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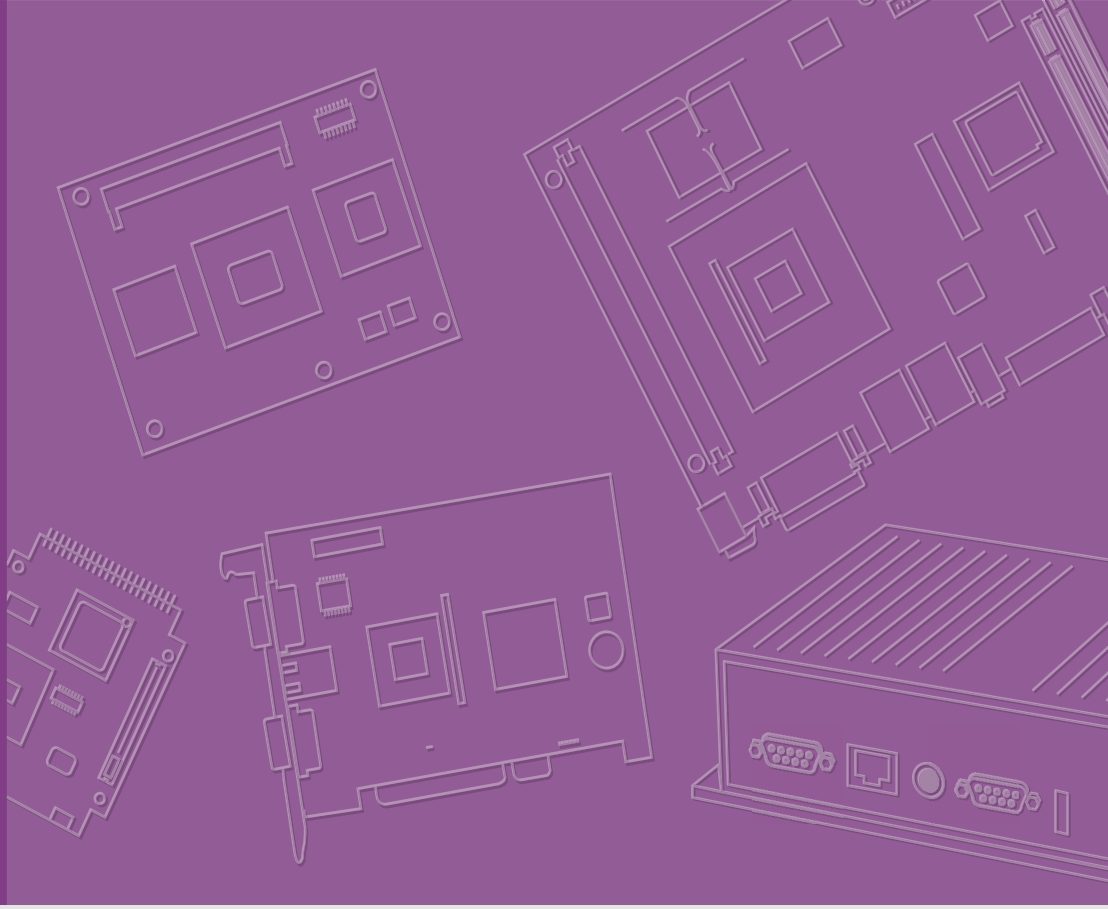

# User Manual

# SOM-5871

## COM Express Basic Module

# Copyright



# Acknowledgements

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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 RMA (return merchandize authorization) 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.

Part No. 2006587100 Edition 1

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# Declaration of Conformity

### CE

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

### 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.

### FM

This equipment has passed the FM certification. According to the National Fire Protection Association, work sites are classified into different classes, divisions and groups, based on hazard considerations. This equipment is compliant with the specifications of Class I, Division 2, Groups A, B, C and D indoor hazards.

# Technical Support and Assistance

1. Visit the Advantech website at http://support.advantech.com 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. e.g.*

*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.*

# Document Feedback

To assist us in making improvements to this manual, we would welcome comments and constructive criticism. Please send all such - in writing to: support@advantech.com

# Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. DO NOT COVER THE OPENINGS.
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so 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 a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
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 -20° C (-4° F) OR ABOVE 60° C (140° 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.

The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

# Safety Precaution - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.
- Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

# Contents

# Chapter 1

## General Information

This chapter gives background information on the SOM-5871 CPU Computer on Module

Sections include:

- Introduction
- Functional Block Diagram
- Product Specification

## 1.1 Introduction

SOM-5871 is equipped with the latest and first 14nm AMD Ryzen™ Embedded V1000 Processor (12-54W TDP) with up to four cores and eight threads. The AMD "Zen" core micro-architecture on the new COM Express (PICMG COM.0) R3.0 Type 6 basic module provides high computing power, and advanced graphics performance. With the integration of the AMD Ryzen Embedded V1000, the SOM-5871 can offer an ideal balance of superior performance and low power consumption for Advantech customers.

**Designed for High Graphic Performance Requirements**

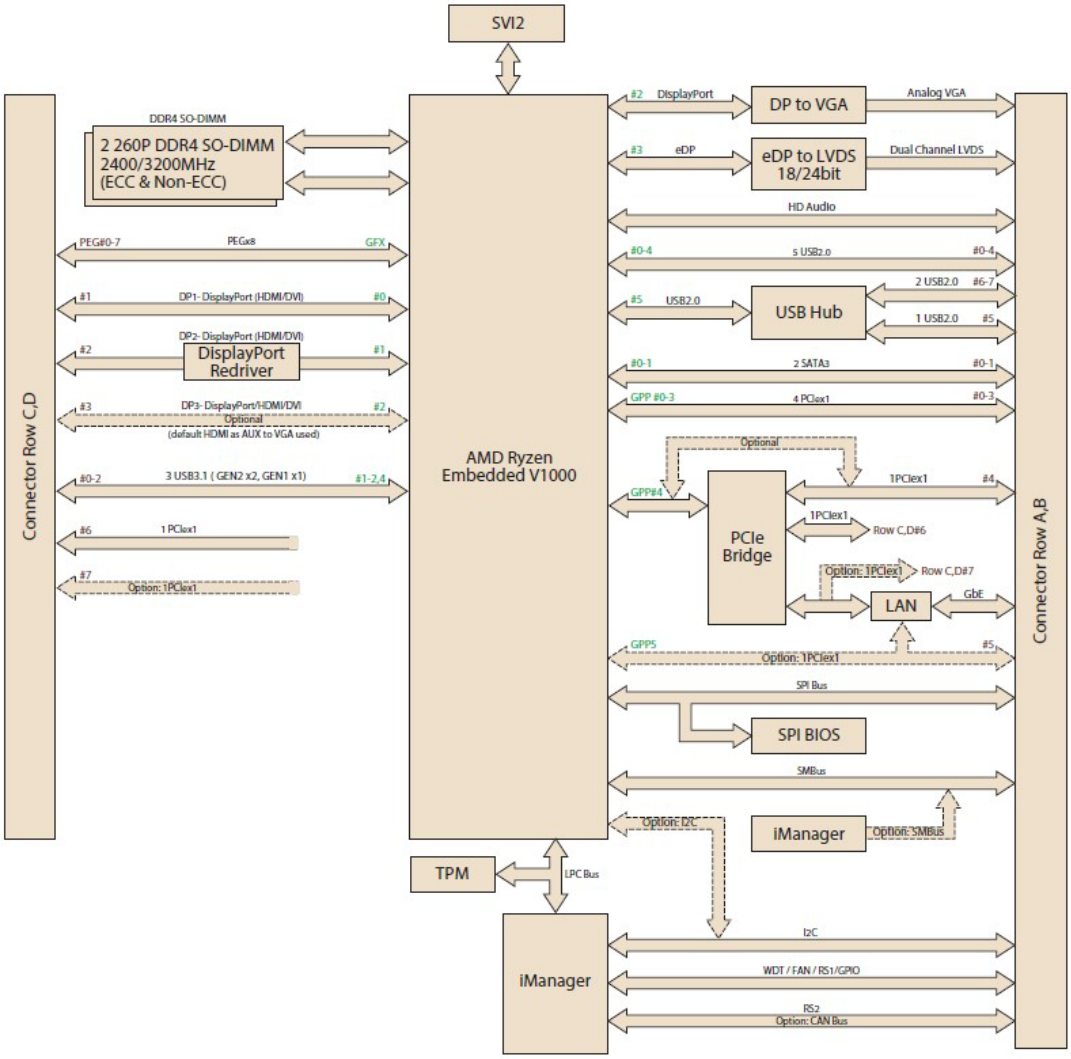
SOM-5871 uses up to 32GB of dual channel DDR4 3200 MT/s memory (both ECC and non-ECC) with higher memory bandwidth for better performance and efficiency. The new COM Express Basic module supports quad independent displays with VGA, LVDS, eDP, DisplayPort, HDMI, and HDR playback support. VP9 decode and H.265 (HEVC) hardware decode and encode as well as four 4K display outputs are supported by leveraging the AMD Ryzen Embedded V1000. The premium performance of the SOM-5871 drives 4K animation and content. SOM-5871 is built for use in demanding applications such as casino gaming, arcade gaming, digital signage, medical, industrial control, automation, thin clients, and communications infrastructure fields.

**Optimized Solutions Extend Design Flexibility**

SOM-5871 adopts 10/100/1000 Mbps speeds Ethernet controller and flexible I/O interface options with: 1 x PCIex4, 3 x PCIex1 through a PCIe Bridge, 2 x SATA Gen. 3 @ 6.0Gb/s, 3 x USB 3.0, 8 x USB 2.0 via USB Hub, 2 x COM ports (2-Wire), TPM 2.0, CAN Bus function (optional support), watchdog timer, and GPIO to fulfill a wide variety of functions and high performance system extension requirements. And for better structural integrity, SOM-5871 added an extra mounting hole design around the CPU for a stronger board structure that avoids board bending and improves thermal throughput to fulfill higher CPU TDP requirements.

| **Acronyms** | |
|---|---|
| Term | Define |
| AC'97 | Audio CODEC (Coder-Decoder) |
| ACPI | Advanced Configuration Power Interface - standard to implement power saving modes in PC-AT systems. |
| BIOS | Basic Input Output System - firmware in PC-AT system that is used to initialize system components before handing control over to the operating system. |
| CAN | Controller-area network (CAN or CAN-bus) is a vehicle bus standard designed to allow micro controllers to communicate with each other within a vehicle without a host computer. |
| DDI | Digital Display Interface - containing DisplayPort, HDMI/DVI, and SDVO |
| EAPI | Embedded Application Programmable Interface<br>Software interface for COM Express© specific industrial function<br>■ System information<br>■ Watchdog timer<br>■ I2C Bus<br>■ Flat panel brightness control<br>■ User storage area<br>■ GPIO |
| GbE | Gigabit Ethernet |
| GPIO | General purpose input output |
| HDA | Intel High Definition Audio (HD Audio) refers to the specification released by Intel in 2004 for delivering high definition audio that is capable of playing back more channels at higher quality than AC'97 |
| I2C | Inter Integrated Circuit - 2 wire (clock and data) signaling scheme allowing communication between integrated circuit, primarily used to read and load register values |
| ME | Management Engine |
| PC-AT | "Personal Computer - Advanced Technology" - an IBM trademark term used to refer to Intel based personal computer in 1990s |
| PEG | PCI Express Graphics |
| RTC | Real Time Clock - battery backed circuit in PC-AT systems that keeps system time and date as well as certain system setup parameters |
| SPD | Serial Presence Detect - refers to serial EEPROM on DRAMs that has DRAM Module configuration information |
| TPM | Trusted Platform Module, chip to enhance the security features of a computer system |
| UEFI | Unified Extensible Firmware Interface |
| WDT | Watch Dog Timer |

## 1.2 Functional Block Diagram



## 1.3 Product Specification

### 1.3.1 Compliance

- PICMG COM.0 (COM Express) Revision 3.0
- Basic Size - 125 x 95mm
- Pin-out Type 6 compatible

### 1.3.2 Feature List

| A-B | System I/O | Rev.3.0 Type 6 | SOM-5871 |
|---|---|---|---|
| | PCI Express Lanes 0 - 5 | 1 / 6 | 6 |
| | LVDS Channel A | 0 / 1 | 1 |
| | LVDS Channel B | 0 / 1 | 1 |
| | eDP on LVDS CH A Pins | 0 / 1 | 1 |
| | VGA Port | 0 / 1 | 1 |
| | TV-Out | N/A | N/A |
| | Digital Display Interface 0 | N/A | N/A |
| | Serial Ports 1 - 2 | 0 / 2 | 2 |
| | CAN Interfaces on SER1 | 0 / 1 | 1 |
| | SATA / SAS Ports | 1 / 4 | 2 |
| | AC'97 / HDA Digital Interface | 0 / 1 | 1 |
| | USB 2.0 Ports (Host) | 4 / 8 | 8 |
| | USB Client 0 (USB2.0) | 0 / 1 | 0 |
| | USB Client 7(USB2.0) | N/A | N/A |
| | USB 3.0 Ports (Host) | N/A | N/A |
| | LAN Port 0 | 1 / 1 | 1 |
| | Express Card Support | N/A | N/A |
| | LPC Bus /eSPI | 1 / 1 | 1 |
| | SPI | 1 / 2 | 2 |
| **A-B** | **System Management** | **Rev.3.0 Type 6** | **SOM-5871 R3.0 Type 6** |
| | SDIO (Muxed on GPIO) | 0 / 1 | 0 |
| | General Purpose I/O | 8 / 8 | 8 |
| | SMBus | 1 / 1 | 1 |
| | I2C | 1 / 1 | 1 |
| | Watchdog Timer | 0 / 1 | 1 |
| | Speaker Out | 1 / 1 | 1 |
| | External BIOS ROM Support | 0 / 2 | 2 |
| | Reset Function | 1 / 1 | 1 |
| **A-B** | **Power Management** | **Rev.3.0 Type 6** | **SOM-5871 R3.0 Type 6** |
| | Thermal Protection | 0 / 1 | 1 |
| | Battery Low Alarm | 0 / 1 | 1 |
| | Suspend / Wake Signals | 0 / 3 | 3 |
| | Power Button Support | 1 / 1 | 1 |
| | Power Good | 1 / 1 | 1 |
| | VCC_5V_SBY Contacts | 4 / 4 | 4 |
| | Sleep | 0 / 1 | 1 |

| | | | |
|---|---|---|---|
| | Lid Input | 0 / 1 | 1 |
| | Fan PWM / Tachometer | 0 / 2 | 2 |
| | Trusted Platform Modules | 0 / 1 | 1 |
| **A-B** | **Power** | **Rev.3.0 Type 6** | **SOM-5871 R3.0 Type 6** |
| | VCC_12V Contacts | 12 / 12 | 12 |
| **C-D** | **System I/O** | **Rev.3.0 Type 6** | **SOM-5871 R3.0 Type 6** |
| | PCI Express Lanes 16 - 31 | 0 / 16 | N/A |
| | PCI Express Graphics (PEG) | 0 / 1 | 1 |
| | Muxed SDVO Channels 1 - 2 | N/A | N/A |
| | PCI Express Lanes 6 - 15 | 0 / 2 | 2 |
| | PCI Bus - 32 Bit | N/A | N/A |
| | PATA Port | N/A | N/A |
| | 10G LAN Port 0 - 3 | N/A | N/A |
| | NC-SI | N/A | N/A |
| | Digital Display Interfaces 1 - 3 | 0 / 3 | 2 |
| | USB 3.0 Ports | 0 / 4 | 3 |
| **C-D** | **Power** | **Rev.3.0 Type 6** | **SOM-5871 R3.0 Type 6** |
| | VCC_12V Contacts | 12 / 12 | 12 |

### 1.3.3 Processor System

| CPU | Std. Freq. | Max. Turbo Freq. | Core/Thread | Cache (MB) | TDP Range (W) |
|---|---|---|---|---|---|
| V1807B | 3.35GHz | 3.8GHz | 4/8 | 2M | 35-54W |
| V1756B | 3.25GHz | 3.6GHz | 4/8 | 2M | 35-54W |
| V1605B | 2.0GHz | 3.6GHz | 4/8 | 2M | 12-25W |
| V1202B | 2.3GHz | 3.2GHz | 2/4 | 2M | 12-25W |

### 1.3.4 Memory

There are a total of two sockets on SOM-5871, up to 32GB capacity. (Supports both non-ECC and ECC memory module).

- 2 DDR4 260pin SODIMM sockets.
- V1807B, V1756B CPU SKU support DDR4 up to 3200.
- V1605B, V1202B CPU SKU support DDR4 up to 2400.

**FP5 Max DDR4 data rate**

(Reference from AMD document)

| APU TDP | Memory Rank | Number of DIMM Socket on Each Channel | Max Data Rate (MT/s) |
|---|---|---|---|
| Above 25W (V1807B, V1756B) | Single Rank | 1 | DDR4-3200 |
| | Dual Rank | 1 | DDR4-2400 |
| 25W or Below (V1605B, V1202B) | Single Rank | 1 | DDR4-2400 |
| | Dual Rank | 1 | DDR4-2400 |

### 1.3.5 Graphics/Audio

Supports 4 4K displays.

Graphic Core: "Vega" Core, up to 11 CUs, ACP3.0, up to 3 codecs,1.8V for I2S, 1.2V, 1.5V, or 1.8V for AZ or Soundwire Direct audio I2S interface

| CPU | Graphic Core | Max GPU Freq. | GPU CU |
|---|---|---|---|
| V1807B | Vega Core | 1.3GHz | 11 |
| V1756B | Vega Core | 1.1GHz | 8 |
| V1605B | Vega Core | 1.1GHz | 8 |
| V1202B | Vega Core | 1.0GHz | 3 |

### 1.3.6 Displays

VGA: 1920 x 1200 @ 60 Hz

LCD: Dual channel 18/24-bit LVDS, up to 1920 x 1200 @ 60 Hz
Option support eDP1.4, up to 4096 x 2304 @ 60Hz, 24bpp

DDI: 2 x ports configurable to HDMI1.4/DVI/DisplayPort1.4 (Option: support 3 ports when VGA is removed)

HDMI up to 4096 x 2160 @ 30Hz, DVI up to 1920 x 1200 @ 60Hz, DisplayPort up to 3840 x 2160 @ 120Hz with re-driver; up to 3840 x 2160 @ 60Hz without re-driver.

Multiple Displays: Quad display with each display combination.

**Theoretical Max SDR and HDR Resolution**

(Reference from AMD document)

| |
|---|
| **Maximum SDR Resolution (Clone/Extended mode) -Dual Channel** |
| ■ 1 display: 2880p60 / 4320p30* |
| ■ 2 displays: 2880p60 / 4320p30* |
| ■ 3 displays: 2160p60 |
| ■ 4 displays: 2160p60 |
| **Maximum SDR Resolution (Clone/Extended mode) -Single Channel** |
| ■ 1 display: 2880p60 / 4320p30* |
| ■ 2 displays: 2160p60 |
| ■ 3 displays: 1440p@60 / 2160p@30 |
| ■ 4 displays:1440p@60 / 2160p@30 |
| **Maximum HDR Resolution (Clone/Extended mode) -Dual Channel** |
| ■ 2 displays: 2160p60 |
| ■ 4 displays: 1440p60 |
| **Maximum HDR Resolution (Clone/Extended mode) -Single Channel** |
| ■ 1 display: 2160p60 |
| ■ 2 displays: 1440p60 |
| ■ 4 displays: 1080p60 |

***Note!***

- *Above maximum resolutions are applicable to V1807B*
- *This is just a statement about supported displays and not about multimedia streams*
- **: V1000 45W OPNs are capable of 2880p60 / 4320p30, but only 2160p60 has been validated as these are the most readily available displays*

## 1.3.7 Expansion Interface

**PCI Express x8** -1 PEGx8

**PCIe x1** - Several configurable combinations may need BIOS modifications. Please contact to Advantech sales or FAE for more details.

| | **Bridge** **[source from]** | **PCIex4** **[COMe PCIe Port#]** | **PCIEx2** **[COMe PCIe Port#]** | **PCIex1** **[COMe PCIe Port#]** | **LAN** **[source from]** | **COMe Gen3 Port#** **(x1 speed: Gen3)** | **COMe Gen2 Port#** **(x1 speed: Gen2)** | **x1 speed** |
|---|---|---|---|---|---|---|---|---|
| **Config A (Default)** | YES [AMD SoC GPP4] | 0 | 0 | 6 [0,1,2,3,4,6] | YES [through bridge] | 0,1,2,3 | 4,6 | GEN3*4+ GEN2*2 |
| **Config B** | YES [AMD SoC GPP4] | 0 | 0 | 7 [0,1,2,3,4,6, 7] | NO | 0,1,2,3 | 4,6,7 | GEN3*4+ GEN2*3 |
| **Config C** | YES [AMD SoC GPP4] | 0 | 1 [3:2] or [1:0] | 5 [0,1,4,5,6] or [2,3,4,5,6] | YES [through bridge] | 0,1,5 or 2,3,5 | 4,6 | GEN3*3+ GEN2*2 |
| **Config E** | YES [AMD SoC GPP4] | 0 | 1 [3:2] or [1:0] | 6 [0,1,4,5,6,7] or [2,3,4,5,6,7] | NO | 0,1,5 or 2,3,5 | 4,6,7 | GEN3*3+ GEN2*3 |
| **Config F** | YES [AMD SoC GPP4] | 0 | 2 [3:2] , [1:0] | 3 [4,5,6] | YES [through bridge] | 5 | 4,6 | GEN3*1+ GEN2*2 |
| **Config H** | YES [AMD SoC GPP4] | 0 | 2 [3:2] , [1:0] | 4 [4,5,6,7] | NO | 5 | 4,6,7 | GEN3*1+ GEN2*3 |
| **Config I (Optional)** | YES [AMD SoC GPP4] | 1 [3:0] | 0 | 3 [4,5,6] | YES [through bridge] | 5 | 4,6 | GEN3*1+ GEN2*2 |
| **Config K** | YES [AMD SoC GPP4] | 1 [3:0] | 0 | 4 [4,5,6,7] | NO | 5 | 4,6,7 | GEN3*1+ GEN2*3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Config L** | NO | 0 | 1<br>[5:4] | 4<br>[0,1,2,3] | NO | 0,1,2,3 | | GEN3 |
| **Config N** | NO | 0 | 1<br>[3:2] or<br>[1:0] | 3<br>[0,1,4] or<br>[2,3,4] | YES<br>[AMD<br>SoC<br>GPP5] | 0,1,4 or<br>2,3,4 | | |
| **Config O** | NO | 0 | 2<br>[3:2] ,<br>[1:0] | 2<br>[4,5] | NO | 4,5 | | |
| **Config P** | NO | 0 | 2<br>[3:2] ,<br>[1:0] | 1<br>[4] | YES<br>[AMD<br>SoC<br>GPP5] | 4 | | |
| **Config Q** | NO | 1<br>[3:0] | 0 | 2<br>[4,5] | NO | 4,5 | | |
| **Config R** | NO | 1<br>[3:0] | 0 | 1<br>[4] | YES<br>[AMD<br>SoC<br>GPP5] | 4 | | |
| **Config S** | NO | 1<br>[3:0] | 1<br>[5:4] | 0 | NO | | | |

## 1.3.8 LPC

Supports Low Pin Count (LPC) 1.1 specification, without DMA or bus mastering. Allows connection to Super I/O, embedded controller, or TPM. LPC clock is 33MHz.

## 1.3.9 Serial Bus

### 1.3.9.1 SMBus

Supports SMBus 2.0 specification with Alert pin.

Default from SoC; option from EC.

### 1.3.9.2 I2C Bus

Supports I2C bus 8-bit and 10-bit address modes, at both 100KHz and 400KHz.

Default from EC; option from SoC.

## 1.3.10 I/O

### 1.3.10.1 Gigabit Ethernet

Ethernet: Intel I210AT Gigabit LAN supports 10/100/1000 Mbps Speed.

### 1.3.10.2 SATA

Supports 2 ports SATA Gen3 (6.0 Gb/s), backward compliant to SATA Gen2 (3.0 Gb/s) and Gen1 (1.5 Gb/s). Maximum data rate is 600 MB/s. Supports AHCI 1.3 mode.

### 1.3.10.3 USB3.0 (3.1)/USB2.0

SOM-5871 supports 2 ports USB3.1 Gen2 (10 Gbps), 1 port USB 3.1 Gen1 (5 Gbps) and 8 ports USB 2.0 (480 Mbps) which are backward compatible to USB1.x. USB 3.1 supports LPM (U0, U1, U2, and U3) manageability to save power.

***Note!*** *To meet USB3.1 Gen2 performance, strongly recommend to use the certificated cable.*

#### 1.3.10.4 USB 3.1 Gen2

| | | |
|---|---|---|
| **Type 6** | P0 | P1 |
| **SoC** | P0 | P1 |

#### 1.3.10.5 USB 3.1 Gen1

| | |
|---|---|
| **Type 6** | P2 |
| **SoC** | P2 |

#### 1.3.10.6 USB 2.0

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Type 6** | P0 | P1 | P2 | P3 | P4 | P5 | P6 | P7 |
| **SoC** | P0 | P1 | P2 | P3 | P4 | P5 | P6 | P7 |
| **Type 6** | OC_01 | | OC_23 | | OC_45 | | OC_67 | |
| **SoC USB_OC#** | OC_01 | | OC_23 | | OC_45 | | OC_67 | |

#### 1.3.10.7 SPI Bus

Supports BIOS flash only. SPI clock can be 50MHz, 33MHz, or 20MHz, capacity up to 16MB.

#### 1.3.10.8 GPIO

8 x programmable general purpose Input or output (GPIO).

#### 1.3.10.9 Watchdog

Supports multi-level watchdog time-out output. Provides 1-65535 level, from 100ms to 109.22 minutes interval.

#### 1.3.10.10 Serial port

2 ports, 2-wire serial port (Tx/Rx) support 16550 UART compliance.

- Programmable FIFO or character mode.
- 16-byte FIFO buffer on transmitter and receiver in FIFO mode.
- Programmable serial-interface characteristics: 5, 6, 7, or 8-bit character.
- Even, odd, or no parity bit selectable.
- 1, 1.5, or 2 stop bit selectable.
- Baud rate up to 115.2K.

#### 1.3.10.11 TPM

Supports TPM 2.0 module by default.

#### 1.3.10.12 CAN Bus

Supports CAN Bus function as optional function by BOM change (co-layout with COM 2).

#### 1.3.10.13 Smart Fan

Supports 2 Fan PWM control signal and 2 tachometer inputs for fan speed detection. Provides 1 on module with connector and the other on the carrier board following PICMG COM Express R3.0 specification.

#### 1.3.10.14 BIOS

BIOS chip is on module by default. Also allows the user to place BIOS chip on the carrier board with appropriate design and jumper setting on BIOS_DIS#[1:0].

| BIOS_DIS0# | BIOS_DIS#1 | Boot up destination/function |
|---|---|---|
| Open | Open | Boot from Module's SPI BIOS |
| Open | GND | SPI_CS0# to Carrier Board, SPI_CS1# to Module |
| GND | GND | SPI_CS0# to Module, SPI_CS1# to Carrier Board |

***Note!*** *If system COMS are cleared, we strongly suggest to go to the BIOS setup menu and load default settings at the first time of boot up.*

## 1.3.11 Power Management

### 1.3.11.1 Power Supply

Supports both ATX and AT power modes. VSB is for suspend power and can be option if not require standby (suspend-to-RAM) support. RTC Battery may be option if keep time/date is not require.

VCC: 8.5V - 20V

VSB: 4.75V - 5.25V (Suspend power)

RTC Battery Power: 2.0V - 3.3V

### 1.3.11.2 PWROK

Power OK from main power supply. A high value indicates that the power is good. This signal can be used to hold off Module startup to allow Carrier based FPGAs or other configurable devices time to be programmed.

### 1.3.11.3 Power Sequence

According to PICMG COM Express R3.0 specification

### 1.3.11.4 Wake Event

Various wake-up events supporting allow user to apply into different scenario.

