



ACS-231xA

Intel Elkhart Lake Processor Embedded System

User Manual

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Revision

V1.7

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Revision History

Reversion	Date	Description
1.0	2023/09/06	Official Version
1.1	2024/5/28	2.1 Delete Storage PCIe support 2.4 LAN indicator
1.2	2024/6/4	Modify MB I/O picture
1.3	2024/6/17	Add 1.5
1.4	2024/6/25	Add ACS-2311A
1.5	2024/7/9	Modify ACS-2310A & ACS-2311A dimension & drawing on page6 & Page8
1.6	2024/09/11	Add x6413E in 1.2 Specifications
1.7	2025/04/02	Modify M.2 storage information in CH1 and CH2.

Warning!

This equipment generates, uses and can 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 are 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 at his 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.

Caution

Risk of explosion if the battery is replaced with an incorrect type.

Batteries should be recycled where possible. Disposal of used batteries must be in accordance with local environmental regulations.

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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Chapter 1

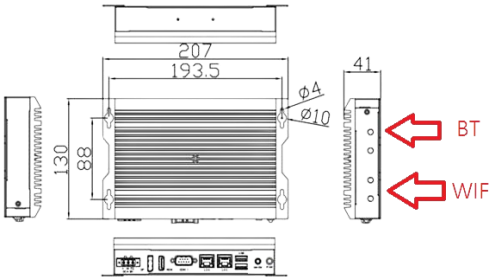
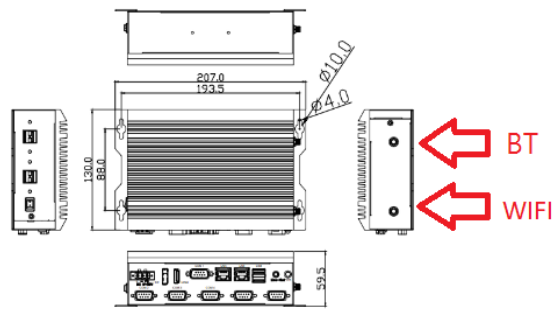
Getting Started

1.1 Features

- Onboard Intel® Atom® x6000 series, Pentium & Celeron N and J series Processors
- 1 x SO-DIMM slot, support up to DDR4 32GB 3200MHz SDRAM
- 2 x USB 3.2 Gen1 type A
- 1 x GbE LAN, 1 x 2.5GbE LAN
- 1 x MO-297/1 x M.2 M-Key for storage
- 1 x RS-232(default)/422/485 (ACS-2311A only)
- Wide range DC 9~36V input
- 5 x RS-232 (ACS-2311A only)
- 4 x USB 2.0 type A (ACS-2311A only)

1.2 Specifications

System		
Model name	ACS-231xA	
Processor	Intel®Atom®x6425E (1.8GHz/3.0GHz, 1.5MB L2 cache, 12W TDP)(option) Intel®Celeron®J6412 (2.0GHz/2.6GHz, 1.5MB L2 cache, 10W TDP)(default) Intel®Celeron®x6413E (1.5GHz/3.0GHz, 1.5MB L2 cache, 9W TDP)(option)	
System Chipset	SoC	
BIOS	AMI	
System Memory	1 x SO-DIMM slot up to 32GB DDR4 3200MHz SDRAM	
Outside I/O		
Model	ACS-2310A	ACS-2311A
USB	2 x USB3.2 Gen1 type A 4 x USB2.0 type A via TB-546(option)	2 x USB3.2 Gen1 type A 4 x USB 2.0 type A via cable
Serial/ Parallel	1 x RS-232(default)/422/485, pin9 RI(default)/5V/12V, select via BIOS, DB9 (COM1) 1 x RS-232 via pitch 2.0mm 2x5pin header, DB9 (COM2) (option)	1 x RS-232(default)/422/485, pin9 RI(default)/5V/12V, select via BIOS, DB9 (COM1) 1 x RS-232 via pitch2.0mm 2x5pin header, DB9 (COM2) 4 x RS-232 by mPCIe module
LAN	1 x GbE LAN RJ-45 (i210AT)	

	1 x 2.5GbE LAN RJ45 (i225LM)	
VGA	1 x DP 1.4 include DP++, up to 4096 x 2160 @60Hz	
HDMI	1 x HDMI2.0b, up to 3840 x 2160 @60Hz	
Audio	1 x Line-out	
Power	1 x power LED light 1 x 3-pin DC power input terminal block 1 x Power Button with Light (From TB-546) (option)	1 x power LED light 1 x 3-pin DC power input terminal block 1 x Power Switch by cable
Options I/O		
Options	1 x Watchdog Timer (256 steps) 1 x Thermal Copper for PCBA Thermal Detection. 4 x SMA holes for Wi-Fi or Wireless 4G LTE/GPS antennas. 1 x AT/ATX (ACS-2311A only)	
		
Storage		
Storage	1 x M.2 M- Key 2242/2280 for SSD(SATA3) (Default) 1 x MO-297 SATA (option)	
Expansion		
Expansion Slots	1 x full-sized mini-PCIe cards (default for 4 x COM module, ACS-2311A only) 1 x with 1xSIM slot. 1 x full-sized mini-PCIe cards with 1xSIM slot. (ACS-2310A only) 1 x M.2 E-Key 2230 for WiFi/BT module (USB2.0, PCIe3.0x1)	
Power		
Power Input	DC 9~36V	
Power Consumption	24W	27.8W
Mechanical		
Construction	Plating Black Aluminum Heatsink and Black Steel Chassis	
Dimension (LxWxH)	207 x 130 x 41mm (Wall) 180 x 130 x 40mm (Din)	207 x 130 x 59.5 mm (w/ wall-mount bracket)
Net Weight	1.1 Kg	1.35 Kg

Mounting	Wall mount(default)/Din Rail (option)	
Environmental		
Operating Temperature	0~50 °C (WT1 -20~60°C/ WT2 -20~70°C for option)	-20~60 °C
Storage Temperature	-40~85 °C	
Storage Temperature	10%~90%@ 40°C, non-condensing	
Certificate	CE / FCC Class A	
TPM	1 x TPM2.0	
Operating System Support	Microsoft®Win10 IoT, Win11 IoT, LINUX Kernel 5.15 (Ubuntu 22.04)_ACS-2310A Microsoft®Win10 IoT, Win11 IoT, LINUX Kernel 4.15 (Ubuntu 18.04)_ACS-2311A	

1.3 Dimensions

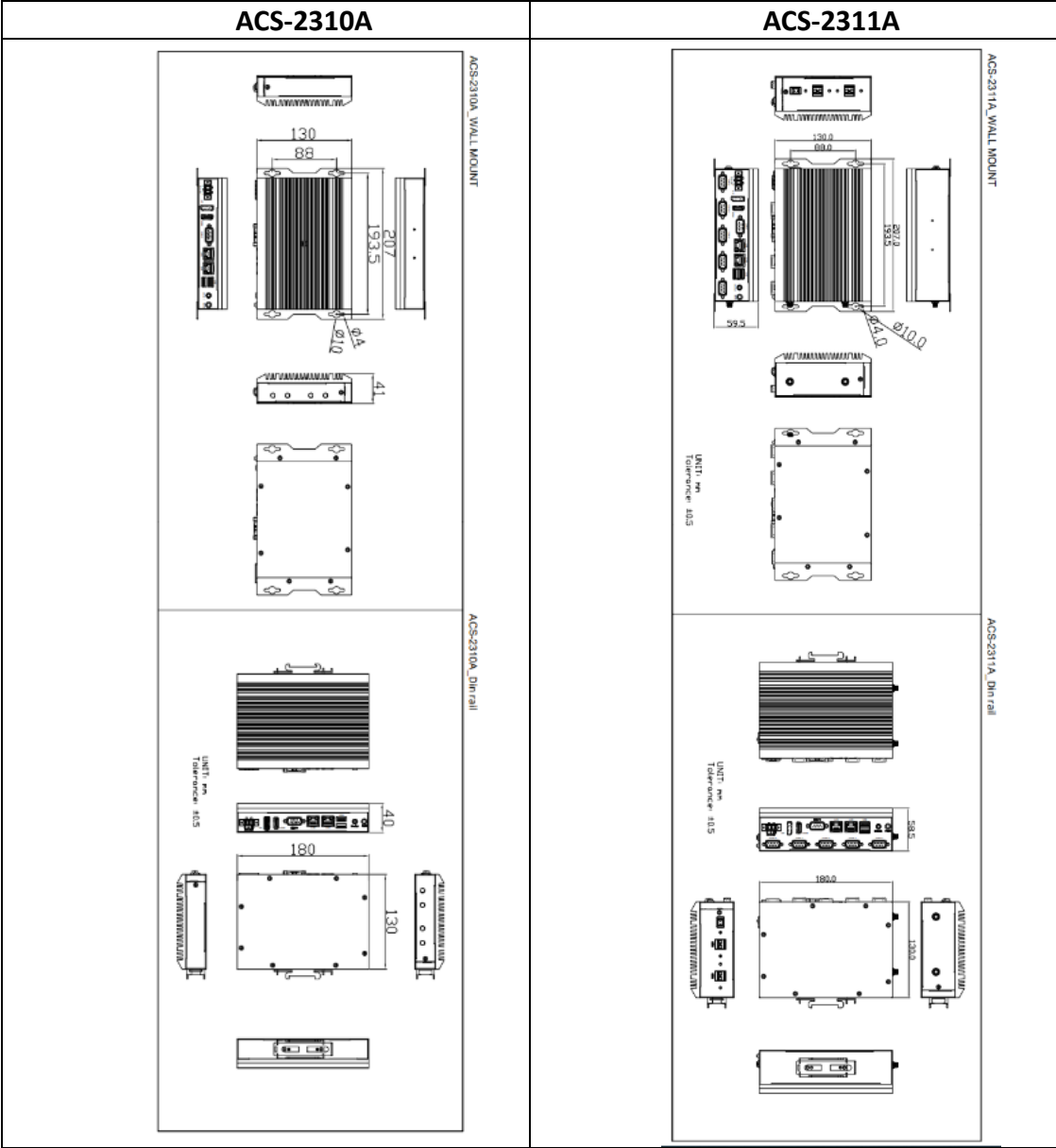


Figure 1.1: Dimensions of ACS-231xA

1.4 Brief Description of ACS-231xA

The ACS-231xA Series is a compact embedded system powered by the Intel Elkhart Lake J6412 processor. It supports up to 32GB of DDR4 memory and offers a range of connectivity, including 1 x DP, 1 x HDMI 2.0, 1 x COM, 2 x GbE LAN ports, 2 x USB 3.2 ports interfaces; where the ACS-2311A has additional 4 x USB 2.0, and 5 x COM ports through extended boards. This system is designed for versatile applications with wide input voltage support (9-36V DC), and flexible mounting options such as DIN rail and wall mounting. It also includes options for storage expansion with M.2 and SATA interfaces, and provides robust environmental endurance with an operating temperature range from -20°C to 70°C for option. Ideal for industrial automation, digital signage, and IoT applications, the ACS-231xA combines high performance, extensive connectivity, and rugged design in a compact form factor.

ACS-2310A



ACS-2311A



Figure 1.2: Overview of ACS-231xA

1.5 DIN-rail Mounting /Booking Mounting (optional)

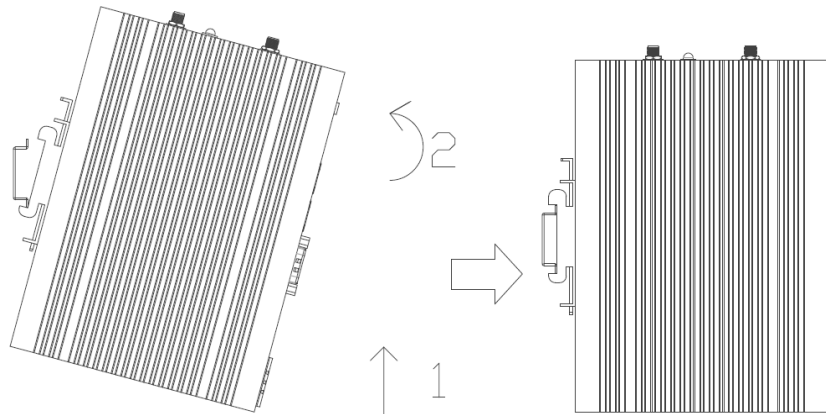
Suggested Installation Method

STEP 1:

Hold the DIN rail lower lip kit on the mounting rail.

STEP 2:

Press the device against the upper mounting rail until it snaps into place



Assembly instructions

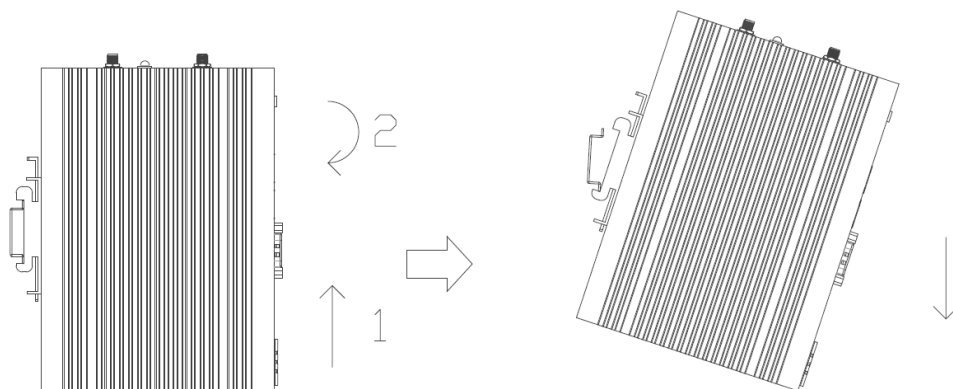
Suggested Removal Method

STEP 1:

Pull the device up and off the DIN rail with the upper lip off the rail.

STEP 2:

Gently pull the device back at a 45° angle away from the rails, and then pull the device down to remove.



Disassembly instructions

Chapter 2

Motherboard

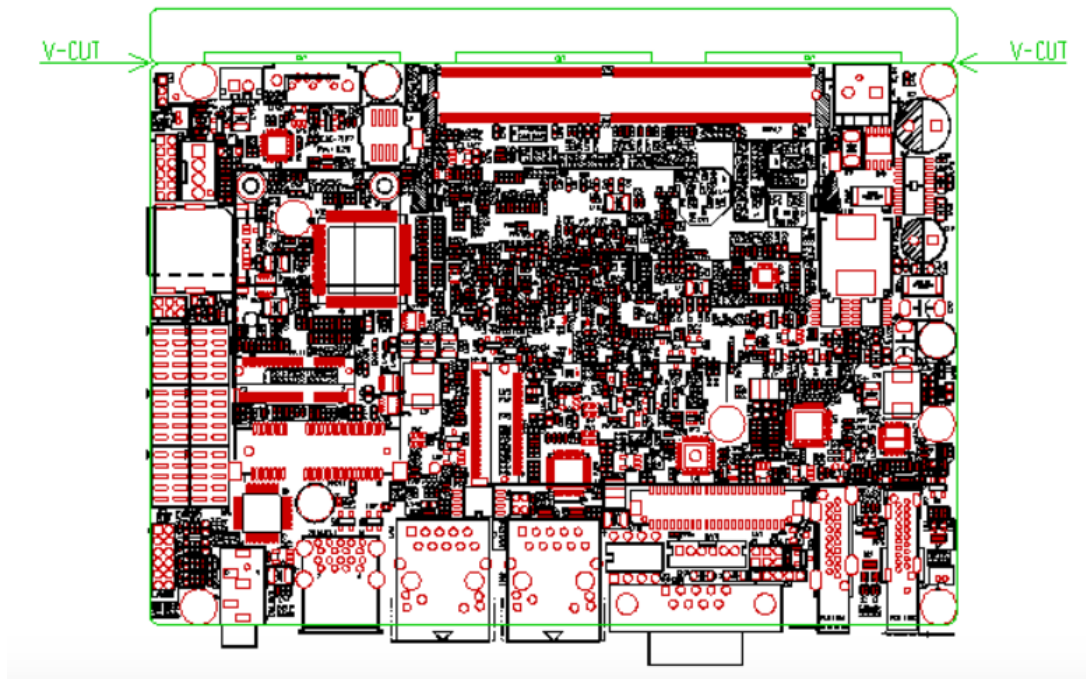
SBC-7127 is a 3.5" industrial motherboard developed on the basis of Intel Elkhart Lake, which provides abundant peripheral interfaces to meet the needs of different customers. Also, it features two GbE ports, 4-COM ports and one Mini PCIE and one M.2 2230 configuration. To satisfy the special needs of high-end customers, due to its compact size, the product is widely used in various sectors of industrial control.

