C&T SOLUTION INC.

USER'S MANUAL

BCO-2000

Compact Fanless Embedded System

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Prefaces

Revision

Revision	Description	Date
1.0	Manual Released	2021/01/30

Disclaimer

All specifications and information in this User's Manual are believed to be accurate and up to date. C&T Solution Inc. does not guarantee that the contents herein are complete, true, accurate or non-misleading. The information in this document is subject to change without notice and does not represent a commitment on the part of C&T Solution Inc.
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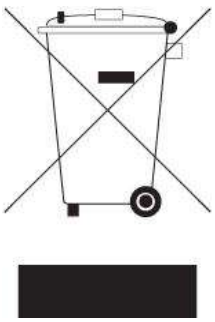
Environmental Protection Announcement

Do not dispose this electronic device into the trash while discarding. Please recycle to minimize pollution and ensure environment protection.



Safety Precautions

Before installing and using the equipment, please read the following precautions:

- Put this equipment on a reliable surface during installation. Dropping it or letting it fall could cause damage.
- The power outlet shall be installed near the equipment and shall be easily accessible.
- Turn off the system power and disconnect the power cord from its source before making any installation. Be sure both the system and the external devices are turned OFF. Sudden surge
- of power could ruin sensitive components. Make sure the equipment is properly grounded.
- When the power is connected, never open the equipment. The equipment should be opened only by qualified service personnel.
- Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
- Disconnect this equipment from the power before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
- Avoid the dusty, humidity and temperature extremes.
- Do not place heavy objects on the equipment.
- If the equipment is not used for long time, disconnect it from the power to avoid being damaged by transient over-voltage.
- The storage temperature shall be above -30°C and below 85°C.
- The computer is provided with a battery-powered real-time clock circuit. There is a danger of explosion if incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.
- If one of the following situation arises, get the equipment checked be service personnel:
    - The power cord or plug is damaged.
    - Liquid has penetrated into the equipment.
    - The equipment has been exposed to moisture.
    - The equipment does not work well or it cannot work according the user's manual.
    - The equipment has been dropped and damaged.
    - The equipment has obvious signs of breakage.

Technical Support and Assistance

1. Visit the C&T Solution Inc website at https://www.candtsolution.com where you can find the latest information about the product.
2. Contact your distributor, our technical support team or sales representative for technical support if you need additional assistance. Please have following information ready before you call:
   - Model name and serial number
   - Description of your peripheral attachments
   - Description of your software (operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wording of any error messages

Conventions Used in this Manual

WARNING This indication alerts operators to an operation that, if not strictly observed, may result in severe injury.

CAUTION This indication alerts operators to an operation that, if not strictly observed, may result in safety hazards to personnel or damage to equipment.

NOTE This indication provides additional information to complete a task easily.

Package Contents

Before installation, please ensure all the items listed in the following table are included in the package.

Item	Description	Q'ty
1	BCO-2000 BOX PC Series Embedded System	1
2	Wall Mount Kit	1
3	Accessory Kit	1

Ordering Information

Model No.	Product Description
BCO-2000-8365UE	Basic Fanless Embedded System with Intel Core i5-8365UE, 1x DP, 2x COM, 2xLAN, 4x USB, 1x 2.5" SATA HDD
BCO-2000-4305UE	Basic Fanless Embedded System with Intel Celeron 4305UE, 1x DP, 2x COM, 2xLAN, 4x USB, 1x 2.5" SATA HDD

Optional Accessories

Model No.	Product Description
1-E09A06007	Adapter AC/DC 12V 5A 60W with 3pin Terminal Block Plug 5.0mm Pitch
1-E09A08002	Adapter AC/DC 12V 6.67A 80W with 3pin Terminal Block Plug 5.0mm Pitch
SFICBL022	Power Cord, 3-pin US Type, 180cm
1-TPCD00002	Power Cord, European Type, 180cm
1-TPCD00001	Power Cord, 3-pin UK Type, 180cm
3-DINR-0004	DIN-Rail Mount Kit
3-BC20002LKIT-S0	Module Kit with 2x LAN for BCO-2000 Series
3-BC20002PKIT-S0	Module Kit with 2x PoE for BCO-2000 Series
3-BC2000CMKIT-S0	Module Kit with 4x COM for BCO-2000 Series
3-BC20002CKIT-S0	Module Kit with 2x COM for BCO-2000 Series
3-BC2000U2KIT-S0	Module Kit with 2x USB 2.0 for BCO-2000 Series
3-BC2000U3KIT-S0	Module Kit with 2x USB 3.0 for BCO-2000 Series

Chapter 1

Product Introductions

1.1 Overview

C&T Basic Fanless Embedded Systems are designed for entry-level applications and basic needs. The BCO series can oversee connected devices and manage the collection, storage, and transmission of sensor data, and is capable of distilling unexplored value in data. It is not only robust and can withstand dust, shock, and vibration, but also can suitable for industrial automation, industrial control, kiosk & retail, and digital signage.

Key Features

- Support 8th Gen. Intel® Core™ i5 & Intel® Celeron® Processor
- 1x 260-pin DDR4 2400 SO-DIMM. Max. up to 32GB
- 2x Intel® GbE (Support Wake-on-LAN and PXE)
- Dual Independent Display, 1x DP, 1x HDMI (optional)
- 2x Mini PCIe Gen3 with 1x SIM Slot
- 4x USB 3.2 Gen 2 (10Gbps), 4x RS-232/422/485 (w/ 2x Internal)
- 1x Internal 2.5" SATA HDD Bay and 1x mSATA
- Watchdog timer, software programmable supports 1-225 sec. system reset
- TPM 2.0 Supported
- UL Listed

1.2 Hardware Specification

System

Processor	Support 8th Gen. Intel® WL-UE Processor (15W TDP)
	Intel® Core™ i5-8365UE Processor 6M Cache, up to 4.10 GHz
	Intel® Celeron® Processor 4305UE 2M Cache, 2.00 GHz
System Chipset	SoC
LAN Chipset	GbE1: Intel® I219LM (Support Wake-on-LAN and PXE)
	GbE2: Intel® I210-IT (Support Wake-on-LAN and PXE)
Audio Code	Realtek ALC888S HD Audio Codec
System Memory	1x 260-Pin DDR4 2400MHz SO-DIMM slot, Max. up to 32GB
BIOS	AMI uEFI 256MB SPI flash
Watchdog	Software Programmable Supports 1~255 sec. System Reset
TPM	TPM 2.0 Through Infineon® SLB9665TT2.0 or Equivalent

Display

Display Port	1x DisplayPort support resolution 4096x2304 @60Hz
HDMI Port	1x HDMI support resolution 4096x2304 @24Hz (Optional)
Multiple Display	Dual Display

Storage

SSD/HDD	1x Internal 2.5" SATA HDD Bay (support H=9.5mm), 1x Internal SATA 7P connector
mSATA	1x mSATA (Shared by 1x Mini PCI Express)
SIM Socket	1x internal SIM slot

Expansion

Mini PCI Express	2x Full-size Mini PCIe (1x shared by 1x mSATA)

I/O

LED	1x Power LED, 1x HDD LED indicator
LAN	2x RJ45 GbE
USB	4x USB 3.2 Gen 2 (10 Gbps) 2x USB 2.0 header (internal)
COM	2x RS-232/422/485
Audio	1x Mic-in, 1x Line-out (Internal connector)
GPIO	2 x4-bit DIO (4-in/4-out) with 2.0 Pitch Header
Universal I/O Bracket	2x Universal I/O Bracket (By mini PCIe interface)
Others	5x WiFi Antenna Holes 1x 4-pin PWM samrt fan 1x RTC battery by cable

Operating System

Windows	Microsoft Windows 10 64-bit (RS5 or Higher)
Linux	Linux Kernel 5.x (Fedora 30 or Higher / Ubuntu 19.04 or Higher)

Power

Power Connector	3-pin Terminal Block
Power Input	AT/ ATX 12V
Management	Power Management | ACPI
Power Adapter	Optional AC/DC 12V/5A, 60W, Optional AC/DC 12V/6.67A, 80W for PoE Module
Power Protection	Reserve Protection

Environment

Operating Temp.	-20°C to 60°C (15W CPU) -20°C to 50°C (15W CPU, with 2 Port LAN Module) -20°C to 45°C (15W CPU, with 2 Port PoE Module)
Storage Temp.	-30°C to 85°C
Relative Humidity	10% to 95% (non-condensing)
Vibration	With SSD: 3 Grms, 5 - 500 Hz, 0.5 hr/axis With HDD: 1 Grms, 5 - 500 Hz, 0.5 hr/axis
Shock	With SSD: 20G, half sine, 11ms
Standards / Certification	UL, CE, FCC Class A

Physical

Construction	Extruded Aluminum with Heavy Duty Metal
Dimension	140 (D) x 192 (W) x 61 (H) mm
Weight	1.4 kg
Mounting	Wall Mounting / DIN-Rail Mounting (Optional)

1.3 System I/O

Front Panel

ATX power on/off switch
Press to power-on or power-off the system

Power LED
Indicates the power status of the system

HDD LED
Indicates the status of the hard drive

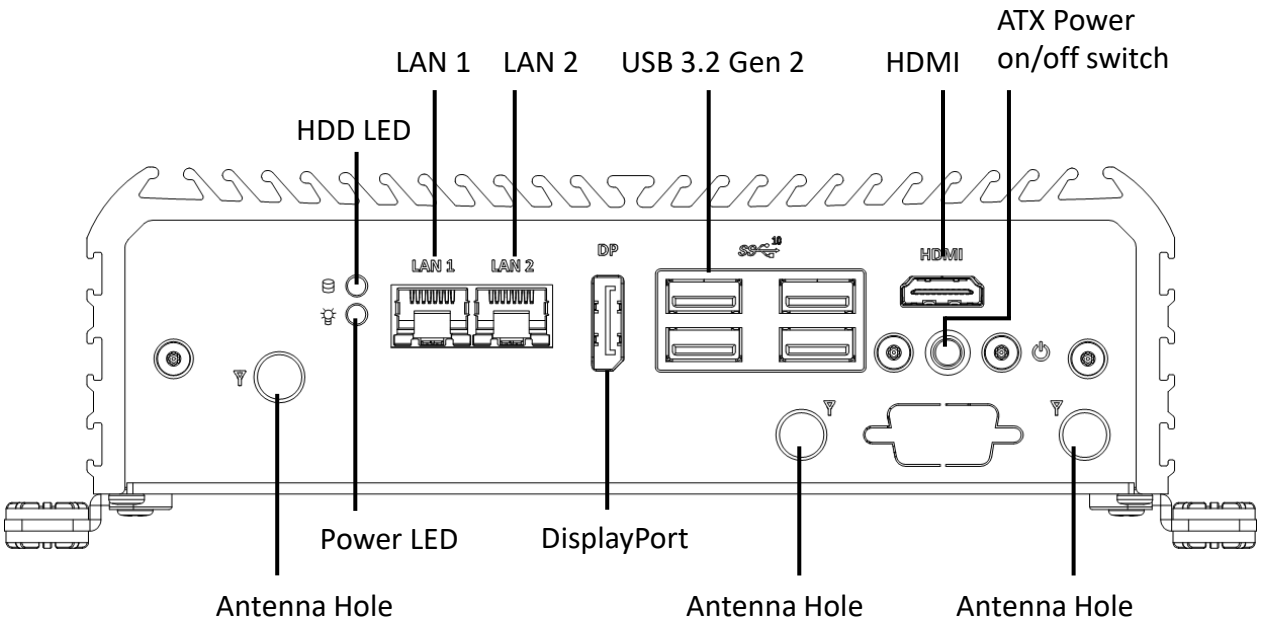
USB 3.2 Gen 2 port (10 Gbps)
Used to connect USB 3.2 device

LAN port
Used to connect the system to a local area network

Antenna hole
Used to connect an antenna for optional Mini-PCIe WiFi module

HDMI
Used to connect a DisplayPort monitor

DisplayPort
Used to connect a DisplayPort monitor



Rear Panel

DC IN
Used to plug a DC power input with terminal block

COM port
COM1 ~ COM2 support RS232/422/485 serial device

Antenna hole
Used to connect an antenna for optional Mini-PCIe WiFi module

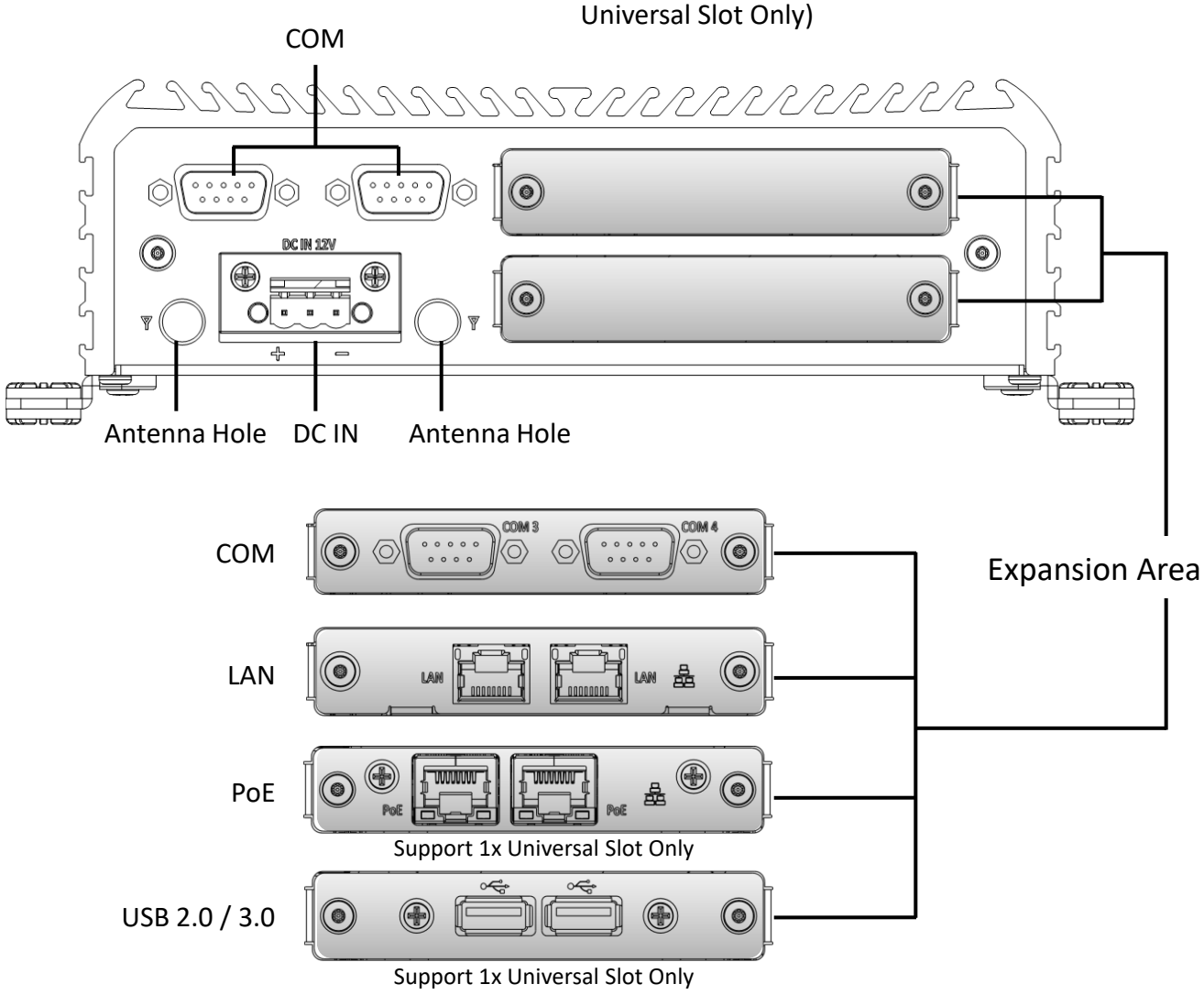
Expandable I/O bracket

- **COM Port**：
COM2 or COM4 Support RS232/422/485 serial device

- **LAN Port**
Used to connect the system to a local area network

- **PoE Port**
Used to connect the system to a local area network with power over Ethernet (Support 1x Universal Slot Only)

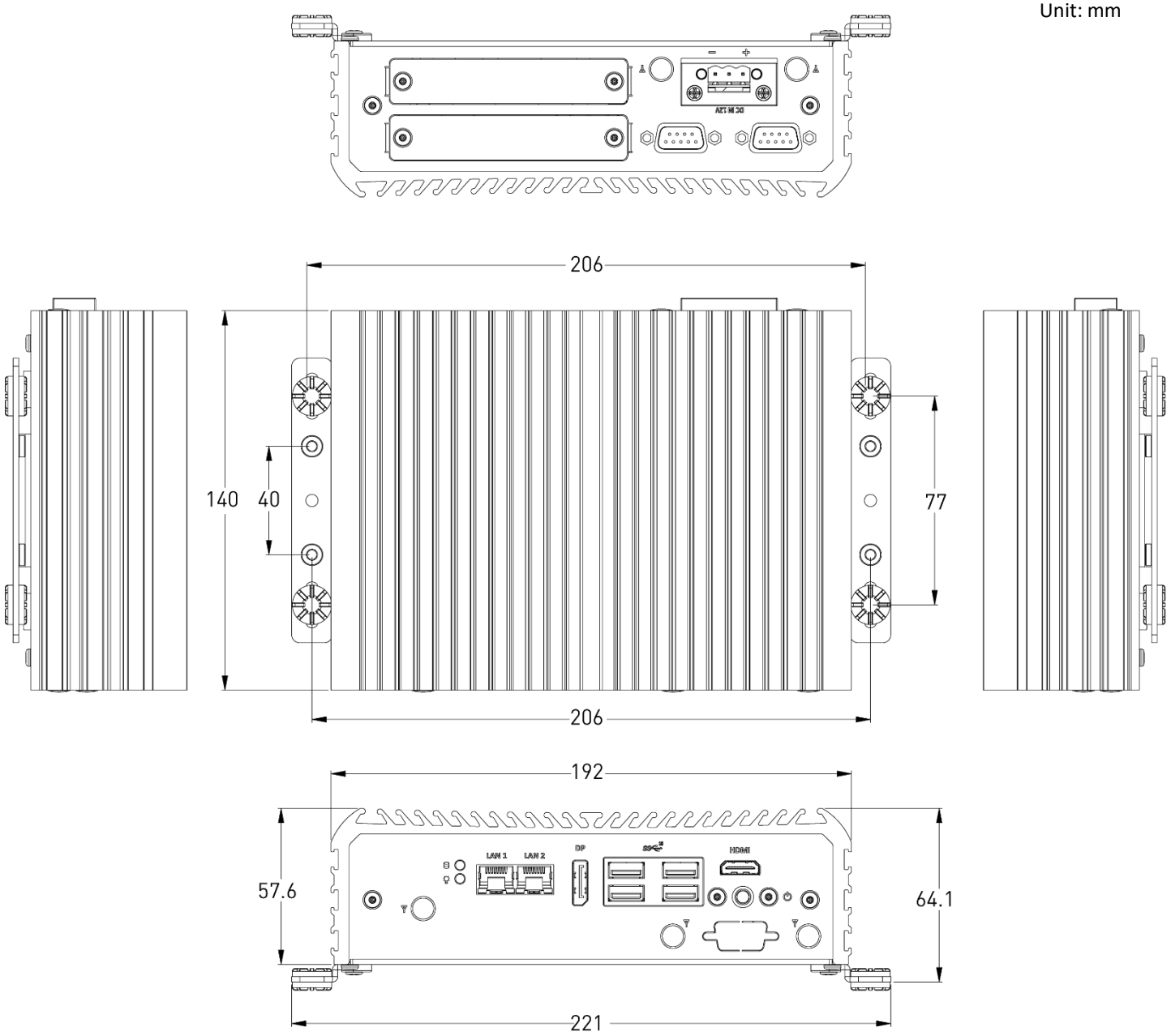
- **USB 2.0/ 3.0 Port**
Used to connect USB 3.0/2.0 (Support 1x Universal Slot Only)



PoE Specifications:
- Single PoE: Support IEEE 802.3.af Standard.
- Dual PoE: Support Up to 20 Watts of total output.

