ECM-WHL

8th Gen Intel® Whiskey Lake 3.5”Micro Module

User’s Manual

4th Ed –12 October 2020

Part No. E2047394603R

FCC Statement

THIS DEVICE COMPLIES WITH PART 15 FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS:

(1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE.

(2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

THIS EQUIPMENT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS "A" DIGITAL DEVICE, PURSUANT TO PART 15 OF THE FCC RULES.

THESE LIMITS ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST HARMFUL INTERFERENCE WHEN THE EQUIPMENT IS OPERATED IN A COMMERCIAL ENVIRONMENT. THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND, IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTION MANUAL, MAY CAUSE HARMFUL INTERFERENCE TO RADIO COMMUNICATIONS.

OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE HARMFUL INTERFERENCE IN WHICH CASE THE USER WILL BE REQUIRED TO CORRECT THE INTERFERENCE AT HIS OWN EXPENSE.

Notice

This guide is designed for experienced users to setup the system within the shortest time. For detailed information, please always refer to the electronic user's manual.

Copyright Notice

Trademark Acknowledgement

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Disclaimer

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these products are free from patent, copyright, or mask work right infringement, unless otherwise specified. Applications that are described in this manual are for illustration purposes only. We make no representation or warranty that such application will be suitable for the specified use without further testing or modification.

Life Support Policy

OUR PRODUCTS ARE NOT FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE PRIOR WRITTEN APPROVAL.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into body, or (b) support or sustain life and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

A Message to the Customer

Customer Services

Each and every product is built to the most exacting specifications to ensure reliable performance in the harsh and demanding conditions typical of industrial environments. Whether your new device is destined for the laboratory or the factory floor, you can be assured that your product will provide the reliability and ease of operation.

Your satisfaction is our primary concern. Here is a guide to our customer services. To ensure you get the full benefit of our services, please follow the instructions below carefully.

Technical Support

We want you to get the maximum performance from your products. So if you run into technical difficulties, we are here to help. For the most frequently asked questions, you can easily find answers in your product documentation. These answers are normally a lot more detailed than the ones we can give over the phone. So please consult the user's manual first.

Product Warranty

We warrant to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized, or which have been subject to misuse, abuse, accident or improper installation. We assume no liability under the terms of this warranty as a consequence of such events. Because of our high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If any of our products is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details. If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered. (For example, CPU type and speed, our products model name, hardware & BIOS revision number, other hardware and software used, etc.) Note anything abnormal and list any on-screen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information available.
3. If your product is diagnosed as defective, obtain an RMA (return material authorization) number from your dealer. This allows us to process your good return more quickly.
4. Carefully pack the defective product, a complete Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Content

1. Getting Started

1.1 Safety Precautions

Warning!

Always completely disconnect the power cord from your chassis whenever you work with the hardware. Do not make connections while the power is on. Sensitive electronic components can be damaged by sudden power surges. Only experienced electronics personnel should open the PC chassis.

Caution!

Always ground yourself to remove any static charge before touching the CPU card. Modern electronic devices are very sensitive to static electric charges. As a safety precaution, use a grounding wrist strap at all times. Place all electronic components in a static-dissipative surface or static-shielded bag when they are not in the chassis.

1.2 Packing List

Before you begin installing your single board, please make sure that the following materials have been shipped:

- 1 x 3.5" ECM-WHL Micro Module
- 1 x Cable set contains the followings:
  - — 1 x Serial ATA cable (7-pin, standard)
  - — 1 x Wire SATA power cable (15-pin,2P/2.0mm)
  - — 1 x Flat cable 9P(M)-PHD 10P/2.0mm)
- 3M foam (VHB-4622 10mm*20mm*1.1mm)
- 1 x CPU Cooler (128*75.6*37.5mm)

If any of the above items is damaged or missing, contact your retailer.

1.3 Document Amendment History

Revision	Date	By	Comment
1st	October 2019		Initial Release
2nd	February 2020		Update 2.3.4 JAT1
3rd	April 2020		Add 2.5 Heatsink/Heat spreader Installation
4th	October 2020		Update 2.3.4 JAT1

1.4 Manual Objectives

We have tried to include as much information as possible but we have not duplicated information that is provided in the standard IBM Technical References, unless it proved to be necessary to aid in the understanding of this board.

We strongly recommend that you study this manual carefully before attempting to set up ECM-WHL or change the standard configurations. Whilst all the necessary information is available in this manual we would recommend that unless you are confident, you contact your supplier for guidance.

Please be aware that it is possible to create configurations within the CMOS RAM that make booting impossible. If this should happen, clear the CMOS settings, (see the description of the Jumper Settings for details).

If you have any suggestions or find any errors regarding this manual and want to inform us of these, please contact our Customer Service department with the relevant details.

1.5 System Specifications

System	
CPU	Intel® Core™ i7-8665UE Processor (8M Cache, up to 4.40 GHz) Intel® Core™ i5-8365UE Processor (6M Cache, up to 4.10 GHz) Intel® Core™ i3-8145UE Processor (4M Cache, up to 3.9GHz) Intel® Celeron® Processor 4305UE (2M Cache, 2.00 GHz)
BIOS	AMI uEFI BIOS,256 Mbit SPI Flash ROM Supports iAMT
I/O Chip	EC (IT8528E)
System Memory	2 x 260-Pin SO-DIMM Socket, Max. Up to 64 GB DDR4 2400
Watchdog Timer	H/W Reset, 1sec. – 65535sec.
H/W Status Monitor	Monitoring CPU Temperature, Voltage and FAN Status with Auto Throttling Control
Expansion	
M.2	1 x M.2 (Key-B, 2242/3042, PCIe, SATA, USB 3.0, USB 2.0, SIM Slot) 1 x M.2 (Key-E, 2230, PCIe, USB2.0, CNVi)
Storage	
SATA	1 x SATA III
M.2	1 x M.2 (Key-B, 2242)
Others	Support TPM2.0(Optional), RAID 0/1
Rear Edge I/O Connectors	
USB	4 x USB 3.1 (Gen 2)
LAN	2 x RJ45
HDMI	2 x HDMI (Factory CEC Controller Option, only for ON/OFF function)
LED	1 x LED for Power 1 x LED for Data Access
Audio	1 x Line-Out 1 x Mic-In
Onboard I/O Connector	
USB	2 x USB 2.0
COM	1 x RS-232
GPIO	1 x 8-bit GPIO
LPC	1 x LPC
SPI	1 x SPI
SMBus	1 x SMBus

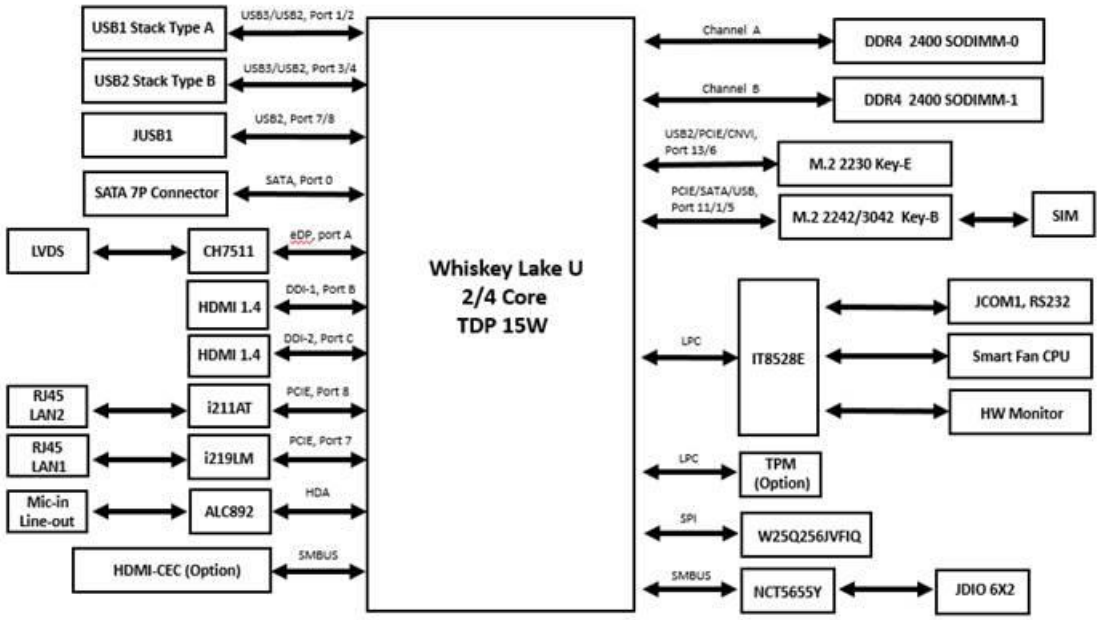
Setting Jumper & Connector List	
COM	2 x 5-Pin Connector for RS232(w/+12V, +5V, Ring)
Fan	1 x 4-Pin Connector for CPU Fan
Buzzer	1 x 2-Pin Wafer for Buzzer
CMOS Battery	1 x 2-Pin Wafer for Wired CR2032 1 x 3-Pin Header for Clear CMOS
Power ON	1 x 10-Pin Header for Front Panel Connector
USB	1 x 10-Pin Header support 2 x USB2.0
LCD	1 x 3-Pin Header for LCD Backlight Brightness Adjustment 1 x 5-Pin Wafer for LCD Inverter 1 x 40-Pin Connector for LVDS
Power Mode	1 x 3-Pin Header for AT/ATX Selection
DIO	1 x 12-Pin Header for GPIO
SATA Power	1 x 2-Pin Wafer for SATA Power
DC-In	1 x 4-Pin Connector for DC-Input
SPI	1 x 8-Pin Header for SPI
EC	1 x 3-Pin Header for EC Debug
LPC	1 x 12-Pin Header for LPC
Display	
Chipset	Intel® UHD Graphics 620/610
Resolution	2 x HDMI 1.4: Max. Resolution 4096 x 2160@24/30Hz 1 x Dual-Channel 18/24-bit LVDS: Max. Resolution 1920 x 1200@60Hz (7511B)
Multiple Display	Triple Display
Audio	
HD Codec	Realtek ALC892 HD Codec
Audio Interface	1 x Mic-In 1 x Line-Out
Ethernet	
LAN Chip	1 x Intel i211AT 1 x Intel i219LM
Ethernet Interface	10/100/1000 Base-Tx GbE compatible
Connector	2 x RJ45 with ACT/LINK and SPEED LEDs
Mechanical & Environmental	
Power Requirement	+12Vdc
ACPI	Single power ATX Support S0,S3, S4, S5

	ACPI 5.0 Compliant
Power Type	AT / ATX
Operating Temp.	0°C ~60°C, with 0.2m/s with air flow
Storage Temp.	-40°C ~ 75°C
Operating Humidity	40°C @ 95% Relative Humidity, Non-condensing
Size (L x W)	5.7" x 4" (146mm x 101mm) (Please consult product engineers for the production feasibility if the size is larger than 410x360mm or smaller than 80x70mm)
Weight	0.44 lbs (0.2 Kg)
Vibration Test	1.5Grms, IEC 60068-2-64, Random, 5 ~ 500Hz, 30min/Axis, 3 Axis
Shock Test	10G, IEC 60068-2-27, Half Sine, 11ms, Z Axis
Drop Test	ISTA 2A, IEC-60068-2-32 Test : Ed, 1 Corner, 3 Edges, 6 Faces
OS Support (listed in accordance with Intel document)	Windows 10 Linux

Note: Specifications are subject to change without notice.

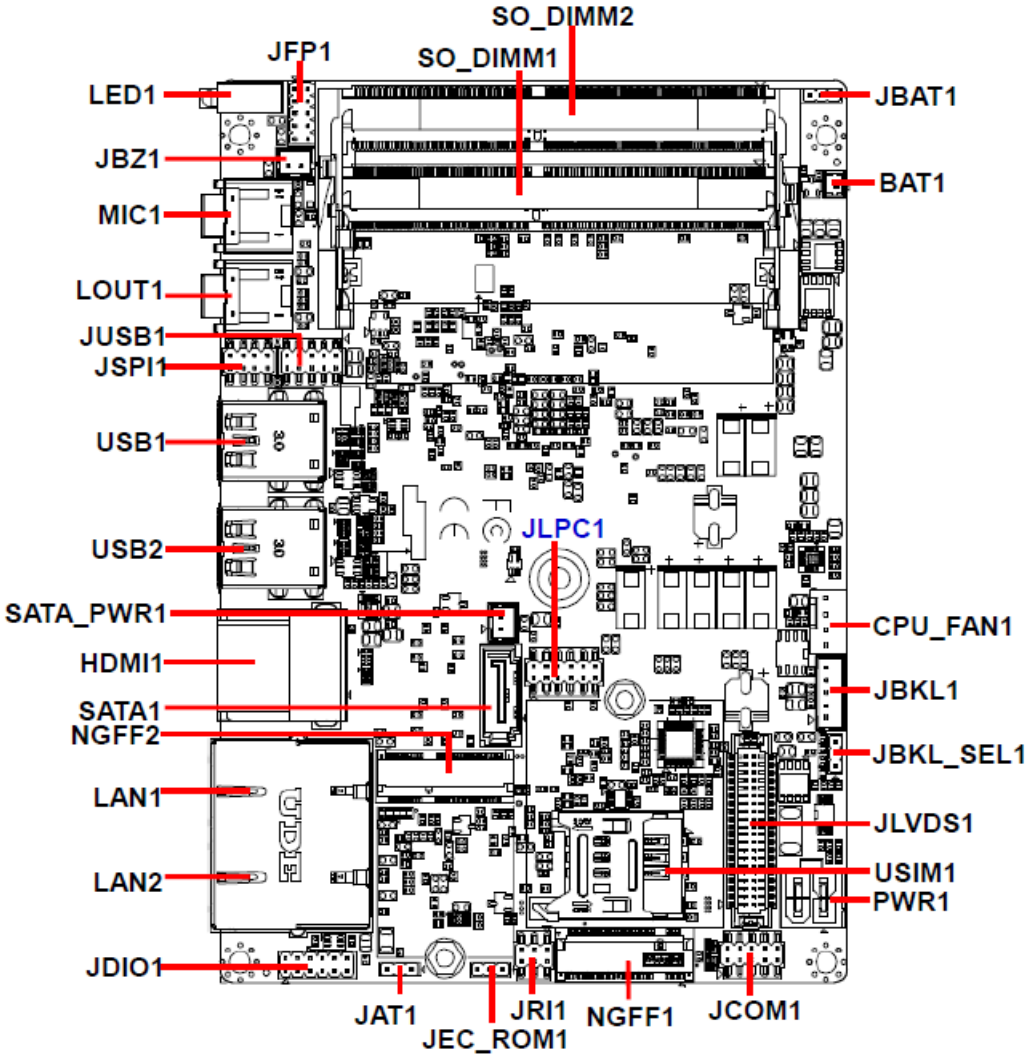
1.6 Architecture Overview—Block Diagram

The following block diagram shows the architecture and main components of ECM-WHL



2. Hardware Configuration

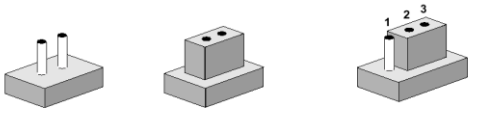
2.1 Product Overview



2.2 Jumper and Connector List

You can configure your board to match the needs of your application by setting jumpers. A jumper is the simplest kind of electric switch.

It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To "close" a jumper you connect the pins with the clip. To "open" a jumper you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2, and 3. In this case, you would connect either two pins.



Open Closed Closed 2-3

The jumper settings are schematically depicted in this manual as follows:

Open Closed Closed 2-3

A pair of needle-nose pliers may be helpful when working with jumpers.

Connectors on the board are linked to external devices such as hard disk drives, a keyboard, or floppy drives. In addition, the board has a number of jumpers that allow you to configure your system to suit your application.

If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any changes.

The following tables list the function of each of the board's jumpers and connectors.

Jumpers

Label	Function	Note
JRI1	Serial port 1 pin9 signal select	3 x 2 header, pitch 2.00mm
JAT1	AT/ATX Input power select	3 x 1 header, pitch 2.00mm
JBKL_SEL1	LCD backlight brightness adjustment	3 x 1 header, pitch 2.00mm
JBAT1	Clear CMOS	3 x 1 header, pitch 2.00mm

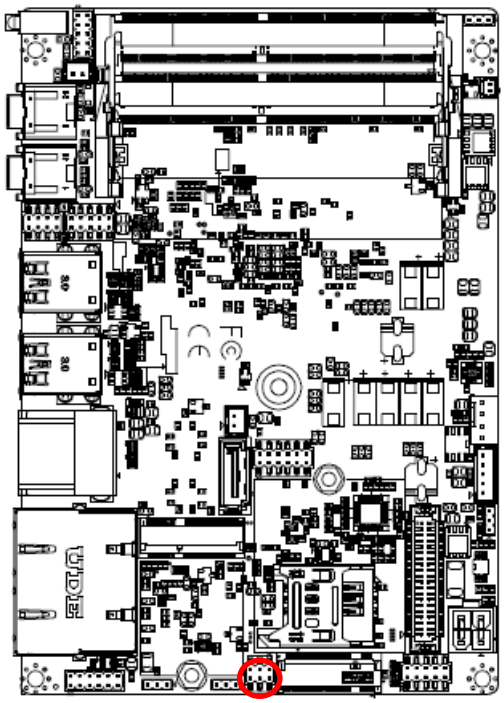
Connectors

Label	Function	Note
JBKL1	LCD inverter connector	5 x 1 wafer, pitch 2.00mm Matching Connector: JST PHR-5
CPU_FAN1	CPU fan connector	4 x 1 wafer, pitch 2.54mm
JCOM1	Serial Port 1 connector	5 x 2 header, pitch 2.00mm
JDIO1	General purpose I/O connector	6 x 2 wafer, pitch 2.00mm

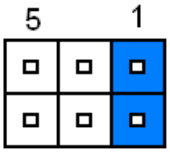
NGFF1	M.2 KEY-B 2242/3042 connector	
NGFF2	M.2 KEY-E 2230 connector	
LED1	HDD/Power LED indicator	
JLVDS1	LVDS connector	DIN 40-pin wafer, pitch 1.25mm Matching Connector: Hirose DF13-40DS-1.25C
JFP1	Front Panel connector	5 x 2 header, pitch 2.00mm
USB1/2	4 x USB3.1 connector	
JUSB1	USB2.0 connector	5 x 2 header, pitch 2.00mm
JBZ1	PC Buzzer connector	2 x 1 wafer, pitch 2.00mm
LAN1/2	RJ-45 Ethernet 1/2	
BAT1	Battery connector	2 x 1 wafer, pitch 1.25mm
JLPC1	LPC connector	6 x 2 header, pitch 2.00mm
PWR1	Power connector	2 x 2 wafer, pitch 4.20mm
JSPI1	SPI connector	4 x 2 header, pitch 2.00mm
JEC_ROM1	EC Debug connector	3 x 1 header, pitch 2.00mm
SATA_PWR1	SATA Power connector	2 x 1 wafer, pitch 2.00mm
SATA1	Serial ATA connector	
HDMI1	HDMI connector	
SO_DIMM1/2	2 x DDR4 SODIMM socket	
MIC1	Mic-in audio jack	
LOUT1	Line-out audio jack	
USIM1	SIM card slot	

2.3 Setting Jumpers & Connectors

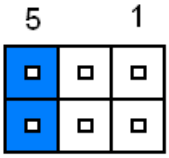
2.3.1 Serial port 1 pin9 signal select (JRI1)



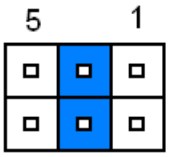
Ring*



+12V

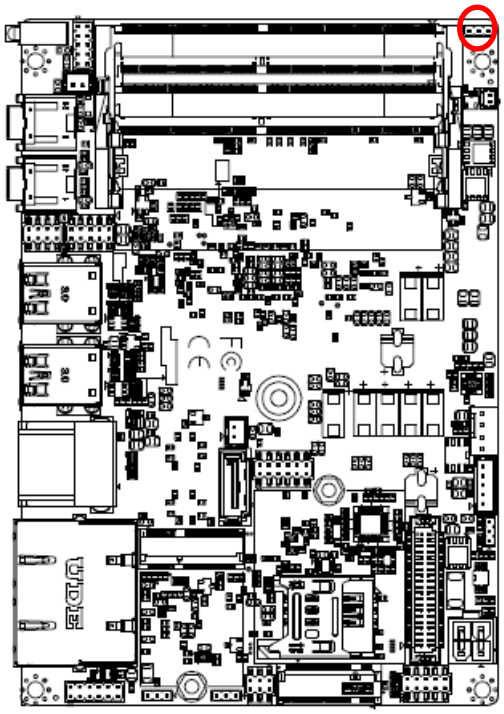


+5V



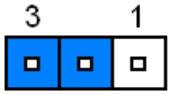
*** Default**

2.3.2 Clear CMOS (JBAT1)



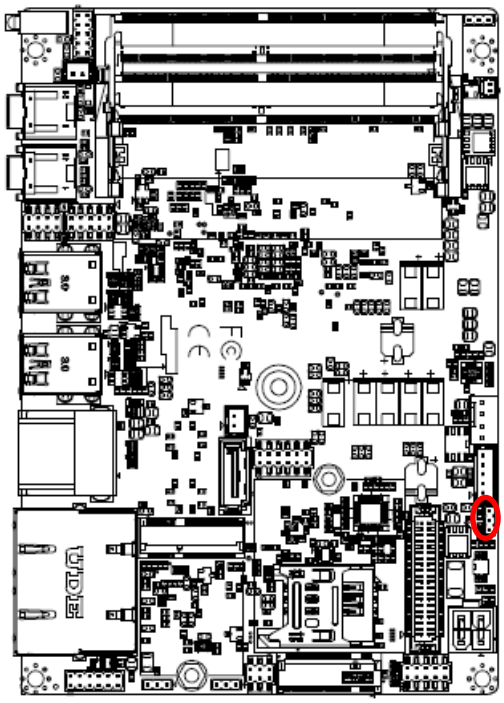
Normal*

Clear CMOS

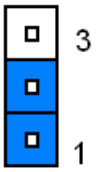


*** Default**

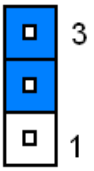
2.3.3 LCD backlight brightness adjustment (JBKL_SEL1)



PWM Mode*

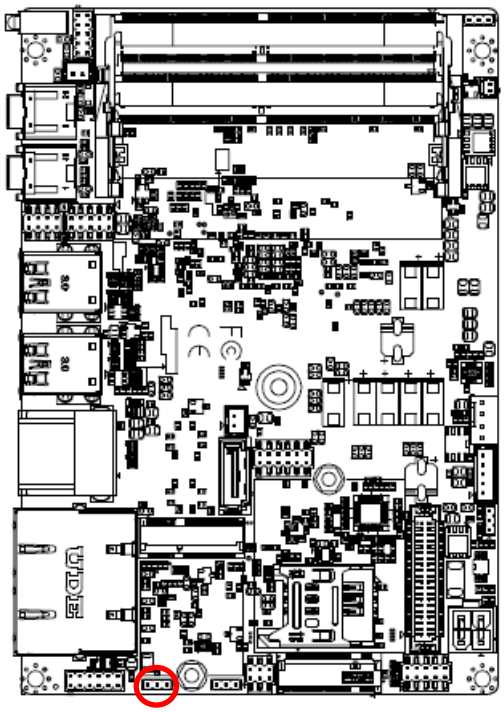


DC Mode

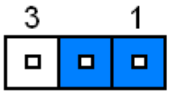


*** Default**

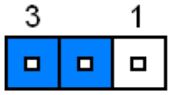
2.3.4 AT/ATX Input power select (JAT1)



AT*

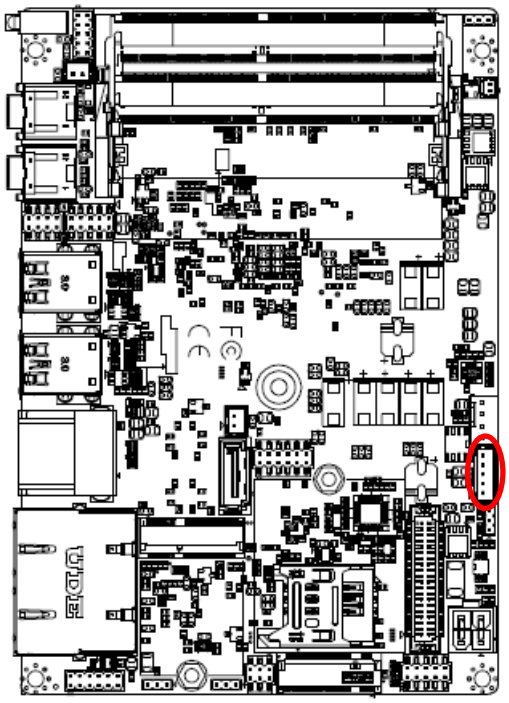


ATX



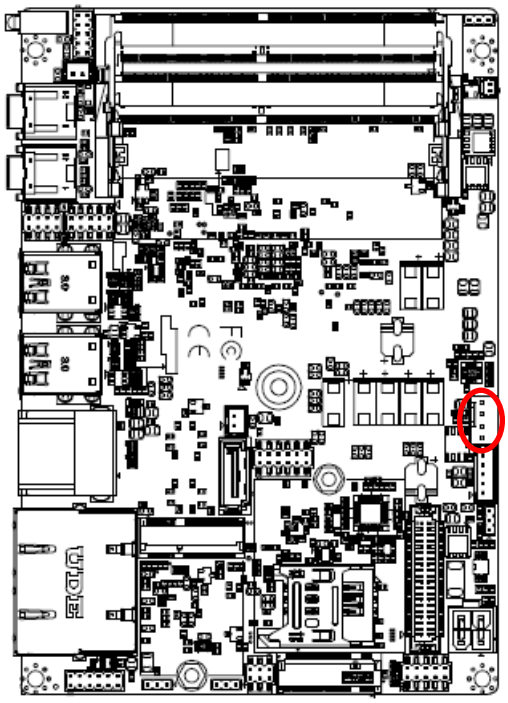
*** Default**

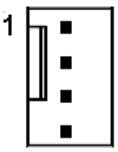
2.3.5 LCD inverter connector (JBKL1)



Signal	PIN
+5V	5
VBRIGHT	4
BKLEN	3
GND	2
+12V	1

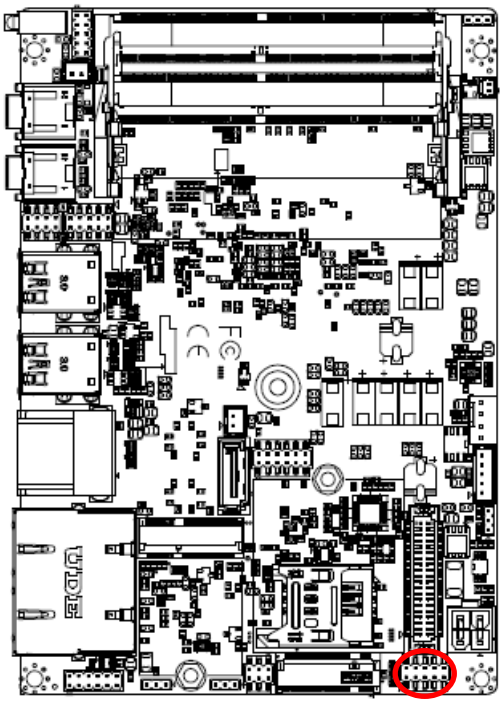
2.3.6 CPU fan connector (CPU_FAN1)

