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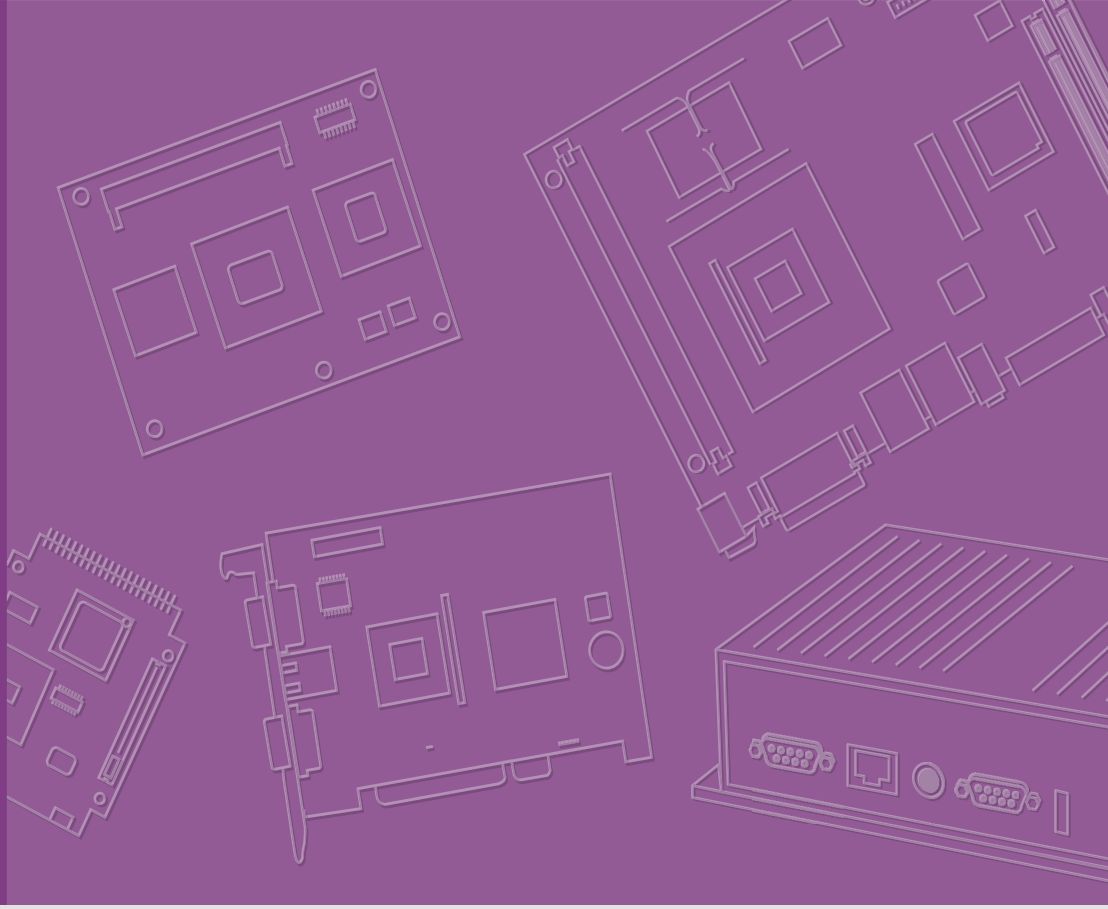
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User Manual

ARK-3500

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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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.

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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-3500 unit
- 1 x Driver/Utility CD
- 1 x Registration and 2 years Warranty card
- 1 x China RoHS
- 1 x DVI-I to VGA adaptor
- 1 x CPU thermal grease pad

Ordering Information

Model Number	Description
ARK-3500P-00A1E	Intel 3rd Gen. Core i High Performance Fanless Embedded BOX PC with 2 x PCI
ARK-3500F-00A1E	Intel 3rd Gen. Core i High Performance Fanless Embedded BOX PC with 1 x PCIe x1 and 1 x PCIe x4

Optional Accessories

Part Number	Description
1757004523-01	AC-to-DC Adaptor, DC 19V/6.32A 120W, 9NA1201410 FSP
1702002600	Power cable 3-pin 180 cm USA type
1702031801	Power cable 3-pin 180 cm UK type
1702002605	Power cable 3-pin 180 cm Europe type
1700000237	Power cable 3-pin 180 cm 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-3500 series.

1.1 Introduction

ARK-3500, an intelligent, fanless embedded system powered by Intel® Core™ i3, i5, i7 rPGA high performance processor with multiple I/O interface and with 2 slot PCI/PCIEx1/PCIEx4 card expansions.

ARK-3500 Core™ i7 CPU performance has over 178% increase compared with ARK-3440 and over 400% increase on graphics. ARK-3500 supports independent triple displays: DVI-I, HDMI and DisplayPort. It also offers 8 x COMs, 2 x GbE, 4 x USB 3.0, 2 x Mini-PCIe shared with mSATA, 2 x 2.5" SATA III storage devices, and 1 x CFast and 2 x full size mSATA.

Rugged & Multifunctional Design

ARK-3500 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 34V, wide temperature range from -10 ~ 60° C, diverse expandability options and structural strengthening. ARK-3500 enlarges the surface of the top cover and flexible thermal design for different CPU from 2nd to 3rd core i and Celeron. It also provides rich I/O interfaces: up to 2 x Intel GbE, 4 x USB 3.0, 2 x USB 2.0,2 x 2.5" HDD, 2 x mSATA, 4 x RS-232 and 4 x RS-232/422/485 COM ports.

Various Expansion Support

ARK-3500 is a flexible model which can work in different environment and applications with multiple I/O and high performance. It can support three kinds of riser cards: 2 x PCI and 1 PCIe x 1 and 1 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 & SUSIAccess

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-3500 also supports Advantech's own SUSIAccess, 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:** Supports Intel® 3rd Gen. Core™ i3/i5/i7 and Celeron® rPGA processor (up to 45W)
- **System Chipset:** Intel® QM77 I/O Controller
- **BIOS:** AMI 64-Mbit SPI Flash BIOS
- **System Memory:** DDR3 1600MHz or DDR3L 1600MHz up to 16GB
- **Watchdog Timer:** Single chip Watchdog 255-level interval timer, setup by software
- **I/O Interface:**
  - 4 x RS232, 4 x RS232/422/485
- **USB:**
  - 4 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 (9.5mm height), 1 x CFast card, and 2 x mSATA
- **Expansion Interface:** 2 x Full-size MiniPCIe with SIM holder (supports mSATA)
- **Software API:** Advantech iManager and SUSIAccess - Remote Device Management technology

1.2.2 Display

- **Controller:** Intel® HD Graphics 4000
- **Resolution:**
  - VGA: VGA Integrated in DVI-I port
  - DVI-I: 1920 x 1200 @ 60Hz
  - HDMI: Support HDMI 1.4, 1920 x 1200 @ 60Hz
  - Display Port: 2560 x 1600 @ 60Hz (Video only, and only support with 3rd gen. processor)
- **Dual Display:**
  - VGA+DVI, VGA+HDMI, VGA + DP, DVI + HDMI, DVI + DP, HDMI + DP
- **Triple Display:**
  - DVI-D + HDMI + DP (DP can't display under DOS)

1.2.3 Ethernet

- **Chipset:**
  - LAN1 Intel® 82579LM,
  - LAN2 Intel® I-210IT
- **Speed:** 10/100/1000 Mbps
- **Interface:** 2 x RJ45

1.3 Chipset

1.3.1 Functional Specification

1.3.1.1 Processor

Processor	Supports rPGA processor (up to 45W): ■ Intel® Core™ i7-3610QE 2.3GHz with 6M L3 cache ■ Intel® Core™ i5-3610ME 2.7GHz with 3M L3 cache ■ Intel® Core™ i3-3120ME 2.4GHz with 3M L3 cache ■ Intel® Celeron® 1020E 2.2GHz with 2M L3 cache
Memory	Supports DDR3 1600 MHz or DDR3L 1600MHz up to 16 GB 2 x 204-pin SODIMM socket type

1.3.1.2 Chipset

Internal Graphics Features	■ DirectX 11 and OpenGL 3.1 ■ Display Port 1.1, HDMI 1.4a ■ Supports HDCP 1.4 ■ Intel® Display Power saving technology 6.0
Video Accelerator	■ HW accelerated Media Decode: AVC/H.264, VC-1, MPEG-2 ■ HW accelerated Media Encode: AVC/H.264, MPEG-2
SATA Interface	**Intel QM77 chip supports:** ■ Supports several optional sections of Serial ATA III ■ Supports SATA transfers to 600 Mbytes/sec. ■ Integrated AHCI controller ■ Supports mSATA socket
USB Interface	**Intel QM77 chip supports:** ■ xHCI Host Controller, supporting SuperSpeed USB 3.0 ports ■ Two EHCI 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 QM77 chip supports:** ■ Supports ACPI 4.0a ■ ACPI-defined power states (processor driven C states) ■ ACPI Power Management Timer ■ SMI# generation
BIOS	**Intel QM77 chip supports:** ■ AMI 64-Mbit EFI Flash BIOS via SPI

1.3.1.3 Others

Serial ports	**ITE 8518 & SMSC SCH3106 supports:** ■ Up to 8 serial ports. ■ Supports IRQ Sharing among serial ports under Microsoft Windows OS ■ COM1, COM2, COM5, COM6: RS-232 ■ COM3, COM4, COM7, COM8: RS-232/422/485
Ethernet	**LAN1 Intel 82579LM, LAN2 Intel I-210IT** ■ Supports 10/100/1000 Mbps. ■ LAN Connectors: Phone Jack RJ45 8P 90D(F)

Audio	**Audio Codec: Realtek ALC892:** ■ 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

290[11.4] x 110[42.9] x 232[9.13] (Unit: mm [Inch])

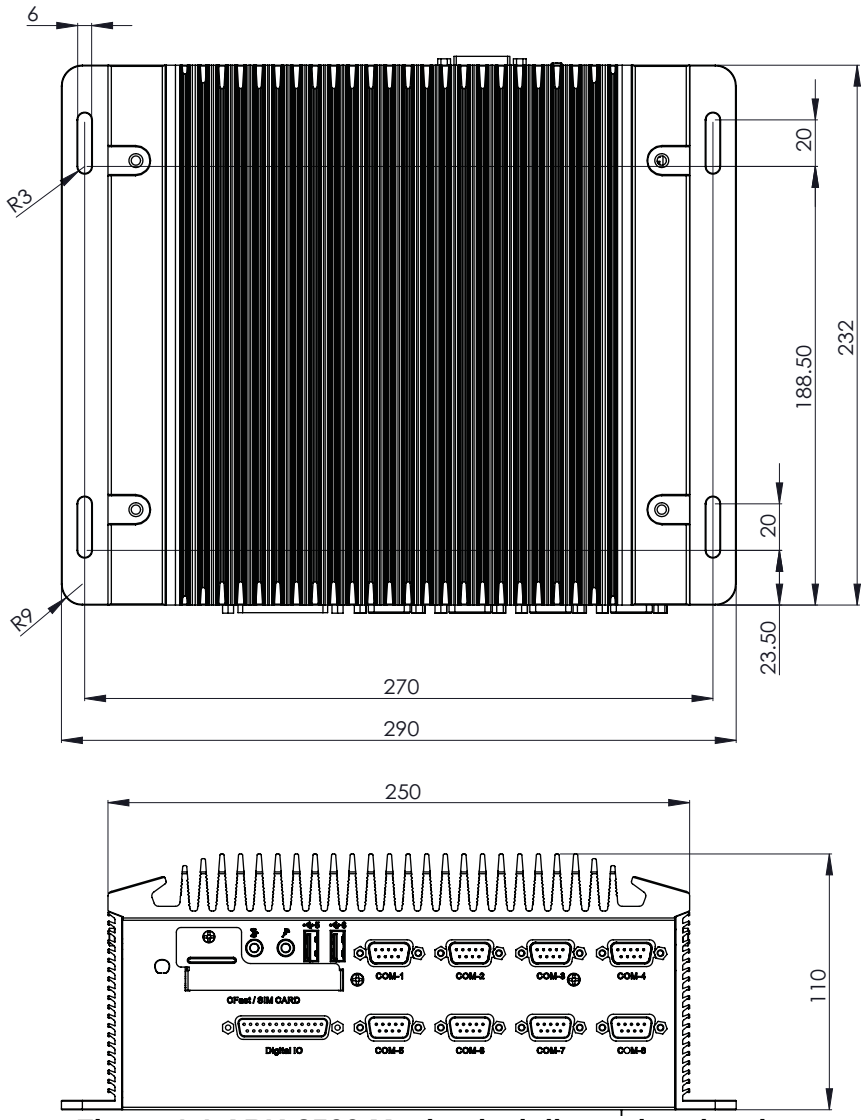


Figure 1.1 ARK-3500 Mechanical dimension drawing

1.4.2 Weight

4.8kg (10.58lb)

1.5 Power Requirement

1.5.1 System Power

- **Minimum power input:**
  - ARK-3500: DC19V / 6.32A

1.5.2 RTC Battery

- Lithium 3 V/210 mAH

1.6 Environment Specification

1.6.1 Operating Temperature

- **With Industrial Grade SSD/Cfast:** -10 ~ 60° C (-14~140° 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: 50G, IEC 60068-2-27

1.6.6 Safety

- UL, CCC, BSMI

1.6.7 EMC

- CE, FCC, CCC, BSMI

Chapter 2

Hardware Configuration

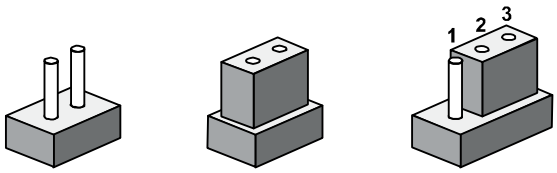
2.1 Introduction

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

2.2 Jumpers

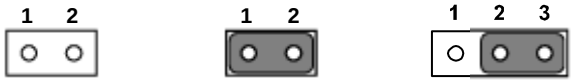
2.2.1 Jumper Description

You may configure ARK-3500 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 of Main Board	
J1	DDR3/DDR3L Setting
J2	Auto Power On Setting
J3	COM4 RS232/422/485 Setting
J4	COM3 RS232/422/485 Setting
J5	COM4 RS232/422/485 Setting
J6	COM3 RS232/422/485 Setting
J7	COM4 RS232/422/485 Setting
J8	COM3 RS232/422/485 Setting
J9	Clear CMOS

2.2.3 Jumper Locations

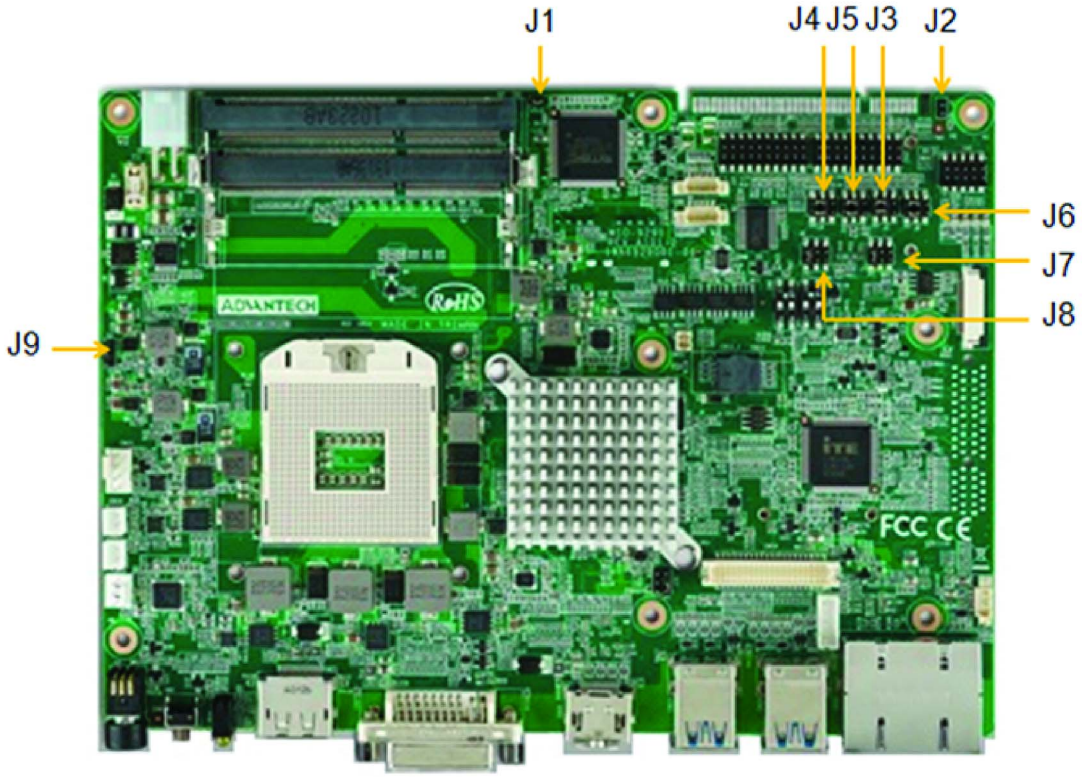


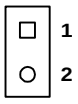
Figure 2.1 Jumper Layout

2.2.4 Jumper Settings

On Motherboard

2.2.4.1 DDR3/DDR3L setting (J1)

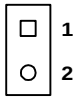
J1	DDR3/DDR3L Setting
Part Number	1653002101
Footprint	HD_2x1P_79_D
Description	
Setting	Function
NC	DDR3 Memory module (Default)
(1-2)	DDR3L Memory module



2.2.4.2 Auto Power On Setting (J2)

J2	Auto Power On Setting
Part Number	1653002101
Footprint	HD_2x1P_79_D
Description	
Setting	Function

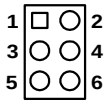
NC	Power Button for Power On (Default)
(1-2)	Auto Power On



2.2.4.3 COM4 RS232/422/485 setting (J3)

* Please check J5/J7 for COM4 RS232/422/485 setting as well

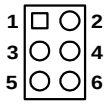
J3	**COM4 RS232/422/485 Setting**
Part Number	1653003260
Footprint	HD_3x2P_79
Description	
Setting	Function
(1-3)*(2-4)	COM4 RS232 (Default)
(3-5)*(4-6)	COM4 RS422/485



