MI1001 Series

Intel® 14th Gen Core™ DT Processor
Mini-ITX Motherboard

User Manual

Version 1.0b
(October 2024)

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). In a domestic environment, this product may cause radio interference in which case users may be required to take adequate measures.

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 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 of 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

Important Safety Information

Carefully read the precautions before using the board.

Environmental conditions:

- Use this product in environments with ambient temperatures between 0˚C and 60˚C.
- Do not leave this product in an environment where the storage temperature may be below -20° C or above 80° C. To prevent from damages, the product must be used in a controlled environment.

Care for your IBASE products:

- Before cleaning the PCB, unplug all cables and remove the battery.
- Clean the PCB with a circuit board cleaner or degreaser, or use cotton swabs and alcohol.
- Vacuum the dust with a computer vacuum cleaner to prevent the fan from being clogged.

WARNING

Attention during use:

- Do not use this product near water.
- Do not spill water or any other liquids on this product.
- Do not place heavy objects on the top of this product.

Anti-static precautions

- Wear an anti-static wrist strap to avoid electrostatic discharge.
- Place the PCB on an anti-static kit or mat.
- Hold the edges of PCB when handling.
- Touch the edges of non-metallic components of the product instead of the surface of the PCB.
- Ground yourself by touching a grounded conductor or a grounded bit of metal frequently to discharge any static.

CAUTION

Danger of explosion if the 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 or recycle them at a local recycling facility or battery collection point.

Warranty Policy

- **IBASE standard products:**

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

- **3rd-party parts:**

  12-month (1-year) warranty from delivery for the 3rd-party parts that are not manufactured by IBASE, such as CPU, CPU cooler, memory, storage devices, power adapter, panel and touchscreen.

* PRODUCTS 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 of your product and elaborate upon the problem.
   - Product model name
   - Product serial number
   - Detailed description of the problem
   - The error messages in text or in screenshots if there is any
   - The arrangement of the peripherals
   - Software in use (such as OS and application software, including the version numbers)
3. If repair service is required, please go to the IBASE website and apply for an RMA number to fill out the RMA application form.

Table of Contents

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Chapter 1
General Information

The information provided in this chapter includes:

- Features
- Packing List
- Optional Accessories
- Specifications
- Block Diagram
- Product View
- Board Dimensions

1.1 Introduction

MI1001 is a Mini ATX motherboard based on 14th Gen Intel® Core DT processors. With support for two DDR5 (5600) slots accommodating up to 64GB memory, it supports independent displays with eDP, LVDS, DisplayPort/DP++ and HDMI interface. This high-performance platform meets demands in next-generation applications in imaging, AI, and edge computing.

1.2 Features

- 14th Gen Intel Core™ i9/i7/i5 Processors
- 2x DDR5 SO-DIMM sockets, Max. 64GB
- Intel processor integrated graphics supporting eDP, LVDS, DisplayPort (1.4a), and HDMI (2.0a)
- Dual Intel 2.5G LAN, Dual Intel 10G LAN
- 4x USB 3.2, 2x USB 2.0
- 2x SATA III (6Gbps)
- 1x PCI-E (x16) [Gen.5], 1x M.2 (M-key), 1x M.2 (E-key)
- Watchdog timer, Digital I/O, iAMT(16.1), dTPM (SLB9672), fTPM (optional)

1.3 Packing List

Your MI1001 package should include the items listed below. If any of the items below is missing, contact the distributor or dealer from whom you purchased the product.

- MI1001 x1
- IO Shield x1
- SATA cable x1

1.4 Optional Accessories

- USB 2.0 Cable
- Cooler

1.5 Specifications

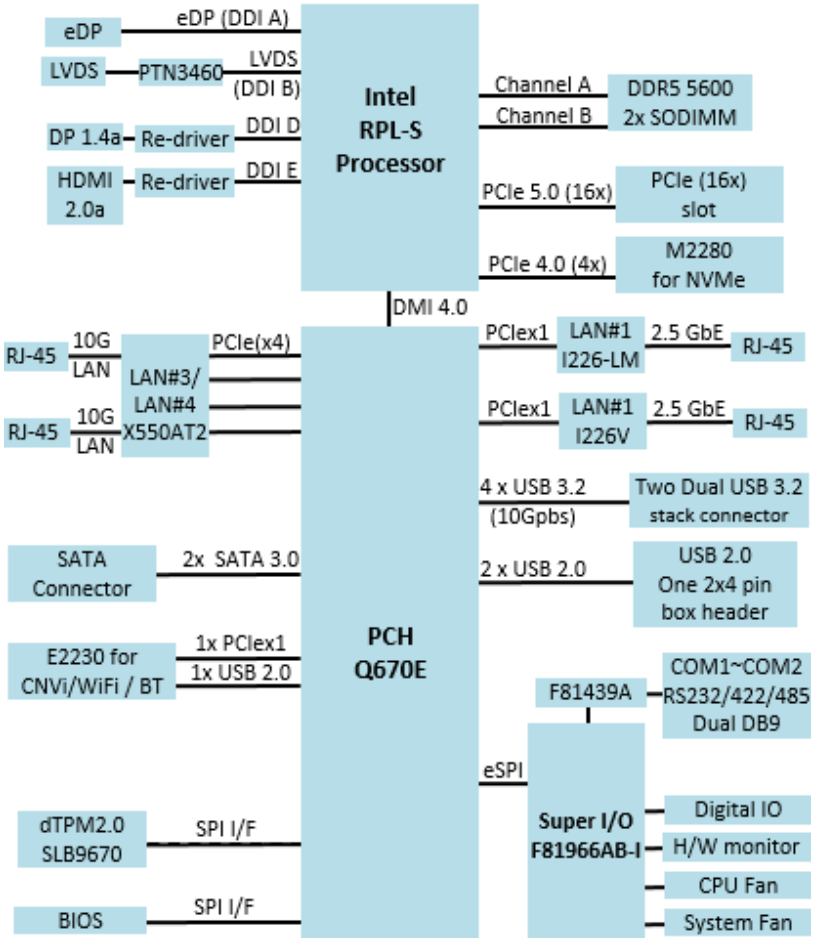
Product Name	**MI1001AF-10G** [with Dual 10GbE, iAMT 16.1, Q670E PCH] **MI1001AF** [with iAMT 16.1, Q670E PCH]
Form Factor	Mini-ITX motherboard
CPU	Intel® 14th Gen. Core™ DT Processor Based
CPU Socket	LGA1700
Chipset	Intel® FH82Q670E PCH
Memory	2x DDR5 SO-DIMM Max. = 64GB
Graphics Interface	- eDP, Up to 3840x2160@60Hz - LVDS (dual channel), Up to 1920x1080 @ 60 Hz - DisplayPort / DP++ (DP1.4a), Up to 7680 x 4320 @ 60 Hz - HDMI (HDMI 2.0a), Up to 3840 x 2160 @ 60 Hz
Network	- 1st LAN for iAMT via Intel I226LM - 2nd LAN for 2.5GbE via Intel I226V - 3rd / 4th LAN for 10GbE via X550-AT2 [TDP@11W, 17mmx17mm package] with HSMI1001-A heat sink ****For MI1001AF-10G model only****
Expansion Slots	- PCIe (16x) x1 - M.2 (M-key@2280), supports NVMe - M.2 (E-key@2230), supports CNVi - E-Key with PDPC feature (CNVi modules not supported)
Super I/O	Fintek F81966AB-I
USB	- USB 3.2 G2 (10 Gbps) x2, type A @ rear panel (Port#0~#1 / USB3.2 #1~#2) - USB 3.2 G2 (10 Gbps) x2, type A @ rear panel (Port#2~#3 / USB3.2 #3~#4) - USB 2.0 x2 ports via box-header
Digital I/O	4-In / 4-Out
Audio Codec	N/A
Watchdog Timer	Yes (256 segments, 0, 1, 2…255 sec / min)
RAID	RAID 0/1
iAMT	iAMT 16.1 (supported by Intel Core i9/i7/i5 CPU SKUs)
TPM	2.0 (fTPM is optional)
Dimensions	170 x 170 mm (6.7” x 6.7”)
RoHS 2	Yes

Edge Connectors	- Dual DB9 stack connector for COM #1 / COM #2 - DP + HDMI stack connector x1 - RJ-45 (2.5G) [red color] + dual USB (3.2) [blue color] stack connector x2 (I226V port with power control) - RJ45 (10G) connector x2 **** MI1001AF-10G model only****
OS Supported	Windows 10 (64-bit), Ubuntu (64-bit)
Others	- LAN Wakeup - BIOS recovery - Supports AT mode boot-up by jumper (via Super I/O) - PDPC (Peripheral Device Power Control)

Environmental	
Operating Temperature	0 ~ 60 °C (32 ~ 140 °F)
Storage Temperature	-20 ~ 80 °C (-4 ~ 176 °F)

All specifications are subject to change without prior notice.

1.6 Block Diagram

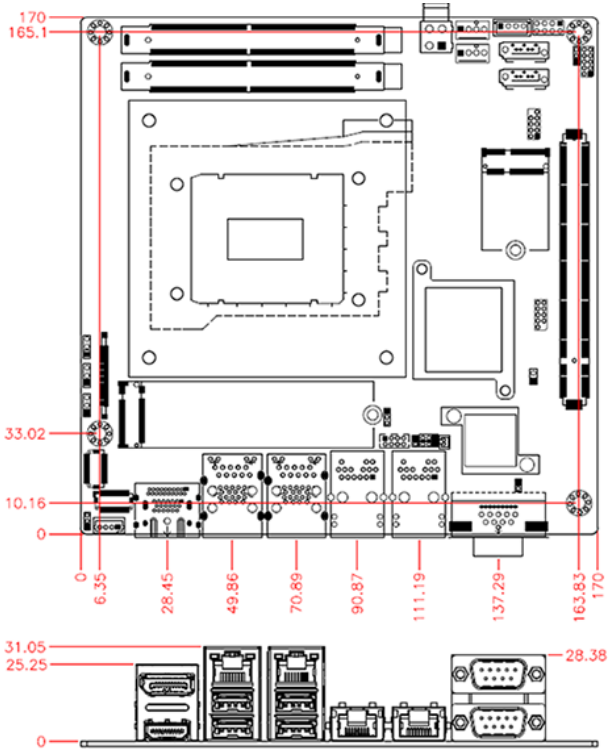


1.7 Product View

Top View

Bottom View

1.8 Board Dimensions



Chapter 2
Hardware Configuration

This section provides information on jumper settings and connectors on the MI1001 and other installation information in order to set up a workable system. The topics covered are:

- Essential installations before you begin
- Jumper and connector locations
- Jumper settings and information of connectors

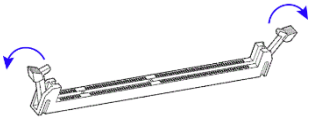
2.1 Essential Installations Before You Begin

Follow the instructions below to install the memory modules.

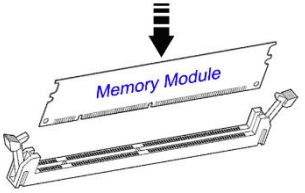
2.1.1 Installing the Memory

To install the modules, locate the memory slot on the board and perform the following steps:

1. Align the key of the memory module with that on the memory slot and insert the module slantwise.



2. Gently push the module in an upright position until the clips of the slot close to hold the module in place when the module touches the bottom of the slot.



