AVS-52X Series

8th /9th Generation, Intel Core i7/i5/i3 Processor Machine Application System

User Manual

Release Date	Revision
FEB 2022	V1.0

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Revision History

Reversion	Date	Description
1.0	2022/02/23	Official Version

Warning!_____

This equipment will generate, use and radiate radio frequency energy and if not installed and used in accordance with the instructions manual, it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to FCC Rules, which is designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user with its own expense will be required to take whatever measures may be required to correct the interference.

Electric Shock Hazard – Do not operate the machine with its back cover removed. There are dangerous high voltages inside.

Packing List

Accessories (as ticked) included in this package are:
☐ Adaptor ☐ Driver & manual CD disc ☐ Other._____(please specify)

Safety Precautions

Follow the messages below to prevent your systems from damage:

- Avoid your system from static electricity on all occasions.
- Prevent electric shock. Don‘t touch any components of this card when the card is power-on. Always disconnect power when the system is not in use.
- Disconnect power when you change any hardware devices. For instance, when you connect a jumper or install any cards, a surge of power may damage the electronic components or the whole system.

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Figures

Chapter 1 Getting Started

1.1 Features

- Vertical System for Artificial Intelligent applications such as Machine Vision, Edge Computing, Machine Learning/Inference, Robotic Control, Automation, and so on.
- High performance CPU of Intel 8th /9th Gen. Core i Processor
- Large memory support with DDR4 (2666MHz) SO-DIMM up to 64GB
- Removable Drive-bays for easy data storage maintenance
- Support extensive GPU Card expansion for Hard-computing requirement (with GPU card holder)
- Mainboard CPU Fan-less Design and GPU Card Expansion with Smart Fan support
- Flexible expansion features through I/O module design with miniPCIe and PCIe/PCI Add-on card support

1.2 Specifications

	AVS-520/522/524
System	
CPU	Intel 9th Gen. Core i7/i5/i3 Processor (LGA1151) Intel® Core™ i7-9700TE Intel® Core™ i5-9500TE Intel® Core™ i3-9300TE
Chipset	Q370
Memory	2 x 260-pin DDR4 SO-DIMM memory, up to 64GB (Up to 2666MHz)
Outside IO Port	
Front I/O Ports	4 x USB 3.2 Gen1 type A, 1 x HDMI 2 x USB 3.2 Gen1 type A 4 x GbE LAN RJ-45(2_M8172+2_TB-619) 1 x RS-232/422/485 DB-9, Default RS-232, COM1 1 x RS-232 DB-9, COM2

	1 x VGA 8 x Digital I/O terminal block 1*10 pin with isolation, 4 x SI, 4 x SO, 1 x 5V, 1 x GND 1 x 3-pin terminal block for DC power input
Internal I/O	
Internal I/O	1 x MIO (1x PWR BTN; 1xPWR LED; 1x Reset BTN; 1x HDD LED; 1x 12V output) 1 x Line out internal pin header (reserve for extension) 1 x Mic-in internal pin header (reserve for extension)
Power Button	
Power Button	1 x Power button (onboard) 1 x 2-pin power switch connector (onboard)
LED	
LED	1 x HDD LED (onboard) 1 x PWR LED (onboard)
M.2	
M.2	1 x M.2 Key M or B, 2280/2242: SMbus, SATA 6GB/s and PCIe x4 supports NVME
AMT	
AMT	1 x AMT support vPro
Storage Space	
Storage	2 x 2.5” SATA3 HDD/SSD (Easy-swappable HDD tray), with RAID 0,1 optional
Expansion	
Expansion Slot	AVS-520: NA
	AVS-522: 1 x PCIe x 16 slot
	AVS-524: 4 x PCI/PCIe slots
Others	
Others	1 x Watchdog Timer (256 steps) 1 x Thermal Copper for PCBA Thermal Detection 3 x SMA holes for Wi-Fi or Wireless 4G LTE/GPS antennas 1 x HDD and large size customized daughter bard or 2 x HDD BIOS set (default): CPU Turbo turn off and hide option
Power	
Power Input	9~36V DC
Mechanical	

Construction	Plating Titanium Gray Aluminum Heatsink and Black Steel Chassis		
Mounting	Wall Mount (Default) & Din Rail back side (option)		
Dimensions(mm)	220 x 149 x 68		
Net Weight(Kg)	AVS-520:3.4Kg	AVS-522:TBD	AVS-524:4.5Kg
Environmental			
Operating Temperature	-20~60°C(for i3/i5 model)	-20~50°C(for i7 model)	
Storage Temperature	-40~85°C		
Storage Humidity	10 to 90% @ 40°C, non-condensing		
Certification	CE / FCC Class A		
Operating System Support	Microsoft® Win10 IoT, Linux Kernel 4.15 (Ubuntu 16.04.4)		
TPM	1 x Infineon's Trusted Platform Module (TPM 2.0)		

1.3 Dimensions

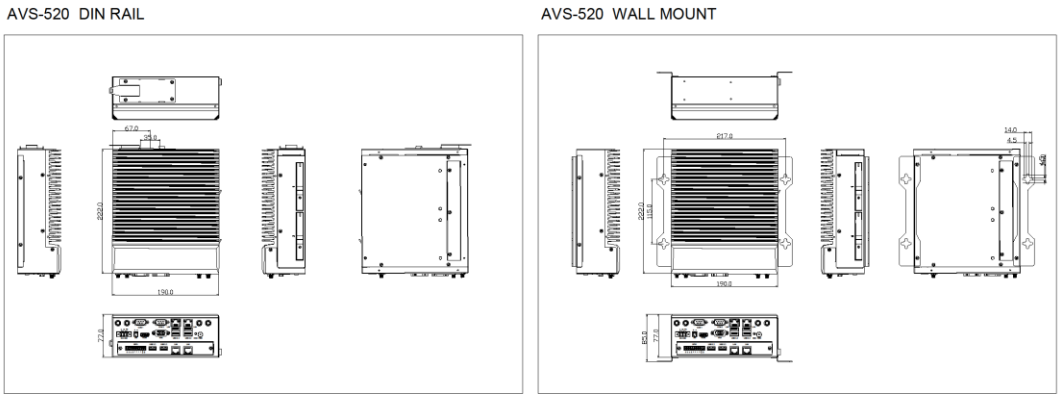


Figure 1.1: Dimension of AVS-520

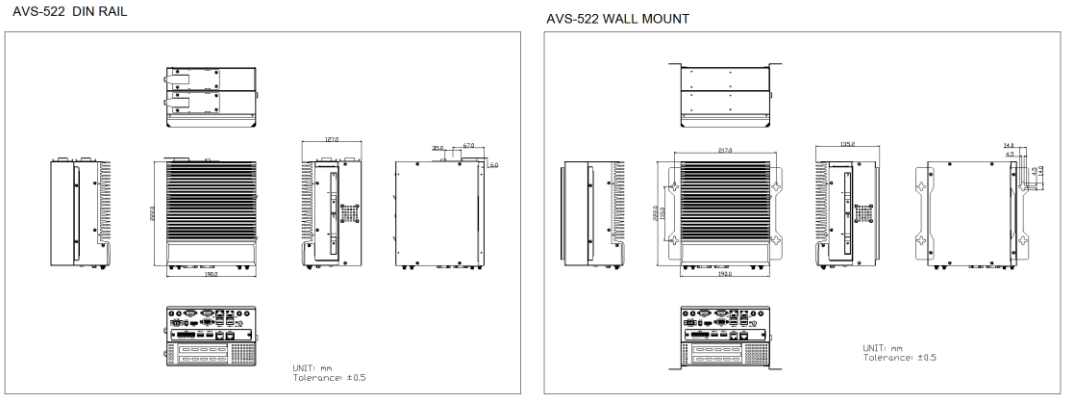


Figure 1.2: Dimension of AVS-522

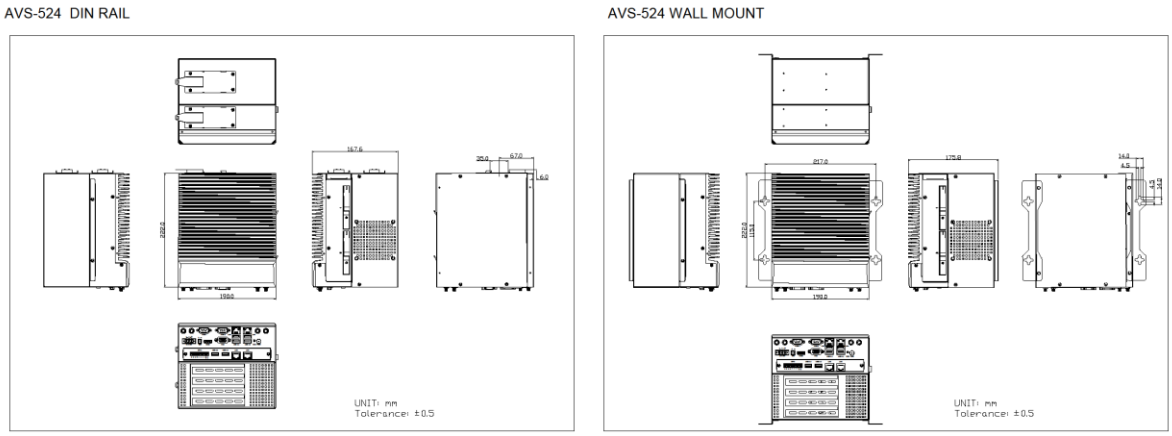


Figure 1.3: Dimension of AVS-524

1.4 Brief Description of AVS-52X Series

AVS-52X series are fanless-design high-efficiency BOX PC, powered by Intel 9th Generation Core i3/i5/i7 processor and supports 2 x 260-pin DDR3 SO-DIMM memory, up to 64GB. They come with 4 x USB 3.2 Gen1 Type A, 2 x USB 3.2 Gen1 Type A, 4 x LAN, 1 x VGA, 2 x COM ports, 1 x audio line-out, and 1 x power button. The models support 2 x 2.5” SATA3 HDD space which is easy accessible design and 9~36V DC wide-ranging power input. They have up to 4 x PCI/PCIe slot for expansion. The models are plating titanium gray aluminum heatsink and black steel chassis design, and can be wall-mounted and din-rail mounted. The AVS-52X series work well with our other products and they can provide an absolute easy way to perform control maintenance.

Figure 1.4: Appearance of AVS-520

Figure 1.5: Appearance of AVS-522

Figure 1.6: Appearance of AVS-524

Chapter 2 Hardware

2.1 Motherboard Introduction

ASB-M8372 is a non-standard industrial motherboard developed on the basis of Intel Q370, which provides abundant peripheral interfaces to meet the needs of different customers. Also, it features dual GbE ports, 6-COM ports, one M.2 M-Key and one mPCIE configuration. To satisfy the special needs of high-end customers, ASB-M8372 is designed with 164-pin PCIe x 16 socket extension interface. The product is widely used in various sectors of industrial control.

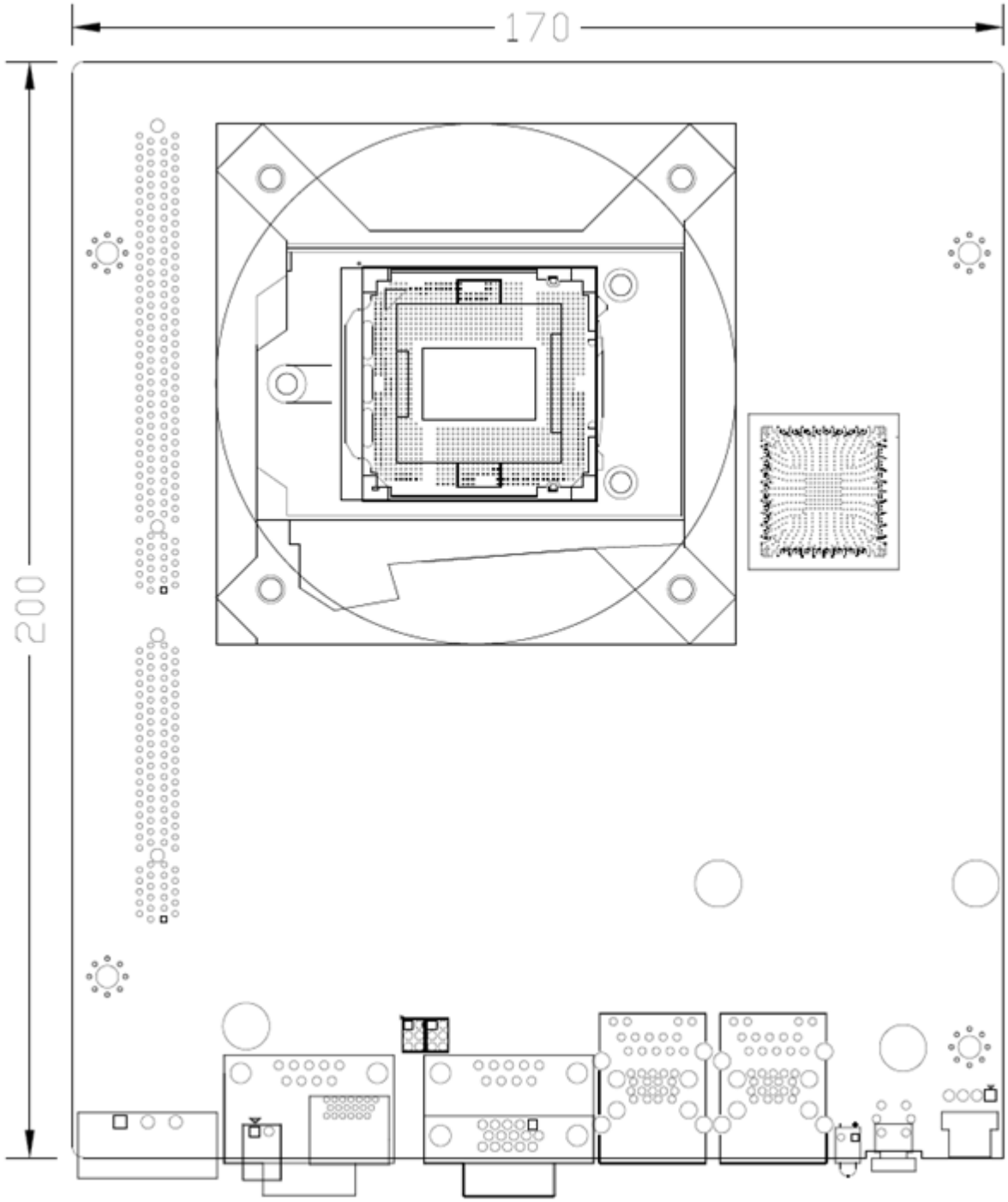
2.2 Specifications

Specifications	
Board Size	200mm x 170mm x 1.6mm
CPU Socket	LGA 1151 Socket
CPU Support	Intel 8th Core i3/i5/i7 Processor Intel® Core™ I3-8100, 3.60GHz 65W Intel® Core™ I3-8100T, 3.10GHz 35W Intel® Core™ I5-8500, 3.00GHz (up to 4.10 GHz) 65W Intel® Core™ I5-8500T, 2.10GHz (up to 3.50 GHz) 35W Intel® Core™ I7-8700, 3.20GHz (up to 4.60 GHz) 65W Intel® Core™ I7-8700T, 2.40GHz (up to 4.00 GHz) 35W Intel 9th Core i3/i5/i7 Processor Intel® Core™ I3-9100E, 3.10GHz (up to 3.70 GHz) 65W Intel® Core™ I3-9100TE, 2.20GHz (up to 3.30 GHz) 35W Intel® Core™ I5-9500E, 3.00GHz (up to 4.20 GHz) 65W Intel® Core™ I5-9500TE, 2.20GHz (up to 3.60 GHz) 35W Intel® Core™ I7-9700E, 2.60GHz (up to 4.40 GHz) 65W Intel® Core™ I7-9700TE, 1.80GHz (up to 3.80 GHz) 35W
Chipset	Intel® Q370
Memory Support	2 x SO-DIMM (260pins) up to 32GB DDR4 2400 MHz FSB(I3-8100/I3-8100T) up to 64GB DDR4 2666 MHz FSB(I5-8500/8500T, I7-8700/8700T) up to 32GB DDR4 2400 MHz FSB(I3-9100TE/I3-9100E)

	up to 64GB DDR4 2666 MHz FSB(I5-9500TE/9500E, I7-9700TE/9700E)
Graphics	Intel® UHD Graphics 630
Display Mode	1 x HDMI interface (HDMI 1.4) 1 x CRT interface
Support Resolution	Up to 4096 x 2304 for HDMI (I3-8100/I3-8100T；I7-8700/I7-8700T) Up to 1920 x 2160 for HDMII Up to 1920 x 1200 for CRT
Double Display	HDMI + CRT
Super I/O	Nuvoton NCT6106D
BIOS	AMI/UEFI BIOS
Storage	2 x SATA3.0 Connector (SATA1/SATA2) 1 x NGFF (M.2) M-Key, support 2242/2280
Ethernet	1 x PCIe GbE LAN via Intel I219-LM Support Intel® AMT Technology (option) 1 x PCIe GbE LAN by Intel I210AT
USB	4 x USB 3.2 Gen1/USB2.0 stack ports for external (USB 3.2: USB3-3/USB3-4/USB3-5/USB3-6) (USB 2.0: USB2-3/USB2-4/USB2-5/USB2-6) 1 x USB 2.0 Single port for internal (USB2-8) 2 x USB 2.0, 2x5 Pin header (USB2-9/USB2-10) 2 x USB 2.0, 2x5 Pin header (USB2-11/USB2-12) 1 x USB 2.0 internal for MPCIE1 (USB2-13) 2 x USB 3.2/2.0 Pin header by CN1 (USB3-1/USB3-2/USB2-1/USB2-2)
Serial	1 x RS232/RS422/RS485 port, DB9 connector for external (COM1) Pin 9 w/5V/12V/Ring select 1 x RS232/RS422/RS485 port, DB9 connector for external (COM2) Pin 9 w/5V/12V/Ring select 2 x RS232 port, 2x5 Pin Header (COM3/COM4)
Digital I/O	8-bit digital I/O by pin header (CN1 to TB-619E2U2G8) 4-bit digital input 4-bit digital output
Battery	Support CR2477 Li battery by 2-pin header (1000mAh)
Audio	Support Audio via Realtek ALC888S HD audio codec

	Support Line-out, Line-in, MIC-in by Pin Header (F_AUDIO1)
Expansion	1 x PCI-express x8 extend by 98 pin slot(PCIE8X_1) 1 x PCI-express x16 extend by 164 pin slot(PCIE16X_1) 1 x mini-PCI-express slot (MPCIE1) CN1 to IO Expansion Board TB-619 Series 80Pin BTB Connector: JAE_AX01F080VABB 2 x USB3.0 Signal 2 x USB2.0 Signal 2 x PCIe3.0x1 Signal 2 x UART Signal 4 x DI Signal 4 x DO Signal
Power Management	1 x 3-Pin power input connector (Wide range DC+9~36V)
Switches and LED Indicators	Power on/off switch by PS_ON2 and BT1 Power LED status by PS_ON2 HDD LED status by LED5
External I/O Port	2 x COM Ports (COM1/COM2) 4 x USB 3.2 Gen1 Ports(stack) 2 x RJ45 GbE LAN Ports 1 x HDMI interface 1 x VGA interface
FAN	2 x FAN Connector 1 x 4Pin wafer, 90 degree (FAN_1) 1 x 4Pin wafer (FAN_2)
SIM	1 x SIM Card holder, 1 x 6-pin Wafer(option)
TPM	Infineon's Trusted Platform Module(TPM2.0) only support Windows 10 IoT
Temperature	Operating: -20℃ to 70℃ Storage: -40℃ to 85℃
Humidity	10% - 90%, non-condensing, operating
Power Consumption	Total Power Design 180W
EMI/EMS	Meet CE/FCC class A

2.3 Motherboard Dimension



(units :mm)

