

SYM86455VGGA-E

(v1.x) Industrial Computer Board



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Revision History

Revision	Date
V1.0	2019/01

Technical Support

If a problem arises with your product and no solution can be obtained from the user's manual, please contact your place of purchase or local distributor. Alternatively, please visit <https://www.grantech.com/support>.

Safety Instructions

- Always read the safety instructions carefully.
- Keep this User's Manual for future reference.
- Keep this equipment away from humidity.
- Lay this equipment on a reliable flat surface before setting it up.
- The openings on the enclosure are for air convection hence protects the equipment from overheating. **DO NOT COVER THE OPENINGS.**
- Make sure the voltage of the power source and adjust properly 110/220V before connecting the equipment to the power inlet.
- Place the power cord such a way that people can not step on it. Do not place anything over the power cord.
- Always Unplug the Power Cord before inserting any add-on card or module.
- All cautions and warnings on the equipment should be noted.
- Never pour any liquid into the opening that could damage or cause electrical shock.
- If any of the following situations arises, get the equipment checked by service personnel:
 - ▶ The power cord or plug is damaged.
 - ▶ Liquid has penetrated into the equipment.
 - ▶ The equipment has been exposed to moisture.
 - ▶ The equipment does not work well or you can not get it work according to User's Manual.
 - ▶ The equipment has dropped and damaged.
 - ▶ The equipment has obvious sign of breakage.
- **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT UNCONDITIONED, STORAGE TEMPERATURE ABOVE 60°C, IT MAY DAMAGE THE EQUIPMENT.**

Chemical Substances Information

In compliance with chemical substances regulations, such as the EU REACH Regulation (Regulation EC No. 1907/2006 of the European Parliament and the Council), grantech provides the information of chemical substances in products at: <https://www.grantech.com>

Battery Information



European Union:

Batteries, battery packs, and accumulators should not be disposed of as unsorted household waste. Please use the public collection system to return, recycle, or treat them in compliance with the local regulations.



廢電池請回收

Taiwan:

For better environmental protection, waste batteries should be collected separately for recycling or special disposal.



California, USA:

The button cell battery may contain perchlorate material and requires special handling when recycled or disposed of in California.

For further information please visit:

<https://www.dtsc.ca.gov/hazardouswaste/perchlorate/>

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.

CE Conformity

Hereby, grantech CO., LTD declares that this device is in compliance with the essential safety requirements and other relevant provisions set out in the European Directive.



FCC-B Radio Frequency Interference Statement



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 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 measures listed below:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and 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/television 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.

Notice 2

Shielded interface cables and AC power cord, if any, must be used in order to comply with the emission limits.

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

- 1) this device may not cause harmful interference, and
- 2) this device must accept any interference received, including interference that may cause undesired operation.

WEEE Statement

Under the European Union ("EU") Directive on Waste Electrical and Electronic Equipment, Directive 2002/96/EC, which takes effect on August 13, 2005, products of "electrical and electronic equipment" cannot be discarded as municipal waste anymore and manufacturers of covered electronic equipment will be obligated to take back such products at the end of their useful life.



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1 Overview



Thank you for choosing the SYM86455VGGA-E, an excellent industrial computer board.

Based on the innovative Intel® Kaby Lake-S and Skylake-S Series Processor, SYM86455VGGA-E is engineered to provide reliable performance for a wide variety of industrial applications.

Specifications

Processor

- Intel® Kaby Lake-S Series Processor
 - Intel® Core i7-7700/i7-7700T
 - Intel® Core i5-7500/i5-7500T
 - Intel® Core i3-7101E/i3-7101TE
- Intel® Skylake-S Series Processor
 - Intel® Core i7-6700/i7-6700TE
 - Intel® Core i5-6500/i5-6500TE
 - Intel® Core i3-6100/i3-6100TE
 - Intel® Pentium G4400/G4400TE
 - Intel® Celeron G3900/G3900TE

PCH

- Intel® H110 Express Chipset

Memory

- 2 * DDR4 UDIMM slots
- Dual-Channel DDR4 memory up to 2133/2400MHz
- Max 32GB

Network

- LAN1: Intel® I219LM GbE LAN PHY
- LAN2: Intel® I211-AT GbE LAN

Storage

- 4 * SATA 6Gb/s ports
 - AHCI Mode supported

Audio

- Realtek® ALC887 High Definition Audio codec (Co-lay ALC888S)
- 1 * Line-In jack
- 1 * Line-Out jack
- 1 * Mic-In jack
- 1 * Front audio box header
- 1 * S/PDIF box header