1.4 Mechanical Dimensions

Unit: mm

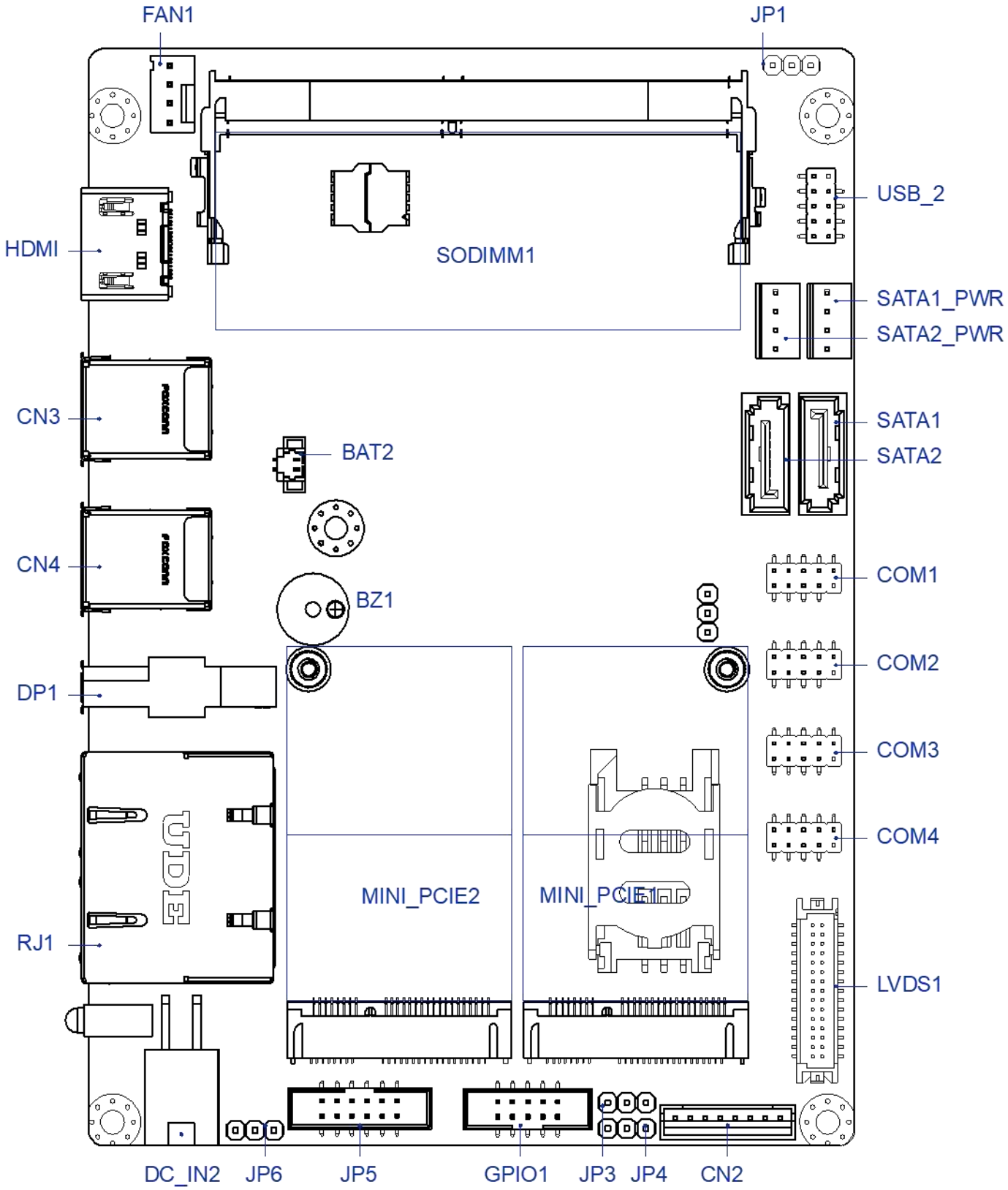


Chapter 2

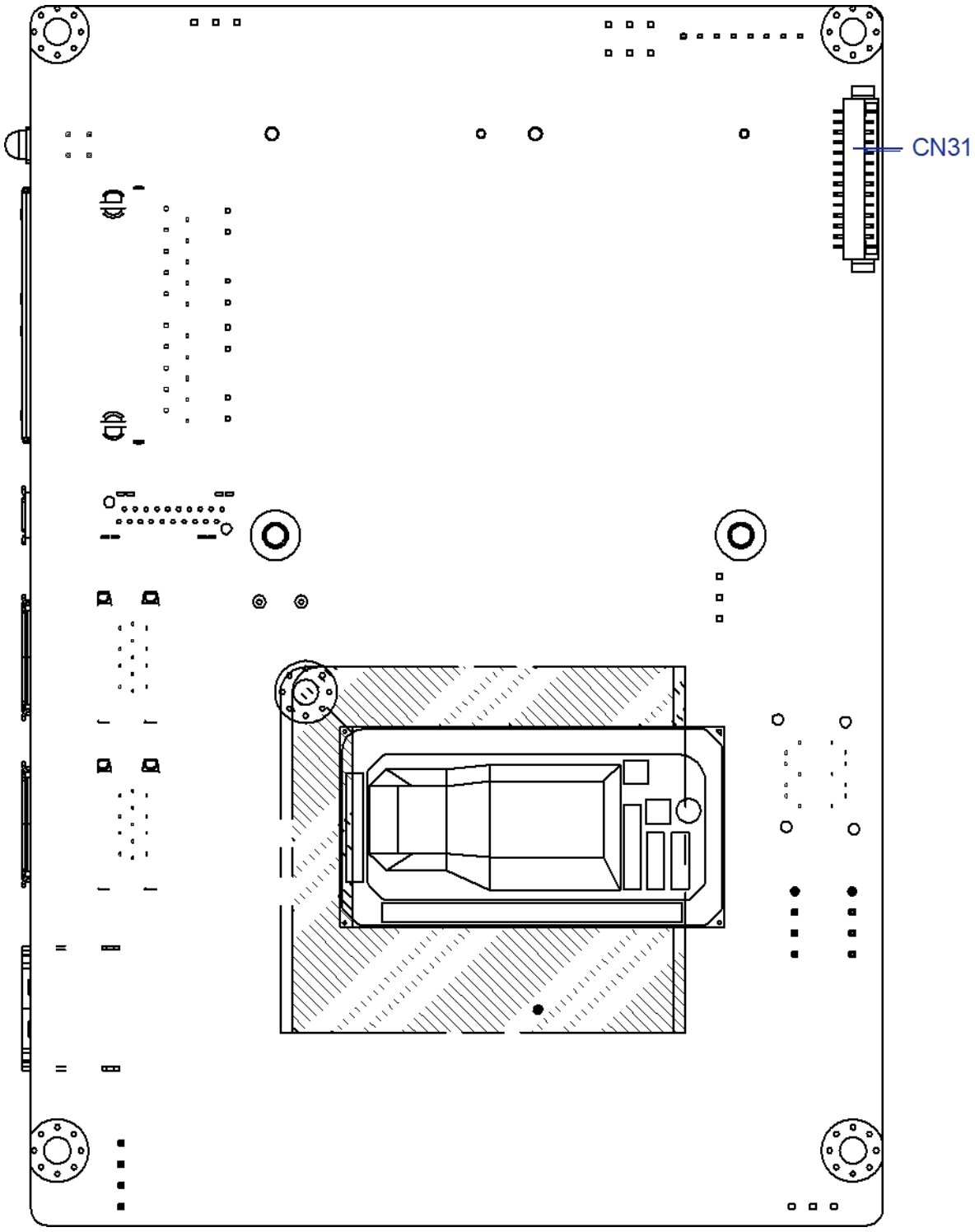
Mechanical Specifications

2.1 Switch and Connector Locations

2.1.1 Top View



2.1.2 Bottom View

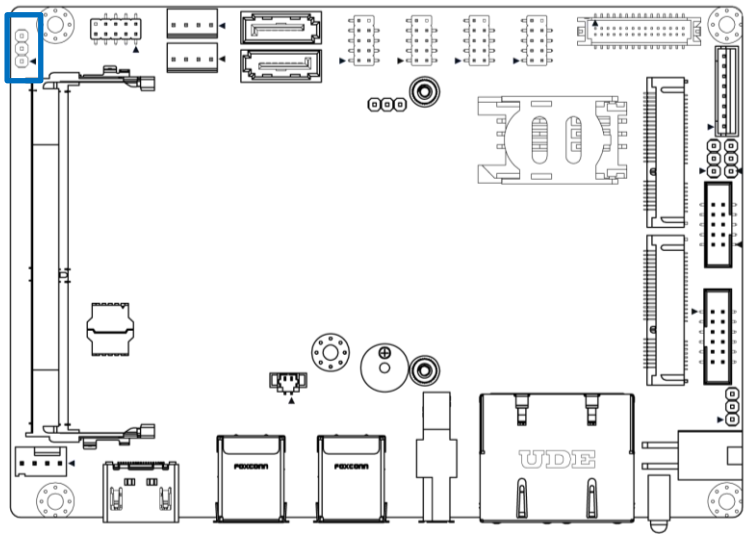


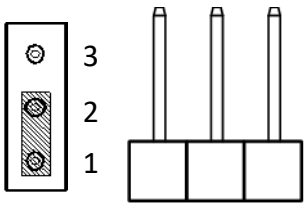
2.2 Connector / Switch Definition

Connector Location	Definition
JP1	Clear CMOS header
JP3	Panel PWR setting header
JP4	Backlight PWR setting header
JP5	Front Panel header
JP6	AT/ATX setting header
CN2	Panel Control
CN3	USB3.1 port
CN4	USB3.1 port
COM1	COM1 Serial Port header
COM2	COM2 Serial Port header
COM3	COM3 Serial Port header
COM4	COM4 Serial Port header
GPIO	4IN/4OUT GPIO header
SATA1	SATA Port 1 signal connector
SATA2	SATA Port 2 signal connector
SATA1_PWR	SATA Port 1 power connector
SATA2_PWR	SATA Port 2 power connector
LVDS1	LVDS connector
USB_2	USB 2.0 headers
MINI_PCIE1	Mini PCI Express slot 1 with SIM
MINI_PCIE2	Mini PCI Express slot 2 with mSATA
DC_IN2	4 PIN Power connector
FAN1	FAN Power connector
RJ45	LAN1/2 ports
HDMI	HDMI signal connector
DP1	DP signal connector
BAT2	Battery connector

2.3 I/O Interface Descriptions

2.3.1 Clear CMOS

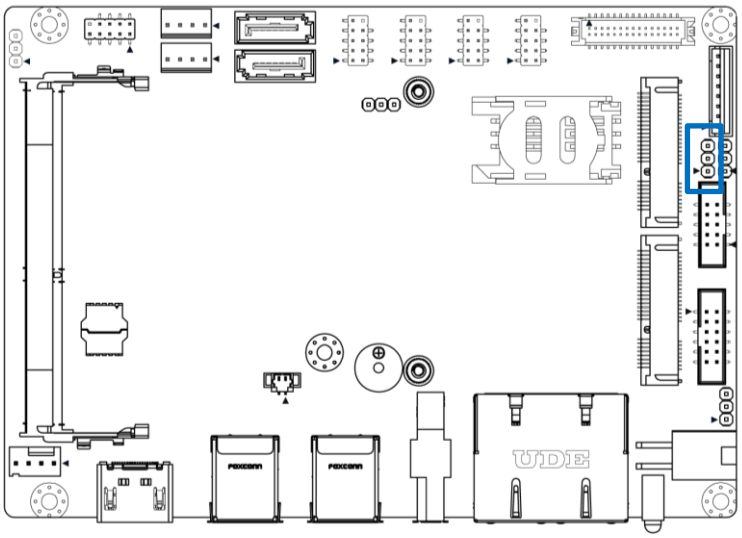


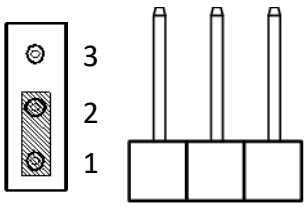


JP1

Pin	Signal
1	NC
2	RTCRST#
3	GND

2.3.2 Panel Power setting



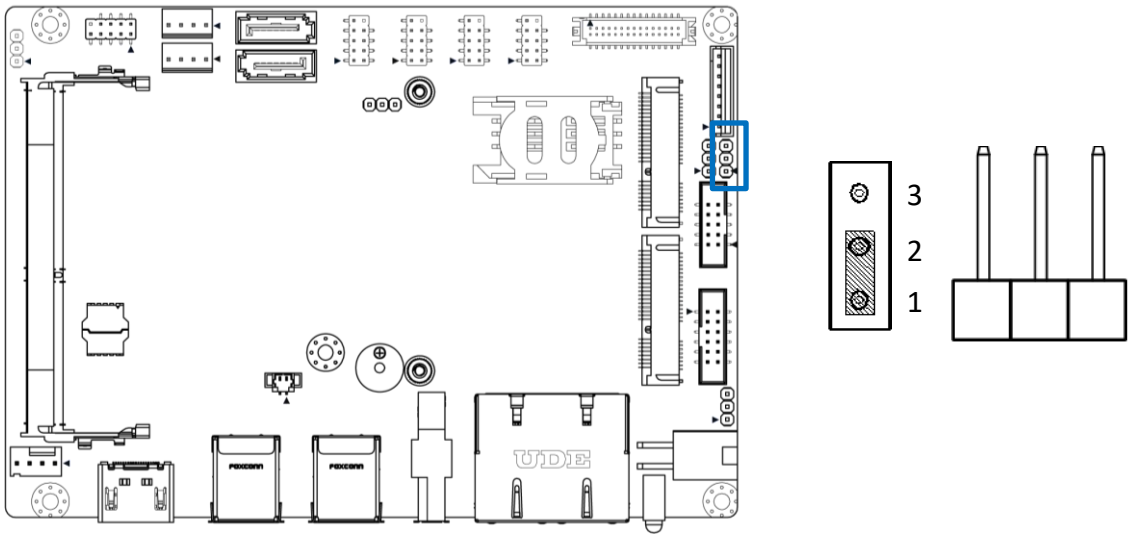


JP3

Pin	Signal
1	+V3.3
2	P3P5V
3	+V5

2.3 I/O Interface Descriptions

2.3.3 Backlight Power setting

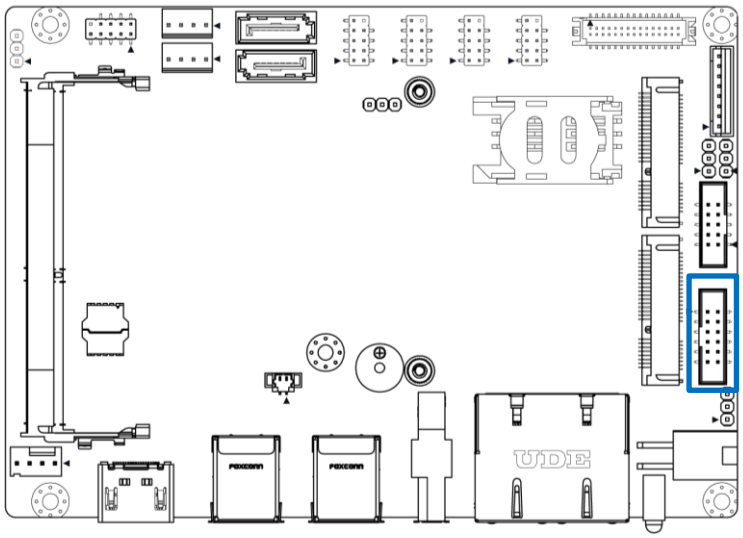


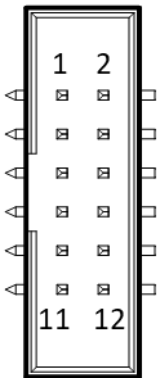
JP4

Pin	Signal
1	+V12
2	P5P12V
3	+V5

2.3 I/O Interface Descriptions

2.3.4 Front Panel Header



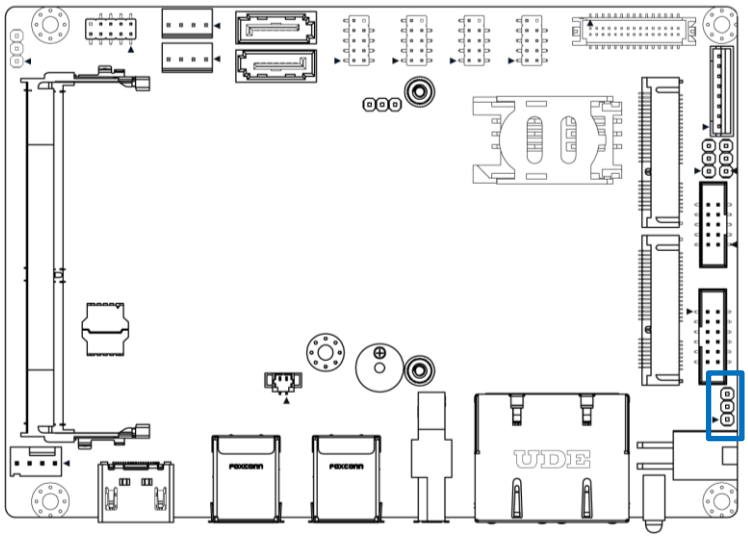


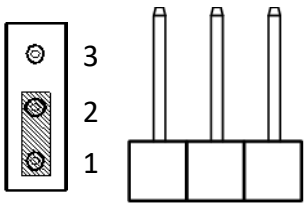
JP5

Pin	Signal	Pin	Signal
1	Power(3.3V)	2	SATA_LED#
3	Power(3.3V)	4	GND
5	LOUT_R	6	RESET_BUTTON_N
7	LOUT_L	8	PS_ON_BUTTON_N
9	MICIN1_R	10	GND
11	MICIN1_L	12	AGND_HD

2.3 I/O Interface Descriptions

2.3.5 AT/ATX setting



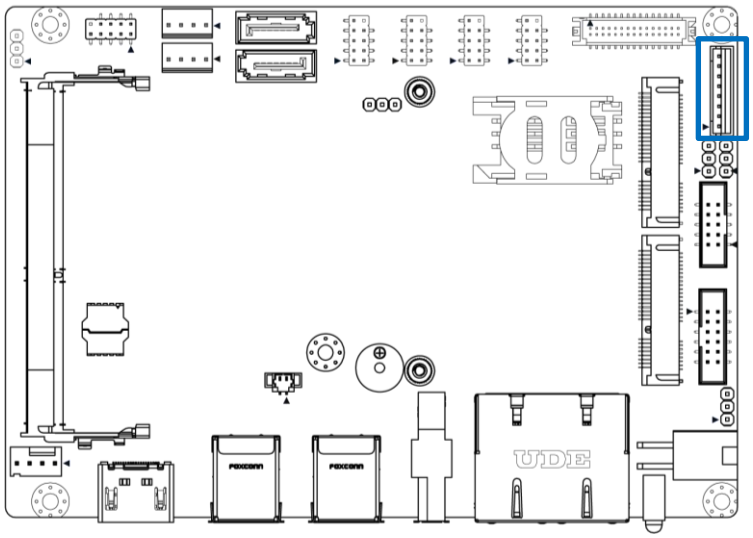


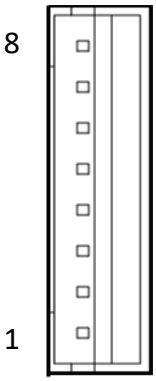
JP6

Pin	Signal
1	NC
2	AT MODE
3	PS_ON_BUTTON_N

2.3 I/O Interface Descriptions

2.3.6 Panel control



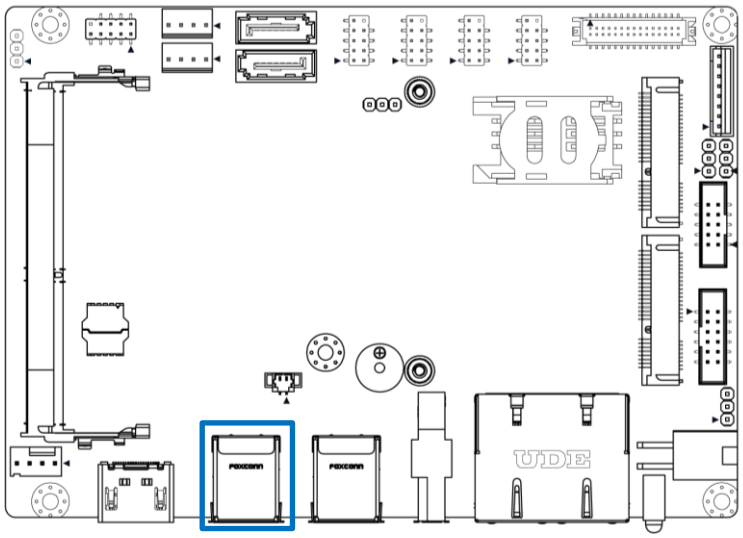


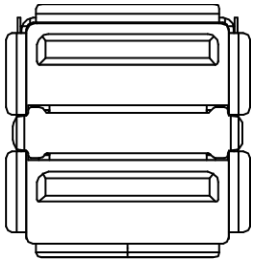
CN2

Pin	Signal	Pin	Signal
1	LVDS_BKLTEN	2	LBKLT_CTRL
3	BLPWR	4	BLPWR
5	GND	6	GND
7	CH7511_BLUP	8	CH7511_BLDN

2.3 I/O Interface Descriptions

2.3.7 USB3



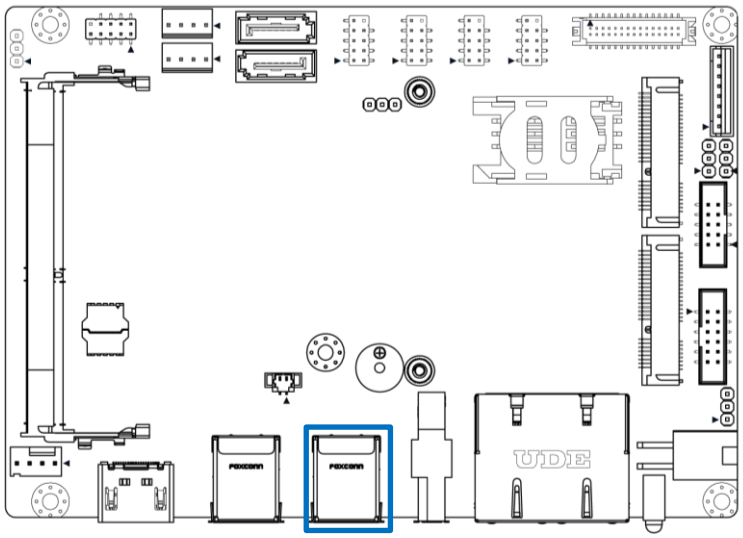


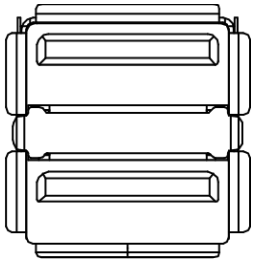
CN3

Pin	Signal	Pin	Signal
1	USBVCC0	10	USBVCC0
2	USB2-2N_CONN	11	USB2-1N_CONN
3	USB2-2P_CONN	12	USB2-1P_CONN
4	GND	13	GND
5	USB3-RN2_CONN	14	USB3-RN1_CONN
6	USB3-RP2_CONN	15	USB3-RP1_CONN
7	GND	16	GND
8	USB3-TN2_CONN	17	USB3-TN1_CONN
9	USB3-TP2_CONN	18	USB3-TP1_CONN

2.3 I/O Interface Descriptions

2.3.8 USB



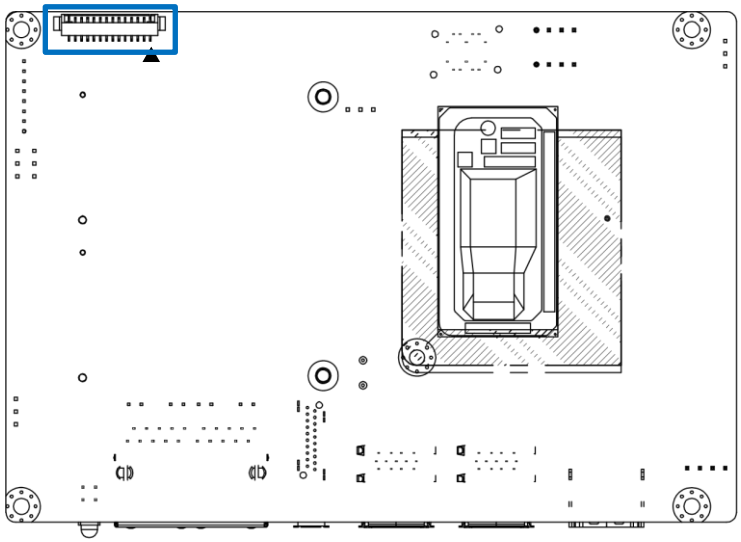


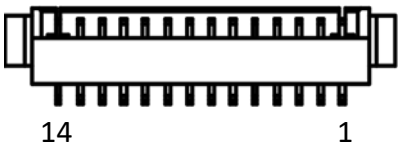
CN4

Pin	Signal	Pin	Signal
1	USBVCC0	10	USBVCC1
2	USB2-2N_CONN	11	USB2-3N_CONN
3	USB2-2P_CONN	12	USB2-3P_CONN
4	GND	13	GND
5	USB3-RN2_CONN	14	USB3-RN3_CONN
6	USB3-RP2_CONN	15	USB3-RP3_CONN
7	GND	16	GND
8	USB3-TN2_CONN	17	USB3-TN3_CONN
9	USB3-TP2_CONN	18	USB3-TP3_CONN

2.3 I/O Interface Descriptions

2.3.9 eDP (Optional)



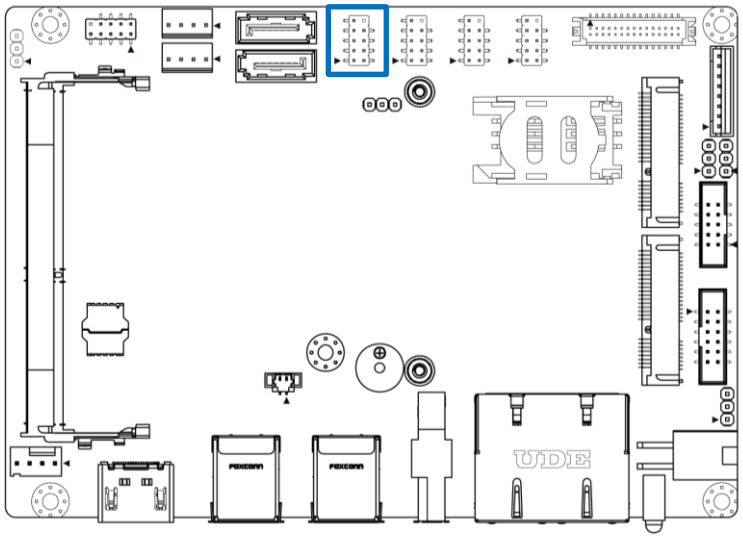


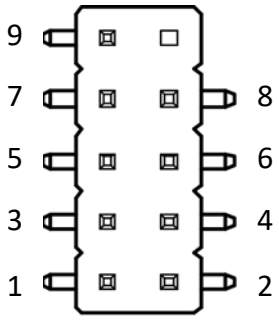
CN31

Pin	Signal
1	EDP_TXP1
2	EDP_TXN1
3	GND
4	EDP_TXP0
5	EDP_TXN0
6	GND
7	EDP_AUX-P
8	EDP_AUX-N
9	GND
10	PNLPWR
11	PNLPWR
12	EDP_HPD
13	GND
14	GND

2.3 I/O Interface Descriptions

2.3.10 COM Port



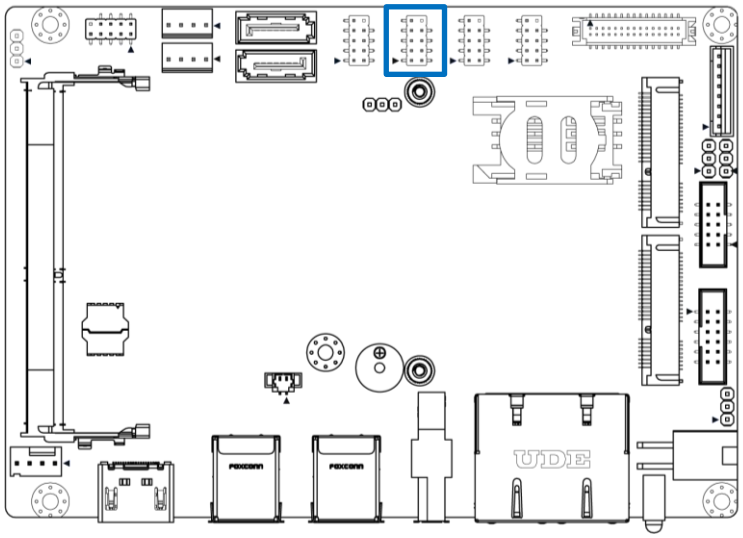


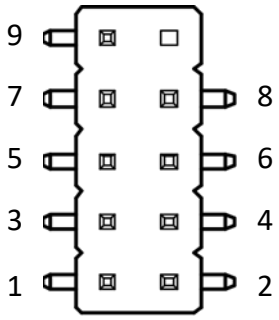
COM1

Pin	Signal	Pin	Signal
1	CM1_DCD	2	CM1_DSR
3	CM1_RXD	4	CM1_RTS
5	CM1_TXD	6	CM1_CTS
7	CM1_DTR	8	CM1_RI
9	GND	10	NC

2.3 I/O Interface Descriptions

2.3.11 COM Port



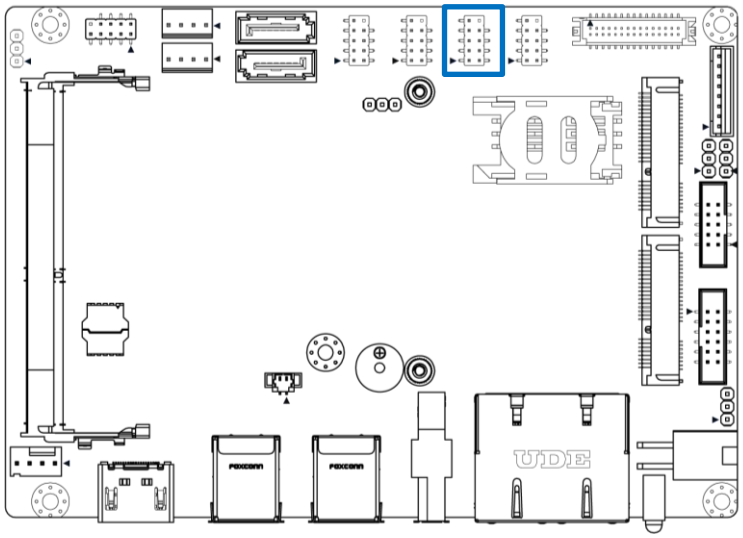


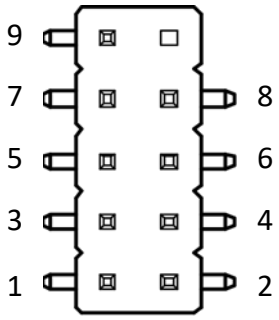
COM2

Pin	Signal	Pin	Signal
1	CM2_DCD	2	CM2_DSR
3	CM2_RXD	4	CM2_RTS
5	CM2_TXD	6	CM2_CTS
7	CM2_DTR	8	CM2_RI
9	GND	10	NC