Figure 2.1: Motherboard ASB-M8372 Dimensions

2.4 Jumpers and Connectors Location

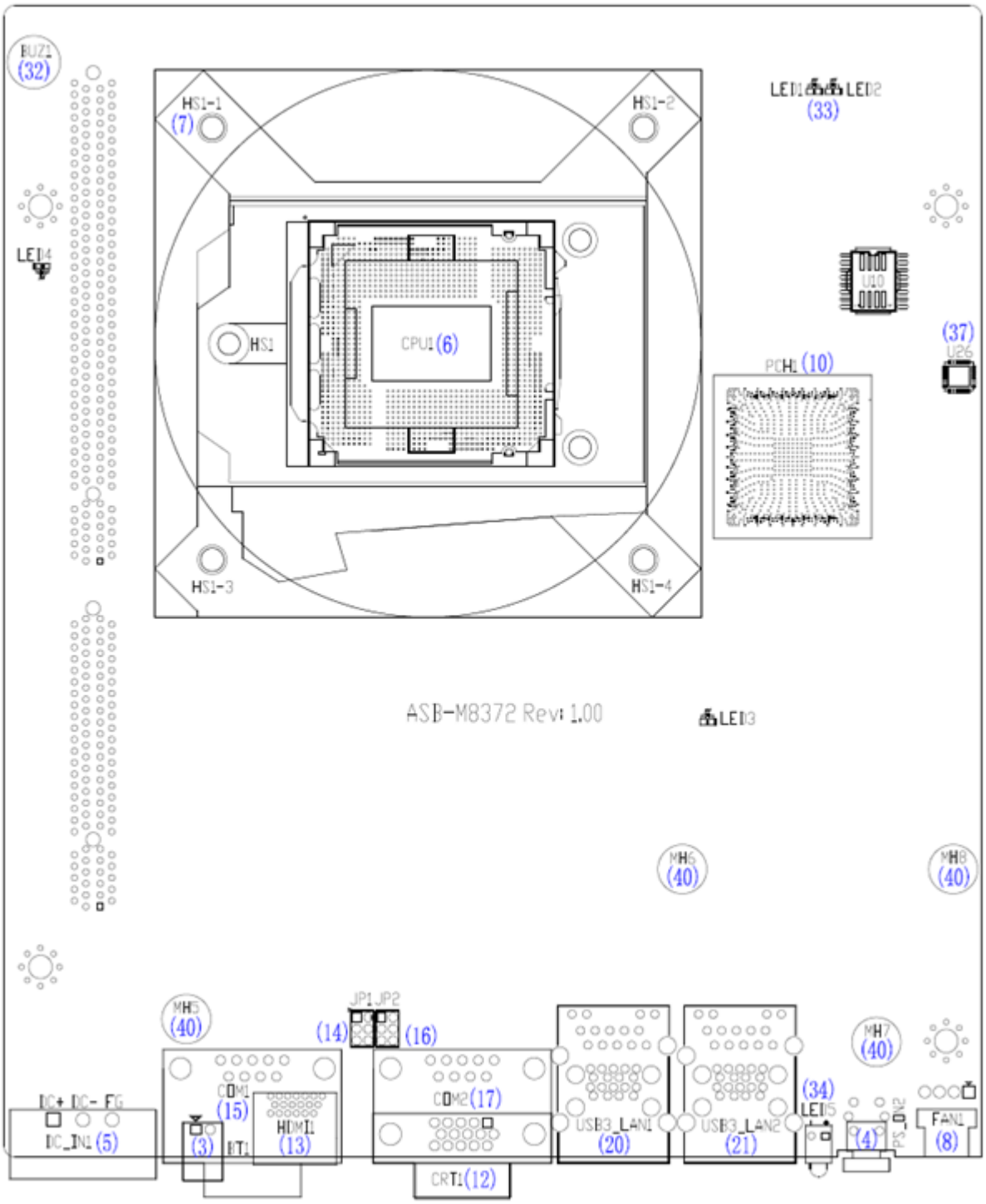


Figure 2.2: Jumpers and Connectors Location- Board Top

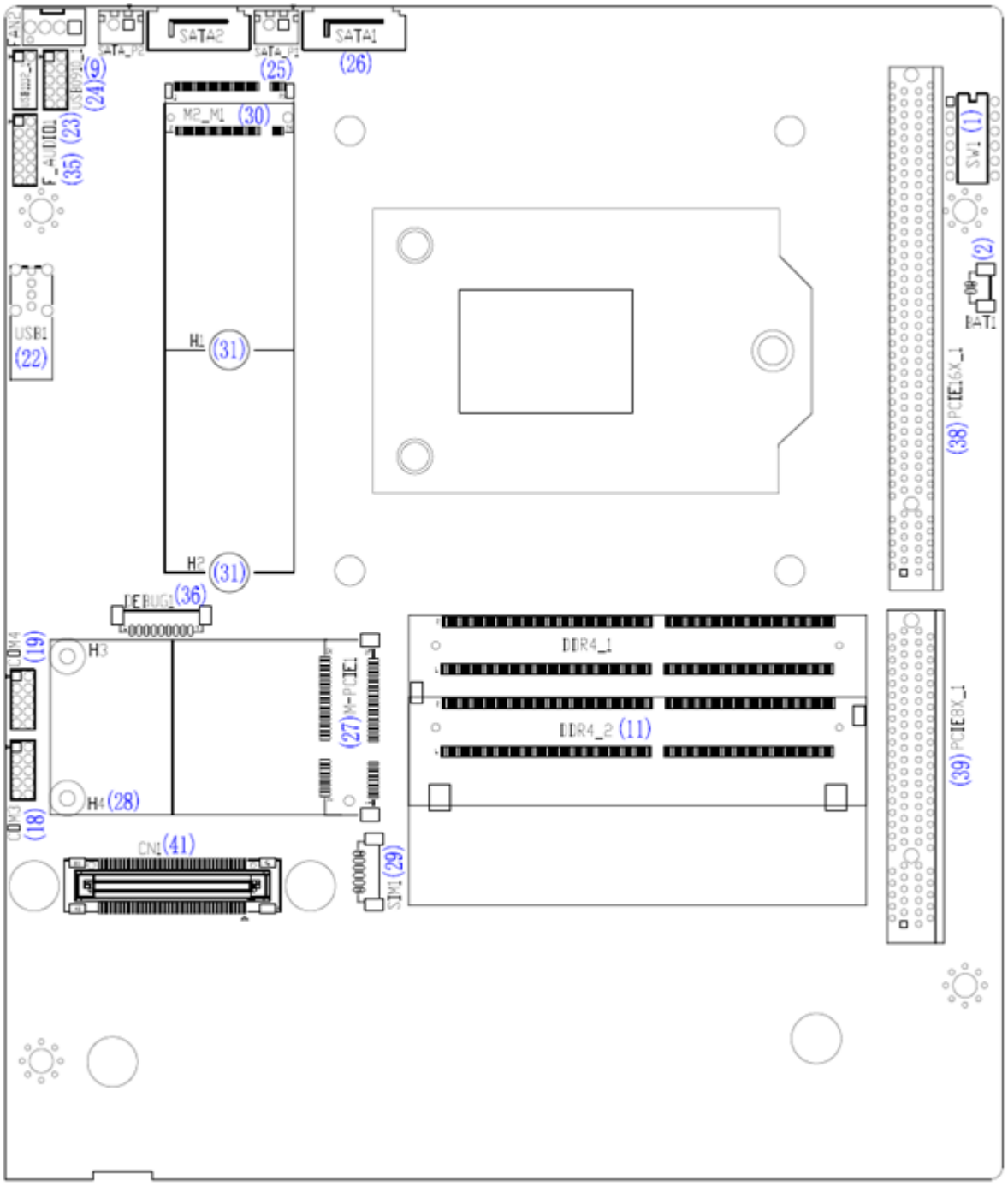


Figure 2.3: Jumpers and Connectors Location- Board Bottom

2.5 Jumpers Setting and Connectors

1. SW1-2:

CMOS clear switch, CMOS clear operation will permanently reset old BIOS settings to factory defaults.

SW1	CMOS
Pin2 OFF	NORMAL (Default)
Pin2 ON	Clear CMOS
Pin3 OFF	**Normal (Default)**
Pin3 ON	Clear 2nd RTC CMOS

Procedures of CMOS clear:

a) Turn off the system and unplug the power cord from the power outlet.

b) To clear the CMOS settings, use the switch to Pin2 on for about 3 seconds then move the switch Pin2 off.

c) Power on the system again.

d) When entering the POST screen, press the <DEL> key to enter CMOS Setup Utility to load optimal defaults.

e) After the above operations, save changes and exit BIOS Setup.

SW1	Function (DC input/DC_IN1)
Pin1 ON	**Auto Power on (Default)**
Pin1 OFF	Power on/off button (option)
Pin4 OFF	NC (Default)
Pin5 OFF	NC (Default)
Pin6 OFF	NC (Default)

2. BAT1:

(1.25mm Pitch 1x2 wafer Pin Header) 3.0V Li Battery is embedded to provide power for CMOS.

Pin#	Signal Name
Pin1	Ground
Pin2	VCC_RTC

3. **BT1:**

(2.5mm Pitch 1x2 Pin Connector) **Power on/off**, use to connect power switch button. The two pins are disconnected under normal condition. You may short them temporarily to realize system startup & shutdown or awaken the system from sleep state.

4. **PS_ON2:**

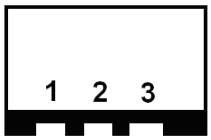
PS_SW: Power on/off Button, use to connect power switch button. The two pins are disconnected under normal condition. You may short them temporarily to realize system startup & shutdown or awaken the system from sleep state.

PWR LED: POWER LED status.

5. **DC_IN1:**

(5.08mm Pitch 1x3 Pin Connector), DC9~36V system power input connector. Maximum power consumption of the whole machine is not more than 180 watts. If it is used in visual system of light control, please use 24V/7.5A power adapter.

Note: The power consumption of power supply needs different combination tests.



Pin#	Power Input（DC_IN1）
Pin1	DC+9V~36V
Pin2	Ground
Pin3	PG

Application	Power Adapter
Vision/ Light Control(DC24V)	**+DC24V input**

6. CPU1:

(LGA1151 Socket), install the 8/9th Generation Intel Core i3/i5/i7 CPU Socket

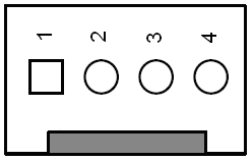
Processor					
Number	PBF/MTF	Cores/Threads	TDP	Embedded	Remarks
I3-8100T	2.40 up to 3.10GHz	4 / 4	35W	●	option
I5-8500T	2.10 up to 3.50GHz	6 / 6	35W	●	option
I7-8700T	2.40 up to 4.00GHz	6 / 12	35W	●	option
I3-9100TE	2.20 up to 3.20GHz	4 / 4	35W	●	option
I5-9500TE	2.20 up to 3.60GHz	6 / 6	35W	●	option
I7-9700TE	1.80 up to 3.80GHz	8 / 8	35W	●	option

7. HS1-1/HS1-2/HS1-3/HS1-4(CPU SCREW HOLES):

CPU FAN SCREW HOLES, Four screw holes for fixed CPU Cooler assemble.

8. FAN1:

(2.54mm Pitch 1x4 Pin Header),CPU FAN connector, cooling fans can be connected directly for use.



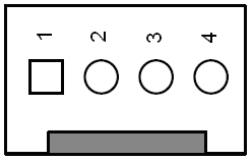
Pin#	Signal Name
1	Ground
2	VCC
3	CPU_FANTACH
4	CPU_FANPWM

Note:

Output power of cooling fan must be limited under 5W.

9. FAN_2:

(2.54mm Pitch 1x4 Pin Header),System FAN connector, cooling fans can be connected directly for use.



Pin#	Signal Name
1	Ground
2	VCC
3	CPU_FANTACH
4	CPU_FANPWM

Note:

Output power of cooling fan must be limited under 5W.

10. PCH1:

(BGA,Package Size:23x24mm),Intel Q370 Chipset.

Model	PCH1 (Chipset)	Remarks
ASB-M8372QB	Intel Q370	Default

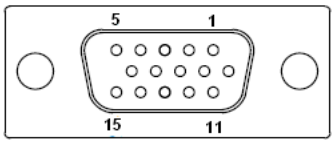
11. DDR4_1/DDR4_2:

(SO-DIMM 260Pin socket), DDR4 memory socket, the socket is located at the top of the board and supports 260Pin 1.2V DDR4 SO-DIMM memory module up to 32/64GB. Max Memory Size (depend on type) supports up to 64 GB, and may require BIOS update. Please contact your hardware provider regarding availability for your system.

CPU	Memory Type (FSB)	Max Memory Size
I3-8100T	2400MHz	32GB
I5-8500T	2666MHz	64GB
I7-8700T	2666MHz	64GB
I3-9100TE	2400MHz	32GB
I5-9500TE	2666MHz	64GB
I7-9700TE	2666MHz	64GB

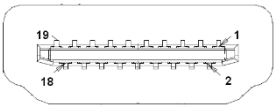
12. CRT1:

(CRT Connector DB15) Video Graphic Array Port, provide high-quality video output.



13. HDMI1:

(HDMI 19P Connector), High Definition Multimedia Interface connector. Support version1.4.



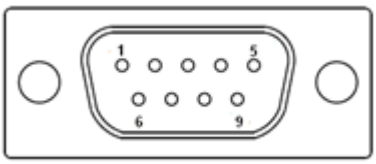
14. JP1:

(2.0mm Pitch 2x3 Pin Header) COM1 jumper setting, use pin 1~6 to select signal out of pin 9 of COM1 port.

JP1 Pin#	Function
Close 1-2	**COM1 Pin9 RI (Ring Indicator) (Default)**
Close 3-4	COM1 Pin9 = +5V (option)
Close 5-6	COM1 Pin9= +12V (option)

15. COM1:

COM1 (Type DB9), Rear serial port, standard DB9 Male serial port is provided to make a direct connection to serial devices.



RS232 (Default):	
Pin#	Signal Name
1	DCD# (Data Carrier Detect)
2	RXD (Received Data)
3	TXD (Transmit Data)
4	DTR (Data Terminal Ready)
5	Ground
6	DSR (Data Set Ready)

7	RTS (Request To Send)
8	CTS (Clear To Send)
9	**JP1 select Setting (RI/5V/12V)**

RS422 (option):	
Pin#	Signal Name
1	422TX-
2	422TX+
3	422RX+
4	422RX-
5	Ground
6	NC
7	NC
8	NC
9	NC

RS485 (option):	
Pin#	Signal Name
1	485-
2	485+
3	NC
4	NC
5	Ground
6	NC
7	NC
8	NC
9	NC

BIOS Config:
[RS-232 Mode]
[RS-485 Mode]
[RS-422 Mode]

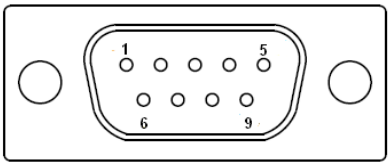
16. JP2:

(2.0mm Pitch 2x3 Pin Header), COM2 jumper setting, use pin1~6 to select signal out of pin 9 of COM2 port.

JP2 Pin#	Function
Close 1-2	**COM2 Pin9 RI (Ring Indicator) (Default)**
Close 3-4	COM2 Pin9 = +5V/1A (option)
Close 5-6	COM2 Pin9= +12V/1A (option)

17. COM2:

COM2 (Type DB9), Rear serial port, standard DB9 Male port is provided to make a direct connection to serial devices.



RS232 (Default):	
Pin#	Signal Name
1	DCD# (Data Carrier Detect)
2	RXD (Received Data)
3	TXD (Transmit Data)
4	DTR (Data Terminal Ready)
5	Ground
6	DSR (Data Set Ready)
7	RTS (Request To Send)
8	CTS (Clear To Send)
9	**JP2 select Setting (RI/5V/12V)**

RS422 (option):	
Pin#	Signal Name
1	422TX-
2	422TX+
3	422RX+
4	422RX-
5	Ground
6	NC
7	NC

8	NC
9	NC

RS485 (option):	
Pin#	Signal Name
1	485-
2	485+
3	NC
4	NC
5	Ground
6	NC
7	NC
8	NC
9	NC

BIOS Config:

[RS-232 Mode]

[RS-485 Mode]

[RS-422 Mode]

18. COM3:

(2.0mm Pitch 2x5Pin Header), COM3 Port, standard RD232 ports are provided. They can be used directly via COM cable connection.

Signal Name	Pin#	Pin#	Signal Name
DCD	1	2	RXD
TXD	3	4	DTR
Ground	5	6	DSR
RTS	7	8	CTS
RI	9	10	NC

19. COM4:

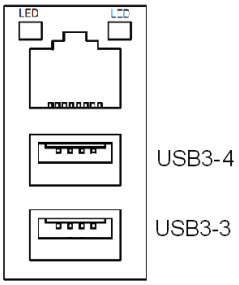
(2.0mm Pitch 2x5Pin Header), COM4 Port, standard RD232 ports are provided. They can be used directly via COM cable connection.

Signal Name	Pin#	Pin#	Signal Name
DCD	1	2	RXD

TXD	3	4	DTR
Ground	5	6	DSR
RTS	7	8	CTS
RI	9	10	NC

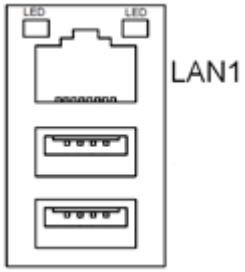
20. USB3_LAN1:

USB3-3/USB3-4: (Double stack USB type A), Rear USB connector, it provides up to 2 USB3.0 ports, USB3.2 Gen1 allows data transfers up to 5.0Gb/s, and supports USB2.0 for full-speed and low-speed signaling.



Each USB Type A Receptacle (2 Ports) Current limited value is 2.0A.
If the external USB device current exceeds 2.0A, please separate connectors into different Receptacle.

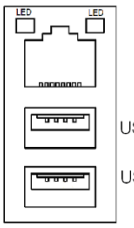
LAN1: (RJ45 Connector), Rear LAN port, one standard 10/100/1000M RJ-45 Ethernet port are provided. Used Intel I219-LM chipset.
Corporate LAN product with support for Intel® AMT2 technology.



BIOS (U10/U11)	Intel AMT2 Technology	Remarks
U10 (32GB)	○	Default
U11 (32GB)	●	option

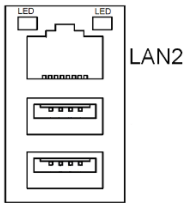
21. USB3_LAN2:

USB3-5/USB3-6: (Double stack USB type A), Rear USB connector, it provides up to 2 USB3.0 ports, USB3.2 Gen1 allows data transfers up to 5.0Gb/s, and supports USB2.0 for full-speed and low-speed signaling.



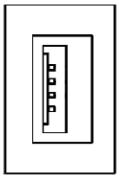
Each USB Type A Receptacle (2 Ports) Current limited value is 2.0A.
If the external USB device current exceeds 2.0A, please separate connectors into different Receptacle.

LAN2: (RJ45 Connector), Rear LAN port, one standard 10/100/1000M RJ-45 Ethernet port are provided. Used Intel I219-LM chipset.
Corporate LAN product with support for Intel® AMT2 technology.



22. USB1:

USB2_8: (Single USB type A), I/O USB2.0 connector, it provides up to 1 USB2.0 port. USB2.0 allows data transfers up to 480Mb/s, and supports USB 2.0 for full-speed and low-speed signaling.



Each USB Type A Receptacle (2 Ports) Current limited value is 2.0A.
If the external USB device current exceeds 2.0A, please separate connectors into different Receptacle.

23. USB0910_1

(2.0mm Pitch 2x5 Pin Header), USB2.0 connector, it provides two USB ports via a dedicated USB cable, speed up to 480Mb/s.

Function	Signal Name	Pin#		Signal Name	Function
USB9	5V_USB0910	1	2	5V_USB0910	USB10
	USB9_DN	3	4	USB10_DN	
	USB9_DP	5	6	USB10_DP	
	Ground	7	8	Ground	
	NC	9	10	Ground	


Note:

Before connection, make sure that pinout of the USB Cable is in accordance with that of the said tables. Any inconformity may cause system down and even hardware damages.

Each USB Type A Receptacle (2 Ports) current value is limited in 2.0A.
If the external USB device current exceeds 2.0A, please separate connectors into different Receptacle.

24. USB1112_1:

(2.0mm Pitch 2x5 Pin Header), USB2.0 connector, it provides two USB ports via a dedicated USB cable, spped up to 480Mb/s.

Function	Signal Name	Pin#		Signal Name	Function
USB11	5V_USB1112	1	2	5V_USB1112	USB12
	USB11_DN	3	4	USB12_DN	
	USB1_DP	5	6	USB12_DP	
	Ground	7	8	Ground	
	NC	9	10	Ground	


Note:

Before connection, make sure that pinout of the USB Cable is in accordance with that of the said tables. Any inconformity may cause system down and even hardware damages.

Each USB Type A Receptacle (2 Ports) current value is limited in 2.0A.
If the external USB device current exceeds 2.0A, please separate connectors into different Receptacle.

25. SATA_P1/SATA_P2:

(2.50mm Pitch 1x2 Wafer Pin Header), Four onboard 5V output connectors are reserved to provide power for SATA devices.

