DFI®

AL102
Mini-ITX Industrial Motherboard
User's Manual

Preliminary Version

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This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. 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 the receiver.
• Connect the equipment into 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.

Notice:

1. The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
2. Shielded interface cables must be used in order to comply with the emission limits.

Table of Contents

Warranty

1. Warranty does not cover damages or failures that arised from misuse of the product, inability to use the product, unauthorized replacement or alteration of components and product specifications.

2. The warranty is void if the product has been subjected to physical abuse, improper installation, modification, accidents or unauthorized repair of the product.

3. Unless otherwise instructed in this user's manual, the user may not, under any circumstances, attempt to perform service, adjustments or repairs on the product, whether in or out of warranty. It must be returned to the purchase point, factory or authorized service agency for all such work.

4. We will not be liable for any indirect, special, incidental or consequencial damages to the product that has been modified or altered.

Static Electricity Precautions

It is quite easy to inadvertently damage your PC, system board, components or devices even before installing them in your system unit. Static electrical discharge can damage computer components without causing any signs of physical damage. You must take extra care in handling them to ensure against electrostatic build-up.

1. To prevent electrostatic build-up, leave the system board in its anti-static bag until you are ready to install it.

2. Wear an antistatic wrist strap.

3. Do all preparation work on a static-free surface.

4. Hold the device only by its edges. Be careful not to touch any of the components, contacts or connections.

5. Avoid touching the pins or contacts on all modules and connectors. Hold modules or connectors by their ends.

> **Important:**
> Electrostatic discharge (ESD) can damage your processor, disk drive and other components. Perform the upgrade instruction procedures described at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

Safety Measures

To avoid damage to the system:
• Use the correct AC input voltage range.

To reduce the risk of electric shock:
• Unplug the power cord before removing the system chassis cover for installation or servicing. After installation or servicing, cover the system chassis before plugging the power cord.

About the Package

The package contains the following items. If any of these items are missing or damaged, please contact your dealer or sales representative for assistance.

• 1 AL102 motherboard

The board and accessories in the package may not come similar to the information listed above. This may differ in accordance to the sales region or models in which it was sold. For more information about the standard package in your region, please contact your dealer or sales representative.

Before Using the System Board

Before using the system board, prepare basic system components.

If you are installing the system board in a new system, you will need at least the following internal components.

• Memory module
• Storage devices such as hard disk drive, etc.

You will also need external system peripherals you intend to use which will normally include at least a keyboard, a mouse and a video display monitor.

Chapter 1 - Introduction

Specifications

SYSTEM	Processor	Intel Atom® Processor E3900 Family, BGA 1296 Intel Atom® x7-E3950 Processor, Quad Core, 2M Cache, 1.6GHz (2.0GHz), 12W Intel Atom® x5-E3940 Processor, Quad Core, 2M Cache, 1.6GHz (1.8GHz), 9.5W Intel® Pentium® Processor N4200, Quad Core, 2M Cache, 1.1GHz (2.5GHz), 6W Intel® Celeron® Processor N3350, Dual Core, 2M Cache, 1.1GHz (2.4GHz), 6W
	Memory	Two 204-pin SODIMM up to 8GB Dual Channel DDR3L 1867MHz
	BIOS	Insyde SPI 128Mbit (supports UEFI boot only)
GRAPHICS	Controller	Intel® HD Graphics GT Series
	Feature	OpenGL 5.0, DirectX 12, OpenCL 2.1 HW Decode: AVC/H.264, MPEG2, VC1/WMV9, JPEG/MJPEG, HEVC/H.265, VP8, VP9, MVC HW Encode: AVC/H.264, JPEG/MJPEG, HEVC/H.265, VP8, VP9, MVC
	Display	1 x VGA 1 x HDMI 1 x LVDS/eDP (opt.) VGA: resolution up to 2560x1600 @ 60Hz HDMI: resolution up to 3840x2160 @ 30Hz LVDS: dual channel 48-bit, resolution up to 1920x1200 @ 60Hz eDP: resolution up to 4096x2160 @ 60Hz
	Triple Displays	VGA/HDMI/LVDS VGA/HDMI/eDP (opt.)
EXPANSION	Interface	1 x M.2 M key (support 2242/2280) (PCIe/SATA3.0) 1 x M.2 E key (support 2230) (PCIe/USB2.0) 1 x Full-size Mini PCIe (PCIe2.0/USB2.0) (opt.)
AUDIO	Audio Codec	Realtek ALC269Q
ETHERNET	Controller	2 x Realtek RTL8111H-CG
REAR I/O	Ethernet	2 x GbE (RJ-45)
	USB	4 x USB 3.0
	Display	1 x VGA 1 x HDMI
	Audio	1 x Line-out (opt.)
	Serial	2 x RS-232/422/485 (RS232 w/ power) (RS422/485 opt.) (DB-9)

INTERNAL I/O	Serial	4 x RS-232 (2.0mm pitch) (opt.)
	USB	4 x USB 2.0 (2.0mm pitch) 1 x USB 2.0 (2.54mm pitch) or 1 x Vertical USB 2.0 Type A (opt.)
	Display	1 x LVDS LCD Panel Connector 1 x LCD/Inverter Power 1 x eDP LCD Panel Connector (opt.)
	Audio	1 x Audio (Line-out/Mic-in)
	SATA	1 x SATA 3.0 (up to 6Gb/s) 1 x SATA power
	DIO	1 x 8-bit DIO
	LPC	1 x LPC (supports LPC EXT-RS232/RS485 module)
	SMBus	1 x SMBus
WATCHDOG TIMER	Output & Interval	System Reset, Programmable via Software from 1 to 255 Seconds
SECURITY	TPM	TPM 2.0 (opt.)
POWER	Type	Single 12V +/-10% DC
	Connector	DC-in Jack (opt.) Right Angle Connector (4-pin) (opt.) Vertical Type Connector (4-pin)
	RTC Battery	CR2032 Coin Cell
OS SUPPORT (UEFI ONLY)	Microsoft	Windows 10 64-bits (LTSB)
ENVIRONMENT	Temperature	Operating: 0 to 50°C Storage: -30 to 60°C
	Humidity	Operating: 5 to 90% RH Storage: 5 to 90% RH
MECHANICAL	Dimensions	Mini-ITX Form Factor 170mm (6.7") x 170mm (6.7")
	Height	PCB: 1.6mm Top Side: 40mm, Bottom Side: 3.3mm

Features

- ### Watchdog Timer

The Watchdog Timer function allows your application to regularly "clear" the system at the set time interval. If the system hangs or fails to function, it will reset at the set time interval so that your system will continue to operate.

- ### DDR3L

DDR3L requires less voltage (1.35V) than DDR3 (1.5V). DDR3L SDRAM modules support 1867MHz for DDR modules.

- ### Graphics

The integrated Intel® HD graphics engine delivers an excellent blend of graphics performance and features to meet business needs. It provides excellent video and 3D graphics with outstanding graphics responsiveness. These enhancements deliver the performance and compatibility needed for today's and tomorrow's business applications. Supports 1 x VGA, 1 x HDMI and 1 x LVDS/eDP (eDP optional) interfaces for triple display outputs.

- ### Serial ATA

Serial ATA is a storage interface that is compliant with SATA 1.0a specification. With speed of up to 6Gb/s (SATA 3.0), it improves hard drive performance faster than the standard parallel ATA whose data transfer rate is 100MB/s.

- ### Gigabit LAN

Two Realtek RTL8111H-CG Ethernet controllers support up to 1Gbps data transmission.

- ### Audio

The Realtek ALC269Q audio codec provides 4-channel High Definition audio output.

- ### Wake-On-LAN

This feature allows the network to remotely wake up a Soft Power Down (Soft-Off) PC. It is supported via the onboard LAN port or via a PCI LAN card that uses the PCI PME (Power Management Event) signal. However, if your system is in the Suspend mode, you can power-on the system only through an IRQ or DMA interrupt.

- ### Wake-On-USB

This function allows you to use a USB keyboard or USB mouse to wake up a system from the S3 (STR - Suspend To RAM) state.

- ### ACPI STR

The system board is designed to meet the ACPI (Advanced Configuration and Power Interface) specification. ACPI has energy saving features that enables PCs to implement Power Management and Plug-and-Play with operating systems that support OS Direct Power Management. ACPI when enabled in the Power Management Setup will allow you to use the Suspend to RAM function.

With the Suspend to RAM function enabled, you can power-off the system at once by pressing the power button or selecting "Standby" when you shut down Windows® without having to go through the sometimes tiresome process of closing files, applications and operating system. This is because the system is capable of storing all programs and data files during the entire operating session into RAM (Random Access Memory) when it powers-off. The operating session will resume exactly where you left off the next time you power-on the system.

- ### Power Failure Recovery

When power returns after an AC power failure, you may choose to either power-on the system manually or let the system power-on automatically.

- ### USB

The system board supports the new USB 3.0. It is capable of running at a maximum transmission speed of up to 5 Gbit/s (625 MB/s) and is faster than USB 2.0 (480 Mbit/s, or 60 MB/s) and USB 1.1 (12Mb/s). USB 3.0 reduces the time required for data transmission, reduces power consumption, and is backward compatible with USB 2.0. It is a marked improvement in device transfer speeds between your computer and a wide range of simultaneously accessible external Plug and Play peripherals.

