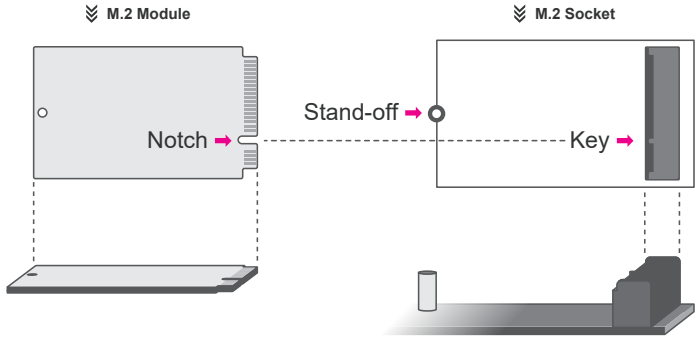
Note:
A maximum size of a PCIe card supports up to >170mm (half-length), and 111mm (full-Height).

▶ Installing an M.2 Card

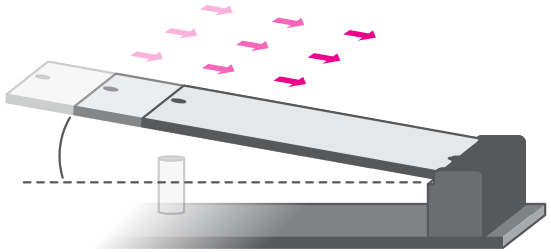
Before installing the M.2 module into the M.2 socket, please make sure that the following safety cautions are well-attended.

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

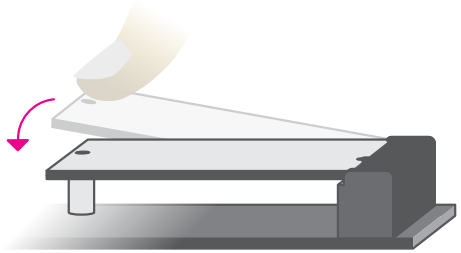




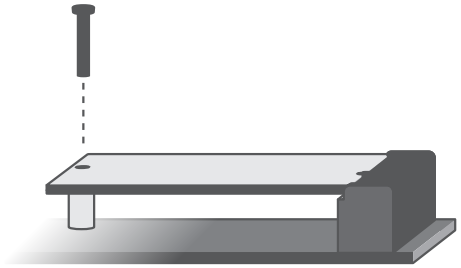
Please follow the steps below to install the card into the socket.



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



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



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

Chapter 3 - BIOS Settings

▶ Overview

The BIOS is a program that takes care of the basic level of communication between the CPU and peripherals. It contains codes for various advanced features found in this system board.

The BIOS allows you to configure the system and save the configuration in a battery-backed CMOS so that the data retains even when the power is off. In general, the information stored in the CMOS RAM of the EEPROM will stay unchanged unless a configuration change has been made such as a hard drive replaced or a device added.

It is possible that the CMOS battery will fail causing CMOS data loss. If this happens, you need to install a new CMOS battery and reconfigure the BIOS settings.

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

Default Configuration

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

Entering the BIOS Setup Utility

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

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

Legends

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

Scroll Bar

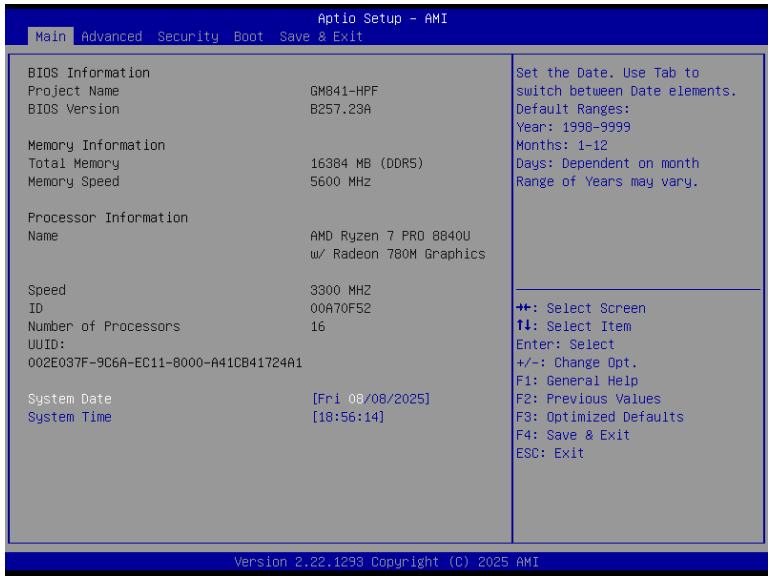
When a scroll bar appears to the right of the setup screen, it indicates that there are more available fields not shown on the screen. Use the up and down arrow keys to scroll through all the available fields.