Pin#	Signal Name
1	+DC5V_S0

2	Ground

Note:

Output current of the connector must not be above 1A.

26. SATA1/SATA2:

(SATA7P), SATA Connectors, Four SATA connectors are provided, SATA1 and SATA2 transfer speed up to 6.0Gb/s.

RAID controller supports RAID0/RAID1.

27. M-PCIE1:

(Socket 52Pin), mini PCIe socket, it is located at the bottom, and supports mini PCIe devices with USB2.0 and SIM and SMbus signal. MPCIe card size is 30x50.95mm.

Function	Support	Remarks
Mini PCIe (PCIe7)	●	
SMbus	●	
SIM	●	
USB2.0 (USB13)	●	

28. H3/H4:

M-PCIE1 SCREW HOLES, H3/H4 for M-PCIE1 card (30mm x 50.95mm) assemble.

29. SIM1 (option):

(2.0mm Pitch 1x6 Pin Wafer Header), support SIM Card devices.

Pin#	Signal Name
1	SIM_VCC
2	Ground
3	SIM_RST
4	NC
5	SIM_CLK
6	SIM_IO

30. M2_M1:

(NGFF M.2 Socket), NGFF(M.2) M-Key, is located at the bottom, and supports M.2 M-Key devices with four PCIe and SATA and SMbus signal. It supports 2242/2280-size cards.

31. H1/H2 (option):

M2_M1 SCREW HOLES, H1 or H2 for M1 card assemble.

The height can be adjusted according to the equipment.

M2_M1 Card Size	H1/H2 (Height)	Remarks
2242	H1=6.45mm H2=2.45mm/6.45mm	
2280	H2=6.45mm H1=2.45mm	

32. BUZ1:

Onboard buzzer

33. LED1/LED2/LED3/LED4:

LED1 STATUS. Green LED for M.2 status.

LED2 STATUS. Green LED for Motherboard Power Supply 3.3V_S5 status.

LED3 STATUS. Green LED for Motherboard Power Supply 3.3V_S0 status.

LED4 STATUS. Green LED for CPU Power status.

34. LED5:

Red LED for SATA HDD status.

35. F_AUDIO1 (option):

(2.0mm pitch 2x6 Pin Header), Front Audio, an onboard Realtek ALC888S-VD2 codec is used to provide high quality audio I/O ports. Line Out can be connected to a headphone or amplifier. Line in is used for the connection of external audio source via a Line in cable. MIC is the port for microphone input audio.

Signal Name	Pin#	Pin#	Signal Name
+5V_F_AUDIO	1	2	GND_AUD
LINE-OUT-L	3	4	LINE-OUT-R
FRONT-JD	5	6	LINE-IN-JD
LINE-IN-L	7	8	LINE-IN-R
MIC-IN-L	9	10	MIC-IN-R
GND_AUD	11	12	MIC1_JD

36. DEBUG1 (option):

(1.25mm Pitch 1x9 Pin Header), supports SPI signal.

Pin#	Signal Name
1	3P3V_S0
2	CLK_LPC_DEBUG
3	PLT_RST_BUF1-
4	Ground
5	LPC_AD0
6	LPC_AD1
7	LPC_AD2
8	LPC_AD3
9	LPC_FRAME-

37. U26 (option):

Infineon's Trusted Platform Module (TPM2.0) SLB9670 is a fully standard compliant TPM based on the latest Trusted Computing Group (TCG) specification 2.0.

Note: Only support Windows 10 IOT.

U26	SLM9670AQ2.0
MODEL	TPM Function
ASB-M8372QB	●

38. PCIE16X_1 (option):

(PCIe 164 Pin slot), Riser Card expansion connector. It supports expansion to one PCIex16 or two PCIex8 signal. PCI express x16 supports GEN1 and GEN2 and GEN3 mode. PCI express x8 supports GEN1 and GEN2 and GEN3 mode.

ASB-M8372QB: PCIE16X_1 slot is located at the bottom.

MODEL	PCIE16X_1 Slot
ASB-M8372QB	Bottom

Riser Card	Function	ASB-M8372QB
TB-620E42E161	PCIex4 (60Pin slot)x1 PCIex4 (60Pin slot)x1 PCIex16 (164Pin slot)x1	●
Note: Please correctly assemble the riser card, otherwise it will burn out the motherboard! If you do not know how to assemble, please contact technical		

support.

39. PCIE8X_1 (option):

(PCIe 98 Pin slot), Riser Card expansion connector. It supports expansion to one PCIex8 or two PCIex4 signal. PCI express x8 supports GEN1 and GEN2 and GEN3 mode. PCI express x4 supports GEN1 and GEN2 and GEN3 mode.
ASB-M8372: PCIE8X_1 slot is located at the bottom.

MODEL	PCIE8X_1 Slot
ASB-M8372QB	Bottom

Riser Card	Function	ASB-M8372QB
TB-620E42E161	PCIex4 (60Pin slot)x1 PCIex4 (60Pin slot)x1 PCIex16 (164Pin slot)x1	●
Note: Please correctly assemble the riser card, otherwise it will burn out the motherboard! If you do not know how to assemble, please contact technical support.		

40. MH5/MH6/MH7/MH8:

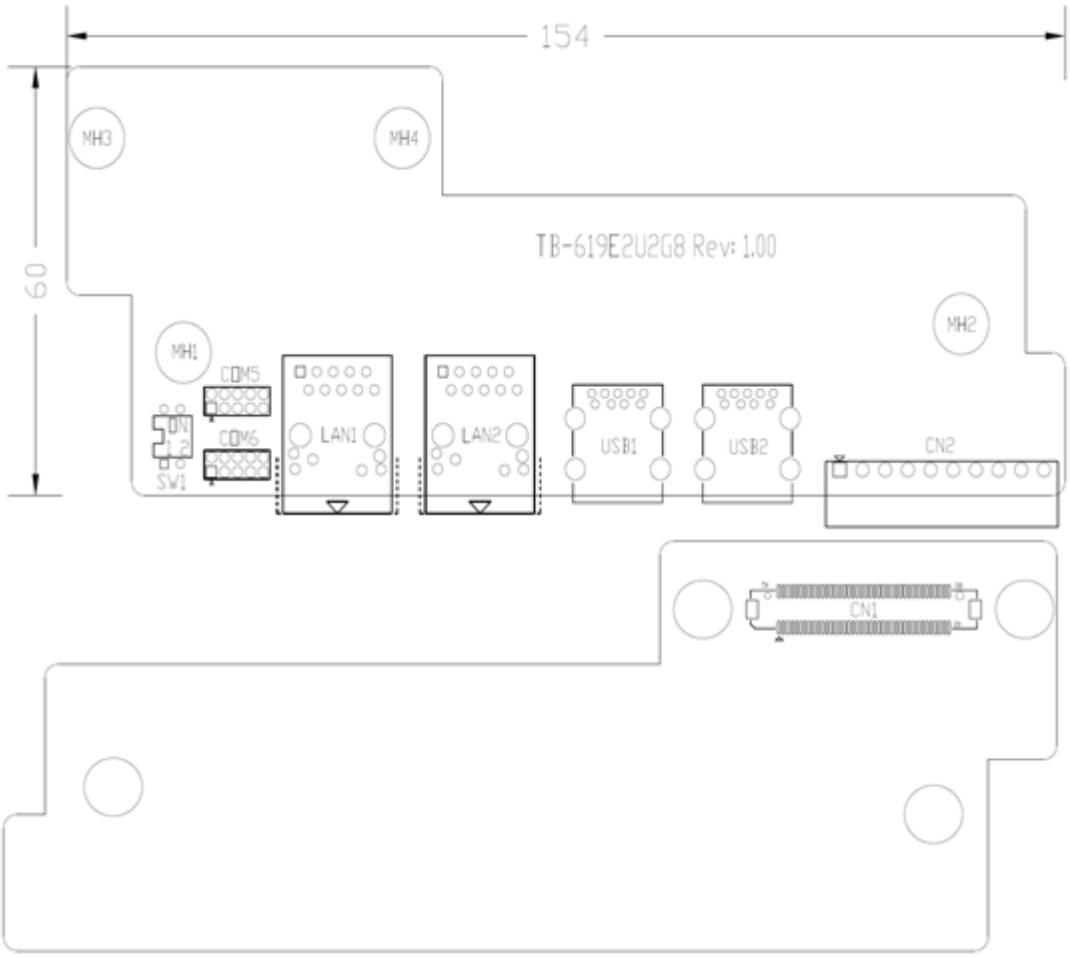
TB-619E2U2G8 SCREW HOLES, MH5, MH6, MH7 and MH8 for TB-619 series cards assemble.

41. CN1:

(JAE 2x40Pin Connector), for expand output connector. It provides two PCIex1 Signal, two USB3.0 Signal, two UART Signal and eight GPIO Signal, board-to-board connects to TB-619 series card CN1.

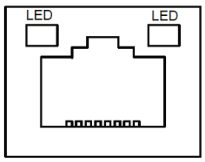
42. TB-619 E2U2G8 R1.00:

IO Expansion Board for AVS-52X series, board-to-board connects to ASB-M8372 CN1.

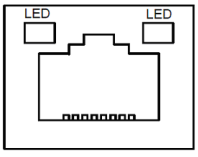


CN1:(JAE 2x40Pin Connector),For expand input connector, it provides two PCIeX1 Signal and two USB3.2 Gen1 Signal and two UART Signal and eight DI/DO Signal, board to board connected to ASB-M8372 card CN1.

LAN1:(RJ45 Connector), Rear LAN port, one standard 10/100/1000M RJ-45 Ethernet port are provided. Used Intel I211AT chipset.

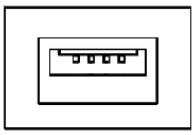


LAN2:(RJ45 Connector), Rear LAN port, one standard 10/100/1000M RJ-45 Ethernet port are provided. Used Intel I211AT chipset.



USB1:(Single USB typeA), Rear USB connector, it provides up to 1 USB3.2 ports, USB3.2 Gen1 allows data transfers up to 5.0Gb/s, support USB2.0 and

full-speed and low-speed signaling.



Each USB Type A Receptacle (2 Ports) Current limited value is 2.0A.
If the external USB device current exceeds 2.0A, please separate connectors into different Receptacle.

SW1: Switch, NPN/PNP Setting, GPIO_OUT1 and GPIO_OUT2 and GPIO_OUT3 and GPIO_OUT23 NPN or PNP mode selection for CN2

SW1	NPN/PNP Mode Setting
Pin1 OFF	PNP
Pin1 ON	NPN
Pin2 OFF	NORMAL (Default)
Pin2 ON	NC

CN2:(3.5mm Pitch 1x10 Pin Connector),General-purpose input/output port, it provides 8 group of self-programming interfaces to customers for flexible use.

Pin#	Signal	GPIO	Function
1	GND_24V_GPIO	GND_24V_GPIO	
2	24V_GND_GPIO	24V_GND_GPIO	
3	GPIO_IN1	FT_GPIO_GP27	INPUT
4	GPIO_IN2	FT_GPIO_GP26	INPUT
5	GPIO_IN3	FT_GPIO_GP25	INPUT
6	GPIO_IN4	FT_GPIO_GP24	INPUT
7	GPIO_OUT1	FT_GPIO_GP23	OUTPUT
8	GPIO_OUT2	FT_GPIO_GP22	OUTPUT
9	GPIO_OUT3	FT_GPIO_GP21	OUTPUT
10	GPIO_OUT4	FT_GPIO_GP20	OUTPUT

COM5:(2.0mm Pitch 2x5 Pin Header),COM5 Port, standard RS232 ports are provided. They can be used directly via COM cable connection.

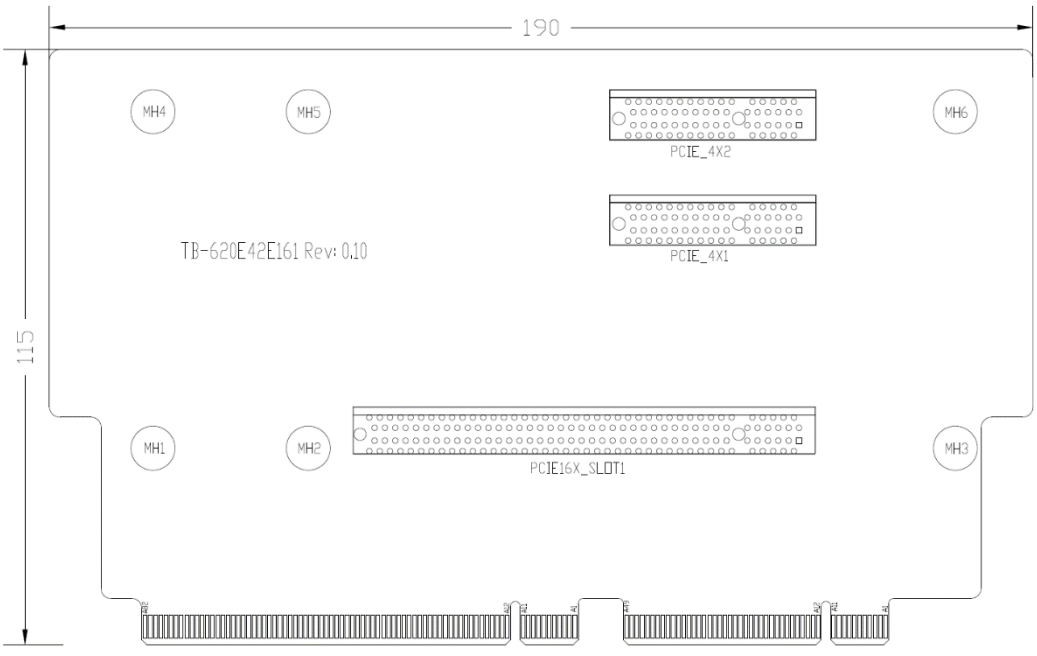
Signal Name	Pin#	Pin#	Signal Name
DCD	1	2	RXD
TXD	3	4	DTR
Ground	5	6	DSR
RTS	7	8	CTS
RI	9	10	NC

COM6:(2.0mm Pitch 2X5 Pin Header),COM6 Port, standard RS232 ports are provided. They can be used directly via COM cable connection.

Signal Name	Pin#	Pin#	Signal Name
DCD	1	2	RXD
TXD	3	4	DTR
Ground	5	6	DSR
RTS	7	8	CTS
RI	9	10	NC

43. TB-620E42E161 R0.10 (option):

TB-620E42E161 R0.10 connects to ASB-M8372 PCIE_16X1 and PCIE_8X1 connector, it provides two PCIEx4 slot and one PCIEx16 slot.



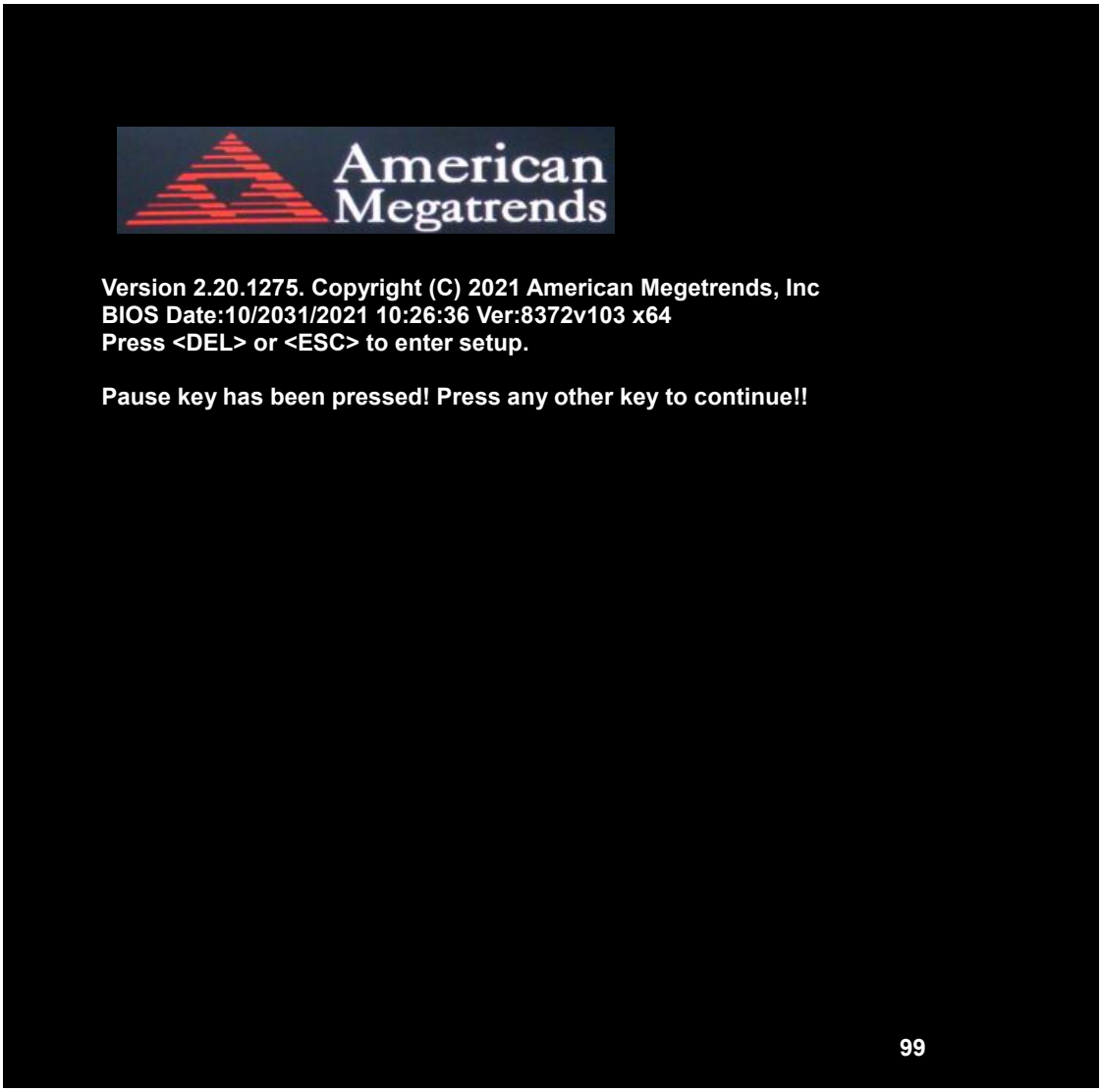
Signal Name	Connect	Signal Name
1	164Pin slot	PCIex16
2	-	-

3	60Pin slot	PCIex4
4	60Pin slot	PCIex4

Chapter 3 BIOS Setup

3.1 Operations after POST Screen

After CMOS discharge or BIOS flashing operation, press [Delete] key to enter CMOS Setup.