2.2.4.4 COM3 RS232/422/485 setting (J4)

* Please check J6/J8 for COM3 RS232/422/485 setting as well

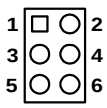
J4	**COM3 RS232/422/485 Setting**
Part Number	1653003260
Footprint	HD_3x2P_79
Description	
Setting	Function
(1-3)*(2-4)	COM3 RS232 (Default)
(3-5)*(4-6)	COM3 RS422/485



2.2.4.5 COM4 RS232/422/485 setting (J5)

* Please check J3/J7 for COM4 RS232/422/485 setting as well

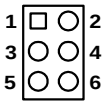
J5	**COM4 RS232/422/485 Setting**
Part Number	1653003260
Footprint	HD_3x2P_79
Description	
Setting	Function
(1-3)*(2-4)	COM4 RS232 (Default)
(3-5)*(4-6)	COM4 RS422/485



2.2.4.6 COM3 RS232/422/485 setting (J6)

* Please check J4/J8 for COM3 RS232/422/485 setting as well

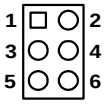
J6	COM3 RS232/422/485 Setting
Part Number	1653003260
Footprint	HD_3x2P_79
Description	
Setting	Function
(1-3)*(2-4)	COM3 RS232 (Default)
(3-5)*(4-6)	COM3 RS422/485



2.2.4.7 COM4 RS232/422/485 setting (J7)

* Please check J3/J5 for COM4 RS232/422/485 setting as well

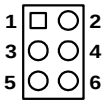
J7	COM4 RS232/422/485 Setting
Part Number	1653003260
Footprint	HD_3x2P_79
Description	
Setting	Function
(1-2)	COM4 RS232 (Default)
(3-4)	COM4 RS485
(5-6)	COM4 RS422



2.2.4.8 COM3 RS232/422/485 setting (J8)

* Please check J4/J6 for COM3 RS232/422/485 setting as well

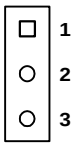
J8	COM3 RS232/422/485 Setting
Part Number	1653003260
Footprint	HD_3x2P_79
Description	
Setting	Function
(1-2)	COM3 RS232 (Default)
(3-4)	COM3 RS485
(5-6)	COM3 RS422



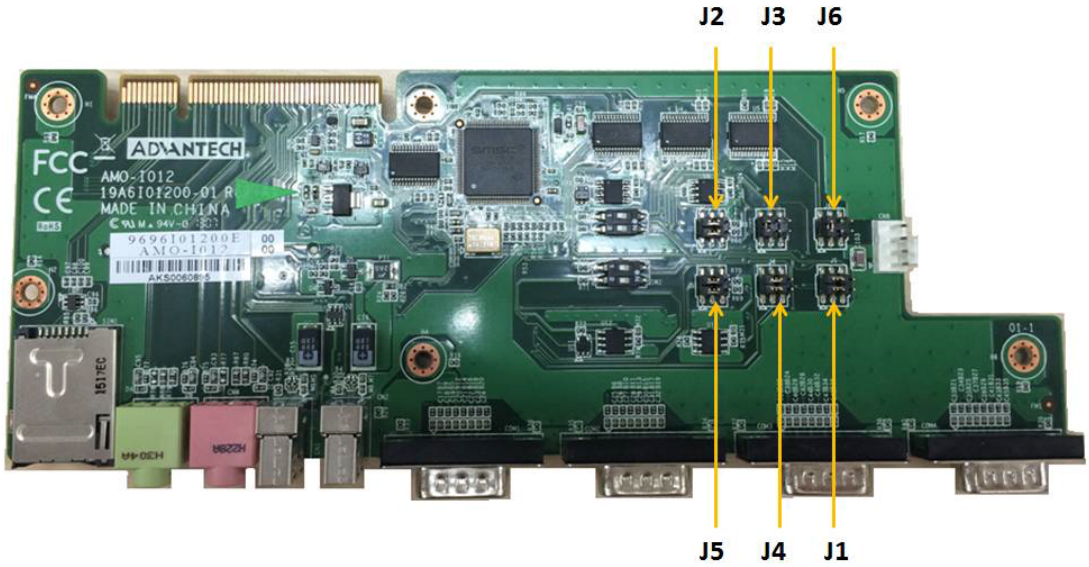
2.2.4.9 Clear CMOS (J9)

J9	Clear CMOS
Part Number	1653003101
Footprint	HD_3x1P_79_D

Description	
Setting	Function
(1-2)	Normal (Default)
(2-3)	Clear CMOS



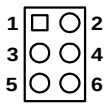
AMO-I012



2.2.4.10 COM7 RS232/422/485 setting (J1) on AMO-I012

* Please check J2/J3 on AMO-I012 for COM7 RS232/422/485 setting as well.

J1	PH_3x2V_S2.00mm
Part Number	1653003260
Footprint	HD_3x2P_79
Description	
Setting	Function
(1-3)*(2-4)	COM7 RS232
(3-5)*(4-6)	COM7 RS422/485

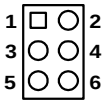


2.2.4.11 COM7 RS232/422/485 setting (J2) on AMO-I012

* Please check J1/J3 on AMO-I012 for COM7 RS232/422/485 setting as well.

J2	PH_3x2V_S2.00mm
Part Number	1653003260
Footprint	HD_3x2P_79
Description	

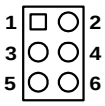
Setting	Function
(1-3)*(2-4)	COM7 RS232
(3-5)*(4-6)	COM7 RS422/485



2.2.4.12 COM7 RS232/422/485 setting (J3) on AMO-I012

* Please check J1/J2 on AMO-I012 for COM7 RS232/422/485 setting as well.

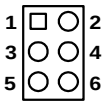
J3	**PH_3x2V_S2.00mm**
Part Number	1653003260
Footprint	HD_3x2P_79
Description	
Setting	Function
(1-2)	COM7 RS232
(3-4)	COM7 RS485
(5-6)	COM7 RS422



2.2.4.13 COM8 RS232/422/485 setting (J4) on AMO-I012

* Please check J5/J6 on AMO-I012 for COM8 RS232/422/485 setting as well.

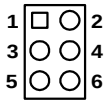
J4	**PH_3x2V_S2.00mm**
Part Number	1653003260
Footprint	HD_3x2P_79
Description	
Setting	Function
(1-3)*(2-4)	COM7 RS232
(3-5)*(4-6)	COM7 RS422/485



2.2.4.14 COM8 RS232/422/485 setting (J5) on AMO-I012

* Please check J4/J6 on AMO-I012 for COM8 RS232/422/485 setting as well.

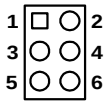
J5	**PH_3x2V_S2.00mm**
Part Number	1653003260
Footprint	HD_3x2P_79
Description	
Setting	Function
(1-3)*(2-4)	COM7 RS232
(3-5)*(4-6)	COM7 RS422/485



2.2.4.15 COM8 RS232/422/485 setting (J6) on AMO-I012

* Please check J4/J5 on AMO-I012 for COM8 RS232/422/485 setting as well.

J6	PH_3x2V_S2.00mm
Part Number	1653003260
Footprint	HD_3x2P_79
Description	
Setting	Function
(1-2)	COM7 RS232
(3-4)	COM7 RS485
(5-6)	COM7 RS422



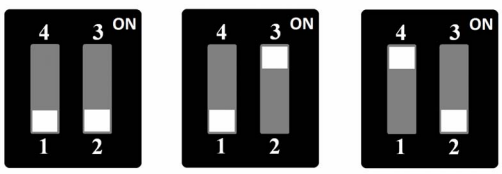
2.3 Switch

2.3.1 Switch List

Table 2.2: Jumper List for Main Board	
SW1	COM4 RS485 Termination PU/PD
SW2	COM3 RS485 Termination PU/PD
SW5	PCIe/mSATA selection
SW6	PCIe/mSATA selection

2.3.1.1 COM4 RS485 Termination PU/PD

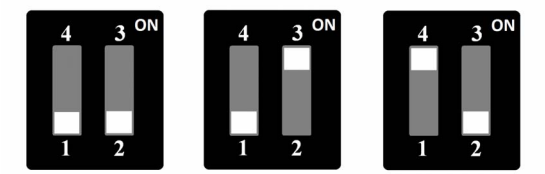
SW1	COM4 RS485 Termination PU/PD
Part Number	1600003089-01
Footprint	SW_2x2P_100_198x378
Description	
Setting	Function
(OFF)1*(OFF)2	NO TERMINATION (Default)
(OFF)1*(ON)3	TERMINATION PU
(OFF)2*(ON)4	TERMINATION PD



(OFF)1*(OFF)2 (OFF)1*(ON)3 (OFF)2*(ON)4

2.3.1.2 COM3 RS485 Termination PU/PD

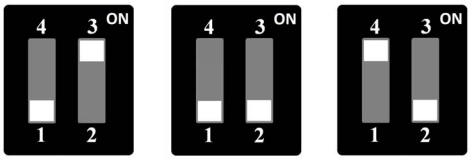
SW2	COM3 RS485 Termination PU/PD
Part Number	1600003089-01
Footprint	SW_2x2P_100_198x378
Description	
Setting	Function
(OFF)1*(OFF)2	NO TERMINATION (Default)
(OFF)1*(ON)3	TERMINATION PU
(OFF)2*(ON)4	TERMINATION PD



(OFF)1*(OFF)2 (OFF)1*(ON)3 (OFF)2*(ON)4

2.3.1.3 PCIE/mSATA Selection

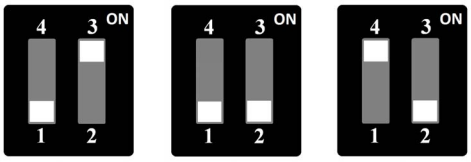
SW5	PCIE/mSATA Selection
Part Number	1600003089-01
Footprint	SW_2x2P_100_198x378
Description	
Setting	Function
(OFF)1*(ON)3	AUTO-DETECTION (Default)
(OFF)1*(OFF)2	PCIE CARD
(OFF)2*(ON)4	mSATA



(OFF)1*(ON)3 (OFF)1*(OFF)2 (OFF)2*(ON)4

2.3.1.4 PCIE/mSATA Selection

SW6	PCIE/mSATA Selection
Part Number	1600003089-01
Footprint	SW_2x2P_100_198x378
Description	
Setting	Function
(OFF)1*(ON)3	AUTO-DETECTION (Default)
(OFF)1*(OFF)2	PCIE CARD
(OFF)2*(ON)4	mSATA



(OFF)1*(ON)3 (OFF)1*(OFF)2 (OFF)2*(ON)4

2.4 Connectors

2.4.1 ARK-3500 External I/O Locations

ARK-3500 Front IO Panel

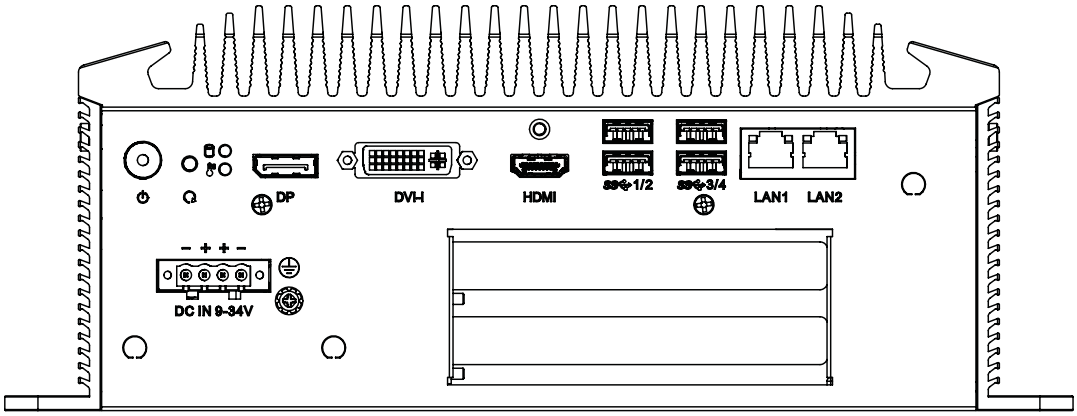


Figure 2.2 ARK-3500 Front IO connector drawing

ARK-3500 Rear IO Panel

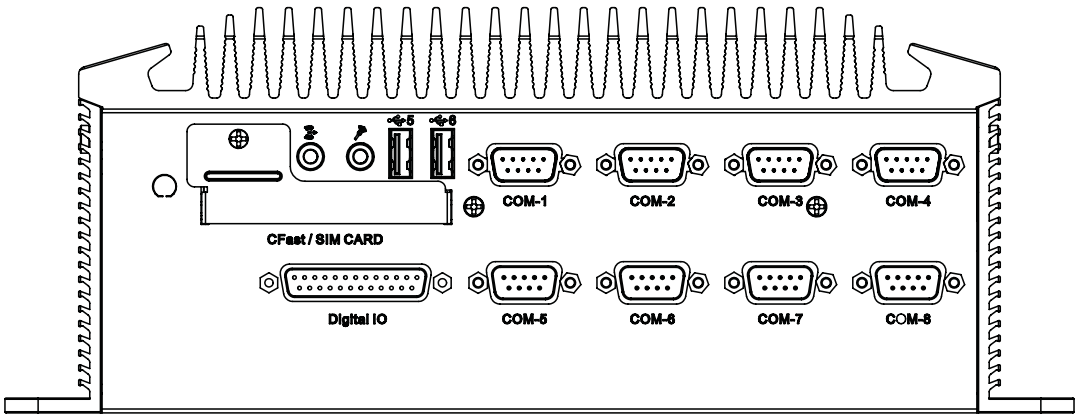


Figure 2.3 ARK-3500 Rear IO connector drawing

2.4.2 ARK-3500 Front I/O connectors

2.4.2.1 Audio Connector

ARK-3500 offers stereo audio ports by three phone jack connectors of Line_Out, Mic_In. The audio chip is controlled by ALC892.

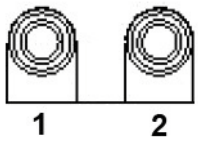


Figure 2.4 Audio connector

Table 2.3: Audio Connector Pin Assignments	
Pin	**Audio Signal Name**
1	Line out
2	Mic in

2.4.2.2 USB2.0 Connector

ARK-3500 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. 2.7 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 BIOS setting, please refer to BIOS setting chapter 3.3.10)

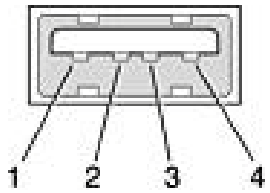


Figure 2.5 USB2.0 connector

Table 2.4: USB 2.0 Connector			
Pin	**Signal Name**	**Pin**	**Signal Name**
1	+5V	2	USB_data-
3	USB_data+	4	GND

2.4.2.3 COM Connector

ARK-3500 provides up to eight D-sub 9-pin connectors, which offers RS-232/422/485 serial communication interface ports. Default setting is RS-232, if you want to use RS-422/485, please refer to the jumper setting pages. The BIOS setting of RS-232/422/485 can be found in Chapter 3.3.8 & 3.3.9.

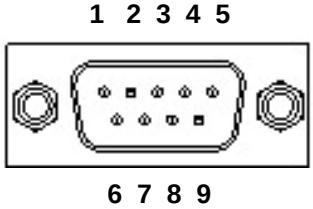


Figure 2.6 COM connector

Table 2.5: 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

2.4.2.4 DIO Connector

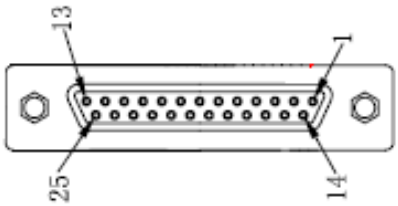


Table 2.6: DIO Connector Pin Assignments			
Pin	**Signal Name**	**Pin**	**Signal Name**
1	Port0 D0	14	Port1 D0
2	Port0 D1	15	Port1 D1
3	Port0 D2	16	Port1 D2
4	Port0 D3	17	Port1 D3
5	Port0 D4	18	Port1 D4
6	Port0 D5	19	Port1 D5
7	Port0 D6	20	Port1 D6
8	Port0 D7	21	Port1 D7
9	GND	22	GND
10	+5V	23	+5V
11	NC	24	NC
12	NC	25	NC
13	NC		

Note! *NC represents "No Connection".*

2.4.3 ARK-3500 Rear I/O connectors

2.4.3.1 Power On/Off Button

ARK-3500 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 2.7 Power ON/OFF Button

2.4.3.2 Reset Button

ARK-3500 has a Reset button on the front panel. Press the button to activate the reset function.

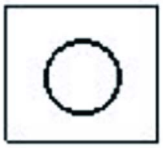


Figure 2.8 Reset Button

2.4.3.3 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 and compact flash disk status.



Figure 2.9 LED Indicators

2.4.3.4 DisplayPort Connector

An integrated, 20-pin receptacle connector DisplayPort Interface is provided. The DisplayPort link supports resolutions up to 2560 x 1600@60Hz. This port is transferred by Intel eDP, there is no audio and hot plug support. And this DisplayPort support by 3rd Gen Intel Core i processor only.

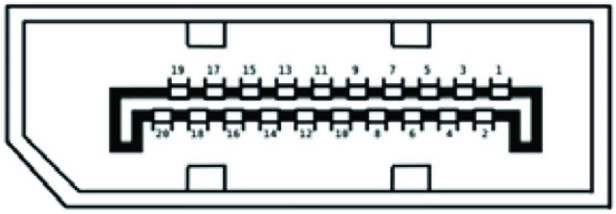


Figure 2.10 DisplayPort connector

Table 2.7: DisplayPort Connector pin assignments			
Pin	**Signal Name**	**Pin**	**Signal Name**
1	ML_Lane 0 (p)	2	GND
3	ML_Lane 0 (n)	4	ML_Lane 1 (p)
5	GND	6	ML_Lane 1 (n)
7	ML_Lane 2 (p)	8	GND
9	ML_Lane 2 (n)	10	ML_Lane 3 (p)
11	GND	12	ML_Lane 3 (n)
13	GND	14	GND
15	AUX CH (p)	16	GND
17	AUX CH (n)	18	Hot Plug
19	GND	20	DP_PWR

2.4.3.5 Digital Visual Interface Connector (DVI-I)

The ARK-3500 offers an integrated D-sub 24-pin female DVI-I Digital Visual Interface connector; it carries integrated analog and digital video signals. This supports high-speed, high-resolution digital displays and traditional analog displays.

