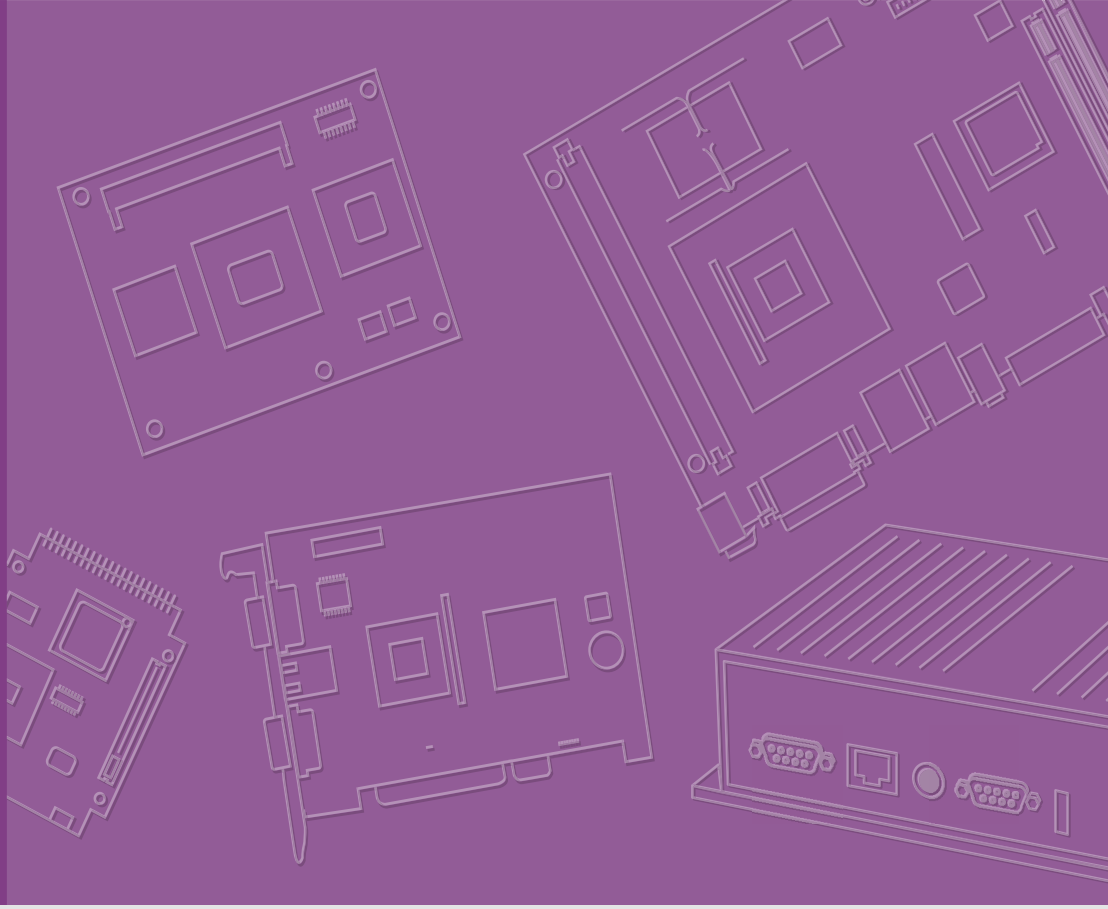

User Manual

ARK-3520P

Fanless Embedded Box PC

ADVANTECH

Enabling an Intelligent Planet

Attention!

Please note:

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

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警告使用者：這是甲類資訊產品，在居住的環境使用時，可能會造成輻射干擾，在這種情況下，使用者會被要求採取某些適當措施。

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Part No. 2006R35200 Edition 1

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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 merchandise 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.

Declaration of Conformity

FCC Class A

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Technical Support and Assistance

1. Visit the Advantech web site at www.advantech.com/support where you can find the latest information about the product.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:
   - Product name and serial number
   - Description of your peripheral attachments
   - Description of your software (operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wording of any error messages

Warnings, Cautions and Notes

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

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

Packing List

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

- 1 x ARK-3520 Unit
- 1 x Registration and 2 years Warranty Card
- 1 x Simplied Chinese Manual
- 1 x China RoHs
- 1 x 4 pin DC in terminal block
- 1 x 2 pin power on/off terminal block

Ordering Information

Model Number	Description
ARK-3520P-U8A1E	Intel 6th Gen. Core i (I7-6820EQ) High Performance Fanless Embedded BOX PC with 2 x PCI
ARK-3520P-U7A1E	Intel 6th Gen. Core i (I5-6440EQ) High Performance Fanless Embedded BOX PC with 2 x PCIe x 4

Optional Accessories

Part Number	Description
96PSA-A150W19P4-1	AC-to-DC Adapter, DC19V 150W
96PSA-A220W24P4-1	AC-to DC adapter, DC24V 220W
1702002600	Power cable 3-pin 183cm, USA type
1702002605	Power cable 3-pin 183cm, EU type
1702031801	Power cable 3-pin 183cm, UK type
1700000237	Power Cord, 3-Pin 183cm, PSE

Safety Instructions

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

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Chapter 1

General Introduction

This chapter gives background information on ARK-3520P series.

1.1 Introduction

ARK-3520, an Intelligent, high performance, fanless embedded system powered by Intel 6th Core i3,i5.i7 BGA processor comes with rich I/O combination and Expansion solution. The expansion are supported by either riser card(PCI/PCIex4)

ARK-3520 Core i7 CPU performance has over 50% increased compared with ARK-3500 and over 200% increased in graphics. ARK-3520 offers independent triple displays: VGA, HDMI and 3rd optional display port. It also provides 8 x COMs, 2 x GbE, 6 x USB 3.0, 2 x USB2.0, 2 x Mini PCIe (1 shared with mSATA), 2 x 2.5" SATAIII storage devices, and 1 16 bits DIO port.

Rugged & Multifunctional Design

ARK-3520 adopts advanced thermal design for HDD and power enhancement. All models are fanless, and highlight various quality features including wide-input power supplies from 9V to 36V, wide temperature range from -20~60° C, diverse expandability options and structural strengthening. ARK-3520 adopt the unique thermal solution which allow Onboard 6th Core i CPU working efficient and smoothly. It also provides rich I/O interfaces: up to 2 x Intel GbE, 6 x USB 3.0, 2 x USB 2.0,2 x 2.5” HDD, 1 x mSATA, 4 x RS-232 and 4 x RS-232/422/485 COM ports.

Various Expansion Support

ARK-3520 is a flexible model which can work in different environment and applications with multiple I/O and high performance. It can support two kinds of riser cards: 2 x PCI or 2 x PCIe x 4. It also has board-to-board design and more I/O ports in coast line without cables.

Built in Intelligent Management Tools - Advantech iManager & WISE-PaaS/RMM

Advantech iManager provides a valuable suite of programmable APIs such as multi-level watchdog, hardware monitor, system restore, and other user-friendly interface.

iManager is an intelligent self-management cross platform tool that monitors system status for problems and takes action if anything is abnormal. iManager offers a boot up guarantee in critical, low temperature environments so systems can automatically recover when voltages dip. iManager makes the whole system more reliable and more intelligent. ARK-3520 also supports Advantech’s own WISE-PaaS/RMM, which provides easy remote management so users can monitor, configure, and control a large number of terminals to make maintenance and system recovery simpler.

1.2 Product Features

1.2.1 General

- **CPU:** Intel ® 6th Gen Core i3/i5/i7 BGA processor (up to 45W)
- **System Chipset:** Intel QM170
- **BIOS:** AMI EFI 128-Mbit SPI Flash BIOS
- **System Memory:** DDR4 2133Mhz up to 32GB
- **Watchdog Timer:** Single chip Watchdog 255-level interval timer, setup by software
- **I/O Interface:**
  - 4 x RS232, 4 x RS232/422/485
  - COM 1, 2 support 5V/12V power supply(by jumper)
- **USB:**
  - 6 x USB 3.0 and 2 x USB 2.0 compliant ports
- **Audio:** High Definition Audio (HD), Line out, Mic-in
- **Storage:** 2 x 2.5" removable HDD drive bays (15 mm height) and 1 x mSATA
- **Expansion Interface:**
  - 2 x Full size MiniPCIe (1 support mSATA and 1 with SIM holder)
  - 1 x iDoor
  - 2 x PCI / 2x PCIex4
  - 1 x M.2 (E key for Wifi)
- **Software API:** Advantech iManager and WISE-PaaS/RMM - Remote Device Management technology

1.2.2 Display

- **Controller:** Intel® HD Graphic 530
- **Resolution:**
  - VGA: support 1920x1200 @ 60 Hz
  - HDMI: Support HDMI 1.4b, 3840 x 2160 @ 30 Hz
  - Display Port: 2560 x 1600 @ 60Hz (Video only, and only support with 3rd gen. processor)
- **Triple Display:**
  - VGA + HDMI + 3rd Optional display module

1.2.3 Ethernet

- **Chipset:**
  - LAN1 Intel® i219LM
  - LAN2 Intel® i210IT
- **Speed:** 10/100/1000 Mbps
- **Interface:** 2 x RJ45

1.3 Chipset

1.3.1 Functional Specification

1.3.1.1 Processor

Processor	Supports BGA processor (up to 45W): ■ Intel® Core™ i7-6820EQ 2.8GHz with 8M L3 cache ■ Intel® Core™ i5-6440EQ 2.7GHz with 6M L3 cache ■ Intel® Core™ i3-6100E 2.7GHz with 3M L3 cache
Memory	Supports DDR4 2133 MHz up to 32GB 2 x 260-pin SODIMM socket type

1.3.1.2 Chipset

Internal Graphics Features	■ Direct x 12, OpenGL 4.4 ■ VGA + HDMI + 3rd optional display module ■ Supports HDCP 1.4b ■ Intel® Display Power saving technology 6.0
Video Accelerator	■ HW accelerated Media Decode: H.265/HEVC, H.264/MPEG-4 AVC, MPEG-2, VC-1/WMV9, JPEG/MJPEG, VP8 and VP9 ■ HW accelerated Media Encode:H. H.265/HEVC, H.264/MPEG-4 AVC, MPEG-2, JPEG/MJPEG and VP8
SATA Interface	**Intel QM170 chip supports:** ■ Supports several optional sections of Serial ATA nia III ■ Supports SATA Data Transfer Rates up to 6 Gb/s ■ Integrated AHCI controller ■ Supports mSATA socket
USB Interface	**Intel QM170 chip supports:** ■ 1 x EHCI Host Controller, supporting SuperSpeed USB 3.0 ports ■ 1 x XHCI Host Controllers, supporting HighSpeed USB 2.0 ports ■ Supports wake-up from sleeping states S3–S4 ■ Maximum 500mA for each USB port
Power Management	**Intel QM170 chip supports:** ■ Supports ACPI ■ ACPI-defined power states (processor driven C states) ■ ACPI Power Management Timer ■ SMI# generation
BIOS	**Intel QM170 chip supports:** ■ AMI 128-Mbit EFI Flash BIOS via SPI

1.3.1.3 Others

Serial ports	■ Up to 8 serial ports. ■ Supports IRQ Sharing among serial ports under Microsoft Windows OS ■ COM1,COM2,COM3,COM4: RS-232/422/485 ■ COM5,COM6,COM7,COM8: RS-232
Ethernet	**LAN1 Intel i219LM, LAN2 Intel i210 IT** ■ Supports 10/100/1000 Mbps. ■ LAN Connectors: Phone Jack RJ45 8P 90D(F)

Audio	**Audio Codec: ALC888S-VD2-GR** ■ Compliant with HD Audio specifications ■ Supports 16/20/24-bit DAC and 16/20/24-bit ADC resolution ■ Supports: Speak-out, Mic-in ■ Audio Connectors: Ear Phone Jack * 2
Battery backup	BATTERY 3V/210 mAh with WIRE x 1

1.3.2 SUSI 4.0

iManager	
Sequence control	Supported
DIO	16-bit programmable DIO
Watchdog timer	Multi-level WDT (set by Advantech iManager) Programmable 1-255 sec / min

Hardware monitor	CPU Temperature / input Current / input Voltage
System information	Running HR / Boot record

1.4 Mechanical Specifications

1.4.1 Dimensions

220[8.66] x 101 [3.98] x 233 [9.17] (Unit: mm [Inch})

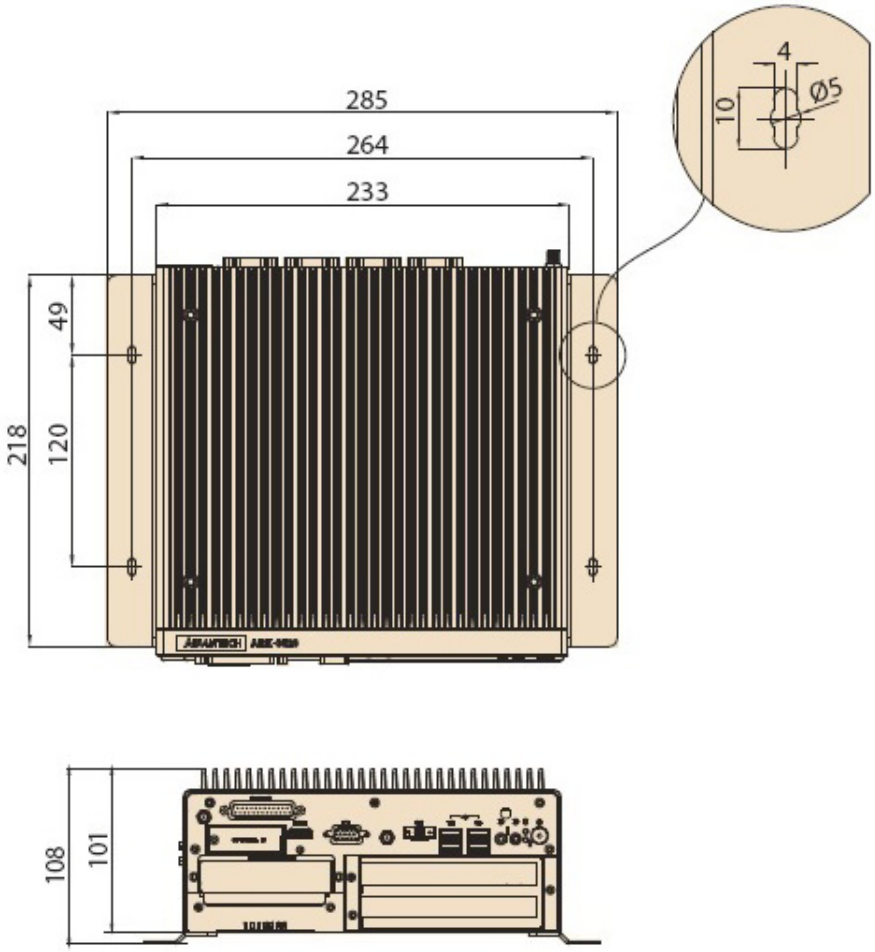


Figure 1.1 ARK-3520P Mechanical dimension drawing

1.4.2 Weight

4.4 kg (9.7 lb)

