

USER'S MANUAL

CT-DML01 Series

3.5" Industrial Motherboard With Intel®
Core™ Ultra Processors

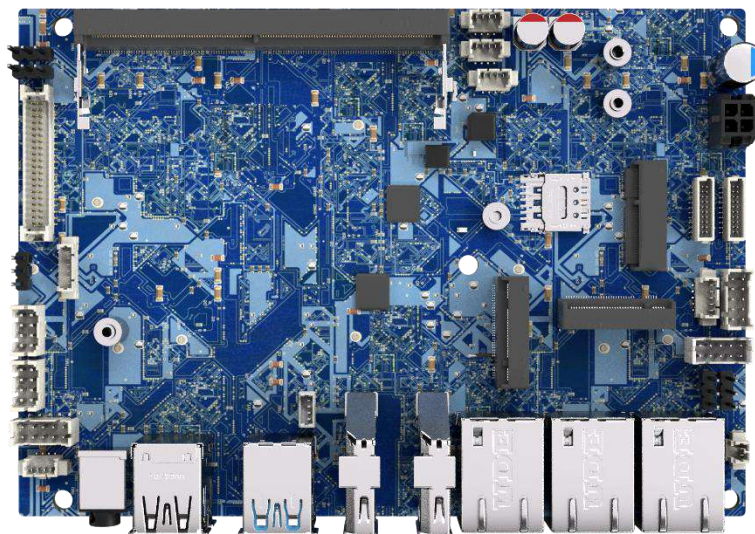


Table of Contents

Prefaces	04
Revision	04
Disclaimer	04
Copyright Notice	04
Trademarks Acknowledgment	04
Environmental Protection Announcement	04
Regulatory Notices	05
Battery Information	06
Safety Information	08
Technical Support and Assistance	09
Chapter 1 Product Introductions	10
1.1 Product Description	11
1.2 Block Diagram	12
1.3 Specifications	13
1.4 Available Models	14
Chapter 2 Switches and Connectors	15
2.1 Switch and Connector Locations	16
2.1.1 Top View	16
2.1.2 Bottom view	16
2.1.3 Rear I/O	16
2.2 Connector / Switch Definition	17
2.3 Definition of Connectors	18
2.3.1 DC_IN1	18
2.3.2 EDP1	19
2.3.3 LVDS1	20
2.3.4 LVDS_P1	21
2.3.5 F_AUDIO1	21
2.3.6 J_SPK1	22
2.3.7 LAN1	23
2.3.8 LAN2	23
2.3.9 LAN3	24
2.3.10 RUSB_C1	25
2.3.11 F_USB1	26
2.3.12 F_USB2	26
2.3.13 J_COM1-2	27
2.3.14 J_COM3-4	28
2.3.15 J_GPIO1	29
2.3.16 F_PANEL1	30
2.3.17 F_PANEL2	30
2.3.18 J_ESPI1	31
2.3.19 CPU_FAN1	31
2.3.20 P_SATA1	31
2.3.21 J_SMB1	32
2.3.22 J_PRM1	32
2.3.23 BAT1	33

Chapter 3	BIOS Setup	34
3.1	Description of the BIOS Options	35
3.1.1	Main	35
3.2	Advanced	36
3.2.1	CPU Configuration	38
3.2.2	System Agent (SA) Configuration	42
3.2.3	PCIE Configuration	48
3.2.4	PCH-IO Configuration	49
3.2.5	PCH-FW Configuration	53
3.2.6	Trusted Computing	54
3.2.7	ACPI Settings	55
3.2.8	Super IO Configuration	56
3.2.9	Hardware Monitor	57
3.2.10	Display Configuration	58
3.2.11	Power Control	59
3.2.12	S5 RTC Wake Settings	60
3.2.13	Network Stack Configuration	61
3.2.14	NVMe Configuration	62
3.3	Security	64
3.3.1	Secure Boot	65
3.4	Boot	66
3.5	Save & Exit	67
3.6	MEBx	68

Prefaces

Revision

Revision	Description	Date
1.0	Manual Released	2025/6/10

Disclaimer

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

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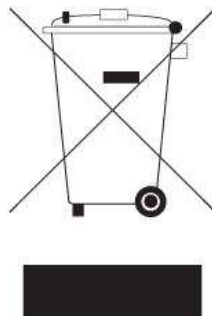
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Environmental Protection Announcement

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



Regulatory Notices

FCC-A Radio Frequency Interference Statement

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 in a residential installation. This equipment generates, uses and radiates radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

NOTE

- The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
- Shield interface cables and AC power cord, if any, must be used in order to comply with the emission limits.

FCC Conditions

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

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

CE Conformity

Hereby, C&T Solution Inc. declares that this device is in compliance with the essential safety requirements and other relevant provisions set out in the European Directive.

WEEE Statement

Under the European Union ("EU") Directive on Waste Electrical and Electronic Equipment, Directive 2012/19/EU, products of "electrical and electronic equipment" cannot be discarded as municipal waste anymore and manufacturers of covered electronic equipment will be obligated to take back such products at the end of their useful life.



Battery Information

Please take special precautions if this product comes with a battery.

- Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.
- Avoid disposal of a battery into fire or a hot oven, or mechanically crushing or cutting of a battery, which can result in an explosion.
- Avoid leaving a battery in an extremely high temperature or extremely low air pressure environment that can result in an explosion or the leakage of flammable liquid or gas.
- Do not ingest battery. If the coin/button cell battery is swallowed, it can cause severe internal burns and can lead to death. Keep new and used batteries away from children.

European Union:



Batteries, battery packs, and accumulators should not be disposed of as unsorted household waste. Please use the public collection system to return, recycle, or treat them in compliance with the local regulations.

BSMI:



For better environmental protection, waste batteries should be collected separately for recycling or special disposal.

California, USA:



The button cell battery may contain perchlorate material and requires special handling when recycled or disposed of in California.

For further information please visit:

<http://www.dtsc.ca.gov/hazardouswaste/perchlorate/>

Chemical Substances Information

In compliance with chemical substances regulations, such as the EU REACH Regulation (Regulation EC No. 1907/2006 of the European Parliament and the Council), C&T provides the information of chemical substances in products at:

<https://www.candtsolution.com>

Environmental Policy

- The product has been designed to enable proper reuse of parts and recycling and should not be thrown away at its end of life.
- Users should contact the local authorized point of collection for recycling and disposing of their end-of-life products.
- Visit the C&T website and locate a nearby distributor for further recycling information.
- Users may also reach us at C&T for information regarding proper Disposal, Take-back, Recycling, and Disassembly of C&T products.



Green Product Features

- Reduced energy consumption during use and stand-by
- Limited use of substances harmful to the environment and health
- Easily dismantled and recycled
- Reduced use of natural resources by encouraging recycling
- Extended product lifetime through easy upgrades
- Reduced solid waste production through take-back policy

Copyright and Trademarks Notice

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Technical Support

If a problem arises with your product and no solution can be obtained from the user's manual, please contact your place of purchase or local distributor. Alternatively, please visit

<https://www.candtsolution.com>

Safety Information

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

- The components included in this package are prone to damage from electrostatic discharge (ESD). Please adhere to the following instructions to ensure successful computer assembly.
- Ensure that all components are securely connected. Loose connections may cause the computer to not recognize a component or fail to start.
- Hold the motherboard by the edges to avoid touching sensitive components.
- It is recommended to wear an electrostatic discharge (ESD) wrist strap when handling the motherboard to prevent electrostatic damage. If an ESD wrist strap is not available, discharge yourself of static electricity by touching another metal object before handling the motherboard.
- Store the motherboard in an electrostatic shielding container or on an anti-static pad whenever the motherboard is not installed.
- Before turning on the computer, ensure that there are no loose screws or metal components on the motherboard or anywhere within the computer case.
- Do not boot the computer before installation is completed. This could cause permanent damage to the components as well as injury to the user.
- If you need help during any installation step, please consult a certified computer technician.
- Always turn off the power supply and unplug the power cord from the power outlet before installing or removing any computer component.
- Keep this user guide for future reference.
- Keep this motherboard away from humidity.
- Make sure that your electrical outlet provides the same voltage as is indicated on the PSU, before connecting the PSU to the electrical outlet.
- Place the power cord such a way that people can not step on it. Do not place anything over the power cord.
- All cautions and warnings on the motherboard should be noted.
- If any of the following situations arises, get the motherboard checked by service personnel:
 - Liquid has penetrated into the computer.
 - The motherboard has been exposed to moisture.
 - The motherboard does not work well or you can not get it work according to user guide.
 - The motherboard has been dropped and damaged.
 - The motherboard has obvious sign of breakage.
- Do not leave this motherboard in an environment above 60°C (140°F), it may damage the motherboard

Technical Support and Assistance

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

Conventions Used in this Manual



WARNING

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



CAUTION

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



NOTE

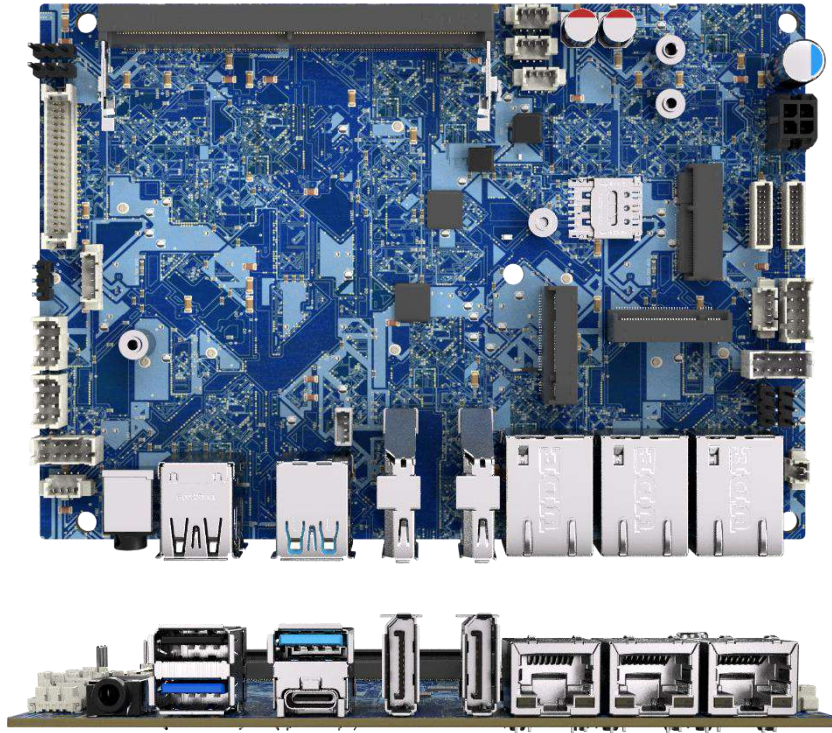
This indication provides additional information to complete a task easily.

Chapter 1

Product Introductions

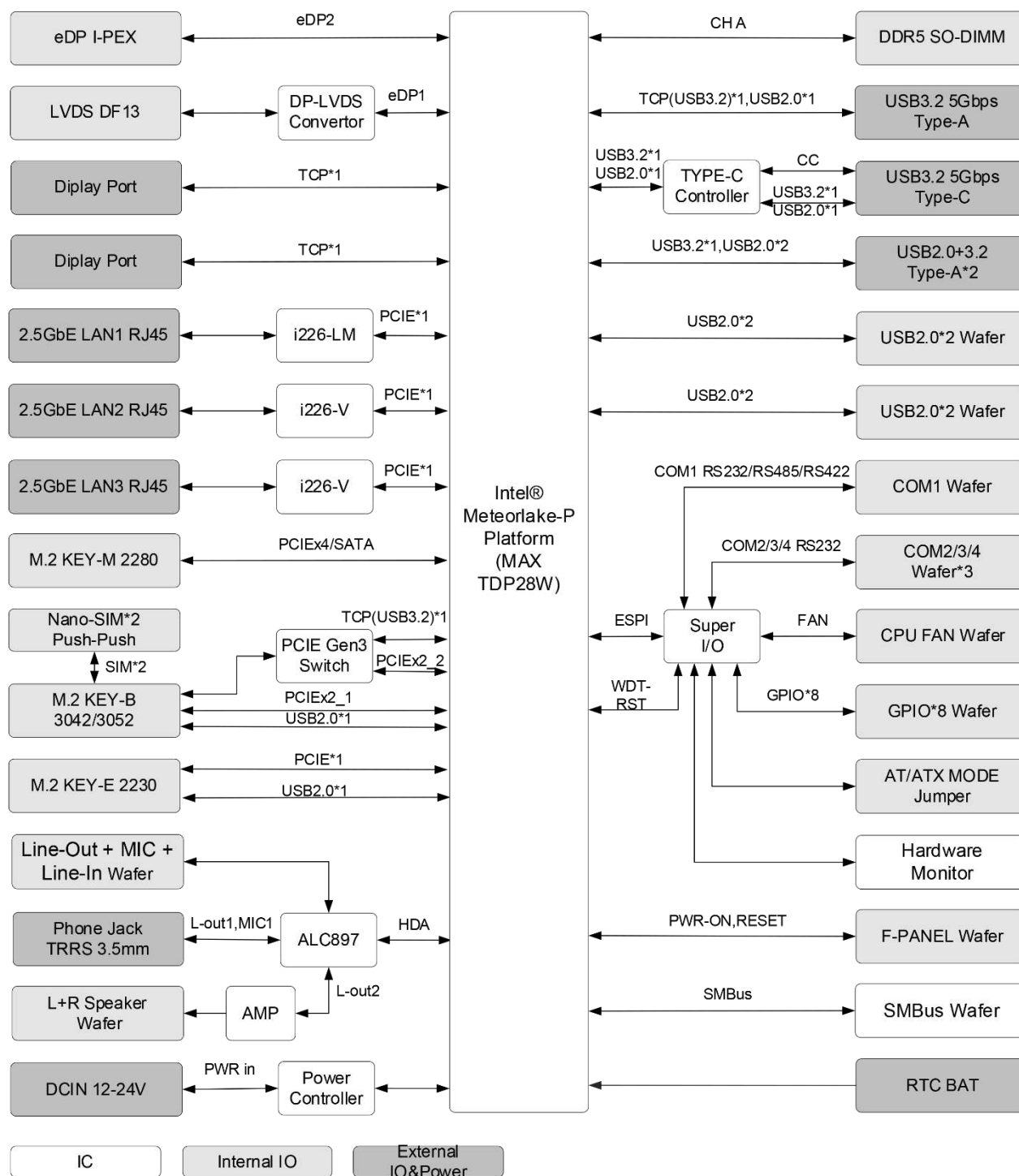
1.1 Product Description

3.5" SBC Industrial Motherboard With Intel® Core™ Ultra Processors, Meteor Lake-U/H



- Supports 14th Gen. Intel® Core™ Ultra Processors, Meteor Lake-U, TDP15W
- 1x 262-pin DDR5 5200 SO-DIMM. Max. up to 32GB
- 3x Intel® 2.5 GbE
- Quad simultaneous display: DP, LVDS, eDP
- 1x M.2 M Key for NVMe/ SATA, Auto detect
- 1x M.2 B Key for 4G/5G support, 1x M.2 E Key for Wifi/Bluetooth
- 2x SIM Nano Socket
- 1x USB Type-C, 1x USB 3.2 Gen 1, 2x USB 2.0
- 4x RS-232/422/485 (internal), 1x 8-bit GPIO
- Watchdog timer 1~255sec. system reset
- dTPM 2.0 Supported
- Wide Voltage DC IN 12~24V

1.2 Block Diagram



1.3 Specifications

System

Processor
Support 14th Gen. Intel® Core™ Ultra Processors

- Intel® Core™ Ultra 5 Processor 125U 12M Cache, up to 4.30 GHz (2+8+2 core)
- Intel® Core™ Ultra 7 Processor 155U 12M Cache, up to 4.80 GHz (2+8+2 core)

System
Chipset

SoC

LAN Chipset

- GbE1: Intel i226-LM 2.5GbE LAN PXE Support
- GbE2: Intel i226-V 2.5GbE LAN PXE Support
- GbE3: Intel i226-V 2.5GbE LAN PXE Support

Audio Codec

Realtek Audio HDA Codec

System
Memory

1x 262-Pin DDR5 5200MHz SO-DIMM. Max. up to 32GB (Non-ECC)

Watchdog

Software Programmable Supports 1~255 sec. System Reset

TPM

dTPM2.0, fTPM2.0

Display

Display Port

2x DP++ 1.4 up to 3040x2160 @60Hz

eDP

1x eDP 1.4b, max 3840x2160 @60Hz

LVDS

1x LVDS up to 1920x1200 @60Hz, dual channel

Multiple
Display

Quad simultaneous display

Storage

M.2

1x M.2 M Key (2280, PCIe x4 Gen 4/SATA) support for NVMe/SATA SSD, Auto Detect

Expansion

M.2

- 1 x M.2 B Key (3042/3052, PCIe x2+USB 3.0+USB 2.0) support for 4G/5G
- 1 x M.2 E Key (2230, PCIe+USB 2.0) for Wifi/Bluetooth

Rear I/O

Display Port	2x DisplayPort
LAN	3x RJ45
SIM	2x SIM Nano Socket
USB	1x USB 3.2 Type-C (5 Gbps) 2x USB 3.2 Gen 2 (5 Gbps) 1x USB 2.0

Internal I/O

COM	4x RS-232-/422/485(internal)
GPIO	1x GPIO 8-pin header (4 In/4 Out)
USB	4x USB 2.0 Internal 2.0PH Headers

Operating System

Windows	Microsoft® Windows® 10 Enterprise Windows 11 IoT Enterprise
Linux	Linux Ubuntu 22.04

Power

Power Adapter	Optional AC/DC 12V/5A, 60W
Power Mode	AT/ ATX
Power Supply Voltage	DC IN 12~24V
Power Connector	Micro fit pitch 3.0 2x2 pin
Power Protection	OVP (Over Voltage Protection) OCP (Over Current Protection) Reverse Protection

Environment

Form Factor	3.5" Embedded SBC
Operating Temperature	0°C to 60°C
Storage Temperature	-20°C to 75°C
Relative Humidity	10% to 95% (non-condensing)
Certification	CE, FCC Class A

Physical

Dimensions	146 mm x 102 mm
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1.4 Available Models

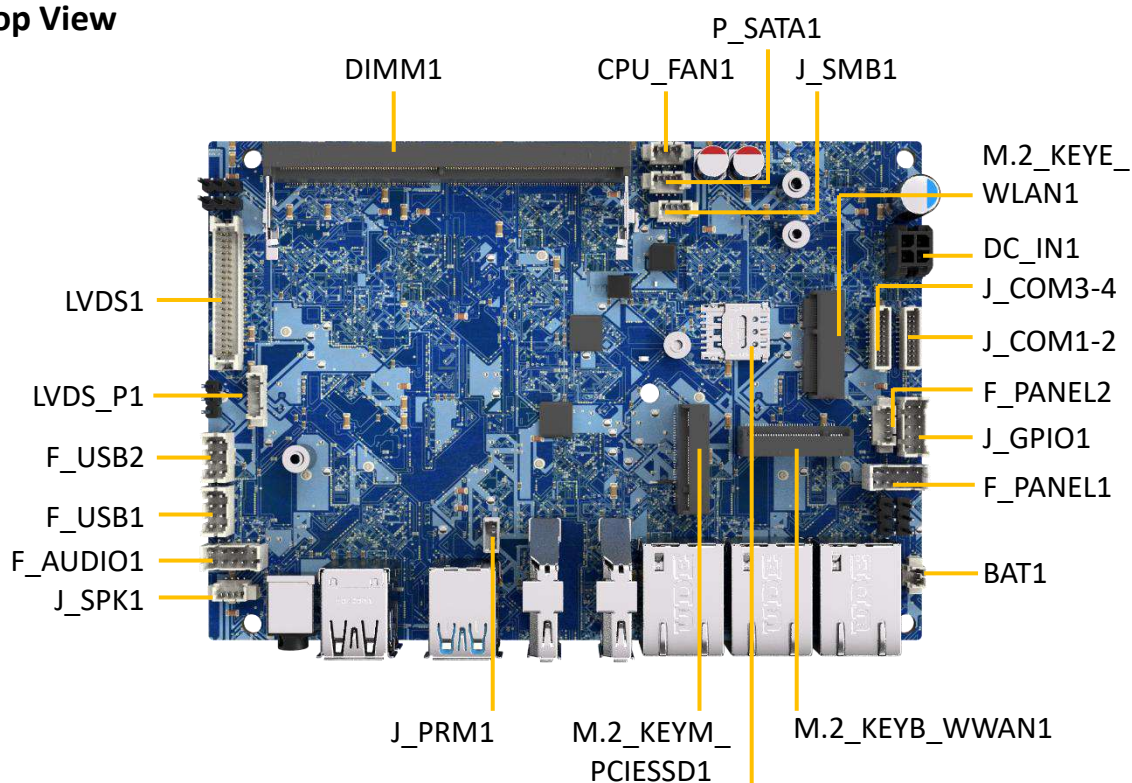
Ordering Information	DESCRIPTION
• CT-DML01	3.5" SBC Industrial Motherboard With Intel® Core™ Ultra Processors, Meteor Lake-U

