User Manual

AIMB-784

**LGA1150 Intel® Core™ i7/i5/i3
ATX with Dual DVI/VGA,
USB 3.0, DDR3, SATA III**

ADVANTECH

Enabling an Intelligent Planet

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This device complies with the requirements in part 15 of the FCC rules:

Operation is subject to the following two conditions:

- This device may not cause harmful interference
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Processor AVL List

Brand	Code Name	Process	Socket	Base Freq(GHz)	Smart cache	TDP	ECC	Cores/ Threads	AMT
Intel® Core™ i7-4770S	Haswell	22nm	LGA 1150	3.1 GHz	8M	65W	No	4/8	9.0
Intel® Core™ i5-4670S	Haswell	22nm	LGA 1150	3.1 GHz	6M	65W	No	4/4	9.0
Intel® Core™ i5-4570S	Haswell	22nm	LGA 1150	2.9 GHz	6M	65W	No	4/4	9.0

Memory AVL List

Brand	Size	Speed	Type	ECC	Vendor PN	Advantech PN
Transcend	1GB	DDR3 1066	DDR3	N	TS128MLK64V1U	96D3-1G1066NN-TR
Transcend	2GB	DDR3 1066	DDR3	N	TS256MLK64V1U	96D3-2G1066NN-TR
Apacer	1GB	DDR3 1066	DDR3	N	78.01GC3.420	96D3-1G1066NN-AP
Apacer	2GB	DDR3 1066	DDR3	N	78.A1GC3.421	96D3-2G1066NN-AP
Apacer	4GB	DDR3 1066	DDR3	N	78.B1GDJ.AF1	NA
Transcend	1GB	DDR3 1333	DDR3	N	TS128MLK64V3U	96D3-1G1333NN-TR
Transcend	2GB	DDR3 1333	DDR3	N	TS256MLK64V3U	96D3-2G1333NN-TR4
Transcend	4GB	DDR3 1333	DDR3	N	TS512MLK64V3N	96D34G1333NN-TR
Apacer	1GB	DDR3 1333	DDR3	N	78.01GC6.AF0	96D3-1G1333NN-AP1
Apacer	2GB	DDR3 1333	DDR3	N	78.A1GDE.4200C	96D3-2G1333NN-AP2
Apacer	2GB	DDR3 1333	DDR3	N	78.A1GDE.AF00C	96D3-2G1333NN-AP1
Apacer	4GB	DDR3 1333	DDR3	N	78.B1GDE.AF1	96D3-4G1333NN-AP
Apacer	4GB	DDR3 1333	DDR3	N	78.B1GDE.AF1	96D3-4G1333NN-AP
Apacer	8GB	DDR3 1333	DDR3	N	78.C1GEP.4210C	78.C1GEP.4210C
Kingston	2GB	DDR3 1333	DDR3	N	KVR1333D3S8N9/2G	NA
Kingston	4GB	DDR3 1333	DDR3	N	KVR1333D3N9/4G	NA
ATP	2GB	DDR3 1600	DDR3	N	XQ16A8N2GS-9-AV	NA
ATP	2GB	DDR3 1600	DDR3	N	XQ16A8N2GM-9-AV	NA
ATP	4GB	DDR3 1600	DDR3	N	XQ16B8N4GS-9-AV	NA
ATP	8GB	DDR3 1600	DDR3	N	XQ16B8N8GS-9-AV	NA
Apacer	8GB	DDR3 1600	DDR3	N	78.C1GET.ATF0C	NA
DSL	2GB	DDR3 1600	DDR3	N	D3US56081XH12AA	NA
DSL	4GB	DDR3 1600	DDR3	N	D3US56082XH12AA	NA
Transcend	2GB	DDR3 1600	DDR3	N	TS256MLK64V6N	NA
Transcend	4GB	DDR3 1600	DDR3	N	TS512MLK64V6N	NA
Transcend	8GB	DDR3 1600	DDR3	N	TS1GLK64V6H	NA
Transcend	8GB	DDR3 1600	DDR3	N	TS9KNH28300-6M?	96D3-8G1600NN-TR

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.

Initial Inspection

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

- 1 AIMB-784 Startup Manual
- 1 Driver CD (user's manual is included)
- 2 Serial ATA HDD data cables
- 2 Serial ATA HDD power cables
- 1 I/O port bracket
- 1 Warranty card
- SUSIAccess CD

If any of these items are missing or damaged, contact your distributor or sales representative immediately. We have carefully inspected the AIMB-784 mechanically and electrically before shipment. It should be free of marks and scratches and in perfect working order upon receipt. As you unpack the AIMB-784, check it for signs of shipping damage. (For example, damaged box, scratches, dents, etc.) If it is damaged or it fails to meet the specifications, notify our service department or your local sales representative immediately. Also notify the carrier. Retain the shipping carton and packing material for inspection by the carrier. After inspection, we will make arrangements to repair or replace the unit.

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Chapter 1

Hardware Configuration

1.1 Introduction

AIMB-784 motherboard is the most advanced Intel Q87 board for industrial applications that require high-performance computing. The motherboard supports 4th generation Intel Core i7/i5/i3 and DDR3 1333/1600 MHz memory up to 32 GB. AIMB-784 provides cost-effective integrated graphics with 1 GB VRAM max shared memory and 2 GB or above system memory installed.

AIMB-784 provides a PCIe x16 gen III expansion slot for add-on graphic cards. In addition, the AIMB-784 has dual Gigabit Ethernet LAN via dedicated PCIe x1 bus, which offers bandwidth of up to 500 MB/s, eliminating network bottlenecks. High reliability and outstanding performance make the AIMB-784 the ideal platform for industrial networking applications.

By using the Intel Q87 chipset, the AIMB-784 offers four 32-bit, 33 MHz PCI slots; one PCIe x1 slot, one PCIe x4 slot, one PCIe x16 slot and a variety of features such as 6 x onboard SATA III interfaces (bandwidth = 600 MB/s) with software RAID; 4 x USB 3.0 and 9 x USB 2.0 connectors and HD Audio. These powerful I/O capabilities ensure even more reliable data storage capabilities and high-speed I/O peripheral connectivity.

The AIMB-784 also adopts Advantech's unique patented Sleep Mode Control Circuit for AT Power Mode. With all the excellent features and outstanding performance, the AIMB-784 is the ideal platform for today's industrial applications.

1.2 Features

- **PCIe architecture:** The Intel Q87 PCH chipset supports 1 PCIe x16 slot, 1 PCIe x4 slot, 1 PCIe x1 slot, 6 SATA III connectors.
- **High Performance I/O capability:** Dual Gigabit LAN via PCIe x1 bus, 4 PCI 32-bit/33MHz PCI slots, and 14 USB 2.0 ports.
- **Standard ATX form factor with industrial features:** AIMB-784 provides industrial features like long product life, reliable operation under wide temperature range, watchdog timer functions, etc.
- **Automatically power on after power failure:** It is often necessary to have an unattended system come back to operation when power resumes after a power failure. Advantech's industrial motherboard allows users to set the system to power on automatically without pushing the power on button. Please refer details in "AT" mode setting.
- **Active Management Technology 9.0:** The hardware and firmware base solution is powered by the system auxiliary power plane to remotely monitor networked systems. Intel AMT(iAMT) stores hardware and software information in nonvolatile memory. Built-in management provides out-of-band management capabilities, allowing remote discovery and KVM to repair systems after OS failures or when a system has crashed. Alert and event logging features detect problems and quickly reduce downtime, pro-actively blocking incoming threats, containing infected clients before they impact the network, and proactively notifying the user when critical software agents are removed. To enable iAMT, please refer to 3.2.2.8 iAMT configuration. Advantech provides a software utility called SUSIAccess to allow users enable iAMT functions and remotely monitor and configure their devices. For detailed information, please download it here: http://www.advantech.com.tw/embcore/SUSIAccess.aspx

1.3 Specifications

1.3.1 System

■ **SATA hard disk drive interface:** Six on-board SATA III connectors support Advanced Host controller interface (AHCI) technology and have data transmission rates up to 600 MB/s.

■ **System Chipset:** Q87

1.3.2 Memory

■ **RAM:** Up to 32 GB in four 240-pin DIMM sockets. Supports dual-channel DDR3 1333/1600 SDRAM.

   – AIMB-784G2: supports non-ECC unbuffered DIMMs and do not support any memory configuration that mixes non-ECC with ECC unbuffered DIMMs

Note!   *A 32-bit OS may not fully detect 4 GB of RAM when 4 GB is installed.*

1.3.3 Input/Output

■ **PCIe slot:** 1 PCIe x16 expansion slot, 1 PCIe x4 expansion slot, and 1 PCIe x1 expansion slots.

■ **PCI Bus:** 4 PCI slots, 32-bit, 33 MHz PCI 2.2 compliant.

■ **Enhanced parallel port:** Configured to LPT1 or disabled. Standard DB-25 female connector cable is a optional accessory. LPT1 supports EPP/SPP/ECP.

■ **Serial port:** Six serial ports, one is RS-232/422/485 with hardware auto-flow control and three are RS-232. One DB-9 connectors located in rear panel are RS-232

■ **Keyboard and PS/2 mouse connector:** Two 6-pin mini-DIN connectors are located on the mounting bracket for easy connection to PS/2 keyboard and mouse.

■ **USB port:** Supports up to 13 USB 3.0/2.0 ports for G2 SKU with transmission rates up to 5 Gb/s.

■ **LPC:** One LPC connector to support Advantech LPC modules, such as TPM module.

■ **GPIO:** AIMB-784 supports 8-bit GPIO from super I/O for general purpose control application.

1.3.4 Graphics

■ *Both dual and quad core processors use integrated Intel HD Graphics.*

■ **Display memory:** 1 GB maximum shared memory with 2 GB and above system memory installed

■ **DVI-D:** Up to resolution 1920 x 1200 @ 60 Hz refresh rate

■ **VGA:** Up to 1920 x 2000 resolution @ 60 Hz refresh rate

1.3.5 Ethernet LAN

■ Supports single/dual 10/100/1000Base-T Ethernet port (s) via PCIe x1 bus which provides a 500 MB/s data transmission rate.

■ **Interface:** 10/100/1000Base-T

■ **Controller:** Intel I217LM(PHY) for LAN1, Intel I211AT for LAN2

1.3.6 Industrial Features

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

1.3.7 Mechanical and Environmental Specifications

- **Operating temperature:** 0 ~ 60°C (32 ~ 140° F, depending on CPU)
- **Storage temperature:** -20 ~ 70° C (-4 ~ 158° F)
- **Humidity:** 5 ~ 95% non-condensing
- **Power supply voltage:** +3.3 V, +5 V, ±12 V, +5 VSB
- **Power consumption:**
  Maximum: +5 V at 2.07 A, +3.3 V at 1.02 A, +12 V at 4.17 A, +5 VSB at 0.55 A
  (Intel Core i7 4770S 3.1 GHz processor, 4 x 8 GB DDR3 Memory)
- **Board size:** 304.8 x 228.6 mm (12" x 9.6")
- **Board weight:** 0.5 kg (1.68 lb)

1.4 Jumpers and Connectors

Connectors on the AIMB-784 motherboard link it to external devices such as hard disk drives and a keyboard. In addition, the board has a number of jumpers that are used to configure your system for your application.

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

Table 1.1: Jumper list	
Label	**Function**
JCMOS1	CMOS Clear
JWDT1	Watchdog reset
PSON1	AT(1-2) / ATX(2-3)

Table 1.2: Connectors	
Label	**Function**
LPT1	Parallel port, supports SPP/EPP/ECP mode
LAN1_USB910	LAN1 / USB port 9, 10
LAN2_USB12	LAN2 / USB port 1, 2
VGA1	VGA connector
DVI1+DVI2	Dual DVI-D connectors
COM 1~2 and 4~6	Serial port: RS-232
COM3	Serial port: RS-232/422/485 (9-pin connector)
KBMS1	PS/2 keyboard and mouse connector
KBMS2	External keyboard connector (6-pin)
JIR1	Infrared connector
JFP3	Keyboard lock and power LED
	Suspend: fast flash (ATX/AT)
	System On: on (ATX/AT)
	System Off: off (AT/ATX)
JFP2	External speaker / HDD LED connector / SM Bus connector

Table 1.2: Connectors	
JFP1	Power switch / reset connector
JCASE1	Case open
VOLT1	Alarm Board Power connector
JOBS1	HW monitor
	Close: enable OBS alarm
	Open: disable OBS alarm
CPUFAN1	CPU fan connector (4-pin)
SYSFAN1	System fan connector (3-pin)
SYSFAN2	System fan connector (3-pin)
LANLED1	LAN1/2 LED extension connector
AUDIO1	Audio connector
FPAUD1	HD audio front panel pin header
USB3	USB port 3 (Type A)
USB56	USB port 5, 6
USB78	USB port7, 8
USB1112	USB port 11,12
USB1314	USB port 13,14
SATA1	Serial ATA1
SATA2	Serial ATA2
SATA3	Serial ATA3
SATA4	Serial ATA4
SATA5	Serial ATA5
SATA6	Serial ATA6
ATX12V1	ATX 12 V auxiliary power connector (for CPU)
EATXPWR1	ATX 24-pin main power connector (for system)
PCIEX16_1	PCIe x16 slot 1
PCIEX4_1	PCIe x4 slot 1
PCIEX1_1	PCIe x1 slot 1
PCI1	PCI slot 1
PCI2	PCI slot 2
PCI3	PCI slot 3
PCI4	PCI slot 4
DIMMA1	Channel A DIMM1
DIMMA2	Channel A DIMM2
DIMMB1	Channel B DIMM1
DIMMB2	Channel B DIMM2
SPI_CN1	Update BIOS pin header
SPDIF_OUT1	SPDIF Audio out pin header
JME1	Intel ME enable/disable
JUSB_1	USB power source switch between +5V and +5V_SB for Rear USB ports
JUSB_2	USB power source switch between +5V and +5V_SB for On Board USB ports
GPIO1	8 bit GPIO from super I/O
SMBUS1	SM Bus from PCH
LPC1	Low pin count connector

1.5 Board Layout: Jumper and Connector Locations

Figure 1.1 Jumper and Connector Locations

AIMB-784G2

Figure 1.2 I/O connectors

1.6 AIMB-784 Block Diagram
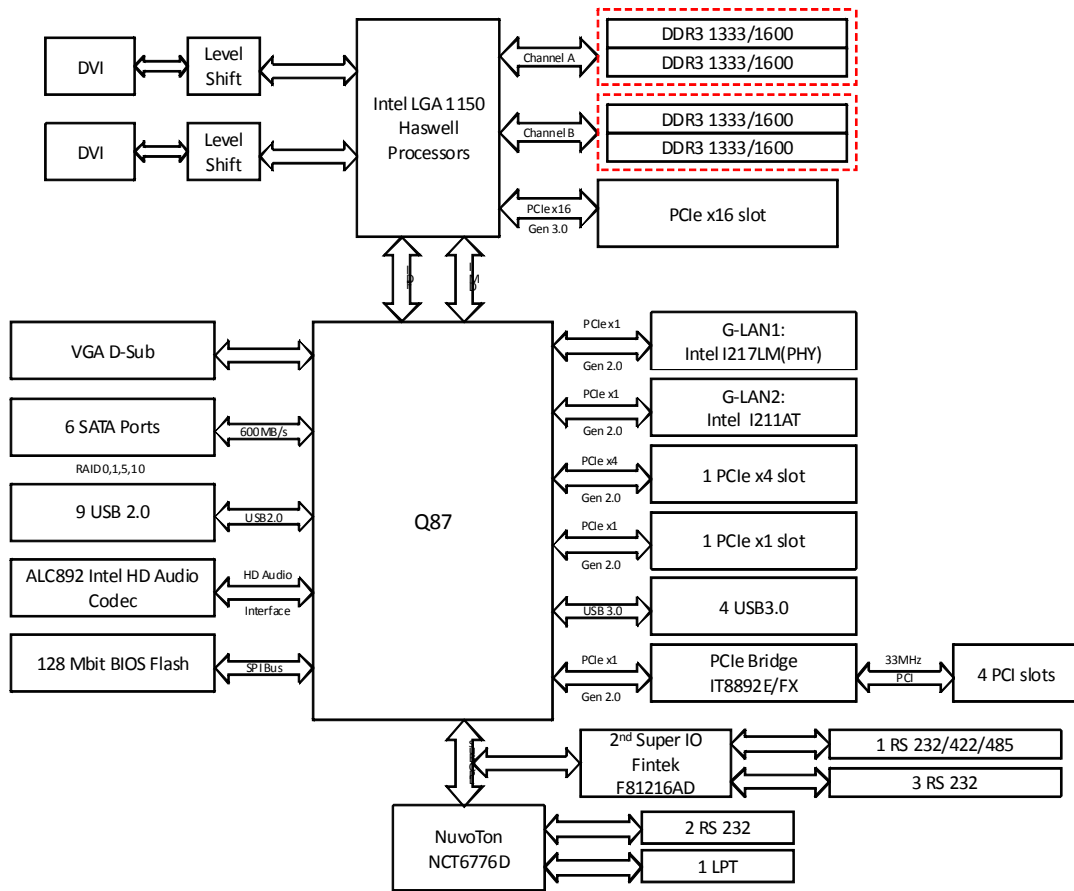
Figure 1.3 AIMB-784 Block Diagram

1.7 Safety Precautions

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

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

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

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

1.8 Jumper Settings

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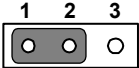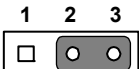
1.8.1 How to set jumpers

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

1.8.2 CMOS clear & ME clear (JCMOS1 & JME1)

The AIMB-784 motherboard contains a jumper that can erase CMOS data and reset the system BIOS information. Normally this jumper should be set with pins 1-2 closed. If you want to reset the CMOS data, set J1 to 2-3 closed for just a few seconds, and then move the jumper back to 1-2 closed. This procedure will reset the CMOS to its default setting.
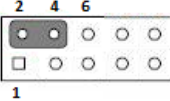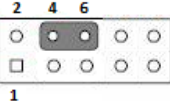
Table 1.3: JCMOS1/JME1	
Function	**Jumper Setting**
* Keep CMOS and ME data	1-2 closed
Clear CMOS and ME data	2-3 closed

* default setting

1.8.3 Watchdog timer output (JWDT1)

The AIMB-784 contains a watchdog timer that will reset the CPU. This feature means the AIMB-784 will recover from a software failure or an EMI problem. The JWDT1 jumper settings control the outcome of what the computer will do in the event the watchdog timer is tripped.
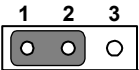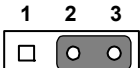
Table 1.4: Watchdog timer output (JWDT1)	
Function	**Jumper Setting**
NC	2-4 closed
* Reset	4-6 closed

* default setting

> **Note!** The interrupt output of the watchdog timer is a low level signal. It will be held low until the watchdog timer is reset.

Table 1.5: ATX/AT mode selector (PSON1)		
Function	**Jumper Setting**	
AT Mode	1 2 3	1-2 closed
* ATX Mode	1 2 3	2-3 closed
* default setting		

1.9 System Memory

AIMB-784 has four 240-pin memory sockets for DDR3 1333/1600 MHz memory modules with maximum capacity of 32 GB (Maximum 8 GB for each DIMM). AIMB-784 only supports non-ECC DDR3 memory modules.

Please note that AIMB-784 does NOT support registered DIMMs (RDIMMs).

Note!

Because AIMB-784 supports Intel Active Management Technology 9.0 (iAMT9.0) which utilizes some memory space of channel 0, it's suggested that the user should not leave channel 0 DIMM slots (DIMMA1 and DIMMA2) empty, or it may cause some system abnormality.

1.10 Memory Installation Procedures

To install DIMMs, first make sure the two handles of the DIMM socket are in the "open" position. i.e. The handles lean outward. Slowly slide the DIMM module along the plastic guides on both ends of the socket, and then press the DIMM module right down into the socket, until you hear a click. This is when the two handles have automatically locked the memory module into the correct position of the DIMM socket. To remove the memory module, just push both handles outward, and the memory module will be ejected by the mechanism in the socket.

1.11 Cache Memory

The AIMB-784 supports a CPU with one of the following built-in full speed L3 caches:

The built-in third-level cache in the processor yields much higher performance than conventional external cache memories.

- 8 MB for 4th Generation Intel Core i7-4xxx CPU
- 6 MB for 4th Generation Intel Core i5-4xxx CPU
- 3 MB for 4th Generation Intel Core i3-4xxx CPU

1.12 Processor Installation

The AIMB-784 is designed for LGA1150, Intel Core i7/i5/i3 processor.

1.13 PCI Bus Routing Table

AD PCI slot INT	PCI1	PCI2	PCI3	PCI4
	AD16	AD21	AD22	AD28
A	A	F	G	H
B	B	G	H	E
C	C	H	E	F
D	D	E	F	G

Chapter 2

Connecting
Peripherals

2.1 Introduction

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

2.2 Parallel Port (LPT1)
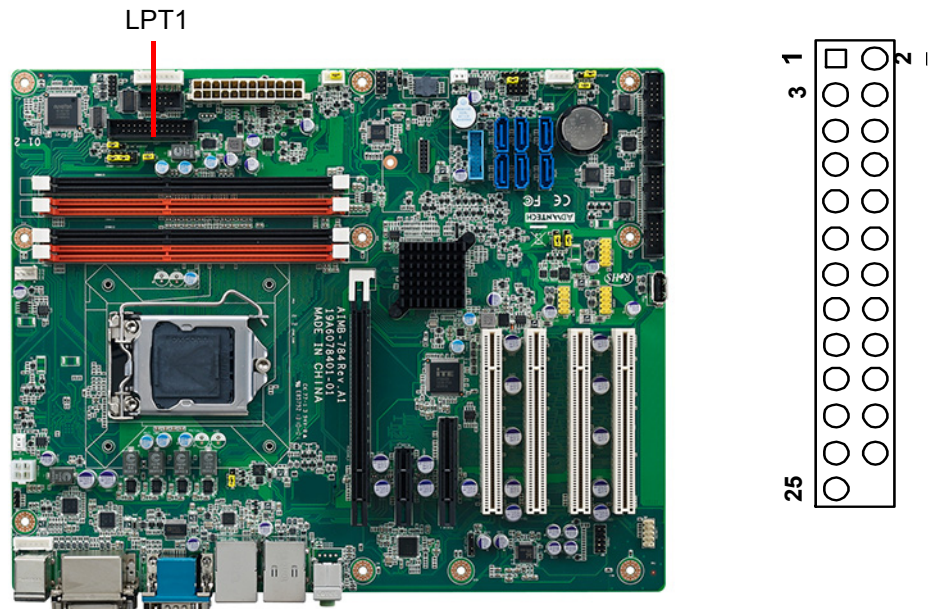
The parallel port is normally used to connect the motherboard to a printer. The AIMB-784 includes an onboard parallel port, accessed through a 25-pin flat-cable connector, LPT1.

2.3 USB Ports (LAN1_USB910, LAN2_USB12, USB3, USB56, USB78, USB1112 & USB1314)

These ports support Plug & Play and hot swapping for up to 127 external devices. The USB 1/2/13/14 ports comply up to USB specification rev. 3.0. Transmission rates of up to 5 Gb/s and fuse protection are supported. The USB interface can be disabled in the system BIOS setup.

The AIMB-784 is equipped with one or two high-performance 1000 Mbps Ethernet LANs. They are supported by all major network operating systems. The RJ-45 jacks on the rear plate provide convenient 1000Base-T operation.

If all USB ports are used, USB power is recommended to switch to +5 V instead of +5 V_DUAL.

