

**TUF GAMING  
Z490-PLUS**

**ASUS**

**Motherboard**

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# Safety information

## Electrical safety

- To prevent electrical shock hazard, disconnect the power cable from the electrical outlet before relocating the system.
- When adding or removing devices to or from the system, ensure that the power cables for the devices are unplugged before the signal cables are connected. If possible, disconnect all power cables from the existing system before you add a device.
- Before connecting or removing signal cables from the motherboard, ensure that all power cables are unplugged.
- Seek professional assistance before using an adapter or extension cord. These devices could interrupt the grounding circuit.
- Ensure that your power supply is set to the correct voltage in your area. If you are not sure about the voltage of the electrical outlet you are using, contact your local power company.
- If the power supply is broken, do not try to fix it by yourself. Contact a qualified service technician or your retailer.

## Operation safety

- Before installing the motherboard and adding devices on it, carefully read all the manuals that came with the package.
- Before using the product, ensure all cables are correctly connected and the power cables are not damaged. If you detect any damage, contact your dealer immediately.
- To avoid short circuits, keep paper clips, screws, and staples away from connectors, slots, sockets and circuitry.
- Avoid dust, humidity, and temperature extremes. Do not place the product in any area where it may become wet.
- Place the product on a stable surface.
- If you encounter technical problems with the product, contact a qualified service technician or your retailer.
- Your motherboard should only be used in environments with ambient temperatures between 0°C and 40°C.

## About this guide

This user guide contains the information you need when installing and configuring the motherboard.

## How this guide is organized

This guide contains the following parts:

- **Chapter 1: Product Introduction**  
This chapter describes the features of the motherboard and the new technology it supports. It includes description of the switches, jumpers, and connectors on the motherboard.
- **Chapter 2: Basic Installation**  
This chapter lists the hardware setup procedures that you have to perform when installing system components.
- **Chapter 3: BIOS and RAID Support**  
This chapter tells how to boot into the BIOS, upgrade BIOS using the EZ Flash Utility and support on RAID.

## Where to find more information

Refer to the following sources for additional information and for product and software updates.

1. **ASUS website**  
The ASUS website ([www.asus.com](http://www.asus.com)) provides updated information on ASUS hardware and software products.
2. **Optional documentation**  
Your product package may include optional documentation, such as warranty flyers, that may have been added by your dealer. These documents are not part of the standard package.

## Conventions used in this guide

To ensure that you perform certain tasks properly, take note of the following symbols used throughout this manual.



