DFI

ARH171_ARH173

Mini-ITX Industrial Motherboard
User's Manual

Copyright

Trademarks

FCC and DOC Statement on Class B

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

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

Notice:

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

Table of Contents

About this Manual

This manual can be downloaded from the website.

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

Warranty

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

Static Electricity Precautions

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

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

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

Safety Measures

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

About the Package

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

- 1 ARH171/ARH173 Motherboard
- 1 COM port cable with bracket (Length: 250mm, 1 x COM port)
- 1 Serial ATA data with power cable (Length: 300mm)
- 4 M.2 screw/standoff
- 1 I/O Shield

  - (2 LAN, Regular type)(For Sample)
  - (3 LAN, Regular type)(For Sample)
  - (2 LAN, Thin type)(For Sample)
  - (3 LAN, Thin type)(For Sample)

- 1 Cooler/Heat sink

  - (Wide/Normal Temp. -Cooler for 28W)
  - (Wide Temp. Fanless HS for 15W
  - (Normal Temp. Fanless HS for 15W)

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

Before Using the System Board

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

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

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

Chapter 1 - Introduction

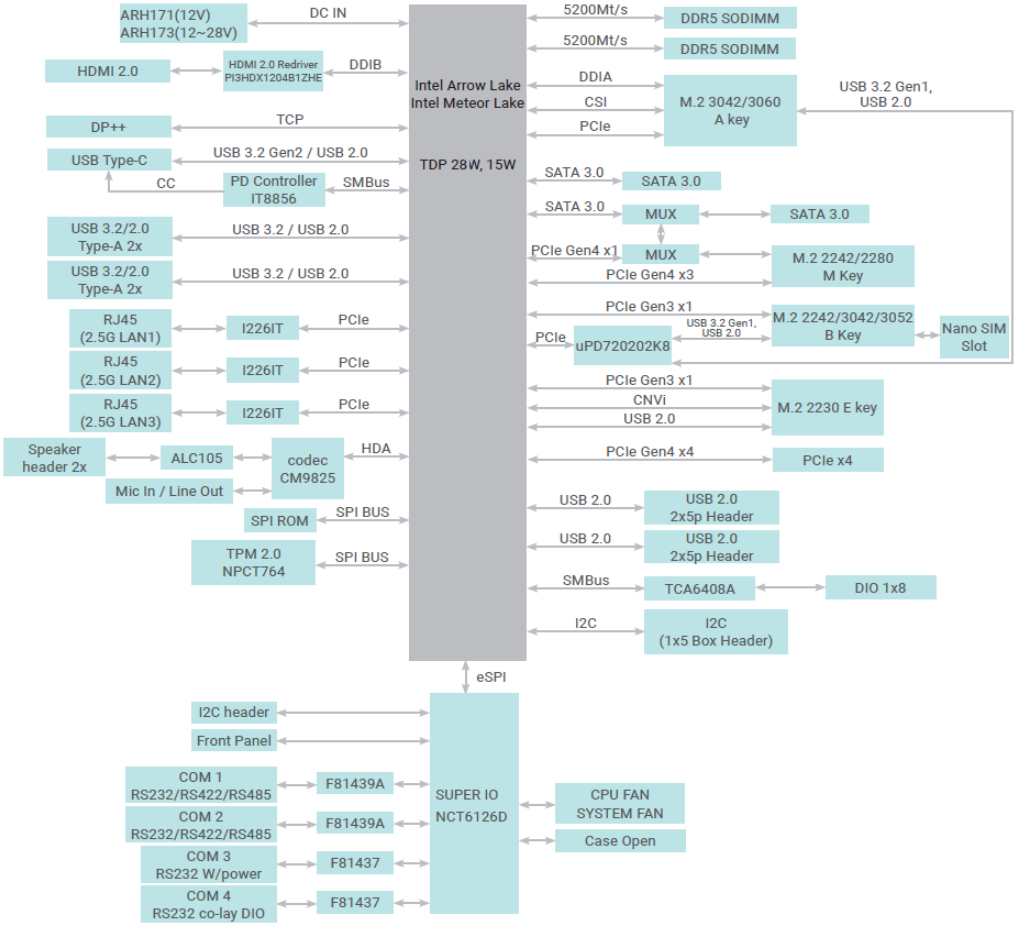
▶ Specifications

SYSTEM	Processor	**Intel® Arrow Lake H/U Processors** Intel® Core™ Ultra 7 265H (28W) (vPro) Intel® Core™ Ultra 7 255H (28W) Intel® Core™ Ultra 5 235H (28W) (vPro) Intel® Core™ Ultra 5 225H (28W) Intel® Core™ Ultra 7 265U (15W) (vPro) Intel® Core™ Ultra 7 255U (15W) Intel® Core™ Ultra 5 235U (15W) (vPro) Intel® Core™ Ultra 5 225U (15W) **Intel® Meteor Lake H/U Processors** Intel® Core™ Ultra 7 165H (28W) (vPro) Intel® Core™ Ultra 7 155H (28W) Intel® Core™ Ultra 5 135H (28W) (vPro) Intel® Core™ Ultra 5 125H (28W) Intel® Core™ Ultra 7 165U (15W) (vPro) Intel® Core™ Ultra 7 155U (15W) Intel® Core™ Ultra 5 135U (15W) (vPro) Intel® Core™ Ultra 5 125U (15W)
	Memory	2x 262-pin SODIMM up to 96GB(MTL)/128GB(ARL) Dual Channel DDR5 5200MHz(MTL)/5200MHz(ARL)
	BIOS	AMI SPI 256Mbit
GRAPHICS	Controller	Intel® Arc™ Graphics 140T (265H/255H) Intel® Arc™ 130T GPU(225H) Intel® Graphics (265U/225U/255U)
	Feature	DirectX12.2, OpenGL4.6, OpenCL3.0, H.264, H.265, AV1, VP9, Intel® Quick Sync Video **AI Software Frameworks Supported by GPU:** OpenVINO™, WindowsML, DirectML, ONNX RT, WebGPU
	Display	1 x DP++ 1 x HDMI **HDMI:** resolution up to 4096x2160 @60Hz **DP:** resolution up to 4096x2304 @60Hz **USB Type C (DP alt-mode/USB3.2 Gen2/PD 15W):** resolution up to 4096x2304 @60Hz (HBR2)
	Quad Displays	1 DP++ + 1 HDMI + 1 USB Type C + 1 M2A Modular (eDP/LVDS/VGA/M21)

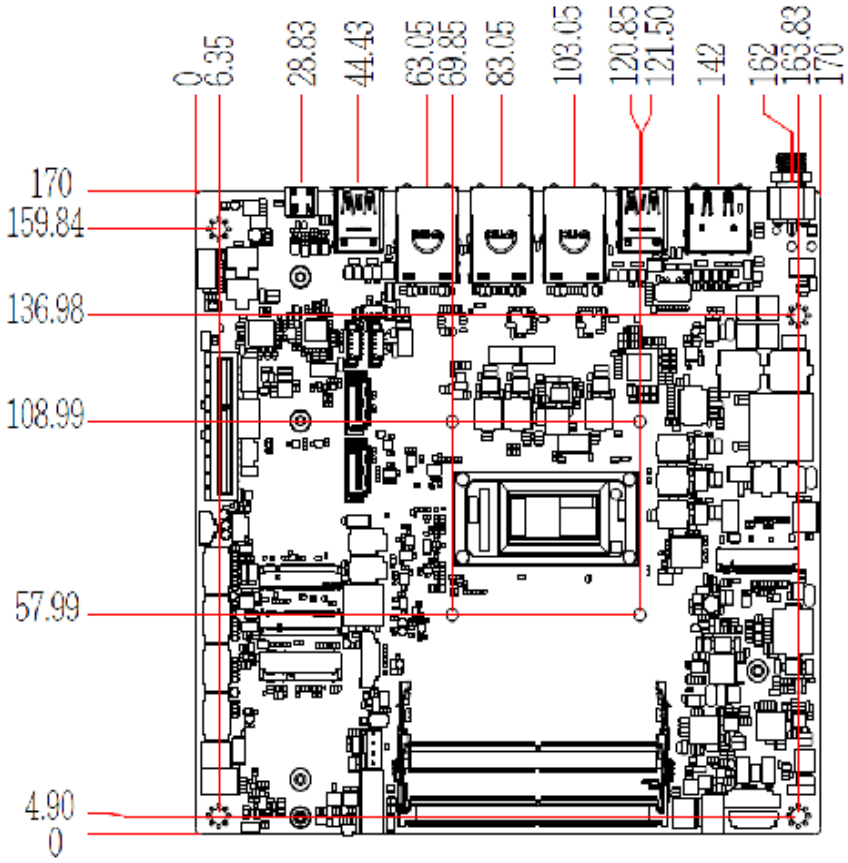
EXPANSION	Interface	1 x PCIe Gen 4 x4
		1 x M.2 2242/2280 M Key (PCIE Gen4x4, support NVMe)
		1 x M.2 2242/3042/3052 B Key (PCIE Gen3x1,USB3.2 Gen2, USB2.0)
		1 x M.2 2230 E Key (PCIE Gen3x1 and USB2.0, support Intel® CNVi)
		1 x M.2 3042/3060 A Key (Standoff 3030)
		Standard (Default) M2A Display(eDP/LVDS/VGA/DP) M2AM21(PCIEx1,USB3/USB2,SIM)
		DFI self define (Jumper Opt.) M2A for Display/MIPI (MTL only) M2A for Wifi (WoWLAN)
AUDIO	Audio Codec	CM9825
REAR I/O	Ethernet	Up to 3 x 2.5GbE RJ45 (LAN 3 colayout with internal vertical RJ45 by option)
	USB	4 x USB 3.2 Gen2 1 x USB Type C (DP alt-mode/USB3.2 Gen2/PD 15W)
	Display	1 x DP++ 1 x HDMI
ETHERNET	Controller	LAN1/2: i226V/IT (10/100/1000/2.5G speeds) LAN3(vPro): i226LM/IT (10/100/1000/2.5Gspeeds)
INTERNAL I/O	Serial	2 x RS-232/422/485 (2.0mm pitch) 1 x RS-232 with power (2.0mm pitch) 1 x RS-232 (2.0mm pitch) colay with DIO-4bit (Selected by JP2)
	USB	4 x USB 2.0 (2.0mm pitch)
	Display	1 x M.2 A key, support M2A-Display (eDP/LVDS/ VGA/DP)
	Audio	1 x Line-out/Mic-in
	SATA	2 x SATA 3.0
	DIO	1 x 8-bit DIO
	SMBus	1 x SMBus
WATCHDOG TIMER	Output & Interval	System Reset, Programmable via Software from 1 to 255 Seconds
SECURITY	TPM	dTPM (default) fTPM (option)

POWER	Type	**ARH171:** Single 12VDC **ARH173:** Wide Range 12~28VDC
	Connector	DC-in Jack Right Angle Connector (4-pin) (available upon request) Straightl Type Connector (4-pin) (available upon request)
	Consumption	**ARH171:** Idle: ARH171-IE-U7265H 28W: 12V@ 0.59A (12.84W) Max: ARH171-IE-U7265H 28W: 12V@ 7.28A (87.36W) **ARH173:** TBD
	RTC Battery	CR2032 Coin Cell
OS SUPPORT	Microsoft	Windows IoT Enterprise 11 LTSC
	Linux	Linux
ENVIRONMENT	Temperature	Operating: -5 to 65°C, -20 to 70°C Storage: -40 to 85°C
	Humidity	Operating: 5 to 90% RH
	MTBF	**ARH171:** ARH171-IE-U7265H 358,912 hrs @ 25°C; 159,169 hrs @ 45°C; 73,318 hrs @ 60°; 42,390 hrs @ 70°C; Calculation model: Telcordia Issue 4 Environment: GB, GC – Ground Benign, Controlled **ARH173:** TBD
MECHANISM	Dimensions	Mini-ITX Form Factor: 170mm (6.7") x 170mm (6.7")
	Height	PCB: 1.6mm Top Side: 19.8mm Bottom Side: 3.2mm
STANDARDS AND CERTIFICATIONS	Certifications	CE, FCC, RoHS, UKCA

▶ Block Diagram

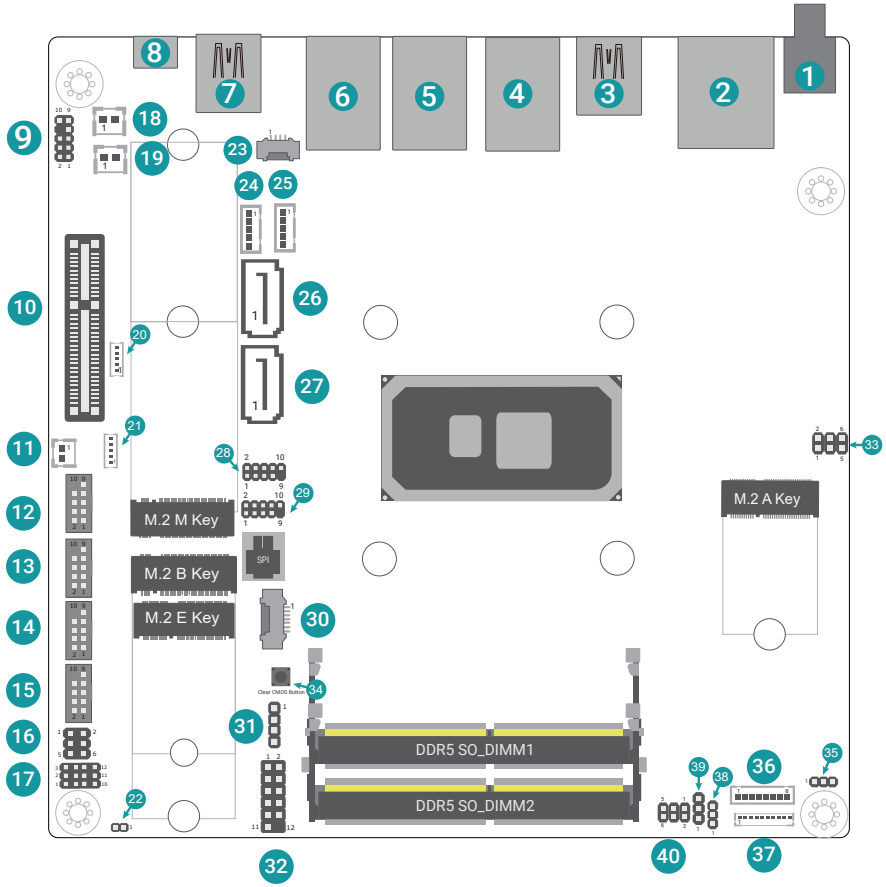


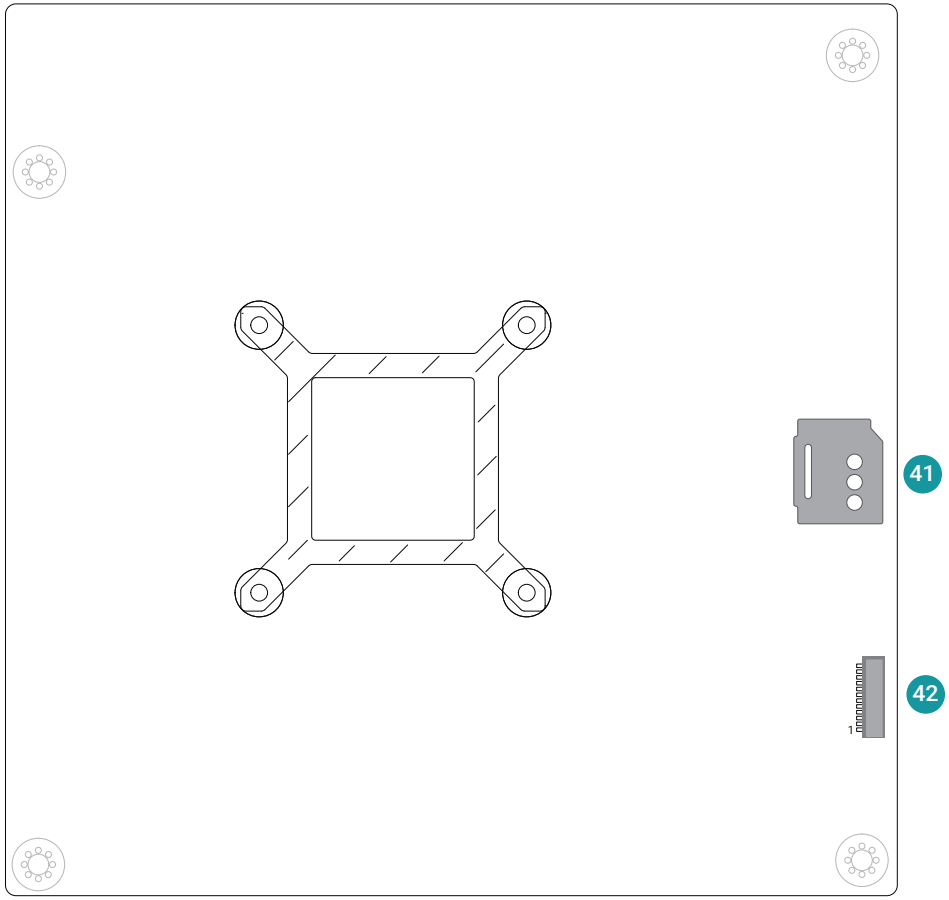
▶ Dimension



Chapter 2 - Hardware Installation

▶ Board Layout





1. DC-in
2. ▲DP++ ▼HDMI
3. USB3.2 Gen2
4. LAN1
5. LAN2
6. LAN3
7. USB3.2 Gen2
8. USB Type C
9. Front Audio
10. PCIE Gen 4x4
11. RTC Battery
12. COM1
13. COM2
14. COM3 (with power selection)
15. COM4 (with DIO function jumper)
16. COM3 Power Selection
17. COM4 DIO & COM4 Selection
18. Speaker L
19. Speaker R
20. I2C Header
21. OOB I2C Connector
22. Case Open
23. CPU Fan
24. SATA Power
25. SATA Power
26. SATA0
27. SATA1
28. USB2_3/5
29. USB2_6/7
30. OOB SPI Connector
31. System Fan
32. Front Panel
33. M2 A-Key eDP/LVDS Selection
34. Clear CMOS Button
35. M2 A-Key Panel Power
36. Panel Backlight Control
37. DIO
38. Panel Backlight Selection
39. Panel Inverter Power
40. Panel Power
41. SIM Card Slot
42. ESPI

▶ Installing the heat sink

Installing the Heat Sink

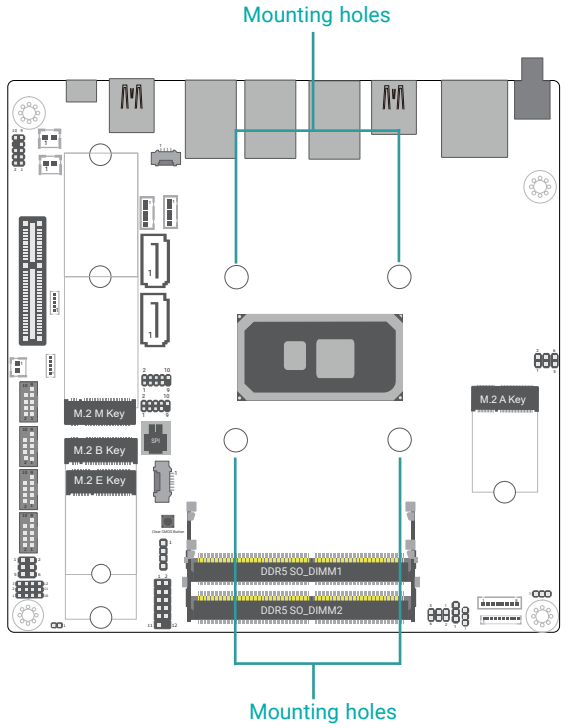
The CPU must be kept cool by using a heat sink, otherwise the CPU will overheat damaging both the CPU and system board.

