

# EMB-H110B



# Industrial Motherboard

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# 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 SATA power cable
- ☒ 1 x I/O Shield
- ☒ 1 x Support CD



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**NOTE:** 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 1151 for 6<sup>th</sup>/7<sup>th</sup> Generation Core™ i7/Core™ i5 / Core™ i3, Pentium® and Celeron™ Processors up to 65W
- Two 260-pin Dual Channel DDR4 2133/1867MHz SO-DIMMs up to 32GB
- 2 x SATA 6.0 Gb/s, 4 x USB3.0, 6 x USB2.0, 2 x COM header
- 1 x PCI Express 2.0 [x1]
- 1 x Full/Half-size Mini card ( default: mSATA) (PCIe +USB optional)
- 1 x Half-size Mini card
- Multi Display: HDMI, (DP optional by BOM change), LVDS, eDP

## 1.3 Specifications

SYSTEM	
CPU	LGA1151 socket for Intel® 6 <sup>th</sup> /7 <sup>th</sup> Generation Core™ i7 / Core™ i5 / Core™ i3, Pentium® / Celeron® processors Supports Intel® CPU Max. 65W TDPs
Chipset	Intel® H110 Express Chipset
Memory	2 x SO-DIMM, max. 32GB, non-ECC DDR4 2133 / 1867 MHz Dual-channel memory architecture
Graphics	Intel® HD Graphics
I/O Chipset	NCT6791D
Storage	2 x SATA 6Gb/s
Ethernet	2 x Realtek® 8111G PCIe Gigabit LAN
Audio	Realtek® ALC887 with Amp.
TPM	Infineon SLB96XX TT 1.2/2.0 (default: No)
Expansion slots	1 x PCI Express 2.0 [x1] slot (Gen 2) 1 x Half size Mini Card (PCIe +USB) 1 x Full/Half size Mini Card (default: mSATA) (PCIe +USB optional)
BIOS	64Mbit 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 steps by software program
Wake on LAN	Yes (WOL / PXE) (PXE only support with LAN1)
Smart Fan Control	CPU Fan(3.3V PWM control) / Chassis Fan
Power State	S3, S4, S5
GRAPHICS	
Graphics Chipset	Intel® HD Graphics
Graphics Multi-Display	2HDMI+LVDS, 2HDMI+eDP, HDMI+LVDS+eDP; both 2HDMI could be replaced with DP by BOM change
HDMI	Up to 4096 x 2160 @ 24 Hz / 2560 x 1600 @ 60 Hz, with Digital Audio
DisplayPort	Up to 4096 x 2160 @ 24 Hz / 3840 x 2160 @ 60 Hz, with Digital Audio
LVDS/eDP	LVDS Up to 1920 x 1200 @60 Hz, Dual Channel 18/24 bit, eDP UP to 4096 x 2340 @ 60Hz
Backlight Control	Voltage / PWM

(continued on the next page)

I/O	
Storage	2 x SATA 6Gb/s 1 x Full size Mini Card (SATA 6Gb/s) 4 pin SATA power (5V, 12V @ 1A)
USB	4 x USB 3.0 ports (4 ports in Rear IO) 6 x USB 2.0 ports (4 ports at mid board, 2 port for mini card)
Display I/O	1 x LVDS, 1 x eDP, 2 x HDMI (DP optional by BOM change)
Audio I/O	Mic-in, Line-out, AAFP at internal connector for 2 additional channel (default Line-out, Mic-in), speaker
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)
DIO	8-bit Digital I/O interface (4-in/4-out)
FAN	1 x CPU Fan connector (4-pin) 1 x Chassis Fan connector (4-pin)
ENVIRONMENT, POWER, & ME	
Battery	Lithium battery
Power requirement	DC input: +12 (± 5%) VDC Back Panel DC jack (5.5/2.5mm) 4-pin internal power connector <b>NOTE:</b> Please use fixed voltage power supply.
Operating Temperature	32°F ~ 140°F (0 ~ 60°C)
Operating Humidity	60°C @ 90% RH Non-Condensing
Certificate	CE & FCC (Class A)
Form Factor	Mini ITX Form Factor, 6.7"x 6.7" (170mmx170mm)
Weight	1.1 lb (0.5 Kg)
PLACEMENT	
Back I/O ports	1 x DC Jack 1 x HDMI / DP (HDMI and DP colay; default: HDMI) 1 x HDMI / DP (HDMI and DP colay; default: HDMI) 2 x LAN (RJ45) 4 x USB 3.0 1 x Audio jacks (Mic-In) pink connector 1 x Audio jacks (Line-Out) green connector

(continued on the next page)

PLACEMENT	
<b>Internal I/O connectors</b>	1 x PCIe[x1] Slot 1 x Full/Half-size Mini Card slot 2 x SATA 6Gb/s 2 x USB 2.0 connectors support additional 4 USB ports (2.00 mm) 2 x boxer header for COM (COM1: RS-232/422/485 supports 5V/12V/RI; COM2: RS-232) 1 x LVDS connector (Top side) 1 x eDP connector (Bottom side) 1 x Panel 3.3V /5V jumper 1 x Panel backlight DC / PWM mode jumper 1 x Panel backlight connector (inverter) 1 x Panel backlight 12V /5V jumper 1 x Digital I/O box 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 1 x Speaker for 2W/4Ω 1 x Chassis Intrusion follow ASUS pin out 1 x Buzzer on board (Pin Header) 1 x AT/ATX mode select jumper 1 x clear CMOS jumper
OTHERS	
<b>OS Support</b>	Windows® 7 32 bit / 64 bit (not supported when a Kaby Lake processor is used) Windows® 8.1 32 bit / 64 bit (not supported when a Kaby Lake processor is used) Windows® 10 64 bit Linux Fedora
<b>Accessories</b>	1 x SATA cable 1 x SATA power cable I/O Shield Support DVD



**NOTE:** Specifications are subject to change without notice.



# 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.

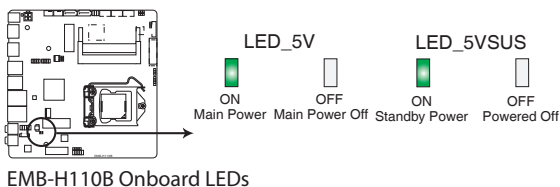


#### CAUTION!

- 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.

