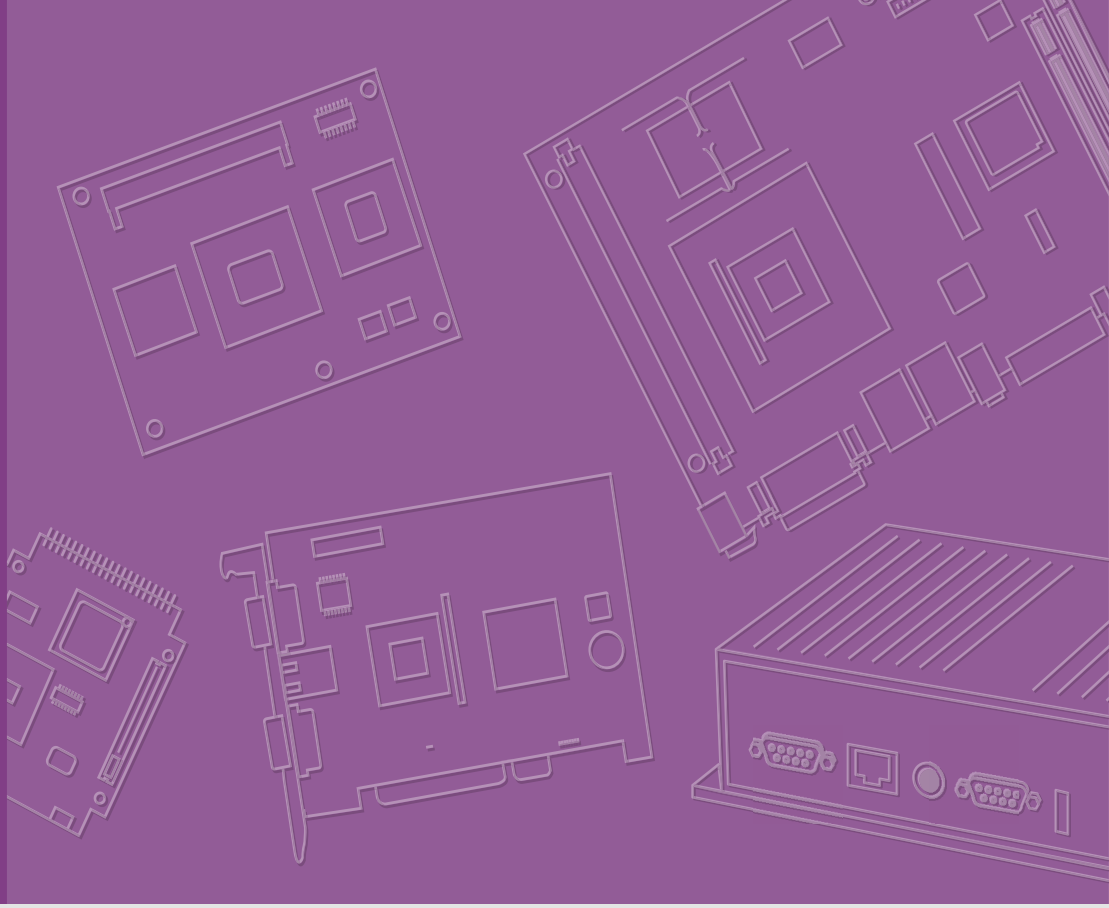

User Manual

EPC-C301

Multiple I/O Fanless Embedded System

ADVANTECH

Enabling an Intelligent Planet

Attention!

Please note:

This package contains a hard-copy user manual in Chinese for China CCC certification purposes, and there is an English user manual included as a PDF file on the website. Please disregard the Chinese hard copy user manual if the product is not to be sold and/or installed in China.

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Product Warranty (2 years)

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident, or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an return merchandise authorization (RMA) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Declaration of Conformity

FCC Class B

Note: This equipment has been tested and found to comply with the limits for a Class B 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 can radiate 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
- Consult the dealer or an experienced radio/TV technician for help

Technical Support and Assistance

1. Visit the Advantech web site at www.advantech.com/support where you can find the latest information about the product.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:
   - Product 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

Warnings, Cautions, and Notes

Warning! *Warnings indicate conditions, which if not observed, can cause personal injury!*

Caution! *Cautions are included to help you avoid damaging hardware or losing data.*

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.

Note! *Notes provide optional additional information.*

Warning! *Les avertissements indiquent des conditions qui, si elles ne sont pas respectées, peuvent provoquer des blessures!*

Caution! *Des précautions sont incluses pour vous aider à éviter d'endommager le matériel ou de perdre des données.*

Il y a un risque d'explosion d'une nouvelle batterie si elle n'est pas installée

correctement. N'essayez pas de recharger, d'ouvrir de force ou de chauffer la batterie. Remplacez la batterie uniquement par un type identique

ou équivalent recommandé par le fabricant. Jetez les piles usagées conformément aux instructions du fabricant.

Note! *Les notes fournissent des informations supplémentaires facultatives.*

Packing List

Before installation, please ensure the following items have been shipped:

- 1 x EPC-C301 unit
- 1 x China RoHS
- 1 x DIN Rail Kit
- 2 x Wall-mount bracket
- 1 x Screw kit

Ordering Information

Model Number	Description
EPC-C301EVK-S7A1	Intel Core i7-8665UE 1.7GHz, Intel EVK system
EPC-C301EVK-S6A1	Intel Core i5-8365UE 1.6GHz, Intel EVK system
EPC-C301C7-S7A1	Intel Core i7-8665UE 1.7GHz, Fanless system
EPC-C301C5-S6A1	Intel Core i5-8365UE 1.6GHz, Fanless system

Optional Accessories

For EPC-C301

Part Number	Description
VEGA-330-02A1	mPCIe Intel® Movidius X AI module
1960092891N001	H.D R1 VEGA-330-HR for MIOe-260
96PSA-A120W12W7-3	A/D 100-240V 120W 12V C14 LOCKABLE DC JACK 62368
1702002600-01	Power cable 3-pin 183 cm (72 in), USA type
1700018704	Power cable 3-pin 180 cm (72 in), UK type
1702002605	Power cable 3-pin 183 cm (72 in), Europe type
1700000237-01	Power cable 3-pin 183 cm (72 in), PSE type

Safety Instructions

1. Please read these safety instructions carefully.
2. Please keep this User Manual for later reference.
3. Please disconnect this equipment from AC outlet before cleaning. Use a damp cloth. Don't use liquid or sprayed detergent for cleaning. Use a moist sheet or clothe for cleaning.
4. For pluggable equipment, the socket-outlet should be near the equipment and should be easily accessible.
5. Protect this equipment from humidity.
6. Lay this equipment on a reliable surface when installing. A drop or fall could cause injury.
7. The openings on the enclosure are for air convection and protecting the equipment from overheating. DO NOT COVER THE OPENINGS.
8. Make sure the voltage of the power source when connecting the equipment to the power outlet.
9. Place the power cord such a way that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for long time, disconnect the equipment from mains to avoid being damaged by transient over-voltage.
12. Never pour any liquid into ventilation openings; this could cause fire or electrical shock.
13. Never open the equipment. For safety reasons, only qualified service personnel should open the equipment.
14. If one of the following situations arises, get the equipment checked by service personnel:
    - The power cord or plug is damaged.
    - Liquid has penetrated into the equipment.
    - The equipment has been exposed to moisture.
    - The equipment does not work well, or you cannot get it to work according to the user's manual.
    - The equipment has been dropped and damaged.
    - The equipment has obvious signs of breakage.
15. Do not leave this equipment in an environment where the storage temperature may go below -40 °C (-40 °F) or above 85 °C (185 °F). This could damage the equipment. the equipment should be in a controlled environment.
16. Caution: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer, discard used batteries according to the manufacturer's instructions.
17. The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).
18. RESTRICTED ACCESS AREA: The equipment should only be installed in a Restricted Access Area.
19. DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.
20. The product is intended to be supplied by an UL certified power supply or dc source suitable for use at Tma 60 degree C min. and output meets SELV or ES1, rated 12Vdc,5A/12Vdc,10A/9-36Vdc,4.4-1.1A
21. The wire of the protective bonding conductor shall be green-and-yellow, 20AWG/0.5(mm2) min.

Safety Instructions

1. Veuillez lire attentivement ces consignes de sécurité.
2. Veuillez conserver ce manuel d'utilisation pour référence ultérieure.
3. Veuillez déconnecter cet équipement de la prise secteur avant de le nettoyer. Utilisez un chiffon humide. N'utilisez pas de détergent liquide ou pulvérisé pour le nettoyage. Utilisez une feuille d'humidité ou des vêtements pour le nettoyage.
4. Pour les équipements enfichables, la prise de courant doit être proche de l'équipement et doit être facilement accessible.
5. Veuillez garder cet équipement à l'abri de l'humidité.
6. Posez cet équipement sur une surface fiable lors de l'installation. Une chute ou une chute pourrait provoquer des blessures.
7. Les ouvertures sur l'enceinte sont destinées à la convection d'air, protégeant ainsi l'équipement de la surchauffe. NE COUVREZ PAS LES OUVERTURES.
8. Assurez-vous de la tension de la source d'alimentation lorsque vous connectez l'équipement à la prise de courant.
9. Placez le cordon d'alimentation de manière à ce que personne ne puisse marcher dessus. Ne placez rien sur le cordon d'alimentation.
10. Toutes les précautions et avertissements sur l'équipement doivent être notés.
11. Si l'équipement n'est pas utilisé pendant une longue période, débranchez-le du secteur pour éviter d'être endommagé par une surtension transitoire.
12. Ne versez jamais de liquide dans les ouvertures de ventilation; cela pourrait provoquer un incendie ou un choc électrique.
13. N'ouvrez jamais l'équipement. Pour des raisons de sécurité, seul un technicien qualifié doit ouvrir l'équipement.
14. Si l'une des situations suivantes se présente, faites vérifier l'équipement par le personnel de service:
    - Le cordon d'alimentation ou la fiche est endommagé.
    - Du liquide a pénétré dans l'équipement.
    - L'équipement a été exposé à l'humidité.
    - L'équipement ne fonctionne pas bien, ou vous ne pouvez pas le faire fonctionner selon le manuel de l'utilisateur.
    - L'équipement est tombé et a été endommagé.
    - L'équipement présente des signes évidents de rupture.
15. Ne laissez pas cet équipement dans un environnement où la température de stockage peut être inférieure à -40 ° C (-40 ° F) ou supérieure à 85 ° C (185 ° F). Cela pourrait endommager l'équipement. l'équipement doit se trouver dans un environnement contrôlé.
16. Attention: risque d'explosion si la batterie n'est pas remplacée correctement. Remplacez uniquement par un type identique ou équivalent recommandé par le fabricant, jetez les piles usagées conformément aux instructions du fabricant.
17. Le niveau de pression acoustique au poste de l'opérateur selon CEI 704-1: 1982 n'est pas supérieur à 70 dB (A).
18. ZONE D'ACCÈS RESTREINT: l'équipement ne doit être installé que dans une zone d'accès restreint.
19. AVIS DE NON-RESPONSABILITÉ: Cet ensemble d'instructions est donné conformément à la CEI 704-1. Advantech décline toute responsabilité quant à l'exactitude des déclarations contenues dans le présent document.
20. Le produit est destiné à être alimenté par une alimentation certifiée UL ou une source cc pouvant être utilisée à Tma 60 degrés C min. et la sortie est conforme SELV ou ES1, nominale 12Vdc, 5A / 12Vdc, 10A / 9-36Vdc, 4.4-1.1A
21. Le fil du conducteur de liaison de protection doit être vert et jaune, 20AWG / 0,5 (mm2) min.

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Chapter 1

General Introduction

This chapter details background information on EPC-C301 series.

1.1 Introduction

EPC-C301 is a compact, fanless embedded system with diverse I/O ports for easy integration and diverse peripheral expansion. EPC-C301 is designed for automated machines, smart parking, and self service HMI applications.

High performance ruggedized design

EPC-C301 is powered by 8th Gen. Intel® Core™ i7-8665UE/i5-8365UE Quad-core processor. The system features up to 32GB DDR4-2400MT/s memory. It is bundled with 128GB M.2 2280 SSD storage and supports -20 ~ 60 °C (-4 ~ 140 °F) operating temperatures yielding a rugged and reliable design.

AI accelerator card and embedded Ubuntu OS support

Advantech and Intel® collaborated on a Computer Vision Developer Kit with EPC-C301 embedded system pre-installed with an Intel® Movidius™ accelerator card. EPC-C301 helps system integrators adopt applications for Industry 4.0, IoT, and intelligent transportation systems (ITS). EPC-C301 features an embedded OS—Ubuntu Desktop 18.04 LTS.

Built in Intelligent Management Tools - WISE-PaaS/DeviceOn

Advantech WISE-PaaS/DeviceOn provides a valuable suite of programmable APIs including multi-level watchdog, hardware monitor, system restore, and other user-friendly interfaces. iManager is an intelligent self-management cross platform tool that monitors system status for problems and takes action during abnormal events. It offers a boot up guarantee in critical, low temperature environments so systems can automatically recover when voltages dip. WISE-PaaS/DeviceOn makes the whole system more reliable and intelligent. EPC-C301 provides easy remote management so users can monitor, configure, and control a large number of terminals to make maintenance and system recovery simpler.

1.2 Product Features

1.2.1 General

- **CPU:**
  8th Gen. Intel® Core i7-8665UE, Quad Core, 1.7 GHz boost up to 4.4 GHz
  8th Gen. Intel® Core i5-8365UE, Quad Core, 1.6 GHz boost up to 4.1 GHz
- **BIOS:** AMI UEFI 256Mbit
- **System Memory:** DDR4 2400MT/s up to 32 GB (Default bundled with 16GB or 8GB memory)
- **Serial Port:** 4 (3 x Full RS-232/422/485 + 1 x RS-232)
- **USB:** 4 x USB 3.0 + 4 x USB 2.0
- **Audio:** High Definition Audio (HD), Line out, Mic-in
- **Storage:** 1 x M.2 2280 SATA SSD 128GB (Default bundled; Up to NVMe/PCIe Gen.3 x4 SSD)
- **Expansion Interface:**
  - Supports 1 x Full size MiniPCIe (Default bundled with VEGA-330 on Intel EVK)
  - Supports 1 x M.2 2230 E-Key
  - Supports 1 x M.2 3042 B-Key (with Nano SIM slot)
  - Supports 1 x M.2 2280 M-Key (Default bundled with 128G SATA SSD)

1.2.2 Display

- **Controller:** Intel® UHD Graphics 620
- **Resolution:**
  - HDMI: HDMI1.4 up to 4096x2160@30/24Hz
  - DP: DP1.2 up to 4096x2306@60Hz (Note: not support Audio stream & Hot-plug & HDCP)
- **Dual Display:** HDMI + DP

1.2.3 Ethernet

- **Chipset:**
  - LAN1 Intel® i219
  - LAN2/LAN3/LAN4 Intel i210
- **Speed:** 10/100/1000 Mbps
- **Interface:** 4 x RJ45
- **Standard:** Compliant with IEEE 802.3, IEEE 802.3u, IEEE 802.3x, IEEE 802.3y, IEEE 802.ab.

1.3 Chipset

1.3.1 Functional Specifications

1.3.1.1 Processor

Processor	8th Gen. Intel® Core i7-8665UE, Quad Core, 1.7 GHz boost up to 4.4 GHz 8th Gen. Intel® Core i5-8365UE, Quad Core, 1.6 GHz boost up to 4.1 GHz
Memory	Supports DDR4 2400MT/s, up to 32GB 2 x 204-pin SODIMM socket type

1.3.1.2 Chipset

Internal Graphics Features	■ DirectX 12, OpenGL 4.4 ■ Display Ports DP1.2 + HDMI, HDMI 1.4a
Video Accelerator	■ HW Encode: H.264, MPEG2 ■ HW Decode: H.264, MPEG2
USB Interface	■ USB host interface with support for 4x USB 3.0 and 4x USB 2.0 ports ■ All ports are High-Speed, Full-Speed, and Low-Speed capable ■ Supports legacy keyboard/mouse software
BIOS	■ UEFI 256Mbit

1.3.1.3 Others

Serial ports	■ COM1 ~ COM4: COM1/COM2/COM3 support full RS-232/422/485 and COM4 supports RS-232 * COM port Baud Rate support 1.5Mbps with COM driver download from Advantech website. ** COM1 ~ COM3 RS-485 supports auto-flow control. COM connector: D-SUB CON. 9P
Ethernet	**LAN1 Intel i219, LAN2/LAN3/LAN4 Intel i210** ■ Compliant with IEEE 802.3, IEEE 802.3u, IEEE 802.3x, IEEE 802.3y, IEEE 802.ab. ■ Supports 10/100/1000 Mbps. LAN Connectors: Phone Jack RJ45 8P 90D(F)
Audio	**Audio Codec: Realtek ALC888S:** ■ Compliant with HD Audio specifications ■ Supports 16/20/24-bit DAC and 16/20/24-bit ADC resolution ■ Supports: Line-out, Mic-in Audio Connectors: Ear Phone Jack * 2
Battery backup	■ BATTERY 3V/210 mAh with WIRE x 1

1.3.2 WISE-PaaS/DeviceOn

Sequence control	Supported
Watchdog timer	Multi Level WDT Programmable 65536 Level sec / min

Hardware monitor	CPU Temperature / input Current / input Voltage
Power saving	Deep sleep S5 mode
System information	Running HR / Boot record

1.4 Mechanical Specifications

1.4.1 Dimensions

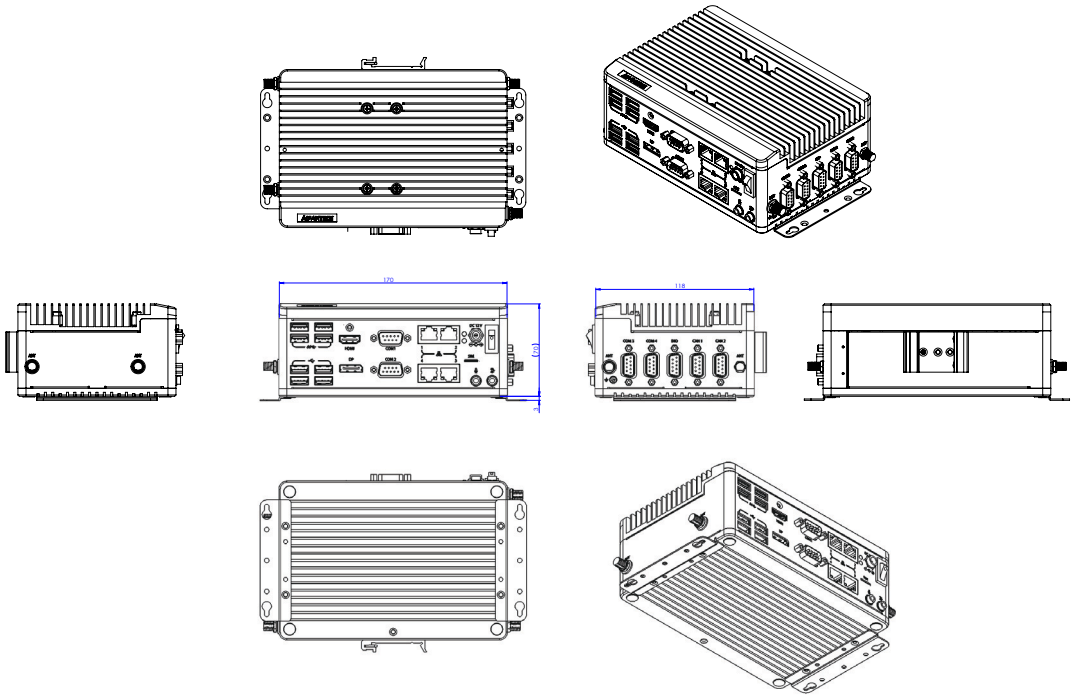


Figure 1.1 EPC-C301 Mechanical Dimension Diagram

1.4.2 Weight

1.5 kg (3.38 lb)

1.5 Power Requirements

1.5.1 System Power

- **Minimum power input:**
  - DC 12V, 10A

1.5.2 RTC Battery

- Lithium 3 V/210 mAH

1.6 Environment Specifications

1.6.1 Operating Temperatures

- With extended temperature peripherals: -20 ~ 60 °C (-4 ~ 140 °F) with 0.7m/s air flow (without VEGA 330)
- With extended temperature peripherals: -20 ~ 50 °C (-4 ~ 122 °F) with 0.7m/s air flow (with VEGA 330)

1.6.2 Relative Humidity

- 95% @ 40 °C (non-condensing)

1.6.3 Storage Temperatures

- -40 ~ 85 °C (-40 ~ 185 °F)

1.6.4 Vibration During Operation

- 3Grms, IEC 60068-2-64, random, 5 ~ 500 Hz, 1hr/axis, x,y,z 3 axes.

1.6.5 Shock During Operation

- 30G, IEC 60068-2-27, half sine, 11 ms duration.

1.6.6 Safety

- UL, CB, CCC, BSMI

1.6.7 EMC

- CE, FCC, CCC, BSMI

Chapter 2

H/W Installation

This chapter details external I/O and installation procedures for EPC-C301 hardware.

2.1 Introduction

The following sections feature and installation guide and detail the external connector pin assignments for applications.

2.2 Connectors

2.2.1 EPC-C301 External I/O

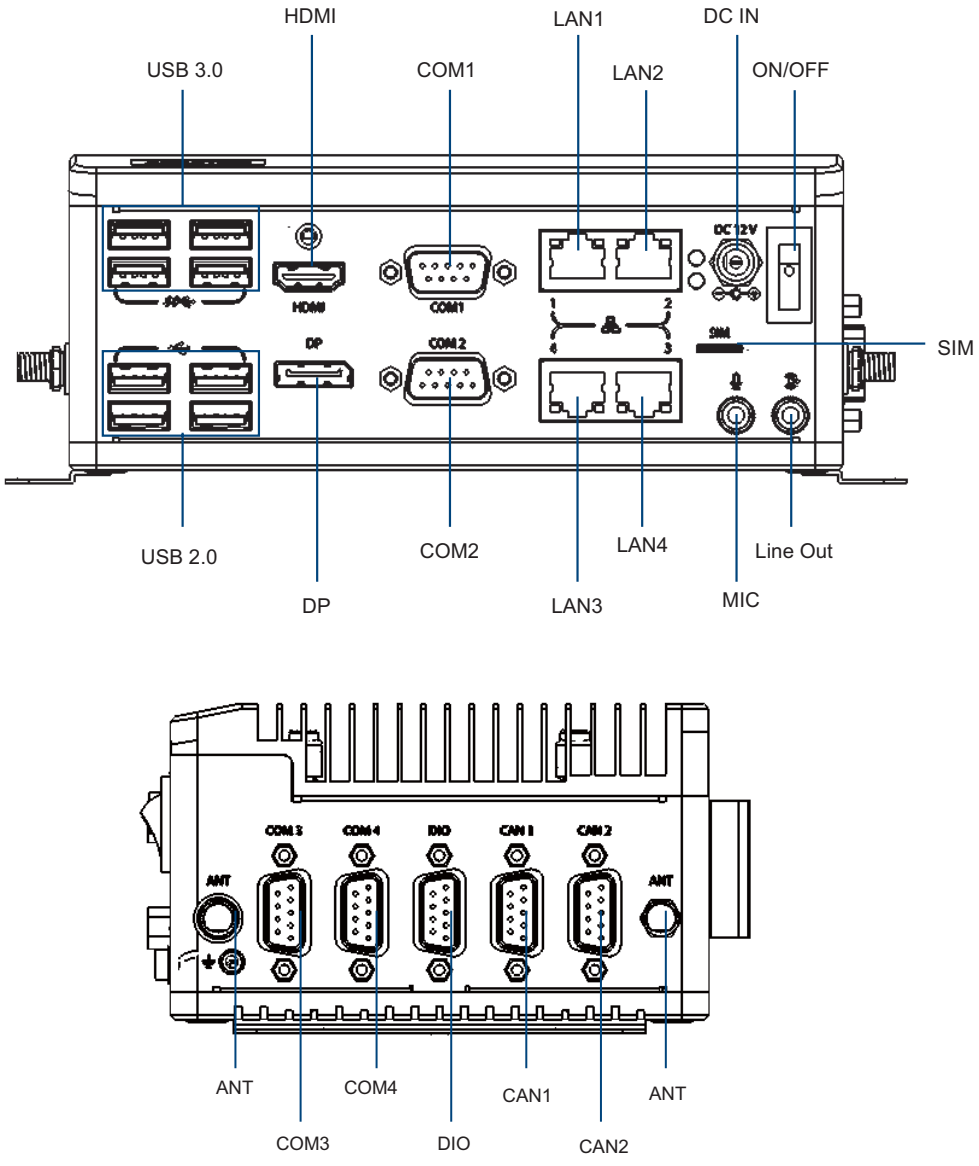


Figure 2.1 EPC-C301 I/O

2.2.1.1 Power On/Off Button

EPC-C301 has a Power On/Off button on the front side.