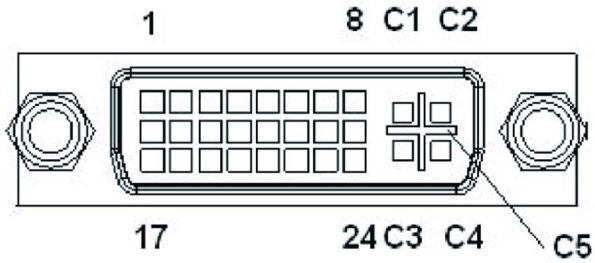


Figure 2.11 DVI-I Connector

Table 2.8: DVI-I Connector pin assignments			
Pin	**Signal Name**	**Pin**	**Signal Name**
1	TMDS Data 2-	2	TMDS Data 2+
3	TMDS Data 2/4 shield	4	TMDS Data 4-
5	TMDS Data 4+	6	DDC clock
7	DDC data	8	Analog vertical sync
9	TMDS Data 1-	10	TMDS Data 1+
11	TMDS Data 1/3 shield	12	TMDS Data 3-
13	TMDS Data 3+	14	+5V
15	GND	16	Hot plug detect
17	TMDS Data 0-	18	TMDS Data 0+
19	TMDS Data 0/5 shield	20	TMDS Data 5-
21	TMDS Data 5+	22	TMDS clock shield
23	TMDS clock+	24	TMDS clock-
C1	Analog red	C2	Analog green
C3	Analog blue	C4	Analog horizontal sync
C5	Analog GND		

2.4.3.6 HDMI Connector

An integrated, 19-pin receptacle connector HDMI Type A Interface is provided. The HDMI link supports resolutions up to 1920 x 1200 @ 60 Hz.

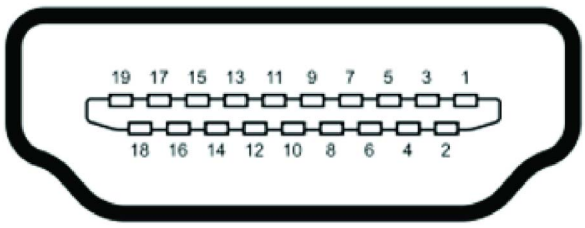


Figure 2.12 HDMI receptacle connector

Table 2.9: 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		

2.4.3.7 USB3.0 Connector

The USB port USB port 1, 2, 3, 4 of ARK-3500 supports USB3.0 interface, which gives complete Plug & Play and hot swapping for up to 127 external devices. The USB interface complies with USB UHCI, Rev. 3.0. Please refer to Table. 2.7 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 (both sets reside in the same connector).

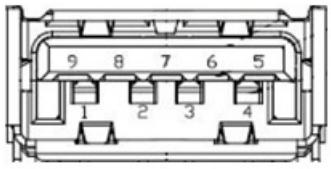


Figure 2.13 USB3.0 Connector

Table 2.10: USB 3.0 Connector

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+		

2.4.3.8 Ethernet Connector (LAN)

ARK-3500 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).

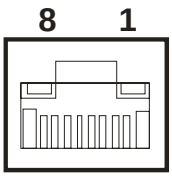


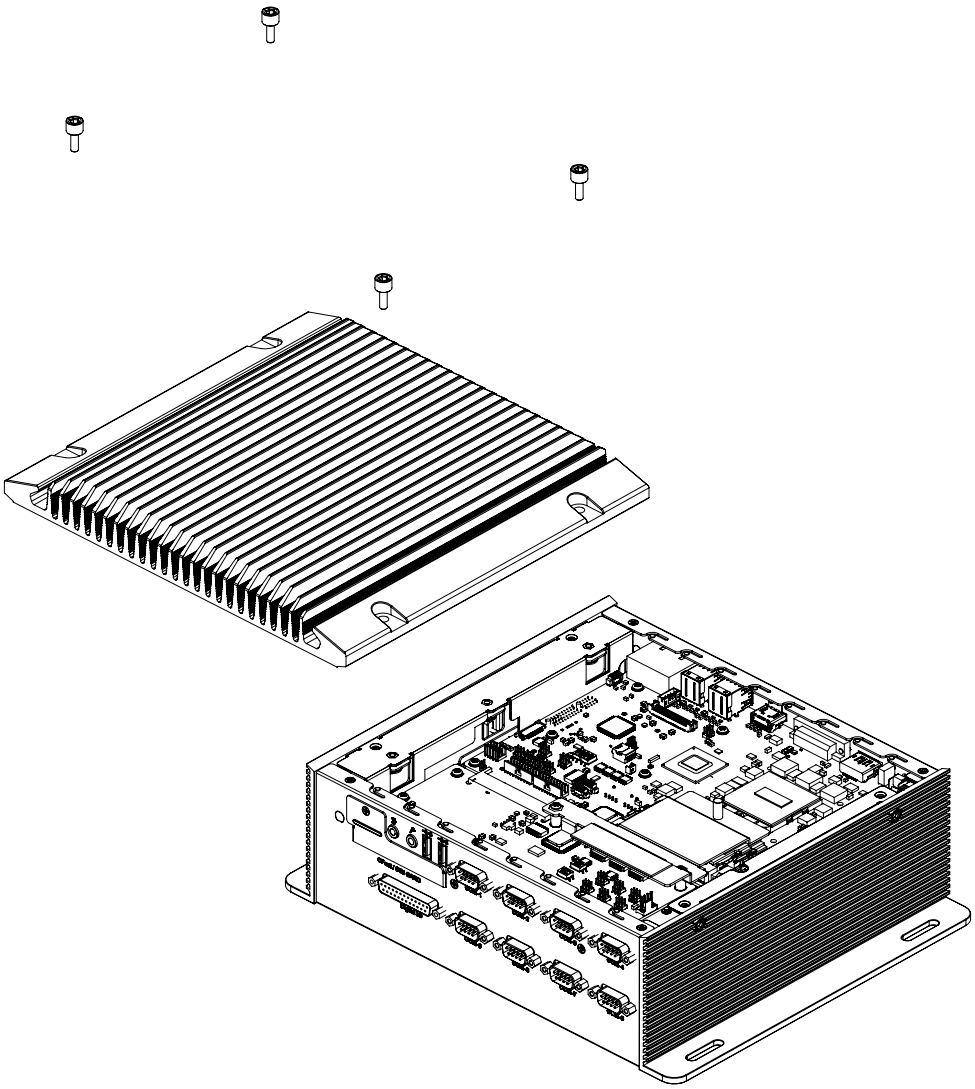
Figure 2.14 Ethernet connector

Table 2.11: 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-

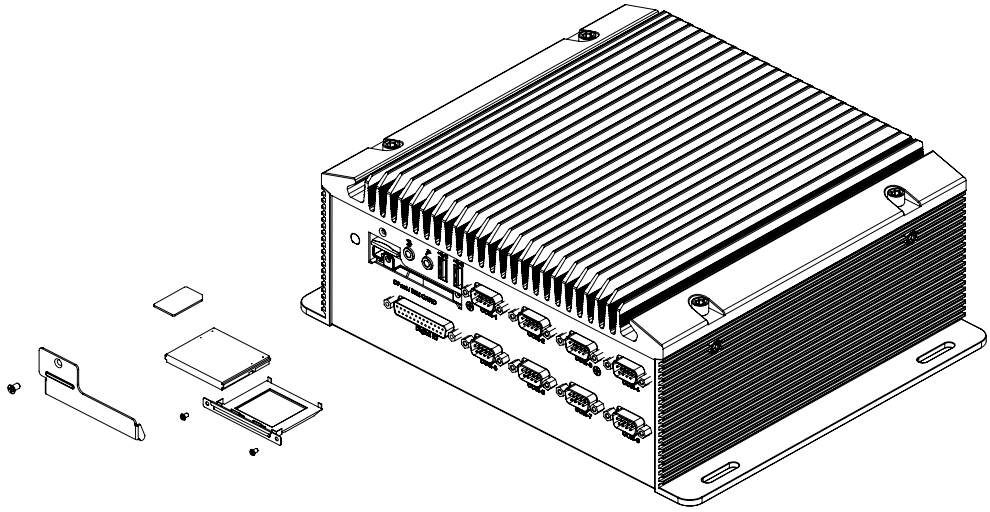
2.5 Installation

2.5.1 CPU / Memory Installation



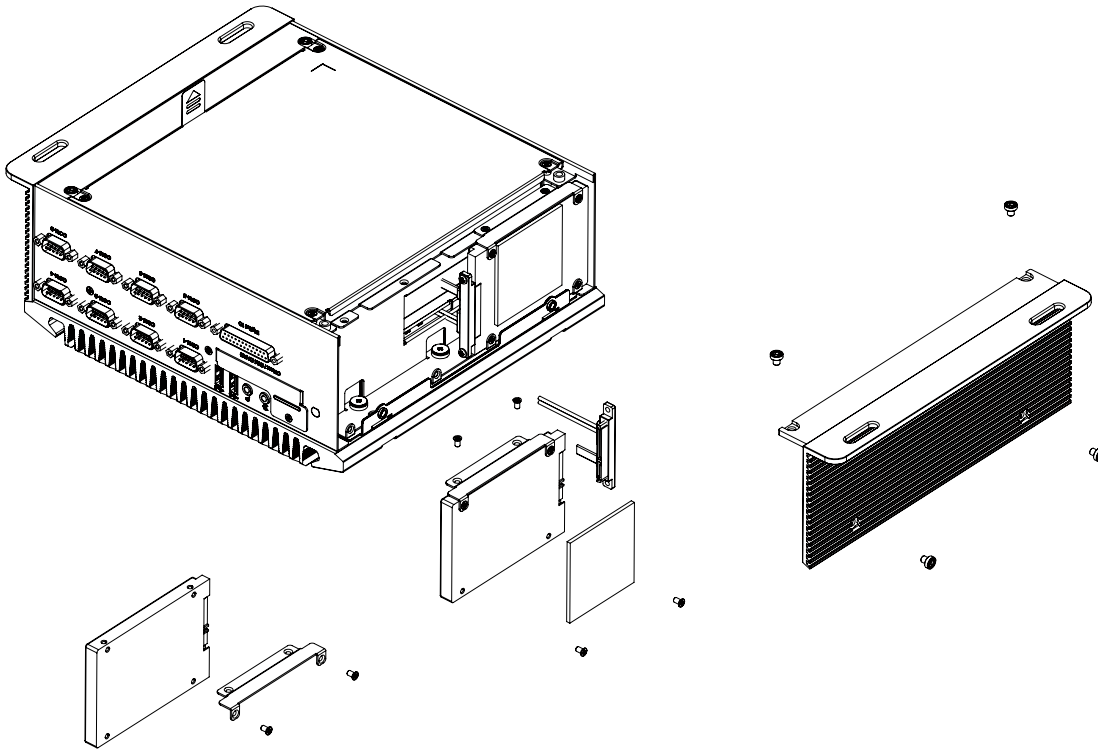
1. Unscrew the 4 screws on the top, and remove the top cover.
2. Install the CPU onto the socket, and turn the special actuator screw to lock it on the socket.
3. Unscrew the 2 screws on the memory bracket.
4. Install the memory onto the system.
5. Screw the 2 screws back into the memory bracket on the M/B.
6. Replace the top chassis.

2.5.2 CFast / SIM Installation



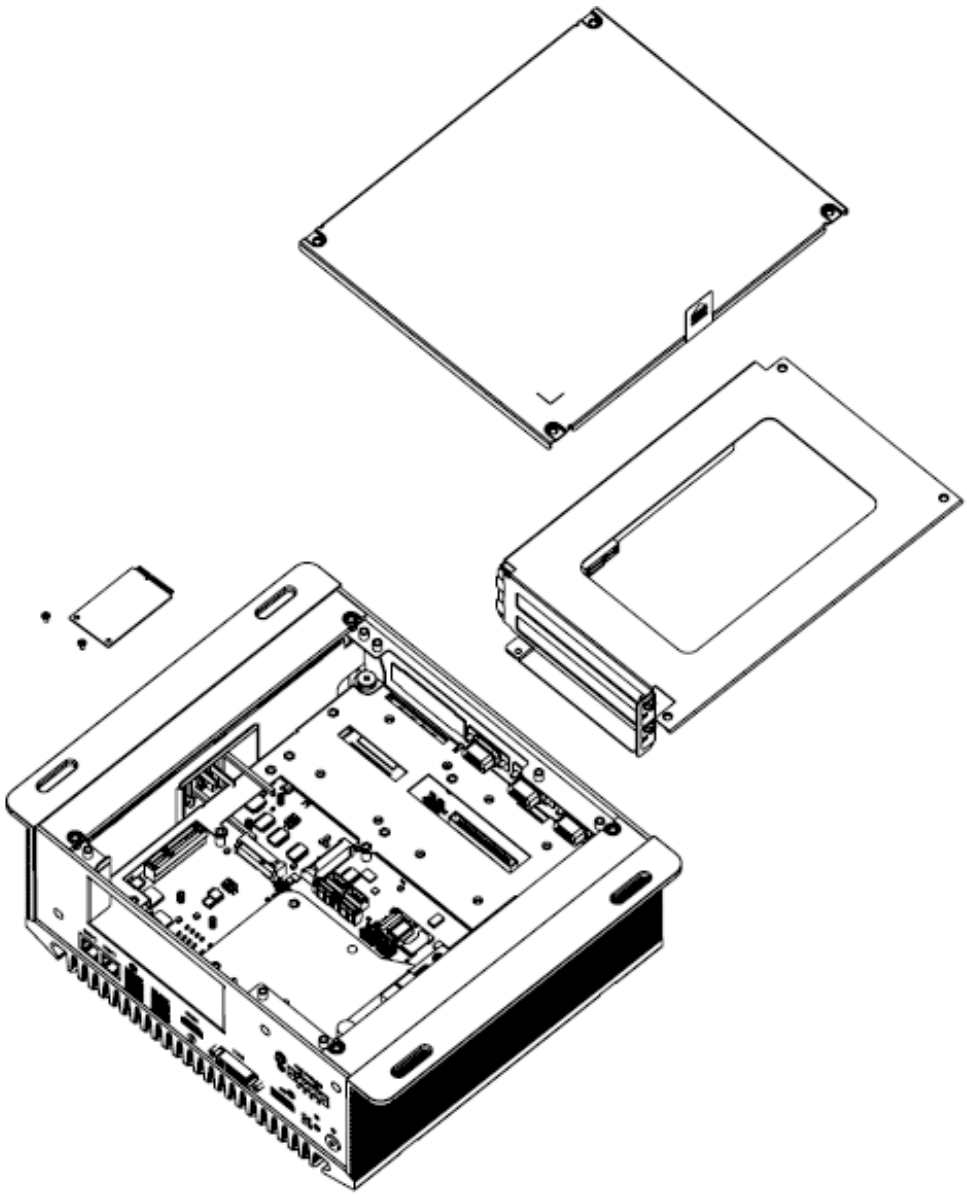
1. Unscrew the 1 screw on the cover of front panel.
2. Unscrew the 2 screws on the CFast bracket.
3. Pull the bracket out and remover the dummy card.
4. Put the CFast card on the bracket, and push the bracket back into the system.
5. Screw the 2 screws back to the CFast bracket with the system.
6. Push the SIM card in the SIM holder (Link to miniPCIe CN38 slot).
7. Screw the cover back onto the front panel.