1. Before you install the fan / heat sink, you must apply a thermal paste onto the top of the CPU. The thermal paste is usually supplied when you purchase the fan / heat sink assembly. Do not spread the paste all over the surface. When you later place the heat sink on top of the CPU, the compound will disperse evenly.

   Some heat sinks come with a patch of preapplied thermal paste. Do not apply thermal paste if the fan / heat sink already has a patch of thermal paste on its underside. Peel the strip that covers the paste before you place the fan / heat sink on top of the CPU.

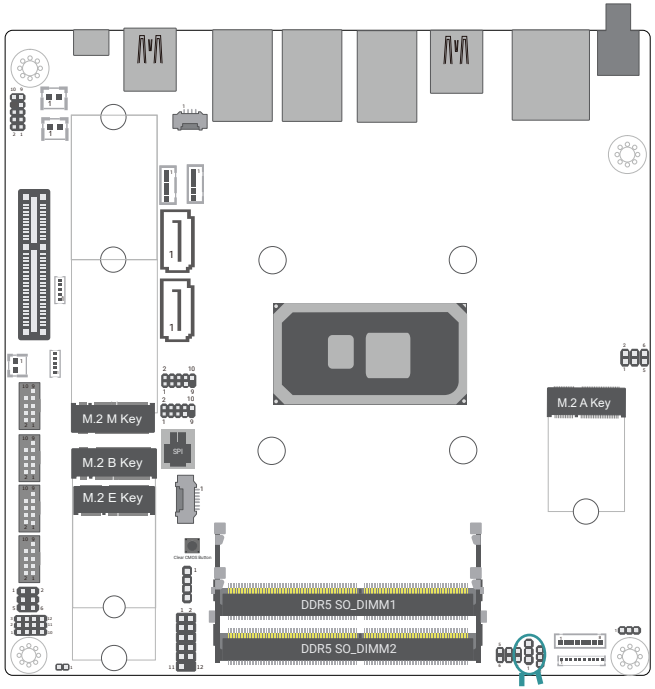
2. Place the heat sink on top of the CPU. The 4 spring screws around the heat sink, which are used to secure the heat sink onto the system board, must match the 4 mounting holes around the board.

3. Screw tight two of the spring screws at opposite corners into the mounting holes. And then proceed with the other two spring screws.



▶ Jumper Settings

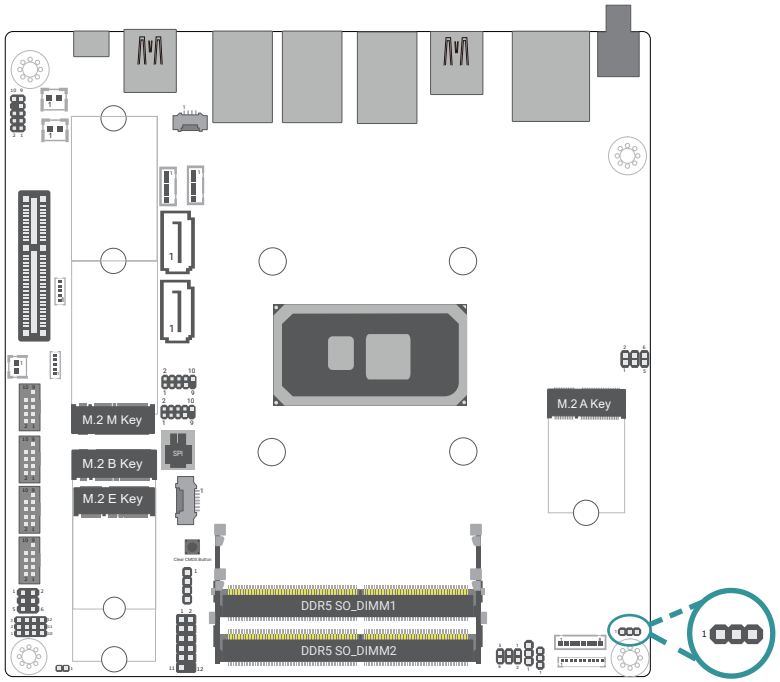
Panel Inverter Power (DPJP4)



■ 1-2 On: 12V

■ 2-3 On: 5V (Default)

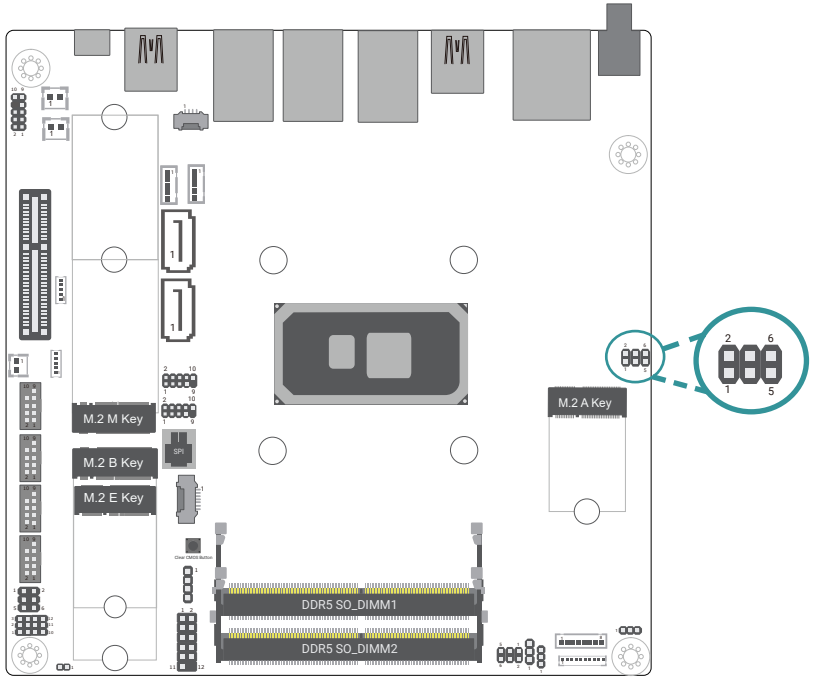
M2 A-Key Panel Power (DPJP5)

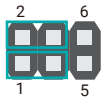


■ 1-2 On: Panel Power

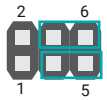
■ 2-3 On: NC (Default)

M2 A-Key eDP/LVDS Selection (DPJP6)



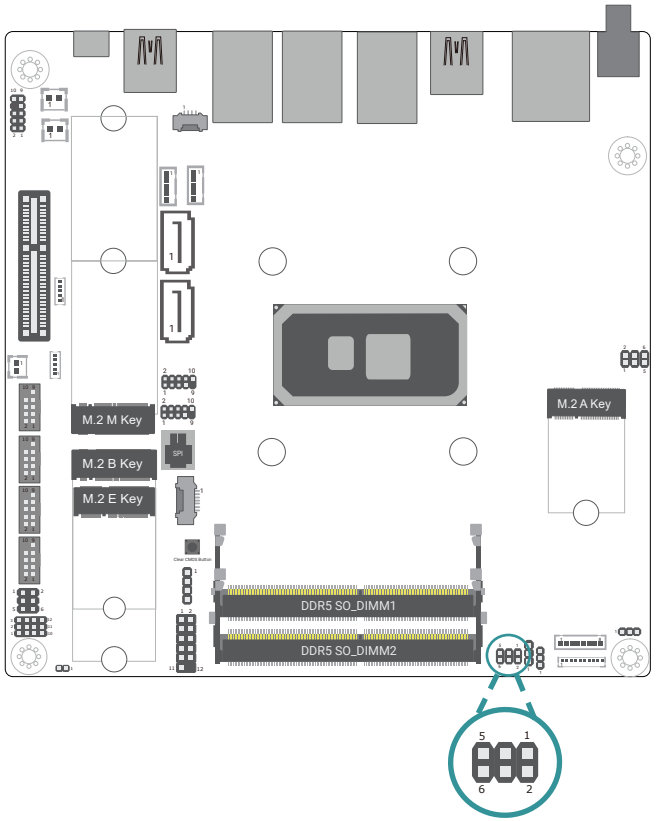


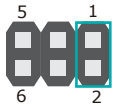
■ 1-3, 2-4 On: LVDS



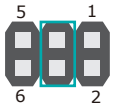
■ 3-5, 4-6 On: eDP (Default)

Panel Power (DPJP7)

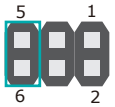




■ 1-2 On: 12V

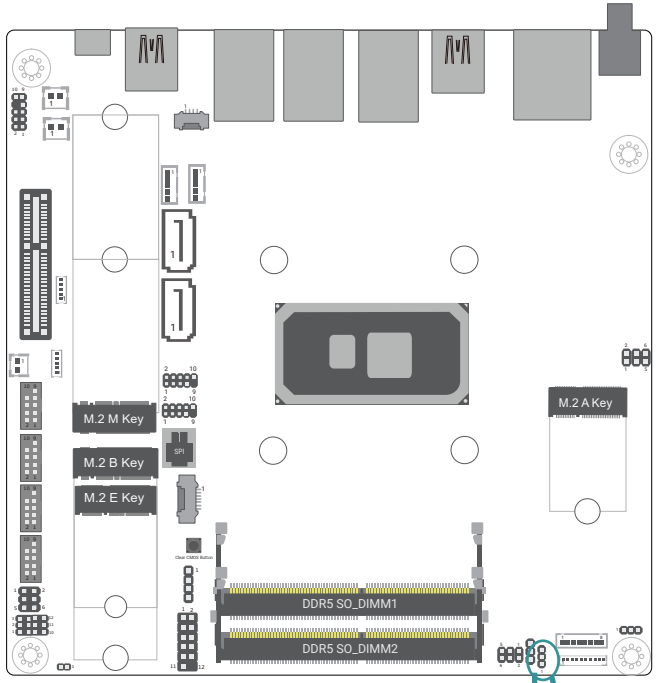


■ 3-4 On: 5V



■ 5-6 On: 3V3 (Default)

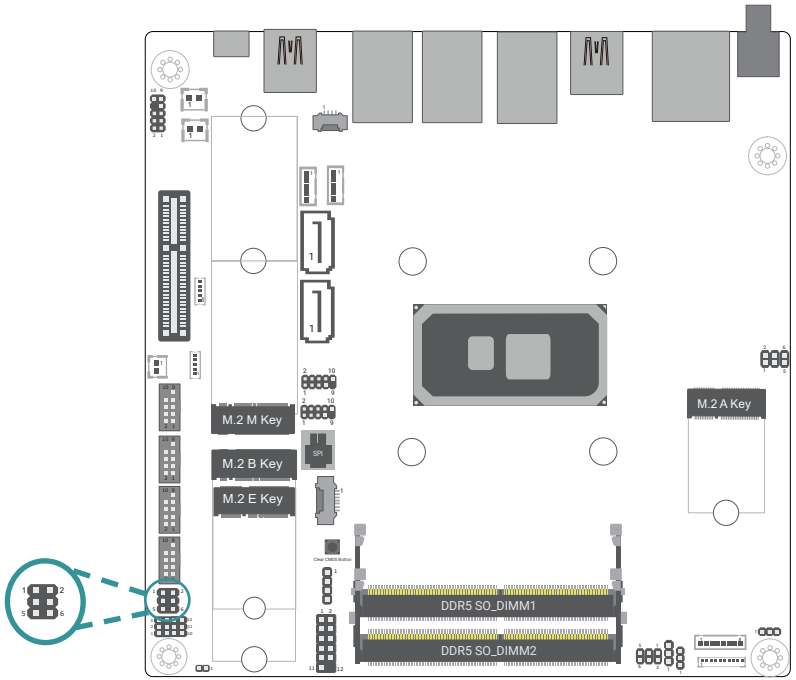
Panel Backlight Power Selection (DPJP8)



■ 1-2 On: 3V3 (Default)

■ 2-3 On: 5V

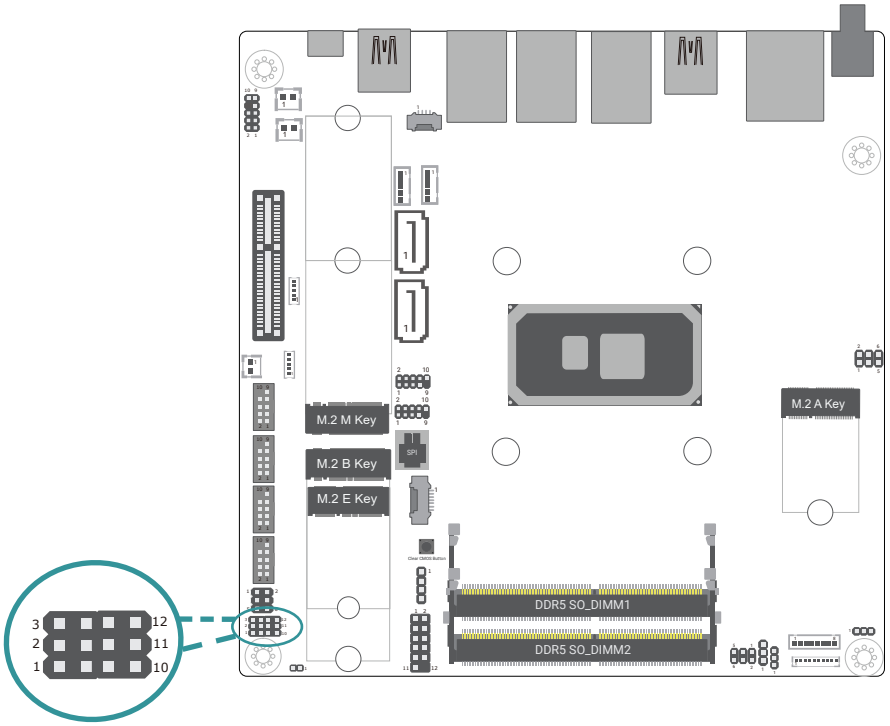
COM3 Power Selection (JP3)



■ 1-3, 2-4 On:
RS232 Standard (Default)

■ 3-5, 4-6 On:
RS232 with Power

COM4 COM/DIO Selection (JP2)

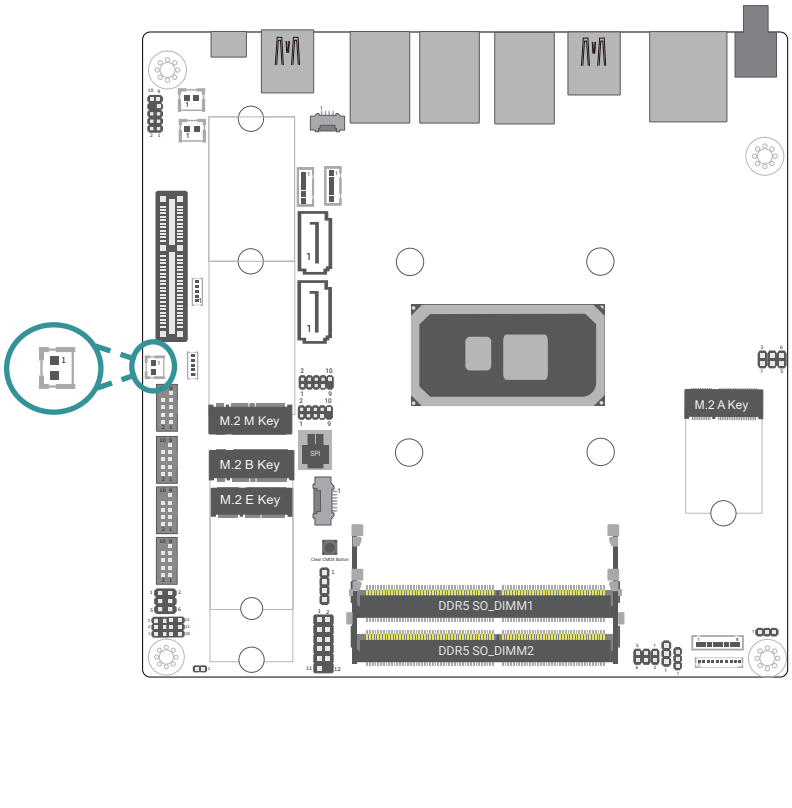


■ 1-2,4-5,7-8,10-11 On:
RS232 standard (Default)

