# SI-121-N

## Intel® Core® Processor N-Series (Twin Lake) Fanless Signage Player

# User's Manual

Version 1.0
(July 2026)

iBASE

## Copyright



## Disclaimer

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## Trademarks

All the trademarks, trade names and brands mentioned herein are used for identification purposes only and may be trademarks or registered trademarks of their respective owners.

# Compliance

CE

This product has passed CE tests for environmental specifications and limits. This product is in accordance with the directives of the European Union (EU). If users modify and/or install other devices in this equipment, the CE conformity declaration may no longer apply.

FC

This product has been tested and found to comply with the limits for a Class B device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instructions, may cause harmful interference to radio communications.

## WEEE

This product must not be disposed of as normal household waste, in accordance with the EU directive for waste electrical and electronic equipment (WEEE 2012/19/EU). Instead, it should be disposed of by returning it to a municipal recycling collection point. Check local regulations for disposal of electronic products.

## Green IBASE


This product complies with RoHS 2 restrictions, which prohibit the use of certain hazardous substances in electrical and electronic equipment. The following substances must not exceed the specified concentrations:

- Hexavalent chromium: 1,000 ppm
- Poly-brominated biphenyls (PBBs): 1,000 ppm
- Poly-brominated diphenyl ethers (PBDEs): 1,000 ppm
- Cadmium: 100 ppm
- Mercury: 1,000 ppm
- Lead: 1,000 ppm
- Bis(2-ethylhexyl) phthalate (DEHP): 1,000 ppm
- Butyl benzyl phthalate (BBP): 1,000 ppm
- Dibutyl phthalate (DBP): 1,000 ppm
- Diisobutyl phthalate (DIBP): 1,000 ppm

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# Important Safety Information

Carefully read the precautions before using the device.

### Environmental conditions:

- Place the device on a stable surface to prevent it from falling and causing damage.
- Leave plenty of space around the device and do not block the openings for ventilation. Never insert objects of any kind into the ventilation openings.

### Care for your IBASE products:

- Before cleaning the device, turn it off and unplug all cables such as the power cable, as residual electrical current may still be present.
- Use a neutral cleaning agent or diluted alcohol with a cloth to clean the device chassis. Then wipe the chassis with a dry cloth.
- Use a computer vacuum cleaner to remove dust and prevent the vents and slots from becoming clogged.

**WARNING**

### Attention during use:

- Do not place heavy objects on the top of the device.
- Operate this device only with the power source indicated on the rating label. If you are not sure of the type of power available, consult your distributor or your local power company.
- Do not walk on the power cord or allow anything to rest on it.
- If you use an extension cord, make sure that the total ampere rating of the product plugged into the extension cord does not exceed the extension cord's rated capacity.

Do not disassemble, repair or make any modification to the device. Disassembly, modification, or any attempt at repair could create hazards and result in device damage, bodily injury, or property damage, and will void any warranty.

**CAUTION**

Danger of explosion if internal lithium-ion battery is replaced by an incorrect type. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

## Warranty Policy

- **IBASE standard products:**

  IBASE offers a 24-month (2-year) warranty from the date of shipment. If the shipment date cannot be determined, the product serial numbers can be used to determine the approximate shipping date.

- **Third-party parts:**

  12-month (1-year) warranty from the delivery for the third-party parts that are not manufactured by IBASE, such as CPU, memory, HDD, power adapter, panel and touchscreen.

∗ PRODUCTS, HOWEVER, THAT FAIL DUE TO MISUSE, ACCIDENT, IMPROPER INSTALLATION OR UNAUTHORIZED REPAIR SHALL BE TREATED AS OUT OF WARRANTY AND CUSTOMERS SHALL BE BILLED FOR REPAIR AND SHIPPING CHARGES.

## Technical Support & Services

1. Visit the IBASE website at www.ibase.com.tw to find the latest information about the product.
2. If you need any further assistance from your distributor or sales representative, prepare the following information regarding your product and provide a detailed description of the problem:

   - Product model name
   - Product serial number
   - Detailed description of the problem
   - Any error messages, either as text or screenshots
   - The arrangement of the peripherals
   - Software in use (such as OS and application software, including the version numbers)

3. If repair service is needed, please log in to the RMA system on the website or contact your distributor or sales representative for assistance.

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# Table of Contents

# Chapter 1
# General Information

The information provided in this chapter includes:

- Features
- Packing List
- Specifications
- Product View
- Dimensions

## 1.1 Introduction

Powered by Intel® Core™ Processor N-series (Twin Lake), the SI-121-N delivers reliable performance for entry-level signage applications. It features integrated Intel® Graphics and supports one HDMI 2.0b output with independent audio. The system is designed with a compact, industrial-grade fanless architecture for silent and stable operation. It supports up to 32GB DDR5 memory through a single SO-DIMM slot. Expansion includes an M.2 M-Key slot for storage and an M.2 B-Key slot for 5G/LTE modules. A Nano SIM card slot is available for cellular connectivity. The platform integrates iSMART energy-saving technology for power scheduling and recovery functions. Additional features include PDPC, optional OOB management, TPM 2.0, and a watchdog timer to enhance system reliability.

## 1.2 Features

- iSMART intelligent energy-saving technology - enables power on/off scheduling and power resume functions
- Intel® Core® Processor N-Series (Twin Lake)
- 1x HDMI 2.0b with independent audio output
- HDMI-CEC and display monitoring functions
- Supports PDPC (Peripheral Device Power Control) function
- Supports OOB function via I210IT LAN port (optional)
- 1x DDR5-4800 SO-DIMM, Max. 32GB
- 1x M.2 M-Key (2280) for storage
- 1x M.2 B-Key (3052) for 5G/LTE
- 1x Nano SIM slot, TPM 2.0 and watchdog timer
- Industrial-grade robust, fanless and compact design

## 1.3 Packing List

The package should contain the following items.

- SI-121-N Digital Signage Player
- Power Adaptor

## 1.4 Specifications

| Product | **SI-121-N** |
|---|---|
| System Mainboard | MBD121 |
| CPU | Intel N-Series (Twin Lake) Processors |
| CPU Socket | FCBGA1264 |
| Chipset | Integrated |
| Memory | • 1x DDR5-4800 SO-DIMM, Max. 32GB |

| | |
|---|---|
| Graphics | Intel Graphics |
| LAN | 1x Gigabit LAN (optional OOB / in-band support) |
| Expansion Slots | • 1x M.2 M-Key 2280 for storage<br>• 1x M.2 B-Key 3052 for 5G/LTE<br>• 1x SIM card slot |
| I/O Interface | • 1x HDMI 2.0b<br>• 2x USB 3.2 (1x supports PDPC)<br>• 1x RJ45 for Gigabit LAN<br>• 1x RJ45 for RS-232 serial port<br>• 1x Audio connector Line-out<br>• 1x Power Button<br>• 1x Power Jack +12V DC<br>• 2x LED Power and Storage |
| Auto Control and Monitoring | Watchdog Timer 256 segments (0 to 255 sec min) |
| Power Requirement | +12V DC |
| Construction | Aluminum and SGCC |
| Weight | 1.0 kg (2.2 lbs) |
| Chassis Color | Black and White |
| Storage | 1x M.2 M-Key 2280 (NVMe / SATA) |
| Power Supply | 50W power adaptor |
| Mounting | Standard system bracket |
| Dimensions | 170mm (W) x 123mm (D) x 22.5mm (H) |
| Operating Temperature | 0°C to 45°C |
| Storage Temperature | -20°C to 80°C |
| Relative Humidity | 10% to 90% non-condensing |
| Vibration | 1Grms 3 to 500Hz random operation |
| Certification | CE, FCC Class B cULus |
| Operating System | Windows 11 IoT Enterprise LTSC, Linux Ubuntu (64-bit) |

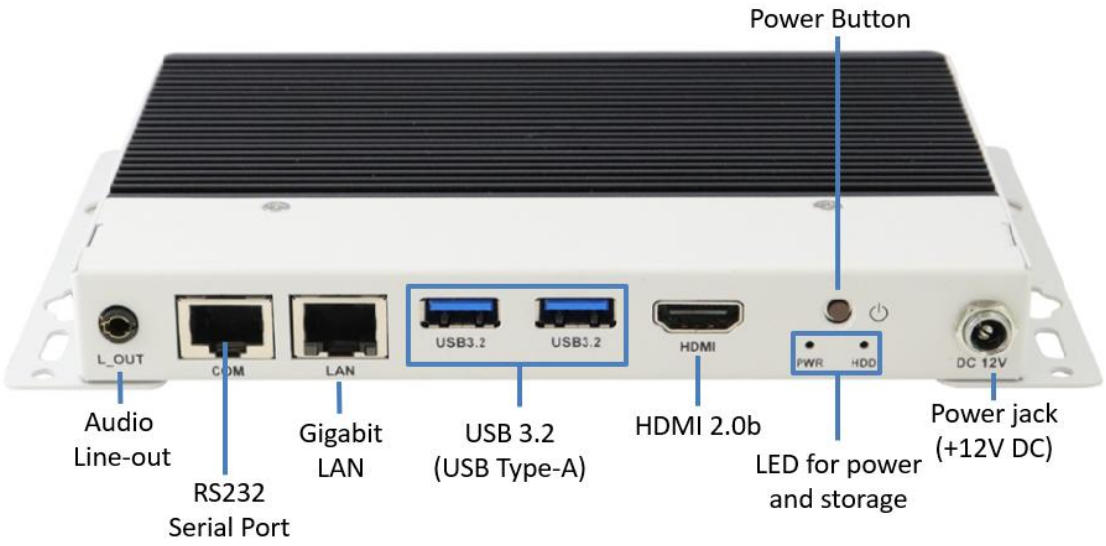
All specifications are subject to change without prior notice.

## 1.5 Product View



SIM

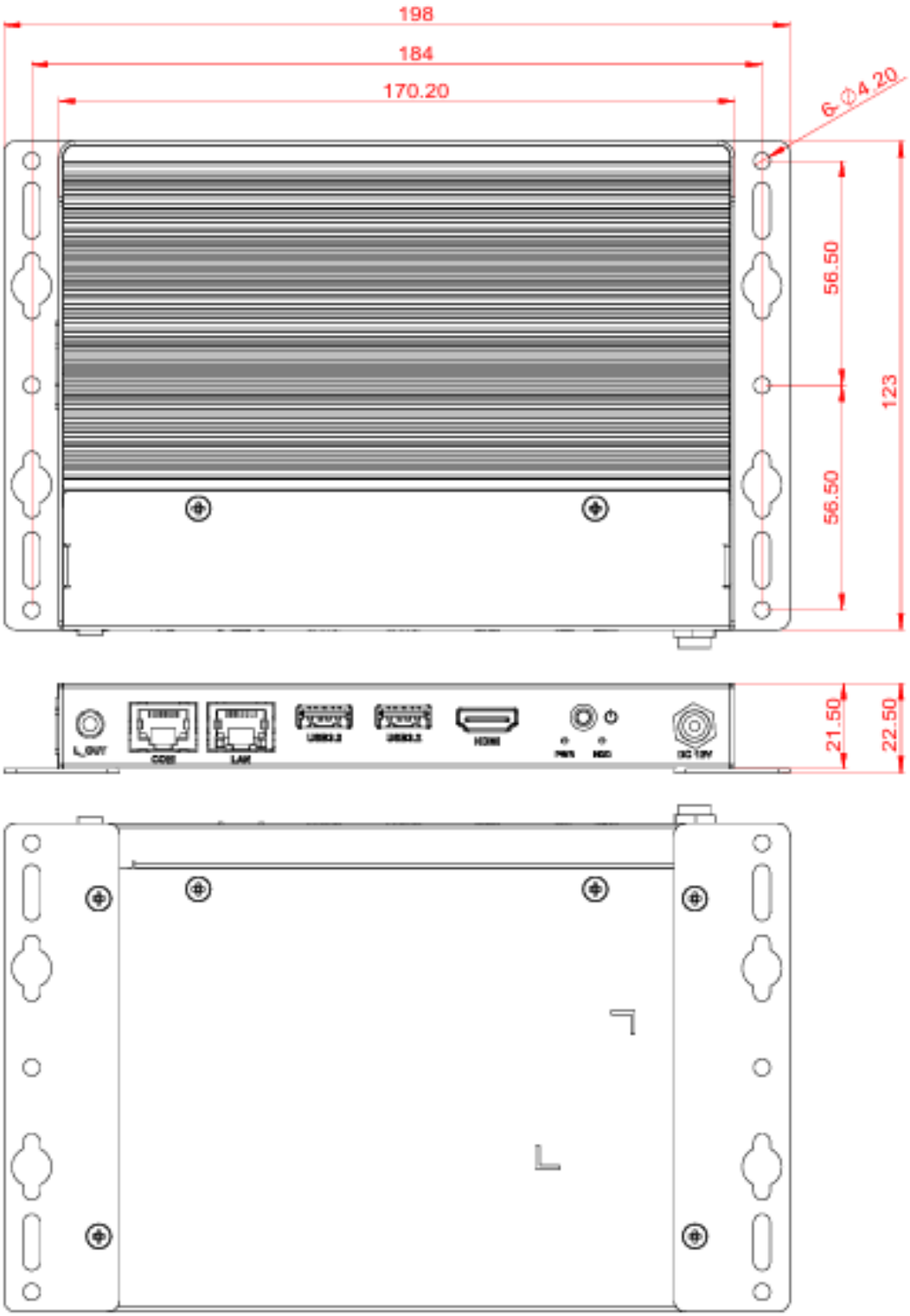
## SI-121-N I/O View




## SI-121-N with mounting brackets

## 1.6 Dimensions

Unit: mm



# Chapter 2
# Hardware Installation & Motherboard Information

The information provided in this chapter includes:

- Installation of memory and M.2 cards
- Information and locations of connectors

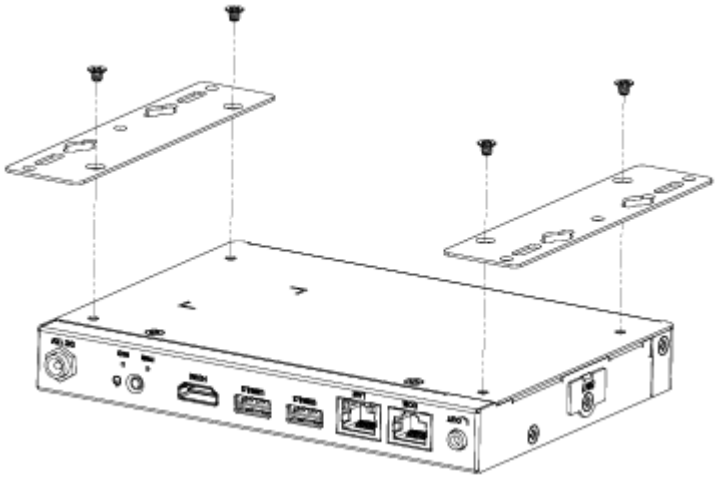
Before installing or replacing any internal modules, power off the system and disconnect the DC power adapter and all external cables. Place the unit on a clean, stable, and ESD-safe surface. To access the internal sockets and connectors, remove the chassis cover and, if applicable, the internal heat shield/protective cover. After the covers are removed, the memory socket, M.2 slots, and SIM card connector can be accessed for installation or replacement.

## 2.1 Internal Access and Module Installation

Before servicing the system, power off the unit and disconnect the power adapter and all external cables. Place the system on a flat, stable, and ESD-safe surface.

### *2.1.1 Remove the Wall-Mount Brackets*

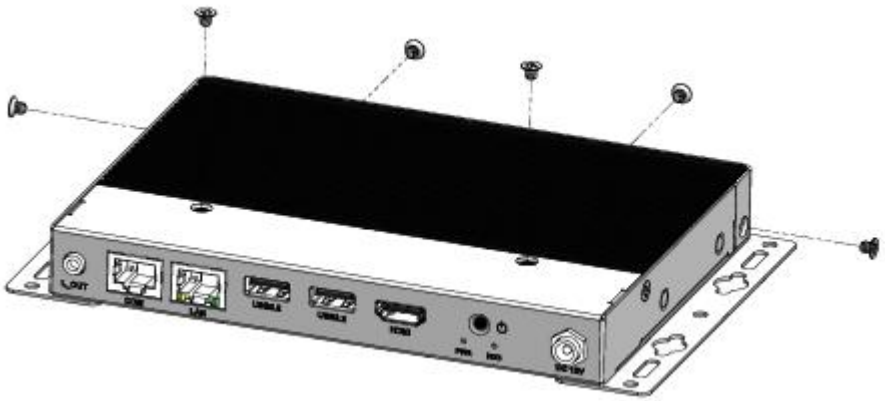
If wall-mount brackets are installed on the chassis, remove the screws securing the left and right brackets, then lift the brackets away from the system.



This step must be completed before removing the chassis cover.

### *2.1.2 Remove the Bottom Cover*

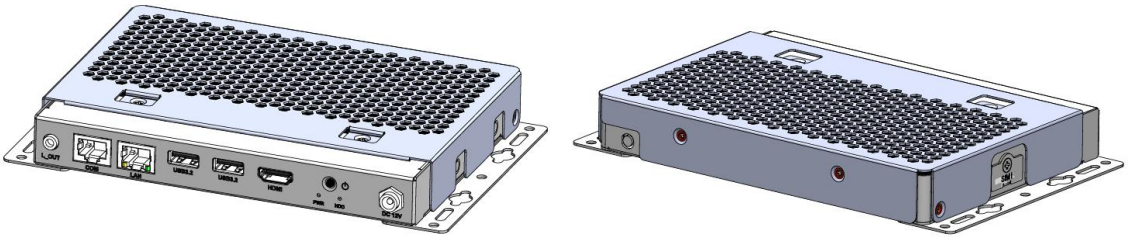
Turn the system over to expose the bottom cover. Remove all screws securing the bottom cover.



Carefully lift the bottom cover off. If the cover does not release easily, check that all screws have been removed.

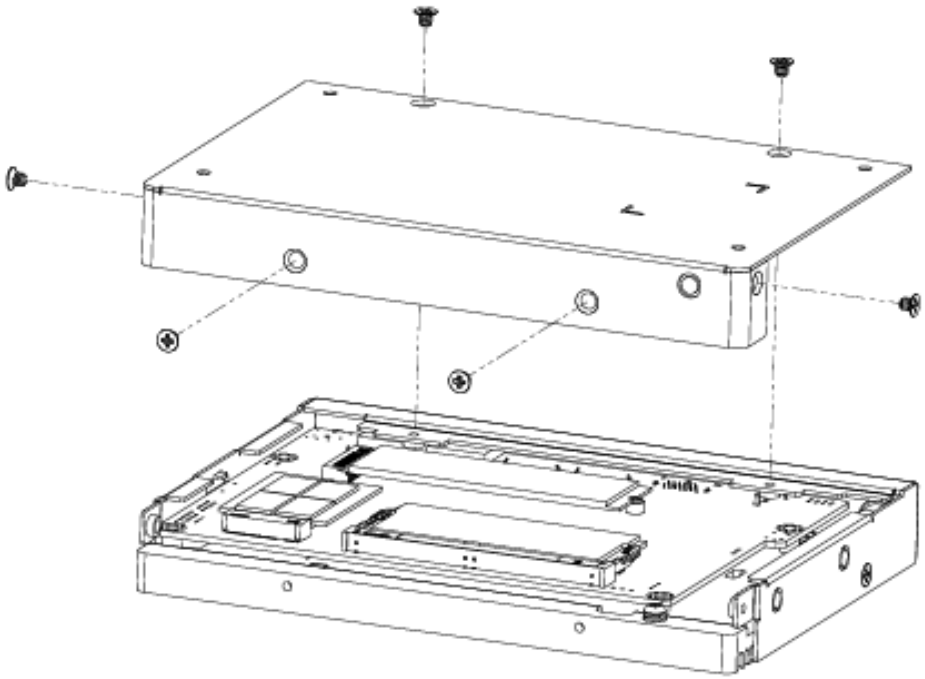
### 2.1.3 Remove the Internal Protective Cover / Heat Shield

If an internal metal protective cover is installed, remove the screws securing it and lift it off carefully to expose the internal service area.