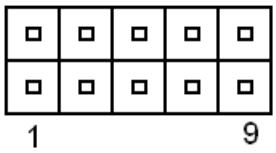




Signal	PIN
GND	1
+12V	2
EC_R_TACH0	3
FAN_PWM0	4

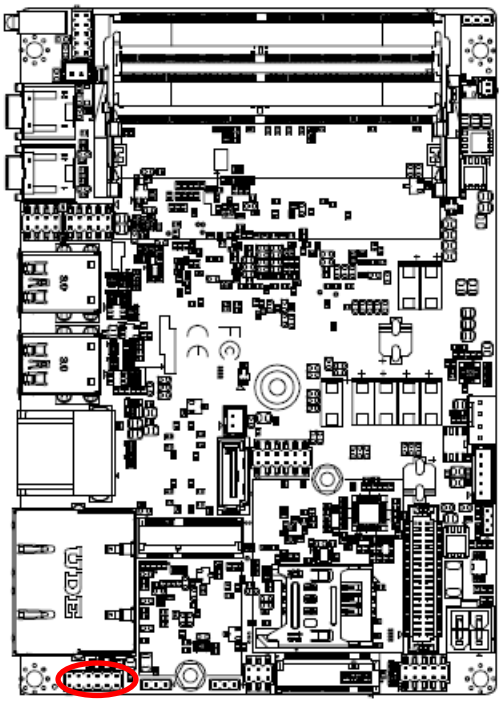
2.3.7 Serial port 1 connector (JCOM1)

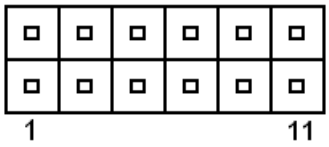




Signal	PIN	PIN	Signal
COM_DCD#_1	1	2	COM_RXD_1
COM_TXD_1	3	4	COM_DTR#_1
GND	5	6	COM_DSR#_1
COM_RTS#_1	7	8	COM_CTS#_1
NRIA#	9	10	NC

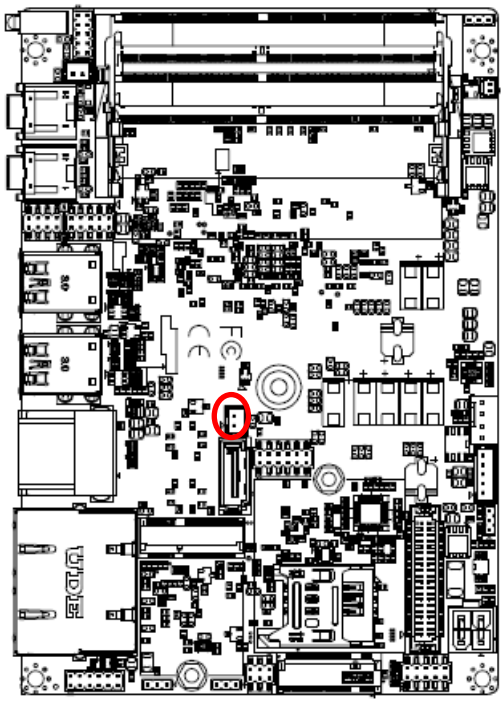
2.3.8 General purpose I/O connector (JDIO1)





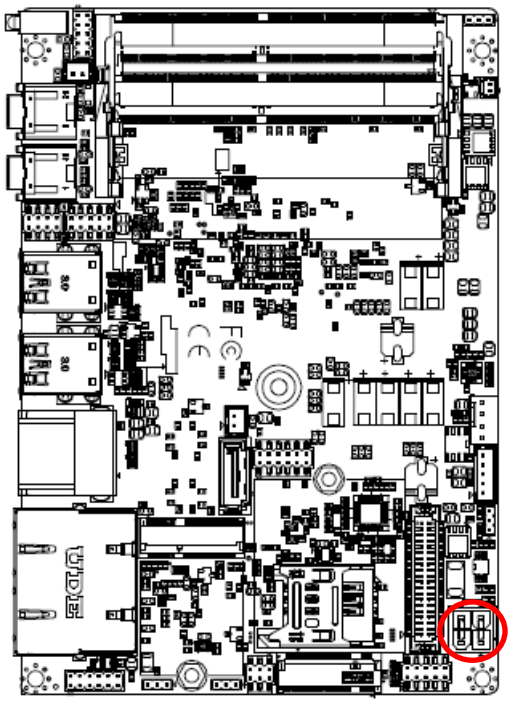
Signal	PIN	PIN	Signal
DIO_GP20	1	2	DIO_GP10
DIO_GP21	3	4	DIO_GP11
DIO_GP22	5	6	DIO_GP12
DIO_GP23	7	8	DIO_GP13
SMB_SCL_S0	9	10	SMB_SDA_S0
GND	11	12	+5V

2.3.9 SATA Power connector (SATA_PWR1)



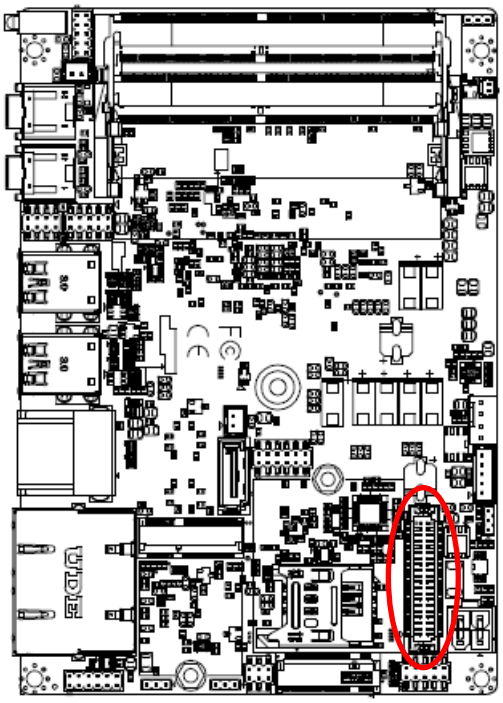
Signal	PIN
+5V	2
GND	1

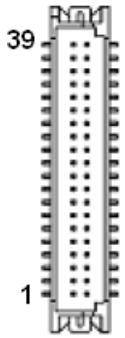
2.3.10 Power connector (PWR1)



Signal	PIN	PIN	Signal
+12V	4	3	+12V
GND	2	1	GND

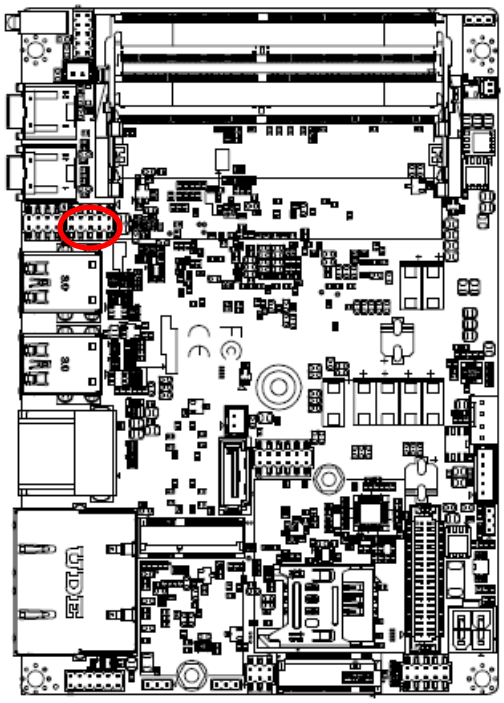
2.3.11 LVDS connector (JLVDS1)

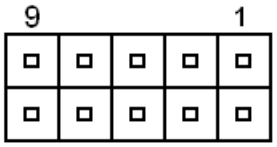




Signal	PIN	PIN	Signal
+12V	39	40	+12V
GND	37	38	GND
LVDS_CLK2_N	35	36	LVDS_CLK1_N
LVDS_CLK2_P	33	34	LVDS_CLK1_P
GND	31	32	GND
LVDS_DATA7_N	29	30	LVDS_DATA6_N
LVDS_DATA7_P	27	28	LVDS_DATA6_P
GND	25	26	GND
LVDS_DATA5_N	23	24	LVDS_DATA4_N
LVDS_DATA5_P	21	22	LVDS_DATA4_P
GND	19	20	GND
LVDS_DATA3_N	17	18	LVDS_DATA2_N
LVDS_DATA3_P	15	16	LVDS_DATA2_P
GND	13	14	GND
LVDS_DATA1_N	11	12	LVDS_DATA0_N
LVDS_DATA1_P	9	10	LVDS_DATA0_P
GND	7	8	GND
NC	5	6	NC
+3.3V	3	4	+5V
+3.3V	1	2	+5V

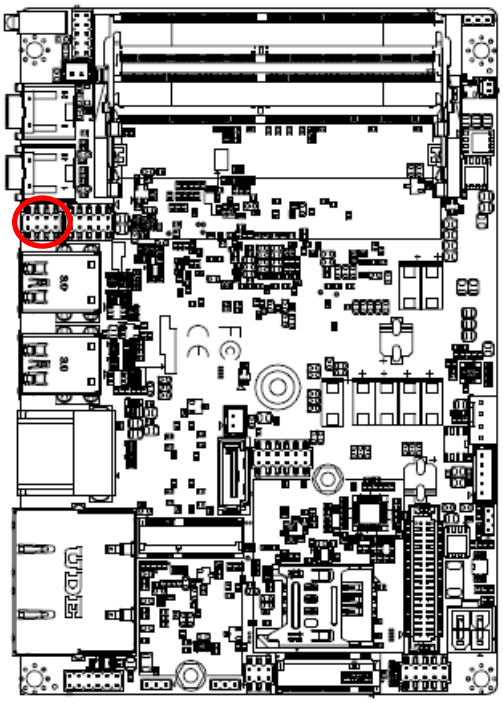
2.3.12 USB2.0 connector (JUSB1)

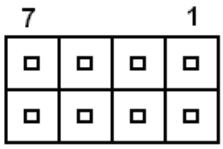




Signal	PIN	PIN	Signal
+5VSB	1	2	GND
USB_R_DN7	3	4	GND
USB_R_DP7	5	6	USB_R_DP8
GND	7	8	USB_R_DN8
GND	9	10	+5VSB

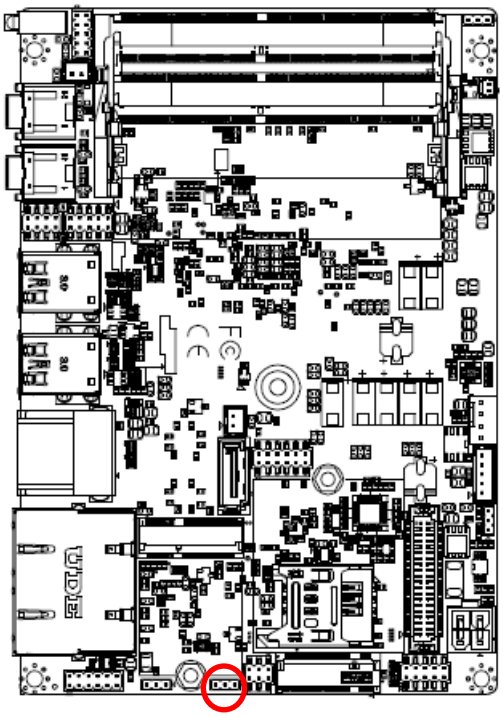
2.3.13 SPI connector (JSPI1)

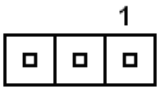




Signal	PIN	PIN	Signal
+3.3VSB	1	2	GND
SPI_CS0#	3	4	SPI_CLK
SPI_MISO	5	6	SPI_MOSI
BIOS_HOLD#	7	8	BIOS_WP#

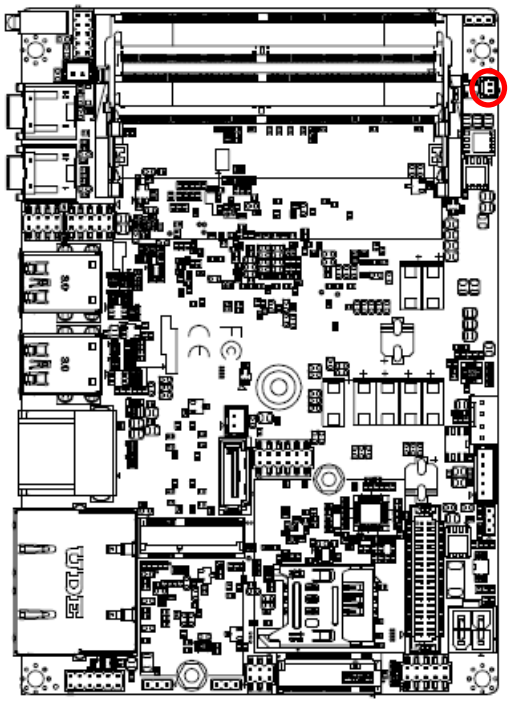
2.3.14 EC Debug connector (JEC_ROM1)





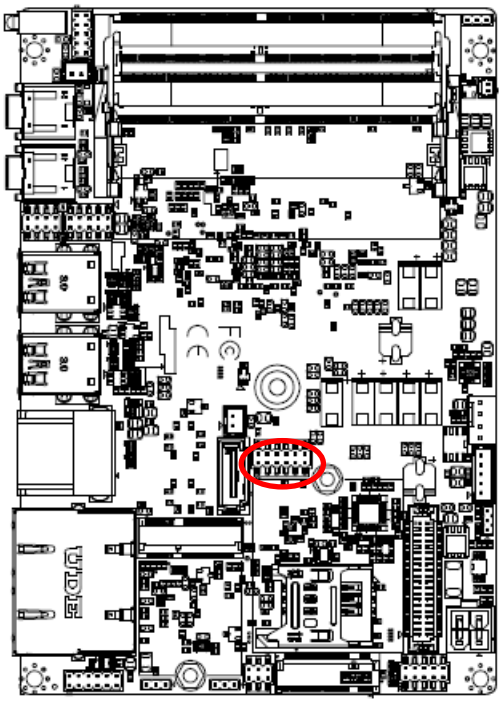
Signal	PIN
EC_SMCLK_DEBUG	1
EC_SMDAT_DEBUG	2
GND	3

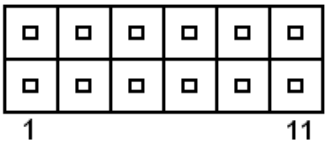
2.3.15 Battery connector (BAT1)



Signal	PIN
GND	2
+RTCBAT	1

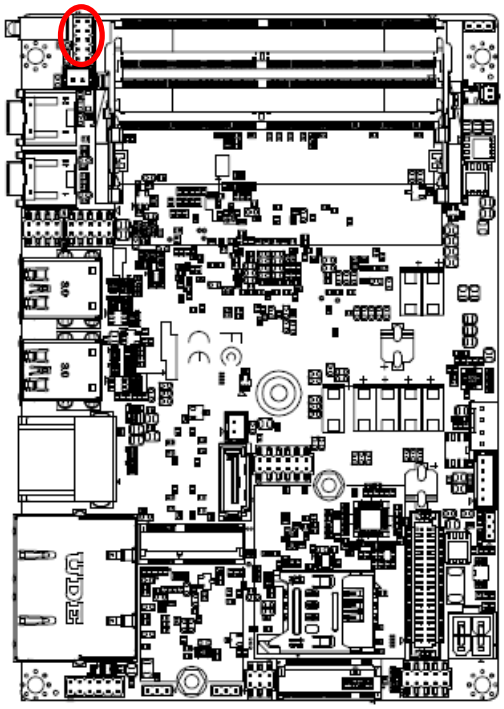
2.3.16 LPC connector (JLPC1)

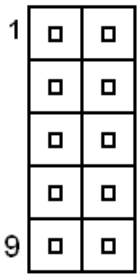




Signal	PIN	PIN	Signal
LPC_AD0	1	2	+3.3V
LPC_AD1	3	4	RST_TPM#
LPC_AD2	5	6	LPC_LFRAME#
LPC_AD3	7	8	CLK2_LPC1_DEBUG
LPC_SERIRQ	9	10	GND
+5V	11	12	GND

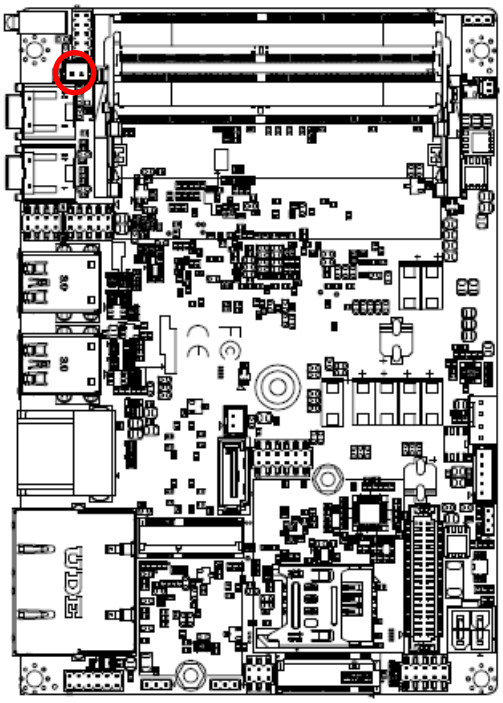
2.3.17 Front Panel connector (JFP1)





Signal	PIN	PIN	Signal
PWRBTN_IN#	1	2	GND
PM_SYSRST#	3	4	GND
FP_PWR_LED+	5	6	PWR_LED#
HDD_LED#	7	8	+5V
CASE_OPEN#	9	10	GND

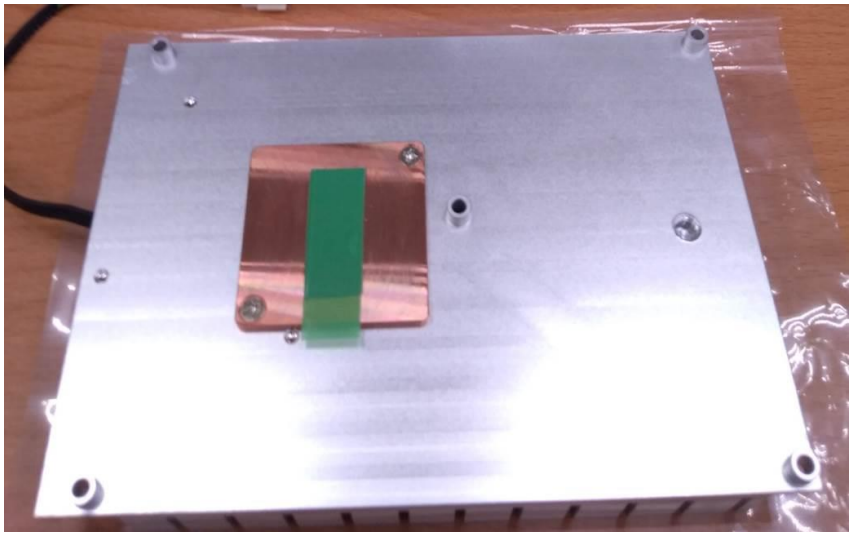
2.3.18 PC Buzzer connector (JBZ1)



Signal	PIN
SOC_SPKR_R	1
+5V	2

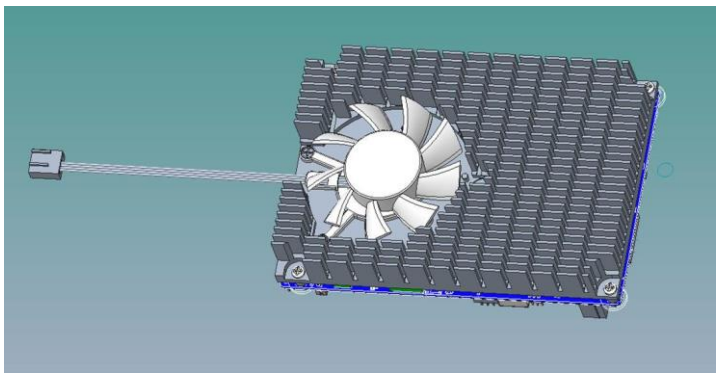
2.4 Cooler Installation

1. Please remove release paper.

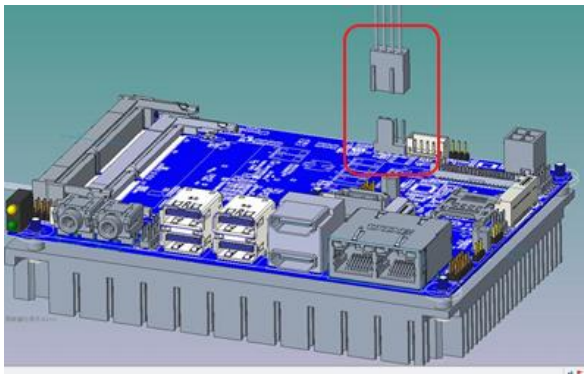


2. Please follow the below picture to install the cooler and cooler wire. And fix the 5 screw of cooler and finish the installation.

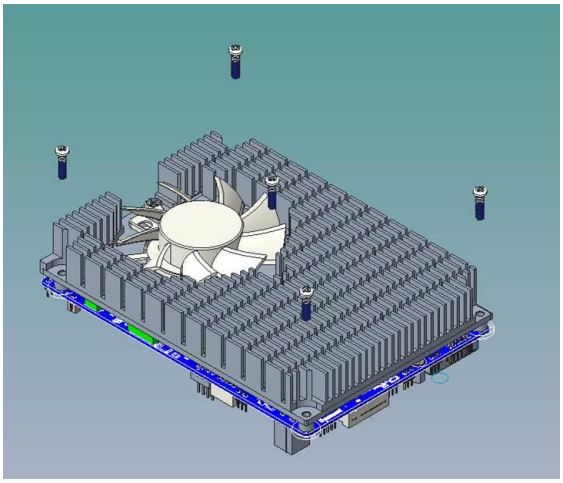
Step1:



Step2:

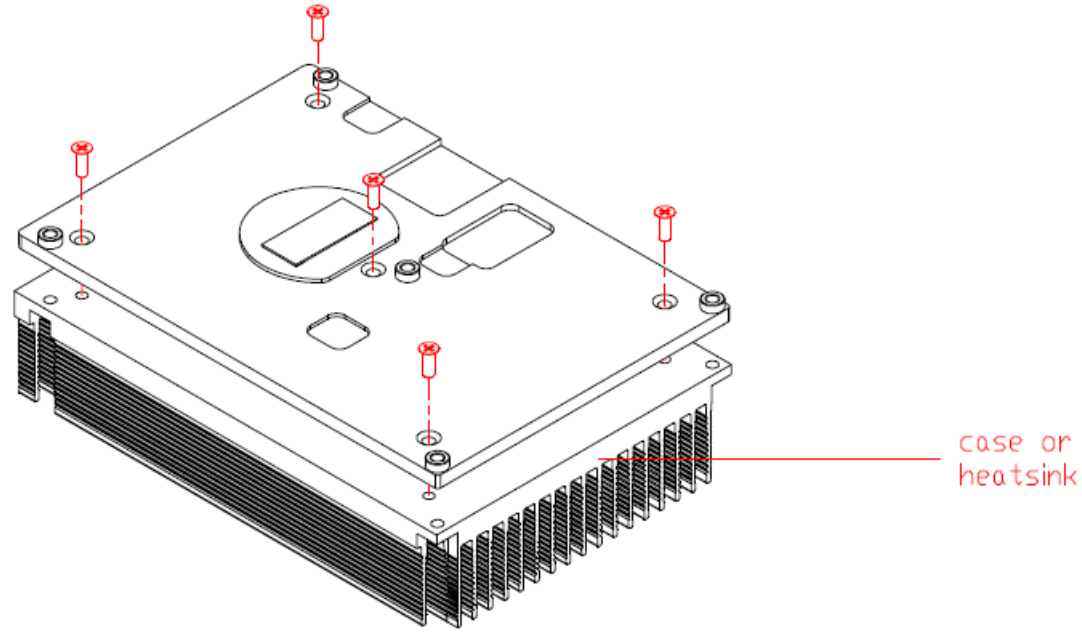


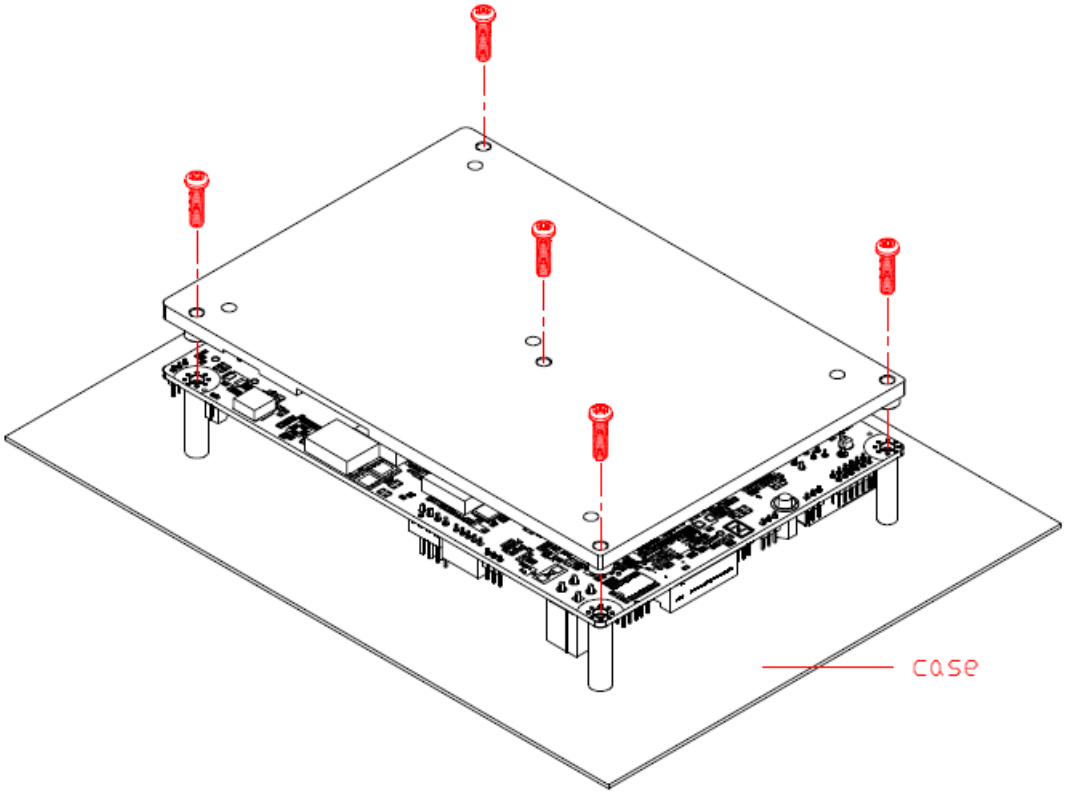
Step3:



2.5 Heatsink/Heat spreader Installation

1. Using 5 screws to lock the Heatsink/Heat spreader from PCB backside.





3.BIOS Setup

3.1 Introduction

The BIOS setup program allows users to modify the basic system configuration. In this following chapter will describe how to access the BIOS setup program and the configuration options that may be changed.