■ 2-3,5-6,8-9,11-12 On:
DIO function

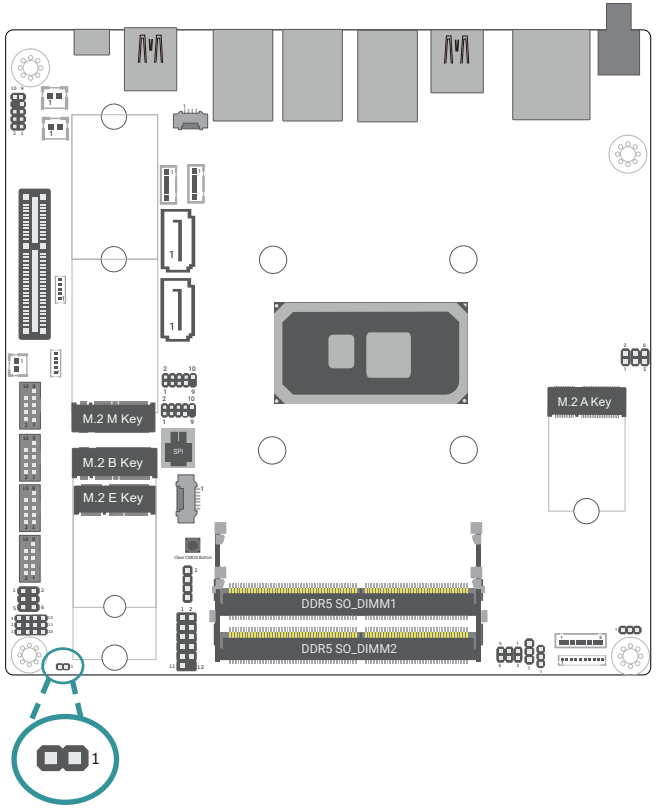
▶ Pin Assignment

RTC Battery (CN7)



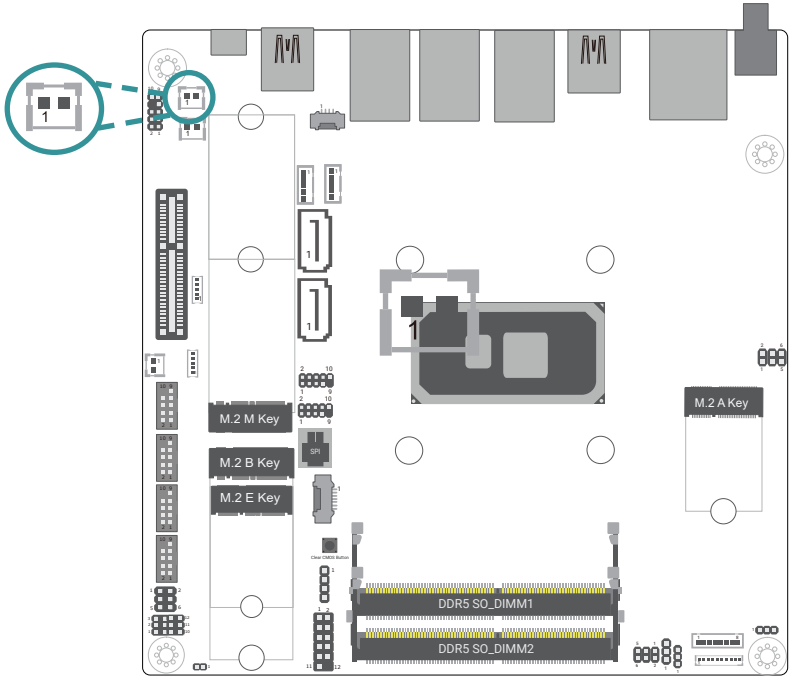
Pin	Assignment
1	V_BAT
2	GND

Case Open (J24)



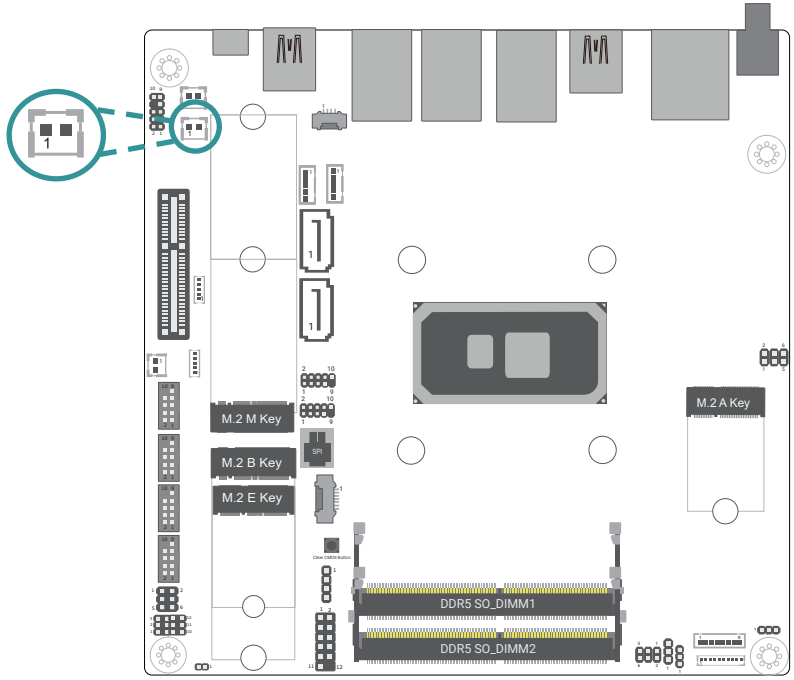
Pin	Assignment
1	CASEOPEN-
2	GND

Speaker L (J38)



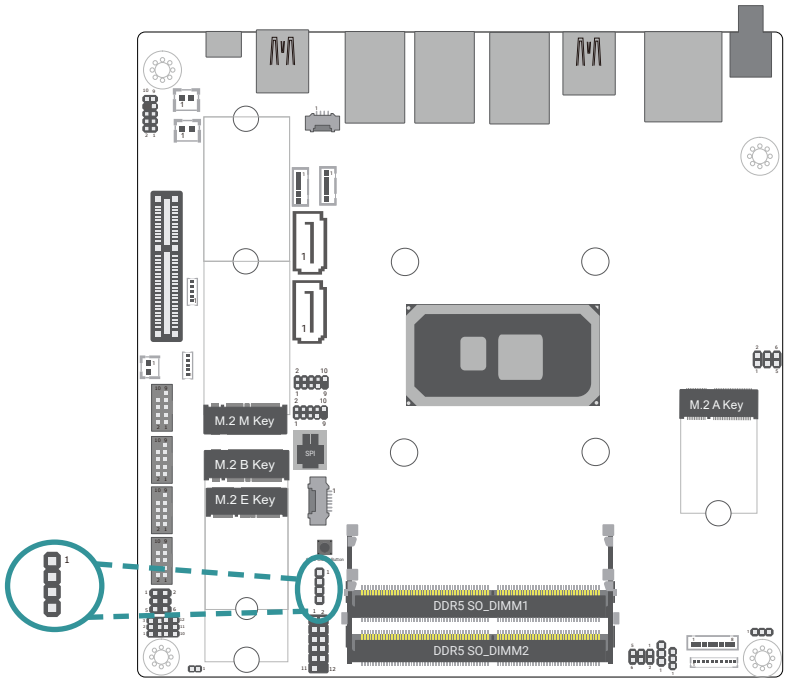
Pin	Assignment
1	SPKOUT_L-
2	SPKOUT_L+

Speaker R (J39)



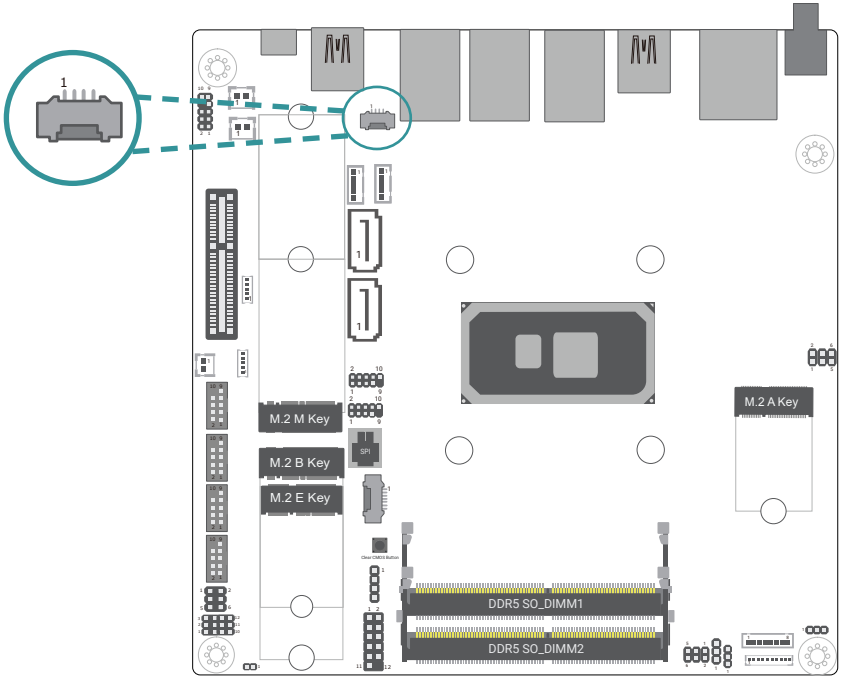
Pin	Assignment
1	SPKOUT_R-
2	SPKOUT_R+

System Fan (CN25)



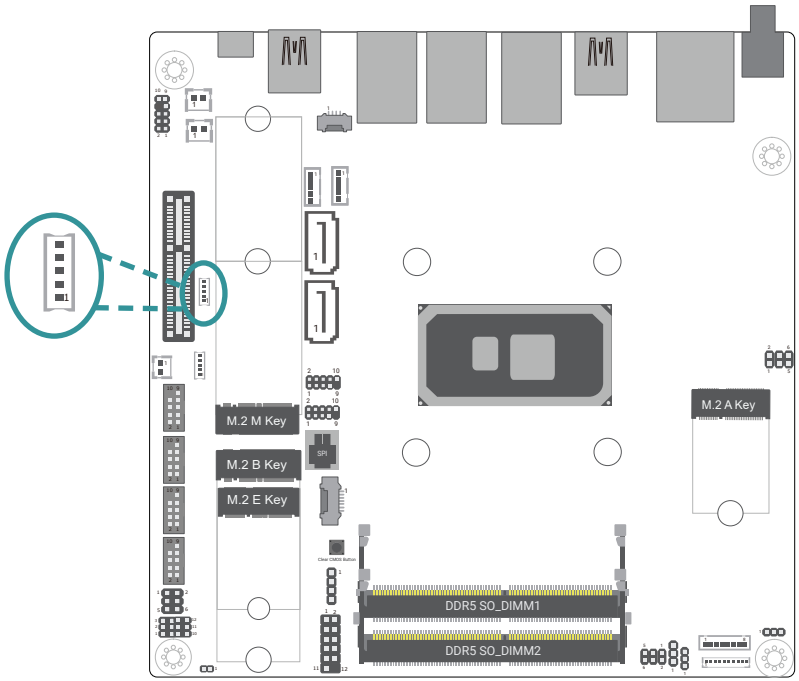
Pin	Assignment
1	GND
2	+12V
3	SYSFANIN (TACH)
4	SYSFANOUT (PWM)

CPU Fan (CN24)



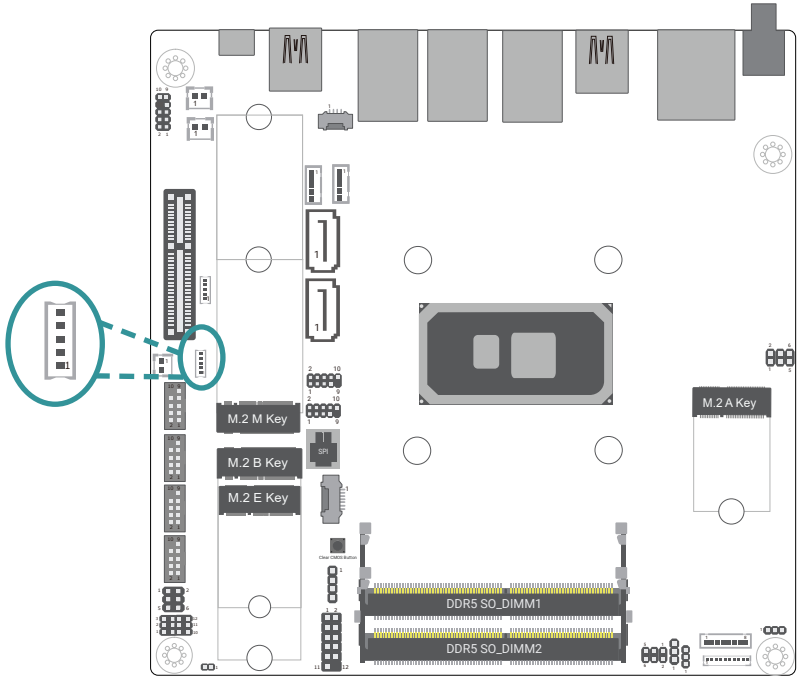
Pin	Assignment
1	GND
2	12V
3	CPUFANIN (TACH)
4	CPUFANOUT (PWM)

I2C Header (CN6)



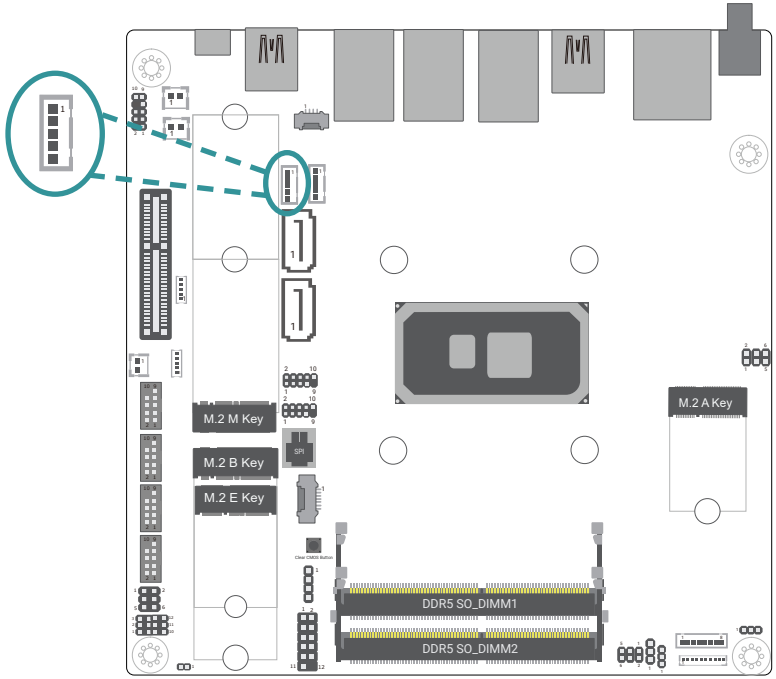
Pin	Assignment
1	3V3SB
2	GND
3	I2C_CLK_C
4	I2C_DATA_C
5	I2C_ALERT#_C

OOB I2C (J42)



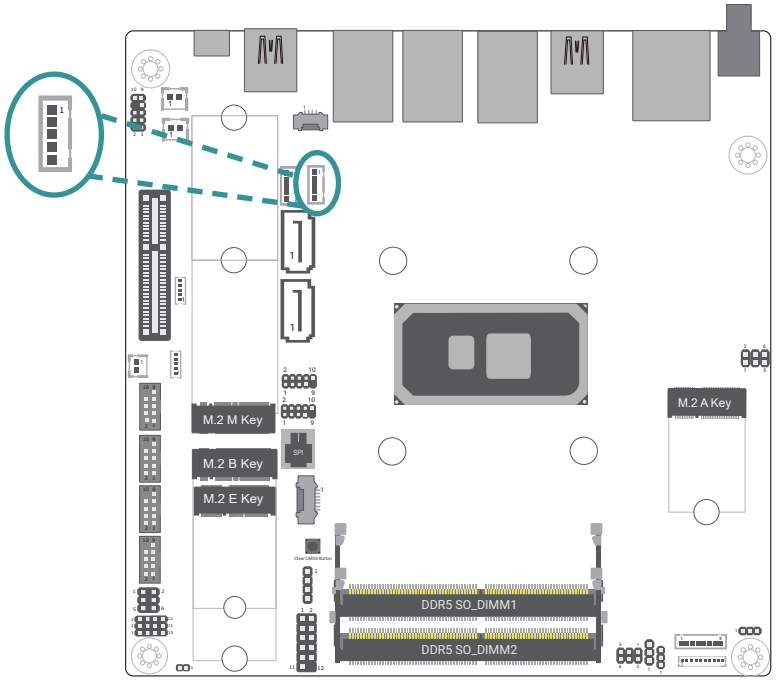
Pin	Assignment
1	NC
2	GND
3	SIO_SCL
4	SIO_SDA
5	NC

SATA Power (CN1)



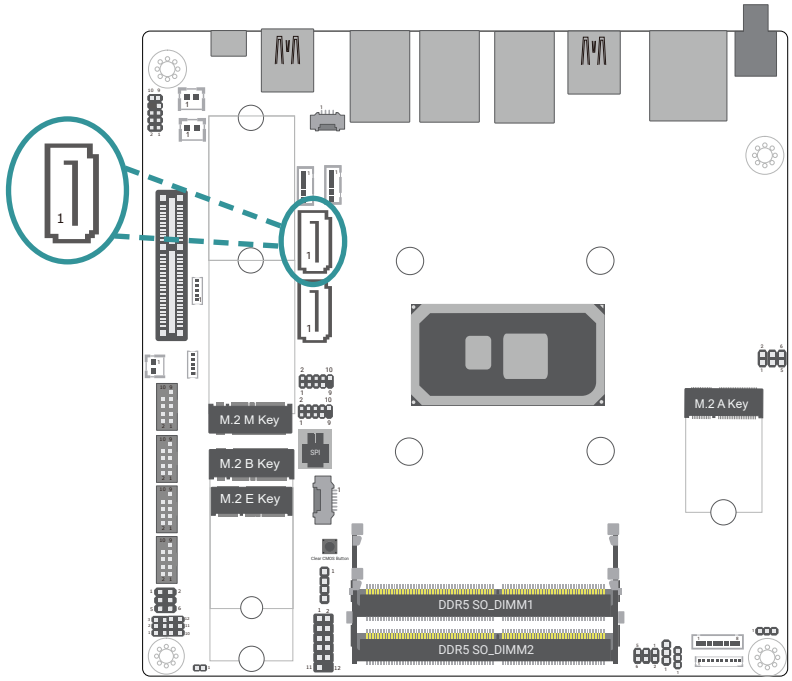
Pin	Assignment
1	5V_SATA
2	5V_SATA
3	12V_SATA
4	GND
5	GND