Graphics

- Integrated Intel® HD Graphics (DirectX12 supported)
- 1 * VGA
 - Max resolution 1920 x 1200 @60Hz
- 1 * HDMI 1.4
 - Max resolution 4096 x 2160 @24Hz
- 2 independent displays
 - HDMI + VGA

Expansion Slots

- 1 * PCIe x16 slot (PCIe1)
- 1 * PCIe x16 slot with PCIe x4 signal (PCIe2)
- 5 * PCI slots (PCI1, PCI2, PCI3, PCI4, PCI5)

Rear Panel I/O

- 1 * Mouse/Keyboard combo port
- 1 * D-Sub VGA port
- 1 * HDMI port
- 1 * RS232/422/485 COM port
- 1 * RS232 COM port
- 2 * GbE RJ45 ports
- 2 * USB2.0 ports
- 4 * USB3.0 ports
- 1 * Line-In jack
- 1 * Line-Out jack
- 1 * Mic-In jack

Internal I/O

- 1 * System power connector
- 1 * CPU power connector
- 1 * CPU fan header
- 2 * System fan headers
- 4 * SATA 6Gb/s ports
- 1 * Vertical USB2.0 port
- 1 * USB2.0 box header (2 ports)
- 1 * Front panel box header
- 1 * TPM box header
- 1 * GPIO header
- 1 * Chassis intrusion header
- 4 * RS232 COM port box headers
- 1 * Front audio box header
- 1 * S/PDIF box header
- 1 * SMBus box header
- 1 * Clear CMOS jumper
- 1 * AT/ATX jumper
- 1 * ME jumper
- 2 * COM port jumpers

Form Factor

- ATX Size: 305mm (L) x 244mm (W) x 1.6mm (H)

