

EMB-QM87A

Intel® 4th Generation Core™ i7/i5/ Celeron Processor

Mini-ITX

Gigabit Ethernet

4 USB2.0, 6 USB3.0, 6 COM

4 SATA 6.0Gb/s, 2 SATA 3.0 Gb/s

Support RAID 0,1,5,10

1 PCI-E[x16], 1 Mini-PCIe socket, 1 Optional TPM

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Packing List

(Standard, not bulk pack)

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

- 1 Jumper Cap
- 1 SATA Cable 7P
- 1 SATA PWR Cable 4P
- 1 Back I/O Shield
- 1 Product DVD-ROM
- 1 EMB-QM87A

If any of these items should be missing or damaged, please contact your distributor or sales representative immediately.

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Chapter

1

**General
Information**

1.1 Introduction

The EMB-QM87A supports Intel® 4th Generation Intel® Core™ i7/i5/ Celeron processor which when paired with the Intel® QM87 Express chipset offers a high performance computing platform with low power consumption. This new product supports two 204-pin dual-channel DDR3L SODIMM at speeds of 1333/1600 MHz, up to 16 GB.

One Mini-PCIe socket, four SATA 6.0Gb/s and two SATA 3.0 Gb/s interfaces provide ample storages. With dual Gigabit Ethernet, six COM ports, six USB3.0, and four USB2.0, the EMB-QM87A meets the requirements of today's demanding applications.

Display requirements are met with an abundance of interfaces such as VGA, HDMI and LVDS. The graphic engine adopts 4th Generation Intel® Core™ i7 / i5 / Celeron® integrated graphics engine (Gen 8, DX11.1, OpenGL 3.2, OpenCL 1.2) to offer high definition display function.

With all of its integrated features, the EMB-QM87A strikes a balance of performance and price. This versatile product targets Industrial Automation, Entertainment, Networking, KIOSK/POS, Transportation, Banking, Healthcare and Digital Signage

applications that require high performance and high reliability.

1.2 Features

- Socket BGA 1364, Intel® 4th Generation Core™ i7/i5/Celeron Processor
- Intel® 4th Generation Core™ i7/i5/Celeron + QM87
- 204-pin Dual-channel DDR3L 1333/1600 MHz SODIMM x 2, Up to 16 GB
- Gigabit Ethernet x 2
- Dual Display Version: Dual 24-bit LVDS, VGA, HDMI
Three Display Version: 3 x HDMI, or 2 x HDMI+VGA, or 2 x HDMI+ 24bit LVDS
- SATA 6.0Gb/s x 4, SATA 3.0Gb/s x 2, Support RAID 0,1,5,10
- USB2.0 x 4, USB3.0 x 6, COM x 6
- PCI-Express [x16] x 1, Mini-PCIe socket x 1, Optional TPM x 1

1.3 Specifications

System

- From Factor Mini-ITX
- Processor Socket BGA 1364, Intel® 4th Generation Core™ i7/i5 Processor
- System Memory 204-pin Dual-channel DDR3L 1333/1600 MHz SODIMM x 2, Up to 16 GB
- Chipset Intel® Core i7/i5/Celeron + QM87
- Ethernet LAN1: Intel® Intel® Ethernet Connection I217-LM 10/100/1000Mb LANs, RJ-45 X1
LAN2: Realtek RTL 8111E 10/100/1000Mb LANs, RJ-45 X1
- BIOS AMI BIOS 128Mbit SPI ROM
- Wake On LAN Yes
- Watchdog Timer Reset: 1 sec. ~ 255 steps programmable
- H/W Status Monitoring System temperature, voltage, and cooling fan status monitoring
- Expansion Interface PCI-E3.0 [x16] x 1
Mini-PCIe socket x 1
Optional TPM x 1
- Battery Lithium Battery
- Power Requirement ATX 8-pin connector for DC+12 V input x 1
CPU fan x 1
System fan with 4-pin wafer x 1
SATA power with 4-pin wafer x 2

- Board Size 6.7" x 6.7" (170mm x 170mm)
- Gross Weight 1.32 lb (0.6Kg)
- Operating Temperature 32°F~140°F (0°C~60°C)
- Storage Temperature -4°F~158°F (-20°C~70°C)
- Operating Humidity 5% ~ 90% relative humidity, non-condensing

Display: Supports CRT/LCD simultaneous / dual / triple view displays

- Chipset Intel® Core i7/i5/Celeron + QM87
4th Generation Intel® Core™ i7 / i5 / Celeron® integrated graphics engine (Gen 8, DX11.1, OpenGL 3.2, OpenCL 1.2)
- Memory Shared system memory up to 256MB
- Resolution Up to 4096 x 2304 @ 24Hz for 1st HDMI
Up to 4096 x 2304 @ 24Hz for 2nd HDMI
Up to 3840 x 2160 @ 60Hz for 3rd HDMI
Up to 1920 x 1200 @ 60Hz for VGA
Up to 3200 x 2000 @ 60Hz for LVDS
- Output Interface Dual channel 24-bit LVDS, HDMI, VGA

I/O: Fintek F81866D-I

- Storage SATA 6.0Gb/s x 4 , SATA 3.0Gb/s x 2, support RAID 0, 1, 5, 10
- Serial Port RS-232 supports pin box header x 5 (5 x 2 box headers)
RS-232/422/485 x 1 supports

- USB
5/12V/RING by jumper on pin-9
USB3.0 x 6
USB2.0 x 4
- PS/2 Port
Keyboard x 1, Mouse x 1
- Digital I/O
8-bit programmable (4-in / 4-out)
- Audio
Line-in, Mic-in, Line-out

Chapter

2

**Quick
Installation
Guide**

2.1 Safety Precautions

Warning!

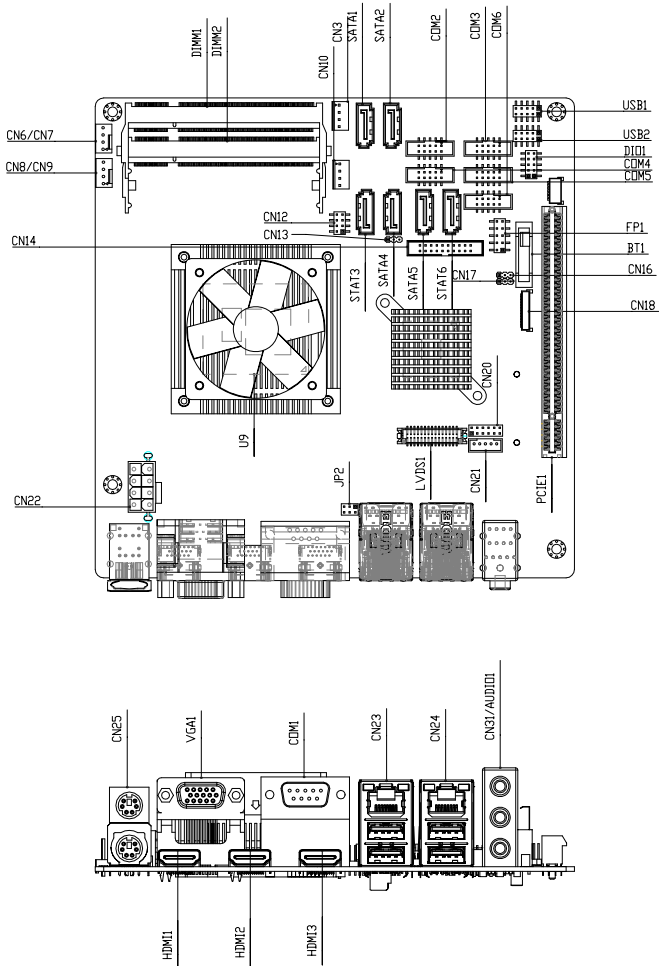
Always completely disconnect the power cord from your board whenever you are working on it. Do not make connections while the power is on, because a sudden rush of power can damage sensitive electronic components.

Caution!

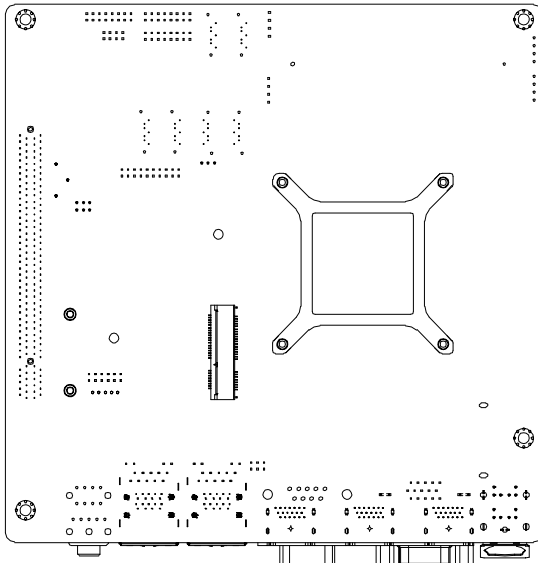
Always ground yourself to remove any static charge before touching the board. Modern electronic devices are very sensitive to static electric charges. Use a grounding wrist strap at all times. Place all electronic components on a static-dissipative surface or in a static-shielded bag when they are not in the chassis

2.2 Location of Connectors and Jumpers

Component Side

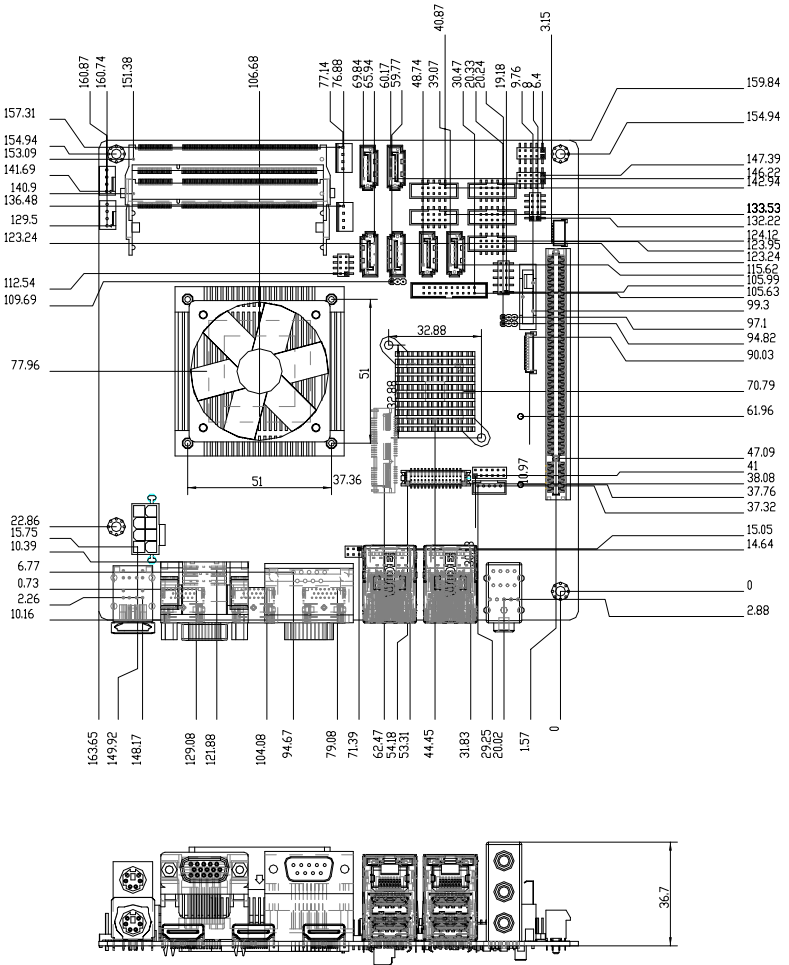


Solder Side

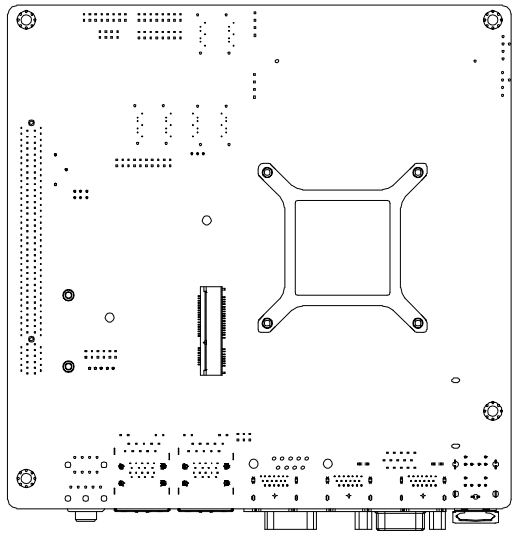
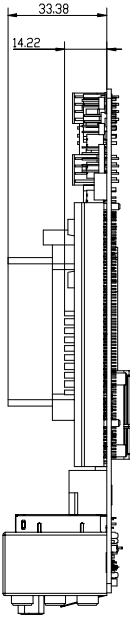


2.3 Mechanical Drawing

Component Side



Solder Side



2.4 List of Jumpers

The board has a number of jumpers that allow you to configure your system to suit your application.

The table below shows the function of each of the board's jumpers:

| Label | Function |
|--------------|---------------------------|
| CN12 | Board ID Setting |
| CN13 | AT/ATX Select |
| CN16 | Clear ME CMOS |
| CN17 | Clear PCH CMOS |
| CN20 | LVDS Setting |
| JP1 | DDR3L Voltage Select |
| JP2 | COM1 Ring/+5V/+12V Select |

2.5 List of Connectors

The board has a number of connectors that allow you to configure your system to suit your application.

