EmETXe-i92U0

COM Express® Compact Type 6 CPU Module

User's Manual

Version 1.0

2022.07

Revision History

Version	Date	Description
1.0	2022.07	Initial release

Copyright Notice

The information in this document is subject to change without prior notice in order to improve the reliability, design and function. It does not represent a commitment on the part of the manufacturer.

Under no circumstances will the manufacturer be liable for any direct, indirect, special, incidental, or consequential damages arising from the use or inability to use the product or documentation, even if advised of the possibility of such damages.

Declaration of Conformity

CE

The CE symbol on your product indicates that it is in compliance with the directives of the Union European (EU). A Certificate of Compliance is available by contacting Technical Support.

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from ARBOR. Please contact your local supplier for ordering information.

This product has passed the CE test for environmental specifications. Test conditions for passing included the equipment being operated within an industrial enclosure. In order to protect the product from being damaged by ESD (Electrostatic Discharge) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

> Warning
>
> This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC Class B

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1)This device may not cause harmful interference, and

(2)This device must accept any interference received, including interference that may cause undesired operation.

NOTE:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

RoHS

ARBOR Technology Corp. certifies that all components in its products are in compliance and conform to the European Union's Restriction of Use of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2002/95/EC.

The above mentioned directive was published on 2/13/2003. The main purpose of the directive is to prohibit the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE) in electrical and electronic products. Member states of the EU are to enforce by 7/1/2006.

ARBOR Technology Corp. hereby states that the listed products do not contain unintentional additions of lead, mercury, hex chrome, PBB or PBDB that exceed a maximum concentration value of 0.1% by weight or for cadmium exceed 0.01% by weight, per homogenous material. Homogenous material is defined as a substance or mixture of substances with uniform composition (such as solders, resins, plating, etc.). Lead-free solder is used for all terminations (Sn(96-96.5%), Ag(3.0-3.5%) and Cu(0.5%)).

SVHC / REACH

To minimize the environmental impact and take more responsibility to the earth we live, Arbor hereby confirms all products comply with the restriction of SVHC (Substances of Very High Concern) in (EC) 1907/2006 (REACH --Registration, Evaluation, Authorization, and Restriction of Chemicals) regulated by the European Union.

All substances listed in SVHC < 0.1 % by weight (1000 ppm)

Warning

Single Board Computers and their components contain very delicate Integrated Circuits (IC). To protect the Single Board Computer and its components against damage from static electricity, you should always follow the following precautions when handling it :

1. Disconnect your Single Board Computer from the power source when you want to work on the inside.

2. Hold the board by the edges and try not to touch the IC chips, leads or circuitry.

3. Use a grounded wrist strap when handling computer components.

4. Place components on a grounded antistatic pad or on the bag that comes with the Single Board Computer, whenever components are separated from the system.

Replacing the Lithium Battery

Incorrect replacement of the lithium battery may lead to a risk of explosion.

The lithium battery must be replaced with an identical battery or a battery type recommended by the manufacturer.

Do not throw lithium batteries into the trash-can. It must be disposed of in accordance with local regulations concerning special waste.

Technical Support

If you have any technical difficulties, please consult the user's manual first at:

http://www.arbor-technology.com

Please do not hesitate to call or e-mail our customer service when you still cannot find out the answer.

http://www.arbor-technology.com
E-mail:info@arbor.com.tw

Warranty

This product is warranted to be in good working order for a period of two years from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster.

Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, or inability to use this product. Vendor will not be liable for any claim made by any other related party.

Vendors disclaim all other warranties, either expressed or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose, with respect to the hardware, the accompanying product's manual(s) and written materials, and any accompanying hardware. This limited warranty gives you specific legal rights.

Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.

Chapter 1

Introduction

1.1 The Product

The EmETXe-i92U0 is a space-conscious CPU board of 95 mm x 95 mm to take up only small footprint in your system. By the architecture of Type 6, the board has two high-performance connectors to promise stable data passing rate. The soldered onboard 6th Generation Intel® Core™ processor, along with integrated Intel® Graphics chipset, bring LVDS, and DDI solution for most monitors or LCD video panels.

For system configuration, the board is supported by AMI UEFI BIOS. EmETXe-i92U0 is an ideal choice for some demanding industrial control and data communications by its significant processing performance, low power consumption and these features:

- Soldered onboard 11th Generation Intel® Core™ i7-1185G7E/ i5-1145G7E/ i3-1115G4E/ Celeron 6305E processor
- Intel I219LM PCIe GbE PHY w/ iAMT
- Dual Channels 24-bit LVDS, Analog RGB and 3 x DDI ports
- Support 4 independent displays
- 8.5V~20V Wide Range Voltage Input
- Wide Range Operating Temp.: -40 ~ 85°C

1.2 About This Manual

This user's manual provides general information and installation instructions about the product. This user's manual is intended for experienced users and integrators with hardware knowledge of personal computers. If you are not sure about any description in this booklet. Please consult your vendor before further handling.

1.3 Specifications

System	
CPU	Soldered onboard 11th Generation Intel® Core™ - i7-1185G7E 1.8GHz(Base)/ 4.4GHz (Turbo) - i5-1145G7E 1.5GHz(Base)/ 4.1GHz (Turbo) - i3-1115G4E 2.2GHz(Base)/ 3.9GHz (Turbo) - Celeron 6305E 1.8GHz processor
Memory	2 x DDR4 SO-DIMM sockets
BIOS	AMI UEFI BIOS
Watchdog Timer	1~255 levels reset
I/O	
USB Port	12 x USB ports: - 8 x USB 2.0 ports - 4 x USB 3.2 ports
Serial Port	2 x UART ports (RX/TX only)
Expansion Bus	1 x PCIex4 lanes*, 4 x PCIex1 lanes, I^2C Interface, GPIO *Note: One PCIex4 lane is from CPU, and it can not be configured as four x1 lanes.
Storage	Two Serial ATA ports with 600MB/s HDD transfer rate
Ethernet Chipset	1 x Intel® i219LM PCIe GbE PHY w/ iAMT
Audio	HD audio link
TPM	Supports TPM 2.0
MIPI DSI	Supports MIPI DSI interface via on CPU module connector (OEM Request)
Display	
Graphic Chipset	Integrated Intel® Iris Xe or UHD Graphics (Depends on CPU SKU)

Graphic Interface	LCD: Dual Channels 24-bit LVDS 1 x Analog RGB port 3 x DDI ports (Max 4 independent display)
Mechanical & Environmental	
Power Requirement	8.5V ~ 20V wide range voltage input, +5VSB +/- 5% support for S3
Power Consumption	1.14A@20V 8A@8.5V (i5-1145G7E CPU Module only)
Operating Temp.	-40 ~ 85ºC (-40 ~ 185ºF)
Operating Humidity	10 ~ 95% @ 85°C (non-condensing)
Dimensions (L x W)	95 x 95 mm (3.7” x 3.7”)

1.4 Inside the Package

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

1 x EmETXe-i92U0 COM Express CPU Module

1 x Quick Installation Guide

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

1.5 Ordering Information

EmETXe-i92U0-WT-1185G7E	11th Gen. Intel® Core™ i7-1185G7E WT COMe Compact Type 6 CPU module, -40 ~ 85°C
EmETXe-i92U0-WT-1145G7E	11th Gen. Intel® Core™ i5-1145G7E WT COMe Compact Type 6 CPU module, -40 ~ 85°C
EmETXe-i92U0-WT-1115G4E	11th Gen. Intel® Core™ i3-1115G4E WT COMe Compact Type 6 CPU module, -40 ~ 85°C
EmETXe-i92U0-WT-6305E	11th Gen. Intel® Celeron 6305E WT COMe Compact Type 6 CPU module, -40 ~ 85°C

1.5.1 Optional Accessories

HS-92U0-C1	Heat sink with Fan (95x95x50mm)
HS-91U0-F2-T	Heat spreader, threaded standoffs (bore hole) (95x95x11mm)
HS-91U0-F2-NT	Heat spreader, non-threaded standoffs (bore hole) (95x95x11mm)
PBE-1705-F1	COM Express® Type 6 evaluation carrier board with SIO F71869ED module in ATX form factor
CBK-03-1705-00	Cable kit 1 x SATA cable 2 x COM Flat cables

Driver Installation

To install the drivers, please visit our website at **www.arbor.technology.com** and download the drivers from the **Download Center**.

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Chapter 2

Board Overview

2.1 What Is "COM Express®"?

With more and more demands on small and embedded industrial boards, a multi-functional COM (Computer-on-Module) surfaces as a great solution.

COM Express® supports seven pin-out types applying to Basic and Extended form factors:

Module Type 1 and 10 support single connector with two rows (220 pins).

Module Type 2, 3, 4, 5 and 6 support two connectors with four rows (440 pins).

EmETXe-i92U0 is a Type-6 module.

Difference between Standard Type 6 and EmETXe-i92U0 is listed as below:

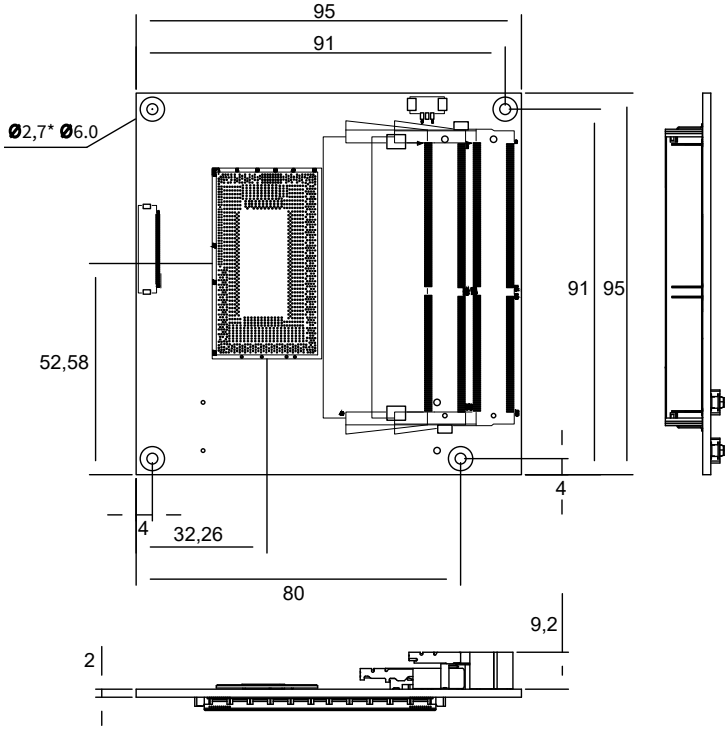
Module Type	Standard Type 6	EmETXe-i92U0
Connectors	2	2
Connector Rows	A, B, C, D	A, B, C, D
PCIe Lanes (Max)	24	8
LAN (Max)	1	1
Serial Ports (Max)	2	2
Digital Display I/F (Max)	3	2
USB 3.0 Ports (Max)	4	4

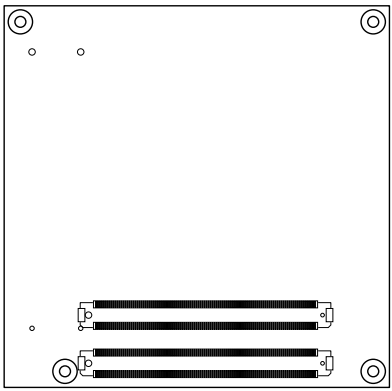
Row AB provides pins for PCI Express, SATA, LVDS, LCD channel, LPC bus, system and power management, VGA, LAN, and power and ground interfaces.

