

**EMB-Q87A**

**Industrial Motherboard**

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# Contents

## Chapter 1: Product overview

1.1	Package contents.....	1-1
1.2	Features .....	1-1
1.3	Specifications.....	1-2

## Chapter 2: Motherboard information

2.1	Before you proceed .....	2-1
2.2	Motherboard layout.....	2-2
2.3	Screw size.....	2-4
2.3.1	Component side .....	2-4
2.3.2	Solder side .....	2-5
2.4	Central Processing Unit (CPU) .....	2-6
2.4.1	Installing the CPU .....	2-7
2.4.2	CPU heatsink and fan assembly installation.....	2-8
2.5	System memory .....	2-11
2.5.1	Installing a DIMM .....	2-11
2.6	Jumpers .....	2-12
2.7	Onboard LEDs .....	2-15
2.8	Connectors .....	2-16
2.8.1	Rear panel connectors.....	2-16
2.8.2	Internal connectors .....	2-18
2.9	Power Supply Considerations .....	2-26

## Chapter 3: BIOS setup

3.1	BIOS setup program .....	3-1
3.1.1	BIOS menu screen.....	3-2
3.1.2	Menu bar .....	3-2
3.2	Main menu .....	3-3
3.2.1	System Time [xx:xx:xx] .....	3-3
3.2.2	System Date [Day xx/xx/xxxx].....	3-3
3.3	Advanced menu .....	3-4
3.3.1	S5 RTC Wake Settings .....	3-4
3.3.2	Dynamic Digital IO .....	3-4
3.3.3	ACPI Settings.....	3-5
3.3.4	Trusted Computing .....	3-5

3.3.5	CPU Configuration .....	3-5
3.3.6	SATA Configuration .....	3-6
3.3.7	PCH-FW Configuration .....	3-6
3.3.8	AMT Configuration .....	3-6
3.3.9	USB Configuration .....	3-7
3.3.10	NCT6791D Super IO Configuration .....	3-7
3.3.11	NCT6791D HW Monitor .....	3-7
<b>3.4</b>	<b>Chipset .....</b>	<b>3-8</b>
3.4.1	System Agent (SA) Configuration .....	3-8
3.4.2	PCH-IO Configuration .....	3-9
<b>3.5</b>	<b>Boot menu .....</b>	<b>3-10</b>
3.5.1	Boot Configuration .....	3-10
<b>3.6</b>	<b>Security menu .....</b>	<b>3-10</b>
<b>3.7</b>	<b>Save &amp; Exit menu .....</b>	<b>3-11</b>
 <b>Appendix</b>		
	<b>Notices .....</b>	<b>A-1</b>

# Chapter 1

## Product overview

### 1.1 Package contents

Check your industrial motherboard package for the following items.

- ☒ 1 x Industrial Motherboard
- ☒ 1 x SATA Cable
- ☒ 1 x I/O Shield
- ☒ 1 x Support CD



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If any of the above items is damaged or missing, contact your distributor or sales representative immediately.

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### 1.2 Features

- Intel® Socket 1150 for 4th Generation Core™ i7/Core™ i5/Core™ i3, Pentium®, and Celeron® Processors up to 65W
- SO-DIMM x 2, Max. 16GB, DDR3 1333/1600MHz DIMMs Non-ECC (Flat type)
- SATA 6.0 Gb/s x 4, USB3.0 x 4, USB2.0 x 6, COM x 2
- PCI-Express 2.0 x 4, Full/Half size Mini Card (mSATA 6.0Gb/s) x 1, Half size Mini Card (PCIe+USB) x 1
- EuP/ErP Compliance

## 1.3 Specifications

SYSTEM	
CPU	Intel® Haswell 22nm LGA 1150 socket Processor, Max. 65W TDPs
Chipset	Intel® Q87 Express Chipset
Memory	2 x SO-DIMM, Max. 16GB, DDR3 1333/1600 MHz Non-ECC (flat type) Dual channel memory architecture
Graphics	Intel® HD Graphics
I/O Chipset	NCT6791D
Storage	Intel® Q87 Express Chipset support 4 x SATA 6Gb/s and mSATA
Ethernet	1 x Intel® PHY I217LM Giga LAN (support vPro) 1 x Intel® I210AT Giga LAN
Audio	Realtek® ALC887 (2ch audio codec)
TPM	Infineon SLB9655
Expansion Slots	1 x PCIe 2.0 (x4) 1 x Full/ Half size Mini Card (mSATA 6.0Gb/s) 1 x Half size Mini Card (PCIe +USB)
BIOS	128Mbit Flash ROM, AMI BIOS
H/W Monitor	Temperature Monitor on CPU/Chassis Voltage Monitor on Vcore 5V/12V Fan Monitor on CPU/Chassis
WatchDog Timer	1~255 step by software program
Smart Fan Control	CPU Fan / Chassis Fan
Wake On LAN / PXE	Yes (WOL / PXE)
Power State	S3, S4, S5
GRAPHICS	
Graphics Chipset	Intel® HD Graphics
Graphics Multi Display	VGA+HDMI, VGA+DP, VGA+LVDS, HDMI+DP, HDMI+LVDS, DP+LVDS VGA+HDMI+DP, VGA+HDMI+LVDS, HDMI+DP+LVDS, VGA+DP+LVDS
VGA	Up to 1920 x 1200 @60 Hz
HDMI	Up to 4096 x 2160 @24 Hz / 2560 x 1600 @60 Hz, with Digital Audio
Display Port	Up to 4096 x 2160 @24 Hz / 2560 x 1600 @60 Hz, with Digital Audio
LVDS	Up to 1920 x 1200 @ 60 Hz, Dual Channel 18/24 bit
Backlight Control	Voltage / PWM

(continued on the next page)

I/O	
Storage	4 x SATA 6Gb/s 1 x Full / Half size Mini Card (mSATA 6.0Gb/s) 1 x Half size Mini Card (PCIe +USB) 4 pin SATA power (5V, 12V @ 1A)
USB	4 x USB 3.0 ports(Rear IO), 6 x USB 2.0 ports (6 ports at mid board)
Display I/O	1 x LVDS, 1x HDMI, 1x DP, 1x VGA
Audio I/O	hdadphone/mic headset analog audio port Internal speakers and front panel headphones/ mic headers
LAN I/O	2 x RJ-45
Serial Port	1 x RS-232 (mid board) 1 x RS-232/422/485 supports 5V/12V/RI option (mid board)
PS/2 Port	1 x keyboard / Mouse with PS/2 for wafer header
DIO	8 bit Digital I/O ( In/Out programmable)
FAN	1 x 4-pin CPU Fan connector 1 x 4-pin Chassis Fan connector
ENVIRONMENT, POWER, & ME	
Battery	Lithium battery
Power Requirement	12~24V wide-range voltage input back panel DC jack (5.5/2.5mm) 2 x 2 pin internal power connector
Power Compliance	Compliant with EuP / ErP
Operating Temperature	0~60°C
Operating Humidity	0%~90%RH, non-condensing
Certificate	CE & FCC
Form Factor	20mm Thin Mini-ITX Form Factor, 6.7"x 6.7" (170mmx170mm) Half-height (25.54mm) IO shield
Weight	1.1 lb (0.5 Kg)

*(continued on the next page)*

Placement	
<b>Rear panel ports</b>	1 x DC Jack 2 x USB 3.0 1 x HDMI 1 x DP 1 x LAN (RJ45) 1 x LAN (RJ45) for vPro 2 x USB 3.0 1 x Audio jacks (Mic-In) pink connector 1 x Audio jacks (Line-Out) green connector
<b>Internal connectors/ jumpers/slots</b>	1 x PCIe4 slot 1 x Full / Half Size Mini Card slot 1 x Half Size Mini Card slot 4 x SATA 6Gb/s 3 x USB 2.0 connectors support additional 6 USB ports (2.00 mm) 2 x boxer header for COM (RS-232) 1 x VGA 1 x 6-pin PS/2 Keyboard and mouse connector 1 x LVDS connector 1 x LVDS 3.3V /5V jumper 1 x LCD DC / PWM mode jumper 1 x LCD backlight connector (inverter) 1 x LCD backlight 12V /5V jumper 1 x Digital I/O header 1 x 4-pin (2x2) internal power connector 1 x 4-pin CPU Fan connector 1 x 4-pin Chassis Fan connector 1 x Front Panel connector 1 x AAFP follow ASUS pin out 1 x Speaker connector 1 x Chassis Intrusion follow ASUS pin out 1 x CLRTC (Clear CMOS) jumper
Others	
<b>OS Support</b>	Windows® 7 32 / 64 bit Windows® 8 32 / 64 bit Linux Fedora
<b>Accessories</b>	1 x SATA cable 1 x SATA power cable I/O Shield Support DVD



# Chapter 2

## Motherboard information

### 2.1 Before you proceed

Take note of the following precautions before you install motherboard components or change any motherboard settings.