Chapter 2 - Hardware Installation

Board Layout
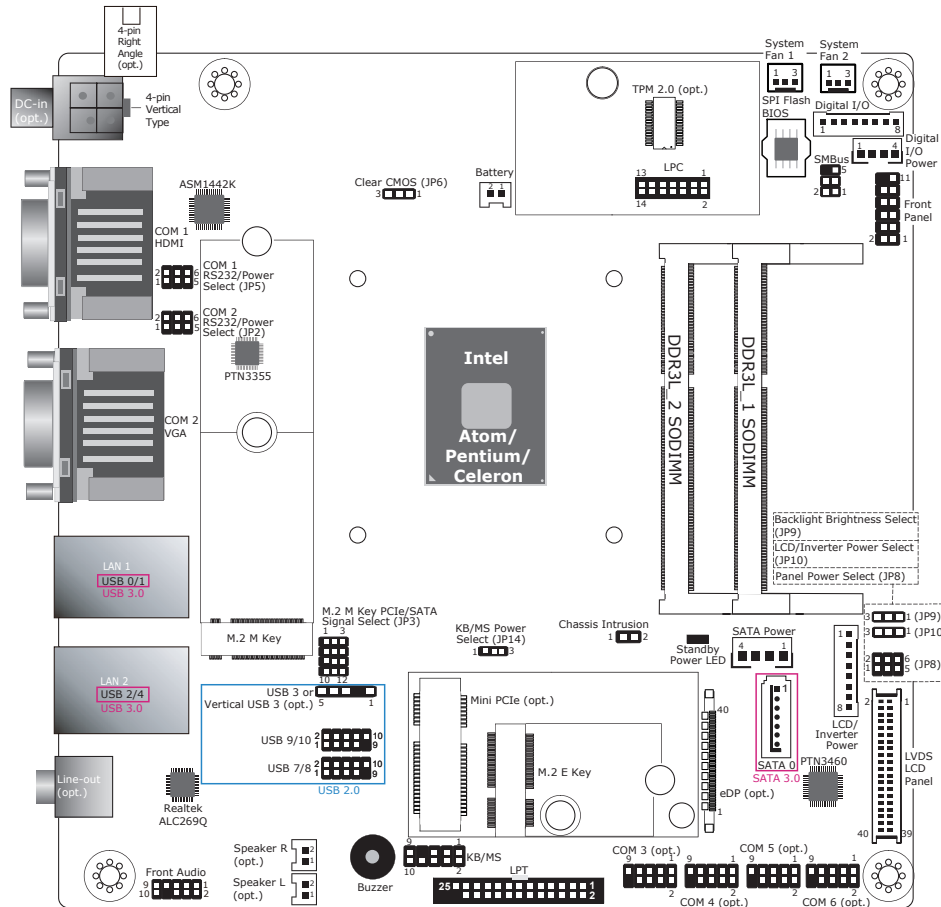
Important:
Electrostatic discharge (ESD) can damage your board, processor, disk drives, add-in boards, and other components. Perform installation procedures at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis. If a wrist strap is unavailable, establish and maintain contact with the system chassis throughout any procedures requiring ESD protection.

System Memory

Important:
When the Standby Power LED lights red, it indicates that there is power on the system board. Power-off the PC then unplug the power cord prior to installing any devices. Failure to do so will cause severe damage to the motherboard and components.
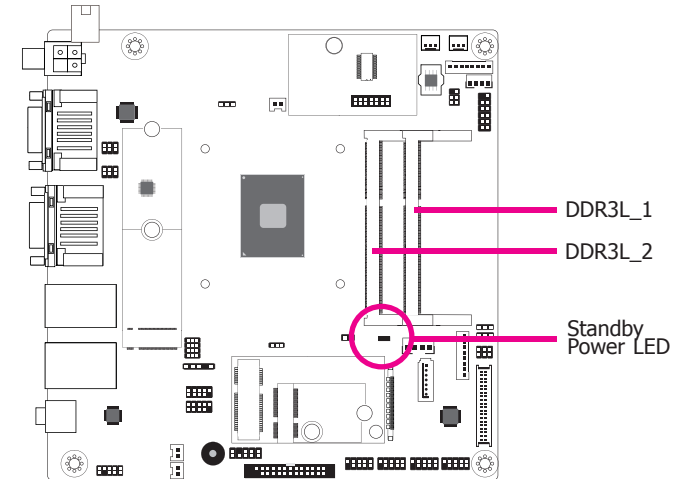
Features

- Two 204-pin SODIMM up to 8GB
- Dual Channel DDR3L 1867MHz

The system board supports the following memory interface.

Single Channel (SC)

Data will be accessed in chunks of 64 bits (8B) from the memory channels.

Dual Channel (DC)

Data will be accessed in chunks of 128 bits from the memory channels. Dual channel provides better system performance because it doubles the data transfer rate.

Installing the SODIMM Module

Note:
The system board used in the following illustrations may not resemble the actual board. These illustrations are for reference only.

1. Make sure the PC and all other peripheral devices connected to it has been powered down.

2. Disconnect all power cords and cables.

3. Locate the SODIMM socket on the system board.

4. Note the key on the socket. The key ensures the module can be plugged into the socket in only one direction.

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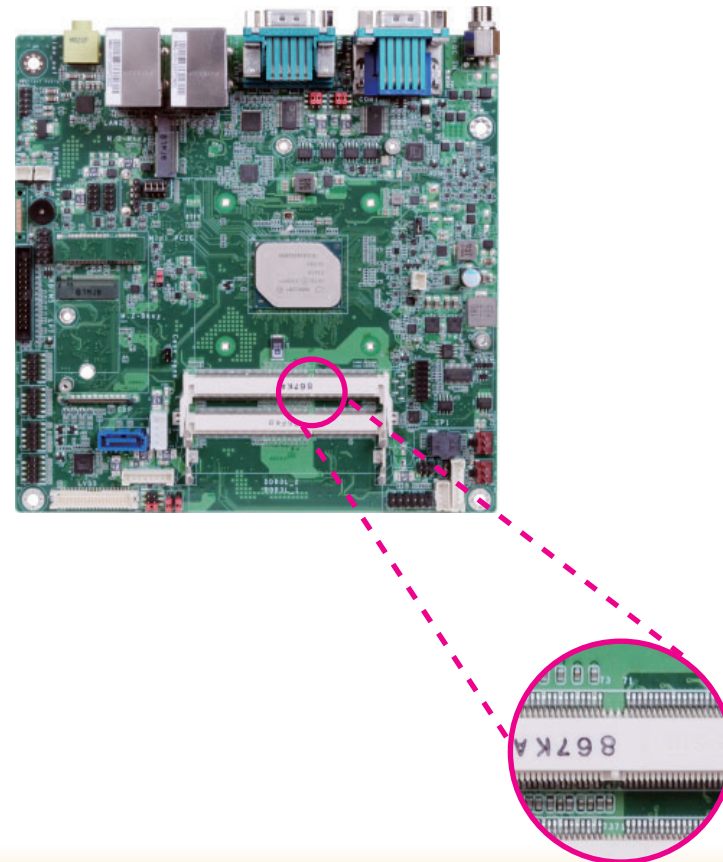
5. Grasping the module by its edges, align the module into the socket at an approximately 30 degrees angle. Apply firm even pressure to each end of the module until it slips down into the socket. The contact fingers on the edge of the module will almost completely disappear inside the socket.
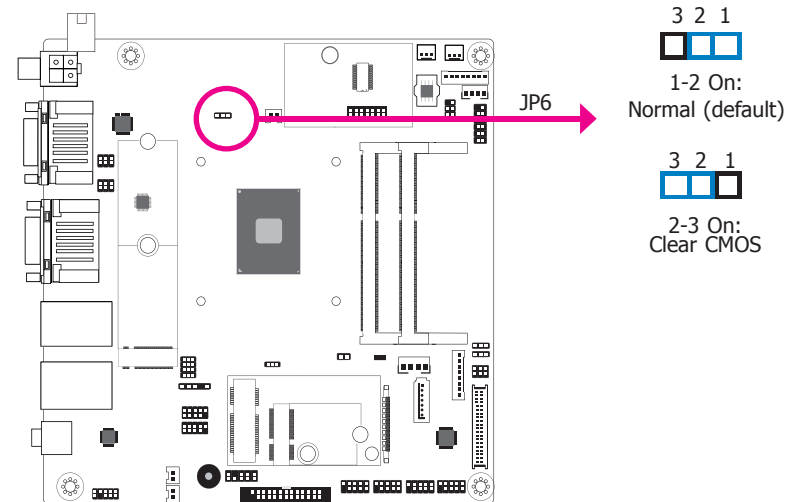
6. Push down the module until the clips at each end of the socket lock into position. You will hear a distinctive "click", indicating the module is correctly locked into position.

Clip   Clip

Jumper Settings

Clear CMOS

JP6

3 2 1

1-2 On:
Normal (default)

3 2 1

2-3 On:
Clear CMOS

If you encounter that CMOS data becomes corrupted, you can reconfigure the system with the default values stored in the ROM BIOS.
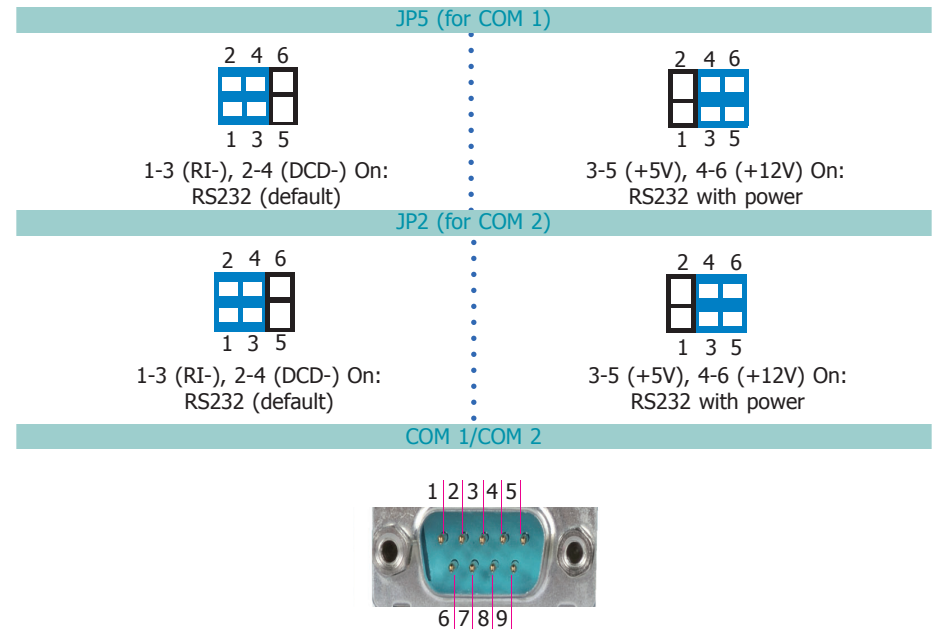
To load the default values stored in the ROM BIOS, please follow the steps below.