Row CD provides SDVO and legacy PCI signals next to additional PCI Express, LAN and power and ground signals. The COM are targeted at following applications:

- Retail & Advertising
- Medical
- Test & Measurement
- Gaming & Entertainment
- Industrial & Automation
- Military & Government
- Security

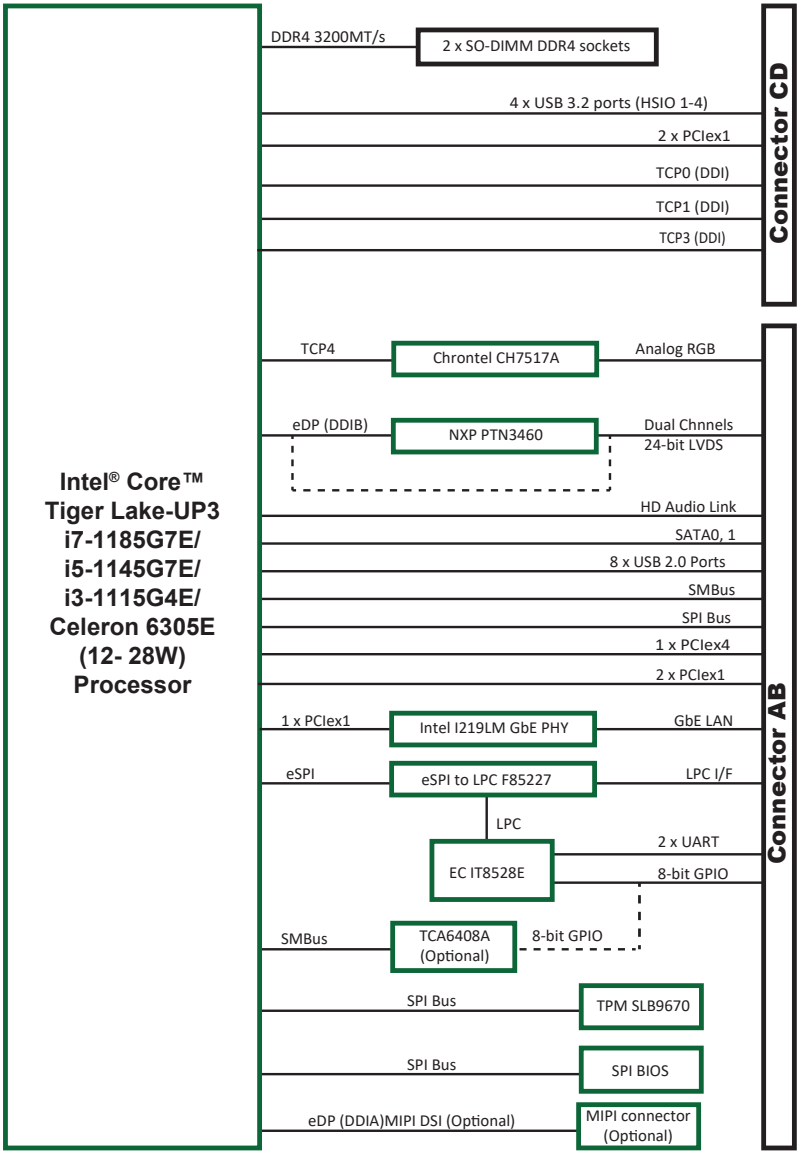
2.2 Board Dimensions





Unit: mm

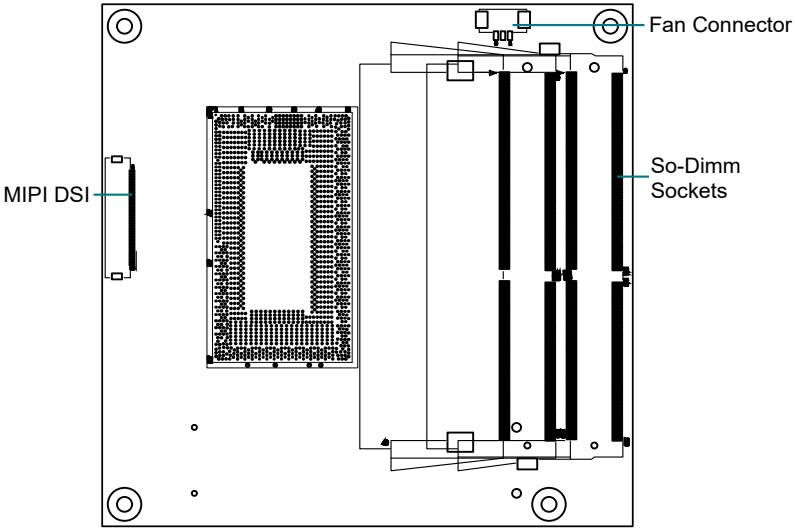
2.3 Block Diagram



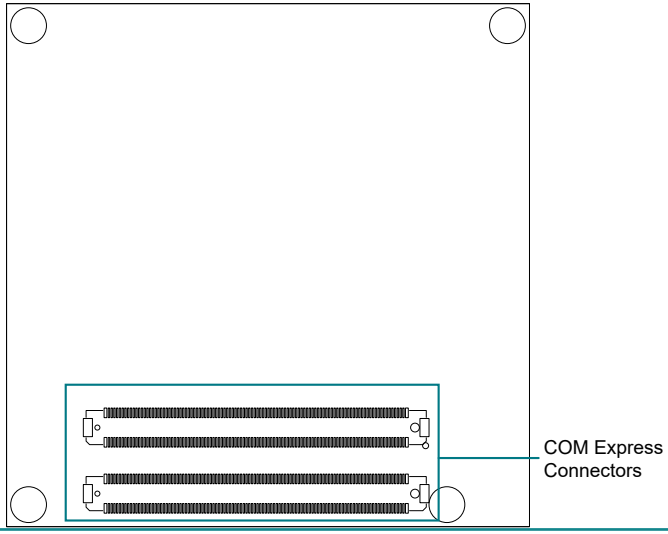
2.4 Connector Pin Definition

Being a most commonly-used Type 6, the EmETXe-i92U0 features two board-to-board connectors on bottom side.

Top Side



Bottom Side



FAN1: Fan connctor

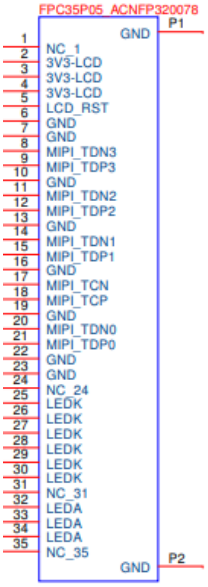
Connector type: Wafer 3-pin 1.25mm 85204-03X0L

Pin	Description
1	GND
2	Fan out
3	Fan Tachometer Input

MIPI DSI: MIPI DSI connector (by OEM request)

Connector type: Wafer 35-pin

Pin	Description	Pin	Description
1	NC1	19	GND
2	3V3-LCD	20	MIPI_TCN0
3	3V3-LCD	21	MIPI_TCP0
4	3V3-LCD	22	GND
5	LCD_RST	23	GND
6	GND	24	NC_24
7	GND	25	LEDK
8	MIPI_TDN3	26	LEDK
9	MIPI_TDP3	27	LEDK
10	GND	28	LEDK
11	MIPI_TDN2	29	LEDK
12	MIPI_TDP2	30	LEDK
13	GND	31	NC_31
14	MIPI_TDN1	32	LEDA
15	MIPI_TDP1	33	LEDA
16	GND	34	LEDA
17	MIPI_TCN	35	NC_35
18	MIPI_TCP		



COM Express AB Connector (bottom side)

B1	GND	GND	A1
B2	GBE0_ACT#	GBE0_MDI3-	A2
B3	LPC_FRAME#	GBE0_MDI3+	A3
B4	LPC_AD0	GBE0_LINK100#	A4
B5	LPC_AD1	GBE0_LINK1000#	A5
B6	LPC_AD2	GBE0_MDI2-	A6
B7	LPC_AD3	GBE0_MDI2+	A7
B8	LPC_DRQ0#	GBE0_LINK#	A8
B9	LPC_DRQ1#	GBE0_MDI1-	A9
B10	LPC_CLK	GBE0_MDI1+	A10
B11	GND	GND	A11
B12	PWRBTN#	GBE0_MDI0-	A12
B13	SMB_CK	GBE0_MDI0+	A13
B14	SMB_DATA	GBE0_CTREF	A14
B15	SMB_ALRERT#	SUS_S3#	A15
B16	ATA1_TX+	SATA0_TX+	A16
B17	SATA1_TX-	SATA0_TX-	A17
B18	SUS_STAT#	SUS_S4#	A18
B19	SATA1_RX+	SATA0_RX+	A19
B20	SATA1_RX-	SATA0_RX-	A20
B21	GND	GND	A21
B22	N/C	N/C	A22
B23	N/C	N/C	A23
B24	PWR_OK	SUS_S5#	A24
B25	N/C	N/C	A25
B26	N/C	N/C	A26
B27	WDT	BATLOW#	A27
B28	N/C	ATA_ACT#	A28
B29	AC_SDIN1	AC_SYNC	A29
B30	AC_SDIN0	AC_RST#	A30
B31	GND	GND	A31
B32	SPKR	AC_BITCLK	A32
B33	I2C_CK	AC_SDOUT	A33
B34	I2C_DAT	BIOS_DISABLE0#	A34
B35	THRM#	THRMTRIP#	A35
B36	USB7-	USB6-	A36
B37	USB7+	USB6+	A37
B38	USB_4_5_OC#	USB_6_7_OC#	A38
B39	USB5-	USB4-	A39
B40	USB5+	USB4+	A40
B41	GND	GND	A41
B42	USB3-	USB2-	A42
B43	USB3+	USB2+	A43
B44	USB_0_1_OC#	USB_2_3_OC#	A44
B45	USB1-	USB0-	A45
B46	USB1+	USB0+	A46
B47	EXCD1_PERST#	VCC_RTC	A47
B48	EXCD1_CPPE#	EXCD0_PERST#	A48
B49	SYS_REST#	EXCD0_CPPE#	A49
B50	CB_REST#	LPC_SERIRQ	A50
B51	GND	GND	A51
B52	PCIE_RX5+	PCIE_TX5+	A52
B53	PCIE_RX5-	PCIE_TX5-	A53
B54	GPO1	GPI0	A54
B55	PCIE_RX4+	PCIE_TX4+	A55