1.5 Power Requirement

1.5.1 System Power

- **Minimum power input:**
  - ARK-3520P: 9 ~ 36V (16.65 ~ 4.16 A)

1.5.2 RTC Battery

- Lithium 3 V/210 mAH

1.6 Environment Specification

1.6.1 Operating Temperature

- **With Industrial Grade SSD:** -20~60° C (-4 ~ 140° F), with air flow, speed=0.7 m/sec
- **With 2.5-inch hard disk:** 0 to 40° C (32 ~ 104° F), with air flow, speed=0.7 m/sec

1.6.2 Relative Humidity

- 95% @ 40° C (non-condensing)

1.6.3 Storage Temperature

- -40 ~ 85° C (-40 ~ 185° F)

1.6.4 Vibration during Operation

- For system equipped with SSD/mSATA: 3Grms, IEC 60068-2-64, random, 5 ~ 500 Hz

1.6.5 Shock during Operation

- For system equipped with SSD/mSATA: 30G, IEC 60068-2-27, half sin, 11 ms duration

1.6.6 Safety

- LVD, CCC, BSMI

1.6.7 EMC

- CE, FCC, CCC, BSMI

Chapter 2

Hardware Configuration

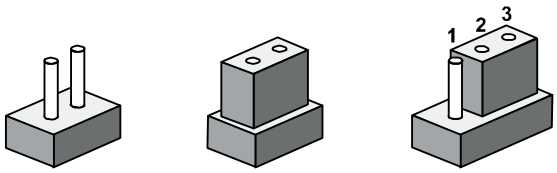
2.1 Introduction

The following sections show the internal jumpers setting and the external connectors pin assignment for application.

2.2 Jumpers

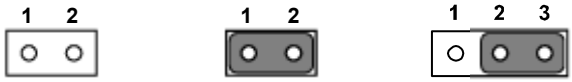
2.2.1 Jumper Description

You may configure ARK-3520P to match the needs of your application by setting jumpers. A jumper is a metal bridge used to close an electric circuit. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To close a jumper, you connect the pins with the clip. To open a jumper, you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2 and 3. In this case you would connect either pins 1 and 2, or 2 and 3.



open **closed** **closed 2-3**

The jumper settings are schematically depicted in this manual as follows.



open **closed** **closed 2-3**

A pair of needle-nose pliers may be helpful when working with jumpers. If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any changes. Generally, you simply need a standard cable to make most connections.

2.2.2 Jumper List

Table 2.1: Jumper List	
J1	Auto Power On Setting
J2	mSATA/PCIe Setting
CN4	COM2 RS-232 Power Setting
CN6	COM1 RS-232 Power Setting
JM1	PCI CLK SELECT setting

2.2.3 Jumper Locations

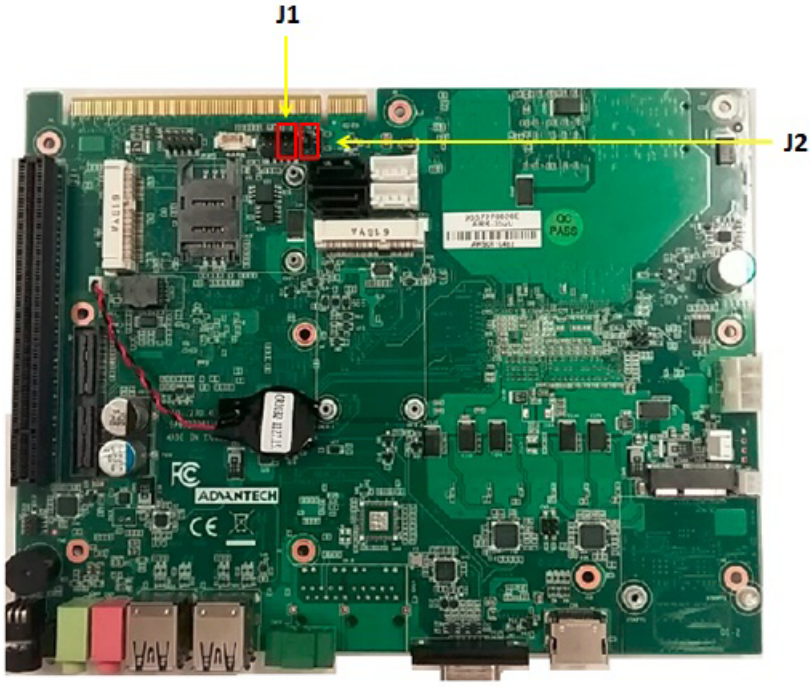


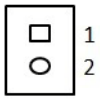
Figure 2.1 Jumper Layout

2.2.4 Jumper Settings

On Motherboard

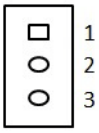
2.2.4.1 Auto Power on Setting (J1)

J1	Auto Power on Setting
Part Number	1653002101-02
Footprint	HD_2x1P_79_D
Description	
Setting	Function
NC	Power Button for Power On (Default)
(1-2)	Auto Power On



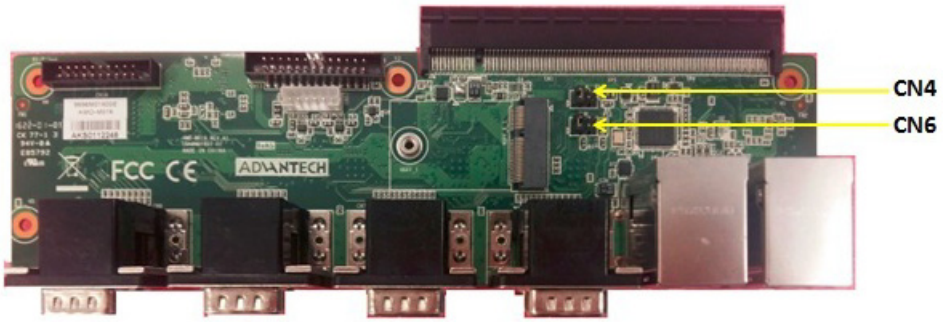
2.2.4.2 mSATA / PCIe Setting (J2)

J2	mSATA / PCIe Setting
Part Number	1653003101
Footprint	HD_2x1P_79_D
Description	PIN HEADER 2x1P 2.0mm 180D(M) DIP 21N12050
Setting	Function
(1-2)	mSATA
(2-3)	PCIe (Default)



2.2.5 Jumper Setting

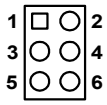
Jumper setting of IO board of AMO-M016:



2.2.5.1 COM2 RS232 Power Setting (CN4) on AMO-M016

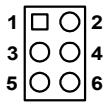
* Please check CN6 on AMO-M016 for COM1 RS-232 setting as well

CN4	PH_3x2V_S2.00mm
Part Number	1653003201
Footprint	HD_3x2P_79_D
Description	
Setting	Function
(1-2)	Normal (default)
(3-4)	+5V
(5-6)	+12V



2.2.5.2 COM1 RS232 Power Setting (CN6) on AMO-M016

CN6	PH_3x2V_S2.00mm
Part Number	1653003201
Footprint	HD_3x2P_79_D
Description	
Setting	Function
(1-2)	Normal (default)
(3-4)	+5V
(5-6)	+12V

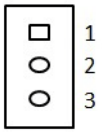


2.2.6 Jumper Setting

Riser card - AMO-R023 jumper setting:

2.2.6.1 AMO-R023 PCI CLK SELECT Setting

JM1	PH 3 x1P 2.54mm
Part Number	1653003100
Footprint	HD_3x1P_100_D
Setting	Function
(1-2)	66 MHz
(2-3)	33 MHz (Default)



2.3 Connectors

2.3.1 ARK-3520P External I/O Locations

ARK-3520 Front IO Panel

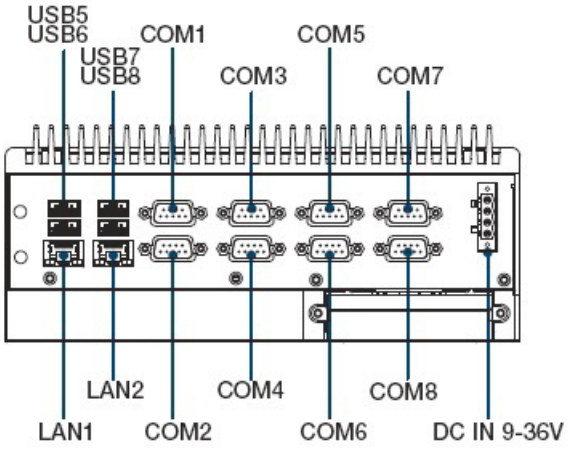


Figure 2.2 ARK-3520 Front IO connector drawing

ARK-3520 Rear IO Panel

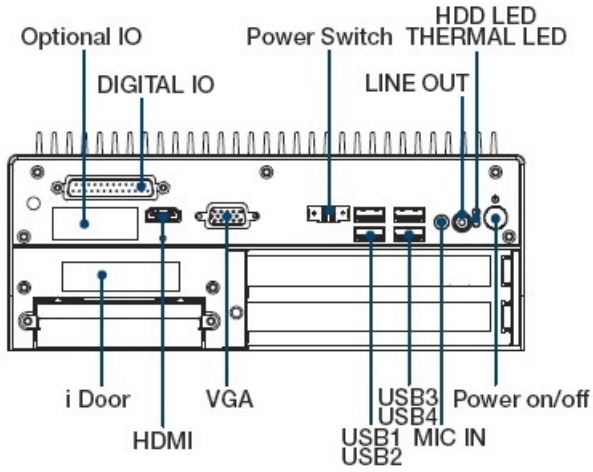


Figure 2.3 ARK-3520 Rear IO connector drawing

2.3.2 ARK-3520P Front I/O Connectors

2.3.2.1 USB2.0 Connector

ARK-3520 provides two USB2.0 interface connectors, which give complete Plug & Play and hot swapping for up to 127 external devices. The USB interface complies with USB UHCI, Rev. 2.0 compliant. The USB interface can be disabled in the system BIOS setup. Please refer to Table. 2.2 for its pin assignments. The USB connectors are used to connect any device that conforms to the USB interface. Most digital devices conform to this standard. The USB interface supports Plug and Play.

* Support power on/off switch in suspend mode (By customize BIOS Request support) .

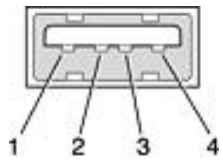


Figure 2.4 USB2.0 connector

Table 2.2: USB 2.0 Connector Pin Assignments

Pin	Signal Name	Pin	Signal Name
1	+5V	2	USB_data-
3	USB_data+	4	GND

2.3.2.2 COM Connector

ARK-3520 provides up to eight D-sub 9-pin connectors, which offers RS-232/422/485 serial communication interface ports. Default setting is RS-232, the mode RS-422/485 of ARK-3520 COM1~4 can be supported via BIOS setting. COM5~8 support RS-232.

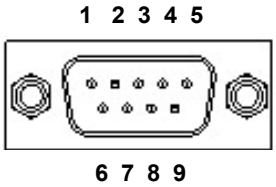


Figure 2.5 COM connector

Table 2.3: COM Connector Pin Assignments

	RS-232	RS-422	RS-485
Pin	Signal Name	Signal Name	Signal Name
1	DCD	Tx-	DATA-
2	RxD	Tx+	DATA+
3	TxD	Rx+	NC
4	DTR	Rx-	NC
5	GND	GND	GND
6	DSR	NC	NC
7	RTS	NC	NC
8	CTS	NC	NC
9	RI	NC	NC

Note! *NC represents "No Connection".*

2.3.2.3 Power Input Connector

ARK-3520P provides a 4-pin connector, which supports 9 ~ 36 VDC external power input. Please refer to Table. 2.4 for its pin assignments.

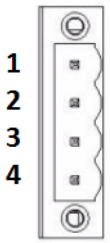


Figure 2.6 Power Input Connector

Table 2.4: Power Input Connector Pin Assignments

Pin	Signal Name
1	GND
2	+9 ~ 36 VDC
3	+9 ~ 36 VDC
4	GND

2.3.2.4 Ethernet Connector (LAN)

ARK-3520 is equipped with 2 Ethernet controllers that are fully compliant with IEEE 802.3u 10/100/1000 Mbps CSMA/CD standards. The Ethernet port provides a standard RJ-45 jack connector with LED indicators on the front side to show its Active/ Link status (Green LED) and Speed status (Yellow LED).

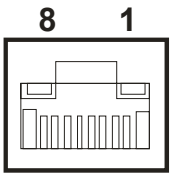


Figure 2.7 Ethernet connector

Table 2.5: Ethernet Connector Pin Assignments

Pin	10/100/1000BaseT Signal Name
1	TX+
2	TX-
3	RX+
4	MDI2+
5	MDI2-
6	RX-
7	MDI3+
8	MDI3-

2.3.3 ARK-3520 Rear I/O Connectors

2.3.3.1 Power On/Off Button

ARK-3520 has a Power On/Off button with LED indicators on the front side that show On status (Green LED) and Off/Suspend status (Orange LED). The Power button supports dual functions: Soft Power -On/Off (Instant off or Delay 4 Seconds then off), and Suspend.

Figure 2.8 Power ON/OFF Button

2.3.3.2 Audio Connector

ARK-3520 offers two stereo audio ports: Line_Out, Mic_In.