2.3 I/O Interface Descriptions

2.3.12 COM Port



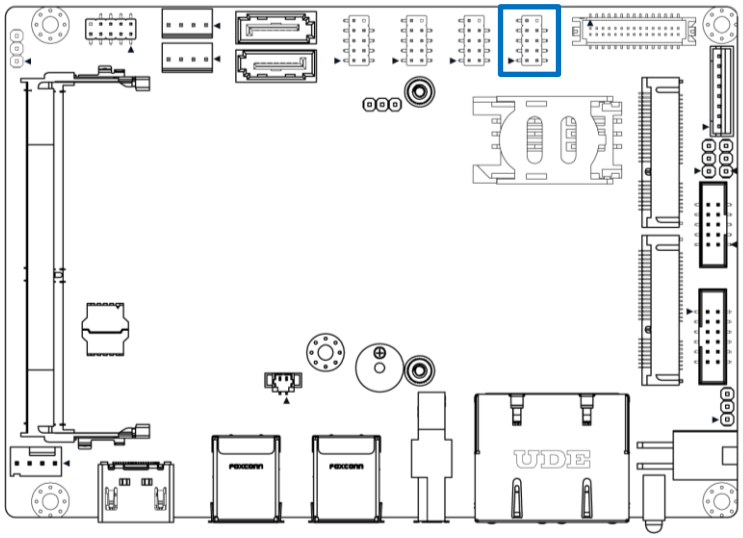


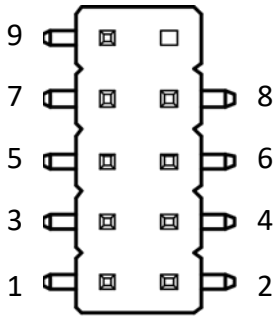
COM3

Pin	Signal	Pin	Signal
1	CM3_DCD	2	CM3_DSR
3	CM3_RXD	4	CM3_RTS
5	CM3_TXD	6	CM3_CTS
7	CM3_DTR	8	CM3_RI
9	GND	10	NC

2.3 I/O Interface Descriptions

2.3.13 COM Port



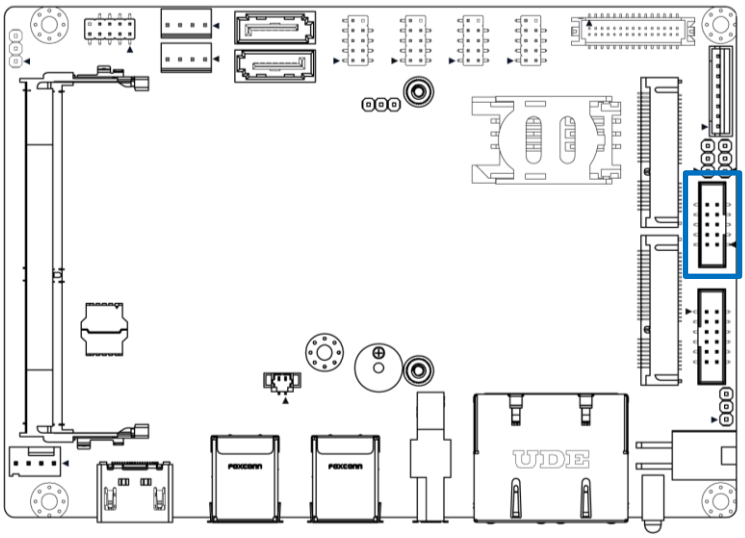


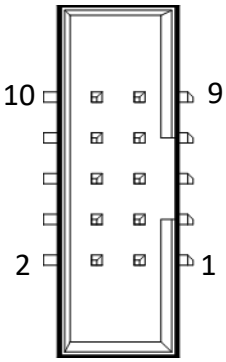
COM4

Pin	Signal	Pin	Signal
1	CM4_DCD	2	CM4_DSR
3	CM4_RXD	4	CM4_RTS
5	CM4_TXD	6	CM4_CTS
7	CM4_DTR	8	CM4_RI
9	GND	10	NC

2.3 I/O Interface Descriptions

2.3.14 GPIO



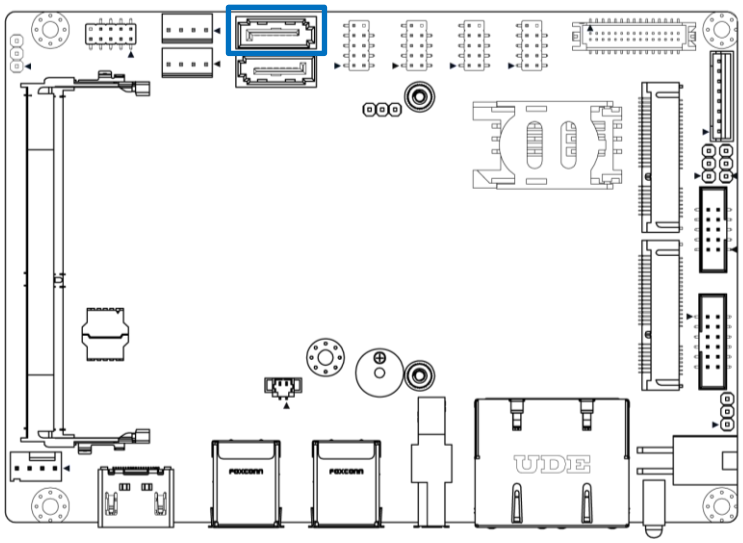


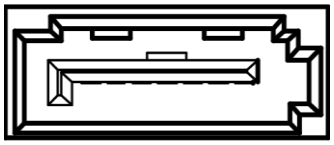
GPIO1

Pin	GPIO	Default Configuration
1		VCC5
2		GND
3	DIO_PH_INT0	GPI0
4	DIO_PH_OUT0	GPO0
5	DIO_PH_INT1	GPI1
6	DIO_PH_OUT1	GPO1
7	DIO_PH_INT2	GPI2
8	DIO_PH_OUT2	GPO2
9	DIO_PH_IN3	GPII3
10	DIO_PH_OUT3	GPO3

2.3 I/O Interface Descriptions

2.3.15 SATA



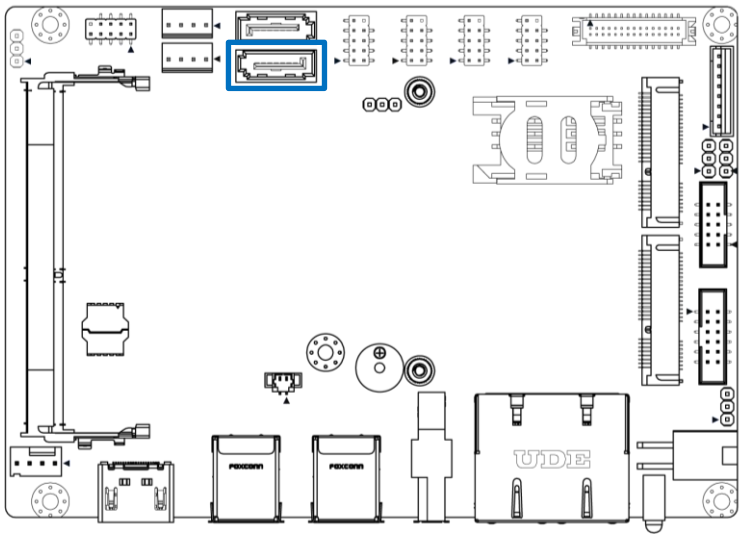


SATA1

Pin	Signal
1	GND
2	SATA_TX0_C_DC_DP
3	SATA_TX0_C_DC_DN
4	GND
5	SATA_RX0_DC_DN
6	SATA_RX0_DC_DP
7	GND

2.3 I/O Interface Descriptions

2.3.16 SATA

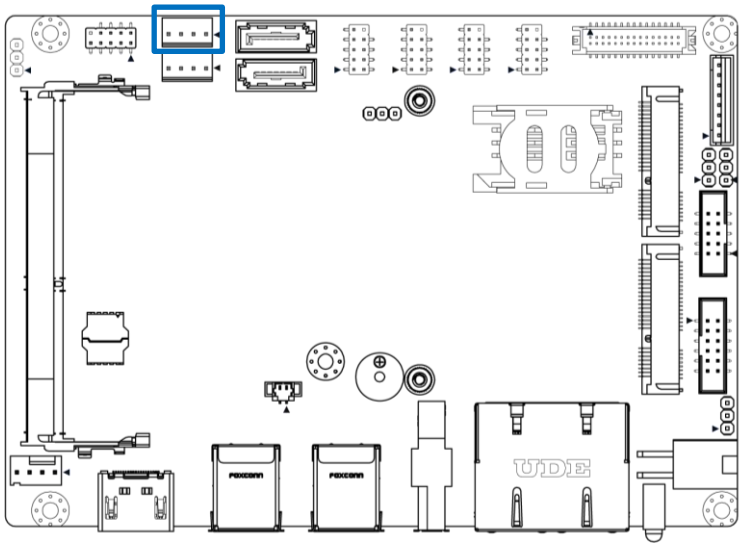


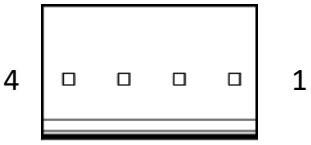
SATA2

Pin	Signal
1	GND
2	SATA_TX1_C_DC_DP
3	SATA_TX1_C_DC_DN
4	GND
5	SATA_RX1_DC_DN
6	SATA_RX1_DC_DP
7	GND

2.3 I/O Interface Descriptions

2.3.17 SATA Power



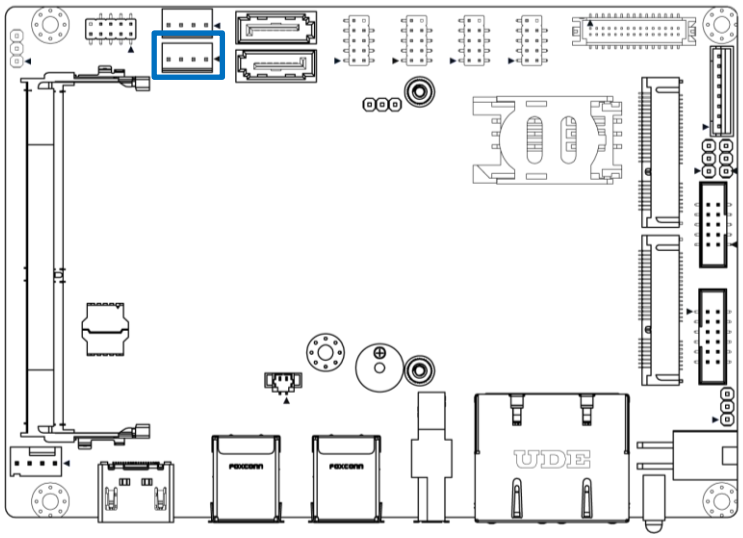


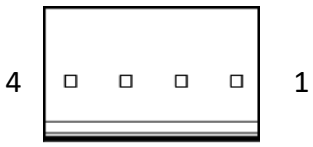
SATA1_PWR1

Pin	Signal
1	+V5
2	GND
3	GND
4	+V12

2.3 I/O Interface Descriptions

2.3.18 SATA Power



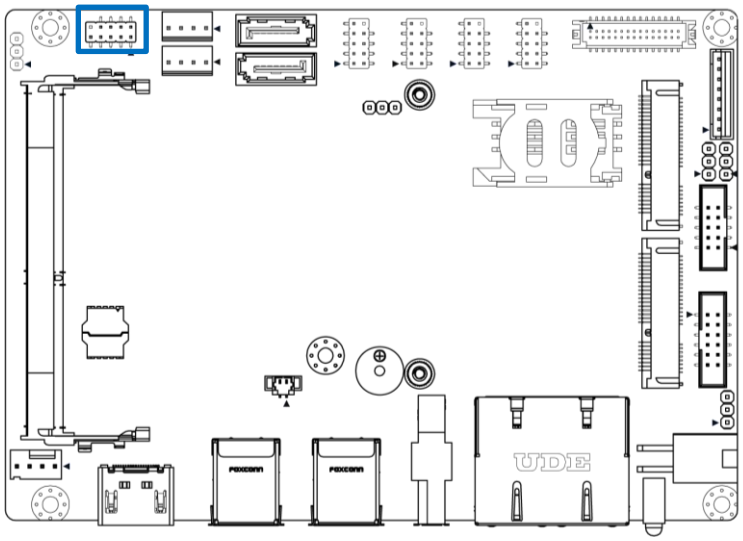


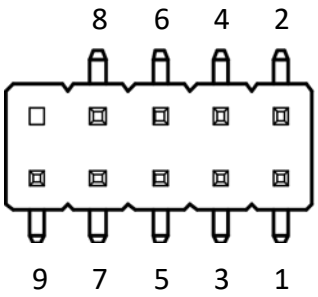
SATA2_PWR1

Pin	Signal
1	+V5
2	GND
3	GND
4	+V12

2.3 I/O Interface Descriptions

2.3.19 USB2.0



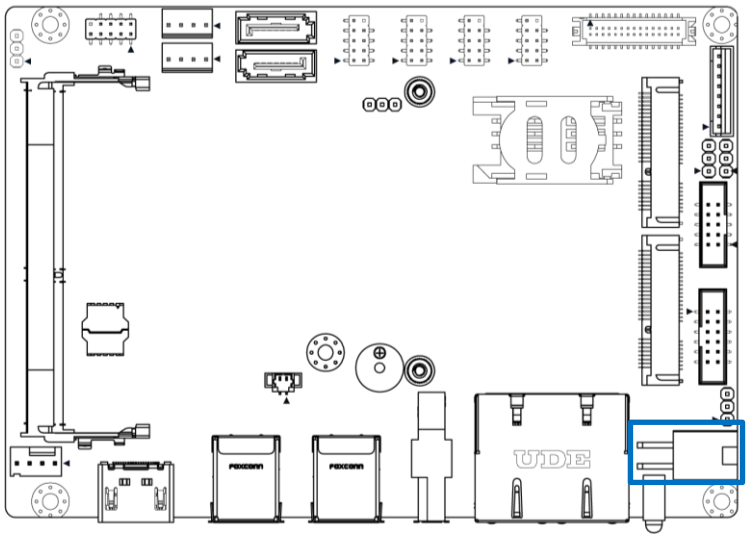


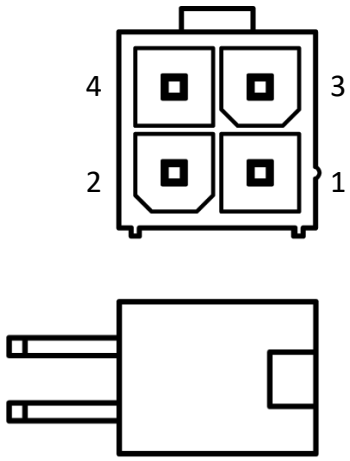
USB_2

Pin	Signal	Pin	Signal
1	USBVCC2	2	USBVCC2
3	USB2-5N_CONN	4	USB2-6N_CONN
5	USB2-5P_CONN	6	USB2-6P_CONN
7	GND	8	GND
9	NC		

2.3 I/O Interface Descriptions

2.3.20 DC12_IN



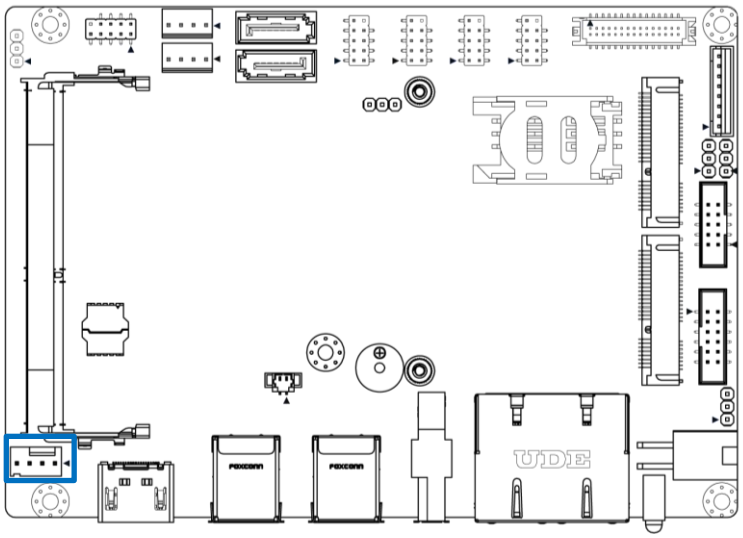


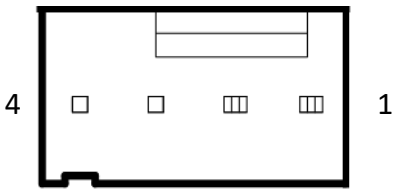
DC_IN2

Pin	Signal
1	GND
2	GND
3	12V
4	12V

2.3 I/O Interface Descriptions

2.3.21 FAN Power



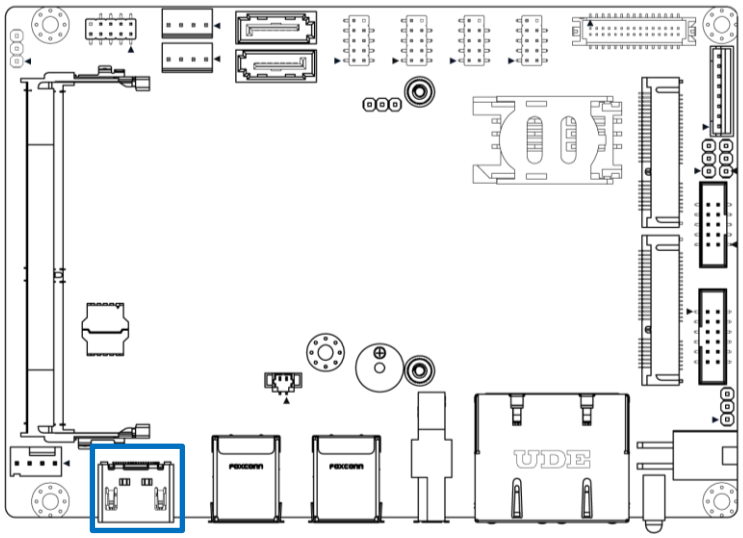


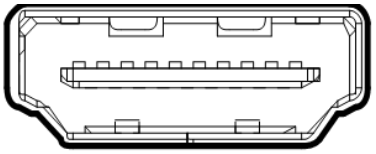
FAN1

Pin	Signal
1	GND
2	+12V
3	FAN_SENSE
4	FAN_CONTROL

2.3 I/O Interface Descriptions

2.3.22 HDMI



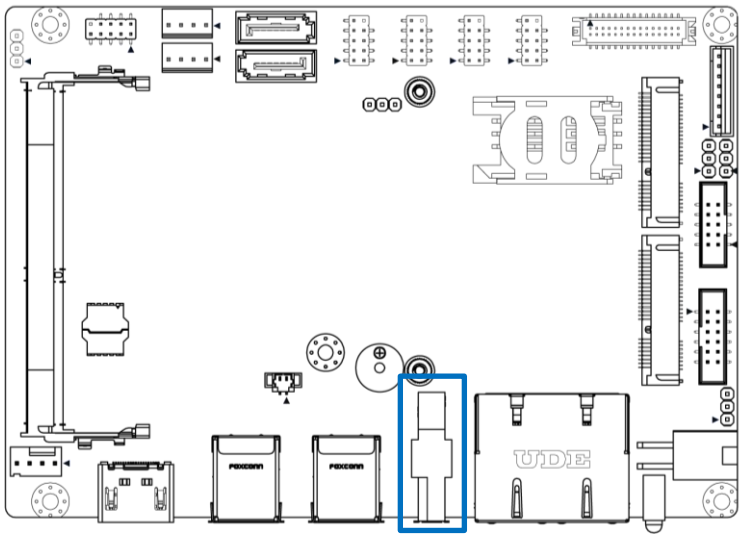


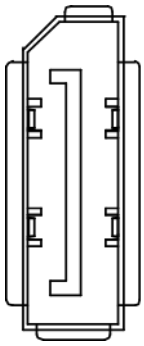
HDMI

Pin	Signal	Pin	Signal
1	HDMI_TX2+_C	2	GND
3	GND	4	HDMI_TXC-_C
5	HDMI_TX2-_C	6	NC
7	HDMI_TX1+_C	8	NC
9	GND	10	HDMI_SCL
11	HDMI_TX1-_C	12	HDMI_SDA
13	HDMI_TX0+_C	14	GND
15	GND	16	VCC5_HDMI
17	HDMI_TX0-_C	18	HDMI_HPD_CON
19	HDMI_TXC+_C	20	

2.3 I/O Interface Descriptions

2.3.23 DP



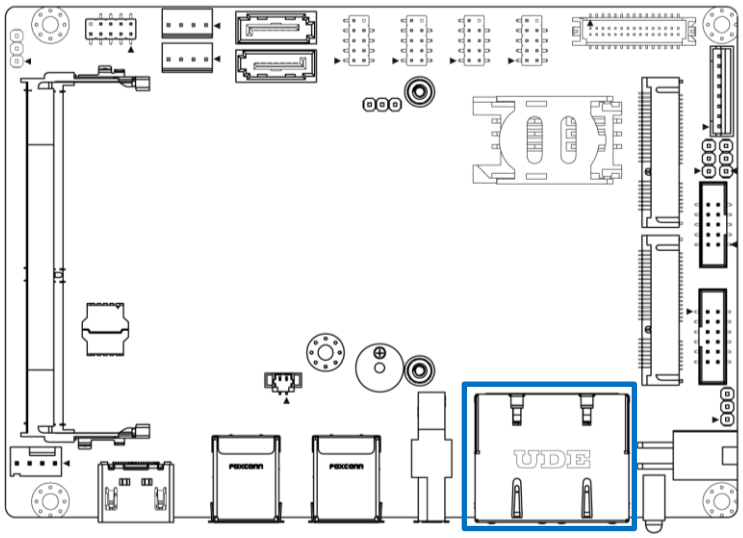


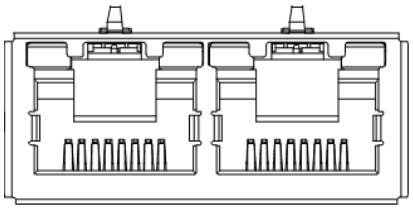
DP1

Pin	Signal
1	ML_LANE0+
2	GND
3	ML_LANE0-
4	ML_LANE1+
5	GND
6	ML_LANE1-
7	ML_LANE2+
8	GND
9	ML_LANE2-
10	ML_LANE3+
11	GND
12	ML_LANE3-
13	GND
14	GND
15	AUX CH+
16	GND
17	AUX CH-
18	HPD
19	DP_PWR Return

2.3 I/O Interface Descriptions

2.3.24 RJ45



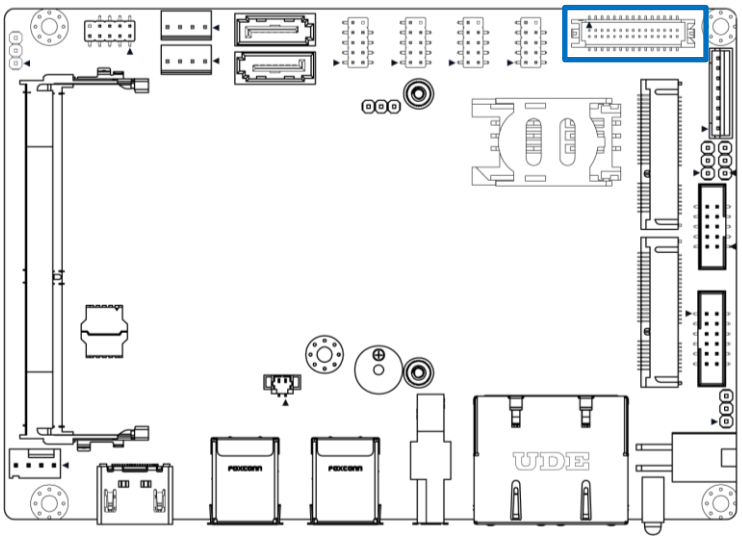


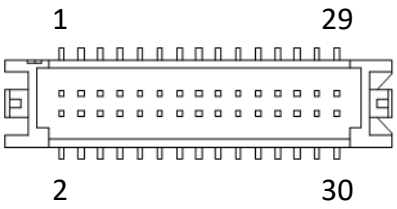
RJ1

Pin	Signal	Pin	Signal
1	R1 GBE1_MDI0P	11	R1 GBE2_MDI0P
2	R2 GBE1_MDI0N	12	R2 GBE2_MDI0N
3	R3 GBE1_MDI1P	13	R3 GBE2_MDI1P
4	R4 GBE1_MDI1N	14	R4 GBE2_MDI1N
5	R5 GBE0_CT	15	R5 GBE0_CT
6	R6 GBE0_CT	16	R6 GBE0_CT
7	R7 GBE1_MDI2P	17	R7 GBE2_MDI2P
8	R8 GBE1_MDI2N	18	R8 GBE2_MDI2N
9	R9 GBE1_MDI3P	19	R9 GBE2_MDI3P
10	R10 GBE1_MDI3N	20	R10 GBE2_MDI3N
L1_1	L1 LINK100J	L1_2	L1 LINK100J
L2_!	L2 LINK1000J	L2_2	L2 LINK1000J
L3_1	L3 GBE_ACTJ	L3_2	L3 GBE_ACTJ
L4_1	L4 P3V3	L4_2	L4 P3V3

2.3 I/O Interface Descriptions

2.3.25 LVDS (Optional)





LVDS1

Pin	Signal	Pin	Signal
1	LB_DATA-N3	2	LB_DATA-P3
3	LB_CLK-N	4	LB_CLK-P
5	LB_DATA-N2	6	LB_DATA-P2
7	LB_DATA-N1	8	LB_DATA-P1
9	LB_DATA-N0	10	LB_DATA-P0
11	MIICSDA	12	MIICSCL
13	GND	14	GND
15	GND	16	GND
17	LA_DATA-P3	18	LA_DATA-N3
19	LA_CLK-P	20	LA_CLK-N
21	LA_DATA-P2	22	LA_DATA-N2
23	LA_DATA-P1	24	LA_DATA-N1
25	LA_DATA-P0	26	LA_DATA-N0
27	PNLPWR	28	PNLPWR
29	PNLPWR	30	PNLPWR

Chapter 3

System Setup

3.1 Set torque force to 3.5 kgf-cm to execute all the screwing and unscrewing.

3.2 Removing the chassis bottom cover

WARNING

In order to prevent electric shock or system damage, before removing the chassis cover, must turn off power and disconnect the unit from power source.