Figure 2.2 Power On/Off Button

2.2.1.2 LED Indicators

There are two LEDs on the front panel that indicate system status: The Power LED is for system power status; and HDD LED is for HDD and compact flash disk status.

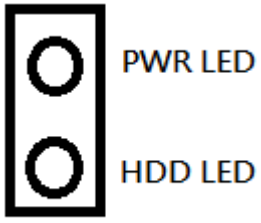


Figure 2.3 LED

2.2.1.3 HDMI Connector

An integrated 19-pin receptacle connector HDMI 1.4a interface is provided. The HDMI link supports resolutions up to 4096 x 2160 @ 30/24 Hz.

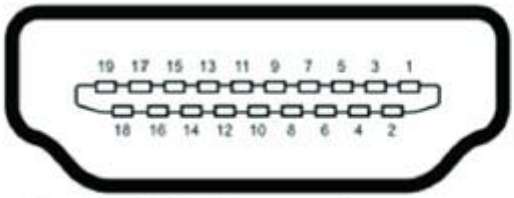
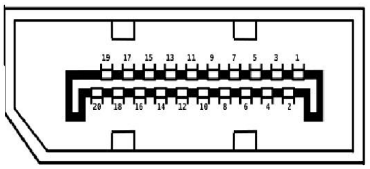


Figure 2.4 HDMI Connector

Pin	Pin Name	Pin	Pin Name
A1	HDMI_TX2+	A2	GND
A3	HDMI_TX2-	A4	HDMI_TX1+
A5	GND	A6	HDMI_TX1-
A7	HDMI_TX0+	A8	GND
A9	HDMI_TX0-	A10	HDMI_CLK+
A11	GND	A12	HDMI_CLK-
A13	NA	A14	NA
A15	SCL	A16	SDA
A17	GND	A18	+5V Power
A19	Hot Plug Detect		

2.2.1.4 DP Connector

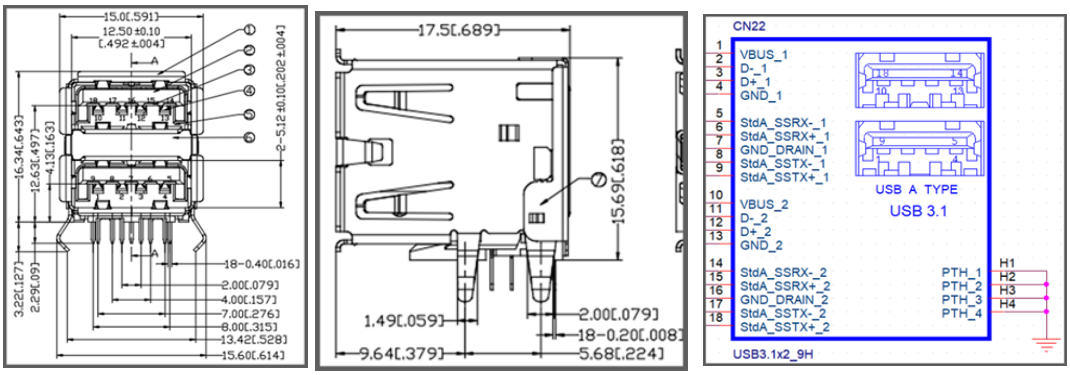
Display port support DP1.2 up to 4096x2306 @60Hz (Note: does not support audio stream, hot-plug, or HDCP)



Pin	Pin Name
1	ML_Lane0(p)
2	GND
3	ML_Lane0(n)
4	ML_Lane1(p)
5	GND
6	ML_Lane1(n)
7	ML_Lane2(p)
8	GND
9	ML_Lane2(n)
10	ML_Lane3(p)
11	GND
12	ML_Lane3(n)
13	CONFIG1
14	CONFIG2
15	AUX CH(p)
16	GND
17	AUX CH(n)
18	Hot Plug Detect
19	GND
20	+3.3V

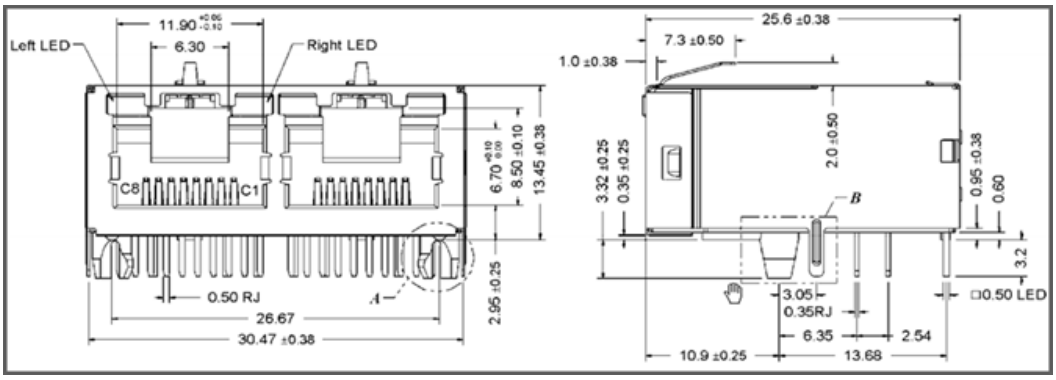
2.2.1.5 USB 3.0 Connector

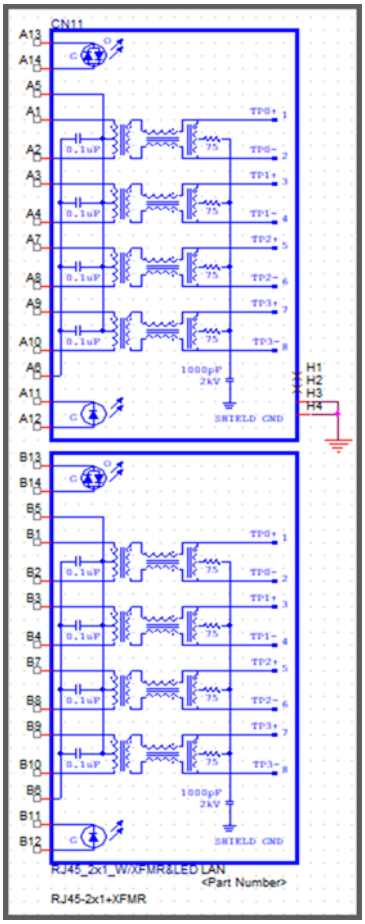
EPC-C301 USB ports 1, 2, 3, and 4 support USB 3.0 interfaces.These facilitate plug-and-play functionality and hot swapping. USB 3.0 connectors contain legacy pins for interfacing with USB 2.0 devices. These connectors also feature a new set of pins for USB 3.0 connectivity (both sets reside on the same connector).



Pin	Signal Pin Definition
1	+V5
2	USB1_P-
3	USB1_P+
4	GND
5	USB1_SSRX-
6	USB1_SSRX+
7	GND
8	USB1_SSTX-
9	USB1_SSTX+
10	+V5
11	USB2_P-
12	USB2_P+
13	GND
14	USB2_SSRX-
15	USB2_SSRX+
16	GND
17	USB2_SSTX-
18	USB2_SSTX+
H1	GND
H2	GND
H3	GND
H4	GND

2.2.1.6 RJ45 (2 port)





Pin	Signal Pin Definition
A1	LAN1_MDIO+
A2	LAN1_MDIO-
A3	LAN1_MDI1+
A4	LAN1_MDI1-
A5	LAN1CONN
A6	LAN1_GND
A7	LAN1_MDI2+
A8	LAN1_MDI2-
A9	LAN1 MDI3+
A10	LAN1_MDI3-
A11	LAN1_ACT#
A12	LAN1_A_ACT#
A13	LAN1_A_LINK100#
A14	LAN1_A_LINK1000#
B1	LAN2_MDIO+
B2	LAN2_MDIO-
B3	LAN2_MDI1+
B4	LAN2_MDI1-
B5	LAN2CONN
B6	LAN2_GND
B7	LAN2_MDI2+
B8	LAN2_MDI2-
B9	LAN2_MDI3+
B10	LAN2_MDI3-
B11	LAN2_ACT#
B12	LAN2_A_ACT#
B13	LAN2_A_LINK100#
B14	LAN2_A_LINK1000#

2.2.1.7 Audio Connectors

EPC-C301 offers stereo audio ports via two phone jack connectors called Line_Out, Mic_In. The audio chip is controlled by ALC888S. It is compliant with Azalea standards.

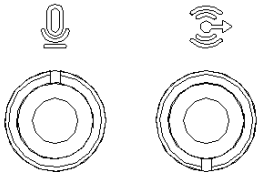
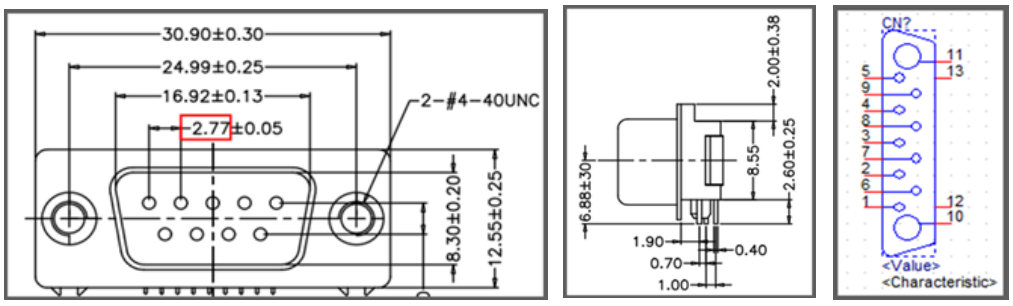


Figure 2.5 Audio Connector

2.2.1.8 COM Connector

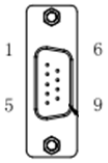
EPC-C301 provides 4x D-sub 9-pin connectors. COM1, COM2, and COM3 supports Full RS232-422-485. COM4 supports RS-232 only.



PinPin	Signal Pin Definition
1	422TX-/485D-/DCD#
2	422TX+/485D+/RXD
3	422RX+/TXD
4	422RX-/DTR#
5	GND
6	DSR#
7	RTS#
8	CTS#
9	RI#

2.2.1.9 Digital In-put/Output (DIO) Connector

EPC-C301 provides 8 bit GPIO. For further details, please refer to the pin definition.



Pin	Signal Name
1	GPIO0
2	GPIO1
3	GPIO2
4	GPIO3
5	GPIO4
6	GPIO5
7	GPIO6
8	GPIO7
9	GND

2.2.1.10 CAN Bus Connector

EPC-C301 provide 2 CANBus. It supports CAN 2.0B at 1Mb/s.

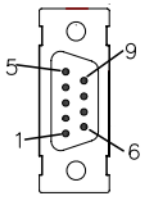


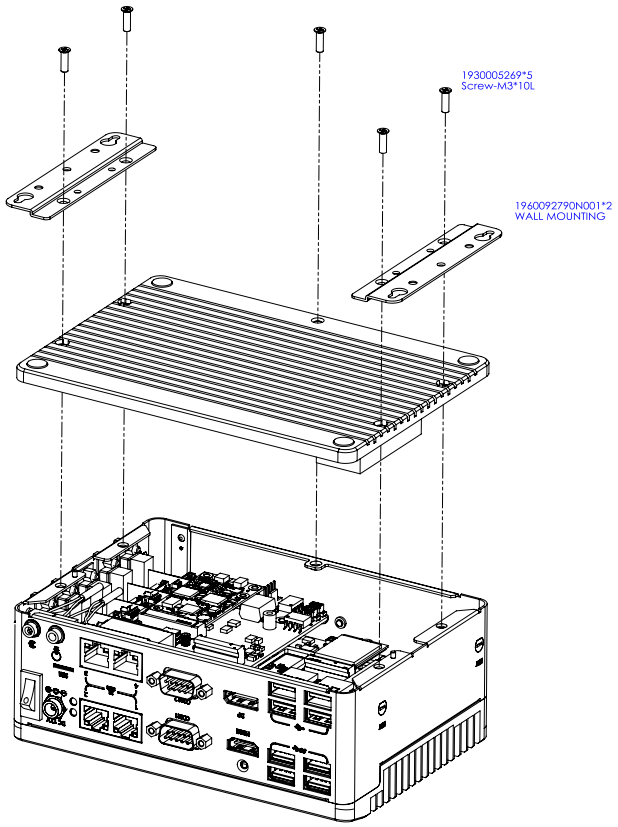
Figure 2.6 CANBus Connector Pin Definition

Pin	Pin Name
1	D+
2	D-
3	Isolated GND

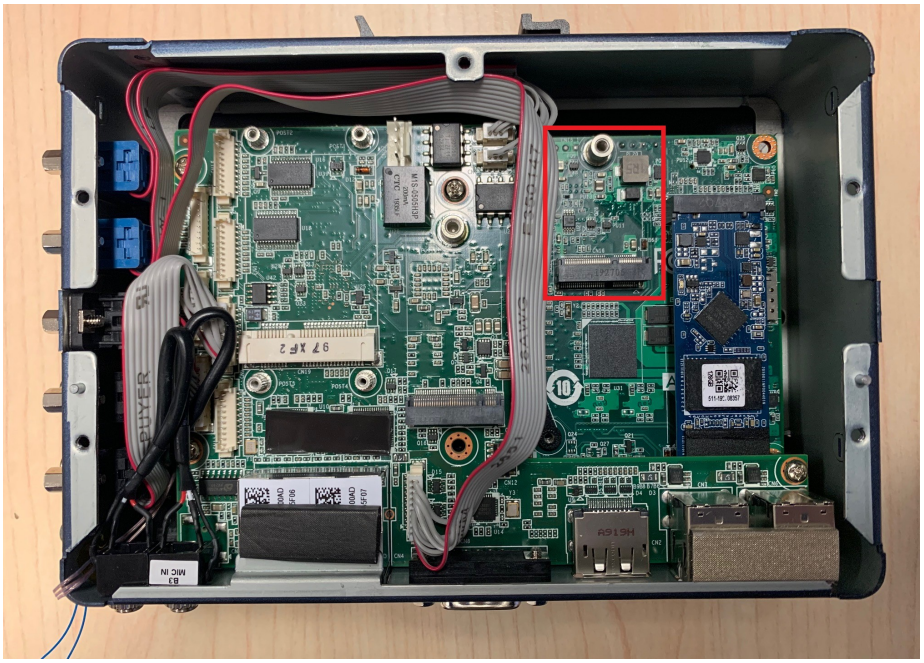
2.3 Installation

2.3.1 M.2 2230 Module Installation

1. Unscrew the 5 screws on the bottom of the case to remove the bottom cover.



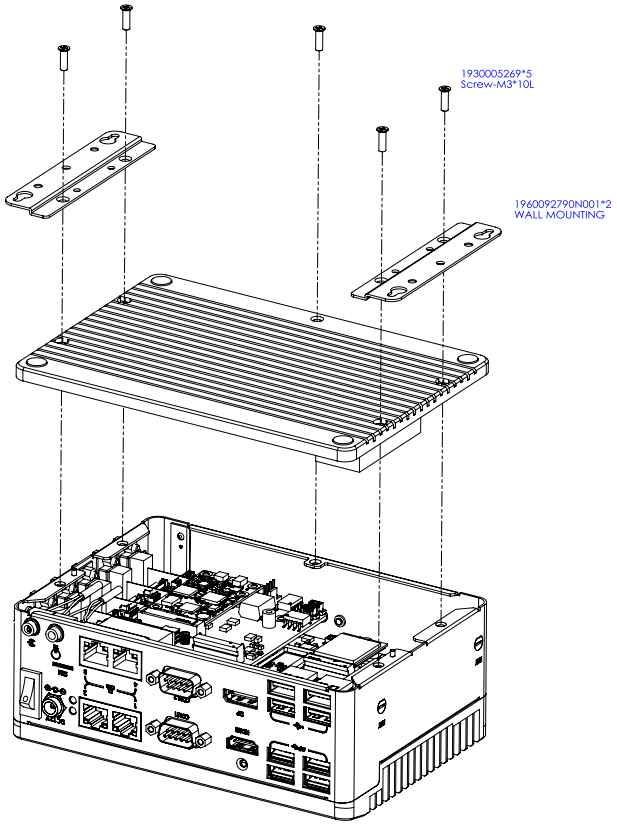
2. Install the M.2 2230 module in to the M.2 E-Key socket.



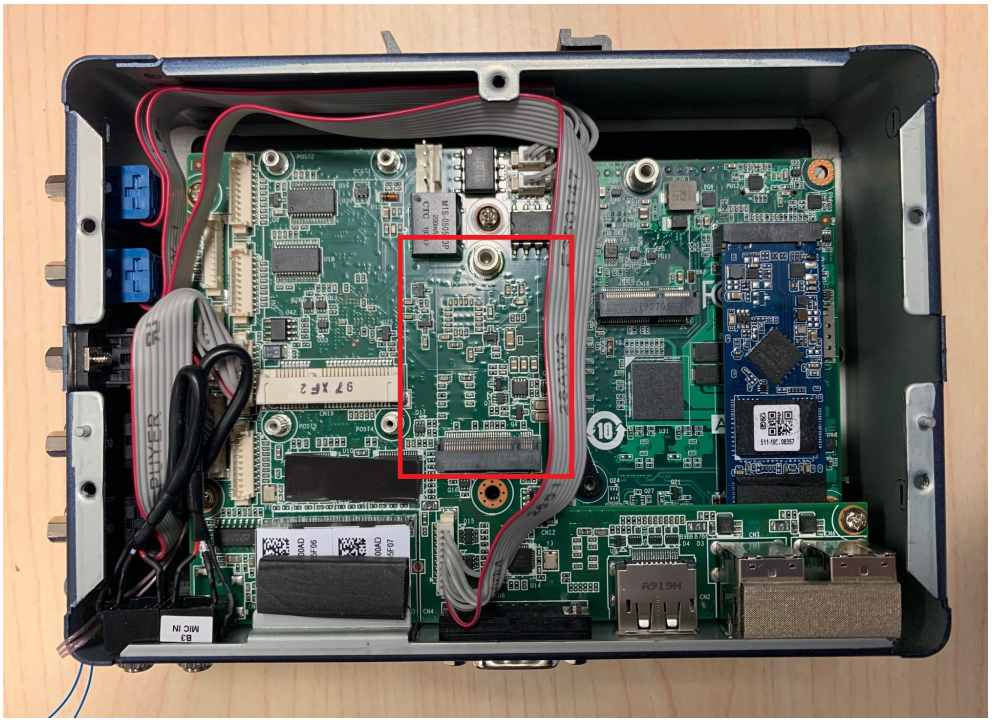
3. Fix the M.2 module using the screws in the zip-lock bag and replace the bottom cover screws.

2.3.2 M.2 3042 Module Installation

1. Unscrew the 5 screws on the bottom of the case and remove the bottom cover.



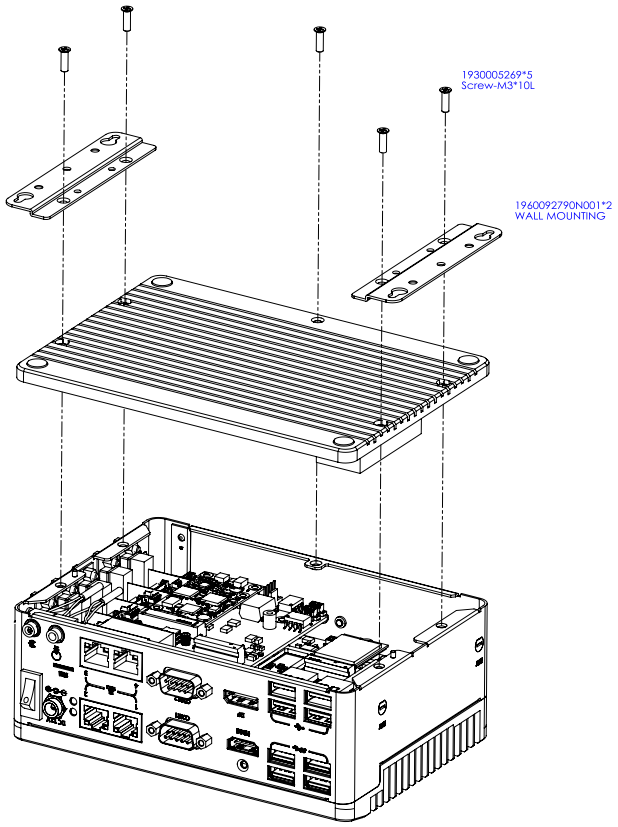
2. Install the M.2 3042 module in to the M.2 B-Key socket.



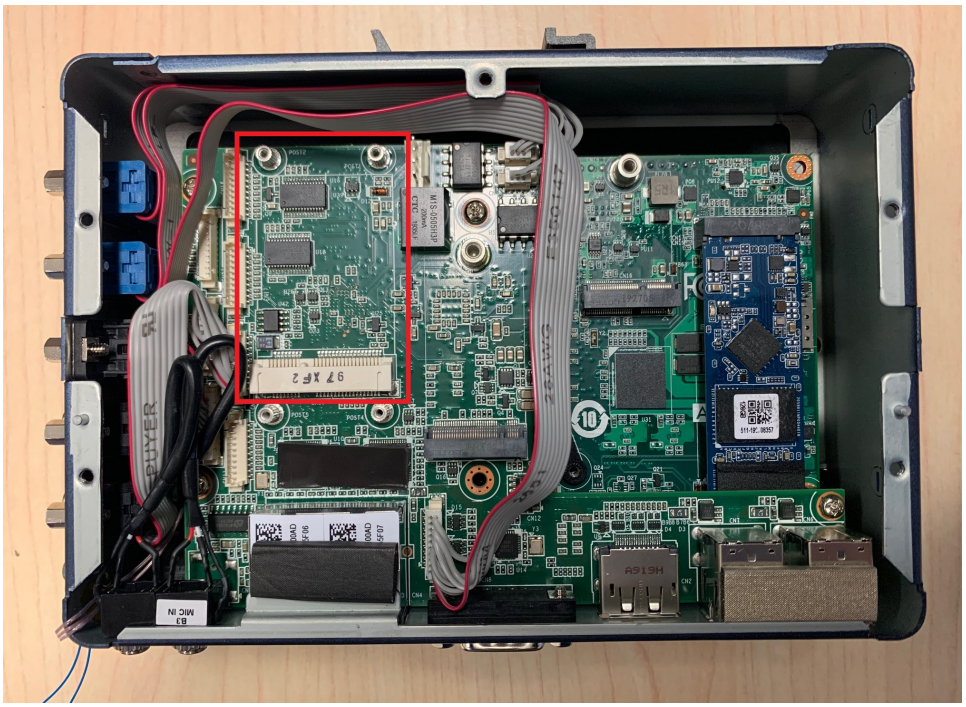
3. Fix the M.2 module with screws from the zip-lock bag and replace the bottom cover using the screws.