The table below shows the function of each of the board's connectors:

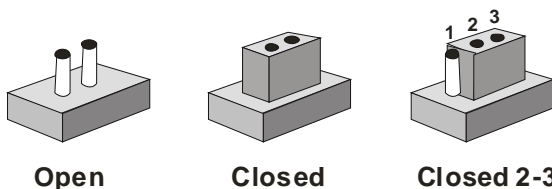
| Label | Function |
|--------------|--------------------------------------|
| FP1 | Front Panel Connector |
| VGA1 | CRT_VGA Port |
| HDMI1~3 | HDMI Port Connector |
| COM1 | RS-232/422/485 Serial Port Connector |
| COM2~6 | COM Port Box Header |
| DIO1 | Digital I/O Pin Header |

| | |
|-------------|--|
| CN3,CN10 | SATA POWER Wafer |
| CN6 | 4 Pin System Fan Connector |
| CN9 | 4 Pin CPU Fan Connector |
| CN11 | SPI Programming Connector |
| CN14 | USB3.0 Port BOX Header |
| CN18 | Debug Port Connector |
| CN21 | LVDS Inverter Power Wafer |
| CN22 | 8 pin DC-IN Power Connector |
| CN23,CN24 | 10/100/1000 Base Ethernet Connector + USB3.0 Connector |
| CN25 | PS/2 keyboard & Mouse Connector |
| CN26 | MINI PCIE SLOT |
| AUDIO1 | Audio Lin-in/Lin-out/MIC |
| DIMM1,DIMM2 | DDR3L SODIMM Slot |
| USB1,USB2 | USB2.0 Port Pin Header |
| SATA1,2,5,6 | SATA 3 Connector |
| SATA 3,4 | SATA 2 Connector |
| PCIE1 | PCI-Ex16 Slot |
| LVDS1 | LVDS Connector |

2.6 Setting Jumpers

You configure your card to match the needs of your application by setting jumpers. A jumper is the simplest kind of electric switch. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To “close” a jumper you connect the pins with the clip.

To “open” a jumper you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2 and 3. In this case you would connect either pins 1 and 2 or 2 and 3.



A pair of needle-nose pliers may be helpful when working with jumpers.

If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any change.

Generally, you simply need a standard cable to make most connections.

2.7 AT/ATX Select (CN13)

| CN13 | Function |
|------|---------------|
| 1-2 | ATX (Default) |
| 2-3 | AT |

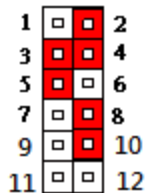
2.8 Clear ME (CN16)

| CN16 | Function |
|------|------------------|
| 1-2 | Normal (Default) |
| 2-3 | Clear CMOS |

2.9 Clear PCH CMOS (CN17)

| CN17 | Function |
|------|------------------|
| 1-2 | Normal (Default) |
| 2-3 | Clear CMOS |

2.10 LVDS Setting & Inverter Voltage Selection (CN20)



LVDS Panel Voltage Select

| CN20 | Function |
|------|-----------------|
| 1-3 | +5V |
| 3-5 | +3.3V (Default) |

LVDS Inverter Voltage Select

| CN20 | Function |
|------|----------|
|------|----------|

| | |
|-----|---------------|
| 2-4 | +5V (Default) |
|-----|---------------|

| | |
|-----|------|
| 4-6 | +12V |
|-----|------|

LVDS Backlight Brightness Control

| CN20 | Function |
|------|----------|
|------|----------|

| | |
|------|------------------------|
| 8-10 | Voltage Mode (Default) |
|------|------------------------|

| | |
|-------|----------|
| 10-12 | PWM Mode |
|-------|----------|

2.11 DDR3L Voltage Select (JP1)

| CN13 | Function |
|------|----------|
|------|----------|

| | |
|-----|-----------------|
| 1-2 | 1.35V (Default) |
|-----|-----------------|

| | |
|-----|------|
| OFF | 1.5V |
|-----|------|

2.12 COM1 Ring/+5V/+12V Select (JP2)

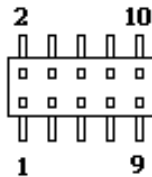
| JP5 | Function |
|-----|----------|
|-----|----------|

| | |
|-----|------|
| 1-2 | +12V |
|-----|------|

| | |
|-----|----------------|
| 3-4 | Ring (Default) |
|-----|----------------|

| | |
|-----|-----|
| 5-6 | +5V |
|-----|-----|

2.13 Front Panel Pin Header (FP1)

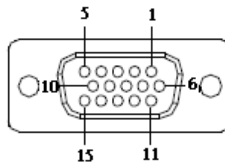


| Pin | Signal | Pin | Signal |
|-----|---------------------|-----|---------------------|
| 1 | Power On Button (-) | 2 | Power On Button (+) |
| 3 | HDD LED (-) | 4 | HDD LED (+) |

| | | | |
|---|------------------|----|------------------|
| 5 | SPEAKER(-) | 6 | SPEAKER(+) |
| 7 | Power LED (-) | 8 | Power LED (+) |
| 9 | Reset Switch (-) | 10 | Reset Switch (+) |

Note: The max. rating of pin1,2,3,4,7,8 is 0.25A @ 5V

2.14 VGA Port Connector (VGA1)



| Pin | Signal | Pin | Signal |
|-----|-------------|-----|-------------|
| 1 | Red | 2 | Green |
| 3 | Blue | 4 | N.C. |
| 5 | GND | 6 | GND |
| 7 | GND | 8 | GND |
| 9 | +5V_CRT | 10 | GND |
| 11 | CRT_PLUG# | 12 | DDC_DATA |
| 13 | CRT_OHSYNCF | 14 | CRT_OVSYNCF |
| 15 | DDC_CLK | | |

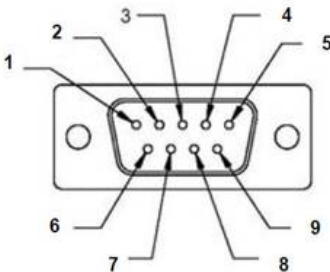
Note: The max. rating of pin9 is 1.5A @ 5V

2.15 HDMI Port Connector (HDMI1~3)



| Pin | Signal | Pin | Signal |
|-----|---------|-----|----------|
| 1 | DATA2_P | 2 | GND |
| 3 | DATA2_N | 4 | N.C. |
| 5 | GND | 6 | DATA1_P |
| 7 | DATA0_P | 8 | DATA1_N |
| 9 | DATA0_N | 10 | GND |
| 11 | GND | 12 | CLK_P |
| 13 | N.C. | 14 | CLK_N |
| 15 | DDC_CLK | 16 | N.C. |
| 17 | GND | 18 | DDC_DATA |
| 19 | HPD | 20 | |

2.16 COM Port Connector (COM1)



RS-232

| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1 | DCD1 | 2 | RXD1 |
| 3 | TXD1 | 4 | DTR1 |
| 5 | GND | 6 | DSR1 |

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| | | | |
|---|------------|----|------|
| 7 | RTS1 | 8 | CTS1 |
| 9 | RI1/5V/12V | 10 | |

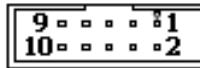
RS-422

| Pin | Signal | Pin | Signal |
|-----|-----------|-----|-----------|
| 1 | RS422_TX- | 2 | RS422_RX+ |
| 3 | RS422_TX+ | 4 | RS422_RX- |
| 5 | GND | 6 | NC |
| 7 | NC | 8 | NC |
| 9 | NC/5V/12V | 10 | |

RS-485

| Pin | Signal | Pin | Signal |
|-----|-----------|-----|--------|
| 1 | RS485_D- | 2 | NC |
| 3 | RS485_D+ | 4 | NC- |
| 5 | GND | 6 | NC |
| 7 | NC | 8 | NC |
| 9 | NC/5V/12V | 10 | |

Note: The max. rating of pin9 is 1A @ 5V & 12V

2.17 COM Port Box Header (COM2~6)

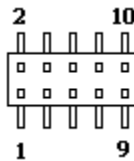
| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1 | DCD | 2 | RXD |
| 3 | TXD | 4 | DTR |

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| | | | |
|---|-----|----|-----|
| 5 | GND | 6 | DSR |
| 7 | RTS | 8 | CTS |
| 9 | RI | 10 | NC |

Note: The max. rating of pin9 is 1A @ 5V & 12V

2.18 Digital I/O Pin Header (DIO1)



| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1 | IN0 | 2 | IN1 |
| 3 | IN2 | 4 | IN3 |
| 5 | OUT0 | 6 | OUT1 |
| 7 | OUT2 | 8 | OUT3 |
| 9 | +3.3V | 10 | GND |

Note: The max. rating of pin9 is 0.5A @ 3.3V

2.27 SATA Power Wafer (CN3,CN10)

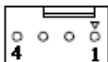


| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1 | +12V | 2 | GND |
| 3 | GND | 4 | +5V |

Note: The max. rating of pin1 is 1 A @ 12V

The max. rating of pin5 is 1 A @ 5V

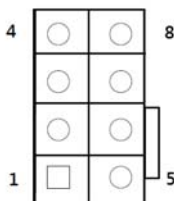
2.22 4 PIN Fan Wafer (CN9,CN6)



| Pin | Signal | Pin | Signal |
|-----|---------|-----|---------|
| 1 | GND | 2 | +12V |
| 3 | FAN_TAC | 4 | FAN_CTL |

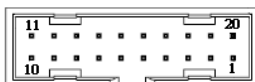
Note: The max. rating of pin2 is 1A @ 12V

2.23 8 pin DC-IN Power Connector Power (CN22)



| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1 | GND | 2 | GND |
| 3 | GND | 4 | GND |
| 5 | +12V | 6 | +12V |
| 7 | +12V | 8 | +12V |

2.21 USB3.0 Box Header (CN23)

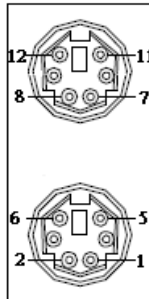


| Pin | Signal | Pin | Signal |
|-----|----------|-----|----------|
| 1 | +5V_USB | 2 | P1_SSRX- |
| 3 | P1_SSRX+ | 4 | GND |
| 5 | P1_SSTX- | 6 | P1_SSTX+ |
| 7 | GND | 8 | P1_D- |
| 9 | P1_D+ | 10 | N.C. |
| 11 | P2_D+ | 12 | P2_D- |
| 13 | GND | 14 | P2_SSTX+ |
| 15 | P2_SSTX- | 16 | GND |
| 17 | P2_SSRX+ | 18 | P2_SSRX- |
| 19 | +5V_USB | 20 | N.C. |

Note: The max. rating of pin1 is 0.9A @ 5V

The max. rating of pin19 is 0.9A @ 5V

2.19 PS/2 keyboard & Mouse Connector (CN25)



| Pin | Signal | Pin | Signal |
|-----|---------|-----|--------|
| 1 | KB_DATA | 2 | N.C. |

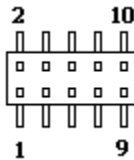
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| Mini-ITX | EMB-QM87A |
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| | | | |
|----|---------|----|--------|
| 3 | GND | 4 | +5V_KB |
| 5 | KB_CLK | 6 | N.C. |
| 7 | MS_DATA | 8 | N.C. |
| 9 | GND | 10 | +5V_KB |
| 11 | MS_CLK | 12 | N.C. |

Note: The max. rating of pin4 is 0.275A @ 5V

The max. rating of pin10 is 0.275A @ 5V

2.20 USB Connector (USB1,USB2)



| Pin | Signal | Pin | Signal |
|-----|---------|-----|---------|
| 1 | +5V_USB | 2 | GND |
| 3 | USB1_N | 4 | GND |
| 5 | USB1_P | 6 | USB2_P |
| 7 | GND | 8 | USB2_N |
| 9 | GND | 10 | +5V_USB |

Note: The max. rating of pin 1 is 0.5A @ 5V

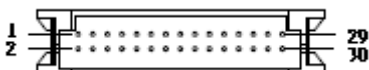
The max. rating of pin 10 is 0.5A @ 5V

2.24 SATA Port Connector (SATA1~6)



| Pin | Signal | Pin | Signal |
|-----|----------|-----|----------|
| 1 | GND | 2 | SATA_TXP |
| 3 | SATA_TXN | 4 | GND |
| 5 | SATA_RXN | 6 | SATA_RXP |
| 7 | GND | | |

2.25 LVDS Connector (LVDS1)

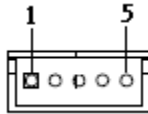


| Pin | Signal | Pin | Signal |
|-----|---------------|-----|--------------|
| 1 | BKLT_EN | 2 | BKLT_CTRL |
| 3 | LVDSVCC | 4 | GND |
| 5 | LVDS1_CLK# | 6 | LVDS1_CLK |
| 7 | LVDSVCC | 8 | GND |
| 9 | LVDS1_DATA0# | 10 | LVDS1_DATA0 |
| 11 | LVDS1_DATA1# | 12 | LVDS1_DATA1 |
| 13 | LVDS1_DATA2# | 14 | LVDS1_DATA2 |
| 15 | LVDS1_DATA3# | 16 | LVDS1_DATA3 |
| 17 | LVDS_DDC_DATA | 18 | LVDS_DDC_CLK |
| 19 | LVDS2_DATA0# | 20 | LVDS2_DATA0 |
| 21 | LVDS2_DATA1# | 22 | LVDS2_DATA1 |
| 23 | LVDS2_DATA2# | 24 | LVDS2_DATA2 |

| | | | |
|----|--------------|----|-------------|
| 25 | LVDS2_DATA3# | 26 | LVDS2_DATA3 |
| 27 | LVDSVCC | 28 | GND |
| 29 | LVDS2_CLK# | 30 | LVDS2_CLK |

Note: The max. rating of pin3,7 is 2A @ 5V / 3.3V

2.26 LVDS Inverter Power Wafer (CN21)



| Pin | Signal | Pin | Signal |
|-----|----------|-----|--------|
| 1 | 12V / 5V | 2 | VCON |
| 3 | GND | 4 | GND |
| 5 | INV_EN | | |

Note: The max. rating of pin1 is 2A @ 12V / 5V

Below Table for China RoHS Requirements

产品中有毒有害物质或元素名称及含量

AAEON Main Board/ Daughter Board/ Backplane

| 部件名称 | 有毒有害物质或元素 | | | | | |
|--|-----------|-----------|-----------|-----------------|---------------|-----------------|
| | 铅 (Pb) | 汞 (Hg) | 镉 (Cd) | 六价铬 (Cr(VI)) | 多溴联苯 (PBB) | 多溴二苯醚 (PBDE) |
| 印刷电路板 及其电子组件 | × | ○ | ○ | ○ | ○ | ○ |
| 外部信号 连接器及线材 | × | ○ | ○ | ○ | ○ | ○ |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| <p>O: 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T 11363-2006 标准规定的限量要求以下。</p> <p>X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T 11363-2006 标准规定的限量要求。</p> <p>备注: 此产品所标示之环保使用期限, 系指在一般正常使用状况下。</p> | | | | | | |

Chapter

3

**AMI
BIOS Setup**

3.1 System Test and Initialization

These routines test and initialize board hardware. If the routines encounter an error during the tests, you will either hear a few short beeps or see an error message on the screen. There are two kinds of errors: fatal and non-fatal. The system can usually continue the boot up sequence with non-fatal errors.