**Optional Protective Cover Kit (Accessory)**
The protective cover is available as an optional accessory. The kit includes the following items:

| Item | Description |
|---|---|
| Heatsink Cover | Cover (1 pc) |
| Screw Set | Screw (6 pcs) |
| Packaging | Plastic bag (6 × 4 cm) |

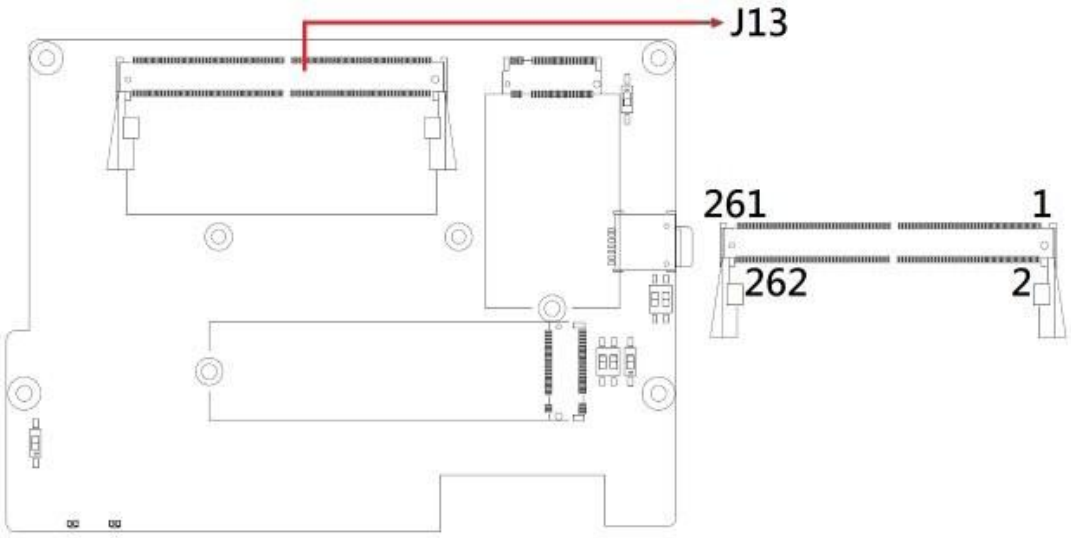


After removing the cover(s), the following components are accessible:

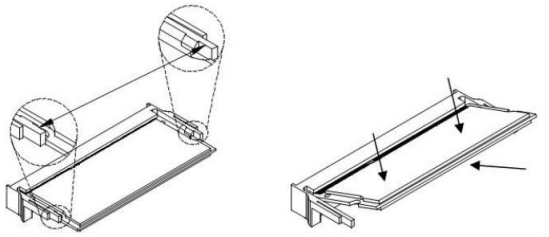
- 1x DDR5 SO-DIMM socket
- 1x M.2 M-Key 2280 slot
- 1x M.2 B-Key 3052 slot
- 1x SIM card connector

### 2.1.4 Memory Installation

Locate the DDR5 SO-DIMM socket on the mainboard.



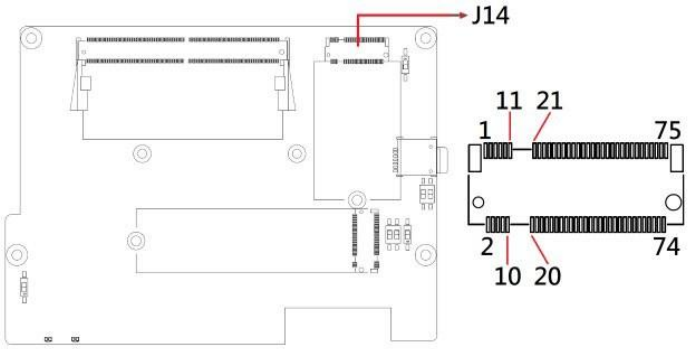

1. Align the notch on the memory module with the key in the socket.
2. Insert the module into the socket at an angle of approximately 30°.
3. Push the module fully into the socket.
4. Press the module downward until the retaining clips lock into place.



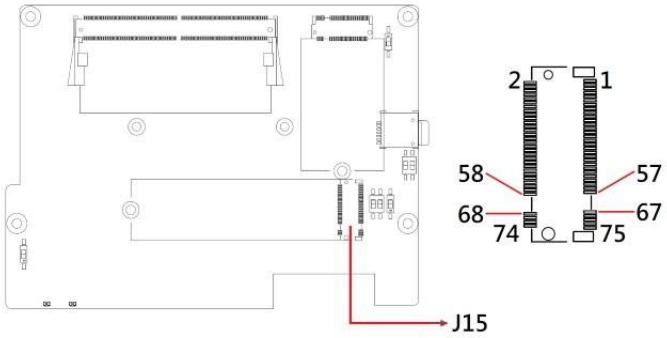
To remove the memory module, push the retaining clips outward and pull the module out at the same angle.

### 2.1.5 M.2 Card Installation

Locate the M.2 connectors on the board.



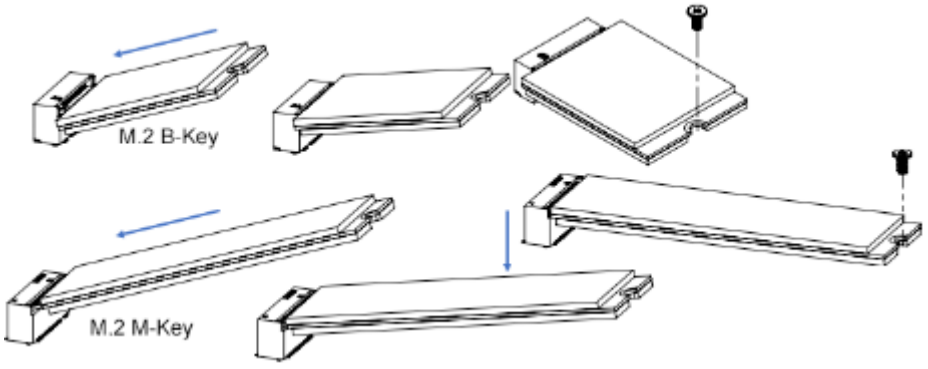

J14: M.2 B-Key 3052 Connector




J15: M.2 M-Key 2280 Connector

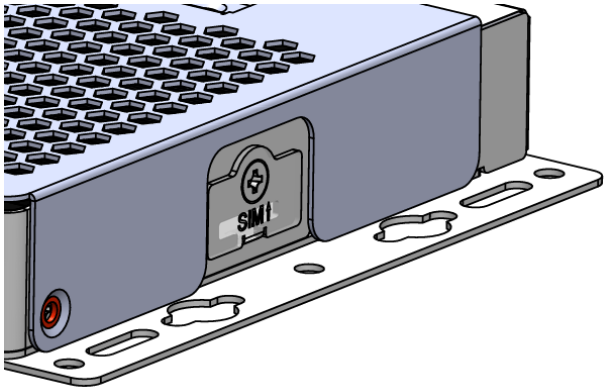
1. Remove the retaining screw from the standoff.
2. Align the M.2 card with the connector key.
3. Insert the card into the connector at a slight angle.
4. Push the card fully into the socket.
5. Press the card downward onto the standoff.
6. Secure the card with the retaining screw.

To remove the card, remove the screw and pull the card out carefully.



### 2.1.6 SIM Card Installation

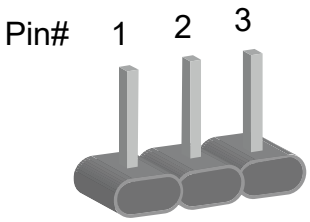
The SIM card slot is externally accessible from the side of the system and does not require chassis disassembly.



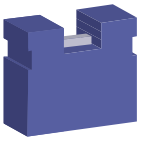

1. Locate the SIM card slot on the side panel of the system.
2. Remove the SIM slot cover screw and open the cover.
3. Insert the SIM card in the correct orientation, then push inward until it clicks and locks into place.
4. To remove, push the SIM card inward again to release it, then pull it out.
5. Close the cover and secure the screw.

## 2.2 Setting the Jumpers

Jumpers are short-length conductors consisting of several metal pins with a non-conductive base mounted on the circuit board. Jumper caps are used to have functions enabled or disabled. If a jumper has 3 pins, you can connect either PIN1 to PIN2 or PIN2 to PIN3 by shorting.

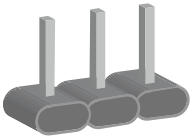
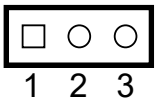
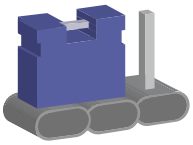
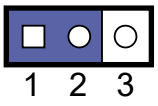
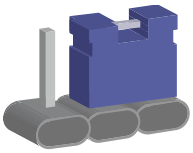
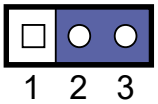



**A 3-pin jumper**



**A jumper cap**

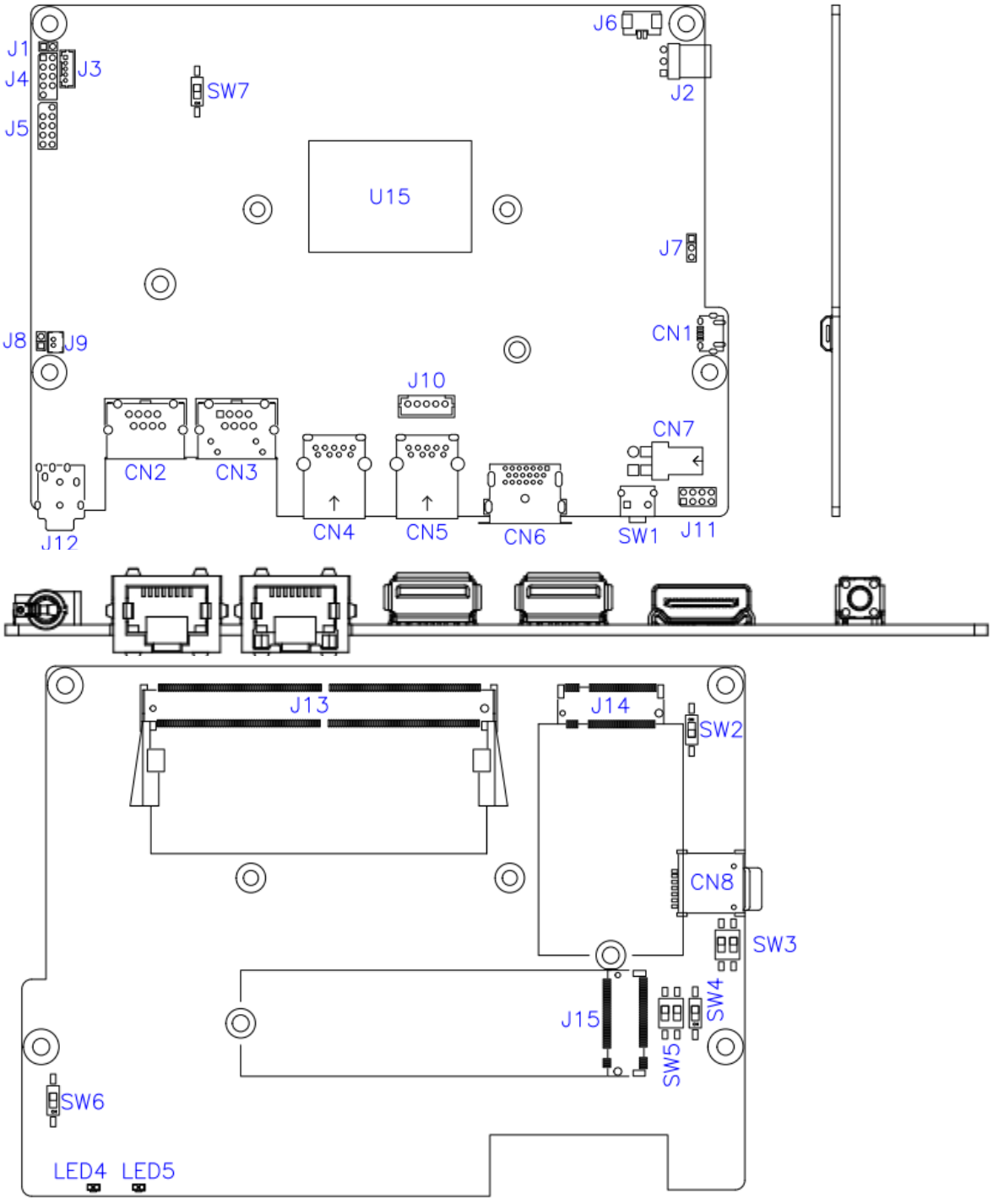
Refer to the illustration below to set jumpers.

| Pin closed | Oblique view | Illustration |
|---|---|---|
| Open |  |   |
| 1-2 |  |   |
| 2-3 |  |   |

When two pins of a jumper are encased in a jumper cap, this jumper is **closed**, i.e. turned **On**.

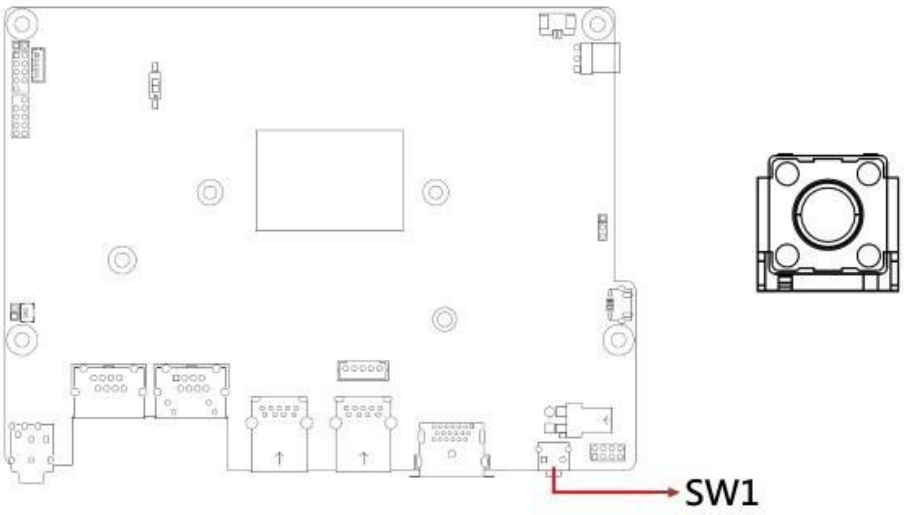
When a jumper cap is removed from two jumper pins, this jumper is **open**, i.e. turned **Off**.

## 2.3 Jumpers, Switches & Connectors Location

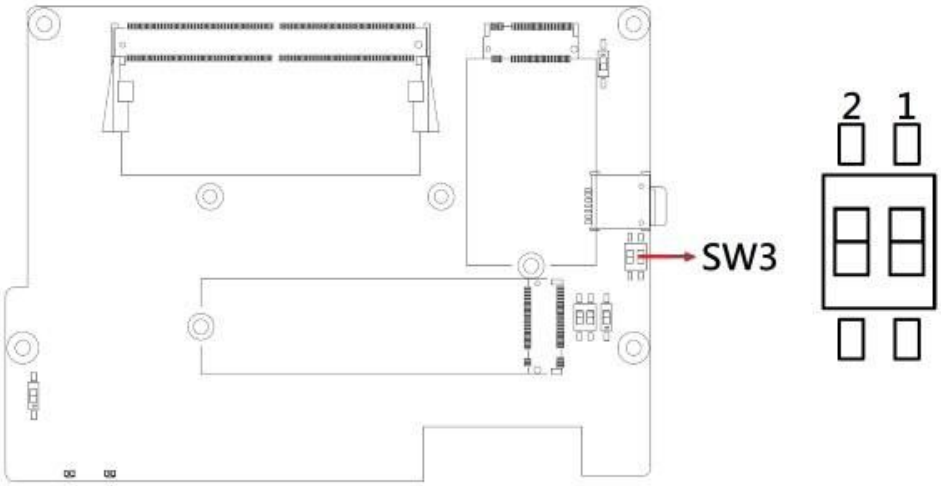


| Jumper / Connector | Function |
|---|---|
| SW1 | Power Button |
| SW3 | OOB Booting |
| SW5-1 | Clear CMOS Data |
| SW5-2 | Clear ME Register |
| SW2 | AT / ATX Mode Selection |
| SW4 | OOB Scheduled for Power On/Off |
| SW6 | LED HW/SW Control Function |
| SW7 | Sierra EM9191 5G Card USB/PCIe Select |
| CN1 | Micro USB Connector |
| CN2 | COM1 RS-232 Port RJ-45 Connector |
| CN3 | LAN Connector |
| CN4, CN5 | USB 3.2 Connector |
| CN6 | HDMI Connector |
| CN7 | DC Power Input Connector |
| CN8 | SIM Card Slot |
| J1 | Factory Use Only |
| J2 | OOB Debug COM Port |
| J3 | iSMART FW Upgrade Connector |
| J4 | Debug 80 Port |
| J5 | SPI Flash Tool Connector |
| J6 | RTC Battery Connector |
| J7 | Factory Use Only |
| J10 | CEC FW Upgrade |
| J11 | Front Panel Connector |
| J12 | Audio Phone Jack |
| J13 | DDR5 SO-DIMM Connector |
| J14 | M.2 B-Key 3052 Connector |
| J15 | M.2 M-Key 2280 Connector |
| LED4, LED5 | LED Indicator Lights |

### 2.3.1 SW1: Power Button



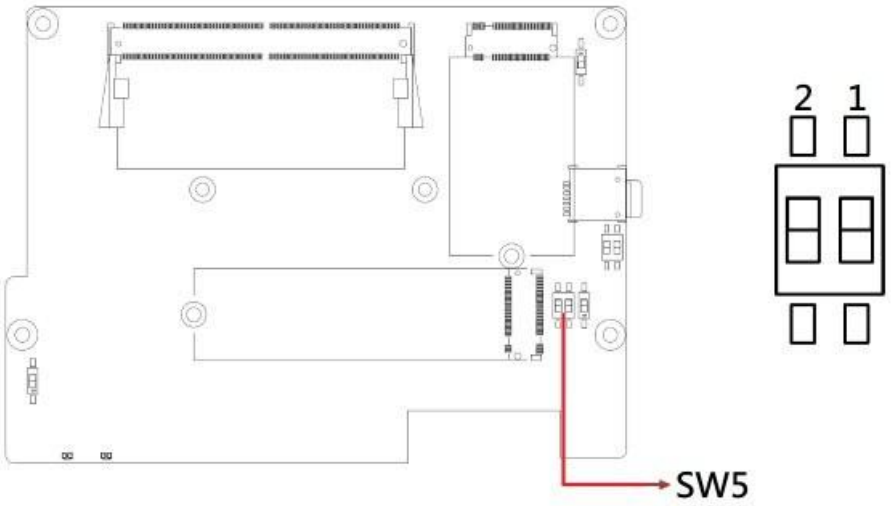

### 2.3.2 OOB Booting (SW3)




| Function | Setting |
|---|---|
| QSPI Flash (default) | P1-OFF<br>P2-OFF |
| USB | P1-ON<br>P2-ON |

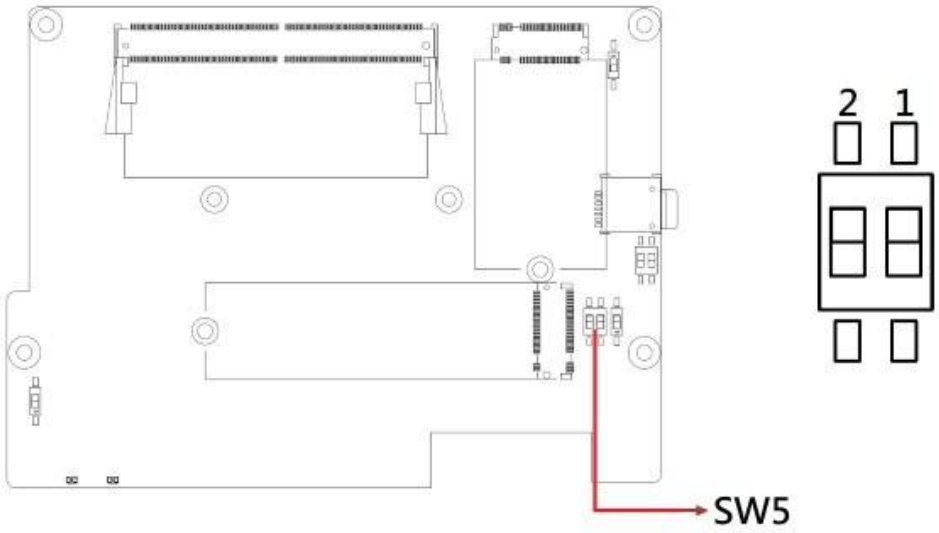
Remarks: Factory use only.

