C&T SOLUTION INC.

USER'S MANUAL

BCO-1000-EHL Series

Basic Fanless Embedded System

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Prefaces

Revision

Revision	Description	Date
1.0	Manual Released	2023/02/17

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 70°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-1000-EHL Series Embedded System	1
2	Wall Mount KIT	1
3	Accessory Kit	1

Ordering Information

- **BCO-1000-EHL-10 Series**

Model No.	Product Description
BCO-1000-EHL-J6413-10	Basic fanless embedded system with Intel J6413 CPU, 2x DP, 2x COM, 1x 2.5" SATA HDD Bay
BCO-1000-EHL-J6413-10A	Basic fanless embedded system with Intel J6413 CPU, 3x DP, 2x COM, DIO, 1x 2.5" SATA HDD Bay
BCO-1000-EHL-J6413-10B	Basic fanless embedded system with Intel J6413 CPU, 2x DP, 4x COM, 1x 2.5" SATA HDD Bay
BCO-1000-EHL-J6413-10U	Basic fanless embedded system with Intel J6413 CPU, 2x DP, 2x COM, 4x USB, 1x 2.5" SATA HDD Bay
BCO-1000-EHL-J6413-10H	Basic fanless embedded system with Intel J6413 CPU, 2x DP, 1x HDMI, 2x COM, DIO, 1x 2.5" SATA HDD Bay
BCO-1000-EHL-J6413-10G	Basic fanless embedded system with Intel J6413 CPU, 2x DP, 2x COM, 1x 2.5" SATA HDD Bay, Power Ignition

- **BCO-1000-EHL-20 Series**

Model No.	Product Description
BCO-1000-EHL-J6413-20C	Basic fanless embedded system with Intel J6413 CPU, 3x DP, 2x COM, DIO, 1x 2.5" SATA HDD Bay
BCO-1000-EHL-J6413-20D	Basic fanless embedded system with Intel J6413 CPU, 2x DP, 4x COM, 1x 2.5" SATA HDD Bay

- **BCO-1000-EHL-30 Series**

Model No.	Product Description
BCO-1000-EHL-J6413-30C	Basic fanless embedded system with Intel J6413 CPU, 3x DP, 2x COM, DIO, 1x 2.5" SATA HDD Bay

Optional Accessories

Model No.	Product Description
1-E09A06008	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-DINR-0004	DIN-Rail Mount Kit

Chapter 1

Product Introductions

1.1 Overview

Based on Intel® Celeron® J6413 (1.8GHz) Quad Core processor, BCO-1000-EHL series is a high variety and diversity fanless embedded system. It offers modularize expansion I/O, rich connectivity interfaces, wide range (9~36V) DC power input, and high reliability even operating in temperature extremes (0 ℃ to 50 ℃).

Featuring with completely cable-less designed, high functional, one-piece housing design, and anti-vibration, BCO-1000-EHL series are ruggedized systems that can operate in harsh environments and easy to install and maintain. A build in over voltage protection (OVP), over current protection (OCP), reserve voltage protection, and wide range DC power input makes BCO-1000-EHL series are safety system for all industrial applications.

- **BCO-1000-EHL-10**
- **BCO-1000-EHL-10A**
- **BCO-1000-EHL-10B**
- **BCO-1000-EHL-10U**
- **BCO-1000-EHL-10H**
- **BCO-1000-EHL-10G**

- **BCO-1000-EHL-20**
- **BCO-1000-EHL-20C**
- **BCO-1000-EHL-20D**

- **BCO-1000-EHL-30C**

Model No.	Rear Panel	Front Panel
BCO-1000-EHL-10		
BCO-1000-EHL-10A Expanslon Modules: 1x DP Port and 1x DIO (4in/4out, Isolated)		
BCO-1000-EHL-10B Expanslon Modules: 2x COM Ports		
BCO-1000-EHL-10U Expanslon Modules: 4x USB Ports		
BCO-1000-EHL-10H Expanslon Modules: 1x HDMI Port		
BCO-1000-EHL-10G (Power Ignition)		

Model No.	Rear Panel	Front Panel
BCO-1000-EHL-20		
BCO-1000-EHL-20C Expanslon Modules: 2x COM Ports, 1x DP Port and 1x DIO (4in/4out, Isolated)		
BCO-1000-EHL-20D Expanslon Modules: 4x COM Ports		

Model No.	Rear Panel	Front Panel
BCO-1000-EHL-30C Expanslon Modules: 4x COM Ports, 1x DP Port and 1x DIO (4in/4out, Isolated)		

1.1.1 Key Features

- Support Intel Celeron® Processor
- 1x 260-pin DDR4 SODIMM. Max. up to 32GB
- Dual Independent Display by 2x Display Port
- 2x Intel® GbE supporting Wake-on-LAN and PXE
- 1x 2.5" SATA HDD Bay, 1x mSATA,
- 1x M.2 (B Key, 2242/3042/3052, Support 4G/LTE)
- 1x Full-size mini PCIe for communication or expansion modules
- 2x RS-232/422/485, 3x USB 3.2 Gen2, 1x USB 2.0
- 9 to 36VDC Wide Range Power Input Supporting AT/ATX Mode
- Wide Operating Temperature 0˚C to 50˚C
- TPM 2.0 Supported
- Up to 4x Universal Expansion Slots
- UL Listed

1.2 Hardware Specification

System

Processor
Support Intel® EHL Processor (Up to 10W TDP)

- Intel® Celeron® Processor J6413, Quad Core, 1.5 MB Cache, 1.8 GHz

System Chipset	SoC integrated
LAN Chipset	• 1 GbE1: Intel I210 (Support Wake-on-LAN and PXE) • 2.5 GbE2: Intel I225 (Support Wake-on-LAN and PXE)
Audio Codec	Realtek ALC888S
System Memory	1x 260-Pin DDR4 2400/2667/3200MT/s SODIMM. Max. up to 32GB
Graphics	Intel® UHD Graphics
BIOS	AMI 256Mbit SPI BIOS
Watchdog	Software Programmable Supports 1~255 sec. System Reset
TPM	TPM 2.0

Display

DisplayPort	2x DisplayPort 1.4, DP++ (4096 x 2160@60Hz)
Multiple Display	Dual Display

Storage

SSD/HDD	1x Internal 2.5" SATA HDD Bay (support H=9.5 mm)
mSATA	1x mSATA (shared by 1x Mini PCI Express)
M.2	1x M.2 (B Key, 2242/3042/3052, PCIex 1 + USB 3.2 Gen2, Support 4G/LTE Module)
SIM Socket	1x External SIM socket

Operating System

Windows	Windows 10
Linux	Linux kernel

Expansion

Mini PCI Express	1x Full-size Mini PCIe
Expansion Modules	Optional: • 2-port COM module with Super I/O Chipset • 4-Port USB module with USB hub • 1-Port DP 1.4 and DIO (4 in / 4 out, Isolated) • 1-Port HDMI 2.0

I/O

COM	2x RS-232/422/485
USB	3x USB 3.2 Gen 2 (10 Gbps), 1x USB 2.0
LAN	2x RJ45 (2.5 & 1 GbE)
Audio	1x Mic-in, 1x Line-out
CAN	2x CAN 2.0 A/B 2-pin Internal header
Universal I/O Bracket	BCO-1000-EHL-10： 1x Universal I/O Bracket (By mini PCIe interface, C&T Priority Module) BCO-1000-EHL-20： 2x Universal I/O Bracket (By mini PCIe interface, C&T Priority Module) BCO-1000-EHL-30： 4x Universal I/O Bracket (By mini PCIe interface, C&T Priority Module)
Others	5x WiFi Antenna Holes 1x Power Switch, 1x AT/ATX Switch, 1x Remote Power On/Off 1x Internal CMOS Battery Cable 1x 4-PIN FAN Connector

Power	
Power Mode	AT, ATX
Power Supply Voltage	9~36VDC
Power Ignition Sensing	6-mode and Adjustable Power Ignition Management, Optional
Power Connector	3-pin Terminal Block
Power Adaptor	Optional AC/DC 12V/5A, 60W
Power Protection	OVP (Over Voltage Protection) OCP (Over Current Protection) Reverse Protection

Environment	
Operating Temp.	0°C to 50°C
Storage Temp.	-30°C to 70°C
Relative Humidity	10% to 95% (non-condensing)
Vibration	• With SSD: 5 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
Standards / Certification	UL, CE, FCC Class A

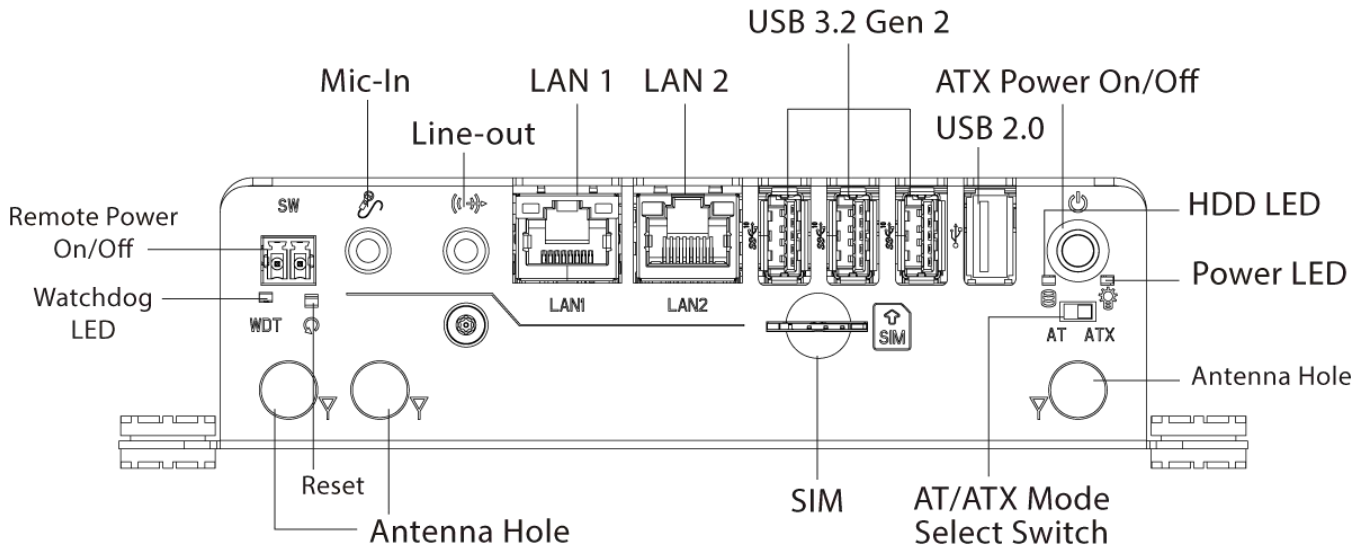
Physical	
Construction	Extruded Aluminum with Heavy Duty Metal
Dimension	• BCO-1000-EHL-10： 142 (W) x 101.2 (D) x 41.5 (H) mm • BCO-1000-EHL-20： 142 (W) x 101.2 (D) x 58 (H) mm • BCO-1000-EHL-30： 142 (W) x 101.2 (D) x 75 (H) mm
Weight	• BCO-1000-EHL-10：0.6 kg BCO-1000-EHL-20：0.7 kg • BCO-1000-EHL-30：0.74 kg
Mounting	• Wall Mounting • DIN-Rail Mounting (Optional)

1.3 System I/O

1.3.1 BCO-1000-EHL-10

Front Panel

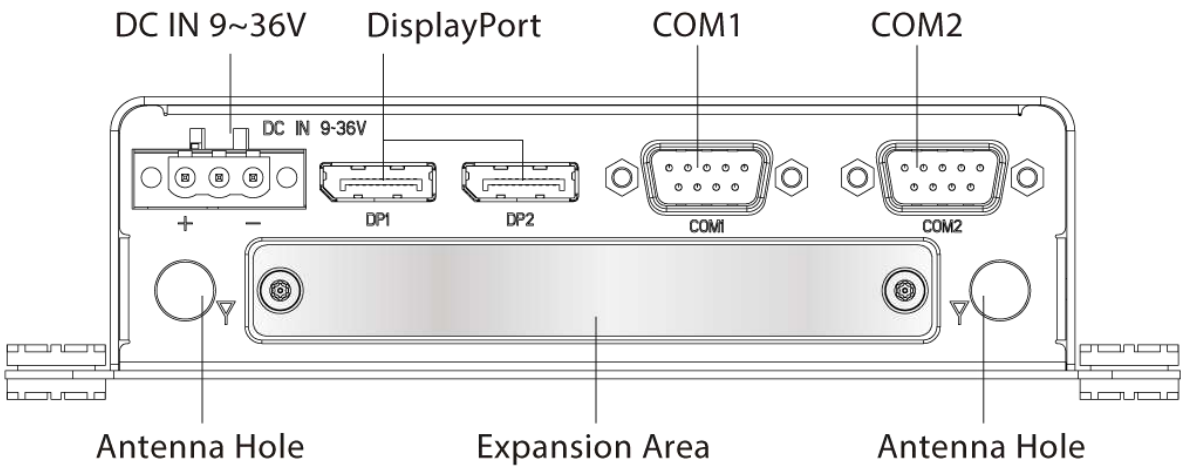
- **ATX power on/off switch**
  Press to power-on or power-off the system
- **AT/ATX mode select switch**
  Used to select AT or ATX power mode
- **Power LED**
  Indicates the power status of the system
- **HDD LED**
  Indicates the status of the hard drive
- **Wachdog LED**
  Indicates the watchdog status of the system
- **USB 3.2 Gen 2**
  Used to connect USB 3.2 device
- **USB 2.0 port**
  Used to connect USB 2.0 device
- **SIM card**
  Used to insert a SIM card
- **LAN port**
  Used to connect the system to a local area network
- **Line-out**
  Used to connect a speaker
- **Mic-in**
  Used to connect a microphone
- **Remote power on/off**
  Used to plug a power on/off with terminal block
- **Reset Hole**
  Used to reset the system
- **Antenna hole**
  Used to connect an antenna for optional Mini-PCIe WiFi module



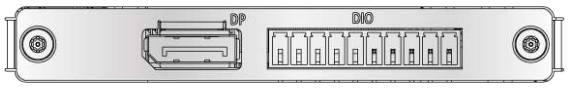
1.3.1 BCO-1000-EHL-10

Rear Panel

- **DC IN**
  Used to plug a DC power input with terminal block
- **DisplayPort**
  Used to connect a DisplayPort monitor
- **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**
  Used to customized I/O output



Available Expansion Module Options for Rear Panel



- 1x DP Port and 1x DIO (4 in / 4 out, Isolated)

- 1x HDMI Port

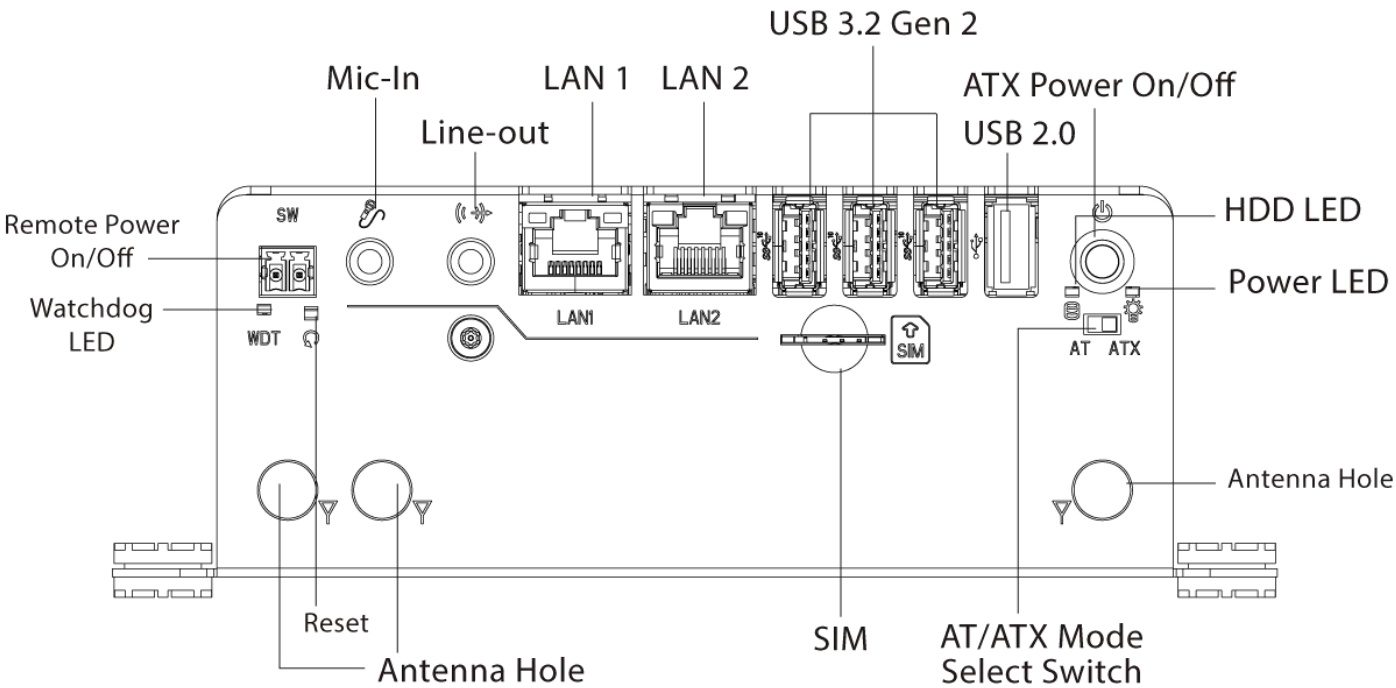
- 4x USB Ports

- 2x COM Ports

1.3.2 BCO-1000-EHL-20

Front Panel

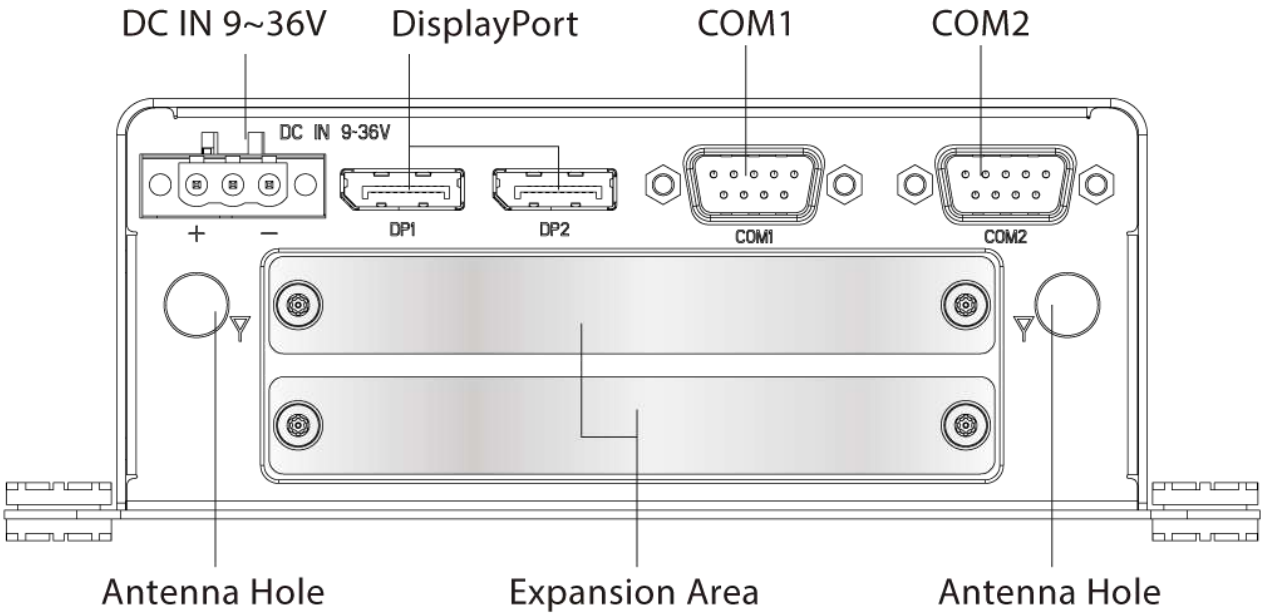
- **ATX power on/off switch**
  Press to power-on or power-off the system
- **AT/ATX mode select switch**
  Used to select AT or ATX power mode
- **Power LED**
  Indicates the power status of the system
- **HDD LED**
  Indicates the status of the hard drive
- **Wachdog LED**
  Indicates the watchdog status of the system
- **USB 3.2 Gen 2**
  Used to connect USB 3.2 device
- **USB 2.0 port**
  Used to connect USB 2.0 device
- **SIM card**
  Used to insert a SIM card
- **LAN port**
  Used to connect the system to a local area network
- **Line-out**
  Used to connect a speaker
- **Mic-in**
  Used to connect a microphone
- **Remote power on/off**
  Used to plug a power on/off with terminal block
- **Reset Hole**
  Used to reset the system
- **Antenna hole**
  Used to connect an antenna for optional Mini-PCIe WiFi module



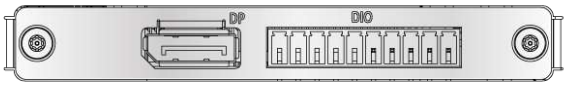
1.3.2 BCO-1000-EHL-20

Rear Panel

- **DC IN**
  Used to plug a DC power input with terminal block
- **DisplayPort**
  Used to connect a DisplayPort monitor
- **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**
  Used to customized I/O output



Available Expansion Module Options for Rear Panel



- 1x DP Port and 1x DIO (4 in / 4 out, Isolated)
  (Support 1x Universal Slot Only)

- 1x HDMI Port
  (Support 1x Universal Slot Only)

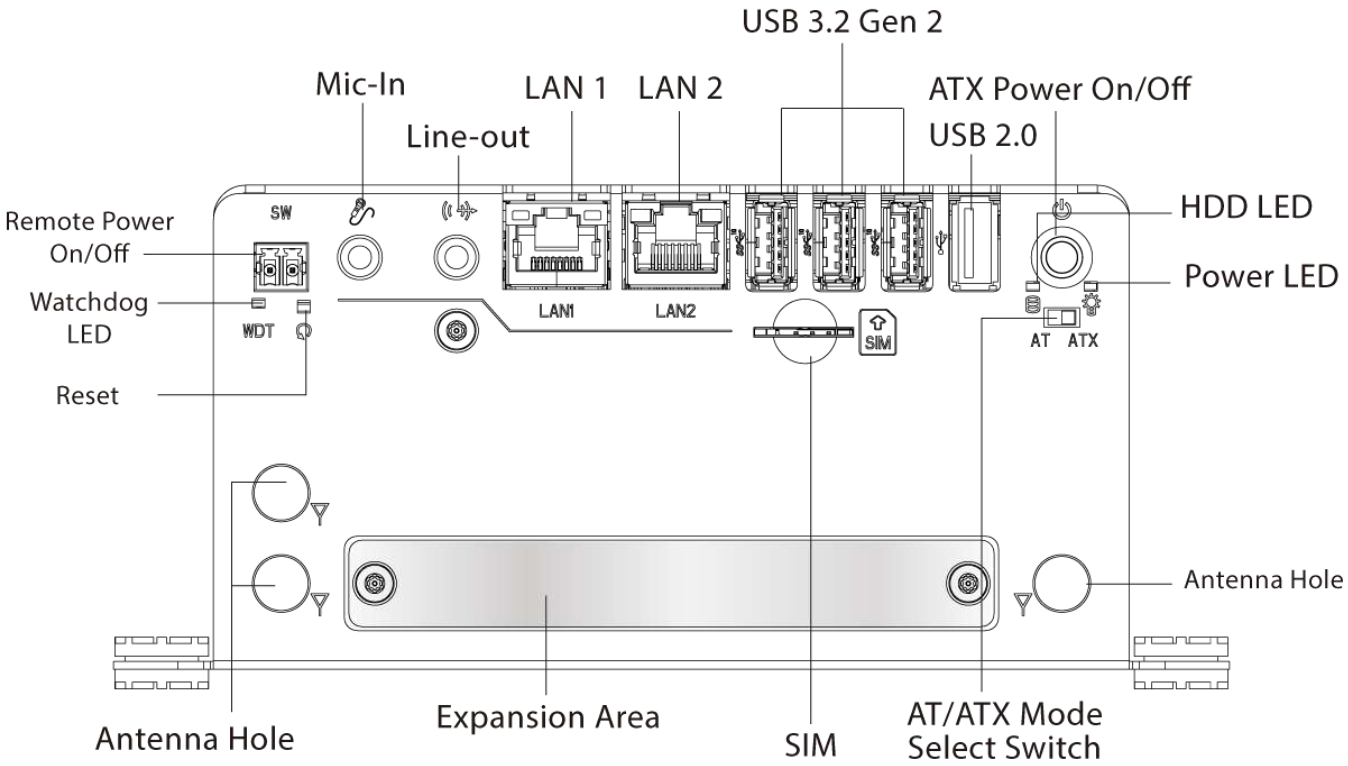
- 4x USB Ports
  (Support 1x Universal Slot Only)

