EBM-APL

Intel® Pentium®/Celeron®/Atom™ SoC BGA Processor 5.25” Mini Module

User’s Manual

4th Ed – 17 April 2018

Part No. E2047582903R

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.

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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.
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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.

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This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Avalue, or which have been subject to misuse, abuse, accident or improper installation. Avalue assumes no liability under the terms of this warranty as a consequence of such events. Because of Avalue's high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If any of Avalue's 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, Avalue's 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 EBM-APL Intel® Pentium®/Celeron®/Atom™ SoC Processor 5.25" Mini Module
- 1 x DVD-ROM or CD-ROM contains the followings:
  - User's Manual (this manual in PDF file)
  - Ethernet driver and utilities
  - VGA drivers and utilities
  - Audio drivers and utilities

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

1.3 Document Amendment History

Revision	Date	By	Comment
1st	November 2016	Avalue	Initial Release
2nd	February 2017	Avalue	Update Setting Jumpers & Connectors
3rd	March 2017	Avalue	Add JLVDS1 and JBKL1 matching connector
4th	April 2018	Avalue	Update Jumper and Connector List

1.4 Manual Objectives

This manual describes in details Avalue Technology EBM-APL Single Board.

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 EBM-APL series 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	Onboard Intel® Pentium®/Celeron®/Atom™ SoC BGA Processor (Apollo Lake Platform)
BIOS	AMI uEFI BIOS, 128Mbit SPI Flash ROM
System Chipset	Apollo SoC integrated
I/O Chip	EC(IT8528E), EC (IT8528I) for Wide temp. model
System Memory	One 204-pin DDR3L SODIMM Socket, Supports 4G/8G & up to 8GB DDR3L 1866MTs SDRAM (Non-ECC)
SSD	1 x M.2 B key (2242) support SATA/PCIex1/USB interface for SSD
Watchdog Timer	H/W Reset, 1sec. ~ 65535sec. and 1sec./step
H/W Status Monitor	Monitoring System Temperature, Voltage and FAN Status with Auto Throttling Control
Expansion	1 x Mini PCIe connector (for PCIe & USB2.0 & SIM Card)
Built-in Touch screen (optional)	EETI ETP-CP-MER4485XRU 1 x 5-pin 2.54mm Pin Header (90 Degree Right Angle Pin Header)
I/O	
MIO	1 x SATA III (1 x 1x2 pin wafer w/2.0mm pitch for SATA Power) 7+15pin SATA (BOM Optional), board not support SATA interface of M.2 when use 7+15pin SATA 2 x DB-9 male connector for COM1/2(RS-232/422/485 selected by jumper w/ Auto Flow), 4xRS-232 (Pin Header) LPCx1, SPIx1
USB	4 x USB3.0 (dual deck USB connector for 2 USB3.0 port), 4 x USB2.0 (pin header & via USB Hub to 4 USB2.0)
GPIO	16bit GPIO (2 x 10 pin wafer w/2.0mm pitch) 8 x In, 8 x Out
	*1 x SIM socket *Backlight 1. 1 x 2 x 3 pin w/2.0mm pitch (VR voltage adjustment)-- 1/3/5 pin connected to EC 2. 1 x 1 x 5 pin wafer w/2.0mm pitch 3. 1 x 1 x 3 pin header w/2.0mm pitch(DC/PWM)-- 1pin for PWM, 3pin for DC *1 x 6pin DIP Switch for COM1 & COM2(RS232/422/485 selection), AT/ATX, Touch on/off *1 x 2 x 5 pin wafer w/2.0mm pitch for Front Panel
Display	

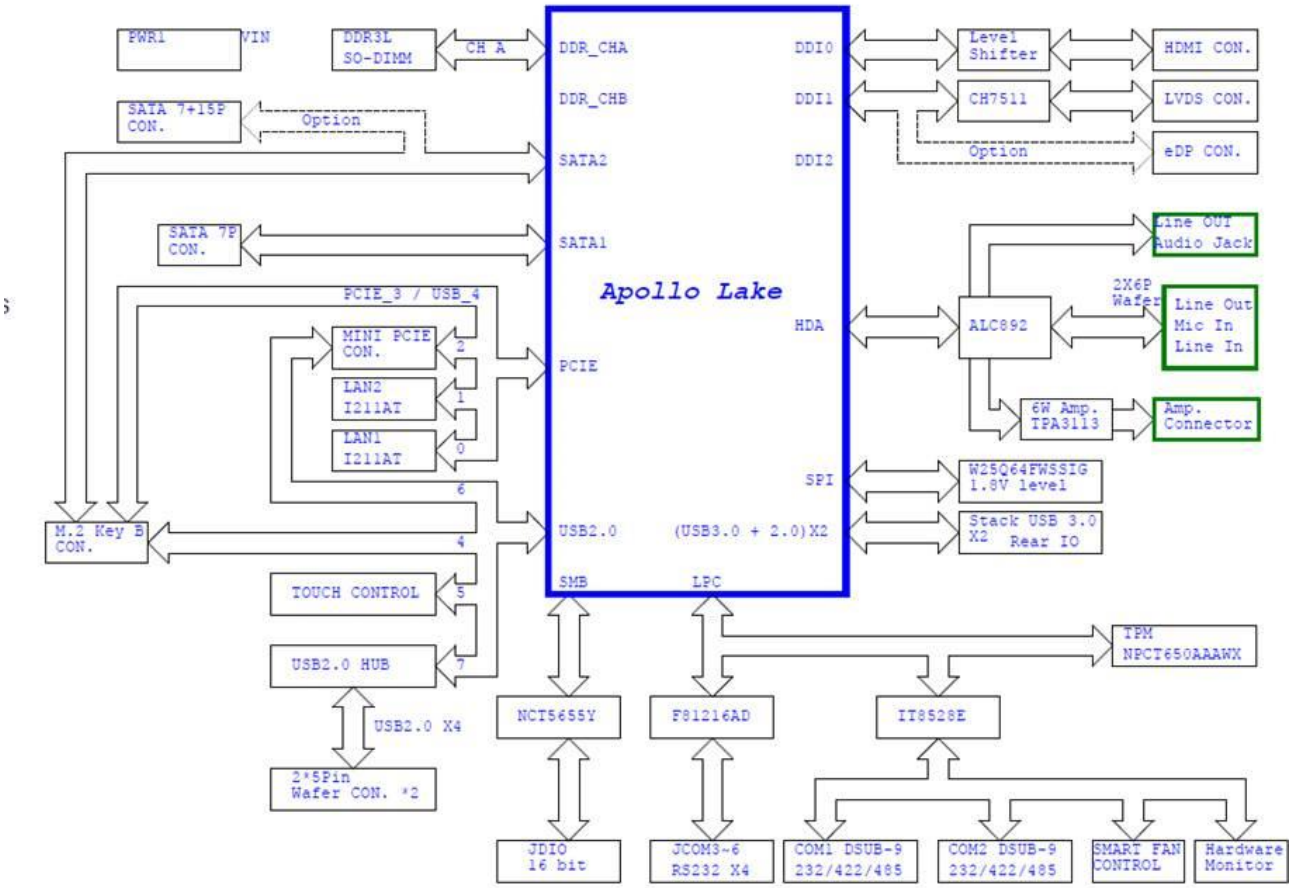
Chipset	Intel® Apollo Lake SoC Processor integrated Gen9 LP graphics
Resolution	LVDS: 1920 x 1080@60Hz HDMI: 3840 x 2160@30Hz eDP:4096 x 2160@60Hz
Multiple Display	LVDS+HDMI LVDS co-lay with eDP
HDMI	HDMI 1.4b
LCD Interface	Dual channel 24-bit LVDS (via 7511B) 2 x 20 pin Hirose Connector for (Optional BOM for 1 x internal eDP or 1 x CH7511B LVDS for 2 x 24-bit.)
Audio	
AC97 CodeC	Realtek ALC892
Audio Amp	5W
	Mic-In, Line-In and Line-Out
Ethernet	
LAN Chip	2 x Intel I211AT GbE controller (Intel I210IT for Wide Temp. model)
Ethernet Interface	10/100/1000 Base-Tx compatible
Internal I/O Connectors	
Fan	1 x 4 pin header w/ 2.54mm pitch
System 1 I2C	I2C connector (for ISH 4.0)
Buzzer	Onboard
CMOS Battery	CR2032
Audio	2 x 1 x 2 wafer w/2.0mm pitch for AMP
COM	4 x RS232
Others	SM bus (for backup battery module)
Rear I/O Connectors	
USB	4 x USB3.0
LAN	RJ-45 connectors for two GbE ports
HDMI	1 x HDMI (HDMI type A connector)
LED	1 x dual deck LED: Green indicator: power-on Yellow indicator: HDD active
Others	1 x Reset button
Mechanical & Environmental	

Power Requirement	+ 11.4V ~ +26V
ACPI	Single power ATX Support S0, S3, S4, S5 ACPI 5.0 Compliant
Power Type	AT/ATX
Operating Temp.	0˚C ~ 60˚C (32˚F ~ 140˚F) Optional: -40˚C ~ 85˚C (-40˚F ~ 185˚F) for Wide Temp. Model
Storage Temp.	-40˚C ~ 75˚C (-40˚F ~ 167˚F)
Operating Humidity	0%~90% relative humidity, non-condensing (Please consult product engineers for the production feasibility if the size is larger than 410 x 360mm or smaller than 80 x 70mm)
Size (L x W)	8" x 5.75" (203mm x 146mm)
Weight	0.55lb (0.25kg)

Note: Specifications are subject to change without notice.

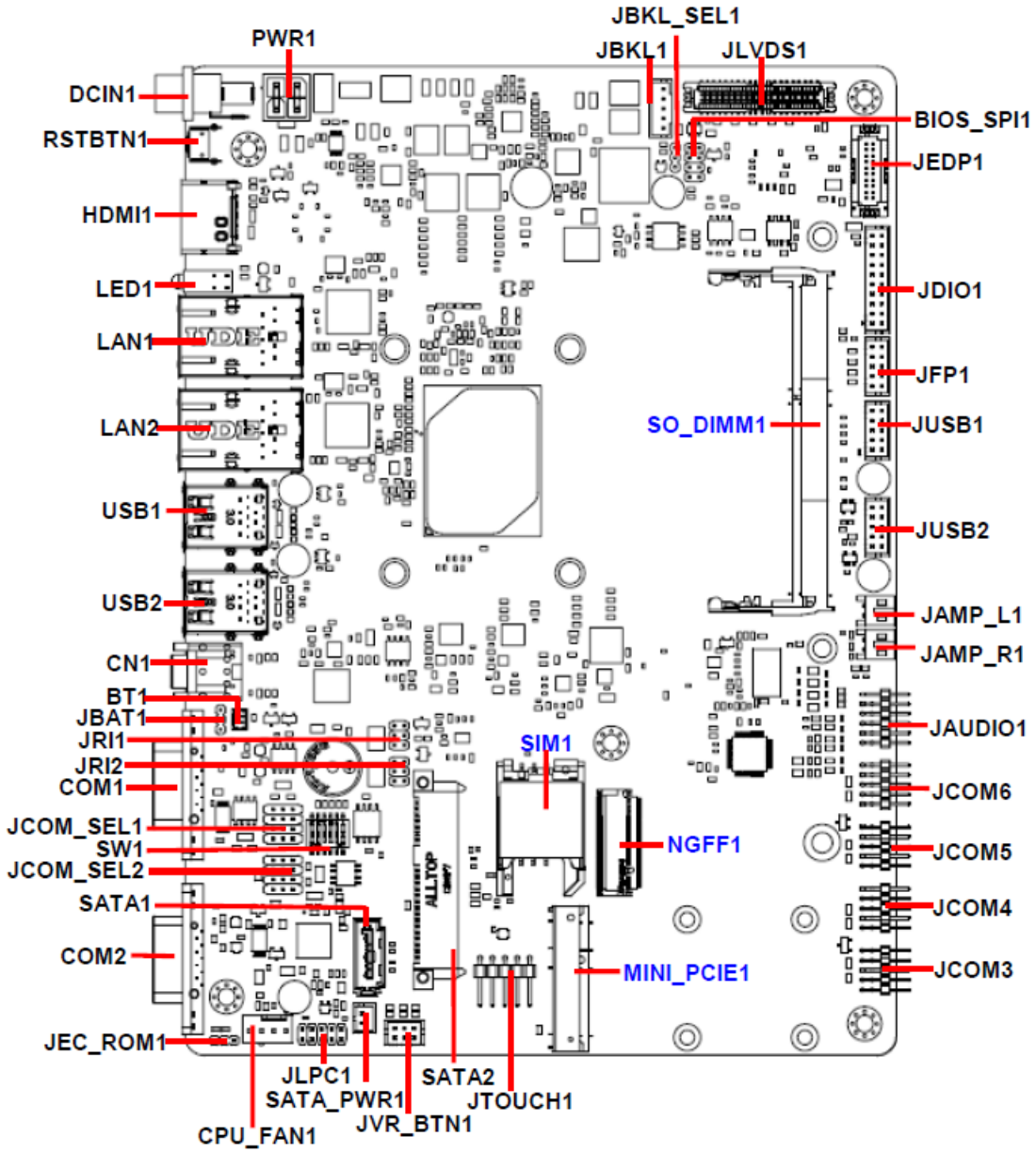
1.6 Architecture Overview—Block Diagram

The following block diagram shows the architecture and main components of EBM-APL.



2. Hardware Configuration

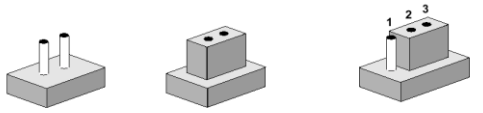
2.1 Product Overview



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
JBAT1	Clear CMOS	3 x 1 header, pitch 2.00mm
JRI1	Serial port 1 pin9 signal select	3 x 2 header, pitch 2.00mm
JRI2	Serial port 2 pin9 signal select	3 x 2 header, pitch 2.00mm
JBKL_SEL1	LCD brightness DC/PWM mode select	3 x 1 header, pitch 2.00mm
JCOM_SEL1/2	Serial port 1/2 – RS232/ 422/ 485 mode select	4 x 3 header, pitch 2.00mm
SW1	Multi-function select	DIP switch 6pin

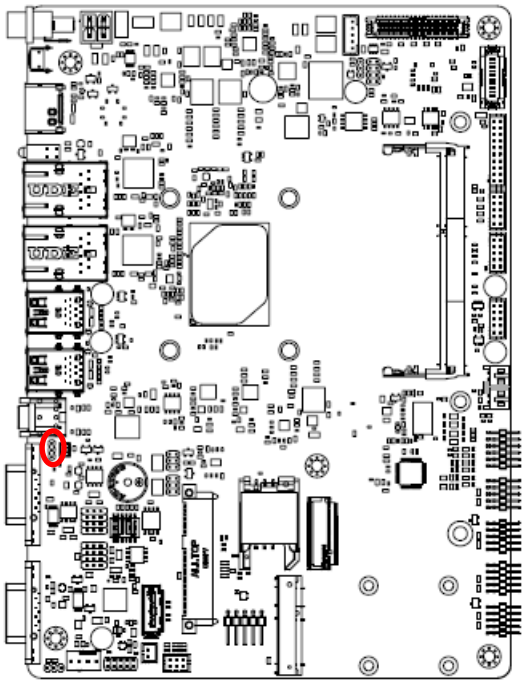
Connectors

Label	Function	Note
CPU_FAN1	CPU fan connector	4 x 1 wafer, pitch 2.54mm
SODIMM1	204-pin DDR3L SODIMM socket	

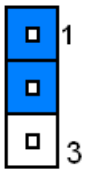
JAUDIO1	Audio connector	6 x 2 header, pitch 2.00mm
JBKL1	LCD Inverter connector	5 x 1 wafer, pitch 2.00mm Matching Connector: JST PHR-5
COM1/2	Serial Port 1/2 connector	D-sub 9 pin, male
JCOM3/4/5/6	Serial Port 3/4/5/6 connector	5 x 2 header, pitch 2.00mm
JDIO1	General purpose I/O connector	10 x 2 wafer, pitch 2.00mm
LED1	HDD/Power LED indicator	
JLVDS1	LVDS Connector	DIN 40-pin wafer, pitch 1.25mm Matching Connector: Hirose DF13-40DS-1.25C
JTOUCH1	Touch panel connector	5 x 1 header, pitch 2.54mm
USB1/2	4 x USB3.0 connector	
JUSB1	USB2.0 connector	5 x 2 wafer, pitch 2.00mm
JUSB2	USB2.0 connector	5 x 2 wafer, pitch 2.00mm
LAN1/2	RJ-45 Ethernet 1/2	
BT1	Battery connector	2 x 1 wafer, pitch 1.25mm
JAMP_R1	AMPLIFIER_R	2 x 1 wafer, pitch 2.00mm
JAMP_L1	AMPLIFIER_L	2 x 1 wafer, pitch 2.00mm
MINI_PCIE1	Mini-PCI connector 1	Support PCIe & USB2.0 & SIM Card
JLPC1	LPC connector	5 x 2 header, pitch 2.00mm
PWR1	Power connector	2 x 2 wafer, pitch 4.20mm
DCIN1	Power connector	
RSTBTN1	Reset button	
JEC_ROM1	EC Debug connector	3 x 1 header, pitch 2.00 mm
SATA_PWR1	SATA Power connector	2 x 1 wafer, pitch 2.00mm
SATA1	Serial ATA connector 1	
SATA2	Serial ATA connector 2	
SIM1	SIM card slot	
HDMI1	HDMI connector	
CN1	Audio line-out connector	
JFP1	Miscellaneous setting connector	5 x 2 wafer, pitch 2.00 mm
BIOS_SPI1	BIOS SPI connector	4 x 2 header, pitch 2.00 mm
JEDP1	eDP Panel connector	10 x 2 wafer, pitch 1.25 mm
NGFF1	M.2 B key connector	
JVR_BTN1	LCD Backlight VR/Push Up/Push Down header	3 x 2 wafer, pitch 2.00 mm

2.3 Setting Jumpers & Connectors

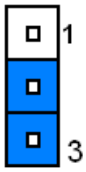
2.3.1 Clear CMOS (JBAT1)



Protect*

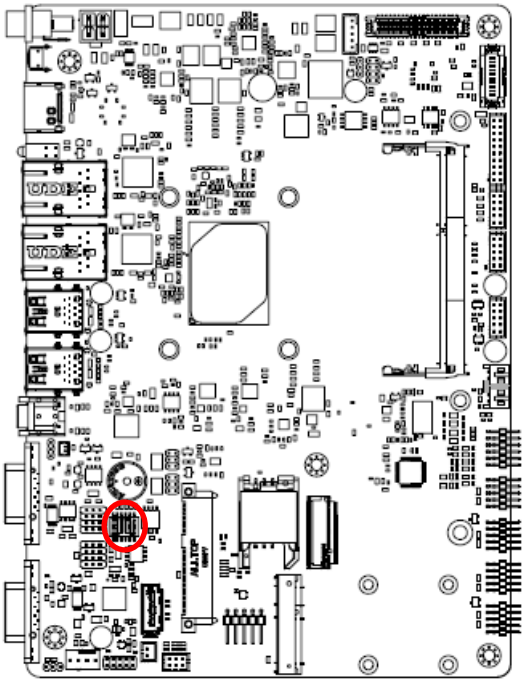


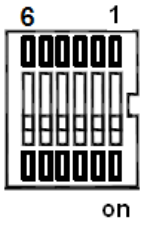
Clear CMOS



*** Default**

2.3.2 Multi-function select (SW1)





In Serial Port 1 mode

	RS-232	RS-422	RS-485
1	OFF	ON	ON
2	ON	OFF	ON

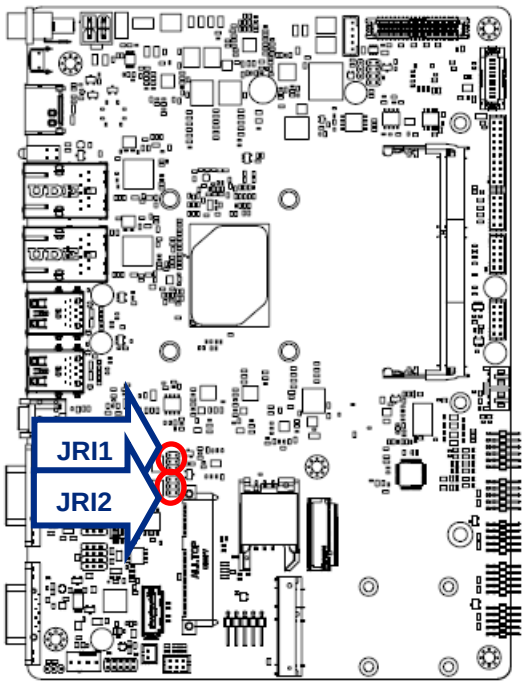
In Serial Port 2 mode

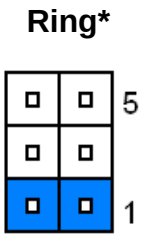
	RS-232	RS-422	RS-485
3	OFF	ON	ON
4	ON	OFF	ON