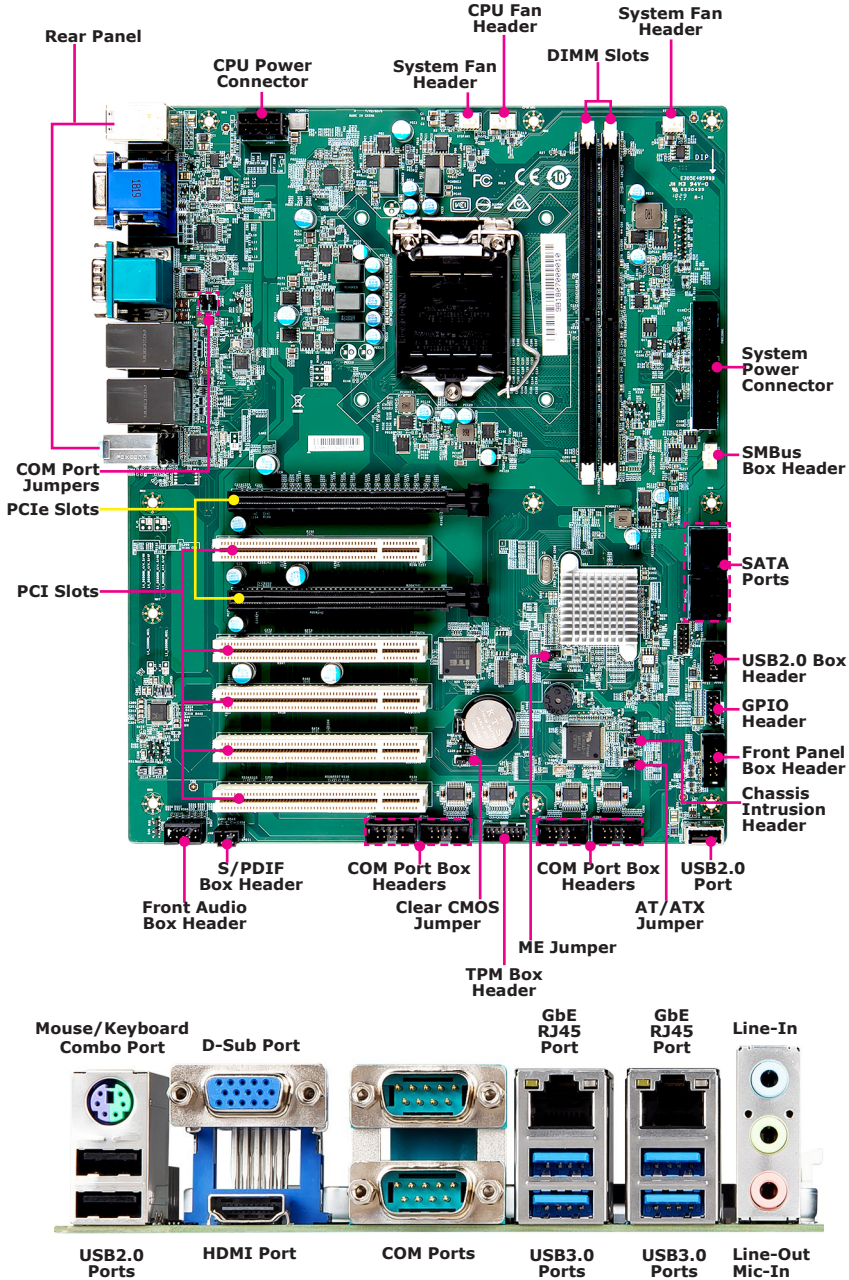
Environment

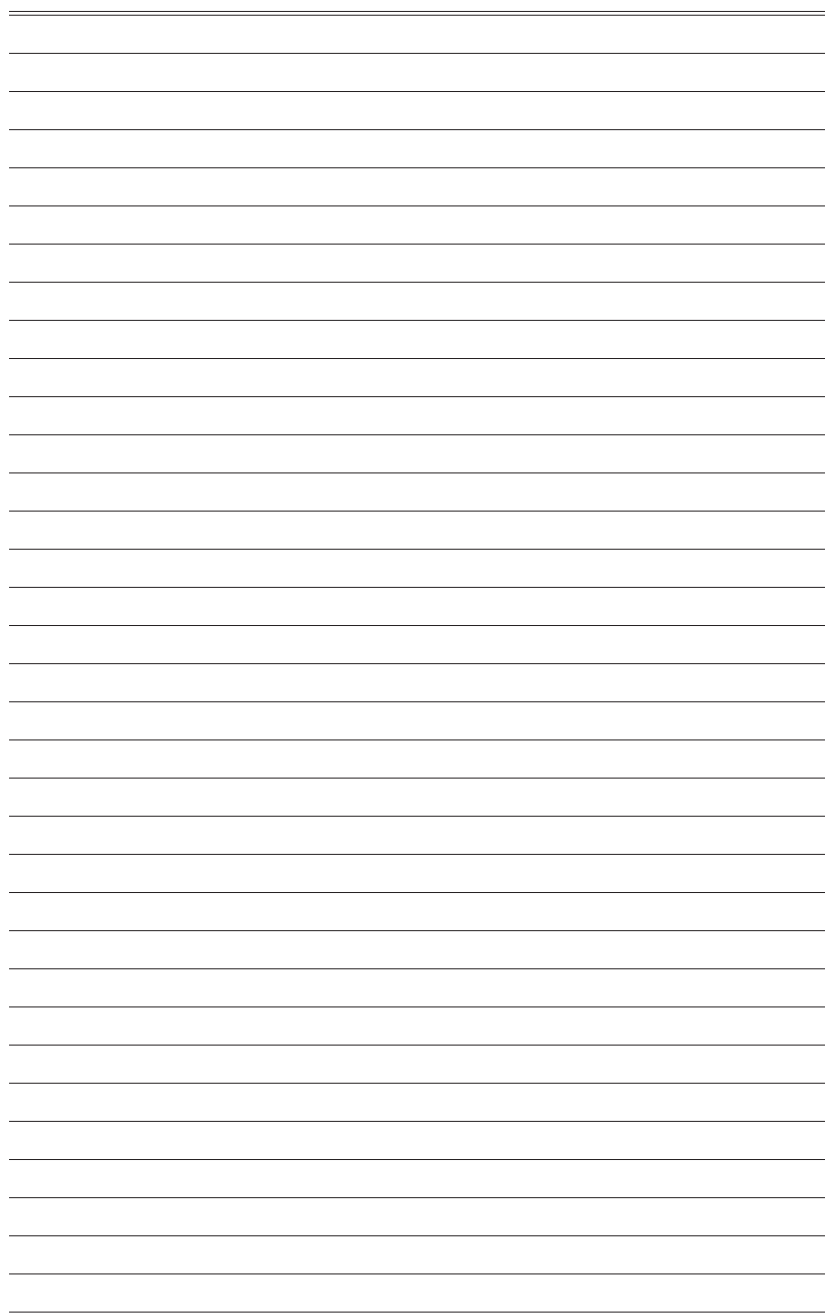
- Operating Temperature: -10 ~ 60°C
- Storage Temperature: -40 ~ 80°C
- Humidity: 10 ~ 90% RH, non-condensing

Accessories

- 2 * SATA3.0 cables
- 1 * COM port cable with bracket
- 1 * USB2.0 cable with bracket
- 1 * Driver & user manual CD
- 1 * I/O shield

Layout





2 Hardware Setup



This chapter provides you with the information about hardware setup procedures. While doing the installation, be careful in holding the components and follow the installation procedures. For some components, if you install in the wrong orientation, the components will not work properly.

