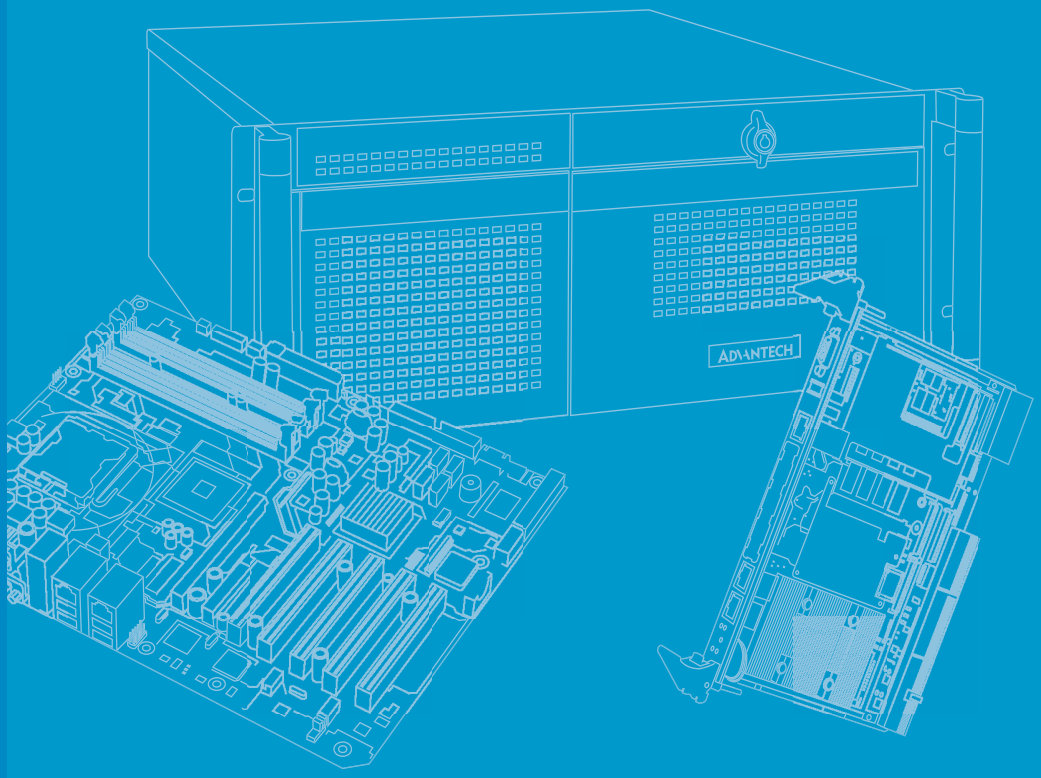

User Manual

PCE-2032/2132

LGA1200 10th Generation Intel® Core™ i9/i7/i5/i3 & Pentium®/ Celeron® CPU Board for IPC-2 Series Chassis

ADVANTECH

Enabling an Intelligent Planet

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5. Write the RMA number clearly on the outside of the package and ship the package prepaid to your dealer.

Part No. 2001203200 Edition 1

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Declaration of Conformity

FCC Class A

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 this event, users are required to correct the interference at their own expense.

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We want you to get the maximum performance from your products. So if you run into technical difficulties, we are here to help. For the most frequently asked questions, you can easily find answers in your product documentation. These answers are normally a lot more detailed than the ones we can give over the phone.

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In addition, free technical support is available from Advantech engineers every business day. We are always ready to give advice on application requirements or specific information on the installation and operation of any of our products.

Specification Comparison

Model	Chipset	Intel CPU Support	USB 3.2	USB 2.0	GbE	NVMe M.2	miniPCIe	COM
PCE-2132	Q470E	10th Gen	6	2	2	1 (PCIe x4 M Key)	1 (Full-Size)	2
PCE-2032	H420E	10th Gen	6	2	2	0	1 (mSATA Only)	2

Initial Inspection

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

- 1 x PCE-2032 or PCE-2132 CPU Board
- 1 x I/O Shield
- 1 x Startup manual
- 1 x Warranty Card

If any of these items are missing or damaged, contact your distributor or sales representative immediately. We have carefully inspected the PCE-2032/2132 mechanically and electrically before shipment. It should be free of marks and scratches and in perfect working order upon receipt. As you unpack the PCE-2032/2132, check it for signs of shipping damage. (For example, damaged box, scratches, dents, etc.) If it is damaged or it fails to meet the specifications, notify our service department or your local sales representative immediately. Also notify the carrier. Retain the shipping carton and packing material for inspection by the carrier. After inspection, we will make arrangements to repair or replace the unit.

Contents

Chapter 1

Hardware Configuration

1.1 Introduction

The Advantech PCE-2032/2132 CPU board is engineered for demanding industrial applications that demand robust computing capabilities in a remarkably compact form factor. This CPU board is fully compatible with 10th generation Intel® Core™ i9/i7/i5/i3 processors and supports DDR4 2933 memory configurations of up to 64GB. Notably, the PCE-2032/2132 offers cost-effective integrated graphics with a maximum shared memory capacity of 1 GB when the system memory reaches 2 GB or more.

In terms of connectivity, the PCE-2032/2132 boasts an extensive range of I/O options, including 2 x LAN ports, 8 x USB ports, dual display outputs, 2 x COM ports, and 2~4 full-height expansion slots. Its single-side I/O design minimizes the space requirements for deployment, streamlining both cabling and maintenance.

Furthermore, the modular design of the PCE-2032/2132 allows users to configure their systems with flexibility. For added versatility, this CPU board can be seamlessly integrated with Advantech's IPC-200 Series ultra-compact IPC chassis, catering to a wide spectrum of application requirements.

1.2 Features & Benefits

- **Processor support:** Intel 10th generation family processors with the latest 14nm lithography.
- **DDR4 2666/2933 up to 64 GB:** DDR4 provides up to 50 percent increased performance and bandwidth while saving up to 40 percent power.
- **Storage:** Support SATA 3.0 ports with 600MB/s transfer rate.
- **High Performance I/O capability:** Provides high transfer data performance interface; USB 3.0 data transfer rate is 5 Gbps which is 10 times faster than USB 2.0.
- **SUSI API:** Supports SUSIAccess and Intelligent system module for remote management.

1.3 Specifications

1.3.1 System

- **CPU:** LGA-1200-socket Core i9/i7/i5/i3, Pentium and Celeron series processors.
- **L2 Cache:** Please refer to CPU specification for detailed information.
- **BIOS:** (PCE-2032) 128Mb SPI; (PCE-2132) 256Mb SPI.
- **System Chipset:** Intel Q470E (PCE-2132); Intel H420E (PCE-2032).
- **SATA hard disk drive interface:** PCE-2032 supports three SATA 3.0 ports (2 SATA ports via gold finger to backplane), and PCE-2132 supports four SATA 3.0 ports (2 SATA ports via gold finger to backplane).

1.3.2 Memory

- **RAM:** Up to 64 GB in two 260-pin SO-DIMM sockets. Supports dual-channel DDR4 2666/2933 SDRAM WITHOUT ECC function.

Note! *Due to the inherent limitations of the PC architecture, the system may not fully detect the exact capacity of RAM installed.*

1.3.3 Input/Output

- **PCIe bus:**
  - PCE-2032: One PCIe x16 or two PCIe x8 from CPU and one PCIe x4 from PCH.
  - PCE-2132: One PCIe x16 or two PCIe x8 from CPU and three PCIe x4 from PCH.
- **Serial ports:** 2 x RS-232 serial ports.
- **USB port:** 6 x USB 3.2 Gen1 and 2 x USB 2.0
- **LPC:** One LPC connector to support optional TPM (PCA-TPM-00B1E), COM-232 (PCA-COM232-00A1E), COM-422/485 (PCA-COM485-00A1E) modules.
- **GPIO:** Supports 8-bit GPIO from super I/O for general purpose control application.

1.3.4 Graphics

- **Controller:** Intel® HD Graphics embedded on processor.
- **Display memory:** Shared memory is subject to OS (install 2 GB or above memory for basic system configuration).
- **VGA:** 1920 x 1080 @ 60Hz.
- **DP:** Up to 4096 x 2160 @ 60 Hz via optional cable.
- **HDMI:** Up to 3840 x 2160 @ 30 Hz or 1920 x 1080 @60Hz
- **PCI express x16 slot on the backplane:** An external graphic card can be installed in the PCIe x16 slot for high 2D/3D graphics capability.

1.3.5 Ethernet LAN

- Supports single/dual 10/100/1000 Mbps Ethernet port(s) via the dedicated PCI Express x1 bus which provides 500 MB/s data transmission rate.
- **Controller:**
  - PCE-2032:
    LAN1: I219-V
    LAN2: I210-AT
  - PCE-2132:
    LAN1: I219-LM
    LAN2: I210-AT

1.3.6 Industrial Features

- **Watchdog timer:** Can generate a system reset. The watchdog timer is programmable, with each unit equal to one second or one minute (255 levels).

1.3.7 Mechanical and Environmental Specifications

- **Operating temperature:** 0 ~ 60°C (32 ~ 140°F, depending on CPU and thermal solution)
- **Storage temperature:** -40 ~ 85°C (-40 ~ 185° F)
- **Operating humidity:** 40° C @ 85% RH, non-Condensing
- **Non-operating humidity:** 60°C @ 95% RH, non-Condensing
- **Power supply voltage:** +3.3 V, +5 V, +12 V, +5 V_{SB}
- **Board size:** 186 x 127 mm
- **Board weight:** 0.4 kg (Weight of board)

1.4 Jumpers and Connectors

Connectors on the PCE-2032/2132 CPU board link it to external devices such as hard disk drives and a keyboard. In addition, the board has a number of jumpers used to configure your system for your application.

The tables below list the function of each of jumpers and connectors. Later sections in this chapter give instructions on setting jumpers. Chapter 2 gives instructions for connecting external devices to your motherboard.

Table 1.1: Jumper List

Label	Function
JCASE1	Case Open connector
JCMOS1	CMOS clear jumper
JFP1	Power Switch / Reset connector
JME1	Intel ME Enable/Disable jumper
JSMB1	Reserved for RD debug
JWDT1	Watchdog Reset
PSON1	AT(1-2) / ATX(2-3) mode selector
SW1	USB power mode, H/W monitor alarm mode and VGA mode change

Table 1.2: Connectors

Label	Function
AUDIO1	Audio connector (Line-out, Mic-In)
COM12	2 x RS232/422/485 (COM1, COM2)
COM34	2 x RS232 (COM3, COM4)
CPUFAN1	CPU FAN connector (4-pin)
DIMMA1	DDR4 SODIMM slot
DIMMB1	DDR4 SODIMM slot
DP1	3rd Display output
GPIO1	8-bit digital I/O connector
HDMI1	HDMI connector
LAN1_USB2C1	LAN, 2 x USB 2.0
LAN2_USB3C1	LAN, 2 x USB 3.2 Gen1
LPC2	LPC box header for optioal accessory
MINIPCIE1	Mini PCIe connector
SATA1~2	Serial ATA connector for storage
SPI1	SPI flash card pin header for BIOS
SW2	Power ON/Off switch
USB2H1	2 x USB 2.0 (PCE-2132 only)
USB3C1	4 x USB 3.2 Gen1
VGA1	VGA display output

1.5 Board Layout: Jumper and Connector Locations

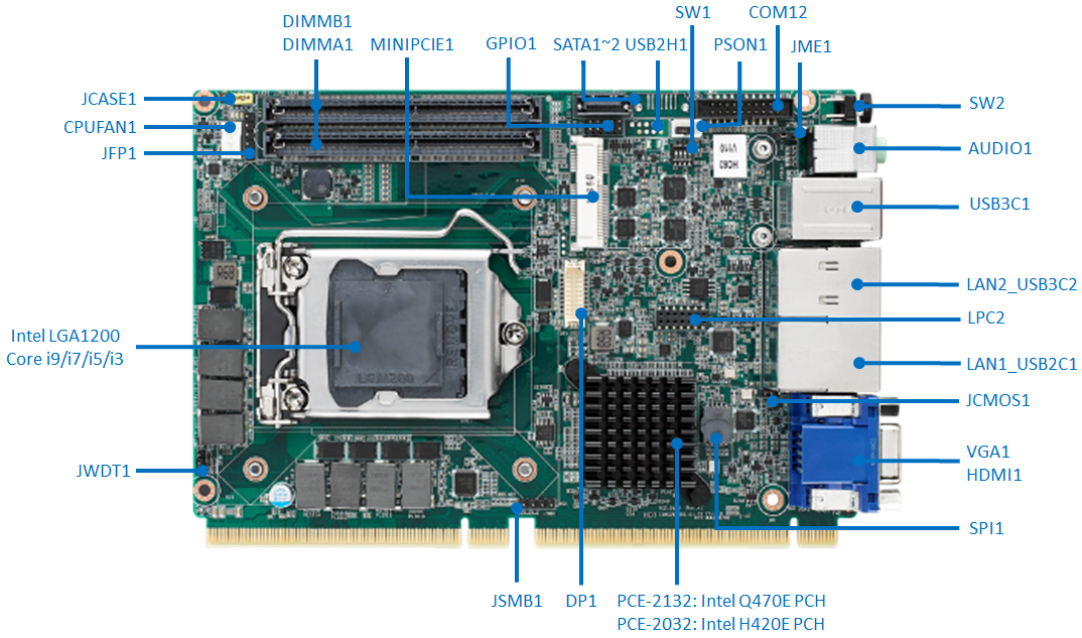


Figure 1.1 Jumper and Connector Locations

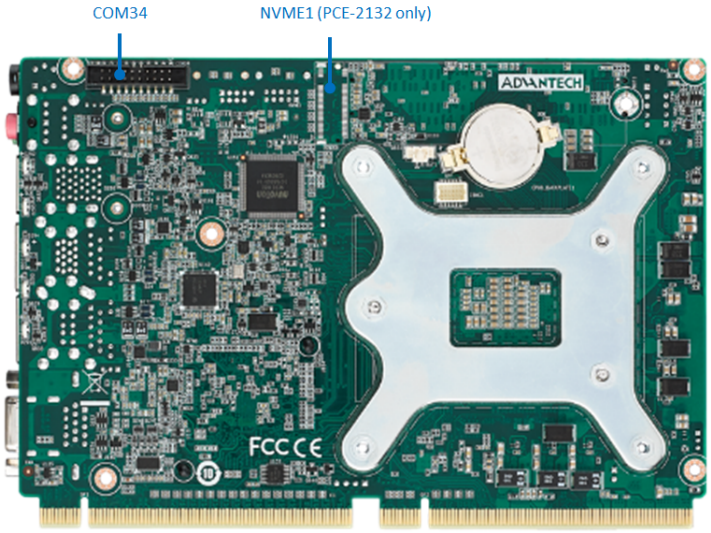


Figure 1.2 Jumper and Connector Locations

1.6 Block Diagram

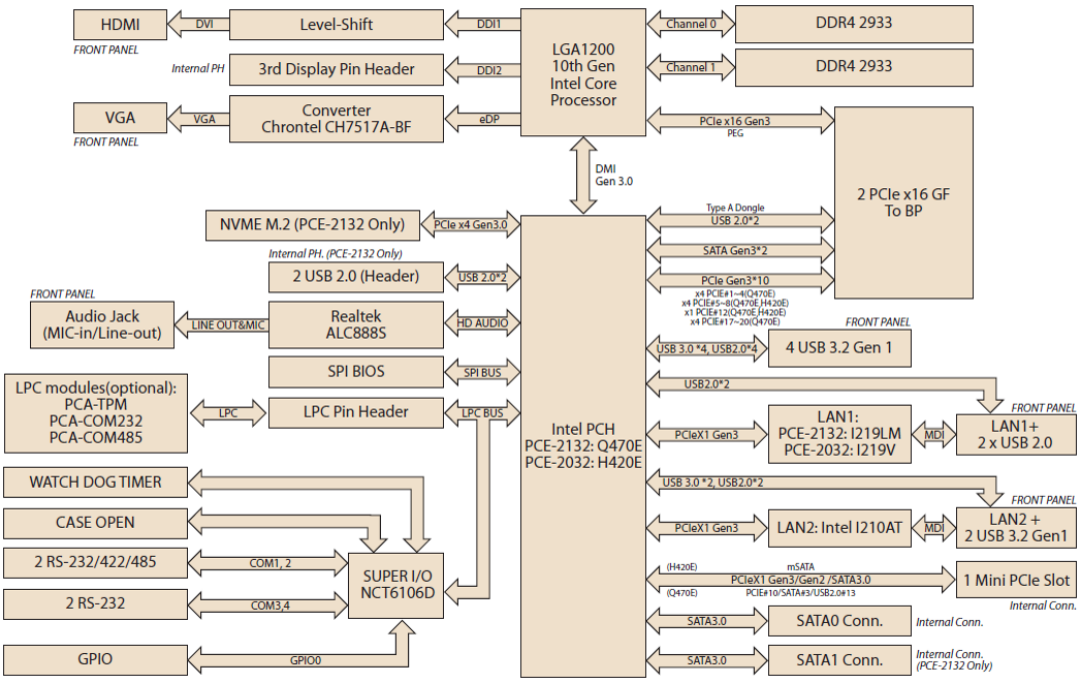


Figure 1.3 PCE-2032/2132 Block Diagram

1.7 Safety Precautions

Warning! *Always completely disconnect the power cord from your chassis whenever you work with the hardware. Do not make connections while the power is on. Sensitive electronic components can be damaged by sudden power surges. Only experienced electronics personnel should open the PC chassis.*

Caution! *Always ground yourself to remove any static charge before touching the motherboard. Modern electronic devices are very sensitive to static electrical discharges. As a safety precaution, use a grounding wrist strap at all times. Place all electronic components on a static-dissipative surface or in a static-shielded bag when they are not in the chassis.*

Caution! *The computer is provided with a battery-powered Real-time Clock. There is a danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by the manufacturer. Discard used batteries according to manufacturer's instructions.*

Caution! *There is a danger of a new battery exploding if it is incorrectly installed. Do not attempt to recharge, force open or heat the battery. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.*

1.8 Jumper Settings

This section provides instructions on how to configure your motherboard by setting the jumpers. It also includes the motherboard's default settings and your options for each jumper.

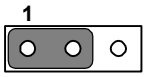
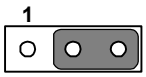
1.8.1 How to Set Jumpers

You can configure your motherboard to match the needs of your application by setting the jumpers. A jumper is a metal bridge that closes an electrical circuit. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To "close" (or turn ON) a jumper, you connect the pins with the clip. To "open" (or turn OFF) a jumper, you remove the clip. Sometimes a jumper consists of a set of three pins, labeled 1, 2 and 3. In this case you connect either pins 1 and 2, or 2 and 3. A pair of needle-nose pliers may be useful when setting jumpers.

1.8.2 BIOS (JCMOS1)

PCE-2032/2132 CPU board contains a jumper that can erase BIOS CMOS data and reset the system BIOS information. Normally this jumper should be set with pins 1-2 closed. If you want to reset them, set JCMOS1 to 2-3 closed for just a few seconds, and then move the jumper back to 1-2 closed. This procedure will reset the CMOS to its last status or default setting.

Table 1.3: Clear BIOS CMOS (JCMOS1)

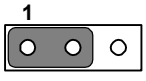
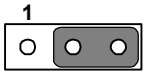
Function	Jumper Setting
*Keep BIOS CMOS data	 1-2 closed
Clear BIOS CMOS data	 2-3 closed

* default setting

1.8.3 ME Enable (JME1)

PCE-2032/2132 CPU board contains a jumper that can enable ME data. Normally this jumper should be set with pins 1-2 closed, then you can see ME information shows in BIOS menu. If you want to disable ME temporarily for firmware update, set JME1 to 2-3 closed.

Table 1.4: JCMOS1/JME1: Clear CMOS/ME FW Update

Function	Jumper Setting
* ME enable	 1-2 closed
ME disable	 2-3 closed

* default setting

1.8.4 JFP1

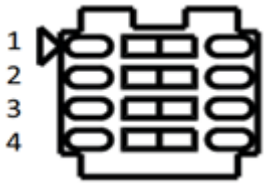
Table 1.5: JFP1	
Pin	**Function**
1	Power On Off
2, 4	Ground
3	System Reset
5	Clear Watchdog

1.8.5 JWDT1

Table 1.6: JWDT1	
Closed Pins	**Result**
1-2	Reserved
2-3*	Watch Dog Timer Reset
* default setting	

1.8.6 SW1

Table 1.7: SW1		
Switch	**State**	**Setting**
1	1* - 8	LAN1_USB2C1 & LAN2_USB3C1 do not provide standby charging
2	2* - 7	USB3C1 does not provide standby charging
3	3* - 6	HW monitor alarm beep
4	4* - 5	VGA always on. VGA will be ON when a cable is detected
* default setting		



1.9 System Memory

PCE-2032/2132 has two 260-pin memory sockets for DDR4 2666/2933 MHz memory modules with maximum capacity of 64 GB. (Maximum 32 GB for each DIMM)

Note! *Both PCE-2032 and PCE-2132 do NOT support registered DIMMs (RDIMMs).*

Chapter 2

Connecting Peripherals

2.1 Introduction

You can access most of the connectors from the top of the board. If you have a number of cards installed, you may need to partially remove a card to make all the connections.

2.2 LAN and USB Ports (USB3C1, USB3C2, USB2C1)

PCE-2032/2132 provides up to 10 x USB (Universal Serial Bus) ports with complete Plug & Play and hot swap support. These USB ports comply with USB Specification 2.0 and 3.0, support transfer rates up to 480 Mbps (USB2.0), and 5 Gbps (USB 3.2 Gen1). 8 ports are located on the I/O bracket, and the other 2 ports USB signal are located on the backplane via gold finger. PCE-2032/2132 is equipped with two high-performance 1000 Mbps Ethernet LANs.