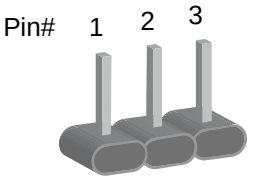
To remove the module, press the ejector tabs at both ends outwards.

2.2 Setting the Jumpers

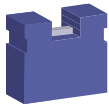
Set up and configure your MI1001 by using jumpers for various settings and features according to your needs and applications. Contact your supplier if you have doubts about the best configuration for your use.

2.2.1 How to Set 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 the functions and features enabled or disabled. If a jumper has 3 pins, you can connect either PIN1 to PIN2 or PIN2 to PIN3 by shorting.

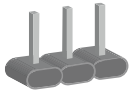
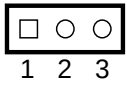
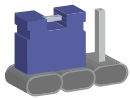
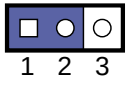
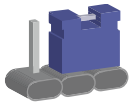
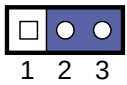


A 3-pin jumper



A jumper cap

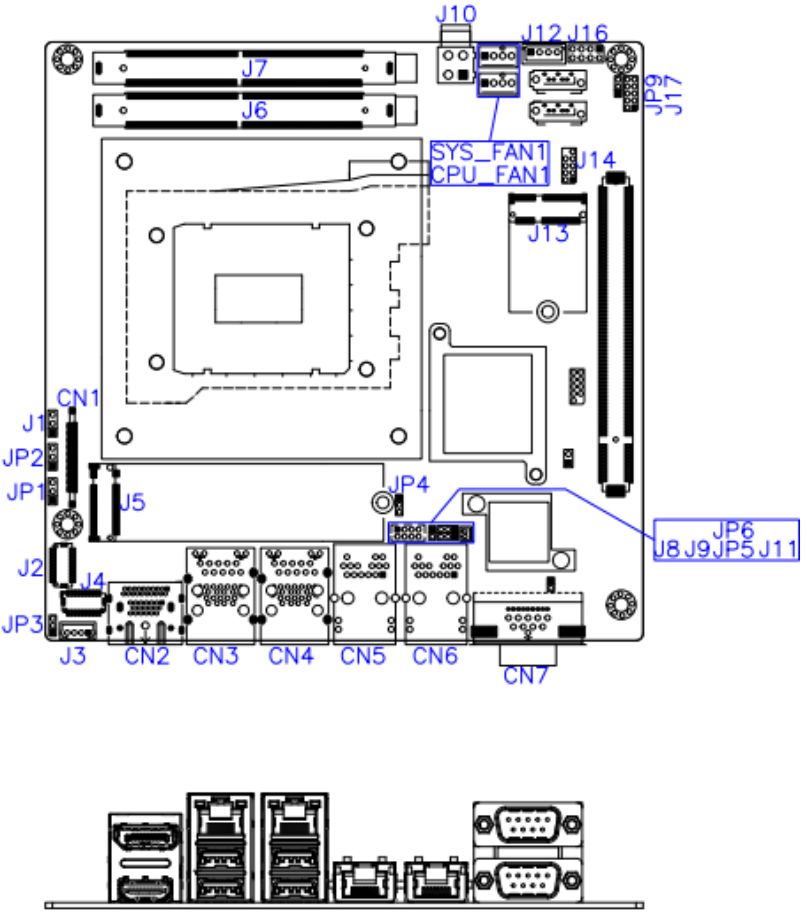
Refer to the illustration below to set jumpers.

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**.

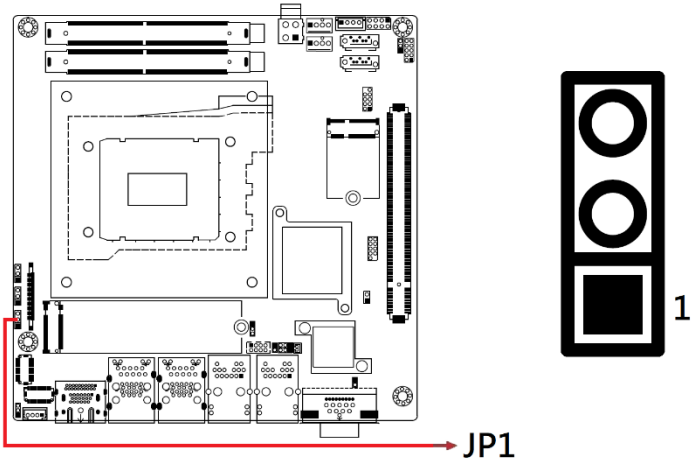
2.3 Jumper & Connector Locations



2.4 Jumpers Quick Reference

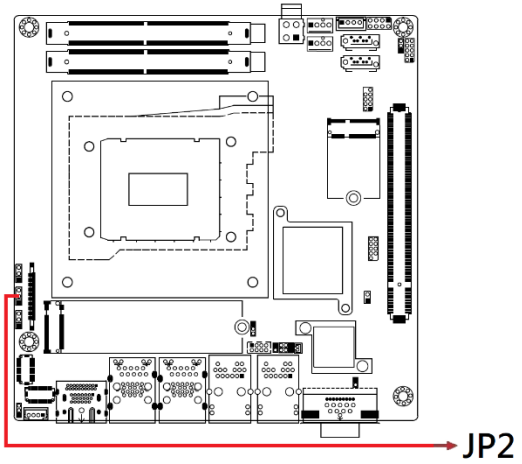
Jumper	Function
JP1	LVDS Power Selection
JP2	eDP Panel Power Selection
JP3	LVDS Power Brightness Selection
JP4	PCIe (x16) Bifurcation Selection
JP5	Clear CMOS Data
JP6	Clear RTC
JP8	Flash Descriptor Security Overide (Factory use only)
JP9	AT / ATX Selection

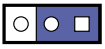
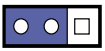
2.4.1 JP1: LVDS Power Selection



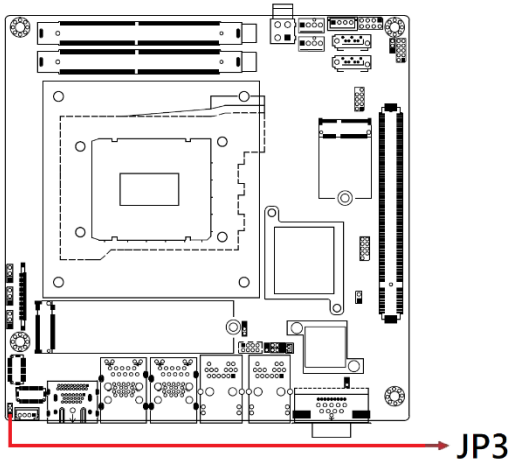
Function	Pin closed	Illustration
3.3V (default)	1-2	 1
5V	2-3	 1

2.4.2 JP2: eDP Panel Power Selection



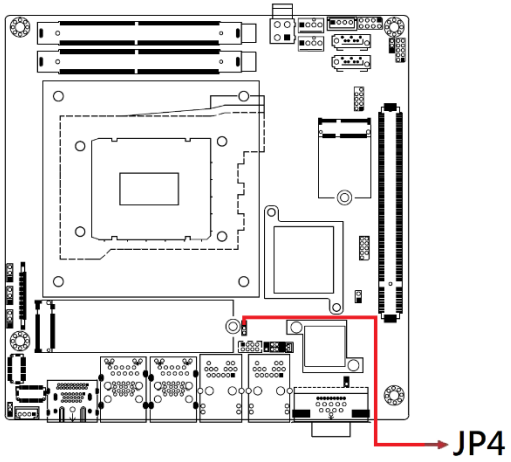
Function	Pin	Illustration
3.3V (default)	1-2	 1
5V	2-3	 1

2.4.3 JP3: LVDS Power Brightness Selection



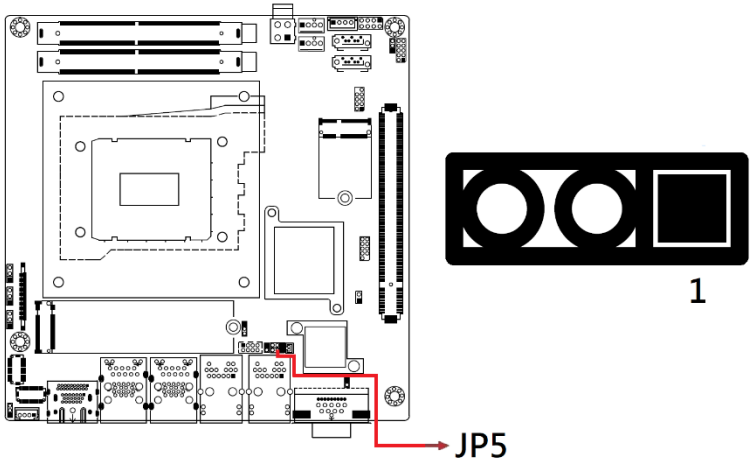
Function	Pin	Illustration
3.3V (default)	1-2	1
5V	2-3	1

2.4.4 JP4: PCI Express Bifurcation



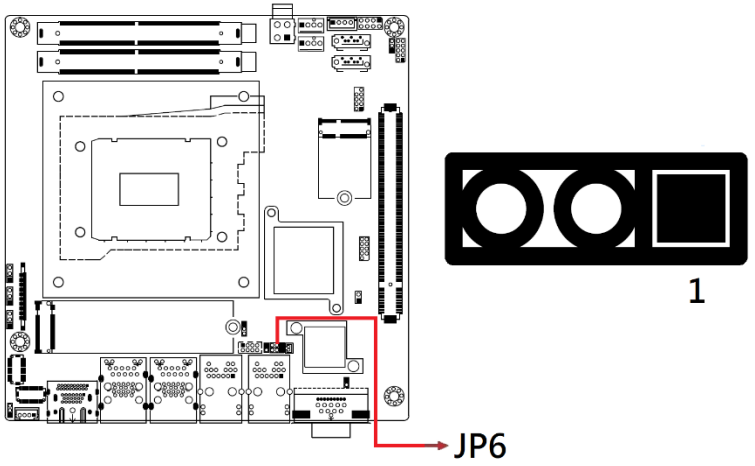
Function	Pin closed	Illustration
1 x PCIe (x16) (default)	1-2	1
2 x PCIe (x8)	2-3	1

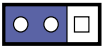
2.4.5 JP5: Clear CMOS



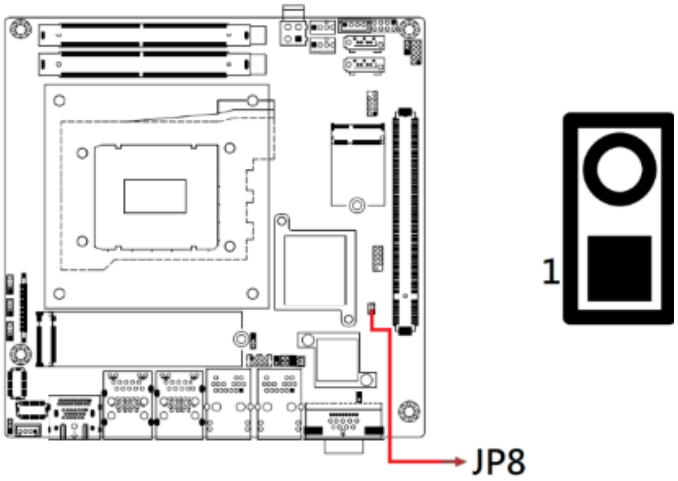
Function	Pin closed	Illustration
Normal (default)	1-2	1
Clear CMOS	2-3	1