Use a grounded wrist strap before handling computer components. Static electricity may damage the components.

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PCI (Peripheral Component Interconnect) Slot	2-17

CPU (Central Processing Unit)

When installing the CPU, make sure that you install the cooler to prevent overheating. If you do not have the CPU cooler, consult your dealer before turning on the computer.

Important

Overheating

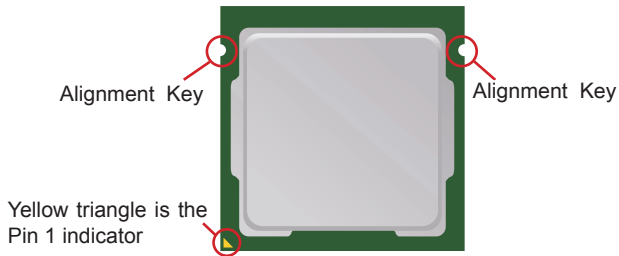
Overheating will seriously damage the CPU and system. Always make sure the cooling fan can work properly to protect the CPU from overheating. Make sure that you apply an even layer of thermal paste (or thermal tape) between the CPU and the heatsink to enhance heat dissipation.

Replacing the CPU

While replacing the CPU, always turn off the power supply or unplug the power supply's power cord from the grounded outlet first to ensure the safety of CPU.

Introduction to LGA 115x CPU

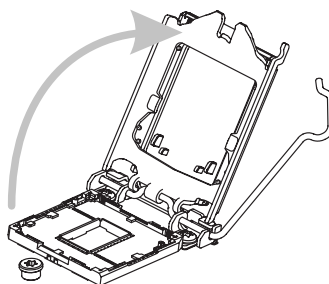
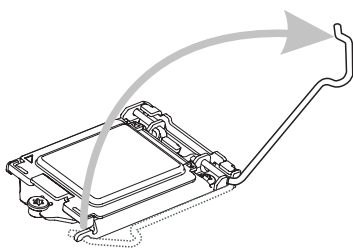
The surface of LGA 115x CPU. Remember to apply some thermal paste on it for better heat dispersion.



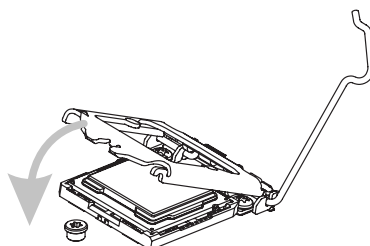
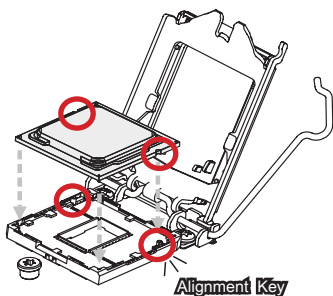
CPU Installation

When you are installing the CPU, **make sure the CPU has a cooler attached on the top to prevent overheating**. Meanwhile, do not forget to apply some thermal paste on CPU before installing the heat sink/cooler fan for better heat dispersion.

1. Open the load lever and remove the plastic cap.
2. Lift the load lever up to fully open position.



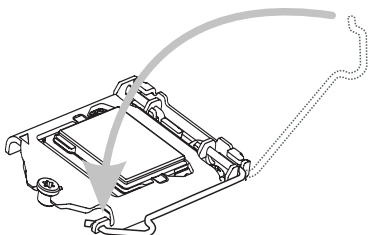
3. After confirming the CPU direction for correct mating, put down the CPU in the socket housing frame. Be sure to grasp on the edge of the CPU base. Note that the alignment keys are matched.
4. Engage the load lever while pressing down lightly onto the load plate.



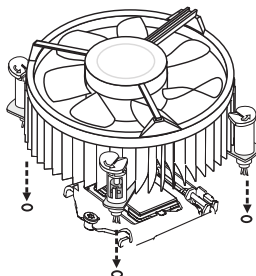
Important

Visually inspect if the CPU is seated well into the socket. If not, take out the CPU with pure vertical motion and reinstall.