**CAUTION:** Information to prevent damage to the components and injuries to yourself when trying to complete a task.



**IMPORTANT:** Instructions that you **MUST** follow to complete a task.



**NOTE:** Tips and additional information to help you complete a task.

# TUF GAMING Z490-PLUS specifications summary

<b>CPU</b>	<p>Intel® Socket LGA1200 for 10<sup>th</sup> Gen Intel® Core™, Pentium® Gold and Celeron® processors*</p> <p>Supports Intel® 14 nm CPU</p> <p>Supports Intel® Turbo Boost Technology 2.0**</p> <p>* Refer to <a href="http://www.asus.com">www.asus.com</a> for CPU support list.</p> <p>** The support of these features depends on the CPU types.</p>
<b>Chipset</b>	Intel® Z490 Chipset
<b>Memory</b>	<p>4 x DIMM, Max. 128GB, DDR4 4600(O.C.)/4500(O.C.)/4400(O.C.)/4266(O.C.)/4133(O.C.)/4000(O.C.)/3866(O.C.)/3733(O.C.)/3600(O.C.)/3466(O.C.)/3400(O.C.)/3333(O.C.)/3200(O.C.)/3000(O.C.)/ 2933(O.C.)/2800(O.C.)/2666/2400/2133 MHz Non-ECC, Un-buffered Memory*</p> <p>Dual Channel Memory Architecture</p> <p>Supports Intel® Extreme Memory Profile (XMP)</p> <p>OptiMem II</p> <p>* 10<sup>th</sup> Gen Intel® Core™ i9/i7 CPUs support 2933/2800/2666/2400/2133 natively. Refer to <a href="http://www.asus.com">www.asus.com</a> for the Memory QVL (Qualified Vendors Lists).</p>
<b>Graphics</b>	<p>1 x DisplayPort 1.4**</p> <p>1 x HDMI™ 1.4b</p> <p>** Graphics specifications may vary between CPU types.</p> <p>** Support DisplayPort 1.4 with max. resolution of 4096 x 2304 @60Hz. Please refer to <a href="http://www.intel.com">www.intel.com</a> for any update.</p>
<b>Expansion Slots</b>	<p><b>Intel® 10<sup>th</sup> Gen Processors*</b></p> <p>1 x PCIe 3.0 x16 slot (supports x16 mode)</p> <p><b>Intel® Z490 Chipset</b></p> <p>1 x PCIe 3.0 x16 slot (supports x4 mode)</p> <p>3 x PCIe 3.0 x1 slots</p> <p>* Support PCIe bifurcation for RAID on CPU function.</p>
<b>Multi-GPU Support</b>	Supports AMD 2-Way CrossFireX™ Technology
<b>Storage</b>	<p><b>Total supports 2 x M.2 slots and 6 x SATA 6Gb/s ports</b></p> <p><b>Intel® Z490 Chipset</b></p> <p>M.2_1 slot (Key M), type 2242/2260/2280/22110 (supports PCIe 3.0 x4 &amp; SATA modes)*</p> <p>M.2_2 slot (Key M), type 2242/2260/2280 (supports PCIe 3.0 x4 &amp; SATA modes)**</p> <p>6 x SATA 6Gb/s ports</p> <p>Intel® Rapid Storage Technology supports Raid 0,1,5,10</p> <p>Intel® Optane™ Memory Ready</p> <p>* M.2_1 shares bandwidth with SATA6G_2. When M.2_1 runs SATA mode, SATA6G_2 will be disabled.</p> <p>** M.2_2 shares bandwidth with SATA6G_56. When M.2_2 is occupied, SATA6G_56 will be disabled.</p>
<b>Ethernet</b>	1 x Intel® I219-V 1Gb Ethernet

(continued on the next page)

# TUF GAMING Z490-PLUS specifications summary

<p><b>USB</b></p>	<p><b>Rear USB (Total 6 ports)</b>                  2 x USB 3.2 Gen 2 ports (1 x Type-A + 1 x USB Type-C®)                  4 x USB 3.2 Gen 1 ports (4 x Type-A)</p> <p><b>Front USB (Total 7 ports)</b>                  1 x USB 3.2 Gen 2 front panel connector (supports USB Type-C®)                  1 x USB 3.2 Gen 1 header supports additional 2 USB 3.2 Gen 1 ports                  2 x USB 2.0 headers support additional 4 USB 2.0 ports</p>
<p><b>Audio</b></p>	<p><b>Realtek ALC S1200A 7.1 Surround Sound High Definition Audio CODEC*</b></p> <ul style="list-style-type: none"> <li>- Supports: Jack detection, Multi-streaming, Front Panel Jack-retasking</li> <li>- Supports up to 24-Bit/192kHz playback</li> </ul> <p><b>Audio Features:</b></p> <ul style="list-style-type: none"> <li>- Rear optical S/PDIF out port</li> <li>- Premium Japanese audio capacitors</li> <li>- Audio Shielding</li> <li>- Dedicated audio PCB layers</li> <li>- Audio cover</li> </ul> <p>* Due to limitations in HDA bandwidth, 32-bit/192kHz is not supported for 7.1 Surround Sound audio.</p>
<p><b>Back Panel I/O Ports</b></p>	<p>2 x USB 3.2 Gen 2 ports (1 x Type-A + 1 x USB Type-C®)                  4 x USB 3.2 Gen 1 ports (4 x Type-A)                  1 x DisplayPort                  1 x HDMI™ port                  1 x Intel® I219-V 1Gb Ethernet port                  5 x Audio jacks                  1 x Optical S/PDIF out port                  1 x PS/2 Keyboard/Mouse combo port</p>
<p><b>Internal I/O Connectors</b></p>	<p><b>Fan and cooling-related</b>                  1 x 4-pin CPU Fan header                  1 x 4-pin CPU OPT Fan header                  1 x 4-pin AIO Pump header                  3 x 4-pin Chassis Fan headers</p> <p><b>Power related</b>                  1 x 24-pin Main Power connector                  1 x 8-pin +12V Power connector                  1 x 4-pin +12V Power connector</p> <p><b>Storage related</b>                  2 x M.2 slots (Key M)                  6 x SATA 6Gb/s ports</p> <p><b>USB</b>                  1 x USB 3.2 Gen 2 Front Panel connector (supports USB Type-C®)                  1 x USB 3.2 Gen 1 header supports additional 2 USB 3.2 Gen 1 ports                  2 x USB 2.0 headers support additional 4 USB 2.0 ports</p>