Chapter 2

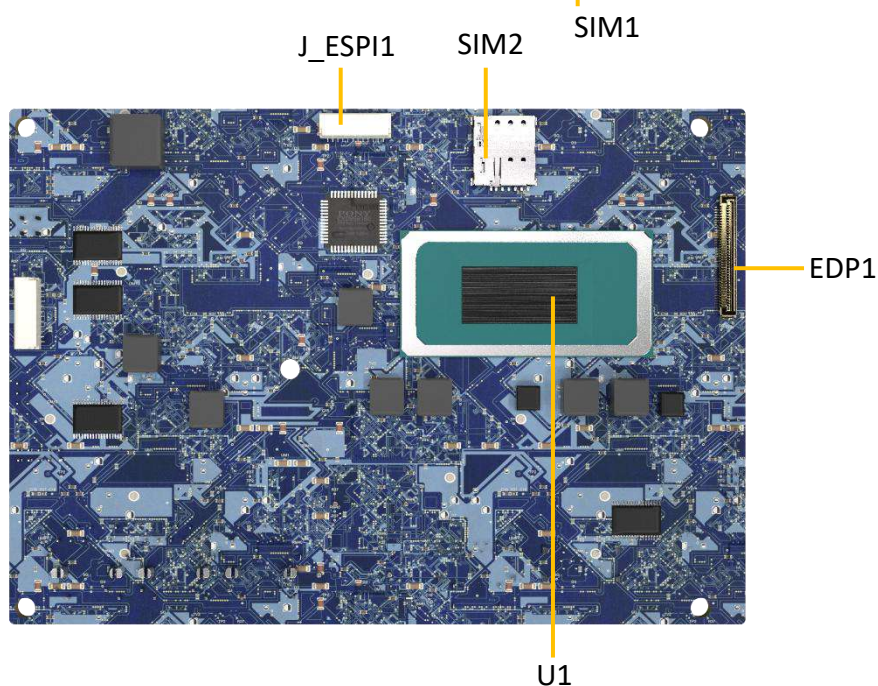
Switches and Connectors

2.1 Switch and Connector Locations

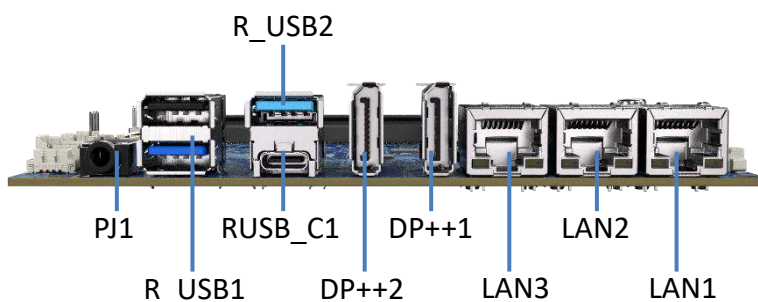
2.1.1 Top View



2.1.2 Bottom view



2.1.3 Rear I/O

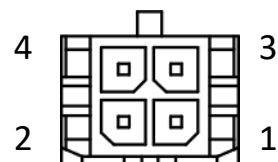
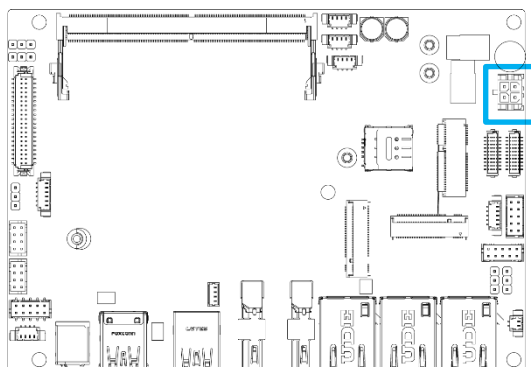


2.2 Connector / Switch Definition

Connector Location	Definition
U1	CPU
DIMM1	DDR5 SO-DIMM Slot
DC_IN1	DC 12-24V Power Input 4P Micro-Fit Connector
EDP1	eDP Signal I-PEX Connector
LVDS1	LVDS Signal DF13 Wafer
LVDS_P1	LVDS Backlight Control Wafer
DP++1	DP++ Upright Connector
DP++2	DP++ Upright Connector
PJ1	Line-Out + MIC 2in1 3.5mm Jack
F_AUDIO1	Front Audio Wafer (Line-Out + MIC + Line-In)
J_SPK1	Left+ Right Amplifier Wafer
M.2_KEYM_PCIESSD1	M.2 M-KEY Slot1 (PCIe x4/SATA, Auto Detect, 2280)
M.2_KEYB_WWAN1	M.2 B-KEY Slot1 (PCIe x2/USB3.0+USB2.0, 3042/3052)
M.2_KEYE_WLAN1	M.2 E-KEY Slot1 (PCIe+USB2.0, 2230)
SIM1	Nano SIM Card Slot1
SIM2	Nano SIM Card Slot2
LAN1	2.5GbE LAN RJ45 Connector1
LAN2	2.5GbE LAN RJ45 Connector2
LAN3	2.5GbE LAN RJ45 Connector3
R_USB1	Dual USB3.0+USB2.0 TYPE-A Connector
R_USB2	USB3.0 TYPE-A Connector
RUSB_C1	USB3.0 TYPE-C Connector
F_USB1	Front Dual USB2.0 Wafer
F_USB2	Front Dual USB2.0 Wafer
J_COM1-2	COM1+COM2 Wafer
J_COM3-4	COM3+COM4 Wafer
J_GPIO1	GPIO Wafer
F_PANEL1	Front Panel Wafer1
F_PANEL2	Front Panel Wafer2
J_ESPI1	ESPI Debug Wafer
CPU_FAN1	CPU FAN Wafer

2.3 Definition of Connectors

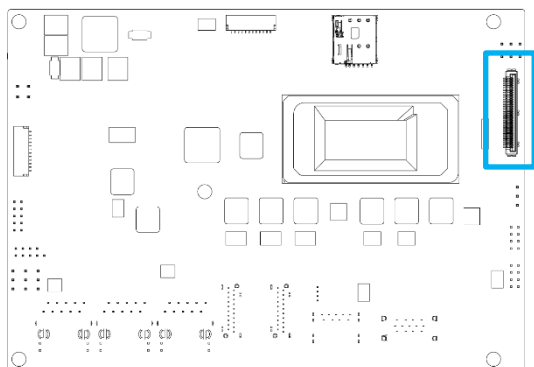
2.3.1 DC 12-24V Power Input 4P Micro-Fit Connector



DC_IN1

Pin	Definition	Pin	Definition
1	GND	2	GND
3	DC_IN	4	DC_IN

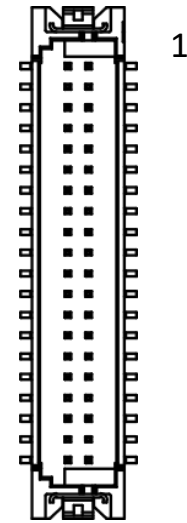
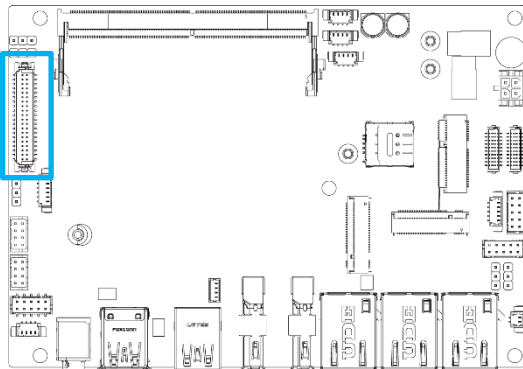
2.3.2 eDP Signal I-PEX Connector



EDP1

Pin	Definition	Pin	Definition
1	VCC3.3/VCC5 ^[1]	21	EDP2_TX1+
2	VCC3.3/VCC5 ^[1]	22	GND
3	VCC3.3/VCC5 ^[1]	23	EDP2_TX0-
4	VCC3.3/VCC5 ^[1]	24	EDP2_TX0+
5	VCC3.3/VCC5 ^[1]	25	GND
6	VCC3.3	26	EDP2_AUX+
7	SMB_SCL	27	EDP2_AUX-
8	SMB_SDA	28	GND
9	GND	29	VCC3.3
10	EDP_HPD	30	GND
11	N/C	31	VCC12
12	N/C	32	GND
13	GND	33	GND
14	EDP2_TX3-	34	VCC5
15	EDP2_TX3+	35	GND
16	GND	36	EPD2_BKLT_CTL
17	EDP2_TX2-	37	EPD2_BKL_EN
18	EDP2_TX2+	38	VCC12
19	GND	39	VCC3.3
20	EDP2_TX1-	40	GND

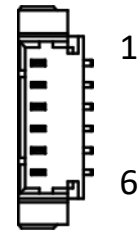
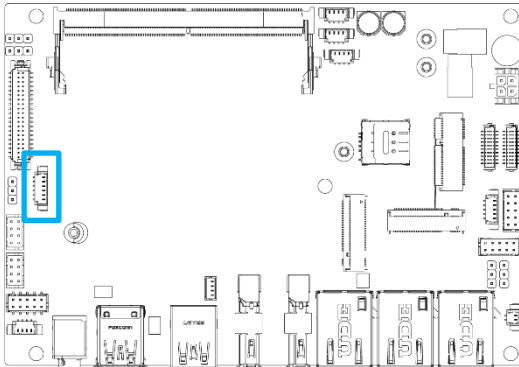
2.3.3 LVDS Signal DF13 Wafer



LVDS1

Pin	Definition	Pin	Definition
1	VCC12	2	VCC12
3	VCC3.3/VCC5 ^[1]	4	VCC12
5	VCC3.3/VCC5 ^[1]	6	VCC3.3/VCC5 ^[1]
7	LVDS_SPC	8	LVDS_SPD
9	LVDS_BKLT_CTL	10	LVDS_BKL_EN
11	VCC3.3	12	LVDS_DET
13	LVDS_A_DATA1+	14	LVDS_A_DATA0+
15	LVDS_A_DATA1-	16	LVDS_A_DATA0-
17	GND	18	GND
19	LVDS_A_DATA3+	20	LVDS_A_DATA2+
21	LVDS_A_DATA3-	22	LVDS_A_DATA2-
23	GND	24	GND
25	LVDS_B_DATA1+	26	LVDS_B_DATA0+
27	LVDS_B_DATA1-	28	LVDS_B_DATA0-
29	GND	30	GND
31	LVDS_B_DATA3+	32	LVDS_B_DATA2+
33	LVDS_B_DATA3-	34	LVDS_B_DATA2-
35	GND	36	GND
37	LVDS_A_CLK+	38	LVDS_B_CLK+
39	LVDS_A_CLK-	40	LVDS_B_CLK-

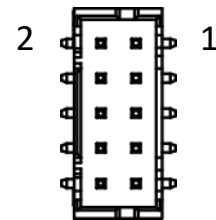
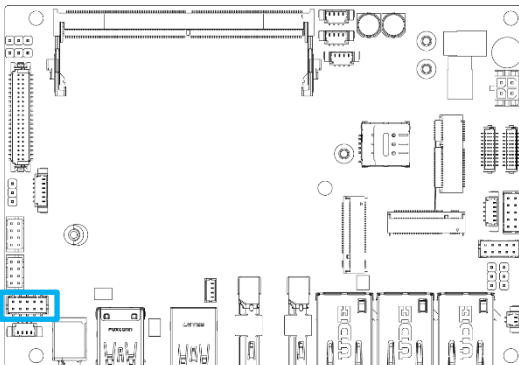
2.3.4 LVDS Backlight Control Wafer



LVDS_P1

Pin	Definition	Pin	Definition
1	VCC5/VCC12 ^[1]	4	LVDS_BKLT_CTL
2	VCC5/VCC12 ^[1]	5	GND
3	LVDS_BKL_EN	6	GND

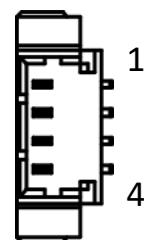
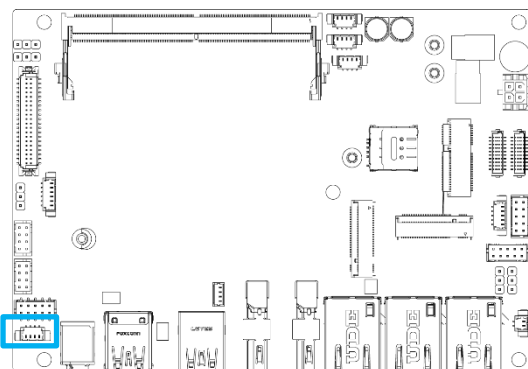
2.3.5 Front Audio Wafer (Line-Out + MIC + Line-In)



F_AUDIO1

Pin	Definition	Pin	Definition
1	LINE_IN_R	2	MIC_IN2_R
3	LINE_IN_L	4	MIC_IN2_L
5	LINE_OUT_R	6	MIC2_JD
7	LINE_OUT_L	8	LINE_JD
9	LINE2_JD	10	GND_AUD

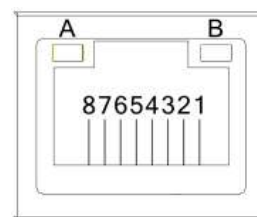
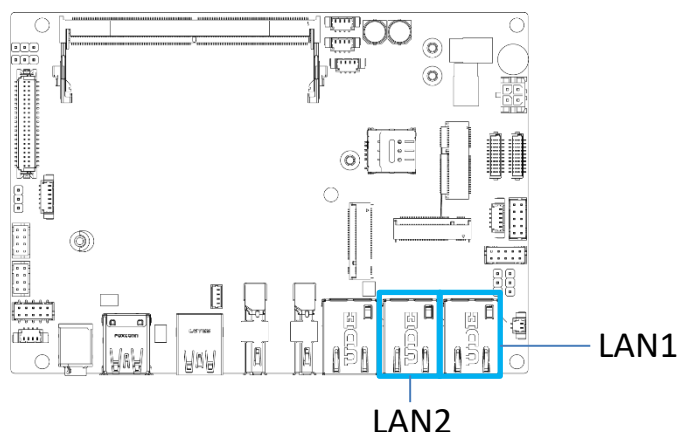
2.3.6 Left+ Right Amplifier Wafer



J_SPK1

Pin	Definition	Pin	Definition
1	LINE_IN_R	2	MIC_IN2_R
3	LINE_IN_L	4	MIC_IN2_L

2.3.7 2.5GbE LAN RJ45 Connector1



LAN1

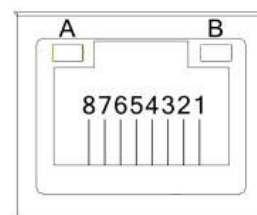
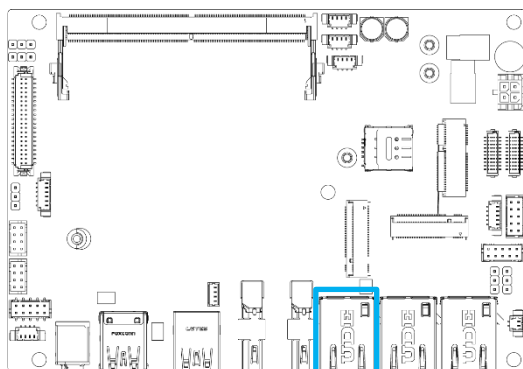
Pin	Definition		Pin	Definition	
1	MDI0+		4	MDI2-	
2	MDI0-		5	MDI1-	
3	MDI1+		7	MDI3+	
4	MDI2+		8	MDI3-	
A	Active LED	ACT: Twinkling Yellow	B	Speed LED	1000M: Turn Orange
		Only LINK: Lights On			1000M: Turn Green
		Only LINK: Lights Off			10M: Lights Off

2.3.8 2.5GbE LAN RJ45 Connector2

LAN2

Pin	Definition		Pin	Definition	
1	MDI0+		4	MDI2-	
2	MDI0-		5	MDI1-	
3	MDI1+		7	MDI3+	
4	MDI2+		8	MDI3-	
A	Active LED	ACT: Twinkling Yellow	B	Speed LED	1000M: Turn Orange
		Only LINK: Lights On			1000M: Turn Green
		Only LINK: Lights Off			10M: Lights Off

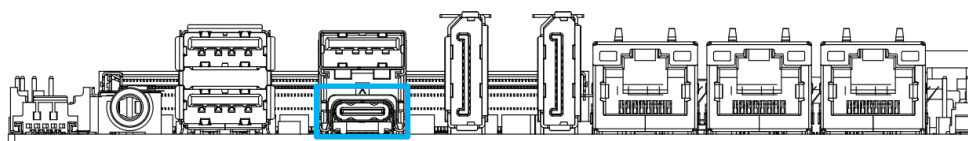
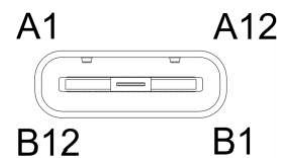
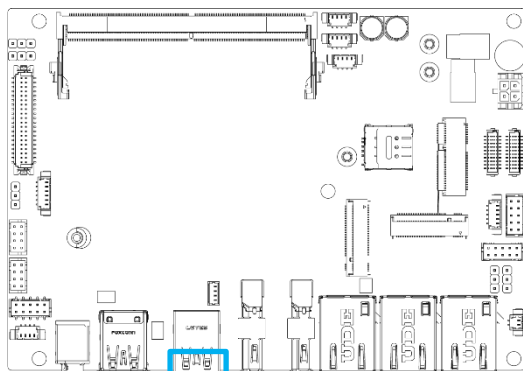
2.3.9 2.5GbE LAN RJ45 Connector3



LAN3

Pin	Definition		Pin	Definition	
1	MDI0+		4	MDI2-	
2	MDI0-		5	MDI1-	
3	MDI1+		7	MDI3+	
4	MDI2+		8	MDI3-	
A	Active LED	ACT: Twinkling Yellow	B	Speed LED	1000M: Turn Orange
		Only LINK: Lights On			1000M: Turn Green
		Only LINK: Lights Off			10M: Lights Off