USB13/14

LAN1_USB910, LAN2_USB12

USB3

USB5/6/7/8/11/12

LAN1_USB910

LAN2_USB12

USB3

USB56

USB78

USB1112

USB1314
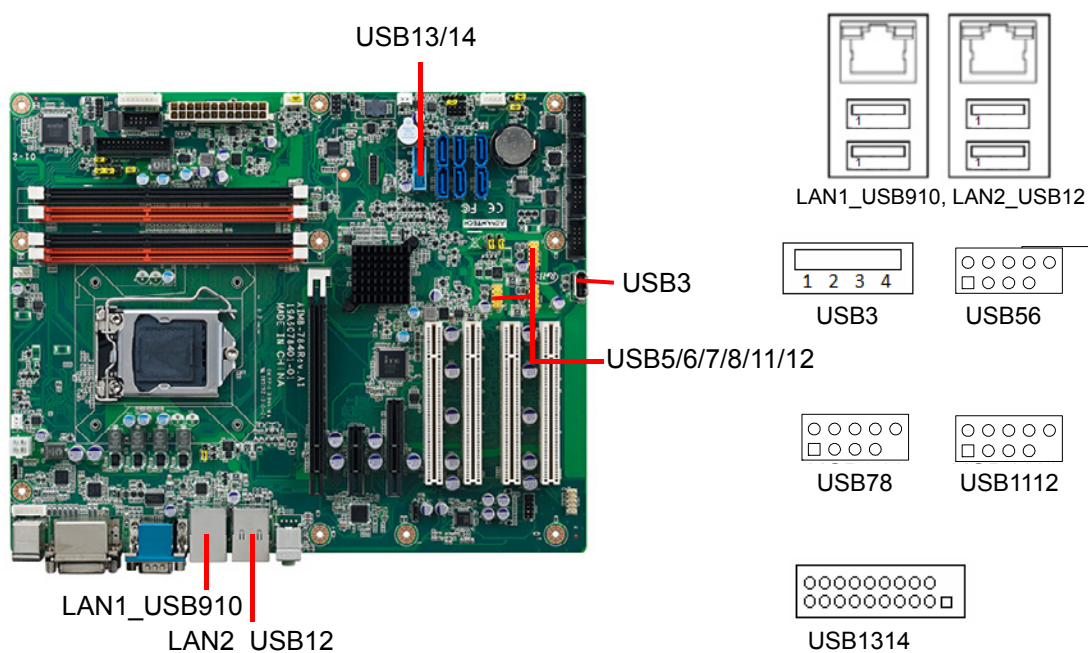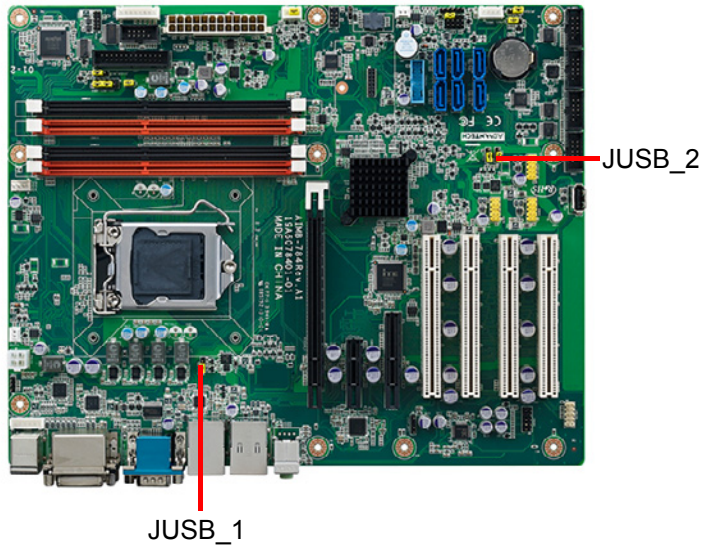
2.4 USB Power Switch

Jumper	USB Ports
JUSB_1	Rear USB ports
JUSB_2	Onboard USB ports

AIMB-784 allows users to set USB power between +5 V_DUAL and +5 V. When the jumper is set as +5 V, the board doesn't support waked from S3 via keyboard or mouse.

> **Note!** When USB power is switched to +5V, it can't be connected with powered KVM.

2.5 VGA Connector and DVI-D Connector (DVI1/DVI2 + VGA1)
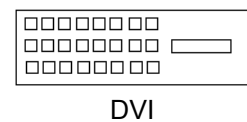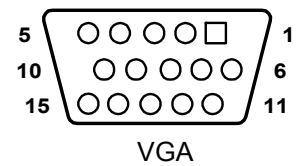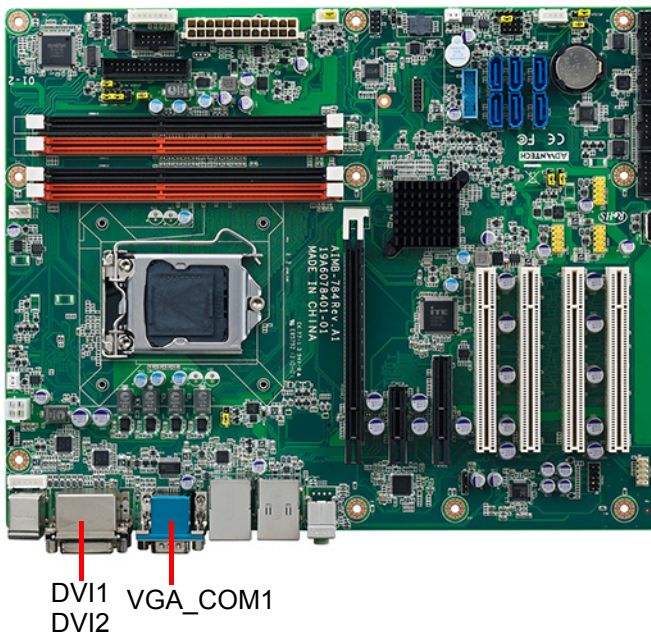
The AIMB-784 includes both VGA and DVI-D interface that can drive conventional CRT and LCD displays. Pin assignments of VGA1 and DVI1/DVI2 are detailed in Appendix B.

2.6 Serial Ports (COM1, COM2, COM3, COM4, COM5 & COM6)
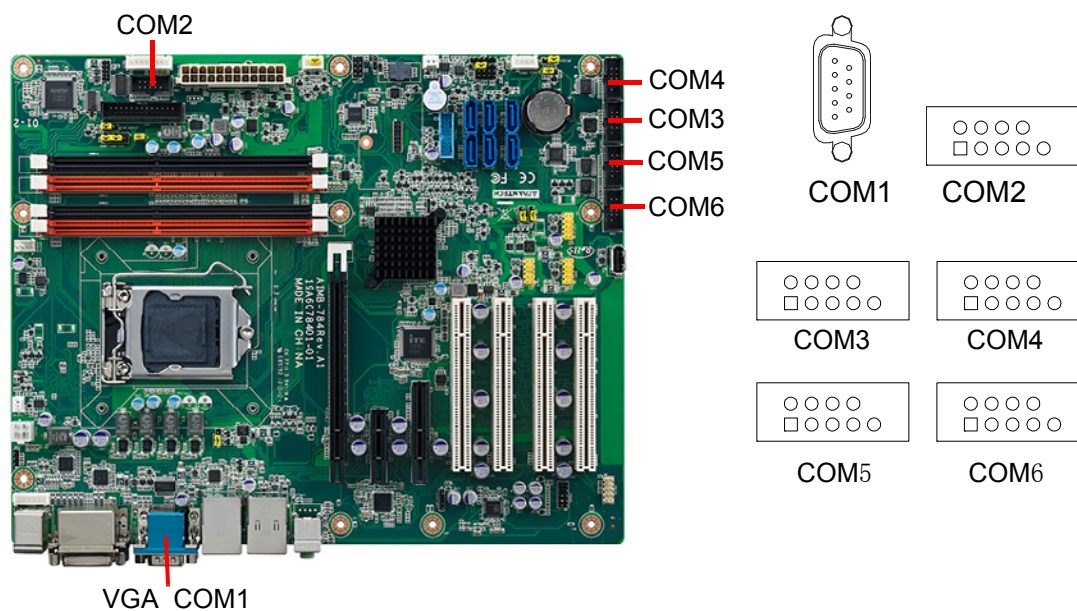
The AIMB-784 offers six serial ports (one on the rear panel and five onboard). RS-232/422/485 mode is selected by BIOS for COM3. These ports can connect to a serial mouse, printer or communications network. The IRQ and address ranges for those ports are fixed. However, if you want to disable the port or change these parameters later, you can do this in the system BIOS setup. Different devices implement the RS-232/422/485 standards in different ways. If you are having problems with a serial device, please be sure to check the pin assignments for the connector.

2.7 PS/2 Keyboard and Mouse Connector (KBMS1)
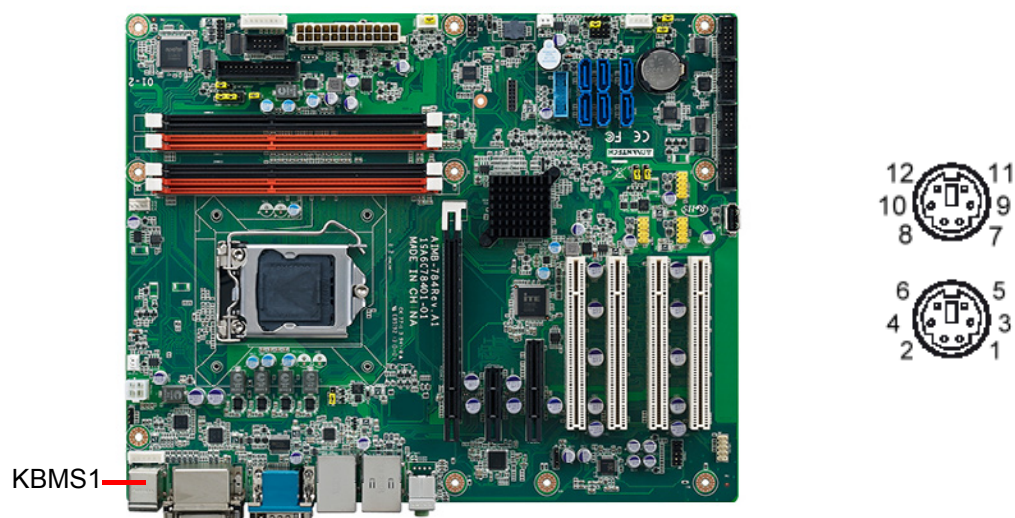
Two 6-pin mini-DIN connectors (KBMS1) on the rear panel of the motherboard provide PS/2 keyboard and mouse connections.

2.8 External Keyboard & Mouse (KBMS2)
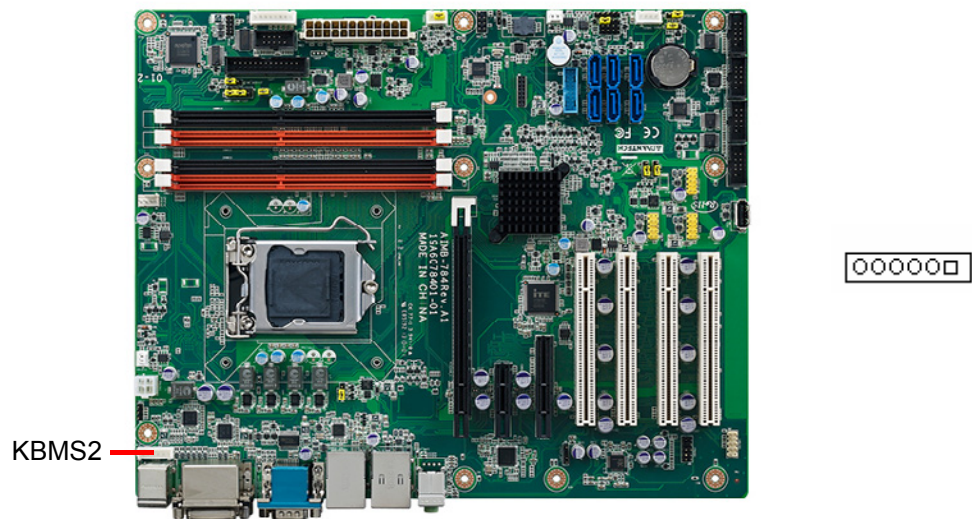
There is also an extra onboard external keyboard and mouse connector on the motherboard. This gives system integrators greater flexibility in designing their systems.

2.9 CPU Fan Connector (CPUFAN1)
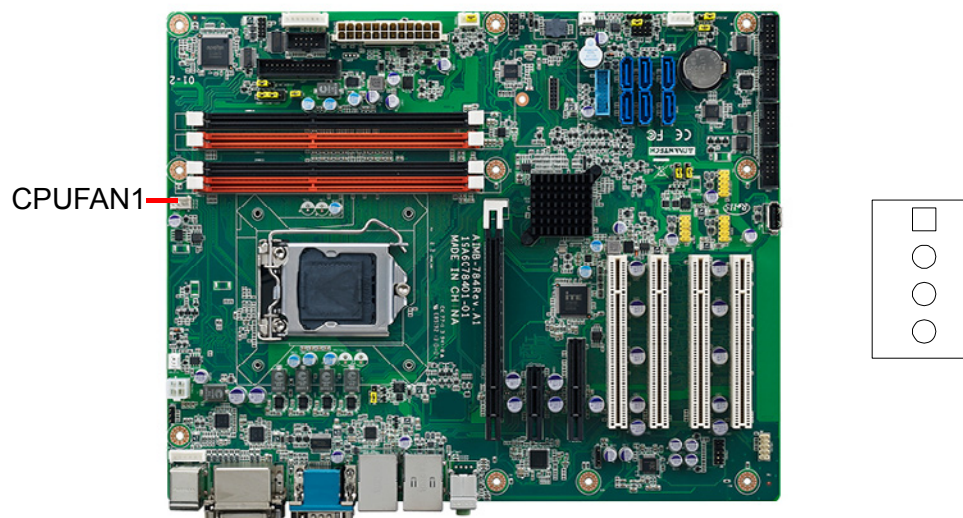
If a fan is used, this connector supports cooling fans that draw up to 500 mA (6 W).

2.10 System FAN Connector (SYSFAN1 and SYSFAN2)
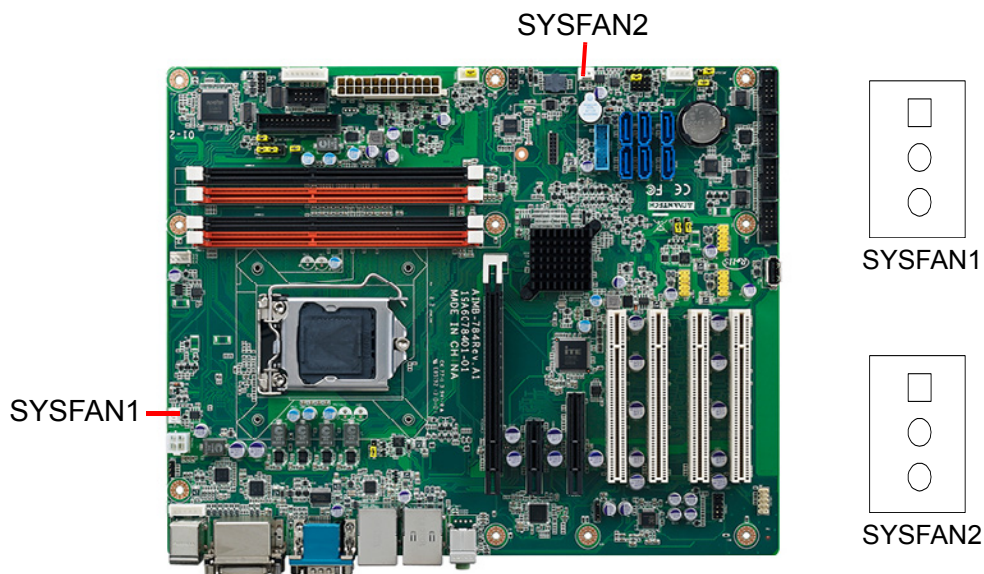
If a fan is used, this connector supports cooling fans that draw up to 500 mA (6 W).

2.11 Front Panel Connectors (JFP1, JFP2 & JFP3)

There are several external switches and LEDs to monitor and control the AIMB-784.
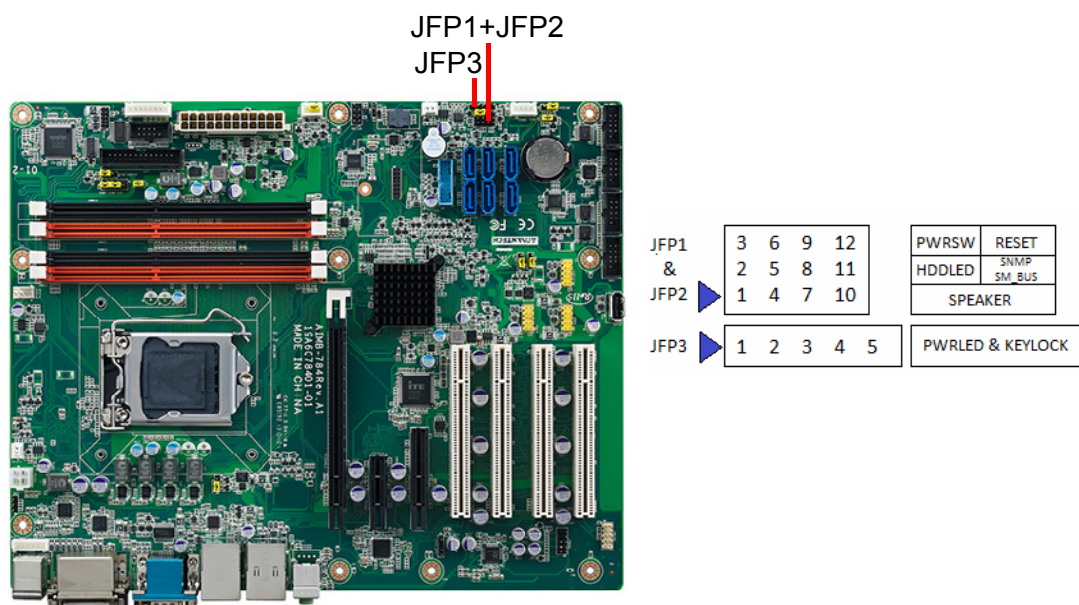
2.11.1 Power LED and Keyboard Lock (JFP3)

JFP3 is a 5-pin connector for the power LED. Refer to Appendix B for detailed information on the pin assignments. If a PS/2 or ATX power supply is used, the system's power LED status will be as indicated as follows.

Table 2.1: PS/2 or ATX power supply LED status		
Power mode	**LED (PS/2 power)**	**LED (ATX power)**
System On	On	On
System Suspend	Fast flashes	Fast flashes
System Off	Off	Off
System Off in deep sleep	Off	Off

2.11.2 External Speaker (JFP2 pins 1, 4, 7 & 10)

JFP2 is a 8-pin connector for an external speaker. The AIMB-784 provides an onboard buzzer as an alternative. To enable the buzzer, set pins 7-10 as closed.

2.11.3 HDD LED Connector (JFP2 pins 2 & 5)

You can connect an LED to connector JFP2 to indicate when the HDD is active.

2.11.4 SNMP SM_Bus connector (JFP2 pins 8 & 11)

AIMB-784 supports Advantech SNMP-1000/SAB-2000 module for providing a platform independent system management. When installing SNMP-1000/SAB-2000 module on AIMB-784, please connect it to pins 8 and 11 of JFP2.

2.11.5 ATX Soft Power Switch (JFP1 pins 3 & 6)

If your computer case is equipped with an ATX power supply, you should connect the power on/off button on your computer case to pins 3 and 6 of JFP1. This connection enables you to turn your computer on and off.

2.11.6 Reset Connector (JFP1 pins 9 & 12)

Many computer cases offer the convenience of a reset button.

2.12 Line Out, Mic In Connector (AUDIO1_AUDIO2)
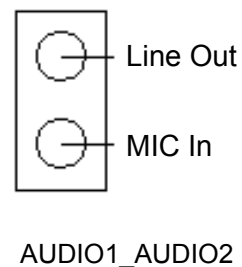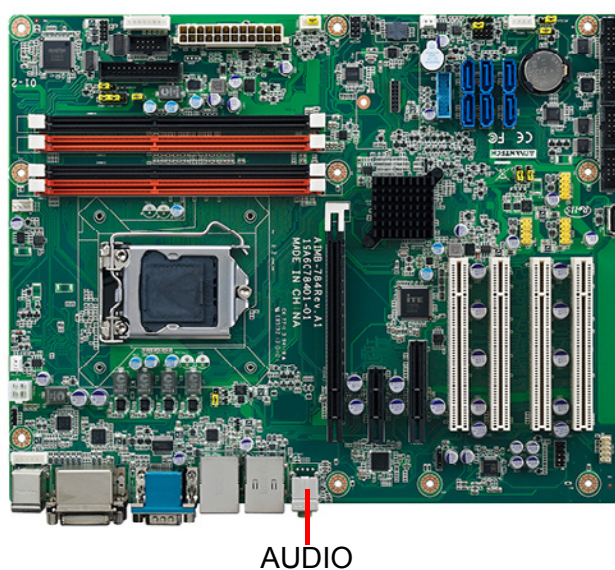
AUDIO

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

2.13 8-pin Alarm Board Connector (VOLT1)
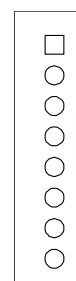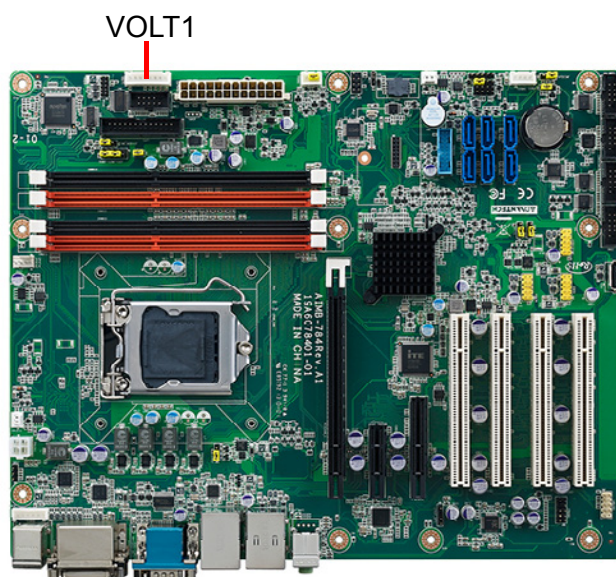
VOLT1 connects to the alarm board of Advantech chassis. The alarm board gives warnings if a power supply or fan fails, chassis overheats, or the backplane malfunctions.