1. Power-off the system and unplug the power cord.

2. Set JP6 pins 2 and 3 to On. Wait for a few seconds and set JP6 back to its default setting, pins 1 and 2 On.

3. Now plug the power cord and power-on the system.

COM1/COM2 RS232/Power Select
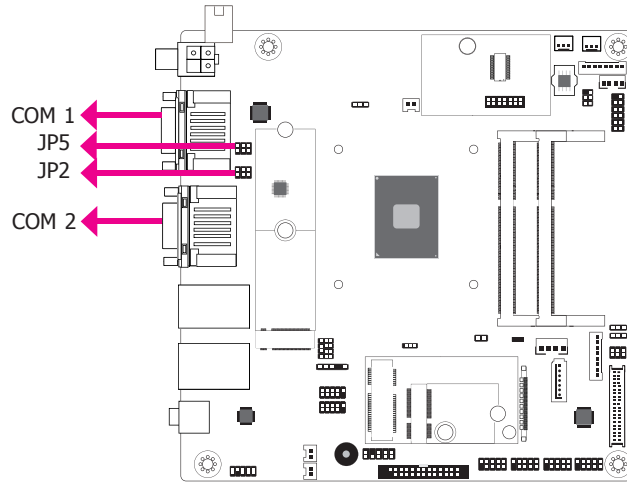
JP5 (for COM 1) and JP2 (for COM 2) are used to configure Serial COM ports to pure RS232 or RS232 with power. The pin functions of COM 1 and COM 2 will vary according to JP5's and JP2's setting respectively.

JP5 (for COM 1)

1-3 (RI-), 2-4 (DCD-) On: RS232 (default)

3-5 (+5V), 4-6 (+12V) On: RS232 with power

JP2 (for COM 2)

1-3 (RI-), 2-4 (DCD-) On: RS232 (default)

3-5 (+5V), 4-6 (+12V) On: RS232 with power

COM 1/COM 2

Pin	RS232	RS232 with power
1	DCD-	+12V
2	RD	RD
3	TD	TD
4	DTR-	DTR-
5	GND	GND
6	DSR-	DSR-
7	RTS-	RTS-
8	CTS-	CTS-
9	RI-	+5V

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LCD/Inverter Power Select

3 2 1

1-2 On:
+12V (default)

JP10

3 2 1

2-3 On:
+5V
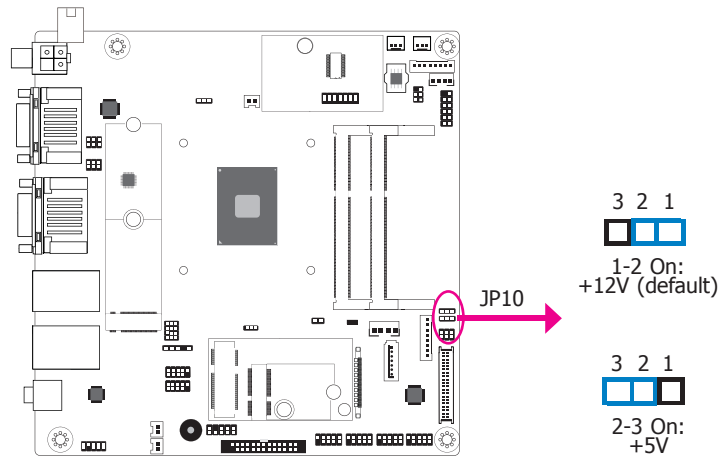
JP10 is used to select the power level of LVDS/eDP (optional) LCD inverter connector.

Backlight Brightness Select

3 2 1

1-2 On:
+3.3V (default)

JP9

3 2 1

2-3 On:
+5V
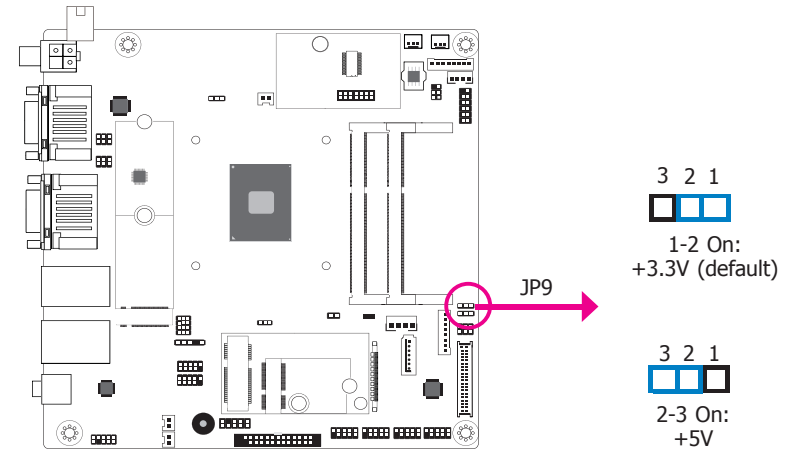
JP9 is used to select the power level of backlight brightness control: +3.3V (default) or +5V.

> **Important:**
> Before powering-on the system, make sure that the power settings of JP9 match the power specification of backlight control. Selecting the incorrect voltage will seriously damage the backlight.

Panel Power Select

JP8

2 4 6
1 3 5
1-2 On:
+12V

2 4 6
1 3 5
3-4 On:
+5V

2 4 6
1 3 5
5-6 On:
+3.3V (default)
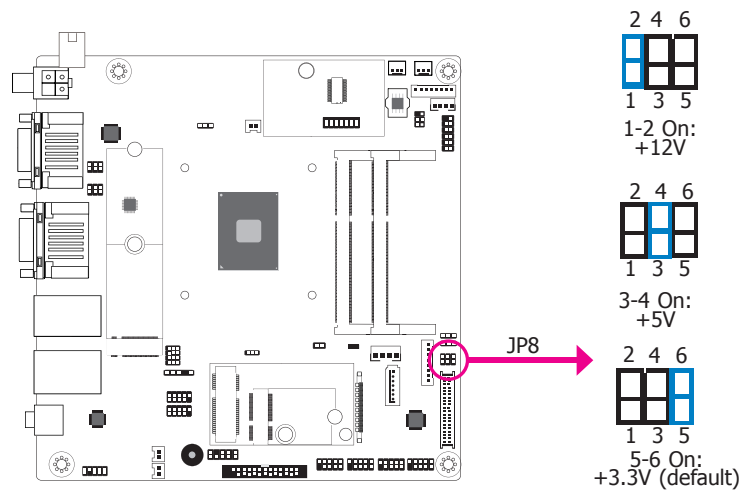
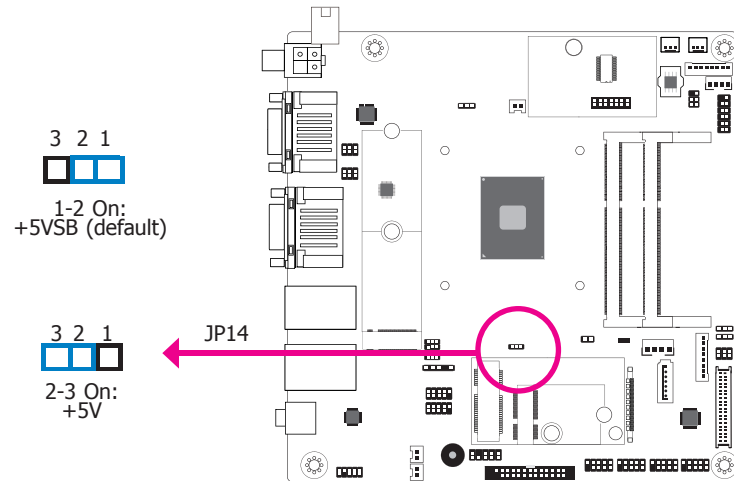JP8 is used to select the power supplied with the LCD panel.

Important:
Before powering-on the system, make sure that the power settings of JP8 match the LCD panel's specification. Selecting the incorrect voltage will seriously damage the LCD panel.
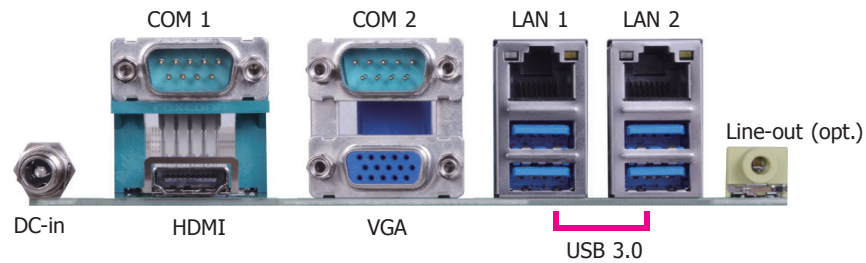
M.2 M Key PCIe/SATA Signal Select

JP3

1 3
10 12
1-2, 4-5, 7-8, 10-11 On:
PCIe

1 3
10 12
2-3, 5-6, 8-9, 11-12 On:
SATA (default)
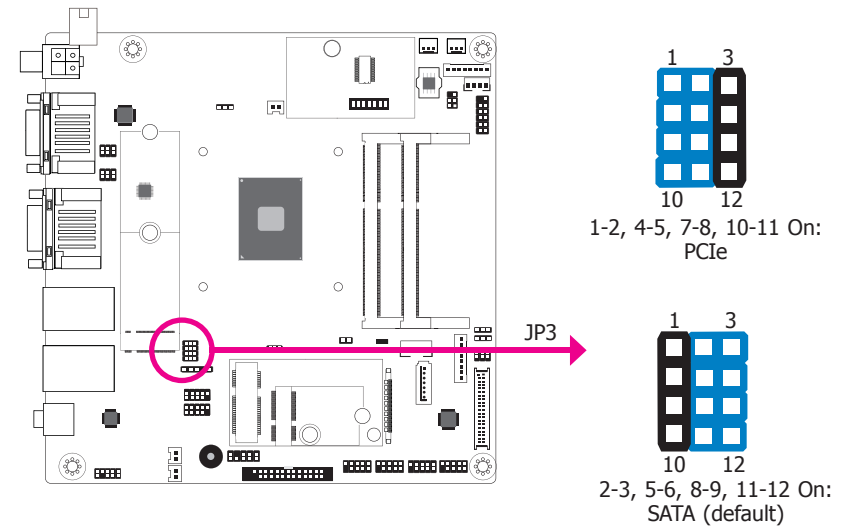
JP3 is used to select the M.2 M Key signal: SATA (default) or PCIe.