(continued on the next page)

# TUF GAMING Z490-PLUS specifications summary

<p><b>Internal I/O Connectors</b></p>	<p><b>Miscellaneous</b></p> <ul style="list-style-type: none"> <li>1 x AURA Addressable Gen 2 header</li> <li>2 x AURA RGB headers</li> <li>1 x Clear CMOS header</li> <li>1 x COM Port header</li> <li>1 x Front Panel Audio header (AAFP)</li> <li>1 x 20-3 pin System Panel header with Chassis intrude function</li> <li>1 x Thunderbolt header</li> </ul>
<p><b>Special Features</b></p>	<p><b>ASUS TUF PROTECTION</b></p> <ul style="list-style-type: none"> <li>- ASUS DIGI+ VRM (- Digital power design with DrMOS)</li> <li>- ASUS Enhanced DRAM Overcurrent Protection</li> <li>- ASUS ESD Guards</li> <li>- TUF LANGuard</li> <li>- ASUS Overvoltage Protection</li> <li>- ASUS SafeSlot</li> <li>- ASUS Stainless-Steel Back I/O</li> </ul> <p><b>ASUS Q-Design</b></p> <ul style="list-style-type: none"> <li>- Q-DIMM</li> <li>- ASUS Q-LED (CPU [red], DRAM [yellow], VGA [white], Boot Device [yellow green])</li> <li>- ASUS Q-Slot</li> </ul> <p><b>ASUS Thermal Solution</b></p> <ul style="list-style-type: none"> <li>- Aluminum heatsink design</li> </ul> <p><b>ASUS EZ DIY</b></p> <ul style="list-style-type: none"> <li>- Procool</li> </ul> <p><b>AURA Sync</b></p> <ul style="list-style-type: none"> <li>- AURA RGB headers</li> <li>- Addressable Gen 2 RGB header</li> </ul>
<p><b>Software Features</b></p>	<p><b>ASUS Exclusive Software Features</b></p> <p>Armoury Crate</p> <ul style="list-style-type: none"> <li>- Aura Sync</li> </ul> <p>AI Suite 3</p> <ul style="list-style-type: none"> <li>- Performance And Power Saving Utility</li> </ul> <p>Turbo V Evo</p> <p>EPU</p> <p>Digi + VRM</p> <p>Fan Xpert 4</p> <p>System information</p> <ul style="list-style-type: none"> <li>- EZ update</li> </ul> <p>AI Charger</p> <p>ASUS Turbo LAN</p> <p>DTS Custom for GAMING Headsets</p> <p>WinRAR</p>

