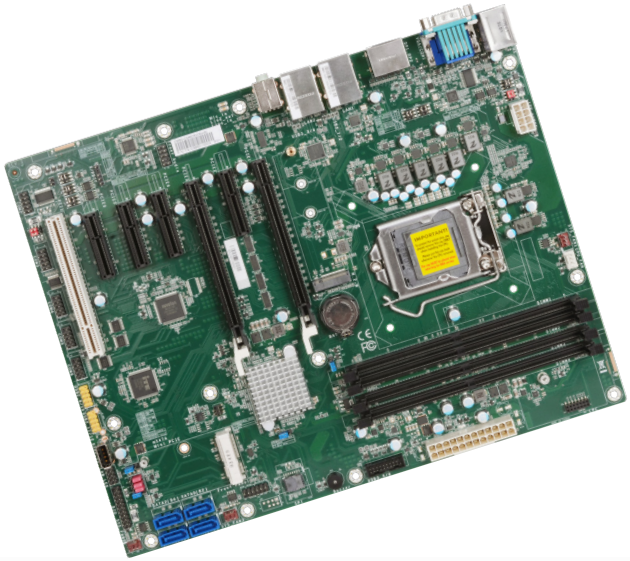


SYM86601VGGA-Q370

Copyright

Trademarks

FCC and DOC Statement on Class B

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

About this Manual

This manual can be downloaded from the website, or acquired as an electronic file included in the optional CD/DVD. The manual is subject to change and update without notice, and may be based on editions that do not resemble your actual products. Please visit our website or contact our sales representatives for the latest editions.

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.

- One Serial ATA data cable (Length: 500mm)
- One COM converter cable, pin headers to 2 DB9 (Length: 300mm)
- One I/O shield
- Two standoff screws (M2x4 mm I-head)
- One Quick Reference

The board and accessories in the package may not come similar to the information listed above. This may differ in accordance with 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.

Optional Items

- USB 2.0 / USB 3.1 cable
- COM cable
- SATA cable
- Thernal Solution (Heat sink and fan)
- EXT-RS232 / EXT-RS485 module (4 external ports via LPC connector)
- DP-to-HDMI dongle

The board and accessories in the package may not come similar to the information listed above. This may differ in accordance with 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

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

- CPU
- Memory module
- Storage device such as hard disk drive, CD-ROM, etc.
- Power adaptor

External system peripherals may also be required for navigation and display, including at least a keyboard, a mouse and a video display monitor.

▶ **Specifications**

SYM86601VGGA-Q370

SYSTEM	Processor	8th Generation Intel® Core™ /Pentium®/Celeron® LGA 1151 Socket Processors: Core™ i7-8700K (6 Cores, 12M Cache, up to 4.7 GHz); 95W Core™ i7-8700 (6 Cores, 12M Cache, up to 4.6 GHz); 65W Core™ i7-8700T (6 Cores, 12M Cache, up to 4.0 GHz); 35W Core™ i5-8500 (6 Cores, 9M Cache, up to 4.1 GHz); 65W Core™ i5-8500T (6 Cores, 9M Cache, up to 3.5 GHz); 35W Core™ i3-8100 (4 Cores, 6M Cache, 3.6 GHz); 65W Core™ i3-8100T (4 Cores, 6M Cache, to 3.1 GHz); 35W Pentium® G5400 (2 Cores, 4M Cache, 3.7 GHz); 58W Pentium® G5400T (2 Cores, 4M Cache, 3.1 GHz); 35W Celeron® G4900 (2 Cores, 2M Cache, 3.1 GHz); 54W Celeron® G4900T (2 Cores, 2M Cache, 2.9 GHz); 35W 9th Generation Intel® Core™ LGA 1151 Socket Processors: Core™ i9-9900K (8 Cores, 16M Cache, up to 5.0 GHz); 95W Core™ i7-9700K (8 Cores, 12M Cache, up to 4.9 GHz); 95W Core™ i7-9700E (8 Cores, 12M Cache, up to 4.4 GHz); 65W Core™ i7-9700TE (8 Cores, 12M Cache, up to 3.8 GHz); 35W Core™ i5-9500E (6 Cores, 9M Cache, up to 4.2 GHz); 65W Core™ i5-9500TE (6 Cores, 9M Cache, up to 3.6 GHz); 35W Core™ i3-9100E (4 Cores, 6M Cache, 3.7 GHz); 65W Core™ i3-9100TE (4 Cores, 6M Cache, to 3.2 GHz); 35W
	Chipset	Intel® Q370 Chipset
	Memory	Four 288-pin DIMM up to 128GB , Dual Channel DDR4 2400/2666MHz
	BIOS	AMI SPI 128Mbit
GRAPHICS	Controller	Intel® HD Gen 9 Graphics
	Feature	OpenGL 5.0, DirectX 12, OpenCL 2.1 HW Decode: AVC/H.264, MPEG2, VC1/WMV9, JPEG/MJPEG, HEVC/H265, VP8, VP9 HW Encode: MPEG2, AVC/H264, JPEG, HEVC/H265, VP8, VP9
	Display	1 x VGA, resolution up to 1920x1200 @ 60Hz 2 x DP++, resolution up to 4096x2160 @ 60Hz
	Triple Displays	VGA + DP++ + DP++
EXPANSION	Interface	2 x PCIe x16 (Gen 3) (1 x16 signal or 2 x8 signals) 1 x PCIe x1 (Gen 3) 3 x PCIe x4 (Gen 3) 1 x PCI 1 x Full-sized Mini PCIe (PCIe/SATA/USB2.0), share with SATA 3(R5) 1 x M.2 2242/2260/2280 M key (PCIe Gen3 x 4 NVMe)
AUDIO	Audio Codec	Realtek ALC888
ETHERNET	Controller	1 x Intel® I211AT PCIe (10/100/1000Mbps) 1 x Intel® I219LM PCIe with iAMT12.0 (10/100/1000Mbps) (only Core i7/i5 supports iAMT)

REAR I/O	Ethernet	2 x GbE (RJ-45)
	USB	2 x USB 3.1 Gen2 2 x USB 2.0 2 x USB 3.1 Gen1
	Serial	1 x RS-232/422/485 (RS-232 w/ power) (DB-9)
	PS/2	1 x PS/2 (mini-DIN-6)
	Display	1 x VGA 2 x DP++
	Audio	1 x Line-out, 1 x Mic-in, 1 x Line-in (opt., MOQ required)
INTERNAL I/O	Serial	1 x RS-232/422/485 (RS-232 w/ power) (2.54mm pitch) 4 x RS-232 (2.54mm pitch)
	USB	2 x USB 3.1 Gen 1 (2.00mm pitch) 4 x USB 2.0 (2.54mm pitch) (1 x USB 2.0 colay vertical Type A) (opt., MOQ required)
	Audio	1 x Front Audio Header 1 x S/PDIF
	SATA	4 x SATA 3.0 (up to 6Gb/s, SATA 3(R5) shared with mini PCIe (SATA), default at mini PCIe) RAID 0/1/5/10
	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	Infineon TPM2.0 (opt., MOQ required)
POWER	Type	ATX
	Connector	8-pin ATX 12V power 24-pin ATX power
	RTC Battery	CR2032 Coin Cell
OS SUPPORT		Windows 10 IoT Enterprise 64-bit Linux
ENVIRONMENT	Temperature	Operating: -10 to 60°C Storage: -30 to 60°C with RTC Battery; -40 to 85°C without RTC Battery
	Humidity	Operating: 5 to 90% RH Storage: 5 to 90% RH
MECHANICAL	Dimensions	ATX Form Factor: 305mm (12") x 244mm (9.6")
	Height	PCB: 1.6mm
CERTIFICATIONS		CE, FCC Class B, RoHS

▶ 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.

DDR4

DDR4 delivers increased system bandwidth and improves performance. The advantages of DDR4 provide an extended battery life and improve the performance at a lower power than DDR3/DDR2.

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.

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

The Intel® I219LM and Intel® I210AT Gigabit Ethernet Controllers support data transmission at 1Gbps. Two additional GbE ports powered by Realtek 8365MB serve as hubs for Layer 2 switching.

Audio

The Realtek ALC888S-VD2-GR audio codec provides 5.1 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.

PCI Express

PCI Express is a high bandwidth I/O infrastructure that possesses the ability to scale speeds by forming multiple lanes. The x4 PCI Express lane supports transfer rate of 4 Gigabyte per second (2 directions). The PCI Express architecture also supports high performance graphics infrastructure by enhancing the capability of a PCIe x16 Gen 3 at 16GB/s bandwidth (8GB/s in each direction).