Submenu

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

▶ Main

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



System Date

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

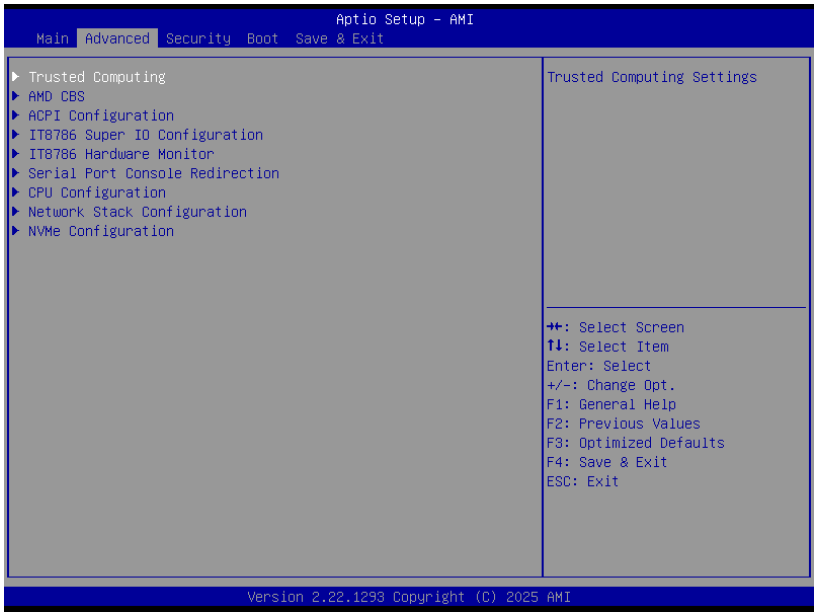
System Time

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

▶ Advanced

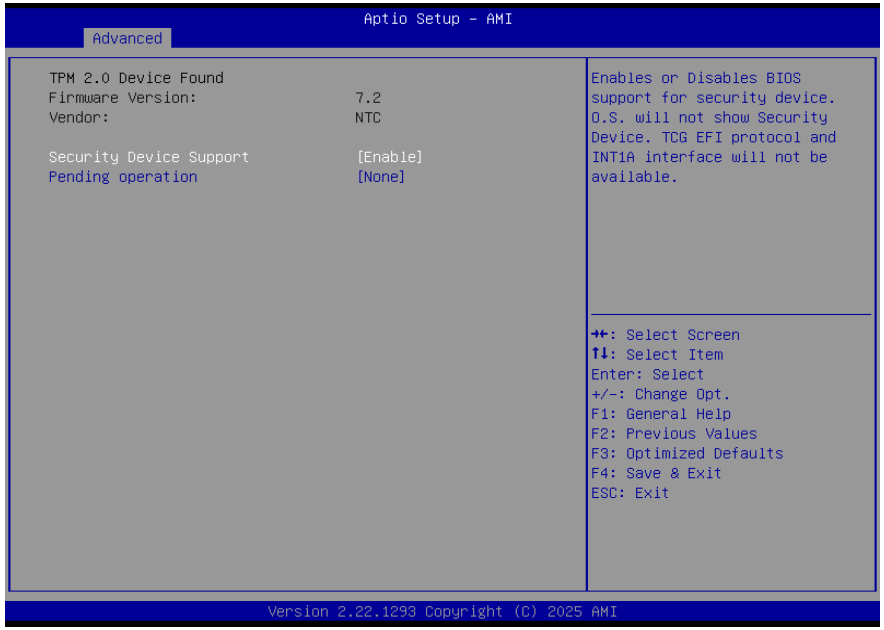
The Advanced menu allows you to configure your system for basic operation. Some entries are defaults required by the system board, while others, if enabled, will improve the performance of your system or let you set some features according to your preference.

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



▶ Advanced

Trusted Computing



Security Device Support

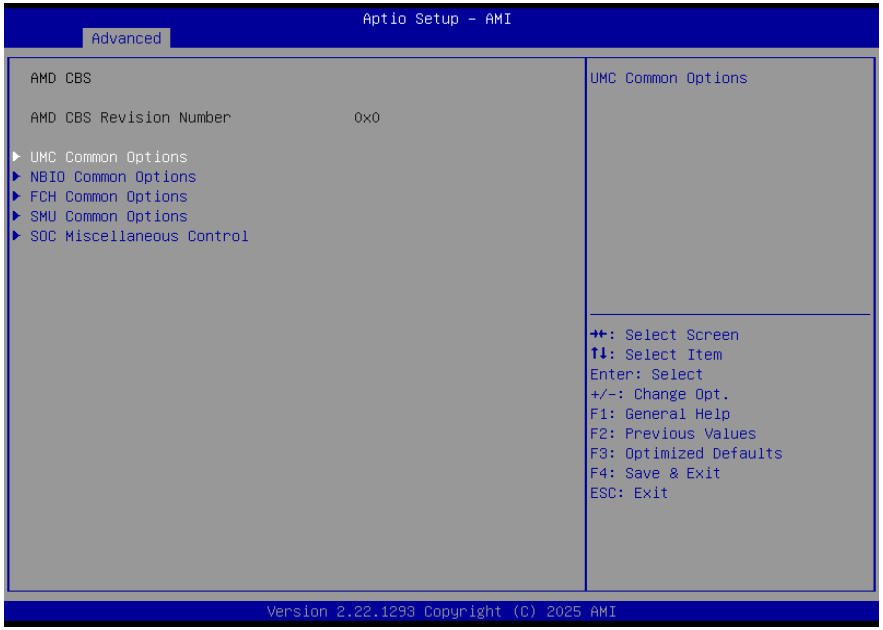
This field is used to enable or disable BIOS support for the security device such as an TPM 2.0 to achieve hardware-level security via cryptographic keys.