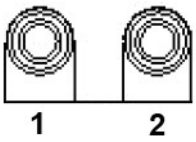


Figure 2.9 Audio Connector

Table 2.6: Audio Connector Pin Assignments

Pin	Audio Signal Name
1	Line out
2	Mic in

2.3.3.3 DIO Connector

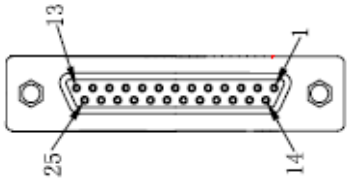


Figure 2.10 DIO Connector

Table 2.7: DIO Connector Pin Assignments

Pin	Signal Name	Pin	Signal Name
1	GND	14	GND
2	Port0 D0	15	Port1 D0
3	Port0 D1	16	Port1 D1
4	Port0 D2	17	Port1 D2
5	Port0 D3	18	Port1 D3
6	Port0 D4	19	Port1 D4
7	Port0 D5	20	Port1 D5
8	Port0 D6	21	Port1 D6
9	Port0 D7	22	Port1 D7
10	+5V	23	+5V
11	NC	24	NC
12	NC	25	NC
13	NC		

Note! *NC represents "No Connection".*

2.3.3.4 LED Indicators

There are two LEDs on the front panel that indicate system status: The thermal LED is for system thermal alarm status; and HDD LED is for HDD status.

Figure 2.11 LED Indicators

2.3.3.5 HDMI Connector

An integrated, 19-pin receptacle connector HDMI Type A Interface is provided. The HDMI link supports resolutions up to 1920 x 1200 @ 30 Hz.

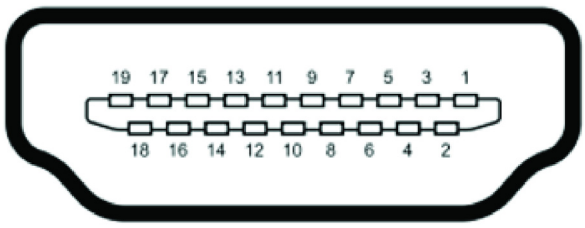


Figure 2.12 HDMI receptacle connector

Table 2.8: HDMI Connector Pin Assignments

Pin	Signal Name	Pin	Signal Name
1	TMDS Data 2+	2	TMDS Data 2 shield
3	TMDS Data 2-	4	TMDS Data 1+
5	TMDS Data 1 shield	6	TMDS Data 1-
7	TMDS Data 0+	8	TMDS Data 0 shield
9	TMDS Data 0-	10	TMDS clock+
11	TMDS clock shield	12	TMDS clock-
13	CEC	14	Reserved
15	SCL	16	SDA
17	DDC/CEC Ground	18	+5V
19	Hot Plug Detect		

2.3.3.6 USB3.0 Connector

ARK-3520 supports six USB 3.0 interfaces. The USB interfaces complies with USB UHCI, Rev. 3.0 standards. Please refer to Table 2.9 for its pin assignments. USB 3.0 connectors contain legacy pins to interface to USB 2.0 devices, and a new set of pins for USB 3.0 connectivity.

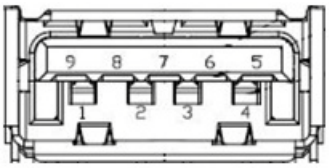


Figure 2.13 USB3.0 Connector

Table 2.9: USB 3.0 Connector Pin Assignments

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

2.3.3.7 VGA Connector

ARK-3520 provides an integrated 15-pin female VGA digital video interface, which supports up to 1920 x 1200 @ 60 Hz. Please refer to Table 2.10 for its pin assignments.

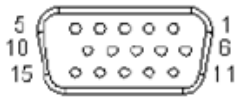


Figure 2.14 VGA Connector

Table 2.10: VGA Connector Pin Assignments

Pin	Signal Name	Pin	Signal Name
1	Red	2	Green
3	Blue	4	NC
5	GND	6	GND
7	GND	8	GND
9	NC	10	GND
11	NC	12	DDAT
13	H-SYNC	14	V-SYNC
15	DCLK		

2.3.3.8 Power Switch Connector

ARK-3520P provides an additional interface for connecting cables to switch on/off the power.

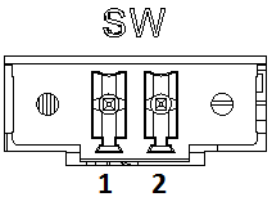


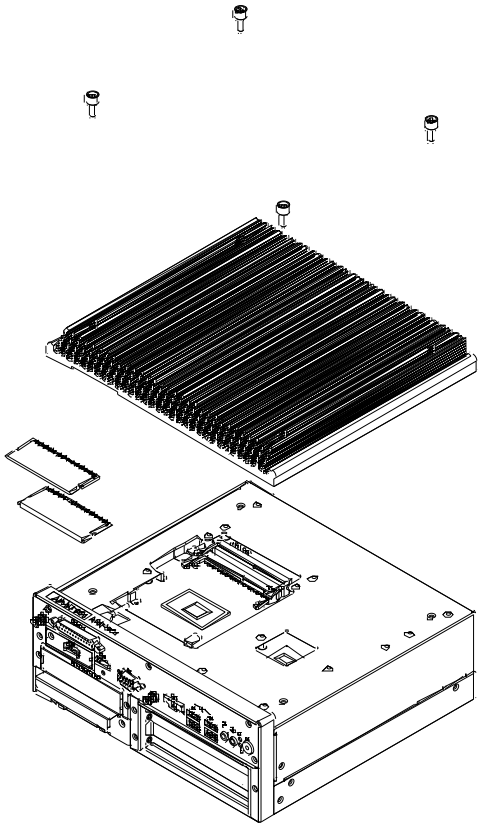
Figure 2.15 Power Switch

Table 2.11: Power Switch Connector Pin Assignments

Pin	Signal Name
1	GND
2	Power switch

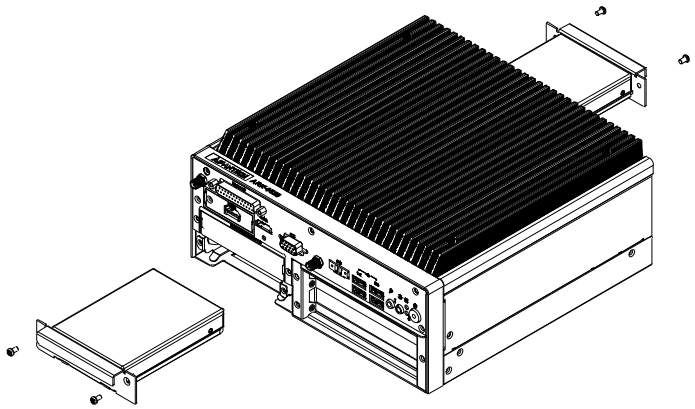
2.4 Installation

2.4.1 Memory Installation



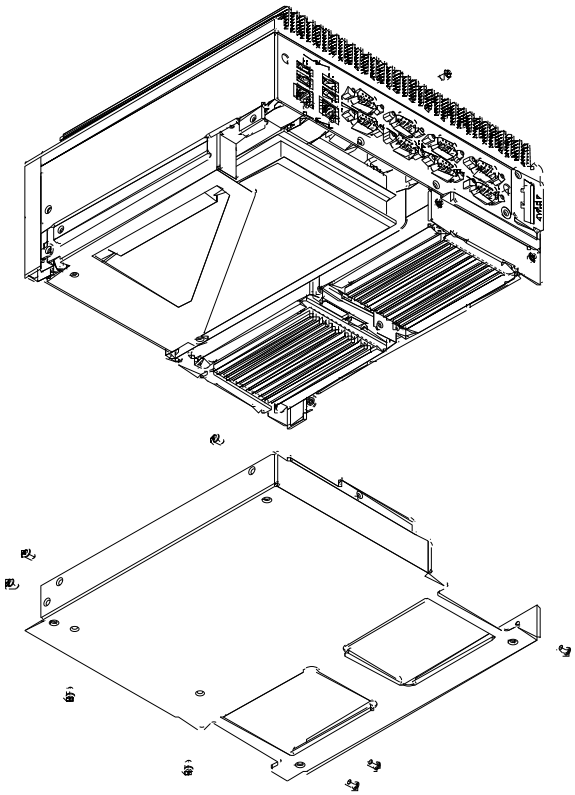
1. Unscrew the 4 screws on the top cover, and remove the top cover.
2. Install the memory into the system.
3. Replace the top cover.

2.4.2 HDD/SSD Installation



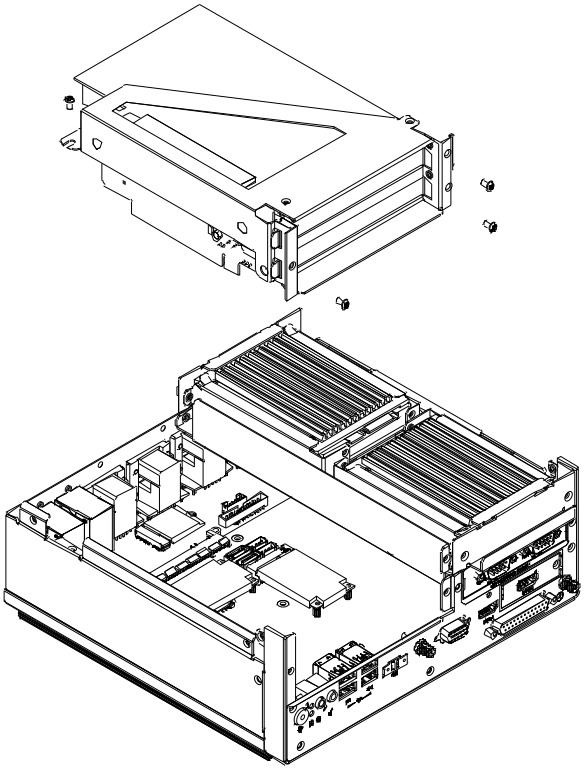
1. Unscrew 2 screws on the panel side.
2. Place the HDD/SDD.

2.4.3 Remove Bottom Cover



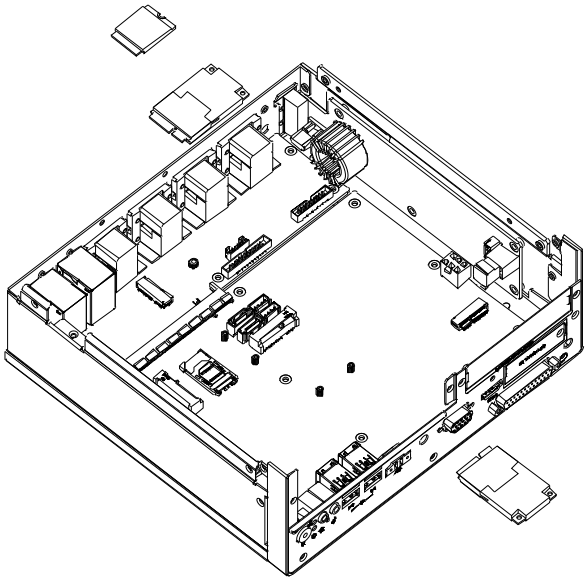
1. Unscrew the nine screws on the bottom cover.

2.4.4 Remove Riser Card Bracket



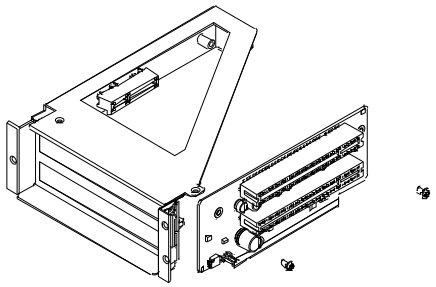
1. Remove the bottom cover (See Chapter 2.4.3).
2. Unscrew the four screws on the riser card.

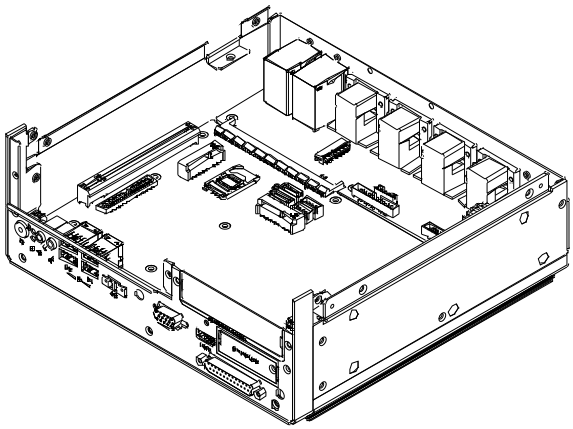
2.4.5 M.2 Module/MiniPCIe Module/Internal SIM Card Slot Installation



1. Remove the bottom cover and the riser card bracket (See Chapter 2.4.3 and Chapter 2.4.4).
2. Install miniPCIe/mSATA module (CN16-1) and fasten the two screws on it.
3. Install miniPCIe module (CN17-1) and fasten the two screws on it (This module is connected with SIM card slot SIM1 in the system).
4. Install M.2 module (NGFF_1) and fasten the one screw on it.