- Wake-on-LAN(WOL): Wake to S0 from S3/S4/S5
- USB Wake: Wake to S0 from S3/S4
- PCIe Device Wake: depends on user inquiry and may need customized BIOS
- LPC Wake: depends on user inquiry and may need customized BIOS

### 1.3.11.5 Advantech S5 ECO Mode (Deep Sleep Mode)

Advantech iManager provides additional features to allow the system to enter a very low suspend power mode - S5 ECO mode. In this mode, the module will cut all power including suspend and active power into the chipset and keep an on-module controller active. Therefore, only under 50mW of power will be consumed which means battery packs can last longer. While this mode is enabled in BIOS, the system (or module) only allows a power button to boot rather than others such as WOL.

## 1.3.12 Environment

### 1.3.12.1 Temperature

- Operating: 0 ~ 60° C (32 ~ 140° F), with an active heat sink under 0.7m/s air flow chamber
- Storage:-40 ~ 85° C (-40 ~ 185° F)

### 1.3.12.2 Humidity

- Operating: 40° C @ 95% relative humidity, non-condensing
- Storage: 60° C @ 95% relative humidity, non-condensing

### 1.3.12.3 Vibrations

IEC60068-2-64: Random vibration test under operation mode, 3.5Grms

### 1.3.12.4 Drop Test (Shock)

Federal Standard 101 Method 5007 test procedure with standard packing

### 1.3.12.5 EMC

CE EN55022 Class B and FCC Certifications: validate with standard development boards in Advantech chassis

## 1.3.13 MTBF

Please refer Advantech SOM-5871 Series Reliability Prediction Report No: TBD. (Estimated date: TBD)

## 1.3.14 OS Support (duplicate with SW chapter)

The mission of Advantech Embedded Software Services is to "Enhance quality of life with Advantech platforms and Microsoft Windows embedded technology." We enable Windows Embedded software products on Advantech platforms to more effectively support the embedded computing community. Customers are freed from the hassle of dealing with multiple vendors (Hardware suppliers, System integrators, Embedded OS distributor) for projects. Our goal is to make Windows Embedded Software solutions easily and widely available to the embedded computing community.

To install the drivers, please connect to internet and browse the website http://support.advantech.com.tw to download the setup file.

## 1.3.15 Advantech iManager

Supports APIs for GPIO, smart fan control, multi-stage watchdog timer and output, temperature sensor, hardware monitor, etc. They follow PICMG EAPI 1.0 specifications that provides backward compatibility.

## 1.3.16 Power Consumption

| Power Consumption Table (Watt.) | | | | | | |
|---|---|---|---|---|---|---|
| VCC=12V, VSB=5V | Active Power Domain | | | Suspend Power Domain | | Mechanical off |
| Power State | S0 Max. Load | S0 Burn-in | S0 Idle | S5 | S5 Deep Sleep | RTC (uA) |
| SOM-5871VC-H3A1 | 68.118W | 39.9791W | 7.3437W | 0.8844W | 0.4914W | 4.69uA |

**Hardware Configurations:**

1. **MB:** SOM-5871VC-H3A1 (PCB: A101-3)
2. **ADVANTECH 16GB SO-DDR4-2400 *2PCS**
3. **Carrier board:** SOM-DB5830 A101-2
4. **Test Condition:**
   - ■Test temperature: room temperature
   - ■Test voltage: rated voltage DC +8.5V, +12.0V, +20.0V
   - ■Test loading:
     - –Idle mode: DUT power management off and no running any program.
     - –Maximum load mode: Running programs.
5. **OS:** Windows 10 Enterprise

## 1.3.17 Performance

For reference performance or benchmark data that compares with other modules, please refer to "Advantech COM Performance & Power Consumption Table".

## 1.3.18 Selection Guide w/ P/N

| Part No. | SoC | Base/1T Boost Freq. | Core/ Thread | LLC | Default TDP | TDP Range | Thermal Solution | Operating Temperature |
|---|---|---|---|---|---|---|---|---|
| SOM-5871VC-H3A1 | V1807B | 3.35GHz/3.8GHz | 4/8 | 2M | 45W | 35-54W | Active | 0 ~ 60 °C |
| SOM-5871VC-H2A1 | V1756B | 3.25GHz/3.6GHz | 4/8 | 2M | 45W | 35-54W | Active | 0 ~ 60 °C |
| SOM-5871VC-U0A1 | V1605B | 2.0GHz/3/6GHz | 4/8 | 2M | 15W | 35-54W | Active | 0 ~ 60 °C |
| SOM-5871VC-U3A1 | V1202B | 2.3GHz/3/2GHz | 2/4 | 1M | 15W | 35-54W | Active | 0 ~ 60 °C |

***Note!*** *Passive = fanless; Active = with fan*

## 1.3.19 Packing list

| Part No. | Description | Quantity |
|---|---|---|
| - | SOM-5871 CPU module | 1 |
| 1960088919N001 | Heatspreader | 1 |

### 1.3.20 Development Board

| Part No. | Description |
|---|---|
| SOM-DB5830-00A1 | COMe R3.0 Devel. Board Type6 Rev.A1 |

### 1.3.21 Pin Description

Advantech provides useful checklists for schematic design and layout routing. The schematic checklist specifies details about each pin's electrical properties and how to connect for different usage. The layout checklist specifies the layout constraints and recommendations for trace length, impedance, and other necessary information during design.

Please contact your nearest Advantech branch office or call for design documents and further advances support.

# Chapter 2

## Mechanical Information

This chapter gives mechanical information on the SOM-5871 CPU Computer on Module

Sections include:

- Board Information
- Mechanical Drawing
- Assembly Drawing

## 2.1 Board Information

The figures below indicate the main chips on SOM-5871 Computer-on-Module.

Please be aware on these positions while designing your customer's own carrier board to avoid mechanical and thermal problems.

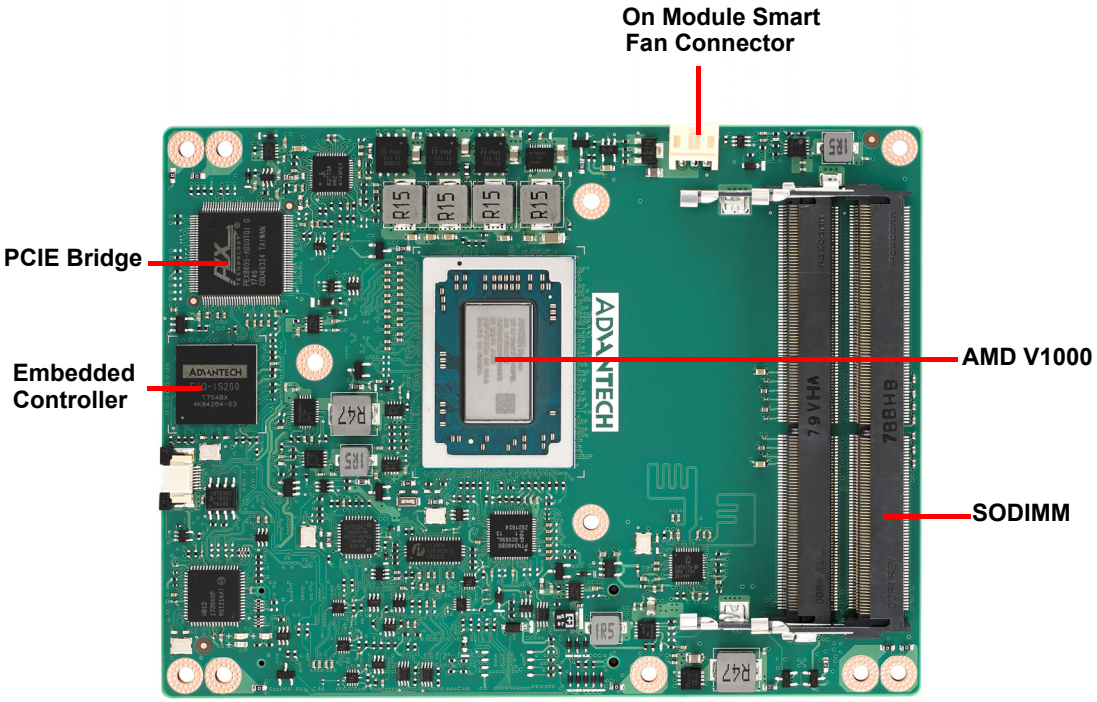



**Figure 2.1 Board chips identification – Front**

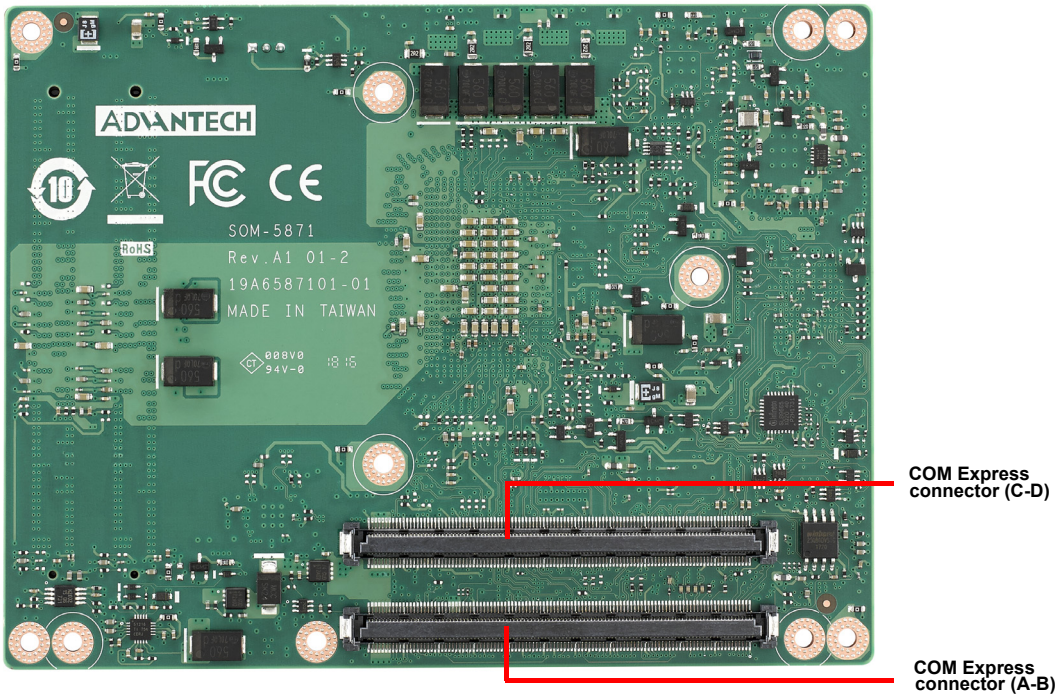
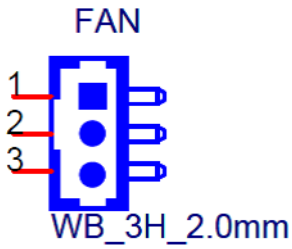



**Figure 2.2 Board chips identification – Rear**

### 2.1.1 Connector List

| Table 2.1: FAN1 Fan | |
|---|---|
| **FAN1** | **Fan** |
| Description | Wafer 2.0mm 3P 90D (M) DIP 2001-WR-03-LF W/Lock |
| Pin | Pin name |
| 1 | Fan Tacho-Input |
| 2 | Fan out |
| 3 | GND |




## 2.2 Mechanical Drawing

For more detail about 2D/3D models, please find on Advantech COM support service website http://com.advantech.com.

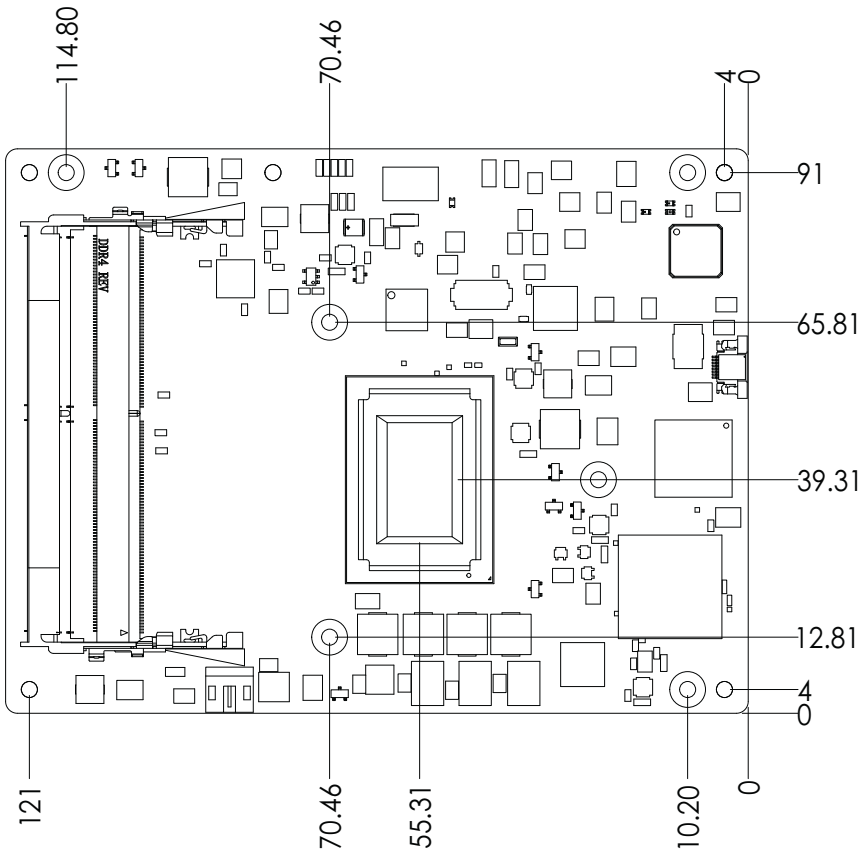



**Figure 2.3 Board Mechanical Drawing – Front**

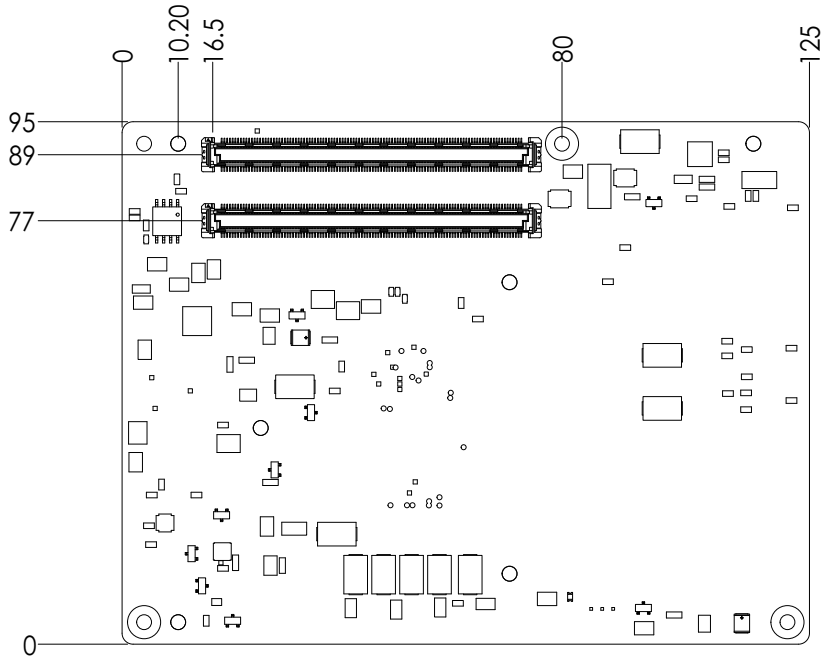



**Figure 2.4 Board Mechanical Drawing – Rear**

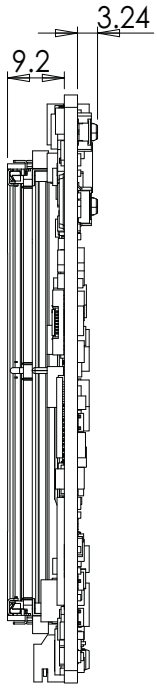



**Figure 2.5 Board Mechanical Drawing – Side**

## 2.3 Assembly Drawing

These figures demonstrate the assembly order from the thermal module, COM module to carrier board.

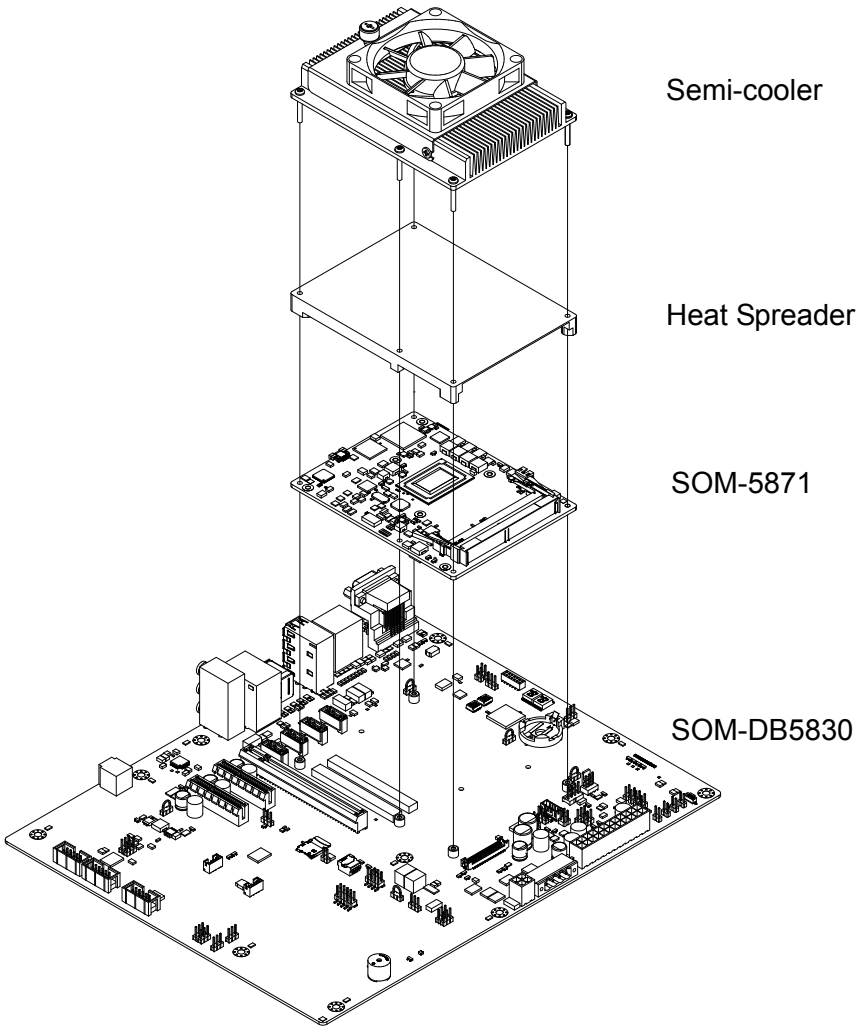



**Figure 2.6 Assembly Drawing**

There are 5 reserved screw holes for SOM-5871 to be pre-assembled with the heat spreader.

# Chapter 3

## AMI BIOS

This chapter gives BIOS setup information for the SOM-5871 CPU Computer-on Module

Sections include:

- Introduction
- Entering Setup
- Hot/Operation Key
- Exit BIOS Setup Utility

# 3.1 Starting

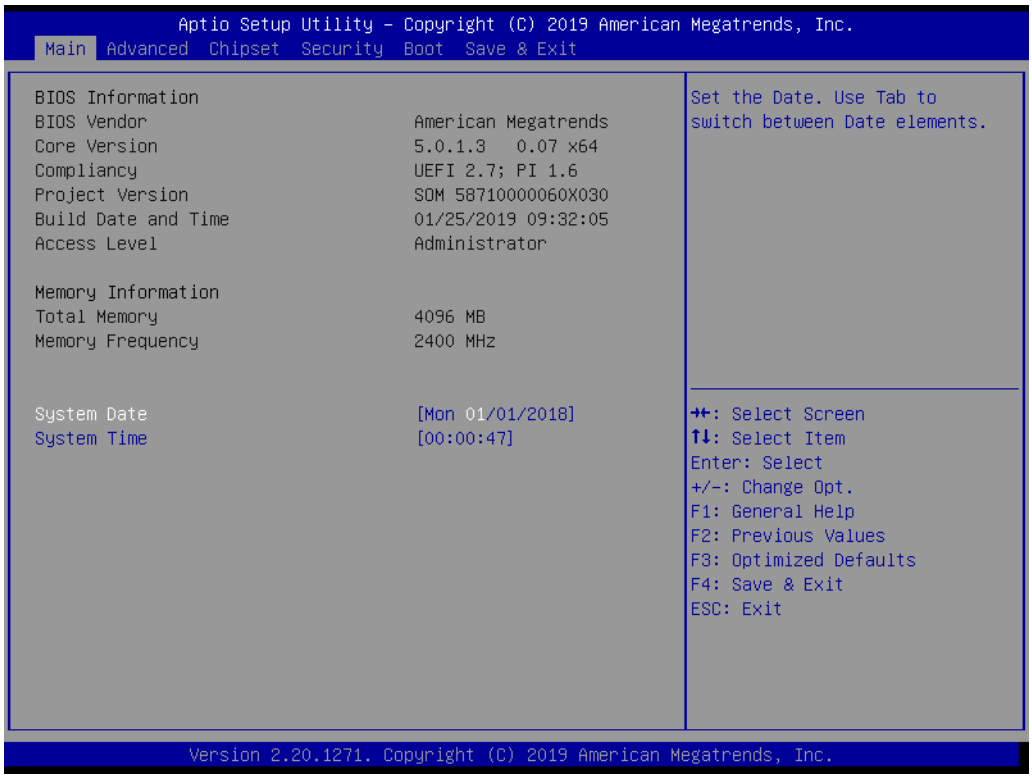
SOM-5871 BIOS is stored in a flash ROM which is inserted into a BIOS socket on the board. With the BIOS Setup program, users can modify BIOS settings and control various system features. This chapter describes the basic navigation of the SOM-5871 BIOS setup screens.

Advantech will have revisions for product optimization so customers can re-flash the latest BIOS through the AFU utility. Please contact Advantech sales or FAE for more details.

**Entering the BIOS**

To enter the BIOS setup screens, follow the steps below:

1. Power on the motherboard.
2. Press the Delete or Esc key on your keyboard when you see the following text prompt: Press Delete or Esc to enter setup.
3. After you press the Delete key, the main BIOS setup menu displays. You can access the other BIOS function settings.




The BIOS setup screen has three main frames. The left frame displays all information and configurable items. Grayed-out text is information only. Blue items are options that can be configured. White one is the current focus item to be selected.

The right-upper frame is an area reserved for a text message. When an option is selected from the left frame, a help text message will show at this area.

The following table shows the hot keys operation guide.

| Hot Key | Description |
|---|---|
| → Right<br>← Left | The Left and Right < > keys allow you to select a BIOS setup page.<br>For example: Main page, Advanced page, Chipset page, and so on. |
| ↑ Up<br>↓ Down | The Up and Down < > keys allow you to select a BIOS setup item or sub-screen. |
| + -<br>Plus/Minus | The Plus and Minus keys allow you to change the field value of a particular setup item. For example: Date and Time. |
| F1 | The <F1> key allows you to display the General Help screen.<br>Press the <F1> key to open the General Help screen. |
| F2 | Load Previous Values. Ignore modified configures. |
| F3 | Load Optimized Defaults. |
| F4 | Save configuration and exit. |
| ESC | The <Esc> key allows you to go back to upper menu item. At root page, <Esc> key is used for Quit without saving. |
| Enter | Entering submenu or display option items. |

**SOM-5871** BIOS has a built-in Setup program that allows users to modify the basic system configuration. This information is stored in flash ROM so it retains the Setup information when the power is turned off.

### 3.1.1 Main Setup

When users first enter the BIOS Setup Utility, they will enter the Main setup screen.

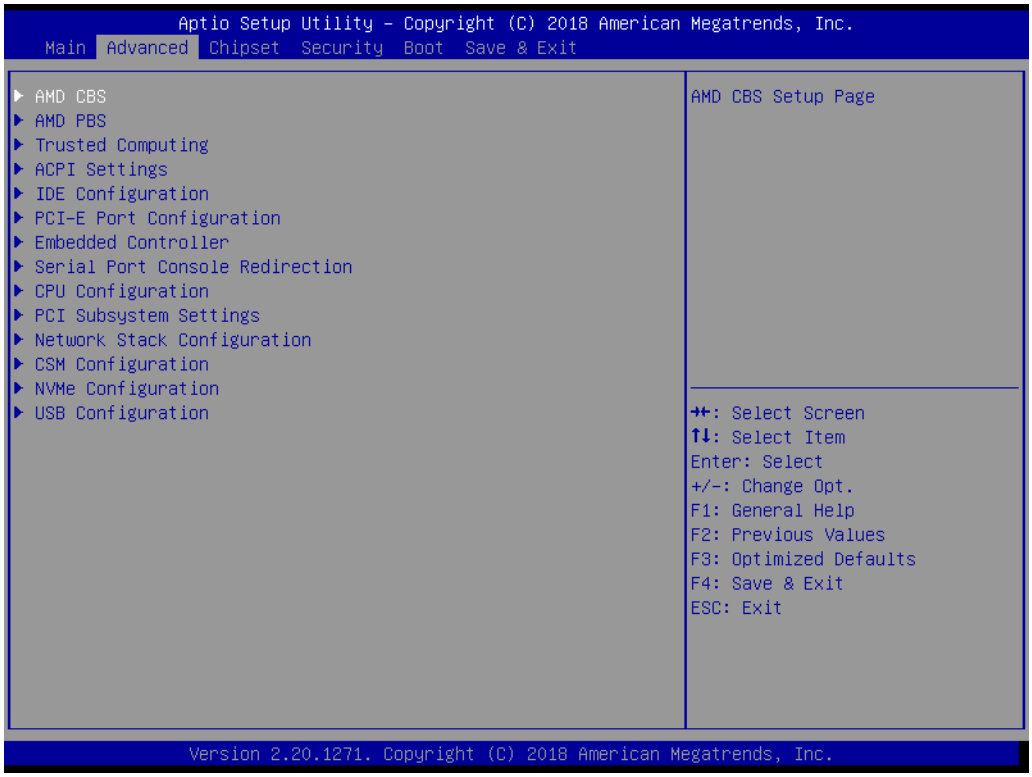
You can always return to the Main setup screen by selecting the Main tab. The Main BIOS Setup screen is shown below.