Pending operation

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

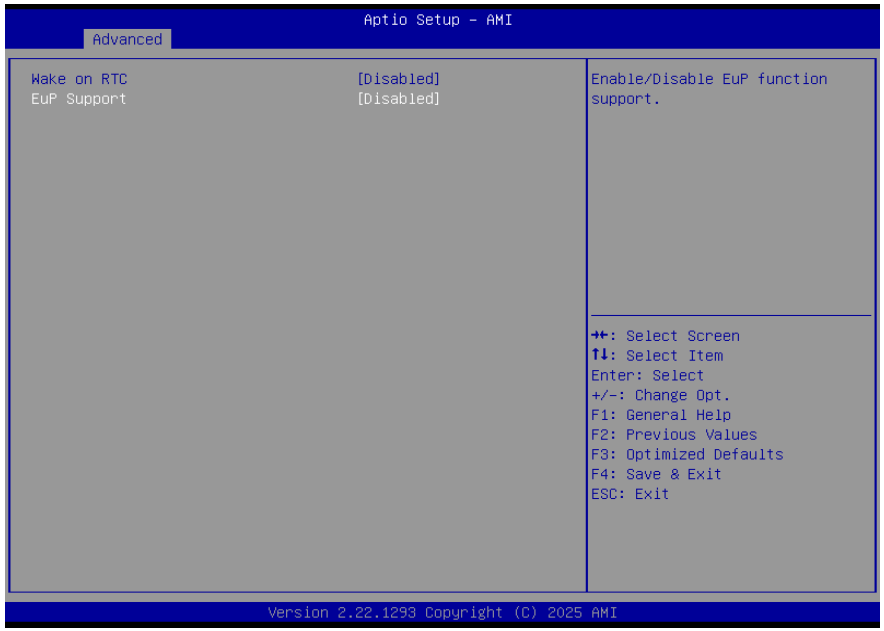
▶ Advanced

AMD CBS



▶ Advanced

ACPI Configuration



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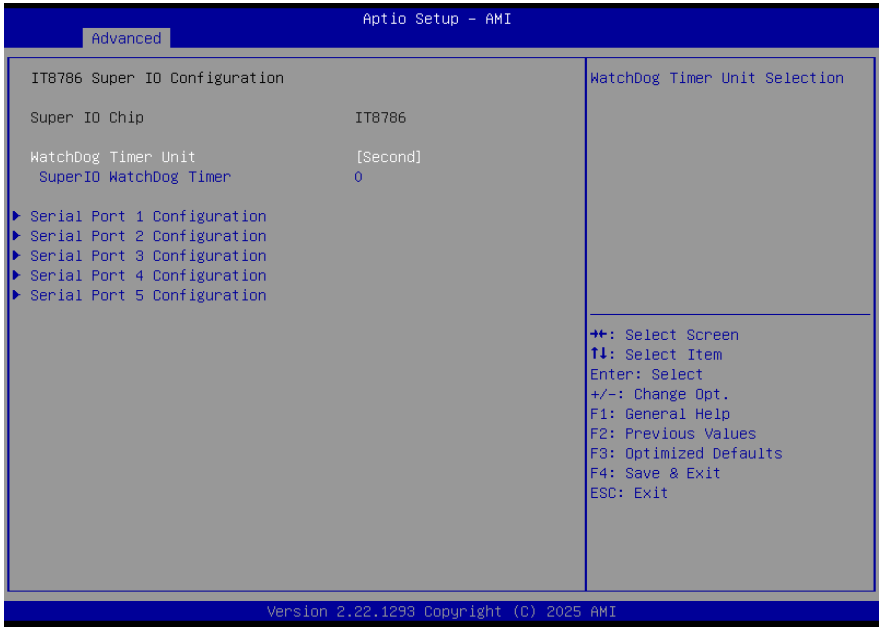
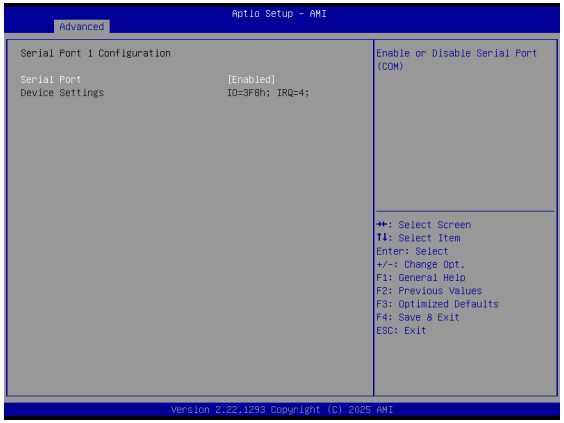
▶ Advanced