2.4.6 JP6: Clear ME RTC



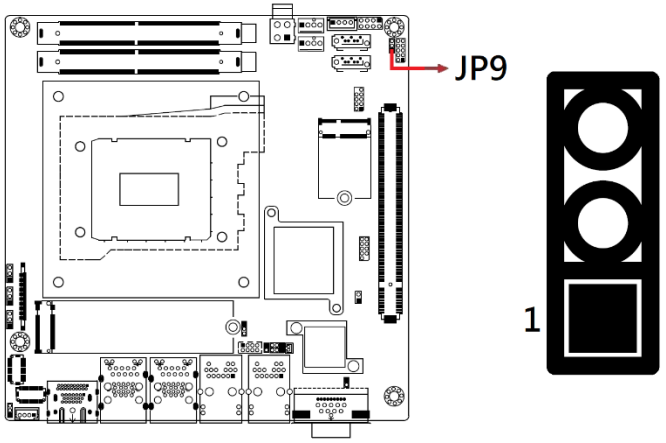
Function	Pin closed	Illustration
Normal (default)	1-2	 1
Clear ME RTC	2-3	 1

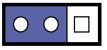
2.4.7 JP8: Flash Descriptor Security Overide (Factory use only)



Flash Descriptor Security Override	Pin	Illustration
Disabled (default)	Open	
Enabled	Close	

2.4.8 JP9: AT/ATX Select



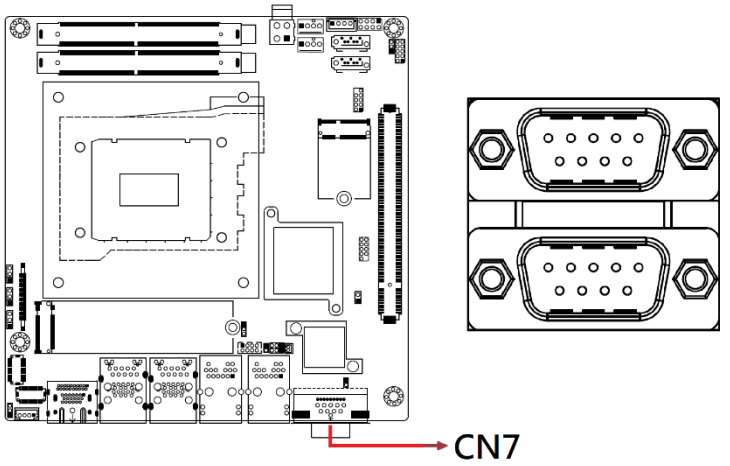
Function	Pin closed	Illustration
ATX (default)	1-2	 1
AT	2-3	 1

2.5 Connectors Quick Reference

Connector	Function
CN7 (top)	COM1 RS-232/422/485 Port
CN7 (bottom)	COM2 RS-232 Port
CN8, CN9	SATA Connectors
CN1	eDP Connector
J2, J4	LVDS Connector (1st/2nd channel)
J3	LCD Backlight Connector
J6, J7	DDR5 UDIMM CHA/CHB
J8	USB 2.0 #5/#6 Connector
J10	24V DC_IN Power Connector
J12	SATA HDD Power Connector
J13	M.2 E-Key Socket
J16	Front Panel Connector
J17	Digital I/O Connector (4 in, 4 out)
CPU_FAN1	CPU Fan Power Connector
SYS_FAN1	System Fan Power Connector

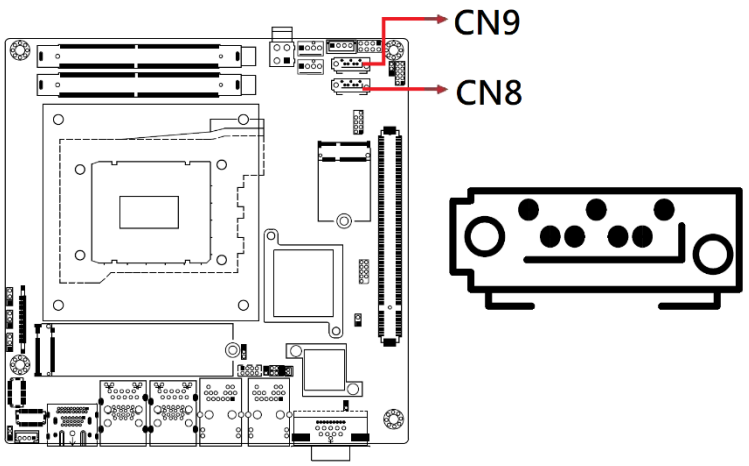
2.5.1 CN7(top): COM1 RS-232/422/485 Ports

2.5.2 CN7(bottom): COM2 RS-232 Port



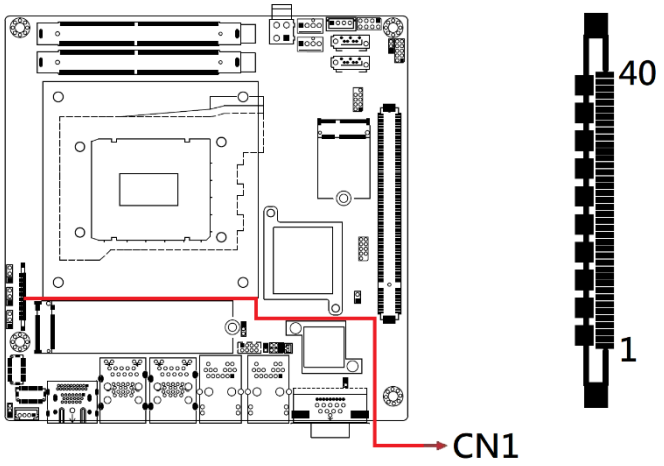
Pin	Signal Name		
	RS-232	RS-422	RS-485
1	DCD	TX-	DATA-
2	RX	TX+	DATA+
3	TX	RX+	NC
4	DTR	RX-	NC
5	Ground	Ground	Ground
6	DSR	NC	NC
7	RTS	NC	NC
8	CTS	NC	NC
9	RI	NC	NC
10	NC	NC	NC

2.5.3 CN8, CN9: SATA Connectors



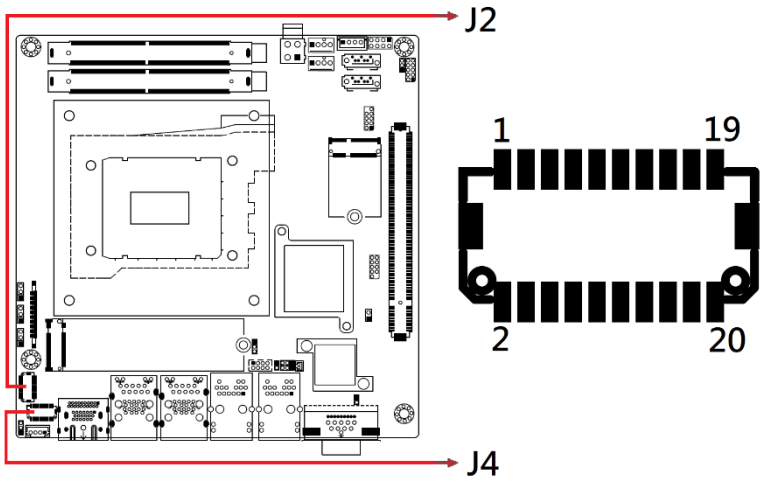
Pin	Signal Name
1	Ground
2	TX+
3	TX-
4	Ground
5	RX-
6	RX+
7	Ground

2.5.4 CN1: eDP Connector



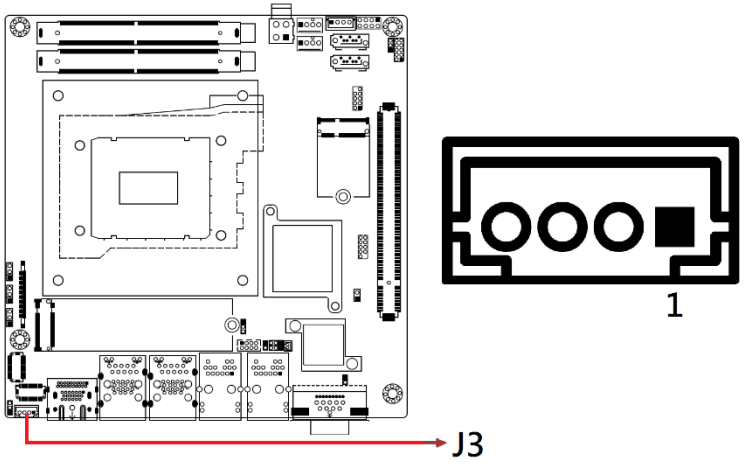
Pin	Signal Name	Pin	Signal Name
1	eDP VCC	21	TXN0
2	eDP VCC	22	TXP0
3	eDP VCC	23	Ground
4	eDP VCC	24	AUXP
5	eDP VCC	25	AUXN
6	Ground	26	NC
7	Ground	27	+3.3V
8	Ground	28	+12V
9	Ground	29	NC
10	Hot Plug detect	30	Ground
11	Ground	31	+5V
12	TXN3	32	NC
13	TXP3	33	Back Light Control
14	Ground	34	Back Lignt Enable
15	TXN2	35	+12V
16	TXP2	36	+3.3V
17	Ground	37	Ground
18	TXN1	38	NC
19	TXP1	39	NC
20	Ground	40	NC

2.5.5 J2, J4 LVDS Connector (1st ch, 2nd ch)



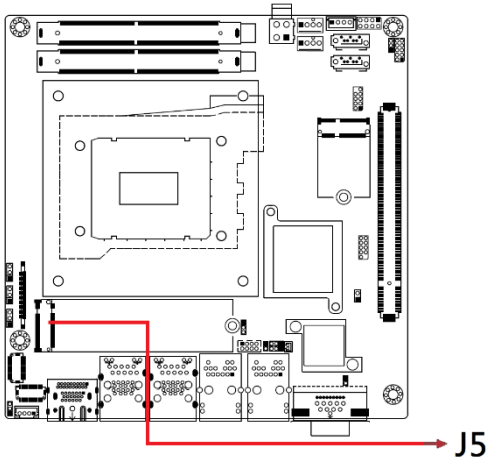
Pin	Signal Name	Pin	Signal Name
1	TX0P	2	TX0N
3	Ground	4	Ground
5	TX1P	6	TX1N
7	Ground	8	Ground
9	TX2P	10	TX2N
11	Ground	12	Ground
13	CLKP	14	CLKN
15	Ground	16	Ground
17	TX3P	18	TX3N
19	VDD	20	VDD

