

# USER'S MANUAL

## BCO-2000-RYZ Series

Fanless Mini Computer with AMD Ryzen™ Embedded  
V1000/R1000 Series



AMD  
**RYZEN**  
EMBEDDED



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## Prefaces

### Revision

Revision	Description	Date
1.0	Manual Released	2023/02/15

### 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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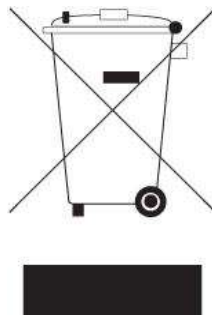
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### Environmental Protection Announcement

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  $-30^{\circ}\text{C}$  and below  $85^{\circ}\text{C}$ .
- 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 by 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-RYZ Series BOX PC Series Embedded System	1
3	Desktop mount kit	1
4	Accessory Kit	1

## Ordering Information

Model No.	Product Description
<b>BCO-2000-RYZ-V1605B</b>	Basic Fanless Embedded System with AMD Ryzen™ Embedded V1605B, 2xLAN, 4x USB, 2x LAN
<b>BCO-2000-RYZ-R1606G</b>	Basic Fanless Embedded System with AMD Ryzen™ Embedded R1606G, 2xLAN, 4x USB, 2x LAN

## Optional Accessories

Model No.	Product Description
1-E09A06007	Adapter AC/DC 12V 5A 60W 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-SIDE-0003	Side Mount Kit
3-BC2000CMKIT-S0	Module Kit with 4x COM for BCO-2000 Series
3-BC2000U2KIT-S0	Module Kit with 2x USB 2.0 for BCO-2000 Series
3-BC2000U31IT-S1	Module Kit with 2x USB 3.0 for BCO-2000 Serie

## 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.



Front Panel



Rear Panel

### Key Features

- Support AMD Ryzen™ Embedded V1000/R1000 Series
- 2x 260-pin DDR4 2400 MHz SODIMM. Max. up to 32GB
- 2x Intel® GbE (Support Wake-on-LAN and PXE)
- Triple Independent Display by 1x DisplayPort, 1x LVDS, 1x HDMI (Optional)
- 1x M.2 B Key for 4G/5G Communications & Storage
- 1x Full-size Mini PCIe for expansion modules
- 2x USB 3.2 Gen 2 (10Gbps), 2x USB 2.0, 2x RS-232/422/485
- 1x Internal 2.5" SATA HDD Bay, 1x internal SIM socket
- Watchdog timer 1-255s system reset
- TPM 2.0 Supported
- UL Listed

## 1.2 Hardware Specification

System		Display	
Processor <b>Support AMD Ryzen™ Embedded V1000/R1000 Series</b> <ul style="list-style-type: none"> <li>AMD Ryzen™ Embedded V1605B with Radeon™ Vega 8 Graphics, 4M Cache, 4 Cores, 8 Threads, Up to 3.6 GHz</li> <li>AMD Ryzen™ Embedded R1606G with Radeon™ Vega 3 Graphics, 4M Cache, 2 Cores, 4 Threads, Up to 3.5 GHz (Optional)</li> </ul>		DisplayPort	1x DisplayPort 1.4, DP++, Support resolution 3840 x 2160 @60 Hz
		HDMI	1x HDMI 2.0b, Support resolution 3840 x 2160 @60 Hz (Optional)
		LVDS	1x 24-bit dual channel LVDS, Support resolution up to 1920x1200 @60Hz
		Multiple Display	Triple Display
System Chipset	SoC integrated		
LAN Chipset	<ul style="list-style-type: none"> <li>GbE1: Intel i210 (Support Wake-on-LAN and PXE)</li> <li>GbE2: Intel i210 (Support Wake-on-LAN and PXE)</li> </ul>		
Audio Codec	Realtek ALC888S		
System Memory	2x 260-Pin DDR4 2400 MHz SODIMM. Max 32 GB		
BIOS	AMI uEFI 64 Mbit SPI flash		
Watchdog	Software Programmable Supports 1~255 Sec. System Reset		
TPM	TPM 2.0		
Storage			
M.2	1x M.2 B Key, 3042, Support SATA		
SIM Socket	1x internal SIM socket (M.2 B Key attached)		
SSD/HDD	1x Internal 2.5" SATA HDD Bay (support H=9.5mm)		
Expansion			
M.2	1x M.2 B Key (PCIe x1 & USB 3.0, 3042/3052, SATA, USIM, Support 4G/5G)		
Mini PCIe	1x Full-Size Mini PCIe for expansion modules		
I/O			
COM	2x RS-232/422/485		
DIO	4 in / 4 out (Isolated)		
LAN	2x RJ45		
Universal I/O Bracket	2x Universal I/O Bracket (By mini PCIe/M.2 interface)		
USB	2x USB 3.2 Gen 2 (10 Gbps) 4x USB 2.0 (2x internal)		
Others	5x WiFi Antenna Holes 1x 4-Pin FAN Connector 1x RTC battery by cable		
Operating System			
Windows	Windows 10		
Linux	Linux Kernel 5.x (Fedora 30 or above / Ubuntu 19.04 or above)		

Power	
Power Adaptor	Optional AC/DC 12V/5A, 60W,
Power Mode	AT, ATX 12VDC
Power Protection	Reserve Protection

Environment	
Operating Temperature	-20°C to 55°C (25W CPU)
Storage Temperature	-30 °C to 85 °C
Relative Humidity	10% to 95% (non-condensing)
Certification	UL, CE, FCC Class A
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: 50G, half sine, 11ms

Physical	
Construction	Extruded Aluminum with Heavy Duty Metal
Dimension	140 (D) x 192 (W) x 57.6 (H) mm
Weight	1.5 Kg
Mounting	Desktop Mounting

## 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

#### USB 2.0

Used to connect USB 2.0 device

#### LAN port

Used to connect the system to a local area network

#### Antenna hole

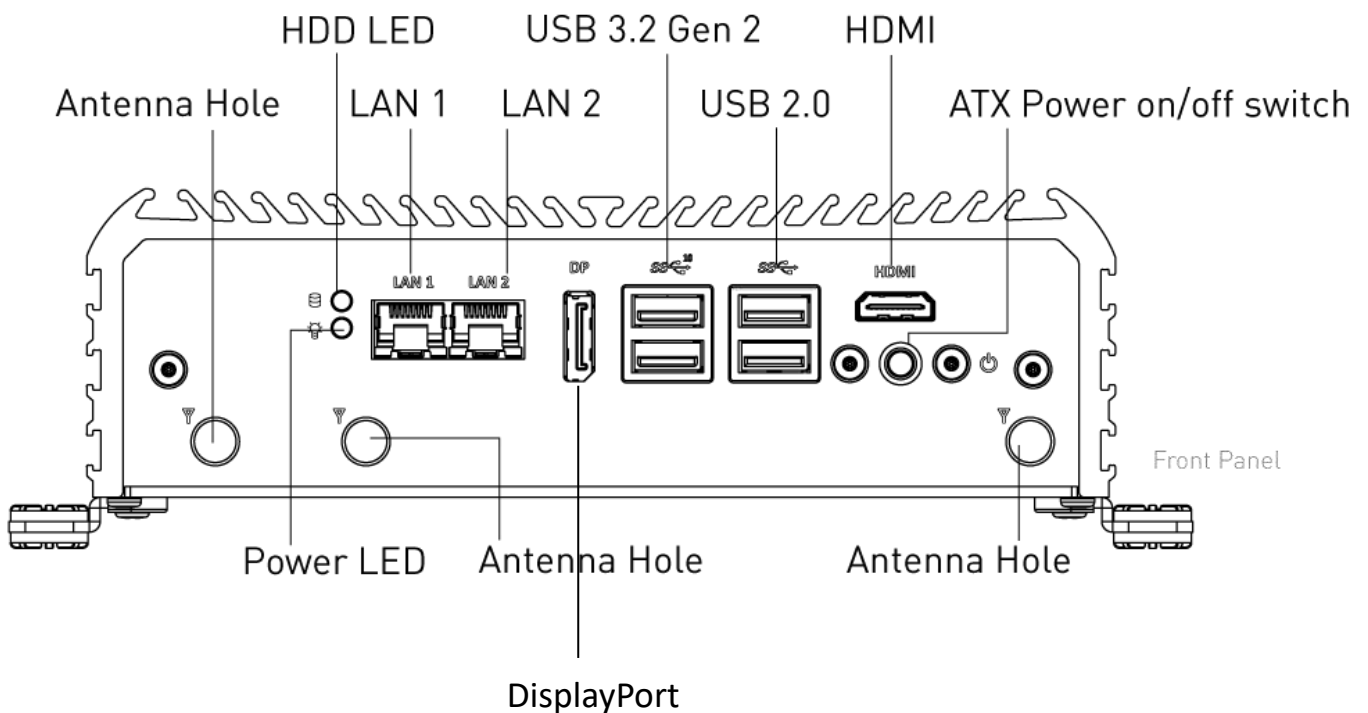
Used to connect an antenna for optional Mini-PCIe WiFi module

#### 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

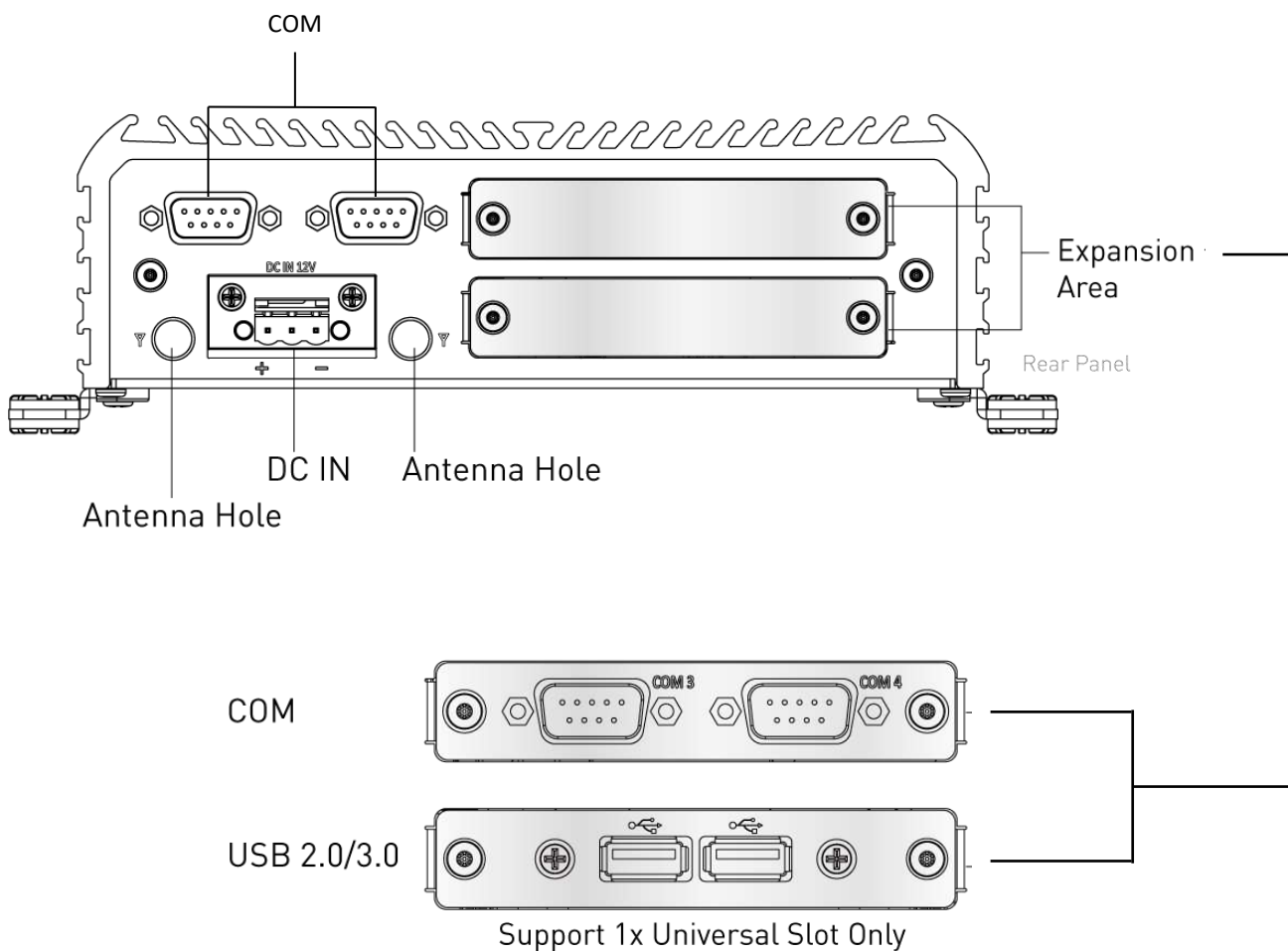
COM1 ~ COM2 support RS232/422/485 serial device

### Antenna hole

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

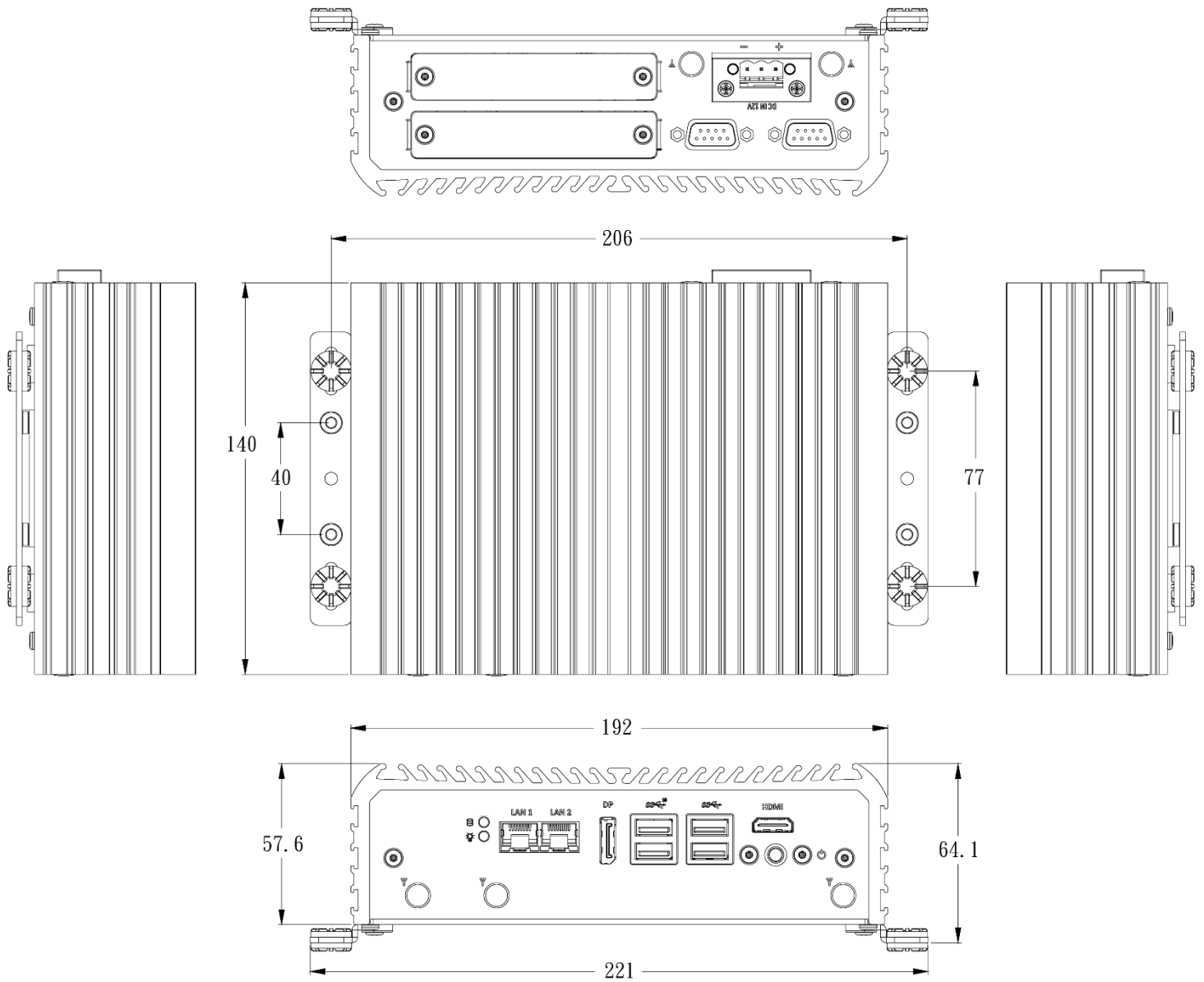
### Expandable I/O bracket

- **COM Port :**  
COM2 or COM4 Support RS232/422/485 serial device
- **USB 2.0/ 3.0 Port**  
Used to connect USB 3.0/2.0 (Support 1x Universal Slot Only)