#### 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.



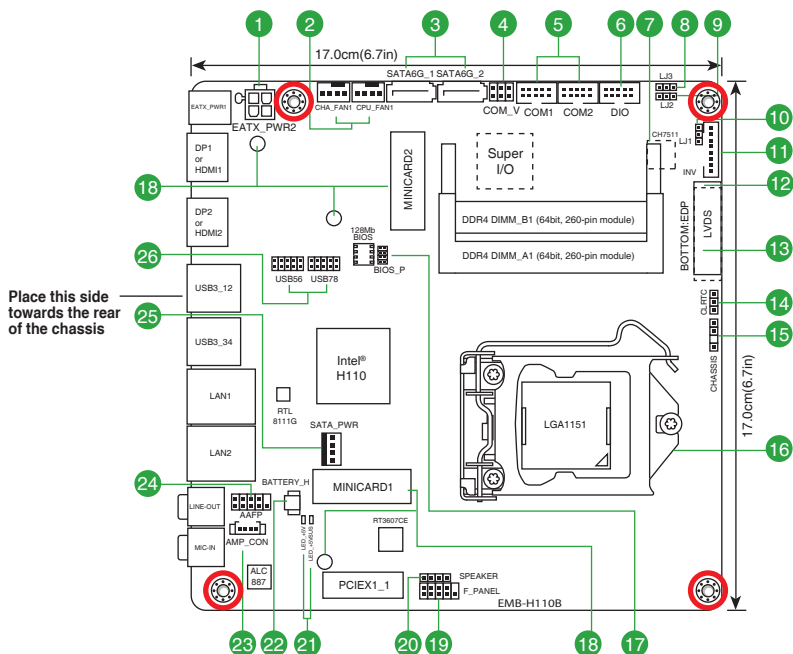
## 2.2 Motherboard layout



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



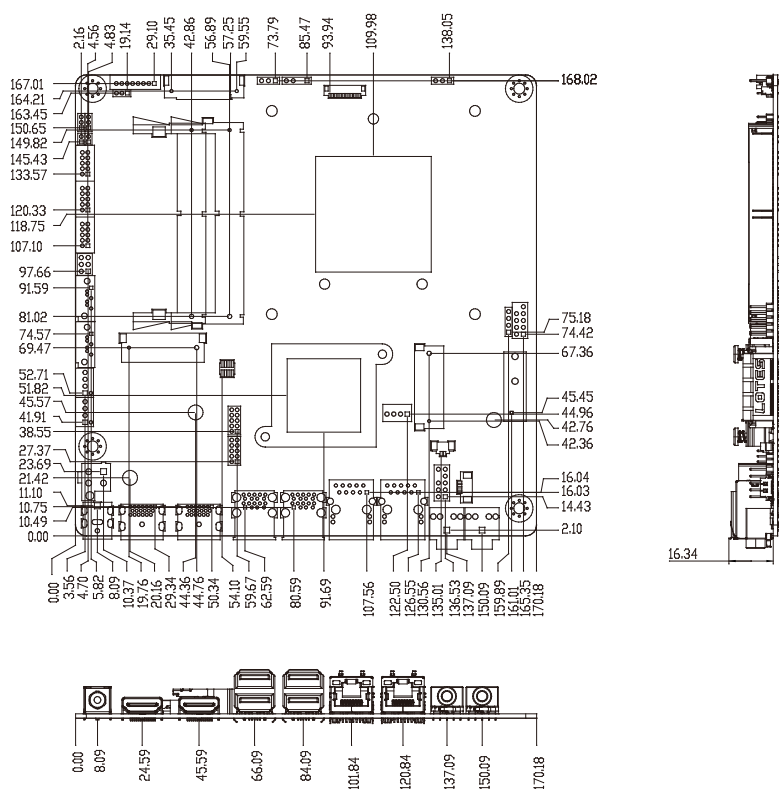
**CAUTION!** Do not overtighten the screws! Doing so can damage the motherboard.



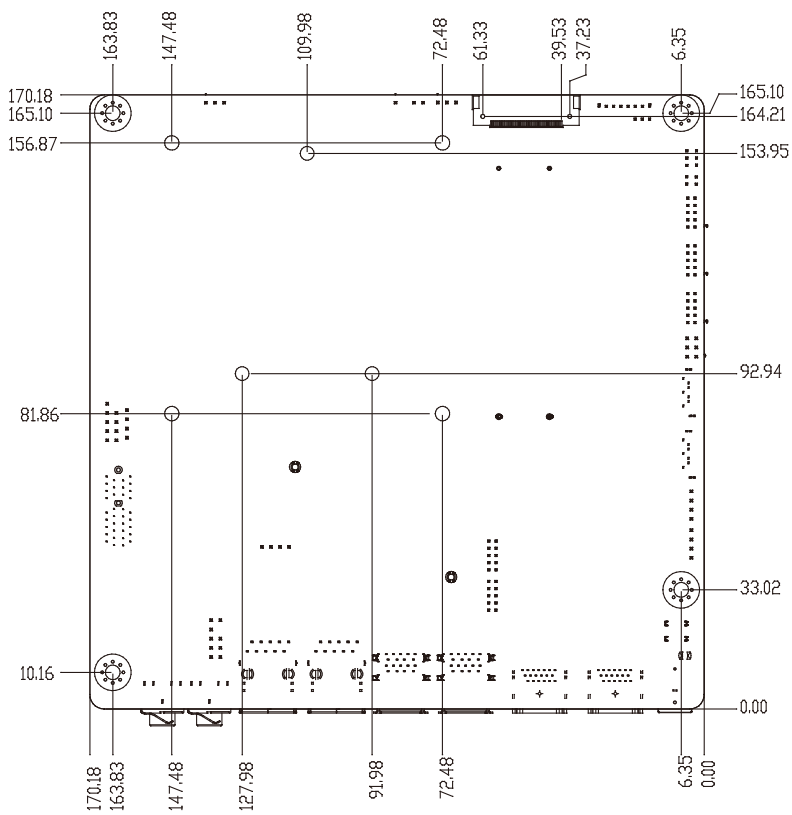
Connectors/Jumpers/Slots	Page
1. EATX power connector (4-pin EATX_PWR2)	2-24
2. CPU and chassis fan connectors (4-pin CPU_FAN1, 4-pin CHA_FAN1)	2-17
3. Serial ATA 6.0Gb/s connectors (7-pin SATA6G_1/2)	2-19
4. COM1 Ring/+5V/+12V selection (COM1_V)	2-13
5. Serial port connectors (10-pin COM1, COM2)	2-23
6. Digital I/O connector (10-pin DIO)	2-18
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10. LVDS panel voltage selection (3-pin LJ1)	2-13
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12. Embedded DisplayPort (40-pin EDP)	2-24
13. LVDS connector (40-pin LVDS)	2-17
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15. Chassis intrusion connector (4-1 pin CHASSIS)	2-18
16. Intel® LGA1151 CPU socket	2-6
17. SPI flash programmable connector (8-pin BIOS_P)	2-22
18. Full / Half size Mini Card (mSATA) (MINICARD2) Half size Mini Card (PCIe+USB) (MINICARD1)	2-20
19. Front panel system panel connector (10-1 pin F_PANEL)	2-19
20. Speaker connector (4-pin SPEAKER)	2-20
21. Standby power LEDs (LED_+5V, LED_+5VSUS)	2-1
22. Battery connector (2-pin BATTERY_H)	2-22
23. Audio amplifier connector (4-pin AMP_CON)	2-16
24. Front panel audio connector (10-1 pin AAFP)	2-25
25. SATA power connector (4-pin SATA_PWR)	2-16
26. USB 2.0 connectors (10-pin USB56, USB78)	2-21