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**CAUTION!**

- Unplug the power cord from the wall socket before touching any component.
  - Before handling components, use a grounded wrist strap or touch a safely grounded object or a metal object, such as the power supply case, to avoid damaging them due to static electricity.
  - Hold components by the edges to avoid touching the ICs on them.
  - Whenever you uninstall any component, place it on a grounded antistatic pad or in the bag that came with the component.
  - Before you install or remove any component, always remove the AC power by unplugging the power cord from the power outlet. Failure to do so may cause severe damage to the motherboard, peripherals, or components.
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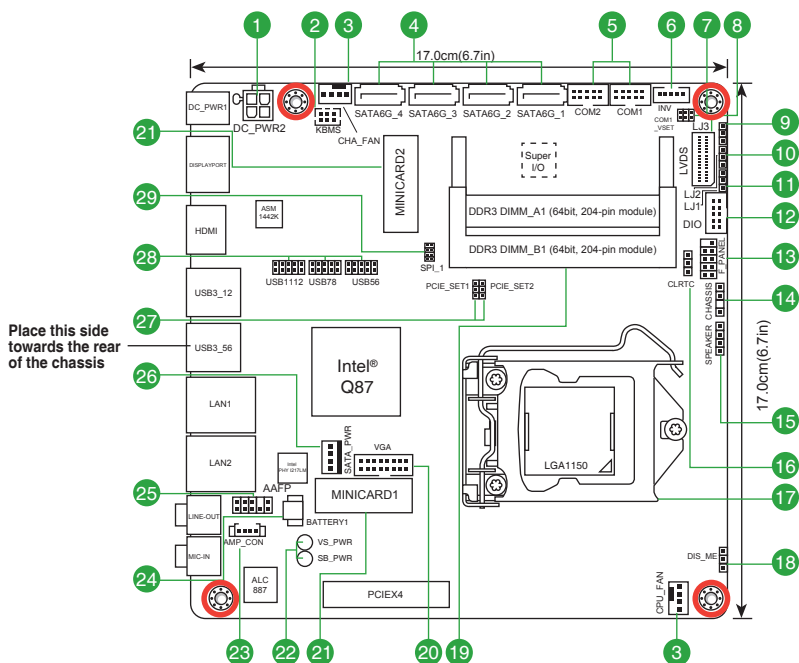
## 2.2 Motherboard layout



**NOTE:** Place four screws into the holes indicated by circles to secure the motherboard to the chassis.



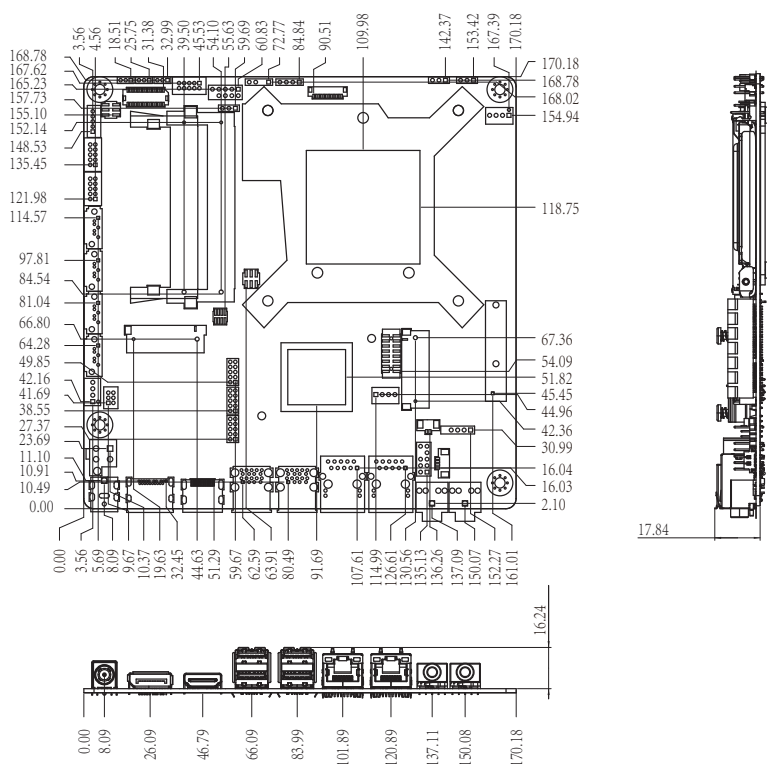
**CAUTION!** Do not overtighten the screws! Doing so can damage the motherboard.



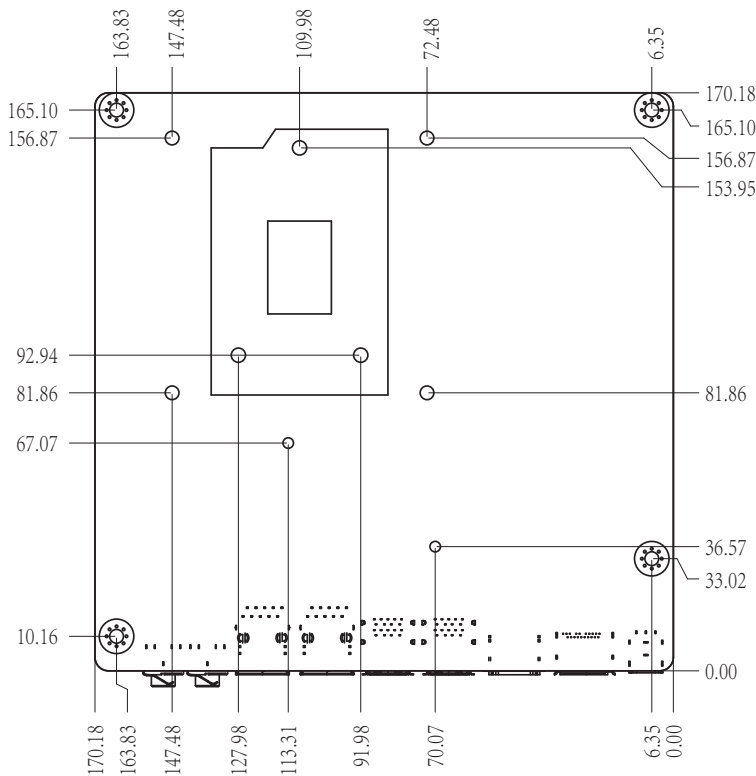
Connectors/Jumpers/Slots	Page
1. DC power connector (DC_PWR2)	2-18
2. PS/2 keyboard/mouse connector (6-pin KBMS)	2-22
3. CPU and system fan connectors (4-pin CPU_FAN, 4-pin CHA_FAN)	2-19
4. Serial ATA 6.0Gb/s connectors (7-pin SATA6G_1~4)	2-23
5. Serial port connectors (10-pin COM1, COM2)	2-25
6. Backlight inverter power connector (5-pin INV)	2-24
7. COM1 Ring/+5V/+12V selection (COM1_VSET)	2-13
8. LVDS connector (30-pin LVDS)	2-20
9. Inverter Backlight Control mode selection (3-pin LJ3)	2-14
10. Inverter voltage selection (3-pin LJ2)	2-14
11. LVDS panel voltage selection (3-pin LJ1)	2-13
12. Digital I/O connector (10-pin DIO)	2-21
13. Front panel system connector (10-1 pin F_PANEL)	2-22
14. Chassis intrusion connector (4-1 pin CHASSIS)	2-21
15. Internal speaker connector (4-pin SPEAKER)	2-23
16. Clear RTC RAM (CLRTC)	2-12
17. Intel® LGA1150 CPU socket	2-6
18. Intel® ME Jumper (3-pin DIS_ME)	2-13
19. SO-DIMM slots	2-11
20. VGA connector (16-pin VGA)	2-18
21. Full/Half size Mini Card slot (mSATA) (MINICARD2) Half size Mini Card slot (PCIe+USB) (MINICARD1)	2-23
22. AUX power LED (SB_PWR) Main power LED (VS_PWR)	2-23
23. Audio amplifier connector (4-pin AMP_CON)	2-26
24. Battery connector (2-pin BATTERY1)	2-19
25. Front panel audio connector (10-1 pin AAFP)	2-20
26. SATA power connector (4-pin SATA_PWR)	2-18
27. mSATA/PCIe mode selection jumper (PCIe_SET1/2)	2-14
28. USB 2.0 connectors (10-pin USB56, USB78, USB112)	2-24
29. SPI flash Programmable Connector (8-pin SPI_1)	2-25

## 2.3 Screw size

### 2.3.1 Component side

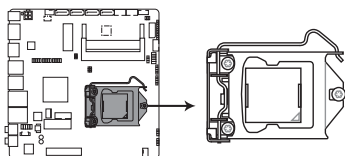


2.3.2 Solder side



## 2.4 Central Processing Unit (CPU)

The motherboard comes with a surface mount LGA1150 socket designed for the Intel® 4th Generation Core™ i7 / Core™ i5 / Core™ i3 processors.