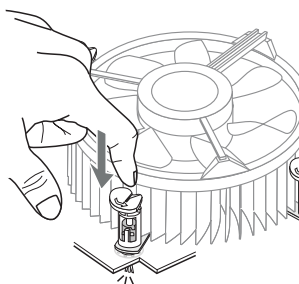
5. Secure the load lever with the hook under the retention tab.



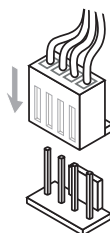
6. Make sure the four hooks are in proper position before you install the cooler. Align the holes on the motherboard with the cooler. Push down the cooler until its four clips get wedged into the holes of the motherboard.



7. Press the four hooks down to fasten the cooler. Turn over the motherboard to confirm that the clip-ends are correctly inserted.



8. Finally, attach the CPU Fan cable to the CPU fan connector on the motherboard.



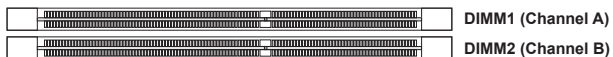
Important

- Confirm if your CPU cooler is firmly installed before turning on your system.
- Do not touch the CPU socket pins to avoid damage.
- Whenever CPU is not installed, always protect your CPU socket pins with the plastic cap covered.
- Please refer to the documentation in the CPU cooler package for more details about the CPU cooler installation.
- Read the CPU status in BIOS.

Memory

Dual-Channel Mode

In Dual-Channel mode, make sure that you install memory modules of the **same type and density** in different channel DIMM slots.



Recommended Memory Population

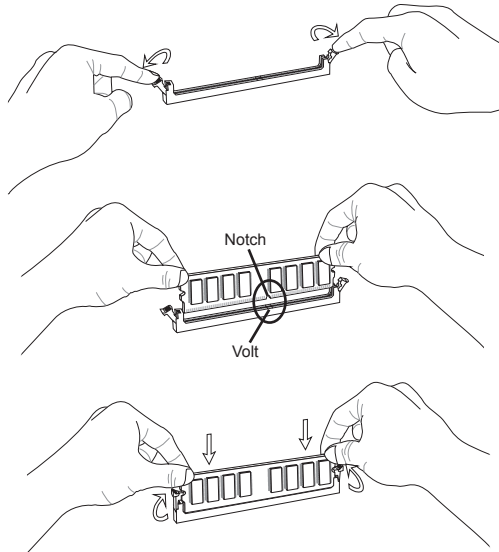
Number of DIMMs installed	1	2
DIMM1 (ch A)	V	V
DIMM2 (ch B)		V

Important

- "V" indicates a populated DIMM slot.
- Paired memory installation for Max performance.
- Populate the same DIMM type in each channel, specifically: 1. Use the same DIMM size; 2. Use the same number of ranks per DIMM.

Installing Memory Modules

1. The memory module has only one notch on the center and will only fit in the right orientation.
2. Insert the memory module vertically into the DIMM slot. Then push it in until the golden finger on the memory module is deeply inserted in the DIMM slot. The plastic clip at each side of the DIMM slot will automatically close when the memory module is properly seated.
3. Manually check if the memory module has been locked in place by the DIMM slot clips at the sides.



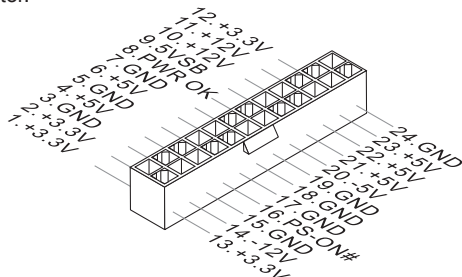
Important

- You can barely see the golden finger if the memory module is properly inserted in the DIMM slot.
- To enable successful system bootup, always insert the memory module into the DIMM1 first.

Power Supply

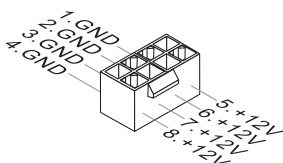
System Power Connector: PWRCONN1

This connector allows you to connect a power supply. To connect to the power supply, make sure the plug of the power supply is inserted in the proper orientation and the pins are aligned. Then push down the power supply firmly into the connector.