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

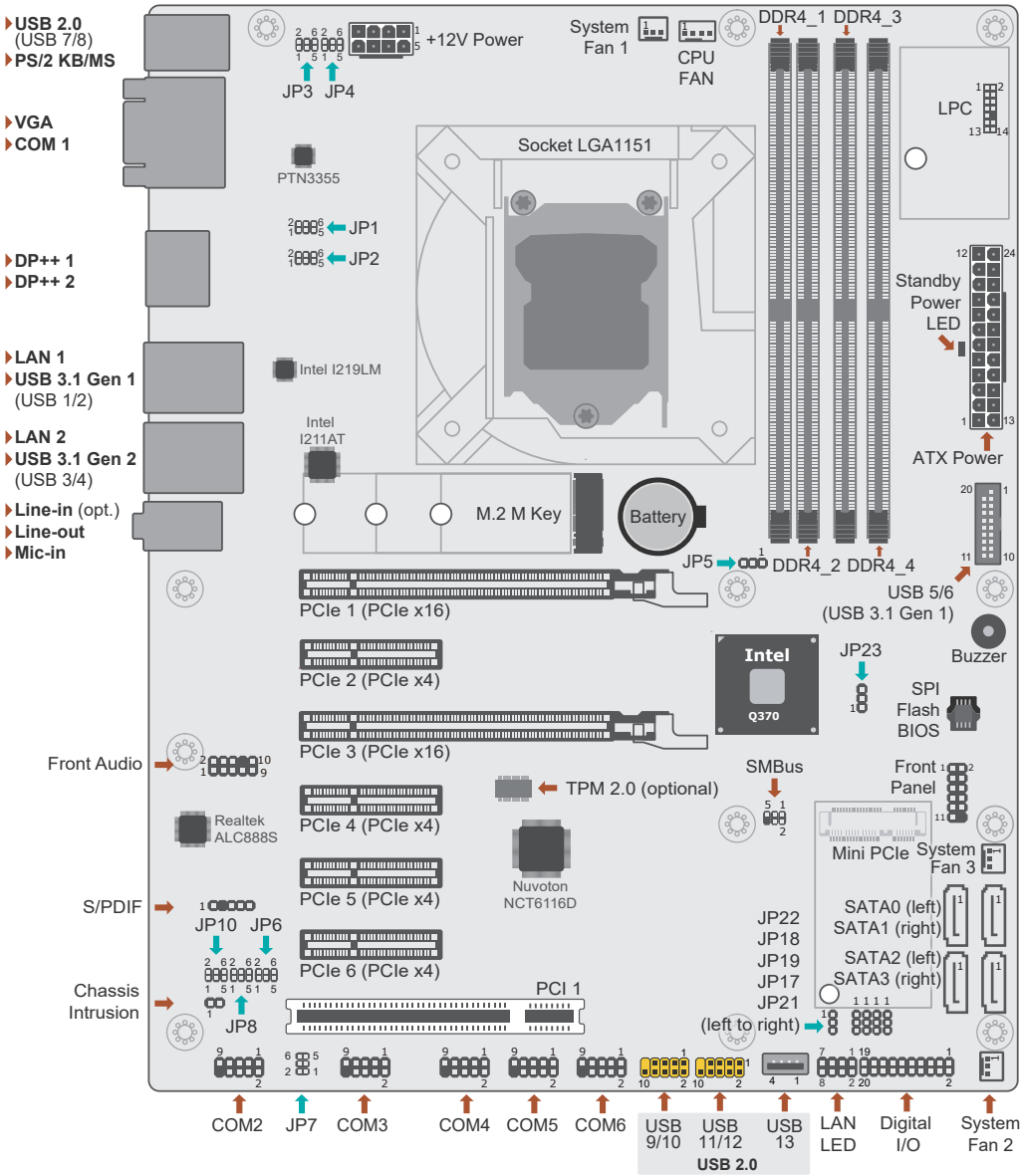
The system board supports the new USB 3.1 Gen 2. It is capable of running at a maximum transmission speed of up to 10 Gbit/s (1.2 GB/s) and is faster than USB 3.1 Gen 1 (5 Gbit/s, or 625 MB/s), USB 2.0 (480 Mbit/s, or 60 MB/s) and USB 1.1 (12Mb/s). USB 3.1 reduces the time required for data transmission, 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.

RTC Timer

The Real Time Clock (RTC) installed on the system board allows your system to automatically power-on on the set date and time.

Chapter 2 - Hardware Installation

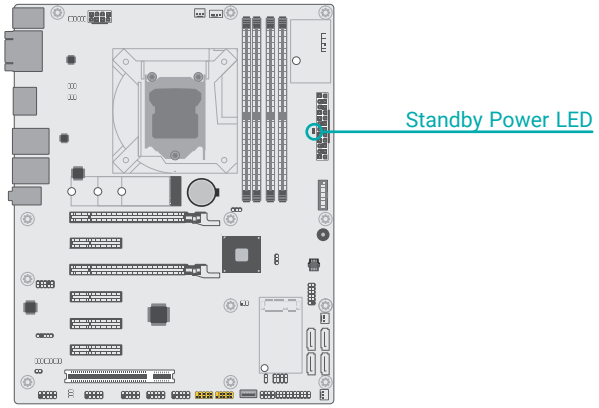
▶ Board Layout



Note:
These optional components are only available upon request.

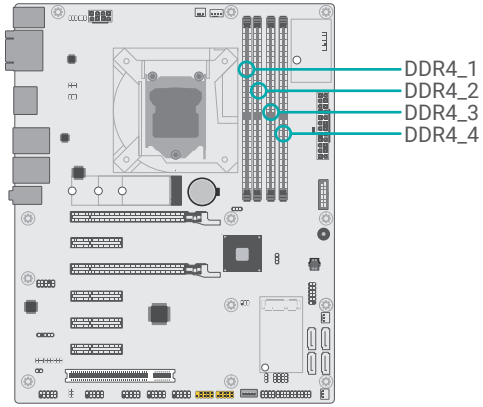
Important:
Electrostatic discharge (ESD) can damage your board, processor, disk drives, add-in boards, and other components. Perform installation procedures at an ESD workstation only. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching 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.

▶ Standby Power LED



Important:
When the Standby Power LED lit 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.

System Memory



The system board supports the following memory interface.

Single Channel (SC)
Data will be accessed in chunks of 64 bits from the memory channels.

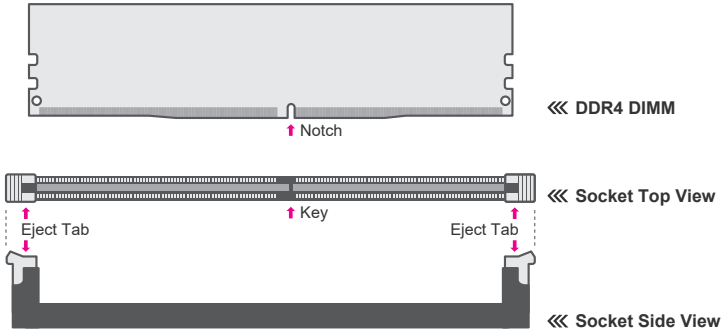
Dual Channel (DC)
Data will be accessed in chunks of 128 bits from the memory channels. Dual channel provides better system performance because it doubles the data transfer rate.

Single Channel	DIMMs are on the same channel. DIMMs in a channel can be identical or completely different. However, we highly recommend using identical DIMMs. Not all slots need to be populated.
Dual Channel	DIMMs of the same memory configuration are on different channels.

Installing the DIMM Module

Before installing the memory module, please make sure that the following safety cautions are well-attended.

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 DIMM socket on the system board
4. Make sure the notch on memory card is aligned to the key on the socket.



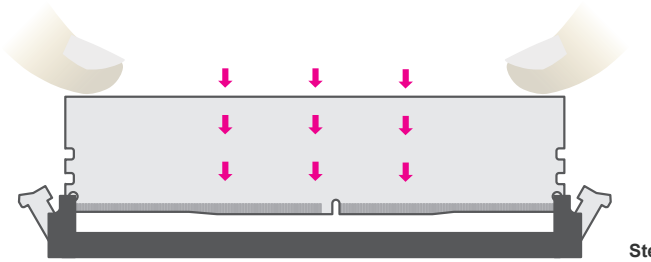
Please follow the steps below to install the memory card into the socket.

Step 1:
Press the eject tabs at both ends of the socket outward and downward to release them from the locked position.

Step 2:
Insert the memory card into the slot while making sure the notch and the key are aligned. Press the card down firmly with fingers while applying and maintaining even pressure on both ends.

Step 3:
The tabs snap automatically to the edges of the card and lock the card in place.

Step 1



Step 2

Step 3

Removing the DIMM Module

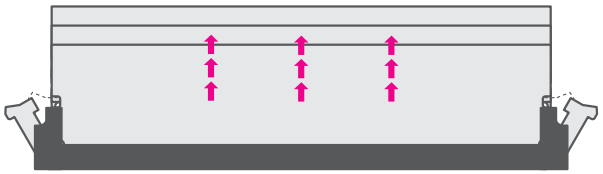
Please follow the steps below to remove the memory card from the socket.

Step 1:
Press the eject tabs at both ends of the socket outward and downward to release them from the locked position.

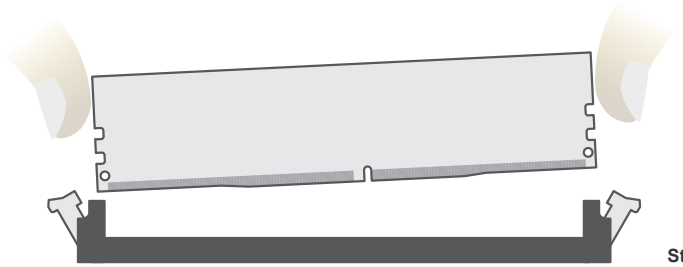
Step 2:
The memory card ejects from the slot automatically.

Step 3:
Hold the card by its edges and remove it from the slot.

Step 1



Step 2

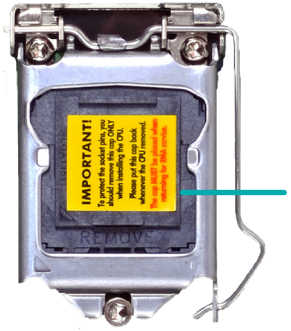


Step 3

▶ CPU

The system board is equipped with a surface mount LGA 1151 socket. This socket is exclusively designed for installing a LGA 1151 packaged Intel CPU.

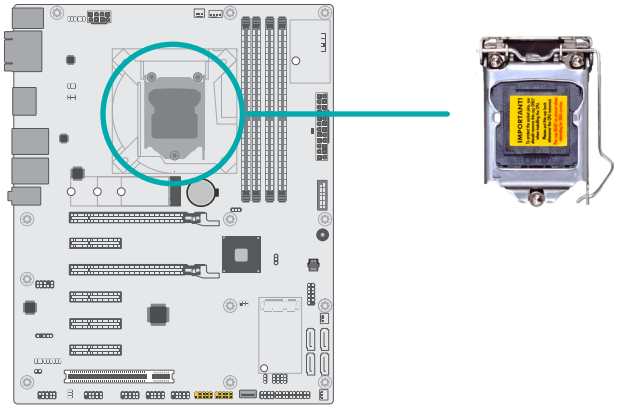
Important:
1. Before you proceed, make sure (1) the LGA 1151 socket comes with a protective cap, (2) the cap is not damaged and (3) the socket's contact pins are not bent. If the cap is missing or the cap and/or contact pins are damaged, contact your dealer immediately.
2. Make sure to keep the protective cap. RMA requests will be accepted and processed only if the LGA 1151 socket comes with the protective cap.