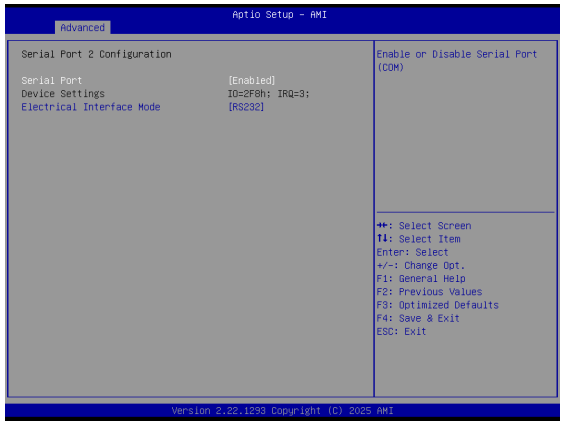
IT8786 Super IO Configuration



▶ Advanced

IT8786 Super IO Configuration ▶ Serial Port 1, 2 Configuration

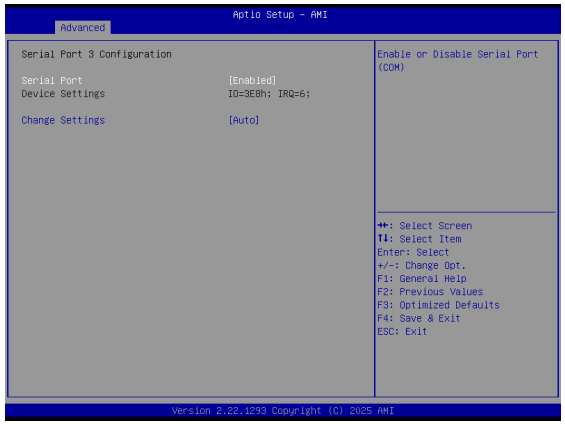


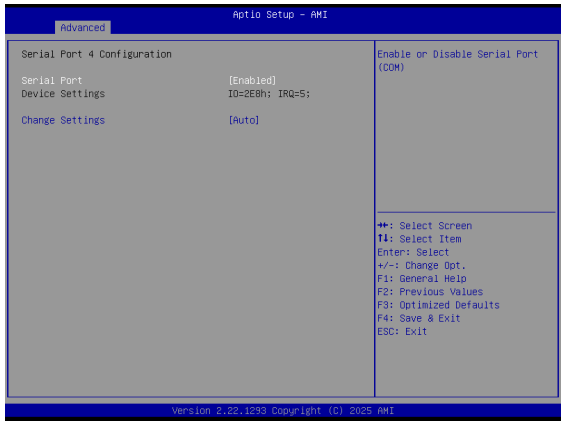


Serial Port
Enable or disable serial port.

▶ Advanced

IT8786 Super IO Configuration ▶ Serial Port 3, 4 Configuration

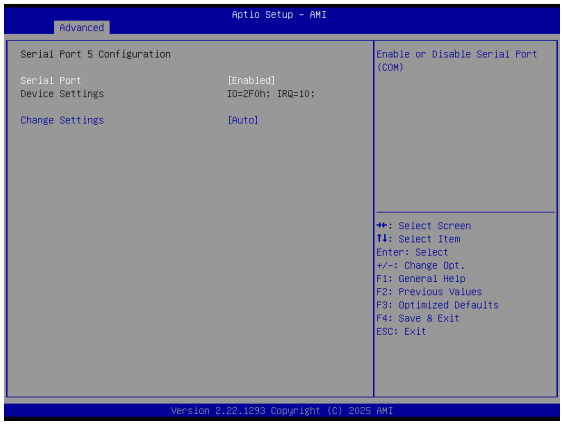




Serial Port
Enable or disable serial port.