# 1.4 Mechanical Dimensions

Unit: mm

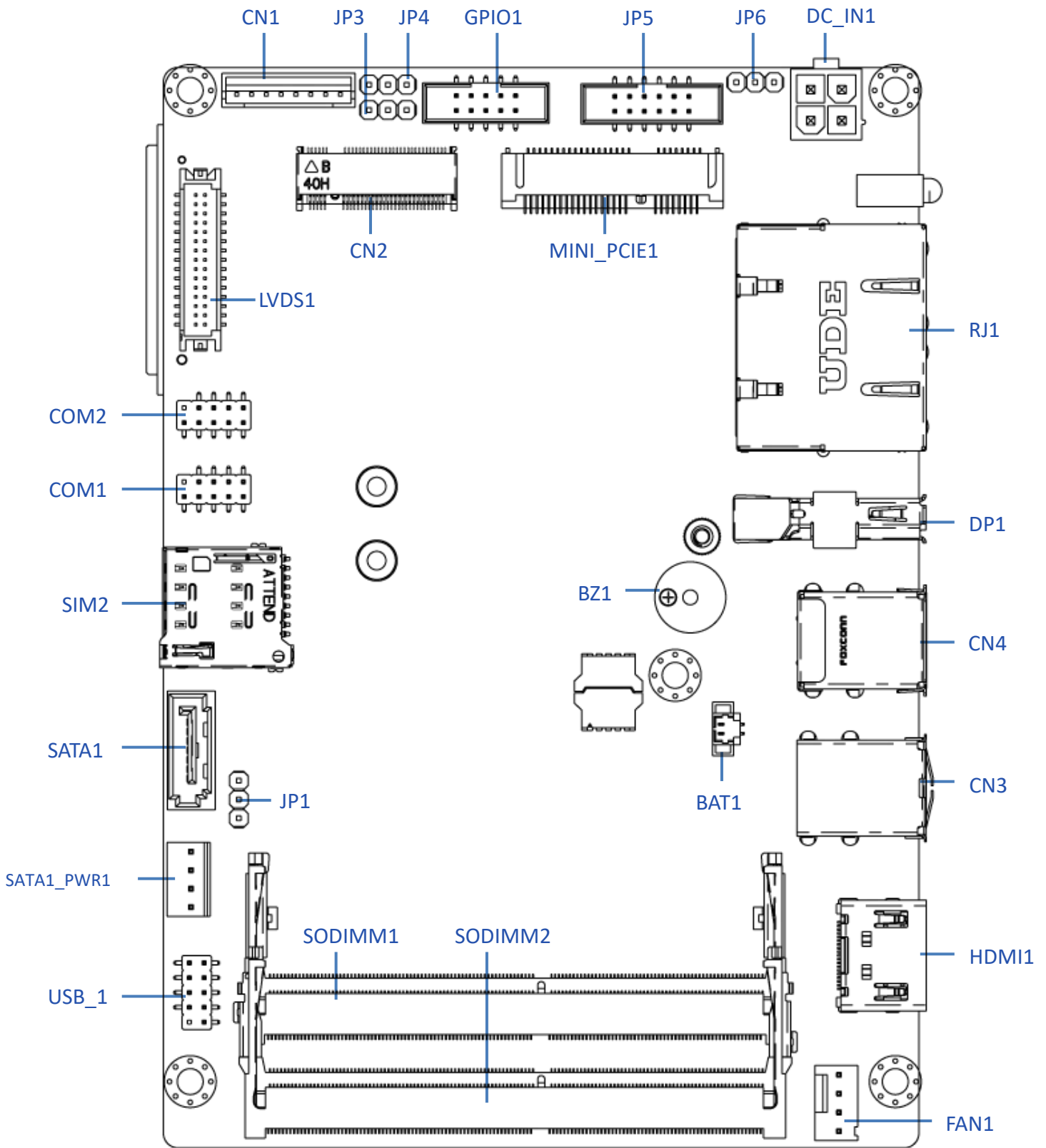


## Chapter 2

# Mechanical Specifications

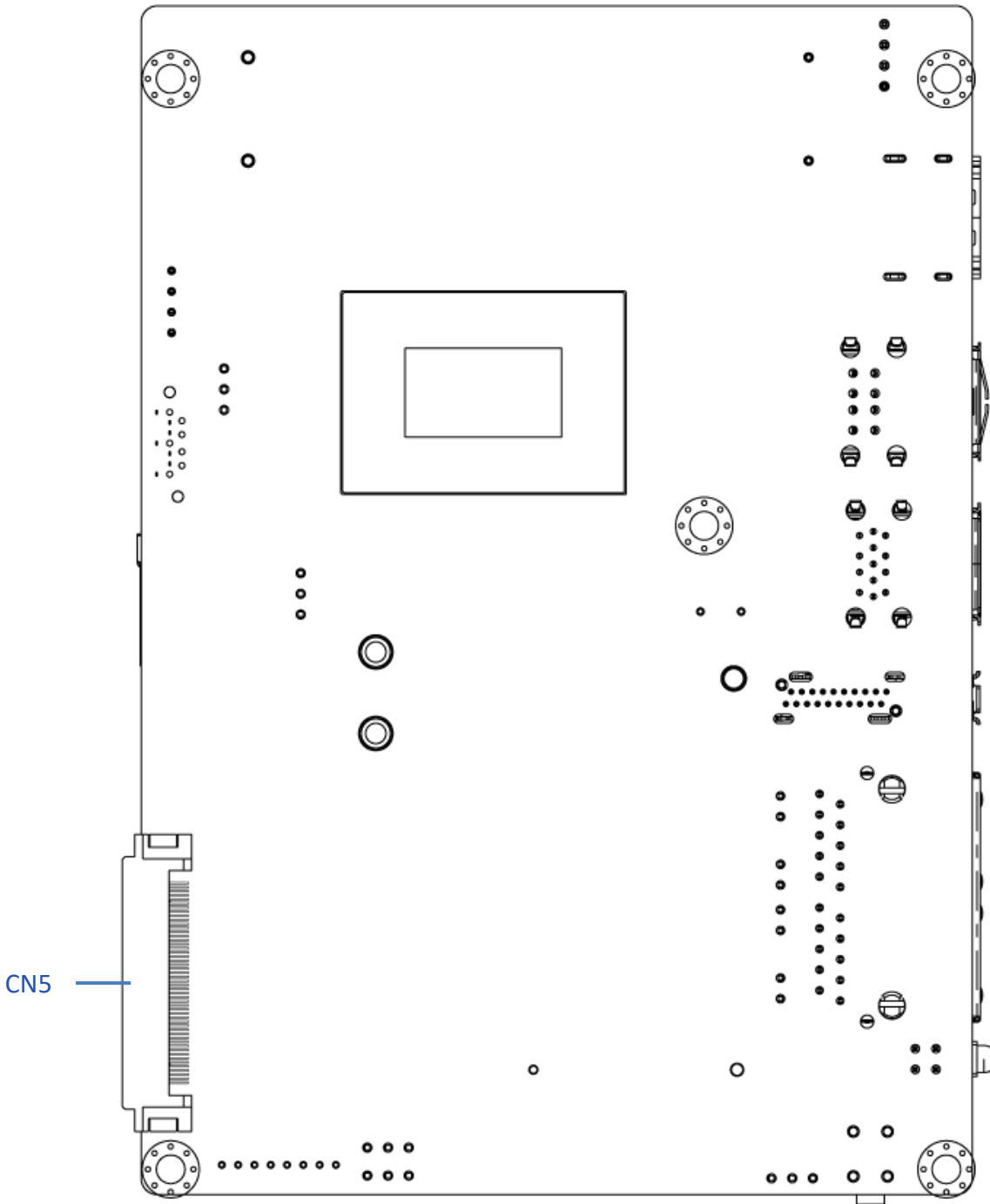
## 2.1 Switch and Connector Locations

### 2.1.1 Top View

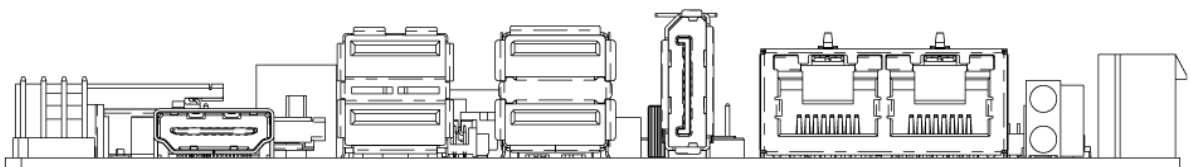




### 2.1.2 Bottom View



### 2.1.3 Rear I/O

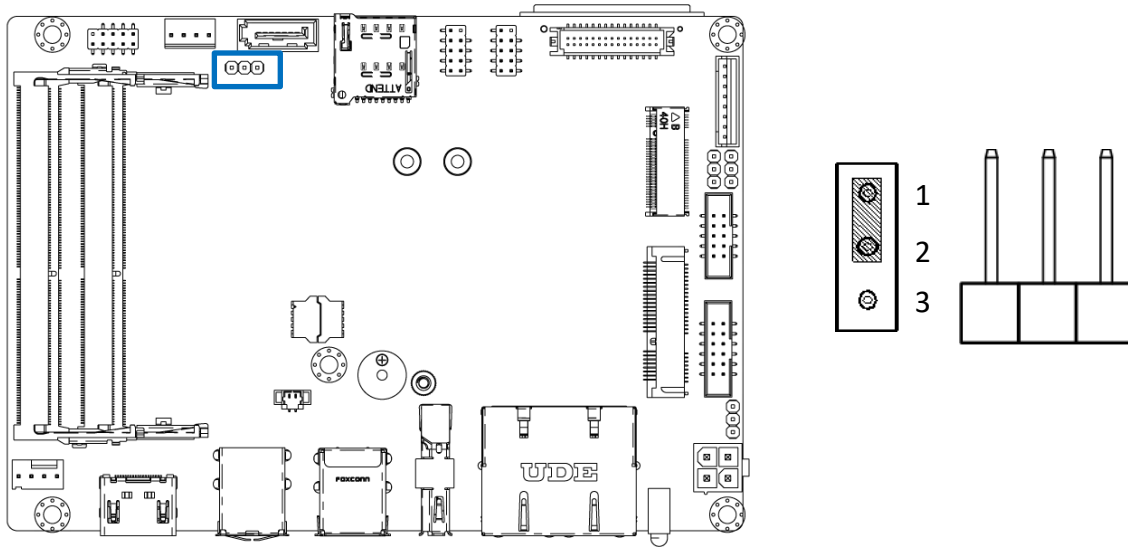


## 2.2 Connector / Switch Definition

Connector Location	Definition
JP1	Clear CMOS
JP3	Panel PWR setting
JP4	Backlight PWR setting
JP5	Front Panel
JP6	AT/ATX setting
CN1	Panel Control
CN2	M.2 B key
CN3	USB 2.0 port
CN4	USB 3.2 Gen 2
CN5	Expansion I/O
COM1	COM Port
COM2	COM Port
GPIO1	4IN/4OUT GPIO header
SATA1	SATA Port 1 signal connector
SATA1_PWR	SATA Port 1 power connector
LVDS1	LVDS connector
USB_1	USB 2.0 header
MINI_PCIE1	Mini PCI Express slot 1
DC_IN1	4 PIN Power connector
FAN1	FAN Power connector
RJ1	Dual LAN ports
HDMI1	HDMI signal connector
DP1	DP signal connector
BAT1	Battery
SIM2	SIM Card
BZ1	Buzzer
SODIMM1 / SODIMM2	Memory

## 2.3 I/O Interface Descriptions

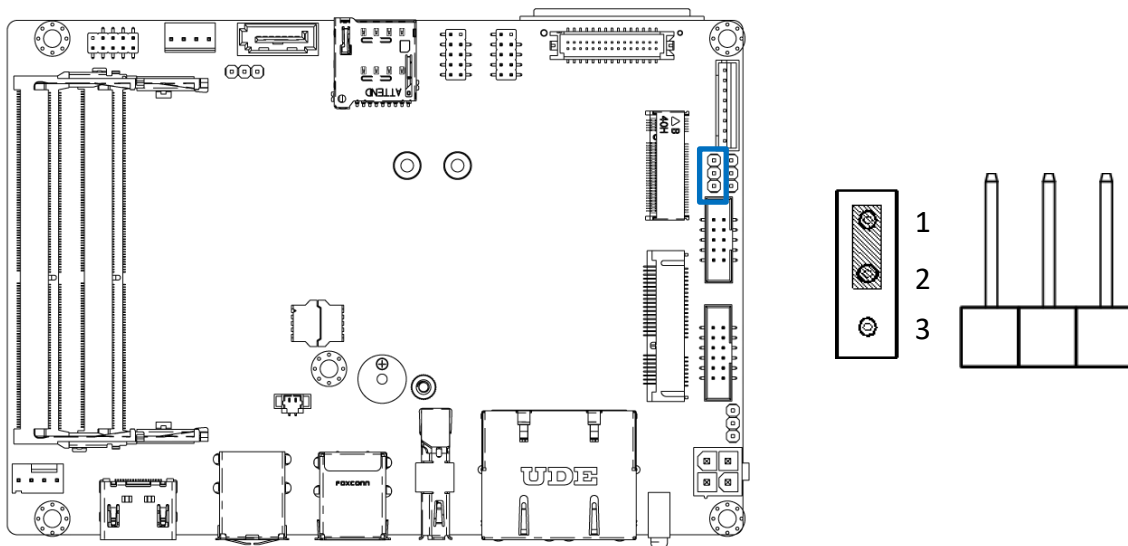
### 2.3.1 Clear CMOS



**JP1**

Pin	Signal
1	NC
2	RTCST#
3	GND

### 2.3.2 Panel Power setting

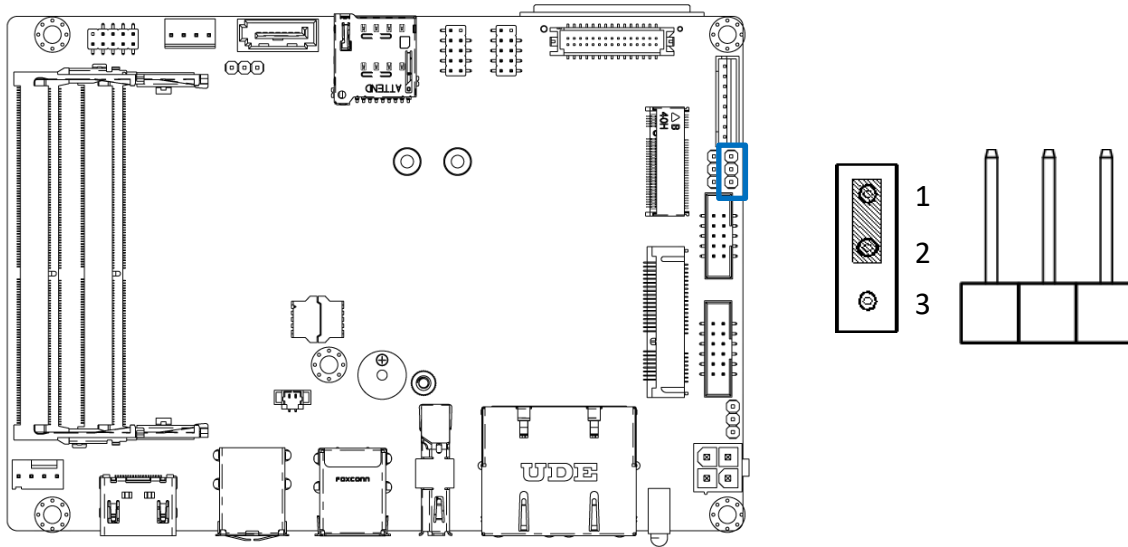


**JP3**

Pin	Signal
1	+V3.3A
2	P3P5V
3	+V5A

## 2.3 I/O Interface Descriptions

### 2.3.3 Backlight Power setting

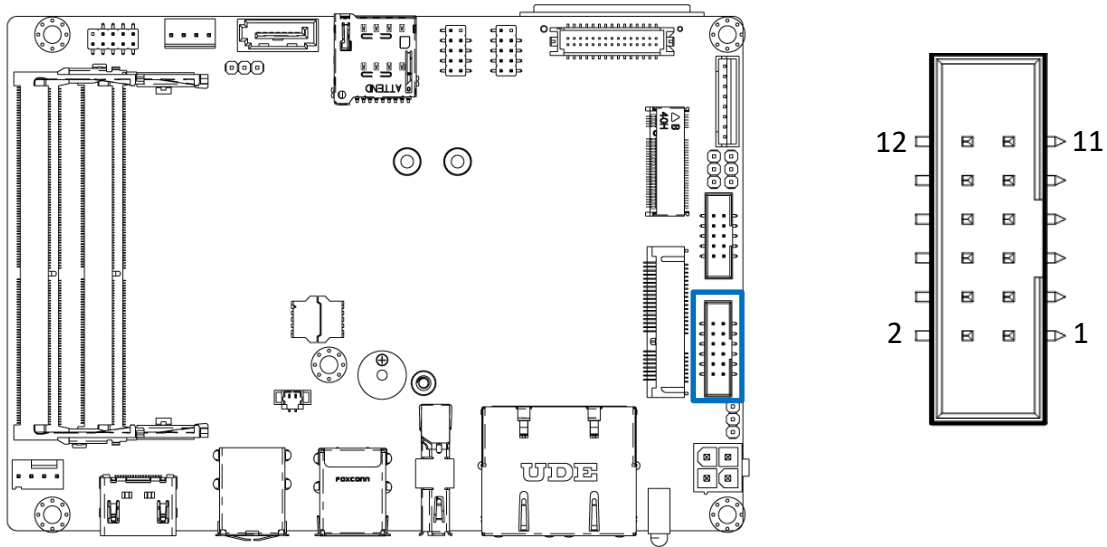


**JP4**

Pin	Signal
1	+V12A
2	P5P12V
3	+V5A

## 2.3 I/O Interface Descriptions

### 2.3.4 Front Panel Header

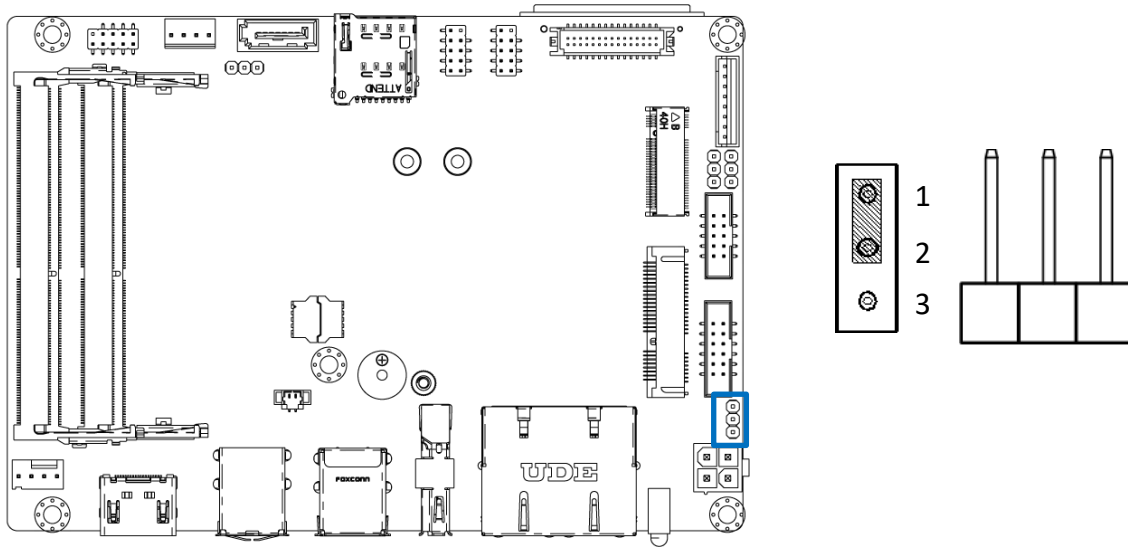


**JP5**

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

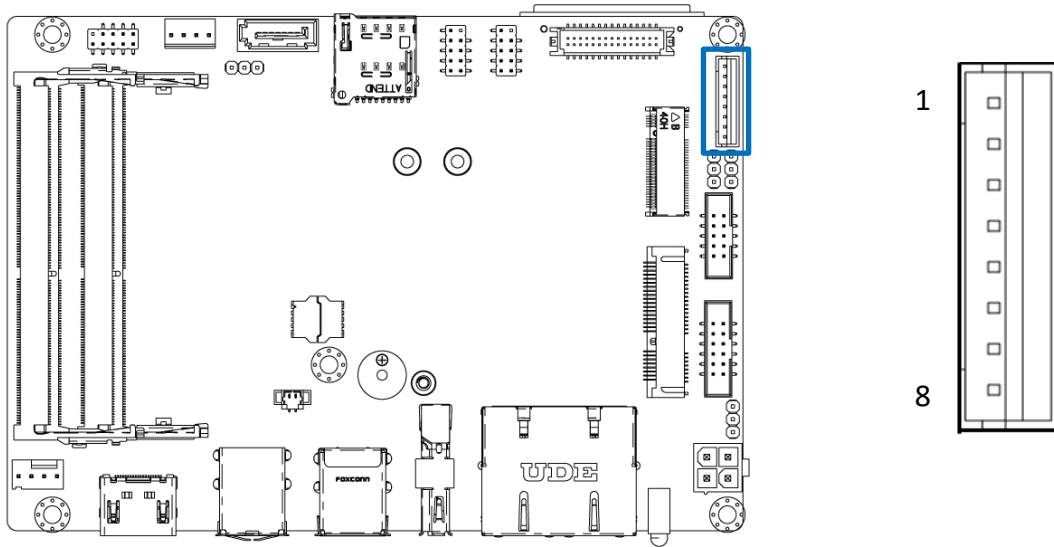


**JP6**

Pin	Signal
1	NC
2	AT MODE
3	PS_ON_BUTTON_N

## 2.3 I/O Interface Descriptions

### 2.3.6 Panel control

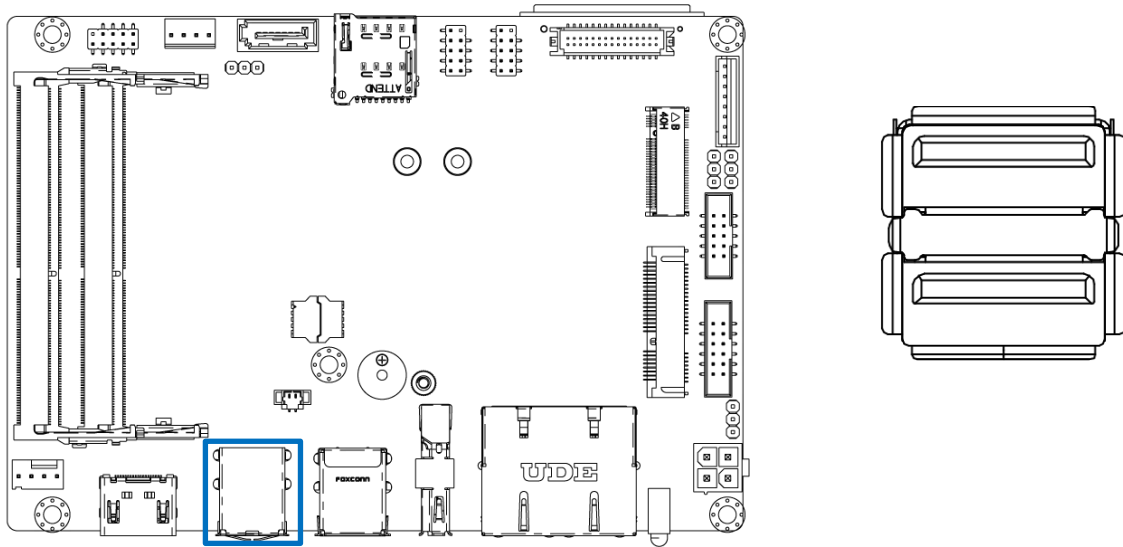


**CN1**

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 USB2



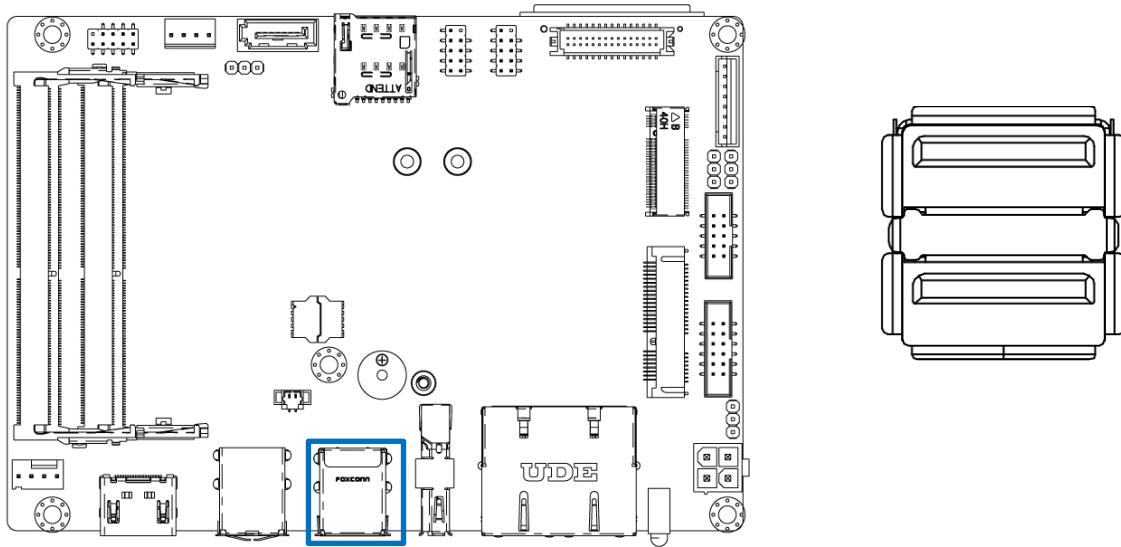
**CN3**

Pin	Signal	Pin	Signal
1	USBVCC0	5	USBVCC0
2	USB0N_CONN	6	USB4N_CONN
3	USB0P_CONN	7	USB4P_CONN
4	GND	8	GND