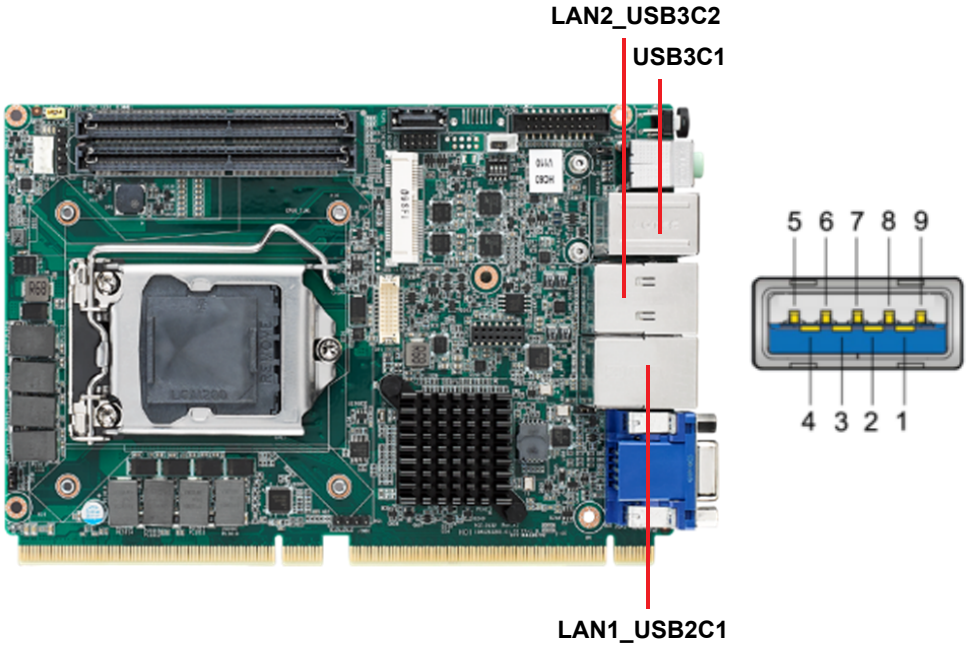
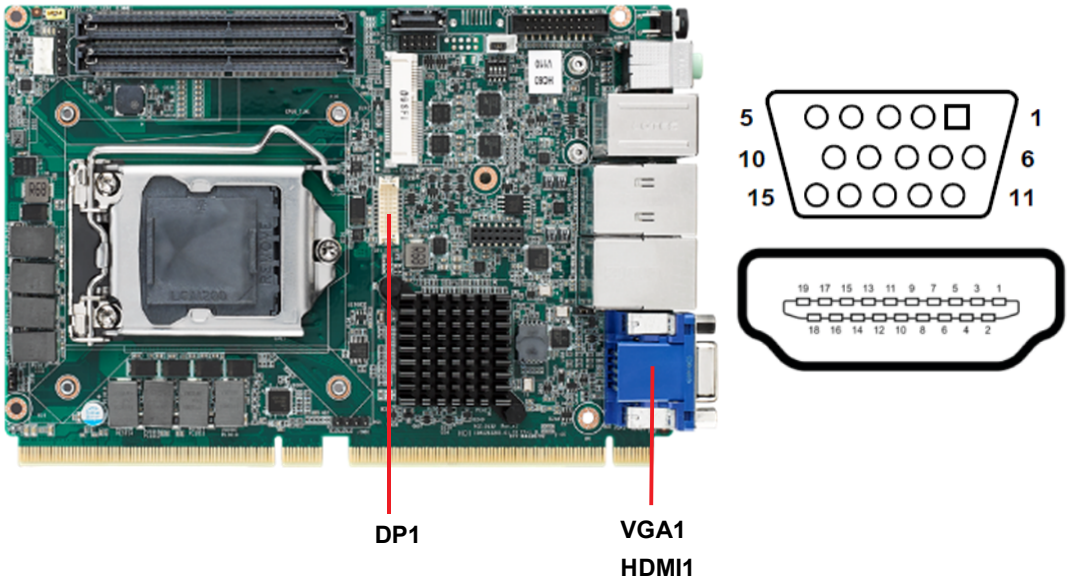


Table 2.1: USB 3.0 Connector Pin Assignment

Pin	Signal
1	+5V
2	USB Data-
3	USB Data+
4	GND
5	SSRX-
6	SSRX+
7	GND
8	SSTX-
9	SSTX+

Table 2.2: USB 2.0 Connector Pin Assignment	
Pin	**Signal**
1	+5V
2	USB Data-
3	USB Data+
4	GND

2.3 VGA Connector (VGA1), HDMI Connector (HDMI1)



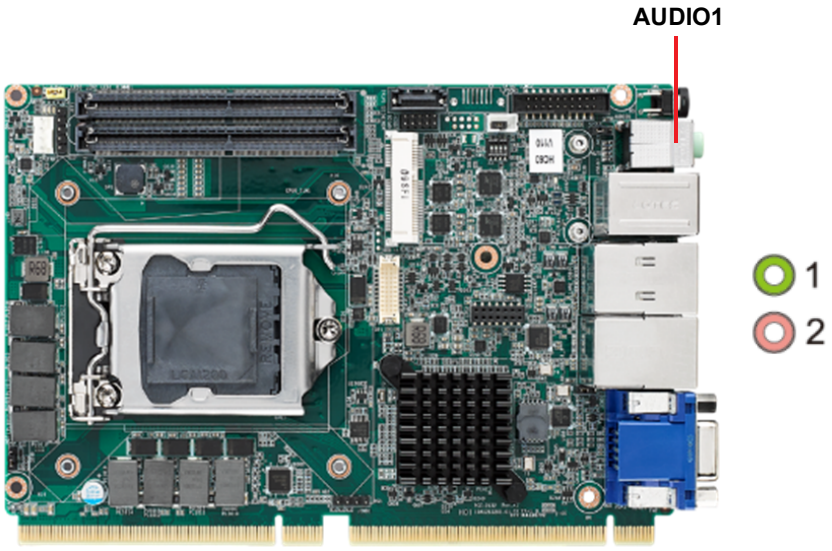
PCE-2032/2132 supports VGA and HDMI video outputs. DP1 could be used to extend another display output via a cable kit.

Note! Only PCE-2132 could output 3 display signals simultaneously.

Table 2.3: VGA Connector (VGA1)			
Pin	**Signal**	**Pin**	**Signal**
1	RED	9	VCC
2	GREEN	10	GND
3	BLUE	11	N/C
4	N/C	12	SDT
5	GND	13	H-SYNC
6	GND	14	V-SYNC
7	GND	15	SCK
8	GND		

Table 2.4: HDMI Receptacle Connector			
Pin	**Signal**	**Pin**	**Signal**
1	TMDS Data 2+	11	TMDS clock shield
2	TMDS Data 2 shield	12	TMDS clock-
3	TMDS Data 2-	13	CEC
4	TMDS Data 1+	14	Reserved
5	TMDS Data 1 shield	15	SCL
6	TMDS Data 1-	16	SDA
7	TMDS Data 0+	17	DDC/CEC Ground
8	TMDS Data 0 shield	18	+5V
9	TMDS Data 0-	19	Hot plug Detect
10	TMDS clock+		

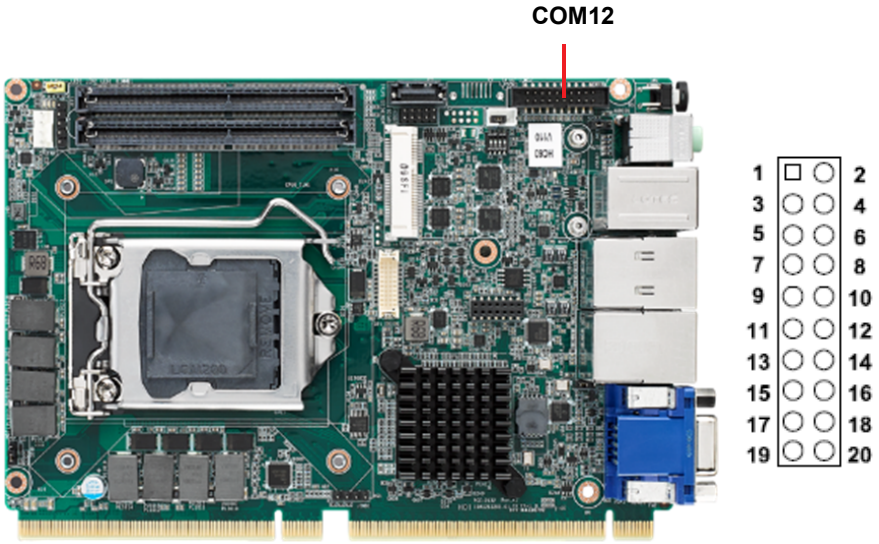
2.4 Line Out, Mic In Connector (AUDIO1)

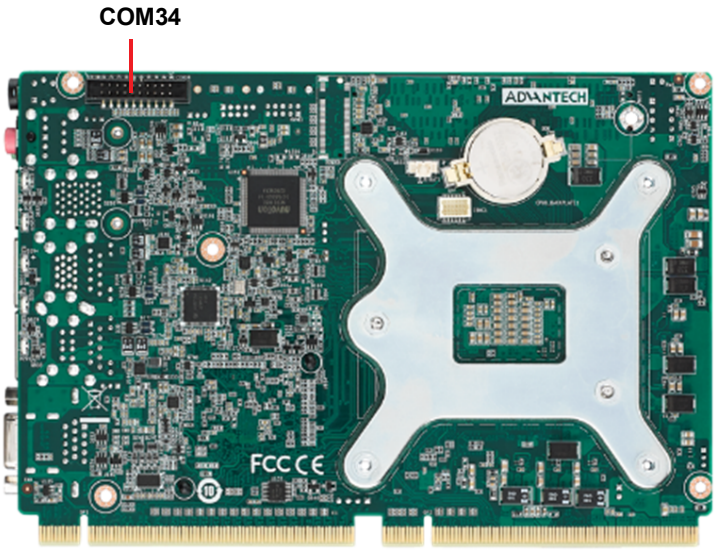


Line Out can be connected to external audio devices like speakers or headphones. Mic_In can be connected to a microphone.

Table 2.5: Audio Connector Pin Assignments	
Pin	**Signal**
1	Line_Out
2	Mic_In

2.5 Serial Ports (COM12, COM34)





PCE-2032/2132 offers totally 4 serial ports. These ports can connect to serial devices such as a mouse or a printer, or to a communication network. The IRQ and address ranges for both ports are fixed.

COM12 supports RS-232/422/485.

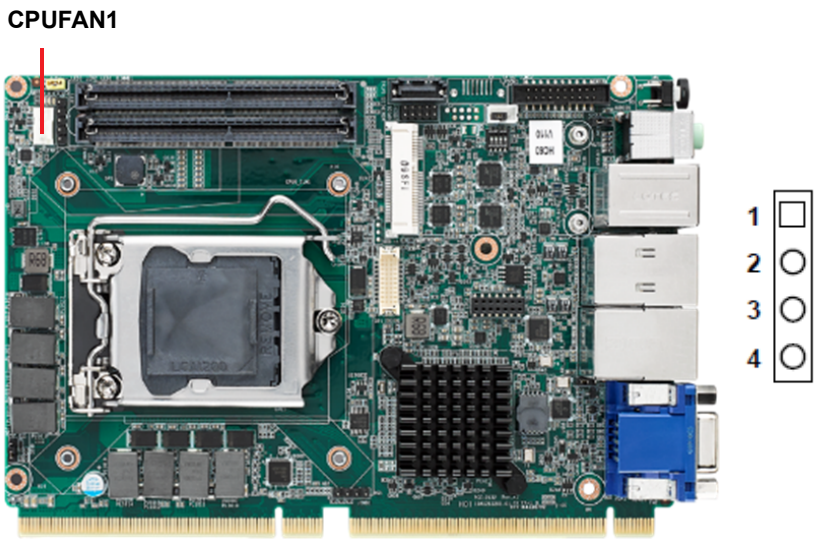
COM34 supports RS-232 only.

Table 2.6: RS-232 Serial Port (COM12)

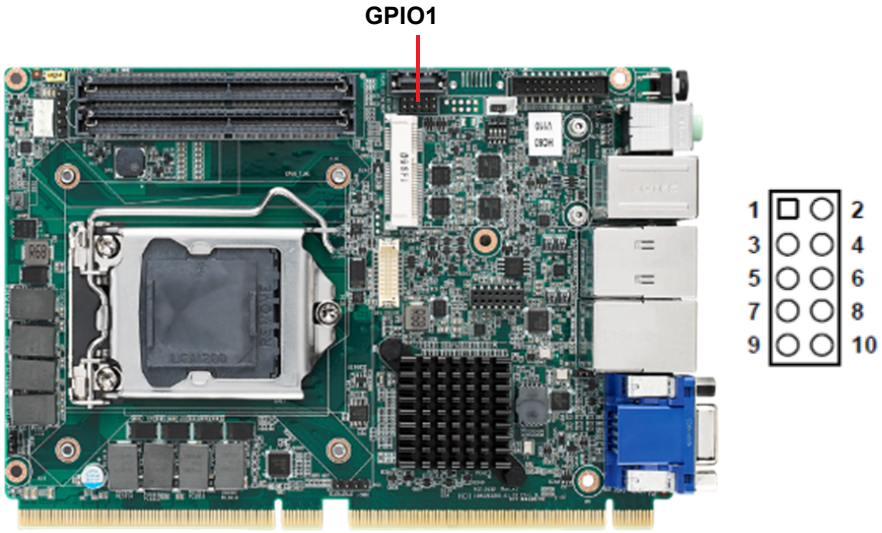
Pin	Signal	Pin	Signal
1	COM1_DCD	11	COM2_DCD
2	COM1_DSR	12	COM2_DSR
3	COM1_SIN	13	COM2_SIN
4	COM1_RTS	14	COM2_RTS
5	COM1_SOUT	15	COM2_SOUT
6	COM1_CTS	16	COM2_CTS
7	COM1_DTR	17	COM2_DTR
8	COM1_RI	18	COM2_RI
9	GND	19	GND
10	GND	20	GND

2.6 CPU Fan Connector (CPUFAN1)

This connector supports cooling fans, and it also supports smart fan control when using 4-pin or 3-pin cooler.



2.7 GPIO Header (GPIO1)

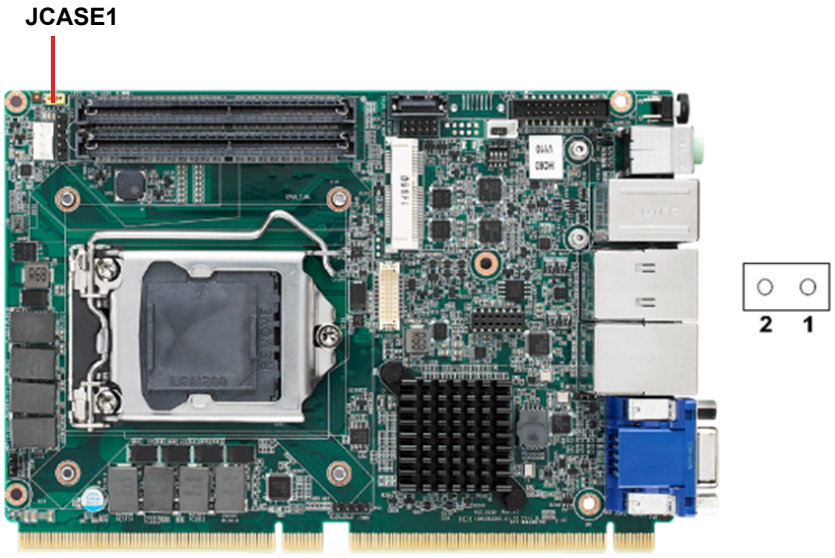


Provides 10-Pin pin header for 8-bit Digital I/O usage. Refer to Appendix B for detailed information on the pin assignments and programming guide in Appendix C.

Table 2.7: GPIO Header (GPIO1)

Pin	Signal
1	SIO_GPIO0
2	SIO_GPIO4
3	SIO_GPIO1
4	SIO_GPIO5
5	SIO_GPIO2
6	SIO_GPIO6
7	SIO_GPIO3
8	SIO_GPIO7
9	VCC_GPIO
10	GND

2.8 Case Open Connector (JCASE1)

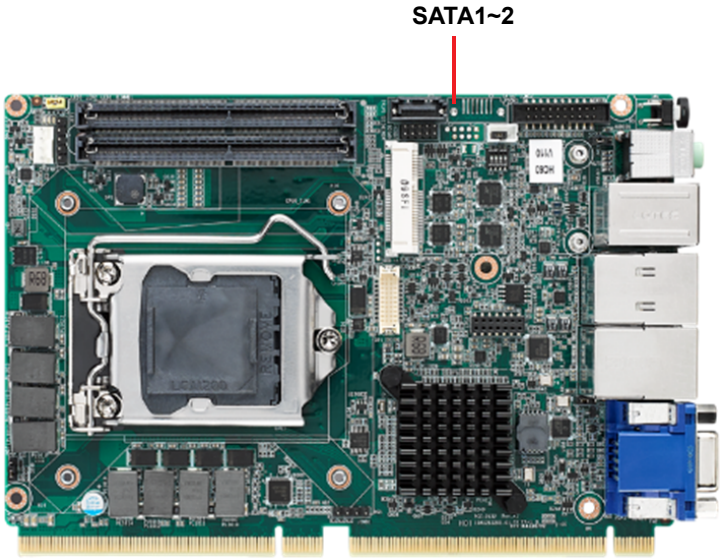


The 2-pin case open connector is for chassis with a case open sensor. When the case is open, the buzzer on motherboard will beep.

Table 2.8: JCASE1

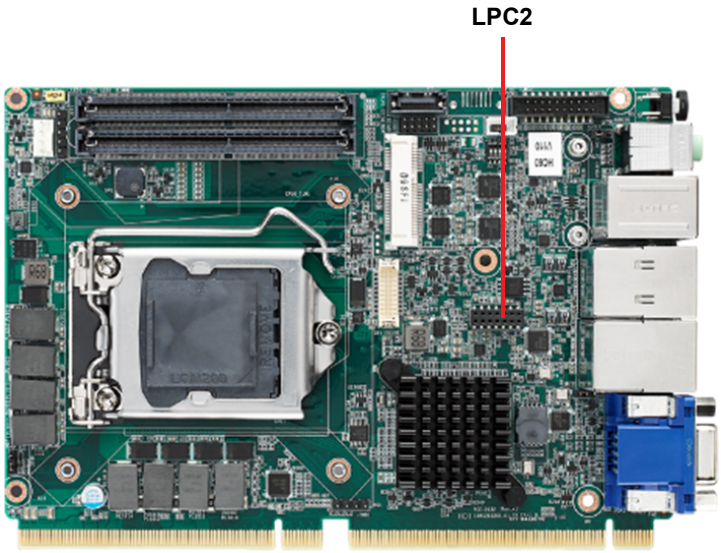
Pin	Signal
1	CASEOP#
2	GND

2.9 Serial ATA Interface (SATA0~SATA3)



PCE-2032/2132 features serial ATA 3.0 interface for storage devices. 2 additional SATA ports are routing to backplane via gold finger.

2.10 LPC Extension Interface (LPC2)



LPC2 is a 14-pin female pin header for implementing Advantech LPC modules such as PCA-COM232, PCA-COM485, PCA-TPM.

Note! *When setting PCA-COM485 to RS-422 mode, BIOS auto-flow control needs to be set to disable.*

Chapter 3

AMI BIOS Setup

3.1 Introduction

With the AMI BIOS Setup program, you can modify BIOS settings and control the special features of your computer. The Setup program uses a number of menus for making changes and turning the special features on or off. This chapter describes the basic navigation of the PCE-2032/2132 setup screens.

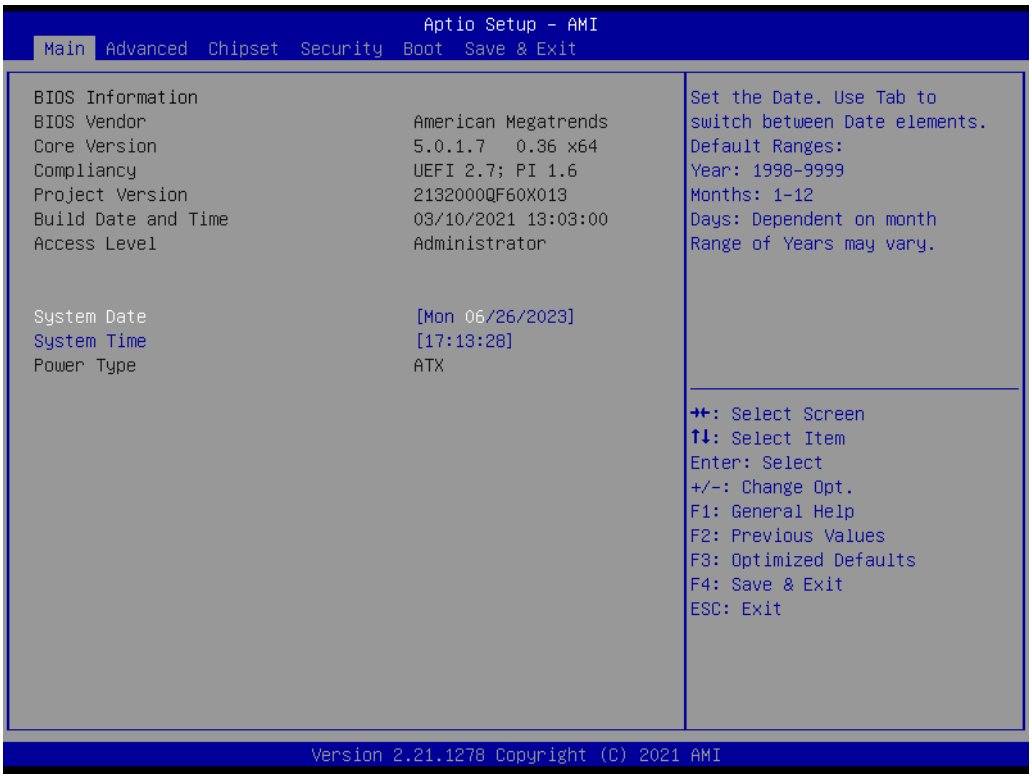


Figure 3.1 Setup Program Initial Screen

3.2 Entering Setup

Upon powering up your computer, the BIOS is automatically activated. You can initiate the setup program by pressing either the "DEL" or "ESC" key.