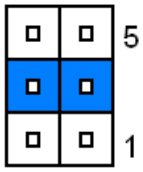
	AT SEL	ATX SEL
5	ON	OFF

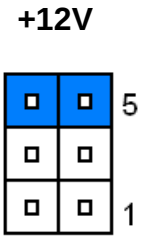
	Touch off	Touch on
6	ON	OFF

2.3.3 Serial port 1/2 pin9 signal select (JRI1/JRI2)



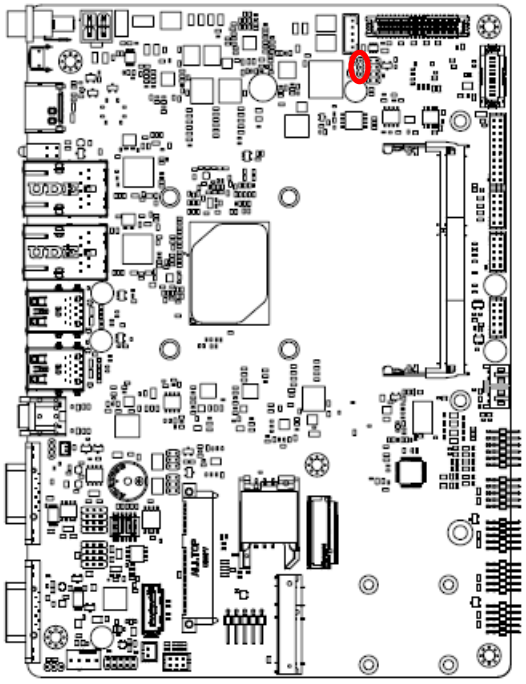


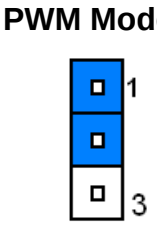


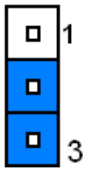


*** Default**

2.3.4 LCD brightness DC/PWM mode select (JBKL_SEL1)

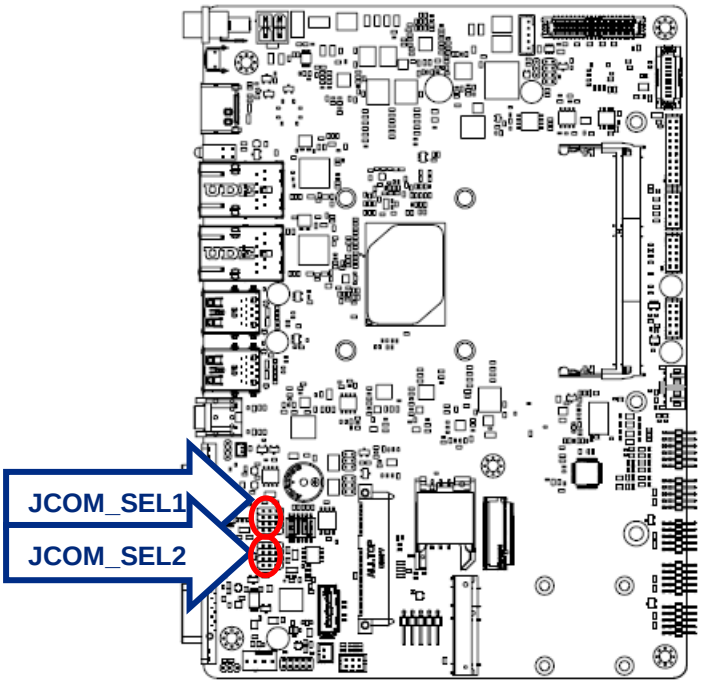




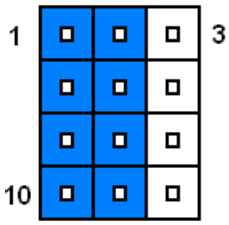


*** Default**

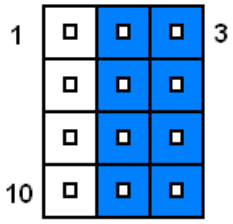
2.3.5 Serial port 1/2 – RS232/ 422/ 485 mode select (JCOM_SEL1/2)



RS-232*

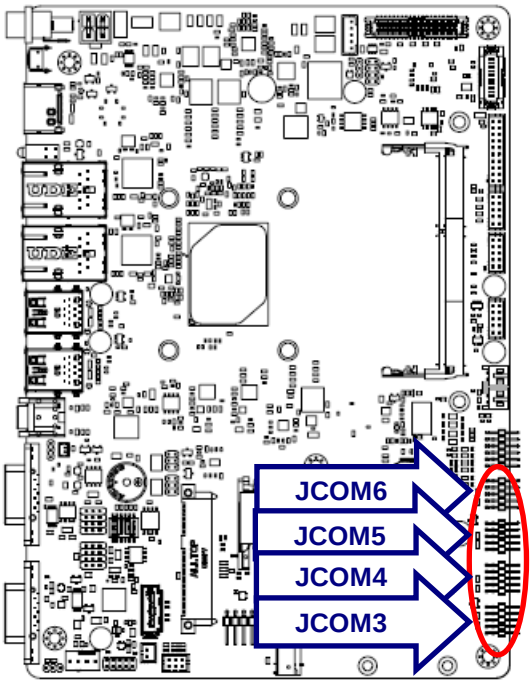


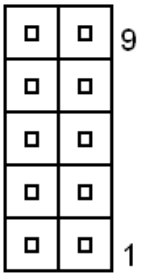
RS422/485



*** Default**

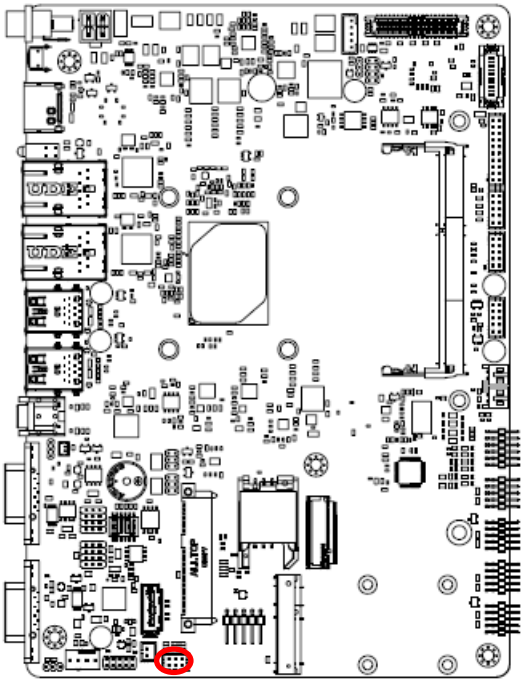
2.3.6 Serial port 3/4/5/6 connector (JCOM3/JCOM4/JCOM5/JCOM6)

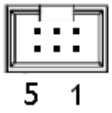




Signal	PIN	PIN	Signal
NC	10	9	COM_RI#
COM_CTS#	8	7	COM_RTS#
COM_DSR#	6	5	GND
COM_DTR#	4	3	COM_TXD
COM_RXD	2	1	COM_DCD#

2.3.7 LCD Backlight VR/Push Up/Push Down header (JVR_BTN1)



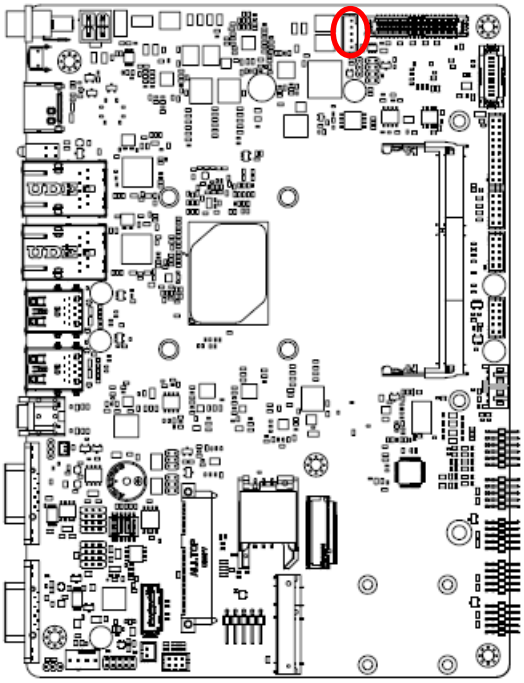


Signal	PIN	PIN	Signal
BLK_VR_MOD	1	2	GND
BLK_BRI_UP	3	4	GND
BLK_BRI_DN	5	6	GND

Note:

For Button down/up control (BLK_BRI_DN/ BLK_BRI_UP), Brightness Control in the BIOS setting must set "BIOS".

2.3.8 LCD Inverter connector (JBKL1)

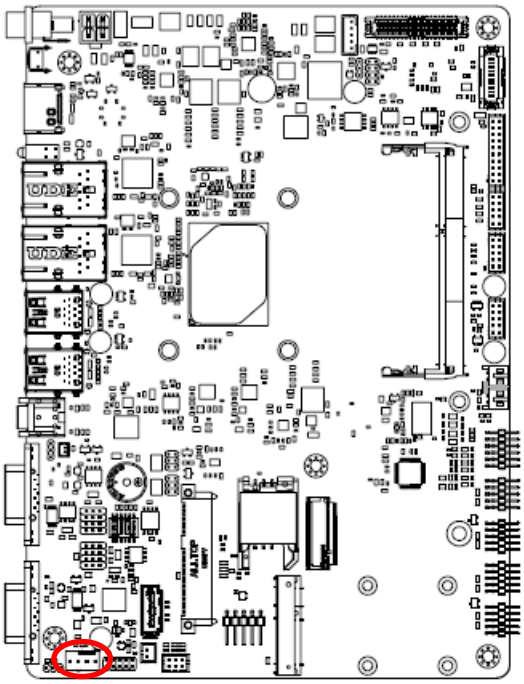


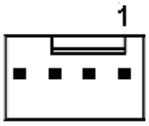
Signal	PIN
+12V	1
GND	2
BKLEN	3
VBRIGHT	4
+5V	5

Note:

For inverters with adjustable Backlight function, it is possible to control the LCD brightness through the VR signal controlled by **JVR_BTN1**. Please see the **JVR_BTN1** section for detailed circuitry information.

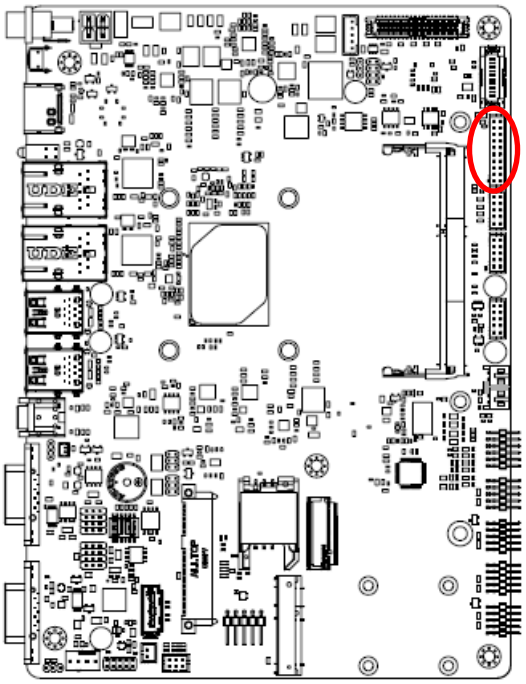
2.3.9 CPU fan connector (CPU_FAN1)

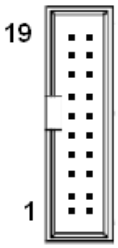




Signal	PIN
GND	1
+12V	2
EC_TACH0	3
FAN_PWM0	4

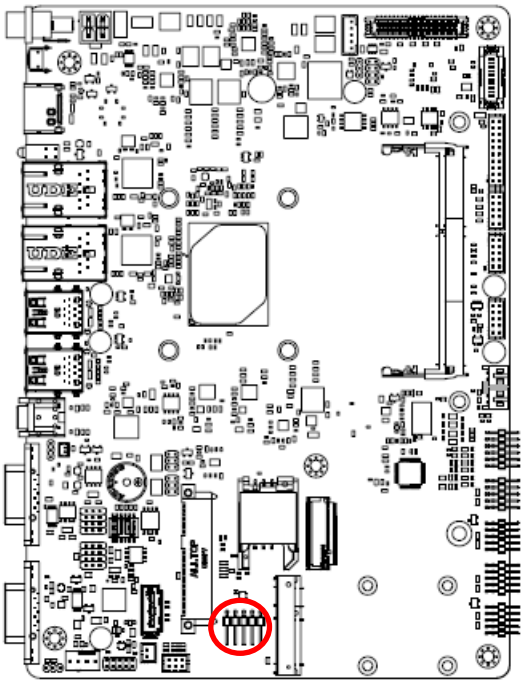
2.3.10 General purpose I/O connector (JDIO1)





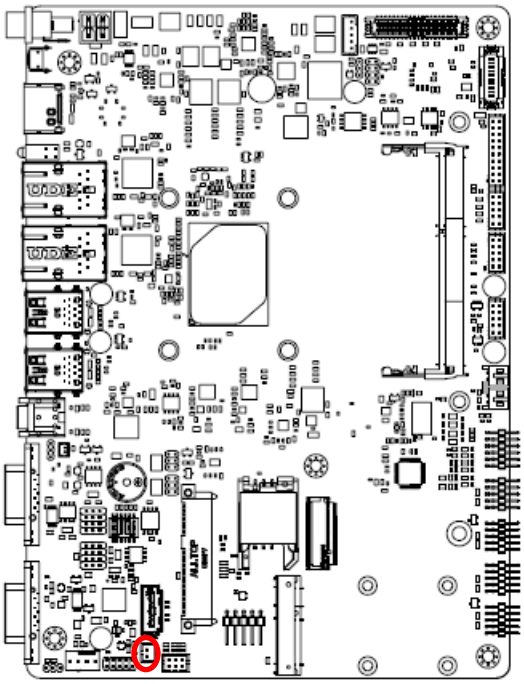
Signal	PIN	PIN	Signal
+5V	19	20	GND
SMB_SDA_S0	17	18	SMB_SCL_S0
DIO_GP27	15	16	DIO_GP17
DIO_GP26	13	14	DIO_GP16
DIO_GP25	11	12	DIO_GP15
DIO_GP24	9	10	DIO_GP14
DIO_GP23	7	8	DIO_GP13
DIO_GP22	5	6	DIO_GP12
DIO_GP21	3	4	DIO_GP11
DIO_GP20	1	2	DIO_GP10

2.3.11 Touch panel connector (JTOUCH1)



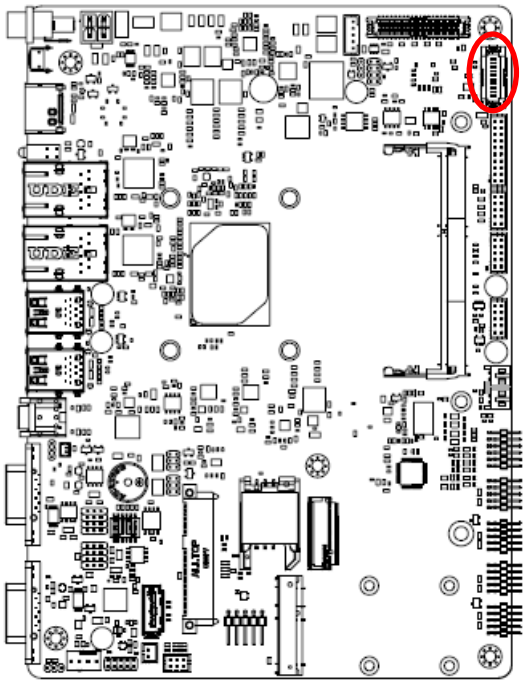
Signal	PIN
THX+	1
THX-	2
THPROBE_R	3
THY+	4
THY-	5

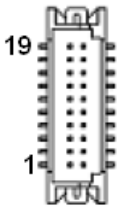
2.3.12 SATA Power connector (SATA_PWR1)



Signal	PIN
SATA_PWR	2
GND	1

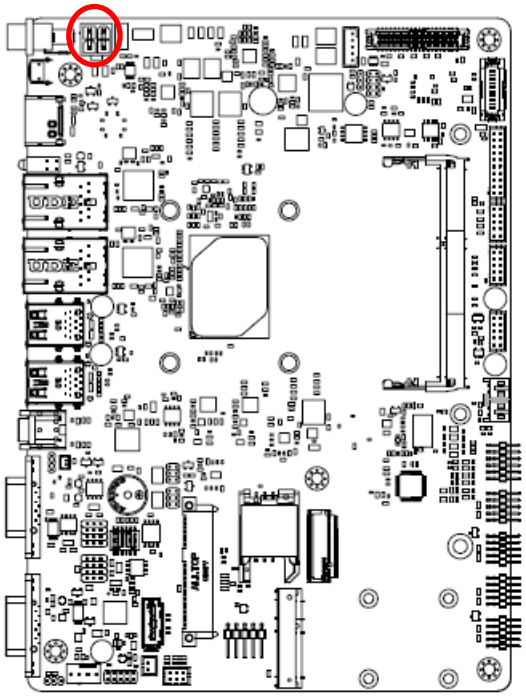
2.3.13 eDP Panel connector (JEDP1)

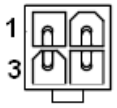




Signal	PIN	PIN	Signal
+V_EDP	19	20	+V_EDP
EDP_Panel_TXP2	17	18	EDP_Panel_HPD
EDP_Panel_TXN2	15	16	GND
GND	13	14	EDP_Panel_AUXP
EDP_Panel_TXP1	11	12	EDP_Panel_AUXN
EDP_Panel_TXN1	9	10	GND
GND	7	8	NC
EDP_Panel_TXP0	5	6	EDP_Panel_TXP3
EDP_Panel_TXN0	3	4	EDP_Panel_TXN3
GND	1	2	GND

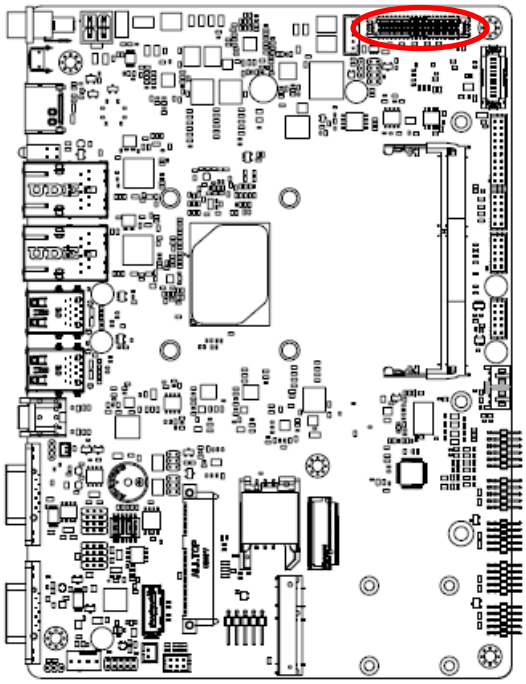
2.3.14 Power connector (PWR1)

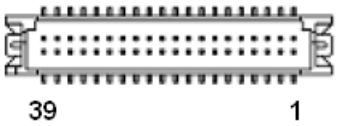




Signal	PIN	PIN	Signal
GND	1	2	GND
+VIN	3	4	+VIN

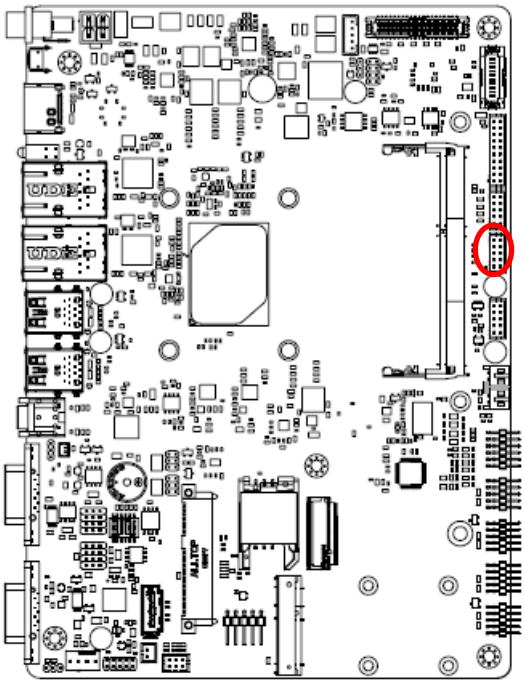
2.3.15 LVDS connector (JLVDS1)

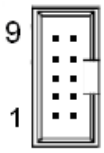




Signal	PIN	PIN	Signal
+3.3V	1	2	+5V
+3.3V	3	4	+5V
NC	5	6	NC
GND	7	8	GND
LVDS_DATA1_P	9	10	LVDS_DATA0_P
LVDS_DATA1_N	11	12	LVDS_DATA0_N
GND	13	14	GND
LVDS_DATA3_P	15	16	LVDS_DATA2_P
LVDS_DATA3_N	17	18	LVDS_DATA2_N
GND	19	20	GND
LVDS_DATA5_P	21	22	LVDS_DATA4_P
LVDS_DATA5_N	23	24	LVDS_DATA4_N
GND	25	26	GND
LVDS_DATA7_P	27	28	LVDS_DATA6_P
LVDS_DATA7_N	29	30	LVDS_DATA6_N
GND	31	32	GND
LVDS_CLK2_P	33	34	LVDS_CLK1_P
LVDS_ CLK2_N	35	36	LVDS_ CLK1_N
GND	37	38	GND
+12V	39	40	+12V

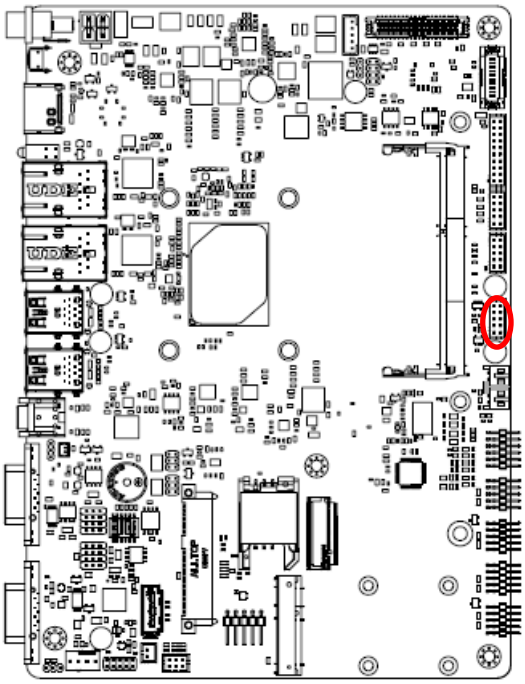
2.3.16 USB connector (JUSB1)

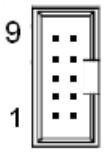




Signal	PIN	PIN	Signal
GND	9	10	GND
GND	7	8	GND
USB_HUB_Z_DP_2	5	6	USB_HUB_Z_DP_1
USB_HUB_Z_DN_2	3	4	USB_HUB_Z_DN_1
+5VSB	1	2	+5VSB

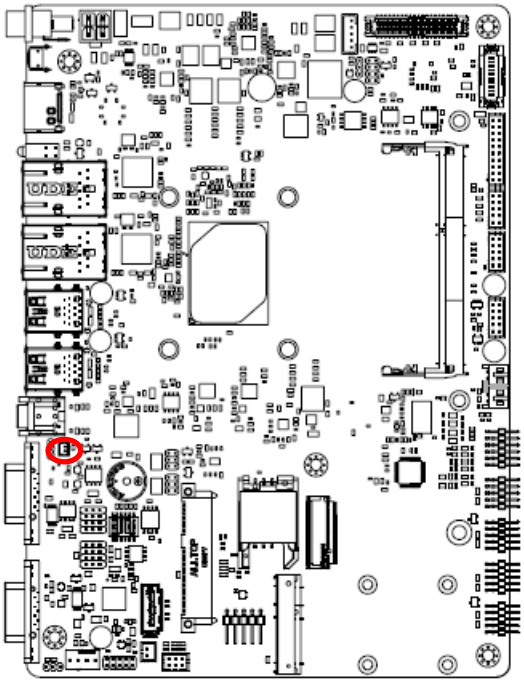
2.3.17 USB connector (JUSB2)