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

Installing the CPU

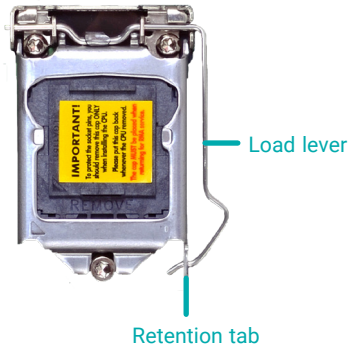
1. Make sure the PC and all other peripheral devices connected to it have been powered down.
2. Disconnect all power cords and cables.



3. Locate the LGA 1151 CPU socket on the system board.

Important:
The CPU socket must not come in contact with anything other than the CPU. Avoid unnecessary exposure. Remove the protective cap only when you are about to install the CPU.

4. Unlock the socket by pressing the load lever down, moving it sideways until it escapes the retention tab. Lift the load lever up when it's released.



5. Lift the load lever and the load plate all the way up as shown in the photo.

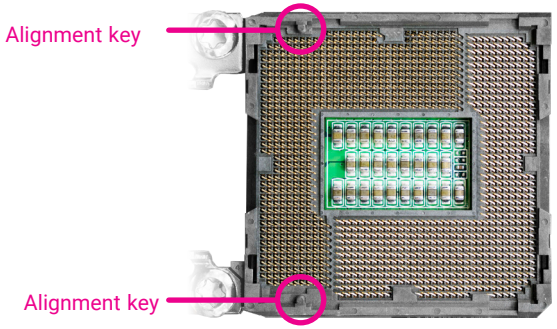
6. Remove the protective cap from the CPU socket. The cap is used to protect the CPU socket against dust and harmful particles. Remove the protective cap only when you are about to install the CPU.

7-1. Insert the CPU into the socket. The gold triangular mark on the CPU must align with the chamfer corner of the CPU socket shown in the photo.

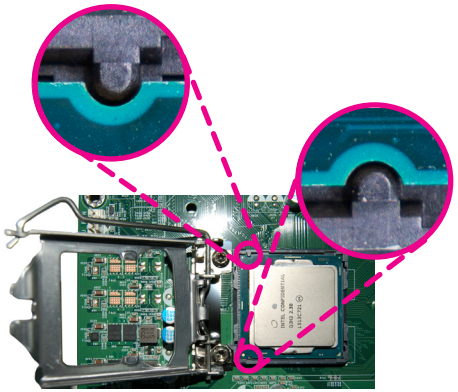
Important:
The CPU will fit in only one orientation and can easily be seated without exerting any force.

▶ CPU ▶ Installing the CPU

7-2. Two keys on the socket and notches on the CPU also facilitate alignment.



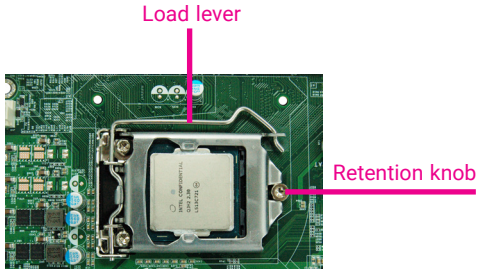
7-3. The CPU's notch will fit into the socket's alignment key when it's seated in the correct orientation.



8. Close the load plate then push the load lever down.

   While closing the load plate, make sure the front edge of the load plate slides under the retention knob.

9. Press down the load lever and hook it under the retention tab.



▶ CPU

Installing the Fan and Heat Sink

The CPU must be kept cool by using a CPU fan with heat sink. Without sufficient air circulation across the CPU and heat sink, the CPU will overheat damaging both the CPU and system board.

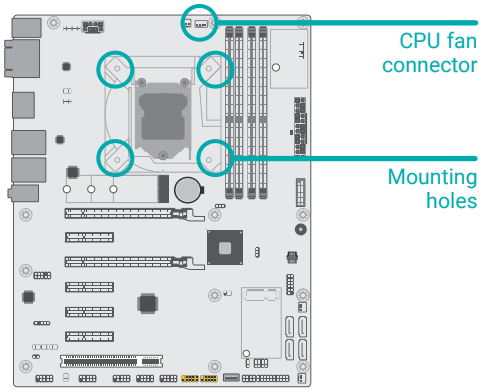
Note:
A boxed Intel® processor already includes the CPU fan and heat sink assembly. If your CPU was purchased separately, make sure to only use Intel®-certified fan and heat sink.

1. Before you install the fan / heat sink, you must apply a thermal paste onto the top of the CPU. The thermal paste is usually supplied when you purchase the fan / heat sink assembly. Do not spread the paste all over the surface. When you later place the heat sink on top of the CPU, the compound will disperse evenly.

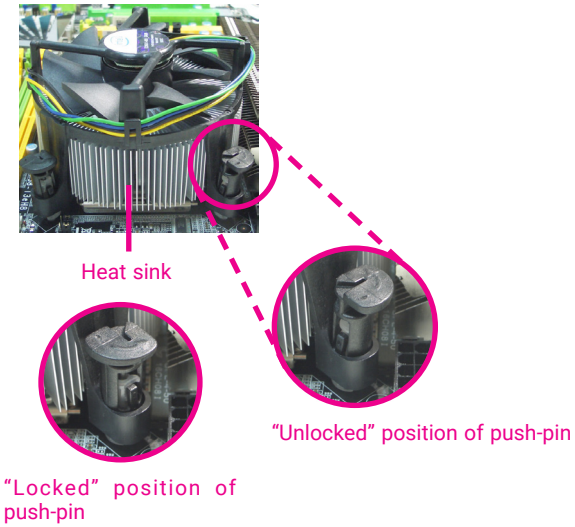
   Some heat sinks come with a patch of pre-applied thermal paste. Do not apply thermal paste if the fan / heat sink already has a patch of thermal paste on its underside. Peel the strip that covers the paste before you place the fan / heat sink on top of the CPU.

2. Place the heat sink on top of the CPU. The 4 spring screws around the heat sink, which are used to secure the heat sink onto the system board, must match the 4 mounting holes around the socket.

3. Orient the heat sink so that the CPU fan's cable is nearest the CPU fan connector.



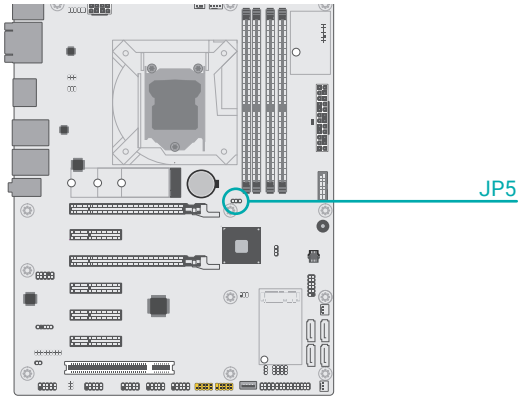
4. Screw tight two of the spring screws at opposite corners into the mounting holes. And then proceed with the other two spring screws.



5. Connect the CPU fan's cable to the CPU fan connector on the system board.

▶ Jumper Settings

Clear CMOS



If any anomaly of the followings is encountered —

a) CMOS data is corrupted;

b) you forgot the supervisor or user password;

c) failure to start the system due to BIOS mis-configuration

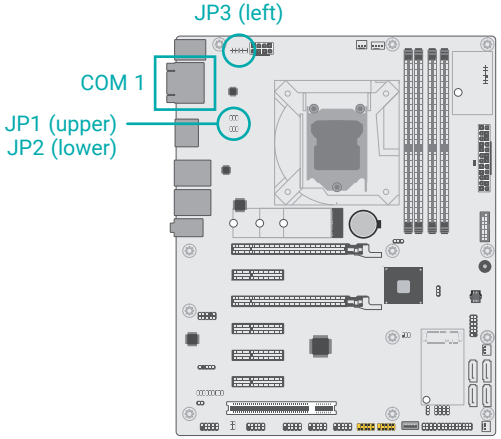
— it is suggested that the system be reconfigured with default values stored in the ROM BIOS. To load the default values stored in the ROM BIOS, please follow the steps below.

1. Power-off the system and unplug the power cord.
2. Put a jumper cap on pin 2 and pin 3. Wait for a few seconds and set it back to its default setting, i.e. jumper cap on pin 1 and pin 2.
3. Plug the power cord and power-on the system.

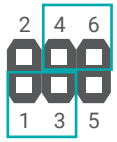
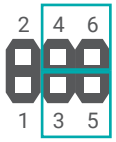
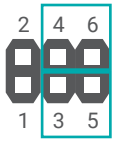
■ 1-2 On: Normal (default)

■ 2-3 On: Clear CMOS

COM 1 Serial Mode

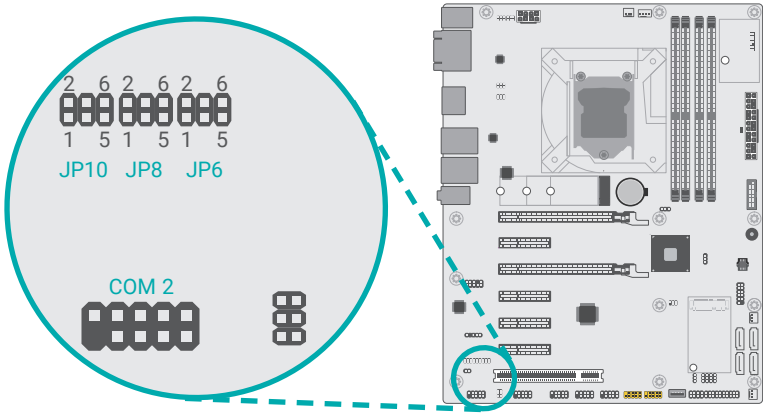


JP1, JP2, and JP3 are used to configure the COM 1 port to RS232, RS422 (Full Duplex) or RS485. The three jumpers must all be configured to the same serial mode.