## 2.3 Screw size

### 2.3.1 Component side

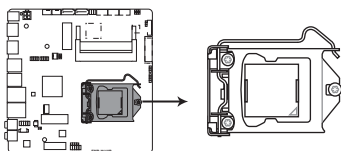


2.3.2 Solder side



## 2.4 Central Processing Unit (CPU)

The motherboard comes with a surface mount LGA1151 socket designed for the Intel® 6<sup>th</sup>/7<sup>th</sup> Generation Core™ i7 / Core™ i5 / Core™ i3, Pentium® / Celeron® processors.



**EMB-H110B CPU socket LGA1151**



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

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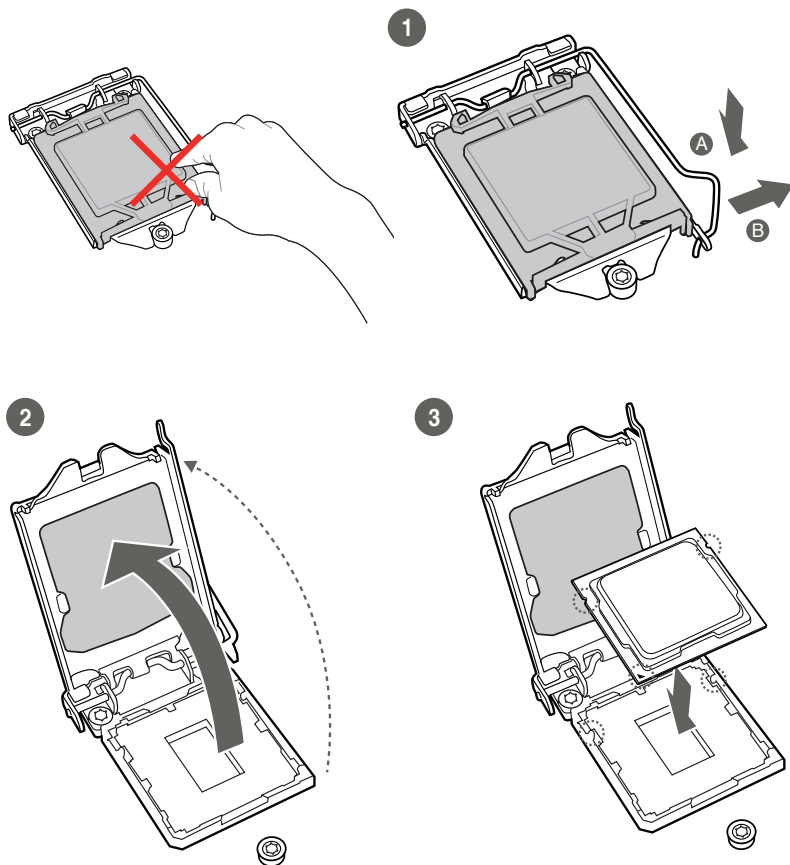


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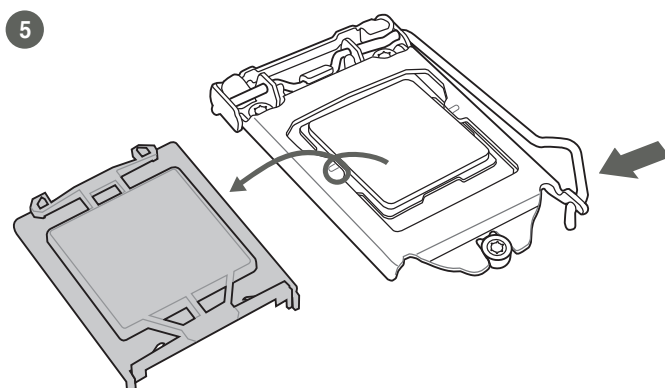
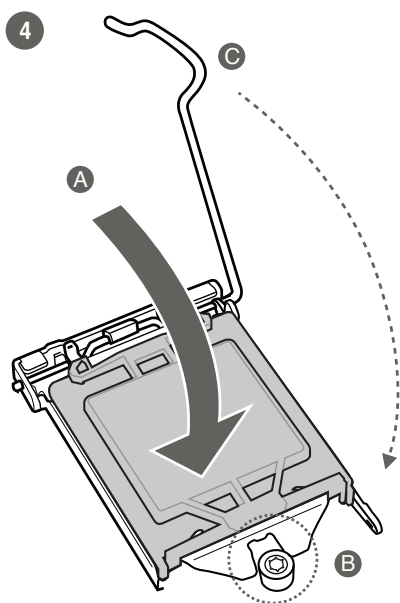
### **CAUTION!**