### 2.3.3 SW5-1: Clear CMOS Data



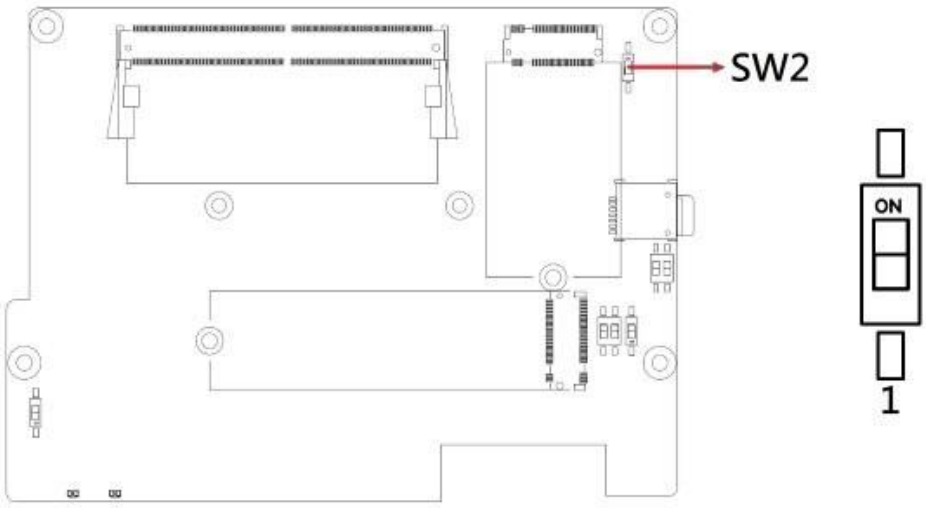

| Function | Setting |
|---|---|
| Normal (default) | P1-OFF |
| Clear CMOS | P1-ON |

### 2.3.4 SW5-2: Clear ME Register




| Function | Setting |
|---|---|
| Normal (default) | P2-OFF |
| Clear ME Register | P2-ON |

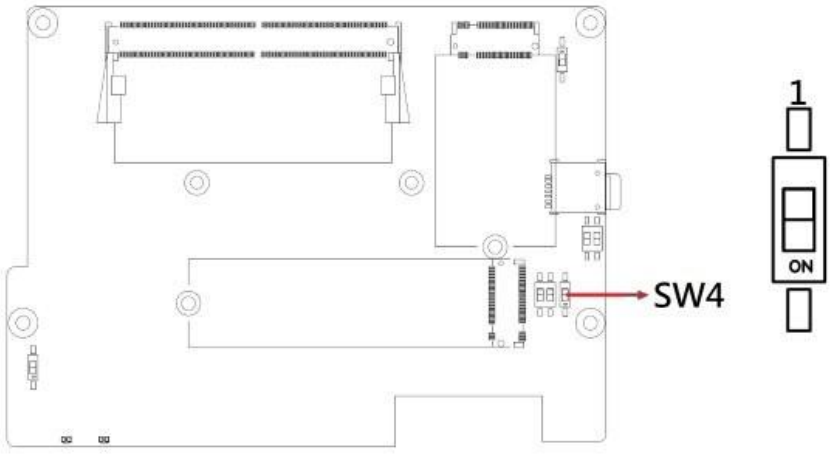
### 2.3.5 SW2: AT / ATX Mode Selection




| Function | Setting |
|---|---|
| ATX (default) | P1-OFF |
| AT | P1-ON |

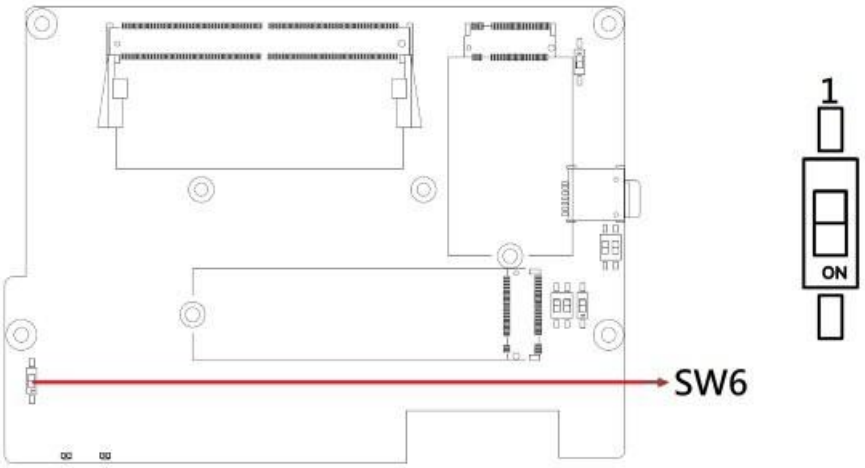
Note: AT: Auto power on; ATX: Manual power on

### 2.3.6 SW4: OOB Scheduled for Power On/Off



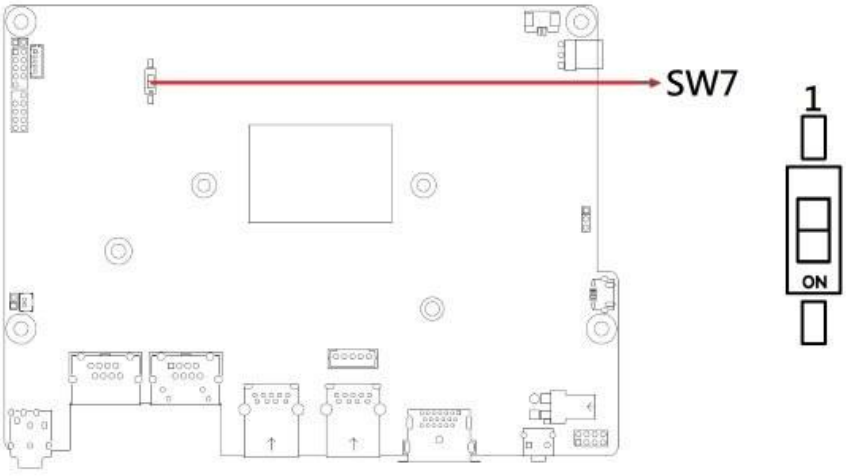

| Function | Setting |
|---|---|
| Disable (default) | P1-OFF |
| Enable | P1-ON |

### 2.3.7 SW6: LED HW/SW Control Function



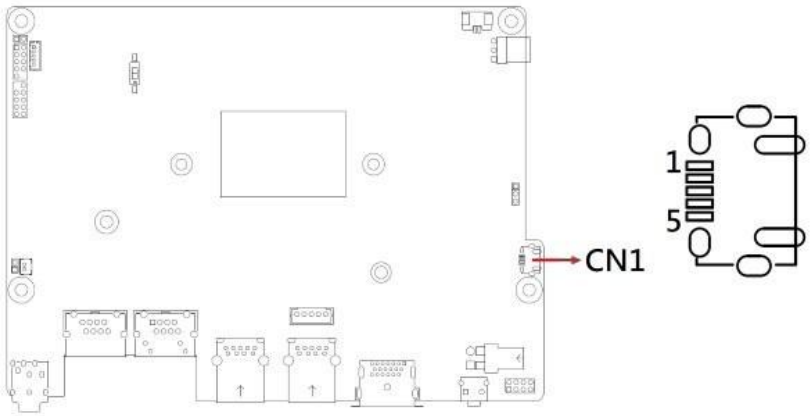

| Function | Pin closed |
|---|---|
| S/W | P1-OFF |
| H/W (default) | P1-ON |

### 2.3.8 SW7: Sierra EM9191 5G Card USB/PCIe Select



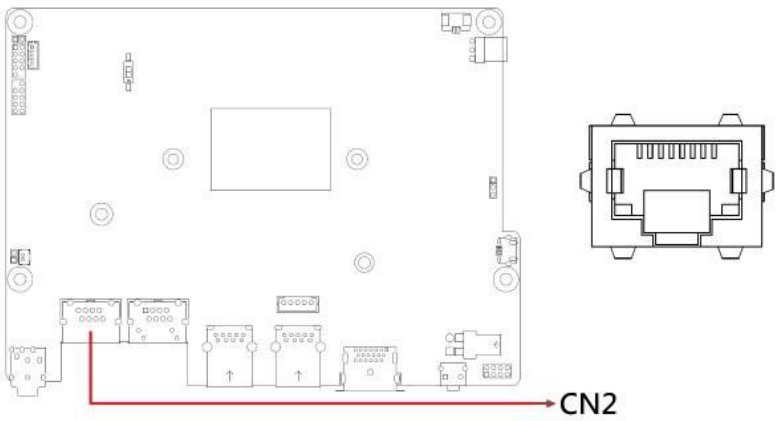

| Function | Pin closed |
|---|---|
| USB (default) | P1-OFF |
| PCIe | P1-ON |

### 2.3.9 CN1: Micro USB Connector



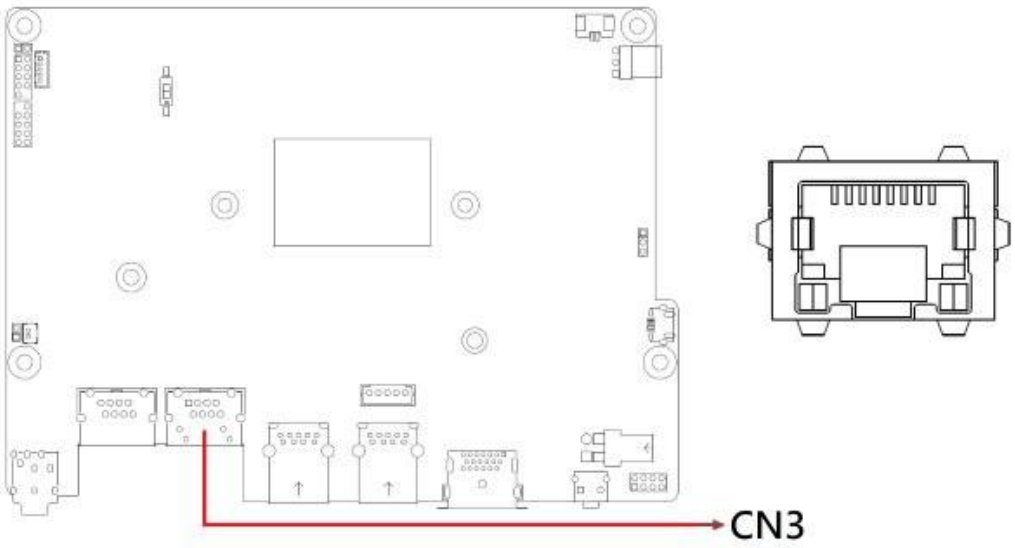

**OOB FW upgrade.**
**Remarks: Factory use only.**

### 2.3.10 CN2: COM1 RS-232 Port RJ-45 Connector

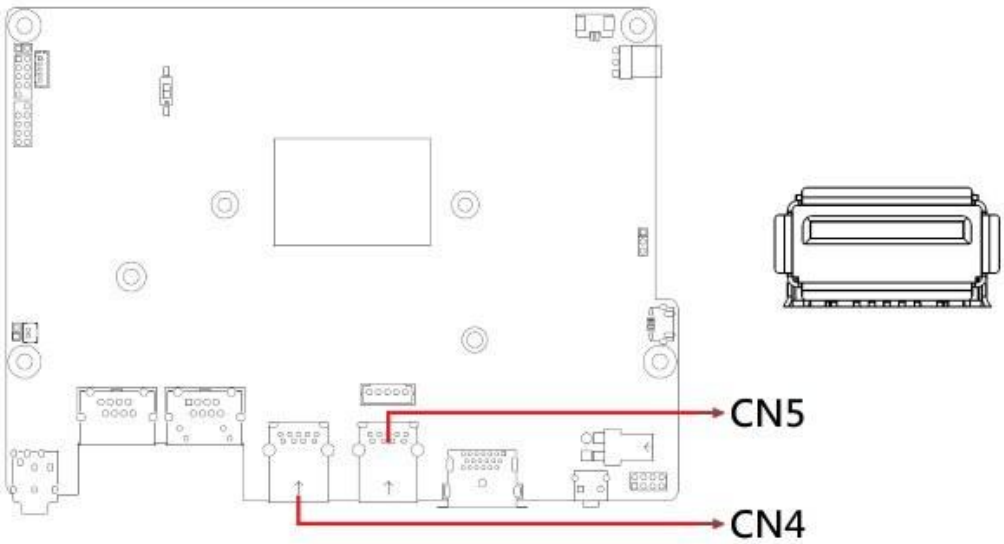



| Pin | Signal Name |
|---|---|
| | RS-232 |
| 1 | RTS |
| 2 | DTR |
| 3 | TX |
| 4 | Ground |
| 5 | Ground |
| 6 | RX |
| 7 | DSR |
| 8 | CTS |