- 2x COM Ports
  (Support 2x Universal Slot Only)

1.3.3 BCO-1000-EHL-30

Front Panel

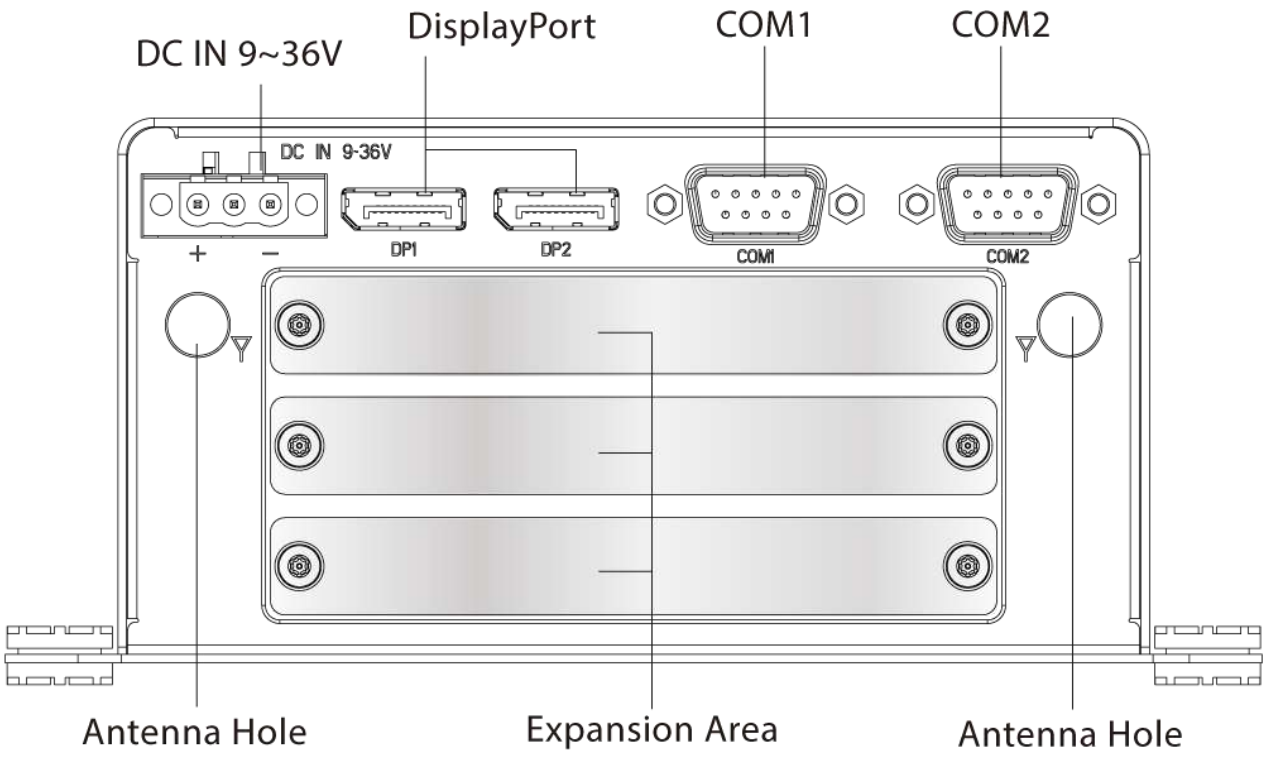
- **ATX power on/off switch**
  Press to power-on or power-off the system
- **AT/ATX mode select switch**
  Used to select AT or ATX power mode
- **Power LED**
  Indicates the power status of the system
- **HDD LED**
  Indicates the status of the hard drive
- **Wachdog LED**
  Indicates the watchdog status of the system
- **USB 3.2 Gen 2**
  Used to connect USB 3.2 device
- **USB 2.0 port**
  Used to connect USB 2.0 device
- **SIM card**
  Used to insert a SIM card
- **LAN port**
  Used to connect the system to a local area network
- **Line-out**
  Used to connect a speaker
- **Mic-in**
  Used to connect a microphone
- **Remote power on/off**
  Used to plug a power on/off with terminal block
- **Reset Hole**
  Used to reset the system
- **Antenna hole**
  Used to connect an antenna for optional Mini-PCIe WiFi module



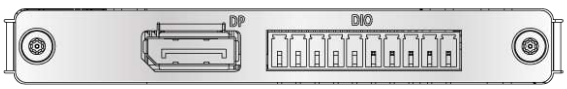
1.3.3 BCO-1000-EHL-30

Rear Panel

- **DC IN**
  Used to plug a DC power input with terminal block
- **DisplayPort**
  Used to connect a DisplayPort monitor
- **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**
  Used to customized I/O output

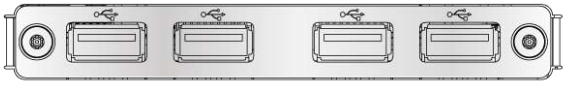


Available Expansion Module Options for Rear Panel



- 1x DP Port and 1x DIO (4 in / 4 out, Isolated)
  (Support 1x Universal Slot Only)

- 1x HDMI Port
  (Support 1x Universal Slot Only)



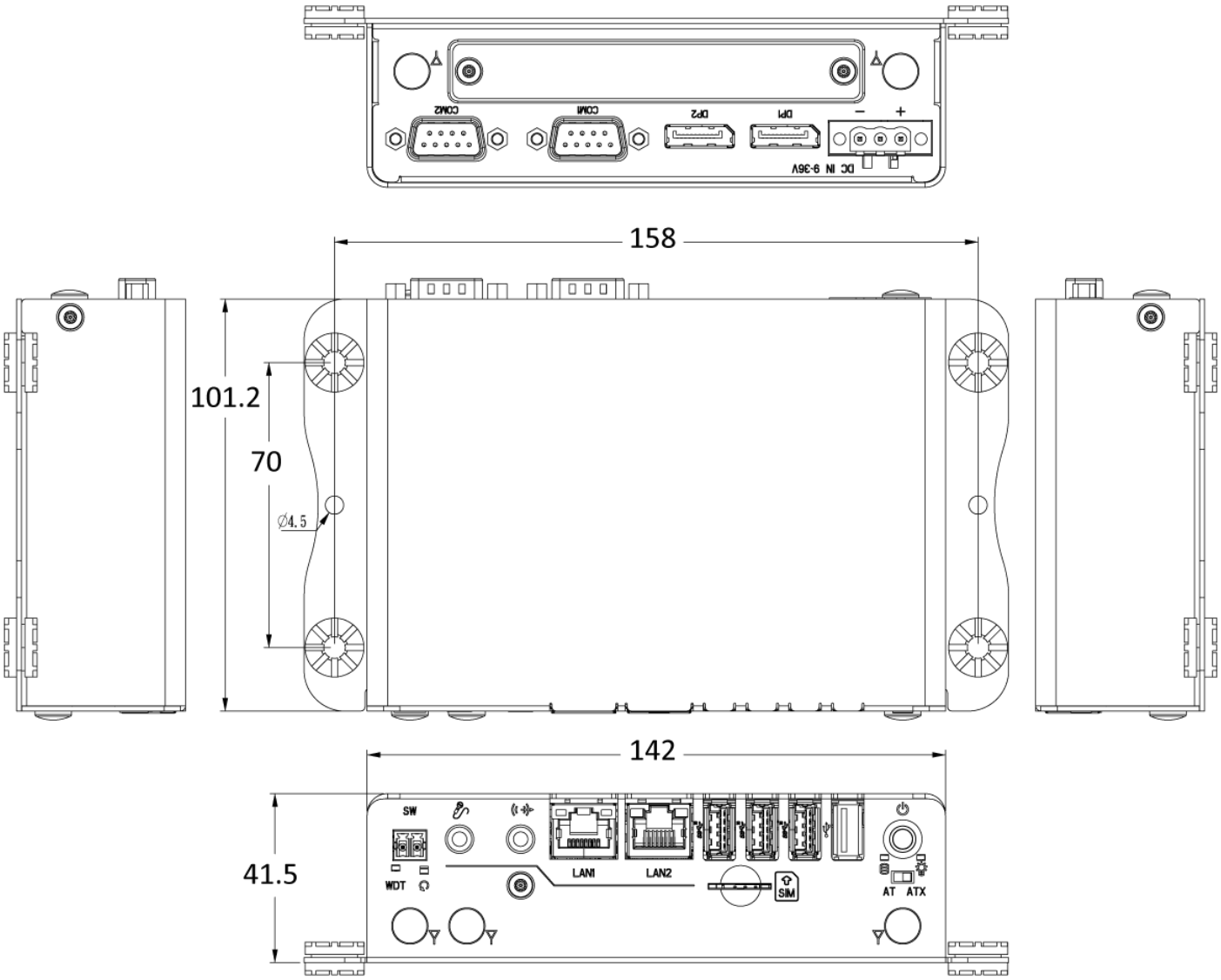
- 4x USB Ports
  (Support 1x Universal Slot Only)

- 2x COM Ports
  (Support 2x Universal Slot Only)