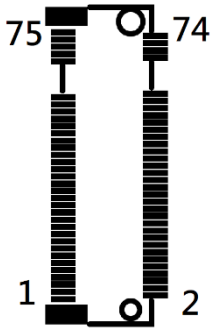
2.5.6 J3: LCD Backlight Connector



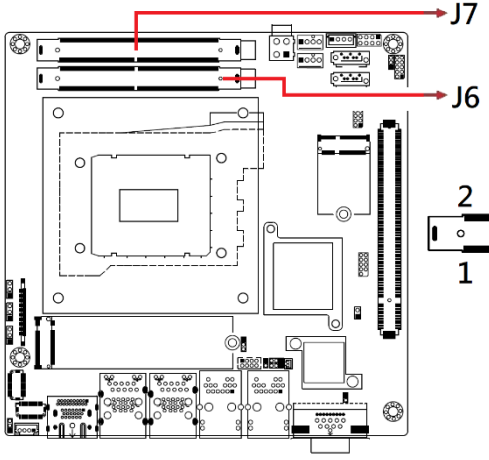
Pin	Signal Name	Pin	Signal Name
1	+12V	3	Brightness Control
2	Backlight Enable	4	Ground

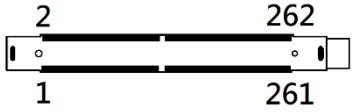
2.5.7 J5: M.2 M-Key NVME (CPU)



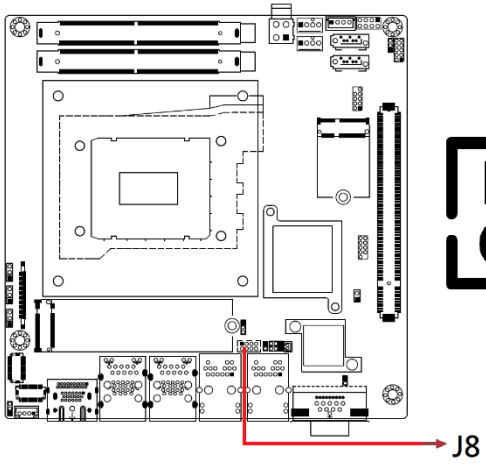


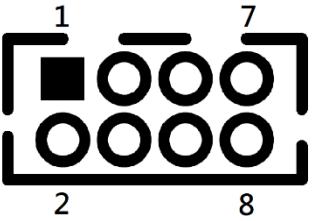
2.5.8 J6, J7: DDR5 UDIMM CHA/CHB





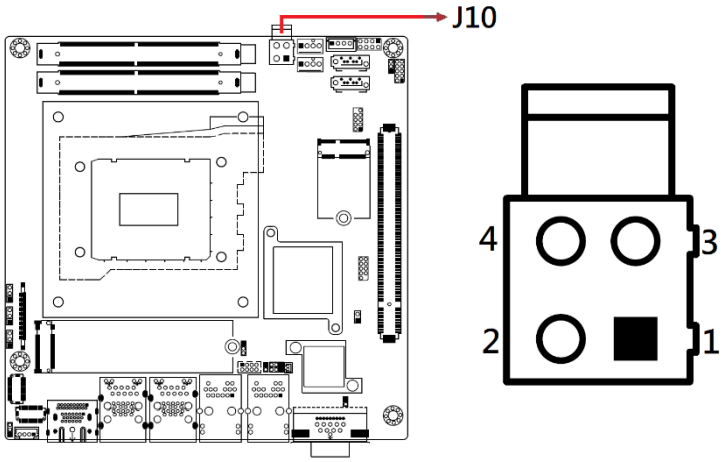
2.5.9 J8: USB 2.0 #5/#6 Connector





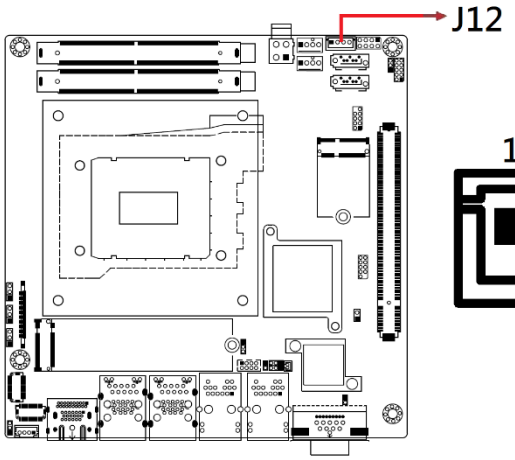
Pin	Signal Name	Pin	Signal Name
1	Vcc	2	Ground
3	D5-	4	D6+
5	D5+	6	D6-
7	Ground	8	Vcc

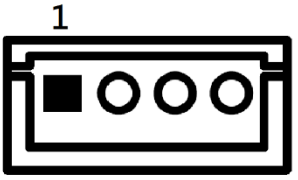
2.5.10 J10: 24V DC_IN Power Connector



Pin	Signal Name	Pin	Signal Name
1	Ground	3	+24V
2	Ground	4	+24V

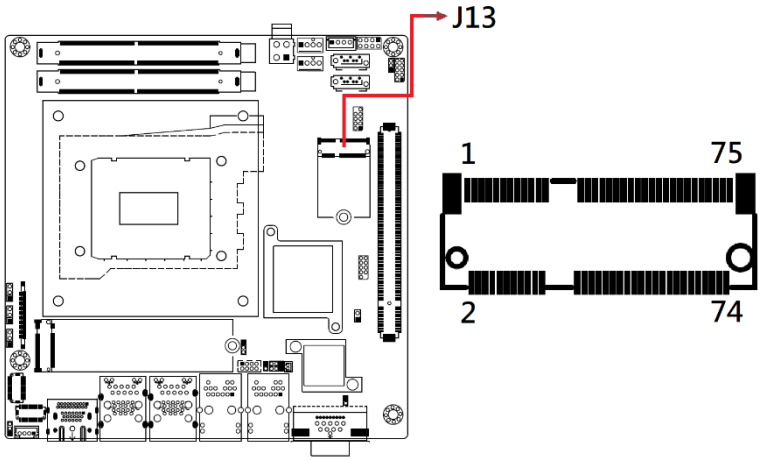
2.5.11 J12: SATA HDD Power Connector



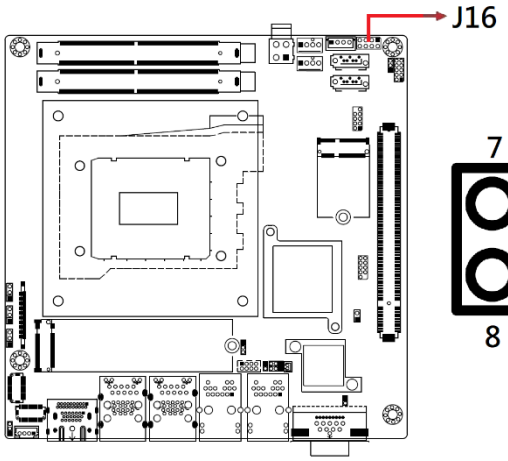


Pin	Signal Name	Pin	Signal Name
1	+5V	3	Ground
2	Ground	4	+12V

2.5.12 J13: M.2 E-Key Socket

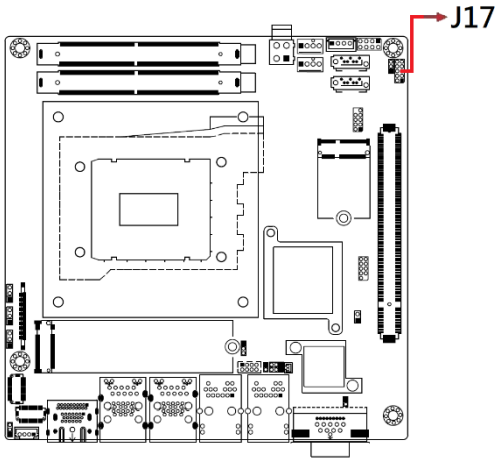


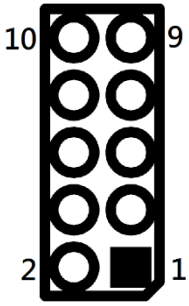
2.5.13 J16: Front Panel Connector



Pin	Signal Name	Pin	Signal Name
1	Power BTN	2	Power BTN
3	HDD LED+	4	HDD LED-
5	Reset BTN	6	Reset BTN
7	Power LED+	8	Power LED-

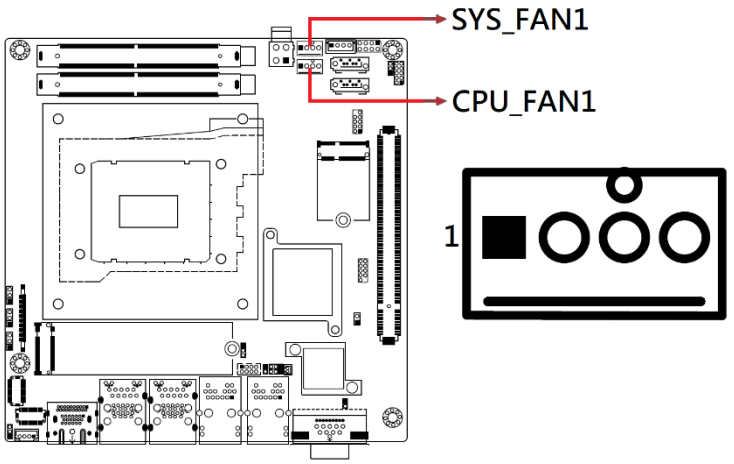
2.5.14 J17: Digital I/O Connector (4 in, 4 out)





Pin	Signal Name	Pin	Signal Name
1	Ground	2	+5V
3	Out3	4	Out1
5	Out2	6	Out0
7	IN3	8	IN1
9	IN2	10	IN0

2.5.15 CPU_FAN1: CPU Fan Power Connector



Pin	Signal Name
1	Ground
2	+12V
3	Rotation detection
4	Control

Note: PWM Only

2.5.16 SYS_FAN1: System Fan Power Connector

Pin	Signal Name
1	Ground
2	+12V
3	Rotation detection
4	Control

Note: PWM Only

Chapter 3
Drivers Installation

This chapter introduces installation of the following drivers:

- Intel® Chipset Software Installation Utility
- VGA Driver
- HD Audio Driver
- Intel® Trusted Execution Engine Drivers
- Intel® Serial I/O Drivers
- LAN Drivers

3.1 Introduction

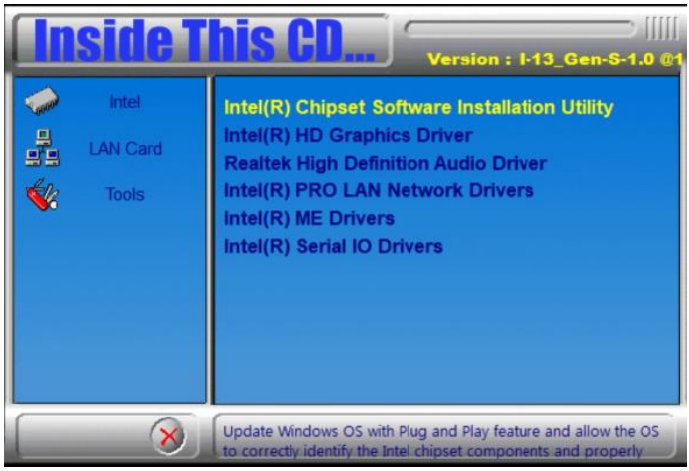
This section describes the installation procedures for software and drivers. The contents of this section include the following:

Note: After installing your Windows operating system, you must install the Intel® Chipset Software Installation Utility first before proceeding with the drivers installation.