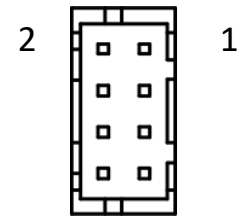
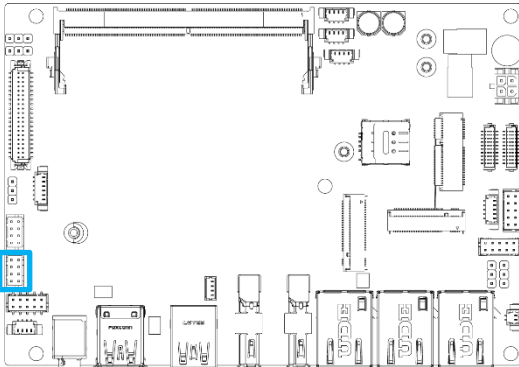
2.3.10 USB3.0 TYPE-C Connector



RUSB_C1

Pin	Definition	Pin	Definition
A1	GND	B1	GND
A2	SS_C1_TX1+	B2	SS_C1_TX2+
A3	SS_C1_TX1-	B3	SS_C1_TX2+
A4	VBUS	B4	VBUS
A5	C1_CC1	B5	C1_CC2
A6	USB2.0+	B6	USB2.0+
A7	USB2.0-	B7	USB2.0-
A8	N/C	B8	N/C
A9	VBUS	B9	VBUS
A10	SS_C1_RX2+	B10	SS_C1_RX1+
A11	SS_C1_RX2-	B11	SS_C1_RX1-
A12	GND	B12	GND

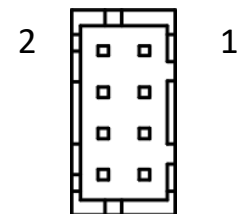
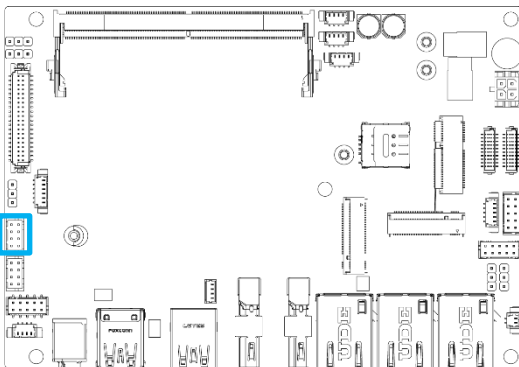
2.3.11 Front Dual USB2.0 Wafer



F_USB1

Pin	Definition	Pin	Definition
1	GND	2	VCC5
3	USB2.0_1+	4	USB2.0_2-
5	USB2.0_1-	6	USB2.0_2+
7	VCC5	8	GND

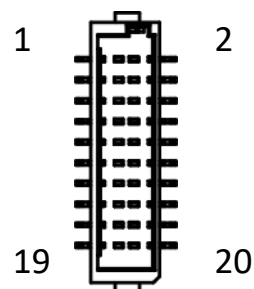
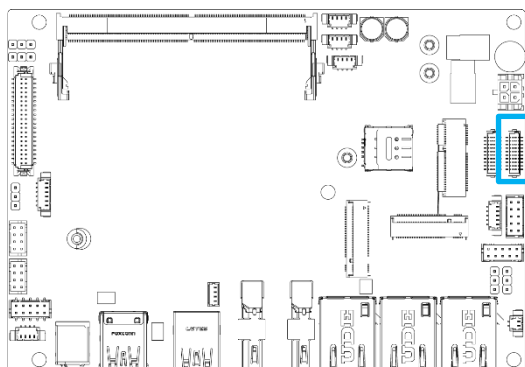
2.3.12 Front Dual USB2.0 Wafer



F_USB2

Pin	Definition	Pin	Definition
1	GND	2	VCC5
3	USB2.0_1+	4	USB2.0_2-
5	USB2.0_1-	6	USB2.0_2+
7	VCC5	8	GND

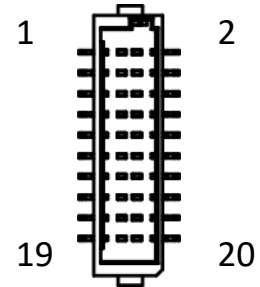
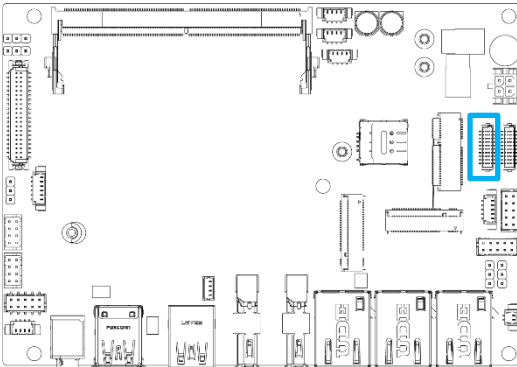
2.3.13 COM1+COM2 Wafer



J_COM1-2

Pin	Definition	Pin	Definition
1	COM1_RS232_DCD/ COM1_RS422_TXD-/ COM1_RS485_TXD-	2	COM2_RS232_DCD/ COM2_RS422_TXD-/ COM2_RS485_TXD-
3	COM1_RS232_RXD/ COM1_RS422_TXD+/ COM1_RS485_TXD+	4	COM2_RS232_RXD/ COM2_RS422_TXD+/ COM2_RS485_TXD+
5	COM1_RS232_TXD/ COM1_RS422_RXD+	6	COM2_RS232_TXD/ COM1_RS422_RXD+
7	COM1_RS232_DTR/ COM1_RS422_RXD+	8	COM2_RS232_DTR/ COM2_RS422_RXD-
9	GND	10	GND
11	COM1_RS232_DSR	12	COM2_RS232_DSR
13	COM1_RS232_RTS	14	COM2_RS232_RTS
15	COM1_RS232_CTS	16	COM2_RS232_CTS
17	COM1_RS232_RI	18	COM2_RS232_RI
19	N/C	20	N/C

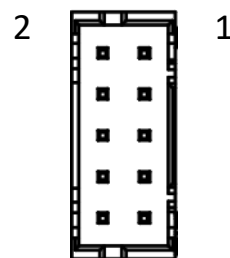
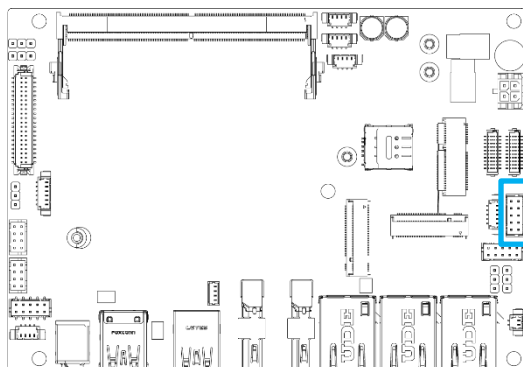
2.3.14 COM3+COM4 Wafer



J_COM3-4

Pin	Definition	Pin	Definition
1	COM3_RS232_DCD	2	COM4_RS232_DCD
3	COM3_RS232_RXD	4	COM4_RS232_RXD
5	COM3_RS232_TXD	6	COM4_RS232_TXD
7	COM3_RS232_DTR	8	COM4_RS232_DTR
9	GND	10	GND
11	COM3_RS232_DSR	12	COM4_RS232_DSR
13	COM3_RS232_RTS	14	COM4_RS232_RTS
15	COM3_RS232_CTS	16	COM4_RS232_CTS
17	COM3_RS232_RI	18	COM4_RS232_RI
19	N/C	20	N/C

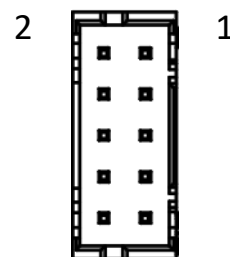
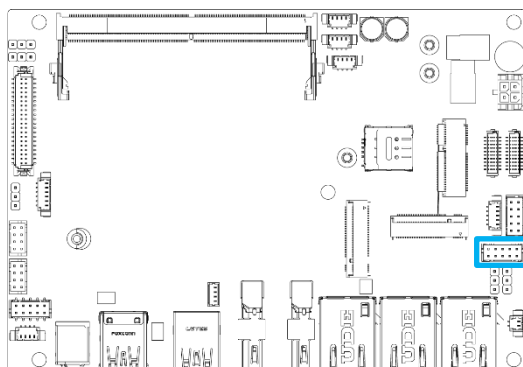
2.3.15 GPIO Wafer



J_GPIO1

Pin	Definition	Pin	Definition
1	SIO_GPO77 (0xA06 Bit7,H ^[1])	2	SIO_GPO77 (0xA06 Bit3,H ^[1])
3	SIO_GPO77 (0xA06 Bit6,H ^[1])	4	SIO_GPO77 (0xA06 Bit2,H ^[1])
5	SIO_GPO77 (0xA06 Bit5,H ^[1])	6	SIO_GPO77 (0xA06 Bit1,H ^[1])
7	SIO_GPO77 (0xA06 Bit4,H ^[1])	8	SIO_GPO77 (0xA06 Bit0,H ^[1])
9	GND	10	VCC5 ^[2]

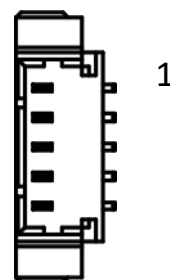
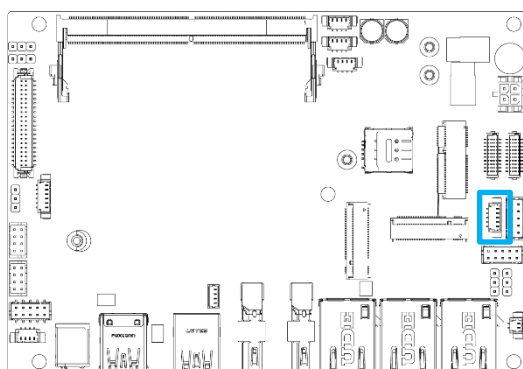
2.3.16 Front Panel Wafer1



F_PANEL1

Pin	Definition	Pin	Definition
1	N/C		
3	Reset+	4	Power On-
5	GND	6	Power On+
7	HDD LED-	8	Sus LED
9	HDD LED+	10	Power LED

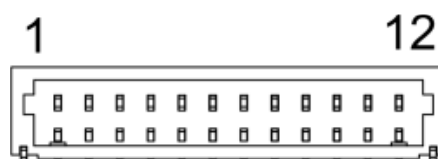
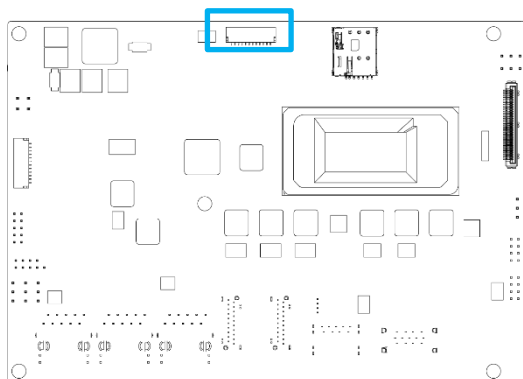
2.3.17 Front Panel Wafer2



F_PANEL2

Pin	Definition	Pin	Definition
1	VCC5A	2	Power On_N
3	GND	4	VCC3.3S
5	Reset_N		

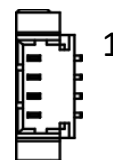
2.3.18 ESPI Debug Wafer



J_ESPI1

Pin	Definition	Pin	Definition
1	ESPI_IO0_SIO	7	ESPI_ALERT0-
2	ESPI_IO1_SIO	8	PLTRST-
3	ESPI_IO2_SIO	9	VCC3.3A
4	ESPI_IO3_SIO	10	VCC3.3S
5	ESPI_CS0-	11	GND
6	ESPI_CLK_SIO-	12	GND

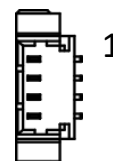
2.3.19 CPU FAN Wafer



CPU_FAN1

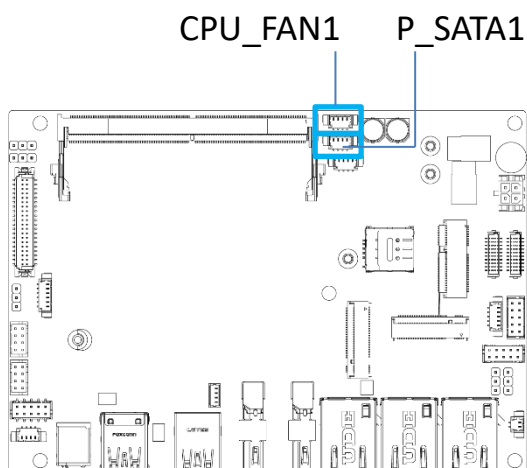
Pin	Definition	Pin	Definition
1	GND	3	FAN Speed Detection
2	VCC12	4	FAN Speed Control

2.3.20 SATA Power Wafer

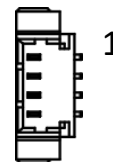
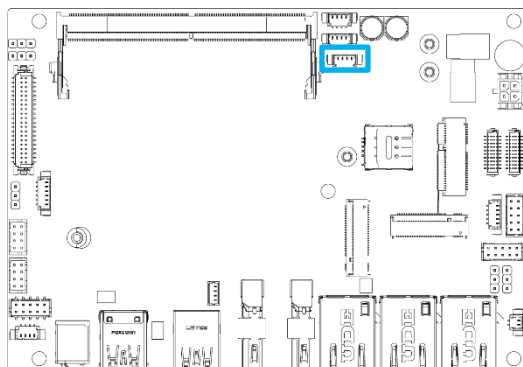


P_SATA1

Pin	Definition	Pin	Definition
1	VCC5S	3	GND
2	VCC5S	4	GND



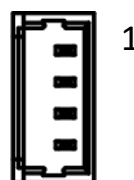
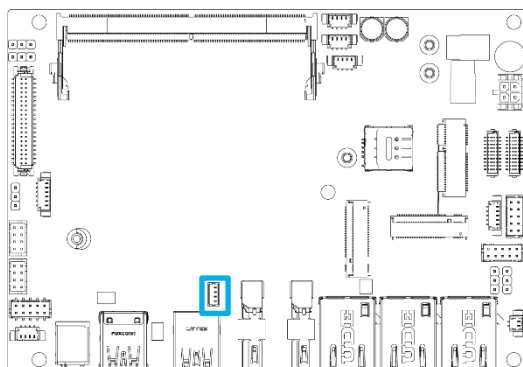
2.3.21 SMBus Wafer



J_SMB1

Pin	Definition	Pin	Definition
1	VCC5	3	SMB_SDA
2	SMB_SCL	4	GND

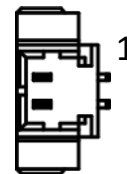
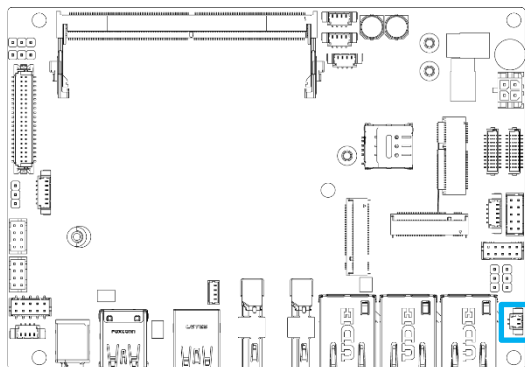
2.3.22 Power Debug Wafer



J_PRM1

Pin	Definition	Pin	Definition
1	GND	3	MPS_SCL
2	N/C	4	MPS_SDA

2.3.23 CMOS Battery Wafer



BAT1

Pin	Definition	Pin	Definition
1	VCC_BAT	2	GND

Chapter 3

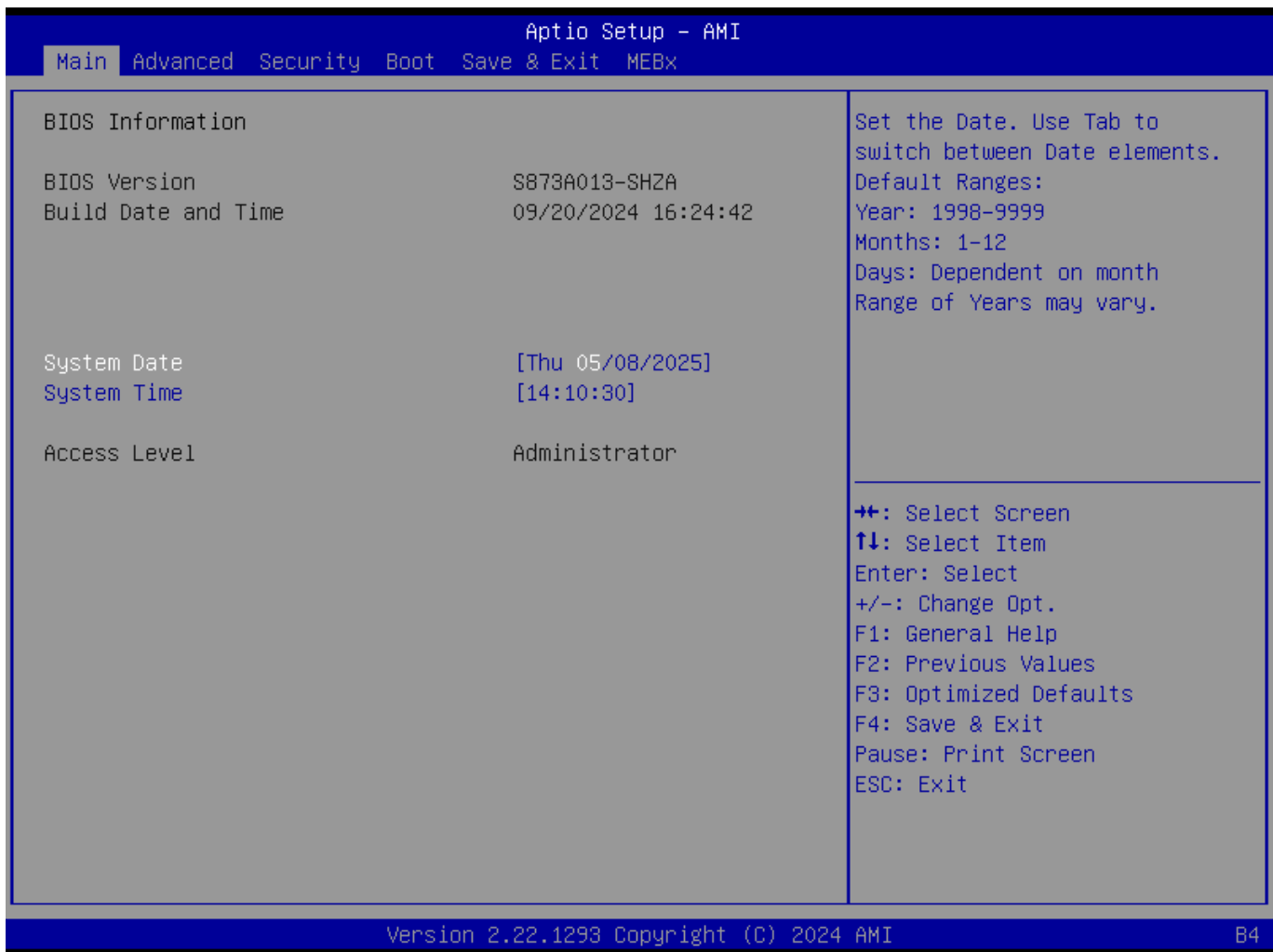
System BIOS

3.1 Description of the BIOS Options



Due to the differences in the specific model of the motherboard and the update of the BIOS version, there may be a few menus that do not match this manual, please take the actual basis.