SATA Power (CN13)



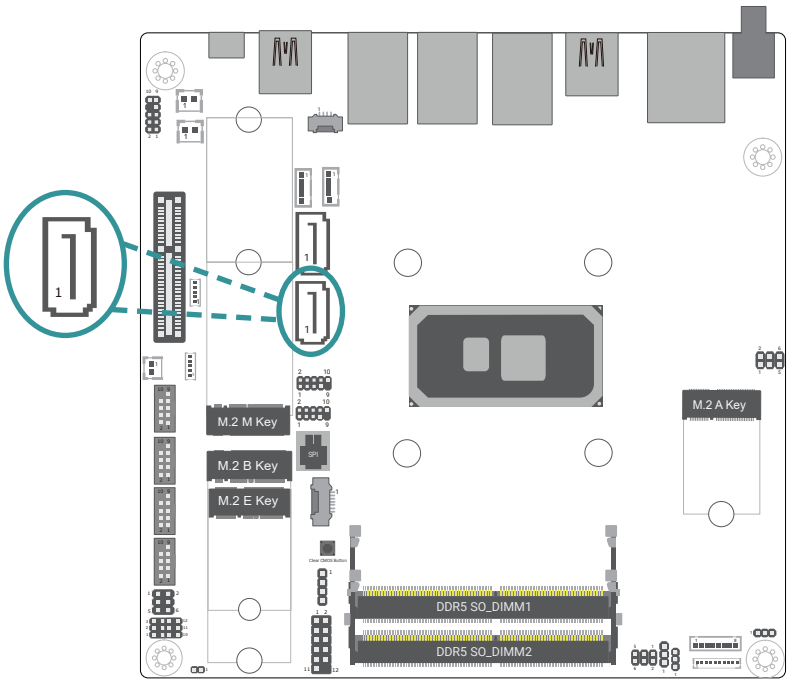
Pin	Assignment
1	5V_SATA
2	5V_SATA
3	12V_SATA
4	GND
5	GND

SATA0 (J1)



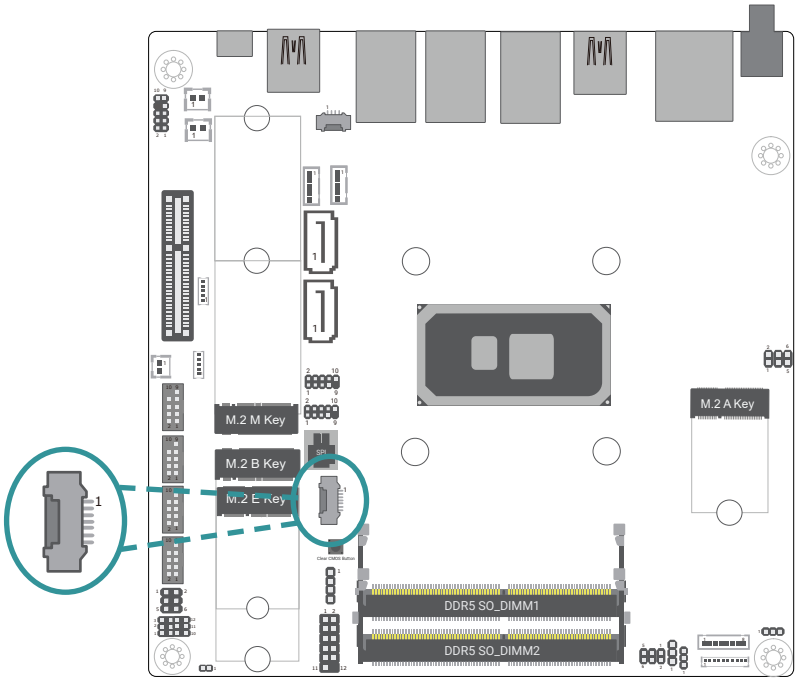
Pin	Assignment
1	GND
2	SATA_0_C_TXP
3	SATA_0_C_TXN
4	GND
5	SATA_0_C_RXN
6	SATA_0_C_RXP
7	GND

SATA1 (J6)



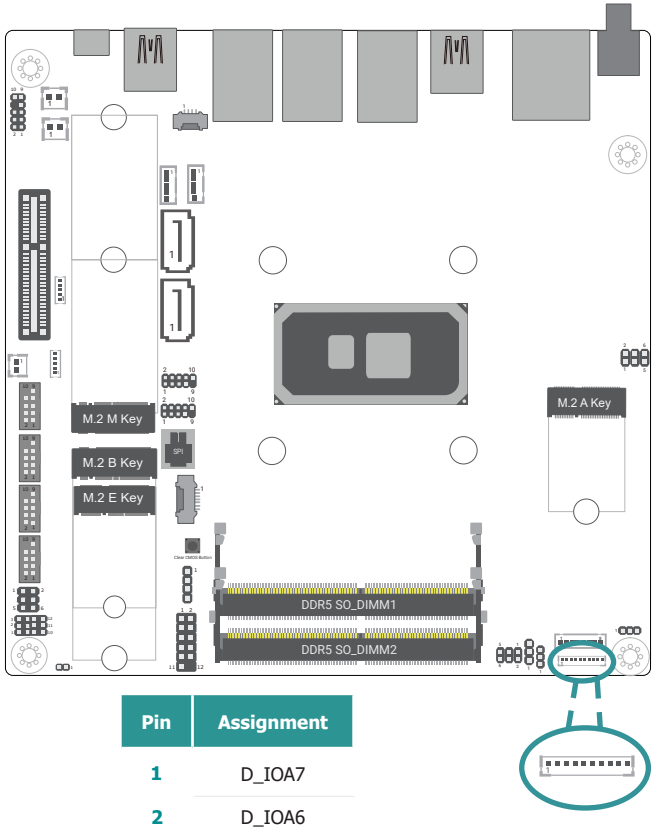
Pin	Assignment
1	GND
2	SATA1_CN_TXP
3	SATA1_CN_TXN
4	GND
5	SATA1_CN_RXN
6	SATA1_CN_RXP
7	GND

OOB SPI (J3)



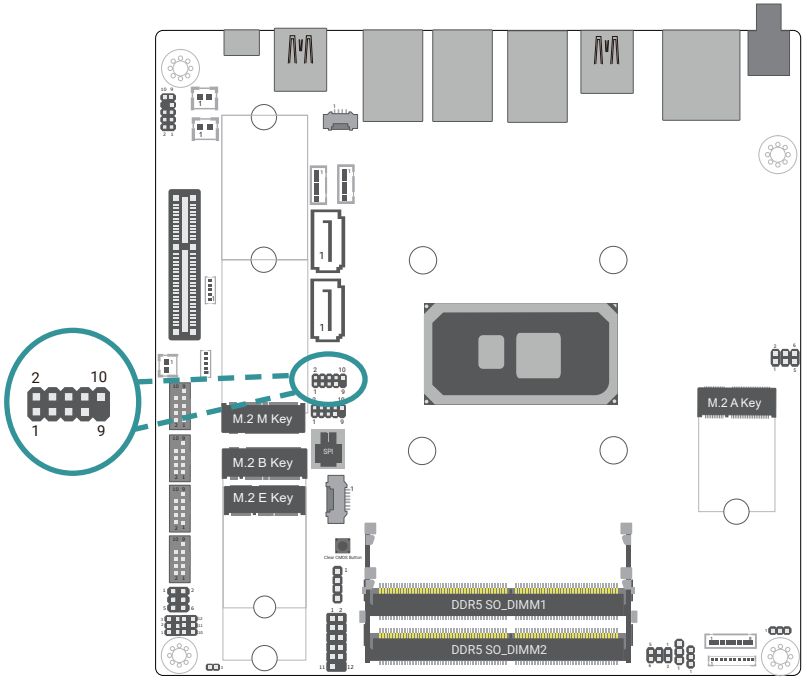
Pin	Assignment
1	EXT_SPI_SW
2	EXT_MOSI
3	EXT_MISO
4	EXT_CLK
5	EXT_CS0
6	GND
7	3V3SB

DIO (J15)



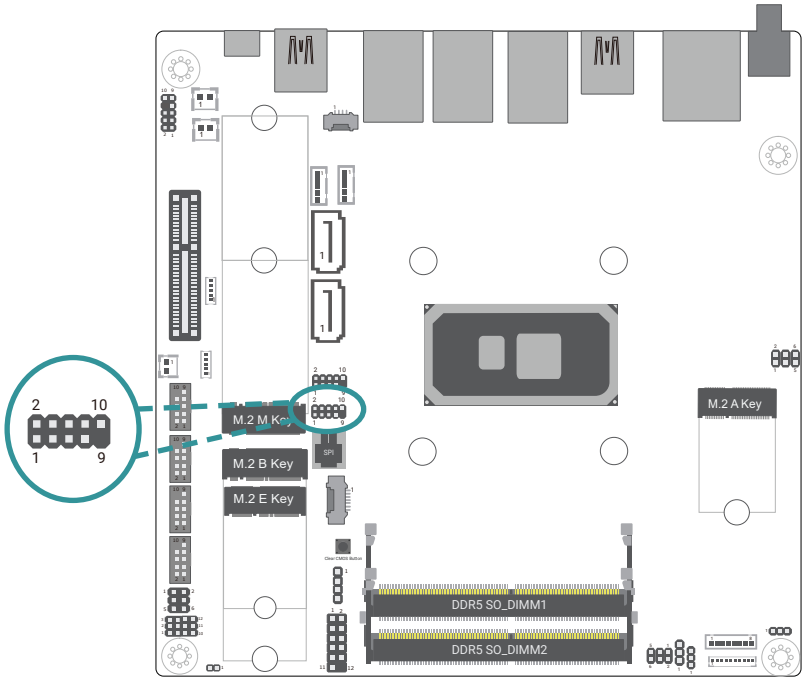
Pin	Assignment
1	D_IOA7
2	D_IOA6
3	D_IOA5
4	D_IOA4
5	D_IOA3
6	D_IOA2
7	D_IOA1
8	D_IOA0
9	5VSB
10	GND

USB2_3/5 (UBJ1)



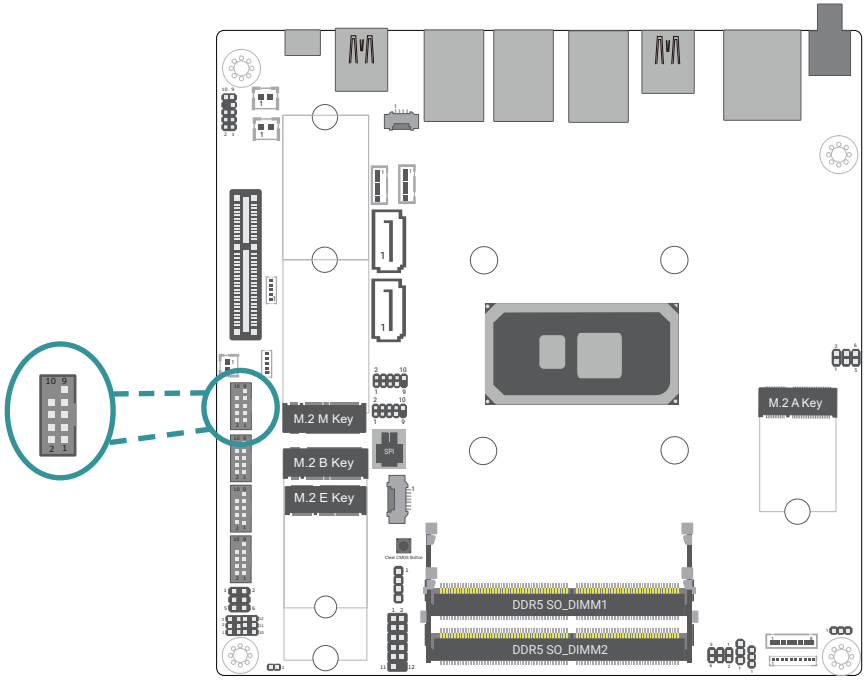
Pin	Assignment
1	VCC
2	VCC
3	USBP_C_3N
4	USBP_C_5N
5	USBP_C_3P
6	USBP_C_5P
7	GND
8	GND
9	NC
10	NC

USB2_6/7 (UBJ2)



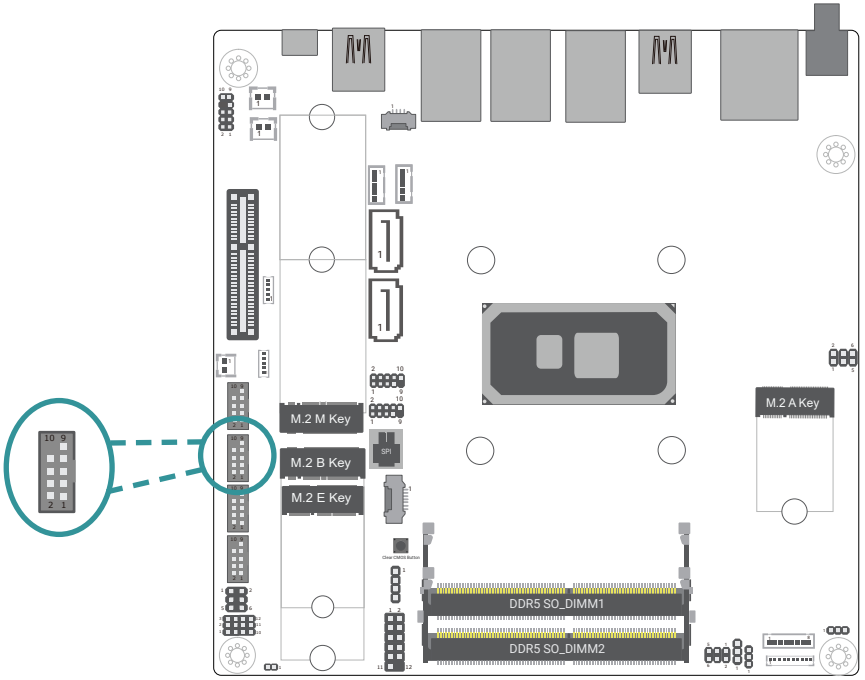
Pin	Assignment
1	VCC
2	VCC
3	USBP_C_6N
4	USBP_C_7N
5	USBP_C_6P
6	USBP_C_7P
7	GND
8	GND
9	NC
10	NC

COM1 (TSJ1)



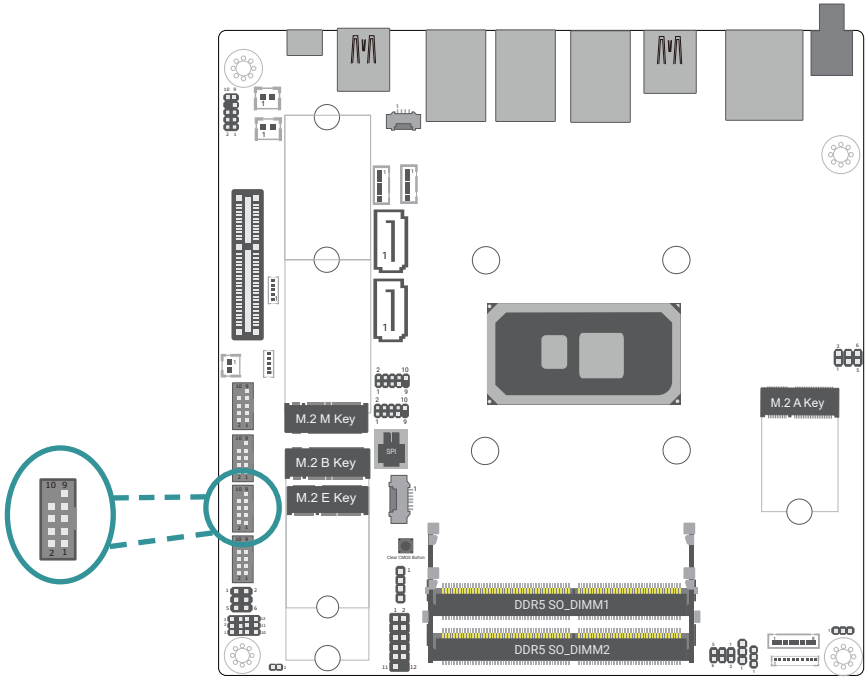
Pin	Assignment	Pin	Assignment
1	MDCD1#	2	MSIN1
3	MSOUT1	4	MDTR1#
5	GND	6	MDSR1#
7	MRTS1#	8	MCTS1#
9	MRI1#	10	NC

COM2 (TSJ2)



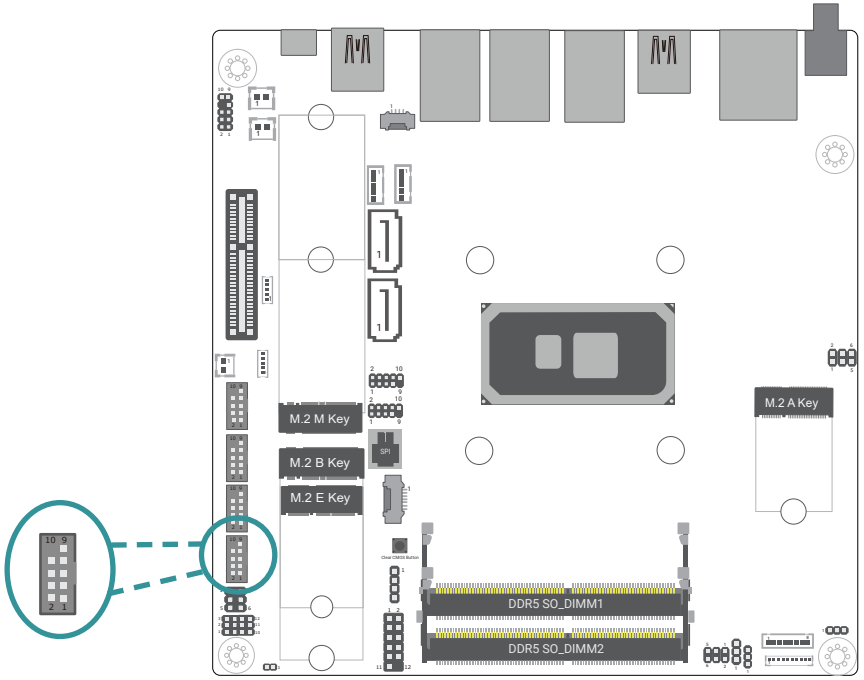
Pin	Assignment	Pin	Assignment
1	MDCD2#	2	MSIN2
3	MSOUT2	4	MDTR2#
5	GND	6	MDSR2#
7	MRTS2#	8	MCTS2#
9	MRI2#	10	NC