Note! *If the message disappears before you press the "DEL" or "ESC" key, please restart the computer and try again.*

3.2.1 Main Setup

Upon entering the BIOS Setup Utility, you'll be directed to the Main setup screen. You can easily return to this screen by selecting the Main tab. This section elaborates on the two Main Setup options, which are as follows:

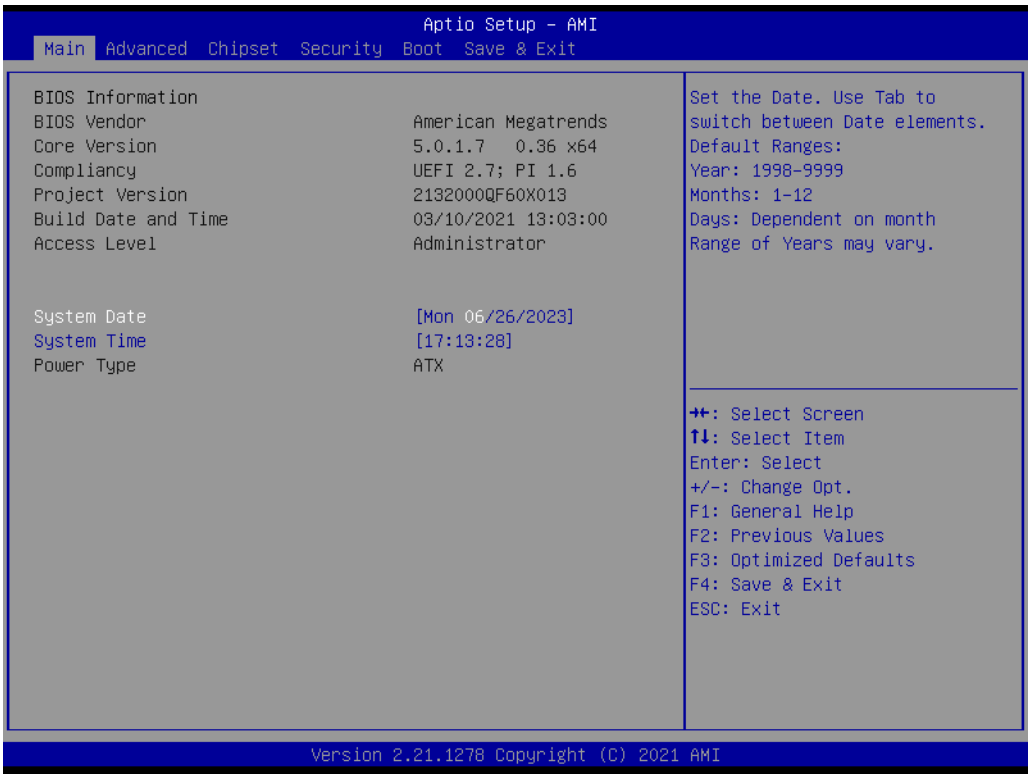


Figure 3.2 Main Setup Screen

The Main BIOS setup screen comprises two key sections. The left frame showcases all configurable options, with grayed-out options indicating non-configurable settings, while blue options signify adjustable ones. The right frame provides the key legend.

Above the key legend, an area is designated for text messages. When an option is selected in the left frame, it appears in white, often accompanied by descriptive text. The following options are covered:

.

- **System Time/System Date**

  System Time/System Date: Use this option to modify the system time and date. Navigate through System Time or System Date using the <Arrow> keys. Input new values via the keyboard and switch between fields using the <Tab> or <Arrow> keys. The date format should be MM/DD/YY, while the time format should be HH:MM:SS.

- **Power Type**
  Choose this item correspond with your power supply type.

3.2.2 Advanced BIOS Features Setup

Access the Advanced BIOS Setup screen by selecting the Advanced tab. In the left frame, you can choose any item, such as CPU Configuration, to navigate to its sub-menu. By highlighting an option using the <Arrow> keys, you can reveal an Advanced BIOS Setup option. This section comprehensively describes all Advanced BIOS Setup options. Below is the Advanced BIOS Setup screen, with subsequent pages detailing submenus.

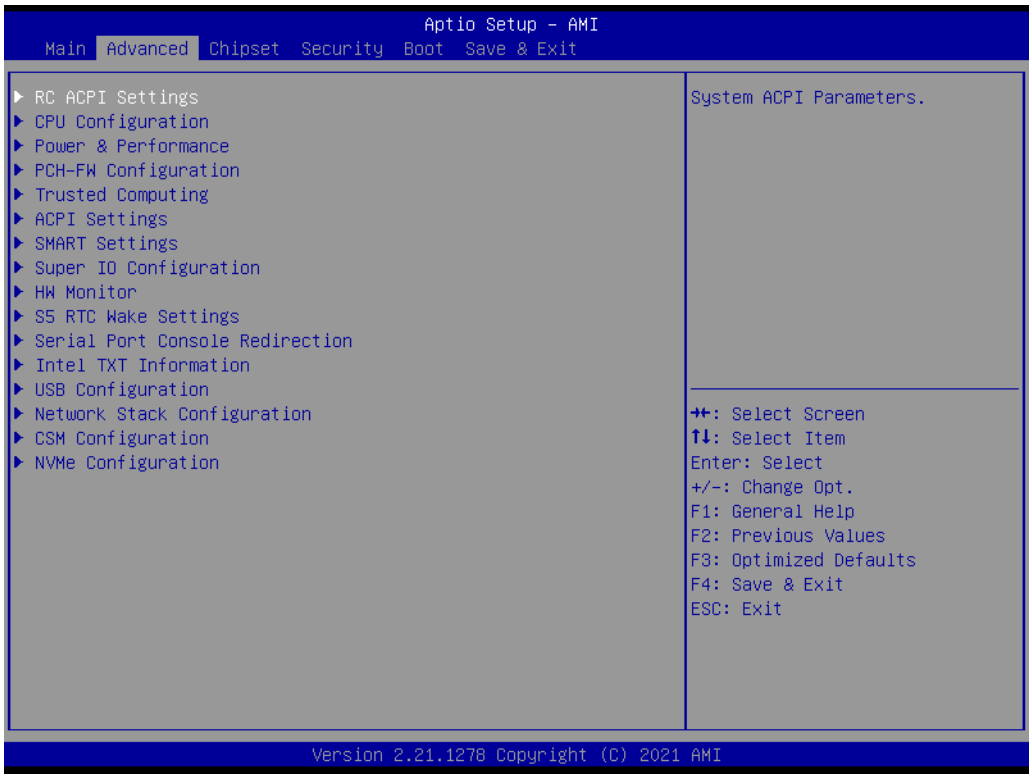


Figure 3.3 Advanced BIOS Features Setup

3.2.2.1 RC ACPI Settings

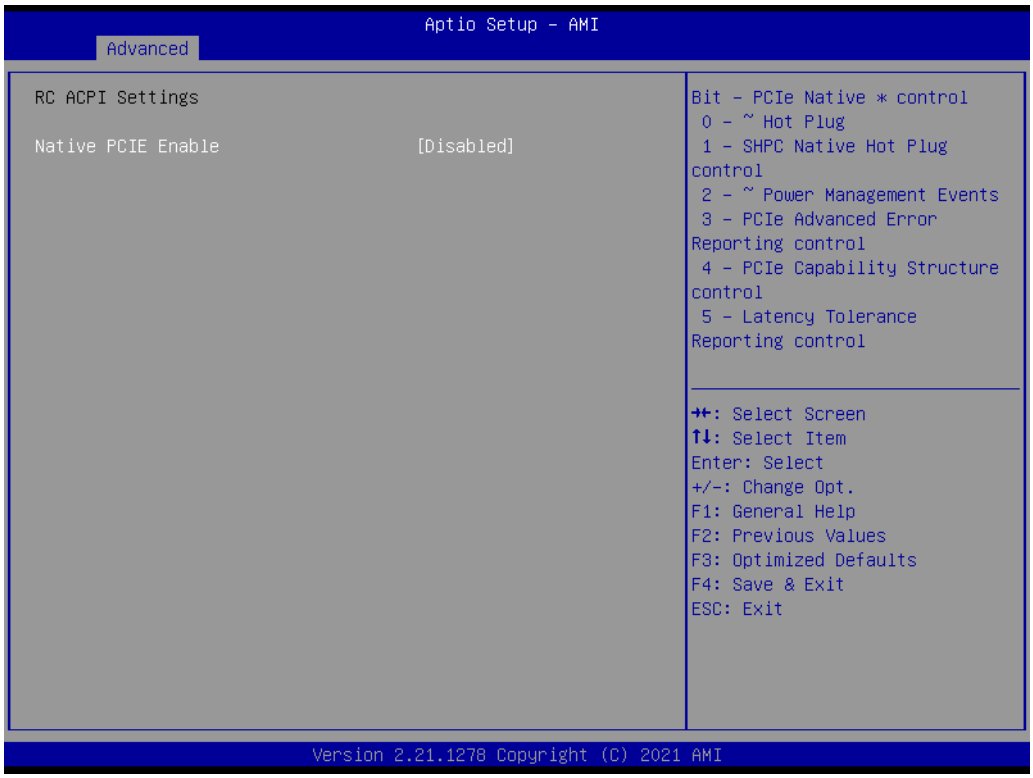


Figure 3.4 RC ACPI Settings

- **RC ACPI Settings**
  This setting allows you to enable Native PCIE.

3.2.2.2 CPU Configuration

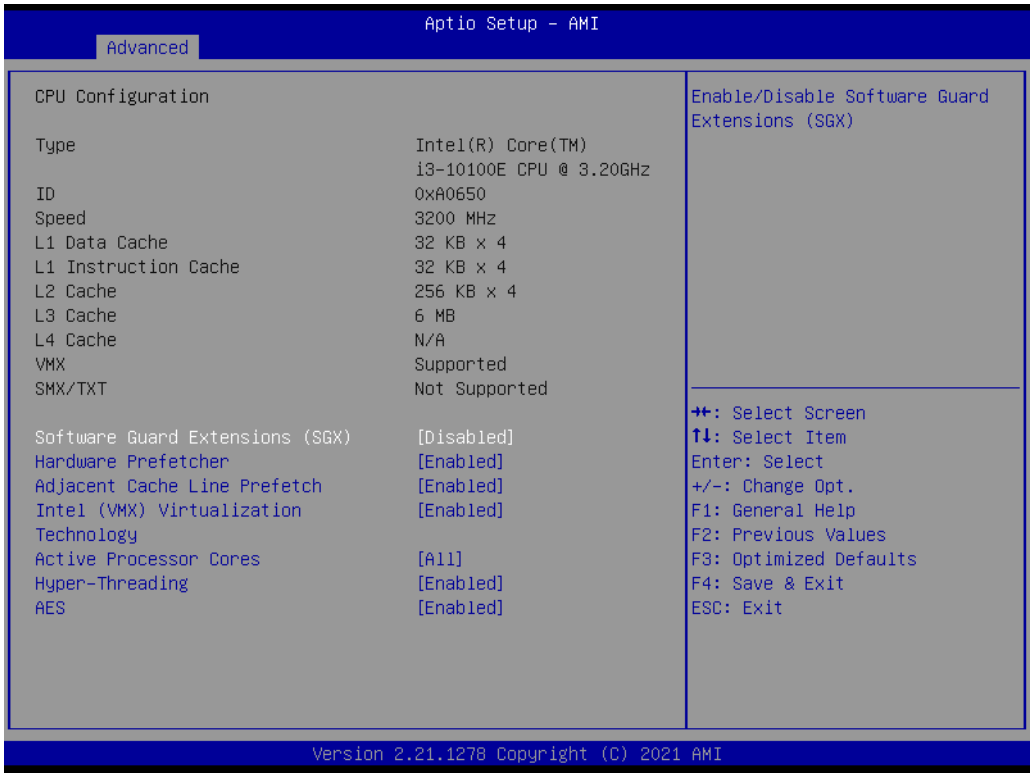
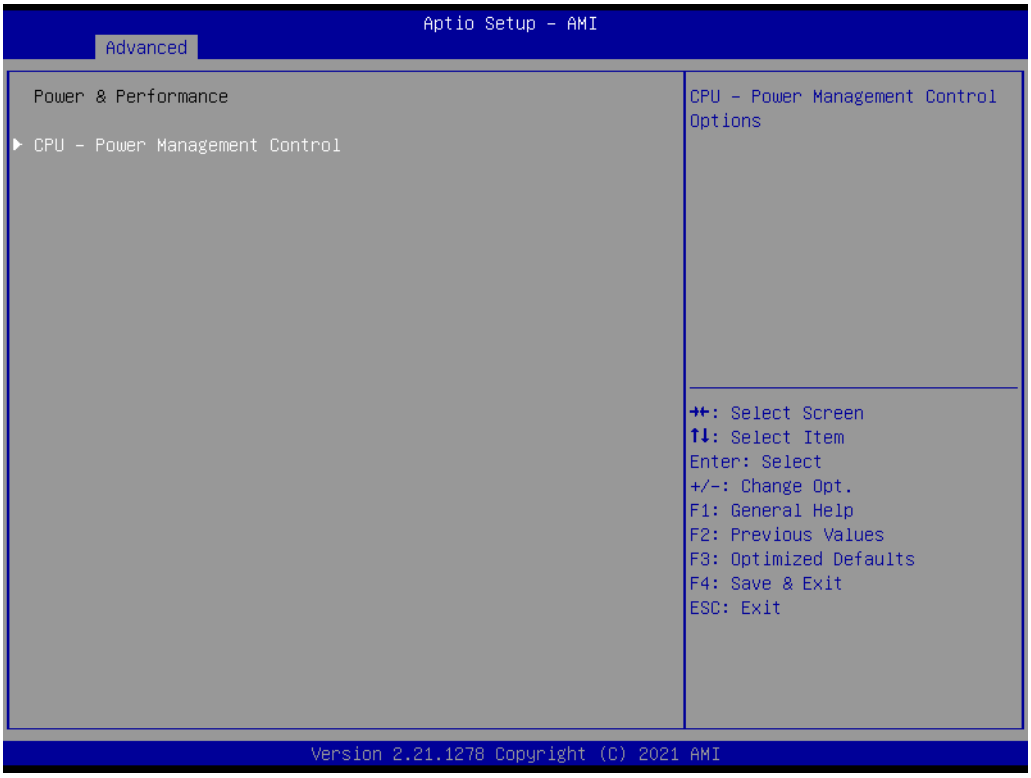


Figure 3.5 CPU Configuration

- **Software Guard Extensions (SGX)**
  Enable or disable Software Guard Extensions (SGX).
- **Hardware Prefetcher**
  Enable or disable the MLC streamer prefetcher on/off.
- **Adjacent Cathe Line Prefetch**
  Enable or disable the prefetching of adjacent cache lines.
- **Intel (VMX) Virtualization Technology**
  When enabled, a VMM can utilize additional hardware capabilities provided by Vanderpool Technology.
- **Hyper-Threading**
  Enable or disable Hyper-Threading Technology.
- **AES**
  Enable or disable AES (Advanced Encryption Standard).
- **Intel Trusted Execution Technology**
  Enables the use of additional hardware capabilities provided by Intel Trusted Execution Technology. Note that changes require a full power cycle to take effect.

3.2.2.3 Power & Performance



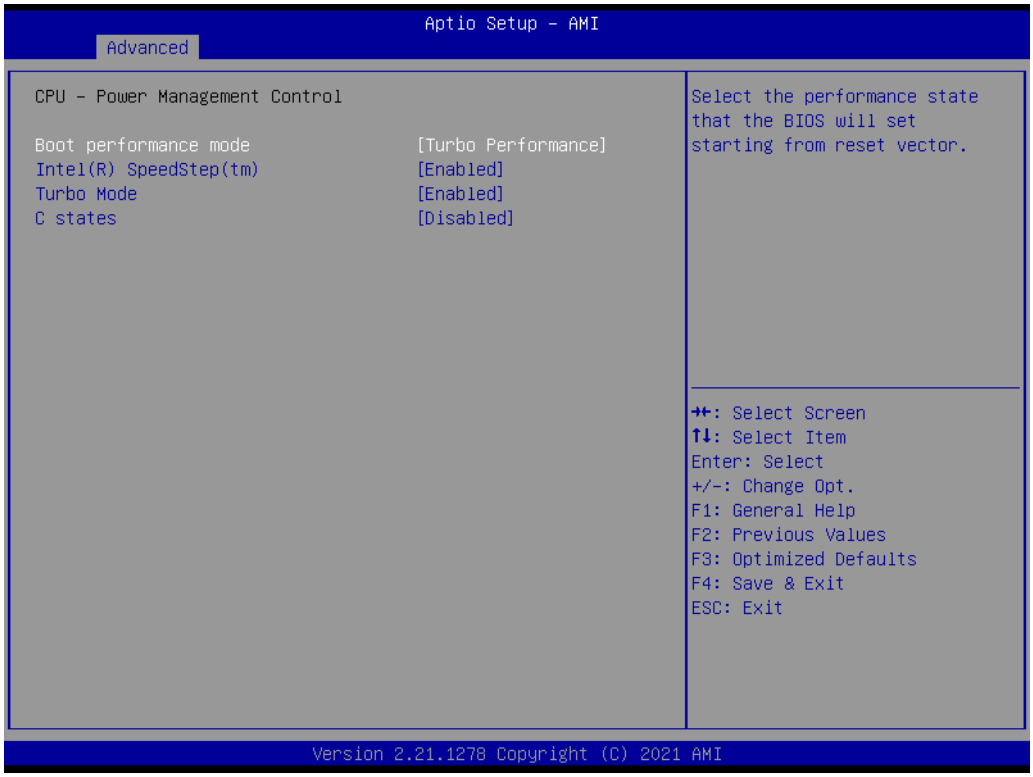


Figure 3.6 Power & Performance

Under Power & Performance, you can configure the following options:

- Boot Performance
  Choose the performance state that the BIOS will set before OS handoff.
- Intel® Speedstep™
  Allows support for more than two frequency ranges.
- Turbo Mode
  Enable or disable processor turbo mode on or off.
- C states
  Configure Intel® C states settings for power saving, with a suggestion to enable it for ErP.

3.2.2.4 PCH-FW Configuration

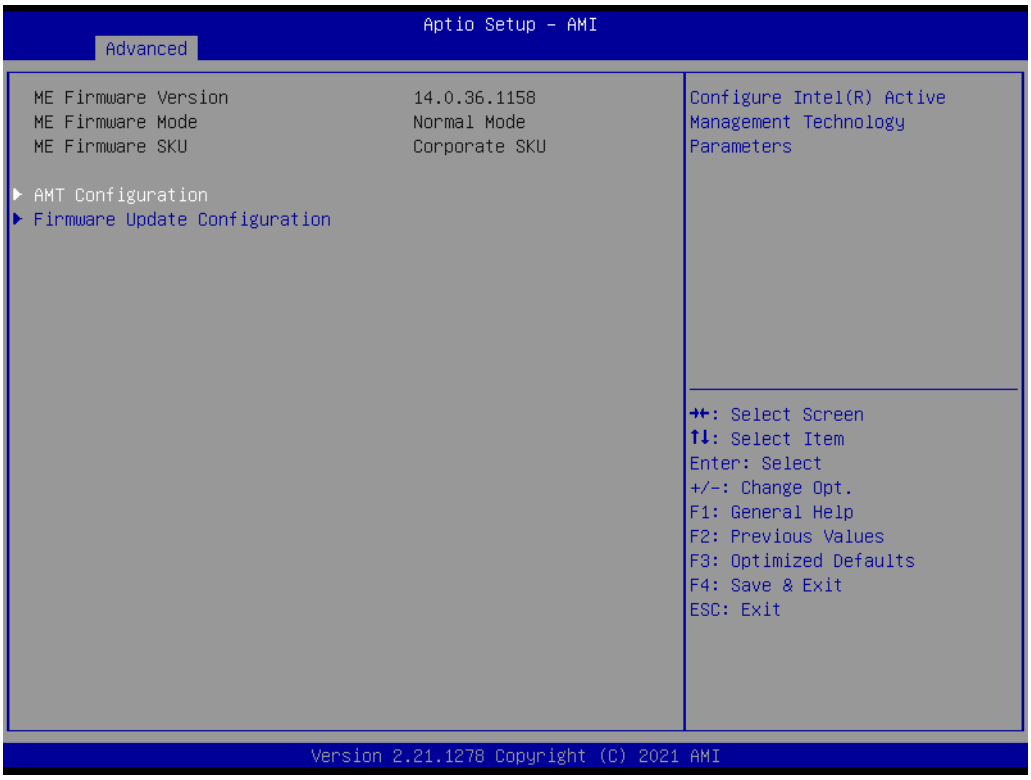
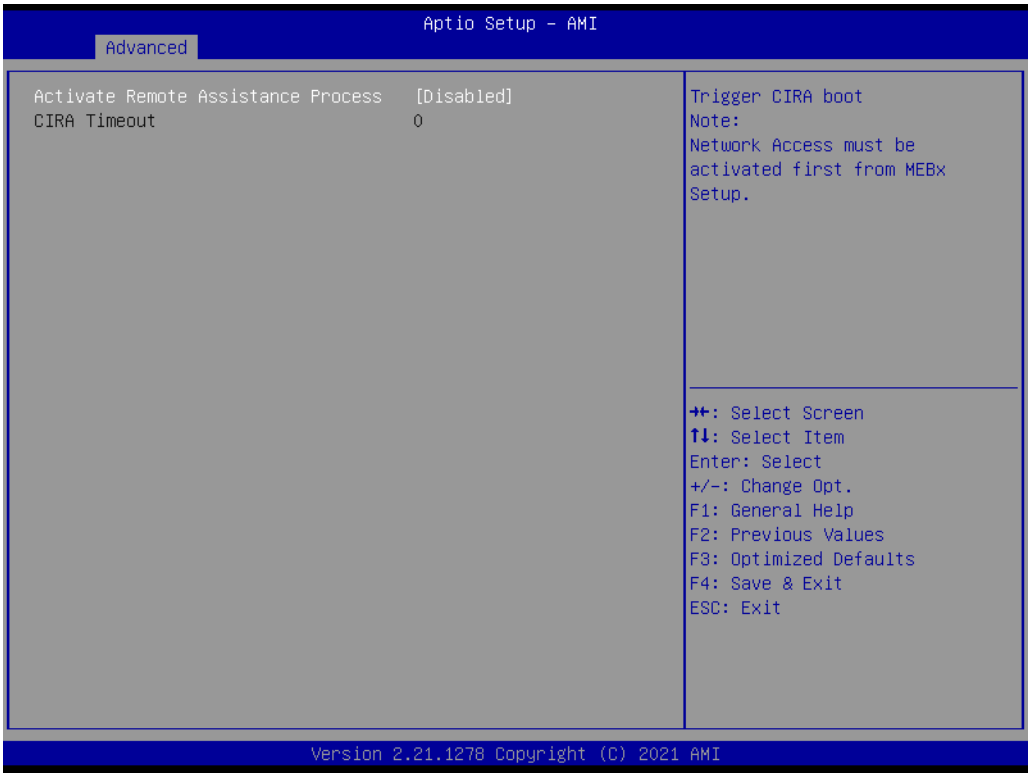
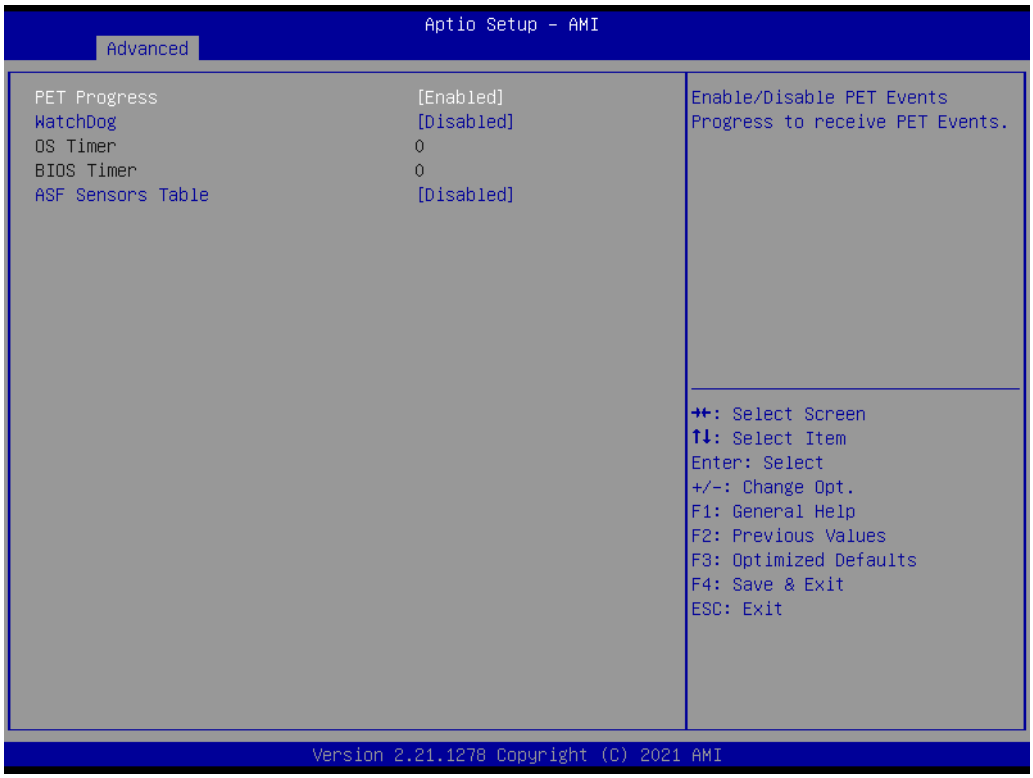