▶ Advanced

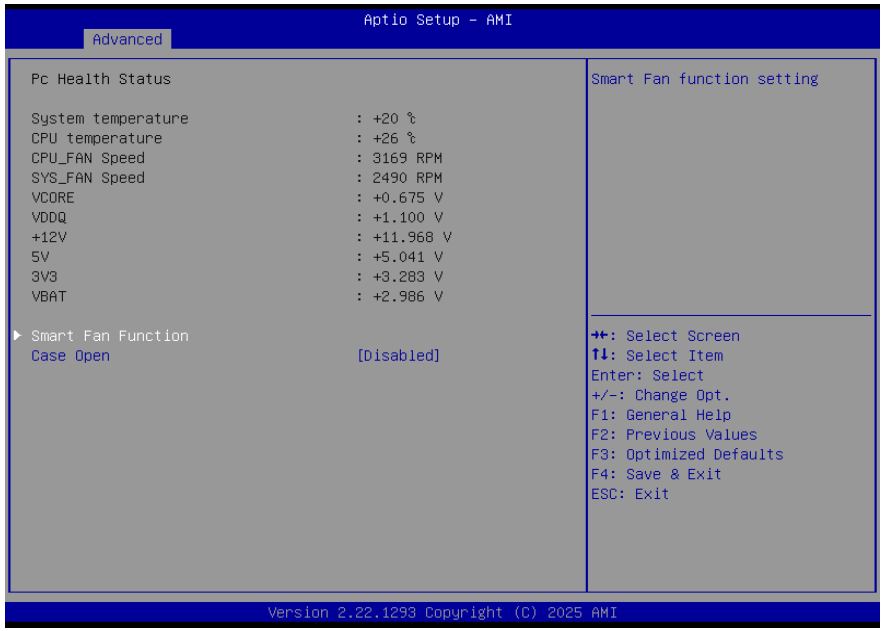
IT8786 Super IO Configuration ▶ Serial Port 5 Configuration



Serial Port
Enable or disable serial port.

▶ Advanced

IT8786 HW Monitor



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

Smart Fan Function

Smart Fan Function Setting.

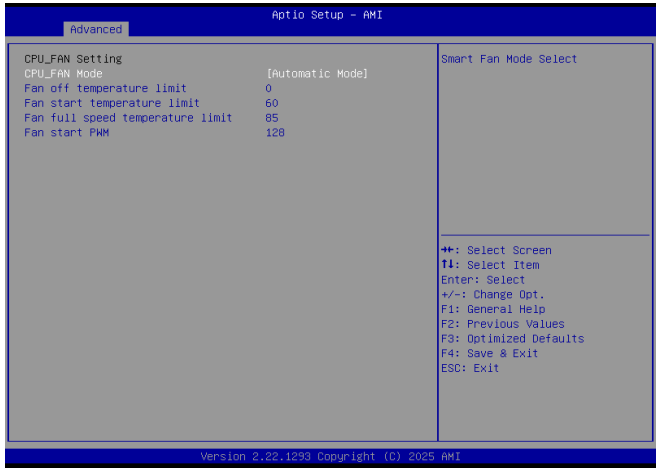
Case Open

Enable or disable the case open detection function.

▶ Advanced

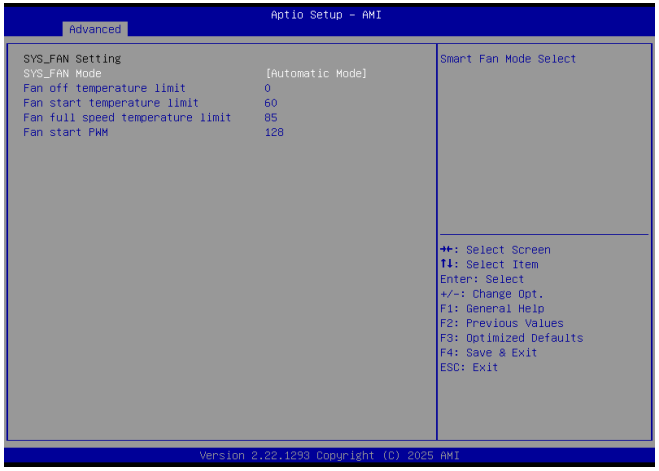
IT8786 HW Monitor ▶ Smart FAN Function

IT8786 HW Monitor ▶ Smart FAN Function ▶ CPU FAN Setting



▶ Advanced

IT8786 HW Monitor ▶ Smart FAN Function ▶ SYS_FAN Setting



CPU Fan/SYS_FAN
Smart Fan Mode Select

Fan off temperature limit
Fan will be turned off when the temperature is lower than this limit.