System configuration verification

These routines check the current system configuration stored in the CMOS memory and BIOS NVRAM. If system configuration is not found or system configuration data error is detected, system will load optimized default and re-boot with this default system configuration automatically.

There are four situations in which you will need to setup system configuration:

1. You are starting your system for the first time
2. You have changed the hardware attached to your system
3. The system configuration is reset by Clear-CMOS jumper
4. The CMOS memory has lost power and the configuration information has been erased.

The EMB-QM87A CMOS memory has an integral lithium battery backup for data retention. You will need to replace the battery when

it finally runs down.

3.2 AMI BIOS Setup

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

Entering Setup

Power on the computer and press or <F2> immediately. This will allow you to enter Setup.

Main

Set the date, use tab to switch between date elements.

Advanced

Enable/disable boot option for legacy network devices.

Chipset

Host bridge parameters.

Boot

Enables/disables quiet boot option.

Security

Set setup administrator password.

Save&Exit

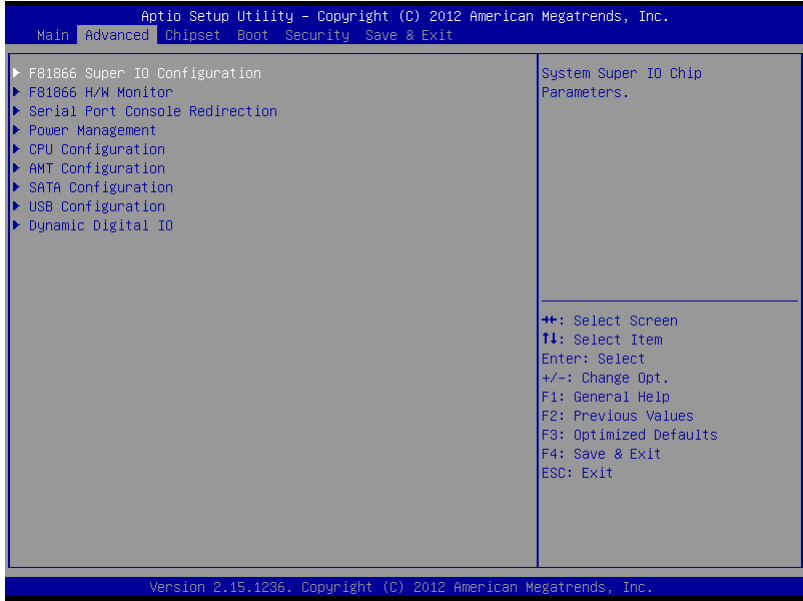
Exit system setup after saving the changes.

Setup Menu

Setup submenu: Main

| Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc. | |
|---|---|
| Main Advanced Chipset Boot Security Save & Exit | |
| BIOS Information EMB-QM87A R1.6(EM87AM16) (12/30/2013) | Set the Date. Use Tab to switch between Date elements. |
| BIOS Vendor: American Megatrends Core Version: 4.6.5.4 Compliancy: UEFI 2.3.1; PI 1.2 | |
| System Date: [Thu 04/16/2009] System Time: [15:12:30] | +-: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit |
| Access Level: Administrator | |
| Version 2.15.1236. Copyright (C) 2012 American Megatrends, Inc. | |

Setup submenu: Advanced



Super IO Configuration

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Advanced

| | |
|---|---|
| <p>F81866 Super IO Configuration</p> <p>F81866 Super IO Chip F81866</p> <ul style="list-style-type: none"> ▶ Serial Port 1 Configuration ▶ Serial Port 2 Configuration ▶ Serial Port 3 Configuration ▶ Serial Port 4 Configuration ▶ Serial Port 5 Configuration ▶ Serial Port 6 Configuration | <p>Set Parameters of Serial Port 1 (COMA)</p> <hr/> <p> ⇧+: Select Screen ⇧↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit </p> |
|---|---|

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Serial Port 1 Configuration

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Advanced

| | | |
|-----------------------------|-----------------|--|
| Serial Port 1 Configuration | | Enable or Disable Serial Port (COM) |
| Serial Port | [Enabled] | |
| Device Settings | IO=3F8h; IRQ=4; | |
| Device Mode | [RS232] | |
| 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 |

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Options summary:

| | |
|--|------------------|
| Serial Port | Disabled |
| | Enabled |
| Enable or Disable Serial Port (COM) | |
| Device Mode | RS232 |
| | RS422 |
| | RS485 |
| Select working model | |
| Serial Port | Auto |
| | IO=3F8h; IRQ=4; |
| | IO=3F8h; IRQ=3,4 |
| | IO=2F8h; IRQ=3,4 |
| | IO=3E8h; IRQ=3,4 |
| | IO=2E8h; IRQ=3,4 |
| Select an optimal setting for Super IO device. | |

Serial Port 2 Configuration

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

Advanced

| | | |
|-----------------------------|-----------------|---|
| Serial Port 2 Configuration | | Enable or Disable Serial Port (COM) |
| Serial Port | [Enabled] | ⇧+: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit |
| Device Settings | IO=2F8h; IRQ=3; | |
| Change Settings | [Auto] | |

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Options summary:

| | |
|--|------------------|
| Serial Port | Disabled |
| | Enabled |
| Enable or Disable Serial Port (COM) | |
| Serial Port | Auto |
| | IO=2F8h; IRQ=3; |
| | IO=3F8h; IRQ=3,4 |
| | IO=2F8h; IRQ=3,4 |
| | IO=3E8h; IRQ=3,4 |
| | IO=2E8h; IRQ=3,4 |
| Select an optimal setting for Super IO device. | |

Serial Port 3 Configuration

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Advanced

| | | |
|-----------------------------|------------------|--|
| Serial Port 3 Configuration | | Enable or Disable Serial Port (COM) |
| Serial Port | [Enabled] | ⇧+: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit |
| Device Settings | IO=3E8h; IRQ=10; | |
| Change Settings | [Auto] | |

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Options summary:

| | |
|--|------------------|
| Serial Port | Disabled |
| | Enabled |
| Enable or Disable Serial Port (COM) | |
| Serial Port | Auto |
| | IO=3E8h; IRQ=10, |
| | IO=3E8h; IRQ=10, |
| | IO=2E8h; IRQ=10, |
| | IO=2D0h; IRQ=10, |
| | IO=2C0h; IRQ=10, |
| Select an optimal setting for Super IO device. | |

Serial Port 4 Configuration

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Advanced

| | | |
|-----------------------------|------------------|-------------------------------------|
| Serial Port 4 Configuration | | Enable or Disable Serial Port (COM) |
| Serial Port | [Enabled] | |
| Device Settings | IO=2E8h; IRQ=10; | |
| 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

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Options summary:

| | |
|--|------------------|
| Serial Port | Disabled |
| | Enabled |
| Enable or Disable Serial Port (COM) | |
| Serial Port | Auto |
| | IO=2E8h; IRQ=10, |
| | IO=3E8h; IRQ=10, |
| | IO=2E8h; IRQ=10, |
| | IO=2D0h; IRQ=10, |
| | IO=2C0h; IRQ=10, |
| Select an optimal setting for Super IO device. | |

Serial Port 5 Configuration

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Advanced

| | | |
|-----------------------------|------------------|--|
| Serial Port 5 Configuration | | Enable or Disable Serial Port (COM) |
| Serial Port | [Enabled] | |
| Device Settings | IO=2D0h; IRQ=10; | |
| 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 |

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Options summary:

| | |
|--|------------------|
| Serial Port | Disabled |
| | Enabled |
| Enable or Disable Serial Port (COM) | |
| Serial Port | Auto |
| | IO=2D0h; IRQ=10, |
| | IO=3E8h; IRQ=10, |
| | IO=2E8h; IRQ=10, |
| | IO=2D0h; IRQ=10, |
| | IO=2C0h; IRQ=10, |
| Select an optimal setting for Super IO device. | |

Serial Port 6 Configuration

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Advanced

| | | |
|-----------------------------|------------------------|---|
| Serial Port 6 Configuration | | Enable or Disable Serial Port (COM) |
| Serial Port | [Enabled] | |
| Device Settings | IO=2C0h; IRQ=10; | |
| Change Settings | [Auto] | |
| Device Mode | [Disable IR1 function] | |
| | | ++: 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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Options summary:

| | |
|--|------------------|
| Serial Port | Disabled |
| | Enabled |
| Enable or Disable Serial Port (COM) | |
| Serial Port | Auto |
| | IO=2C0h; IRQ=10, |
| | IO=3E8h; IRQ=10, |
| | IO=2E8h; IRQ=10, |
| | IO=2D0h; IRQ=10, |
| | IO=2C0h; IRQ=10, |
| Select an optimal setting for Super IO device. | |

H/W Monitor

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

Advanced

| | |
|--|---|
| <p>Pc Health Status</p> <p>▶ Smart Fan Mode Configuration</p> <p>CPU temperature : +44 %</p> <p>System temperature : +31 %</p> <p>Fan1 Speed : N/A</p> <p>Fan2 Speed : 4918 RPM</p> <p>VCore : +1.808 V</p> <p>V1.5S : +1.360 V</p> <p>V5S : +5.045 V</p> <p>V12S : +11.792 V</p> <p>VSB5V : +5.088 V</p> <p>VCC3V : +3.376 V</p> <p>VSB3V : +3.392 V</p> <p>VBAT : +3.248 V</p> | <p>Smart Fan Mode Select</p> <hr/> <p>→+: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit</p> |
|--|---|

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Smart Fan Function

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Advanced

| | |
|--|--|
| <p>Smart Fan Mode Configuration</p> <pre> Fan 1 Smart Fan Control [Auto Duty-Cycle Mode] Temperature 1 60 Temperature 2 50 Temperature 3 40 Temperature 4 30 Duty Cycle 1 85 Duty Cycle 2 70 Duty Cycle 3 60 Duty Cycle 4 50 Fan 2 Smart Fan Control [Auto Duty-Cycle Mode] Temperature 1 60 Temperature 2 50 Temperature 3 40 Temperature 4 30 Duty Cycle 1 85 Duty Cycle 2 70 Duty Cycle 3 60 Duty Cycle 4 50 </pre> | <p>Smart Fan Mode Select</p> <hr/> <pre> +/: Select Screen F1: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit </pre> |
|--|--|

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Options summary:

| | |
|--|-----------------------------|
| Fan 1,2 Smart Fan Mode | Manual RPM Mode |
| | Manual Duty Mode |
| | Auto RPM Mode |
| | Auto Duty-Cycle Mode |
| Smart Fan Mode Select | |
| Fan off temperature limit | 15 (0-127) |
| Fan will of when temperature lower than this limit. | |
| Fan start temperature limit | 45 (0-127) |
| Fan will work when temperature higher than this limit. | |
| Fan start PWM | 35 (0-255) |
| Fan will start with this PWM value(Range 0-255). | |

| | |
|---------------------|--------------|
| PWM SLOPE SETTING | 0.125 PWM |
| | 0.25 PWM |
| | 0.5 PWM |
| | 1 PWM |
| | 2 PWM |
| | 4 PWM |
| | 8 PWM |
| | 15.875 PWM |
| PWM SLOPE Selection | |

Serial Port Cons

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Advanced

| | |
|---|---|
| <p>COM1 Console Redirection [Disabled] ▶ Console Redirection Settings</p> <p>COM2 Console Redirection [Disabled] ▶ Console Redirection Settings</p> <p>SOL_COM3(Pci Bus0,Dev22,Func3) Console Redirection [Disabled] ▶ Console Redirection Settings</p> <p>Serial Port for Out-of-Band Management/ Windows Emergency Management Services (EMS) Console Redirection [Disabled] ▶ Console Redirection Settings</p> | <p>Console Redirection Enable or Disable.</p> <hr/> <p>+/: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit</p> |
|---|---|

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Options summary:

| | |
|--|-----------------|
| Console Redirection | Disabled |
| | Enabled |
| Console Redirection Enabled or Disabled. | |

Console Redirection Settings

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Advanced

| | |
|--|---|
| <p>COM1 Console Redirection Settings</p> <p>Terminal Type [VT100+] Bits per second [115200] Data Bits [8] Parity [None] Stop Bits [1] Flow Control [None] VT-UTF8 Combo Key Support [Enabled] Recorder Mode [Disabled] Resolution 100x31 [Disabled] Legacy OS Redirection Resolution [80x24] Putty KeyPad [VT100] Redirection After BIOS POST [Always Enable]</p> | <p>Emulation: ANSI: Extended ASCII char set. VT100: ASCII char set. VT100+: Extends VT100 to support color, function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.</p> <hr/> <p> ++: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit </p> |
|--|---|

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Options summary:

| | |
|---|--|
| Terminal Type | VT100 VT100+ VT-UTF8 ANSI |
| Emulation: ANSI: Extended ASCII char set. VT100: ASCII char set. VT100+: Extends VT100 to support color, function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes. | |
| Bits per second | 9600 19200 38400 57600 115200 |
| Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds. | |
| Data Bits | 7 8 |
| Data Bits | |

| | |
|---|------------------|
| Parity | None |
| | Even |
| | Odd |
| | Mark |
| | Space |
| <p>A parity bit can be sent with the data bits to detect some transmission errors. Even: parity bit is 0 if the num of 1's in the data bits is even. Odd: parity bit is 0 if num of 1's in the data bits is odd. Mark: parity bit is always 1. Space: Parity bit is always 0. Mark and Space Parity do not allow for error detection.</p> | |
| Stop Bits | 1 |
| | 2 |
| <p>Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning). The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit.</p> | |
| Flow Control | None |
| | Hardware RTS/CTS |
| <p>Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a 'stop' signal can be sent to stop the data flow. Once the buffers are empty, a 'start' signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals.</p> | |

| | |
|--|----------------------|
| VT-UTF8 Combo Key Support | Disabled |
| | Enabled |
| Enable VT-UTF8 Combination Key Support for ANSI/VT100 terminals | |
| Recorder Mode | Disabled |
| | Enabled |
| On this mode enabled only text will be send. This is to capture Terminal data. | |
| Resolution 100x31 | Disabled |
| | Enabled |
| Enables or disables extended terminal resolution | |
| Legacy OS Redirection Resolution | 80x24 |
| | 80x25 |
| On Legacy OS, the Number of Rows and Columns supported redirection | |
| Putty KeyPad | VT100 |
| | LINUX |
| | XTERMR6 |
| | SCO |
| | ESCN |
| | VT400 |
| Select FunctionKey and KeyPad on Putty. | |
| Redirection After BIOS POST | Always Enable |
| | BootLoader |
| The Setting Specify if BootLoader is selected than Legacy console redirection is disabled before booting to Legacy OS. Default value is Always Enable which means Legacy console Redirection is enabled for Legacy OS. | |