2.5.3 HDD/SSD Installation

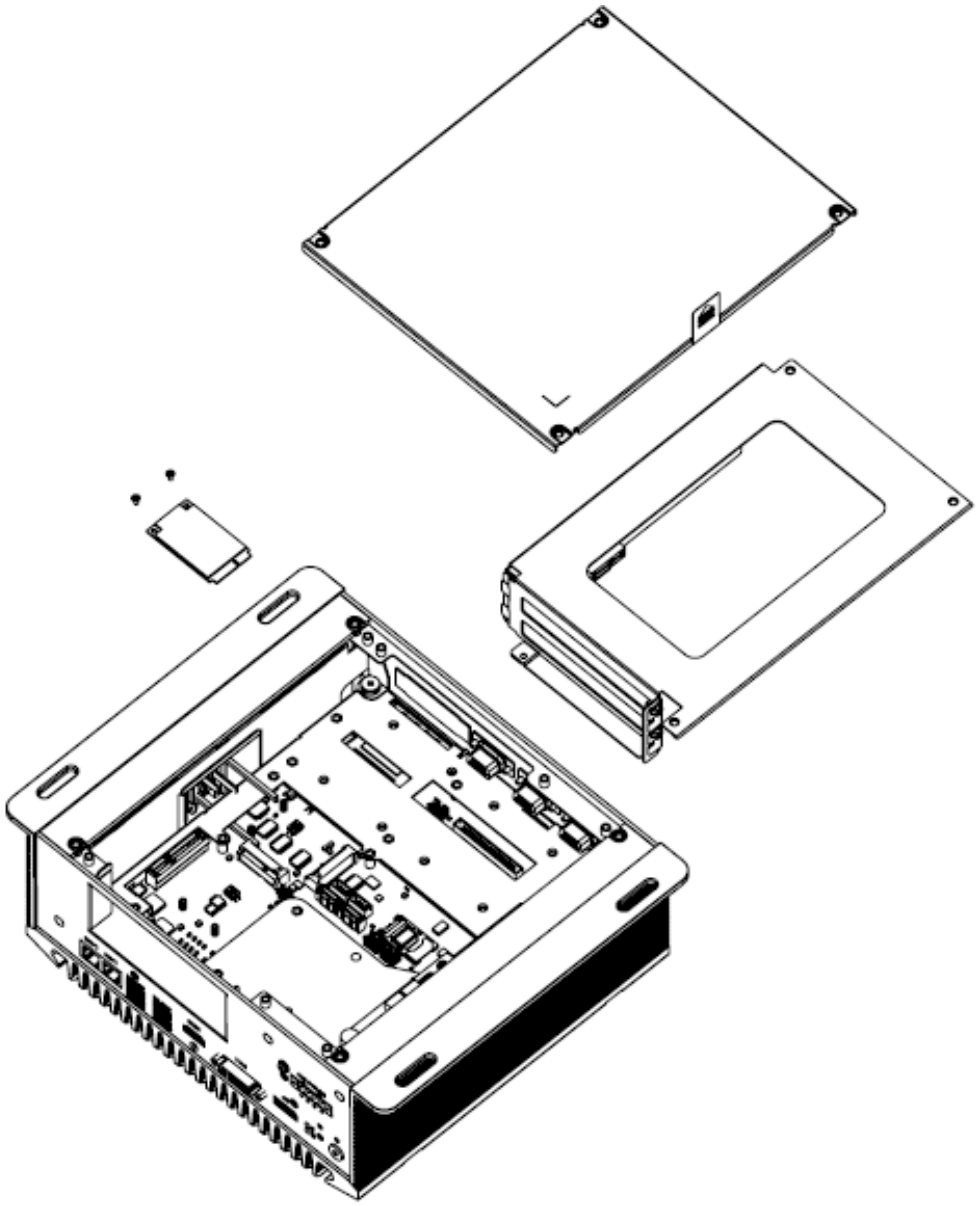


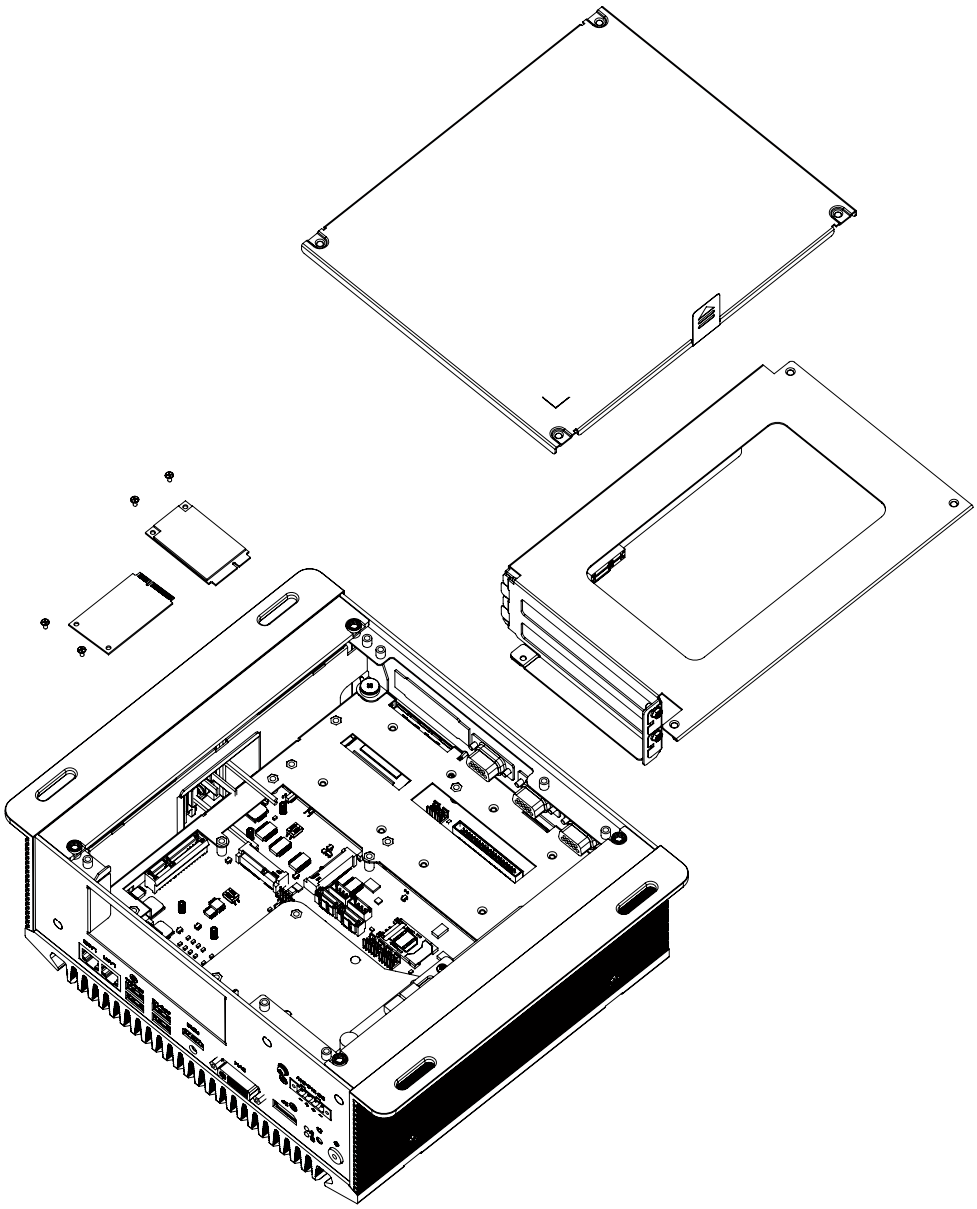
1. Unscrew 4 screws on the side heatsink cover.
2. Connect the cable to the SSD/HDD and put SSD/HDD on the bracket.
3. Screw 4 screws back onto the system.
4. Screw the side cover back on.

2.5.4 MiniPCIe module / Internal SIM holder Installation



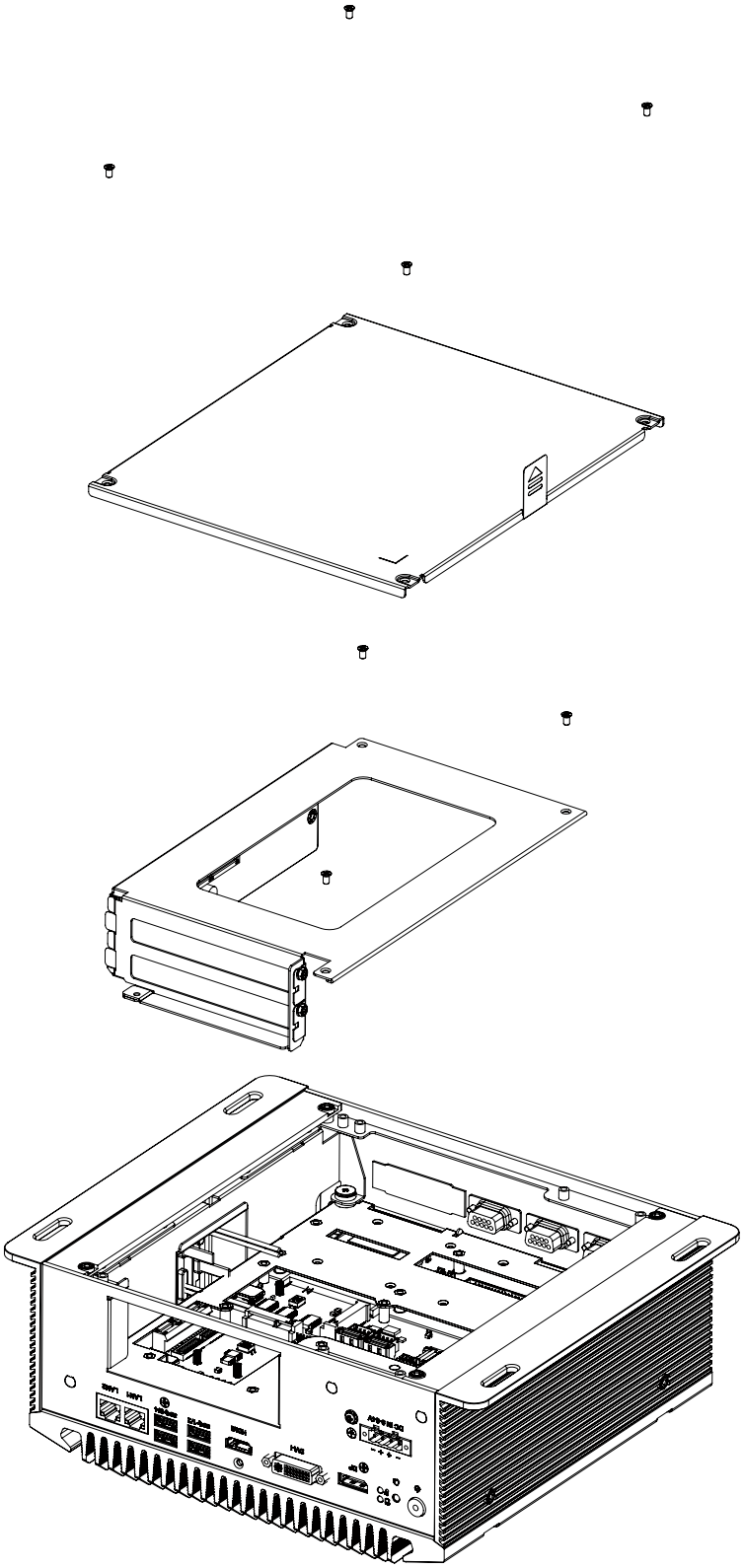
1. Unscrew 4 screws on the bottom cover and remove it.
2. Unscrew 3 screws on the bracket.
3. Install the miniPCIe module (CN38) and screw 2 screws. (This module is connected to front panel SIM holder)



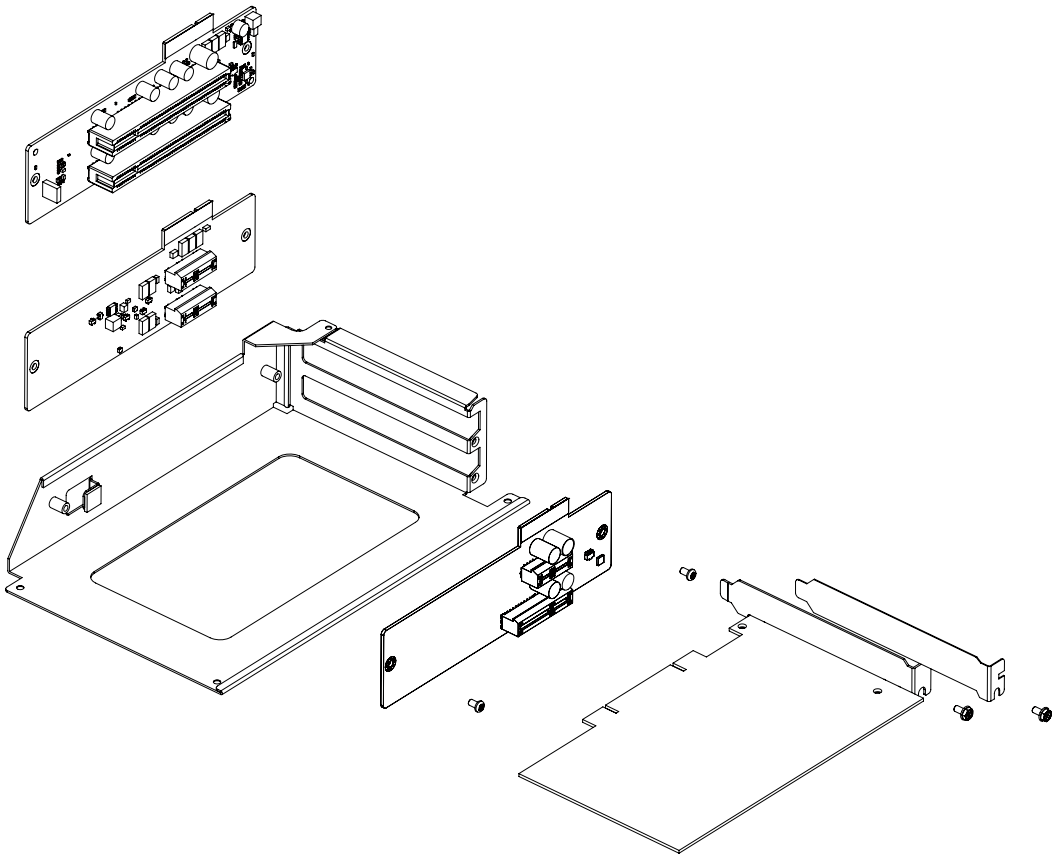


4. Install the mPCIe module (CN29) and screw in the 2 screws. (This module is connected to inner SIM holder CN36 SIM1)
5. Screw the bracket back on.
6. Screw the top cover back on.

2.5.5 Riser Card Installation



1. Unscrew 4 screws on the bottom side.
2. Unscrew 3 screws on the bracket.



3. Unscrew 1 screw on card bracket.
4. Repeat step3 if needed.
5. Unscrew 2 screws on the board.
6. Install the PCI or PCIe device on the board and screw on the bracket.
7. Screw the board back.
8. Screw the bracket back.
9. Screw the bottom side back.

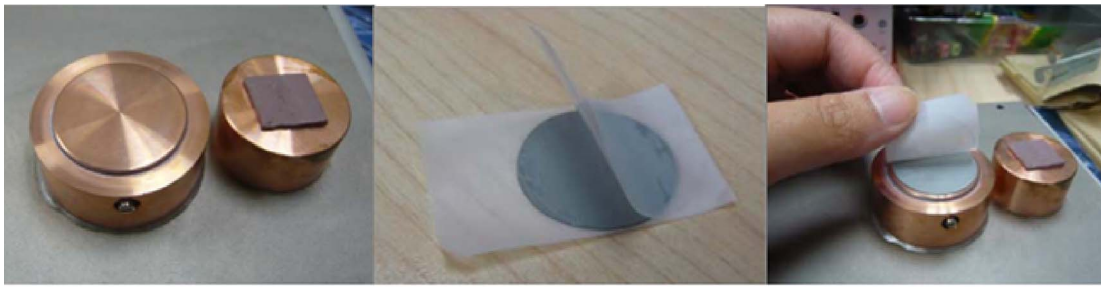
2.5.6 CPU thermal Grease Pad

CPU thermal grease pad is one of the key components of ARK-3500 thermal design. Always use the grease pad provided by Advantech. The P/N of the grease pad is:

Part Number	Description
1990020828N001	Thermal-Pad D27*0.25 K=3 TP HW-PCM45Fφ27*0.25

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.



2.5.7 Memory thermal Pad

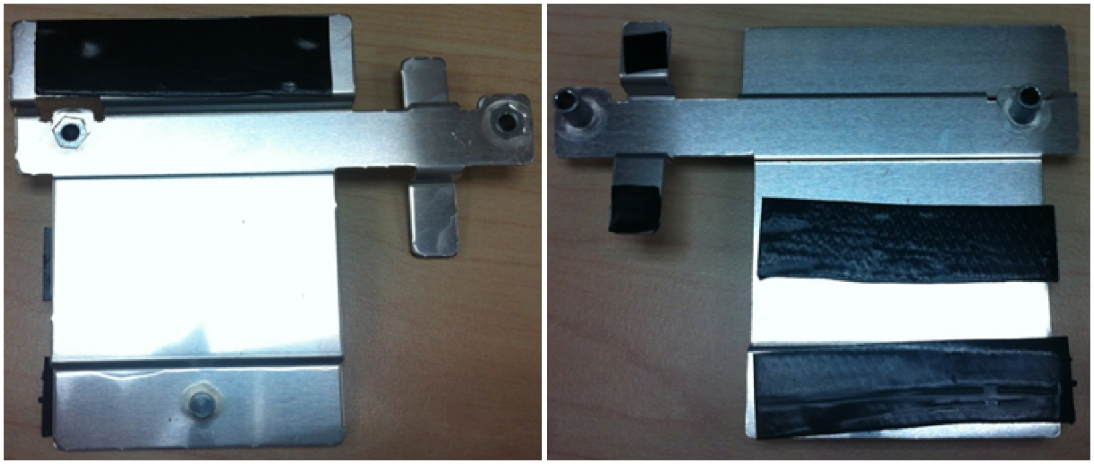
Memory thermal pad is one of the key components of ARK-3500 thermal design.

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

Part Number	Description
1990018953T001	Thermal-Pad 59X16X1.0mm K=1.2 TP Fujipoly XR-HI

To ensure the best thermal performance, please always make sure the memory thermal pad is well taped between the memory bracket and memory module. And please make sure the memory thermal pad is well taped between the memory bracket and top cover as well.

And we suggest you choose the I-grade memory module if you will use the unit in a high temperature operating environment.



2.5.8 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

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-3500 BIOS setup screens.

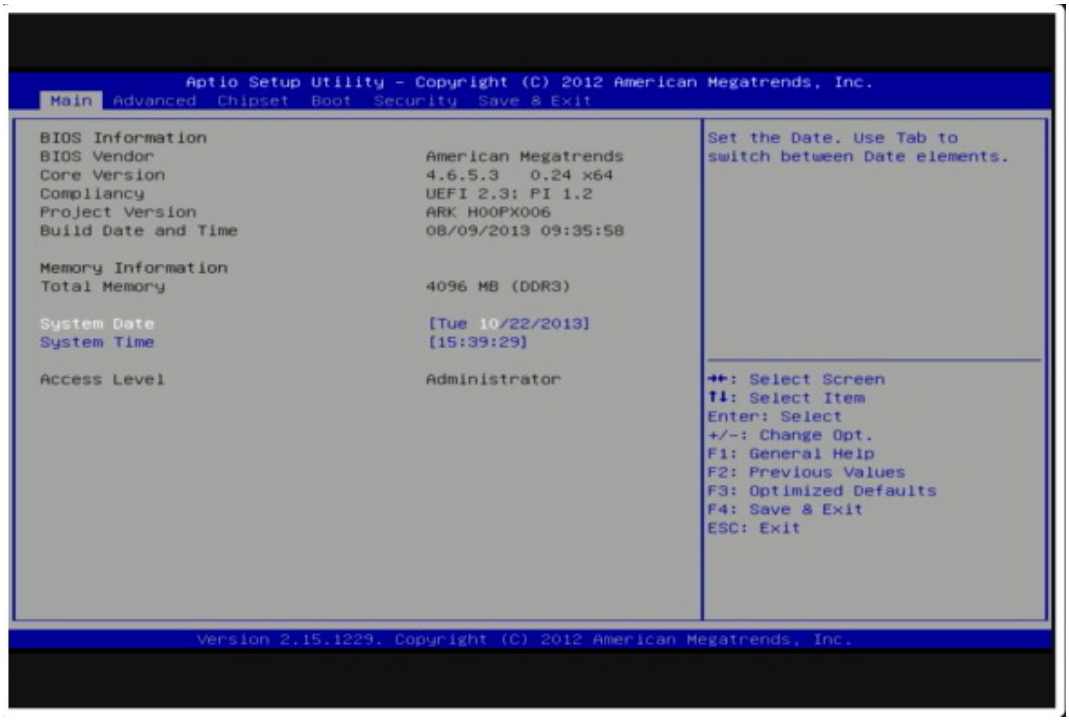


Figure 3.1 Setup program initial screen

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.

3.1 Entering Setup

Turn on the computer and then press <F2> or <DEL> to enter Setup menu.

3.2 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.