1.4 Mechanical Dimensions

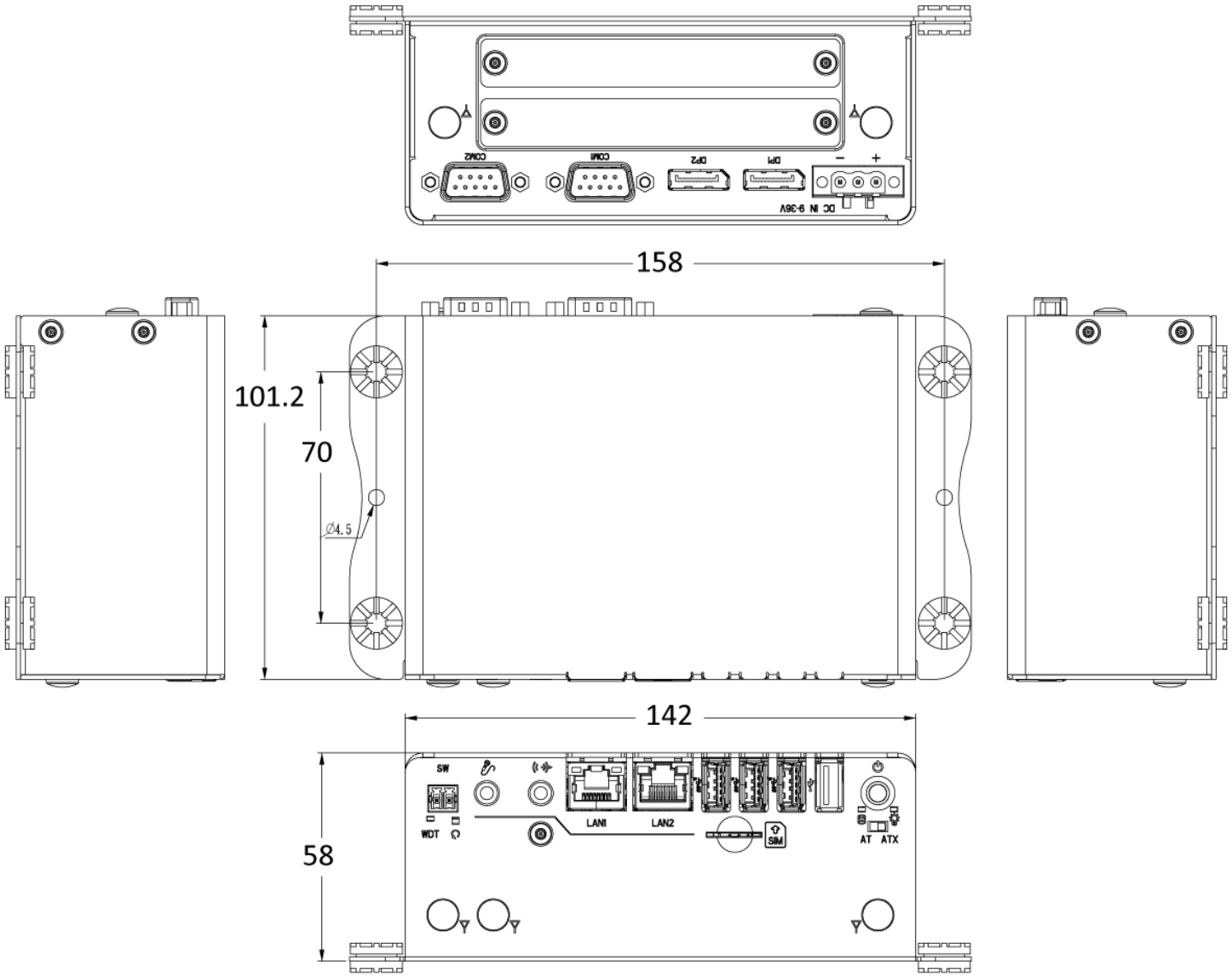
1.4.1 BCO-1000-EHL-10

Unit: mm



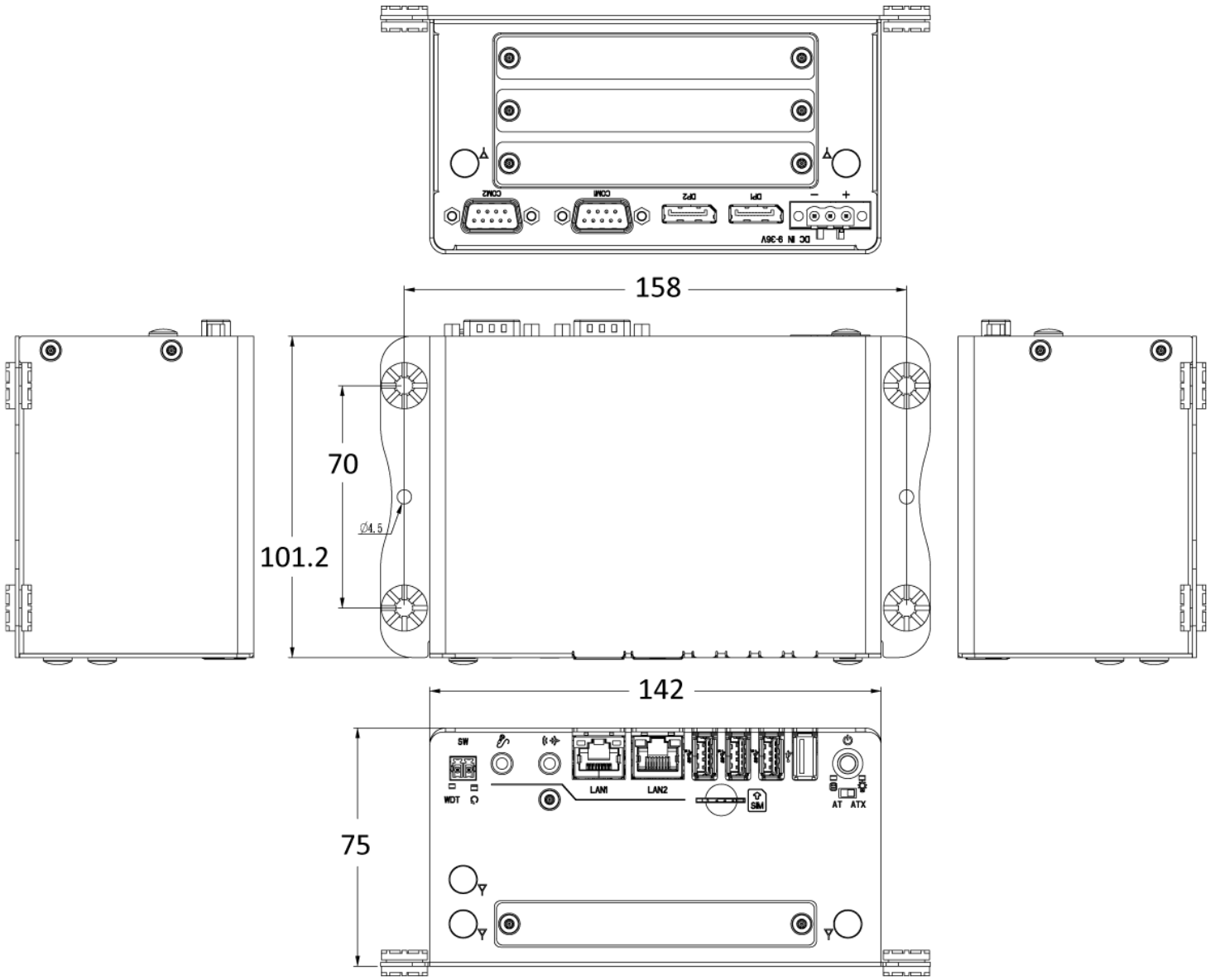
1.4.2 BCO-1000-EHL-20

Unit: mm



1.4.3 BCO-1000-EHL-30

Unit: mm

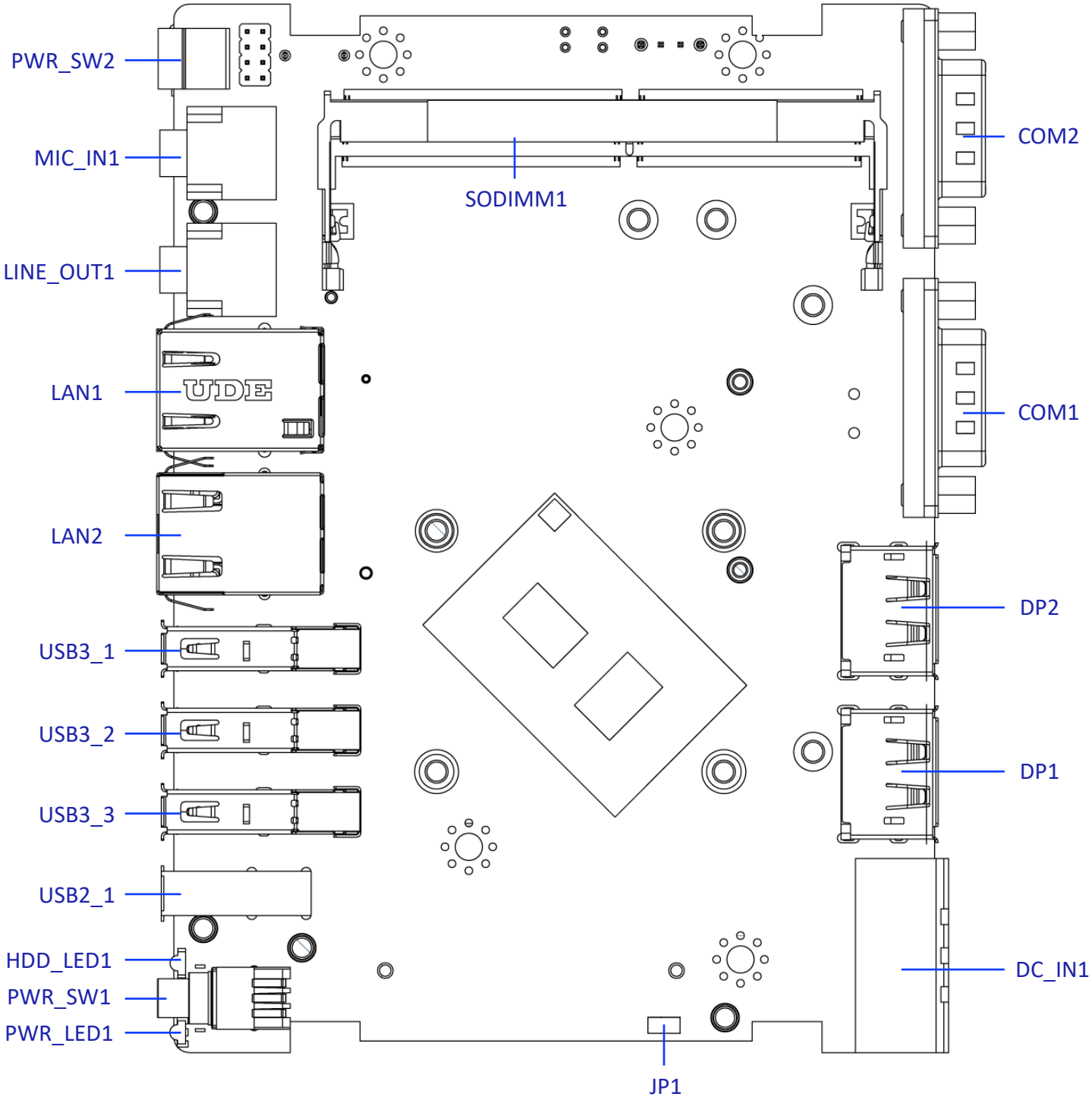


Chapter 2

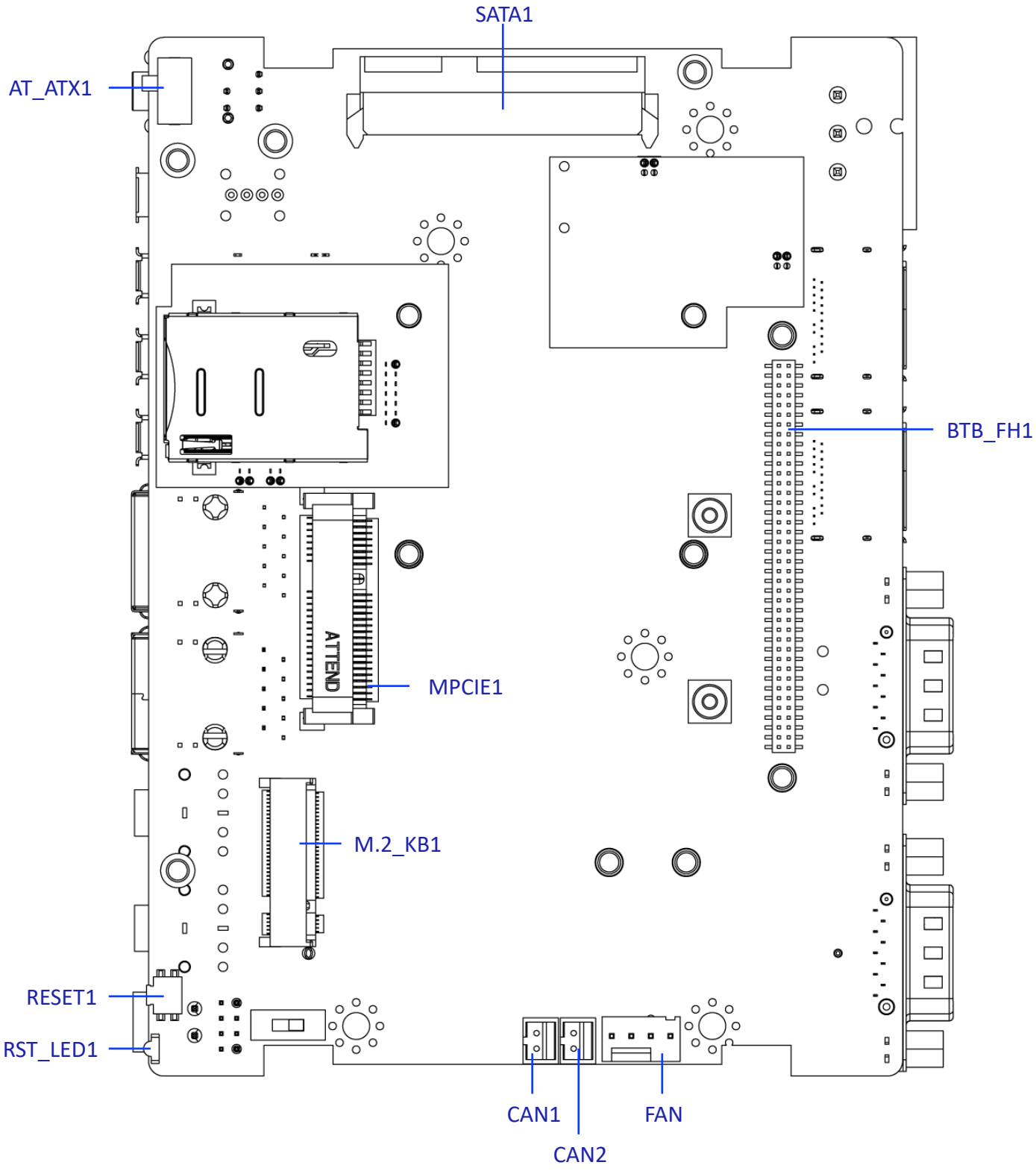
Switches and Connectors

2.1 Switch and Connector Locations

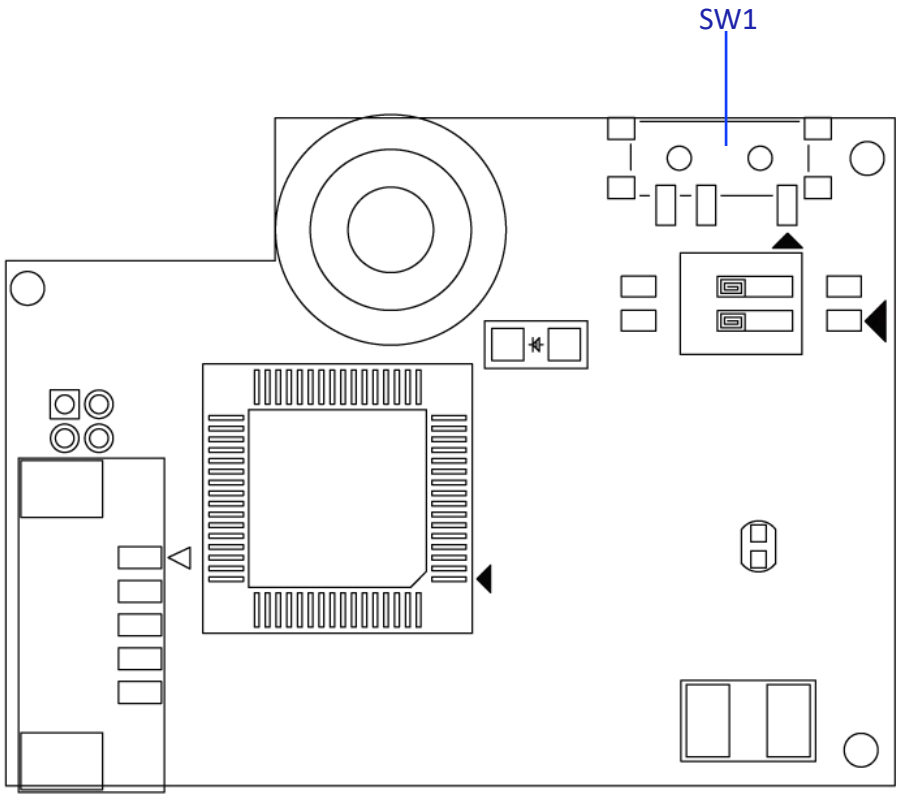
2.1.1 Top View



2.1.2 Bottom View



2.1.3 Daughter board view



2.2 Connector / Switch Definition

List of Connector / Switch

Connector Location	Definition
DC_IN1	3-pin DC +9~36V Power Input Connector
PWR_SW1	Power Switch
PWR_SW2	Remote Power Switch
DP1 - 2	Display Port
COM1 - 2	RS232 / RS422 / RS485 Connector
USB2_1	USB2.0 Port
USB3_1 - 3	USB 3.2 Gen 2 Port
LAN1	1G bit/s LAN Port
LAN2	2.5G bit/s LAN Port
MIC_IN1	Mic-in Jack
LINE_OUT1	LINE-OUT Jack
PWR_LED1	Power LED Status
HDD_LED1	HDD Access LED Status
AT_ATX1	AT / ATX Power Mode Switch
SATA1	SATA with Power Connector
FAN	Smart FAN Connector
CAN1 - 2	CAN Bus Connector
MPCIE1	Mini PCI-Express Socket
M.2_KB1	M.2 B-Key Socket
RESET1	Reset Switch
RST_LED1	Reset LED Status
SIM1, SIM2	SIM Card Socket
DIO1	4DI/DO Connector
CN1 - 2	RS232 / RS422 / RS485 Connector
SW1	PC mode / CAR mode select

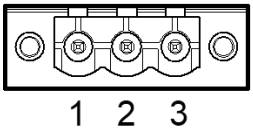
2.3 Switches Definitions

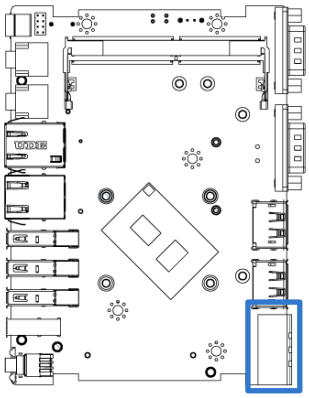
2.3.1 DC Power Input Connector (+9~36V)

DC_IN1

Connector Type: Terminal Block 1X3 3-pin, 5.0mm pitch

Switch	Definition
1	9~36 VIN
3	GND

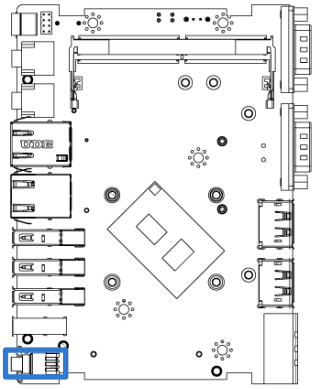




2.3.2 Power Button

PWR_SW1

Pin	Definition	Pin	Definition
1	NC	4	GND
2	Power Button	5	NC
3	NC	6	GND

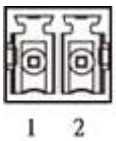


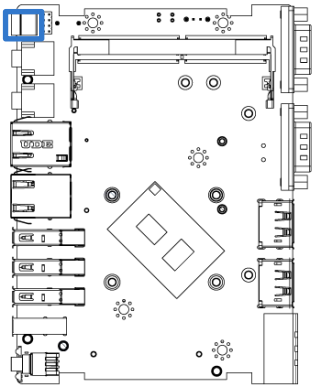
2.3.3 Remote Power Switch

PWR_SW2

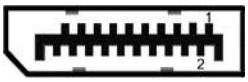
Connector Type: Terminal Block 1X2 2-pin, 3.5mm pitch

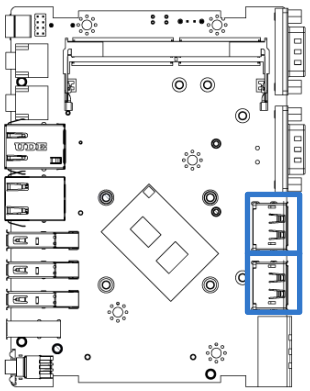
Pin	Definition
1	Power Button
2	GND





2.3.4 DisplayPort Connector

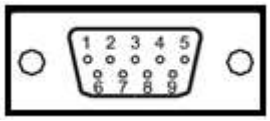


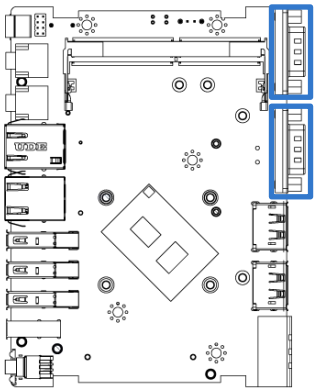


DP1-2

Pin	Definition	Pin	Definition
1	DP_LANE0_P	11	GND
2	GND	12	DP_LANE3_N
3	DP_LANE0_N	13	GND
4	DP_LANE1_P	14	GND
5	GND	15	DP_AUX_P
6	DP_LANE1_N	16	GND
7	DP_LANE2_P	17	DP_AUX_N
8	GND	18	DP_HPD
9	DP_LANE2_N	19	GND
10	DP_LANE3_P	20	DP_PWR

2.3.5 RS232 / RS422 / RS485 Connector





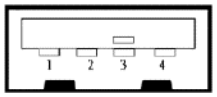
COM1-2
Connector Type: 9-pin D-Sub

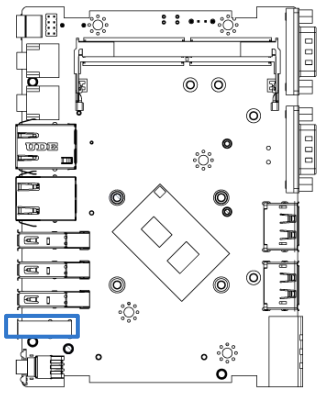
Pin	RS232 Definition	RS422 / 485 Full Duplex Definition	RS485 Half Duplex Definition
1	DCD2	TX2-	DATA2-
2	RxD2	TX2+	DATA2+
3	TxD2	RX2+	
4	DTR2	RX2-	
5	GND		
6	DSR2		
7	RTS2		
8	CTS2		
9	RI2		

2.3.6 USB2.0 Connector, Type A

USB2_1

Pin	Definition
1	+5V
2	USB2_D2-
3	USB2_D2+
4	GND

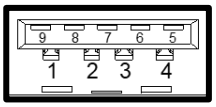


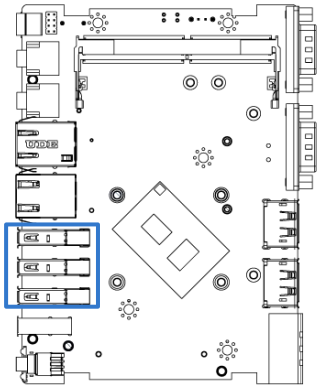


2.3.7 USB 3.2 Connector, Type A

USB3_1-3

Pin	Definition	Pin	Definition
1	+5V	6	USB3_RX+
2	USB2_DATA1-	7	GND
3	USB2_DATA1+	8	USB3_TX-
4	GND	9	USB3_TX+
5	USB3_RX-		

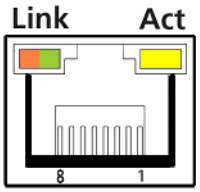


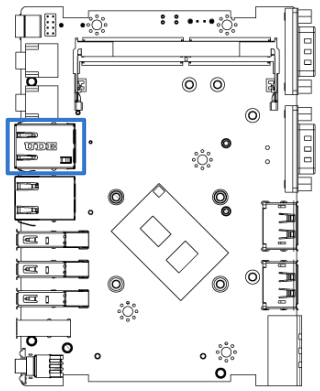


2.3.8 RJ45 with LEDs Port

LAN1

Pin	Definition	Pin	Definition
1	LAN1_MDI0P	5	LAN1_MDI2N
2	LAN1_MDI0N	6	LAN1_MDI1N
3	LAN1_MDI1P	7	LAN1_MDI3P
4	LAN1_MDI2P	8	LAN1_MDI3N

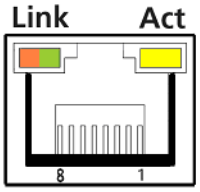


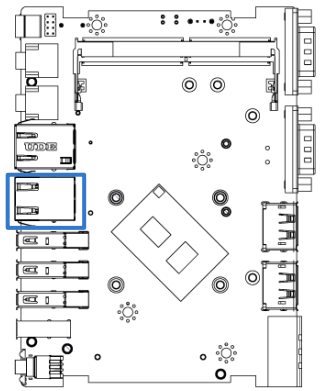


Link LED Status	Definition	Act LED Status	Definition
Steady Orange	1Gbps Network Link	Blinking Yellow	Data Activity
Steady Green	100Mbps Network Link	Off	No Activity
Off	10Mbps Network Link		

LAN2

Pin	Definition	Pin	Definition
1	LAN1_MDI0P	5	LAN1_MDI2N
2	LAN1_MDI0N	6	LAN1_MDI1N
3	LAN1_MDI1P	7	LAN1_MDI3P
4	LAN1_MDI2P	8	LAN1_MDI3N





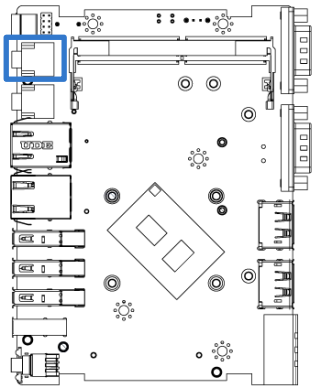
Link LED Status	Definition	Act LED Status	Definition
Steady Orange	1Gbps Network Link	Blinking Yellow	Data Activity
Steady Green	2.5Gbps Network Link	Off	No Activity
Off	10Mbps Network Link		

2.3.9 Microphone Jack (Pink)

MIC_IN1

Connector Type: 5-pin Phone Jack

Pin	Definition
1	GND
2	MIC_R
3	NC
4	GND
5	MIC_L

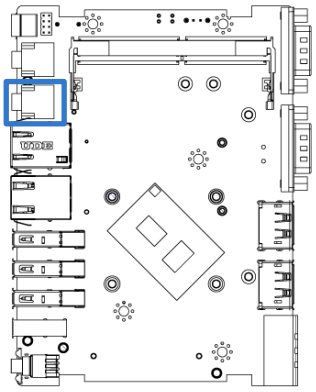


2.3.10 Line-out Jack (Green)

LINE_OUT1

Connector Type: 5-pin Phone Jack

Pin	Definition
1	GND
2	OUT_R
3	NC
4	GND
5	OUT_L



PWR_LED1: Power LED Status

Pin	Definition
1	POWER LED+
2	POWER LED-

RESET1 : Reset Button

Pin	Definition
1	RESET
2	GND

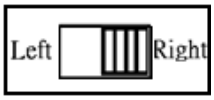
HDD_LED1: HDD Access LED Status

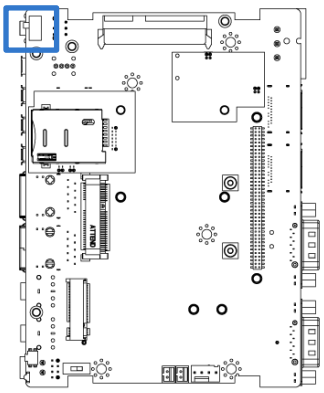
Pin	Definition
1	HDD LED+
2	HDD LED-

RST_LED1: Power LED Status

Pin	Definition
1	RST LED
2	RST LED

2.3.11 AT / ATX Power Mode Switch

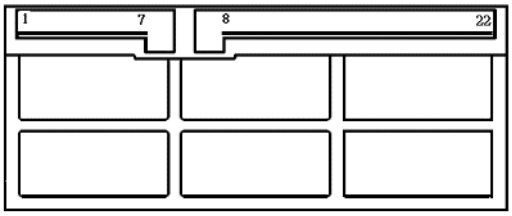


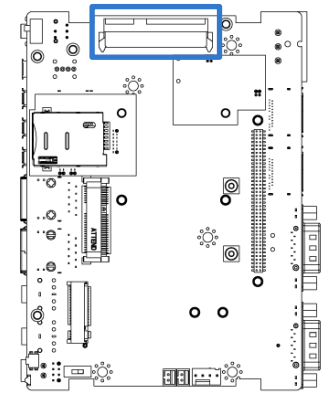


AT_ATX1

Switch	Definition
1-2 (Right)	ATX Power Mode（Default）
2-3 (Left)	AT Power Mode

2.3.12 SATA with Power Connector





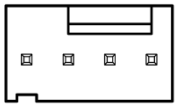
SATA1

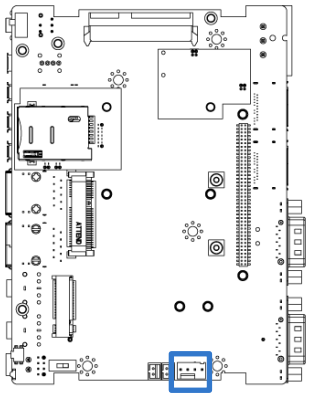
Pin	Definition	Pin	Definition
1	GND	12	GND
2	SATA_TXP1	13	GND
3	SATA_TXN1	14	+5V
4	GND	15	+5V
5	SATA_RXN1	16	+5V
6	SATA_RXP1	17	GND
7	GND	18	GND
8	+3.3V	19	GND
9	+3.3V	20	+12V
10	+3.3V	21	+12V
11	GND	22	+12V

2.3.13 Smart FAN Connector

FAN

Pin	Definition
1	GND
2	+12V
3	FANIN
4	FANCTL

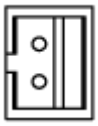


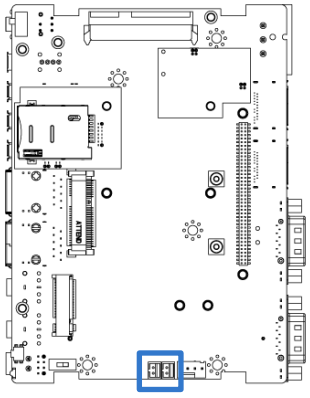


2.3.14 CAN Bus Connector

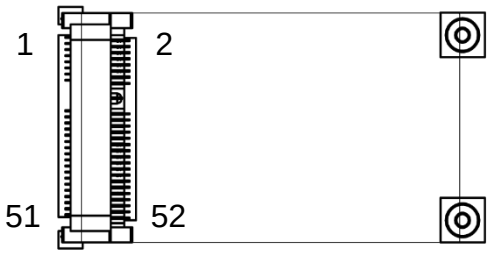
CAN 1-2

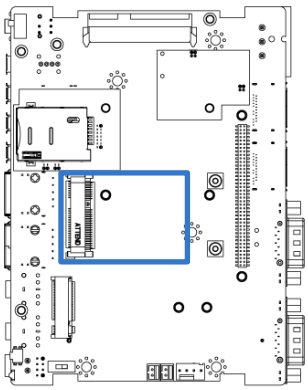
Pin	Definition
1	CAN_H
2	CAN_L





2.3.15 Mini PCI-Express / mSATA Socket

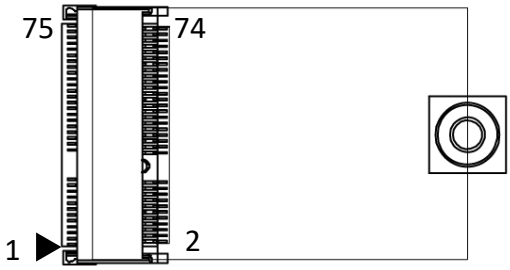


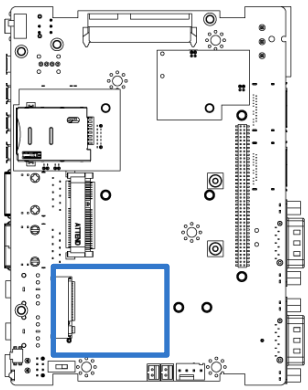


MPCIE1

Pin	Definition	Pin	Definition	Pin	Definition
1	WAKE#	19	NC	37	GND
2	+3.3V	20	+3.3V	38	USB_DP1
3	NC	21	GND	39	+3.3V
4	GND	22	MINIPCIE RST#	40	GND
5	NC	23	MINIPCIE_RXN1	41	+3.3V
6	+1.5V	24	+3.3V	42	NC
7	CLKREQ1#	25	MINIPCIE_RXP1	43	GND
8	USIM_VCC	26	GND	44	NC
9	GND	27	GND	45	NC
10	USIM_DATA	28	+1.5V	46	NC
11	MINIPCIE_CLKN1	29	GND	47	NC
12	USIM_CLK	30	SMB_CLK	48	+1.5V
13	MINIPCIE_CLKP1	31	MINIPCIE_TXN1	49	NC
14	USIM_RST	32	SMB_DATA	50	GND
15	GND	33	MINIPCIE_TXP1	51	NC
16	USIM_VPP	34	GND	52	+3.3V
17	NC	35	GND		
18	GND	36	USB_DN1		

2.3.16 M.2 B Key Socket

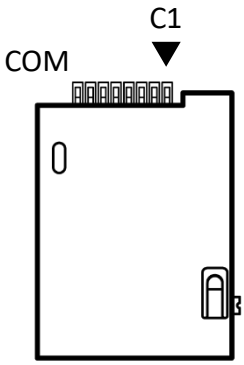


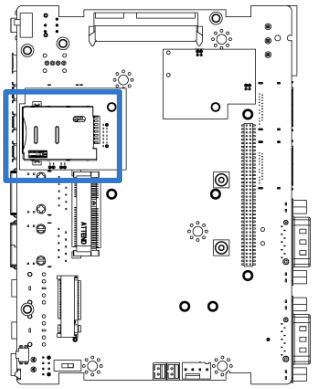


M2_KB1

Pin	Definition	Pin	Definition
1	+3.3V	2	+3.3V
3	GND	4	+3.3V
5	GND	6	+1.8S
7	USB2_D+	8	+3.3V
9	USB2_D-	10	NC
11	GND		
21	+3.3V	20	NC
23	NC	22	NC
25	NC	24	NC
27	GND	26	NC
29	USB_RxN0	28	NC
31	USB_RxP0	30	SIM_RST
33	GND	32	SIM_CLK
35	USB_TxN0	34	SIM_DATA
37	USB_TxP0	36	SIM_VDD
39	GND	38	NC
41	PCIE_RxN0	40	NC
43	PCIE_RxP0	42	NC
45	GND	44	NC
47	PCIE_TxN0	46	NC
49	PCIE_TxP0	48	NC
51	GND	50	PCIE_RST#
53	REFCLK1-	52	CLK_REQ#
55	REFCLK1+	54	PCIE_WAKE#
57	GND	56	NC
59	NC	58	NC
61	NC	60	NC
63	NC	62	NC
65	NC	64	NC
67	NC	66	NC
69	+3.3V	68	NC
71	GND	70	+3.3V
73	GND	72	+3.3V
75	+3.3V	74	+3.3V

2.3.17 SIM Card Socket





SIM1 - 2

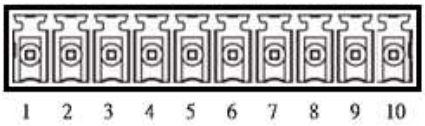
Pin	Definition	Pin	Definition
C1	UIM_PWR	C6	UIM_VPP
C2	UIM_RESET	C7	UIM_DATA
C3	UIM_CLK	CD	NC
C5	GND	COM	GND

2.3.18 Digital Input / Output Connector

DIO1

Connector Type: Terminal Block 1X10 10-pin, 3.5mm pitch

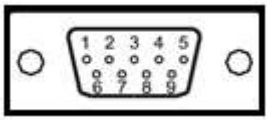
Pin	Definition	Pin	Definition
1	DC INPUT	6	DO1
2	DI1	7	DO2
3	DI2	8	DO3
4	DI3	9	DO4
5	DI4	10	GND



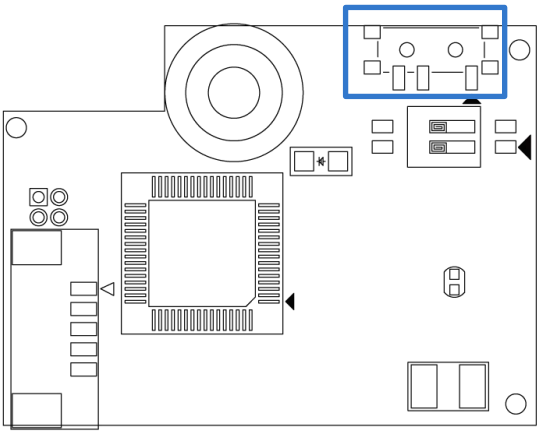
2.3.19 RS232 / RS422 / RS485 Connector

CN1 – 2
Connector Type: 9-pin D-Sub

Pin	RS232 Definition	RS422 / 485 Full Duplex Definition	RS485 Half Duplex Definition
1	DCD3 (DCD5)	TX3- (TX5-)	DATA3- (DATA5-)
2	RxD3 (RxD5)	TX3+ (TX5+)	DATA3+ (DATA5+)
3	TxD3 (TxD5)	RX3+ (RX5+)	
4	DTR3 (DTR5)	RX3- (RX5-)	
5	GND		
6	DSR3 (DSR5)		
7	RTS3 (RTS5)		
8	CTS3 (CTS5)		
9	RI3 (RI5)		



2.3.20 PC / CAR Mode Switch



SW1

Pin	Definition
1-2	PC Mode
2-3	CAR Mode

Chapter 3

System Setup

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

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.