Power Management

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Advanced

| | |
|---|--|
| Power Management Power Mode [ATX Type] ACPI Sleep State [S3 only(Suspend to ...)] Restore AC Power Loss [Last State] Resume on Ring [Enabled] Resume on PCIE [Enabled] S5 RTC Wake Settings Wake system with Fixed Time [Disabled] Wake system with Dynamic Time [Disabled] | Select Power Supply Mode. ++: 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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Options summary:

| | |
|---|---------------------------------|
| Power Mode | ATX Type |
| | AT Type |
| Select Power Supply Mode. | |
| ACPI Sleep State | Suspend Disabled |
| | S3 only (Suspend to RAM) |
| Select ACPI sleep state the system will enter when the SUSPEND button is pressed. | |
| Restore AC Power Loss | Power Off |
| | Power On |
| | Last State |
| Select AC power state when power is re-applied after a power failure. | |
| Resume on Ring | Disabled |
| | Enabled |
| Enable/Disable Resume from RI# signal. | |
| Resume on PCIE | Disabled |
| | Enabled |
| Enable/Disable Resume from PCIE signal. | |
| Wake system with Fixed Time | Disabled |

| | |
|--|----------------|
| | Enabled |
| Enable or disable System wake on alarm event. When enable, System will wake on the hr::min::sec specified. | |
| Wake up day | 0 |
| Select 0 for daily system wake up, 1-31 for which day of month that you would like the system to wake up. | |
| Wake up hour | 0 |
| Select 0-23 For example enter 3 for 3am and 15 for 3pm. | |
| Wake up minute | 0 |
| 0-59 | |
| Wake up second | 0 |
| 0-59 | |
| Wake system with Dynamic Time | Disabled |
| | Enabled |
| Enable or disable System wake on alarm event. When enabled, System will wake on the current time + Increase minute(s). | |
| Wake up minute increase | 1 |
| 1-5 | |

CPU Configuration

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Advanced

| | | |
|---|------------|---|
| CPU Configuration | | Enabled for Windows XP and Linux OS optimized for Hyper-Threading Technology) and Disabled for other OS (OS not optimized for Hyper-Threading Technology). When Disabled only one thread per enabled core is enabled. |
| Intel(R) Core(TM) i7-4700EQ CPU @ 2.40GHz | | |
| CPU Signature | 306c3 | ++: Select Screen F1: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit |
| Processor Family | 6 | |
| Microcode Patch | 17 | |
| FSB Speed | 100 MHz | |
| Max CPU Speed | 2400 MHz | |
| Min CPU Speed | 800 MHz | |
| CPU Speed | 2800 MHz | |
| Processor Cores | 4 | |
| 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 | |
| CPU C7 state | Supported | |
| L1 Data Cache | 32 kB x 4 | |
| L1 Code Cache | 32 kB x 4 | |
| L2 Cache | 256 kB x 4 | |
| L3 Cache | 6144 kB | |

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Advanced

| | | |
|---------------------------------|------------|-------------|
| CPU Signature | 306c3 | Turbo Mode. |
| Processor Family | 6 | |
| Microcode Patch | 17 | |
| FSB Speed | 100 MHz | |
| Max CPU Speed | 2400 MHz | |
| Min CPU Speed | 800 MHz | |
| CPU Speed | 2800 MHz | |
| Processor Cores | 4 | |
| 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 | |
| CPU C7 state | Supported | |
| L1 Data Cache | 32 kB x 4 | |
| L1 Code Cache | 32 kB x 4 | |
| L2 Cache | 256 kB x 4 | |
| L3 Cache | 6144 kB | |
| Hyper-threading | [Enabled] | |
| Intel Virtualization Technology | [Enabled] | |
| Turbo Mode | [Enabled] | |

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Options summary :

| | |
|---|----------------|
| Hyper-threading | Disabled |
| | Enabled |
| Enabled for Windows XP and Linux (OS optimized for Hyper-Threading Technology) and Disabled for other OS (OS not optimized for Hyper-Threading Technology). When Disabled only on thread per enabled core is enabled. | |
| Intel Virtualization Technology | Disabled |
| | Enabled |
| When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology. | |
| Turbo Mode | Disabled |
| | Enabled |
| Turbo Mode | |

AMT Configuration

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Advanced

| | | |
|-----------------|------------|---|
| Intel AMT | [Enabled] | Enable/Disable Intel (R) Active Management Technology BIOS Extension. Note : iAMT H/W is always enabled. This option just controls the BIOS extension execution. If enabled, this requires additional firmware in the SPI device |
| Un-Configure ME | [Disabled] | |

+/: 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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Options summary:

| | |
|--|----------------|
| Intel AMT | Disabled |
| | Enabled |
| Enable/Disable Intel® Active Management Technology BIOS Extension. Note : iAMT H/W is always enabled. This option just controls the BIOS extension execution. If enabled, this requires additional firmware in the SPI device | |
| Un-Configure ME | Disabled |
| | Enabled |
| OEMFlag Bit 15: Un-Configure ME without password. | |

SATA Configuration (IDE)

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

Advanced

| | | |
|---------------------|-----------|--|
| SATA Controller(s) | [Enabled] | Enable or disable SATA Device. |
| SATA Mode Selection | [IDE] | |
| Serial ATA Port 0 | Empty | ⇧⇩: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit |
| Software Preserve | Unknown | |
| Serial ATA Port 1 | Empty | |
| Software Preserve | Unknown | |
| Serial ATA Port 2 | Empty | |
| Software Preserve | Unknown | |
| Serial ATA Port 3 | Empty | |
| Software Preserve | Unknown | |
| Serial ATA Port 4 | Empty | |
| Software Preserve | Unknown | |
| Serial ATA Port 5 | Empty | |
| Software Preserve | Unknown | |

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Options summary :

| | |
|--|----------------|
| SATA Controller(s) | Disabled |
| | Enabled |
| Enable or disable SATA Device. | |
| SATA Mode Selection | IDE |
| | AHCI |
| | RAID |
| Determines how SATA controller(s) operate. | |

SATA Configuration (AHCI)

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

Advanced

| | | |
|-----------------------|-------------------|--|
| SATA Controller(s) | [Enabled] | Identify the SATA port is connected to Solid State Drive or Hard Disk Drive. |
| SATA Mode Selection | [AHCI] | |
| SATA Controller Speed | [Default] | |
| Serial ATA Port 0 | Empty | ++: Select Screen ↑↓: Select Item Enter: Select +/=: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit |
| Software Preserve | Unknown | |
| Port 0 | [Enabled] | |
| Hot Plug | [Disabled] | |
| External SATA | [Disabled] | |
| SATA Device Type | [Hard Disk Drive] | |
| Spin Up Device | [Disabled] | |
| Serial ATA Port 1 | Empty | |
| Software Preserve | Unknown | |
| Port 1 | [Enabled] | |
| Hot Plug | [Disabled] | |
| External SATA | [Disabled] | |
| SATA Device Type | [Hard Disk Drive] | |
| Spin Up Device | [Disabled] | |
| Serial ATA Port 2 | Empty | |
| Software Preserve | Unknown | |
| Port 2 | [Enabled] | |
| Hot Plug | [Disabled] | |
| External SATA | [Disabled] | |
| SATA Device Type | [Hard Disk Drive] | |
| Spin Up Device | [Disabled] | |

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Options summary :

| | |
|--|----------------|
| SATA Controller Speed | Disabled |
| | Enabled |
| Enable or disable SATA Device. | |
| SATA Mode Selection | Default |
| | Gen1 |
| | Gen2 |
| | Gen3 |
| Indicates the maximum speed the SATA controller can support. | |
| Port | Disabled |
| | Enabled |
| Enable or Disable SATA Port | |
| Hot Plug | Disabled |
| | Enabled |
| Designates this port as Hot Pluggable. | |
| External SATA | Disabled |
| | Enabled |
| External SATA Support. | |

| | |
|---|------------------------|
| SATA Device Type | Hard Disk Drive |
| | Solid State Drive |
| Identify the SATA port is connected to Solid State Drive or Hard Disk Drive. | |
| Spin Up Device | Disabled |
| | Enabled |
| On an edge detect from 0 to 1, the PCH starts a COMRESET initialization sequence to device. | |

SATA Configuration (RAID)

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

Advanced

| | | |
|-----------------------|-------------------|--|
| SATA Controller(s) | [Enabled] | Determines how SATA controller(s) operate. |
| SATA Mode Selection | [RAID] | |
| SATA Controller Speed | [Default] | |
| Serial ATA Port 0 | Empty | ++: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit |
| Software Preserve | Unknown | |
| Port 0 | [Enabled] | |
| Hot Plug | [Disabled] | |
| External SATA | [Disabled] | |
| SATA Device Type | [Hard Disk Drive] | |
| Spin Up Device | [Disabled] | |
| Serial ATA Port 1 | Empty | |
| Software Preserve | Unknown | |
| Port 1 | [Enabled] | |
| Hot Plug | [Disabled] | |
| External SATA | [Disabled] | |
| SATA Device Type | [Hard Disk Drive] | |
| Spin Up Device | [Disabled] | |
| Serial ATA Port 2 | Empty | |
| Software Preserve | Unknown | |
| Port 2 | [Enabled] | |
| Hot Plug | [Disabled] | |
| External SATA | [Disabled] | |
| SATA Device Type | [Hard Disk Drive] | |
| Spin Up Device | [Disabled] | |

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Options summary :

| | |
|--|----------------|
| SATA Controller Speed | Disabled |
| | Enabled |
| Enable or disable SATA Device. | |
| SATA Mode Selection | Default |
| | Gen1 |
| | Gen2 |
| | Gen3 |
| Indicates the maximum speed the SATA controller can support. | |
| Port | Disabled |
| | Enabled |
| Enable or Disable SATA Port | |
| Hot Plug | Disabled |
| | Enabled |
| Designates this port as Hot Pluggable. | |
| External SATA | Disabled |
| | Enabled |
| External SATA Support. | |

| | |
|---|------------------------|
| SATA Device Type | Hard Disk Drive |
| | Solid State Drive |
| Identify the SATA port is connected to Solid State Drive or Hard Disk Drive. | |
| Spin Up Device | Disabled |
| | Enabled |
| On an edge detect from 0 to 1, the PCH starts a COMRESET initialization sequence to device. | |

USB Configuration

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

Advanced

| | |
|--|---|
| <p>USB Configuration</p> <p>USB Devices: 1 Drive, 1 Keyboard, 1 Mouse, 2 Hubs</p> <p>Legacy USB Support [Enabled]</p> | <p>Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.</p> <hr/> <p> ++: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit </p> |
|--|---|

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

Options summary:

| | | | | |
|---|--|----------------|----------|------|
| Legacy USB Support | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Enabled</td> </tr> <tr> <td style="padding: 2px 5px;">Disabled</td> </tr> <tr> <td style="padding: 2px 5px;">Auto</td> </tr> </table> | Enabled | Disabled | Auto |
| Enabled | | | | |
| Disabled | | | | |
| Auto | | | | |
| Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB device available only for EFI applications. | | | | |

Dynamic Digital IO

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

Advanced

| | | |
|---------------------|-----------|--|
| SATA Controller(s) | [Enabled] | Enable or disable SATA Device. |
| SATA Mode Selection | [IDE] | |
| Serial ATA Port 0 | Empty | ⇧⇩: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit |
| Software Preserve | Unknown | |
| Serial ATA Port 1 | Empty | |
| Software Preserve | Unknown | |
| Serial ATA Port 2 | Empty | |
| Software Preserve | Unknown | |
| Serial ATA Port 3 | Empty | |
| Software Preserve | Unknown | |
| Serial ATA Port 4 | Empty | |
| Software Preserve | Unknown | |
| Serial ATA Port 5 | Empty | |
| Software Preserve | Unknown | |

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Options Summary:

| | |
|------------------------------------|----------------------------|
| DIOx Direction | Input (DIO0,1,2,3) |
| | Output (DIO4,5,6,7) |
| Set Digital IO as Input or Output | |
| Output Level | Hi |
| | Low |
| Set Digital IO Output as Hi or Low | |

Setup submenu: Chipset



PCH-IO Configuration

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Chipset

| | |
|---|---|
| <p>PCI Express Configuration</p> <p>PCH LAN Controller [Enabled]</p> <p>LAN RTL8111E [Enabled]</p> <p>Mini Card [Enabled]</p> <p>PCH Azalia Configuration</p> <p>Azalia [Auto]</p> | <p>Enable or disable onboard NIC.</p> <p> ++: Select Screen ↑: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit </p> |
|---|---|

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Options summary:

| | |
|---|----------------|
| PCH LAN Controller | Enabled |
| | Disabled |
| Enable or disable onboard NIC. | |
| LAN RTL8111E | Disabled |
| | Enabled |
| Control the PCI Express Root Port. | |
| Mini Card | Disabled |
| | Enabled |
| Control the PCI Express Root Port. | |
| Aazlia | Disabled |
| | Enabled |
| | Auto |
| Control Detection of the Azalia device. Disabled = Azalia will be unconditionally disabled Enabled = Azalia will be unconditionally Enabled Auto = Azalia will be enabled If present , disabled otherwise. | |

System Agent (SA) Configuration

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Chipset

| | | |
|--------------------------------|-----------------------|---|
| VT-d Capability | Supported | Check to enable VT-d function on MCH. |
| VT-d | [Enabled] | |
| Primary Display | [Auto] | |
| Internal Graphics | [Auto] | |
| Primary IGFX Boot Display | [VBIOS Default] | |
| LVDS | [Enabled] | |
| LVDS Panel Type | [1024x768,18bit,60Hz] | |
| CH7511B Backlight Control Mode | [DC Mode] | |
| Brightness Setting | [100%] | |
| ▶ Memory Configuration | | |
| | | ++: 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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Options summary :