COM3 (J40) (with power selection)



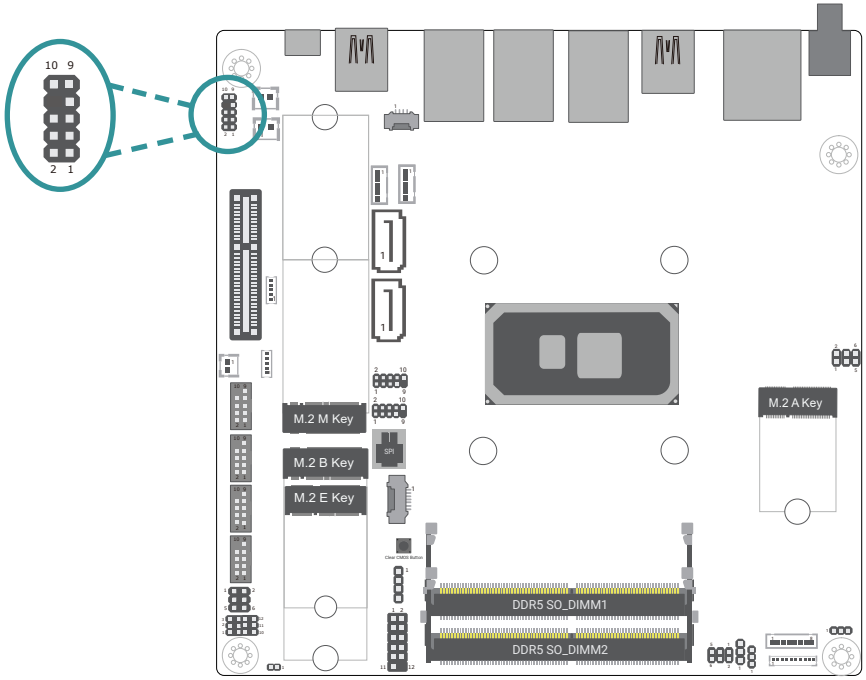
Pin	Assignment	Pin	Assignment
1	X_MDCD3#	2	MSIN3
3	MSOUT3	4	MDTR3#
5	GND	6	MDSR3#
7	MRTS3#	8	MCTS3#
9	X_MRI3#	10	NC

COM4 (J41) (with DIO function jumper)



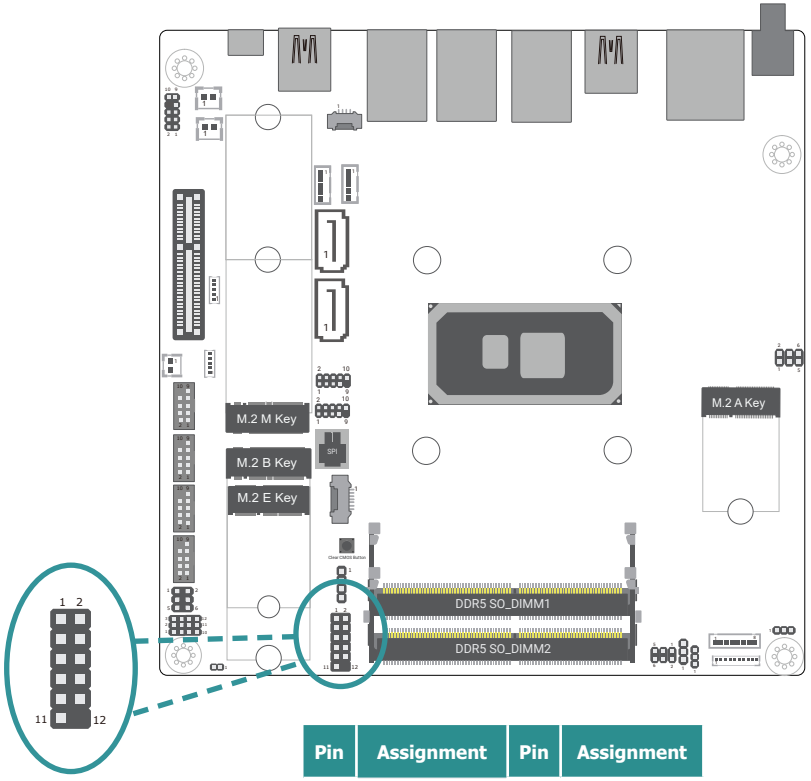
Pin	Assignment	Pin	Assignment
1	X_MDCD4#	2	X_MSIN4#
3	X_MSO4#	4	X_MDTR4#
5	GND	6	MDSR4#
7	MRTS4#	8	MCTS4#
9	MRI4#	10	NC

Front Audio (AUCN1)



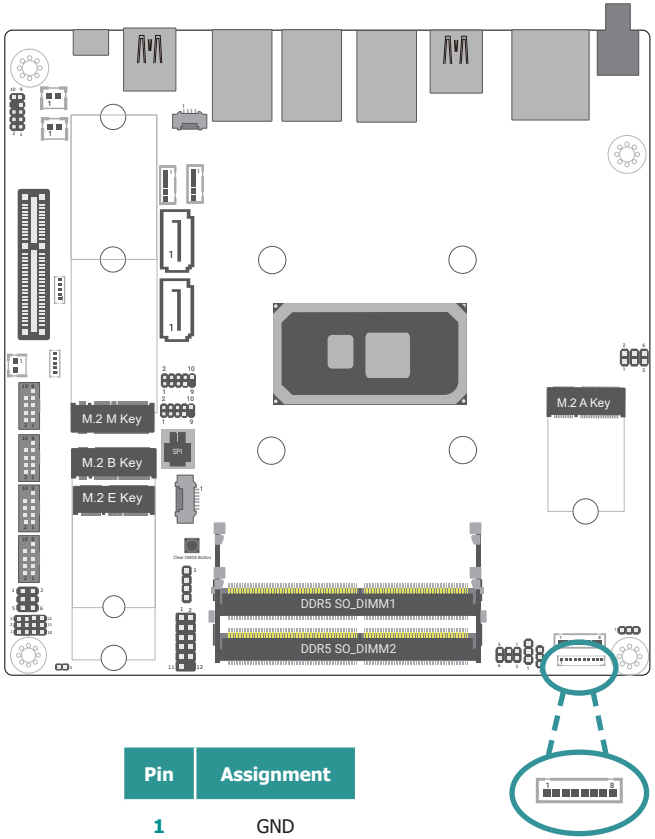
Pin	Assignment	Pin	Assignment
1	LINE1-L	2	GND
3	LINE1-R	4	NC
5	HPOUT-R	6	MIC-JD
7	GND	8	NC
9	HPOUT-L	10	HPOUT-JD

Front Panel (J17)



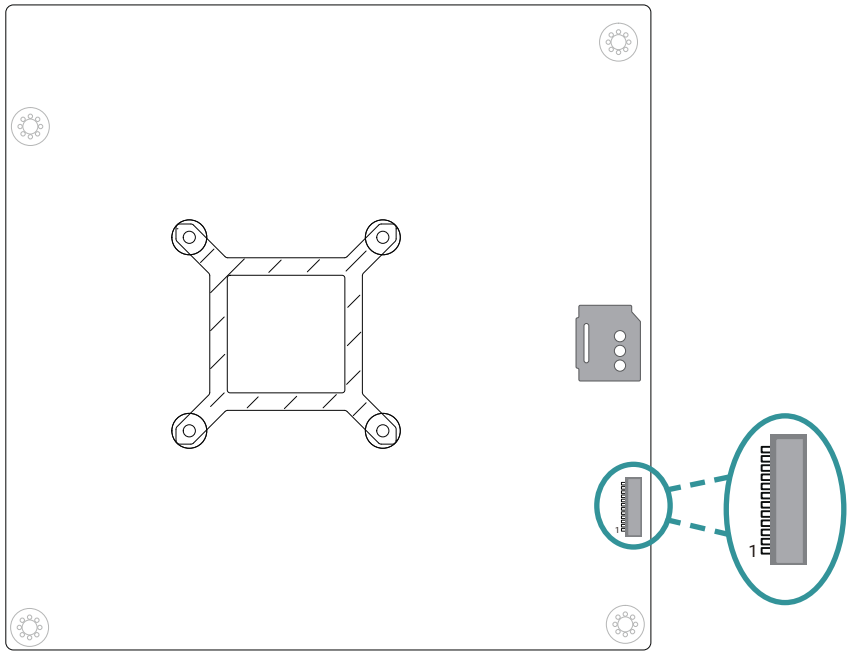
Pin	Assignment	Pin	Assignment
1	NC	2	3V3SB
3	3V3	4	3V3SB
5	HD_LED#	6	SUS_LED#
7	GND	8	GND
9	SYS_RST-	10	SIO_PWSIN#
11	NC	12	---

Panel Backlight Control (DPJ1)



Pin	Assignment
1	GND
2	GND
3	DIMMING
4	VCC_PANEL_PWR
5	LVDS_3V3
6	BLONOFF
7	VCC_INV_PWR
8	VCC_INV_PWR

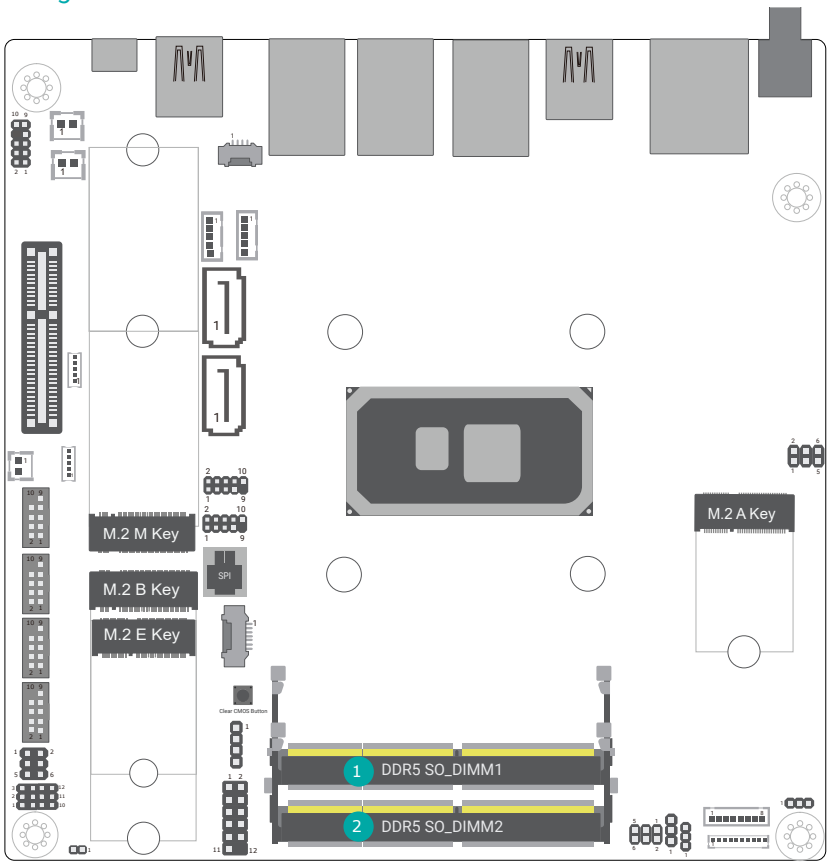
ESPI (J9)



Pin	Assignment
1	3V3SB
2	ESPI_RST
3	ESPI_ALERT1
4	ESPI_IO_0
5	ESPI_IO_1
6	ESPI_IO_2
7	ESPI_IO_3
8	ESPI_CLK
9	ESPI_CS0
10	DEBUG_UART_RX
11	DEBUG_UART_TX
12	GND

▶ Expansion Slots

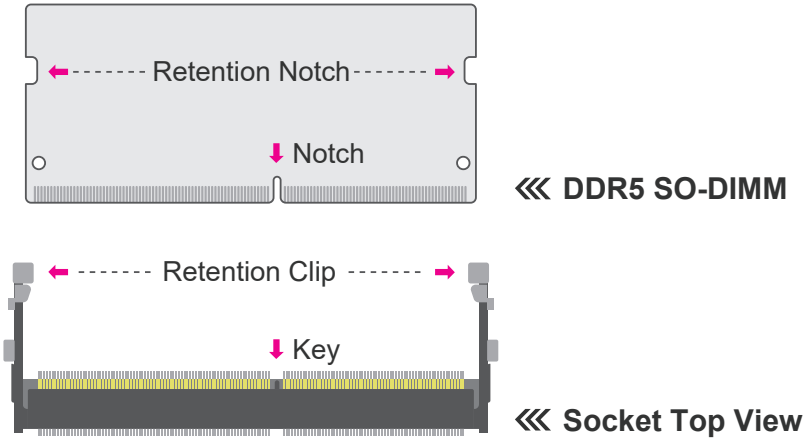
Installing the SO-DIMM Module



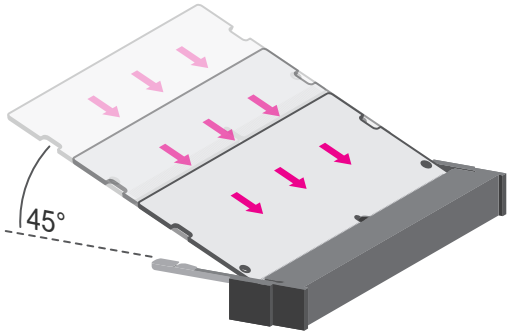
1. DDR5 SO-DIMM 1
2. DDR5 SO-DIMM 2

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

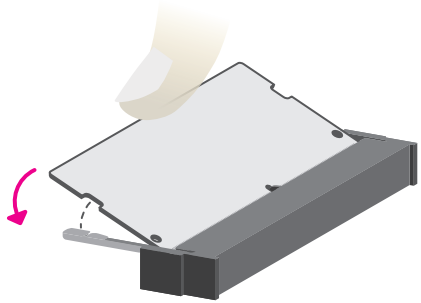
1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.
3. Locate the SO-DIMM socket on the system board
4. Make sure the notch on memory card is aligned to the key on the socket.



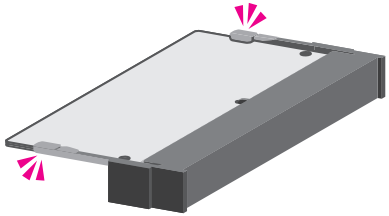
Please follow the steps below to install the memory card into the socket.



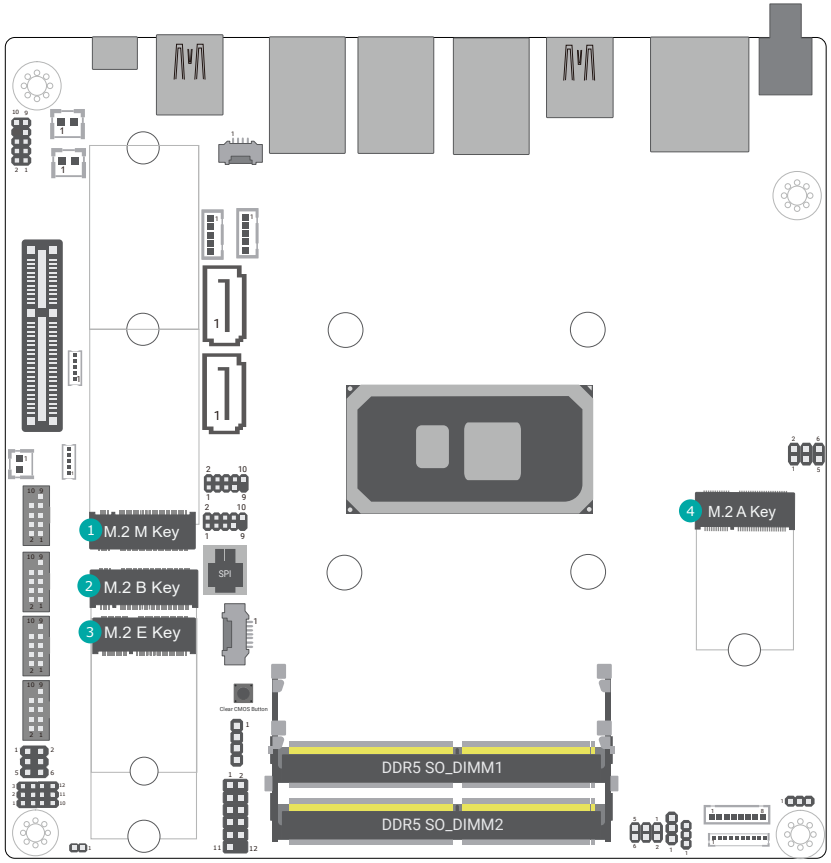
Step 1:
Insert the memory card into the slot while making sure 1) the notch and the key are aligned, and 2) the non-connector end rises approximately 45 degrees horizontally. Press the card firmly into the socket while applying and maintaining even pressure on both ends.



Step 2:
Press the end of the card far from the socket down while making sure the retention notch and the clip align as indicated by the dotted line in the illustration. If the retention notch and the clip do not align, please remove the card and re-insert it. Press the card all the way down.



Step 3:
The clips snap automatically and abruptly to the retention notches of the card sounding a distinctive click, and lock the card in place. Inspect that the clip sits in the notch. If not, please pull the clips outward, release and remove the card, and mount it again.

