EmCOMe-i94M0

COM Express® Basic
Type 6 CPU Module

User's Manual

Version 1.0

2025.03

Revision History

Version	Date	Description
1.0	2025.03	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 European Union (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 A

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 EmCOMe-i94M0 is a space-conscious CPU board of 125 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 13th 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.
EmCOMe-i94M0 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 13th Generation Intel® Raptor Lake Core™ i7 13800HE / i7-1370PE / i5-13600HE / i5-1350PE / i3-13300HE / i3-1320PE processor
- Up to 6x Performance core + 8x Efficient core and up to 96x graphic execution units
- Dual channel DDR5 memory up to 64GB, 4800MT/s
- Supports NVMe for up to 1TB
- Support Max 4 independent displays
- 8.5V~20V Wide Range Voltage Input

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.

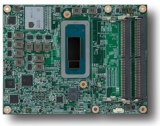
1.3 Specifications

System	
CPU	Soldered onboard 13th Generation Intel® Core™ - i7-13800HE 4.0GHz (E-core) / 5.0GHz (P-core) - i5-13600HE 3.6GHz (E-core) / 4.8GHz (P-core) - i3-13300HE 3.4GHz (E-core) / 4.6GHz (P-core) - i7-1370PE 3.7GHz (E-core) / 4.8GHz (P-core) - i5-1350PE 3.4GHz (E-core) / 4.6GHz (P-core) - i3-1320PE 3.3GHz (E-core) / 4.5GHz (P-core)
Memory	2 x DDR5 SO-DIMM 4800MHz up to 64GB
BIOS	AMI UEFI BIOS
TPM	Supports TPM 2.0
Watchdog Timer	1~255 levels reset
I/O Interface	
Storage	2 x SATA Gen3 ports 1 x BGA NVMe SSD (Optional) (Share PCIe x 4)
Serial Port	2 x UART ports (RX/TX only)
Others	I^2C, GPIO , SMBUS , LPC Interface
USB Port	8 x USB 2.0 ports 4 x USB 3.0 ports
Expansion Bus	1 x PCIex8 lanes 2 x PCIex4 lanes 8 x PCIex1 lanes (or 1 x PCIex4 + 4 x PCIex1)
Ethernet Chipset	1 x Intel® i226 series PCIe 2.5GbE Ethernet controller
Audio	Intel® High Definition Audio
Display	
Graphic Chipset	Integrated Intel® Iris Xe or UHD Graphics (Depends on CPU SKU)
Graphic Interface	1 x Dual Channel 24-bit LVDS (default) or eDP 1 x Analog RGB port 3 x DDI ports

Graphic Resolution	VGA : up to 1920x1200 @ 60Hz DVI : up to 1920x1200 @ 60Hz LVDS: up to 1920x1200 @ 60Hz (dual channel 24-bit) DP: up to 3840x2160 @ 60Hz
OS Support	
Microsoft	Windows® 10 64-bit / Windows® 11 64-bit
Linux	Ubuntu
Mechanical & Environmental	
Power Requirement	8.5V ~ 20V wide range voltage input, +5VSB
Operating Temp.	-40 ~ 60ºC (-40 ~ 140ºF)
Operating Humidity	10 ~ 95% @ 85°C (non-condensing)
Dimensions (L x W)	95 x 125 mm (3.7” x 4.9”)

1.4 Inside the Package

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



1 x EmCOMe-i94M0 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

EmCOMe-i94M0-13800HE	13th Gen. Intel® Core™ i7-13800HE COMe Basic Type 6 CPU Module, -40 ~ 60°C
EmCOMe-i94M0-13600HE	13th Gen. Intel® Core™ i5-13600HE COMe Basic Type 6 CPU Module, -40 ~ 60°C
EmCOMe-i94M0-13300HE	13th Gen. Intel® Core™ i3-13300HE COMe Basic Type 6 CPU Module, -40 ~ 60°C
EmCOMe-i94M0-1370PE	13th Gen. Intel® Core™ i7-1370PE COMe Basic Type 6 CPU Module, -40 ~ 60°C
EmCOMe-i94M0-1350PE	13th Gen. Intel® Core™ i5-1350PE COMe Basic Type 6 CPU Module, -40 ~ 60°C
EmCOMe-i94M0-1320PE	13th Gen. Intel® Core™ i3-1320PE COMe Basic Type 6 CPU Module, -40 ~ 60°C

1.5.1 Optional Accessories

HS-93M0-C1	Heat sink 95 x 125mm, W/ FAN+PAD
PBE-1705	COM Express® Type 6 evaluation carrier board(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 driver pack from the product page.

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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).

EmCOMe-i94M0 is a Type-6 module.

Difference between Standard Type 6 and EmCOMe-i94M0 is listed as below:

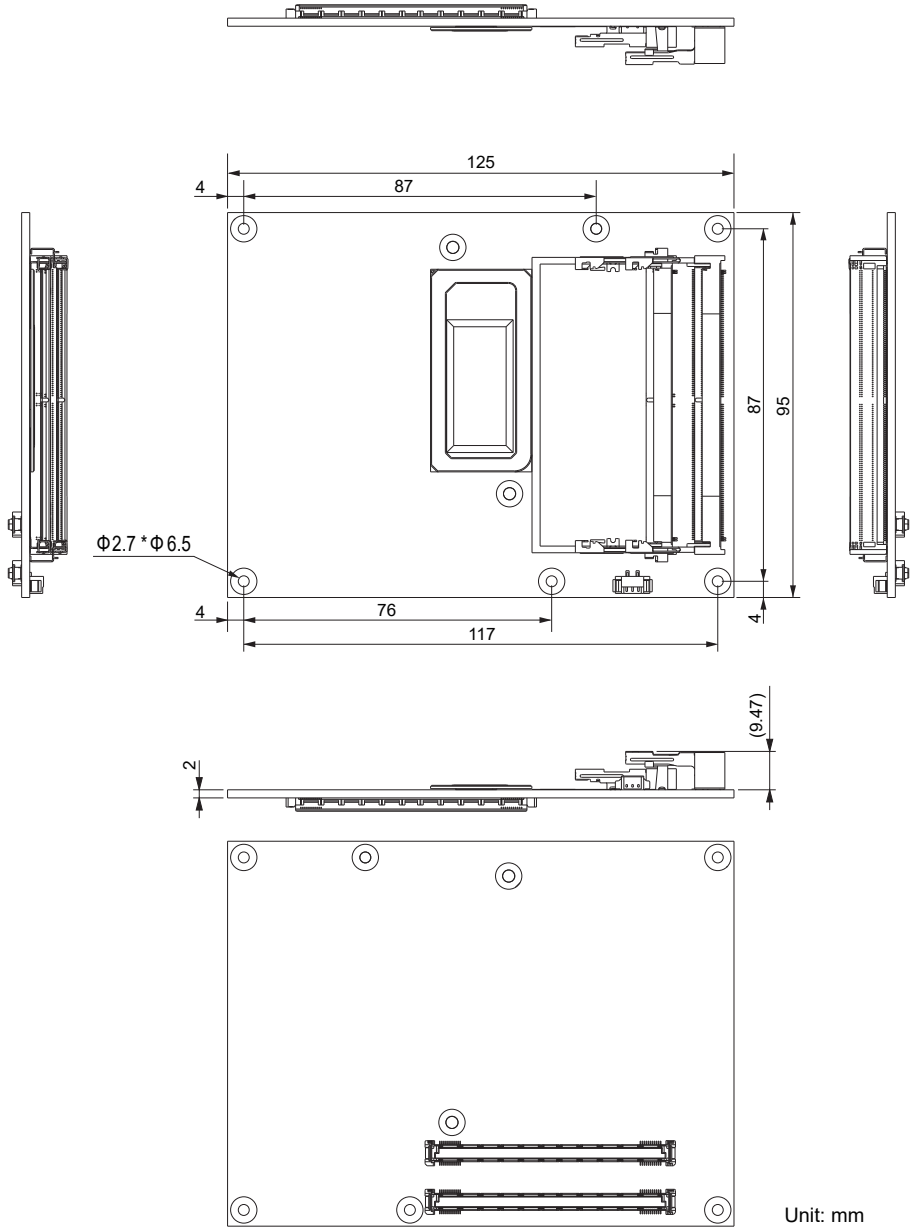
Module Type	Standard Type 6	EmCOMe-i94M0
Connectors	2	2
Connector Rows	A, B, C, D	A, B, C, D
PCIe Lanes (Max)	24	24
LAN (Max)	1	1
Serial Ports (Max)	2	2
Digital Display I/F (Max)	3	3
USB 3.0 Ports (Max)	4	4

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

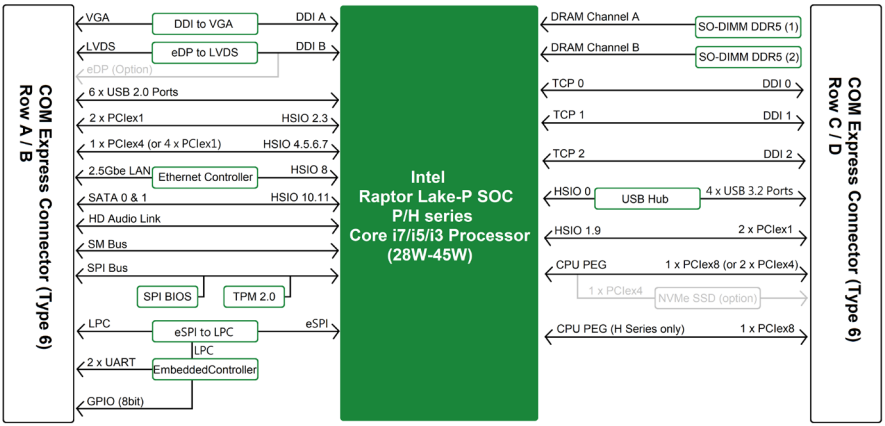
Row CD provides SDVO and legacy PCI signals next to additional PCI Express, LAN and power and ground signals. The COM are targeted at following applications:

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

2.2 Board Dimensions



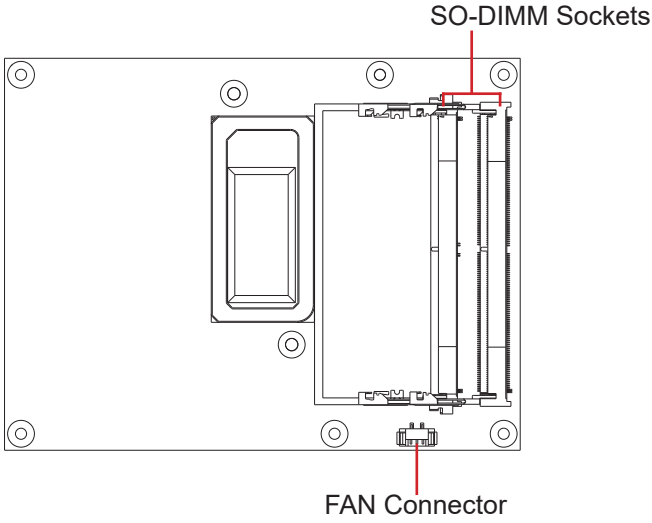
2.3 Block Diagram



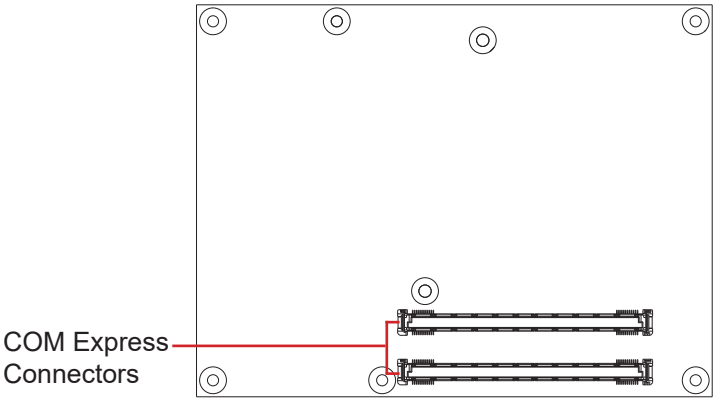
2.4 Connector Pin Definition

Being a most commonly-used Type 6, the EmCOMe-i94M0 features two board-to-board connectors on bottom side.

Top Side



Bottom Side



FAN: Fan connector

Connector type: Wafer 3-pin 1.25mm 85204-0300L

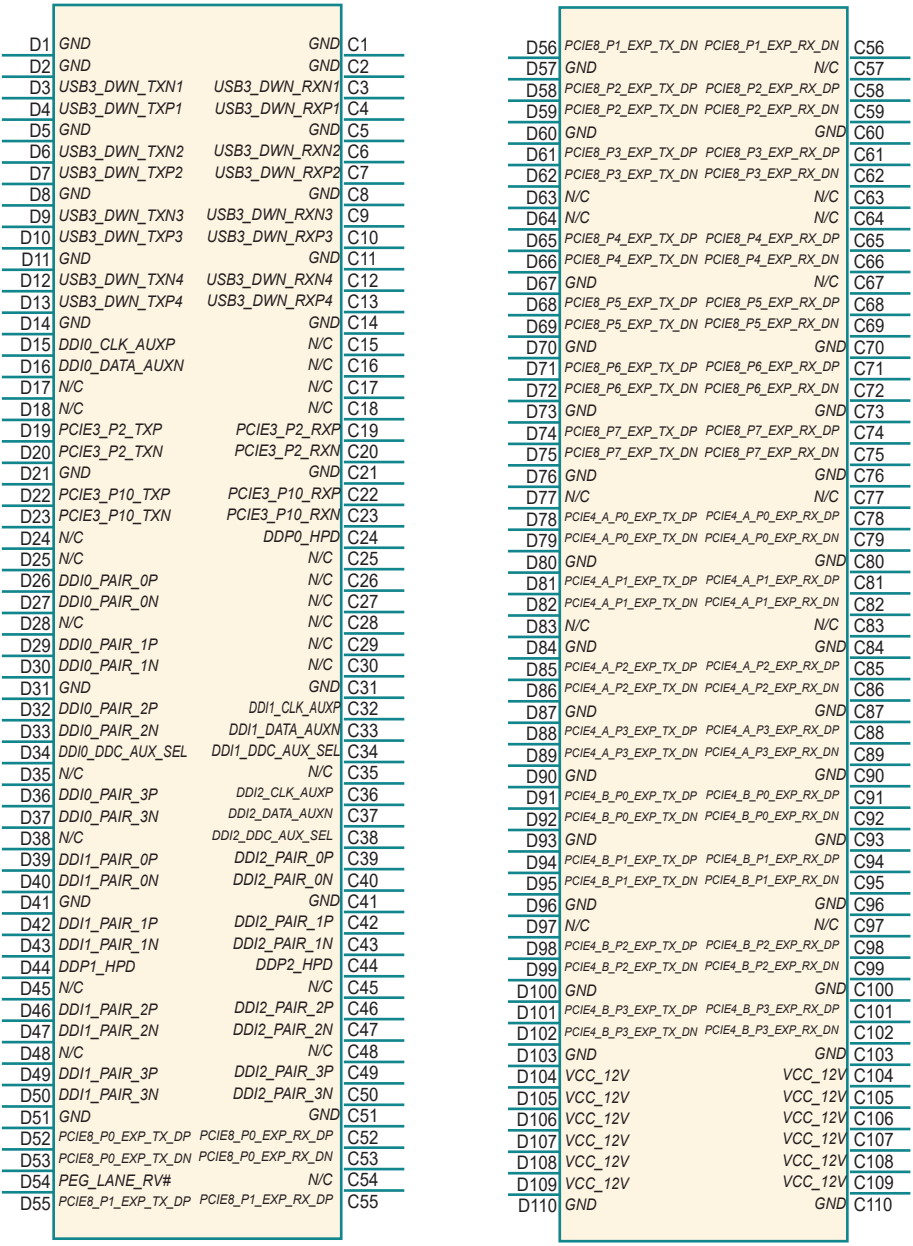
Pin	Description
1	GND
2	Fan out
3	Fan Tachometer Input

COM Express AB Connector (bottom side)

B1	GND	GND	A1
B2	LAN_LED_LNK#_ACT	LAN1_MDI3N	A2
B3	LPC_FRAME#	LAN1_MDI3P	A3
B4	LPC_AD0	LAN_LED_1000#	A4
B5	LPC_AD1	LAN_LED_2500#	A5
B6	LPC_AD2	LAN1_MDI2N	A6
B7	LPC_AD3	LAN1_MDI2P	A7
B8	LPC_DRQ0#	LAN_LED_LNK#	A8
B9	LPC_DRQ1#	LAN1_MDI1N	A9
B10	LPC_CLK	LAN1_MDI1P	A10
B11	GND	GND	A11
B12	CB_PWRBTN#	LAN1_MDI0N	A12
B13	CB_SMB_CLK	LAN1_MDI0P	A13
B14	CB_SMB_DATA	0V9_LAN	A14
B15	SMB_ALERT_N	SLP_S3#	A15
B16	SATA_TXP1	SATA_TXP0	A16
B17	SATA_TXN1	SATA_TXN0	A17
B18	SUS_STAT#	SLP_S4#	A18
B19	SATA_RXP1	SATA_RXP0	A19
B20	SATA_RXN1	SATA_RXN0	A20
B21	GND	GND	A21
B22	N/C	N/C	A22
B23	N/C	N/C	A23
B24	CB_PWROK	SLP_S5#	A24
B25	N/C	N/C	A25
B26	N/C	N/C	A26
B27	WDT	PM_BATLOW#	A27
B28	N/C	SATA_LED	A28
B29	HDA_SDIN1	HDA_SYNC	A29
B30	HDA_SDIN0	HDA_RST_N	A30
B31	GND	GND	A31
B32	SPKR	HDA_BIT_CLK	A32
B33	EC_I2C_CLK	HDA_SDOUT	A33
B34	EC_I2C_DATA	BIOS_DISABLE0#	A34
B35	THRM#	CB_TRIP#	A35
B36	USB2_P9_DN	USB2_P8_DN	A36
B37	USB2_P9_DP	USB2_P8_DP	A37
B38	USB_OC6789_N	USB_OC6789_N	A38
B39	USB2_P7_DN	USB2_P6_DN	A39
B40	USB2_P7_DP	USB2_P6_DP	A40
B41	GND	GND	A41
B42	USB2_P5_DN	USB2_P4_DN	A42
B43	USB2_P5_DP	USB2_P4_DP	A43
B44	USB_OC2345_N	USB_OC2345_N	A44
B45	USB2_P3_DN	USB2_P2_DN	A45
B46	USB2_P3_DP	USB2_P2_DP	A46
B47	PLTRST#_BUFF	+VRTC_BATT	A47
B48	EXCD1_CCPE#	PLTRST#_BUFF	A48
B49	CB_SYSRST#	EXCD0_CCPE#	A49
B50	CB_RESET#	LPC_SERIRQ	A50
B51	GND	GND	A51
B52	PCIE3_P4_RXP	PCIE3_P4_TXP	A52
B53	PCIE3_P4_RXN	PCIE3_P4_TXN	A53
B54	DIO_5	DIO_0	A54
B55	PCIE3_P3_RXP	PCIE3_P3_TXP	A55