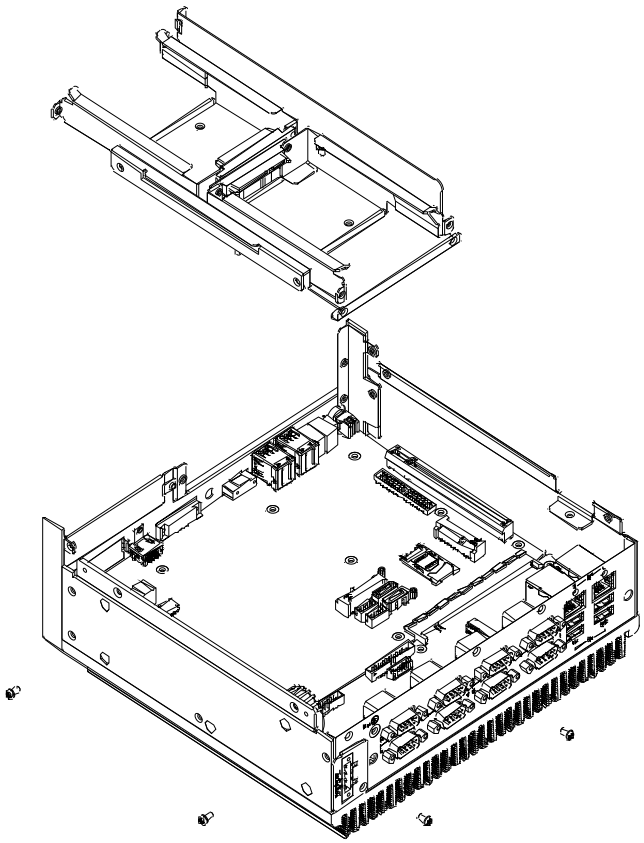
2.4.6 Riser Card Installation





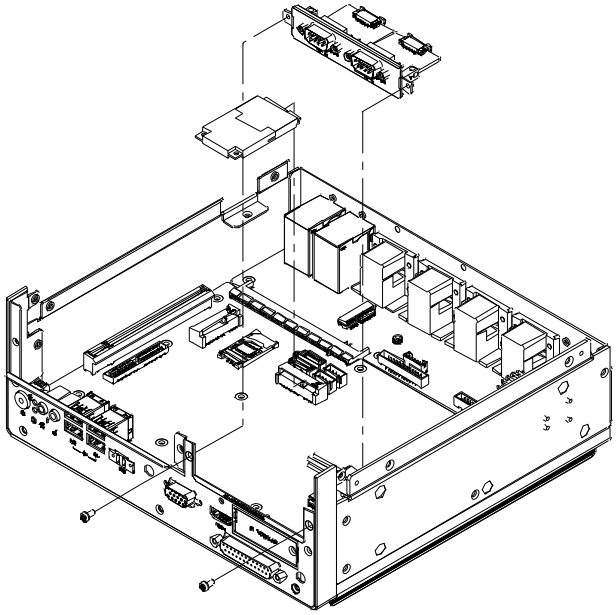
1. Remove the bottom cover and the riser card bracket (See Chapter 2.4.3 and Chapter 2.4.4).
2. Unscrew the two screws on the riser card bracket.
3. Install PCI or PCIe device onto the board and use screws to fix it on the bracket.
4. Screw the board back.
5. Screw and fix the bracket.
6. Screw the bottom cover back.

2.4.7 Remove HDD Bracket



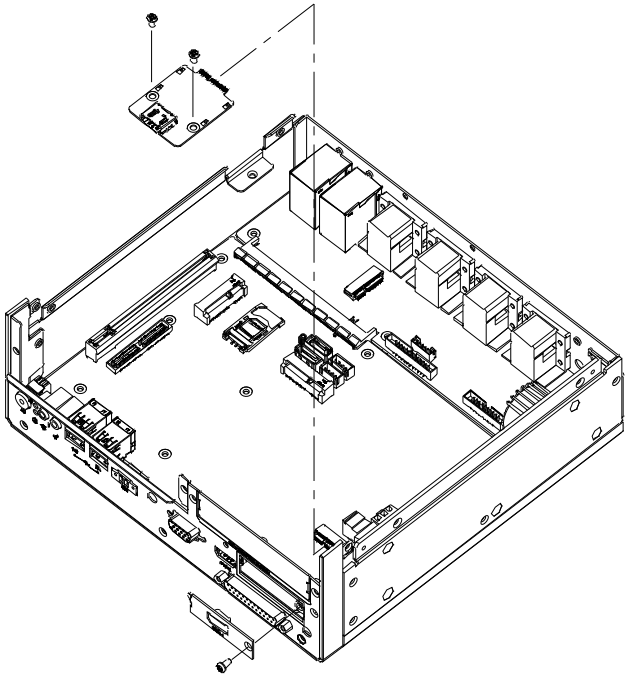
1. Remove the four screws on the HDD bracket.

2.4.8 iDoor Installation



1. Remove the bottom cover and the riser card bracket (See Chapter 2.4.3 and Chapter 2.4.4).
2. Remove the screws on the door.
3. Install iDoor module onto Mini PCIe and iDoor door frame.
4. Screw the two screws.

2.4.9 Optional Module for Third Display Installation



1. Remove the bottom cover and the HDD bracket (See Chapter 2.4.3 and Chapter 2.4.7).
2. Install the optional module and fasten the two screws.
3. Replace the panel and screw it.

2.4.10 Replace CPU thermal Grease Pad

Always use the grease pad provided by Advantech. The P/N of the grease pad is:

Part Number	Description
1990028893N000	Thermal Pad 25x15x0.2mm K=3.4 PSX-D ARK-3520

To ensure the best thermal performance, it is recommended to replace the thermal grease for CPU thermal pole each time the top cover is opened.

1. To replace the thermal grease, clean up the CPU thermal pole by using paper tissue or soft cloth. DO NOT USE any kind of solvent to clean the thermal pole as this may damage the thermal grease inside the thermal pole.
2. Gently remove one of the protective papers on the grease pad and apply the grease to the CPU thermal pole. Press onto the grease pad for 30 seconds, then remove the protective paper gently from the grease pad.

2.4.11 Wide operating temperature support

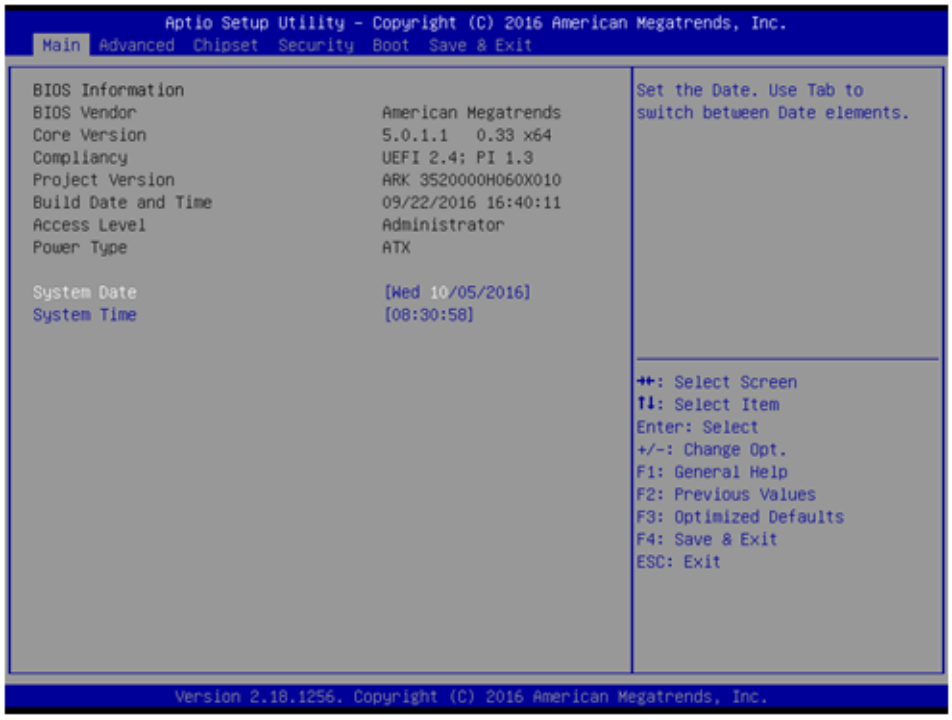
To make sure the system works well under 0° C or over 40° C, please ensure your peripherals are i-grade, which support wide temperature operation.

Chapter 3

BIOS Settings

3.1 Introduction

AMIBIOS has been integrated into zillions of motherboards for over two decades. With the AMIBIOS Setup program, users can modify BIOS settings and control various system features. This chapter describes the basic navigation of the ARK-3520 BIOS setup screens.



AMI's BIOS ROM 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.

3.2 Entering Setup

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

3.2.1 Main Setup

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

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

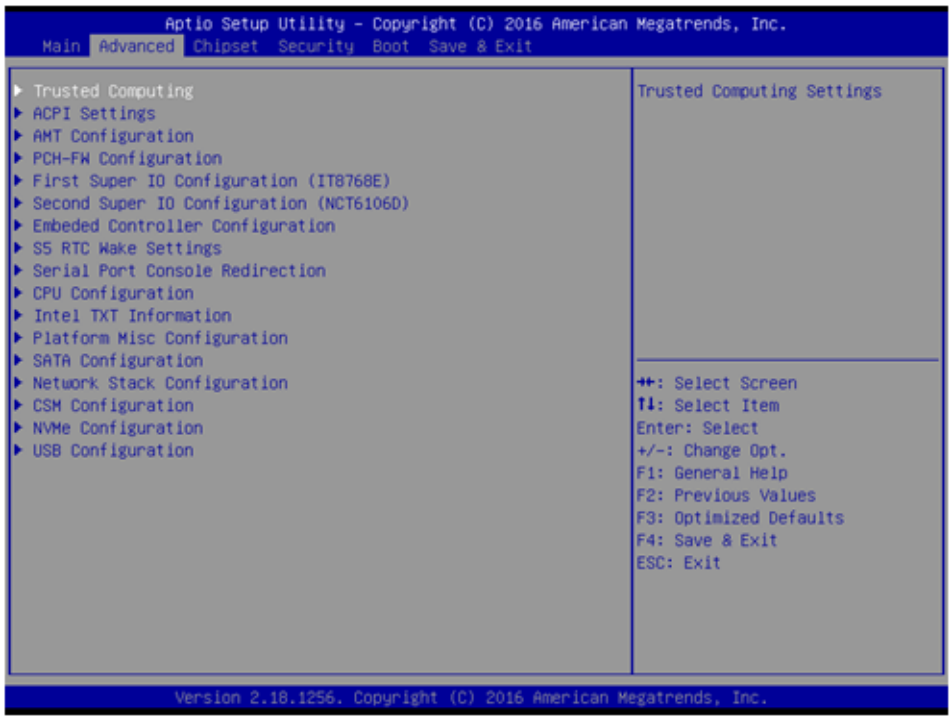
Above the key legend is an area reserved for a text message. When an option is selected in the left frame, it is highlighted in white. Often a text message will accompany it.

- **System time / System date**

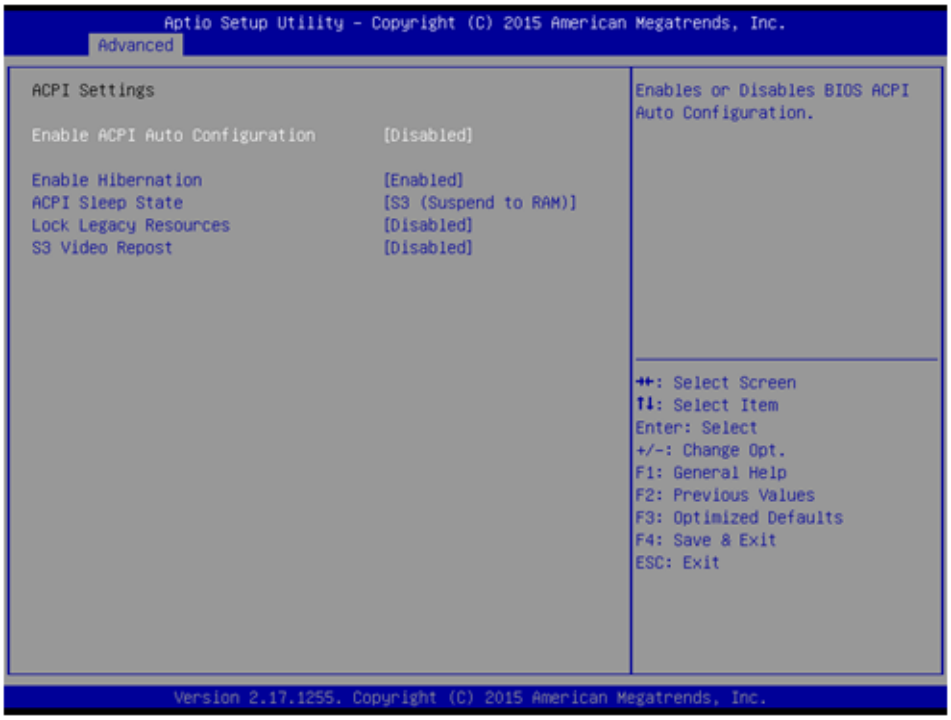
  Use this option to change the system time and date. Highlight System Time or System Date using the <Arrow> keys. Enter new values through the keyboard. Press the <Tab> key or the <Arrow> keys to move between fields. The date must be entered in MM/DD/YY format. The time must be entered in HH:MM:SS format.

3.2.2 Advanced BIOS Features Setup

Select the Advanced tab from the ARK-3520P 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.