**EMB-Q87A CPU socket LGA1150**



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**IMPORTANT:** Unplug all power cables before installing the CPU.

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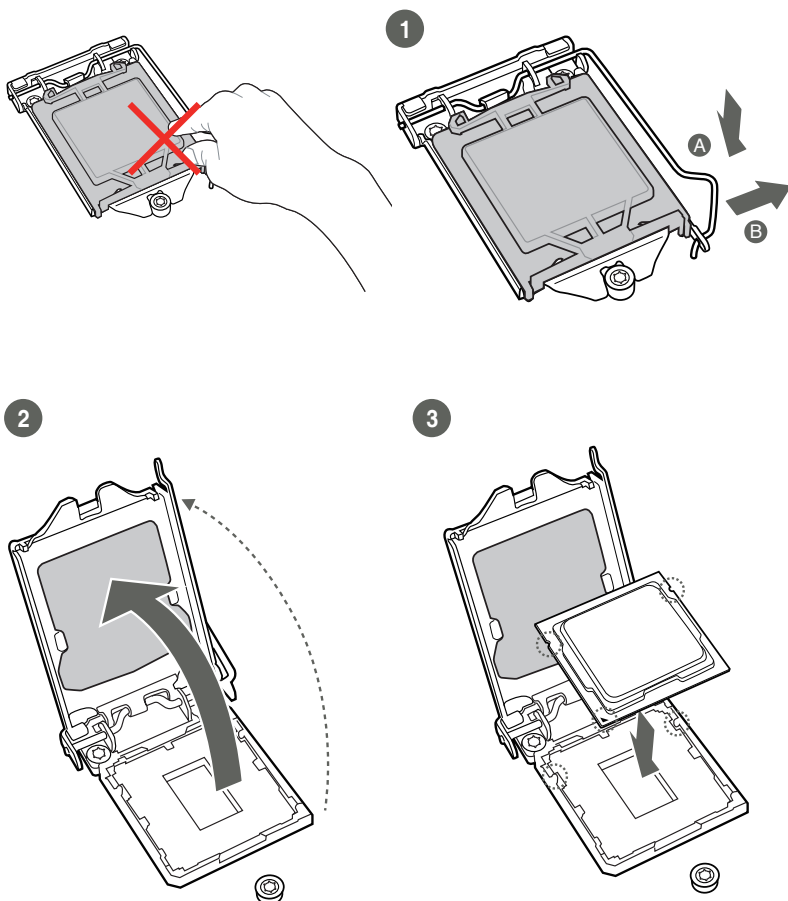
### **CAUTION!**

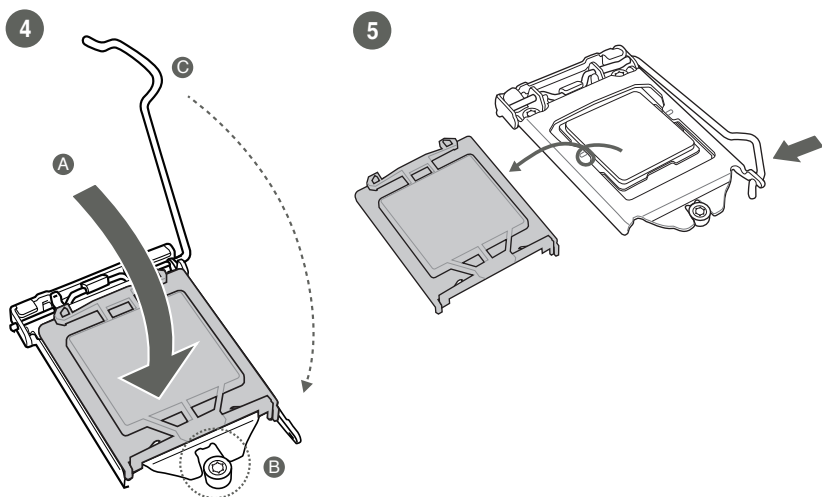
- Upon purchase of the motherboard, ensure that the PnP cap is on the socket and the socket contacts are not bent. Contact your retailer immediately if the PnP cap is missing, or if you see any damage to the PnP cap/socket contacts/motherboard components. The manufacturer will shoulder the cost of repair only if the damage is shipment/transit-related.
  - Keep the cap after installing the motherboard. The manufacturer will process Return Merchandise Authorization (RMA) requests only if the motherboard comes with the cap on the LGA1150 socket.
  - The product warranty does not cover damage to the socket contacts resulting from incorrect CPU installation/removal, or misplacement/loss/incorrect removal of the PnP cap.
-

## 2.4.1 Installing the CPU

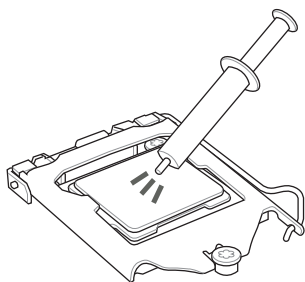


**CAUTION!** The LGA1156 CPU is incompatible with the LGA1150 socket. DO NOT install a LGA1156 CPU on the LGA1150 socket.





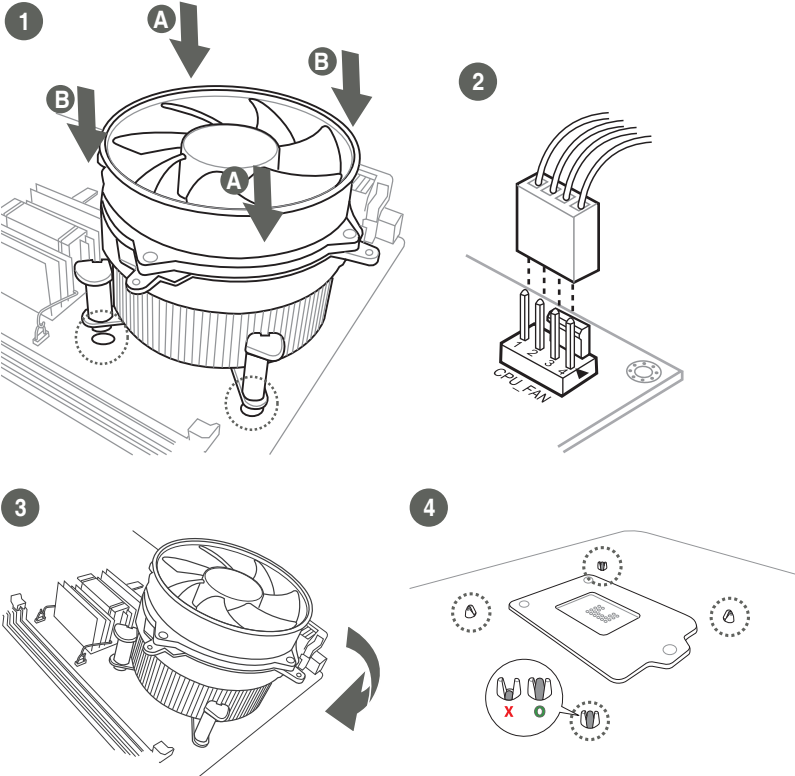
## 2.4.2 CPU heatsink and fan assembly installation



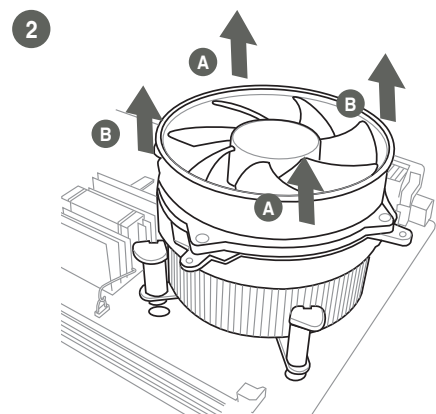
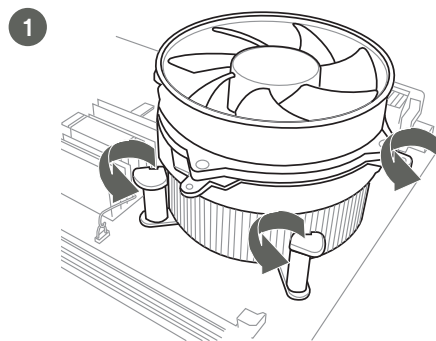
**CAUTION!** Apply the Thermal Interface Material to the CPU heatsink and CPU before you install the heatsink and fan if necessary.