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KB/MS Power Select

3 2 1

1-2 On:
+5VSB (default)

3 2 1

JP14

2-3 On:
+5V

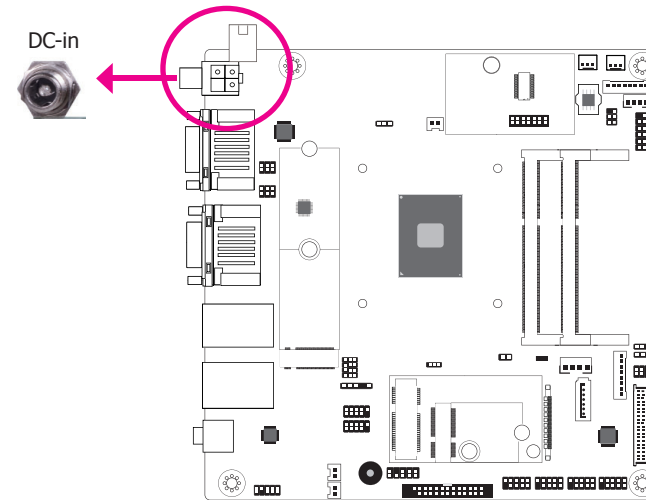JP14 is used to select the power of the Keyboard/Mouse.

Rear Panel I/O Ports

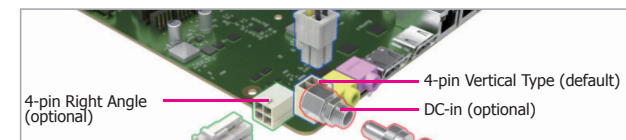The rear panel I/O ports consist of the following:

- 1 DC-in
- 2 Serial COM ports
- 1 HDMI port
- 1 VGA port
- 2 RJ-45 LAN ports
- 4 USB 3.0 ports
- 1 Line-out jack (optional)

12V DC-in

This 4-pin vertical type connector is considered a low power solution. Connect a DC power cord to this connector. Using a voltage more than the recommended range may fail to boot the system or cause damage to the system board.
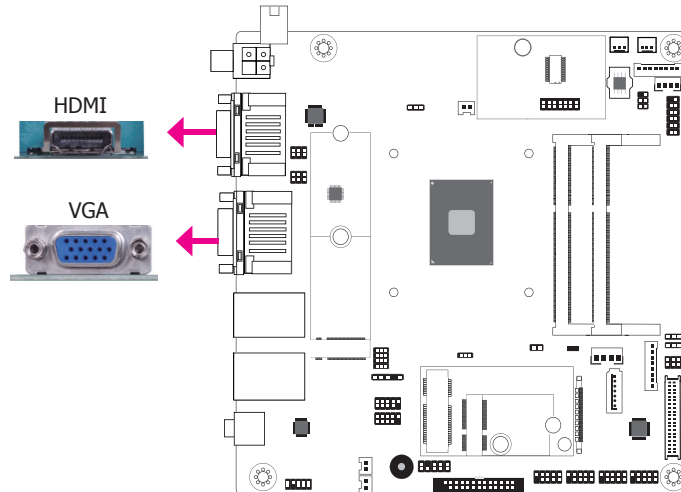
The 4-pin vertical type connectoron the system board co-lays with a DC-in jack (optional) or 4-pin right angle connector (optional) as the photo displayed below.

Graphics Interfaces

The display ports consist of the following:

- 1 HDMI port
- 1 VGA port

HDMI

VGA

HDMI Port

The HDMI port which carries both digital audio and video signals is used to connect a LCD monitor or digital TV that has the HDMI port.

VGA Port

The VGA port is used for connecting a VGA monitor. Connect the monitor's 15-pin D-shell cable connector to the VGA port. After you plug the monitor's cable connector into the VGA port, gently tighten the cable screws to hold the connector in place.
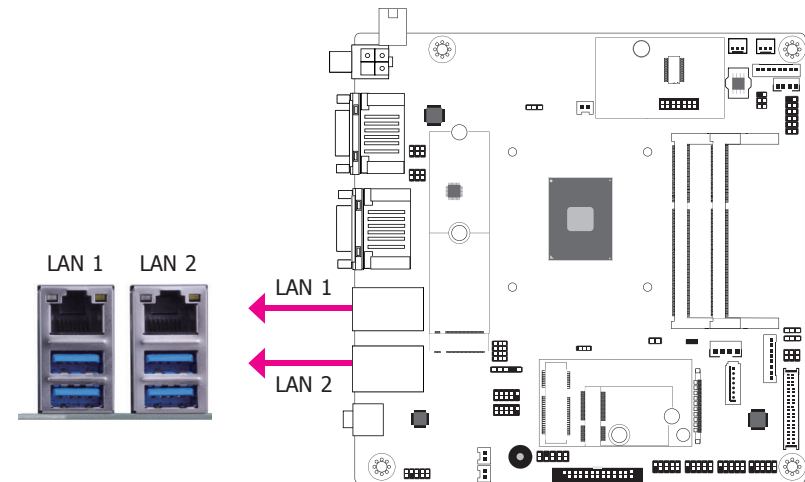
BIOS Setting

Configure the display devices in the advanced menu ("Video Configuration" submenu) of the BIOS. Refer to the chapter 3 for more information.

Driver Installation

Install the graphics driver. Refer to the chapter 4 for more information.

RJ45 LAN Ports

LAN 1   LAN 2

LAN 1

LAN 2

Features

- Two Realtek RTL8111H-CG Ethernet controllers

The two LAN ports allow the system board to connect to a local area network by means of a network hub.
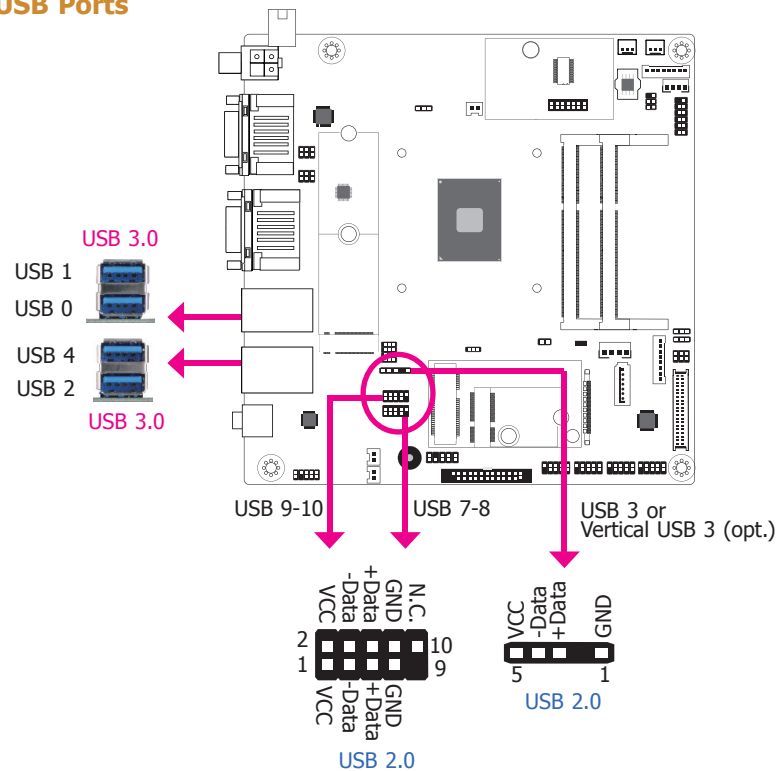
BIOS Setting

Configure the onboard LAN ports in the Advanced menu ("ACPI Configuration" submenu) of the BIOS. Refer to the chapter 3 for more information.

Driver Installation

Install the LAN drivers. Refer to the chapter 4 for more information.

USB Ports

USB 3.0

USB 1
USB 0

USB 4
USB 2

USB 3.0

USB 9-10   USB 7-8   USB 3 or
                               Vertical USB 3 (opt.)

USB 2.0

USB 2.0

Wake-On-USB Keyboard/Mouse

The Wake-On-USB Keyboard/Mouse function allows you to use a USB keyboard or USB mouse to wake up a system from the S3 (STR - Suspend To RAM) state.

The USB device allows data exchange between your computer and a wide range of simultaneously accessible external Plug and Play peripherals.

The system board is equipped with 4 onboard USB 3.0 ports (USB 0-1/2-4) at the rear panel I/O ports. The 10-pin connectors allow you to connect 4 additional USB 2.0 ports (USB 7-8/9-10). The 5-pin connector allows you to connect 1 additional USB 2.0 port (USB 3).The additional USB ports may be mounted on a card-edge bracket. Install the card-edge bracket to an available slot at the rear of the system chassis and then insert the USB port cables to a connector.
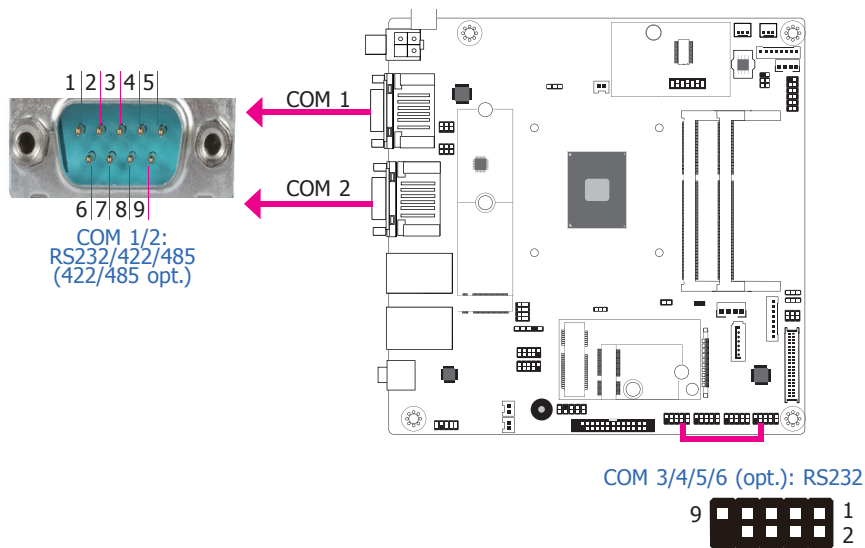
BIOS Setting

Configure these onboard USB devices in the Advanced menu ("USB Configuration" submenu) of the BIOS. Refer to the chapter 3 for more information.