The Main page shows BIOS Information

| Feature | Options | Description |
|---|---|---|
| BIOS Information | No Option | Subtitle |
| BIOS Vender | No Option | Displays the BIOS vendor, where we suppliers license from. |
| Core Version | No Option | Displays the BIOS vendor's kernel core version. |
| Compliancy | No Option | Displays this BIOS supporting industry standards compliance. |
| Project Version | No Option | Displays the project version of Advantech projects. |
| Build Date and Time | No Option | Displays this BIOS build date and time. |
| Access Level | No Option | Please refer to session "3.1.4 Security". |
| Total Memory | No Option | Displays the total memory size of the system. |
| Memory Frequency | No Option | Displays the memory frequency. |
| System Date | mm/dd/yyyy | Set the system date. Use Tab to switch between Date elements. Use + / - or numbers to change the value. |
| System Time | hh:mm:ss | Set the system time. Use Tab to switch between Date elements. Use + / - or numbers to change the value. |

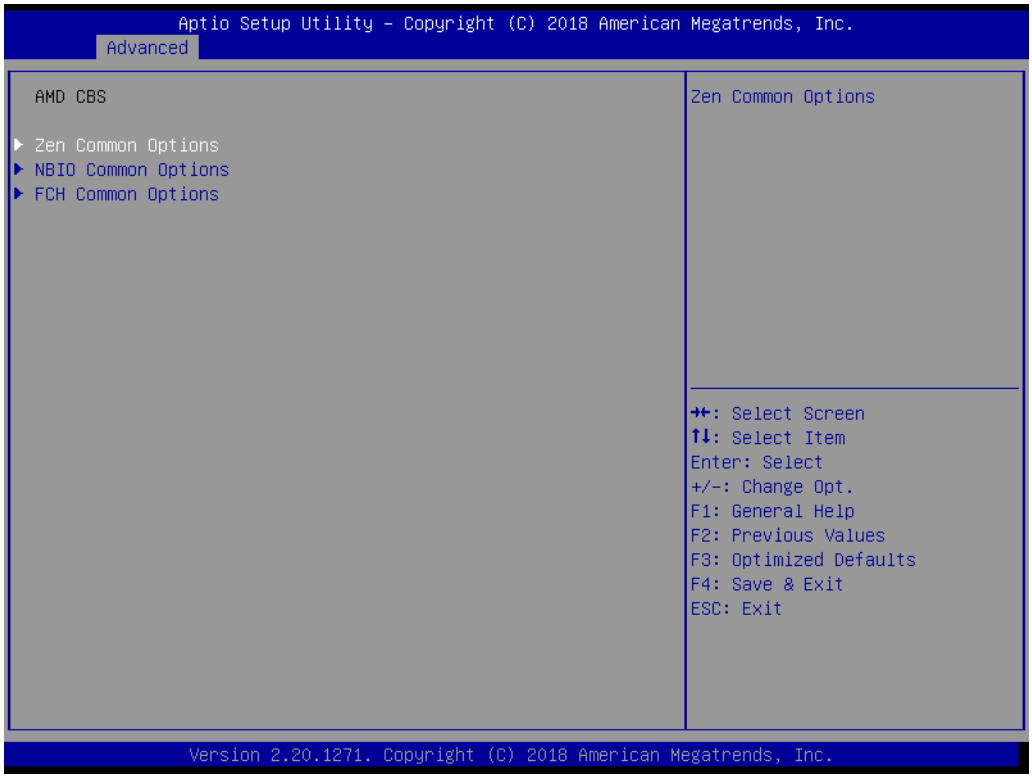
### 3.1.2 Advanced BIOS Features Setup

Select the Advanced tab from the SOM-5871 setup screen to enter the Advanced BIOS Setup screen. Users can select any item in the left frame of the screen, such as CPU Configuration, to go to the sub menu for that item. Users 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 are shown below. The sub menus are described on the following pages.



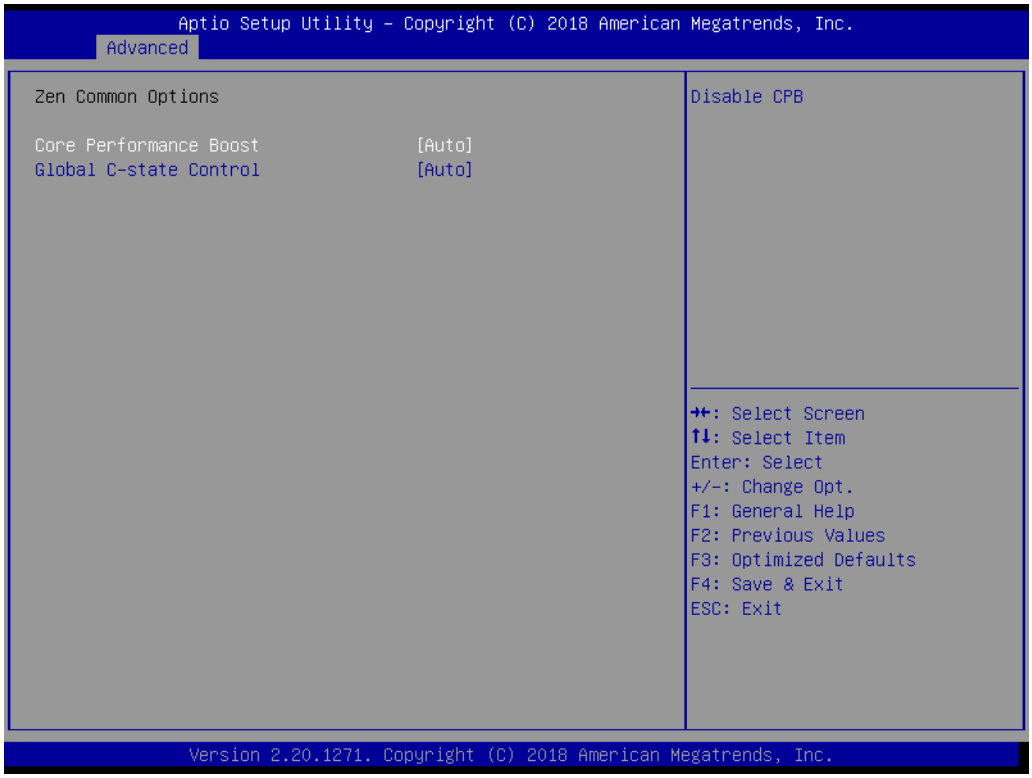

| Feature | Options | Description |
|---|---|---|
| AMD CBS | <Sub Menu> | AMD CBS Setup Page |
| AMD PBS | <Sub Menu> | AMD PBS Setup Page |
| Trusted Computing | <Sub Menu> | Trusted Computing Settings |
| ACPI Settings | <Sub Menu> | System ACPI Parameters |
| IDE Configuration | <Sub Menu> | IDE Devices Configuration |
| PCI-E Port Configuration | <Sub Menu> | PCI-E Port Parameters |
| Embedded Controller | <Sub Menu> | Embedded Controller Parameters |
| Serial Port Console Redirection | <Sub Menu> | Serial Port Console Redirection |
| CPU Configuration | <Sub Menu> | CPU Configuration Parameters |
| PCI Subsystem Settings | <Sub Menu> | PCI Subsystem Settings |
| Network Stack Configuration | <Sub Menu> | Network Stack Settings |
| CSM Configuration | <Sub Menu> | CSM Configuration: Enable/Disable, option ROM execution settings, etc. |
| NVMe Configuration | <Sub Menu> | NVMe Device Options Settings |
| USB Configuration | <Sub Menu> | USB Configuration Parameters |

### 3.1.2.1 AMD CBS



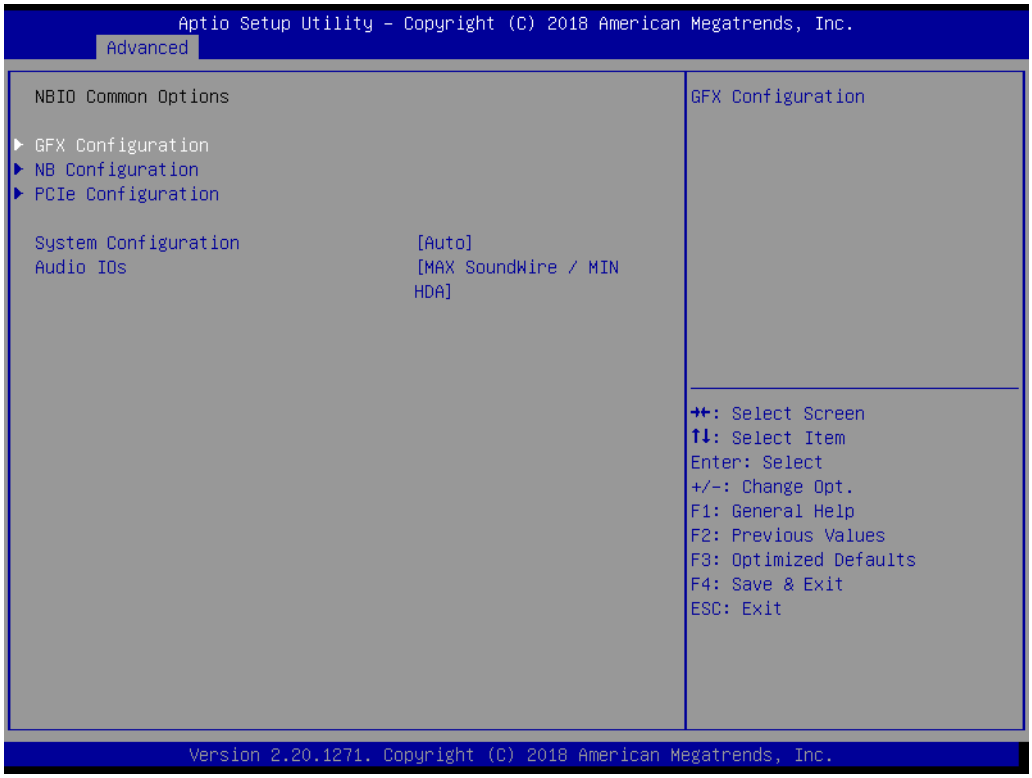

| Feature | Options | Description |
|---|---|---|
| Zen Common Options | <Sub Menu> | Zen Common Options |
| NBIO Common Options | <Sub Menu> | NBIO Common Options |
| FCH Common Options | <Sub Menu> | FCH Common Options |

### 3.1.2.2 Zen Common Options



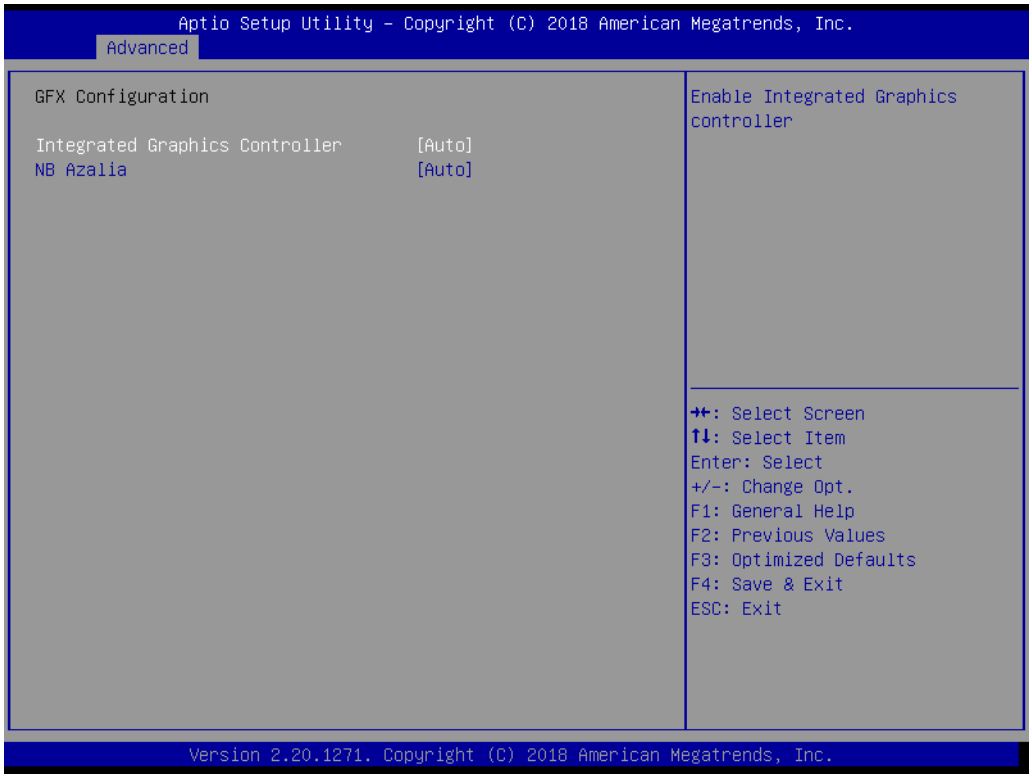

| Feature | Options | Description |
|---|---|---|
| Core Performance Boost | Disabled<br>Auto | Disable CPB |
| Global C-state Control | Disabled<br>Enabled<br>Auto | Controls IO based C-state generation and DF C-states |

### 3.1.2.3 NBIO Common Options



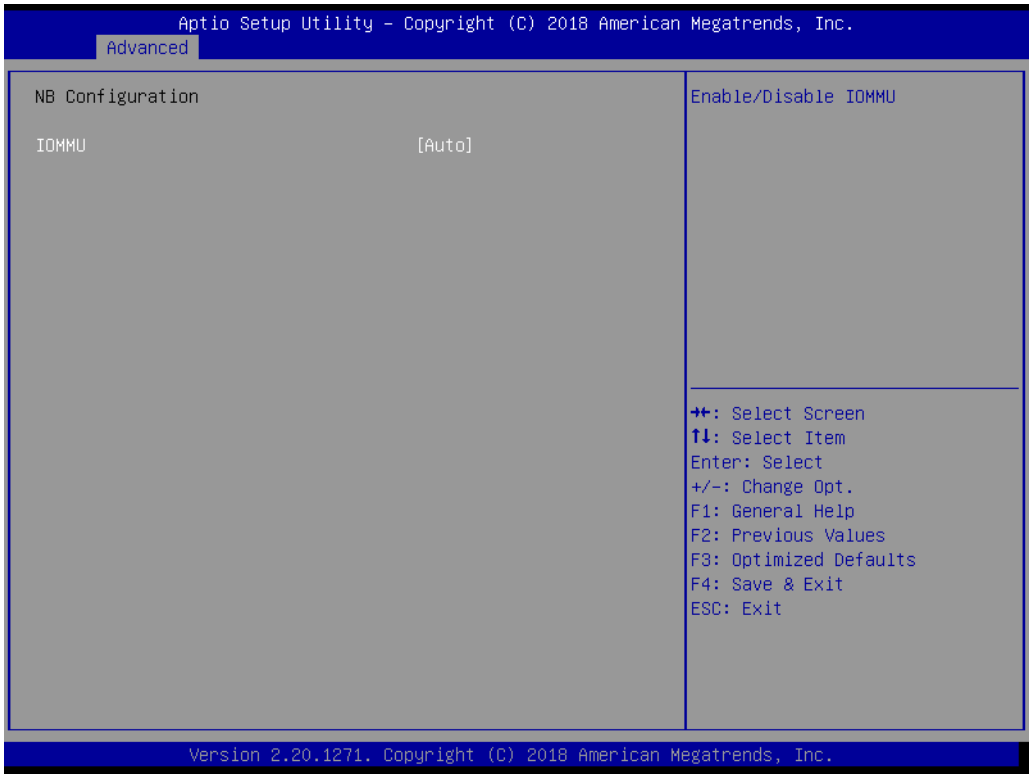

| Feature | Options | Description |
|---|---|---|
| GFX Configuration | <Sub Menu> | GFX Configuration |
| NB Configuration | <Sub Menu> | NB Configuration |
| PCIe Configuration | <Sub Menu> | PCIe Configuration |
| System Configuration | 35W POR Configuration<br>45W POR Configuration<br>54W POR Configuration<br>Auto | Warning: Selecting some system configurations may cause the system to hang, as some setting may not be supported by your OPN. |
| Audio I/O | Auto<br>MAX HAD/MIN SoundWire<br>MAX mHDA/MIN SoundWire<br>Max SoundWire/MIN HAD<br>I2S/TDM<br>Soundwire<br>DISABLE AUDIO IOs | Audio I/O Control |

## GFX Configuration



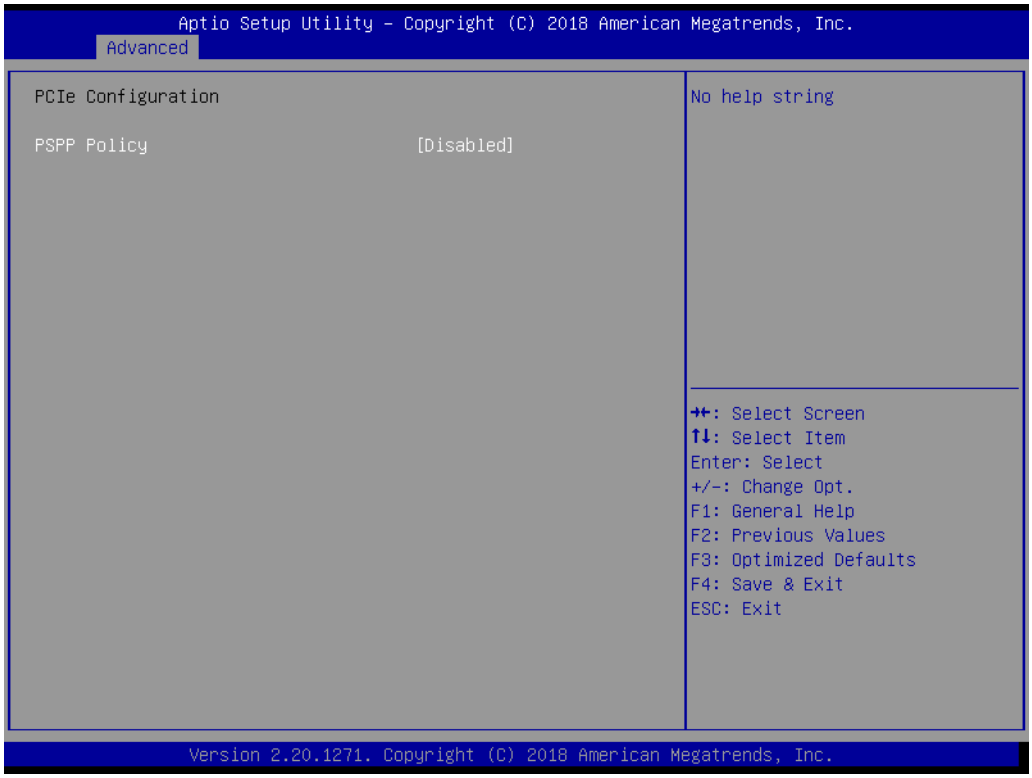

| Feature | Options | Description |
|---|---|---|
| Integrated Graphics Controller | Disabled<br>Forces<br>Auto | Enable Integrated Graphics controller |
| NB Azalia | Disabled<br>Enabled<br>Auto | Enable Integrate HD Audio controller |

## NB Configuration



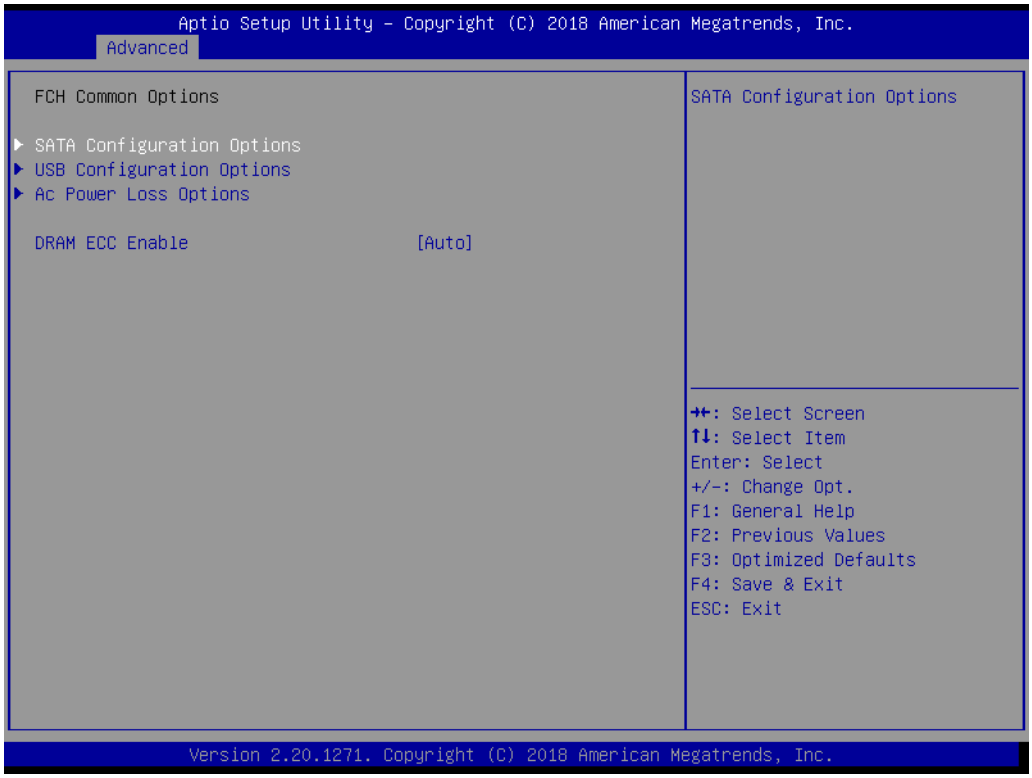

| Feature | Options | Description |
|---|---|---|
| IOMMU | Disabled<br>Enabled<br>Auto | Enable/Disable IOMMU |

### 3.1.2.4 PCIe Configuration



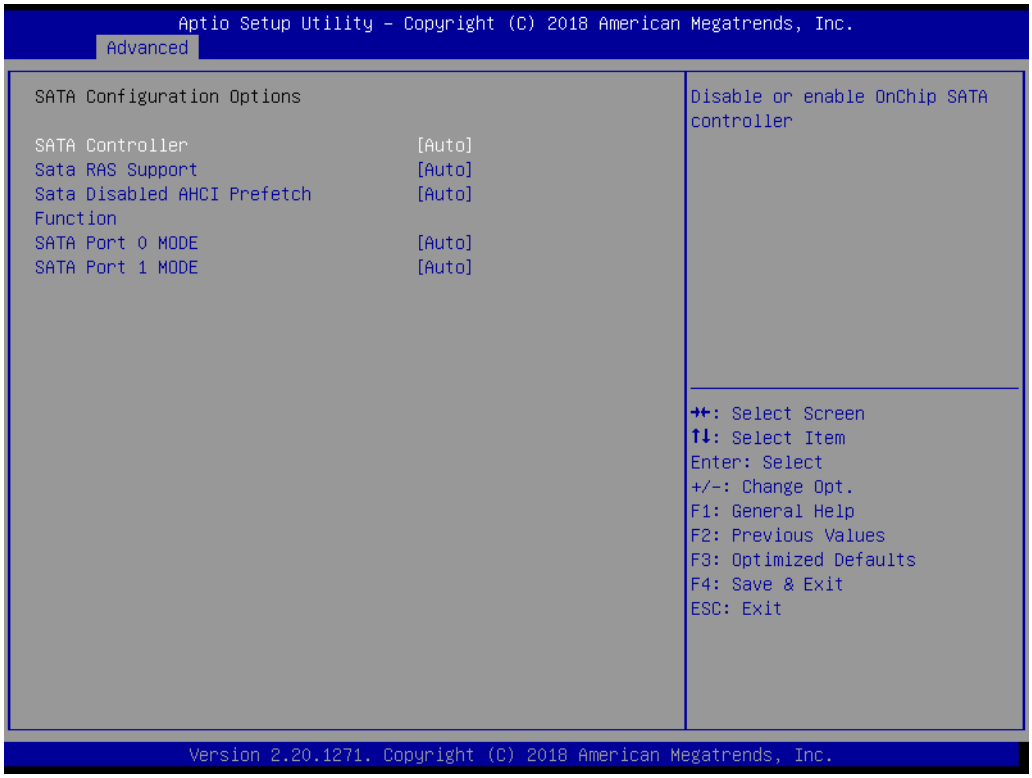

| Feature | Options | Description |
|---|---|---|
| PSPP Policy | Disabled<br>Performance<br>Balanced-High<br>Balanced-Low<br>Power Saving<br>Auto | No help string |

## FCH Common Options



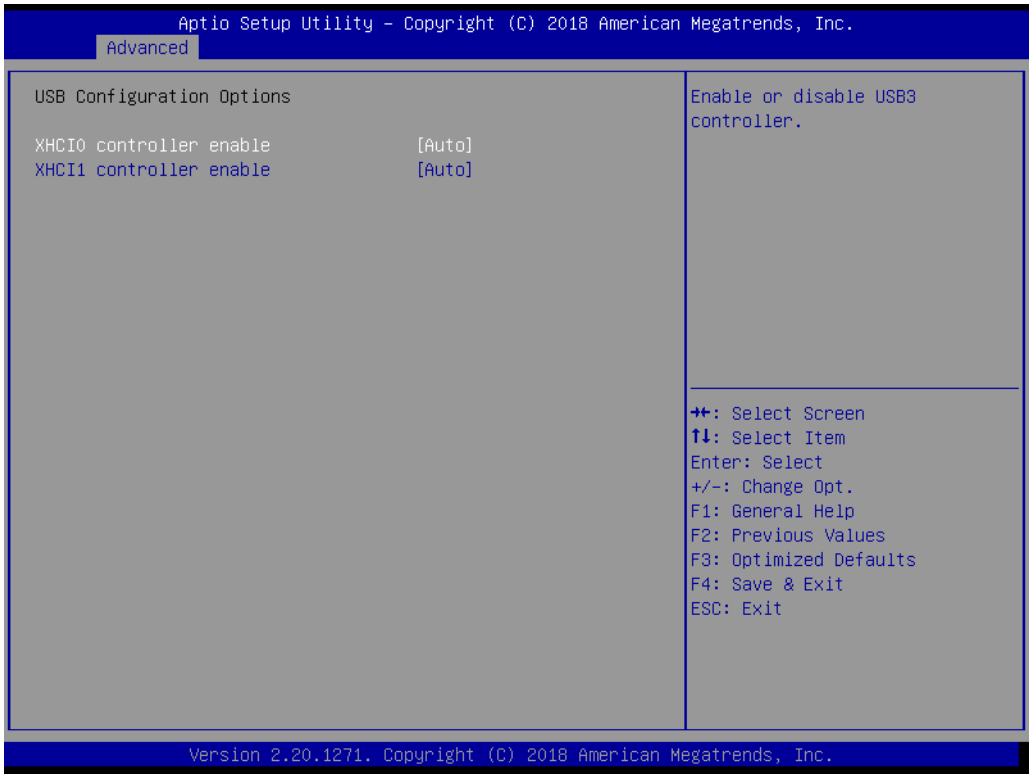

| Feature | Options | Description |
|---|---|---|
| SATA Configuration Options | <Sub Menu> | SATA Configuration Options |
| USB Configuration Options | <Sub Menu> | USB Configuration Options |
| AC Power Loss Options | <Sub Menu> | AC Power Loss Options |
| DRAM ECC Enable | Disabled<br>Enabled<br>Auto | |

## SATA Configuration Options



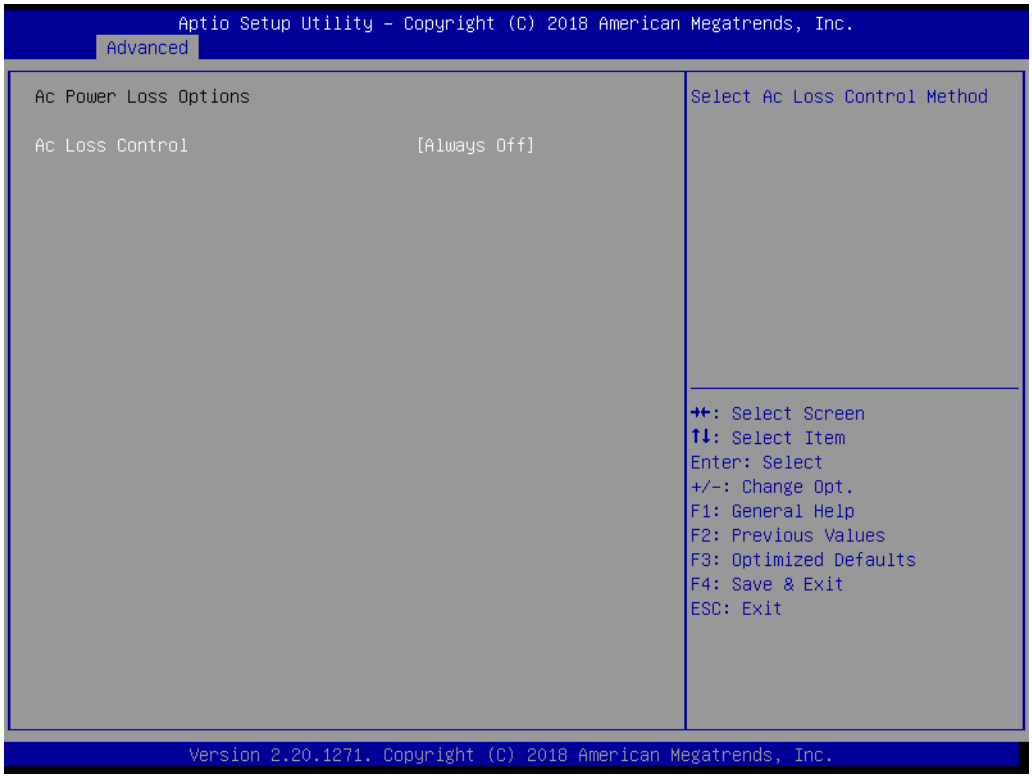

| Feature | Options | Description |
|---|---|---|
| SATA Controller | Disabled<br>Enabled<br>Auto | Disable or enable on chip SSATA controller |
| SATA RAS Support | Disabled<br>Enabled<br>Auto | Disable or enable SATA RAS support |
| SATA Disabled AHCI Prefetch Function | Disabled<br>Enabled<br>Auto | Disable or enable SATA AHCI prefetch function |
| SATA Port 0 MODE | GEN1<br>GEN2<br>Auto | Indicates the highest allowable speed of the SATA port 0 |
| SATA Port 1 MODE | GEN1<br>GEN2<br>Auto | Indicates the highest allowable speed of the SATA port 1 |