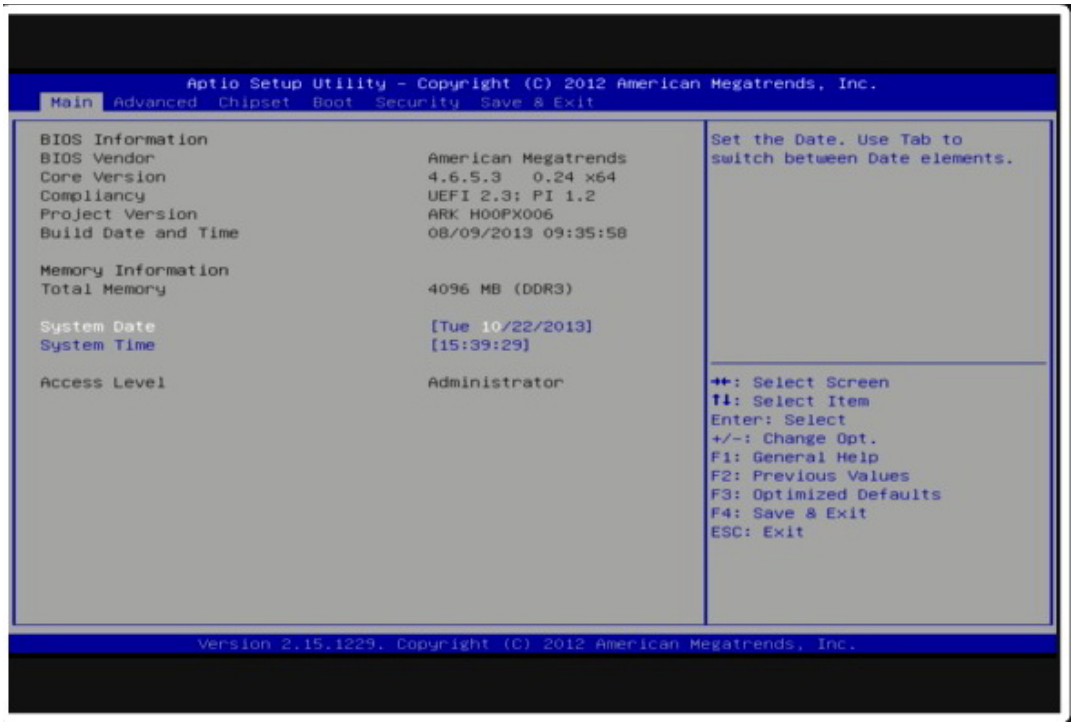


Figure 3.2 Main setup screen

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.

3.2.1 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.

3.3 Advanced BIOS Features Setup

Select the Advanced tab from the ARK-3500 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.

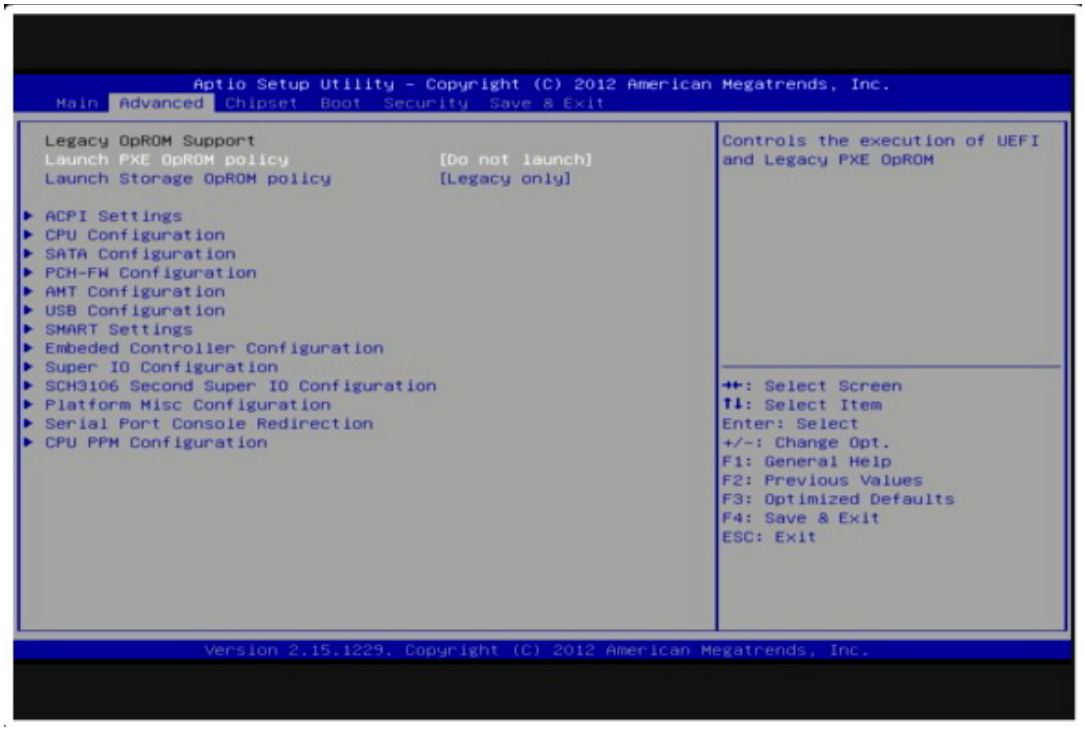


Figure 3.3 Advanced BIOS features setup screen

3.3.1 ACPI Settings

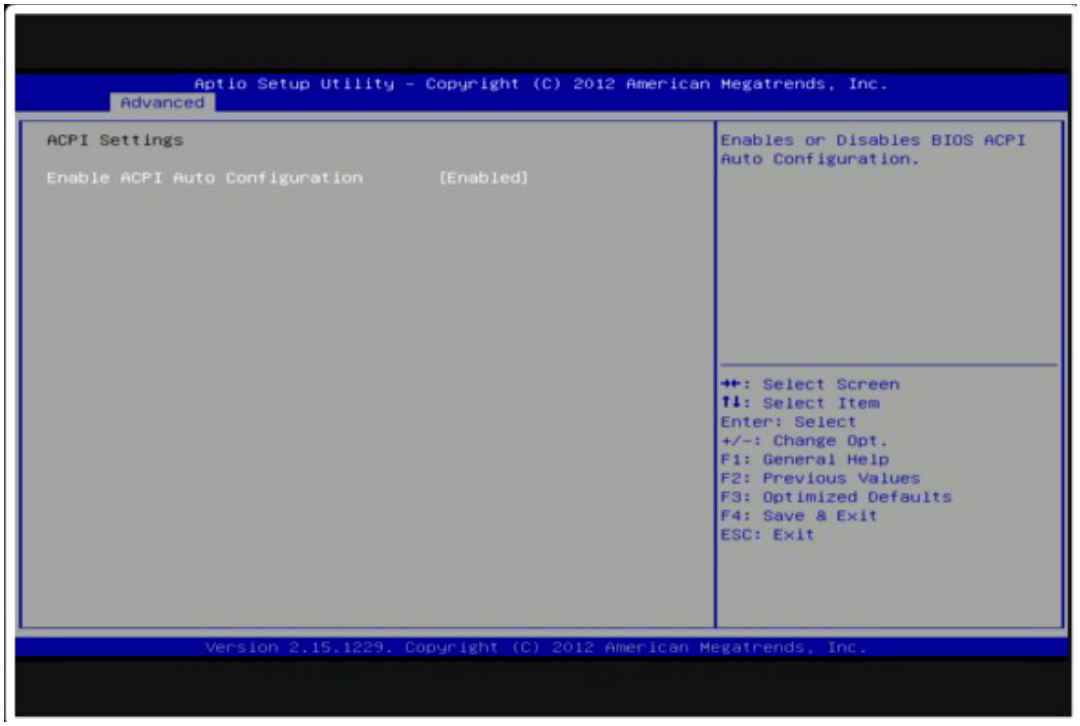


Figure 3.4 ACPI Setting

Enable ACPI Auto Configuration

This item allows users to enable or disable BIOS ACPI auto configuration.

3.3.2 CPU Configuration

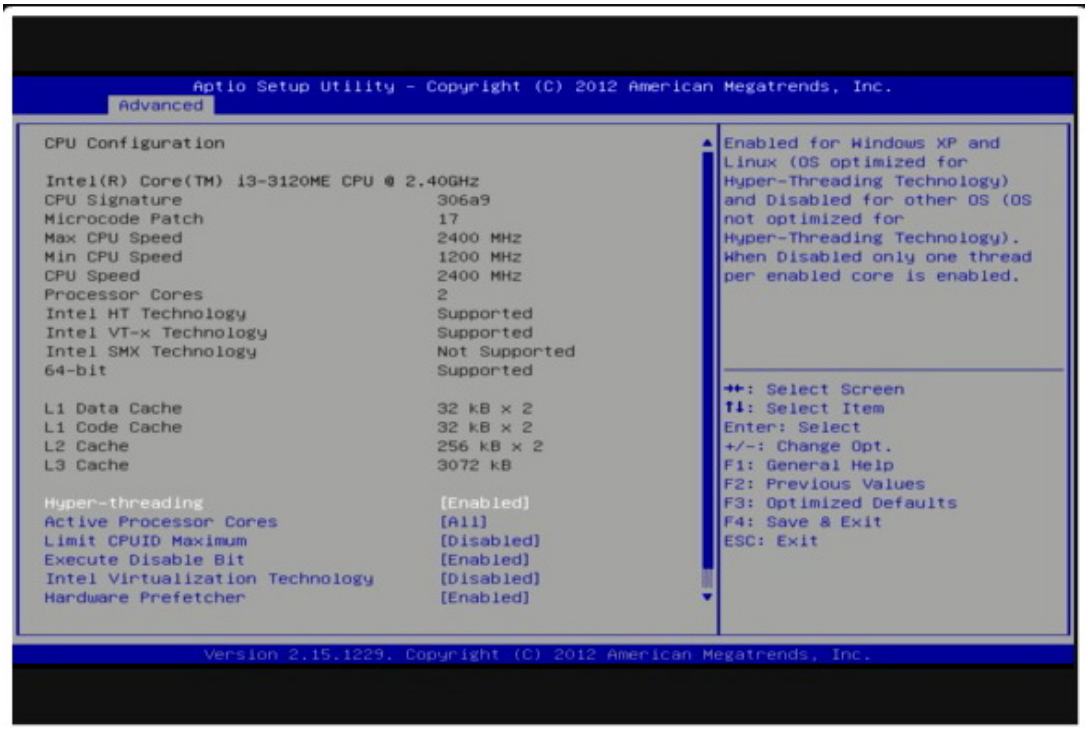


Figure 3.5 CPU Configuration

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.

Limit CPUID Maximum

This item allows users to limit the maximum value of CPUID.

Execute Disable Bit

This item allows users to enable or disable the No-Execution page protection technology.

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.

3.3.3 SATA Configuration

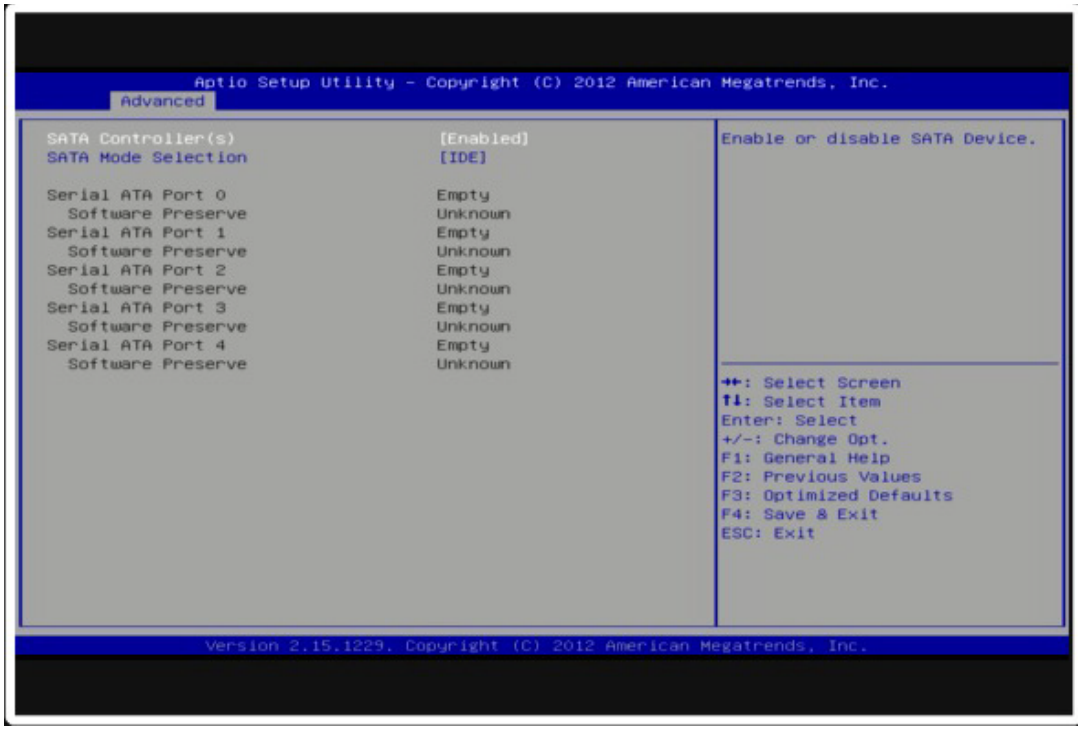


Figure 3.6 SATA Configuration: IDE Mode (Default)

SATA Controller(s)

This item allows users to enable or disable the SATA controller(s).

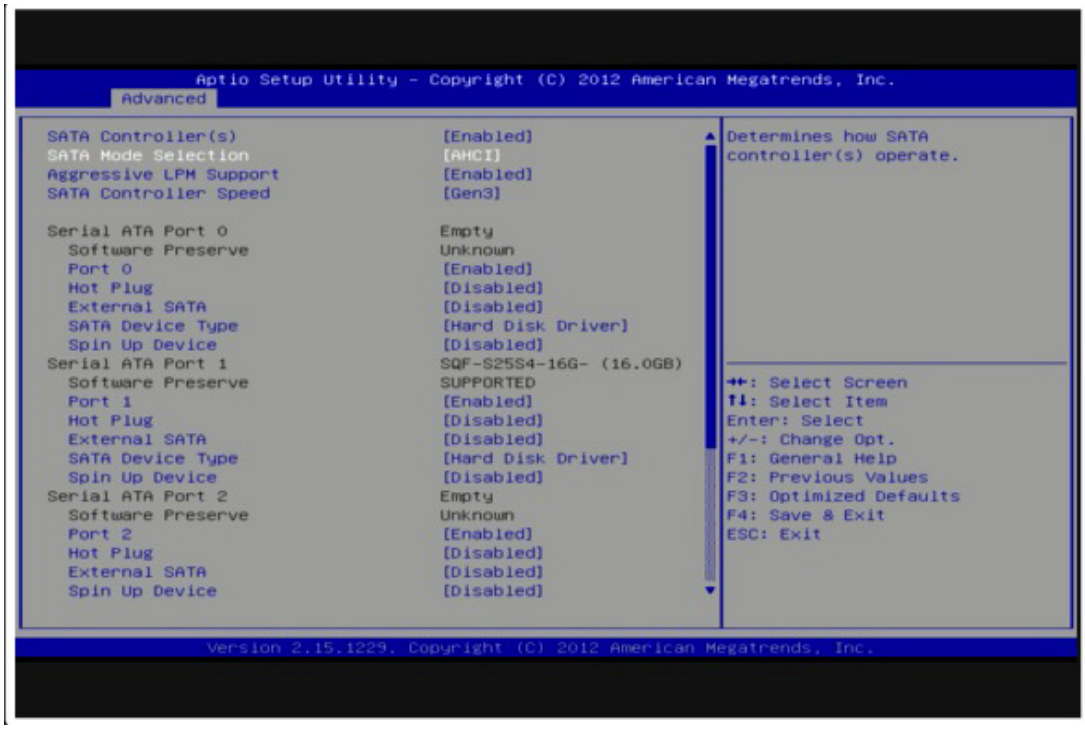


Figure 3.7 SATA Configuration: AHCI Mode

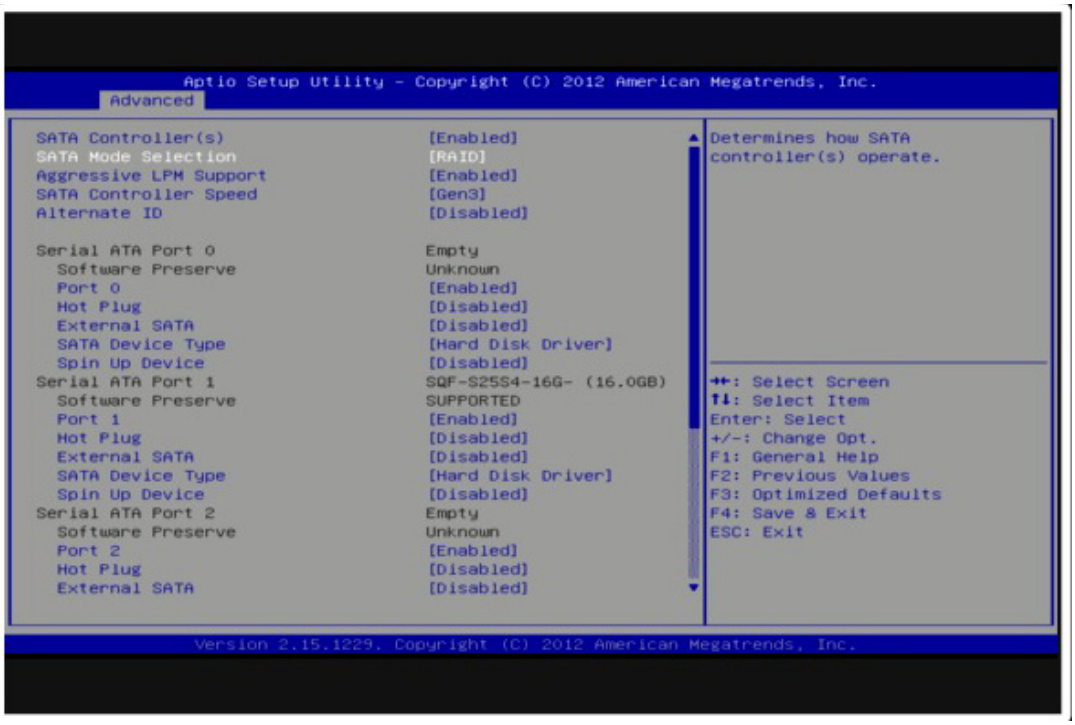


Figure 3.8 SATA Configuration: RAID Mode

SATA Mode Selection

This item allows users to select mode of SATA controller(s).