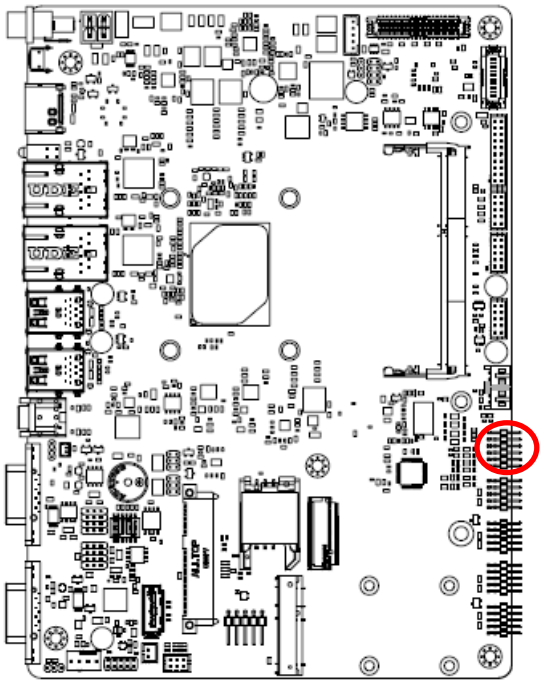
Signal	PIN	PIN	Signal
GND	9	10	GND
GND	7	8	GND
USB_HUB_Z_DP_4	5	6	USB_HUB_Z_DP_3
USB_HUB_Z_DN_4	3	4	USB_HUB_Z_DN_3
+5VSB	1	2	+5VSB

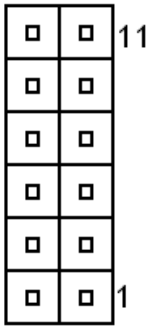
2.3.18 Battery connector (BT1)



Signal	PIN
+VBAT	2
GND	1

2.3.19 Audio connector (JAUDIO1)



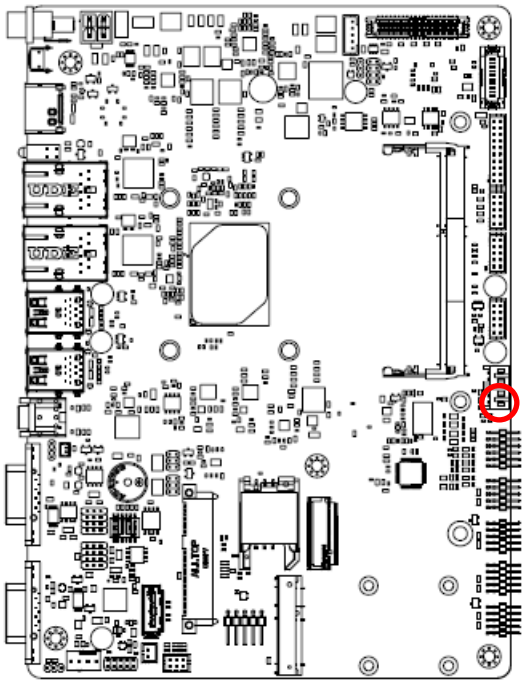


Signal	PIN	PIN	Signal
HD_AGND	12	11	MIC1-JD
LINE1-JD	10	9	FRONT-JD
MIC1-L-IN	8	7	MIC1-R-IN
LINE1-L-IN	6	5	LINE1-R-IN
HD_AGND	4	3	HD_AGND
FRONT-L-OUT	2	1	FRONT-R-OUT

2.3.19.1 Signal Description – Audio connector (JAUDIO1)

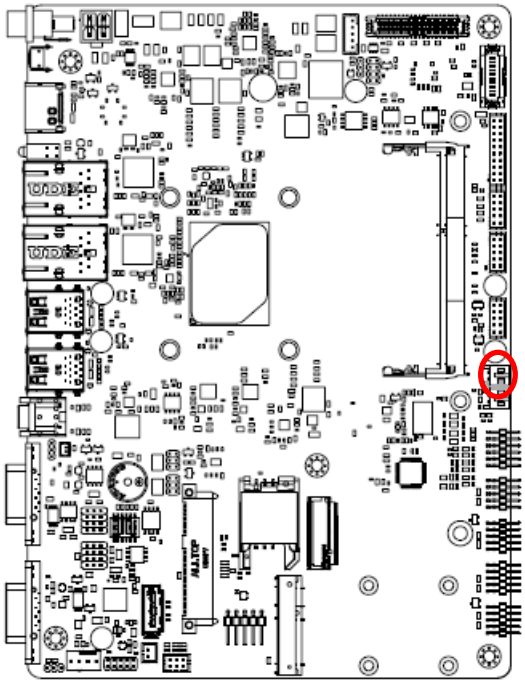
Signal	Signal Description
LINE1_JD	AUDIO IN (LINE_RIN/LIN)sense pin
FRONT_JD	AUDIO Out(ROUT/LOUT) sense pin
MIC1_JD	MIC IN (MIC_RIN/LIN) sense pin

2.3.20 AMPLIFIER_R (JAMP_R1)



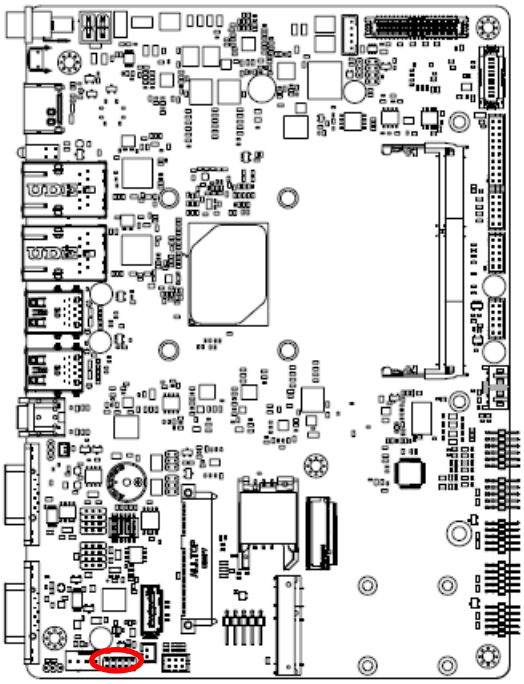
Signal	PIN
SPK_R-	2
SPK_R+	1

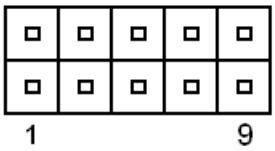
2.3.21 AMPLIFIER_L (AMP_L1)



Signal	PIN
SPK_L-	2
SPK_L+	1

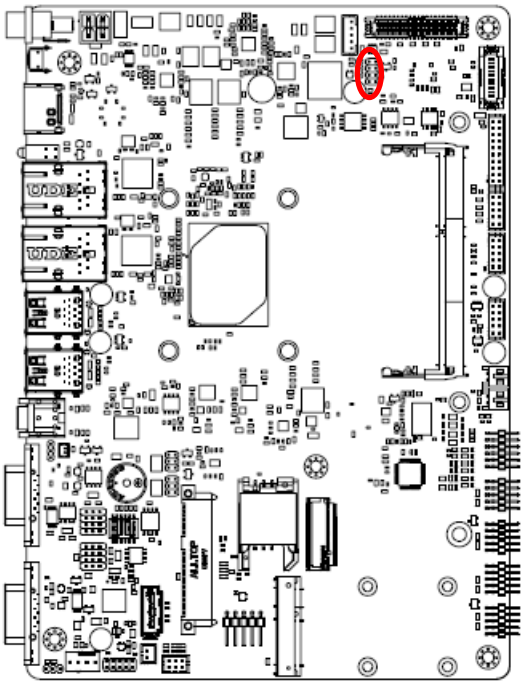
2.3.22 LPC connector (JLPC1)

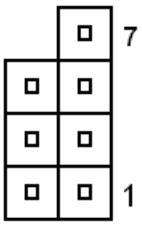




Signal	PIN	PIN	Signal
LPC_AD0	1	2	+3.3V
LPC_AD1	3	4	PLT_RST_BUF#
LPC_AD2	5	6	LPC_FRAME#
LPC_AD3	7	8	LPC_PORT80_CLK
LPC_SERIRQ	9	10	GND

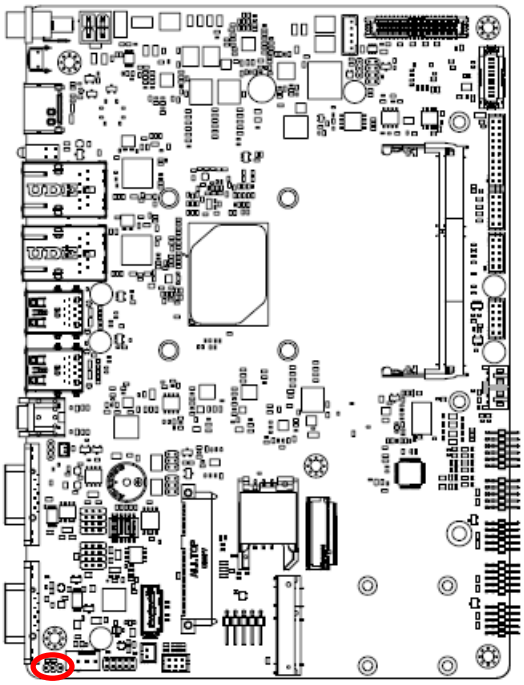
2.3.23 BIOS SPI connector (BIOS_SPI1)

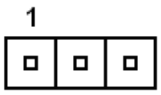




Signal	PIN	PIN	Signal
		7	SPI_HOLD#
SPI_MOSI	6	5	SPI_MISO
SPI_CLK	4	3	SPI_CS#0
GND	2	1	+1.8VSB

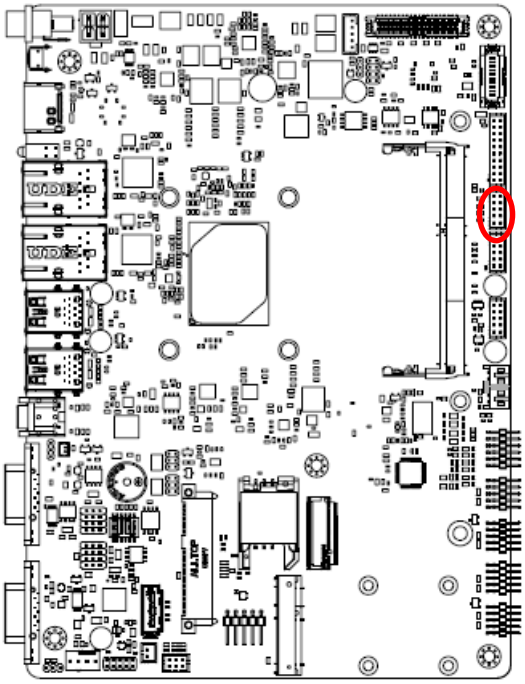
2.3.24 EC Debug connector (JEC_ROM1)

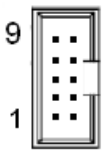




Signal	PIN
EC_SMCLK_DEBUG	1
EC_SMDAT_DEBUG	2
GND	3

2.3.25 Miscellaneous setting connector (JFP1)





Signal	PIN	PIN	Signal
GND	9	10	PWR_BTN_IN_EC#
+5VSB	7	8	LAN2_ACT#_LED
+5VSB	5	6	LAN1_ACT#_LED
+5V	3	4	HDD_LED#
+5VSB	1	2	PWR_LED-

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

The 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 <Del> or <F2> immediately after switching the system on, or
By pressing the <Del> or <F2> key when the following message appears briefly at the left-top of the screen during the POST (Power On Self Test).

Press <Del> or <F2> 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. If you do not press the keys at the correct time and the system does not boot, an error message will be displayed and you will again be asked to.

Press F1 to Continue, DEL to enter SETUP

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>.

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.

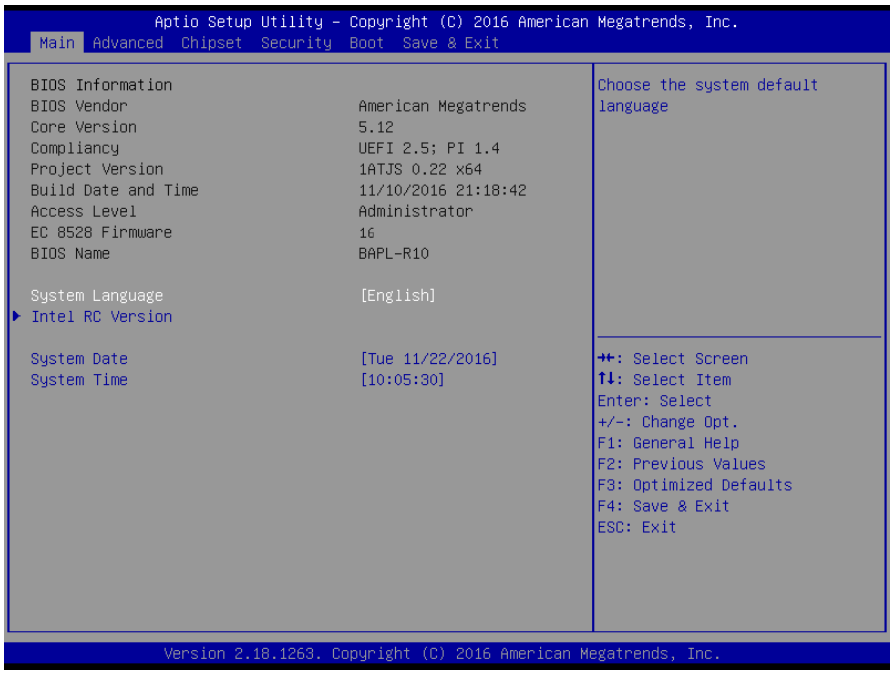
The best advice is to only alter settings which you thoroughly understand. To this end, we strongly recommend that you avoid making any changes to the chipset defaults. These defaults have been carefully chosen by both BIOS Vendor and your systems manufacturer to provide the absolute maximum performance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

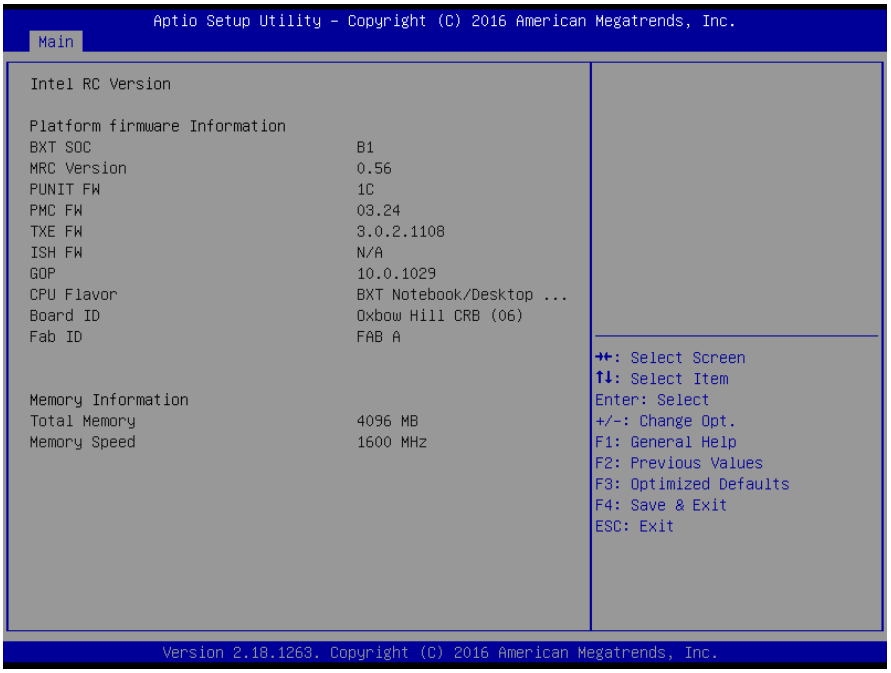
3.6 BIOS setup

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.

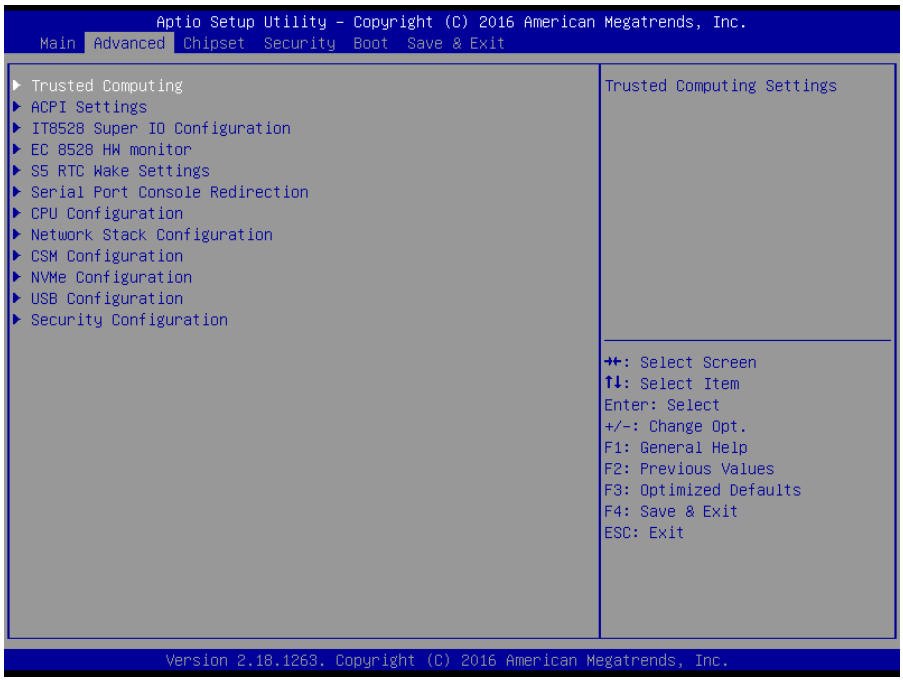
3.6.1.3 System Time

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

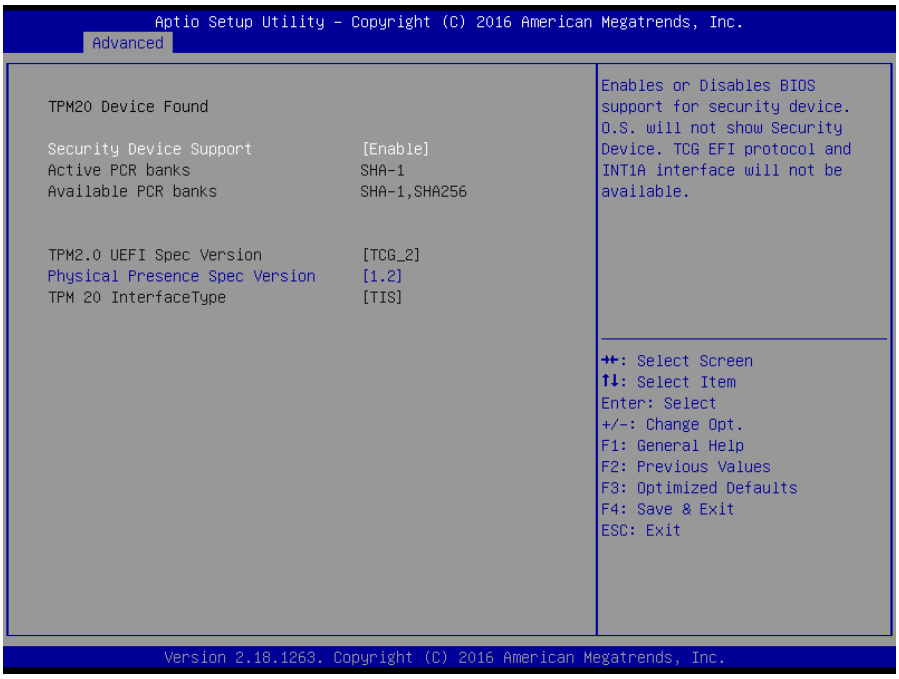
Note: The BIOS setup screens shown in this chapter are for reference purposes only, and may not exactly match what you see on your screen.
Visit the Avalue website (www.avalue.com.tw) to download the latest product and BIOS information.

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.

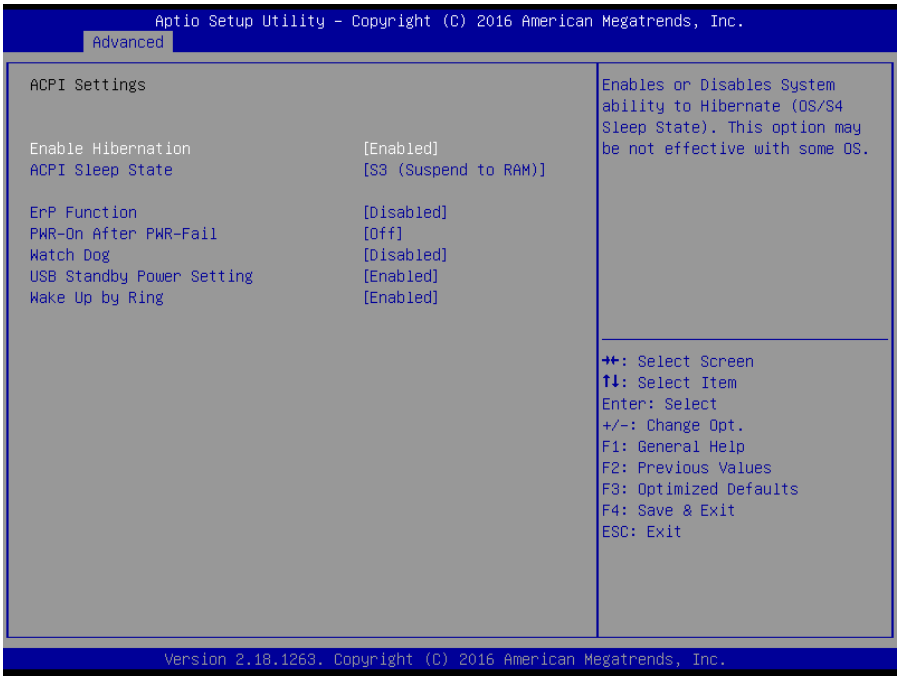


3.6.2.1 Trusted Computing



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.
Physical Presence Spec Version	1.2**[Default]**, 1.3	Select to Tell O.S. to support PPI Spec Version 1.2 or 1.3. Note some HCK tests might not support 1.3.

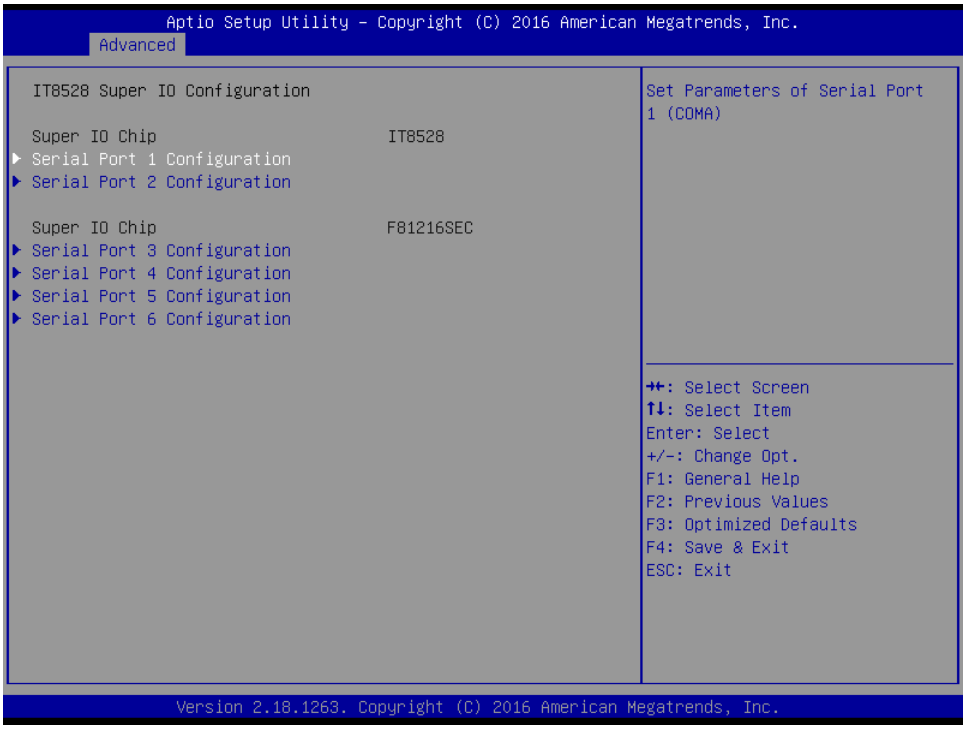
3.6.2.2 APCI Settings



Item	Options	Description
Enable Hibernation	Disabled Enabled**[Default]**,	Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.
ACPI Sleep State	Suspend Disabled, S3 (Suspend to RAM) **[Default]**	Select the highest ACPI sleep state the system will enter the SUSPEND button is pressed.
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.
USB Standby Power Setting	Disabled Enabled**[Default]**,	Enabled/Disabled USB Standby Power during S3/S4/S5.
Wake Up by Ring	Disabled Enabled**[Default]**,	Wake Up by Ring from S3/S4/S5.