To install the CPU heatsink and fan assembly



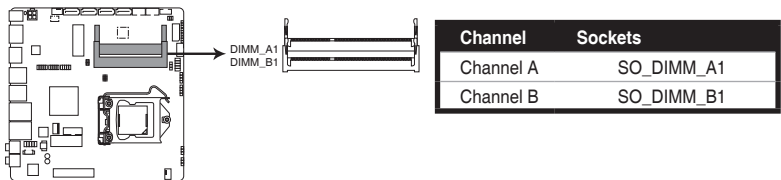
## To uninstall the CPU heatsink and fan assembly



## 2.5 System memory

This motherboard comes with two Double Data Rate 3 (DDR3) Small Outline Dual Inline Memory Module (SO-DIMM) sockets. A DDR3 module has the same physical dimensions as a DDR2 DIMM but is notched differently to prevent installation on a DDR2 DIMM socket. DDR3 modules are developed for better performance with less power consumption.

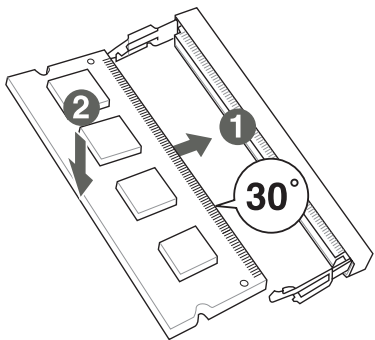
The figure below illustrates the location of the DDR3 SO-DIMM sockets:



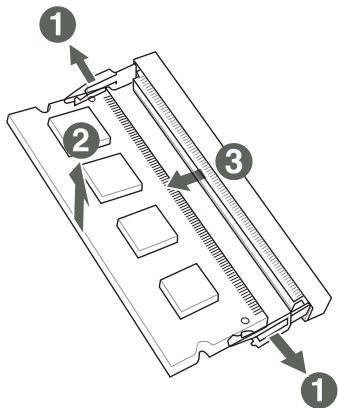
**EMB-Q87A 204-pin DDR3 SO-DIMM sockets**

### 2.5.1 Installing a DIMM

To install a DIMM



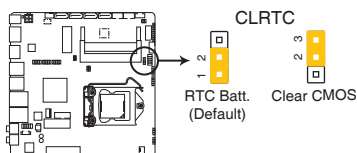
To remove a DIMM



## 2.6 Jumpers

### 1. Clear RTC RAM (CLRTC)

This jumper allows you to clear the Real Time Clock (RTC) RAM in CMOS. You can clear the CMOS memory of system setup parameters by erasing the CMOS RTC RAM data. The onboard button cell battery powers the RAM data in CMOS, which include system setup information such as system passwords.



**EMB-Q87A Clear RTC RAM**

#### To erase the RTC RAM:

1. Turn OFF the computer and unplug the power cord.
2. Move the jumper cap from pins 1-2 (default) to pins 2-3. Keep the cap on pins 2-3 for about 5~10 seconds, then move the cap back to pins 1-2.
3. Plug the power cord and turn ON the computer.
4. Hold down the <Del> key during the boot process and enter BIOS setup to reenter data.



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**CAUTION!** Except when clearing the RTC RAM, never remove the cap on CLRTC jumper default position. Removing the cap will cause system boot failure!

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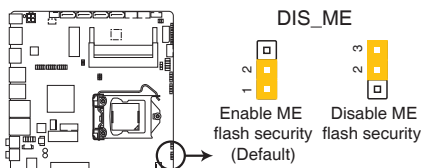


#### NOTES:

- If the steps above do not help, remove the onboard battery and move the jumper again to clear the CMOS RTC RAM data. After clearing the CMOS, reinstall the battery.
  - You do not need to clear the RTC when the system hangs due to overclocking. For system failure due to overclocking, use the CPU Parameter Recall (C.P.R) feature. Shut down and reboot the system so the BIOS can automatically reset parameter settings to default values.
-

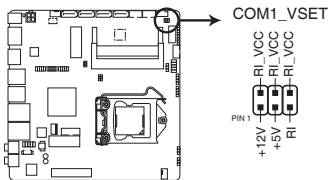
2. Intel® ME Jumper (3-pin DIS\_ME)

This jumper allows you to force Intel® Management Engine (ME) boot from recovery mode when ME become corrupted.



EMB-Q87A Intel® ME Flash Security selection

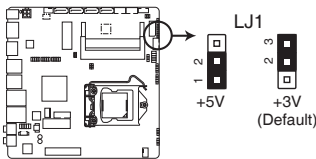
3. COM1 Ring/+5V/+12V selection (COM1\_VSET)



EMB-Q87A COM VSET connector

Setting	Pins
+12V	1-2
+5V	3-4
Ring (Default)	5-6

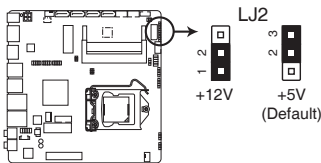
4. LVDS panel voltage selection (3-pin LJ1)



EMB-Q87A LVDS Panel Voltage Selection

Setting	Pins
+5V	1-2
+3.3V (Default)	2-3

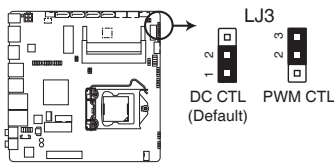
5. Inverter voltage selection (3-pin LJ2)



EMB-Q87A Inverter Voltage Selection

Setting	Pins
+12V	1-2
+5V (Default)	2-3

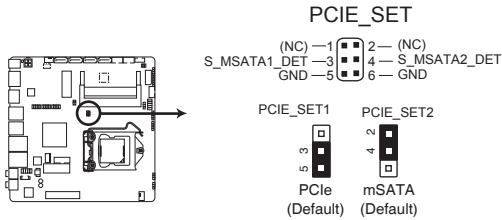
6. Inverter Backlight Control mode selection (3-pin LJ3)



EMB-Q87A Inverter Backlight Control mode selection

Setting	Pins
DC Voltage Control (Default)	1-2
PWM Control	2-3

7. mSATA/PCIe mode selection (6-pin PCIE\_SET1/2)



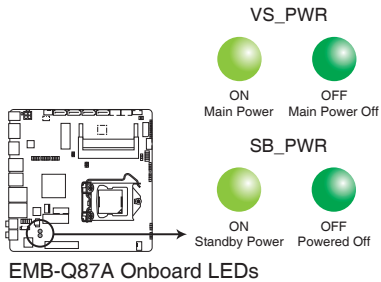
EMB-Q87A mSATA/PCIe selection jumper

	Setting	Pins
PCIE_SET1	mSATA	1-3
	PCIe (Default)	3-5
PCIE_SET2	mSATA (Default)	2-4
	PCIe	4-6

## 2.7 Onboard LEDs

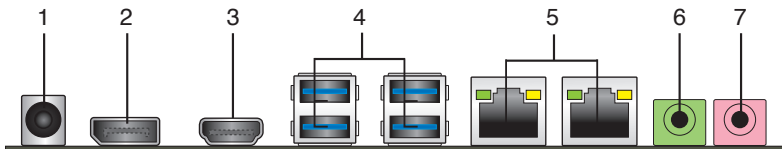
### 1. Standby Power LED

The motherboard comes with a standby power LED that lights up to indicate that the system is ON, in sleep mode, or in soft-off mode. This is a reminder that you should shut down the system and unplug the power cable before removing or plugging in any motherboard component. The illustration below shows the location of the onboard LED.