3.3.4 PCH-FW Configuration

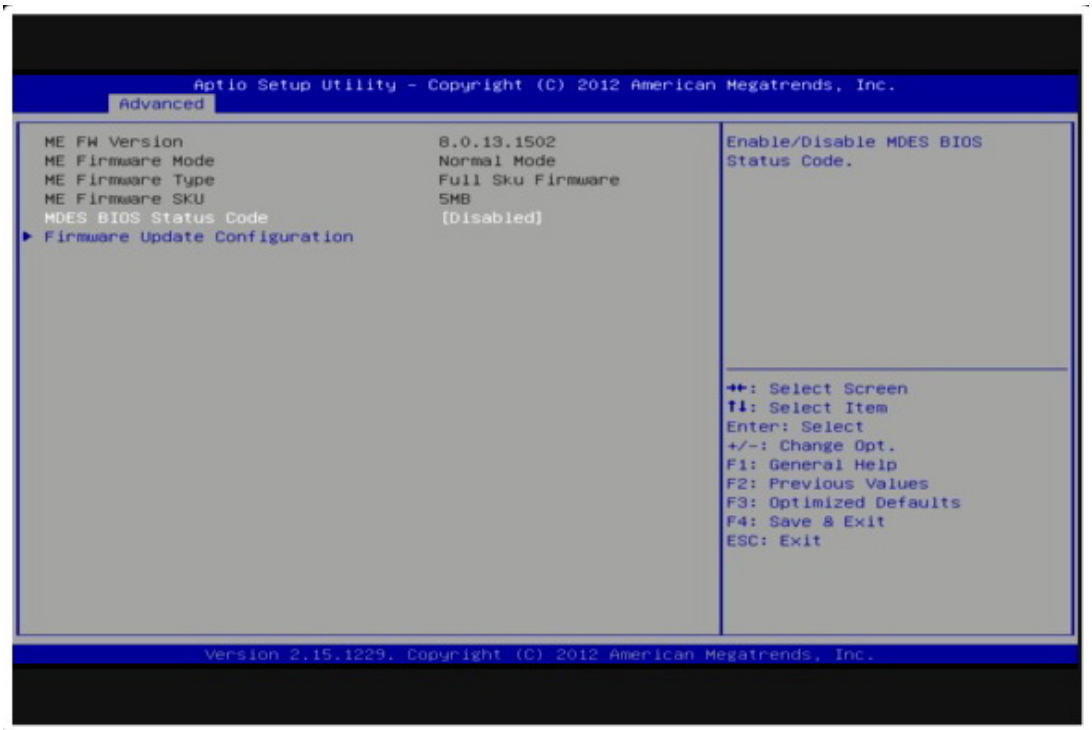


Figure 3.9 PCH-FW Configuration

MDES BIOS Status Code

This item allows users to enable or disable MDES BIOS Status Code function.

Firmware Update Configuration

This item allows users to enable or disable ME FW image re-flash function.

3.3.5 AMT Configuration

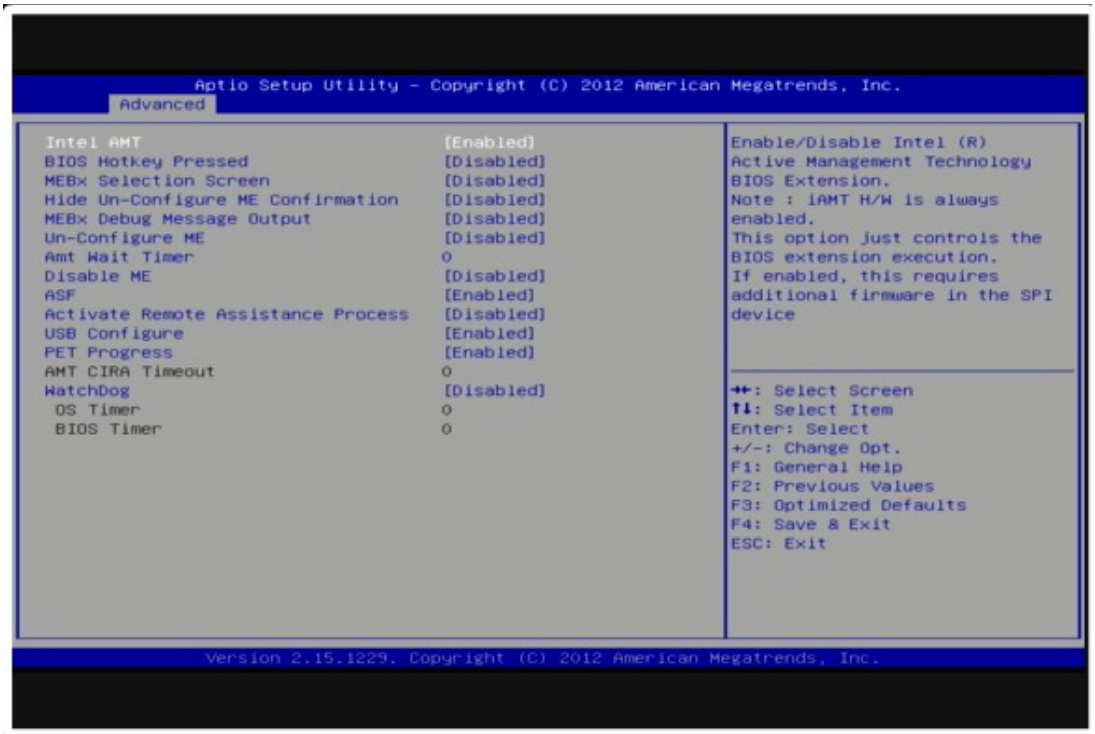


Figure 3.10 AMT Configuration

Intel® AMT

This item allows users to enable or disable Intel AMT BIOS extension.

BIOS Hotkey Pressed

This item allows users to enable or disable BIOS hotkey press.

MEBx Selection Screen

This item allows users to enable or disable MEBx selection screen.

Hide Un-Configuration ME Confirmation

This item allows users to hide un-configure ME without password confirmation prompt.

MEBx Debug Message Output

This item allows users to enable or disable MEBx debug message.

Un-Configure ME

This item allows users to un-configure ME without password.

Amt Wait Timer

Set timer to wait before sending ASF_GET_BOOT_OPTIONS.

Disable ME

This item allows users to enable or disable Intel ME.

ASF

This item allows users to enable or disable Alert Specification Format.

Activate Remote Assistance Process

This item allows users to enable or disable trigger CIRA boot.

USB Configure

This item allows users to enable or disable USB configure function.

PET Progress

This item allows users to enable or disable PET events progress to receive PET events or not.

AMT CIRA Timeout

OEM defined timeout for MPS connection to be established.

WatchDog

This item allows users to enable or disable WatchDog Timer.

OS Timer

Set OS watchdog timer.

BIOS Timer

Set BIOS watchdog timer.

3.3.6 USB Configuration

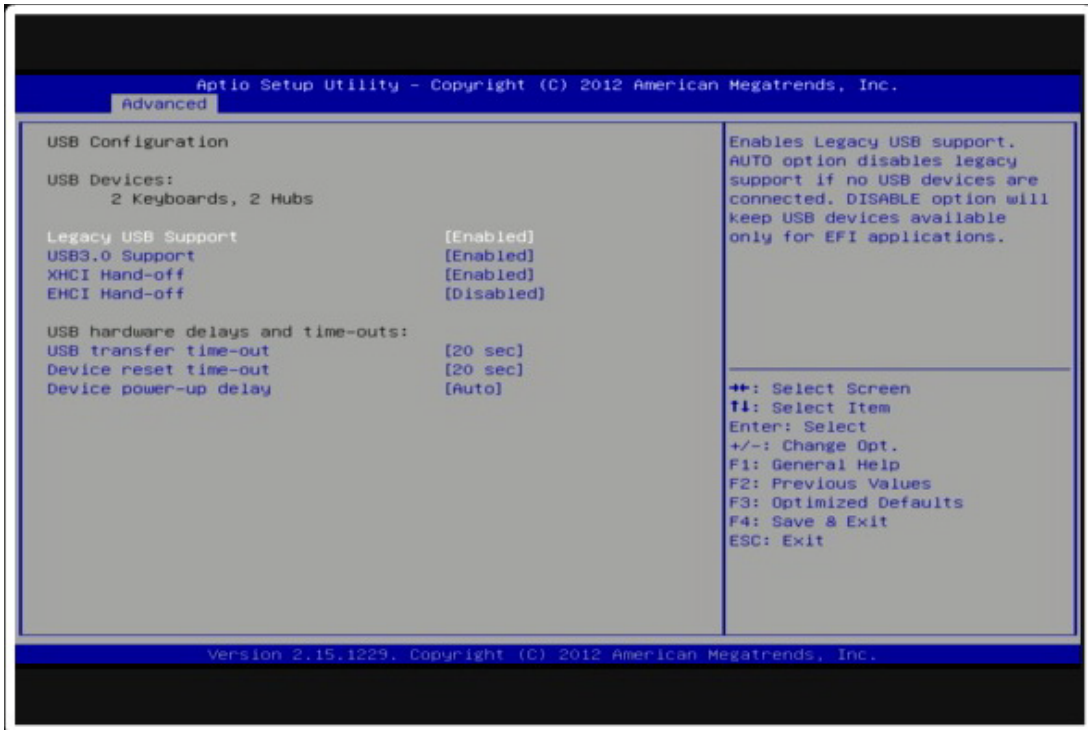


Figure 3.11 USB Configuration

Legacy USB Support

Enable the support for legacy USB. Auto option disables legacy support if no USB devices are connected.

USB3.0 Support

This item allows users to enable or disable USB3.0 support.

XHCI Hand-Off

This is a workaround for the OS without XHCI hand-off support. The XHCI ownership change should claim by XHCI driver.

EHCI Hand-Off

This is a workaround for the OS without EHCI hand-off support. The EHCI ownership change should be claimed by EHCI driver.

USB transfer time-out

Set the time-out value for Control, Bulk, and Interrupt transfers.

Device reset time-out

Set USB mass storage device Start Unit command time-out value.

Device power-up delay

Set the maximum time of 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.

3.3.7 SMART Settings

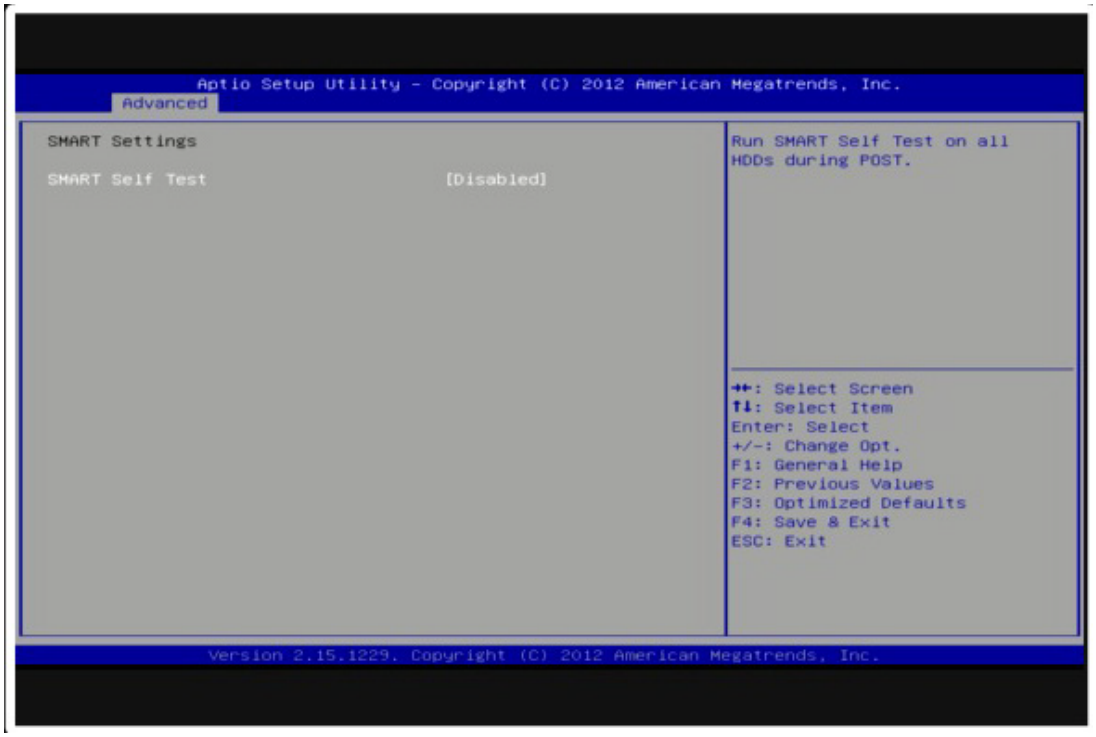


Figure 3.12 SMART Settings

SMART Self Test

This item allows users to enable or disable SMART Self Test.

3.3.8 Super IO Configuration

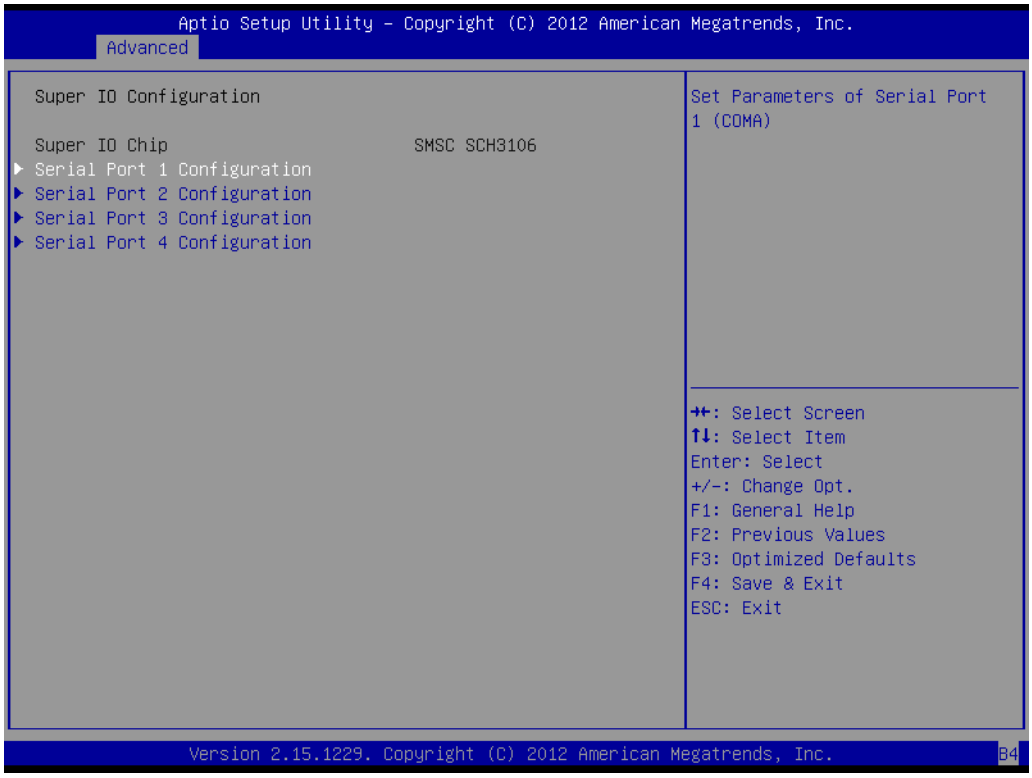


Figure 3.13 Super IO Configuration

3.3.8.1 Serial Port 1 Configuration

Serial Port

This item allows users to enable or disable COM1.

Change Settings

This item allows users to select super I/O device.

3.3.8.2 Serial Port 2 Configuration

Serial Port

This item allows users to enable or disable COM2.

Change Settings

This item allows users to select super I/O device.

3.3.8.3 Serial Port 3 Configuration

Serial Port

This item allows users to enable or disable COM3.

Change Settings

This item allows users to select super I/O device.

3.3.8.4 Serial Port 4 Configuration

Serial Port

This item allows users to enable or disable COM4.

Change Settings

This item allows users to select super I/O device

3.3.9 SCH3106 Second Super IO Configuration

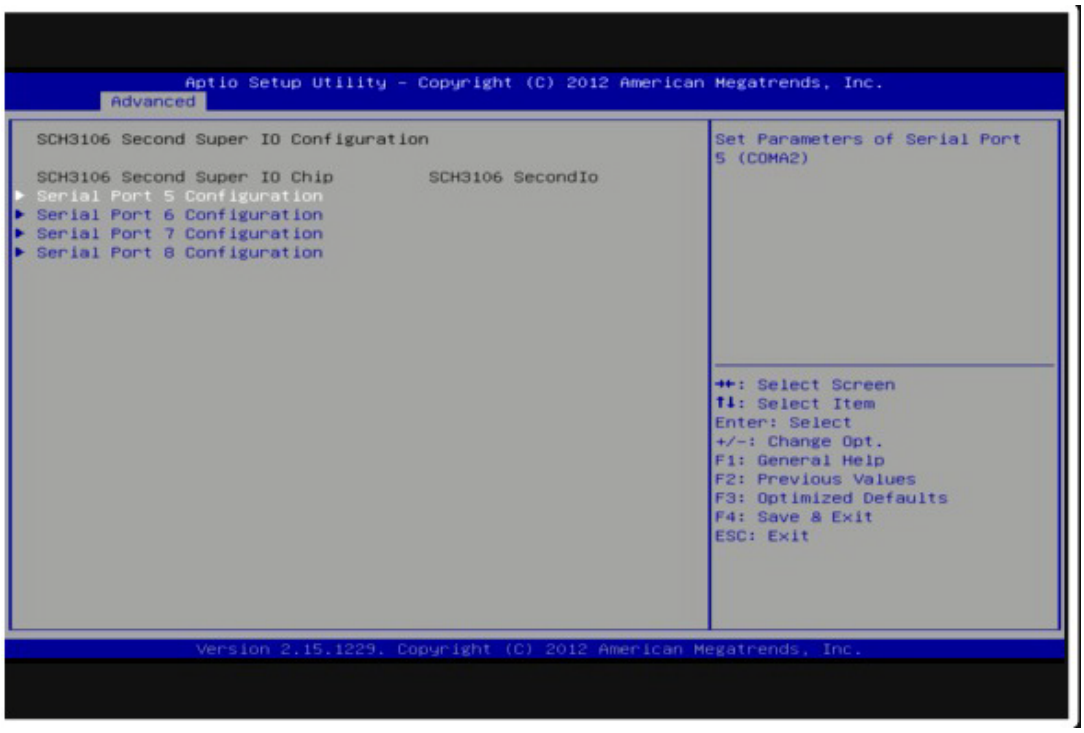


Figure 3.14 Super IO Configuration

3.3.9.1 Serial Port 5 Configuration

Serial Port

This item allows users to enable or disable COM5.