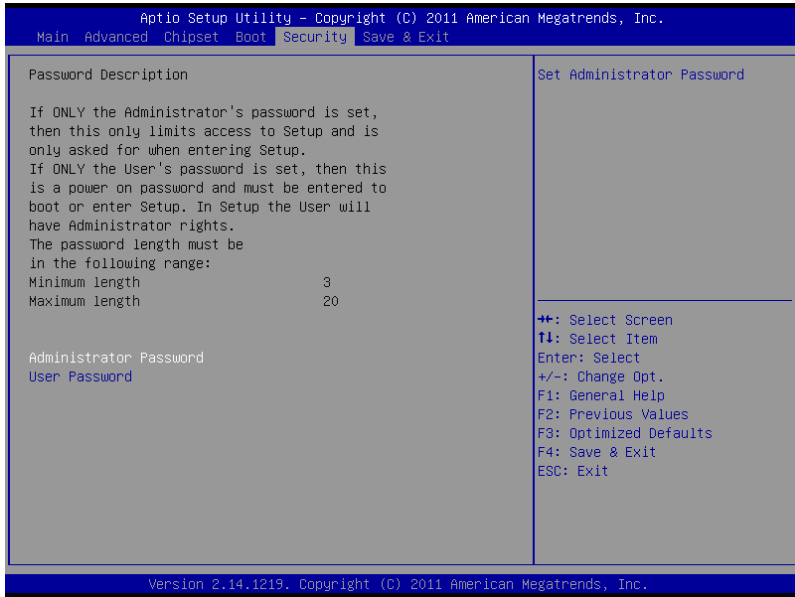
| | |
|--|----------------------|
| VT-d | Disabled |
| | Enabled |
| Check to enable VT-d function on MCH. | |
| Primary Display | Auto |
| | IGFX |
| | PEG |
| | PCIE |
| Select which of IGFX/PEG/PCI Graphic device should be Primary Display. | |
| Internal Graphics | Auto |
| | Disabled |
| | Enabled |
| Keep IGD enabled base on the setup options. | |
| Primary IGFX Boot Display | VBIOS Default |
| | CRT |
| | LVDS |
| | HDMI1 |
| | HDMI2 |
| | HDMI3 |

| | |
|--|--|
| <p>Select the Video Device which will be activated during POST. This has no effect if external graphics present. Secondary boot display selection will appear based on your selection. VGA modes will be supported only on primary display.</p> | |
| Secondary IGFX Boot Display | <p>Disabled</p> <p>CRT</p> <p>LVDS</p> <p>HDMI1</p> <p>HDMI2</p> <p>HDMI3</p> |
| <p>Select Secondary Display Device.</p> | |
| LVDS | <p>Disabled</p> <p>Enabled</p> |
| <p>LVDS(CH7511) Enabled/Disabled</p> | |
| LVDS Panel Type | <p>640x480,18bit,60Hz</p> <p>800x480,18bit,60Hz</p> <p>800x600,18bit,60Hz</p> <p>1024x600,18bit,60Hz</p> <p>1024x768,18bit,60Hz</p> <p>1024x768,24bit,60Hz</p> <p>1280x768,24bit,60Hz</p> <p>1280x1024,48bit,60Hz</p> <p>1366x768,24bit,60Hz</p> <p>1440x900,48bit,60Hz</p> <p>1600x1200,48bit,60Hz</p> <p>1920x1080,48bit,60Hz</p> <p>1920x1200,48bit,60Hz</p> |
| <p>Select LCD panel used.</p> | |
| CH7511B Backlight Control Mode | <p>DC Mode</p> <p>PWM Mode</p> |
| <p>Select CH7511B Backlight Control by DC or PWM Mode.</p> | |
| Brightness Setting | <p>100%</p> <p>75%</p> <p>50%</p> <p>25%</p> |
| <p>CH7511B Brightness Setting</p> | |

Memory Configuration

| Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc. | |
|---|---|
| Main Advanced Chipset Boot Security Save & Exit | |
| Boot Configuration Quiet Boot [Enabled] Launch I218LM PXE OpROM [Disabled] Launch RTL8111E PXE OpROM [Disabled] Boot Option Priorities Boot Option #1 [UEFI: USB FLASH DR...] Boot Option #2 [USB FLASH DRIVE PMAP] Hard Drive BBS Priorities | Enables or disables Quiet Boot option ⇧+: 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. | |

Security



Change User/Supervisor Password

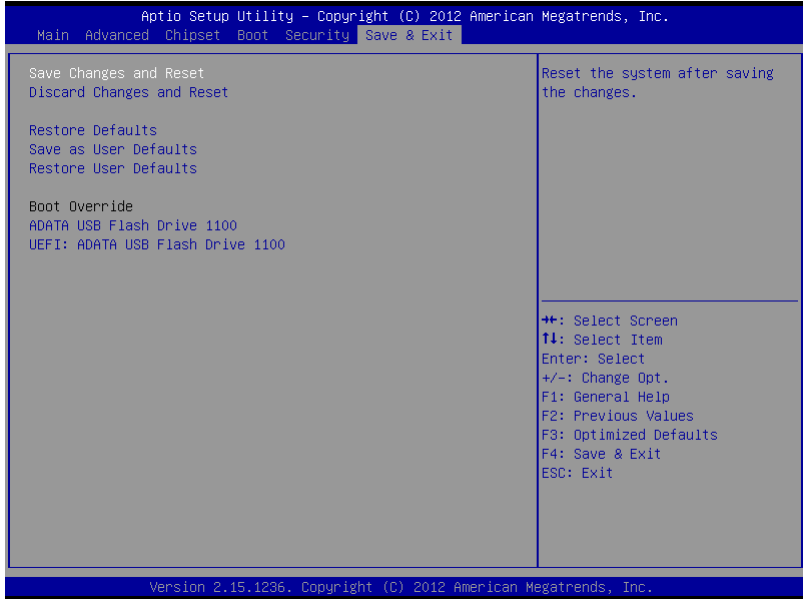
You can install a Supervisor password, and if you install a supervisor password, you can then install a user password. A user password does not provide access to many of the features in the Setup utility.

If you highlight these items and press Enter, a dialog box appears which lets you enter a password. You can enter no more than six letters or numbers. Press Enter after you have typed in the password. A second dialog box asks you to retype the password for confirmation. Press Enter after you have retyped it correctly. The password is required at boot time, or when the user enters the Setup utility.

Removing the Password

Highlight this item and type in the current password. At the next dialog box press Enter to disable password protection.

Setup submenu: Exit



Chapter

4

**Driver
Installation**

The EMB-QM87A comes with an AutoRun DVD-ROM that contains all drivers and utilities that can help you to install the driver automatically.

Insert the driver DVD, the driver DVD-title will auto start and show the installation guide. If not, please follow the sequence below to install the drivers.

Follow the sequence below to install the drivers:

- Step 1 – Install INF Driver
- Step 2 – Install VGA Driver
- Step 3 – Install USB3.0 Driver
- Step 4 – Install Audio Driver
- Step 5 – Install LAN Driver
- Step 6 – Install RAID & AHCI Driver
- Step 7 – Install ME Driver
- Step 8 – Install TPM Driver
- Step 9 – Install UART Driver (Optional)

Please read instructions below for further detailed installations.

4.1 Installation:

Insert the EMB-QM87A DVD-ROM into the DVD-ROM drive. And install the drivers from Step 1 to Step 9 in order.

Step 1 – Install Chipset Driver

1. Click on the **Step 1-INF** folder and double click on the ***infinst_autol.exe*** file
2. Follow the instructions that the window shows
3. The system will help you install the driver automatically

Step 2 – Install VGA Driver

1. Click on the **Step 2-VGA** folder and select the OS folder your system is
2. Double click on the **Setup.exe** file located in each OS folder
3. Follow the instructions that the window shows
4. The system will help you install the driver automatically

Step 3 – Install USB3.0 Driver

1. Click on the **Step 5-USB3.0** folder and double click on the **Setup.exe** file
2. Follow the instructions that the window shows
3. The system will help you install the driver automatically

Step 4 – Install Audio Driver

1. Click on the **Step 4- Audio** folder and select the OS folder your system is
2. Double click on the **.exe** located in each OS folder
3. Follow the instructions that the window shows
4. The system will help you install the driver automatically

Step 5 – Install LAN Driver

1. Click on the **Step 5-LAN** folder and select the folder of LAN chip the system adopted
2. Select the OS folder your system is and double click on the **.exe** file located in each OS folder
3. Follow the instructions that the window shows
4. The system will help you install the driver automatically

Step 6 – Install RAID & AHCI Driver

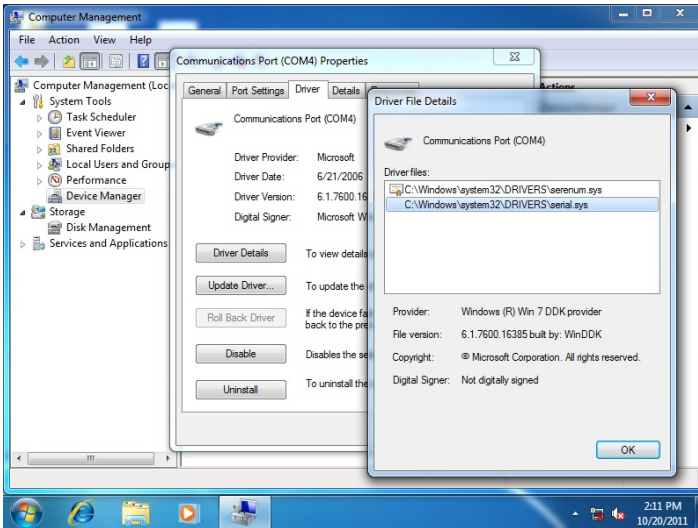
If you use AHCI or RAID mode to install your OS, you can run the **SetupRST.exe** located in the folder.

Step 7 – Install ME Driver

1. Click on the **Step 7-ME** folder and double click on the **setup.exe** file
2. Follow the instructions that the window shows
3. The system will help you install the driver automatically

Step 8 – Install TPM Driver

4. Click on the **STEP8-TPM** folder and select the OS folder your system is
5. Double click on the **Setup.exe** file
6. Follow the instructions that the window shows
7. The system will help you install the driver automatically



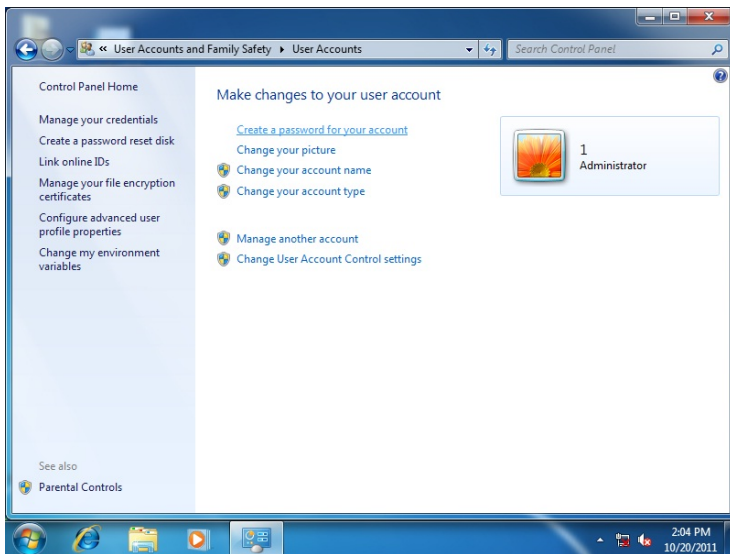
Step 9 – Install UART Driver (Optional)

For Windows® XP

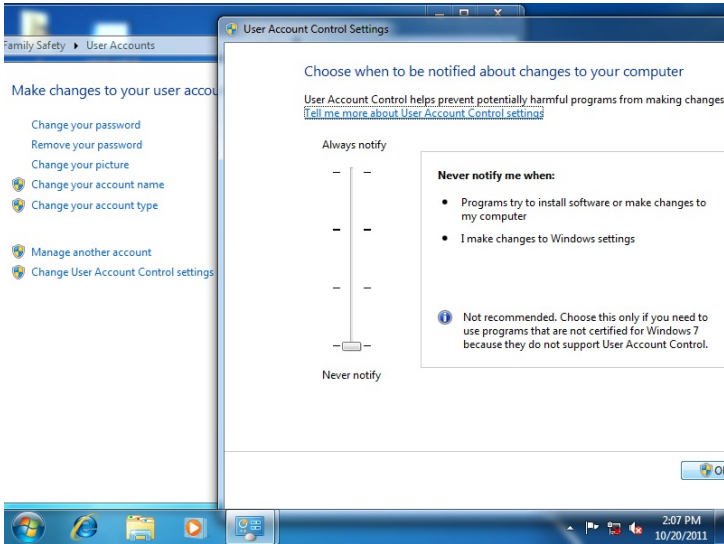
1. Click on the **STEP9-UART** folder and double click on **patch.bat** file
2. Follow the instructions that the window shows
3. The system will help you to install the driver automatically

For Windows® 7

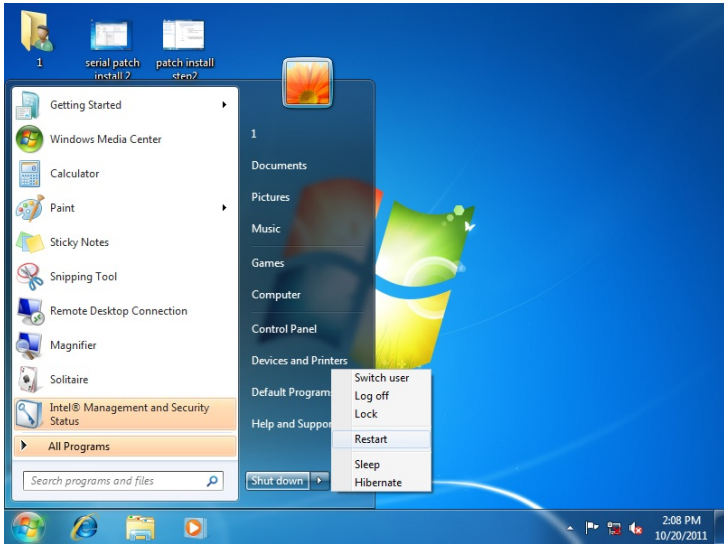
1. Create a password for Administrator account.