1. Turn the system upside down. Unscrew the 4 screws (M3x5L) on the bottom cover.

2. Open the bottom cover.

3. Remove the sata cable、power cable & remove the bottom cover.

3.3 Installing SODIMM

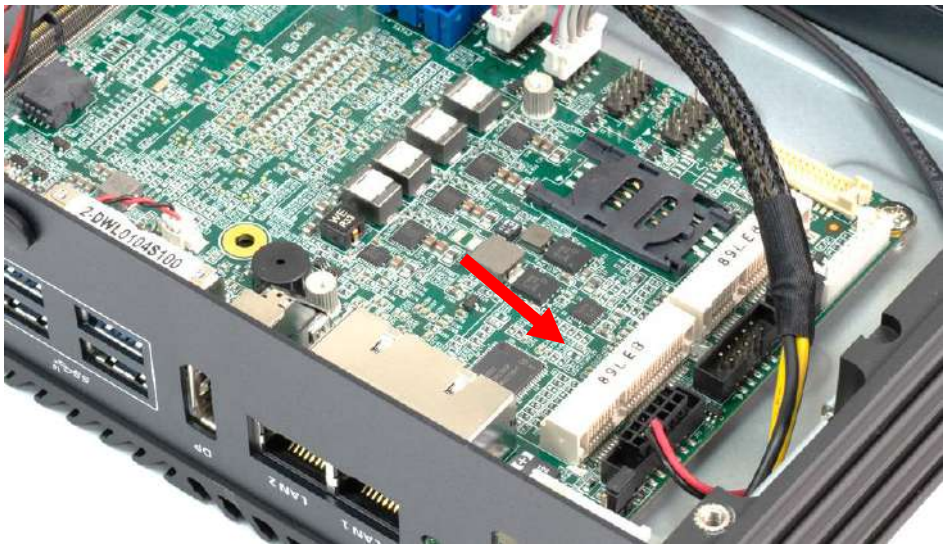
1. SODIMM sockets are available for BCO-2000 series on the top side.

2. Insert memory module from 45 degree direction.

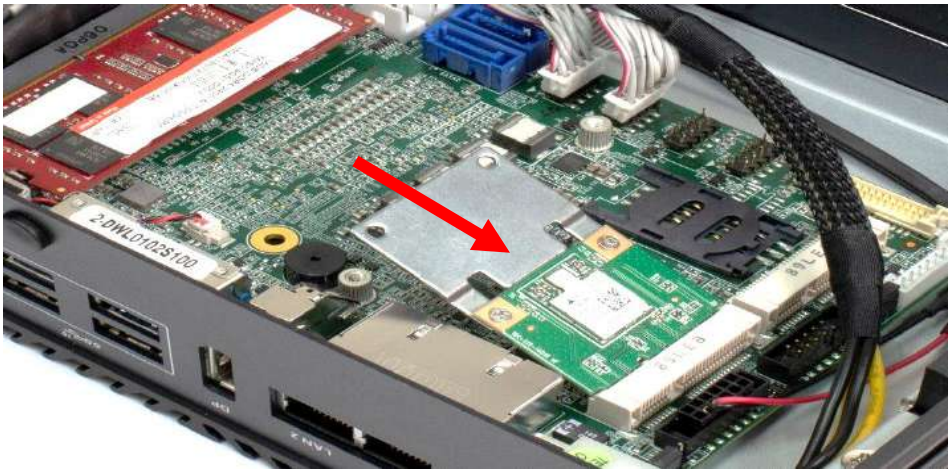
3. Press the memory module vertically downward until you hear the "click" sound. Make sure the memory module is firmly in place.

3.4 Installing Mini PCIe card / mSATA

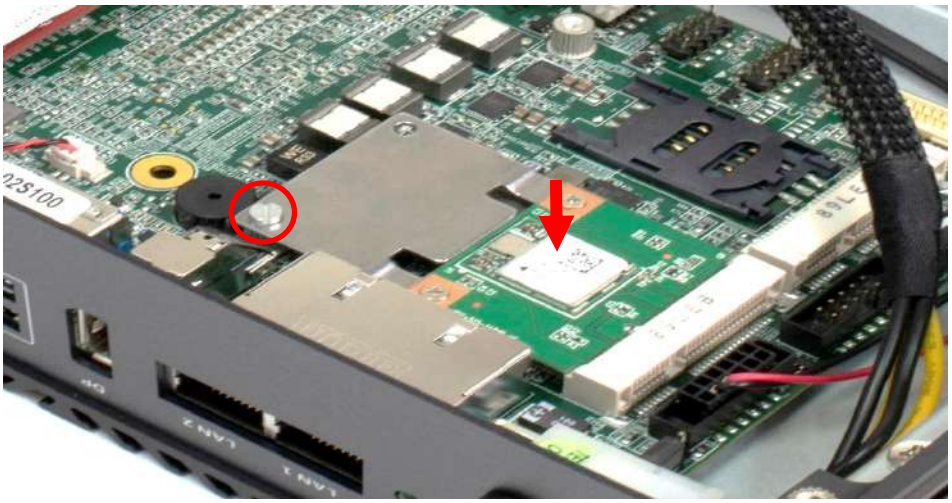
1. Mini PCIe 2 can support mSATA.



2. Insert mini PCIe card or mSATA module from 45 degree direction.



3. Press the mini PCIe card or mSATA module down and lock it with one screws (M2.5x3.7L).



3.5 Installing antenna

1. Remove antenna hole cover on the system panel.

Front

Rear

2. Have antenna jack penetrate through the hole.

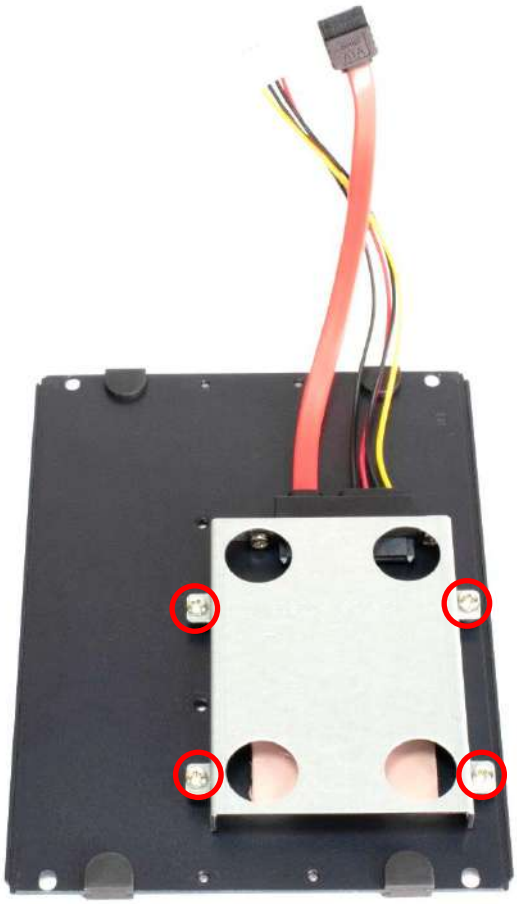
3. Put on washer and fasten the nut with antenna jack.

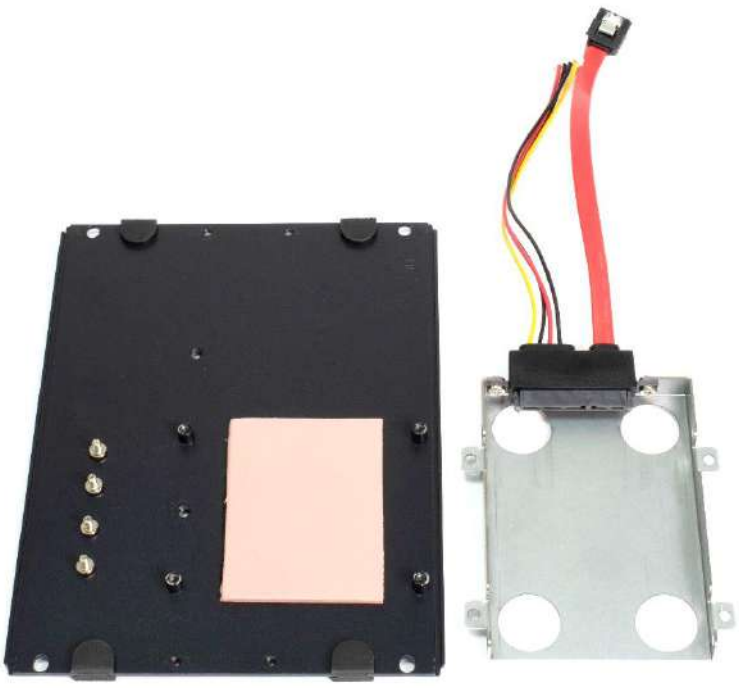
4. Assemble the antenna and antenna jack together.

5. Attach the RF connector at the cable-end onto the communication module.

3.6 Removing HDD bracket

1. Unscrew four screws (M3x5L) circled below.

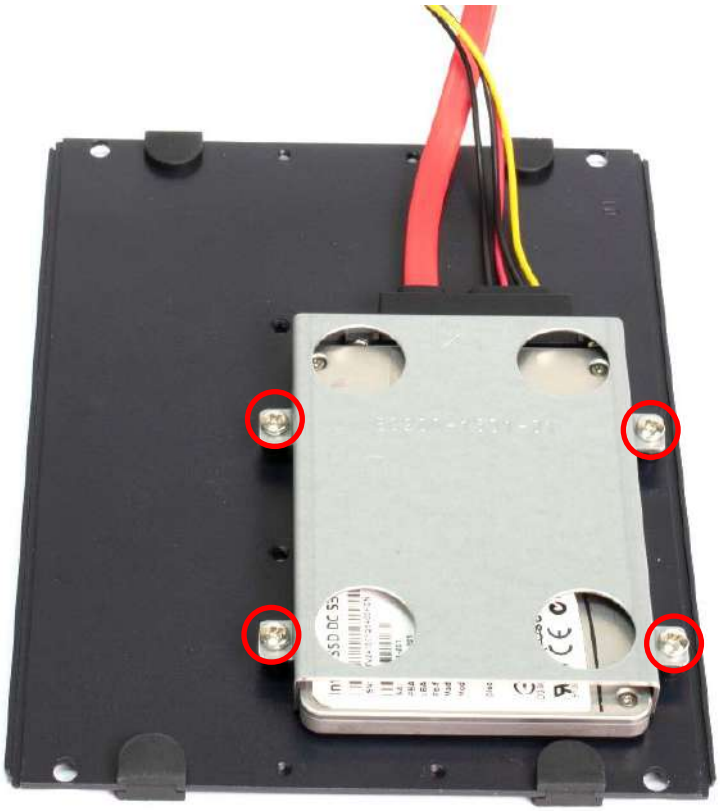




3.7 Installing SATA HDD

1. Lock the 2.5" HDD with HDD bracket using four screws (M3x4L).

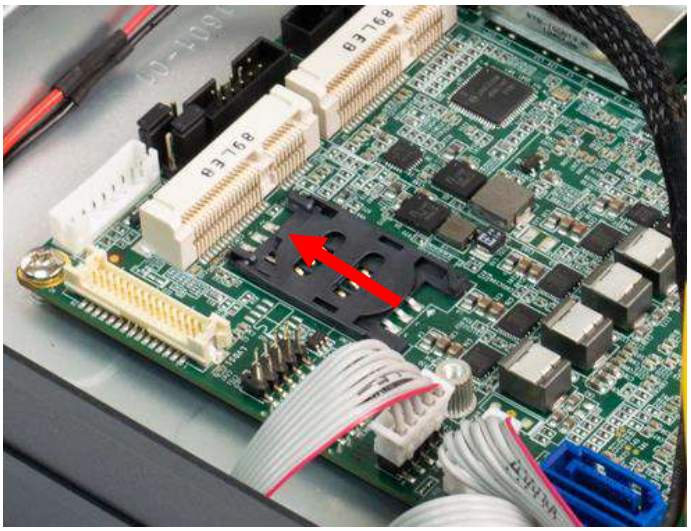
2. Fasten the four screws (M3x5L) to lock the HDD bracket in place.



3. insert power cable and sata cable.

3.8 Installing SIM card

1. **Following the below direction to open the SIM cover**



2. **Inser SIM card.**

3. **Following the below direction until you hear the "click" sound. Make sure the SIM card is firmly in place.**

3.9 Installing DIN rail holder

1. **Din rail holder is available for BCO-2000 series as optional accessories.**

2. **Place the system upside down so you can see the bottom cover. The highlighted screw holes below will be used.**

3. **Place the din rail holder on top of the bottom cover and lock it with two screws (M4x5L, Nylok).**

Chapter 4

BIOS Setup

4.1 BIOS Introduction

The BIOS provides an interface to modify the configuration. When the battery is removed, all the parameters will be reset.

BIOS Setup

Power on the embedded system and by pressing <Del> immediately allows you to enter the setup screens. If the message disappears before you respond and you still wish to enter the Setup, restart the system by turning it OFF and ON or pressing the RESET button.
You may also restart the system by simultaneously pressing <Ctrl>, <Alt>, and <Delete> keys.

Control Keys	
<→> <←>	Select Screen
<↑> <↓>	Select Item
<Enter>	Select
<Page Up/+>	Increases the numeric value or makes changes
<Page Down/->	Decreases the numeric value or makes changes
<F1>	General Help
<F2>	Previous Value
<F3>	Load Optimized Defaults
<F4>	Save Configuration and Exit
<Tab>	Select Setup Fields
<Esc>	Exit BIOS Setup

Main Setup

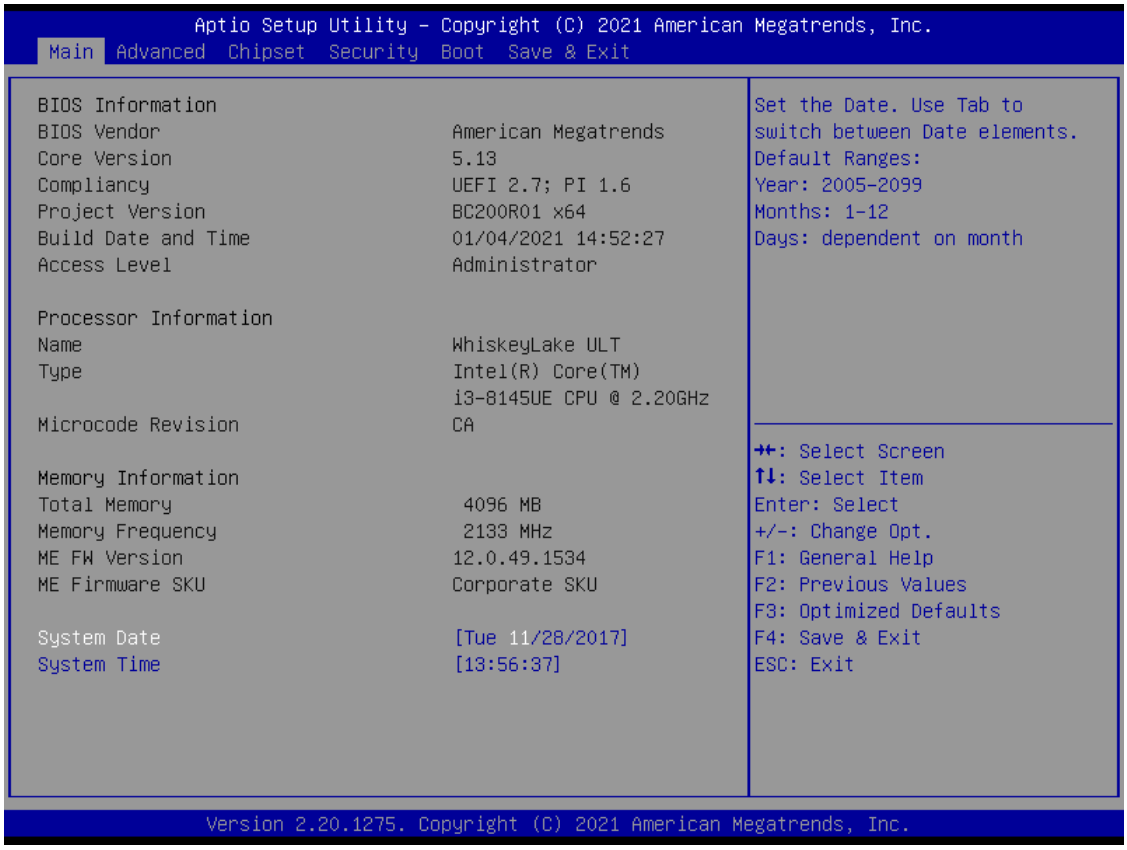
The main menu lists the setup functions you can make changes to. You can use the arrow keys (↑↓) to select the item. The on-line description of the highlighted setup function is displayed at the bottom of the screen.

General Help <F1>

The BIOS setup program provides a General Help screen. You can call up this screen from any menu by simply pressing <F1>. The Help screen lists the appropriate keys to use and the possible selections for the highlighted item. Press <Esc> to exit the Help screen.

4.2 Main Setup

Press <Del> to enter BIOS CMOS Setup Utility. The Main setup screen is showed as following when the setup utility is entered. System Date/Time is set up in the Main Menu.



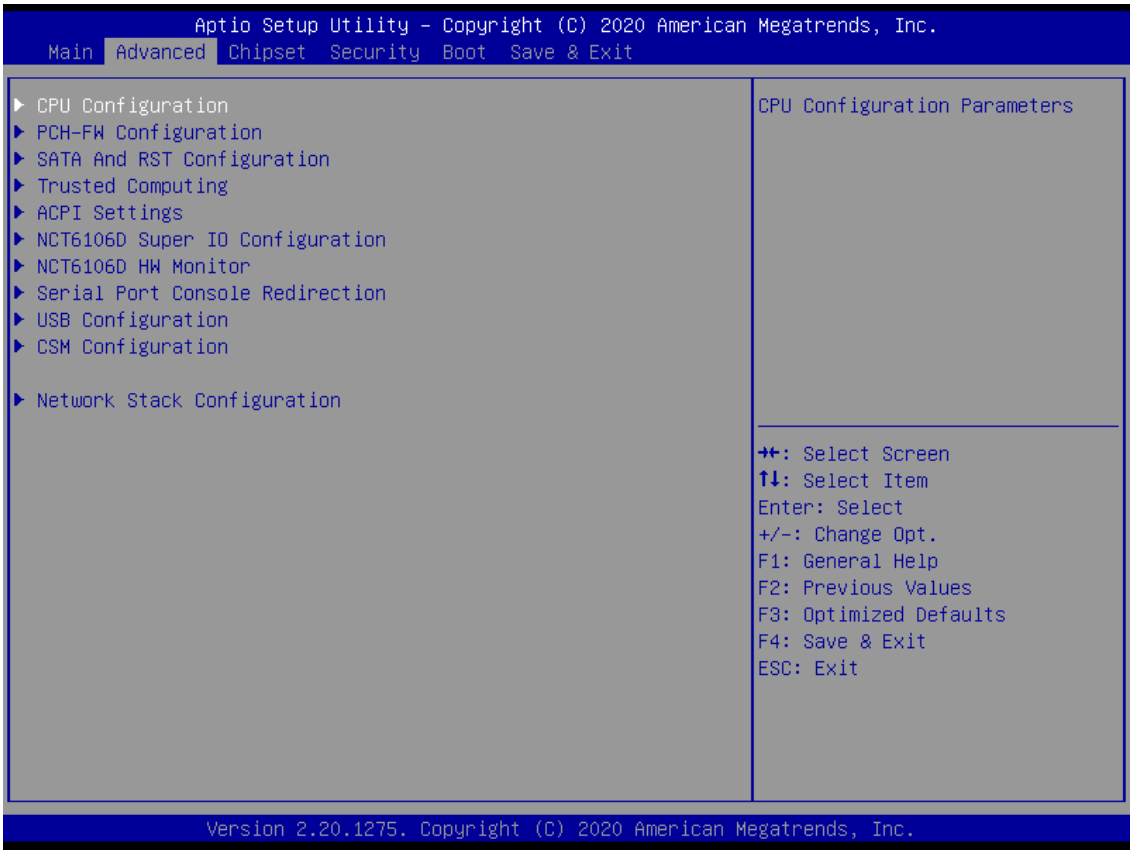
■ System Date

Set the system date. Please use <Tab> to switch between data elements.

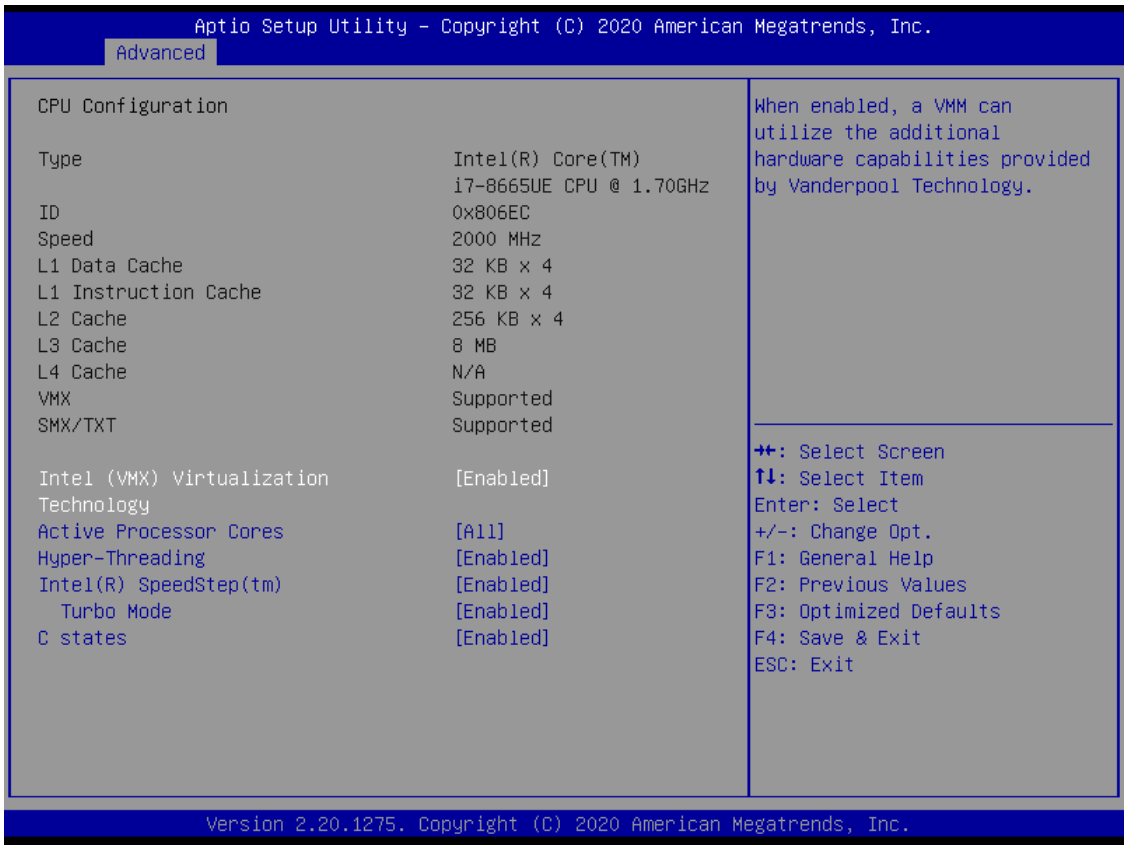
■ System Time

Set the system time. Please use <Tab> to switch between time elements.