Driver Installation

You may need to install the proper drivers in your system operation to use the USB device. Refer to your operating system's manual or documentation for more information.

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COM (Serial) Ports

1 2 3 4 5

COM 1

COM 2

6 7 8 9

COM 1/2:
RS232/422/485
(422/485 opt.)

COM 3/4/5/6 (opt.): RS232

9 ▢▢▢▢▢ 1
2

COM 1/2

Pin	RS232	RS422 Full Duplex (opt.)	RS485 (opt.)
1	DCD-	RX+	DATA+
2	RD	RX-	DATA-
3	TD	TX+	N.C.
4	DTR-	TX-	N.C.
5	GND	GND	GND
6	DSR-	N.C.	N.C.
7	RTS-	N.C.	N.C.
8	CTS-	N.C.	N.C.
9	RI-	N.C.	N.C.

COM 1 and COM 2 can be configured as RS232, RS422 and RS485 (RS422/RS485 opt.) by BIOS setting. The pin functions are listed at right. The pin functions of COM ports 1/2 will also vary according to JP5's and JP2's settings. JP5 and JP2 are used to configure the Serial COM ports 1/2 to pure RS232 or RS232 with power. Refer to "COM1/COM2 RS232/Power Select" in this chapter for more information.

COM 3/4/5/6 (opt.) are fixed at RS232. The pin functions are listed at right.

The serial ports are asynchronous communication ports with 16C550A-compatible UARTs that can be used with modems, serial printers, remote display terminals, and other serial devices.

COM 3/4/5/6 (opt.)

Pin	Pin Assignment
1	DCD-
2	RD
3	TD
4	DTR-
5	GND
6	DSR-
7	RTS-
8	CTS-
9	RI-

Connecting External Serial Ports

Your COM port may come mounted on a card-edge bracket. Install the card-edge bracket to an available slot at the rear of the system chassis then insert the serial port cable to the COM connector. Make sure the colored stripe on the ribbon cable is aligned with pin 1 of the COM connector.

BIOS Setting

Configure the serial COM ports in the Advanced menu ("SIO NUVOTON6112D" submenu) of the BIOS. Refer to the chapter 3 for more information.
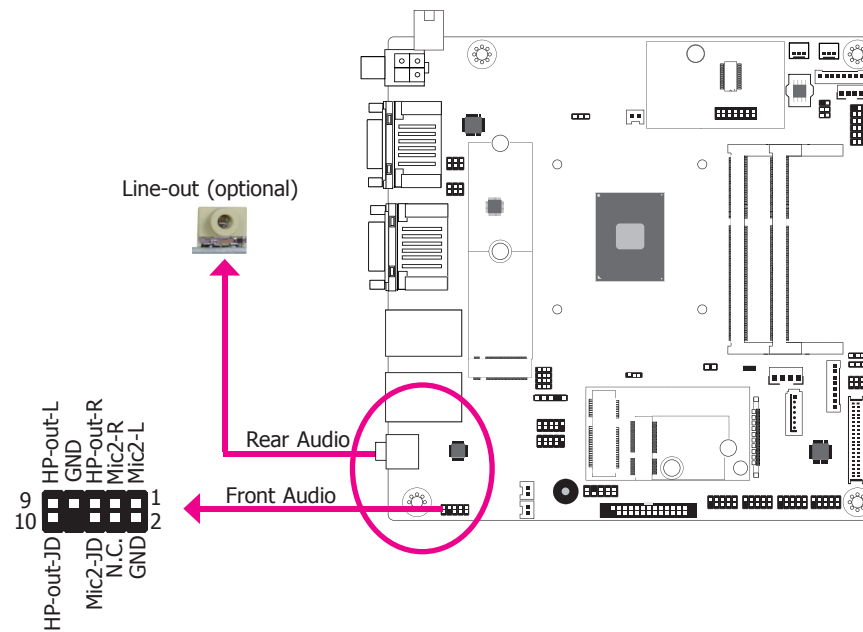
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Audio

Line-out (optional)

Rear Audio

Front Audio

HP-out-L
GND
HP-out-R
Mic2-R
Mic2-L

9
10

1
2

HP-out-JD
Mic2-JD
N.C.
GND

Rear Audio

The system board is equipped with 1 optional audio jack (Line-out). A jack is a one-hole connecting interface for inserting a plug.

• Line-out Jack (Lime) (optional)
  This jack is used to connect a headphone or external speakers.

Front Audio

The front audio connector allows you to connect to the second line-out and mic-in jacks that are at the front panel of your system.
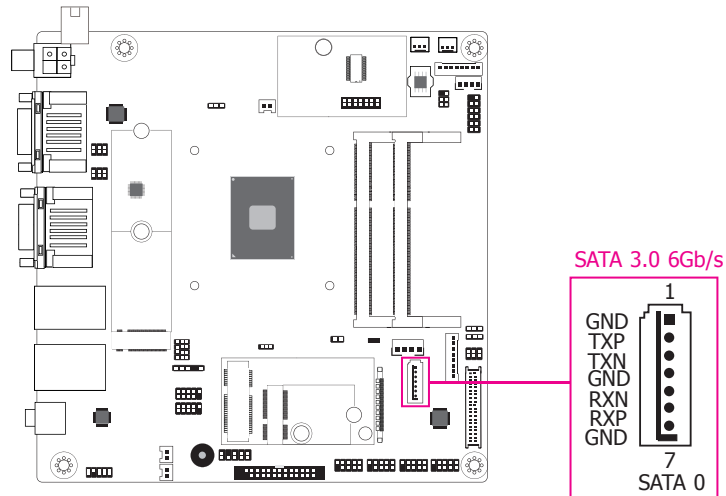
BIOS Setting

Configure these onboard Audio devices in the Advanced menu ("Audio Configuration" sub-menu) of the BIOS. Refer to the chapter 3 for more information.

Driver Installation

Install the audio driver. Refer to the chapter 4 for more information.

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I/O Connectors

SATA (Serial ATA) Connector

SATA 3.0 6Gb/s

```
      1
GND ▪
TXP ●
TXN ●
GND ●
RXN ●
RXP ●
GND ●
      7
  SATA 0
```

Features

• 1 Serial ATA 3.0 port with data transfer rate up to 6Gb/s (SATA 0)

• Integrated Advanced Host Controller Interface (AHCI) controller

The Serial ATA connector is used to connect Serial ATA device. Connect one end of the Serial ATA data cable to a SATA connector and the other end to your Serial ATA device.

BIOS Setting

Configure the Serial ATA drive in the Advanced menu ("SATA Configuration" submenu) of the BIOS. Refer to the chapter 3 for more information.

SATA (Serial ATA) Power Connector


```
                Ground
         +5V   Ground
SATA          +12V
Power 0
         ▪ ▪ ▪ ▪
         4       1
```
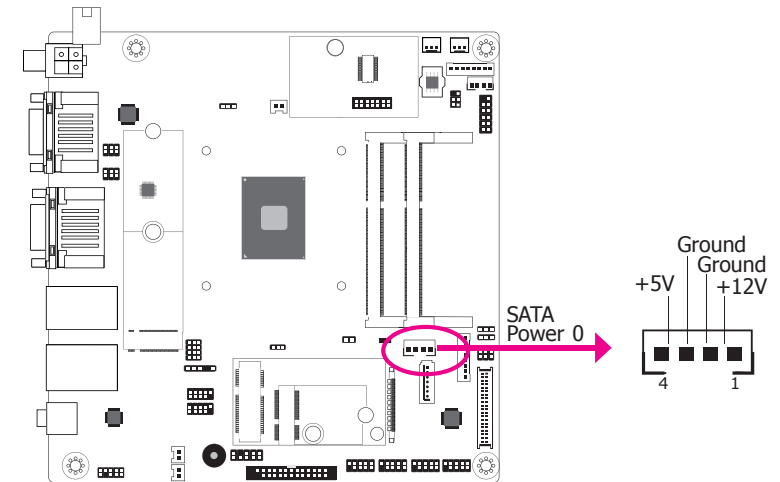
The SATA power connectors supply power to the SATA drive. Connect one end of the provided power cable to the SATA power connector and the other end to your storage device.

Speaker Connectors

2
SPK_R-
SPK_R+
1
Speaker R

2
SPK_L-
SPK_L+
1
Speaker L
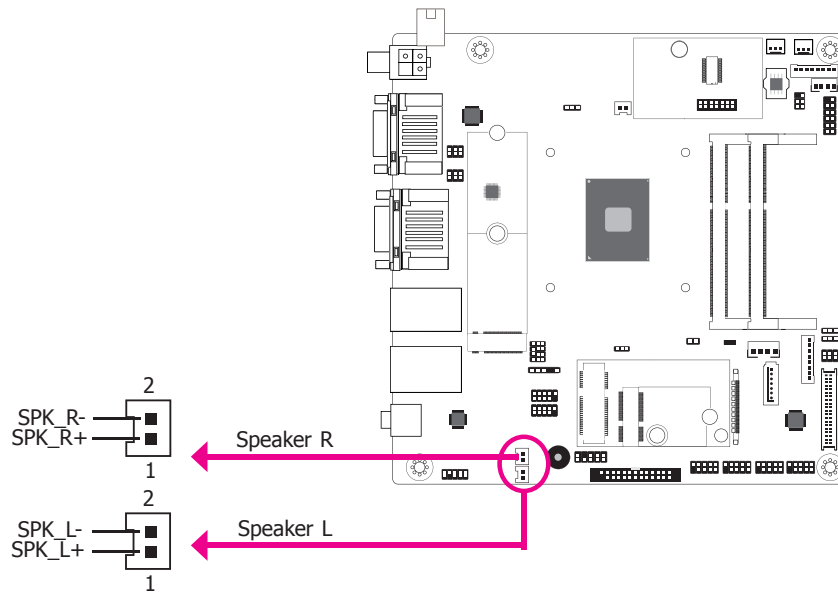
The amplify right/left connectors which have amplifying feature are used to connect external speakers.