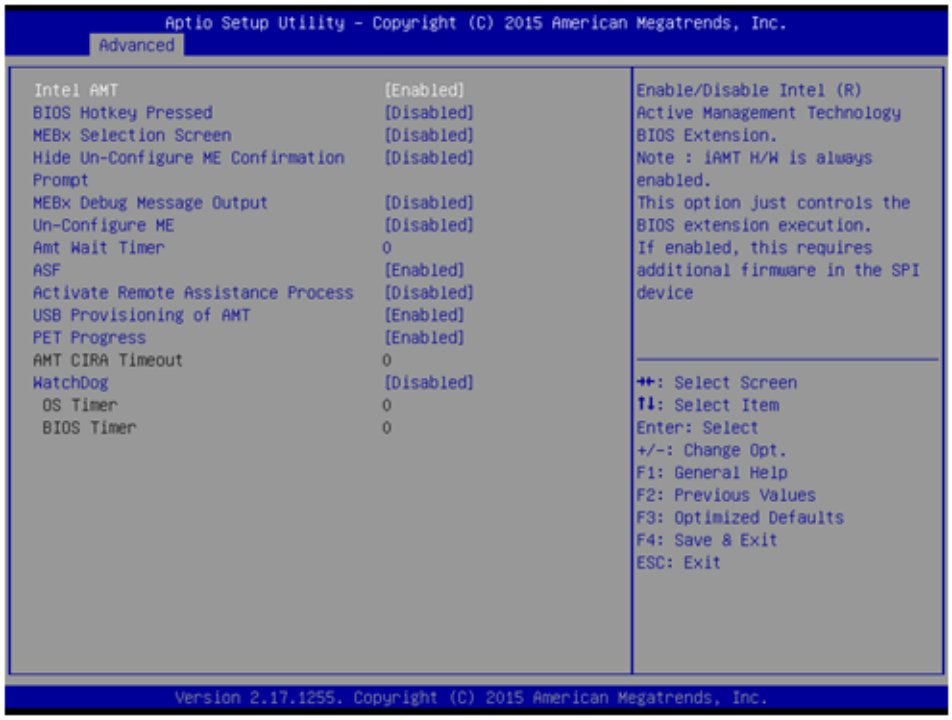


3.2.2.1 ACPI Settings



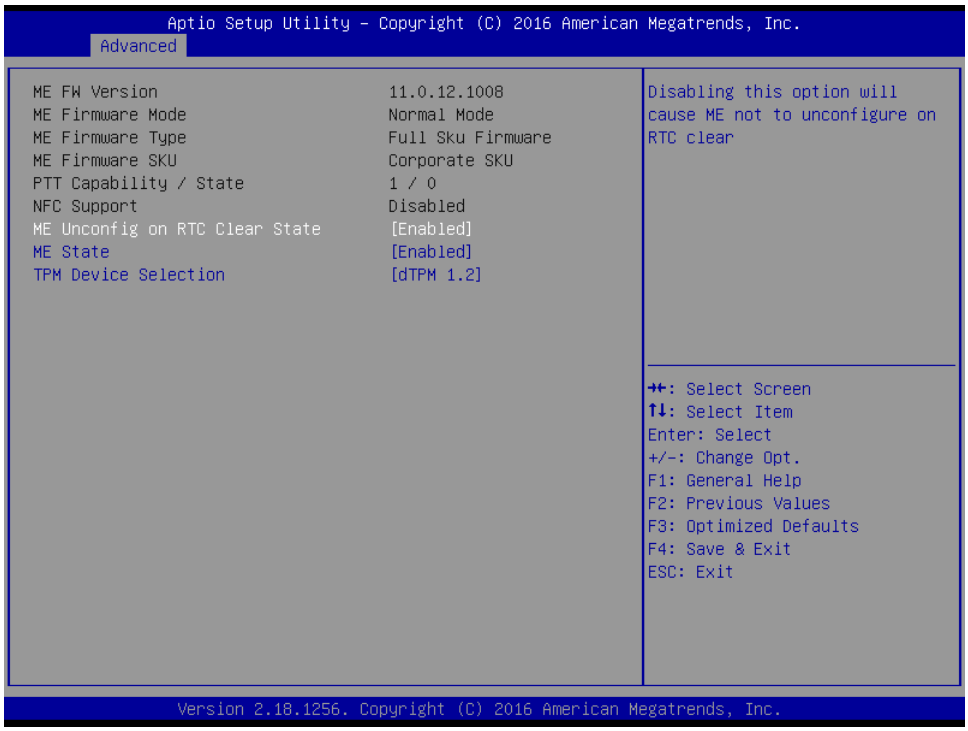
- **Enable ACPI Auto Configuration**
  Enable or disable BIOS ACPI auto configuration.
- **Enable Hibernation**
  Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.
- **ACPI Sleep State**
  Select the highest ACPI sleep state the system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

3.2.2.2 AMT Configuration



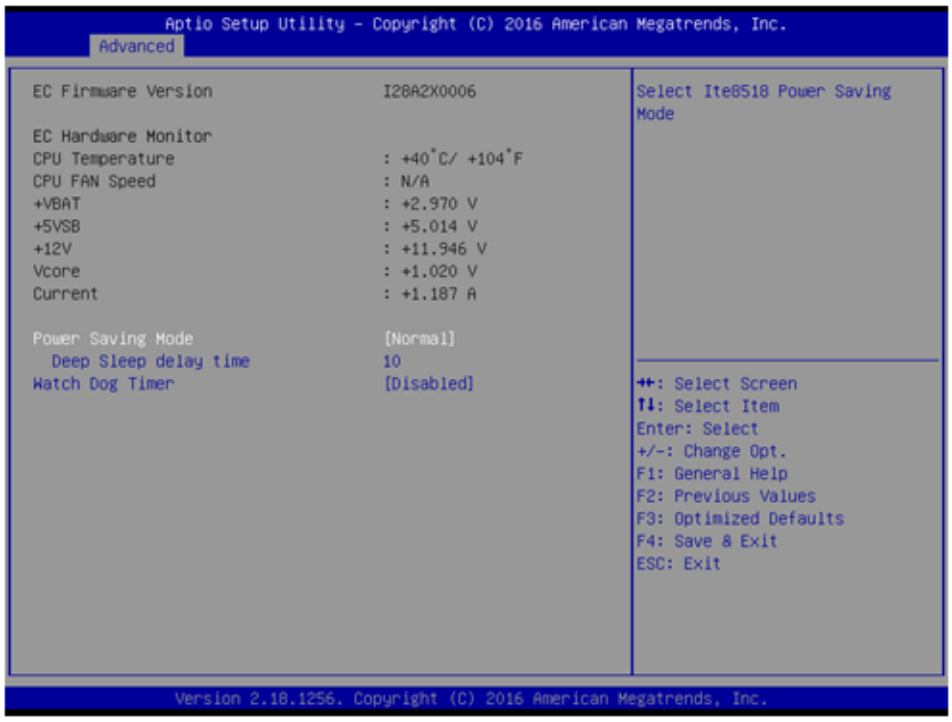
- **Intel AMT**
  Enable/Disable Intel® Active Management Technology BIOS Extension.
- **BIOS Hotkey Pressed**
  Enable/Disable BIOS hotkey press.
- **MEBx Selection Screen**
  Enable/Disable MEBx selection screen.
- **Hide Un-Configure ME Configuration Prompt**
  Hide Un-Configure ME without password Configuration Prompt.
- **MEBx Debug Message Output**
  Enable MEBx debug message output.
- **Un-Configure ME**
  Un-Configure ME without password.
- **Amt Wait Timer**
  Set timer to wait before sending ASF_GET_BOOT_OPTIONS.
- **ASF**
  Enable/Disable Alert Specification Format.
- **Activate Remote Assistance Process**
  Trigger CIRA boot.
- **USB Provisioning of AMT**
  Enable/Disable of AMT USB Provisioning.
- **PET Progress**
  User can Enable/Disable PET Events progress to receive PET events or not.
- **Watch Dog**
  Enable/Disable WatchDog Timer.

3.2.2.3 PCH-FW Configuration



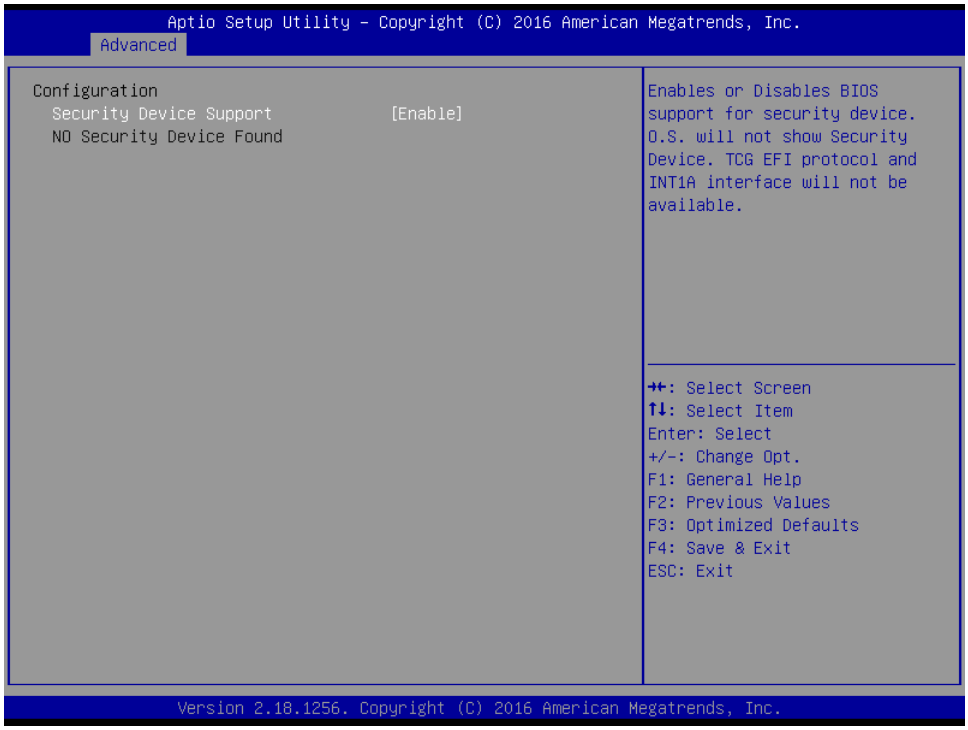
- **PCH-FW Configuration**
  This page display all information about system ME FW.
- **ME State**
  Set ME to Soft Temporary Disabled.
- **TPM Device Selection**
  Selects TPM device.

3.2.2.4 Embedded Controller Configuration



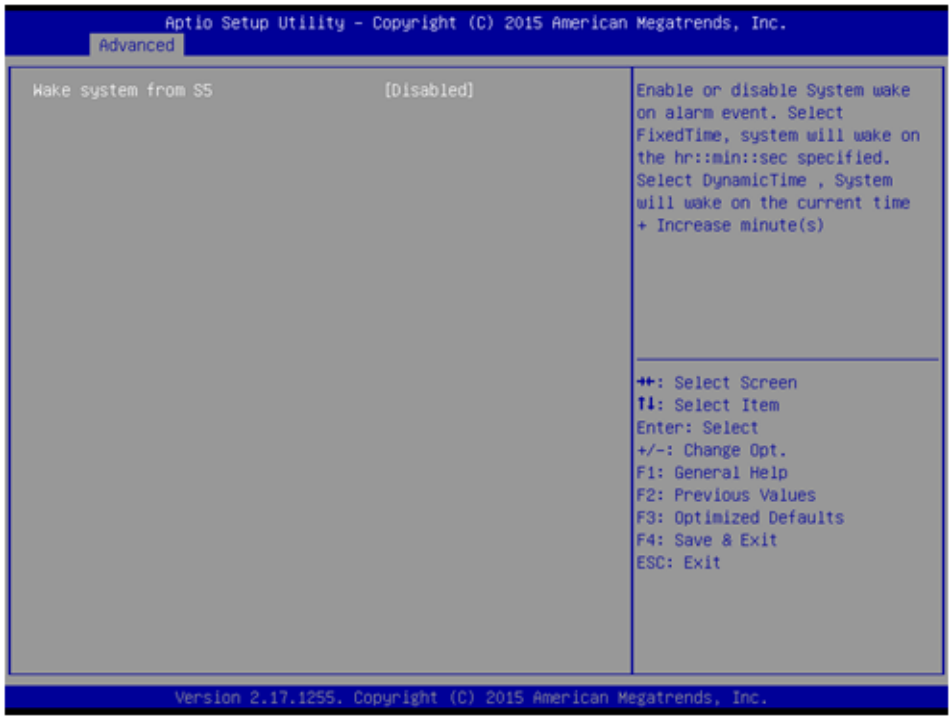
- **EC Hardware Monitor**
  This page display all information about system Temperature/Voltage/Current.
- **Power Saving Mode**
  This item allows users to set board's power saving mode when off.
- **Deep Sleep delay time**
  Set delay time for Deep Sleep mode.
- **Watch Dog Timer**
  This item allows users to select EC watchdog timer.

3.2.2.5 Trusted Computing



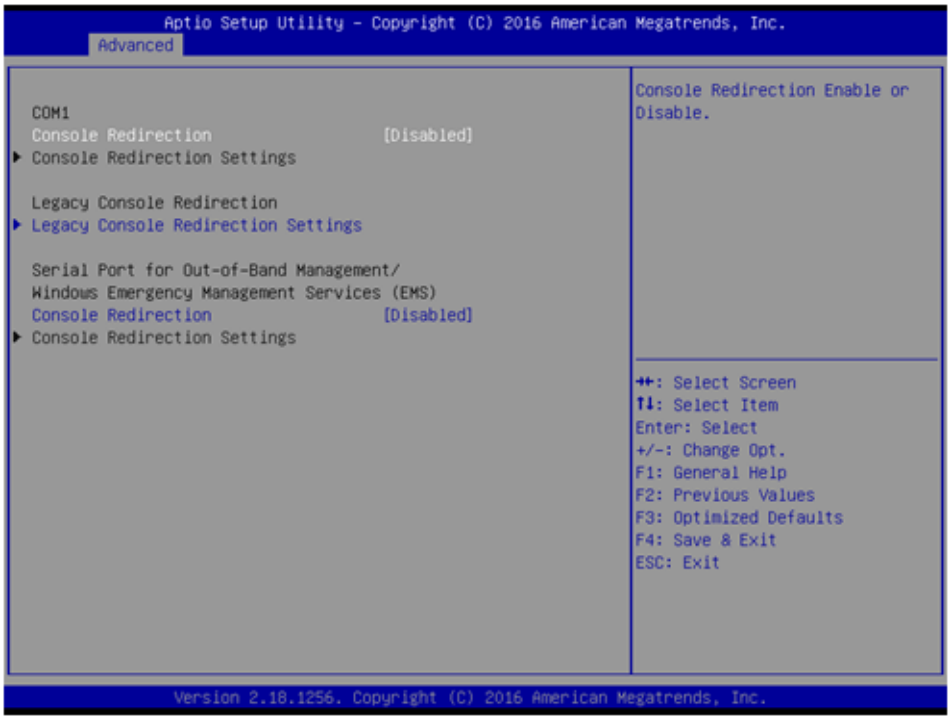
- **Trusted Computing**
  Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.

3.2.2.6 S5 RTC Wake Settings



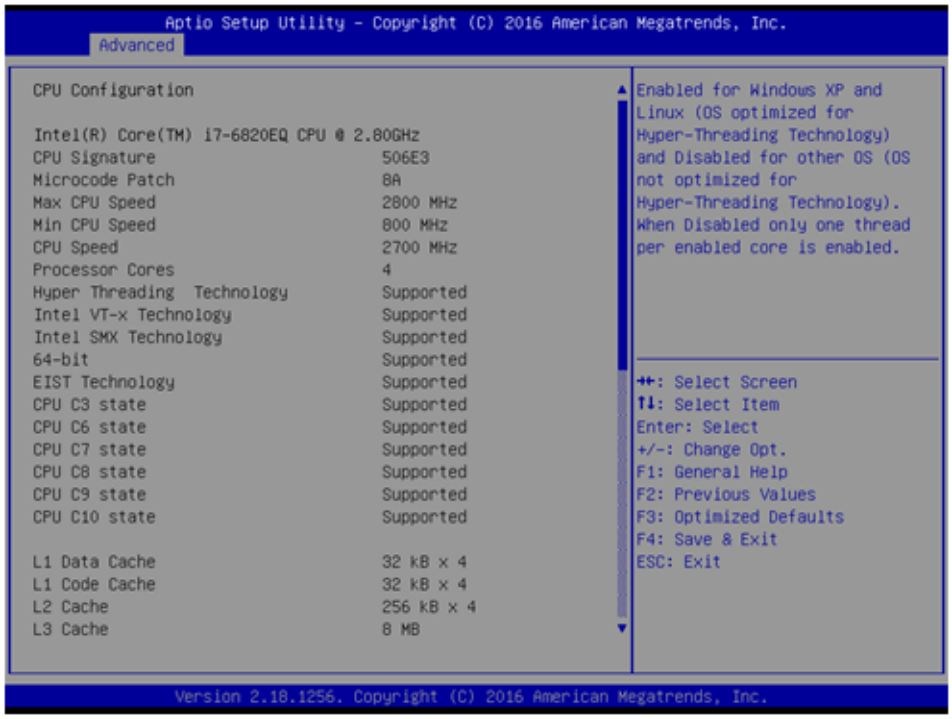
- **Wake system from S5**
  Enable or disable System wake on alarm event. Select FixedTime, system will wake on the hr::min::sec specified.