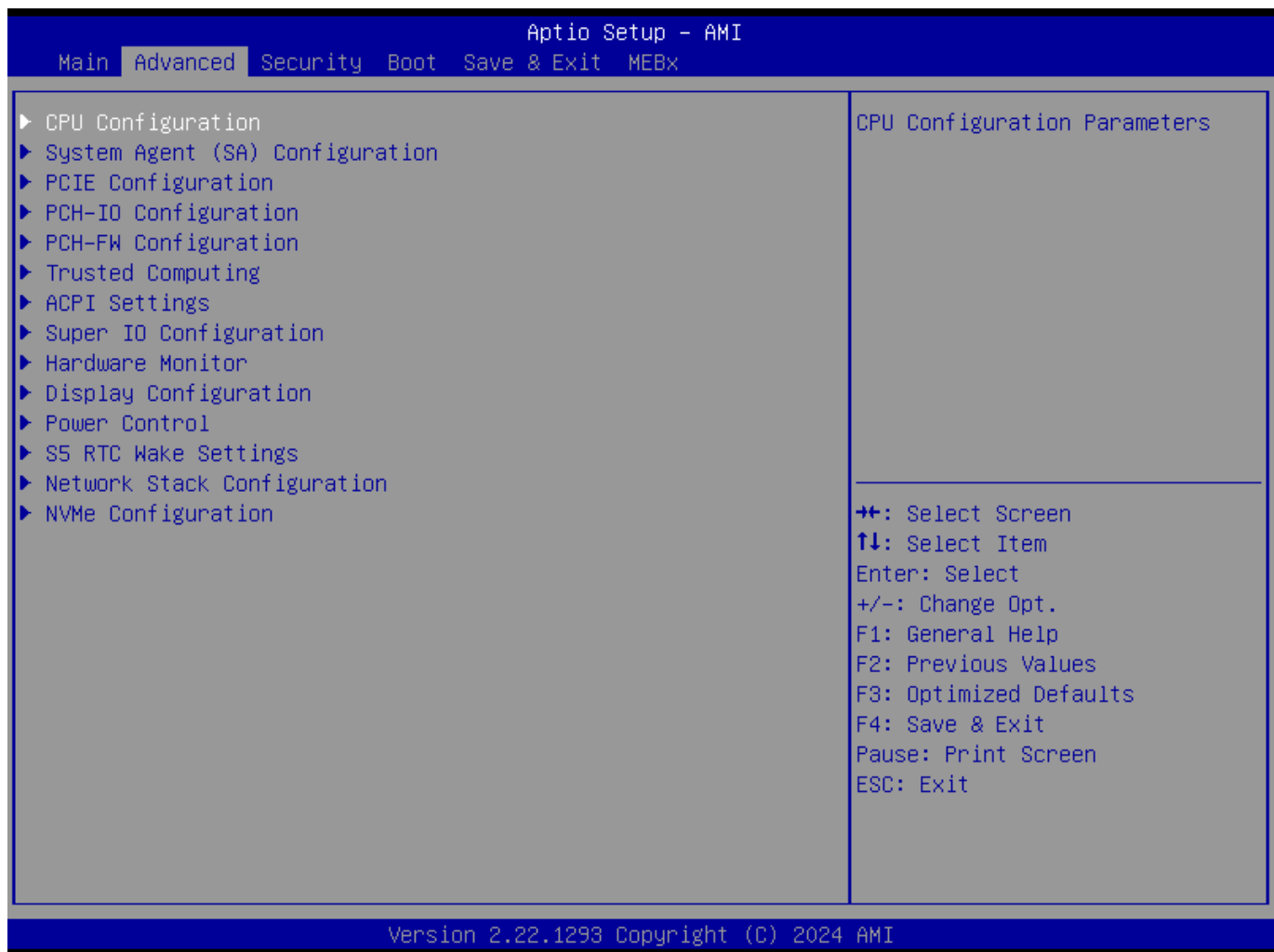
3.1.1 Main



This menu contains the following information:

- BIOS Version
Display the BIOS version information.
- Build Date and Time
Display the BIOS Build date and time.
- System Date
Set the date. Use Tab to switch between date elements. Default ranges: Year: 1998-9999
Months: 1-12
Days: Dependent on month
Range of Years may vary.
- System Time
Set the time. Use Tab to switch between time elements.
- Access Level
Display the current access level to BIOS Setup Utility.

3.2 Advanced



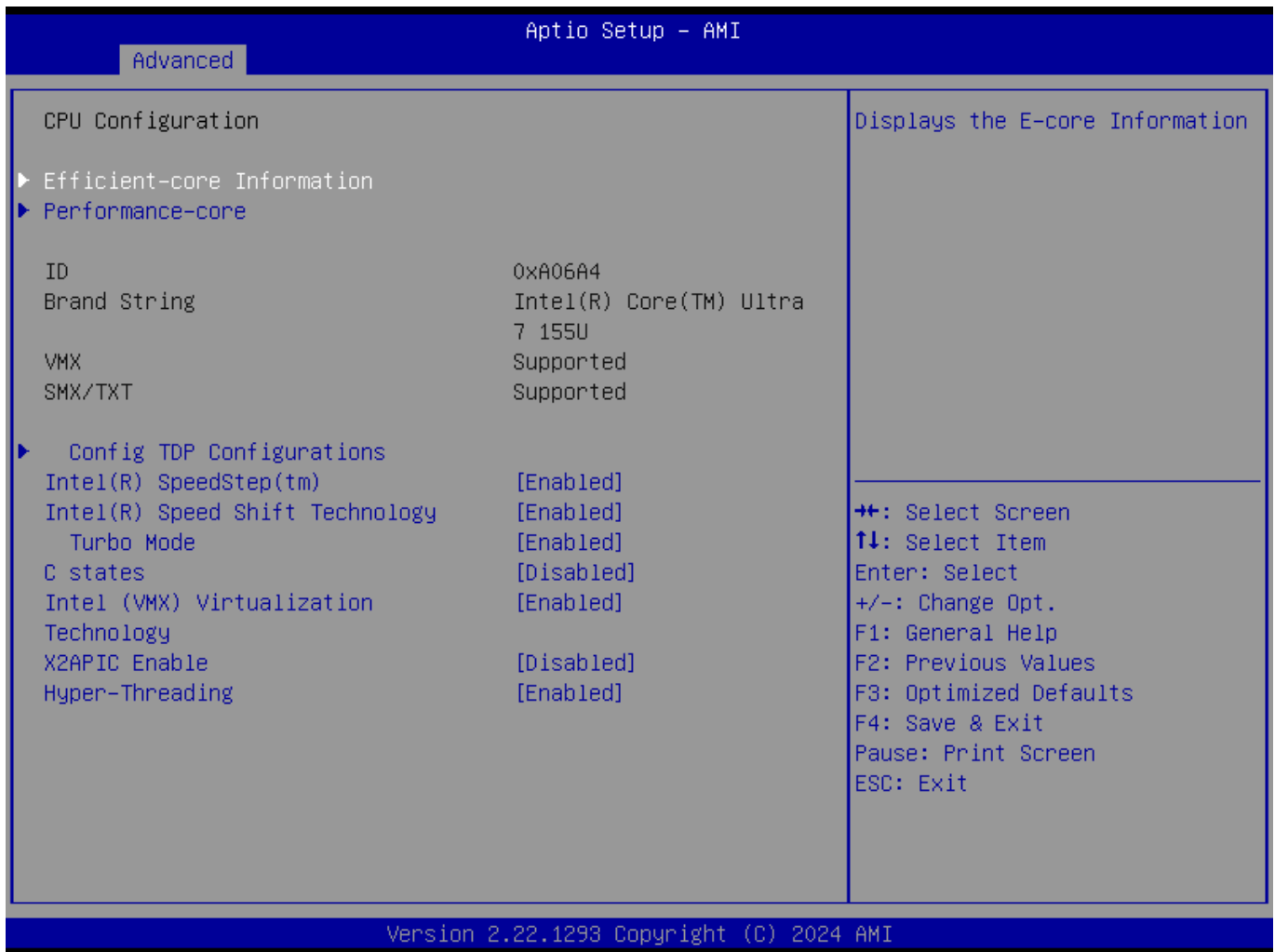
This menu contains the following information:

- CPU Configuration
CPU Configuration Parameters.
- System Agent (SA) Configuration
System Agent (SA) Parameters.
- PCIE Configuration
PCIE Parameters.
- PCH-IO Configuration
PCH Parameters.
- PCH-FW Configuration
Configure Management Engine Technology Parameters.
- Trusted Computing
Trusted Computing Settings.
- ACPI Settings
System ACPI Parameters.
- Super IO Configuration
System Super IO Chip Parameters.
- Hardware Monitor Monitor
hardware status.
- Display Configuration
Display Configuration Parameters.
- Power Control
- S5 RTC Wake Settings

Enable system to wake from S5 using RTC alarm.

- Network Stack Configuration
Network Stack Settings.
- NVMe Configuration
NVMe Device Options Settings.

3.2.1 CPU Configuration

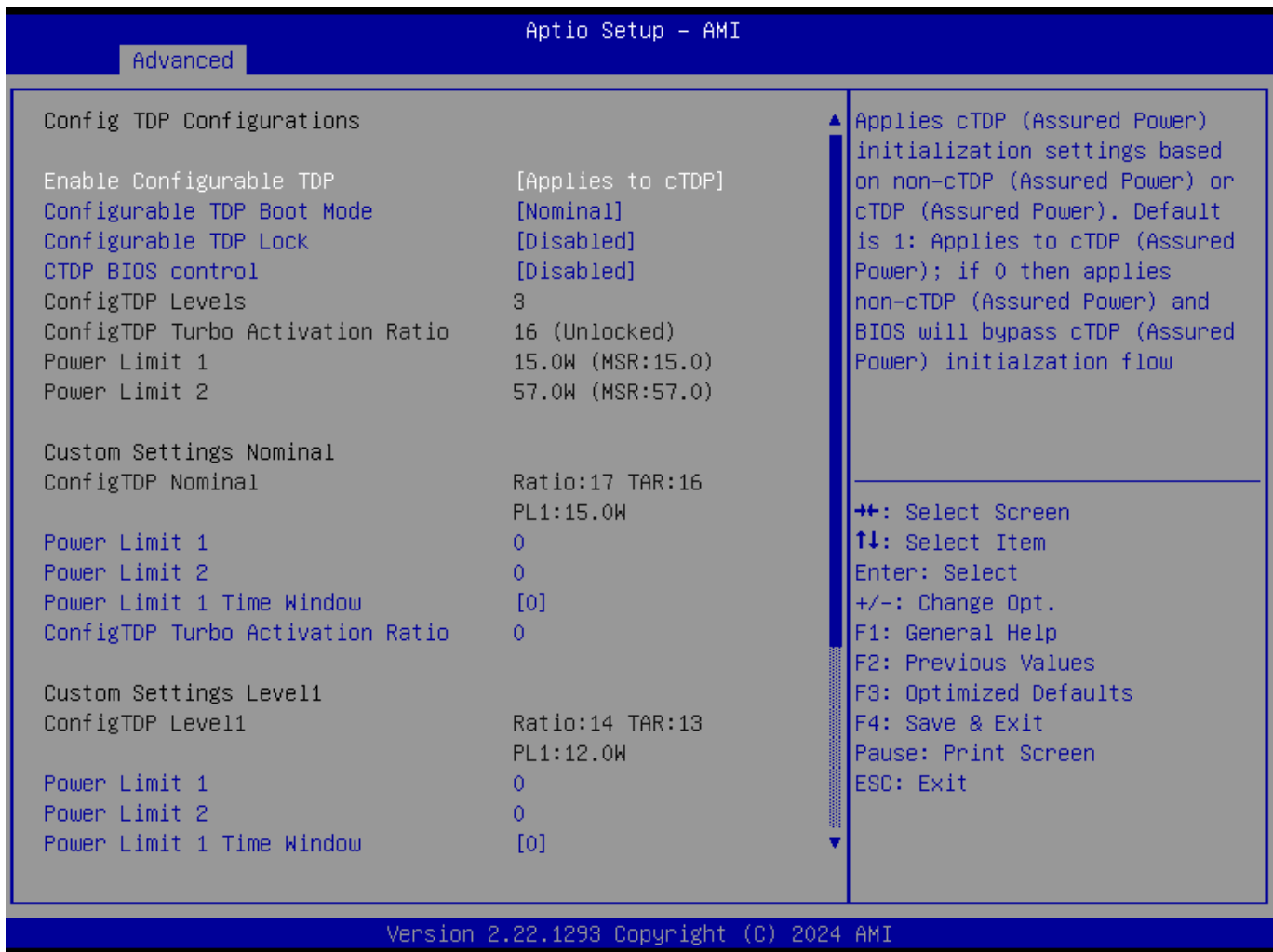


This menu contains the following information:

- Efficient-core Information Displays the E-core Information.
- Performance-core Displays the P-core Information.
- ID Display the Processor ID.
- Brand String Display the Brand String.
- VMX VMX (Virtual-Machine Extensions) supported or not.
- SMX/TXT SMX (Safer Mode Extensions) /TXT (Trusted Execution Technology) Supported or not.
- Config TDP Configurations cTDP (Assured Power) Configurations.
- Intel(R) Speed Step(tm) Allows more than two frequency ranges to be supported.
- Intel(R) Speed Shift Technology Enable or Disable Intel(R) Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states.

- Turbo Mode
Enable or Disable processor Turbo Mode.
- C states
Enable or Disable CPU Power Management. Allows CPU to go to C states when it's not 100% utilized.
- Intel (VMX) Virtualization Technology
When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.
- X2APIC Enable
Enable or Disable X2APIC Operating Mode.
When this option is configured as 'Enabled', 'VT-d' option must be 'Enabled' and 'X2APIC Opt Out' option must be 'Disabled' as well.
This option will be grayed out when 'VT-d' option is configured as 'Disabled'.
- Hyper-Threading
Enable or Disable Hyper-Threading Technology.

3.2.1.1 Config TDP Configurations



This menu contains the following information:

- **Enable Configurable TDP**
Applies cTDP (Assured Power) initialization settings based on non-cTDP (Assured Power) or cTDP (Assured Power). Default is 1: Applies to cTDP (Assured Power); if 0 then applies non-cTDP (Assured Power) and BIOS will bypass cTDP (Assured Power) initialization flow.
- **Configurable TDP Boot Mode**
cTDP (Assured Power) Mode as Nominal/Level1/Level2/Deactivate TDP (Base Power) selection. Deactivate option will set MSR to Nominal and MMIO to Zero.
- **Configurable TDP Lock**
cTDP (Assured Power) Mode Lock sets the Lock bits on TURBO_ACTIVATION_RATIO and CONFIG_TDP_CONTROL.
Note: When CTD P (Assured Power) Lock is enabled Custom ConfigTDP Count will be forced to 1 and Custom ConfigTDP Boot Index will be forced to 0.
- **CTDP BIOS control**
Enables cTDP (Assured Power) control via runtime ACPI BIOS methods. This 'BIOS only' feature does not require EC or driver support.

Custom Settings Nominal/Level1/Level2

- **ConfigTDP Nominal/Level1/Level2**

The options are as follows:

Power Limit 1: Power Limit 1 in Milli Watts. BIOS will round to the nearest 1/8W when programming. 0 = no custom override. For 12.50W, enter 12500. Overclocking SKU: Value must be between Max

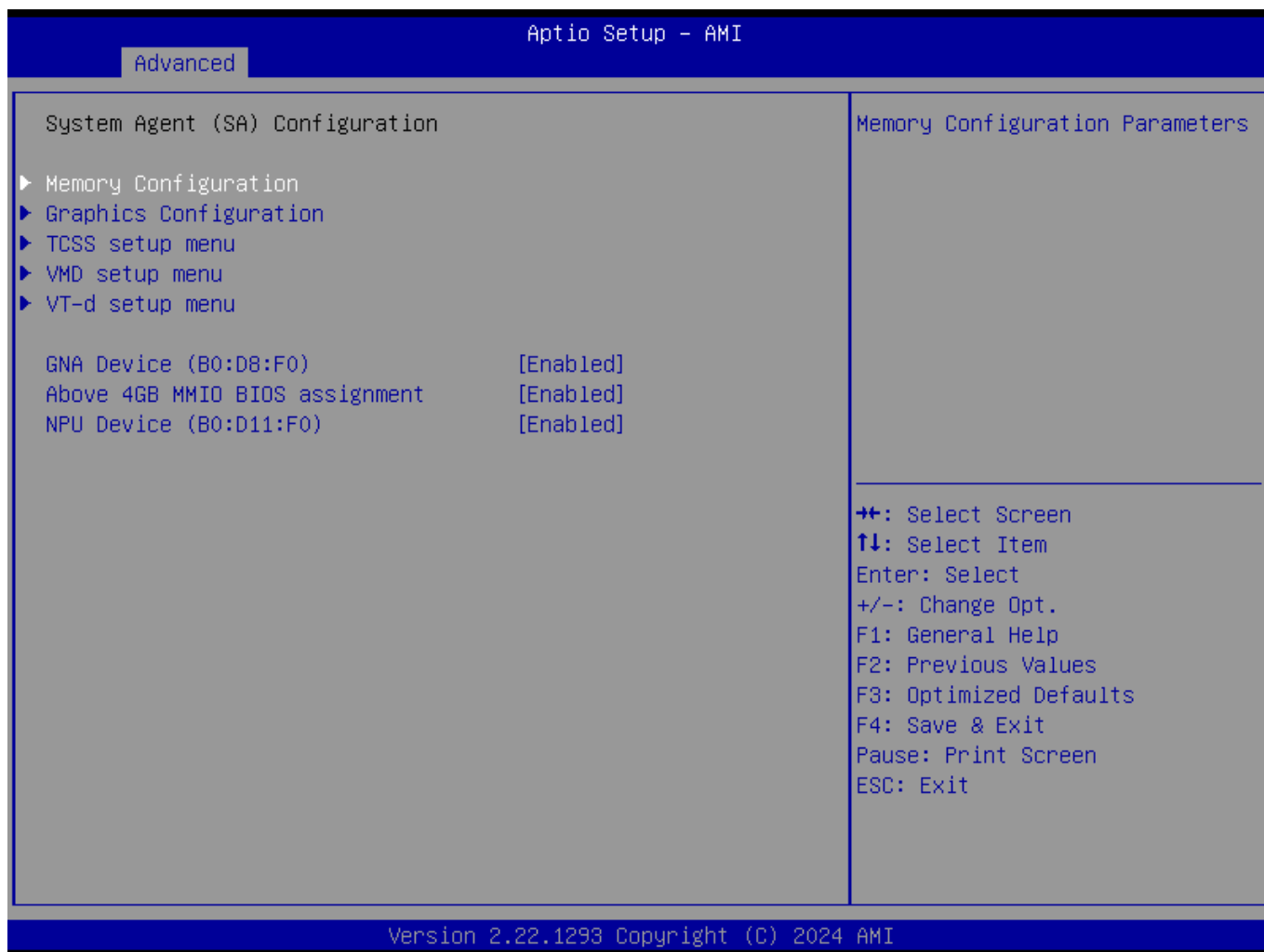
and Min Power Limit and Processor Base Power (TDP) Limit.

Power Limit 2: Power Limit 2 value in Milli Watts. BIOS will round to the nearest 1/8W when programming. 0 = no custom override. For 12.50W, enter 12500. Processor applies control policies such that the package power does not exceed this limit.

Power Limit 1 Time Window: Power Limit 1 Time Window value in seconds. The value may vary from 0 to 128. 0 = default value (28 sec for Mobile and 8 sec for Desktop). Defines time window which Processor Base Power (TDP) value should be maintained.

ConfigTDP Turbo Activation Ratio: Custom value for Turbo Activation Ratio. Needs to be configured with valid values from LFM to Max Turbo. 0 means don't use custom value.