## 2.8 Connectors

### 2.8.1 Rear panel connectors



1. **DC-In power jack.** This jack connects to a DC power adapter.
2. **DisplayPort.** This port connects a DisplayPort monitor or a home-theater system.
3. **HDMI port.** This port is for a High-Definition Multimedia Interface (HDMI), and is HDCP compliant allowing playback of HD DVD, Blu-ray, and other protected content.
4. **USB 3.0 ports.** These 9-pin Universal Serial Bus (USB) ports connect to USB 3.0/2.0 devices.



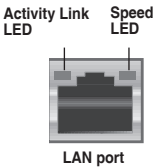
#### NOTES:

- DO NOT connect a keyboard / mouse to any USB 3.0 port when installing Windows® operating system.
- Due to USB 3.0 controller limitation, USB 3.0 devices can only be used under Windows® OS environment and after the USB 3.0 driver installation.
- USB 3.0 devices can only be used as data storage only.
- We strongly recommend that you connect USB 3.0 devices to USB 3.0 ports for faster and better performance for your USB 3.0 devices.

5. **LAN (RJ-45) ports.** These ports allow Gigabit connection to a Local Area Network (LAN) through a network hub. Refer to the table below for the LAN port LED indications.

#### LAN port LED indications

ACT/LINK LED		SPEED LED	
Status	Description	Status	Description
OFF	No link	OFF	10 Mbps connection
GREEN	Linked	ORANGE	100 Mbps connection
BLINKING	Data activity	GREEN	1 Gbps connection





6. **Line Out port (green).** This port connects to a headphone or a speaker. In a 4-channel, 6-channel and 8-channel configurations, the function of this port becomes Front Speaker Out.
7. **Microphone port (pink).** This port connects a microphone.



**NOTE:** Refer to the audio configuration table for the function of the audio ports in the 2, 4, 6, or 8-channel configuration.

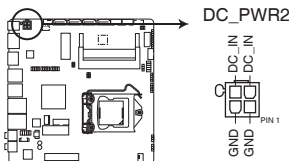
Audio 2, 4, 6, or 8-channel configuration

Ports	Headset 2-channel	4-channel	6-channel	8-channel
Pink (Rear panel)	Mic In	Mic In	Bass/Center	Bass/Center
Green (Rear panel)	Line Out	Front Speaker Out	Front Speaker Out	Front Speaker Out

## 2.8.2 Internal connectors

### 1. DC power connector (4-pin DC\_PWR2)

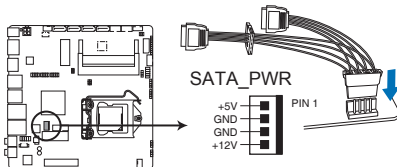
This connector is for the DC power plug. The power supply plug is designed to fit this connector in only one orientation. Find the proper orientation and push down firmly until the connector completely fits.



EMB-Q87A 1 x 4 PIN (2x2)  
internal power connector

### 2. SATA power connector (4-pin SATA\_PWR)

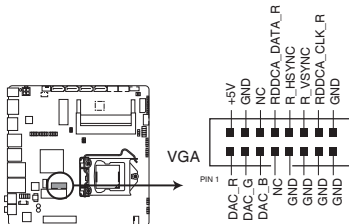
This connector is for the SATA power cable. The power cable plug is designed to fit this connector in only one orientation. Find the proper orientation and push down firmly until the connector completely fits.



EMB-Q87A SATA POWER Connector

### 3. VGA connector (16-pin VGA)

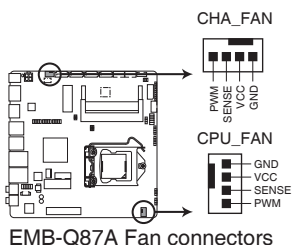
This 16-pin connector is for a VGA monitor or other VGA-compatible devices.



EMB-Q87A VGA Connector

#### 4. CPU and chassis fan connectors (4-pin CPU\_FAN, 4-pin CHA\_FAN)

Connect the fan cables to the fan connectors on the motherboard, ensuring that the black wire of each cable matches the ground pin of the connector.



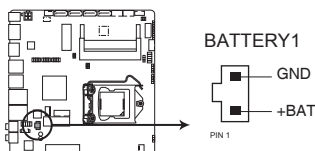
**CAUTION:** Do not forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! Do not place jumper caps on the fan connectors!



**NOTE:** The CPU\_FAN connector supports a CPU fan of maximum 2A (24 W) fan power.

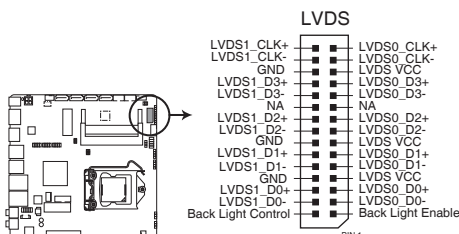
#### 5. Battery connector (2-pin BATTERY1)

This connector is for the lithium CMOS battery.



## 6. LVDS connector (30-pin LVDS)

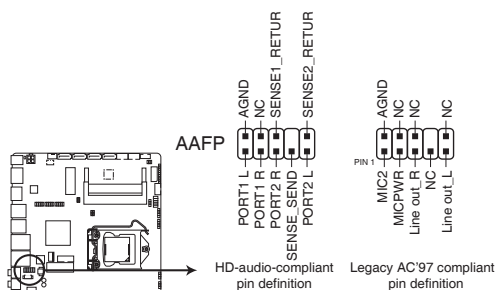
This connector is for an LCD monitor that supports Low Voltage Differential Signalling (LVDS) interface.



EMB-Q87A LVDS Connector

## 7. Front panel audio connector (10-1 pin AAFP)

This connector is for a chassis-mounted front panel audio I/O module that supports either HD Audio or legacy AC'97 audio standard. Connect one end of the front panel audio I/O module cable to this connector.



EMB-Q87A Front panel audio connector



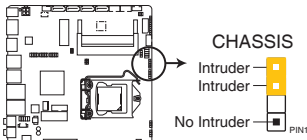
### NOTES:

- We recommend that you connect a high-definition front panel audio module to this connector to avail of the motherboard's high-definition audio capability.
- If you want to connect a high-definition front panel audio module to this connector, set the Front Panel Type item in the BIOS setup to [HD]; if you want to connect an AC'97 front panel audio module to this connector, set the item to [AC97]. By default, this connector is set to [HD].

8. **Chassis intrusion connector (4-1 pin CHASSIS)**

This connector is for a chassis-mounted intrusion detection sensor or switch. Connect one end of the chassis intrusion sensor or switch cable to this connector. The chassis intrusion sensor or switch sends a high-level signal to this connector when a chassis component is removed or replaced. The signal is then generated as a chassis intrusion event.

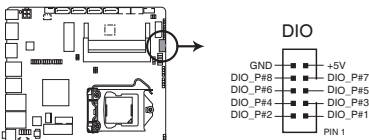
By default, the pins labeled “Intruder” are shorted with a jumper cap. Remove the jumper caps only when you intend to use the chassis intrusion detection feature.



**EMB-Q87A Chassis intrusion connector**

9. **Digital I/O connector (10-pin DIO)**

This connector includes 8 I/O lines (In/Out programmable). All of the Digital I/O lines are programmable and each I/O pin can be individually programmed to support various devices.



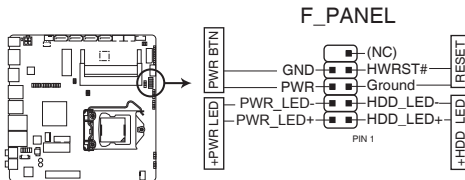
**EMB-Q87A DIO connector**



**NOTE:** To configure the I/O pins in BIOS, go to the **Advanced** tab > **Dynamic Digital IO** > **DIO0~7**. See section **3.3.2 Dynamic Digital IO** for details.

## 10. Front panel system connector (10-1 pin F\_PANEL)

This connector supports several chassis-mounted functions.



EMB-Q87A Front panel system connector

- **System power LED (2-pin PWR\_LED)**

This 2-pin connector is for the system power LED. Connect the chassis power LED cable to this connector. The system power LED lights up when you turn on the system power, and blinks when the system is in sleep mode.

- **Hard disk drive activity LED (2-pin HDD\_LED)**

This 2-pin connector is for the HDD Activity LED. Connect the HDD Activity LED cable to this connector. The IDE LED lights up or flashes when data is read from or written to the HDD.