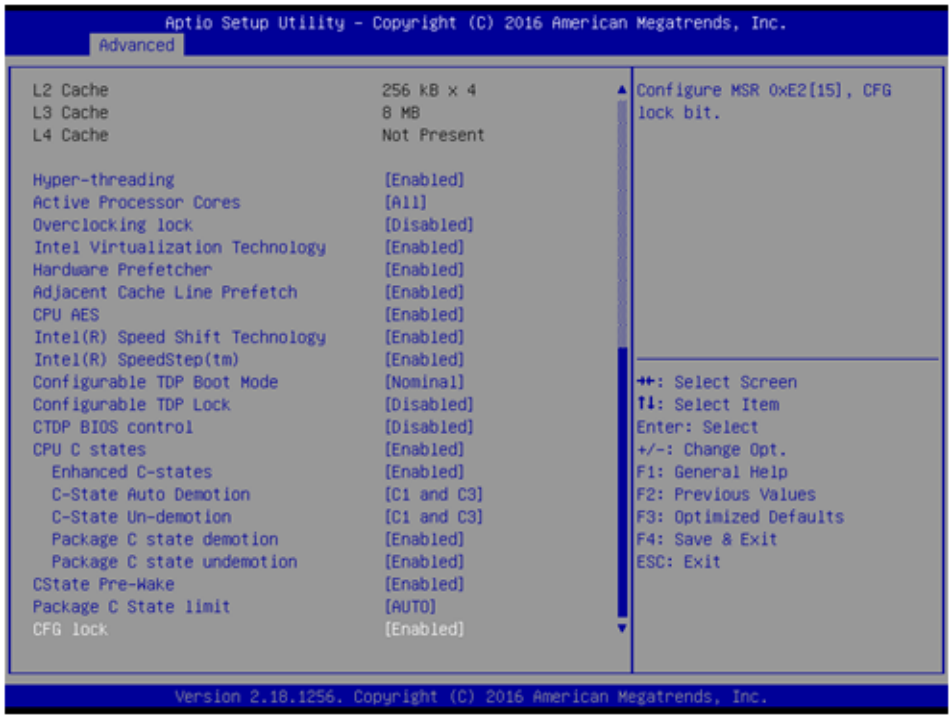
3.2.2.7 Serial Port Console Redirection



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

3.2.2.8 CPU Configuration





- **Hyper Threading Technology**
  This item allows users to enable or disable Intel? Hyper Threading technology.
- **Active Processor Cores**
  This item allows users to set how many processor cores should be active.
- **Intel Virtualization Technology**
  This item allows users to enable or disable the intel virtualization technology.
- **Hardware Prefetcher**
  This item allows users to enable or disable the hardware prefetcher feature.
- **Adjacent Cache Line Prefetch**
  This item allows users to enable or disable the adjacent cache line prefetch feature.
- **CPU AES**
  Enable/Disable CPU Advanced Encryption Standard instructions.
- **Intel® Speed Shift Technology**
  Enable/Disable Intel® Speed Shift Technology support.
- **Intel® SpeedStep™**
  Allows more than two frequency ranges to be supported.
- **CPU C states**
  Enable or disable CPU C states.
- **CState Pre-Wake**
  Disable – to disable the CState Pre-Wake.
- **Package C State limit**
  Package C State limit.

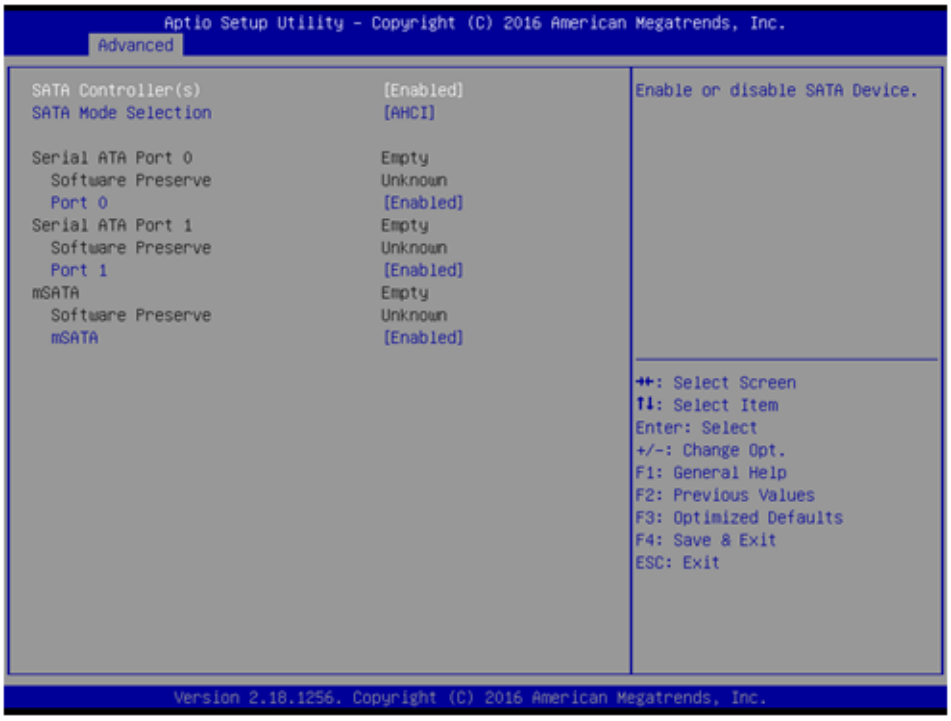
3.2.2.9 Intel TXT Information

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

3.2.2.10 Platform Misc Configuration

- **Native PCIE Enable**
  PCI Express Native Support Enable/Disable.
- **Native ASPM**
  PCI Express Native ASPM Enable/Disable.

3.2.2.11 SATA Configuration

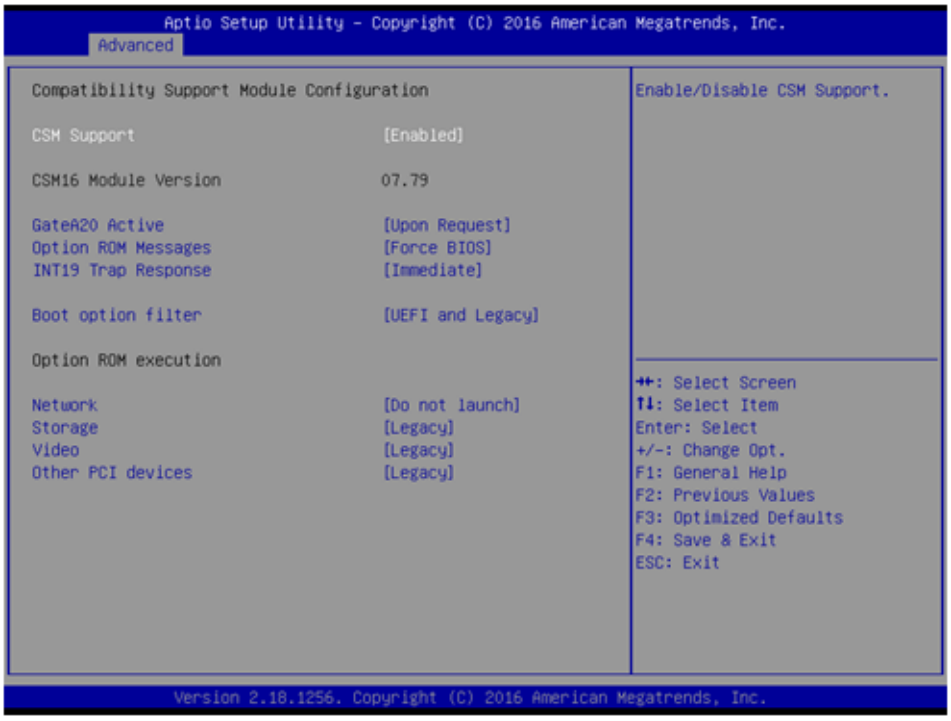


- **SATA Controller**
  Enable / Disable SATA Device.
- **SATA Mode Selection**
  Determine how SATA controller operate.
- **Port 0 / Port 1 / mSATA**
  Enable / Disable Serial ATA Port 1 / Port 2 / mSATA Port.

3.2.2.12 Network Stack Configuration

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

3.2.2.13 CSM Configuration

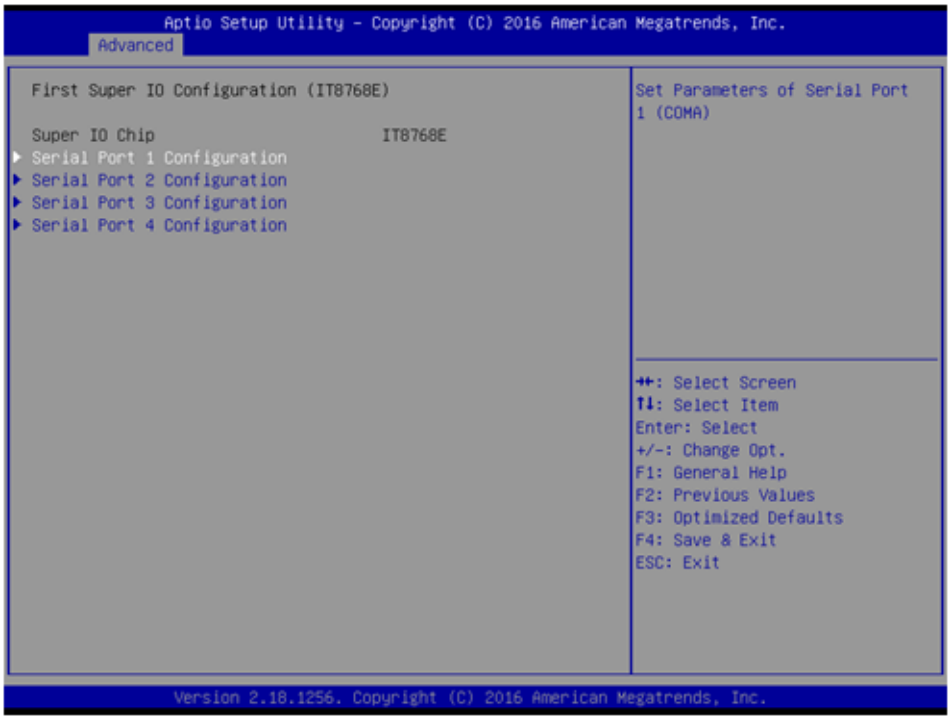


- **CSM Support**
  Enable/Disable CSM Support.
- **GateA20 Active**
  UPON REQUEST - GA20 can be disabled using BIOS services. ALWAYS - do not allow disabling GA20; this option is useful when any RT code is executed above 1MB.
- **Option ROM Message**
  BIOS Set display mode for Option ROM.
- **INT19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

3.2.2.14 USB Configuration

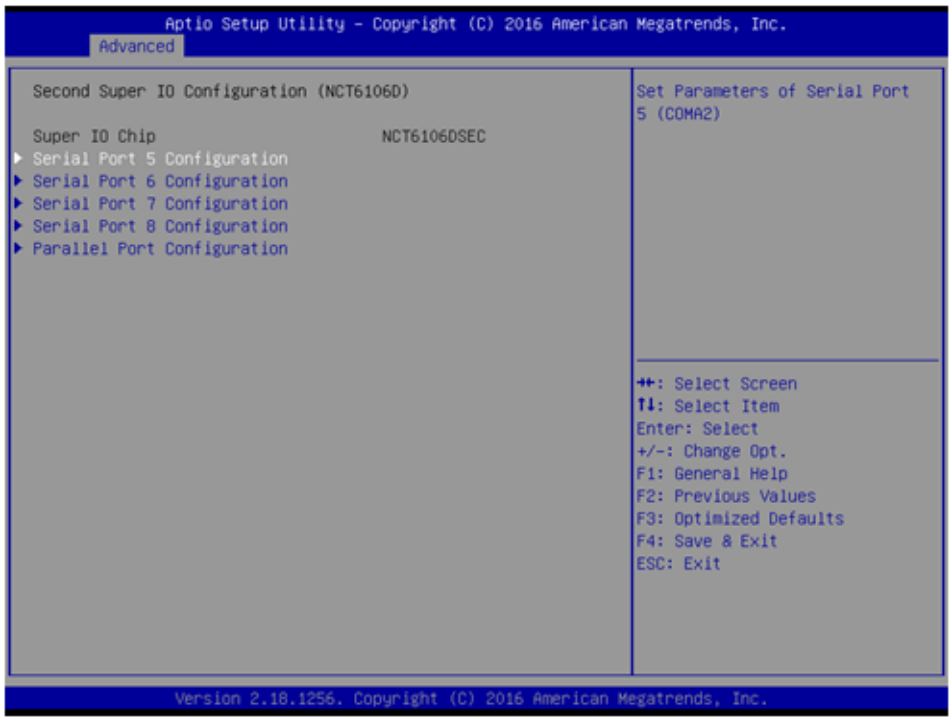
- **Legacy USB Support**
  Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.
- **XHCI Hand-off**
  This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
- **USB Mass Storage Driver Support**
  Enable/Disable USB Mass Storage Driver Support.
- **Port 60/64 Emulation**
  Enables I/O port 60h/64h emulation support. This should be enabled for the complete USB keyboard legacy support for non-USB aware OSes.
- **USB transfer time-out**
  Time-out value for control, Bulk, and interrupt transfers.
- **Device reset time-out**
  USB mass storage device start unit command time-out.
- **Device power-up delay**
  Maximum time the device will take before it properly reports itself to the Host Controller. 'Auto' uses default value: for a Root port it is 100 ms, for a Hub port the delay is taken from Hub descriptor.