Change Settings

This item allows users to select super I/O device.

3.3.9.2 Serial Port 6 Configuration

Serial Port

This item allows users to enable or disable COM6.

Change Settings

This item allows users to select super I/O device.

3.3.9.3 Serial Port 7 Configuration

Serial Port

This item allows users to enable or disable COM7.

Change Settings

This item allows users to select super I/O device.

Device Mode

This item allows users to select Serial Port mode.

Serial interface

This item allows users to select RS-232/422/485. Default by RS-232.

3.3.9.4 Serial Port 8 Configuration

Serial Port

This item allows users to enable or disable COM8.

Change Settings

This item allows users to select super I/O device

Device Mode

This item allows users to select Serial Port mode.

Serial interface

This item allows users to select RS-232/422/485. Default by RS-232.

3.3.10 Platform Misc Configuration

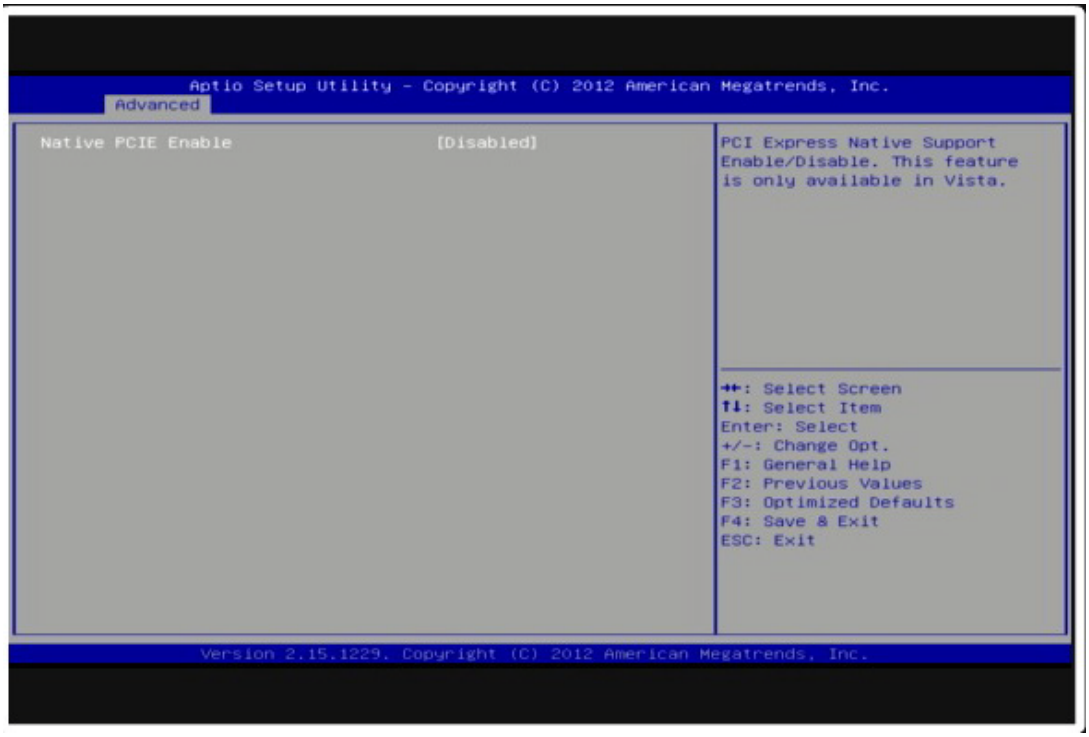


Figure 3.15 Platform Misc Configuration

Native PCIE Enable

This item allows users to enable or disable native PCIE support feature.

3.3.11 Embedded Controller Configuration

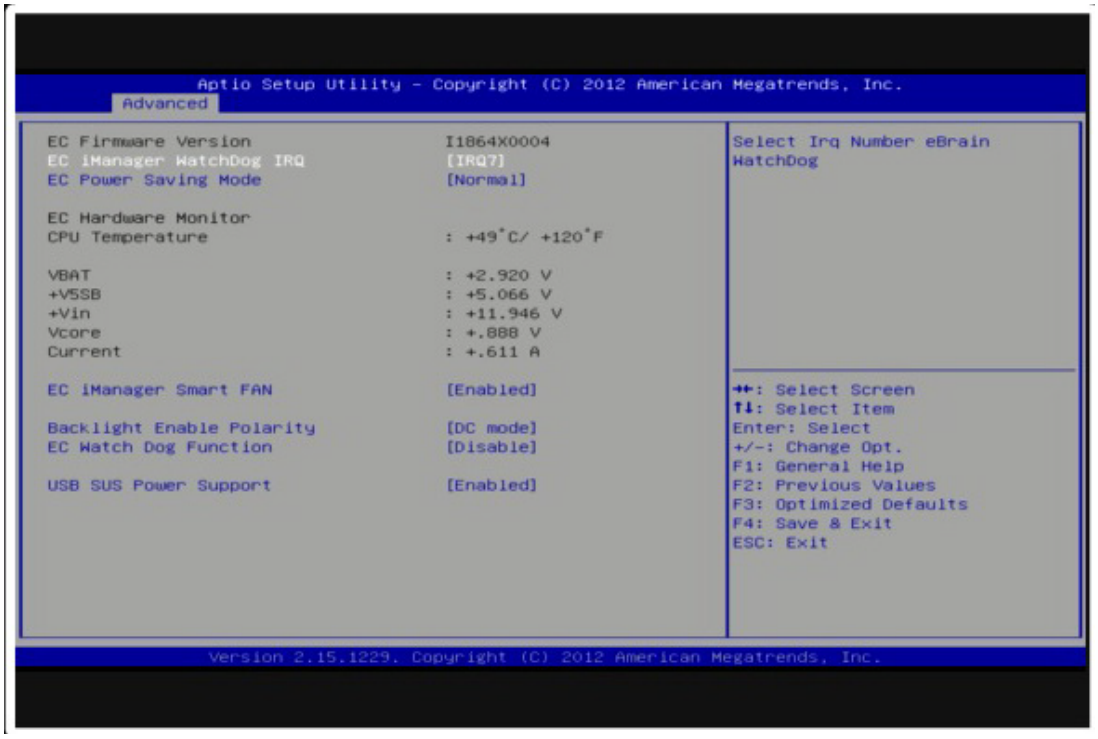


Figure 3.16 Embedded Controller Configuration

EC Power Saving Mode

This item allows users to select ITE8518 power saving mode.

H/W Monitor

This item is show CPU temperature and VBAT / +5VSB / +12V / +Vcore current voltage information.

Backlight Enable Polarity

This item allows users to set backlight Function.

EC Watch Dog Function

This item allows users to set EC Watch Dog Function.

USB SUS Power Support

This item allows users to set the standby power for USB5, USB6 under SUS mode.

3.3.12 Serial Port Console Redirection

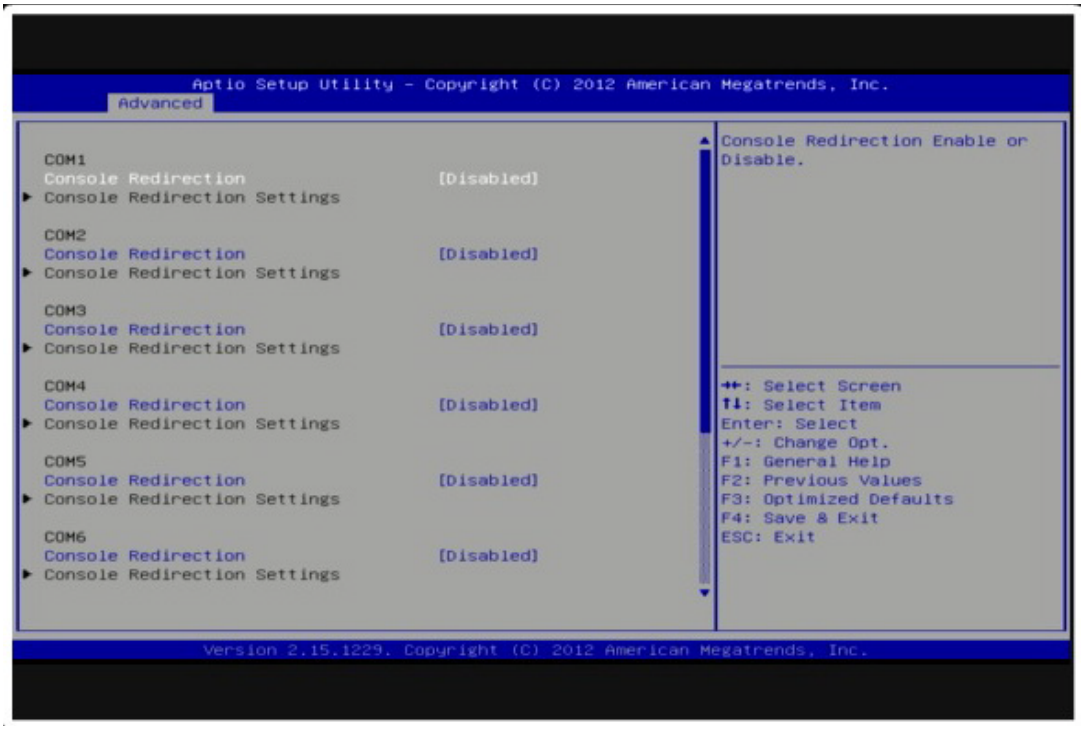


Figure 3.17 Serial Port Console Redirection

Console Redirection

This item allows users to enable or disable console redirection for Microsoft Windows Emergency Management Services (EMS).

Console Redirection Settings

This item allows users to configure console redirection detailed settings.

3.3.13 CPU PPM Configuration

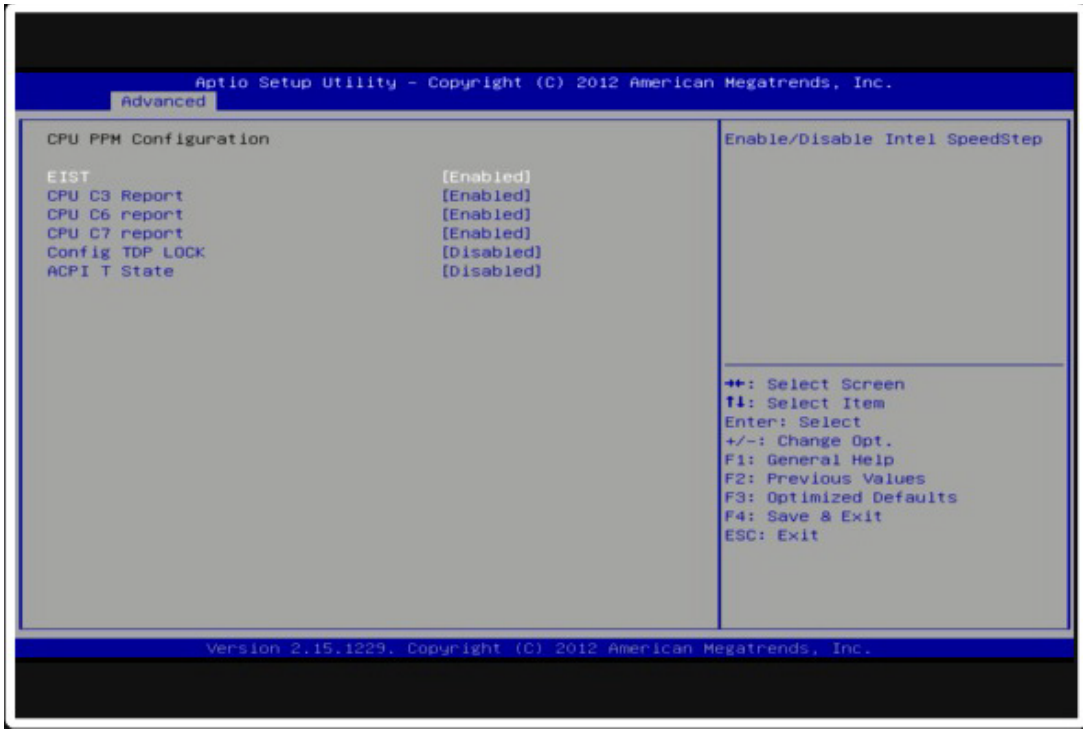


Figure 3.18 CPU PPM Configuration

EIST

CPU runs at its default speed if disabled; CPU speed is controlled by the operating system if enabled.

CPU C3/C6/C7 Report

This item allows users to enable or disable CPU C-state support.

Config TDP LOCK

This item allows users to enable or disable Config TDP LOCK.

ACPI T State

This item allows users to enable or disable ACPI T State.

3.4 Chipset

Select the Chipset tab from the ARK-3500 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.

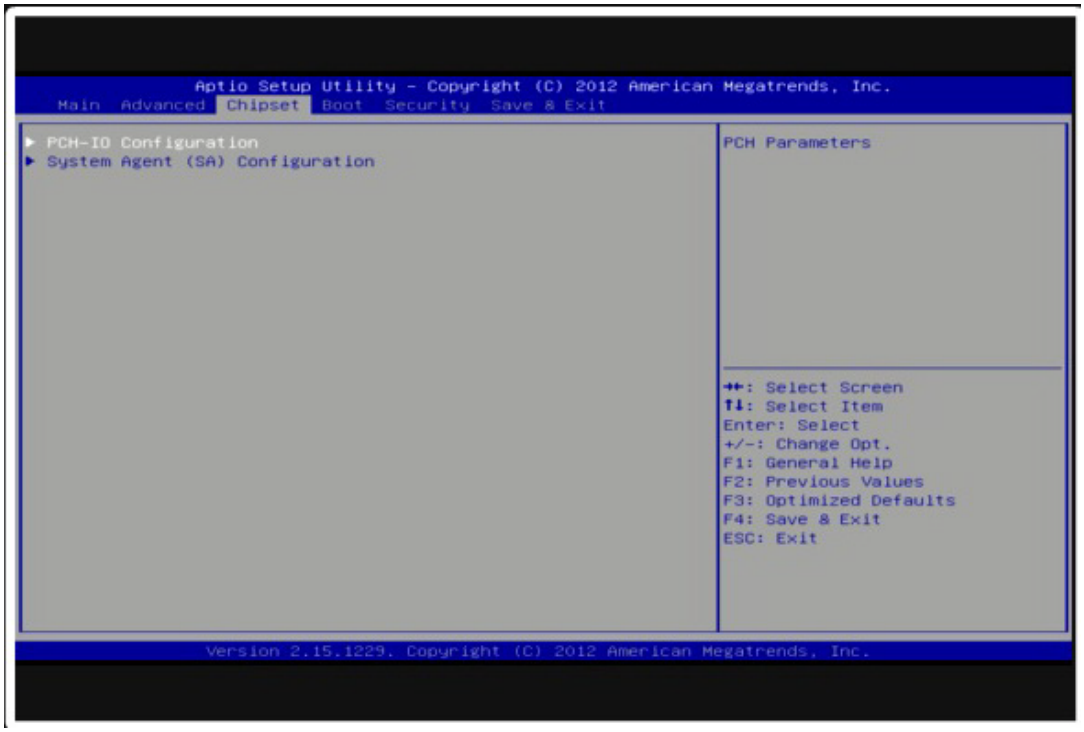


Figure 3.19 Chipset Setup

3.4.1 PCH-IO Configuration

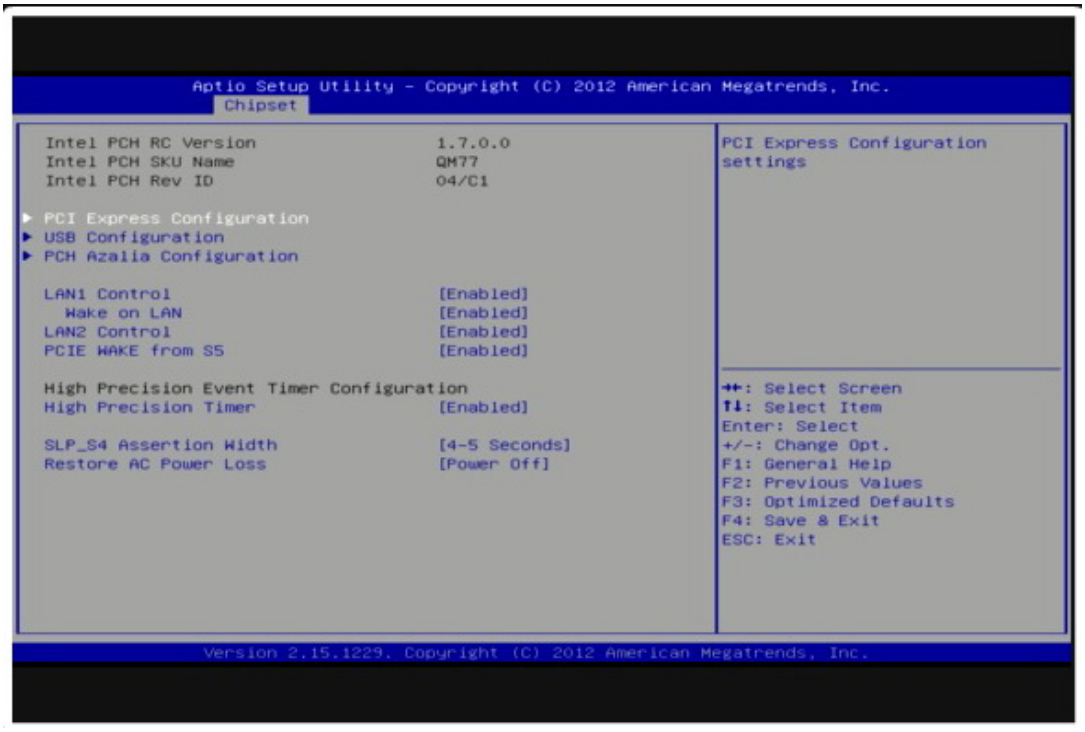


Figure 3.20 PCH-IO Configuration

PCI Express Configuration

This item allows users to configuration PCIE1~PCIE8 root port detail settings.

USB Configuration

This item allows users to configuration detail of USB functions.

PCH Azalia Configuration

This item allows users to configuration detail of azalia functions.

PCH LAN controller

Enables or disables the PCH LAN controller.

PCIE Wake from S5

PCIE wake Enables or disables from S5 state.