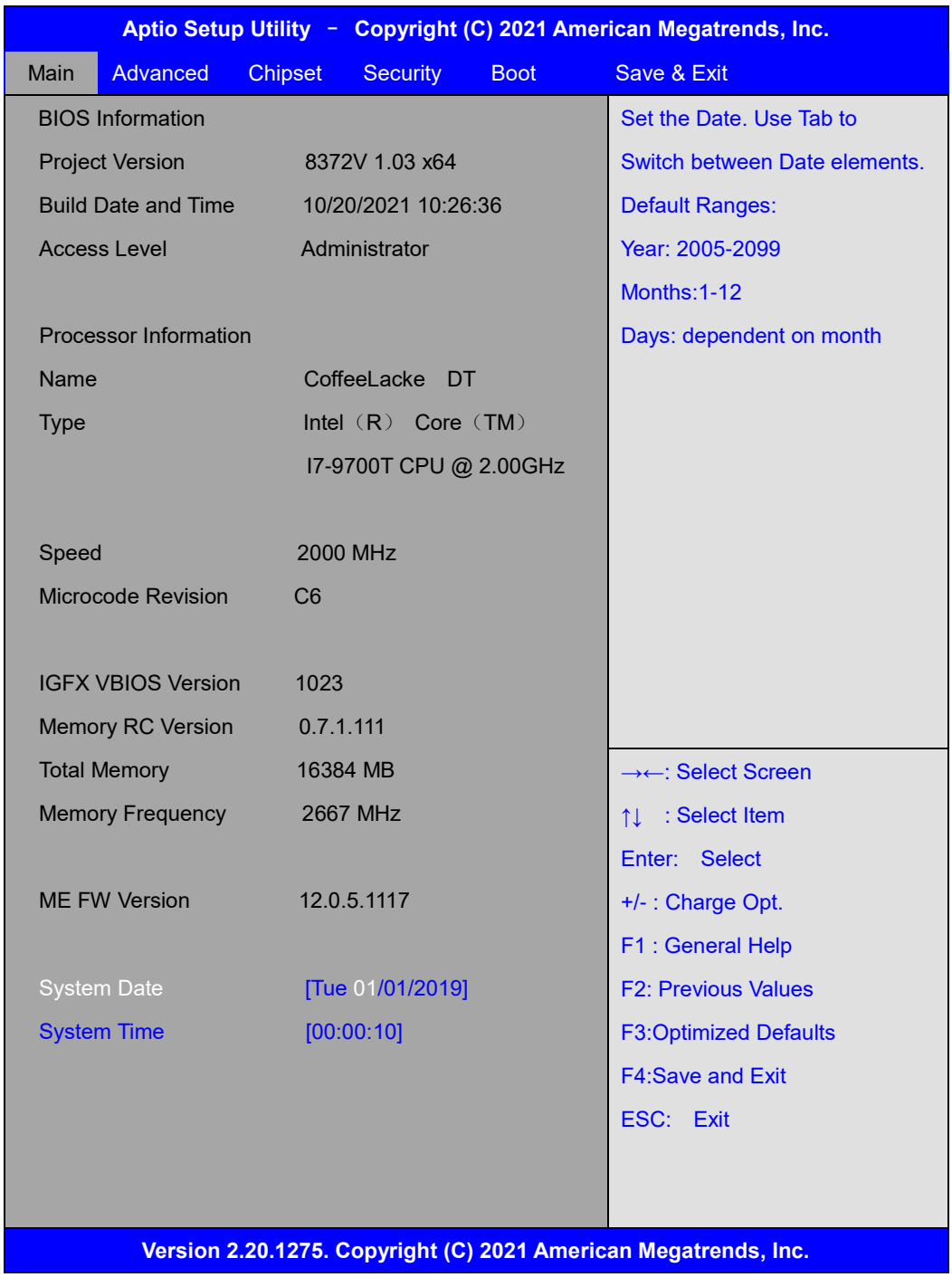


After optimizing, exits CMOS Setup.

3.2 BIOS Setup Utility

Press [Delete] key to enter BIOS Setup utility during POST, and then a main menu containing system summary information will appear.

3.3 Main Settings



System Time:

Set the system time, the time format is:

Hour :	0 to 23
Minute :	0 to 59
Second :	0 to 59

System Date:

Set the system date, the date format is:

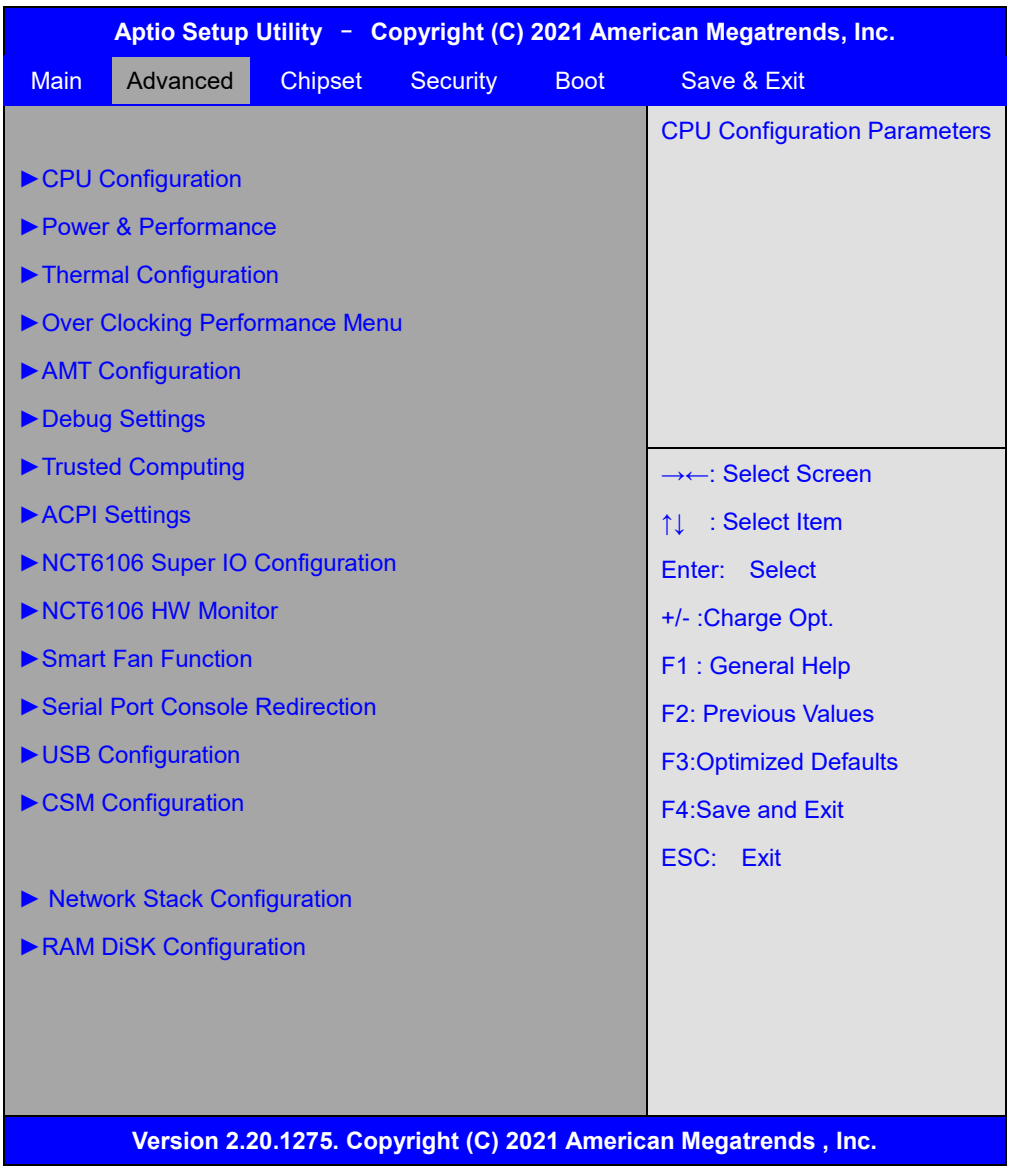
Day: Note that the ‘Day’ automatically changes when you set the date.

Month: 01 to 12

Date: 01 to 31

Year: 1998 to 2099

3.4 Advanced Settings



3.4.1 CPU Configuration

Type	Intel® Core™ i7-9700T CPU@ 2.00GHz
ID	0x906ED
Speed	2000 MHz
L1 Date Cache	32 KB x 8
L1 Instruction Cache	32 KB x 8
L2 Cache	256 KB x 8
L3 Cache	12 MB
L4 Cache	N/A
VMX	Supported

SMX/TXT	Not Supported
C6DRAM	[Enabled]
SW Guard Extensions(SGX)	[Software Controlled]
Select Owner EPOCH input type	[No Change In Owner EPOCHs]
CPU Flex Ratio Override	[Disabled]
CPU Flex Ratio Settings	20
Hardware Prefetcher	[Enabled]
Adjacent Cache Line Prefetch	[Enabled]
Intel (VMX)Virtualization Technology	[Enabled]
PECI	[Enabled]
Active Processor Cores	[All]
BIST	[Disabled]
AP threads Idle Manner	[MWAIT Loop]
AES	[Enabled]
Machine Check	[Enabled]
MonitorMWait	[Enabled]
►BIOS Guard	
FCLK Frequency for Early Power On	[Auto]
Voltage Optimization	[Auto]

3.4.2 Power & Performance

►CPU – Power Management Control

Boot performance mode	[Max Non-Turbo Performance]
Intel® SpeedStep™	[Enabled]
Race To Halt (RTH)	[Enabled]
Intel® Speed Shift Technology	[Enabled]
HDC Control	[Enabled]

►CPU VR Settings

Platform PL1 Enable	[Disabled]
Platform PL2 Enable	[Disabled]
Power Limit 4 Override	[Disabled]
C states	[Disabled]
Thermal Monitor	[Enabled]
Interrupt Redirection Mode Selection	[PAIR with Fixde Priority]

Timed MWAIT	[Disabled]
►Custom P-state Table	
Energy Performance Gain	[Disabled]
EPG DIMM Idd3N	26
EPG DIMM Idd3P	11
►Power Limit 3 Settings	
Power Limit 3 Override	[Disabled]
►CPU Lock Configuration	
CFG Lock	[Enabled]
Overclocking Lock	[Disabled]
►GT – Power Management Control	
RC6(Render Standby)	[Enabled]
Maximum GT frequency	[Default Max Frequency]
Disabled Turbo GT frequency	[Disabled]

3.4.3 Thermal Configuration

►CPU Thermal Configuration	
DTS SMM	[Disabled]
Tcc Activation Offset	0
Tcc offset Time Window	[Disabled]
Tcc offset Clamp Enable	[Disabled]
Tcc offset Lock Enable	[Disabled]
Bi-directional PROCHOT#	[Enabled]
Disable PROCHOT# Output	[Enabled]
Disable VR Thermal Alert# Output	[Disabled]
PROCHOT Response	[Disabled]
PROCHOT Lock	[Disabled]
ACPI T-States	[Disabled]
PECI Reset	[Disabled]
PECI C10 Reset	[Disabled]
►Platform Thermal Configuration	
Automatic Thermal Reporting	[Disabled]
Critical Trip Point	[119 C (POR)]

Active Trip Point 0	[71 C]
Active Trip Point 0 Fan Speed	100
Active Trip Point 1	[55 C]
Active Trip Point 1 Fan Speed	75
Passive Trip Point	[95 C]
Passive TC1 Value	1
Passive TC2 Value	5
Passive TSP Value	10
Active Trip Points	[Enabled]
Passive Trip Poinst	[Disabled]
Critical Trip Points	[Enabled]
PCH Temp Read	[Enabled]
CPU Energy Read	[Enabled]
CPU Temp Read	[Enabled]
Alert Enable Lock	[Disabled]
CPU Temp	72
CPU Fan Speed	65
►DPTF Configuration	
DPTF	[Disabled]

3.4.4 Over Clocking Performance Menu

Over Clocking Feature	[Enabled]
WDT Enable	[Enabled]
BCLK Freauency (Pcode)	99.731 MHz
XTU Interface	[Disabled]
BCLK Aware Adaptive Voltage	[Enabled]

►Processor

►Ring

►GT

►Uncore

►Voltage PLL Trim Controls

►Platform Voltage Overrides

►Memory

►Advanced Debug Settings

3.4.5 AMT Configuration

ASF Support	[Disabled]
USB Provisioning of AMT	[Disabled]
►CIRA Configuration	
►ASF Configuration	
►Secure Erase Configuration	
►OEM Flags Settings	
►MEBX Resolution Settings	

3.4.6 Debug Settings

Kernel Debug Serial Port	[Legacy UART] [SERIALIO UART2]
Platform Debug Consent	[Disabled]

3.4.7 Trusted Computing

TPM20 Device Found	
Firmware Version:	13.11
Vendor:	IFX
Security Device Support	[Enabled]
Active PCR banks	SHA-1 , SHA
Available PCR banks	SHA-1 , SHA256
SHA-1 PCR Bank	[Enabled]
SHA256 PCR Bank	[Enabled]
Pending operation	[None]
Platform Hierarchy	[Enabled]
Storage Hierarchy	[Enabled]
Endorsement Hierarchy	[Enabled]
TPM2.0 UEFI Spec Version	[TCG_ 2]
Physical Presence Spec a Version	[1.3]
TPM 20 InterfaceType	[TIS]
Device Select	[Auto]

3.4.8 ACPI Settings

Enable ACPI Auto Configuration:	[Disabled]

[Enabled]

Enable Hibernation: [Enabled]

[Disabled]

ACPI Sleep State: [S3 (Suspend to RAM)]

[Suspend Disabled]

Lock Legacy Resources: [Disabled]

[Enabled]

S3 Video Repost: [Disabled]

[Enabled]

3.4.9 NCT6106D Super IO Configuration

Super IO Chip NCT6106D

►Serial Port 1 Configuration

Serial port [Enabled]

[Disabled]

Device Settings IO=3F8h； IRQ=4；

Change Settings [Auto]

COM1 Config [RS-232 Mode]

[RS-485 Mode]

[RS-422 Mode]

►Serial Port 2 Configuration

Serial port [Enabled]

[Disabled]

Device Settings IO=2F8h； IRQ=3

Change Settings [RS-232 Mode]

[RS-485 Mode]

[RS-422 Mode]

►Serial Port 3 Configuration

Serial port [Enabled]

[Disabled]

Device Settings IO=3E8h； IRQ=6；

Change Settings [Auto]

►Serial Port 4 Configuration

Serial port [Enabled]

[Disabled]

Device Settings IO=2E8h； IRQ=6；

Change Settings [Auto]

►Serial Port 5 Configuration

Serial port [Enabled]

[Disabled]

Device Settings IO=2F0h； IRQ=6；

Change Settings [Auto]

►Serial Port 6 Configuration

Serial port [Enabled]

[Disabled]

Device Settings IO=2E0h； IRQ=6；

Change Settings [Auto]

WatchDog Controller Settings

WatchDog Mode Select [Disabled]

3.4.10 NC 6106D Hardware Monitor

Pc Health Status

SYS temperature ：+35 C

CPU DIE temperature ：+53 C

SYS FAN Speed ：N/A

CPU FAN Speed ：1548 RPM

VORE ：+0.800 V

12V ：+12.151 V

5V ：+5.120 V

1.5V ：+1.478 V

3.3V ：+3.360 V

3.4.11 Smart Fan Function

Pc Health Status

CPU Temperature1 50

CPU Temperature2 60

CPU Temperature3 65

CPU Temperature4 70

CPU Duty Cycle 1 100

CPU Duty Cycle 2	150
CPU Duty Cycle 3	200
CPU Duty Cycle 4	255
System Temperature 1	35
System Temperature 2	45
System Temperature 3	50
System Temperature 4	55
System Duty Cycle 1	100
System Duty Cycle 2	150
System Duty Cycle 3	200
System Duty Cycle 4	255

3.4.12 Serial Port Console Redirection

COMO

Console Redirection [Disabled]

►Console Redirection settings

COM1(Pci Bus0,Dev0,Func0) (Disabled)

Console Redirection Port Is Disabled

Legacy Console Redirection

►Legacy Console Redirection Settings

Redirecton COM Port [COMO]

[COM1 (PCI Bus0，Devo，Func0)(Disabled)]

Resolution [80x24]

[80x25]

Redirect After POST [Always Enable]

[BootLoader]

When Bootloader is selected,then Legacy Console Redirection is disabled before booting to legacy OS.When Always Enable is selected,then Legacy Console Redirecion is enabled for legacy OS.Default setting for this option is set to Always Enable.

Serial Port for Out-of-Band Management/

Windows Emergeny Management Services (EMS)

Console Redirection [Disabled]
►Console Redirection settings

3.4.13 USB Configuration

USB Module Version 23

USB Controllers: 1XHCI
USB Devices: 1 Keyboard, 1 Mouse

Legacy USB Support **[Enabled]**
XHCI Hand-off **[Enabled]**
USB Mass Storage Driver Support **[Enabled]**

USB Hardware delays and time-outs:
USB transfer time-out **[20 sec]**
Device reset time-out **[20 sec]**
Device power-up delay **[Auto]**

3.4.14 CSM Configuration

Compatibility Support Module Configuration

CSM Support [Enabled]

CSM16 Module Version 07.82

GateA20 Active [Upon Request]
Option ROM Messages [Force BIOS]
INT19 Trap Response [Immediate]

HDD Connection Order [Adjust]

Boot option filter [UEFI and Legacy]
[Legacy only]
[UEFI only]

Option ROM execution

Network	[Do not launch]
Storage	[UEFI]
Video	[Legacy]
Other PCI devices	[UEFI]

3.4.15 Network Stack Configuration

Network Stack	[Disabled]

3.4.16 RAM Disk Configuration

Disk Memory Type:	[Boot Service Data]

►Create raw

►Create from file

Created RAM disk list:

Remove selected RAM disk(s).

3.5 Chipset Settings

Firmware Configuration	[Test]
Type C Support	[Platform-FOR]

3.5.1 System Agent (SA) Configuration

SA PCIe Code Version	7.0.108.64
VT-d	Supported

►**Memory Configuration**

►Memory Thermal Configuration

►Memory Thermal Algorithms	
Memory RC Version	0.7.1.111
Memory Frequency	2667MHz
Memory Timings (Tcl-Trcd-TRP-TRAS)	19-19-19-43
Channel 0 Slot 0	Not Populated / Disabled
Channel 0 Slot 1	Not Populated / Disabled
Channel 1 Slot 0	Populated/&Enabled
Size	16384 MB (DDR4)
Number of Ranks	2
Manufacturer	Transcend
Channel 1 Slot 1	Not Present / Disabled
Memory ratio/reference clock Options moved to Overclock->Memory->Custom Profile menu	
MRC ULT Safe Conifg	**[Disabled]**
LPDDR Dqdqs Re-Training	[Enabled]
Safe Mode Support	[Disabled]
Memory Test on Warm Boot	[Enabled]
Maximum Memory Frequency	[Auto]
HOB Buffer Size	[Auto]
ECC Support	[Enabled]
Max TOLUD	[Dynamic]
SA GV	[Enabled]
SA GV Low Freq	[MRC default]
Retrain on Fast fail	[Enabled]
BER Support	[Enabled]
Enable RH Prevention	[Enabled]
Row Hammer Solution	[Hardware RHP]
RH Activation Probability	[1/2^11]
Exit On Failure (MRC)	[Enabled]
Probeless Trace	[Disabled]
Enable/Disable IED(Intel Enhanced Debug)	[Disabled]
Ch Hash Support	[Enabled]
Ch Hash Mask	0
Ch Hash Interleaved Bit	[BIT8]

VC1 Read Metering	[Enabled]
Strong Weak Leaker	7
Memory Scrambler	[Enabled]
Force ColdReset	[Disabled]
Channel A DIMM Control	[Enable both DIMMS]
Channel B DIMM Control	[Enable both DIMMS]
Force Single Rank	[Disabled]
Memory Remap	[Enabled]
Time Measure	[Disabled]
DLL Weak Lock Support	[Enabled]
Pwr Down Idle Timer	0
Fast Boot	[Enabled]
Train On Warm boot	[Disabled]
Rank Margin Tool Per Task	[Disabled]
Training Tracing	[Disabled]
Lpddr Mem WL Set	[Set B]
BDAT ACPI Table Support	[Disabled]
BDAT Memory Test Type	[Rank Margin Tool Rank]
Rank Margin Tool Loop Count	0
Lpddr Dram Odt	[Auto]
DDR4 Skip Refresh Enable	[Enabled]
Late Command Training Relaxed	[Disabled]
Reset	
►Graphics Configuration	
Graphics Turbo IMON Current	31
Skip Scaning of External Gfx Card	[Disabled]
Primary Dispiay	[Auto]
Select PCIE Card	[Auto]
►External GFx Primary Dispiay Configuration	
Internal Graphics	[Auto]
GTT Size	[8MB]
Aperture Size	[256MB]
PSMI SUPPORT	[Disabled]
DVMT Pre-Allocated	[32M]
DVMT Total GFx Mem	[256M]

Intel Graphics Pei Display Peim VDD Enable	[Disabled]
VDD Enable	[Enabled]
PM Support	[Enabled]
PAVP Enable	[Enabled]
Cdynmax Clamping Enable	[Enabled]
Cd Clock Frequency	[675Mhz]
Skip CD Clock Init in S3 Resume	[Disabled]
IUER Button Enable	[Disabled]

►DMI/OPI Configuration

DMI	X4 Gen3
DMI Max Link Speed	[Auto]
DMI Gen3 Eq Phase 2	[Auto]
DMI Gen3 Eq Phase 3 Method	[Auto]
Program Static Phase1 Eq	[Enabled]

►Gen3 Root Port Preset value for each Lane

Lane 0	4
Lane 1	4
Lane 2	4
Lane 3	4

►Gen3 Endpoint Preset value for each Lane

Lane 0	7
Lane 1	7
Lane 2	7
Lane 3	7

►Gen3 Endpoint Hint value for each Lane

Lane 0	2
Lane 1	2
Lane 2	2
Lane 3	2

►Gen3 RxCTLE Control

Bundle0	0
Bundle1	0

DMI Link ASPM Control	[LosL1]
DMI Extended Sync Control	[Disabled]
DMI De-emphasis Control	[-3.5 dB]
DMI IOT	[Disabled]