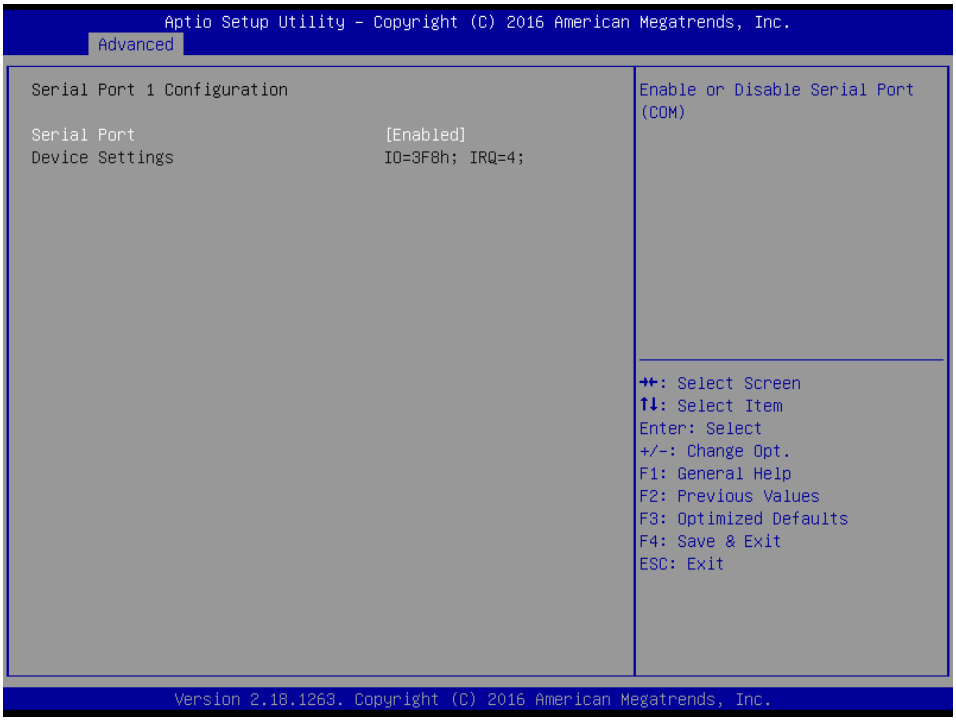
3.6.2.3 IT8528 Super IO Configuration

You can use this item to set up or change the IT8528 Super IO configuration for serial ports. Please refer to 3.6.2.3.1~ 3.6.2.3.6 for more information.



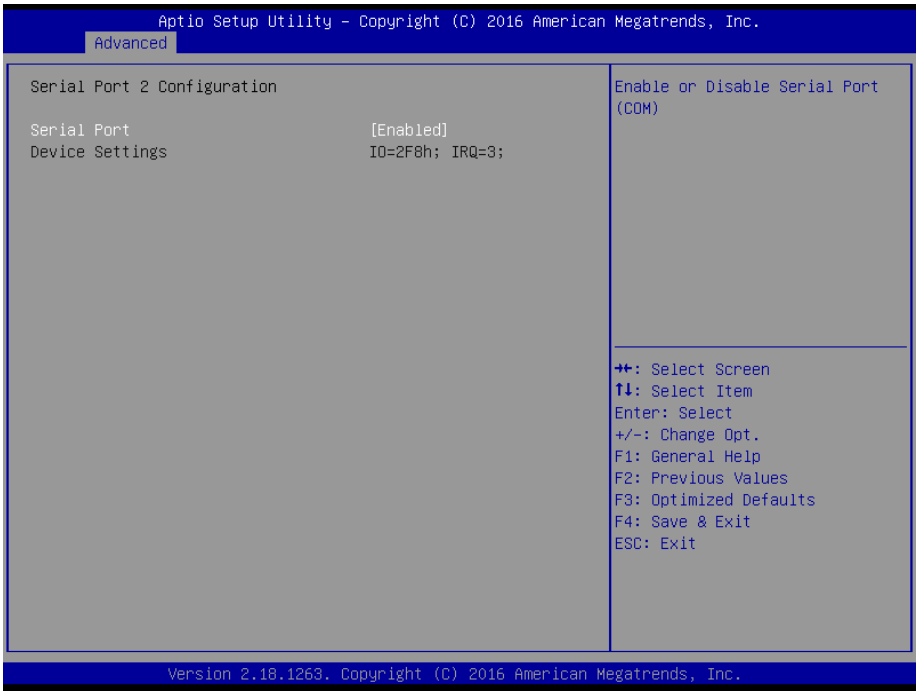
Item	Description
Serial Port 1 Configuration	Set Parameters of Serial Port 1 (COMA).
Serial Port 2 Configuration	Set Parameters of Serial Port 2 (COMB).
Serial Port 3 Configuration	Set Parameters of Serial Port 3 (COMC).
Serial Port 4 Configuration	Set Parameters of Serial Port 4 (COMD).
Serial Port 5 Configuration	Set Parameters of Serial Port 5 (COME).
Serial Port 6 Configuration	Set Parameters of Serial Port 6 (COMF).

3.6.2.3.1 Serial Port 1 Configuration



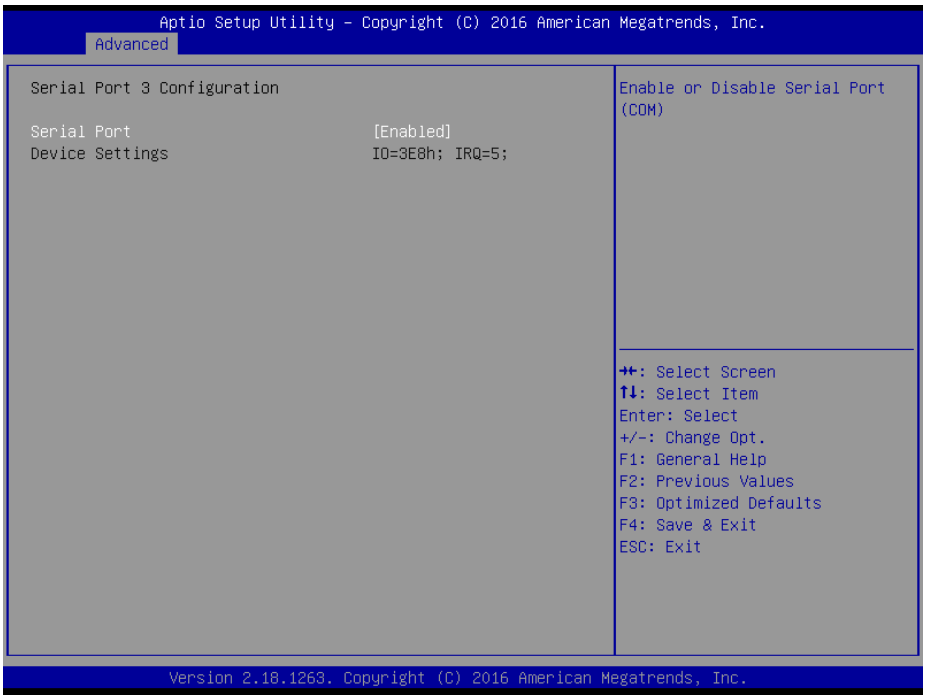
Item	Option	Description
Serial Port	Disabled Enabled**[Default]**,	Enable or Disable Serial Port (COM).

3.6.2.3.2 Serial Port 2 Configuration



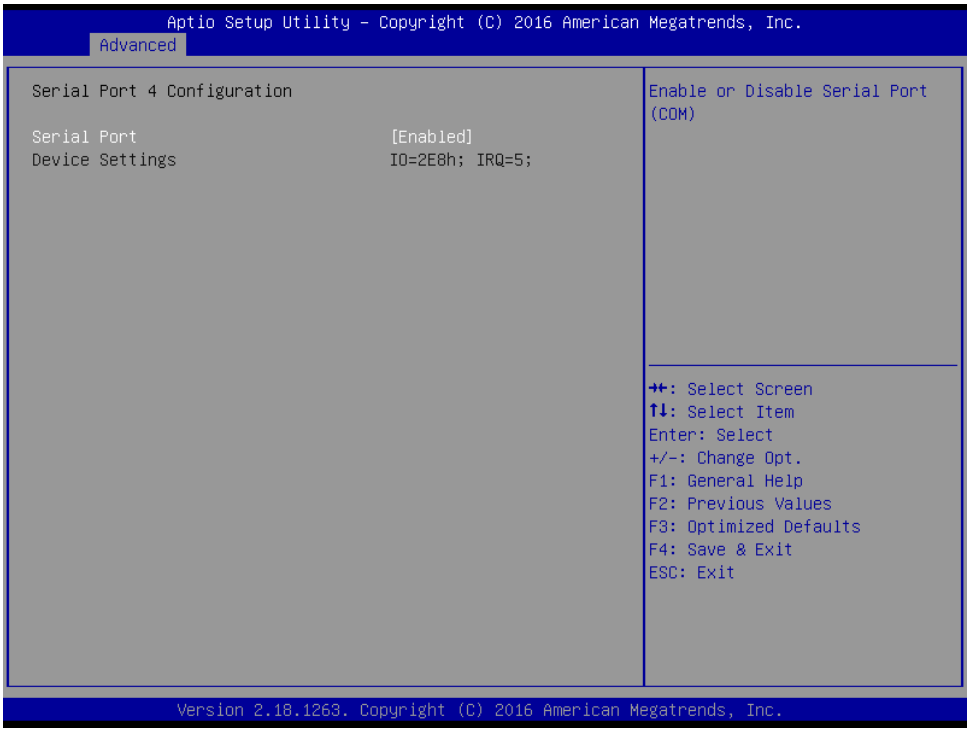
Item	Option	Description
Serial Port	Disabled Enabled**[Default]**,	Enable or Disable Serial Port (COM).

3.6.2.3.3 Serial Port 3 Configuration



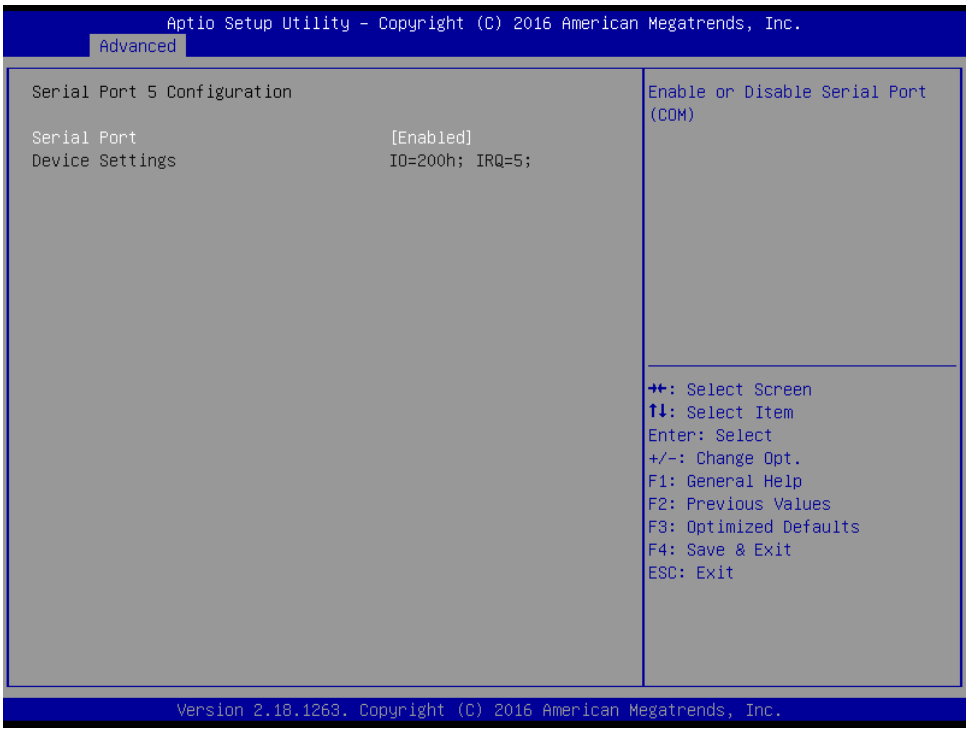
Item	Option	Description
Serial Port	Disabled Enabled**[Default]**,	Enable or Disable Serial Port (COM).

3.6.2.3.4 Serial Port 4 Configuration



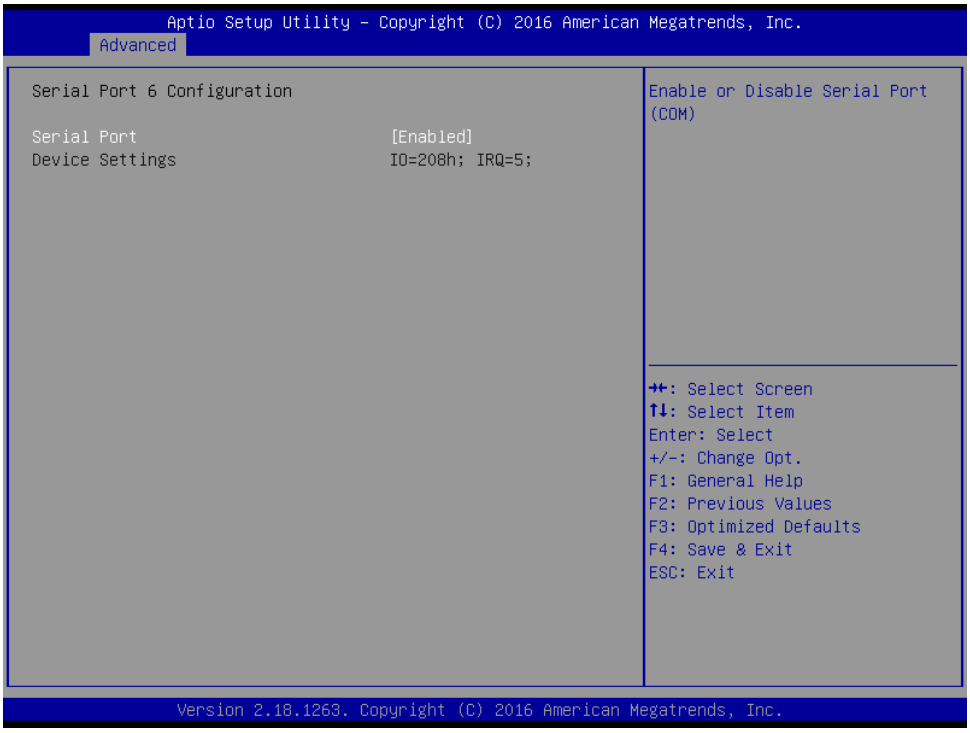
Item	Option	Description
Serial Port	Disabled Enabled**[Default]**,	Enable or Disable Serial Port (COM).

3.6.2.3.5 Serial Port 5 Configuration



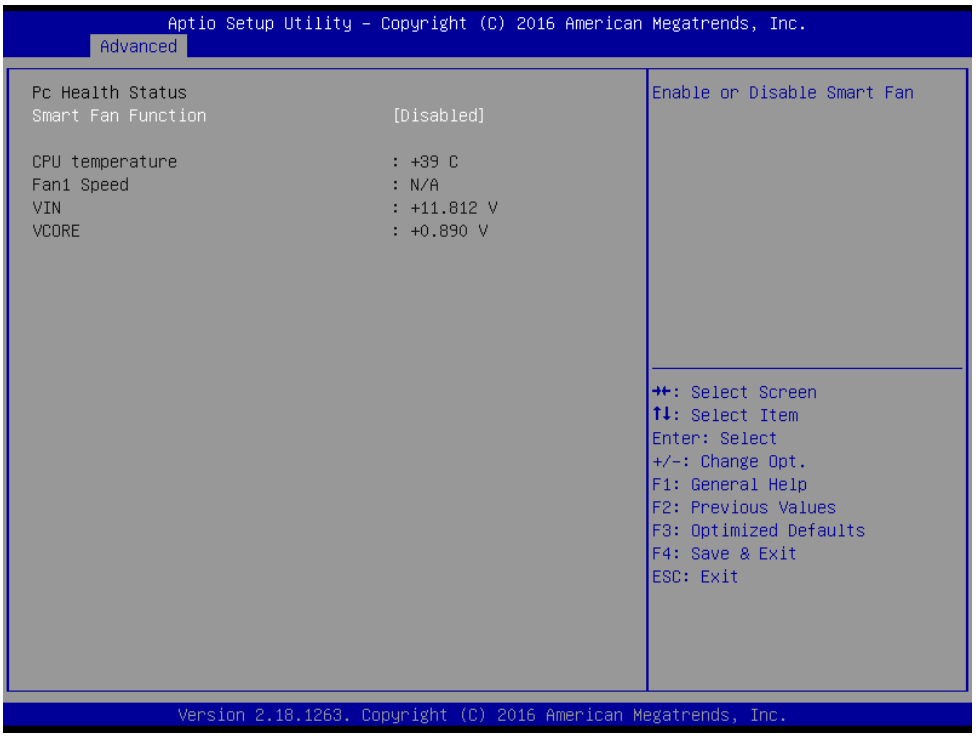
Item	Option	Description
Serial Port	Disabled Enabled**[Default]**,	Enable or Disable Serial Port (COM).

3.6.2.3.6 Serial Port 6 Configuration



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

3.6.2.4 H/W Monitor

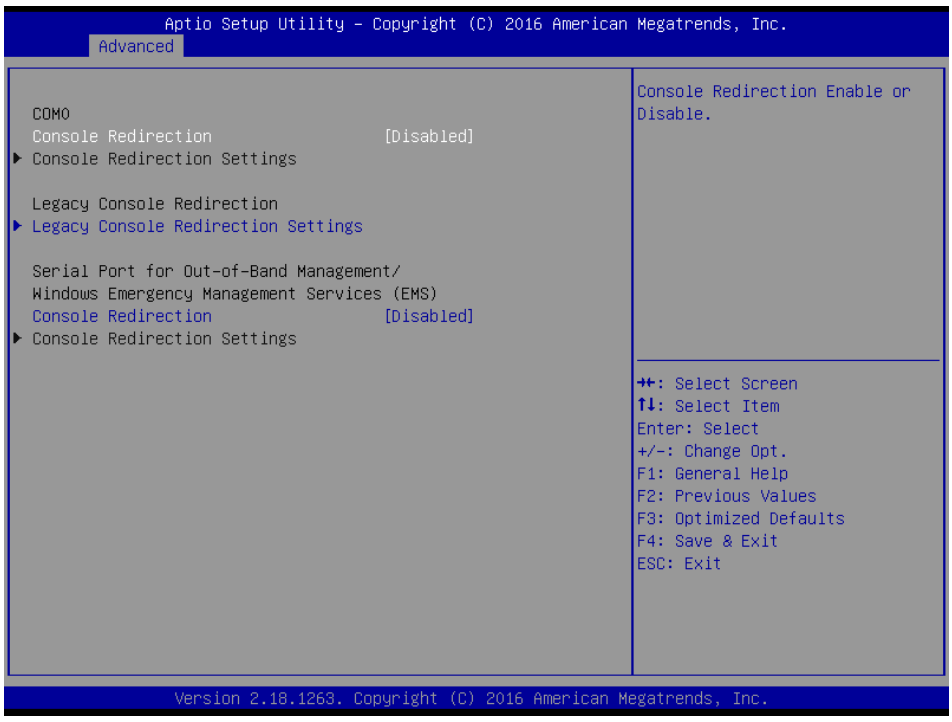


Item	Options	Description
Smart Fan Function	Disabled**[Default]** Enabled	Enables or Disables Smart Fan.

3.6.2.5 S5 RTC Wake Settings

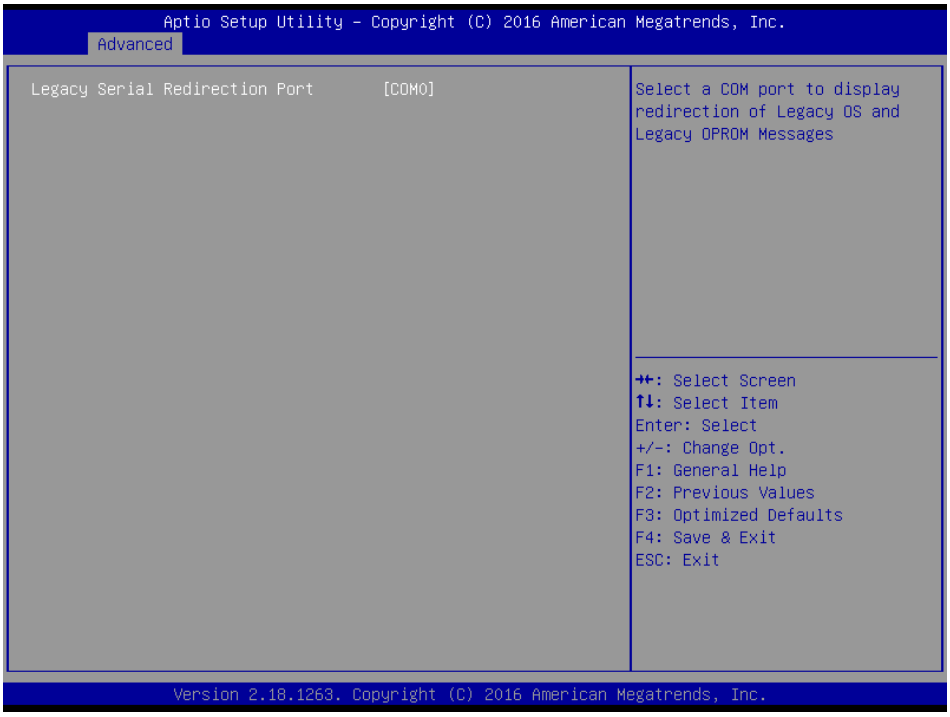
Item	Options	Description
Wake system from S5	Disabled**[Default]**, Fixed Time Dynamic Time	Enable or disable System wake on alarm event. Select Fixed Time, system will wake on the hr::min::sec specified. Select Dynamic Time, System will wake on the current time + Increase minute(s).