CPU Power Connector: JPWR1

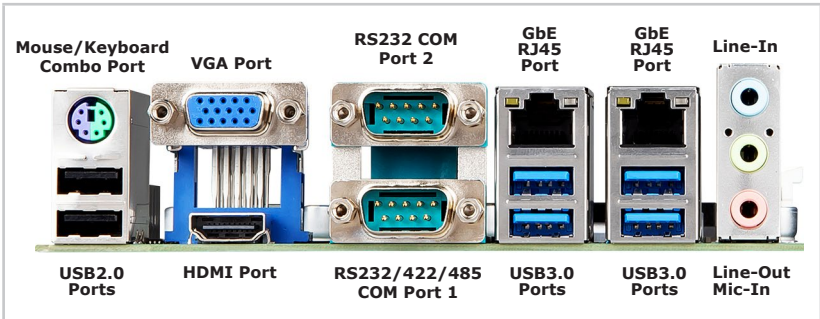
This connector is used to provide power to the CPU.



Important

Make sure that all power connectors are connected to the power supply to ensure stable operation of the motherboard.

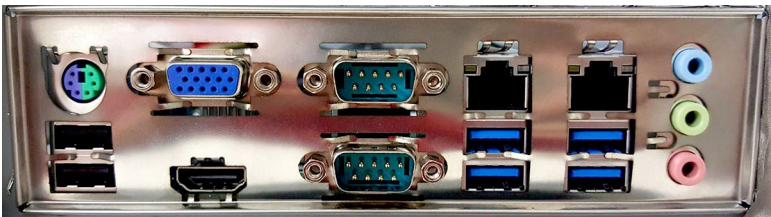
Rear Panel I/O



Important

Installing the I/O shield

1. Open the case.
2. Put the I/O shield in from inside the case. Make sure the I/O shield is put in the right orientation with motherboard I/O ports aligning with the holes in the I/O shield.
3. Apply pressure to all four corners of the I/O shield to secure it to the case.



➤ **Mouse/Keyboard Combo Port**

The standard PS/2® mouse/keyboard DIN connector is for a PS/2® mouse/keyboard.

➤ **USB2.0 Ports**

The USB (Universal Serial Bus) port is for attaching USB devices such as keyboard, mouse, or other USB-compatible devices.

➤ **USB3.0 Ports**

The USB 3.0 port is backward-compatible with USB 2.0 devices and supports data transfer rate up to 5 Gbit/s (SuperSpeed).

➤ **VGA Port**

The DB15-pin female connector is provided for monitors.

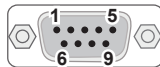
► **HDMI Port**



The High-Definition Multimedia Interface (HDMI) is an all-digital audio/video interface capable of transmitting uncompressed streams. HDMI supports all TV format, including standard, enhanced, or high-definition video, plus multi-channel digital audio on a single cable.

► **RS232/422/485 COM Port 1**

The serial port is a 16550A high speed communications port that sends/receives 16 bytes FIFOs. It supports barcode scanners, barcode printers, bill printers, credit card machine, etc.



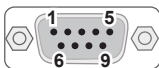
	PIN	SIGNAL	DESCRIPTION
RS232	1	ND CD	Data Carrier Detect
	2	NS IN	Signal In
	3	NS OUT	Signal Out
	4	ND TR	Data Terminal Ready
	5	GND	Signal Ground
	6	ND SR	Data Set Ready
	7	NR TS	Request To Send
	8	NC TS	Clear To Send
	9	0V/5V/12V	Power Pin

	PIN	SIGNAL	DESCRIPTION
RS422	1	422 TXD-	Transmit Data, Negative
	2	422 TXD+	Transmit Data, Positive
	3	422 RXD+	Receive Data, Positive
	4	422 RXD-	Receive Data, Negative
	5	GND	Signal Ground
	6	NC	No Connection
	7	NC	No Connection
	8	NC	No Connection
	9	NC	No Connection

	PIN	SIGNAL	DESCRIPTION
RS485	1	485 TXD-	Transmit Data, Negative
	2	485 TXD+	Transmit Data, Positive
	3	NC	No Connection
	4	NC	No Connection
	5	GND	Signal Ground
	6	NC	No Connection
	7	NC	No Connection
	8	NC	No Connection
	9	NC	No Connection

► RS232 COM Port 2

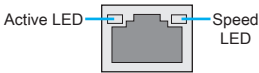
The serial port is a 16550A high speed communications port that sends/receives 16 bytes FIFOs. It supports barcode scanners, barcode printers, bill printers, credit card machine, etc.



	PIN	SIGNAL	DESCRIPTION
RS232	1	NDCD	Data Carrier Detect
	2	NSIN	Signal In
	3	NSOUT	Signal Out
	4	NDTR	Data Terminal Ready
	5	GND	Signal Ground
	6	NDSR	Data Set Ready
	7	NRTS	Request To Send
	8	NCTS	Clear To Send
	9	0V/5V/12V	Power Pin

► GbE RJ45 Port

The standard single RJ45 LAN jack is provided for connection to the Local Area Network (LAN). You can connect a network cable to it.