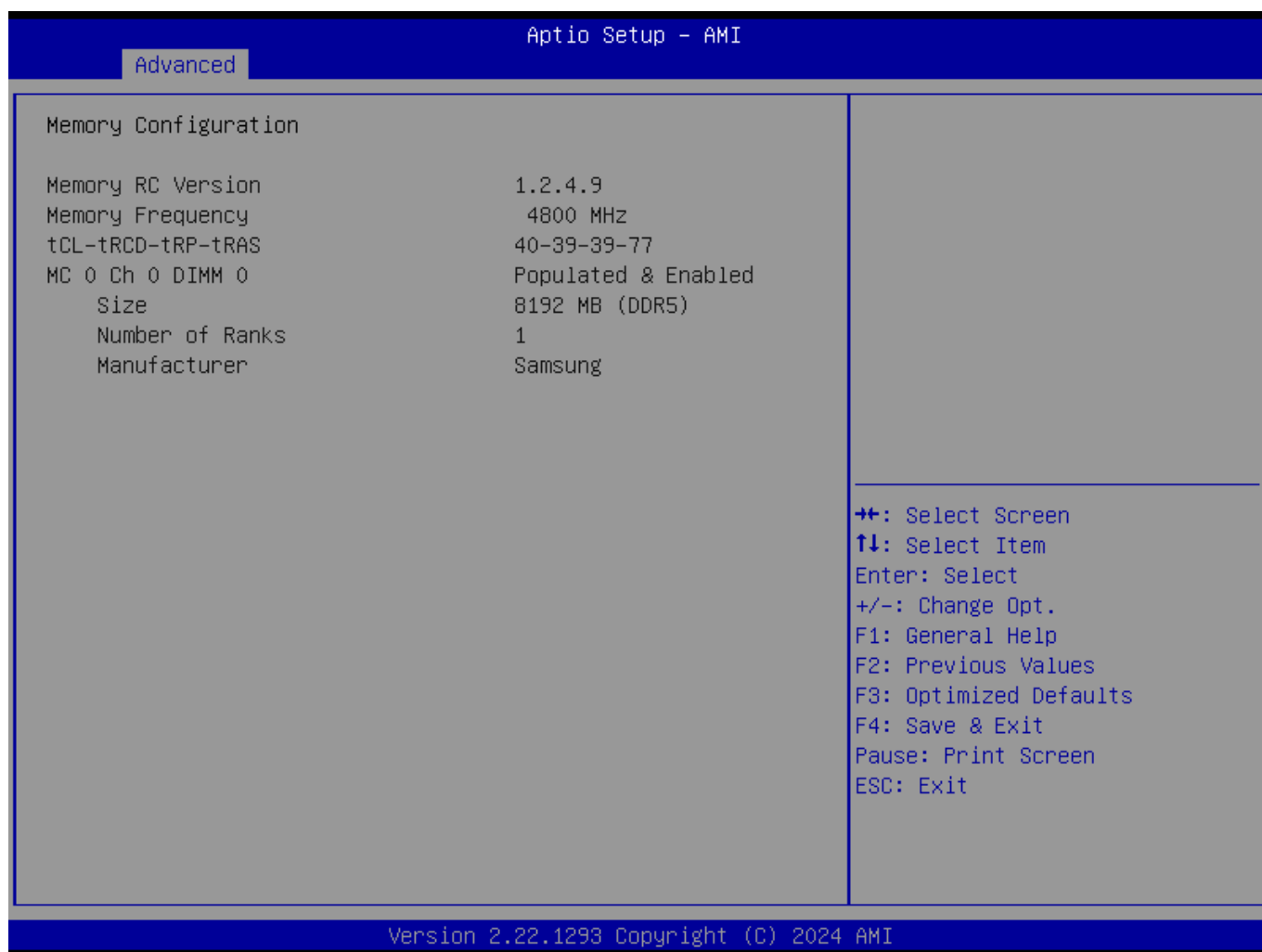
3.2.2 System Agent (SA) Configuration



This menu contains the following information:

- Memory Configuration
Memory Configuration Parameters.
- Graphics Configuration
Graphics Configuration.
- TCSS setup menu
TCSS Configuration settings.
- VMD setup menu
VMD Configuration settings.
- VT-d setup menu
VT-d Configuration settings.
- GNA Device (B0:D8:F0)
Enable or Disable SA GNA Device.
- Above 4GB MMIO BIOS assignment
Enable or Disable above 4GB Memory Mapped IO BIOS assignment. This is enabled automatically when Aperture Size is set to 2048MB.
- NPU Device (B0:D11:F0)
Enable or Disable NPU (Neural Processing Unit) Device.

3.2.2.1 Memory Configuration



This menu contains the following information:

- Memory Configuration
Display the Memory RC Version, Data Rate, Timings, etc.

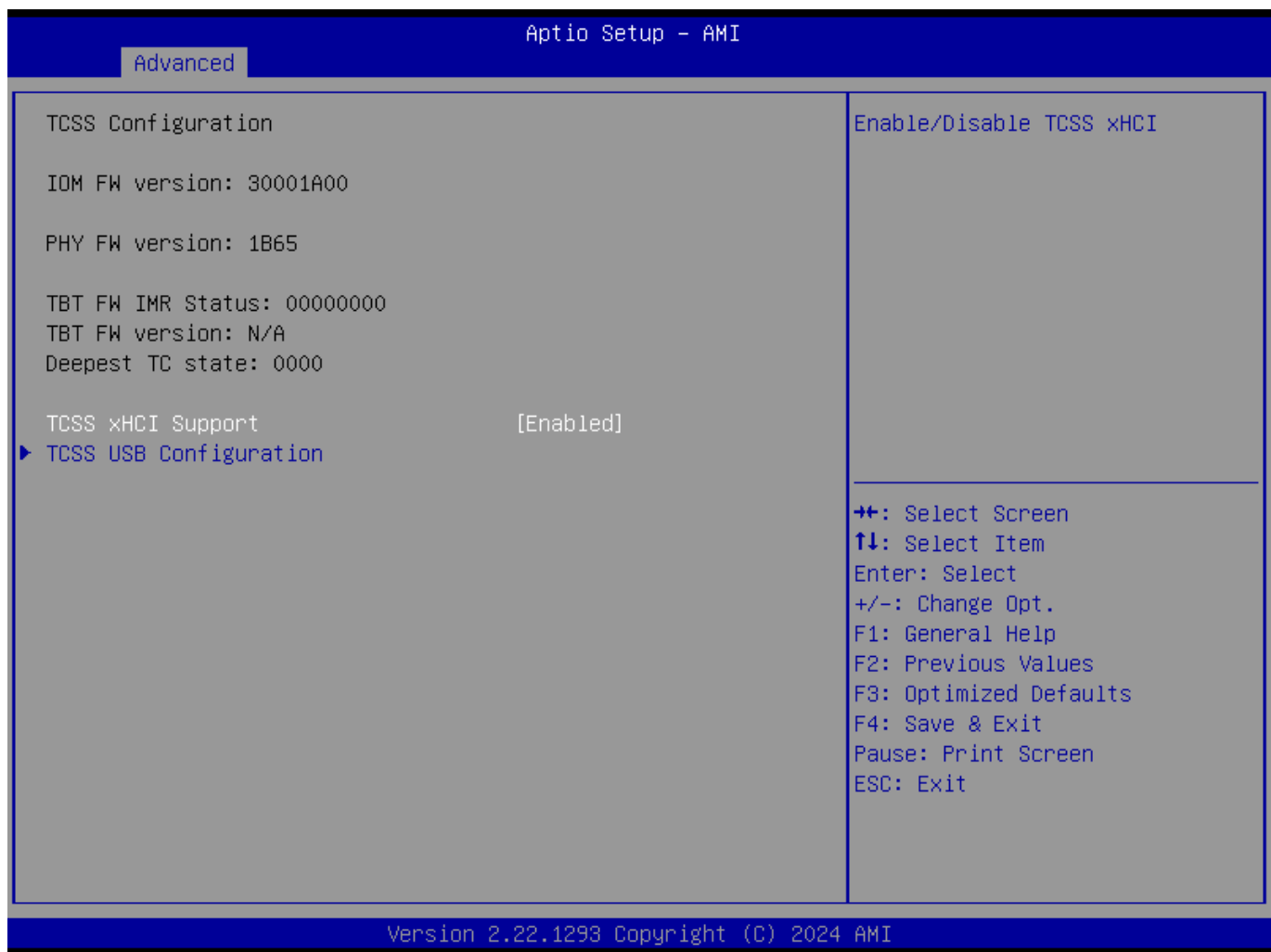
3.2.2.2 Graphics Configuration



This menu contains the following information:

- **Primary Display**
Select AUTO set IGD to be Primary Display if no external Graphics Device connected otherwise external Graphics Device detected on first PCIE port will be Primary Display or Select IGFX for IGD to be Primary Display Or select HG for Hybrid Gfx.
- **Internal Graphics**
Keep IGFX enabled based on the setup options.

3.2.2.3 TCSS setup menu



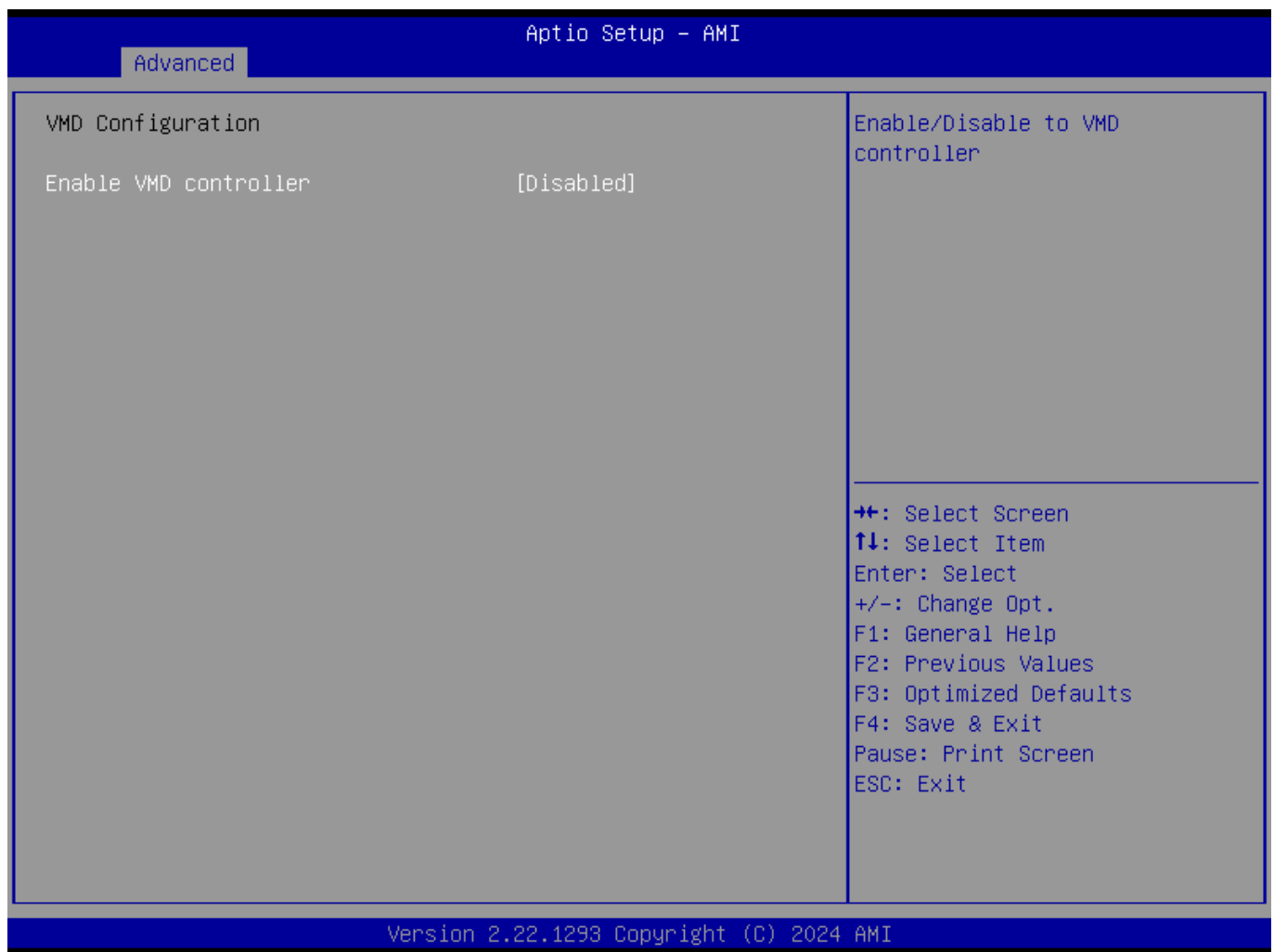
This menu contains the following information:

- TCSS xHCI Support
Enable or Disable TCSS xHCI.
- TCSS USB Configuration
SA TCSS USB Configuration settings.

The option after entering the interface settings above is as follows:

TCSS CPU USB Port Disable Override: Selectively Enable or Disable the corresponding USB port from reporting a Device Connection to the controller.

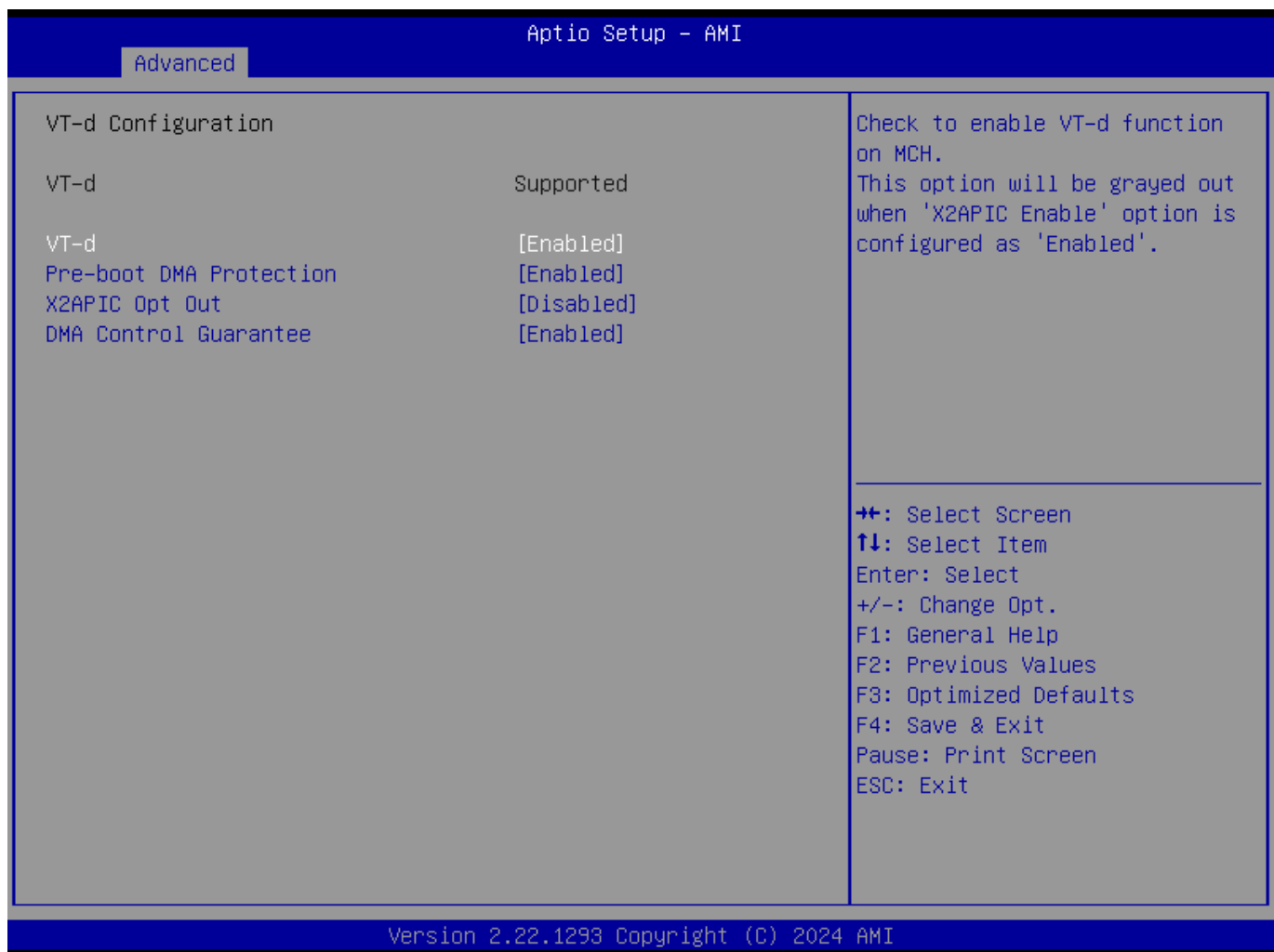
3.2.2.4 VMD setup menu



This menu contains the following information:

- Enable VMD controller
Enable or Disable to VMD controller.

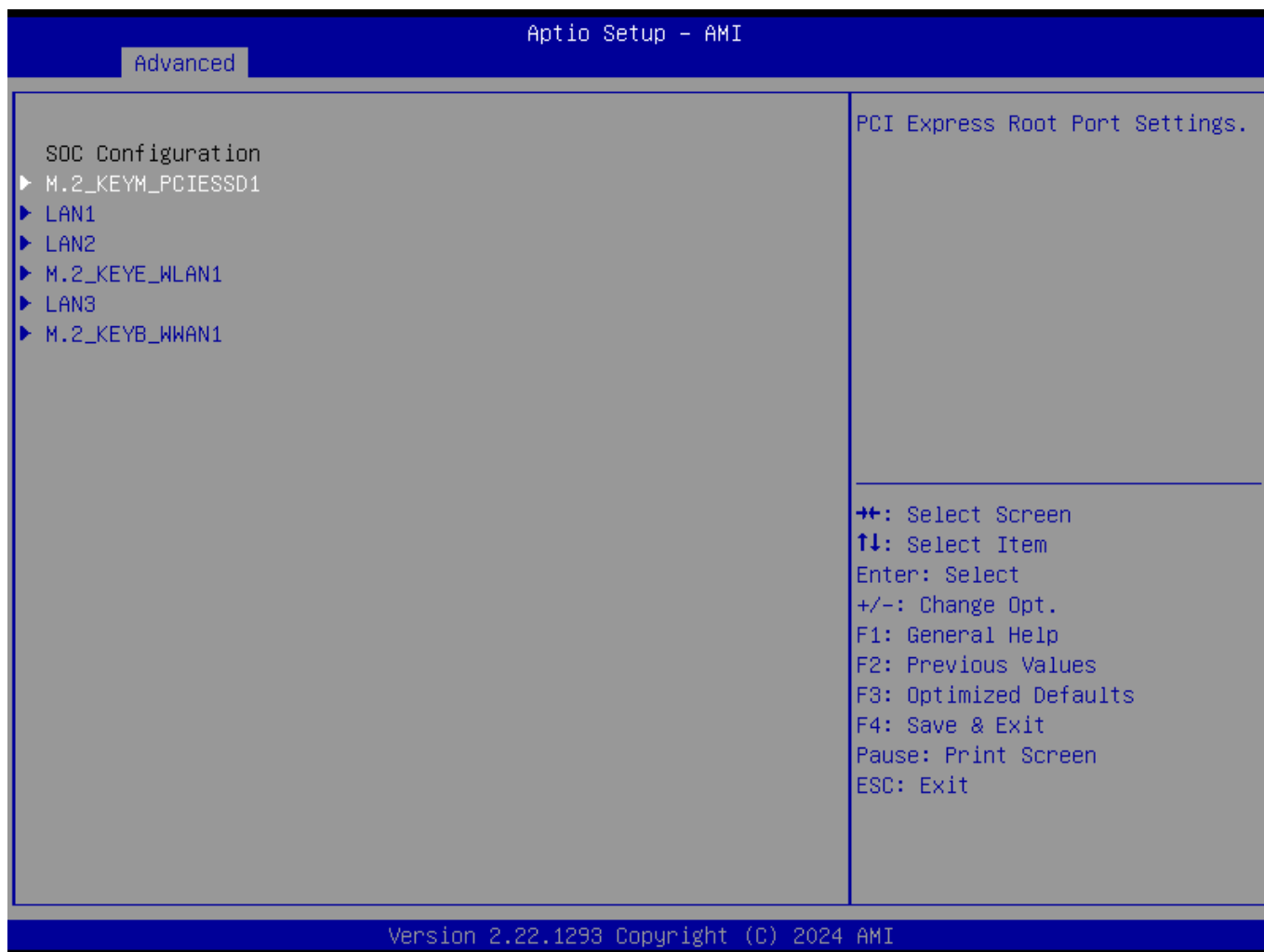
3.2.2.5 VT-d setup menu



This menu contains the following information:

- VT-d
Check to enable VT-d function on MCH.
This option will be grayed out when 'X2APIC Enable' option is configured as 'Enabled'.
- Pre-boot DMA Protection
Enable DMA Protection in Pre-boot environment (If DMAR table is installed in DXE and If VTD_INFO_PPI Is installed in PEI).
- X2APIC OPT OUT
Enable or Disable X2APIC_OPT_OUT bit.
This option will be grayed out when 'X2APIC Enable' option is configured as 'Enabled'.
- DMA Control Guarantee
Enable or Disable DMA_CONTROL_GUARANTEE bit.