- 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 LGA1151 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

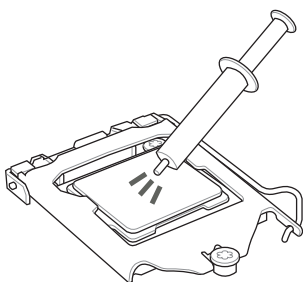


**CAUTION!** LGA1156 CPU is not compatible with the LGA1151 socket. DO NOT install an LGA1156 CPU on the LGA1151 socket.



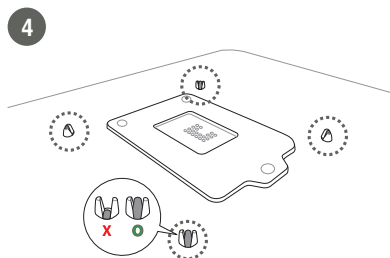
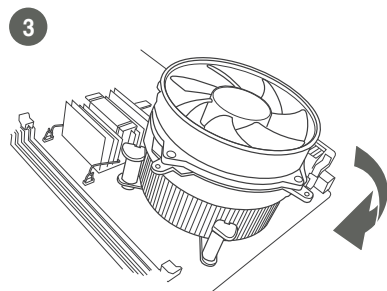
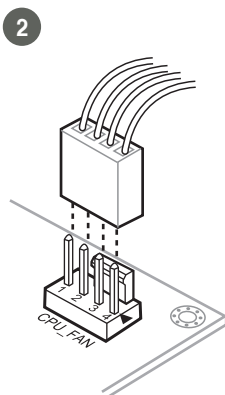
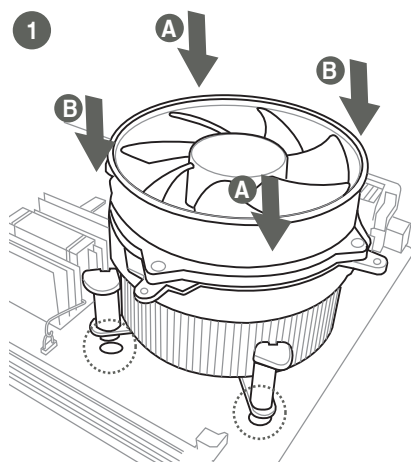


## 2.4.2 CPU heatsink and fan assembly installation

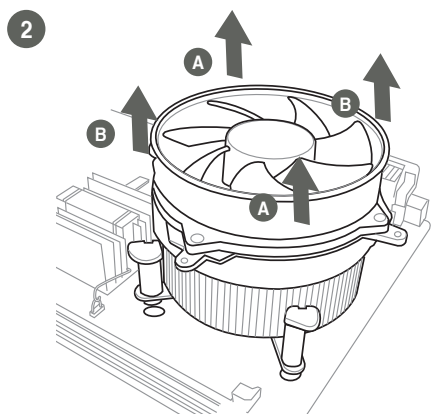
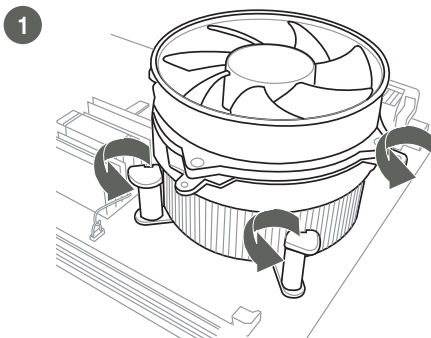


**CAUTION!** Apply the Thermal Interface Material to the CPU heatsink and CPU before you install the heatsink and fan if necessary.

To install the CPU heatsink and fan assembly

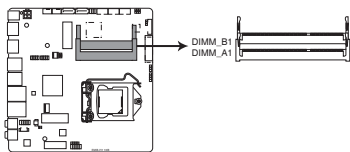


## To uninstall the CPU heatsink and fan assembly



# 2.5      System memory

This motherboard comes with two Double Data Rate 4 (DDR4) Small Outline Dual Inline Memory Module (SO-DIMM) sockets. The figure below illustrates the location of the DDR4 SO-DIMM sockets:

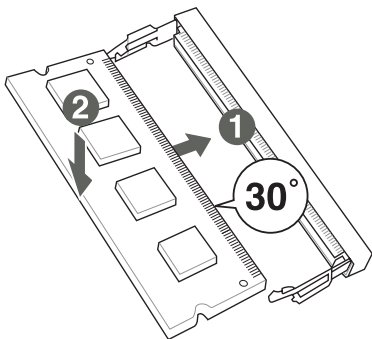


Channel	Sockets
Channel A	SO-DIMM_A1
Channel B	SO-DIMM_B1

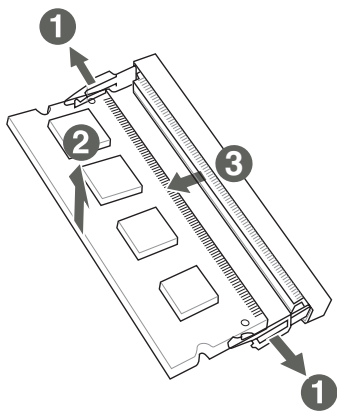
EMB-H110B 260-pin DDR4 SO-DIMM sockets

## 2.5.1      Installing a DIMM

To install a DIMM



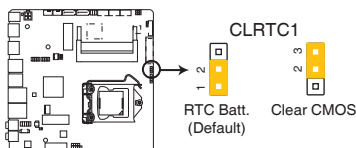
To remove a DIMM



## 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-H110B 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.



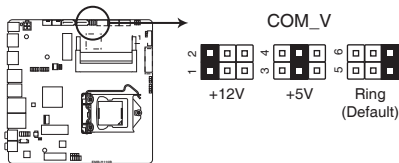
**CAUTION!** Except when clearing the RTC RAM, never remove the cap on CLRTC jumper default position. Removing the cap will cause system boot failure!