3.2 Starting Setup

AMI BIOS™ is immediately activated when you first power on the computer. The BIOS reads the system information contained in the NVRAM and begins the process of checking out the system and configuring it. When it finishes, the BIOS will seek an operating system on one of the disks and then launch and turn control over to the operating system.

While the BIOS is in control, the Setup program can be activated in one of two ways:
By pressing <ESC> or <Del> immediately after switching the system on, or
By pressing the < ESC> or <Del> key when the following message appears briefly at the left-top of the screen during the POST (Power On Self Test).

Press <ESC> or <Del> to enter SETUP

If the message disappears before you respond and you still wish to enter Setup, restart the system to try again by turning it OFF then ON or pressing the "RESET" button on the system case. You may also restart by simultaneously pressing <Ctrl>, <Alt>, and <Delete> keys.

3.3 Using Setup

In general, you use the arrow keys to highlight items, press <Enter> to select, use the PageUp and PageDown keys to change entries, press <F1> for help and press <Esc> to quit. The following table provides more detail about how to navigate in the Setup program using the keyboard.

Button	Description
↑	Move to previous item
↓	Move to next item
←	Move to the item in the left hand
→	Move to the item in the right hand
Esc key	Main Menu -- Quit and not save changes into NVRAM Status Page Setup Menu and Option Page Setup Menu -- Exit current page and return to Main Menu
+ key	Increase the numeric value or make changes
- key	Decrease the numeric value or make changes
F1 key	General help, only for Status Page Setup Menu and Option Page Setup Menu
F2 key	Previous Values
F3 key	Optimized defaults
F4 key	Save & Exit Setup

- **Navigating Through The Menu Bar**

  Use the left and right arrow keys to choose the menu you want to be in.

Note: Some of the navigation keys differ from one screen to another.

- **To Display a Sub Menu**

  Use the arrow keys to move the cursor to the sub menu you want. Then press <Enter>. A "➢" pointer marks all sub menus.

3.4 Getting Help

Press F1 to pop up a small help window that describes the appropriate keys to use and the possible selections for the highlighted item. To exit the Help Window press <Esc> or the <Enter> key again.

3.5 In Case of Problems

If, after making and saving system changes with Setup, you discover that your computer no longer is able to boot, the AMI BIOS supports an override to the NVRAM settings which resets your system to its defaults.

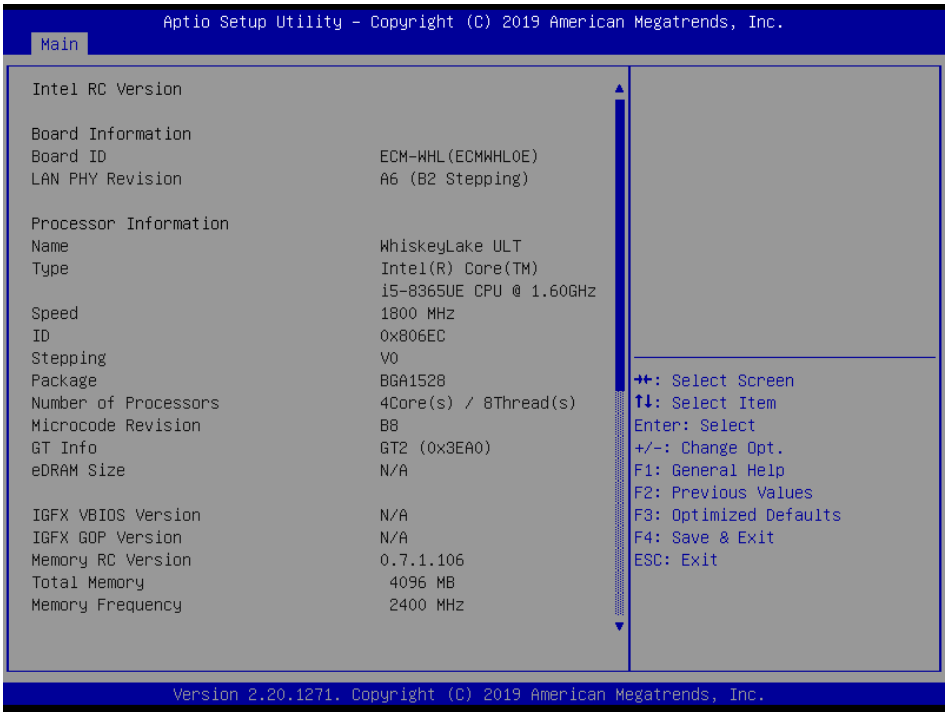
The best advice is to only alter settings which you thoroughly understand. To this end, we strongly recommend that you avoid making any changes to the chipset defaults. These defaults have been carefully chosen by both BIOS Vendor and your systems manufacturer to provide the absolute maximum performance and reliability. Even a seemingly small change to the chipset setup has the potential for causing you to use the override.

3.6 BIOS setup

Once you enter the Aptio Setup Utility, the Main Menu will appear on the screen. The Main Menu allows you to select from several setup functions and exit choices. Use the arrow keys to select among the items and press <Enter> to accept and enter the sub-menu.

3.6.1 Main Menu

This section allows you to record some basic hardware configurations in your computer and set the system clock.



3.6.1.1 System Language

This option allows choosing the system default language.

3.6.1.2 System Date

Use the system date option to set the system date. Manually enter the day, month and year.

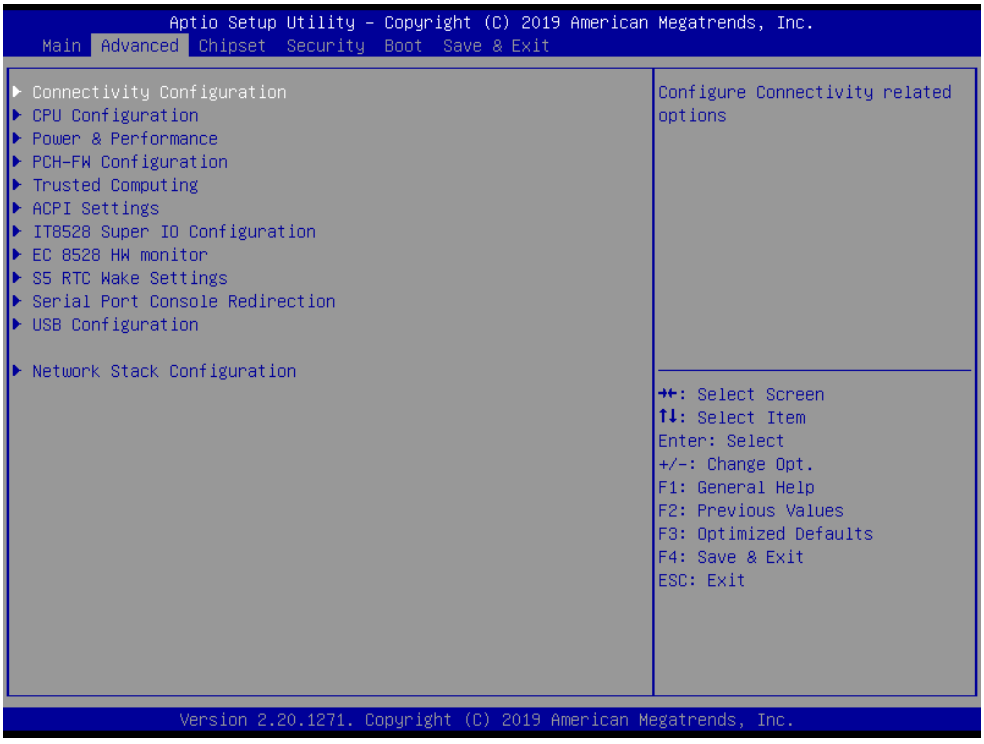
3.6.1.3 System Time

Use the system time option to set the system time. Manually enter the hours, minutes and seconds.

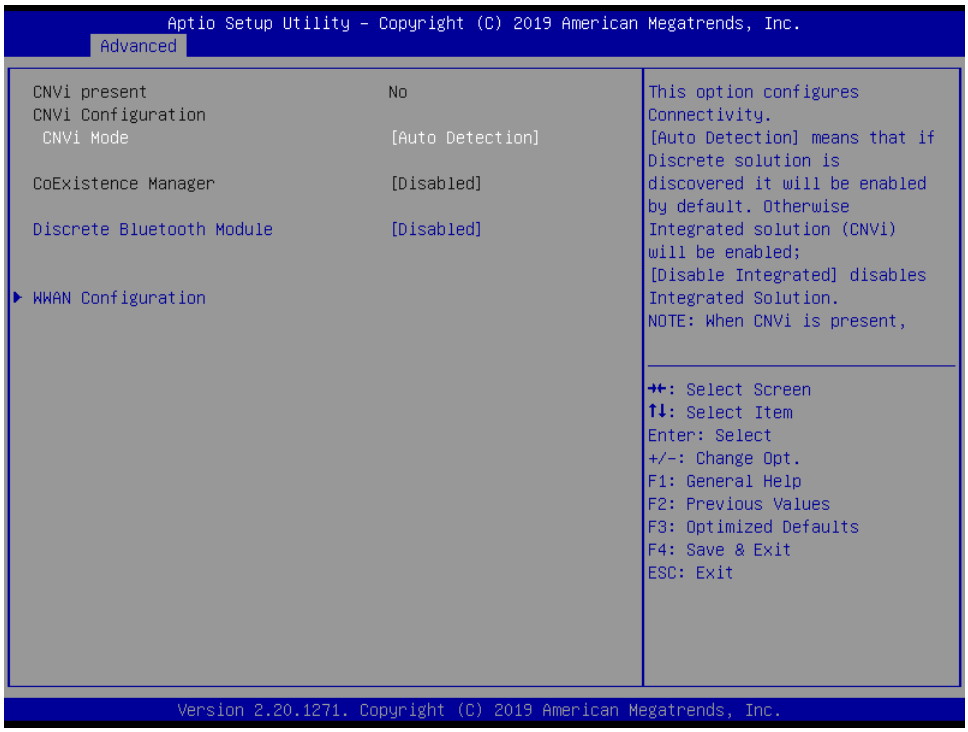
Note: The BIOS setup screens shown in this chapter are for reference purposes only, and may not exactly match what you see on your screen.

3.6.2 Advanced Menu

This section allows you to configure your CPU and other system devices for basic operation through the following sub-menus.

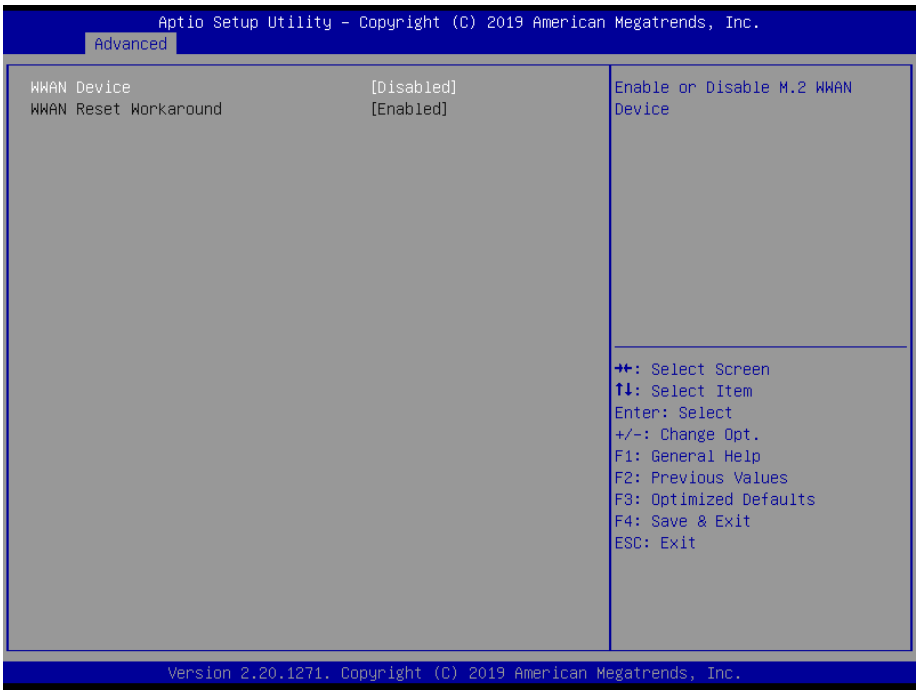


3.6.2.1 Connectivity Configuration



Item	Options	Description
CNVi Mode	Disable Integrated Auto Detection**[Default]**	This option configures Connectivity. [Auto Detection] means that if Discrete solution is discovered it will be enabled by default. Otherwise Integrated solution (CNVi) will be enabled; [Disable Integrated] disables Integrated Solution. NOTE: When CNVi is present, the GPIO pins that are used for radio.
Discrete Bluetooth Module	Disabled**[Default]** Thunder Peak	Seriallo UART0 needs to be enabled to select BT Module.

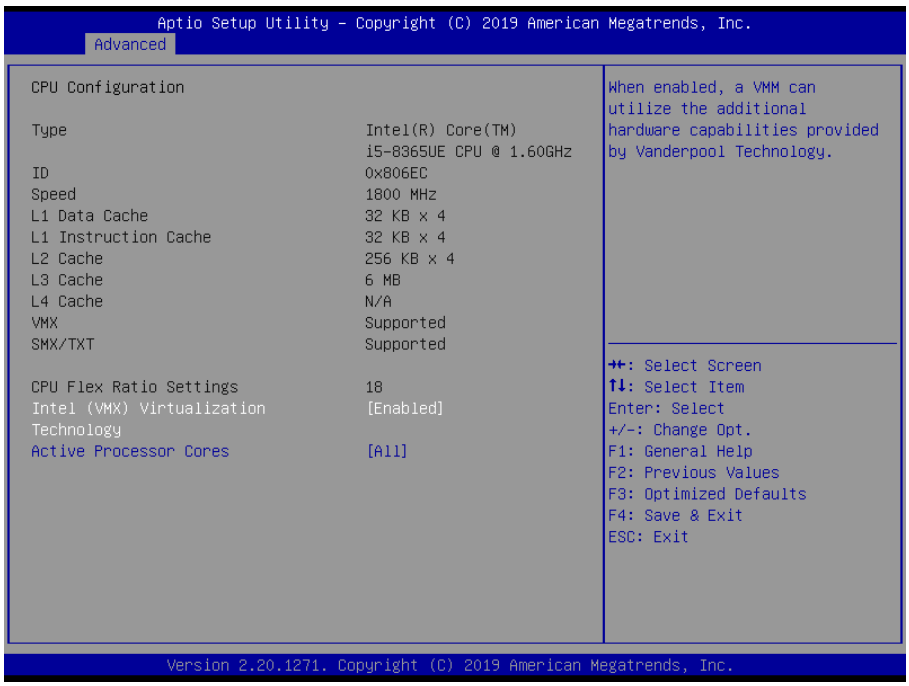
3.6.2.1.1 WWAN Configuration



Item	Option	Description
WWAN Device	Enabled Disabled**[Default]**	Enable or Disable M.2 WWAN Device.

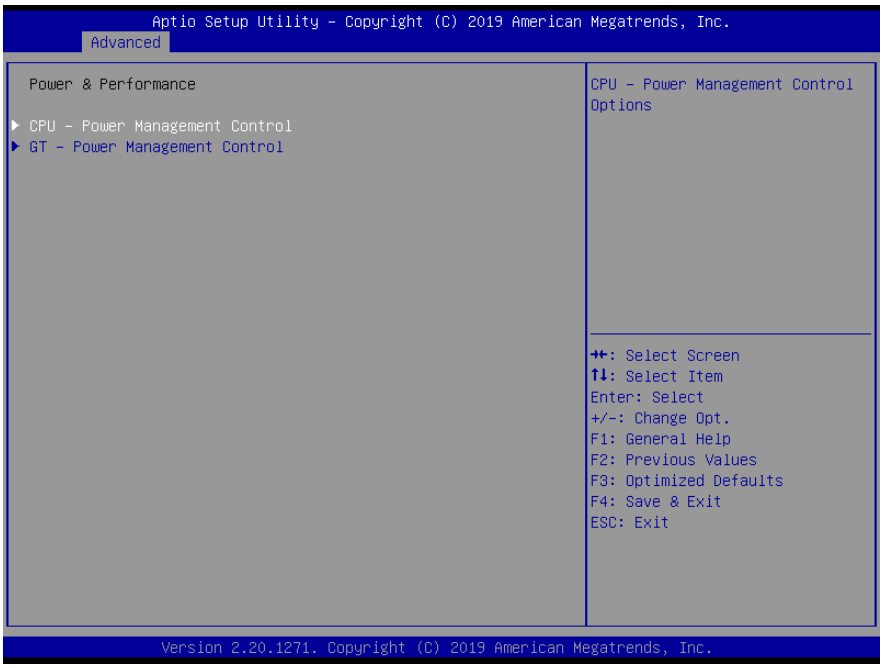
3.6.2.2 CPU Configuration

Use the CPU configuration menu to view detailed CPU specification and configure the CPU.

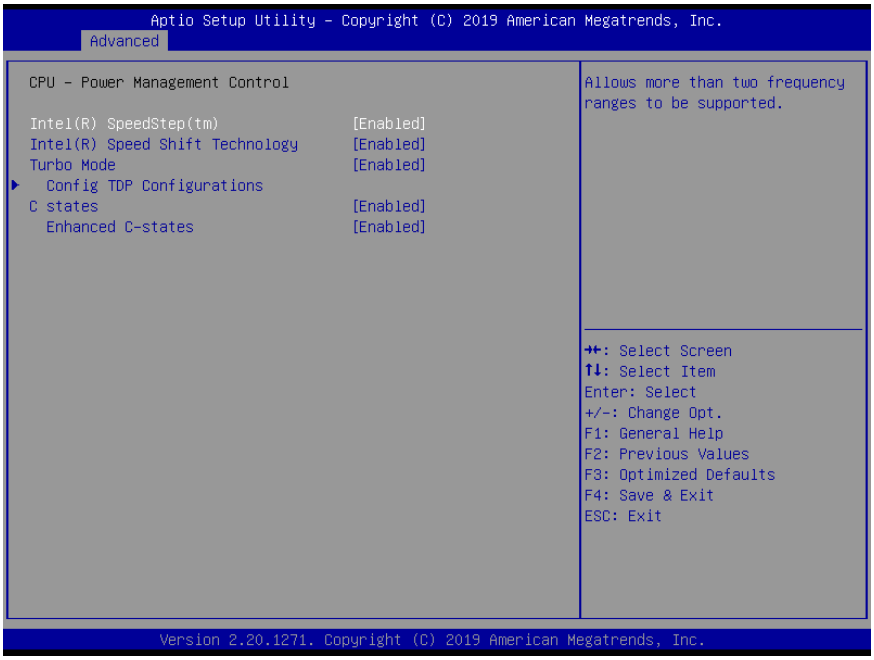


Item	Options	Description
Intel (VMX) Virtualization Technology	Disabled Enabled**[Default]**	When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.
Active Processor Cores	All**[Default]** 1 2 3 4 5 6 7 8	Number of cores to enable in each processor package.

3.6.2.3 Power & Performance

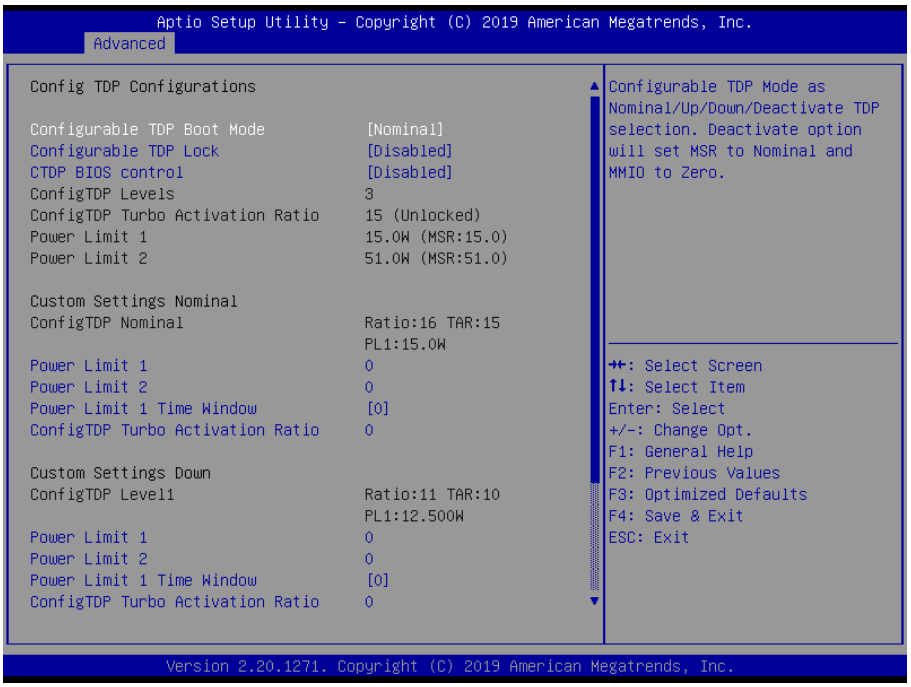


3.6.2.3.1 CPU – Power Management Control



Item	Option	Description
Intel® SpeedStep™	Enabled**[Default]**, Disabled	Allows more than two frequency ranges to be supported.
Intel® Speed Shift Technology	Enabled**[Default]**, Disabled	Eanble/Disable Intel® Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states.
Turbo Mode	Enabled**[Default]**, Disabled	Enable/Disable processor Turbo Mode (requires Intel Speed Step or Intel Speed Shift to be available and enabled).
C States	Enabled**[Default]**, Disabled	Enable/Disable CPU Power Management.
Enhanced C-States	Enabled**[Default]**, Disabled	Enable/Disable C1E. When enabled, CPU will switch to minimum speed when all cores enter C-State.

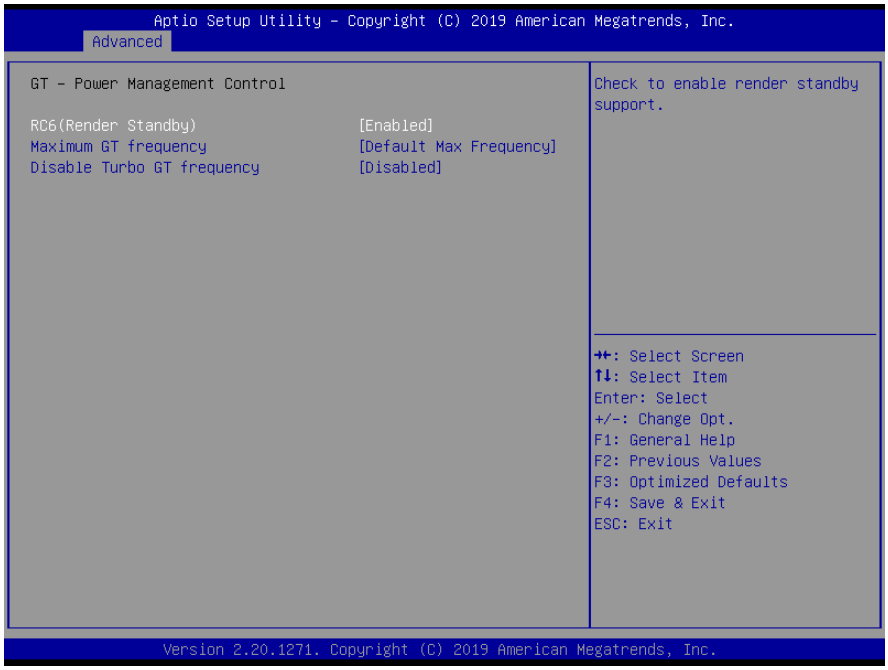
3.6.2.3.1.1 Config TDP Configurations



Item	Option	Description
Configurable TDP Boot Mode	Nominal**[Default]**, Down Up Deactivate	Configurable TDP Mode as Nominal/Up/Down/Deactivate TDP selection. Deactivate option will set MSR to Nominal and MMIO to Zero.
Configurable TDP Lock	Disabled**[Default]** Enabled	Configurable TDP Mode Lock sets the Lock bits on TURBO_ACTIVATION_RATIO and CONFIG_TDP_CONTROL. Custom ConfigTDP Count will be forced to 1 and Custom ConfigTDP Boot Index will be forced to 0.
CTDP BIOS control	Disabled**[Default]** Enabled	Enable CTDP control via runtime ACPI BIOS methods. This "BIOS only "feature does not require EC or driver support.
Power Limit 1	0	Power Limit 1 in Milli Watts. BIOS will round to the nearest 1/8W when programming. 0= no custom override. For 12.50W, enter 12500. Overclocking SKU: Value must be between Max and Min Power Limits (specified by PACKAGE_POWER_SKU_MSR). Other SKUs: This value must be between Min Power.
Power Limit 2	0	Power Limit 2 value in Milli Watts. BIOS will round to the nearest 1/8W when programming. 0= no custom override. For 12.50W, enter 12500. Processor applies

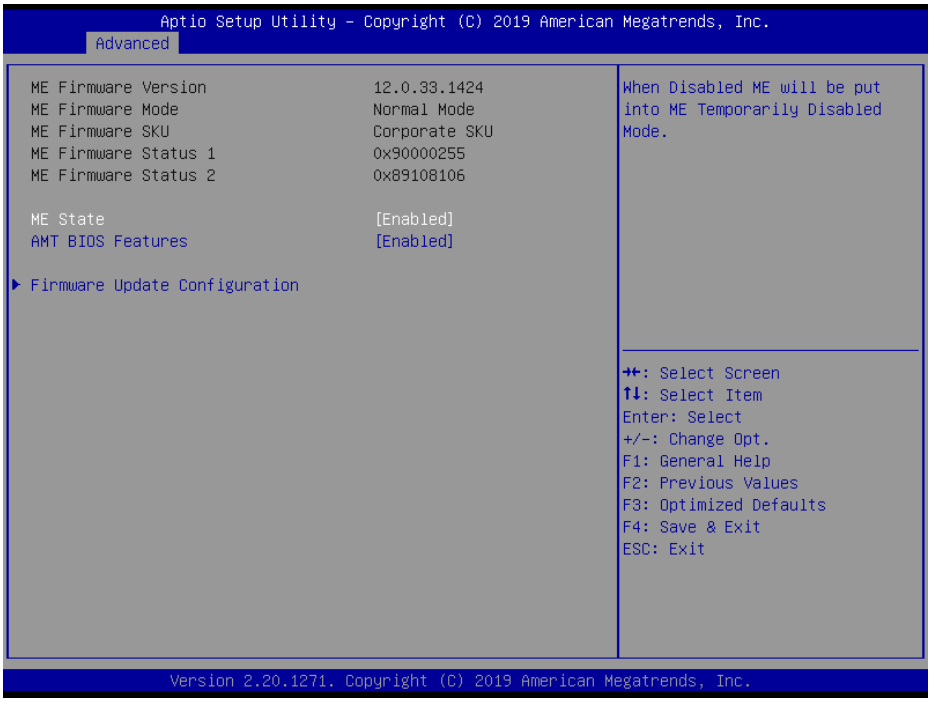
		control policies such that the package power does not exceed this limit.
Power Limit 1 Time Window	0**[Default]**/1/2/3/4/5/6/7/8/10/12/14/16/20/24/28/32/40/48/56/64/80/96/112/128	Power Limit 1 Time Window value in seconds. The value may vary from 0 to 128.0 = use default value (28 sec). Defines time window which TDP value should be maintained.
ConfigTDP Turbo Activation Rtaio	0	Custom value for Turbo Activation Ratio. Needs to be configured with valid values from LFM to Max Turbo. 0 means don't use custom value.