## USB Configuration Options



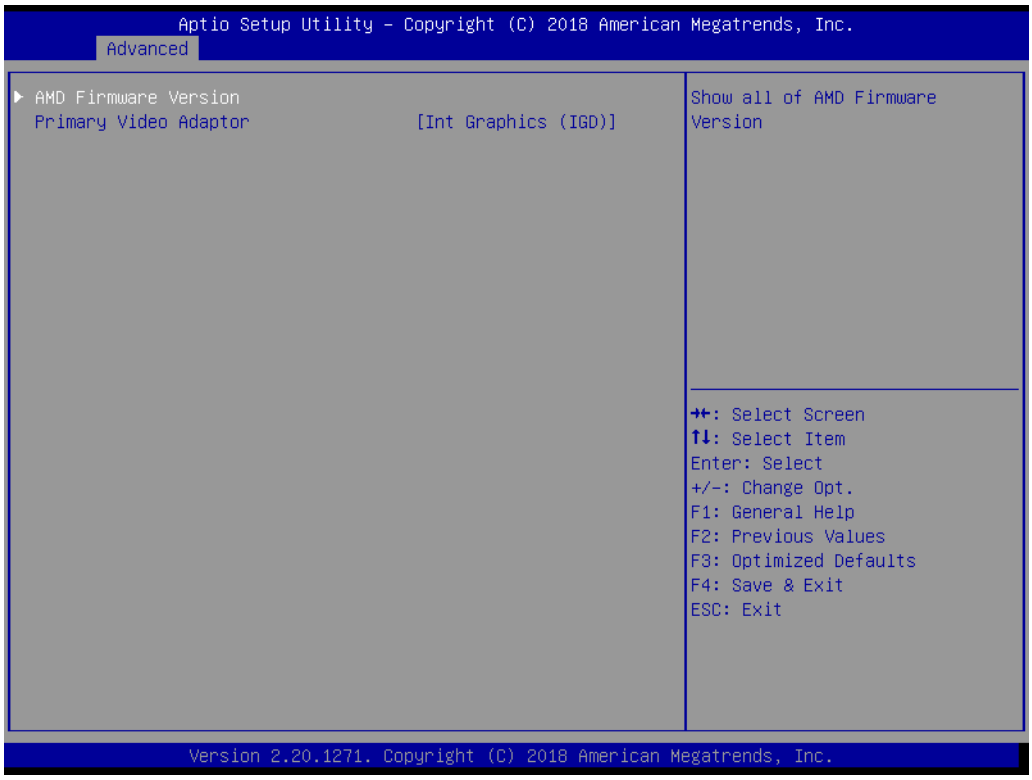

| Feature | Options | Description |
|---|---|---|
| XHCIO controller enable | Enabled<br>Disabled<br>Auto | Enable or disable USB3 controller |
| XHCI1 controller enable | Enabled<br>Disabled<br>Auto | Enable or disable USB3 controller |

## AC Power Loss Options



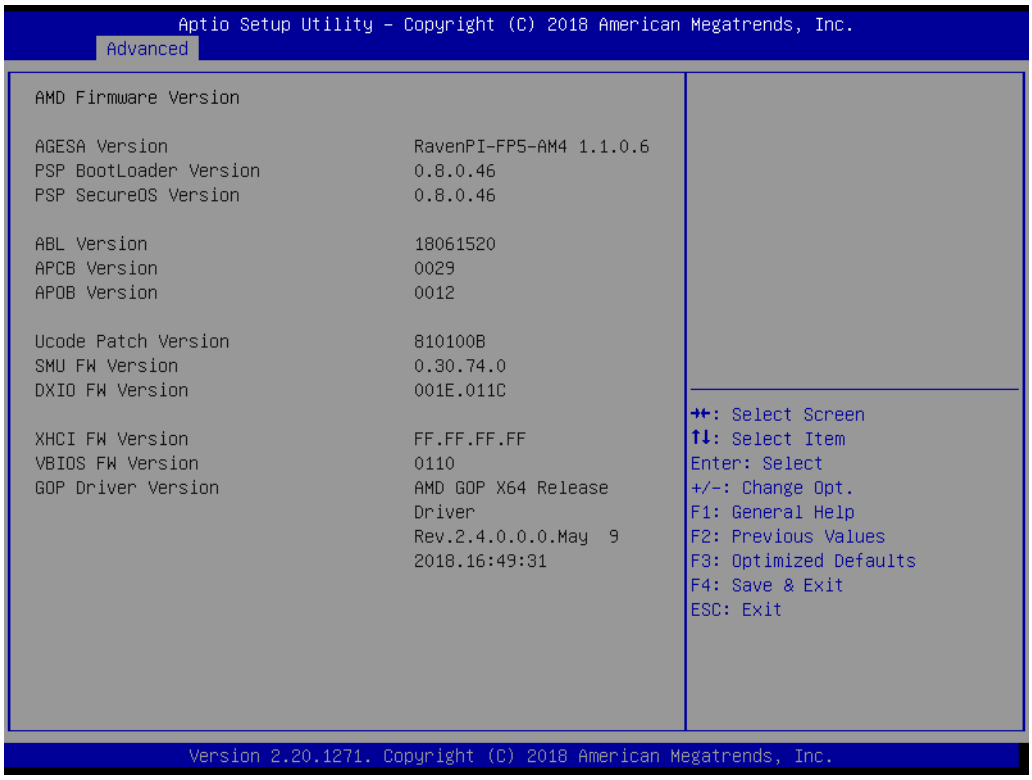

| Feature | Options | Description |
|---|---|---|
| AC Loss Control | Always Off<br>Always On<br>Reserved<br>Previous | Select AC loss control method |

## AMD PBS



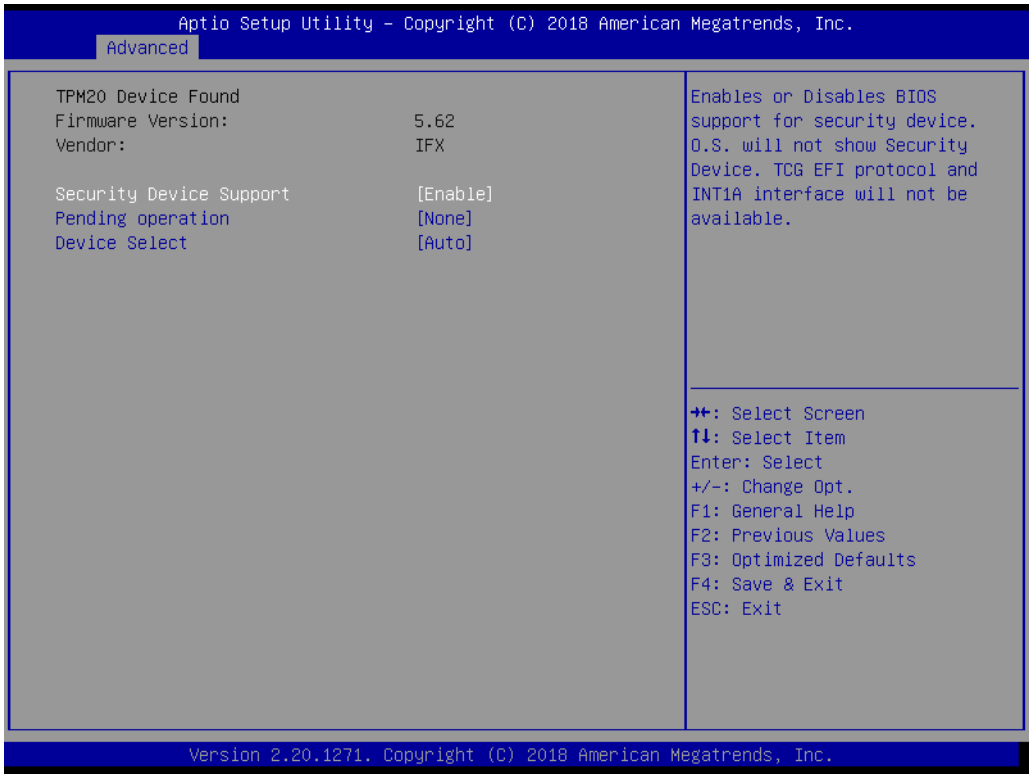

| Feature | Options | Description |
|---|---|---|
| AMD Firmware Version | <Sub Menu> | Shows all of AMD Firmware Version |
| Primary Video Adaptor | Int Graphics (IGD)<br>Ext Graphics (PEG) | Select Internal/External Graphics |

## AMD Firmware Version



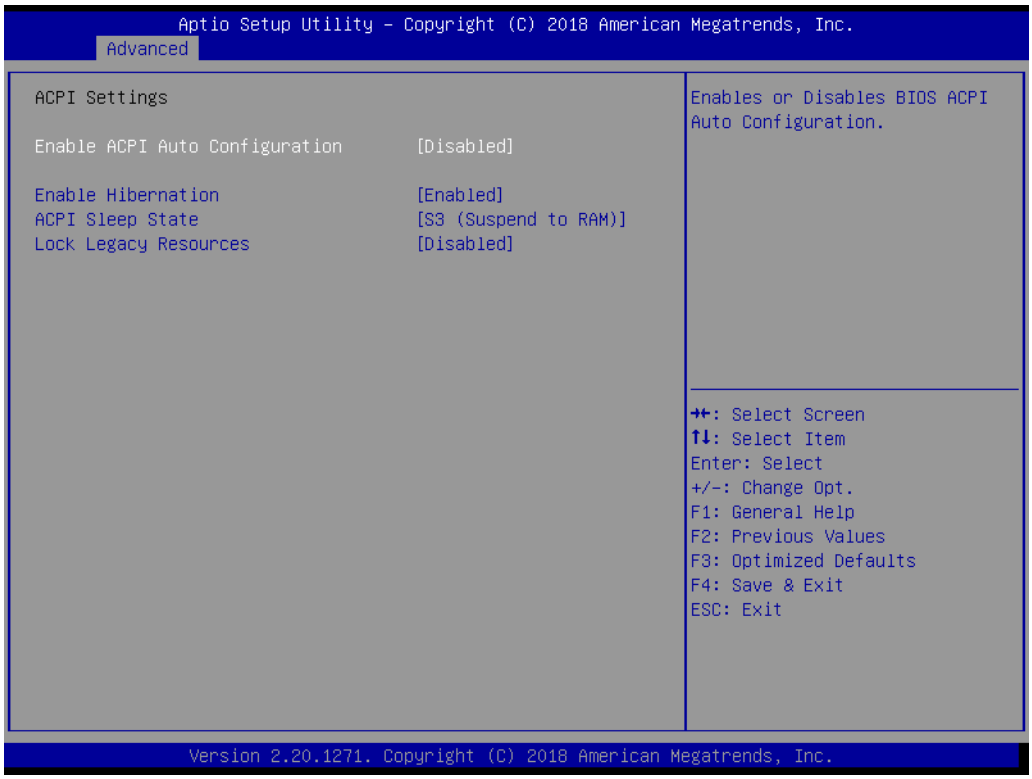

| Feature | Options | Description |
|---|---|---|
| AGESA Version | No option | Shows the current status |
| PSP BootLoader Version | No option | Shows the current status |
| PSP SecureOS Version | No option | Shows the current status |
| ABL Version | No option | Shows the current status |
| APCB Version | No option | Shows the current status |
| APOB Version | No option | Shows the current status |
| Ucode Patch Version | No option | Shows the current status |
| SMU FW Version | No option | Shows the current status |
| DXIO FW Version | No option | Shows the current status |
| XHCI FW Version | No option | Shows the current status |
| VBIOS FW Version | No option | Shows the current status |
| GOP Driver Version | No option | Shows the current status |

## Trusted Computing



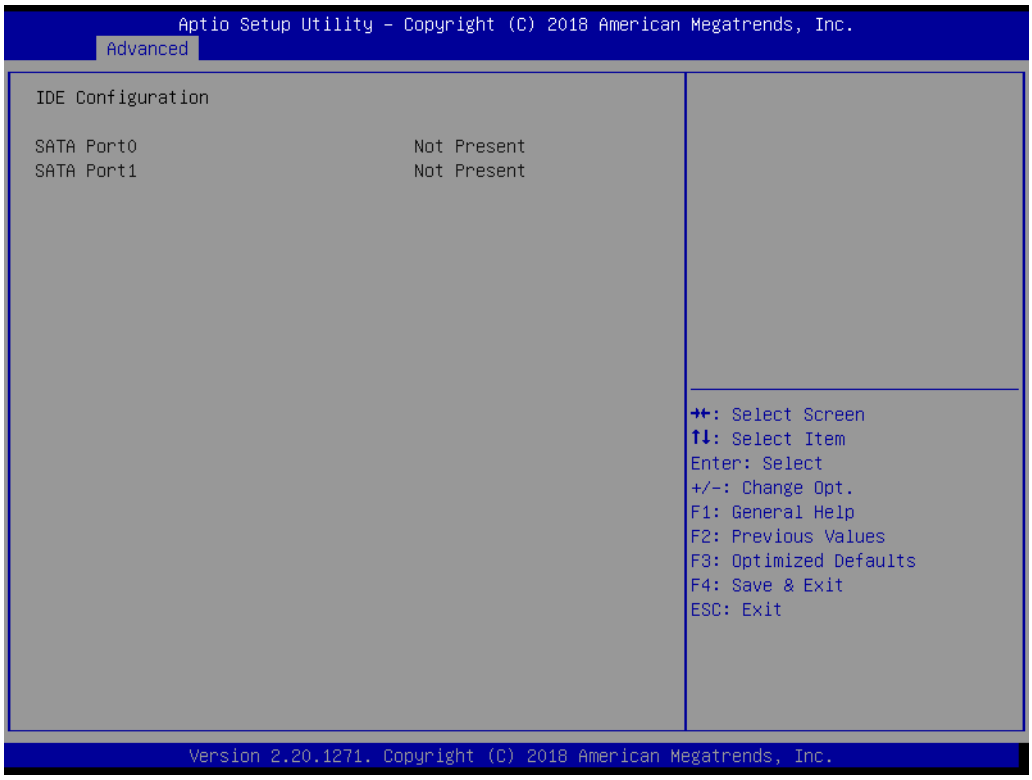

| Feature | Options | Description |
|---|---|---|
| Security Device Support | Disable<br>Enable | Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available. |
| Pending operation | None<br>TPM Clear | Schedule an Operation for the Security Device. NOTE: Your Computer will reboot during restart in order to change State of Security Device. |
| Device Select | TPM 1.2<br>TPM 2.0<br>Auto | TPM 1.2 will restrict support to TPM 1.2 devices, TPM 2.0 will restrict support to TPM 2.0 devices, Auto will support both with the default set to TPM 2.0 devices if not found, TPM 1.2 devices will be enumerated |

## ACPI Settings



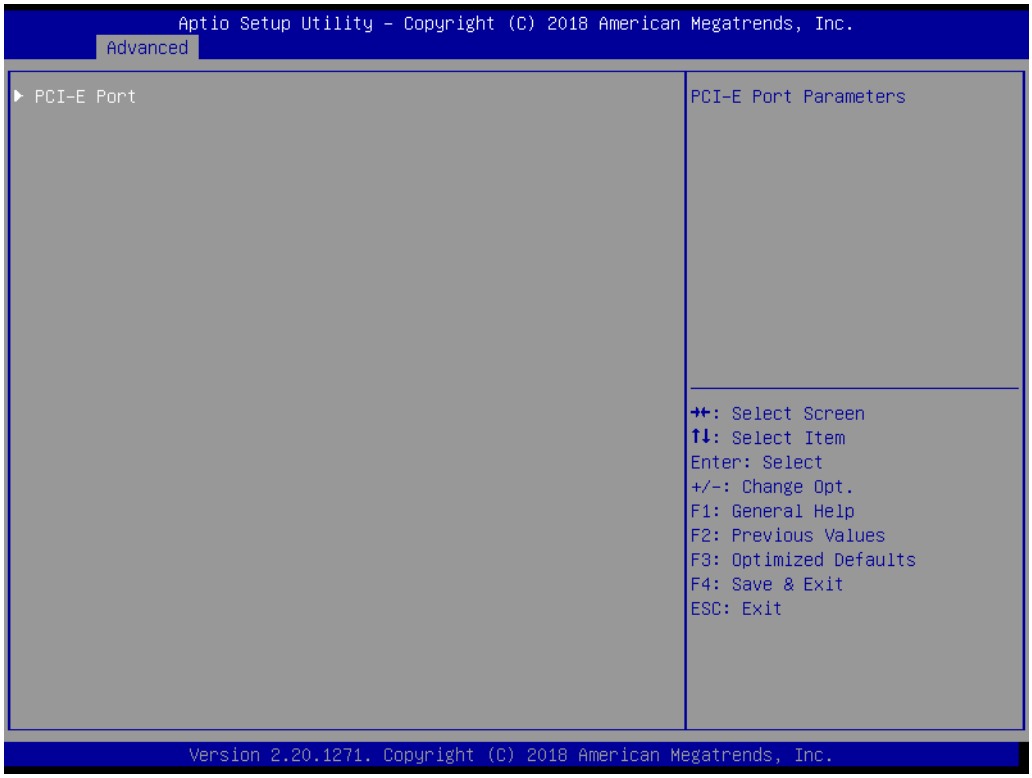

| Feature | Options | Description |
|---|---|---|
| Enable ACPI Auto Configuration | Disabled<br>Enabled | Enables or Disables BIOS ACPI Auto Configuration. |
| Enable Hibernation | Disabled<br>Enabled | Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may not be effective with some operating systems. |
| ACPI Sleep State | Suspend Disable<br>S3(Suspend to RAM) | Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed. |
| Lock Legacy Resources | Disabled<br>Enabled | Enables or Disables Lock of Legacy Resources |

### 3.1.2.5 IDE Configuration



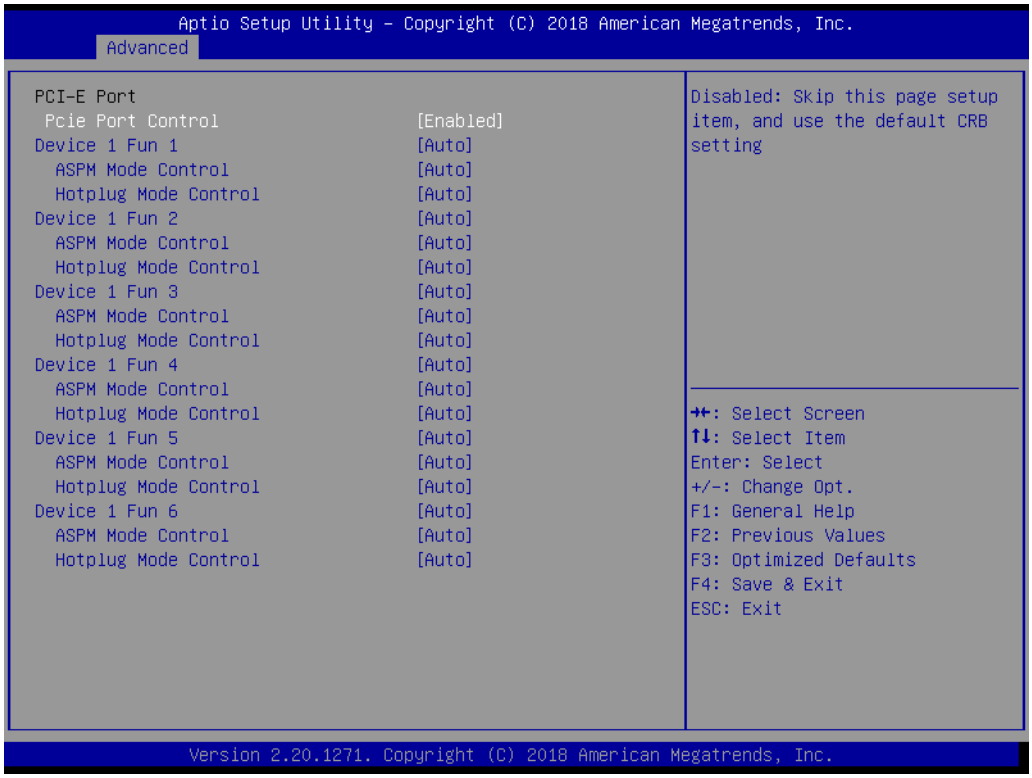

| Feature | Options | Description |
|---|---|---|
| SATA Port0 | No option | Shows the current status |
| SATA Port1 | No Option | Shows the current status |

### 3.1.2.6 PCI-E Port Configuration




| Feature | Options | Description |
|---|---|---|
| PCI-E Port | <Sub Menu> | PCI-E Port Parameters |

### 3.1.2.7 PCI-E Port

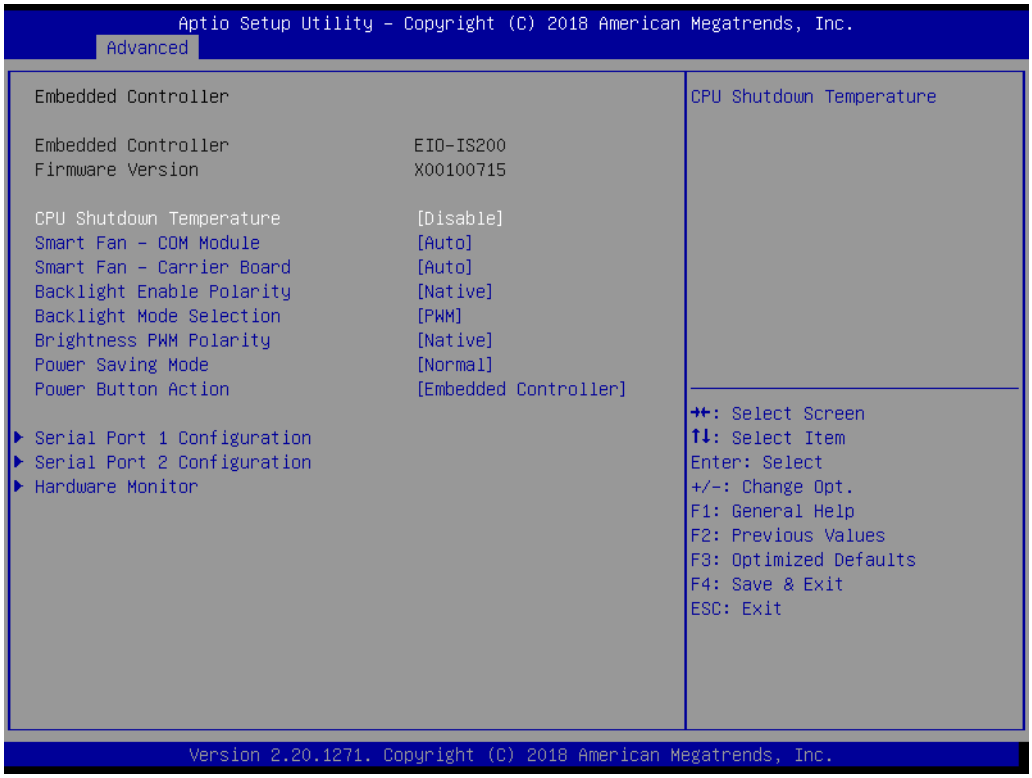



| Feature | Options | Description |
|---|---|---|
| PCie Port Control | Disabled<br>Enabled | Disabled: Skip this page setup item, and use the default CRB setting |
| Device 1 Fun 1 | Disabled<br>Enabled<br>Auto | Enable/Disable/Auto, Auto uses board default setting |
| ASPM Mode Control | Disabled<br>L0s Entry<br>L1 Entry<br>L0s And L1 Entry<br>Auto | NB Root Port ASPM Mode Control |
| Hotplug Mode Control | Disabled<br>Hotplug Basic<br>Hotplug Server<br>Hotplug Enhanced<br>Hotplug Inboard<br>Auto | NB Root Port Hotplug Mode Control |
| Device 1 Fun 2 | Disabled<br>Enabled<br>Auto | Enable/Disable/Auto, Auto uses board default setting |
| ASPM Mode Control | Disabled<br>L0s Entry<br>L1 Entry<br>L0s And L1 Entry<br>Auto | NB Root Port ASPM Mode Control |

| | | |
|---|---|---|
| Hotplug Mode Control | Disabled<br>Hotplug Basic<br>Hotplug Server<br>Hotplug Enhanced<br>Hotplug Inboard<br>Auto | NB Root Port Hotplug Mode Control |
| Device 1 Fun 3 | Disabled<br>Enabled<br>Auto | Enable/Disable/Auto, Auto uses board default setting |
| ASPM Mode Control | Disabled<br>L0s Entry<br>L1 Entry<br>L0s And L1 Entry<br>Auto | NB Root Port ASPM Mode Control |
| Hotplug Mode Control | Disabled<br>Hotplug Basic<br>Hotplug Server<br>Hotplug Enhanced<br>Hotplug Inboard<br>Auto | NB Root Port Hotplug Mode Control |
| Device 1 Fun 4 | Disabled<br>Enabled<br>Auto | Enable/Disable/Auto, Auto uses board default setting |
| ASPM Mode Control | Disabled<br>L0s Entry<br>L1 Entry<br>L0s And L1 Entry<br>Auto | NB Root Port ASPM Mode Control |
| Hotplug Mode Control | Disabled<br>Hotplug Basic<br>Hotplug Server<br>Hotplug Enhanced<br>Hotplug Inboard<br>Auto | NB Root Port Hotplug Mode Control |
| Device 1 Fun 5 | Disabled<br>Enabled<br>Auto | Enable/Disable/Auto, Auto uses board default setting |
| ASPM Mode Control | Disabled<br>L0s Entry<br>L1 Entry<br>L0s And L1 Entry<br>Auto | NB Root Port ASPM Mode Control |
| Hotplug Mode Control | Disabled<br>Hotplug Basic<br>Hotplug Server<br>Hotplug Enhanced<br>Hotplug Inboard<br>Auto | NB Root Port Hotplug Mode Control |
| Device 1 Fun 6 | Disabled<br>Enabled<br>Auto | Enable/Disable/Auto, Auto uses board default setting |
| ASPM Mode Control | Disabled<br>L0s Entry<br>L1 Entry<br>L0s And L1 Entry<br>Auto | NB Root Port ASPM Mode Control |

| | | |
|---|---|---|
| Hotplug Mode Control | Disabled<br>Hotplug Basic<br>Hotplug Server<br>Hotplug Enhanced<br>Hotplug Inboard<br>Auto | NB Root Port Hotplug Mode Control |