#### 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.

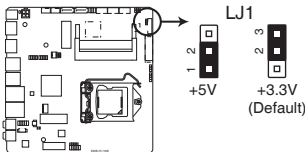
2. COM1 Ring/+5V/+12V selection (COM1\_VSET)



EMB-H110B COM1 Ring/+5V/+12V Selection

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

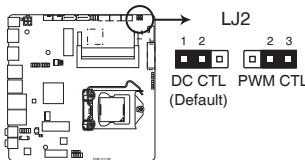
3. LVDS panel voltage selection (3-pin LJ1)



EMB-H110B LVDS Panel Voltage Selection

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

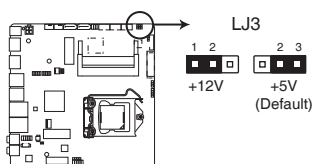
4. Inverter voltage selection (3-pin LJ2)



EMB-H110B Inverter Voltage Selection

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

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

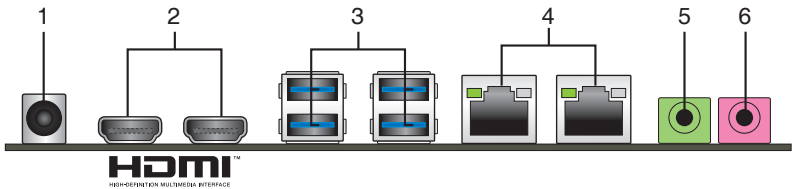


### EMB-H110B Mode Selection for Back Light Control of Inverter

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

## 2.7 Connectors

### 2.7.1 Rear panel connectors



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



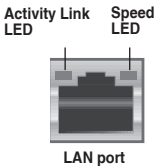
#### NOTES:

- 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.
- 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.

4. **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



- 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.
- 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.

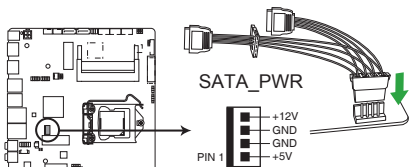
Audio 2, 4, 6, or 8-channel configuration

Port	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

2.7.2 Internal connectors

1. SATA power connector (4-pin SATA\_PWR)

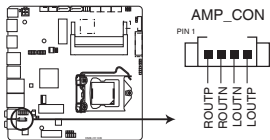
This connector is for the SATA power cable. The power cable plug is designed to fit this connector in only one orientation. Find the proper orientation and push down firmly until the connector completely fits.



EMB-H110B SATA POWER connector

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

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

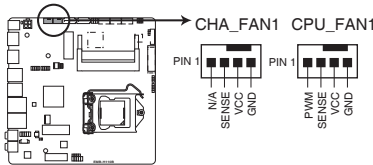


EMB-H110B Audio Stereo Output with Amp connector



### 3. CPU and chassis fan connectors (4-pin CPU\_FAN1, 4-pin CHA\_FAN1)

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.



**EMB-H110B Fan connectors**



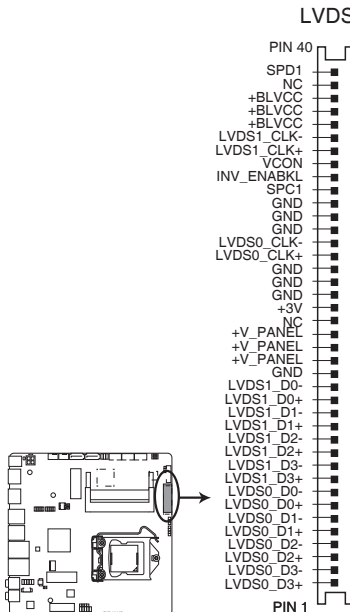
**CAUTION:** Do not forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! Do not place jumper caps on the fan connectors!



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

### 4. LVDS connector (40-pin LVDS)

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

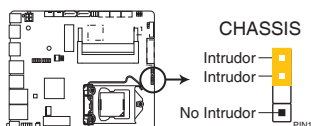


**EMB-H110B LVDS connector**

## 5. 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.

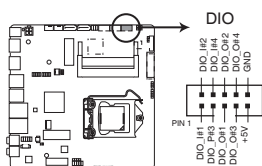
By default, the pins labeled “Intruder” are shorted with a jumper cap. Remove the jumper caps only when you intend to use the chassis intrusion detection feature.



**EMB-H110B Chassis intrusion connector**

## 6. 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.



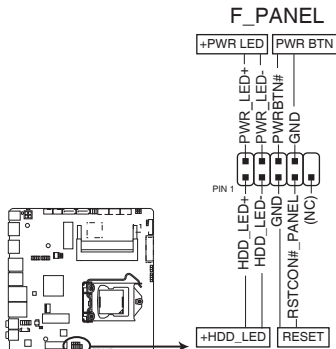
**EMB-H110B DIO connector**



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

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

This connector supports several chassis-mounted functions.



**EMB-H110B System panel 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)**

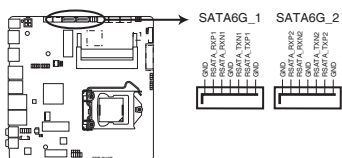
This 2-pin connector is for the system power button.

- **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.

## 8. Serial ATA 6.0Gb/s connectors (7-pin SATA6G\_1/2)

These 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-H110B SATA 6.0Gb/s connectors**



**NOTE:** You must install Windows® 7 or later version before using Serial ATA hard disk drives.

## 9. Speaker connector (4-pin SPEAKER)

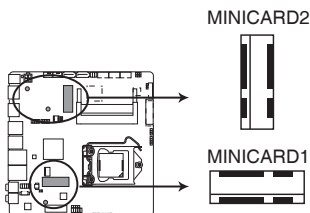
The 4-pin connector is for the chassis-mounted system warning speaker. The speaker allows you to hear system beeps and warnings.



**EMB-H110B SPEAKER connector**

## 10. Minicard connectors

Use these connectors to connect a Minicard device.