2.3.3 MiniPCIe Module Installation

1. Unscrew the 5 screws on the bottom of the case and remove the bottom cover.



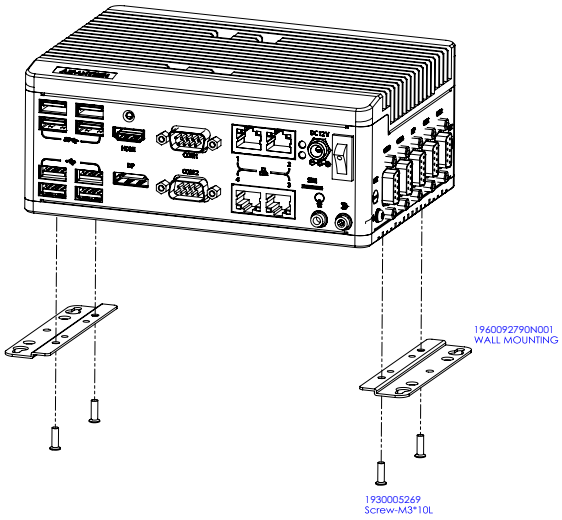
2. Install the MiniPCIe module in to the MiniPCIe socket.



3. Fix the MiniPCIe module with a screw from the zip-lock bag and replace the bottom cover using the screws.

2.3.4 Wall Mount Bracket Installation

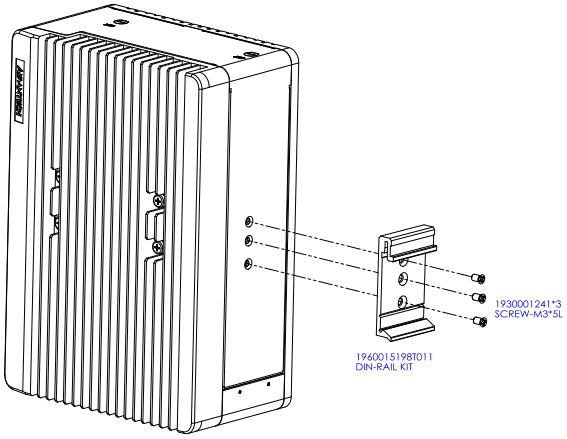
1. Loosen the four screws (M3x10L) on the bottom of the case.
2. Lock two wall mount brackets with these four screws.



1. Desserrez les quatre vis (M3x10L) du boîtier inférieur.
2. Verrouillez deux supports de montage mural avec ces quatre vis.

2.3.5 DIN Rail Installation (default installation)

1. Loosen the 3 Din rail screws on the back cover.
2. Use the Din rail screws to mount the Din rail.

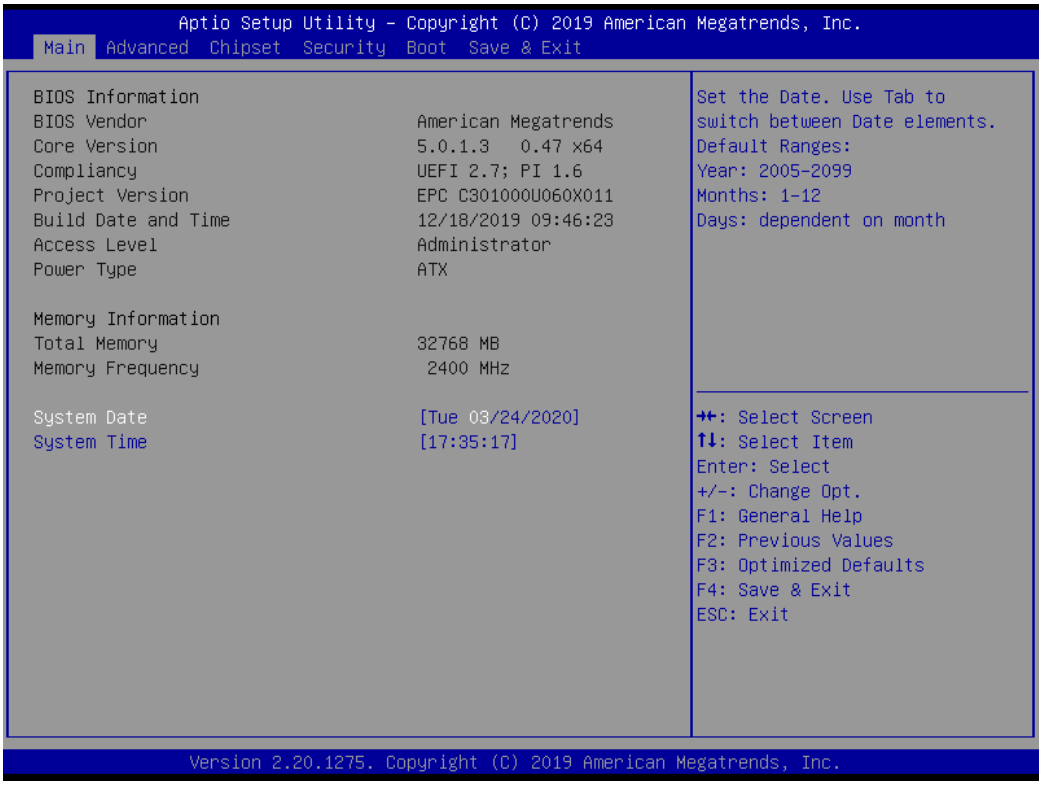


1. Desserrez 3 vis de rail DIN sur le capot arrière.
2. Utilisez des vis pour rail Din pour monter le rail Din.

Chapter 3

BIOS Settings

AMIBIOS has been integrated into various motherboards for decades. Using the AMIBIOS Setup program, users can modify BIOS settings and control various system features. This chapter describes the basic navigation of the EPC-C301 BIOS setup screens.



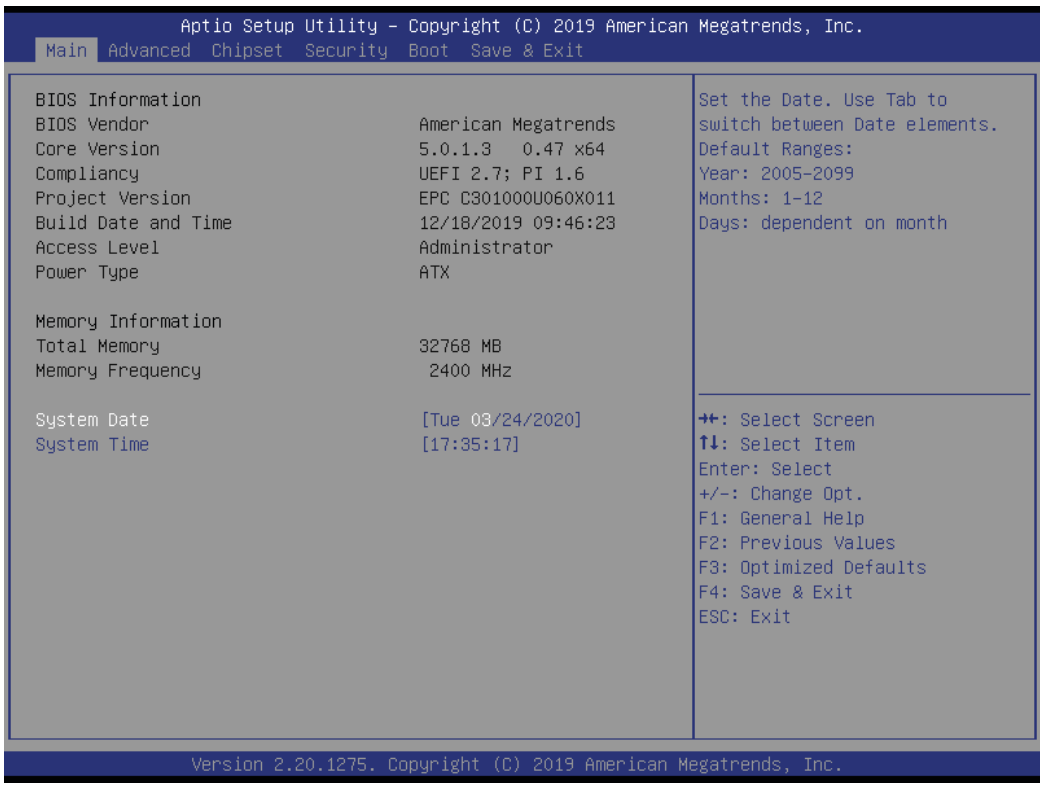
AMI BIOS ROM has a built-in Setup program that allows users to modify basic system configurations. This information is stored in battery-backed CMOS so it retains the Setup information when the power is turned off.

3.1 Entering Setup

Turn on the computer and check for the patch code. If there is a number assigned to the patch code, it means that the BIOS supports your CPU. If there is no number assigned to the patch code, please contact an Advantech application engineer to obtain an up-to-date patch code file. This will ensure that your CPU's system status is valid. After ensuring that you have a number assigned to the patch code, press <DEL> and you will immediately be allowed to enter Setup.

3.1.1 Main Setup

When you first enter the BIOS Setup Utility, you will encounter the Main setup screen. You can always return to the Main setup screen by selecting the Main tab. There are two Main Setup options. They are described in this section. The Main BIOS Setup screen is shown below.



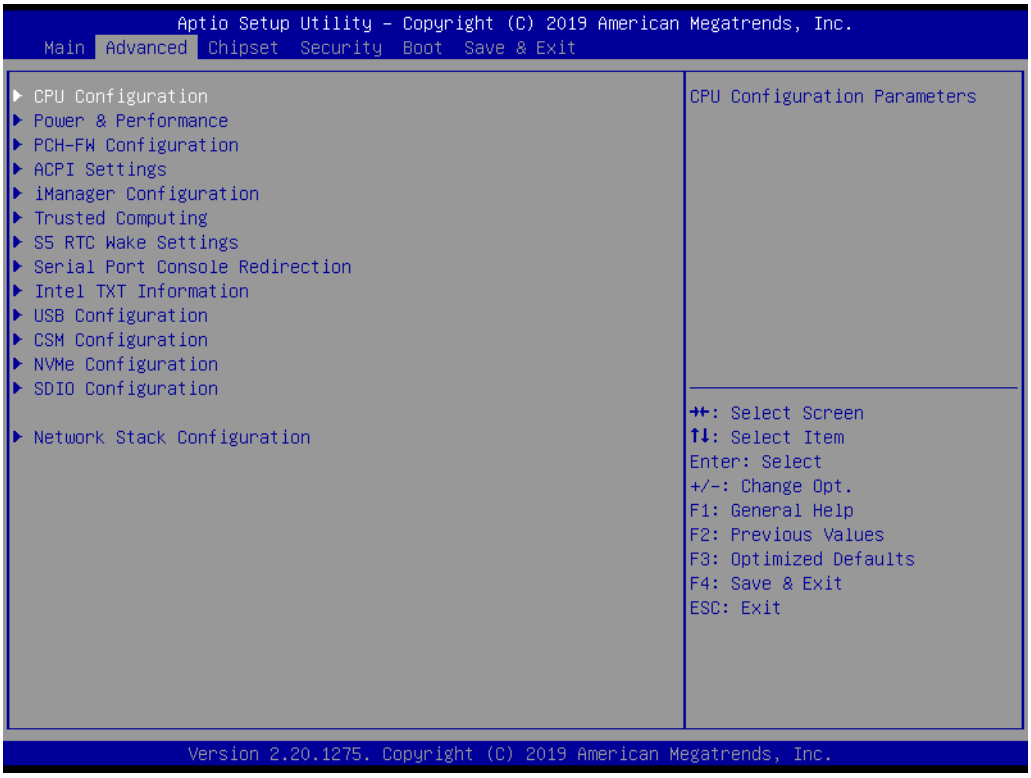
The Main BIOS setup screen has two main frames. The left frame displays all the options that can be configured. Grayed-out options cannot be configured; options in blue can. The right frame displays the key legend.

Above the key legend is an area reserved for a text messages. When an option is selected in the left frame, it is highlighted in white. Often a text message will accompany it.

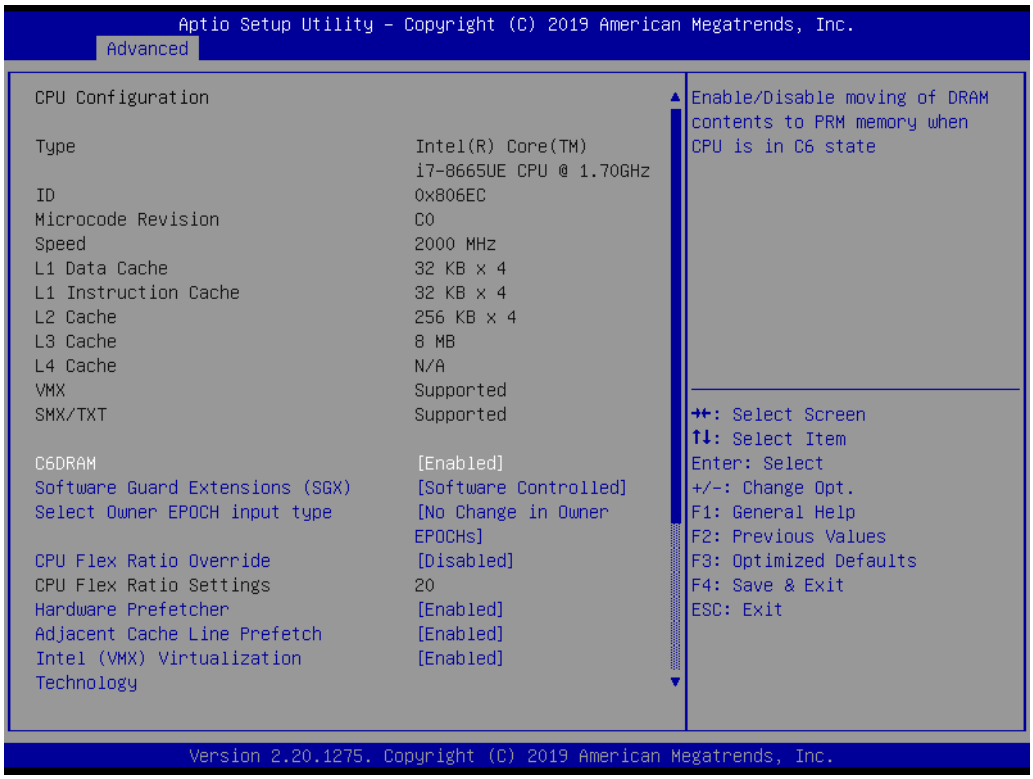
- **System time / System date**
  Use this option to change the system time and date. Highlight System Time or System Date using the <Arrow> keys. Enter new values through the keyboard.Press the <Tab> key or the <Arrow> keys to move between fields. The date must be entered in MM/DD/YY format. The time must be entered in HH:MM:SS format.

3.1.2 Advanced BIOS Features Setup

Select the Advanced tab from the EPC-C301 setup screen to enter the Advanced BIOS Setup screen. You can select any of the items in the left frame of the screen, such as CPU Configuration, to go to the sub menu for that item. You can display an Advanced BIOS Setup option by highlighting it using the <Arrow> keys. All Advanced BIOS Setup options are described in this section. The Advanced BIOS Setup screens is shown below. The sub menus are described on the following pages.



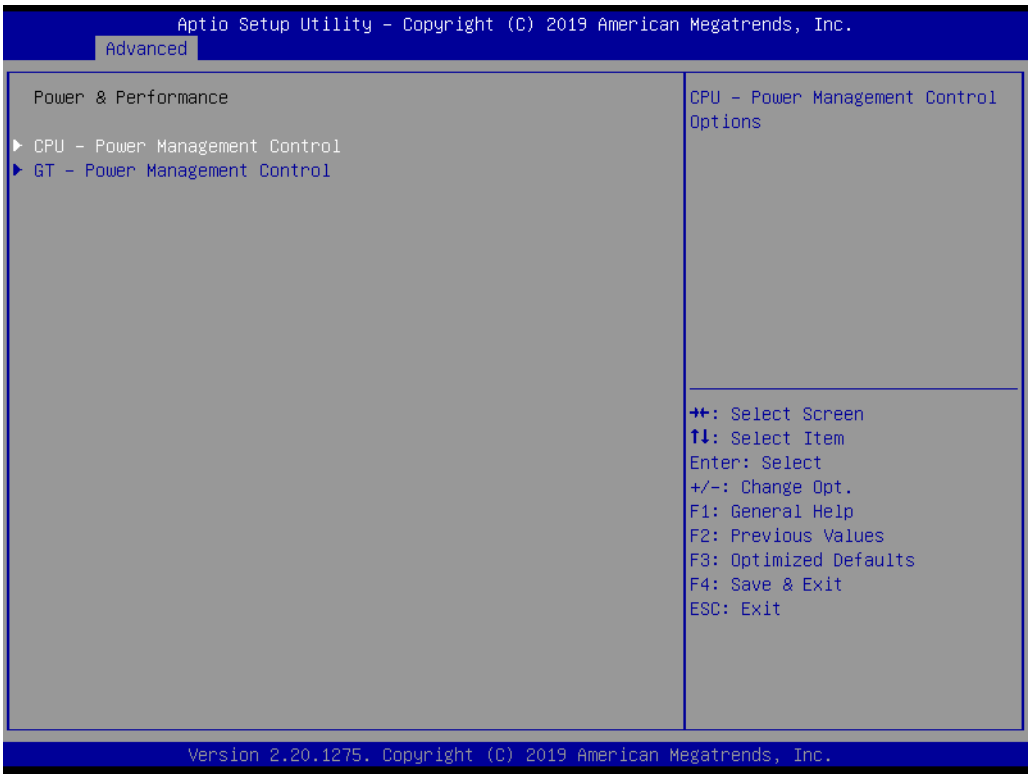
3.1.2.1 CPU Configuration



- **C6DRAM**
  Enable/Disable moving of dram contents to PRM memory when CPU is in C6 state.
- **SW Guard Extension (SGX)**
  Enable/Disable Software Guard Extensions (SGX).
- **Select Owner EPOCH input type**
  Choose Owner EPOCH modes.
- **CPU Flex Ratio Override**
  Enable/Disable CPU Flex Ratio Programming.
- **Hardware Prefetcher**
  This item allows users to enable or disable the hardware prefetcher feature.
- **Adjacent Cache Line Prefetch**
  This item allows users to enable or disable the adjacent cache line prefetch feature.
- **Intel (VMX) Virtualization Technology**
  When Enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.
- **Active Processor Cores**
  This item allows users to set how many processor cores should be active.
- **AES**
  Enable/Disable AES (Advanced Encryption Standard).
- **MachineCheck**
  Enable/Disable Machine Check.
- **MonitorMWait**
  Enable/Disable MonitorMWait.

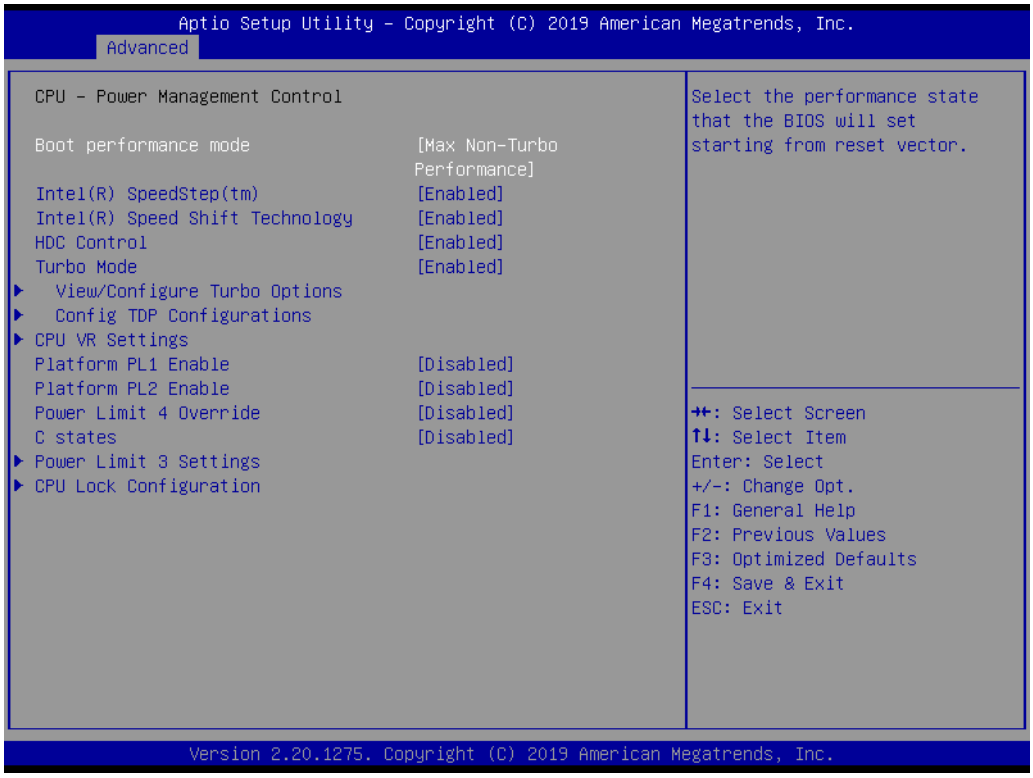
- **Intel Trusted Execution Technology**
  Enables utilization of additional hardware capabilities provided by Intel® Trusted Execution Technology.

3.1.2.2 Power & Performance



- **CPU - Power Management Control**
  CPU - Power Management Control Options.
- **GT - Power Management Control**
  GT - Power Management Control Options.

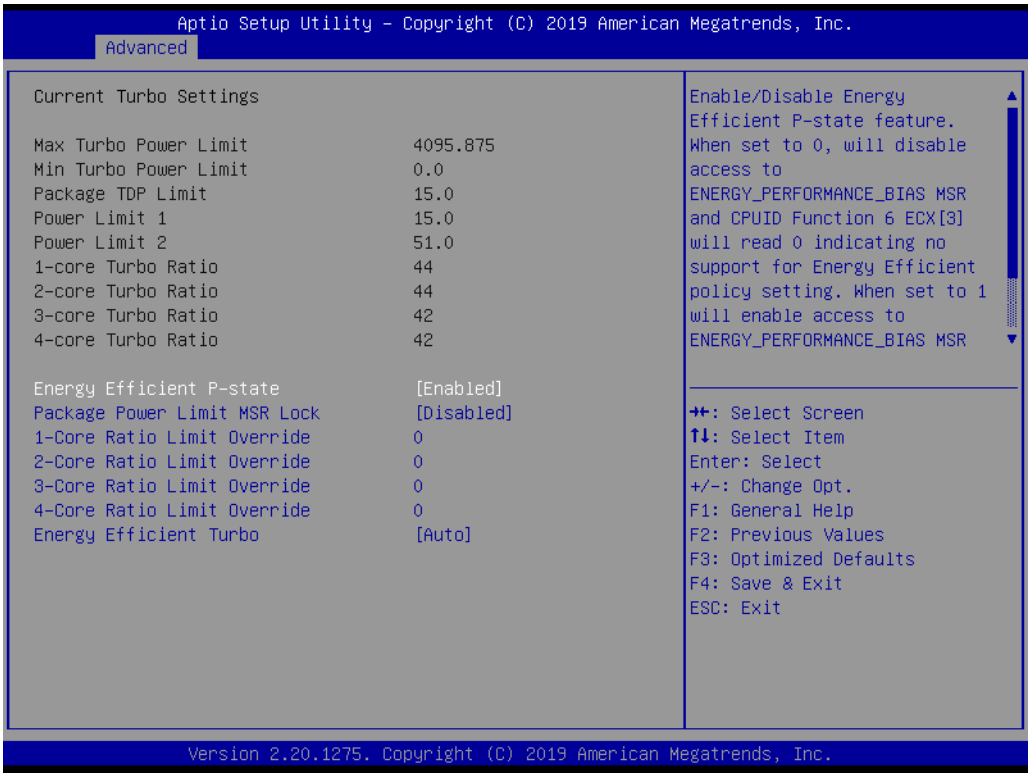
CPU - Power Management Control



- **Boot Performance mode**
  Select the performance state that the BIOS will set before OS handoff.
- **Intel® SpeedStep™**
  Allows more than two frequency ranges to be supported.
- **Intel® Speed Shift Technology**
  Enable/Disable Intel® Speed Shift Technology support.
- **HDC Control**
  Enable/Disable Intel® HDC.
- **Turbo Mode**
  Enable/Disable processor turbo mode.
- **View/Configure Turbo Options**
  View and Configure Turbo Options.
- **Config TDP Configuration**
  Config TDP Configurations.
- **CPU VR Setting**
  CPU CR Settings.
- **Platform PL1 Enable**
  Enable/Disable Platform Power Limit 1 programming.
- **Platform PL2 Enable**
  Enable/Disable Platform Power Limit 1 programming.
- **Power Limit 4 Override**
  Enable/Disable Power Limit 4 override.
- **C states**
  Enable/Disable CPU Power Management.
- **PowerLimit 3 Settings**
  Power Limit 3 Settings.