4.3 Advanced Setup

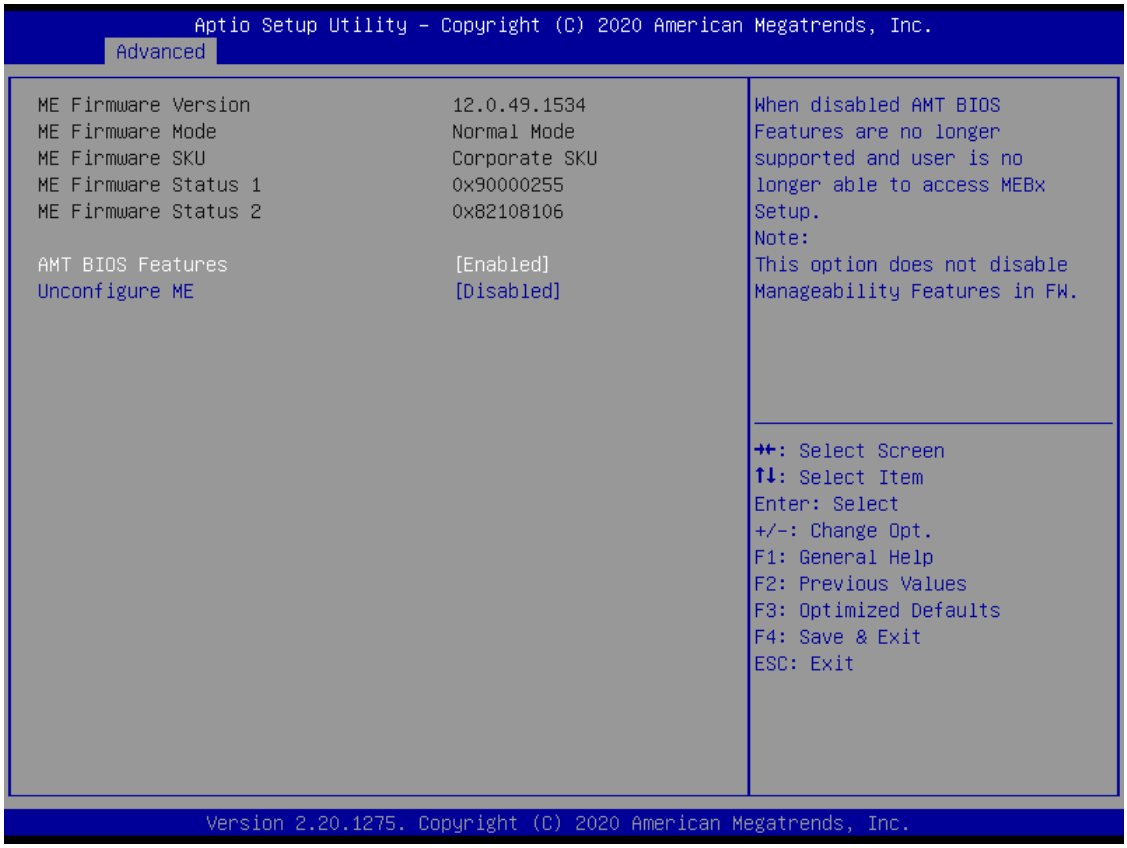


4.3.1 CPU Configuration



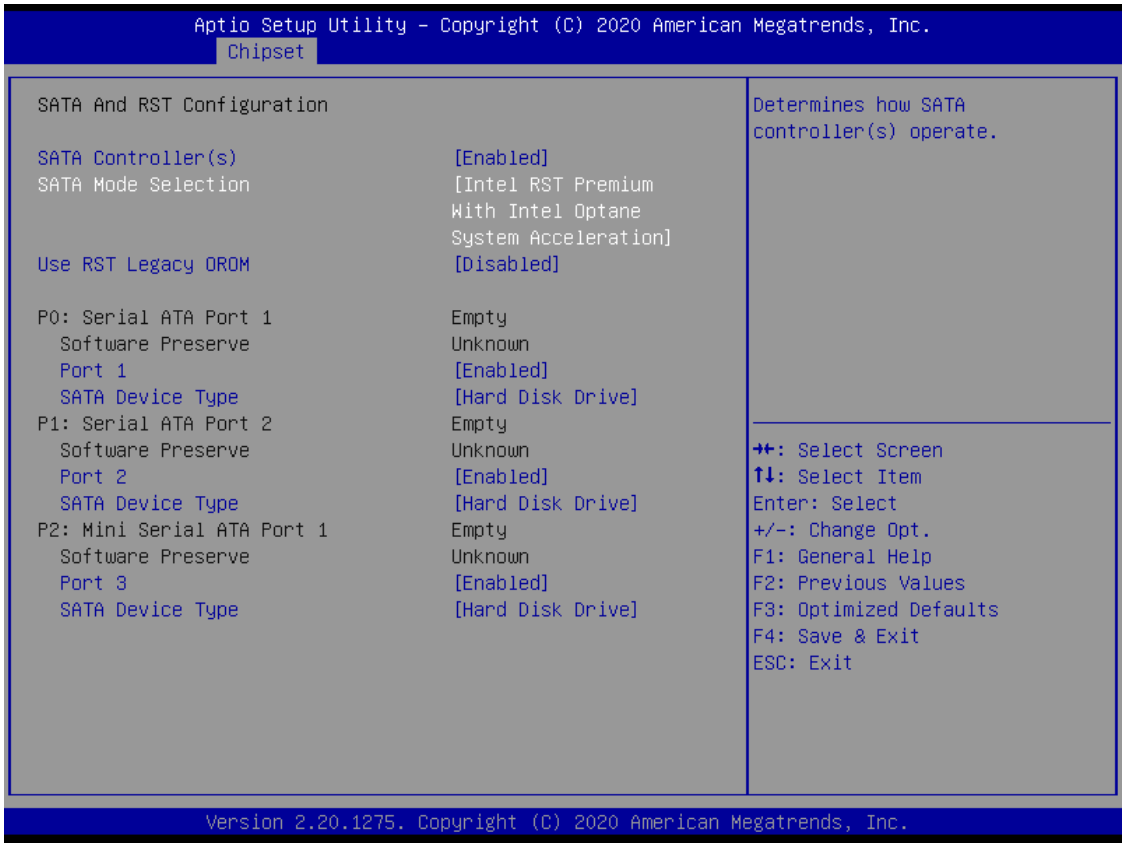
Item	Options	Description
Intel (VMX) Virtualization Technology	Disabled, Enabled**[Default]**	When enabled, a VMM can utilize the additional hardware capabilities provided by Virtualization Technology.
Active Processor Cores	All**[Default]** 1 2 3	Number of cores to enable in each processor package.
Hyper-Threading	Disabled, Enabled**[Default]**	Enabled for Windows XP and Linux (OS optimized for Hyper-Threading Technology) and Disabled for other OS (OS not optimized for Hyper-Threading Technology).
Intel SpeedStep	Disabled, Enabled**[Default]**	This item allows you to enable or disable the Intel SpeedStep.
Turbo Mode	Disabled, Enabled**[Default]**	This item allows you to enable or disable the Turbo Mode.
C states	Disabled, Enabled**[Default]**	Enable/Disable CPU Power Management. Allows CPU to go to C states when it's not 100% utilized.

4.3.2 PCH-FW Configuration



Item	Options	Description
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.
Unconfigure ME	Disabled[Default] , Enabled	OEMFlag Bit 15: Unconfigure ME with resetting MEBx password to default.

4.3.3 SATA and RST Configuration

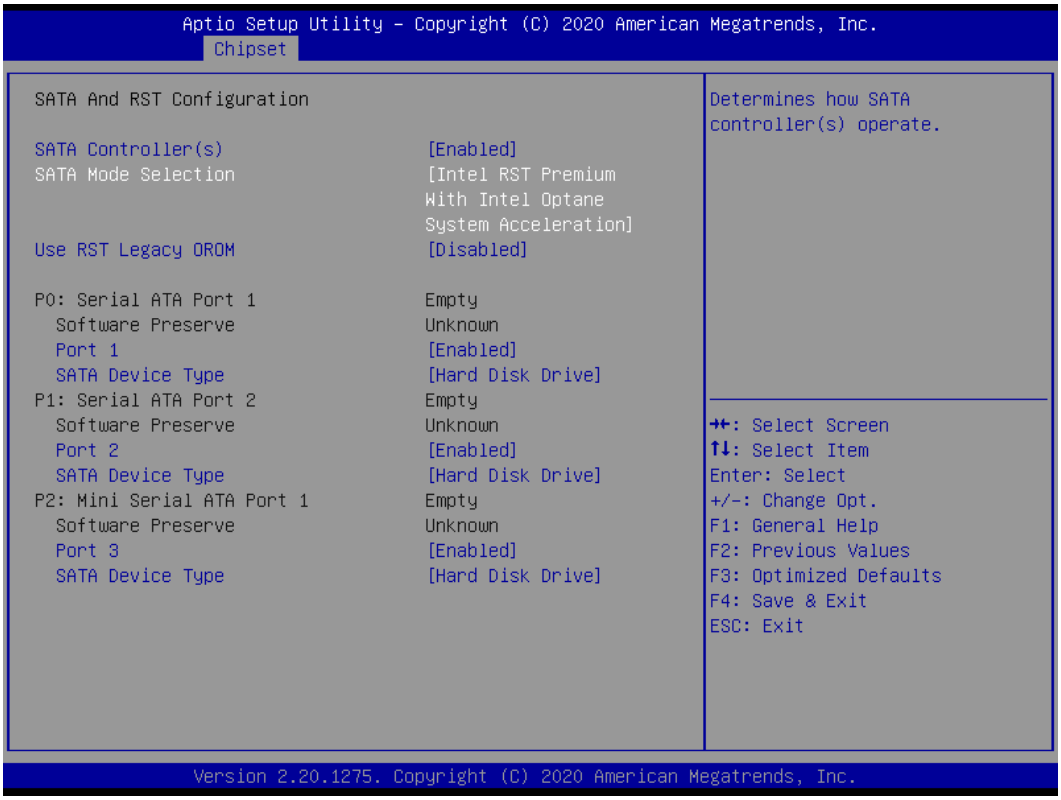


Item	Options	Description
SATA Controller(s)	Disabled, Enabled**[Default]**	Enable/Disable SATA Device.
SATA Mode Selection	**AHCI[Default] ,** Intel RST Premium With Intel Optane System Acceleration	Determines how SATA controller(s) operate.
Use RST Legacy OROM	Disabled**[Default]** , Enabled	Use RST Legacy OROM when CSM is Enabled. Note: When you see the POST screen, Please press <CTRL-I> to into Legacy RAID setting interface.
Port1	Disabled, Enabled**[Default]**	Enable/Disable SATA Port.
SATA Device Type	Hard Disk Drive Solid State Drive**[Default]**	Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.
Port2	Disabled, Enabled**[Default]**	Enable/Disable SATA Port.
SATA Device Type	Hard Disk Drive Solid State Drive**[Default]**	Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.
Port3	Disabled, Enabled**[Default]**	Enable/Disable SATA Port.
SATA Device Type	Hard Disk Drive Solid State Drive**[Default]**	Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.

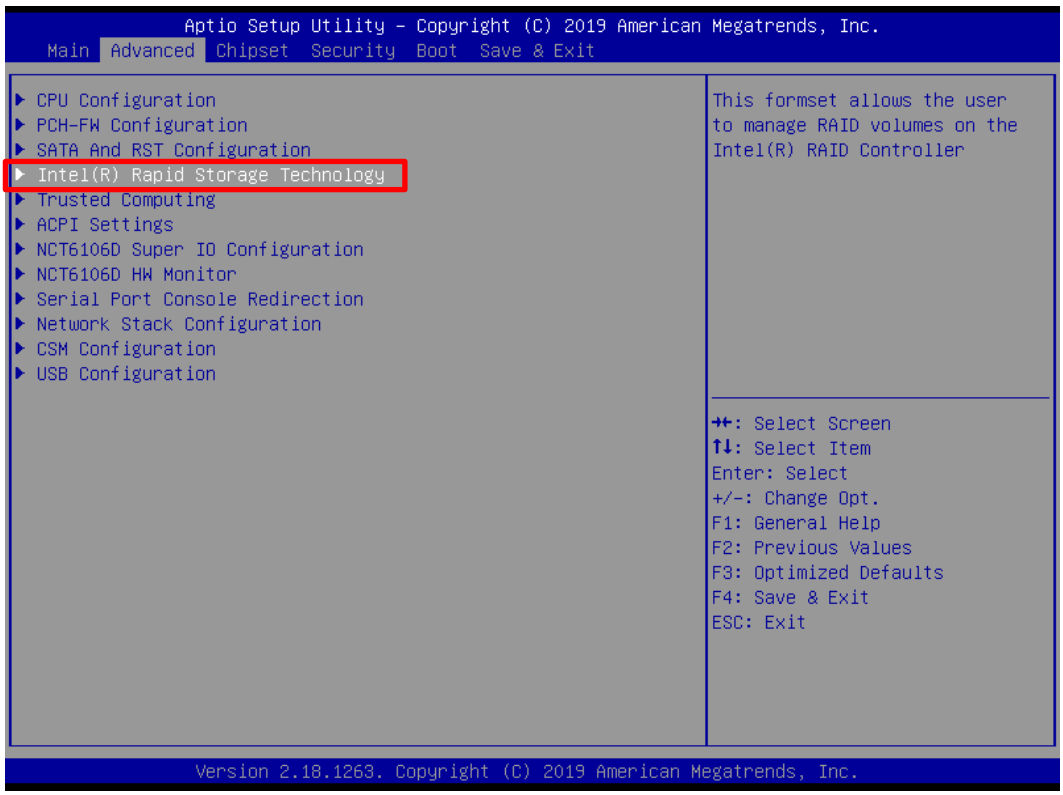
4.3.4 RST (UEFI RAID) Configuration

How to set the UEFI RAID:

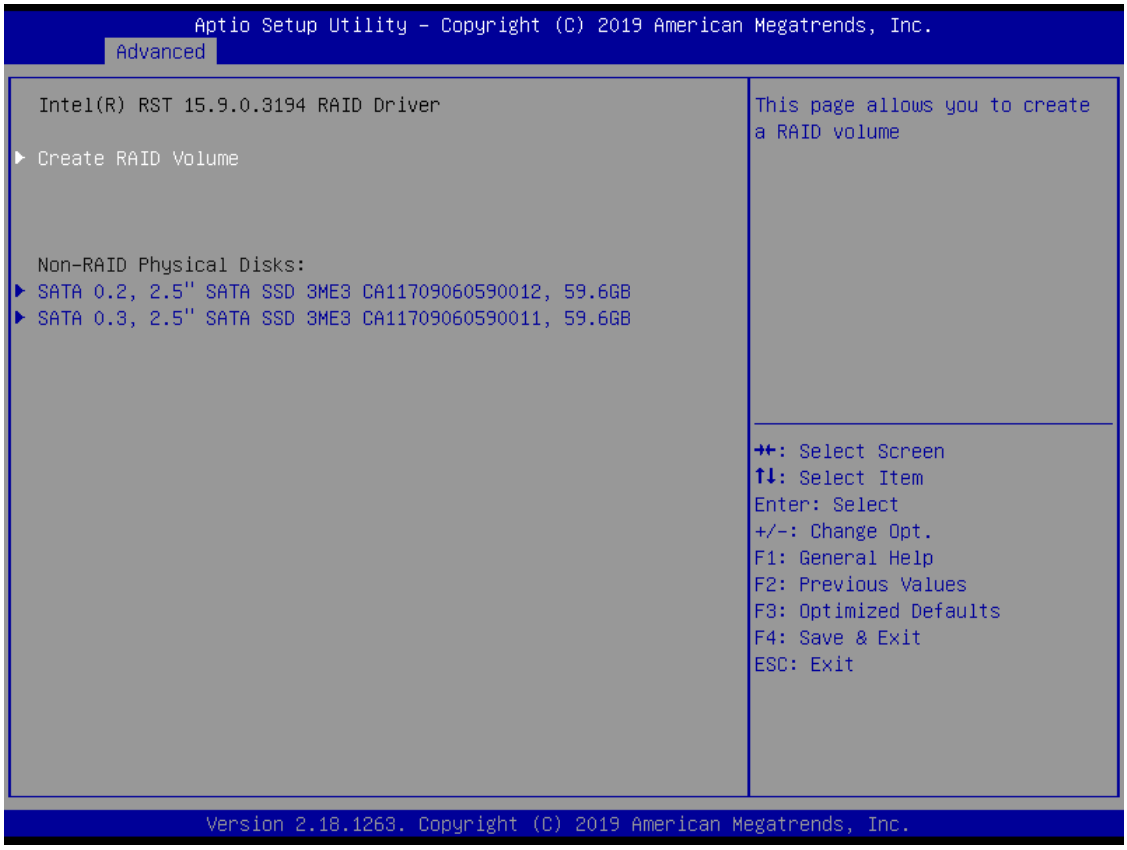
1. When set to "Intel RST Premium With Intel Optane System Acceleration", please save change reset system.



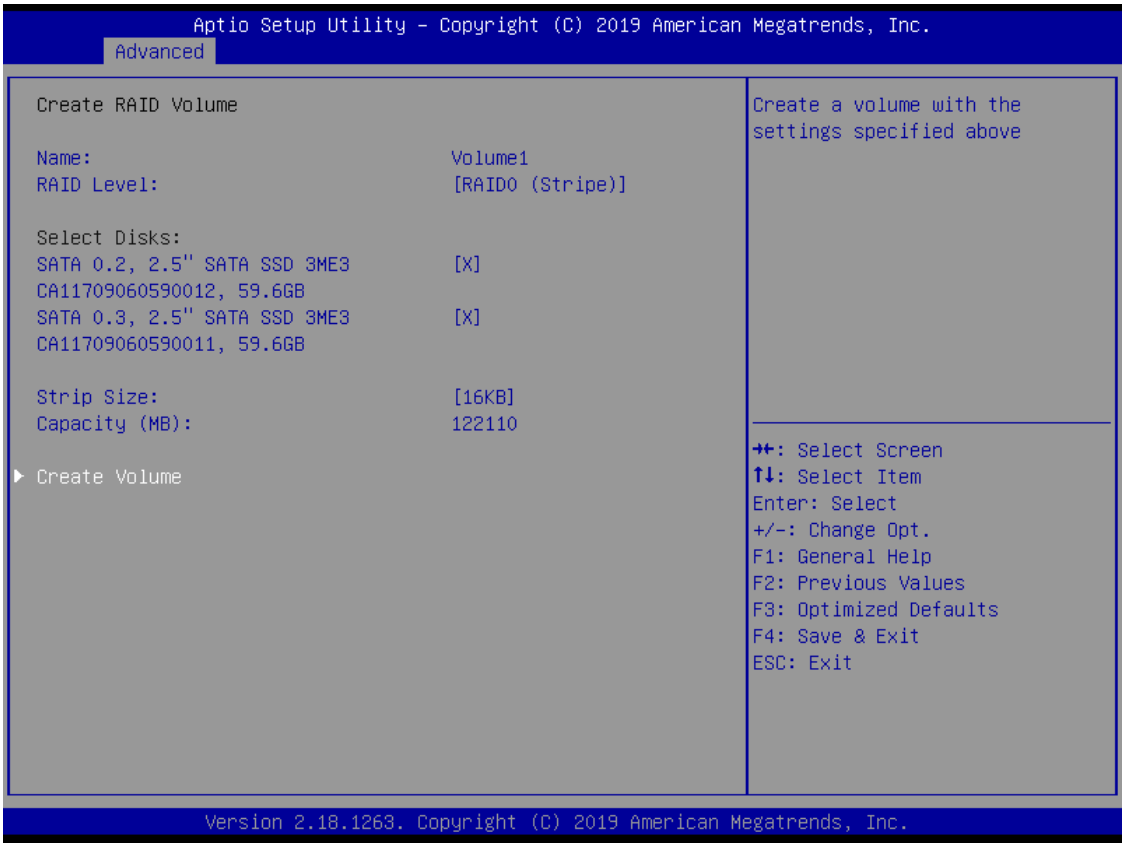
2. After reboot the system, please into BIOS utility and then will see "Intel (R) Rapid Storage Technology"



3. Into Intel(R) Rapid Storage Technology, and start create RAID volume.

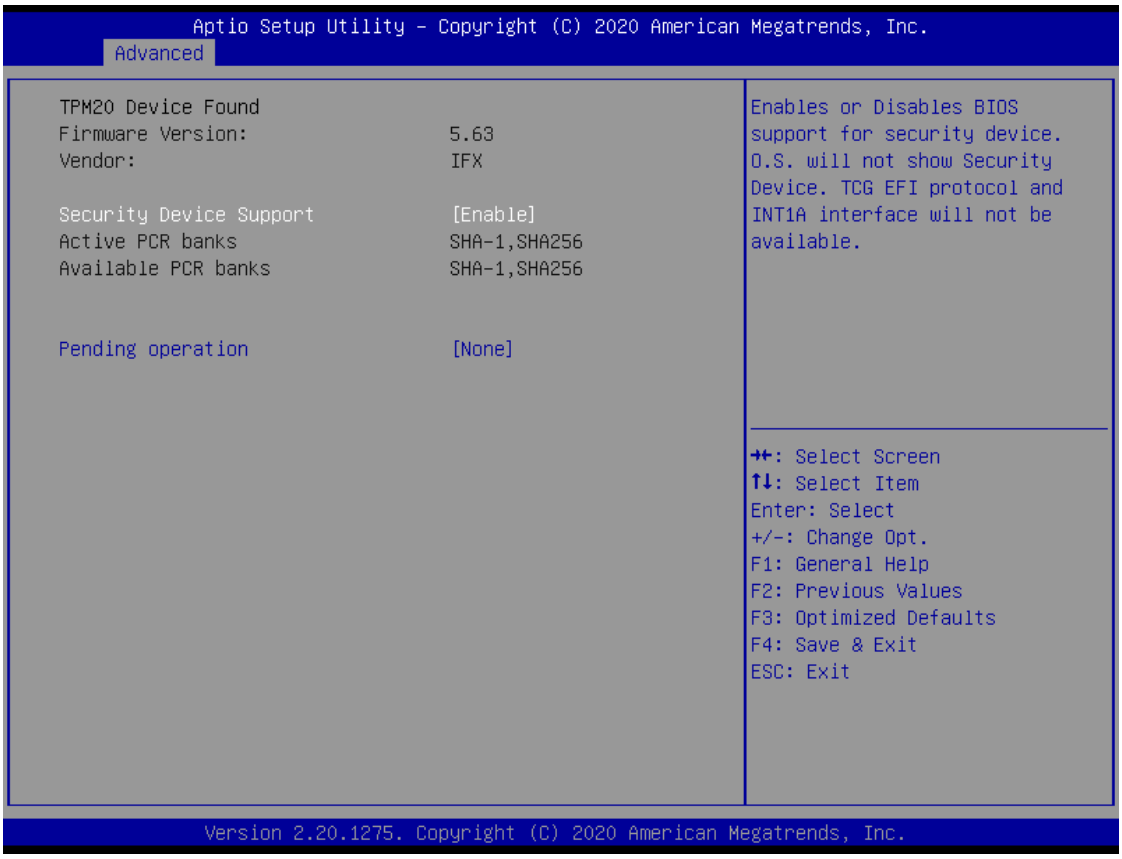


4. Start Create the RAID



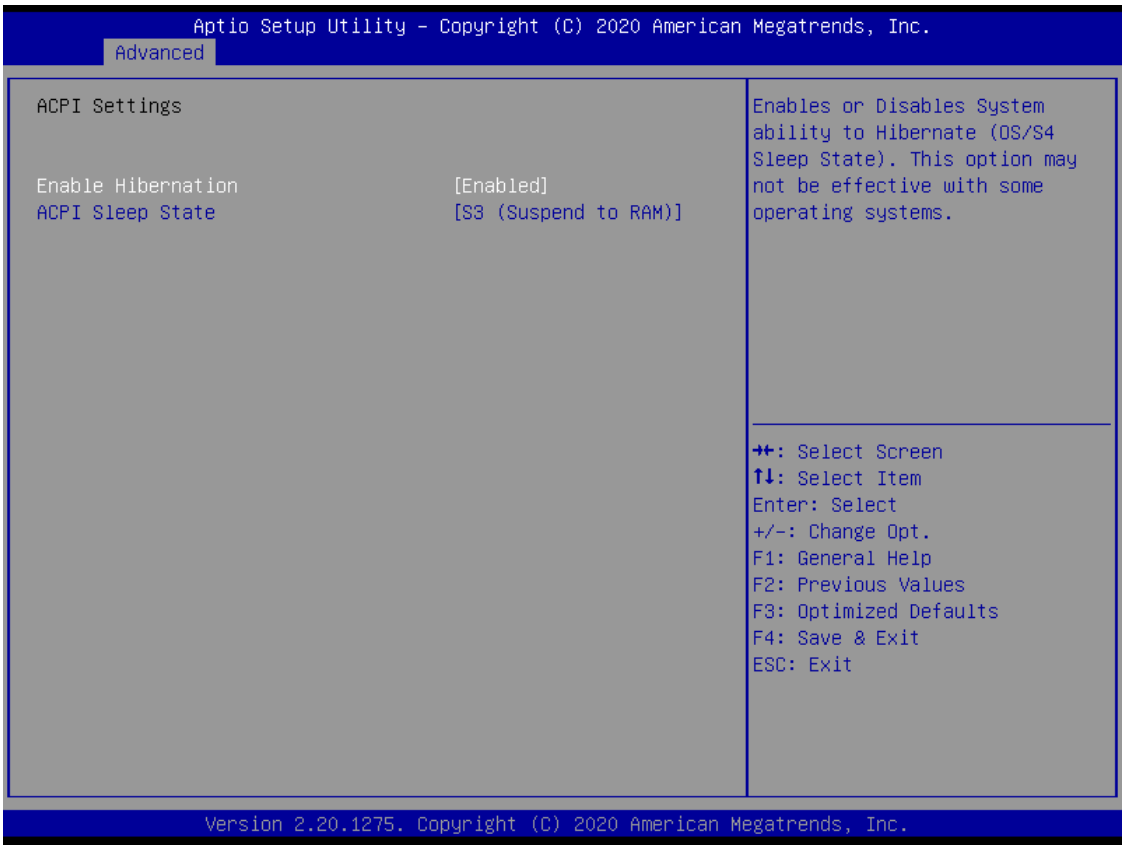
- Select Disk that you want to do the RAID
- Select [x]; No-Select [ ]

4.3.5 Trusted Computing



Item	Options	Description
Security Device Support	Enabled, Disabled**[Default]** ,	Enable/Disable BIOS support for security device. O.S. will not show Security Device.TCG EFI protocol and INT1A interface will not be available.
Pending operation	None**[Default]** , TPM Clear	Schedule an Operation for the Security Device. NOTE: Your Computer will reboot during restart in order to change State of Security Device.

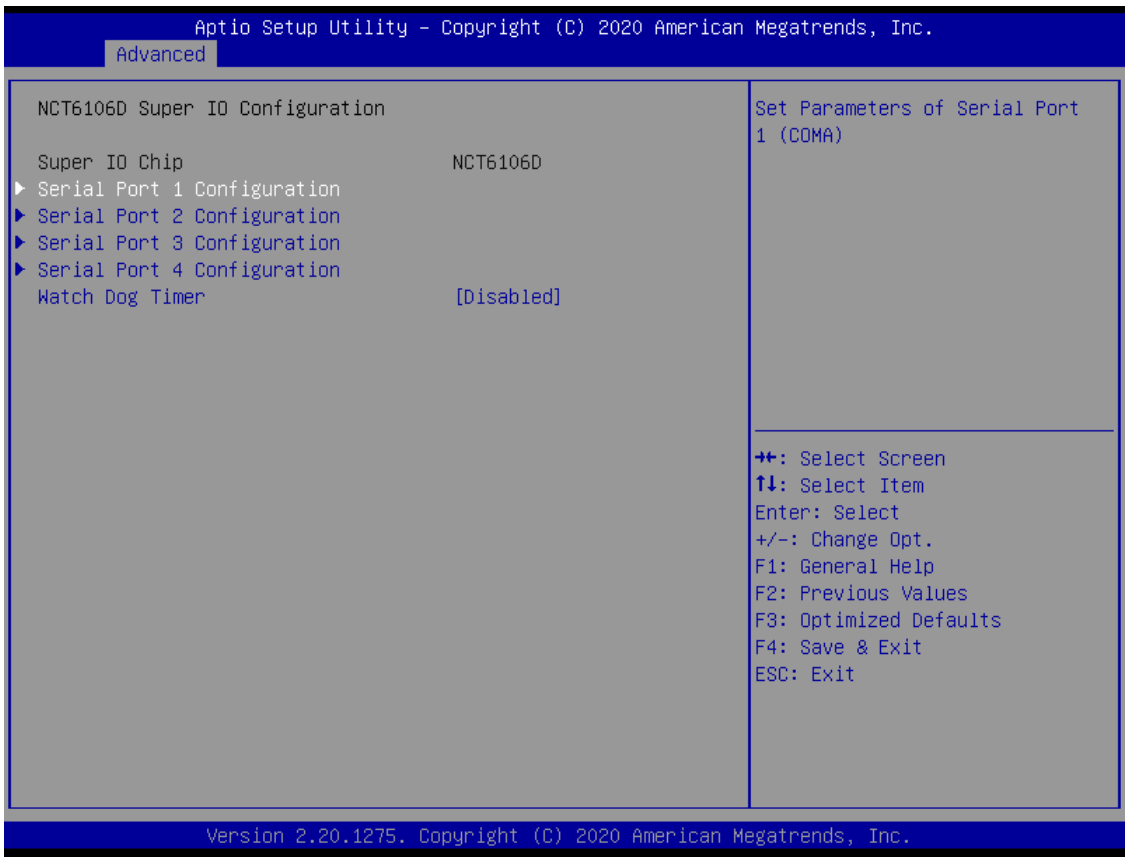
4.3.6 ACPI Settings



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 operating systems.
ACPI Sleep State	Suspend Disabled, S3 (Suspend to RAM)**[Default]**	Select the highest ACPI sleep state the system will enter when the SUSPEDN button is pressed.