	RS232 (default)	RS422	RS485
JP3	 ■ 1-3, 4-6 On	 ■ 3-5, 4-6 On	 ■ 3-5, 2-4 On
JP1 & JP2	 ■ 1-3, 2-4 On	 ■ 3-5, 4-6 On	 ■ 3-5, 4-6 On

▶ **Jumper Settings**

COM 2 Serial Mode

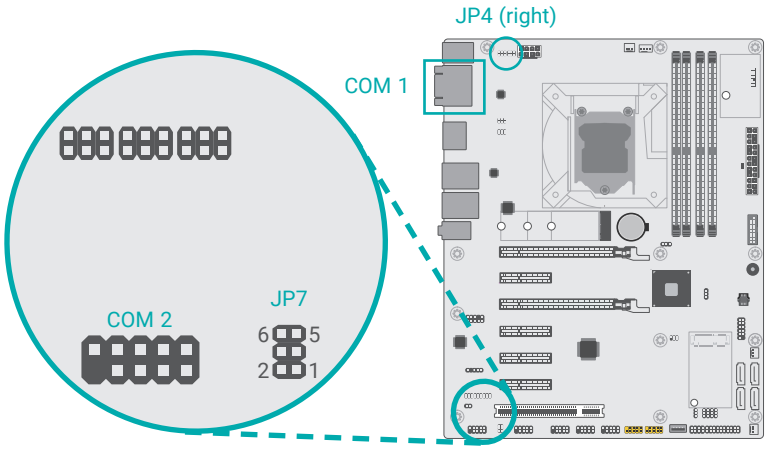


JP6, JP8, and JP10 are used to configure the COM 2 port to RS232, RS422 (Full Duplex) or RS485. The three jumpers must all be configured to the same serial mode.

	RS232 (default)	RS422	RS485
JP10	2 4 6 1 3 5 ■ 1-3, 4-6 On	2 4 6 1 3 5 ■ 3-5, 4-6 On	2 4 6 1 3 5 ■ 3-5, 2-4 On
JP6 & JP8	2 4 6 1 3 5 ■ 1-3, 2-4 On	2 4 6 1 3 5 ■ 3-5, 4-6 On	2 4 6 1 3 5 ■ 3-5, 4-6 On

▶ **Jumper Settings**

COM 1/2 RS232 Power Select

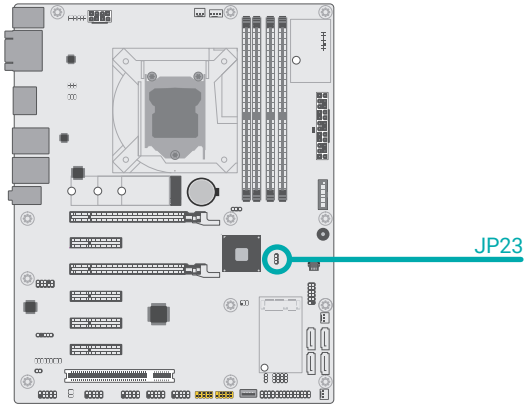


The COM 1 and COM 2 serial ports support RS232 with or without power configured via jumper settings of JP4 and JP7.

	Standard RS232 (default)	RS232 with Power
	■ 2-4 On: Pin 1 = DCD- 1-3 On: Pin 9 = RI-	■ 4-6 On: Pin 1 = +12V 3-5 On: Pin 9 = +5V
JP7 (COM2)	6 5 4 3 2 1	6 5 4 3 2 1
JP4 (COM1)	2 4 6 1 3 5	2 4 6 1 3 5

▶ **Jumper Settings**

Mini PCIe Signal Select



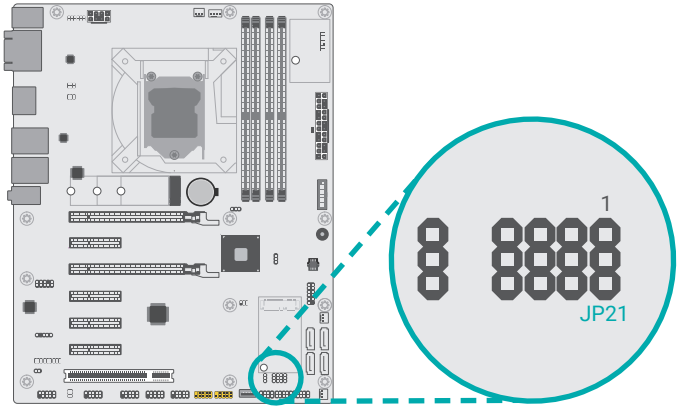
The signal of Mini PCIe can be switched between SATA (default) or PCIe via JP23. When SATA bus is selected, please further decide whether it is directed to the Mini PCIe connector (mSATA signal) or the 7-pin SATA connector, SATA 3 (R5).

■ 1-2 On: SATA bus (default)

■ 2-3 On: PCIe bus

▶ **Jumper Settings**

mSATA (Mini PCIe connector) / 7-pin SATA (SATA 3) Switch



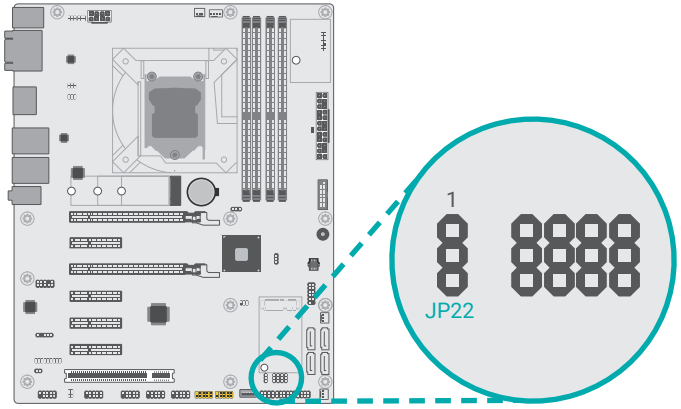
The Mini PCIe bus is shared by a SATA bus and a PCIe bus. When set to SATA bus via JP23 as previously instructed, this SATA bus can further be directed to either the 7-pin SATA connector, SATA3 (R5) or the Mini PCIe connector (mSATA signal) via JP21.

■ 1-2 On: 7-pin SATA connector (SATA4)

■ 2-3 On: mSATA via Mini PCIe (default)

▶ **Jumper Settings**

Mini PCIe Power Select



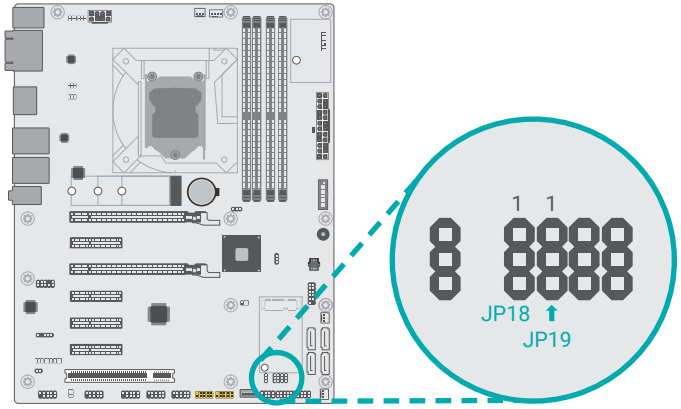
The power of Mini PCIe can be switched between 3V3DU and 3V3 via JP22.

■ 1-2 On: 3V3DU

■ 2-3 On: 3V3 (default)

▶ **Jumper Settings**

Digital I/O (DIO) Power Supply



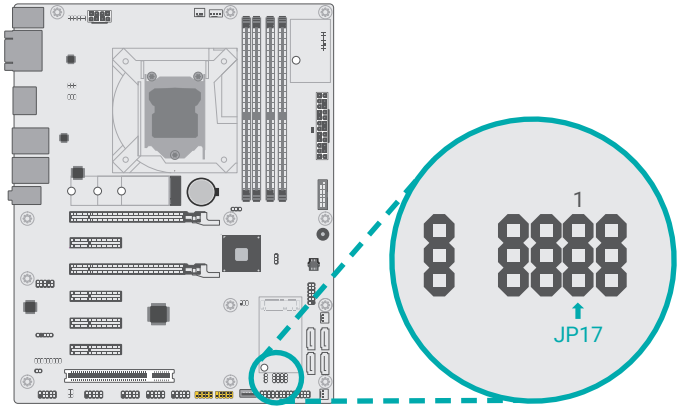
The Digital I/O can be configured to use the power bus of the Digital I/O connector for power supply or not. JP18 is used to select for DIO0~DIO3. JP19 is used to select for DIO4~DIO7.

■ 1-2 On: DIO power used (default)

■ 2-3 On: GND

▶ **Jumper Settings**

Digital I/O (DIO) Power Select

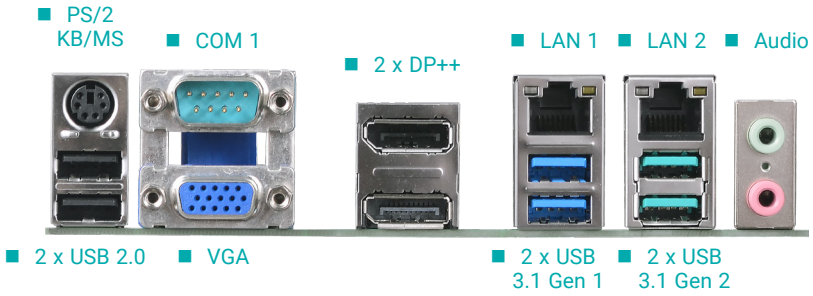


JP17 is used to select the power of Digital I/O: +5VDU (default) or +5V.

■ 1-2 On: +5VDU (default)

■ 2-3 On: +5V

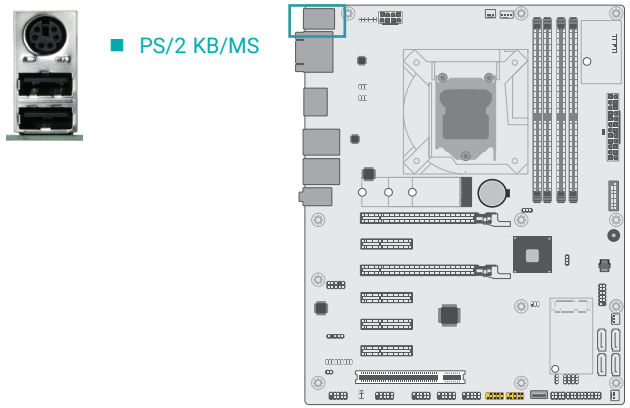
▶ Rear I/O Ports



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

- 1 PS/2 Keyboard/Mouse port
- 2 USB 2.0 ports
- 1 Serial COM port (DB9)
- 1 VGA port (DB15)
- 2 DP++ ports
- 2 LAN ports (RJ45)
- 2 USB 3.1 Gen1 ports
- 2 USB 3.1 Gen2 ports
- 1 Line-in jack (optional)
- 1 Line-out jack
- 1 Mic-in jack

PS/2 Keyboard/Mouse

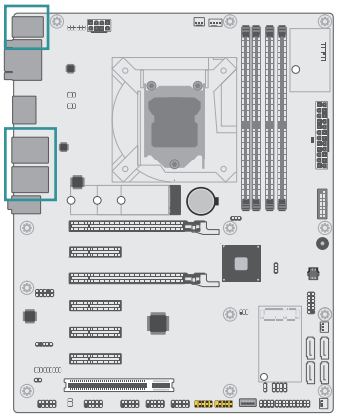


This rear I/O port is used to connect a PS/2 keyboard/mouse. IRQ12 is reserved for the PS/2 mouse connector.