2.1 Specifications

Specifications	
Board Size	146mm x 101.6mm
CPU Support	Intel Celeron J6412 Processor,2.0GHz up to 2.60GHz,10W Intel Atom x6425E Processor,2.0GHz up to 3.00GHz,12W (option)
Chipset	SoC
Memory Support	1x SO-DIMM (260pins), up to 32GB DDR4 3200MT/s
Graphics	Integrated Intel UHD Graphics 400/800 MHz (J6412) Integrated Intel UHD Graphics 500/750 MHz (x6425E)
Display Mode	1 x DisplayPort1.4, DP++ via DP Port 1 x HDMI1.4b via HDMI Port 1 x LVDS (18/24-bit dual LVDS)
Support Resolution	DP: support up to 4096 x 2160 @60Hz HDMI: support up to 3840x2160@30Hz LVDS: support up to 1920 x 1200
Super I/O	ITE IT8786E-I/HX
BIOS	AMI/UEFI BIOS
Storage	1 x SATAIII via 7pin SATA connector 1 x M.2 M-Key(SATA III),2242/2280 for Storage
Ethernet	1 x 10/100/GbE LAN via intel® I210-AT controller (PXE/WoL) 1 x 10/100/1000/2.5GbE LAN via intel® I225-LM/I226-LM controller (PXE/WoL)
USB	2 x USB3.2 gen2/USB2.0,Type-A stack ports (USB3_1) 2 x USB2.0 via pitch 2.0mm 2x5pin header (USB1) 2 x USB2.0 via pitch 2.0mm 2x5pin header (USB2) 1 x USB2.0 for touch screen (CN3) 1x USB2.0 for MPCIE1 1x USB2.0 for M2_E1
Serial	1 x RS-232(default)/422/485, signals select via BIOS (COM1), pin9 RI(default)/5V/12V, select via JP1. (DB9, COM1) 1 x RS-232 via pitch 2.0mm 2x5pin header, pin9 RI(default)/5V/12V, select via JP2 (COM2)

	2 x 2wired RS485 via pitch 2.0mm 2x5pin header (COM3)
GPIO	8-bit digital I/O by Pin header (GPIO2) 4-bit digital Input 4-bit digital Output
Audio	Support Audio via Realtek ALC888S-VD2 HD audio codec 1x Line out via 3.5mm audio jack Support Line-in,Line-out,MIC by 2x6-pin header
Expansion Slots	1 x full-sized mini-PCI-express slot (MPCIE1) with micro SIM slot (SIM1) 1 x M.2 E-Key(PCIex1,USB2.0),2230 for WIFI/BT module
FAN	1x 4pin fan connector
Watchdog Timer	Software programmable 1–255 level
TPM	-Onboard TPM IC Infineon_SLB9670AQ2.0 -Support fTPM, select via BIOS
Switches and LED Indicators	Power button/reset button/power LED/HDD LED/buzzer via pitch 2.0mm 2x5pin header (FP1)
Battery	Support 3V RTC Li-battery via 2pin wafer (BAT1)
Power Management	Wide range DC 9~36V±10% power input via 2pin terminal block
Temperature	Operating: -20℃ to 70℃ Storage: -40℃ to 85℃
Humidity	10% - 90%, non-condensing, operating
Certifications	Meet CE/FCC class A UL RoHS2.0

2.2 Board Dimensions



Dimensions: 146 x 101.6 (units :mm)

Figure 2.1: Dimensions of motherboard SBC-7127

2.3 Jumpers and Connectors Location

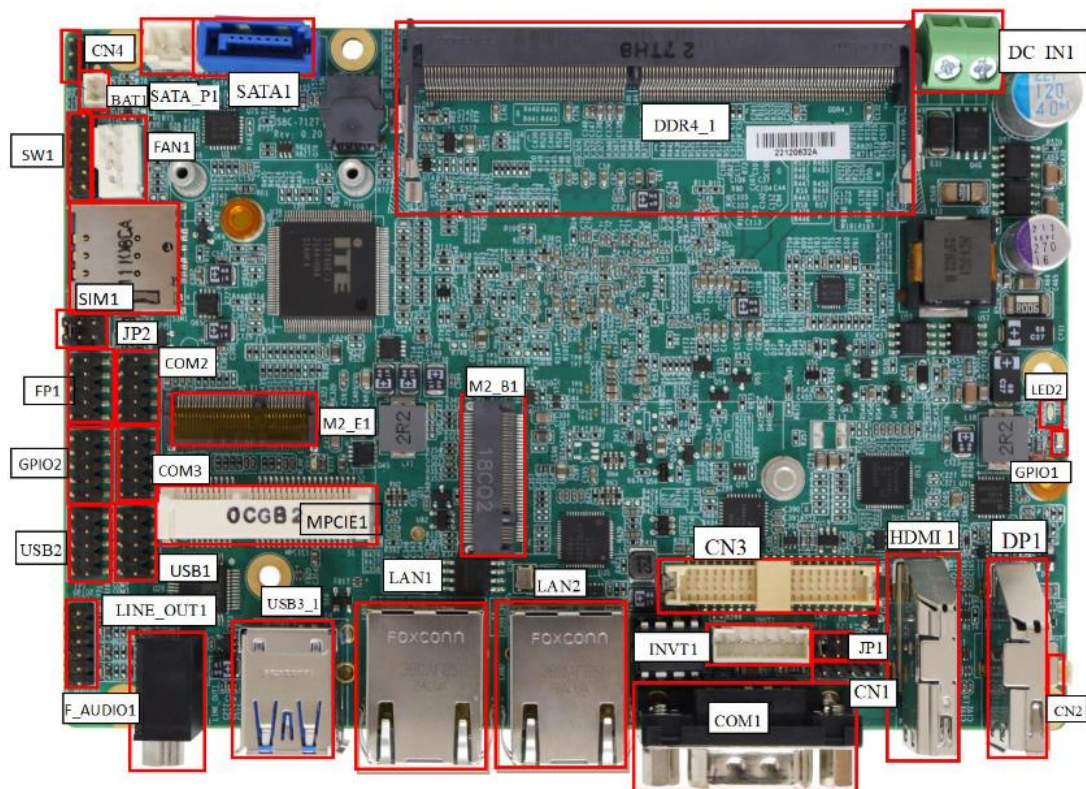


Figure 2.2: Top of motherboard SBC-7127

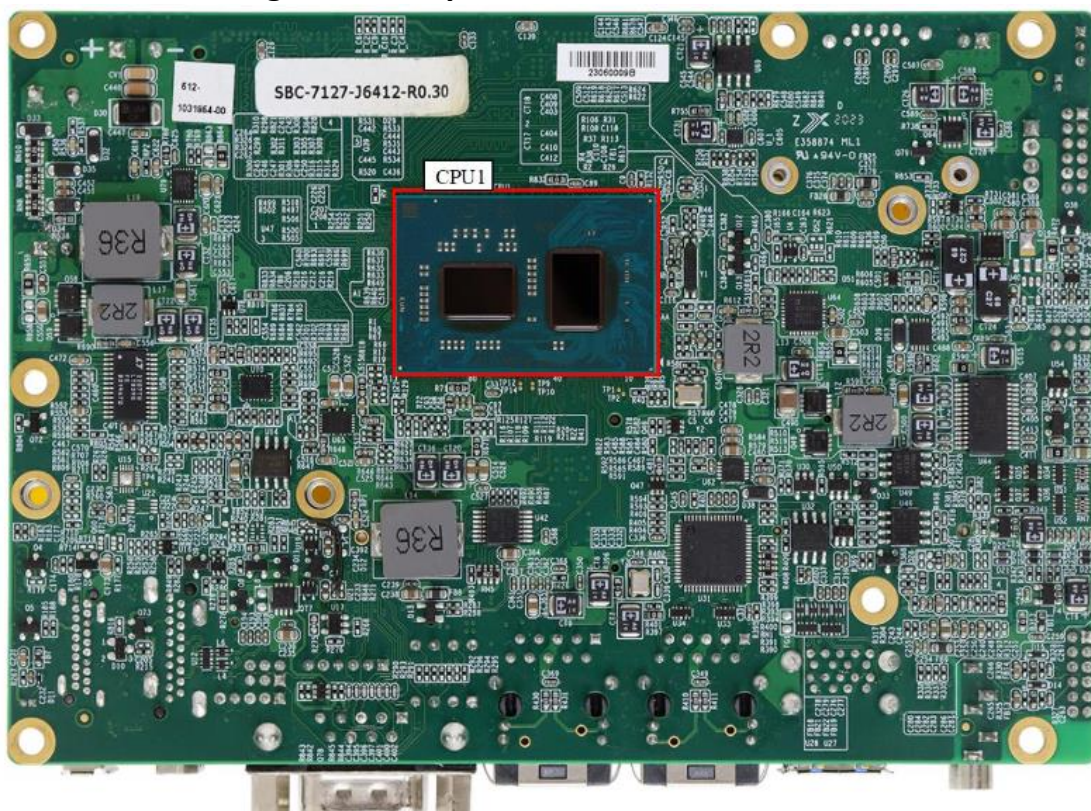
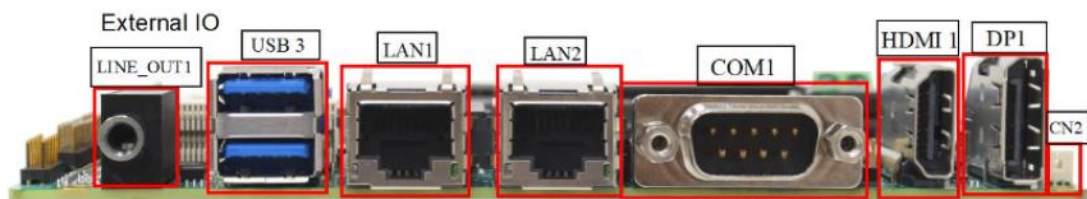


Figure 2.3: Bottom of motherboard SBC-7127



2.4 Jumpers Setting and Connectors

1. CPU1:

(FCBGA1493) Onboard Intel Elkhart Lake SoC.

Model	SoC				
	Number	PBF	Cores/ Threads	TDP	Remarks
SBC-7127-J6412	J6412	2.0~2.6GHz	4 / 4	10W	Default
SBC-7127-X6425E	X6425E	2.0~3.0GHz	4 / 4	12W	Option

2. DDR4_1:

(SO-DIMM 260Pin slot) 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 32GB.

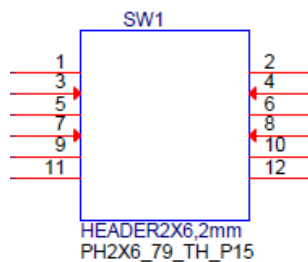
Max Memory Size (dependent on memory type).

3. BAT1:

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

Pin#	Signal Name
Pin1	VCC_RTC
Pin2	GND

4. SW1:



(2.00mm Pitch 2x6 Pin Header) Power mode and LVDS setting.

Switch	Open	Close
Pin1-2	Default, PWRBTN-ON	Auto-PSON
Pin3-4	ATX Mode	Default, AT Mode
Pin5-6	Default, Normal	Close 1sec to Clear CMOS
Pin7-8	Default, Normal	Write EDID
Pin9-10	Default, LVDS Dual CH.	LVDS Single CH.
Pin11-12	Default, LVDS 6 bit Signal	LVDS 8 bit Signal

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

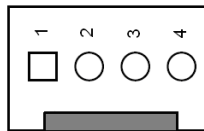


Procedures of CMOS clear:

- Turn off the system and unplug the power cord from the power outlet.
- To clear the CMOS settings, close Pin5-6 for 1 second
- Power on the system again.
- When entering the POST screen, press the key to enter CMOS Setup Utility to load optimal defaults.
- After the above operations, save changes and exit BIOS Setup.

5. FAN1:

(2.54mm Pitch 1x4 Pin Header) Fan connector, cooling fans can be connected directly for use. You may set the rotation condition of cooling fan in menu of BIOS CMOS Setup.



Pin#	Signal Name
1	GND
2	VCC(12V_S0)
3	CPU_FANTACH
4	CPU_FANPWM



Note:

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

6. DC_IN1:

(5.08mm Pitch 1x2 Pin Connector) DC9~36V System power input connector.

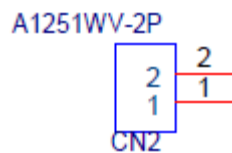
Pin#	Power Input
Pin1	DC_IN+ (DC+9V~36V)
Pin2	DC_IN- (Ground)

7. CN1:

(2.00mm Pitch 1x4 Pin Header) For onboard MCU service.

Pin#	Signals
1	GND
2	nRST
3	TICECLK
4	TICECDAT

8. CN2:



(1.25mm Pitch 2-Pin Wafer) Connect to ambient light sensor to support auto light sensing function.

Pin#	Signals
1	ALS
2	MCU_PWR

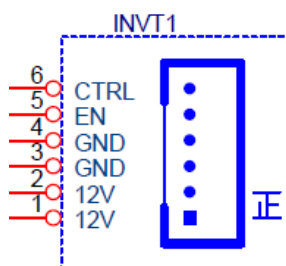
9. CN3:

(1.25mm Pitch 2x20 Connector, DF13-40P) Support 18/24-bit LVDS interface LCM with USB2.0 signal for touch screen.

Function	Signal Name	Pin#		Signal Name	Function
DC12V	12V_S0	2	1	12V_S0	DC12V
LVDS Signals	BKLT_EN_OUT	4	3	BKLT_CTRL	LVDS Signals
	GND	6	5	GND	
	LVDS_VDD5	8	7	LVDS_VDD5	
	LVDS_VDD3	10	9	LVDS_VDD3	
	GND	12	11	GND	
	LA_D0_P	14	13	LA_D0_N	
	LA_D1_P	16	15	LA_D1_N	
	LA_D2_P	18	17	LA_D2_N	

	LA_D3_P	20	19	LA_D3_N	
	LA_CLKP	22	21	LA_CLKN	
	LB_D0_P	24	23	LB_D0_N	
	LB_D1_P	26	25	LB_D1_N	
	LB_D2_P	28	27	LB_D2_N	
	LB_D3_P	30	29	LB_D3_N	
	LB_CLKP	32	31	LB_CLKN	
USB3	GND	34	33	GND	USB3
	USB3_CN3_P	36	35	USB3_CN3_N	
	5V_S5	38	37	5V_S5	
Power LED+	PWR_LED+	40	39	GND	Power LED-

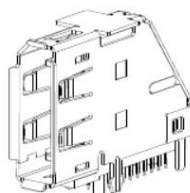
10. INVT1:



(2.0mm Pitch 1x8 wafer Pin Header) Provide backlight power & control for LVDS.

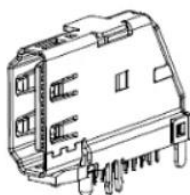
Pin#	Signal Name
1	12V_S0
2	12V_S0
3	GND
4	GND
5	BKLT_EN_OUT
6	BKLT_CTRL

11. DP1:



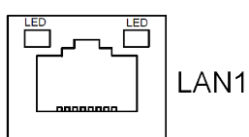
(Vertical DP Connector) DisplayPort Interface connector.
DisplayPort 1.4, DP++ support resolution up to 4096x2160@60Hz.

12. HDMI1:



(Vertical HDMI Connector) HDMI Interface connector.
HDMI 1.4, Support resolution up to 3840x2160@30H.

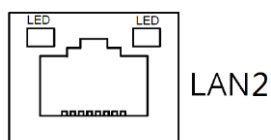
13. LAN1:



(RJ45 Connector) Provide 10/100/GbE LAN via Intel® I210-AT.
Active/Link LED Indicators

Status	Description
OFF	10Mbps
Yellow	100Mbps
Green	1Gbps

14. LAN2:



(RJ45 Connector) Provide 10/100/1000/2.5GbE LAN via Intel® I225-LM/I226-LM.
Active/Link LED Indicators

Status	Description
OFF	10M/100Mbps
Yellow	1000Mbps
Green	2.5 Gbps

15. LINE_OUT1:



(Diameter 3.5mm Jack) Provide line-out via onboard Realtek ALC888S codec.

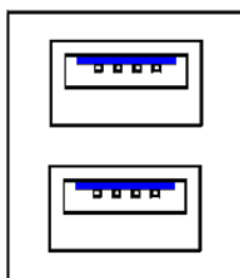
16. F_AUDIO1:

(2.0mm Pitch 2x6 Pin Header) Provide line-in/line-out/mic-in via onboard Realtek ALC888S codec.