Digital I/O and Power Connectors

Digital I/O
1   8

Digital I/O Power

+12V
Ground
5VDU
+5V
1   4
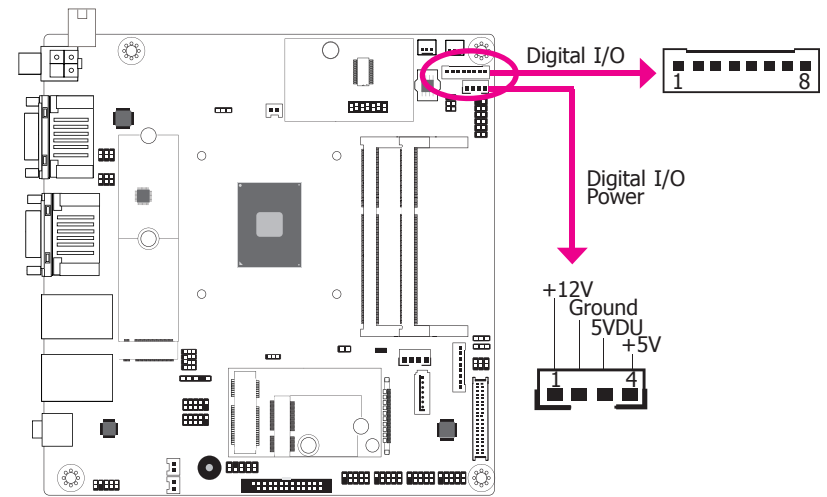
The 8-bit Digital I/O connector provides powering-on function to external devices that are connected to these connectors. The pin functions of the 8-bit digital I/O connector are listed below.

Digital I/O Connector

Pin	Function
1	DIO0
2	DIO1
3	DIO2
4	DIO3
5	DIO4
6	DIO5
7	DIO6
8	DIO7

Cooling Fan Connectors

Ground
12V
FAN IN
1 3
System Fan 1

Ground
12V
FAN IN
1 3
System Fan 2
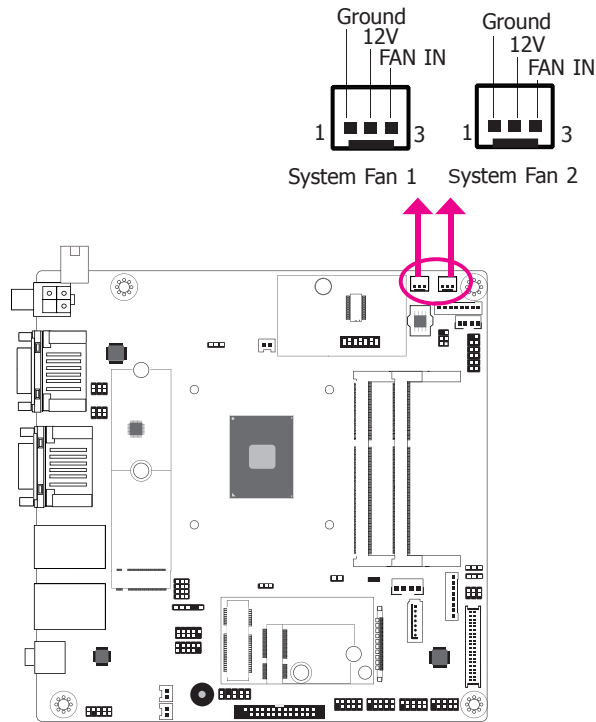
The fan connectors are used to connect cooling fans. The cooling fans will provide adequate airflow throughout the chassis to prevent overheating the CPU and system board components.

BIOS Setting

The Advanced menu ("SIO NUVOTON6112D" submenu) of the BIOS will display the current speed of the cooling fans. Refer to the chapter 3 for more information.

Front Panel Connector

Front Panel

12 11
ATX-SW   RESET
PWR-LED   HD-LED
2 1
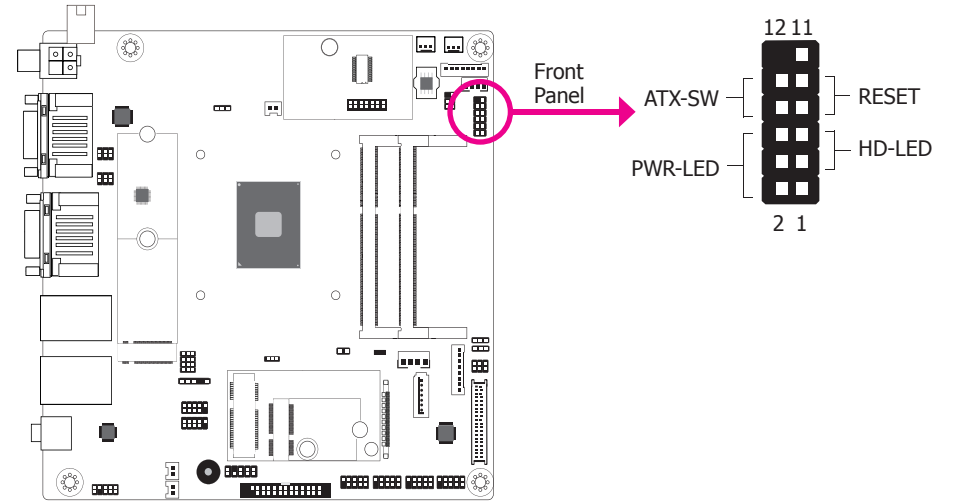
HD-LED - Hard Drive LED

This LED will light when the hard drive is being accessed.

RESET - Reset Switch

This switch allows you to reboot without having to power off the system.

ATX-SW - Power Switch

This switch is used to power on or off the system.

PWR-LED - Power/Standby LED

When the system's power is on, this LED will light. When the system is in the S1 (POS - Power On Suspend) state, it will blink every second. When the system is in the S3 (STR - Suspend To RAM) state, it will blink every 4 seconds.

	Pin	Pin Assignment		Pin	Pin Assignment
HD-LED	3	HDD Power	PWR-LED	2	LED Power
HD-LED	5	Signal	PWR-LED	4	LED Power
RESET	7	Ground		6	Signal
RESET	9	RST Signal	ATX-SW	8	Ground
	1, 11	N.C.	ATX-SW	10	Signal

22

LVDS LCD Panel Connector

LCD/Inverter Power Connector

LCD/Inverter Power
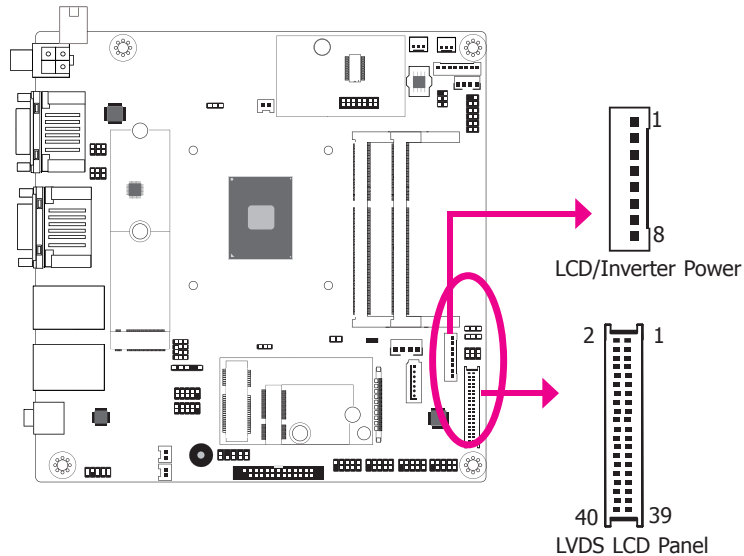
LVDS LCD Panel

The system board allows you to connect a LCD Display Panel by means of the LVDS LCD panel connectors and the LCD/Inverter power connectors. These connectors transmit video signals and power from the system board to the LCD Display Panel.

Refer to the right side for the pin functions of these connectors.

Jumper Settings

Refer to the "Jumper Settings" section in this chapter for settings relevant to the LCD panel.

BIOS Setting

Configure the LCD panel in the Advanced menu ("Video Configuration" sub-menu) of the BIOS. Refer to chapter 3 for more information.

LVDS LCD Panel Connector

Pin	Function	Pin	Function
1	GND	2	GND
3	LVDSA_3+	4	LVDSB_3+
5	LVDSA_3-	6	LVDSB_3-
7	GND	8	GND
9	LVDSA_2+	10	LVDSB_2+
11	LVDSA_2-	12	LVDSB_2-
13	GND	14	GND
15	LVDSA_1+	16	LVDSB_1+
17	LVDSA_1-	18	LVDSB_1-
19	GND	20	GND
21	LVDSA_0+	22	LVDSB_0+
23	LVDS_0-	24	LVDSB_0-
25	GND	26	GND
27	LVDSA_CLK+	28	LVDSB_CLK+
29	LVDSA_CLK-	30	LVDSB_CLK-
31	GND	32	GND
33	LVDS_DDC_CLK	34	N.C.
35	LVDS_DDC_DATA	36	3.3V
37	Panel Power	38	Panel Power
39	Panel Power	40	Panel Power

LCD/Inverter Power Connector

Pin	Function
1	GND
2	GND
3	Panel Inverter Brightness Voltage Control
4	Panel Power
5	+3.3V
6	Panel Backlight On/Off Control
7	LCD/Inverter Power: +12V (default)/+5V
8	LCD/Inverter Power: +12V (default)/+5V

Note:
DFI board's LVDS connector: PRINEX 712-76-40GWE0/40P/1.25mm

SMBus Connector

5
SMBus_Data   SMBus_Alert-
GND   SMBus_CLK
              3V3SB
2 1
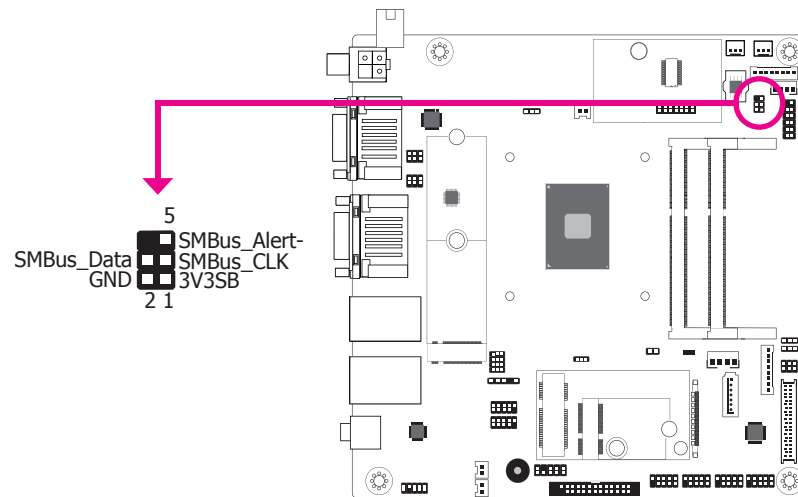
The SMBus (System Management Bus) connector is used to connect SMBus devices. It is a multiple device bus that allows multiple chips to connect to the same bus and enable each one to act as a master by initiating data transfer.