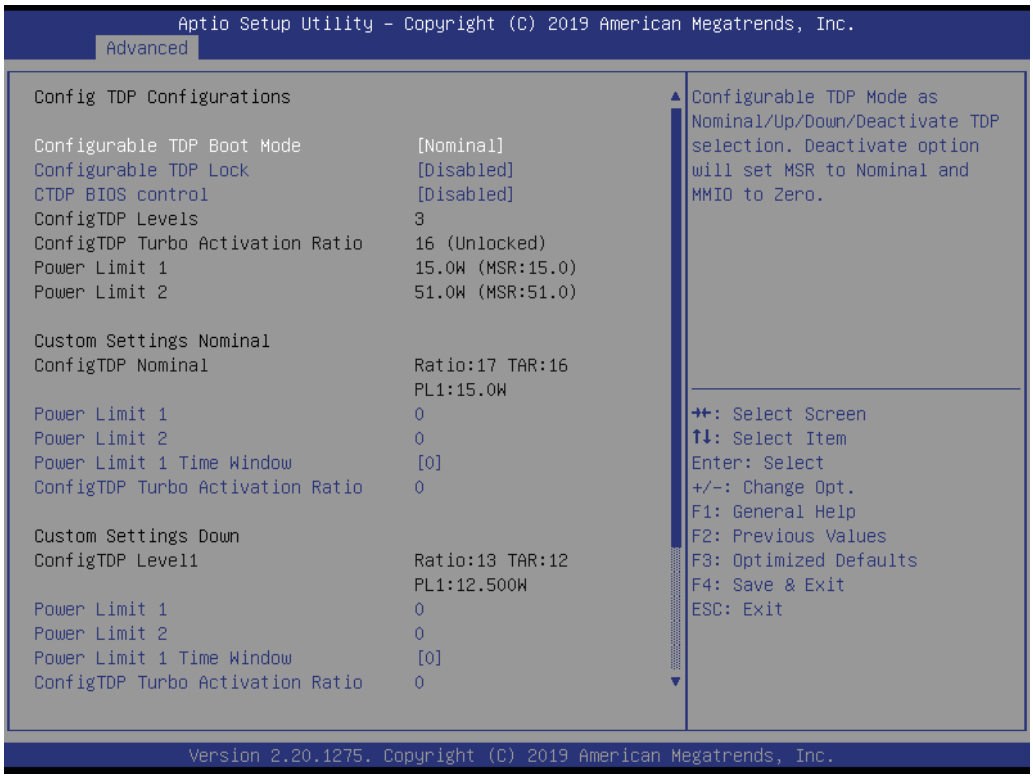
- **CPU Lock Configuration**
  CPU Lock Configuration.

View/Configure Turbo Options



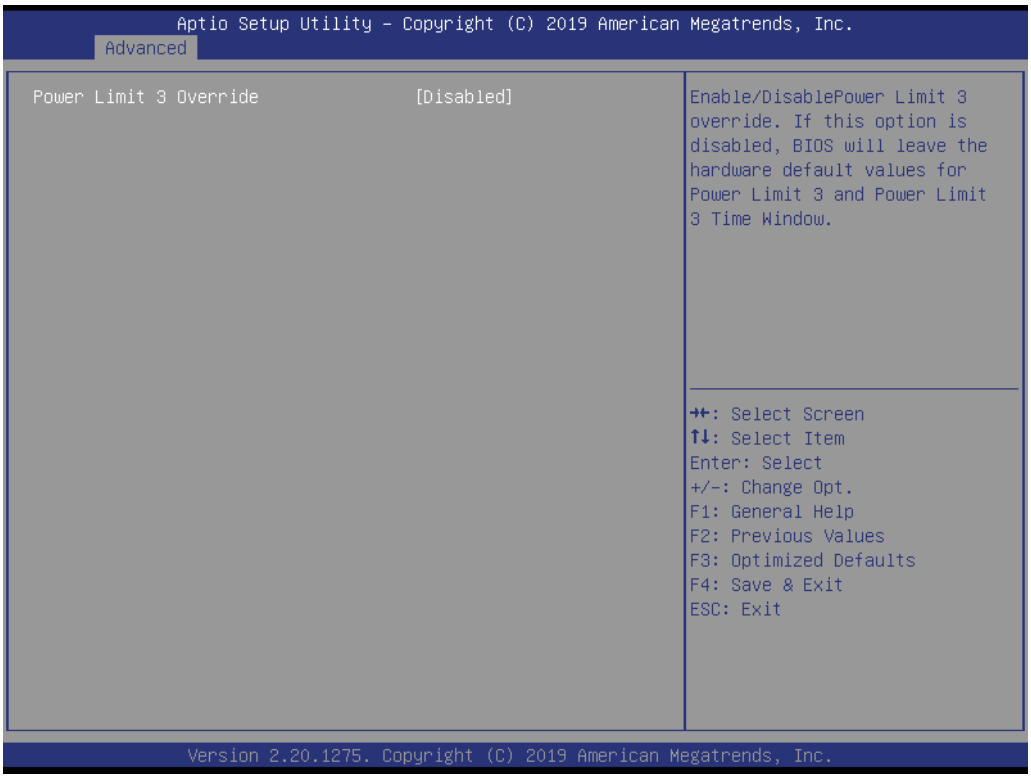
- **Energy Efficient P-state**
  Enable/Disable Energy Efficient P-state feature.
- **Package Power Limit MSR Lock**
  Enable/Disable locking of Package Power Limit settings.
- **Energy Efficient Turbo**
  Enable/Disable Energy Efficient Turbo feature.

Config TDP Configurations



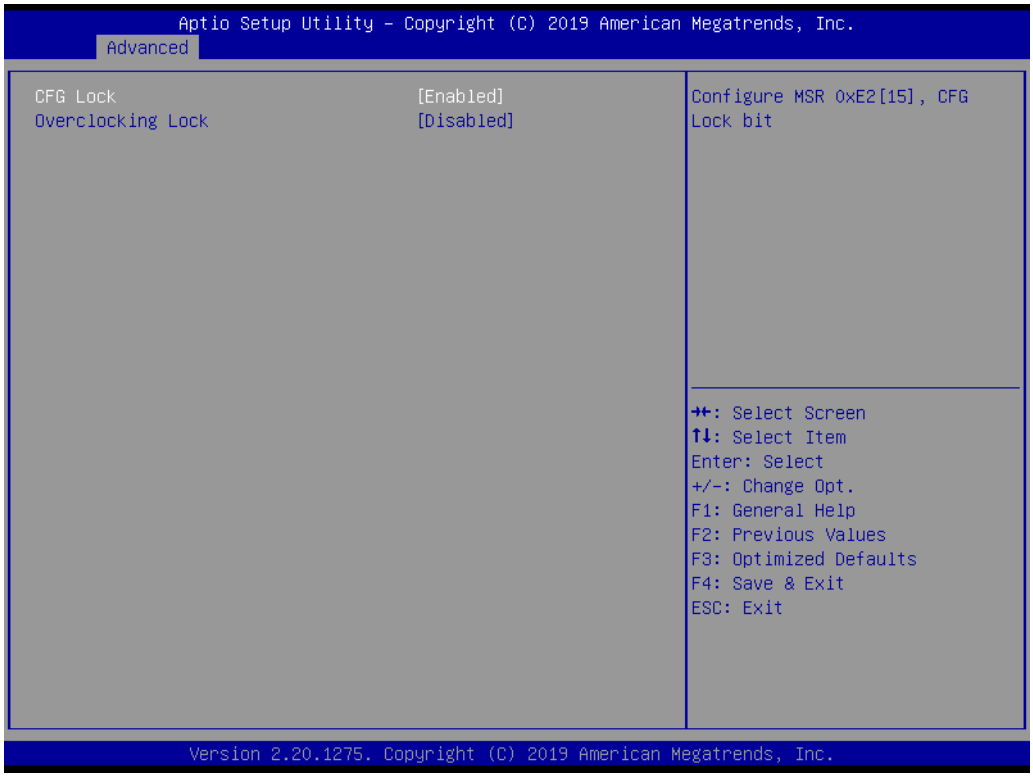
- **Configurable TDP Boot Mode**
  Configurable TDP Mode as Nominal/Up/Down/Deactivate TDP selection.
- **Configurable TDP Lock**
  Configurable TDP Mode Lock sets the Lock bit.
- **CTDP BIOS control**
  Enables CTDP control via runtime ACPI BIOS method.

Power Limit 3 Settings



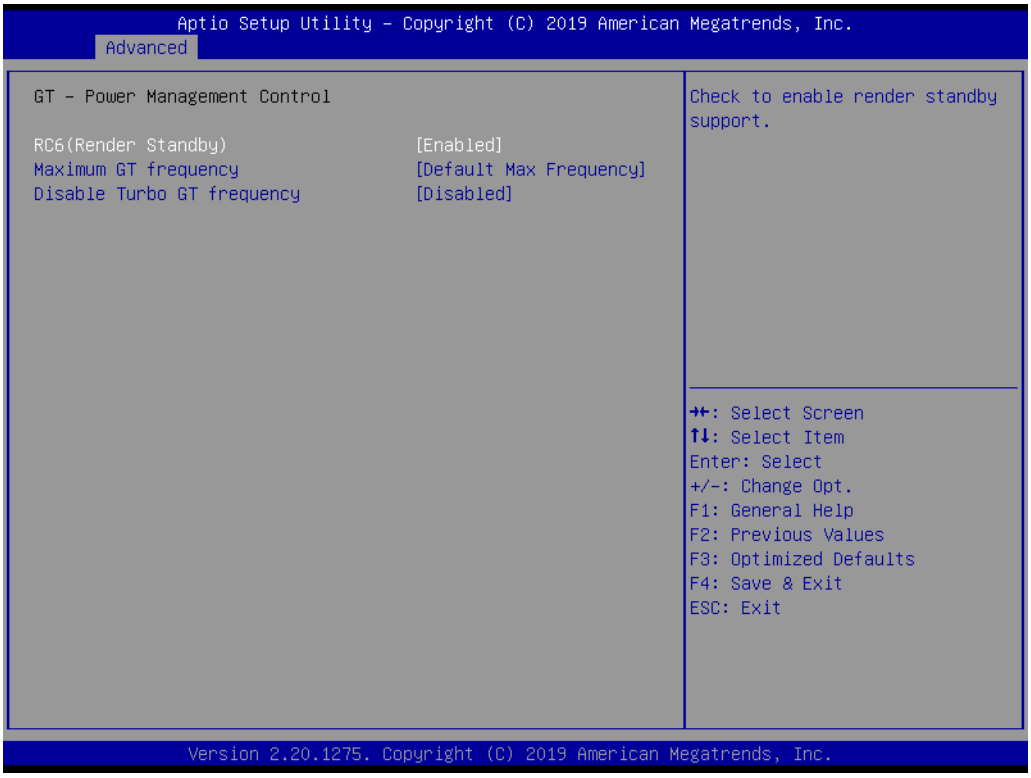
- **Power Limit 3 Override**
  Enable/Disable Power Limit 3 override.

CPU Lock Configuration



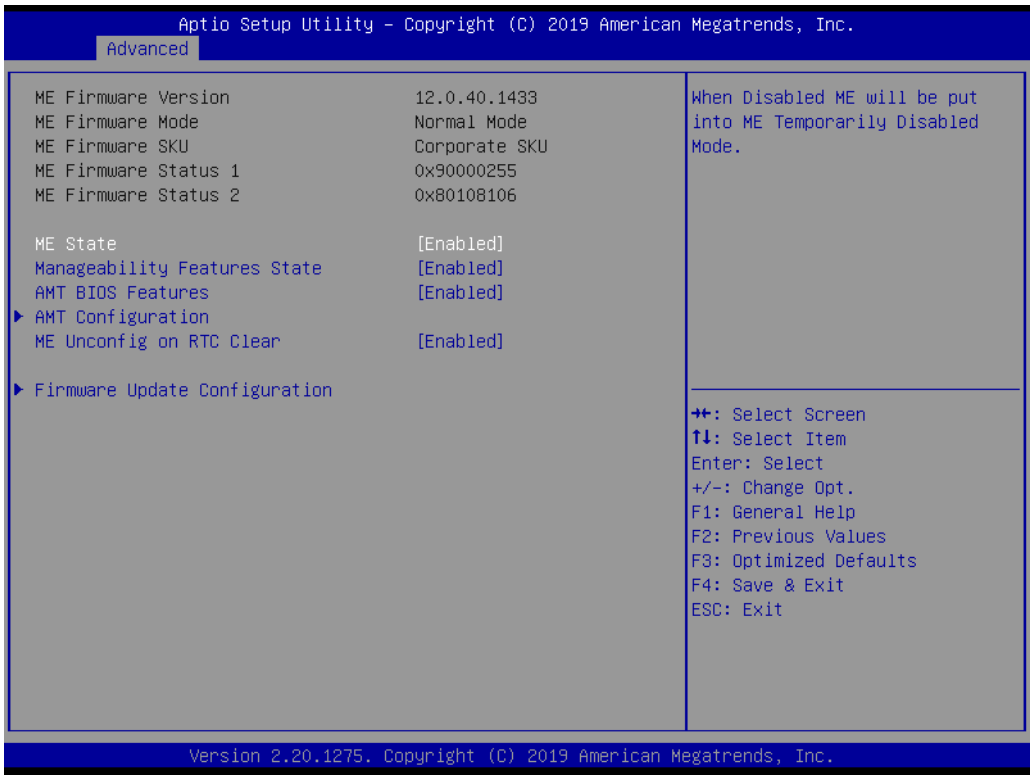
- **CFG Lock**
  Configure MSR 0xE2[15], CFG Lock bit.
- **Overclocking Lock**
  Enable/Disable Overclocking Lock (BIT 20) in FLEX_RATIO(194) MSR.

GT - Power Management Control



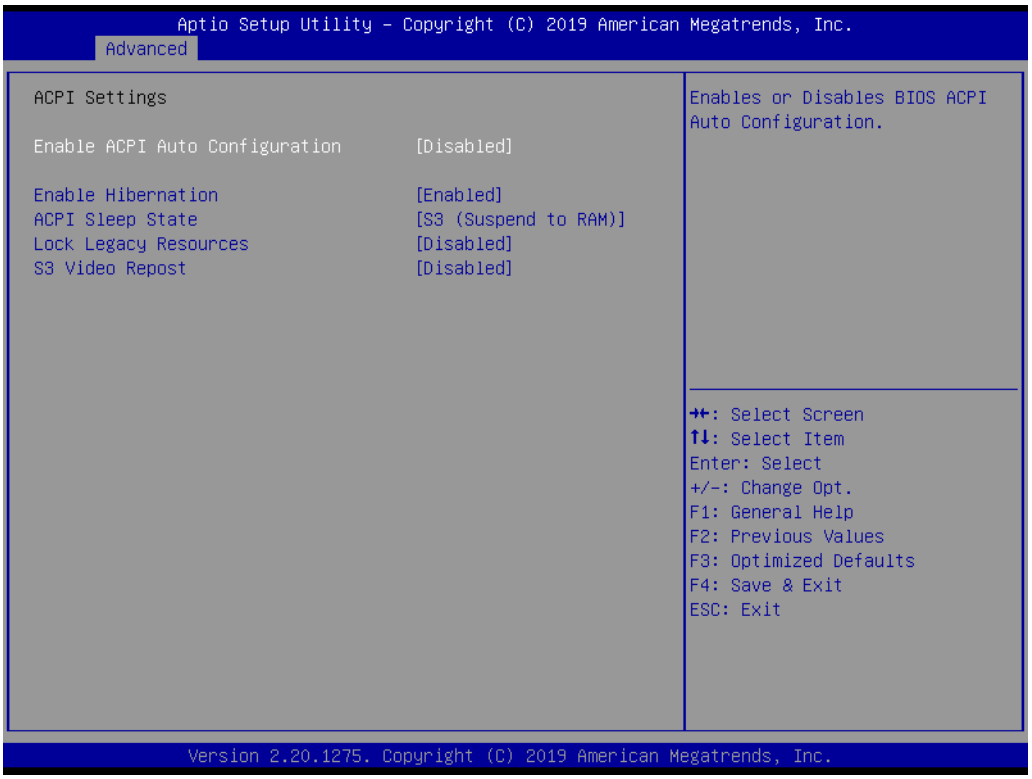
- **RC6(Render Standby)**
  Check to enable render standby support.
- **Maximum GT frequency**
  Maximum GT frequency limited by user.
- **Disable Turbo GT frequency**
  Enabled/Disabled Turbo GT frequency.

3.1.2.3 PCH-FW Configuration



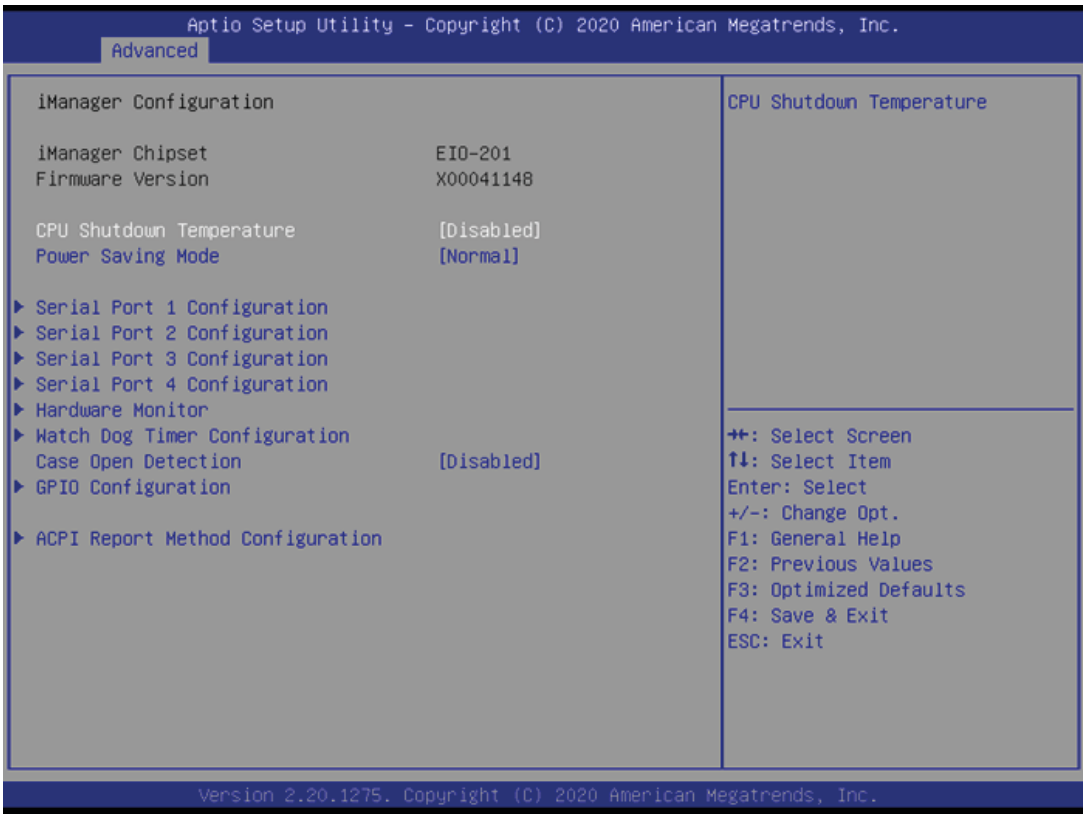
- **ME State**
  When Disabled ME will be put ME into Temporarily Disabled Mode.
- **Manageability Features State**
  Enable/Disable Intel® Manageability features.
- **AMT BIOS Features**
  When disabled, AMT BIOS Features are no longer supported and user is no longer able to access MEBx setup.
- **AMT Configuration**
  Configure Intel® Active Management Technology Parameters.
- **ME Unconfig on RTC Clear**
  When Disabled, ME will not be unconfigured on RTC Clear.
- **Firmware Update Configuration**
  Configure Management Engine Technology Parameters.

3.1.2.4 ACPI Settings



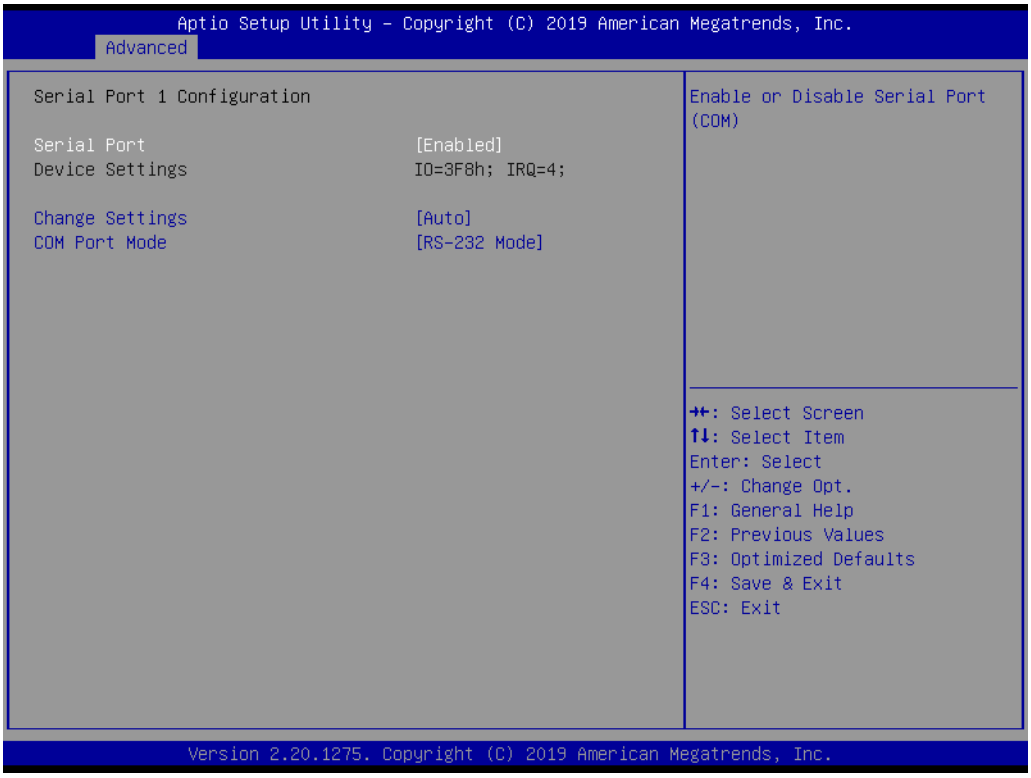
- **Enable ACPI Auto Configuration**
  Enable or disable BIOS ACPI auto configuration.
- **Enable Hibernation**
  Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.
- **ACPI Sleep State**
  Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.
- **Lock Legacy Resources**
  Enables or Disables Lock of Legacy Resources.
- **S3 Video Repost**
  Enable or Disable S3 Video Repost.