3.6.2.3.2 GT – Power Management Control



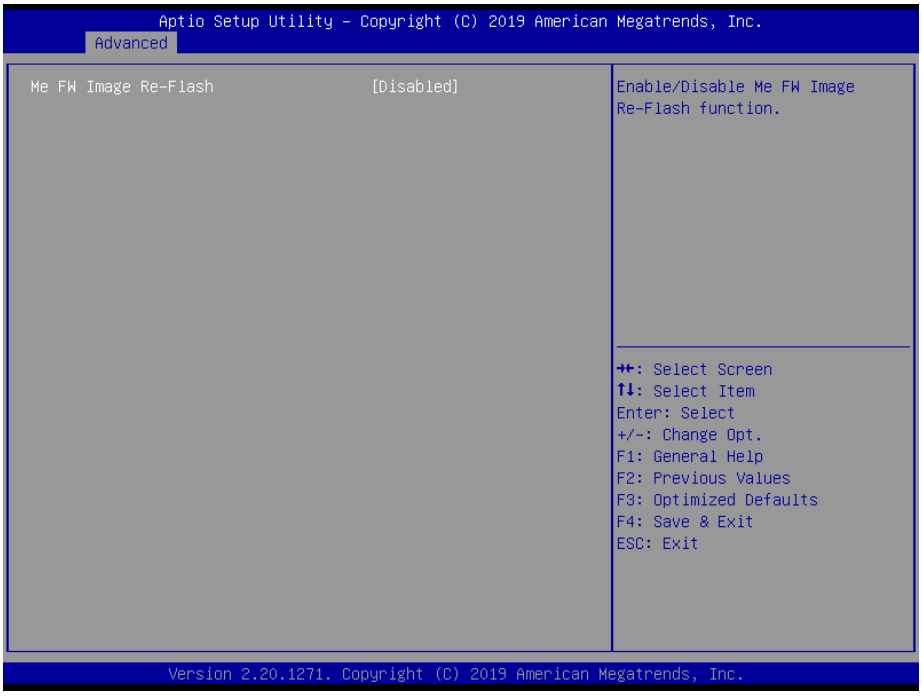
Item	Option	Description
RC6(Render Standby)	Enabled**[Default]**, Disabled	Check to enable render standby support.
Maximum GT frequency	Default Max Frequency**[Default]** 100Mhz/150Mhz/200Mhz/250Mhz/300Mhz/350Mhz/400Mhz/450Mhz/500Mhz/550Mhz/600Mhz/650Mhz/700Mhz/750Mhz/800Mhz/850Mhz/900Mhz/950Mhz/1000Mhz/1050Mhz/1100Mhz/1150Mhz/1200Mhz	Auto Updated.
Disable Turbo GT frequency	Enabled Disabled**[Default]**	Enabled: Disables Turbo GT frequency. Disabled: GT frequency is not limited.

3.6.2.4 PCH-FW Configuration



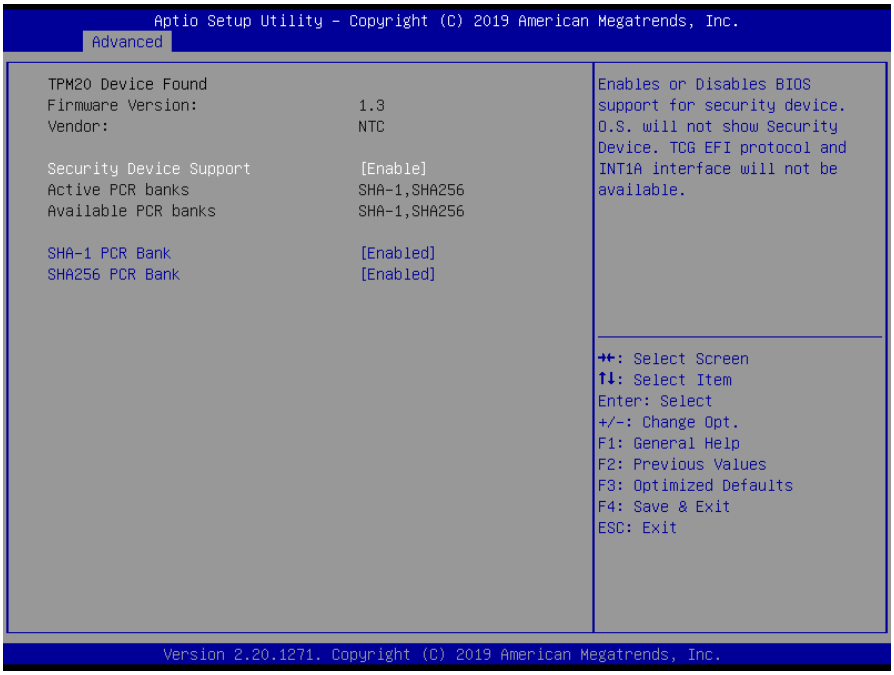
Item	Options	Description
ME State	Disabled, Enabled**[Default]**	When Disabled ME will be put into ME Temporarily Disabled Mode.
AMT BIOS Features	Disabled, Enabled**[Default]**	When disabled AMT BIOS Features are no longer supported and user is no longer able to access MEBx Setup. Note: This option does not disable Manageability Features in FW.

3.6.2.4.1 Firmware Update Configuration



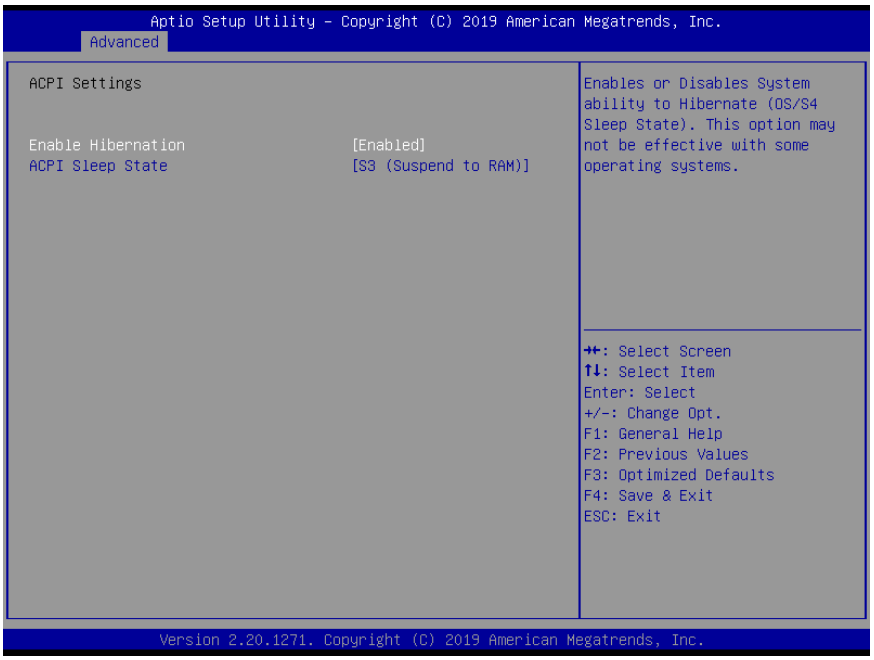
Item	Option	Description
ME FW Image Re-Flash	Disabled **[Default]**, Enabled	Enable/Disable Me FW Image Re-Flash function.

3.6.2.5 Trusted Computing



Item	Options	Description
Security Device Support	Disable, Enable**[Default]**	Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.
SHA-1 PCR Bank	Disable, Enable**[Default]**	Enables or Disables SHA-1 PCR Bank.
SHA256 PCR Bank	Disable, Enable**[Default]**	Enables or Disables SHA256 PCR Bank.

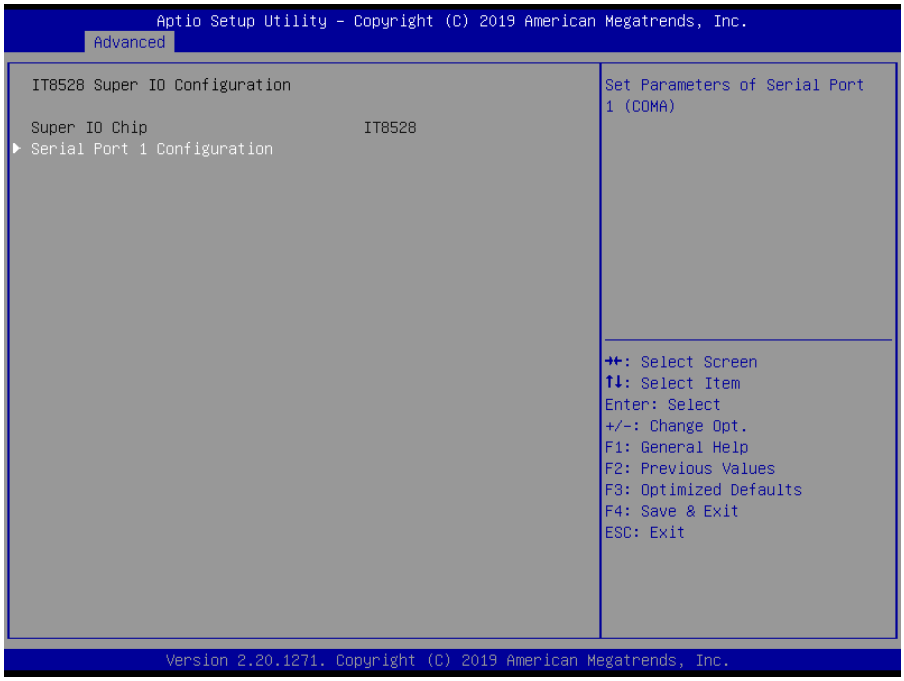
3.6.2.6 APCI Settings



Item	Options	Description
Enable Hibernation	Disabled Enabled**[Default]**,	Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may not be effective with some OS.
ACPI Sleep State	Suspend Disabled, S3 (Suspend to RAM)**[Default]**	Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.

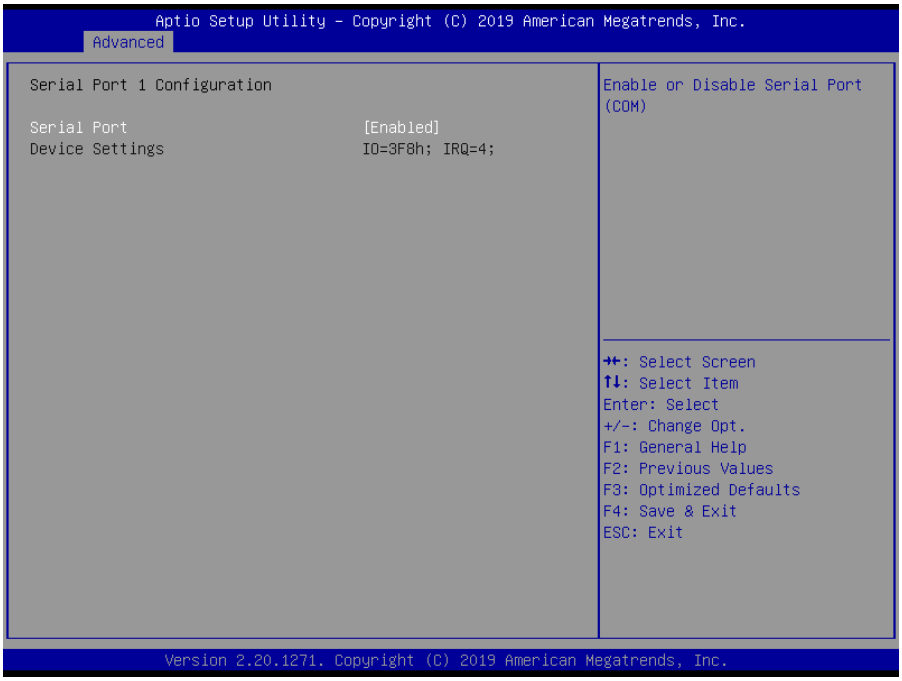
3.6.2.7 IT8528 Super IO Configuration

You can use this item to set up or change the IT8528 Super IO configuration for serial ports. Please refer to 3.6.2.7.1 for more information.



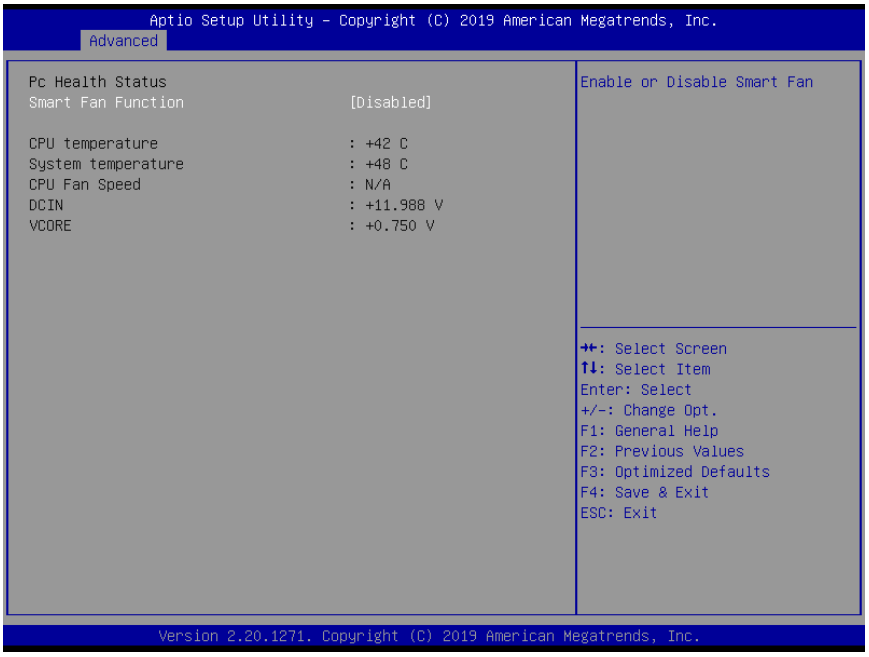
Item	Description
Serial Port 1 Configuration	Set Parameters of Serial Port 1 (COMA).

3.6.2.7.1 Serial Port 1 Configuration



Item	Option	Description
Serial Port	Enabled**[Default]**, Disabled	Enable or Disable Serial Port (COM).

3.6.2.8 HW Monitor

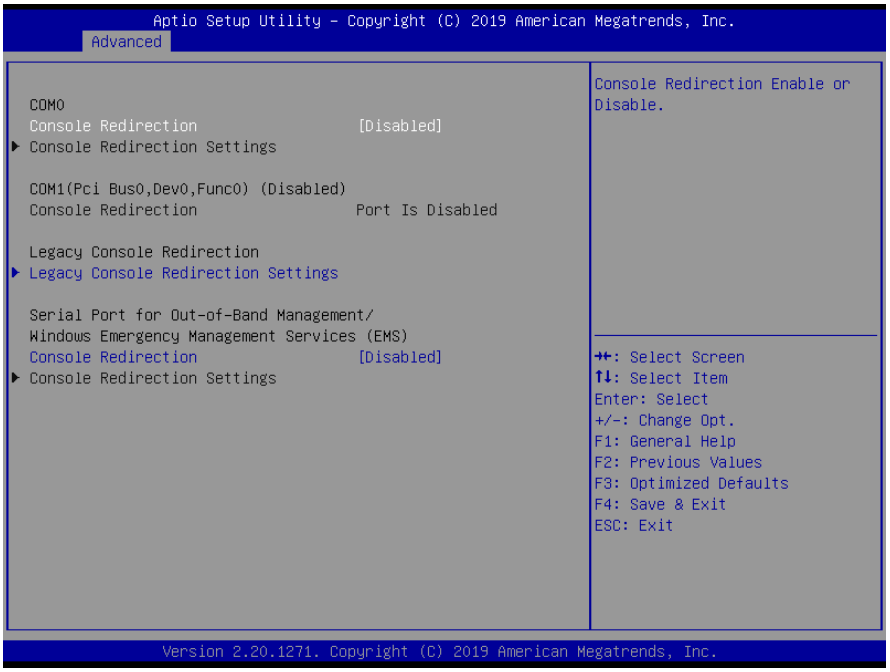


Item	Options	Description
Smart Fan Function	Enabled, Disabled**[Default]**	Enables or Disables Smart Fan.

3.6.2.9 S5 RTC Wake Settings

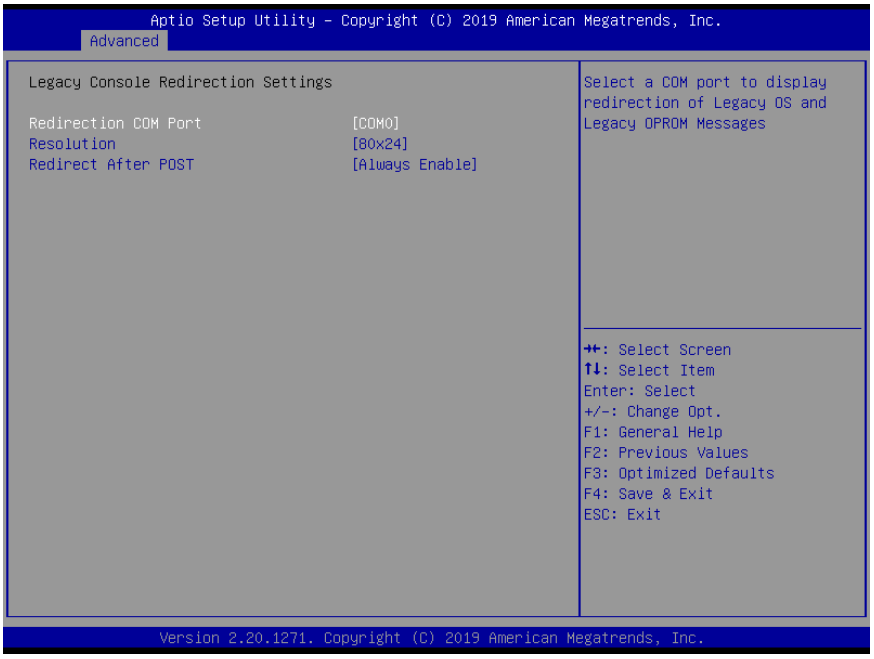
Item	Options	Description
Wake system from S5	Disabled**[Default]**, Fixed Time Dynamic Time	Enable or disable System wake on alarm event. Select Fixed Time, system will wake on the hr::min::sec specified. Select Dynamic Time, System will wake on the current time + Increase minute(s).

3.6.2.10 Serial Port Console Redirection



Item	Options	Description
Console Redirection	Disabled**[Default]**, Enabled	Console Redirection Enable or Disable.

3.6.2.10.1 Legacy Console Redirection Settings

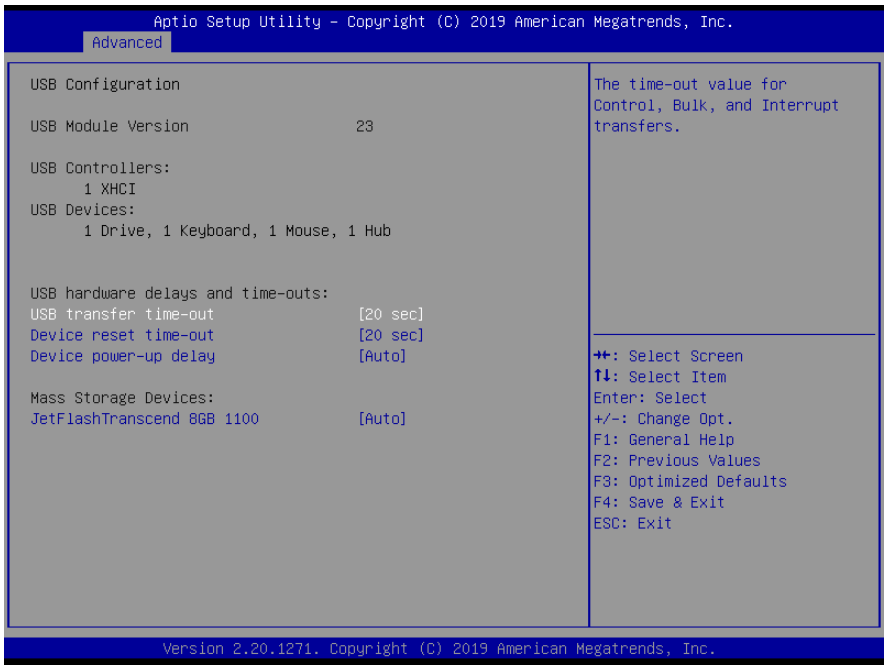


Item	Option	Description
Redirection COM Port	COM0**[Default]**	Select a COM port to display redirection of Legacy OS and Legacy OPROM Messages.
Resolution	80x24**[Default]** 80x25	On Legacy OS, the Number of Rows and Columns supported redirection.

Redirect After POST	Always Enable**[Default]** BootLoader	When Bootloader is selected, then Legacy Console Redirection is disabled before booting to legacy OS. When Always Enable is selected, then Legacy Console Redirection is enabled for legacy OS. Default setting for this option is set to Always Enable.

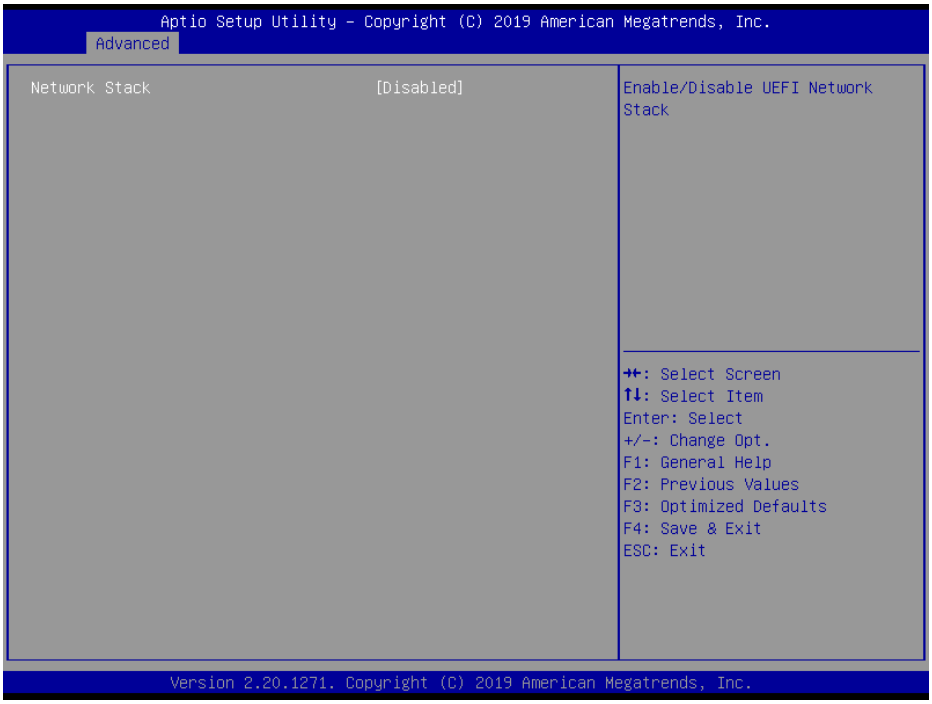
3.6.2.11 USB Configuration

The USB Configuration menu helps read USB information and configures USB settings.



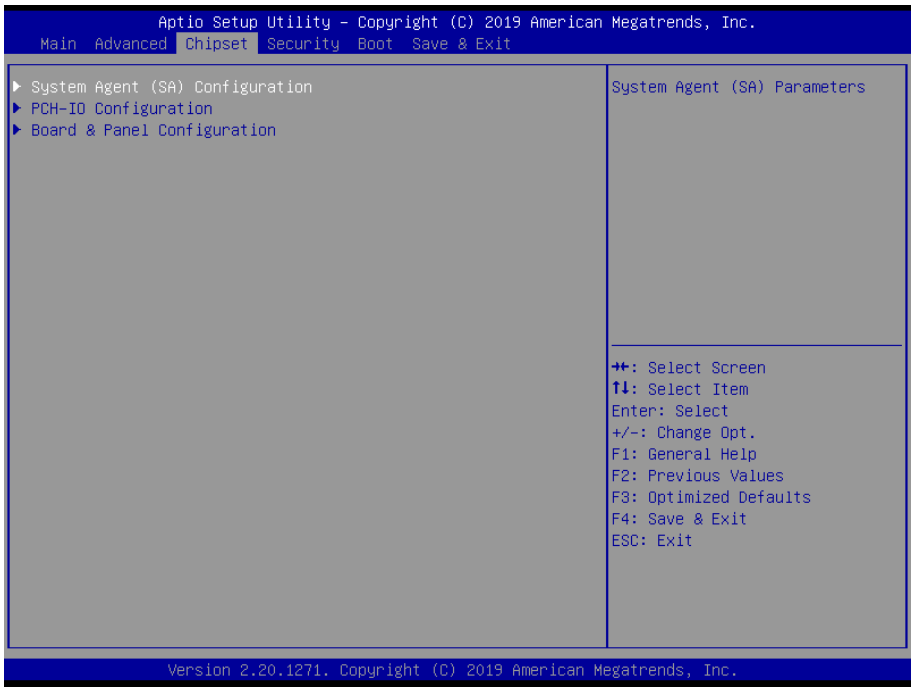
Item	Options	Description
USB transfer time-out	1 sec 5 sec 10 sec 20 sec**[Default]**	The time-out value for Control, Bulk, and Interrupt transfers.
Device reset time-out	10 sec 20 sec**[Default]** 30 sec 40 sec	USB mass storage device Start Unit command time-out.
Device power-up delay	Auto**[Default]** Manual	Maximum time the device will take before it properly reports itself to the Host Controller. 'Auto' uses default value: for a Root port it is 100ms, for a Hub port the delay is taken form Hub descriptor.
Mass Storage Devices	Auto**[Default]** Floppy Forced FDD Hard Disk CD-ROM	Mass storage device emulation type. 'AUTO' enumerates devices according to their media format. Optical drives are emulated as 'CDROM', drives with no media will be emulated according to a drive type.