3.6.2.6 Serial Port Console Redirection



Item	Options	Description
Legacy Serial Redirection Port	Disabled**[Default]**, Enabled	Select a COM port to display redirection of Legacy OS and Legacy OPROM Messages.

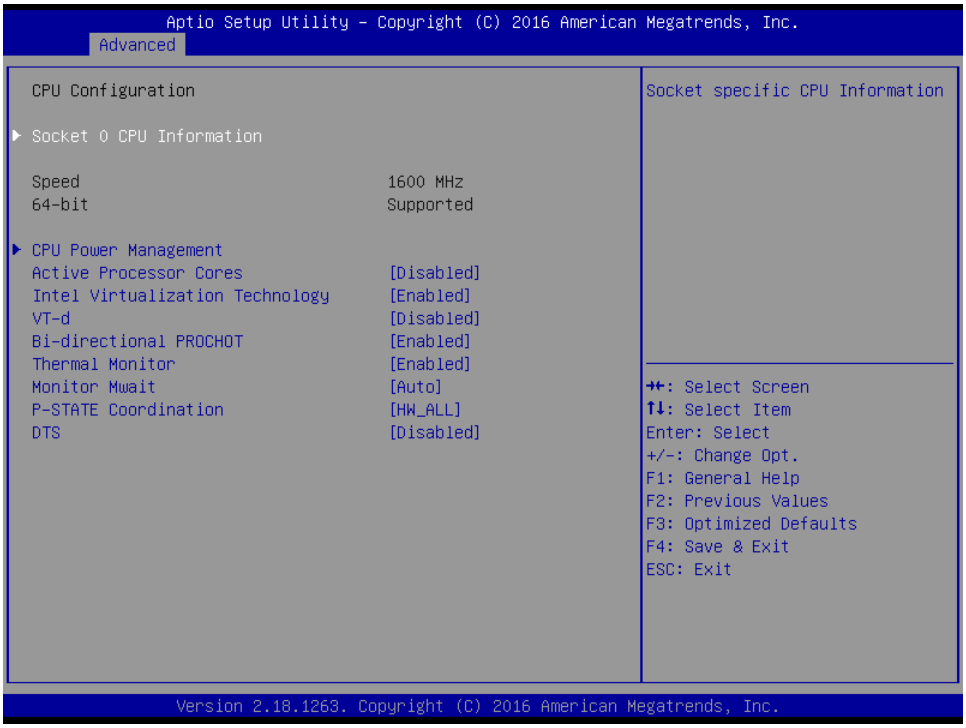
3.6.2.6.1 Legacy Console Redirection Settings



Item	Option	Description
Legacy Serial Redirection Port	COM0**[Default]**,	Select a COM port to display redirection of Legacy OS and Legacy OPROM Messages.

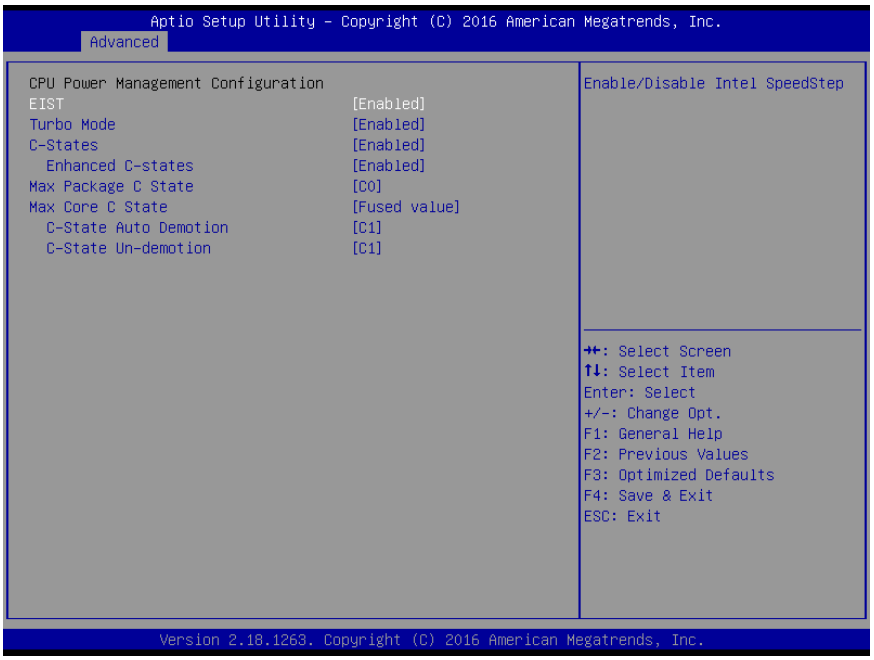
3.6.2.7 CPU Configuration

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



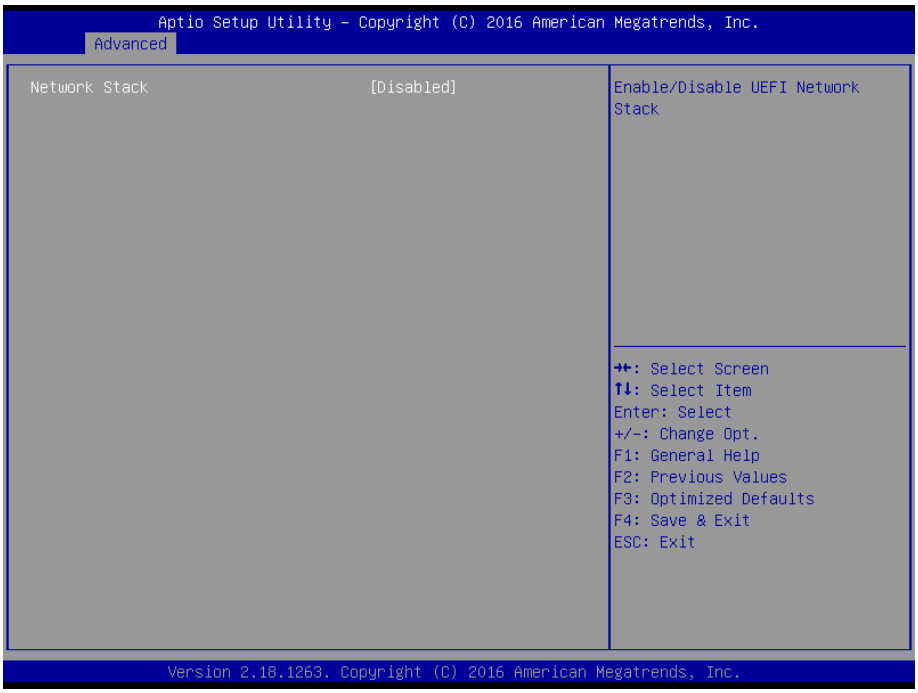
Item	Options	Description
Active Processor Cores	Disabled**[Default]**, Enabled	Number of cores to enable in each processor package.
Intel Virtualization Technology	Disabled, Enabled**[Default]**	When enabled, a VMM can utilize the additional hardware capabilities provided by Virtualization Technology.
VT-d	Disabled**[Default]**, Enabled	Enable/Disable CPU VT-d.
Bi-directional PROCHOT	Disabled, Enabled**[Default]**	When a processor thermal sensor trips (either core), the PROCHOT# will be driven. If bi-direction is enabled, external agents can drive PROCHOT# to throttle the processor.
Thermal Monitor	Disabled, Enabled**[Default]**	Enable/Disable Thermal Monitor.
Monitor Mwait	Disabled, Enabled Auto**[Default]**	Enable/Disable Monitor Mwait.
P-STATE Coordination	HW_ALL**[Default]** SW_ALL SW_ANY	Change P-STATE Coordination type.
DTS	Disabled**[Default]**, Enabled	Enable/Disable Digital Thermal Sensor.

3.6.2.7.1 CPU Power Management Configuration



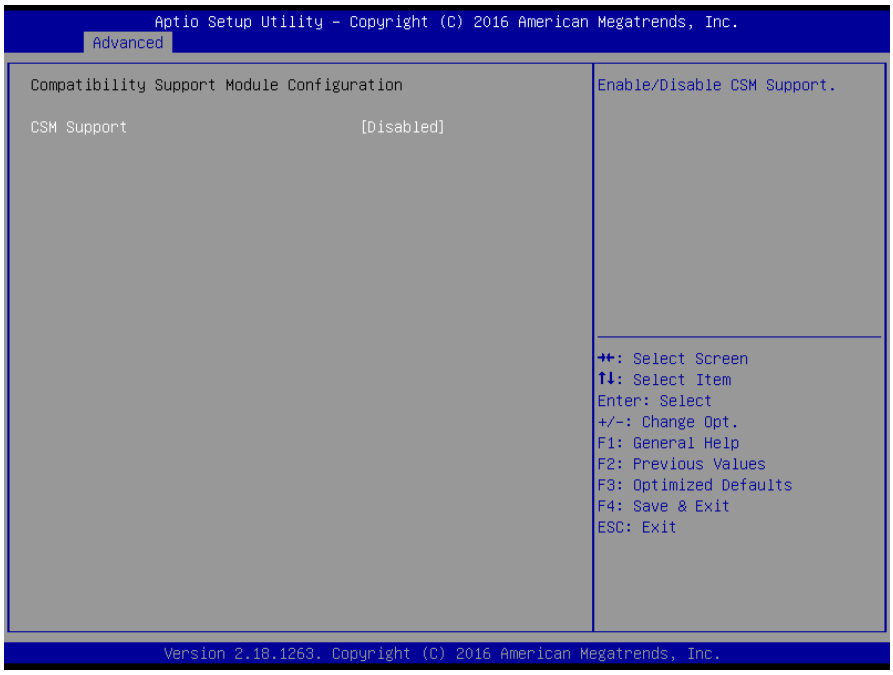
Item	Options	Description
EIST	Disabled, Enabled**[Default]**	Enable/Disable Intel SpeedStep.
Turbo Mode	Disabled, Enabled**[Default]**	Turbo Mode.
C-States	Disabled, Enabled**[Default]**	Enable/Disable C States.
Enhanced C-states	Disabled, Enabled**[Default]**	Enable/Disable C1E. When enabled, CPU will switch to minimum speed when all cores enter C-State.
Max Package C State	PC2 PC1 C0**[Default]**	Control the Max Package C State that the processor will support.
Max Core C State	Fused value**[Default]** Core C10 Core C9 Core C8 Core C7 Core C6 Core C1 Unlimited	This option controls the Max Core C State that cores will support.
C-State Auto Demotion	Disabled, C1**[Default]**	Configure C-State Auto Demotion.
C-State Un-demotion	Disabled, C1**[Default]**	Configure C-State Un-demotion.

3.6.2.8 Network Stack Configuration



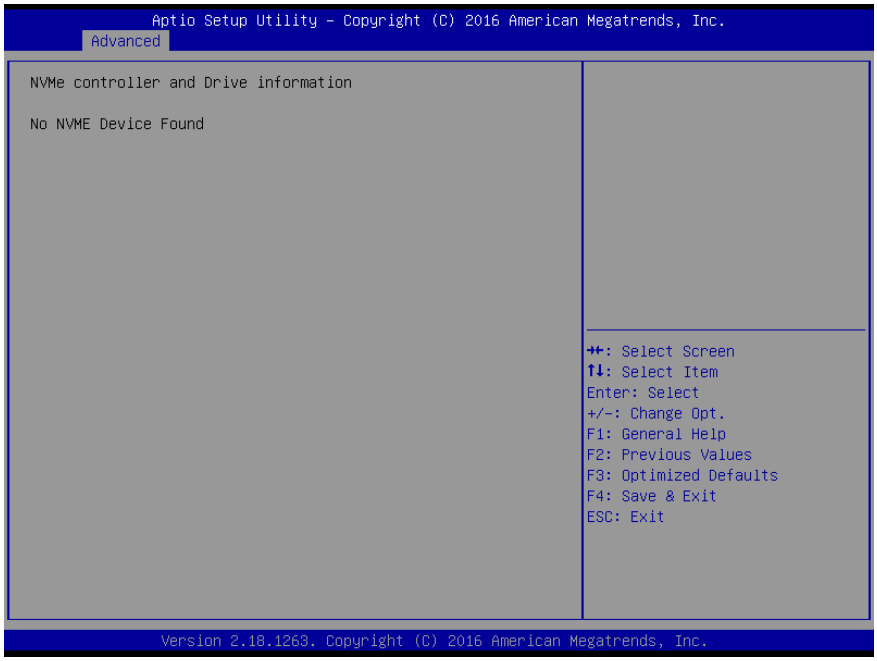
Item	Options	Description
Network Stack	Enabled Disabled**[Default]**	Enable/Disable UEFI Network Stack.

3.6.2.9 CSM Configuration



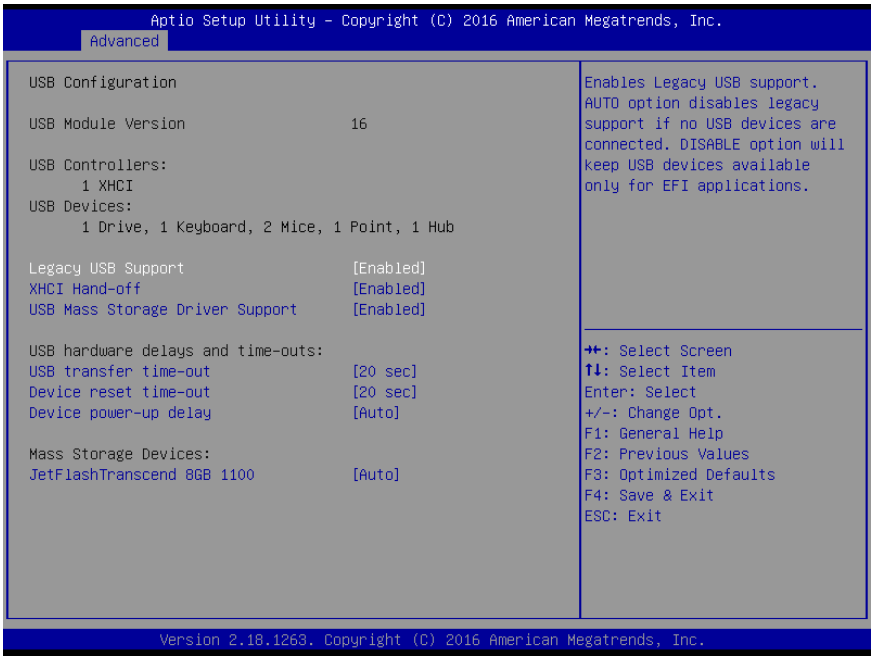
Item	Options	Description
CSM Support	Disabled**[Default]** Enabled	Enable/Disable CSM Support.

3.6.2.10 NVMe Configuration



3.6.2.11 USB Configuration

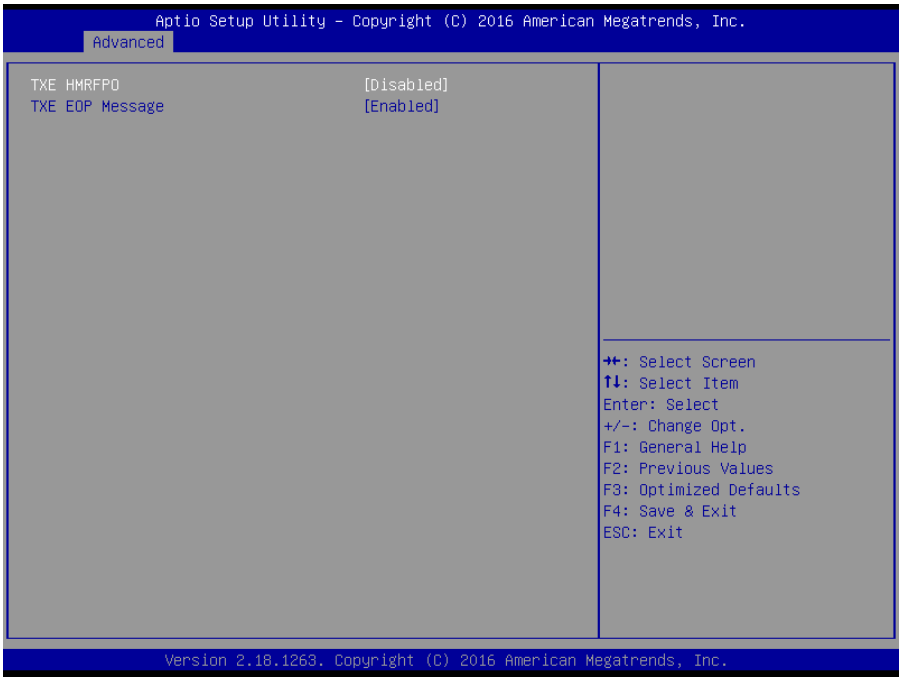
The USB Configuration menu helps read USB information and configures USB settings.



Item	Options	Description
Legacy USB Support	Enabled**[Default]** Disabled Auto	Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.
XHCI Hand-off	Enabled**[Default]** Disabled	This is a workaround for OSew without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.

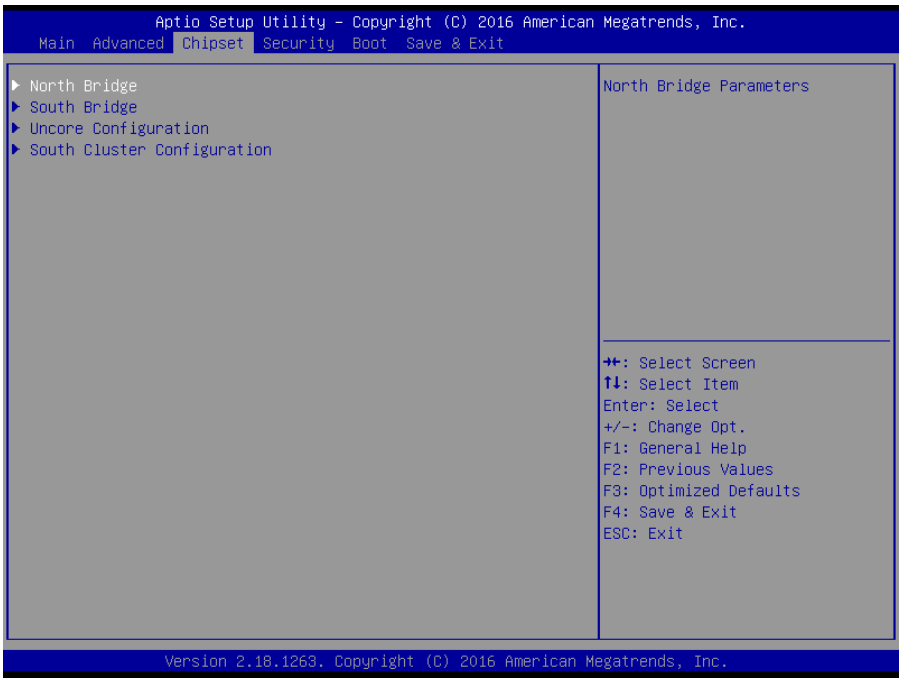
USB Mass Storage Driver Support	Disabled Enabled**[Default]**	Enable/Disable USB Mass Storage Driver Support.
USB transfer time-out	1 sec 5 sec 10 sec 20 sec**[Default]**	The time-out value for Control, Bulk, and Interrupt transfers.
Device reset time-out	10 sec 20 sec**[Default]** 30 sec 40 sec	USB 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.

3.6.2.12 Security Configuration

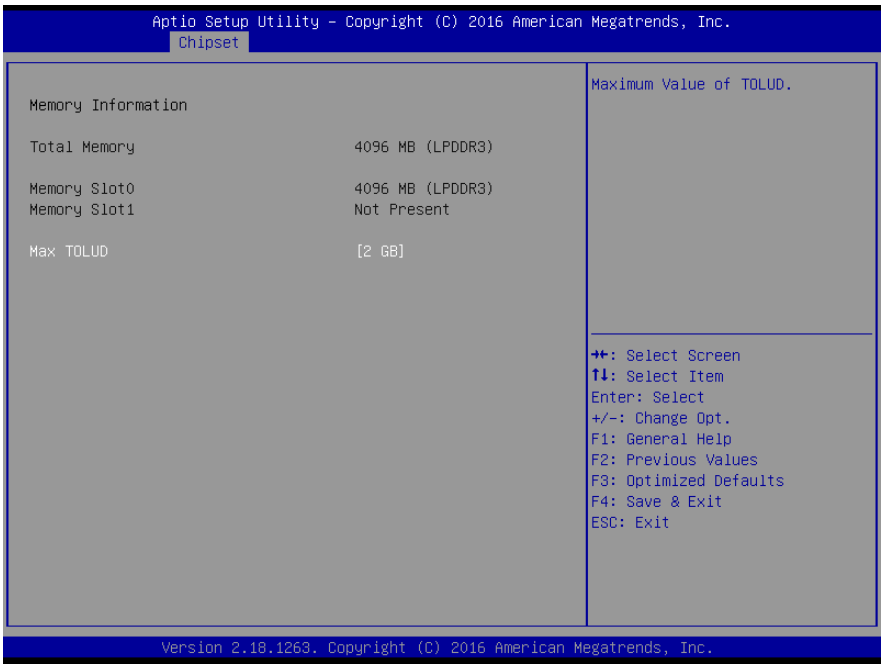


Item	Options	Description
TXE HMRFPO	Enabled, Disabled**[Default]**	TXE HMRFPO.
TXE EOP Message	Enabled**[Default]** Disabled	Send EOP Message Before Enter OS.