### 2.3.11 CN3: LAN Connector

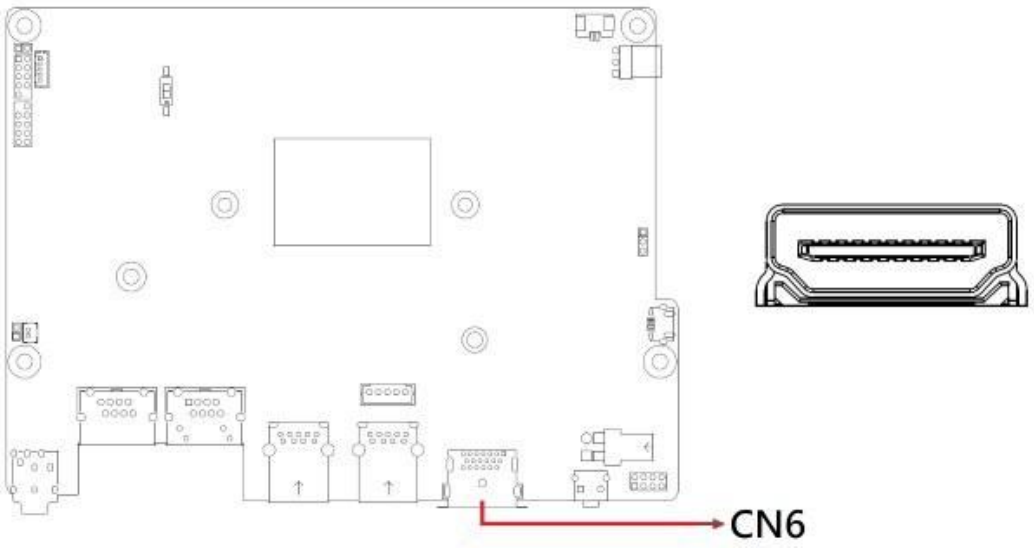



### 2.3.12 CN4, CN5: USB 3.2 Connector

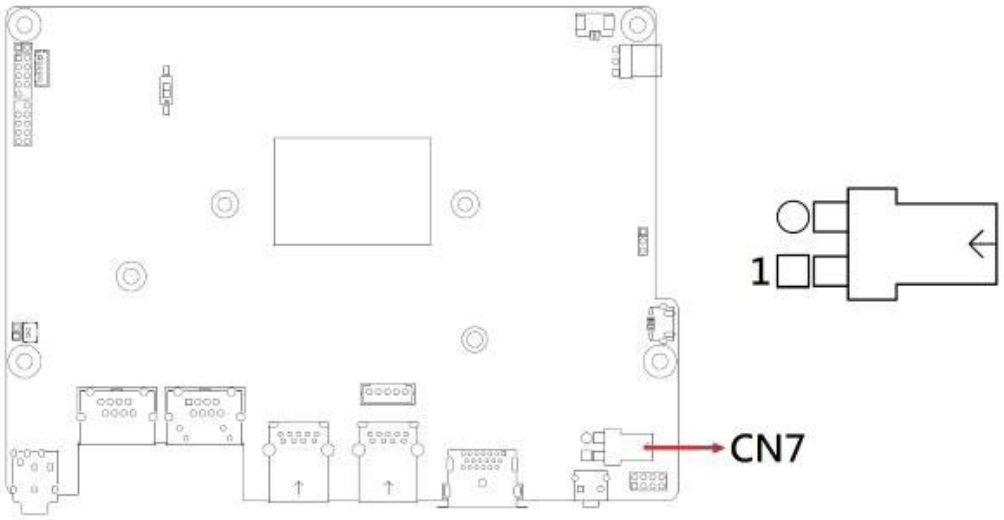



*Note: CN5 supports PDPC*

### 2.3.13 CN6: HDMI Connector

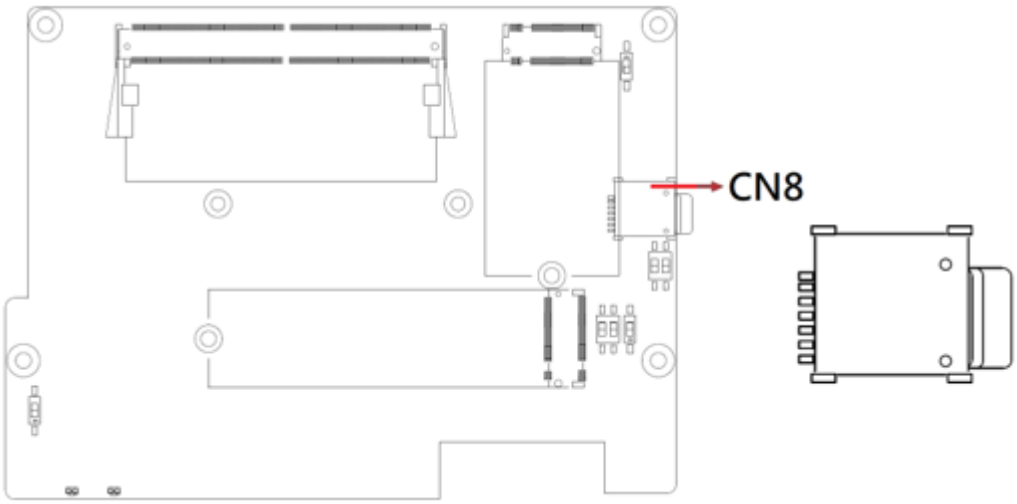



### 2.3.14 CN7: DC Power Input Connector

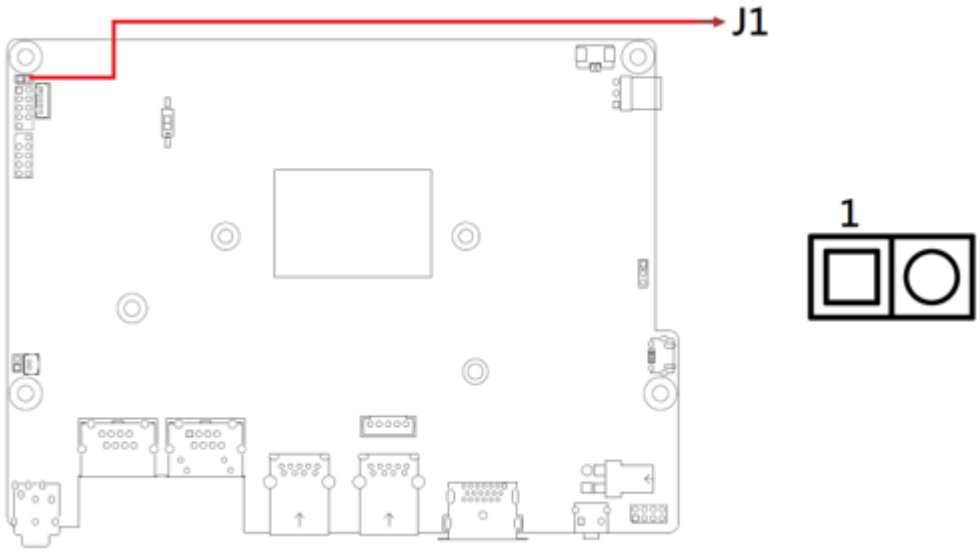



| Pin | Assignment |
|---|---|
| 1 | Ground |
| 2 | +12V |

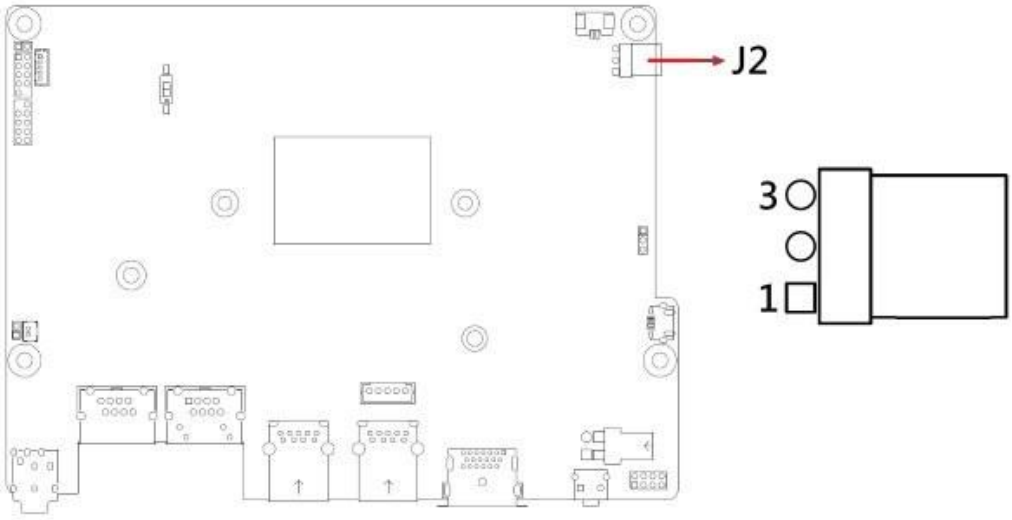
### 2.3.15 CN8: SIM Card Slot




### 2.3.16 J1: Factory Use Only



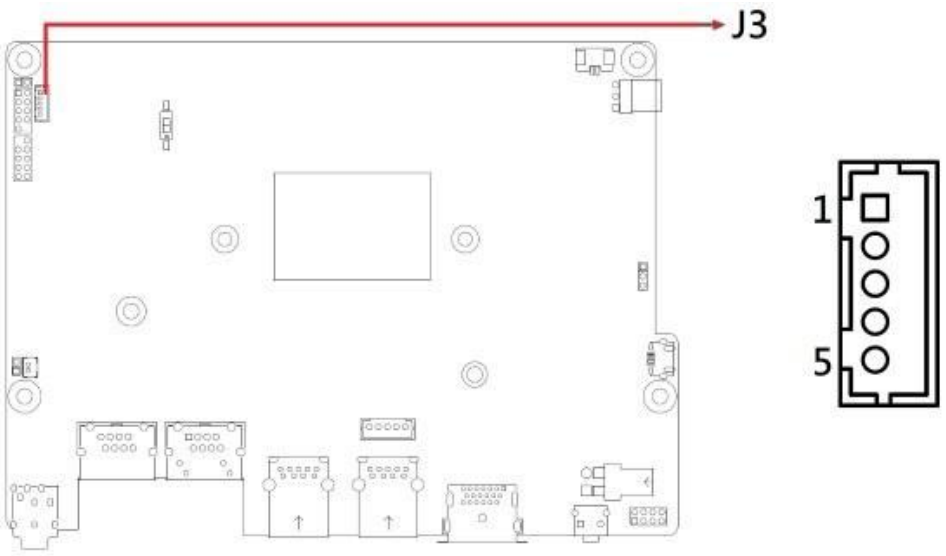
### 2.3.17 J2: OOB Debug COM Port




| Pin | Assignment |
|---|---|
| 1 | TXD |
| 2 | RXD |
| 3 | Ground |

*Remarks: Factory use only.*

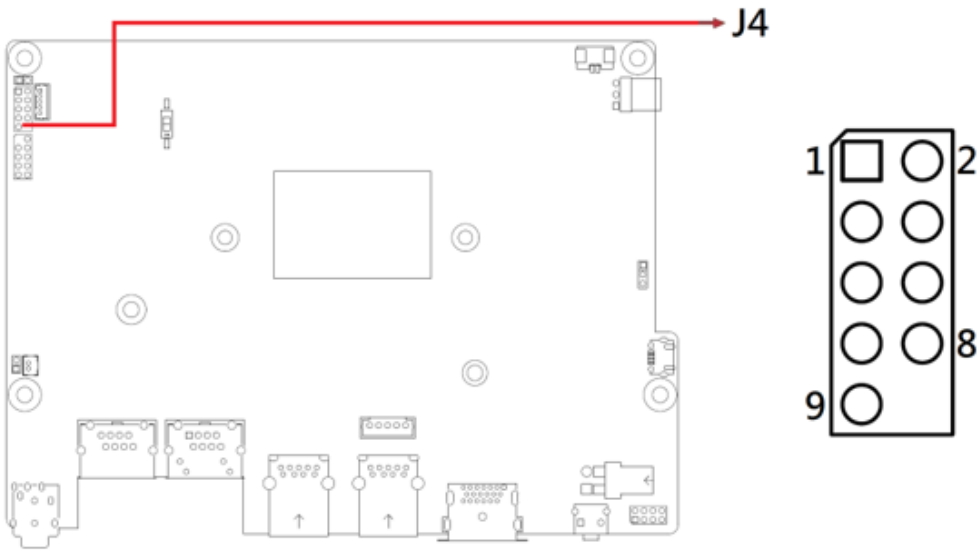
### 2.3.18 J3: iSMART FW Upgrade Connector




*Remarks: Factory use only.*

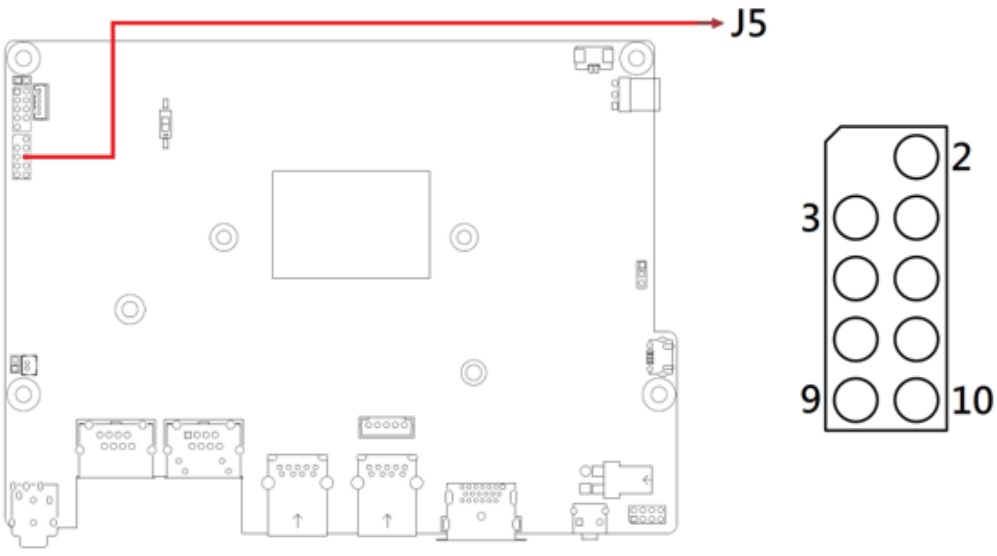
| Pin | Assignment |
|---|---|
| 1 | +3.3V |
| 2 | SBWTCK |
| 3 | SBWTDIO |
| 4 | MCU_RESET |
| 5 | Ground |

### 2.3.19 J4: Debug 80 Port



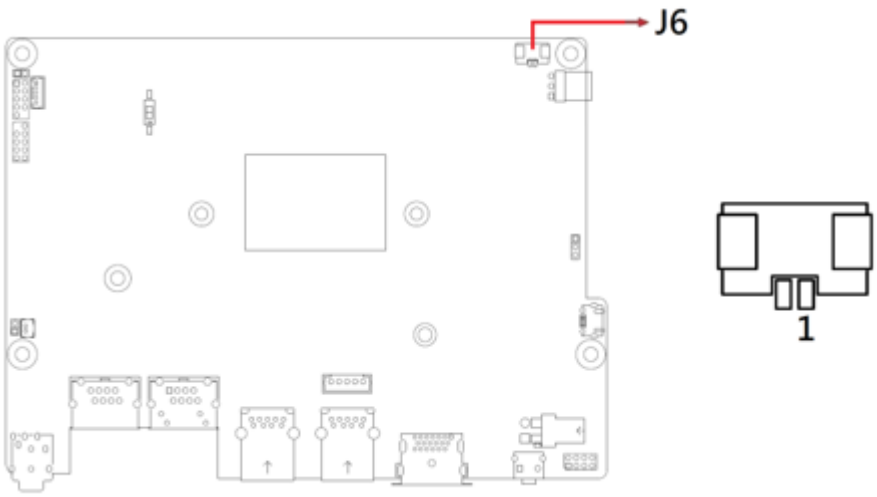

*Remarks: Factory use only.*

### 2.3.20 J5: SPI Flash Tool Connector




*Remarks: Factory use only.*

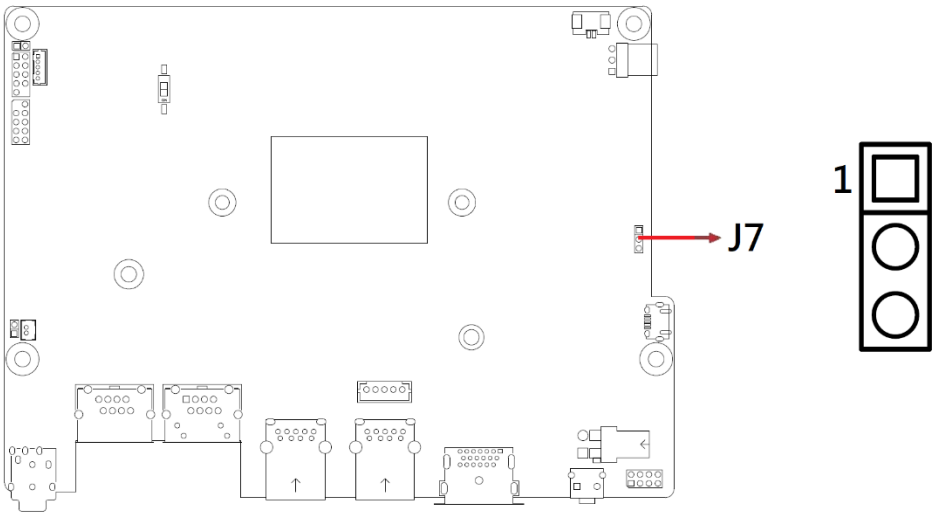
### 2.3.21 J6: RTC Battery Connector



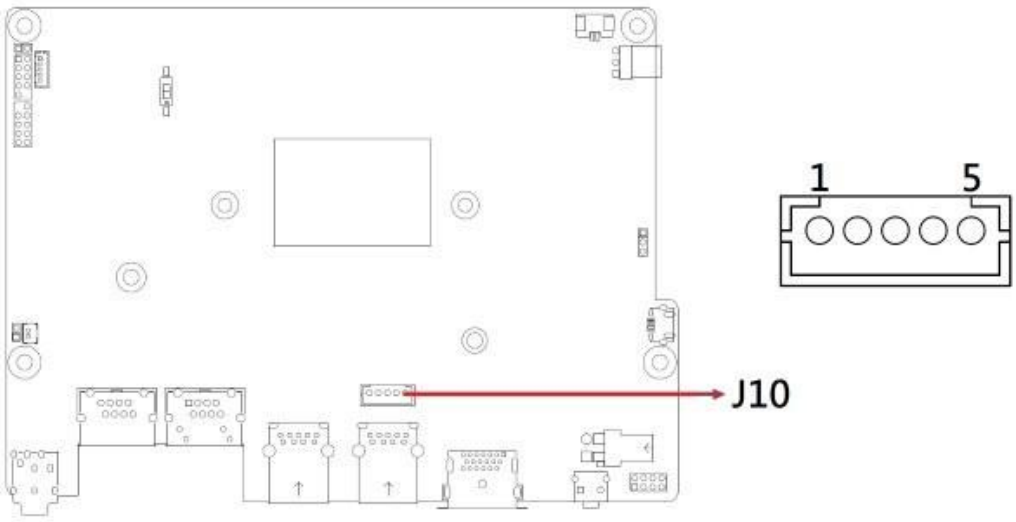

*Note: Coin battery with cable.*

| Pin | Assignment |
|---|---|
| 1 | +3V |
| 2 | Ground |

### 2.3.22 J7: Factory Use Only

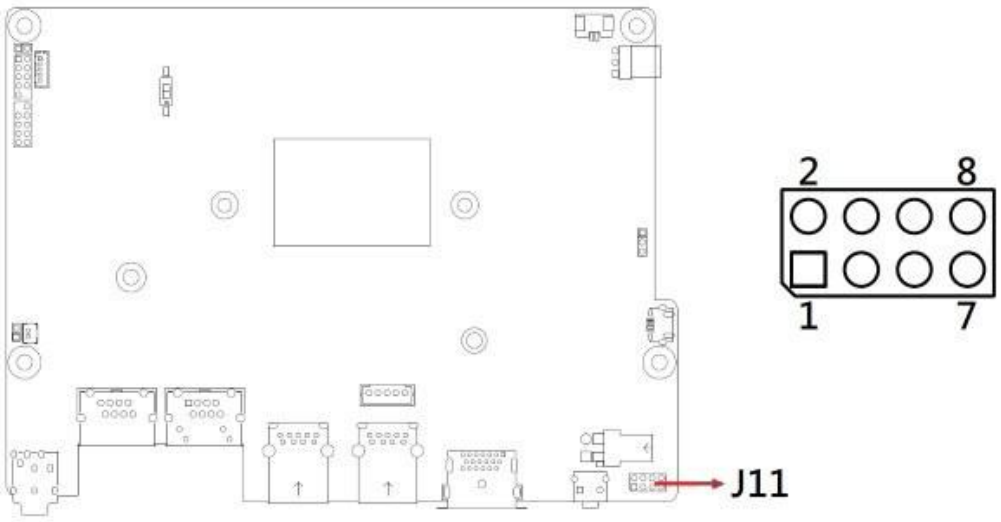


### 2.3.23 J10: CEC FW Upgrade




*Remarks: Factory use only.*

### 2.3.24 J11: Front Panel Connector




| Pin | Assignment | Pin | Assignment |
|---|---|---|---|
| 1 | Ground | 2 | PWR_BTN+ |
| 3 | HDD_LED+, 3.3V | 4 | HDD Active |
| 5 | Ground | 6 | Reset |
| 7 | POWER_LED+, 5V | 8 | Ground |

J11 is utilized for system indicators to provide light indication of the computer activities and switches to change the computer status. It provides interfaces for the following functions:

- **ATX Power ON Switch (Pins 1 and 2)**

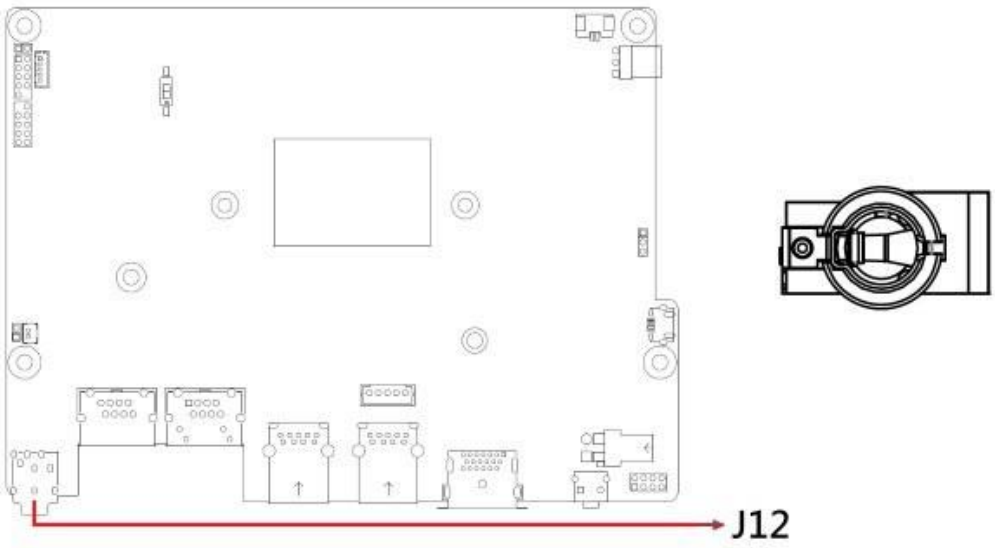
  The 2 pins make an “ATX Power Supply On/Off Switch” for the system that connects to the power switch on the case. When pressed, the power switch will force the system to power on. When pressed again, it will power off the system.
- **Hard Disk Drive LED Connector (Pins 3 and 4)**

  This connector connects to the hard drive activity LED on control panel. This LED will flash when the HDD is being accessed.
- **Reset Switch (Pins 5 and 6)**

  The reset switch allows you to reset the system without turning the main power switch off and then on again. Orientation is not required when making a connection to this header.
- **Power LED (Pins 7 and 8)**

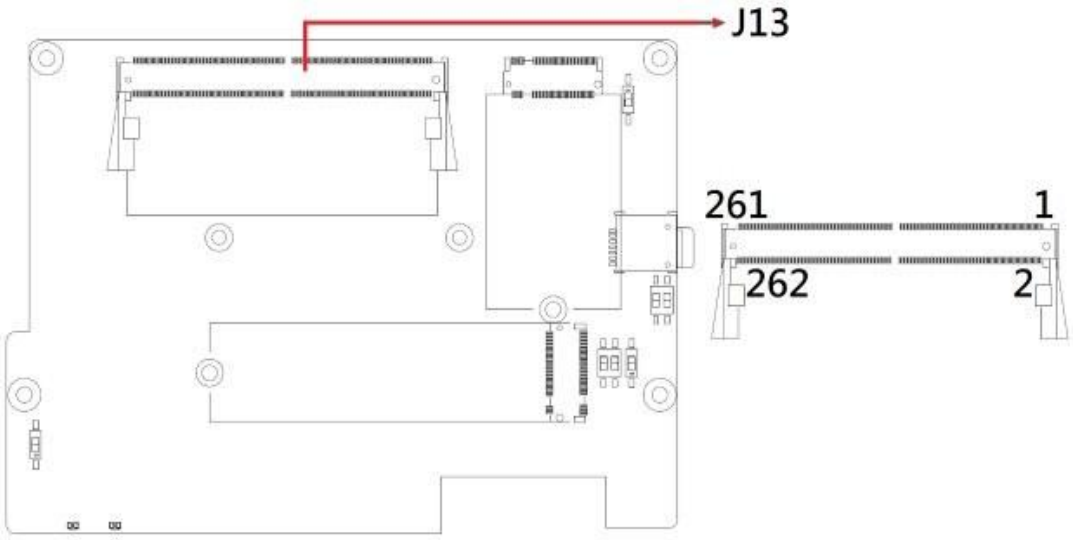
  This connector connects to the system power LED on control panel. This LED will light when the system turns on.