3.2.3 PCIE Configuration



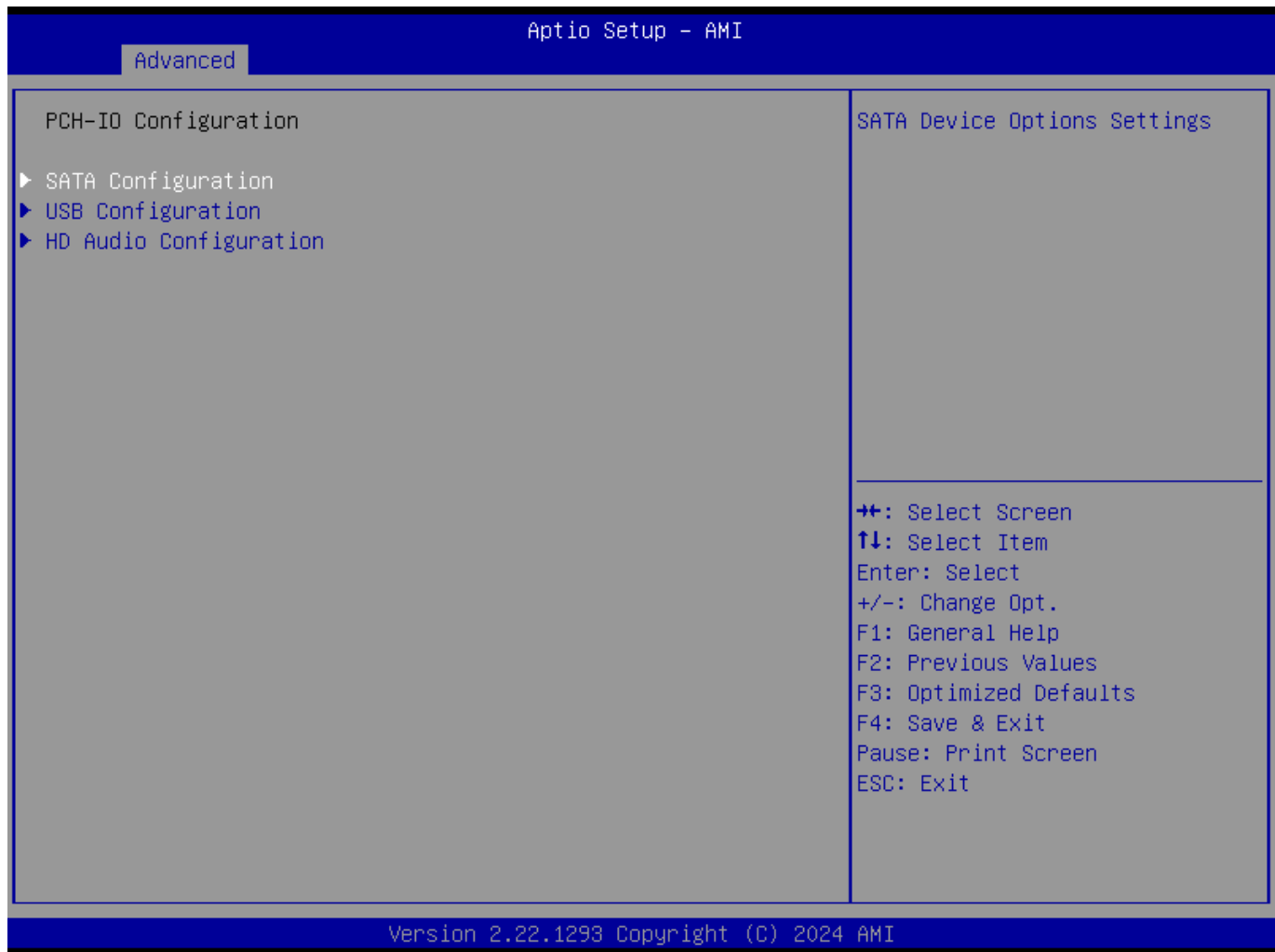
This menu contains the following information:

- M.2_KEYM_PCIESSD1/LAN1/LAN2/M.2_KEYE_WLAN1/LAN3/M.2_KEYB_WWAN1:
PCI Express Root Port Settings.

The options after entering the interface settings above are as follows.

PCI Express Root Port PXPA1/PXPB1/PXPB2/PXPB3/PXPB4/PXPC: Control the PCI Express Root Port. PCIe Speed:
Configure PCIe Speed.

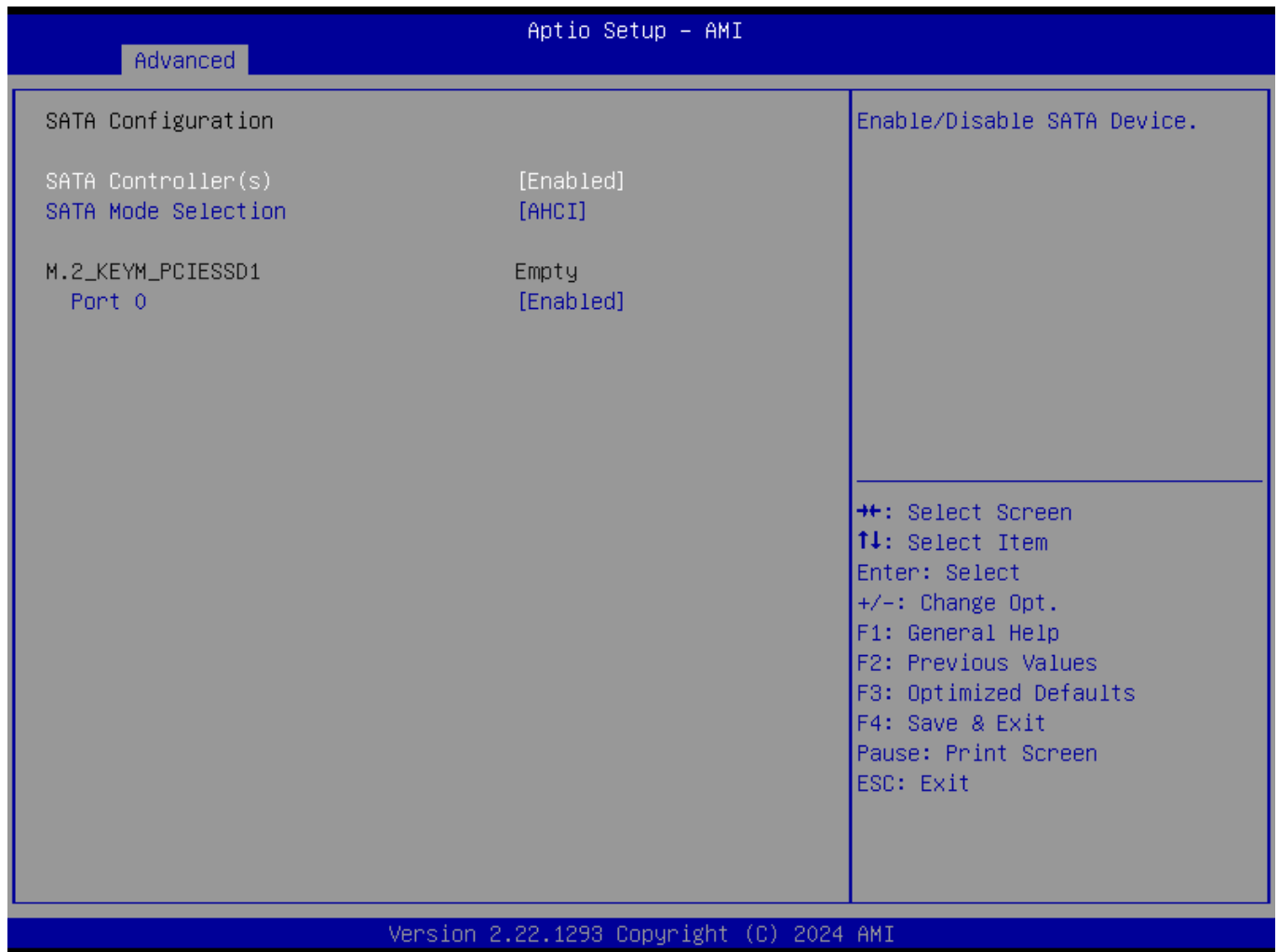
3.2.4 PCH-IO Configuration



This menu contains the following information:

- SATA Configuration
SATA Device Options Settings.
- USB Configuration
USB Configuration Settings.
- HD Audio Configuration
HD Audio Subsystem Configuration Settings.

3.2.4.1 SATA Configuration



This menu contains the following information:

- SATA Controller(s)
Enable or Disable SATA Device.
- SATA Mode Selection
Determines how SATA controller(s) operate.
- M.2_KEYM_PCIESSD1
Display M.2_KEYM_PCIESSD1 Information.
- Port X
Enable or Disable SATA Port X.

3.2.4.2 USB Configuration



This menu contains the following information:

- USB3.1 Port 0 Speed Selection
USB3.1 Speed selection; Gen1 or Gen2.
- USB3.1 Port 1 Speed Selection
USB3.1 Speed selection; Gen1 or Gen2.
- USB Port Disable Override
Selectively Enable or Disable the corresponding USB port from reporting a Device Connection to the controller.

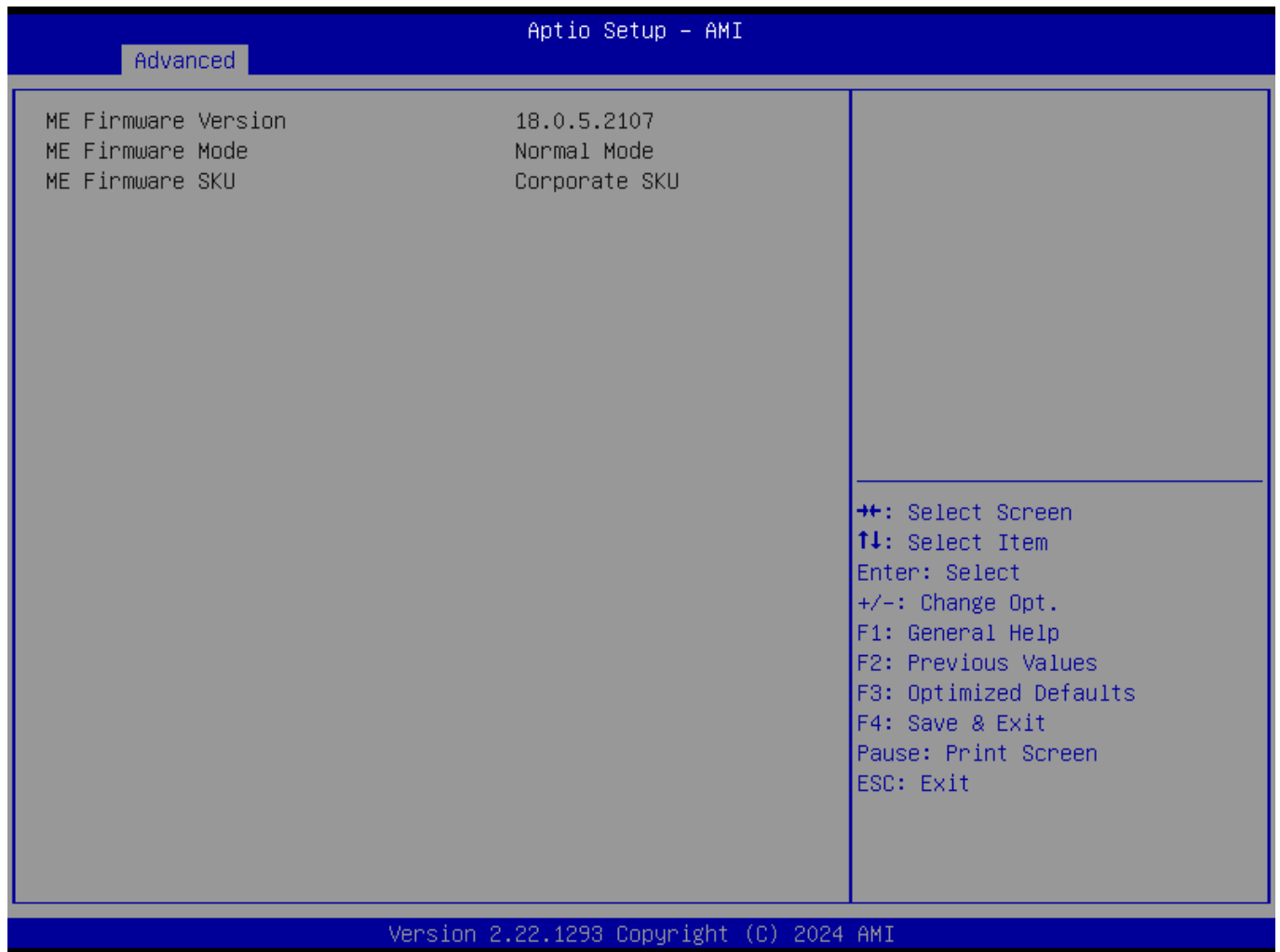
3.2.4.3 HD Audio Configuration



This menu contains the following information:

- **HD Audio**
Control Detection of the HD-Audio device. Disabled = HAD will be unconditionally disabled. Enabled = HAD will be unconditionally enabled.
- **Audio DSP**
Enable or Disable Audio DSP.
- **Audio DSP Compliance Mode**
Specifies DSP enabled system compliance:
 1. Non-UAA (Intel SST driver support only – CC_040100).
 2. UAA (HD Audio Inbox or Intel SST driver support – CC_040380). Note: NHLT (DMIC/BT/I2S configuration) is published for non-UAA only.

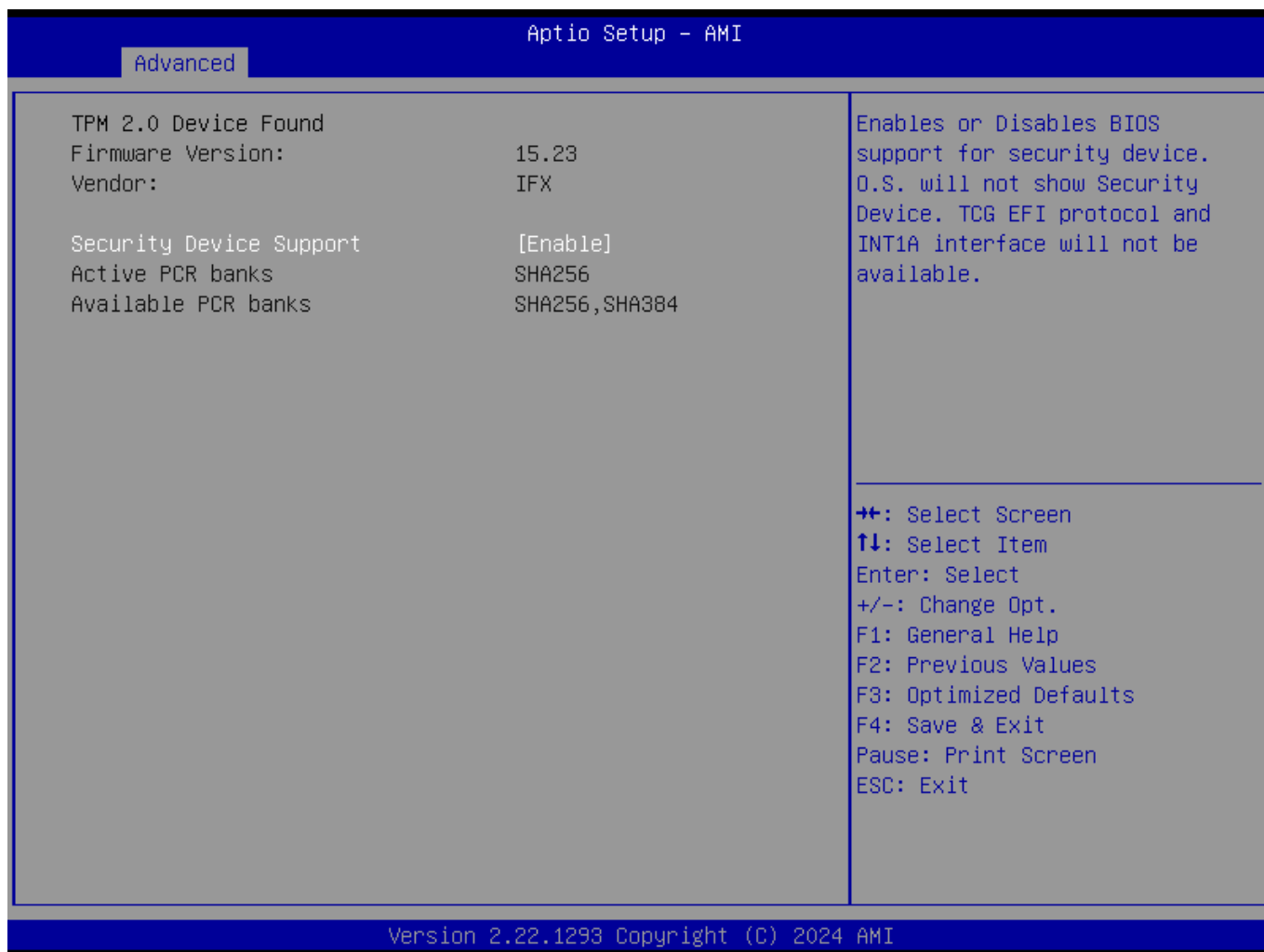
3.2.5 PCH-FW Configuration



This menu contains the following information:

- ME Firmware Version
Display the ME Firmware information.
- Me Firmware Mode
Display the Me Firmware Mode.
- Me Firmware SKU
Display the Me Firmware SKU.

3.2.6 Trusted Computing



This menu contains the following information:

- TPM 2.0 Device Found
Display the information of the TPM 2.0 Device: Firmware Version, Vendor.
- Security Device Support
Enable or Disable BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.