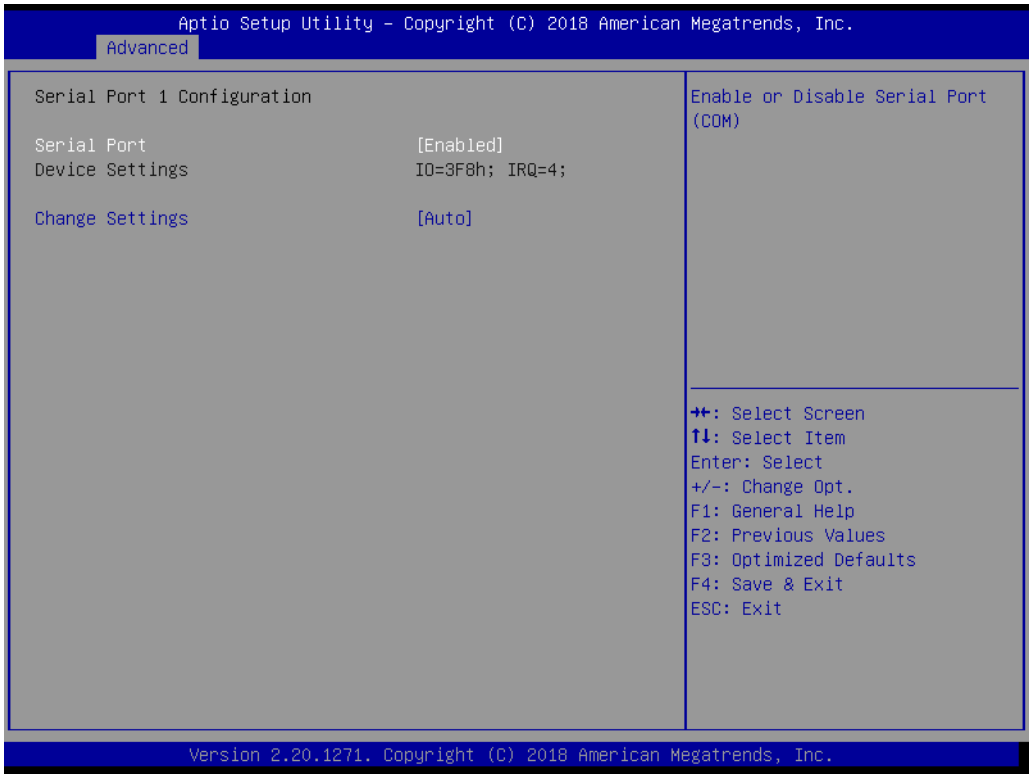
## Embedded Controller




| Feature | Options | Description |
|---|---|---|
| CPU Shutdown Temperature | Disable<br>70°C/158°F<br>75°C/167°F<br>80°C/176°F<br>85°C/185°F<br>90°C/194°F<br>95°C/203°F<br>100°C/212°F | CPU shutdown temperature |
| Smart Fan - COM Module | Stop<br>Full<br>Manual<br>Auto | Controls COM module smart FAN function. Gets value from EC and only sets value when changes are saved. |
| Smart Fan - Carrier Board | Stop<br>Full<br>Manual<br>Auto | Controls carrier board smart FAN function. Gets value from EC and only set value when changes are saved. |
| Backlight Enable Polarity | Native<br>Invert | Switches backlight to enable polarity for native or invert |
| Backlight Mode Selection | PWM<br>DC | Switches backlight control to PWM or DC mode. |
| Brightness PWM Polarity | Native<br>Invert | Backlight controls brightness PWM polarity for native or invert |
| Power Saving Mode | Normal<br>Deep Sleep | Selects power saving mode |
| Power Button Action | Embedded Controller<br>Operating System | Selects power button action control by EC or OS |
| Serial Port 1 Configuration | <Sub Menu> | Sets parameters of serial port 1 (COMG) |

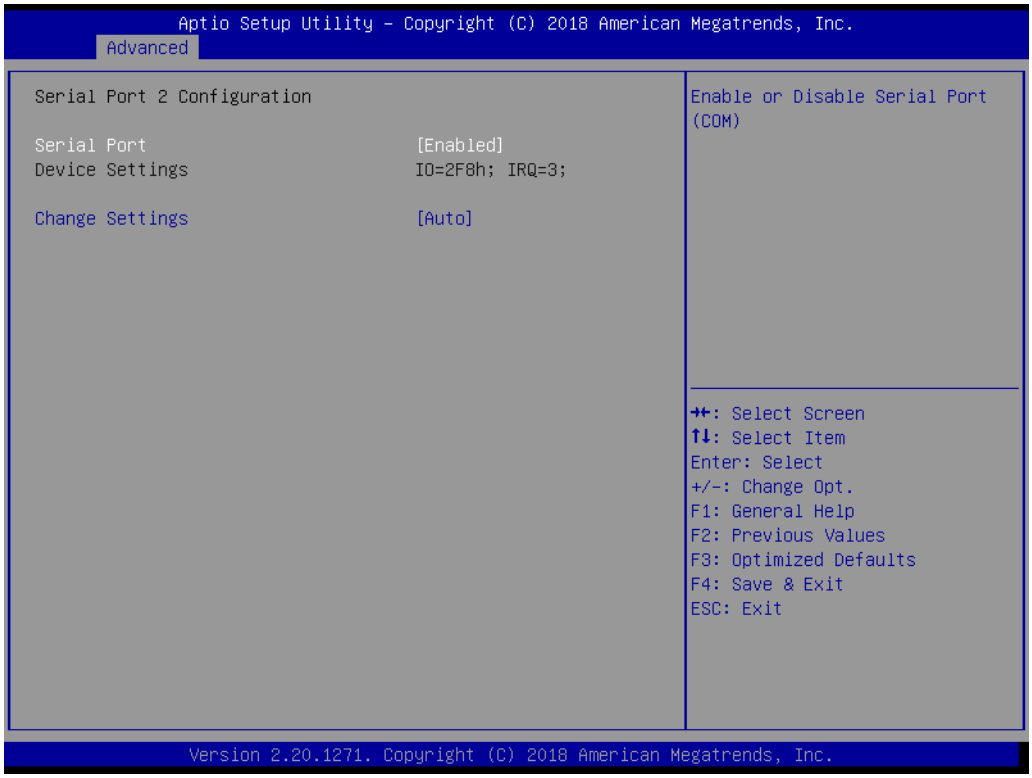
| | | |
|---|---|---|
| Serial Port 2 Configuration | <Sub Menu> | Sets parameters of serial port 2 (COMH) |
| Hardware Monitor | <Sub Menu> | Monitor hardware status |

## Serial Port 1 Configuration



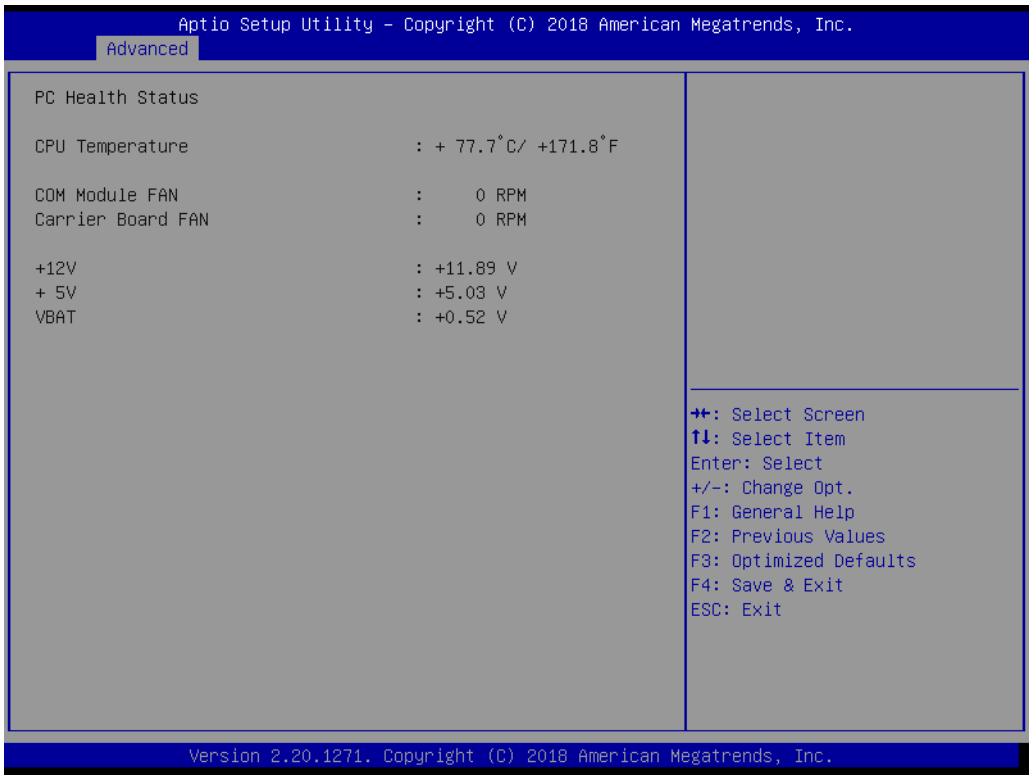

| Feature | Options | Description |
|---|---|---|
| Serial Port | Disabled<br>Enabled | Enable or Disable serial port (COM) |
| Change Setting | Auto<br>IO=3F8h; IRQ=4<br>IO=2F8h; IRQ=4<br>IO=3E8h; IRQ=4<br>IO=2E8h; IRQ=4 | Select an optimal setting for Super IO Device |

## Serial Port 2 Configuration



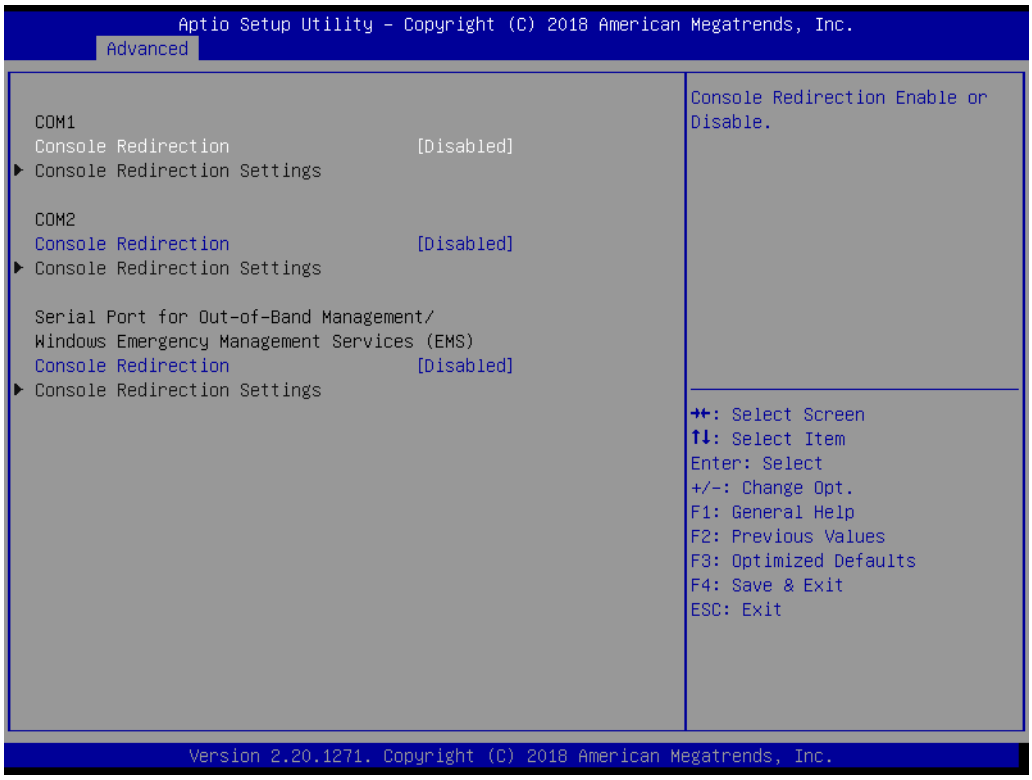

| Feature | Options | Description |
|---|---|---|
| Serial Port | Disabled<br>Enabled | Enable or Disable serial port (COM) |
| Change Settings | Auto<br>IO=2F8h; IRQ=3<br>IO=3F8h; IRQ=3<br>IO=3E8h; IRQ=3<br>IO=2E8h; IRQ=3 | Select an optimal settings for Super IO Device |

## Hardware Monitor



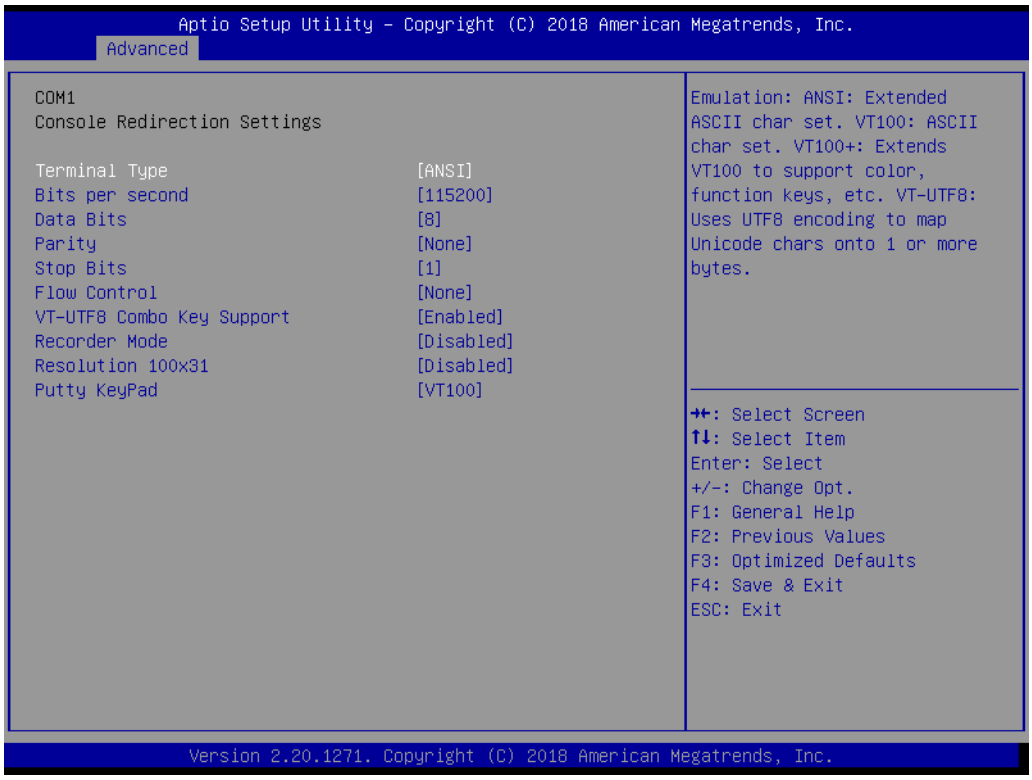

| Feature | Options | Description |
|---|---|---|
| CPU Temperature | No option | Shows the current status |
| COM Module FAN | No option | Shows the current status |
| Carrier Board FAN | No option | Shows the current status |
| +12V | No option | Shows the current status |
| + 5V | No option | Shows the current status |
| VBAT | No option | Shows the current status |

### 3.1.2.8 Serial Port Console Redirection




| Feature | Options | Description |
|---|---|---|
| COM1 | | |
| Console Redirection | Disabled<br>Enabled | Console Redirection Enable or Disable. |
| COM2 | | |
| Console Redirection | Disabled<br>Enabled | Console Redirection Enable or Disable. |
| EMS | | |
| Console Redirection | Disabled<br>Enabled | Console Redirection Enable or Disable. |

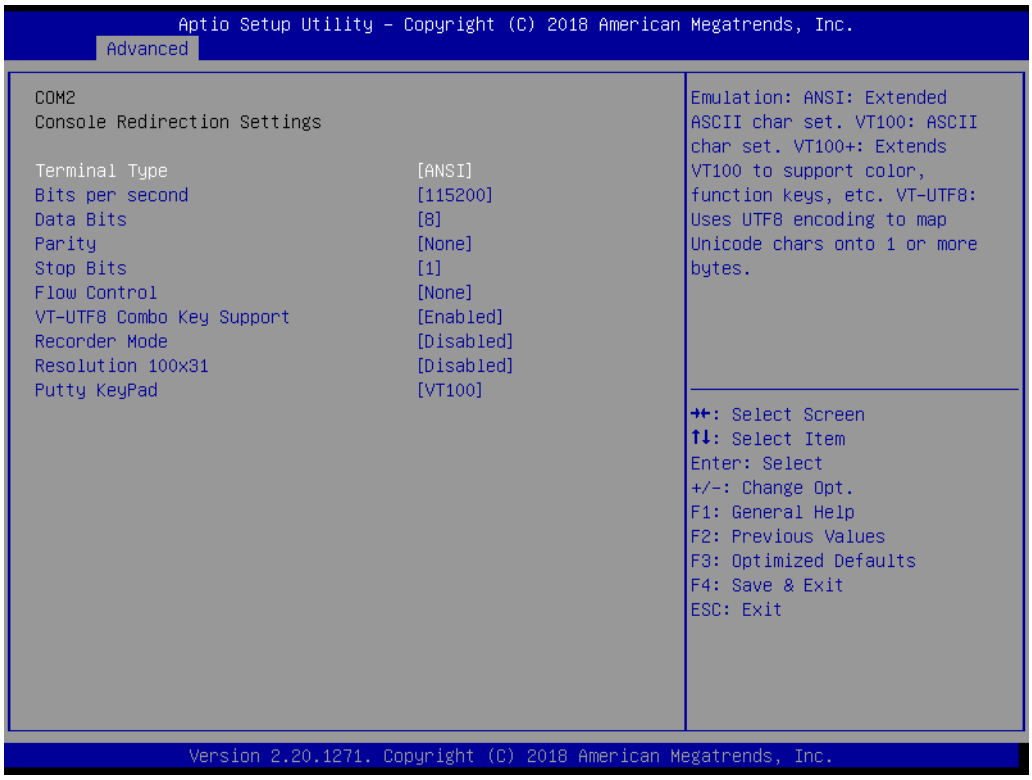
### 3.1.2.9 Console Redirection Settings (COM1)




| Feature | Options | Description |
|---|---|---|
| Terminal Type | VT100<br>VT100+<br>VT-UTF8<br>ANSI | Emulation: ANSI: Extended ASCII char set. VT100: ASCII char set. VT100+: Extends VT100 to support color, function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes. |
| Bits per second | 9600<br>19200<br>38400<br>57600<br>115200 | Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds. |
| Data Bits | 7<br>8 | Data Bits |
| Parity | None<br>Even<br>Odd<br>Mark<br>Space | A parity bit can be sent with the data bits to detect some transmission errors. Even: parity bit is 0 if the num of 1's in the data bits is even. Odd: parity bit is 0 if num of 1's in the data bits is odd. Mark: parity bit is always 1. Space: Parity bit is always 0. Mark and Space Parity do not allow for error detection. They can be used as an additional data bit. |
| Stop Bits | 1<br>2 | Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning). The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit. |
| Flow Control | None<br>Hardware RTS/CTS | Flow control can prevent data loss from buffer overflows. When sending data, if the receiving buffers are full, a 'stop' signal can be sent to stop the data flow. Once the buffers are empty, a 'start' signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals. |

| | | |
|---|---|---|
| VT-UTF8 Combo Key Support | Disabled<br>Enabled | Enables VT-UTF8 combination key support for ANSI/ VT100 terminals |
| Recorder Mode | Disabled<br>Enabled | With this mode enabled only text will be sent. This is to capture terminal data. |
| Resolution 100x31 | Disabled<br>Enabled | Enables or disables extended terminal resolution |
| Putty KeyPad | VT100<br>LINUX<br>XTERMR6<br>SCO<br>ESCN<br>VT400 | Selects FunctionKey and KeyPad on Putty. |

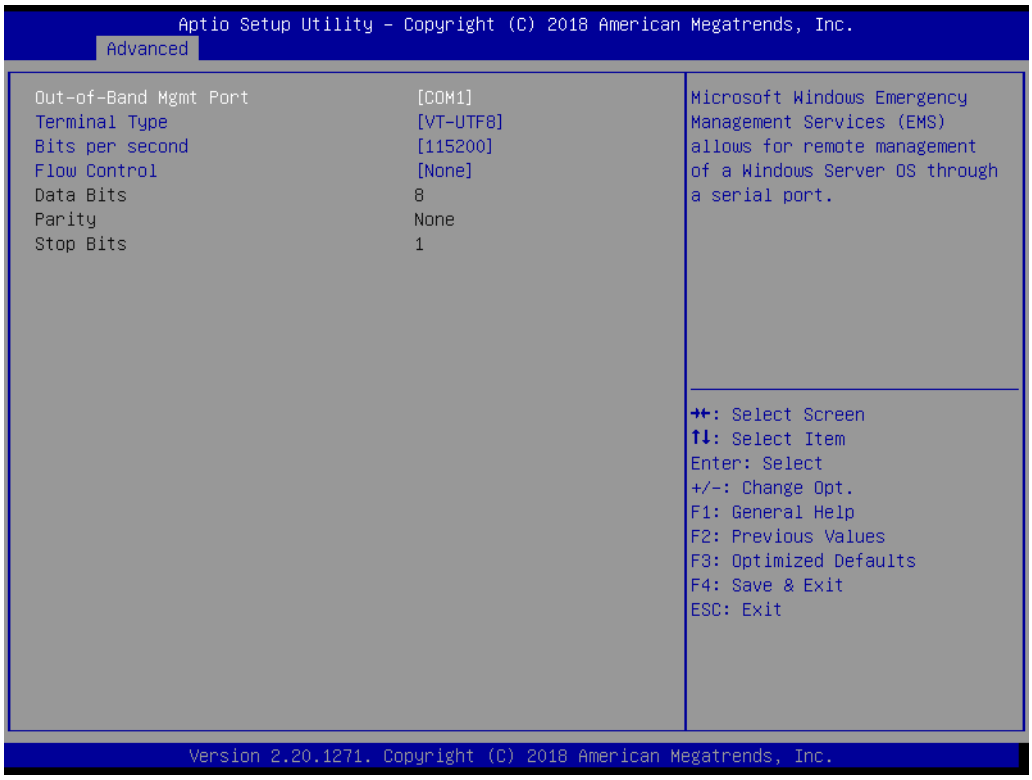
### 3.1.2.10 Console Redirection Settings (COM2)




| Feature | Options | Description |
|---|---|---|
| Terminal Type | VT100<br>VT100+<br>VT-UTF8<br>ANSI | Emulation: ANSI: Extended ASCII char set. VT100: ASCII char set. VT100+: Extends VT100 to support color, function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes. |
| Bits per second | 9600<br>19200<br>38400<br>57600<br>115200 | Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds. |
| Data Bits | 7<br>8 | Data Bits |
| Parity | None<br>Even<br>Odd<br>Mark<br>Space | A parity bit can be sent with the data bits to detect some transmission errors. Even: parity bit is 0 if the num of 1's in the data bits is even. Odd: parity bit is 0 if num of 1's in the data bits is odd. Mark: parity bit is always 1. Space: Parity bit is always 0. Mark and Space Parity do not allow for error detection. They can be used as an additional data bit. |
| Stop Bits | 1<br>2 | Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning). The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit. |
| Flow Control | None<br>Hardware RTS/CTS | Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a 'stop' signal can be sent to stop the data flow. Once the buffers are empty, a 'start' signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals. |

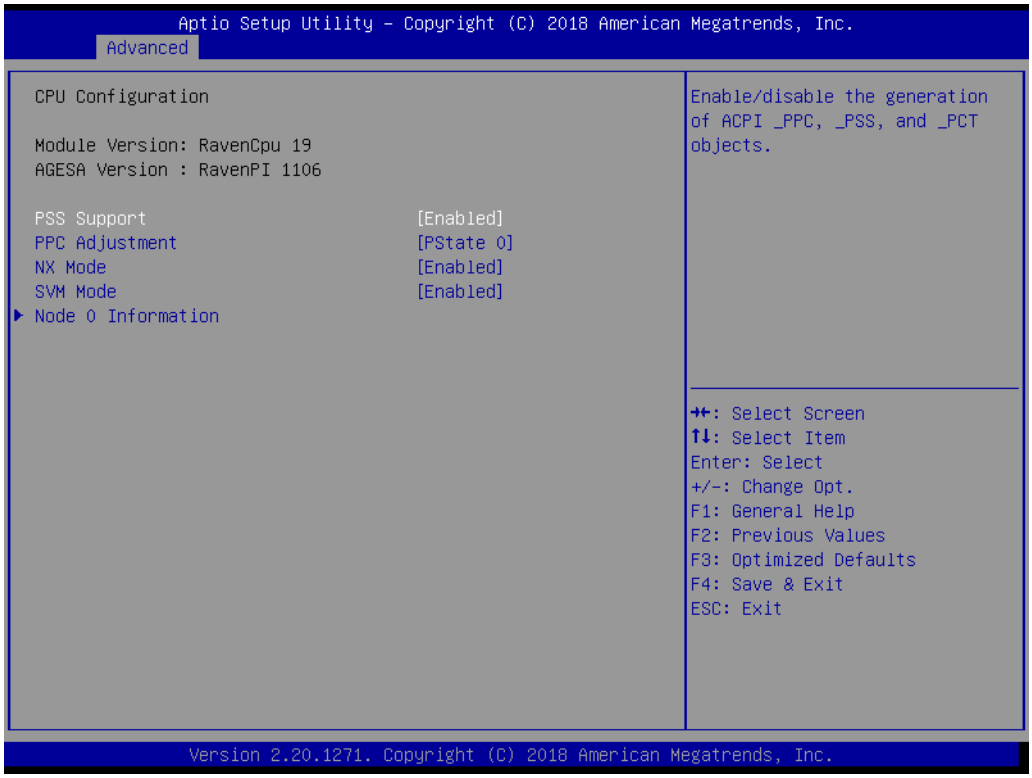
| | | |
|---|---|---|
| VT-UTF8 Combo Key Support | Disabled<br>Enabled | Enables VT-UTF8 combination key support for ANSI/ VT100 terminals |
| Recorder Mode | Disabled<br>Enabled | With this mode enabled only text will be sent. This is to capture terminal data. |
| Resolution 100x31 | Disabled<br>Enabled | Enables or disables extended terminal resolution |
| Putty KeyPad | VT100<br>LINUX<br>XTERMR6<br>SCO<br>ESCN<br>VT400 | Select FunctionKey and KeyPad on Putty. |

### 3.1.2.11 Console Redirection Settings



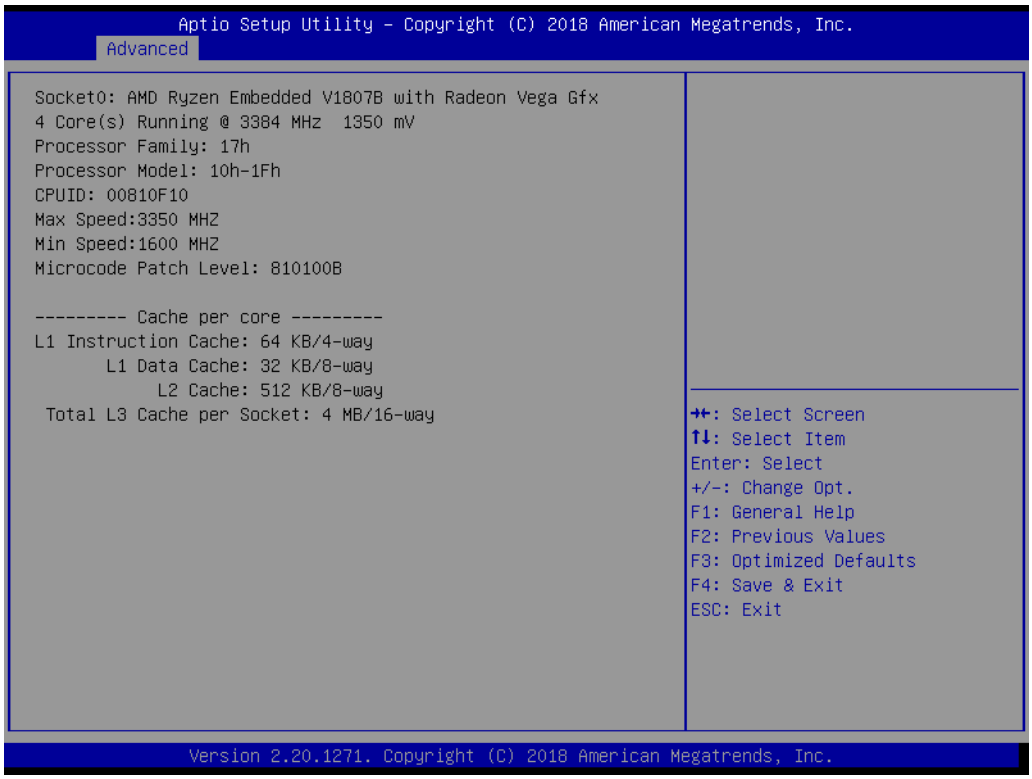

| Feature | Options | Description |
|---|---|---|
| Out-of-Band Mgmt Port | COM1<br>COM2 | Microsoft Windows Emergency Management Services (EMS) allows for remote management of a Windows Server OS through a serial port. |
| Terminal Type | VT100<br>VT100+<br>VT-UTF8<br>ANSI | VT-UTF8 is the preferred terminal type for out-of-band management. The next best choice is VT100+ and then VT100. See above, in Console Redirection Settings page, for more help with terminal type/emulation. |
| Bits per second | 9600<br>19200<br>57600<br>115200 | Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds. |
| Flow Control | None<br>Hardware RTS/CTS<br>Software Xon/Xoff | Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a 'stop' signal can be sent to stop the data flow. Once the buffers are empty, a 'start' signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals. |
| Data Bits | No option | Shows the current status |
| Parity | No option | Shows the current status |
| Stop Bits | No option | Shows the current status |