3.6.2.12 Network Stack Configuration

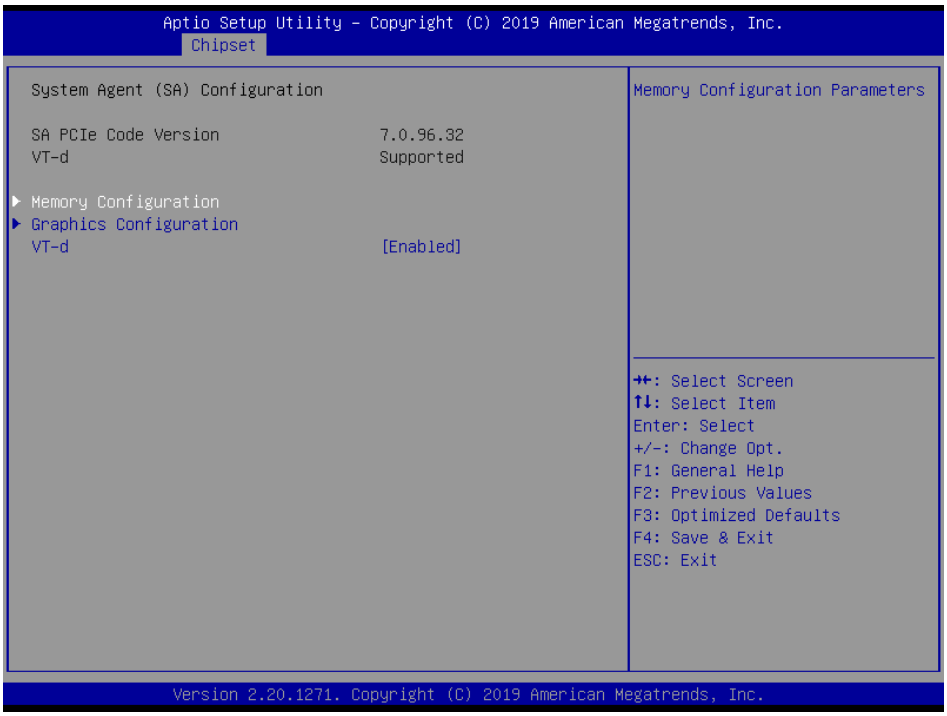


Item	Options	Description
Network Stack	Enabled Disabled**[Default]**	Enable/Disable UEFI Network Stack.

3.6.3 Chipset

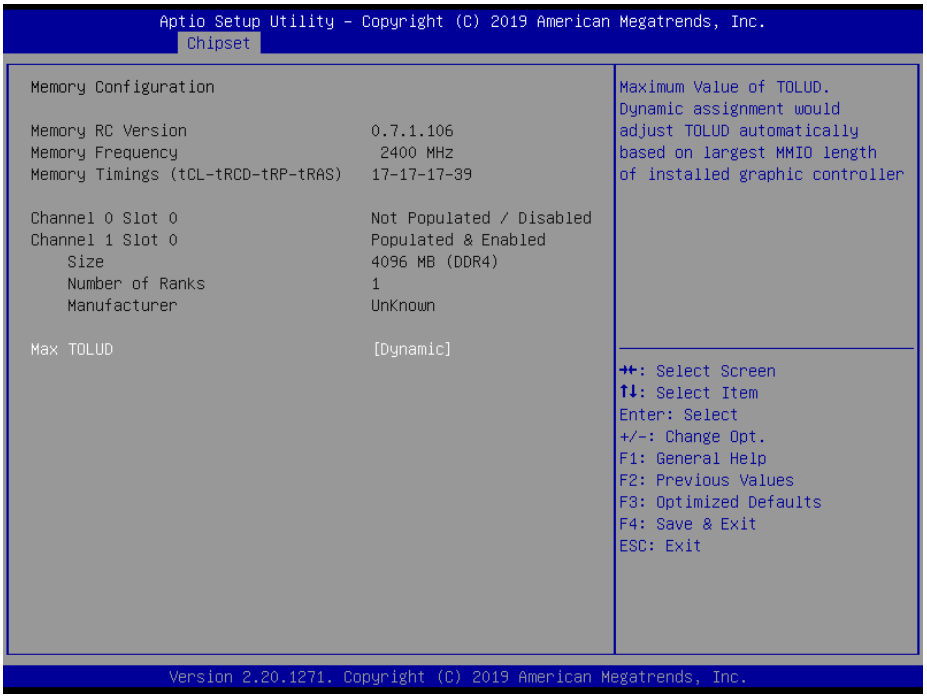


3.6.3.1 System Agent (SA) Configuration



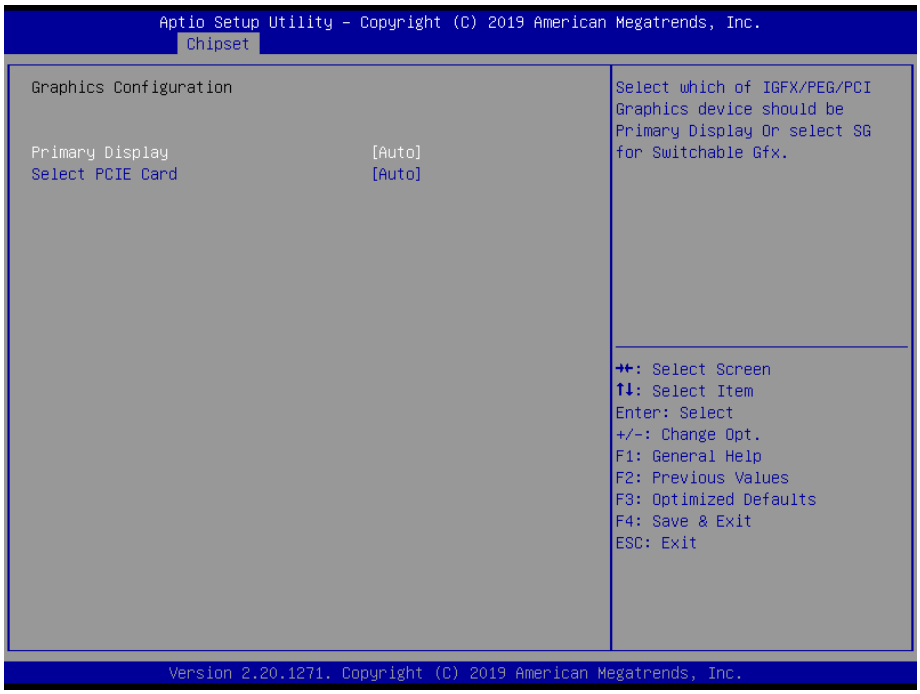
Item	Option	Description
VT-d	Enabled**[Default]** Disabled	VT-d capability.

3.6.3.1.1 Memory Configuration



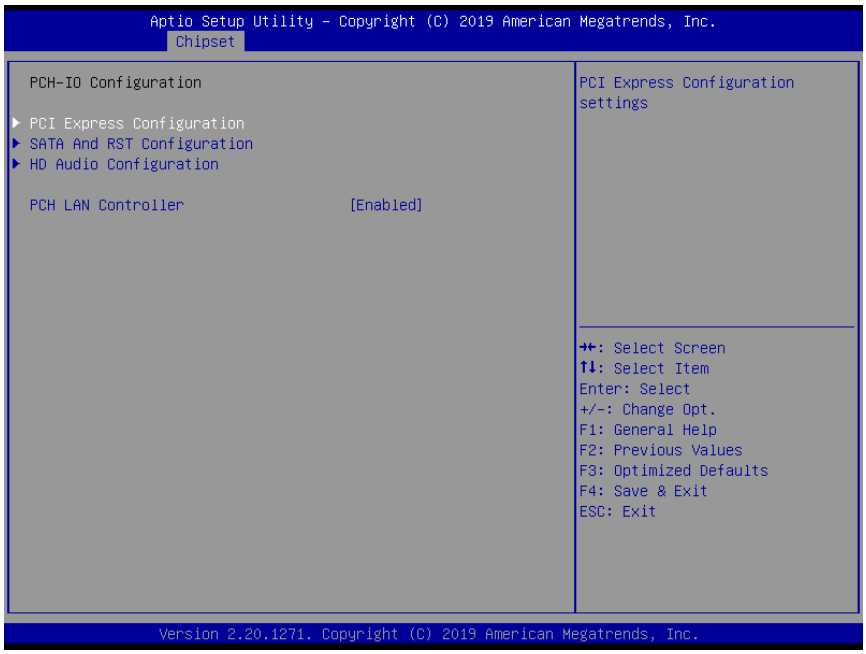
Item	Option	Description
Max TOLUD	Dynamic**[Default]** 1 GB 1.25 GB 1.5 GB 1.75 GB 2 GB 2.25 GB 2.5 GB 2.75 GB 3 GB	Maximum Value of TOLUD. Dynamic assignment would adjust TOLUD automatically based on largest MMIO length of installed graphic controller.

3.6.3.1.2 Graphics Configuration



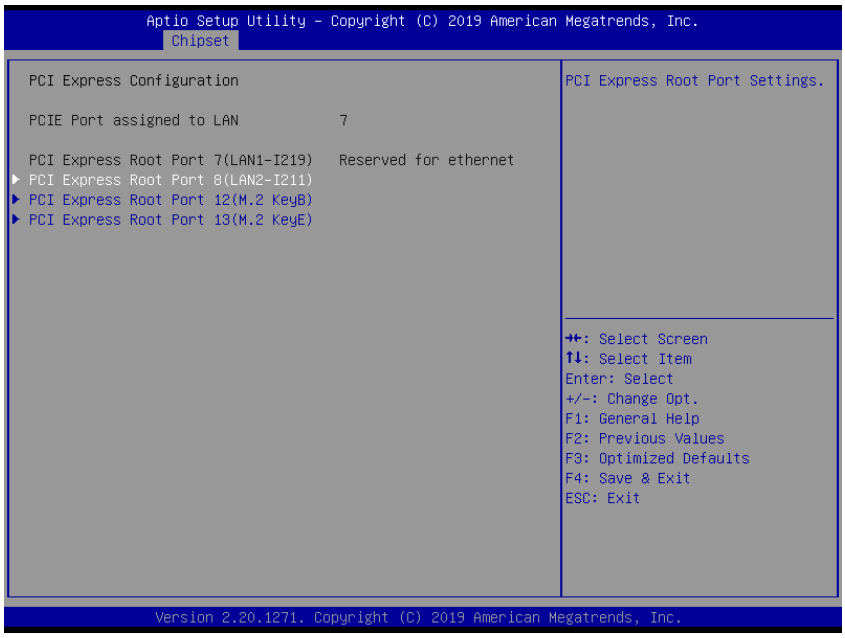
Item	Option	Description
Primary Display	Auto**[Default]** IGFX PEG PCI SG	Select which of IGFX/PEG/PCI Graphics device should be Primary Display Or select SG for Switchable Gfx.
Select PCIE Card	Auto**[Default]** Elk Creek 4 PEG Eval	Select the card used on the platform Auto: Skip GPIO based Power Enable to dGPU Elk Creek 4: DGPU Power Enable = ActiveLow PEG Eval : DGPU Power Enable= ActiveHigh.

3.6.3.2 PCH-IO Configuration

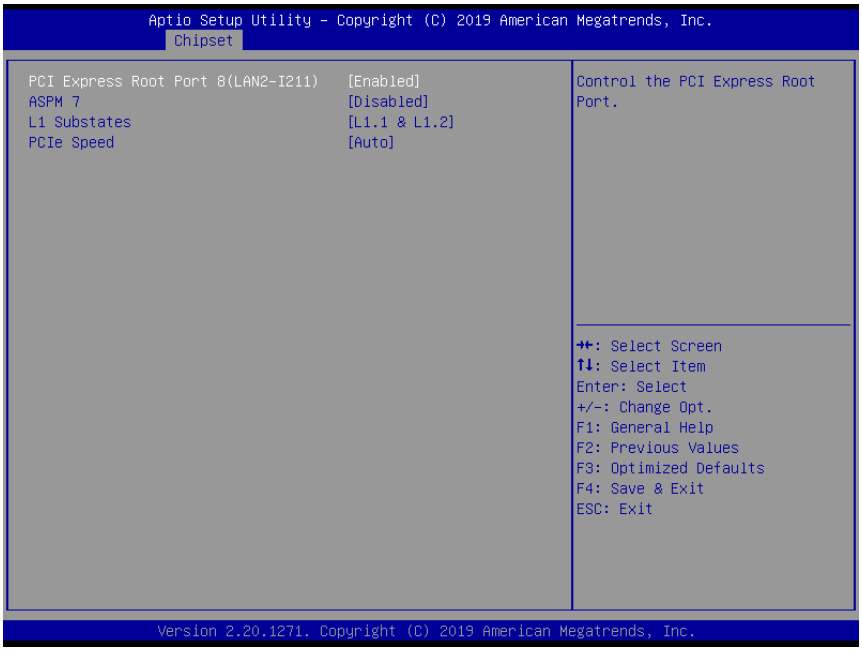


Item	Option	Description
PCH LAN Controller	Disabled Enabled**[Default]**	Enable/Disable onboard NIC.

3.6.3.2.1 PCI Express Configuration



3.6.3.2.1.1 PCI Express Root Port 8(LAN2-I211)

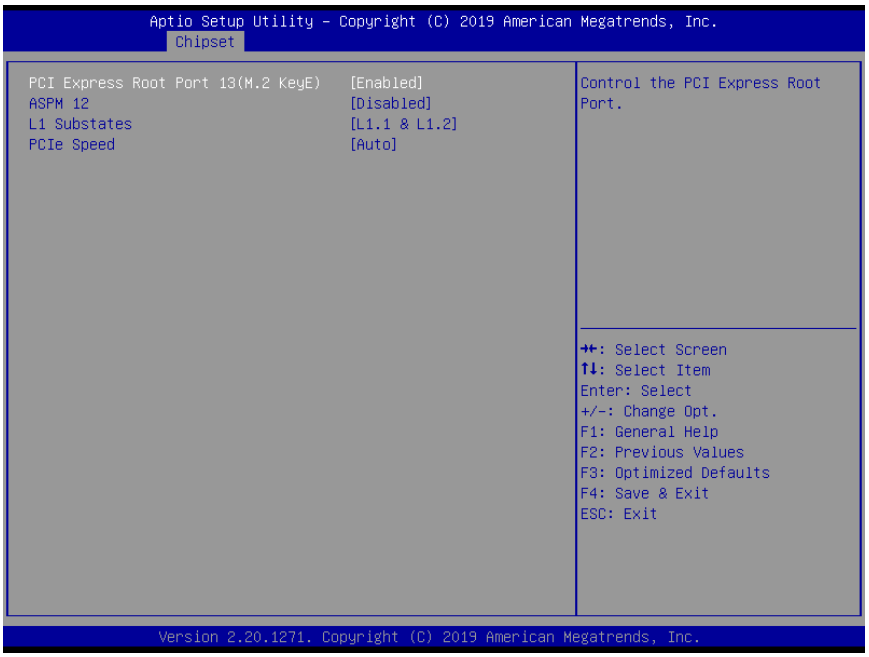


Item	Option	Description
PCI Express Root Port 8(LAN2-I211)	Enabled**[Default]**, Disabled	Control the PCI Express Root Port.
ASPM7	Disabled**[Default]**, L0s L1 L0sL1 Auto	Set the ASPM Level: Force L0s – Force all links to L0s State AUTO – BIOS auto configure DISABLE – Disables ASPM.
L1 Substates	Disabled, L1.1 L1.1 & L1.2**[Default]**	PCI Express L1 Substates settings.
PCIe Speed	Auto**[Default]** Gen1 Gen2 Gen3	Configure PCIe Speed.

3.6.3.2.1.2 PCI Express Root Port 12(M.2 KeyB)

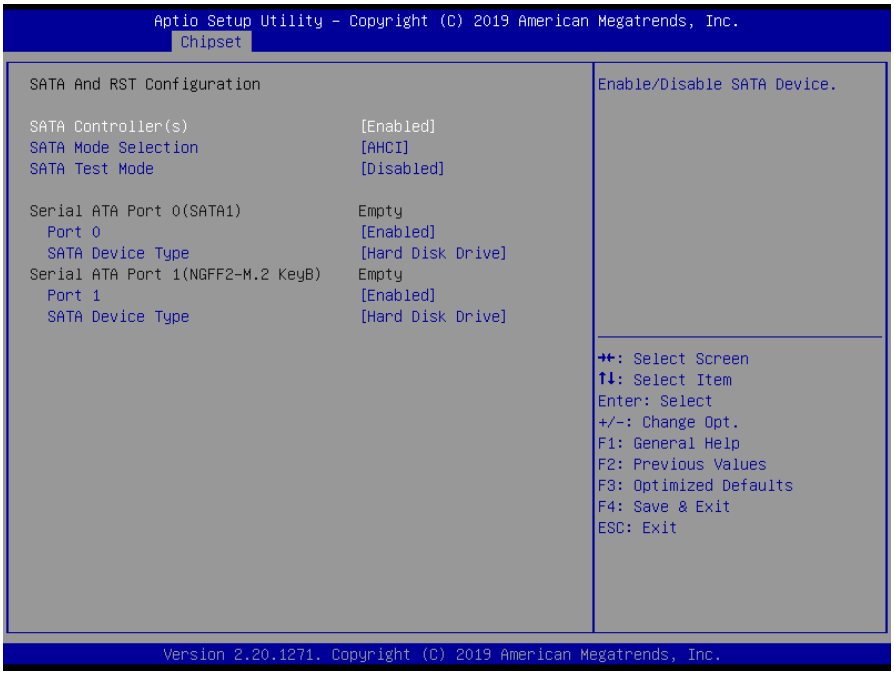
Item	Option	Description
PCI Express Root Port 12(M.2 KeyB)	Enabled**[Default]**, Disabled	Control the PCI Express Root Port.
ASPM11	Disabled**[Default]**, L0s L1 L0sL1 Auto	Set the ASPM Level: Force L0s – Force all links to L0s State AUTO – BIOS auto configure DISABLE – Disables ASPM.
L1 Substates	Disabled, L1.1 L1.1 & L1.2**[Default]**	PCI Express L1 Substates settings.
PCIe Speed	Auto**[Default]** Gen1 Gen2 Gen3	Configure PCIe Speed.

3.6.3.2.1.3 PCI Express Root Port 13(M.2 KeyE)



Item	Option	Description
PCI Express Root Port 13(M.2 KeyE)	Enabled**[Default]**, Disabled	Control the PCI Express Root Port.
ASPM12	Disabled**[Default]**, L0s L1 L0sL1 Auto	Set the ASPM Level: Force L0s – Force all links to L0s State AUTO – BIOS auto configure DISABLE – Disables ASPM.
L1 Substates	Disabled, L1.1 L1.1 & L1.2**[Default]**	PCI Express L1 Substates settings.
PCIe Speed	Auto**[Default]** Gen1 Gen2 Gen3	Configure PCIe Speed.

3.6.3.2.2 SATA And RST Configuration



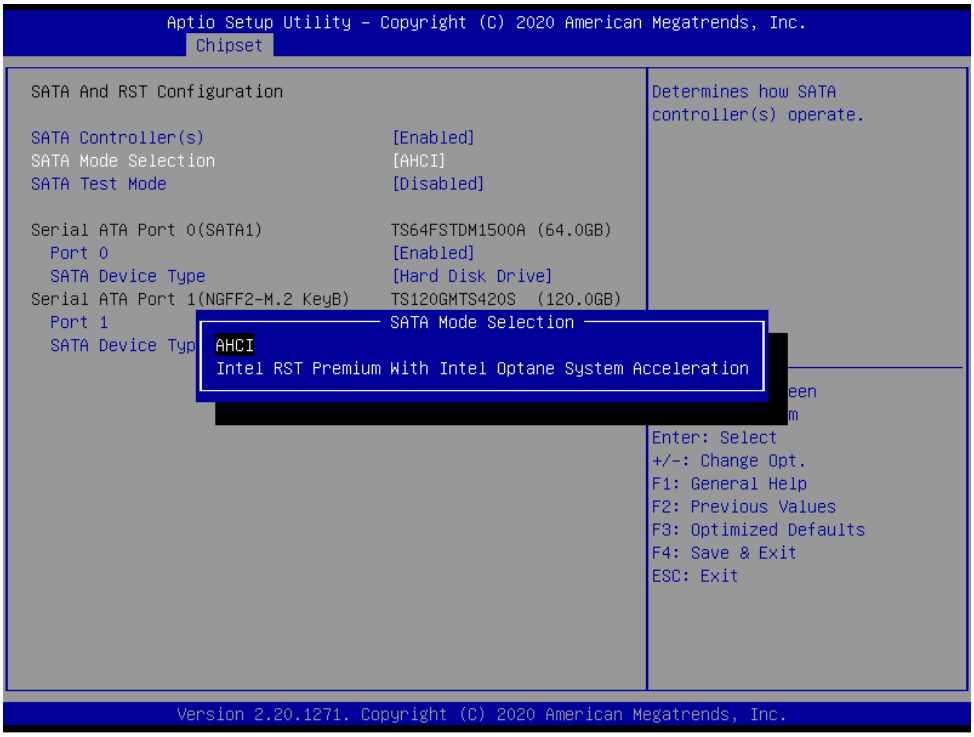
Item	Options	Description
SATA Controller(s)	Enabled**[Default]** Disabled,	Enable/Disable SATA Device.
SATA Mode Selection	AHCI**[Default]**, RAID/Intel RST	Determines how SATA controller(s) operate.
SATA Test Mode	Enabled Disabled**[Default]**	Test Mode Enable/Disable (Loop Back).
Port 0	Enabled**[Default]** Disabled	Enable or Disable SATA Port.
SATA Device Type	Hard Disk Drive**[Default]** Solid State Drive	Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.
Port 1	Enabled**[Default]** Disabled	Enable or Disable SATA Port.
SATA Device Type	Hard Disk Drive**[Default]** Solid State Drive	Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.

Note: RAID/RST Mode support RAID 0 & RAID 1.
To set RAID configuration, please follow the instruction below.

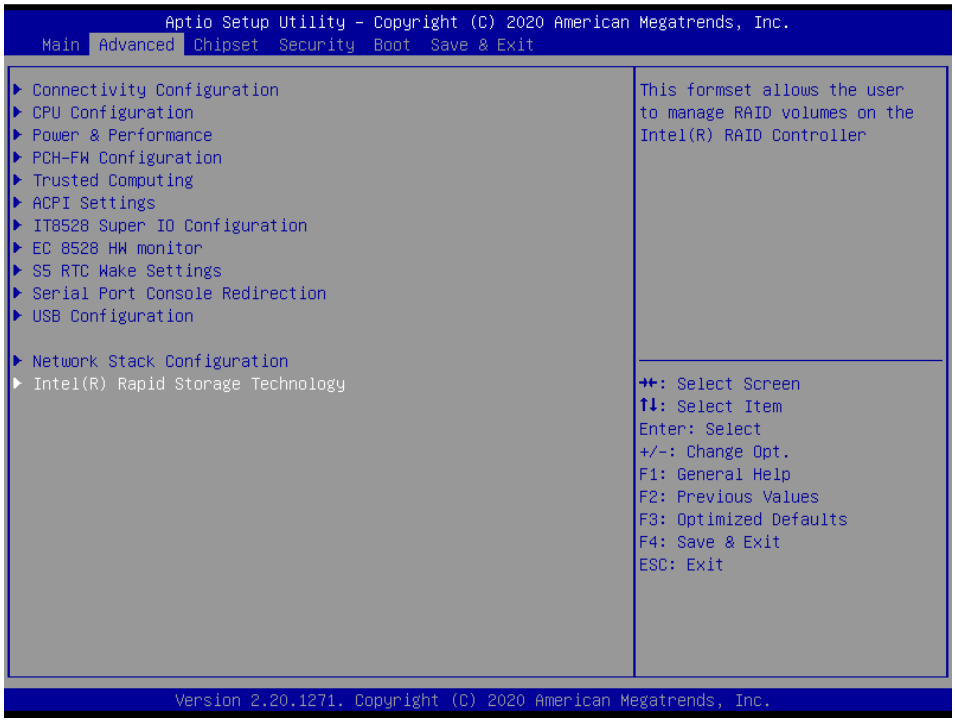
- **Set RAID 0 (DATA Striping)**

Step 1:

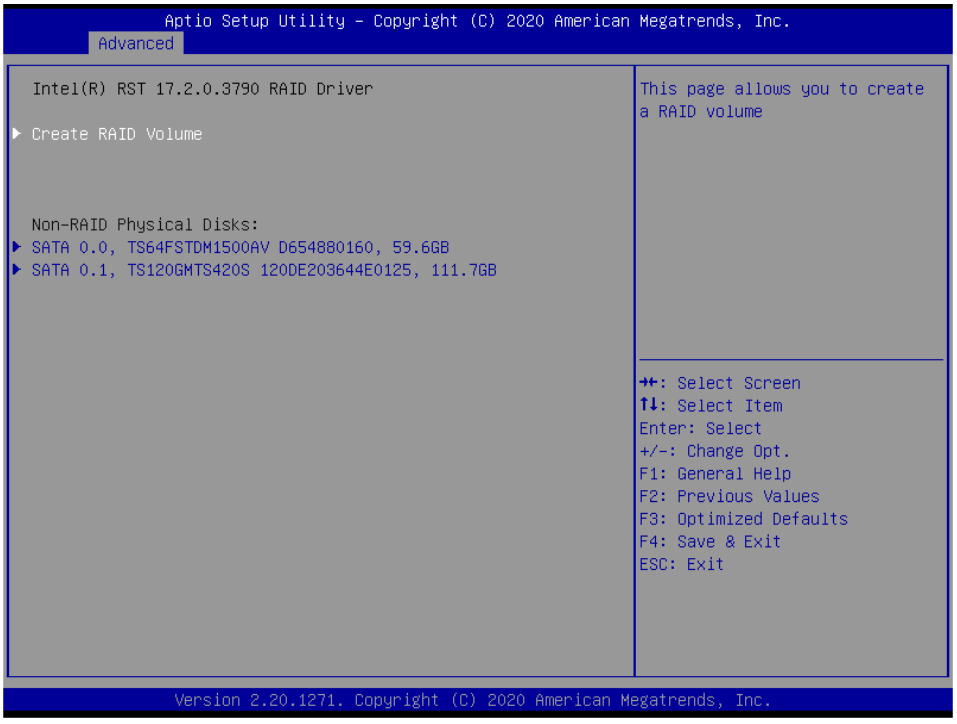
- Select "SATA mode selection" as "Intel RST Premium with Intel Optane System Acceleration"
- Save and Reset system



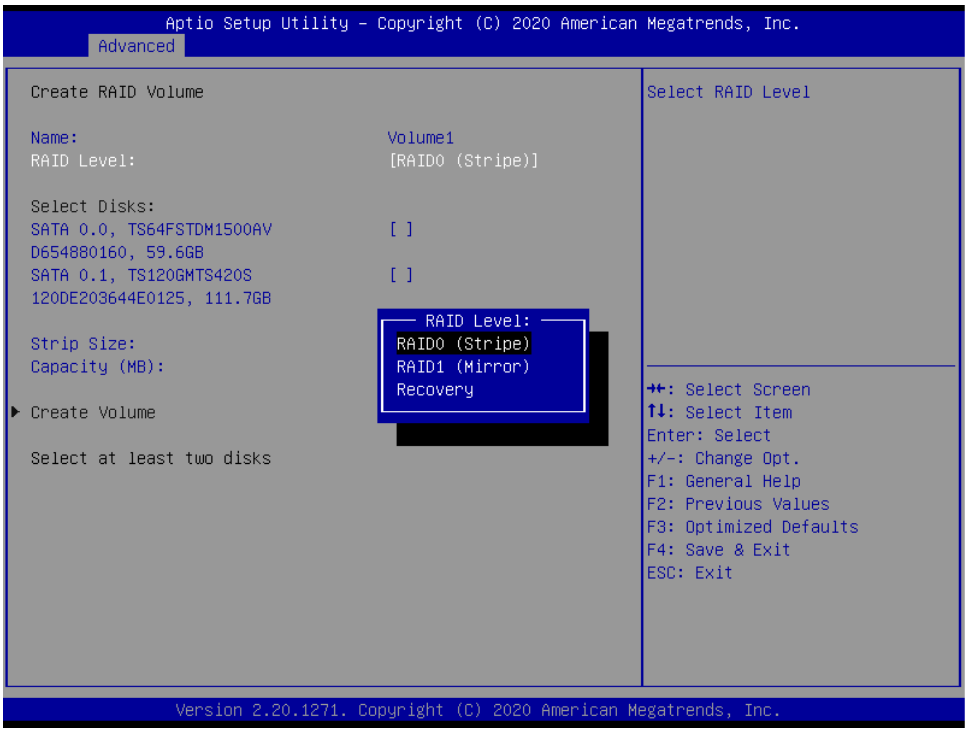
Step 2: Enter "Intel® Rapid Storage Technology"