Signal Name	Pin#	Pin#	Signal Name
5V_S5	1	2	GND_AUD
LINE-OUT-L	3	4	LINE-OUT-R
FRONT_JD	5	6	LINE_JD
LINE-IN-L	7	8	LINE-IN-R
MIC-IN-L	9	10	MIC-IN-R
GND_AUD	11	12	MIC1_JD

17. USB3_1:

(Double stack USB type A) Rear USB3.2 connector, provides up to 2 USB3.2 gen2/USB2.0 ports, USB3.2 gen2 allows data transfers up to 10.0Gbps.



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.

18. USB1:

(2.0mm Pitch 2x5 Pin Header) Provide 2xUSB2.0 signals.

Signal Name	Pin#	Pin#	Signal Name
5V_USB56	1	2	5V_USB56
USB5_N	3	4	USB6_N
USB5_P	5	6	USB6_P
GND	7	8	GND
NC	9	10	NC

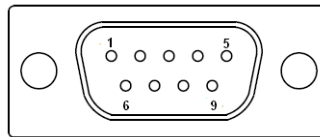
19. USB2:

(2.0mm Pitch 2x5 Pin Header) Provide 2xUSB2.0 signals.

Signal Name	Pin#	Pin#	Signal Name
5V_USB47	1	2	5V_USB47
USB4_N	3	4	USB7_N
USB4_P	5	6	USB7_P
GND	7	8	GND
GND	9	10	NC

20. COM1:

(DB9 connector) Provide serial RS232/422/485 via standard DB9 male connector. Default is set to RS232, RS422/485 can be selected via BIOS. Pin 9 RI/5V/12V select via JP1.



RS232 (Default):	
Pin#	Signal Name
1	DCD# (Data Carrier Detect)
2	RXD (Received Data)
3	TXD (Transmit Data)
4	DTR (Data Terminal Ready)
5	GND
6	DSR (Data Set Ready)
7	RTS (Request To Send)
8	CTS (Clear To Send)
9	JP1 select Setting (RI/5V/12V)
BIOS Setup: Serial Port 1 Configuration 【RS-232】	

RS422 (option):	
Pin#	Signal Name
1	422_TX-
2	422_TX+
3	422_RX+
4	422_RX-
5	GND
6	NC
7	NC
8	NC
9	NC
BIOS Setup: Serial Port 1 Configuration 【RS-422】	

RS485 (option):	
Pin#	Signal Name
1	485-
2	485+
3	NC
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC
BIOS Setup: Serial Port 1 Configuration 【RS-485】	

21. JP1:

(2.0mm Pitch 2x3 Pin Header) For COM1 pin9 signal setting.

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

22. COM2:

(2.0mm Pitch 2x5 Pin Header) Provide RS232, pin 9 RI/5V/12V select via JP2.

Signal Name	Pin#	Pin#	Signal Name
DCD	1	2	RXD
TXD	3	4	DTR
GND	5	6	DSR
RTS	7	8	CTS
RI/5V/12V via JP2	9	10	NC

23. JP2:

(2.0mm Pitch 2x3 Pin Header) For COM2 pin9 signal setting.

JP1 Pin#	Function
Close 1-2	COM2 Pin9 RI (Ring Indicator, Default)
Close 3-4	COM2 Pin9 = +5V
Close 5-6	COM2 Pin9 = +12V

24. COM3:

(2.0mm Pitch 2x5 Pin Header) Provide 2x2wired RS485(COM3/4).

Signal Name	Pin#	Pin#	Signal Name
COM3_485-	1	2	COM4_485-
COM3_485+	3	4	COM4_485+
GND	5	6	GND
NC	7	8	NC
NC	9	10	NC

25. GPIO2:

(2.0mm Pitch 2x5 Pin Header) Provide 8xGPIO(4xDI,4xDO) with 5V VCC.

Signal Name	Pin#	Pin#	Signal Name
5V_GPIO	1	2	GND
GPIO_IN1	3	4	GPIO_IN2
GPIO_IN3	5	6	GPIO_IN4
GPIO_OUT1	7	8	GPIO_OUT2
GPIO_OUT3	9	10	GPIO_OUT4

26. FP1:

(2.0mm Pitch 2x5 Pin Header) Provide power button/reset button/power LED/HDD LED/buzzer.

Signal Name	Pin#	Pin#	Signal Name
HDD LED+	1	2	Power LED+
HDD LED-	3	4	Power LED-
Reset Button-	5	6	Power Button+
Reset Button+	7	8	Power Button-
Buzzer+	9	10	Buzzer-

27. M-PCIE1:

(Socket 52Pin) Mini-PCI express socket, supports full-sized mini-PCIe cards with 1xSIM slot.

Function	Support	Remarks
PClex1 (PCIe 5)	●	
SMbus	●	
Micro SIM (SIM1)	●	
USB2.0 (USB8)	●	

28. SIM1:

(Micro-SIM Slot) Support Micro SIM card for M_PCIE1.

Pin#	Signal Name
1	NC
2	GND
3	SIMVCC
4	NC
5	SIM_RST
6	NC
7	SIM_IO
8	SIM_CLK

29. M2_B1:

(M.2 M-Key Socket) Support 2242/2280 SATA III/PCIex1 interface SSD.

30. M2_E1:

(M.2 E-Key Socket) Provide USB2.0/PCIex1, support E-key 2230 WiFi/BT expansion cards. Status LED is supported via WLAN1.

31. SATA1:

(SATA 7Pin) SATA connector provide SATA III signal for storages.

32. SATA_P1:

(2.5mm Pitch 1x2 Wafer Pin Header) 5V power supply for SATA1 port device.

Pin#	Signal Name
1	5V_S0
2	GND



Note:

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

33. WLAN_1/LED2/GPIO1:

WLAN_1 : Green LED for M.2 E-key status.

LED2 : Green LED for power status.

GPIO1 : Red LED for MCU status.

Chapter 3

BIOS Setup

3.1 Operations after POST Screen

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

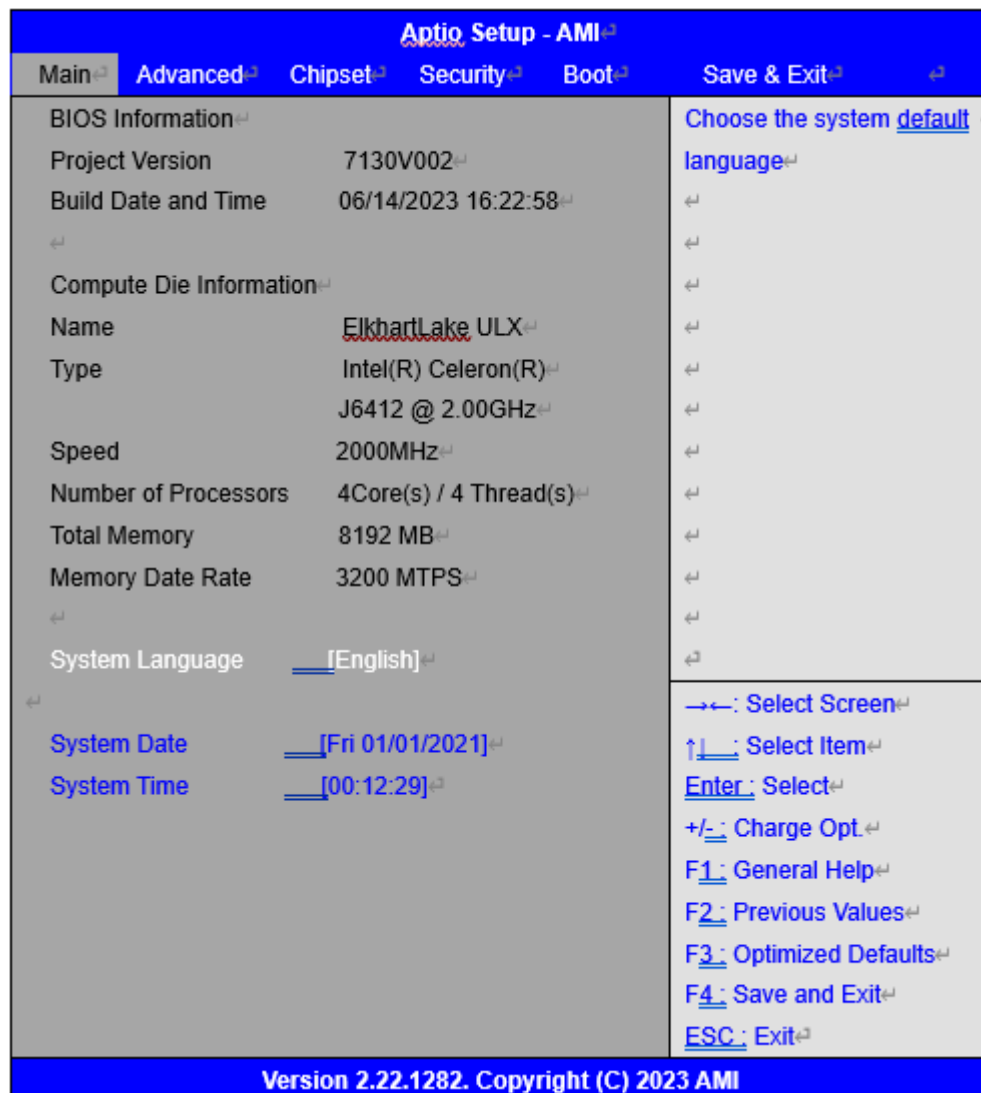


After optimizing and exiting CMOS Setup

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

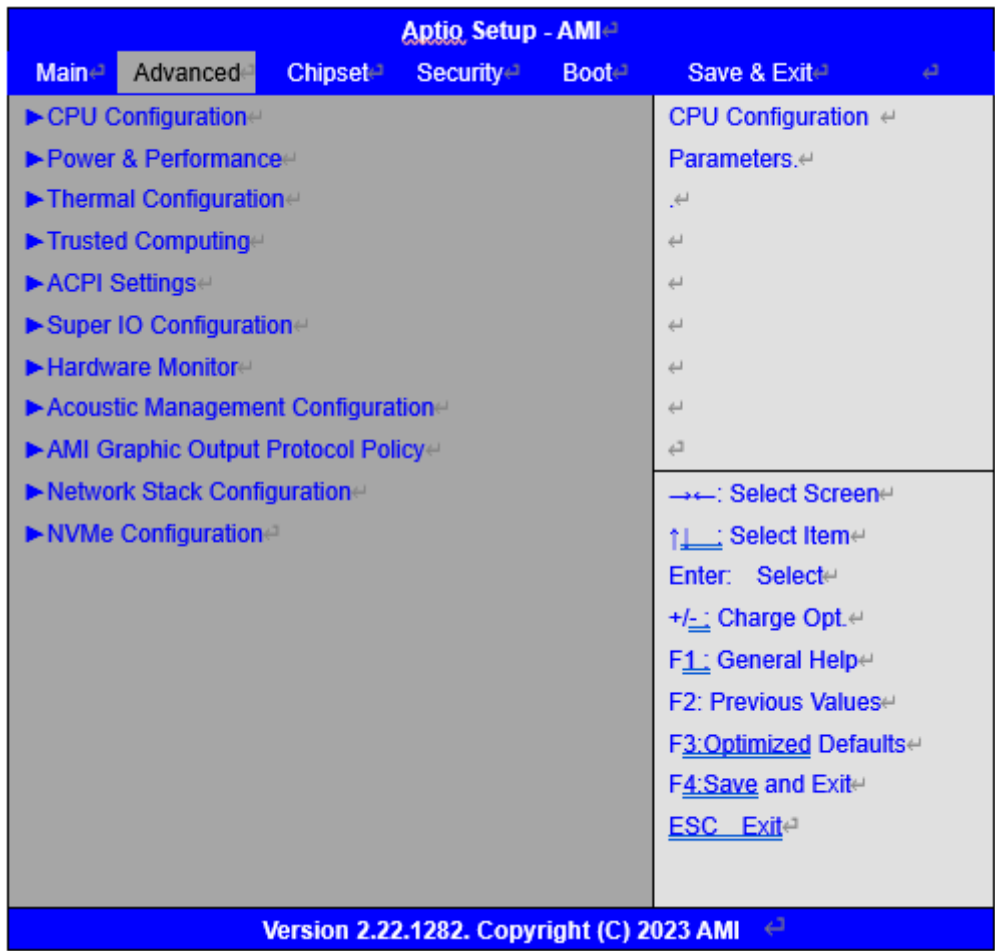
System Date:

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 Configurations

CPU Configuration

Type	Intel(R) Celeron(R)
	J6412 @ 2.00GHz
ID	0x90661
Speed	2000 MHz
L1 Data Cache	32 KB x 4
L1 Instruction Cache	32 KB x 4
L2 Cache	1536 KB x 4
L3 Cache	4 MB
L4 Cache	N/A
VMX	Supported
SMX/TXT	Not Supported
CPU Flex Ratio Override:	
	[Disabled]
	[Enabled]
CPU Flex Ratio Settings	20
Hardware Prefetcher:	[Disabled]

	[Enabled]
Intel (VNX) Virtualization Technology:	[Disabled]
	[Enabled]
PECI:	[Disabled]
	[Enabled]
Active Processor Cores:	[ALL]
	[1]
	[2]
	[3]
BIST:	[Disabled]
	[Enabled]
AP threads Idle Manner:	[HALT Loop]
	[MWAIT Loop]
	[RUN Loop]
AES:	[Disabled]
	[Enabled]
MachineCheck:	[Disabled]
	[Enabled]
MonitorMWait:	[Disabled]
	[Enabled]
CPU SMM Enhancement	
CPU SMM Enhancement	
SMM Use Delay Indication:	[Disabled]
	[Enabled]
SMM Use Block Indication:	[Disabled]
	[Enabled]
SMM Use SMM en-US Indication:	[Disabled]
	[Enabled]
#AC Split Lock:	[Enabled]
	[Disabled]

3.4.2 Power & Performance

Power & Performance

CPU – Power Management Control

CPU – Power Management Control

P0 Fused Max Core Ratio	N/A
P1 Fused Max Core Ratio	N/A
P2 Fused Max Core Ratio	N/A
P3 Fused Max Core Ratio	N/A
Boot performance mode:	[Max Battery] [Max Non-Turbo Performance] [Turbo Performance]
Intel (R) Speed Step(tm):	[Disabled] [Enabled]
Race To Halt (RTH):	[Disabled] [Enabled]
Intel (R) Speed Shift Technology:	[Disabled] [Enabled]
HWP Autonomous EPP Grouping:	[Disabled] [Enabled]
EPB override over PECL:	[Disabled] [Enabled]
HWP Fast MSR Support:	[Disabled] [Enabled]
HDC Control:	[Disabled] [Enabled]
Turbo Mode:	[Disabled] [Enabled]

View/Configure Turbo Options

Current Turbo Settings

Max Turbo Power Limit	4095.875
Min Turbo Power Limit	0.0
Package TDP Limit	10.0
Power Limit 1	10.0
Power Limit 2	20.0
1-core Turbo Ratio	26
2- core Turbo Ratio	26
3- core Turbo Ratio	26
4- core Turbo Ratio	26

Energy Efficient P-state:	[Disabled] [Enabled]
Package Power Limit MSR Lock:	[Disabled] [Enabled]
Power Limit 1 Override:	[Disabled] [Enabled]
Power Limit 2 Override:	[Disabled] [Enabled]
Power Limit 2	0
1-Core Ratio Limit Override	26
2-Core Ratio Limit Override	26
3-Core Ratio Limit Override	26
4-Core Ratio Limit Override	26
Energy Efficient Turbo:	[Disabled] [Enabled]
CPU VR Settings	
CPU VR Sstings	
PSYS Slope	0
PSYS Offset	0
PSYS Prefix:	[+] [-]
PSYS PMax Power	0
Acoustic Noise Settings	
Acoustic Noise Settings	
Acoustic Noise Mitigation:	[Disabled] [Enabled]
VccIn VR Domain	
Disable Fast PKG C State Ramp for VccIn Domain:	[FALSE] [TRUE]
Slow Slew Rate for VccIn Domain:	[Fast/2] [Fast/4] [Fast/8] [Fast/16]
VccIn VR Settings	
VccIn VR Domain	
VR Config Enable:	