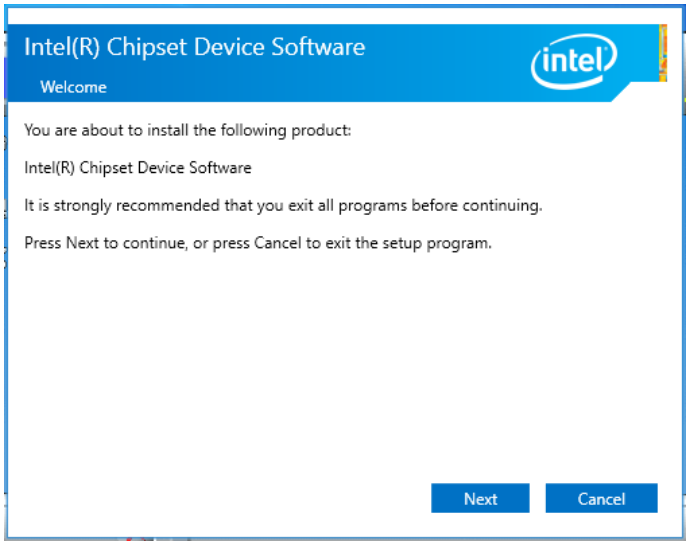
3.2 Intel® Chipset Software Installation Utility

The Intel® Chipset drivers should be installed first before the software drivers to install INF files for Plug & Play function for Intel chipset components. Follow the instructions below to complete the installation.

1. The software drivers are available on the IBASE website. Go to the download page of the product. Copy the compressed drivers file to your computer. Double click the file to decompress it. Run “CDGuide” to go to the main drivers page. Click **Intel** on the left pane and then **Intel(R) AlderLake-S/RaptorLake-S Chipset Drivers**, and **Intel(R) Chipset Software Installation Utility** on the right pane.

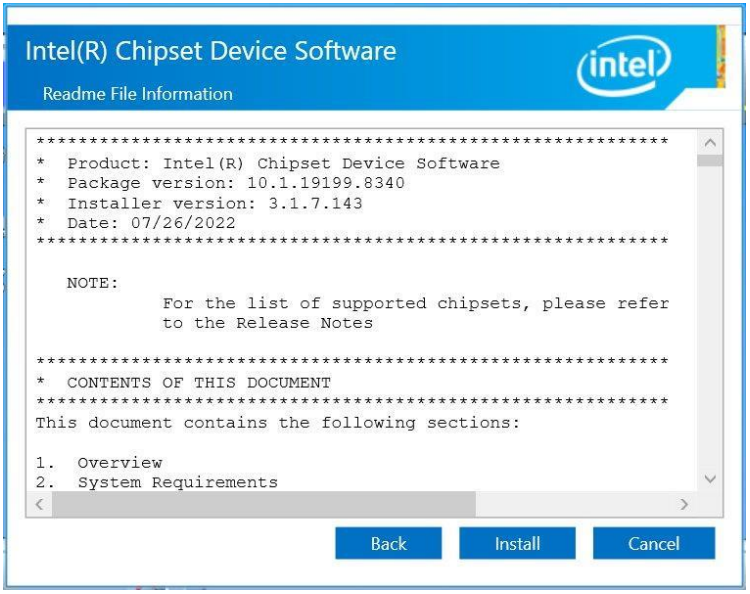


2. When the *Welcome* screen to the Intel® Chipset Device Software appears, click **Next** to continue.



3. Accept the terms in the *License Agreement* and click **Accept**.

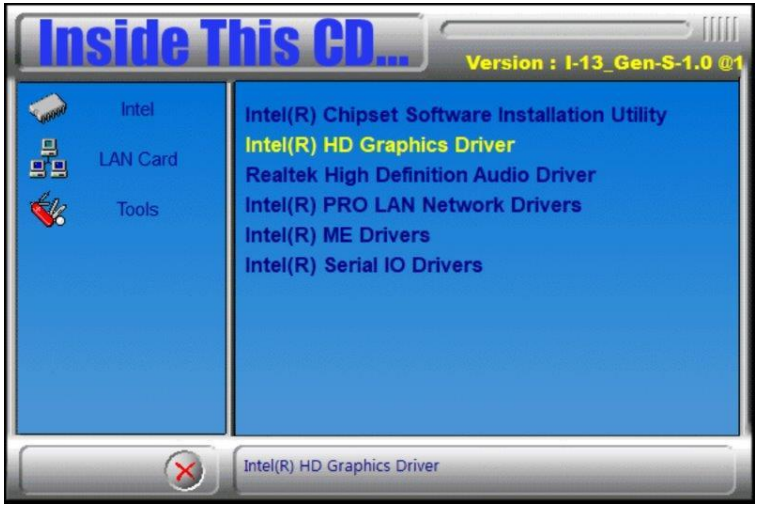
4. On the *Readme File Information* screen, click **Install**.



5. When the driver has been completely installed, press **Finish** to complete the setup process.

3.3 VGA Driver Installation

1. Click **Intel** on the left pane and then **Intel(R) AlderLake-S/ RaptorLake-S Chipset Drivers**, and **Intel(R) HD Graphics Driver** on the right pane.

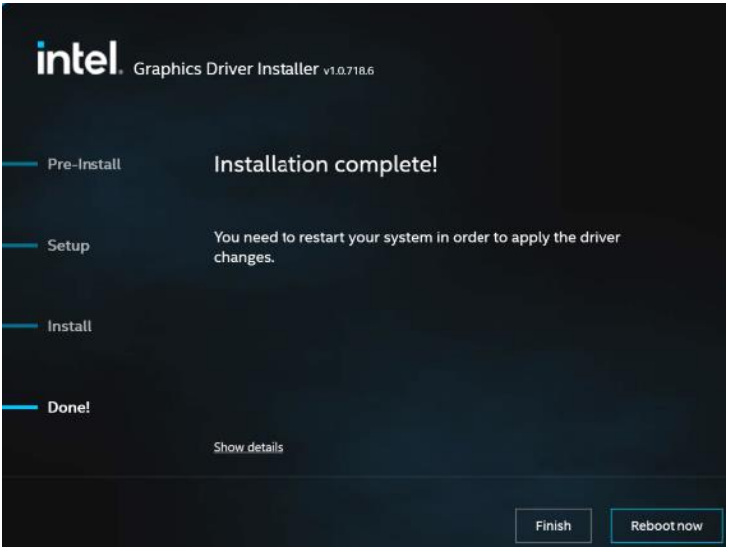


2. When the ***Intel Graphics Driver Installer*** screen appears, click **Begin installation**.

3. Click **I agree** to accept the INTEL SOFTWARE LICENSE AGREEEMENT.

4. In the Pre-Install stage, press **Start** to start installing the new graphics driver.

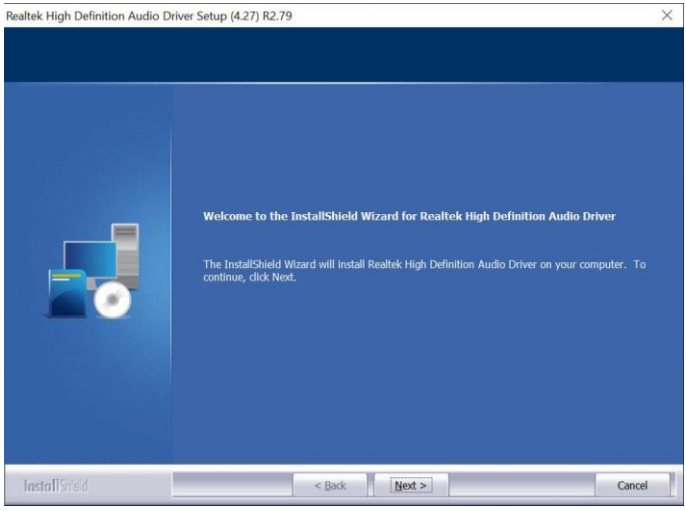
5. The next screen will indicate that the new graphics driver is being installed. When the message "**Installation complete!**" appears, restart your system in order to apply the driver changes.



3.4 Realtek HD Audio Driver Installation

1. Click **Intel** on the left pane and then **Intel(R) AlderLake-S/ RaptorLake-S Chipset Drivers**, and **Realtek High Definition Audio Driver** on the right pane.

2. On the *Welcome* screen of the InstallShield Wizard, click **Next** to install the drivers.

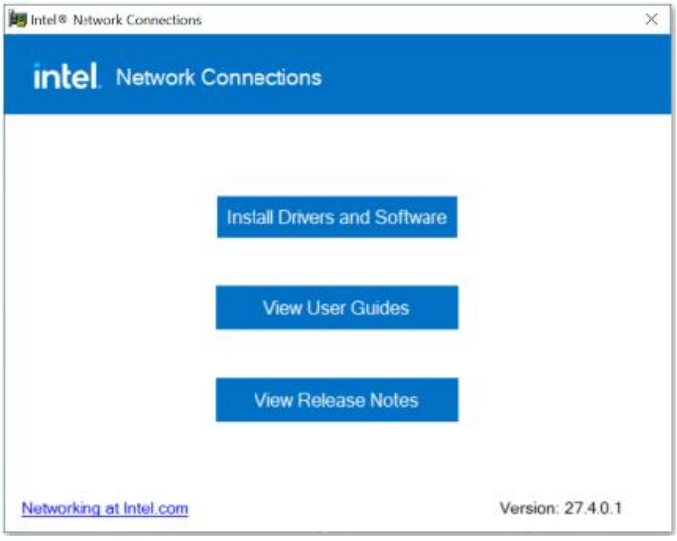


3. When the audio driver has been successfully installed, press **Finish** to restart the computer.

3.5 LAN Drivers Installation

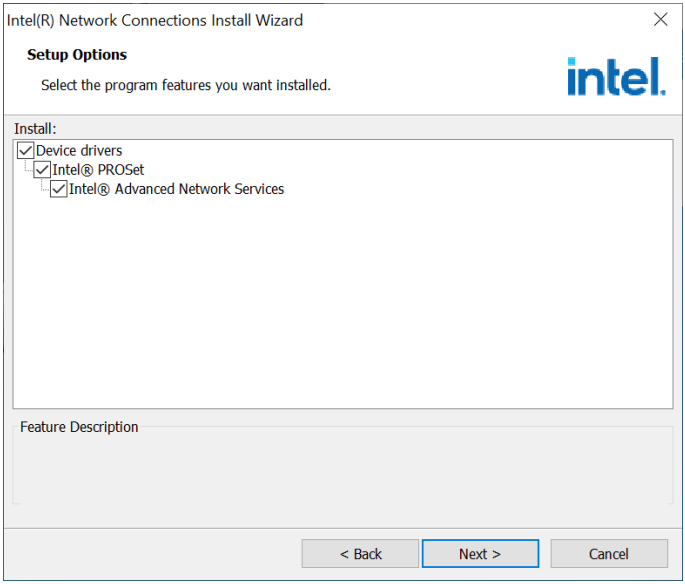
1. Click **LAN Card** on the left pane and then **Intel PRO LAN Network Drivers** on the right pane.