- **ATX power button/soft-off button (2-pin PWR\_BTN)**

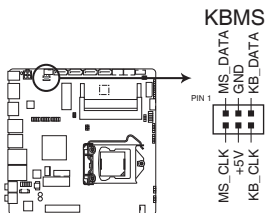
This 2-pin connector is for the system power button.

- **Reset button (2-pin RESET)**

This 2-pin connector is for the chassis-mounted reset button for system reboot without turning off the system power.

## 11. PS/2 keyboard/mouse connector (6-pin KBMS)

This connector is for an IBM PS/2-compatible keyboard and mouse.



EMB-Q87A PS/2 keyboard/mouse connector

**12. Serial ATA 6.0Gb/s connector (7-pin SATA6G\_1~SATA6G\_4)**

This connector connects to Serial ATA 6.0 Gb/s hard disk drives or an optical drive via Serial ATA 6.0 Gb/s signal cables.



**EMB-Q87A SATA 6.0Gb/s connectors**

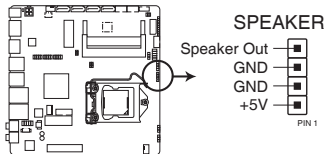


**NOTES:**

- You must install Windows® XP Service Pack 3 or later version before using Serial ATA hard disk drives.
- When using hot-plug and NCQ, set the SATA Mode Selection item in the BIOS to [AHCI]. See section **3.3.6 SATA Configuration** for details.

**13. Speaker connector (4-pin SPEAKER)**

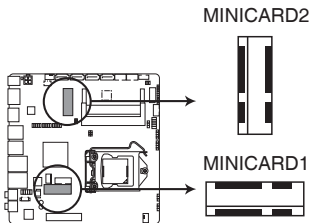
The 4-pin connector is for the chassis-mounted system warning speaker. The speaker allows you to hear system beeps and warnings.



**EMB-Q87A Speaker Out Connector**

**14. Minicard connector**

Use this connector to connect a Minicard device.



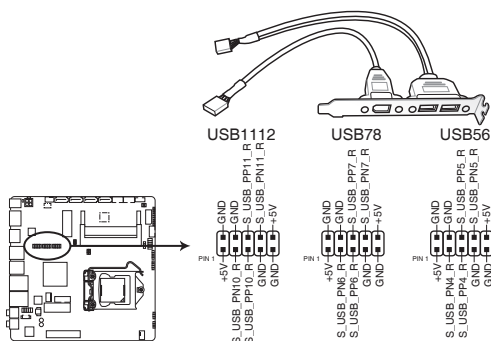
**EMB-Q87A MINICARD connectors**



**NOTE:** The Minicard device is purchased separately.

## 15. USB 2.0 connectorS (10 pin USB56, USB78, USB1112)

These connectors are for USB 2.0 ports. Connect the USB cable to these connectors. These USB connectors comply with USB 2.0 specification that supports up to 480 Mbps connection speed.



EMB-Q87A USB2.0 connectors



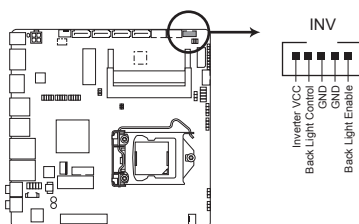
**CAUTION:** Never connect a 1394 cable to the USB connector. Doing so will damage the motherboard.



**NOTE:** The USB cable is purchased separately.

## 16. Backlight inverter power connector (5-pin INV)

Connect the backlight inverter power cable to this connector.



EMB-Q87A Inverter Connector

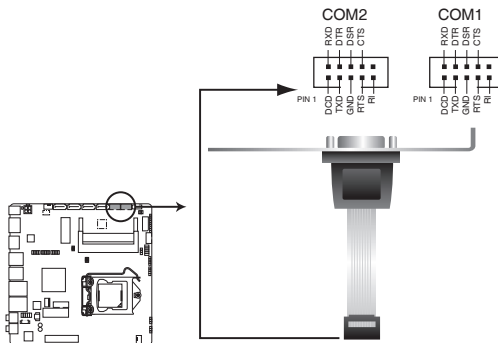


**NOTE:** The backlight inverter power cable and inverter module are purchased separately.



17. Serial port connectors (10-pin COM1, COM2)

These connectors are for serial (COM) ports. Connect the serial port cables to these connectors, then install the module to a slot opening at the back of the system chassis.



EMB-Q87A Serial port connectors

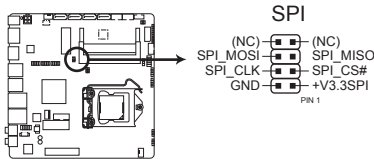
Pin	Signal	Pin	Signal
1	DCD	2	RXD
3	TXD	4	DTR
5	GND	6	DSR
7	RTS	8	CTS
9	RI/+12V/+5V	10	N.C.



**NOTE:** The serial port cables are purchased separately.

18. SPI flash programmable connector (8-pin SPI\_1)

This connector is for SPI flash program machine. Connect the flash BIOS cable to this connector.



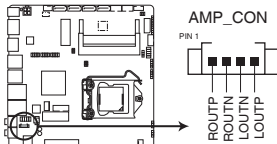
EMB-Q87A SPI flash programmable connector



**NOTE:** The flash BIOS cable is purchased separately.

## 19. Audio amplifier connector (4-pin AMP\_CON)

This connector is for an internal stereo amplifier speakers support (2W/4Ω via WtoB header).



**EMB-Q87A Audio Stereo Output  
with Amp Connector**

## 2.9 Power Supply Considerations



### CAUTION!

- The external DC jack (5.5/2.5mm) is the primary power input connector of EMB-Q87A. However, the desktop board also provides an internal 2 x 2 power connector that can be used in custom-developed systems that have an internal power supply.
- There is no isolation circuitry between the external DC jack and the internal 2 x 2 power connector. It is the system integrator's responsibility to ensure no more than one power supply unit is or can be attached to the board at any time and to ensure the external DC jack is covered if the internal 2 x 2 power connector is to be used.
- Simultaneous connection of both external and internal power supply units could result in potential damage to the desktop board, power supplies, or other hardware.
- System power requirements will depend on actual system configurations chosen by the integrator, as well as end user expansion preferences. It is the system integrator's responsibility to ensure an appropriate power budget for the system configuration is properly assessed based on the system-level components chosen.
- Considering the power conversion efficiency between  $V_{in}$  (+12V) to  $V_{out}$  (+12V), the  $V_{out}$  (+12V) output voltage is set around 11.6V. It is not a problem as long as it stays above -10% of 12V nominal.

# Chapter 3

## BIOS setup

### 3.1 BIOS setup program

Use the BIOS Setup program to update the BIOS or configure its parameters. The BIOS screens include navigation keys and brief online help to guide you in using the BIOS Setup program.

#### Entering BIOS Setup at startup

##### To enter BIOS Setup at startup:

Press <Delete> during the Power-On Self Test (POST). If you do not press <Delete>, POST continues with its routine.

#### Entering BIOS Setup after POST

##### To enter BIOS Setup after POST:

- Press <Ctrl>+<Alt>+<Del> simultaneously.
- Press the reset button on the system chassis.
- Press the power button to turn the system off then back on. Do this option only if you failed to enter BIOS Setup using the first two options.



---

**CAUTION!** Using the power button, reset button, or the <Ctrl>+<Alt>+<Del> keys to reboot a running operating system can cause damage to your data or system. Always shut down the system properly from the operating system.

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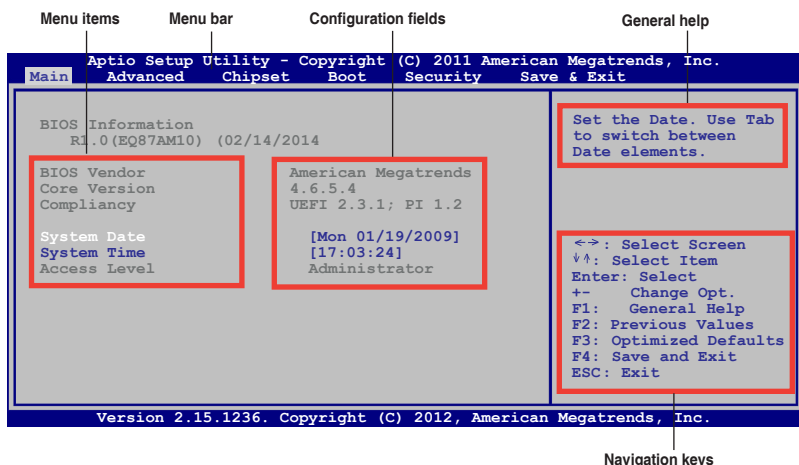


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#### IMPORTANT:

- The default BIOS settings for this motherboard apply to most working conditions and ensures optimal performance. If the system becomes unstable after changing any BIOS settings, load the default settings to regain system stability. Select the option **Restore Defaults** under the Save & Exit Menu. See section 3.7 **Save & Exit Menu**.
  - The BIOS setup screens shown in this section are for reference purposes only, and may not exactly match what you see on your screen.
-

### 3.1.1 BIOS menu screen



### 3.1.2 Menu bar

The menu bar on top of the screen has the following main items:

- Main** For changing the basic system configuration.
- Advanced** For changing the advanced system settings.
- Chipset** For changing the chipset configuration.
- Boot** For changing the system boot configuration.
- Security** For selecting the exit options and loading default settings.
- Save & Exit** For selecting the exit options and loading default settings.