	[Disabled]
	[Enabled]
AC Loadline	880
DC Loadline	860
PS Current Threshold1	0
PS Current Threshold2	0
PS Current Threshold3	0
PS3 Enable:	
	[Disabled]
	[Enabled]
PS4 Enable:	
	[Disabled]
	[Enabled]
IMON Slope	100
IMON Offset	1
IMON Prefix	[+]
VR Current Limit	90
TDC Enable:	
	[Disabled]
	[Enabled]
TDC Current Limit	112
TDC Time Window:	
	[1 ms]
	[2 ms]
	[3 ms]
	[4 ms]
	[5 ms]
	[6 ms]
	[7 ms]
	[8 ms]
	[9 ms]
	[10 ms]
TDC Lock:	
	[Disabled]
	[Enabled]
RFI Settings	
RFI Domain	
RFI Current Frequency	139.200MHz
RFI Frequency	0
RFI Spread Spectrum	15
Platform PL1 Enable:	
	[Disabled]
	[Enabled]
Platform PL2 Enable:	
	[Disabled]

	[Enabled]
Power Limit 4 Override:	[Disabled]
	[Enabled]
C states:	[Disabled]
	[Enabled]
Enhanced C-states:	[Disabled]
	[Enabled]
C-state Auto Demotion	[C1]
C-state Un-demotion	[C1]
Package C-State Demotion:	[Disabled]
	[Enabled]
Package C-State Un-demotion:	[Disabled]
	[Enabled]
CState Pre-Wake:	[Disabled]
	[Enabled]
IO MWAIT Redirection:	[Disabled]
	[Enabled]
Package C State Limit	[C3]
C6/C7 Short Latency Control(MSR 0x60B)	
Time Unit	[1024 ns]
Latency	0
C6/C7 Short Latency Control(MSR 0x60C)	
Time Unit	[1024 ns]
Latency	0
C8 Latency Control(MSR 0x633)	
Time Unit	[1024 ns]
Latency	0
C9 Latency Control(MSR 0x634)	
Time Unit	[1024 ns]
Latency	0
C10 Latency Control(MSR 0x635)	
Time Unit	[1024 ns]
Latency	0
Thermal Monitor:	[Disabled]
	[Enabled]
Interrupt Redirection Mode Selection:	[Fixed Priority]
	[Round robin]

	[Hash Vector]
	[No Change]
Timed MWAIT:	
	[Disabled]
	[Enabled]
Custom P-state Table	
Custom P-state Table	
Number of P states	0
EC Turbo Control Mode:	
	[Disabled]
	[Enabled]
Energy Performance Gain:	
	[Disabled]
	[Enabled]
EPG DIMM Idd3N	26
EFG DIMM Idd3P	11
Power Limit 3 Settings	
CPU Lock Configuration	
CFG Lock:	
	[Disabled]
	[Enabled]
Overclocking Lock:	
	[Disabled]
	[Enabled]
GT – Power Management Control	
GT – Power Management Control	
Maximum GT frequency:	
	[Default Max Frequency]
	[100Mhz]
	[150Mhz]
	[200Mhz]
	[250Mhz]]
	[300Mhz]
	[350Mhz]
	[400Mhz]
	[450Mhz]
	[500Mhz]
	[550Mhz]
	[600Mhz]
	[650Mhz]
	[700Mhz]
	[750Mhz]
	[800Mhz]
	[850Mhz]
	[900Mhz]
	[950Mhz]
	[1000Mhz]

		[1050Mhz]
		[1100Mhz]
		[1150Mhz]
		[1200Mhz]
	Disable Turbo GT frequency:	
		[Enabled]
		[Disabled]
3.4.3 Thermal Configuration		
	Thermal Configuration	
	Enable All Thermal Funcations:	
		[Disabled]
		[Enabled]
	CPU Thermal Configuration	
	Cpu Thermal Configuration	
	DTS SMM:	
		[Disabled]
		[Enabled]
		[Critical Temp Reporting(Out of spec)]
	Tcc Activation Offset	25
	Tcc Offset Time Window:	
		[Disabled]
		[5ms]
		[10 ms]
		[55 ms]
		[156 ms]
		[375 ms]
		[500 ms]
		[750 ms]
		[1 sec]
		[2 sec]
		[3 sec]
		[4 sec]
		[5 sec]
		[6 sec]
		[7 sec]
		[8 sec]
		[10 sec]
		[12 sec]
		[14 sec]
		[16 sec]
		[20 sec]
		[24 sec]
		[28 sec]
		[32 sec]

	[40 sec]
	[48 sec]
	[56 sec]
	[64 sec]
	[80 sec]
	[96 sec]
	[112 sec]
	[128 sec]
	[160 sec]
	[192 sec]
	[224 sec]
	[256 sec]
	[320 sec]
Tcc Offset Clamp Enable:	[Disabled]
	[Enabled]
Tcc Offset Lock Enable:	[Disabled]
	[Enabled]
Bi-directional PROCHOT#:	[Disabled]
	[Enabled]
Disable PROCHOT# Output:	[Disabled]
	[Enabled]
Disable VR Thermal Alert:	[Disabled]
	[Enabled]
PROCHOT Response:	[Disabled]
	[Enabled]
PROCHOT Lock:	[Disabled]
	[Enabled]
ACPI T-States:	[Disabled]
	[Enabled]
Platform Thermal Configuration	
Platform Thermal Configuration	
Critical Trip Point:	[15 C]
	[23 C]
	[31 C]
	[39 C]
	[47 C]

	[55 C]
	[63 C]
	[71 C]
	[79 C]
	[87 C]
	[95 C]
	[100 C]
	[103 C]
	[111 C]
	[119 C (POR)]
	[127 C]
	[130 C]
Active Trip Point 0:	
	[Disabled]
	[15 C]
	[23 C]
	[31 C]
	[39 C]
	[47 C]
	[55 C]
	[63 C]
	[71 C]
	[79 C]
	[87 C]
	[95 C]
	[103 C]
	[111C]
	[119 C (POR)]
Active Trip Point 0 Fan Speed:	100
Active Trip Point 1:	
	[Disabled]
	[15 C]
	[23 C]
	[31 C]
	[39 C]
	[47 C]
	[55 C]
	[63 C]
	[71 C]
	[79 C]
	[87 C]
	[95 C]
	[103 C]
	[111C]
	[119 C (POR)]
Active Trip Point 1 Fan Speed:	75
Passive Trip Point :	

	[Disabled]
	[15 C]
	[23 C]
	[31 C]
	[39 C]
	[47 C]
	[55 C]
	[63 C]
	[71 C]
	[79 C]
	[87 C]
	[95 C]
	[103 C]
	[111C]
	[119 C (POR)]
Passive TC1 Value	1
Passive TC2 Value	5
Passive TSP Value	10
Active Trip Points:	
	[Disabled]
	[Enabled]
Passive Trip Points:	
	[Disabled]
	[Enabled]
CriticalTrip Points:	
	[Disabled]
	[Enabled]
PCH Temp Read:	
	[Disabled]
	[Enabled]
CPU Energy Read:	
	[Disabled]
	[Enabled]
CPU Temp Read:	
	[Disabled]
	[Enabled]
Alert Enable Lock:	
	[Disabled]
	[Enabled]
CPU Temp	72
CPU Fan Speed	65

DPTF Configuration

DPTF Configuration

Hardware Health Monitor

Hardware Health Monitor

Thermal Sensor 1 Temp	0.0 C
Thermal Sensor 2 Temp	0.0 C
Thermal Sensor 3 Temp	0.0 C
Thermal Sensor 4 Temp	0.0 C
CPU Fan Speed	0 rpm

3.4.4 Trusted Computing Configuration

Security Device Support:

[Disabled]

[Enabled]

NO Security Device Found

3.4.5 ACPI Settings

ACPI Settings

Enable Hibernation:

[Disabled]

[Enabled]

ACPI Sleep State:

[Suspend]

[S3 (Suspend to RAM)]

3.4.6 Super IO Configuration

Super IO Configuration

Super IO Chip IT8786

Serial Port 1 Configuration

Serial Port 1 Configuration

Serial Port:

[Disabled]

[Enabled]

Device Settings

IO=3F8h; IRQ=4;

Change Settings:

[Auto]

[IO=3F8h; IRQ=4]

[IO=3F8h; IRQ=3,4,5,6,7,9,10,11,12;]

[IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12;]

[IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12;]

[IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12;]

COM1 Config:

[RS232 mode]
[RS485 mode]
[RS422 mode]

Serial Port 2 Configuration

Serial Port 2 Configuration

Serial Port:

[Disabled]
[Enabled]

Device Settings

IO=2F8h; IRQ=4;

Change Settings:

[Auto]
[IO=2F8h; IRQ=4]
[IO=3F8h;

IRQ=3,4,5,6,7,9,10,11,12;]

[IO=2F8h;

IRQ=3,4,5,6,7,10,11,12;]

[IO=3E8h;

IRQ=3,4,5,6,7,9,10,11,12;]

[IO=2E8h;

IRQ=3,4,5,6,7,9,10,11,12;]

Serial Port 3 Configuration

Serial Port 3 Configuration

Serial Port:

[Disabled]
[Enabled]

Device Settings

IO=3E8h; IRQ=4;

Change Settings:

[Auto]

Serial Port 4 Configuration

Serial Port 4 Configuration

Serial Port:

[Disabled]
[Enabled]

Device Settings

IO=2E8h; IRQ=4;

Change Settings:

[Auto]

Serial Port 5 Configuration

Serial Port 5 Configuration

Serial Port:

[Disabled]
[Enabled]

Device Settings

IO=2F0h; IRQ=4;

	Change Settings:	[Auto]
	COM5 Config:	[RS485 mode] [RS422 mode]
	Serial Port 6 Configuration	
	Serial Port 6 Configuration	
	Serial Port:	[Disabled] [Enabled]
IRQ=4;	Device Settings	IO=2F0h;
	Change Settings:	[Auto]
	COM6 Config:	[RS485 mode] [RS422 mode]
3.4.7 Hardware Monitor		
	Pc Health Status	
	System temperature1	: +39 C
	Fan1 Speed	: 6887 RPM
	CPU_CORE_VIN	: +1.653 V
	+1.2V	: +1.236 V
	+12V	: +13.120 V
	+5V	: +5.123 V
	Smart Fan Function	
	Fan 1 Setting	
	Fan 1 Setting	
	Smart Fan 1 Mode:	[Software Mode] [Automatic Mode]
	Fan 1 Type:	[PWM] [RPM]
	Temperature select:	[TMPIN1] [TMPIN2] [TMPIN3]
	Fan off temperature limit:	0
	Fan start temperature limit:	30
	Fan full speed temperature limit:	90
	Fan start PWM:	75
	PWM SLOPE SETTING:	3

Temperature: 4

3.4.8 AMI Graphic Output Protocol Policy
Intel® Graphics Controller
Intel® GOP Driver [18.0.1034]

Output Select: [EDP1]
[DP1]
Brightness Setting 255
BIST Enable: [Disabled]
[Enabled]

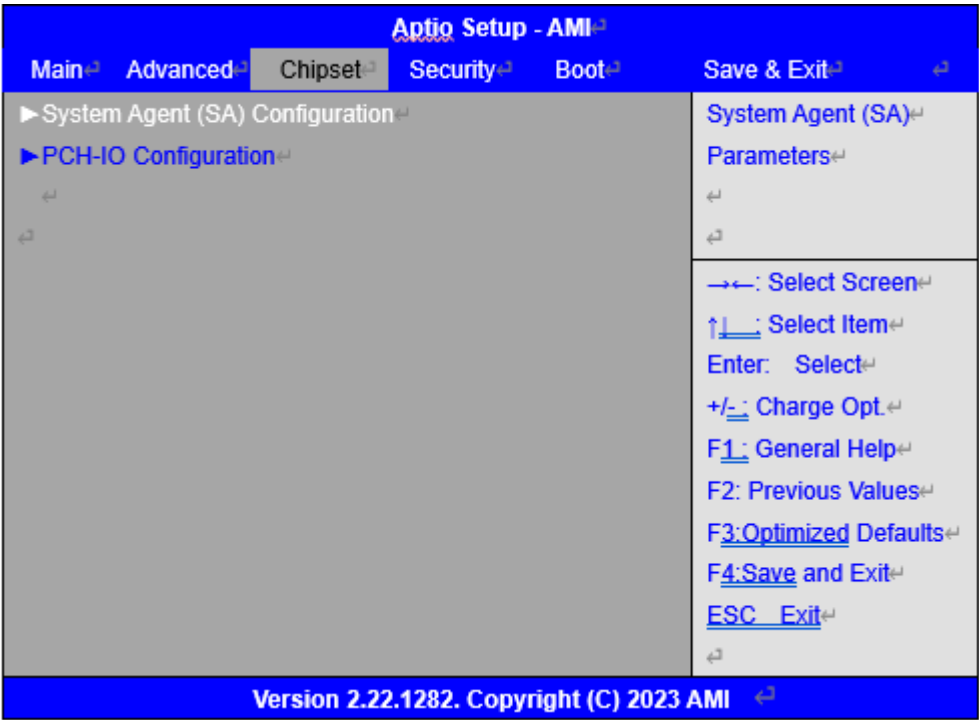
3.4.9 Network Stack Configuration
Network Stack:

[Disabled]
[Enabled]

3.4.10 NVME Configuration
NVMe Configuration

No NVME Device Found

3.5 Chipset Settings



3.5.1 System Agent (SA) Configuration

System Agent (SA) Configuration

Memory Configuration

Memory Thermal Configuration

Memory Thermal Configuration

Memory Power and Thermal Throttling

Memory Power and Thermal Throttling

DDR PowerDown and idle counter:

[PCODE]

[BIOS]

FOR LPDDR Only: DDR PowerDown and
Idle counter

[PCODE]

[BIOS]

REFRESH_2X_MODE:

[Disabled]

[1- Enabled for WARM or HOT]

[2- Enabled HOT only]

LPDDR Thermal Sensor:

[Disabled]

[Enabled]

Self Refresh Enable:

[Disabled]

[Enabled]

Self Refresh IdleTimer:

512

Throttler CKEMin Defeature:

[Enabled]

[Disabled]

Throttler CKKEMin Timer:

48

For LPDDR Only: Throttler CKEMin Defeature:

[Enabled]

[Disabled]

For LPDDR Only: Throttler CKEMin Timer: 64

Dram Power Meter

Dram Power Meter

Use user provided power weights,
Sacle factor, and channel power

Floor values:

[Disabled]

[Enabled]

Energy Scale Factor	4
Idle Energy Ch0Dimm0	10
PowerDown Energy Ch0Dimm0	6
Activate Energy Ch0Dimm0	172
Read Energy Ch0Dimm0	212
Write Energy Ch0Dimm0	221
Idle Energy Ch0Dimm1	10
PowerDown Energy Ch0Dimm1	6
Activate Energy Ch0Dimm1	172
Read Energy Ch0Dimm1	212
Write Energy Ch0Dimm1	221
Idle Energy Ch1Dimm0	10
PowerDown Energy Ch1Dimm0	6
Activate Energy Ch1Dimm0	172
Read Energy Ch1Dimm0	212
Write Energy Ch1Dimm0	221
Idle Energy Ch1Dimm1	10
PowerDown Energy Ch1Dimm1	6
Activate Energy Ch1Dimm1	172
Read Energy Ch1Dimm1	212
Write Energy Ch1Dimm1	221

Memory Thermal Reporting

Lock Thermal Management Registers:

[Disabled]

[Enabled]

Memory Thermal Reporting

Extern Therm Status:

[Disabled]

[Enabled]

Closed Loop Therm Manage:

[Disabled]

[Enabled]

Open Loop Therm Manage:

[Disabled]

[Enabled]

Thermal Threshold Settings

Warm Threshold Ch0 Dimm0 255

Warm Threshold Ch0 Dimm1 255

Hot Threshold Ch0 Dimm0 255

Hot Threshold Ch0 Dimm1 255

Warm Threshold Ch1 Dimm0	255
Warm Threshold Ch1 Dimm1	255
Hot Threshold Ch1 Dimm0	255
Hot Threshold Ch1 Dimm1	255

Thermal Throttle Budget Settings

Warm Budget Ch0 Dimm0	255
Warm Budget Ch0 Dimm1	255
Hot Budget Ch0 Dimm0	255
Hot Budget Ch0 Dimm1	255
Warm Budget Ch1 Dimm0	255
Warm Budget Ch1 Dimm1	255
Hot Budget Ch1 Dimm0	255
Hot Budget Ch1 Dimm1	255

Memory RAPL

Memory RAPL

Rap1 Power Floor Ch0	0
Rap1 Power Floor Ch1	0

RAPL PL Lock:

[Disabled]
[Enabled]

RAPL PL 1 enable:

[Disabled]
[Enabled]