3.2 Removing chassis bottom cover

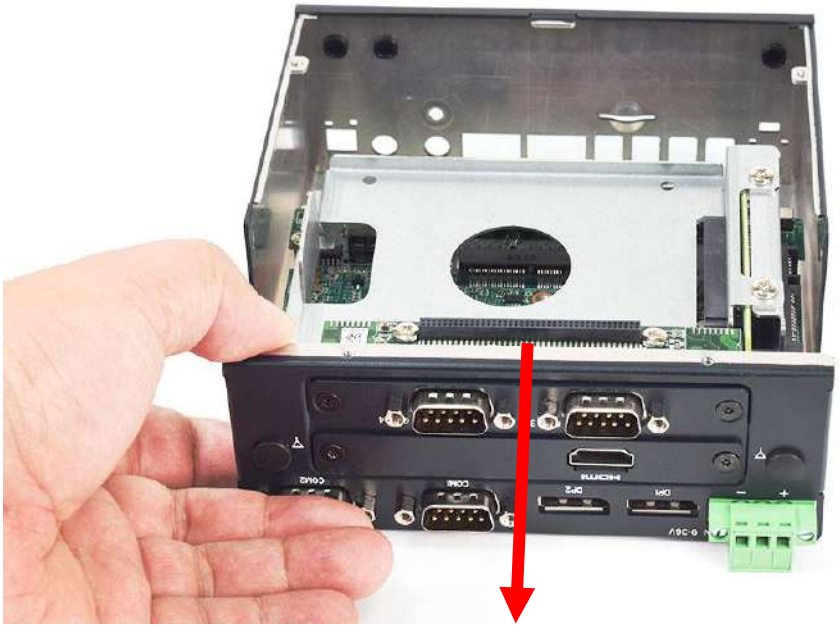
1. Turn the system upside down. Unscrew the 4 screws on the bottom cover.

2. Now you can remove the bottom cover.

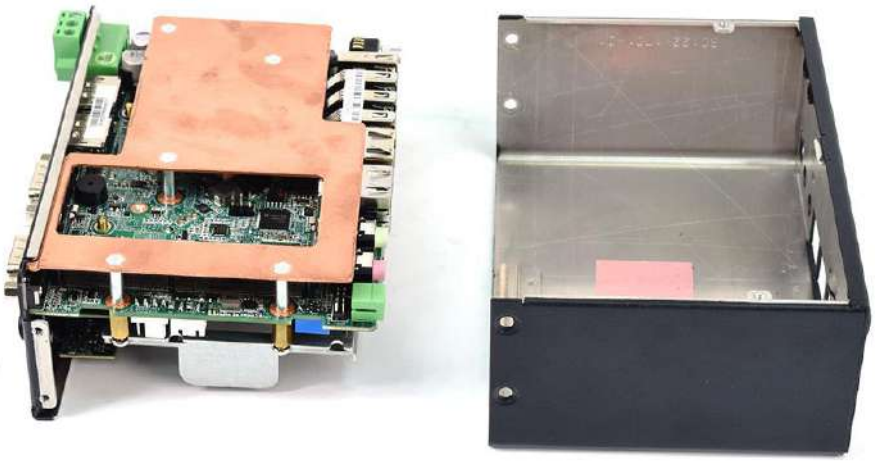
3.3 Installing SODIMM

1. Unscrew five screws on the chassis: one screw on front panel, two screws on system left side, and two screws on system right side.

2. Hold the chassis top cover. Pull the system main body following the below direction so the top cover can be separated from it.



3. System main body and top cover separated.

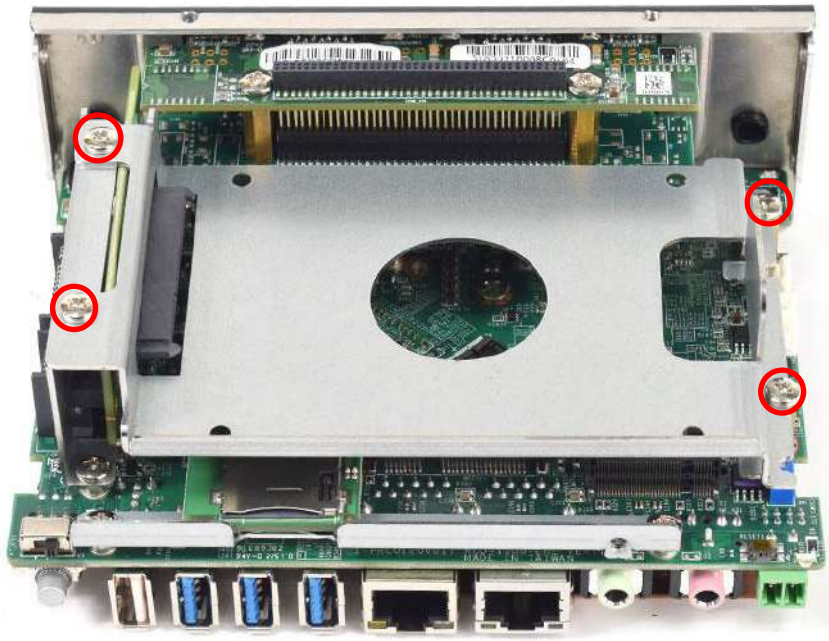


4. Insert memory module from 45 degree direction.

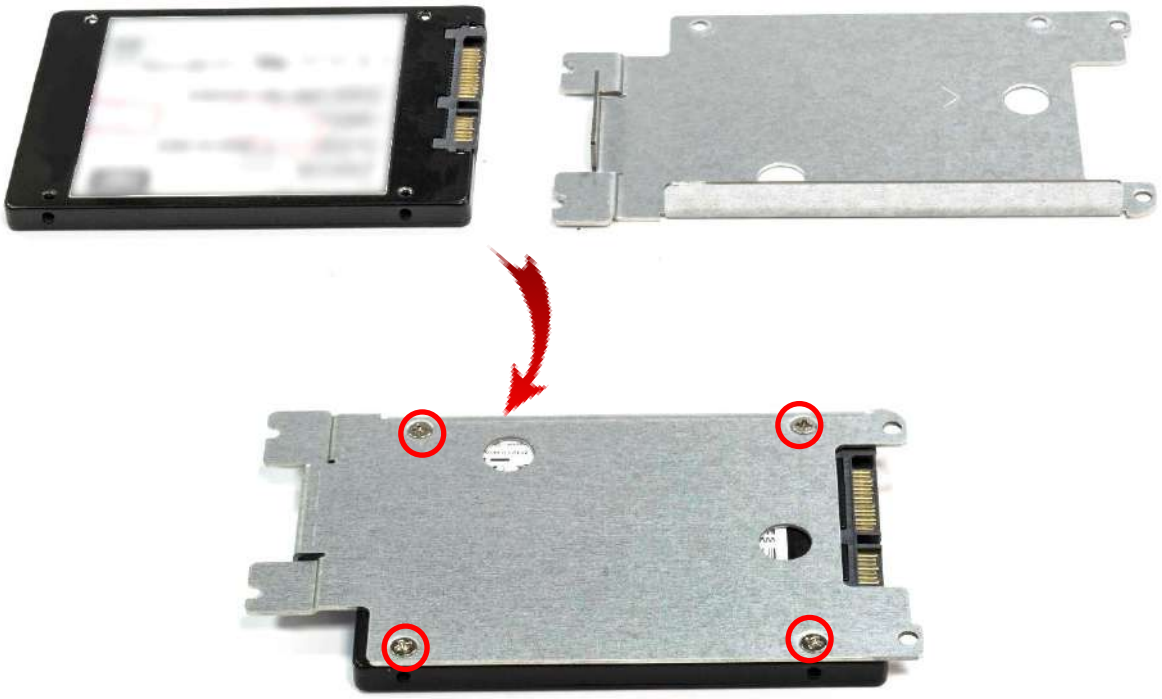
5. Press the memory module vertically downward until you hear the "click" sound. Make sure the memory module is firmly in place.

3.4 Installing SATA HDD/SSD

1. Remove HDD bracket by unscrewing the four screws.



2. Lock the 2.5" HDD with HDD bracket using four screws.

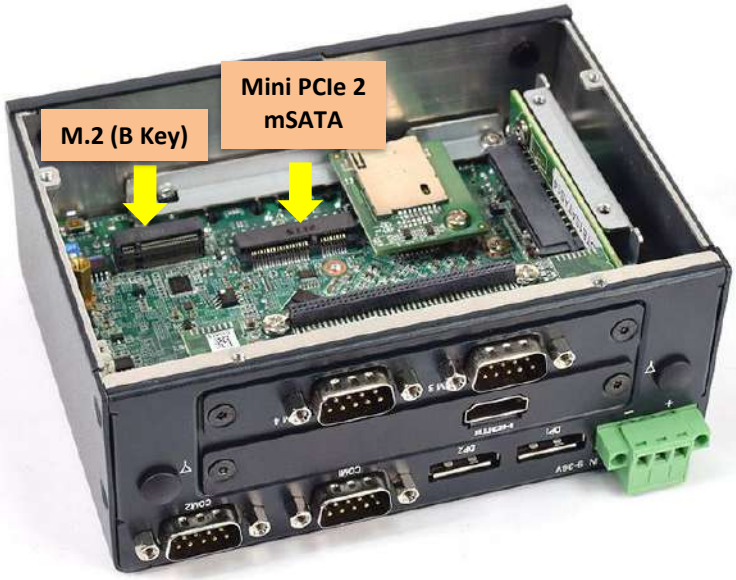


3. Insert the entire bracket following the below direction so the SATA connector is firmly plugged into the HDD.

4. Fasten the four screws to lock the HDD bracket in place.

3.5 Installing Mini PCIe card / mSATA

1. Place the system body upside down so you can see the 2x mini card socket. Mini PCIe 2 (CN3) can support mSATA.



1. 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 two screws.`

3.6 Installing antenna

1. Remove antenna hole cover on the system panel.

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.

3.7 Assemble chassis bottom cover

1. Place the bottom cover according to the below direction.

2. Lock the bottom cover with the four screws.

3.8 Installing SIM card

1. SIM card socket is located on the front panel of the system.

2. Now you can insert SIM card into the socket.

3. To uninstall SIM card, simply press the installed SIM card and then the card will be pushed out.

3.9 Installing DIN rail holder

1. Din rail holder is available for BCO-1000 series as optional accessories.

2. in 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.

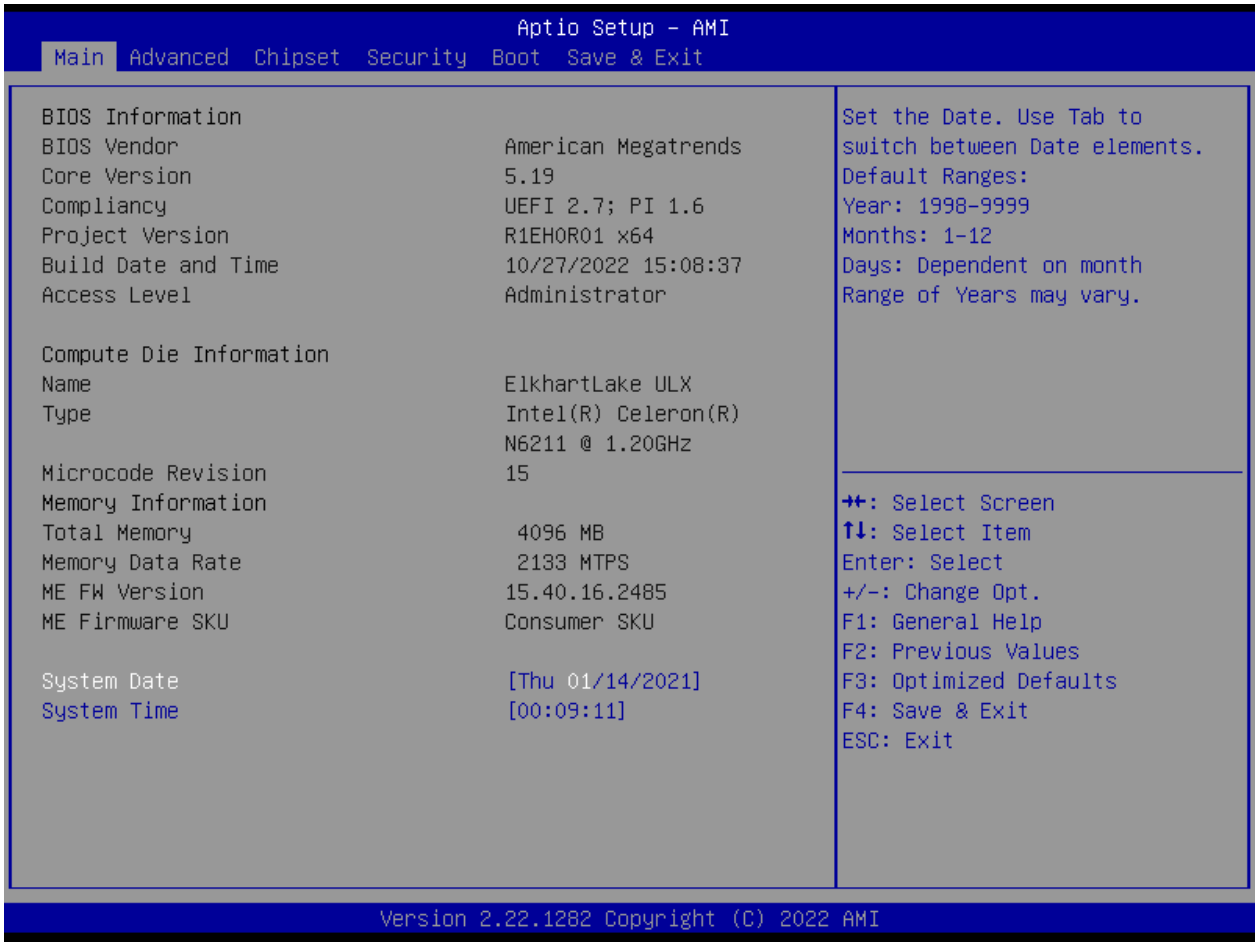
Control Keys	
<→> <←>	Select Screen
<↑> <↓>	Select Item
<Enter>	Select
<Page Up/+>	Increases the numeric value or makes changes
<Page Down/->	Decreases the numeric value or makes changes
<F1>	General Help
<F2>	Previous Value
<F3>	Load Optimized Defaults
<F4>	Save Configuration and Exit
<Tab>	Select Setup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