B56	PCIE_RX4-	PCIE_TX4-	A56
B57	GPO2	GND	A57
B58	PCIE_RX3+	PCIE_TX3+	A58
B59	PCIE_RX3-	PCIE_TX3-	A59
B60	GND	GND	A60
B61	PCIE_RX2+	PCIE_TX2+	A61
B62	PCIE_RX2-	PCIE_TX2-	A62
B63	GPO3	GPI1	A63
B64	PCIE_RX1+	PCIE_TX1+	A64
B65	PCIE_RX1-	PCIE_TX1-	A65
B66	PCIE_RX0+	GND	A66
B67	WAKE1#	GPI2	A67
B68	PCIE_RX0+	PCIE_TX0+	A68
B69	PCIE_RX0-	PCIE_TX0-	A69
B70	GND	GND	A70
B71	LVDS_B0+	LVDS_A0+	A71
B72	LVDS_B0-	LVDS_A0-	A72
B73	LVDS_B1+	LVDS_A1+	A73
B74	LVDS_B1-	LVDS_A1-	A74
B75	LVDS_B2+	LVDS_A2+	A75
B76	LVDS_B2-	LVDS_A2-	A76
B77	LVDS_B3+	LVDS_VDD_EN	A77
B78	LVDS_B3-	LVDS_A3+	A78
B79	LVDS_BKLT_EN	LVDS_A3-	A79
B80	GND	GND	A80
B81	LVDS_B_CK+	LVDS_A_CK+	A81
B82	LVDS_B_CK-	LVDS_A_CK-	A82
B83	LVDS_BKLT_CTRL	LVDS_I2C_CK	A83
B84	VCC_5V_SBY	LVDS_I2C_DAT	A84
B85	VCC_5V_SBY	GPI3	A85
B86	VCC_5V_SBY	RSV4	A86
B87	VCC_5V_SBY	RSV3	A87
B88	BIOS_DIS1#	PCIE0_CK_REF+	A88
B89	VGA_RED	PCIE0_CK_REF-	A89
B90	GND	GND	A90
B91	VGA_GRN	SPI_POWER	A91
B92	VGA_BLU	SPI_MISO	A92
B93	VGA_HSYNC	GPO0	A93
B94	VGA_VSYNC	SPI_CLK	A94
B95	VGA_I2C_CK	SPI_MOSI	A95
B96	VGA_I2C_DAT	TPM_PP	A96
B97	SPI_CS#	N/C	A97
B98	RSV2	SERR0_TX	A98
B99	RSV1	SERR0_RX	A99
B100	GND	GND	A100
B101	FAN_PWMOUT	SERR1_TX	A101
B102	FAN_TACHIN	SERR1_RX	A102
B103	SLEEP#	LID#	A103
B104	VCC_12V	VCC_12V	A104
B105	VCC_12V	VCC_12V	A105
B106	VCC_12V	VCC_12V	A106
B107	VCC_12V	VCC_12V	A107
B108	VCC_12V	VCC_12V	A108
B109	VCC_12V	VCC_12V	A109
B110	GND	GND	A110

COM Express CD Connector (bottom side)

D1	GND	GND	C1
D2	GND	GND	C2
D3	USB_SSTX0-	USB_SSRX0-	C3
D4	USB_SSTX0+	USB_SSRX0+	C4
D5	GND	GND	C5
D6	USB_SSTX1-	USB_SSRX1+	C6
D7	USB_SSTX1+	USB_SSRX1-	C7
D8	GND	GND	C8
D9	USB_SSTX2-	USB_SSRX2-	C9
D10	USB_SSTX2+	USB_SSRX2+	C10
D11	GND	GND	C11
D12	USB_SSTX3-	USB_SSRX3-	C12
D13	USB_SSTX3+	USB_SSRX3+	C13
D14	GND	GND	C14
D15	DDI1_CTRLCLK_AUX+	N/C	C15
D16	DDI1_CTRLCLK_AUX-	N/C	C16
D17	RSV10	RSV8	C17
D18	RSV9	RSV7	C18
D19	PCIE_TX6+	PCIE_RX6+	C19
D20	PCIE_TX6-	PCIE_RX6-	C20
D21	GND	GND	C21
D22	PCIE_TX7+	PCIE_RX7+	C22
D23	PCIE_TX7-	PCIE_RX7-	C23
D24	RSV5	DDI_HPD	C24
D25	RSV6	N/C	C25
D26	DDI1_PAIR0+	N/C	C26
D27	DDI1_PAIR0-	RSV1	C27
D28	RSV3	RSV2	C28
D29	DDI1_PAIR1+	N/C	C29
D30	DDI1_PAIR1-	N/C	C30
D31	GND	GND	C31
D32	DDI_PAIR2+	DDI2_CTRLCLK_AUX+	C32
D33	DDI1_PAIR2-	DDI2_CTRLCLK_AUX-	C33
D34	DDI1_DDC_AUX_SEL	DDI2_DDC_AUX_SEL	C34
D35	RSV11	RSV12	C35
D36	DDI1_PAIR3+	DDI3_CTRLCLK_AUX+	C36
D37	DDI1_PAIR3-	DDI3_CTRLDATA_AUX-	C37
D38	RSV4	DDI3_DDC_AUX_SEL	C38
D39	DDI2_PAIR0+	DDI3_PAIR0+	C39
D40	DDI2_PAIR0-	DDI3_PAIR0-	C40
D41	GND	GND	C41
D42	DDI2_PAIR1+	DDI3_PAIR1+	C42
D43	DDI2_PAIR1-	DDI3_PAIR1-	C43
D44	DDI2_HPD	DDI3_HPD	C44
D45	RSV13	RSV14	C45
D46	DDI2_PAIR2+	DDI3_PAIR2+	C46
D47	DDI2_PAIR2-	DDI3_PAIR2-	C47
D48	RSV16	RSV15	C48
D49	DDI2_PARI3+	DDI3_PAIR3+	C49
D50	DDI2_PAIR3-	DDI3_PAIR3-	C50
D51	GND	GND	C51
D52	N/C	N/C	C52
D53	N/C	N/C	C53
D54	PEG_LANE_RV#	N/C	C54
D55	N/C	N/C	C55

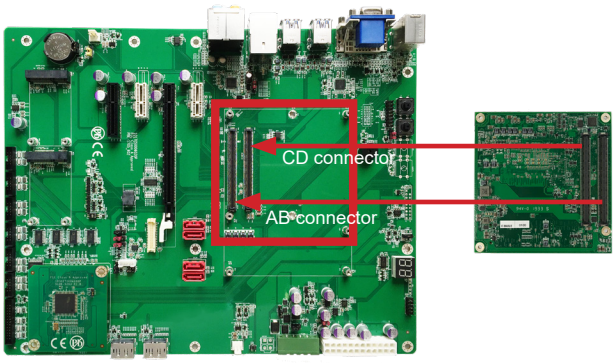
D56	N/C	N/C	C56
D57	TYPE2#	N/C	C57
D58	N/C	N/C	C58
D59	N/C	N/C	C59
D60	GND	GND	C60
D61	N/C	N/C	C61
D62	N/C	N/C	C62
D63	N/C	RSV18	C63
D64	N/C	RSV19	C64
D65	N/C	N/C	C65
D66	N/C	N/C	C66
D67	GND	RSV20	C67
D68	N/C	N/C	C68
D69	N/C	N/C	C69
D70	GND	GND	C70
D71	N/C	N/C	C71
D72	N/C	N/C	C72
D73	GND	GND	C73
D74	N/C	N/C	C74
D75	N/C	N/C	C75
D76	GND	GND	C76
D77	RSV17	N/C	C77
D78	N/C	N/C	C78
D79	N/C	N/C	C79
D80	GND	GND	C80
D81	N/C	N/C	C81
D82	N/C	N/C	C82
D83	RSV25	RSV24	C83
D84	GND	GND	C84
D85	N/C	N/C	C85
D86	N/C	N/C	C86
D87	GND	GND	C87
D88	N/C	N/C	C88
D89	N/C	N/C	C89
D90	GND	GND	C90
D91	N/C	N/C	C91
D92	N/C	N/C	C92
D93	GND	GND	C93
D94	N/C	N/C	C94
D95	N/C	N/C	C95
D96	GND	GND	C96
D97	RSV23	RSV22	C97
D98	N/C	N/C	C98
D99	N/C	N/C	C99
D100	GND	GND	C100
D101	N/C	N/C	C101
D102	N/C	N/C	C102
D103	GND	GND	C103
D104	VCC_12V	VCC_12V	C104
D105	VCC_12V	VCC_12V	C105
D106	VCC_12V	VCC_12V	C106
D107	VCC_12V	VCC_12V	C107
D108	VCC_12V	VCC_12V	C108
D109	VCC_12V	VCC_12V	C109
D110	GND (FIXED)	GND	C110

Chapter 3

Installation & Maintenance

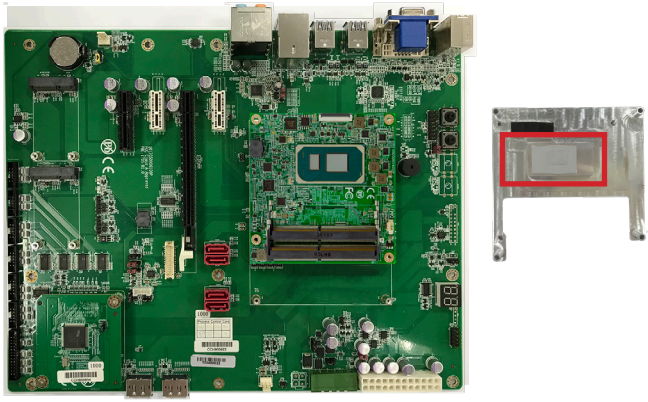
3.1 Installing the CPU Module to Carrier Board

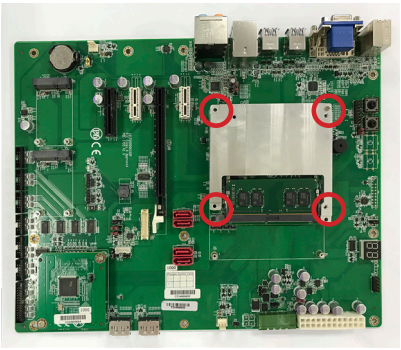
1. Mount the EmETXe-i92U0 into PBE-1705 via COM Express connectors as below; that is, COM Express AB to AB and CD to CD.



2. Install the optional heat spreader or heat sink with fan to the COM module.

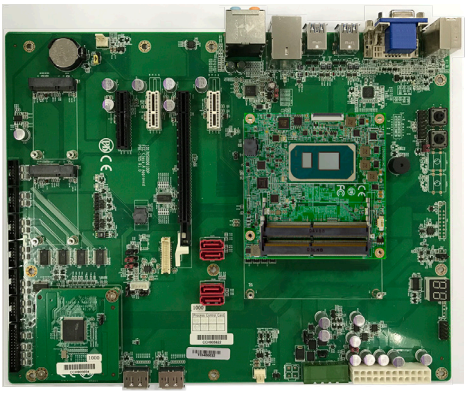
   For heat spreader
   Apply thermal grease to the CPU area on the CPU module. Place the heat spreader over the CPU module and fasten the four screws to secure it in place.

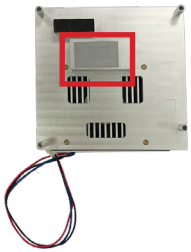




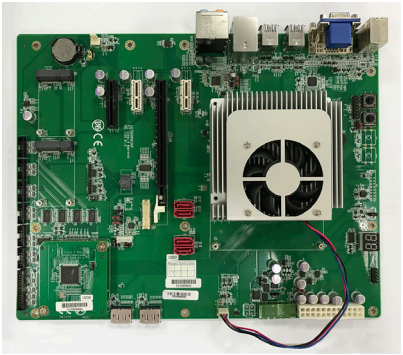
For heat sink with fan

Apply thermal grease to the CPU area on the CPU module. Place the heat sink over the CPU module and fasten the six screws to secure it in place.





Then connect the fan cable to the fan connector on the carrier board.