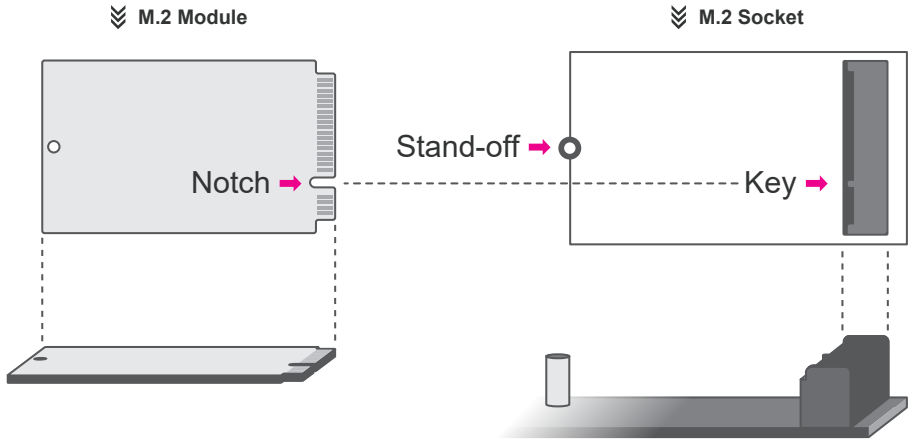


1. M.2 M-Key
2. M.2 B-Key
3. M.2 E-Key
4. M.2 A-Key

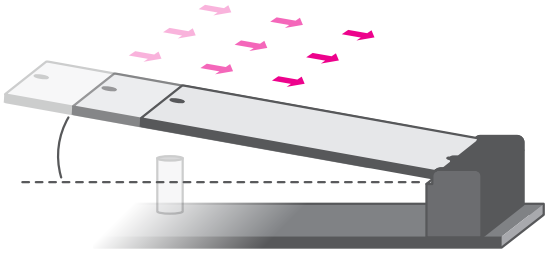
Installing the M.2 Module

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

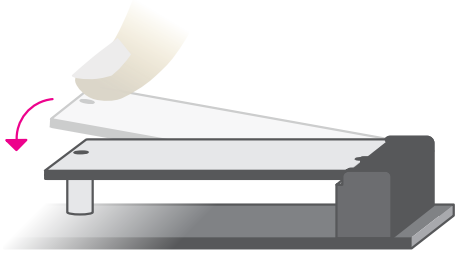
1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.
3. Locate the M.2 socket on the system board
4. Make sure the notch on card is aligned to the key on the socket.
5. Make sure the standoff screw is removed from the standoff.



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



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



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

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

Chapter 3 - BIOS Settings

▶ Overview

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

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

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

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

Default Configuration

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

Entering the BIOS Setup Utility

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

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

Legends

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

Scroll Bar

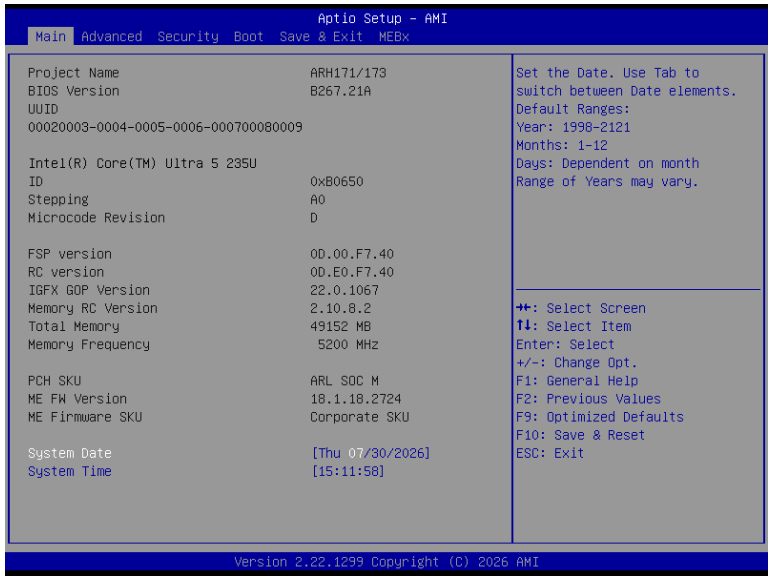
When a scroll bar appears to the right of the setup screen, it indicates that there are more available fields not shown on the screen. Use the up and down arrow keys to scroll through all the available fields.

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.

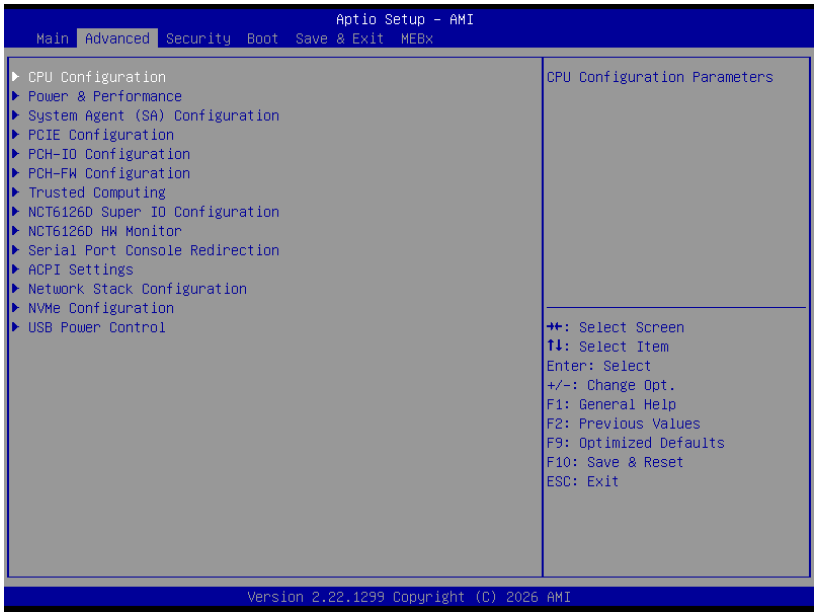
System Time

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.

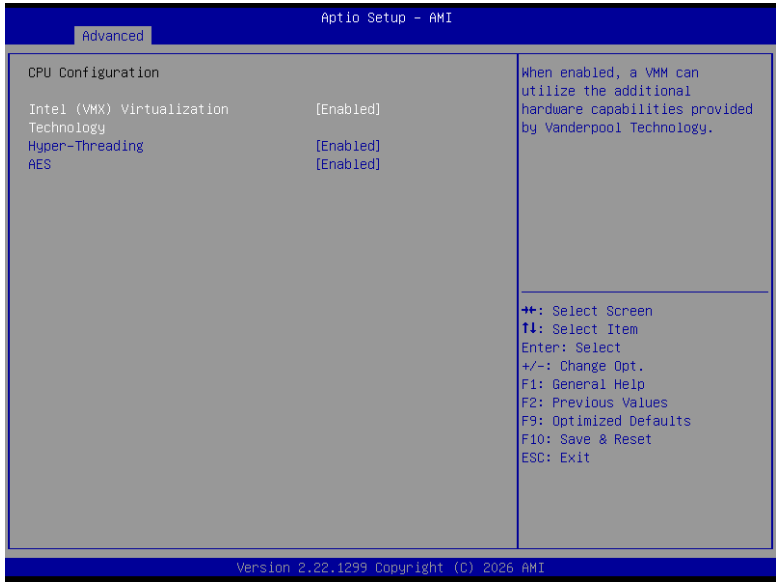
▶ Advanced

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.



CPU Configuration



Intel (VMX) Virtualization Technology

When this field is set to Enabled, the VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

Hyper-threading

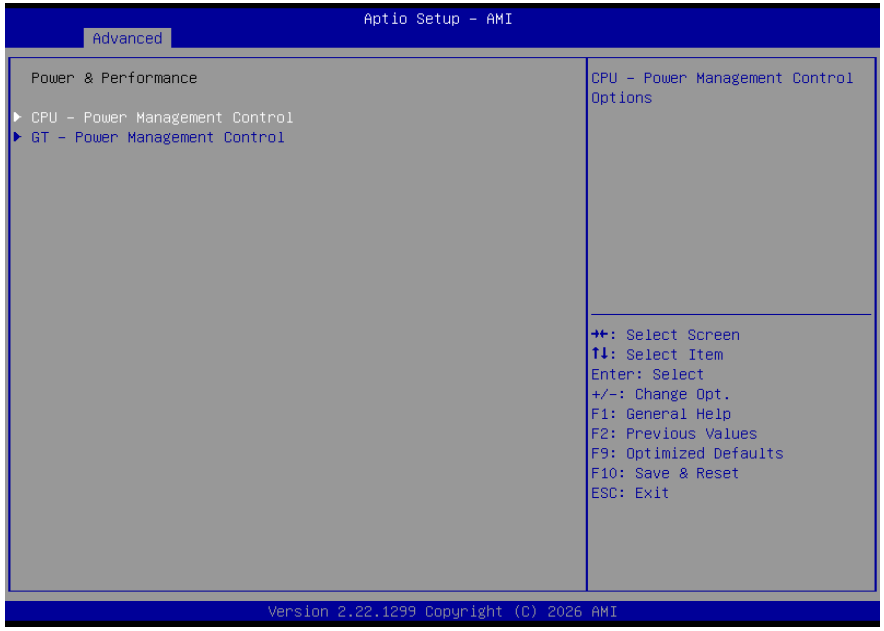
Enables this field for Windows XP and Linux which are optimized for Hyper-Threading technology. Select disabled for other OSes not optimized for Hyper-Threading technology. When disabled, only one thread per enabled core is enabled.

AES

Enable or disable AES function.

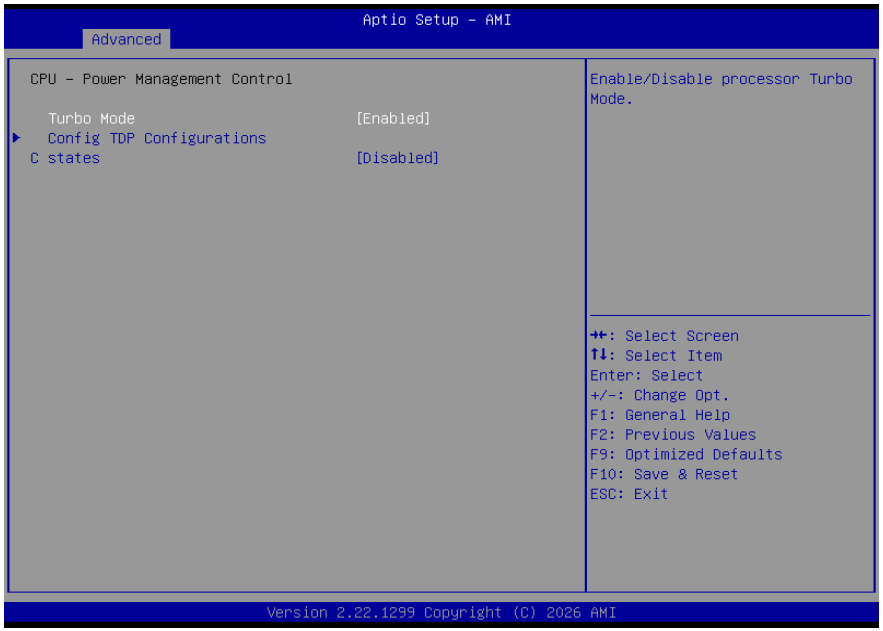
Note:
Some of the fields may not be available when the features are not supported by the equipped CPU.

Power & Performance



▶ Advanced

Power & Performance ▶ CPU- Power Management Control



Turbo Mode

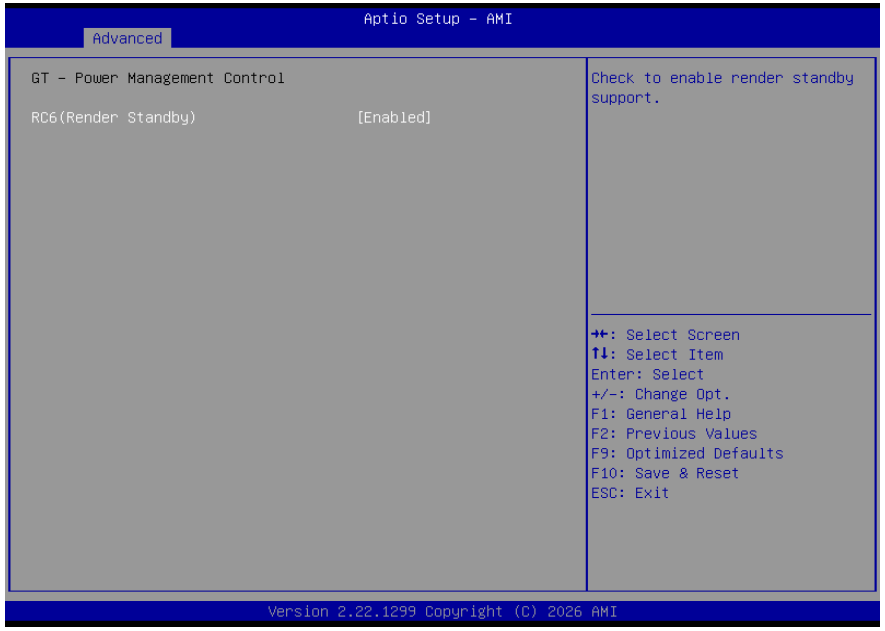
Enable/Disable processor Turbo Mode (requires EMTTM enabled too). AUTO means enabled.

C states

Enable or disable CPU Power Management. It allows CPU to enter "C states" when it's idle and nothing is executing.

▶ Advanced

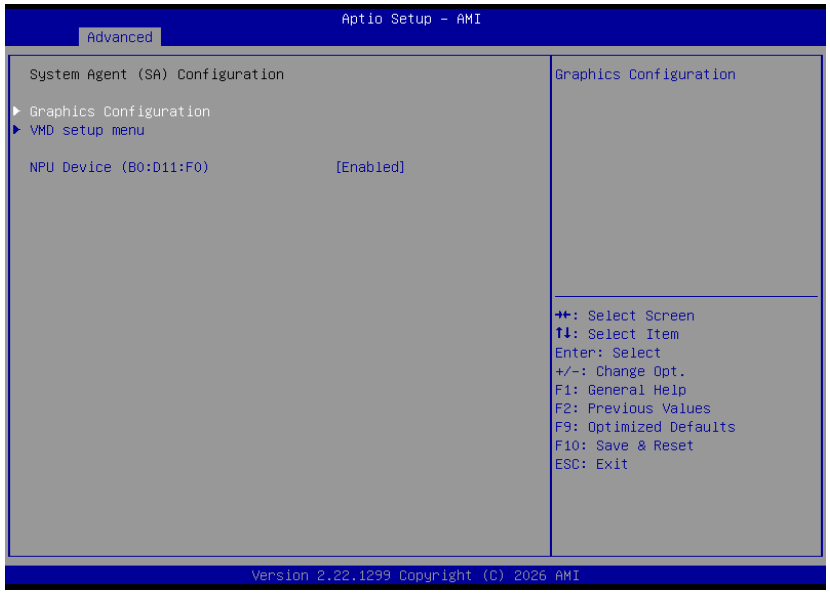
Power & Performance ▶ GT- Power Management Control



RC6 (Render Standby)
Check to enable render standby support.

▶ Advanced

System Agent (SA) Configuration



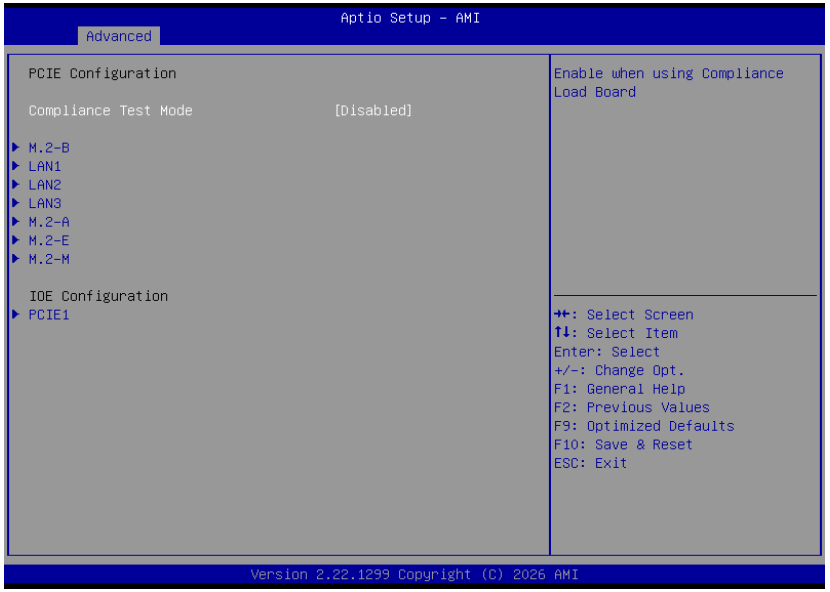
Graphics Configuration
Graphics Configuration

VMD setup menu
VMD Configuration settings

NPU Device
Enable/Disable NPU (Neural Processing Unit) Device.

▶ Advanced

PCIE Configuration



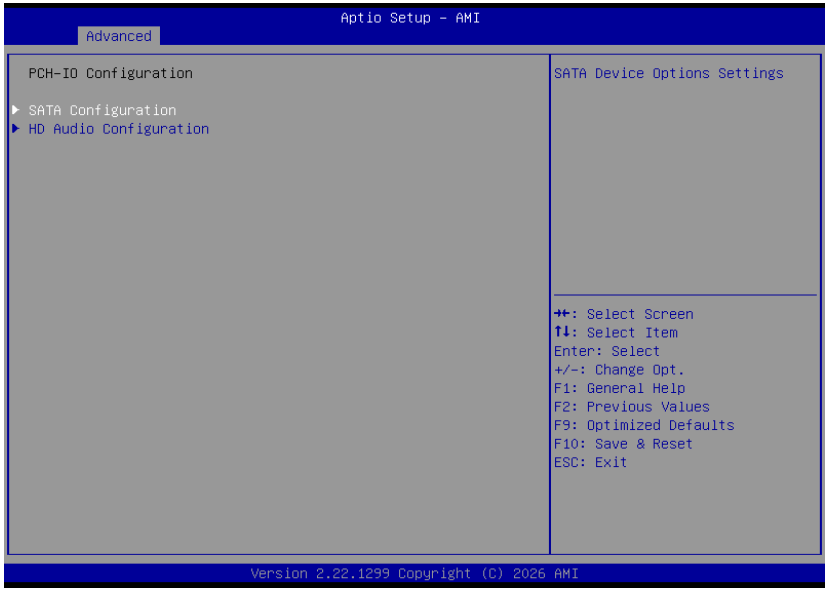
Select one of the PCI Express channels and press enter to configure the following settings.