Step 3: Enter "Create RAID Volume"

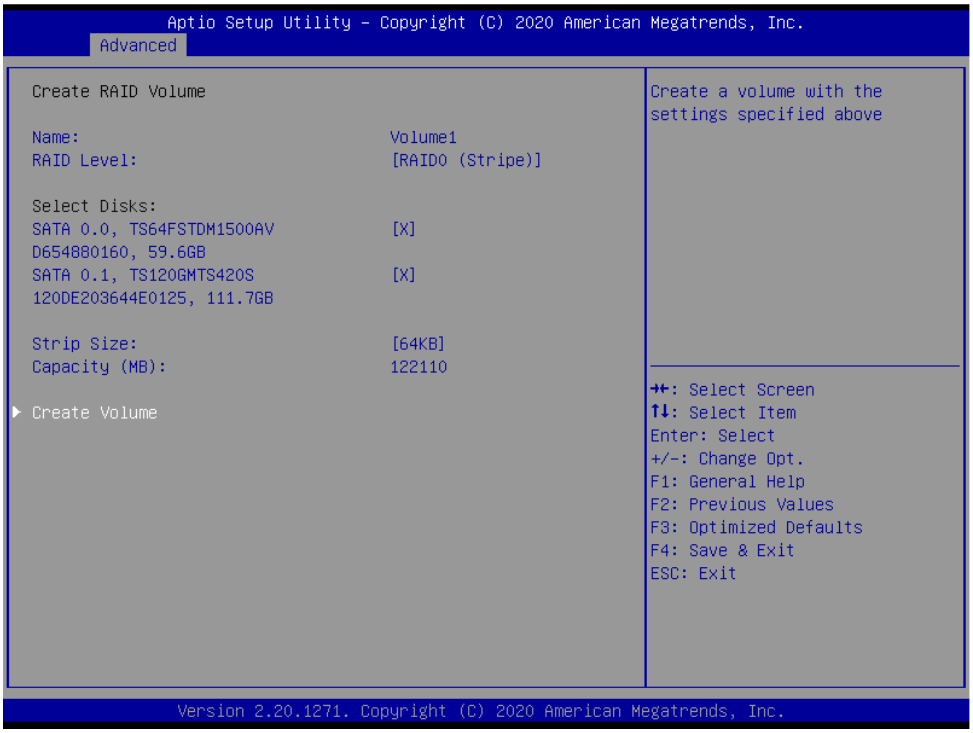


Step 4: Enter "Name "as "name of raid "and Set "RAID Level" as "RAID0"

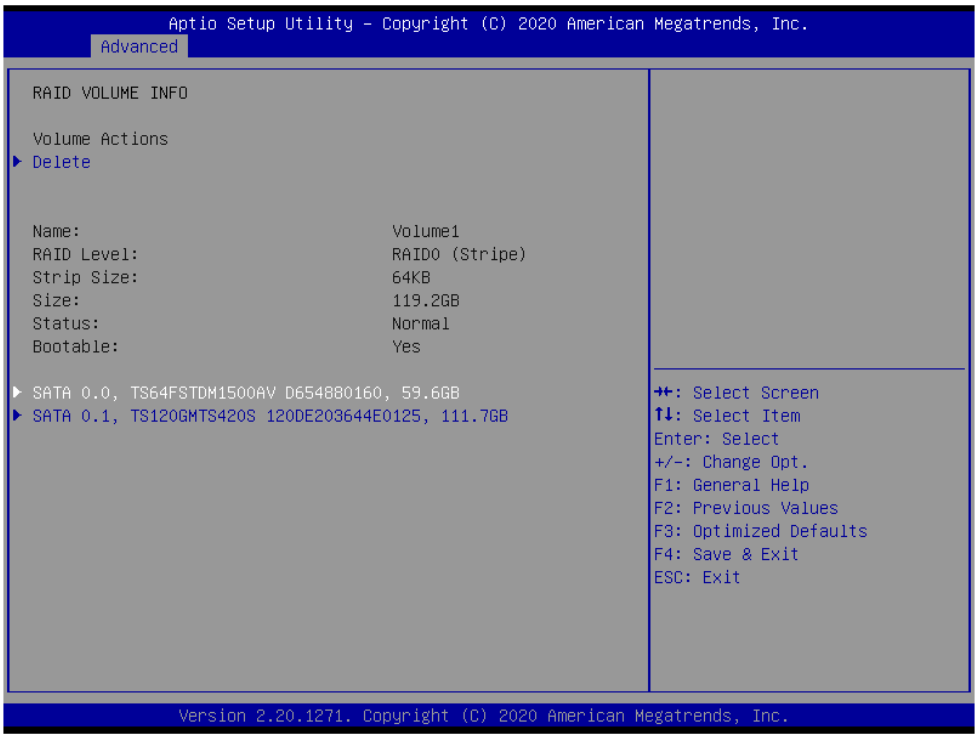


Step 5:

- Select disk SATA 0.0 and SATA 0.1
- Select "Strip Size"
- Select "Capacity"
- Enter "Create Volume"

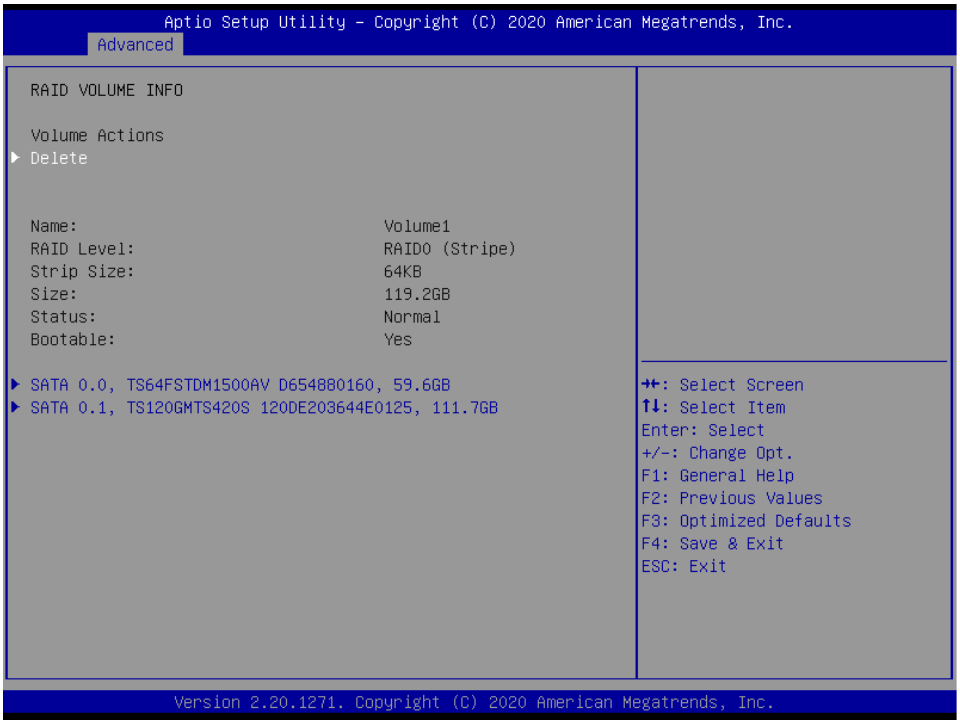


Step 6: Completed. This page show the information of raid created by user

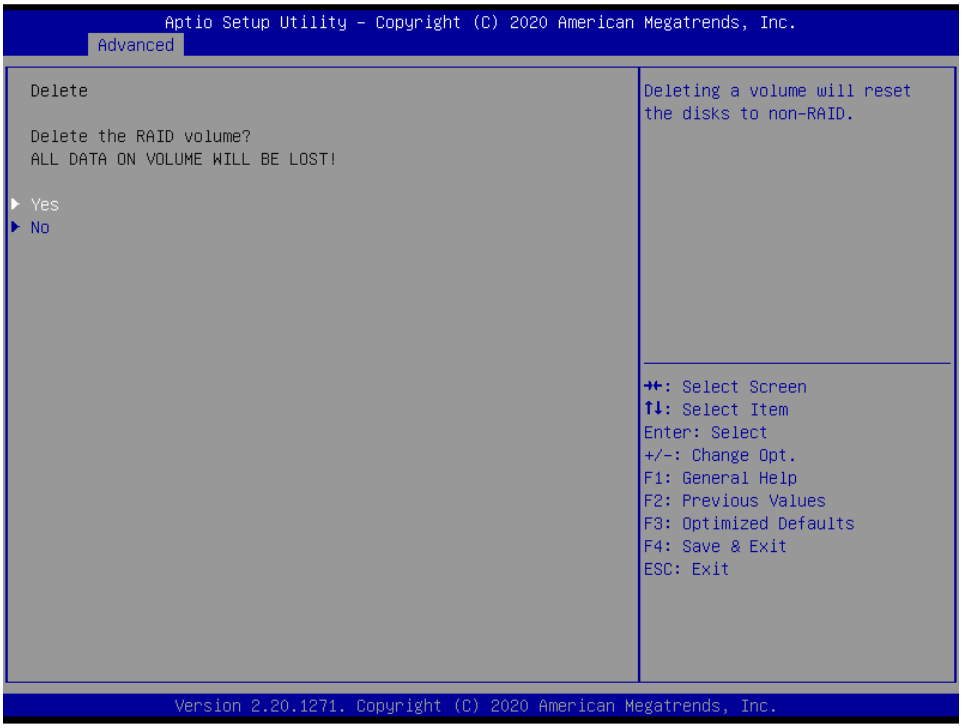


➢ **Delete Raid 0:**

Step1: Enter "Delete"

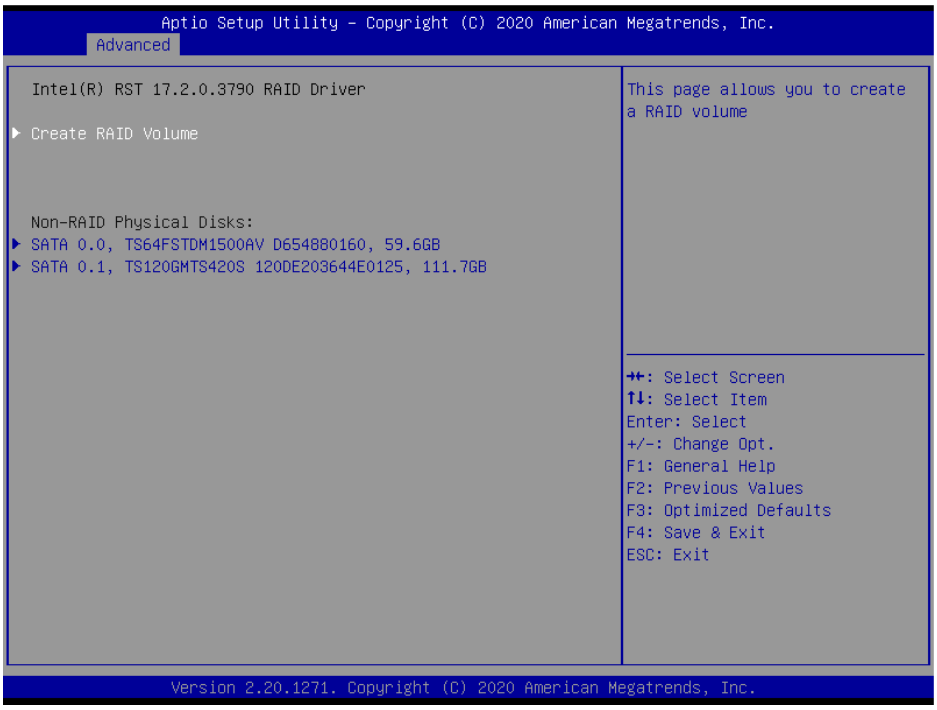


Step 2: Select "Yes "to delete RAID



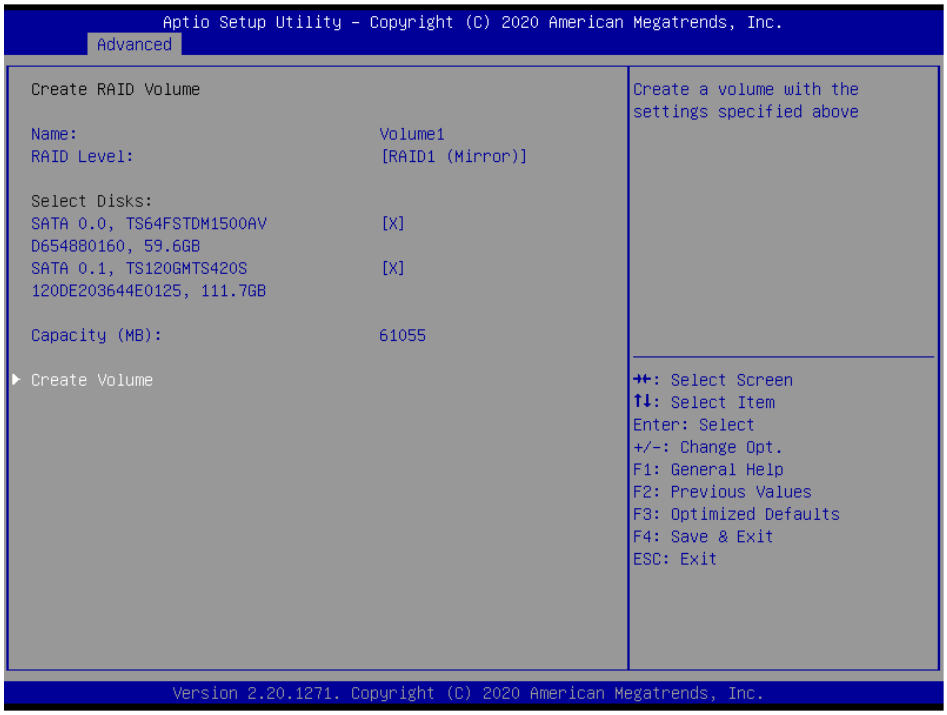
- **Set RAID 1 (DATA Mirroring)**

Step1: Enter "Create RAID Volume"

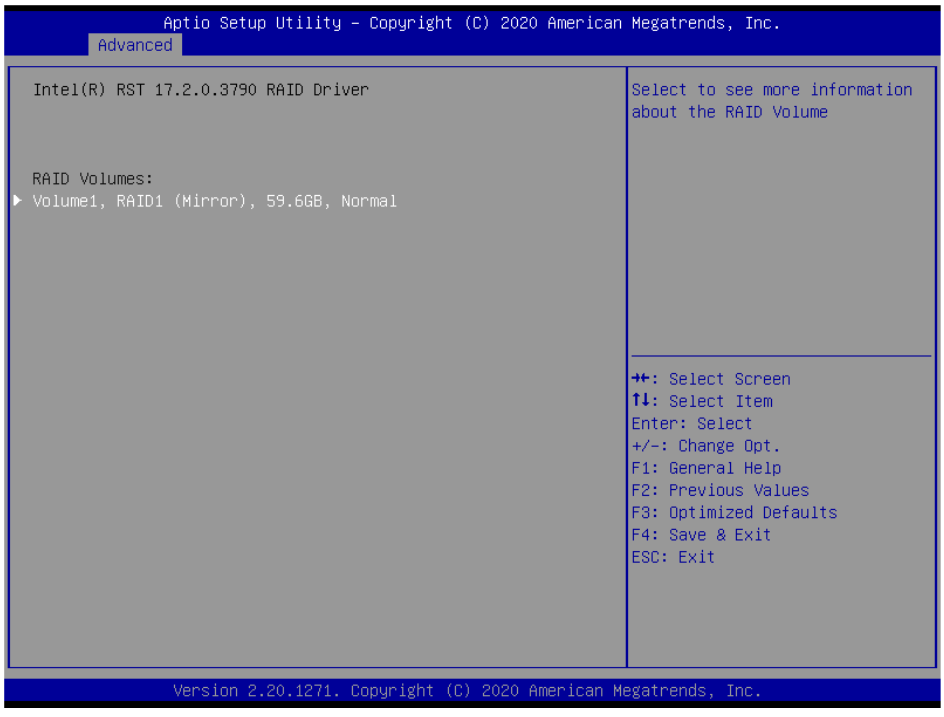


Step2:

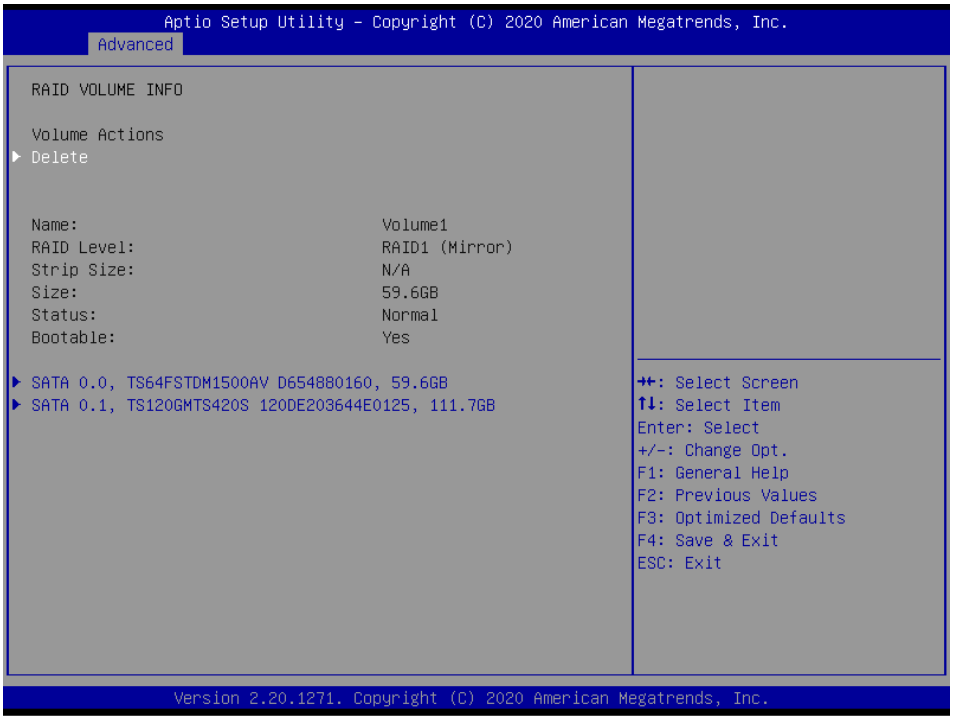
- Enter "Name " as "name of raid"
- Set "RAID Level " as "RAID1"
- Select disk "SATA 0.0" and "SATA 0.1"
- Select "Strip Size"
- Select "Capacity"
- Enter "Create Volume"



Step 3: Raid 1 be created. Select"Volume1" to see detail.

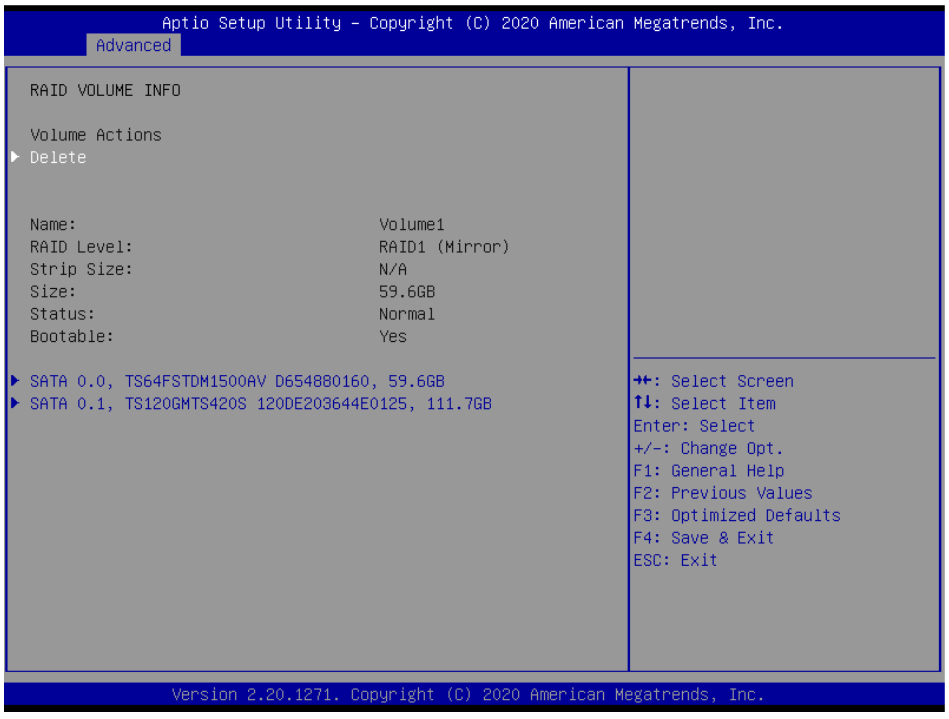


Step 4: Completed. This page show the information of raid created by user.



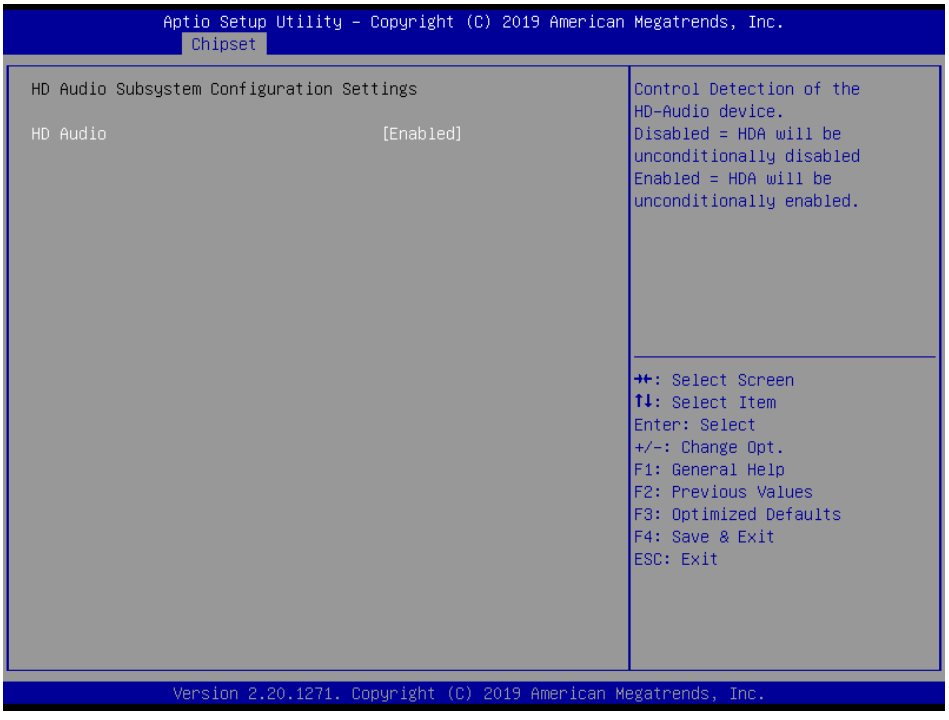
➢ **Delete Raid 1**

Step1: Enter "Delete"



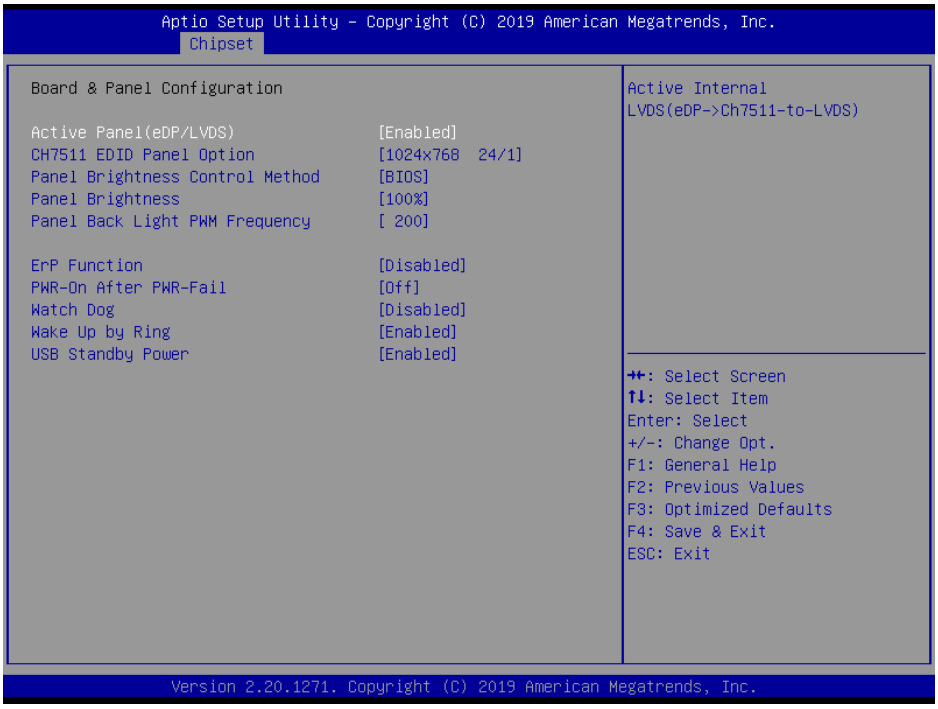
Step2: Select "Yes" to delete RAID

3.6.3.2.3 HD Audio Configuration



Item	Option	Description
HD Audio	Disabled Enabled**[Default]**	Control Detection of the HD-Audio device. Disable = HDA will be unconditionally disabled Enabled = HDA will be unconditionally enabled.