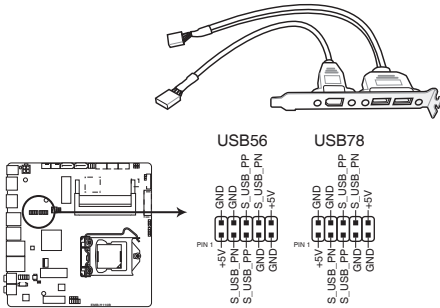
**EMB-H110B MINICARD connectors**



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

### 11. USB 2.0 connectors (10-pin USB56, USB78)

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-H110B 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.



**IMPORTANT!**

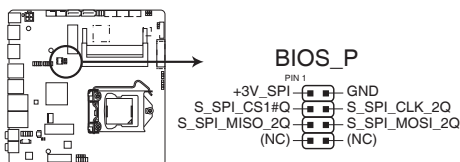
- Before you install Windows® 7, go to the **Advanced** tab of the BIOS Setup program and configure the following items: **XHCI mode [Disabled]** and **USB (EHCI support) [Enabled]**. You can re-configure these BIOS items after the Windows® 7 installation.
- You can download the Intel-released XHCI Driver Creator Utility for Windows 7 from: <https://downloadcenter.intel.com/download/25476/Windows-7-USB-3-0-Creator-Utility>

### Installing Windows® 7 in Skylake platform

1. Use the Windows® 7 XHCI Driver Creator Utility to pack the XHCI driver into the original Windows 7 OS image. A new Windows 7 OS image will be created.
2. Use the new OS image to install Windows® 7.

## 12. SPI Flash programmable connector (8-pin BIOS\_P)

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



**EMB-H110B SPI programming connector**

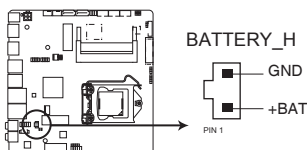
---

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

---

## 13. Battery connector (2-pin BATTERY\_H)

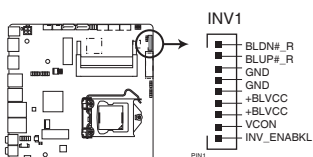
This connector is for the lithium CMOS battery.



**EMB-H110B Battery Holder connector**

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

Connect the backlight inverter power cable to this connector.



**EMB-H110B Inverter connector**



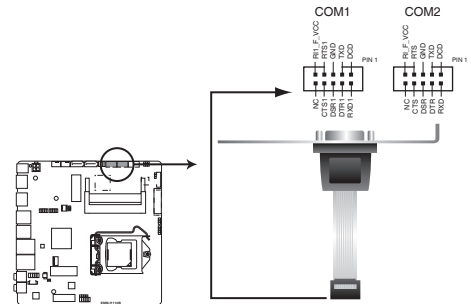
---

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

---

15. 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-H110B Serial port connectors

Pin	Signal	Pin	Signal
1	DCD (422TXD-/485DATA-)	2	RXD (422RXD+)
3	TXD (422TXD+/485DATA+)	4	DTR (422RXD-)
5	GND	6	DSR
7	RTS	8	CTS
9	RI/+12V/+5V	10	N.C.

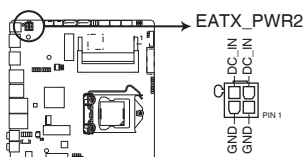


NOTES:

- The serial port cables are purchased separately.
- Only COM1 can support RS-422 and RS-485.

## 16. EATX power connector (4-pin EATX\_PWR2)

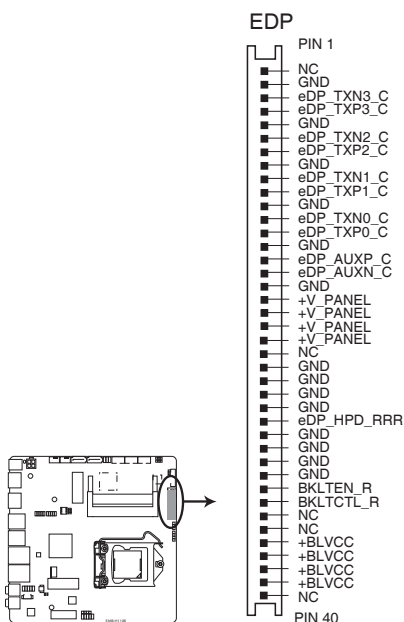
This connector is for EATX power supply plug. The power supply plug is designed to fit this connector in only one orientation. Find the proper orientation and push down firmly until the connector completely fit.



**EMB-H110B 1 x 4 PIN (2x2)**  
**internal power connector**

## 17. Embedded DisplayPort (40-pin EDP)

This connector is for an internal embedded DisplayPort connection.

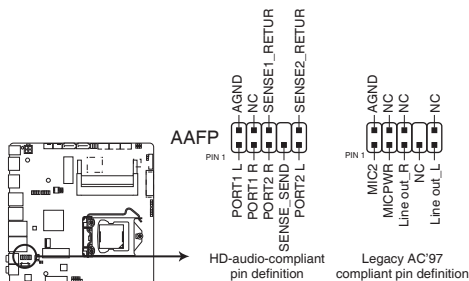


**EMB-H110B Embedded DisplayPort**



## 18. 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-H110B Front panel audio connector**



### IMPORTANT!

- 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].

## 2.8 Power Supply Considerations



---

### CAUTION!

- The external DC jack (5.5/2.5mm) is the primary power input connector of EMB-H110B. 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), the  $V_{out}$  (+12V) output voltage is set around 11.6V.
-

# 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.



---

**NOTE:** 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.

---



---

#### 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**.
  - 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:

<b>Main</b>	For changing the basic system configuration.
<b>Advanced</b>	For changing the advanced system settings.
<b>Chipset</b>	For viewing and changing chipset settings.
<b>Security</b>	For setting up BIOS security settings.
<b>Boot</b>	For changing the system boot configuration.
<b>Save &amp; Exit</b>	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

The Main menu provides you an overview of the basic system information, and allows you to set the system date, time, language, and security settings.