LAN1, LAN2, LAN3, M.2-A, M.2-B, M.2-E, M.2-M, PCIE1

Control the PCI Express Root Port.

▶ Advanced

PCH-IO Configuration



SATA Configuration

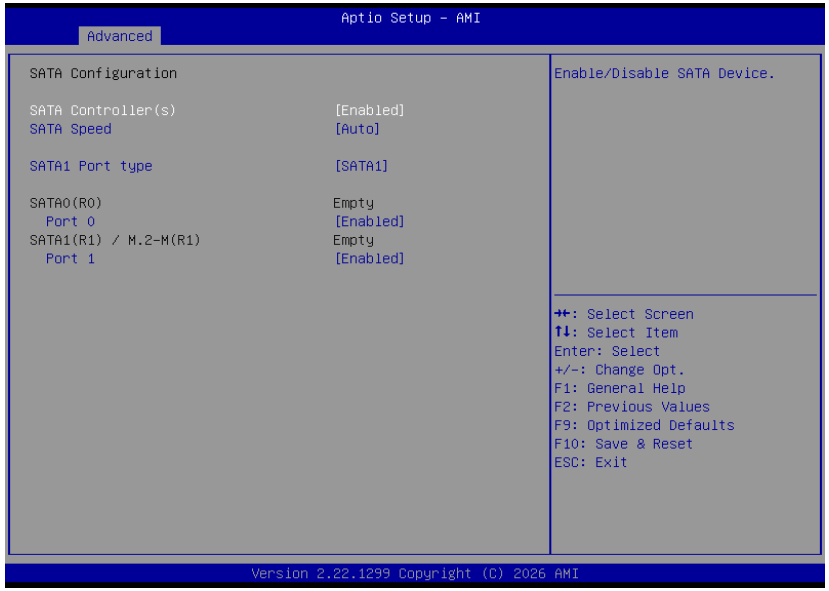
SATA Device Otpions Settings

HD Audio Configuration

HD Audio Subsystem Configuration Settings

▶ Advanced

PCH-IO Configuration▶ SATA Configuration



SATA Controller(s)

This field is used to enable or disable the Serial ATA controller.

SATA Speed

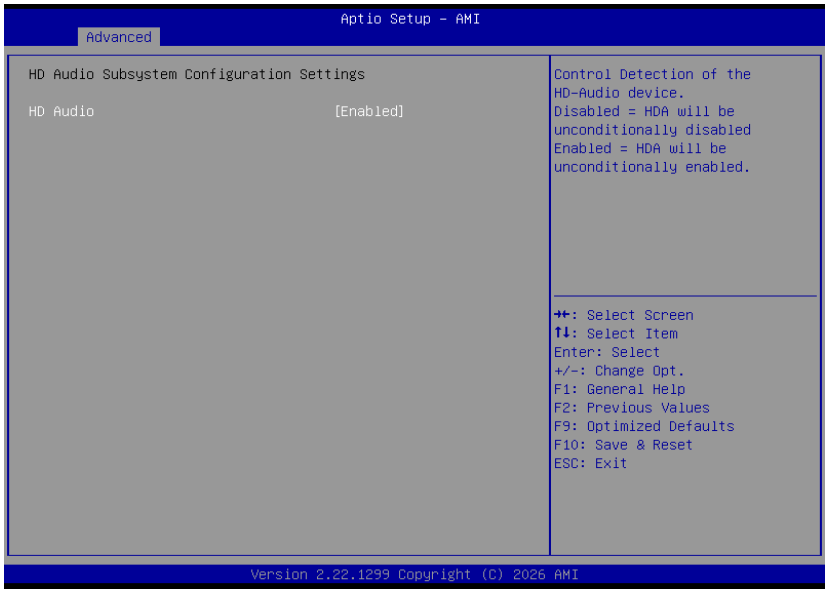
This field is used to select SATA speed generation limit: Auto, Gen1, Gen2 or Gen3.

Ports

Enable or disable the Serial ATA port function.

▶ Advanced

PCH-IO Configuration▶ HD Audio Configuration



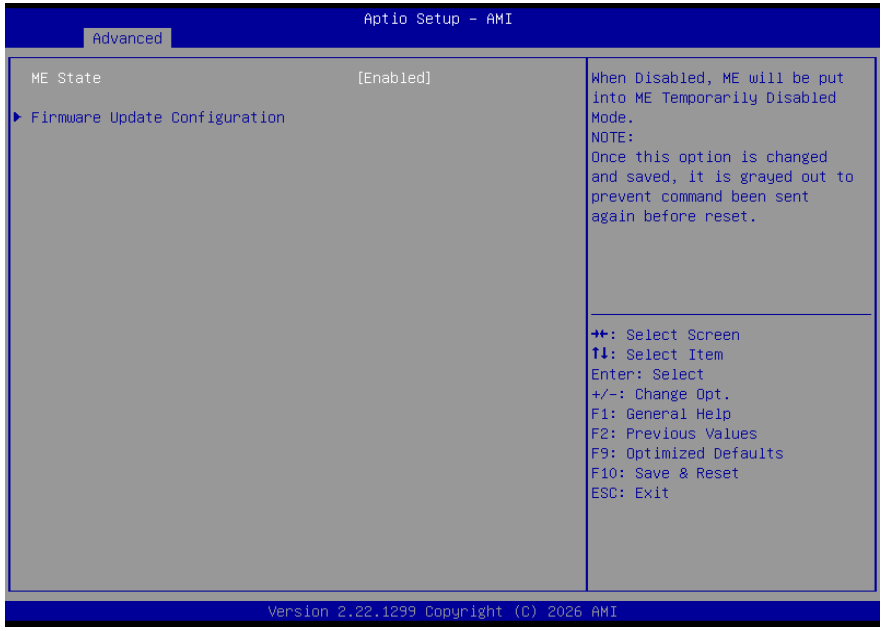
HD Audio

Control the detection of the HD Audio device.

- **Disabled** HDA will be unconditionally disabled.
- **Enabled** HDA will be unconditionally enabled.

▶ Advanced

PCH-FW Configuration



ME State

When this field is set to Disabled, ME will be put into ME Temporarily Disabled Mode.

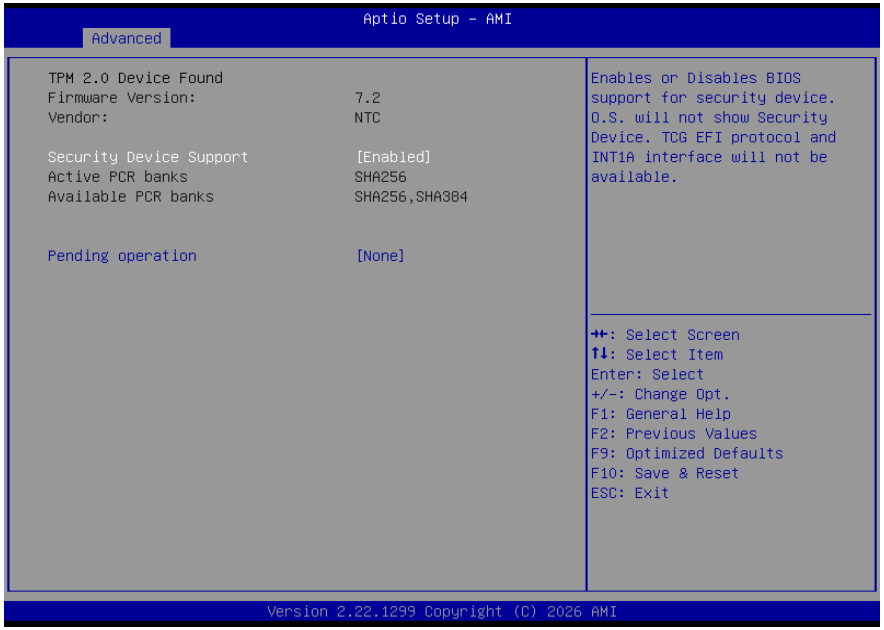
Firmware Update Configuration

Configure Management Engine Technology Parameter

Note:
The sub-menus are detailed in following sections.

▶ Advanced

Trusted Computing



Security Device Support

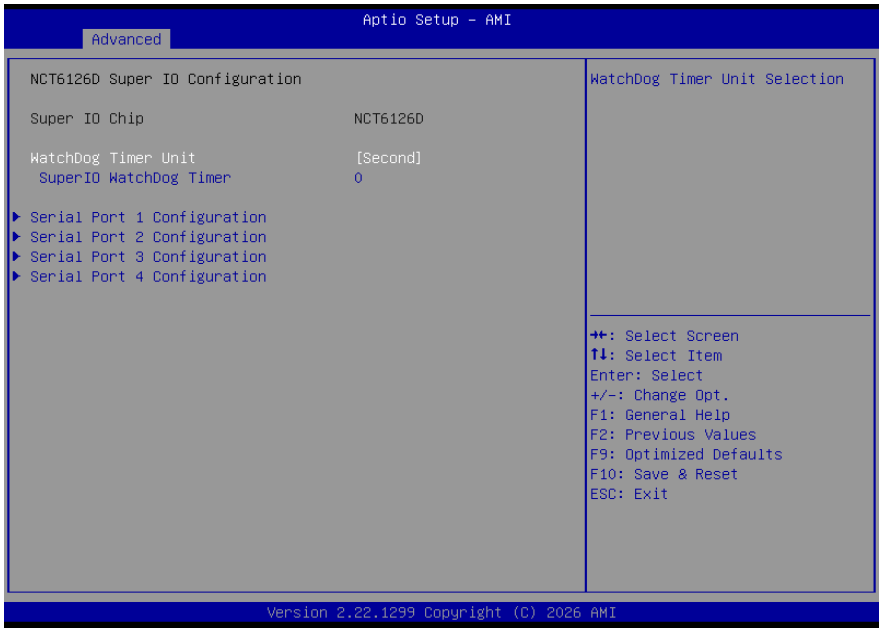
This field is used to enable or disable BIOS support for the security device such as an TPM 2.0 to achieve hardware-level security via cryptographic keys.

Pending operation

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

▶ Advanced

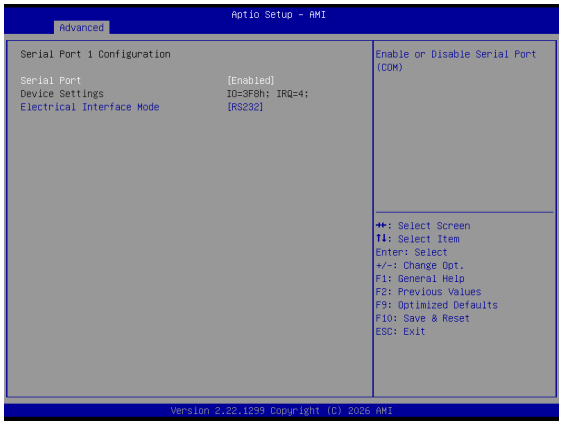
NCT6126D Super IO Configuration

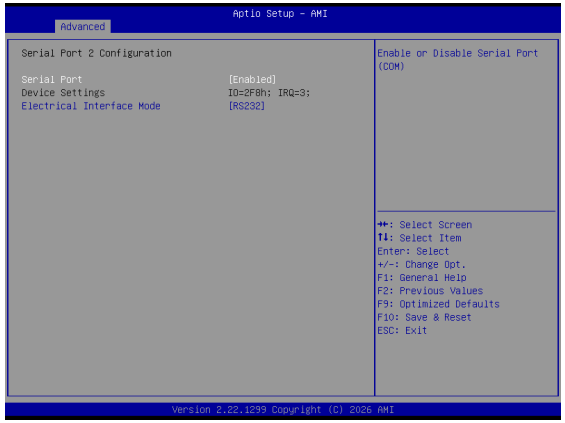


Note:
The sub-menus are detailed in following sections.

▶ Advanced

NCT6126D Super IO Configuration ▶ Serial Port 1, 2 Configuration



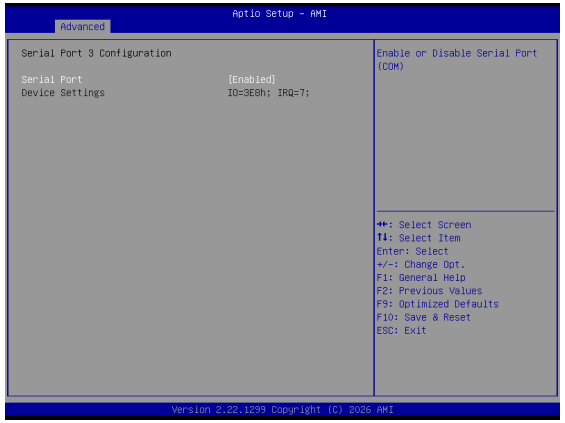


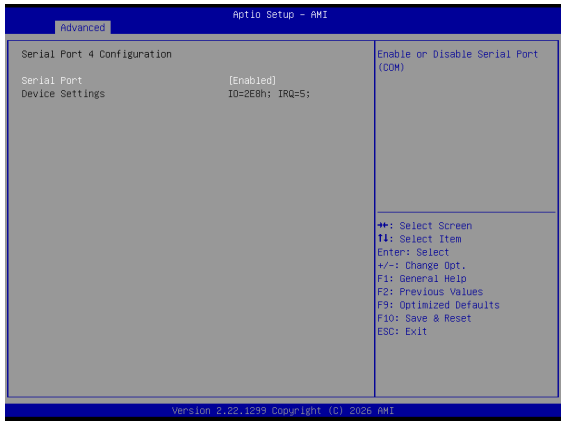
Serial Port
Enable or disable serial port.

Electrical Interface Mode
Change electrical interface for UART.

▶ Advanced

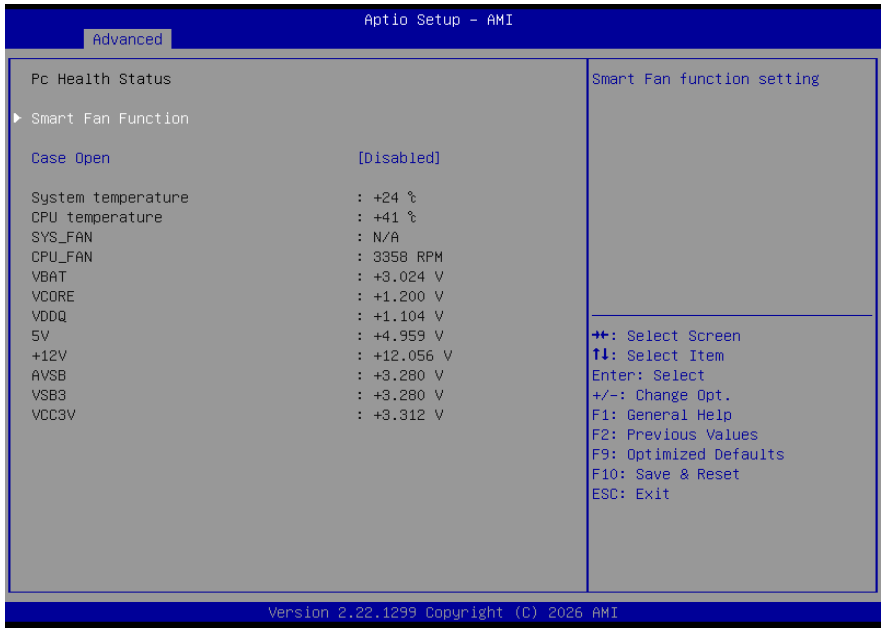
NCT6126D Super IO Configuration ▶ Serial Port 3, 4 Configuration





Serial Port
Enable or disable serial port.

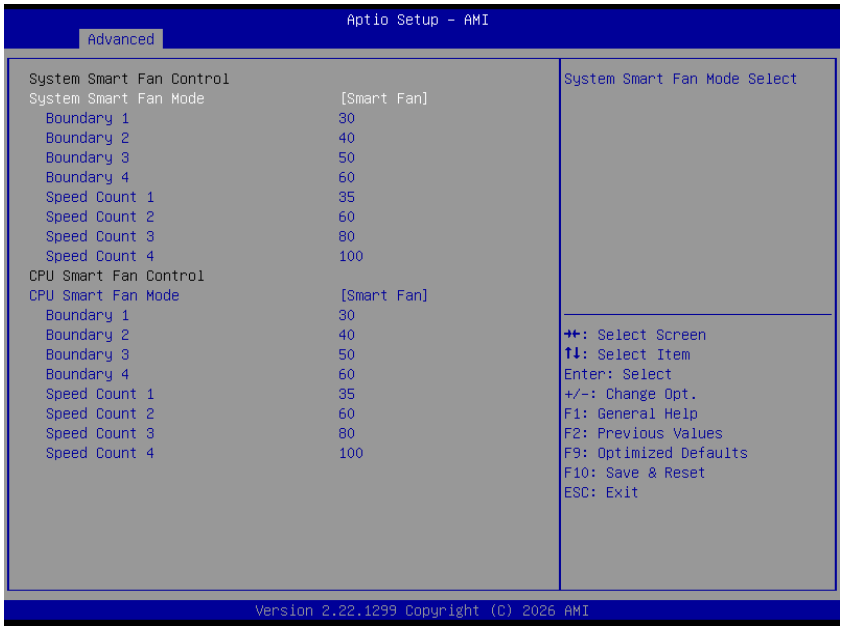
NCT6126D Hardware Monitor



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

▶ Advanced

NCT6126D Hardware Monitor ▶ Smart FAN Function



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

Boundary 1 to Boundary 4

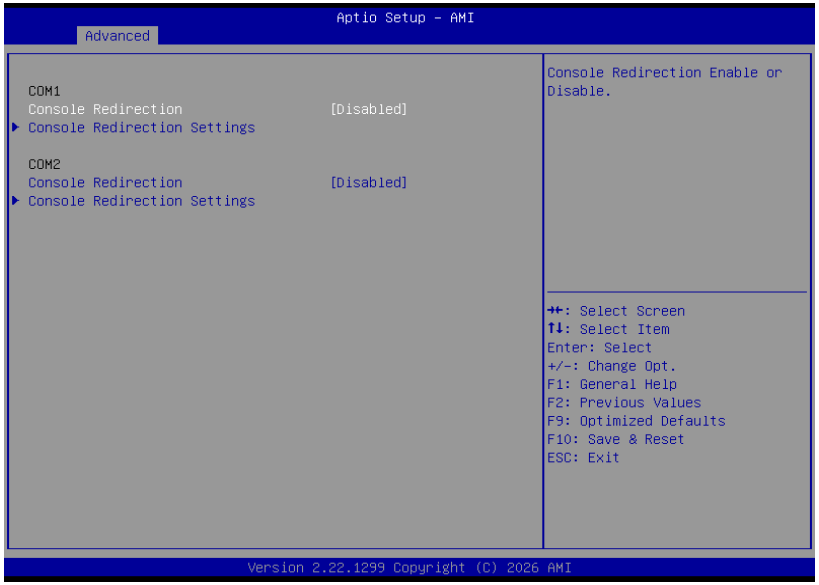
Set the boundary temperatures that determine the fan speeds accordingly, the value ranging from 0-127℃. For example, when the system temperature reaches Boundary 1 setting, the fan speed will be turned up to the designated speed of the Fan Speed Count 1 field.