## 2.3 I/O Interface Descriptions

### 2.3.8 USB 3.2

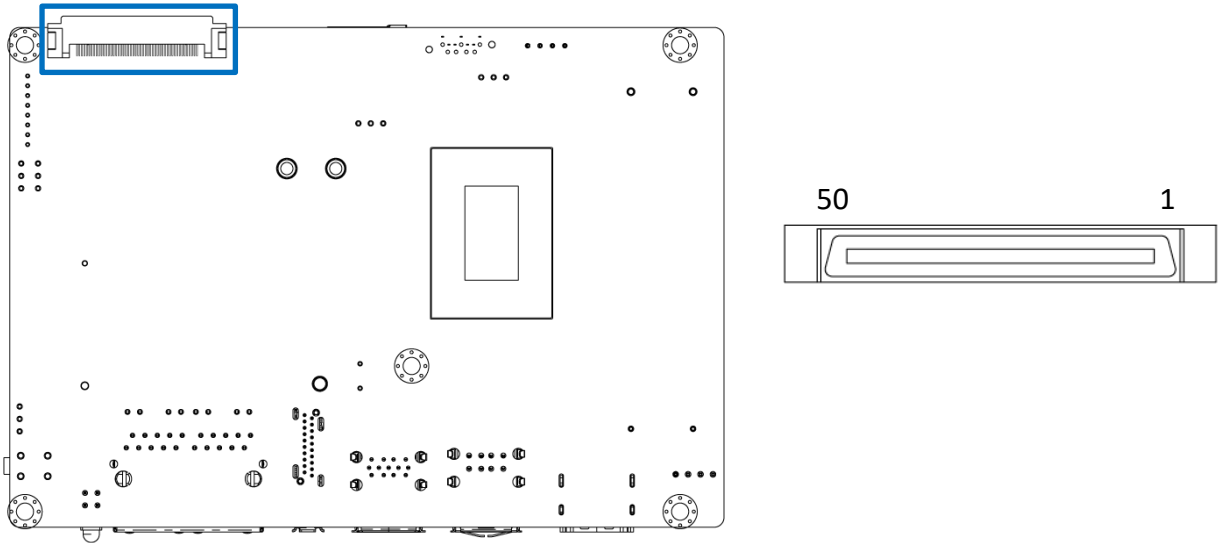


**CN4**

Pin	Signal	Pin	Signal
1	USBVCC0	10	USBVCC1
2	USB2-2N_CONN	11	USB1N_CONN
3	USB2-2P_CONN	12	USB1P_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

### 2.3.9 Expansion I/O

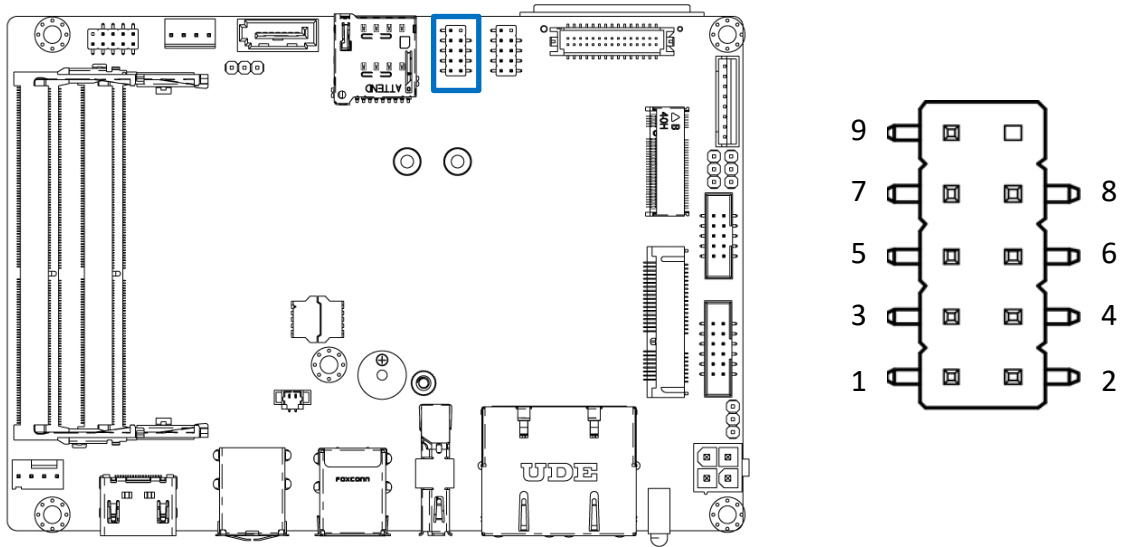


#### CN5

Pin	Signal	Pin	Signal
1	PE1_TX+	26	PE3_RX-
2	PE1_TX-	27	GND
3	GND	28	GND
4	GND	29	PE4_TX+
5	PE1_RX+	30	PE4_TX-
6	PE1_RX-	31	GND
7	GND	32	GND
8	GND	33	PE4_RX+
9	PE2_TX+	34	PE4_RX-
10	PE2_TX-	35	GND
11	GND	36	USB_OP
12	GND	37	USB_ON
13	PE2_RX+	38	Power_BTN
14	PE2_RX-	39	SYS_RST#
15	GND	40	PLTST_N
16	GND	41	SMB_DAT(3.3V)
17	REF_CLK+	42	SMB_CLK(3.3V)
18	REF_CLK-	43	+V3.3S
19	GND	44	+V3.3S
20	GND	45	+V3.3S
21	PE3_TX+	46	+V3.3S
22	PE3_TX-	47	+V5S
23	GND	48	+V5S
24	GND	49	+V5S
25	PE3_RX+	50	+V5S

## 2.3 I/O Interface Descriptions

### 2.3.10 COM Port

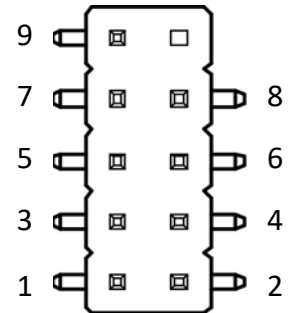
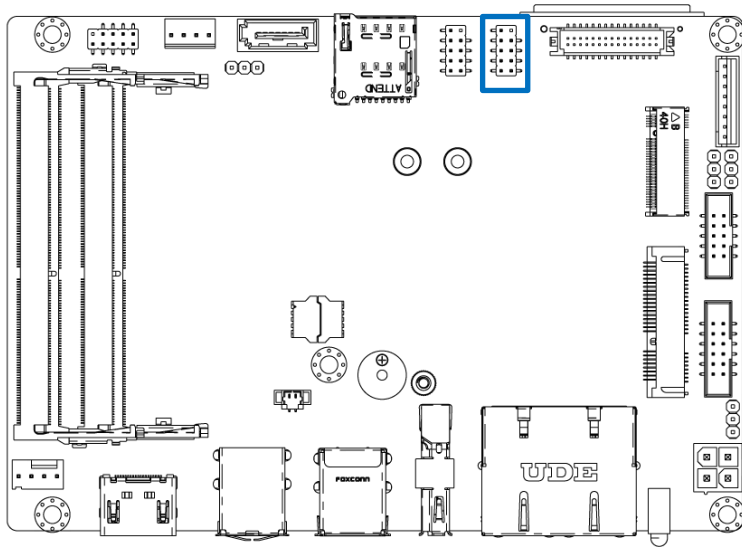


#### COM1

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

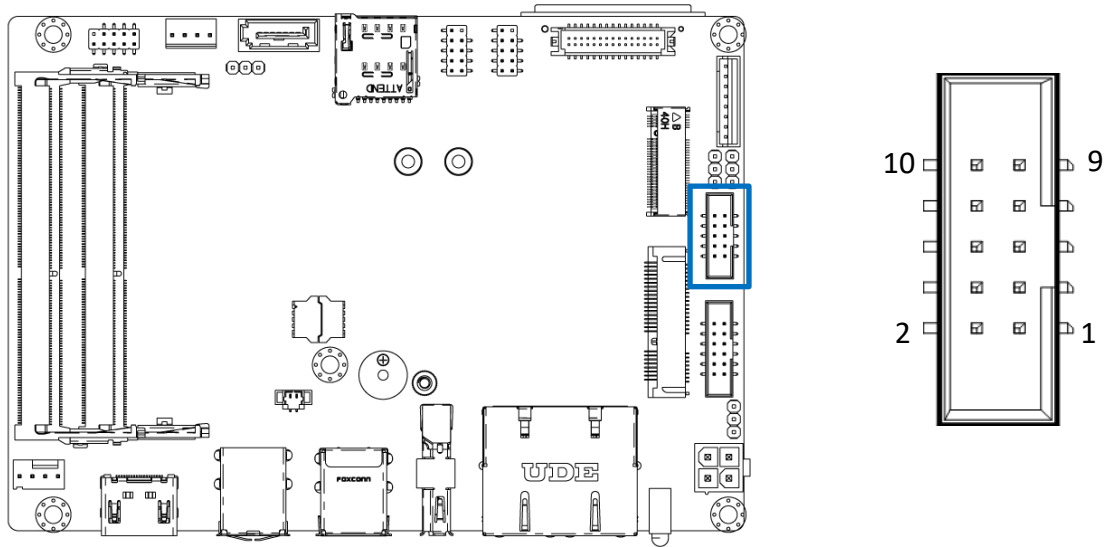


#### COM2

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 GPIO

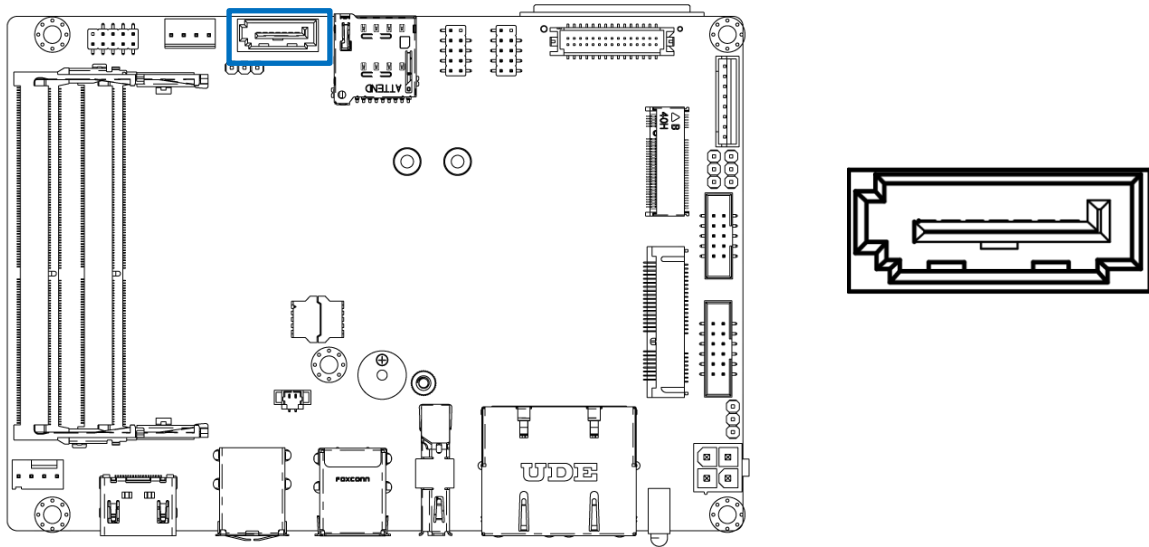


#### GPIO1

Pin	Signal	Pin	Signal
1	Power	2	GND
3	SIO_GPI1	4	SIO_GPO1
5	SIO_GPI2	6	SIO_GPO2
7	SIO_GPI3	8	SIO_GPO3
9	SIO_GPI4	10	SIO_GPO4