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2.14 Case Open Connector (JCASE1)
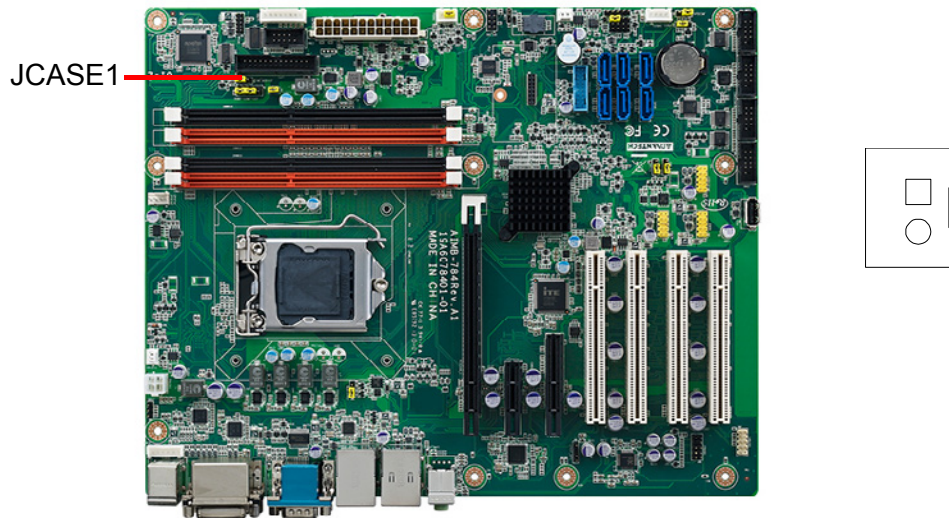
JCASE1 is for chassis with a case open sensor. The buzzer on the motherboard sounds if the case is opened unexpectedly.

2.15 Front Panel LAN Indicator Connector (LANLED1)

Table 2.2: Front Panel LAN Indicator Connector	
LAN Mode	**Indicator**
LAN Link ON	ON
LAN Active	Flash
LAN Link Off	OFF
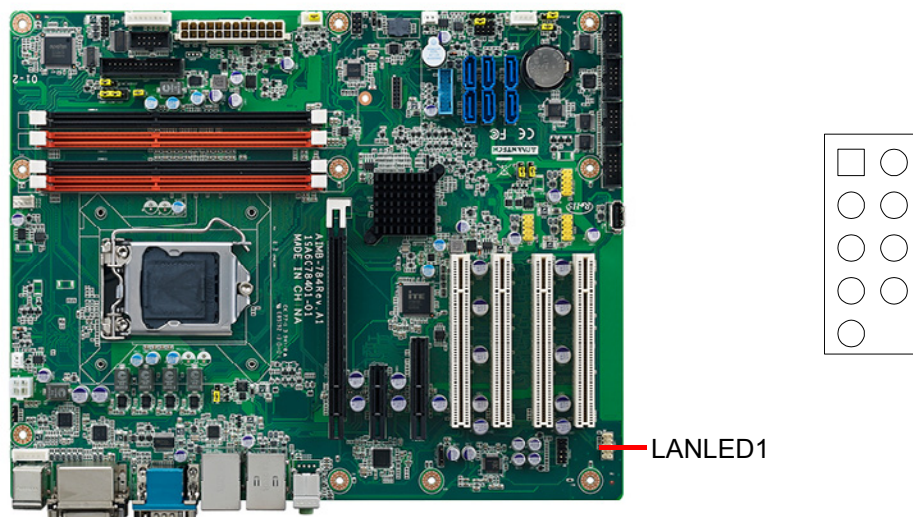
2.16 Serial ATA Interface (SATA1, SATA2, SATA3, SATA4, SATA5 & SATA6)
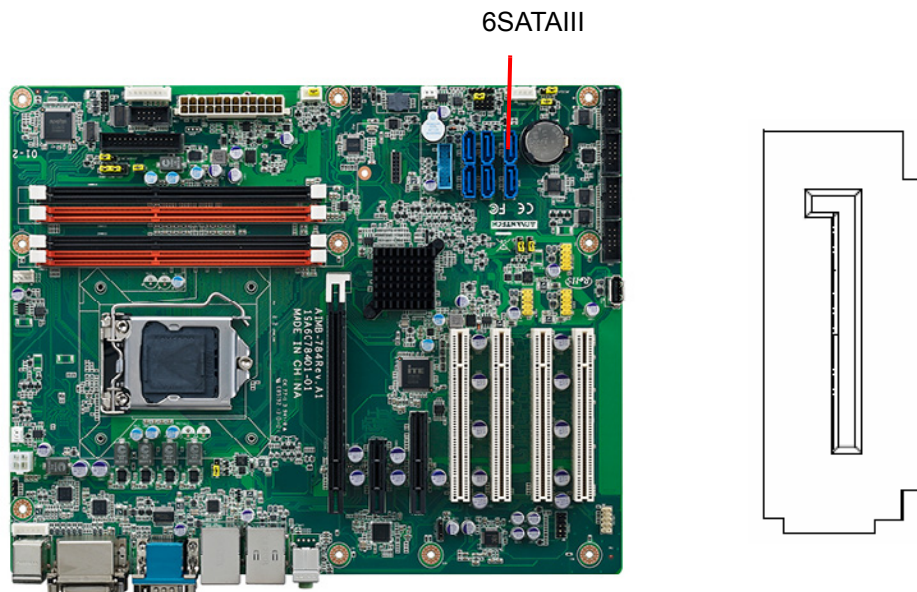
6SATAIII

AIMB-784 features six high performance serial ATA III interfaces (up to 600 MB/s) with long, thin, easy-to-run SATA cables.

2.17 PCI Slots (PCI 1 ~ PCI 4)

PCI1
PCI2
PCI3
PCI4
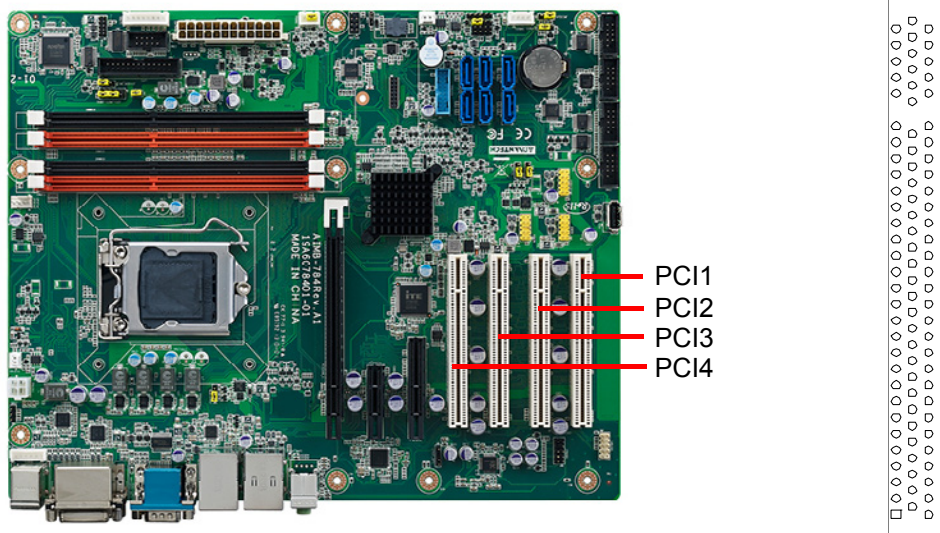
The AIMB-784 provides four 32-bit / 33 MHz PCI slots.

2.18 PCIe x16 Expansion Slot (PCIEX16_1)
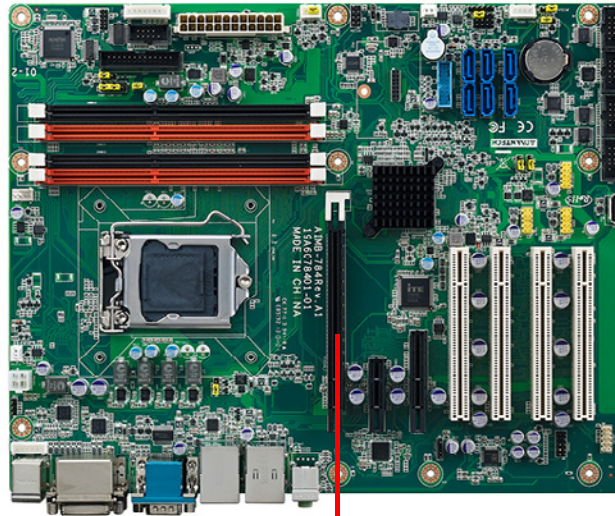
PCIe x16
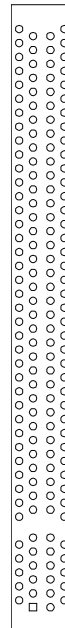
The AIMB-784 provides a PCIe x16 slot for users to install an add-on peripheral card for extension requirements.

2.19 PCIEX4_1
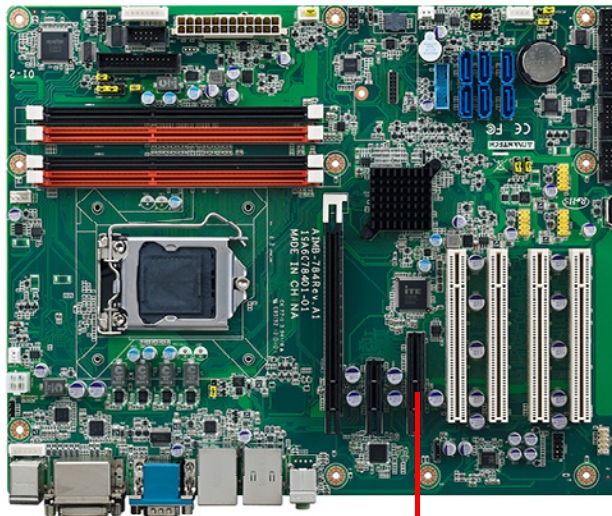
PCIe x4
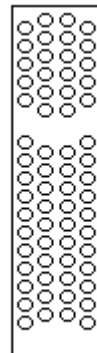
2.20 PCIEX1_1
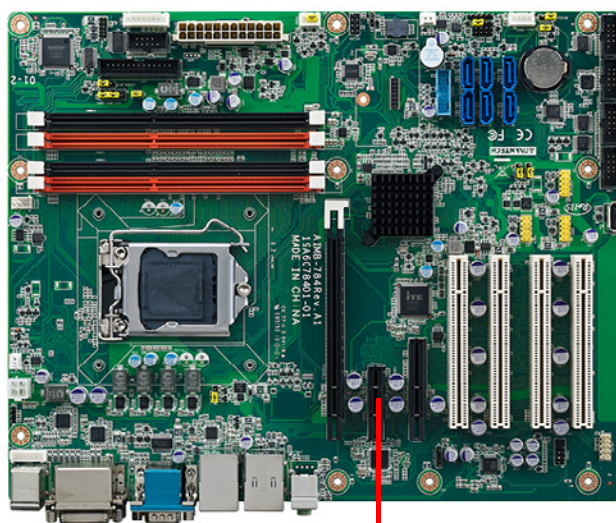
PCIe x1
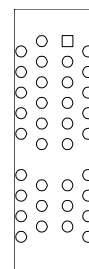
2.21 Auxiliary 4-pin power connector (ATX12V1)

To ensure the enough power is supplied to the motherboard, one auxiliary 4-pin power connector is available on the AIMB-784. ATX1 must be used to provide sufficient 12 V power to ensure the stable operation of the system.
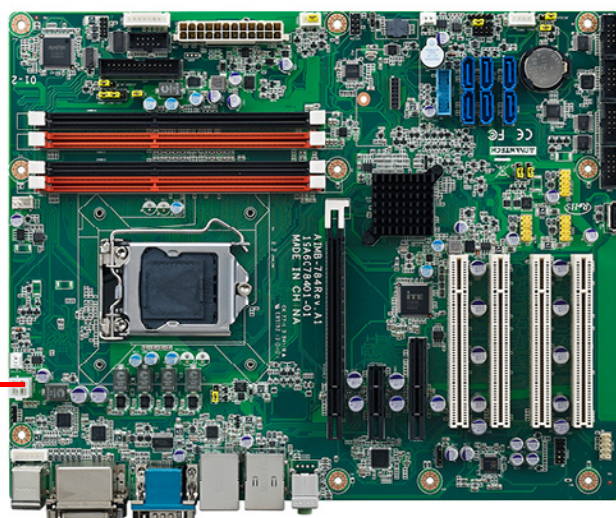
ATX12V1
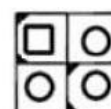
2.22 SPI Flash Connector (SPI_CN1)

The SPI flash card (fixture) via the pin header of SPI_CN1 can flash the BIOS if AIMB-784 BIOS has crashed and can't be powered up (booted up).
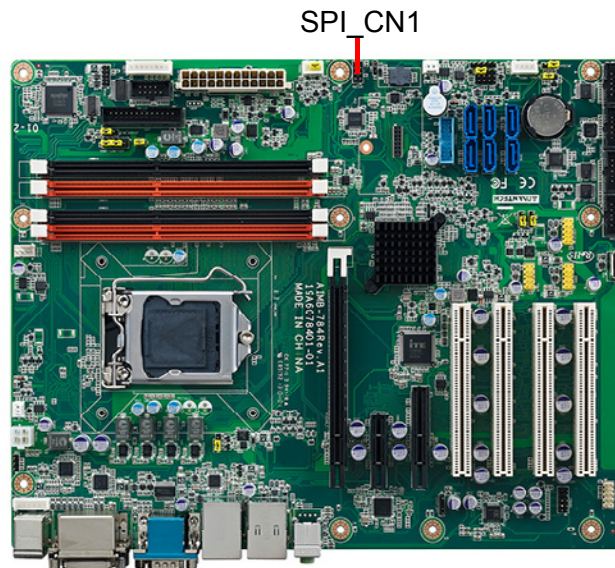
2.23 Low Pin Count Connector (LPC1)
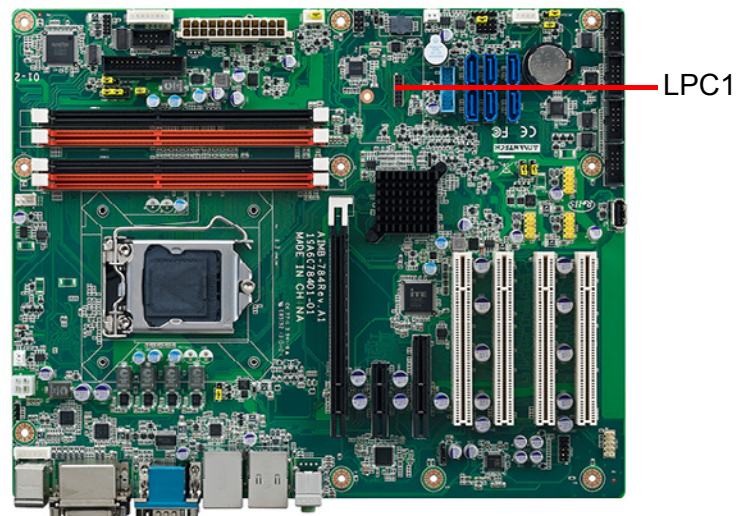
LPC connector on AIMB-784 is reserved for Advantech LPC modules.

Table 2.3: Advantech LPC Module List	
P/N	Description
PCA-TPM-00A1E	TPM Module

Chapter 3

BIOS Operation

3.1 Introduction

AMI BIOS has been integrated into myriads of motherboards for decades. In the past, people often referred to the AMI BIOS setup menu as BIOS, BIOS setup or CMOS setup.

With the AMI BIOS Setup Utility, you can modify BIOS settings and control the specific features of your computer. The Setup Utility uses a number of menus for making changes and turning the specific features on or off. This chapter describes the basic navigation of the AIMB-784 setup screens.

```
               Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
  Main  Advanced  Chipset  Boot  Security  Save & Exit

  BIOS Information                                          Set the Date. Use Tab to
  BIOS Vendor                   American Megatrends         switch between Date elements.
  Core Version                  4.6.5.4   0.24 x64
  Compliancy                    UEFI 2.3.1; PI 1.2
  Project Version               AIMB A784X010
  Build Date and Time           05/15/2013 09:26:35


  System Date                   [Fri 06/21/2013]
  System Time                   [15:39:50]

  Access Level                  Administrator

                                                           →←: Select Screen
                                                           ↑↓: Select Item
                                                           Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F2: Previous Values
                                                           F3: Optimized Defaults
                                                           F4: Save & Exit
                                                           ESC: Exit



               Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

Figure 3.1 Main setup 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 NVRAM area so it retains the Setup information when the power is turned off.

3.2 Entering BIOS Setup

Press <Del> to enter AMI BIOS Setup Utility, the Main Menu will appear on the screen. Use arrow keys to select among the items and press <Enter> to accept or enter the sub-menu.

When users first enter the BIOS Setup Utility, they 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 described in this section. The Main BIOS Setup screen is shown below.

3.2.1 Main Menu

Press <Del> at bootup to enter AMI BIOS Setup Utility, the Main Menu will appear on the screen. Use arrow keys to select among the items and press <Enter> to accept or enter the sub-menu.

```
Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
Main  Advanced  Chipset  Boot  Security  Save & Exit

BIOS Information                                          Set the Date. Use Tab to
BIOS Vendor              American Megatrends             switch between Date elements.
Core Version             4.6.5.4   0.24 x64
Compliancy               UEFI 2.3.1; PI 1.2
Project Version          AIMB A784X010
Build Date and Time      05/15/2013 09:26:35


System Date              [Fri 06/21/2013]
System Time              [15:39:50]

Access Level             Administrator

                                                         ++: Select Screen
                                                         ↑↓: Select Item
                                                         Enter: Select
                                                         +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F3: Optimized Defaults
                                                         F4: Save & Exit
                                                         ESC: Exit

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```

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 be. The right frame displays the key legend.

The key legend above 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 AIMB-784 setup screen to enter the Advanced BIOS setup screen. You can select any of the items in the left frame of the screen, such as CPU configuration, to go to the sub menu for that item. You can display an Advanced BIOS Setup option by highlighting it using the <Arrow> keys. All Advanced BIOS Setup options are described in this section. The Advanced BIOS Setup screens are shown below. The sub menus are described on the following pages.

```
          Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
        Main  Advanced  Chipset  Boot  Security  Save & Exit

   ▶ PCI Subsystem Settings                          PCI, PCI-X and PCI Express
   ▶ ACPI Settings                                   Settings.
   ▶ Trusted Computing
   ▶ S5 RTC Wake Settings
   ▶ CPU Configuration
   ▶ SATA Configuration
   ▶ PCH-FW Configuration
   ▶ AMT Configuration
   ▶ USB Configuration
   ▶ SMART Settings
   ▶ Super IO Configuration
   ▶ H/W Monitor
   ▶ Second Super IO Configuration
                                                     →←: Select Screen
                                                     ↑↓: Select Item
                                                     Enter: Select
                                                     +/-: Change Opt.
                                                     F1: General Help
                                                     F2: Previous Values
                                                     F3: Optimized Defaults
                                                     F4: Save & Exit
                                                     ESC: Exit



          Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

Figure 3.3 Advanced BIOS features setup screen

3.2.2.1 PCI Subsystem Settings
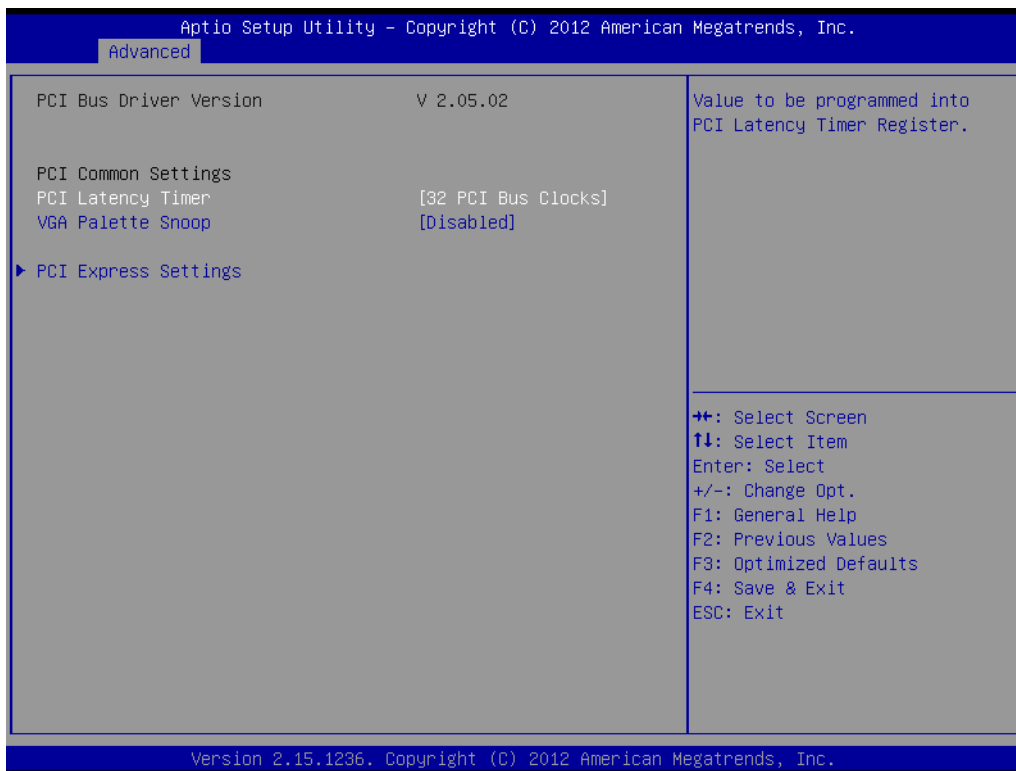
Figure 3.4 PCI Subsystem Settings

■ **PCI Common Settings**
PCI Latency Timer

Value to be programed into PCI Latency Timer Register.
VGA Palette Snoop

"Enable or Disable" VGA palette registers snooping.
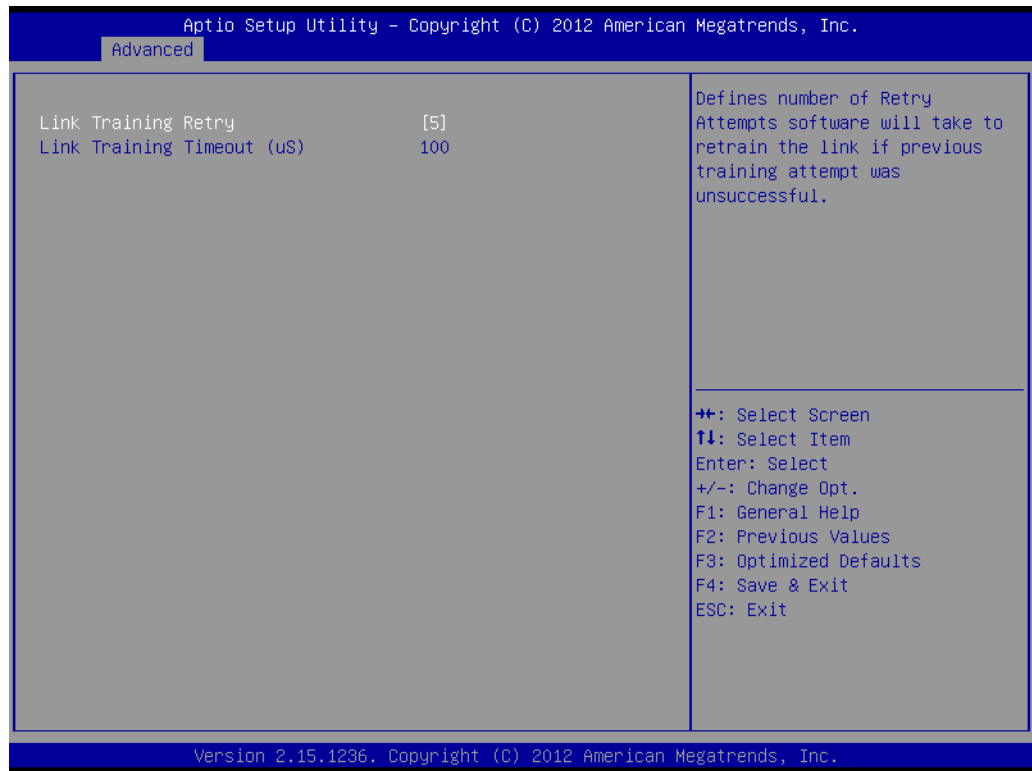
Figure 3.5 PCI Express Settings

PCI Express Settings

■ **Link Training Retry**

Defines number of retry attempts software will take to retrain the link if previous training attempt was unsuccessful.

■ **Link Training Timeout**

Defines number of micro-secondes software that will wait before polling "Link Training " bit in link status register. Values range from 10 to 1000 uS.

3.2.2.2 ACPI Settings

```
                    Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
          Advanced

ACPI Settings                                                    Enables or Disables System
                                                                 ability to Hibernate (OS/S4
                                                                 Sleep State). This option may
Enable Hibernation                    [Enabled]                  be not effective with some OS.
ACPI Sleep State                      [S3 only(Suspend to ...]
Lock Legacy Resources                 [Disabled]
S3 Video Repost                       [Disabled]
PowerOn by Modem                      [Disabled]
Power Type                            [ATX]


                                                                 →←: Select Screen
                                                                 ↑↓: Select Item
                                                                 Enter: Select
                                                                 +/-: Change Opt.
                                                                 F1: General Help
                                                                 F2: Previous Values
                                                                 F3: Optimized Defaults
                                                                 F4: Save & Exit
                                                                 ESC: Exit



                    Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

Figure 3.6 ACPI Settings

■ **Enable Hibernation**

"Enable or Disable" Hibernation (OS/S4 Sleep State). This option may not be applied in some OS.