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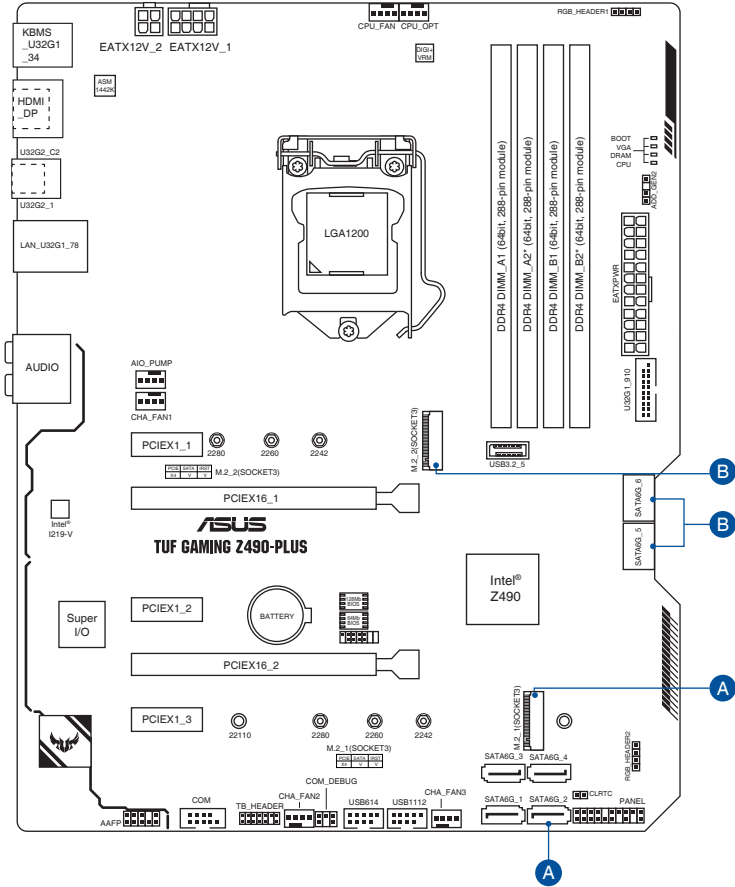
# TUF GAMING Z490-PLUS specifications summary

<b>Software Features</b>	<b>UEFI BIOS</b> ASUS EZ DIY - ASUS CrashFree BIOS 3 - ASUS EZ Flash 3 - ASUS UEFI BIOS EZ Mode
<b>BIOS</b>	192 (128+64) Mb Flash ROM, UEFI AMI BIOS
<b>Manageability</b>	WOL by PME, PXE
<b>Operating System</b>	Windows 10 64 - bit
<b>Form Factor</b>	ATX Form Factor 12 inch x 9.6 inch (30.5 cm x 24.4 cm)



Specifications are subject to change without notice. Please refer to the ASUS website for the latest specifications.

# Connectors with shared bandwidth



Configuration	1 [Default]	2	
A	M.2_1	SATA	PCIe x4 mode
	SATA6G_2	-	V
Configuration	1 [Default]	2	
B	M.2_2	V	-
	SATA6G_56	-	V

- M.2\_1 shares bandwidth with SATA6G\_2. When M.2\_1 runs SATA mode, SATA6G\_2 will be disabled.
- M.2\_2 shares bandwidth with SATA6G\_56. When M.2\_2 is occupied, SATA6G\_56 will be disabled.
- Please adjust BIOS setting for changing onboard device configuration.

## Package contents

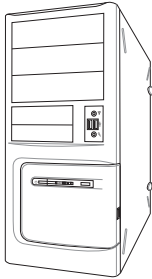

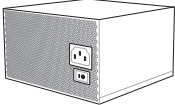
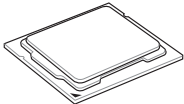
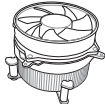
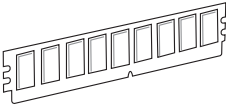
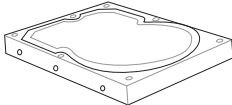
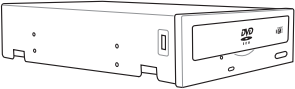
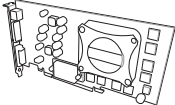

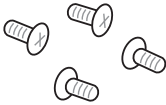
Check your motherboard package for the following items.