3.2.2.15 First Super IO Configuration (IT8768E)



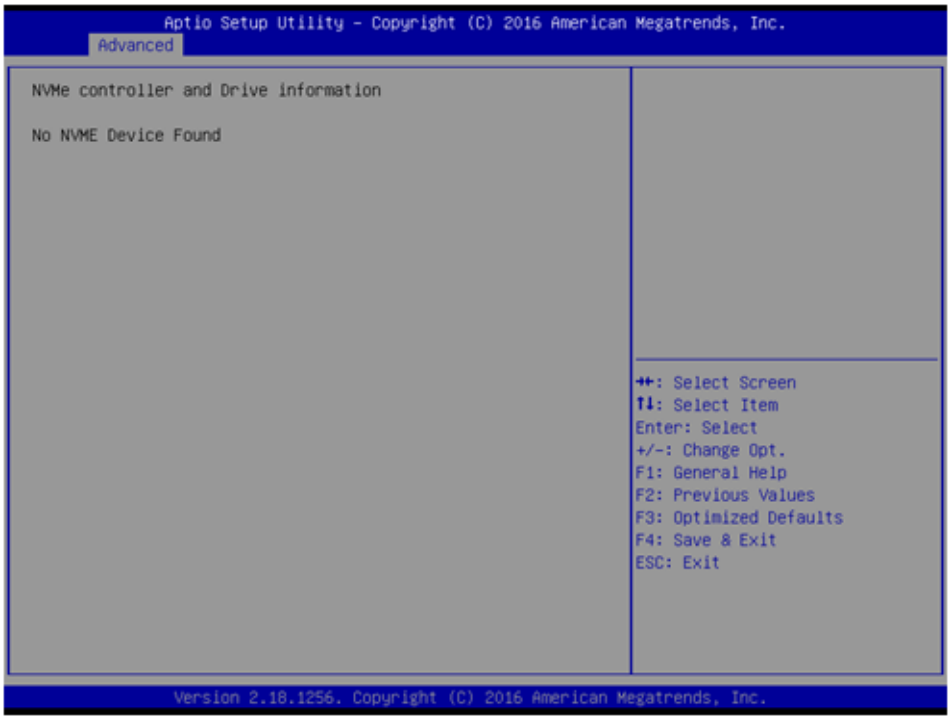
- **Serial Port 1 Configuration**
  Set Parameters of Serial Port 1 (COMA).
- **Serial Port 2 Configuration**
  Set Parameters of Serial Port 2 (COMB).
- **Serial Port 3 Configuration**
  Set Parameters of Serial Port 3 (COMC).
- **Serial Port 4 Configuration**
  Set Parameters of Serial Port 4 (COMD).

3.2.2.16 Second Super IO Configuration (NCT6106D)



- **Serial Port 5 Configuration**
  Set Parameters of Serial Port 5 (COMA2).
- **Serial Port 6 Configuration**
  Set Parameters of Serial Port 6 (COMB2).
- **Serial Port 7 Configuration**
  Set Parameters of Serial Port 7 (COMC2).
- **Serial Port 8 Configuration**
  Set Parameters of Serial Port 8 (COMD2).
- **Parallel Port Configuration**
  Set Parameters of Parallel Port (LPT/LPTE).

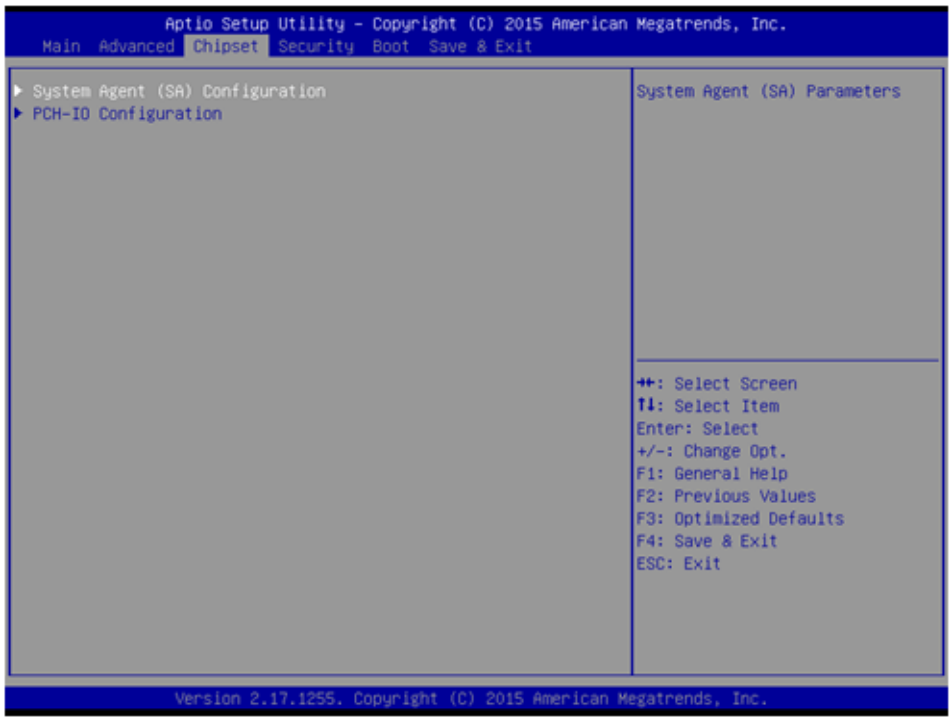
3.2.2.17 NVMe Configuration



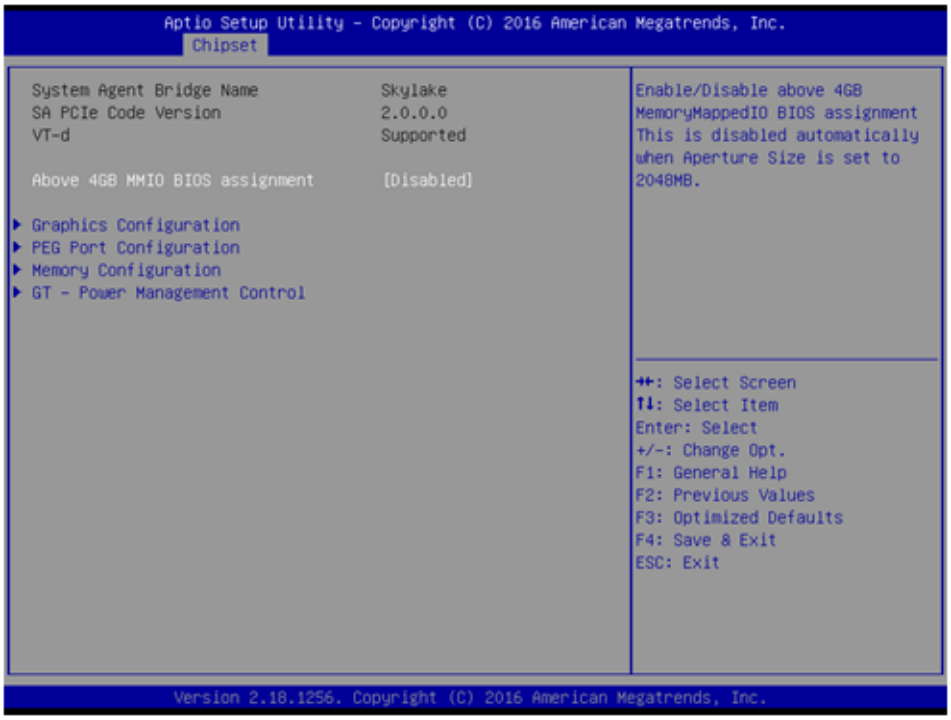
- **NVMe Device Options Settings**

3.2.3 Chipset Configuration

Select the Chipset tab from the ARK-3520 setup screen to enter the Chipset BIOS Setup screen. You can display a Chipset BIOS Setup option by highlighting it using the <Arrow> keys. All Plug and Play BIOS Setup options are described in this section. The Plug and Play BIOS Setup screen is shown below.

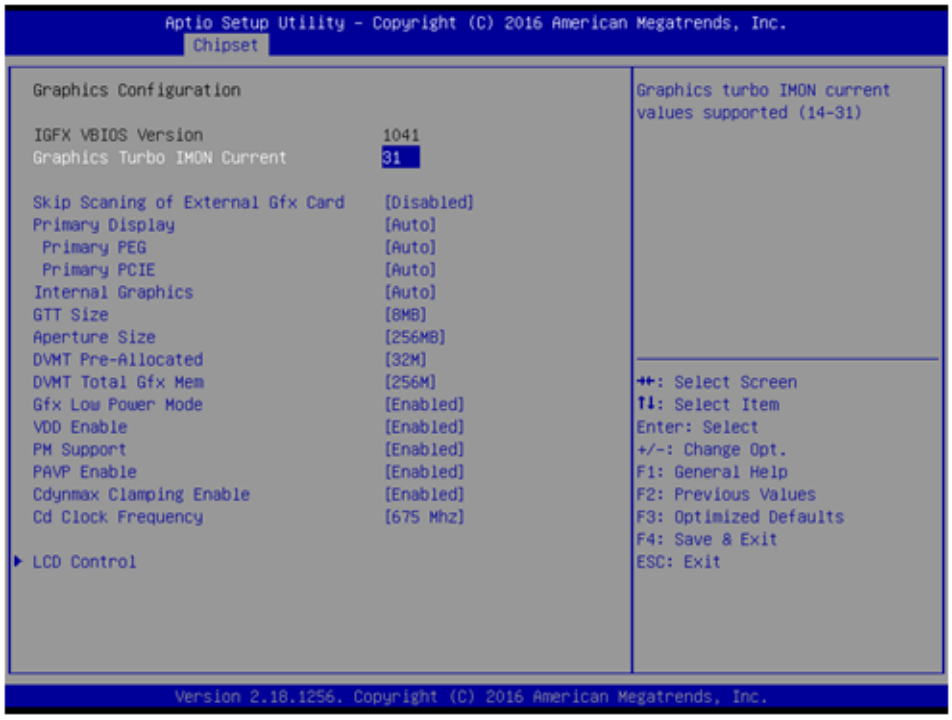


3.2.3.1 System Agent (SA) Configuration



- **Above 4GB MMIO BIOS assigment**
  Enable/Disable above 4GB Memory Mapped IO BIOS assignment.

3.2.3.2 Graphics Configuration



- **Graphics Turbo IMON Current**
  Graphics turbo IMON current values supported.
- **Skip Scaning of External Gfx Card**
  If Enable, it will not scan for External Gfx Card on PEG and PCH PCIE Ports.
- **Primary Display**
  Select which of IGFX/PEG/PCI Graphics device should be Primary Display Or select SG for Switchable Gfx.
- **Internal Graphics**
  Keep IGFX enabled based on the setup options.
- **GTT Size**
  Select the GTT Size.
- **Aperture Size**
  Select the Aperture Size.
- **DVMT Pre-Allocated**
  Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.
- **DVMT Total Gfx Mem**
  Select DVMT 5.0 Total Graphic Memory size used by the Internal Graphics Device.
- **Gfx Low Power Mode**
  This option is applicable for SFF only.
- **VDD Enable**
  Enable/Disable forcing of VDD in the BIOS.
- **PM Support**
  Enable/Disable PM Support.
- **PAVP Enable**
  Enable/Disable PAVP.

- **Cdynmax Clamping Enable**
  Enable/Disable Cdynmax Clamping.
- **Cd Clock Frequency**
  Select the highest Cd Clock frequency supported by the platform.

3.2.3.3 LCD Control

- **Primary IGFX Boot Display**
  Select the Video Device which will be activated during POST. This has no effect if an external graphics present. Secondary boot display selection will appear based on your selection. VGA modes will be supported only on primary display.

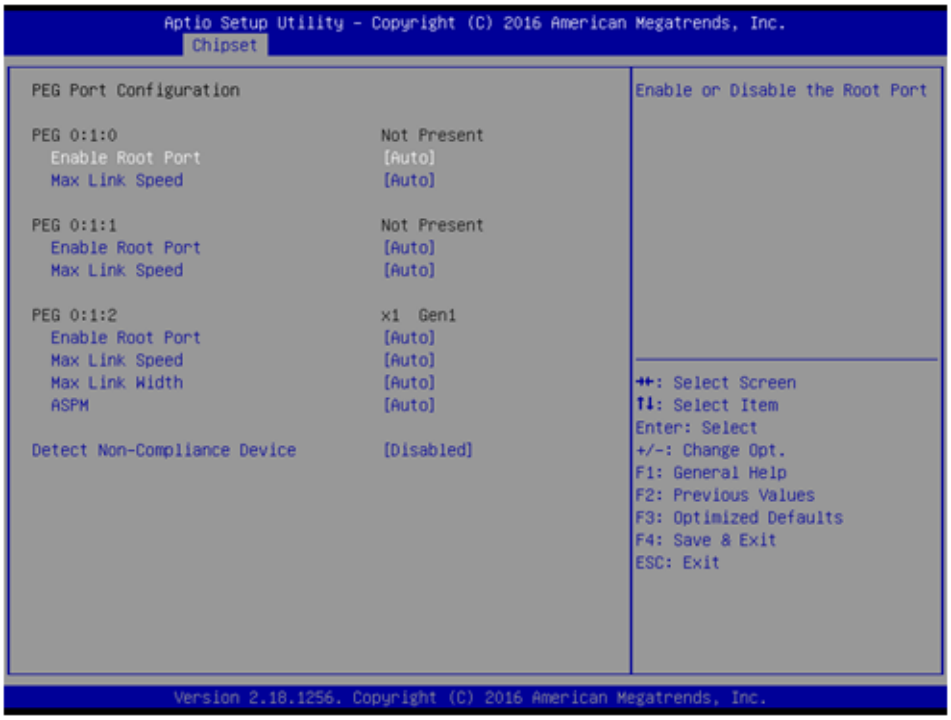
3.2.3.4 Memory Configuration Options

- **Max TOLUD**
  Maximum Value of TOLUD.