■ **ACPI Sleep State**

"Auto or S1 only or S3 only" ACPI Sleep State

■ **Lock Legacy Resources**

"Enable or Disable" Lock Legacy Resources

■ **S3 Video Repost**

"Enable or Disable" S3 Video Repost

■ **PowerOn by Modem**

"Enable and Disable" PowerOn by Modem

3.2.2.3 Trusted Computing


```
            Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
   Advanced

Configuration                                          Enables or Disables BIOS
  Security Device Support           [Disable]          support for security device.
                                                       O.S. will not show Security
                                                       Device. TCG EFI protocol and
Current Status Information                             INT1A interface will not be
  NO Security Device Found                             available.



                                                       →←: Select Screen
                                                       ↑↓: Select Item
                                                       Enter: Select
                                                       +/-: Change Opt.
                                                       F1: General Help
                                                       F2: Previous Values
                                                       F3: Optimized Defaults
                                                       F4: Save & Exit
                                                       ESC: Exit



            Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

Figure 3.7 TPM Settings

■ **TPM Support**

"Enable or Disable" TPM Support. You can purchase Advantech LPC TPM module to enable TPM function. P/N: PCA-TPM-00A1E

3.2.2.4 S5 RTC Wake Settings


```
                Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
        Advanced

Wake system with Fixed Time        [Disabled]                      Enable or disable System wake
                                                                   on alarm event. When enabled,
                                                                   System will wake on the
                                                                   hr::min::sec specified




                                                                   _____

                                                                   →←: Select Screen
                                                                   ↑↓: Select Item
                                                                   Enter: Select
                                                                   +/-: Change Opt.
                                                                   F1: General Help
                                                                   F2: Previous Values
                                                                   F3: Optimized Defaults
                                                                   F4: Save & Exit
                                                                   ESC: Exit




                Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

Figure 3.8 S5 RTC Wake Settings

■ **Wake system with Fixed Time**
To "Enable or Disable" System wake on alarm event. The system will wake on the hr:min:sec as specified.

3.2.2.5 CPU Configuration


```
          Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
     Advanced

  CPU Configuration                                        ▲ FLEX_RATIO(194) MSR

  Genuine Intel(R) CPU 0000 @ 2.00GHz
  CPU Signature                       306c2
  Microcode Patch                     ffff0006
  CPU Speed                           2400 MHz
  Processor Cores                     2
  Intel HT Technology                 Supported
  Intel VT-x Technology               Supported
  Intel SMX Technology                Supported
  64-bit                              Supported
  EIST Technology                     Supported
  CPU C3 state                        Supported
  CPU C6 state                        Supported        ➜←: Select Screen
  CPU C7 state                        Supported        ↑↓: Select Item
                                                       Enter: Select
  L1 Data Cache                       32 kB x 2        +/-: Change Opt.
  L1 Code Cache                       32 kB x 2        F1: General Help
  L2 Cache                            256 kB x 2       F2: Previous Values
  L3 Cache                            4096 kB          F3: Optimized Defaults
                                                       F4: Save & Exit
                                                       ESC: Exit
  Active Processor Cores              [All]
  Overclocking lock                   [Disabled]
  Limit CPUID Maximum                 [Disabled]    ▼

          Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

Figure 3.9 CPU Configuration

- ■ **Active Processor Core**

  Use this item to select the number of processor cores you want to activate when you are using a dual or quad core processor.

- ■ **Overclocking lock**

  Enable or Disable the overclocking lock function.

- ■ **Limit CPUID Maximum**

  Setting this item to [Enable] allows legacy operating systems to boot even without support for CPUs with extended CPUID functions.

- ■ **Execute Disable Bit**

  This item specifies the Execute Disable Bit Feature. The settings are Enabled and Disabled. The Optimal and Fail-Safe default setting is Enabled. If Disabled is selected, the BIOS forces the XD feature flag to always return to 0.

- ■ **Intel Virtualization Technology**

  This feature is used to "Enable or Disable" the Intel Virtualization Technology (IVT) extension. It allows multiple operating systems to run simultaneously on the same system by creating virtual machines, each running its own x86 operating system.

- ■ **Hardware Prefetcher**

  Hardware Prefetcher is a technique that fetches instructions and/or data from memory into the CPU cache memory well before the CPU needs it to improve the load-to-use latency. You may choose to "Enable or Disable" it.

- ■ **Adjacent Cache Line Prefetch**

  The Adjacent Cache-Line Prefetch mechanism, like automatic hardware prefetch, operates without programmer intervention. When it is enabled through the BIOS, two 64-byte cache lines are fetched into a 128-byte sector, regardless of whether the additional cache line has been requested or not. You may choose to "Enable or Disable" it.

- ■ **EIST**

  Enable or Disable Intel SpeedStep.

- ■ **CPU C states**

  Intel C states setting for power saving.

- ■ **Package C State limit**

  To select Package C State limit: C0/C1, C2, C3, C6, C7, C7s, or AUTO

- ■ **Intel TXT(LT) Support**

  Enable or Disable Intel TXT support.

- ■ **ACPI T State**

  Enable or Disable ACPI T state support

3.2.2.6 SATA Configuration
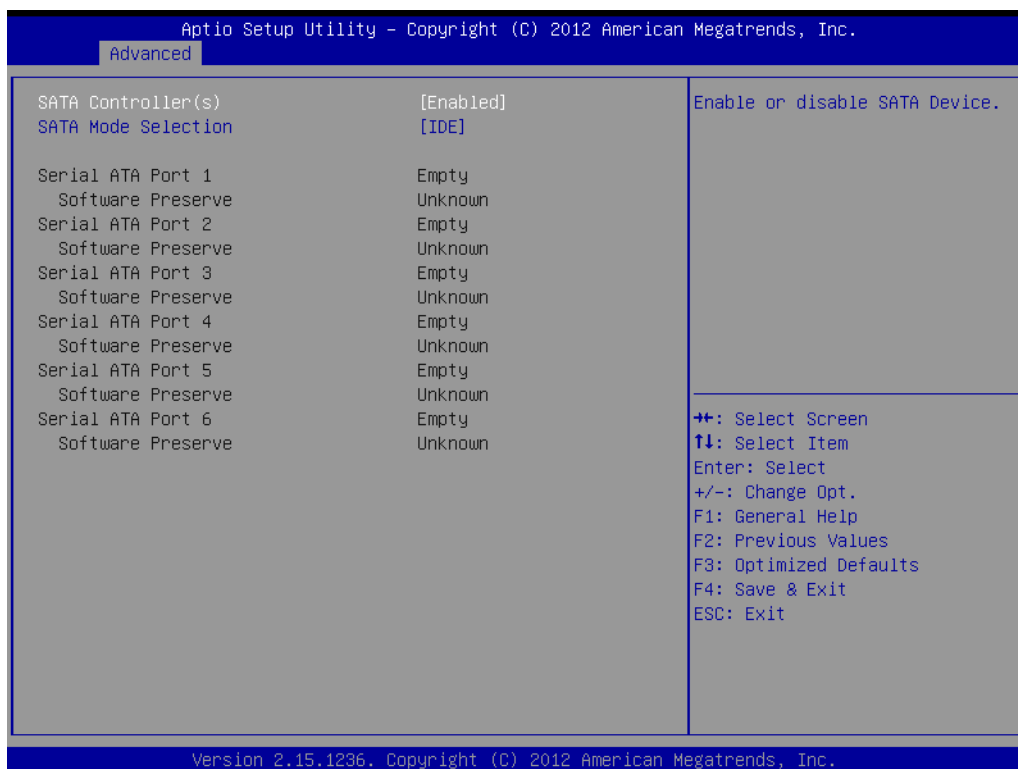
Figure 3.10 SATA Configuration

- ■ **SATA Controller(s)**

  "Enable or Disable" SATA Controller

- ■ **SATA Mode Selection**

  This can be configured as IDE, RAID or AHCI.

3.2.2.7 PCH-FW Configuration


```
                   Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
         Advanced

  ME FW Version                        9.0.2.1345
  ME Firmware Mode                     Normal Mode
  ME Firmware Type                     Full Sku Firmware
  ME Firmware SKU                      5MB




                                                          →←: Select Screen
                                                          ↑↓: Select Item
                                                          Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F3: Optimized Defaults
                                                          F4: Save & Exit
                                                          ESC: Exit




                   Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

Figure 3.11 PCH-FW Configuration

■ **PCH-FW Version**
PCH-FW page shows Intel ME FW information.

3.2.2.8 AMT Configuration
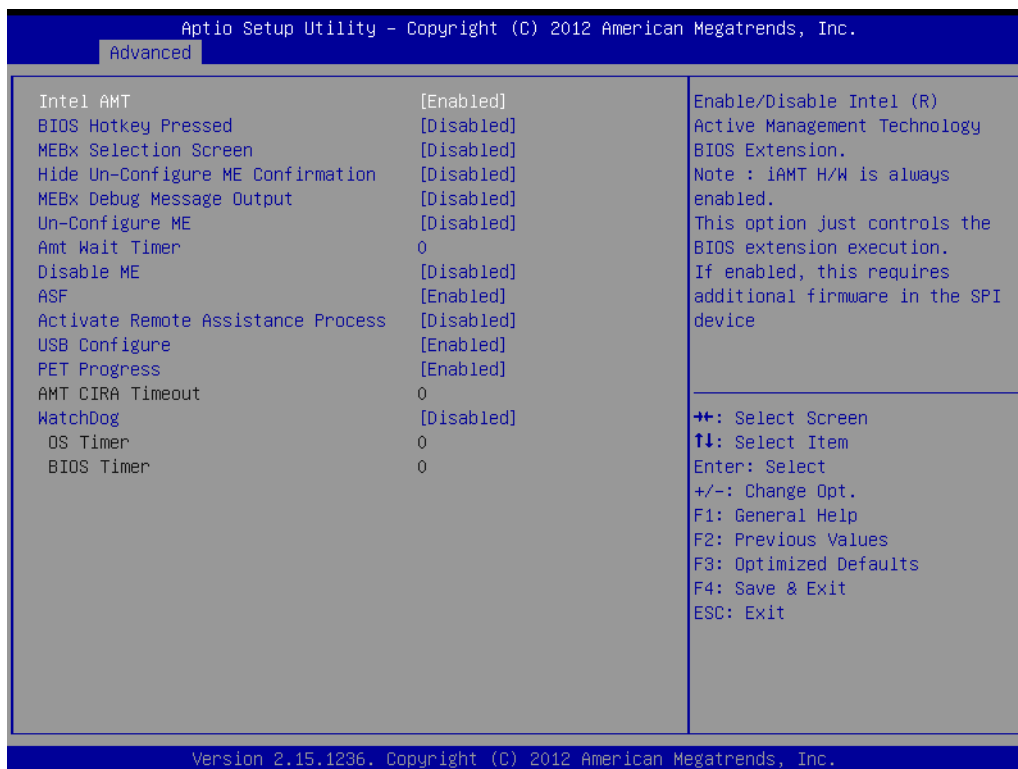
Figure 3.12 AMTConfiguration

■ **Intel AMT**
"Enable or Disable" Intel Active Management Technology

■ **BIOS Hotkey Pressed**
"Enable or Disable" BIOS Hotkey press

■ **MEBx Selection Screen**
"Enable or Disable" MEBx Selection Screen

■ **Hide Un-Configure ME Confirmation**
Hide Un-Configure ME without password confirmation prompt

■ **MEBx Debug Message Output**
"Enable or Disable" MEBx Debug Message Output

■ **Unconfigure ME**
Un-Configure ME without password

■ **AMT Wait Timer**
Set timer to wait before sending ASF_GET_Boot_Options

■ **Disable ME**
Set ME to Soft temporary disable.

■ **ASF**
"Enable or Disable" ASF (Alert specification format)

■ **Activate Remote Assistance Process**
Trigger CIRA boot

■ **USB Configure**
"Enable or Disable" USB Configure function

■ **PET Progress**
"Enable or Disable" PET Progress to receive PET event or not.

■ **WatchDog**

"Enable or Disable" Watchdog Timer

3.2.2.9 USB Configuration
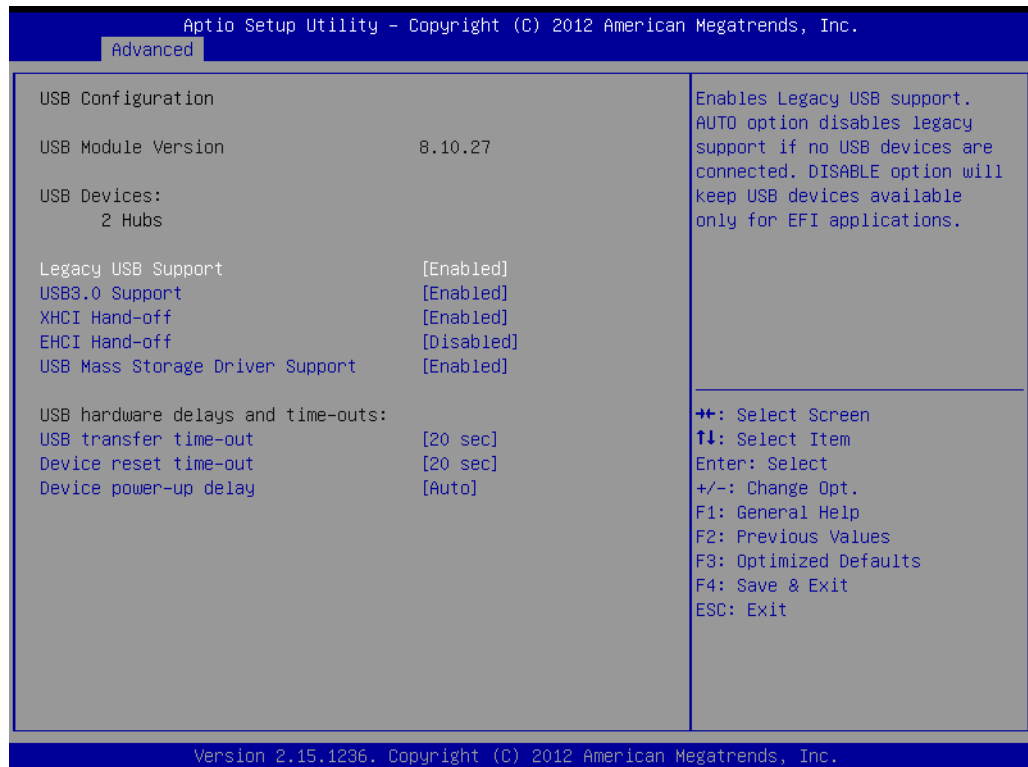
Figure 3.13 USB Configuration

■ **Legacy USB Support**

This is for supporting USB device under legacy OS such as DOS. When choosing "AUTO", the system will automatically detect if any USB device is plugged into the computer and enable USB legacy mode when a USB device is plugged and disable USB legacy mode when no USB device is plugged.

■ **USB3.0 support**

Enable/Disable USB3.0 (XHCI) support

■ **XHCI Hand-off**

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

■ **EHCI Hand-off**

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

■ **USB Mass Storage Driver Support**

Enable or Disable USB Mass Storage driver support.

■ **USB transfer time-out**

Allows you to select the USB transfer time-out value. [1,5,10,20sec]

■ **Device reset time-out**

Allows you to select the USB device reset time-out value. [10,20,30,40sec]

■ **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 take from Hub descriptor.