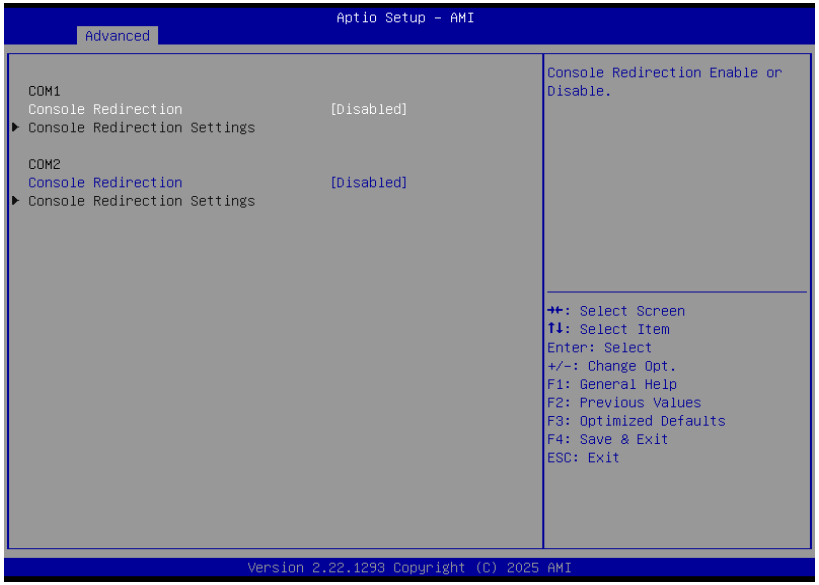
Fan start temperature limit
Fan will start working when the temperature is higher than this limit.

Fan full speed temperature limit
Fan will be full speed when the temperature is higher than this limit.

Fan start PWM
Fan will start with this PWM value.

▶ Advanced

Serial Port Console Redirection



Console Redirection

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

▶ Advanced

Serial Port Console Redirection ▶ Console Redirection Settings

Configure the serial settings of the current COM port.

Terminal Type

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

Bits per second

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

Data Bits

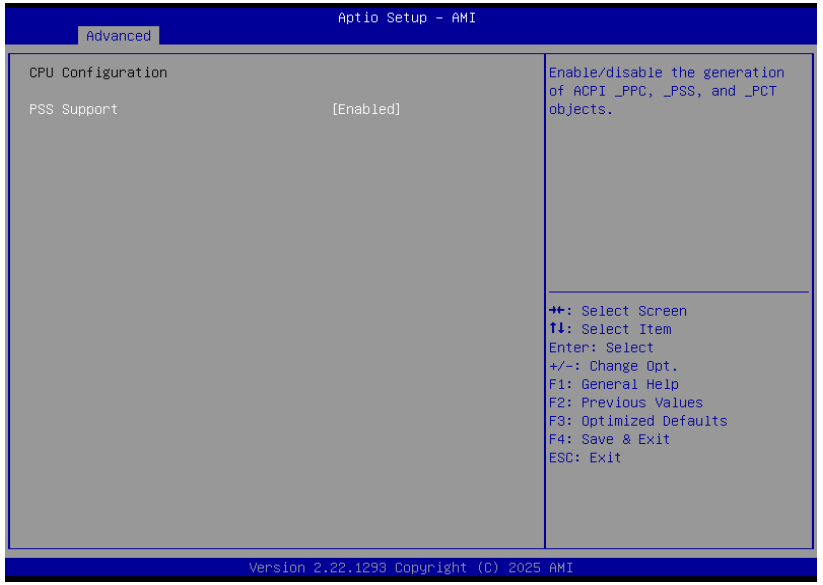
Select data bits: 7 bits or 8 bits.

Parity

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

▶ Advanced

CPU Configuration

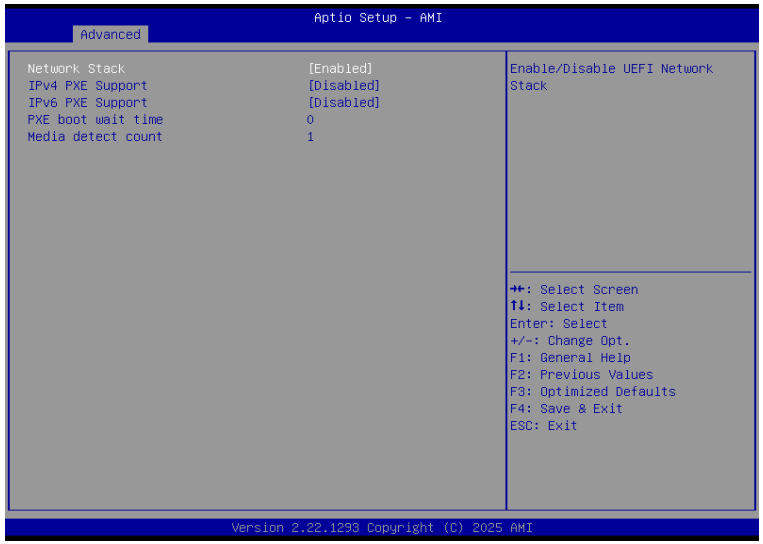


PSS Support

Enabled/Disable the generation of ACPI_PPC, _PSS, and _PCT objects.