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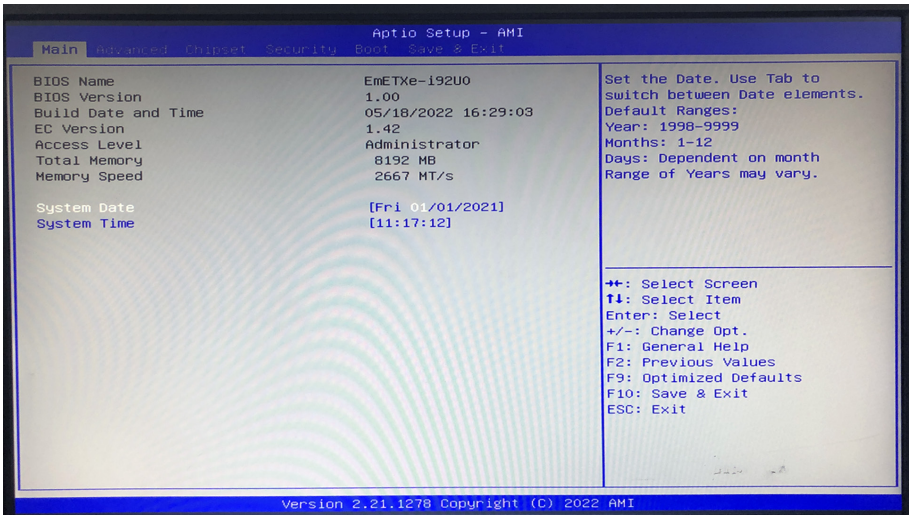
Chapter 4

BIOS

4.1 Main

The AMI BIOS provides a Setup utility program for specifying the system configurations and settings. The BIOS RAM of the system stores the Setup utility and configurations. When you turn on the computer, the AMI BIOS is immediately activated. To enter the BIOS SETUP UTILITY, press **"Delete"** once the power is turned on.

The **Main Setup** screen lists the following information:



Setting	Description
System Language	Choose the system default language.
System Date	Set the system date. Use Tab to switch between Data elements. Note that the 'Day' automatically changes when you set the date. ► The date format is: **Day:** Sun to Sat **Month:** 1 to 12 **Date:** 1 to 31 **Year:** 1998 to 2099

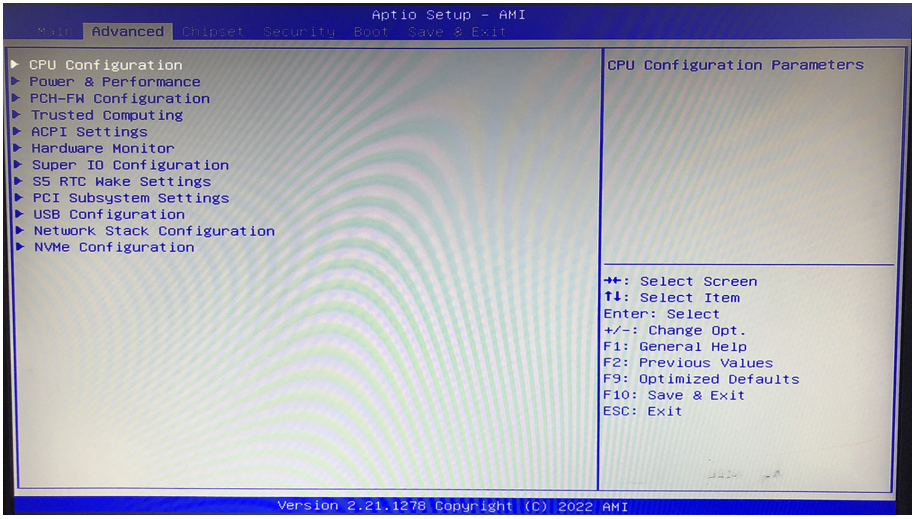
System Time	Set the system time. Use Tab to switch between Time elements. ► The time format is: **Hour:** 00 to 23 **Minute:** 00 to 59 **Second:** 00 to 59

Key Commands

BIOS Setup Utility is mainly a key-based navigation interface. Please refer to the following key command instructions for navigation process.

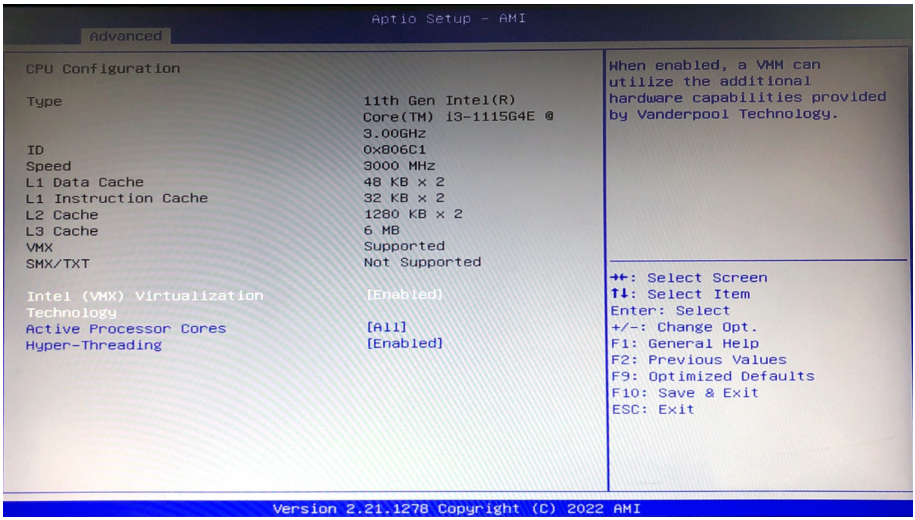
Keystroke	Function
◄ ►	Move to highlight a particular configuration screen from the top menu bar / Move to highlight items on the screen
▼ ▲	Move to highlight previous/next item
Enter	Select and access a setup item/field
Esc	On the Main Menu – Quit the setup and not save changes into CMOS (a message screen will display and ask you to select “OK” or “Cancel” for exiting and discarding changes. Use “←” and “→” to select and press “Enter” to confirm) On the Sub Menu – Exit current page and return to main menu
Page Up / +	Increase the numeric value on a selected setup item / make change
Page Down / -	Decrease the numeric value on a selected setup item / make change
F1	Activate “General Help” screen
F10	Save the changes that have been made in the setup and exit. (a message screen will display and ask you to select “OK” or “Cancel” for exiting and saving changes. Use “←” and “→” to select and press “Enter” to confirm)

4.2 Advanced



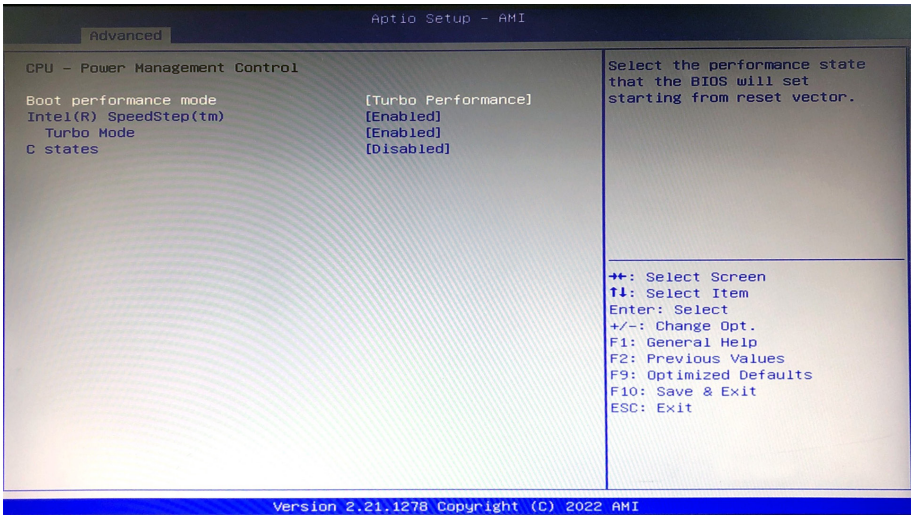
Setting	Description
CPU Configuration	See 4.2.1 CPU Configuration on page 23
Power & Performance	See 4.2.2 Power & Performance on page 24
PCH-FW Configuration	See 4.2.3 PCH-FW Configuration on page 22
Trusted Computing	See 4.2.4 Trusted Computing on page 26
ACPI Settings	See 4.2.5 ACPI Settings on page 27
Hardware Monitor	See 4.2.6 Hardware Monitor on page 28
Super IO Configuration	See 4.2.7 Super IO Configuration on page 29
S5 RTC Wake Settings	See 4.2.8 S5 RTC Configuration on page 32
PCI Subsystem Settings	See 4.2.9 PCI Subsystem Settings on page 33
USB Configuration	See 4.2.10 USB Configuration on page 36
Network Stack Configuration	See 4.2.11 Network Stack Configuration on page 38
NVMe Configuration	See 4.2.12 NVMe Configuration on page 39

4.2.1 CPU Configuration



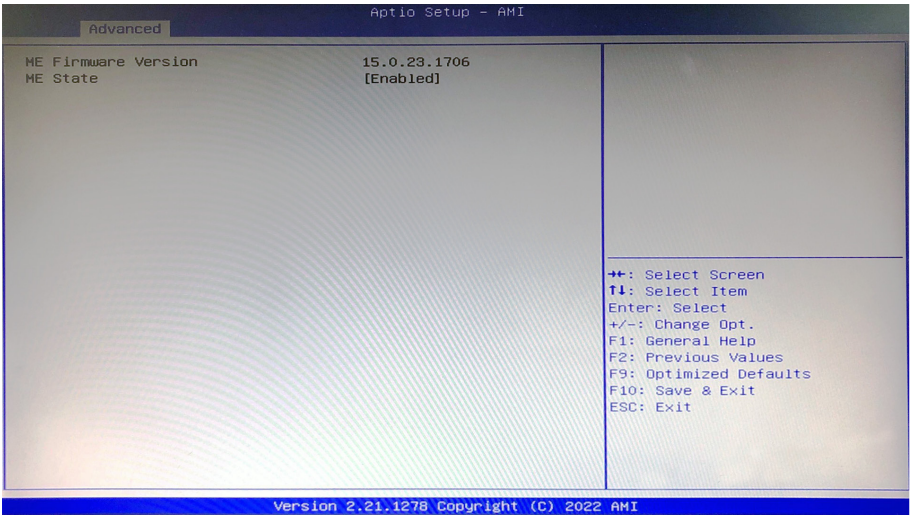
Setting	Description
Intel (VMX) Virtualization	Enable or disable Intel virtualization technology. When enabled, a VMM can utilize the additional hardware capabilities provide by Vanderpool Technology. ► Options: **Enabled** (default) or **Disabled**
Active Processor Cores	Number of cores to enable in each processor package. ► Options: **All** (default), **1, 2** and **3**
Hyper-threading	**Enabled** (default) for Windows and Linux (OS optimized for Hyper-Threading Technology) and **Disabled** for other OS (OS not optimized or Hyper-Threading Technology). When disabled only one thread per enabled core is enabled.