## 2.3 I/O Interface Descriptions

### 2.3.13 SATA

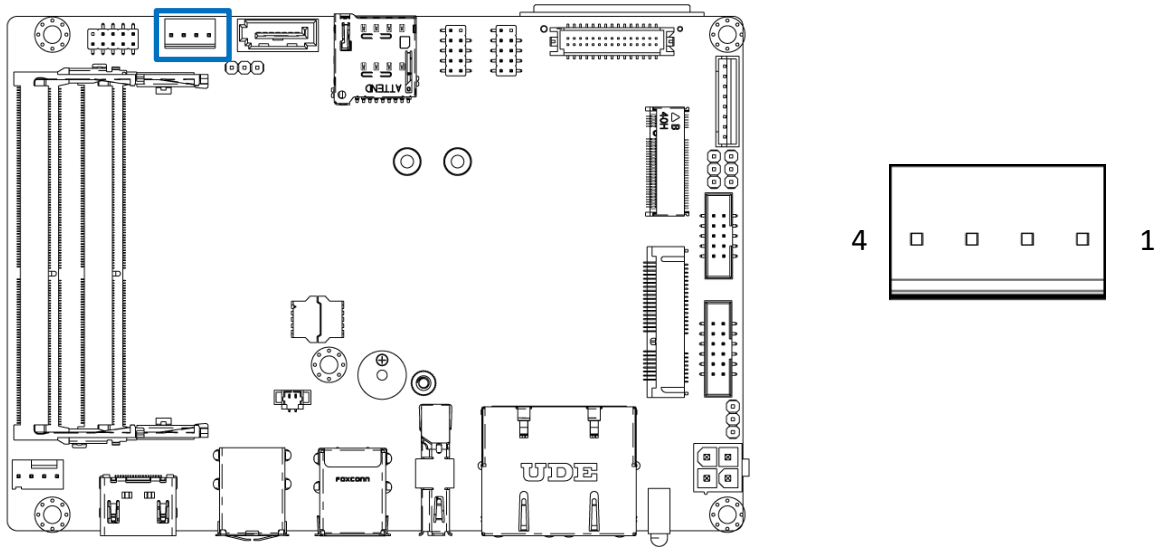


#### SATA1

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

### 2.3.14 SATA\_PWR

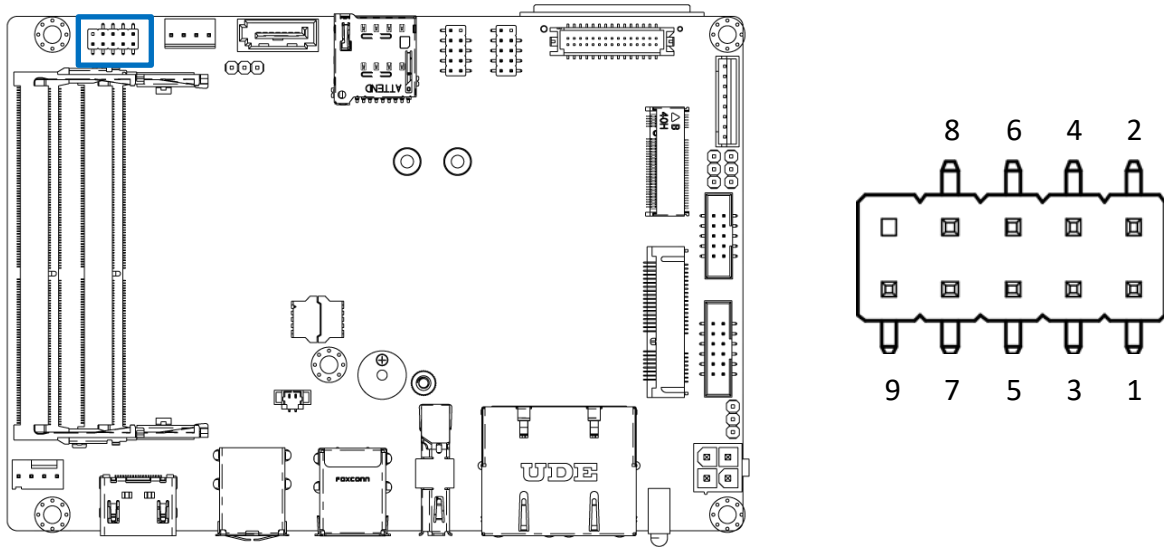


#### SATA1\_PWR1

Pin	Signal
1	+V5S
2	GND
3	GND
4	+V12S

## 2.3 I/O Interface Descriptions

### 2.3.15 USB2.0 Header



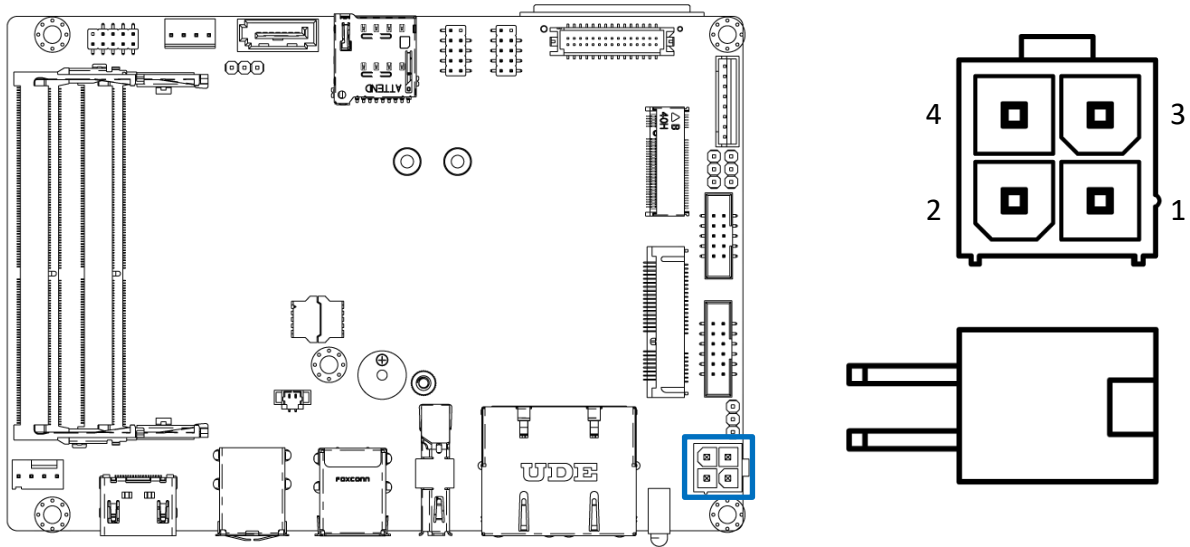
#### USB\_1

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

### 2.3.16 Power IN

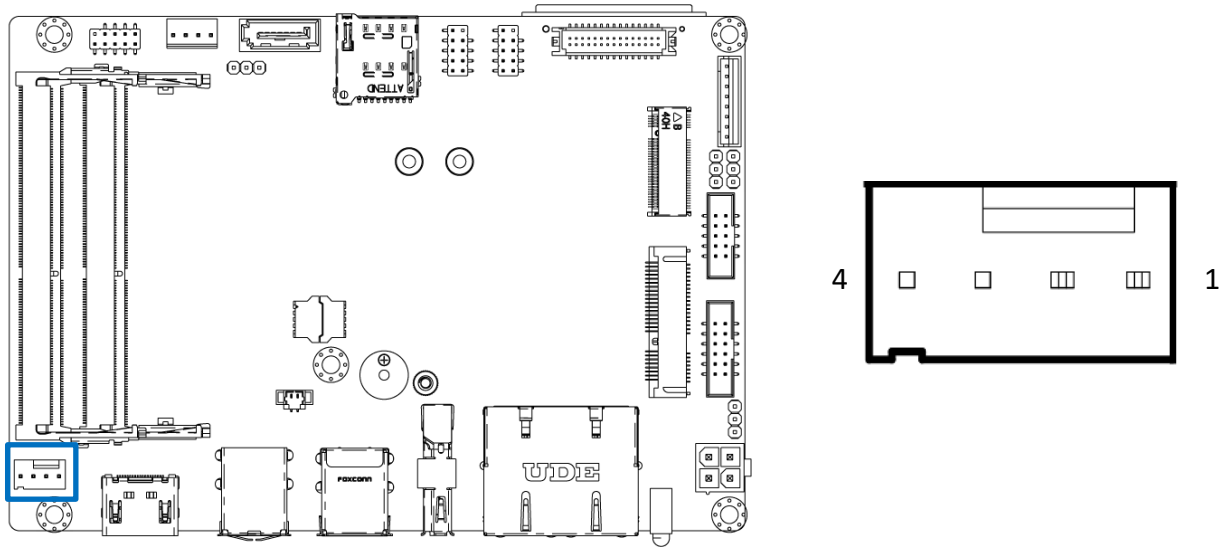


#### DC\_IN1

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

## 2.3 I/O Interface Descriptions

### 2.3.17 FAN PWR

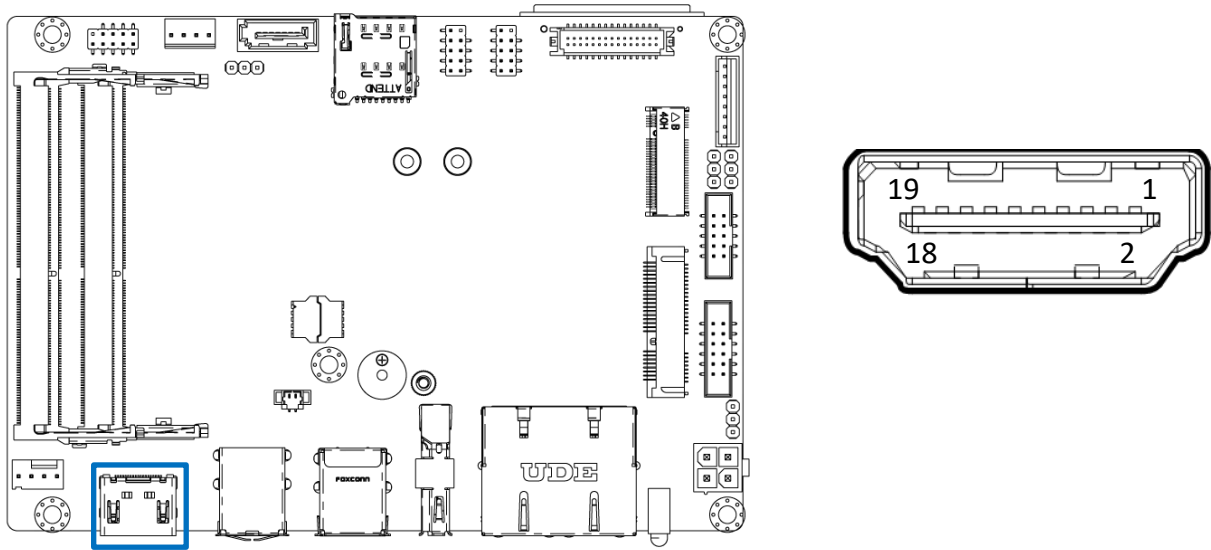


#### FAN1

Pin	Signal
1	FANCTL1
2	FAN_SEN1
3	FAN_IN1
4	GND

## 2.3 I/O Interface Descriptions

### 2.3.18 HDMI Display

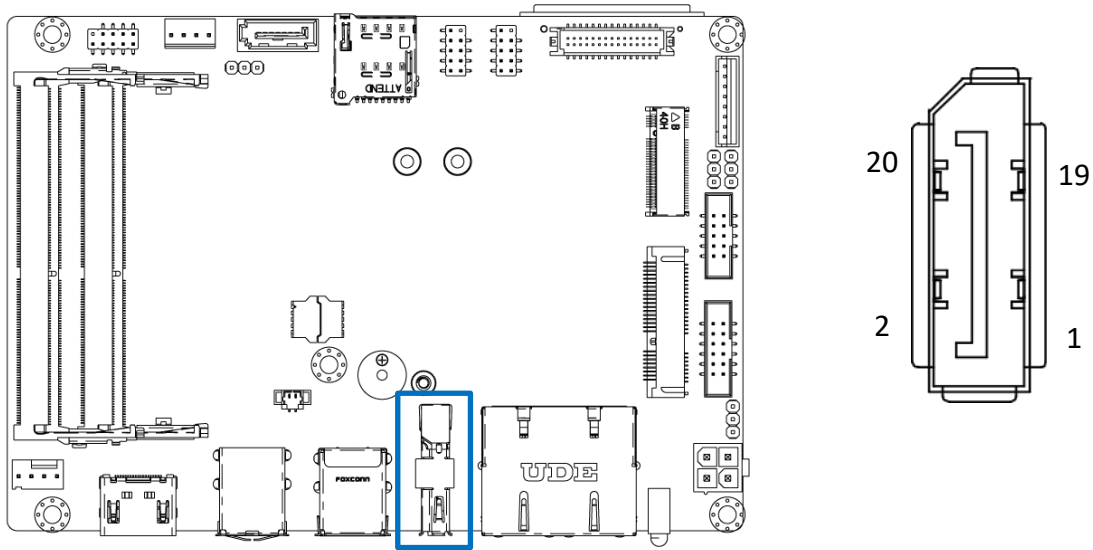


#### HDMI1

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

## 2.3 I/O Interface Descriptions

### 2.3.19 Display Port

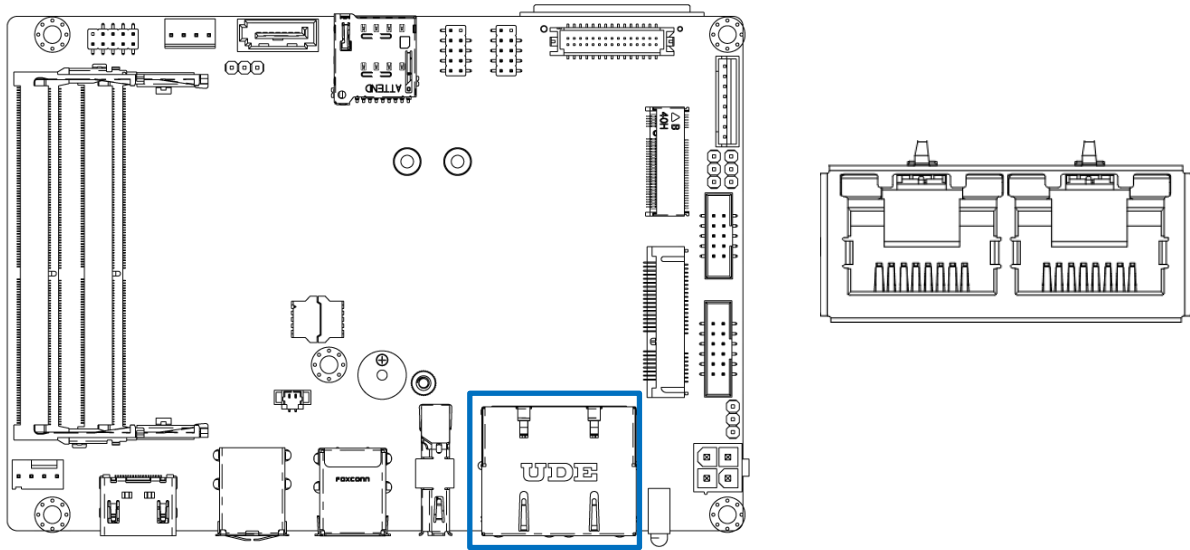


#### DP1

Pin	Signal	Pin	Signal
1	ML_LANE0+	11	GND
2	GND	12	ML_LANE3-
3	ML_LANE0-	13	GND
4	ML_LANE1+	14	GND
5	GND	15	AUX CH+
6	ML_LANE1-	16	GND
7	ML_LANE2+	17	AUX CH-
8	GND	18	HPD
9	ML_LANE2-	19	DP_PWR Return
10	ML_LANE3+	20	DP_PWR

## 2.3 I/O Interface Descriptions

### 2.3.20 Dual RJ45

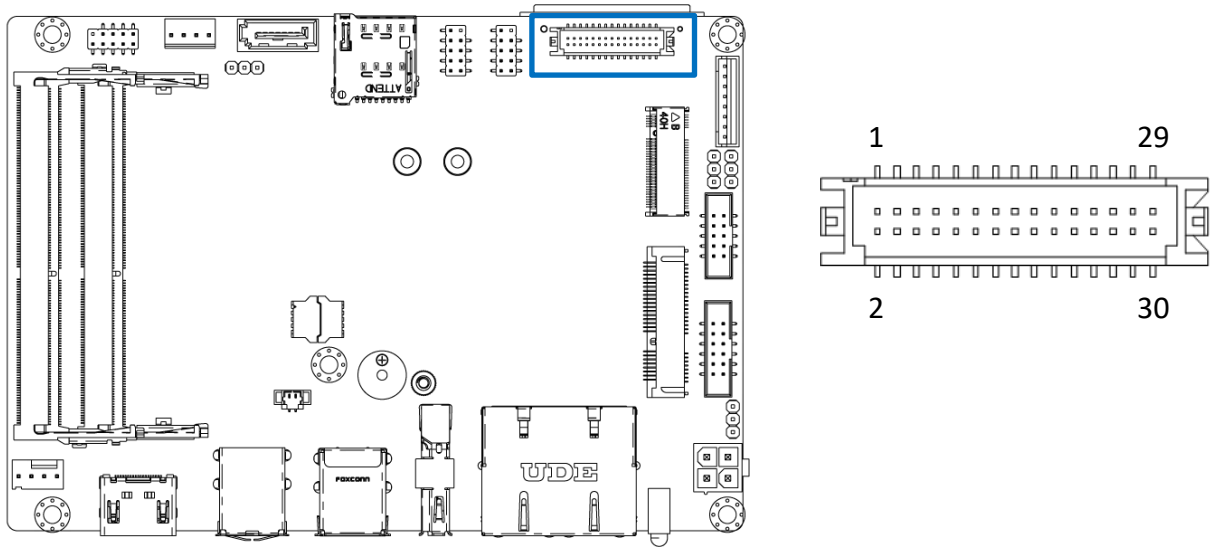


#### RJ1

Pin	Signal	Pin	Signal
1	R1 GBE1_MDI0P	11	R1 GBE2_MDI0P
2	R2 GBE1_MDION	12	R2 GBE2_MDION
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_1	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

### 2.3.21 LVDS Header

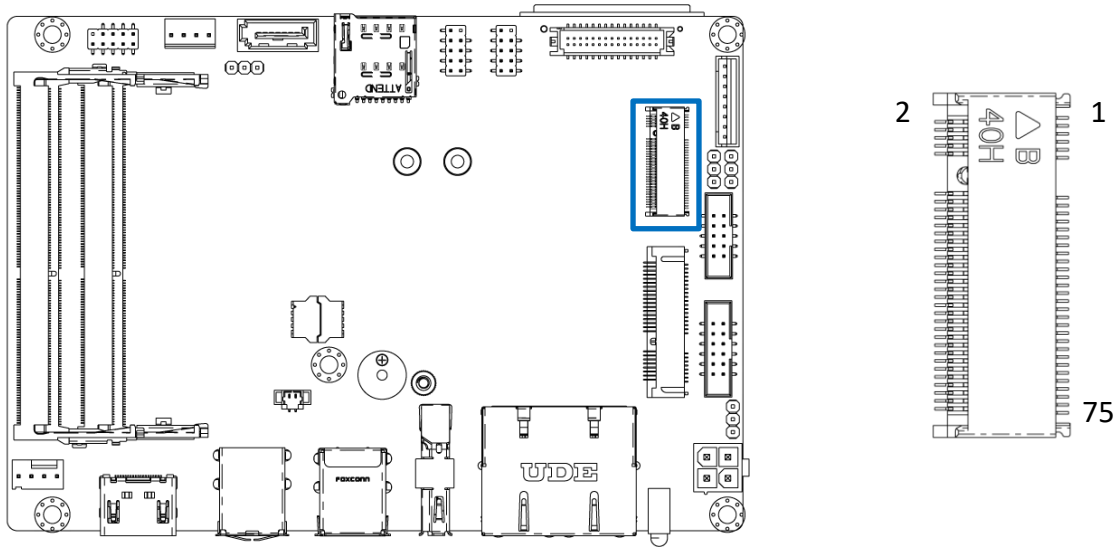


#### LVDS1

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	MIIC_SCL
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

## 2.3 I/O Interface Descriptions

### 2.3.22 M.2 B key



#### CN2

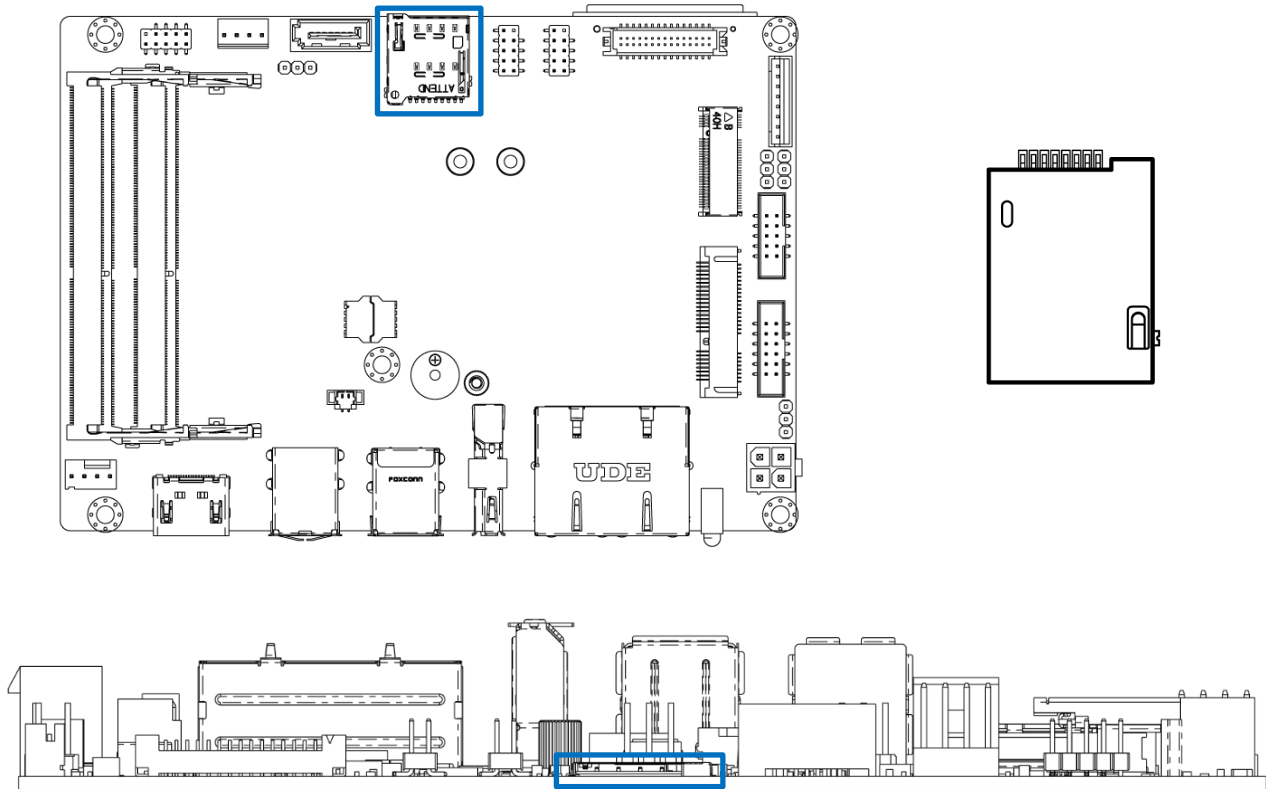
Pin	Signal	Pin	Signal
1	CONFIG_3	2	VCC1
3	GND	4	VCC2
5	GND	6	FULL_CARD_POWER_OFF#
7	USB_D+	8	W_DISABLE1#
9	USB_D-	10	WWAN_LED#
11	GND	12	NOTCH
13	NOTCH	14	NOTCH
15	NOTCH	16	NOTCH
17	NOTCH	18	NOTCH
19	NOTCH	20	GPIO_5(O/1.8V)
21	CONFIG_0	22	GPIO_6(O/1.8V)
23	GPIO_11(O/1.8V)	24	GPIO_7(O/1.8V)
25	DPR	26	GPIO_10(O/1.8V)
27	GND	28	GPIO_8(O/1.8V)
29	PERn1/USB3.0-Rx-	30	USIM1_RST
31	PERp1/USB3.0-Rx+	32	USIM1_CLK
33	GND	34	USIM1_DATA
35	PETn1/USB3.0-Tx-	36	USIM1_VDD
37	PETp1/USB3.0-Tx+	38	DEVSLP (O)
39	GND	40	USIM2_DET
41	PERn0/SATA-B+	42	USIM2_DATA

Pin	Signal	Pin	Signal
43	PERp0/SATA-B-	44	USIM2_CLK
45	GND	46	USIM2_RST
47	PETn0/SATA-A-	48	USIM2_VDD
49	PETp0/SATA-A+	50	PCIE_RST_N
51	GND	52	PCIE_CLKREQ_N
53	PCIE_REFCLK_M	54	PCIE_WAKE_N
55	PCIE_REFCLK_P	56	N/C
57	GND	58	N/C
59	ANTCTL0	60	COEX3(O/1.8V)
61	ANTCTL1	62	COEX2(O/1.8V)
63	ANTCTL2	64	COEX1(O/1.8V)
65	ANTCTL3	66	USIM1_DET
67	RESET_N	68	SUSCLK(32kHz)
69	CONFIG_1	70	VCC3
71	GND	72	VCC4
73	GND	74	VCC5
75	CONFIG_2	76	