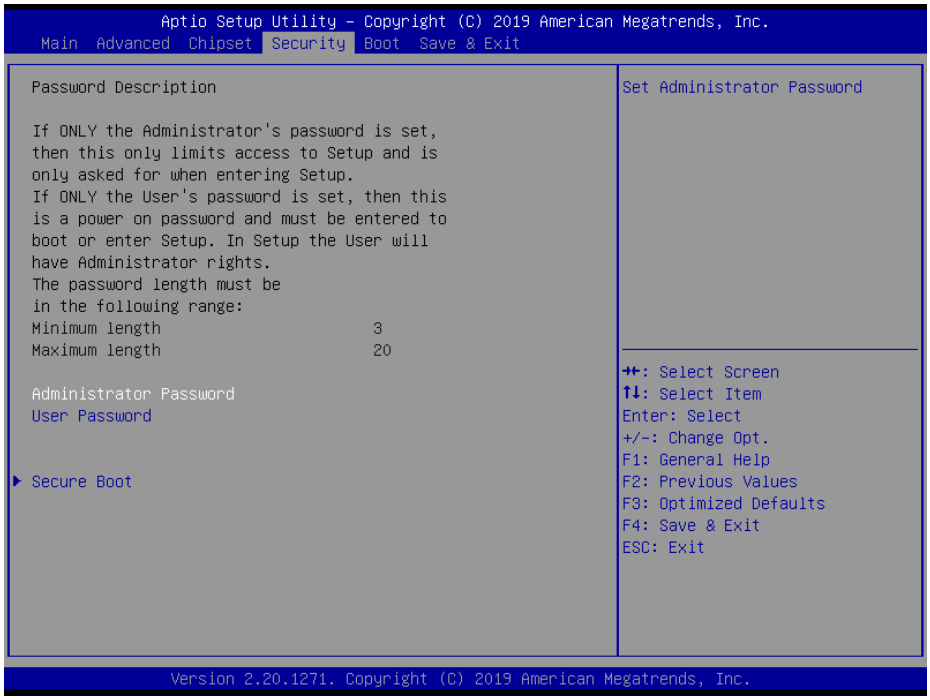
3.6.3.3 Board & Panel Configuration



Item	Option	Description
Active Panel (eDP/LVDS)	Disabled Enabled**[Default]**	Active Internal LVDS(eDP->Ch7511-to-LVDS).
CH7511 EDID Panel Option	1024x768 24/1**[Default]** 800x600 18/1 1024x768 18/1 1366x768 18/1 1024x600 18/1 1280x800 18/1 1920x1200 24/2 1920x1080 18/2 1280x1024 24/2 1366x768 24/1 1920x1080 24/2 1680x1050 24/2	Port-EDP to LVDS(Chrotel 7511) Panel EDID Option.
Panel Brightness Control Method	BIOS**[Default]** OS Driver	Panel Brightness Control Method. 1.BIOS 2.OS Driver.
Panel Brightness	00% 25% 50% 75% 100%**[Default]**	Select Panel(eDP/LVDS) back light PWM duty.
Panel Back Light PWM Frequency	200**[Default]** 300 400 500 700	Select Panel(eDP/LVDS) back light PWM Frequency.

	1k 2k 3k 5k 10k 20k	
ErP Function	Disabled**[Default]** Enabled	ErP Function (Deep S5).
PWR-On After PWR-Fail	Off**[Default]** On Last state	AC loss resume.
Watch Dog	Disabled**[Default]** 30 sec 40 sec 50 sec 1 min 2 min 10 min 30 min	Select WatchDog.
Wake Up by Ring	Disabled Enabled**[Default]**	Wake Up by Ring from S3/S4/S5.
USB Standby Power	Disabled Enabled**[Default]**	Enable/Disabled USB Standby Power during S3/S4/S5.

3.6.4 Security

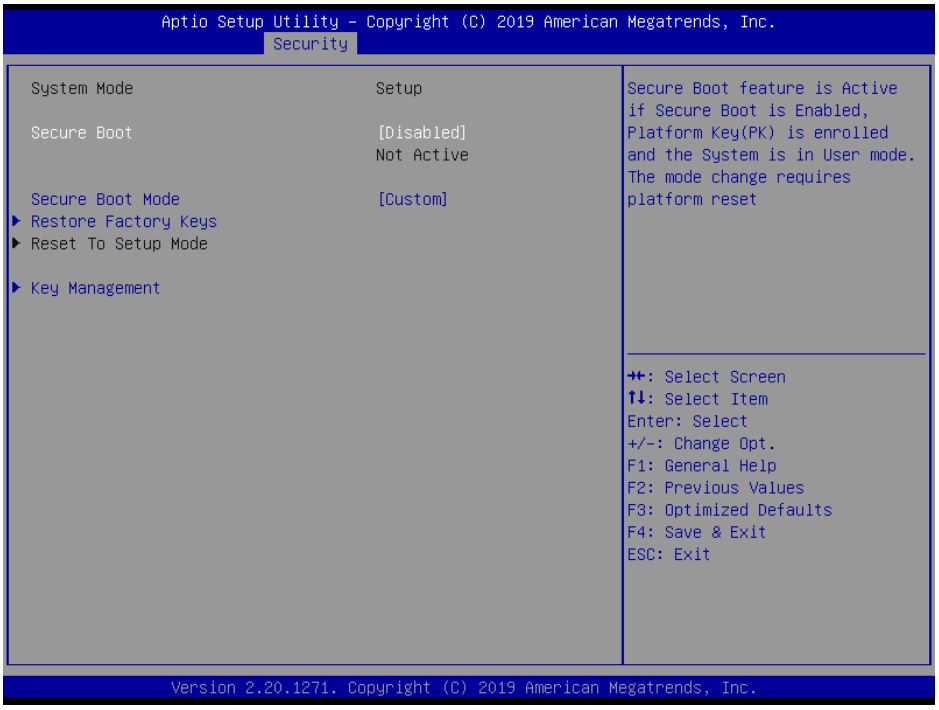


- **Administrator Password**

Set setup Administrator Password

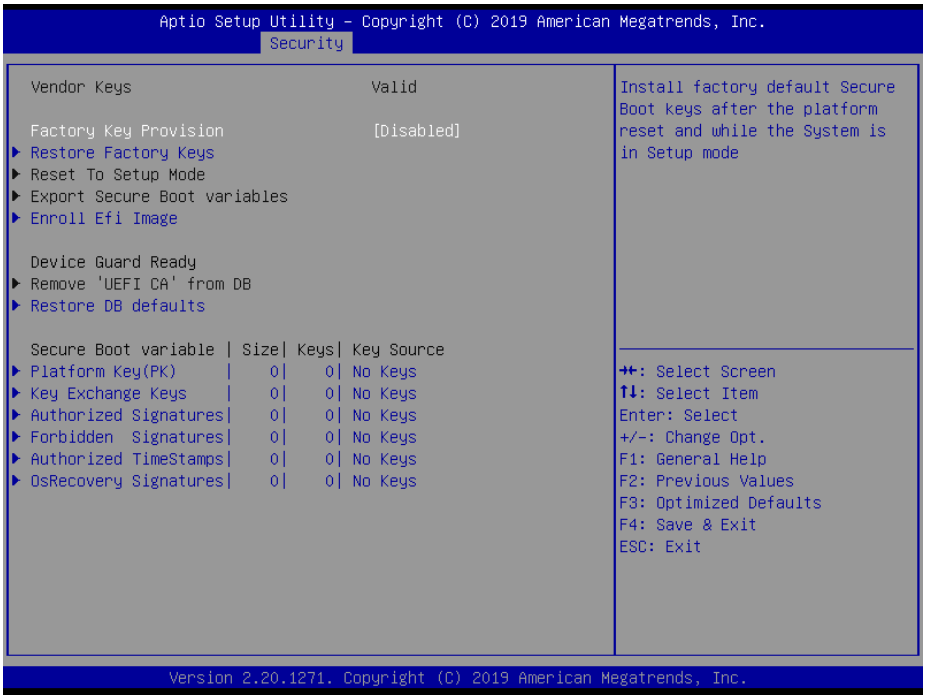
- **User Password**

3.6.4.1 Secure Boot



Item	Option	Description
Secure Boot	Disabled**[Default]** Enabled	Secure Boot feature is Active if Secure Boot is Enable, Platform Key(PK) is enrolled and the System is in User mode. The mode change requires platform reset.
Secure Boot Mode	Standard Custom**[Default]**	Secure Boot mode selector: Standard/Custom. In Custom mode Secure Boot Variables can be configured without authentication.

3.6.4.1.1 Key Management

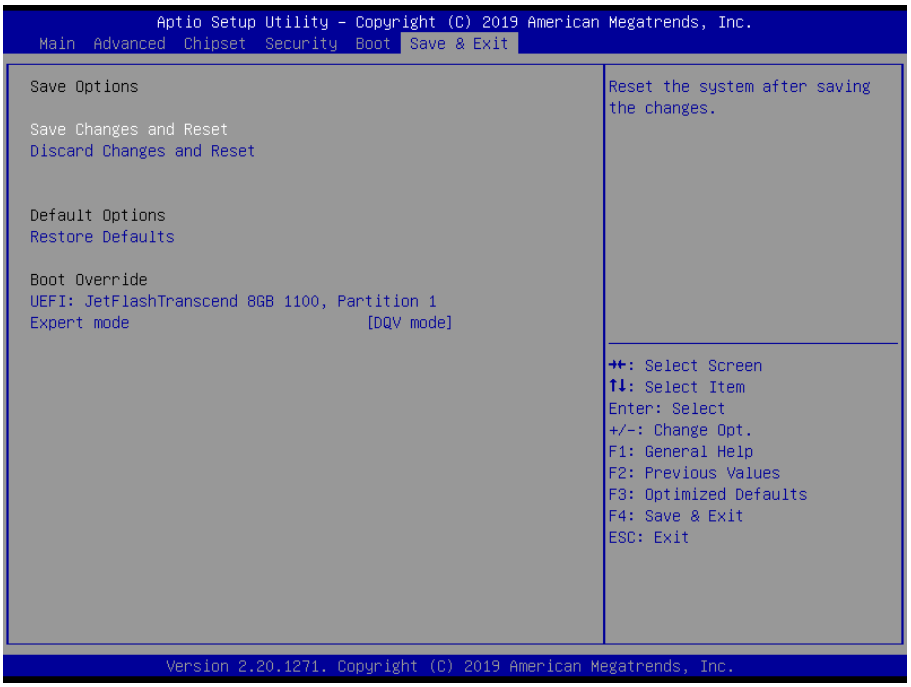


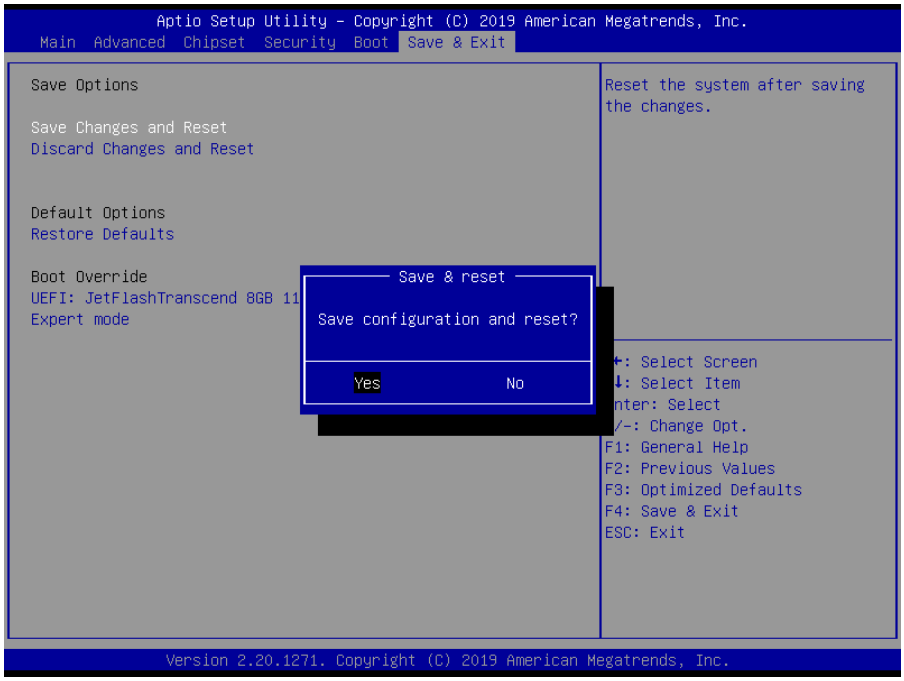
Item	Option	Description
Factory Key Provision	Disabled**[Default]** Enabled	Install factory default Secure Boot keys after the platform reset and while the System is in Setup mode.

3.6.5 Boot

Item	Option	Description
Setup Prompt Timeout	1~ 65535	Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.
Bootup NumLock State	On Off**[Default]**	Select the keyboard NumLock state
Quiet Boot	Disabled**[Default]** Enabled	Enables or disables Quiet Boot option
Boot Option #1	Set the system boot order.	

3.6.6 Save and exit





3.6.6.1 Save Changes and Reset

Reset the system after saving the changes.

3.6.6.2 Discard Changes and Reset

Any changes made to BIOS settings during this session of the BIOS setup program are discarded. The setup program then exits and reboots the controller.

3.6.6.3 Restore Defaults

This option restores all BIOS settings to the factory default. This option is useful if the controller exhibits unpredictable behavior due to an incorrect or inappropriate BIOS setting.

3.6.6.4 Launch EFI Shell from filesystem device

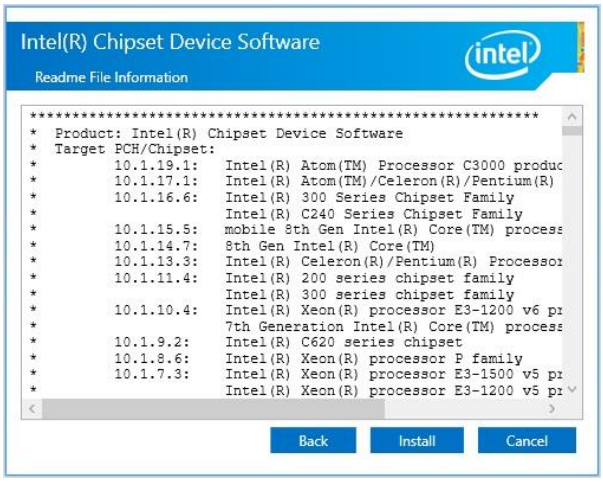
Attempts to Launch EFI Shell application (Shellx64.efi) from one of the available filesystem devices.

4. Drivers Installation

Note: Installation procedures and screen shots in this section are for your reference and may not be exactly the same as shown on your screen.

4.1 Install Chipset Driver

Note: The installation procedures and screen shots in this section are based on Windows 10 operation system. If the warning message appears while the installation process, click Continue to go on.



Step 3. Click **Install**.

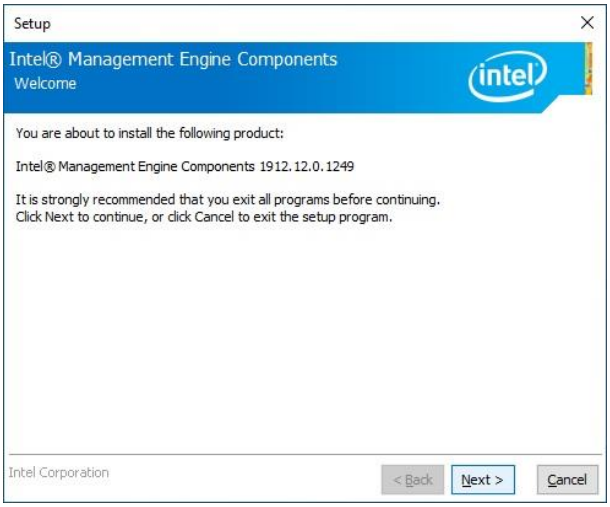
Step1. Click **Next**.

Step 4. Setup completed.

Step 2. Click **Accept**.

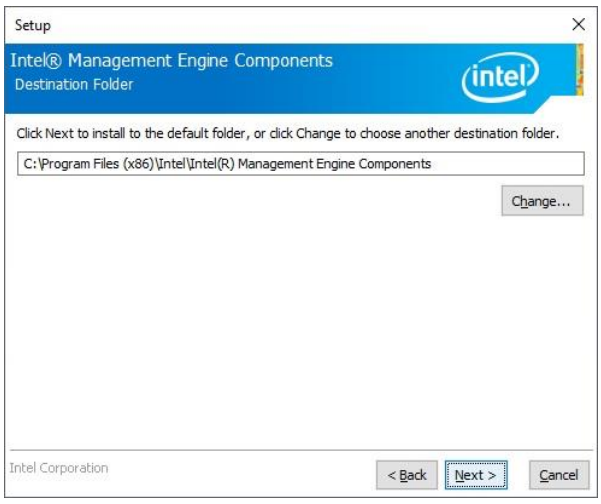
4.2 Install ME Driver

Note: The installation procedures and screen shots in this section are based on Windows 10 operation system. If the warning message appears while the installation process, click Continue to go on.

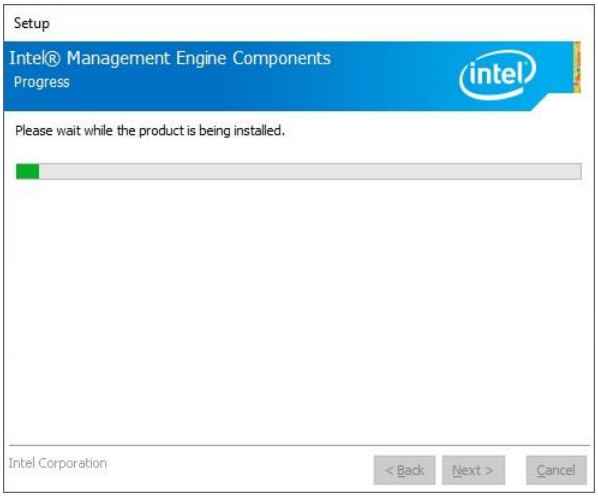


Step1. Click **Next** to start installation.

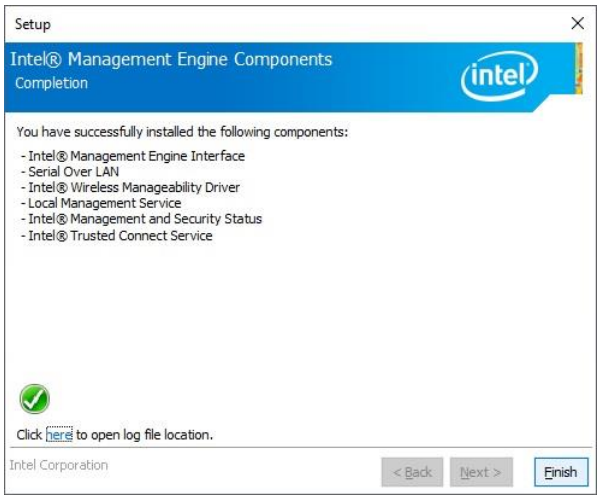
Step 2. Click **Next**.



Step 3. Click **Next** to continue installation.



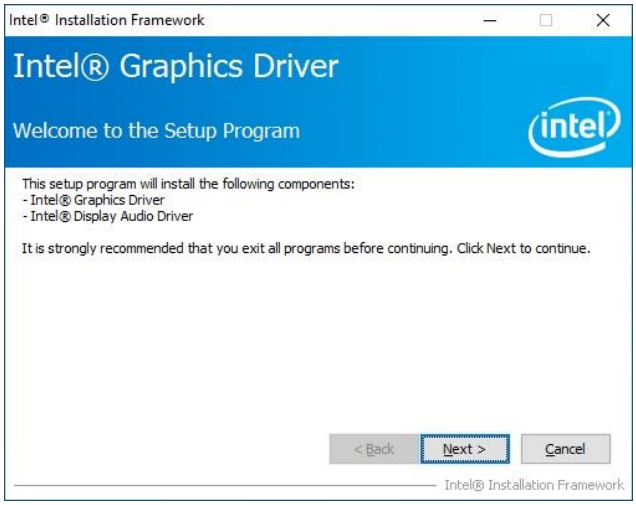
Step 4. Installing.



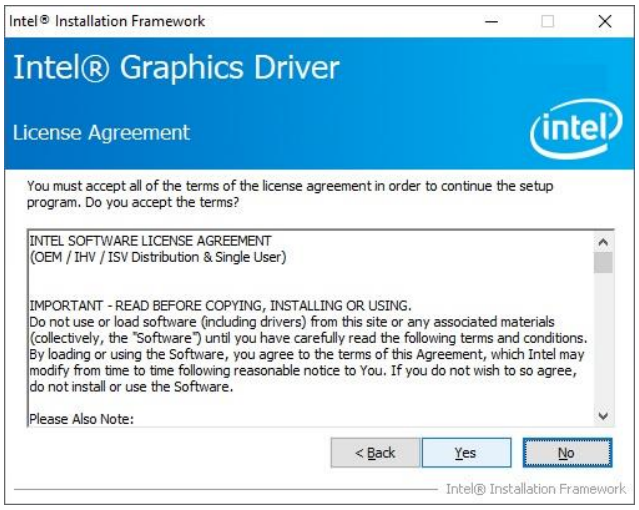
Step 5. Click **Finish** to complete setup.

4.3 Install VGA Driver

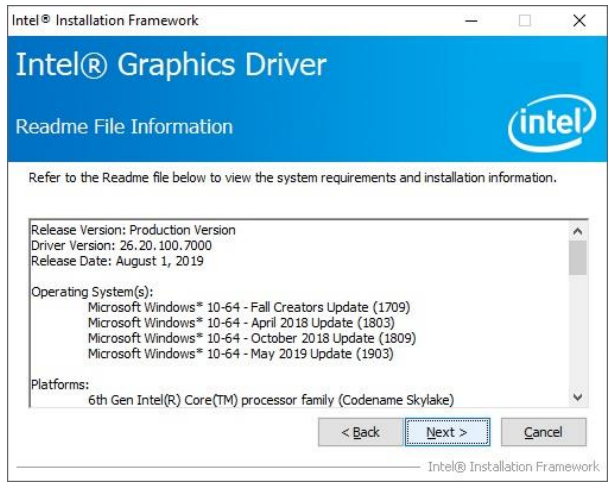
Note: The installation procedures and screen shots in this section are based on Windows 10 operation system.



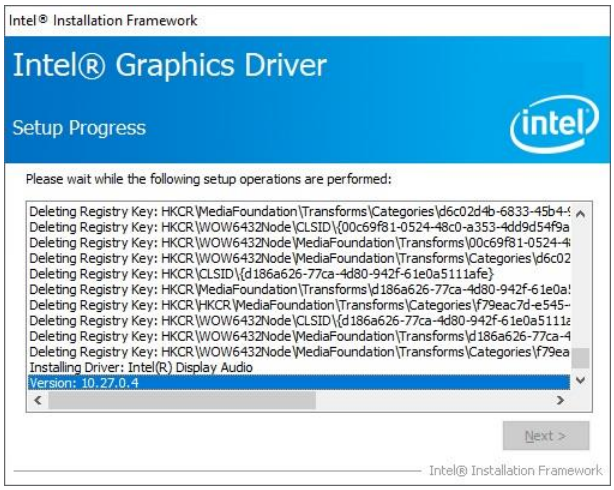
Step 1. Click **Next** to continue installation.



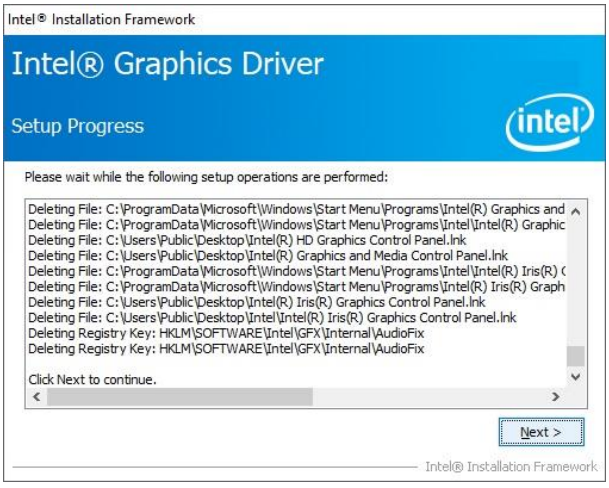
Step 6. Click **Yes**.



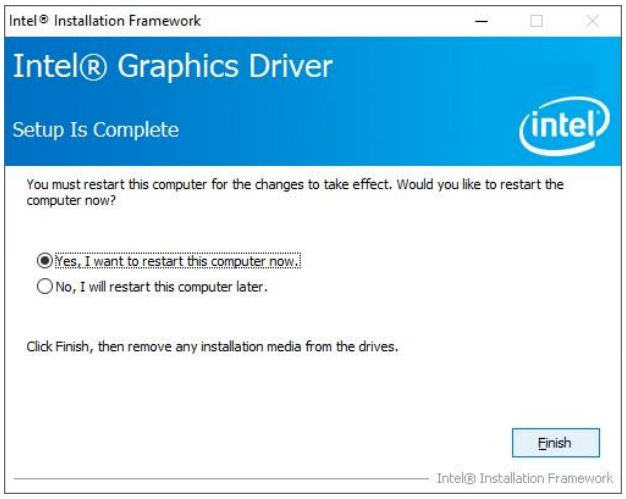
Step 3. Click **Next.**



Step 4. Click **Next**.



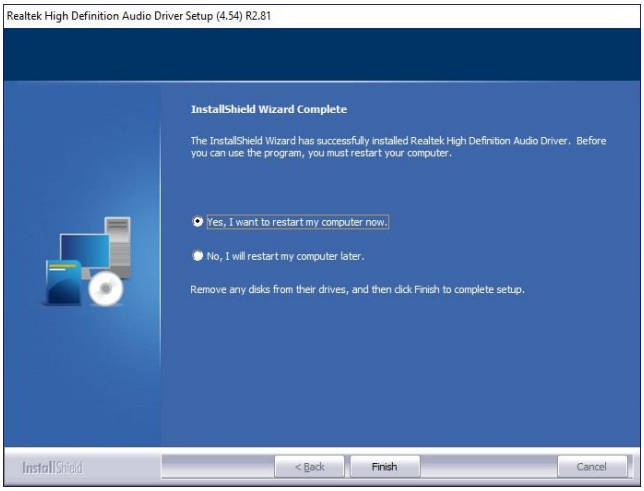
Step 5. Click **Next**.



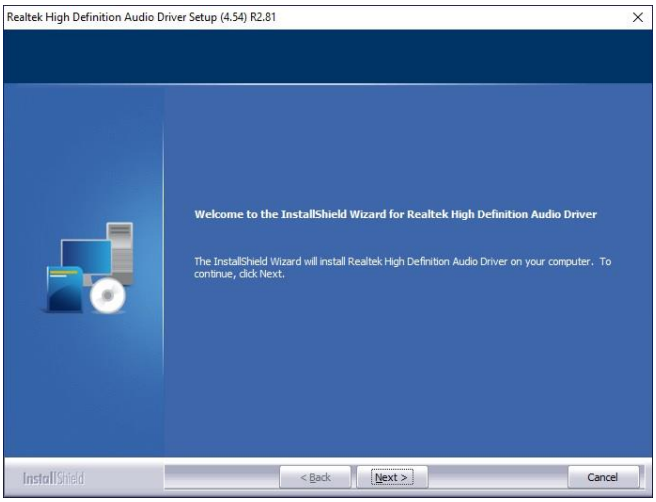
Step 6. Click **Finish** to complete setup.

4.4 Install Audio Driver (For Realtek ALC892)

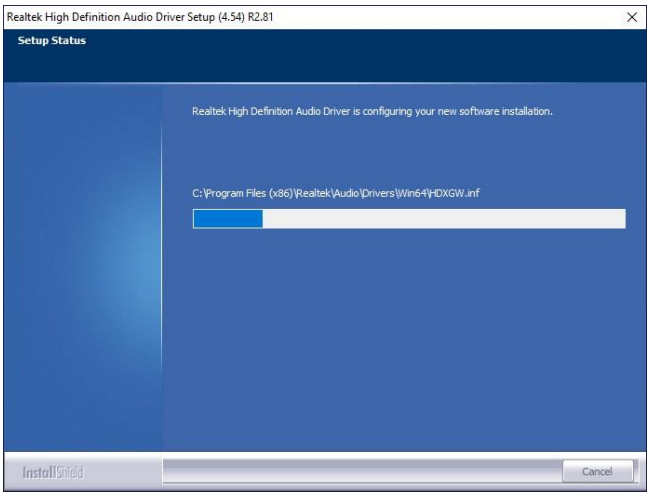
Note: The installation procedures and screen shots in this section are based on Windows 10 operation system.