2. Click **Install Drivers and Software**.



3. When the *Welcome to the install wizard for Intel(R) Nework Connection* screen appears, press **Next**.

4. On the *Setup Options* screen, select the program features you want installed. Then press **Next** to continue.



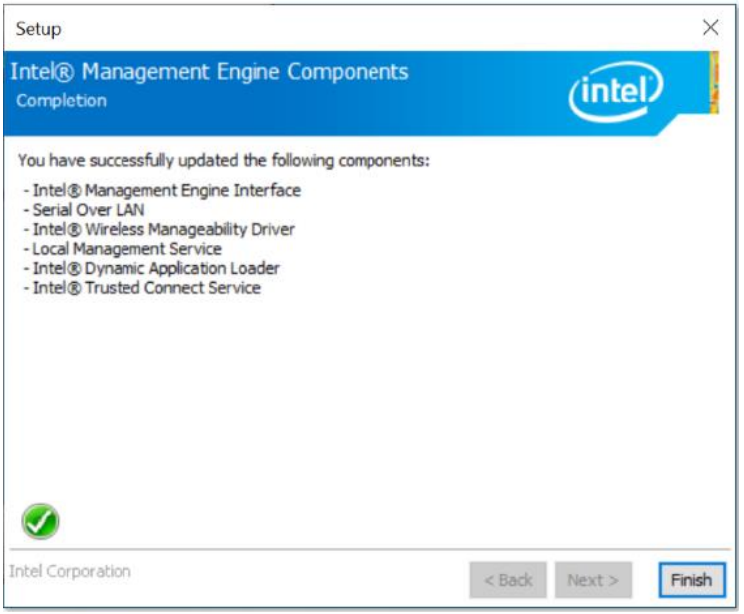
5. On the *Ready to Install the Program* screen, press **Install** to begin the installation.

6. When the *Install wizard Completed* screen appears, press **Finish**.

3.6 Intel® ME Drivers Installation

1. Click **Intel** on the left pane and then **Intel(R) AlderLake-S/ RaptorLake-S Chipset Drivers,** and **Intel(R) ME Drivers** on the right pane.

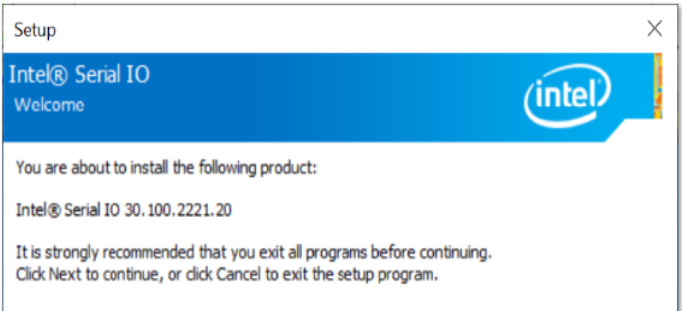
2. When the *Welcome* screen to the **Intel® Management Engine Components** appears, press **Next**.
3. Accept the terms in the License Agreement and press **Next**.
4. On the next screen, press **Next** to install to the default folder.
5. Press **Finish** when the necessary components have been successfully installed.



3.7 Intel® Serial IO Drivers Installation

1. Click **Intel** on the left pane and then **Intel(R) AlderLake-S/ RaptorLake-S Chipset Drivers,** and **Intel(R) Serial IO Drivers** on the right pane.

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



3. Accept the terms in the license agreement and press **Next**.
4. On the **Readme File Information** and **Confirmation** screens, press **Next**.

   Press **Finish** when the **Completion** screen appears.

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Chapter 4
BIOS Setup

This chapter describes the different settings available in the AMI BIOS that comes with the board. 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 your computer system supports Intel® processors. The BIOS provides critical low-level support for standard devices such as disk drives, serial ports and parallel 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. Press 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.

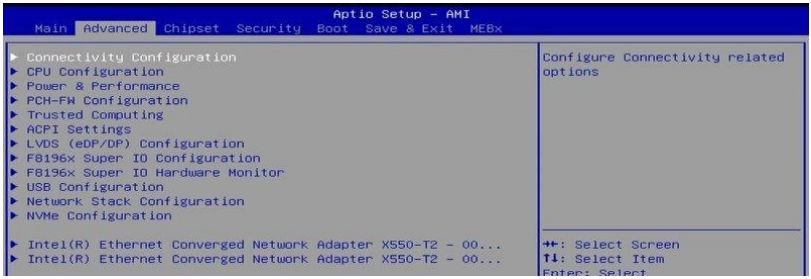
These defaults have been carefully chosen by both AMI and your system manufacturer to provide the absolute maximum performance and reliability. Changing the defaults could make the system unstable and crash in some cases.

4.3 Main Settings

BIOS Setting	Description
System Language	Choose the system default language.
System Date	Sets the date. Use the <Tab> key to switch between the date elements.
System Time	Set the time. Use the <Tab> key to switch between the time elements.

4.4 Advanced Settings

This section allows you to configure, improve your system and allows you to set up some system features according to your preference.



4.4.1 Connectivity Configuration

BIOS Setting	Description
BT Audio Offload	This is an option to enable/disable BT audio offload which enables audio input from BT device to the audio DSP and enables power efficient audio output to BT device.
RFI Mitigation	This is an option intended to enable/disable DDR-RFIM feature for Connectivity. This feature may result in temporary slowdown of the DDR speed.
Preboot BLE	This will be used to enable Preboot Bluetooth function.
Discrete Bluetooth Interface	Seriallo UARTO needs to be enabled to select BT interace.
BT Tile Mode	Enable/Disable Tile.
Advanced Settings	Configure ACPI objects for wireless devices.
WWAN Configuration	Configure WWAN related options.
WWAN Device	Select the M.2 WWAN Device options to enable 4G – 7360/7560 (Intel), 5G- M80 (MediaTek) Modems

4.4.2 CPU Configuration

BIOS Setting	Description
Intel (VMX) Virtualization Technology	When enable, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.
Active Performance-cores Active Efficient-cores	Number of P-cores to enable in each processor package. Note: Number of Cores and E-cores are looked at together. When both are (0,0), Pcode will enable all cores
Hyper-Threading	Enable or disable Hyper-Threading Technology.
Legacy Game Compatibility Mode	When enable, pressing the scroll lock key will toggle the Efficient-cores between being parked when Scroll Lock LED is on and un-parked when LED is off.

4.4.3 Power & Performance

BIOS Setting	Description
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). AUTO means enabled.

4.4.4 PCH-FW Configuration

BIOS Setting	Description
ME State	When Disabled ME will be put into ME Temporarily Disabled Mode.
Manageability Features State	Enable/Disable Intel(R) Manageability features. **Note:** This option disables/enables Manageability Features support in FW. To disable support platform must be in an unprovisioned state first.
AMT BIOS Features	When disabled AMT BIOS Features are no longer supported and user is no longer able to access MEBx Setup. **Note:** This opton does not disable Manageability Features in FW.

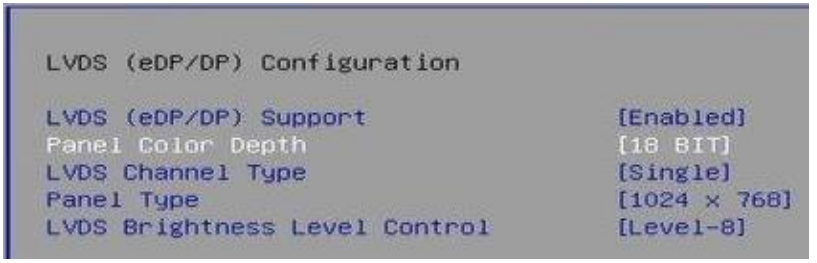
4.4.5 Trusted Computing

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 / SHA384 / SH3_256 PCR Bank	Option: Enabled / Disabled
Pending operation	Schedule an operation for the security device. Note: Your computer will reboot during restart in order to change state of security device.
Platform Hierarchy	Enables / Disables platform hierarchy.
Storage Hierarchy	Enables / Disables storage hierarchy.
Endorsement Hierarchy	Enables / Disables endorsement hierarchy.
Physical Presence Spec Version	Select to tell O.S to support PPI Spec Version (1.2 or 1.3). **Note:** Some HCK tests might not support 1.3.
Device Select	Auto will support TPM 1.2 / 2.0 devices with the default set to TPM 2.0. If not found, TPM 1.2 devices will be enumerated

4.4.6 ACPI Settings

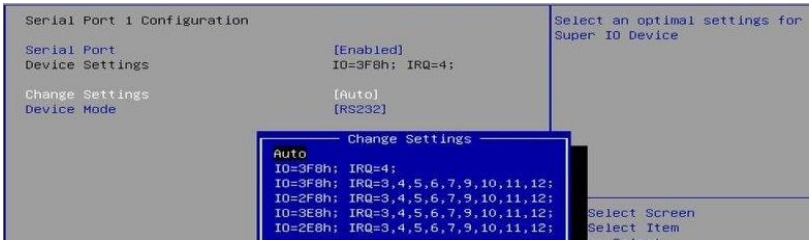
BIOS Setting	Description
Enable ACPI Auto Configuration	Enables or Disables BIOS ACPI Auto Configuration
Enable Hibernation	Enables / Disables the system ability to hibernate (OS/S4 Sleep State). This option may be not effective with some OS.
ACPI Sleep State	Select the highest ACPI sleep state the system will enter when the Suspend button is pressed. Options: Suspend Disabled, S3 (Suspend to RAM)

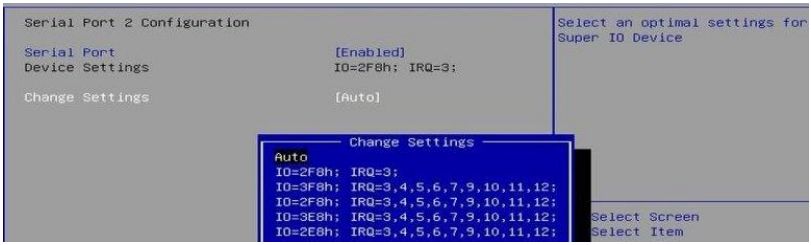
4.4.7 LVDS (eDP/DP) Configuration



BIOS Setting	Description
LVDS (eDP/DP) Support	LVDS (eDP/DP) ON/OFF
Panel Color Depth	Options: 18 BIT, 24bit(VESA), 24bit(JEIDA)
LVDS Channel Type	Options: Single, Dual
Panel Type	Options: 800 x 480, 800 x 600, 1024 x 768, 1280 x 768, 1280 x 800, 1280 x 960, 1366 x 768, 1440 x 900, 1600 x 900, 1600 x 1200, 1680 x 1050, 1920 x 1080, 1920 x 1200
LVDS Brightness Level Control	Options: Level-1 to Level-8

4.4.8 F8196x Super IO Configuration





4.4.9 F8196x Super IO Hardware Monitor

BIOS Setting	Description
CPU Smart Fan Control	Enables / Disables the CPU smart fan feature. Options: Disabled / 50 °C / 60 °C / 70 °C / 80 °C
SYS Smart Fan Control	Enables / Disables the system smart fan feature. Options: Disabled / 50 °C / 60 °C / 70 °C / 80 °C
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.