4.2.2 Power & Performance



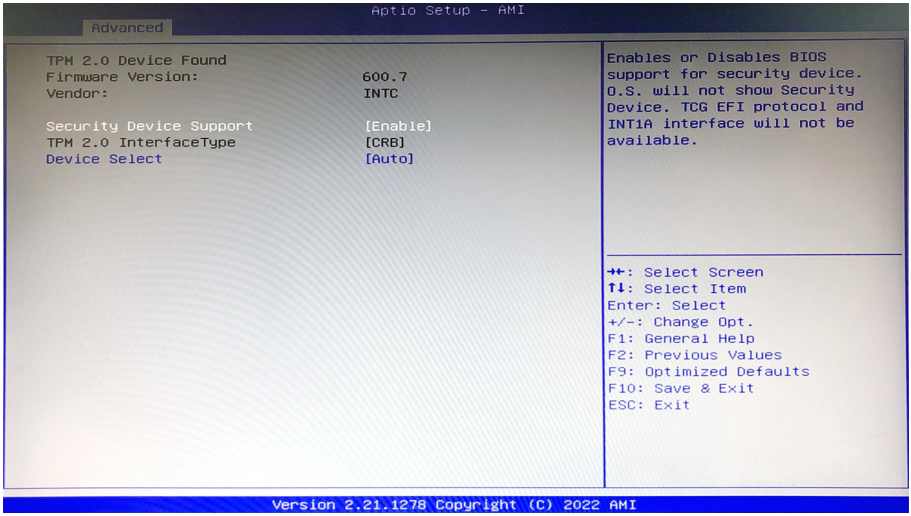
Setting	Description
Boot performance Mode	Set the performance state that the BIOS will set before the OS handoff. ► Options: **Max Non-Turbo Performance**, **Max Power Saving** and **Turbo Performance** (default)
Intel (R) Speed Step (tm)	**Enable** (default)/**Disable** processor Trubo Mode (requires Intel SpeedStep or Intel Speed Shift to be available and enabled.
Trubo Mode	**Enable** (default)/**Disable** Intel SpeedStep. Allows more than two frequency ranges to be supported.
C States	**Enable** /**Disable** (default) CPU C States

4.2.3 PCH-FW Configuration



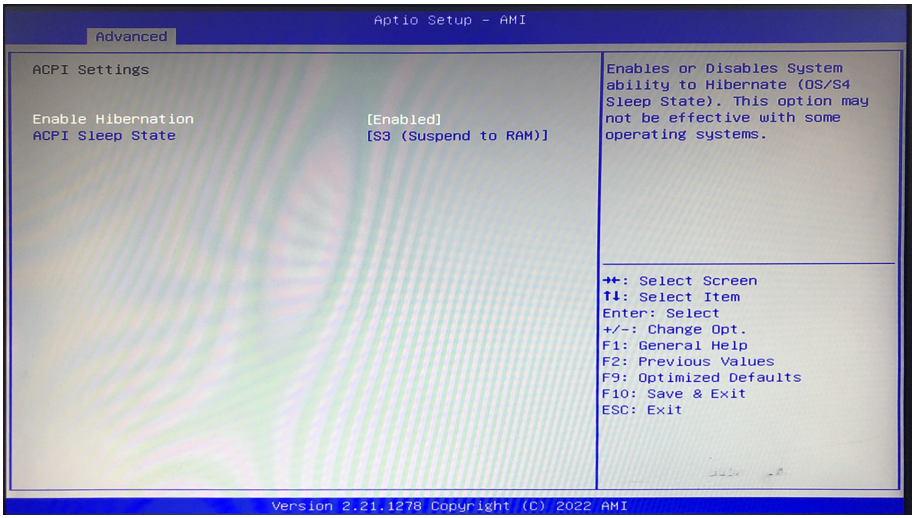
Setting	Description
ME State	**Enable** / **Disable** (Default) ME state. When disabled, ME will be put into ME Temporariily Disabled Mode.

4.2.4 Trusted Computing



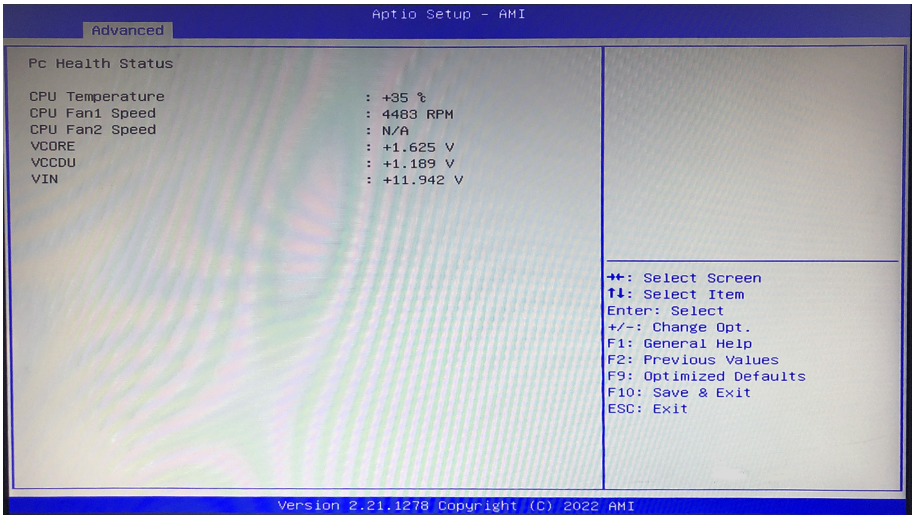
Setting	Description
Security Device Support	**Enable** (default) or **Disable** BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.
Device Select	Select the TPM device: Options: **TPM 1.2**, **TPM 2.0** and **Auto** (default) ► TPM 1.2 will restrict supoort to TPM 1.2 devices ► TPM 2.0 will restrict support to TPM 2.0 devices ► Auto will support both with the default set to TPM 2.0 devices if not found., TPM 1.2 device will be enumerated.

4.2.5 ACPI Settings



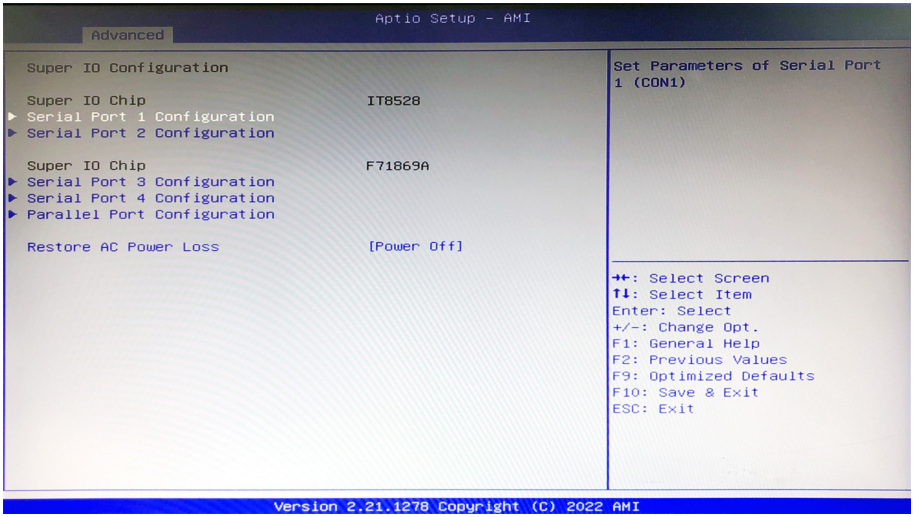
Setting	Description
Enable Hibernation	**Enable** (default) or **Disable** System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.
ACPI Sleep State	Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed. ► Options: **Suspend Disabled** and **S3 (Suspend to RAM)** (default).

4.2.6 Hardware Monitor



Access this submenu to monitor the hardware status.

4.2.7 Super IO Configuration



Setting	Description
Serial Port 1/2/3/4 & Parallel Port Configuration	See next page.
Restore AC Power Loss	Specify what state to go to when power is re-applied after a power failure. ► Options: **Last State**, **Power On** and **Power Off** (def ault)

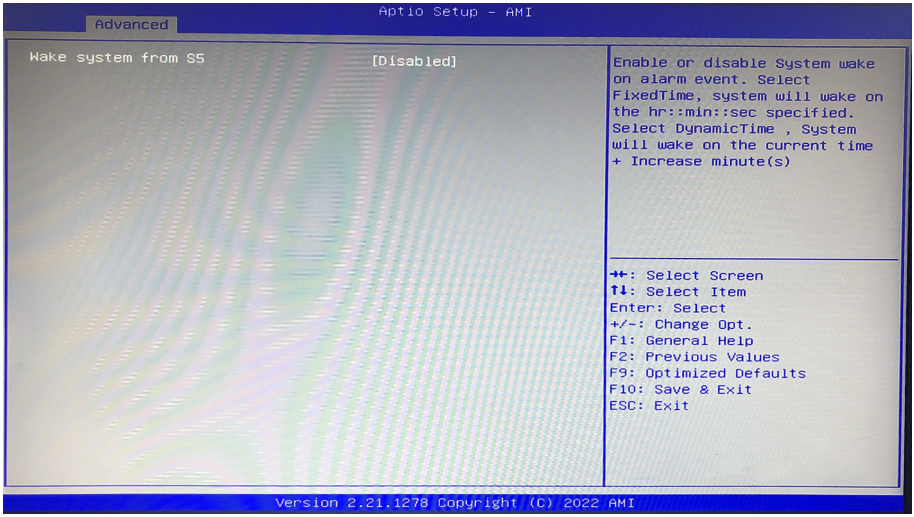
Serial Port 1/2/3/4 Configuration

Setting	Description
Serial Port	**Enable** (default) or **Disable** Serial Port (COM).
Change Settings	Select an optimal setting for Super IO device. ► Options for Serial Port 1: **Auto**; **IO=3F8h; IRQ=4** (default) ; **IO=3F8h; IRQ=5, 7, 10, 11, 12** **IO=2E8h; IRQ=5, 7, 10, 11, 12** ► Options for Serial Port 2: **Auto** **IO=2F8h; IRQ=3** (default) **IO=3F8h; IRQ=3, 4, 7, 12** **IO=2F8h; IRQ=3, 4, 7, 12** ► Options for Serial Port 3: **Auto** **IO=3E8h; IRQ=11** (default) **IO=3E8h; IRQ=7, 10, 11, 12** **IO=2E8h; IRQ=7, 10, 11, 12** **IO=2F0h; IRQ=7, 10, 11, 12** **IO=2E0h; IRQ=7, 10, 11, 12** ► Options for Serial Port 4: **Auto** **IO=2E8h; IRQ=10** **IO=3E8h; IRQ=7, 10, 11, 12** **IO=2E8h; IRQ=7, 10, 11, 12** **IO=2F0h; IRQ=7, 10, 11, 12** **IO=2E0h; IRQ=7, 10, 11, 12**

Parallel Port Configuration

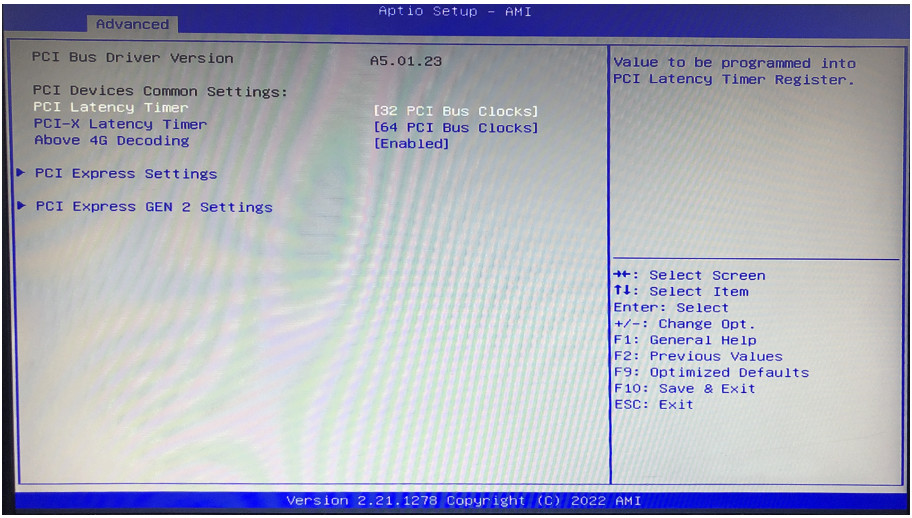
Setting	Description
Parallel Port	**Enable** (default) or **Disable** Parallel Port (LPT/LPTE).
Change Settings	Select an optimal setting for Super IO device. ► Options: **Auto** **IO=378h; IRQ=7** (default) **IO=378h; IRQ=7, 10, 11, 12** **IO=278h; IRQ=7, 10, 11, 12** **IO=3BCh; IRQ=7, 10, 11, 12**
Device Mode (only for Parallel Port Configuration)	Change the Printer Port mode. ► Options: **STD Printer Mode** (default) **SPP Mode** **EPP-1.9 and SPP Mode** **EPP-1.7 and SPP Mode** **ECP Mode** **ECP and EPP 1.9 Mode** **ECP and EPP 1.7 Mode**.