Figure 3.7 PCH-FW Configuration

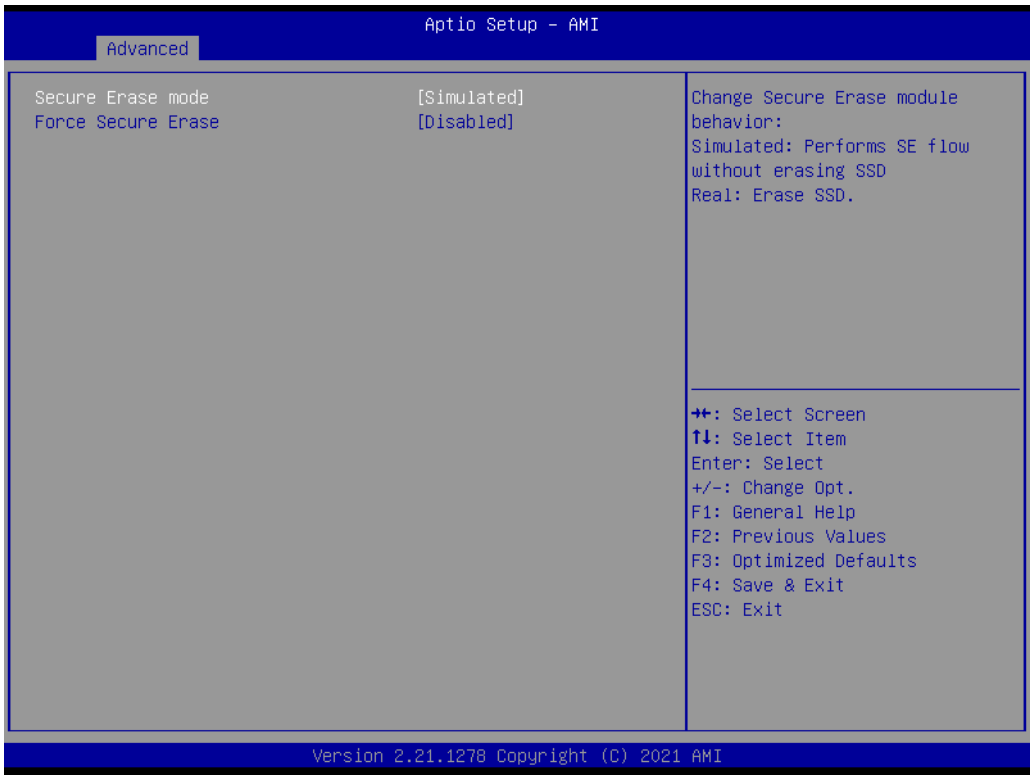
- **CIRA Configuration**



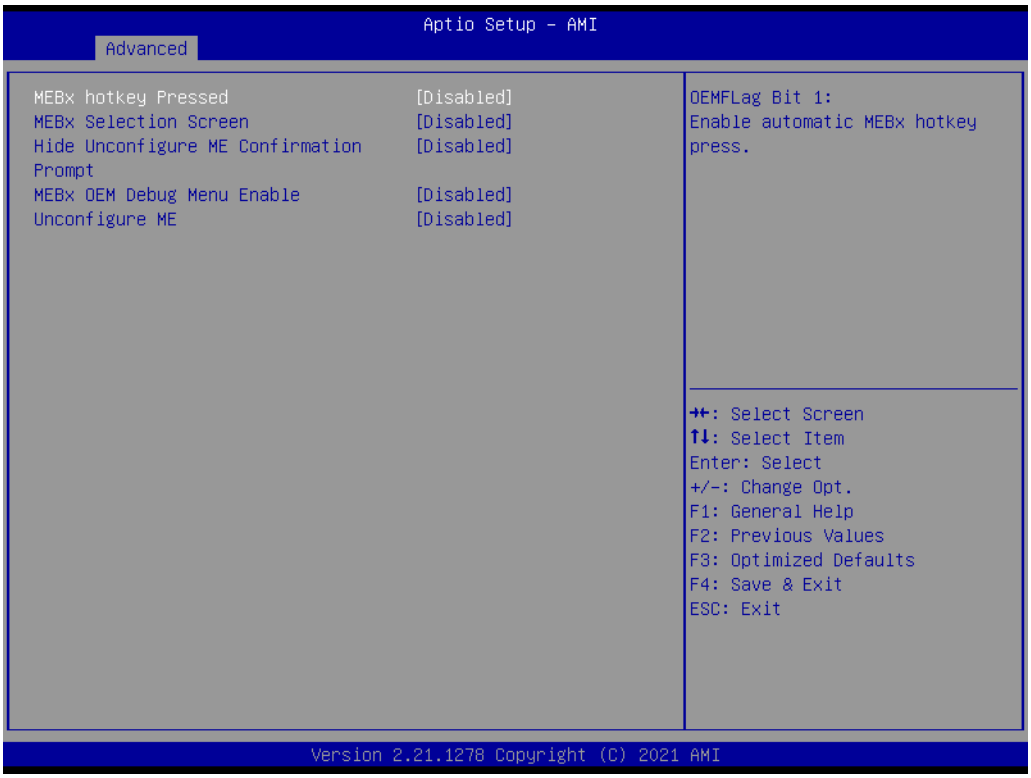
- **ASF Configuration**



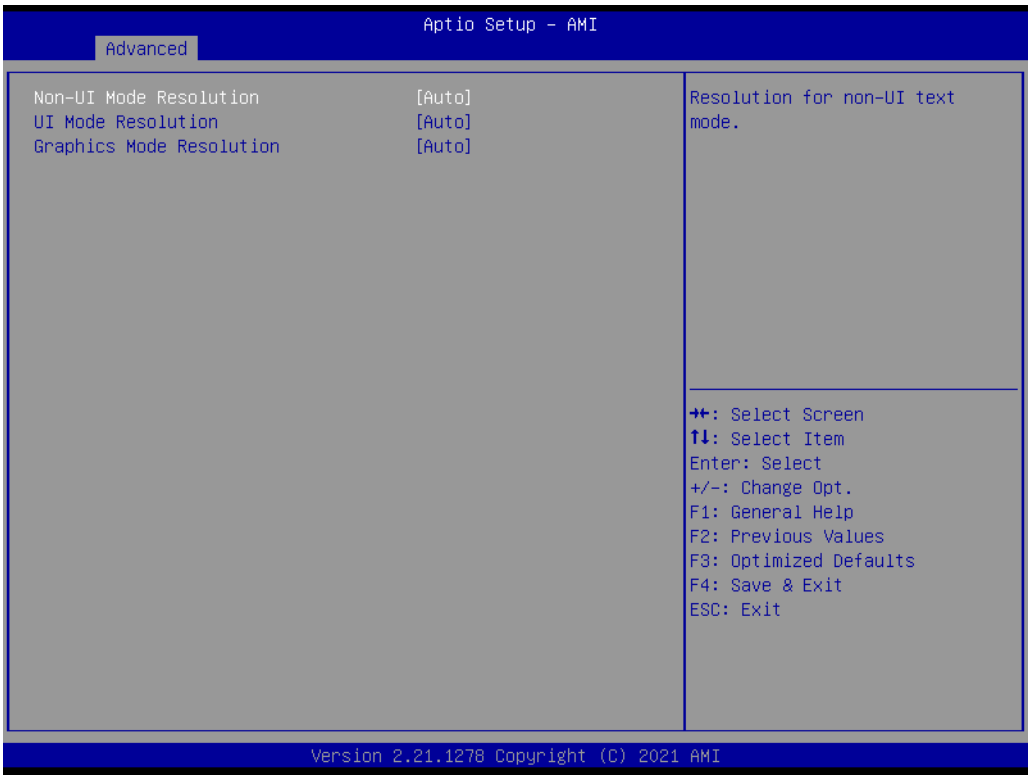
- **Secure Erase Configuration**



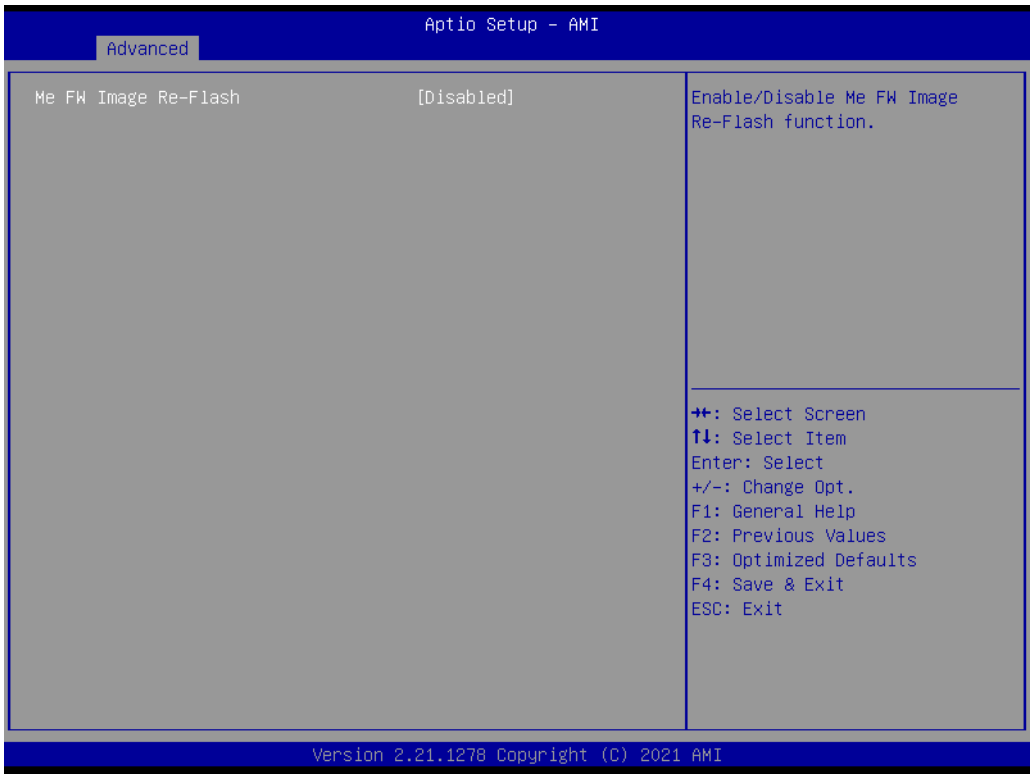
- **OEM Flags Settings**



- **MEBx Resolution Settings**



- **Firmware Update Configuration**



3.2.2.5 Trusted Computing

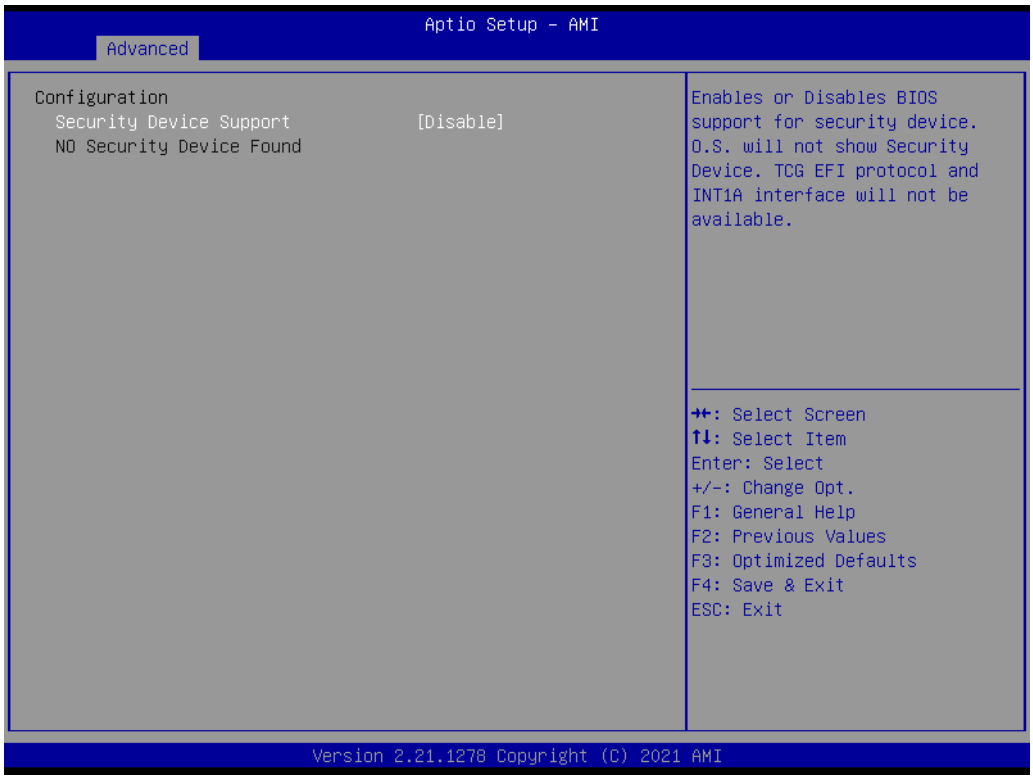
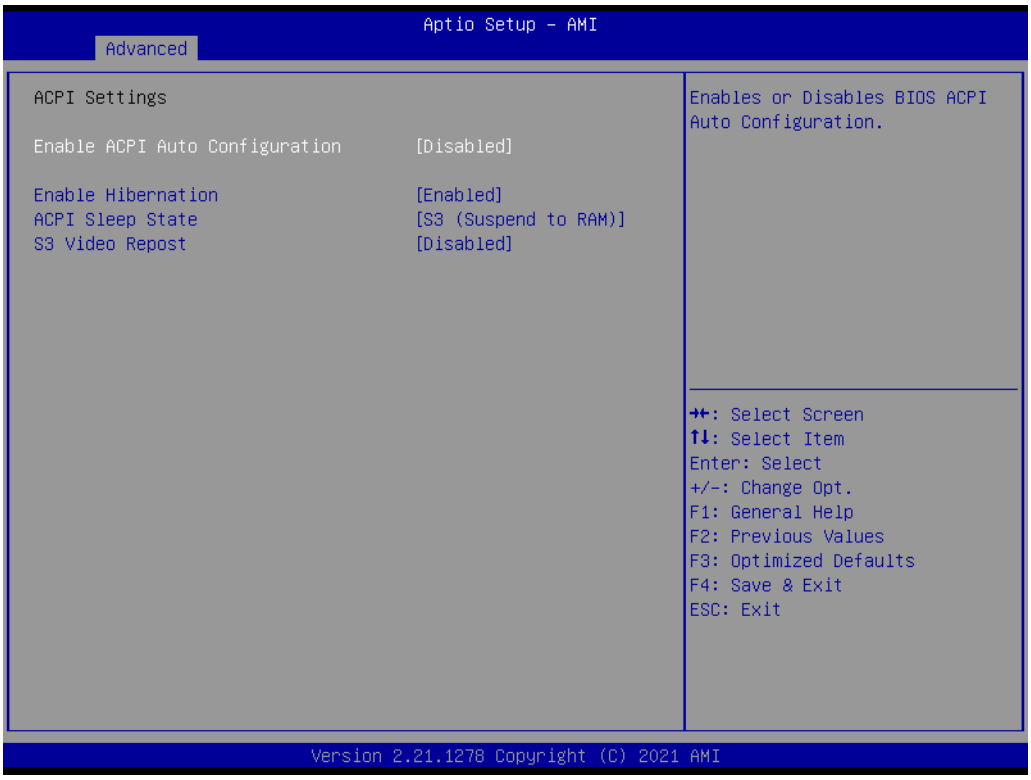


Figure 3.8 Trusted Computing

3.2.2.6 ACPI Settings



Under ACPI Settings, you can manage the following options:

- **Enable ACPI Auto Configuration**
  Enable or disable BIOS ACPI Auto Configuration.
- **Enable Hibernation**
  Enable or disable the system's ability to hibernate (OS/S4 Sleep State). Please note that this option may not be effective with certain operating systems.
- **S3 Video Repost**
  Enable or disable S3 Video Repost.

3.2.2.7 SMART Settings

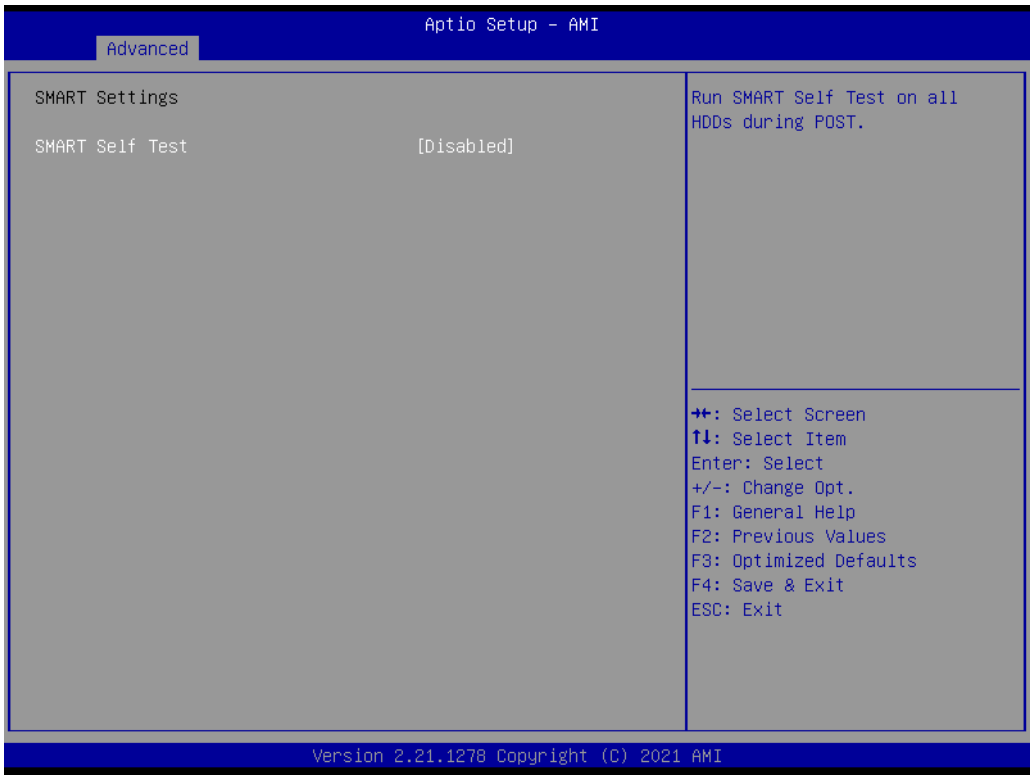
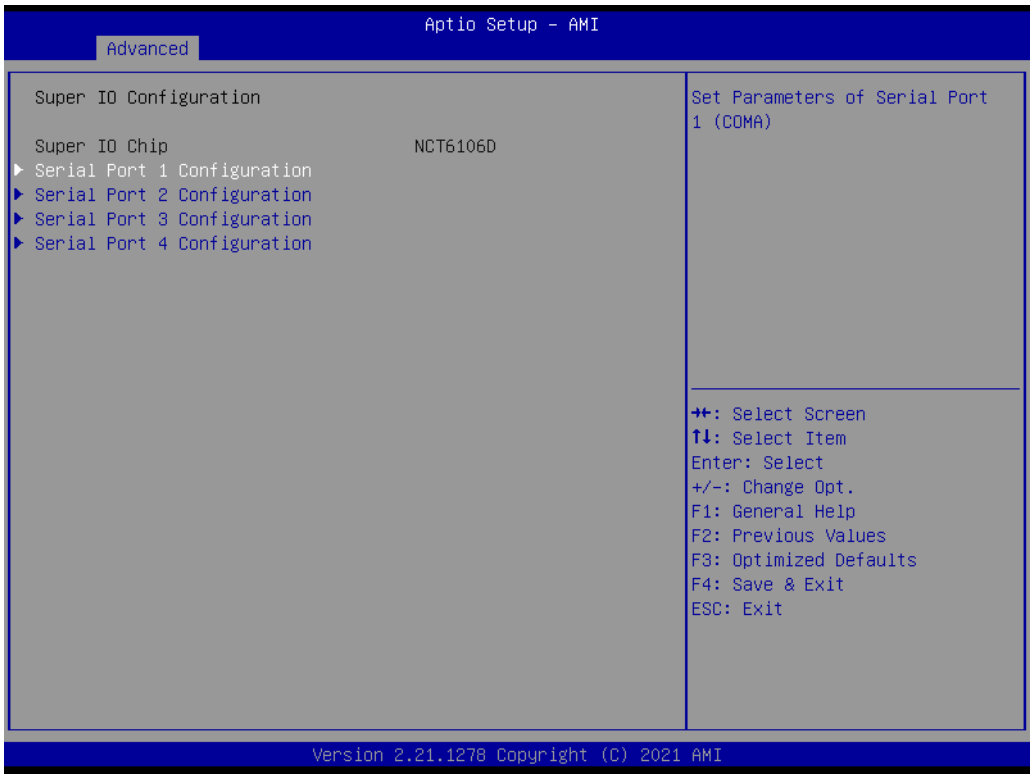


Figure 3.9 SMART Settings

- **SMART Self Test**
  You can choose to run Run SMART Self Test on all HDDs during POST.