RAPL PL 1 Power	0
RAPL PL 1 WindowX	0
RAPL PL 1 WindowY	0

RAPL PL 2 enable:

[Disabled]
[Enabled]

RAPL PL 2 Power	222
RAPL PL 2 WindowX	1
RAPL PL 2 WindowY	10

Memory Thermal Management:

[Disabled]
[Enabled]

Memory Training Algorithms:

Early Command Training:

[Disabled]
[Enabled]

SenseAmp Offset Training:

[Disabled]

Early ReadMPR Timing Centering 2D:	[Enabled]
	[Disabled]
Read MPR Training:	[Enabled]
	[Disabled]
Receive Enable Training:	[Enabled]
	[Disabled]
Jedec Write Leveling:	[Enabled]
	[Disabled]
LPDDR4 Write DQ DQS Retraining:	[Enabled]
	[Disabled]
Early Write Time Centering 2D:	[Enabled]
	[Disabled]
Early Read Time Centering 2D:	[Enabled]
	[Disabled]
Write Timing Centering 1D:	[Enabled]
	[Disabled]
Write Voltage Centering 1D:	[Enabled]
	[Disabled]
Read Timing Centering 1D:	[Enabled]
	[Disabled]
Dimm ODT Trainning* :	[Enabled]
	[Disabled]
Max RTT_WR:	[ODT Off]
	[120 Ohms]
DIMM RON Training*:	[Enabled]
	[Disabled]
Write Drive Strength/Equalization 2D*:	[Enabled]
	[Disabled]
Write Slew Rate Training*:	[Enabled]
	[Disabled]
Read ODT Training*:	[Enabled]

	[Disabled] [Enabled]
Read Equalization Training*:	[Disabled] [Enabled]
Read Amplifier Training*:	[Disabled] [Enabled]
Write Timing Centering 2D:	[Disabled] [Enabled]
Read Timing Centering 2D:	[Disabled] [Enabled]
Command Voltage Centering:	[Disabled] [Enabled]
Write Voltage Centering 2D:	[Disabled] [Enabled]
Read Voltage Centering 2D:	[Disabled] [Enabled]
Late Command Training:	[Disabled] [Enabled]
Round Trip Latency:	[Disabled] [Enabled]
Turn Around Timing Training:	[Disabled] [Enabled]
Rank Margin Tool:	[Disabled] [Enabled]
Rank Margin Tool Per Bit:	[Disabled] [Enabled]
Margin Check Limit:	[Disabled] [L1] [L2] [Both]
Margin Limit Check L2:	100
Memory Test:	

	[Disabled] [Enabled]
DIMM SPD Alias Test:	[Disabled] [Enabled]
Receive Enable Centering 1D:	[Disabled] [Enabled]
Retrain Margin Check:	[Disabled] [Enabled]
Write Drive Strength Up/ Dn independently:	[Disabled] [Enabled]
Command Slew Rate Training:	[Disabled] [Enabled]
Command Drive Strength and Equalization:	[Disabled] [Enabled]
Command Normalization:	[Disabled] [Enabled]
Early DQ Write Drive Strength and Equalization Training:	[Disabled] [Enabled]
Read Voltage Centering 1D:	[Disabled] [Enabled]
Write TC0 Comp Training:	[Disabled] [Enabled]
Clock TC0 Comp Training:	[Disabled] [Enabled]
Dimm ODT CA Training:	[Disabled] [Enabled]
Write TC0 Dqs Training:	[Disabled] [Enabled]
Duty Cycle Correction:	[Disabled] [Enabled]

	DQ DFE Training:	[Disabled] [Enabled]
	Sense Amplifier Correction Training:	[Disabled] [Enabled]
	Memory Configuration	
	Memory RC Version	0.0.4.104
	Memory Data Rate	3200 MTPS
	Memory Timings (tCL-tRCD-tRP-tRAS)	22-22-22-52
Populated / Disabled	Channel 0 Slot 0	Not
Populated / Disabled	Channel 0 Slot 1	Not
Enabled	Channel 1 Slot 0	Populated &
(DDR4)	Size	8192 MB
	Number of Ranks	1
	Manufacturer	Samsung
Populated / Disabled	Channel 1 Slot 1	Not
	Memory ratio/reference clock	
	Options moved to	
	Overclock->Memory->Custom Profile	
	Menu	
	MRC ULT Safe Config:	[Disabled] [Enabled]
	Safe Mode Support:	[Disabled] [Enabled]
	Maximum Memory Frequency:	[Auto] [1067] [1200] [1333] [1400] [1600] [1800] [1867] [2000] [2133] [2200]

		[2400]
		[2600]
		[2667]
		[2800]
		[2933]
		[3000]
		[3200]
		[3467]
		[3600]
		[3733]
		[4000]
		[4200]
		[4267]
	HOB Buffer Size:	
		[Auto]
		[1B]
		[1KB]
		[Max (assuming 63KB total HOB size)]
	Max TOLUD:	
		[Dynamic]
		[1 GB]
		[1.25 GB]
		[1.5 GB]
		[1.75 GB]
		[2 GB]
		[2.25 GB]
		[2.5 GB]
	SA GV:	
		[Disabled]
		[Fixed]
Low]		
		[Fixed Mid]
		[Fixed]
High]		
		[Enabled]
	DDR Speed Control:	
		[Auto]
		[Manual]
	Retrain on Fast Fail:	
		[Disabled]
		[Enabled]
	DDR4_1DPC:	
		[Disabled]
		[Enabled on DIMM0 only]
		[Enabled on DIMM1 only]
		[Enabled]
	Enable RH Prevention:	

	[Disabled]
	[Enabled]
REFRESH_PANIC_WM:	9
REFRESH_HP_WM:	8
Exit On Failure (MRC):	[Disabled]
	[Enabled]
Enable/Disable IED (Intel Enhanced Debug):	[Enabled]
	[Disabled]
Ch Hash Support:	[Disabled]
	[Enabled]
Ch Hash Mask:	12492
Ch Hash Interleaved Bit:	[BIT6]
	[BIT7]
	[BIT8]
	[BIT9]
	[BIT10]
	[BIT11]
	[BIT12]
	[BIT13]
Extended Bank Hashing:	[Disabled]
	[Enabled]
Per Bank Refresh:	[Disabled]
	[Enabled]
Power Down Mode:	[Auto]
	[No Power Down]
	[APD]
	[PPD-DLLoff]
Page Close Idle Timeout:	[Enabled]
	[Disabled]
Memory Scrambler:	[Enabled]
	[Disabled]
Force ColdReset:	[Enabled]
	[Disabled]
Channel 0 DIMM Control:	[Enable both DIMMs]
	[Disable DIMM0]

	[Disable DIMM1] [Disable both DIMMs]
Channel 1 DIMM Control:	[Enable both DIMMs] [Disable DIMM0] [Disable DIMM1] [Disable both DIMMs]
Force Single Rank:	[Disabled] [Enabled]
Force Single Sub Channel:	[Disabled] [Enabled]
MRC TASK Debug Print Enable:	0
Memory Remap:	[Enabled] [Disabled]
Time Measure:	[Disabled] [Enabled]
DLL Weak Lock Support:	[Disabled] [Enabled]
Fast Boot:	[Disabled] [Enabled]
Train On Warm boot:	[Disabled] [Enabled]
Rank Margin Tool Per Task:	[Disabled] [Enabled]
Training Tracing:	[Disabled] [Enabled]
Lpddr Mem WL Set:	[Set A] [Set B]
BDAT Memory Test Type	[Rank Margin Tool Rank]
Rank Margin Tool Loop Count:	0
Low Supply for LPDDR4 Data:	[Disabled] [Enabled]
Low Supply for LPDDR4 Clock/Command/Control:	

	[Disabled]
	[Enabled]
Memory Test on Warm Boot:	
	[Disabled]
	[Enabled]

Graphics Configuration

Graphics Configuration

Primary Display:

[Auto]
[IGFX]
[PEG]
[PCI]

External Gfx Card Primary Display Configuration

External Gfx Card Primary Display Configuration

Primary PCIe:

[Auto]
[PCI E 1]
[PCI E 2]
[PCI E 3]
[PCI E 4]
[PCI E 5]
[PCI E 6]
[PCI E 7]
[PCI E 8]
[PCI E 9]
[PCI E 10]
[PCI E 11]
[PCI E 12]
[PCI E 13]
[PCI E 14]
[PCI E 15]
[PCI E 16]
[PCI E 17]
[PCI E 18]
[PCI E 19]

Internal Graphics:

[Auto]
[Disabled]
[Enabled]

GTT Size:

[2 MB]
[4 MB]
[8 MB]

Aperture Size:

	[128 MB]
	[256 MB]
	[512 MB]
	[1024 MB]
	[2048 MB]
PSMI SUPPORT:	
	[Disabled]
	[Enabled]
DVMT- Pre-Allocated:	
	[0M]
	[32M]
	[64M]
	[96M]
	[128M]
	[160M]
	[4M]
	[8M]
	[12M]
	[16M]
	[20M]
	[24M]
	[28M]
	[32M/F7]
	[36M]
	[40M]
	[44M]
	[48M]
	[52M]
	[56M]
	[60M]
DVMT Total Gfx Mem:	
	[128M]
	[256M]
	[MAX]
DISM Size:	
	[0GB]
	[1GB]
	[2GB]
	[3GB]
	[4GB]
	[5GB]
	[6GB]
	[7GB]
Intel Graphics Pei Display Peim:	
	[Enabled]
	[Disabled]
VDD Enable:	

	[Disabled] [Enabled]
Configure GT for use:	[Enabled] [Disabled]
PAVP Enable:	[Enabled] [Disabled]
Cdynmax Clamping Enable:	[Enabled] [Disabled]
Cd Clock Frequency:	[172.8 Mhz] [307.2 Mhz] [556.8 Mhz] [652.8 Mhz] [Max CdClock freq based on Reference C1k]
Skip Full CD Clock Init:	[Enabled] [Disabled]
VBT Select:	[eDP] [MIPI]
IUER Button Enable:	[Disabled] [Enabled]
Intel(R) Ultrabook Event Support: Intel(R) Ultrabook Event Support	
IUER Slate Enable:	[Disabled] [Enabled]
IUER Dock Enable:	[Disabled] [Enabled]
VT-d:	[Disabled] [Enabled]

3.5.2 PCH-IO Configuration

PCH-IO Configuration

PCI Express Configuration

PCI Express Configuration

DMI Link ASPM Control:	[Disabled] [L0s] [L1] [L0sL1] [Auto]
PCIE Port assigned to LAN	Disabled
Port8xh Decode:	[Disabled] [Enabled]
Peer Memory write Enable:	[Disabled] [Enabled]
Compliance Test Mode:	[Disabled] [Enabled]
PCH PCI Express Clock Gating:	[Platform-POR] [Enabled] [Disabled]
PCIe function swap:	[Disabled] [Enabled]
PCIe EQ settings	
PCIe EQ override:	[Disabled] [Enabled]
PCIe Express Root Port 1	
PCIe Express Root Port 1:	[Disabled] [Enabled]
Connection Type:	[Built - in] [Slot]
ASPM:	[Disabled] [L0s] [L1] [L0sL1] [Auto]
L1 Substates:	[Disabled] [L1.1] [L1.1 & L1.2]
ACS:	[Disabled]

	[Enabled]
PTM:	[Disabled]
	[Enabled]
DPC:	[Disabled]
	[Enabled]
EDPC:	[Disabled]
	[Enabled]
URR:	[Disabled]
	[Enabled]
FER:	[Disabled]
	[Enabled]
NFER:	[Disabled]
	[Enabled]
CER:	[Disabled]
	[Enabled]
SEFE:	[Disabled]
	[Enabled]
SEFE:	[Disabled]
	[Enabled]
SECE:	[Disabled]
	[Enabled]
PME SCI:	[Disabled]
	[Enabled]
Hot Plug:	[Disabled]
	[Enabled]
Advanced Error Reporting:	[Disabled]
	[Enabled]
PCIe Speed:	[Auto]
	[Gen1]
	[Gen2]
	[Gen3]
Transmitter Half Swing:	[Disabled]

	[Enabled]
Detect Timeout:	0
Extra Bus Reserved:	0
Reserved Memory:	10
Reserved I/O:	4
PCH PCIe LTR Configuration	
LTR:	
	[Disabled]
	[Enabled]
Snoop Latency Override:	
	[Disabled]
	[Manual]
	[Auto]
Non Snoop Latency Override:	
	[Disabled]
	[Manual]
	[Auto]
Force LTR Override:	
	[Disabled]
	[Enabled]
LTR Lock:	
	[Disabled]
	[Enabled]
Extra options	
Detect Non-Compliance Device:	
	[Disabled]
	[Enabled]
Prefetchable Memory:	10
Reserved Memory	
Alignment:	1
Prefetchable Memory	
Alignment:	1
PCIe Express Root Port 2	
PCIe Express Root Port 2:	
	[Disabled]
	[Enabled]
Connection Type:	
	[Built - in]
	[Slot]
ASPM:	
	[Disabled]
	[L0s]
	[L1]
	[L0sL1]
	[Auto]
L1 Substates:	

	[Disabled] [L1.1] [L1.1 & L1.2]
ACS:	[Disabled] [Enabled]
PTM:	[Disabled] [Enabled]
DPC:	[Disabled] [Enabled]
EDPC:	[Disabled] [Enabled]
URR:	[Disabled] [Enabled]
FER:	[Disabled] [Enabled]
NFER:	[Disabled] [Enabled]
CER:	[Disabled] [Enabled]
SEFE:	[Disabled] [Enabled]
SENF:	[Disabled] [Enabled]
SECE:	[Disabled] [Enabled]
PME SCI:	[Disabled] [Enabled]
Hot Plug:	[Disabled] [Enabled]
Advanced Error Reporting:	[Disabled] [Enabled]
PCIe Speed:	[Auto]

	[Gen1]
	[Gen2]
	[Gen3]
Transmitter Half Swing:	[Disabled]
	[Enabled]
Detect Timeout:	0
Extra Bus Reserved:	0
Reserved Memory:	10
Reserved I/O:	4
PCH PCIe LTR Configuration	
LTR:	[Disabled]
	[Enabled]
Snoop Latency Override:	[Disabled]
	[Manual]
	[Auto]
Non Snoop Latency Override:	[Disabled]
	[Manual]
	[Auto]
Force LTR Override:	[Disabled]
	[Enabled]
LTR Lock:	[Disabled]
	[Enabled]
Extra options	
Detect Non-Compliance Device:	[Disabled]
	[Enabled]
Prefetchable Memory:	10
Reserved Memory	
Alignment:	1
Prefetchable Memory	
Alignment:	1
PCIe Express Root Port 3	
PCIe Express Root Port 3:	[Disabled]
	[Enabled]
Connection Type:	[Built - in]
	[Slot]

ASPM:	[Disabled] [L0s] [L1] [L0sL1] [Auto]
L1 Substates:	[Disabled] [L1.1] [L1.1 & L1.2]
ACS:	[Disabled] [Enabled]
PTM:	[Disabled] [Enabled]
DPC:	[Disabled] [Enabled]
EDPC:	[Disabled] [Enabled]
URR:	[Disabled] [Enabled]
FER:	[Disabled] [Enabled]
NFER:	[Disabled] [Enabled]
CER:	[Disabled] [Enabled]
SEFE:	[Disabled] [Enabled]
SENF:	[Disabled] [Enabled]
SECE:	[Disabled] [Enabled]
PME SCI:	[Disabled] [Enabled]
Hot Plug:	

	[Disabled]
	[Enabled]
Advanced Error Reporting:	
	[Disabled]
	[Enabled]
PCIe Speed:	
	[Auto]
	[Gen1]
	[Gen2]
	[Gen3]
Transmitter Half Swing:	
	[Disabled]
	[Enabled]
Detect Timeout:	0
Extra Bus Reserved:	0
Reserved Memory:	10
Reserved I/O:	4
PCH PCIe LTR Configuration	
LTR:	
	[Disabled]
	[Enabled]
Snoop Latency Override:	
	[Disabled]
	[Manual]
	[Auto]
Non Snoop Latency Override:	
	[Disabled]
	[Manual]
	[Auto]
Force LTR Override:	
	[Disabled]
	[Enabled]
LTR Lock:	
	[Disabled]
	[Enabled]
Extra options	
Detect Non-Compliance Device:	
	[Disabled]
	[Enabled]
Prefetchable Memory:	10
Reserved Memory	
Alignment:	1
Prefetchable Memory	
Alignment:	1
PCIe Express Root Port 4	