▶ Advanced

Network Stack Configuration



Network Stack

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

Ipv4 PXE Support

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

Ipv6 PXE Support

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

PXE boot wait time

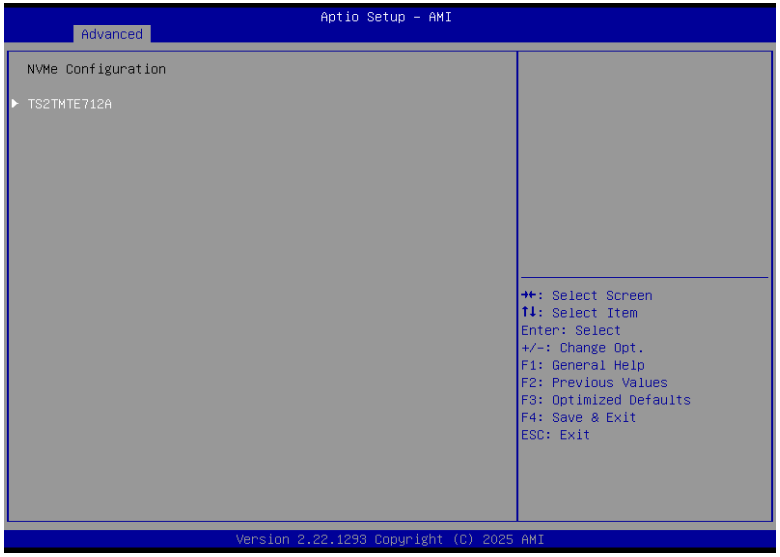
Set the wait time in seconds to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the value.