3.2.2.8 Super IO Configuration



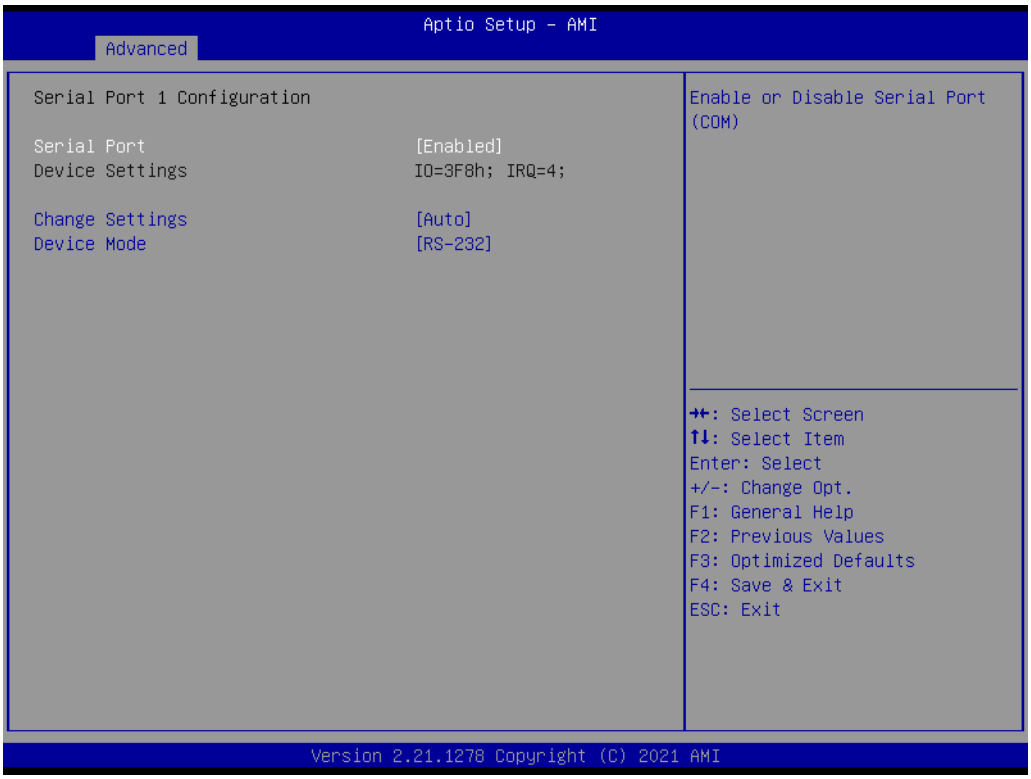
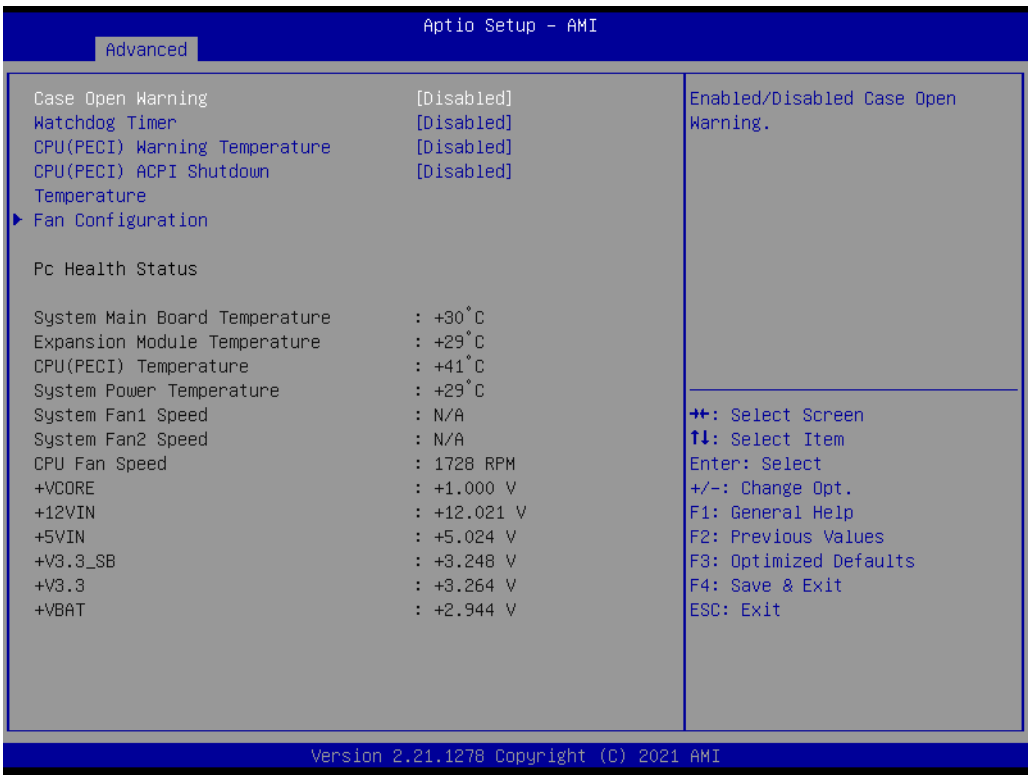


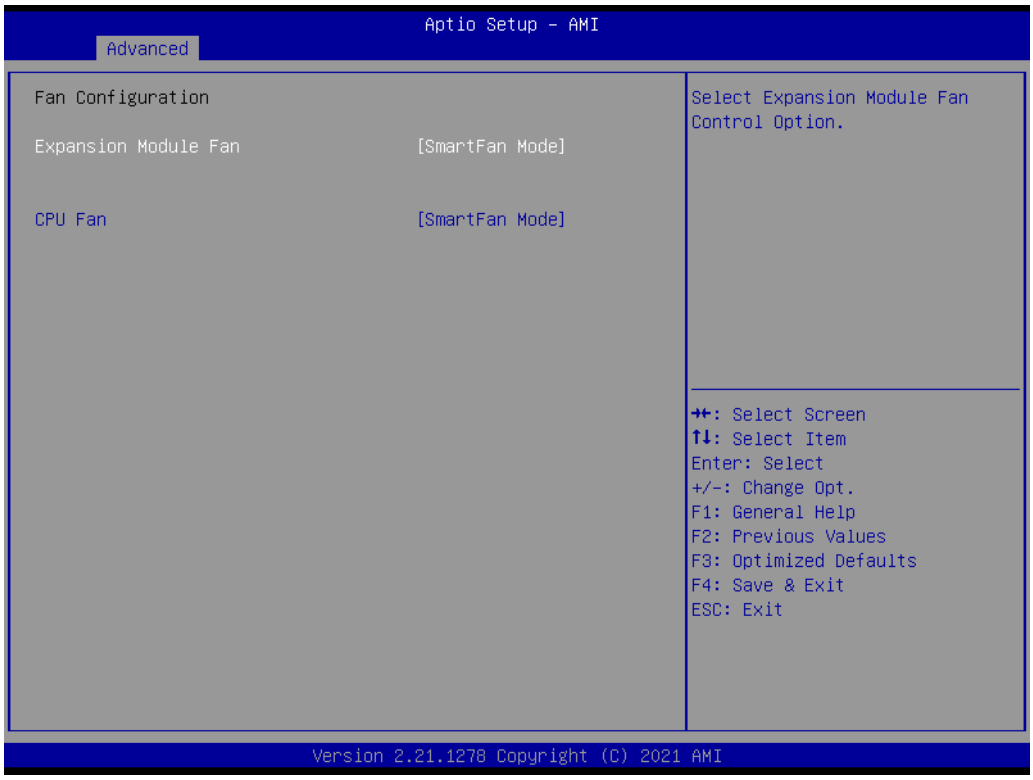
Figure 3.10 Super IO Configuration

- **Serial Port 1 Configuration**
  Sets Parameters of Serial Port 1 (COMA).
- **Serial Port 2 Configuration**
  Sets Parameters of Serial Port 2 (COMB).

3.2.2.9 HW Monitor



Fan Configuration



- **CPU Warning Temperature**
  Sets CPU warning temperature.
- **ACPI Shutdown Temperature**
  Sets ACPI shutdown temperature.
- **CPUFAN1 Smartfan Setting**
  Fan configuration mode setting.

3.2.2.10 S5 RTC Wake Settings

Figure 3.11 S5 RTC Wake Settings

- **Wake system from S5**
  Enable or disable system wake on alarm event. Select FixedTime, system will wake on the hr:min:sec specified.
  Select DynamicTime, the system will wake on the current time + Increase minute(s).

3.2.2.11 Serial Port Console Redirection

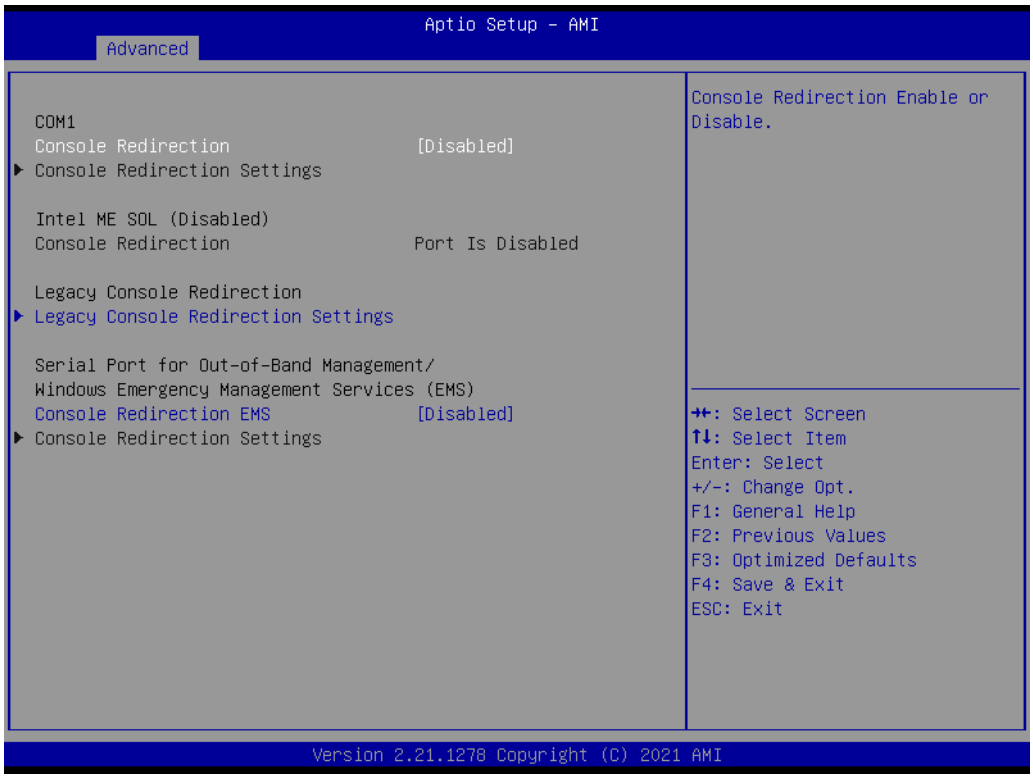
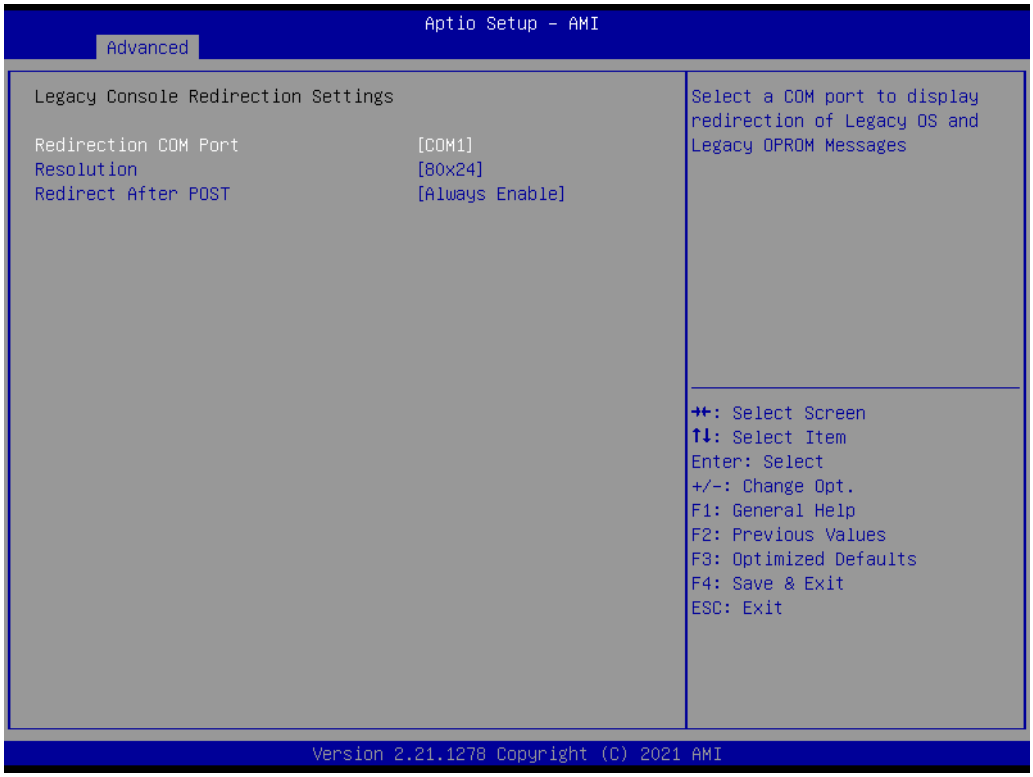


Figure 3.12 Serial Port Console Redirection

- **Console Redirection EMS**
  Enable or disable console redirection.
- **Legacy Console Redirection Settings**



3.2.2.12 Intel TXT Information

Figure 3.13 Intel TXT Information

3.2.2.13 USB Configuration

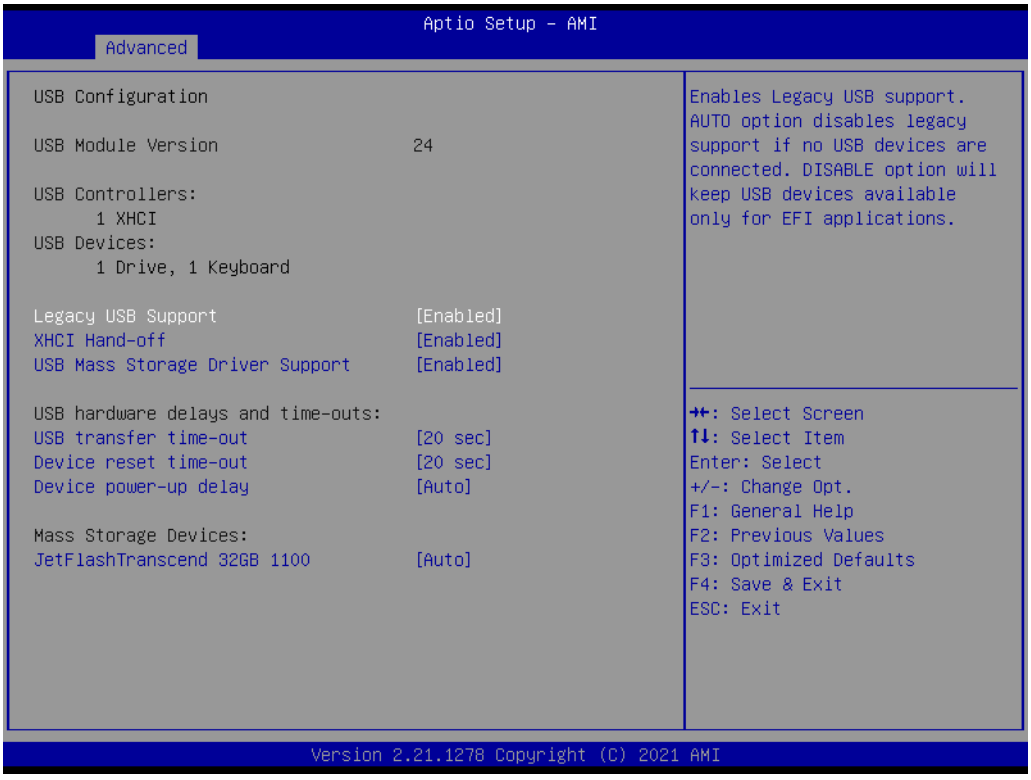


Figure 3.14 USB Configuration

- **XHCI Hand-off**
  This is a workaround for OS without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
- **USB Mass Storage Driver Support**
  Enable or disable USB mass storage driver support.
- **Device reset time-out**
  Timeout duration reset for executing a Start Unit command for a USB mass storage device.
- **Device power-up delay**
  Maximum time the device will take before it properly reports itself to the Host Controller. "Auto" uses default value: for a Root port it is 100 ms, for a Hub port the delay is taken from Hub descriptor.

3.2.2.14 Network Stack Configuration

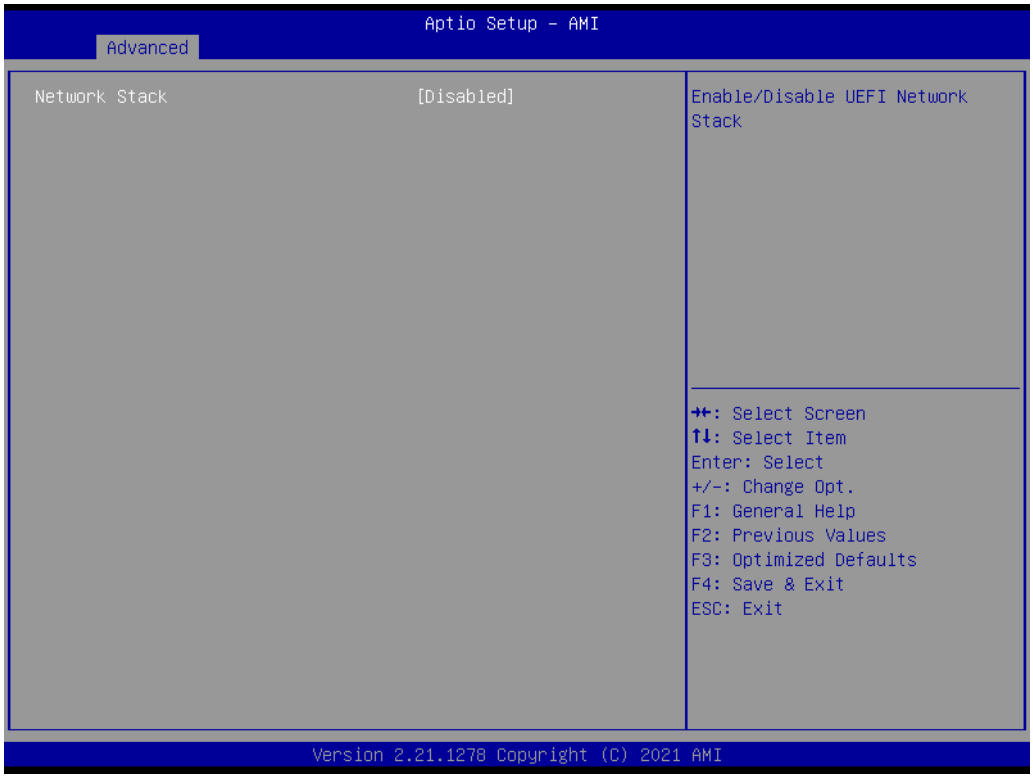


Figure 3.15 Network Stack Configuration

- **Network stack**
  Enable or disable UEFI Network Stack.

3.2.2.15 CSM Configuration

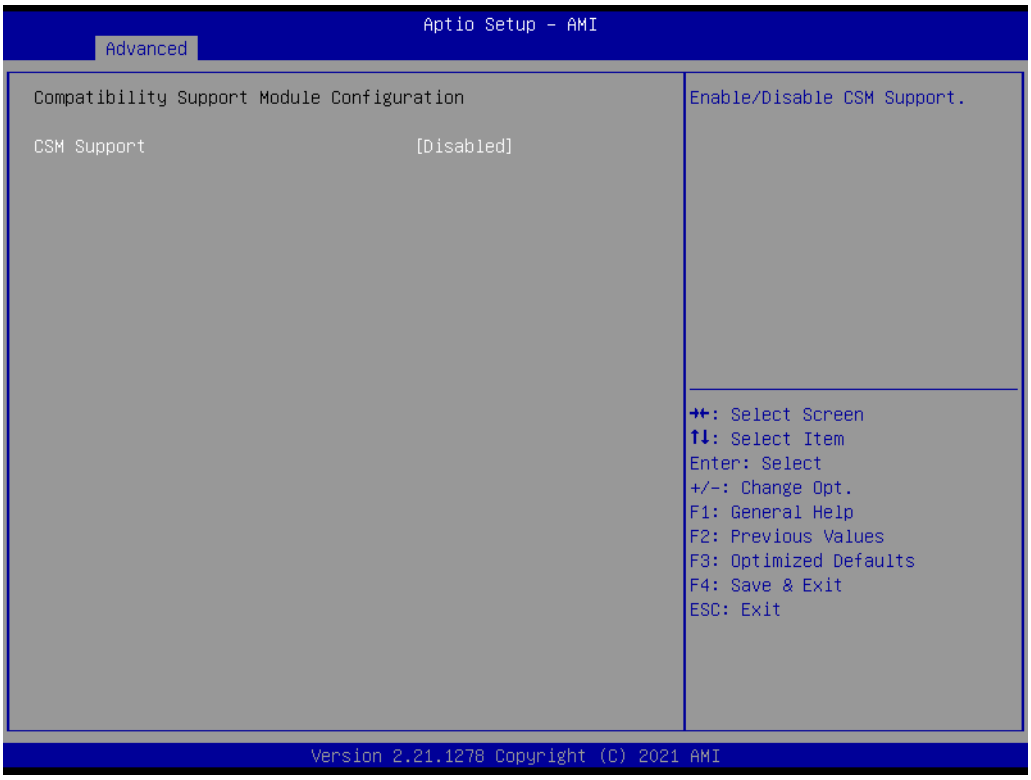


Figure 3.16 CSM Configuration

- **CSM**
  Enable or disable CSM Support.