High Precision Timer

Enables or disables the high precision timer.

SLP_S4 Assertion Width

This item allows users to set minimum assertion width of the SLP-S4# signal to guarantee DRAM has been safely power-cycled.

Restore AC Power Loss

This item allows users to select off, on and last state.

3.4.2 System Agent (SA) Configuration

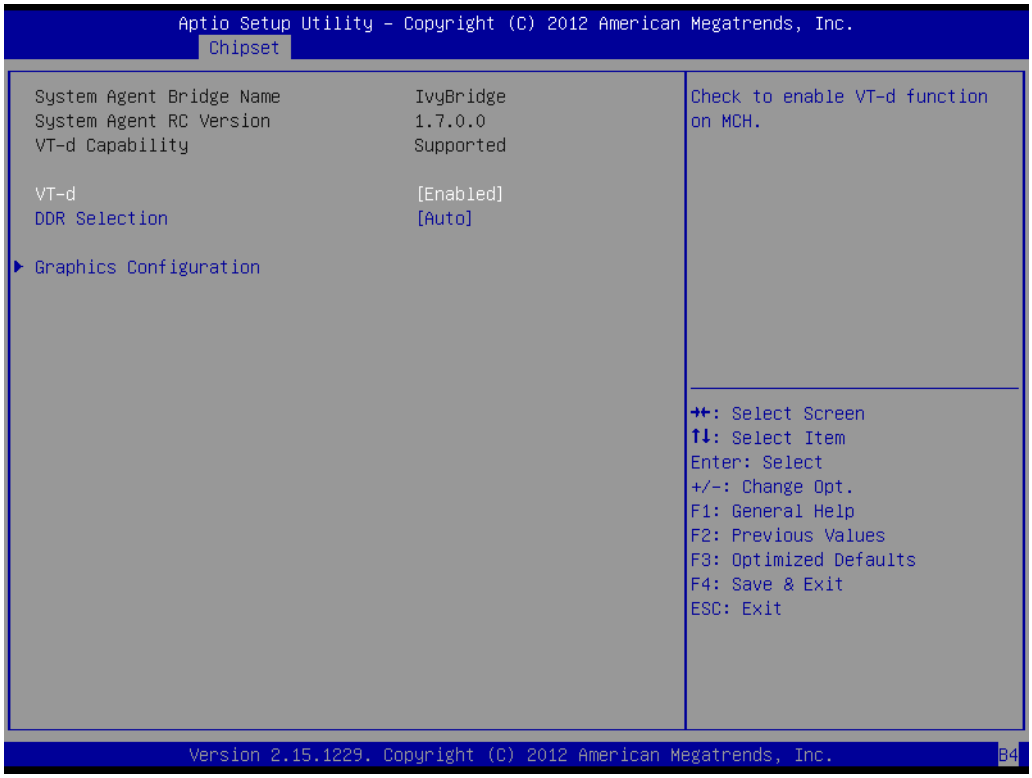


Figure 3.21 System Agent (SA) Configuration

VT-d

This item allows users to enable or disable VT-d.

DDR Selection

This item allows users to select which DDR or DDRL voltage.

3.4.2.1 Graphic Configuration

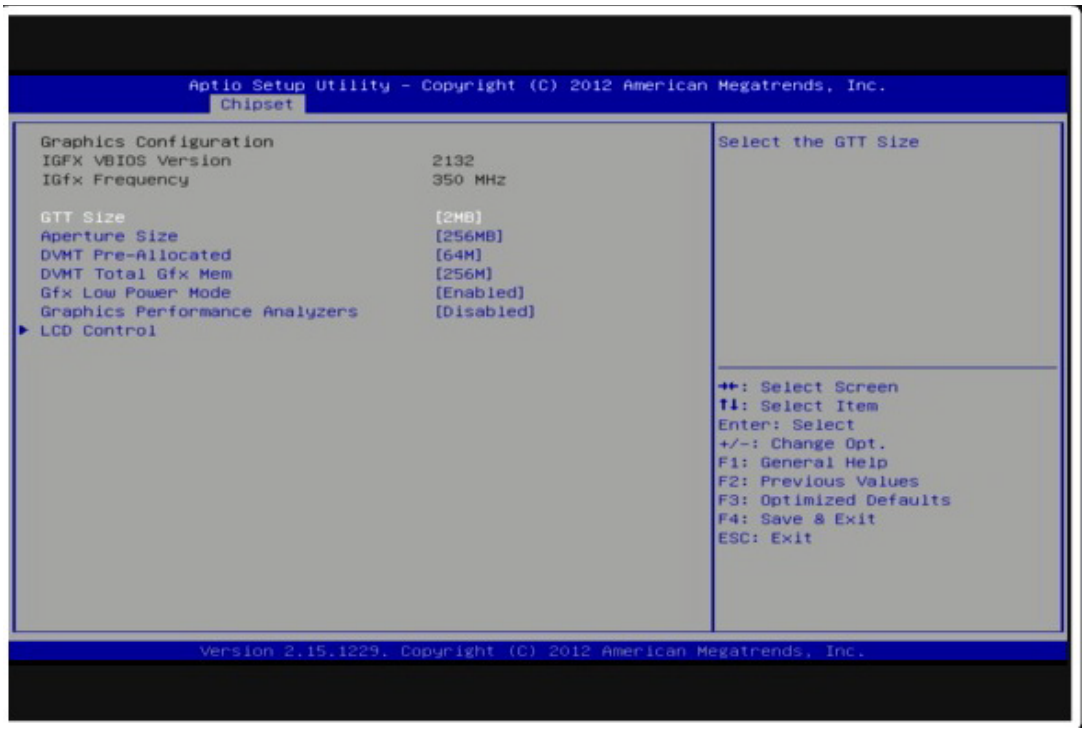


Figure 3.22 Intel IGFX Configuration

GTT Size

This item allows users to select GTT size.

Aperture Size

This item allows users to select aperture size.

DVMT Pre-Allocated

This item allows users to select DVMT pre-allocated memory size.

DVMT Total Gfx Mem

This item allows users to select DVMT total memory size.

Gfx Low Power Mode

This item allows users to enable or disable IGD low power mode.

Graphics Performance Analyzers

This item allows users to enable or disable Graphics Performance Analyzers

LCD Control

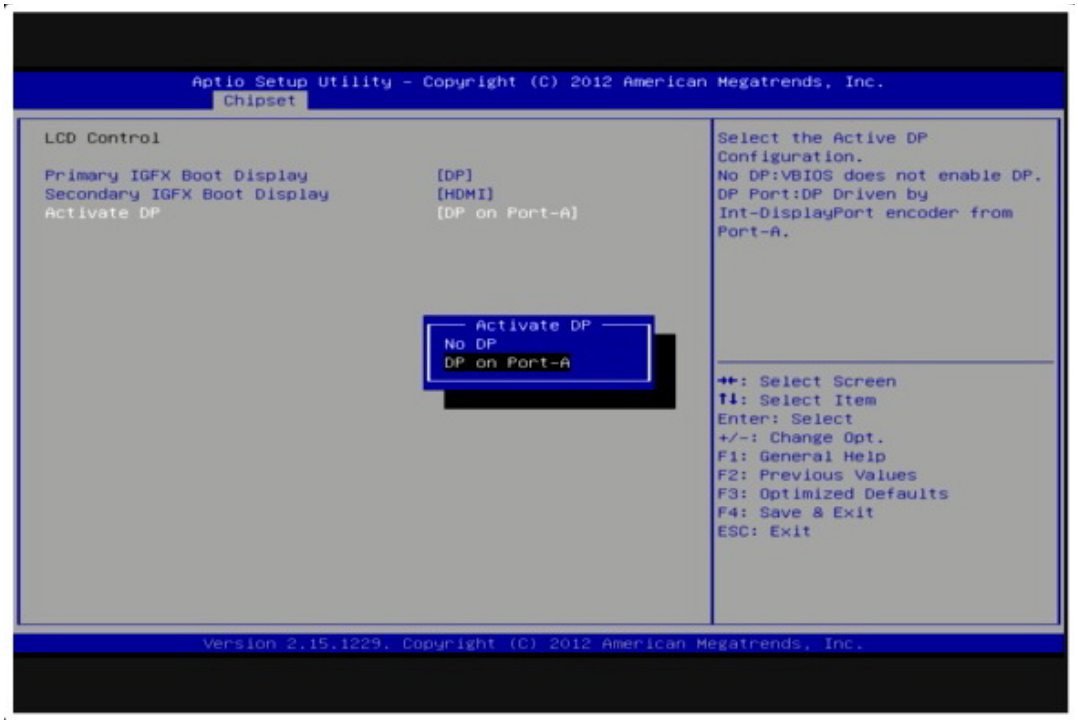


Figure 3.23 LCD Control

Primary IGFX Boot Display

Select boot display device at post stage.

Secondary IGFX Boot Display

Select boot display device at post stage.

Active DP

This item allows users to select the Active DP Configuration.

3.5 Boot Settings

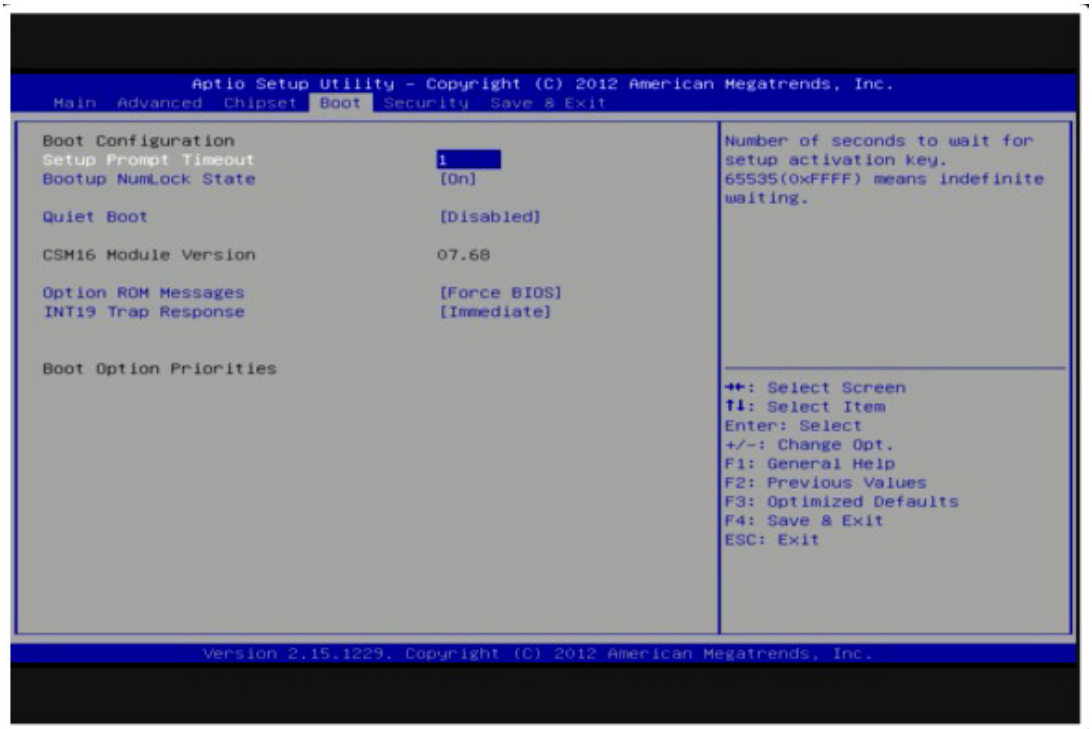


Figure 3.24 Boot Setup Utility

Setup Prompt Timeout

This item allows users to select the number of seconds to wait for setup activation key.

Bootup NumLock State

Selects the Power-on state for Numlock.

Quiet Boot

If this option is set to Disabled, the BIOS displays normal POST messages. If Enabled, an OEM Logo is shown instead of POST messages.

Option ROM Message

Set display mode for option ROM.

INT19 Trap Response

This item allows option ROMs to trap interrupt 19.

3.6 Security Setup

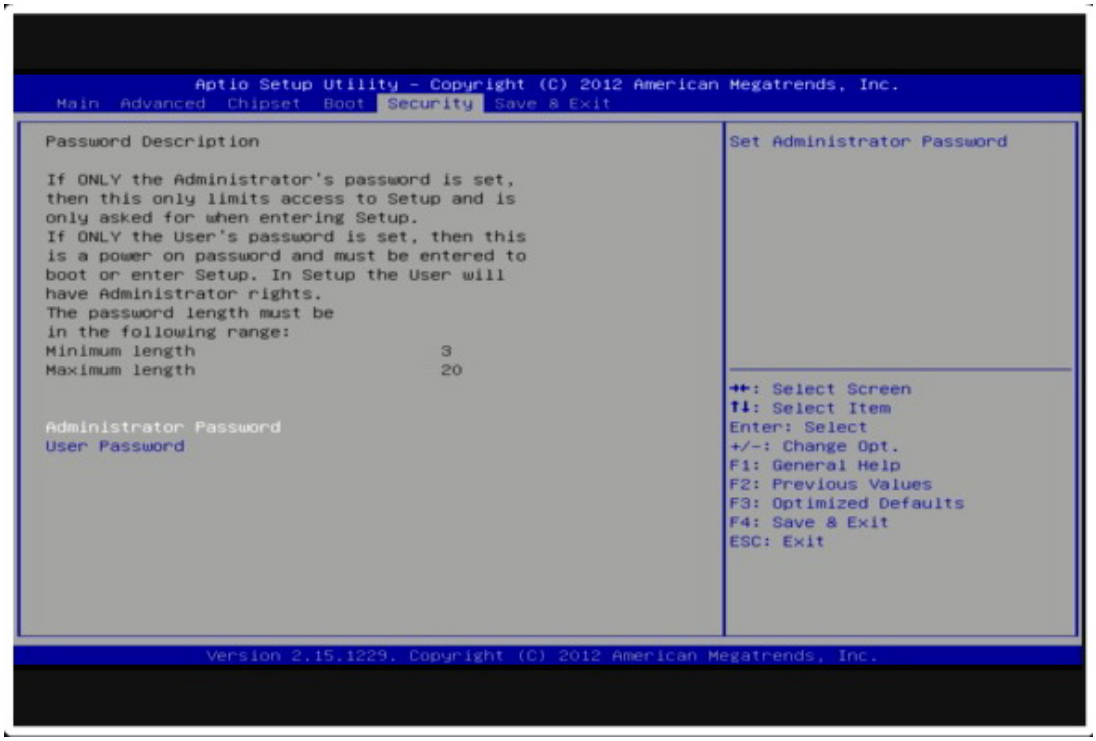


Figure 3.25 Password Configuration

Select Security Setup from the ARK-3500 Setup main BIOS setup menu. All Security Setup options, such as password protection is 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.

3.7 Save & Exit

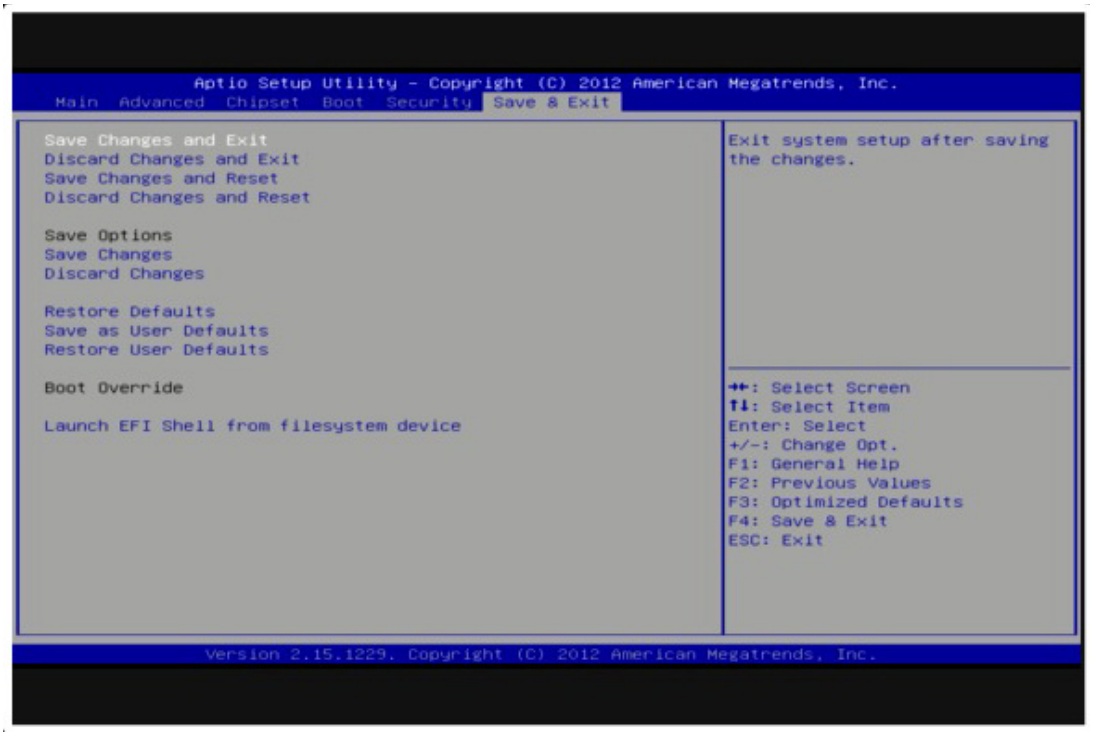


Figure 3.26 Save & Exit

Save Changes and Exit

When users have completed system configuration, select this option to save changes, exit BIOS setup menu and reboot the computer if necessary to take effect all system configuration parameters.

Discard Changes and Exit

Select this option to quit Setup without making any permanent changes to the system configuration.

Save Changes and Reset

When users have completed system configuration, select this option to save changes, exit BIOS setup menu and reboot the computer to take effect all system configuration parameters.

Discard Changes and Reset

Select this option to quit Setup without making any permanent changes to the system configuration and reboot the computer.

Save Changes

When users have completed system configuration, select this option to save changes without exit BIOS setup menu.

Discard Changes

Select this option to discard any current changes and load previous system configuration.

Restore Defaults

The ARK-3500 automatically configures all setup items to optimal settings when users select this option. Optimal Defaults are designed for maximum system performance, but may not work best for all computer applications. In particular, do not use the Optimal Defaults if the user's computer is experiencing system configuration problems.

Save User Defaults

When users have completed system configuration, select this option to save changes as user defaults without exit BIOS setup menu.

Restore User Defaults

The users can select this option to restore user defaults.

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

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