4.4.10 USB Configuration

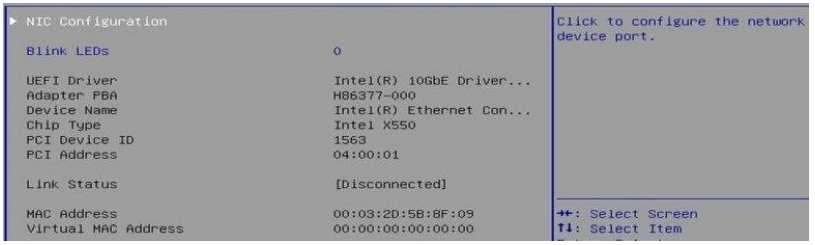
BIOS Setting	Description
Legacy USB Support	• **Enabled** enables Legacy USB support. • **Auto** disables legacy support if there is no USB device connected. • **Disabled** keeps USB devices available only for EFI applications.
XHCI Hand-off	This is a workaround for OSes without XHCI hand-off support. 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 (1 / 5 10 / 20 secs) for Control, Bulk, and Interrupt transfers.
Device reset time-out	Gives seconds (10 / 20 / 30 / 40 secs) to delay 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. **Auto** uses default value for a Root port it is 100ms. But for a Hub port, the delay is taken from Hub descriptor.

4.4.11 Network Stack Configuration

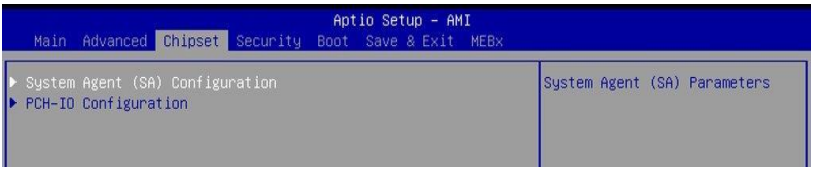
BIOS Setting	Description
Network Stack	Enables / Disables UEFI Network Stack.
IPv4 PXE Support	Enables / Disables IPv4 PXE Boot Support. If disabled, Ipv4 PXE boot option will not be created.
IPv4 HTTP Support	Enables / Disables IPv4 HTTP Boot Support. If disabled, Ipv4 HTTP boot option will not be created.
IPv6 PXE Support	Enables / Disables IPv6 PXE Boot Support. If disabled, Ipv4 PXE boot option will not be created.
IPv6 HTTP Support	Enables / Disables IPv6 HTTP Boot Support. If disabled, Ipv4 HTTP boot option will not be created.
PXE boot wait time	Assigns a period of time to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the value
Media detect count	Assigns a number of times to check the presence of media.

4.4.12 NVMe Configuration

4.4.13 Intel(R) Ethernet Converged Network Adapter



4.5 Chipset Settings



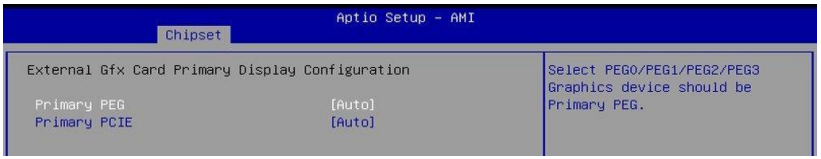
BIOS Setting	Description
System Agent (SA) Configuration	System Agent (SA) parameters
PCH-IO Configuration	PCH parameters

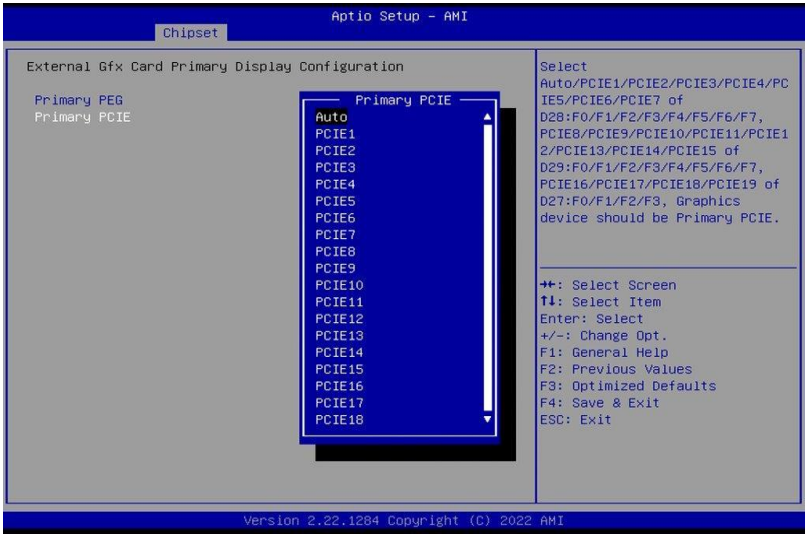
4.5.1 System Agent (SA) Configuration

Graphics Configuration

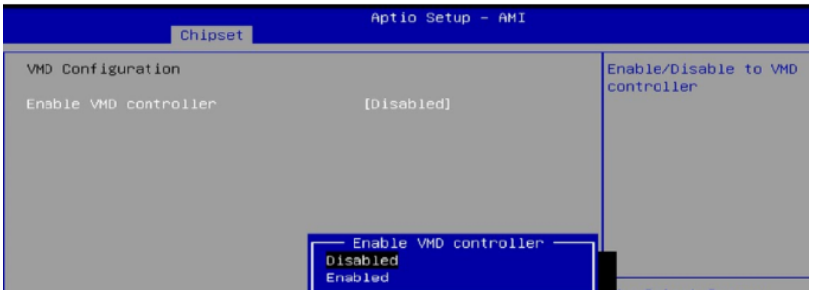
BIOS Setting	Description
Primary Display	Select which of IGFX/PEG/PCI Graphics device should be primary display or select HG for Hybrid Gfx. Options: Auto, IGFX, PEG Slot, PCH PCI, HG
External Gfx Card Primary Display Configuration	External Gfx Card Primary Display Configuration
Primary PEG	Select PEG0/PEG1/PEG3 Graphics device should be Primary PEG.
Primary PCIE	Select the graphics device as Primary PCIE.
Internal Graphics	Keep IGFX enabled based on the setup options. Options: Auto, Disabled, Enabled
GTT Size	Sets the GTT size as 2 MB, 4 MB, or 8 MB.

Aperture Size	Sets the aperture size. **Note:** Above 4 GB MMIO BIOS assignment is automatically enabled when selecting 2048 MB aperture. To use this feature, disable CSM support.



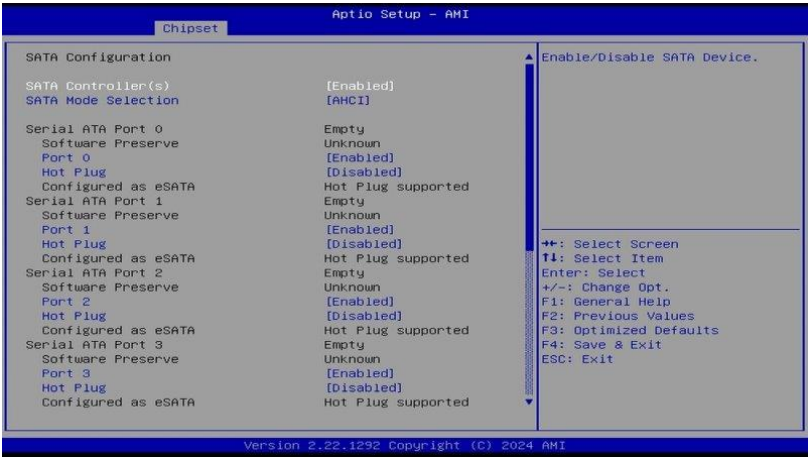


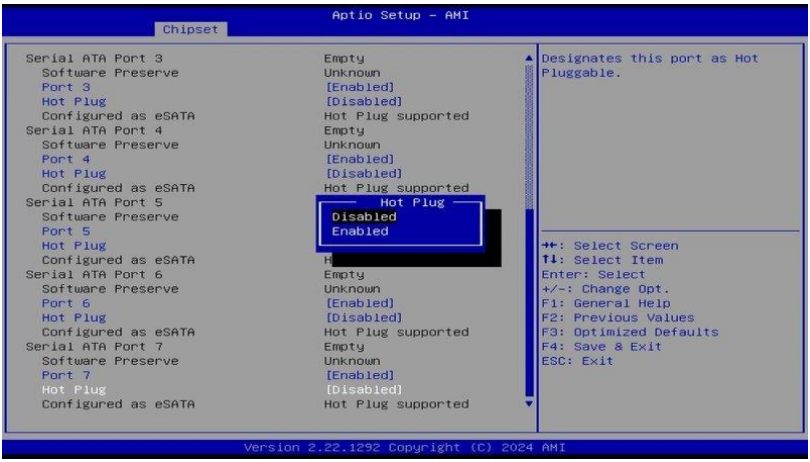
VMD Setup Menu



4.5.2 PCH-IO Configuration

BIOS Setting	Description
SATA Configuration	SATA device options settings.
Power Failure	Specify what state to go to when power is re-applied after a power failure (G3 state). Options: Always On, Always Off



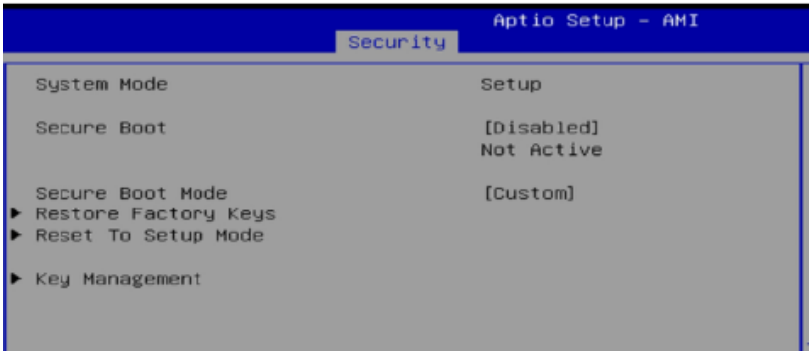


BIOS Setting	Description
SATA Controller(s)	Enables / Disables the SATA device.
SATA Mode Selection	Determines how SATA controller(s) operate.
Serial ATA Ports	Enables / Disables SATA ports.
Hot Plug	Designates the port as Hot Pluggable.

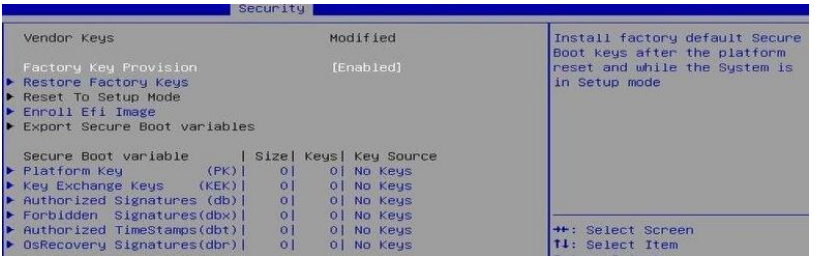
4.6 Security Settings

BIOS Setting	Description
Administrator Password	Sets an administrator password for the setup utility.
User Password	Sets a user password.
Secure Boot	Configures Secure Boot.