3.2.2.16 NVME Configuration

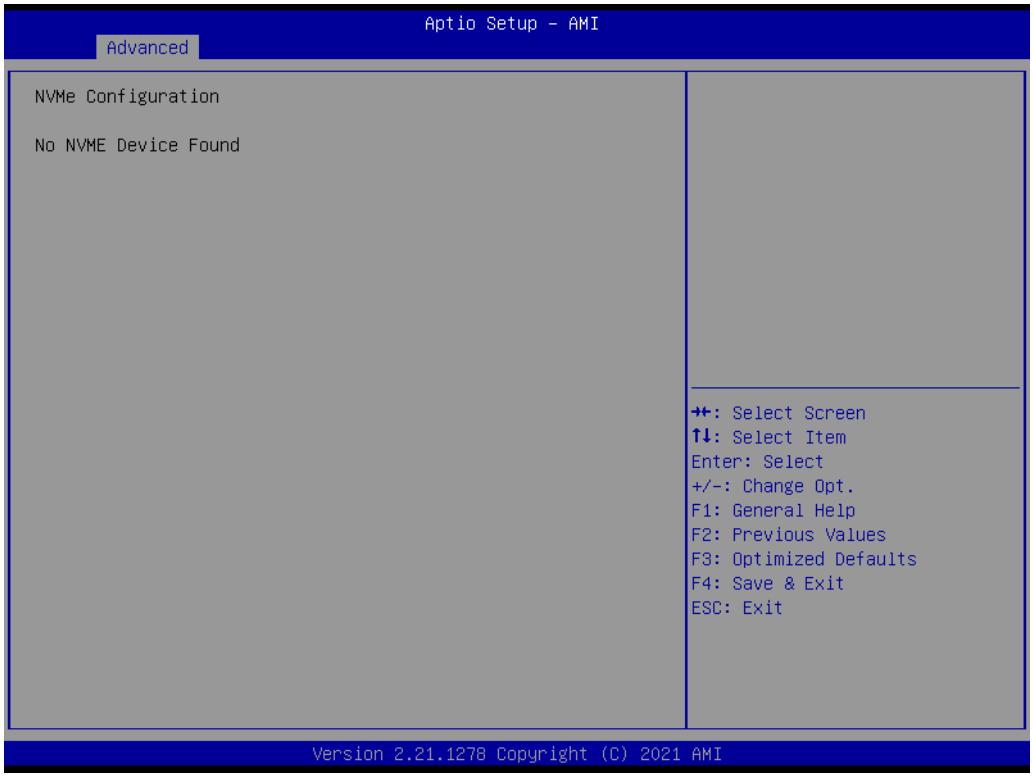


Figure 3.17 NVME Configuration

Note! Only PCE-2132 supports NVMe M.2 slot; PCE-2032 does not support this feature.

3.2.3 Chipset

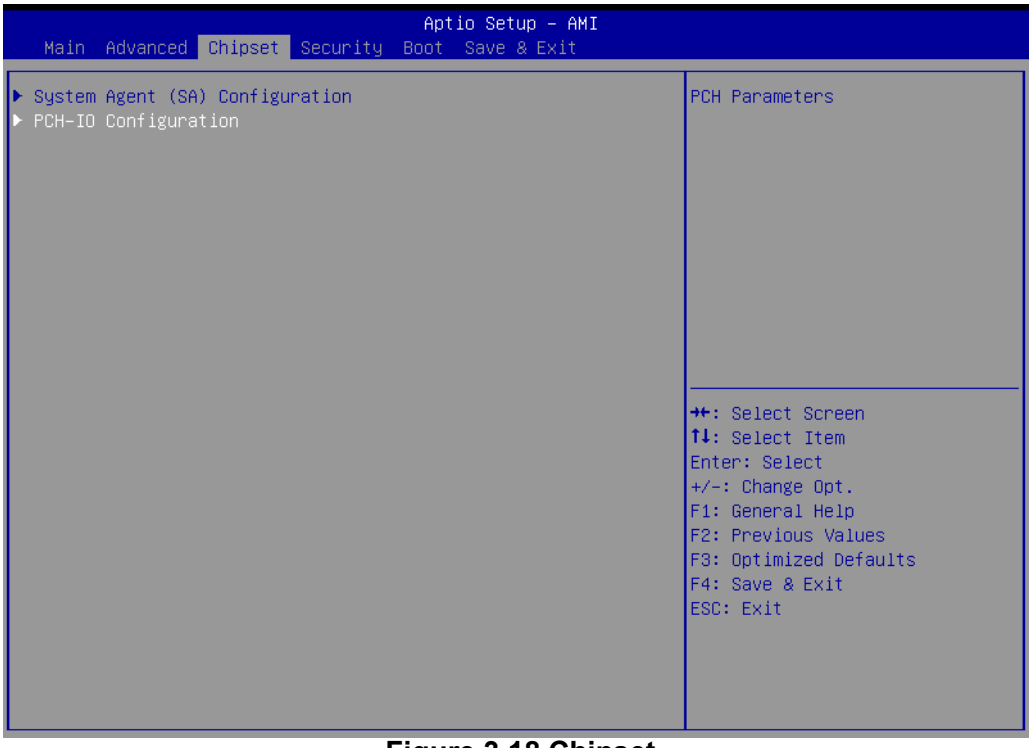


Figure 3.18 Chipset

3.2.3.1 System Agent (SA) Configuration

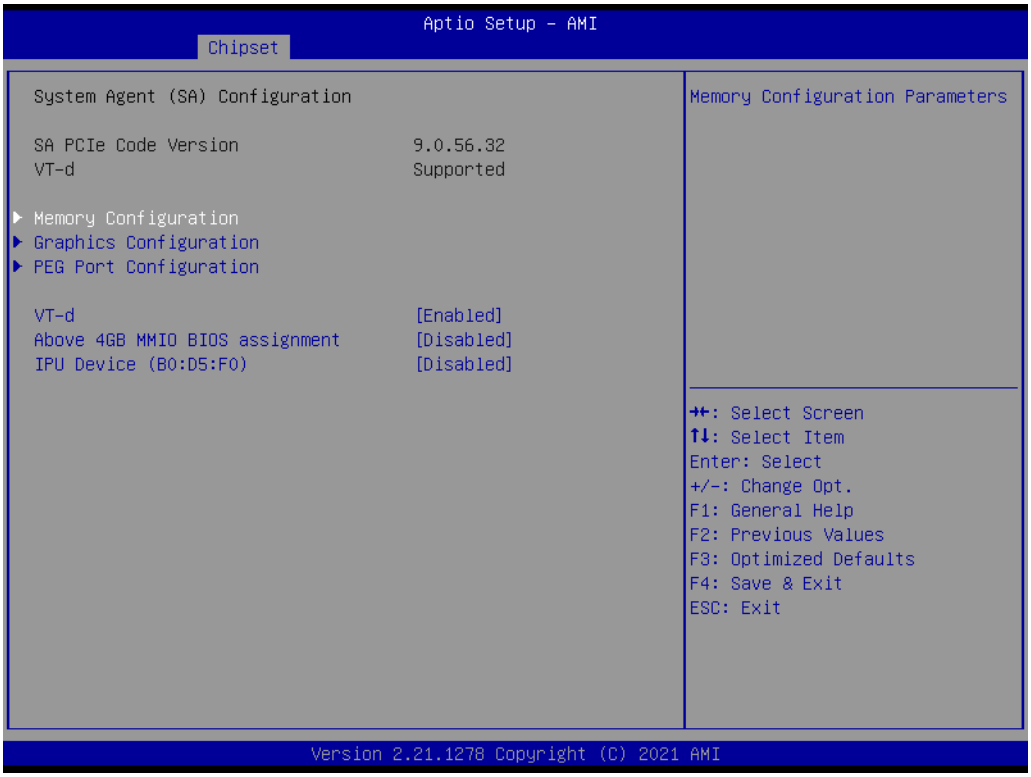
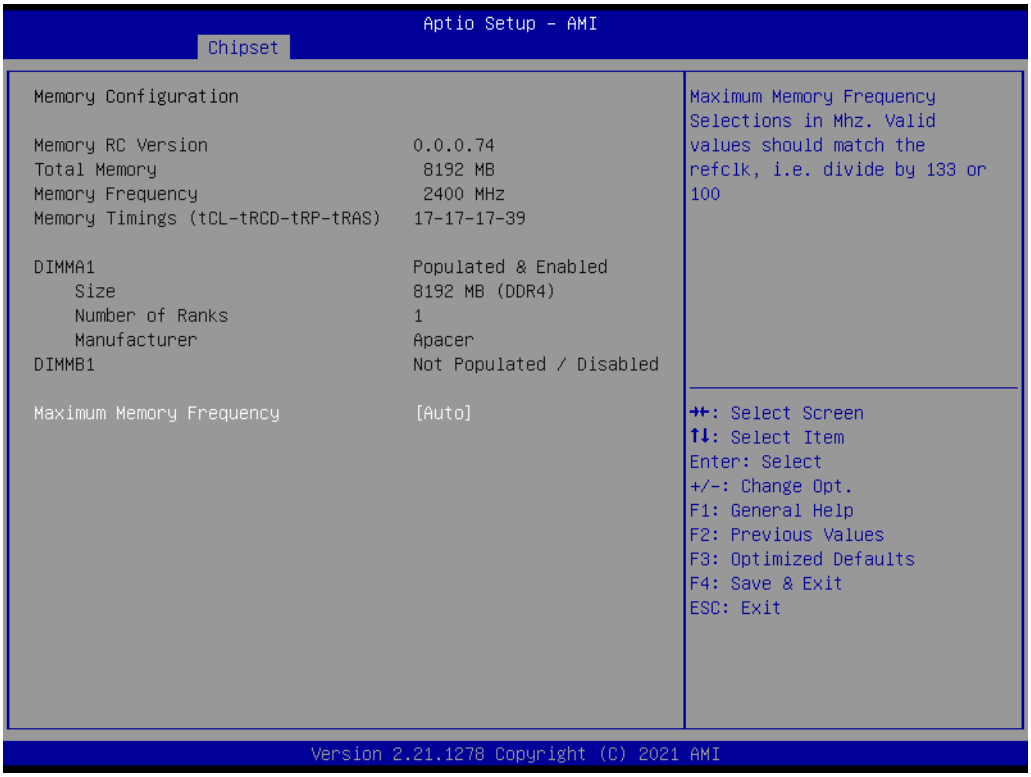
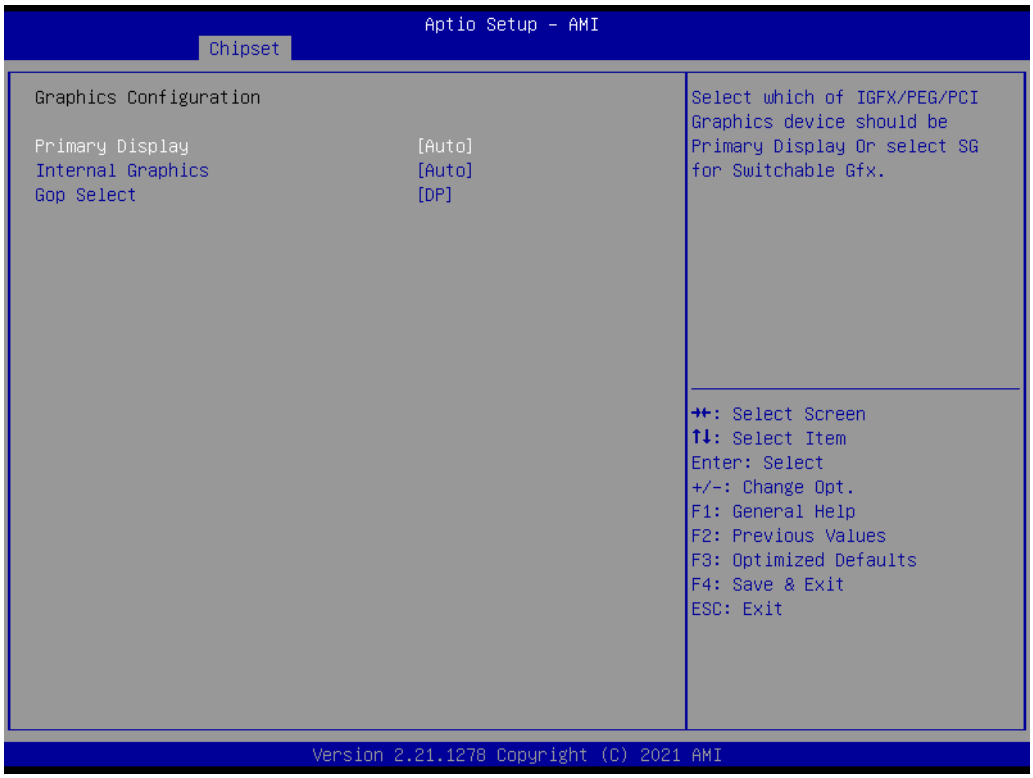


Figure 3.19 System Agent (SA) Configuration

- **VT-d**
  Check to enable VT-d function on MCH.
- **Memory Configuration**



3.2.3.2 Graphics Configuration



- **Primary Display**
  Select which of IGFX/PEG/PCI graphics device should be primary display or select SG for switchable Gfx.
- **Internal Graphics**
  Keep IGFX enabled based on the setup options.

3.2.3.3 PEG Port Configuration

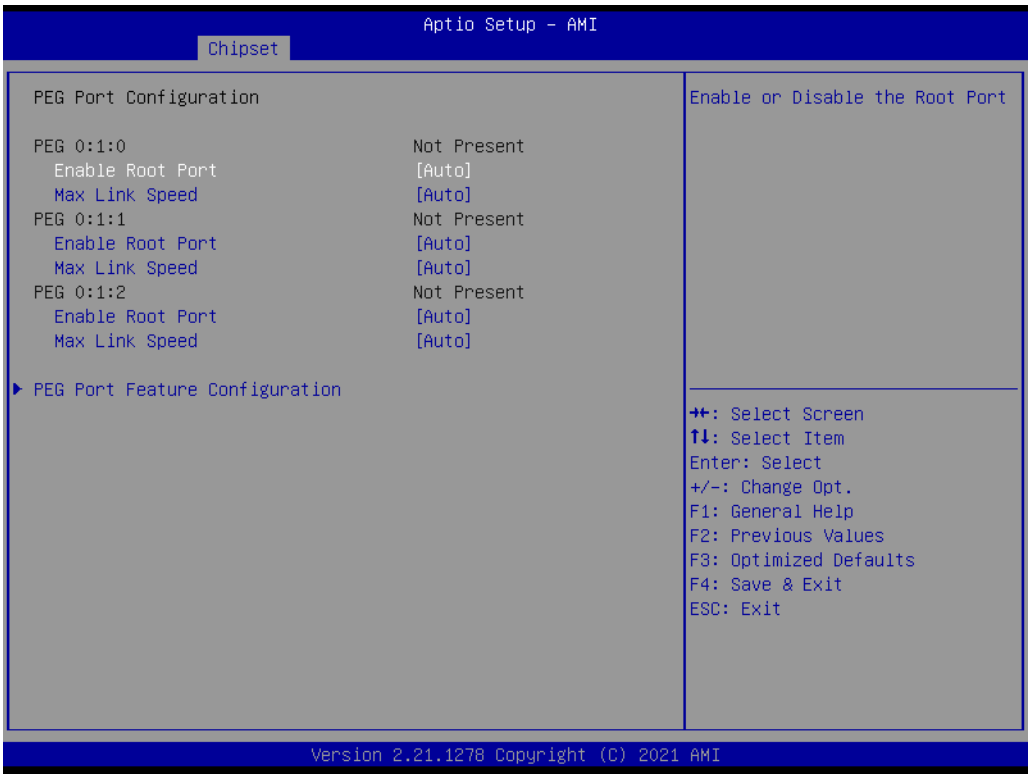
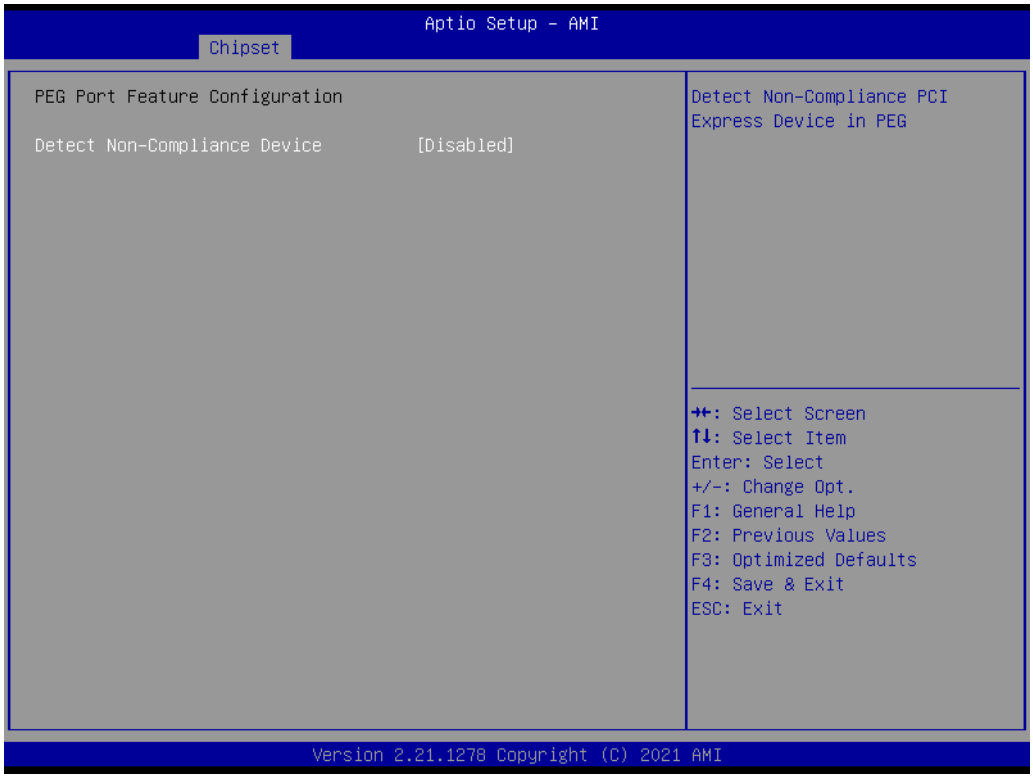


Figure 3.20 PEG Port Configuration

- **Enable Root Port**
  Enable or disable the root port.
- **Max Link Speed**
  Configure PEG 0:1:0 max speed.
- **Max Link Speed**
  Configure PEG 0:1:1 Max Speed.
- **Enable Root Port**
  Enable or disable the root port.
- **Max Link Speed**
  Configure PEG 0:1:2 max speed.
- **PEG Port Feature Configuration**
  PEG port feature configuration.
- **PEG Port Feature Configuration**



3.2.3.4 PCH-IO Configuration

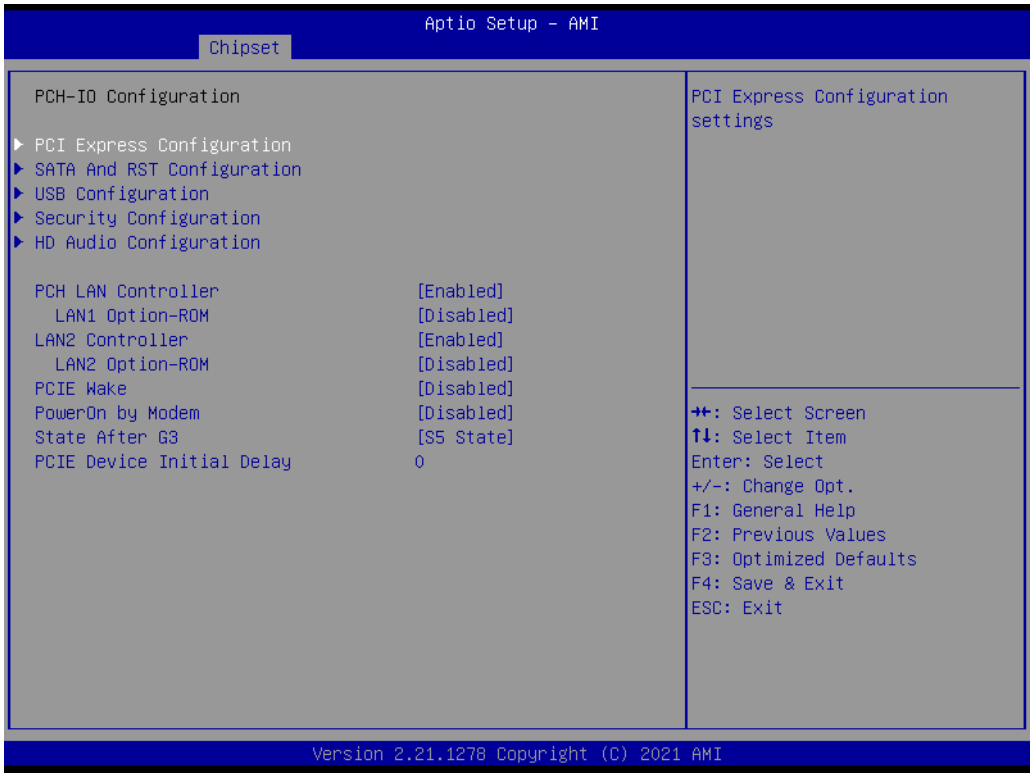


Figure 3.21 PCH IO Configuration

- **LAN1 Controller**
  Enable or disable LAN1 controller on or off.
- **LAN1 Option-ROM**
  Enable or disableLAN1 boot option for legacy network devices on or off.

- **LAN2 Controller**
  Enable or disable LAN2 controller on or off.
- **LAN2 Option-ROM**
  Enable or disable LAN2 boot option for legacy network devices on or off.
- **PCIE Wake**
  Enable or disable PCIE to wake the system from S5. When set to "Disabled," the Wake on LAN2 function is also disabled.
- **PowerOn by Modem**
  Enable or disable PowerOn by Modem on or off. This feature determines the behavior when recovering from AC power loss: "S0" (power on), "S5" (power off), or "Last State."
- **PCIE Device Initial Delay**
  Users can set the number of seconds to delay the initial time for PCIE devices.