## 2.3 I/O Interface Descriptions

### 2.3.23 SIM Card

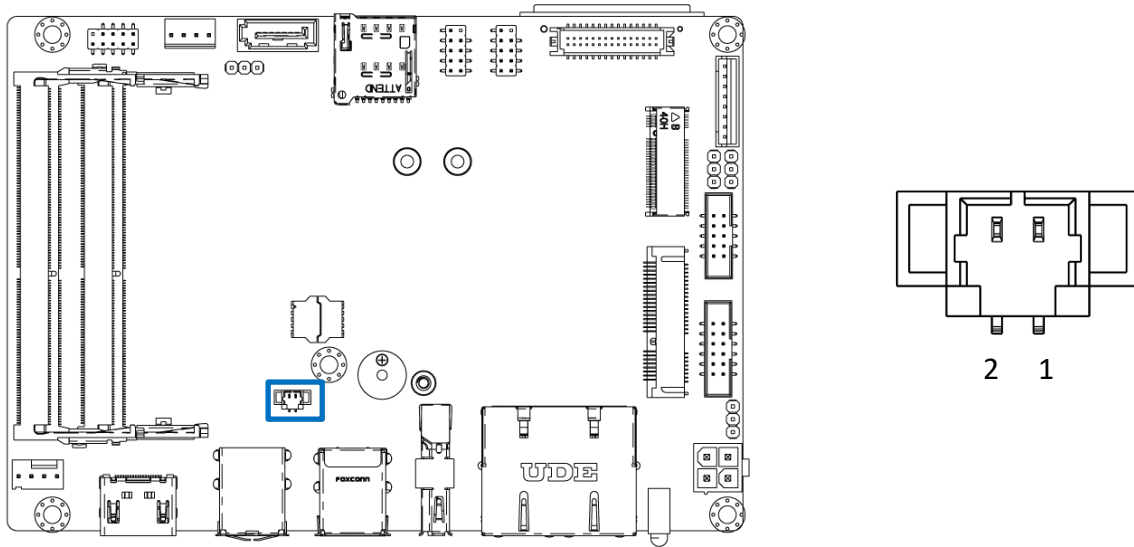


#### SIM2

Pin	Signal	Pin	Signal
1	VCC	2	RST
3	CLK	4	NC
5	GND	6	VPP
7	DATA	8	NC
9	CD		

## 2.3 I/O Interface Descriptions

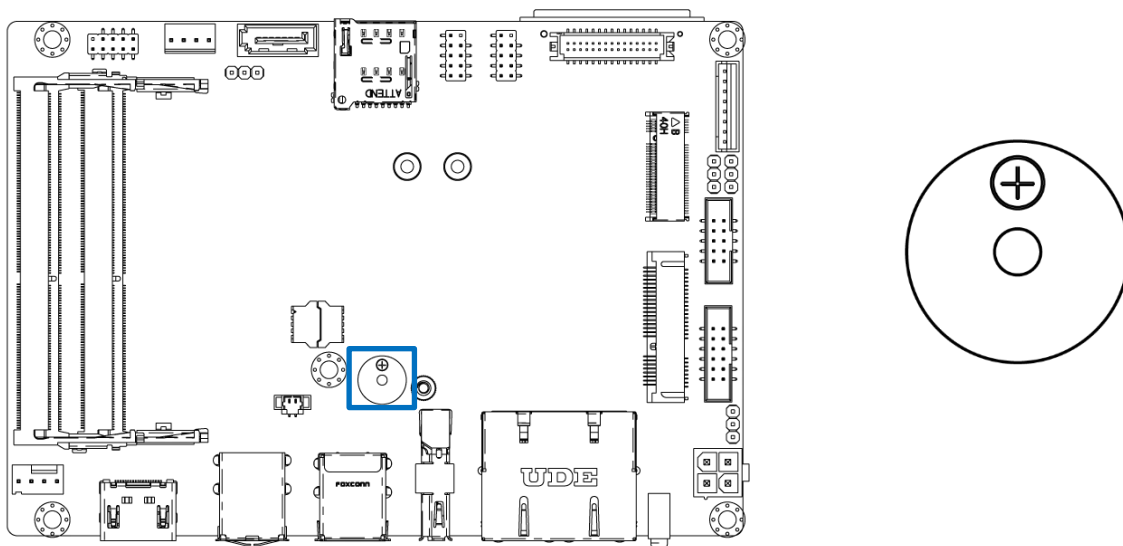
### 2.3.24 Battery



**BAT1**

Pin	Signal	Pin	Signal
1	Battery Power	2	GND

### 2.3.25 Buzzer

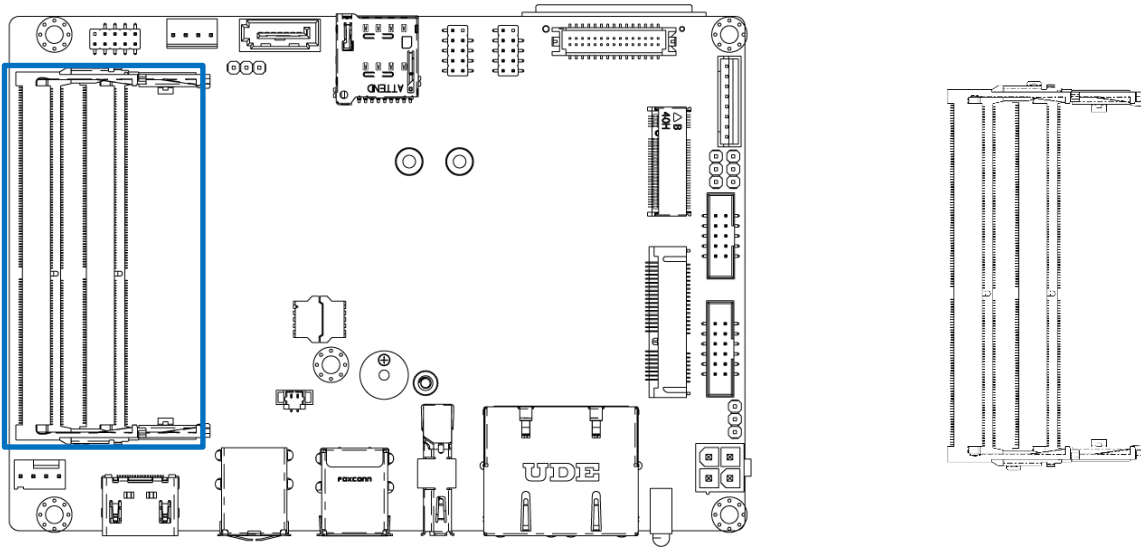


**BZ1**

Pin	Signal	Pin	Signal
1	Passive	2	Negative

## 2.3 I/O Interface Descriptions

### 2.3.26 Memory



**SODIMM1/SODIMM2 Socket**

## 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. Insert memory module from 45 degree direction.



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



2. Press the mini PCIe card or mSATA module down and lock it with one screws (M2.5x5L).





## 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.

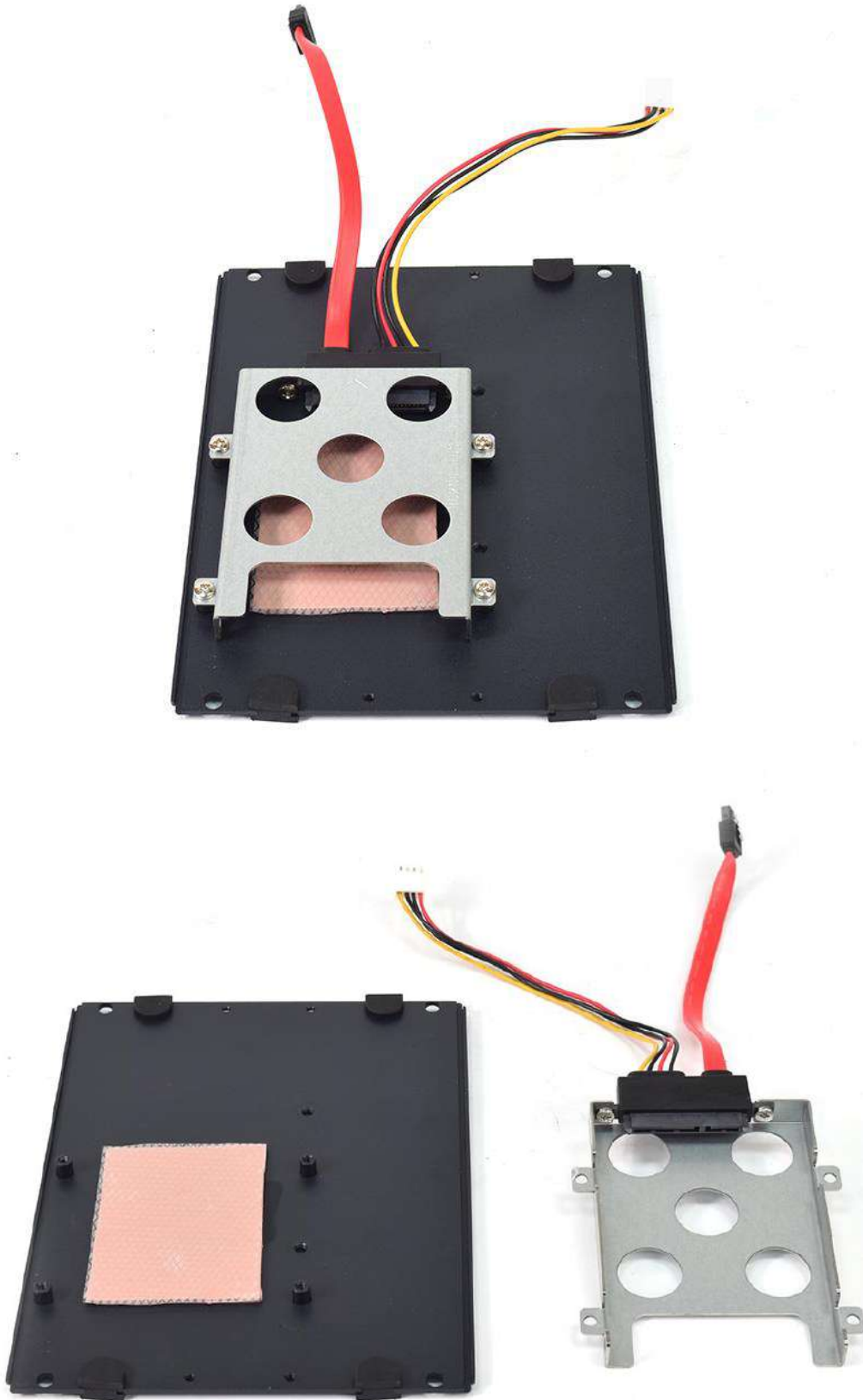


#### 5. Attach the RF connector at the cable-end onto the communication module.



## 3.6 Removing HDD bracket

1. Unscrew four screws (M3x5L) circled below.



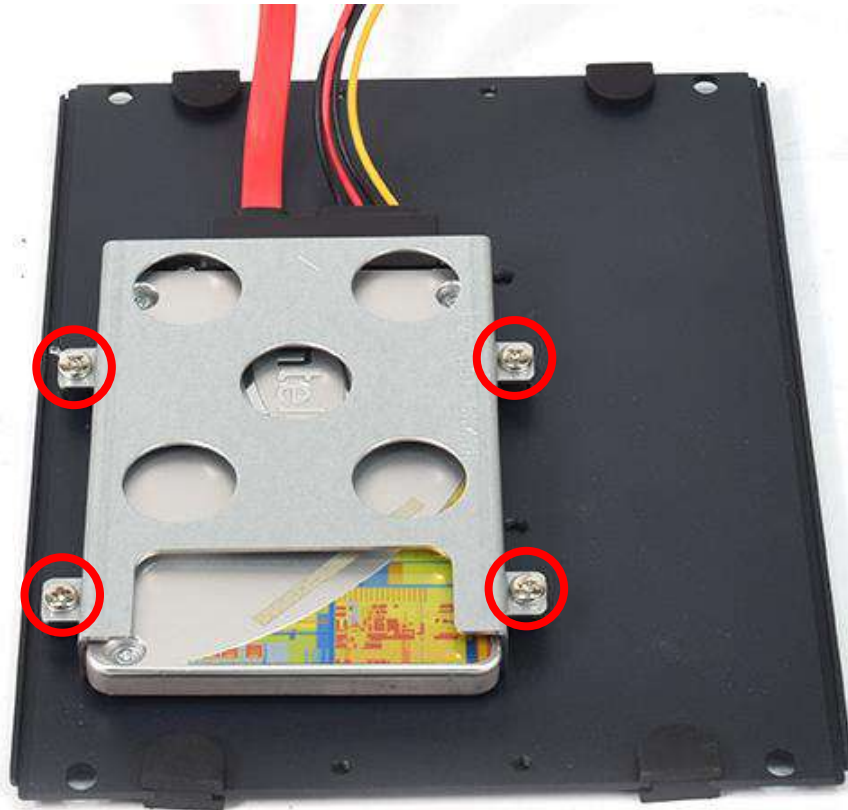


## 3.7 Installing SATA HDD

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. Insert SIM card into the socket.



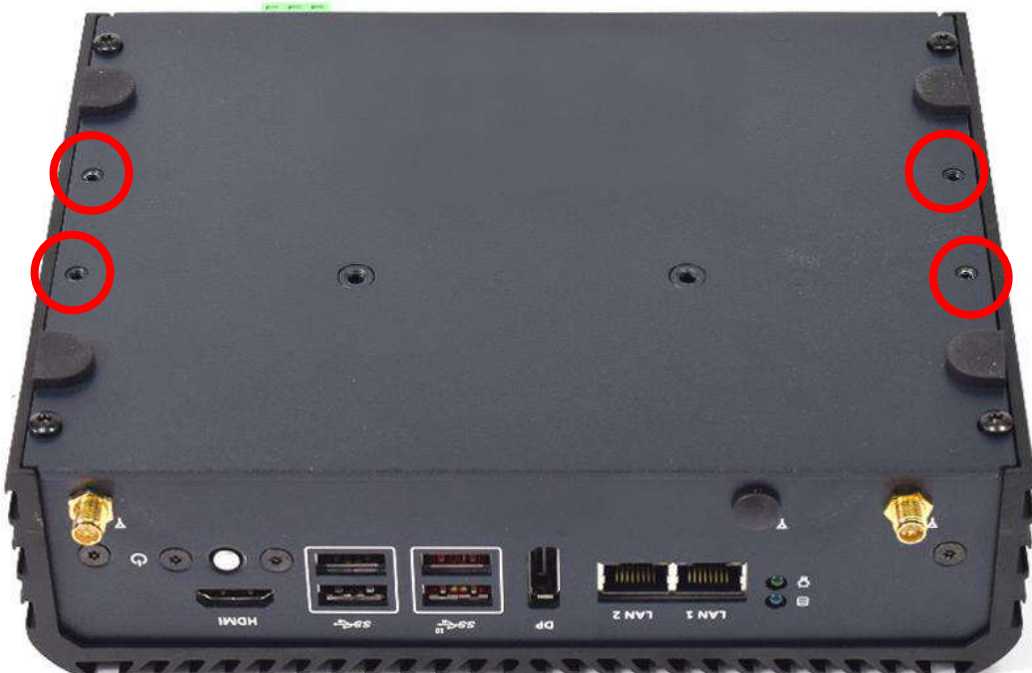


### 3.9 Installing Desktop mount kit

1. Wall mount kit is available for BCO-2000 series included in the standard package.



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



### 3. Lock the wall mount kit with eight screws (M3x5L, 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

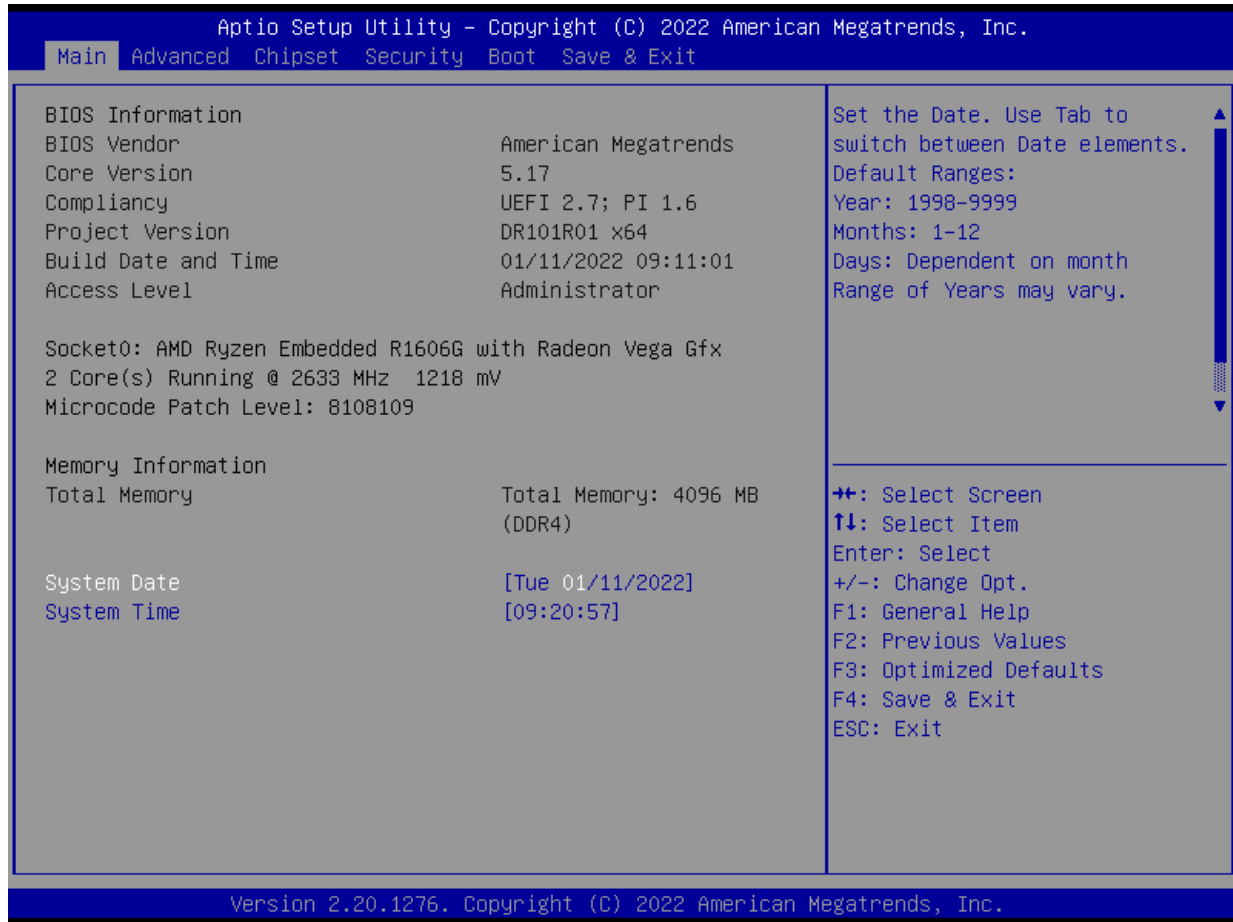
The main menu lists the setup functions you can make changes to. You can use the arrow keys ( ↑↓ ) to select the item. The on-line description of the highlighted setup function is displayed at the bottom of the screen.