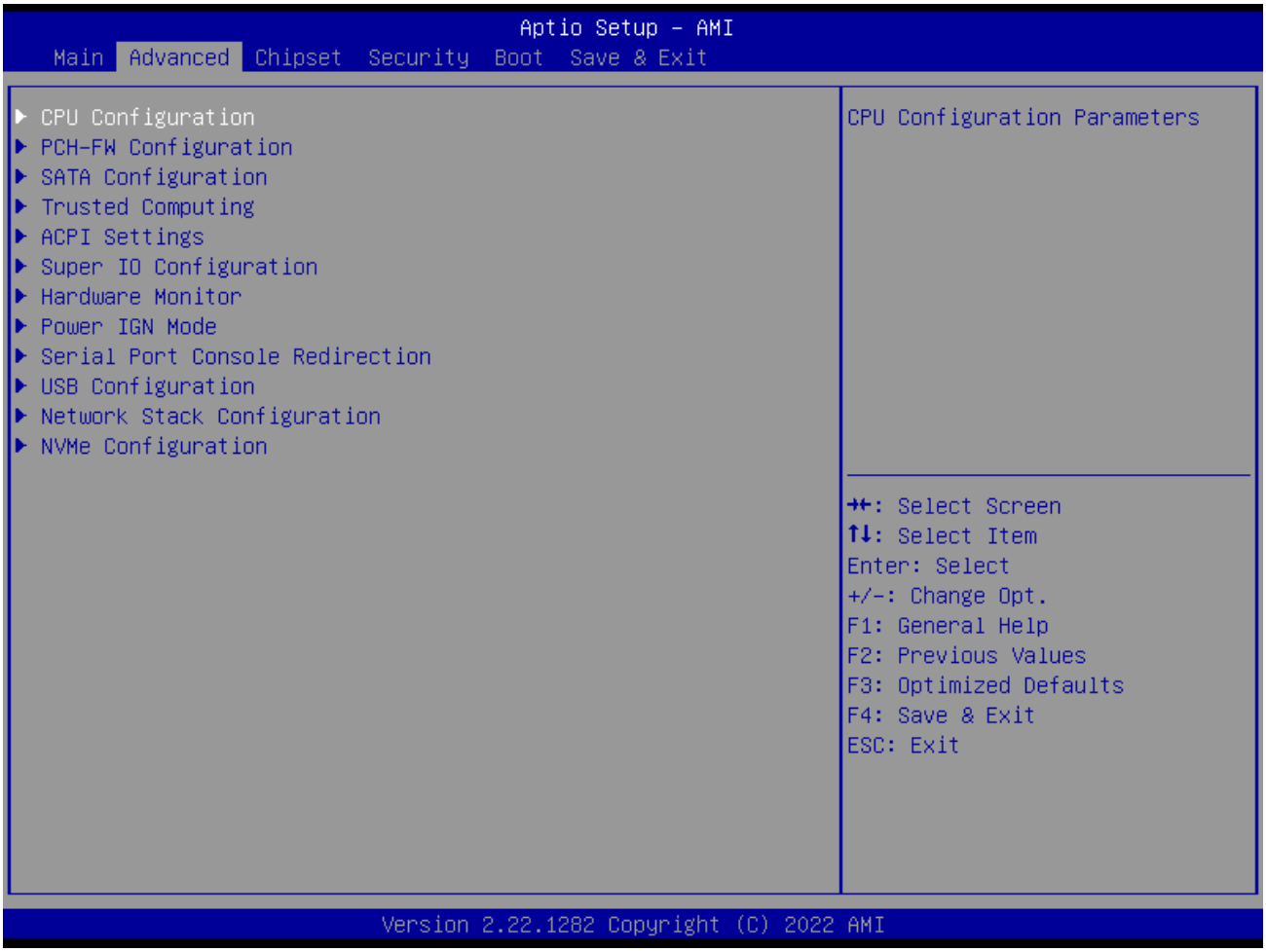
■ **System Date**

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

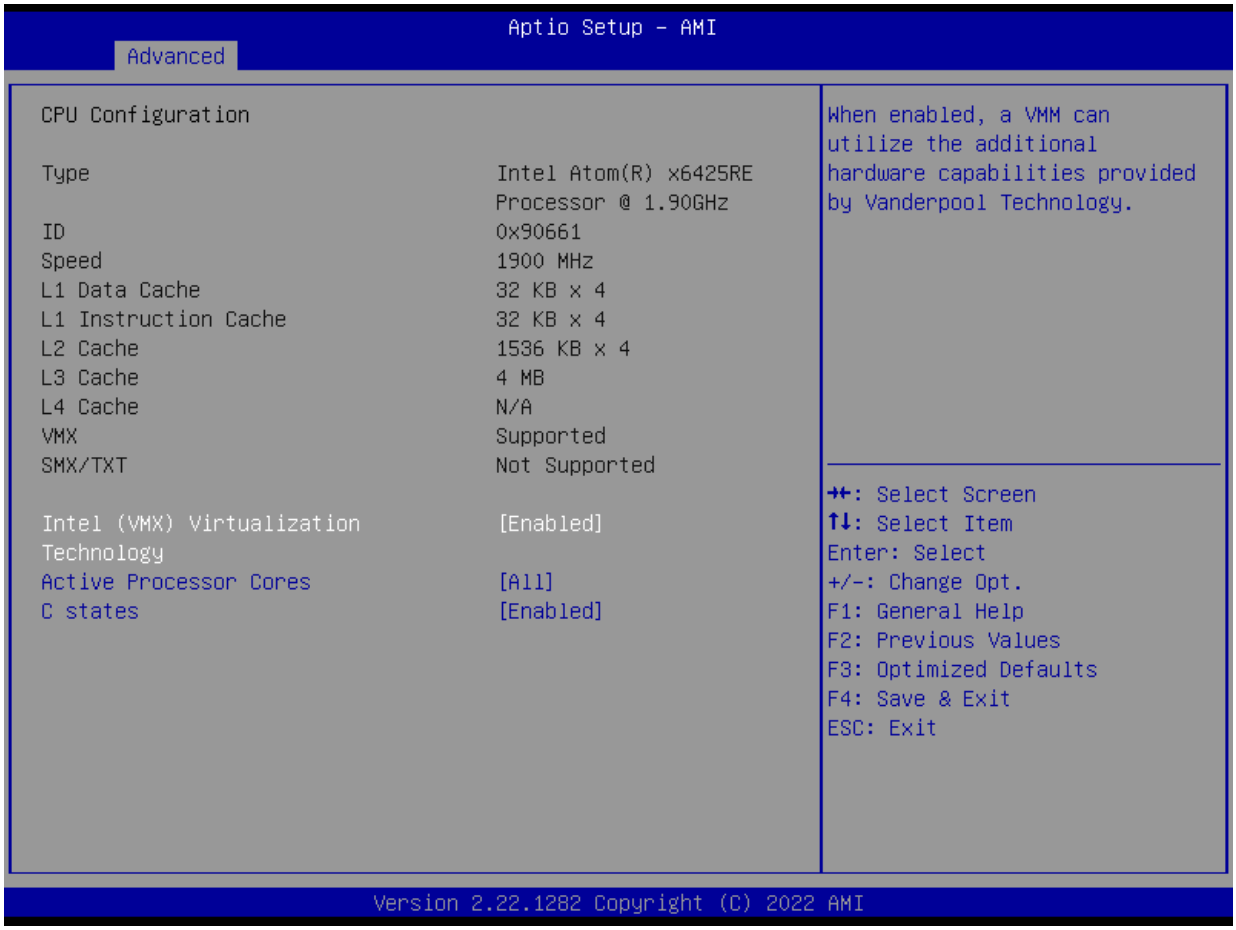
■ **System Time**

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

4.3 Advanced Setup

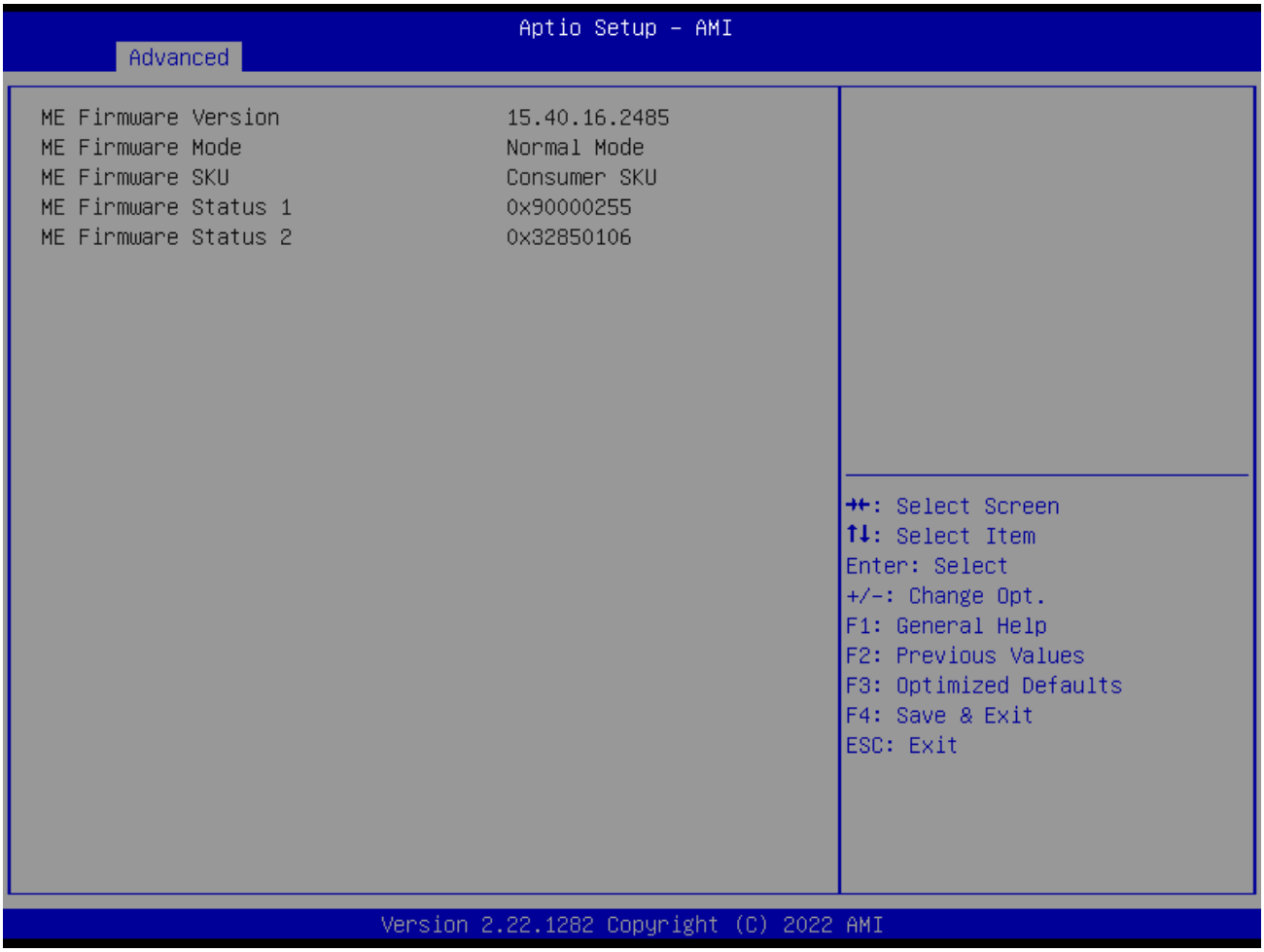


4.3.1 CPU Configuration

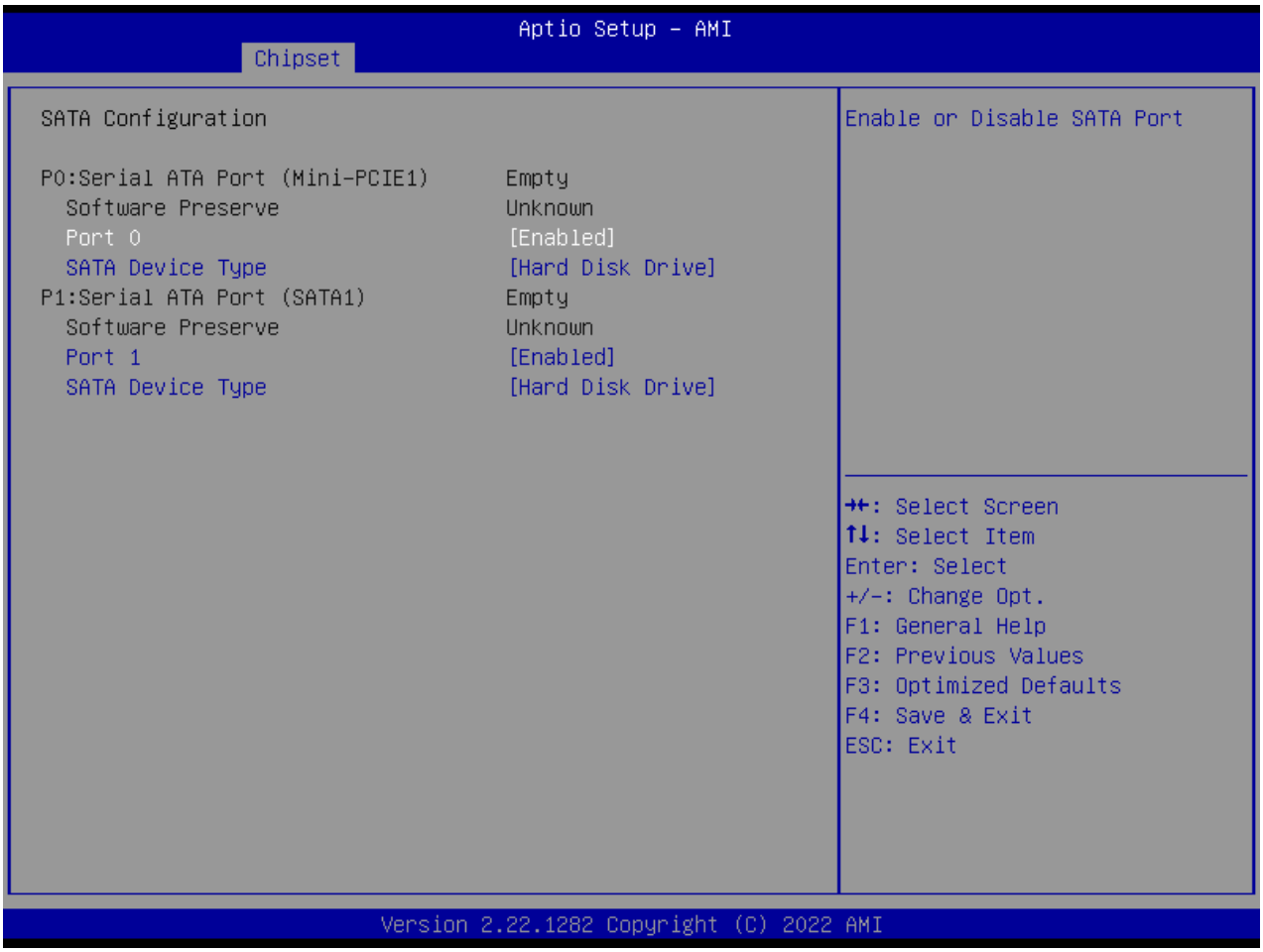


Item	Options	Description
Intel (VMX) Virtualization Technology	Disabled, Enabled**[Default]**	When enabled, a VMM can utilize the additional hardware capabilities provided by Virtualization Technology.
Active Processor Cores	All**[Default]** 1 2 3	Number of cores to enable in each processor package.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



4.3.3 SATA and RST Configuration

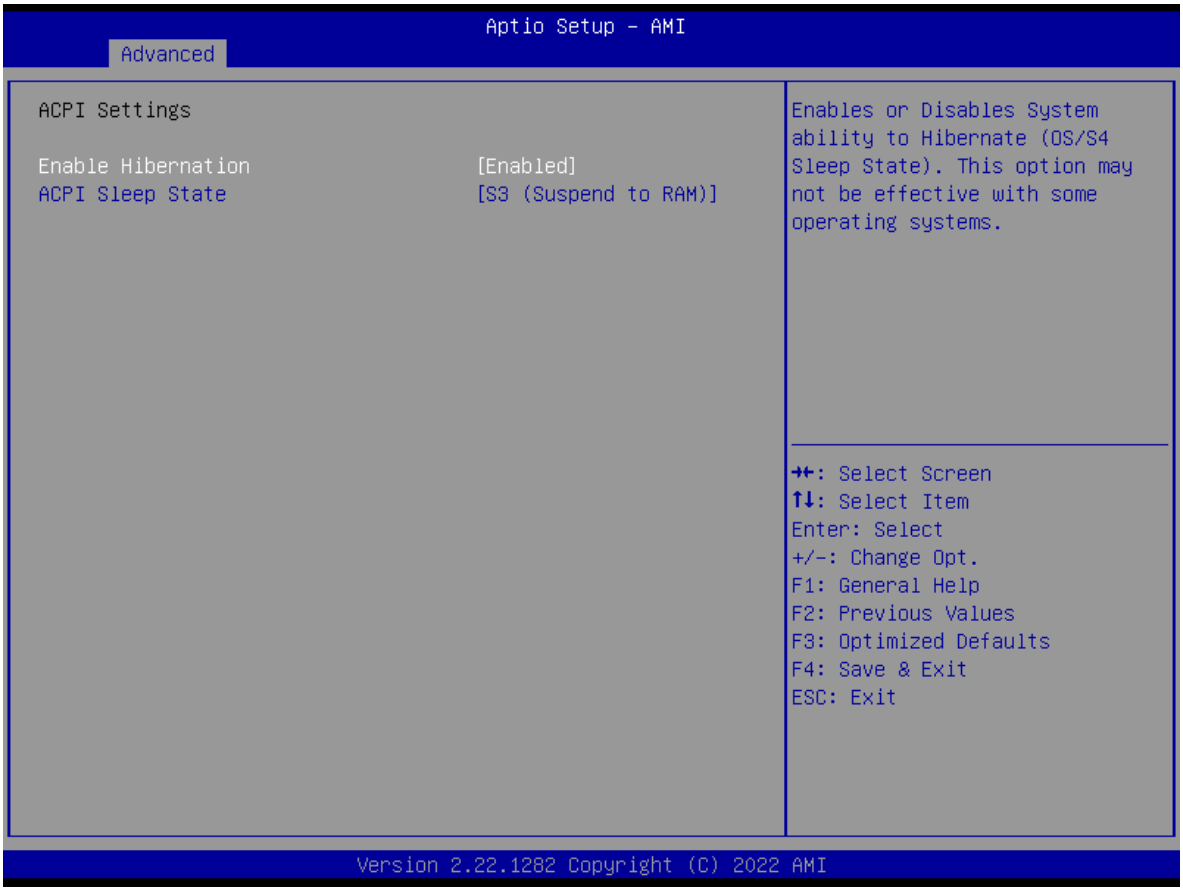


Item	Options	Description
Port0 ~1	Disabled, Enabled**[Default]**	Enable or Disable SATA Port.
SATA Device Type	Hard Disk Drive**[Default] ,** Solid State Drive	Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.

4.3.4 Trusted Computing

Item	Options	Description
Security Device Support	Enabled**[Default]** , Disabled,	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.

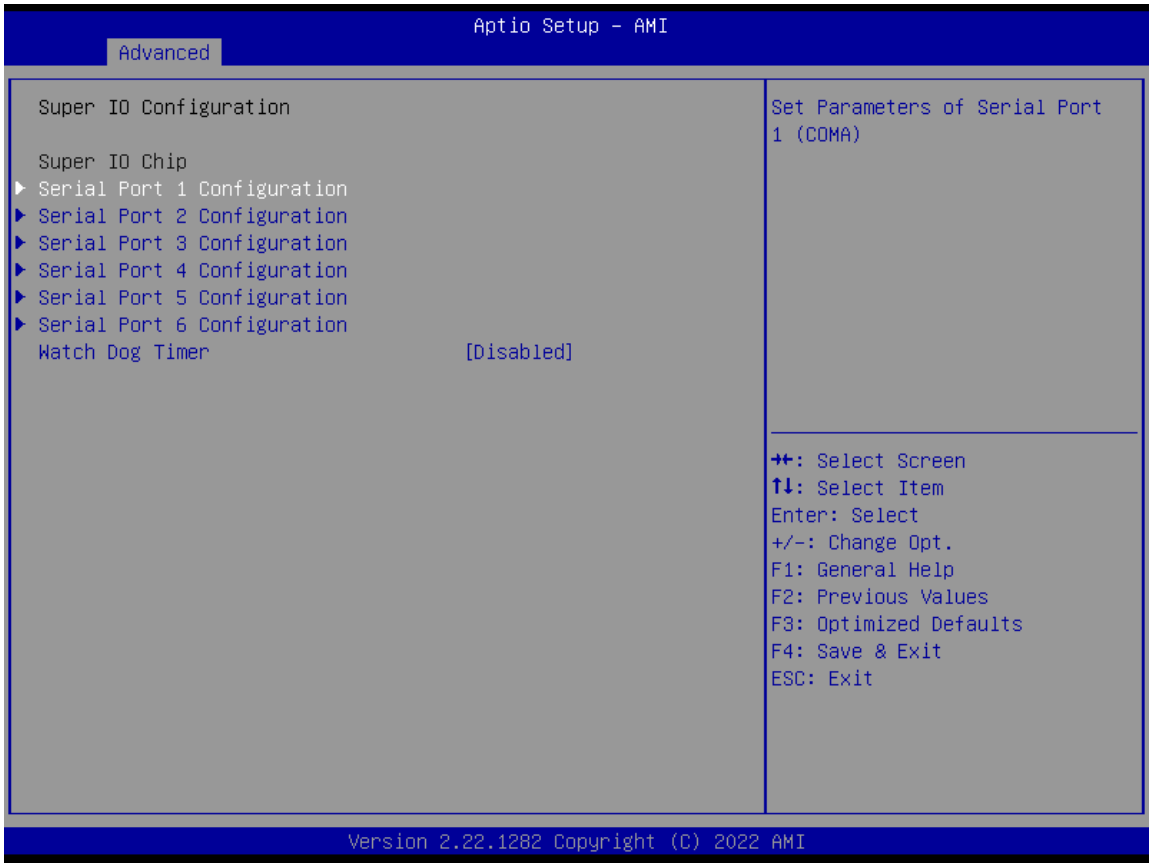
4.3.5 ACPI Settings



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.

4.3.6 Super IO Configuration

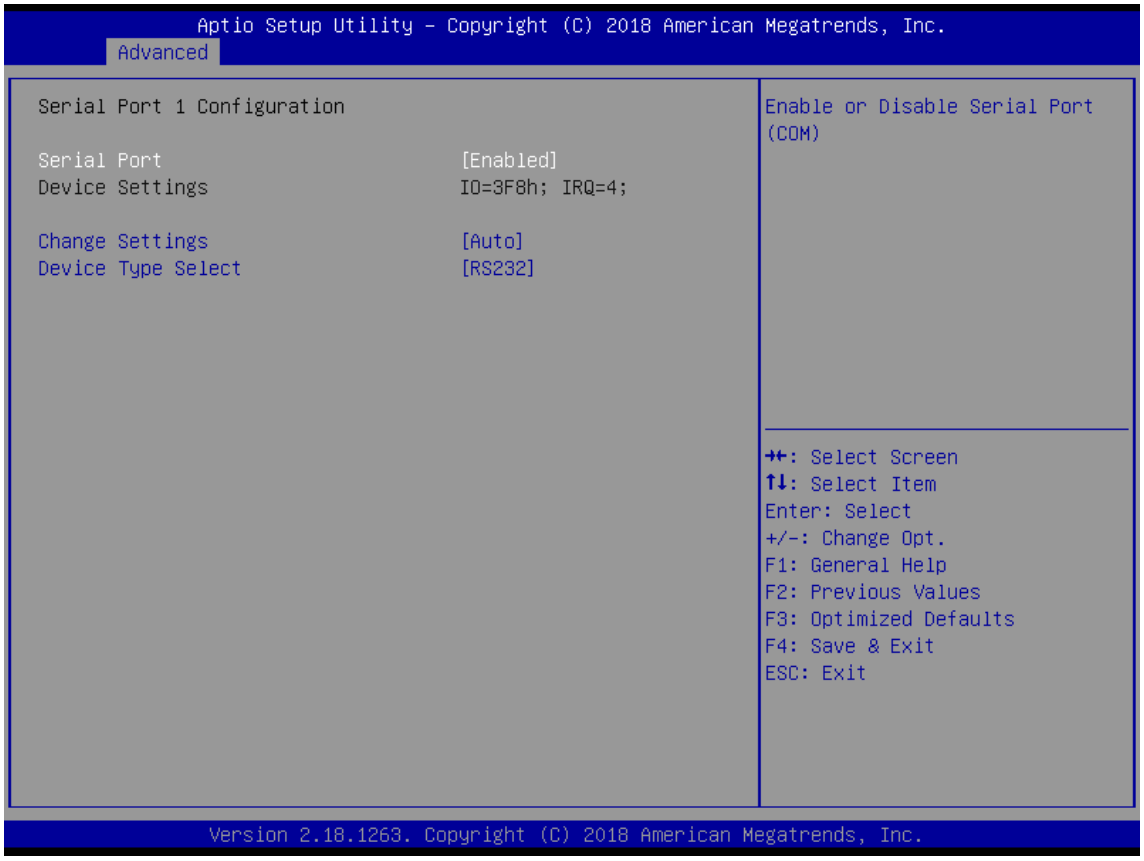
This setting allows you to select options for the Super IO Configuration, and change the value of the selected option.



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 4 (COMD).
Serial Port 5 Configuration	Set Parameters of Serial Port 5 (COME).
Serial Port 6 Configuration	Set Parameters of Serial Port 6 (COMF).

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

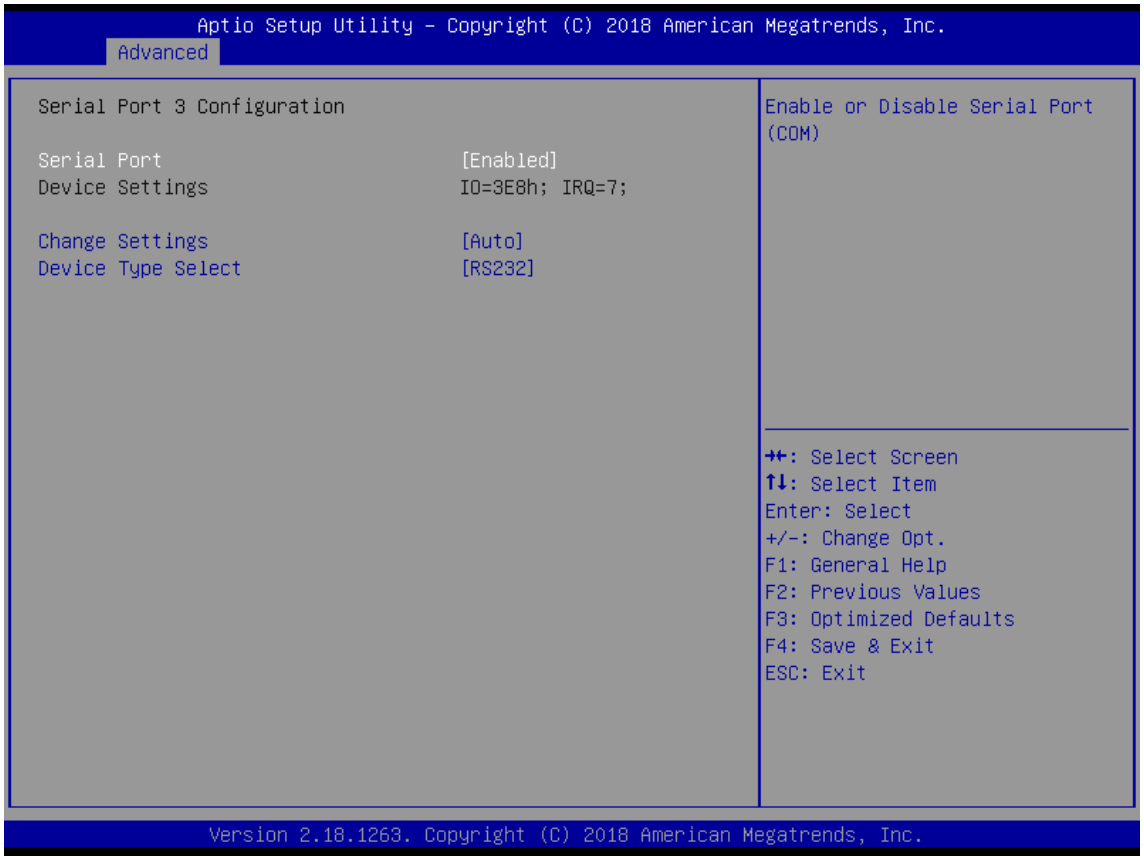


Item	Options	Description
Serial Port	Disabled, Enabled**[Default]**	Enable or Disable Serial Port (COM).
Change Settings	Auto**[Default]**, IO=3F8h; IRQ=4; , IO=3F8h; IRQ=3,4,5,6,7,9,10,11,12; , IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12;, IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12;, IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12;	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
RS-485 Auto Flow Function	Disabled, Enabled**[Default]**	Enabled/Disabled RS485 Autoflow Function

■ Serial Port 2 Configuration

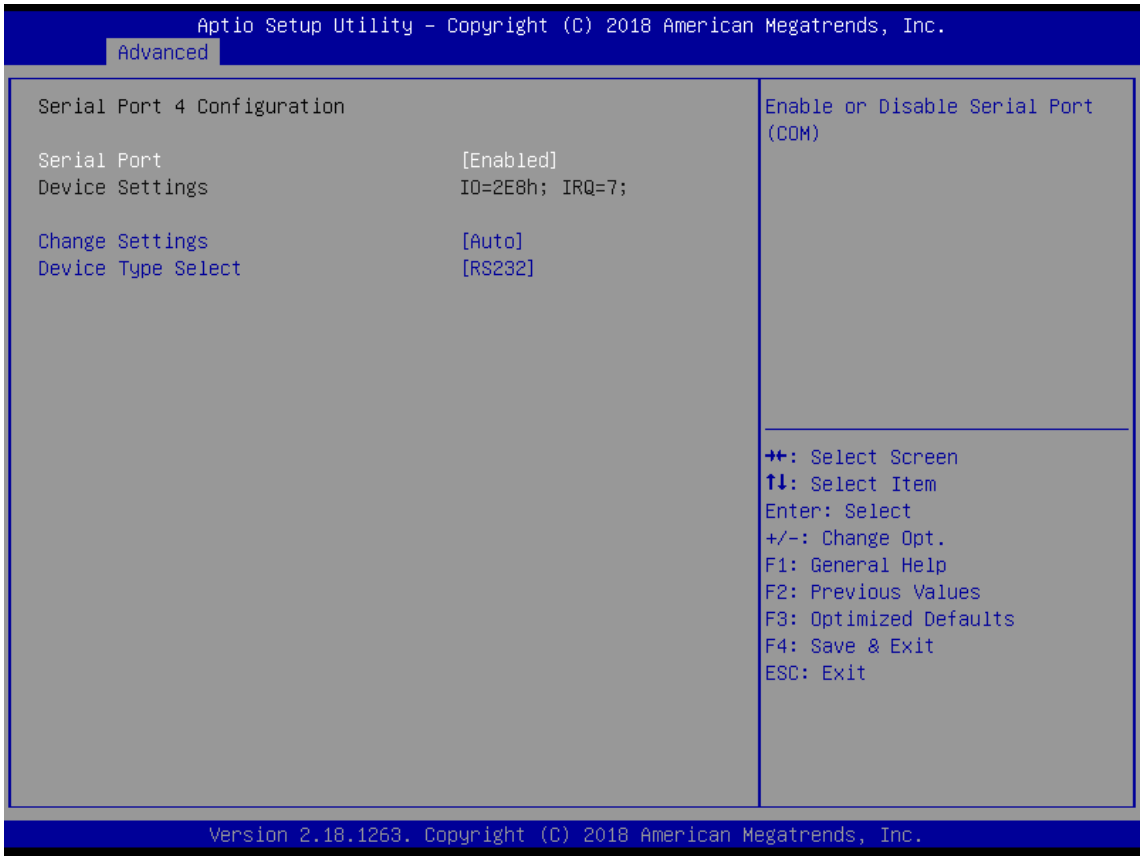
Item	Options	Description
Serial Port	Disabled, Enabled**[Default]**	Enable or Disable Serial Port (COM).
Change Settings	Auto**[Default]**, IO=2F8h; IRQ=3; , IO=3F8h; IRQ=3,4,5,6,7,9,10,11,12; , IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12;, IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12;, IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12;	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
RS-485 Auto Flow Function	Disabled, Enabled**[Default]**	Enabled/Disabled RS485 Autoflow Function