### 3.1.2.12 CPU Configuration



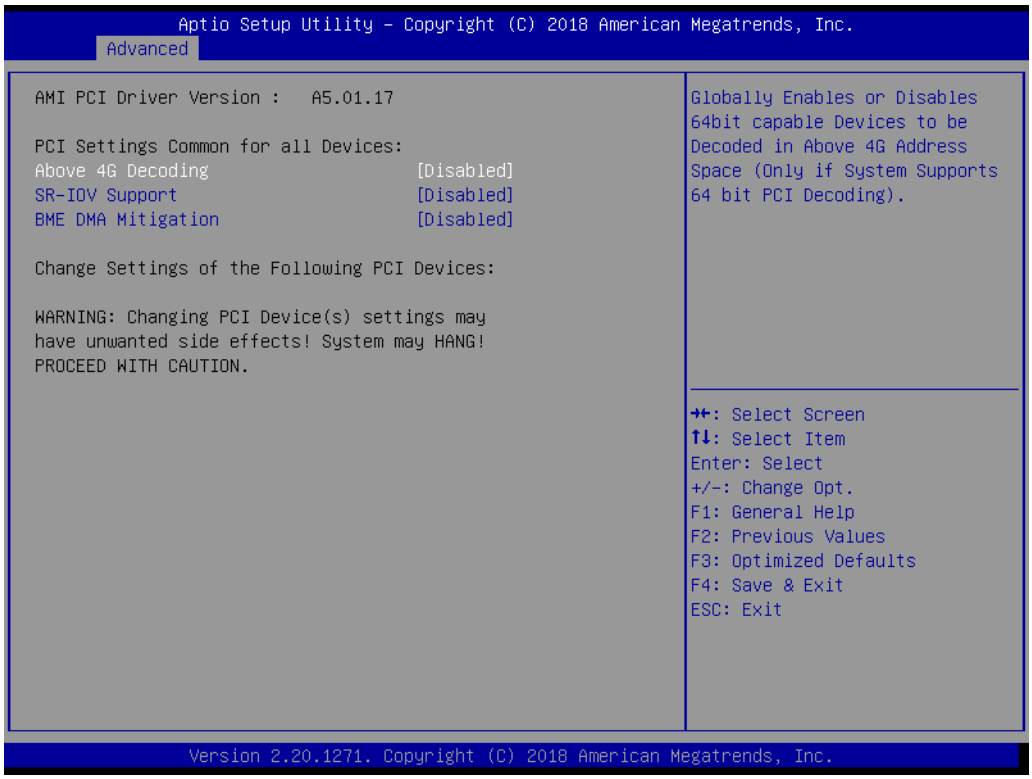

| Feature | Options | Description |
|---|---|---|
| PSS Support | Disabled<br>Enabled | Enable/disable the generation of ACPI _PPC, _PSS, and _PCT objects. |
| PPC Adjustment | PState 0<br>PState 1<br>PState 2 | Provide to adjust _PPC object. |
| NX Mode | Disabled<br>Enabled | Enable/disable No-execute page protection Function |
| SVM Mode | Disabled<br>Enabled | Enable/disable CPU Virtualization |
| Node 0 Information | <Sub Menu> | View memory information related to Node 0 |

### 3.1.2.13 Node 0 Information



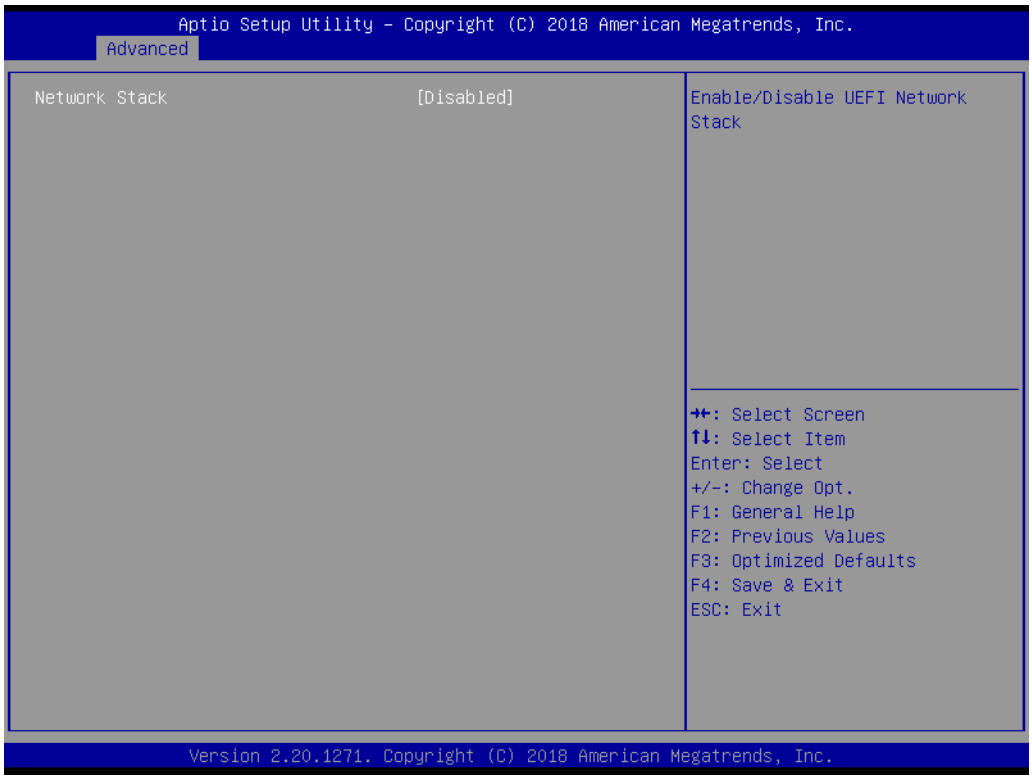

| Feature | Options | Description |
|---|---|---|
| Socket0 | No option | Shows the current status |
| Processor Family | No option | Shows the current status |
| Processor Model | No option | Shows the current status |
| CPUID | No option | Shows the current status |
| Max Speed | No option | Shows the current status |
| Min Speed | No option | Shows the current status |
| Microcode Patch Level | No option | Shows the current status |
| Catch per core | No option | Shows the current status |

### 3.1.2.14 PCI Subsystem Settings



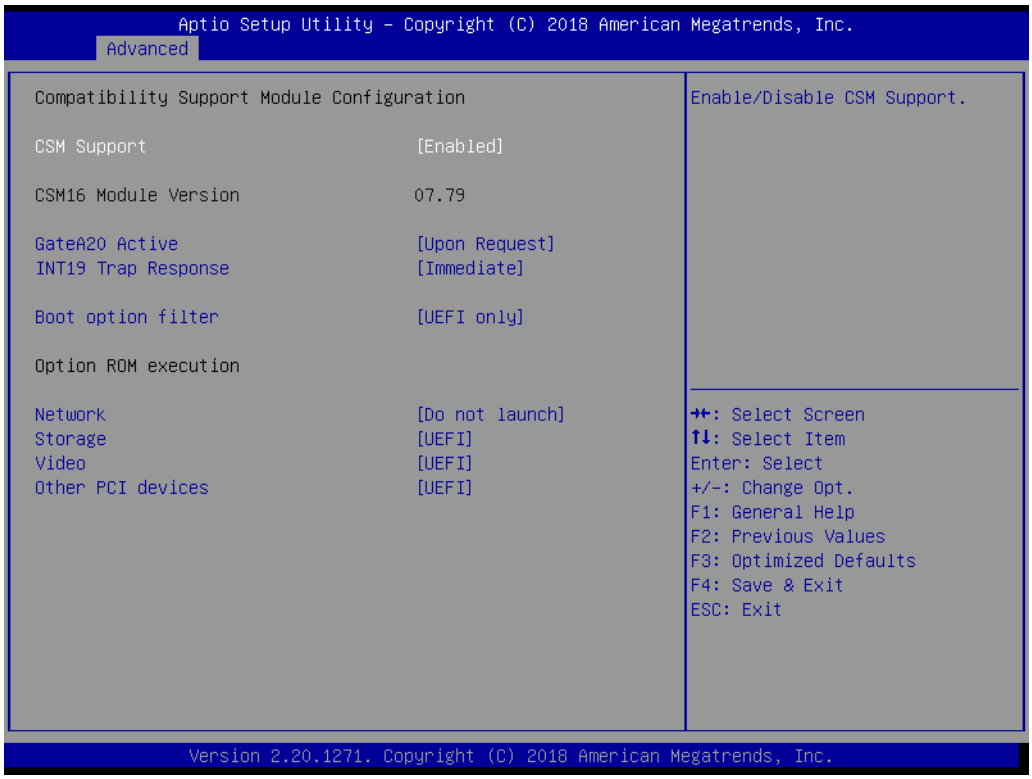

| Feature | Options | Description |
|---|---|---|
| Above 4G Decoding | Disabled<br>Enabled | Globally enables or disables 64-bit capable devices to be decoded in above 4G address space (only if the system supports 64-bit PCI decoding). |
| SR-IOV Support | Disabled<br>Enabled | If the system has SR-IOV capable PCIe devices, this option enables or disables Single Root IO Virtualization Support. |
| BME DMA Mitigation | Disabled<br>Enabled | Re-enable bus master attribute disabled during PCi enumeration for PCI bridges after SMM is locked. |

### 3.1.2.15 Network Stack Configuration




| Feature | Options | Description |
|---|---|---|
| Network Stack | Disabled<br>Enabled | Enables/disables UEFI Network Stack |

### 3.1.2.16 CSM Configuration



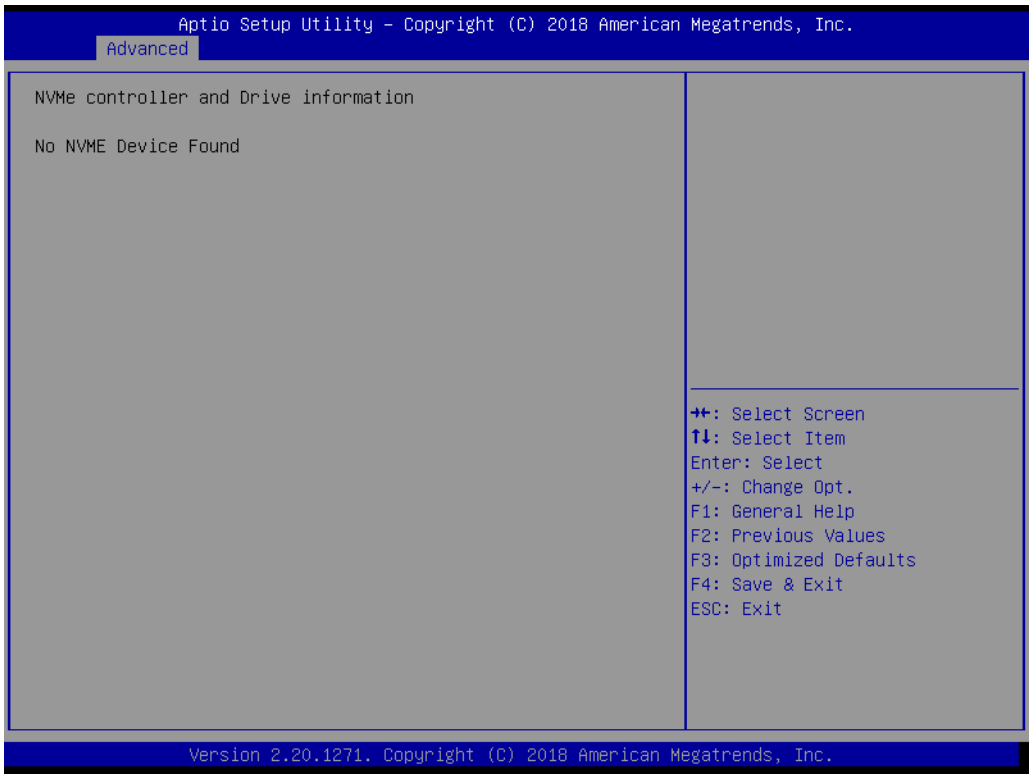

| Feature | Options | Description |
|---|---|---|
| CSM Support | Disabled<br>Enabled | Enable/disable CSM support. |
| Gate A20 Active | Upon Request<br>Always | UPON REQUEST - GA20 can be disabled using BIOS services. ALWAYS - do not allow disabling GA20; this option is useful when any RT code is executed above 1MB. |
| INT19 Trap Response | Immediate<br>Postponed | BIOS reaction on INT19 trapping by Option ROM: IMMEDIATE - execute the trap right away; POSTPONED - execute the trap during legacy boot. |
| Boot option filter | UEFI and Legacy<br>Legacy only<br>UEFI only | This option controls Legacy/UEFI ROMs priority |
| Network | Do not launch<br>UEFI<br>Legacy | Controls the execution of UEFI and Legacy PXE OpROM |
| Storage | Do not launch<br>UEFI<br>Legacy | Controls the execution of UEFI and Legacy Storage OpROM |
| Video | Do not launch<br>UEFI<br>Legacy | Controls the execution of UEFI and Legacy Video OpROM |
| Other PCI Devices | Do not launch<br>UEFI<br>Legacy | Determines OpROM execution policy for devices other than Network, Storage, or Video |

***Note!***

*CSM: The Compatibility Support Module (CSM) is a component of the UEFI firmware that provides legacy BIOS compatibility by emulating a BIOS environment, allowing legacy operating systems and some option ROMs that do not support UEFI to still be used.*

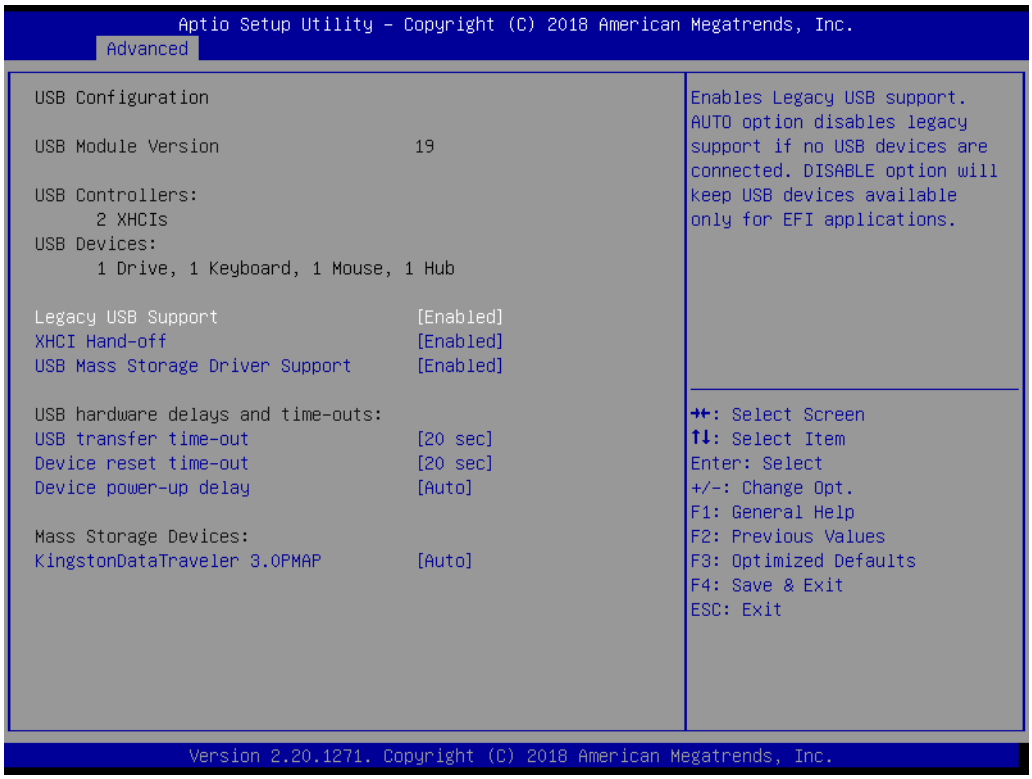
*CSM also provides required legacy System Management Mode (SMM) functionality, called CompatibilitySmm, as an addition to features provided by the UEFI SMM. This is optional and highly chipset- and platform-specific. An example of such a legacy SMM functionality is providing USB legacy support for keyboard and mouse, by emulating their classic PS/2counterparts.*

### 3.1.2.17 NVMe Configuration




| Feature | Options | Description |
|---|---|---|
| NVMe Device | No option | Shows the current status |

### 3.1.2.18 USB Configuration



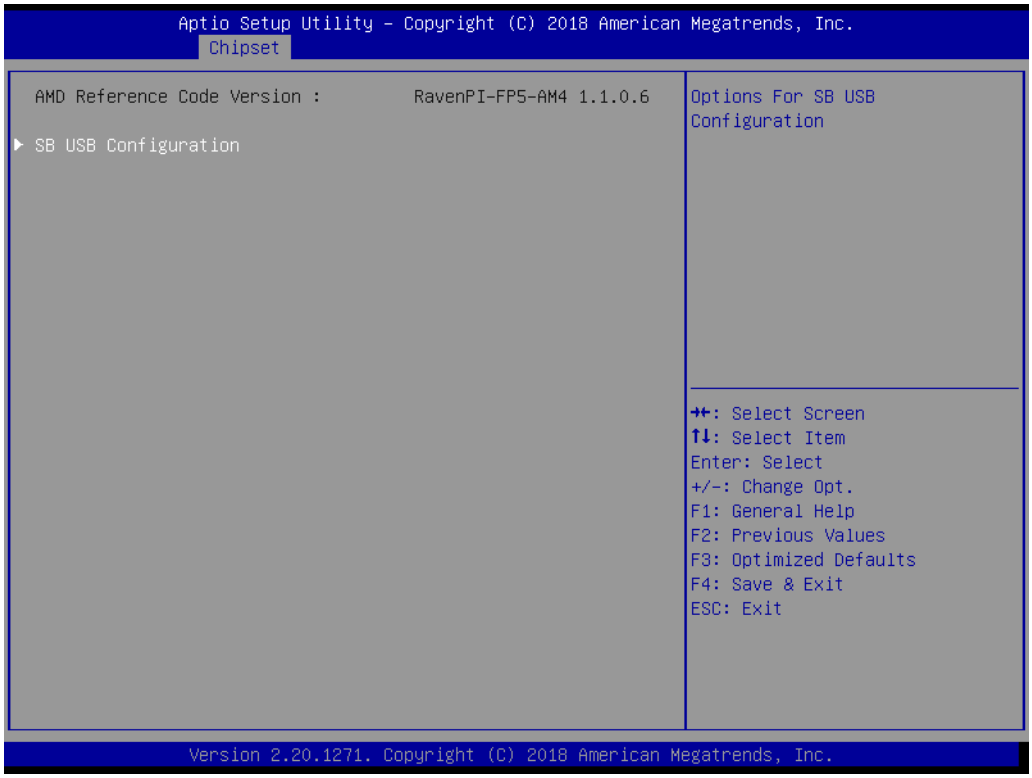

| Feature | Options | Description |
|---|---|---|
| Legacy USB Support | Enabled<br>Disabled<br>Auto | Enables legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications. |
| XHCI Hand-off | Enabled<br>Disabled | 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 | Enabled<br>Disabled | Enable/Disable USB mass storage driver support. |
| USB transfer time-out | 1 sec<br>5 sec<br>10 sec<br>20 sec | The time-out value for control, bulk, and interrupt transfers. |
| Device reset time-out | 10 sec<br>20 sec<br>30 sec<br>40 sec | USB mass storage device Start Unit command time-out. |
| Device power-up delay | Auto<br>Manual | 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. |

### 3.1.3 Chipset

Select the **Chipset** tab from the **SOM-5871** 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.

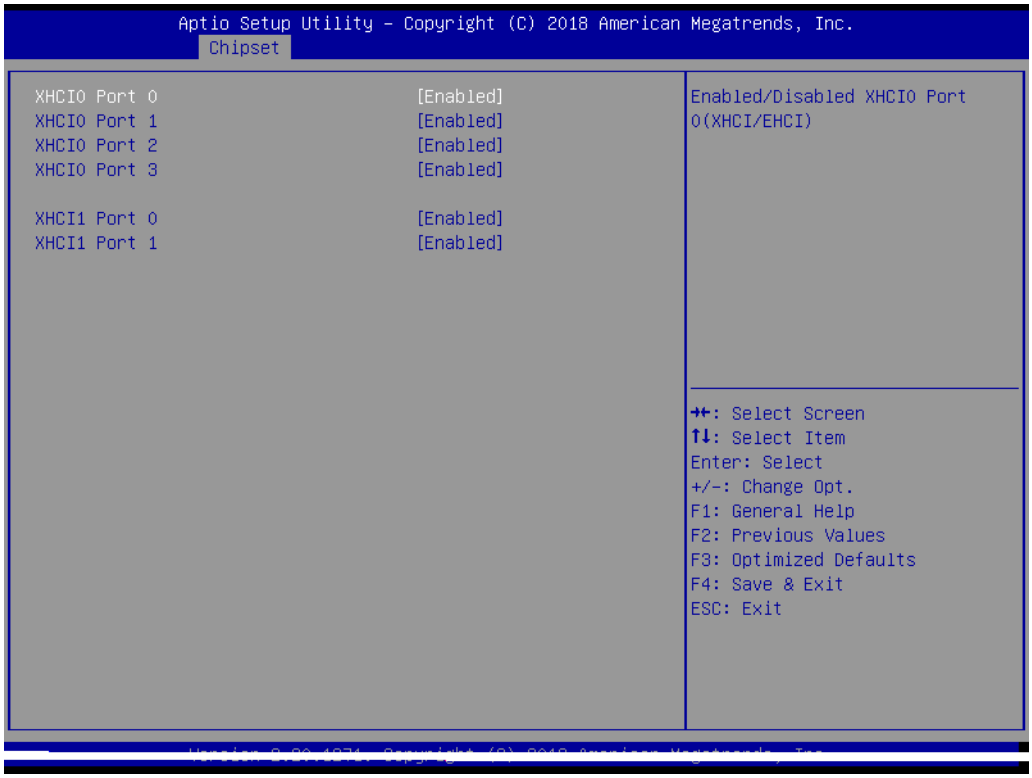

| Feature | Options | Description |
|---|---|---|
| South Bridge | <Sub Menu> | South bridge parameters |
| NXP3460 Configuration | <Sub Menu> | NXP3460 parameters |
| North Bridge | <Sub Menu> | North bridge parameters |
| BIOS Option Item | <Sub Menu> | Optional item for PCIe and display configuration setting |

### 3.1.3.1 South Bridge



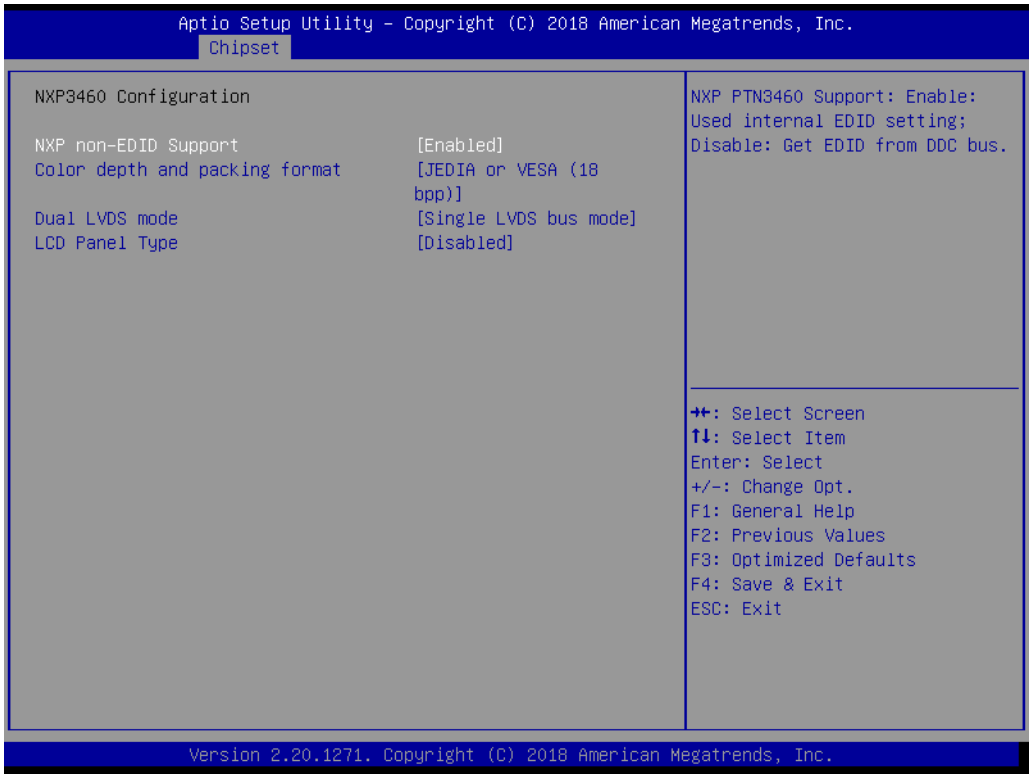

| Feature | Options | Description |
|---|---|---|
| SB USB Configuration | <Sub Menu> | Options For SB USB Configuration |