4.2.8 S5 RTC Configuration



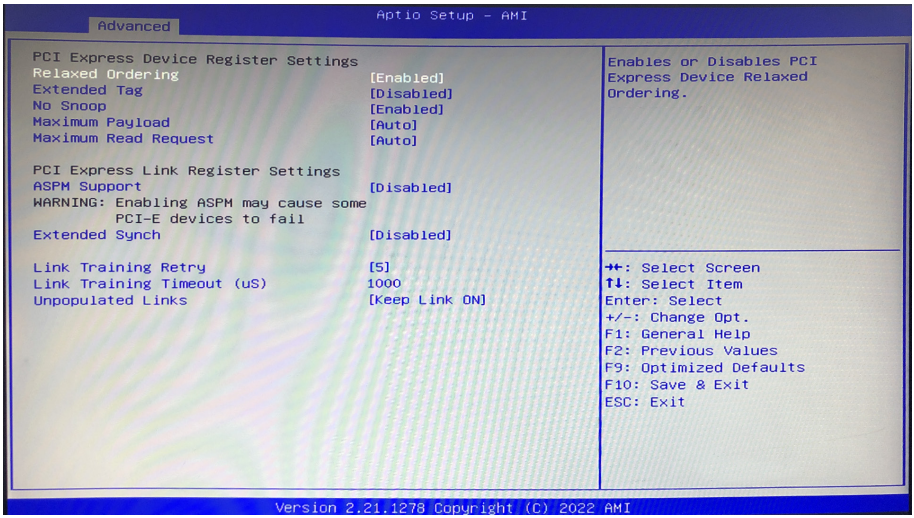
Setting	Description
Wake System from S5	**Enable** or **Disable** (default) system wake on alarm event. ► Options available are: **Disabled** (default): **Fixed Time:** System will wake on the hr::min::sec specifiedc. **DynamicTime:** If selected, you need to set **Wake up minute increase** from 1 - 5. System will wake on the current time + increase minute(s).

4.2.9 PCI Subsystem Settings



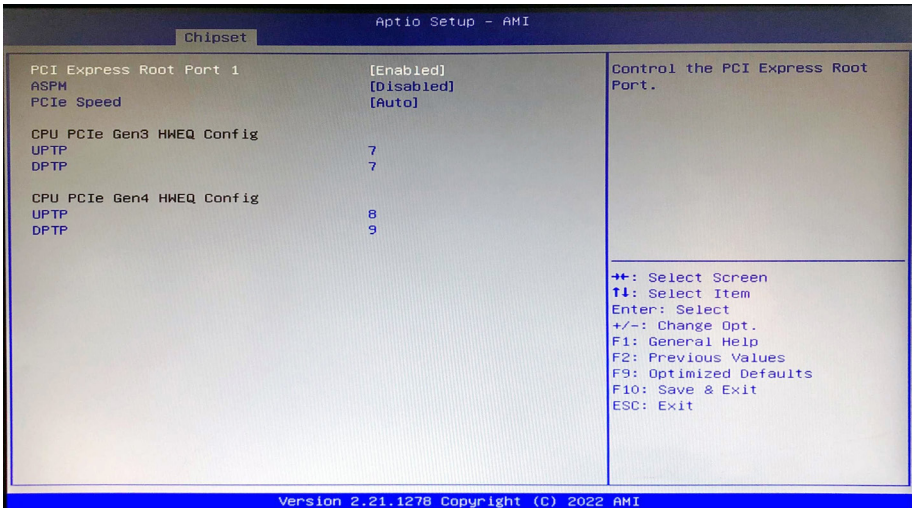
Setting	Description
PCI Latency Timer	Value to be programmed into PCI Latency timer Register. ► Default: **32 PCI Bus Clocks**
PCI-X Latency Timer	Value to be programmed into PCI Latency timer Register. ► Default: **64 PCI Bus Clocks**
Above 4G Decoding	**Enable**(default)/**Disable** 64bit capable Devices to be Decoded in Above 4G Address Space (Only if System Supports 64 bit PCI Decoding).
PCI Express Setting	See next page.
PCI Express GEN2 Setting	Supports 64 bit PCI Decoding).

4.2.9.1 PCI Express Setting



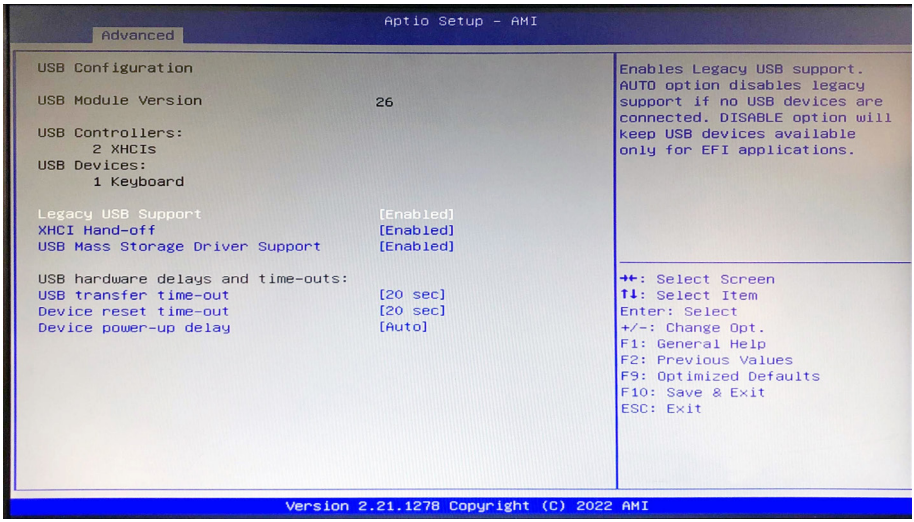
Setting	Description
Relaxed Ordering	**Enable**(default) or **Disable** Relaxed Ordering.
Extended Tag	**Enable** or **Disable**(default) Extended Tag.
No Snoop	**Enable**(default)/**Disable** No Snoop.
Maximum Payload	This item allows users to set the Maximum Payload.
ASPM Support	**Enable**/**Disable**(default) or **Auto** ASPM Support.
Extended Synch	**Enable** or **Disable**(default) Extended Synch.
Link Training Retry	This item allows users to set the Link Training Retry
Training Retry Timeout	This item allows users to set the Link Training Time-out (uS)
Unpopulated Links	This item allows users to set the Unpopulated Links

4.2.9.2 PCI Express GEN 2 Settings



Setting	Description
PCI Express Root Port1	Control the PCI Express Root Port. **Enable**(default) or **Disable**
ASPM	PCI Express Active State Power Management settings. **Enable** or **Disable**(default) ASPM.
CPU PCIe Gen3 HWEQ Config	**UPTP**: Upstream Port Transmitter Preset. Values: 7 (Default) **DPTP**: Downstream Port Transmitter Preset. Values: 7 (Default)
CPU PCIe Gen4 HWEQ Config	**UPTP**: Upstream Port Transmitter Preset. Values: 8 (Default) **DPTP**: Downstream Port Transmitter Preset. Values: 9 (Default)

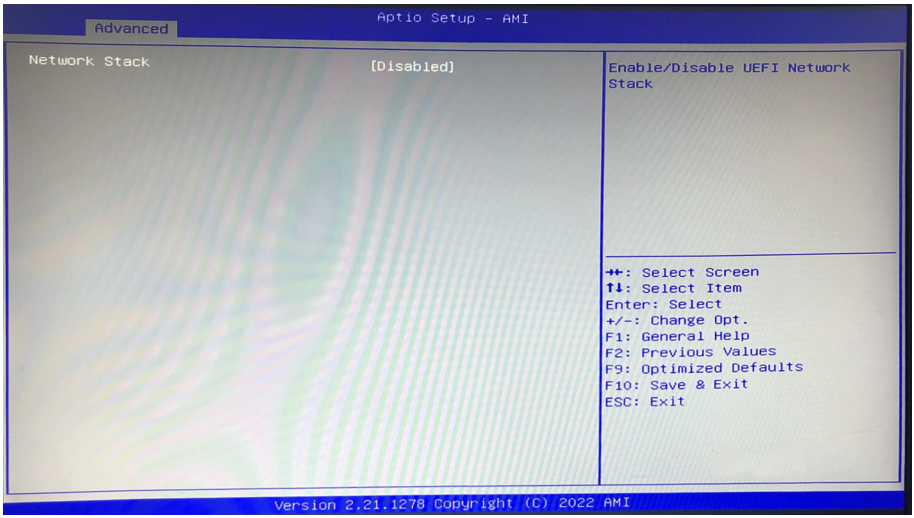
4.2.10 USB Configuration



Setting	Description
Legacy USB Support	Sets legacy USB support. ► Options: **Enabled** (default), **Disabled** and **Auto**. **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	**Enable** (default) or **Disable** XHCI Hand-off This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
USB Mass Storage Driver Support	**Enable** (default) or **Disable** USB Mass Storage Driver Support.
USB hardware delay and time-out	
USB Transfer time-out	Use this item to set the time-out value for control, bulk, and interrupt transfers. ‣ Options available are: **1 sec, 5 sec, 10 sec, 20 sec** (default)

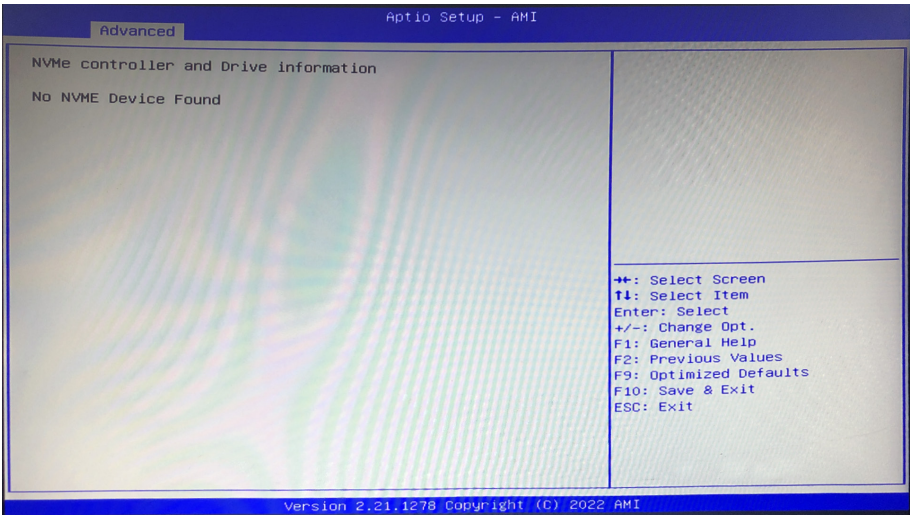
Device reset time-out	Use this item to set USB mass storage device start unit command time-out. ▸ Options available are: **10 sec, 20 sec** (default)**, 30 sec, 40 sec**
Device power-up delay	Use this item to set maximum time the device will take before it properly reports itself to the host controller. ▸ Options available are: **Auto** (Default): 'Auto' uses default value: for a root port it is 100 ms, for a hub port the delay is taken from hub descriptor. **Manual**: Select **Manual** you can set value for the following sub-item: '**Device Power-up delay in seconds**', the delay range in from 1 to 40 seconds, in one second increments.