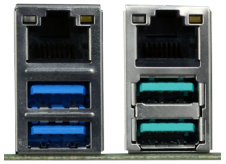
▶ Rear I/O Ports

USB Ports

- USB 8 (USB 2.0)
- USB 7 (USB 2.0)



- USB 2 (USB 3.1 Gen 1)
- USB 1 (USB 3.1 Gen 1)



- USB 4 (USB 3.1 Gen 2)
- USB 3 (USB 3.1 Gen 2)

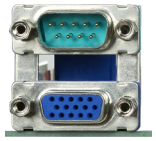
USB allows data exchange between your computer and a wide range of simultaneously accessible external Plug and Play peripherals. The system board is equipped with multiple USB Type A ports at the rear side — two USB 2.0 ports, two USB 3.1 Gen1 ports, and two USB 3.1 Gen2 ports. For the internal USB ports, please refer to the next section. Please refer to the next section for internal USB connectors.

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

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.

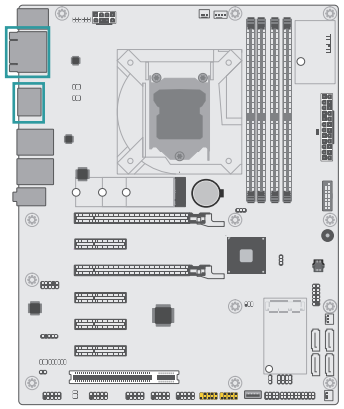
▶ Rear I/O Ports

Graphics Display



- VGA

- DP++ 2
- DP++ 1



VGA
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.

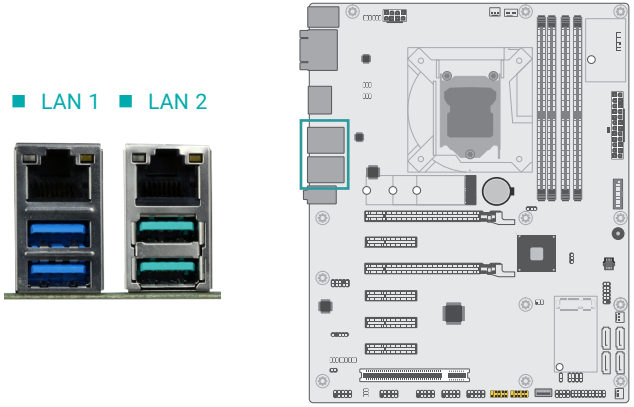
DisplayPort ++
The DisplayPort (DP) is a digital display interface used to connect a display device such as a computer monitor. It is used to transmit audio and video simultaneously. The interface, which is developed by VESA, delivers higher performance features than any other digital interface. DP++ is supported by the system board for converting to DVI and HDMI signals.

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.

▶ Rear I/O Ports

RJ45 LAN



The two LAN ports allow the system board to connect to a local area network.

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.

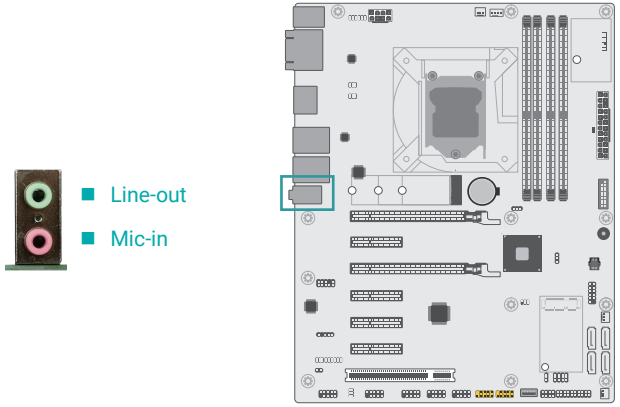
Driver Installation
Install the LAN drivers. Refer to the chapter 4 for more information.

Features

- 1 Intel® I211AT PCIe Gigabit Ethernet LAN Controller
- 1 Intel® I219LM LAN PHY with iAMT12.0 (only Xeon/Core i7/i5 supports iAMT)

▶ Rear I/O Ports

Audio



The system board is equipped with three rear audio jacks:

- Line-in Jack (Light Blue), optional

  This jack is used to connect any audio devices such as Hi-fi set, CD player, tape player, AM/FM radio tuner, synthesizer, etc.

- Line-out Jack (Lime)

  This jack is used to connect a headphone or external speakers.

- Mic-in Jack (Pink)

  This jack is used to connect an external microphone.

For the internal Front Audio connector, please refer to the next section.

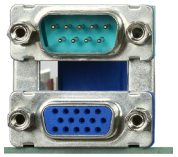
BIOS Setting
Configure the onboard audio port in the Advanced menu ("Audio Configuration" submenu) of the BIOS. Refer to chapter 3 for more information.

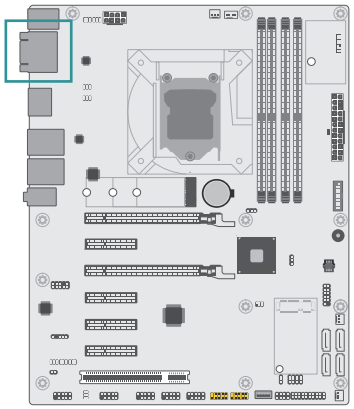
Driver Installation
Install the audio driver. Refer to Chapter 4 for more information.

▶ Rear I/O Ports

COM 1 (Serial) Port

■ COM 1





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 1 supports three serial modes, i.e. RS232, RS422, and RS485, as well as RS232 with/without power.

Jumper Setting
Serial mode and RS232 with/without power of COM 1 are configured via jumper settings as previously instructed in this chapter.

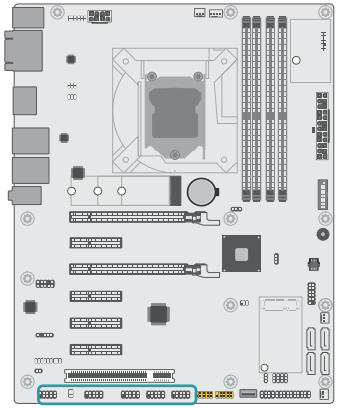
BIOS Setting
Configure the onboard COM ports in the Advanced menu (“Console Redirection” and "SIO NUVOTON6116D" submenus) of the BIOS. Refer to chapter 3 for more information.

Note:
Please refer to the Internal I/O section later in this chapter for more information on the internal COM ports.

▶ Internal I/O Connectors

COM (Serial) Ports

■ COM 2/3/4/5/6 from left to 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.

Foru of the internal COM (serial) ports, i.e. COM 3/4/5/6, support only RS232 serial mode, while COM 2 supports RS232, RS422, and RS485, as well as RS232 with/without power.

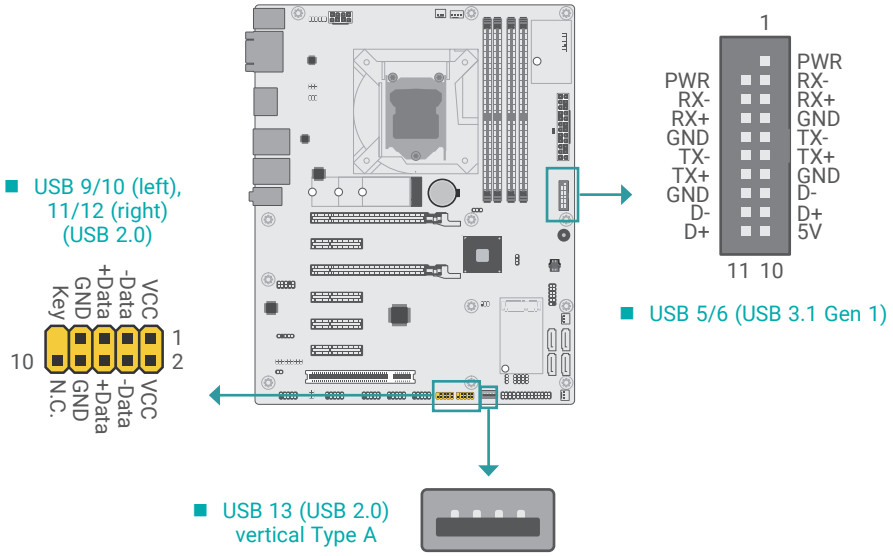
BIOS Setting
Configure the onboard COM ports in the Advanced menu (“Console Redirection” and "SIO NUVOTON6116D" submenus) of the BIOS. Refer to chapter 3 for more information.

Jumper Setting
Serial mode and RS232 with/without power of COM 2 are configured via jumper settings as previously instructed in this chapter.

■ Internal COM Port Pin Assdignment

Pin	Standard RS232	RS232 with Power (COM 2 only)	RS422 (COM 2 only)	RS485 (COM 2 only)
1	DCD-	+12V	RXD+	Data+
2	RD	RD	RXD-	Data-
3	TD	TD	TXD+	N.C.
4	DTR-	DTR-	TXD-	N.C.
5	GND	GND	GND	GND
6	DSR-	DSR-	N.C.	N.C.
7	RTS-	RTS-	N.C.	N.C.
8	CTS-	CTS-	N.C.	N.C.
9	RI-	+5V	N.C.	N.C.

USB Ports



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

In addition to the rear USB ports as introduced previously in this chapter, the system board is equipped with five internal USB 2.0 ports and 2 USB 3.1 Gen 1 ports as illustrated above.

The internal USB pin headers may be connected to 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. The Part Number of the 20-pin USB 3.1 connector is 346-521081-200G. Please contact our sales representatives for more information if the cable is to be customized.