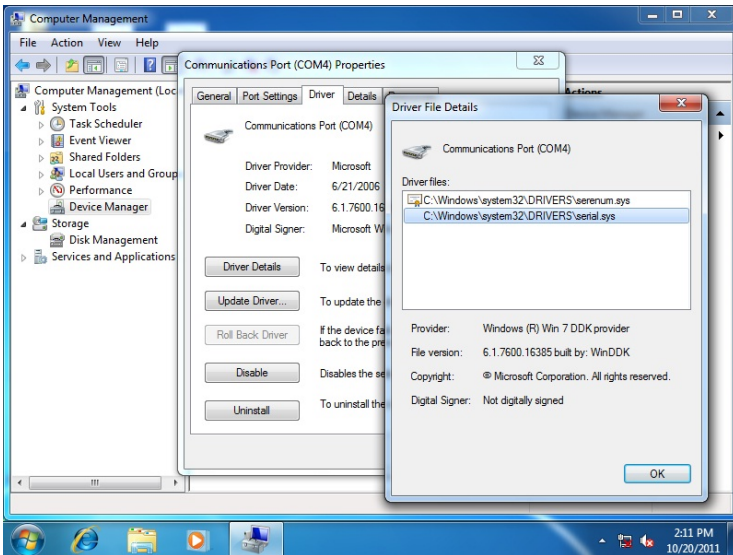
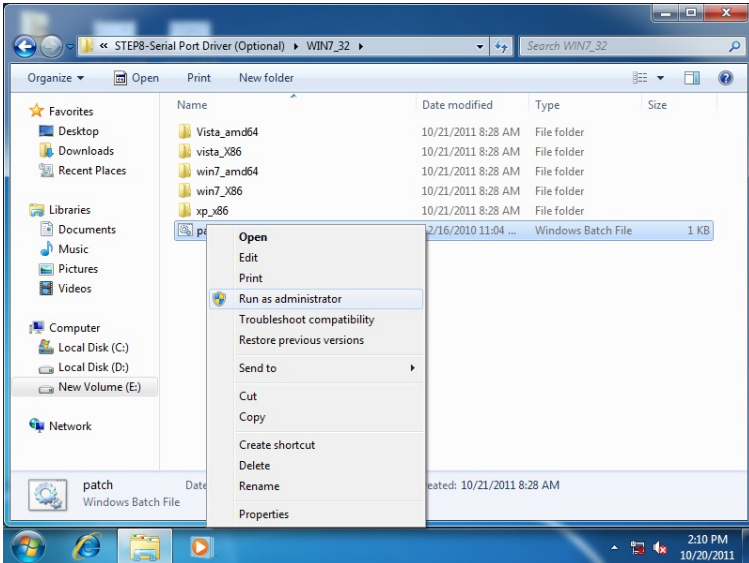
2. Change User Account Control Settings to [Never notify]



3. Reboot and Administrator login.

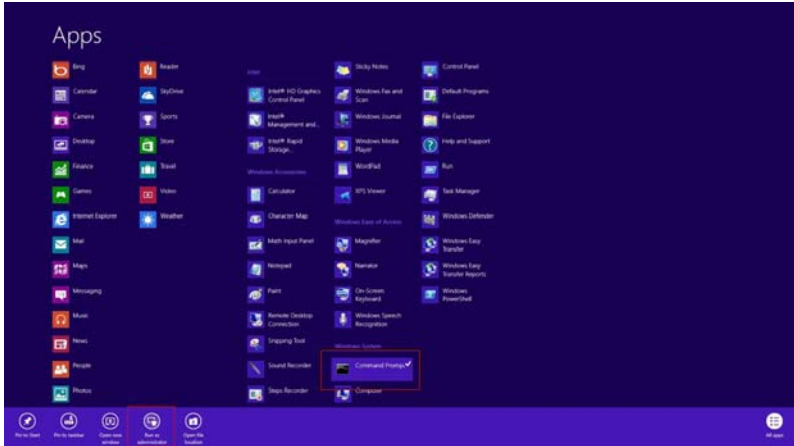


4. To run patch.bat with [Run as administrator].

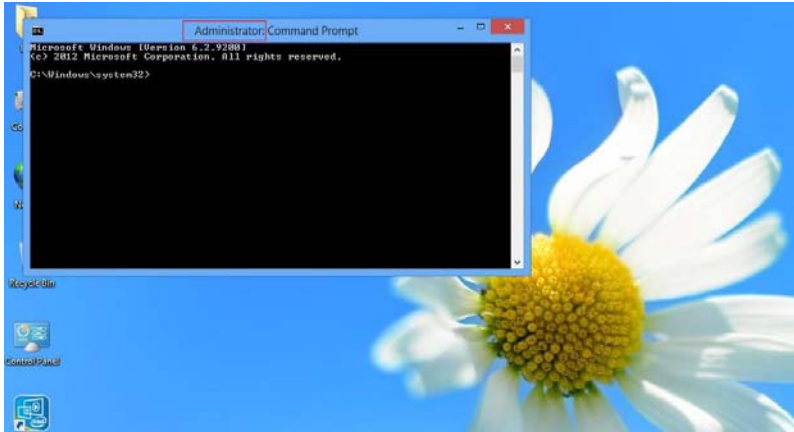


For Windows® 8

1. Right click [Command Prompt] and [run as administrator]



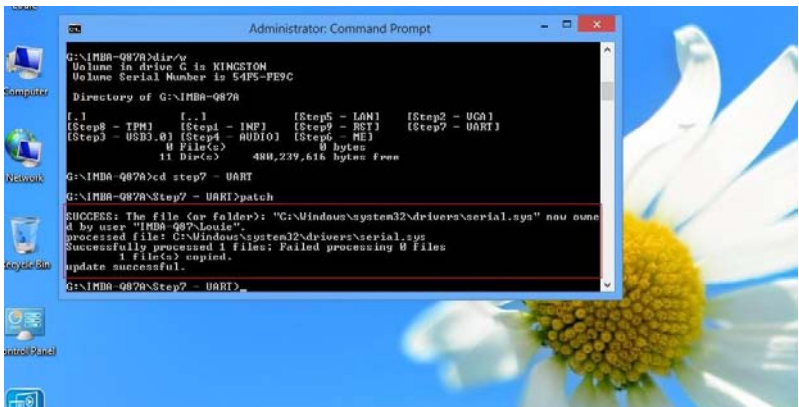
2. Run Command Prompt by administrator.



3. Run patch.bat in UART driver folder path.



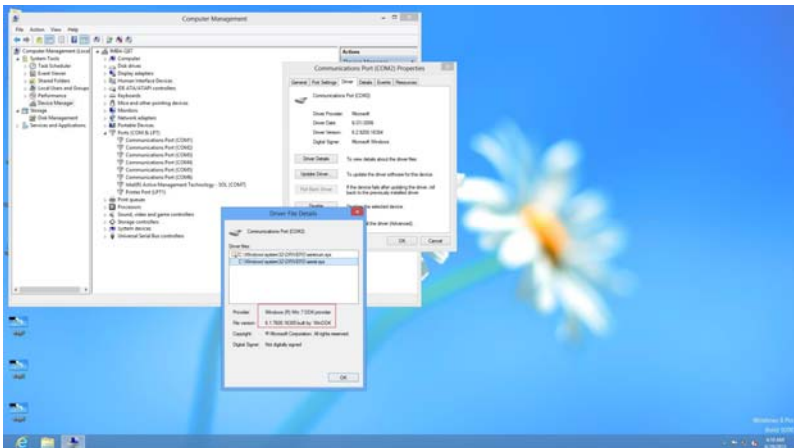
4. Update successful.



5. Restart.



6. Com port driver\serial.sys, provider will change to [Windows(R) Win7 DDK provider].



Appendix

A

Programming the Watchdog Timer

A.1 Watchdog Timer Initial Program

Table 1 : SuperIO relative register table

| | Default Value | Note |
|--------------|---------------------|--|
| Index | 0x2E (Note1) | SIO MB PnP Mode Index Register 0x2E or 0x4E |
| Data | 0x2F (Note2) | SIO MB PnP Mode Data Register 0x2F or 0x4F |

Table 2 : Watchdog relative register table

| | LDN | Register | BitNum | Value | Note |
|------------------------|----------------------|----------------------|-------------------|-------------------|--|
| Timer Counter | 0x07 (Note3) | 0xF6 (Note4) | | (Note24) | Time of watchdog timer (0~255) This register is byte access |
| Counting Unit | 0x07 (Note5) | 0xF5 (Note6) | 3 (Note7) | 0 (Note8) | Select time unit. 0: second 1: minute |
| Watchdog Enable | 0x07 (Note9) | 0xF5 (Note10) | 5 (Note11) | 1 (Note12) | 0: Disable 1: Enable |
| Timeout Status | 0x07 (Note13) | 0xF5 (Note14) | 6 (Note15) | 1 | 1: Clear timeout status |
| Output Mode | 0x07 (Note16) | 0xF5 (Note17) | 4 (Note18) | 1 (Note19) | Select WDTRST# output mode 0: level 1: pulse |
| WDTRST output | 0x07 (Note20) | 0xFA (Note21) | 0 (Note22) | 1 (Note23) | Enable/Disable time out output via WDTRST# 0: Disable 1: Enable |


```
*****
// SuperIO relative definition (Please reference to Table 1)
#define byte SIOIndex //This parameter is represented from Note1
#define byte SIOData //This parameter is represented from Note2
#define void IOWriteByte(byte IOPort, byte Value);
#define byte IOReadByte(byte IOPort);
// Watch Dog relative definition (Please reference to Table 2)
#define byte TimerLDN //This parameter is represented from Note3
#define byte TimerReg //This parameter is represented from Note4
#define byte TimerVal // This parameter is represented from Note24
#define byte UnitLDN //This parameter is represented from Note5
#define byte UnitReg //This parameter is represented from Note6
#define byte UnitBit //This parameter is represented from Note7
#define byte UnitVal //This parameter is represented from Note8
#define byte EnableLDN //This parameter is represented from Note9
#define byte EnableReg //This parameter is represented from Note10
#define byte EnableBit //This parameter is represented from Note11
#define byte EnableVal //This parameter is represented from Note12
#define byte StatusLDN // This parameter is represented from Note13
#define byte StatusReg // This parameter is represented from Note14
#define byte StatusBit // This parameter is represented from Note15
#define byte ModeLDN // This parameter is represented from Note16
#define byte ModeReg // This parameter is represented from Note17
#define byte ModeBit // This parameter is represented from Note18
#define byte ModeVal // This parameter is represented from Note19
#define byte WDRstLDN // This parameter is represented from Note20
#define byte WDRstReg // This parameter is represented from Note21
#define byte WDRstBit // This parameter is represented from Note22
#define byte WDRstVal // This parameter is represented from Note23
*****
```

```
*****
VOID Main() {
    // Procedure : AaeonWDTConfig
    // (byte)Timer : Time of WDT timer.(0x00~0xFF)
    // (boolean)Unit : Select time unit(0: second, 1: minute).
    AaeonWDTConfig();

    // Procedure : AaeonWDTEnable
    // This procedure will enable the WDT counting.
    AaeonWDTEnable();
}
*****
```

```

*****
// Procedure : AaeonWDTEnable
VOID AaeonWDTEnable (){
    WDTEnableDisable(EnableLDN, EnableReg, EnableBit, 1);
}

// Procedure : AaeonWDTConfig
VOID AaeonWDTConfig (){
    // Disable WDT counting
    WDTEnableDisable(EnableLDN, EnableReg, EnableBit, 0);
    // Clear Watchdog Timeout Status
    WDTClearTimeoutStatus();
    // WDT relative parameter setting
    WDTParameterSetting();
}

VOID WDTEnableDisable(byte LDN, byte Register, byte BitNum, byte Value){
    SIOBitSet(LDN, Register, BitNum, Value);
}

VOID WDTParameterSetting(){
    // Watchdog Timer counter setting
    SIOByteSet(TimerLDN, TimerReg, TimerVal);
    // WDT counting unit setting
    SIOBitSet(UnitLDN, UnitReg, UnitBit, UnitVal);
    // WDT output mode setting, level / pulse
    SIOBitSet(ModeLDN, ModeReg, ModeBit, ModeVal);
    // Watchdog timeout output via WDTRST#
    SIOBitSet(WDTRstLDN, WDTRstReg, WDTRstBit, WDTRstVal);
}

VOID WDTClearTimeoutStatus(){
    SIOBitSet(StatusLDN, StatusReg, StatusBit, 1);
}
*****

```

```

VOID SIOEnterMBPnPMode(){
    IOWriteByte(SIOIndex, 0x87);
    IOWriteByte(SIOIndex, 0x87);
}

VOID SIOExitMBPnPMode(){
    IOWriteByte(SIOIndex, 0xAA);
}

VOID SIOSelectLDN(byte LDN){
    IOWriteByte(SIOIndex, 0x07); // SIO LDN Register Offset = 0x07
    IOWriteByte(SIOData, LDN);
}

VOID SIOBitSet(byte LDN, byte Register, byte BitNum, byte Value){
    Byte TmpValue;

    SIOEnterMBPnPMode();
    SIOSelectLDN(byte LDN);
    IOWriteByte(SIOIndex, Register);
    TmpValue = IOReadByte(SIOData);
    TmpValue &= ~(1 << BitNum);
    TmpValue |= (Value << BitNum);
    IOWriteByte(SIOData, TmpValue);
    SIOExitMBPnPMode();
}

VOID SIOByteSet(byte LDN, byte Register, byte Value){
    SIOEnterMBPnPMode();
    SIOSelectLDN(LDN);
    IOWriteByte(SIOIndex, Register);
    IOWriteByte(SIOData, Value);
    SIOExitMBPnPMode();
}