	LED	LED Status	Description
	Active LED	Off	No link
		Yellow	Linked
		Blinking	Data activity
	Speed LED	Off	10 Mbps connection
		Green	100 Mbps connection
		Orange	1 Gbps connection

► Audio Ports

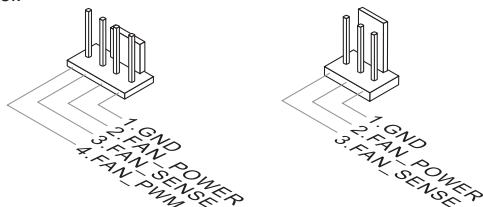
These audio connectors are used for audio devices. It is easy to differentiate between audio effects according to the color of audio jacks.

- Line-In (Blue) - Line In, is used for external CD player, tapeplayer or other audio devices.
- Line-Out (Green) - Line Out, is a connector for speakers or headphones.
- Mic (Pink) - Mic, is a connector for microphones.

Connector

CPU/System Fan Header: CPUFAN1, SYSFAN1, SYSFAN2

The fan power connectors support system cooling fan with +12V. When connecting the wire to the connectors, always note that the red wire is the positive and should be connected to the +12V; the black wire is Ground and should be connected to GND. If the motherboard has a System Hardware Monitor chipset onboard, you must use a specially designed fan with speed sensor to take advantage of the CPU fan control.

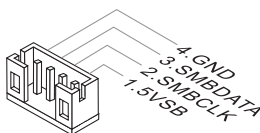


Important

- Please refer to the recommended CPU fans at processor's official website or consult the vendors for proper CPU cooling fan.
- Fan cooler sets with 3- or 4-pin power connector are both available.

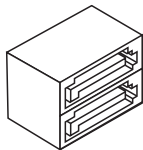
SMBus Box Header: JSMB1

This connector is provided for users to connect System Management Bus (SMBus) interface.



Serial ATA Connector: SATA1~4

This connector is a high-speed Serial ATA interface port. Each connector can connect to one Serial ATA device.

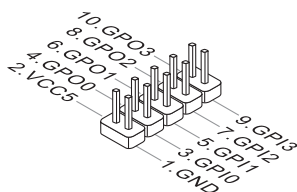


Important

Please do not fold the SATA cable into a 90-degree angle. Otherwise, data loss may occur during transmission.

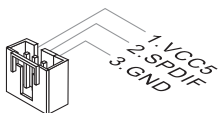
GPIO Header: JGPIO1

This connector is provided for the General-Purpose Input peripheral module.



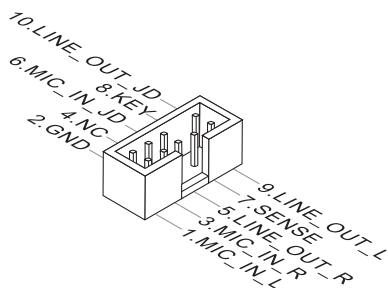
S/PDIF Box Header: JSPDI1

This pinheader is used to connect S/PDIF (Sony & Philips Digital Interconnect Format) interface for digital audio transmission.



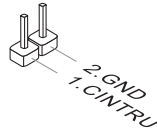
Front Audio Box Header: JAUD1

This connector allows you to connect the front panel audio and is compliant with Intel Front Panel I/O Connectivity Design Guide.



Chassis Intrusion Header: JCASE1

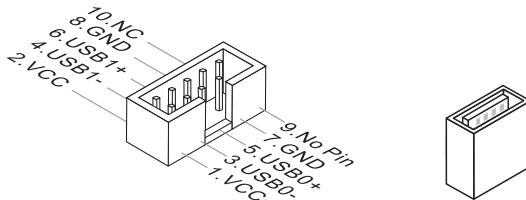
This connector connects to the chassis intrusion switch cable. If the computer case is opened, the chassis intrusion mechanism will be activated. The system will record this intrusion and a warning message will flash on screen. To clear the warning, you must enter the BIOS utility and clear the record.



USB2.0 Box Header: JUSB1

USB2.0 Port: JUSB2

This connector is ideal for connecting USB devices such as keyboard, mouse, or other USB-compatible devices.