3.2.3.5 PCI Express Configuration

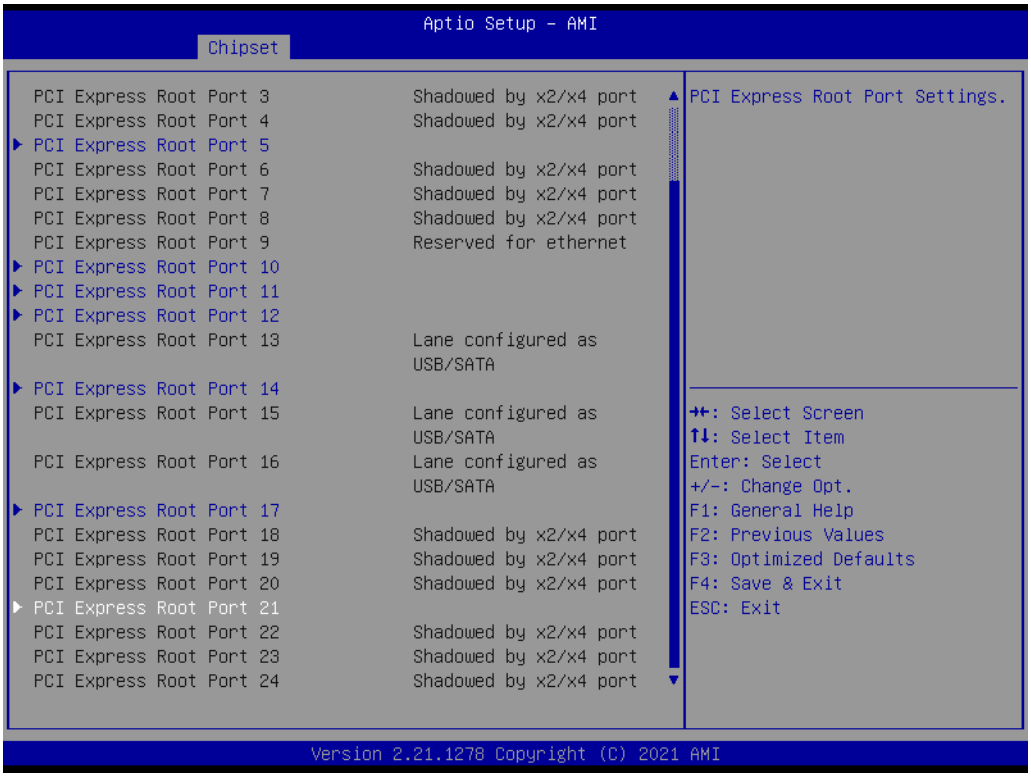
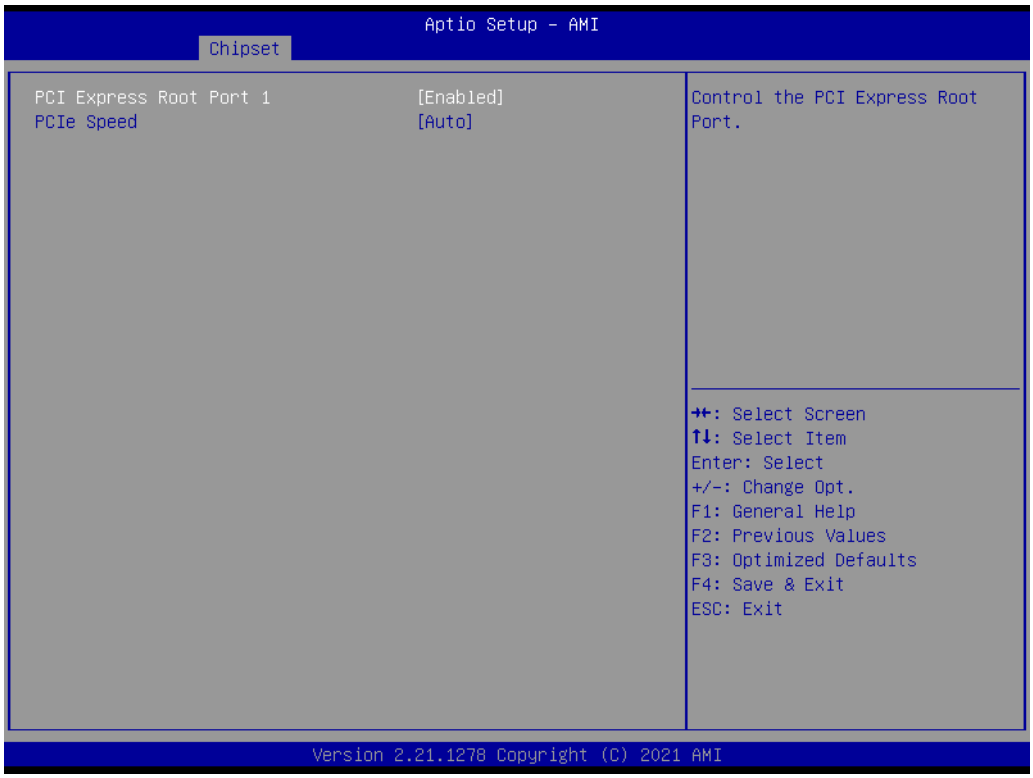
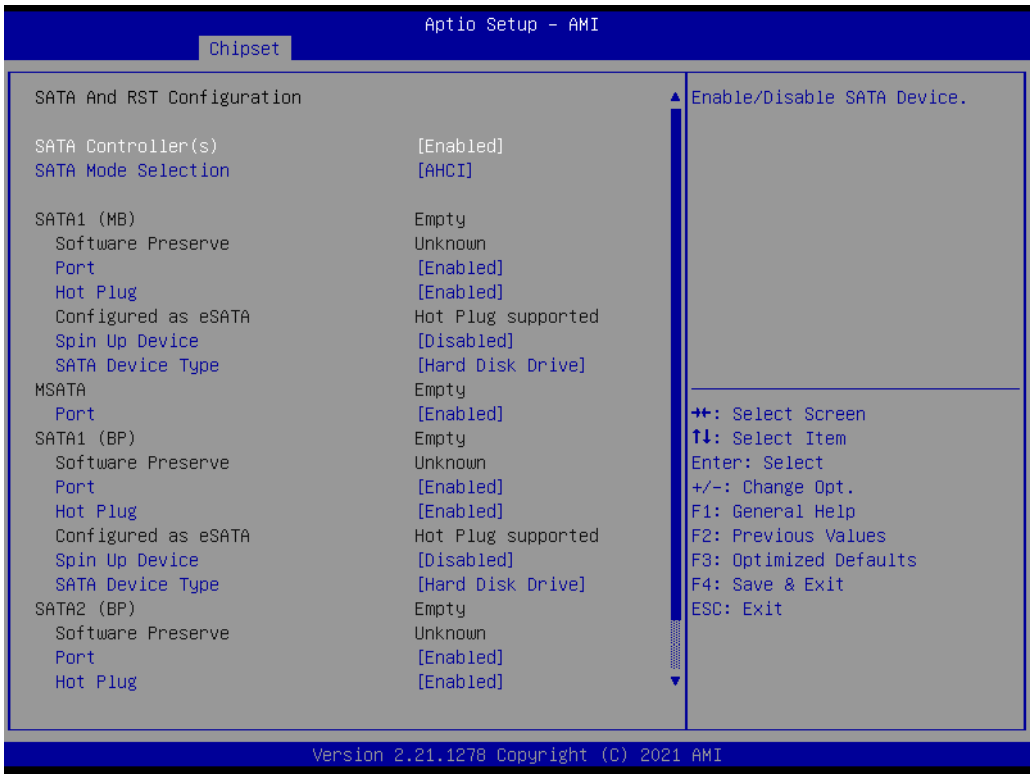


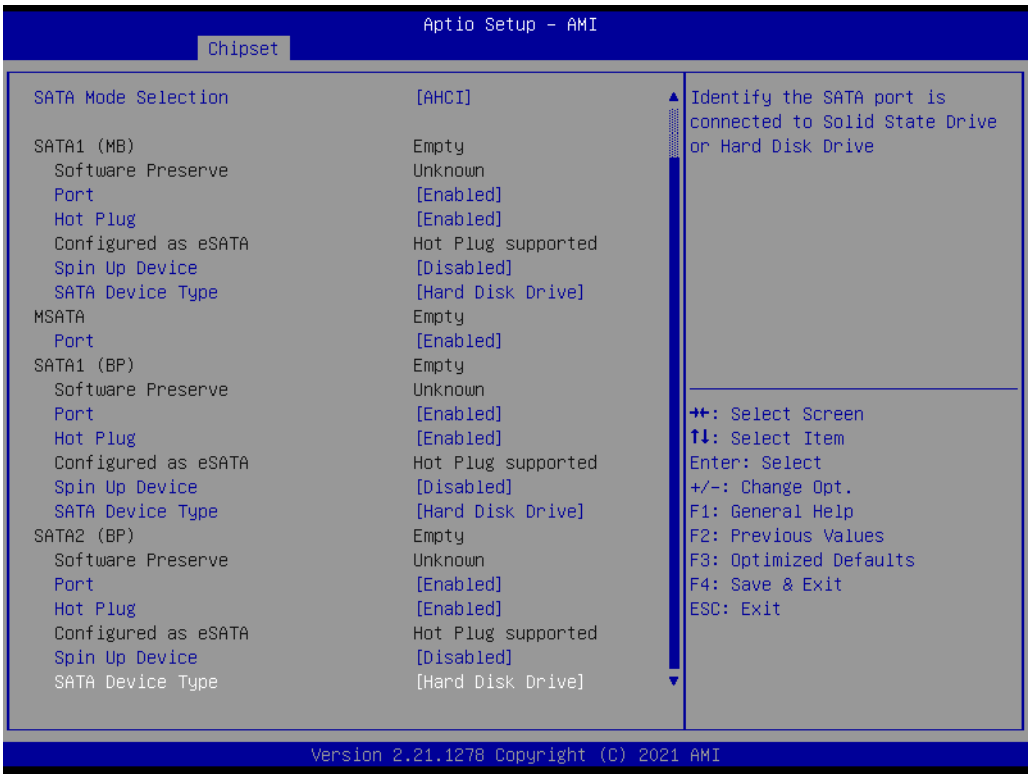
Figure 3.22 PCI Express Configuration

- **PCI Express Root Port 1~24 status**
- **PCI Express Root Port Settings**



3.2.3.6 SATA And RST Configuration





3.2.3.7 USB Configuration

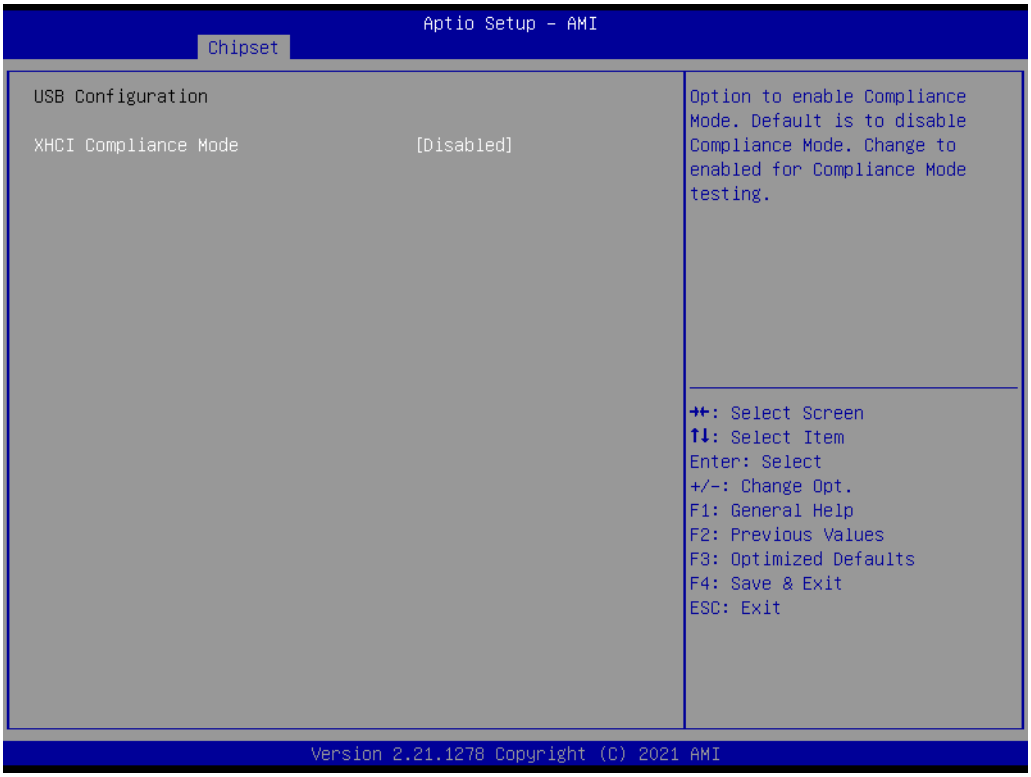
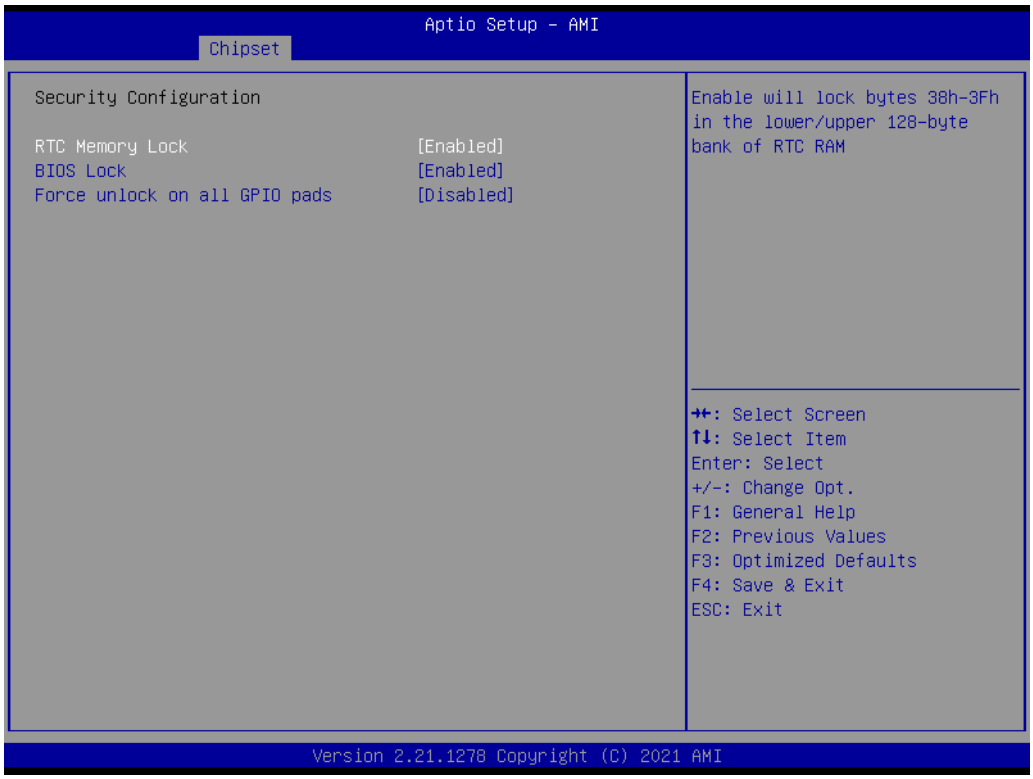


Figure 3.23 USB Configuration

- **XHCI Compliance Mode**
  Toggle the option to enable compliance mode. The default is to disable compliance mode; enable it for compliance mode testing.

3.2.3.8 Security Configuration



3.2.3.9 HD Audio Configuration

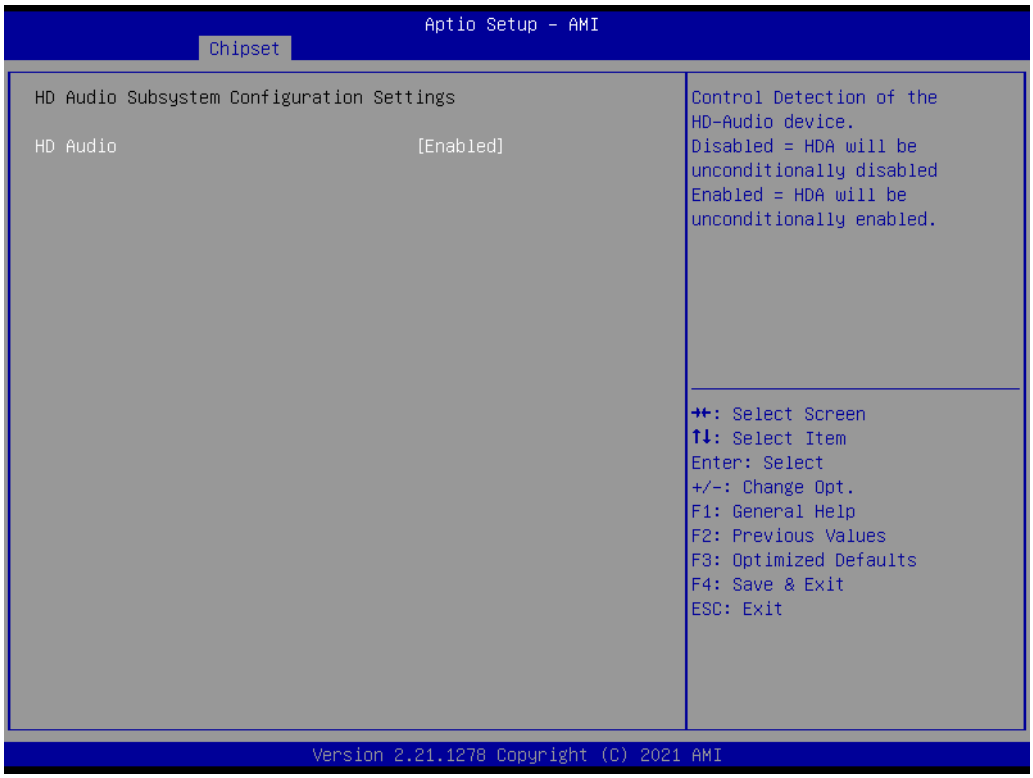


Figure 3.24 PCH Azalia Configuration

- **HD Audio**

  Controls the detection of the HD Audio device.

  Disable=HDA will be unconditionally disabled.

Enable=HDA will be unconditionally enabled.

Auto=HDA will be enabled if present, disabled otherwise.

3.2.4 Security

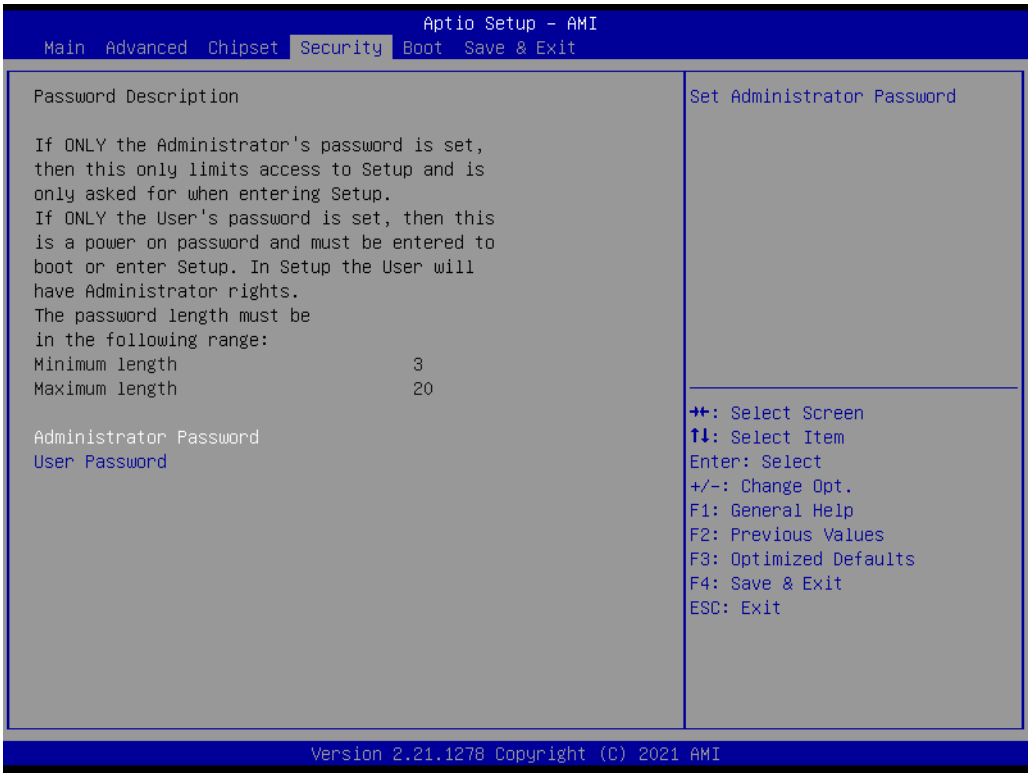


Figure 3.25 Security

- **RTC Memory Lock**
  Enable to lock bytes 38h-3Fh in the lower/upper 128-byte bank of RTC RAM.
- **BIOS Lock**
  Enable or disable the PCH BIOS lock feature. This must be enabled for SMM protection of the flash.

3.2.5 Boot

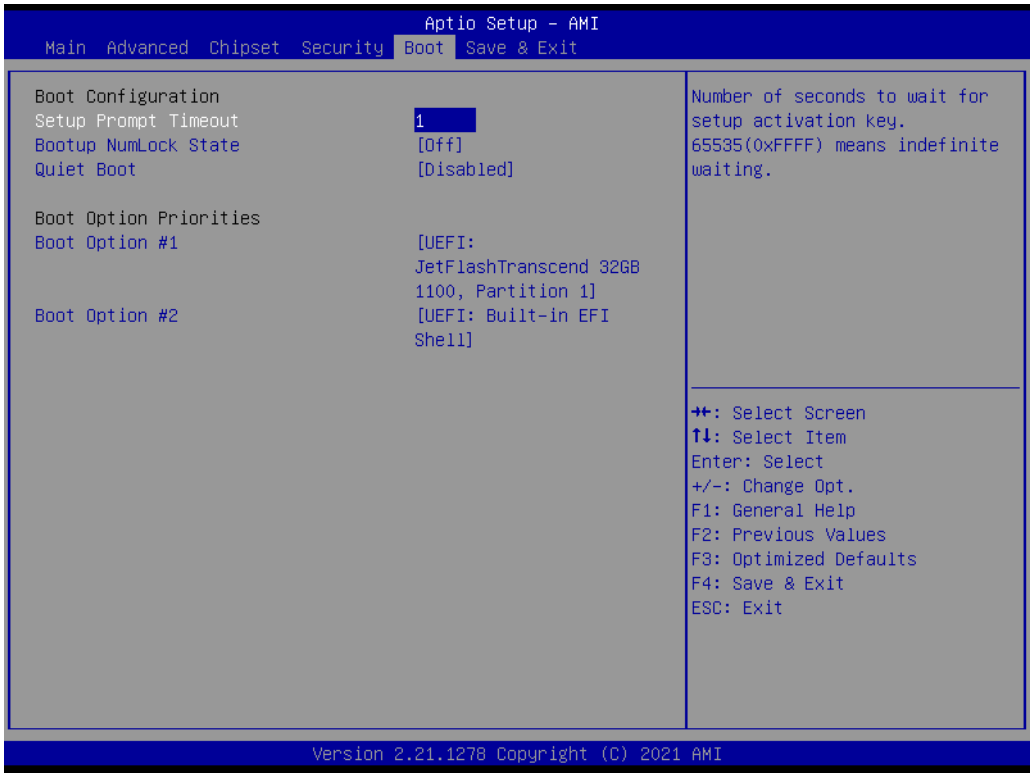


Figure 3.26 Boot

- **Setup Prompt timeout**
  Set the number of seconds to wait for the setup activation key.
- **Bootup NumLock State**
  Select the keyboard Numlock state.
- **Quiet Boot**
  Enable or disable the quiet boot option.
- **Boot Option #1**
  Set the system boot order.
- **Boot Option #2**
  Set the system boot order.