3.1.2.5 iManager Configuration



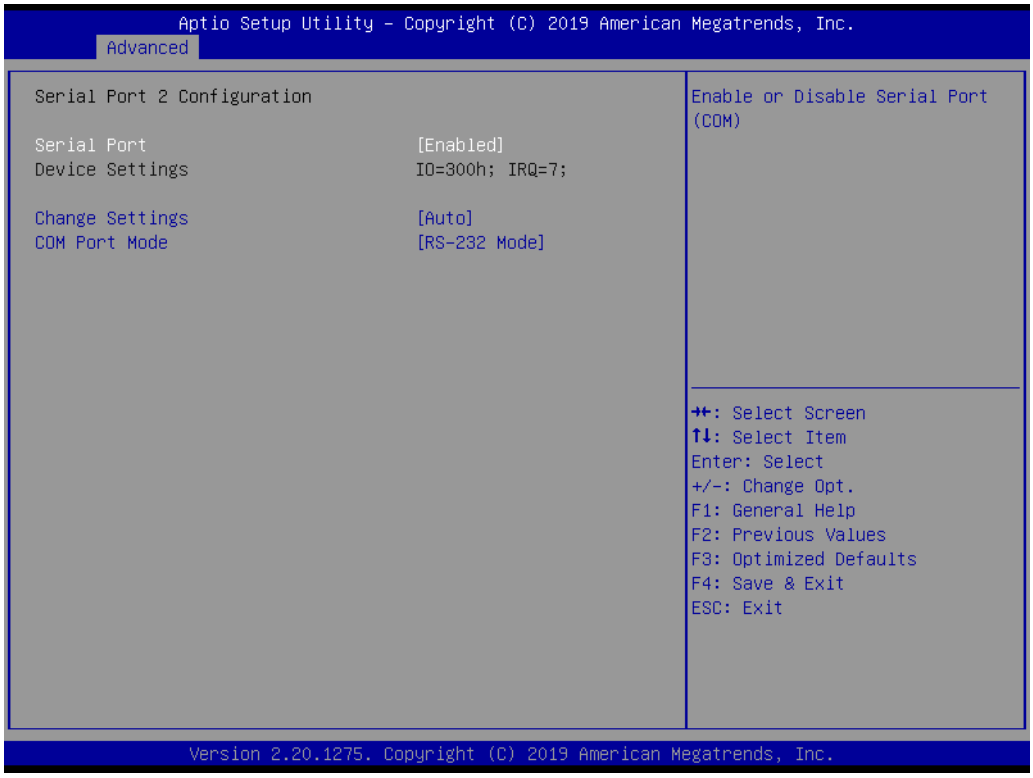
- **CPU Shutdown Temperature**
  Enable/Disable CPU Shutdown Temperature.
- **Power Saving Mode**
  Enable/Disable power saving mode.
- **Serial Port 1 Configuration**
  Set Parameters of Serial Port 1.
- **Serial Port 2 Configuration**
  Set Parameters of Serial Port 2.
- **Serial Port 3 Configuration**
  Set Parameters of Serial Port 3.
- **Serial Port 4 Configuration**
  Set Parameters of Serial Port 4.
- **Hardware Monitor**
  Monitor hardware Status.
- **Watch Dog Timer Configuration**
  Watch Dog Timer Configuration Page.
- **Case Open Detection**
  Enable or Disable Case Open Detect Function.
- **GPIO Configuration**
  GPIO Configuration Settings.
- **ACPI Report Method Configuration**
  Select ACPI Reporting Method for EC Devices.
  * COM port can support 1.5Mbps Baud Rate under Linux OS by selecting ACPI reporting method.

Serial Port 1 Configuration



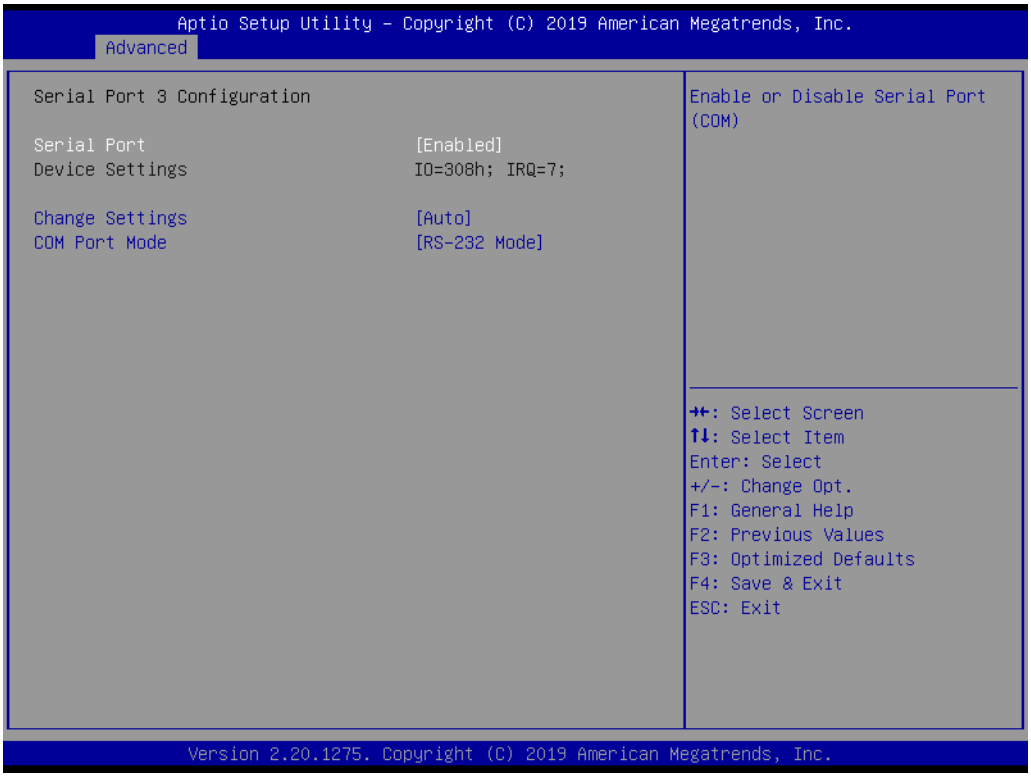
- **Serial Port**
  Enable or Disable Serial Port (COM).
- **Change Settings**
  Select an optimal settings for Serial Port device.
- **COM Port Mode**
  COM Port Mode Select.

Serial Port 2 Configuration



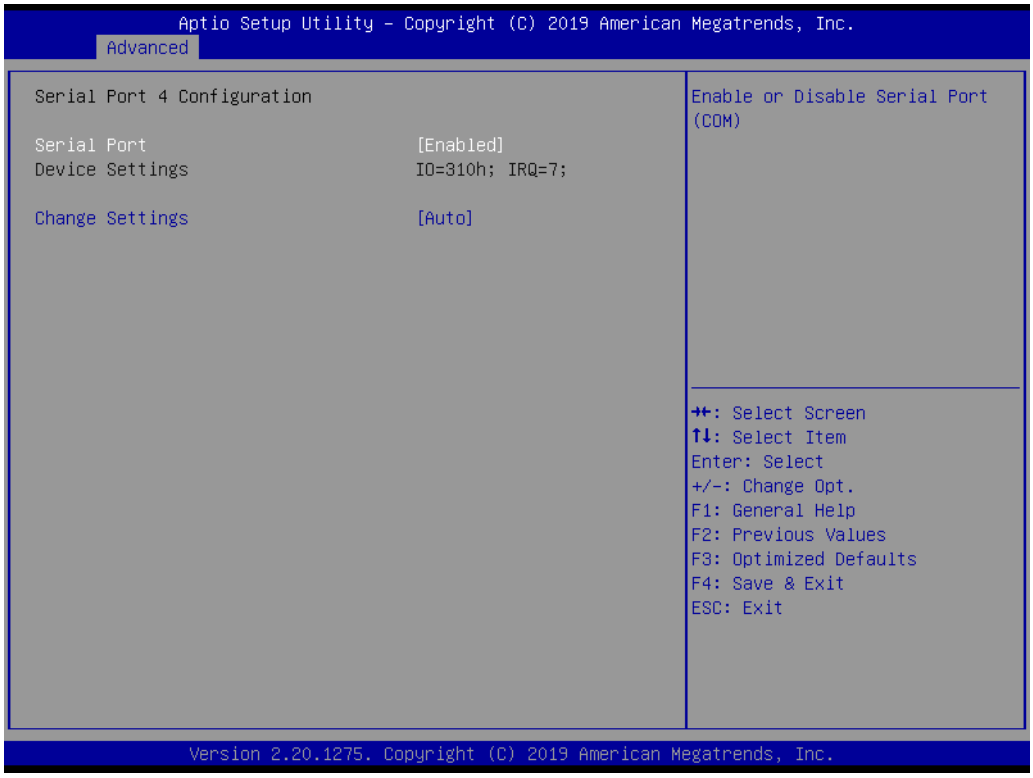
- **Serial Port**
  Enable or Disable Serial Port (COM).
- **Change Settings**
  Select an optimal settings for Serial Port device.
- **COM Port Mode**
  COM Port Mode Select.

Serial Port 3 Configuration



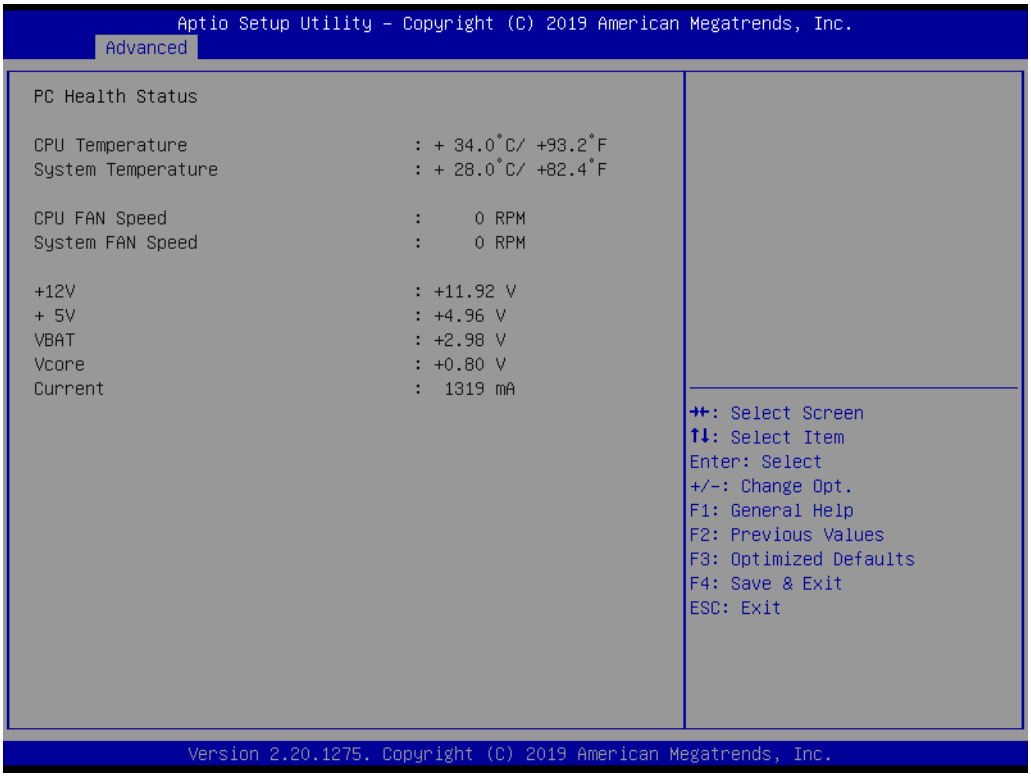
- **Serial Port**
  Enable or Disable Serial Port (COM).
- **Change Settings**
  Select an optimal settings for Serial Port device.
- **COM Port Mode**
  COM Port Mode Select.

Serial Port 4 Configuration

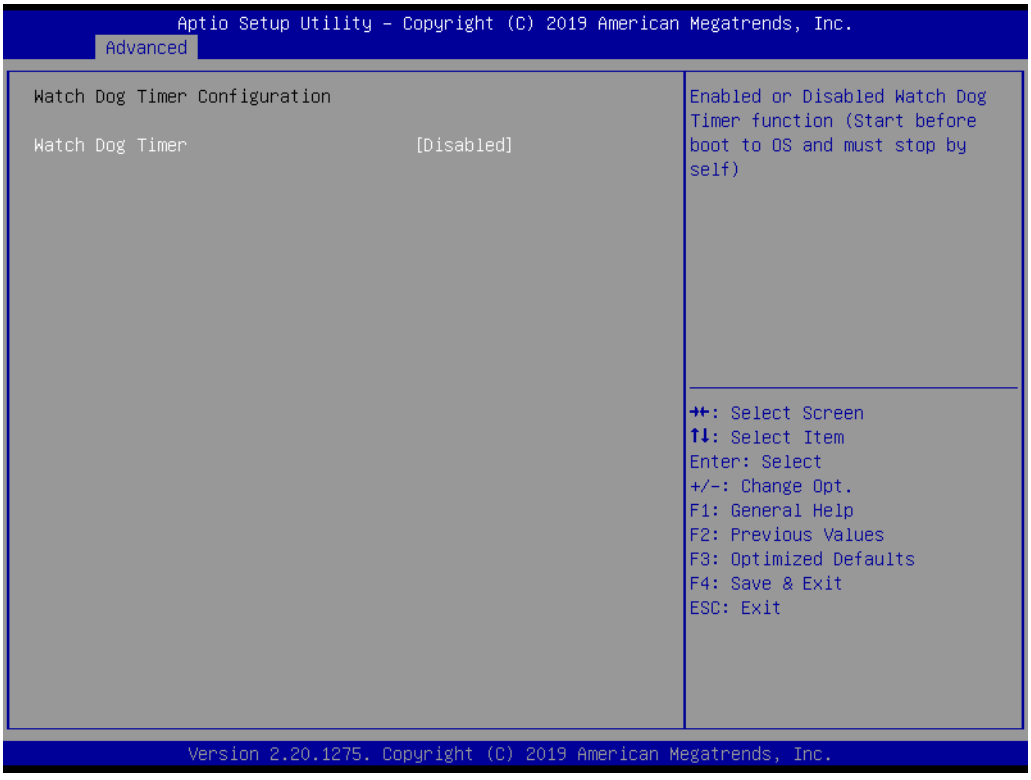


- **Serial Port**
  Enable or Disable Serial Port (COM).
- **Change Settings**
  Select an optimal settings for Serial Port device.

Hardware Monitor

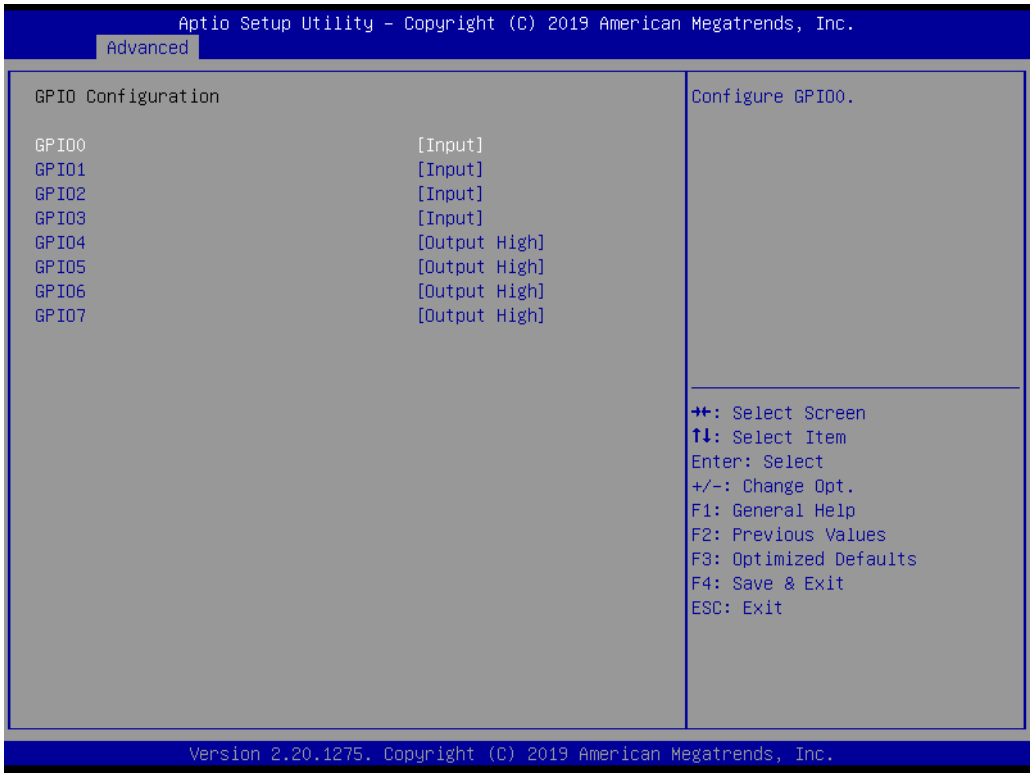


Watchdog Timer Configuration



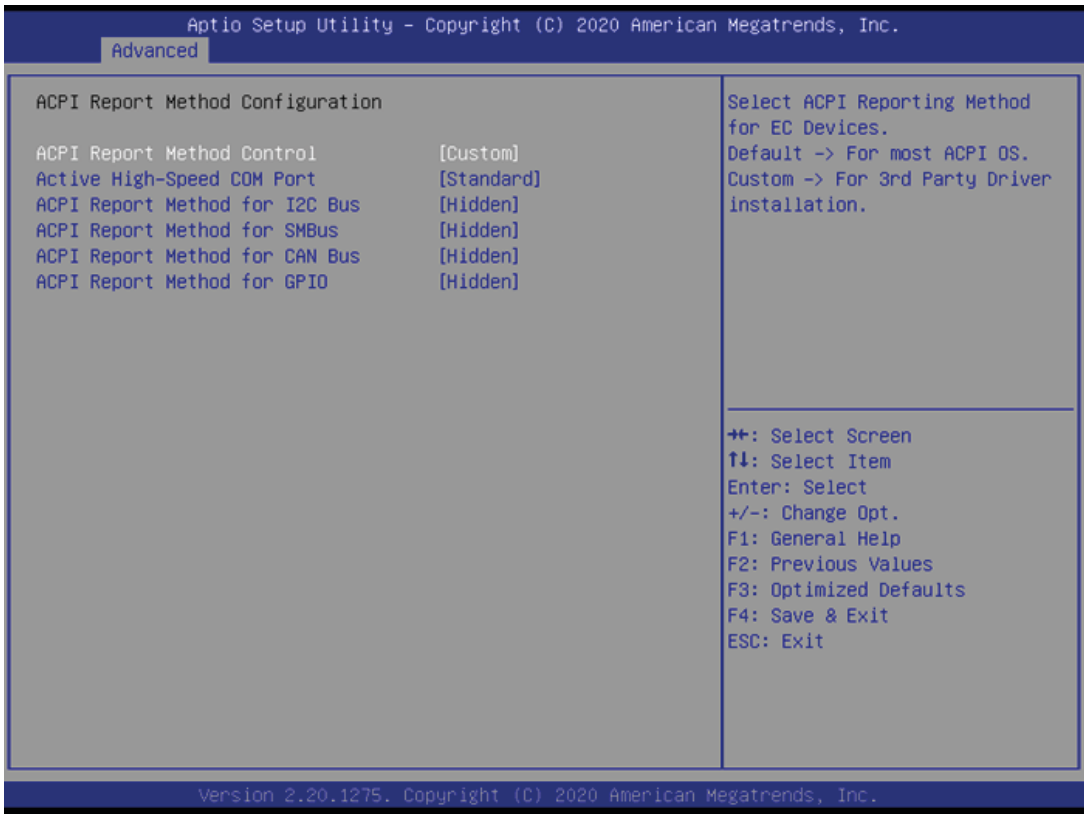
- **Watchdog Timer**
  Enable or Disable Watch Dog Timer Function.

GPIO Configuration



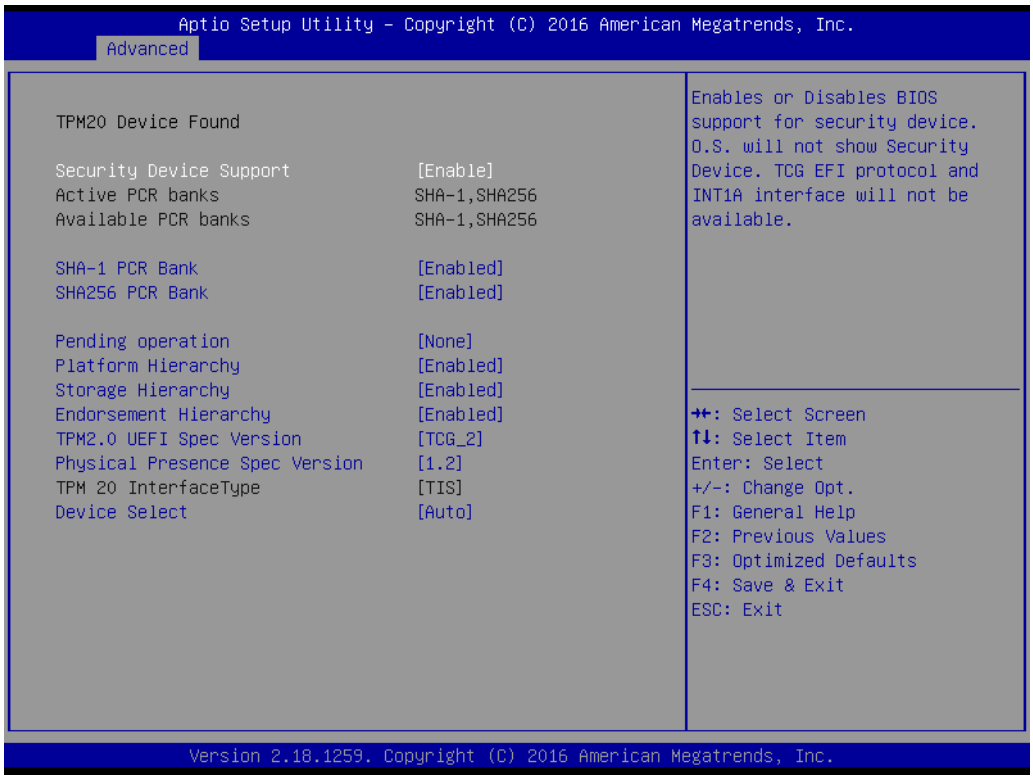
- **GPIO0/1/2/3/4/5/6/7**
  Configure GPIO0/1/2/3/4/5/6/7.