3.6.3 Chipset

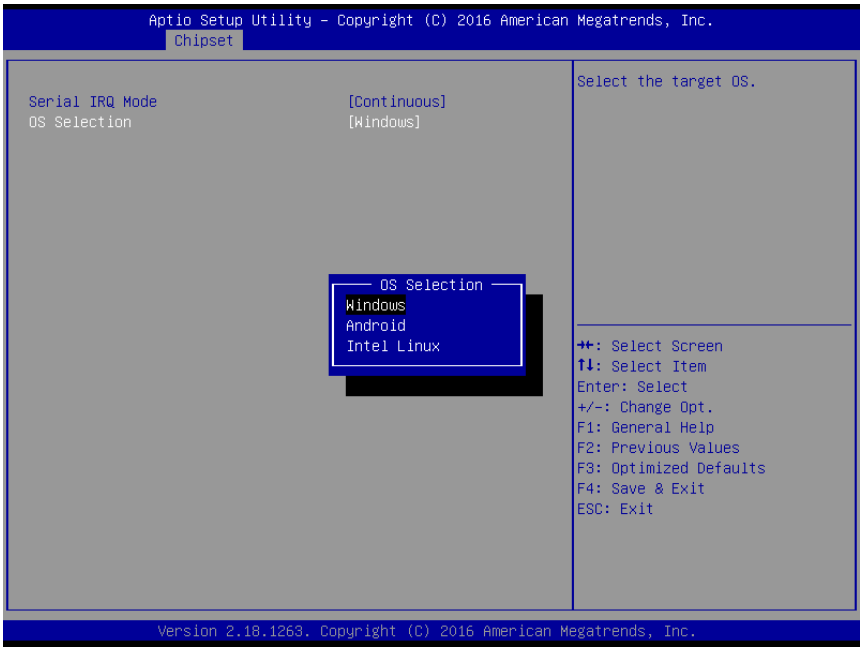


3.6.3.1 North Bridge



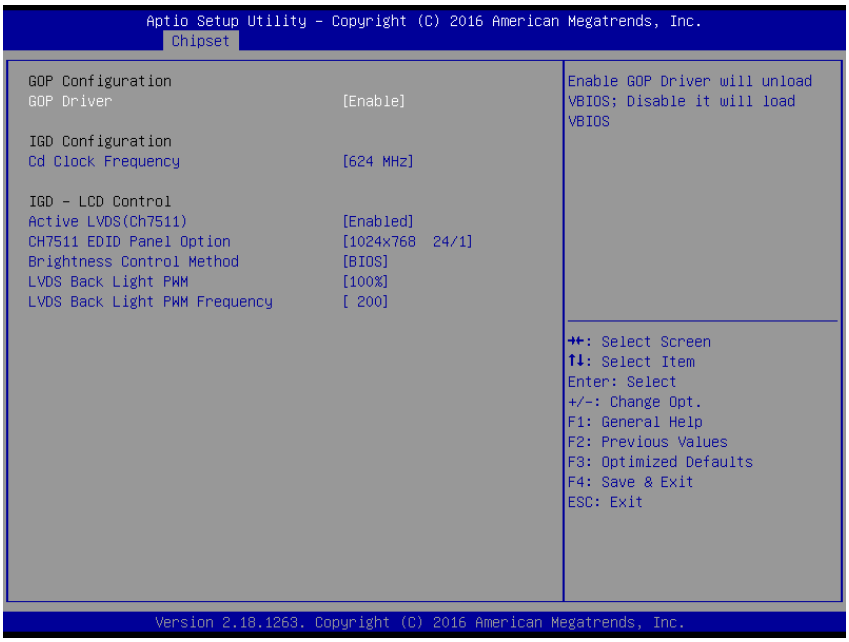
Item	Option	Description
Max TOLUD	2 GB**[Default]** 2.25 GB 2.5 GB 2.75 GB	Maximum Value of TOLUD.

3.6.3.2 South Bridge



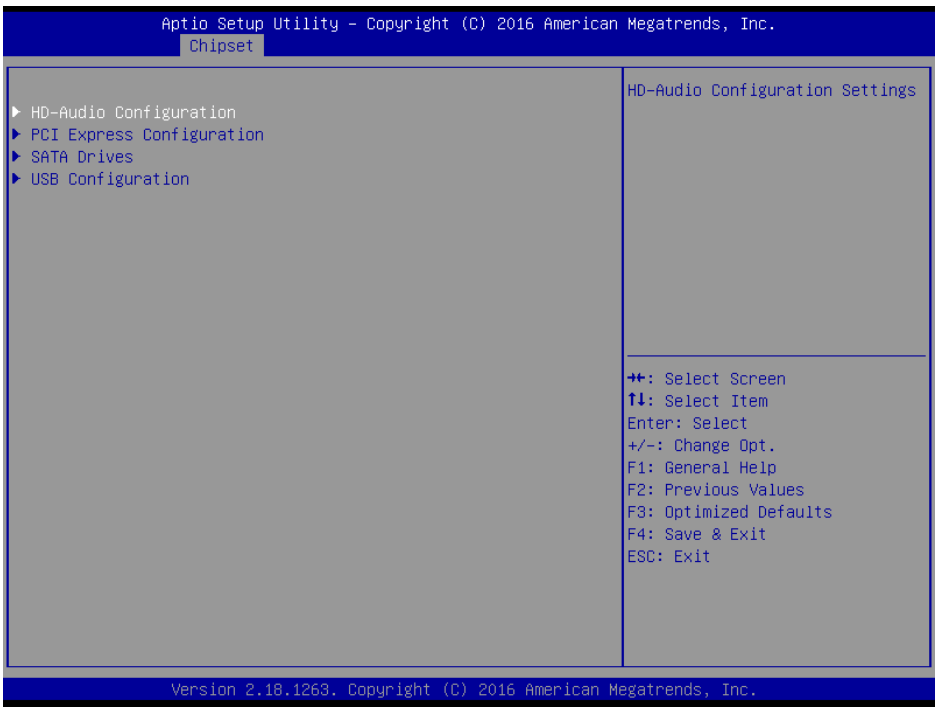
Item	Option	Description
Serial IRQ Moed	Quiet Continuous**[Default]**	Configure Serial IRQ Mode.
OS Selection	Windows**[Default]** Android Intel Linux	Select the target OS.

3.6.3.3 Uncore Configuration

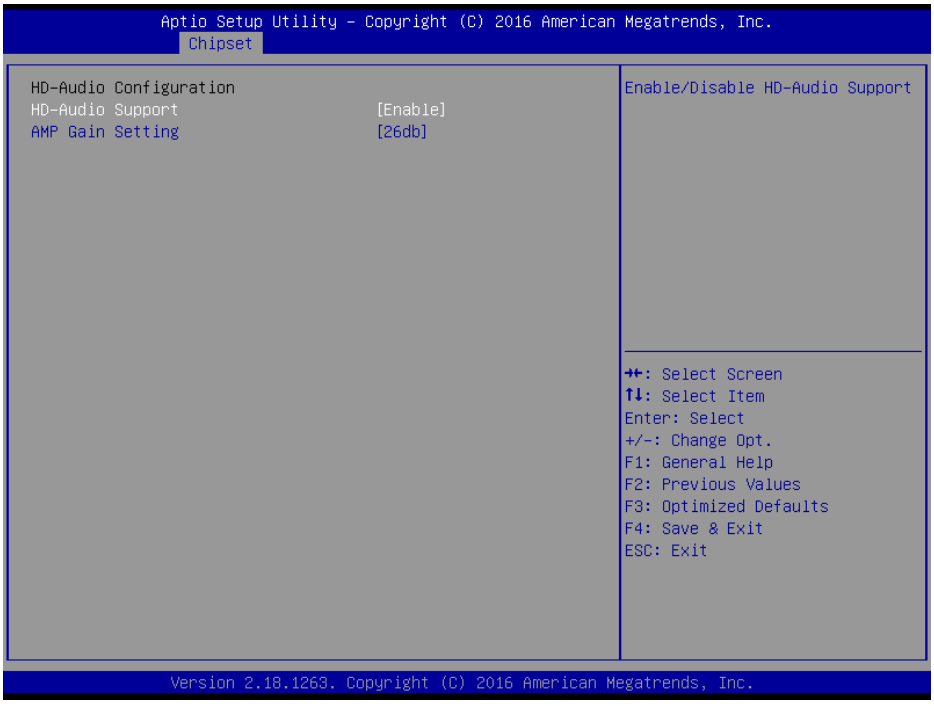


Item	Option	Description
GOP Driver	Enable**[Default]** Disable	Enable GOP Driver will unload VBIOS; Disable it will load VBIOS.
Cd Clock Frequency	144 MHz 288 MHz 384 MHz 576 MHz 624 MHz**[Default]**	Select the highest Cd Clock frequency supported by the platform.
Active LVDS(CH7511)	Disable Enabled**[Default]**	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 1440x900 18/2 1600x1200 24/2 1366x768 24/1 1920x1080 24/2 1680x1050 24/2	Port1-EDP to LVDS(Chrotel 7511) Panel EDID Option.
Brightness Control Method	BIOS**[Default]** BR Button VR OS driver	LVDS Brightness Control Method. 1.BIOS 2.Brightness Button 3.Variable Resistor 4.OS Driver.
LVDS Back Light PWM	00% 25% 50% 75% 100%**[Default]**	Select LVDS back light PWM duty.
LVDS Back Light PWM Frequency	200**[Default]** 300 400 500 700 1k 2k 3k 5k 10k 20k	Select LVDS back light PWM Frequency.

3.6.3.4 South Cluster Configuration



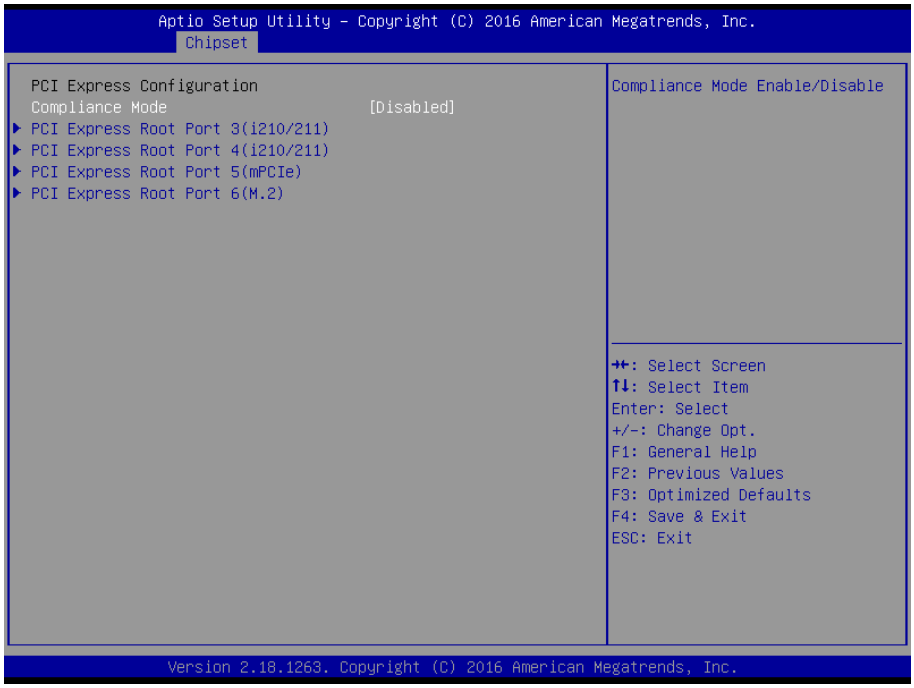
3.6.3.4.1 HD-Audio Configuration



Item	Option	Description
HD-Audio Support	Disable Enable**[Default]**,	Enable/Disable HD-Audio Support.
AMP Gain Setting	20db 26db**[Default]**, 32db	Select AMP Gain db.

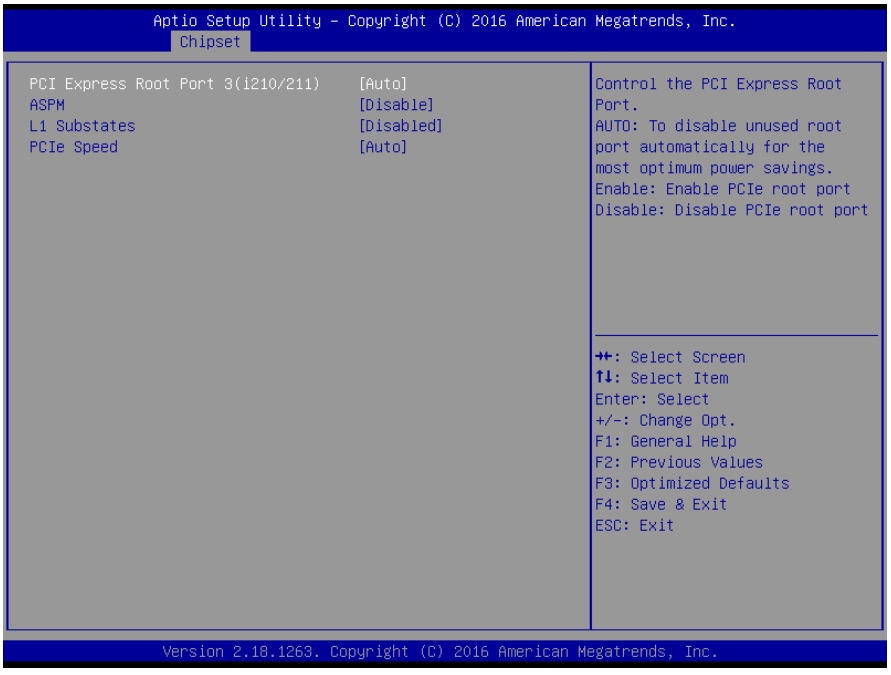
	36db	

3.6.3.4.2 PCI Express Configuration



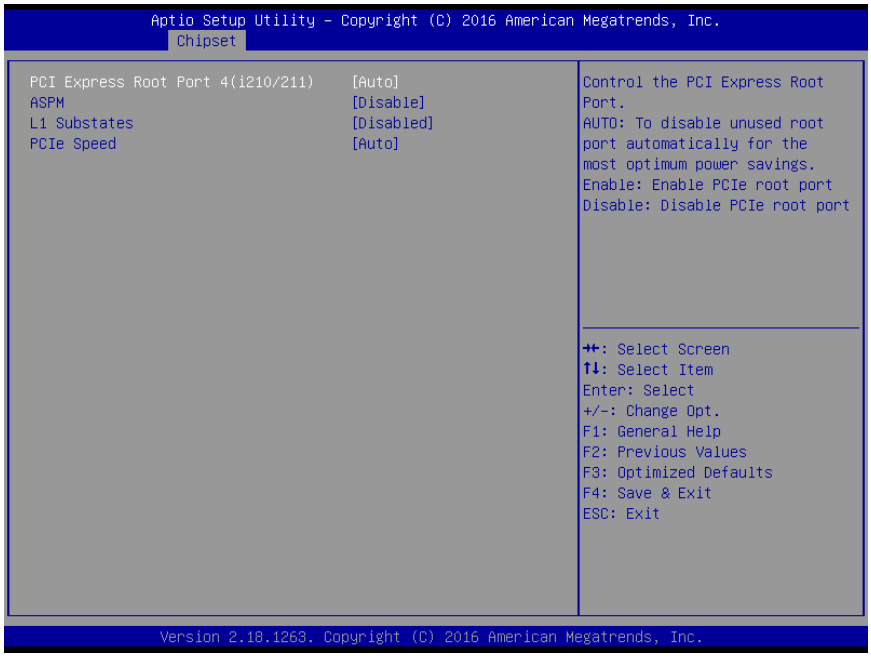
Item	Option	Description
Compliance Mode	Disabled**[Default]** Enabled,	Compliance Mode Enable/Disable.

3.6.3.4.2.1 PCI Express Root Port 3(i210/211)



Item	Option	Description
PCI Express Root Port 3(i210/211)	Disable Enable Auto**[Default]**	Control the PCI Express Root Port. AUTO: To disable unused root port automatically for the most optimum power savings. Enable: Enable PCIe root port Disable: Disable PCIe root port.
ASPM	Disable**[Default]** L0s L1 L0sL1 Auto	PCI Express Active State Power Management settings.
L1 Substates	Disabled**[Default]** L1.1 L1.2 L1.1 & L1.2	PCI Express L1 Substates settings.
PCIe Speed	Auto**[Default]** Gen1 Gen2	Configure PCIe Speed.

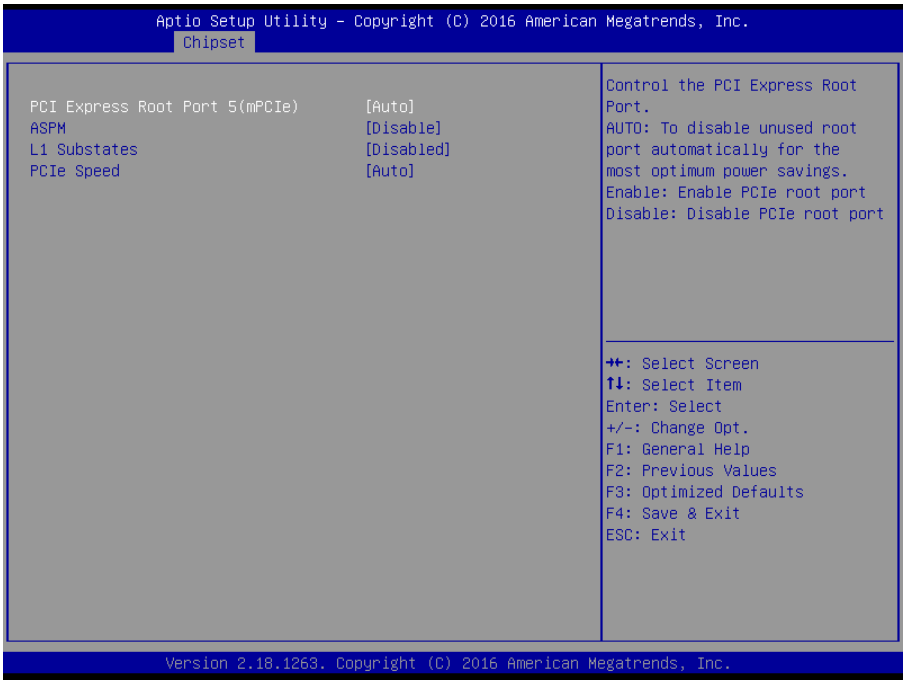
3.6.3.4.2.2 PCI Express Root Port 4(i210/211)



Item	Option	Description
PCI Express Root Port 4(i210/211)	Disable Enable Auto**[Default]**	Control the PCI Express Root Port. AUTO: To disable unused root port automatically for the most optimum power savings. Enable: Enable PCIe root port Disable: Disable PCIe root port.
ASPM	Disable**[Default]** L0s L1	PCI Express Active State Power Management settings.

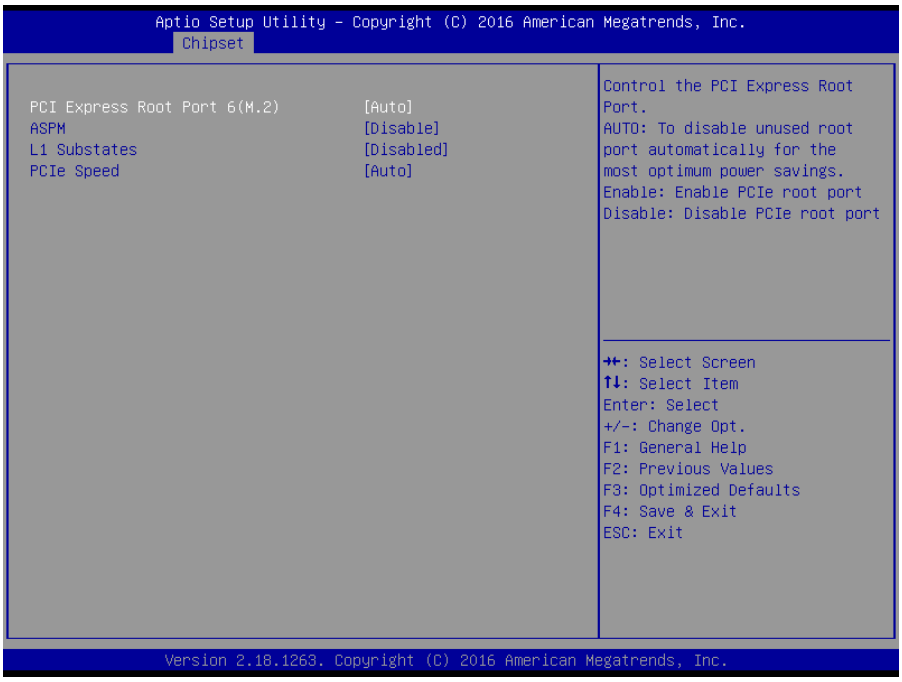
	L0sL1 Auto	
L1 Substates	Disabled**[Default]** L1.1 L1.2 L1.1 & L1.2	PCI Express L1 Substates settings.
PCIe Speed	Auto**[Default]** Gen1 Gen2	Configure PCIe Speed.

3.6.3.4.2.3 PCI Express Root Port 5(mPCIe)



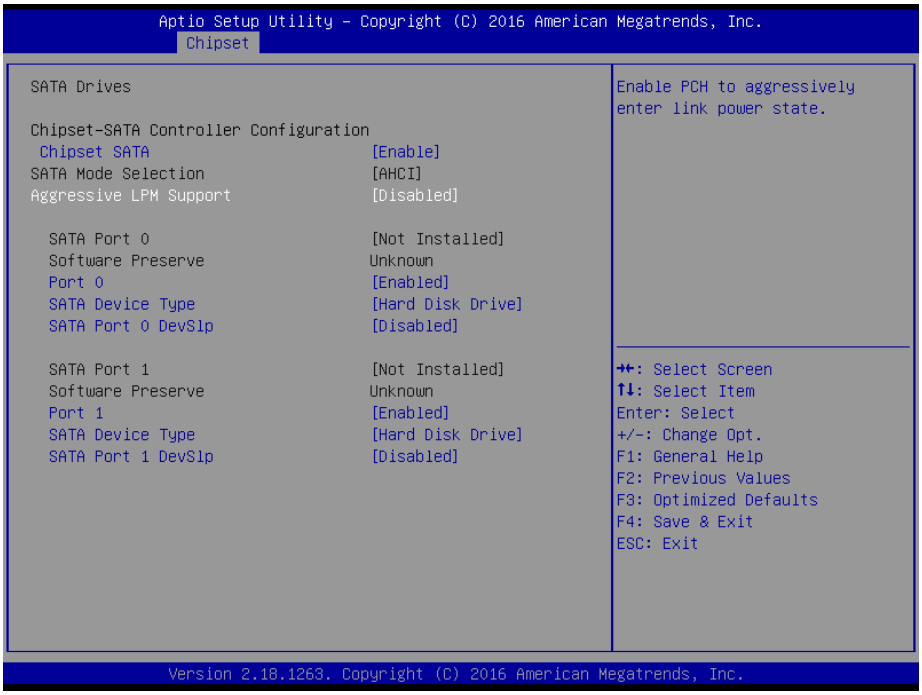
Item	Option	Description
PCI Express Root Port 5(mPCIe)	Disable Enable Auto**[Default]**	Control the PCI Express Root Port. AUTO: To disable unused root port automatically for the most optimum power savings. Enable: Enable PCIe root port Disable: Disable PCIe root port.
ASPM	Disable**[Default]** L0s L1 L0sL1 Auto	PCI Express Active State Power Management settings.
L1 Substates	Disabled**[Default]** L1.1 L1.2 L1.1 & L1.2	PCI Express L1 Substates settings.
PCIe Speed	Auto**[Default]** Gen1 Gen2	Configure PCIe Speed.