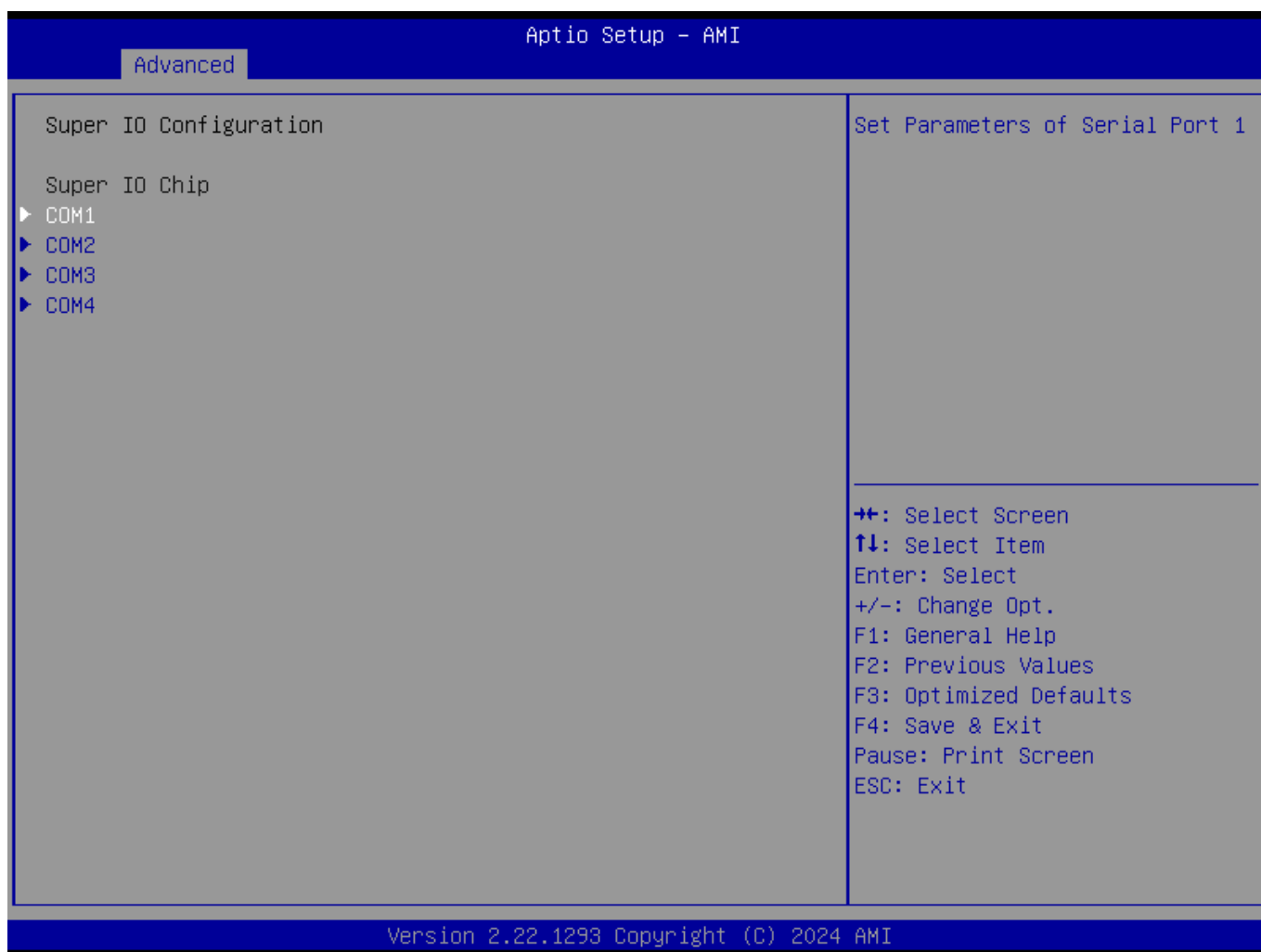
3.2.7 ACPI Settings



This menu contains the following information:

- Enable Hibernation
Enable or Disable System ability to Hibernate (OS/S4 Sleep State). This option may not be effective with some operating systems.

3.2.8 Super IO Configuration



This menu contains the following information:

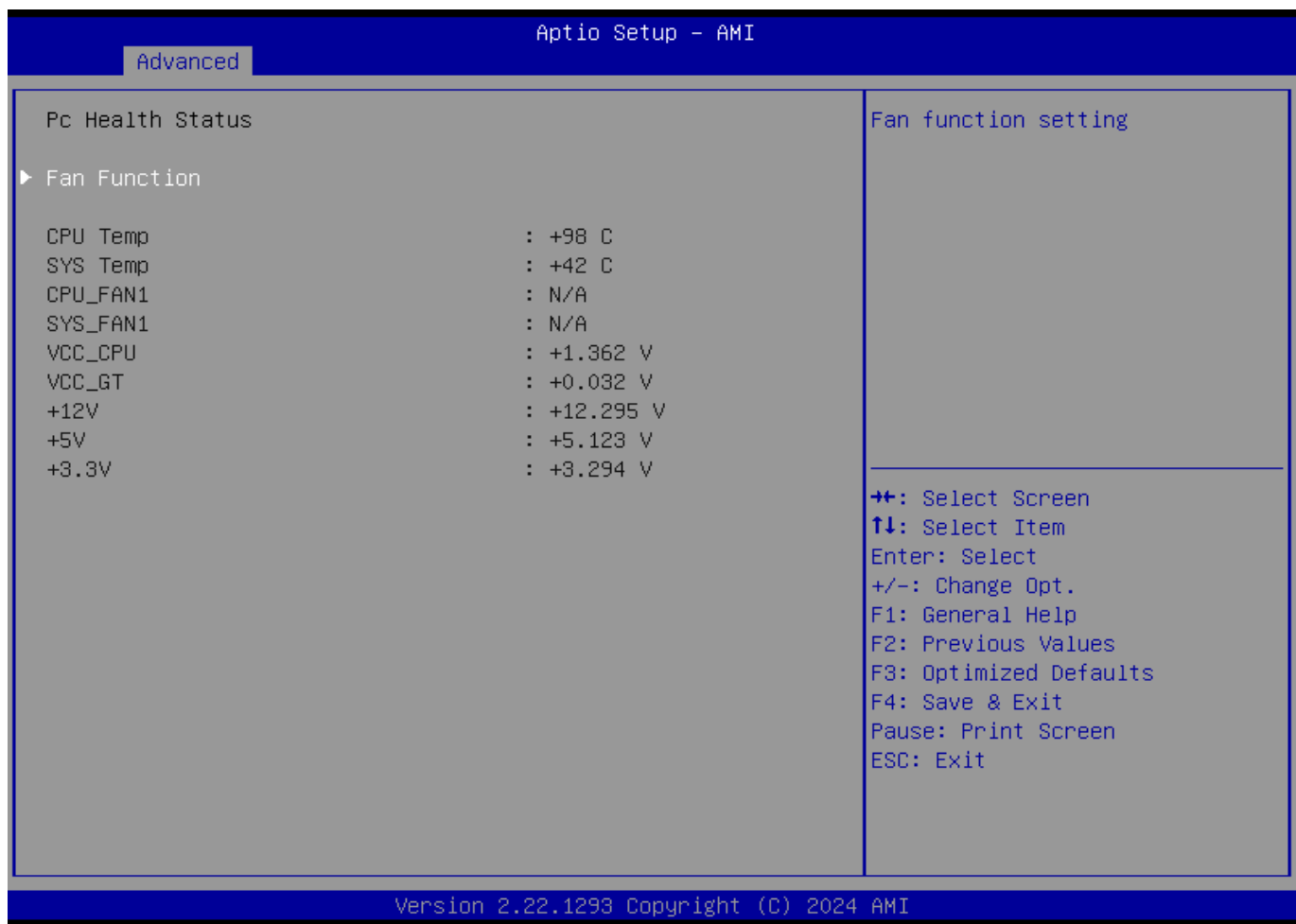
- COM X
Set Parameters of Serial Port x:

The options after entering the interface settings above are as follows. Serial Port: Enable or Disable Serial Port (COM).

Device Settings: Display the Current Device Settings.

Change Settings: If the board supported, this menu shows. Select an optimal setting for Super IO Device.

3.2.9 Hardware Monitor



This menu contains the following information:

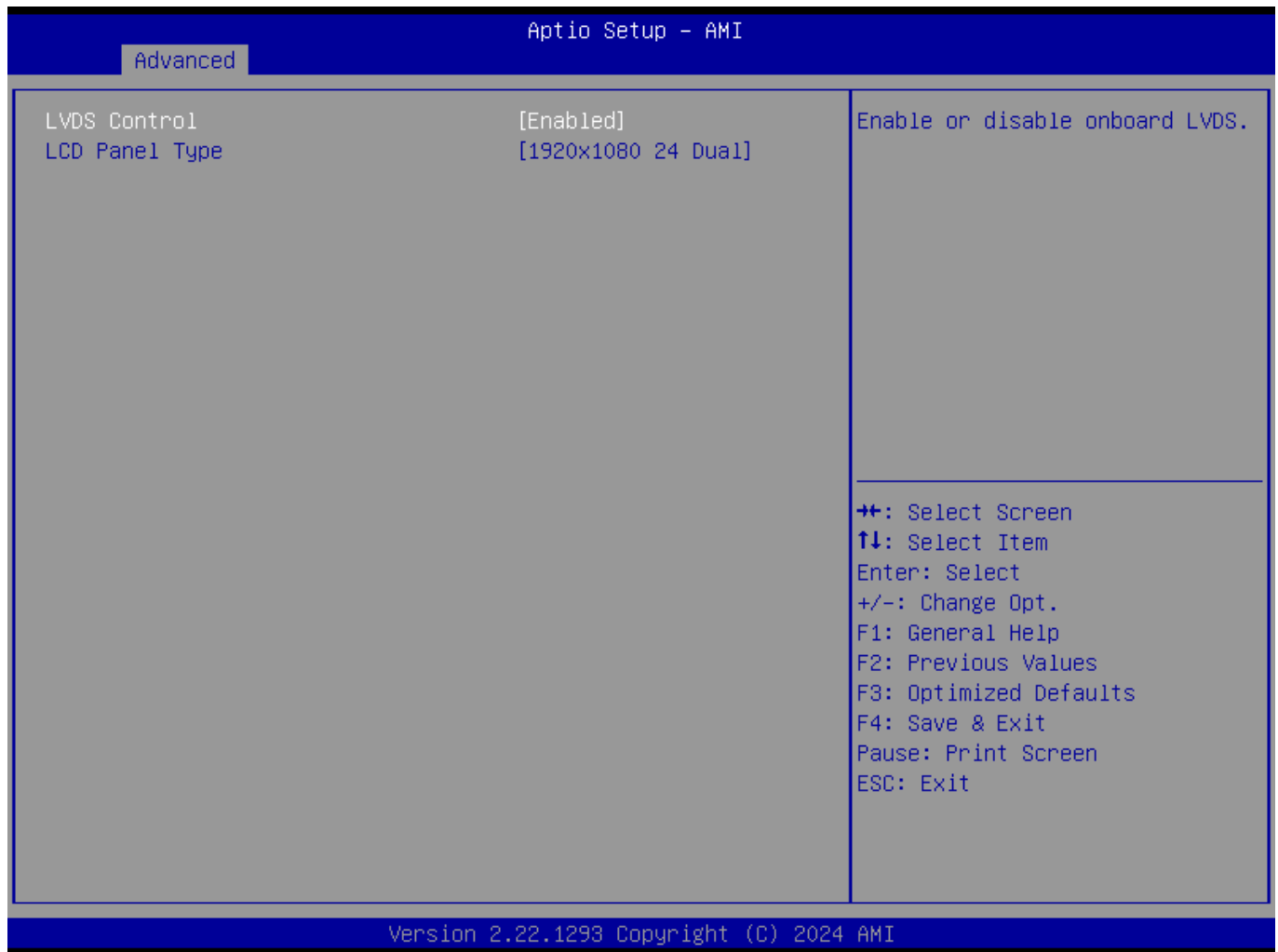
- Fan Function (If the board supported, this menu shows.) Fan Function setting.

CPU_FAN1/SYS_FAN1 Mode: FAN Mode Select.

Full on Mode; Automatic Mode; Manual Mode. Refer to section 2.7 of this manual for setting up.

- CPU Temp
Display CPU Temperature.
- SYS Temp
Display System Temperature.
- CPU_FAN1
Display CPU_FAN1 Speed.
- SYS_FAN1
Display SYS_FAN1 Speed.
- VCC_CPU
Display CPU Core Voltage Value.
- VCC_GT
Display Memory Voltage Value.
- +12V
Display +12 Voltage Value.
- +5V
Display +5 Voltage Value.
- +3.3V
Display +3.3 Voltage Value.

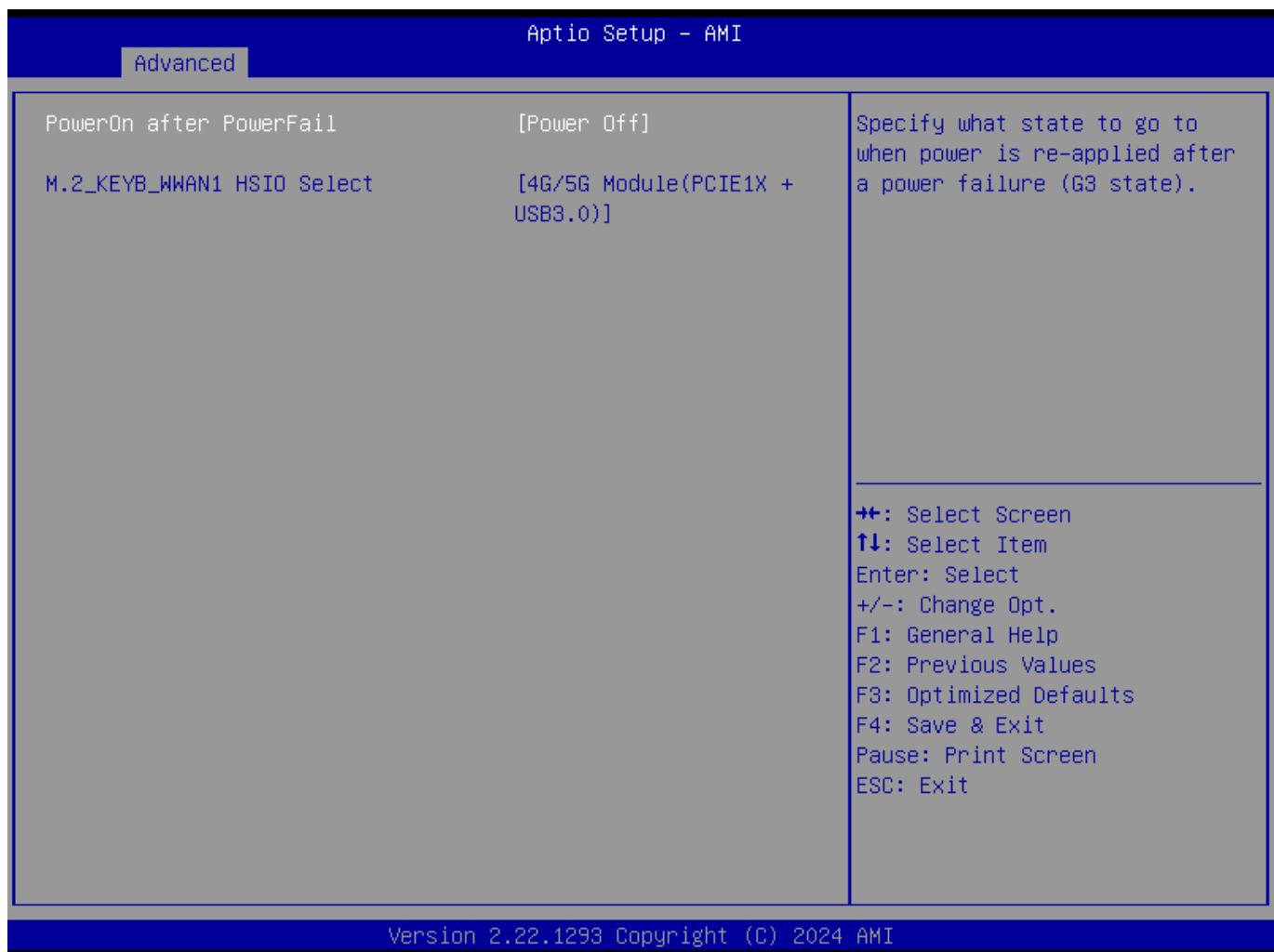
3.2.10 Display Configuration



This menu contains the following information:

- LVDS Control
Enable or Disable onboard LVDS.
- LCD Panel Type
Select LCD Panel Type.

3.2.11 Power Control



This menu contains the following information:

- Power On after Power Fail
Specify what state to go to when power is re-applied after a power failure (G3 state).
- M.2_KEYB_WWAN1 HSIO Select Select
M.2_KEYB_WWAN1 HSIO Type.

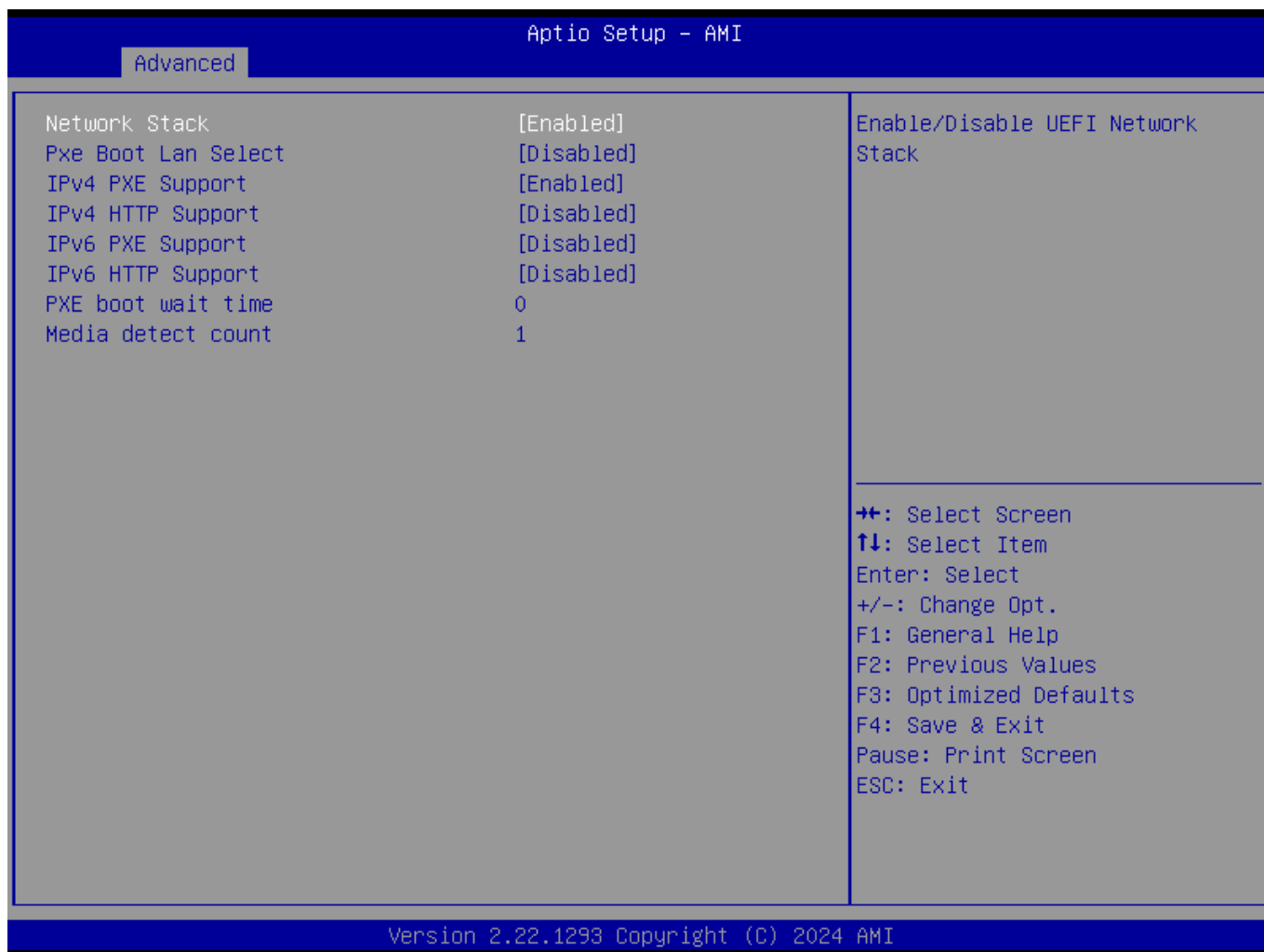
3.2.12 S5 RTC Wake Settings

Aptio Setup - AMI		
Advanced		
Wake system from S5	[Daily Time]	Enable or disable System wake on alarm event. Select FixedTime(Daily/Weekly/Monthly Time), system will wake on the hr::min::sec specified.
Wake up hour	0	
Wake up minute	0	
Wake up second	0	
		→: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit Pause: Print Screen ESC: Exit
Version 2.22.1293 Copyright (C) 2024 AMI		

This menu contains the following information:

- Wake system from S5
Enable or Disable System wake on alarm event. Select FixedTime (Daily/Weekly/Monthly Time), system will wake on the hr::min::sec specified.
Refer to section 2.6 of this manual for setting up.