4.3.7 Super IO Configuration

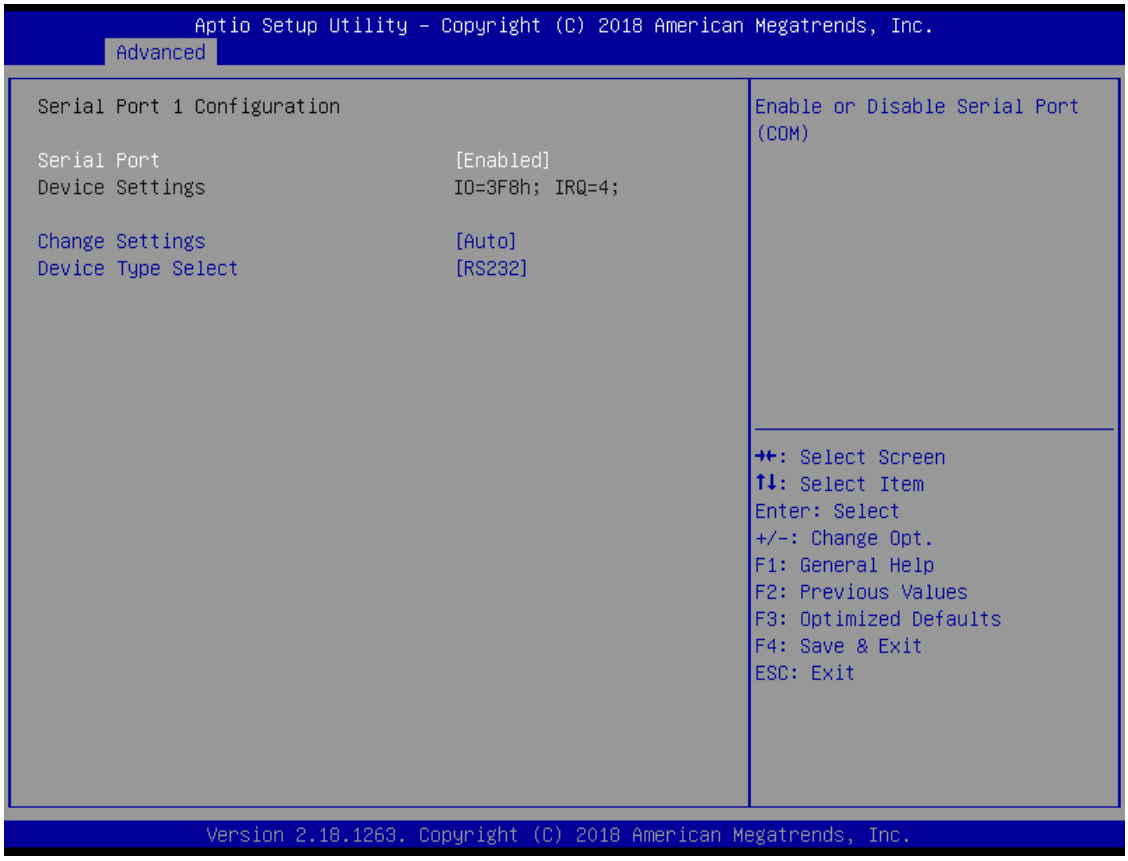
This setting allows you to select options for the Super IO Configuration, and change the value of the selected option.



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 3 (COMD).

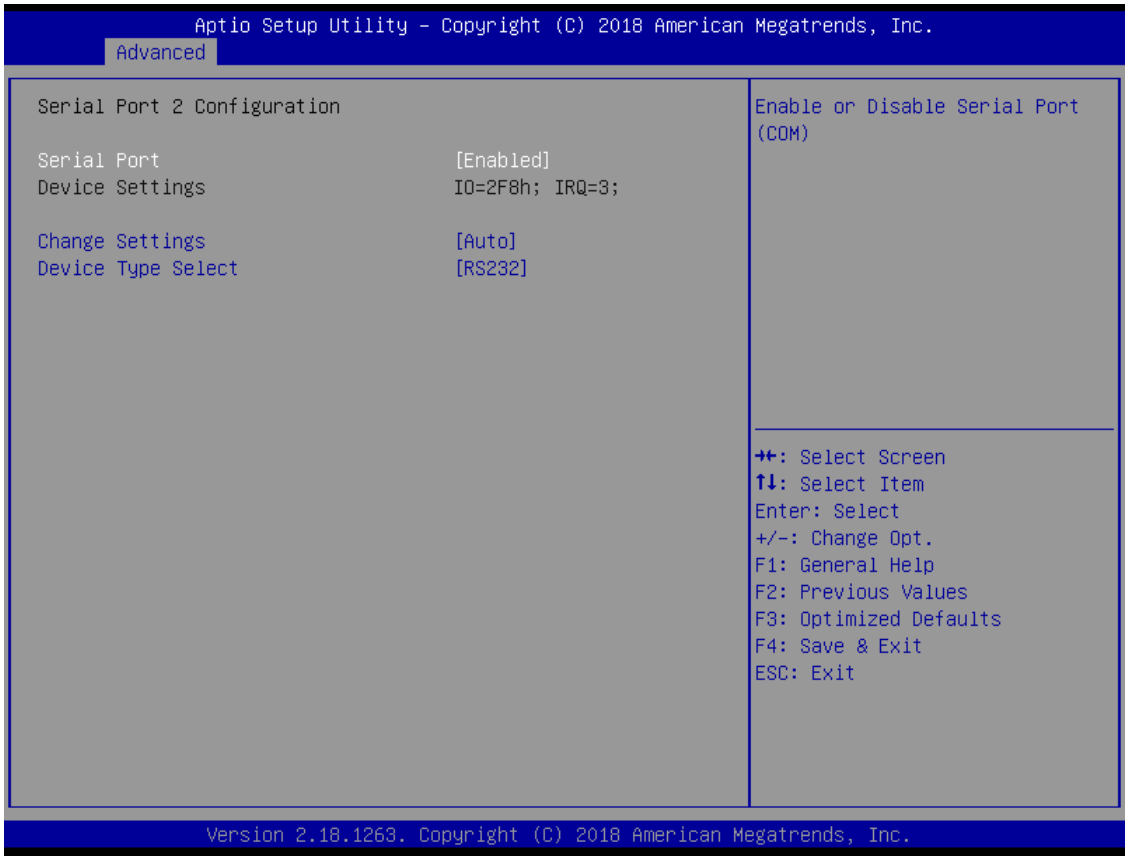
Item	Options	Description
Watch Dog Timer	Disabled **[Default],** Enabled	Enabled or Disabled Watch Dog Timer function.
Watch Dog Timer Count Mode	Second Mode**[Default]**, Minute Mode	Select Second Mode or Minute Mode.
Watch Dog Timer Time out Value	20~255(Second)**[Default],** 1~255(Minute)	Watch Dog Timer Time out Value.

Serial Port 1 Configuration



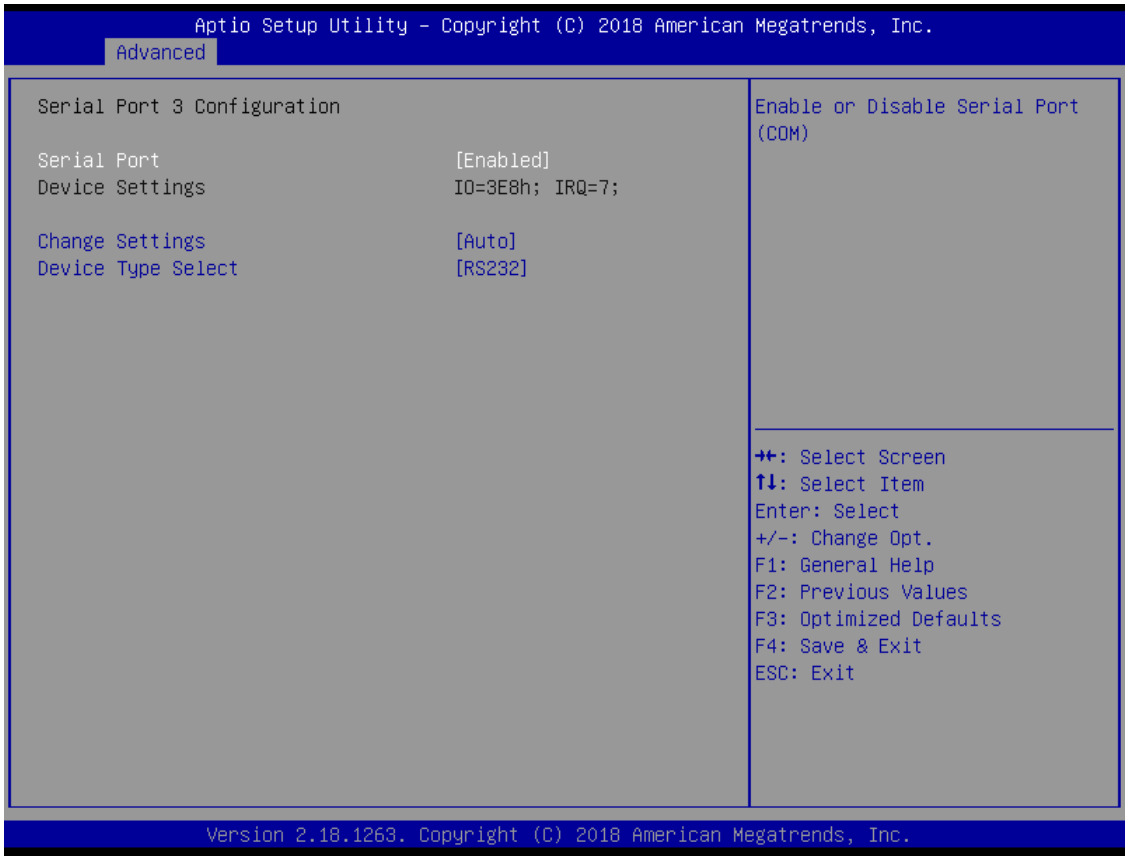
Item	Options	Description
Serial Port	Disabled, Enabled**[Default]**	Enable or Disable Serial Port (COM).
Change Settings	Auto**[Default]**, IO=3F8h; IRQ=4; , IO=3F8h; IRQ=3,4,5,6,7,9,10,11,12; , IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12;, IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12;, IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12;	This item allows you to change the address & IRQ settings of the specified serial port.
Device Type Select	UART 232**[Default],** UART 422, UART 485	Set the Serial Port to RS232 & RS422 & RS485

Serial Port 2 Configuration



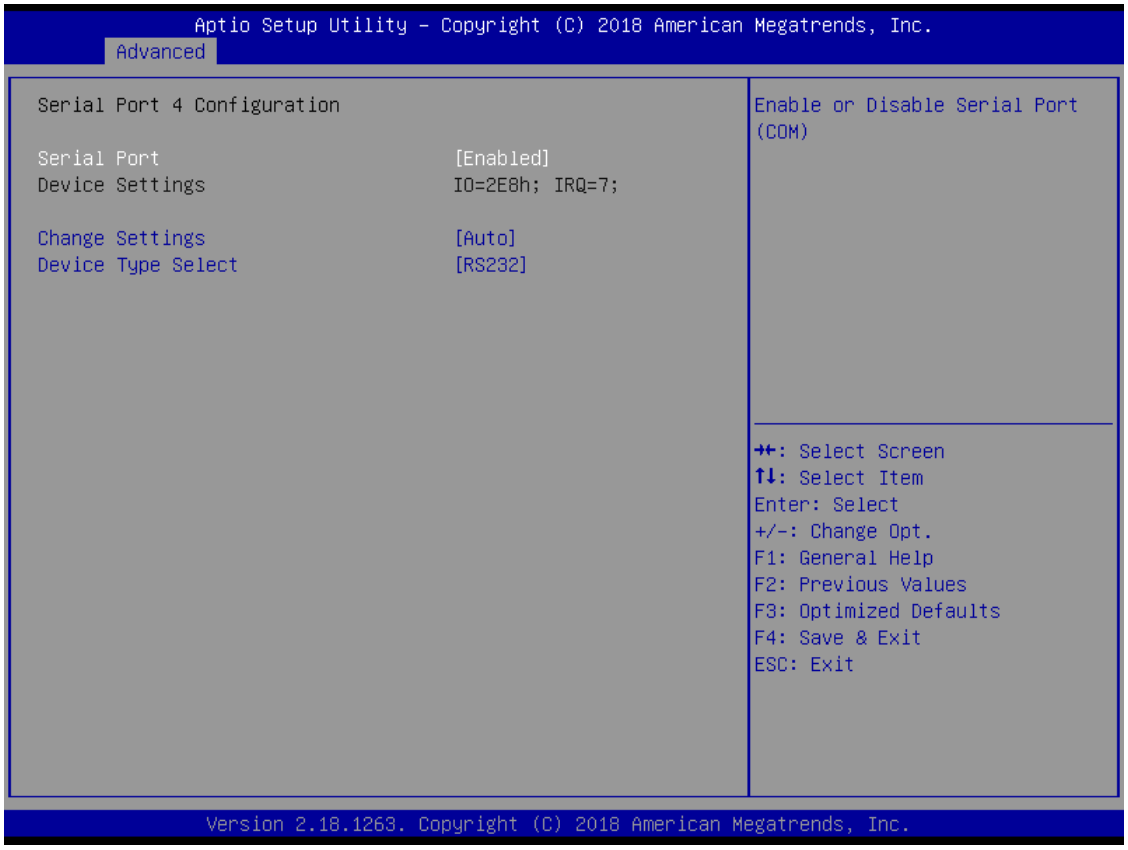
Item	Options	Description
Serial Port	Disabled, Enabled**[Default]**	Enable or Disable Serial Port (COM).
Change Settings	Auto**[Default]**, IO=2F8h; IRQ=3; , IO=3F8h; IRQ=3,4,5,6,7,9,10,11,12; , IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12;, IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12;, IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12;	This item allows you to change the address & IRQ settings of the specified serial port.
Device Type Select	UART 232**[Default],** UART 422, UART 485	Set the Serial Port to RS232 & RS422 & RS485

Serial Port 3 Configuration



Item	Options	Description
Serial Port	Disabled, Enabled**[Default]**	Enable or Disable Serial Port (COM).
Change Settings	Auto**[Default]**, IO=3E8h; IRQ=7; , IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12; , IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12;, IO=2F0h; IRQ=3,4,5,6,7,9,10,11,12;, IO=2E0h; IRQ=3,4,5,6,7,9,10,11,12;	This item allows you to change the address & IRQ settings of the specified serial port.
Device Type Select	UART 232**[Default],** UART 422, UART 485	Set the Serial Port to RS232 & RS422 & RS485

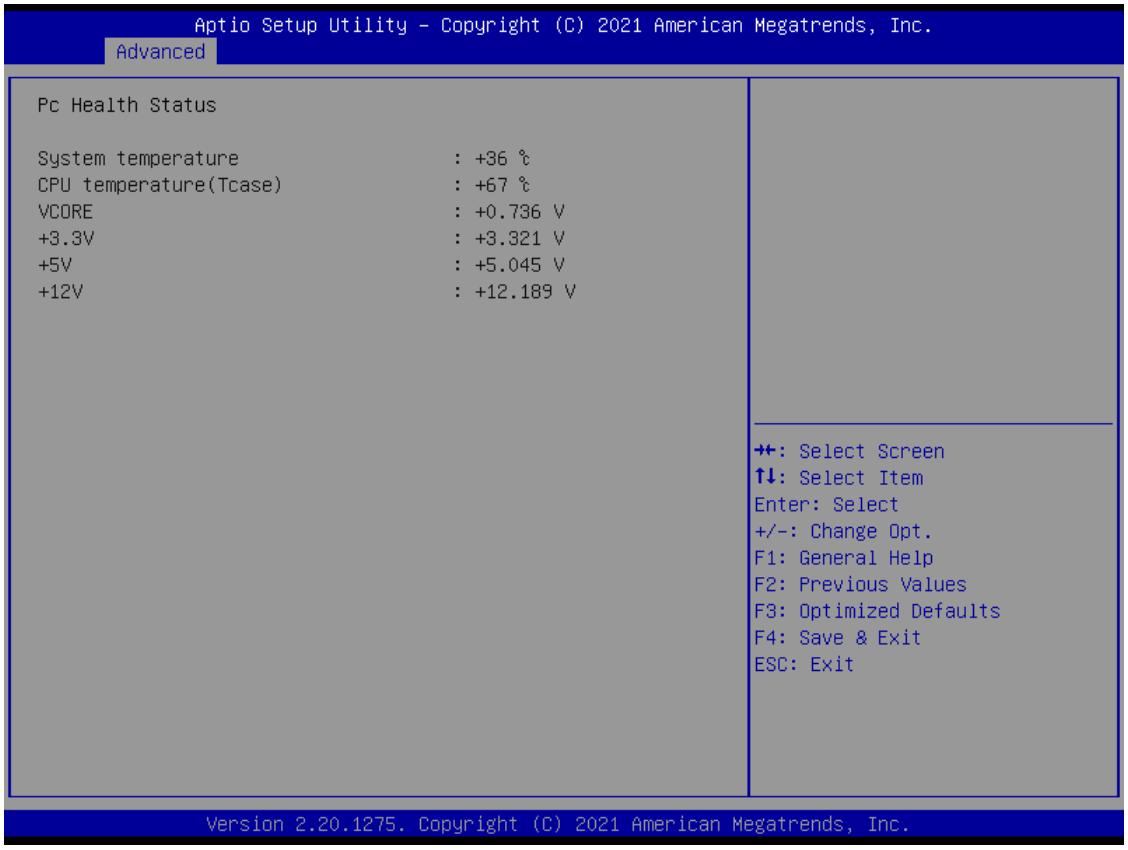
Serial Port 4 Configuration



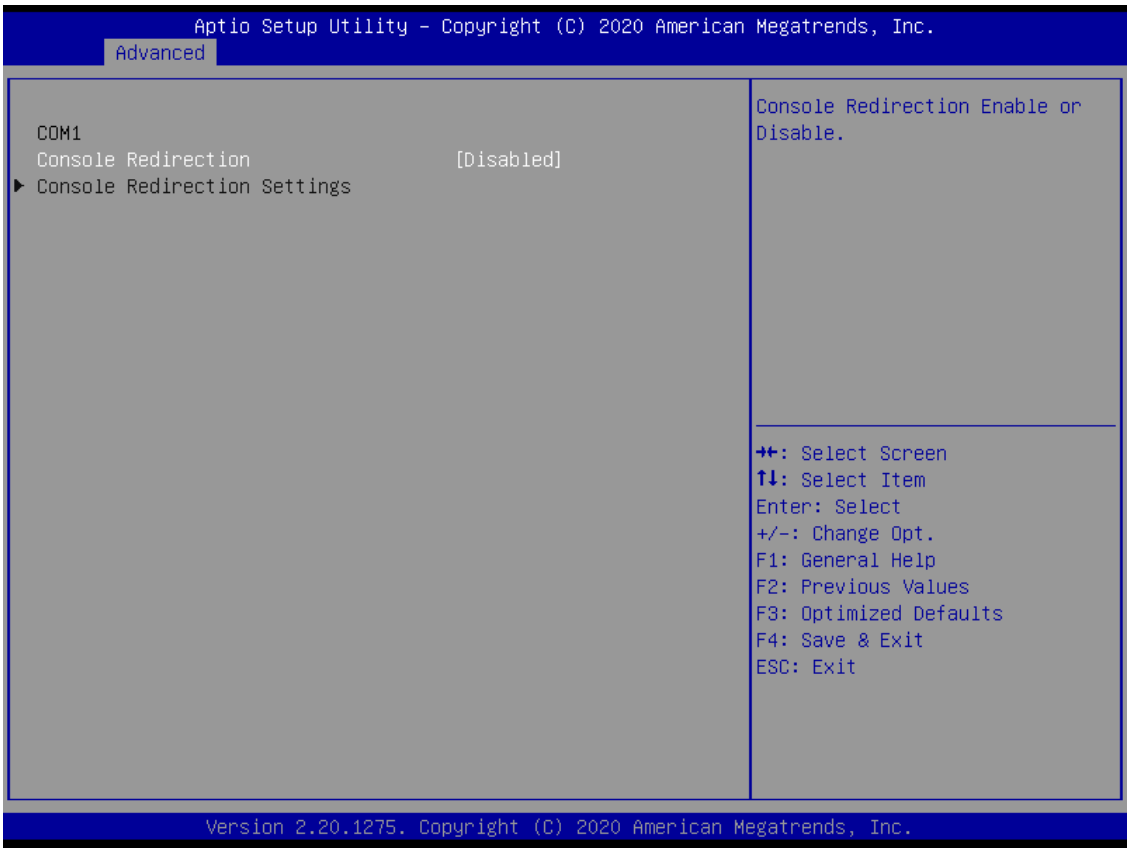
Item	Options	Description
Serial Port	Disabled, Enabled**[Default]**	Enable or Disable Serial Port (COM).
Change Settings	Auto**[Default]**, IO=2E8h; IRQ=7; , IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12; , IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12;, IO=2F0h; IRQ=3,4,5,6,7,9,10,11,12;, IO=2E0h; IRQ=3,4,5,6,7,9,10,11,12;	This item allows you to change the address & IRQ settings of the specified serial port.
Device Type Select	UART 232**[Default],** UART 422, UART 485	Set the Serial Port to RS232 & RS422 & RS485

4.3.8 Hardware Monitor

These items display the current status of all monitored hardware devices/ components such as voltages and temperatures.