### 2.3.25 J12: Audio Phone Jack

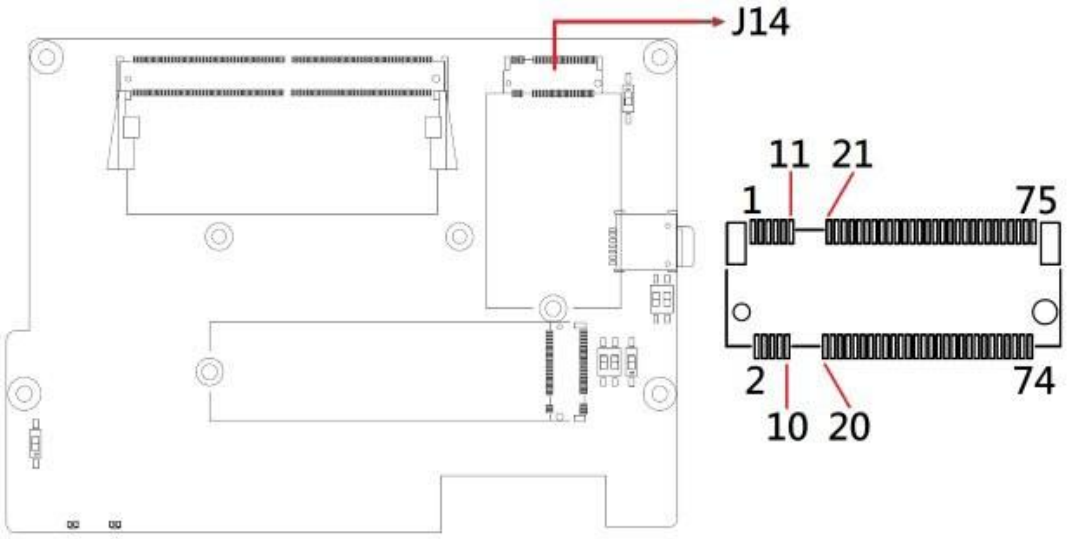



*Note: Line out only.*

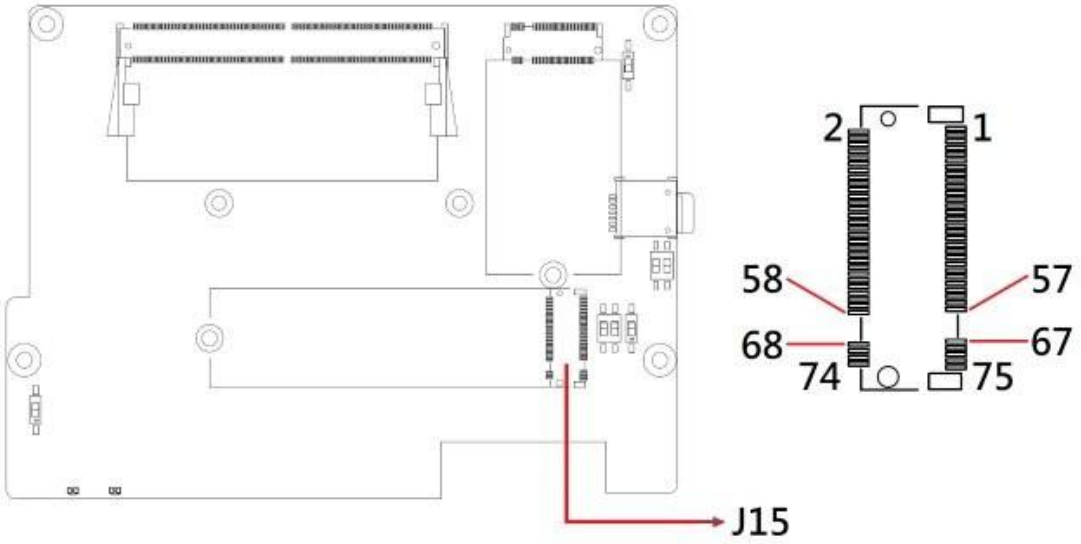
### 2.3.26 J13: DDR5 SO-DIMM Connector



### 2.3.27 J14: M.2 B-Key 3052 Connector

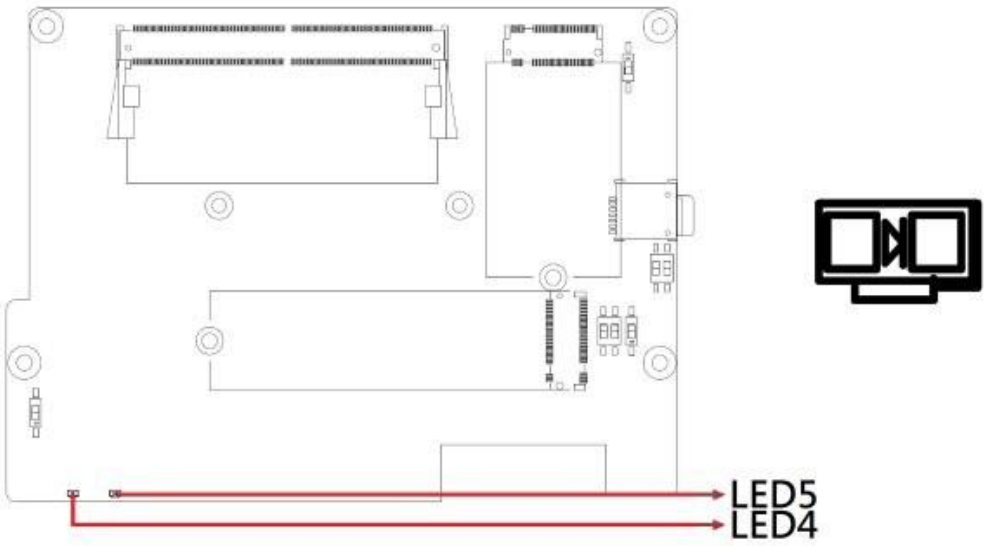



### 2.3.28 J15: M.2 M-Key 2280 Connector




***Note: PCIe x2, SATA***

### 2.3.29 LED4, LED5: LED Indicator Lights




**Note**: Use SW6 to set LED function.
Hardware Control (Default)
LED4: HDD LED(Green)
LED5: POWER LED(Red)

Software Control by Super-IO GPO
LED4: Green LED
LED5: Red LED
GPO_L：LED_ON
GPO_H：LED_OFF*

# Chapter 3
# Driver Installation

The information provided in this chapter includes:

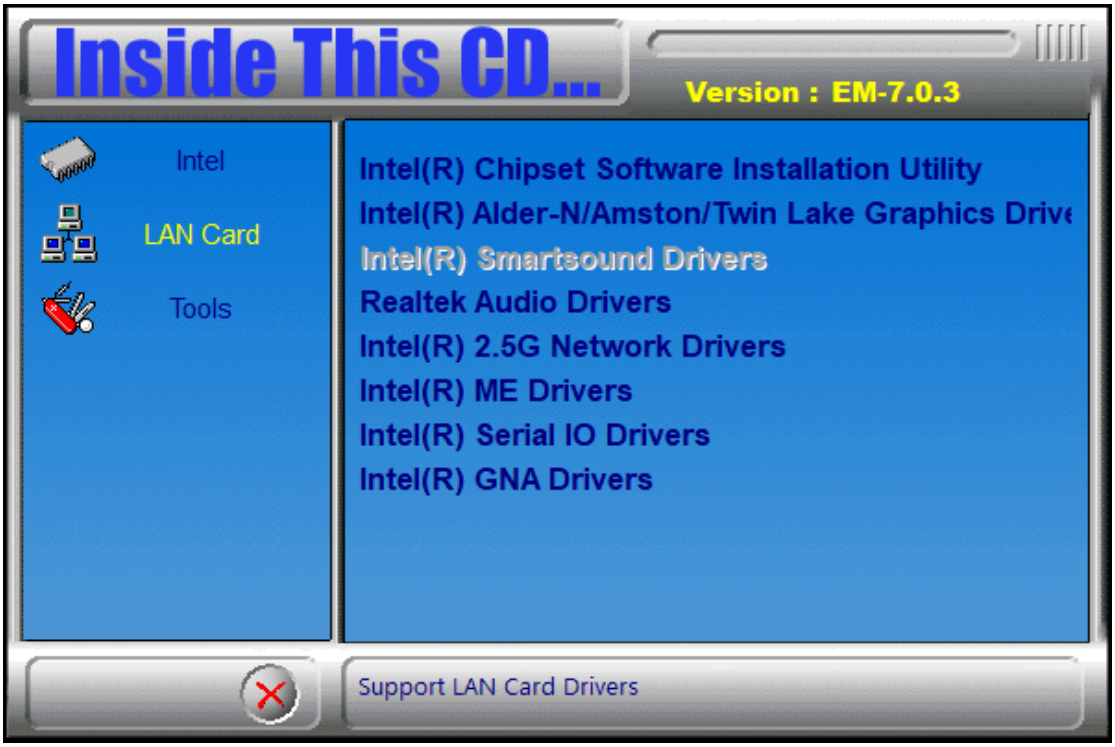
- Intel(R) Chipset Software Installation Utility
- Intel(R) Alder-N/Amston/Twin Lake Graphics Driver
- Realtek Audio Drivers
- Intel(R) 2.5G Network Drivers
- Intel(R) ME Drivers
- Intel(R) Serial IO Drivers
- Intel(R) GNA Drivers

## 3.1 Introduction

This section describes the driver installation procedure. Drivers are available on the IBASE website. Download and extract the driver package, then run "CDGuide" to open the main driver menu.
**Note: Install the Intel® Chipset Software Installation Utility before installing other drivers.**

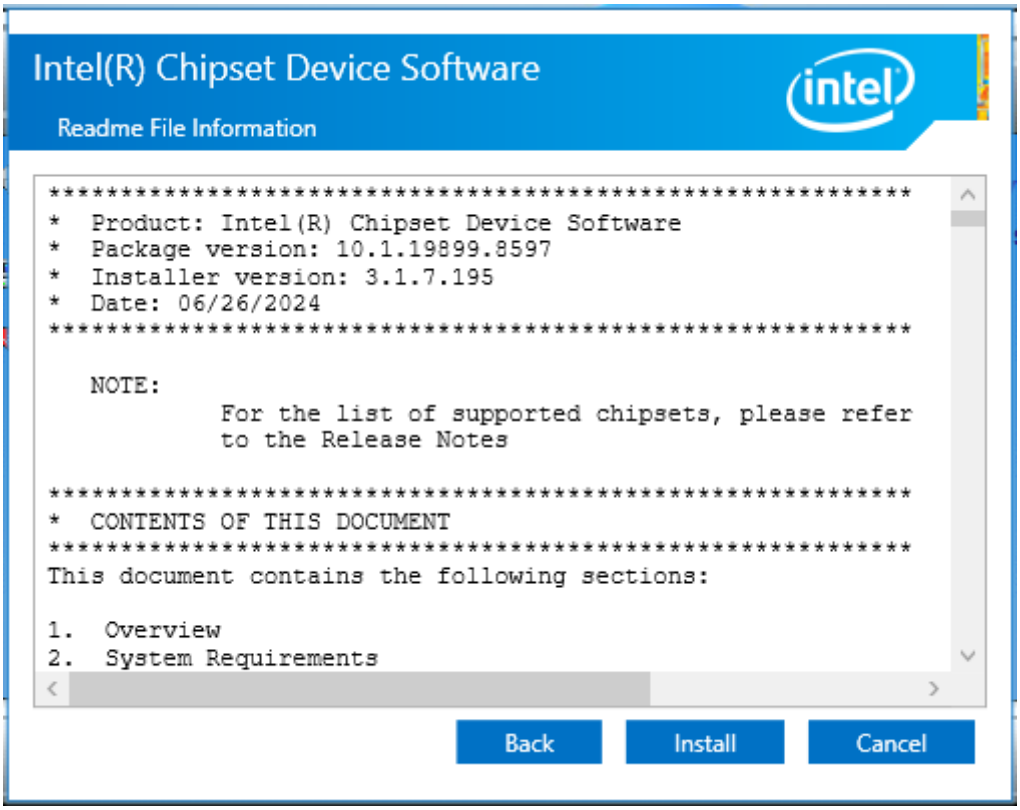
## 3.2 Intel® Chipset Software Installation Utility

1. Click **Intel** on the left pane and then **Intel(R) Alder-N/Amston/Twin Lake Chipset Drivers**. Click **Intel(R) Chipset Software Installation Utility**.

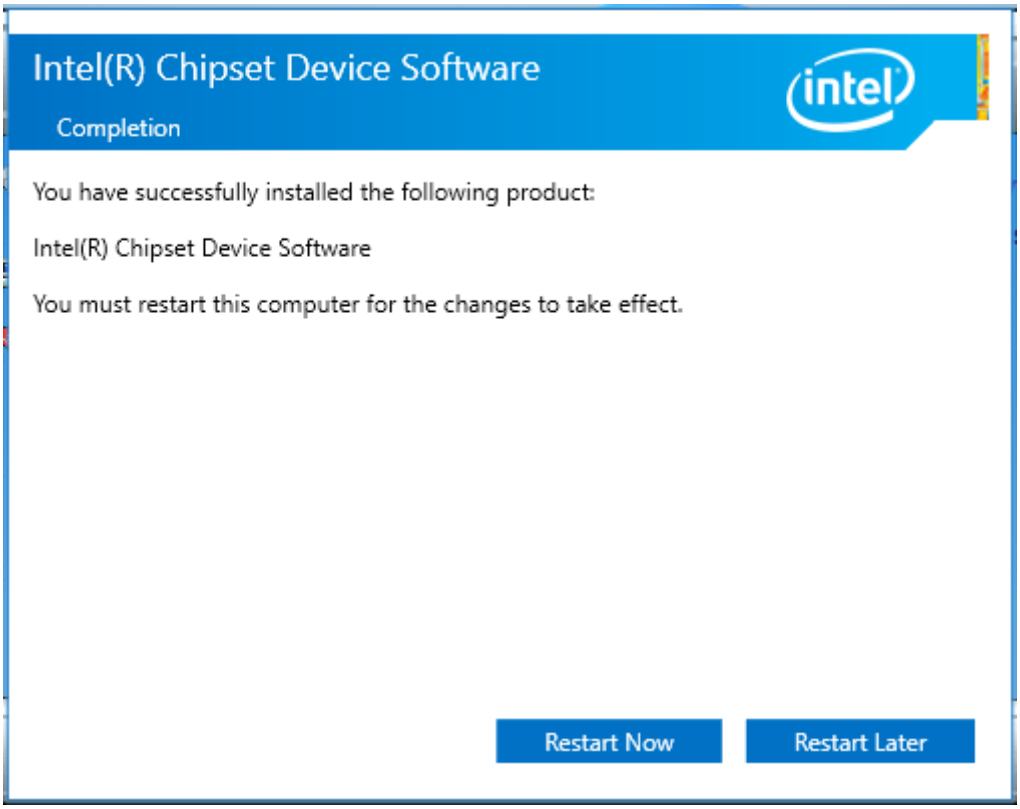



2. When the Welcome screen to the Intel® Chipset Device Software appears, click **Next** to continue.


3. On the Readme File Information screen, click **Install**.

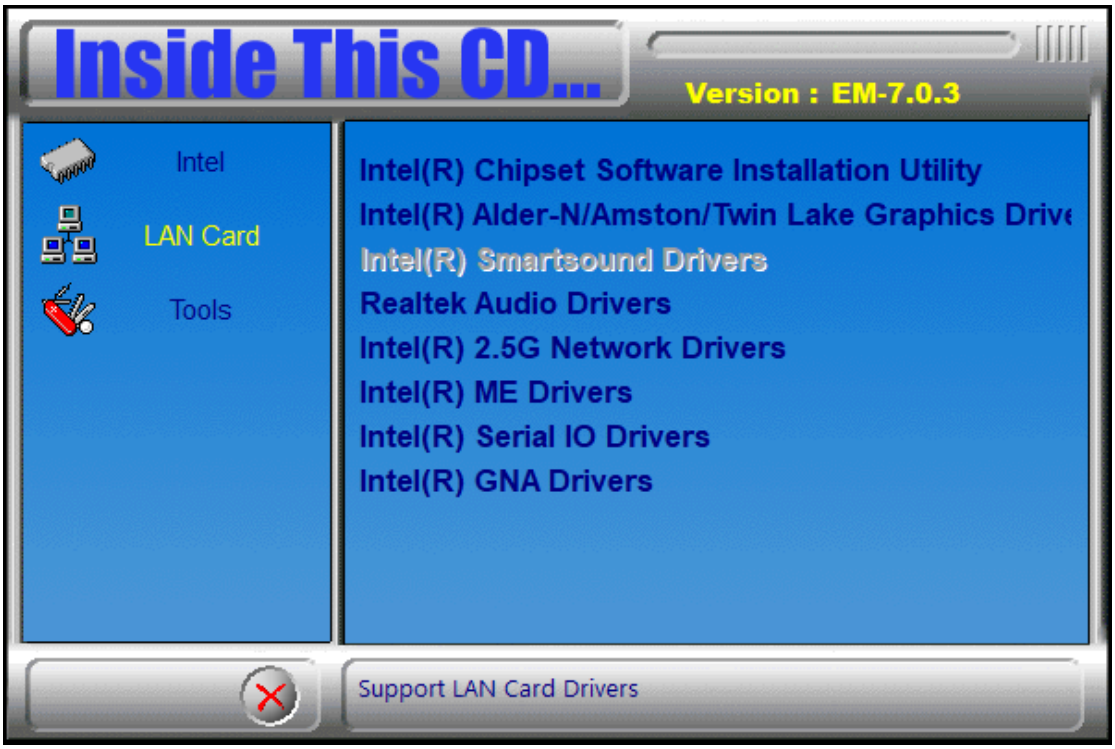



4. After the Intel® Chipset Device Software has been installed, restart the system.


Intel(R) Chipset Device Software
Completion
intel
You have successfully installed the following product:
Intel(R) Chipset Device Software
You must restart this computer for the changes to take effect.
Restart Now
Restart Later

## 3.3 Graphics Driver Installation

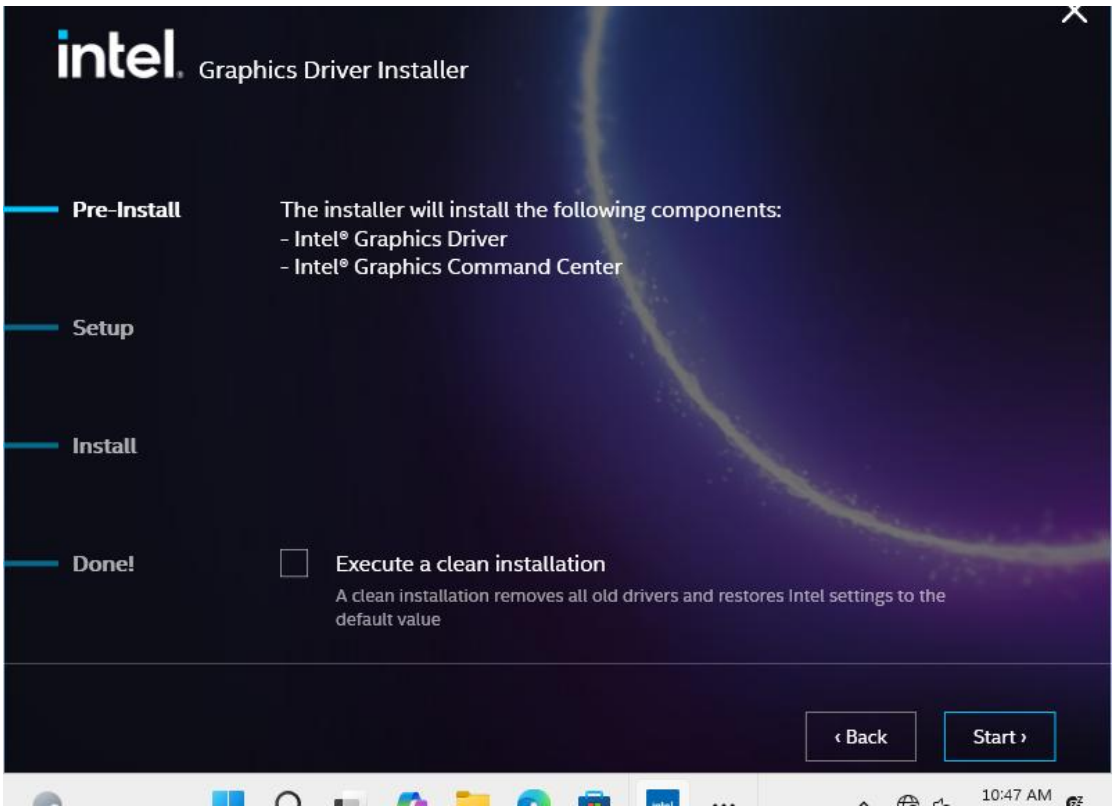
1. Click **Intel** on the left pane and then **Intel(R) Alder-N/Amston/Twin Lake Chipset Drivers**. Click **Intel(R) Alder-N/Amston/Twin Lake Graphics Driver**.