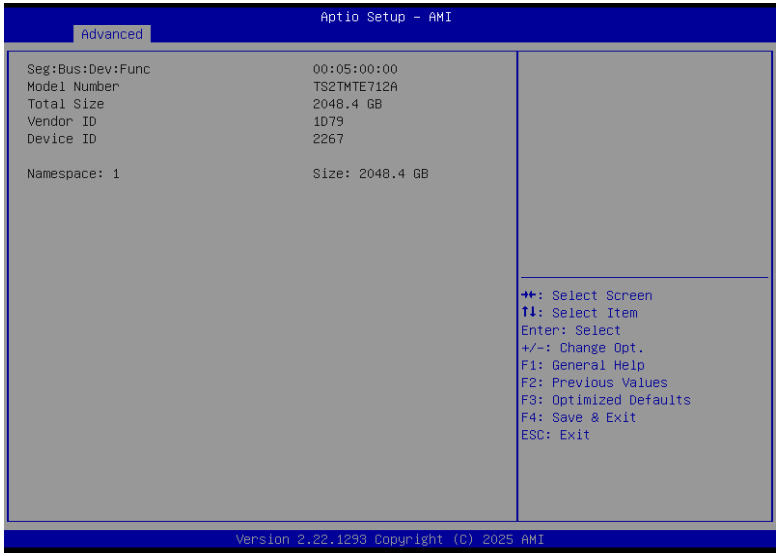
Media detect count

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

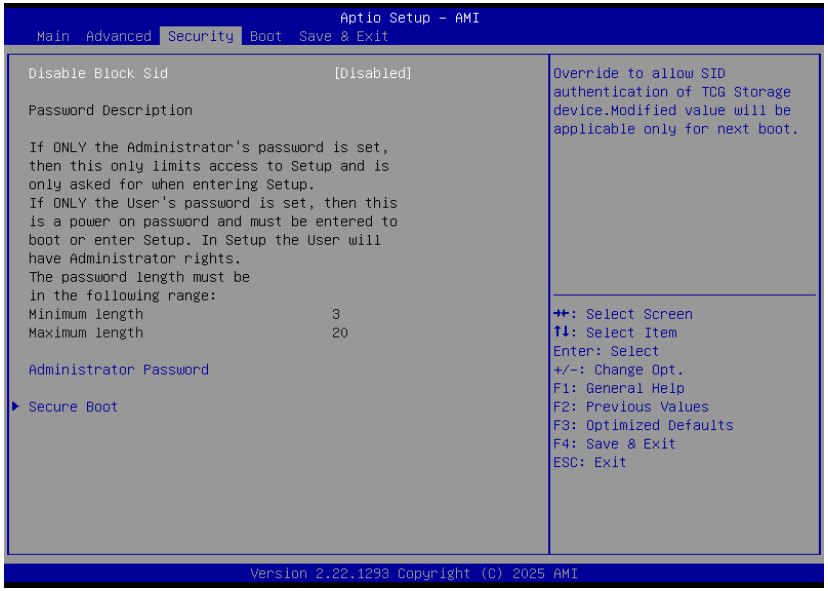
▶ Advanced

NVMe Configuration





▶ Security



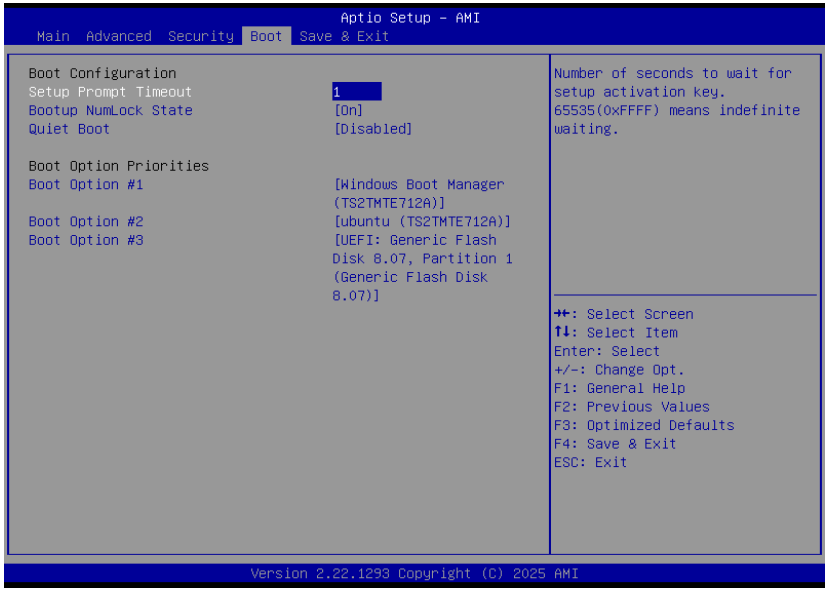
Administrator Password

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

User Password

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

▶ Boot



Setup Prompt Timeout

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

Bootup NumLock State

Select the keyboard NumLock state: On or Off.

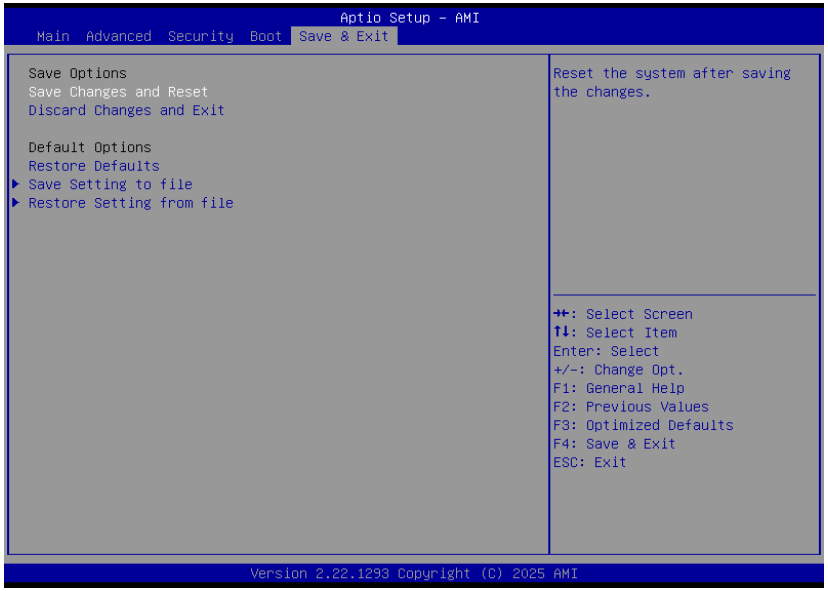
Quiet Boot

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

Boot Option Priorities

Rearrange the system boot order of available boot devices.

▶ Save & Exit



Save Changes and Reset

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

Discard Changes and Reset

To discard the changes, select this field and then press <Enter>. A dialog box will appear. Select Yes to reset the system setup without saving any changes.

Restore Defaults

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

Boot Override

Move the cursor to an available boot device and press Enter, and then the system will immediately boot from the selected boot device. The Boot Override function will only be effective for the current boot. The “Boot Option Priorities” configured in the Boot menu will not be changed.

• **Save Setting to file** Select this option to save BIOS configuration settings to a USB flash device.

• **Restore Setting from file** This field will appear only when a USB flash device is detected. Select this field to restore set-ting from the USB flash device.

▶ Updating the BIOS

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

▶ Notice: BIOS SPI ROM

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

Note:

a. You can take advantage of flash tools to update the default configuration of the BIOS (SPI ROM) to the latest version anytime.

b. When the BIOS IC needs to be replaced, you have to populate it properly onto the system board after the EEPROM programmer has been burned and follow the technical person's instructions to confirm that the MAC address should be burned or not.

c. After updating unique MAC Address from manufacturing, NVM will be protected immediately after power cycle.
Users cannot update NVM or MAC address.