Motherboard	1 x TUF GAMING Z490-PLUS motherboard
Cables	2 x SATA 6Gb/s cables
	1 x Fan Bracket
	1 x I/O Shield
Miscellaneous	1 x M.2 Rubber Package
	1 x M.2 Screw Package
	1 x TUF GAMING sticker
Installation Media	1 x Support DVD
Documentation	1 x TUF Certification card
	1 x User manual



If any of the above items is damaged or missing, contact your retailer.

# Installation tools and components

	
	<p>Phillips (cross) screwdriver</p>
<p>PC chassis</p>	
<p>Power supply unit</p>	
<p>Intel® LGA 1200 CPU</p>	
<p>Intel® LGA 1200 compatible CPU Fan</p>	
<p>DDR4 DIMM</p>	
<p>SATA hard disk drive</p>	
<p>SATA optical disc drive (optional)</p>	
<p>Graphics card (optional)</p>	
<p>M.2 SSD module (optional)</p>	
<p>1 Bag of screws</p>	



The tools and components in the table above are not included in the motherboard package.

# Product Introduction

# 1

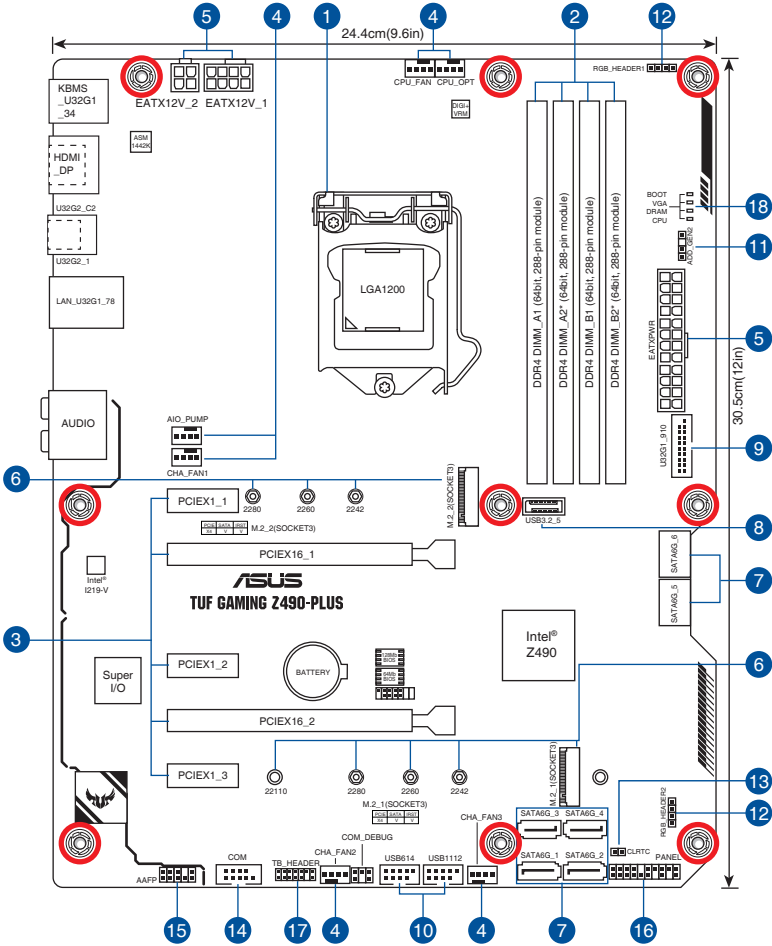
## 1.1 Before you proceed

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



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

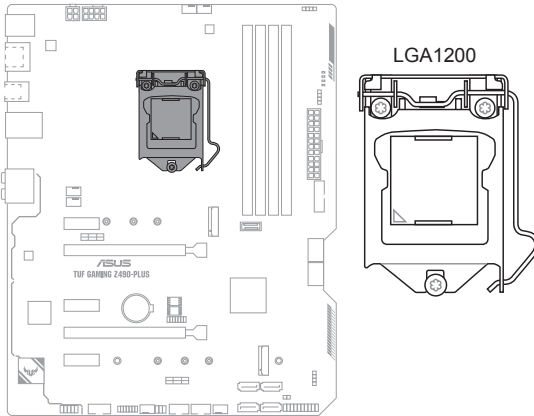
## 1.2 Motherboard layout



Layout contents	Page
1. CPU socket	1-4
2. DIMM slots	1-5
3. Expansion slots	1-7
4. Fan and Pump headers	1-9
5. Power connectors	1-10
6. M.2 slots (SOCKET 3)	1-11
7. SATA 6GB/s ports	1-12
8. USB 3.2 Gen 2 Front Panel connector	1-13
9. USB 3.2 Gen 1 header	1-14
10. USB 2.0 headers	1-15
11. AURA Addressable Gen2 header	1-16
12. AURA RGB headers	1-17
13. Clear CMOS header	1-18
14. COM Port header	1-19
15. Front Panel Audio header	1-19