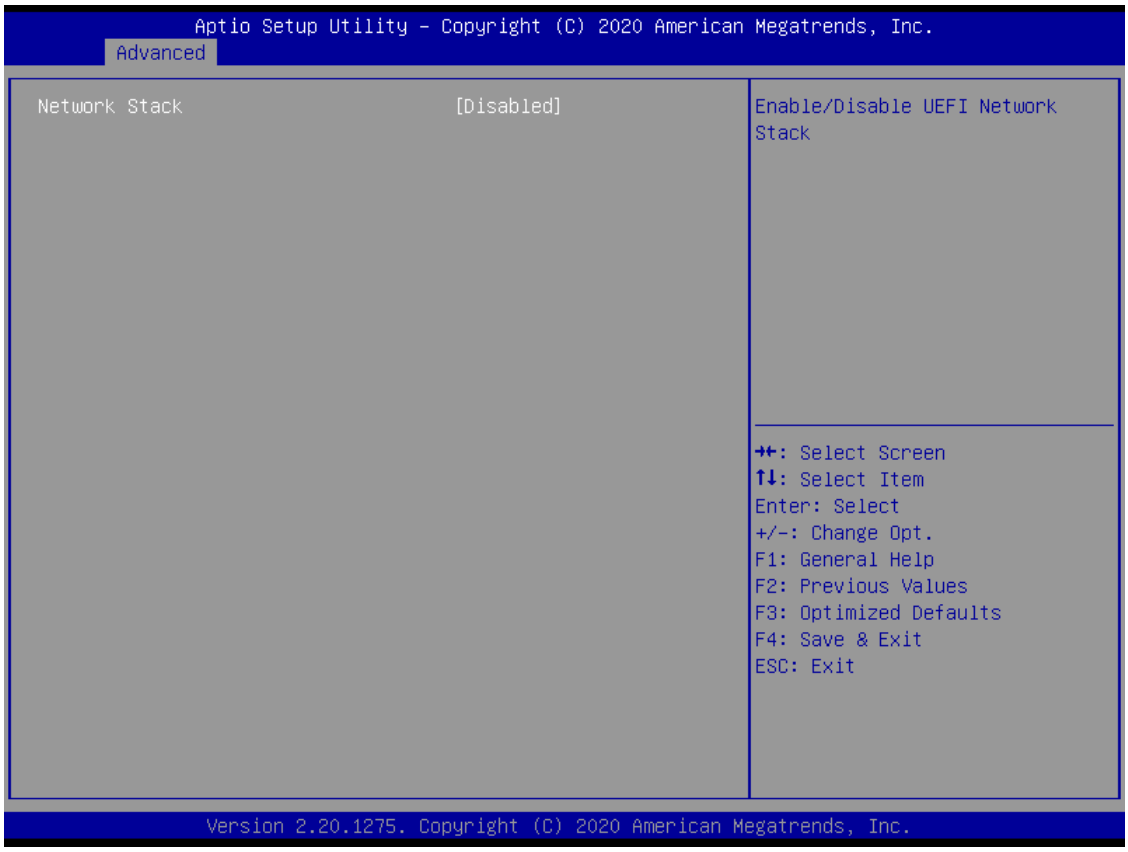


4.3.9 Serial Port Console Redirection



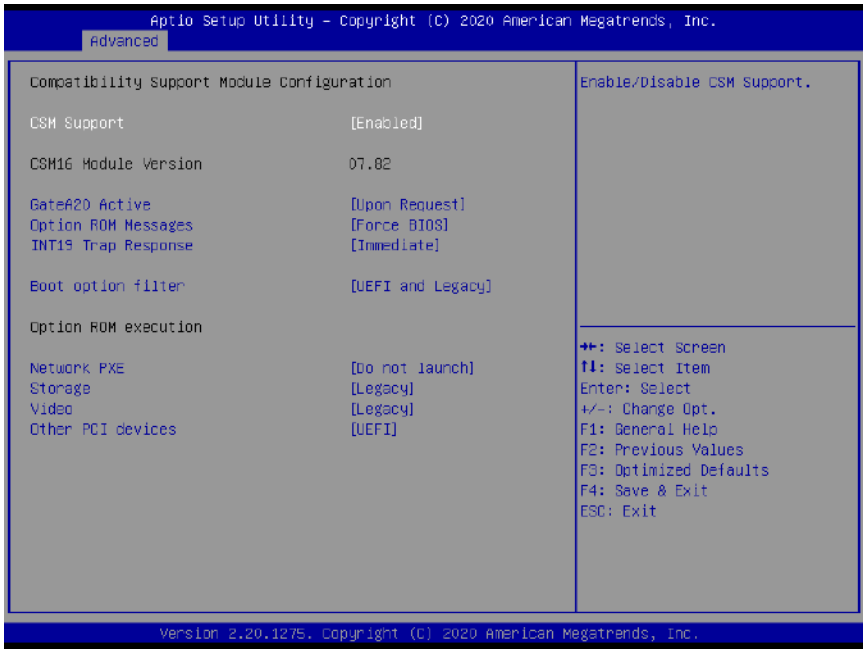
Item	Options	Description
Console Redirection	Disabled**[Default],** Enabled	These items allows you to enable or disable COM1 console redirection

4.3.10 Network Stack Configuration



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

4.3.11 CSM Configuration



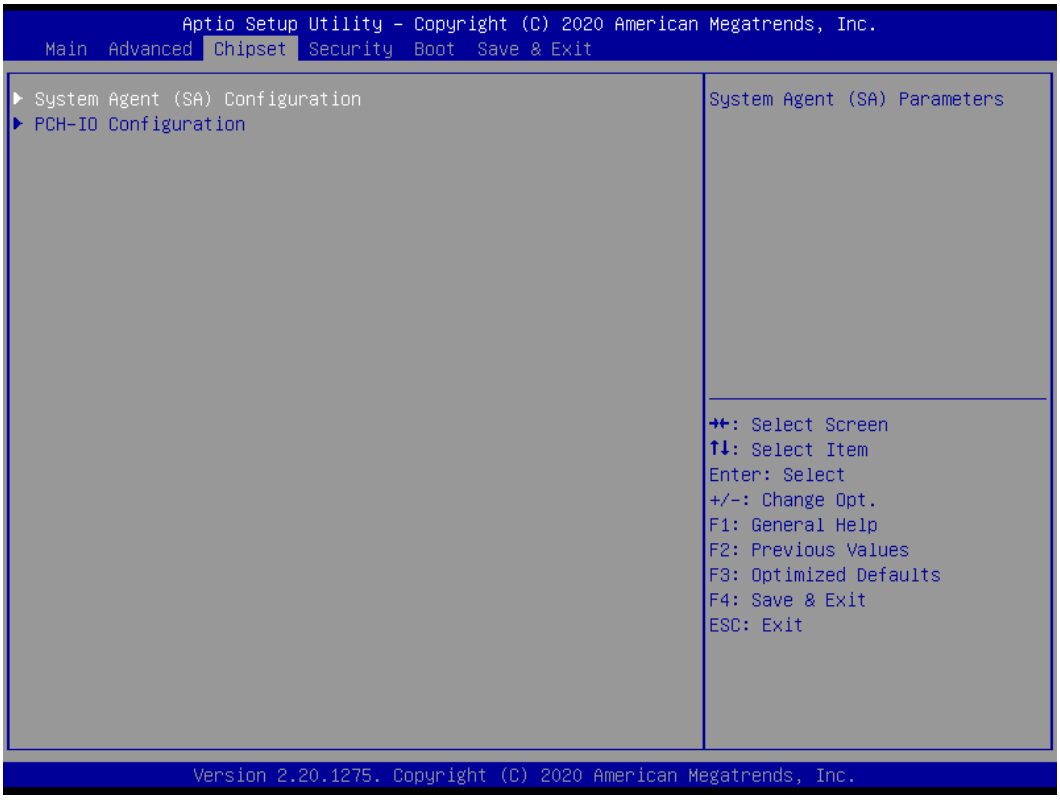
Item	Options	Description
CSM Support	Disabled, Enabled**[Default]**	This item allows users to enable or disable for "CSM Support".
GateA20 Active	Upon Request**[Default] ,** Always	This item allows users to set Upon Request or Always for "GateA20 Active".
Option ROM Messages	Force BIOS**[Default] ,** Keep Current	This item allows users to set Force BIOS or Keep Current for "Option ROM Messages".
INT19 Trap Response	Immediate**[Default] ,** Immediate	This item allows users to set the BIOS reaction to INT19 trapping by Option ROM: "Immediate" - execute the trap right away; "postponed" - execute the trap during legacy boot.
Boot option filter	UEFI and Legacy**[Default] ,** Legacy only, UEFI only	This item allows users to select which type of operating system to boot by option. This item is configurable only when CSM Support is set to Enabled.
Network PXE	Do not launch**[Default]** , UEFI, Legacy	Controls the execution of UEFI and Legacy Video OpROM.
Storage	Do not launch, UEFI, Legacy**[Default]**	Controls the execution of UEFI and Legacy Storage OpROM.
Video	Do not launch, UEFI, Legacy**[Default]**	Controls the execution of UEFI and Legacy Video OpROM.
Other PCI devices	Do not launch, UEFI**[Default]** , Legacy	Determines OpROM execution policy for devices other than Network, Storage, or Video.

4.3.12 USB Configuration

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	Enabled**[Default]** Disabled	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.

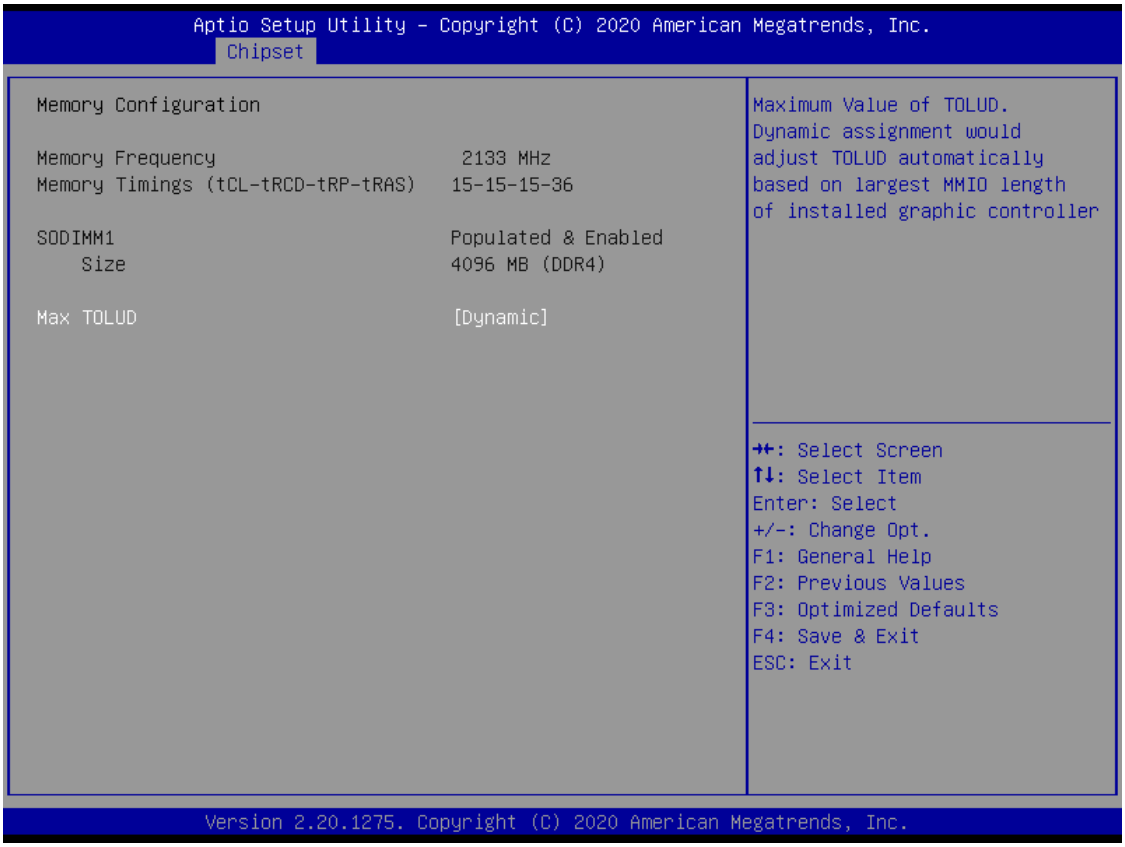
4.4 Chipset

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



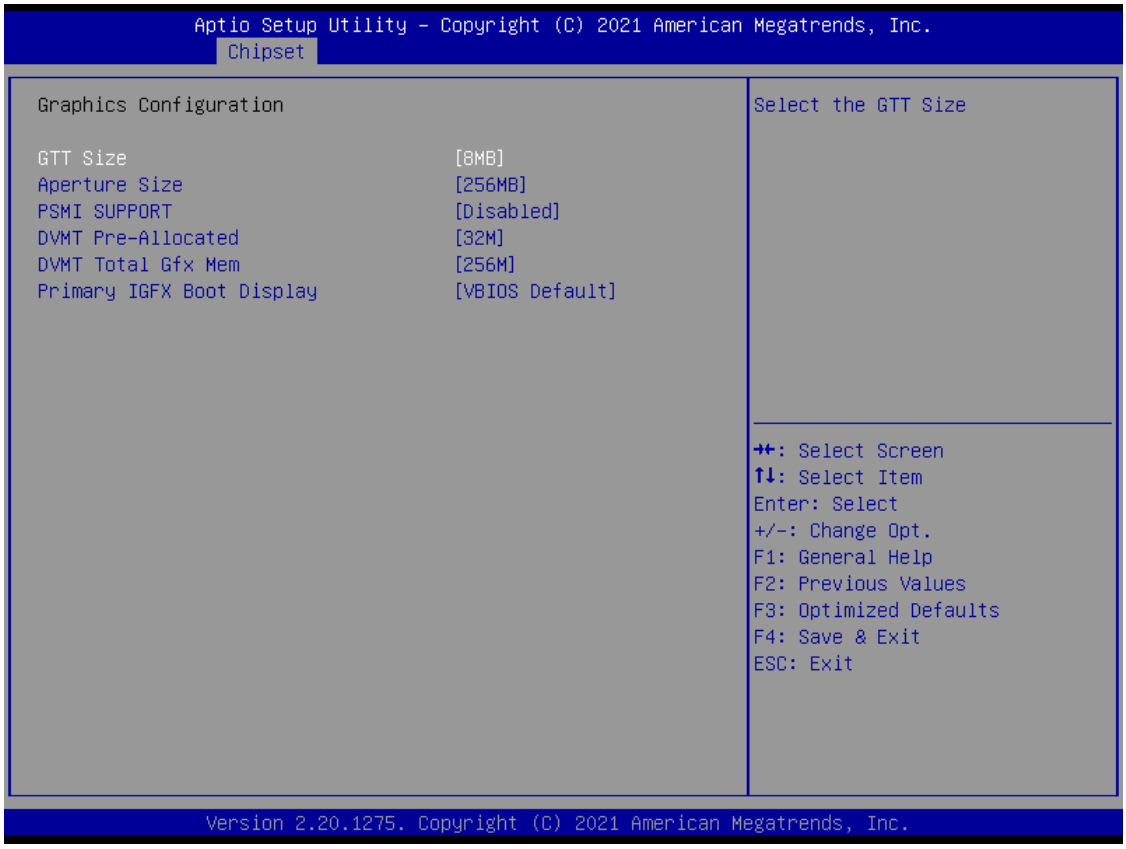
4.4.1 System Agent (SA) Configuration

Memory Configuration



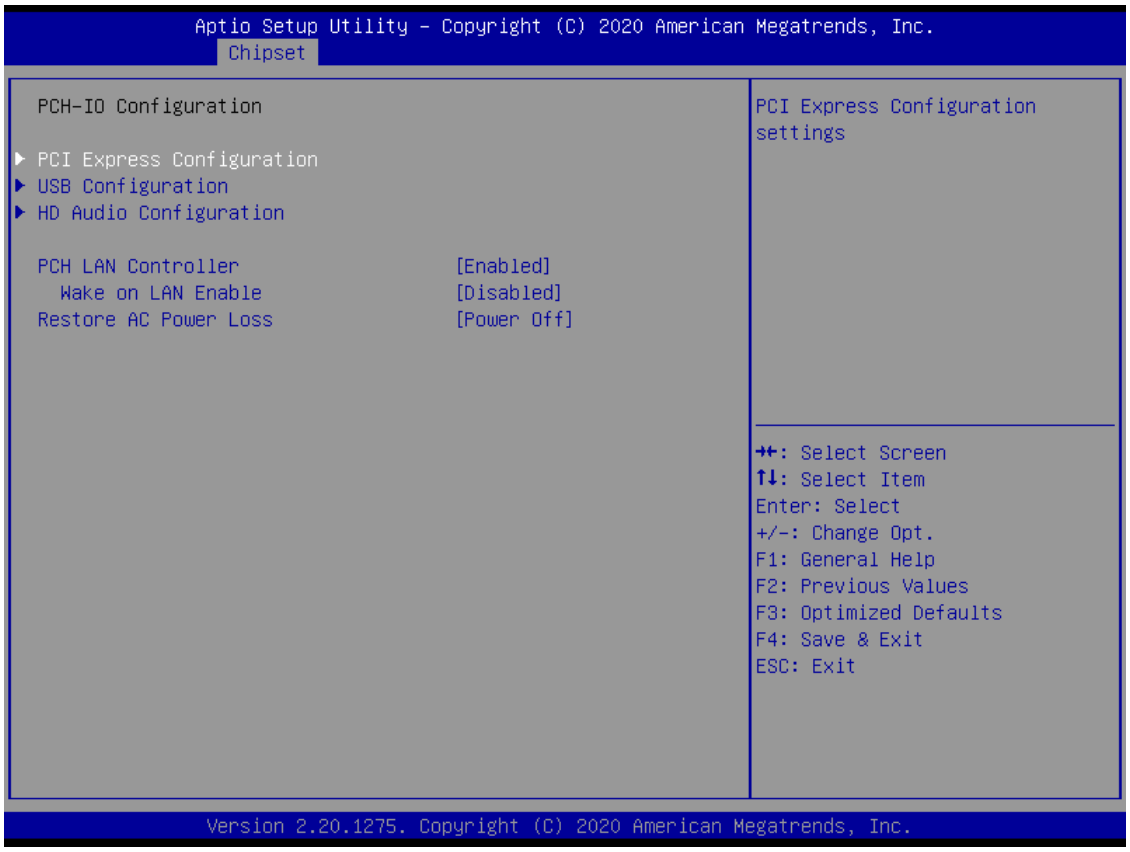
Item	Options	Description
Max TOLUD	Dynamic**[Default],** 1GB, 1.25GB, 1.5 GB, 1.75 GB, 2 GB, 2.25 GB, 2.5 GB, 2.75 GB, 3 GB, 3.25 GB, 3.5 GB	Maximum Value of TOLUD. Dynamic assignment would adjust TOLUD automatically based on largest MMIO length of installed graphic controller

Graphic Configuration



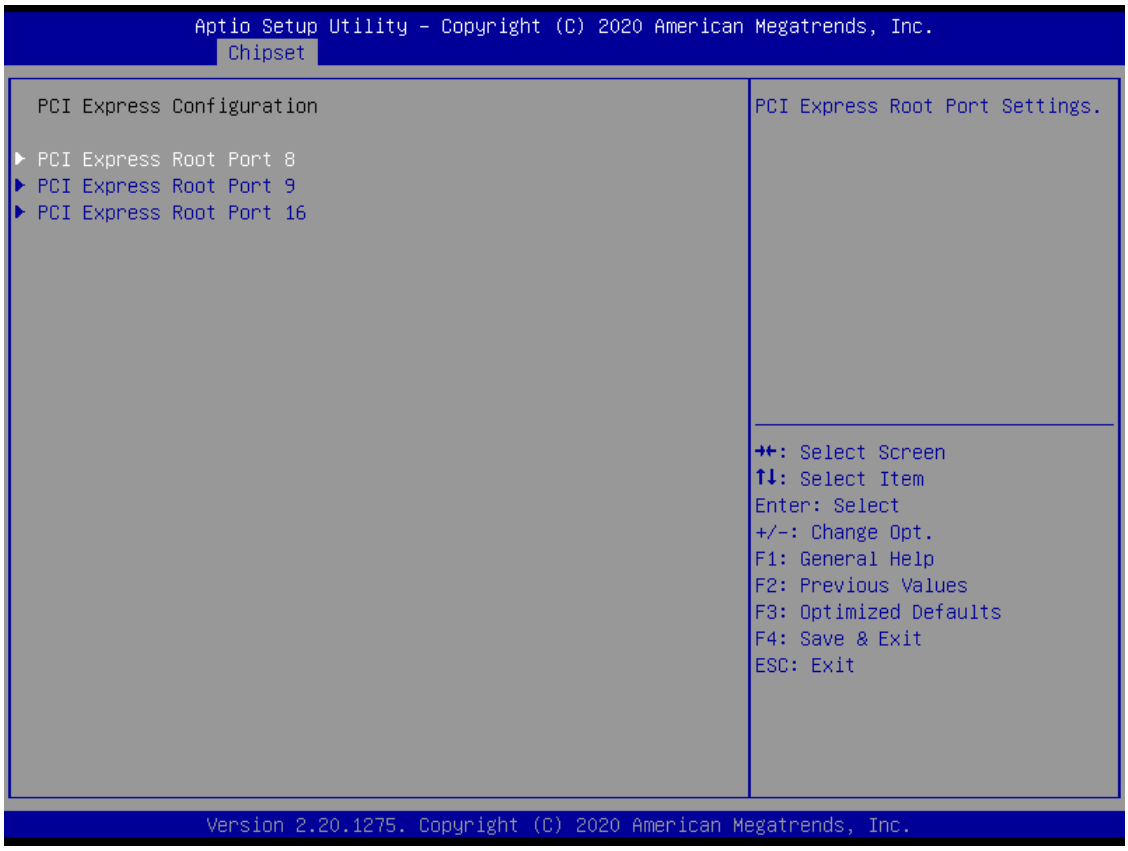
Item	Options	Description
GTT Size	2MB, 4MB, 8MB**[Default]**	Select the GTT Size .
Aperture Size	128MB, 256MB**[Default] ,** 512MB, 1024MB, 2048MB	Select the Aperture Size. Note : Above 4GB MMIO BIOS assignment is automatically enabled when selecting 2048MB aperture. To use this feature, please disable CSM Support.
PSMI SUPPORT	Disabled **[Default] ,** Enabled	PSMI Enable/Disable.
DVMT Pre-Allocated	32M **[Default] ,** 64M,4M,8M, 12M,16M, 20M, 24M, 28M,32M/F7, 36M, 40M,44M, 48M,52M,56M,60M	Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.
DVMT Total Gfx Mem	128M, 256M**[Default] ,** MAX	Select DVMT5.0 Total Graphic Memory size used by the Internal Graphics Device.
Primary IGFX Boot Display	VBIOS Default**[Default] ,** DP, LCD, HDMI	Select the Video Device which will be activated during POST. This has no effect if external graphics present. Secondary boot display selection will appear based on your selection.VGA modes will be supported only on primary display

4.4.2 PCH-IO Configuration

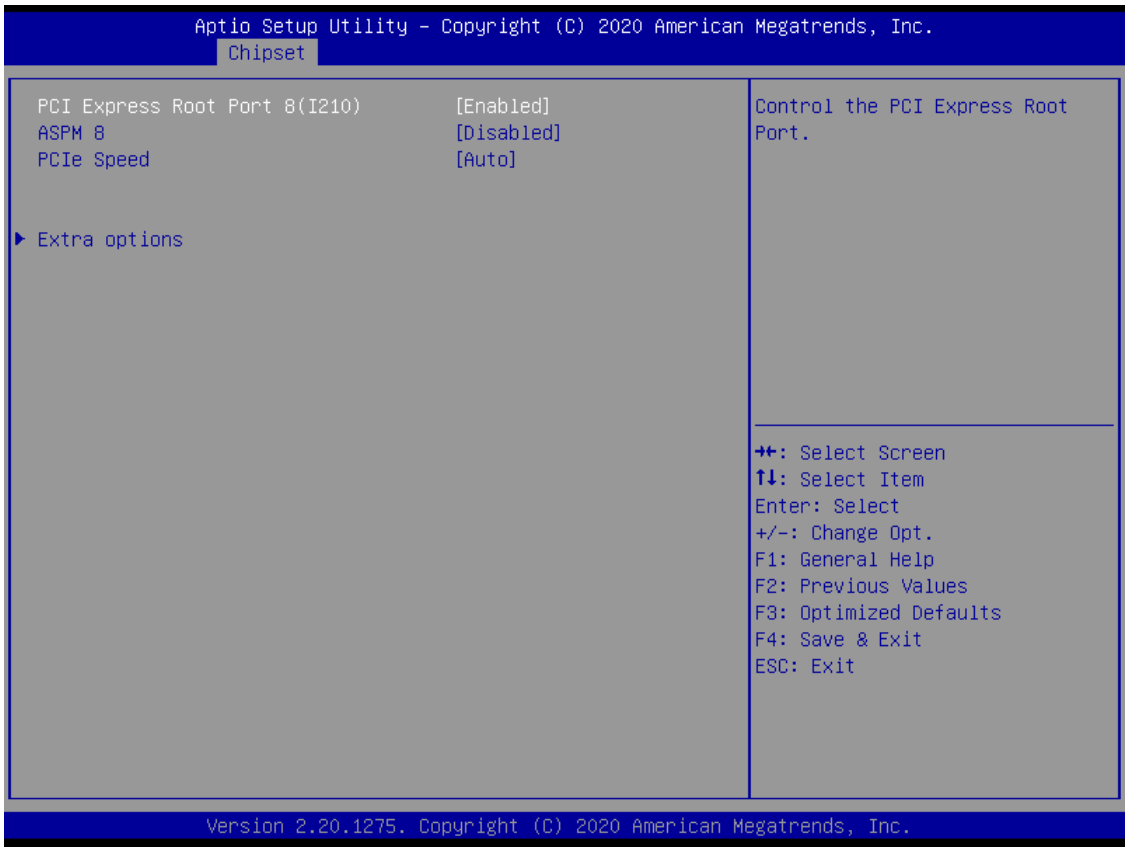


Item	Options	Description
PCH LAN Controller	Enabled **[Default] ,** Disabled	Enable/Disable onboard NIC.
Wake on LAN Enable	Enabled**,** Disabled **[Default]**	Enable/Disable integrated LAN to wake the system.
Restore AC Power Loss	Power On, Power Off **[Default] ,** Lase State	Specify what state to go to when power is re-applied after a power failure (G3 state).