BIOS Setting

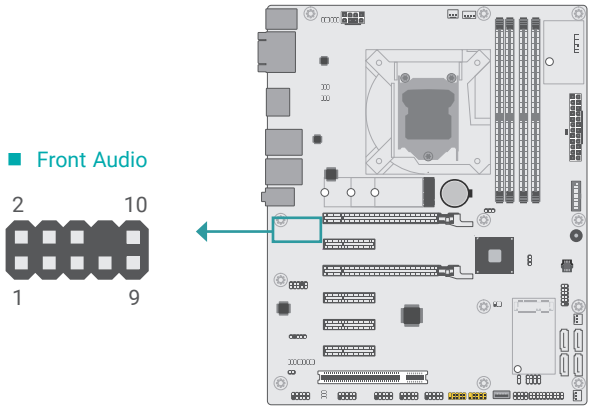
Configure the onboard USB in the Advanced menu ("USB Configuration" submenu) of the BIOS. Refer to chapter 3 for more information.

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 S state(s).

Note:
The pin headers for USB 2.0 ports (USB 11/12) can be optionally replaced by a USB 2.0 Type A port by request.

Front Audio



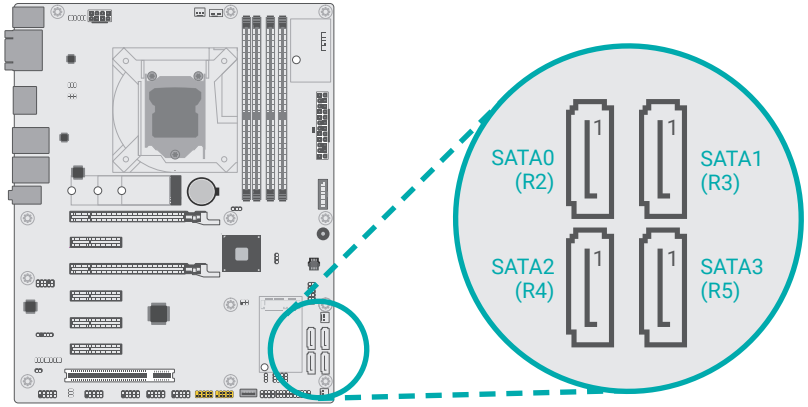
The Front Audio internal connector allows you to connect to the second line-out and mic-in jacks that are at the front panel of your system.

■ Front Audio Pin Assignment

Pin	Assignment	Pin	Assignment
1	Mic-L	2	GND
3	Mic-R	4	N.C.
5	Line-Out-R	6	Mic-JD (sense)
7	GND	8	KEY
9	Line-Out-L	10	Line-JD (sense)

Internal I/O Connectors

SATA (Serial ATA)



The Serial ATA (SATA) connectors are used to connect the Serial ATA device. SATA 3.0 is supported by the five SATA ports and provides data rate up to 6Gb/s. Connect one end of the Serial ATA cable to a SATA connector and the other end to your Serial ATA device.

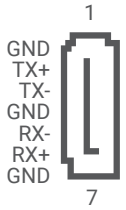
BIOS Setting

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

Jumper Setting

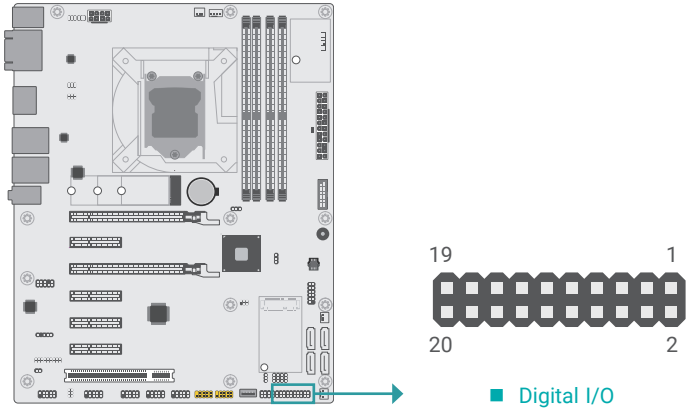
A SATA bus is either terminated at SATA3 (R5) or Mini PCIe (mSATA), and is configured via JP23 and JP21 as previously instructed in this chapter.

■ SATA Pin Assignment



Note:
The SATA bus of SATA3 (R5) is shared with Mini PCIe (mSATA), and will be inactive when the SATA bus is directed to Mini PCIe (mSATA).

Digital I/O



The 8-bit Digital I/O (DIO) connector allows for input/output signals of digital logical states defined by voltage levels.

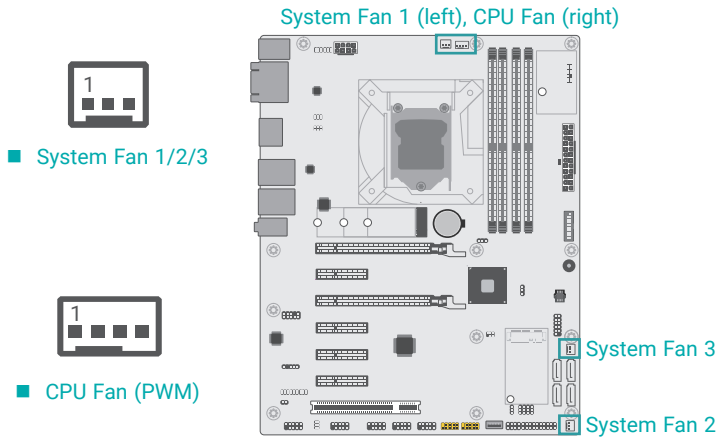
Jumper Setting

DIO signal and power can be configured via jumper settings as previously instructed in this chapter.

■ Digital I/O Pin Assignment

Pin	Assignment	Pin	Assignment
1	GND	2	+12V
3	DIO_7	4	+12V
5	DIO_6	6	GND
7	DIO_5	8	+5V
9	DIO_4	10	+5V
11	DIO_3	12	GND
13	DIO_2	14	+5VDU
15	DIO_1	16	+5VDU
17	DIO_0	18	GND
19	GND	20	---

Cooling Fan Connectors



These fan connectors are used to connect to cooling fans. Cooling fans provide adequate air circulation throughout the chassis and dissipate heat to prevent overheating of the system board and components. The 4-pin fan provides PWM to modulate fan speed whereas the 3-pin fans modulate fan speed via voltage modulation.

BIOS Setting

Configure the Smart Fans in the Advanced menu ("SIO NUVOTON6116D" submenu) of the BIOS. Refer to chapter 3 for more information.

■ 3-pin Fan Pin Assignment

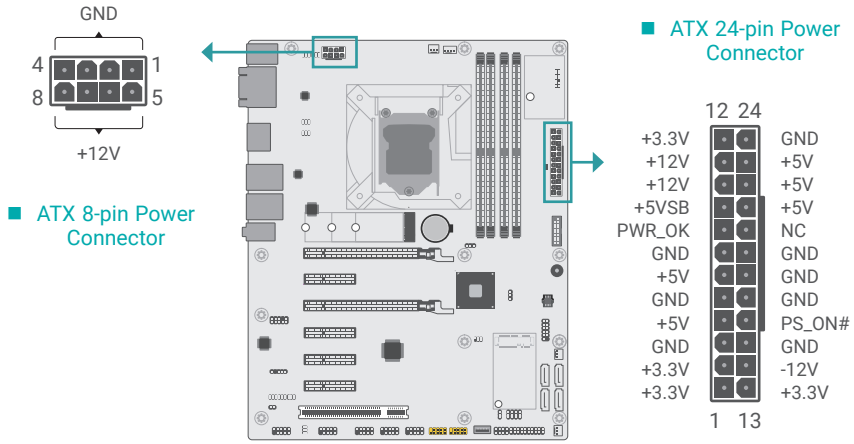
Pin	Assignment
1	Ground
2	Power
3	Sense

■ 4-pin Fan Pin Assignment

Pin	Assignment
1	Ground
2	Power
3	Sense
4	Speed Control

▶ Internal I/O Connectors

Power Connector

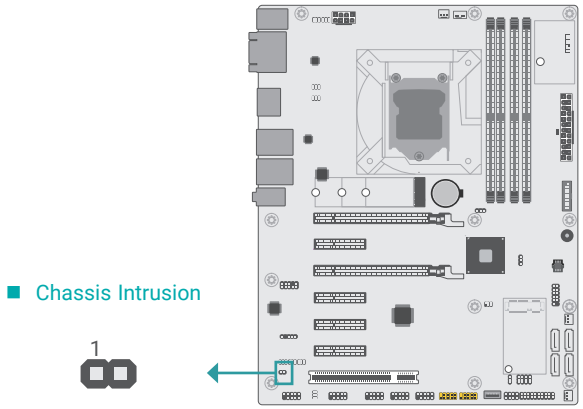


Use a power supply that complies with the ATX12V Power Supply Design Guide Version 1.1. An ATX12V power supply unit has a standard 24-pin ATX main power connector that must be inserted into the 24-pin connector. The 8-pin +12V power connector enables the delivery of more +12VDC current to the processor's Voltage Regulator Module (VRM).
The power connectors from the power supply unit are designed to fit the 24-pin and 8-pin connectors in only one orientation. Make sure to find the proper orientation before plugging the connectors.
The system board requires a minimum of 300 Watt power supply to operate. Your system configuration (CPU power, amount of memory, add-in cards, peripherals, etc.) may exceed the minimum power requirement. To ensure that adequate power is provided, we strongly recommend that the system is supplied with a minimum of 400 Watt power.

Important:
Insufficient power supplied to the system may result in instability or malfunction of the add-in boards and peripherals. Calculating the system's approximate power usage is important to ensure that the power supply meets the system's consumption requirements.