3.1.2.6 ACPI Report Method Configuration



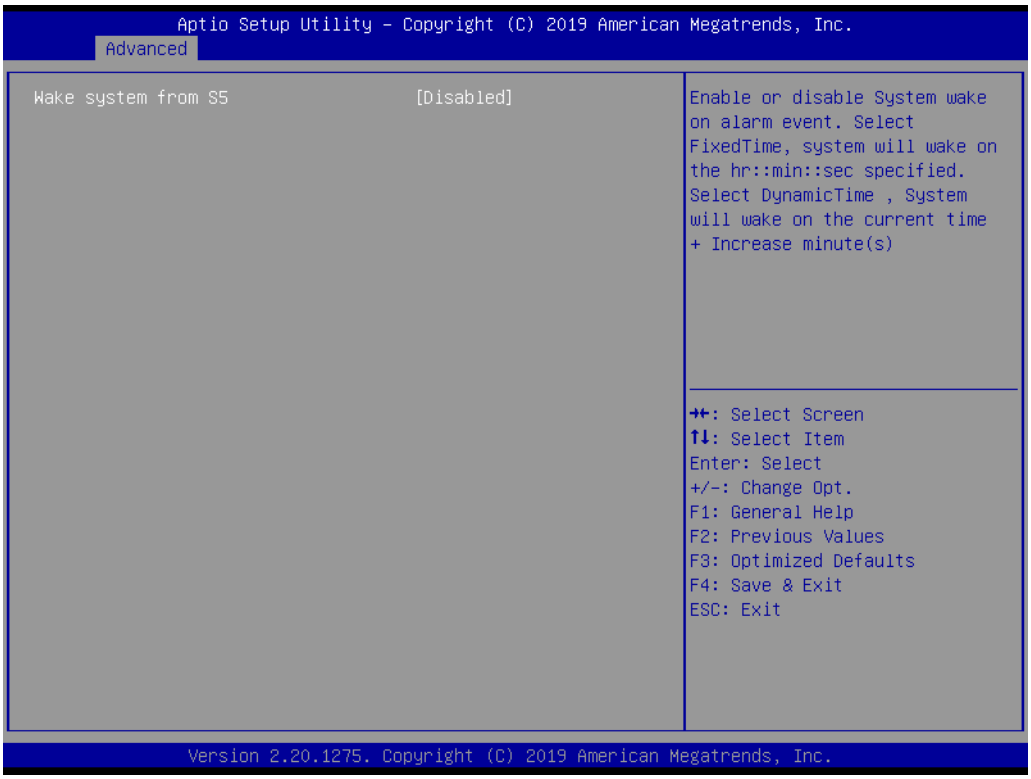
- **ACPI Report Method Control**
  Select ACPI Reporting Method for EC Devices.
- **Active High-Speed COM Port**
  Select to Enable High-Speed COM Port or Standard COM Port.
- **ACPI Report Method for I2C Bus**
  Select ACPI Reporting Method for EC I2C Bus.
- **ACPI Report Method for SMBus**
  Select ACPI Reporting Method for EC SMBus.
- **ACPI Report Method for CAN Bus**
  Select ACPI Reporting Method for EC CAN Bus.
- **ACPI Report Method for GPIO**
  Select ACPI Reporting Method for EC GPIO.

3.1.2.7 Trusted Computing



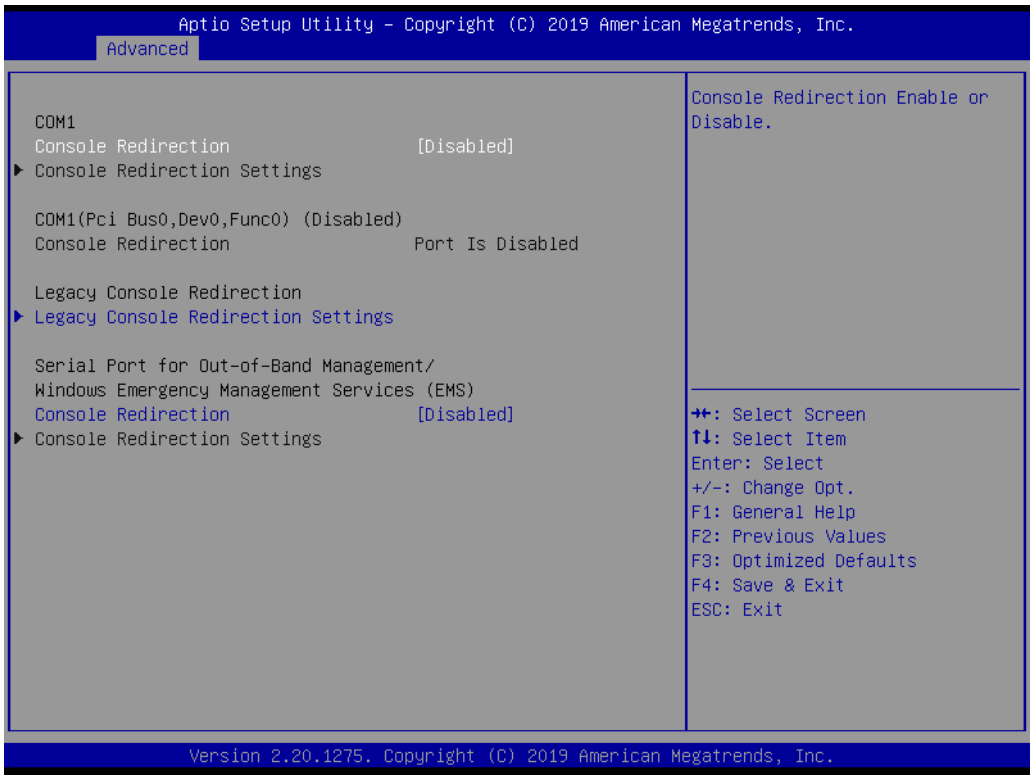
- **Security Device Support**
  Enable or disable BIOS support for security device.
- **SHA-1 PCR Bank**
  Enable or Disable SHA-1 PCR Bank.
- **SHA256 PCR Bank**
  Enable or Disable SHA256 PCR Bank.
- **Pending operation**
  Schedule an Operation for the Security Device.
- **Platform Hierarchy**
  Enable or Disable Platform Hierarchy.
- **Storage Hierarchy**
  Enable or Disable Storage Hierarchy.
- **Endorsement Hierarchy**
  Enable or Disable Endorsement Hierarchy.
- **TPM 2.0 UEFI Spec Version**
  Select the TCG2 Spec Version Support.
- **Physical Presence Spec Version**
  Select to Tell O.S. to support PPI Spec Version 1.2 or 1.3.
- **Device Select**
  TPM 1.2 will restrict support to TPM 1.2 devices, TPM 2.0 will restrict support to TPM 2.0 devices.

3.1.2.8 S5 RTC Wake Settings



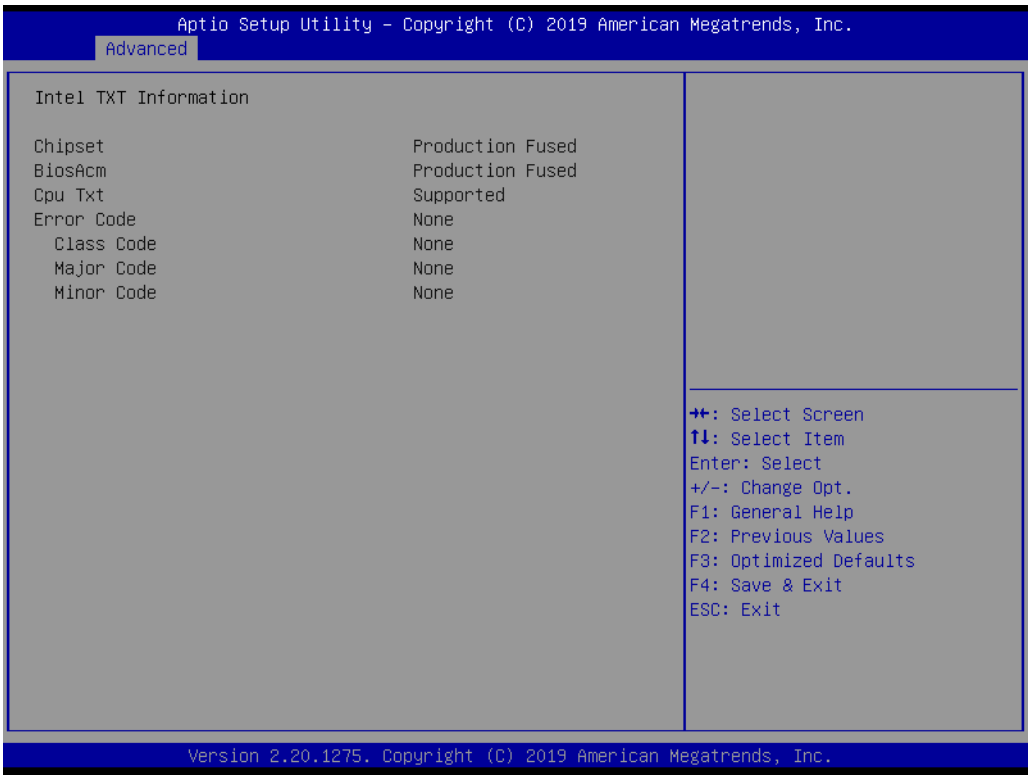
- **Wake system from S5**
  Enable or disable System wake on alarm event. Select FixedTime, system will wake on the hr::min::sec specified.

3.1.2.9 Serial Port Console Redirection



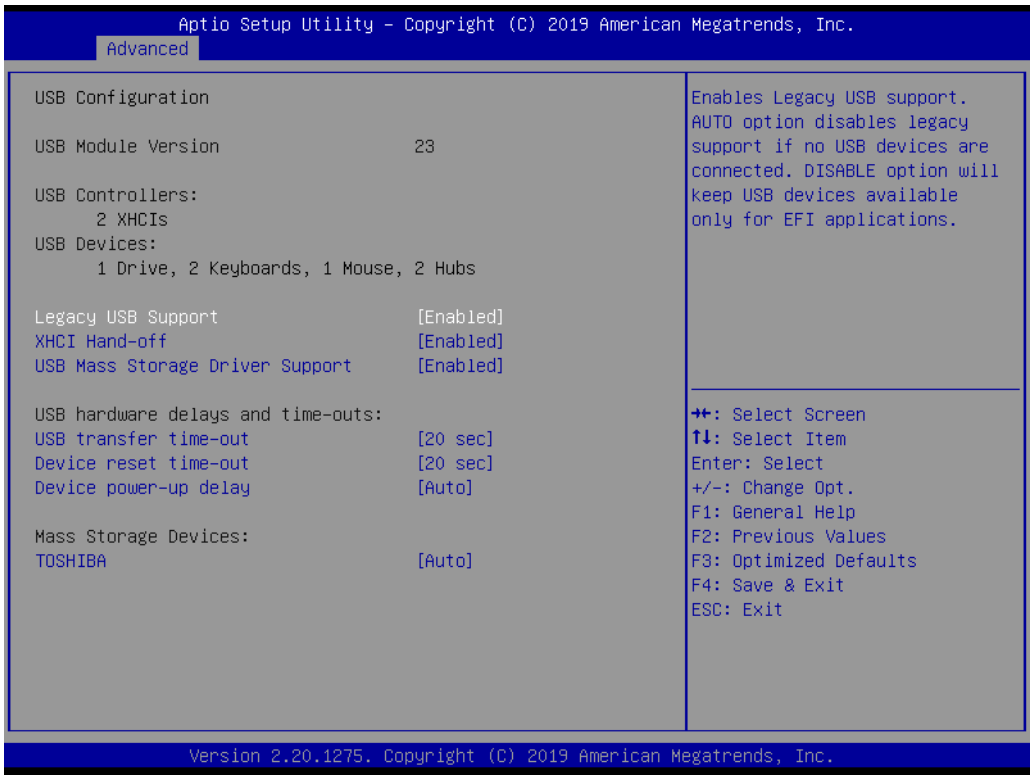
- **Console Redirection**
  This item allows users to enable or disable console redirection for Microsoft Windows Emergency Management Services (EMS).
- **Console Redirection**
  This item allows users to configuration console redirection detail settings.

3.1.2.10 Intel® TXT Information



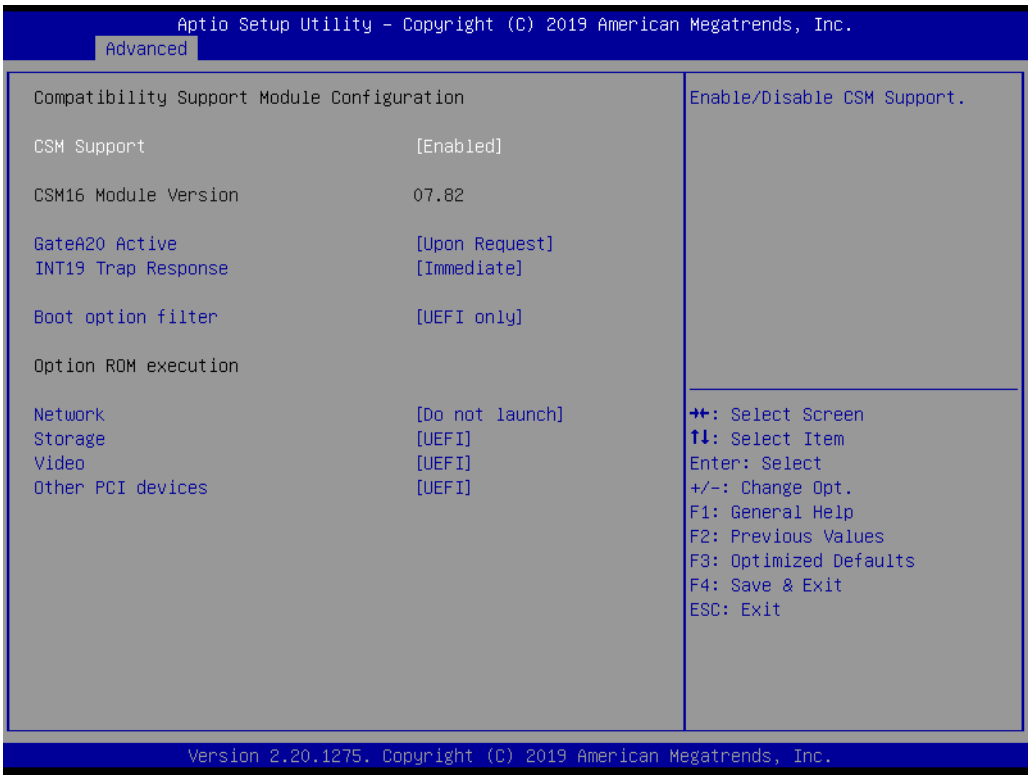
- **Intel® TXT Information**
  Display Intel TXT information.

3.1.2.11 USB Configuration



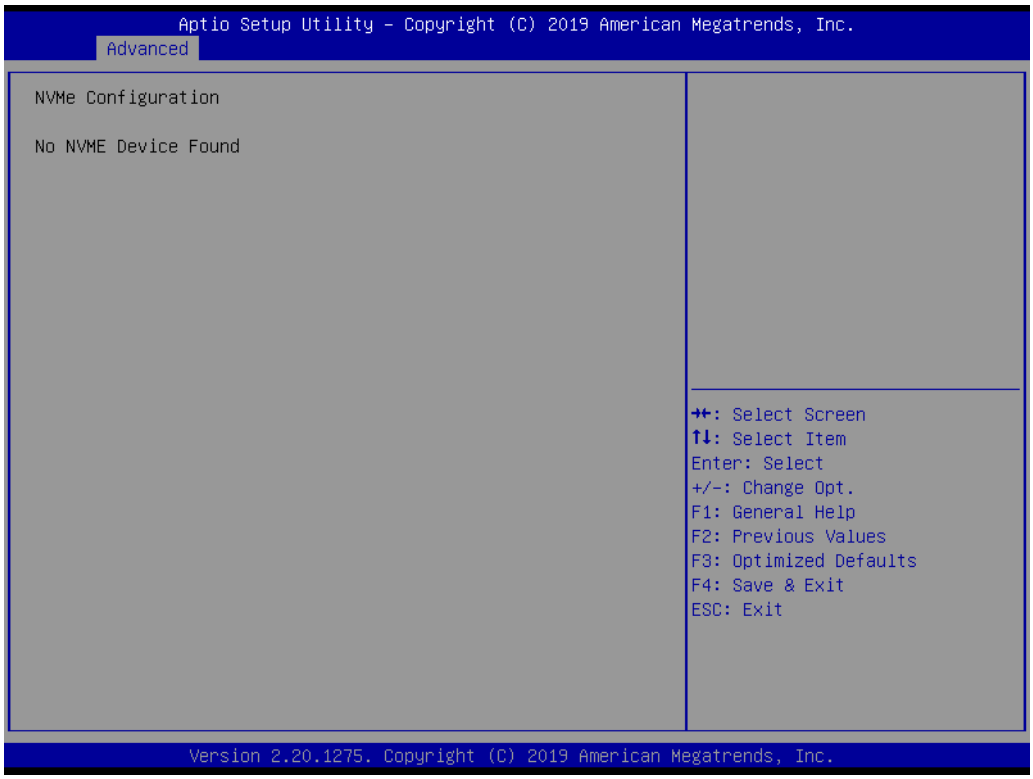
- **Legacy USB Support**
  Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.
- **XHCI Hand-off**
  This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
- **USB Mass Storage Driver Support**
  Enable/Disable USB Mass Storage Driver Support.
- **USB transfer time-out**
  Time-out value for control, bulk, and interrupt transfers.
- **Device reset time-out**
  USB mass storage device start unit command time-out.
- **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.

3.1.2.12 CSM Configuration

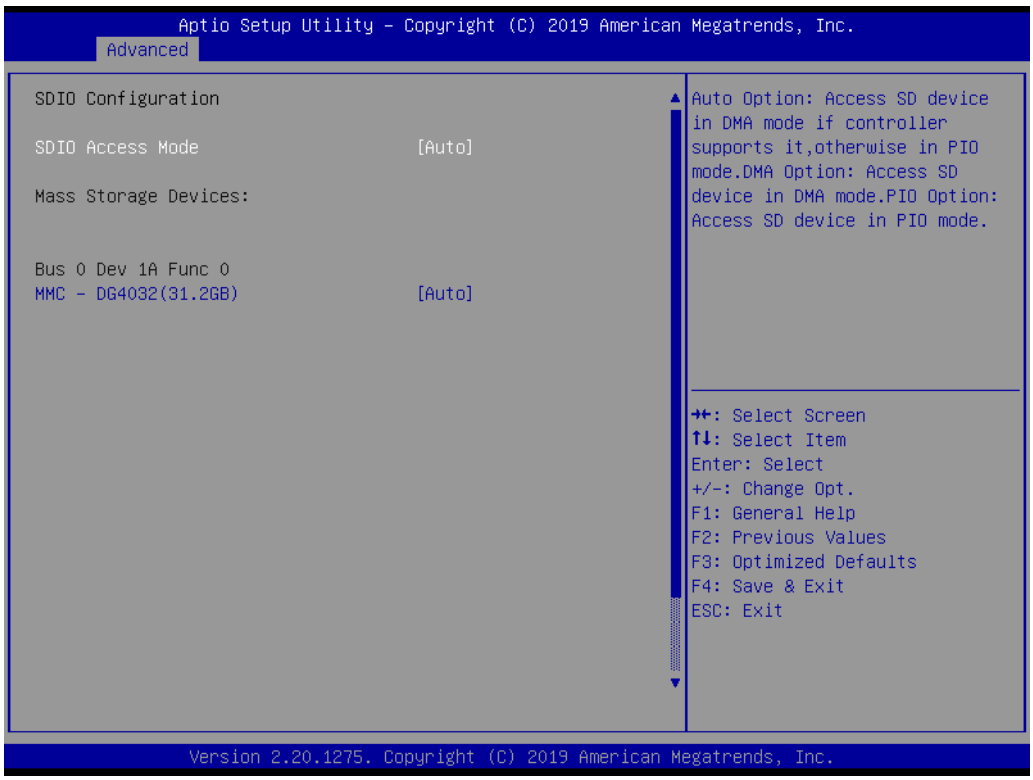


- **CSM Support**
  Enable/Disable CSM Support.
- **GateA20 Active**
  UPON REQUEST - GA20 can be disabled using BIOS services. ALWAYS - do not allow disabling GA20; this option is useful when any RT code is executed above 1MB.
- **INT19 Trap Response**
  BIOS reaction on INT19 trapping by Option ROM: IMMEDIATE - execute the trap right away; POSTPONED - execute the trap during legacy boot.
- **Boot option filter**
  This option controls Legacy/UEFI ROMs priority.
- **Network**
  Controls the execution of UEFI and Legacy PXE OpROM.
- **Storage**
  Controls the execution of UEFI and Legacy Storage OpROM.
- **Video**
  Controls the execution of UEFI and Legacy Video OpROM.
- **Other PCI devices**
  Determines OpROM execution policy for devices other than Network, Storage, or Video.

3.1.2.13 NVMe Configuration

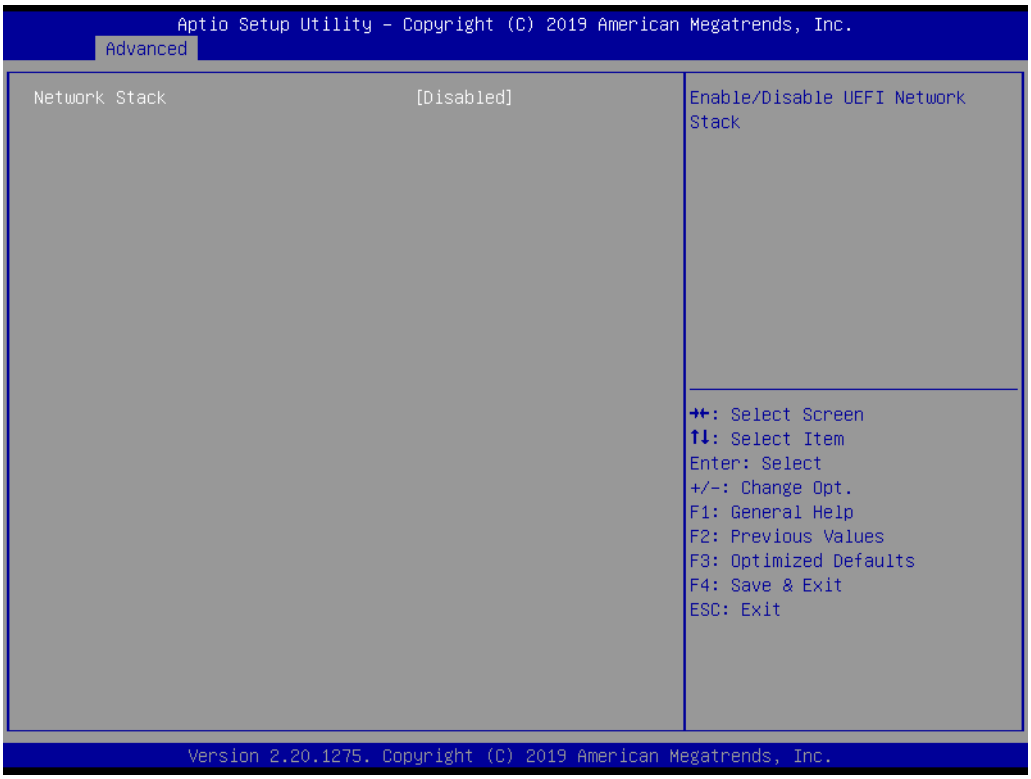


3.1.2.14 SDIO Configuration



- **SDIO Access Mode**
  Select access SD device in DMA mode or PIO mode.