```

Appendix

B

I/O Information

B.1 I/O Address Map

| Input/output (IO) | |
|-----------------------|-----------------------------------|
| [00000000 - 0000001F] | Direct memory access controller |
| [00000000 - 00000CF7] | PCI bus |
| [00000010 - 0000001F] | Motherboard resources |
| [00000020 - 00000021] | Programmable interrupt controller |
| [00000022 - 0000003F] | Motherboard resources |
| [00000024 - 00000025] | Programmable interrupt controller |
| [00000028 - 00000029] | Programmable interrupt controller |
| [0000002C - 0000002D] | Programmable interrupt controller |
| [0000002E - 0000002F] | Motherboard resources |
| [00000030 - 00000031] | Programmable interrupt controller |
| [00000034 - 00000035] | Programmable interrupt controller |
| [00000038 - 00000039] | Programmable interrupt controller |
| [0000003C - 0000003D] | Programmable interrupt controller |
| [00000040 - 00000043] | System timer |
| [00000044 - 0000005F] | Motherboard resources |
| [0000004E - 0000004F] | Motherboard resources |
| [00000050 - 00000053] | System timer |
| [00000060 - 00000060] | Standard PS/2 Keyboard |
| [00000061 - 00000061] | Motherboard resources |
| [00000063 - 00000063] | Motherboard resources |
| [00000064 - 00000064] | Standard PS/2 Keyboard |
| [00000065 - 00000065] | Motherboard resources |
| [00000067 - 00000067] | Motherboard resources |
| [00000070 - 00000070] | Motherboard resources |
| [00000070 - 00000077] | System CMOS/real time clock |
| [00000072 - 0000007F] | Motherboard resources |
| [00000080 - 00000080] | Motherboard resources |
| [00000080 - 00000080] | Motherboard resources |
| [00000081 - 00000091] | Direct memory access controller |
| [00000084 - 00000086] | Motherboard resources |
| [00000088 - 00000088] | Motherboard resources |
| [0000008C - 0000008E] | Motherboard resources |
| [00000090 - 0000009F] | Motherboard resources |
| [00000092 - 00000092] | Motherboard resources |
| [00000093 - 0000009F] | Direct memory access controller |
| [000000A0 - 000000A1] | Programmable interrupt controller |
| [000000A2 - 000000BF] | Motherboard resources |
| [000000A4 - 000000A5] | Programmable interrupt controller |
| [000000A8 - 000000A9] | Programmable interrupt controller |
| [000000AC - 000000AD] | Programmable interrupt controller |
| [000000B0 - 000000B1] | Programmable interrupt controller |
| [000000B2 - 000000B3] | Motherboard resources |
| [000000B4 - 000000B5] | Programmable interrupt controller |













































| | | |
|--|-------------------------|---|
| | [000000B8 - 000000B9] | Programmable interrupt controller |
| | [000000BC - 000000BD] | Programmable interrupt controller |
| | [000000C0 - 000000DF] | Direct memory access controller |
| | [000000E0 - 000000EF] | Motherboard resources |
| | [000000F0 - 000000F0] | Numeric data processor |
| | [00000290 - 0000029F] | Motherboard resources |
| | [000002C0 - 000002C7] | Communications Port (COM6) |
| | [000002D0 - 000002D7] | Communications Port (COM5) |
| | [000002E8 - 000002EF] | Communications Port (COM4) |
| | [000002F8 - 000002FF] | Communications Port (COM2) |
| | [000003B0 - 000003BB] | Intel(R) HD Graphics 4600 |
| | [000003C0 - 000003DF] | Intel(R) HD Graphics 4600 |
| | [000003E8 - 000003EF] | Communications Port (COM3) |
| | [000003F8 - 000003FF] | Communications Port (COM1) |
| | [000004D0 - 000004D1] | Motherboard resources |
| | [000004D0 - 000004D1] | Programmable interrupt controller |
| | [00000680 - 0000069F] | Motherboard resources |
| | [00000A00 - 00000A0F] | Motherboard resources |
| | [00000A10 - 00000A1F] | Motherboard resources |
| | [00000D00 - 0000FFFF] | PCI bus |
| | [0000164E - 0000164F] | Motherboard resources |
| | [00001800 - 000018FE] | Motherboard resources |
| | [00001854 - 00001857] | Motherboard resources |
| | [00001C00 - 00001CFE] | Motherboard resources |
| | [00001D00 - 00001DFE] | Motherboard resources |
| | [00001E00 - 00001EFE] | Motherboard resources |
| | [00001F00 - 00001FFE] | Motherboard resources |
| | [0000E000 - 0000E0FF] | Realtek PCIe GBE Family Controller |
| | [0000E000 - 0000EFFF] | Intel(R) 8 Series/C220 Series PCI Express Root Port #4 - 8C16 |
| | [0000F000 - 0000F03F] | Intel(R) HD Graphics 4600 |
| | [0000F040 - 0000F05F] | Intel(R) 8 Series/C220 Series SMBus Controller - 8C22 |
| | [0000F080 - 0000F08F] | Intel(R) 8 Series 4 port Serial ATA Storage Controller - 8C01 |
| | [0000F090 - 0000F09F] | Intel(R) 8 Series 4 port Serial ATA Storage Controller - 8C01 |
| | [0000F0A0 - 0000F0A3] | Intel(R) 8 Series 4 port Serial ATA Storage Controller - 8C01 |
| | [0000F0B0 - 0000F0B7] | Intel(R) 8 Series 4 port Serial ATA Storage Controller - 8C01 |
| | [0000F0C0 - 0000F0C3] | Intel(R) 8 Series 4 port Serial ATA Storage Controller - 8C01 |
| | [0000F0D0 - 0000F0DF] | Intel(R) 8 Series 4 port Serial ATA Storage Controller - 8C01 |
| | [0000F0E0 - 0000F0E7] | Intel(R) Active Management Technology - SOL (COM7) |
| | [0000FFFF - 0000FFFF] | Motherboard resources |
| | [0000FFFF - 0000FFFF] | Motherboard resources |
| | [0000FFFF - 0000FFFF] | Motherboard resources |
| | Interrupt request (IRQ) | |
| | (ISA) 0x00000000 (00) | System timer |
| | (ISA) 0x00000001 (01) | Standard PS/2 Keyboard |













































B.2 Memory Address Map





| Address Range | Device Name |
|------------------------|---|
| [000A0000 - 000BFFFF] | Intel(R) HD Graphics 4600 |
| [000A0000 - 000BFFFF] | PCI bus |
| [000D0000 - 000D3FFF] | PCI bus |
| [000D4000 - 000D7FFF] | PCI bus |
| [000D8000 - 000DBFFF] | PCI bus |
| [000DC000 - 000DFFFF] | PCI bus |
| [000E0000 - 000E3FFF] | PCI bus |
| [000E4000 - 000E7FFF] | PCI bus |
| [7D200000 - FEFFFFFF] | PCI bus |
| [E0000000 - EFFFFFFF] | Intel(R) HD Graphics 4600 |
| [F0000000 - F003FFF] | Realtek PCIe GBE Family Controller |
| [F0000000 - F00FFFF] | Intel(R) 8 Series/C220 Series PCI Express Root Port #4 - 8C16 |
| [F7800000 - F7BFFFFF] | Intel(R) HD Graphics 4600 |
| [F7C00000 - F7C0FFFF] | Realtek PCIe GBE Family Controller |
| [F7C00000 - F7CFFFF] | Intel(R) 8 Series/C220 Series PCI Express Root Port #4 - 8C16 |
| [F7D00000 - F7D1FFFF] | Intel(R) Ethernet Connection I217-LM |
| [F7D20000 - F7D2FFFF] | Intel(R) USB 3.0 eXtensible Host Controller |
| [F7D30000 - F7D33FFF] | High Definition Audio Controller |
| [F7D39000 - F7D390FF] | Intel(R) 8 Series/C220 Series SMBus Controller - 8C22 |
| [F7D3A000 - F7D3A3FF] | Intel(R) 8 Series/C220 Series USB EHCI #1 - 8C26 |
| [F7D3B000 - F7D3B3FF] | Intel(R) 8 Series/C220 Series USB EHCI #2 - 8C2D |
| [F7D3C000 - F7D3CFFF] | Intel(R) Ethernet Connection I217-LM |
| [F7D3D000 - F7D3DFFF] | Intel(R) Active Management Technology - SOL (COM7) |
| [F7D3F000 - F7D3F00F] | Intel(R) Management Engine Interface |
| [F7DF0000 - F7DFFFFF] | Motherboard resources |
| [F7FE0000 - F7FEFFFF] | Motherboard resources |
| [F8000000 - FBFFFFFF] | Motherboard resources |
| [FED00000 - FED003FF] | High precision event timer |
| [FED10000 - FED17FFF] | Motherboard resources |
| [FED18000 - FED18FFF] | Motherboard resources |
| [FED19000 - FED19FFF] | Motherboard resources |
| [FED1C000 - FED1FFFF] | Motherboard resources |
| [FED20000 - FED3FFFF] | Motherboard resources |
| [FED40000 - FED44FFF] | System board |
| [FED45000 - FED8FFFF] | Motherboard resources |
| [FED90000 - FED93FFF] | Motherboard resources |
| [FEE00000 - FEEFFFFFF] | Motherboard resources |
| [FF000000 - FFFFFFFF] | Intel(R) 82802 Firmware Hub Device |
| [FF000000 - FFFFFFFF] | Motherboard resources |

B.3 IRQ Mapping Chart

| Interrupt request (IRQ) | |
|-------------------------|---------------------------------|
| (ISA) 0x00000000 (00) | System timer |
| (ISA) 0x00000001 (01) | Standard PS/2 Keyboard |
| (ISA) 0x00000003 (03) | Communications Port (COM2) |
| (ISA) 0x00000004 (04) | Communications Port (COM1) |
| (ISA) 0x00000008 (08) | System CMOS/real time clock |
| (ISA) 0x0000000A (10) | Communications Port (COM3) |
| (ISA) 0x0000000A (10) | Communications Port (COM4) |
| (ISA) 0x0000000A (10) | Communications Port (COM5) |
| (ISA) 0x0000000A (10) | Communications Port (COM6) |
| (ISA) 0x0000000C (12) | Microsoft PS/2 Mouse |
| (ISA) 0x0000000D (13) | Numeric data processor |
| (ISA) 0x00000051 (81) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000052 (82) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000053 (83) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000054 (84) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000055 (85) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000056 (86) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000057 (87) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000058 (88) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000059 (89) | Microsoft ACPI-Compliant System |
| (ISA) 0x0000005A (90) | Microsoft ACPI-Compliant System |
| (ISA) 0x0000005B (91) | Microsoft ACPI-Compliant System |
| (ISA) 0x0000005C (92) | Microsoft ACPI-Compliant System |
| (ISA) 0x0000005D (93) | Microsoft ACPI-Compliant System |
| (ISA) 0x0000005E (94) | Microsoft ACPI-Compliant System |
| (ISA) 0x0000005F (95) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000060 (96) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000061 (97) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000062 (98) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000063 (99) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000064 (100) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000065 (101) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000066 (102) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000067 (103) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000068 (104) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000069 (105) | Microsoft ACPI-Compliant System |
| (ISA) 0x0000006A (106) | Microsoft ACPI-Compliant System |
| (ISA) 0x0000006B (107) | Microsoft ACPI-Compliant System |
| (ISA) 0x0000006C (108) | Microsoft ACPI-Compliant System |
| (ISA) 0x0000006D (109) | Microsoft ACPI-Compliant System |
| (ISA) 0x0000006E (110) | Microsoft ACPI-Compliant System |
| (ISA) 0x0000006F (111) | Microsoft ACPI-Compliant System |
| (ISA) 0x00000070 (112) | Microsoft ACPI-Compliant System |

| | |
|--|---------------------------------|
|  (ISA) 0x00000071 (113) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000072 (114) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000073 (115) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000074 (116) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000075 (117) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000076 (118) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000077 (119) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000078 (120) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000079 (121) | Microsoft ACPI-Compliant System |
|  (ISA) 0x0000007A (122) | Microsoft ACPI-Compliant System |
|  (ISA) 0x0000007B (123) | Microsoft ACPI-Compliant System |
|  (ISA) 0x0000007C (124) | Microsoft ACPI-Compliant System |
|  (ISA) 0x0000007D (125) | Microsoft ACPI-Compliant System |
|  (ISA) 0x0000007E (126) | Microsoft ACPI-Compliant System |
|  (ISA) 0x0000007F (127) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000080 (128) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000081 (129) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000082 (130) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000083 (131) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000084 (132) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000085 (133) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000086 (134) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000087 (135) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000088 (136) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000089 (137) | Microsoft ACPI-Compliant System |
|  (ISA) 0x0000008A (138) | Microsoft ACPI-Compliant System |
|  (ISA) 0x0000008B (139) | Microsoft ACPI-Compliant System |
|  (ISA) 0x0000008C (140) | Microsoft ACPI-Compliant System |
|  (ISA) 0x0000008D (141) | Microsoft ACPI-Compliant System |
|  (ISA) 0x0000008E (142) | Microsoft ACPI-Compliant System |
|  (ISA) 0x0000008F (143) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000090 (144) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000091 (145) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000092 (146) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000093 (147) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000094 (148) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000095 (149) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000096 (150) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000097 (151) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000098 (152) | Microsoft ACPI-Compliant System |
|  (ISA) 0x00000099 (153) | Microsoft ACPI-Compliant System |
|  (ISA) 0x0000009A (154) | Microsoft ACPI-Compliant System |
|  (ISA) 0x0000009B (155) | Microsoft ACPI-Compliant System |
|  (ISA) 0x0000009C (156) | Microsoft ACPI-Compliant System |

| | | |
|---|-------------------------|---|
|  | (ISA) 0x0000009D (157) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x0000009E (158) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x0000009F (159) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000A0 (160) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000A1 (161) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000A2 (162) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000A3 (163) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000A4 (164) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000A5 (165) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000A6 (166) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000A7 (167) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000A8 (168) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000A9 (169) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000AA (170) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000AB (171) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000AC (172) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000AD (173) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000AE (174) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000AF (175) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000B0 (176) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000B1 (177) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000B2 (178) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000B3 (179) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000B4 (180) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000B5 (181) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000B6 (182) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000B7 (183) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000B8 (184) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000B9 (185) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000BA (186) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000BB (187) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000BC (188) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000BD (189) | Microsoft ACPI-Compliant System |
|  | (ISA) 0x000000BE (190) | Microsoft ACPI-Compliant System |
|  | (PCI) 0x00000005 (05) | Intel(R) 8 Series/C220 Series SMBus Controller - 8C22 |
|  | (PCI) 0x00000010 (16) | Intel(R) 8 Series/C220 Series USB EHCI #2 - 8C2D |
|  | (PCI) 0x00000010 (16) | Intel(R) Management Engine Interface |
|  | (PCI) 0x00000013 (19) | Intel(R) 8 Series 4 port Serial ATA Storage Controller - 8C01 |
|  | (PCI) 0x00000013 (19) | Intel(R) Active Management Technology - SOL (COM7) |
|  | (PCI) 0x00000016 (22) | High Definition Audio Controller |
|  | (PCI) 0x00000017 (23) | Intel(R) 8 Series/C220 Series USB EHCI #1 - 8C26 |
|  | (PCI) 0xFFFFFFFF8 (-8) | Realtek PCIe GBE Family Controller |
|  | (PCI) 0xFFFFFFFF9 (-7) | Intel(R) Ethernet Connection I217-LM |
|  | (PCI) 0xFFFFFFFFFA (-6) | Intel(R) USB 3.0 eXtensible Host Controller |