Standby Power LED

Standby Power LED
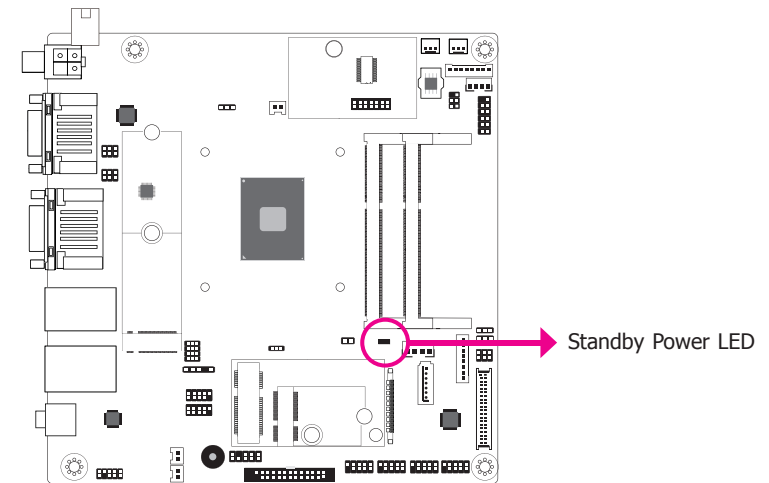
This LED will lit red when the system is in the standby mode. It indicates that there is power on the system board. Power-off the PC and then unplug the power cord prior to installing any devices. Failure to do so will cause severe damage to the motherboard and components.

Chassis Intrusion Connector
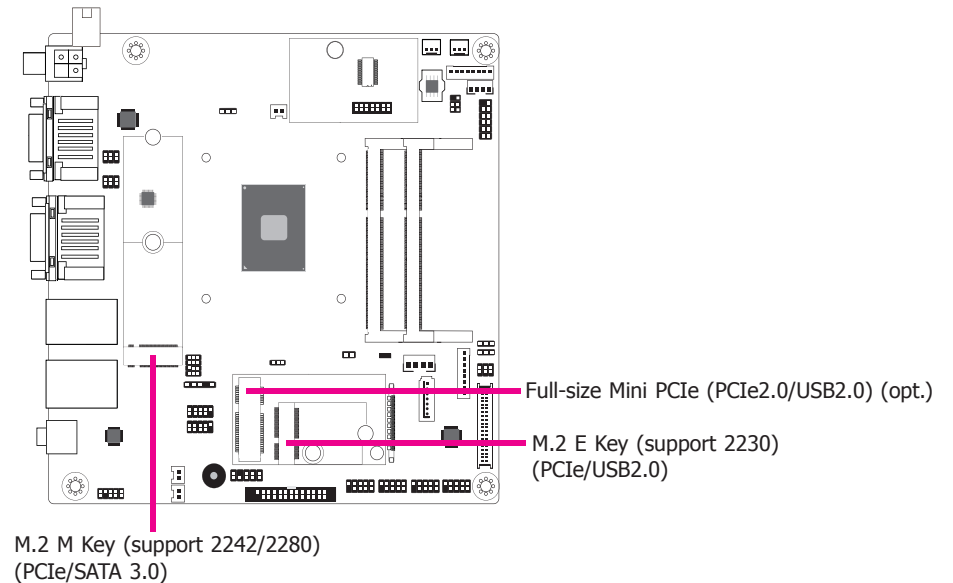

Signal
Ground

Chassis
Intrusion

1 2
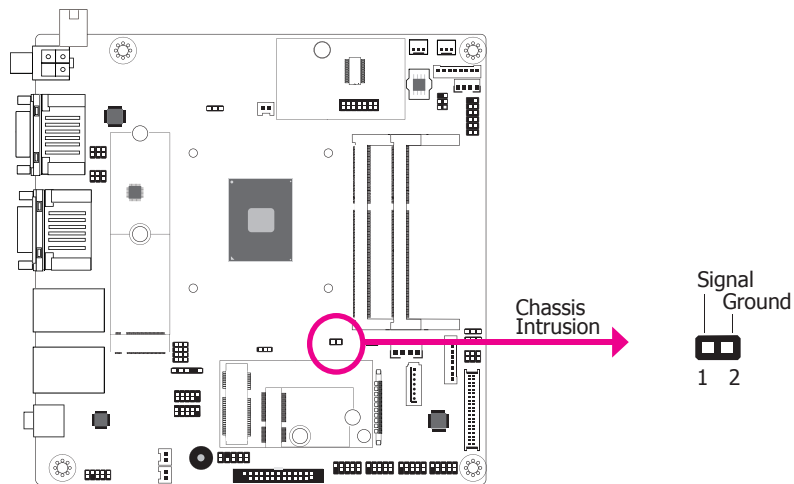
The board supports the chassis intrusion detection function. Connect the chassis intrusion sensor cable from the chassis to this connector. When the system's power is on and a chassis intrusion occurred, an alarm will sound. When the system's power is off and a chassis intrusion occurred, the alarm will sound only when the system restarts.

BIOS Setting

Configure the chassis intrusion detection function in the Advanced menu ("SIO NUVO-TON6112D" submenu) of the BIOS. Refer to the chapter 3 for more information.

Expansion Slots

Full-size Mini PCIe (PCIe2.0/USB2.0) (opt.)

M.2 E Key (support 2230)
(PCIe/USB2.0)

M.2 M Key (support 2242/2280)
(PCIe/SATA 3.0)

M.2 Socket

The M.2 socket is the Next Generation Form Factor (NGFF) which is designed to support multiple modules and make the M.2 more suitable in application for solid-state storage.

Mini PCI Express Slot (opt.)

The Mini PCIe socket is used to install a Mini PCIe card. Mini PCIe card is a small form factor PCIe card with the same signal protocol, electrical definitions, and configuration definitions as the conventional PCIe.

LPC Connector

LPC

```
13 ▭▭▭▭▭▭▭ 1
14             2
```
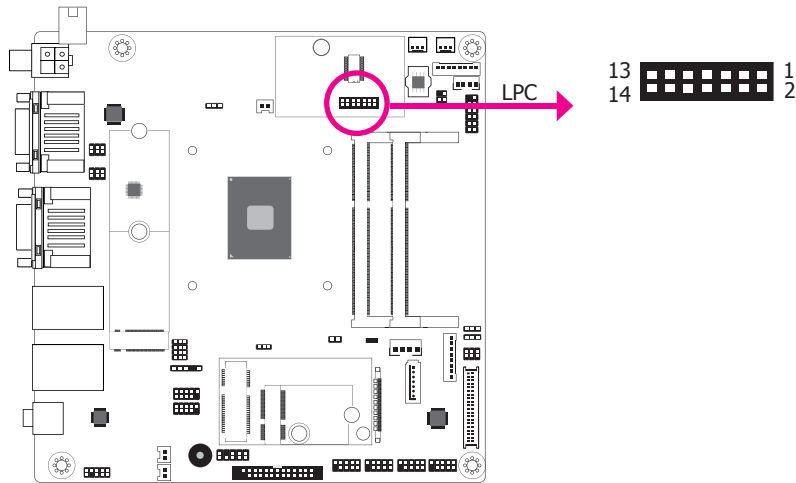
The Low Pin Count Interface was defined by Intel® Corporation to facilitate the industry's transition towards legacy free systems. It allows the integration of low-bandwidth legacy I/O components within the system, which are typically provided by a Super I/O controller. Furthermore, it can be used to interface firmware hubs, Trusted Platform Module (TPM) devices and embedded controller solutions. Data transfer on the LPC bus is implemented over a 4 bit serialized data interface, which uses a 33MHz LPC bus clock. For more information about LPC bus refer to the Intel® Low Pin Count Interface Specification Revision 1.1'. The table below indicates the pin fuctions of the LPC connector.
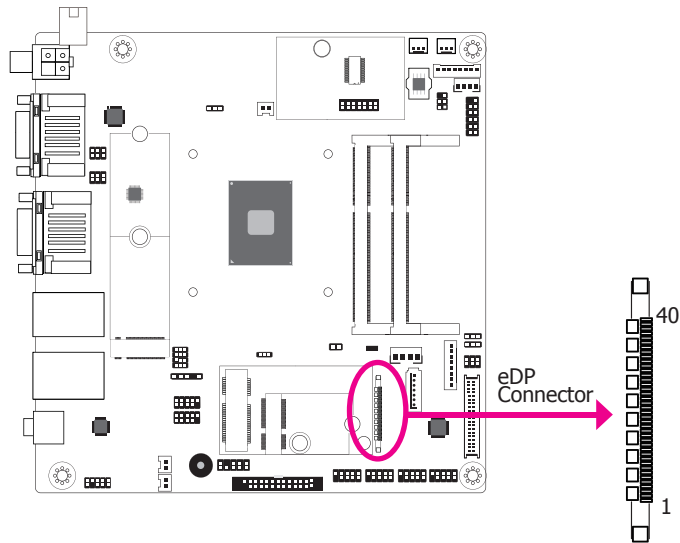
Pin	Function	Pin	Function
1	CLK	2	LAD1
3	RST#	4	LAD0
5	FRAME#	6	3V3
7	LAD3	8	GND
9	LAD2	10	---
11	INT_SERIRQ	12	GND
13	5VSB	14	5V

Connecting the EXT-RS232/RS485 Card to the Motherboard

With DFI's proprietary technology, AL102 supports two extension modules for additional four COM ports. The EXT-RS232/RS485 card is connected to AL102 via the LPC connector. The illustrations below guide you how to connect the extension module to the motherboard.