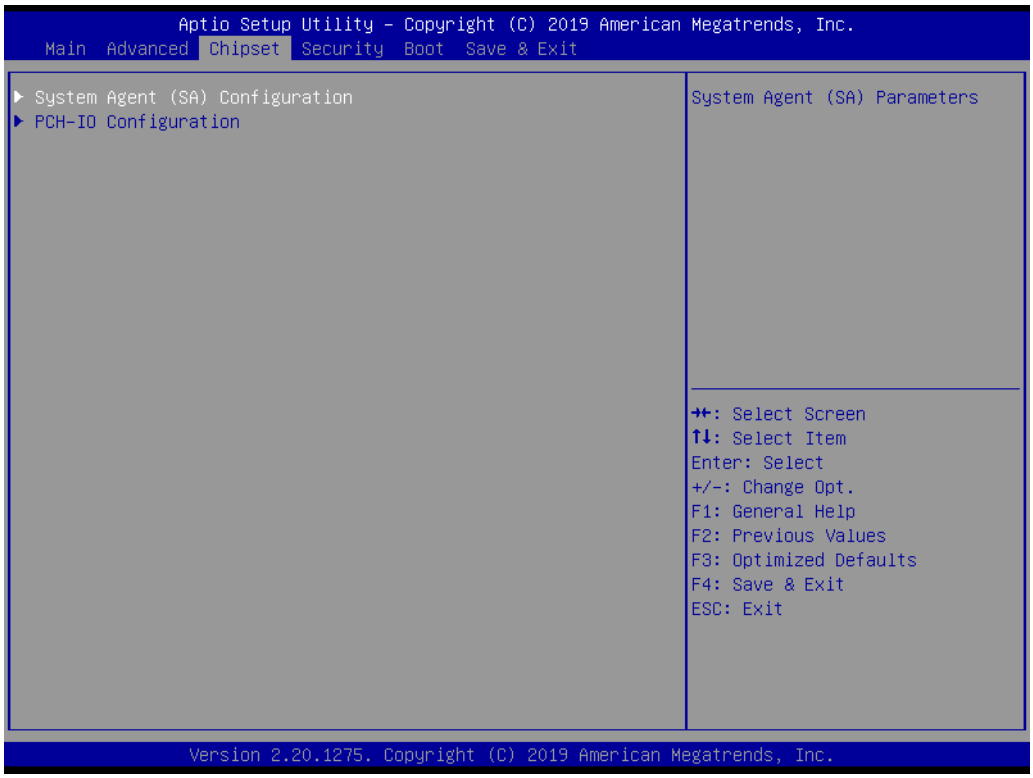
3.1.2.15 Network Stack Configuration



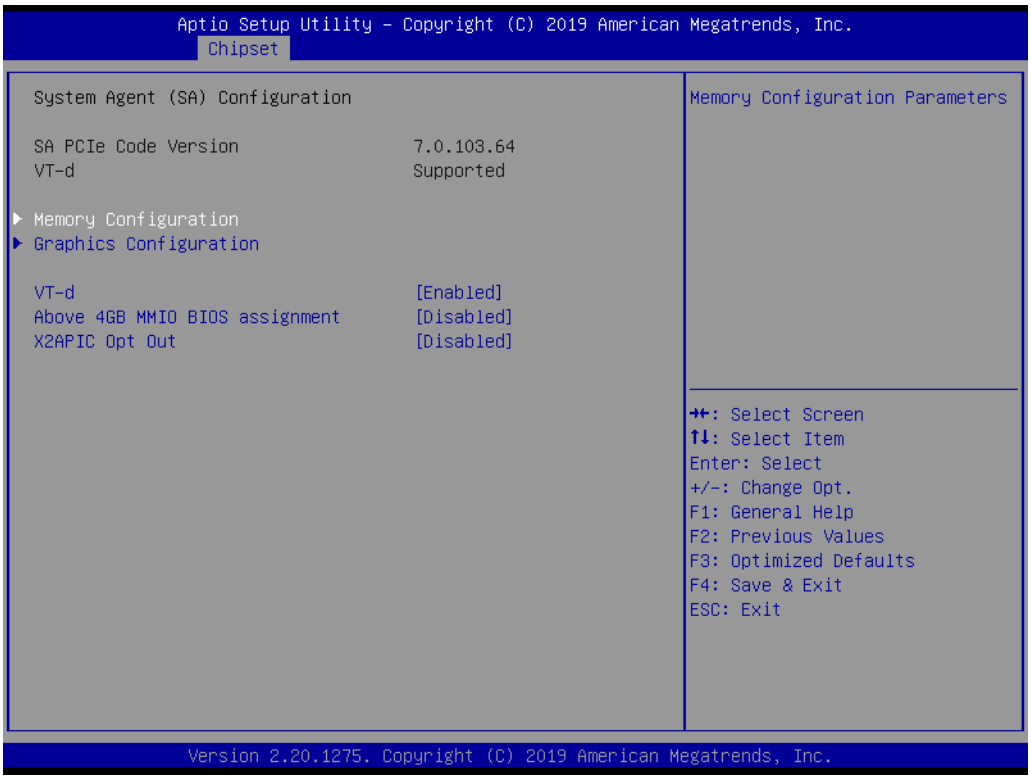
- **Network Stack**
  Enable/Disable UEFI Network Stack.

3.1.3 Chipset Configuration

Select the Chipset tab from the EPC-C301 setup screen to enter the Chipset BIOS Setup screen. You can display a Chipset BIOS Setup option by highlighting it using the <Arrow> keys. All plug-and-play BIOS Setup options are described in this section. The plug-and-play BIOS Setup screen is shown below.

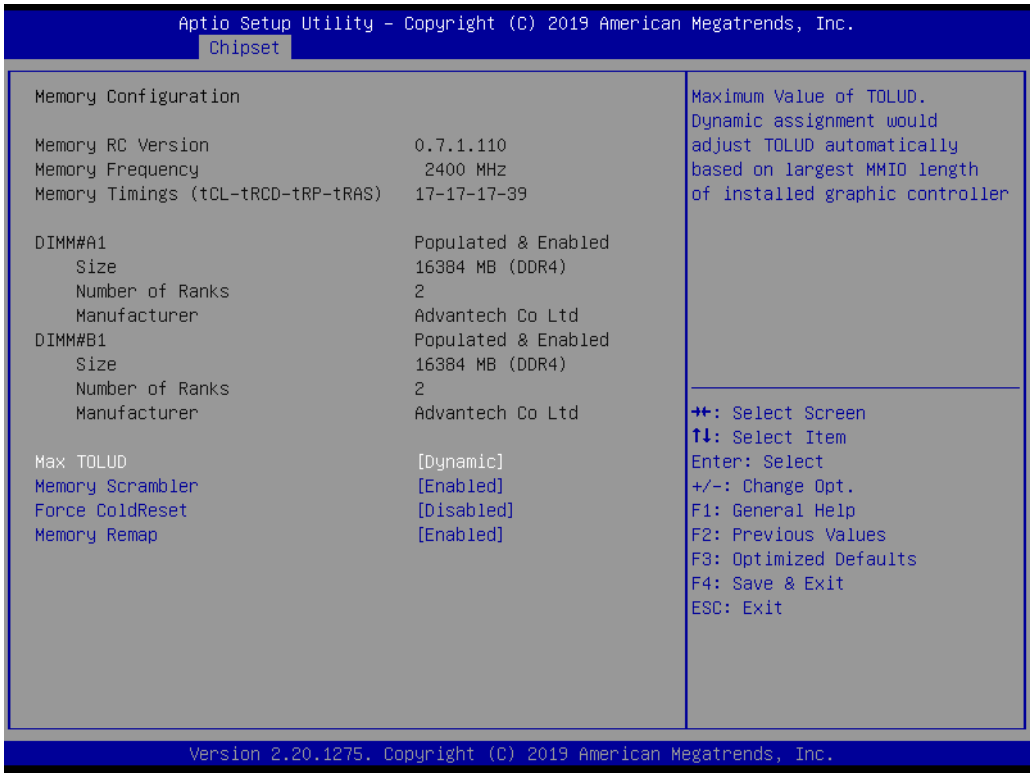


3.1.3.1 System Agent (SA) Configuration



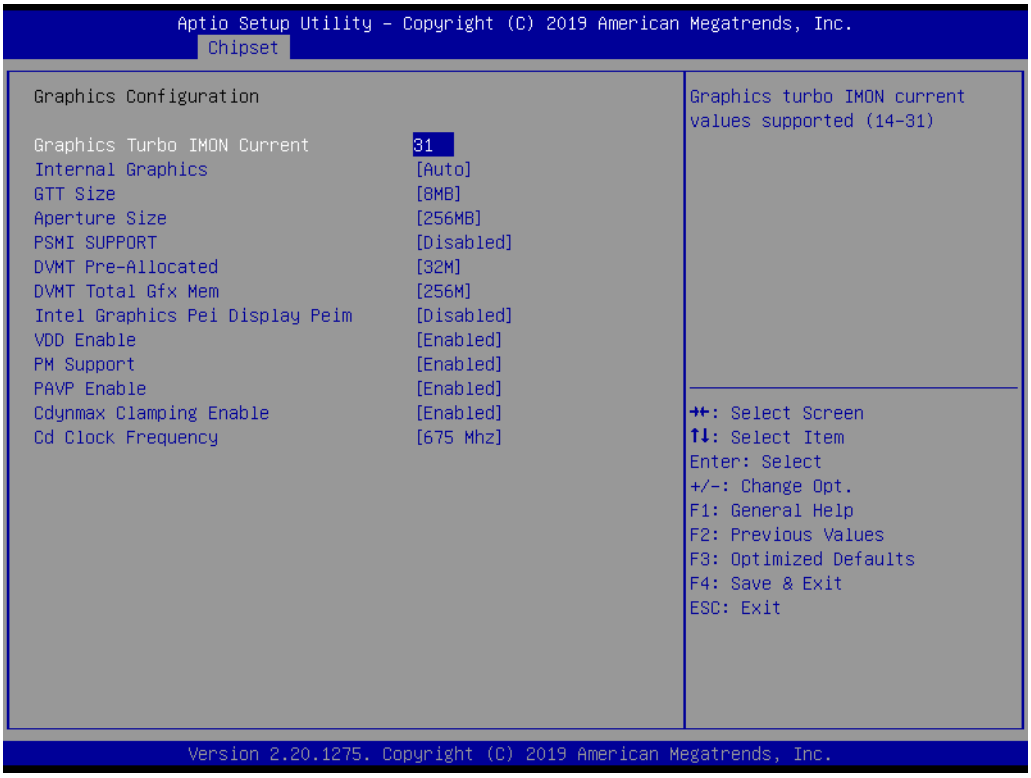
- **Memory Configuration**
  Memory Configuration Parameters.
- **Graphics Configuration**
  Graphics Configuration Parameters.
- **VT-d**
  VT-D capability.
- **Above 4GB MMIO BIOS assignment**
  Enable/Disable above 4GB Memory Mapped IO BIOS assignment.
- **X2APIC Opt Out**
  Enable/Disable X2APIC Opt Out Bit.

Memory Configuration



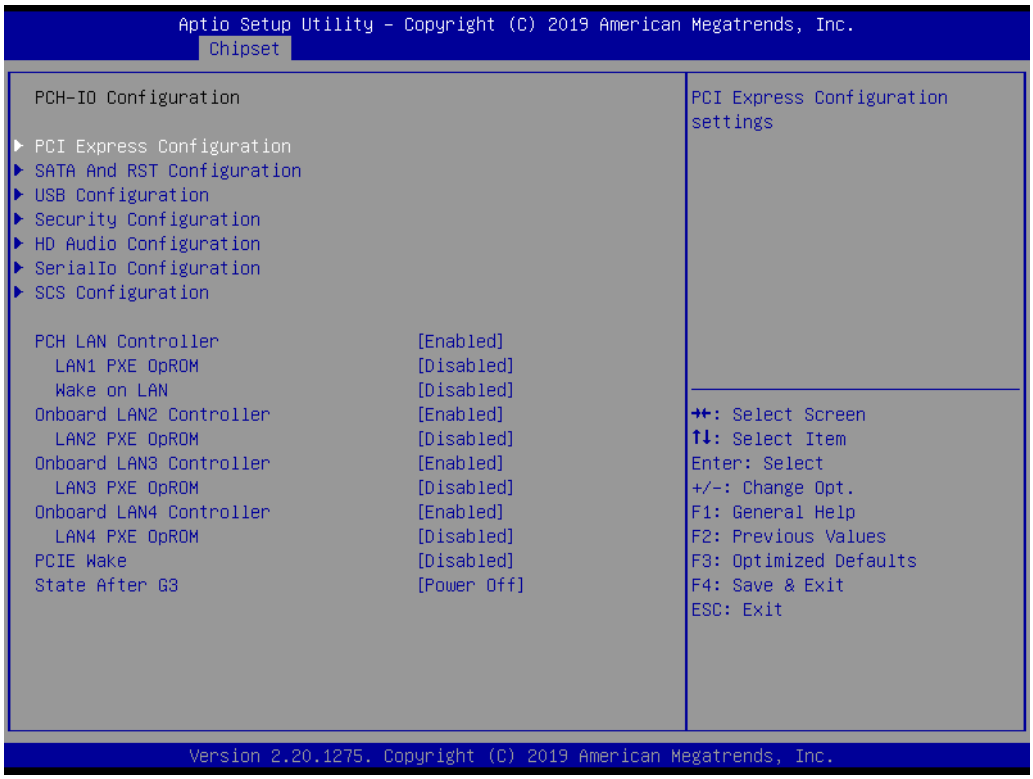
- **Max TOLUD**
  Maximum Value of TOLUD.
- **Memory Scrambler**
  Enable/Disable Memory Scrambler support.
- **Force ColdReset**
  Force ColdReset OR Choose MrcColdBoot mode.
- **Memory Remap**
  Enable/Disable Memory Remap above 4GB.

Graphics Configuration



- **Graphics Turbo IMON Current**
  Graphics turbo IMON current values supported.
- **Internal Graphics**
  Keep IGFX enabled based on the setup options.
- **GTT Size**
  Select the GTT Size.
- **Aperture Size**
  Select the Aperture Size.
- **DVMT Pre-Allocated**
  Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.
- **DVMT Total Gfx Mem**
  Select DVMT 5.0 Total Graphic Memory size used by the Internal Graphics Device.
- **Gfx Low Power Mode**
  This option is applicable for SFF only.
- **PM Support**
  Enable/Disable PM Support.
- **PAVP Enable**
  Enable/Disable PAVP.
- **CD Clock Frequency**
  Select the highest Cd clock frequency supported by this platform.

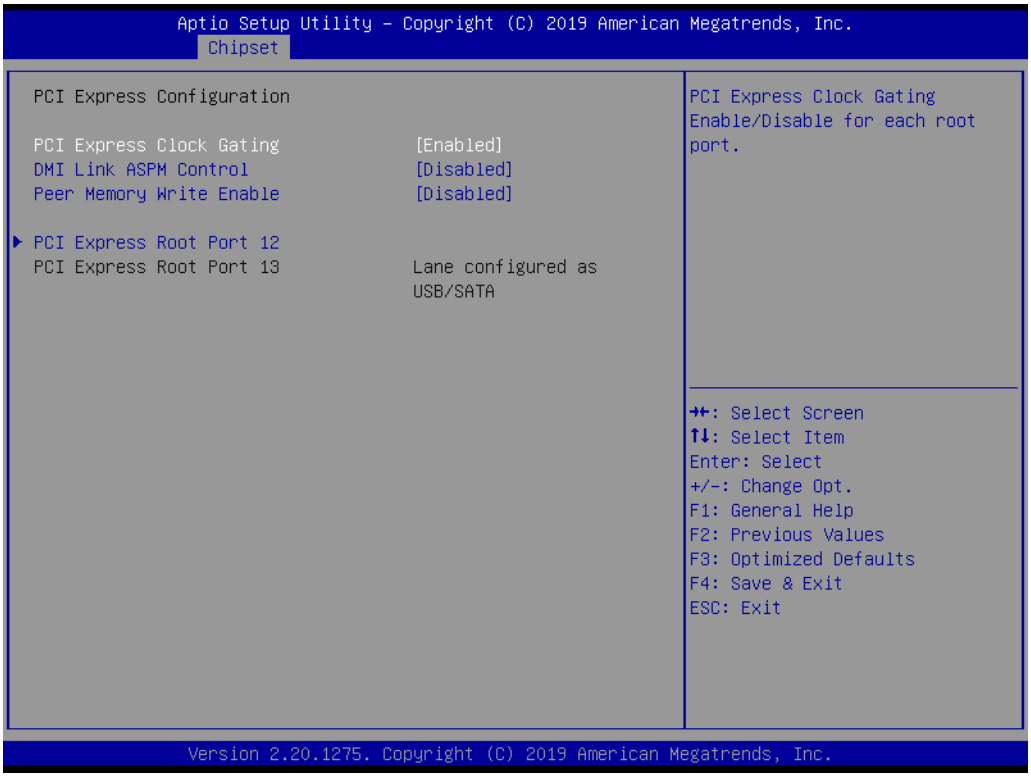
3.1.3.2 PCH I/O Configuration



- **PCI Express Configuration**
  PCI Express Configuration Settings.
- **SATA And RST Configuration**
  SATA Device Options Settings.
- **USB Configuration**
  USB Configuration Settings.
- **Security Configuration**
  Security Configuration Settings.
- **HD Audio Configuration**
  HD Audio Subsystem Configuration Settings.
- **SerialIO Configuration**
  SerialIO Configuration Settings.
- **SCS Configuration**
  Storage and Communication Subsystem Configuration.
- **PCH LAN Controller**
  Enable or Disable onboard NIC.
- **LAN1 PXE ROM**
  Enable or Disable onboard LAN's PXE option ROM.
- **Wake on LAN**
  Enable or Disable Integrated LAN to wake the system from S5.
- **Onboard LAN2 Controller**
  Enable or Disable onboard NIC.
- **LAN2 PXE ROM**
  Enable or Disable onboard LAN's PXE option ROM.
- **Onboard LAN3 Controller**
  Enable or Disable onboard NIC.

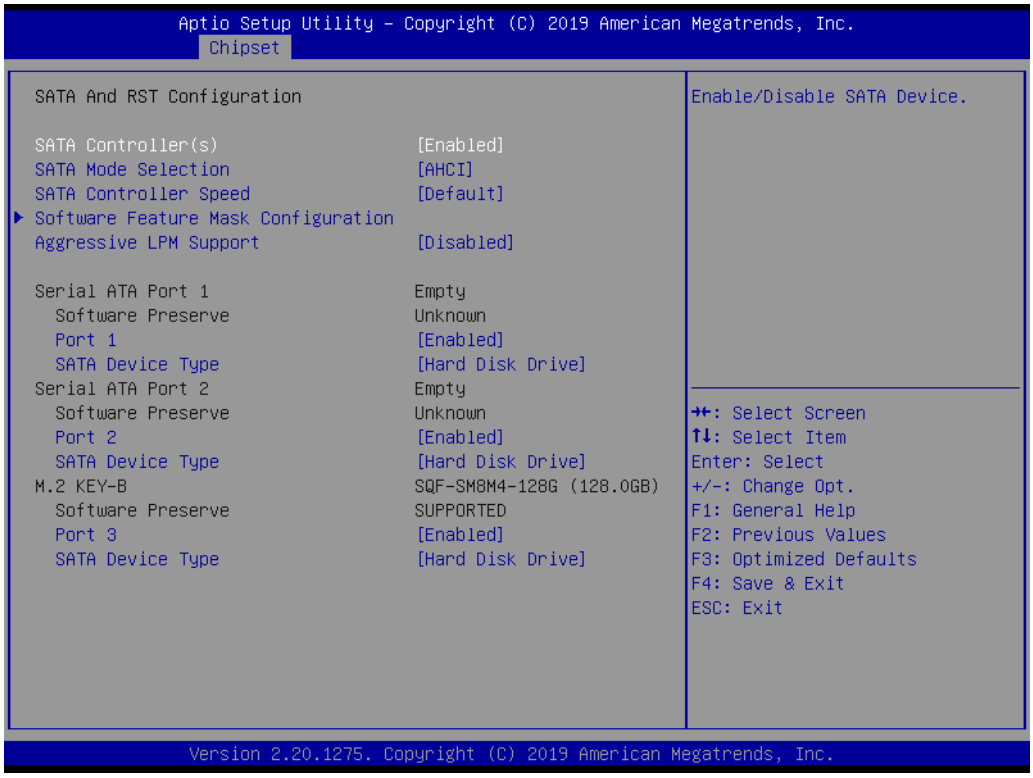
- **LAN3 PXE ROM**
  Enable or Disable onboard LAN's PXE option ROM.
- **Onboard LAN4 Controller**
  Enable or Disable onboard NIC.
- **LAN4 PXE ROM**
  Enable or Disable onboard LAN's PXE option ROM.
- **PCIE Wake**
  Enable or Disable PCIE to wake the system from S5.
- **State After S3**
  Specify what state to go to when power is re-applied after a power failure (G3 state).

PCI Express Configuration



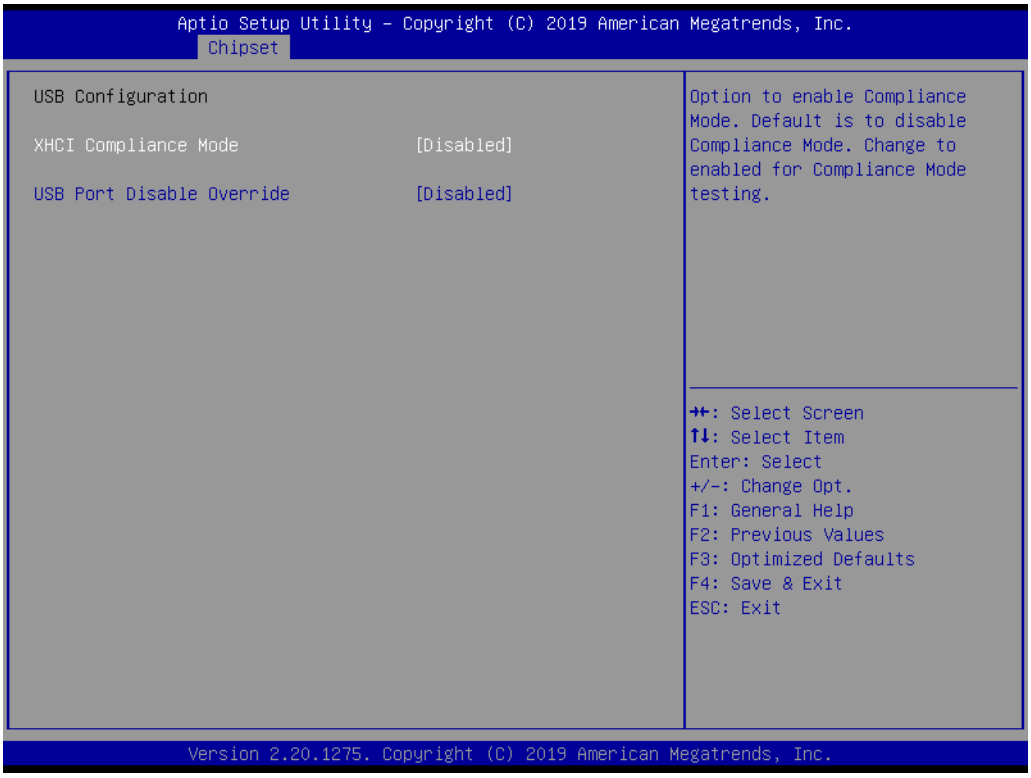
- **PCI Express Root Port 12/13**
  PCI Express Port 12/13 Settings.