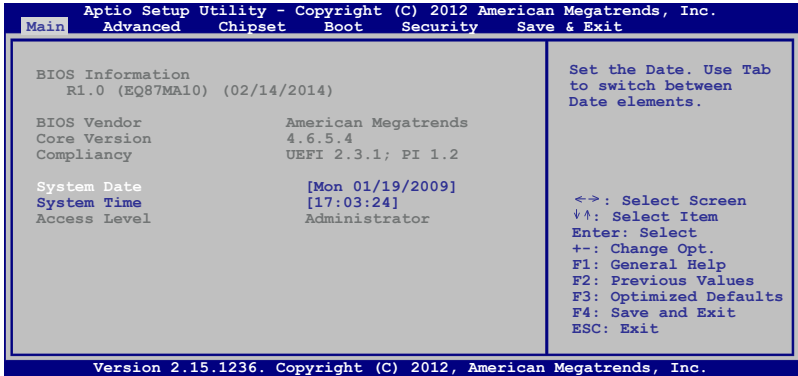
To select an item on the menu bar, press the right or left arrow key on the keyboard until the desired item is highlighted.

## 3.2 Main menu

When you enter the BIOS Setup program, the **Main** menu screen appears, giving you an overview of the basic system information.



Refer to section **3.1.1 BIOS menu screen** for information on the menu screen items and how to navigate through them.



### 3.2.1 System Time [xx:xx:xx]

Allows you to set the system time.

### 3.2.2 System Date [Day xx/xx/xxxx]

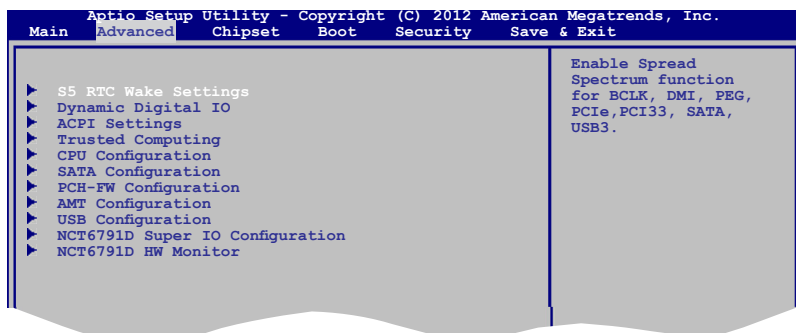
Allows you to set the system date.

## 3.3 Advanced menu

The **Advanced** menu items allow you to change the settings for the CPU and other system devices.



Be cautious when changing the settings of the Advanced menu items. Incorrect field values can cause the system to malfunction.



### 3.3.1 S5 RTC Wake Settings

This item allows you to enable the system to wake up from S5 state using an alert event.

#### Wake system with Fixed Time [Disabled]

Allows you to enable or disable the system's wake-on alert event. When enabled, the system wakes up on the specified time.

Configuration options: [Enabled] [Disabled]

#### Wake system with Dynamic Time [Disabled]

Allows you to enable or disable the system's wake-on alert event. When enabled, the system wakes up on the current time plus the specified wake-up minute.

Configuration options: [Enabled] [Disabled]

### 3.3.2 Dynamic Digital IO

The items in this menu allows you to configure the Digital IO as input or output and Digital IO Output as high or low.

#### DIO0~3 Direction [Input]

Allows you to configure the Digital IO. Configuration options: [Input] [Output]

### **DIO4~7 Direction [Output]**

Allows you to configure the Digital IO. Configuration options: [Input] [Output]

#### **Output Level [Hi]**

Allows you to set the Output level as high or low. Configuration options: [Hi]  
[Low]

### **3.3.3 ACPI Settings**

The items in this menu allows you to configure the system ACPI parameters.

#### **ACPI Sleep State [S3 only (Suspend to...)]**

Allows you to select the ACPI sleep state that the system will enter when the SUSPEND button is pressed.

Configuration options: [Suspend Disabled] [S3 only(Suspend to RAM)]

### **3.3.4 Trusted Computing**

The items in this menu allows you to configure the Trusted Computing settings.

#### **Security Device Support [Disabled]**

Allows you to enable or disable BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.

Configuration options: [Disabled] [Enabled]

### **3.3.5 CPU Configuration**

The items in this menu show the CPU-related information that the BIOS automatically detects.

#### **Intel(R) Virtualization Tech [Enabled]**

Enables or disables Intel® Virtualization Technology. Virtualization enhanced by Intel® Virtualization Technology allows a platform to run multiple operating systems and applications in independent partitions. With virtualization, one computer system can function as multiple virtual systems.

Configuration options: [Enabled] [Disabled]

#### **Turbo Mode [Disabled]**

Allows you to enable or disable Turbo Mode.

Configuration options: [Enabled] [Disabled]

#### **Boot Performance Mode [Max Non-Turbo Perfo...]**

Allows you to select the performance state that the BIOS will set before OS handoff. Configuration options: [Max Non-Turbo Performance] [Max Battery] [Turbo Performance]

### 3.3.6 SATA Configuration

While entering Setup, the BIOS automatically detects the presence of SATA devices. The SATA Port items show **Not Present** if no SATA device is installed to the corresponding SATA port.

#### SATA Mode Selection [AHCI]

Allows you to set the SATA configuration.

[Disabled]	Disables the SATA function.
[IDE]	Set to [IDE] when you want to use the Serial ATA hard disk drives as Parallel ATA physical storage devices.
[AHCI]	Set to [AHCI] when you want the SATA hard disk drives to use the AHCI (Advanced Host Controller Interface). The AHCI allows the onboard storage driver to enable advanced Serial ATA features that increases storage performance on random workloads by allowing the drive to internally optimize the order of commands.
[RAID]	Set to [RAID] when you want to create a RAID configuration from the SATA hard disk drives.

### 3.3.7 PCH-FW Configuration

Displays the Management Engine Technology parameters.

### 3.3.8 AMT Configuration

The items in this menu allow you to change the Intel® Active Management Technology (AMT) feature.

#### Intel® AMT [Enabled]

Allow you to enable or disable the Intel® Active Management Technology (AMT) in the BIOS extension. Configuration options: [Enabled] [Disabled]



- iAMT H/W is always enabled. This option just controls the BIOS extension execution. If enabled, this requires additional firmware in the SPI device.
- The following two items become configurable only when you set the Intel®AMT item to [Enabled].

#### Un-Configure ME [Disabled]

Sets this item to [Disabled] to unconfigure AMT/ME without using a password or set it to [Enabled] to use a password. Configuration options: [Enabled] [Disabled]



### 3.3.9 USB Configuration

The items in this menu allow you to change the USB-related features.



The USB Devices item shows the auto-detected values. If no USB device is detected, the item shows **None**.

#### Legacy USB Support [Enabled]

- [Enabled] Enables the support for USB devices on legacy operating systems (OS).
- [Disabled] The USB devices can be used only for the BIOS setup program.
- [Auto] Allows the system to detect the presence of USB devices at startup. If detected, the USB controller legacy mode is enabled. If no USB device is detected, the legacy USB support is disabled.

### 3.3.10 NCT6791D Super IO Configuration

The items in this menu allow you to configure the system super IO chip settings.

#### Serial Port 1/Port 2 Configuration

Allow you to configure the Serial Port 1/Port 2 settings.