3.2.2.10 SMART Settings

```
              Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
     Advanced

 SMART Settings                                        Run SMART Self Test on all
                                                       HDDs during POST.
 SMART Self Test                      [Disabled]




                                                       →←: Select Screen
                                                       ↑↓: Select Item
                                                       Enter: Select
                                                       +/-: Change Opt.
                                                       F1: General Help
                                                       F2: Previous Values
                                                       F3: Optimized Defaults
                                                       F4: Save & Exit
                                                       ESC: Exit


              Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```
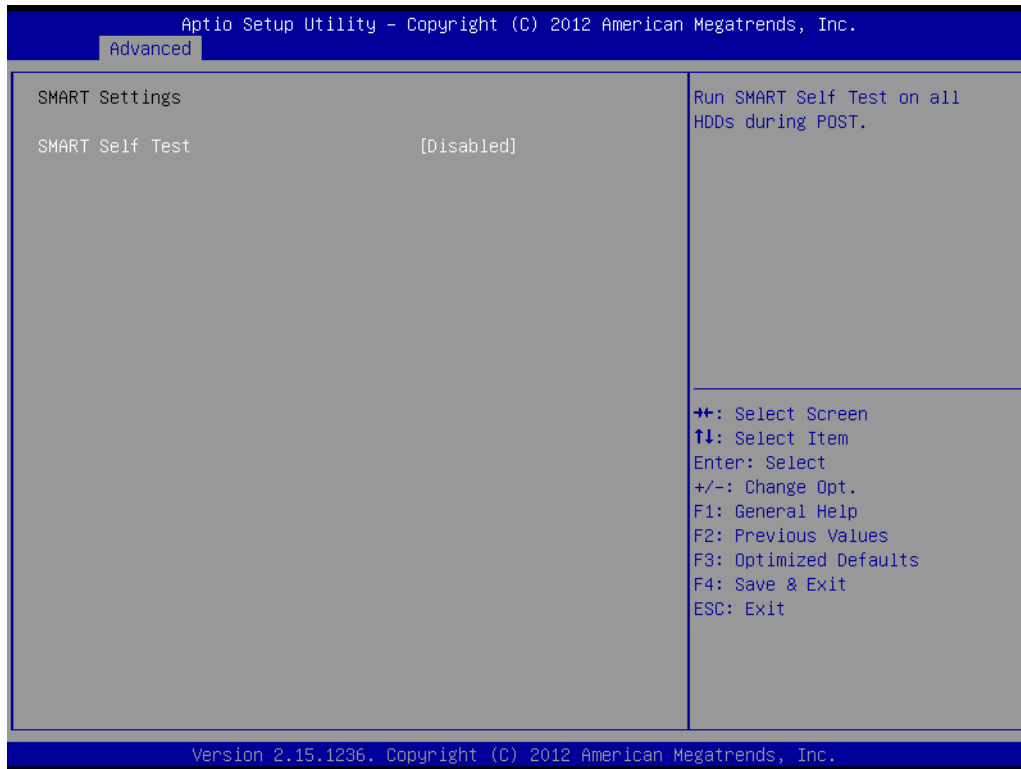
Figure 3.14 SMART Settings

■   **SMART Self Test**
"Enable or Disable" SMART Self Test on all HDDs during POST.

3.2.2.11 Super IO Configuration
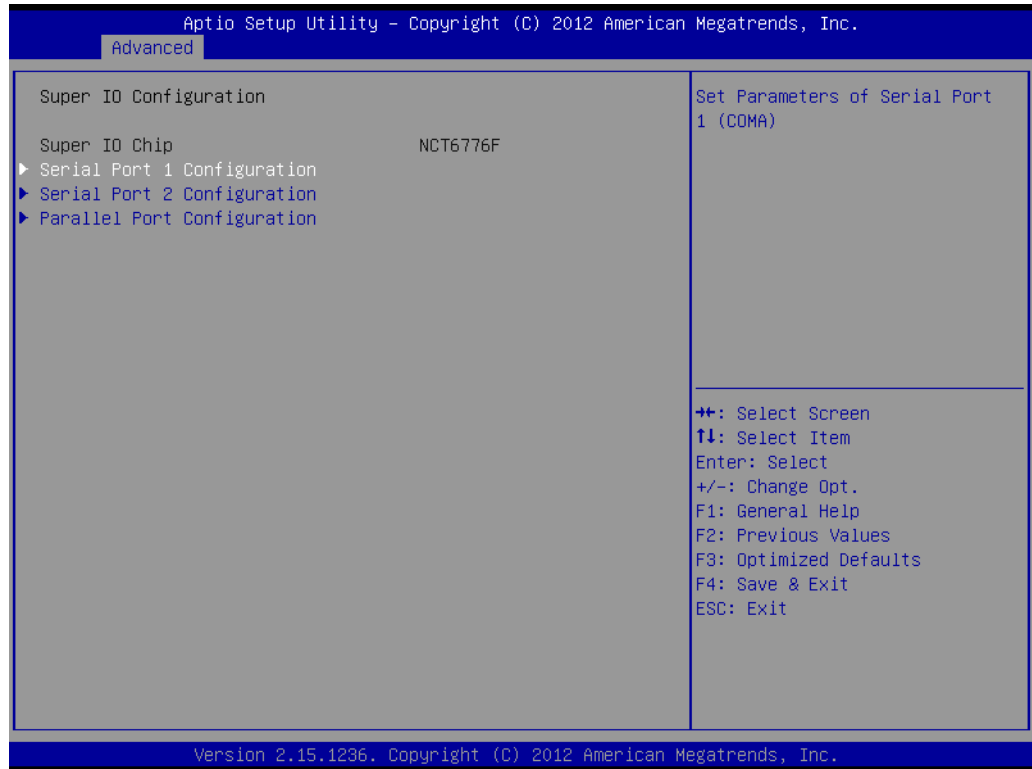
Figure 3.15 Super IO Configuration
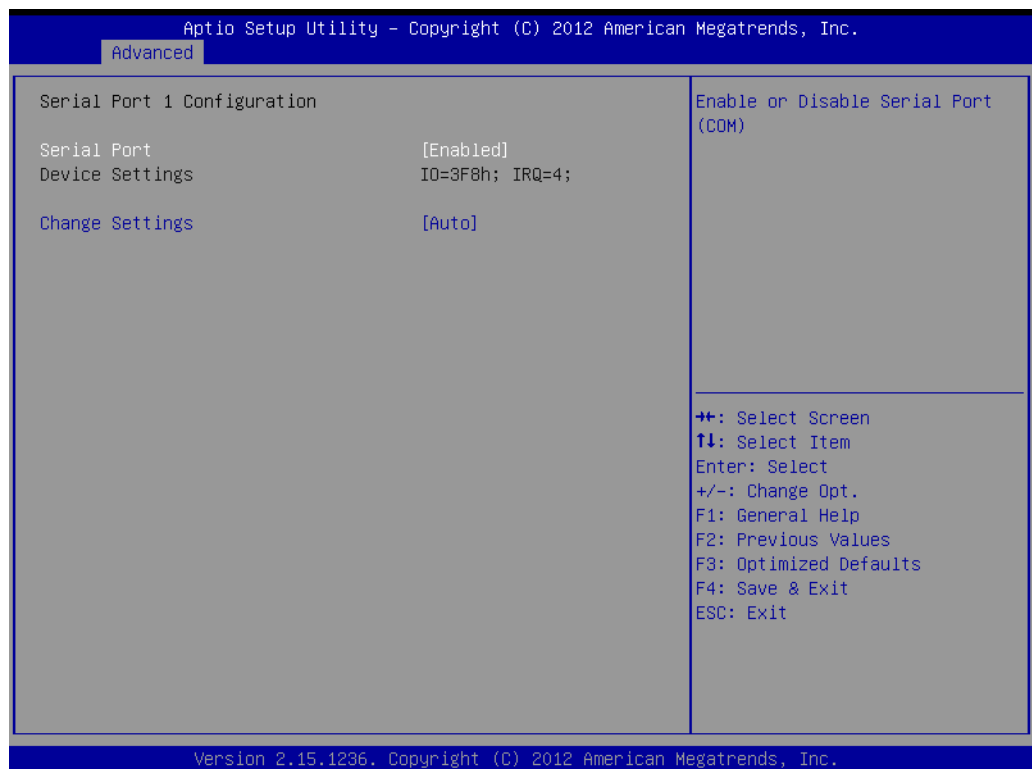
Figure 3.16 Serial Port 1 Configuration
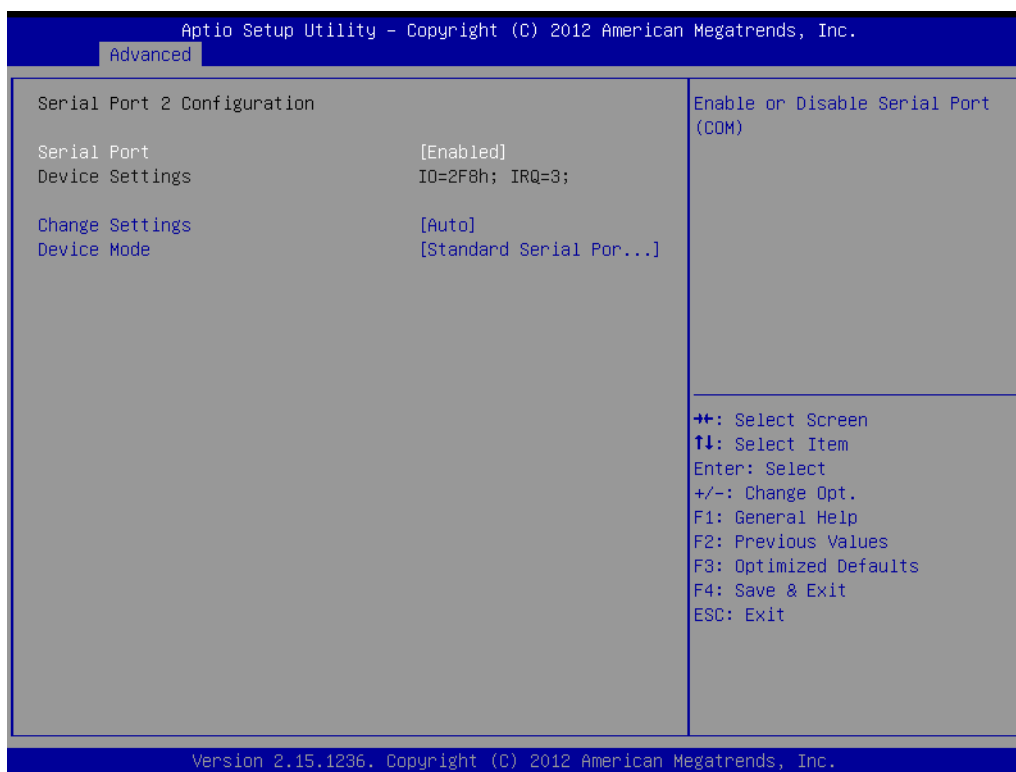
Figure 3.17 Serial Port 2 Configuration
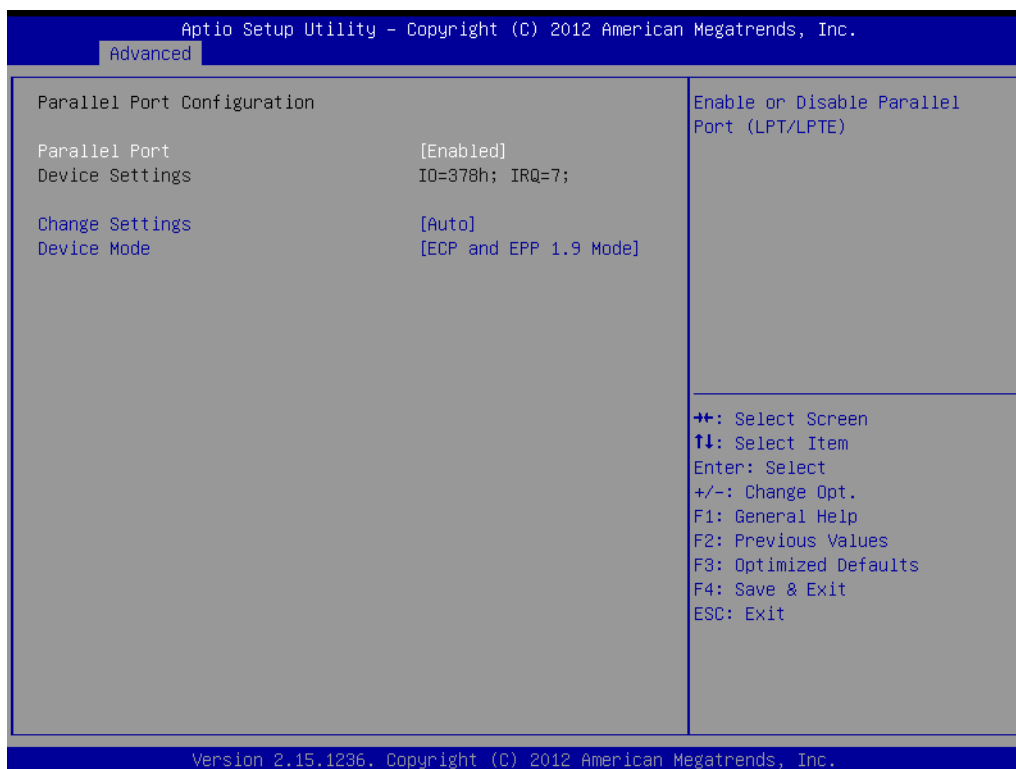
Figure 3.18 Parallel Configuration

■ **Serial Port 1 Configuration**
  – **Serial Port**
    "Enable or Disable" Serial Port 1.

- **Change Settings**

  To select an optimal setting for serial port 1.

- ■ **Serial Port 2 Configuration**

  - **Serial Port**

    "Enable or Disable" Serial Port 2.

  - **Change Settings**

    To select an optimal setting for serial port 2.

  - **Device Mode**

    Serial port 2 could be selected as "Standard serial port mode" or "IrDA 1.0 (HP SIR) mode".

- ■ **Parallel Port**

  To "Enable or Disable" Parallel Port.

  - **Change Settings**

    To select an optimal setting for parallel port.

  - **Device Mode**

    Parallel port could be selected as "ECP and EPP 1.9 Mode" and other settings.

3.2.2.12 H/W Monitor
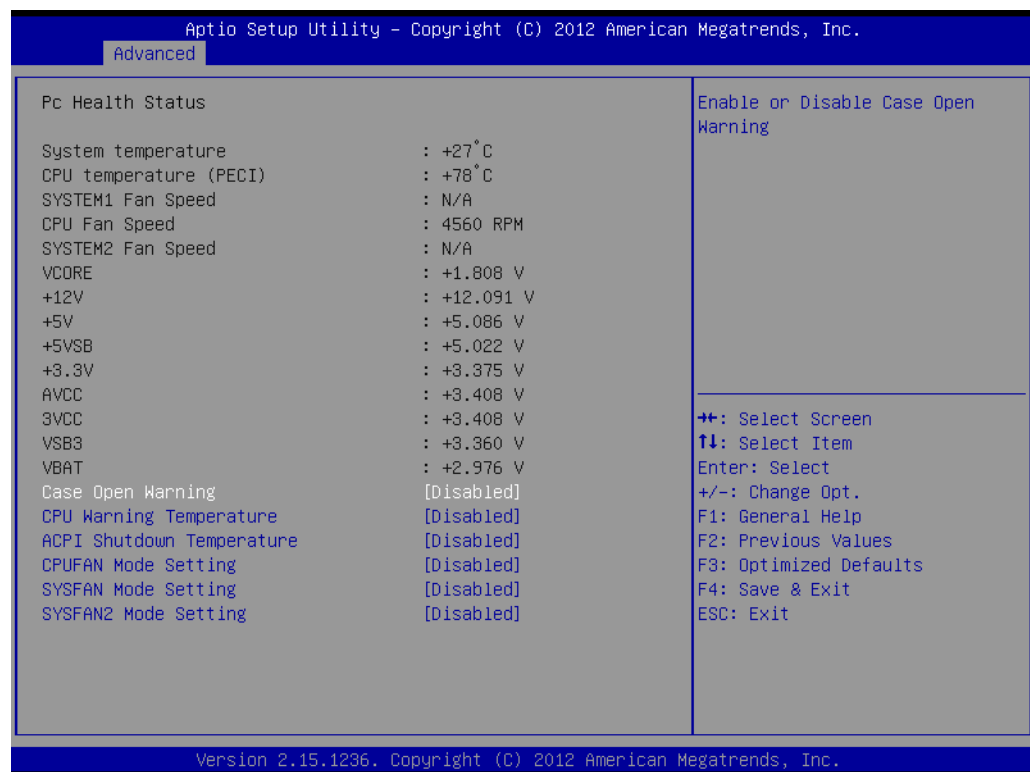
Figure 3.19 PC Health Status

- ■ **Case Open Warning**

  To "Enable or Disable" the Chassis Intrusion monitoring function. When it is enabled and the case is opened, the speaker beeps.

- ■ **CPU Warning Temperature**

  Use this item to set the CPU warning temperature. When the system reaches the warning temperature, the speaker will beep.

■ **ACPI Shutdown Temperature**
Use this item to set the ACPI shutdown temperature. When the system reaches the shutdown temperature, it will be automatically shut down by ACPI OS to protect the system from overheat damage.

■ **CPUFAN Mode Setting**
"Enable or Disable" CPUFAN Mode to SMART FAN setting.

■ **SYSFAN Mode Setting**
"Enable or Disable" SYSFAN Mode to SMART FAN setting.

■ **SYSFAN2 Mode Setting**
Enable or Disable SYSFAN Mode to SMART FAN setting.

3.2.2.13 Second Super IO Configuration
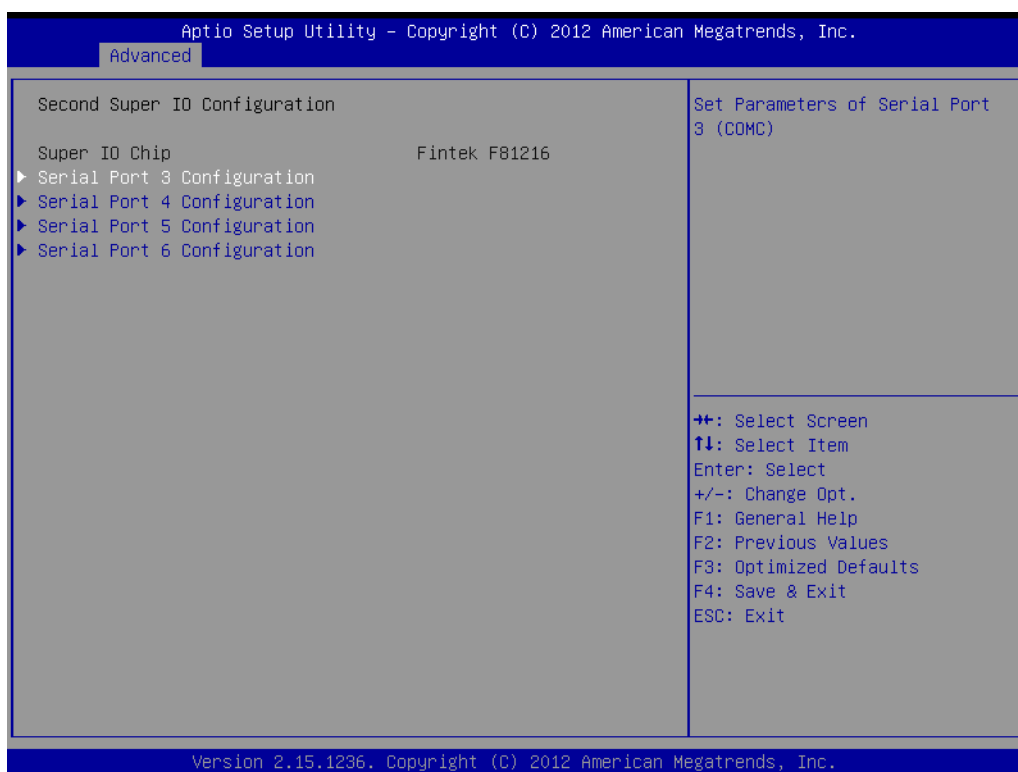
Figure 3.20 Super IO Configuration

AIMB-784 supports 2nd super IO for COM 3~6, this page of BIOS menu is to set respective serial port configuration.
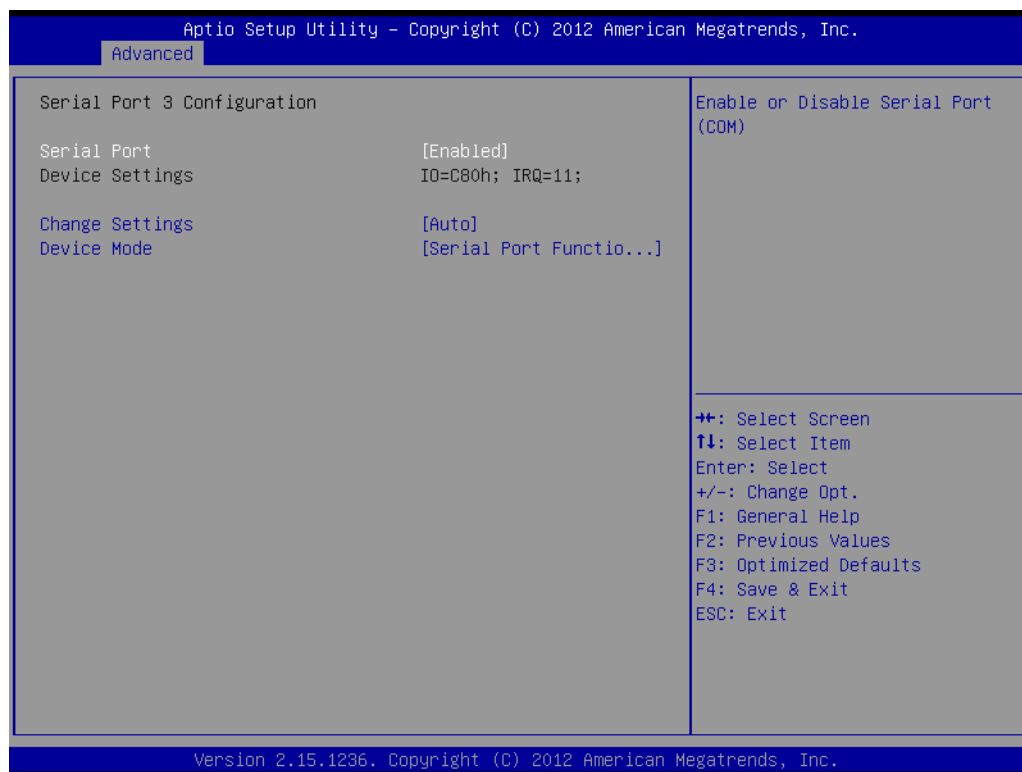
Figure 3.21 Serial Port 3 Configuration

■ **Serial Port 3 Configuration**
  – **Serial Port**
    To "Enable or Disable" Serial Port 3.
  – **Change Settings**
    To select an optimal setting for serial port 3.
  – **Device Mode**
    Can be selected to Serial Port Function Mode (RS-232), RS-422 Half Duplex, or RS-422 Full Duplex.
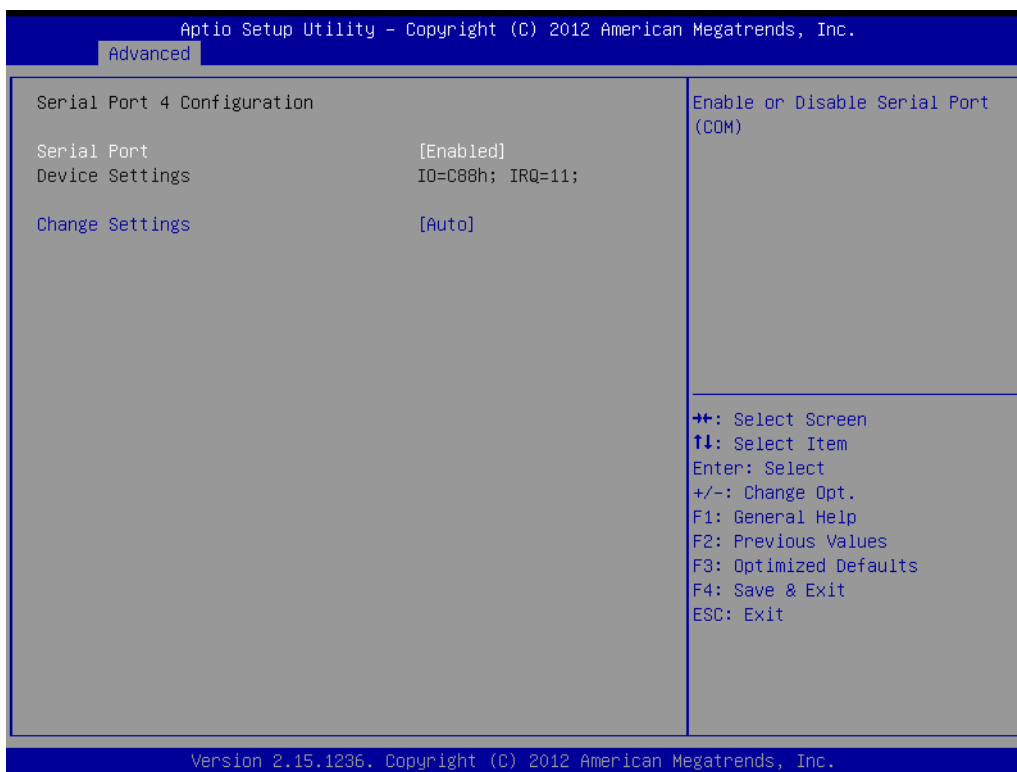
Figure 3.22 Serial Port 4 Configuration
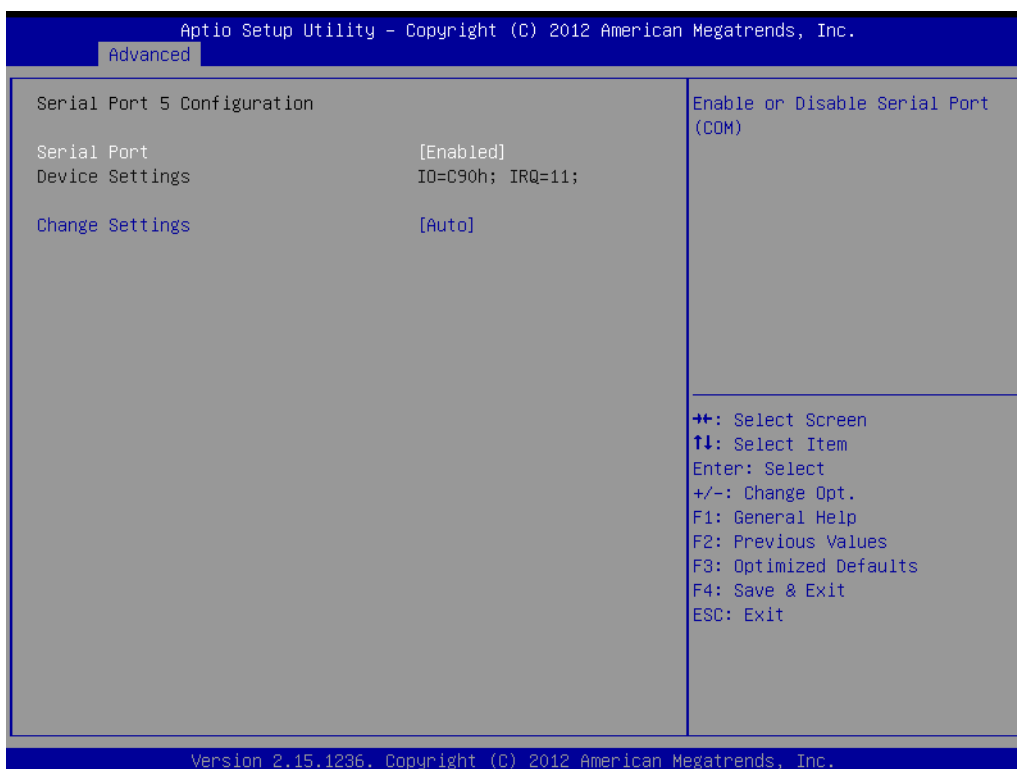
Figure 3.23 Serial Port 5 Configuration

```
                Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
         Advanced

    Serial Port 6 Configuration                              Enable or Disable Serial Port
                                                             (COM)
    Serial Port                         [Enabled]
    Device Settings                     IO=C98h; IRQ=11;

    Change Settings                     [Auto]




                                                             →←: Select Screen
                                                             ↑↓: Select Item
                                                             Enter: Select
                                                             +/-: Change Opt.
                                                             F1: General Help
                                                             F2: Previous Values
                                                             F3: Optimized Defaults
                                                             F4: Save & Exit
                                                             ESC: Exit




                Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

Figure 3.24 Serial Port 6 Configuration

■ **Serial Port 4 configuration**
  – **Serial Port**
     To "Enable or Disable" Serial Port 4.
  – **Change Settings**
     To select an optimal setting for serial port 4.

■ **Serial Port 5 configuration**
  – **Serial Port**
     To "Enable or Disable" Serial Port 5.
  – **Change Settings**
     To select an optimal setting for serial port 5.

■ **Serial Port 6 configuration**
  – **Serial Port**
     To "Enable or Disable" Serial Port 6.
  – **Change Settings**
     To select an optimal setting for serial port 6.

3.2.3 Chipset

Figure 3.25 Chipset

This page provides information of the chipset on AIMB-784.