3.6.3.4.2.4 PCI Express Root Port 6(M.2)



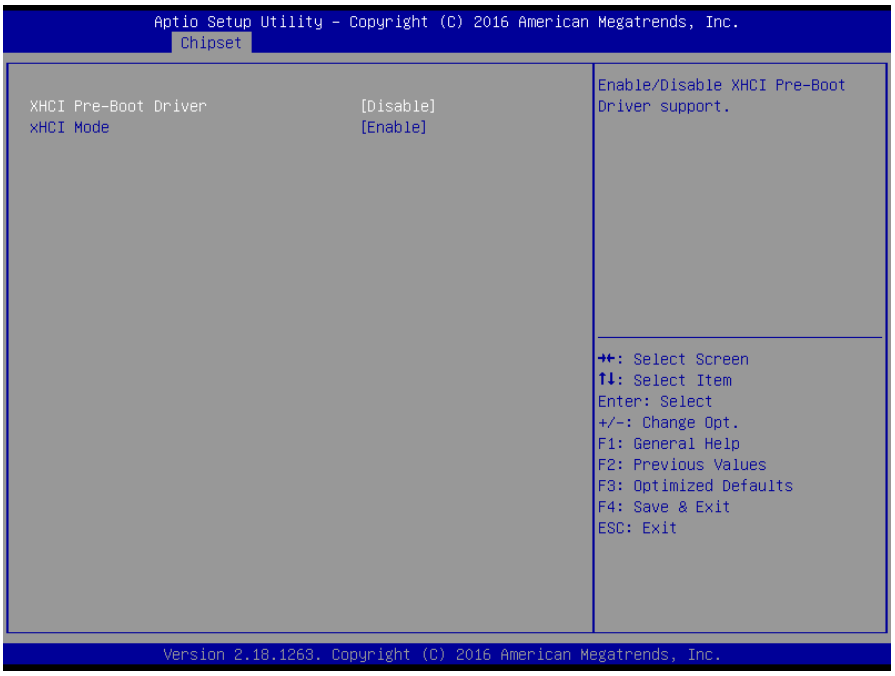
Item	Option	Description
PCI Express Root Port 6(M.2)	Disable Enable Auto**[Default]**	Control the PCI Express Root Port. AUTO: To disable unused root port automatically for the most optimum power savings. Enable: Enable PCIe root port Disable: Disable PCIe root port.
ASPM	Disable**[Default]** L0s L1 L0sL1 Auto	PCI Express Active State Power Management settings.
L1 Substates	Disabled**[Default]** L1.1 L1.2 L1.1 & L1.2	PCI Express L1 Substates settings.
PCIe Speed	Auto**[Default]** Gen1 Gen2	Configure PCIe Speed.

3.6.3.4.3 SATA Drives



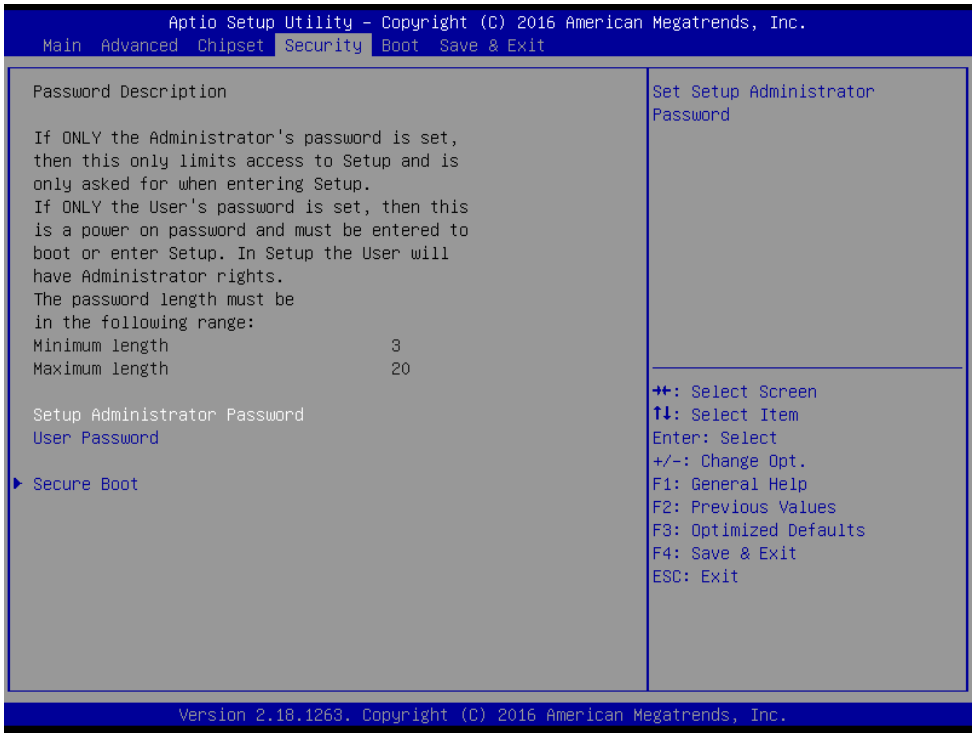
Item	Option	Description
Chipset SATA	Enable Disable**[Default]**	Enables or Disables the Chipset SATA Controller. The Chipset SATA controller supports the 2 black internal SATA ports (up to 3Gb/s supported per port).
Aggressive LPM Support	Disabled**[Default]** Enabled	Enable PCH to aggressively enter link power state.
Port 0/1	Disabled Enabled**[Default]**	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.
SATA Port 0/1 DevS1P	Disabled**[Default]** Enabled	Enable/Disable SATA Port 0/1 DevS1p. Board rework for LP needed before enable.

3.6.3.4.4 USB Configuration



Item	Option	Description
XHCI Pre-Boot Driver	Enable Disable**[Default]**	Enable/Disable XHCI Pre-Boot Driver support.
xHCI Mode	Enable**[Default]** Disable	Once disabled, XHCI controller would be function disabled, none of the USB devices are detectable and usable during boot and in OS. Do not disable it unless for debug purpose.

3.6.4 Security



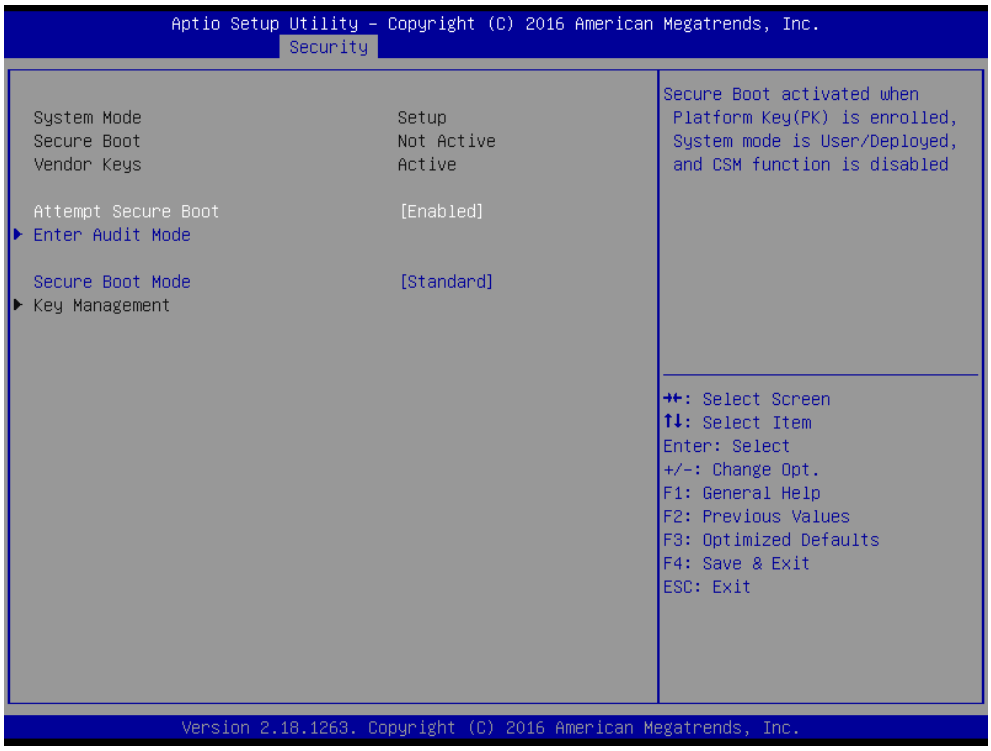
- **Setup Administrator Password**

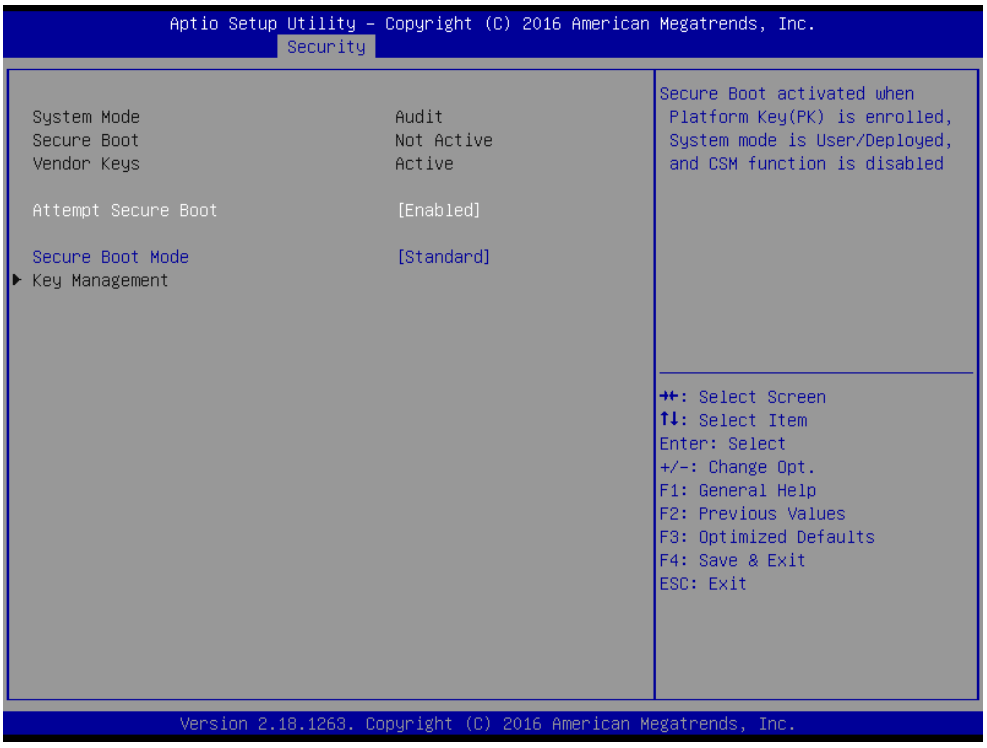
Set setup Administrator Password

- **User Password**

Set User Password

3.6.4.1 Secure Boot

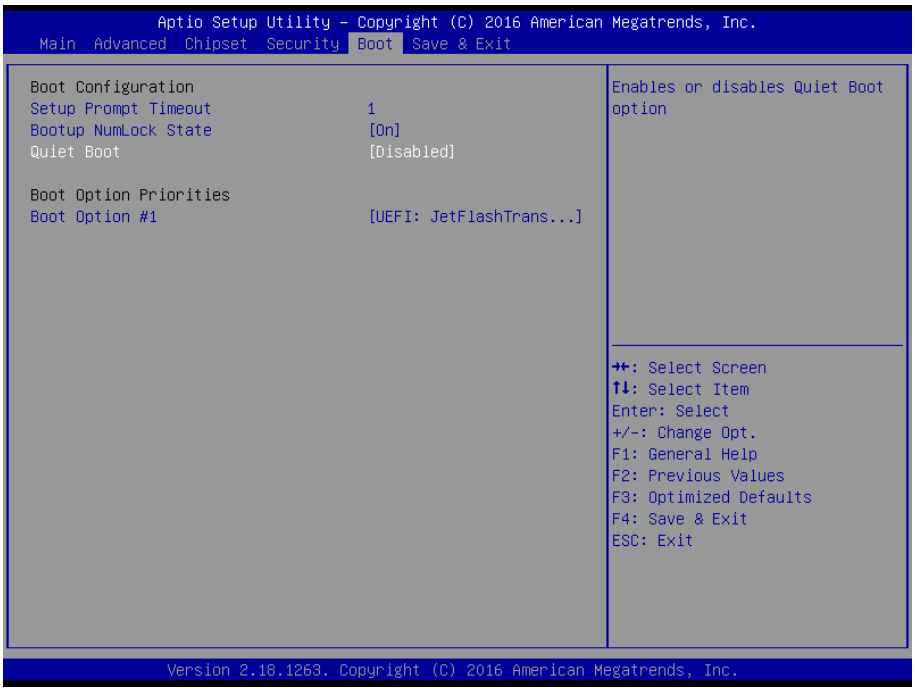




Item	Option	Description
Attempt Secure Boot	Disabled Enabled**[Default]**	Secure Boot activated when Platform Key(PK) is enrolled, System mode is User/Deployed, and CSM function is disabled.

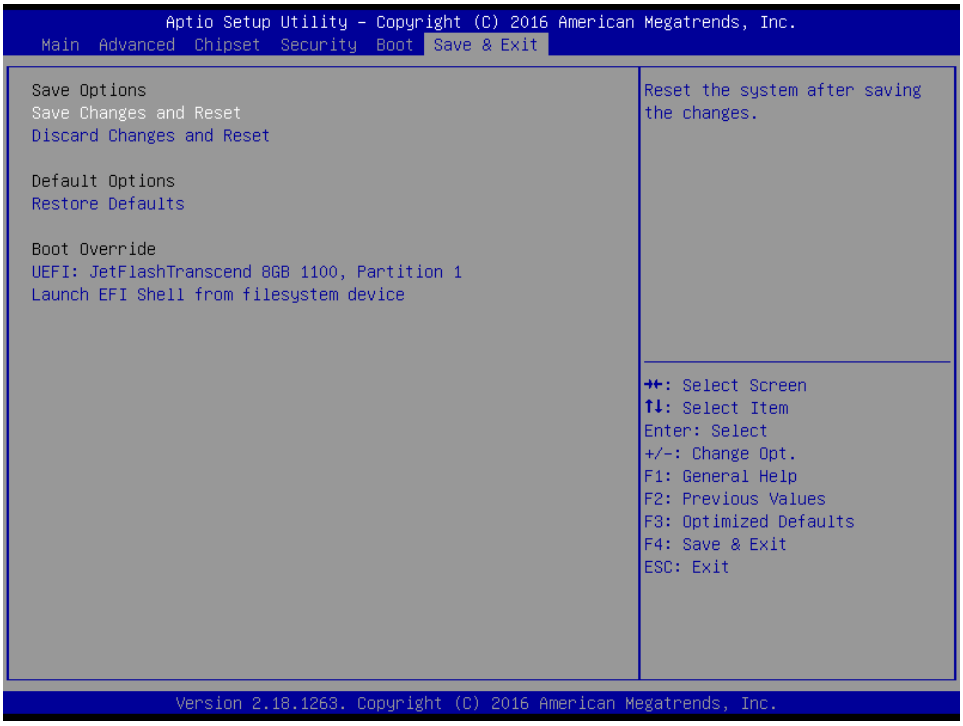
Secure Boot Mode	Standard**[Default]** Customized	Secure Boot mode – Custom_Standard, Set UEFI Secure Boot Mode to STANDARD mode or CUSTOM mode, this change is effect after save. And after reset, the mode will return to STANDARD mode.

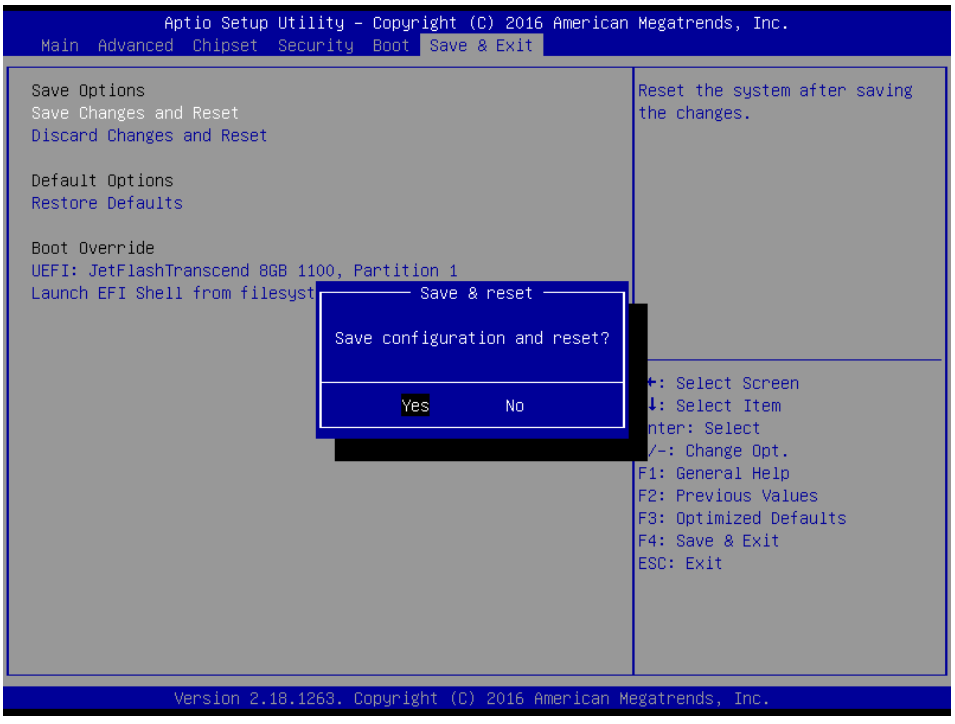
3.6.5 Boot



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**[Default]** Off	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.

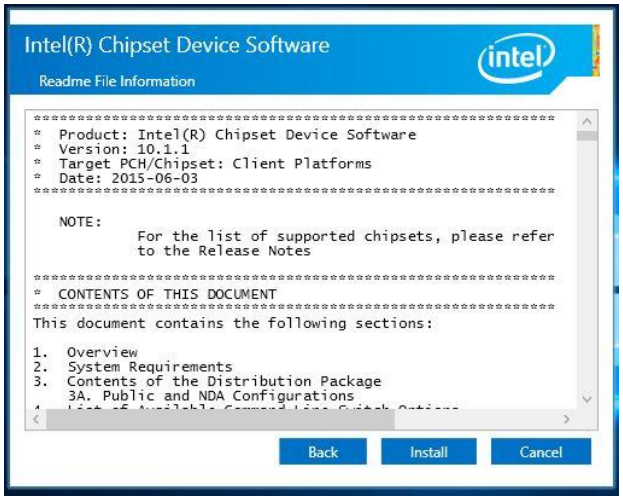
4.1 Install Chipset Driver

Insert the Supporting DVD-ROM to DVD-ROM drive, and it should show the index page of Avalue's products automatically. If not, locate Index.htm and choose the product from the menu left, or link to **/Driver_Chipset/Intel/EBM-APL**.

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**.

Step 2. Click **Accept**.

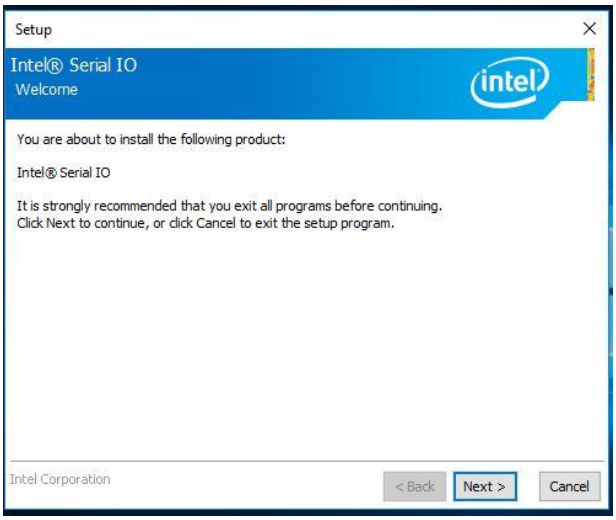


Step 3. Click **Install** to complete setup.

4.2 Install Serial IO Driver

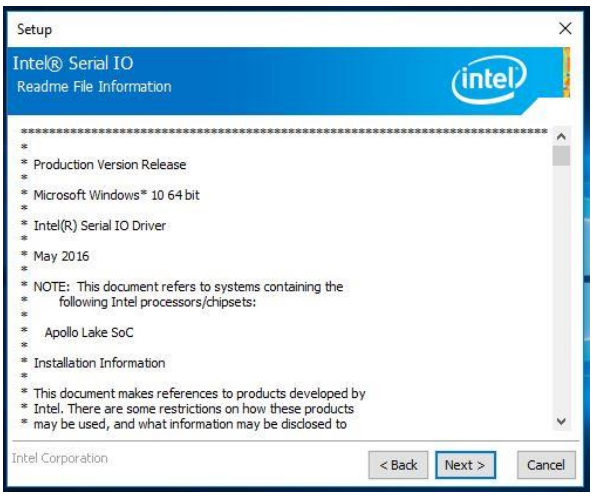
Insert the Supporting DVD-ROM to DVD-ROM drive, and it should show the index page of Avalue's products automatically. If not, locate Index.htm and choose the product from the menu left, or link to **/Utility/EBM-APL_Serial_IO**.

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.

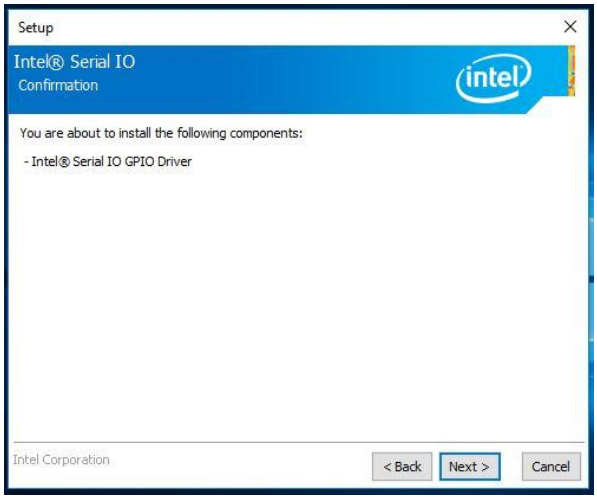


Step1. Click **Next** to start installation.

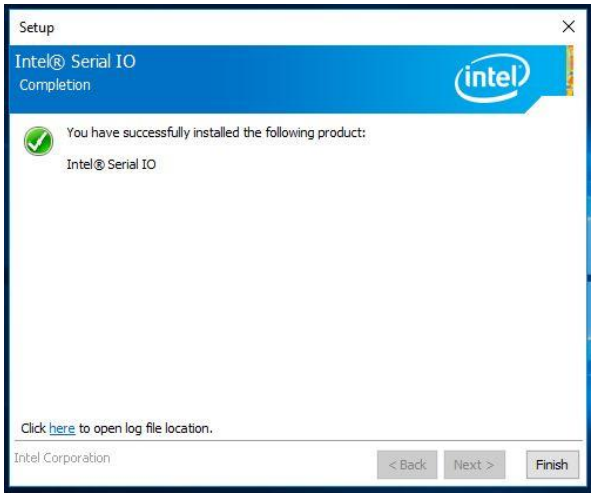
Step 2. Click **Next**.



Step 3. Click **Next** to proceed setup.



Step 4. Click **Next**.