B56	PCIE3_P3_RXN	PCIE3_P3_TXN	A56
B57	DIO_6	GND	A57
B58	PCIE3_P8_RXP	PCIE3_P8_TXP	A58
B59	PCIE3_P8_RXN	PCIE3_P8_TXN	A59
B60	GND	GND	A60
B61	PCIE3_P7_RXP	PCIE3_P7_TXP	A61
B62	PCIE3_P7_RXN	PCIE3_P7_TXN	A62
B63	DIO_7	DIO_1	A63
B64	PCIE3_P6_RXP	PCIE3_P6_TXP	A64
B65	PCIE3_P6_RXN	PCIE3_P6_TXN	A65
B66	PCH_WAKE#	GND	A66
B67	EC_WAKE_IN#	DIO_2	A67
B68	PCIE3_P5_RXP	PCIE3_P5_TXP	A68
B69	PCIE3_P5_RXN	PCIE3_P5_TXN	A69
B70	GND	GND	A70
B71	LVDSB_DATA0P	LVDSA_DATA0P_EDP_TXP2	A71
B72	LVDSB_DATA0N	LVDSA_DATA0N_EDP_TXN2	A72
B73	LVDSB_DATA1P	LVDSA_DATA1P_EDP_TXP1	A73
B74	LVDSB_DATA1N	LVDSA_DATA1N_EDP_TXN1	A74
B75	LVDSB_DATA2P	LVDSA_DATA2P_EDP_TXP0	A75
B76	LVDSB_DATA2N	LVDSA_DATA2N_EDP_TXN0	A76
B77	LVDSB_DATA3P	LVDS_VDD_EN	A77
B78	LVDSB_DATA3N	LVDS_DATA3P	A78
B79	LVDS_BKLTEN	LVDS_DATA3N	A79
B80	GND	GND	A80
B81	LVDSB_CLKP	LVDSA_CLKP_EDP_TXP3	A81
B82	LVDSB_CLKN	LVDSA_CLKN_EDP_TXN3	A82
B83	COM_BKLT_CTRL	LVDS_DDC_CLK_EDP_AUXP	A83
B84	VCC_5V_SBY	LVDS_DDC_DATA_EDP_AUXN	A84
B85	VCC_5V_SBY	DIO_3	A85
B86	VCC_5V_SBY	H_RCIN#	A86
B87	VCC_5V_SBY	COME_EDP_HPD	A87
B88	BIOS_DISABLE1#	COM_EXP_CLK_P	A88
B89	VGA_RED	COM_EXP_CLK_N	A89
B90	GND	GND	A90
B91	VGA_GREEN	SPI_POWER_+V3.3A	A91
B92	VGA_BLUE	SPI_MISO	A92
B93	VGA_HSYNC	DIO_4	A93
B94	VGA_VSYNC	SPI_CLK	A94
B95	VGA_I2C_CK	SPI_MOSI	A95
B96	VGA_I2C_DAT	COM_TPM_PP	A96
B97	SPI_CS0#	N/C	A97
B98	N/C	UART_TX0	A98
B99	N/C	UART_RX0	A99
B100	GND	GND	A100
B101	FAN_PWMOUT	UART_TX1	A101
B102	FAN_TACHIN	UART_RX1	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	USB3_DWN_TXN1	USB3_DWN_RXN1	C3
D4	USB3_DWN_TXP1	USB3_DWN_RXP1	C4
D5	GND	GND	C5
D6	USB3_DWN_TXN2	USB3_DWN_RXN2	C6
D7	USB3_DWN_TXP2	USB3_DWN_RXP2	C7
D8	GND	GND	C8
D9	USB3_DWN_TXN3	USB3_DWN_RXN3	C9
D10	USB3_DWN_TXP3	USB3_DWN_RXP3	C10
D11	GND	GND	C11
D12	USB3_DWN_TXN4	USB3_DWN_RXN4	C12
D13	USB3_DWN_TXP4	USB3_DWN_RXP4	C13
D14	GND	GND	C14
D15	DDI0_CLK_AUXP	N/C	C15
D16	DDI0_DATA_AUXN	N/C	C16
D17	N/C	N/C	C17
D18	N/C	N/C	C18
D19	PCIE3_P2_TXP	PCIE3_P2_RXP	C19
D20	PCIE3_P2_TXN	PCIE3_P2_RXN	C20
D21	GND	GND	C21
D22	PCIE3_P10_TXP	PCIE3_P10_RXP	C22
D23	PCIE3_P10_TXN	PCIE3_P10_RXN	C23
D24	N/C	DDP0_HPD	C24
D25	N/C	N/C	C25
D26	DDI0_PAIR_0P	N/C	C26
D27	DDI0_PAIR_0N	N/C	C27
D28	N/C	N/C	C28
D29	DDI0_PAIR_1P	N/C	C29
D30	DDI0_PAIR_1N	N/C	C30
D31	GND	GND	C31
D32	DDI0_PAIR_2P	DDI1_CLK_AUXP	C32
D33	DDI0_PAIR_2N	DDI1_DATA_AUXN	C33
D34	DDI0_DDC_AUX_SEL	DDI1_DDC_AUX_SEL	C34
D35	N/C	N/C	C35
D36	DDI0_PAIR_3P	DDI2_CLK_AUXP	C36
D37	DDI0_PAIR_3N	DDI2_DATA_AUXN	C37
D38	N/C	DDI2_DDC_AUX_SEL	C38
D39	DDI1_PAIR_0P	DDI2_PAIR_0P	C39
D40	DDI1_PAIR_0N	DDI2_PAIR_0N	C40
D41	GND	GND	C41
D42	DDI1_PAIR_1P	DDI2_PAIR_1P	C42
D43	DDI1_PAIR_1N	DDI2_PAIR_1N	C43
D44	DDP1_HPD	DDP2_HPD	C44
D45	N/C	N/C	C45
D46	DDI1_PAIR_2P	DDI2_PAIR_2P	C46
D47	DDI1_PAIR_2N	DDI2_PAIR_2N	C47
D48	N/C	N/C	C48
D49	DDI1_PAIR_3P	DDI2_PAIR_3P	C49
D50	DDI1_PAIR_3N	DDI2_PAIR_3N	C50
D51	GND	GND	C51
D52	PCIE8_P0_EXP_TX_DP	PCIE8_P0_EXP_RX_DP	C52
D53	PCIE8_P0_EXP_TX_DN	PCIE8_P0_EXP_RX_DN	C53
D54	PEG_LANE_RV#	N/C	C54
D55	PCIE8_P1_EXP_TX_DP	PCIE8_P1_EXP_RX_DP	C55

D56	PCIE8_P1_EXP_TX_DN	PCIE8_P1_EXP_RX_DN	C56
D57	GND	N/C	C57
D58	PCIE8_P2_EXP_TX_DP	PCIE8_P2_EXP_RX_DP	C58
D59	PCIE8_P2_EXP_TX_DN	PCIE8_P2_EXP_RX_DN	C59
D60	GND	GND	C60
D61	PCIE8_P3_EXP_TX_DP	PCIE8_P3_EXP_RX_DP	C61
D62	PCIE8_P3_EXP_TX_DN	PCIE8_P3_EXP_RX_DN	C62
D63	N/C	N/C	C63
D64	N/C	N/C	C64
D65	PCIE8_P4_EXP_TX_DP	PCIE8_P4_EXP_RX_DP	C65
D66	PCIE8_P4_EXP_TX_DN	PCIE8_P4_EXP_RX_DN	C66
D67	GND	N/C	C67
D68	PCIE8_P5_EXP_TX_DP	PCIE8_P5_EXP_RX_DP	C68
D69	PCIE8_P5_EXP_TX_DN	PCIE8_P5_EXP_RX_DN	C69
D70	GND	GND	C70
D71	PCIE8_P6_EXP_TX_DP	PCIE8_P6_EXP_RX_DP	C71
D72	PCIE8_P6_EXP_TX_DN	PCIE8_P6_EXP_RX_DN	C72
D73	GND	GND	C73
D74	PCIE8_P7_EXP_TX_DP	PCIE8_P7_EXP_RX_DP	C74
D75	PCIE8_P7_EXP_TX_DN	PCIE8_P7_EXP_RX_DN	C75
D76	GND	GND	C76
D77	N/C	N/C	C77
D78	PCIE4_A_P0_EXP_TX_DP	PCIE4_A_P0_EXP_RX_DP	C78
D79	PCIE4_A_P0_EXP_TX_DN	PCIE4_A_P0_EXP_RX_DN	C79
D80	GND	GND	C80
D81	PCIE4_A_P1_EXP_TX_DP	PCIE4_A_P1_EXP_RX_DP	C81
D82	PCIE4_A_P1_EXP_TX_DN	PCIE4_A_P1_EXP_RX_DN	C82
D83	N/C	N/C	C83
D84	GND	GND	C84
D85	PCIE4_A_P2_EXP_TX_DP	PCIE4_A_P2_EXP_RX_DP	C85
D86	PCIE4_A_P2_EXP_TX_DN	PCIE4_A_P2_EXP_RX_DN	C86
D87	GND	GND	C87
D88	PCIE4_A_P3_EXP_TX_DP	PCIE4_A_P3_EXP_RX_DP	C88
D89	PCIE4_A_P3_EXP_TX_DN	PCIE4_A_P3_EXP_RX_DN	C89
D90	GND	GND	C90
D91	PCIE4_B_P0_EXP_TX_DP	PCIE4_B_P0_EXP_RX_DP	C91
D92	PCIE4_B_P0_EXP_TX_DN	PCIE4_B_P0_EXP_RX_DN	C92
D93	GND	GND	C93
D94	PCIE4_B_P1_EXP_TX_DP	PCIE4_B_P1_EXP_RX_DP	C94
D95	PCIE4_B_P1_EXP_TX_DN	PCIE4_B_P1_EXP_RX_DN	C95
D96	GND	GND	C96
D97	N/C	N/C	C97
D98	PCIE4_B_P2_EXP_TX_DP	PCIE4_B_P2_EXP_RX_DP	C98
D99	PCIE4_B_P2_EXP_TX_DN	PCIE4_B_P2_EXP_RX_DN	C99
D100	GND	GND	C100
D101	PCIE4_B_P3_EXP_TX_DP	PCIE4_B_P3_EXP_RX_DP	C101
D102	PCIE4_B_P3_EXP_TX_DN	PCIE4_B_P3_EXP_RX_DN	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	GND	C110

Chapter 3

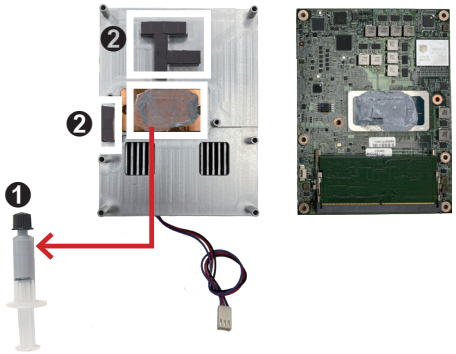
Installation & Maintenance

3.1 Installing the Heatsink

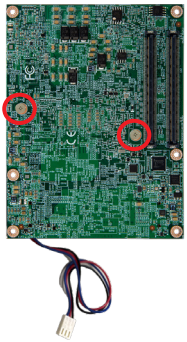
Prepare the heat sink in the optional accessories and follow the steps below to install the heat sink.

1. Find the thermal paste tube included in the heat sink accessory box. Apply the thermal paste to the CPU area.

2. Remove the tapes of the areas as shown in the picture below.



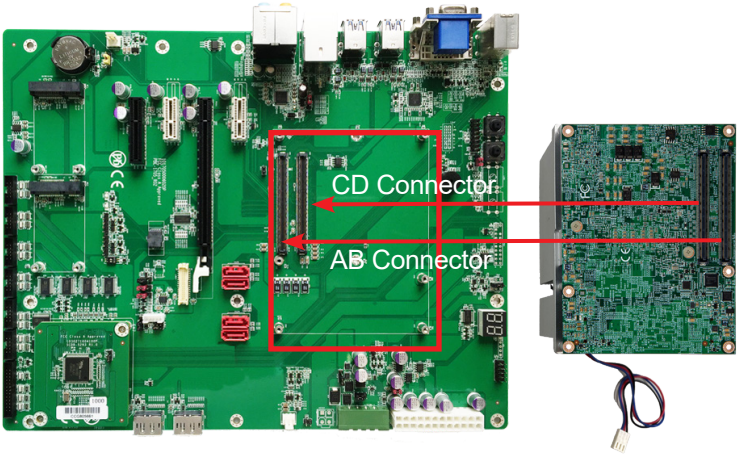
3. Secure the heat sink assembly to the CPU module by fastening the 2 screws included in the heat sink accessory pack.