16. System Panel header	1-20
17. Thunderbolt header	1-21
18. Q-LEDs	1-21

## 1. CPU socket

The motherboard comes with a LGA1200 socket designed for 10<sup>th</sup> Gen Intel® Core™, Pentium® Gold and Celeron® Processors.



- Ensure that you install the correct CPU designed for LGA1200 socket only. DO NOT install a CPU designed for other sockets on the LGA1200 socket.
- The CPU fits in only one correct orientation. DO NOT force the CPU into the socket to prevent bending the connectors on the socket and damaging the CPU.
- Ensure that all power cables are unplugged before installing the CPU.
- Upon purchase of the motherboard, ensure that the PnP cap is on the socket and the socket contacts are not bent. Contact your retailer immediately if the PnP cap is missing, or if you see any damage to the PnP cap/socket contacts/motherboard components. ASUS will shoulder the cost of repair only if the damage is shipment/transit-related.
- Keep the cap after installing the motherboard. ASUS will process Return Merchandise Authorization (RMA) requests only if the motherboard comes with the cap on the LGA1200 socket.
- The product warranty does not cover damage to the socket contacts resulting from incorrect CPU installation/removal, or misplacement/loss/incorrect removal of the PnP cap.

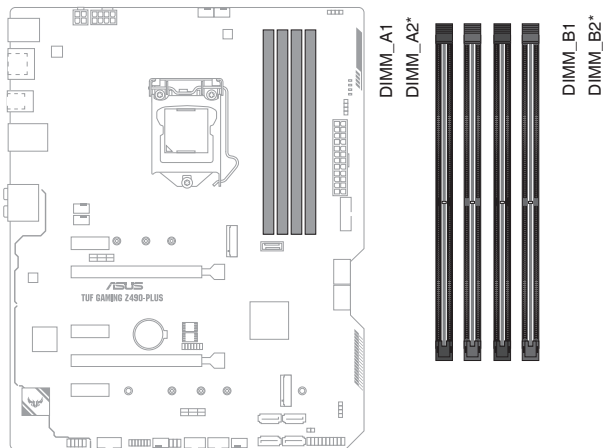


## 2. DIMM slots

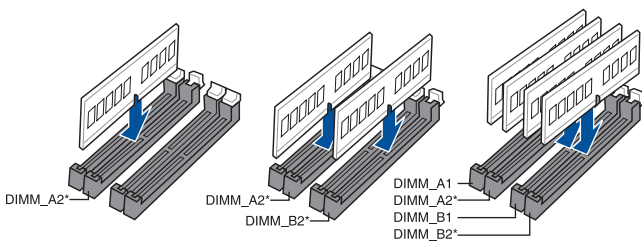
The motherboard comes with Dual Inline Memory Modules (DIMM) slots designed for DDR4 (Double Data Rate 4) memory modules.