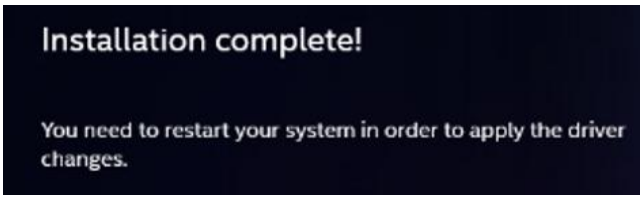

2. On the following screen, click **Begin Installation**.

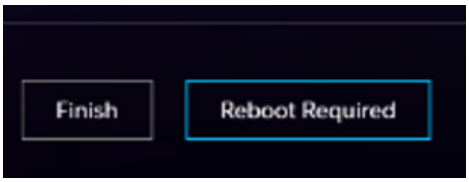

3. Agree to accept the INTEL SOFTWARE LICENSE AGREEMENT.

4. On the next screen, click **Start**.



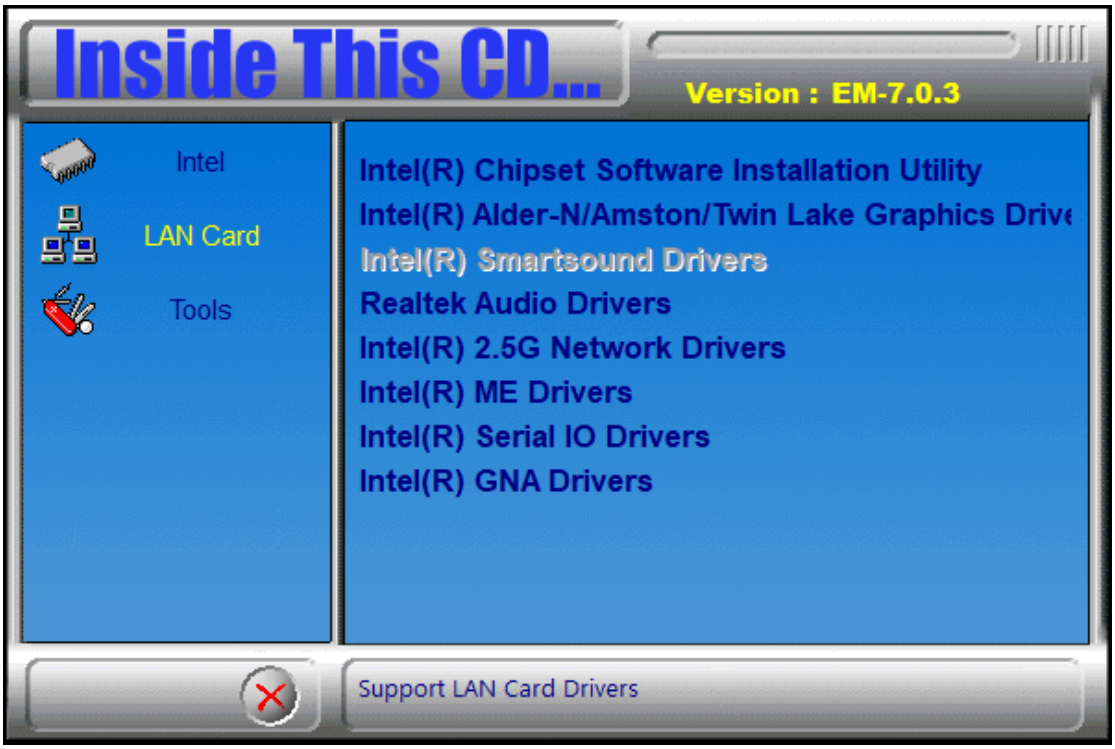

5. After the installation has been completed, click **Finish**.



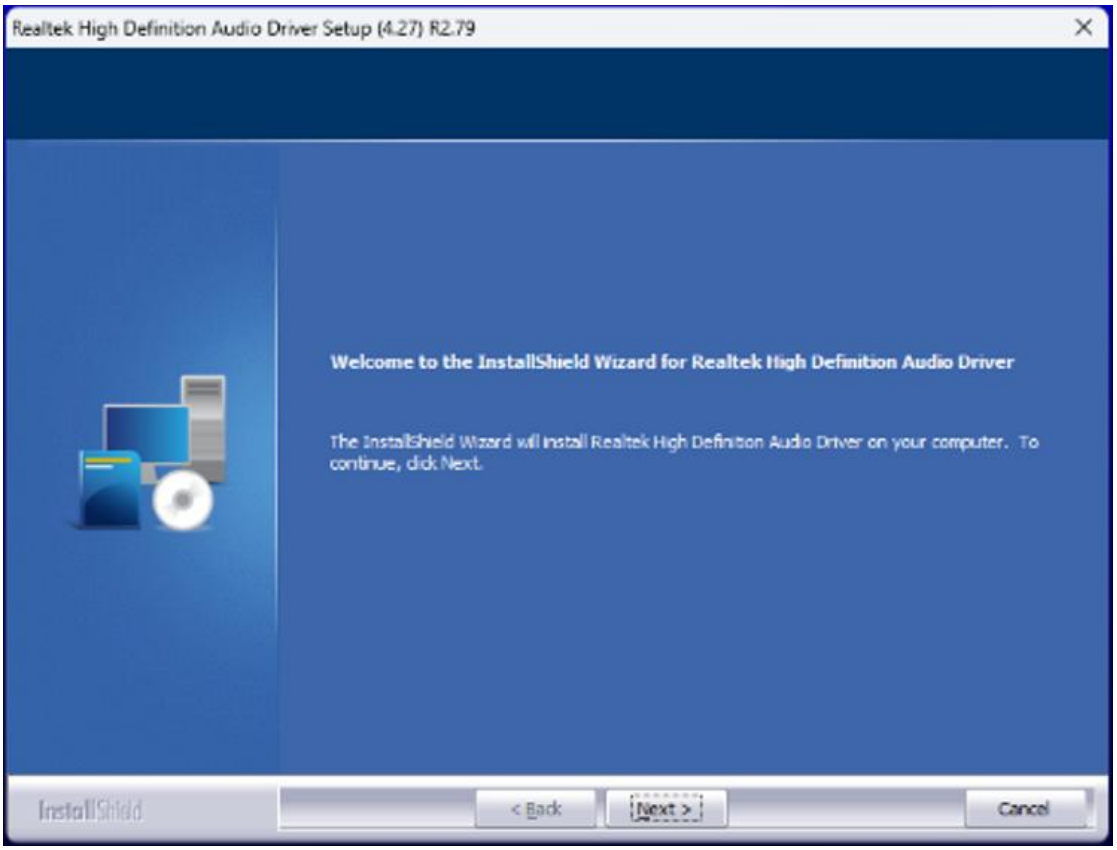



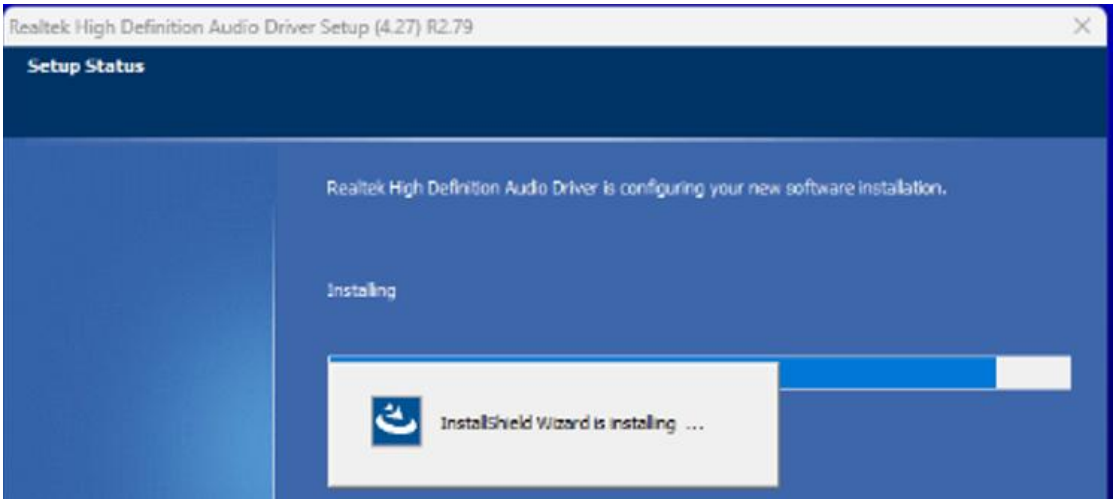
## 3.4 HD Audio Driver Installation

1. Click **Intel** on the left pane and then **Intel(R) Alder-N/Amston/Twin Lake Chipset Drivers.** Click **Realtek Audio Drivers**, then click **Realtek Audio DCH Drivers**.




2. On the Welcome screen, click **Next** to continue.



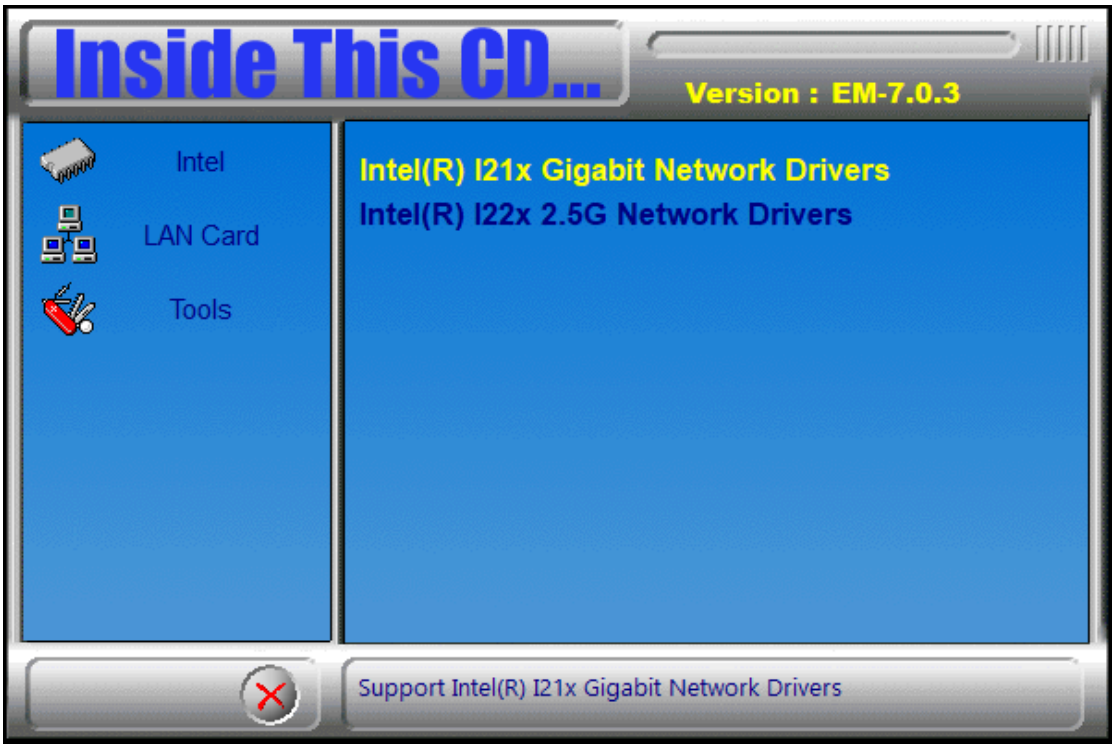




3. When the InstallShield Wizard has successfully installed the Realtek Audio Driver, click **Finish** to complete setup.

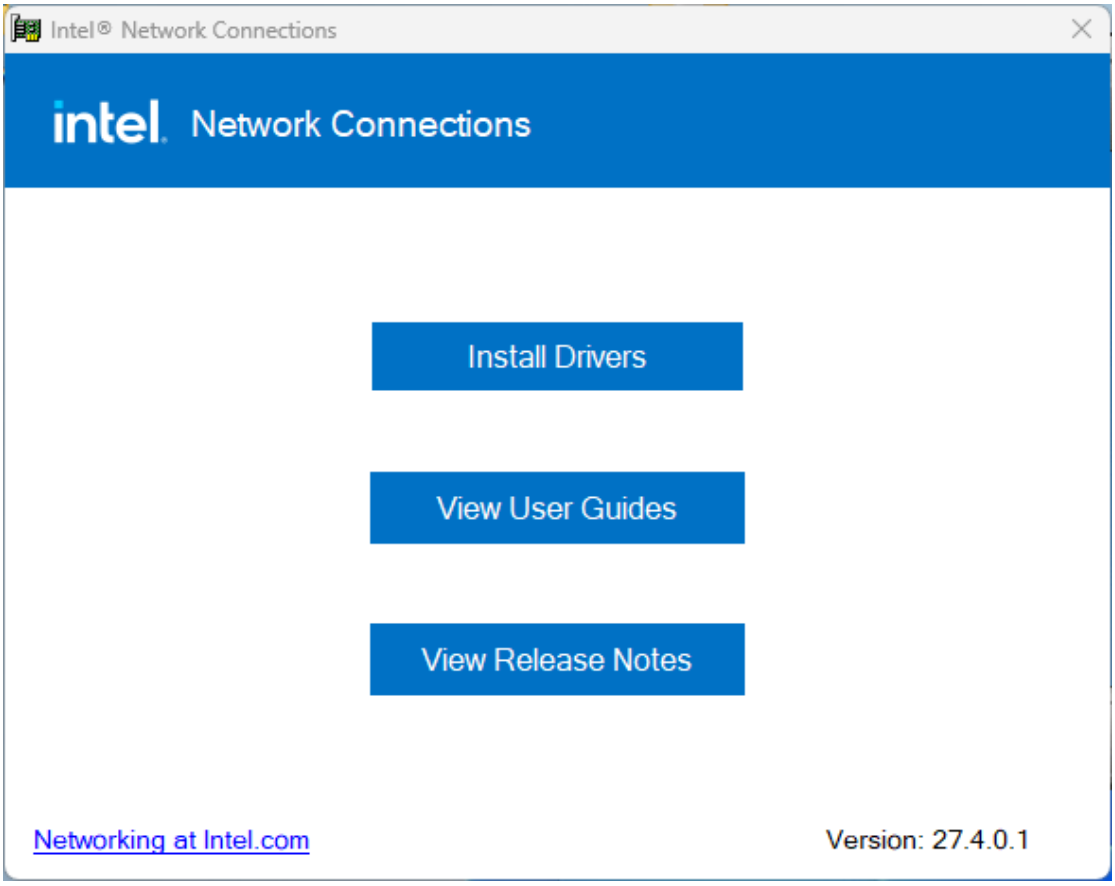
## 3.5 LAN Drivers Installation

1. Click **Intel** on the left pane and then **Intel(R) Alder-N/Amston/Twin Lake Chipset Drivers**. Click **Intel(R) 2.5G Network Drivers**.

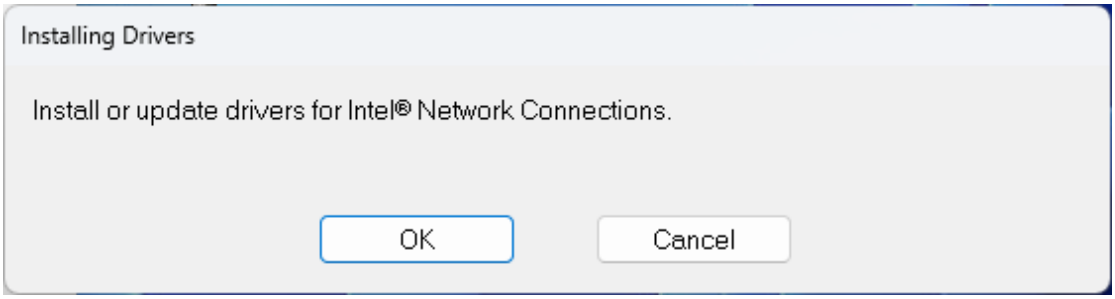

2. Click **Intel(R) 121x Gigabit Network Drivers**.



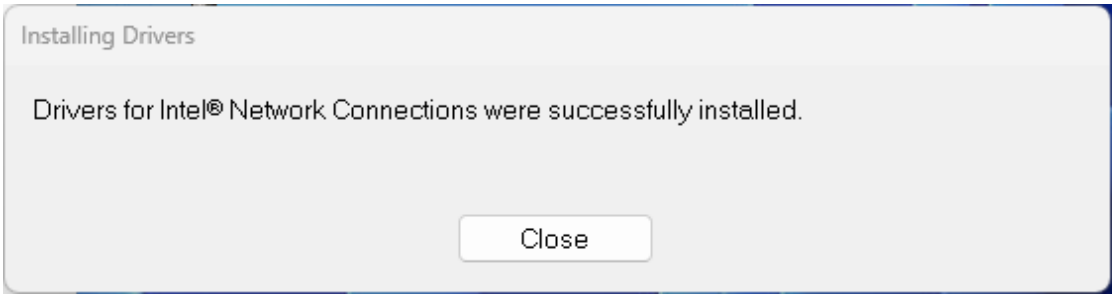
3. Choose **Install Drivers**.




4. Click OK to install the drivers.



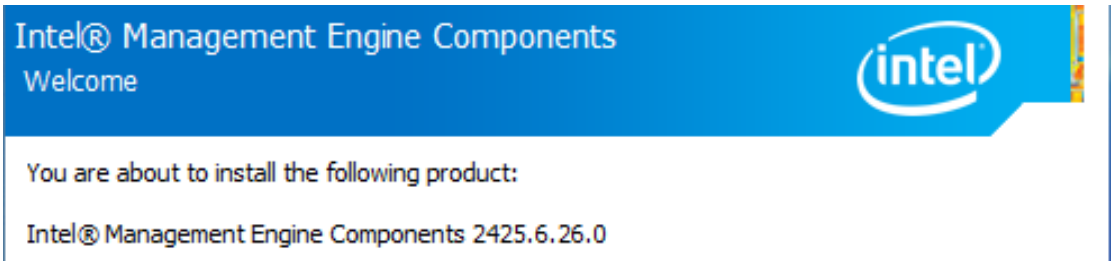

5. Click **Close** when the Drivers for Intel® Network Connections are installed.



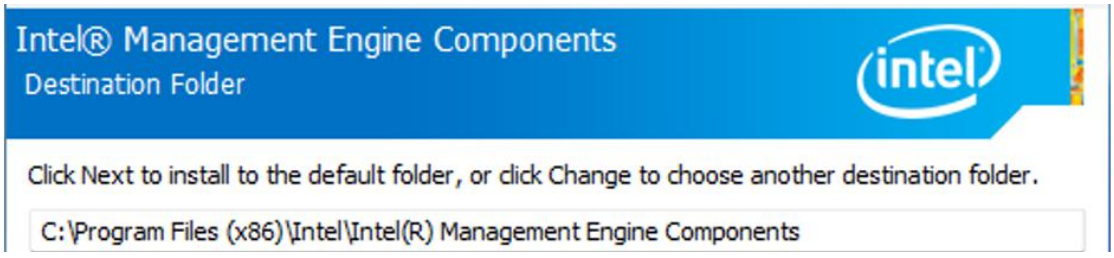
## 3.6 Intel® ME Drivers Installation

1. Click **Intel** on the left pane and then **Intel(R) Alder-N/Amston/Twin Lake Chipset Drivers**. Click **Intel(R) ME Drivers**.


2. When the welcome screen to the Intel® Management Engine Components appears, click **Next**.




3. Accept the license agreement and click **Next**.
4. On the Setup's Destination Folder screen, click **Next**.



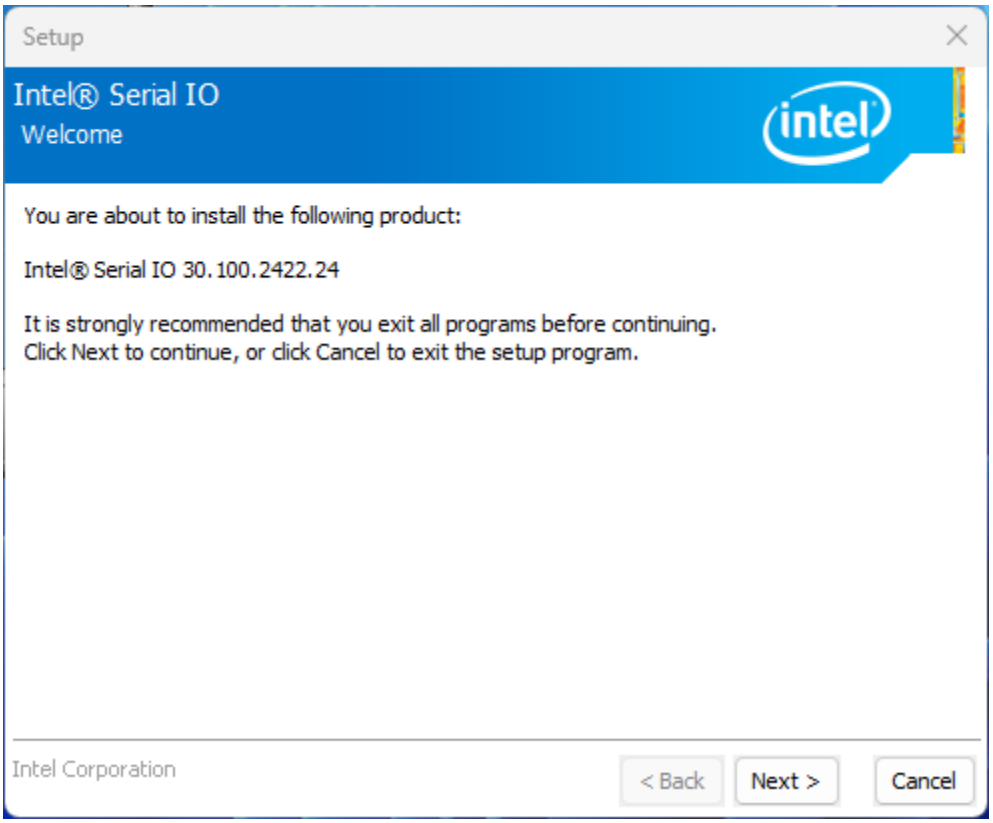

5. After the components have been completely installed, click **Finish**.

- Intel® Management Engine Interface
- Intel® Dynamic Application Loader
- Intel® Trusted Connect Service

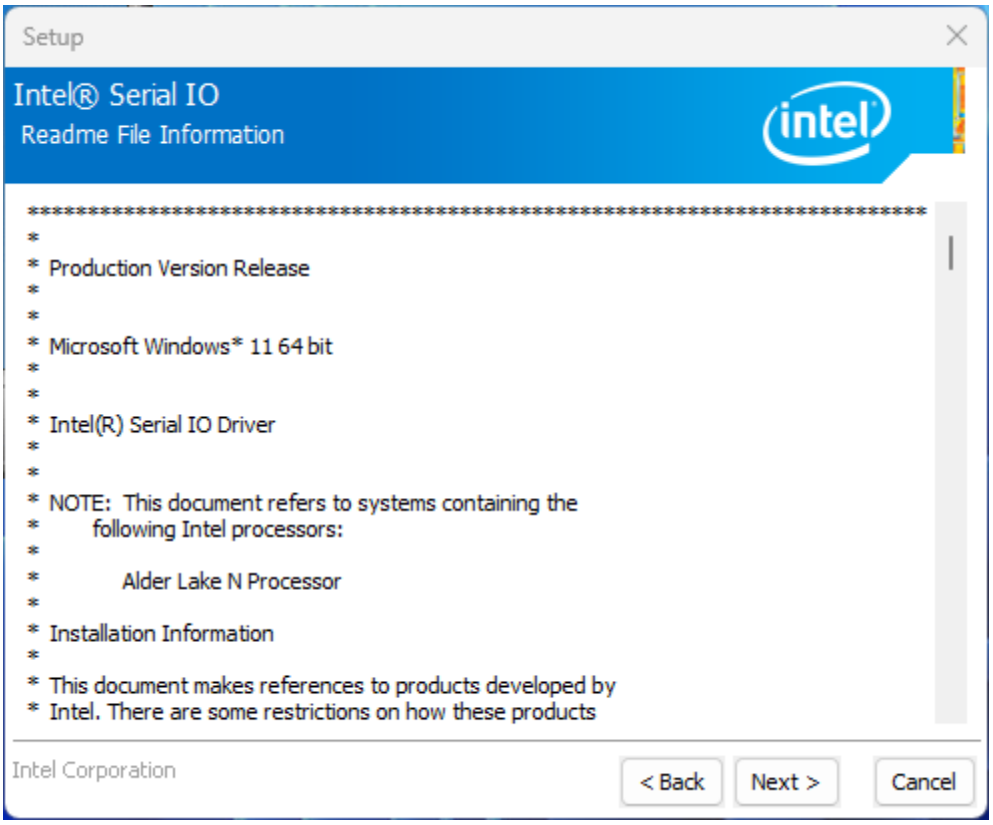
## 3.7 Intel® Serial IO Drivers Installation

1. Click **Intel** on the left pane and then **Intel(R) Alder-N/Amston/Twin Lake Chipset Drivers**. Click **Intel(R) Serial IO Drivers**.