►PEG Port Configuration

PEG 0:1:0	Not Present
Enable Root Port	[Auto]
Max Link Speed	[Auto]
PEG0 Slot Power Limit Value	75
PEG0 Slot Power Limit Scale	[1.0x]
PEG0 Slot Power Limit Number	1

PEG 0:1:1	Not Present
Enable Root Port	[Auto]
Max Link Speed	[Auto]
PEG1 Slot Power Limit Value	75
PEG1 Slot Power Limit Scale	[1.0x]
PEG1 Slot Power Limit Number	2

PEG 0:1:2	Not Present
Enable Root Port	[Auto]
Max Link Speed	[Auto]
PEG2 Slot Power Limit Value	75
PEG2 Slot Power Limit Scale	[1.0x]
PEG2 Slot Power Limit Number	3

PEG 0:6:0	Not Present
Enable Root Port	[Auto]
Max Link Speed	[Auto]
PEG2 Slot Power Limit Value	75
PEG2 Slot Power Limit Scale	[1.0x]
PEG2 Slot Power Limit Number	3

►PEG Port Feature Configuration

Program PCIe ASPM after opROM	[Disabled]
Program Static Phase1 Eq	[Enabled]

►Gen3 Root Port Preset value for each Lane

Lane 0	7
Lane 1	7
Lane 2	7
Lane 3	7
Lane 5	7
Lane 6	7
Lane 7	7
Lane 8	7
Lane 9	7
Lane 10	7
Lane 11	7
Lane 12	7
Lane 13	7
Lane 14	7
Lane 15	7

►Gen3 Endpoint Preset value for each Lane

Lane 0	7
Lane 1	7
Lane 2	7
Lane 3	7
Lane 5	7
Lane 6	7
Lane 7	7
Lane 8	7
Lane 9	7
Lane 10	7
Lane 11	7
Lane 12	7
Lane 13	7
Lane 14	7
Lane 15	7

►Gen3 Endpoint Hint value for each Lane

Lane 0	2
Lane 1	2

Lane 2	2
Lane 3	2
Lane 5	2
Lane 6	2
Lane 7	2
Lane 8	2
Lane 9	2
Lane 10	2
Lane 11	2
Lane 12	2
Lane 13	2
Lane 14	2
Lane 15	2

►Gen3 RxCTLE Control

Bundle0	0
Bundle2	0
Bundle3	0
Bundle4	0
Bundle5	0
Bundle6	0
Bundle7	0
PEG10 RxCTLE Override	[Disabled]
PEG11 RxCTLE Override	[Disabled]
PEG12 RxCTLE Override	[Disabled]
DMI PEG10 RxCTLE Override	[Disabled]

Gen3 Adaptive Software Equalization	
Always Attempt SW EQ	[Disabled]
Number of Presets to test	[Auto]
Allow PERST# GPIO Usage	[Enabled]
SW EQ Enable VOC	[Auto]
Jitter Dwell Time	3000
Jitter Error Target	2
VOC Dwell Time	10000
VOC Error Target	2
Generate BDAT PEG Margin Date	[Disabled]

PCIe Rx CEM Test Mode	[Disabled]
PCIe Spread Spectrum Clocking	[Enabled]

3.5.2 PCH-IO Configuration

►PCI Express Configuration

PCI Express Clock Gating	[Enabled]
DMI Link ASPM Control	[Auto]
PCIE Port assigned to LAN	5
Port8xh Decode	[Disabled]
Peer Memory Write Enable	[Disabled]
Compliance Test Mode	[Disabled]
PCIe-USB Glitch W/A	[Disabled]
PCIe function swap	[Enabled]

►PCI Express Gen3 Eq Lanes

PCIE1 Cm	6
PCIE1 Cp	2
PCIE2 Cm	6
PCIE2 Cp	2
PCIE3 Cm	6
PCIE3 Cp	2
PCIE4 Cm	6
PCIE4 Cp	2
PCIE5 Cm	6
PCIE5 Cp	2
PCIE6 Cm	6
PCIE6 Cp	2
PCIE7 Cm	6
PCIE7 Cp	2
PCIE8 Cm	6
PCIE8 Cp	2
PCIE9 Cm	6
PCIE9 Cp	2
PCIE10 Cm	6
PCIE10 Cp	2
PCIE11 Cm	6
PCIE11 Cp	2
PCIE12 Cm	6

PCIE12 Cp	2
PCIE13 Cm	6
PCIE13 Cp	2
PCIE14 Cm	6
PCIE14 Cp	2
PCIE15 Cm	6
PCIE15 Cp	2
PCIE16 Cm	6
PCIE16 Cp	2
PCIE17 Cm	6
PCIE17 Cp	2
PCIE18 Cm	6
PCIE18 Cp	2
PCIE19 Cm	6
PCIE19 Cp	2
PCIE20 Cm	6
PCIE20 Cp	2
PCIE21 Cm	6
PCIE21 Cp	2
PCIE22 Cm	6
PCIE22 Cp	2
PCIE23 Cm	6
PCIE23 Cp	2
PCIE24 Cm	6
PCIE24 Cp	2

Override SW EQ Settings [Disabled]

►IMR Configuration

PCIe IMR [Disabled]

PCI Express Root Port 1 Lane configured as USB/SATA

PCI Express Root Port 2 Lane configured as USB/SATA

►PCI Express Root Port 3

PCI Express Root Port 3 [Enabled]

Disable Gen2 P11 Shutdown and L1 Controller Power gating [Disabled]

Connection Type	[Slot]
ASPM2	[Auto]
L1 SubStates	[L1.1&L1.2]
Gen3 Eq Phase3 Method	[Software Search]
UPTP	5
DPTP	7
ACS	[Enabled]
PTM	[Enabled]
DRC	[Enabled]
EDPC	[Enabled]
URR	[Disabled]
FER	[Disabled]
NFER	[Disabled]
CER	[Disabled]
CTO	[Disabled]
SEFE	[Disabled]
SENFE	[Disabled]
SECE	[Disabled]
PME SCI	[Enabled]
Hot Plug	[Disabled]
Advanced Error Reporting	[Enabled]
PCIe Speed	[Auto]
Transmitter Half Swing	[Disabled]
Detect Timeout	0
Extra Bus Reserved	0
Reserved Memory	10
Reserved I/O	4

PCH PCIe LTR Configuration	
LTR	[Enabled]
Snoop Latency Override	[Auto]
Non-Snoop Latency Override	[Auto]
Force LTR Override	[Disabled]

►Extra options	
Detect Non-Compliance Device	[Disabled]
Prefetchable Memory	10
Reserved Memory Alignment	1

Prefetchable Memory Alignment	1
►PCI Express Root Port 4	
PCI Express Root Port 4	[Enabled]
Disable Gen2 P11 Shutdown and L1 Controller Power gating	[Disabled]
Connection Type	[Slot]
ASPM3	[Auto]
L1 SubStates	[L1.1&L1.2]
Gen3 Eq Phase3 Method	[Software Search]
UPTP	5
DPTP	7
ACS	[Enabled]
PTM	[Enabled]
DRC	[Enabled]
EDPC	[Enabled]
URR	[Disabled]
FER	[Disabled]
NFER	[Disabled]
CER	[Disabled]
CTO	[Disabled]
SEFE	[Disabled]
SENFE	[Disabled]
SECE	[Disabled]
PME SCI	[Enabled]
Hot Plug	[Disabled]
Advanced Error Reporting	[Enabled]
PCIe Speed	[Auto]
Transmitter Half Swing	[Disabled]
Detect Timeout	0
Extra Bus Reserved	0
Reserved Memory	10
Reserved I/O	4
PCH PCIe LTR Configuration	
LTR	[Enabled]
Snoop Latency Override	[Auto]
Non-Snoop Latency Override	[Auto]

Force LTR Override	[Disabled]
►Extra options	
Detect Non-Compliance Device	[Disabled]
Prefetchable Memory	10
Reserved Memory Alignment	1
Prefetchable Memory Alignment	1
PCI Express Root Port 5	Reserved for ethernet
►PCI Express Root Port 6	
PCI Express Root Port 6	[Enabled]
Disable Gen2 P11 Shutdown and L1 Controller Power gating	[Disabled]
Connection Type	[Slot]
ASPM5	[Auto]
L1 SubStates	[L1.1&L1.2]
Gen3 Eq Phase3 Method	[Software Search]
UPTP	5
DPTP	7
ACS	[Enabled]
PTM	[Enabled]
DRC	[Enabled]
EDPC	[Enabled]
URR	[Disabled]
FER	[Disabled]
NFER	[Disabled]
CER	[Disabled]
CTO	[Disabled]
SEFE	[Disabled]
SENFE	[Disabled]
SECE	[Disabled]
PME SCI	[Enabled]
Hot Plug	[Disabled]
Advanced Error Reporting	[Enabled]
PCIe Speed	[Auto]
Transmitter Half Swing	[Disabled]
Detect Timeout	0

Extra Bus Reserved	0
Reserved Memory	10
Reserved I/O	4
PCH PCIe LTR Configuration	
LTR	[Enabled]
Snoop Latency Override	[Auto]
Non-Snoop Latency Override	[Auto]
Force LTR Override	[Disabled]
►Extra options	
Detect Non-Compliance Device	[Disabled]
Prefetchable Memory	10
Reserved Memory Alignment	1
Prefetchable Memory Alignment	1
►PCI Express Root Port 7	
PCI Express Root Port 7	[Enabled]
Disable Gen2 P11 Shutdown and L1 Controller Power gating	[Disabled]
Connection Type	[Slot]
ASPM6	[Auto]
L1 SubStates	[L1.1&L1.2]
Gen3 Eq Phase3 Method	[Software Search]
UPTP	5
DPTP	7
ACS	[Enabled]
PTM	[Enabled]
DRC	[Enabled]
EDPC	[Enabled]
URR	[Disabled]
FER	[Disabled]
NFER	[Disabled]
CER	[Disabled]
CTO	[Disabled]
SEFE	[Disabled]
SENFE	[Disabled]
SECE	[Disabled]

PME SCI	[Enabled]
Hot Plug	[Disabled]
Advanced Error Reporting	[Enabled]
PCIe Speed	[Auto]
Transmitter Half Swing	[Disabled]
Detect Timeout	0
Extra Bus Reserved	0
Reserved Memory	10
Reserved I/O	4
PCH PCIe LTR Configuration	
LTR	[Enabled]
Snoop Latency Override	[Auto]
Non-Snoop Latency Override	[Auto]
Force LTR Override	[Disabled]
►Extra options	
Detect Non-Compliance Device	[Disabled]
Prefetchable Memory	10
Reserved Memory Alignment	1
Prefetchable Memory Alignment	1
►PCI Express Root Port 8	
PCI Express Root Port 8	[Enabled]
Disable Gen2 P11 Shutdown and L1 Controller Power gating	[Disabled]
Connection Type	[Slot]
ASPM7	[Auto]
L1 SubStates	[L1.1&L1.2]
Gen3 Eq Phase3 Method	[Software Search]
UPTP	5
DPTP	7
ACS	[Enabled]
PTM	[Enabled]
DRC	[Enabled]
EDPC	[Enabled]
URR	[Disabled]
FER	[Disabled]

NFER	[Disabled]
CER	[Disabled]
CTO	[Disabled]
SEFE	[Disabled]
SENFE	[Disabled]
SECE	[Disabled]
PME SCI	[Enabled]
Hot Plug	[Disabled]
Advanced Error Reporting	[Enabled]
PCIe Speed	[Auto]
Transmitter Half Swing	[Disabled]
Detect Timeout	0
Extra Bus Reserved	0
Reserved Memory	10
Reserved I/O	4
PCH PCIe LTR Configuration	
LTR	[Enabled]
Snoop Latency Override	[Auto]
Non-Snoop Latency Override	[Auto]
Force LTR Override	[Disabled]
►Extra options	
Detect Non-Compliance Device	[Disabled]
Prefetchable Memory	10
Reserved Memory Alignment	1
Prefetchable Memory Alignment	1
►PCI Express Root Port 9	
PCI Express Root Port 9	[Enabled]
Disable Gen2 P11 Shutdown and L1 Controller Power gating	[Disabled]
Connection Type	[Slot]
ASPM8	[Auto]
L1 SubStates	[L1.1&L1.2]
Gen3 Eq Phase3 Method	[Software Search]
UPTP	5
DPTP	7

ACS	[Enabled]
PTM	[Enabled]
DRC	[Enabled]
EDPC	[Enabled]
URR	[Disabled]
FER	[Disabled]
NFER	[Disabled]
CER	[Disabled]
CTO	[Disabled]
SEFE	[Disabled]
SENFE	[Disabled]
SECE	[Disabled]
PME SCI	[Enabled]
Hot Plug	[Disabled]
Advanced Error Reporting	[Enabled]
PCIe Speed	[Auto]
Transmitter Half Swing	[Disabled]
Detect Timeout	0
Extra Bus Reserved	0
Reserved Memory	10
Reserved I/O	4
PCH PCIe LTR Configuration	
LTR	[Enabled]
Snoop Latency Override	[Auto]
Non-Snoop Latency Override	[Auto]
Force LTR Override	[Disabled]
►Extra options	
Detect Non-Compliance Device	[Disabled]
Prefetchable Memory	10
Reserved Memory Alignment	1
Prefetchable Memory Alignment	1

PCI Express Root Port 10	Shadowed by x2/x4 Port
PCI Express Root Port 11	Shadowed by x2/x4 Port
PCI Express Root Port 12	Shadowed by x2/x4 Port
PCI Express Root Port 13	Lane configured as USB/SATA

PCI Express Root Port 14	Lane configured as USB/SATA
PCI Express Root Port 15	Lane configured as USB/SATA
PCI Express Root Port 16	Lane configured as USB/SATA

►PCI Express Root Port 17

PCI Express Root Port 17	[Enabled]
Disable Gen2 P11 Shutdown and L1 Controller Power gating	[Disabled]
Connection Type	[Slot]
ASPM16	[Auto]
L1 SubStates	[L1.1&L1.2]
Gen3 Eq Phase3 Method	[Software Search]
UPTP	5
DPTP	7
ACS	[Enabled]
PTM	[Enabled]
DRC	[Enabled]
EDPC	[Enabled]
URR	[Disabled]
FER	[Disabled]
NFER	[Disabled]
CER	[Disabled]
CTO	[Disabled]
SEFE	[Disabled]
SENFE	[Disabled]
SECE	[Disabled]
PME SCI	[Enabled]
Hot Plug	[Disabled]
Advanced Error Reporting	[Enabled]
PCIe Speed	[Auto]
Transmitter Half Swing	[Disabled]
Detect Timeout	0
Extra Bus Reserved	0
Reserved Memory	10
Reserved I/O	4

PCH PCIe LTR Configuration

LTR	[Enabled]

Snoop Latency Override	[Auto]
Non-Snoop Latency Override	[Auto]
Force LTR Override	[Disabled]
►Extra options	
Detect Non-Compliance Device	[Disabled]
Prefetchable Memory	10
Reserved Memory Alignment	1
Prefetchable Memory Alignment	1
PCI Express Root Port 18	Shadowed by x2/x4 Port
PCI Express Root Port 19	Shadowed by x2/x4 Port
PCI Express Root Port 20	Shadowed by x2/x4 Port
►PCI Express Root Port 21	
PCI Express Root Port 21	[Enabled]
Disable Gen2 P11 Shutdown and L1 Controller Power gating	[Disabled]
Connection Type	[Slot]
ASPM20	[Auto]
L1 SubStates	[L1.1&L1.2]
Gen3 Eq Phase3 Method	[Software Search]
UPTP	5
DPTP	7
ACS	[Enabled]
PTM	[Enabled]
DRC	[Enabled]
EDPC	[Enabled]
URR	[Disabled]
FER	[Disabled]
NFER	[Disabled]
CER	[Disabled]
CTO	[Disabled]
SEFE	[Disabled]
SENFE	[Disabled]
SECE	[Disabled]
PME SCI	[Enabled]
Hot Plug	[Disabled]

Advanced Error Reporting	[Enabled]
PCIe Speed	[Auto]
Transmitter Half Swing	[Disabled]
Detect Timeout	0
Extra Bus Reserved	0
Reserved Memory	10
Reserved I/O	4
PCH PCIe LTR Configuration	
LTR	[Enabled]
Snoop Latency Override	[Auto]
Non-Snoop Latency Override	[Auto]
Force LTR Override	[Disabled]
►Extra options	
Detect Non-Compliance Device	[Disabled]
Prefetchable Memory	10
Reserved Memory Alignment	1
Prefetchable Memory Alignment	1
PCI Express Root Port 22	Shadowed by x2/x4 Port
PCI Express Root Port 23	Shadowed by x2/x4 Port
PCI Express Root Port 24	Shadowed by x2/x4 Port
►SATA And RST Configuration	
SATA Controller(s)	[Enabled]
SATA Mode Selection	[AHCI]
SATA Test Mode	[Disabled]
►Software Feature Mask Configuration	
Aggressive LPM Support	[Enabled]
Serial ATA Port 0	Empty
Software Preserve	Unknown
Port 0	[Enabled]
Hot Plug	[Disabled]
Configured as ESATA	Hot Plug supported
Spin Up Device	[Disabled]

SATA Device Type	[Hard Disk Drive]
SATA Port 0 DevSlp	[Disabled]
DIT0 Configuration	[Disabled]
DIT0 Value	625
DM Value	15
Serial ATA Port 1	Empty
Software Preserve	Unknown
Port 1	[Enabled]
Hot Plug	[Disabled]
Configured as ESATA	Hot Plug supported
Spin Up Device	[Disabled]
SATA Device Type	[Hard Disk Drive]
SATA Port 1 DevSlp	[Disabled]
DIT0 Configuration	[Disabled]
DIT0 Value	625
DM Value	15
Serial ATA Port 2	Empty
Software Preserve	Unknown
Port 2	[Enabled]
Hot Plug	[Disabled]
Configured as ESATA	Hot Plug supported
Spin Up Device	[Disabled]
SATA Device Type	[Hard Disk Drive]
SATA Port 2 DevSlp	[Disabled]
DIT0 Configuration	[Disabled]
DIT0 Value	625
DM Value	15
Serial ATA Port 3	Empty
Software Preserve	Unknown
Port 3	[Enabled]
Hot Plug	[Disabled]
Configured as ESATA	Hot Plug supported
Spin Up Device	[Disabled]
SATA Device Type	[Hard Disk Drive]
SATA Port 3 DevSlp	[Disabled]