### 3.1.3.2 SB USB Configuration



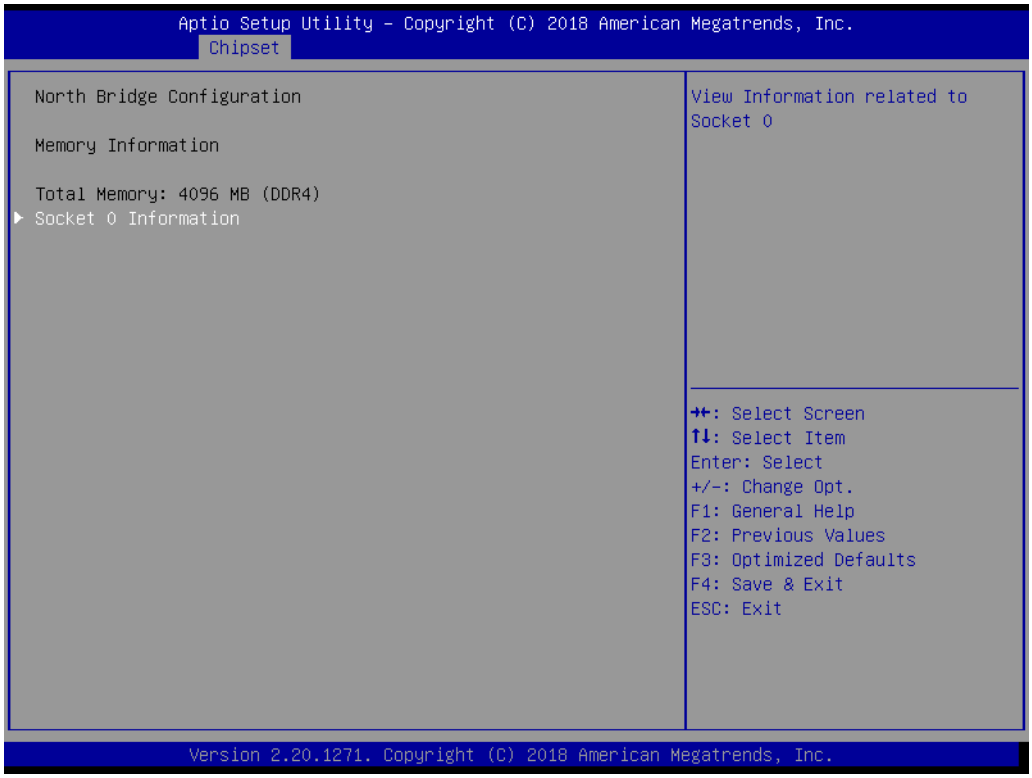

| Feature | Options | Description |
|---|---|---|
| XHCI0 Port 0 | Disabled<br>Enabled | Enabled/Disabled XHCI0 Port 0(XHCI/EHCI) |
| XHCI0 Port 1 | Disabled<br>Enabled | Enabled/Disabled XHCI0 Port 1(XHCI/EHCI) |
| XHCI0 Port 2 | Disabled<br>Enabled | Enabled/Disabled XHCI0 Port 2(XHCI/EHCI) |
| XHCI0 Port 3 | Disabled<br>Enabled | Enabled/Disabled XHCI0 Port 3(XHCI/EHCI) |
| XHCI1 Port 0 | Disabled<br>Enabled | Enabled/Disabled XHCI1 Port 0(XHCI/EHCI) |
| XHCI1 Port 1 | Disabled<br>Enabled | Enabled/Disabled XHCI1 Port 1(EHCI) |

### 3.1.3.3 NXP3460 Configuration



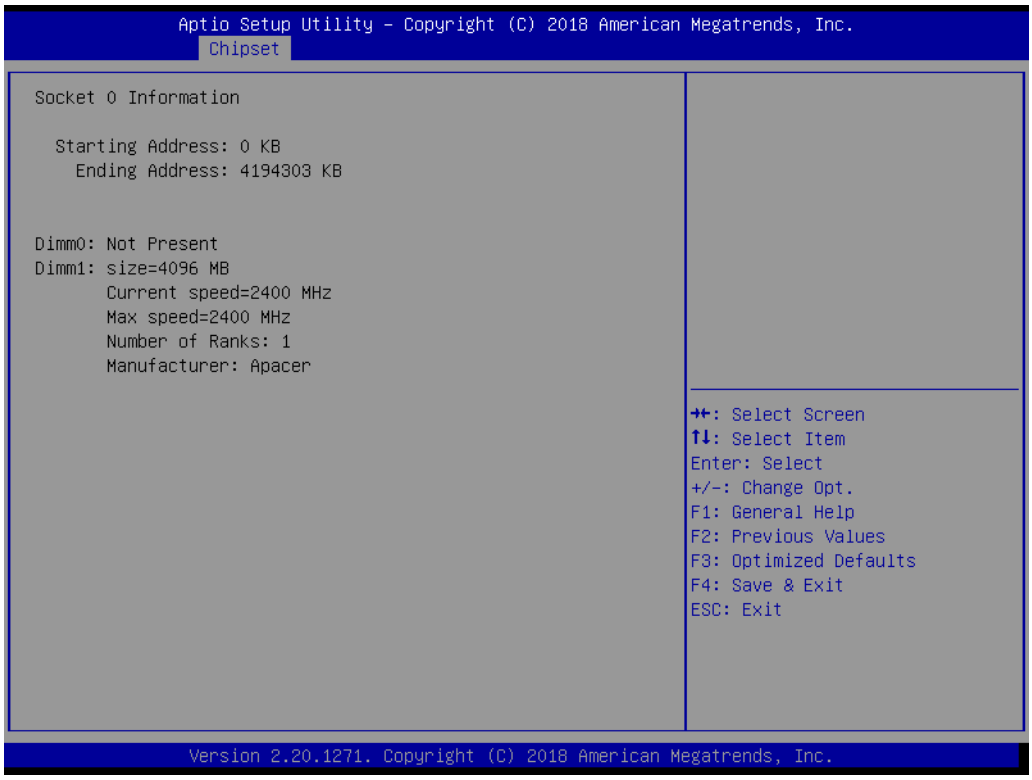

| Feature | Options | Description |
|---|---|---|
| NXP non-EDID Support | Enabled<br>Disabled | NXP PTN3460 Support:<br>Enable: Used internal EDID setting;<br>Disable: Get EDID from DDC bus. |
| Color depth and packing format | JEDIA or VESA (18 bpp)<br>VESA (24 bpp) | Color depth and packing format |
| Dual LVDS mode | Single LVDS bus mode<br>Dual LVDS bus mode | Dual LVDS mode |
| LCD Panel Type | 800x600<br>1024x768<br>1280x1024 48bit<br>1680x1050 48bit<br>1600x1200 48bit<br>1920x1080 48bit<br>Customize<br>Disabled | |

### 3.1.3.4 North Bridge Configuration



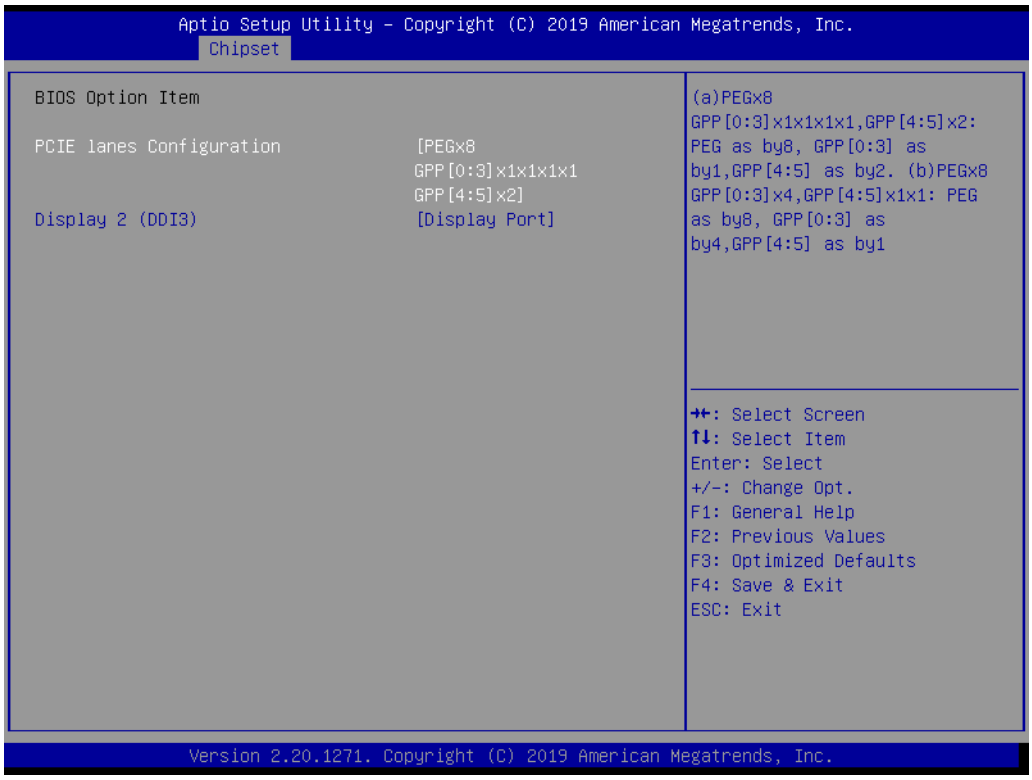

| Feature | Options | Description |
|---|---|---|
| Socket 0 Information | <Sub Menu> | View Information related to Socket 0 |

### 3.1.3.5 Socket 0 Information




| Feature | Options | Description |
|---|---|---|
| Starting Address | No option | Shows the current status |
| Ending Address | No option | Shows the current status |
| Dimm0 | No option | Shows the current status |
| Dimm1 | No option | Shows the current status |

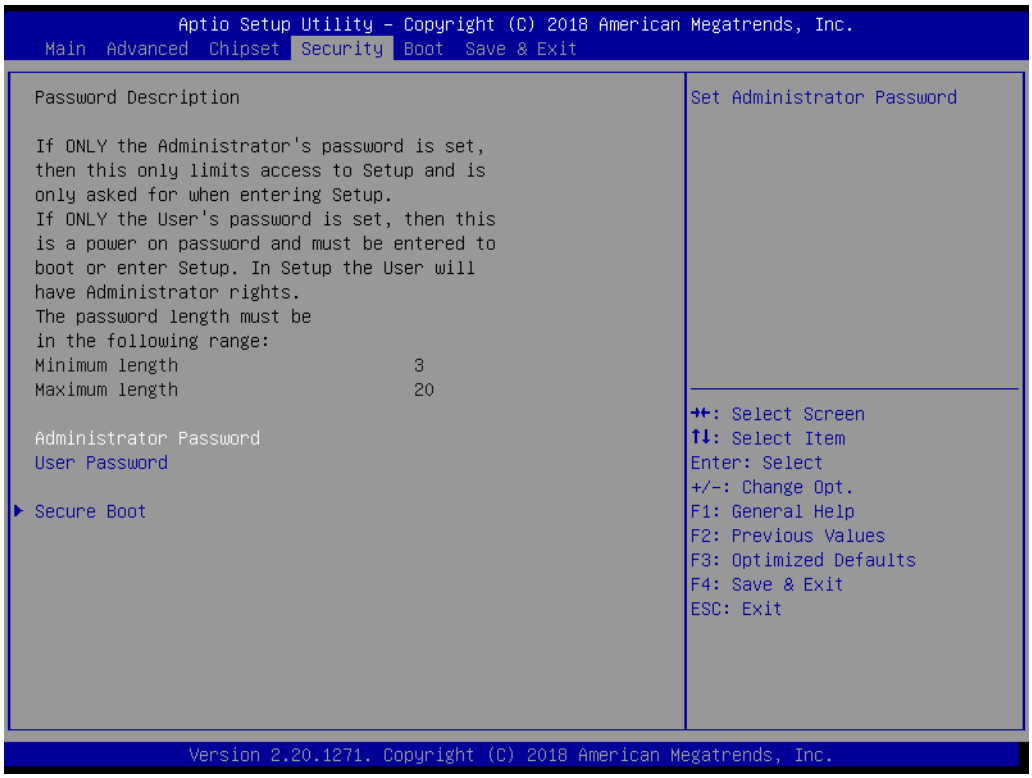
### 3.1.3.6 BIOS Option Item




| Feature | Options | Description |
|---|---|---|
| PCIE lanes Configuration | PEGx8 GPP[0:3]x1x1x1x1 GPP[4:5] x2<br>PEGx8 GPP[0:3]x4 GPP[4:5]x1x1 | (a)PEGx8 GPP[0:3]x1x1x1x1,GPP[4:5]x2: PEG as by8, GPP[0:3] as by1,GPP[4:5] as by2.<br>(b)PEGx8 GPP[0:3]x4,GPP[4:5]x1x1: PEG as by8, GPP[0:3] as by4,GPP[4:5] as by1 |
| Display 2 (DDI3) | Display Port<br>HDMI | Config Display Port 2 to Display Port or HDMI |

### 3.1.4 Security

Select **Security** tab from the **SOM-5871** main BIOS setup menu. All security setup options, such as password protection are described in this section. To access the sub menu for the following items, select the item and press <Enter>:




| Feature | Options | Description |
|---|---|---|
| Administrator Password | <Insert Password> | Set Administrator password |
| User Password | <Insert Password> | Set User password |
| Secure Boot | <Sub Menu> | Customizable secure boot settings |

**Change Administrator / User Password:** Select this option and press Enter to access the sub menu, and then type in the password.

The password length is minimum 3 digits and maximum 20 digits.

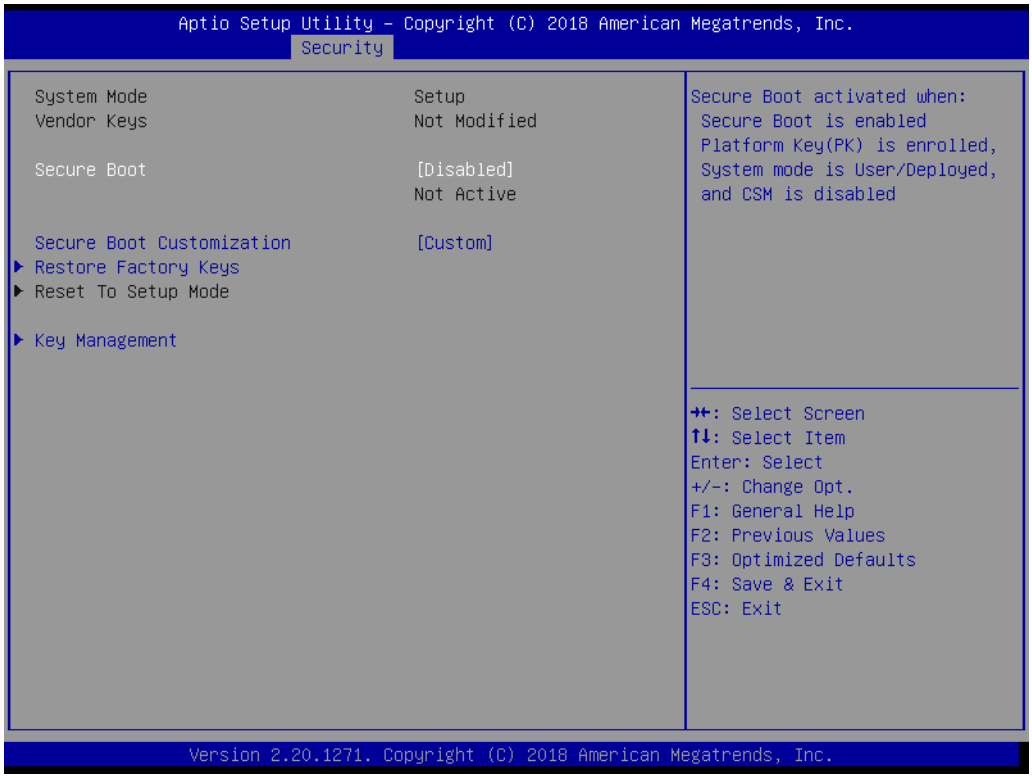
If you set "Administrator Password" only, it will require a password only when entering the BIOS setup.

If you set "User Password" only, it will require a password every boot-up. However, if the Administrator password is not set, using "User Password" to enter the BIOS setup will permit all access privileges.

If you set both passwords, it will require a password every boot-up. To boot into the OS, you can use either password. To enter BIOS setup, "Administrator Password" gives all privileges to access all items, while "User Password" only gives partial privileges.

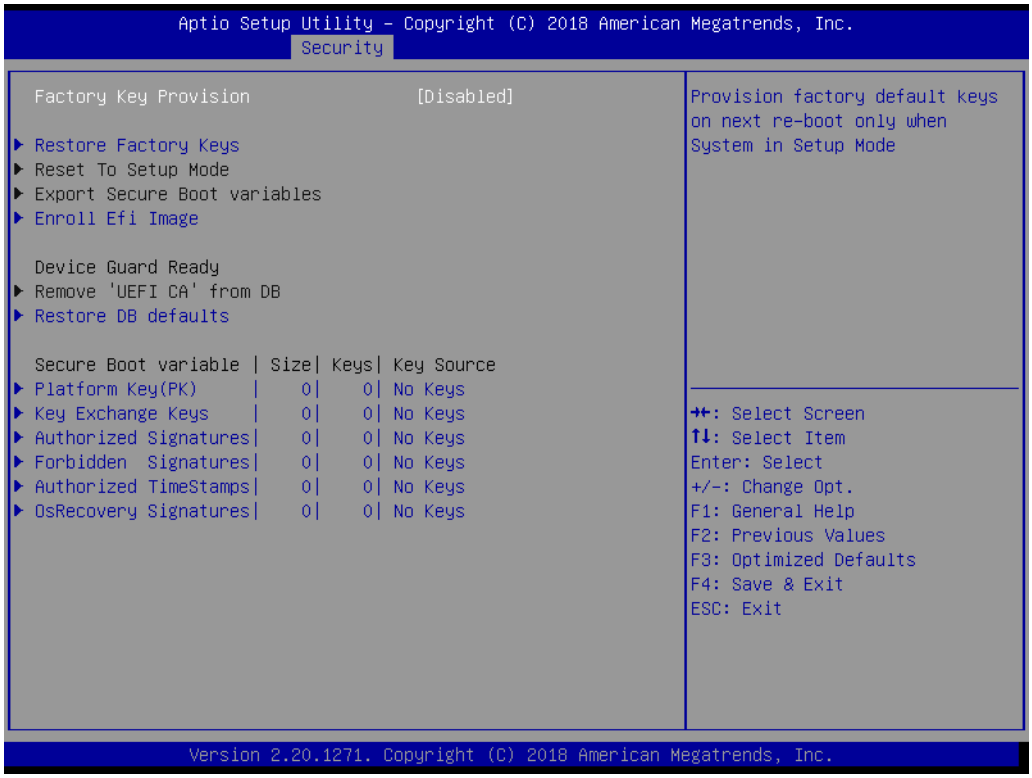
***Note!*** *Please keep your password safe. For security reasons, the BIOS password can't be reset by clearing CMOS. If you forget your password, please contact Advantech for technical support.*

#### 3.1.4.1 Secure Boot




| Feature | Options | Description |
|---|---|---|
| Secure Boot | Disabled<br>Enabled | Secure Boot active when: Secure Boot is enabled Platform Key (PK) is enrolled System mode is User/Deployed, and CSM is disabled |
| Secure Boot Customization | Standard<br>Custom | Customizable Secure Boot mode: in Custom mode Secure Boot Policy variables can be configured by a physically present user without full authentication |
| Restore Factory Keys | Press Yes or No | Force System to User Mode. Configure NVRAM to contain OEM-defined factory default Secure Boot Keys |
| Reset to Setup Mode | <Sub Menu> | |
| Key Management | <Sub Menu> | Enables expert users to modify Secure Boot Policy variables without full authentication |

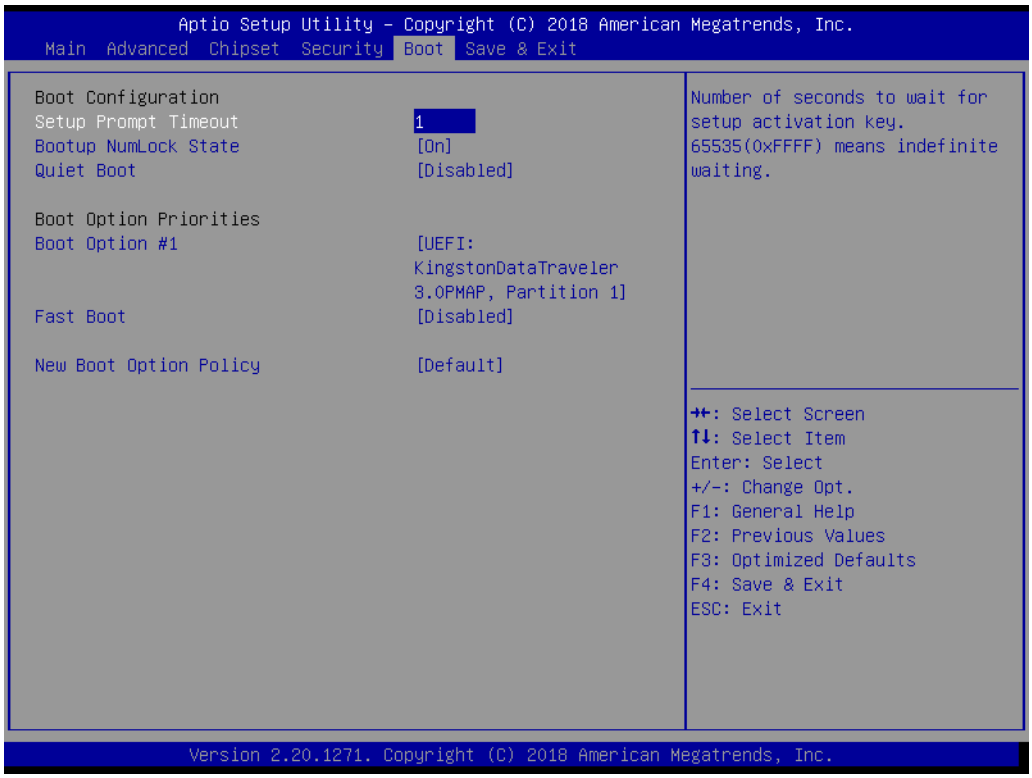
### 3.1.4.2 Key Management




| Feature | Options | Description |
|---|---|---|
| Factory Key Provision | Disabled<br>Enabled | Provision factory default keys on next re-boot only when system in Setup Mode |
| Restore Factory Keys | Press Yes or No | Force system to User Mode. Configure NVRAM to contain OEM-defined factory default secure boot keys |
| Enroll Efi Image | Check Valid File System Available or not | Allow the image to run in Secure Boot mode. Enroll SHA256 Hash certificate of a PE image into Authorized Signature Database (db) |
| Restore DB defaults | Press Yes or No | Restore DB variable to factory defaults |
| Platform Key(PK) | Update<br>Append | Enroll factory defaults or load certificates from a file:<br>1. Public Key Certificate in: a)EFI_SIGNATURE_LIST, b) EFI_CERT_X509(DER ), c) EFI_CERT_RSA2048 (bin), d) EFI_CERT_SHA256, 384, 512<br>2. Authenticated UEFI Variable<br>3. EFI PE/COFF Image (SHA256)<br>Key Source: Factory, External, Mixed |

| | | |
|---|---|---|
| Key Exchange Keys | Update<br>Append | Enroll Factory Defaults or load certificates from a file:<br>1. Public Key Certificate in: a)EFI_SIGNATURE_LIST, b) EFI_CERT_X509(DER ), c) EFI_CERT_RSA2048 (bin), d) EFI_CERT_SHA256, 384, 512<br>2. Authenticated UEFI Variable<br>3. EFI PE/COFF Image (SHA256)<br>Key Source: Factory, External, Mixed |
| Authorized Signatures | Update<br>Append | Enroll Factory Defaults or load certificates from a file:<br>1. Public Key Certificate in: a)EFI_SIGNATURE_LIST, b) EFI_CERT_X509(DER ), c) EFI_CERT_RSA2048 (bin), d) EFI_CERT_SHA256, 384, 512<br>2. Authenticated UEFI Variable<br>3. EFI PE/COFF Image (SHA256)<br>Key Source: Factory, External, Mixed |
| Forbidden Signatures | Update<br>Append | Enroll Factory Defaults or load certificates from a file:<br>1. Public Key Certificate in: a)EFI_SIGNATURE_LIST, b) EFI_CERT_X509(DER), c) EFI_CERT_RSA2048 (bin), d) EFI_CERT_SHA256, 384, 512<br>2. Authenticated UEFI Variable<br>3. EFI PE/COFF Image (SHA256)<br>Key Source: Factory, External, Mixed |
| Authorized TimeStamps | Update<br>Append | Enroll Factory Defaults or load certificates from a file:<br>1. Public Key Certificate in: a)EFI_SIGNATURE_LIST, b) EFI_CERT_X509(DER ), c) EFI_CERT_RSA2048 (bin), d) EFI_CERT_SHA256, 384, 512<br>2. Authenticated UEFI Variable<br>3. EFI PE/COFF Image (SHA256)<br>Key Source: Factory, External, Mixed |
| OsRecovery Signatures | Update<br>Append | Enroll Factory Defaults or load certificates from a file:<br>1. Public Key Certificate in: a)EFI_SIGNATURE_LIST, b) EFI_CERT_X509(DER ), c) EFI_CERT_RSA2048 (bin), d) EFI_CERT_SHA256, 384, 512<br>2. Authenticated UEFI Variable<br>3. EFI PE/COFF Image (SHA256)<br>Key Source: Factory, External, Mixed |

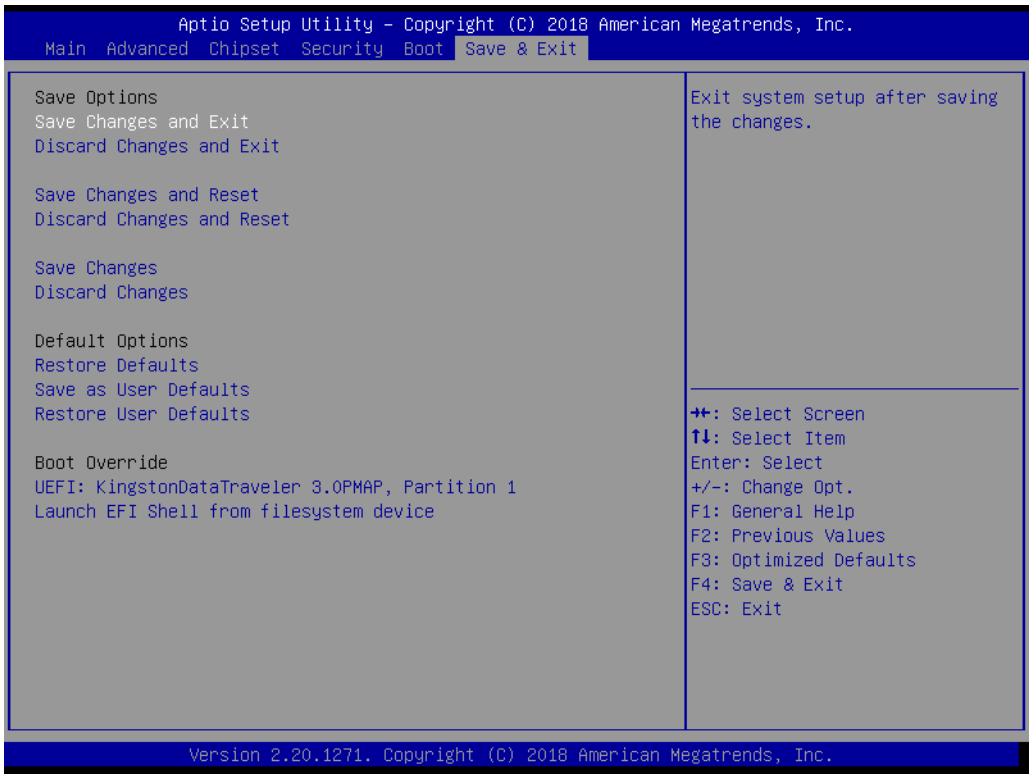
### 3.1.5 Boot Settings




| Feature | Options | Description |
|---|---|---|
| Setup Prompt Timeout | <insert number> | Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting. |
| Bootup NumLock State | On<br>Off | Select the keyboard NumLock state |
| Quiet Boot | Disabled<br>Enabled | Enables or disables Quiet Boot option |
| Fast Boot | Disabled<br>Enabled | 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. |
| New Boot Option Policy | Default<br>Place First<br>Place Last | Controls the placement of newly detected UEFI boot options |

***Note!*** *These items will be hidden when "Fast Boot" is disabled.*

### 3.1.6 Save & Exit




| Feature | Options | Description |
|---|---|---|
| Save Changes and Exit | Yes<br>No | Exit system setup after saving the changes. |
| Discard Changes and Exit | Yes<br>No | Exit system setup without saving any changes. |
| Save Changes and Reset | Yes<br>No | Reset the system after saving the changes. |
| Discard Changes and Reset | Yes<br>No | Reset system setup without saving any changes. |
| Save Changes | Yes<br>No | Save Changes done so far to any of the setup options. |
| Discard Changes | Yes<br>No | Discard changes done so far to any of the setup options. |
| Restore Defaults | Yes<br>No | Restore/Load Default values for all the setup options. |
| Save as User Defaults | Yes<br>No | Save the changes done so far as User Defaults. |
| Restore User Defaults | Yes<br>No | Restore the User Defaults to all the setup options. |
| Launch EFI Shell from file system device | Yes<br>No | Attempts to Launch EFI Shell application (Shell.efi) from one of the available file system devices |

# Chapter 4

## S/W Introduction & Installation

- S/W Introduction
- Driver Installation
- Advantech iManager

## 4.1 S/W Introduction

The mission of Advantech Embedded Software Services is to "Enhance quality of life with Advantech platforms and Microsoft Windows embedded technology." We enable Windows Embedded software products on Advantech platforms to more effectively support the embedded computing community. Customers are freed from the hassle of dealing with multiple vendors (Hardware suppliers, System integrators, Embedded OS distributor) for projects. Our goal is to make Windows Embedded Software solutions easily and widely available to the embedded computing community.