SATA and RST Configuration



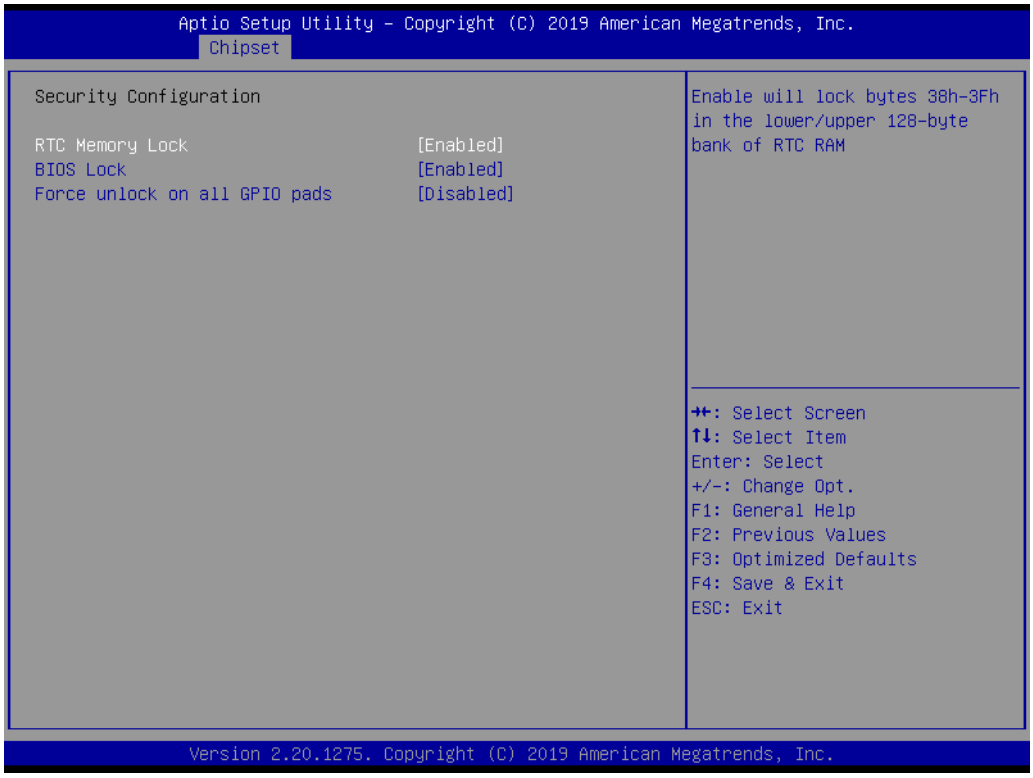
- **SATA Controller(s)**
  Enable/Disable SATA Device.
- **SATA Mode Selection**
  Determine how SATA controller operate.
- **SATA Controller Speed**
  Indicates the maximum speed the SATA controller can support.
- **Software Feature Mask Configuration**
  RST Legacy ROM/RST UEFI Driver will refer to the SWFM configuration to enable/disable the storage feature.
- **Aggressive LPM Support**
  Enabled PCH to aggressively enter link power state.

USB Configuration



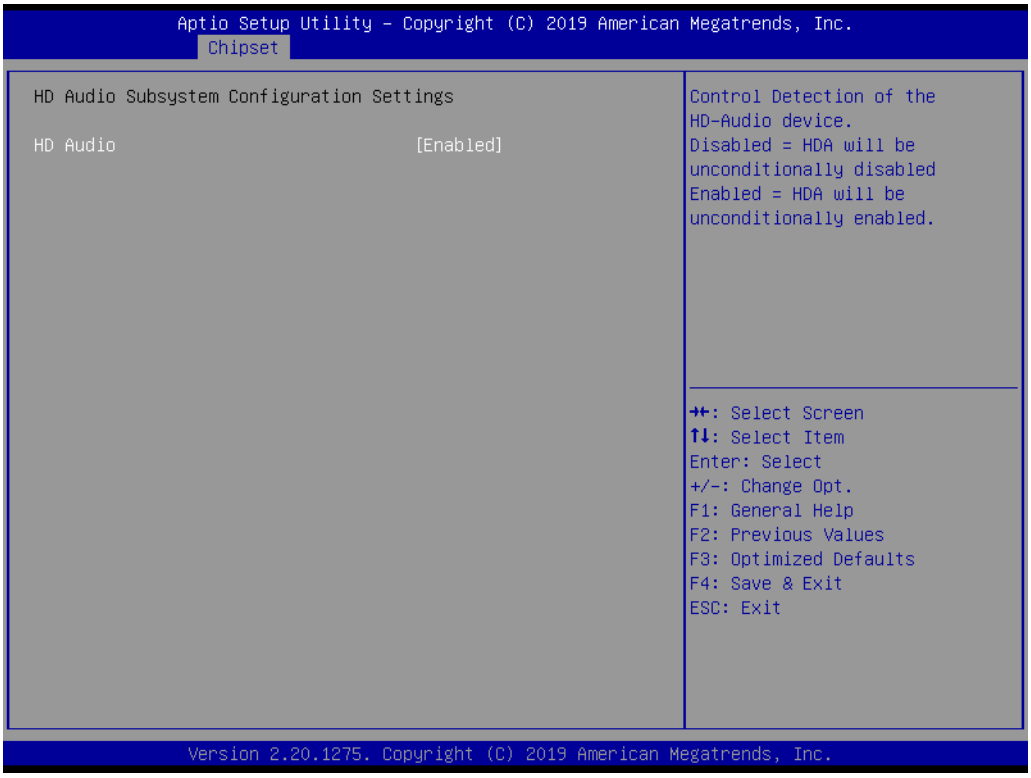
- **XHCI Disable Compliance Mode**
  Option to disable Compliance Mode.
- **USB Port Disable Override**
  Selectively Enable/Disable the corresponding USB Port from reporting a Device Connection to the Controller.

Security Configuration



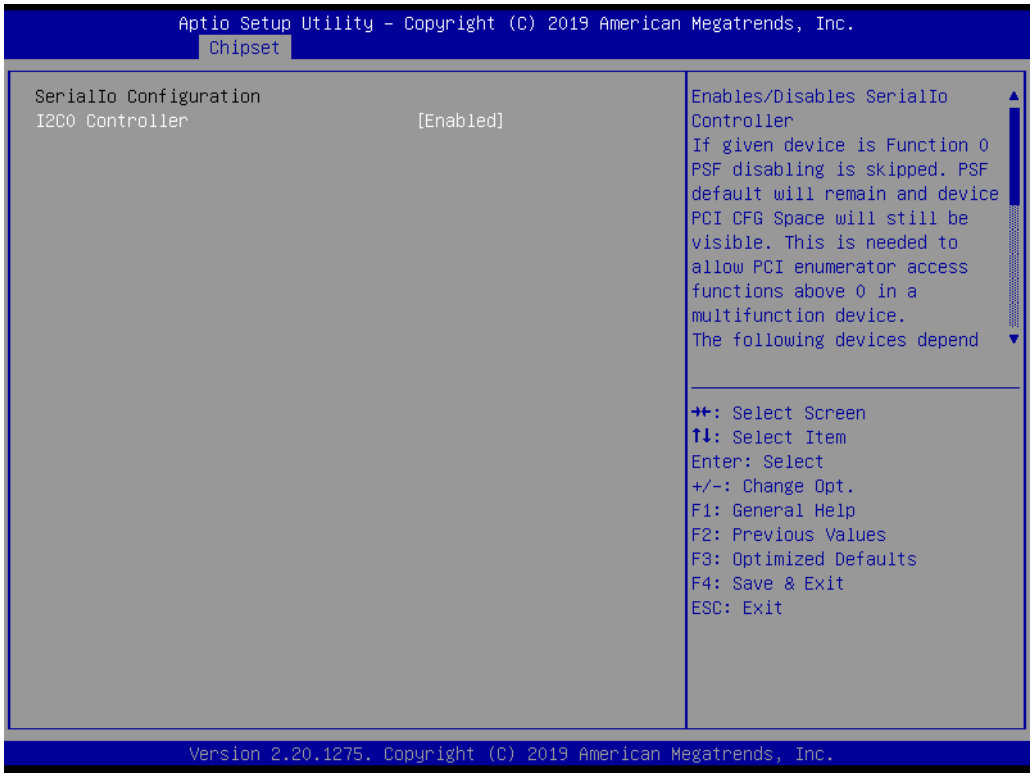
- **RTC Lock**
  Enable will lock bytes 38h-3Fh in the lower/upper 128-byte bank of RTC RAM.
- **BIOS Lock**
  Enable or Disable the PCH BIOS Lock Enable feature.
- **Force unlock on all GPIO pads**
  If Enabled BIOS will force all GPIO pads to be in unlock state.

HD Audio Configuration



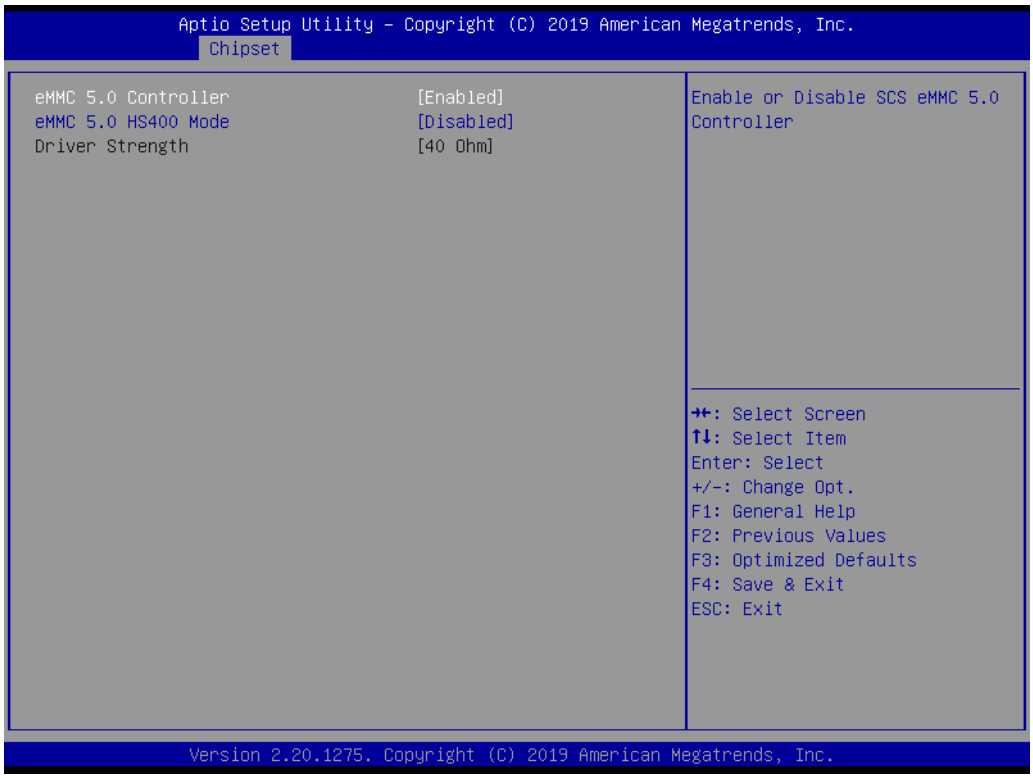
- **HD Audio**
  Control Detection of the HD-Audio device. Disabled = HDA will be uncondition-ally disabled. Enabled = HDA will be unconditionally Enabled.

Serial IO Configuration



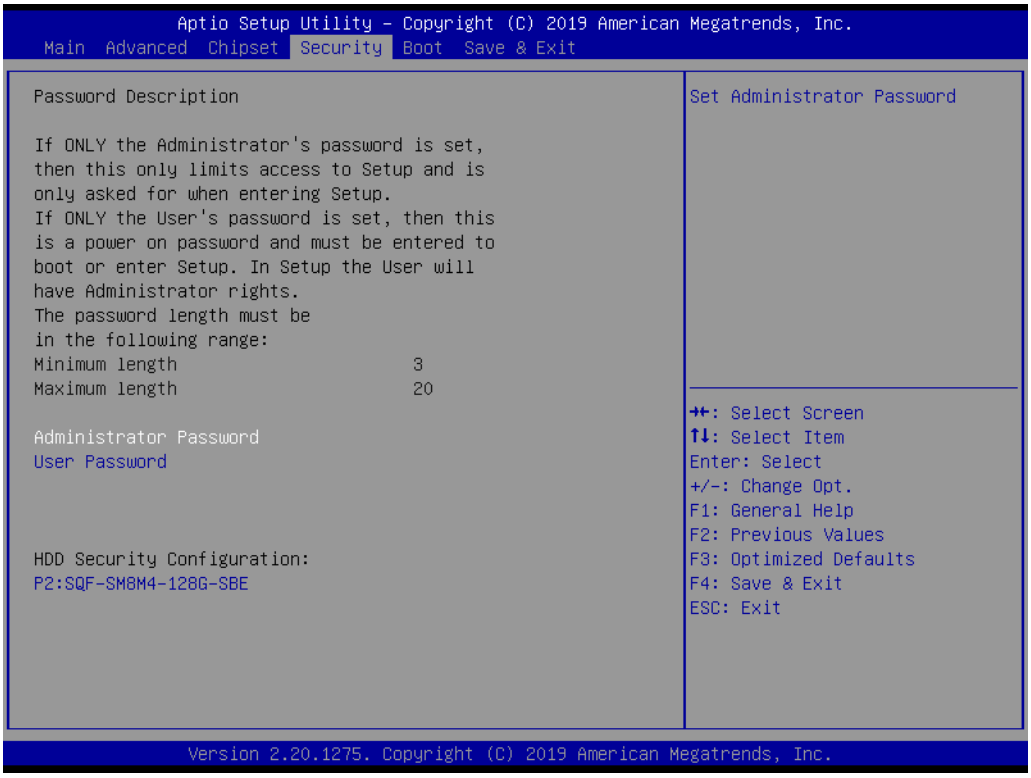
- **I2C0 Controller**
  Enable/Disables Serial IO Controller.

SCS Configuration



- **eMMC 5.0 Controller**
  Enable or Disable SCS eMMC 5.0 Controller.

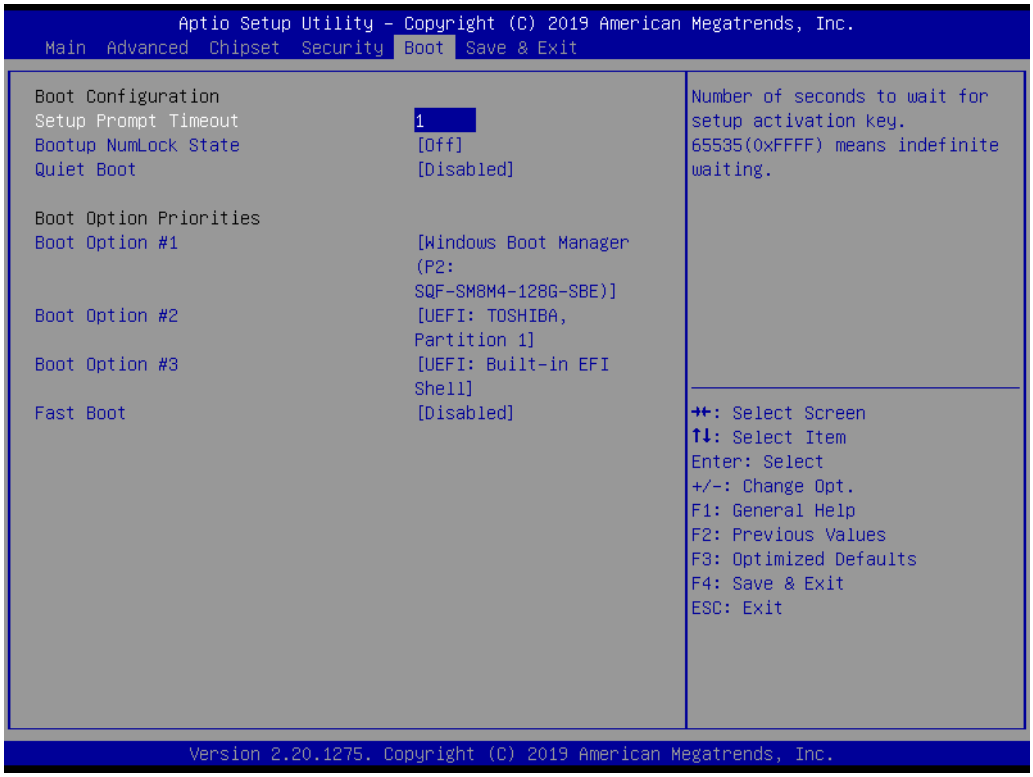
3.1.4 Security



Select Security Setup from the EPC-C301 Setup main BIOS setup menu. All Security Setup options, such as password protection and virus protection are described in this section. To access the sub menu for the following items, select the item and press <Enter>:

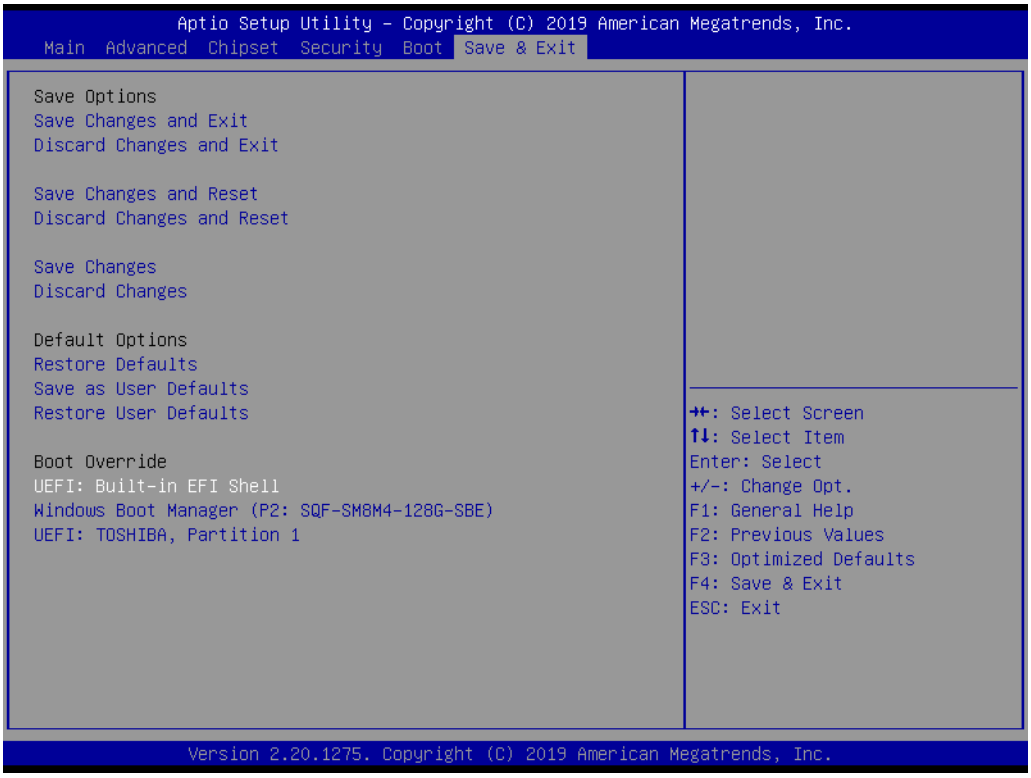
- **Change Administrator / User Password**
  Select this option and press <ENTER> to access the sub menu, and then type in the password.

3.1.5 Boot



- **Setup Prompt Timeout**
  Number of seconds that the firmware will wait before initiating the original default boot selection. A value of 0 indicates that the default boot selection is to be initiated immediately on boot. A value of 65535(0xFFFF) indicates that firmware will wait for user input before booting. This means the default boot selection is not automatically started by the firmware.
- **Bootup NumLock State**
  Select the keyboard NumLock state.
- **Quiet Boot**
  Enables or disables Quiet Boot option.
- **Boot Option #1**
  Sets the system boot order.
- **Fast Boot**
  Enables or disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options.

3.1.6 Save & Exit



- **Save Changes and Exit**
  This item allows you to exit system setup after saving the changes.
- **Discard Changes and Exit**
  This item allows you to exit system setup without saving any changes.
- **Save Changes and Reset**
  This item allows you to reset the system after saving the changes.
- **Discard Changes and Reset**
  This item allows you to rest system setup without saving any changes.
- **Save Changes**
  This item allows you to save changes done so far to any of the options.
- **Discard Changes**
  This item allows you to discard changes done so far to any of the options.
- **Restore Defaults**
  This item allows you to restore/load default values for all the options.
- **Save as User Defaults**
  This item allows you to save the changes done so far as user defaults.
- **Restore User Defaults**
  This item allows you to restore the user defaults to all the options.
- **Boot Override**
  Boot device select can override your boot priority.

Appendix A

Watchdog Timer Sample Code

A.1 EC Watchdog Timer Sample Code

```
EC_Command_Port = 0x29Ah
EC_Data_Port = 0x299h
Write EC HW ram = 0x89
Watch dog event flag = 0x57
Watchdog reset delay time = 0x5E
Reset event = 0x04
Start WDT function = 0x28
================================================
.model small
.486p
.stack 256
.data
.code
org 100h
.STARTup

mov dx, EC_Command_Port
mov al,89h          ; Write EC HW ram.
out dx,al

mov dx, EC_Command_Port
mov al, 5Fh         ; Watchdog reset delay time low byte (5Eh is high byte) index.
out dx,al

mov dx, EC_Data_Port
mov al, 30h         ;Set 3 seconds delay time.
out dx,al

mov dx, EC_Command_Port
mov al,89h          ; Write EC HW ram.
out dx,al

mov dx, EC_Command_Port
mov al, 57h         ; Watch dog event flag.
out dx,al

mov dx, EC_Data_Port
mov al, 04h          ; Reset event.
out dx,al

mov dx, EC_Command_Port
mov al,28h          ; start WDT function.
out dx,al

.exit
END
```

Appendix B

System Assignments

B.1 System I/O Ports

Addr. Range (Hex) Device

00h-1Fh DMA Controller
20h-2Dh Interrupt Controller
2Eh-2Fh Motherboard resources
30h-3Dh Interrupt Controller
40h-43h Timer/Counter
4Eh-4Fh Motherboard resources
50h-53h Timer/Counter
60h-6Fh 8042 (keyboard controller)/NMI Controller/Microcontroller
70h-7Fh Real-time Controller
80h-8Fh Debug Port/Reserved
90h-9Fh Debug Port/Reset Generator
A0h-ADh Interrupt Controller
B0h-B1h Interrupt Controller
B4h-BDh Power Management
200h-27Fh CANBus Controller
280h-28Fh I2C Controller
290h-29Fh EC Index port and Data port
2A0h-2BFh GPIO Controller
2C0h-2DFh SMBus Controller
2F0h-2F7h EC/PMC Controller
2F8h-2FFh Motherboard resources
300h-307h Communications Port (COM2)
308h-30Fh Communications Port (COM3)
310h-317h Communications Port (COM4)
380h-3AFh Motherboard resources
3C0h-3DFh Motherboard resources
3F8h-3FFh Communications Port (COM1)
480h-4CFh Motherboard resources
4D0h-4D1h Interrupt Controller
680h-69Fh Motherboard resources
A00h-AFFh Motherboard resources
164Eh-164Fh Motherboard resources
1800h-18FFh Motherboard resources
CF9h-CF9h Reset Generator

B.2 DMA Channel Assignments

Channel Function

0 Available
1 Available
2 Available
3 Available
4 Direct memory access controller
5 Available
6 Available
7 Available

B.3 1st MB Memory Map

Addr. Range (Hex) Device

E0000h - FFFFFh System board
D0000h - DFFFFh PCI Bus
C0000h - CFFFFh System board
A0000h - BFFFFh PCI Bus
A0000h - BFFFFh Intel® HD Graphic
00000h - 9FFFFh System board

B.4 Interrupt Assignments

Interrupt# Interrupt source

NMI Parity error detected
IRQ0 System timer
IRQ1 Using SERIRQ, Keyboard Emulation
IRQ2 Interrupt from controller 2 (cascade)
IRQ3 Available
IRQ4 Communications Port (COM1)
IRQ5 EC Watch DOG
IRQ6 CANBus Controller
IRQ7 Communications Port (COM2/COM3/COM4)
IRQ8 System CMOS/real time clock
IRQ9 Microsoft ACPI-Compliant System
IRQ10 Available
IRQ11 Display Controller
IRQ12 Available
IRQ13 Numeric data processor
IRQ14 GPIO Controller
IRQ15 Reserved

ADVANTECH

Enabling an Intelligent Planet

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