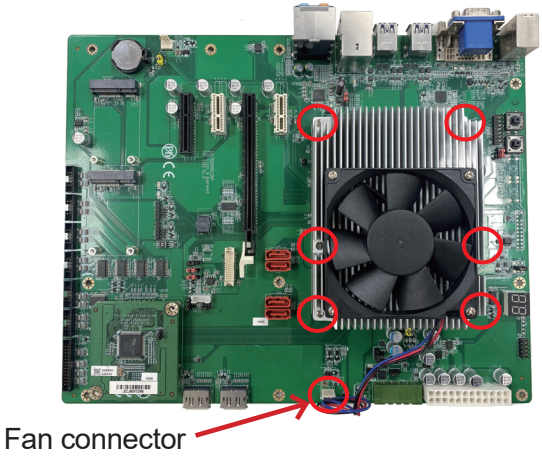
3.2 Installing the CPU Module to Carrier Board

Prepare the carrier board in the optional accessories and follow the steps below to install the CPU module to the carrier board.

1. Mount the Embedded EmCOMe-i94M0 into PBE-1705 via COM Express connectors as below; that is, COM Express AB to AB and CD to CD.



2. Secure the CPU module to the carrier board by fastening the 6 screws included in the heat sink accessory pack. Then connect the fan cable to the fan connector on the carrier board.



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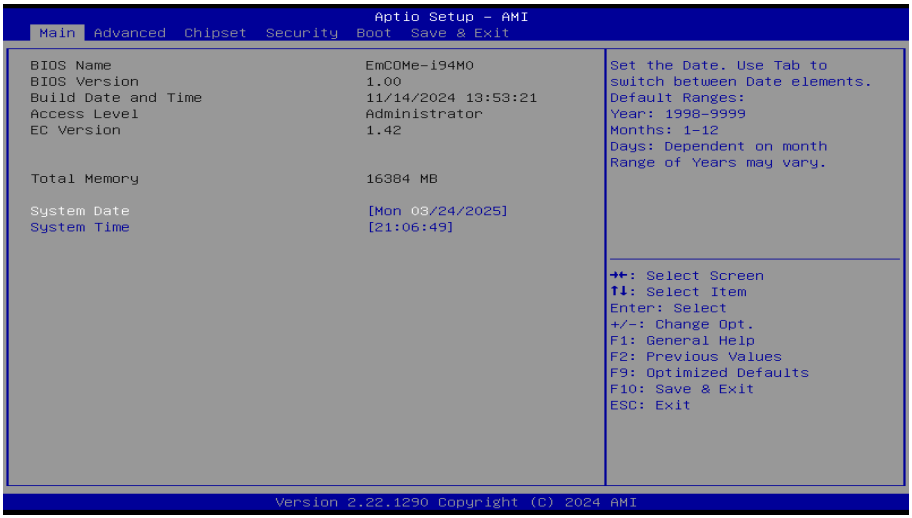
Chapter 4

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:



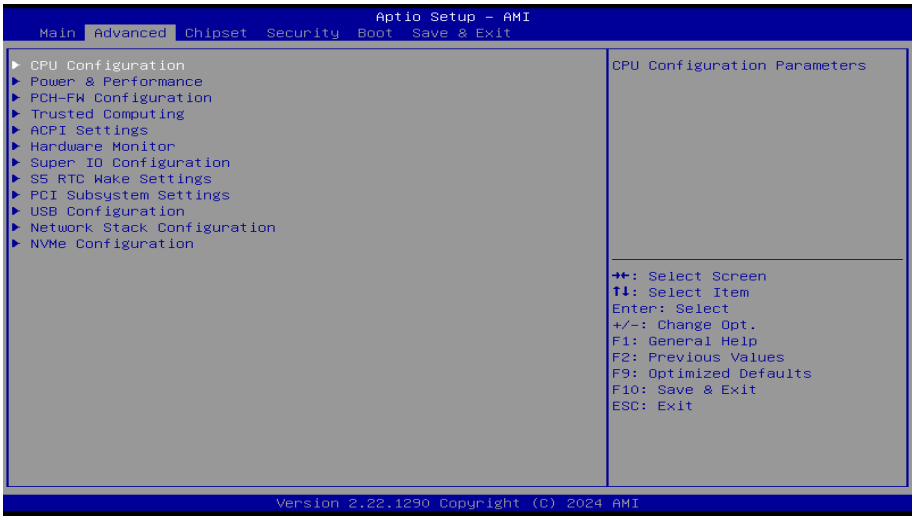
Setting	Description
System Date	Set the system date. Use Tab to switch between Date elements. Note that the 'Day' automatically changes when you set the date. ► The date format is: **Day:** Sun to Sat **Month:** 1 to 12 **Date:** 1 to 31 **Year:** 1998 to 9999
System Time	Set the system time. Use Tab 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.

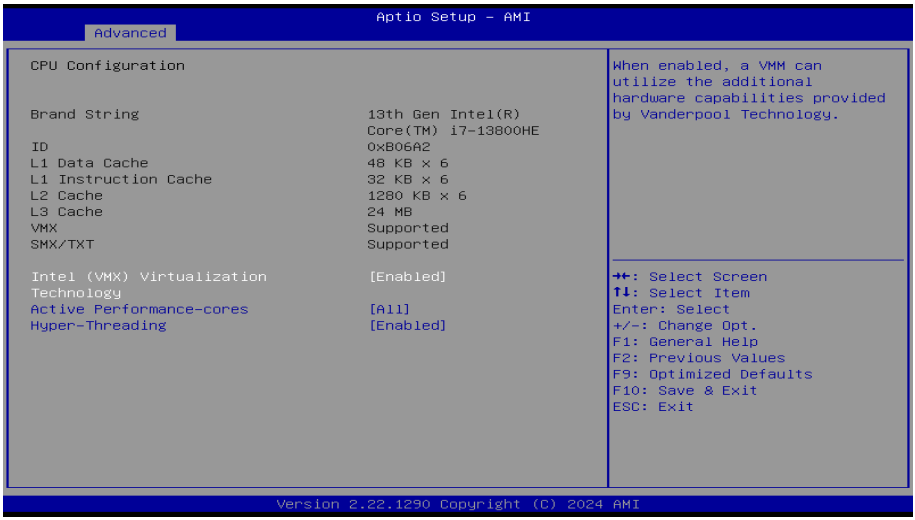
Keystroke	Function
◄ ►	Move to highlight a particular configuration screen from the top menu bar / Move to highlight items on the screen
▼ ▲	Move to highlight previous/next item
Enter	Select and access a setup item/field
Esc	On the Main Menu – Quit the setup and not save changes into CMOS (a message screen will display and ask you to select “Yes” or “No” 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 “Yes” or “No” for exiting and saving changes. Use “←” and “→” to select and press “Enter” to confirm)

4.2 Advanced



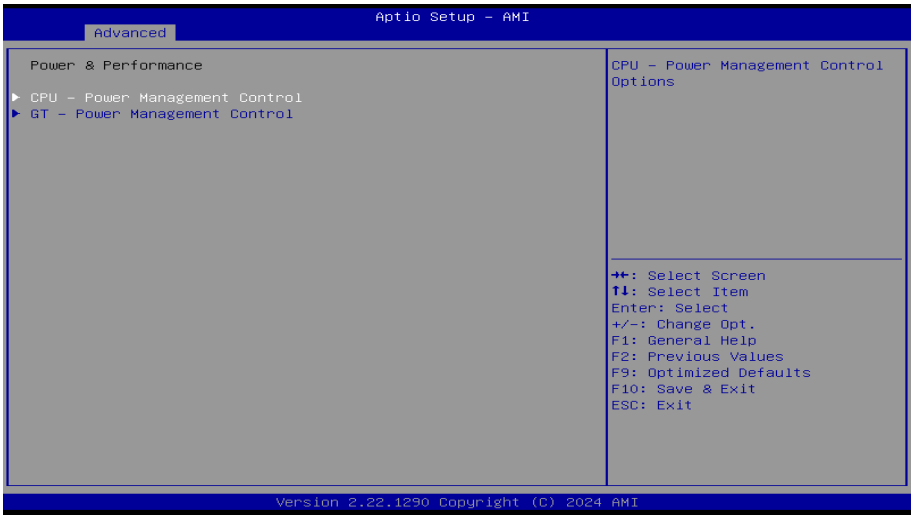
Setting	Description
CPU Configuration	See 4.2.1 CPU Configuration on page 23
Power & Performance	See 4.2.2 Power & Performance on page 24
PCH-FW Configuration	See 4.2.3 PCH-FW Configuration on page 25
Trusted Computing	See 4.2.4 Trusted Computing on page 26
ACPI Settings	See 4.2.5 ACPI Settings on page 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 35
Network Stack Configuration	See 4.2.11 Network Stack Configuration on page 37
NVMe Configuration	See 4.2.12 NVMe Configuration on page 38

4.2.1 CPU Configuration



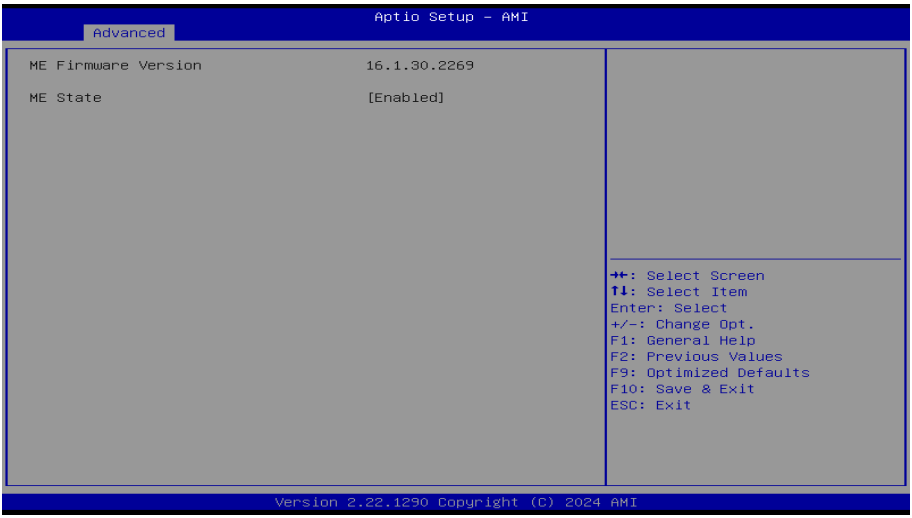
Setting	Description
Intel (VMX) Virtualization Technology	Enable or disable Intel virtualization technology. When enabled, a VMM can utilize the additional hardware capabilities provide by Vanderpool Technology. ► Options: **Enabled** (Default) or **Disabled**
Active Performance-cores	Number of P-cores to enable in each processor package. Note: Number of Cores and E-cores are looked at together. When both are {0,0}, Pcode will enable all cores. ► Options: **All** (Default), **1**, **2**, **3**, **4** and **5**.
Hyper-Threading	**Enabled** (Default) or Disabled Hyper-Threading Technology.