3.2.3.1 PCH-IO Configuration
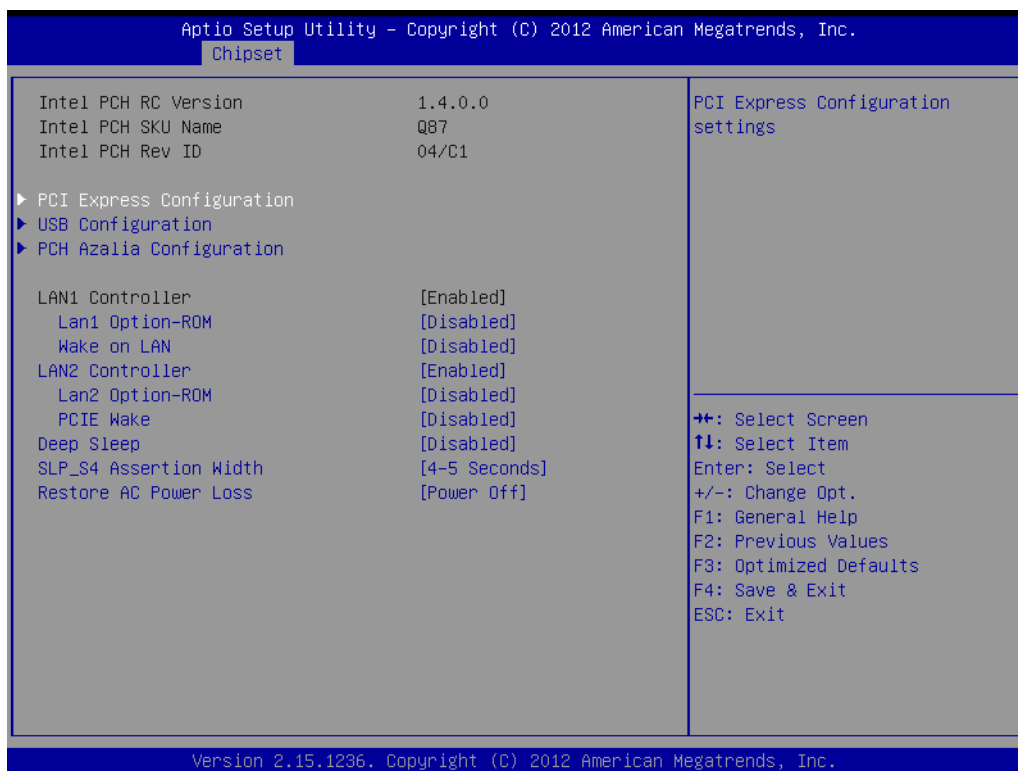
Figure 3.26 PCH-IO Configuration

- **LAN1 Controller**
  - – **LAN1 Option-ROM**
    "Enable or Disable" LAN 1 boot option for legacy network devices.
  - – **Wake on LAN**
    "Enable or Disable" Wake on LAN1
- **LAN2 Controller**
  - – **LAN2 Option-ROM**
    "Enable or Disable" LAN 2 boot option for legacy network devices
  - – **PCIE Wake**
    "Enable or Disable" PCIE Wake function
- **Deep Sleep**
  "Enable or Disable" Deep Sleep
- **SLP_S4 Assertion Width**
  Select a minimum assertion width of the SLP_S4# signal
- **Restore AC Power Loss**
  "Power off or Power on" or Last State to restore AC Power Loss

3.2.3.2 PCI Express Configuration

PCI Express Root Port 1 to 8 Setting.

```
            Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
              Chipset

    PCI Express Root Port 1          [Enabled]            Control the PCI Express Root
    PCIe Speed                       [Auto]               Port.
    Detect Non-Compliance Device     [Disabled]




                                                          →←: Select Screen
                                                          ↑↓: Select Item
                                                          Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F3: Optimized Defaults
                                                          F4: Save & Exit
                                                          ESC: Exit




            Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

◼ **PCI Express Root Port 1**

Enable or Disable PCI Express Root Port.

◼ **PCIe Speed**

Select PCI Express port speed [Auto, Gen1, Gen2].

◼ **Detect Non-Compliance Device**

Detect Non-Compliance PCI Express Device. If enable, it will take more time at POST time.

3.2.3.3 USB Configuration

```
            Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
            Chipset

 USB Configuration                                          Precondition work on USB host
                                                            controller and root ports for
 USB Precondition                  [Disabled]               faster enumeration.
 XHCI Mode                         [Auto]

 USB Ports Per-Port Disable Control  [Disabled]



                                                            →←: Select Screen
                                                            ↑↓: Select Item
                                                            Enter: Select
                                                            +/-: Change Opt.
                                                            F1: General Help
                                                            F2: Previous Values
                                                            F3: Optimized Defaults
                                                            F4: Save & Exit
                                                            ESC: Exit



            Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

■ **USB Precondition**
Pre-condition work on USB host controller and root ports for faster enumeration.

■ **XHCI Mode**
Select Smart auto, Auto, Enabled and Disable Mode of operation of XHCI controller.

Note! *Smart auto setting remembers the last setting, but auto mode does not.*
Using smart auto setting, USB devices may not be recognized when
system rebooting with more than one USB device connected.

■ **USB Ports Pre-port Disable Control**
Control each of the USB ports disabling.

3.2.3.4 PCH Azalia Configuration

```
            Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
             Chipset

    PCH Azalia Configuration                              Control Detection of the
                                                          Azalia device.
    Azalia                          [Enabled]             Disabled = Azalia will be
                                                          unconditionally disabled
                                                          Enabled = Azalia will be
                                                          unconditionally Enabled
                                                          Auto = Azalia will be enabled
                                                          if present, disabled otherwise.


                                                          ─────────────────────────────
                                                          →←: Select Screen
                                                          ↑↓: Select Item
                                                          Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F3: Optimized Defaults
                                                          F4: Save & Exit
                                                          ESC: Exit




            Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

■ **Azalia**

Control detection of the Azalia device.

Disable = Azalia will be unconditionally disabled

Enable=Azalia will be unconditionally enabled

Auto=Azalia will be enabled if present, disabled otherwise

3.2.3.5 System Agent (SA) Configuration
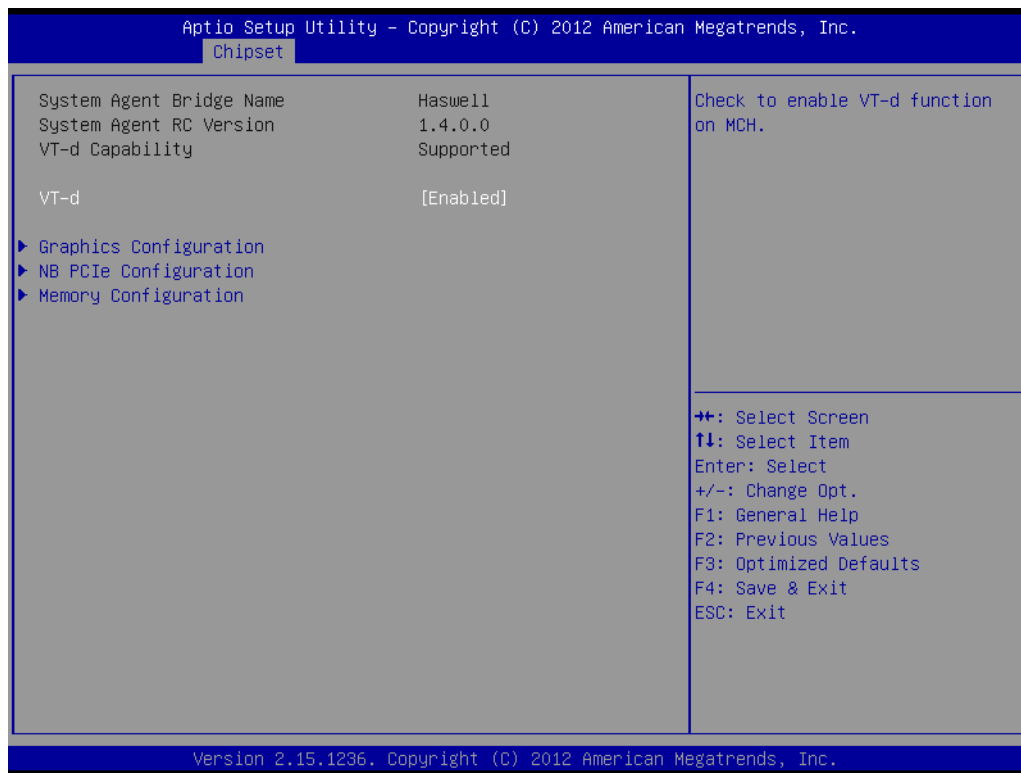
Figure 3.27 System Agent (SA) Configuration

- ■ **VT-d**

  "Enable or Disable" VT-d function.
- ■ **Graphics Configuration**
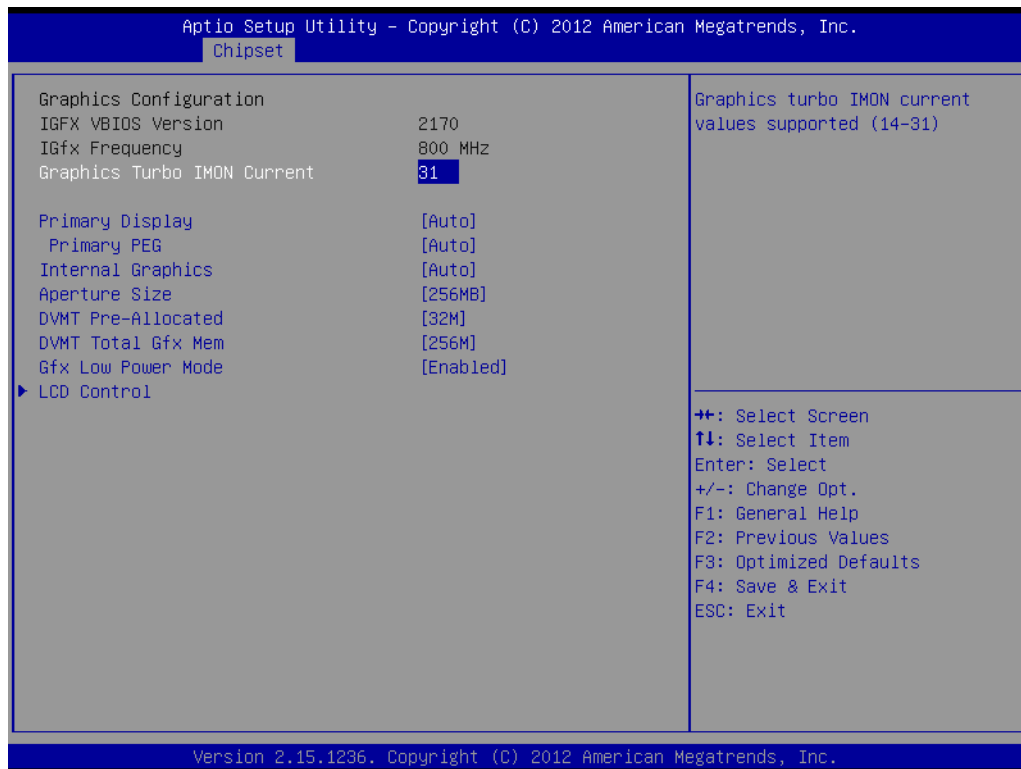
Figure 3.28 Graphics Configuration

- **Graphics Turbo IMON Current**

  Graphics turbo IMON current values supported (14-31)

- **Primary Display**

  "Auto or IGFX or PEG or PCI or SG" optimal to Primary Display

  Primary PEG

  Select PEG0/PEG1/PEG2/PEG3 graphics device should be Primary PEG.

- **Internal Graphics**

  "Auto or Disable or Enable" Internal Graphics

- **Aperture Size**

  Aperture size optimal between 128MB, 256MB, or 512MB

- **DVMT Pre-Allocated**

  DVMT pre-allocated (fixed) Graphics memory size optimal from 32M to 1024M

- **DVMT Total Gfx Mem**

  DVMT Total Gfx Mem optimal Between 128M, 256M or MAX

- **Gfx Low Power Mode**

  "Enable or Disable" Gfx Low Power Mode

- **LCD Control**

  Select Primary IGFX Boot Display [VBIOS Default, CRT, DVI1, DVI2]

- **NB PCIe Configuration**

```
          Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
          Chipset

 NB PCIe Configuration                                     Configure PEG0 B0:D1:F0
 PEG0                            Not Present               Gen1-Gen3
   PEG0 - Gen X                  [Auto]


 Run-time C7 Allowed             [Enabled]
 Enable PEG                      [Auto]
 Detect Non-Compliance Device    [Disabled]
 Program PCIe ASPM after OpROM   [Disabled]
 PEG0 De-emphasis Control        [-3.5 dB]
 PEG0 - ASPM                     [Auto]



                                                           ++: Select Screen
                                                           ↑↓: Select Item
                                                           Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F2: Previous Values
                                                           F3: Optimized Defaults
                                                           F4: Save & Exit
                                                           ESC: Exit




          Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

- **PEG0 - Gen X**

  "Auto, Enable or Disable" PEG0 - Gen X

- **Run-time C7 Allowed**

  Enable or Disable the entry to C7 state. Don't enable this feature until you have all the appropriate Save/Restore Controller/Endpoint state.

- **Enable PEG**

  "Auto, Enable or Disable" Enable PEG

■ **Detect Non-Compliance Device**

Detect Non-Compliance PCI Express Device in PEG

■ **Program PCIe ASPM after OpROM**

Enabled: PCIe ASPM will be programmed after OpROM

Disabled: PCIe ASPM will be programme before OpROM

■ **PEG0 De-emphasis Control**

Configure the De-emphasis control on PEG

■ **PEG0 - ASPM**

Control ASPM support for the PEG device. This has no effect if PEG is not the currently active device

■ **Memory Configuration**

```
              Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
              Chipset

  Memory Information                                       Maximum Memory Frequency
                                                           Selections in Mhz.
  Memory RC Version          1.4.0.3
  Memory Frequency           1333 Mhz
  Total Memory               4096 MB (DDR3)
  DIMM#0                     4096 MB (DDR3)
  DIMM#1                     Not Present
  DIMM#2                     Not Present
  DIMM#3                     Not Present

  Memory Frequency Limiter   [Auto]

                                                           →←: Select Screen
                                                           ↑↓: Select Item
                                                           Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F2: Previous Values
                                                           F3: Optimized Defaults
                                                           F4: Save & Exit
                                                           ESC: Exit

              Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

■ **Memory Frequency Limiter**

Maximum Memory Frequency selection in MHz

3.2.4 Boot

```
              Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
      Main   Advanced   Chipset   Boot   Security   Save & Exit

    Boot Configuration                                     Number of seconds to wait for
    Setup Prompt Timeout             1                     setup activation key.
    Bootup NumLock State             [On]                  65535(0xFFFF) means indefinite
                                                           waiting.
    Quiet Boot                       [Disabled]


    Boot Option Priorities

  ▶ CSM16 Parameters



                                                           ↔: Select Screen
                                                           ↑↓: Select Item
                                                           Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F2: Previous Values
                                                           F3: Optimized Defaults
                                                           F4: Save & Exit
                                                           ESC: Exit



              Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

Figure 3.29 Boot

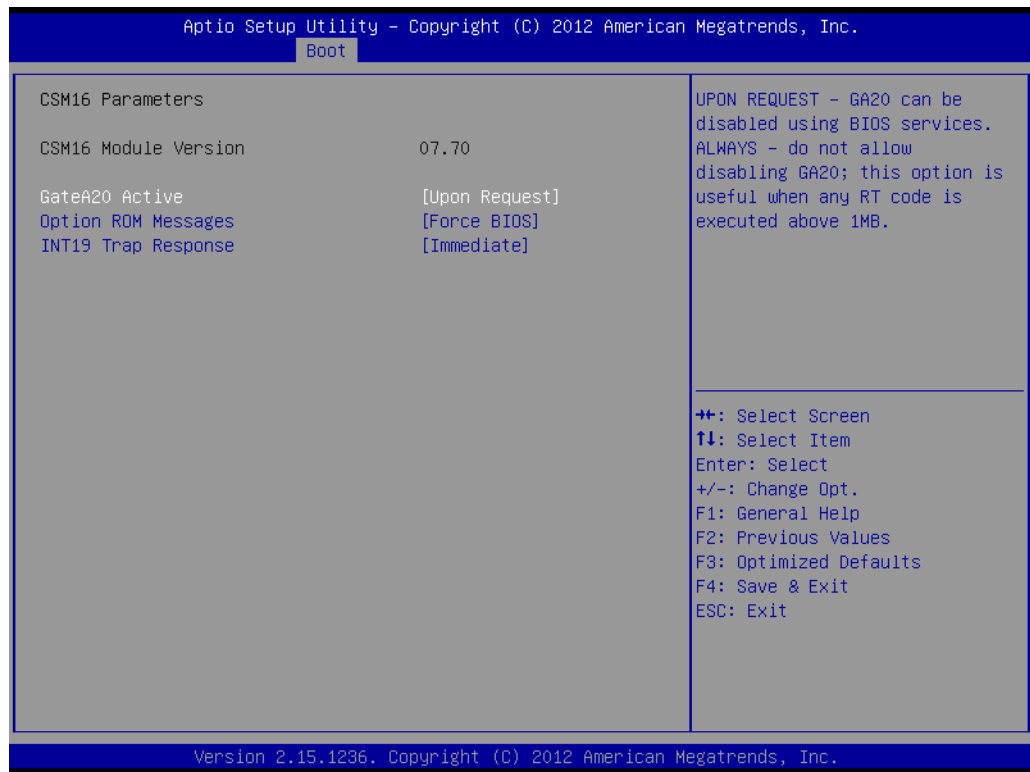- **Setup Prompt Timeout**
  Use the <+> and <-> keys to adjust the number of seconds to wait for setup activation key.

- **Bootup NumLock State**
  "On or Off" power-on state for the NumLock

- **Quiet Boot**
  "Enable or Disable" Quiet Boot option

■ **CSM16 Parameters**

Enable/Disable Option ROM execution settings, etc.

```
            Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
                      Boot

 CSM16 Parameters                                              UPON REQUEST - GA20 can be
                                                               disabled using BIOS services.
 CSM16 Module Version              07.70                       ALWAYS - do not allow
                                                               disabling GA20; this option is
 GateA20 Active                    [Upon Request]              useful when any RT code is
 Option ROM Messages               [Force BIOS]                executed above 1MB.
 INT19 Trap Response               [Immediate]



                                                               ――――――――――――――――――――――
                                                               →←: Select Screen
                                                               ↑↓: Select Item
                                                               Enter: Select
                                                               +/-: Change Opt.
                                                               F1: General Help
                                                               F2: Previous Values
                                                               F3: Optimized Defaults
                                                               F4: Save & Exit
                                                               ESC: Exit




            Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

■ **GateA20 Active**

Upon request-GA20 can be disabled using BIOS service.

Always do not allow disabling GA20; this option is useful when any RT code is executed above 1MB.
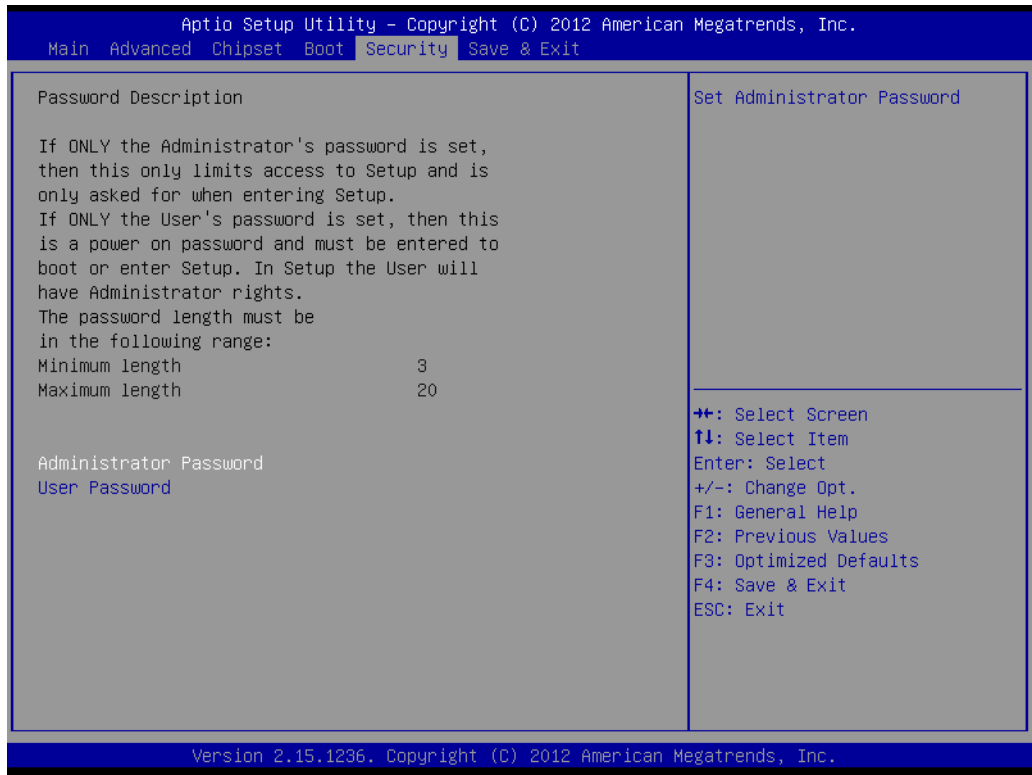
■ **Option ROM Messages**

Set display mode for option ROM

■ **INT19 Trap Response**

"Immediate or Postponed" Option ROM to trap Interrupt 19

3.2.5 Security

```
           Aptio Setup Utility – Copyright (C) 2012 American Megatrends, Inc.
    Main  Advanced  Chipset  Boot  Security  Save & Exit

 Password Description                                 Set Administrator Password

 If ONLY the Administrator's password is set,
 then this only limits access to Setup and is
 only asked for when entering Setup.
 If ONLY the User's password is set, then this
 is a power on password and must be entered to
 boot or enter Setup. In Setup the User will
 have Administrator rights.
 The password length must be
 in the following range:
 Minimum length                    3
 Maximum length                   20                  →←: Select Screen
                                                      ↑↓: Select Item
                                                      Enter: Select
                                                      +/-: Change Opt.
 Administrator Password                               F1: General Help
 User Password                                        F2: Previous Values
                                                      F3: Optimized Defaults
                                                      F4: Save & Exit
                                                      ESC: Exit



           Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc.
```

Figure 3.30 Security

Select Security Setup from the AIMB-784 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>.
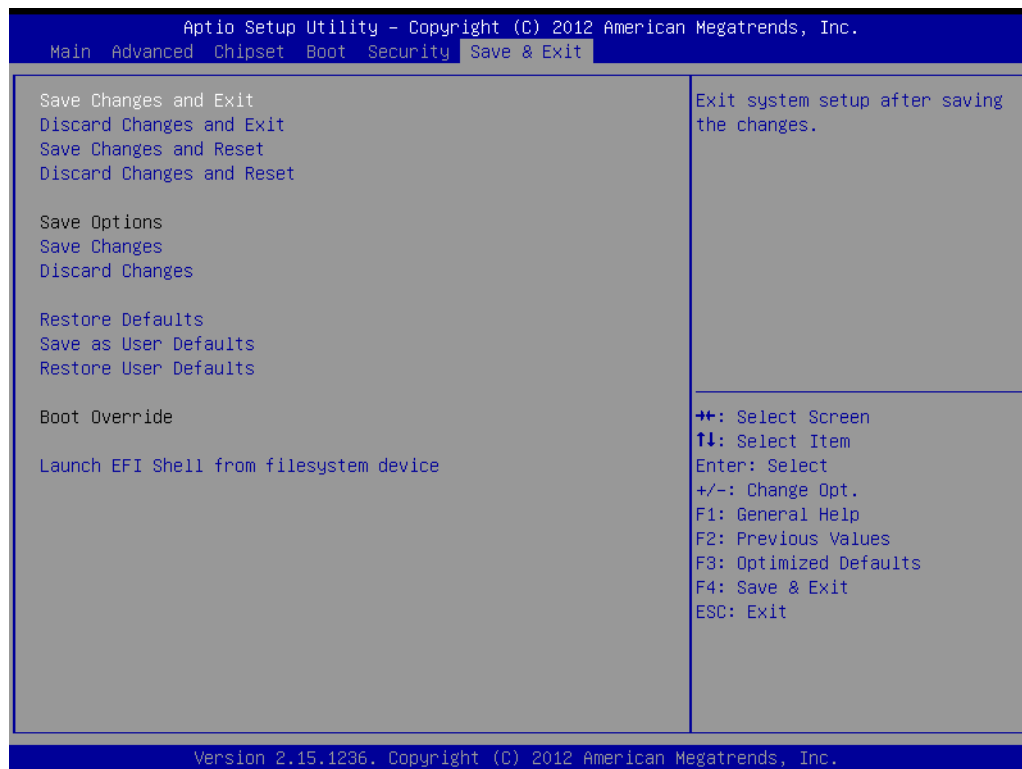
3.2.6 Save & Exit

```
            Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.
     Main  Advanced  Chipset  Boot  Security  Save & Exit

   Save Changes and Exit                           Exit system setup after saving
   Discard Changes and Exit                        the changes.
   Save Changes and Reset
   Discard Changes and Reset

   Save Options
   Save Changes
   Discard Changes

   Restore Defaults
   Save as User Defaults
   Restore User Defaults

   Boot Override                                   →←: Select Screen
                                                   ↑↓: Select Item
   Launch EFI Shell from filesystem device         Enter: Select
                                                   +/-: Change Opt.
                                                   F1: General Help
                                                   F2: Previous Values
                                                   F3: Optimized Defaults
                                                   F4: Save & Exit
                                                   ESC: Exit


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```

Figure 3.31 Save & Exit

Save Changes and Exit

When you complete system configuration, select this option to save your changes, exit BIOS setup and reboot the computer so the new system configuration parameters can take effect.