A DDR4 memory module is notched differently from a DDR, DDR2, or DDR3 module. DO NOT install a DDR, DDR2, or DDR3 memory module to the DDR4 slot.



### Recommended memory configurations



## Memory configurations

You may install 4 GB, 8 GB, 16 GB, and 32 GB unbuffered and non-ECC DDR4 DIMMs into the DIMM sockets.



---

You may install varying memory sizes in Channel A and Channel B. The system maps the total size of the lower-sized channel for the dual-channel configuration. Any excess memory from the higher-sized channel is then mapped for single-channel operation.

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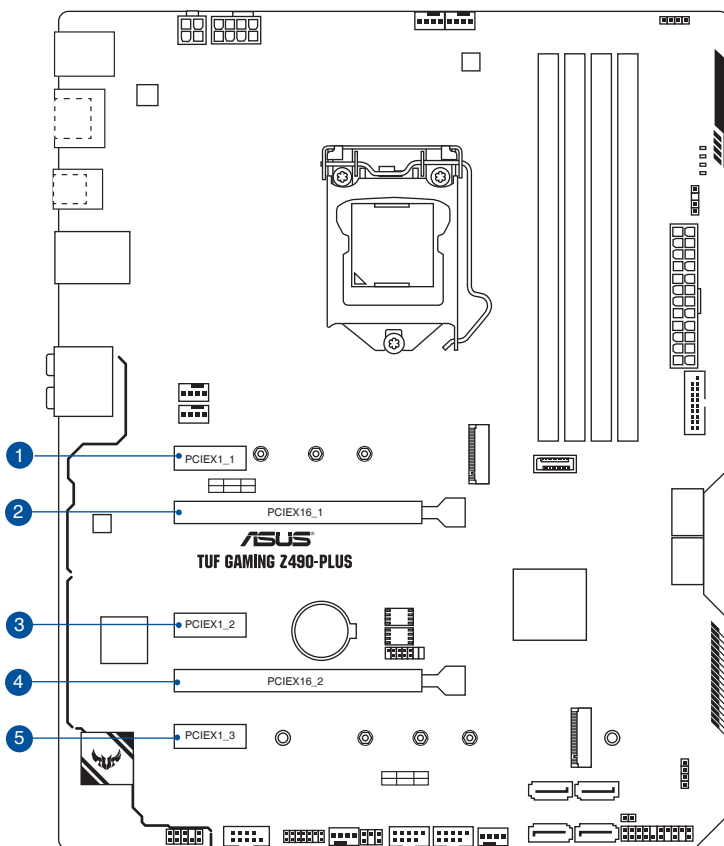


- The default memory operation frequency is dependent on its Serial Presence Detect (SPD), which is the standard way of accessing information from a memory module. Under the default state, some memory modules for overclocking may operate at a lower frequency than the vendor-marked value.
  - For system stability, use a more efficient memory cooling system to support a full memory load or overclocking condition.
  - Always install the DIMMS with the same CAS Latency. For an optimum compatibility, we recommend that you install memory modules of the same version or data code (D/C) from the same vendor. Check with the vendor to get the correct memory modules.
  - Visit the ASUS website for the latest QVL.
-

### 3. Expansion slots



Unplug the power cord before adding or removing expansion cards. Failure to do so may cause you physical injury and damage motherboard components.



#### Recommended VGA configuration

Slot Description	Single VGA	Dual VGA
2. PCIe 3.0 x16_1	x16	x16
4. PCIe 3.0 x16_2	-	x4



- We recommend that you provide sufficient power when running CrossFire™ mode.
- Ensure to connect the 8-pin and 4-pin power plugs when running CrossFire™ mode.
- Connect a chassis fan to the chassis fan connectors when using multiple graphics cards for better thermal environment.