Fan Speed Count 1 to Fan Speed Count 4

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

▶ Advanced

Serial Port Console Redirection

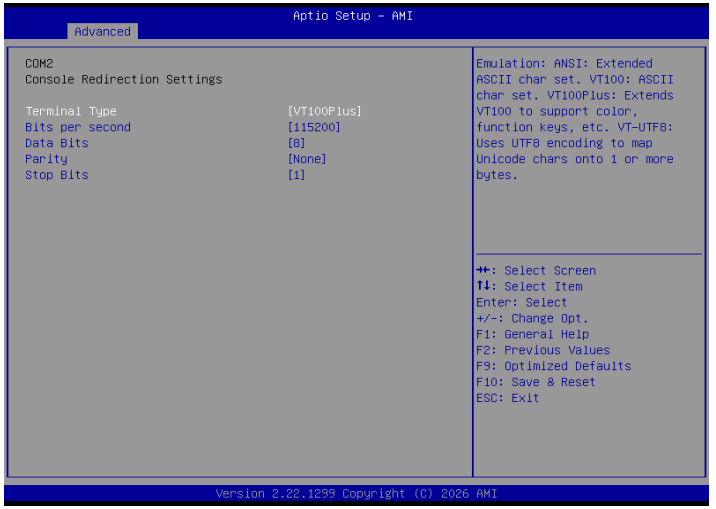


Console Redirection

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

▶ Advanced

Serial Port Console Redirection ▶ Console Redirection Settings



Configure the serial settings of the current COM port.

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

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

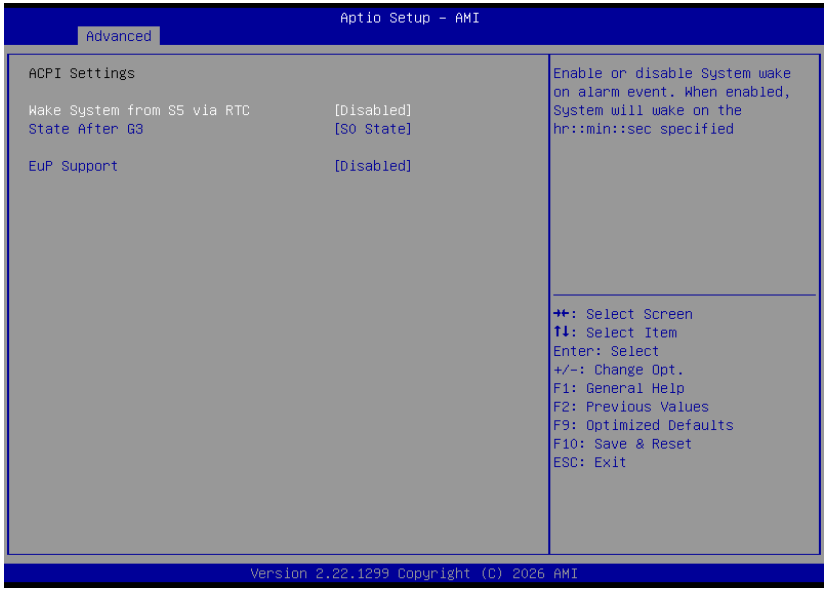
Data Bits
Select data bits: 7 bits or 8 bits.

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

Stop Bits
Select stop bits: 1 bit or 2 bits.

▶ Advanced

ACPI Settings



Wake system from S5 via RTC

When Enabled, the system will automatically power up at a designated time every day. Once it's switched to [Enabled], please set up the time of day — hour, minute, and second — for the system to wake up.

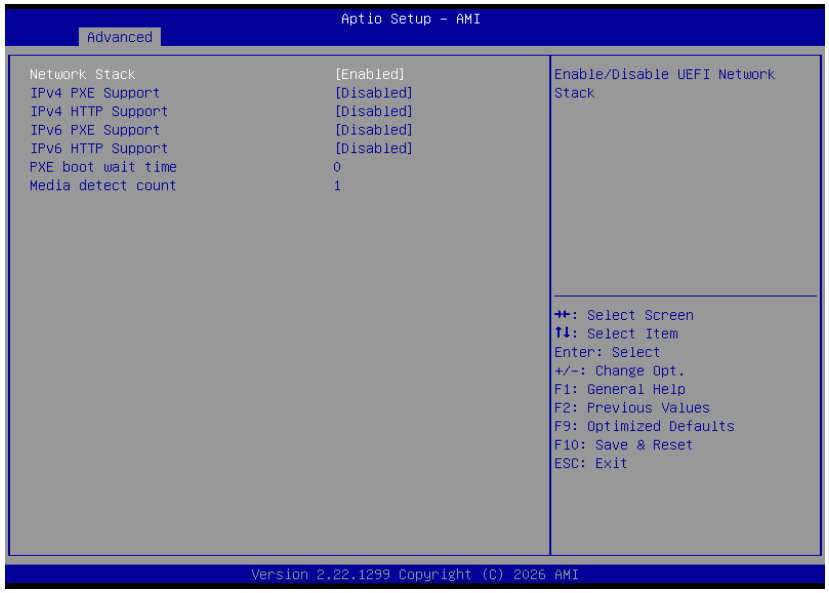
State After G3

Select between S0 State, and S5 State. This field is used to specify what state the system is set to return to when power is re-applied after a power failure (G3 state).

- **S0 State** The system automatically powers on after power failure.
- **S5 State** The system enter soft-off state after power failure. Power-on signal input is required to power up the system.
- **Last State** The system returns to the last state right before power failure.

EuP Support
Enable or disable EuP function support.

Network Stack Configuration



Network Stack

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

Ipv4 PXE/HTTP Support

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

Ipv6 PXE/HTTP Support

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

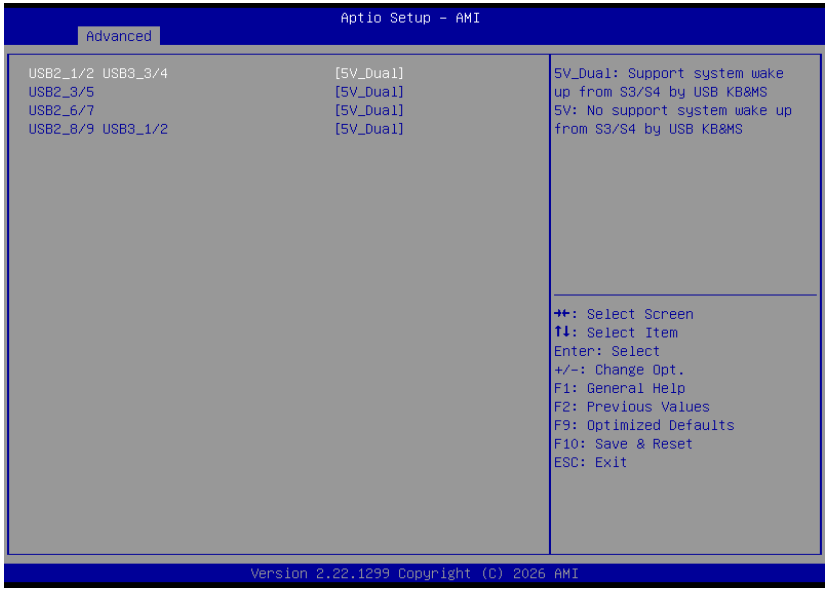
PXE boot wait time

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.

USB Power Control



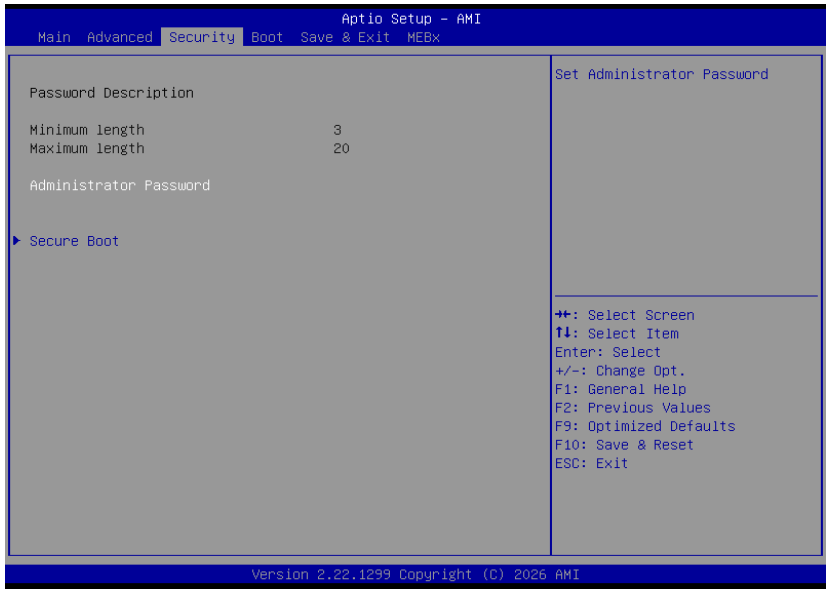
USB Power Switch

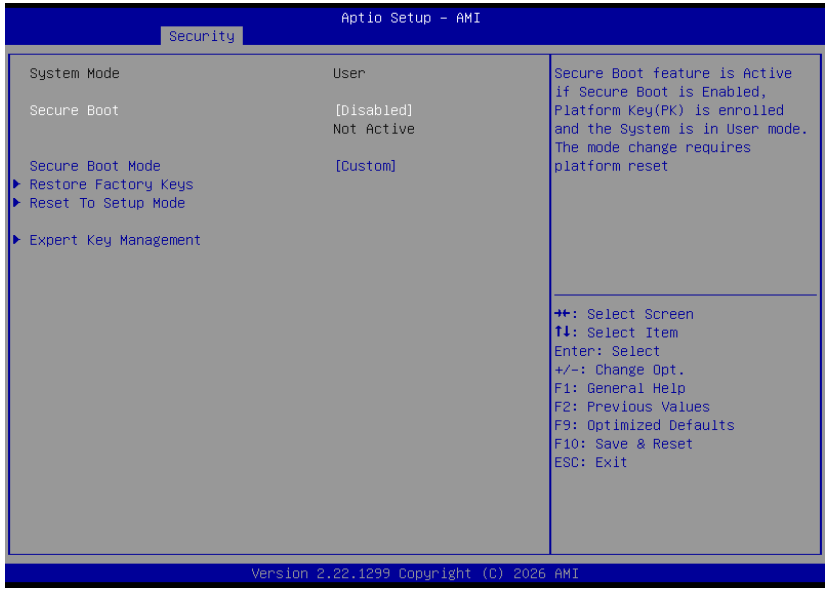
5_Dual: Support system wake up from S3/S4 by USB KB&MS

5V: No support system wake up from S3/54 by USB KB&MS

▶ Security

Secure Boot





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.

Secure Boot

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

Secure Boot Mode

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

Restore Factory Keys

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

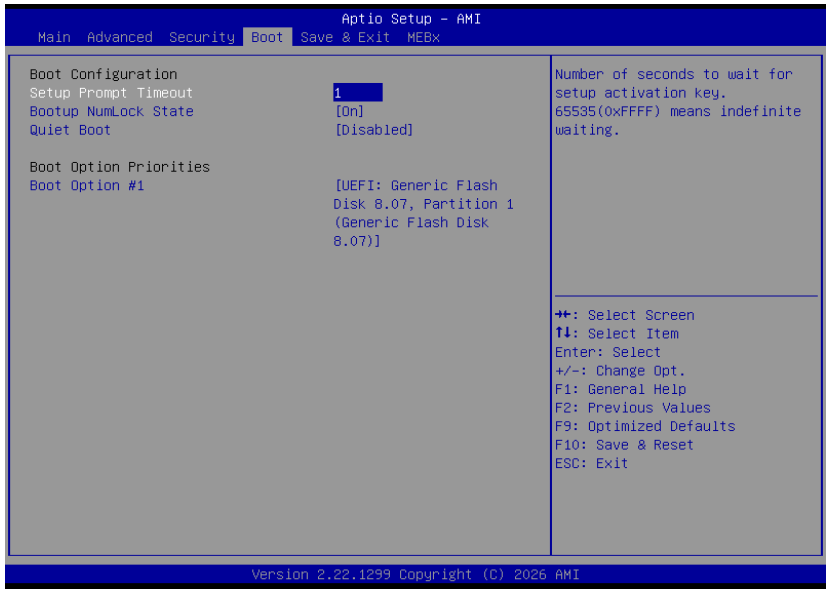
Reset To Setup Mode

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

Expert Key Management

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

▶ Boot



Setup Prompt Timeout

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

Bootup NumLock State

Select the keyboard NumLock state: On or Off.

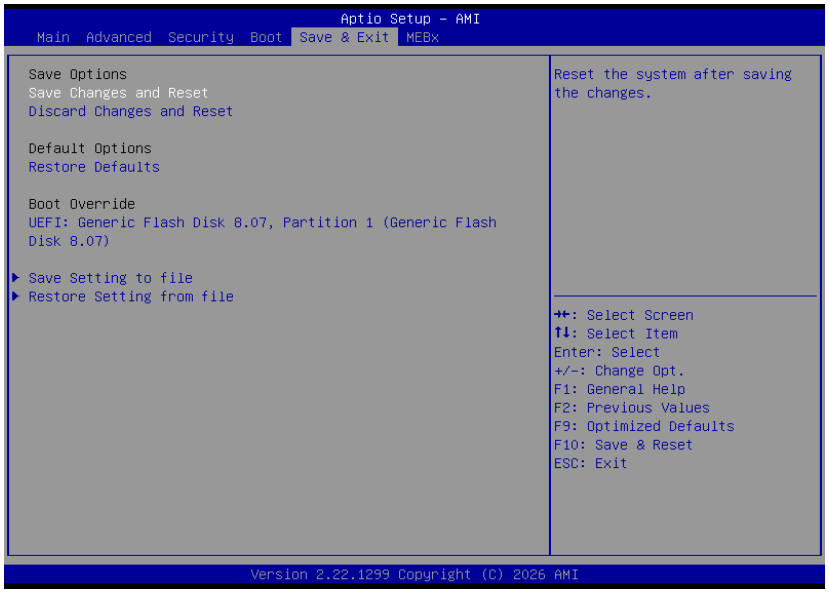
Quiet Boot

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

Boot Option Priorities

Rearrange the system boot order of available boot devices.

▶ Save & Exit



Save Changes and Reset

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

Discard Changes and 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 dia-log 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.

Appendix A- Mating Connectors

▶ The Mating Connectors List

Please refer to the following list of the mating connectors.

Header/Connector	Location	Connector information
RTC Battery	CN7	BOX HEADER, 1*2P/1.25mm,
Case Open	J24	PIN PLUG 1*2pin/2.54mm
System Fan	CN25	BOX HEADER 1*4, 2.54mm
CPU Fan	CN24	BOX HEADER 1*4P, 1.25mm
I2C Header	CN6	BOX HEADER, 1*5P/1.0mm
OOB I2C	J42	BOX HEADER, 1*5P/1.0mm
SATA Power	CN1	PIN PLUG 2*5-1(K8),2.0mm
SATA Power	CN13	Wafer 1.25mm wire to board 5PIN
SATA0	J1	SATA3 CONNECTOR 7Pin
SATA1	J6	SATA3 CONNECTOR 7Pin
OOB SPI	J3	BOX HEADER, 1*7P/1.25mm
DIO	J15	BOX HEADER 1*10/1.00mm
USB2_3/5	UBJ1	PIN PLUG 2*5-1(K9),2.0mm
USB2_6/7	UBJ2	PIN PLUG 2*5-1(K9),2.0mm
COM1	TSJ1	BOX HEADER, 2*5P-1(K10)/2mm
COM2	TSJ2	BOX HEADER, 2*5P-1(K10)/2mm
COM3 (with power selection)	J40	BOX HEADER, 2*5P-1(K10)/2mm,
COM4 (with DIO function jumper)	J41	BOX HEADER, 2*5P-1(K10)/2mm
Front Audio	AUCN1	PIN PLUG 2*5-1(K8),2.0mm
Speaker L	J38	BOX HEADER, 1*2P/2.0mm,
Speaker R	J39	BOX HEADER, 1*2P/2.0mm
Panel Backlight Control	DPJ1	BOX HEADER, 1*8P/1.25mm
ESPI	J9	BOX HEADER 1*12P/1.0mm
Front Panel	J17	PIN PLUG 2*6-1(K12),2.54mm