### 3.2.1 System Date [Day MM/DD/YYYY]

Allows you to set the system date.

### 3.2.2 System Time [HH:MM:SS]

Allows you to set the system time.

## 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.

---

### Case Open Warning [Disabled]

Allows you to enable or disable case open warning function. Configuration options: [Disabled] [Enabled] [Clear]

### 3.3.1 CPU Configuration

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



---

The items shown in the submenu may be different depending on the type of CPU installed.

---

**Hyper-threading [Enabled]**

The Intel Hyper-Threading Technology allows a hyper-threading processor to appear as two logical processors to the operating system, allowing the operating system to schedule two threads or processes simultaneously.

- [Enabled] Two threads per activated core are enabled.
- [Disabled] Only one thread per activated core is enabled.



Configuration options for active processor cores are dependent on the installed CPU.

**Intel Virtualization Technology [Enabled]**

- [Enabled] Allows a hardware platform to run multiple operating systems separately and simultaneously, enabling one system to virtually function as several systems.
- [Disabled] Disables this function.

**3.3.2 SATA Configuration**

The BIOS automatically detects the presence of SATA devices. The Serial ATA Ports listed will display **Empty** if there are no Serial devices connected to the ports.

**Serial ATA Port 0, 1, 3**

**Port 0, 1, 3 [Enabled]**

These items become configurable when you set the SATA Mode Selection item to [AHCI] and [RAID], and allow you to enable/disable the SATA port(s).  
Configuration options: [Disabled] [Enabled]

**Hot Plug [Disabled]**

These items become configurable when you set the SATA Mode Selection item to [AHCI] and [RAID], and allow you to enable/disable SATA Hot Plug Support.  
Configuration options: [Disabled] [Enabled]

**3.3.3 USB Configuration**



The USB Devices item lists 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] USB devices are only available when running BIOS Setup.
- [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.

### **XHCI Hand-off [Enabled]**

- [Enabled] Enables the support for operating systems without an XHCI hand-off feature.
- [Disabled] Disables the XHCI Hand-off support.

## **3.3.4 PCH-FW Configuration**

### **Firmware Update Configuration**

#### **Me FW Image Re-Flash [Disabled]**

This item allows you to enable or disable Me FW Image Re-Flash function.  
Configuration options: [Disabled] [Enabled]

#### **Local FW Update [Enabled]**

This item allows you to enable or disable the local FW update function.  
Configuration options: [Disabled] [Enabled]

## **3.3.5 SIO Configuration**

The items in this menu allow you to configure Super IO settings.

### **[\*Active\*] Serial Port 1**

#### **Use this device [Enabled]**

Allows you to enable or disable this logical device. Configuration options: [Enabled] [Disabled]



---

The following two items appear only when you set **Use this device** to [Enabled].

---

#### **Possible [Use Automatic Settings]**

Allows you to select an optimal setting for Super I/O devices. Configuration options: [Use Automatic Settings] [IO=3F8h; IRQ=4;] [IO=2F8h; IRQ=3]

#### **Mode [RS-232]**

Allows you to select the Serial Port mode. Configuration options: [RS-232] [RS-422] [RS-485]

### **[\*Active\*] Serial Port 2**

#### **Use this device [Enabled]**

Allows you to enable or disable this logical device. Configuration options: [Enabled] [Disabled]

### Possible [Use Automatic Settings]

This item appears only when you set **Use this device** to [Enabled] and allows you to select an optimal setting for Super I/O devices. Configuration options: [Use Automatic Settings] [IO=2F8h; IRQ=3] [IO=3F8h; IRQ=4;]

## 3.3.6 Hardware Monitor

The items in this menu allow you to configure the smart fan.

### Smart Fan Configuration

#### CPU Smart Fan Control [Enabled]

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



---

The following sub-items appear only when you set **CPU Smart Fan Control** to [Enabled].

---

#### Fan Control Mode [SMART FAN IV Mode]

Select fan control mode. Configuration options: [Manual Mode] [Thermal Cruise Mode] [SMART FAN IV Mode]



---

The following 6 items appear only when you set Fan Control Mode to [Smart FAN IV Mode].

---

##### Temperature source [PECI Agent 0]

Allows you to select the temperature source. Configuration options: [SYSTIN] [CPUTIN] [AUXTIN0] [AUXTIN1] ~ [BYTE\_TEMP]

##### Temperature 1~4 [xx]

Input temperature setting. The values range from 0~255.

##### Fan PWM 1~4 [xx]

Input amount of Fan PWM 4 for Smart Fan IV Mode. The values range from 0~255.

##### Tolerance of Temperature [xx]

Input tolerance of target temperature. The values range from 0~7.

##### Critical Temperature [xx]

Determines the time that Fan Out takes to decrease its value by one step. The values range from 0~255.

##### Critical Temp Tolerance [xx]

Input tolerance of critical temperature. The values range from 0~7.



---

The following item appears only when you set Fan Control Mode to [Manual Mode].

---

### **PWM/DC Voltage Output [255]**

Sets the voltage allocated for Fan Control. Input value range: [0~255]



---

The following item appears only when you set Fan Control Mode to [Thermal Cruise Mode].

---

### **Temperature source [PECI Agent 0]**

Allows you to select the temperature source. Configuration options: [SYSTIN] [CPUTIN] [AUXTIN0] [AUXTIN1] ~ [BYTE\_TEMP]

## **Chassis 1 Smart Fan Control [Enabled]**

Allows you to enable or disable Chassis 1 Smart Fan Control. Configuration options: [Enabled] [Disabled]



---

The following sub-items appear only when you set Chassis 1 Smart Fan Control to [Enabled].

---

### **Temperature source [PWM Mode]**

Allows you to select the temperature source. Configuration options: [PWM Mode] [DC Mode]

### **Fan Control Mode [SMART FAN IV Mode]**

Select fan control mode. Configuration options: [Manual Mode] [Thermal Cruise Mode] [SMART FAN IV Mode]



---

The following 6 items appear only when you set Fan Control Mode to [Smart FAN IV Mode].