3.2.3.5 GT – Power Management Control

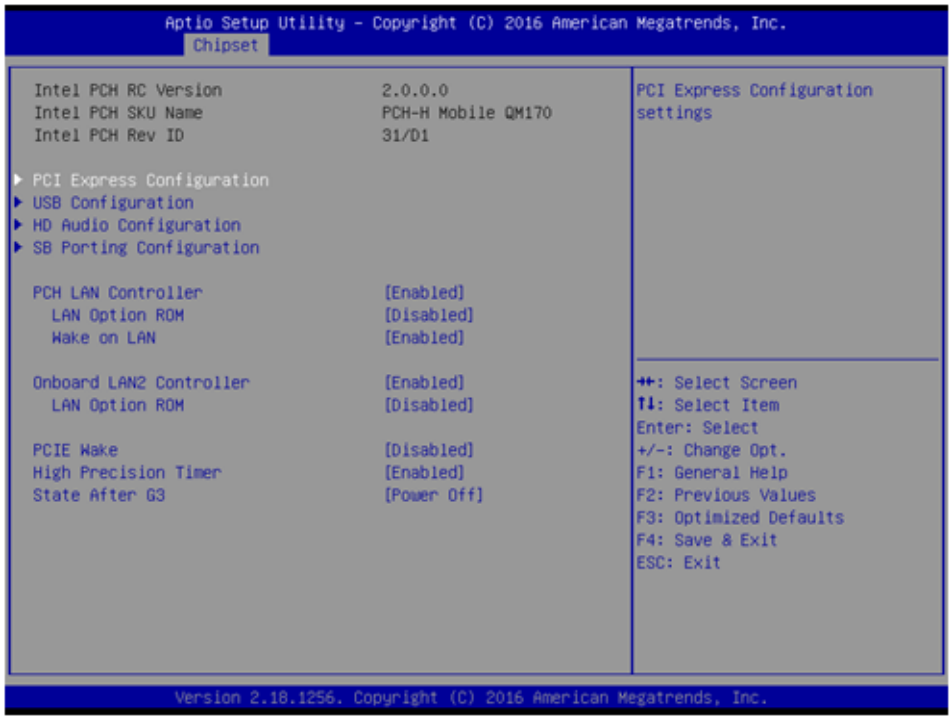
- **RC6 Render Standby)**
  Check to enable render standby support.

3.2.3.6 PEG Port Configuration



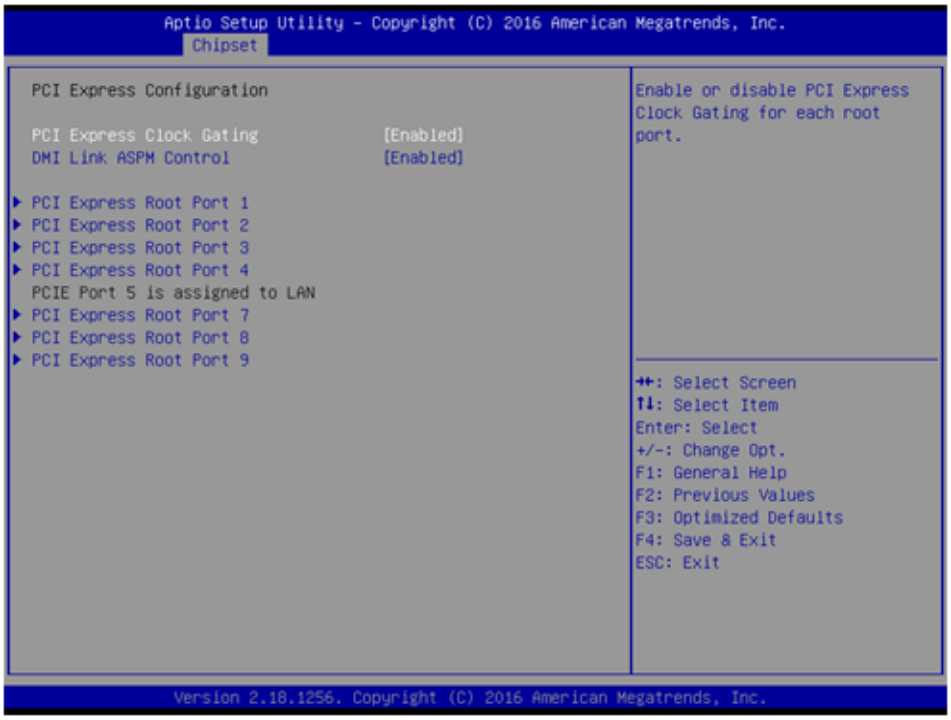
- **PEG Link and Speed Information**
- **Enable Root Port**
  Enable or Disable the Root Port.
- **Max Link Speed**
  Configure PEG Max Speed.
- **Max Link Width**
  Force PEG link to retrain to X1/2/4/8 or Auto.
- **ASPM**
  Enable PCI Express Active State Power Management settings.
- **Detect Non-Compliance Device**
  Detect Non-Compliance PCI Express Device in PEG.

3.2.3.7 PCH-IO Configuration



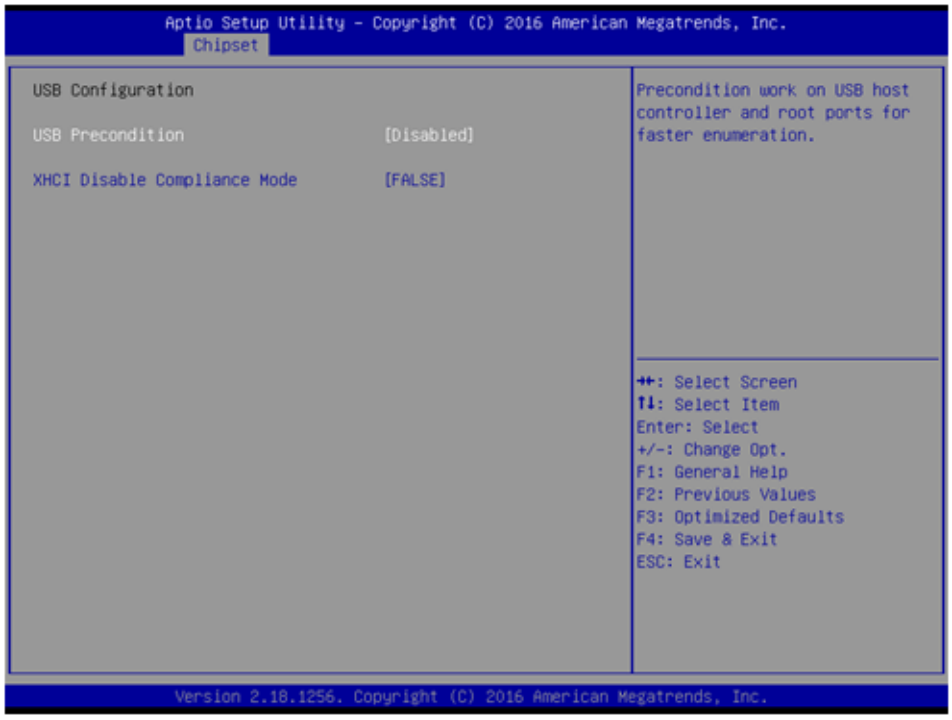
- **PCI Express Configuration**
  PCI Express Configuration Settings.
- **USB Configuration**
  USB Configuration Settings.
- **HD Audio Configuration**
  HD Audio Susbsystem Configuration Settings.
- **SB Porting Configuration**
  SB Porting Configuration Settings.
- **PCH LAN Controller**
  Enable or Disable onboard NIC.
- **LAN Option ROM**
  Enable or Disable onboard LAN's PXE option ROM.
- **Wake on LAN**
  Enable or Disable Integrated LAN to wake the system from S5.
- **Onboard LAN2 Controller**
  Enable or Disable onboard NIC.
- **LAN Option ROM**
  Enable or Disable onboard LAN's PXE option ROM.
- **PCIE Wake**
  Enable or Disable PCIE to wake the system from S5.
- **High Precision Timer**
  Enable or Disable High Precision Event Timer.
- **State After S3**
  Specify what state to go to when power is re-applied after a power failure (G3 state).

3.2.3.8 PCI Express Configuration



- **PCI Express Clock Gating**
  Enable or disable PCI Express Clock Gating for each root port.
- **DMI Link ASPM Control**
  Enable/Disable the control of Active State Power Management on SA side of the DMI Link.
- **PCI Express Root Port 1/2/3/4/7/8/9**
  PCI Express Port 1/2/3/4/7/8/9 Settings.

3.2.3.9 USB Configuration



- **USB Precondition**
  Precondition work on USB host controller and root ports for faster enumeration.
- **XHCI Disable Compliance mode**
  Option to disable Compliance Mode.

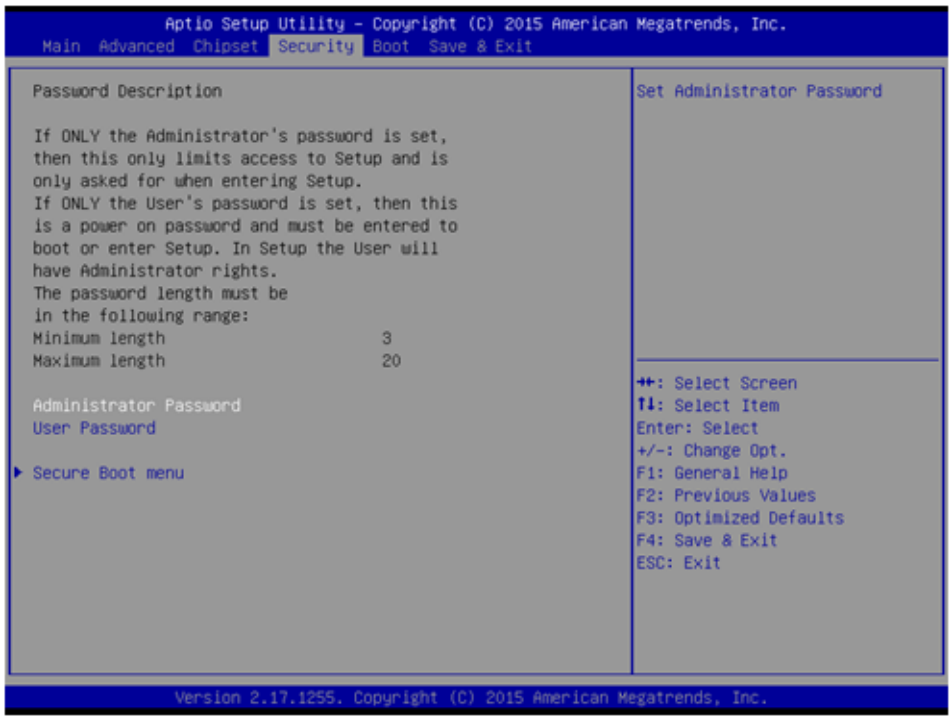
3.2.3.10 HD Audio Configuration

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

3.2.3.11 SB Porting Configuration

- **SATA RAID ROM**
  Run the Legacy ROM or UEFI Driver.

3.2.4 Security



Select Security Setup from the PCM-3365 Setup main BIOS setup menu. All Security Setup options, such as password protection and virus protection are described in this section. To access the sub menu for the following items, select the item and press <Enter>:

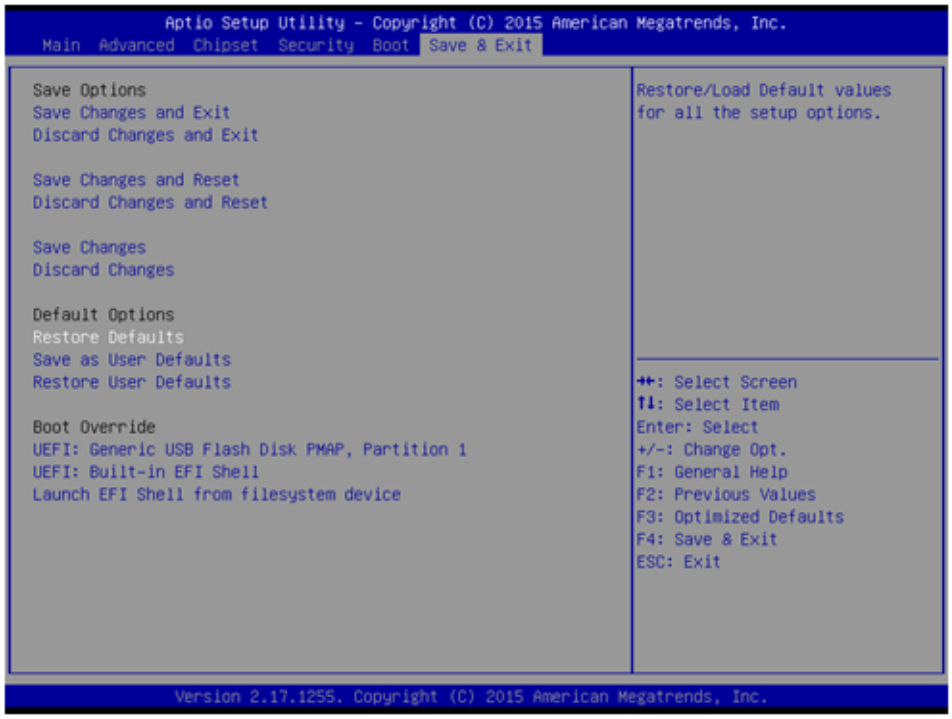
- **Change Administrator / User Password**

  Select this option and press <ENTER> to access the sub menu, and then type in the password.

3.2.5 Boot

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

3.2.6 Save & Exit



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

Appendix A

Watchdog Timer Sample Code

A.1 EC Watchdog Timer Sample Code

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

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

mov dx, EC_Data_Port
mov al, 5Fh ; Watchdog reset delay time low byte (5Eh is high byte) index, Timebase:
100ms
out dx,al

mov dx, EC_Data_Port
mov al, 64h ;Set 10 seconds delay time.
out dx,al

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

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

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

mov dx, EC_Command_Port
mov al,28h ; start WDT function. (Stop: 0x29, Reset: 0x2A)
out dx,al

.exit
```

END

Appendix B

USB 3.0 Drivers Installation Instruction

B.1 USB 3.0 Drivers Installation Instruction

For customers using Windows 7 OS, they need to install drivers to active the USB 3.0 function. Please download driver installation instructions from the Intel website. (https://downloadcenter.intel.com/download/25476/Windows-7-USB-3-0-Creator-Utility)

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