### 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.



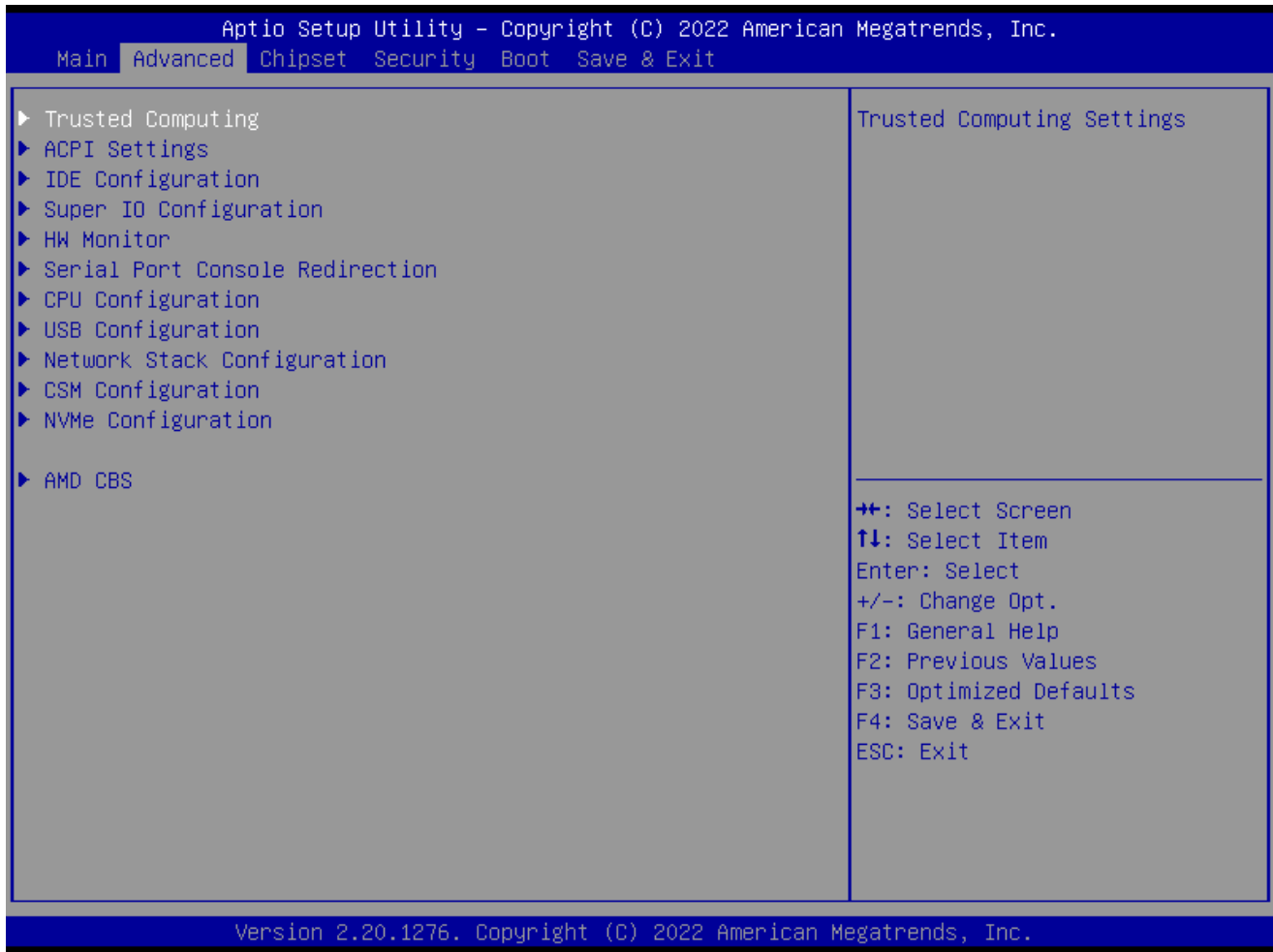
### ■ System Date

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

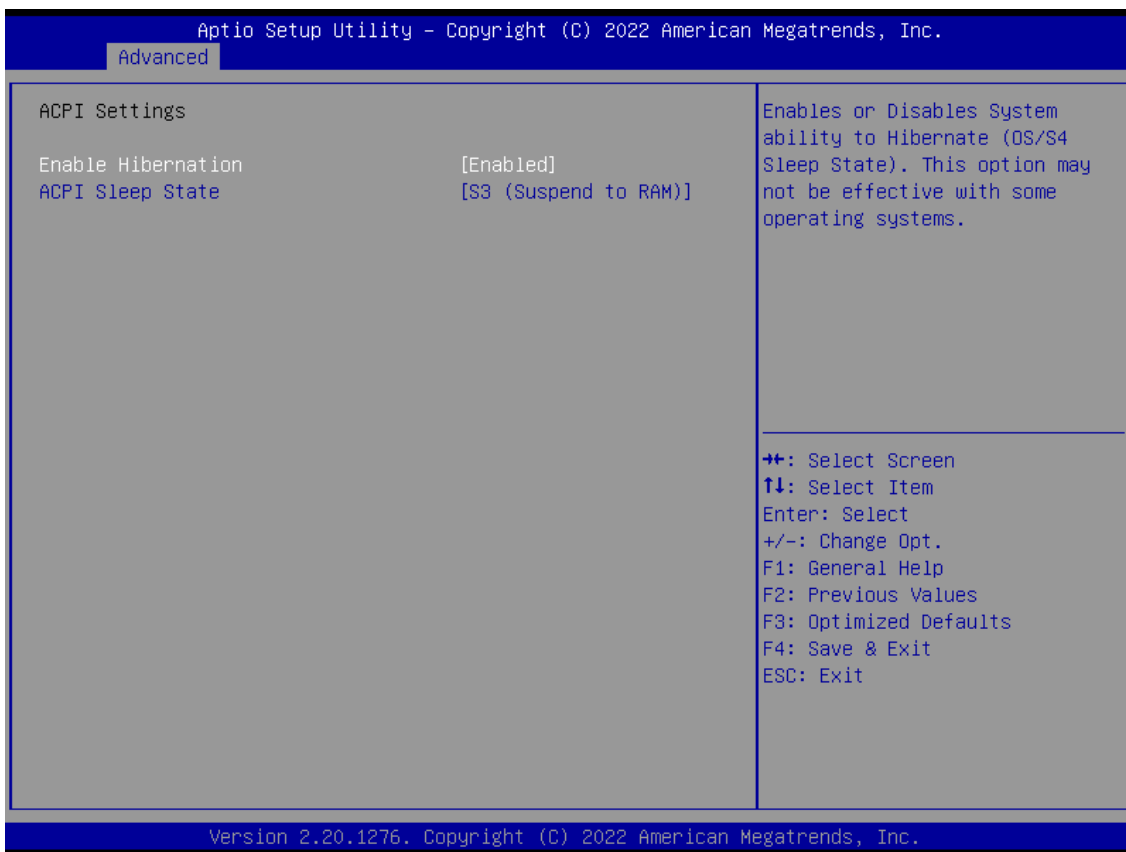


### 4.3.1 Trusted Computing



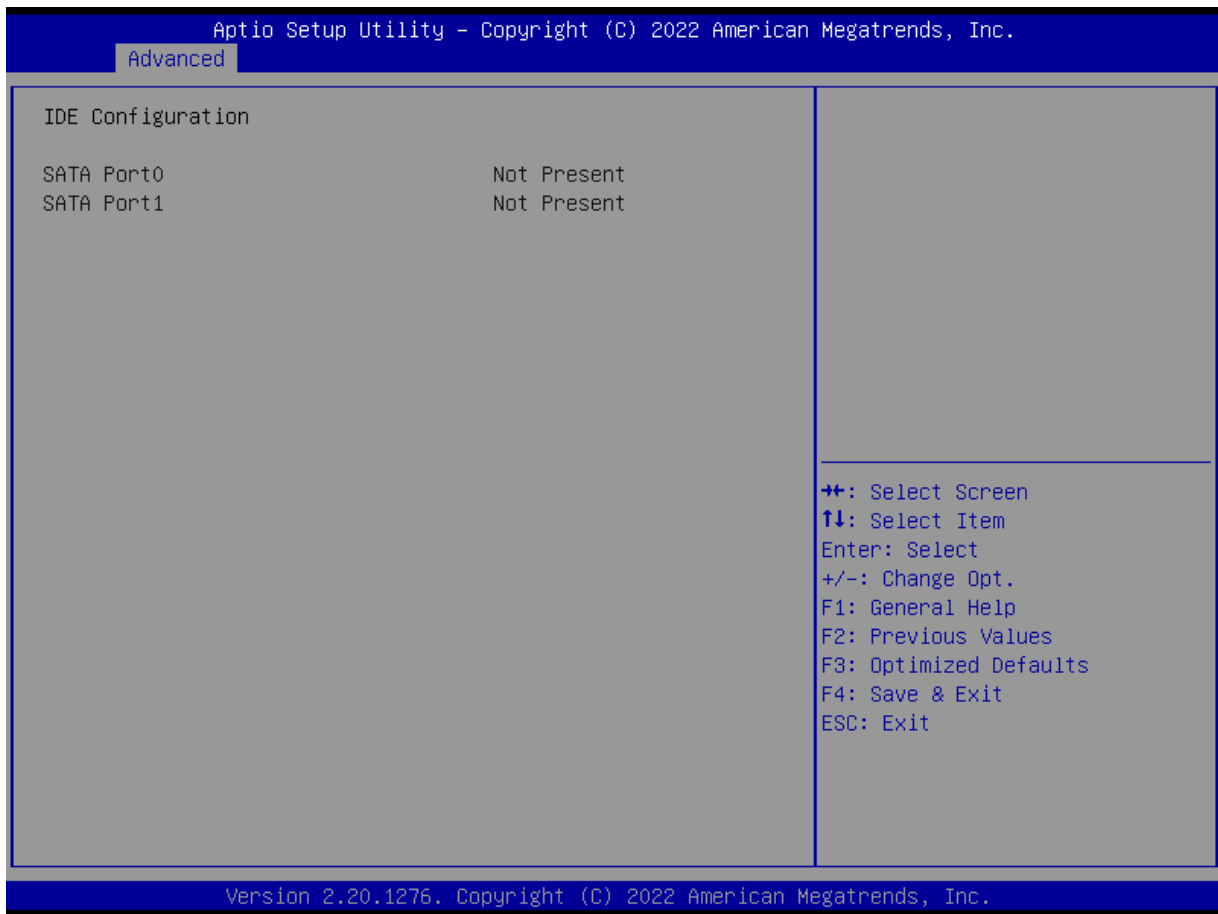
Item	Options	Description
<b>Security Device Support</b>	Enabled, Disabled <b>[Default]</b> ,	Enable/Disable BIOS support for security device. O.S. will not show Security Device.TCG EFI protocol and INT1A interface will not be available.
<b>Pending operation</b>	None <b>[Default]</b> , TPM Clear	Schedule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

### 4.3.2 ACPI Settings



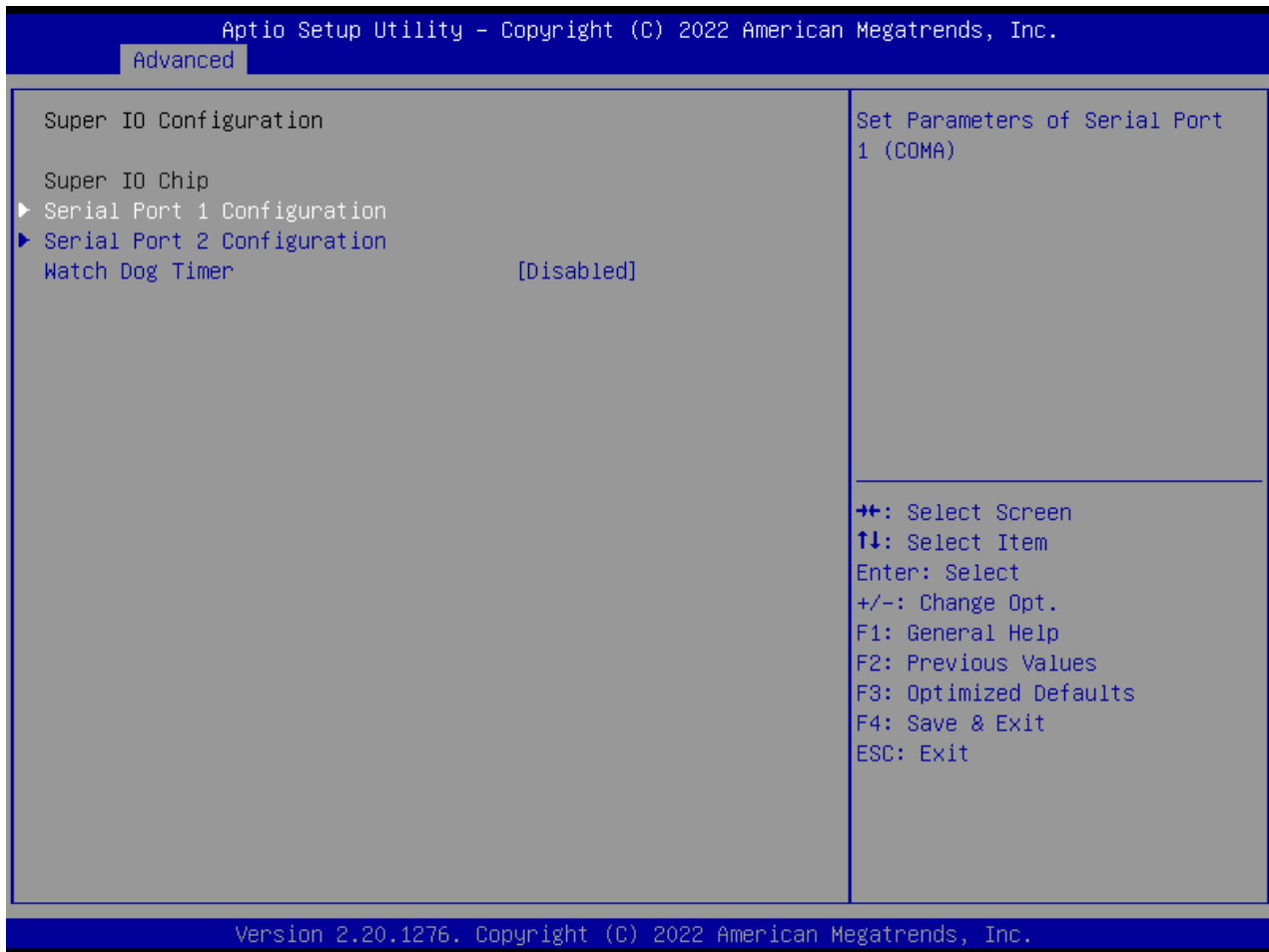
Item	Options	Description
<b>Enable Hibernation</b>	Disabled , Enabled[ <b>Default</b> ],	Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may not be effective with some operating systems.
<b>ACPI Sleep State</b>	Suspend Disabled, S3 (Suspend to RAM)[ <b>Default</b> ]	Select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

### 4.3.3 IDE Configuration



### 4.3.4 Super IO Configuration

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

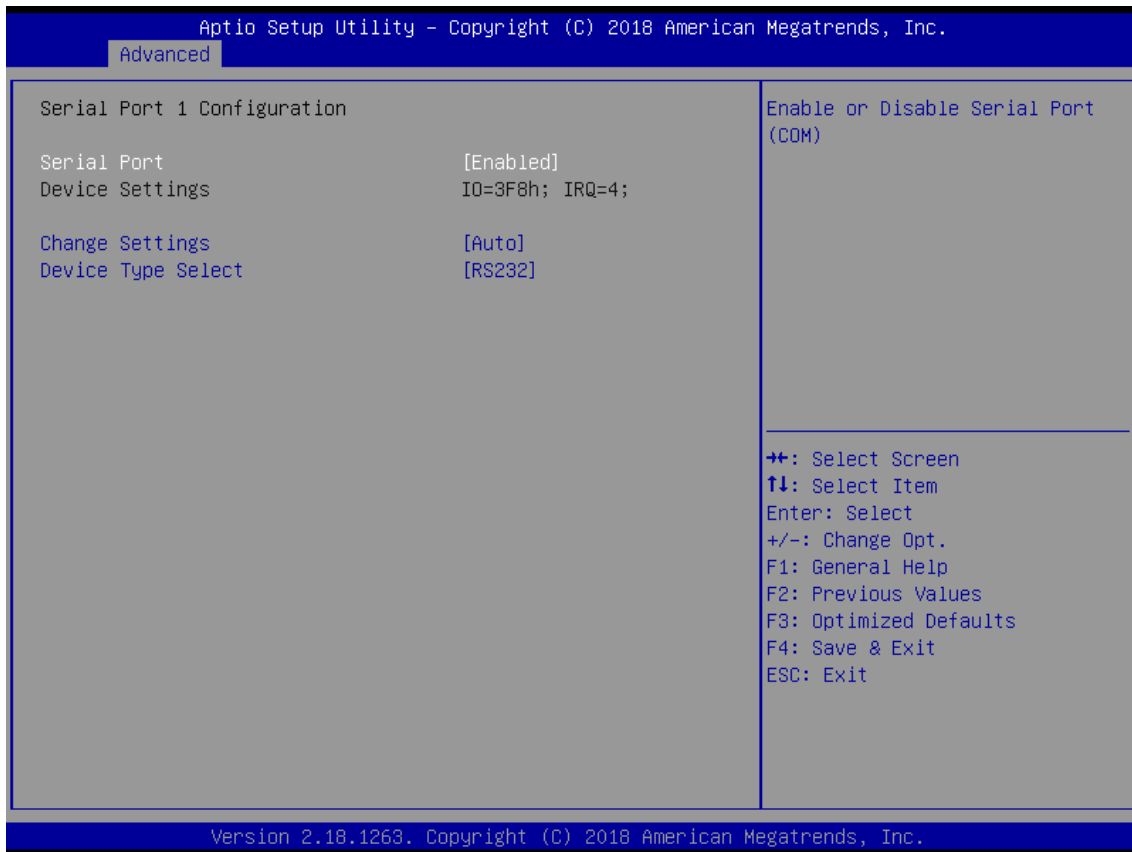


Item	Description
Serial Port 1 Configuration	Set Parameters of Serial Port 1 (COMA).
Serial Port 2 Configuration	Set Parameters of Serial Port 2 (COMB).

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.

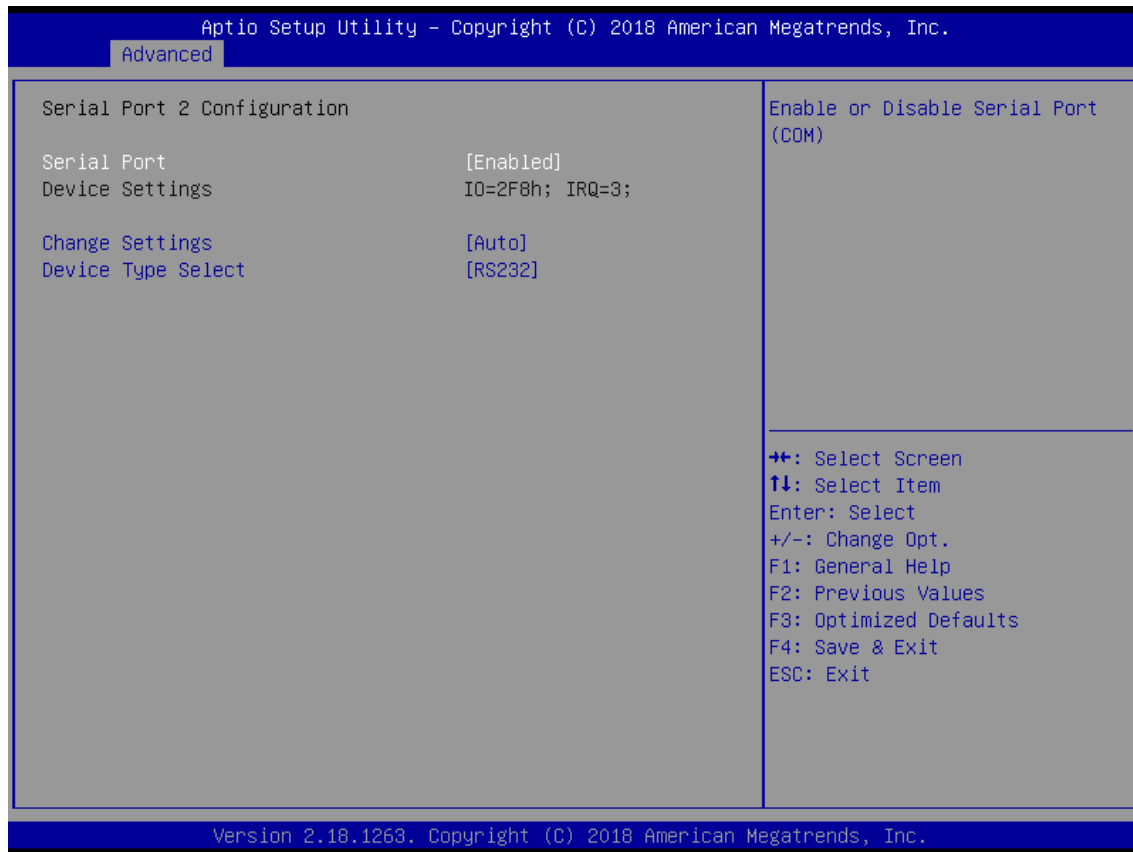


**Serial Port 1 Configuration**



Item	Options	Description
<b>Serial Port</b>	Disabled, Enabled[Default]	Enable or Disable Serial Port (COM).
<b>Change Settings</b>	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.
<b>Device Type Select</b>	UART 232[Default], UART 422, UART 485	Set the Serial Port to RS232 & RS422 & RS485
<b>RS-485 Auto Flow Function</b>	Disabled, Enabled[Default]	Enabled/Disabled RS485 Autoflow Function

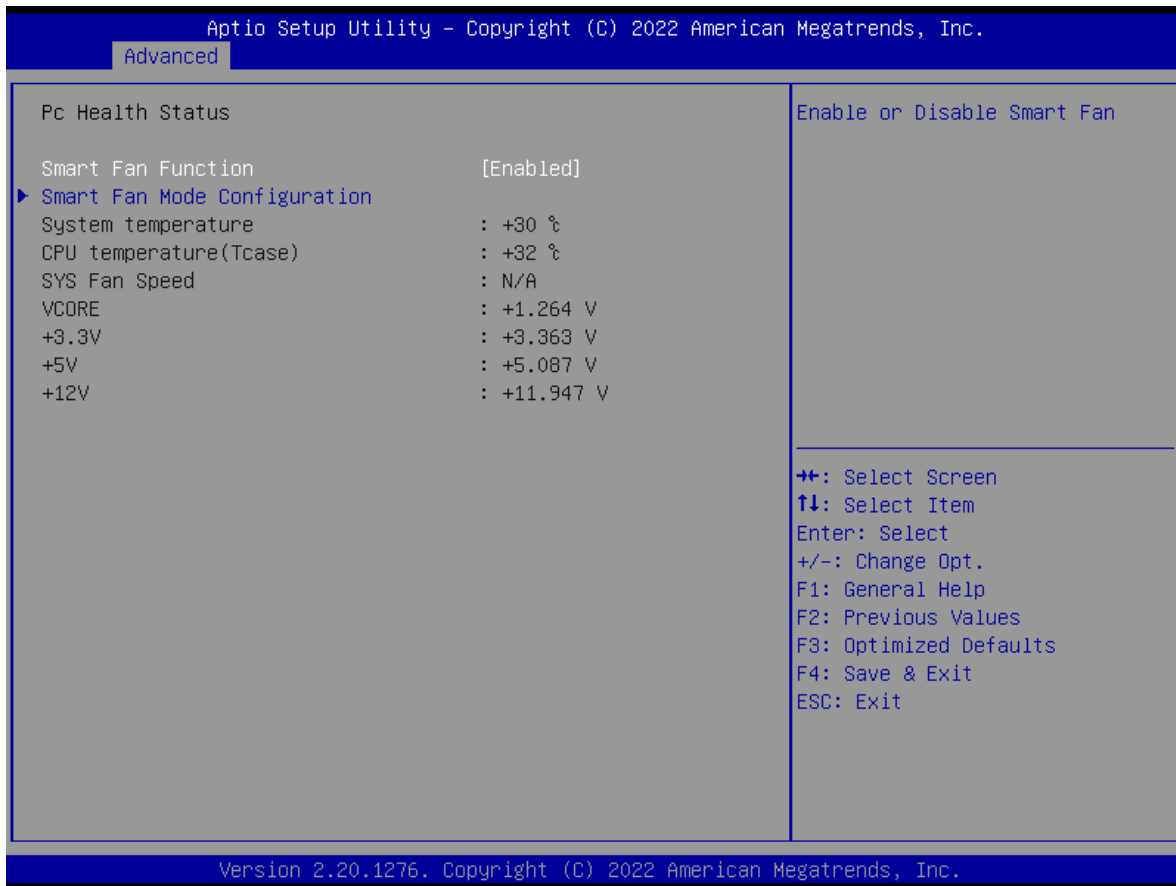
**Serial Port 2 Configuration**



Item	Options	Description
<b>Serial Port</b>	Disabled, Enabled[ <b>Default</b> ]	Enable or Disable Serial Port (COM).
<b>Change Settings</b>	Auto[ <b>Default</b> ], 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.
<b>Device Type Select</b>	UART 232[ <b>Default</b> ], UART 422, UART 485	Set the Serial Port to RS232 & RS422 & RS485
<b>RS-485 Auto Flow Function</b>	Disabled, Enabled[ <b>Default</b> ]	Enabled/Disabled RS485 Autoflow Function