■ Serial Port 3 Configuration



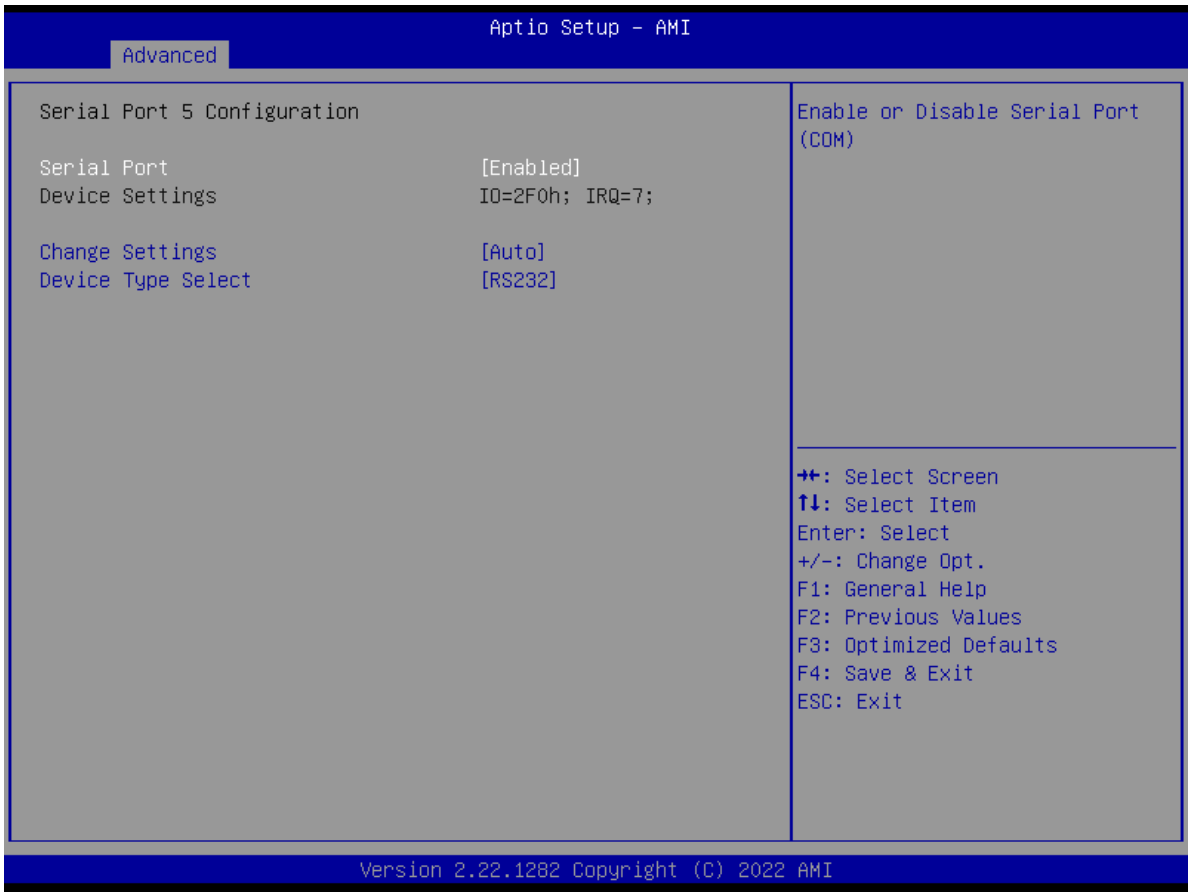
Item	Options	Description
Serial Port	Disabled, Enabled**[Default]**	Enable or Disable Serial Port (COM).
Change Settings	Auto**[Default]**, IO=3E8h; IRQ=7; , IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12; , IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12;, IO=2F0h; IRQ=3,4,5,6,7,9,10,11,12;, IO=2E0h; IRQ=3,4,5,6,7,9,10,11,12;	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
RS-485 Auto Flow Function	Disabled, Enabled**[Default]**	Enabled/Disabled RS485 Autoflow Function

■ Serial Port 4 Configuration



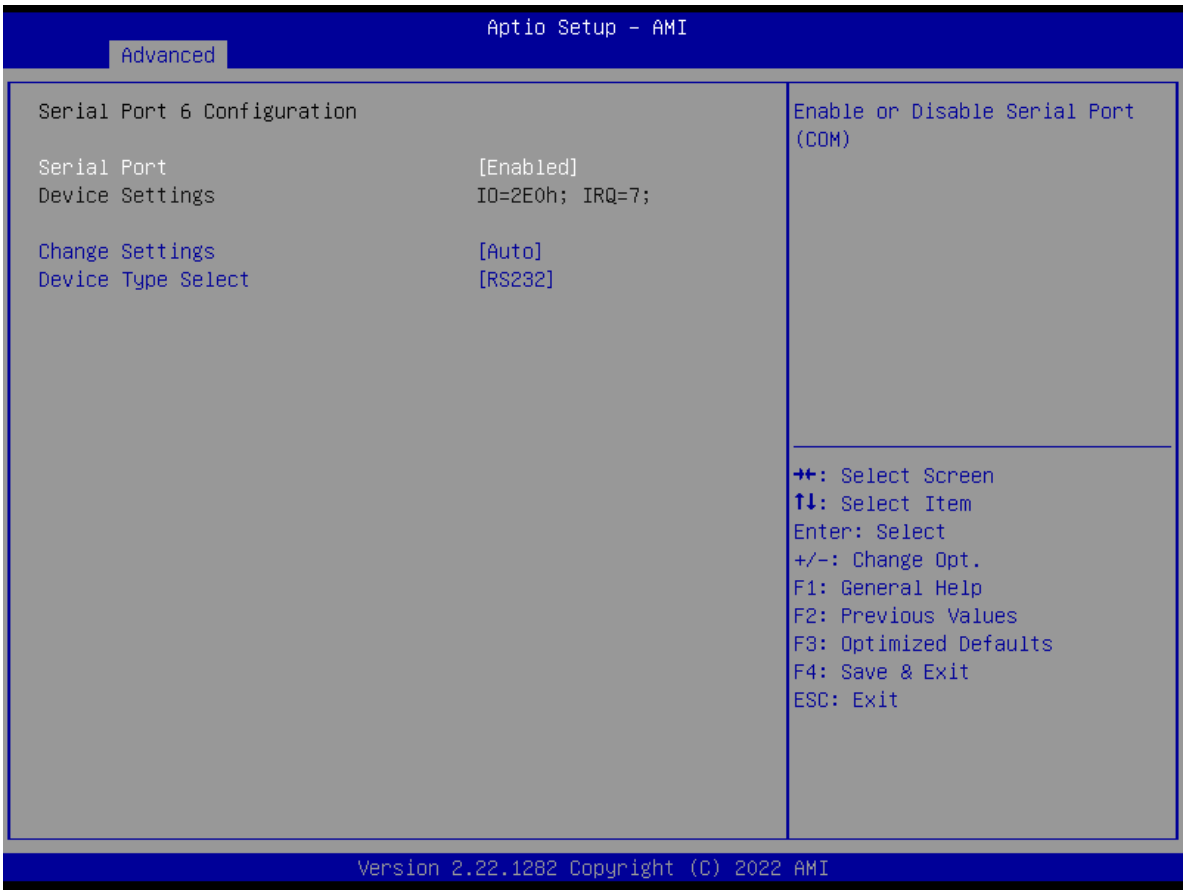
Item	Options	Description
Serial Port	Disabled, Enabled**[Default]**	Enable or Disable Serial Port (COM).
Change Settings	Auto**[Default]**, IO=2E8h; IRQ=7; , IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12; , IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12;, IO=2F0h; IRQ=3,4,5,6,7,9,10,11,12;, IO=2E0h; IRQ=3,4,5,6,7,9,10,11,12;	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
RS-485 Auto Flow Function	Disabled, Enabled**[Default]**	Enabled/Disabled RS485 Autoflow Function

■ Serial Port 5 Configuration



Item	Options	Description
Serial Port	Disabled, Enabled**[Default]**	Enable or Disable Serial Port (COM).
Change Settings	Auto**[Default]**, IO=2F0h; 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
RS-485 Auto Flow Function	Disabled, Enabled**[Default]**	Enabled/Disabled RS485 Autoflow Function

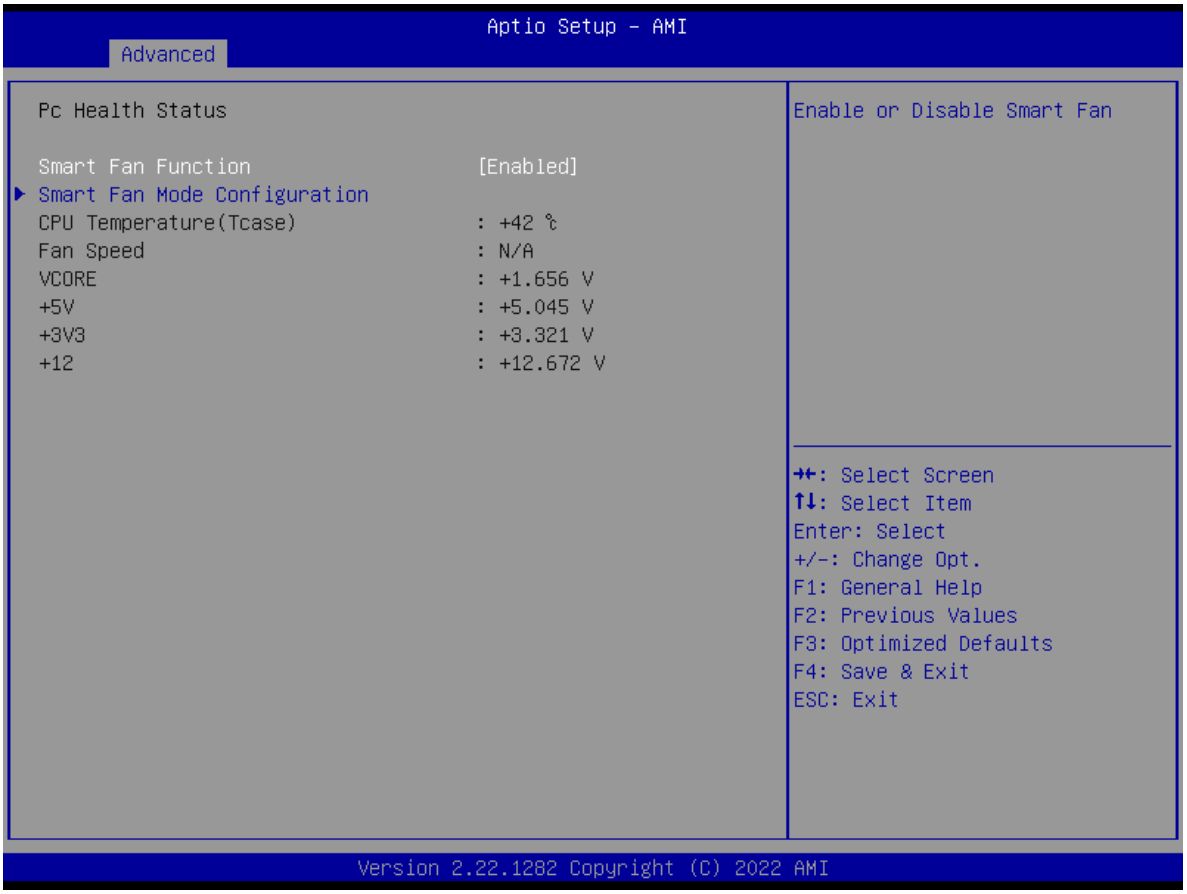
■ Serial Port 6 Configuration



Item	Options	Description
Serial Port	Disabled, Enabled**[Default]**	Enable or Disable Serial Port (COM).
Change Settings	Auto**[Default]**, IO=2E0h; 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
RS-485 Auto Flow Function	Disabled, Enabled**[Default]**	Enabled/Disabled RS485 Autoflow Function

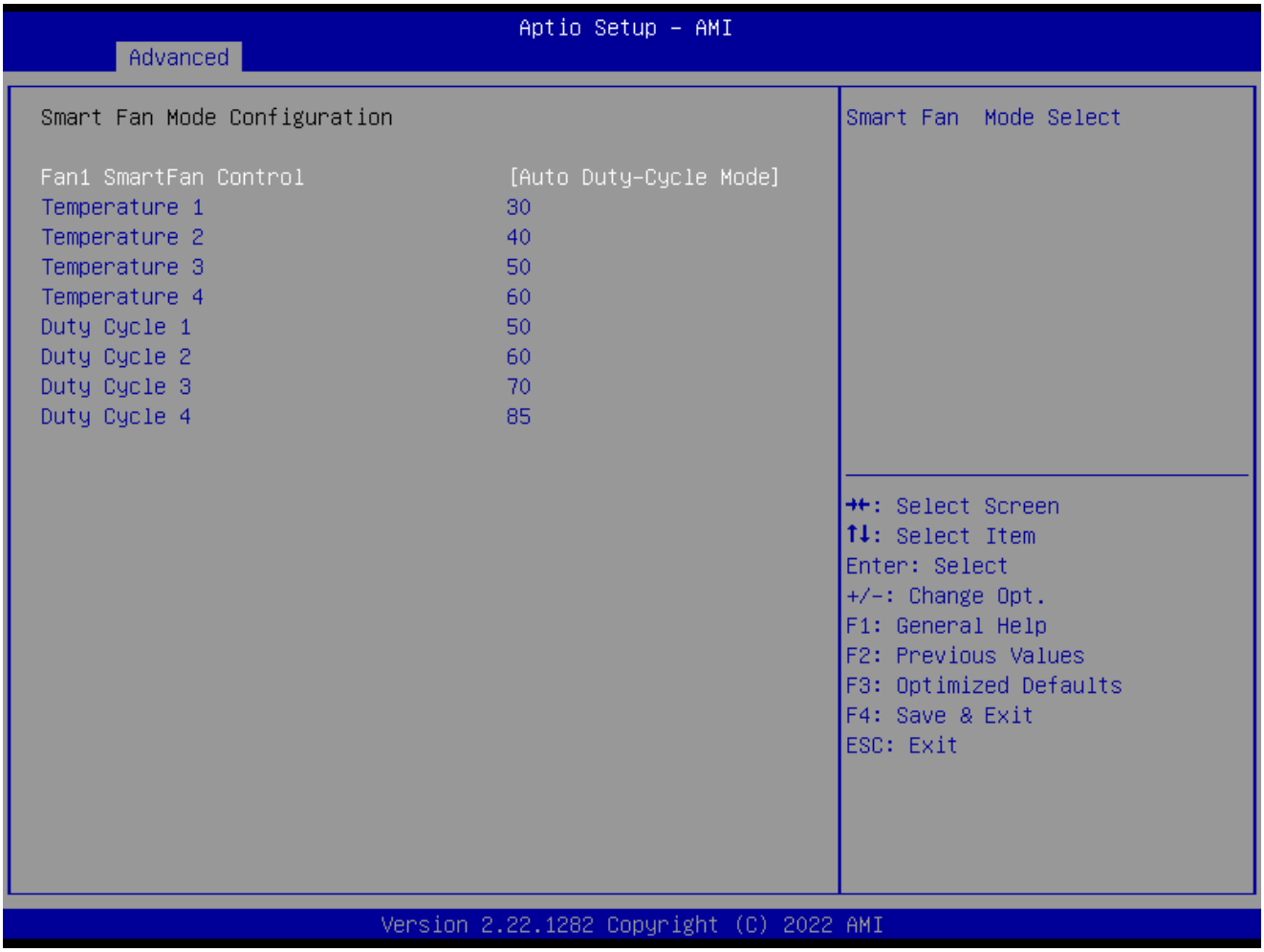
4.3.7 Hardware Monitor

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



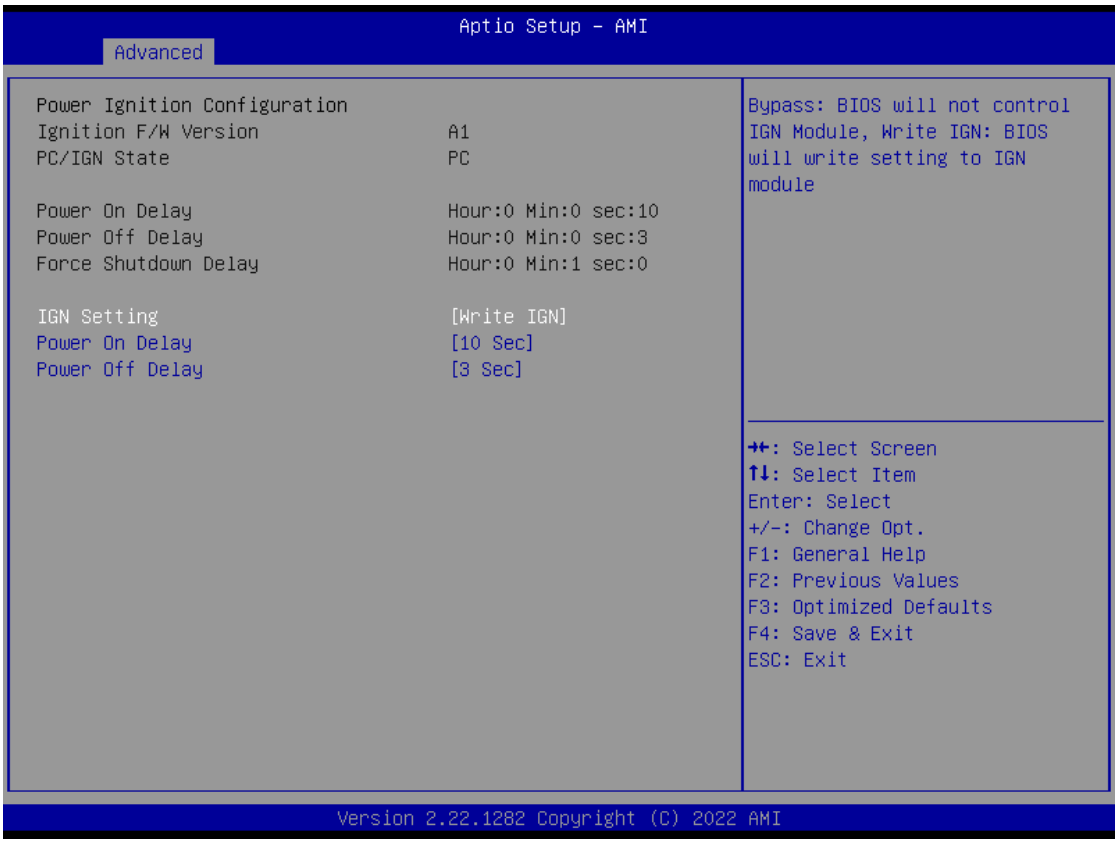
Item	Options	Description
Smart Fan Function	Disabled**[Default],** Enabled	Enabled or Disable Smart Fan

■ Smart Fan Mode Configuration



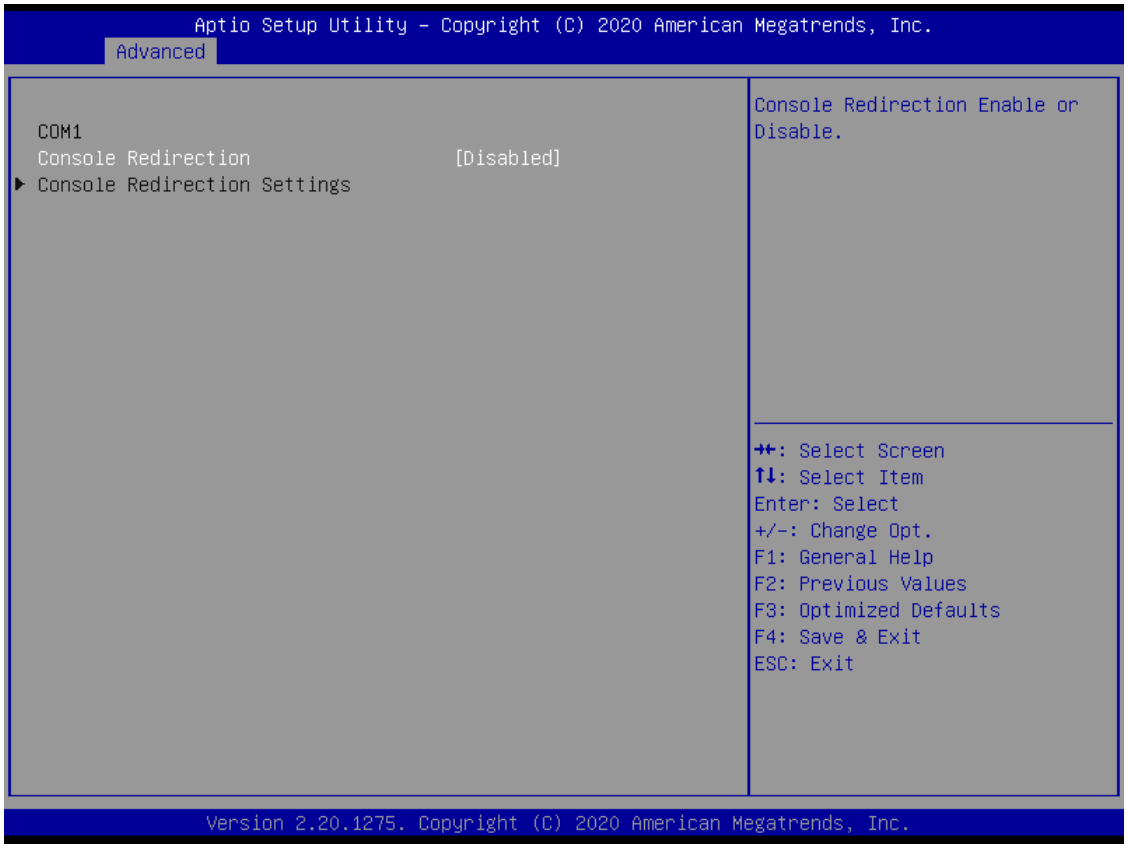
Item	Options	Description
Fan1 SmartFan Control	Manual Duty Mode, Auto Duty-Cycle Mode**[Default],**	Smart Fan Mode Select
Temperature 1~4	1~100	Auto fan speed control. SMART FAN IV
Duty Cycle 1~4	20~100	Auto fan speed control. SMART FAN IV

4.3.8 Power IGN Mode



Item	Options	Description
IGN Setting	Bypass mode**[Default]** Write IGN	Bypass: BIOS will not control IGN Module, Write IGN: BIOS will write setting to IGN module
Power On Delay	10 Sec**[Default]** 20 Sec 30 Sec 40 Sec 50 Sec 1 Min Manual Mode	Power On Delay Select
Manual Mode	10 Sec**[Default]**	10~60 Sec
Power Off Delay	3 Sec**[Default]** , 1 Min, 5 Min, 10 Min, 30 Min, 1 Hour, 2 Hour, Manual Mode	Power Off Delay Select
Manual Mode	3 Sec**[Default]**	3~7200 Sec

4.3.9 Serial Port Console Redirection

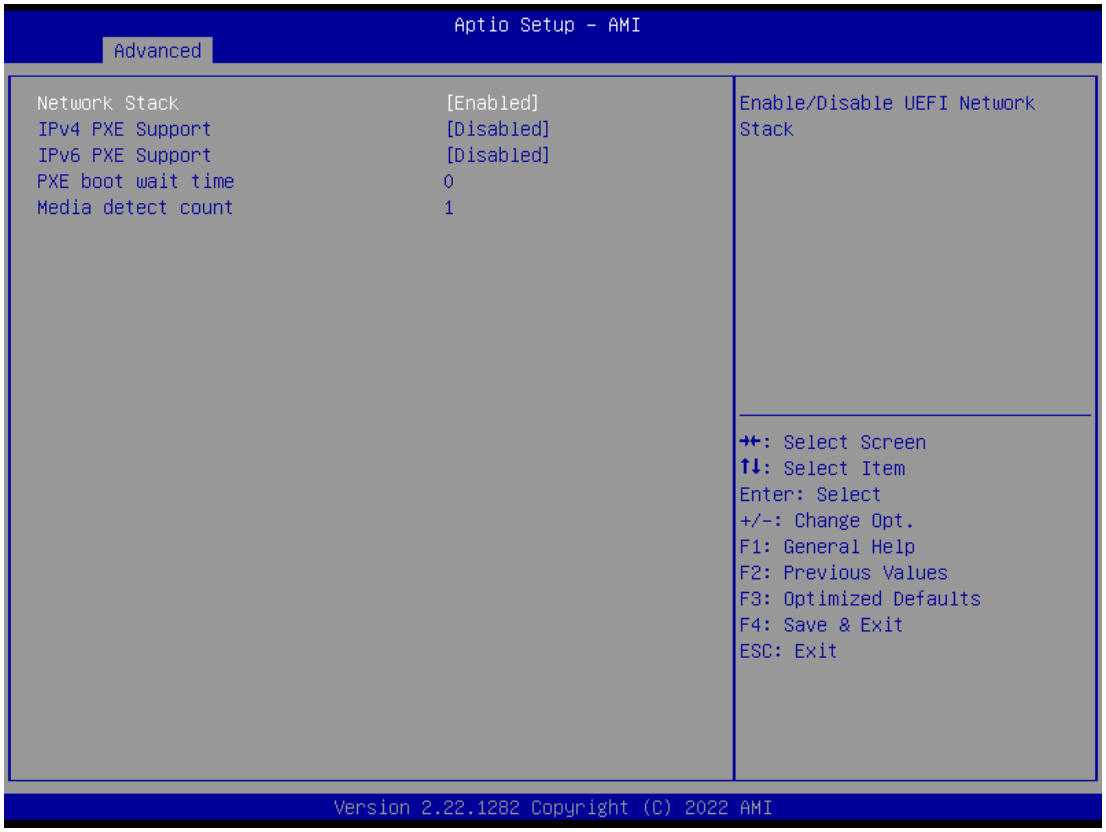


Item	Options	Description
Console Redirection	Disabled**[Default],** Enabled	These items allows you to enable or disable COM1 console redirection

4.3.10 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	Disabled Enabled**[Default]**	Enable/Disable USB Mass Storage Driver Support.
USB transfer time-out	1 sec , 5 sec , 10 sec , 20 sec**[Default]**	The time-out value for Control, Bulk, and Interrupt transfers.
Device reset time-out	10 sec , 20 sec**[Default] ,** 30 sec, 40 sec	USB mass storage device Start Unit command time-out.
Device power-up delay	Auto**[Default]** Manual	Maximum time the device will take before it properly reports itself to the Host Controller. 'Auto' uses default value: for a Root port it is 100ms, for a Hub port the delay is taken form Hub descriptor.