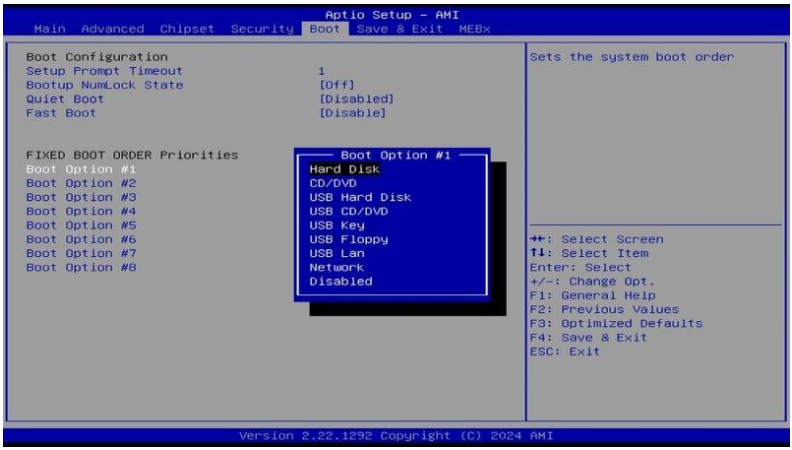
4.6.1 Secure Boot



BIOS Setting	Description
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: Standard or Custom. 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.
Key Management	Enables expert users to modify Secure Boot Policy variables without full authentication.



4.7 Boot Settings

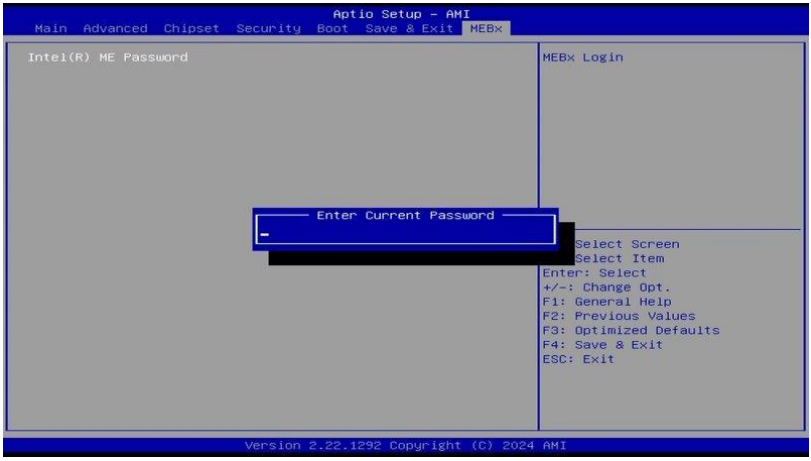


BIOS Setting	Description
Setup Prompt Timeout	Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.
Bootup NumLock State	Selects the keyboard NumLock state.
Quiet Boot	Enables / Disables Quiet Boot option.
Fast Boot	Enables or disables boot with initialization of a minimal set of devices required to launch active boot optin. Has no effect for BBS boot options.
Boot Option Priorities	Sets the system boot order.

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.
Launch EFI Shell from filesystem device	Attempts to launch EFI Shell application (Shell.efi) from one of the available filesystem devices.

4.9 MEBx


Aptio Setup – AMI
Main Advanced Chipset Security Boot Save & Exit MEBx
Intel(R) ME Password
MEBx Login
Enter Current Password
Select Screen
Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.22.1292 Copyright (C) 2024 AMI

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Appendix

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

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
0x00000A10-0x00000A1F	Motherboard resources
0x00000A20-0x00000A2F	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
0x00000040-0x00000043	System timer
0x00000050-0x00000053	System timer
0x00003000-0x0000303F	Microsoft Basic Display Adapter
0x000003F8-0x000003FF	Communications Port (COM1)
0x000002F8-0x000002FF	Communications Port (COM2)
0x0000EFA0-0x0000EFBF	SM Bus Controller
0x00003090-0x00003097	Standard SATA AHCI Controller
0x00003080-0x00003083	Standard SATA AHCI Controller
0x00003060-0x0000307F	Standard SATA AHCI Controller
0x00000000-0x00000CF7	PCI Express Root Complex

Address	Device Description
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
0x00002000-0x000020FE	Motherboard resources
0x00000060-0x00000060	Standard PS/2 Keyboard
0x00000064-0x00000064	Standard PS/2 Keyboard
0x00001854-0x00001857	Motherboard resources

B. Interrupt Request Lines (IRQ)

The following table shows the IRQ used by the devices on board.

Level	Function
IRQ 4294967264~88	Intel(R) Ethernet Controller I226-V #3
IRQ 4294967289	Intel(R) USB 3.20 eXtensible Host Controller - 1.20 (Microsoft)
IRQ 0	System timer
IRQ 4294967238	Intel(R) Management Engine Interface #1
IRQ 4294967292	PCI Express Root Port
IRQ 4	Communications Port (COM1)
IRQ 3	Communications Port (COM2)
IRQ 4294967290	Standard SATA AHCI Controller
IRQ 4294967239~63	Intel(R) Ethernet Controller I226-LM
IRQ 4294967293	PCI Express Root Port
IRQ 55~204	Microsoft ACPI-Compliant System
IRQ 17	High Definition Audio Controller
IRQ 1	Standard PS/2 Keyboard
IRQ 4294967294	PCI Express Root Port
IRQ 12	Microsoft PS/2 Mouse
IRQ 4294967291	PCI Express Root Port

C. Watchdog Timer Configuration

The Watchdog Timer (WDT) is used to generate a variety of output signals after a user programmable count. The WDT is suitable for use in the prevention of system lock-up, such as when software becomes trapped in a deadlock. Under these sorts of circumstances, the timer will count to zero and the selected outputs will be driven.

Under normal circumstance, you will need to restart the WDT at regular intervals before the timer counts to zero.

Sample Code:

```
//---------------------------------------------------------------------------
//
// 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 "F81966.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 81966 watch dog program\n");
        SIO = Init_F81966();
        if (SIO == 0)
        {
                printf("Can not detect Fintek 81966, 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_F81966_Reg(0x2B);
        bBuf &= (~0x20);
        Set_F81966_Reg(0x2B,   bBuf);          //Enable WDTO

        Set_F81966_LD(0x07);                   //switch to logic device 7
        Set_F81966_Reg(0x30,   0x01);          //enable timer

        bBuf = Get_F81966_Reg(0xF5);
        bBuf &= (~0x0F);
        bBuf |= 0x52;
        Set_F81966_Reg(0xF5,   bBuf);          //count mode is second

        Set_F81966_Reg(0xF6,   interval);      //set timer

        bBuf = Get_F81966_Reg(0xFA);
        bBuf |= 0x01;
        Set_F81966_Reg(0xFA,   bBuf);          //enable WDTO output

        bBuf = Get_F81966_Reg(0xF5);
        bBuf |= 0x20;
        Set_F81966_Reg(0xF5,   bBuf);          //start counting
}
//-----------------------------------------------------------------------
void DisableWDT(void)
{
        unsigned char bBuf;

        Set_F81966_LD(0x07);                   //switch to logic device 7

        bBuf = Get_F81966_Reg(0xFA);
        bBuf &= ~0x01;
        Set_F81966_Reg(0xFA,   bBuf);          //disable WDTO output

        bBuf = Get_F81966_Reg(0xF5);
        bBuf &= ~0x20;
        bBuf |= 0x40;
        Set_F81966_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 "F81966.H"
#include <dos.h>
//---------------------------------------------------------------------------
unsigned int F81966_BASE;
void Unlock_F81966 (void);
void Lock_F81966 (void);
//---------------------------------------------------------------------------
unsigned int Init_F81966(void)
{
        unsigned int result;
        unsigned char ucDid;

        F81966_BASE = 0x4E;
        result = F81966_BASE;

        ucDid = Get_F81966_Reg(0x20);
        if (ucDid == 0x07)                      //Fintek 81966
        {       goto Init_Finish;               }

        F81966_BASE = 0x2E;
        result = F81966_BASE;

        ucDid = Get_F81966_Reg(0x20);
        if (ucDid == 0x07)                      //Fintek 81966
        {       goto Init_Finish;               }

        F81966_BASE = 0x00;
        result = F81966_BASE;

Init_Finish:
        return (result);
}
//---------------------------------------------------------------------------
void Unlock_F81966 (void)
{
        outportb(F81966_INDEX_PORT, F81966_UNLOCK);
        outportb(F81966_INDEX_PORT, F81966_UNLOCK);
}
//---------------------------------------------------------------------------
void Lock_F81966 (void)
{
        outportb(F81966_INDEX_PORT, F81966_LOCK);
}
//---------------------------------------------------------------------------
void Set_F81966_LD( unsigned char LD)
{
        Unlock_F81966();
        outportb(F81966_INDEX_PORT, F81966_REG_LD);
        outportb(F81966_DATA_PORT, LD);
        Lock_F81966();
}
```

```
//---------------------------------------------------------------------------
void Set_F81966_Reg( unsigned char REG, unsigned char DATA)
{
                Unlock_F81966();
                outportb(F81966_INDEX_PORT, REG);
                outportb(F81966_DATA_PORT, DATA);
                Lock_F81966();
}
//---------------------------------------------------------------------------
unsigned char Get_F81966_Reg(unsigned char REG)
{
                unsigned char Result;
                Unlock_F81966();
                outportb(F81966_INDEX_PORT, REG);
                Result = inportb(F81966_DATA_PORT);
                Lock_F81966();
                return Result;
}
//---------------------------------------------------------------------------
```

```
//---------------------------------------------------------------------------
//
// 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   F81966_H
#define   F81966_H                          1
//---------------------------------------------------------------------------
#define         F81966_INDEX_PORT       (F81966_BASE)
#define         F81966_DATA_PORT        (F81966_BASE+1)
//---------------------------------------------------------------------------
#define         F81966_REG_LD           0x07
//---------------------------------------------------------------------------
#define         F81966_UNLOCK           0x87
#define         F81966_LOCK             0xAA
//---------------------------------------------------------------------------
unsigned int Init_F81966(void);
void Set_F81966_LD( unsigned char);
void Set_F81966_Reg( unsigned char,
unsigned char); unsigned char
Get_F81966_Reg( unsigned char);
//---------------------------------------------------------------------------
#endif  //   F81966_H
```

D. Onboard Connector Types

Function	Connector	Type	Compatible Mating Type (for reference)
COM1 & COM2 RS-232/422/485	CN7	YIMTEX 40909AANSABR	D-SUB 9-pin
Digital I/O Connector	J17	E-CALL 0196-01-200-100	Dupont 2.0 mm 2*5-pin
USB 2.0	J8	E-CALL 0126-01-2811009	Dupont 2.54 mm 2*5-pin
Front Panel Settings	J16	E-CALL 0126-01-203-200	Dupont 2.54 mm 2*5-pin
CPU Fan Power	CPU_FAN1	Techbest W2-03I104132S1WT(A)-L	Molex 47054-1000
System Fan Power	SYS_FAN1	Techbest W2-03I104132S1WT(A)-L	Molex 47054-1000

E. MI1001 USB Power Control Bit Mapping.

Function	Connector	Software Mapping
M.2 –E Key	J13	bit_0
USB 3.1	CN3	bit_1