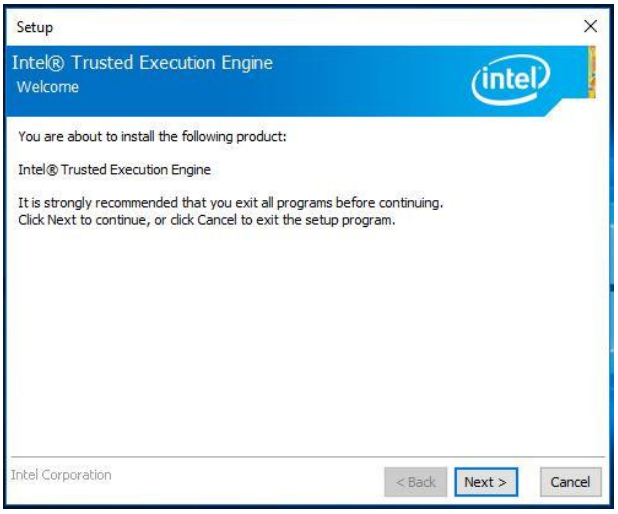


Step 5. Click **Finish** to complete setup.

4.3 Install TXE Driver

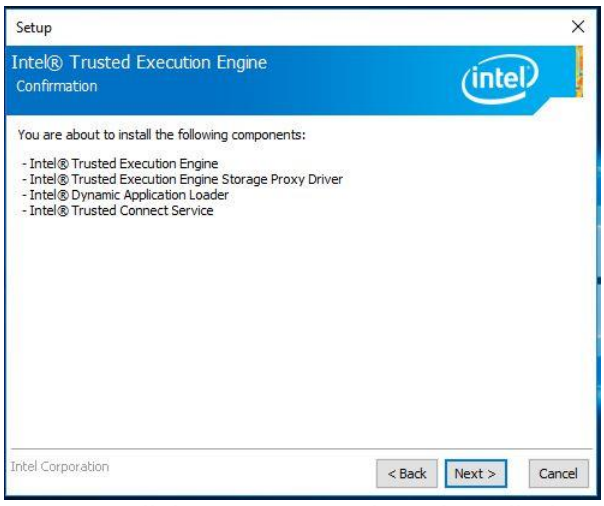
Insert the Supporting DVD-ROM to DVD-ROM drive, and it should show the index page of Avalue's products automatically. If not, locate Index.htm and choose the product from the menu left, or link to **/Utility/EBM-APL_TXE**.

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.

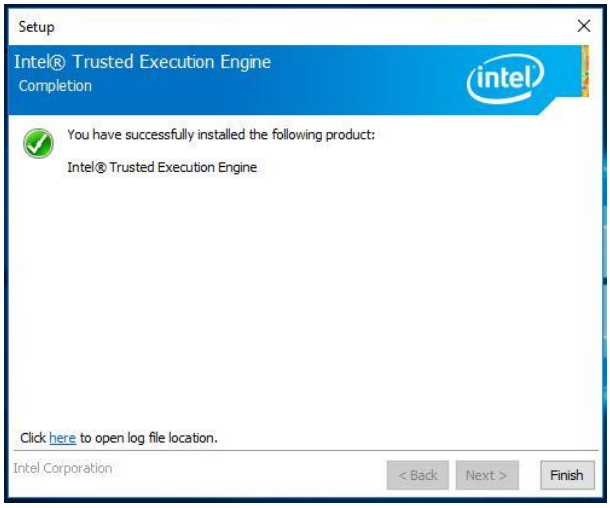


Step1. Click **Next** to start installation.

Step 2. Click **Next**.



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

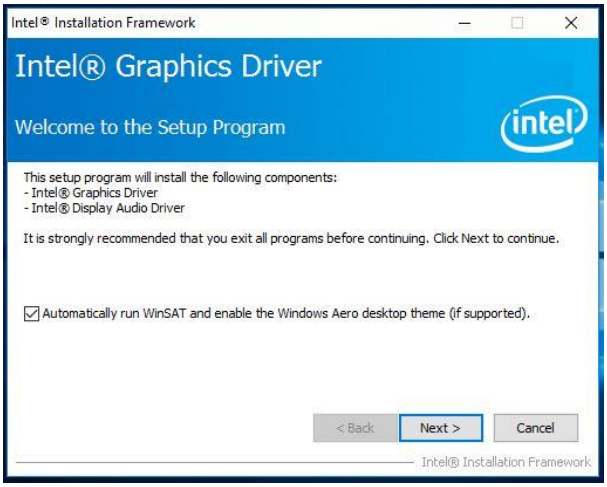


Step 4. Click **Finish** to complete setup.

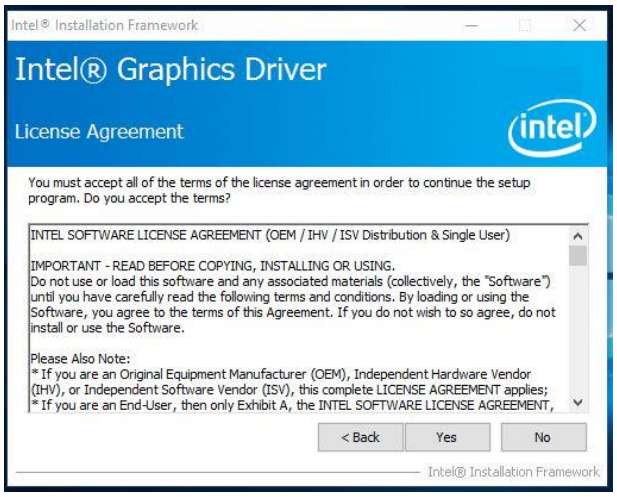
4.4 Install VGA Driver

Insert the Supporting DVD-ROM to DVD-ROM drive, and it should show the index page of Avalue's products automatically. If not, locate Index.htm and choose the product from the menu left, or link to **/VGA/EBM-APL**.

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

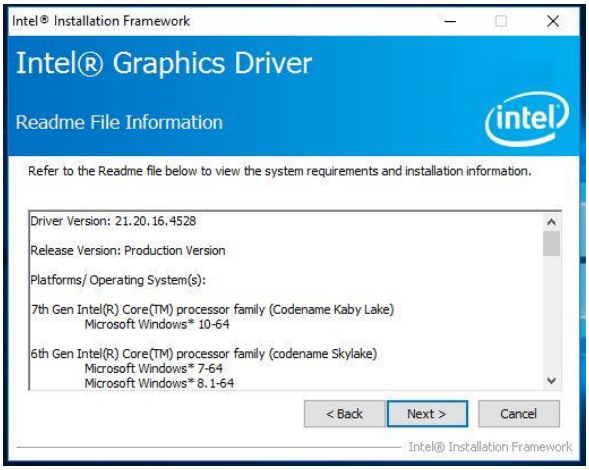


Step 1. Click **Next** to continue installation.

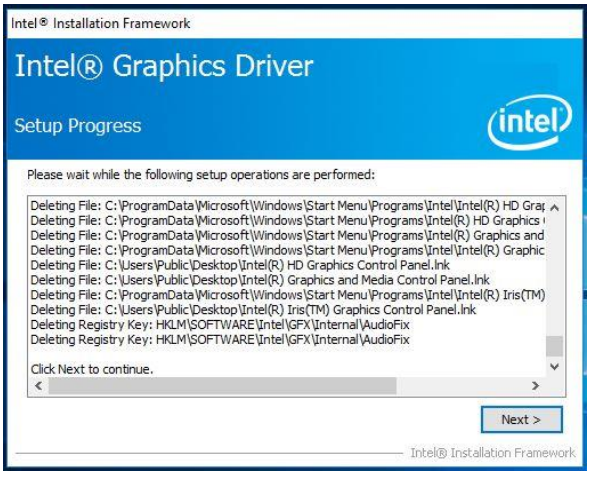


Step 2.

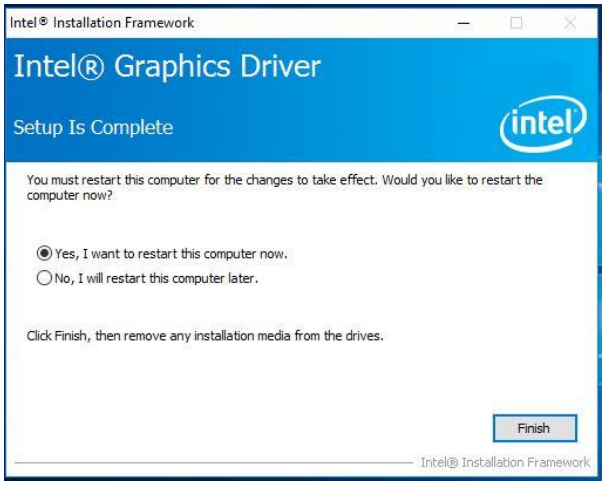
Click **Yes** to accept license agreement.



Step 3. Click **Next.**



Step 4. Click **Next**.

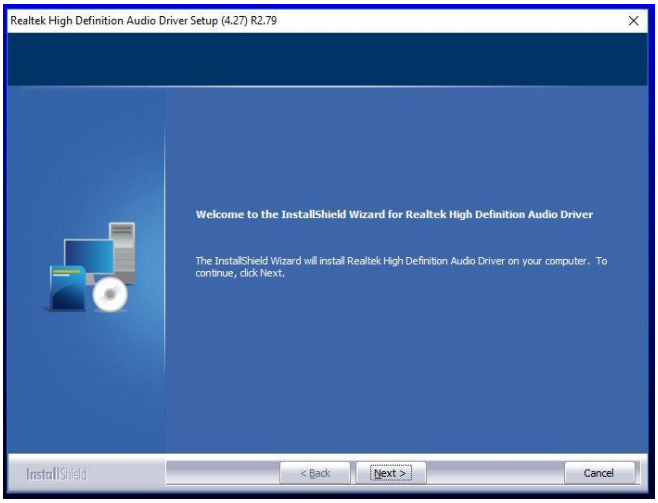


Step 5. Click **Finish** to complete setup.

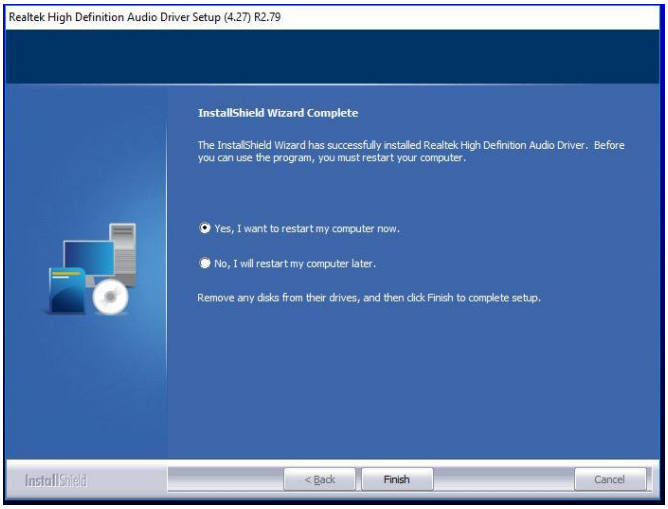
4.5 Install Audio Driver (For Realtek ALC892)

Insert the Supporting CD-ROM to CD-ROM drive, and it should show the index page of Avalue's products automatically. If not, locate Index.htm and choose the product from the menu left, or link to **/Driver_Audio/Realtek/ALC892/EBM-APL_Audio**.

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



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

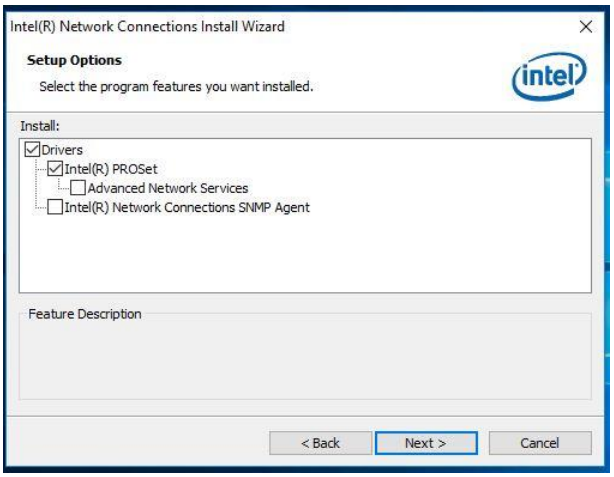


Step 2. Click **Finish** to complete the setup.

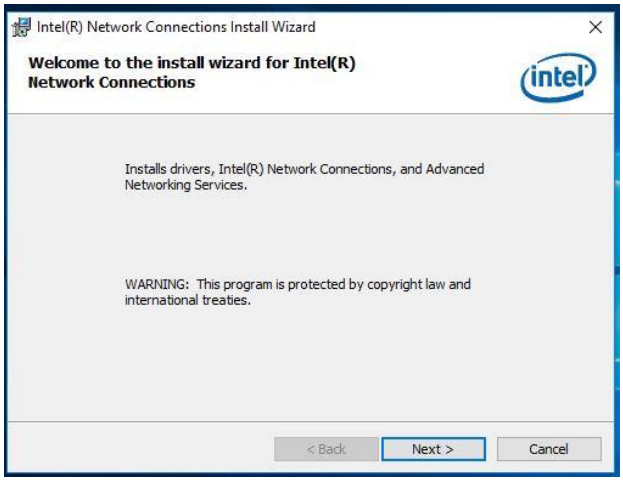
4.6 Install Ethernet Driver

Insert the Supporting DVD-ROM to DVD-ROM drive, and it should show the index page of Avalue's products automatically. If not, locate Index.htm and choose the product from the menu left, or link to **/Driver_Gigabit/Intel/I211AT/EBM-APL_LAN**.

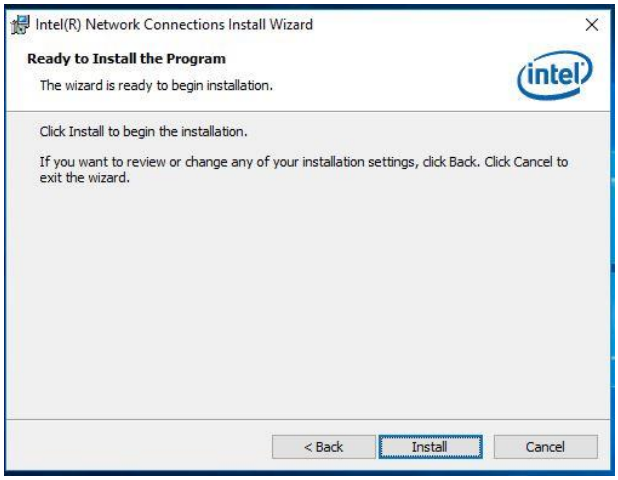
Note: The installation procedures and screen shots in this section are based on Windows 10 operation system.



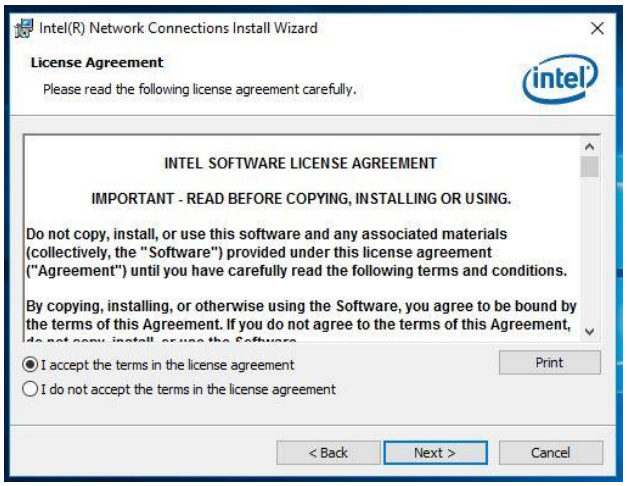
Step 3. Click **Next**.



Step 1. Click **Next**.

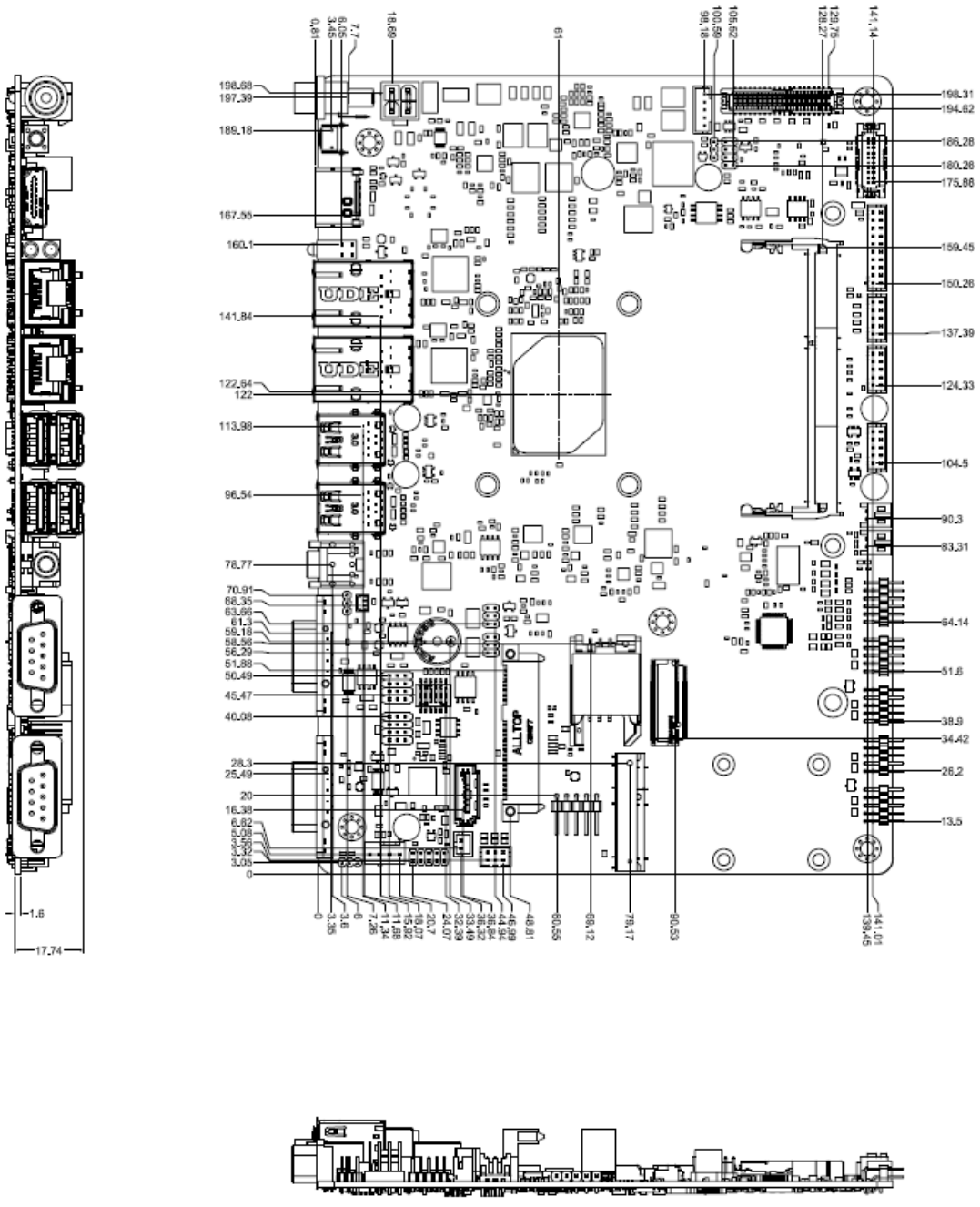


Step 4. Click **Install** to complete the setup.

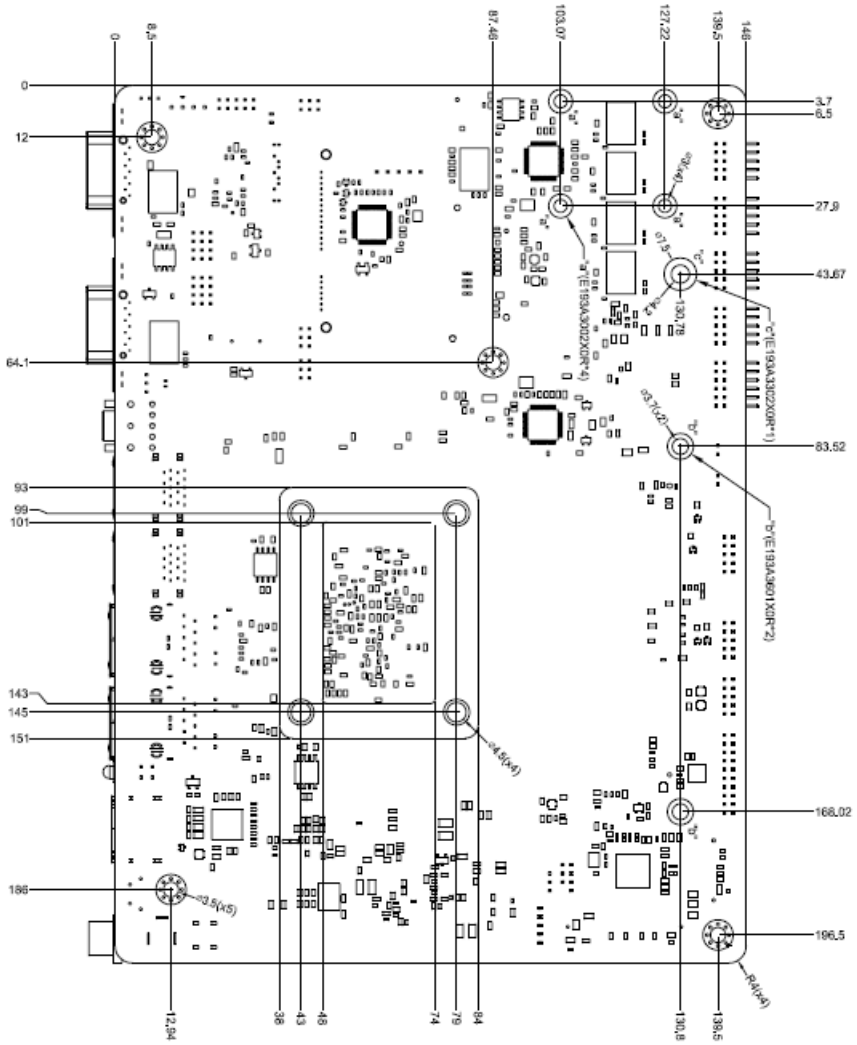


Step 2. Click **Next** to accept license agreement.

5. Mechanical Drawing


198.68
197.39
189.18
167.55
160.1
141.84
122.64
122
113.98
96.54
78.77
70.91
68.35
63.66
61.3
59.18
58.58
56.29
51.88
50.49
45.47
40.08
28.3
25.49
20
16.38
6.82
5.08
3.59
3.32
3.05
0
198.31
194.62
186.28
180.26
175.86
159.45
150.26
137.39
124.33
104.5
90.3
83.31
64.14
51.6
38.9
34.42
26.2
13.5
ALLTOP
1.6
17.74

Unit: mm


0
8.5
87.46
103.07
127.22
139.5
148
3.7
6.5
12
27.9
43.67
64.1
83.52
93
99
101
143
145
151
168.02
186
196.5
12.94
36
43
48
74
79
84
130.8
139.5

Unit: mm