▶ Internal I/O Connectors

Chassis Intrusion



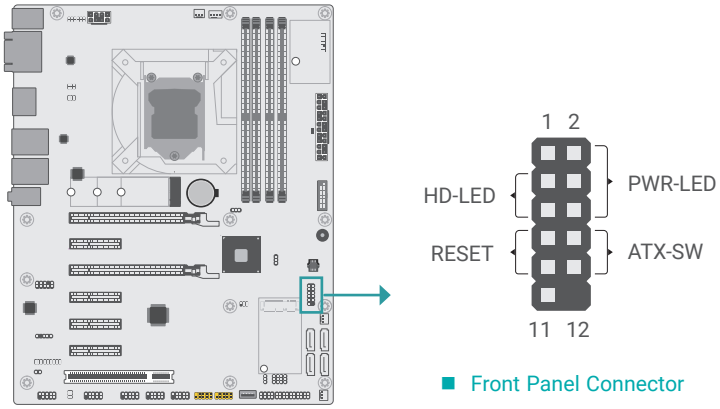
The board supports the chassis intrusion detection function. Connect the chassis intrusion sensor cable from the chassis to this connector. When the system's power is on and a chassis intrusion occurred, an alarm will sound. When the system's power is off and a chassis intrusion occurred, the alarm will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

■ Chassis Intrusion Pin Assignment

Pin	Assignment	Pin	Assignment
1	Signal	2	GND

▶ Internal I/O Connectors

Front Panel



■ Front Panel Connector

■ Front Panel Pin Assignment

	Pin	Assignment		Pin	Assignment
	1	N.C.		2	LED Power
HD-LED	3	HDD Power	PWR-LED	4	LED Power
	5	Signal		6	Signal
RESET	7	Ground	ATX-SW	8	Ground
	9	Signal		10	Signal
	11	N.C.		12	---

HDD-LED - Hard Disk Drive LED
Lighting of the LED indicates that the hard drive is being accessed.

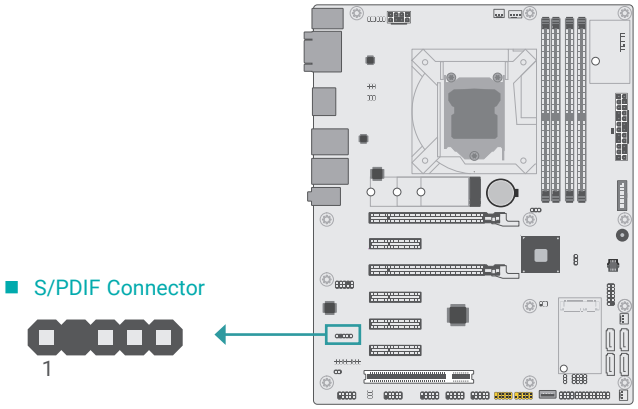
RESET - Reset Switch
This switch allows you to reboot without having to power off the system.

PWR-LED - Power/Standby LED
When the system's power is on, this LED will light up. When the system is in the S1 (POS - Power On Suspend) state, it will blink at 1-second intervals. When the system is in the S3 (STR - Suspend To RAM) state, it will blink at 4-second intervals.

ATX-SW - ATX Power Switch
This switch is used to power on or off the system.

▶ Internal I/O Connectors

S/PDIF



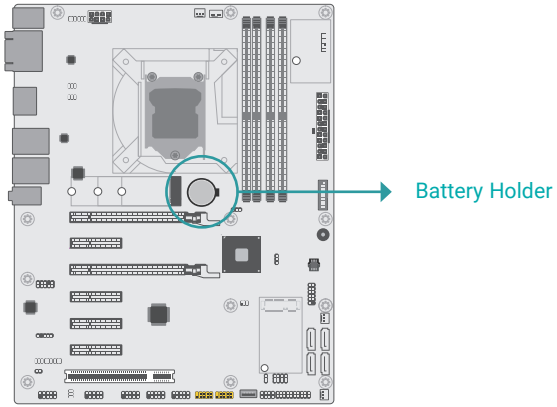
■ S/PDIF Connector

The Sony/Philips Digital Interface (S/PDIF) connector is for audio output to external audio equipment. The S/PDIF port may be mounted on a card-edge bracket. Install the card-edge bracket to an available slot at the rear of the system chassis then connect the audio cable to the S/PDIF connector. Make sure pin 1 of the audio cable is aligned with pin 1 of the S/PDIF connector.

■ S/PDIF Pin Assignment

Pin	Assignment
1	+5V
2	---
3	SPDIF Out
4	GND
5	SPDIF In

Battery



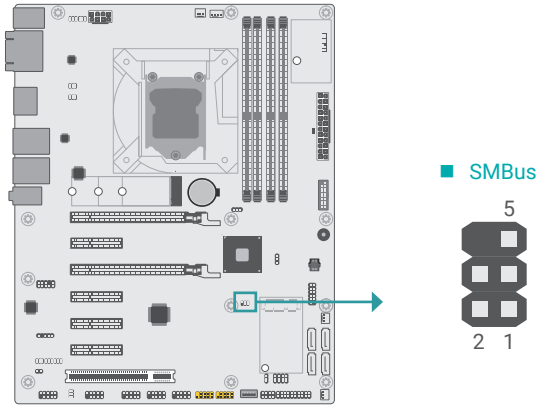
The lithium ion battery addendum supplies power to the real-time clock and CMOS memory as an auxiliary source of power when the main power is shut off. Insert a coin cell battery into the holder and make sure the polarities are correctly oriented — the cap side (rimmed rounded edge) is negative and should be facing the holder; the flat side with a + mark is positive and should be facing away from the holder.

Safety Measures

- There exists explosion hazard if the battery is incorrectly installed.
- Replace only with the same or equivalent type recommended by the manufacturer.
- Dispose of used batteries according to local ordinances.

Internal I/O Connectors

SMBus



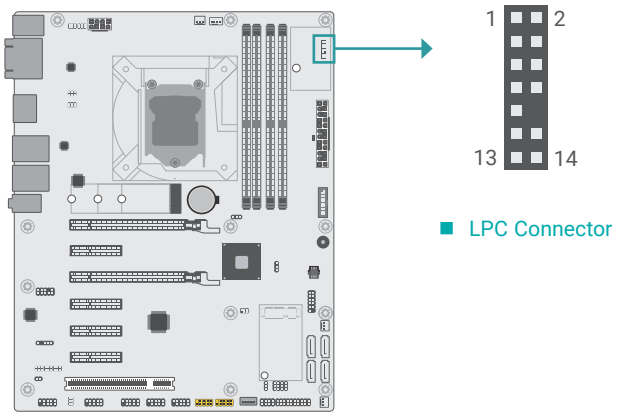
The SMBus (System Management Bus) connector is used to connect the SMBus device. It is a multiple device bus that allows multiple chips to connect to the same bus and enable each one to act as a master by initiating data transfer.

SMBus Pin Assignment

Pin	Assignment	Pin	Assignment
1	3V3SB	2	GND
3	SMBus_Clock	4	SMBus_DATA
5	SMBus_Alert	6	---

LPC

The LPC connector is used for debugging.



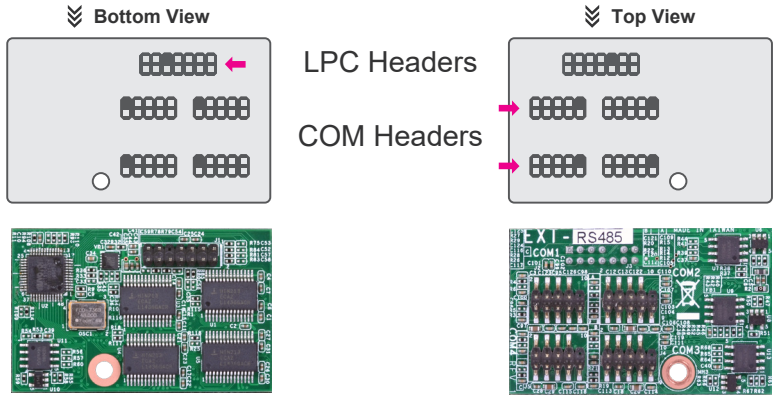
■ LPC Connector

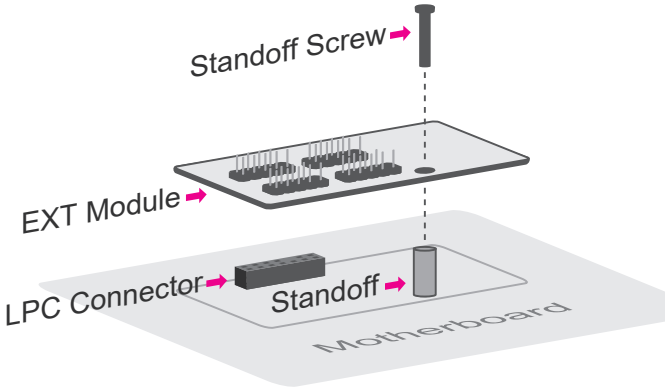
■ LPC Pin Assignment

Pin	Assignment	Pin	Assignment
1	L_CLK	2	L_LAD1
3	L_RST#	4	L_LAD0
5	L_FRAME#	6	3.3V
7	L_LAD3	8	GND
9	L_LAD2	10	---
11	SERIRQ	12	GND
13	5VSB	14	5V

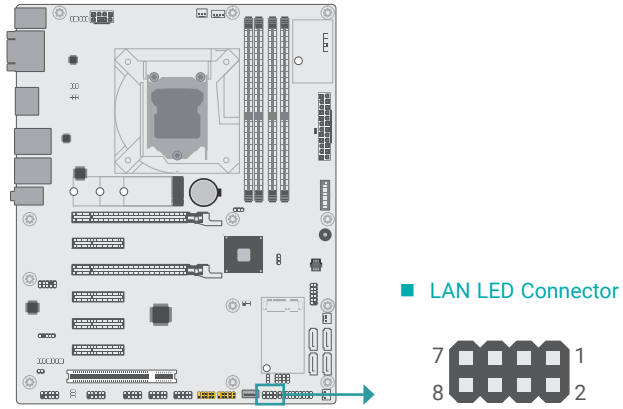
External COM port Module

The external COM port modules — EXT-RS232 and EXT-RS485 — are designed by GT's proprietary technology, and support four additional COM ports per module. The EXT-RS232/RS485 card is connected to the motherboard via the LPC connector and secured by a standoff as illustrated below.