-  (PCI) 0xFFFFF7B (-5) Intel(R) HD Graphics 4600
-  (PCI) 0xFFFFF7C (-4) Intel(R) 8 Series/C220 Series PCI Express Root Port #4 - 8C16
-  (PCI) 0xFFFFF7D (-3) Intel(R) 8 Series/C220 Series PCI Express Root Port #1 - 8C10
-  (PCI) 0xFFFFF7E (-2) Intel(R) Xeon(R) processor E3-1200 v3/4th Gen Core processor PCI Express x16 Controller - 0C01

B.4 DMA Channel Assignments

- Direct memory access (DMA)
 - 4 Direct memory access controller

Appendix

C

Mating Connector

C.1 List of Mating Connectors and Cables

The table notes mating connectors and available cables.

| Connector Label | Function | Mating Connector | | Available Cable | Cable P/N |
|-----------------|----------------------------|------------------|---------------------|------------------|------------|
| | | Vendor | Model No. | | |
| CN22 | +12V AUX power connector | PINREX | 740-81-08TVY8 | | |
| CN6, CN9 | 4 Pin FAN connector | PINREX | 744-81-04TG20 | | |
| COM2 ~ COM6 | COM port connector | PINREX | 522-90-10GBE0 | | |
| DIO1 | Digital I/O Pin Header | PINREX | 222-97-05GBE1 | | |
| FP1 | Front panel pin header | Astron | 27-06061-205-1G-1-R | | |
| CN21 | LVDS panel power connector | PINREX | 721-81-05TW00 | | |
| LVDS1 | LVDS panel connector | PINREX | 712-76-30GWE0 | | |
| PCIE1 | PCI-E X16 slot | FOXCON N | 2EG08217-D2D-DF | | |
| CN3, CN10 | Serial ATA power Connector | HO-BASE | P201-04 | SATA power cable | 1702151201 |

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| | | | | | |
|--------------------------------------|-----------------------|--------|---------------|---------------|----------------|
| SATA1, SATA2, SATA5, SATA6. | SATA III Connector | PINREX | 770-83-07SV29 | SATA CABLE | 17090708 00 |
| SATA3, SATA4. | SATA II Connector | PINREX | 770-83-07SG29 | SATA CABLE | 17090708 00 |
| USB1, USB2 | USB2.0 pin header | PINREX | 222-97-05GBE1 | | |
| CN14 | USB3.0 pin header | PINREX | 52X-40-20GV52 | | |

Note: The AAEON Cable P/N with “ * ” sign is for WiTAS series products.

Appendix

D

Electrical Specifications for I/O Ports

D.1 DIO Programming

EMB-QM87A utilizes FINTEK 81866 chipset as its Digital I/O controller.

Below are the procedures to complete its configuration and the AAeon initial watchdog timer program is also attached based on which you can develop customized program to fit your application. There are three steps to complete the configuration setup: (1) Enter the MB PnP Mode; (2) Modify the data of configuration registers; (3) Exit the MB PnP Mode. Undesired result may occur if the MB PnP Mode is not exited normally. (These three steps are the same as programming WDT)

D.2 Digital I/O Register

Table 1 : SuperIO relative register table

| | Default Value | Note |
|--------------|---------------------|--|
| Index | 0x2E (Note1) | SIO MB PnP Mode Index Register 0x2E or 0x4E |
| Data | 0x2F (Note2) | SIO MB PnP Mode Data Register 0x2F or 0x4F |

Table 2 : Digital Input relative register table

| | LDN | Register | BitNum | Value | Note |
|-------------------------|----------------------|----------------------|-------------------|-------|--------|
| DIO-1 Pin Status | 0x06 (Note3) | 0x82 (Note4) | 0 (Note5) | | GPIO70 |
| DIO-2 Pin Status | 0x06 (Note6) | 0x82 (Note7) | 1 (Note8) | | GPIO71 |
| DIO-3 Pin Status | 0x06 (Note9) | 0x82 (Note10) | 2 (Note11) | | GPIO72 |
| DIO-4 Pin Status | 0x06 (Note12) | 0x82 (Note13) | 3 (Note14) | | GPIO73 |
| DIO-5 Pin Status | 0x06 (Note15) | 0x82 (Note16) | 4 (Note17) | | GPIO74 |
| DIO-6 Pin Status | 0x06 (Note18) | 0x82 (Note19) | 5 (Note20) | | GPIO75 |
| DIO-7 Pin Status | 0x06 (Note21) | 0x82 (Note22) | 6 (Note23) | | GPIO76 |
| DIO-8 Pin Status | 0x06 (Note24) | 0x82 (Note25) | 7 (Note26) | | GPIO77 |

Table 3 : Digital Output relative register table

| | LDN | Register | BitNum | Value | Note |
|--------------------------|----------------------|----------------------|-------------------|----------|--------|
| DIO-1 Output Data | 0x06 (Note27) | 0x88 (Note28) | 0 (Note29) | (Note30) | GPIO70 |
| DIO-2 Output Data | 0x06 (Note31) | 0x88 (Note32) | 1 (Note33) | (Note34) | GPIO71 |
| DIO-3 Output Data | 0x06 (Note35) | 0x88 (Note36) | 2 (Note37) | (Note38) | GPIO72 |
| DIO-4 Output Data | 0x06 (Note39) | 0x88 (Note40) | 3 (Note41) | (Note42) | GPIO73 |
| DIO-5 Output Data | 0x06 (Note43) | 0x88 (Note44) | 4 (Note45) | (Note46) | GPIO74 |
| DIO-6 Output Data | 0x06 (Note47) | 0x88 (Note48) | 5 (Note49) | (Note50) | GPIO75 |
| DIO-7 Output Data | 0x06 (Note51) | 0x88 (Note52) | 6 (Note53) | (Note54) | GPIO76 |
| DIO-8 Output Data | 0x06 (Note55) | 0x88 (Note56) | 7 (Note57) | (Note58) | GPIO77 |

D.3 Digital I/O Sample Program

```

*****
// SuperIO relative definition (Please reference to Table 1)
#define byte SIOIndex //This parameter is represented from Note1
#define byte SIOData //This parameter is represented from Note2
#define void IOWriteByte(byte IOPort, byte Value);
#define byte IOReadByte(byte IOPort);
// Digital Input Status relative definition (Please reference to Table 2)
#define byte DInput1LDN // This parameter is represented from Note3
#define byte DInput1Reg // This parameter is represented from Note4
#define byte DInput1Bit // This parameter is represented from Note5
#define byte DInput2LDN // This parameter is represented from Note6
#define byte DInput2Reg // This parameter is represented from Note7
#define byte DInput2Bit // This parameter is represented from Note8
#define byte DInput3LDN // This parameter is represented from Note9
#define byte DInput3Reg // This parameter is represented from Note10
#define byte DInput3Bit // This parameter is represented from Note11
#define byte DInput4LDN // This parameter is represented from Note12
#define byte DInput4Reg // This parameter is represented from Note13
#define byte DInput4Bit // This parameter is represented from Note14
#define byte DInput5LDN // This parameter is represented from Note15
#define byte DInput5Reg // This parameter is represented from Note16
#define byte DInput5Bit // This parameter is represented from Note17
#define byte DInput6LDN // This parameter is represented from Note18
#define byte DInput6Reg // This parameter is represented from Note19
#define byte DInput6Bit // This parameter is represented from Note20
#define byte DInput7LDN // This parameter is represented from Note21
#define byte DInput7Reg // This parameter is represented from Note22
#define byte DInput7Bit // This parameter is represented from Note23
#define byte DInput8LDN // This parameter is represented from Note24
#define byte DInput8Reg // This parameter is represented from Note25
#define byte DInput8Bit // This parameter is represented from Note26
*****

```

```

*****
// Digital Output control relative definition (Please reference to Table 3)
#define byte DOutput1LDN // This parameter is represented from Note27
#define byte DOutput1Reg // This parameter is represented from Note28
#define byte DOutput1Bit // This parameter is represented from Note29
#define byte DOutput1Val // This parameter is represented from Note30
#define byte DOutput2LDN // This parameter is represented from Note31
#define byte DOutput2Reg // This parameter is represented from Note32
#define byte DOutput2Bit // This parameter is represented from Note33
#define byte DOutput2Val // This parameter is represented from Note34
#define byte DOutput3LDN // This parameter is represented from Note35
#define byte DOutput3Reg // This parameter is represented from Note36
#define byte DOutput3Bit // This parameter is represented from Note37
#define byte DOutput3Val // This parameter is represented from Note38
#define byte DOutput4LDN // This parameter is represented from Note39
#define byte DOutput4Reg // This parameter is represented from Note40
#define byte DOutput4Bit // This parameter is represented from Note41
#define byte DOutput4Val // This parameter is represented from Note42
#define byte DOutput5LDN // This parameter is represented from Note43
#define byte DOutput5Reg // This parameter is represented from Note44
#define byte DOutput5Bit // This parameter is represented from Note45
#define byte DOutput5Val // This parameter is represented from Note46
#define byte DOutput6LDN // This parameter is represented from Note47
#define byte DOutput6Reg // This parameter is represented from Note48
#define byte DOutput6Bit // This parameter is represented from Note49
#define byte DOutput6Val // This parameter is represented from Note50
#define byte DOutput7LDN // This parameter is represented from Note51
#define byte DOutput7Reg // This parameter is represented from Note52
#define byte DOutput7Bit // This parameter is represented from Note53
#define byte DOutput7Val // This parameter is represented from Note54
#define byte DOutput8LDN // This parameter is represented from Note55
#define byte DOutput8Reg // This parameter is represented from Note56
#define byte DOutput8Bit // This parameter is represented from Note57
#define byte DOutput8Val // This parameter is represented from Note58
*****

```

```
*****
VOID Main() {
    Boolean PinStatus ;

    // Procedure : AaeonReadPinStatus
    // Input :
    //     Example, Read Digital I/O Pin 3 status
    // Output :
    //     InputStatus :
    //         0: Digital I/O Pin level is low
    //         1: Digital I/O Pin level is High
    PinStatus = AaeonReadPinStatus(DInput3LDN, DInput3Reg, DInput3Bit);

    // Procedure : AaeonSetOutputLevel
    // Input :
    //     Example, Set Digital I/O Pin 6 level
    AaeonSetOutputLevel(DOutput6LDN, DOutput6Reg, DOutput6Bit, DOutput6Val);
}
*****
```

```
*****  
Boolean AaeonReadPinStatus(byte LDN, byte Register, byte BitNum){  
    Boolean PinStatus ;  
  
    PinStatus = SIOBitRead(LDN, Register, BitNum);  
    Return PinStatus ;  
}  
VOID AaeonSetOutputLevel(byte LDN, byte Register, byte BitNum, byte Value){  
    ConfigToOutputMode(LDN, Register, BitNum);  
    SIOBitSet(LDN, Register, BitNum, Value);  
}  
*****
```

```

VOID SIOEnterMBPnPMode(){
    IOWriteByte(SIOIndex, 0x87);
    IOWriteByte(SIOIndex, 0x87);
}

VOID SIOExitMBPnPMode(){
    IOWriteByte(SIOIndex, 0xAA);
}

VOID SIOSelectLDN(byte LDN){
    IOWriteByte(SIOIndex, 0x07); // SIO LDN Register Offset = 0x07
    IOWriteByte(SIOData, LDN);
}

VOID SIOBitSet(byte LDN, byte Register, byte BitNum, byte Value){
    Byte TmpValue;

    SIOEnterMBPnPMode();
    SIOSelectLDN(byte LDN);
    IOWriteByte(SIOIndex, Register);
    TmpValue = IOReadByte(SIOData);
    TmpValue &= ~(1 << BitNum);
    TmpValue |= (Value << BitNum);
    IOWriteByte(SIOData, TmpValue);
    SIOExitMBPnPMode();
}

VOID SIOByteSet(byte LDN, byte Register, byte Value){
    SIOEnterMBPnPMode();
    SIOSelectLDN(LDN);
    IOWriteByte(SIOIndex, Register);
    IOWriteByte(SIOData, Value);
    SIOExitMBPnPMode();
}

```

```

Boolean  SIOBitRead(byte LDN, byte Register, byte BitNum){
    Byte TmpValue;

    SIOEnterMBPnPMode();
    SIOSelectLDN(LDN);
    IOWriteByte(SIOIndex, Register);
    TmpValue = IOReadByte(SIOData);
    TmpValue &= (1 << BitNum);
    SIOExitMBPnPMode();
    If(TmpValue == 0)
        Return 0;
    Return 1;
}
VOID  ConfigToOutputMode(byte LDN, byte Register, byte BitNum){
    Byte TmpValue, OutputEnableReg;

    OutputEnableReg = Register-1;
    SIOEnterMBPnPMode();
    SIOSelectLDN(LDN);
    IOWriteByte(SIOIndex, OutputEnableReg);
    TmpValue = IOReadByte(SIOData);
    TmpValue |= (1 << BitNum);
    IOWriteByte(SIOData, OutputEnableReg);
    SIOExitMBPnPMode();
}

```