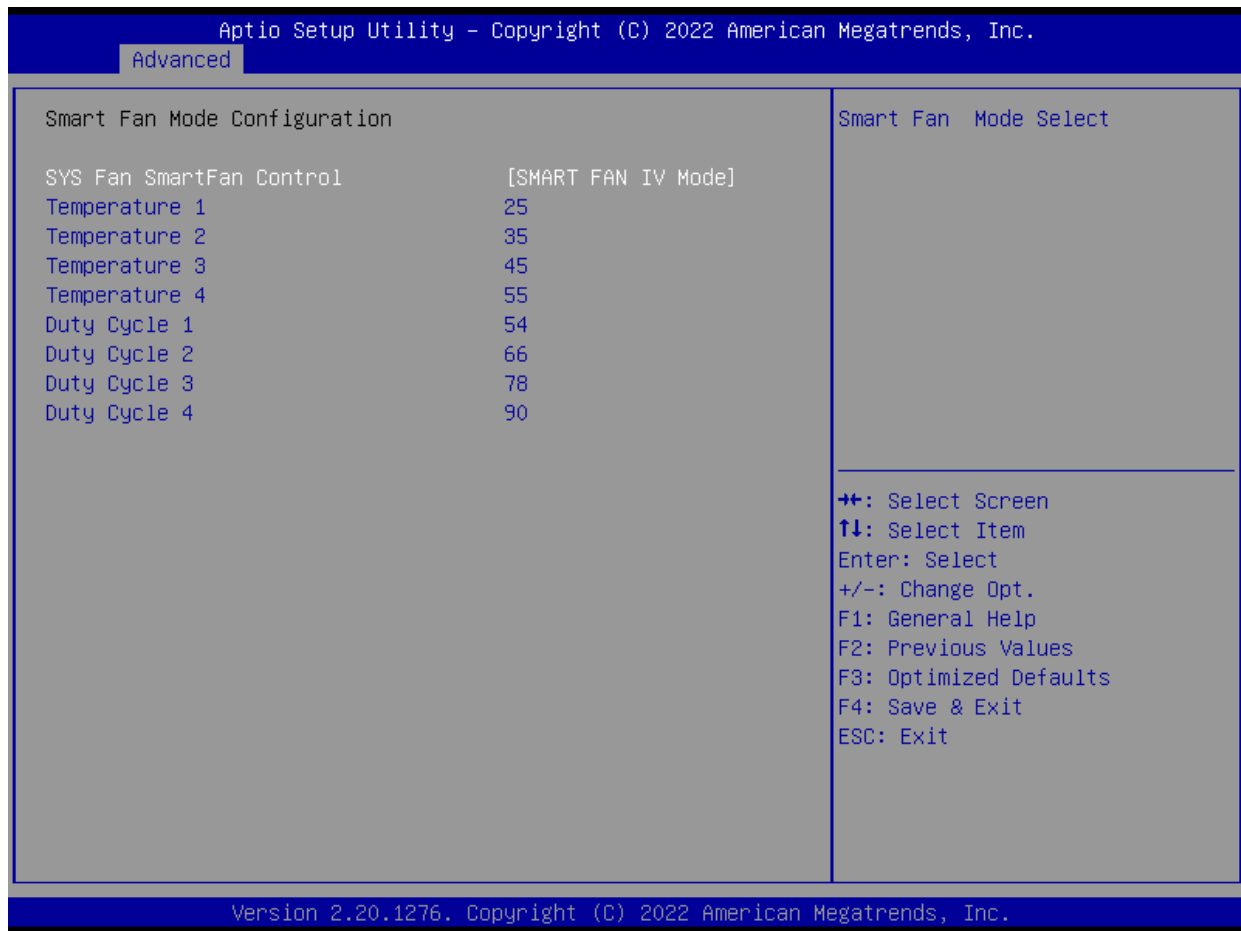
### 4.3.5 Hardware Monitor

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



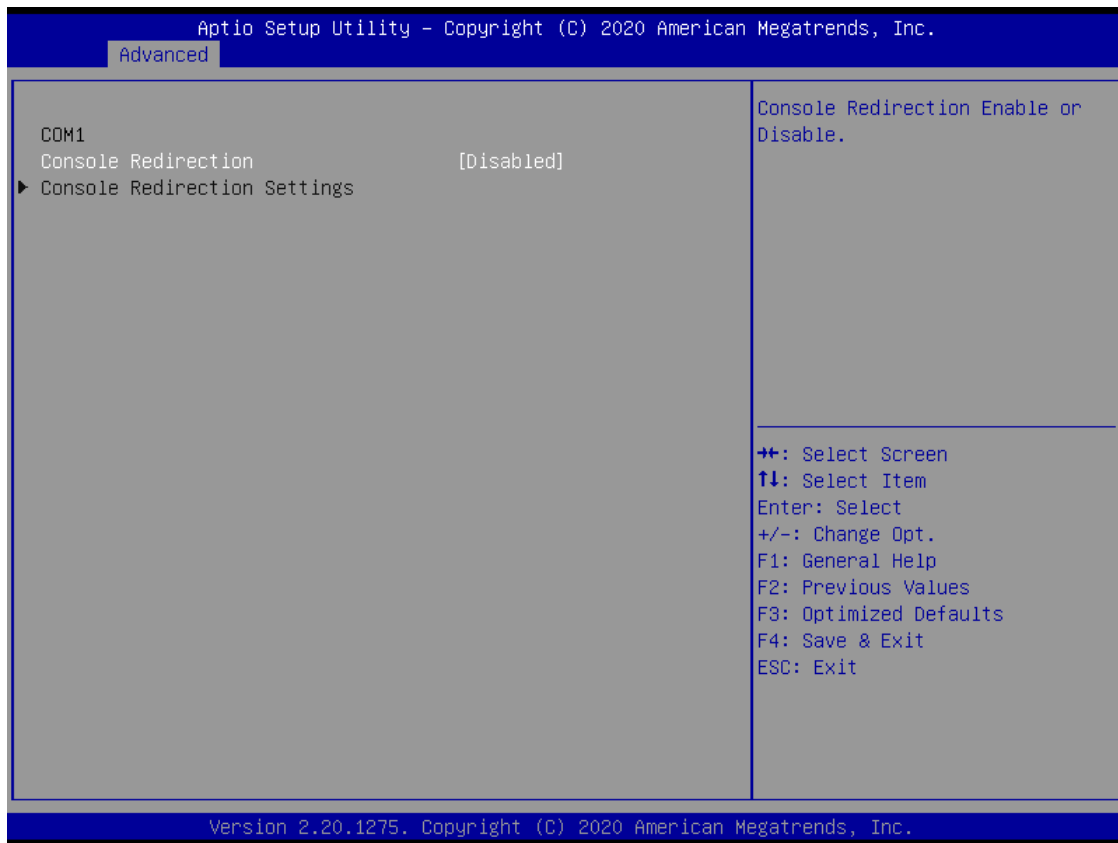
Item	Options	Description
Smart Fan Function	Disabled[Default], Enabled	Enabled or Disable Smart Fan

**Smart Fan Mode Configuration**



Item	Options	Description
<b>SYS Fan SmartFan Control</b>	Manual Mode, Thermal Cruise Mode, SMART FAN IV Mode[ <b>Default</b> ],	Smart Fan Mode Select
<b>Temperature 1~4</b>	1~100	Auto fan speed control. SMART FAN IV
<b>Duty Cycle 1~4</b>	1~100	Auto fan speed control. SMART FAN IV

### 4.3.6 Serial Port Console Redirection



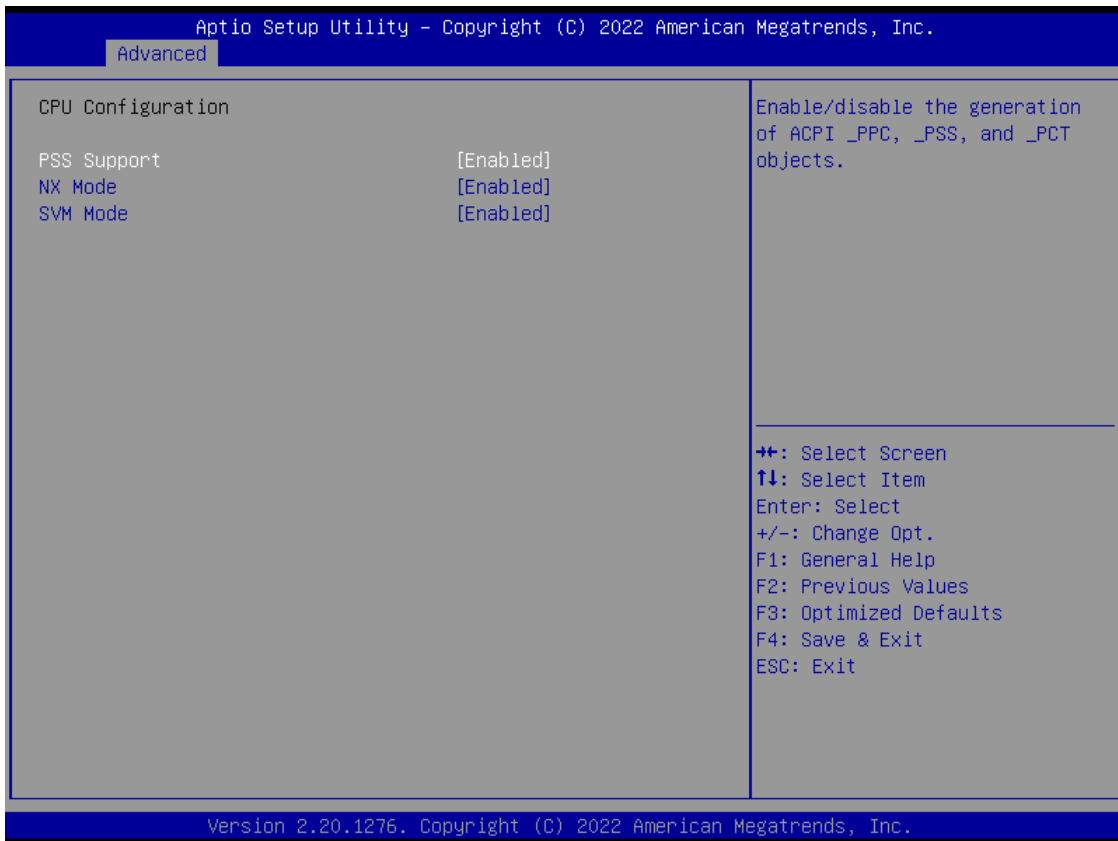
Item	Options	Description
<b>Console Redirection</b>	Disabled[ <b>Default</b> ], Enabled	These items allows you to enable or disable COM1 console redirection

## Console Redirection Settings



Item	Options	Description
<b>Terminal Type</b>	VT100 VT100+, VT-UTF8, ANSI [Default],	Emulation: ANSI: Extended ASCII char set. VT100: ASCII char set. VT100+: Extends VT100 to support color, function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.
<b>Bits per second</b>	9600, 19200, 38400, 57600, 115200[Default],	Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.
<b>Data Bits</b>	7, 8[Default]	Data Bits
<b>Parity</b>	None[Default], Even, Odd, Mark, Space	A parity bit can be sent with the data bits to detect some transmission errors. Even: parity bit is 0 if the num of 1's in the data bits is even. Odd: parity bit is 0 if num of 1's in the data bits is odd. Mark: parity bit is always 1. Space: Parity bit is always 0. Mark and Space Parity do not allow for error detection. They can be used as an additional data bit.
<b>Stop Bits</b>	1[Default], 2	Stop bits indicate the end of a serial data packet.
<b>Flow Control</b>	None[Default], Hardware RTS/CTS	Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a 'stop' signal can be sent to stop the data flow. Once the buffers are empty, a 'start' signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals.
<b>VT-UTF8 Combo Key Support</b>	Disabled, Enabled[Default]	Enable VT-UTF8 Combination Key Support for ANSI/VT100 terminals
<b>Recorder Mode</b>	Disabled[Default], Enabled	With this mode enabled only text will be sent. This is to capture Terminal data.
<b>Resolution 100x31</b>	Disabled[Default], Enabled	Enables or disables extended terminal resolution
<b>Putty KeyPad</b>	VT100[Default], LINUX,XTERMR6, SCO,ESCN,VT400	Select FunctionKey and KeyPad on Putty.

### 4.3.7 CPU Configuration



Item	Options	Description
<b>PSS Support</b>	Disabled, Enabled[ <b>Default</b> ]	Enable/disable the generation of ACPI _PPC, _PSS, and _PCT objects.
<b>NX Mode</b>	Disabled, Enabled[ <b>Default</b> ]	Enable/disable No-execute page protection Function
<b>SVM Mode</b>	Disabled, Enabled[ <b>Default</b> ]	Enable/disable CPU Virtualization

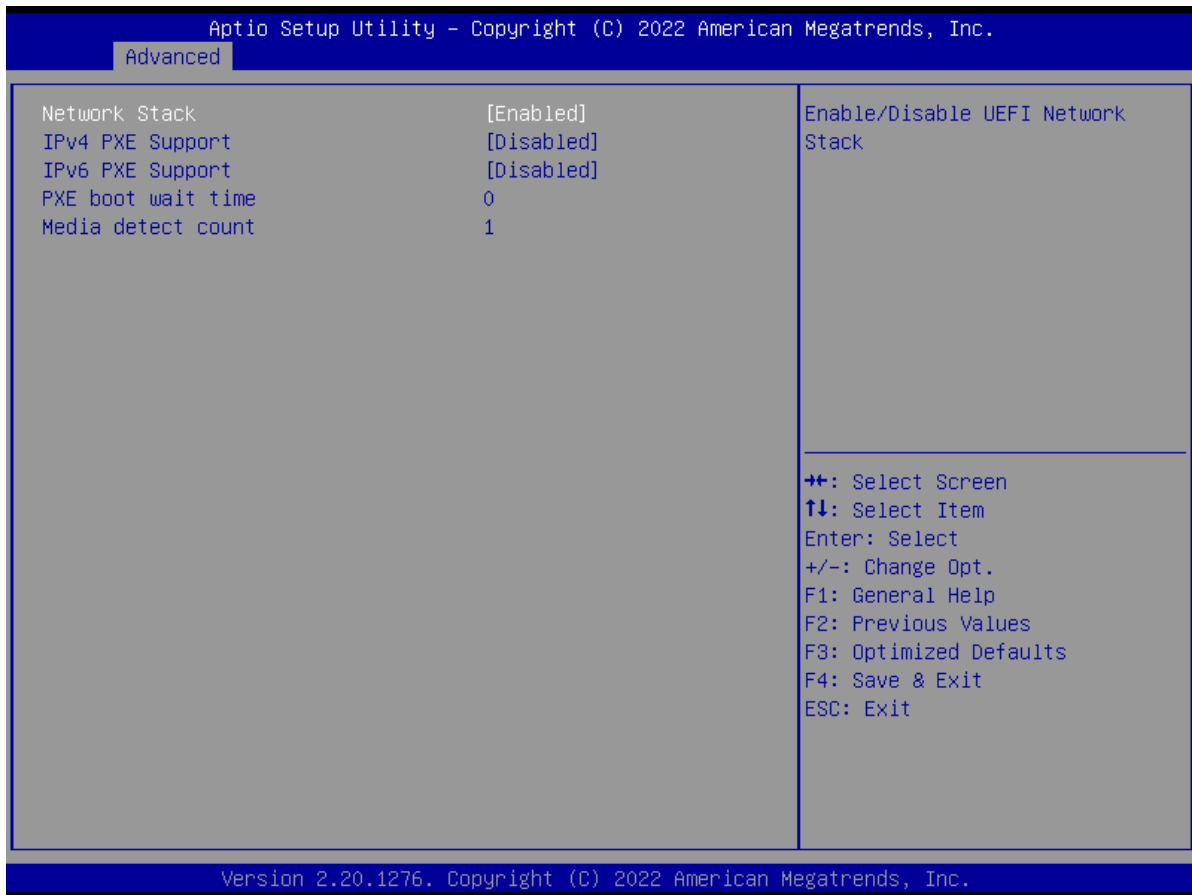
### 4.3.8 USB Configuration



Item	Options	Description
<b>Legacy USB Support</b>	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.
<b>XHCI Hand-off</b>	Enabled[Default] Disabled	This is a workaround for OSeW without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
<b>USB transfer time-out</b>	1 sec , 5 sec , 10 sec , 20 sec[Default]	The time-out value for Control, Bulk, and Interrupt transfers.
<b>Device reset time-out</b>	10 sec , 20 sec[Default] , 30 sec, 40 sec	USB mass storage device Start Unit command time-out.
<b>Device power-up delay</b>	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 from Hub descriptor.

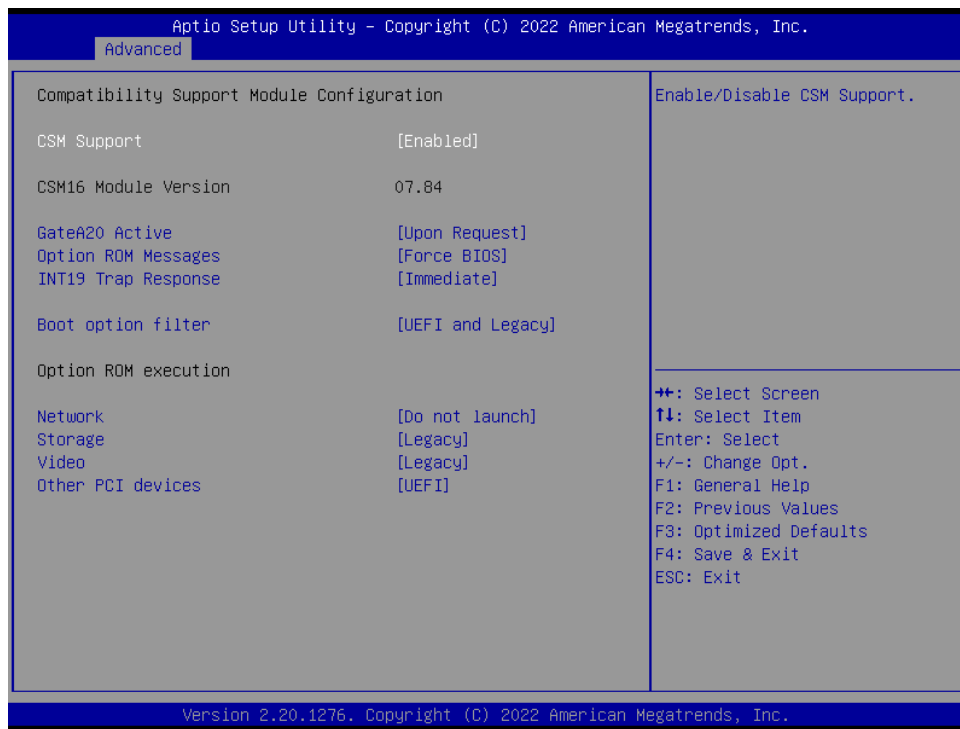


### 4.3.9 Network Stack Configuration



Item	Options	Description
<b>Network Stack</b>	Disabled[Default] , Enabled	Enable/Disable UEFI Network Stack.
<b>IPv4 PXE Support</b>	Disabled[Default] , Enabled	Enable/Disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available.
<b>IPv6 PXE Support</b>	Disabled[Default] , Enabled	Enable/Disable IPv6 HTTP boot support. If disabled, IPv6 HTTP boot support will not be available.
<b>PXE boot wait time</b>	<b>0[Default]</b>	Wait time in seconds to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the value.
<b>Media detect count</b>	<b>1[Default]</b>	Number of times the presence of media will be checked. Use either +/- or numeric keys to set the value.

### 4.3.10 CSM Configuration



Item	Options	Description
<b>CSM Support</b>	Disabled[Default] , Enabled	This item allows users to enable or disable for "CSM Support".
<b>GateA20 Active</b>	Upon Request[Default] , Always	This item allows users to set Upon Request or Always for "GateA20 Active".
<b>Option ROM Messages</b>	Force BIOS[Default] , Keep Current	Set display mode for Option ROM
<b>INT19 Trap Response</b>	Immediate[Default] , Postponed	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.
<b>Boot option filter</b>	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.
<b>Network</b>	Do not launch[Default] , UEFI, Legacy	Controls the execution of UEFI and Legacy Video OpROM.
<b>Storage</b>	Do not launch, UEFI[Default] , Legacy	Controls the execution of UEFI and Legacy Storage OpROM.
<b>Video</b>	Do not launch, UEFI, Legacy[Default]	Controls the execution of UEFI and Legacy Video OpROM
<b>Other PCI devices</b>	Do not launch, UEFI[Default] , Legacy	Determines OpROM execution policy for devices other than Network, Storage, or Video.