---

### **Temperature source [SYSTIN]**

Allows you to select the temperature source. Configuration options: [SYSTIN] [CPUTIN] [AUXTIN0] [AUXTIN1] ~ [BYTE\_TEMP]

### **Temperature 1~4 [xx]**

Input temperature setting. The values range from 0~255.

### **Fan PWM 1~4 [xx]**

Input amount of Fan PWM 4 for Smart Fan IV Mode. The values range from 0~255.

### **Tolerance of Temperature [xx]**

Input tolerance of target temperature. The values range from 0~7.

### **Critical Temperature [xx]**

Determines the time that Fan Out takes to decrease its value by one step. The values range from 0~255.



### **Critical Temp Tolerance [xx]**

Input tolerance of critical temperature. The values range from 0~7.



---

The following item appears only when you set Fan Control Mode to [Manual Mode].

---

### **PWM/DC Voltage Output [255]**

Sets the voltage allocated for Fan Control. Input value range: [0~255]



---

The following item appears only when you set Fan Control Mode to [Thermal Cruise Mode].

---

### **Temperature source [SYSTIN]**

Allows you to select the temperature source. Configuration options: [SYSTIN] [CPUTIN] [AUXTIN0] [AUXTIN1] ~ [BYTE\_TEMP]

## **3.3.7 Power Management**

### **Power Mode [ATX Type]**

Select power supply mode. Configuration options: [ATX Type] [AT Type]



---

The following items appear when you set Power Mode to [ATX Type].

---

### **Power Saving (ERP) Control [Disabled]**

This item configures power mode for power saving function.

Configuration options: [Disabled] [Enabled]

### **Restore AC Power Loss [Last State]**

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

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

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

### **RTC Wake system from S5 [Disabled]**

[Disabled] Disables system wake up from S5.

[Fixed Time] The system will wake up at the specified hr::min::sec. Configuration options: [Disabled] [Enabled] .

[Dynamic Time] The system will wake up at the current time plus a specified number of minutes.



---

The following items appear when Fixed Time is enabled.

---

### **Wake up day/hour/minute/second [0]**

Specify the values for day/hour/minute/second.



---

The following item appears when Wake System with Dynamic Time is enabled.

---

### **Wake up minute increase [1]**

Specify the number of minutes added to the current time before waking up system. Input value range: [1~5]

### **Resume from PME# [Enabled]**

Allows you to enable or disable resume from PME# function. Configuration options: [Enabled] [Disabled]

### **Resume from PCIE/RI [Enabled]**

Allows you to enable or disable resume from PCIE/RI function. Configuration options: [Enabled] [Disabled]

## **3.3.7 Digital IO Port Configuration**

The items listed in this screen configure Digital IO settings.

### **DIO Port1~DIO Port4 [Output]**

Configuration options: [Input] [Output]



---

The following item appears only when you set **DIO Port1/2/3/4** to [Output].

---

### **Output Level [High]**

Configuration options: [High] [Low]

### **DIO Port5~DIO Port8 [Input]**

Configuration options: [Input] [Output]

## 3.4 Chipset menu

The Chipset menu items allow you to change the settings for the chipset.

### 3.4.1 System Agent (SA) Configuration

#### **Max TOLUD [Dynamic]**

Allows you to select more useable memory on x86 OS. Select [Dynamic] to adjust TOLUD automatically based on the largest MMIO length of the installed graphic controller. Configuration options: [Dynamic] [1 GB] [1.25 GB] [1.5 GB] [1.75GB] [2 GB] [2.25 GB] [2.5GB] [2.75GB] [3 GB] [3.25 GB]

#### **Max Link Speed [Auto]**

Allows you to configure the PEG port Gen speed. Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

#### **Graphics Configuration**

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

Allows you to decide which graphics controller to use as the primary boot device. Configuration options: [Auto] [IGFX] [PEG] [PCIE]

##### **Primary IGFX Boot Display [VBIOS Default]**

Select the video device which will be activated during POST. This setting has no effect if an external graphics device is present. The secondary boot display selection appears based on your selection and the VGA mode is supported only on primary display. Configuration options: [VBIOS Default] [DP] [eDP] [LVDS] [HDMI]

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

Allows you to enable or disable LVDS (CH7511). Configuration options: [Disabled] [Enabled]

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

Allows you to configure LVDs panel used by Internal Graphics Device. 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] [1280x800, 24bit, 60Hz] [12800x800, 18bit, 60Hz]

## 3.4.2 PCH-IO Configuration

### HD Audio [Auto]

This item controls the detection of HD Audio devices. Configuration options:  
[Disabled] [Enabled] [Auto]

## 3.5 Security menu

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

### 3.5.1 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.

### 3.5.2 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.

#### To change a user password:

1. Select the User 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 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**.

## 3.6 Boot menu

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

### Boot Configuration

#### Quiet Boot [Enabled]

This item enables/disables Quiet Boot. Configuration options: [Disabled] [Enabled]

#### Launch PXE ROM [Disabled]

This item enables/disables the execution of UEFI and Legacy PXE OpROM. Configuration options: [Disabled] [Enabled]

#### Boot Option Priorities

These items specify the boot device priority sequence from the available devices. The number of device items that appears on the screen depends on the number of devices installed in the system.



- To select the boot device during system startup, press <F7> during POST.
- To access Windows OS in Safe Mode, do any of the following:
  - Press <F5> during POST.
  - Press <F8> after POST.

#### Boot Override

These items display the available devices. The number of device items that appears on the screen depends on the number of devices installed in the system. Click an item to start booting from the selected device.

## 3.7 Save & Exit menu

### **Save Changes and Reset**

Once you are finished making your selections, choose this option from the Save & Exit menu to ensure the values you selected are saved. When you select this option, a confirmation window appears. Select Yes to save changes and reset.

### **Discard Changes and Reset**

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.

### **Save Options**

Save or discard changes to current configuration.

### **Restore Defaults**

Save or restore User Defaults to all setup options.

### **Save as User Defaults**

This item saves current configuration as User Default.

### **Restore User Defaults**

This option restores User Defaults to all setup options.

# 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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HDMI Trademark Notice

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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。