4.2.11 Network Stack Configuration



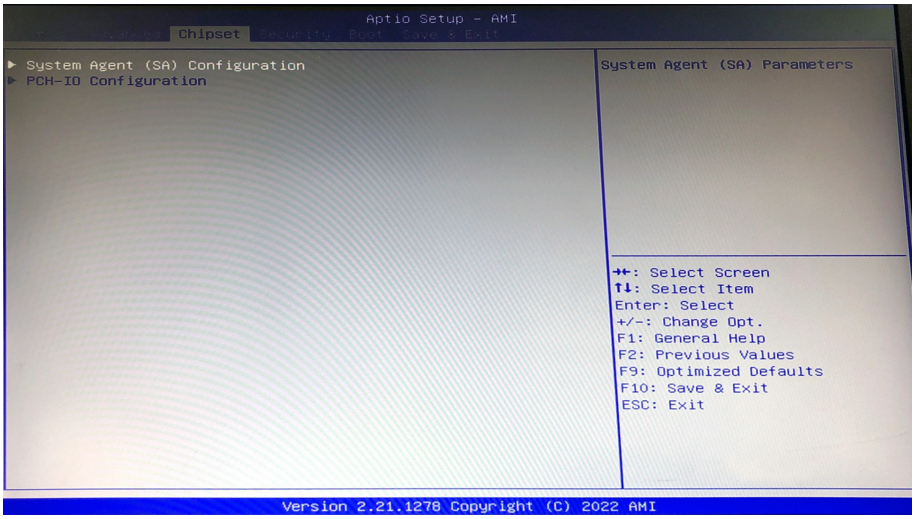
Setting	Description
Network Stack	Enables/disables UEFI network stack. ► **Disabled** is the default.

4.2.12 NVMe Configuration



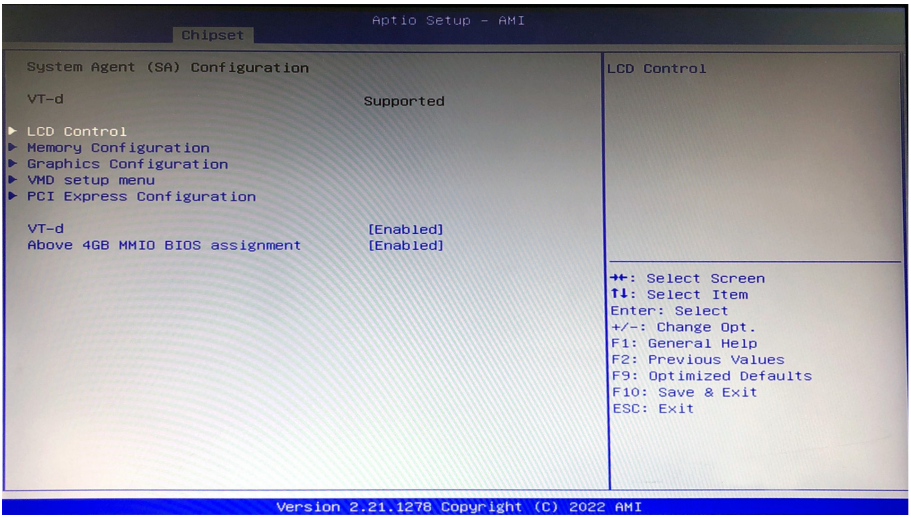
Access this submenu to view the NVMe controller and driver information.

4.3 Chipset



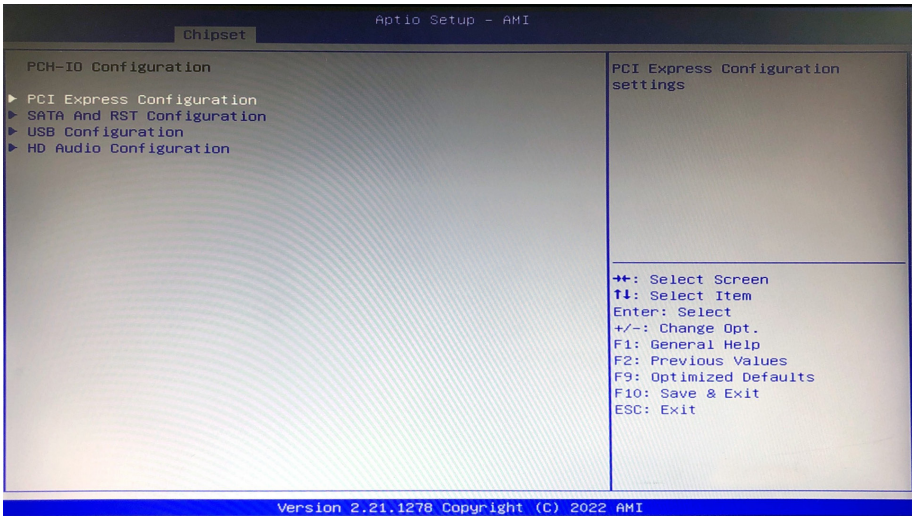
Setting	Description
System Agent (SA) Configuration	See 4.3.1 System Agent (SA) Configuration on page 43
PCH-IO Configuration	See 4.3.2 PCH-IO Configuration on page 42

4.3.1 System Agent (SA) Configuration



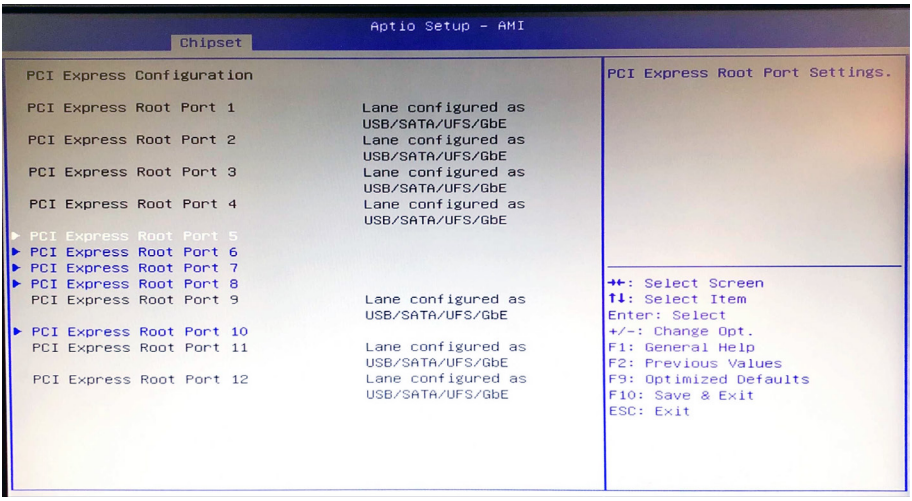
Setting	Description
VT-d	**Enable** (default) or **Disable** VT-d function
Above 4GB MMIO BIOS assignment	**Enable** or **Disable** (default) Above 4GB MmemoryMapped BIOS assignment. This is automatically enabled when Aperture Size is set to 2048MB.
Display Control	
Primary IGFX Boot Display	Select the Video Device which will be activated during POST. This has no effect if external graphics present. Secondary boot display selection will appear based on your selection. VGA modes will be supported only on primary display. ► Options: **VBIOS Default** (default), **LFP**, **EFP2**, **EFP** and **EFP3**.
Active LFP	Configuring LFP usage ► Options: **No eDP** (default) and **eDP Port-A**
Memory Configuration	**ENABLE**(default) or **Disable** above 4GB MemoryMappedIO BIOS assignment.

4.3.2 PCH-IO Configuration



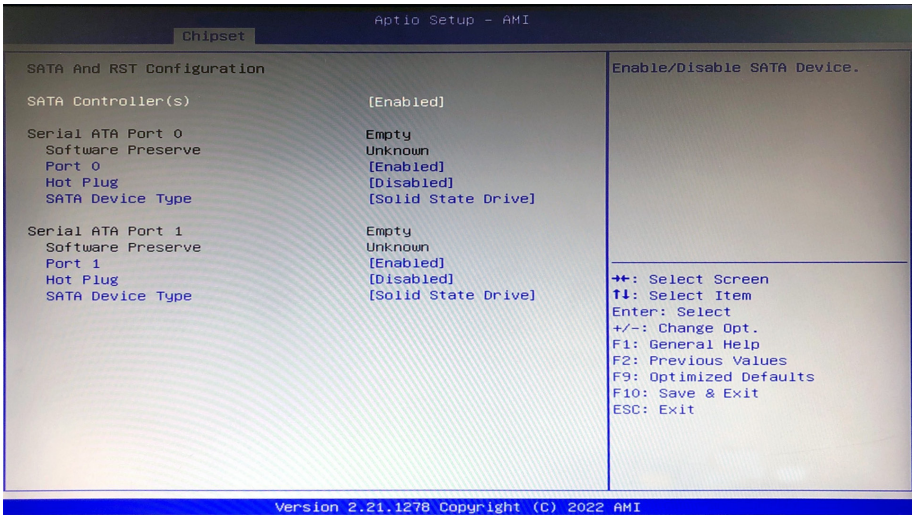
Setting	Description
PCI Express Configuration	See 4.3.2.1 PCI Express Configuration on page 43
SATA Configuration	See 4.3.2.2 SATA Configuration on page 44
USB Configuration	See 4.3.2.3 USB Configuration on page 45
HD Audio Configuration	See 4.3.2.4 HD Audio Configuration on page 46

4.3.2.1 PCI Express Configuration



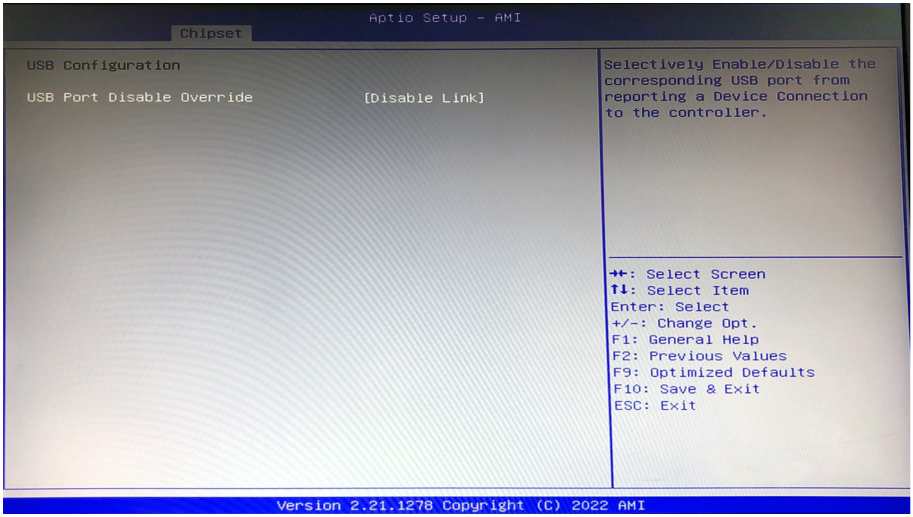
Setting	Description
PCI Express Root Port 5-11	PCI Express Root Port Settingss