LAN LED



■ LAN LED Connector

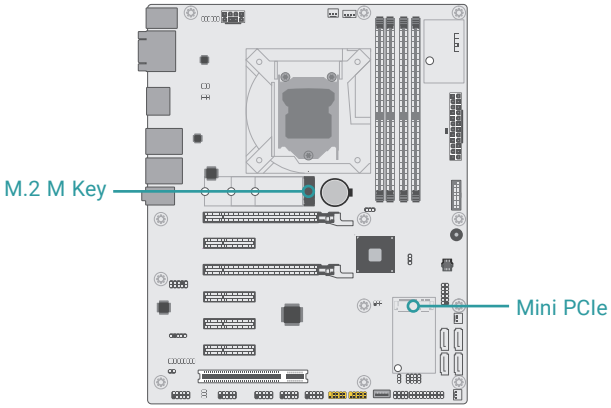
The LAN LED connector is used to detect the connection state of RJ45 LAN ports when the connection is made to an active network via a cable. The pin functions of the LAN LED connector are listed below.

■ LAN LED Pin Assignment

Pin	Assignment	Pin	Assignment
1	GBE(LAN1)_1000	2	GBE(LAN1)_100
3	GBE(LAN1)_LED_LINK_ACT	4	3V3DU
5	LINK(LAN2)_1000	6	LINK(LAN2)_100
7	LINK(LAN2)_ACTIVITY	8	3V3DU

▶ Internal I/O Connectors

Expansion Slots

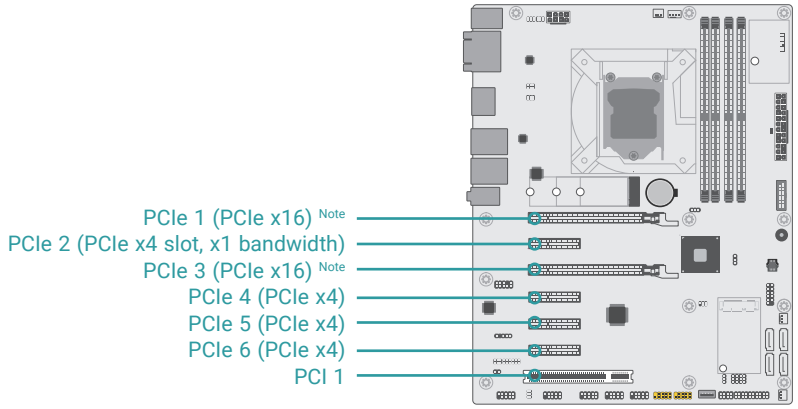


M.2 Sockets
The M.2 socket is the Next Generation Form Factor (NGFF) which is designed to support multiple modules and make the M.2 more suitable in application for solid-state storage. The board preserves space for the M.2 M key socket (22mm x 42mm, 22mm x 60mm, and 22mm x 80mm).

Mini PCIe
The Mini PCIe socket allows for a full-size Mini PCIe module. The Mini PCIe supports PCIe, SATA, and USB signals.

BIOS Setting
Configure PCIe root ports in the Advanced menu (“PCI Express Configuration” submenu) of the BIOS. Refer to chapter 3 for more information.

Jumper Setting
Select the signal of Mini PCIe via jumper settings as previously instructed in this chapter.



PCI Express x16 Slot

Install a PCI Express x16 graphics card that complies to the PCI Express specifications into the PCI Express x16 slot. To install a graphics card into the x16 slot, align the graphics card to the socket and perpendicularly to the board, be cautious in aligning the locations of notch and key, and then press the card down firmly until it is completely seated. The retaining clip of the slot will close up automatically to hold the graphics card in place.

PCI Express x4 Slot

Install PCI Express cards such as network cards or other cards that comply to the PCI Express specifications into the PCI Express x4 slot.

PCI Slot

The two PCI slots support expansion cards that comply with PCI specifications. You can install a PCI expansion card or a customized riser card designed for only 2 PCI slots expansion (for low profile PCI card only) into the PCI slot.

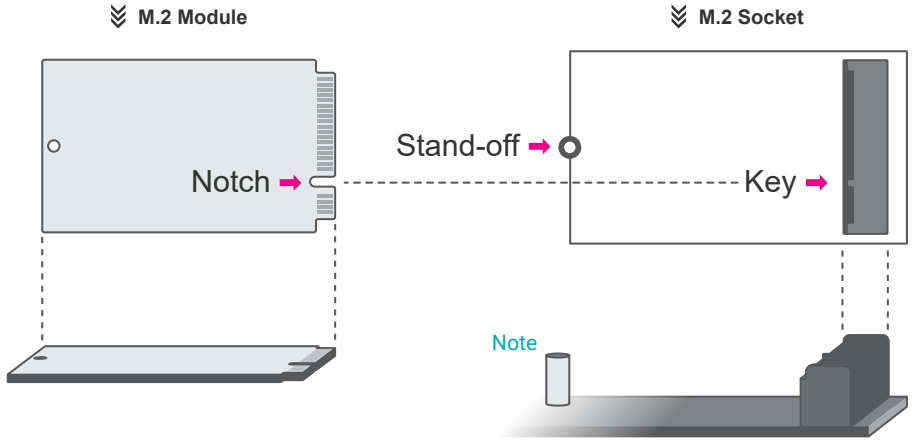
Note:
The PCIe x16 slots share one x16 bandwidth in the following manners: PCIe 1 is x16 bandwidth when PCIe 3 is unused; when PCIe 3 is in used, both PCIe 1 and PCIe 3 are x8 bandwidth.

▶ Internal I/O Connectors ▶ Expansion Slots

Installing the M.2 Module

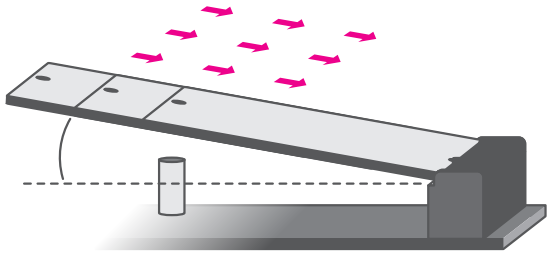
Before installing the M.2 module into the M.2 socket, please make sure that the following safety cautions are well-attended.

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 M.2 socket on the system board
4. Make sure the notch on card is aligned to the key on the socket.
5. Make sure the standoff screw is removed from the standoff.

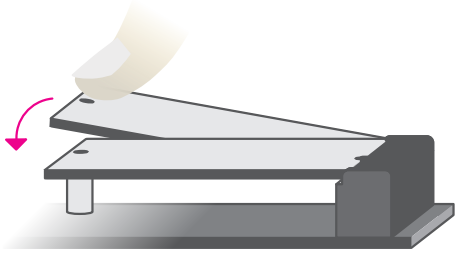


Note:
The M.2 stand-off (M2X4, M2.5x4.5) is detachable and is screwed onto one of the reserved bases for the three supported form factors. Please remove and install it into the base of the form factor that matches the M.2 module to be installed.

Please follow the steps below to install the card into the socket.



Step 1:
Insert the card into the socket at an angle while making sure the notch and key are perfectly aligned.



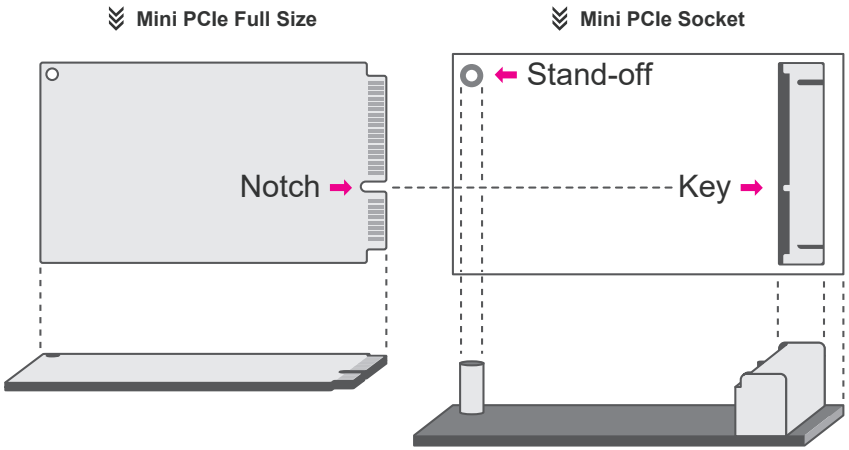
Step 2:
Press the end of the card far from the socket down until against the stand-off.

Step 3:
Screw tight the card onto the stand-off with a screw driver and a stand-off screw until the gap between the card and the stand-off closes up. The card should be lying parallel to the board when it's correctly mounted.

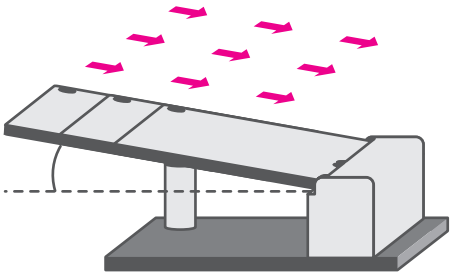
Installing the Mini PCIe Module

Before installing the Mini PCIe module into the Mini PCIe socket, please make sure that the following safety cautions are well-attended.

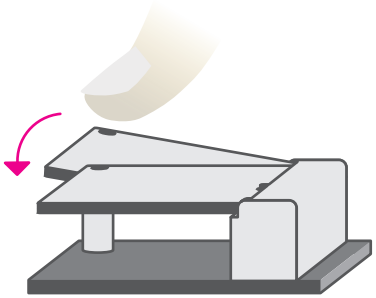
1. Make sure the PC and all other peripheral devices connected to it has been powered down.
2. Disconnect all power cords and cables.
3. Locate the Mini PCIe socket on the system board
4. Make sure the notch on card is aligned to the key on the socket.



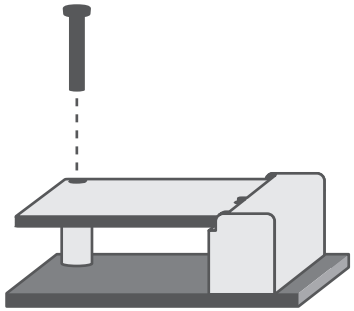
Please follow the steps below to install the card into the socket.



Step 1:
Insert the card into the socket at an angle while making sure the notch and key are perfectly aligned.



Step 2:
Press the end of the card far from the socket down until against the stand-off.



Step 3:
Screw tight the card onto the stand-off with a screw driver and a stand-off screw until the gap between the card and the stand-off closes up. The card should be lying parallel to the board when it's correctly mounted.