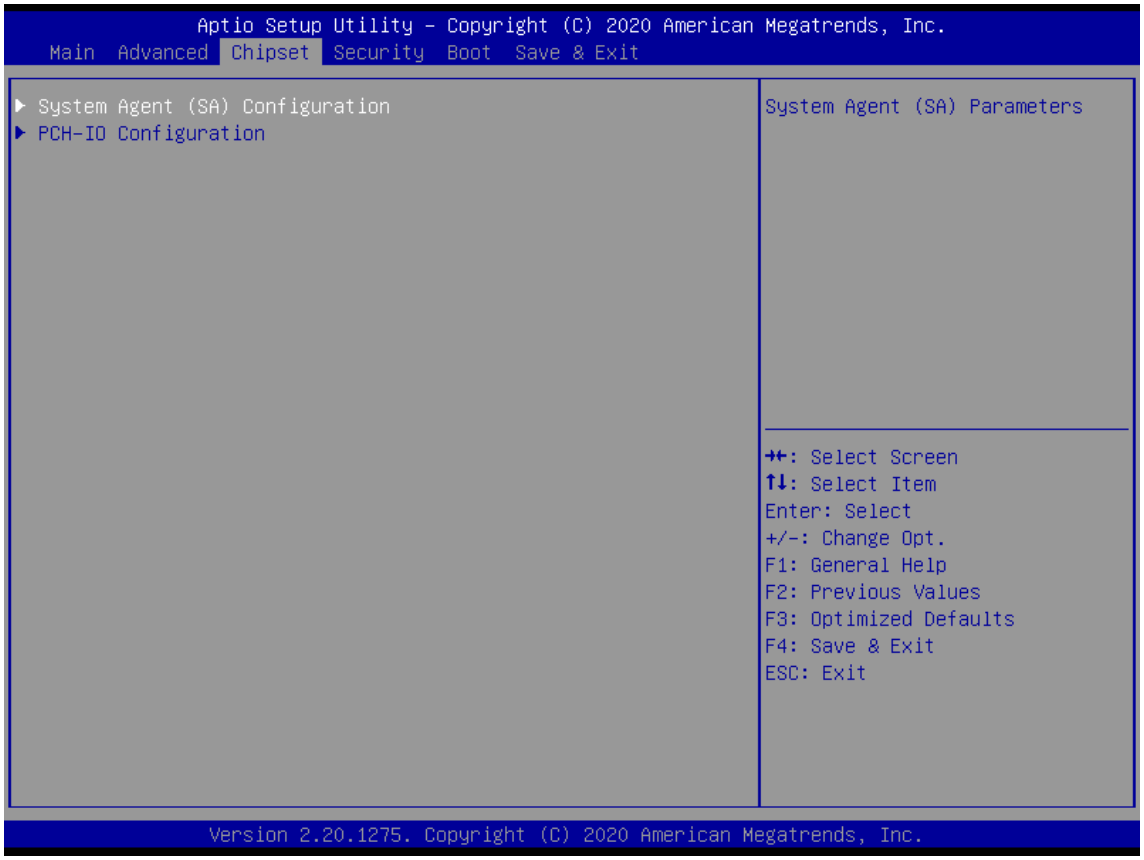
4.3.11 Network Stack Configuration



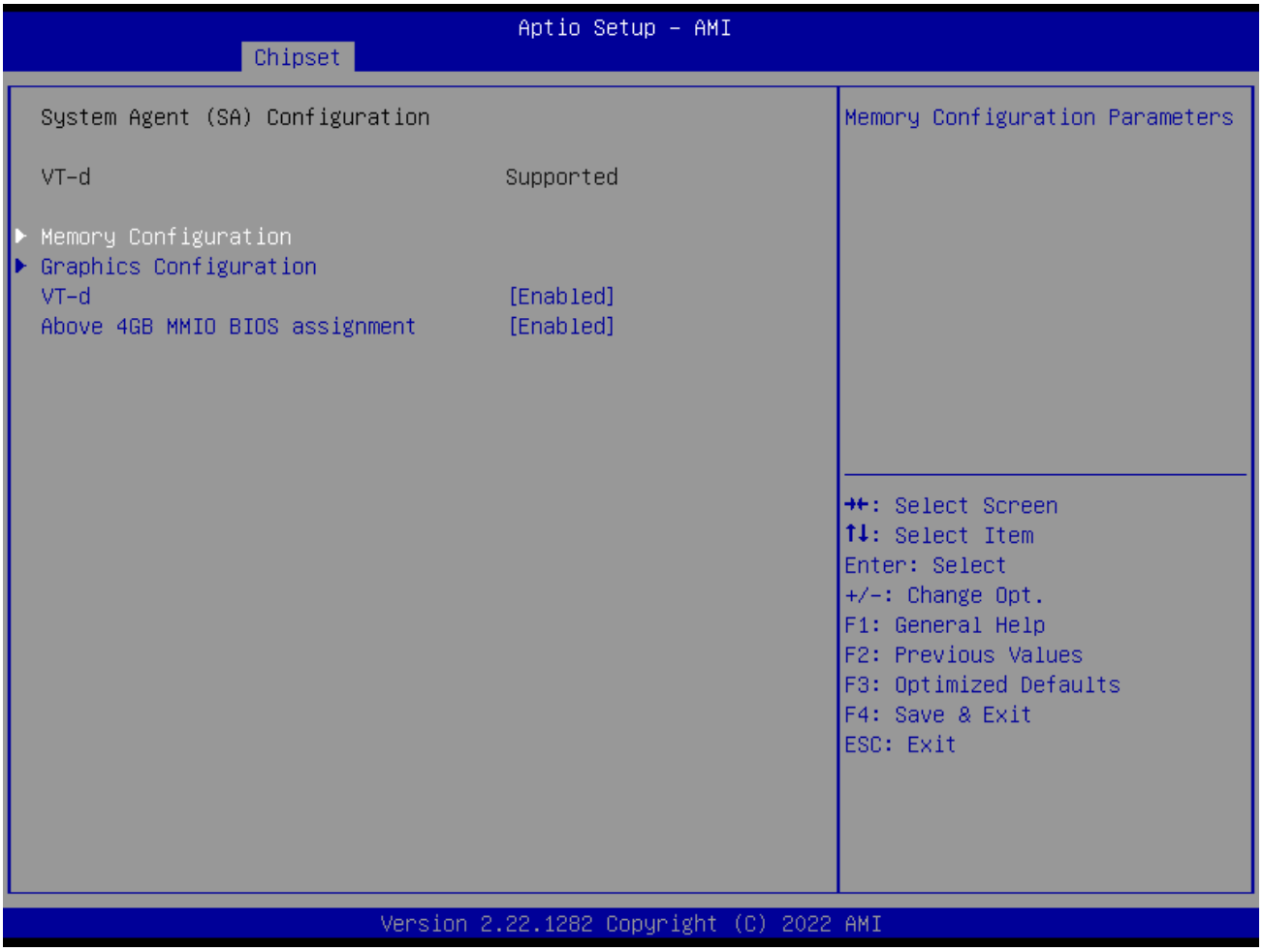
Item	Options	Description
Network Stack	Disabled**[Default]** , Enabled	Enable/Disable UEFI Network Stack.
IPv4 PXE Support	Disabled**[Default]** , Enabled	Enable/Disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available.
IPv6 PXE Support	Disabled**[Default]** , Enabled	Enable/Disable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

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.

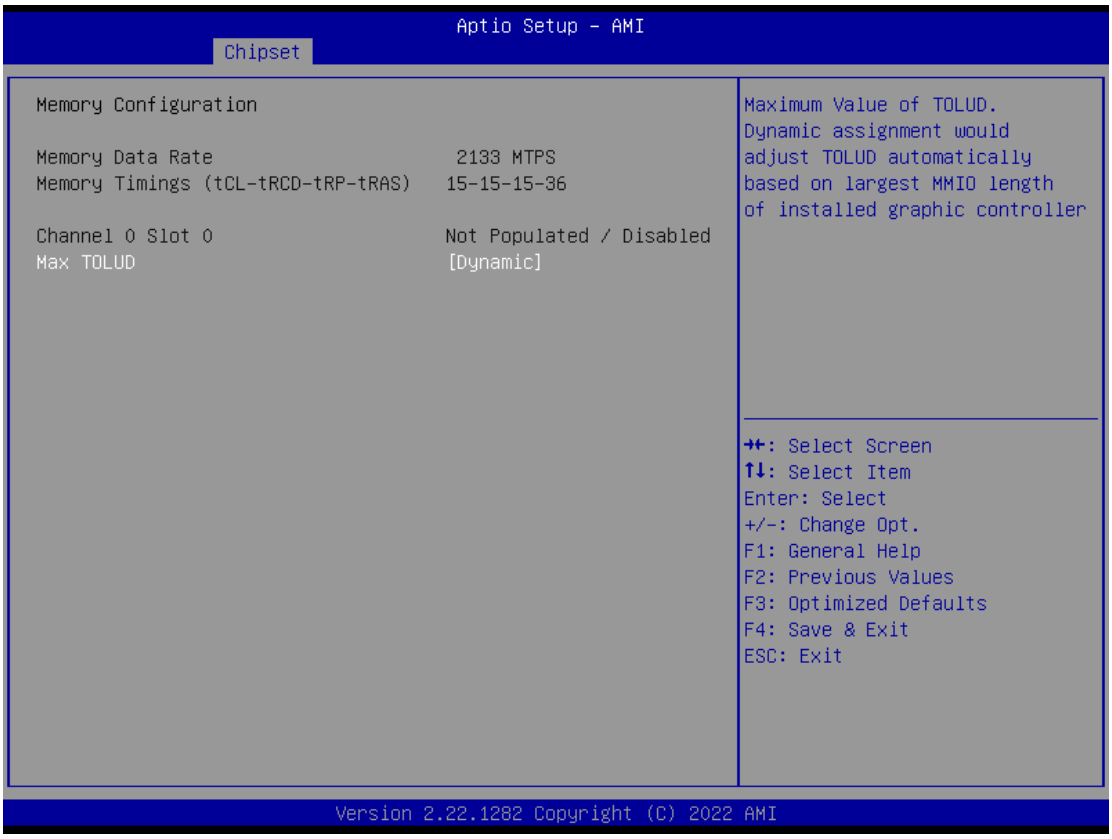


4.4.1 System Agent (SA) Configuration



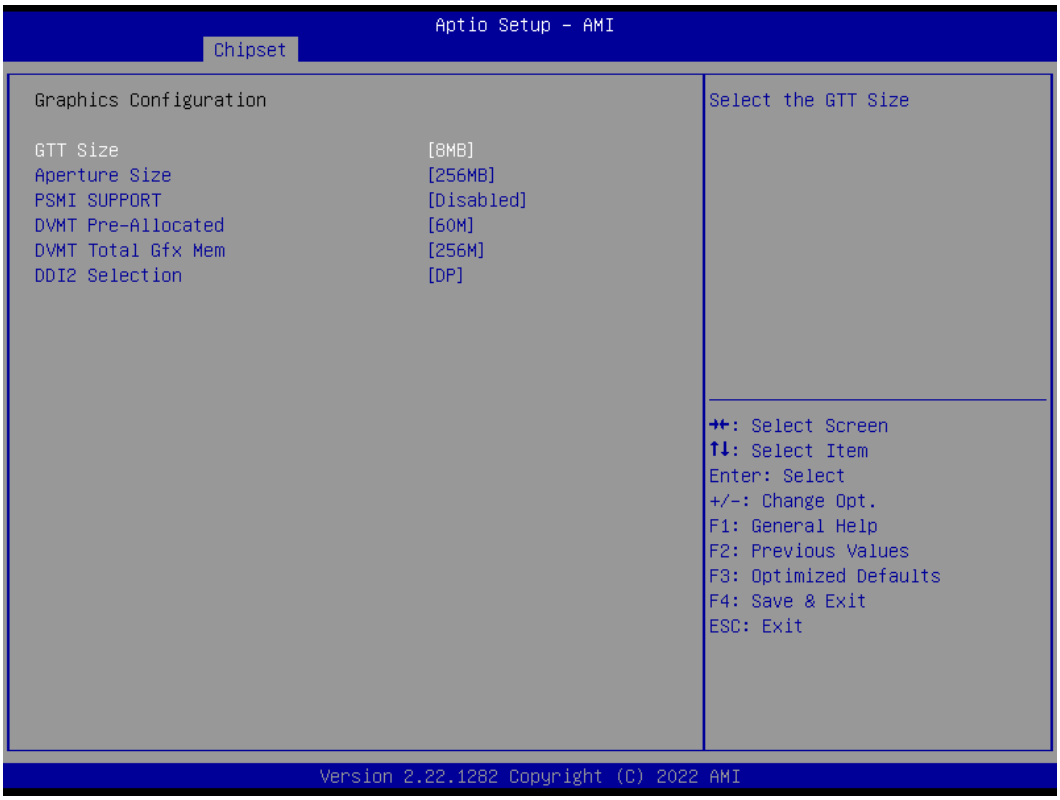
Item	Options	Description
VT-d	Disabled, Enabled **[Default]**	VT-d capability.
Above 4GB MMIO BIOS assignment	Enabled**[Default]** , Disabled	Enable/Disable above 4GB MemoryMappedIO BIOS assignment\n\nThis is enabled automatically when Aperture Size is set to 2048MB.

■ Memory Configuration



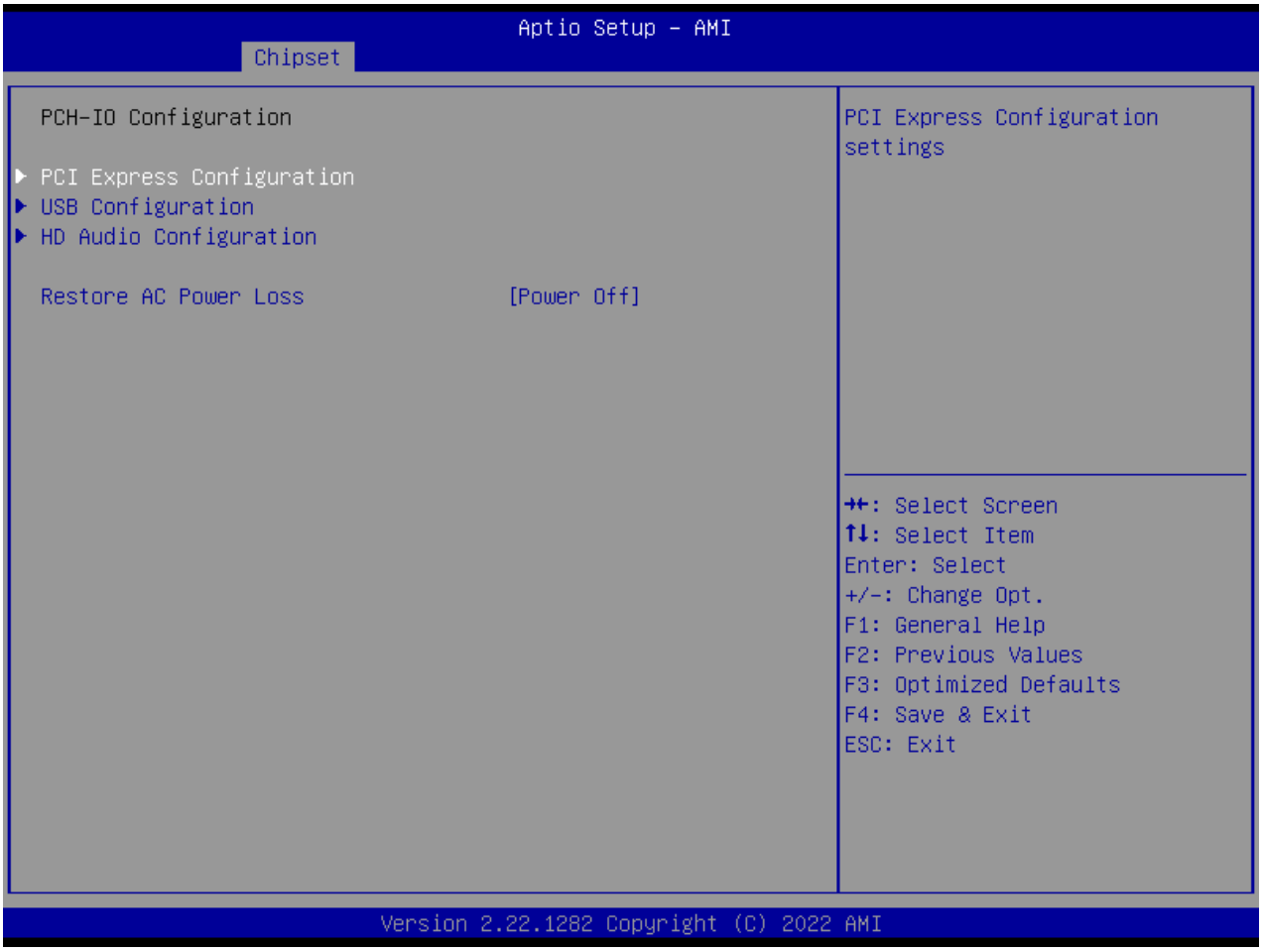
Item	Options	Description
Max TOLUD	Dynamic**[Default],** 1GB, 1.25GB, 1.5 GB, 1.75 GB, 2 GB, 2.25 GB, 2.5 GB,	Maximum Value of TOLUD. Dynamic assignment would adjust TOLUD automatically based on largest MMIO length of installed graphic controller

■ Graphic Configuration



Item	Options	Description
GTT Size	2MB, 4MB, 8MB**[Default]**	Select the GTT Size .
Aperture Size	128MB, 256MB**[Default] ,** 512MB, 1024MB	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**,**64M,96M,128M, 160M,4M, 8M,12M, 16M,20M,24M, 28M, 32M/F7,36M, 40M,44M, 48M,52M,56M, 60M**[Default]**	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.
DDI2 Selection	DP**[Default] ,** HDMI	Selects DDI2 function: DP or HDMI

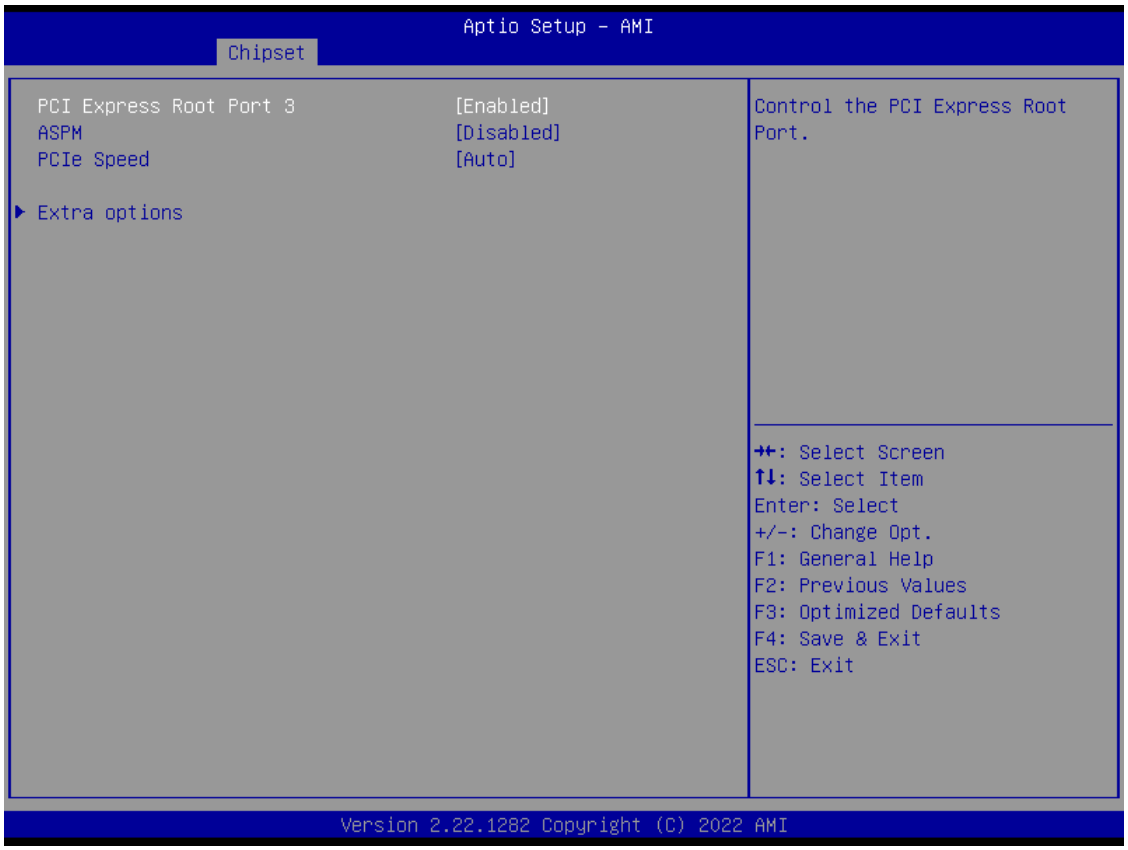
4.4.2 PCH-IO Configuration



Item	Options	Description
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).