##### Serial Port [Enabled]

Enables or disables the Serial COM port. Configuration options: [Enabled] [Disabled]

##### Change Settings [Auto]

Allows you to select an optimal setting for the Super IO device. Configuration options: [Auto] [IO=3F8h; IRQ=4] [IO=3F8h; IRQ=3,4,5,6,7,10,11,12] [IO=2F8h; IRQ=3,4,5,6,7,10,11,12] [IO=3E8h; IRQ=3,4,5,6,7,10,11,12] [IO=2E8h; IRQ=3,4,5,6,7,10,11,12]

### 3.3.11 NCT6791D HW Monitor

The items in this menu allows you to monitor the hardware status.

#### Smart Fan Configuration

The sub-items in this menu allow you to set the smart fan configuration.

##### CPU Smart Fan Control [Disabled]

Allows you to enable or disable the CPU Smart Fan Control. Configuration options: [Enabled] [Disabled]

##### Chassis Smart Fan Control [Disabled]

Allows you to enable or disable the Chassis Smart Fan Control. Configuration options: [Enabled] [Disabled]

## 3.4 Chipset

The Chipset menu allows you to change the advanced chipset settings. Select an item then press <Enter> to display the sub-menu.

### 3.4.1 System Agent (SA) Configuration

#### **VT-d [Enabled]**

Allows you to enable or disable VT-d function on MCH. Configuration options: [Enabled] [Disabled]

#### **PCIe x 16 port Speed [Auto]**

Allows you to configure the PCIe x16 port speed.

Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

#### **Primary Display [Auto]**

Allows you to select the graphics device for primary display.

Configuration options: [Auto] [IGFX] [PEG]

#### **Graphics Configuration**

##### **Internal Graphics [Auto]**

Configures IGD enabled based on setup options. Configuration options: [Auto] [Disabled] [Enabled]

##### **DVMT Pre-Allocated [32M]**

Allows you to select the amount of system memory allocated to DVMT 5.0 used by the Internal Graphics Device. Configuration options: [32M] [64M] [96M] [128M] ~ [416M] [448M] [480M] [512M] [1024M]

##### **DVMT Total Gfx Mem [256M]**

Allows you to select the total amount of system memory allocated to DVMT 5.0 used by the Internal Graphics Device. Configuration options: [128M] [256M] [MAX]

##### **LVDS Enable [Enabled]**

Configuration options: [Disabled] [Enabled]

##### **LVDS Panel Type [1024x768, 18bit, 60Hz]**

Select the type of LCD panel used as display. Configuration options:  
[640x480, 18bit, 60Hz] [800x480, 18bit, 60Hz] [800x600, 18bit, 60Hz]  
[1024x600, 18bit, 60Hz] [1024x768, 18bit, 60Hz] [1024x768, 24bit, 60Hz]  
[1280x768, 24bit, 60Hz] [1280x1024, 48bit, 60Hz] [1366x768, 24bit, 60Hz]  
[1440x900, 48bit, 60Hz] [1600x1200, 48bit, 60Hz] [1920x1080, 48bit, 60Hz]  
[1920x1200, 48bit, 60Hz]

### **LVDS Backlight Level [80%]**

Select the backlight level. Configuration options: [0%] [10%] [20%] [30%] [40%] [50%] [60%] [70%] [80%] [90%] [100%]

### **LVDS Backlight Type [Normal]**

Select the backlight mode. Configuration options: [Normal] [Inverted]

## **Memory Information**

Provides information on the memory settings.

## **3.4.2 PCH-IO Configuration**

### **Power Mode [ATX Types]**

Allows you to select the power supply mode.

Configuration options: [ATX Type] [AT Type]

### **Resume on Ring [Enabled]**

[Disabled] Disables Ring to generate a wake event.

[Enabled] Enables Ring to generate a wake event.

### **Restore AC Power Loss [Power Off]**

[Power On] The system goes into on state after an AC power loss.

[Power Off] The system goes into off state after an AC power loss.

[Last State] The system goes into either off or on state, whatever the system state was before the AC power loss.

### **ERP/EUP mode [Disabled]**

Allows you to enable or disable ERP/EUP mode for energy star.

Configuration options: [Enabled] [Disabled]

### **Intel WGI210AT Speed, Intel I217LM Speed, and PCIe x4 port Speed [Auto]**

Allows you to select the PCI Express port speed.

Configuration options: [Auto] [Gen1] [Gen 2]

### **Multi VerbTable Switch [HD Audio]**

Configuration options: [AC97] [HD Audio]

## 3.5 Boot menu

The Boot menu items allow you to change the system boot options.

### 3.5.1 Boot Configuration

#### **Quiet Boot [Enabled]**

Enables or disables the Quiet Boot option.

Configuration options: [Enabled] [Disabled]

#### **Launch PXE OpROM policy [Disabled]**

Controls the launch of UEFI and Legacy PXE OpROM.

Configuration options: [Disabled] [Enabled]

## 3.6 Security menu

The Security menu items allow you to change the system security settings.

### **Administrator Password**

If you have set an administrator password, we recommend that you enter the administrator password for accessing the system. Otherwise, you might be able to see or change only selected fields in the BIOS setup program.

#### **To set an administrator password:**

1. Select the **Administrator Password** item and press <Enter>.
2. From the **Create New Password** box, key in a password, then press <Enter>.
3. Confirm the password when prompted.

#### **To change an administrator password:**

1. Select the Administrator Password item and press <Enter>.
2. From the Enter Current Password box, key in the current password, then press <Enter>.
3. From the Create New Password box, key in a new password, then press <Enter>.
4. Confirm the password when prompted.

To clear the administrator password, follow the same steps as in changing an administrator password, but press <Enter> when prompted to create/confirm the password. After you clear the password, the Administrator Password item on top of the screen shows Not Installed.

## User Password

If you have set a user password, you must enter the user password for accessing the system. The User Password item on top of the screen shows the default Not Installed. After you set a password, this item shows Installed.

### To set a user password:

1. Select the **User Password** item and press <Enter>.
2. From the **Create New Password** box, key in a password, then press <Enter>.
3. Confirm the password when prompted.
4. Confirm the password when prompted.

To clear the user password, follow the same steps as in changing a user password, but press <Enter> when prompted to create/confirm the password. After you clear the password, the User Password item on top of the screen shows Not Installed.

## 3.7 Save & Exit menu

The Save & Exit menu items allow you to load the optimal default values for the BIOS items, and save or discard your changes to the BIOS items.

### Save Changes & Reset

This option allows you to save the changes and exit the Setup program.

### Discard Changes & Exit

This option allows you to exit the Setup program without saving your changes. When you select this option or if you press <Esc>, a confirmation window appears. Select **Yes** to discard changes and exit.

### Restore Defaults

This option allows you to load the default values for each of the parameters on the Setup menus. When you select this option or if you press <F3>, a confirmation window appears. Select **Yes** to load the default values.

## **Save as User Defaults**

This option allows you to save the current changes as the user's default values.

## **Restore User Defaults**

This option allows you to load the user's default values.

## **Launch EFI Shell from filesystem device**

This item allows you to attempt to launch EFI Shell application (Shellx64.efi) from one of the available filesystem devices.

# Appendix

## Notices

### Federal Communications Commission Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with manufacturer's instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



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**WARNING!** The use of shielded cables for connection of the monitor to the graphics card is required to assure compliance with FCC regulations. Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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DO NOT throw the motherboard in municipal waste. This product has been designed to enable proper reuse of parts and recycling. This symbol of the crossed out wheeled bin indicates that the product (electrical and electronic equipment) should not be placed in municipal waste. Check local regulations for disposal of electronic products.

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DO NOT throw the mercury-containing button cell battery in municipal waste. This symbol of the crossed out wheeled bin indicates that the battery should not be placed in municipal waste.

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**有毒有害物質或元素的名稱及含量說明標示：**

部件名稱	有害物質或元素					
	鉛 (Pb)	汞 (Hg)	鎘 (Cd)	六 價 鉻 (Cr(VI))	多 溴 聯 苯 (PBB)	多 溴 二 苯 醚 (PBDE)
印刷電路板及其 電子組件	×	○	○	○	○	○
外部信號連接頭 及線材	×	○	○	○	○	○

○：表示該有毒有害物質在該部件所有均質材料中的含量均在 SJ/T 11363-2006 標準規定的限量要求以下。

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表示該有毒有害物質至少在該部件的某一均質材料中的含量超出 SJ/T 11363-2006 標準規定的限量要求，然該部件仍符合歐盟指令 2002/95/EC 的規範。

備註：此產品所標示之環保使用期限，係指在一般正常使用狀況下。