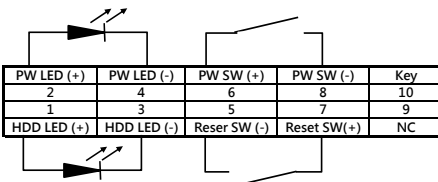
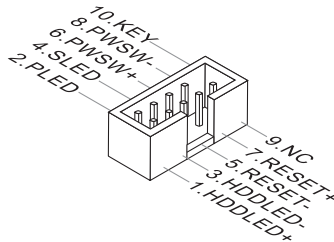


Important

- Note that the pins of VCC and GND must be connected correctly to avoid possible damage.
- Avoid holding the motherboard by JUSB2 to prevent the component from falling off.

Front Panel Box Header: JFP1

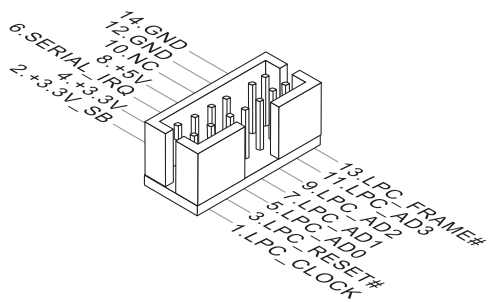
This front panel connector is provided for electrical connection to the front panel switches & LEDs and is compliant with Intel Front Panel I/O Connectivity Design Guide.



LED(+)	Voltage(V)	Current(mA)
Power	5	18.51
HDD	5	18.51

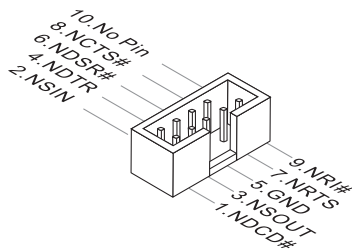
TPM Box Header: JTPM1

This connector works as LPC debug port and supports TPM modules.



RS232 COM Port Box Header: JCOM3 ~ JCOM6

This connector is a 16550A high speed communications port that sends/receives 16 bytes FIFOs. You can attach a serial device to it.



	PIN	SIGNAL	DESCRIPTION
RS232	1	NDCD	Data Carrier Detect
	2	NSIN	Signal In
	3	NSOUT	Signal Out
	4	NDTR	Data Terminal Ready
	5	GND	Signal Ground
	6	NDSR	Data Set Ready
	7	NRTS	Request To Send
	8	NCTS	Clear To Send
	9	RI	Ring Indicate

Jumper

Important

Avoid adjusting jumpers when the system is on; it will damage the motherboard.

Clear CMOS Jumper: J_CMOS1

There is a CMOS RAM onboard that has a power supply from an external battery to keep the data of system configuration. With the CMOS RAM, the system can automatically boot OS every time it is turned on. If you want to clear the system configuration, set the jumper to clear data.

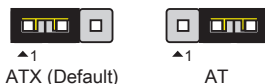


Important

You can clear CMOS by shorting 2-3 pin while the system is off. Then return to 1-2 pin position. Avoid clearing the CMOS while the system is on; it will damage the motherboard.

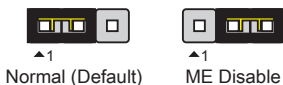
AT/ATX Jumper: JAT1

This jumper allows users to select between AT and ATX power.



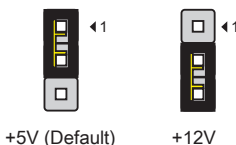
ME Jumper: JME_DIS1

This jumper is used to enable/disable the Intel ME function.



COM Port Jumper: JCOMP1, JCOMP2

These jumpers specify the operation voltage of the JCOM1~JCOM2 serial ports.

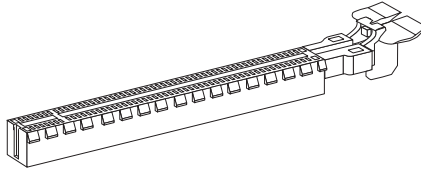


Slot

PCIe (Peripheral Component Interconnect Express) Slot

The PCI Express slot supports PCIe interface expansion cards.

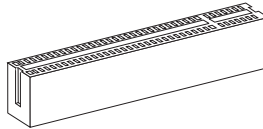
- PCIe1: PCIe x16 slot
- PCIe2: PCIe x16 slot with PCIe x4 signal



PCIe x16 slot

PCI (Peripheral Component Interconnect) Slot

The PCI slot supports PCI interface expansion cards.



Important

When adding or removing expansion cards, make sure that you unplug the power supply first. Meanwhile, read the documentation for the expansion card to configure any necessary hardware or software settings for the expansion card, such as jumpers, switches or BIOS configuration.