PCI Express Configuration

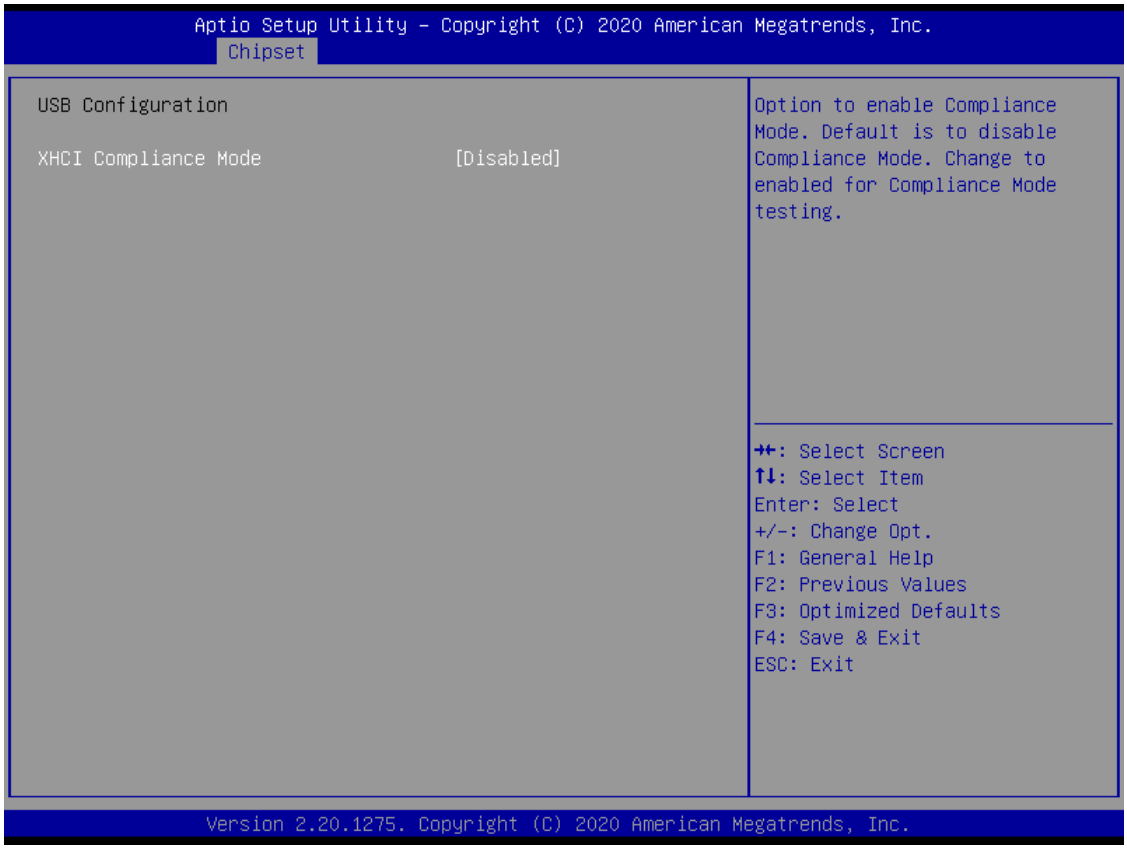


- **PCI Express Root Port 8 / 9 / 16**



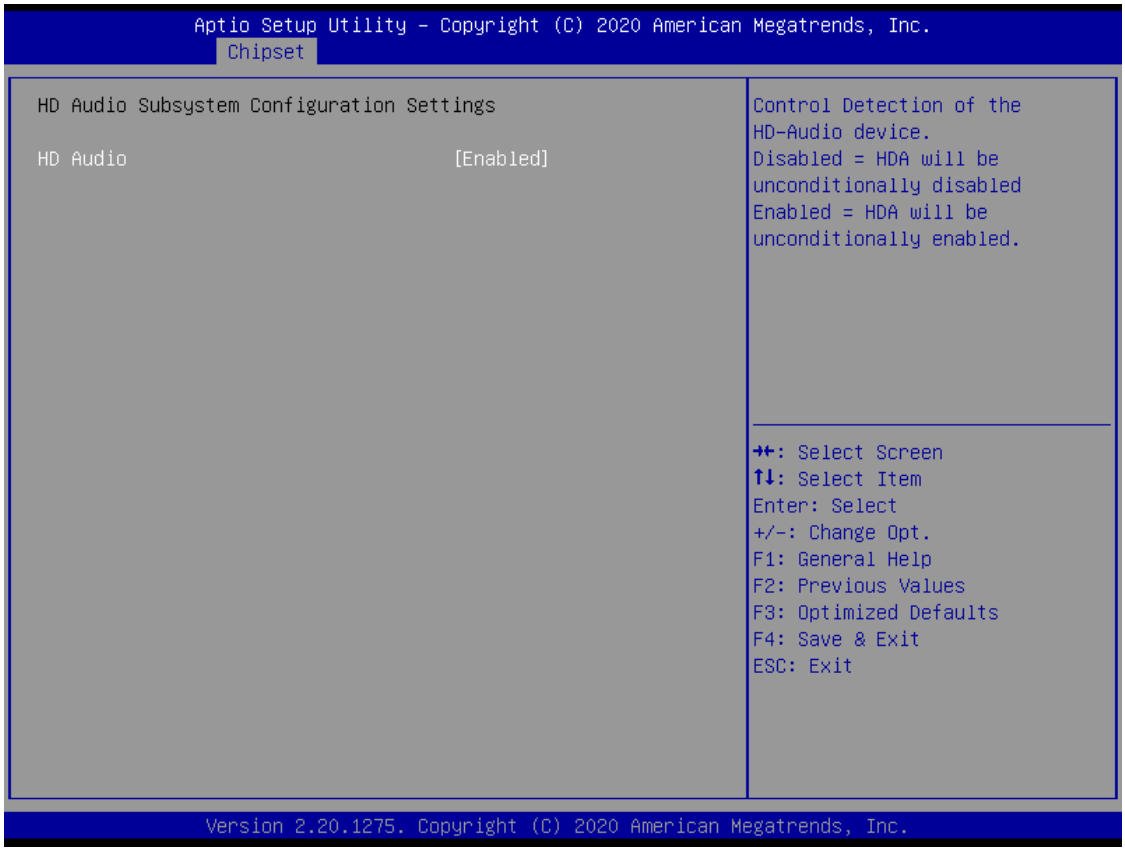
Item	Options	Description
PCI Express Root Port 8 / 9 /16	Disabled **[Default] ,** Enabled	Control the PCI Express Root Port.
ASPM	Disabled **[Default] ,** L0s, L1, L0sL1, Auto	Set the ASPM Level: Force L0s - Force all links to L0s State, AUTO - BIOS auto configure, DISABLE - Disables ASPM,
PCIe Speed	Auto**[Default]** , Gen1**,** Gen2, Gen3	Configure PCIe speed.
Detect Non-Compliance Device	Disabled **[Default] ,** Enabled	Detect Non-Compliance PCI Express Device. If enable, it will take more time at POST time.

USB Configuration



Item	Options	Description
XHCI Disable Compliance mode	Disabled **[Default] ,** Enabled	Option to enable Compliance Mode. Default is to disable Compliance Mode. Change to enabled for Compliance Mode testing.

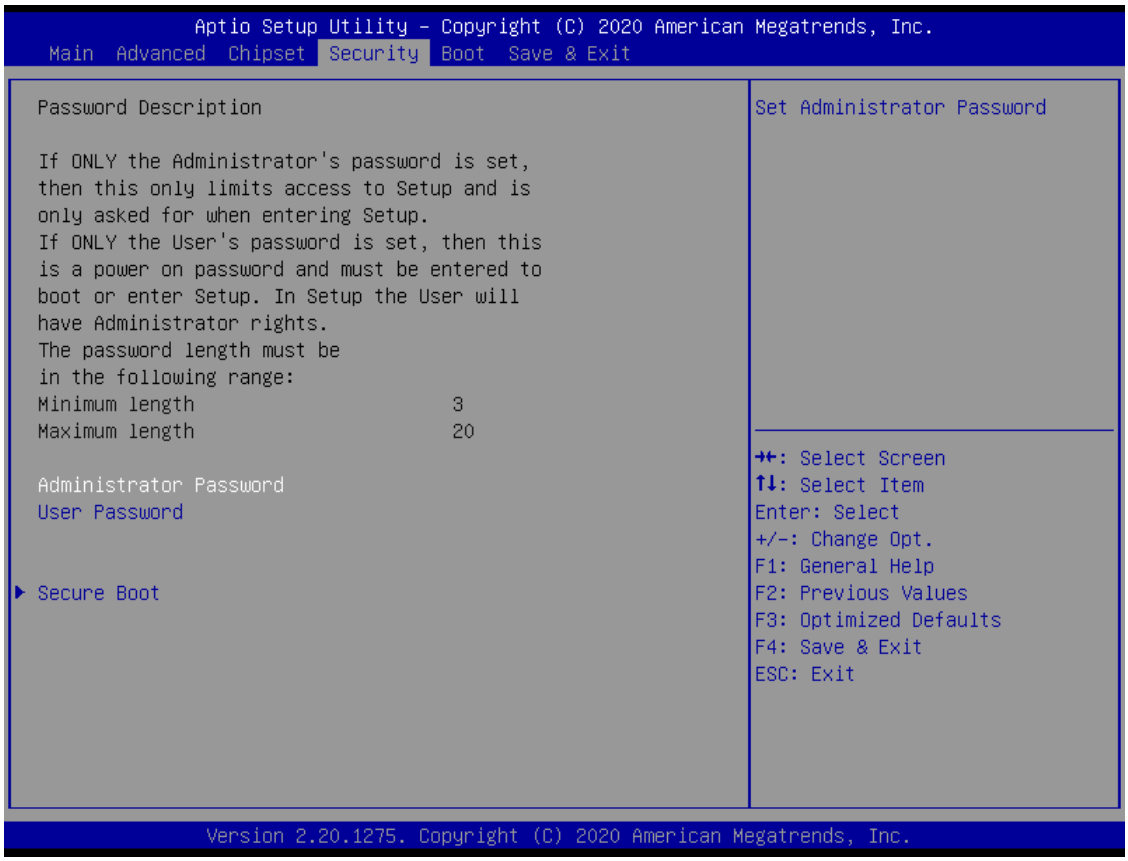
HD Audio Configuration



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

4.5 Security

Security menu allow users to change administrator password and user password settings.



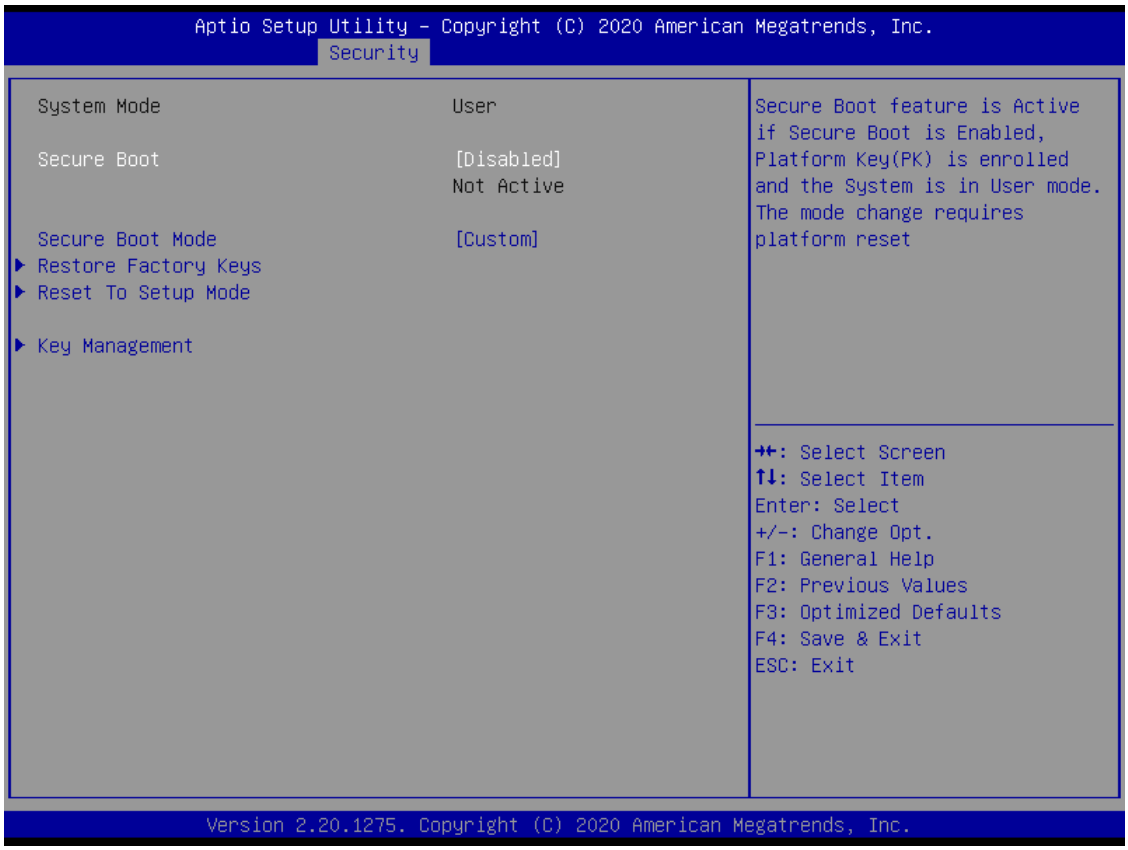
■ Administrator Password

This item allows you to set Administrator Password.

■ User Password

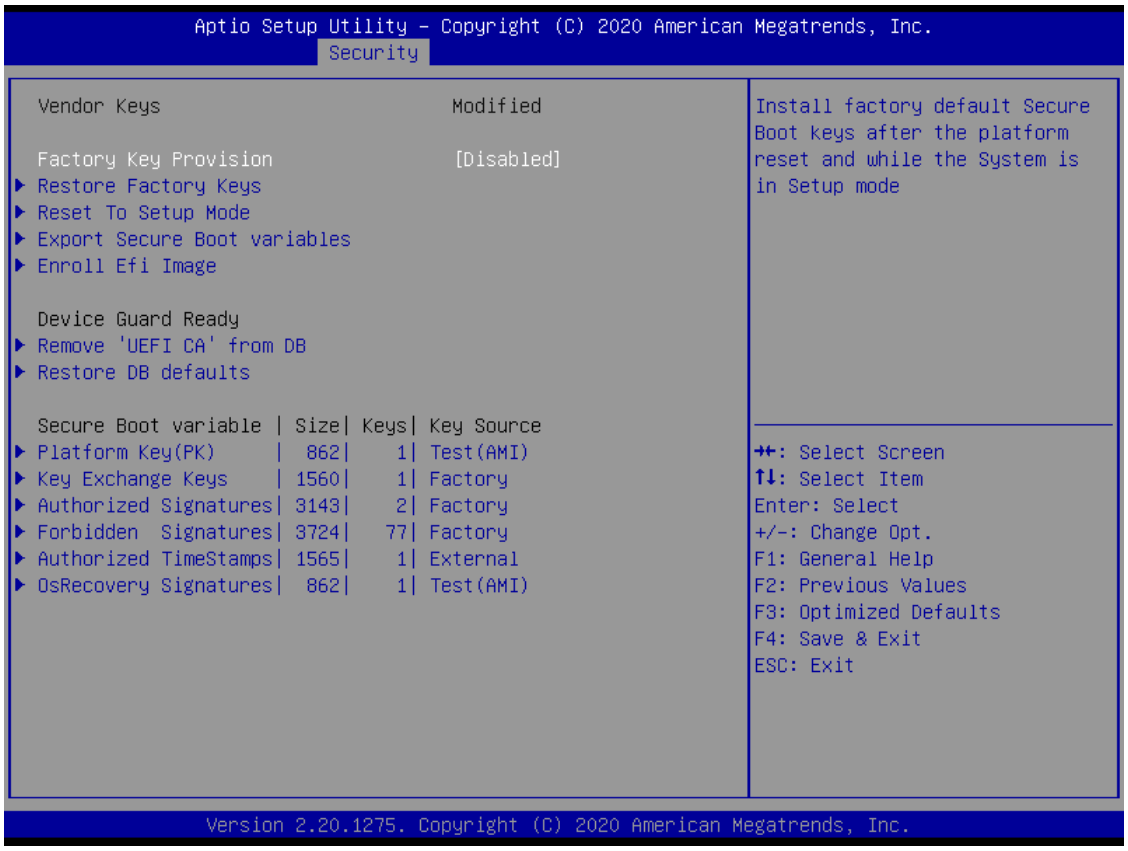
This item allows you to set User Password.

Security Boot



Item	Options	Description
Secure Boot	Disabled **[Default] ,** Enabled	Secure Boot feature is Active if Secure Boot is Enabled,Platform Key(PK) is enrolled and the System is in User mode. The mode change requires platform reset
Secure Boot Mode	Standard, Custom**[Default]**	Secure Boot mode options:Standard or Custom. In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full authentication

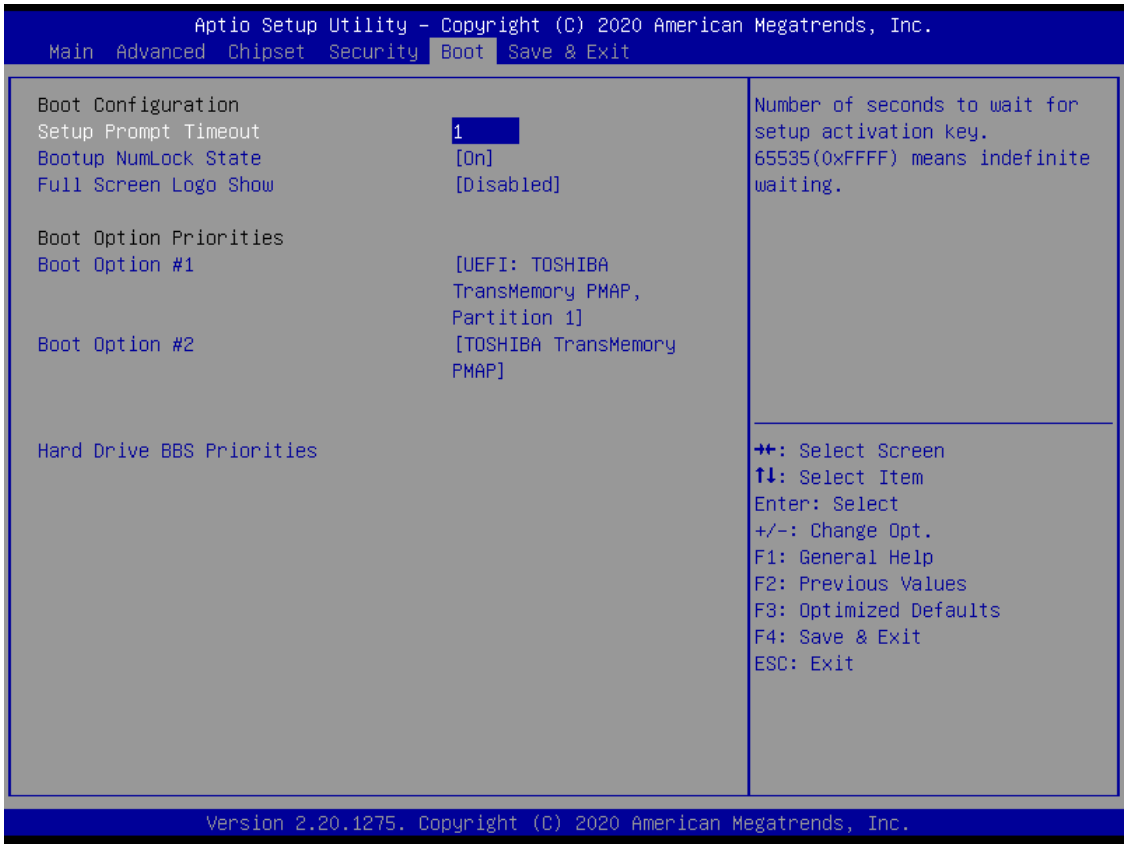
Key Management



Item	Options	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

4.6 Boot

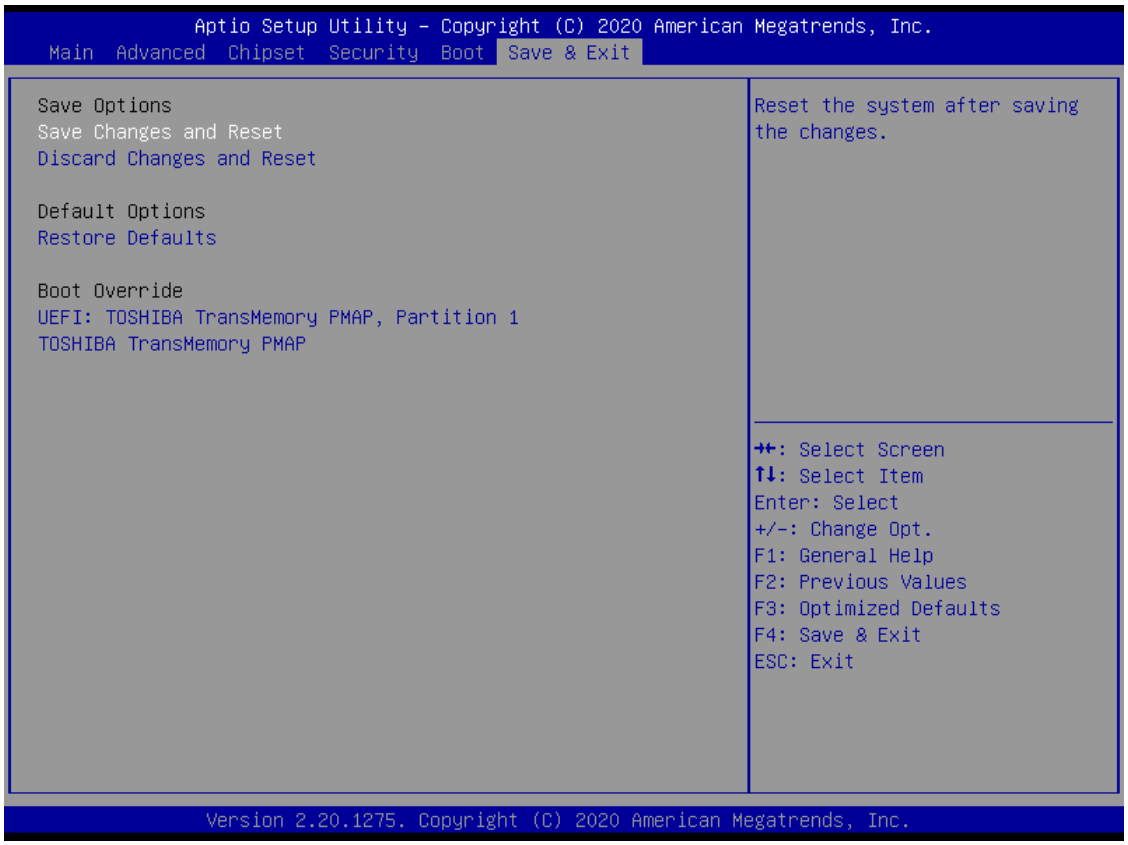
This menu allows you to setup the system boot options.



Item	Options	Description
Setup Prompt Timeout	1**[Default]**	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.
Full Screen Logo Show	Disabled**[Default]** , Enabled	Enables or disables Full Screen Logo Show option.
Boot Option #1		Set the system boot order.

4.7 Save & Exit

This setting allows users to configure the boot settings.



Save Changes and Reset

This item allows user to reset the system after saving the changes. This item allows user to reset the system after saving the changes.

Discard Changes and Reset

This item allows user to reset the system without saving any changes.

Restore Defaults

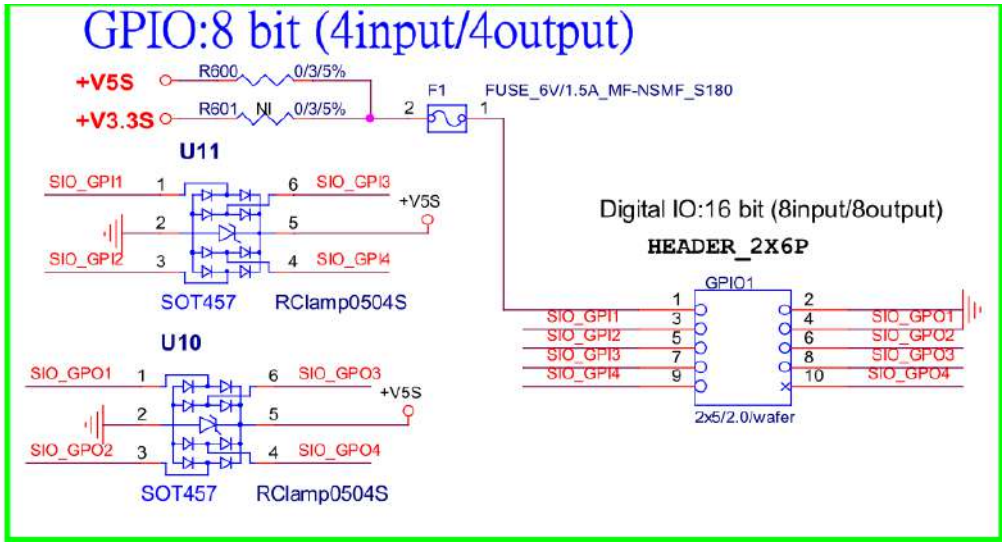
Use this item to restore /load default values for all the setup options.

Appendix

WDT & GPIO

This appendix provides the sample codes of WDT (Watch Dog Timer) and GPIO (General Purpose Input/ Output).

GPIO Sample Code



GPIO Setting

PIN#	GPIO#	Default Configuration
10	SIO_GPO4	DIO Output4
9	SIO_GPI	DIO Input4
8	SIO_GPO 3	DIO Output3
7	SIO_GPI 3	DIO Input3
6	SIO_GPO 2	DIO Output2
5	SIO_GPI 2	DIO Input2
4	SIO_GPO 1	DIO Output1
3	SIO_GPI1	DIO Input1
2	GND	GND
1	+5V	+5V

The GPIO function is provided by Nuvoton NCT6106D, and it can be accessed through its GPIO index/data port. To access the GPIO register, write index to the index port, and then read/write from/to data port. The configuration on the RCO-6000 is described as below.

Psuedo Code

```
#define AddrPort 0x2e
#define DataPort 0x2f
#define SIO_UnLock_Value        0x87
#define SIO_Lock_Value          0xaa
#define SIO_LDN_GPIO            0x07
#define GPIO_Port               0xF1


//Enter_Config
WriteByte (AddrPort, SIO_UnLock_Value);
WriteByte (AddrPort, SIO_UnLock_Value);

WriteByte (AddrPort, 0x07);
WriteByte (DataPort, SIO_LDN_GPIO);

//Set OUT1~OUT4Value
WriteByte (AddrPort, GPIO_Port);
WriteByte (DataPort, 0x00);          //set OUT1~OUT8 value, OUT1=Bit0, OUT2=Bit1
```

```
#define GPIO_Port       0xF1


//Enter_Config
WriteByte (AddrPort, SIO_UnLock_Value);
WriteByte (AddrPort, SIO_UnLock_Value);

WriteByte (AddrPort, 0x07);
WriteByte (DataPort, SIO_LDN_GPIO);

//Set OUT1~OUT4Value
WriteByte (AddrPort, GPIO_Port);
WriteByte (DataPort, 0x00);          //set OUT1~OUT8 value, OUT1=Bit0, OUT2=Bit1
```

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
				OUT4	OUT 3	OUT2	OUT 1

```
// Read In1~In4 value
WriteByte (AddrPort, 0xED);
Data= ReadByte (DataPort);       //Read In1~In8 value
```

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
				IN4	IN3	IN2	IN1

```
// close config mode
WriteByte (AddrPort, SIO_Lock_Value);
```

WDT Sample Code:

```
#define AddrPort        0x2e
#define DataPort        0x2f
#define SIO_UnLock_Value            0x87
#define SIO_Lock_Value              0xaa
#define WATCHDOG_LDN                0x08

#define GPIO_Port                   0xF1

//Enter_Config
WriteByte (AddrPort, SIO_UnLock_Value);
WriteByte (AddrPort, SIO_UnLock_Value);

//Enter WATCHDOG LDN
WriteByte (AddrPort, 0x07);
WriteByte (DataPort, WATCHDOG_LDN);

//Set count mode
WriteByte (AddrPort, 0xf0);
buf2 = ReadByte (DataPort) & 0xf4;   //clear "Select Watchdog Timer I count mode
buf2 |= 0x02;                        //Enable the Watchdog Timer I output low pulse to the KBRST# pin
// buf2 |= 0x08;                     //Bit3 = (1:Minute Mode/0:Second Mode)
WriteByte (DataPort, buf2);          //Write back

//Set watch dog time value
WriteByte (AddrPort, 0xf1)
WriteByte (DataPort, Time)     //Set watch dog time value

// close config mode
WriteByte (AddrPort, 0xaa);
```

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