3.2.6 Save & Exit

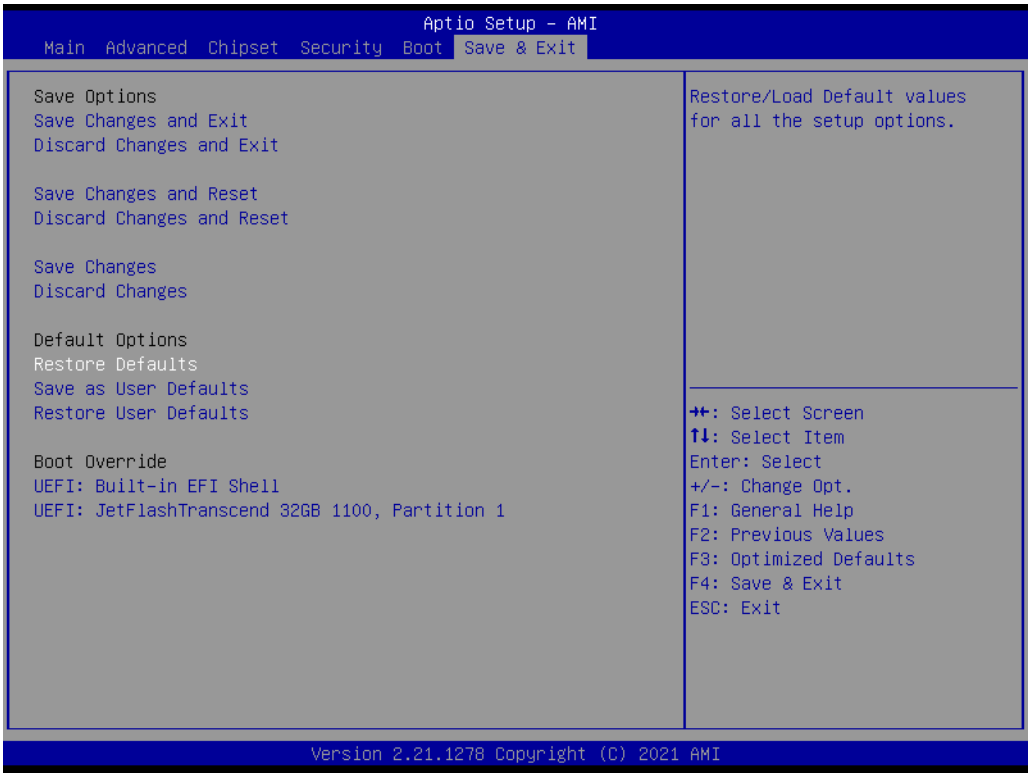


Figure 3.27 Save & Exit

- **Save Changes and Exit***

  Select this option to save your system configuration changes.

- **Discard Changes and Exit**

  Select this option to exit setup without making permanent changes to the system configuration.

- **Save Changes and Reset**

  Select this option to save your changes, exit BIOS setup, and reboot the computer for the new system configuration to take effect.

- **Discard Changes and Reset**

  Select this option to exit setup and reset the computer without making permanent changes to the system configuration.

- **Save Changes**

  Select this option to save your changes.

- **Discard Changes**

  Select this option to discard your changes.

- **Restore Defaults**

  Select this option to restore the BIOS configuration to its original settings.

- **Save as User Defaults**

  Select this option to save the user's configuration.

- **Restore User Defaults**

  Select this option to restore BIOS to the user's configuration.

Note! *When making critical changes, the system may still reboot even if you choose "Save Changes and Exit."*

Chapter 4

Value-Added Software Services

4.1 Value-Added Software Services

Software APIs are interfaces that define how an application program can request services from libraries and/or operating systems. They encompass not only the essential drivers but also a comprehensive suite of user-friendly, intelligent, and seamlessly integrated interfaces. These interfaces expedite development, bolster security, and provide additional value for customers using Advantech platforms. APIs serve as a catalyst bridging the gap between developers and solutions, simplifying the adoption and operation of Advantech embedded platforms in conjunction with customer applications. It's important to note that this API and utility is specifically designed for Windows OS. If users require a Linux version of the API and utility, we encourage them to reach out to an Advantech representative for further assistance.

4.1.1 Software API

4.1.1.1 Control

GPIO

The General Purpose Input/Output (GPIO) is a versatile parallel interface that accommodates various custom connections. It enables users to monitor signal input levels and control the status of outputs to activate or deactivate devices. Additionally, our API offers programmable GPIO functionality, empowering developers to dynamically configure GPIO pins for both input and output operations.

4.1.1.2 Monitor

Watchdog

A watchdog timer (WDT) is a component designed to execute a predefined action if a system encounters an issue and fails to recover independently within a specified timeframe. It can be configured to initiate a warm boot, effectively restarting the system, after a designated number of seconds.

Hardware Monitor

The Hardware Monitor (HWM) API is a system health supervision API that inspects certain condition indexes, such as fan speed, temperature and voltage.

Chapter 5

Chipset Software Installation Utility

5.1 Before You Begin

To ensure a smooth installation of the upgraded display drivers and utility software, follow the instructions outlined in this chapter. You can find the drivers for the PCE-2032/2132 on the Advantech support website at http://www.advantech.com/support. Updates are periodically delivered through Microsoft's Service Packs.

Before commencing the installation process, it's crucial to bear in mind that most display drivers require the associated software application to be pre-installed on your system. Furthermore, many installation procedures assume a certain level of familiarity with both the relevant software applications and operating system commands. We recommend reviewing the necessary operating system commands and consulting the relevant sections of your application software's user manual before proceeding with the installation.

Note! *For system stability, installing the drivers in the following sequence is highly recommended:*

- *Chipset*
- *Graphics*
- *ME*
- *Other drivers*

5.2 Introduction

The Intel® Chipset Software Installation (CSI) utility installs the Windows INF files that outline to the operating system how the chipset components will be configured.

This is needed for the proper functioning of the following features:

- Core PCI PnP services
- Serial ATA interface support
- Identification of Intel® chipset components in the Device Manager

Note! *The chipset driver is used for the following versions of Windows, and it has to be installed before installing all the other drivers.:*

- *Windows 10 (64-bit)*
- *Windows 11 (64-bit)*

5.3 Windows Driver Setup

Enter the Advantech support website, then search product PCE-2032/2132. You can see "Chipset" driver inside.

Chapter 6

Integrated Graphic Device Setup

6.1 Introduction

The Intel® processors are embedded with integrated graphics controllers. You need to install the graphics driver to enable their function. The graphics driver provides graphics, computing, media, and display capabilities.

6.2 Windows Driver Setup

Go to the Advantech support website and search for PCE-2032/2132. You can find the "Graphics" drivers inside.

Chapter 7

LAN Configuration

7.1 Introduction

The PCE-2032/2132 has dual Gigabit Ethernet LANs via dedicated PCI Express x1 lanes that offer bandwidth of up to 1000 MB/sec, eliminating the bottleneck of network data flow and incorporating Gigabit Ethernet at 1000 Mbps.

7.2 Features

- 10/100/1000Base-T Ethernet controller
- 10/100/1000Base-T triple-speed MAC
- Full duplex at 10, 100, or 1000 Mbps and half duplex at 10 or 100 Mbps
- Wake-on-LAN (WOL) support
- PCIe x1 host interface

7.3 Installation

Note!

Before installing the LAN drivers, make sure the Chipset driver has been installed on your system. See Chapter 5 for information on installing the Chipset driver.

The integrated Intel® gigabit Ethernet controller supports all major network operating systems. However, the installation procedure varies with different operating systems.

In the following sections, refer to the one that provides the driver setup procedure for the operating system you are using.

7.4 Windows Driver Setup

Go to the Advantech support website and search for PCE-2032/2132. You can find "LAN" drivers inside.

Chapter 8

Intel ME

8.1 Introduction

The Intel® ME software components that need to be installed depend on the system's specific hardware and firmware features. The installer detects the system's capabilities and installs the relevant drivers and applications.

8.2 Installation

Go to the Advantech support website and search for PCE-2032/2132. You can find the "ME" drivers inside.

Chapter 9

SATA RAID Setup

9.1 Introduction

To meet the demands of high-performance disk I/O operations, the PCE-2132, equipped with an Intel chipset, incorporates Serial ATA controllers featuring software RAID 0, 1, 5, and 10 capabilities.

RAID 0 (striping) enhances storage performance and accelerates data transfer rates, making it ideal for disk-intensive applications.

RAID 1 (mirroring) provides data redundancy, safeguarding valuable information in case of a hard drive failure.

RAID 5 arrays consist of three or more hard drives, dividing data into manageable strips and employing parity for fault tolerance. Data and parity are striped across all drives, with a rotating sequence to optimize parity calculations.

RAID 10 arrays employ four hard drives, combining RAID levels 0 and 1. Data is striped across a two-drive array (RAID 0 component), and each drive in the RAID 0 array is mirrored by a RAID 1 component.

To streamline the installation of enhanced display drivers and utility software, please carefully follow the instructions in this chapter. The drivers for the PCE-2032/2132 can be found on the Advantech support website at http://www.advantech.com/support. Updates are periodically distributed through Microsoft's Service Packs.

9.2 SATA RAID Driver and Utility Setup

Go to the Advantech support website and search for PCE-2032/2132. There you will see the "Others" folder containing the RST driver.

Chapter 10

HD Audio

10.1 Introduction

PCE-2032/2132 is equipped with an Audio chip. It provides "Line-out" & "Micro-phone" ports for varying applications.

10.2 Installation

Go to the Advantech support website and search for the PCE-2032/2132. You will find the "Audio" drivers inside.

Appendix A

Programming the Watchdog Timer

A.1 Introduction

The watchdog function serves as a means to oversee the operation of system software and, in the event of software malfunction within the predetermined timeframe, initiate corrective measures. This section describes the operation of the watchdog timer and provides instructions on its programming.

A.1.1 Watchdog Timer Overview

The watchdog timer is an integral component of the NCT6106D super I/O controller, offering the following user-configurable capabilities:

- Can be enabled and disabled through user-programmed instructions.
- Adjustable timer settings, ranging from 1 to 255 seconds or 1 to 255 minutes.
- Automatic generation of a reset signal in the event that the software fails to reset the timer before it reaches a timeout condition.

A.1.2 Programming the Watchdog Timer

The I/O port address assigned to the watchdog timer consists of two components: 2E (hex) serves as the address port, while 2F (hex) functions as the data port. To interact with the watchdog timer, the procedure involves first writing an address value into the address port at 2E (hex) and subsequently performing read or write operations on the designated register via the data port at 2F (hex).

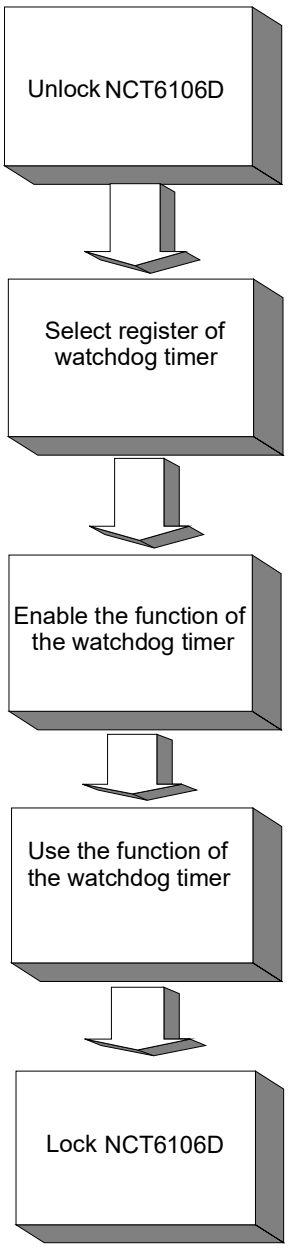


Table A.1: Watchdog Timer Registers

Address of register (2E)	Attribute Read/Write	Value (2F)& description
87 (hex)	-----	Write this address to I/O address port 2E (hex) twice to unlock the NCT6106D
07 (hex)	write	Write 08 (hex) to select register of watchdog timer.
30 (hex)	write	Write 01 (hex) to enable the function of the watchdog timer. Disabled is set as default.
F0 (hex)	write	Set seconds or minutes as units for the timer. Write 0 to bit 3: set second as counting unit. [default]. Write 1 to bit 3: set minutes as counting unit Write 1 to bit 4: Watchdog timer count mode is 1000 times faster. If bit 3 is 0, the count mode is 1/1000 seconds mode. If bit 3 is 1, the count mode is 1/1000 minutes mode.

F1 (hex)	write	0: stop timer [default] 01~FF (hex): The amount of the count, in seconds or minutes, depends on the value set in register F1 (hex). This number decides how long the watchdog timer waits for strobe before generating an interrupt or reset signal. Writing a new value to this register can reset the timer to count with the new value.
F2 (hex)	read/write	Bit 7:Write 1 to enable mouse to reset the timer, 0 to disable[default]. Bit 6: Write 1 to enable keyboard to reset the timer, 0 to disable.[default] Bit 5: Write 1 to generate a timeout signal immediately and automatically return to 0. [default=0] Bit 4: Read status of watchdog timer, 1 means timer is “timeout”.
AA (hex)	-----	Write this address to I/O port 2E (hex) to lock the NCT6106D.

A.1.3 Example Program

1. Enable watchdog timer and set 10 sec. as timeout interval.

```
;--------------------------------------------------------
Mov dx,2eh          ; Unlock NCT6106D
Mov al,87h
Out dx,al
Out dx,al
;--------------------------------------------------------
Mov al,07h          ; Select registers of watchdog timer
Out     dx,al
Inc     dx
Mov     al,08h
Out     dx,al
;--------------------------------------------------------
Dec dx              ; Enable the function of watchdog timer
Mov     al,30h
Out     dx,al
Inc     dx
In      al,dx
Or      al,01h
Out     dx,al
;--------------------------------------------------------
Dec dx              ; Set second as counting unit
Mov     al,0f5h
Out     dx,al
Inc     dx
In      al,dx
And al,not 08h
Out     dx,al
;--------------------------------------------------------
Dec dx              ; Set timeout interval as 10 seconds and start counting
```

```
Mov     al,0f6h
Out     dx,al
Inc     dx
Mov     al,10       ; 10 seconds
Out     dx,al
;--------------------------------------------------------
Dec dx              ; Lock NCT6106D
Mov     al,0aah
Out     dx,al
```

2. Enable watchdog timer and set 5 minutes as timeout interval.

```
;--------------------------------------------------------
Mov dx,2eh          ; Unlock NCT6106D
Mov al,87h
Out dx,al
Out dx,al
;--------------------------------------------------------
Mov al,07h          ; Select registers of watchdog timer
Out     dx,al
Inc     dx
In        al,dx
Or      al,08h
Out     dx,al
;--------------------------------------------------------
Dec dx              ; Enable the function of watchdog timer
Mov     al,30h
Out     dx,al
Inc     dx
Mov     al,01h
Out     dx,al
;--------------------------------------------------------
Dec dx              ; Set minute as counting unit
Mov     al,0f5h
Out     dx,al
Inc     dx
In      al,dx
Or      al,08h
Out     dx,al
;--------------------------------------------------------
Dec dx              ; Set timeout interval as 5 minutes and start counting
Mov     al,0f6h
Out     dx,al
Inc     dx
Mov     al,5        ; 5 minutes
Out     dx,al
```

```
;--------------------------------------------------------
Dec dx                  ; Lock NCT6106D
Mov     al,0aah
Out     dx,al
```

3. Enable watchdog timer to be reset by mouse.

```
;--------------------------------------------------------
Mov dx,2eh              ; Unlock NCT6776D
Mov al,87h
Out dx,al
Out dx,al
;--------------------------------------------------------
Mov al,07h              ; Select registers of watchdog timer
Out     dx,al
Inc     dx
Mov     al,08h
Out     dx,al
;--------------------------------------------------------
Dec dx                  ; Enable the function of watchdog timer
Mov     al,30h
Out     dx,al
Inc     dx
In      al,dx
Or      al,01h
Out     dx,al
;--------------------------------------------------------
Dec dx                  ; Enable watchdog timer to be reset by mouse
Mov     al,0f7h
Out     dx,al
Inc     dx
In      al,dx
Or   al,80h
Out     dx,al
;--------------------------------------------------------
Dec dx                  ; Lock NCT6106D
Mov     al,0aah
Out     dx,al
```

4. Enable watchdog timer to be reset by keyboard.

```
;--------------------------------------------------------
Mov dx,2eh            ; Unlock NCT6106D
Mov al,87h
Out dx,al
Out dx,al
;--------------------------------------------------------
```

```
Mov al,07h              ; Select registers of watchdog timer
Out     dx,al
Inc     dx
Mov     al,08h
Out     dx,al
;--------------------------------------------------------
Dec dx                  ; Enable the function of watchdog timer
Mov     al,30h
Out     dx,al
Inc     dx
Mov     al,01h
Out     dx,al
;--------------------------------------------------------
Dec dx                  ; Enables watchdog timer to be strobe reset by keyboard
Mov     al,0f7h
Out     dx,al
Inc     dx
In      al,dx
Or   al,40h
Out     dx,al
;--------------------------------------------------------
Dec dx                  ; Lock NCT6106D
Mov     al,0aah
Out     dx,al
```

5. Generate a time-out signal without timer counting.

```
;--------------------------------------------------------
Mov dx,2eh          ; Unlock NCT6106D
Mov al,87h
Out dx,al
Out dx,al
;--------------------------------------------------------
Mov al,07h          ; Select registers of watchdog timer
Out     dx,al
Inc     dx
Mov     al,08h
Out     dx,al
;--------------------------------------------------------
Dec dx              ; Enable the function of watchdog timer
Mov     al,30h
Out     dx,al
Inc     dx
Mov     al,01h
Out     dx,al
;--------------------------------------------------------
```

```
Dec dx                  ; Generate a time-out signal
Mov     al,0f7h
Out     dx,al           ;Write 1 to bit 5 of F7 register
Inc     dx
In      al,dx
Or   al,20h
Out     dx,al
;--------------------------------------------------------
Dec dx                  ; Lock NCT6106D
Mov     al,0aah
Out     dx,al
```

Appendix B

Programming the GPIO

B.1 Supported GPIO Register

Provided below are comprehensive descriptions of the GPIO addresses, along with a sample programming demonstrations.

B.2 GPIO Registers

GPIO 1

CRF0 (GP10-GP17 I/O selection register. Default 0xFF)

When set to '1', the respective GPIO port is programmed as an input port.

When set to '0', the respective GPIO port is programmed as an output port.

CRF1 (GP10-GP17 data register. Default 0x00)

If a port is programmed to be an output port, then its respective bit can be read/written.

If a port is programmed to be an input port, then its respective bit can only be read.

CRF2 (GP10-GP17 inversion register. Default 0x00)

When set to '1', the incoming/outgoing port value is inverted.

When set to '0', the incoming/outgoing port value is the same as in data register.

GPIO 0

CREC (GP00-GP07 I/O selection register. Default 0xFF)

When set to '1', the respective GPIO port is programmed as an input port.

When set to '0', the respective GPIO port is programmed as an output port.

CRED (GP00-GP07 data register. Default 0xFF)

If a port is programmed to be an output port, then its respective bit can be read/written.

If a port is programmed to be an input port, then its respective bit can only be read.

CREE (GP00-GP07 inversion register. Default 0x00)

When set to '1', the incoming/outgoing port value is inverted.

When set to '0', the incoming/outgoing port value is the same as in data register.

Extended Function Index Registers (EFIRs)

The EFIRs are write-only registers with port address 2Eh or 4Eh on PC/AT systems.

Extended Function Data Registers (EFDRs)

The EFDRs are read/write registers with port address 2Fh or 4Fh on PC/AT systems

B.3 GPIO Example Program

```
------------------------------------------------------------
Enter the extended function mode, interruptible double-write
------------------------------------------------------------
MOV DX, 2EH
MOV AL, 87H
OUT DX, AL
OUT DX, AL
------------------------------------------------------------
Configure logical device 7(GP10~GP17), configuration register CRE4,CRE5,CRE6
------------------------------------------------------------
MOV DX, 2EH
MOV AL, 07H ; Point to Logical Device Number Reg.
OUT DX, AL
MOV DX, 2FH
MOV AL, 07H ; Select logical device 7
OUT DX, AL
------------------------------------------------------------
Configure GPIO1 I/O Register
------------------------------------------------------------
MOV DX, 2EH
MOV AL, ECH
OUT DX, AL
MOV DX, 2FH
MOV AL, ??H ; 0: The respective GPIO1 PIN is programmed as an output port
;1: The respective GPIO1 PIN is programmed as an input port.
OUT DX, AL
------------------------------------------------------------
Configure GPIO1 Inversion Register
------------------------------------------------------------
MOV DX, 2EH
MOV AL, EEH
OUT DX, AL
MOV DX, 2FH
MOV AL, 00H ; Set GPIO is normal not inverter
OUT DX, AL
------------------------------------------------------------
Configure GPIO1 Data Register
------------------------------------------------------------
MOV DX, 2EH
MOV AL, EDH
OUT DX, AL
MOV DX, 2FH
MOV AL, ??H ; Put the output value into AL
OUT DX, AL
```

```
-------------------------------------------------------
Exit extended function mode |
-------------------------------------------------------
MOV DX, 2EH
MOV AL, AAH
OUT DX, AL
```

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