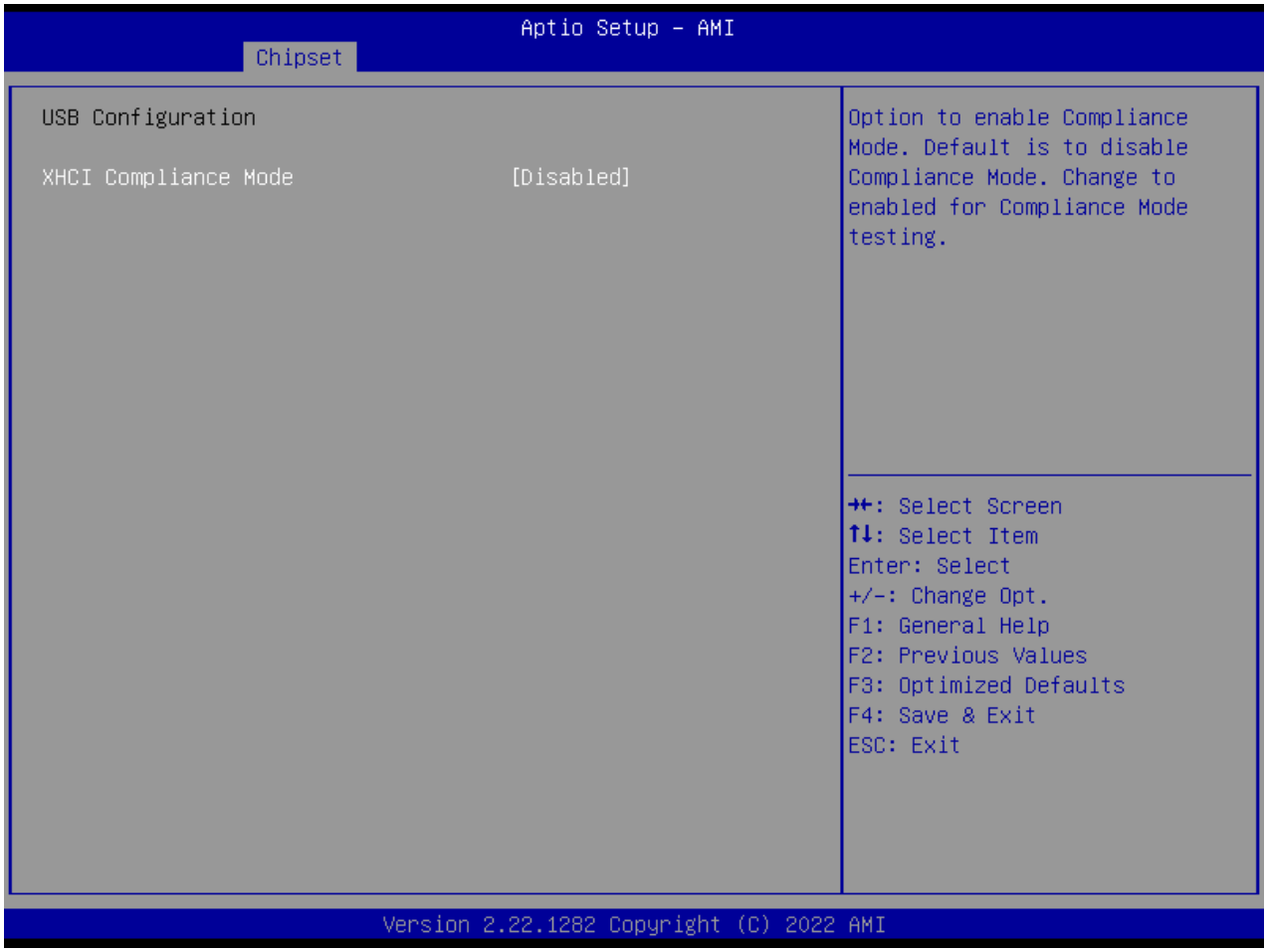
■ PCI Express Configuration

■ PCI Express Root Port 3 /4 /5 /7



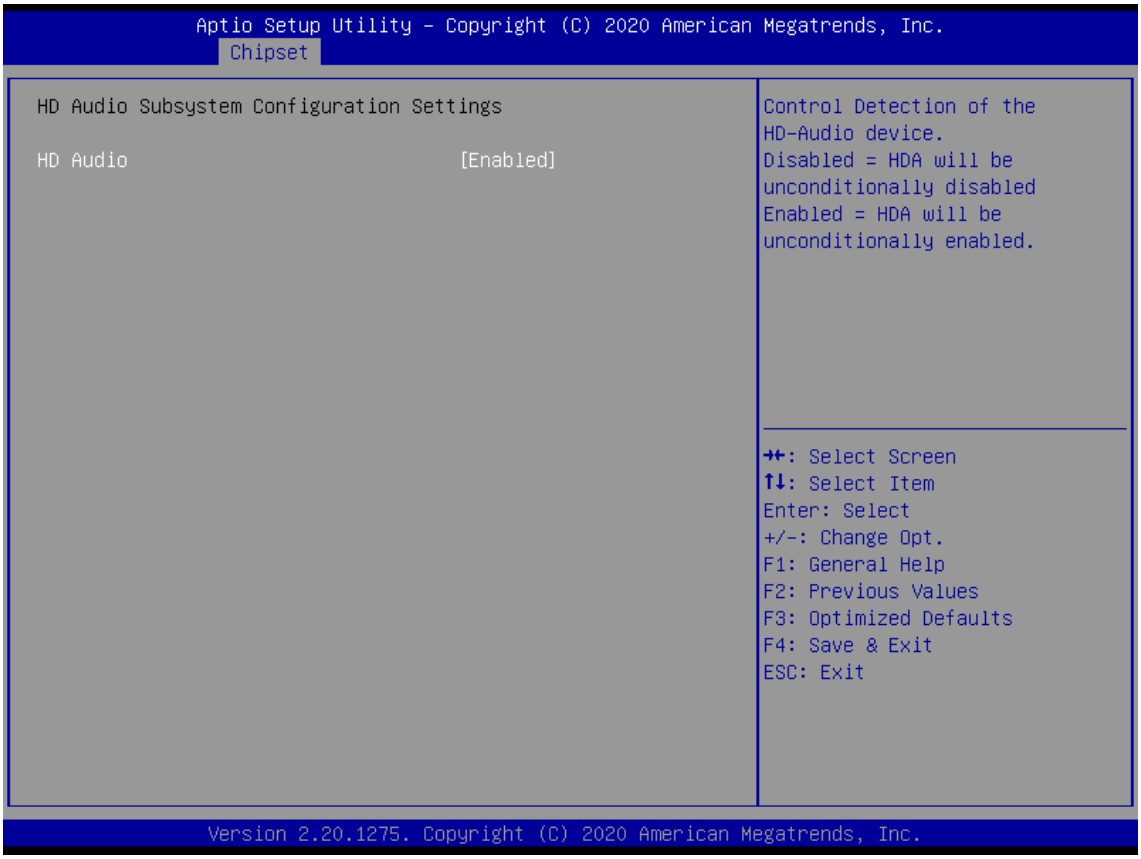
Item	Options	Description
PCI Express Root Port 3 /4 /5 /7	Disabled, Enabled **[Default]**	Control the PCI Express Root Port.
ASPM	Disabled **[Default]** , L0s, L1, L0sL1, Auto	Set the ASPM Level: Force L0s - Force all links to L0s State, AUTO - BIOS auto configure, DISABLE - Disables ASPM,
PCIe Speed	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 Compliance mode	Disabled **[Default]** , Enabled	Option to enable Compliance Mode. Default is to disable Compliance Mode. Change to enabled for Compliance Mode testing.

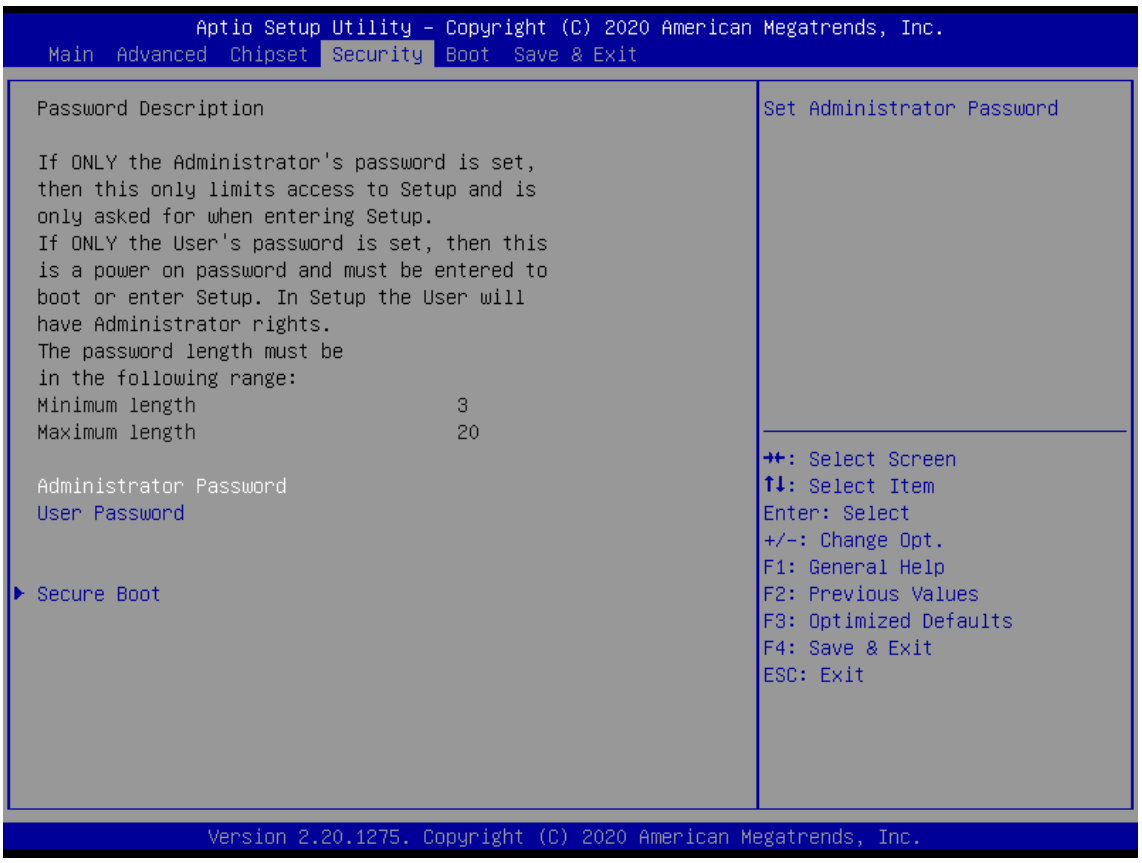
■ HD Audio Configuration



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.



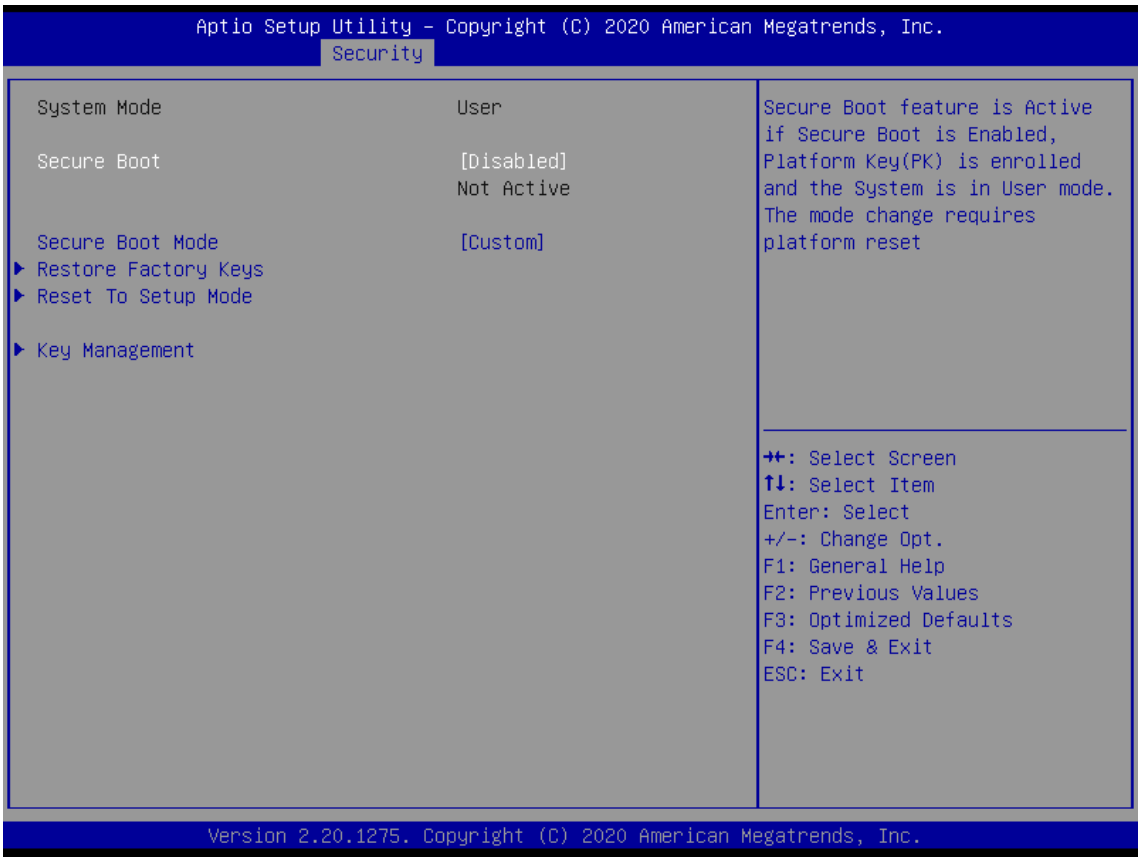
■ **Administrator Password**

This item allows you to set Administrator Password.

■ **User Password**

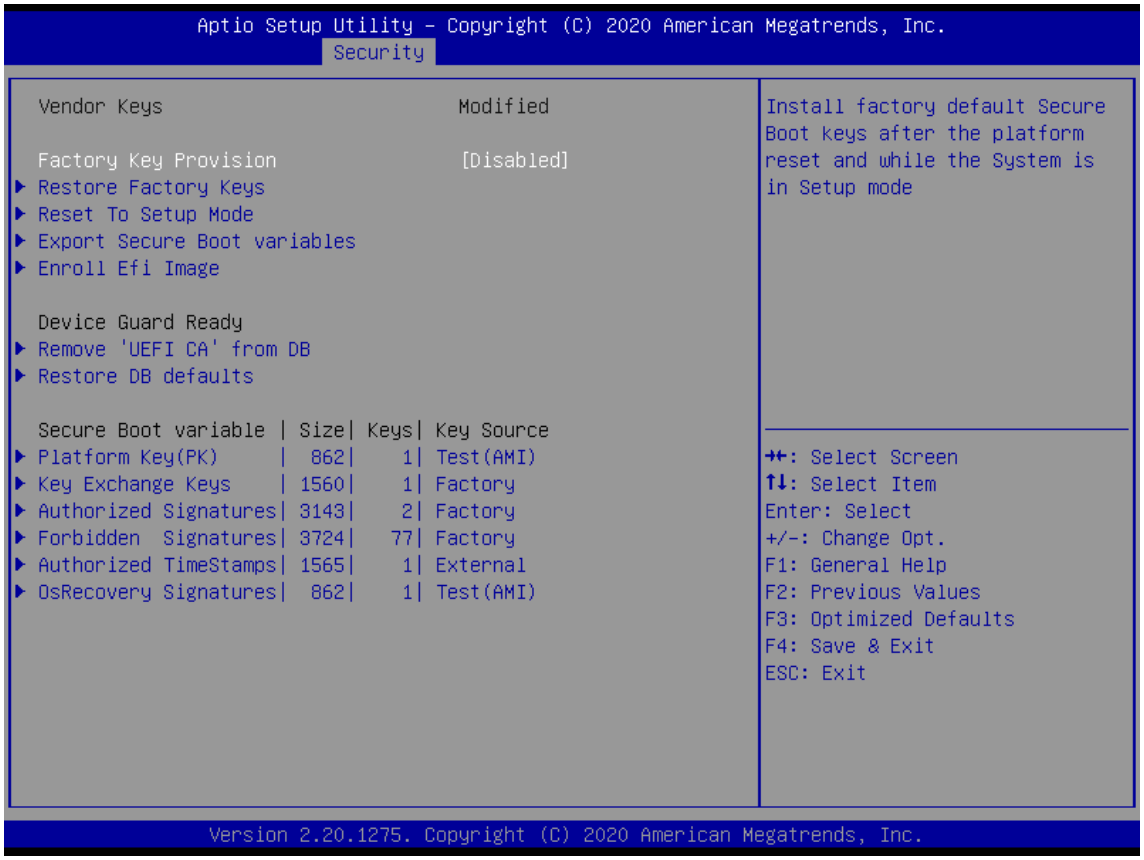
This item allows you to set User Password.

■ 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

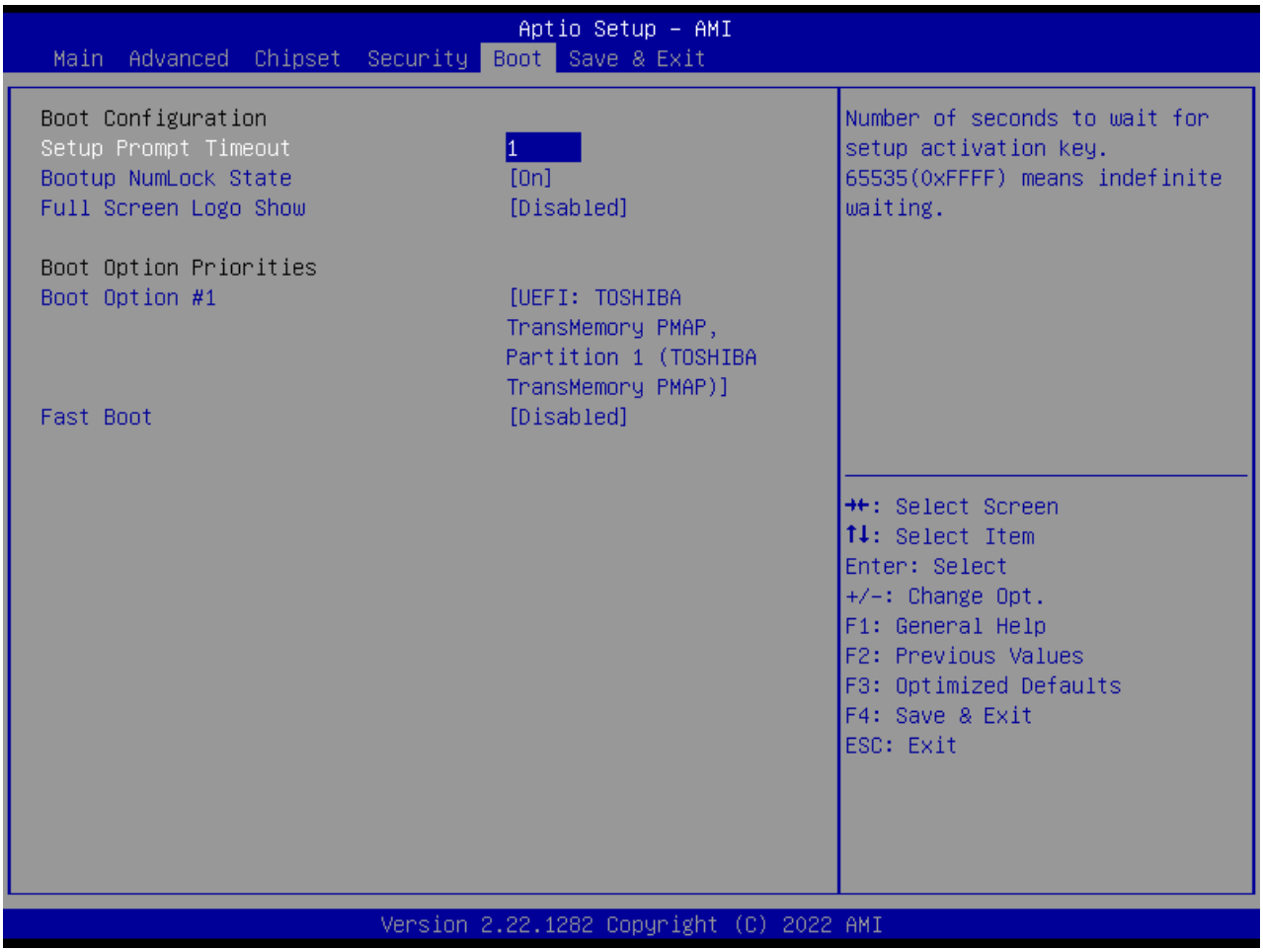
■ Key Management



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

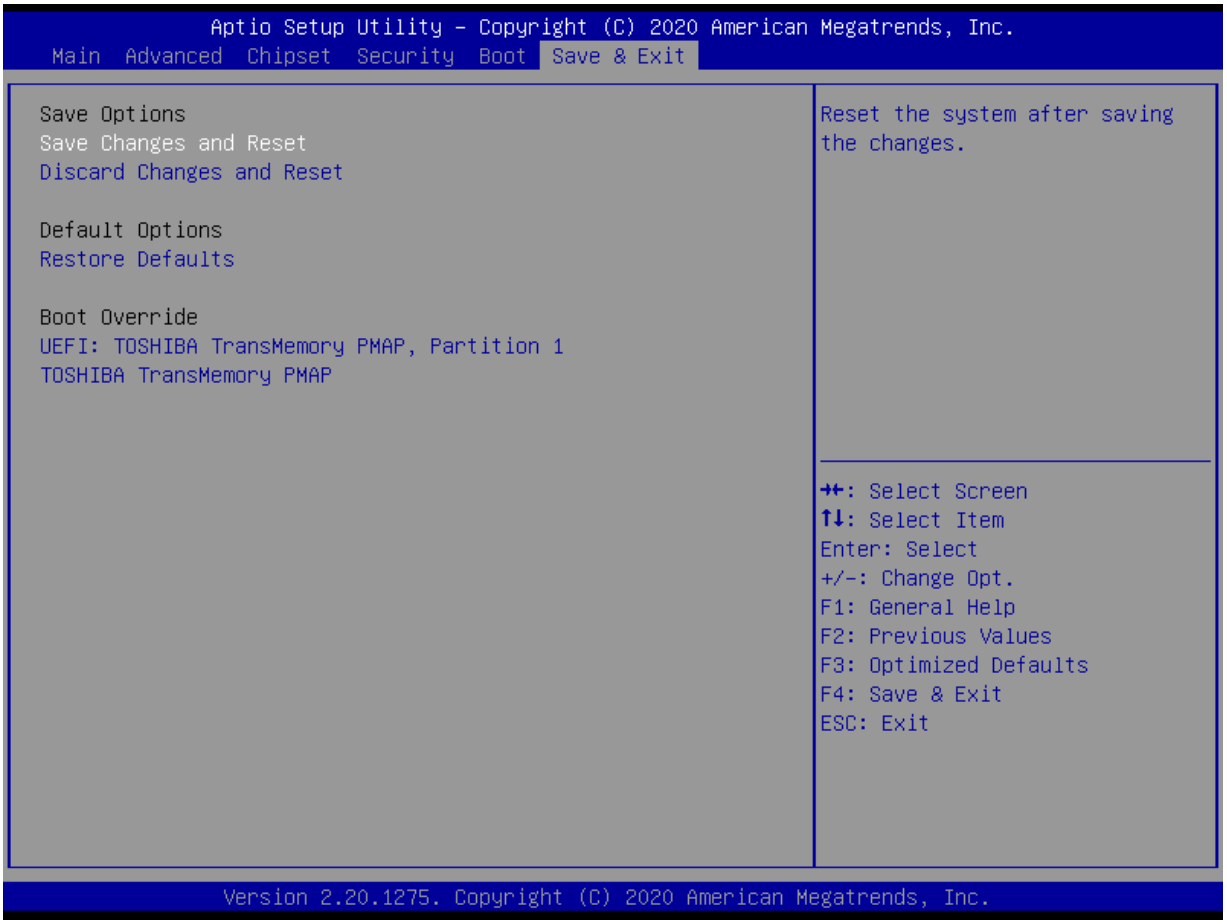
This menu allows you to setup the system boot options.



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.
Fast Boot	Disabled**[Default]** , Enabled	Enables or disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options.
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).

WDT Sample Code

WDT Setting

Psuedo Code

// IO Address 0xA16 is time value
// IO Address 0xA15 is WDT enable and configuration
Example, Set 0xA16=-0x03, 0xA15=0x31, it will reset after 3 seconds

```
#define TimePort          0xA16
#define TimeEnablePort  0xA15

WriteByte (TimePort,0x03)
WriteByte (TimeEnablePort,0x31)
```

GPIO Sample Code

GPIO Setting

IO_DO4	**I/O 0xA02h Bit3**
IO_DO3	I/O 0xA02h Bit2
IO_DO2	I/O 0xA02h Bit1
IO_DO1	I/O 0xA02h Bit0
IO_DI4	I/O 0xA03h Bit7
IO_DI3	I/O 0xA03h Bit6
IO_DI2	I/O 0xA03h Bit5
IO_DI1	I/O 0xA03h Bit4

The GPIO function is provided by SIO, and it can be accessed through its GPIO port. To access the GPIO register, write value to data port. The configuration on the BCO-1000-EHL is described as below.

Psuedo Code

```
#define GPI_ADDR    0xA03h
#define GPO_ADDR  0xA02h

// 0xA03h is Pin Status(default 0xF5 )(at IO_DI1(Bit4) ~  IO_DI4(Bit7))
ByteData = ReadByte (GPI_ADDR)      //Read current Pin Status

//Offset 0xA02h default setting is 0x5F (output pin set to output high) (at IO_DO1(Bit0) ~  IO_DO4(Bit3))
ByteData = 0x0F                          //set IO_DO1~ IO_DO4 to high
WriteByte (GPO_ADDR, ByteData)
```

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