4.3.2.2 SATA Configuration



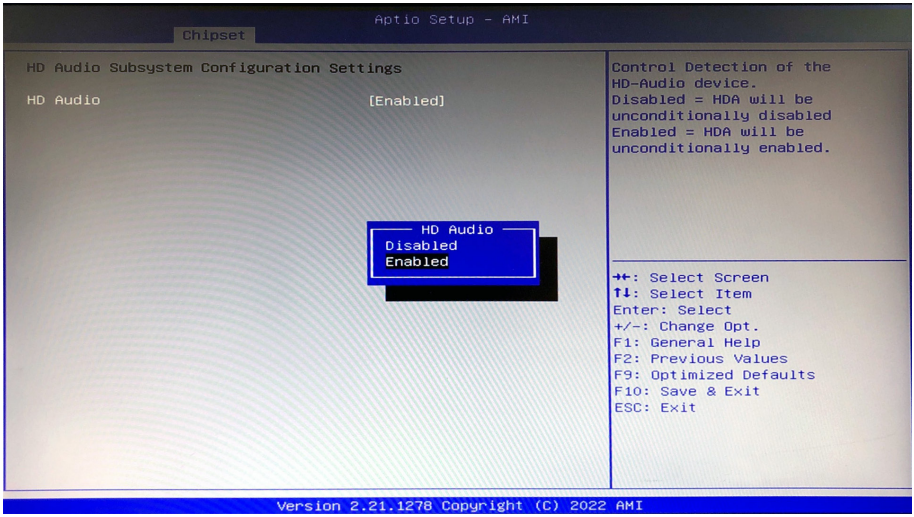
Setting	Description
SATA Controller`(s)	**Enable** (default) or **Disable** SATA Device.
SATA Mode Selection	Determines how SATA controller(s) operate. ► Options: **AHCI** (default) and **RAID**
Port 0/1	**Enable** or **Disable**(default) SATA Port.
Hot Plug	**Enable** or **Disable** (default) the port as pluggable.
SATA Device Type	Identify the SATA port is connected to Solid State Drive or hard Disk Drive. ► Options: **Hard Disk Drive** and **Solid State Drive** (default).

4.3.2.3 USB Configuration



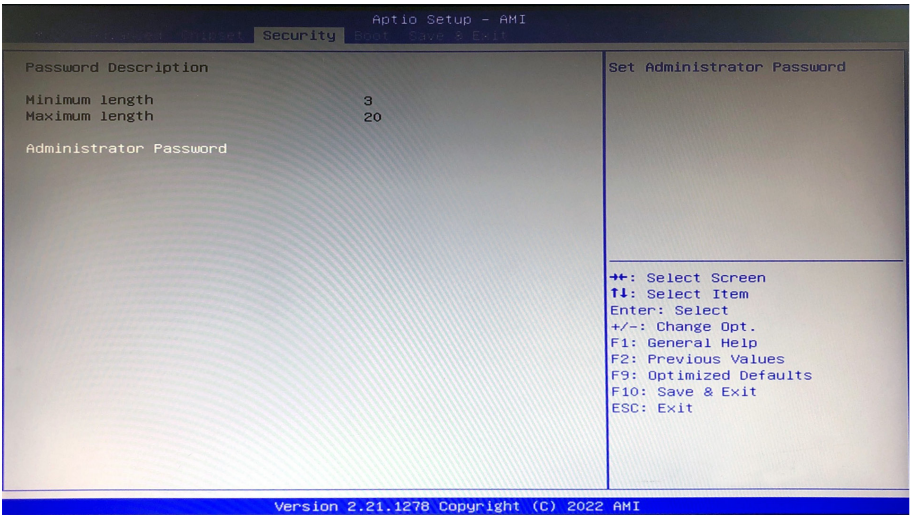
Setting	Description
USB Port Disable Override	Selectively Enable/Disable (default) the corresponding USB port from reporting a Device Connection to the controller. ► Options: **Disable Link** (default) and **Select Per-Pin**

4.3.2.4 HD Audio Configuration



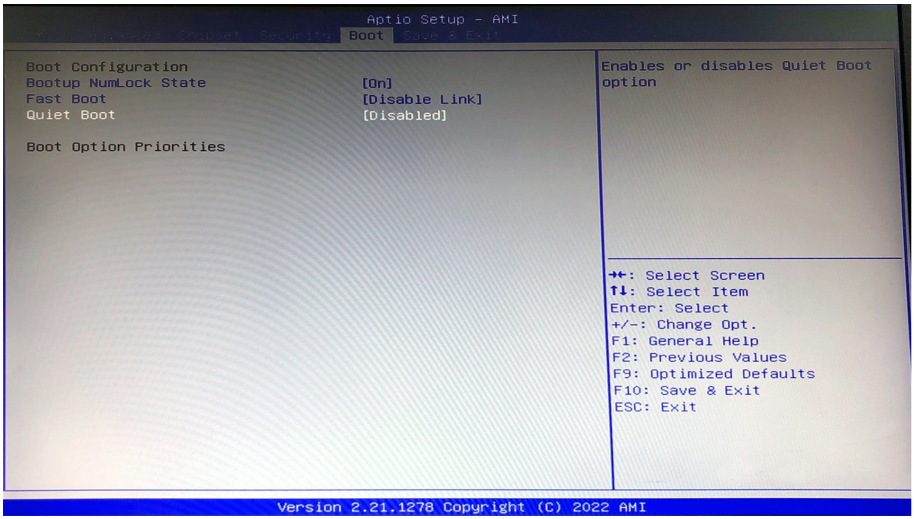
Setting	Description
HD Audio Configuration	Control Detection of the HD-Audio device. ► Options available are: **Disabled**: HDA will be unconditionally disabled **Enabled** (default): HDA will be unconditionally Enabled

4.4 Security



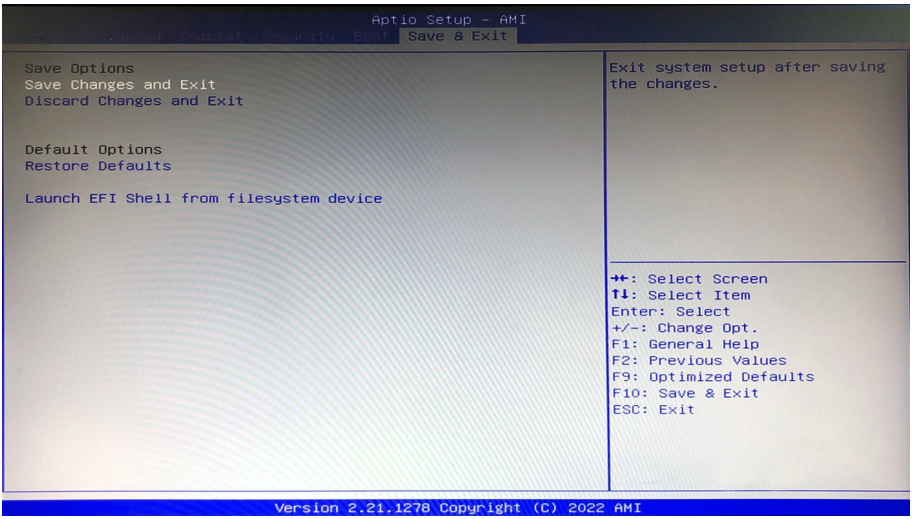
Setting	Description
Administrator Password	To set up an administrator password: 1. Select **Administrator Password**. The screen then pops up an **Create New Password** dialog. 2. Enter your desired password that is no less than 3 characters and no more than 20 characters. 3. Hit [Enter] key to submit.

4.5 Boot



Setting	Description
Boot NumLock State	Select the keyboard NumLock state. ► Options: **On** (default) and **Off**.
Fast Boot	**Enable** or **Disable** (default) boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for.BBS boot options.
Quiet Boot	**Enable** (default) or **Disable** Quiet Boot option.
Boot Option Priority	Set the system boot priorities.
Hard Drive BBS Priorities	BBS means “BIOS Boot Specification”. Sets the order of the legacy devices in this group.

4.6 Save & Exit



Setting	Description
Save Changes and Exit	Exit system setup after saving the changes. ► Enter the item and then a dialog box pops up: **Save configuration and exit? (Yes/ No)**
Discard Changes and Exit	Exit system setup without saving the changes. ► Enter the item and then a dialog box pops up: **Quit without saving? (Yes/ No)**
Restore Defaults	Restore/Load Default values for all the setup options. ► Enter the item and then a dialog box pops up: **Load Optimized Defaults? (Yes/ No)**
Launch EFI Shell from filesystem device	Attempts to launch EFI shell application (Shell.efi) from one of the available filesystem devices.

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Appendix

Appendix A: Watchdog Timer (WDT) Setting

WDT is widely used for industry application to monitor the activity of CPU. Application software depends on its requirement to trigger WDT with adequate timer setting. Before WDT time out, the functional normal system will reload the WDT. The WDT never time out for a normal system. The WDT will not be reloaded by an abnormal system, then WDT will time out and reset the system automatically to avoid abnormal operation.

This board supports 255 levels watchdog timer by software programming I/O ports. Below are the source codes written in C, please take them as WDT application example.

```
/*---------------------------------------------------------------------------*/
#include <math.h>
#include <stdio.h>
#include <dos.h>

int WDTCount;

int main(void)
{
    unsigned char                   iCount;

    printf("WDT Times ( 1 ~ 255 ) : ");
    scanf("%d",&iCount);
    printf("\n");

    WDT_Start(iCount);

    return 0;
}

void WDT_Start(int iCount)
{
    outportb(0x66,0xBA);            /* Enable Watch Dog */
    delay(2000);

    WDTCount = iCount;
    outportb(0x62, WDTCount);       /* Number is Watch Dog Down count
number */
    delay(2000);

    outportb(0x62, 0x00);           /* Minute is 1 count unit by minute */
                                    /* Minute is 0 count unit by second */
```

```
}

void WDT_Stop(void)
{
    outportb(0x66,0xBB);                    /* Disable Watch Dog */
}

void WDT_Clear(void)
{
    outportb(0x66,0xBA);                    /* Enable Watch Dog */
    delay(2000);

    outportb(0x62, WDTCount);               /* Number is Watch Dog Down count
number */
    delay(2000);

    outportb(0x62, 0x00);                   /* Minute is 1 count unit by minute */
                                            /* Minute is 0 count unit by second */}
```

Appendix B: DIO Sample Code

```
/*---------------------------------------------------------------------------*/
#include "math.h"
#include "stdio.h"
#include "dos.h"

void GPIOMode(int iMode);
void GPIOData(int iData);
int  GPIOStatus();

int main(void)
{
        int iInput;

        GPIOMode(0xF);
        delay(10000);

        GPIOData(0x0A);
        delay(30000);
        iInput = GPIOStatus();
        printf(" Data : %2x \n",iInput);

        GPIOData(0x05);
        delay(30000);
        iInput = GPIOStatus();
        printf(" Data : %2x \n",iInput);

        return 0;
}

void GPIOMode(int iMode)
{
        outportb(0x66,0xEB);              /* Select DIO pin to output or input */
        delay(2000);
        outportb(0x62,iMode);
}

void GPIOData(int iData)
{
        outportb(0x66,0xEA);              /* Set DIO output pin status */
        delay(2000);
        outportb(0x62,iData);
}

int GPIOStatus()
{
        int iStatus;

        outportb(0x66,0xEC);              /* Get DIO pin status */
        delay(2000);
    iStatus = inportb(0x62);

        return iStatus;
}
```