3.2.13 Network Stack Configuration



This menu contains the following information:

- **Network Stack**
Enable or Disable UEFI Network Stack.
- **PXE Boot Lan Select**
Select the LAN port to Support PXE Boot.
- **IPv4 PXE Support**
Enable or Disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available.
- **IPv4 HTTP Support**
Enable or Disable IPv4 HTTP boot support. If disabled, IPv4 HTTP boot support will not be available.
- **IPv6 PXE Support**
Enable or Disable IPv6 PXE boot support. If disabled, IPv6 PXE boot support will not be available.
- **IPv6 HTTP Support**
Enable or Disable IPv6 HTTP boot support. If disabled, IPv6 HTTP boot support will not be available.
- **PXE boot wait time**
Wait time in seconds to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the value.
- **Media detect count**
Number of times the presence of media will be checked. Use either +/- or numeric keys to set the value.

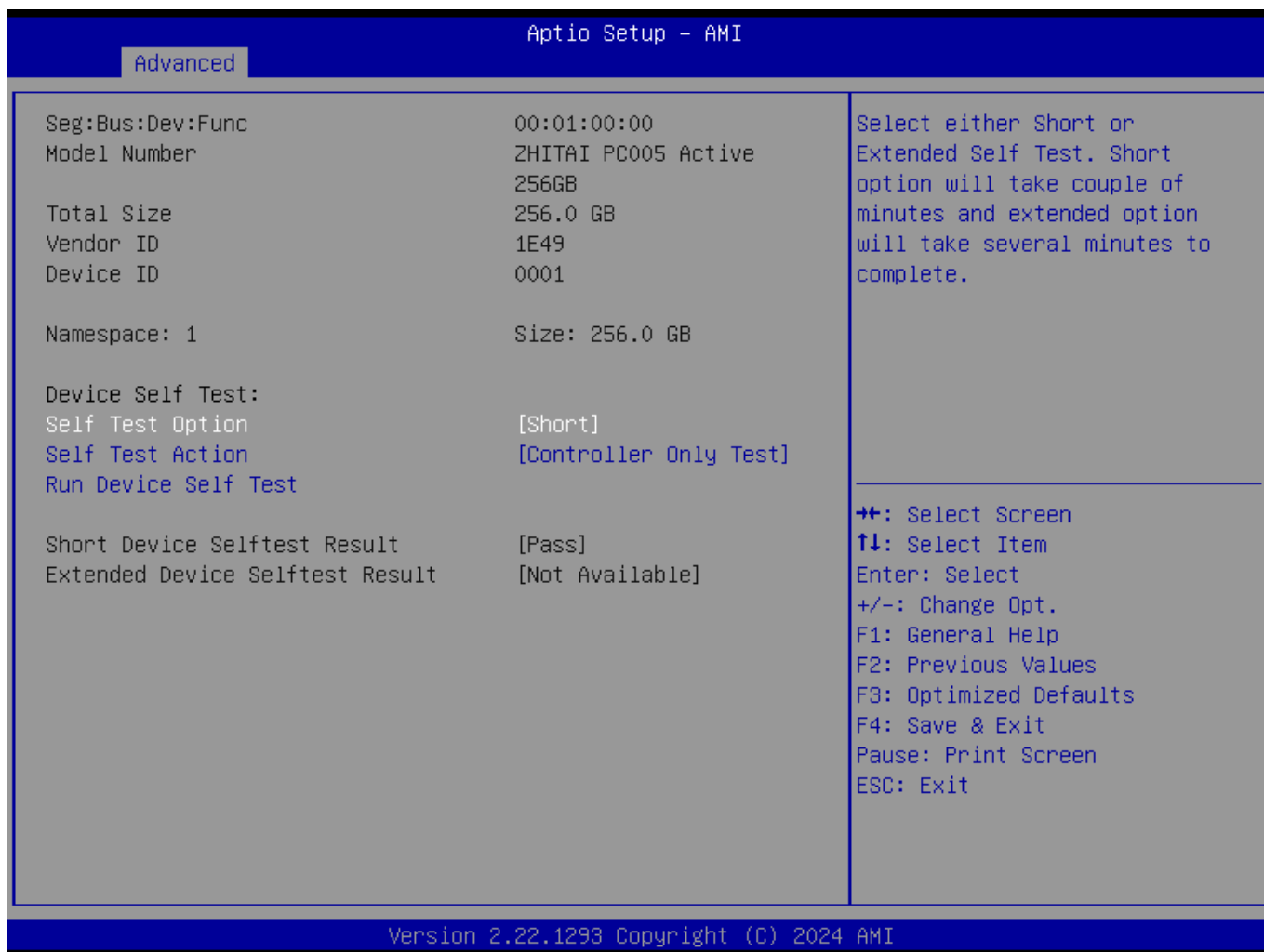
3.2.14 NVMe Configuration



This menu contains the following information:

- NVMe Configuration
NVMe Device Options Settings. (When no device is connected, the Option display 'No NVMe Device Found').

3.2.14.1 NVMe Device Options Settings



This menu contains the following information:

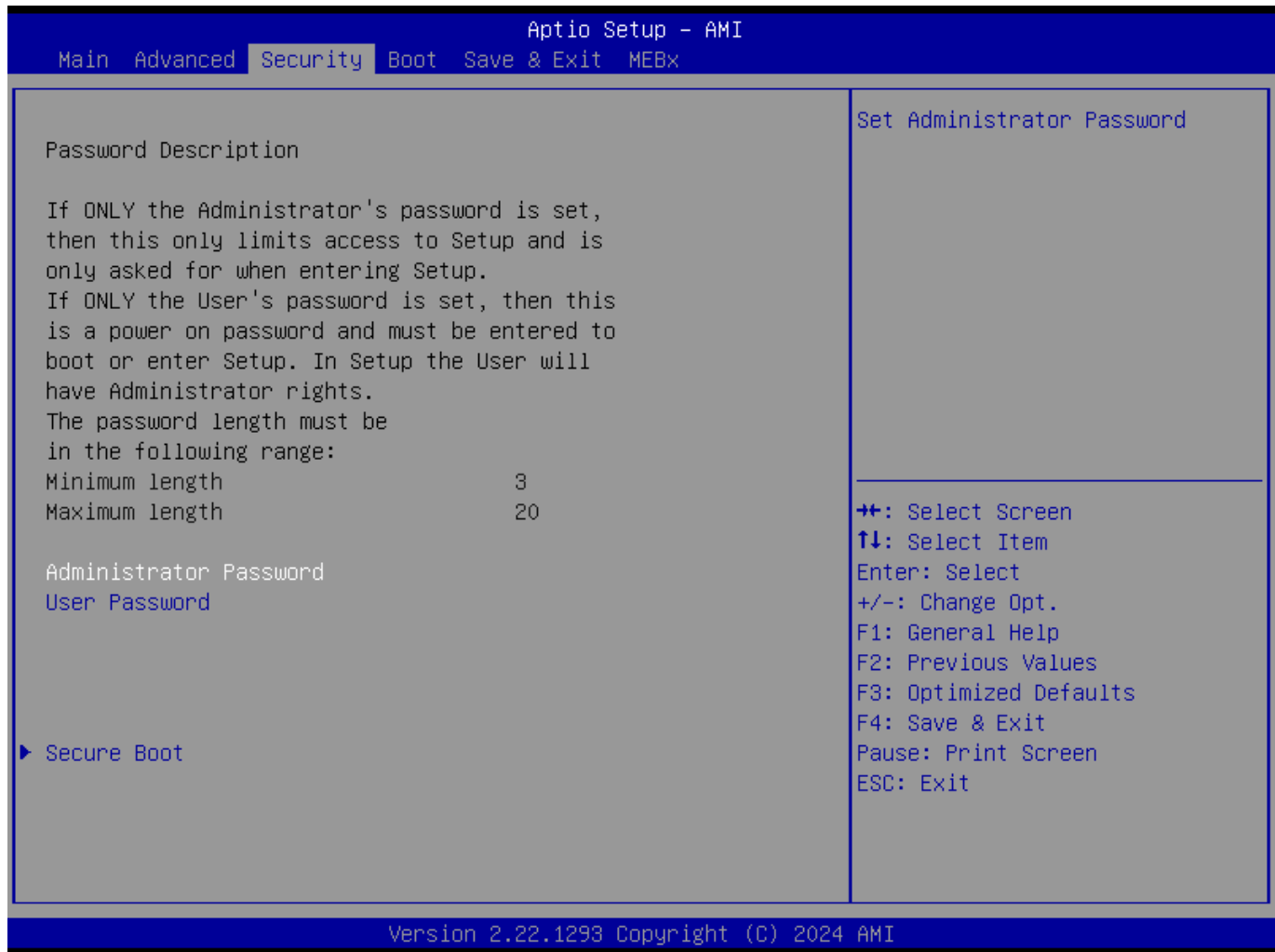
- Display the NVME device information
- Device Self Test

Self Test Option: Select either Short or Extended Self Test. Short option will take couple of minutes and extended option will take several minutes to complete.

Self Test Action: Select either to test Controller alone or Controller and Name Space. Selecting Controller and Name Space option will take lot longer to complete the test.

Run Device Self Test: Perform device self test for the corresponding Option and Action selected by user. Pressing 'Esc' key will abort the test. Result shown below is the recent result logged in the device.

3.3 Security



This menu contains the following information:

- Administrator Password
Set Setup Administrator Password.
- User Password
Set User Password.
- Secure Boot
Secure Boot configuration.

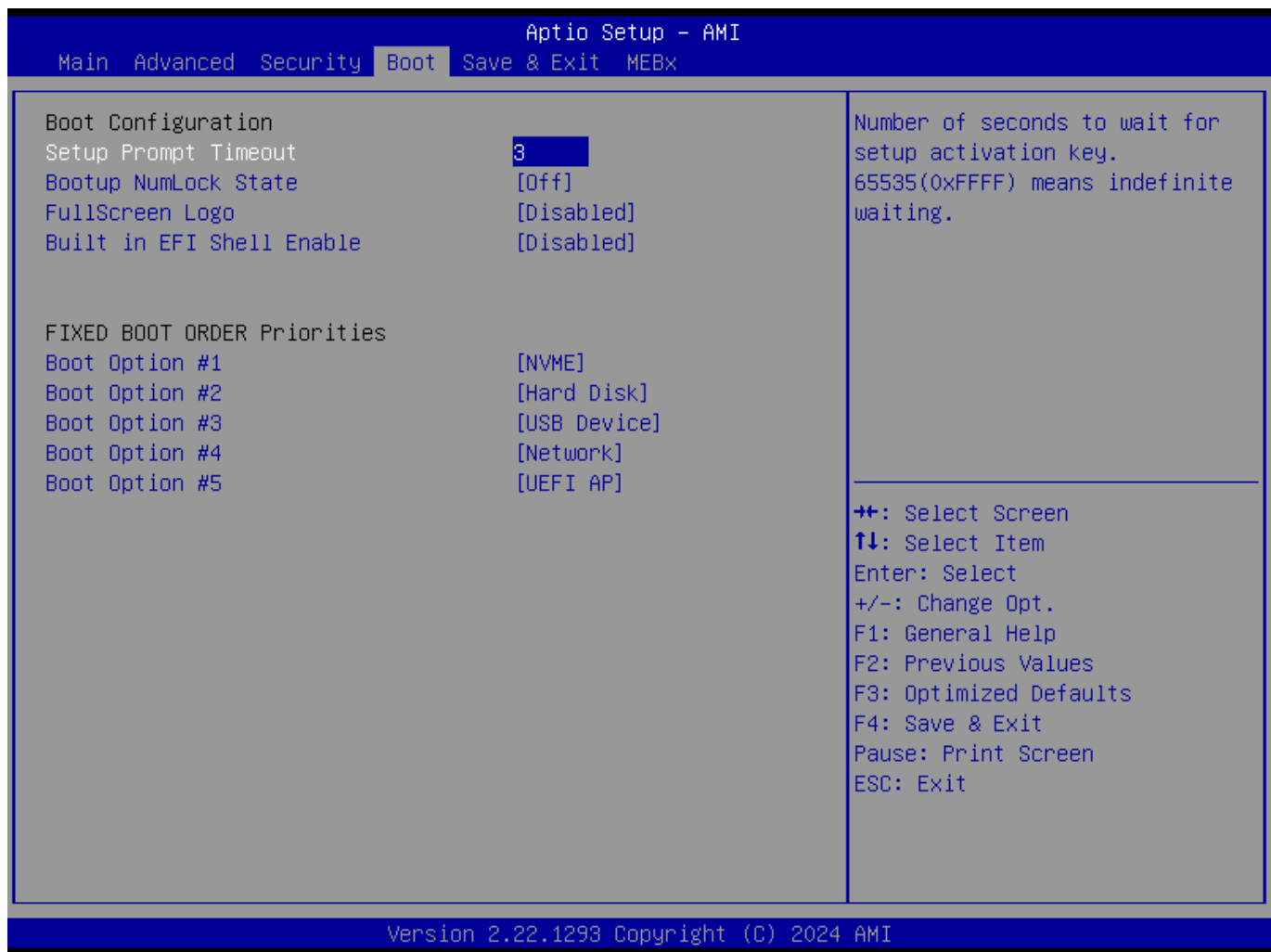
3.3.1 Secure Boot



This menu contains the following information:

- **System Mode**
Display the System Mode.
- **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.
- **Secure Boot Mode**
Secure Boot mode options: Standard or Custom.
In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full authentication.
- **Restore Factory Keys**
Force System to User Mode. Install factory default Secure Boot key databases.
- **Reset To Setup Mode**
Delete all Secure Boot key databases from NVRAM.
- **Expert Key Management**
Enables expert users to modify Secure Boot Policy variables without full authentication.

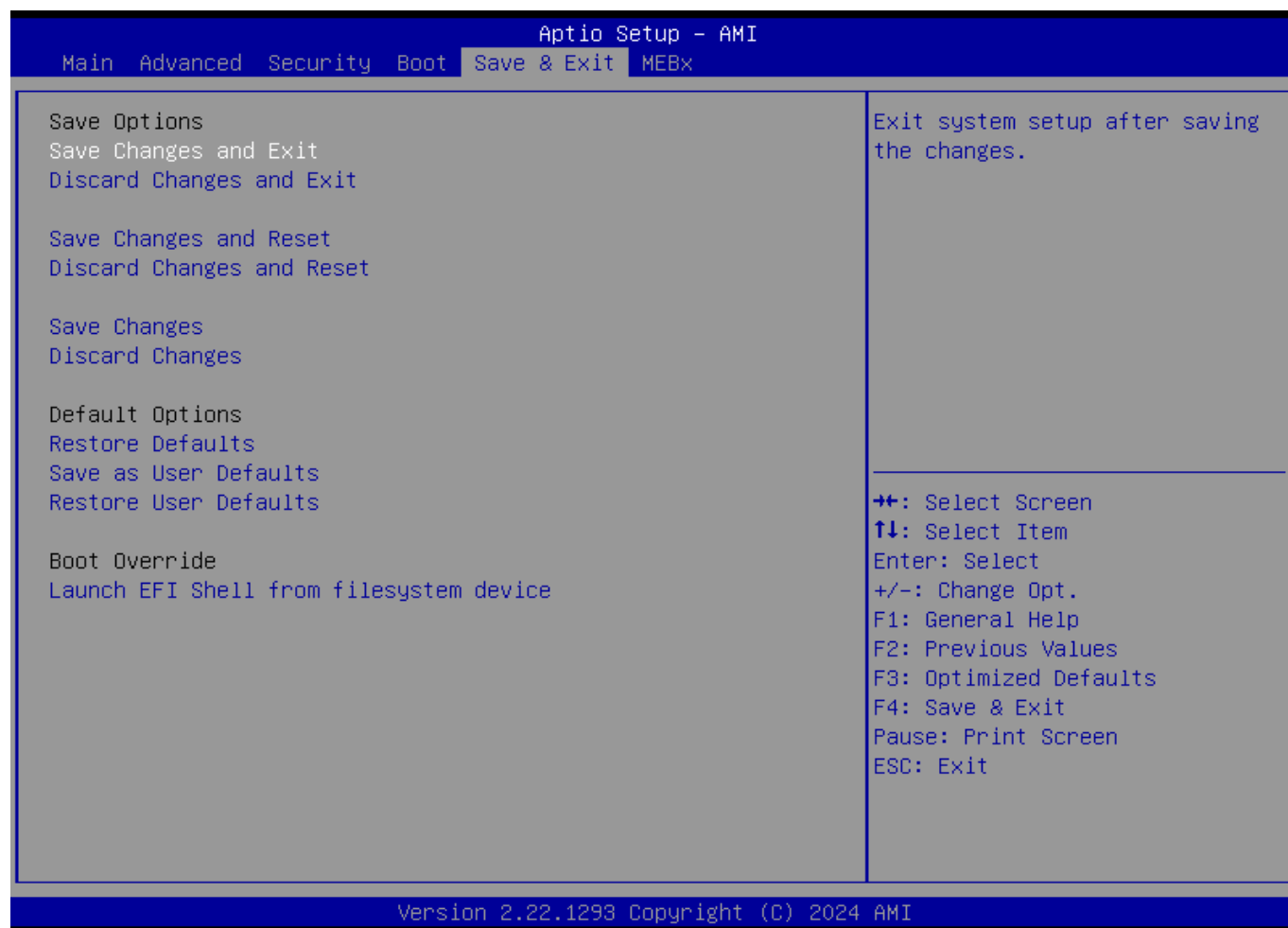
3.4 Boot



This menu contains the following information:

- **Setup Prompt Timeout**
Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.
- **Bootup Num Lock State**
Select the keyboard Num Lock state.
- **Full Screen Logo**
Enable or Disable Full Screen Logo option.
- **Built in EFI Shell Enable**
Enable or Disable Built in EFI Shell.
- **FIXED BOOT ORDER Priorities**
Display Boot order, and allow to set NVME/Hard Drive/USB/XXX boot order in this group.

3.5 Save & Exit



This menu contains the following information:

Save Options:

- Save Changes and Exit
Exit the system after saving the changes.
- Discard Changes and Exit
Exit system setup without saving any changes.
- Save Changes and Reset
Reset the system after saving the changes.
- Discard Changes and Reset
Reset system setup without saving any changes.
- Save Changes
Save Changes done so far to any of far to any of the setup options.
- Discard Changes:
Discard Changes done so far to any of the setup options.

Default Options

- Restore Defaults
Restore or Load Default values for all the setup options.
- Save as User Defaults
Save the changes done so far as User Defaults.
- Restore User Defaults
Restore the User Defaults to all the setup options.

Boot Override

- Launch EFI Shell from filesystem device
Attempts to launch EFI Shell application (Shell.efi) from one of the available filesystem devices.

3.6 MEBx



This menu contains the following information:

- Intel(R) ME Password
MEBx Login.