4.2.2 Power & Performance



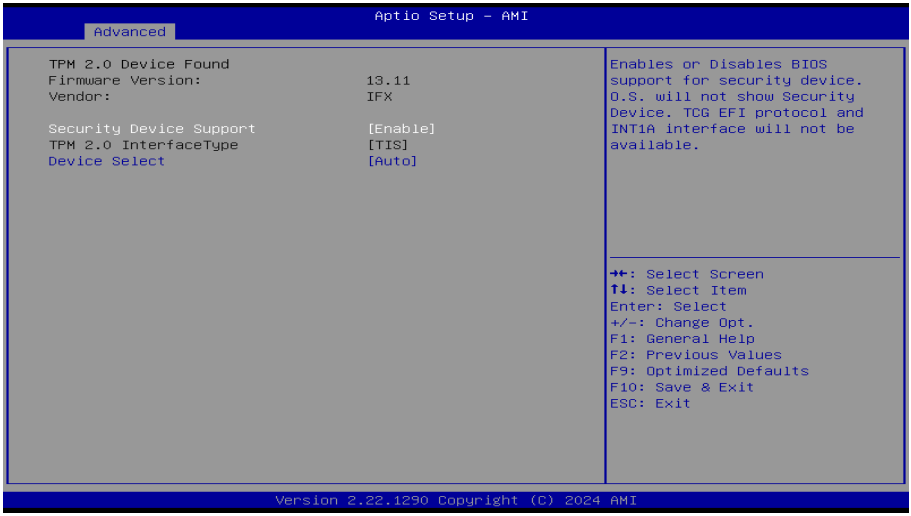
Setting	Description
CPU - Power Management Control	CPU - Power Management Control Options Control CPU Power Management: ► Options: Boot performance mode: **Max Battery, Max Non-Turbo Performance, Turbo Performance (Default)** Intel(R) SpeedStep(tm) ► Options: **Enabled** (Default)**, Disabled** Turbo Mode: **Enable/Disable** processor Turbo Mode. ► Options: Turbo mode: **Enabled** (Default)**, Disabled** C States: **Enable/Disable** CPU C States ► Options: **Disabled** (Default)**, Enabled**
GT - Power Management Control	Maximum GT frequency: Maxium GT frequency limited by the user. Choose between 100MHz and 1200MHz. ► Options: **Default Max Frequency** (Default), **100MHz~1400MHz** Disable Turbo GT frequency: Enabled/Disabled GT Frequency. ► Options: **Disabled** (Default)**, Enabled**

4.2.3 PCH-FW Configuration



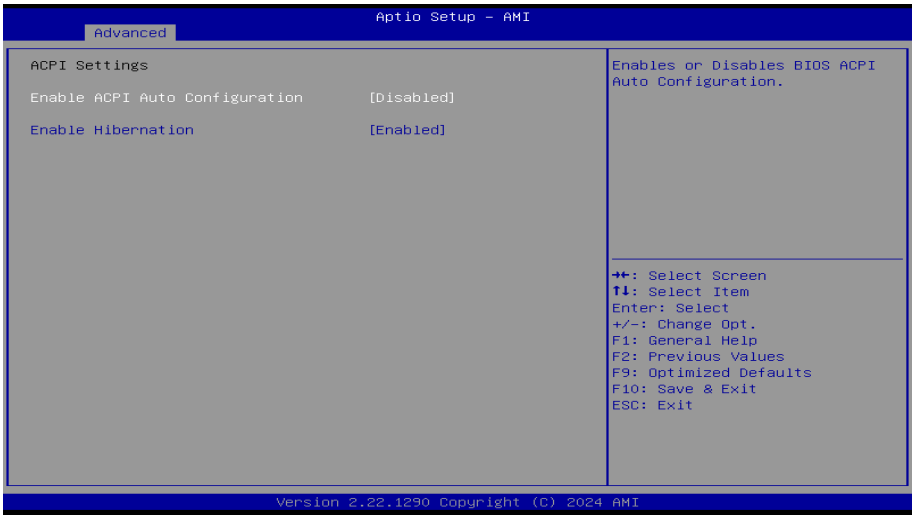
Setting	Description
ME State	**Enable** (Default) / **Disable** ME state. When disabled, ME will be put into ME Temporariily Disabled Mode.

4.2.4 Trusted Computing



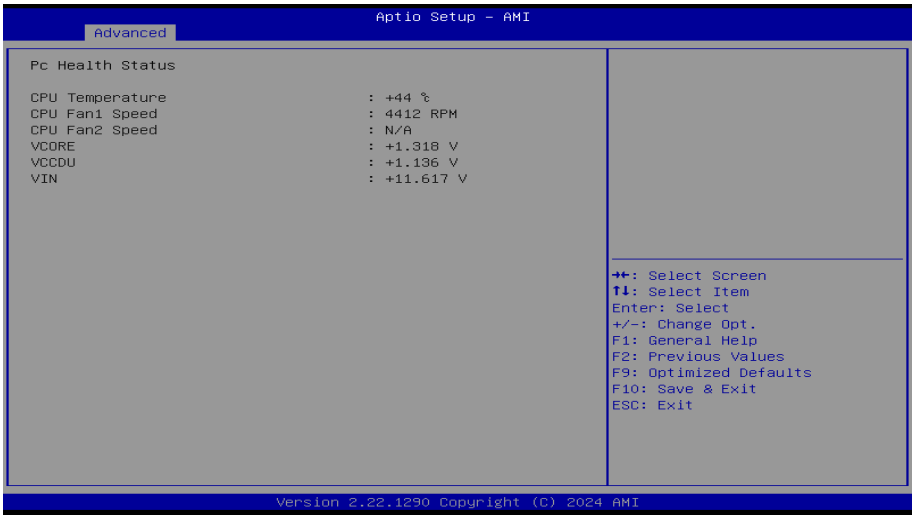
Setting	Description
Security Device Support	**Enable** (Default) or **Disable** BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.
Device Select	Select the TPM device: Options: **TPM 1.2**, **TPM 2.0** and **Auto** (Default) ► TPM 1.2 will restrict support 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



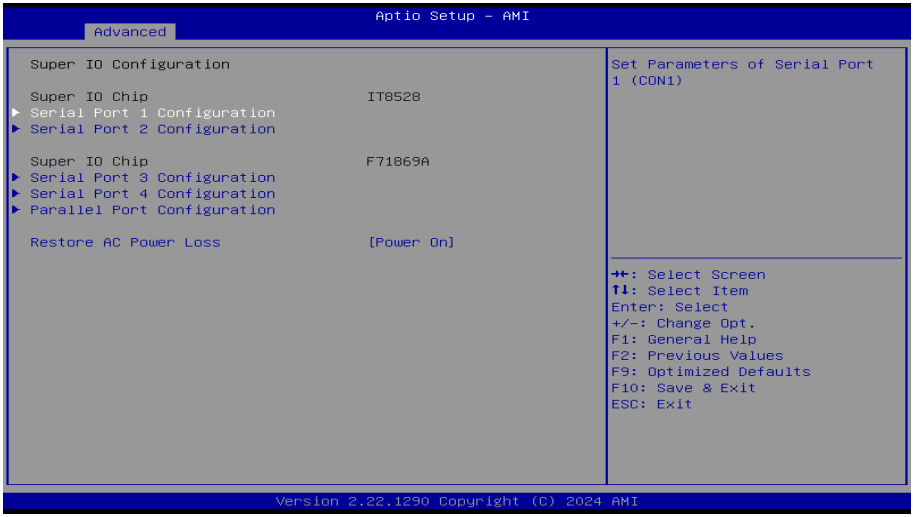
Setting	Description
Enable ACPI Auto Configuration	**Enables** or **Disables** BIOS ACPI Auto Configuration. (**Disabled** is the default)
Enable Hibernation	**Enable** (Default) or **Disable** System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some operating systems.

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** (Default) and **Power Off**

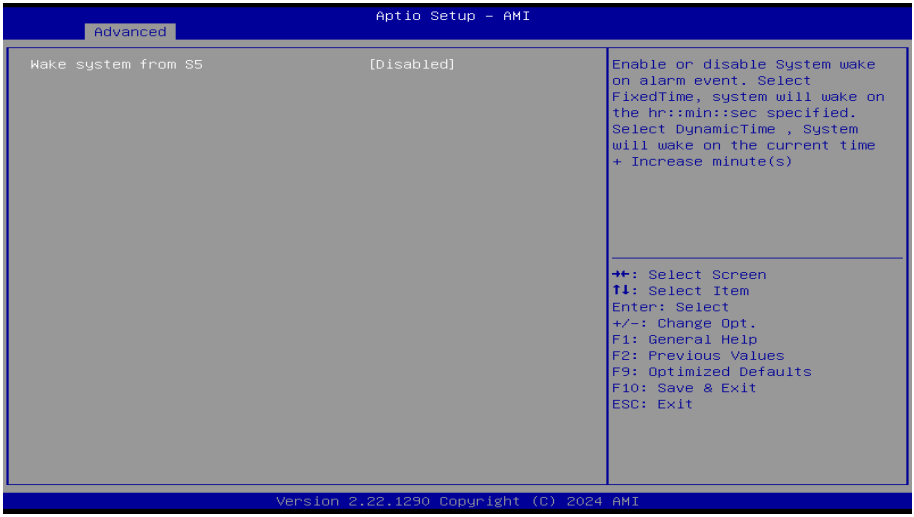
Serial Port 1/2/3/4 Configuration

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=3, 4, 7, 12** **IO=2F8h; IRQ=3, 4, 7, 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** (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**