PCIe Express Root Port 4:	[Disabled] [Enabled]
Connection Type:	[Built - in] [Slot]
ASPM:	[Disabled] [L0s] [L1] [L0sL1] [Auto]
L1 Substates:	[Disabled] [L1.1] [L1.1 & L1.2]
ACS:	[Disabled] [Enabled]
PTM:	[Disabled] [Enabled]
DPC:	[Disabled] [Enabled]
EDPC:	[Disabled] [Enabled]
URR:	[Disabled] [Enabled]
FER:	[Disabled] [Enabled]
NFER:	[Disabled] [Enabled]
CER:	[Disabled] [Enabled]
SEFE:	[Disabled] [Enabled]
SENF:	[Disabled] [Enabled]
SECE:	[Disabled] [Enabled]

	[Disabled]
	[Enabled]
PME SCI:	
	[Disabled]
	[Enabled]
Hot Plug:	
	[Disabled]
	[Enabled]
Advanced Error Reporting:	
	[Disabled]
	[Enabled]
PCIe Speed:	
	[Auto]
	[Gen1]
	[Gen2]
	[Gen3]
Transmitter Half Swing:	
	[Disabled]
	[Enabled]
Detect Timeout:	0
Extra Bus Reserved:	0
Reserved Memory:	10
Reserved I/O:	4
PCH PCIe LTR Configuration	
LTR:	
	[Disabled]
	[Enabled]
Snoop Latency Override:	
	[Disabled]
	[Manual]
	[Auto]
Non Snoop Latency Override:	
	[Disabled]
	[Manual]
	[Auto]
Force LTR Override:	
	[Disabled]
	[Enabled]
LTR Lock:	
	[Disabled]
	[Enabled]
Extra options	
Detect Non-Compliance Device:	
	[Disabled]
	[Enabled]
Prefetchable Memory:	10
Reserved Memory	

Alignment:	1
Prefetchable Memory Alignment:	1
PCI Express Root Port 5	USB/SATA/UFS
PCI Express Root Port 5:	[Disabled] [Enabled]
Connection Type:	[Built-in] [Slot]
ASPM:	[Disabled] [L0s] [L1] [L0sL1] [Auto]
L1 Substates:	[Disabled] [L1.1] [L1.1 & L1.2]
ACS:	[Disabled] [Enabled]
Multi-VC:	[Disabled] [Enabled]
VC to TC Mapping	
TC0:	VC0
TC1:	[VC0] [VC1]
TC2:	[VC0] [VC1]
TC3:	[VC0] [VC1]
TC4:	[VC0] [VC1]
TC5:	[VC0] [VC1]
TC6:	[VC0] [VC1]

TC7:	[VC0] [VC1]
PTM:	[Disabled] [Enabled]
DPC:	[Disabled] [Enabled]
EDPC:	[Disabled] [Enabled]
URR:	[Disabled] [Enabled]
FER:	[Disabled] [Enabled]
NFER:	[Disabled] [Enabled]
CER:	[Disabled] [Enabled]
SEFE:	[Disabled] [Enabled]
SENF:	[Disabled] [Enabled]
SECE:	[Disabled] [Enabled]
PME SCI:	[Disabled] [Enabled]
Hot Plug:	[Disabled] [Enabled]
Advanced Error Reporting:	[Disabled] [Enabled]
PCIe Speed:	[Auto] [Gen1] [Gen2] [Gen3]

USB/SATA/UFS	Transmitter Half Swing:		[Disabled]
			[Enabled]
	Detect Timeout:	0	
	Extra Bus Reserved:	0	
	Reserved Memory:	10	
	Reserved I/O:	4	
	PCH PCIe LTR Configuration		
	LTR:		[Disabled]
			[Enabled]
	Snoop Latency Override:		[Disabled]
			[Manual]
			[Auto]
	Non Snoop Latency Override:		[Disabled]
			[Manual]
			[Auto]
	Force LTR Override:		[Disabled]
			[Enabled]
	LTR Lock:		[Disabled]
			[Enabled]
	Extra options		
	Detect Non-Compliance Device:		[Disabled]
			[Enabled]
	Prefetchable Memory:		10
	Reserved Memory		
	Alignment:		1
	Prefetchable Memory		
	Alignment:		1
	PCI Express Root Port 6		Lane configured as
	PCI Express Root Port 7		
	PCI Express Root Port 7:		[Disabled]
		[Enabled]	
Connection Type:		[Built-in]	
		[Slot]	
ASPM:		[Disabled]	
		[L0s]	

	[L1]
	[L0sL1]
	[Auto]
L1 Substates:	
	[Disabled]
	[L1.1]
	[L1.1 & L1.2]
ACS:	
	[Disabled]
	[Enabled]
Multi-VC:	
	[Disabled]
	[Enabled]
VC to TC Mapping	
TC0:	VC0
TC1:	
	[VC0]
	[VC1]
TC2:	
	[VC0]
	[VC1]
TC3:	
	[VC0]
	[VC1]
TC4:	
	[VC0]
	[VC1]
TC5:	
	[VC0]
	[VC1]
TC6:	
	[VC0]
	[VC1]
TC7:	
	[VC0]
	[VC1]
PTM:	
	[Disabled]
	[Enabled]
DPC:	
	[Disabled]
	[Enabled]
EDPC:	
	[Disabled]
	[Enabled]
URR:	
	[Disabled]

	[Enabled]
FER:	[Disabled]
	[Enabled]
NFER:	[Disabled]
	[Enabled]
CER:	[Disabled]
	[Enabled]
SEFE:	[Disabled]
	[Enabled]
SENE:	[Disabled]
	[Enabled]
SECE:	[Disabled]
	[Enabled]
PME SCI:	[Disabled]
	[Enabled]
Hot Plug:	[Disabled]
	[Enabled]
Advanced Error Reporting:	[Disabled]
	[Enabled]
PCIe Speed:	[Auto]
	[Gen1]
	[Gen2]
	[Gen3]
Transmitter Half Swing:	[Disabled]
	[Enabled]
Detect Timeout:	0
Extra Bus Reserved:	0
Reserved Memory:	10
Reserved I/O:	4
PCH PCIe LTR Configuration	
LTR:	[Disabled]
	[Enabled]
Snoop Latency Override:	[Disabled]
	[Manual]

Non Snoop Latency Override:	[Auto]
	[Disabled]
	[Manual]
Force LTR Override:	[Auto]
	[Disabled]
	[Enabled]
LTR Lock:	[Disabled]
	[Enabled]
Extra options	
Detect Non-Compliance Device:	[Disabled]
	[Enabled]
Prefetchable Memory:	10
Reserved Memory	
Alignment:	1
Prefetchable Memory	
Alignment:	1
PCIe clocks	
Clock0 assignment:	[Platform-POR]
	[Enabled]
	[Disabled]
ClkReq for Clock0:	[Platform-POR]
	[Disabled]
Clock1 assignment:	[Platform-POR]
	[Enabled]
	[Disabled]
ClkReq for Clock1:	[Platform-POR]
	[Disabled]
Clock2 assignment:	[Platform-POR]
	[Enabled]
	[Disabled]
ClkReq for Clock2:	[Platform-POR]
	[Disabled]
Clock3 assignment:	[Platform-POR]
	[Enabled]
	[Disabled]

ClkReq for Clock3:	[Platform-POR] [Disabled]
Clock4 assignment:	[Platform-POR] [Enabled] [Disabled]
ClkReq for Clock4:	[Platform-POR] [Disabled]
Clock5 assignment:	[Platform-POR] [Enabled] [Disabled]
ClkReq for Clock5:	[Platform-POR] [Disabled]

SATA Configuration

SATA Configuration

SATA Controller(s):

[Enabled]
[Disabled]

SATA Mode Selection:

AHCI

SATA Ports Multiplier:

[Enabled]
[Disabled]

SATA Test Mode:

[Enabled]
[Disabled]

Software Feature Mask Configuration

Software Feature Mask Configuration

HDD Unlock:

[Disabled]
[Enabled]

LED Locate:

[Disabled]
[Enabled]

Aggressive LPM Support:

[Disabled]
[Enabled]

Serial ATA Port 0

Empty

Software Preserve

unknown

Port 0:

[Disabled]
[Enabled]

Hot Plug:

	[Disabled]
	[Enabled]
Configured as eSATA External:	Hot Plug supported
	[Disabled]
	[Enabled]
Spin Up Device:	
	[Disabled]
	[Enabled]
SATA Device Type:	
	[Hard Disk Drive]
	[Solid State Drive]
Topology:	
	[Unknown]
	[ISATA]
	[Direct Connect]
	[Flex]
	[M2]
SATA Port 0 DevSlp:	
	[Disabled]
	[Enabled]
SATA Port 0 RxPolarity:	
	[Disabled]
	[Enabled]
DITO Configuration:	
	[Disabled]
	[Enabled]
DITO Value	625
DM Value	15
Serial ATA Port 1 Software Preserve Port 1:	Empty unknown
	[Disabled]
	[Enabled]
Hot Plug:	
	[Disabled]
	[Enabled]
Configured as eSATA External:	Hot Plug supported
	[Disabled]
	[Enabled]
Spin Up Device:	
	[Disabled]
	[Enabled]
SATA Device Type:	

	[Hard Disk Drive] [Solid State Drive]
Topology:	[Unknown] [ISATA] [Direct Connect] [Flex] [M2]
SATA Port 1 DevSlp:	[Disabled] [Enabled]
SATA Port 1 RxPolarity:	[Disabled] [Enabled]
DITO Configuration:	[Disabled] [Enabled]
DITO Value	625
DM Value	15
Serial ATA Port 2	Empty
Software Preserve	unknown
Port 2:	[Disabled] [Enabled]
Hot Plug:	[Disabled] [Enabled]
Configured as eSATA	Hot Plug supported
External:	[Disabled] [Enabled]
Spin Up Device:	[Disabled] [Enabled]
SATA Device Type:	[Hard Disk Drive] [Solid State Drive]
Topology:	[Unknown] [ISATA] [Direct Connect] [Flex] [M2]
SATA Port 2 DevSlp:	[Disabled] [Enabled]

SATA Port 2 RxPolarity:	[Disabled] [Enabled]
DITO Configuration:	[Disabled] [Enabled]
DITO Value	625
DM Value	15
USB Configuration	
USB Configuration	
XHCI Compliance Mode:	[Disabled] [Enabled]
xDCI Support:	[Disabled] [Enabled]
USB2 PHY Sus Well Power Gating:	[Disabled] [Enabled]
USB3 Link Speed Selection:	[GEN1] [GEN2]
USB PDO Programming:	[Disabled] [Enabled]
USB Overcurrent:	[Disabled] [Enabled]
USB Internal Pullup resistor:	[Disabled] [Enabled]
USB Overcurrent Lock:	[Disabled] [Enabled]
USB Port Disable Override:	[Disabled] [Select Per-Pin]
USB Device/HOST Mode Override:	[Disabled] [Select Per-Pin]
USB UCSI ACPI device:	[Disabled] [Enabled]
SCS Configuration	

eMMC 5.1 Controller:	[Disabled] [Enabled]
eMMC 5.1 HS400 Mode:	[Disabled] [Enabled]
Enable HS400 software tuning:	[Disabled] [Enabled]
Enable HS400 software tuning:	[33 Ohm] [40 Ohm] [50 Ohm]
SDCard 3.0 Controller:	[Disabled] [Enabled]

3.6 Security Settings



3.6.1 Administrator Password



3.6.2 User Password

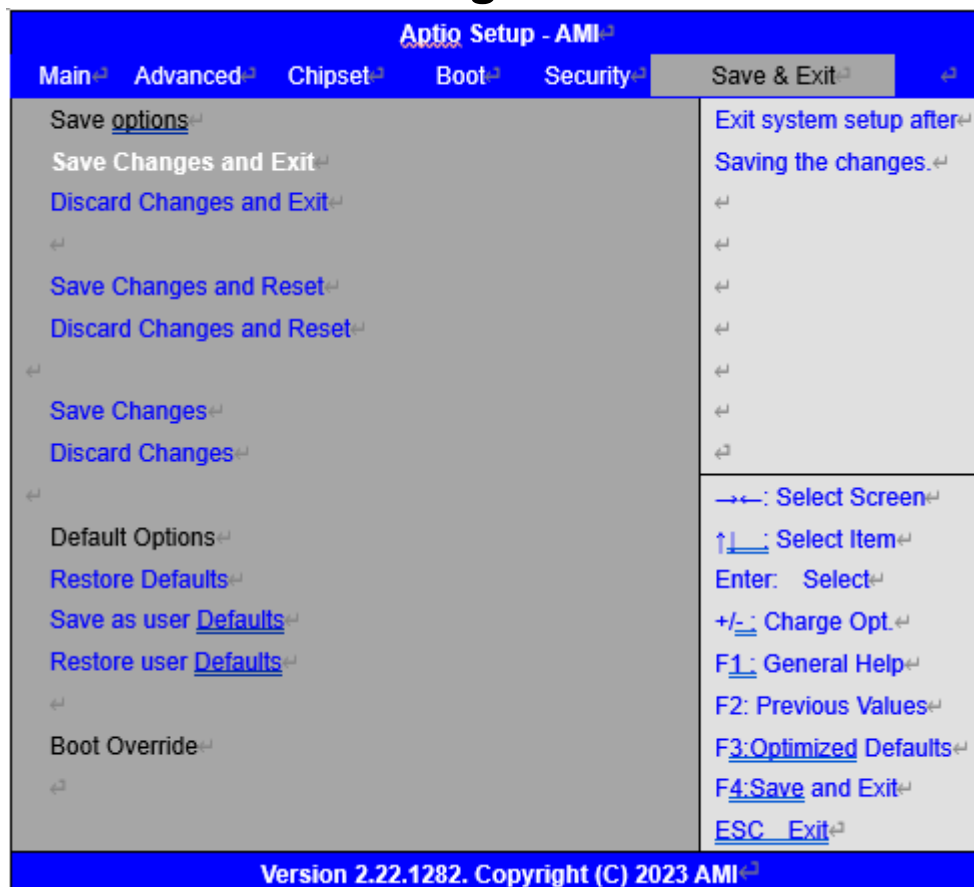


3.7 Boot Settings



Setup Prompt Timeout	[1]
Bootup Numlock State:	[On] [off]
Quiet Boot:	[Disabled] [Enabled]
Fast Boot:	[Disabled] [Enabled]

3.8 Save & Exit Settings



Save Changes and Exit

Save & Exit Setup save Configuration and exit ?

[Yes]

[No]

Discard Changes and Exit

Exit Without Saving Quit without saving?

[Yes]

[No]

Save Changes and Reset

Reset the system after Saving The changes?

[Yes]

[No]

Discard Changes and Reset

Reset system setup without Saving any changes?

[Yes]

[No]

Save Changes

Save Setup done so far to any of the setup options?

[Yes]

[No]

Discard Changes

Discard Changes done so far to any of the setup options?

[Yes]
[No]

Restore Defaults
Restore /Load Defaults values for all the setup options?

[Yes]
[No]

Save as user Defaults
Save the changes done so far as User Defaults?

[Yes]
[No]

Restore user Defaults
Restore the User Defaults to all the setup options?

[Yes]
[No]

Chapter 4 Installation of Drivers

This chapter describes the installation procedures for software and drivers under the windows 10/11. The software and drivers are included with the motherboard. The contents include **Intel chipset driver, Graphics driver, Audio driver, Network Connection and Management Engine Components**, install instructions are given below.