## 4.2 Driver Installation

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.

### 4.2.1 Windows Driver Setup

To install the drivers on a windows-based operation system, please connect to internet and browse the website http://support.advantech.com.tw and download the drivers that you want to install and follow Driver Setup instructions to complete the installation.

### 4.2.2 Other OS

SOM-5871 supports Linux:

Ubuntu-16.04.1-desktop-AMD 64bit

## 4.3 Advantech iManager

Advantech's platforms come equipped with iManager, a micro controller that provides embedded features for system integrators. Embedded features have been moved from the OS/BIOS level to the board level, to increase reliability and simplify integration.

iManager runs whether the operating system is running or not; it can count the boot times and running hours of the device, monitor device health, and provide an advanced watchdog to handle errors just as they happen. iManager also comes with a secure & encrypted EEPROM for storing important security key or other customer define information. All the embedded functions are configured through API and provide corresponding utilities to demonstrate. These APIs comply with PICMG EAPI (Embedded Application Programmable Interface) specification and unify in the same structures. It makes these embedded features easier to integrate, speed up development schedule, and provide the customer's software continuity while upgrade hardware. More details of how to use the APIs and utilities, please refer to Advantech iManager 2.0 Software API User Manual.

### Control

**GPIO**

General Purpose Input/Output is a flexible parallel interface that allows a variety of custom connections. It allows users to monitor the level of signal input or set the output status to switch on/off a device. Our API also provides Programmable GPIO, which allows developers to dynamically set the GPIO input or output status.

**SMBus**

SMBus is the System Management Bus defined by Intel® Corporation in 1995. It is used in personal computers and servers for low-speed system management communications. The SMBus API allows a developer to interface a embedded system environment and transfer serial messages using the SMBus protocols, allowing multiple simultaneous device control.

**I²C**

I²C is a bi-directional two wire bus that was developed by Philips for use in their televisions in the 1980s.
The I²C API allows a developer to interface with an embedded system environment and transfer serial messages using the I²C protocols, allowing multiple simultaneous device control.

### Display

**Brightness Control**

The Brightness Control API allows a developer to interface with an embedded device to easily control brightness.

**Backlight**

The Backlight API allows a developer to control the backlight (screen) on/off in an embedded device.

### Monitor

**Watchdog**

A watchdog timer (WDT) is a device that performs a specific operation after a certain period of time if something goes wrong and the system does not recover on its own.
A watchdog timer can be programmed to perform a warm boot (restarting the system) after a certain 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.

**Hardware Control**

The Hardware Control API allows developers to set the PWM (Pulse Width Modulation) value to adjust fan speed or other devices; it can also be used to adjust the LCD brightness.

### Power Saving

**CPU Speed**

Make use of Intel SpeedStep technology to reduce power power consumption. The system will automatically adjust the CPU Speed depending on system loading.

**System Throttling**

Refers to a series of methods for reducing power consumption in computers by lowering the clock frequency. These APIs allow the user to lower the clock from 87.5% to 12.5%.

# Appendix A

## Pin Assignment

This appendix gives you the information about the hardware pin assignment of the SOM-5871 CPU System on Module

Sections include:

- SOM-5871 Type 6 Pin Assignment

# A.1 SOM-5871 Type 6 Pin Assignment

This section gives SOM-5871 pin assignment on COM Express connector which compliant with COMR.0 R3.0 Type 6 pin-out definitions. More details about how to use these pins and get design reference. Please contact to Advantech for design guide, checklist, reference schematic, and other hardware/software supports.

| SOM-5871 Row A,B | | | |
|---|---|---|---|
| A1 | GND (FIXED) | B1 | GND (FIXED) |
| A2 | GBE0_MDI3- | B2 | GBE0_ACT# |
| A3 | GBE0_MDI3+ | B3 | LPC_FRAME# |
| A4 | GBE0_LINK100# | B4 | LPC_AD0 |
| A5 | GBE0_LINK1000# | B5 | LPC_AD1 |
| A6 | GBE0_MDI2- | B6 | LPC_AD2 |
| A7 | GBE0_MDI2+ | B7 | LPC_AD3 |
| A8 | GBE0_LINK# | B8 | N/A |
| A9 | GBE0_MDI1- | B9 | N/A |
| A10 | GBE0_MDI1+ | B10 | LPC_CLK |
| A11 | GND (FIXED) | B11 | GND (FIXED) |
| A12 | GBE0_MDI0- | B12 | PWRBTN# |
| A13 | GBE0_MDI0+ | B13 | SMB_CK |
| A14 | N/A | B14 | SMB_DAT |
| A15 | SUS_S3# | B15 | SMB_ALERT# |
| A16 | SATA0_TX+ | B16 | SATA1_TX+ |
| A17 | SATA0_TX- | B17 | SATA1_TX- |
| A18 | SUS_S5# | B18 | SUS_STAT# |
| A19 | SATA0_RX+ | B19 | SATA1_RX+ |
| A20 | SATA0_RX- | B20 | SATA1_RX- |
| A21 | GND (FIXED) | B21 | GND (FIXED) |
| A22 | N/A | B22 | N/A |
| A23 | N/A | B23 | N/A |
| A24 | SUS_S5# | B24 | PWR_OK |
| A25 | N/A | B25 | N/A |
| A26 | N/A | B26 | N/A |
| A27 | BATLOW# | B27 | WDT |
| A28 | (S)ATA_ACT# | B28 | HDA_SDIN2 |
| A29 | HDA_SYNC | B29 | HDA_SDIN1 |
| A30 | HDA_RST# | B30 | HDA_SDIN0 |
| A31 | GND (FIXED) | B31 | GND (FIXED) |
| A32 | HDA_BITCLK | B32 | SPKR |
| A33 | HDA_SDOUT | B33 | I2C_CK |
| A34 | BIOS_DIS0# | B34 | I2C_DAT |
| A35 | THRMTRIP# | B35 | THRM# |
| A36 | USB6- | B36 | USB7- |
| A37 | USB6+ | B37 | USB7+ |
| A38 | USB_6_7_OC# | B38 | USB_4_5_OC# |
| A39 | USB4- | B39 | USB5- |
| A40 | USB4+ | B40 | USB5+ |

| | | | |
|---|---|---|---|
| A41 | GND (FIXED) | B41 | GND (FIXED) |
| A42 | USB2- | B42 | USB3- |
| A43 | USB2+ | B43 | USB3+ |
| A44 | USB_2_3_OC# | B44 | USB_0_1_OC# |
| A45 | USB0- | B45 | USB1- |
| A46 | USB0+ | B46 | USB1+ |
| A47 | VCC_RTC | B47 | N/A |
| A48 | RSVD | B48 | N/A |
| A49 | GBE0_SDP | B49 | SYS_RESET# |
| A50 | LPC_SERIRQ | B50 | CB_RESET# |
| A51 | GND (FIXED) | B51 | GND (FIXED) |
| A52 | N/A | B52 | N/A |
| A53 | N/A | B53 | N/A |
| A54 | GPI0 | B54 | GPO1 |
| A55 | PCIE_TX4+ | B55 | PCIE_RX4+ |
| A56 | PCIE_TX4- | B56 | PCIE_RX4- |
| A57 | GND | B57 | GPO2 |
| A58 | PCIE_TX3+ | B58 | PCIE_RX3+ |
| A59 | PCIE_TX3- | B59 | PCIE_RX3- |
| A60 | GND (FIXED) | B60 | GND (FIXED) |
| A61 | PCIE_TX2+ | B61 | PCIE_RX2+ |
| A62 | PCIE_TX2- | B62 | PCIE_RX2- |
| A63 | GPI1 | B63 | GPO3 |
| A64 | PCIE_TX1+ | B64 | PCIE_RX1+ |
| A65 | PCIE_TX1- | B65 | PCIE_RX1- |
| A66 | GND | B66 | WAKE0# |
| A67 | GPI2 | B67 | WAKE1# |
| A68 | PCIE_TX0+ | B68 | PCIE_RX0+ |
| A69 | PCIE_TX0- | B69 | PCIE_RX0- |
| A70 | GND (FIXED) | B70 | GND (FIXED) |
| A71 | LVDS_A0+ | B71 | LVDS_B0+ |
| A72 | LVDS_A0- | B72 | LVDS_B0- |
| A73 | LVDS_A1+ | B73 | LVDS_B1+ |
| A74 | LVDS_A1- | B74 | LVDS_B1- |
| A75 | LVDS_A2+ | B75 | LVDS_B2+ |
| A76 | LVDS_A2- | B76 | LVDS_B2- |
| A77 | LVDS_VDD_EN | B77 | LVDS_B3+ |
| A78 | LVDS_A3+ | B78 | LVDS_B3- |
| A79 | LVDS_A3- | B79 | LVDS_BKLT_EN |
| A80 | GND (FIXED) | B80 | GND (FIXED) |
| A81 | LVDS_A_CK+ | B81 | LVDS_B_CK+ |
| A82 | LVDS_A_CK- | B82 | LVDS_B_CK- |
| A83 | LVDS_I2C_CK | B83 | LVDS_BKLT_CTRL |
| A84 | LVDS_I2C_DAT | B84 | VCC_5V_SBY |
| A85 | GPI3 | B85 | VCC_5V_SBY |
| A86 | RSVD | B86 | VCC_5V_SBY |
| A87 | N/A | B87 | VCC_5V_SBY |
| A88 | PCIE_CLK_REF+ | B88 | BIOS_DIS1# |

| | | | |
|---|---|---|---|
| A89 | PCIE_CLK_REF- | B89 | VGA_RED |
| A90 | GND (FIXED) | B90 | GND (FIXED) |
| A91 | SPI_POWER | B91 | VGA_GRN |
| A92 | SPI_MISO | B92 | VGA_BLU |
| A93 | GPO0 | B93 | VGA_HSYNC |
| A94 | SPI_CLK | B94 | VGA_VSYNC |
| A95 | SPI_MOSI | B95 | VGA_I2C_CK |
| A96 | TPM_PP | B96 | VGA_I2C_DAT |
| A97 | N/A | B97 | SPI_CS# |
| A98 | SER0_TX | B98 | RSVD |
| A99 | SER0_RX | B99 | RSVD |
| A100 | GND (FIXED) | B100 | GND (FIXED) |
| A101 | SER1_TX | B101 | FAN_PWMOUT |
| A102 | SER1_RX | B102 | FAN_TACHIN |
| A103 | LID# | B103 | SLEEP# |
| A104 | VCC_12V | B104 | VCC_12V |
| A105 | VCC_12V | B105 | VCC_12V |
| A106 | VCC_12V | B106 | VCC_12V |
| A107 | VCC_12V | B107 | VCC_12V |
| A108 | VCC_12V | B108 | VCC_12V |
| A109 | VCC_12V | B109 | VCC_12V |
| A110 | GND (FIXED) | B110 | GND (FIXED) |

| **SOM-5871 Row C,D** | | | |
|---|---|---|---|
| C1 | GND (FIXED) | D1 | GND (FIXED) |
| C2 | GND | D2 | GND |
| C3 | USB_SSRX0- | D3 | USB_SSTX0- |
| C4 | USB_SSRX0+ | D4 | USB_SSTX0+ |
| C5 | GND | D5 | GND |
| C6 | USB_SSRX1- | D6 | USB_SSTX1- |
| C7 | USB_SSRX1+ | D7 | USB_SSTX1+ |
| C8 | GND | D8 | GND |
| C9 | USB_SSRX2- | D9 | USB_SSTX2- |
| C10 | USB_SSRX2+ | D10 | USB_SSTX2+ |
| C11 | GND (FIXED) | D11 | GND (FIXED) |
| C12 | N/A | D12 | N/A |
| C13 | N/A | D13 | N/A |
| C14 | GND | D14 | GND |
| C15 | N/A | D15 | DDI1_CTRLCLK_AUX+ |
| C16 | N/A | D16 | DDI1_CTRLDATA_AUX- |
| C17 | RSVD | D17 | RSVD |
| C18 | RSVD | D18 | RSVD |
| C19 | PCIE_RX6+ | D19 | PCIE_TX6+ |
| C20 | PCIE_RX6- | D20 | PCIE_TX6- |
| C21 | GND (FIXED) | D21 | GND (FIXED) |
| C22 | N/A | D22 | N/A |
| C23 | N/A | D23 | N/A |
| C24 | DDI1_HPD | D24 | RSVD |

| | | | |
|---|---|---|---|
| C25 | N/A | D25 | RSVD |
| C26 | N/A | D26 | DDI1_PAIR0+ |
| C27 | RSVD | D27 | DDI1_PAIR0- |
| C28 | RSVD | D28 | RSVD |
| C29 | N/A | D29 | DDI1_PAIR1+ |
| C30 | N/A | D30 | DDI1_PAIR1- |
| C31 | GND (FIXED) | D31 | GND (FIXED) |
| C32 | DDI2_CTRLCLK_AUX+ | D32 | DDI1_PAIR2+ |
| C33 | DDI2_CTRLDATA_AUX- | D33 | DDI1_PAIR2- |
| C34 | DDI2_DDC_AUX_SEL | D34 | DDI1_DDC_AUX_SEL |
| C35 | RSVD | D35 | RSVD |
| C36 | N/A | D36 | DDI1_PAIR3+ |
| C37 | N/A | D37 | DDI1_PAIR3- |
| C38 | N/A | D38 | RSVD |
| C39 | N/A | D39 | DDI2_PAIR0+ |
| C40 | N/A | D40 | DDI2_PAIR0- |
| C41 | GND (FIXED) | D41 | GND (FIXED) |
| C42 | N/A | D42 | DDI2_PAIR1+ |
| C43 | N/A | D43 | DDI2_PAIR1- |
| C44 | N/A | D44 | DDI2_HPD |
| C45 | RSVD | D45 | RSVD |
| C46 | N/A | D46 | DDI2_PAIR2+ |
| C47 | N/A | D47 | DDI2_PAIR2- |
| C48 | RSVD | D48 | RSVD |
| C49 | N/A | D49 | DDI2_PAIR3+ |
| C50 | N/A | D50 | DDI2_PAIR3- |
| C51 | GND (FIXED) | D51 | GND (FIXED) |
| C52 | PEG_RX0+ | D52 | PEG_TX0+ |
| C53 | PEG_RX0- | D53 | PEG_TX0- |
| C54 | N/A | D54 | PEG_LANE_RV# |
| C55 | PEG_RX1+ | D55 | PEG_TX1+ |
| C56 | PEG_RX1- | D56 | PEG_TX1- |
| C57 | N/A | D57 | GND |
| C58 | PEG_RX2+ | D58 | PEG_TX2+ |
| C59 | PEG_RX2- | D59 | PEG_TX2- |
| C60 | GND (FIXED) | D60 | GND (FIXED) |
| C61 | PEG_RX3+ | D61 | PEG_TX3+ |
| C62 | PEG_RX3- | D62 | PEG_TX3- |
| C63 | RSVD | D63 | RSVD |
| C64 | RSVD | D64 | RSVD |
| C65 | PEG_RX4+ | D65 | PEG_TX4+ |
| C66 | PEG_RX4- | D66 | PEG_TX4- |
| C67 | RAPID_SHUTDOWN | D67 | GND |
| C68 | PEG_RX5+ | D68 | PEG_TX5+ |
| C69 | PEG_RX5- | D69 | PEG_TX5- |
| C70 | GND (FIXED) | D70 | GND (FIXED) |
| C71 | PEG_RX6+ | D71 | PEG_TX6+ |
| C72 | PEG_RX6- | D72 | PEG_TX6- |

| | | | |
|---|---|---|---|
| C73 | GND | D73 | GND |
| C74 | PEG_RX7+ | D74 | PEG_TX7+ |
| C75 | PEG_RX7- | D75 | PEG_TX7- |
| C76 | GND | D76 | GND |
| C77 | RSVD | D77 | RSVD |
| C78 | N/A | D78 | N/A |
| C79 | N/A | D79 | N/A |
| C80 | GND (FIXED) | D80 | GND (FIXED) |
| C81 | N/A | D81 | N/A |
| C82 | N/A | D82 | N/A |
| C83 | RSVD | D83 | RSVD |
| C84 | GND | D84 | GND |
| C85 | N/A | D85 | N/A |
| C86 | N/A | D86 | N/A |
| C87 | GND | D87 | GND |
| C88 | N/A | D88 | N/A |
| C89 | N/A | D89 | N/A |
| C90 | GND (FIXED) | D90 | GND (FIXED) |
| C91 | N/A | D91 | N/A |
| C92 | N/A | D92 | N/A |
| C93 | GND | D93 | GND |
| C94 | N/A | D94 | N/A |
| C95 | N/A | D95 | N/A |
| C96 | GND | D96 | GND |
| C97 | RSVD | D97 | RSVD |
| C98 | N/A | D98 | N/A |
| C99 | N/A | D99 | N/A |
| C100 | GND (FIXED) | D100 | GND (FIXED) |
| C101 | N/A | D101 | N/A |
| C102 | N/A | D102 | N/A |
| C103 | GND | D103 | GND |
| C104 | VCC_12V | D104 | VCC_12V |
| C105 | VCC_12V | D105 | VCC_12V |
| C106 | VCC_12V | D106 | VCC_12V |
| C107 | VCC_12V | D107 | VCC_12V |
| C108 | VCC_12V | D108 | VCC_12V |
| C109 | VCC_12V | D109 | VCC_12V |
| C110 | GND (FIXED) | D110 | GND (FIXED) |

# Appendix B

## Watchdog Timer

This appendix gives you the information about the watchdog timer programming on the SOM-5871 CPU System on Module

Sections include:

- Watchdog Timer Programming

## B.1 Programming the Watchdog Timer

| Trigger Event | Note |
|---|---|
| IRQ | (BIOS setting default disable)** |
| NMI | N/A |
| SCI | Power button event |
| Power Off | Support |
| H/W Restart | Support |
| WDT Pin Activate | Support |

** WDT new driver support automatically select available IRQ number from BIOS, and then set to EC. Only Win10 support it.

In other OS, it will still use IRQ number from BIOS setting as usual.

For details, please refer to iManager & Software API User Manual.

# Appendix C

## Programming GPIO

This Appendix gives the illustration of the General Purpose Input and Output pin setting.

Sections include:

- System I/O ports

## C.1 GPIO Register

| GPIO Byte Mapping | H/W Pin Name |
|---|---|
| BIT0 | GPO0 |
| BIT1 | GPO1 |
| BIT2 | GPO2 |
| BIT3 | GPO3 |
| BIT4 | GPI0 |
| BIT5 | GPI1 |
| BIT6 | GPI2 |
| BIT7 | GPI3 |

For details, please refer to iManager & Software API User Manual.

# Appendix D

## System Assignments

This appendix gives you the information about the system resource allocation on the SOM-5871 CPU System on Module

Sections include:

- System I/O ports
- DMA Channel Assignments
- Interrupt Assignments
- 1st MB Memory Map

All System Assignments are based on AMD Ryzen V1807B, Radeon(TM) Vega 11 Graphics.

# D.1 System I/O Ports

**Table D.1: System I/O ports**

| Addr.Range(Hex) | Device |
|---|---|
| 0000-03AF | Direct memory access controller |
| 0000-03AF | PCI Express Root Complex |
| 0010-001F | Motherboard resources |
| 0020-0021 | Programmable interrupt controller |
| 0022-003F | Motherboard resources |
| 0040-0043 | System timer OK |
| 0060-006F | Motherboard resources |
| 0061-0061 | System speaker |
| 0062-0062 | Microsoft ACPI-Compliaedded Controller |
| 0063-0063 | Motherboard resources |
| 0065-0065 | Motherboard resources |
| 0066-0066 | Microsoft ACPI-Compliant Embedded Controller |
| 0067-006F | Motherboard resources |
| 0070-0071 | System CMOS/real time clock |
| 0072-007F | Motherboard resources |
| 0080-0080 | Motherboard resources |
| 0081-0083 | Direct memory access controller |
| 0084-0086 | Motherboard resources |
| 0087-0087 | Direct memory access controller |
| 0088-0088 | Motherboard resources |
| 0089-008B | Direct memory access controller |
| 008C-008E | Motherboard resources |
| 008F-008F | Direct memory access controller |
| 0090-009F | Motherboard resources |
| 00A0-00A1 | Programmable interrupt controller |
| 00A2-00BF | Motherboard resources |
| 00B1-00B1 | Motherboard resources |
| 00C0-00DF | Direct memory access controller |
| 00E0-00EF | Motherboard resources |
| 0200-027F | Motherboard resources |
| 0200-027F | Motherboard resources |
| 0280-028F | Motherboard resources |
| 0280-028F | Motherboard resources |
| 0290-029F | Motherboard resources |
| 0299-029A | Motherboard resources |
| 029E-02AD | Motherboard resources |
| 02A0-02BF | Motherboard resources |
| 02A0-02BF | Motherboard resources |
| 02C0-02DF | Motherboard resources |

| Table D.1: System I/O ports | |
|---|---|
| 02F0-02F7 | Motherboard resources |
| 02F8-02FF | Communications Port (COM2) |
| 0300-037F | Motherboard resources |
| 03B0-03DF | PCI Express Root Complex |
| 03E0-0CF7 | PCI Express Root Complex |
| 03F8-03FF | Communications Port (COM1) |
| 040B-040B | Motherboard resources |
| 04D0-04D1 | Motherboard resources |
| 04D6-04D6 | Motherboard resources |
| 0800-089F | Motherboard resources |
| 0900-090F | Motherboard resources |
| 0910-091F | Motherboard resources |
| 0B00-0B0F | Motherboard resources |
| 0B20-0B3F | Motherboard resources |
| 0C00-0C01 | Motherboard resources |
| 0C14-0C14 | Motherboard resources |
| 0C50-0C51 | Motherboard resources |
| 0C52-0C52 | Motherboard resources |
| 0C6C-0C6C | Motherboard resources |
| 0C6F-0C6F | Motherboard resources |
| 0CD0-0CD1 | Motherboard resources |
| 0CD2-0CD3 | Motherboard resources |
| 0CD4-0CD5 | Motherboard resources |
| 0CD6-0CD7 | Motherboard resources |
| 0CD8-0CDF | Motherboard resources |
| 0D00-FFFF | PCI Express Root Complex |
| E000-EFFF | AMD Radeon(TM) Vega 11 Graphics |
| E000-EFFF | PCI Express Root Port |
| F000-FFFF | PCI Express Downstream Switch Port |
| F000-FFFF | PCI Express Root Port |
| F000-FFFF | PCI Express Upstream Switch Port |

## D.2 DMA Channel Assignments

| Table D.2: DMA Channel Assignments | |
|---|---|
| **Channel** | **Function** |
| 4 | Direct Memory Access Controller |

## D.3 Interrupt Assignments

**Table D.3: Interrupt Assignments**

| Interrupt# | Interrupt Source |
|---|---|
| IRQ 0 | High precision event timer |
| IRQ 0 | System timer |
| IRQ 3 | Communications Port (COM2) |
| IRQ 4 | Communications Port (COM1) |
| IRQ 6 | Motherboard resources |
| IRQ 7 | AMD GPIO Controller |
| IRQ 8 | High precision event timer |
| IRQ 12 | Motherboard resources |
| IRQ 53 | High Definition Audio Controller |
| IRQ 53 | AMD Audio CoProcessor |
| IRQ 54 | AMD High Definition Audio Controller |
| IRQ 55 | AMD SFHKMDF I2C |
| IRQ 54-IRQ 204 | Microsoft ACPI-Compliant System |
| IRQ 256-IRQ 511 | Microsoft ACPI-Compliant System |
| IRQ 4294967263-<br>IRQ 4294967268 | Intel(R) I210 Gigabit Network Connection #3 |
| IRQ 4294967269-<br>IRQ 4294967284 | AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft) |
| IRQ 4294967285-<br>IRQ 4294967287 | AMD Radeon(TM) Vega 11 Graphics |
| IRQ 4294967288-<br>IRQ 4294967289 | AMD PSP 10.0 Device |
| IRQ 4294967290 | Standard SATA AHCI Controller |
| IRQ 4294967291 | PCI Express Downstream Switch Port |
| IRQ 294967292-<br>IRQ 4294967294 | PCI Express Root Port |

# D.4 1st MB Memory Map

**Table D.4: 1st MB Memory Map**

| Addr. Range (Hex) | Device |
|---|---|
| 0xA0000-0xBFFFF | PCIExpress Root Complex |
| 0xC0000-0xDFFFF | PCIExpress Root Complex |
| 0xE0000000-0xF01FFFFF | PCI Express Root Port |
| 0xE0000000-0xF01FFFFF | PCI Express Root Complex |
| 0xE0000000-0xF01FFFFF | AMD Radeon(TM) Vega 11 Graphics |
| 0xF0000000-0xF01FFFFF | AMD Radeon(TM) Vega 11 Graphics |
| 0xF8000000-0xFBFFFFFF | System board |
| 0xFD100000-0xFDFFFFFF | Motherboard resources |
| 0xFE100000-0xFE5FFFFF | PCI Express Root Port |
| 0xFE100000-0xFE5FFFFF | AMD SFH KMDF I2C |
| 0xFE200000-0xFE2FFFFF | AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft) |
| 0xFE300000-0xFE3FFFFF | AMD USB 3.10 eXtensible Host Controller - 1.10 (Microsoft) |
| 0xFE400000-0xFE4FFFFF | AMD PSP 10.0 Device |
| 0xFE500000-0xFE57FFFF | AMD Radeon(TM) Vega 11 Graphics |
| 0xFE580000-0xFE5BFFFF | AMD Audio CoProcessor |
| 0xFE5C0000-0xFE5C7FFF | AMD High Definition Audio Controller |
| 0xFE5C8000-0xFE5CBFFF | High Definition Audio Controller |
| 0xFE5CC000-0xFE5CDFFF | AMD SFH KMDF I2C |
| 0xFE5CE000-0xFE5CFFFF | AMD PSP 10.0 Device |
| 0xFE600000-0xFE8FFFFF | PCI Express Downstream Switch Port |
| 0xFE600000-0xFE8FFFFF | PCI Express Root Port |
| 0xFE600000-0xFE8FFFFF | PCI Express Upstream Switch Port |
| 0xFE700000-0xFE7FFFFF | Intel(R) I210 Gigabit Network Connection #3 |
| 0xFE800000-0xFE803FFF | Intel(R) I210 Gigabit Network Connection #3 |
| 0xFE900000-0xFE903FFF | PCI Express Upstream Switch Port |
| 0xFEA00000-0xFEAFFFFF | PCI Express Root Port |
| 0xFEA00000-0xFEAFFFFF | Standard SATA AHCI Controller |
| 0xFEB80000-0xFEBFFFFF | Motherboard resources |
| 0xFEC00000-0xFEC00FFF | Motherboard resources |
| 0xFEC01000-0xFEC01FFF | Motherboard resources |
| 0xFEC10000-0xFEC10FFF | Motherboard resources |
| 0xFED00000-0xFED003FF | High precision event timer |
| 0xFED40000-0xFED44FFF | Trusted Platform Module 2.0 |
| 0xFED80000-0xFED8FFFF | Motherboard resources |
| 0xFED81500-0xFED818FF | AMD GPIO Controller |
| 0xFEDC0000-0xFEDC0FFF | Motherboard resources |
| 0xFEE00000-0xFFFFFFFF | PCI Express Root Complex |
| 0xFEE00000-0xFFFFFFFF | Motherboard resources |
| 0xFF000000-0xFFFFFFFF | Motherboard resources |

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