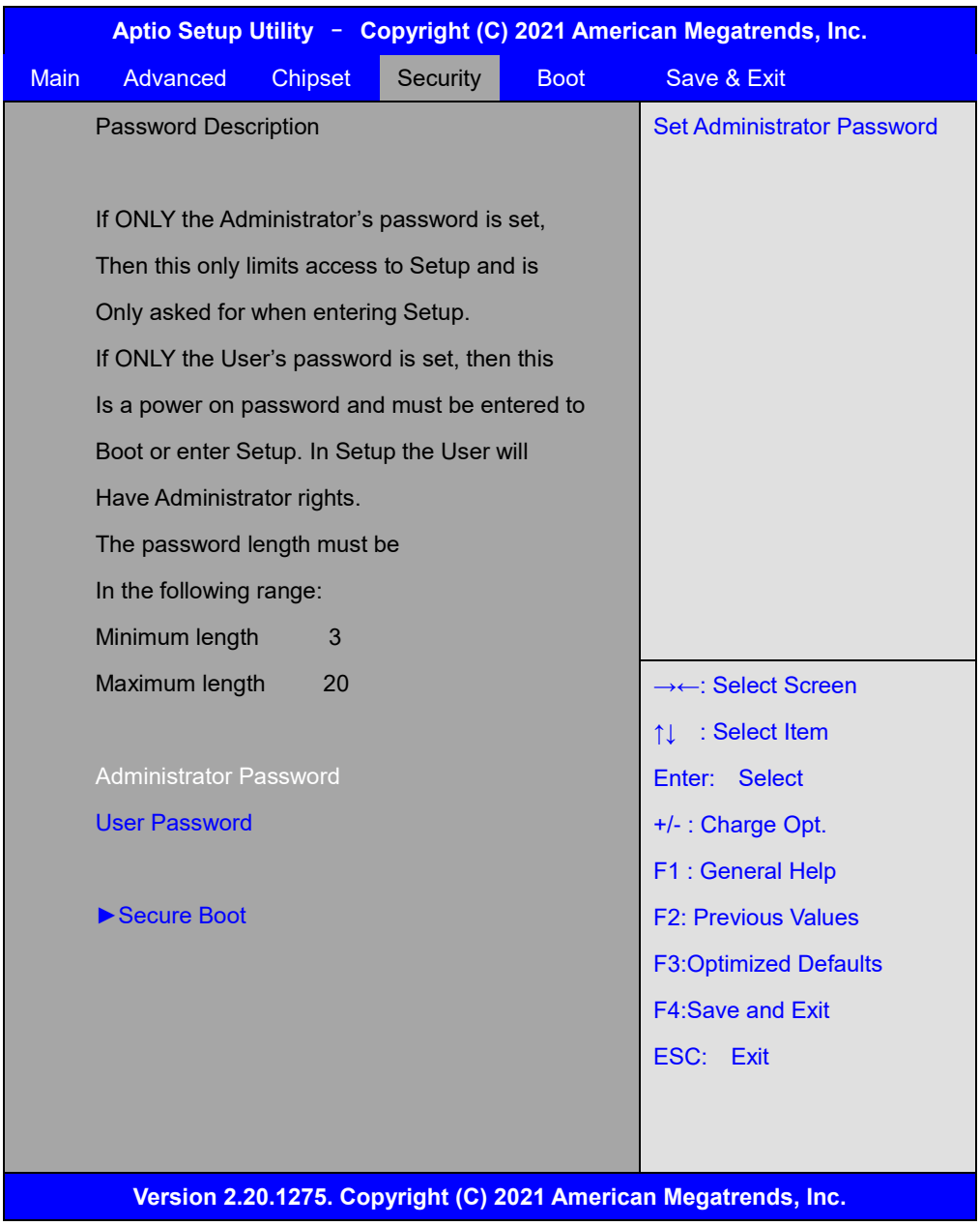
DIT0 Configuration	[Disabled]
DIT0 Value	625
DM Value	15
Serial ATA Port 4	Empty
Software Preserve	Unknown
Port 4	[Enabled]
Hot Plug	[Disabled]
Configured as ESATA	Hot Plug supported
Spin Up Device	[Disabled]
SATA Device Type	[Hard Disk Drive]
SATA Port 4 DevSlp	[Disabled]
DIT0 Configuration	[Disabled]
DIT0 Value	625
DM Value	15
Serial ATA Port 5	Empty
Software Preserve	Unknown
Port 5	[Enabled]
Hot Plug	[Disabled]
Configured as ESATA	Hot Plug supported
Spin Up Device	[Disabled]
SATA Device Type	[Hard Disk Drive]
SATA Port 5 DevSlp	[Disabled]
DIT0 Configuration	[Disabled]
DIT0 Value	625
DM Value	15
Serial ATA Port 6	Empty
Software Preserve	Unknown
Port 6	[Enabled]
Hot Plug	[Disabled]
Configured as ESATA	Hot Plug supported
Spin Up Device	[Disabled]
SATA Device Type	[Hard Disk Drive]
SATA Port 6 DevSlp	[Disabled]
DIT0 Configuration	[Disabled]
DIT0 Value	625

DM Value	15
Serial ATA Port 7	Empty
Software Preserve	Unknown
Port 7	[Enabled]
Hot Plug	[Disabled]
Configured as ESATA	Hot Plug supported
Spin Up Device	[Disabled]
SATA Device Type	[Hard Disk Drive]
SATA Port 7 DevSlp	[Disabled]
DIT0 Configuration	[Disabled]
DIT0 Value	625
DM Value	15

►USB Configuration

XHCI Compliance Mode	[Disabled]
XDCI Support	[Disabled]
USB2 PHY Sus Well Power Gating	[Enabled]
USB Overcurrent	[Enabled]
USB Overcurrent Lock	[Enabled]
USB Port Disable Override	[Disabled]
Serial IRQ Mode	[Continuous]
State After G3	[S0 State]
	[S5 State]

3.6 Security Settings



3.6.1 Administrator Password

3.6.2 User Password

Type the password with up to 20 characters and then press <Enter> key. This will clear all previously typed CMOS passwords. You will be requested to confirm the password. Type the password again and press <Enter> key. You may press <Esc> key to abandon password entry operation.

To clear the password, just press <Enter> key when password input window pops up. A confirmation message will be shown on the screen as to whether the password will be disabled. You will have direct access to BIOS setup without typing any password after system reboot once the password is disabled.

Once the password feature is used, you will be requested to type the password each time you enter BIOS setup. This will prevent unauthorized persons from changing your system configurations.

Also, the feature is capable of requesting users to enter the password prior to system boot to control unauthorized access to your computer. Users may enable the feature in Security Option of Advanced BIOS Features. If Security Option is set to System, you will be requested to enter the password before system boot and when entering BIOS setup; if Security Option is set to Setup, you will be requested for password for entering BIOS setup.

3.6.3 Secure Boot

System Mode Setup

Secure Boot [Disabled]
Not Active

Secure Boot Mode [Custom]

►Restore Factory Keys

►Restore To Setup Mode

►Key Management

Vendor Keys Valid

Factory Key Provision [Disabled]

►Restore Factory Keys

►Restore To Setup Mode

►Export Secure Boot variables

►Enroll Efi Image

Device Guard Ready

►Remove 'UEFI CA' from DB

►Restore DB defaults

Secure Boot variables	Size	Key#	Key Source
► Platform Key(PK)	862	1	Test (AMI)
► Key Exchange Keys	1560	1	Factory
► Authorized Signatures	3143	2	Factory
► Forbidden Signatures	3724	77	Factory
► Authorized TimeStamps	0	0	No Key
► osRecovery Signatures	0	0	No Key

3.7 Boot Settings

Setup Prompt Timeout	1
Bootup Numlock State	**[Off]**
Quiet Boot	**[Disabled**
Boot Option Priorities	
Fast Boot	**[Disabled]**

3.8 Save & Exit Settings

Save Options

Save Changes and Exit

Save & Exit Setup save Configuration and exit ?

[Yes]

[No]

Discard Changes and Ext

Exit Without Saving Quit without saving?

[Yes]

[No]

Save Changes and Reset

Save configuration and Reset

[Yes]
[No]

Discard Changes and Reset
Reset Without saving?

[Yes]
[No]

Save Changes
Save configuration?

[Yes]
[No]

Discard Changes
Load Previous Values?

[Yes]
[No]

Default Options
Restore Default
Load Optimized Defaults?

[Yes]
[No]

Save as User Default
Save configuration?

[Yes]
[No]

Restore User Default
Restore User Defaults?

[Yes]
[No]

Boot Override

Chapter 4 Installation of Drivers

This chapter describes the installation procedures for software and drivers under Windows 8.1 & 10. The software and drivers are included with the motherboard. The contents include **Intel Q370, Graphics 630 chipset driver, Audio driver, LAN Driver and Intel® ME Driver.**

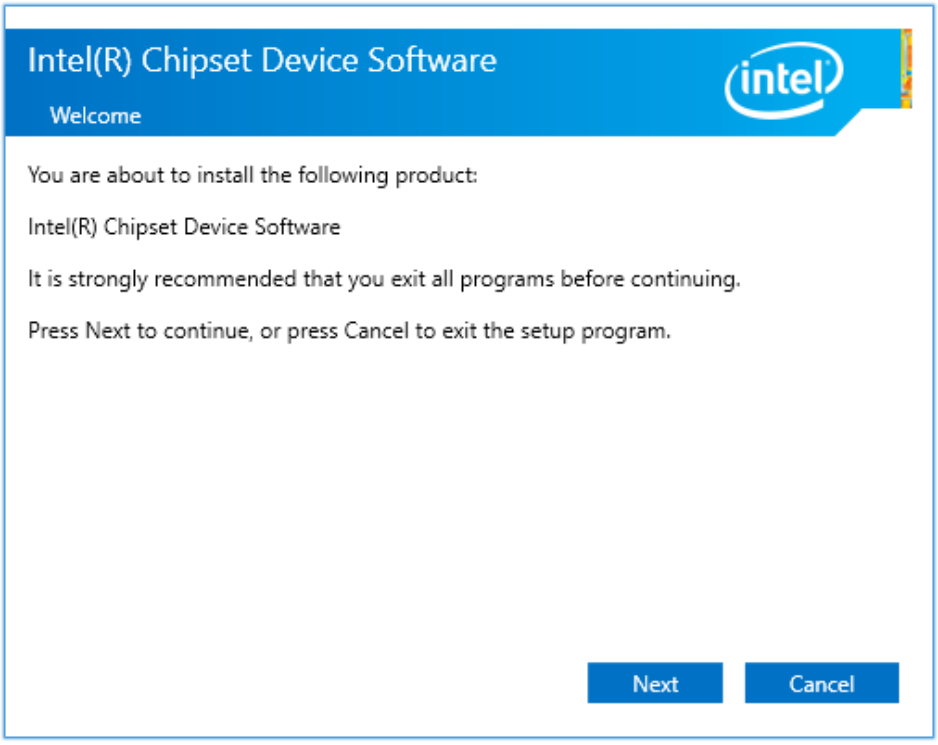
Important Note:
After installing your Windows operating system, you must install Intel Chipset Software Installation Utility before proceeding with the installation of drivers.

4.1 Intel Q370 Chipset

To install the Intel Q370chipset driver, please follow the steps below.

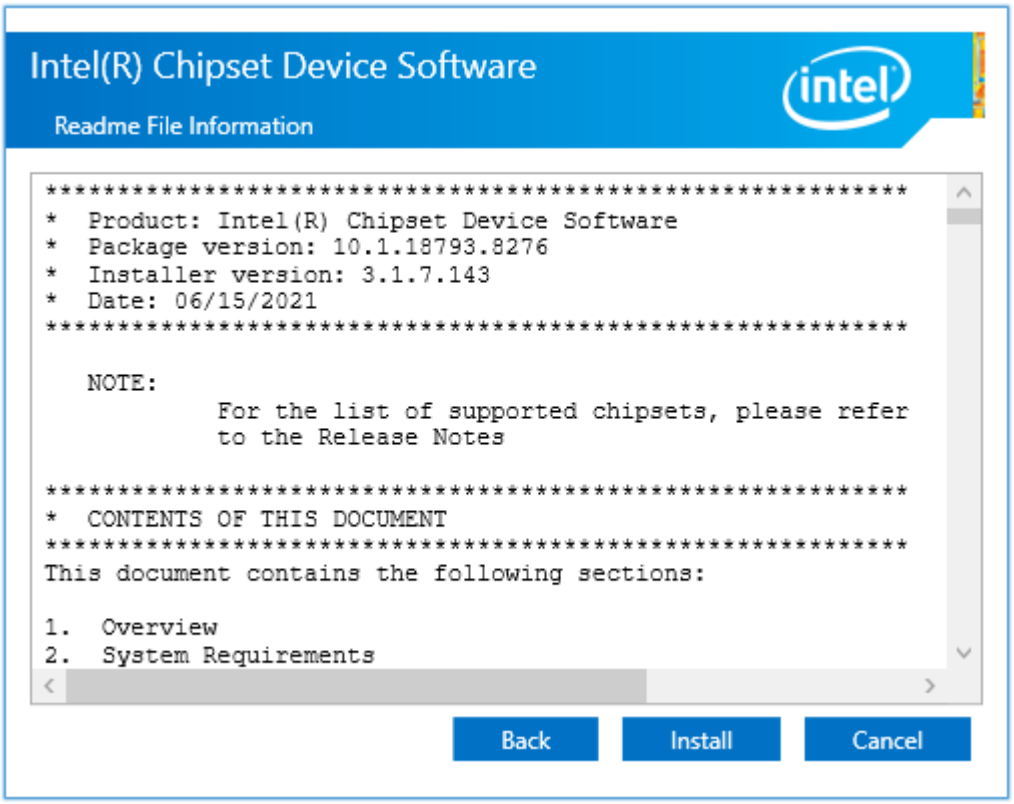
Step1. Select **Intel Q370 Chipset** from the list

Step2. Click **Next** to setup program.



Step3. Read the license agreement. Click **Accept** to accept all of the terms of the license agreement.

Step4. Click **Install** to begin the installation.



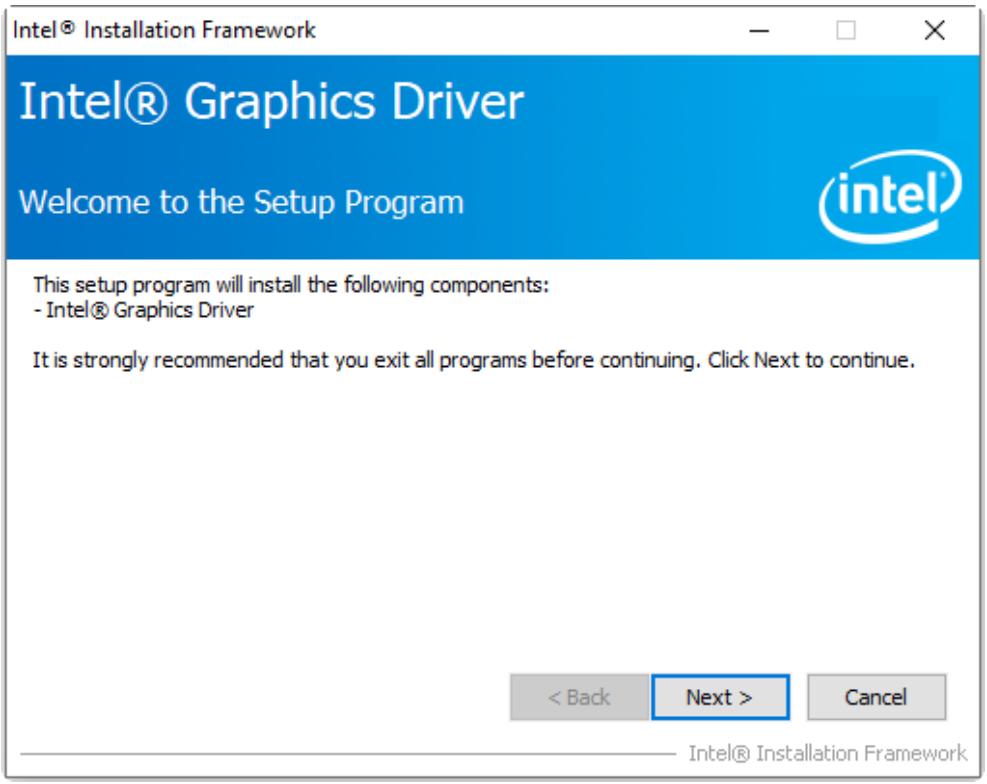
Step5. Click **Finish** to complete the setup process.

4.2 Intel® UHD Graphics 630 Chipset

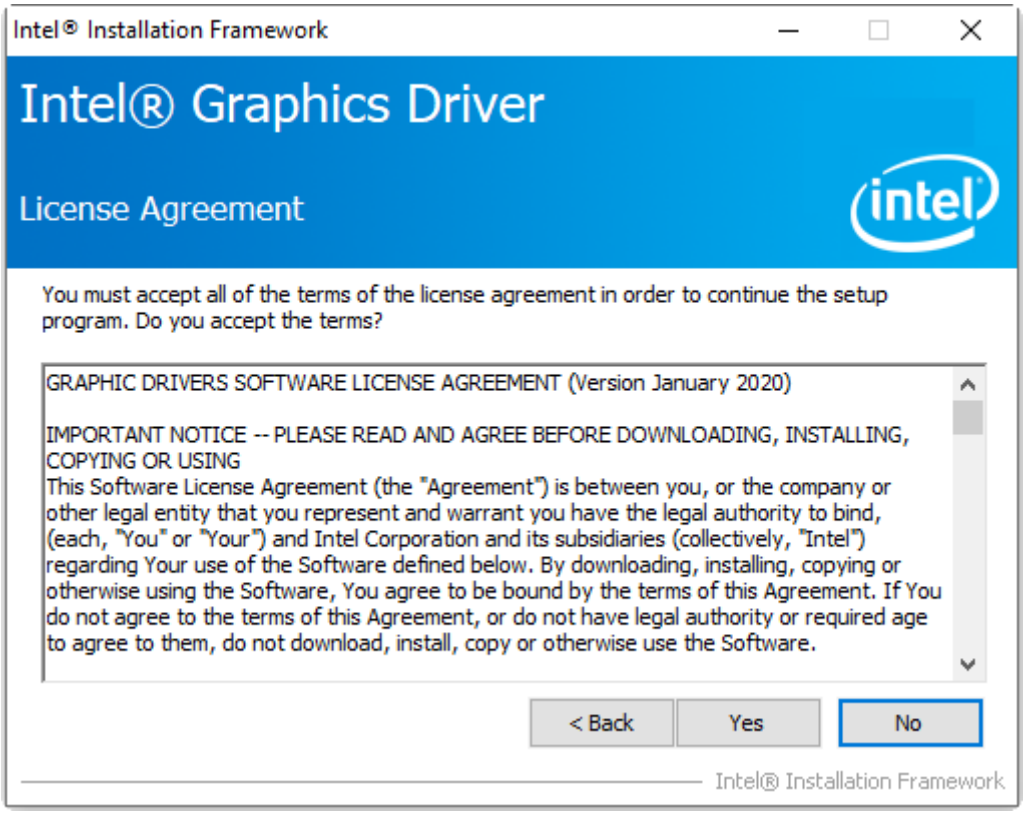
To install the Intel® UHD Graphics 630 Chipset, please follow the steps below.

Step1. Select **Intel® UHD Graphics 630 Chipset** from the list**.**

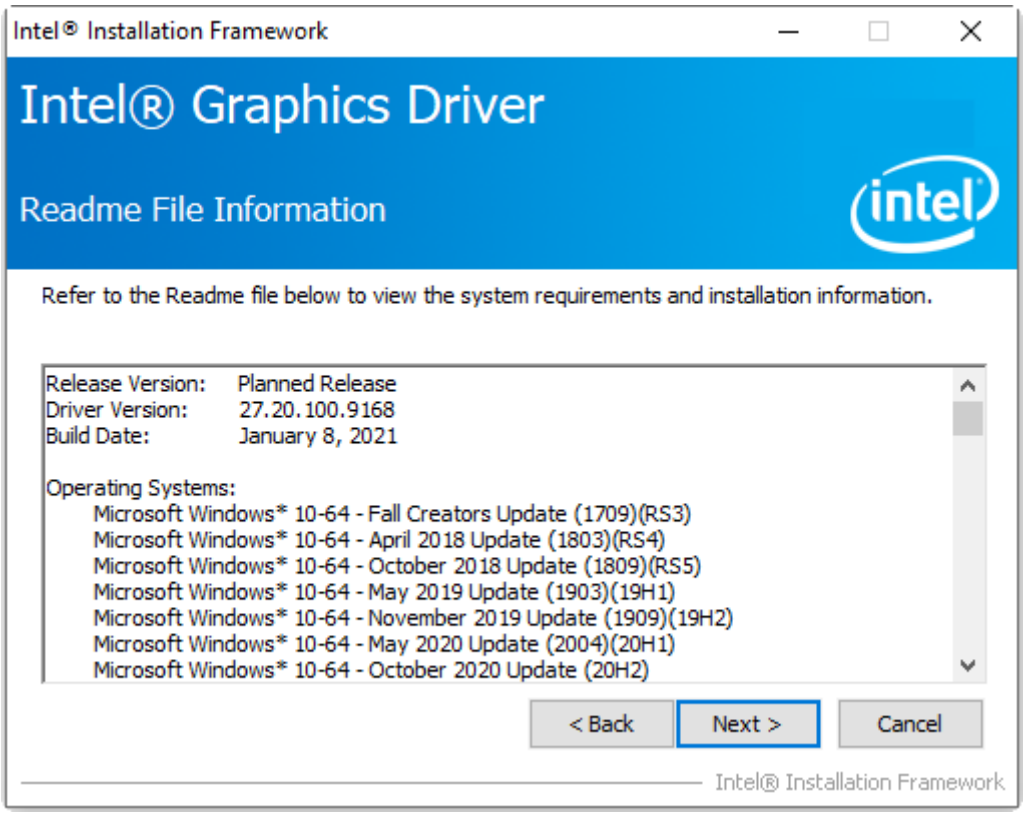
Step2. Click **Next.**



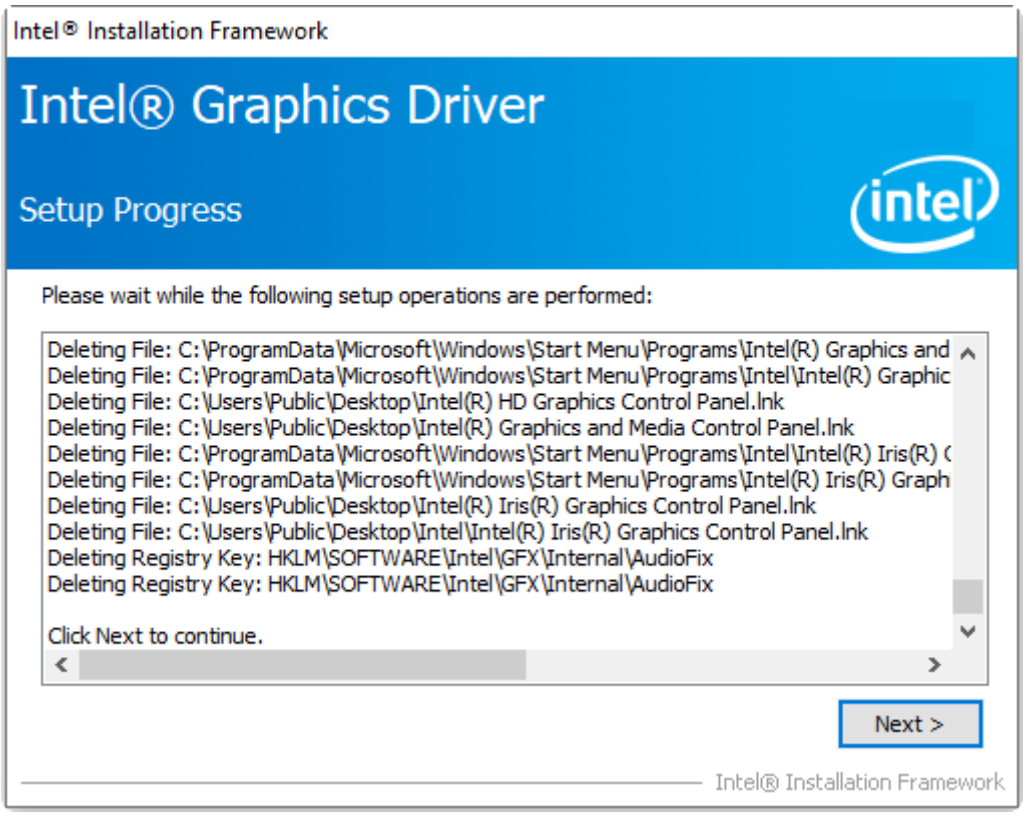
Step3. Read the license agreement. Click **Yes** to accept all of the terms of the license agreement.