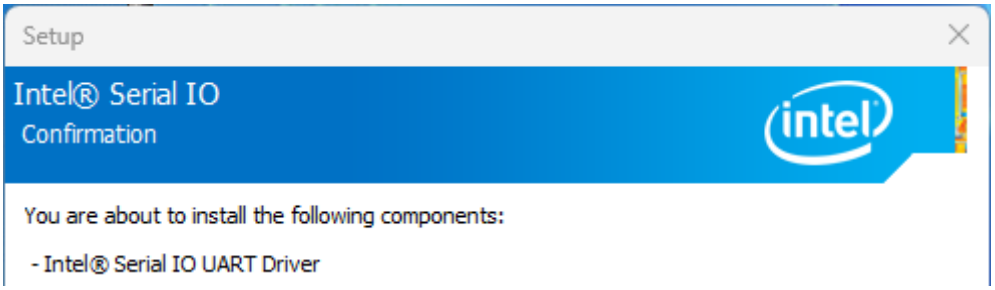

2. When the welcome screen to the Intel® Serial IO appears, click **Next**.



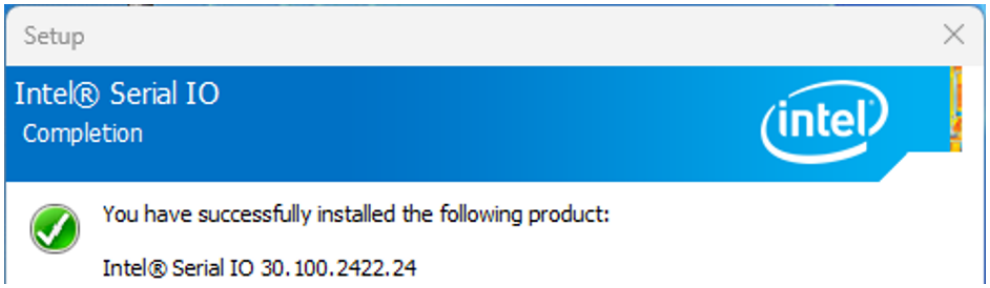
3. Agree to the terms in the license agreement. Click **Next**.
4. In the Readme File Information screen, click **Next**.




5. In the Confirmation screen, click **Next** to install the driver components.



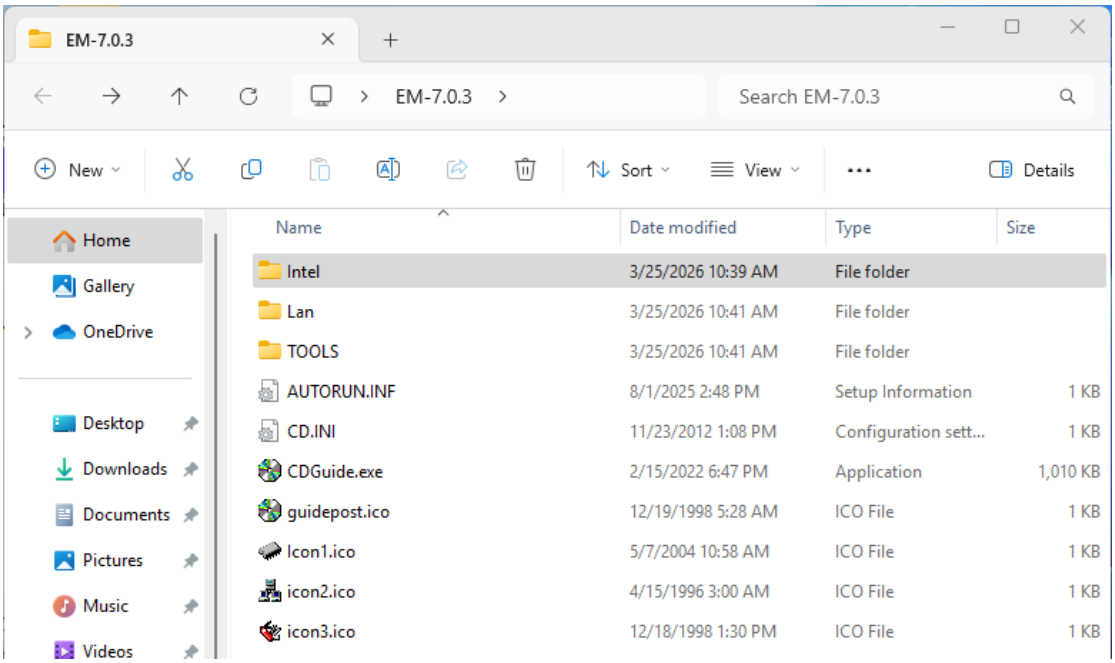

6. When the Intel® Serial IO has been installed, click **Finish**.

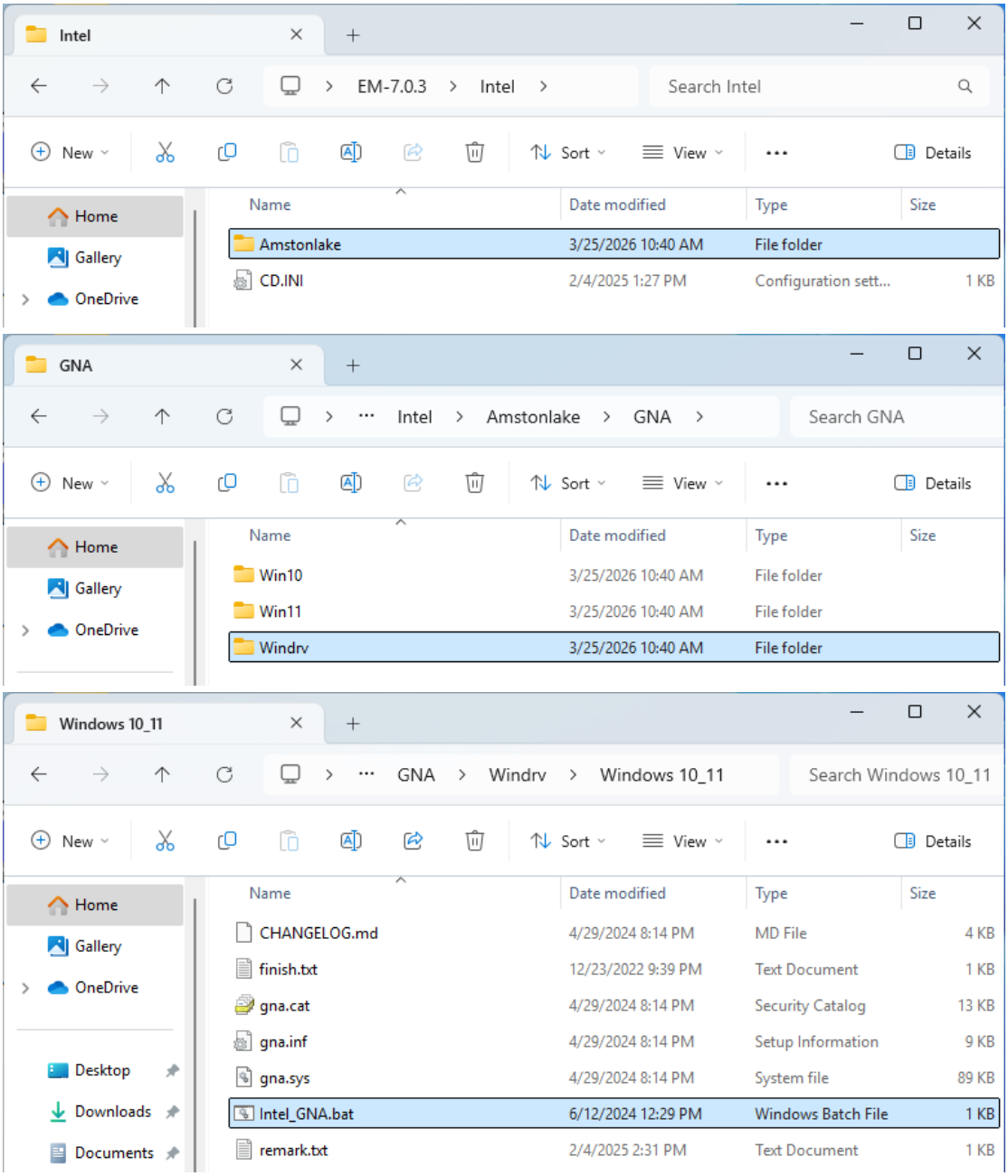


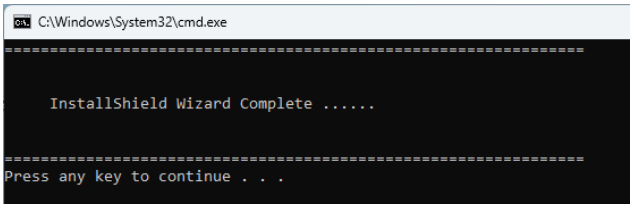
## 3.8 Intel® GNA Drivers Installation

1. Click **Intel** on the left pane and then **Intel(R) Alder-N/Amston/Twin Lake Chipset Drivers**. Click **Intel(R) GNA Drivers**.


2. Run the Intel_GNA.bat batch file for InstallShield Wizard to start and complete the installation. Follow the on-screen prompts and click the folders that appear during the process.






3. When InstallShield Wizard has completed the installation, press any key to continue.

# Chapter 4
# BIOS Setup

This chapter describes the different settings available in the AMI BIOS. The topics covered in this chapter are as follows:

- Main Settings
- Advanced Settings
- Chipset Settings
- Security Settings
- Boot Settings
- Save & Exit

## 4.1 Introduction

The BIOS (Basic Input/Output System) installed in the ROM of the system supports Intel® processors. The BIOS provides critical low-level support for standard devices such as disk drives and serial ports. It also provides password protection as well as special support for detailed fine-tuning of the chipset controlling the entire system.

## 4.2 BIOS Setup

The BIOS provides a Setup utility program for specifying the system configurations and settings. The BIOS ROM of the system stores the Setup utility. When you turn on the computer, the BIOS is immediately activated. Pressing the <Del> key immediately allows you to enter the Setup utility. If you are a little bit late pressing the <Del> key, POST (Power On Self Test) will continue with its test routines, thus preventing you from invoking the Setup.

If you still need to enter Setup, restart the system by pressing the ”Reset” button or simultaneously pressing the <Ctrl>, <Alt> and <Delete> keys. You can also restart by turning the system Off and back On again.

The following message will appear on the screen:

```
Press <DEL> to Enter Setup
```

In general, press the arrow keys to highlight items, <Enter> to select, the <PgUp> and <PgDn> keys to change entries, <F1> for help, and <Esc> to quit.

When you enter the BIOS Setup utility, the *Main Menu* screen will appear on the screen. The Main Menu allows you to select from various setup functions and exit choices.

---

**Warning:** It is strongly recommended that you avoid making any changes to the chipset defaults.

These defaults have been carefully chosen by both AMI and the system manufacturer to provide the absolute maximum performance and reliability. Changing the defaults could make the system unstable and crash in some cases.

---

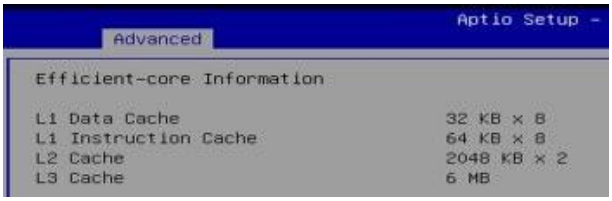
## 4.3 Main Settings


| BIOS Setting | Description |
|---|---|
| System Date | Sets the date.<br>Use the <Tab> key to switch between the date elements. |
| System Time | Set the time.<br>Use the <Tab> key to switch between the time elements. |

## 4.4 Advanced Settings

This section allows the configuration of the system and the selection of the system features according to your preference.

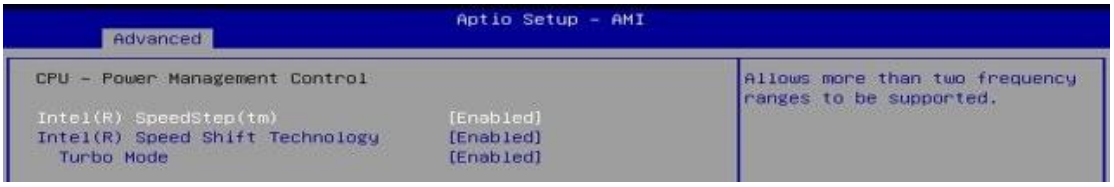
### 4.4.1 CPU Configuration



| BIOS Setting | Description |
|---|---|
| Efficient-core Information | Displays the E-core Information. |
| Intel (VMX) Virtualization Technology | When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology. |
| Active Efficient-cores | Number of E-cores to enable in each processor package. |
| Hyper-Threading | Enable/Disable Hyper-Threading Technology. |
| AES | Enable/Disable AES (Advanced Encryption Standard) |

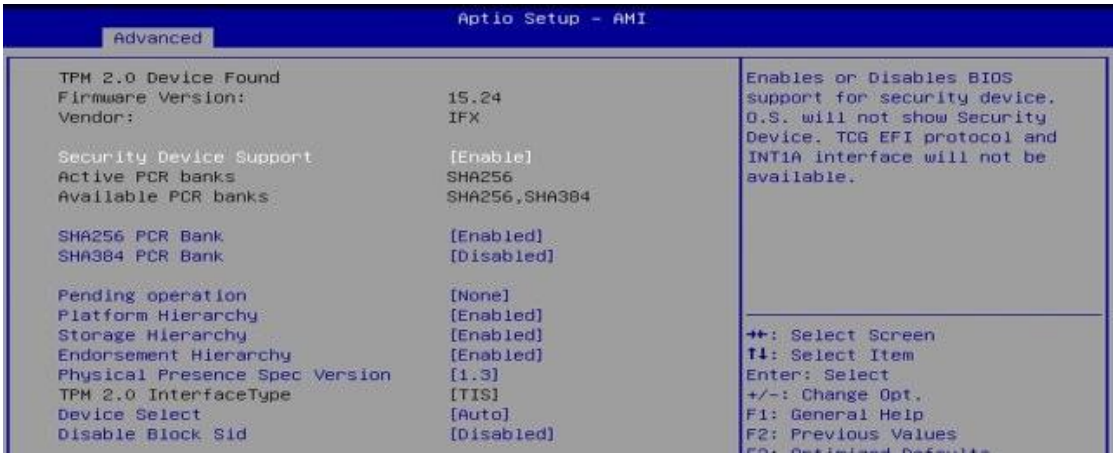
### 4.4.2 Power & Performance


| BIOS Setting | Description |
|---|---|
| CPU – Power Management Control | CPU – Power Management Control Options |
| Intel(R) SpeedStep(tm) | Allows more than two frequency ranges to be supported |
| Intel(R) Speed Shift Technology | Enable/Disable Intel(R) Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states |
| Turbo Mode | Enable/Disable processor Turbo Mode (requires EMTTM enabled too).<br>AUTO means enabled. |

### 4.4.3 PCH-FW Configuration


### 4.4.4 Trusted Computing




| BIOS Setting | Description |
|---|---|
| Security Device Support | Enables / Disables BIOS support for security device. OS will not show security device. TCG EFI protocol and INTIA interface will not be available. |
| SHA256/384 PCR Bank | Enables / Disables SHA256 PCR Bank. |
| Pending operation | Schedule an operation for the security device.<br>Note: Your computer will reboot during restart in order to change state of the security device. |
| Platform Hierarchy | Enables / Disables platform hierarchy. |
| Storage Hierarchy | Enables / Disables storage hierarchy. |
| Endorsement Hierarchy | Enables / Disables endorsement hierarchy. |
| Physical Presence Spec Version | Selects to show the PPI Spec Version (1.2 or 1.3) that the OS supports. **Note:** Some HCK tests might not support 1.3. |
| Device Select | • **TPM 1.2** will restrict support to TPM 1.2 devices only. **TPM 2.0** will restrict support to TPM 2.0 devices only.<br>• **Auto** will support both with the default being set to TPM 2.0 devices if not found, and TPM 1.2 device will be enumerated. |
| Disable Block Sid | Override to allow SID authentication in TCG storage device. |

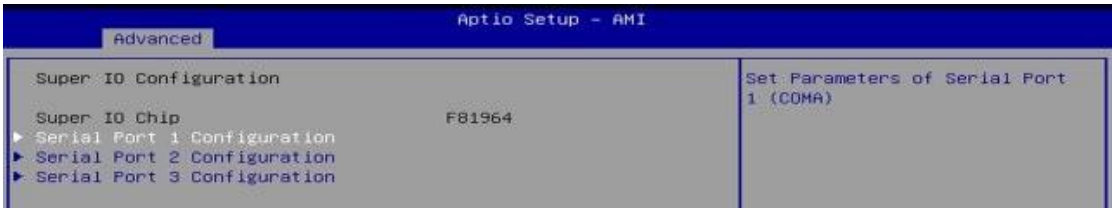
### 4.4.5 ACPI Settings


| BIOS Setting | Description |
|---|---|
| Enable Hibernation | Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may not be effective with some operating systems. |
| ACPI Sleep State | Select the highest ACPI sleep state the system will enter when the suspend button is pressed. |

### 4.4.6 iSMART Controller


| BIOS Setting | Description |
|---|---|
| Power-On after Power failure | Options: Enable or Disable |
| PWR Resume Delay | Options: Enable or Disable |
| Temperature Guardian | Options: Enable or Disable |
| Schedule Slot 1 | Setup the hour/minute for system power on |
| Schedule Slot 2 | Setup the hour/minute for system power on |
| Power Unlocker | iSmart will monitor the system power status. If the system is unable to boot within 6 seconds after the power button is pressed, iSmart will activate the recovery process. The iSmart controller will perform the RTC clear sequence and then trigger the power button to turn on the system. |

### 4.4.7 Super IO Configuration


| BIOS Setting | Description |
|---|---|
| Serial Port Configuration | Sets parameters of Serial Port. |
| Serial Port | Enable / Disable the serial port. |
| Serial Port 1 / 2 / 3 Device Settings and Options | Serial Port 1<br>Auto<br>IO=3F8h; IRQ=4;<br>IO=3F8h; IRQ=3,4,5,6,7,9,10,11,12;<br>IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12;<br>IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12;<br>IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12;<br>Serial Port 2<br>Auto<br>IO=2F8h; IRQ=3;<br>IO=3F8h; IRQ=3,4,5,6,7,9,10,11,12;<br>IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12;<br>IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12;<br>IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12;<br>Serial Port 3<br>Auto<br>IO=3E8h; IRQ=5;<br>IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12;<br>IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12;<br>IO=2F0h; IRQ=3,4,5,6,7,9,10,11,12;<br>IO=2E0h; IRQ=3,4,5,6,7,9,10,11,12; |