Parallel Port Configuration

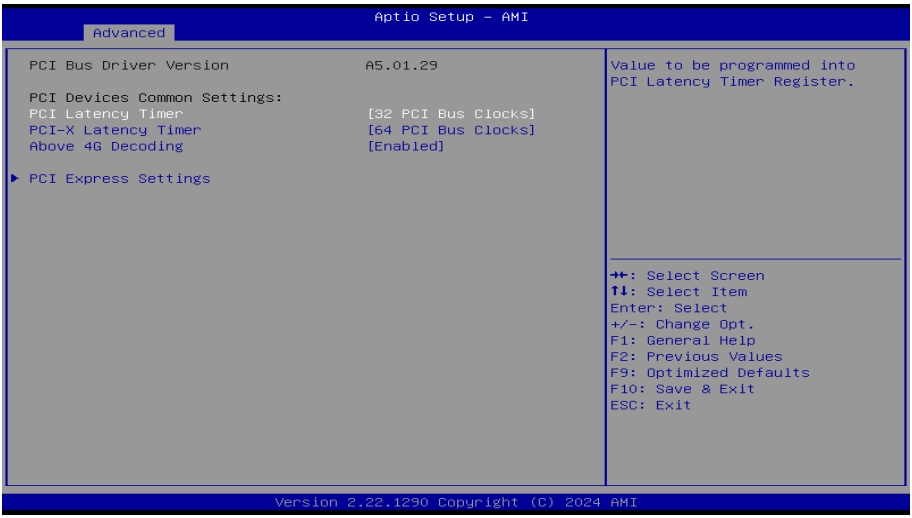
Setting	Description
Parallel Port	**Enable** (default) or **Disable** Parallel Port (LPT/LPTE).
Change Settings	Select an optimal setting for Super IO device. ► Options: **Auto** **IO=378h; IRQ=7** (Default) **IO=378h; IRQ=7, 10, 11, 12** **IO=278h; IRQ=7, 10, 11, 12** **IO=3BCh; IRQ=7, 10, 11, 12**
Device Mode	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



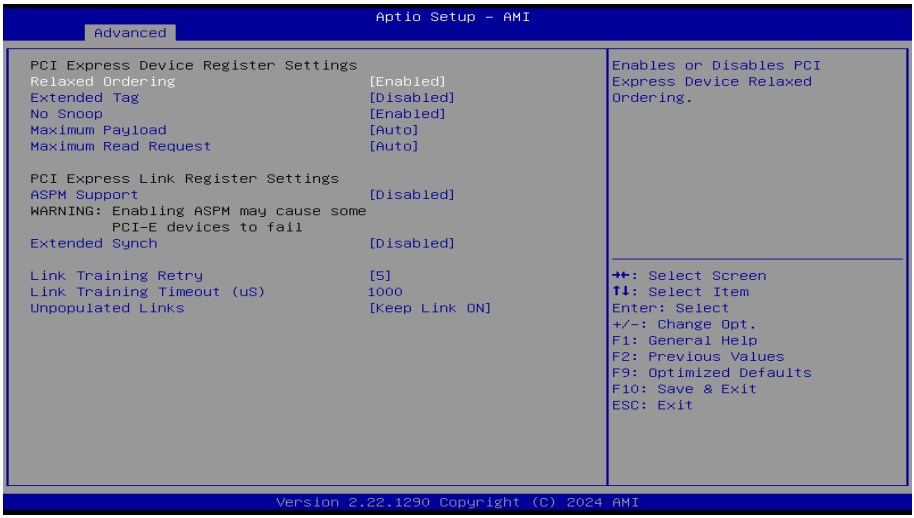
Setting	Description
Wake System from S5	**Enable** or **Disable** (Default) system wake on alarm event. ► Options available are: **Disabled** (Default): **Fixed Time:** System will wake on the hr::min::sec specified. **DynamicTime:** If selected, you need to set **Wake up minute increase** from 1 - 5.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

4.2.9 PCI Subsystem Settings



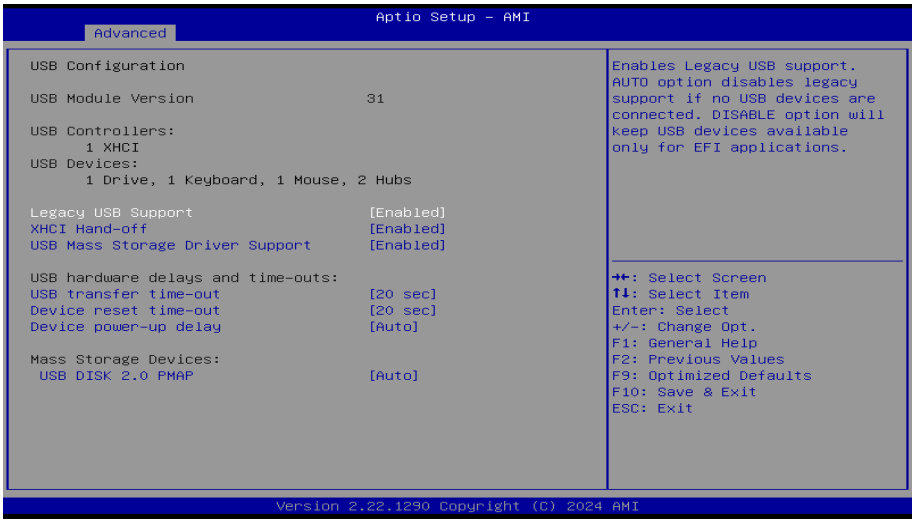
Setting	Description
PCI Latency Timer	Value to be programmed into PCI Latency timer Register. ► Default: **32 PCI Bus Clocks**
PCI-X Latency Timer	Value to be programmed into PCI Latency timer Register. ► Default: **64 PCI Bus Clocks**
Above 4G Decoding	**Enable**(Default)/**Disable** 64bit capable Devices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

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.
Maximum Read Request	This item allows users to set the Maximum Read Request Size.
ASPM Support	**Force L0s**/**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.
Link Training Timeout (uS)	This item allows users to set the Link Training Timeout (uS)
Unpopulated Links	This item allows users to set the Unpopulated Links. (to **Keep Link ON** or **Disable Link**)

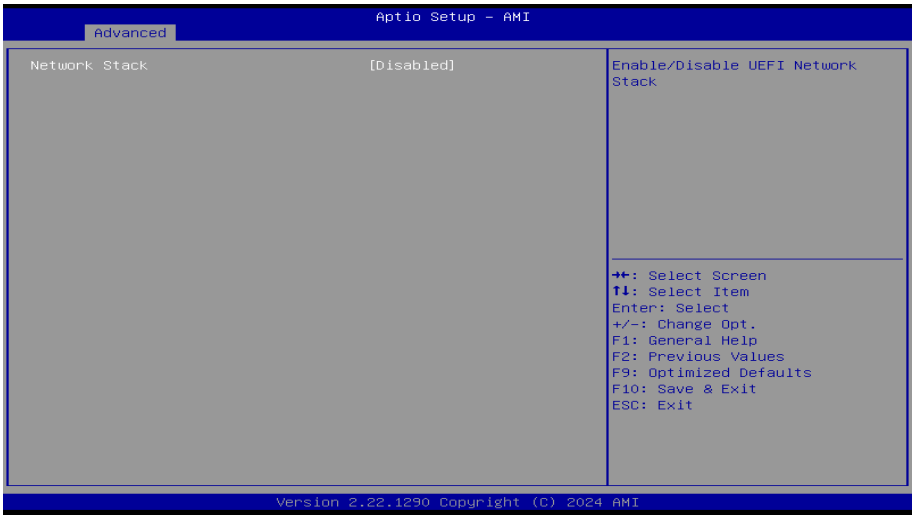
4.2.10 USB Configuration



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 delays and time-outs	
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)

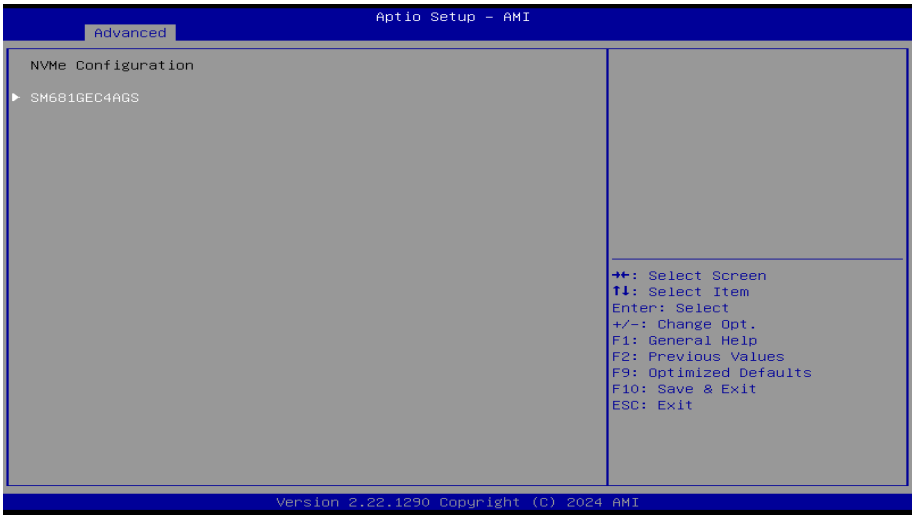
Device reset time-out	Use this item to set USB mass storage device start unit command time-out. ▸ Options available are: **10 sec, 20 sec** (default)**, 30 sec, 40 sec**
Device power-up delay	Use this item to set maximum time the device will take before it properly reports itself to the host controller. ▸ 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.
Mass Storage Devices	
USB DISK 2.0 PMAP	Use this item to set mass device emulation type. ▸ Options available are: **Auto** (Default): 'Auto' enumerates devices according to their media format. **CD-ROM**: Optical drives are emulated as 'CD-ROM'. **Floppy/Forced FDD/Hard Disk**: Drives with no media will be emulated according to a drive type.

4.2.11 Network Stack Configuration



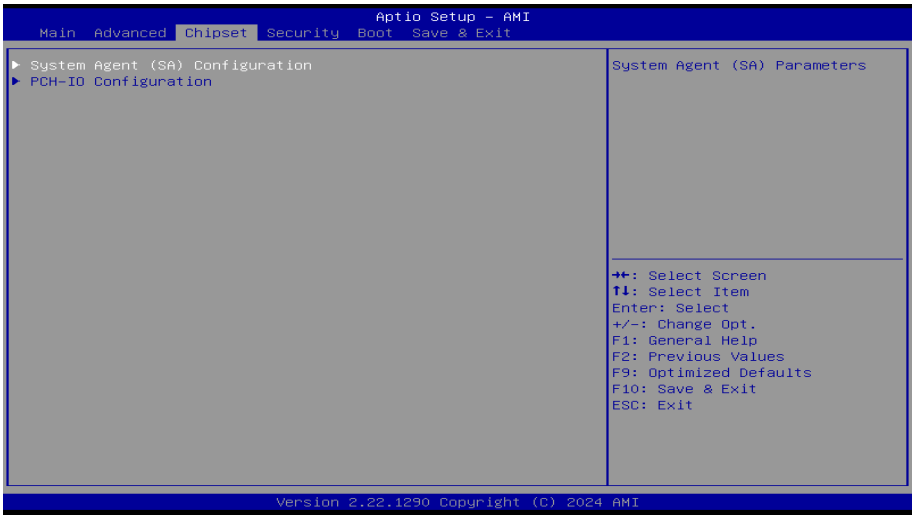
Setting	Description
Network Stack	Enables/disables UEFI network stack. ► **Disabled** is the default.