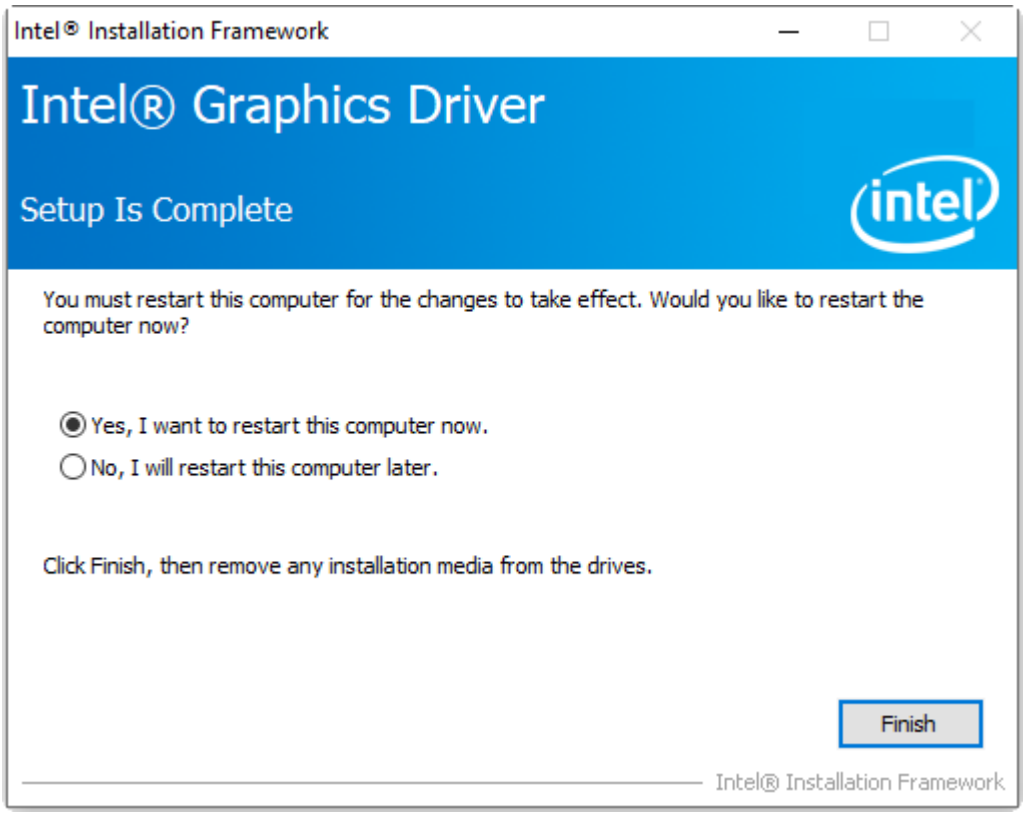
Step4. Click **Next** to continue.



Step5. Click **Next** to continue.



Step6. Click **Finish** to complete the setup process.

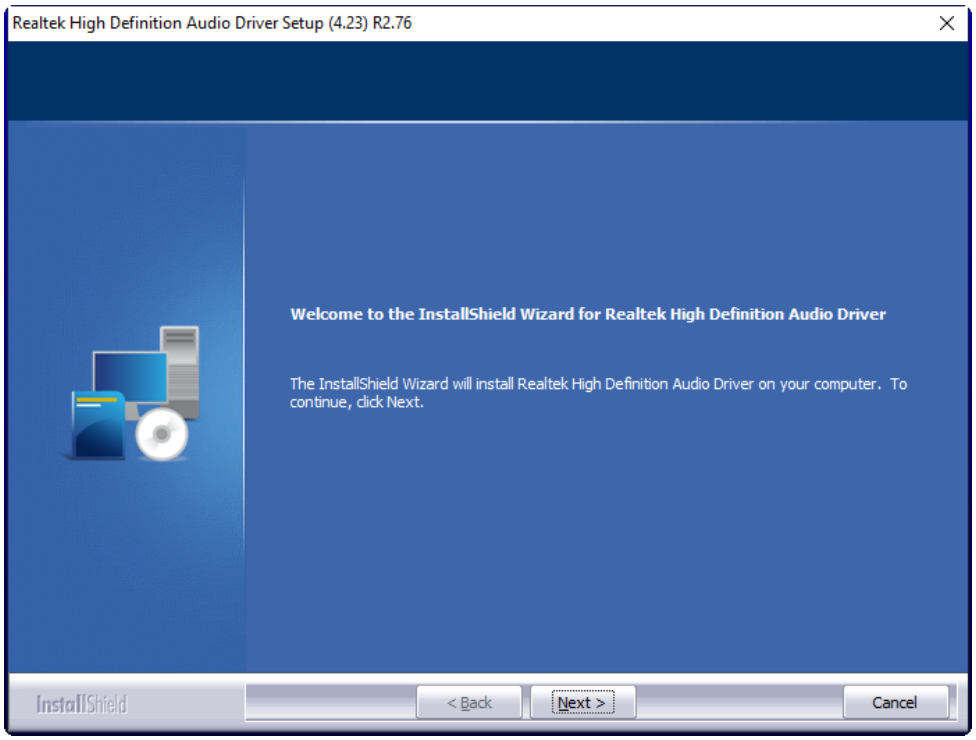


4.3 Realtek HD Audio Driver Installation

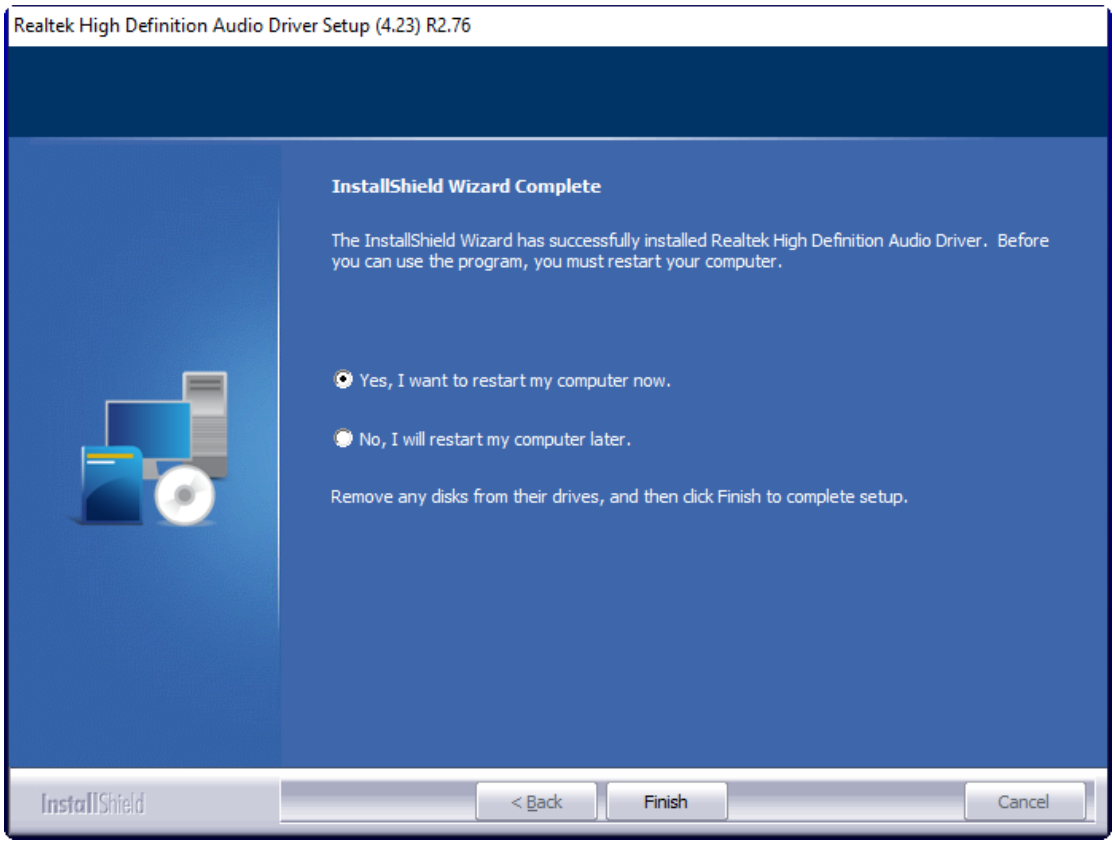
To install Realtek HD Audio Driver, please follow the steps below.

Step1. Select **Realtek HD Audio Driver** from the list**.**

Step2. Click **Next** to continue.



Step3. Click **Yes, I want to restart my computer now**. Click **Finish** to complete the installation.

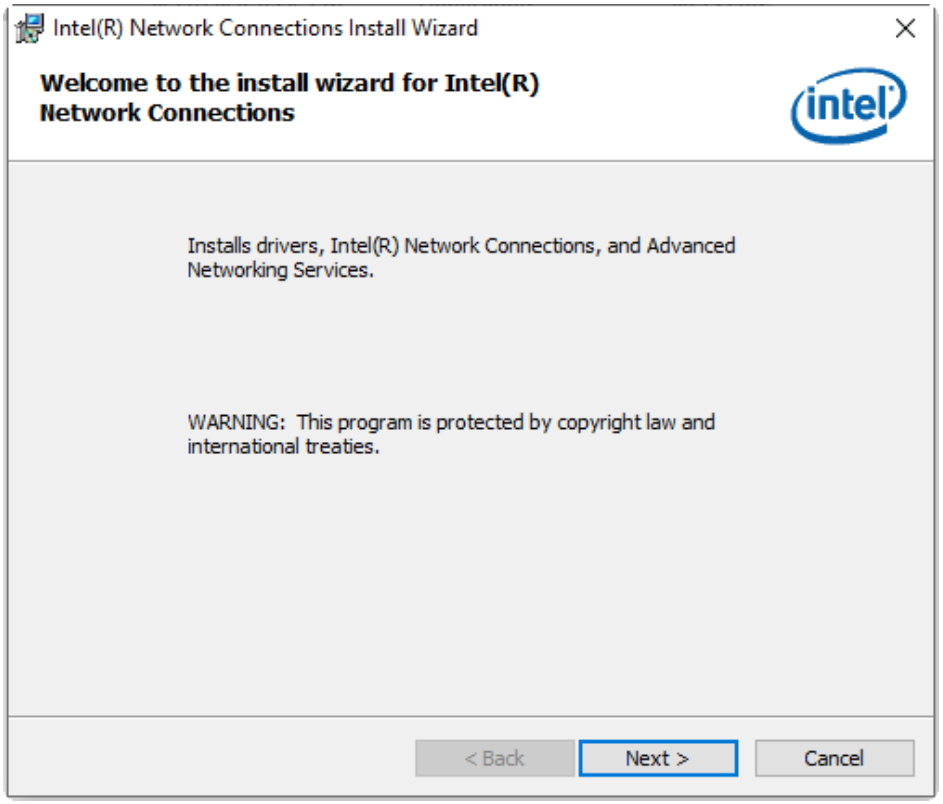


4.4 LAN Driver

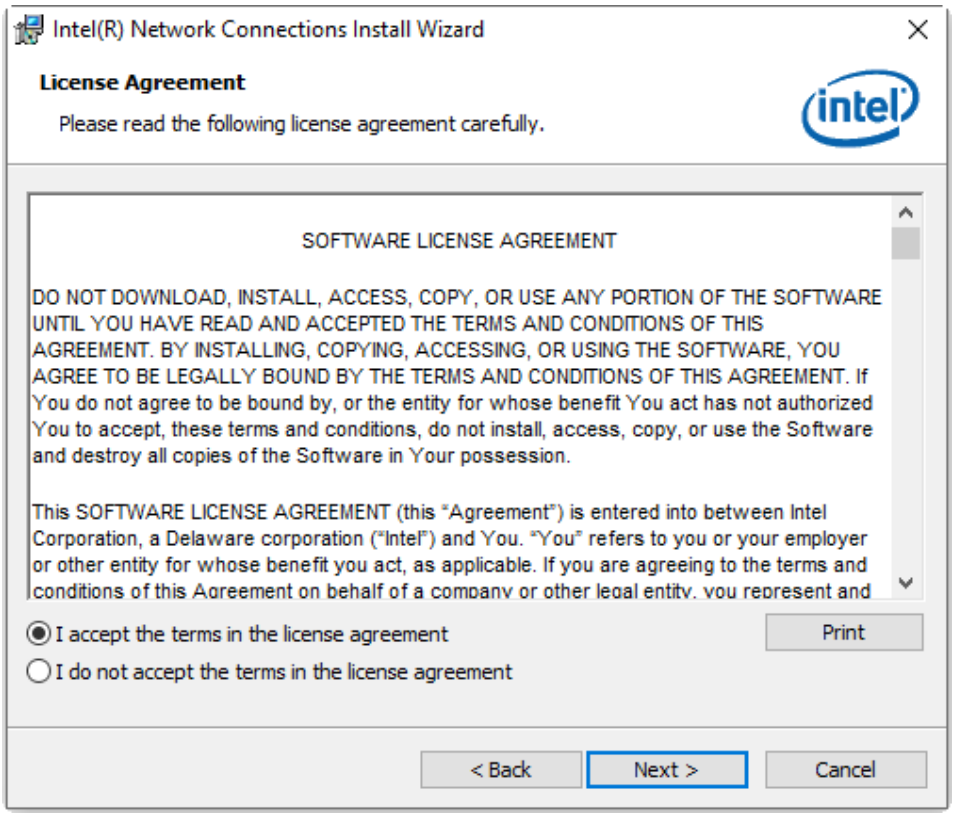
To install the LAN Driver, please follow the steps below.

Step1. Select LAN Driver from the list

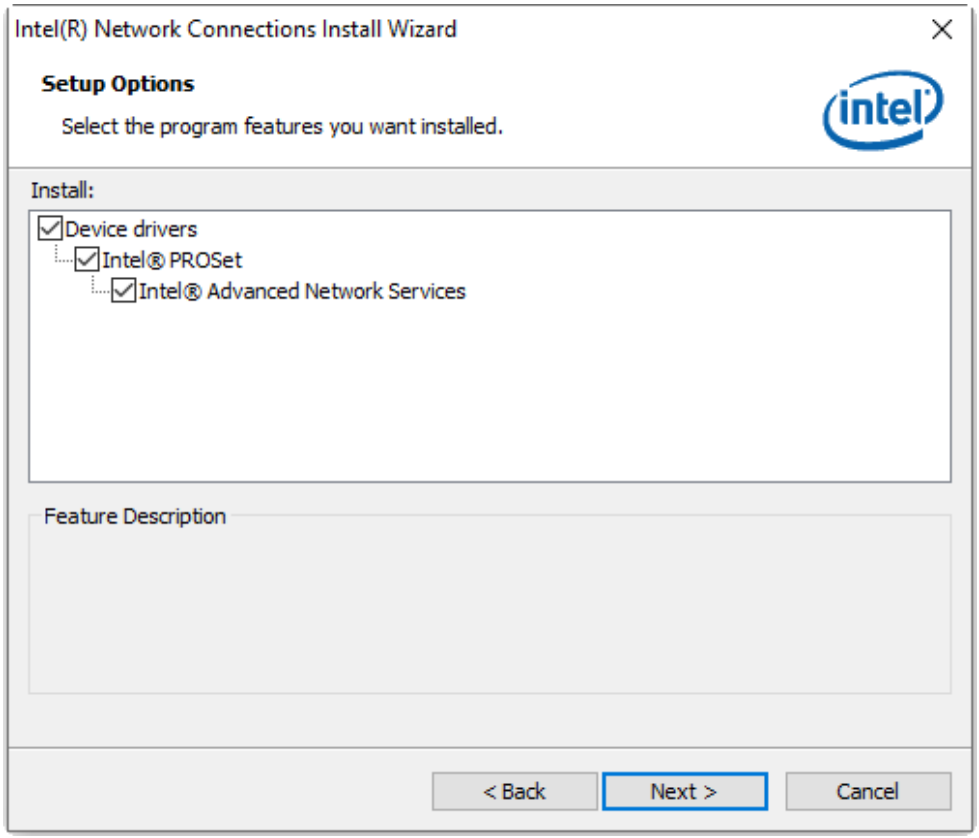
Step2. Click **Next** to continue.



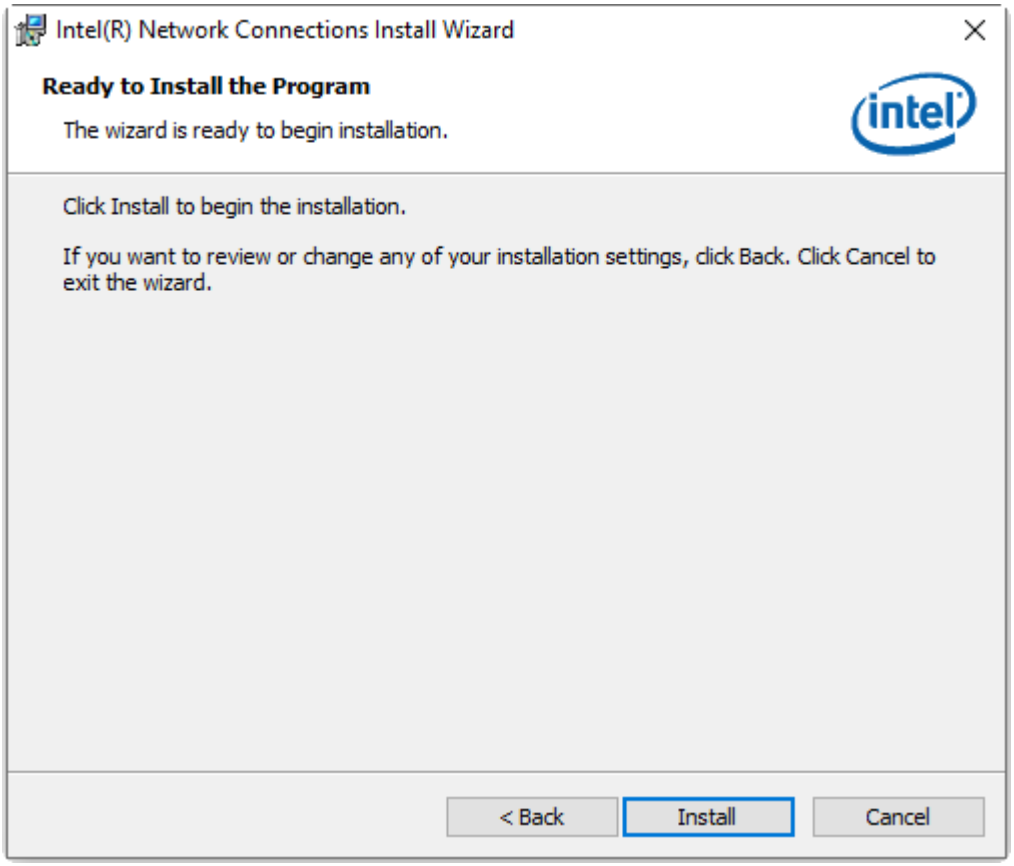
Step3. Choose **I accept the terms in the License Agreement** and click **Next** to begin the installation.