1.   Select Exit Saving Changes from the Exit menu and press <Enter>. The following message appears:

   Save Configuration Changes and Exit Now?

   [Yes] [No]

2.   Select Yes or No.

Discard changes and exit

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

1.   Select Exit Discarding Changes from the Exit menu and press <Enter>. The following message appears:

   Quit without saving?

   [Yes] [No]

2.   Select Yes to discard changes and exit.

Discard Changes

Select Discard Changes from the Exit menu and press <Enter>.

Chapter 4

Chipset Software Installation Utility

4.1 Before you begin

To facilitate the installation of the enhanced display drivers and utility software, read the instructions in this chapter carefully. The drivers for the AIMB-784 are located on the software installation CD.

> *Note!* *The files on the software installation CD are compressed. Do not attempt to install the drivers by copying the files manually. You must use the supplied SETUP program to install the drivers.*

Before you begin, it is important to note that most display drivers need to have the relevant software application already installed in the system prior to installing the enhanced display drivers. In addition, many of the installation procedures assume that you are familiar with both the relevant software applications and operating system commands. Review the relevant operating system commands and the pertinent sections of your application software's user manual before performing the installation.

4.2 Introduction

The Intel Chipset Software Installation (CSI) utility installs the Windows INF files that outline to the operating system how the chipset components will be configured. This is needed for the proper functioning of the following features:

- Core PCI PnP services
- Serial ATA interface support
- USB 1.1/2.0/3.0 support
- Identification of Intel chipset components in the Device Manager

> *Note!* *The chipset driver is used for the following versions of Windows, and it has to be installed before installing all the other drivers:*
> - *Windows 8 (32-bit)*
> - *Windows 8 (64-bit)*
> - *Windows 7 (32-bit)*
> - *Windows 7 (64-bit)*

4.3 Windows 8 / Windows 7 Driver Setup

1. Insert the driver CD into your system's CD-ROM drive. You can see the driver folders items. Move the mouse cursor over the folder "01 Chipset". In CSI folder, you can click find an executable file to complete the implement of the driver
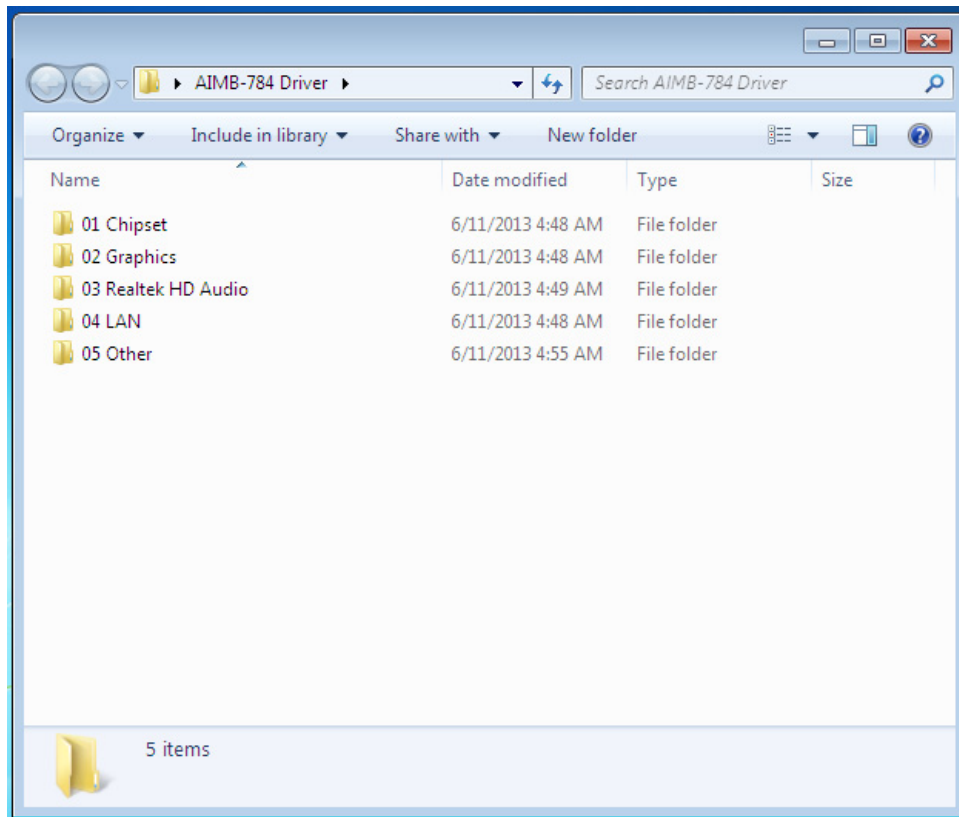
2. Click setup to execute program.
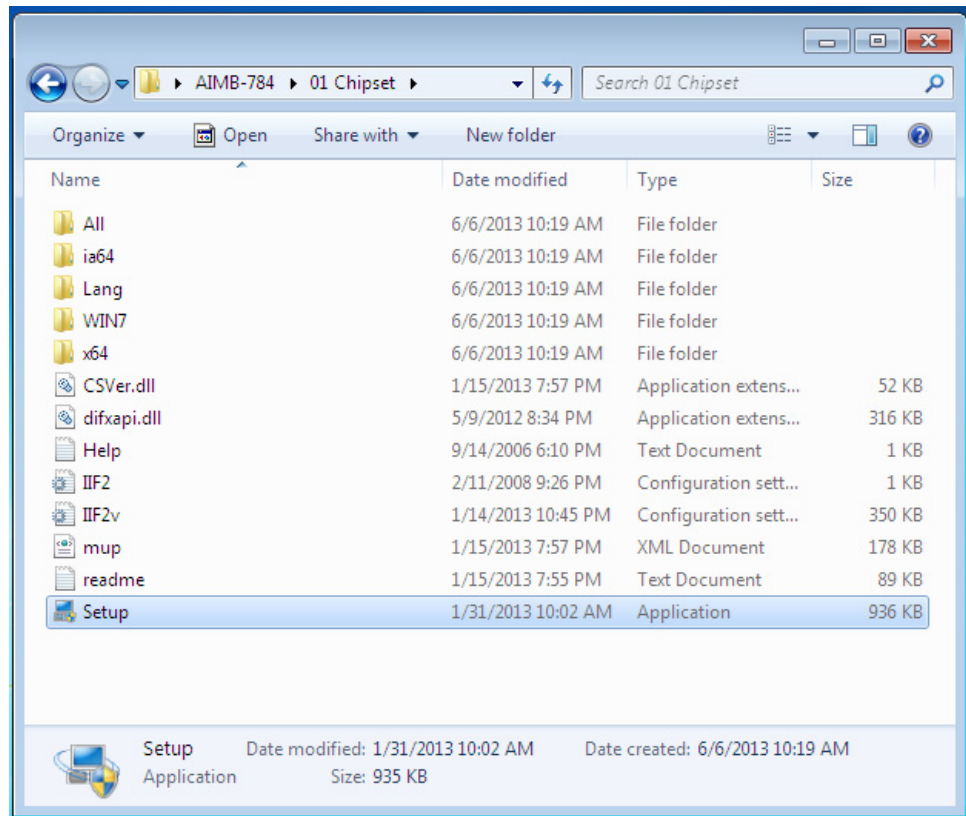
Chapter 5

Integrated Graphic Device Setup

5.1 Introduction

The 4th Gen Intel Core i processors are embedded with integrated graphics controller. You need to install the VGA driver to enable this function, which includes the following features:

- Optimized integrated graphic solution: With Intel Graphics Flexible Display Interface, it supports versatile display options and 32-bit 3D graphics engine. Dual independent display, enhanced display modes for widescreen flat panels for extend, twin, and clone dual display mode, and optimized 3D support delivers an intensive and realistic visual experience.

5.2 Windows 8/Windows 7 Driver Setup

> **Note!** *Before installing this driver, make sure the INF driver has been installed in your system. See Chapter 4 for information on installing the INF driver.*

Insert the driver CD into your system's CD-ROM drive. You can see the driver folders items. Navigate to the "02 Graphic" folder and click the executable file to complete the installation of the drivers for Windows 7, Windows 8.
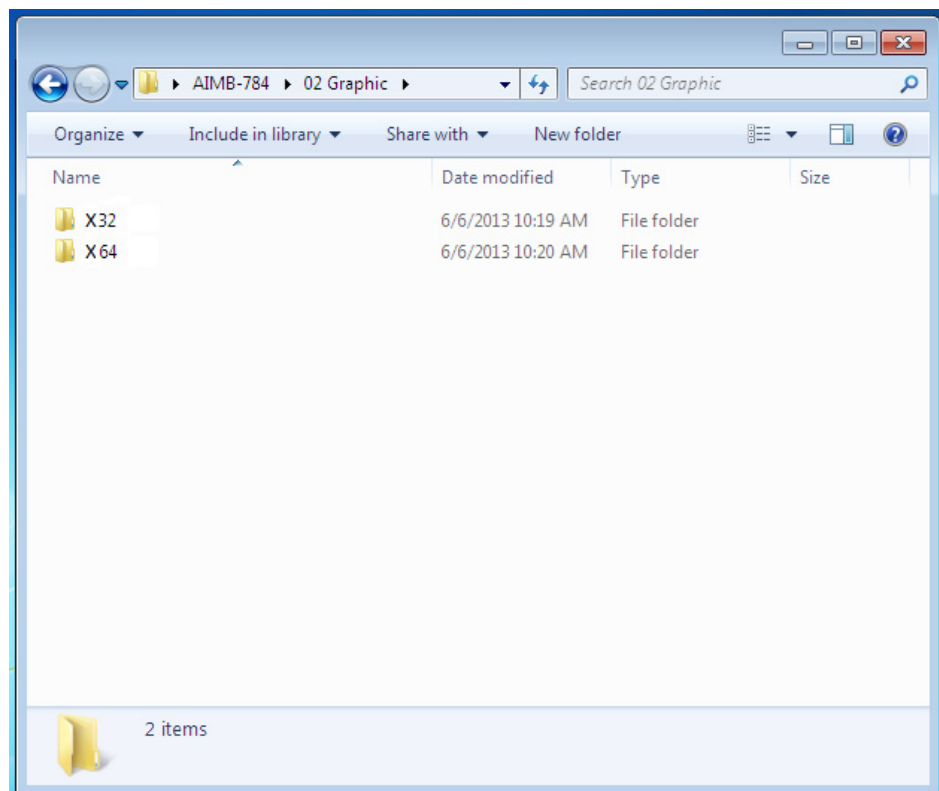
Chapter   6

LAN Configuration

6.1 Introduction

The AIMB-784 has dual Gigabit Ethernet LANs via dedicated PCI Express x1 lanes (Intel I217LM (LAN1) and I211AT (LAN2)) that offer bandwidth of up to 500 MB/sec, eliminating the bottleneck of network data flow and incorporating Gigabit Ethernet at 1000 Mbps.

6.2 Features

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

6.3 Installation

> *Note!* *Before installing the LAN drivers, make sure the CSI utility have been installed on your system. See Chapter 4 for information on installing the CSI utility.*

The integrated Intel gigabit Ethernet controller supports all major network operating systems. However, the installation procedure varies with different operating systems. In the following sections, refer to the one that provides the driver setup procedure for the operating system you are using.

6.4 Win 8/Win 7 Driver Setup (LAN)

Insert the driver CD into your system's CD-ROM drive. Select folder "04.LAN" then click the proper LAN driver for the OS.
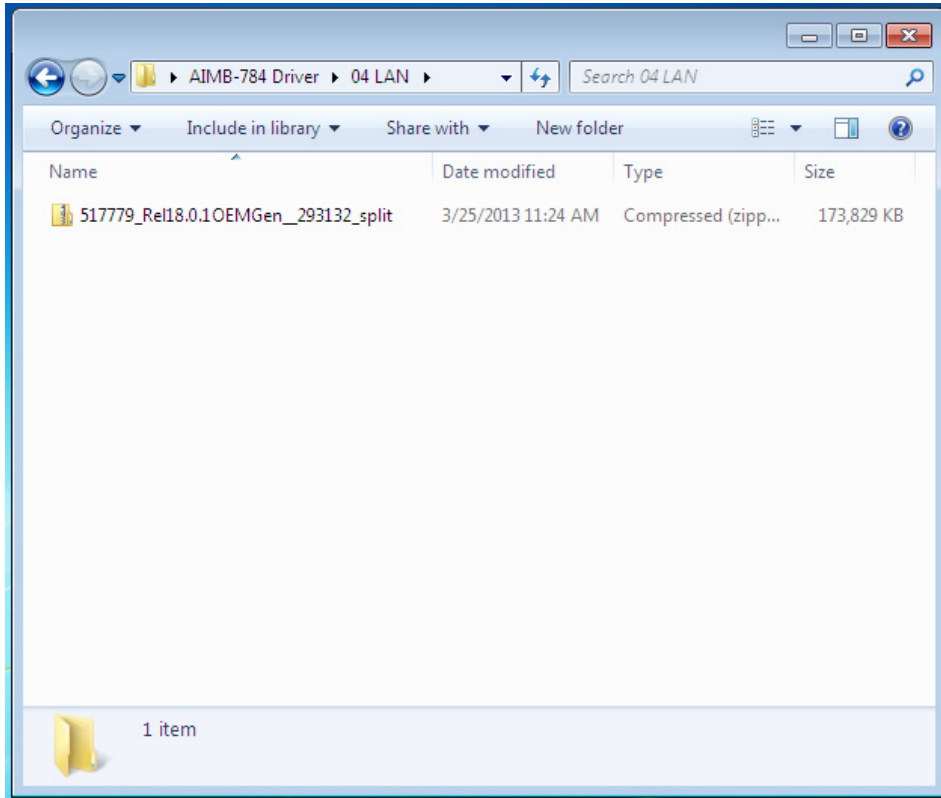
Chapter 7

Intel ME

7.1 Introduction

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

7.2 Installation

Insert the driver CD into your system's CD-ROM drive. Navigate to the "05 Other" folder and find folder "Intel ME" to install the driver.

Note! *If the Intel® Management Engine (Intel® ME) driver has not been successfully installed, you may see an error on a "PCI Simple Communications Controller" in Device Manager.*
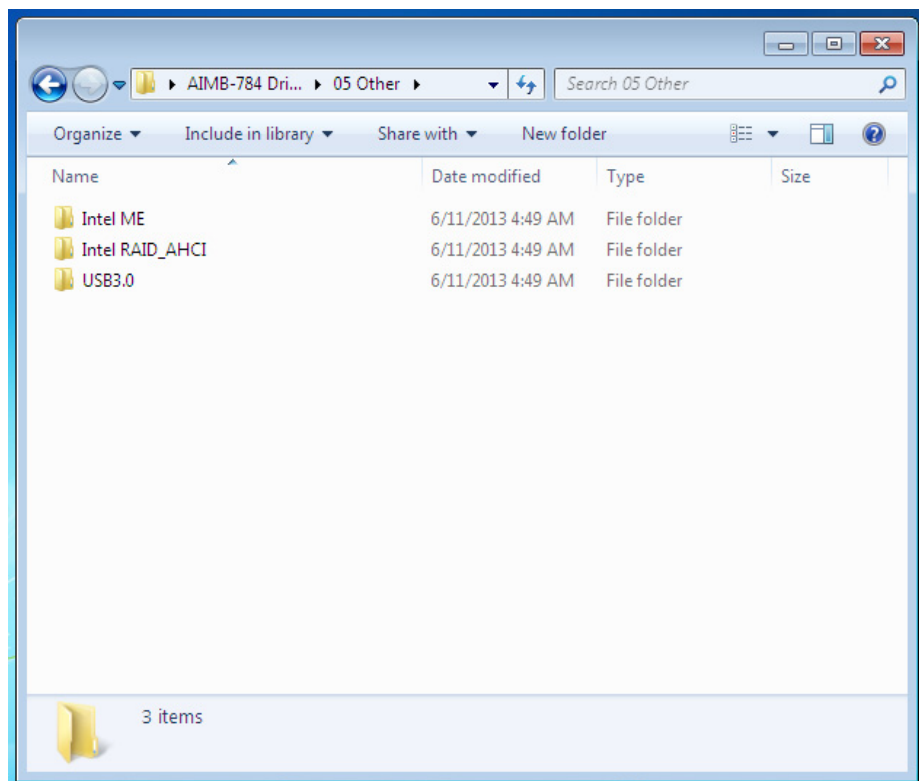
Chapter   8

Intel USB 3.0

8.1 Introduction

AIMB-784 provides Intel® USB 3.0 and the data transfer rate of USB3.0 (5Gb/s) is 10 times to USB2.0 (480 Mbps).

8.2 Installation

Insert the driver CD into your system's CD-ROM drive. Navigate to the "05 Other" folder and find "Intel USB3.0" folder to install the driver.

> **Note!** The Intel® USB 3.0 eXtensible Host Controller Driver is native built in Windows 8. For these operating systems, ensure your BIOS settings have the xHCI Mode set to "Auto" or "Smart Auto". This will reconfigure the USB 3.0 ports to function as USB 2.0 ports using the native Windows* EHCI driver.
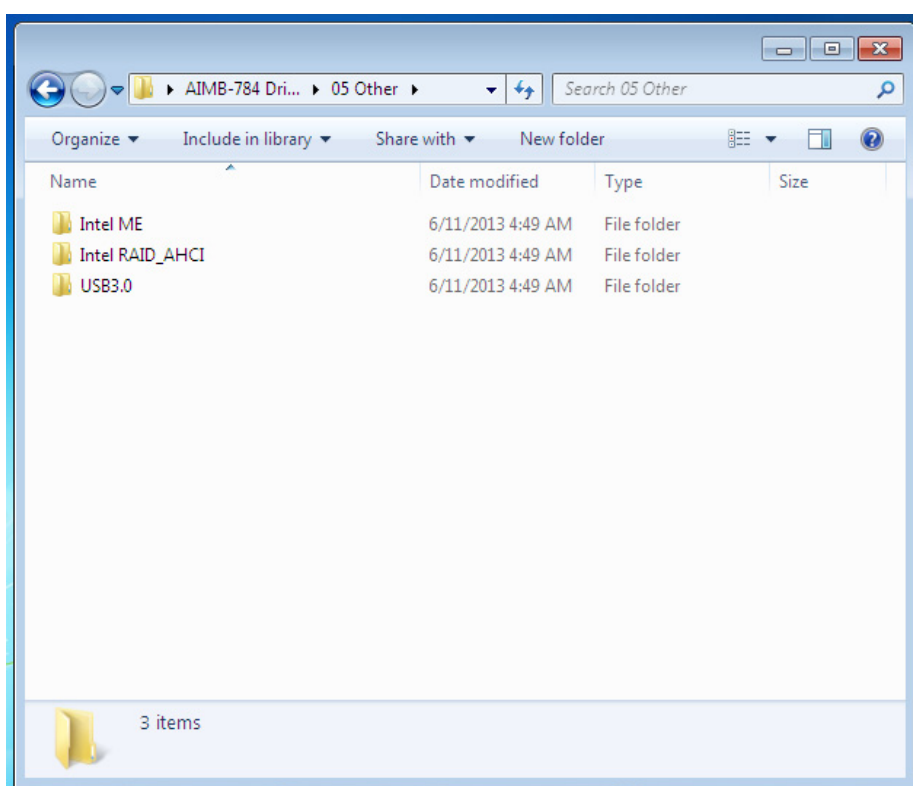
Chapter 9

SATA RAID Setup

9.1 Introduction

To support demanding disk I/O, Intel Q87 chipset integrates six Serial ATA controllers with software RAID 0, 1, 5, 10 capabilities.

RAID 0 striping increases the storage performance and is designed to speed up data transfer rates for disk-intensive applications.

RAID 1 mirroring protects valuable data that might be lost in the event of a hard drive failure.

RAID 5 array contains three or more hard drives where the data is divided into manageable blocks called strips. Parity is a mathematical method for recreating data that was lost from a single drive, which increases fault-tolerance. The data and parity are striped across all the hard drives in the array. The parity is striped in a rotating sequence to reduce bottlenecks associated with the parity calculations.

RAID 10 array uses four hard drives to create a combination of RAID levels 0 and 1. The data is striped across a two-drive array forming the RAID 0 component. Each of the drives in the RAID 0 array is then mirrored by a RAID 1 component.

9.2 SATA RAID Driver and Utility Setup

The installation utility is in the CD's "05 Other" folder. You may go to the directory of the CD and follow the steps to install.

Appendix A

Programming the Watchdog Timer

The AIMB-784's watchdog timer can be used to monitor system software operation and take corrective action if the software fails to function within the programmed period. This section describes the operation of the watchdog timer and how to program it.
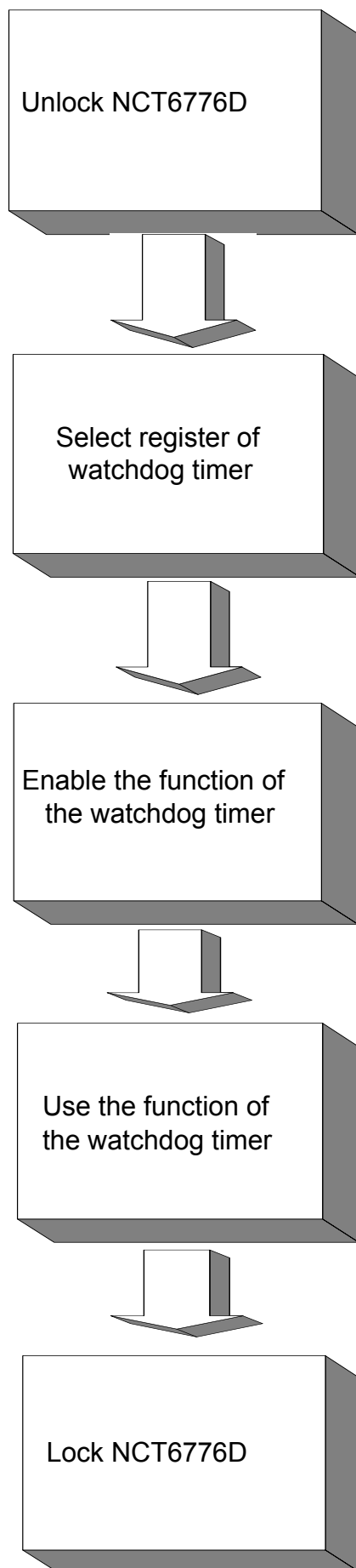
A.1 Watchdog timer overview

The watchdog timer is built in to the super I/O controller NCT6776D. It provides the following functions for user programming:

- Can be enabled and disabled by user's program
- Timer can be set from 1 to 255 seconds
- Generates an interrupt or resets signal if the software fails to reset the timer before time-out

A.2 Programming the Watchdog Timer

The I/O port address of the watchdog timer is 2E (hex) and 2F (hex). 2E (hex) is the address port. 2F (hex) is the data port. You must first write an address value into address port 2E (hex), and then write/read data to/from the assigned register through data port 2F (hex).