4.2.12 NVMe Configuration



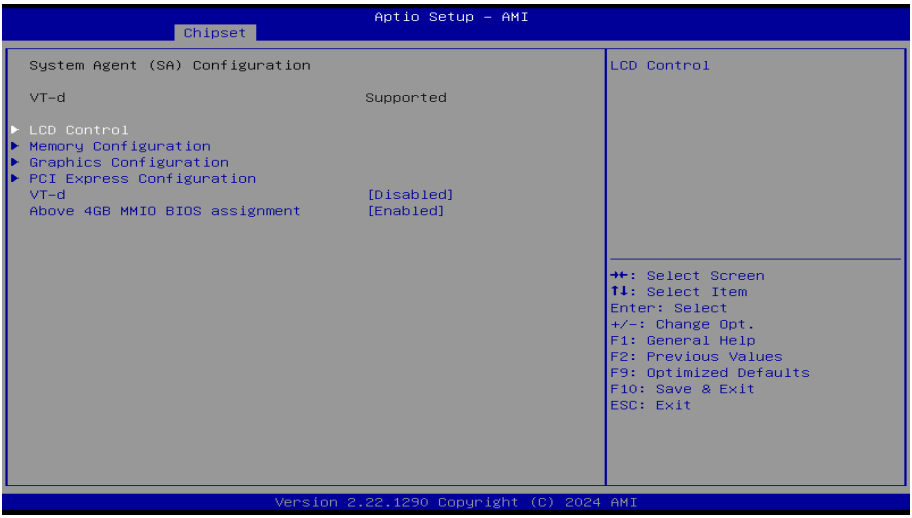
Access this submenu to view the NVMe controller and driver information.

4.3 Chipset



Setting	Description
System Agent (SA) Configuration	See 4.3.1 System Agent (SA) Configuration on page 40
PCH-IO Configuration	See 4.3.2 PCH-IO Configuration on page 42

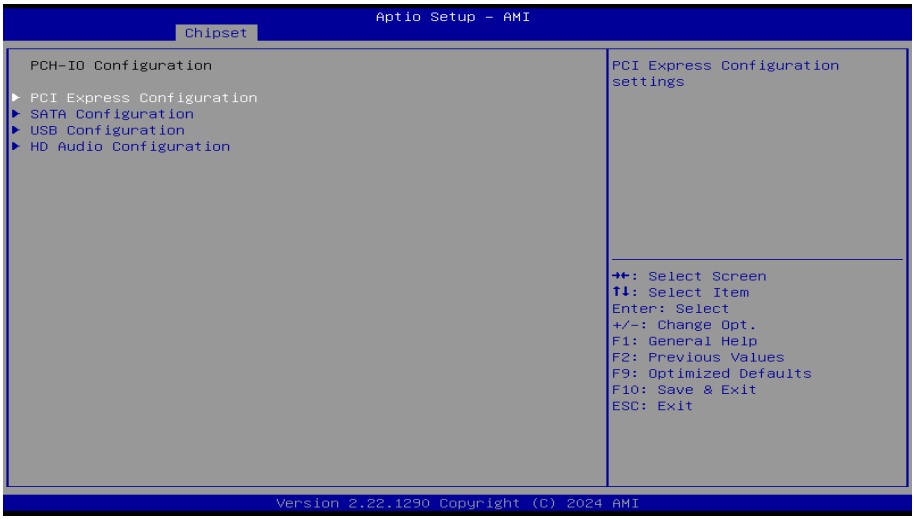
4.3.1 System Agent (SA) Configuration



Setting	Description
LCD Control	
Active LFP	Configuring LFP usage ► Options: **No eDP** (default) and **eDP Port-A**
Memory Configuration	
Memory Configuration	Access to view the memory configuration.
Graphics Configuration	
Primary Display	Select which of IGFX/PEG/PCI Graphics devices should be Primary Display or select HG for Hybrid Gfx. ► Options: **Auto**(default), **IGFX, PEG Slot**.
Aperture Size	Select the Aperture Size ► Options: **128MB, 256MB, 512MB, 1024MB** Note: Above 4GB MMIO BIOS assignment is automatically enabled when selecting > 2048MB aperture. To use this feature, please disable CSM Support.

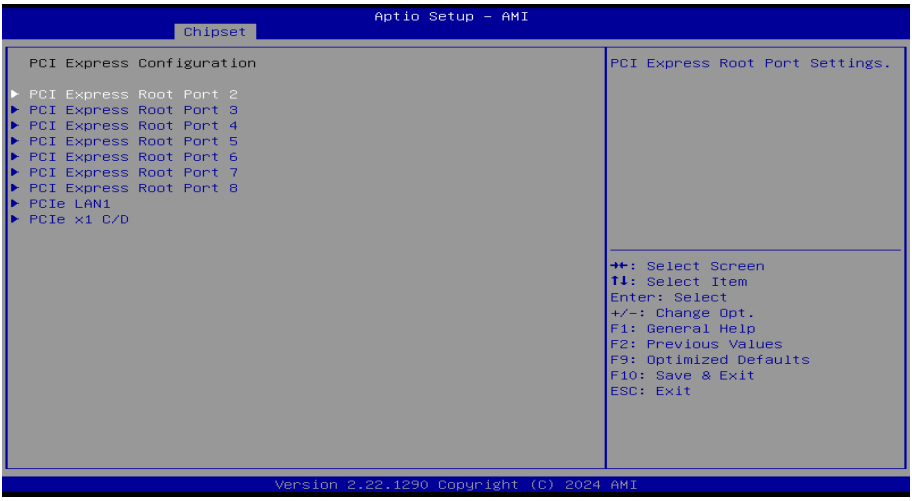
DVMT Pre-Allocated	Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device. ► Options: **0M**, **32M, 64M, 96M, 128M, 160M, 4M, 8M, 12M, 16M, 20M, 24M, 28M, 32M/F7, 36M, 40M, 44M, 48M, 52M, 56M, 60M**
DVMT Total Gfx Mem	Select DVMT 5.0 Total Graphic Memory size from 128MB to MAX used by the Internal Graphics Device . (256MB is the default)
PCI Express Configuration	
Fia Programming	Load Fia Configuration if Enabled for each root port. ► Options: **Enabled, Disabled.**
Compliance Test Mode	Enable when using Compliance Load Board. ► Options: **Enabled, Disabled.**
CDR Relock	Enable/Disable CDR Relock. ► Options: **Enabled, Disabled.**
Assertion on Link Down GPIOs	GPIO Assertion on Link Down. ► Options: **Enabled, Disabled.**
PCI Express Slot Selection	Select the PCIe M2 or CEMx4 slot. ► Options: **M2, CEMx4 slot.**
PCI Express Root Port 1/2/3	**PCI Express Root Port1/2/3:** Control the PCI Express Root Port. ► Options: **Enabled, Disabled** **ASPM:** Set the ASPM level. ► Options: **Disabled, L0S, L1, L0sL1** **L1 Substates:** PCI Express L1 Substates settings. ► Options: **Disabled, L1.1, L1.1&L1.2** **PCIe Speed:** Configure PCIe Speed. ► Options: **Auto, Gen1, Gen2, Gen3, Gen4.**
VT-d	**Enable** or **Disable** (default) VT-d capability.
Above 4GB MMIO BIOS assignment	**Enable** (default) or **Disable** Above 4GB MmemoryMapped BIOS assignment. This is enabled automatically when Aperture Size is set to 2048MB.

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 45
USB Configuration	See 4.3.2.3 USB Configuration on page 46
HD Audio Configuration	See 4.3.2.4 HD Audio Configuration on page 47

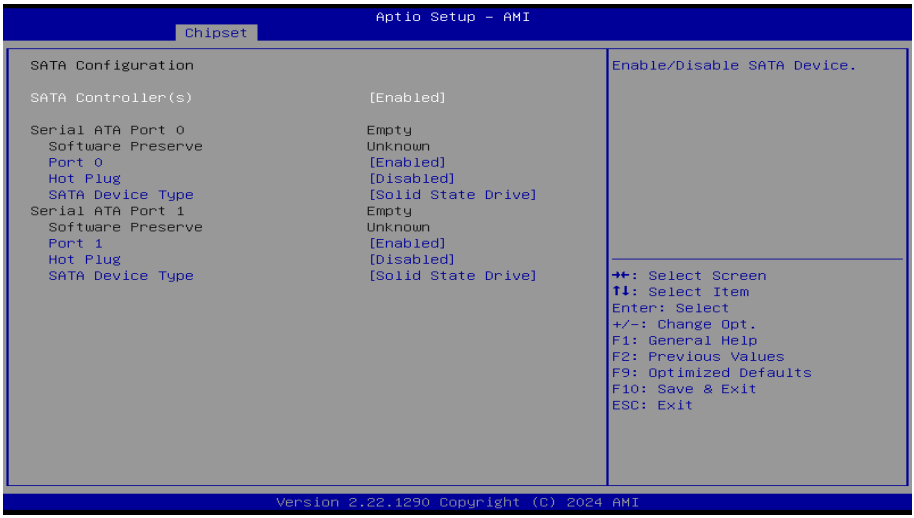
4.3.2.1 PCI Express Configuration



Setting	Description
PCI Express Root Port 2-8	**PCI Express Root Port 2-8:** Control the PCI Express Root Port. ► Options: **Enabled, Disabled** **ASPM:** Set the ASPM level. ► Options: **Disabled, L1, Auto** **L1 Substates:** PCI Express L1 Substates settings. ► Options: **Disabled, L1.1, L1.1&L1.2** **PCIe Speed:** Configure PCIe Speed. ► Options: **Auto, Gen1, Gen2, Gen3**
PCIe LAN1	**PCIe LAN1:** Control the PCI Express Root Port. ► Options: **Enabled, Disabled** **ASPM:** Set the ASPM level. ► Options: **Disabled, L1, Auto** **L1 Substates:** PCI Express L1 Substates settings. ► Options: **Disabled, L1.1, L1.1&L1.2** **PCIe Speed:** Configure PCIe Speed. ► Options: **Auto, Gen1, Gen2, Gen3**