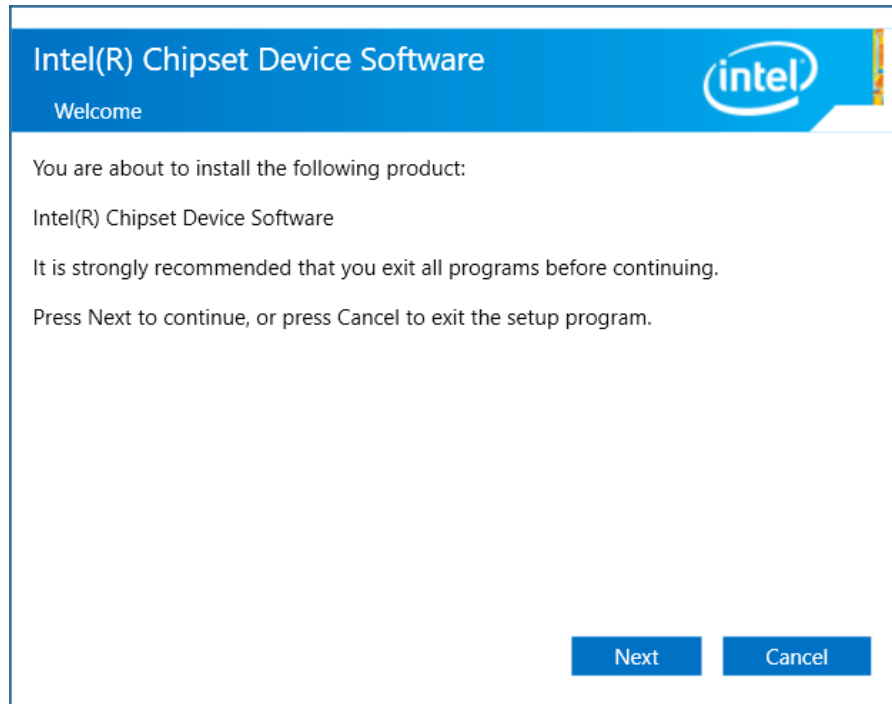
Important Note:

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

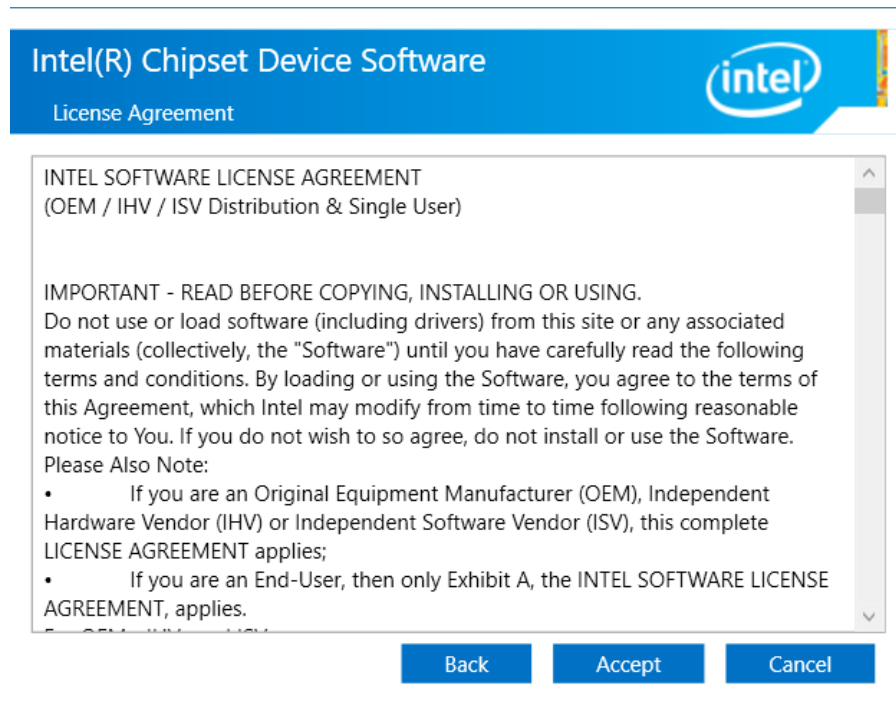
4.1 Intel® Chipset

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

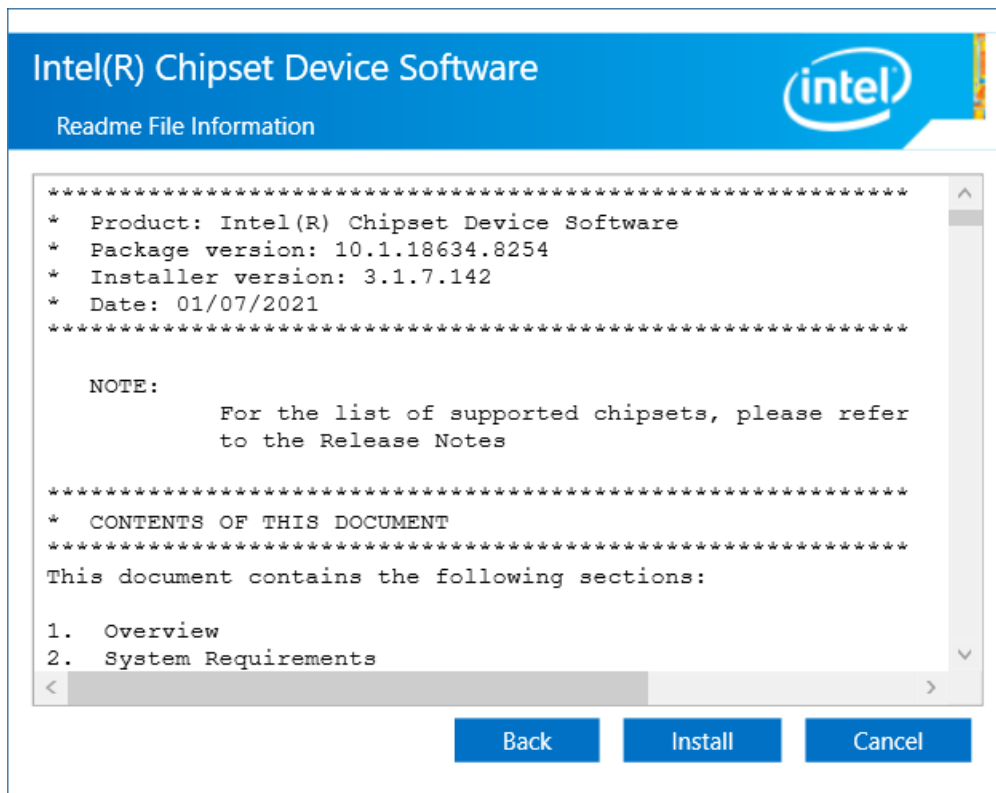
Step 1. Here is welcome page. Please make sure you save and exit all programs before install. Click **Next**.



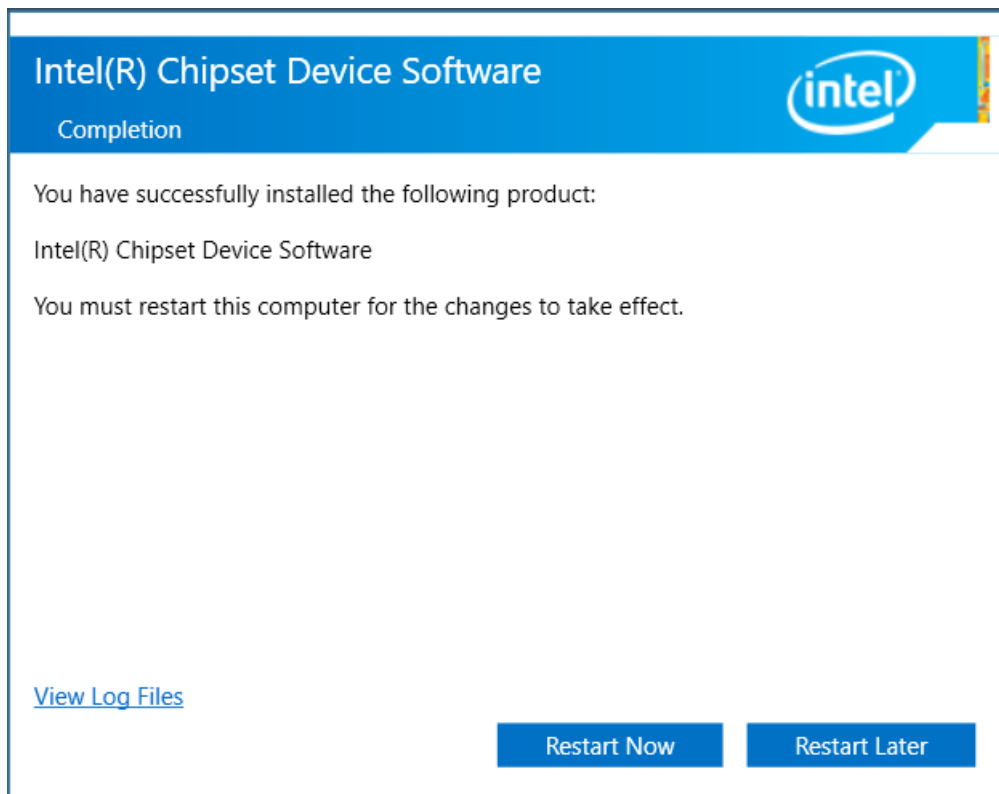
Step 2. Read the license agreement. Click **Accept** to accept all of the terms of the license agreement.



Step 3. Click **Install** to begin the installation.



Step 5. Click **Restart now** to exit the wizard and restart computer.



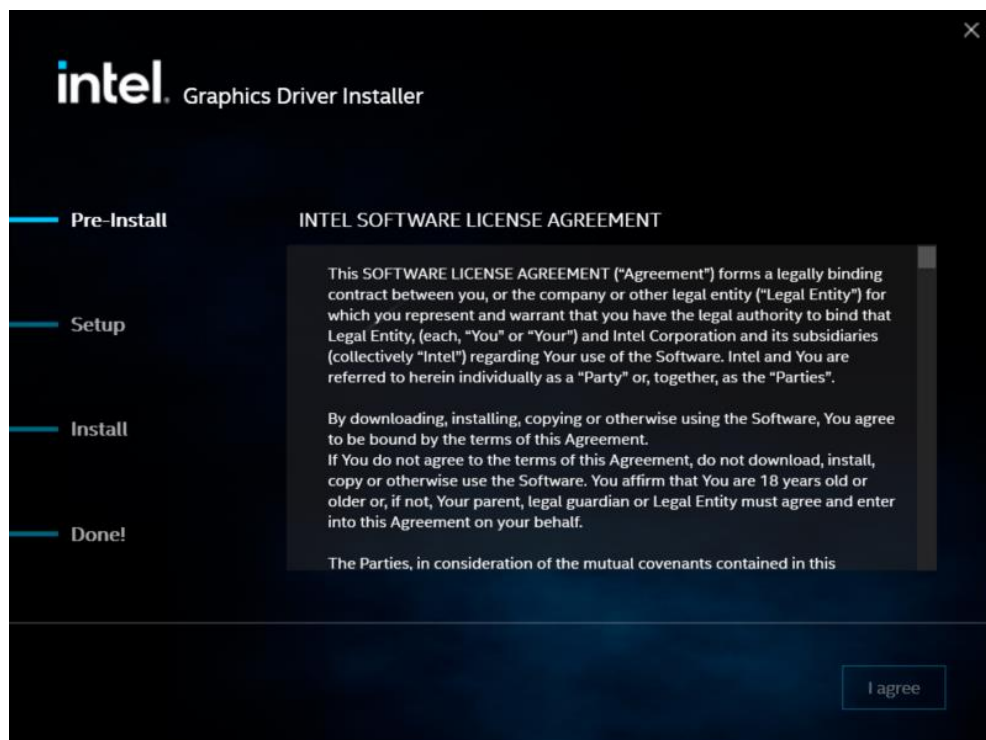
4.2 Intel Graphics Driver Installer

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

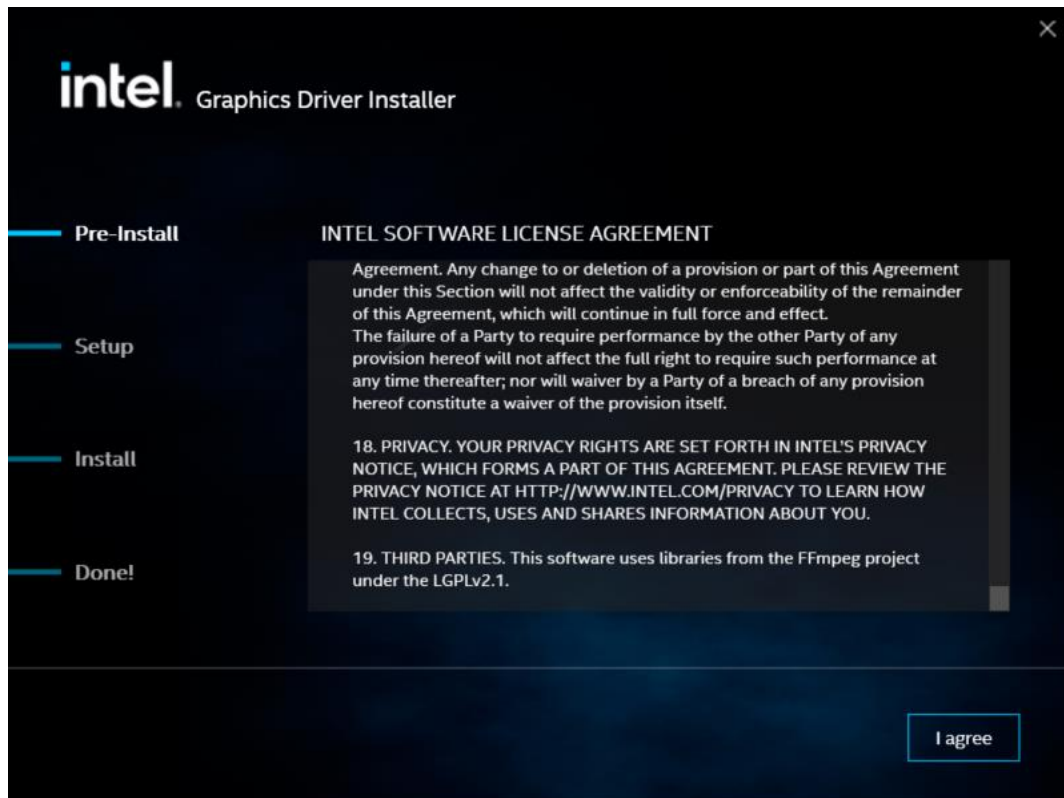
Step 1. Here is the welcome page, press **Begin Installation** to start install procedures.



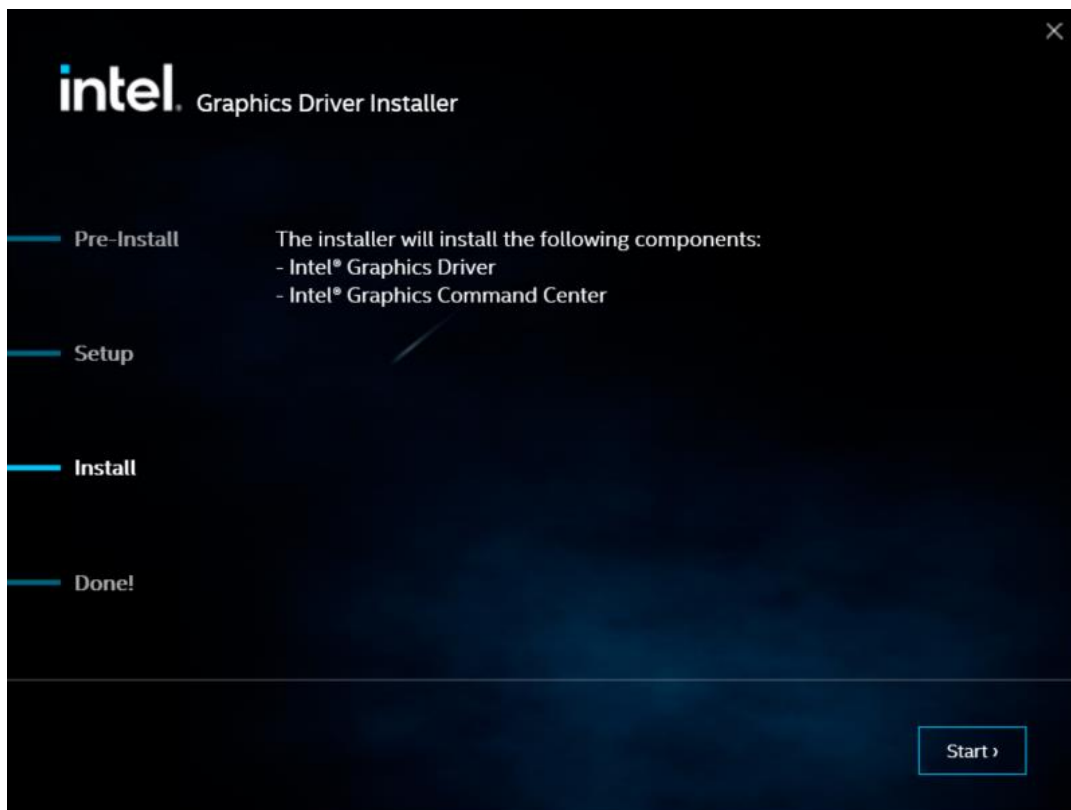
Step 2. Scroll down to read the license agreement.