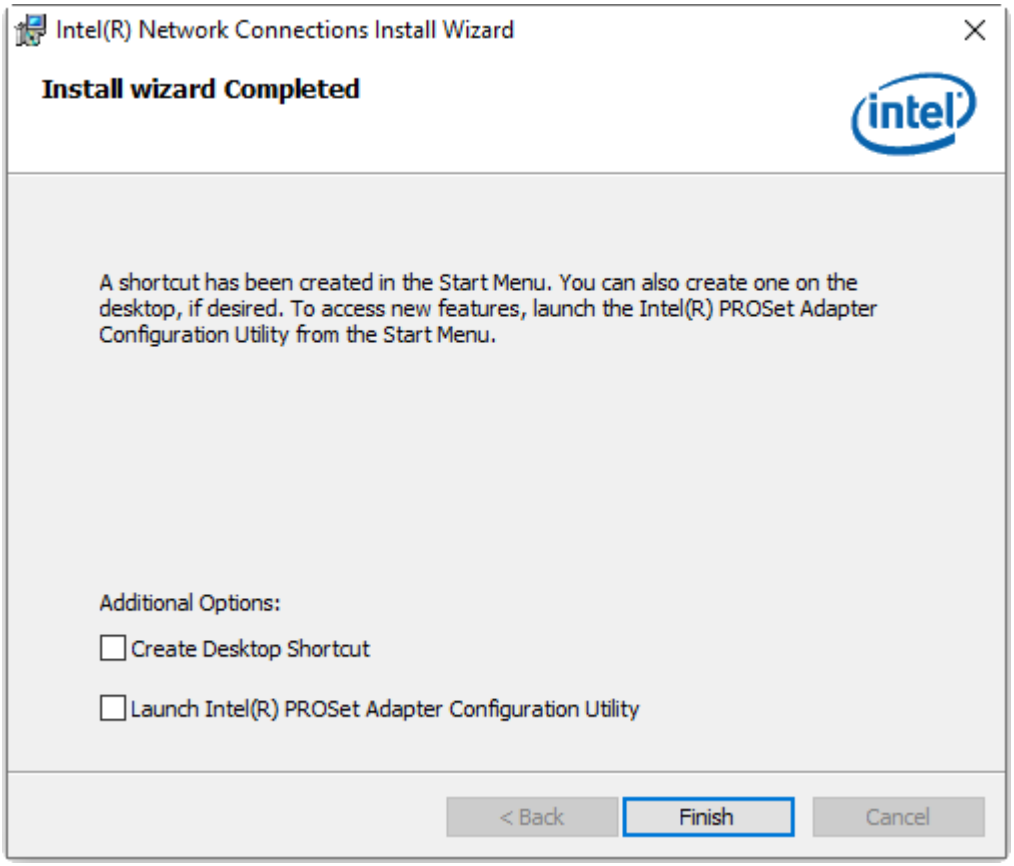
Step4. Choose the items you need to install and click **Next** to continue.



Step5. Click **Install** to begin the installation.



Step6. Click **Finish** to complete the installation.

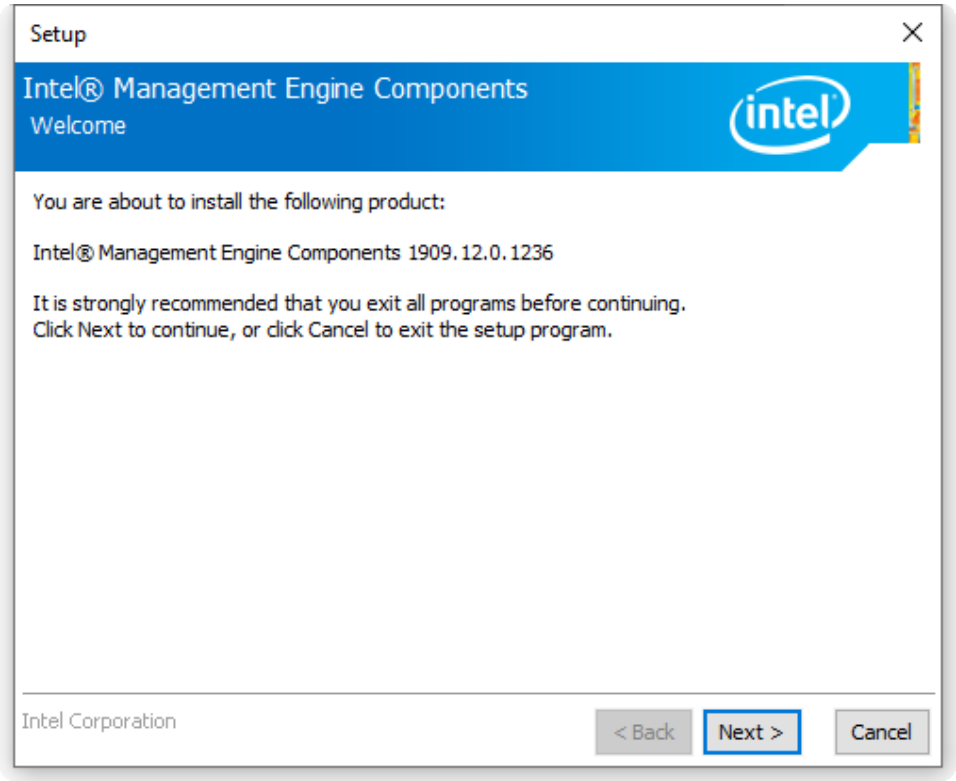


4.5 Intel® ME Driver

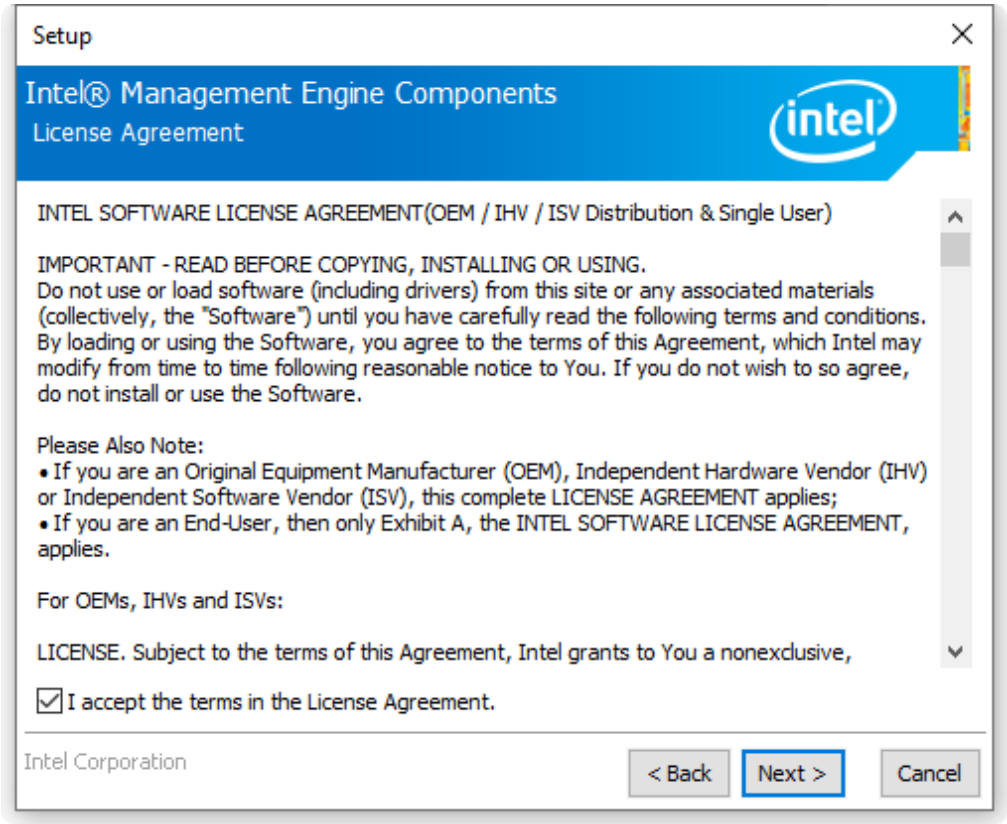
To install the Intel® ME Driver, please follow the steps below.

Step1. Select **Intel® ME Driver** from the list

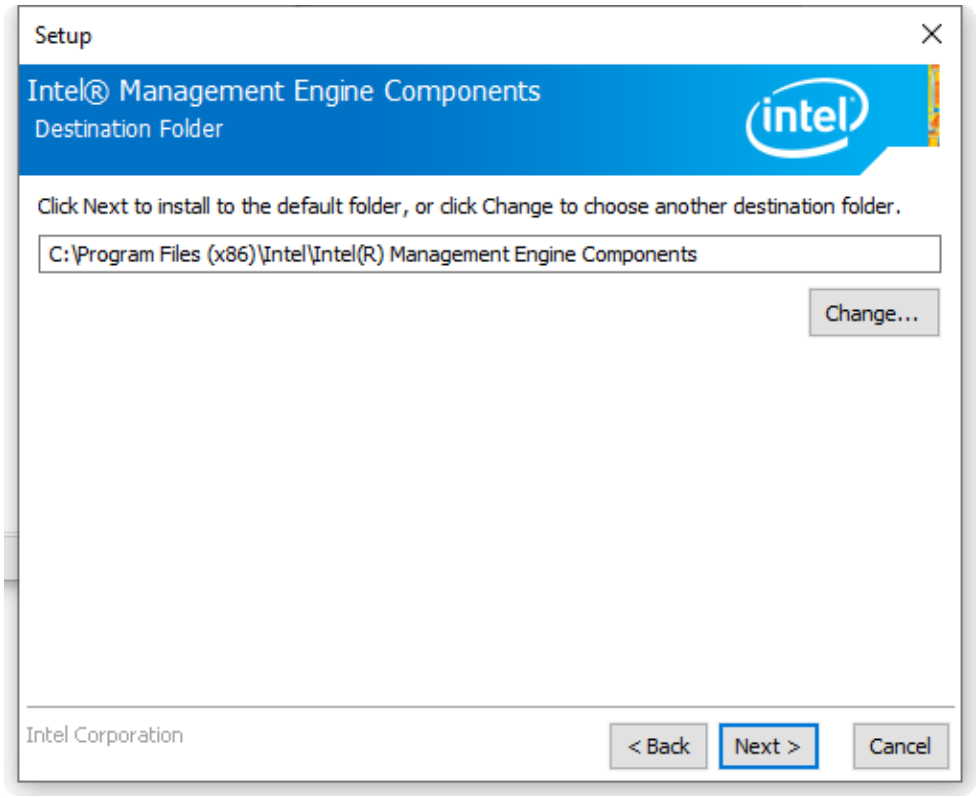
Step2. Click **Next** to continue.



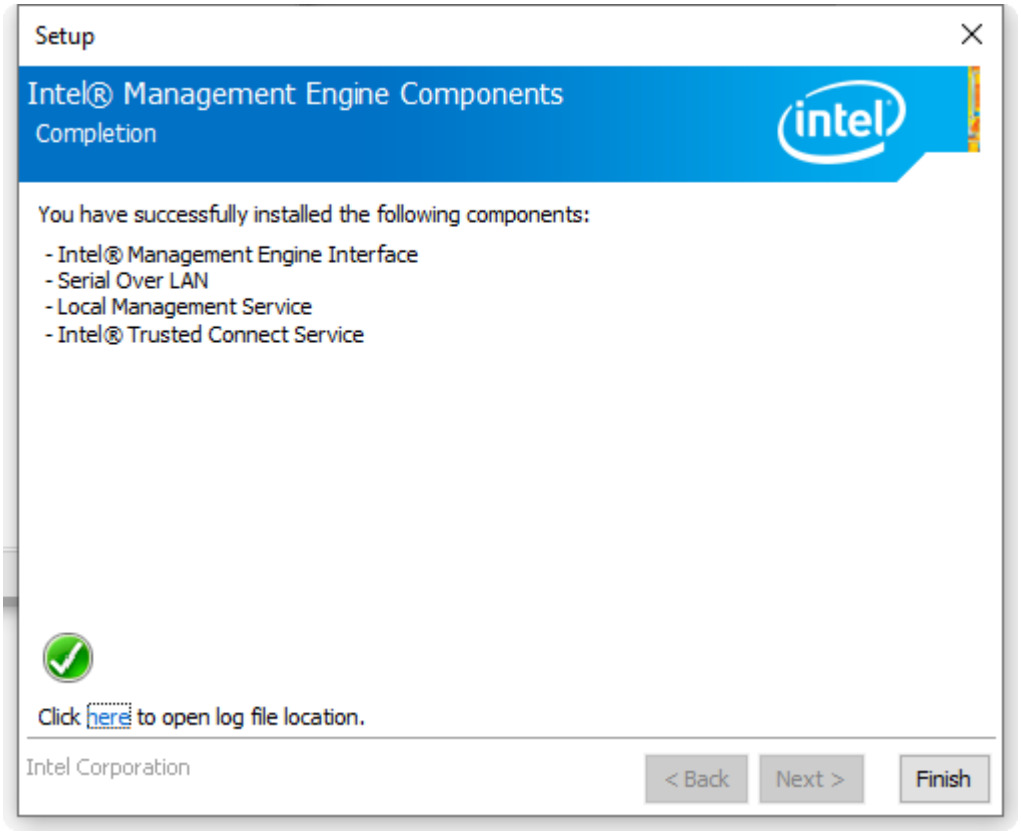
Step3. Choose **I accept the terms in the License Agreement** and click **Next** to begin the installation.



Step4. Click **Next** to continue.



Step6. Click **Finish** to complete the installation.



Chapter 5 Mounting Suggestions

5.1 AVS-520 Wall Mount and Din Rail Mount

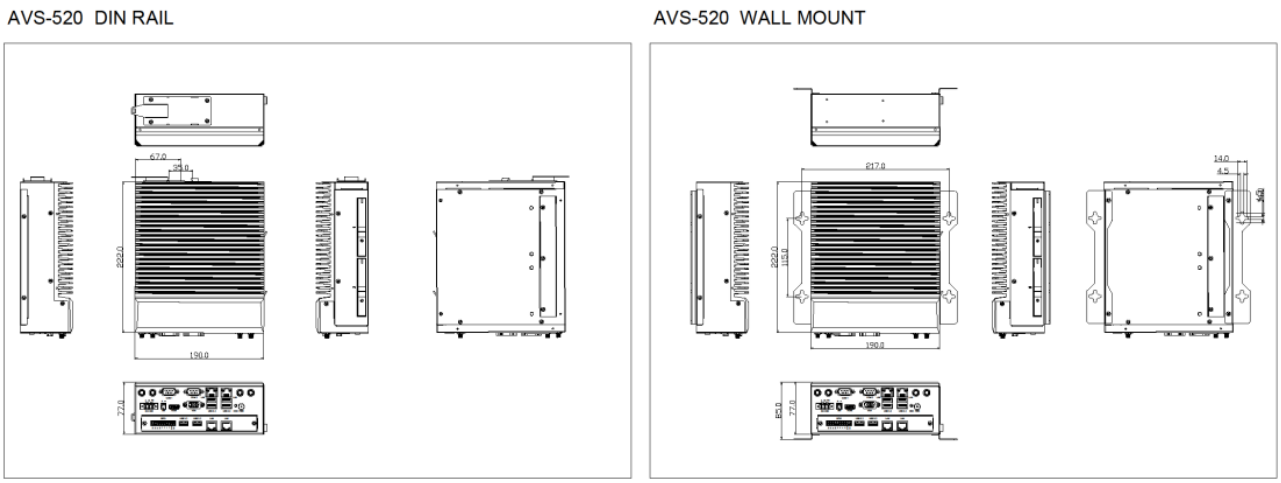


Figure 5.1 Mounting of AVS-520

5.2 AVS-522 Wall Mount and Din Rail Mount

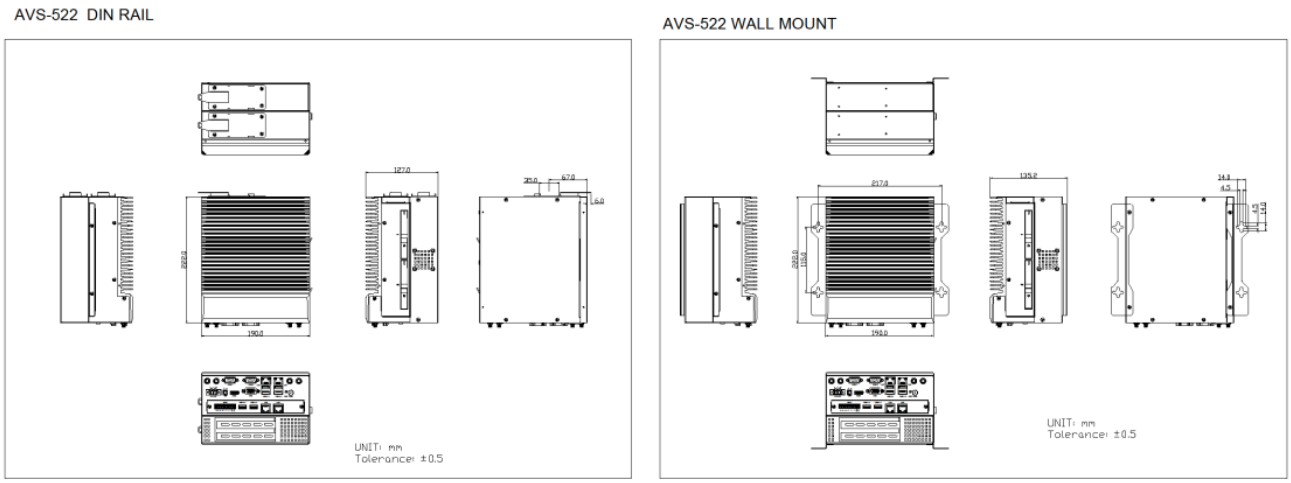


Figure 5.2 Mounting of AVS-522

5.3 AVS-524 Wall Mount and Din Rail Mount

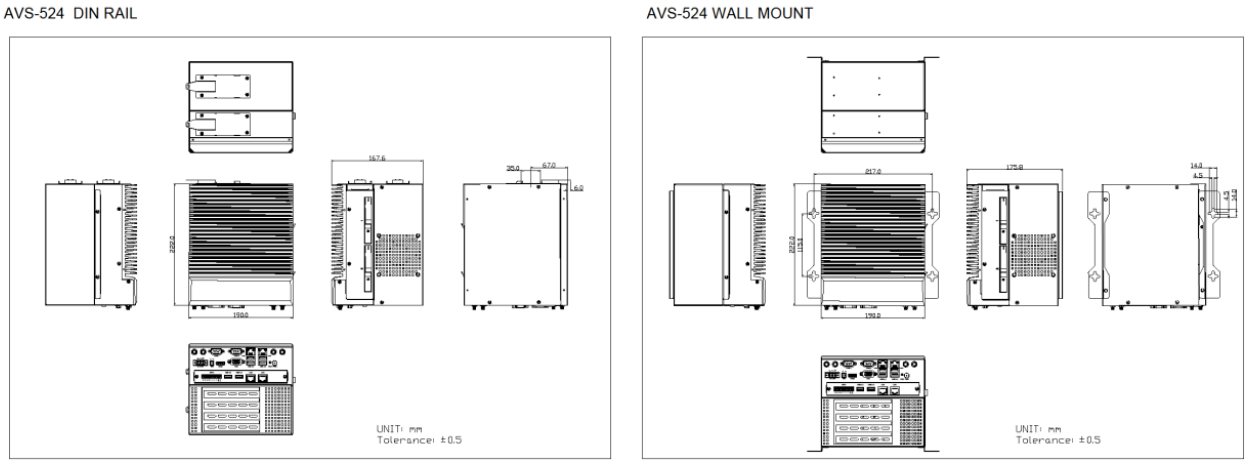


Figure 5.3 Mounting of AVS-524