## 4.3.11 AMD CBS



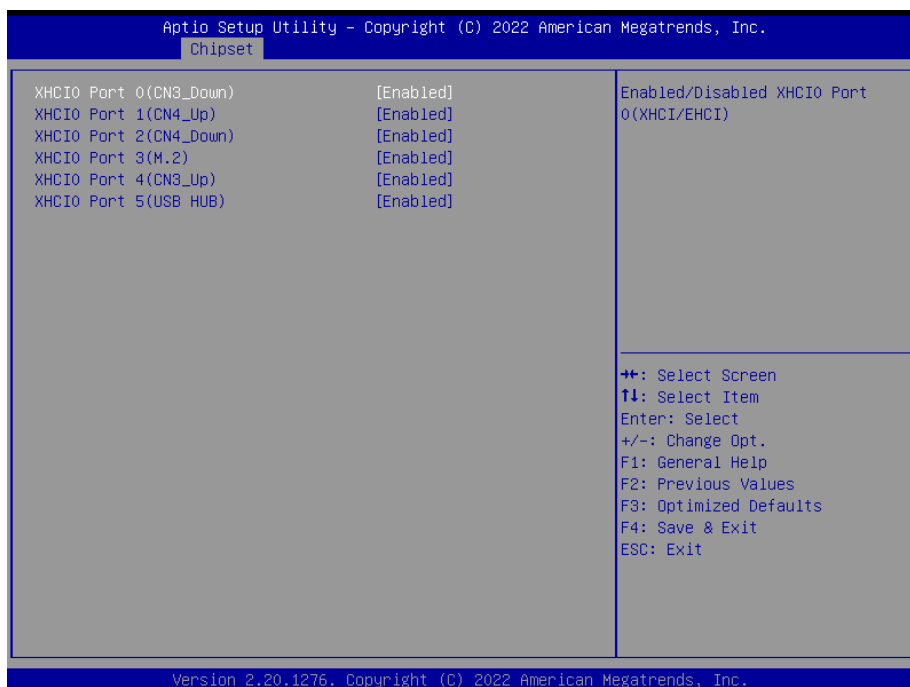
Item	Options	Description
<b>AC Loss Control</b>	Power Off[ <b>Default</b> ] , Power On, Last State	Specify what state to go to when power is re-applied after a power failure (G3 state).
<b>Hd Audio</b>	Enable Audio[ <b>Default</b> ] , Disable Audio	HD Audio Control.

## 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 reference.



### 4.4.1 SB USB Configuration

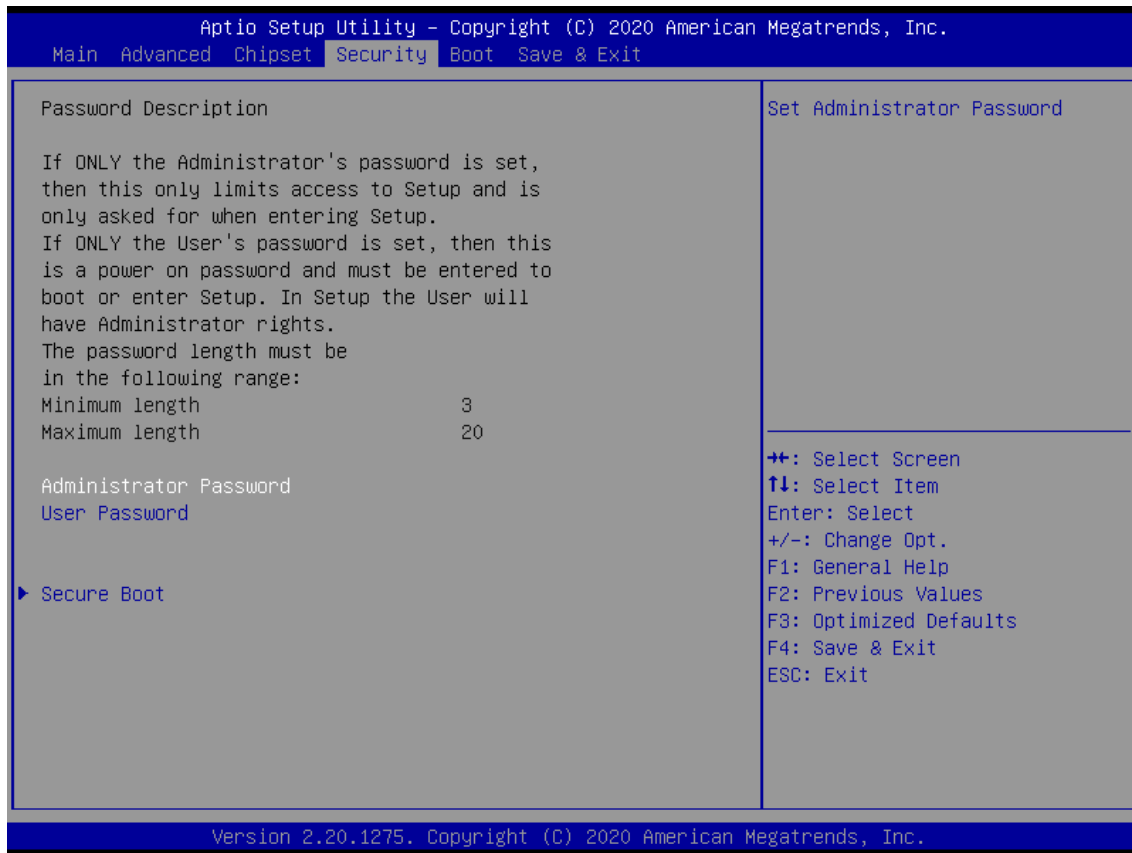


Item	Options	Description
XHCI0 Port X	Enabled[Default], Disabled	Enabled/Disabled XHCI0 Port



## 4.5 Security

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



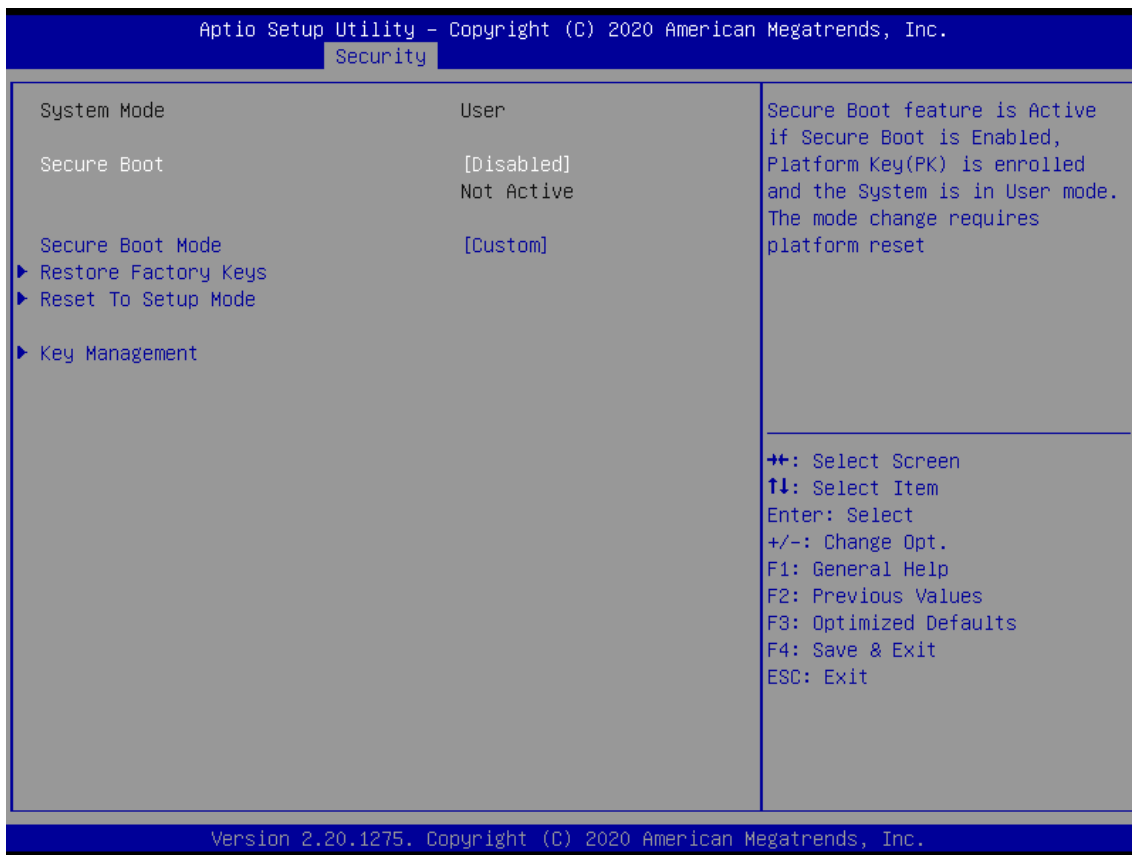
### ■ Administrator Password

This item allows you to set Administrator Password.

### ■ User Password

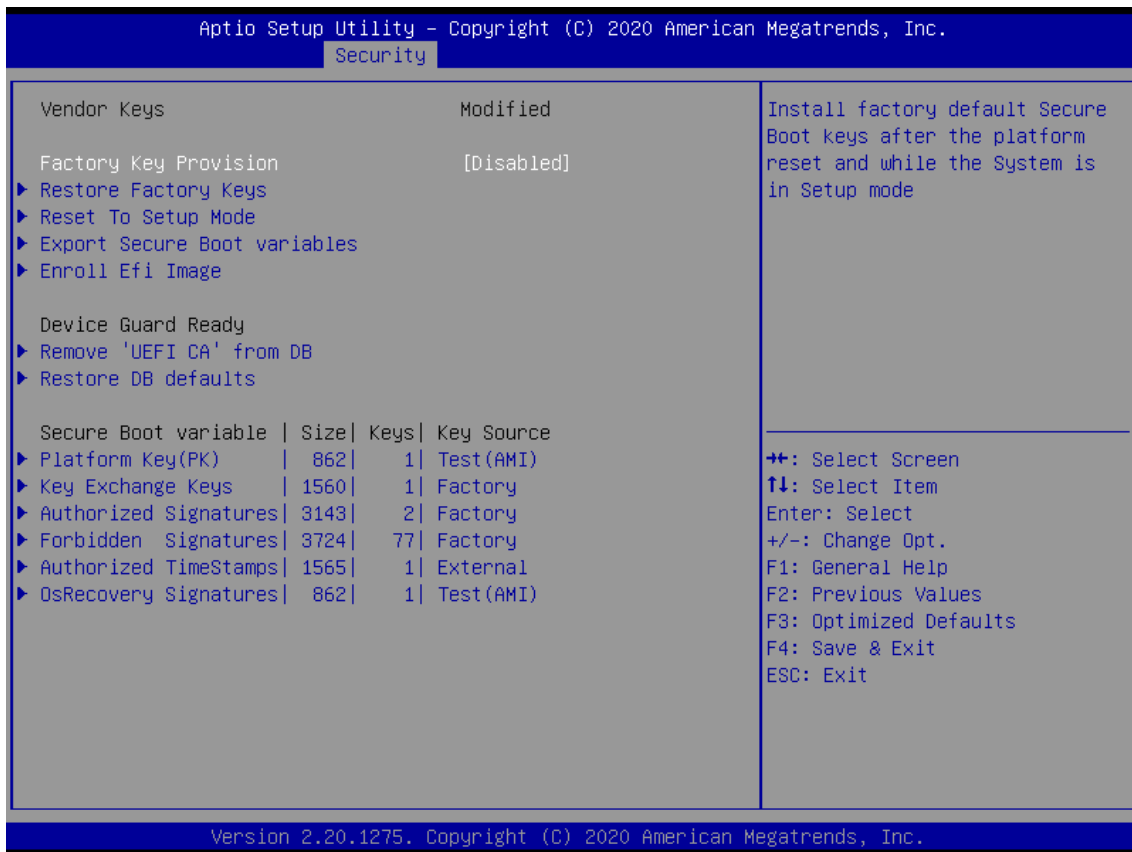
This item allows you to set User Password.

■ Security Boot



Item	Options	Description
Secure Boot	Disabled <b>[Default]</b> , 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 <b>[Default]</b>	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

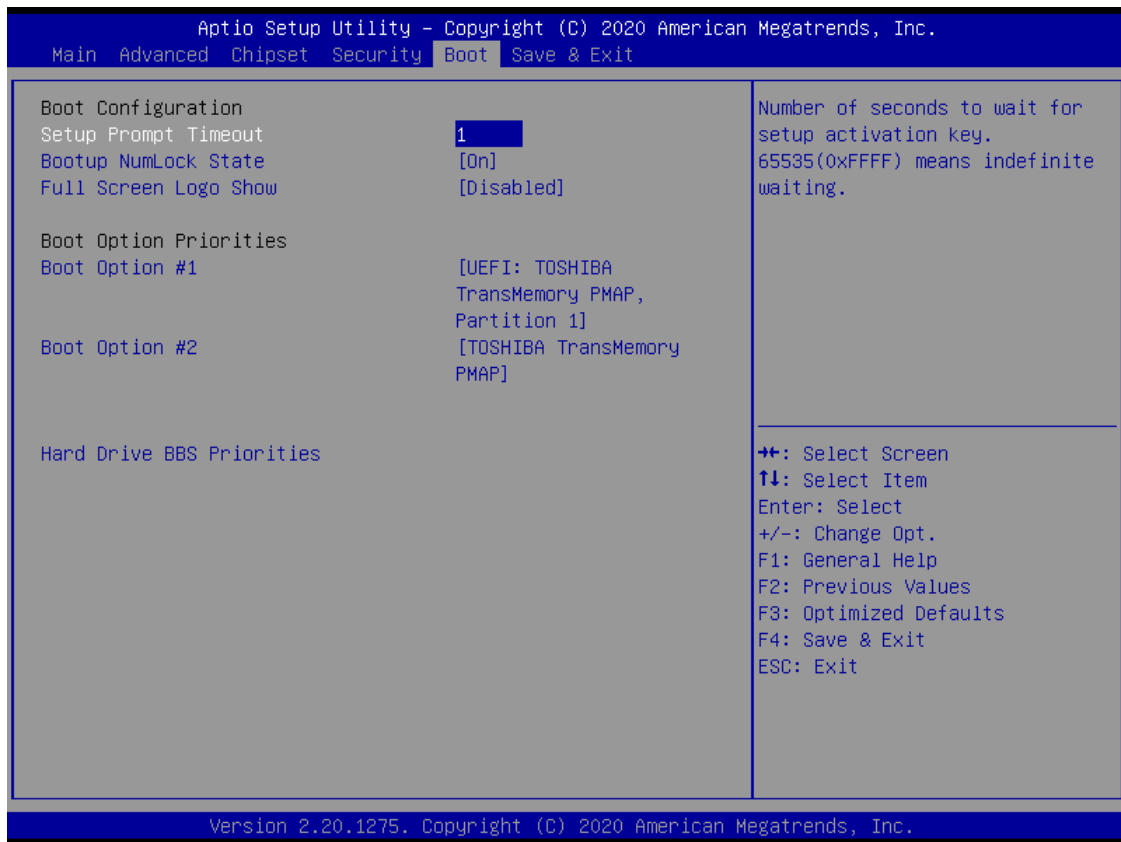


Item	Options	Description
Factory Key Provision	Disabled <b>[Default]</b> , Enabled	Install factory default Secure Boot keys after the platform reset and while the System is in Setup mode



## 4.6 Boot

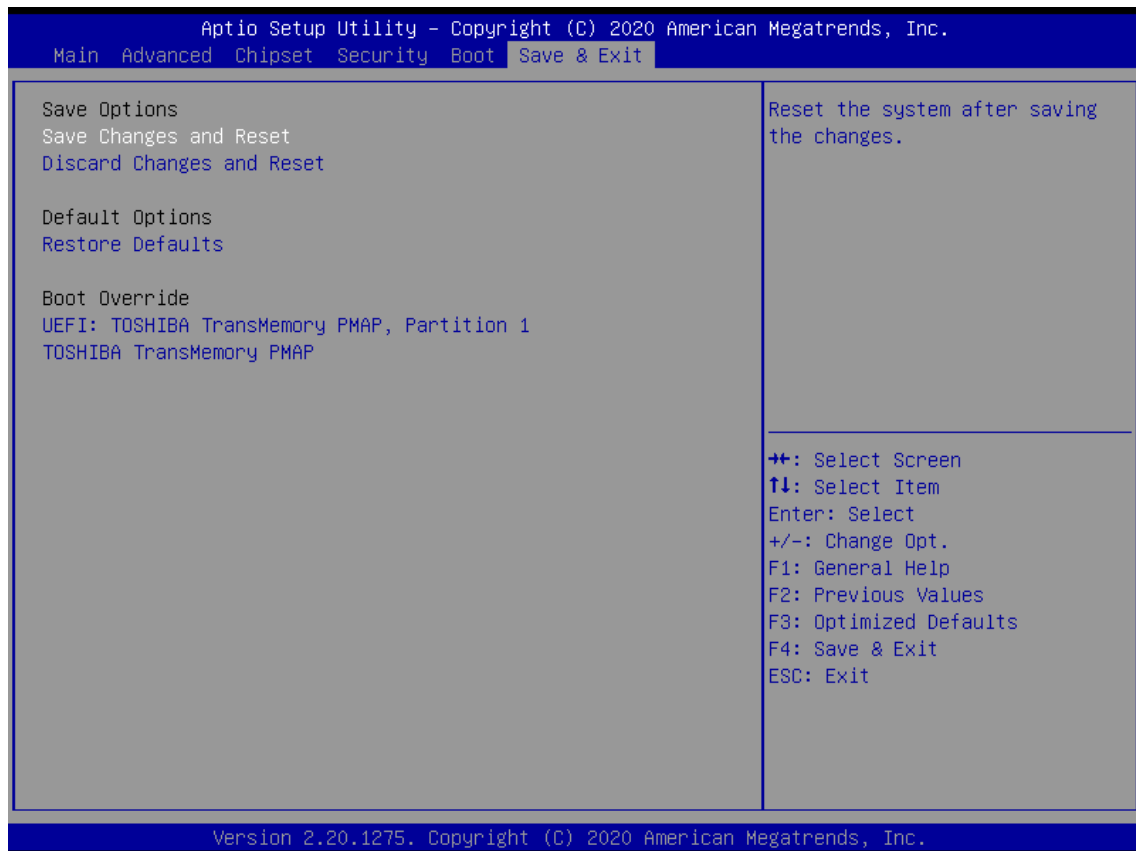
This menu allows you to setup the system boot options.



Item	Options	Description
<b>Setup Prompt Timeout</b>	1 [Default]	Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.
<b>Bootup NumLock State</b>	On [Default], Off	Select the Keyboard NumLock state.
<b>Full Screen Logo Show</b>	Disabled [Default], Enabled	Enables or disables Full Screen Logo Show option.
<b>Boot Option #1</b>		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).

## WDT Sample Code

### WDT Setting

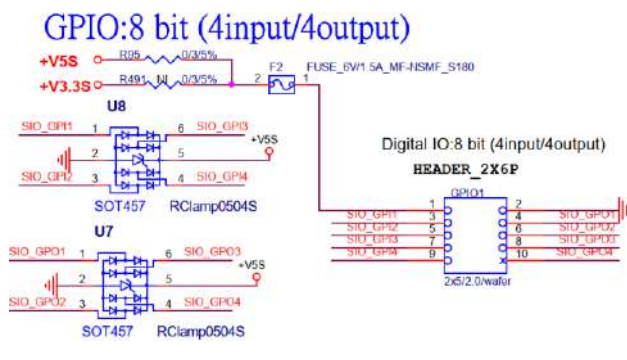
#### **Pseudo Code**

```
UINT8   WDT_TimeOut_Sec=2;           //Second value

//Set Second Number
*(volatile UINT32 *)0xFEB00000= 0x03; //Initialization WatchdogControl
  IoWrite8(0x80,0xFF);                //Delay time
  *(volatile UINT32 *)0xFEB00004= WDT_TimeOut_Sec; //Set watch dog time value(Bit15~Bit0)
  IoWrite8(0x80,0xFF);
  *(volatile UINT32 *)0xFEB00000= 0xFB; //Start watch dog
  IoWrite8(0x80,0xFF);
}
```

# GPIO Sample Code

## GPIO Setting



PIN#	GPIO#	Default Configuration
1	VCC	+V5S
2	GND	GND
3	IN1	DIO Input1
4	OUT1	DIO Output1
5	IN2	DIO Input2
6	OUT2	DIO Output2
7	IN3	DIO Input3
8	OUT3	DIO Output3
9	IN4	DIO Input4
10	OUT4	DIO Output4

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 CT-DR101 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~OUT8Value
WriteByte (AddrPort, GPIO_Port);
WriteByte (DataPort, 0x00); //set OUT1~OUT4 value, OUT1=Bit0, OUT2=Bit1
```

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
NC	NC	NC	NC	OUT4	OUT3	OUT2	OUT1

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

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

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