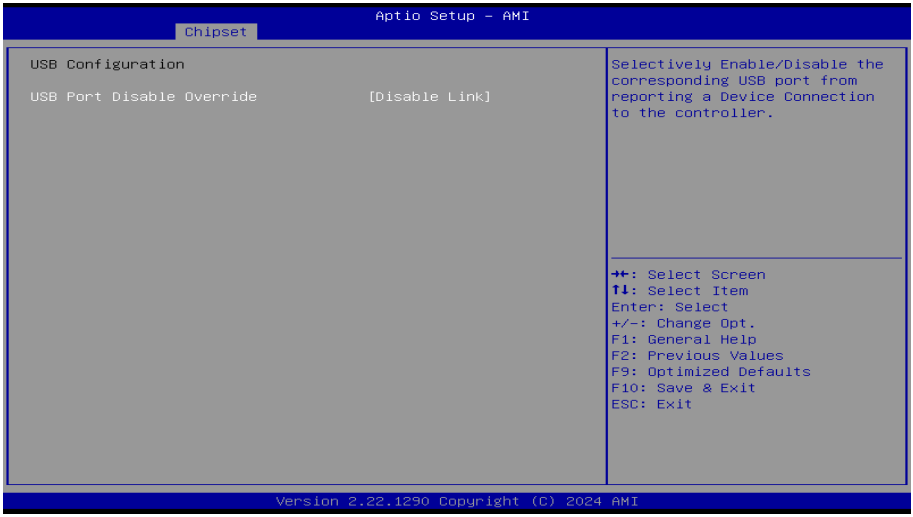
PCIe x1 C/D	**PCIe x1 C/D:** Control the PCI Express Root Port. ► Options: **Enabled, Disabled** **ASPM:** Set the ASPM level. ► Options: **Disabled, L1, Auto** **L1 Substates:** PCI Express L1 Substates settings. ► Options: **Disabled, L1.1, L1.1&L1.2** **PCIe Speed:** Configure PCIe Speed. ► Options: **Auto, Gen1, Gen2, Gen3**

4.3.2.2 SATA Configuration



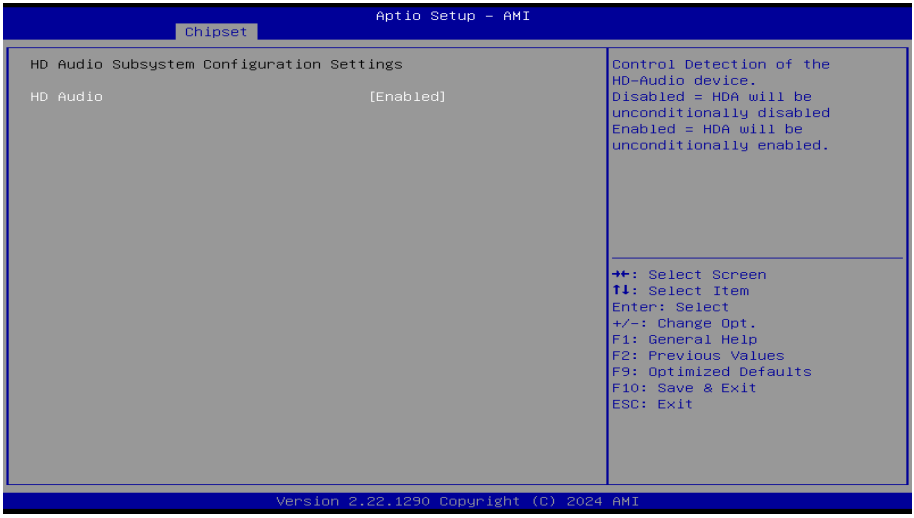
Setting	Description
SATA Controller(s)	**Enable** (default) or **Disable** SATA Device.
Port 0/1	**Enable**(default) or **Disable** SATA Port.
Hot Plug	**Enable** or **Disable** (default) this port as Hot plug-gable.
SATA Device Type	Identify the SATA port is connected to Solid State Drive or Hard Disk Drive. ► Options: **Hard Disk Drive** and **Solid State Drive** (default).

4.3.2.3 USB Configuration



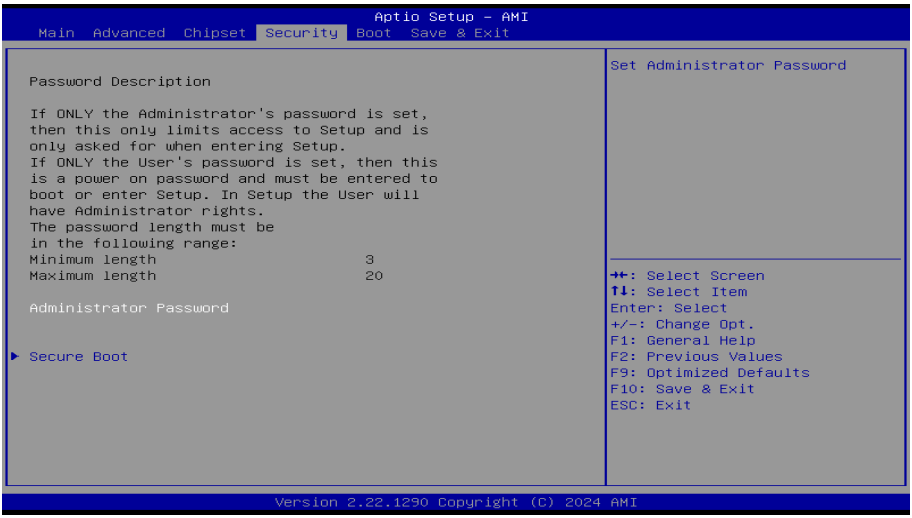
Setting	Description
USB Port Disable Override	Selectively Enable/Disable the corresponding USB port from reporting a Device Connection to the controller. ► Options: **Disable Link** (default) and **Select Per-Pin**

4.3.2.4 HD Audio Configuration



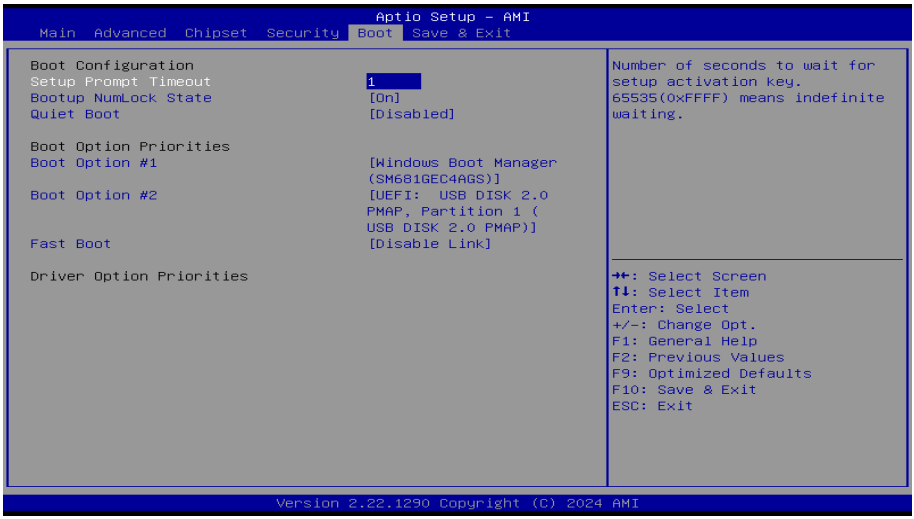
Setting	Description
HD Audio	Control Detection of the HD-Audio device. ► Options available are: **Disabled**: HDA will be unconditionally disabled **Enabled** (default): HDA will be unconditionally Enabled

4.4 Security



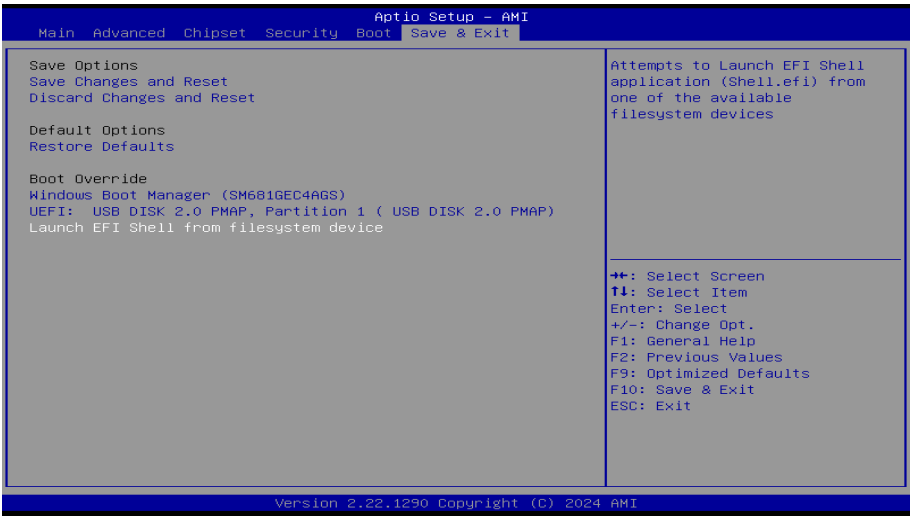
Setting	Description
Administrator Password	To set up an administrator password: 1. Select **Administrator Password**. The screen then pops up an **Create New Password** dialog. 2. Enter your desired password that is no less than 3 characters and no more than 20 characters. 3. Hit [Enter] key to submit.
Secure Boot menu	**Secure Boot** 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. ► Options are: [**Disabled**] or [**Enabled**] **Secure Boot Mode** Secure Boot fearuew is Active if Secure Boot is Enabled: ► Options are: [**Custom**] or [**Standard**] **Restore Factory Keys** ► Force System to User Mode. **Key Management** ► Enables expert users to modify Secure Boot Policy variables without variable authentication.

4.5 Boot



Setting	Description
Setup Prompt Timeout	Use this item to set number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting.
Boot NumLock State	Select the keyboard NumLock state. ► Options: **On** (default) and **Off**.
Quiet Boot	**Enable** or **Disable** Quiet Boot option.
Boot Option Priority	Set the system boot priorities.
Fast Boot	**Enable** or **Disable Link** (default) boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options.

4.6 Save & Exit



Setting	Description
Save Changes and Reset	Reset the system after saving the changes. ► Enter the item and then a dialog box pops up: **Save configuration and reset? (Yes/ No)**
Discard Changes and Reset	Reset system setup without saving any changes. ► Enter the item and then a dialog box pops up: **Reset 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.

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 */}
```