Step 3. Click **Finish** to complete the setup



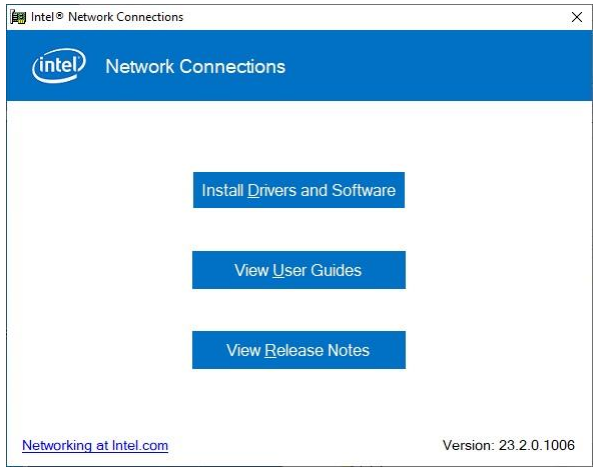
Step 1. Click **Next** to continue setup.



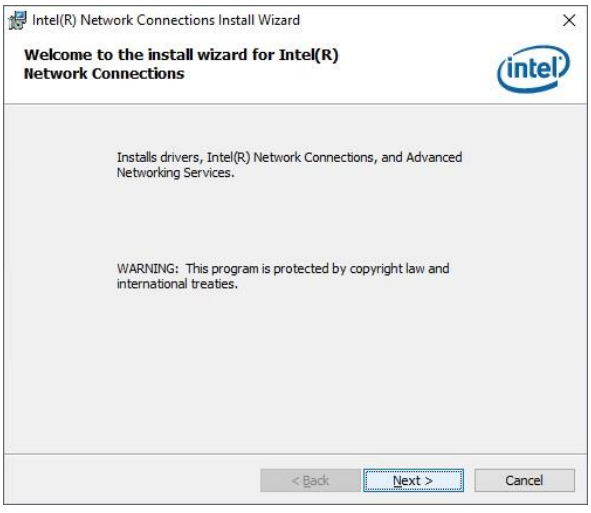
Step 2. Installing.

4.5 Install Ethernet Driver

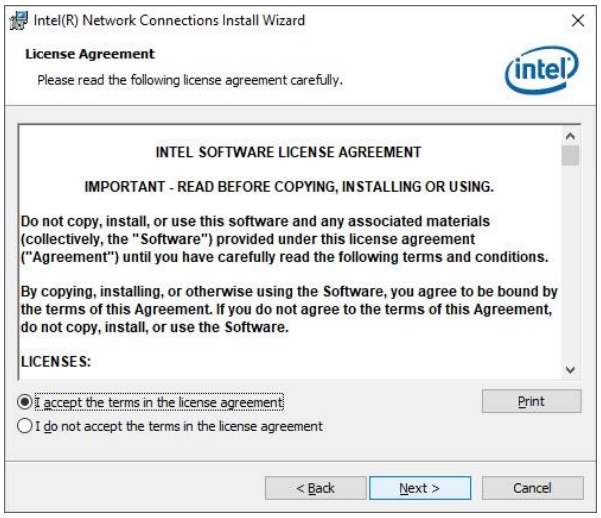
Note: The installation procedures and screen shots in this section are based on Windows 10 operation system.



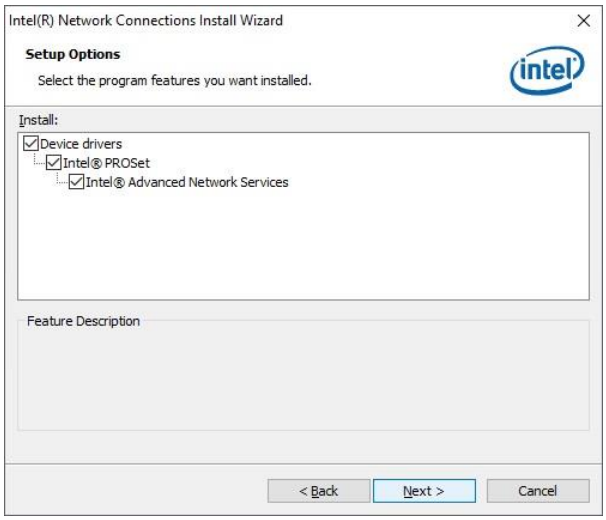
Step 1. Click **Install Drivers and Software** to continue installation.



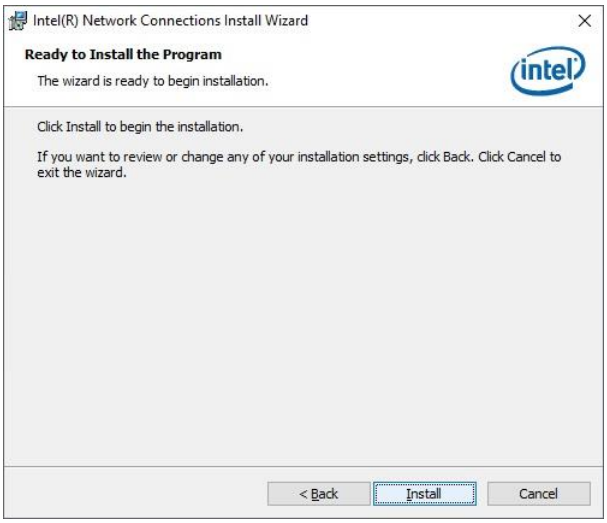
Step 2. Click **Next**.



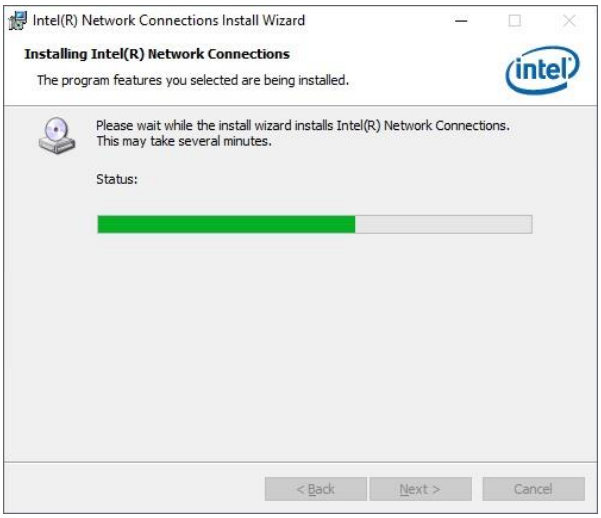
Step 3. Click **Next.**



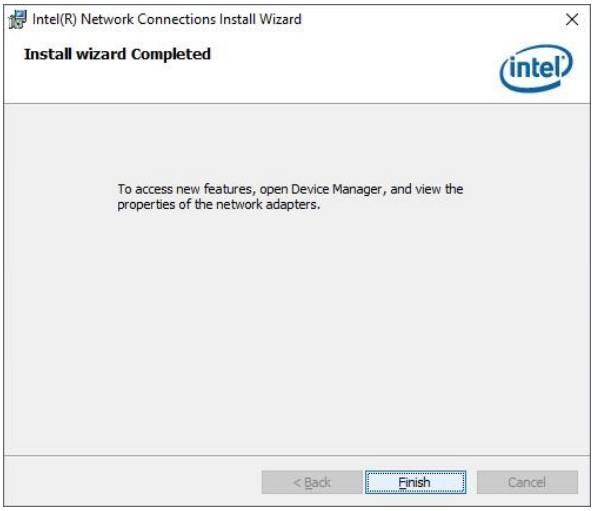
Step 4. Click **Next.**



Step 5. Click **Install**.



Step 6. Installing.

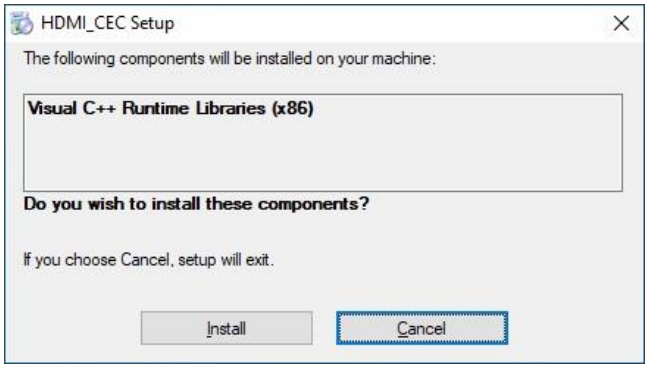


Step 7. Click **Finish** to complete setup.

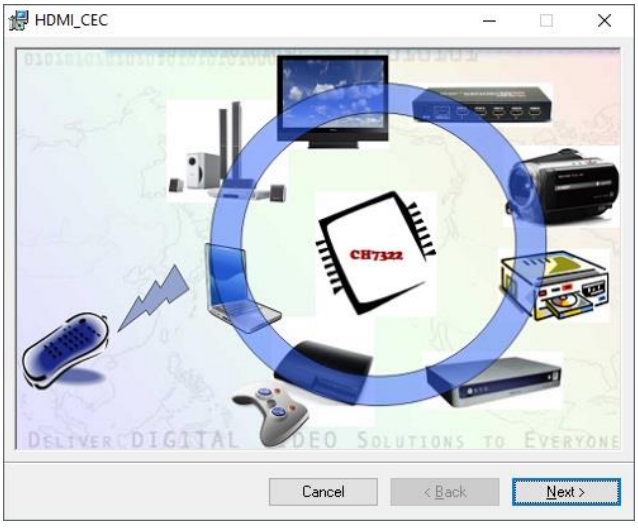
4.6 Install HDMI_CEC Driver

Note:

1. The installation procedures and screen shots in this section are based on Windows 10 operation system.
2. Please note the device (TV/Monitor) will be connected with board should build-in HDMI-CEC function.
3. Please use HDMI1 first if single device (TV/Monitor) will be connected.
4. HDMI-CEC supports ON/OFF function only.

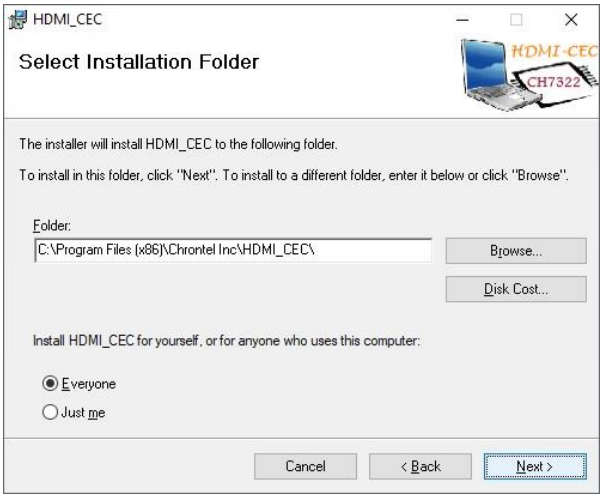


Step 1. Click **Install** to continue installation.

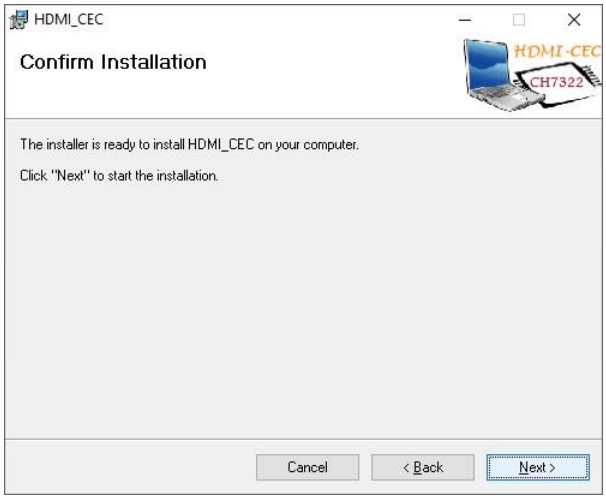


Step 2. Click **Next**.

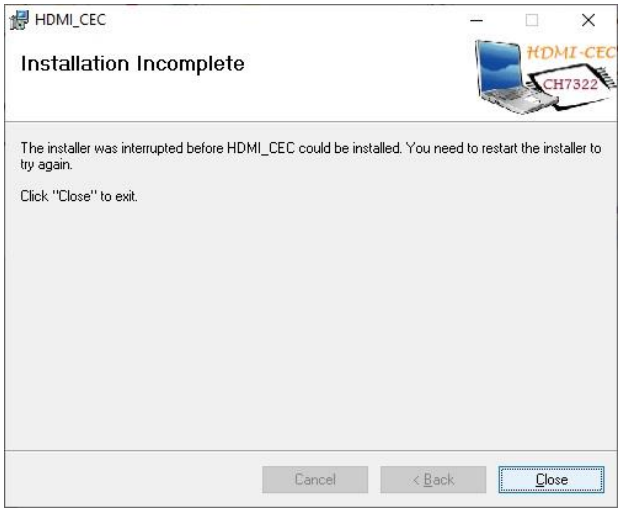
Step 3. Click **Next.**



Step 4. Click **Next**.



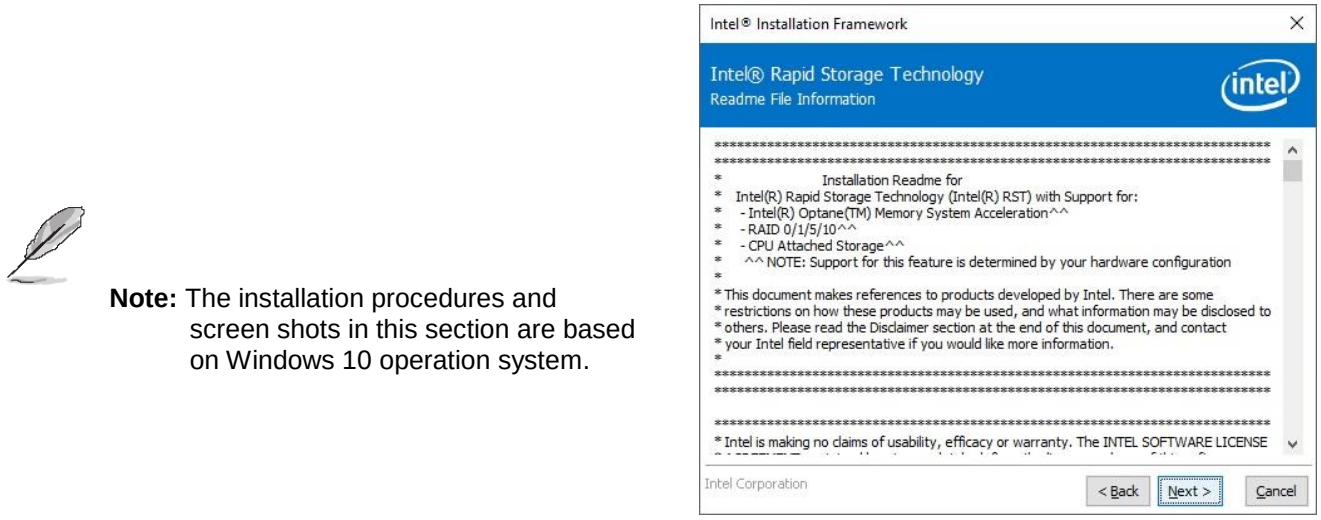
Step 5. Click **Next**.



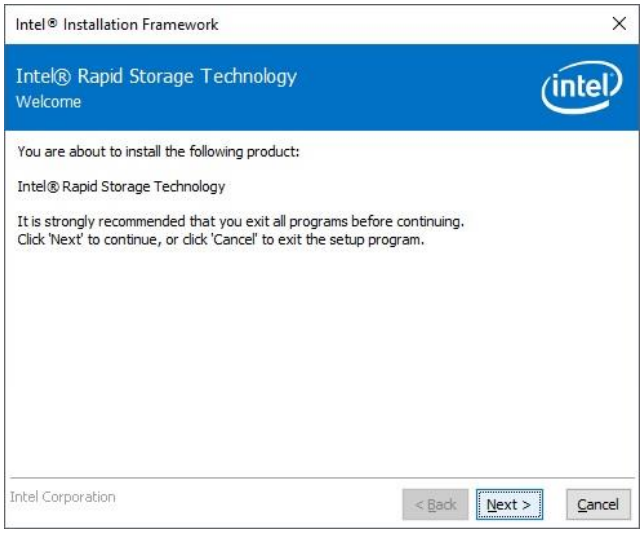
Step 6. Install complete.

4.7 Install IRST Driver

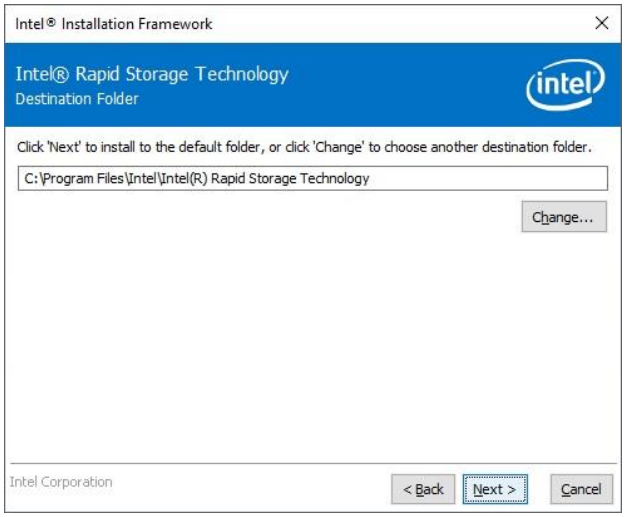
Note: The installation procedures and screen shots in this section are based on Windows 10 operation system.



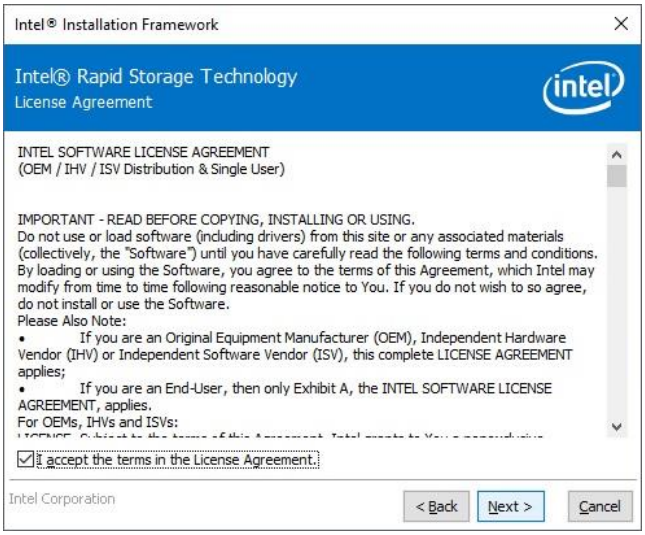
Step 3. Click **Next.**



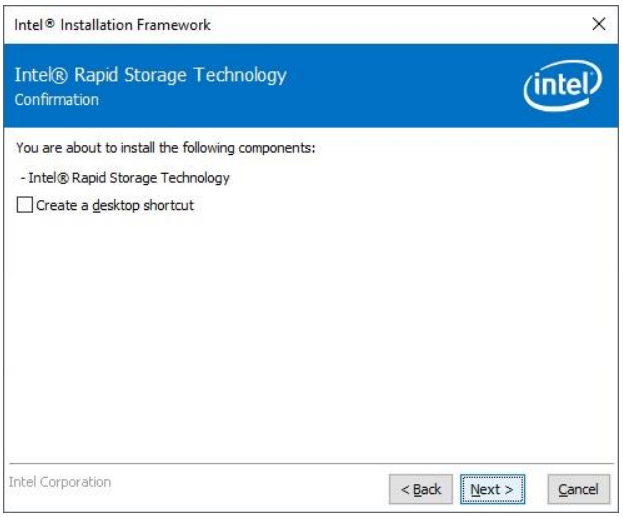
Step 1. Click **Next** to continue installation.



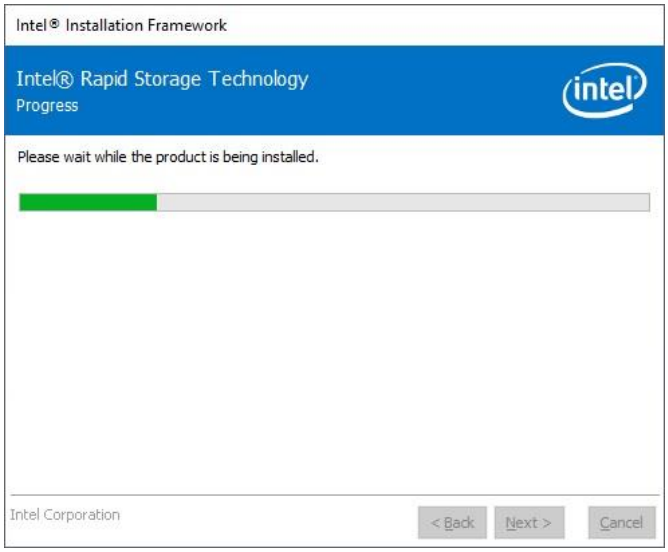
Step 4. Click **Next**.



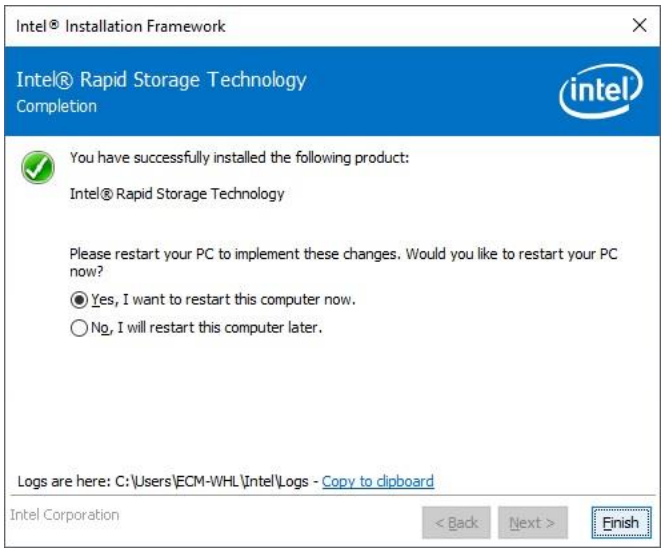
Step 2. Click **Next**.



Step 5. Click **Next**.

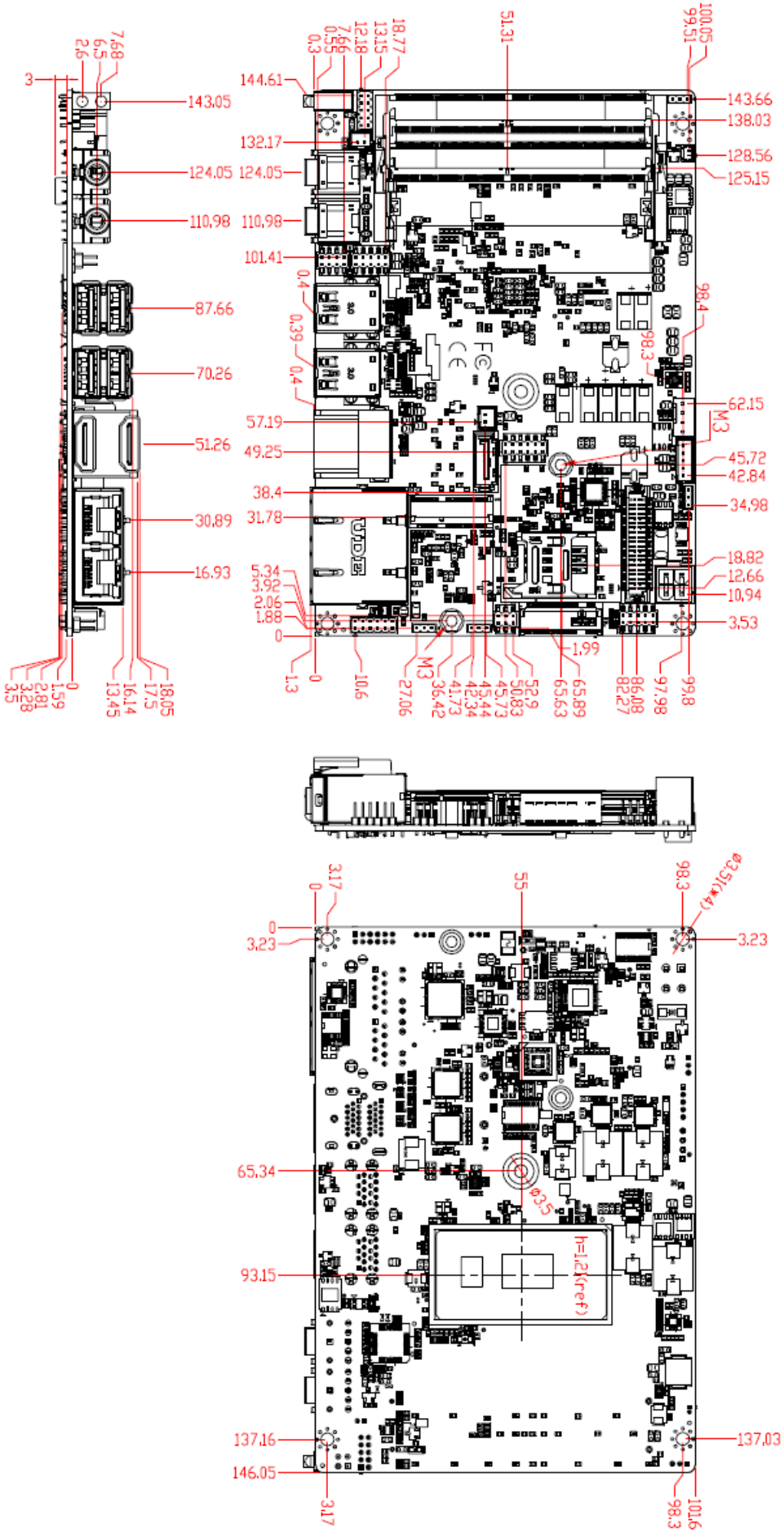


Step 6. Installing.



Step 7. Click **Finish** to complete setup.

5. Mechanical Drawing


3
2.6
6.5
7.68
143.05
124.05
110.98
87.66
70.26
51.26
30.89
16.93
0
1.59
2.81
3.28
3.5
13.45
16.14
17.5
18.05
144.61
132.17
124.05
110.98
101.41
0.3
0.55
7.66
12.18
13.15
18.77
51.31
99.51
100.05
143.66
138.03
128.56
125.15
0.4
0.39
0.4
57.19
49.25
38.4
31.78
5.34
3.92
2.06
1.88
0
1.3
0
10.6
27.06
36.42
41.73
42.34
45.44
45.73
50.83
52.9
65.63
65.89
82.27
86.08
97.98
99.8
98.4
98.3
62.15
M3
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3.17
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98.3
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93.15
137.16
146.05
3.17
137.03
98.3
101.6
H=1.2(ref.)

Unit: mm