LPC

Top View

COM

Bottom View

LPC

EXT-RS485

EXT-RS485

DFI Motherboard

EXT-RS232/RS485

Additional 4 COM

26
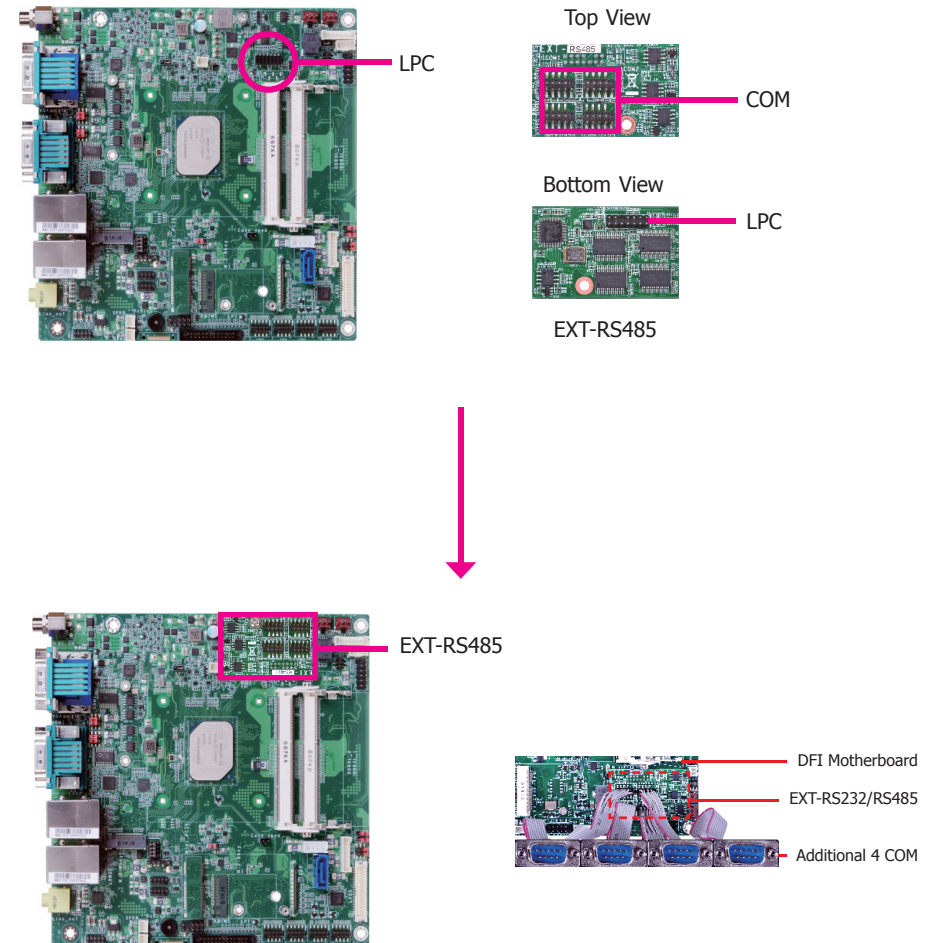
eDP Connector (optional)

eDP Connector

The eDP connector is an embedded displayport which has advanced power-saving features to connect a display device to transmit digital communication of audio and video signals. The table on the right indicates the pin fuctions of the eDP connector.

eDP Connector

Pin	Function	Pin	Function
1	N.C.	21	eDP_Panel PWR
2	GND	22	N.C.
3	eDP_Lane 3-	23	GND
4	eDP_Lane 3+	24	GND
5	GND	25	GND
6	eDP_Lane 2-	26	GND
7	eDP_Lane 2+	27	Hot Plug
8	GND	28	eDP_GND
9	eDP_Lane 1-	29	eDP_GND
10	eDP_Lane 1+	30	eDP_GND
11	GND	31	eDP_GND
12	eDP_Lane 0-	32	Panel Backlight On/Off Control
13	eDP_Lane 0+	33	Panel Inverter Brightness Voltage Control
14	GND	34	N.C.
15	eDP_AUX+	35	N.C.
16	eDP_AUX-	36	Inverter PWR
17	GND	37	Inverter PWR
18	eDP Panel PWR	38	Inverter PWR
19	eDP Panel PWR	39	Inverter PWR
20	eDP Panel PWR	40	N.C.

LPT Connector

LPT
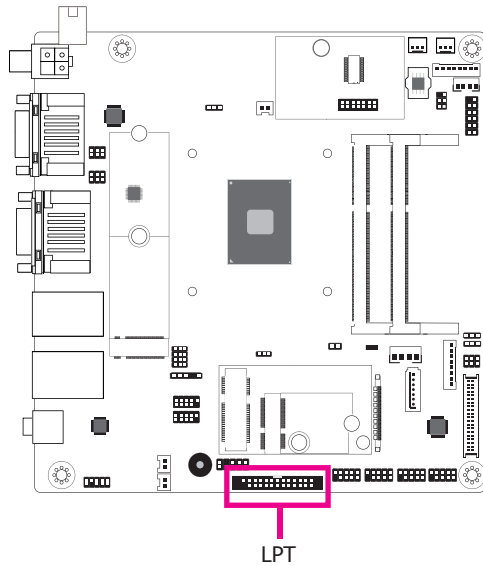
The LPT port is for interfacing your PC to a parallel printer. It supports SPP, ECP and EPP.

SPP **(Standard Parallel Port)**	Allows normal speed operation but in one direction only.
ECP **(Extended Capabilities Port)**	Allows parallel port to operate in bidirectional mode and at a speed faster than the SPP's data transfer rate.
EPP **(Enhanced Parallel Port)**	Allows bidirectional parallel port operation at maximum speed.

KB/MS Connector

KB/MS

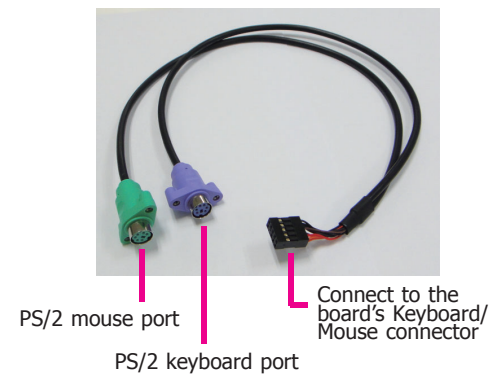KBMS POWER
KBDATA
KBCLK
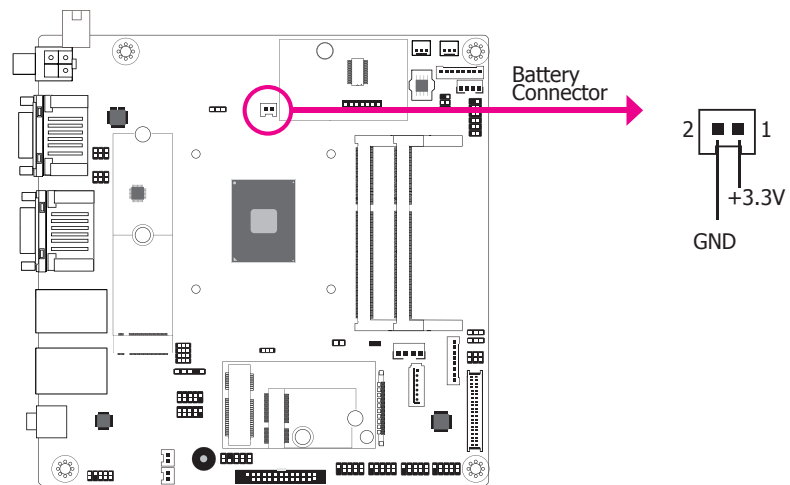GND
9
10
1
2
MSCLK
MSDATA
GND
GND
KBMS POWER
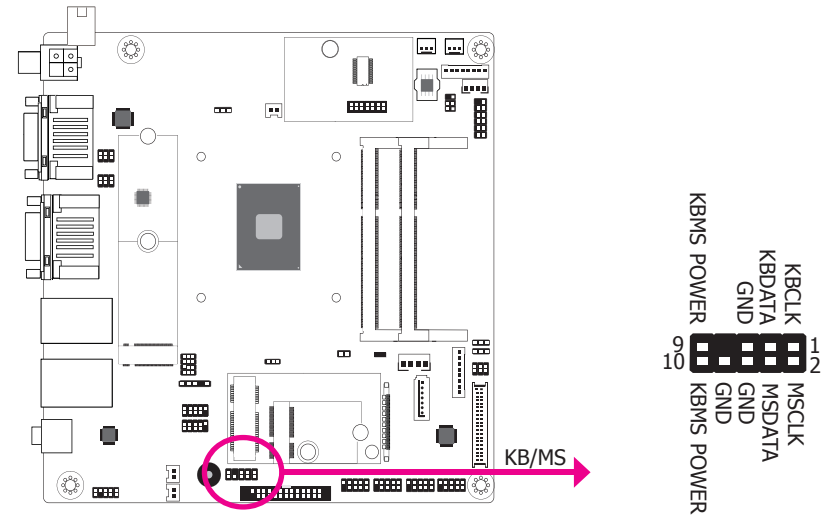
The Keyboard/Mouse connector is used to connect PS/2 keyboard and PS/2 mouse by means of a PS/2 cable.

Connecting the PS/2 Cable

The system board package comes with a PS/2 cable. Connect one end of the cable to the KB/Mouse connector. The other ends are used to connect a PS/2 keyboard and a PS/2 mouse.

PS/2 mouse port

PS/2 keyboard port

Connect to the board's Keyboard/Mouse connector

Battery

Battery
Connector

2 ▪▪ 1

+3.3V

GND

Battery

Connect to the
battery connector

The lithium ion battery powers the real-time clock and CMOS memory. It is an auxiliary source of power when the main power is shut off.

Safety Measures

• Danger of explosion if battery incorrectly replaced.

• Replace only with the same or equivalent type recommended by the manufacturer.

• Dispose of used batteries according to local ordinance.