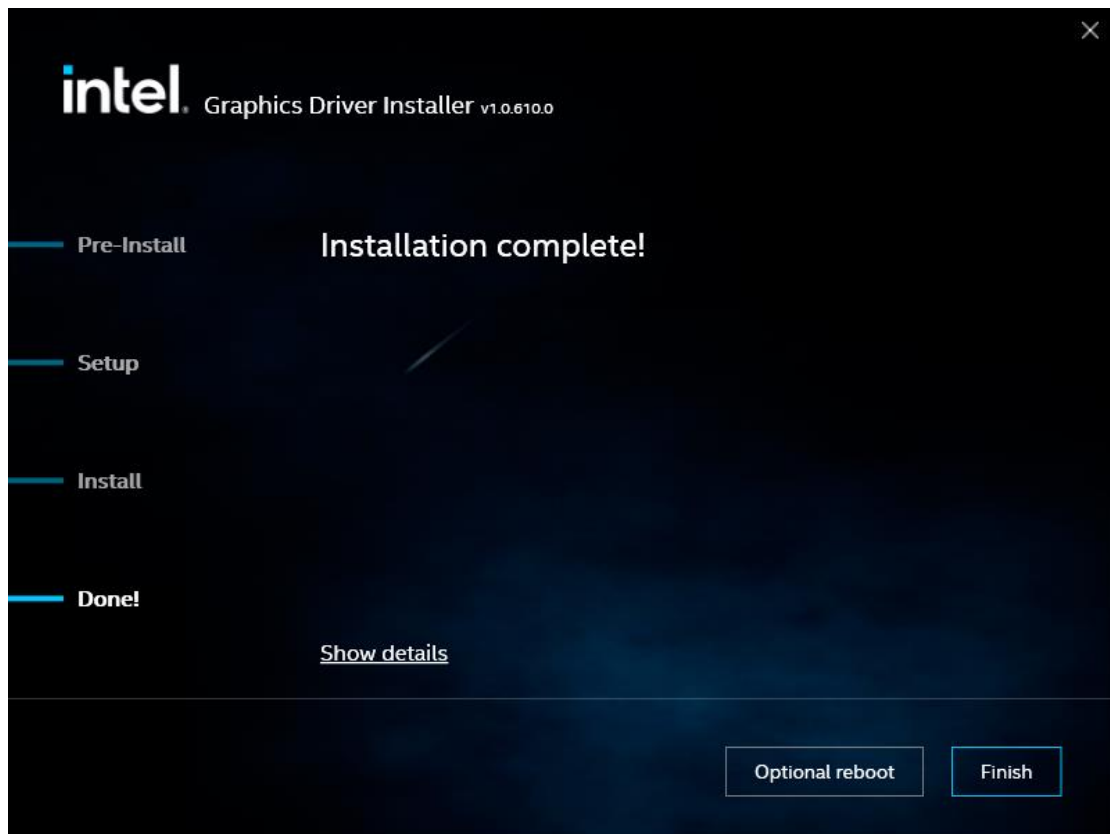
Step 3. Read the license agreement. Click **I agree** to accept all the terms of the license agreement.



Step 4. Click **Start** to install the components.



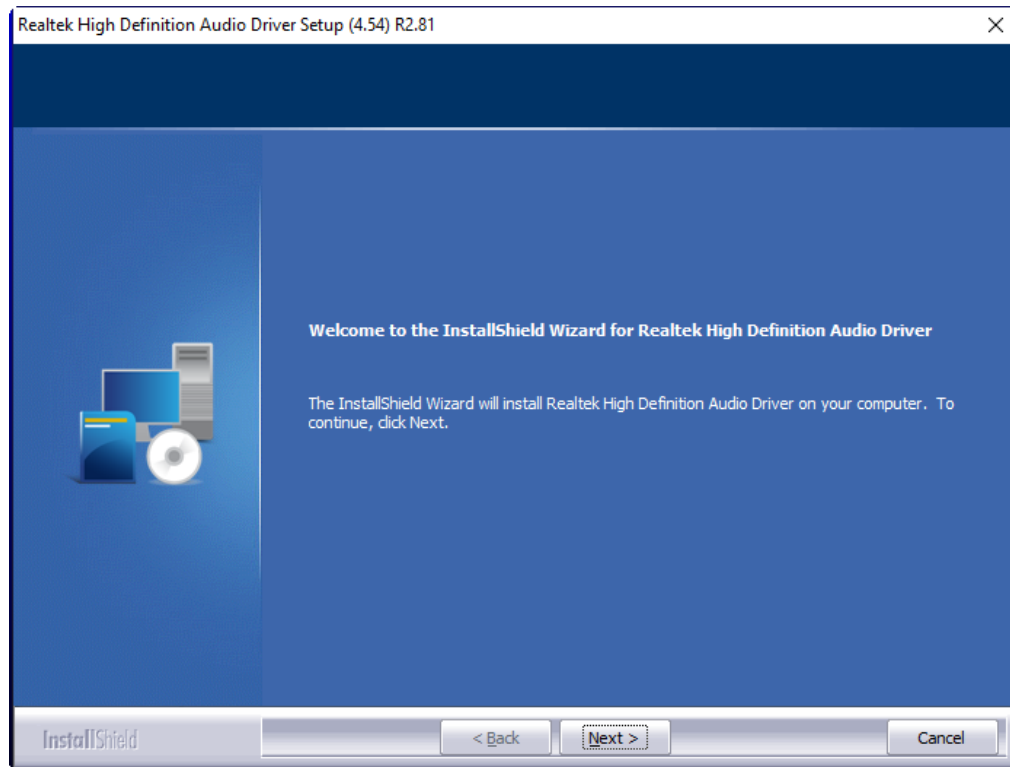
Step 5. Click **Finish** to finish installation.



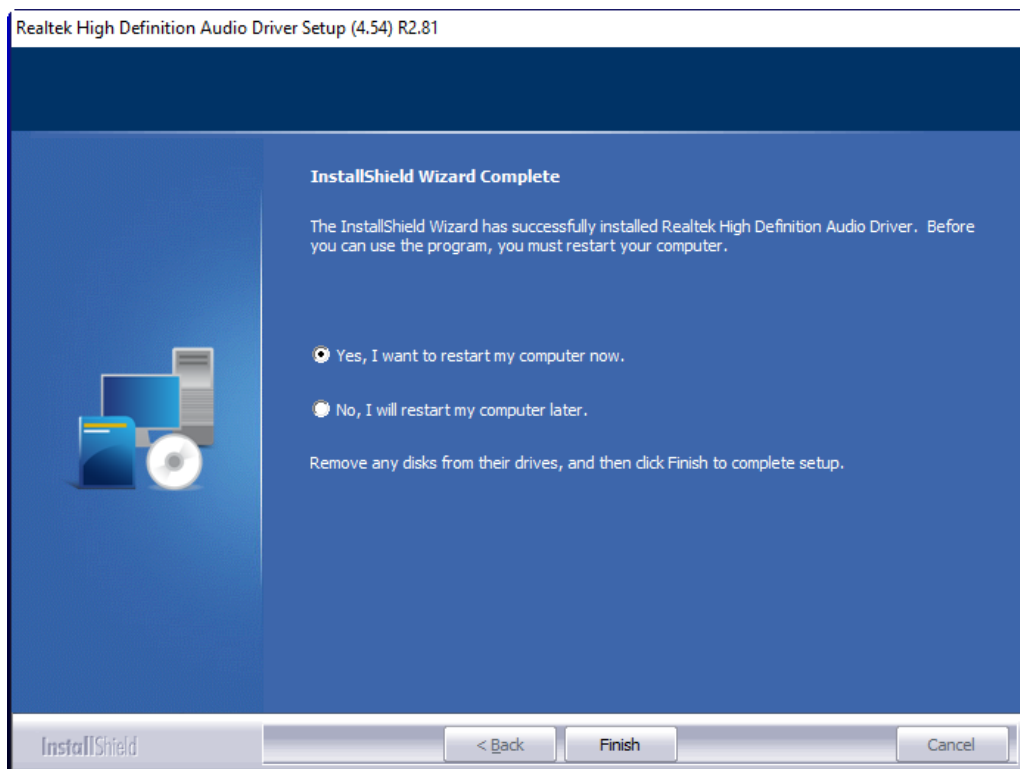
4.3 Realtek High Definition Audio Driver

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

Step 1. Here is the welcome page, click **Next** to continue.



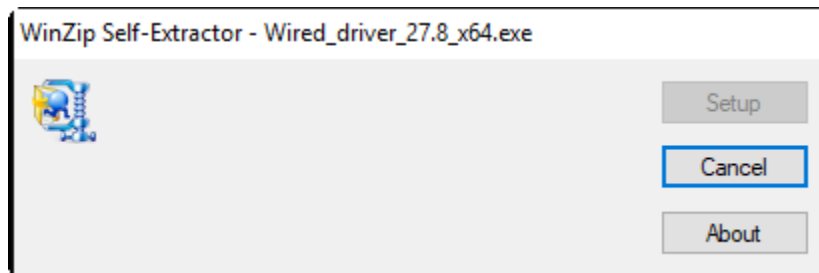
Step 2. Choose **Yes, I want to restart my computer now.** Click **Finish** to complete the installation.



4.4 Intel® Network Connection

To install the Intel® Network Connection, please follow the steps below.

Step 1. Here is the Wired_Driver_27.8_x64 Win Zip file, click **Cancel** to continue.



Step 2. Click **OK** to continue the installation of Intel® Network Connection.

Installing Drivers

Install or update drivers for Intel® Network Connections.

OK

Cancel

Step 4. Click **Close** to complete installation.

Installing Drivers

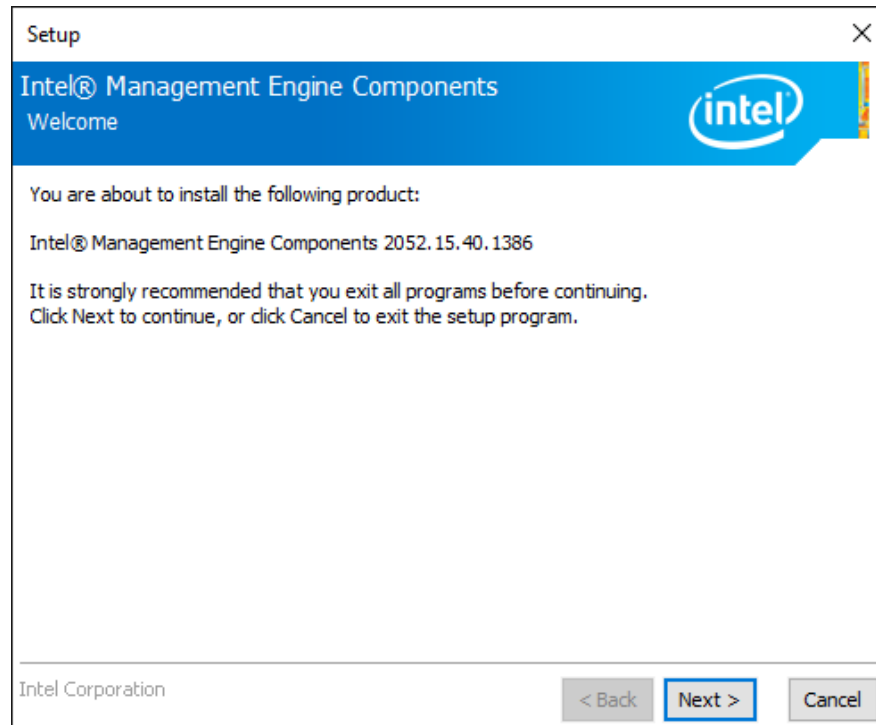
Drivers for Intel® Network Connections were successfully installed.

Close

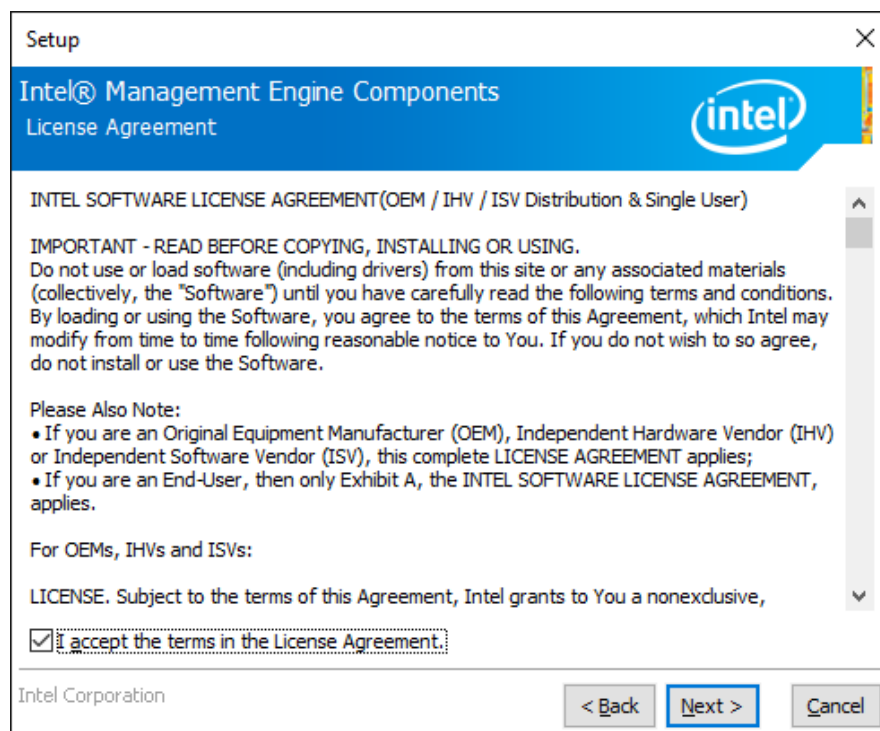
4.5 Intel® Management Engine Components

To install the Intel® Management Engine Components, please follow the steps below.

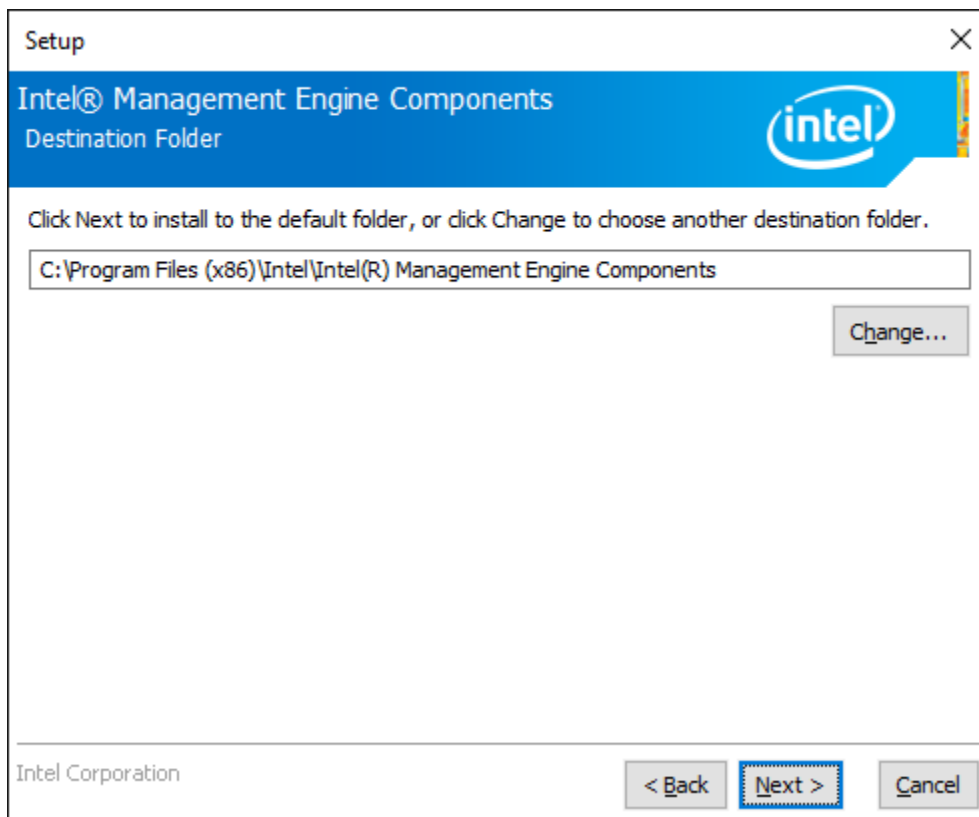
Step 1. Here is the welcome page, click **Next** to continue.



Step 2. Read the license agreement. Click **Accept** to accept all the terms of the license agreement.



Step 3. Choose a location to store the files and click **Next** to continue installation.



Step 4. Click **Finish** to finish installation.