Unlock NCT6776D

Select register of
watchdog timer

Enable the function of
the watchdog timer

Use the function of
the watchdog timer

Lock NCT6776D

Table A.1: Watchdog timer registers		
Address of register (2E)	Read/ Write	Value (2F) & description
87 (hex)	-	Write this address to I/O address port 2E (hex) twice to unlock the NCT6776D
07 (hex)	write	Write 08 (hex) to select register of watchdog timer.
30 (hex)	write	Write 01 (hex) to enable the function of the watchdog timer. Disabled is set as default.
F5 (hex)	write	Set seconds or minutes as units for the timer. Write 0 to bit 3: set seconds as counting unit. [default]. Write 1 to bit 3: set minutes as counting unit. Write 1 to bit 4: Watchdog timer count mode is 1000 times faster. If bit 3 is 0, the count mode is 1/1000 seconds mode. If bit 3 is 1, the count mode is 1/1000 minutes mode.
F6 (hex)	write	0: stop timer [default] 01 ~ FF (hex): The amount of the count, in seconds or minutes, depends on the value set in register F5 (hex). This number decides how long the watchdog timer waits for strobe before generating an interrupt or reset signal. Writing a new value to this register can reset the timer to count with the new value.
F7 (hex)	read/ write	Bit 6: Write 1 to enable keyboard to reset the timer, 0 to disable.[default] Bit 5: Write 1 to generate a timeout signal immediately and automatically return to 0. [default=0] Bit 4: Read status of watchdog timer, 1 means timer is "timeout".
AA (hex)	-	Write this address to I/O port 2E (hex) to lock NCT6776D.

A.2.1 Example Programs

Enable watchdog timer and set 10 seconds as the timeout interval

```
;----------------------------------------------------------
Mov dx,2eh ; Unlock NCT6776D
Mov al,87h
Out dx,al
Out dx,al
;----------------------------------------------------------
Mov al,07h ; Select registers of watchdog timer
Out dx,al
Inc dx
in al,dx
Or al,08h
Out dx,al
;----------------------------------------------------------
Dec dx; Enable the function of watchdog timer
Mov al,30h
Out dx,al
Inc dx
Mov al,01h
Out dx,al
;----------------------------------------------------------
```

Dec dx ; Set second as counting unit

Mov al,0f5h

Out dx,al

Inc dx

In al,dx

And al,not 08h

Out dx,al

;--

Dec dx ; Set timeout interval as 10 seconds and start counting

Mov al,0f6h

Out dx,al

Inc dx

Mov al,10; 10 minutes

Out dx,al

;--

Dec dx ; lock NCT6776D

Mov al,0aah

Out dx,al

Enable watchdog timer and set 5 minutes as the timeout interval

;--

Mov dx,2eh ; unlock NCT6776D

Mov al,87h

Out dx,al

Out dx,al

;--

Mov al,07h ; Select registers of watchdog timer

Out dx,al

Inc dx

In al,dx

Or al,08h

Out dx,al

;--

Dec dx ; Enable the function of watchdog timer

Mov al,30h

Out dx,al

Inc dx

Mov al,01h

Out dx,al

;--

Dec dx ; Set minute as counting unit

Mov al,0f5h

Out dx, al

Inc dx

In al,dx

Or al, 08h

```
Out dx,al
;-------------------------------------------------------
Dec dx ; Set timeout interval as 5 minutes and start counting
Mov al,0f6h
Out dx,al
Inc dx
Mov al,5; 5 minutes
Out dx,al
;-------------------------------------------------------
Dec dx ; lock NCT6776D
Mov al,0aah
Out dx,al
```

Enable watchdog timer to be reset by mouse

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

Enable watchdog timer to be reset by keyboard

```
;------------------------------------------------------
Mov dx,2eh ; unlock NCT6776D
Mov al,87h
Out dx,al
Out dx,al
;------------------------------------------------------
Mov al,07h ; Select registers of watchdog timer
Out dx,al
Inc dx
Mov al,08h
Out dx,al
;------------------------------------------------------
Dec dx ; Enable the function of watchdog timer
Mov al,30h
Out dx,al
Inc dx
Mov al,01h
Out dx,al
;------------------------------------------------------
Dec dx ; Enable watchdog timer to be strobed reset by keyboard
Mov al,0f7h
Out dx,al
Inc dx
In al,dx
Or al,40h
Out dx,al
;------------------------------------------------------
Dec dx ; lock NCT6776D
Mov al,0aah
Out dx,al
```

Generate a time-out signal without timer counting

```
;------------------------------------------------------
Mov dx,2eh ; unlock NCT6776D
Mov al,87h
Out dx,al
Out dx,al
;------------------------------------------------------
Mov al,07h ; Select registers of watchdog timer
Out dx,al
Inc dx
Mov al,08h
Out dx,al
;------------------------------------------------------
Dec dx ; Enable the function of watchdog timer
Mov al,30h
```

```
Out dx,al
Inc dx
In al,dx
Or al,01h
Out dx,al
;--------------------------------------------------------
Dec dx ; Generate a time-out signal
Mov al,0f7h
Out dx,al ;Write 1 to bit 5 of F7 register
Inc dx
In al,dx
Or al,20h
Out dx,al
;--------------------------------------------------------
Dec dx ; lock NCT6776D
Mov al,0aah
Out dx,al
```

Appendix B

I/O Pin Assignments

B.1 Parallel Port (LPT1)
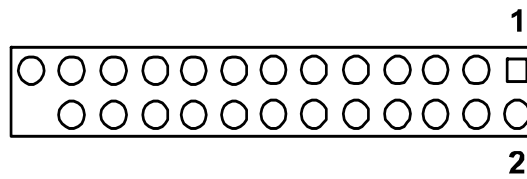
Table B.1: Parallel Port (LPT1)			
Pin	**Signal**	**Pin**	**Signal**
1	STROBE#	14	AUTO-LINEFEED#
2	DATA0	15	ERROR#/FAULT#
3	DATA1	16	INITIALIZE#
4	DATA2	17	SELECT-PRINTER#/ SELECT-IN#
5	DATA3	18	GND
6	DATA4	19	GND
7	DATA5	20	GND
8	DATA6	21	GND
9	DATA7	22	GND
10	ACK#	23	GND
11	BUSY	24	GND
12	PAPER-OUT/ PAPER-END	25	GND
13	SELECT		

B.2 USB2.0 Type A Port (USB3)
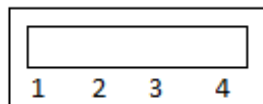
Table B.2: USB2.0 Type A Port (USB3)	
Pin	**Signal**
1	+5V
2	D-
3	D+
4	GND

B.3 USB3.0 Header (USB1314)
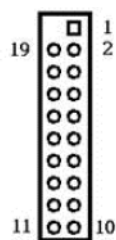
Pin	Signal	Pin	Signal
1	+5V	2	STDA_SSRX-
3	STDA_SSRX+	4	GND
5	STDA_SSTX-	6	STDA_SSTX+
7	GND	8	D-
9	D+	10	OC#
11	D+	12	D-
13	GND	14	STDA_SSTX+
15	STDA_SSTX-	16	GND
17	STDA_SSRX+	18	STDA_SSRX-
19	+5V		

B.4 USB2.0 Header (USB56, USB78, USB1112)
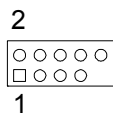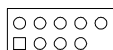
USB78   USB1112

Table B.3: USB2.0 Header (USB56, USB78, USB1112)			
Pin	Signal	Pin	Signal
1	+5V	2	+5V
3	D-	4	D-
5	D+	6	D+
7	GND	8	GND
9	N/A	10	N/C

B.5 VGA Connector (VGA1)
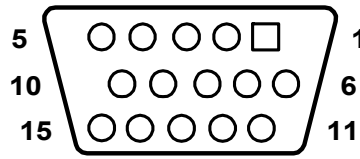
Table B.4: VGA Connector (VGA1)

Pin	Signal	Pin	Signal
1	RED	9	KEY/PWR
2	GREEN	10	GND
3	BLUE	11	ID0/RES
4	ID2/RES	12	ID1/SDA
5	GND	13	HSYNC
6	RED_RTN	14	VSYNC
7	GREEN_RTN	15	ID3/SCL
8	BLUE_RTN		

B.6 DVI Interface
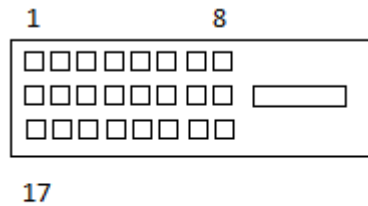
Table B.5: DVI-D Connector (DVI1/DVI2)

Pin	Signal	Pin	Signal
1	TMDS Data 2-	13	TMDS Data 3+
2	TMDS Data 2+	14	+5V
3	TMDS Data 2/4 shield	15	GND
4	TMDS Data 4-	16	Hot plug detect
5	TMDS Data 4+	17	TMDS data 0-
6	DDC clock	18	TMDS data 0+
7	DDC data	19	TMDS data 0/5 shield
8	Analog vertical sync	20	TMDS data 5-
9	TMDS Data 1-	21	TMDS data 5+
10	TMDS Data 1+	22	TMDS clock shield
11	TMDS Data 1/3 shield	23	TMDS clock+
12	TMDS Data 3-	24	TMDS clock-

B.7 RS-232 Interface

Table B.6: RS-232 Interface (Rear)

Pin	Signal
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

Table B.7: RS-232 Interface (onboard)

Pin	Signal
1	DCD
2	DSR
3	RXD
4	RTS
5	TXD
6	CTS
7	DTR
8	RI
9	GND

B.8 PS/2 Keyboard and Mouse Connector (KBMS1)
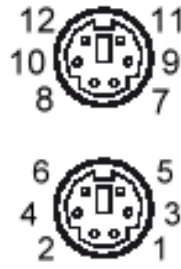
Table B.8: Keyboard and Mouse Connector (KBMS1)	
Pin	**Signal**
1	KB DATA
2	Reserved
3	GND
4	KB +5V
5	KB CLK
6	Reserved
7	MS_DATA
8	Reserved
9	GND
10	MS +5V
11	MS CLK
12	Reserved

B.9 External Keyboard Connector (KBMS2)
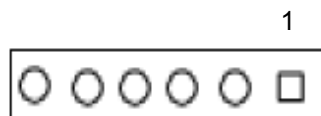
Table B.9: External Keyboard Connector (KBMS2)	
Pin	**Signal**
1	DATA
2	Reserved
3	GND
4	+5V
5	CLK
6	Reserved

B.10 Infrared (IR) connector (JIR1) and JWDT1 and HW Monitor Alarm (JOBS1)

Table B.10: JIR1+JWDT1+JOBS1			
Pin	Signal	Pin	Signal
1	+5V	6	SYSTEM RESET#
2	N/C	7	GND
3	N/C	8	ERROR_BEEP
4	WG#	9	IR TXD
5	IR RXD	10	OBS_BEEP

B.11 System Fan Power Connector (SYSFAN1/ SYSFAN2)
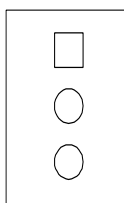
Table B.11: Fan Power Connector (SYSFAN1/SYSFAN2)	
Pin	Signal
1	GND
2	+12 V
3	SENSE

B.12 Power LED and Keyboard Lock (JFP3)

1

Table B.12: Power LED and Keyboard Lock (JFP3)	
Pin	Function
1	POWER_LED+
2	N/C
3	GND
4	KEYLOCK#
5	GND

B.13 External Speaker Connector (JFP2)

Table B.13: External Speaker Connector (JFP2)	
Pin	Function
1	EXTENAL_SPK_P1
4	EXTENAL_SPK_2
7	INTENAL_SPK_P3
10	INTENAL_SPK_P4

B.14 Reset Connector (JFP1)
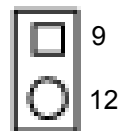
Table B.14: Reset Connector (JFP1)	
Pin	Signal
9	SYSTEM RESET#
12	GND

B.15 HDD LED Connector (JFP2)
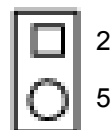
Table B.15: HDD LED Connector (JFP2)	
Pin	Signal
2	HDD_LED+
5	SATA_LED+

B.16 ATX Soft Power Switch (JFP1)
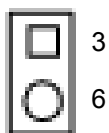
Table B.16: ATX Soft Power Switch (JFP1)	
Pin	**Signal**
3	PANSWIN#
6	GND

B.17 SNMP SM_BUS Bus Connector (JFP2)
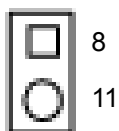
Table B.17: SM Bus Connector (JFP2)	
Pin	**Signal**
8	W83782G_SDAT
11	W83782G_SCLK

B.18 USB/LAN ports (LAN1_USB910 and LAN2_USB12)
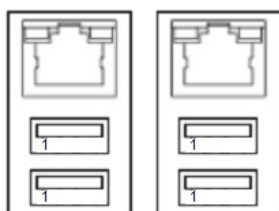
LAN1_USB910 LAN2_USB12

Table B.18: USB2.0 Port			
Pin	**Signal**	**Pin**	**Signal**
1	+5V	3	D+
2	D-	4	GND

Table B.19: USB3.0 Port	
Pin	**Signal**
1	+5V
2	D-
3	D+
4	GND
5	STDA_SSRX−
6	STDA_SSRX+
7	Shield GND_DRAIN
8	STDA_SSTX−
9	STDA_SSTX+

Table B.20: Giga LAN 10/100/1000 Base-T RJ-45 port			
Pin	**Signal**	**Pin**	**Signal**
1	DA+	5	DC+
2	DA-	6	DC-
3	DB+	7	DD+
4	DB-	8	DD-

B.19 Line Out, MIC IN Connector (AUDIO)
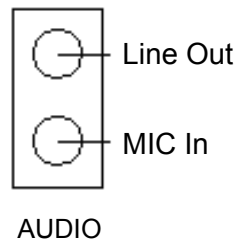
AUDIO

B.20 Front Panel Audio Connector (FPAUD1)
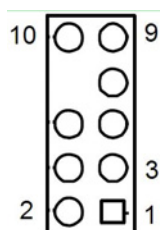
Table B.21: Front Panel Audio Connector (FPAUD1)	
Pin	Signal
1	MIC-L
2	GND
3	MIC-R
4	PRESENSE#
5	LINE-R
6	MIC-JD
7	SENSE
8	N/A
9	LINE-L
10	LINE-JD

B.21 8-pin Alarm Board Connector (VOLT1)
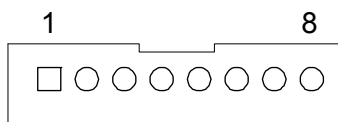
Table B.22: 8-pin Alarm Board Connector (VOLT1)			
Pin	Signal	Pin	Signal
1	+5V_STBY	5	+5 V
2	GND	6	+3.3 V
3	GND	7	-12 V
4	-5 V	8	+12 V

B.22 Case Open Connector (JCASE1)
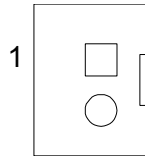
Table B.23: Case Open Connector (JCASE1)	
Pin	Signal
1	CASEOP
2	GND

B.23 Front Panel LAN LED Connector (LAN_LED1)
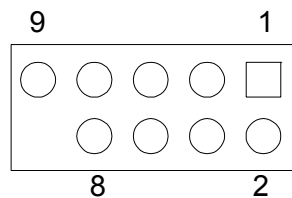
Table B.24: LAN LED Connector (LANLED1)			
Pin	Signal	Pin	Signal
1	LAN_LED0_ACT#	2	LAN_LED0_ACT#
3	+3.3V	4	+3.3V
5	LAN_LED1_1G#	6	LAN_LED1_1G#
7	LAN_LED2_100M#	8	LAN_LED2_100M#
9	+3.3V		

B.24 SPI_CN1: SPI Flash Card Pin Connector

Table B.25: SPI_CN1:SPI fresh card pin connector			
Pin	Signal	Pin	Signal
1	+V3.3V	2	GND
3	CS#	4	CLK
5	MISO	6	MOSI
7	N/A	8	N/C

B.25 Fixed I/O Ranges Decoded by Intel PCH

Table B.26: Fixed I/O Ranges Decoded by PCH			
I/O Address	**Read Target**	**Write Target**	**Internal Unit**
00h–08h	DMA Controller	DMA Controller	DMA
00h–08h	DMA Controller	DMA Controller	DMA
09h–0Eh	RESERVED	DMA Controller	DMA
0Fh	DMA Controller	DMA Controller	DMA
10h–18h	DMA Controller	DMA Controller	DMA
19h–1Eh	RESERVED	DMA Controller	DMA
1Fh	DMA Controller	DMA Controller	DMA
20h–21h	Interrupt Controller	Interrupt Controller	Interrupt
24h–25h	Interrupt Controller	Interrupt Controller	Interrupt
28h–29h	Interrupt Controller	Interrupt Controller	Interrupt
2Ch–2Dh	Interrupt Controller	Interrupt Controller	Interrupt
2Eh–2Fh	LPC SIO	LPC SIO	Forwarded to LPC
30h–31h	Interrupt Controller	Interrupt Controller	Interrupt
34h–35h	Interrupt Controller	Interrupt Controller	Interrupt
38h–39h	Interrupt Controller	Interrupt Controller	Interrupt
3Ch–3Dh	Interrupt Controller	Interrupt Controller	Interrupt
40h–42h	Timer/Counter	Timer/Counter	PIT (8254)
43h	RESERVED	Timer/Counter	PIT
4Eh–4Fh	LPC SIO	LPC SIO	Forwarded to LPC
50h–52h	Timer/Counter	Timer/Counter	PIT
53h	RESERVED	Timer/Counter	PIT
60h	Microcontroller	Microcontroller	Forwarded to LPC
61h	NMI Controller	NMI Controller	Processor I/F
62h	Microcontroller	Microcontroller	Forwarded to LPC
64h	Microcontroller	Microcontroller	Forwarded to LPC
66h	Microcontroller	Microcontroller	Forwarded to LPC
70h	RESERVED[1]	NMI and RTC Controller	RTC
71h	RTC Controller	RTC Controller	RTC
72h	RTC Controller	NMI and RTC Controller	RTC
73h	RTC Controller	RTC Controller	RTC
74h	RTC Controller	NMI and RTC Controller	RTC
75h	RTC Controller	RTC Controller	RTC
76h	RTC Controller	NMI and RTC Controller	RTC
77h	RTC Controller	RTC Controller	RTC
80h	DMA Controller, LPC, PCI, or PCIe*	DMA Controller and LPC, PCI, or PCIe	DMA
81h–83h	DMA Controller	DMA Controller	DMA
84h–86h	DMA Controller	DMA Controller and LPC, PCI, or PCIe	DMA
87h	DMA Controller	DMA Controller	DMA

88h	DMA Controller	DMA Controller and LPC, PCI, or PCIe	DMA
89h–8Bh	DMA Controller	DMA Controller	DMA
8Ch–8Eh	DMA Controller	DMA Controller and LPC, PCI, or PCIe	DMA
8Fh	DMA Controller	DMA Controller	DMA
90h–91h	DMA Controller	DMA Controller	DMA
92h	Reset Generator	Reset Generator	Processor I/F
93h–9Fh	DMA Controller	DMA Controller	DMA
A0h–A1h	Interrupt Controller	Interrupt Controller	Interrupt
A4h–A5h	Interrupt Controller	Interrupt Controller	Interrupt
A8h–A9h	Interrupt Controller	Interrupt Controller	Interrupt
ACh–ADh	Interrupt Controller	Interrupt Controller	Interrupt
B0h–B1h	Interrupt Controller	Interrupt Controller	Interrupt
B2h–B3h	Power Management	Power Management	Power Management
B4h–B5h	Interrupt Controller	Interrupt Controller	Interrupt
B8h–B9h	Interrupt Controller	Interrupt Controller	Interrupt
BCh–BDh	Interrupt Controller	Interrupt Controller	Interrupt
C0h–D1h	DMA Controller	DMA Controller	DMA
D2h–DDh	RESERVED	DMA Controller	DMA
DEh–DFh	DMA Controller	DMA Controller	DMA
F0h	FERR# / Interrupt Controller	FERR# / Interrupt Controller	Processor I/F
170h–177h	SATA Controller, PCI, or PCIe	SATA Controller, PCI, or PCIe*	SATA
1F0h–1F7h	SATA Controller, PCI, or PCIe	SATA Controller, PCI, or PCIe	SATA
200h–207h	Gameport Low	Gameport Low	Forwarded to LPC
208h–20Fh	Gameport High	Gameport High	Forwarded to LPC
376h	SATA Controller, PCI, or PCIe	SATA Controller, PCI, or PCIe	SATA
3F6h	SATA Controller, PCI, or PCIe	SATA Controller, PCI, or PCIe	SATA
4D0h–4D1h	Interrupt Controller	Interrupt Controller	Interrupt
CF9h	Reset Generator	Reset Generator	Processor I/F

B.26 System I/O Ports

I/O Address (Hex)	Device
290h-29Fh	H/W Monitor
2F8h-2FFh	Communication Port (COM2)
378h-37Fh	ECP Printer Port (LPT1)
3B0h-3BBh	Graphics
3C0h-3DFh	Graphics
3F8h-3FFh	Communication Port (COM1)
400h-47Fh	PMBASE
500h-57Fh	GPIOBASE
778h-77Fh	ECP Printer Port (LPT1)
C80h-C9Fh	Communication Port (COM3~6)

B.27 DMA Channel Assignments

Table B.27: DMA channel assignments	
Channel	**Function**
0	Available
1	Available
2	Available
3	Available
4	Cascade for DMA controller 1
5	Available
6	Available
7	Available

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B.28 Interrupt Assignments

Table B.28: Interrupt assignments		
Priority	**Interrupt#**	**Interrupt source**
1	NMI	Parity error detected
2	IRQ0	System timer
3	IRQ1	Keyboard
-	IRQ2	Interrupt from controller 2 (cascade)
4	IRQ8	Real-time clock
5	IRQ9	SCI IRQ
6	IRQ10	Available
7	IRQ11	COM3 ~ 6
8	IRQ12	PS/2 mouse
9	IRQ13	Numeric data processor
10	IRQ14	Available
11	IRQ15	Available
12	IRQ3	Communication port (COM2)
13	IRQ4	Communication port (COM1)
14	IRQ5	Available
15	IRQ6	Floppy
16	IRQ7	Parallel port 1 (print port)

B.29 1st MB Memory Map

Table B.29: 1st MB memory map	
Addr. range (Hex)	**Device**
E0000h - FFFFFh	BIOS
CC000h - DFFFFh	Unused
C0000h - CBFFFh	VGA BIOS
A0000h - BFFFFh	Video Memory
00000h - 9FFFFh	Base memory

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