### 4.4.8 Hardware Monitor

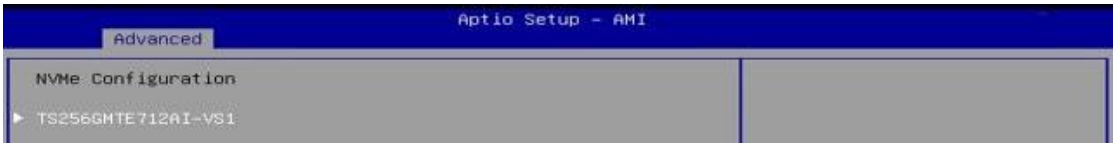

| BIOS Setting | Description |
|---|---|
| Temperatures / Voltages | These fields are the parameters of the hardware monitoring function feature of the motherboard. The values are read-only values as monitored by the system and show the PC health status. |

### 4.4.9 USB Configuration


| BIOS Setting | Description |
|---|---|
| Legacy USB Support | • **Enable:** Enables Legacy USB Support.<br>• **Auto:** Disables legacy support if no USB devices are connected.<br>• **Disable:** Keeps USB devices available only for EFI applications. |
| XHCI Hand-off | This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver. |
| USB Mass Storage Driver Support | Enables / Disables the support for USB mass storage driver. |
| USB Transfer time-out | The time-out value for Control, Bulk, and Interrupt transfers. |
| Device reset time-out | Seconds of delaying execution of start unit command to USB mass storage device. |
| Device power-up delay | The maximum time the device will take before it properly reports itself to the Host Controller.<br>“Auto” uses default value for a Root port it is 100ms. But for a Hub port, the delay is taken from Hub descriptor. |

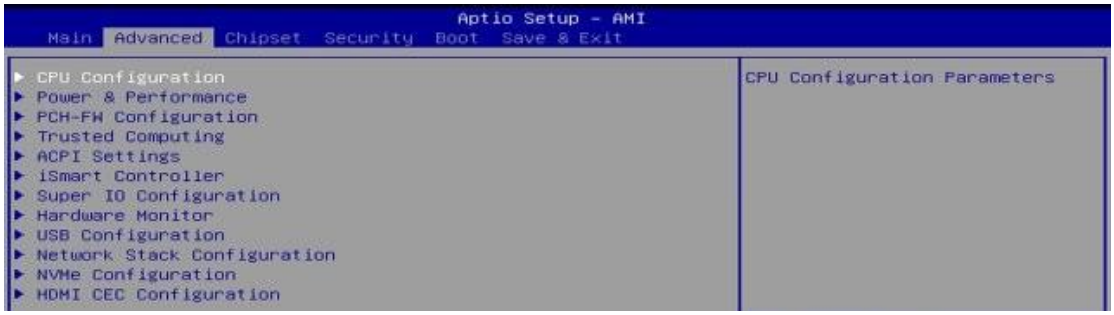
### 4.4.10 Network Stack Configuration


### 4.4.11 NVMe Configuration





### 4.4.12 HDMI CEC Configuration





## 4.5 Chipset Settings


| BIOS Setting | Description |
|---|---|
| System Agent (SA) Configuration | System Agent (SA) parameters |
| PCH-IO Configuration | PCH parameters |

### *4.5.1 System Agent (SA) Configuration*


| BIOS Setting | Description |
|---|---|
| Graphics Configuration | Configures the graphics settings. |
| VMD setup menu | VMD Configuration settings |
| VT-d | Checks if VT-d function on MCH is supported. |

#### 4.5.1.1. Graphics Configuration


| BIOS Setting | Description |
|---|---|
| Graphics Turbo IMON Current Values | Supported values: 14-31 |
| GTT Size | Sets the GTT size as 2MB, 4MB, or 8MB. |
| Aperture Size | Sets the aperture size as 128MB, 256MB, 512MB, 1024MB or 2048MB.<br>**Note:** Above 4GB MMIO BIOS assignment is automatically enabled when selecting 2048 MB aperture. To use this feature, disable CSM support. |
| DVMT Pre-Allocated | Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the internal graphics device |

#### 4.5.1.2. VT-d


### *4.5.2 PCH-IO Configuration*


| BIOS Setting | Description |
|---|---|
| SATA Configuration | Configures SATA devices. |
| USB Configuration | Configures USB ports. |
| Power-On after Power failure | Specify what state to go to when power is reapplied after a power failure (G3 state) |

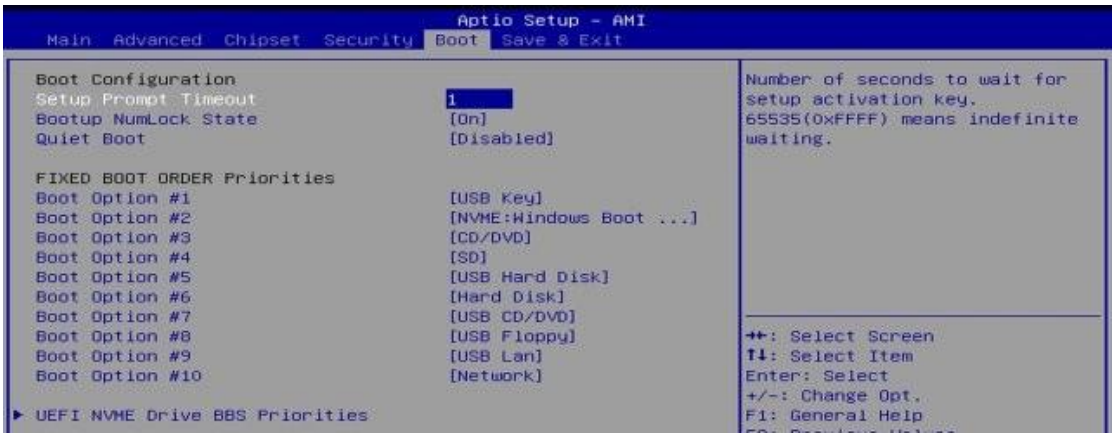
#### 4.5.2.1. SATA Configuration:

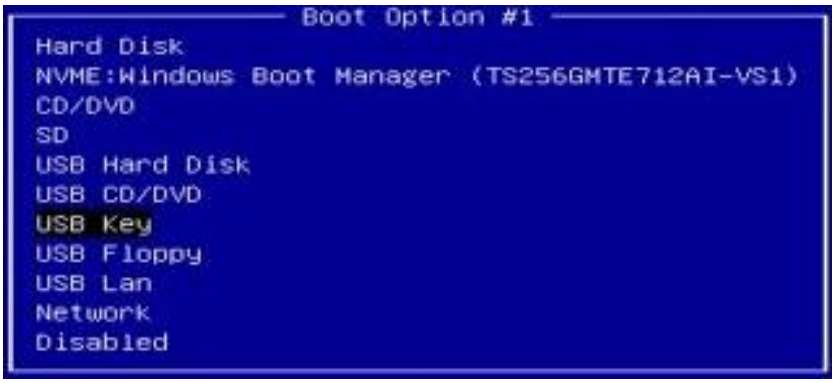

#### 4.5.2.2. USB Configuration:

## 4.6 Security Settings


| BIOS Setting | Description |
|---|---|
| Administrator Password | Sets an administrator password for the setup utility. |
| User Password | Sets a user password. |
| Secure Boot | Secure Boot feature is Active if Secure Boot is enabled. Platform Key (PK) is enrolled and the system is in User mode. The mode change requires platform reset. |
| Secure Boot Mode | Secure Boot mode options:<br>Standard or Custom.<br>In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full authentication. |
| Restore Factory Keys | Forces system to user mode. Install factory default Secure Boot key databases. |
| Expert Key Management | Enables expert users to modify Secure Boot Policy variables without full authentication. |

## 4.7 Boot Settings




| BIOS Setting | Description |
|---|---|
| Setup Prompt Timeout | Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting. |
| Bootup NumLock State | Selects the keyboard NumLock state. |
| Quiet Boot | Enables / Disables Quiet Boot option. |
| Fixed Boot Order Priorities | Sets the system boot order |
| UEFI NVME Drive BBS Priorities | Specifies the Boot Device Priority sequence from available UEFI Hard Disk Drives. |

## 4.8 Save & Exit Settings


| BIOS Setting | Description |
|---|---|
| Save Changes and Exit | Exits system setup after saving the changes. |
| Discard Changes and Exit | Exits system setup without saving any changes. |
| Save Changes and Reset | Resets the system after saving the changes. |
| Discard Changes and Reset | Resets system setup without saving any changes. |
| Save Changes | Saves changes done so far to any of the setup options. |
| Discard Changes | Discards changes done so far to any of the setup options. |
| Restore Defaults | Restores / Loads defaults values for all the setup options. |
| Save as User Defaults | Saves the changes done so far as User Defaults. |
| Restore User Defaults | Restores the user defaults to all the setup options. |

# Appendix

This section provides the mapping addresses of peripheral devices and the sample code of watchdog timer configuration.

- I/O Port Address Map
- Interrupt Request Lines (IRQ)
- Watchdog Timer
- USB Power Control Mapping

# A. I/O Port Address Map

Each peripheral device in the system is assigned a set of I/O port addresses which also becomes the identity of the device. The following table lists the I/O port addresses used.

| Address | Device Description |
|---|---|
| 0x00000A00-0x00000A0F | Motherboard resources |
| 0x00000A20-0x00000A2F | Motherboard resources |
| 0x00000A10-0x00000A1F | Motherboard resources |
| 0x0000002E-0x0000002F | Motherboard resources |
| 0x0000004E-0x0000004F | Motherboard resources |
| 0x00000061-0x00000061 | Motherboard resources |
| 0x00000063-0x00000063 | Motherboard resources |
| 0x00000065-0x00000065 | Motherboard resources |
| 0x00000067-0x00000067 | Motherboard resources |
| 0x00000070-0x00000070 | Motherboard resources |
| 0x00000080-0x00000080 | Motherboard resources |
| 0x00000092-0x00000092 | Motherboard resources |
| 0x000000B2-0x000000B3 | Motherboard resources |
| 0x00000680-0x0000069F | Motherboard resources |
| 0x0000164E-0x0000164F | Motherboard resources |
| 0x00000020-0x00000021 | Programmable interrupt controller |
| 0x00000024-0x00000025 | Programmable interrupt controller |
| 0x00000028-0x00000029 | Programmable interrupt controller |
| 0x0000002C-0x0000002D | Programmable interrupt controller |
| 0x00000030-0x00000031 | Programmable interrupt controller |
| 0x00000034-0x00000035 | Programmable interrupt controller |
| 0x00000038-0x00000039 | Programmable interrupt controller |
| 0x0000003C-0x0000003D | Programmable interrupt controller |
| 0x000000A0-0x000000A1 | Programmable interrupt controller |
| 0x000000A4-0x000000A5 | Programmable interrupt controller |
| 0x000000A8-0x000000A9 | Programmable interrupt controller |
| 0x000000AC-0x000000AD | Programmable interrupt controller |

| | |
|---|---|
| 0x000000B0-0x000000B1 | Programmable interrupt controller |
| 0x000000B4-0x000000B5 | Programmable interrupt controller |
| 0x000000B8-0x000000B9 | Programmable interrupt controller |
| 0x000000BC-0x000000BD | Programmable interrupt controller |
| 0x000004D0-0x000004D1 | Programmable interrupt controller |
| 0x00001854-0x00001857 | Motherboard resources |
| 0x00004090-0x00004097 | Standard SATA AHCI Controller |
| 0x00004080-0x00004083 | Standard SATA AHCI Controller |
| 0x00004060-0x0000407F | Standard SATA AHCI Controller |
| 0x000003F8-0x000003FF | Communications Port (COM1) |
| 0x000002F8-0x000002FF | Communications Port (COM2) |
| 0x00001800-0x000018FE | Motherboard resources |
| 0x00004000-0x0000403F | Intel(R) UHD Graphics |
| 0x00000000-0x00000CF7 | PCI Express Root Complex |
| 0x00000D00-0x0000FFFF | PCI Express Root Complex |
| 0x00000040-0x00000043 | System timer |
| 0x00000050-0x00000053 | System timer |
| 0x00003000-0x00003FFF | Intel(R) PCI Express Root Port #7 - A0BE |
| 0x00002000-0x000020FE | Motherboard resources |
| 0x00000060-0x00000060 | Standard PS/2 Keyboard |
| 0x00000064-0x00000064 | Standard PS/2 Keyboard |
| 0x0000EFA0-0x0000EFBF | Intel(R) SMBus - A0A3 |

## B. Interrupt Request Lines (IRQ)

Peripheral devices use interrupt request lines to notify CPU for the service required. The following table shows the IRQ used by the devices on board.

| Level | Function |
|---|---|
| IRQ 4294967288 | Intel(R) Ethernet Connection (13) I219-V |
| IRQ 4294967289 | Intel(R) USB 3.10 eXtensible Host Controller - 1.20 (Microsoft) |
| IRQ 4294967291 | Standard SATA AHCI Controller |
| IRQ 4294967290 | Intel(R) USB 3.10 eXtensible Host Controller - 1.20 (Microsoft) |
| IRQ 4 | Communications Port (COM1) |
| IRQ 3 | Communications Port (COM2) |
| IRQ 4294967284 | Intel(R) UHD Graphics |
| IRQ 54 ~ IRQ 204 | Microsoft ACPI-Compliant System |
| IRQ 256 ~ IRQ 511 | Microsoft ACPI-Compliant System |
| IRQ 4294967294 | PCI Express Root Port |
| IRQ 14 | Intel(R) GPIO Controller - 34C5 |
| IRQ 0 | System timer |
| IRQ 28 | Trusted Platform Module 2.0 |
| IRQ 4294967292 | Intel(R) PCI Express Root Port #7 - A0BE |
| IRQ 4294967282 | Intel(R) Management Engine Interface |
| IRQ 1 | Standard PS/2 Keyboard |
| IRQ 12 | Microsoft PS/2 Mouse |
| IRQ 4294967287 | Intel(R) I211 Gigabit Network Connection |
| IRQ 4294967286 | Intel(R) I211 Gigabit Network Connection |
| IRQ 4294967285 | Intel(R) I211 Gigabit Network Connection |
| IRQ 4294967283 | Intel(R) I211 Gigabit Network Connection |
| IRQ 4294967293 | PCI Express Root Port |
| IRQ 16 | High Definition Audio Controller |
| IRQ 17 | USB Synopsys Controller |

# C. Watchdog Timer

```
//---------------------------------------------------------------------------
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A
// PARTICULAR PURPOSE.
//---------------------------------------------------------------------------
#include <dos.h>
#include <conio.h>
#include <stdio.h>
#include <stdlib.h>
#include "F81964.H"
//---------------------------------------------------------------------------
int main (int argc, char *argv[]);
void EnableWDT(int);
void DisableWDT(void);
//---------------------------------------------------------------------------
int main (int argc, char *argv[])
{
    unsigned char bBuf;
    unsigned char bTime;
    char **endptr;

    char SIO;

    printf("Fintek 81964 watch dog program\n");
    SIO = Init_F81964();
    if (SIO == 0)
    {
        printf("Can not detect Fintek 81964, program abort.\n");
        return(1);
    }//if (SIO == 0)

    if (argc != 2)
    {
        printf(" Parameter incorrect!!\n");
        return (1);
    }

    bTime = strtol (argv[1], endptr, 10);
    printf("System will reset after %d seconds\n", bTime);

    if (bTime)
    {   EnableWDT(bTime);   }
    else
    {   DisableWDT();   }
    return 0;
}
//---------------------------------------------------------------------------
void EnableWDT(int interval)
```

```
{
	unsigned char bBuf;

	bBuf = Get_F81964_Reg(0x27);
	bBuf &= (~0x0C);
	bBuf |= (0x08);
	Set_F81964_Reg(0x27, bBuf);		//Switch to bank 2

	bBuf = Get_F81964_Reg(0x2A);
	bBuf &= (~0x70);
	bBuf |= (0x60);
	Set_F81964_Reg(0x2A, bBuf);		//Select WDTRST# function

	Set_F81964_LD(0x07);			 //Switch to logic device 7
	Set_F81964_Reg(0x30, 0x01);		//Enable timer

	bBuf = Get_F81964_Reg(0xF5);
	bBuf &= (~0x0F);
	bBuf |= 0x52;
	Set_F81964_Reg(0xF5, bBuf);		//Count mode is second

	Set_F81964_Reg(0xF6, interval); //Set timer

	bBuf = Get_F81964_Reg(0xFA);
	bBuf |= 0x01;
	Set_F81964_Reg(0xFA, bBuf);		//Enable WDTO output

	bBuf = Get_F81964_Reg(0xF5);
	bBuf |= 0x20;
	Set_F81964_Reg(0xF5, bBuf);		//Start counting
}
//-----------------------------------------------------------------------------
void DisableWDT(void)
{
	unsigned char bBuf;

	Set_F81964_LD(0x07);			 //switch to logic device 7

	bBuf = Get_F81964_Reg(0xFA);
	bBuf &= ~0x01;
	Set_F81964_Reg(0xFA, bBuf);		//disable WDTO output

	bBuf = Get_F81964_Reg(0xF5);
	bBuf &= ~0x20;
	bBuf |= 0x40;
	Set_F81964_Reg(0xF5, bBuf);		//disable WDT
}
//-----------------------------------------------------------------------------
```

```
//---------------------------------------------------------------------------
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A
// PARTICULAR PURPOSE.
//
//---------------------------------------------------------------------------
#include "F81964.H"
#include <dos.h>
//---------------------------------------------------------------------------
unsigned int F81964_BASE;
void Unlock_F81964 (void);
void Lock_F81964 (void);
//---------------------------------------------------------------------------
unsigned int Init_F81964(void)
{
    unsigned int result;
    unsigned char ucDid;

    F81964_BASE = 0x4E;
    result = F81964_BASE;

    ucDid = Get_F81964_Reg(0x20);
    if (ucDid == 0x15)                  //Fintek 81964
    {   goto Init_Finish;   }

    F81964_BASE = 0x2E;
    result = F81964_BASE;

    ucDid = Get_F81964_Reg(0x20);
    if (ucDid == 0x15)                  //Fintek 81964
    {   goto Init_Finish;   }

    F81964_BASE = 0x00;
    result = F81964_BASE;

Init_Finish:
    return (result);
}
//---------------------------------------------------------------------------
void Unlock_F81964 (void)
{
    outportb(F81964_INDEX_PORT, F81964_UNLOCK);
    outportb(F81964_INDEX_PORT, F81964_UNLOCK);
}
//---------------------------------------------------------------------------
void Lock_F81964 (void)
{
    outportb(F81964_INDEX_PORT, F81964_LOCK);
}
//---------------------------------------------------------------------------
void Set_F81964_LD( unsigned char LD)
```

```
{
	Unlock_F81964();
	outportb(F81964_INDEX_PORT, F81964_REG_LD);
	outportb(F81964_DATA_PORT, LD);
	Lock_F81964();
}
//-----------------------------------------------------------------------
void Set_F81964_Reg( unsigned char REG, unsigned char DATA)
{
	Unlock_F81964();
	outportb(F81964_INDEX_PORT, REG);
	outportb(F81964_DATA_PORT, DATA);
	Lock_F81964();
}
//-----------------------------------------------------------------------
unsigned char Get_F81964_Reg(unsigned char REG)
{
	unsigned char Result;
	Unlock_F81964();
	outportb(F81964_INDEX_PORT, REG);
	Result = inportb(F81964_DATA_PORT);
	Lock_F81964();
	return Result;
}
//-----------------------------------------------------------------------
```

F81964.H

```
//-----------------------------------------------------------------------
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A
PARTICULAR
// PURPOSE.
//
//-----------------------------------------------------------------------
#ifndef	F81964_H
#define	F81964_H		1
//-----------------------------------------------------------------------
#define	F81964_INDEX_PORT	(F81964_BASE)
#define	F81964_DATA_PORT	(F81964_BASE+1)
//-----------------------------------------------------------------------
#define	F81964_REG_LD		0x07
//-----------------------------------------------------------------------
#define	F81964_UNLOCK		0x87
#define	F81964_LOCK		0xAA
//-----------------------------------------------------------------------
unsigned int Init_F81964(void);
void Set_F81964_LD(unsigned char);
void Set_F81964_Reg(unsigned char, unsigned char);
unsigned char Get_F81964_Reg(unsigned char);
//-----------------------------------------------------------------------
#endif	//F81964_H
```

# D. USB Power Control Mapping

PDPC (Peripheral Device Power Control) allows users to turn off the external power and restart it via software, enabling the external device to recover and ensuring the system remains operational. The following table shows the bit-mapping for software SDK.

| Function | Connector | Software Mapping |
|---|---|---|
| **USB** | **CN5** | **bit_0** |