## Hyper M.2 X16 series card configuration

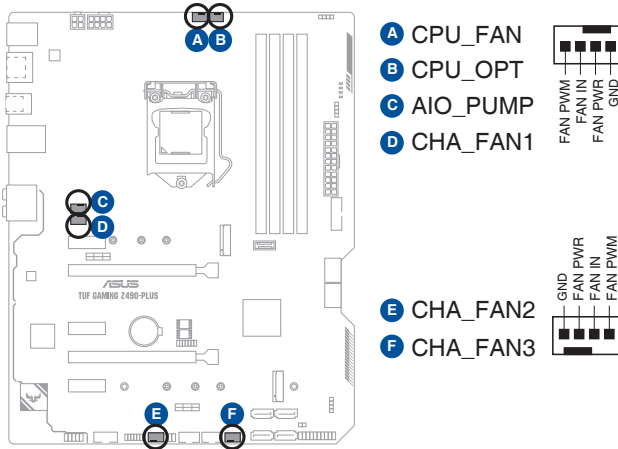
Slot Description	up to 3 Intel® SSD on CPU support
2. PCIe 3.0 x16_1	x8+x4+x4



- The Hyper M.2 X16 series card is sold separately.
- Ensure to install the Hyper M.2 X16 series card to PCIe 3.0 x16\_1. If you wish to connect a display, we suggest using the internal VGA or installing a VGA card to PCIe 3.0 x16\_2, which will run at x4.
- Enable the Hyper M.2 X16 series card under BIOS settings.

#### 4. Fan and Pump headers

The Fan and Pump headers allow you to connect fans or pumps to cool the system.

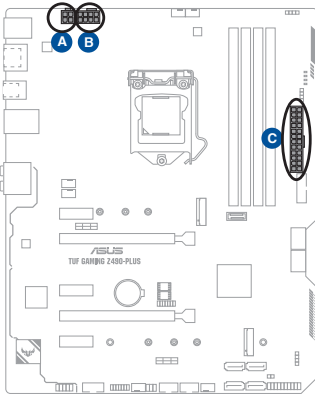


- DO NOT forget to connect the fan cables to the fan headers. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! Do not place jumper caps on the fan headers!
- Ensure the cable is fully inserted into the header.

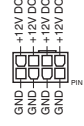
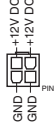
Header	Max. Current	Max. Power	Default Speed	Shared Control
CPU_FAN	1A	12W	Q-Fan Controlled	A
CPU_OPT	1A	12W	Q-Fan Controlled	A
CHA_FAN1	1A	12W	Q-Fan Controlled	-
CHA_FAN2	1A	12W	Q-Fan Controlled	-
CHA_FAN3	1A	12W	Q-Fan Controlled	-
AIO_PUMP	1A	12W	Full-Speed	

## 5. Power connectors

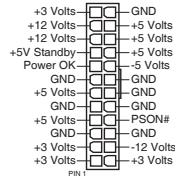
These Power connectors allow you to connect your motherboard to a power supply. The power supply plugs are designed to fit in only one orientation. Find the proper orientation and push down firmly until the power supply plugs are fully inserted.



**A** EATX12V\_2      **B** EATX12V\_1



**C** EATXPWR



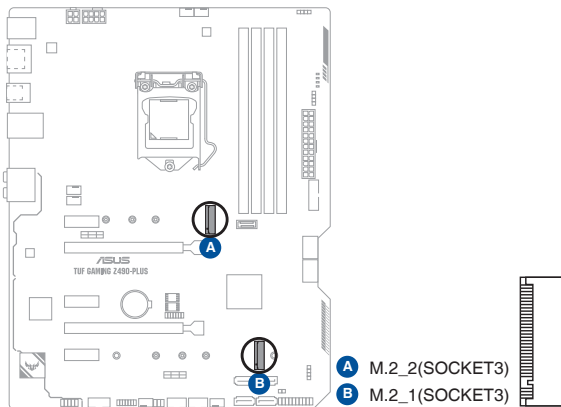
Ensure to connect the 8-pin power plug.



- For a fully configured system, we recommend that you use a power supply unit (PSU) that complies with ATX 12V Specification 2.0 (or later version) and provides a minimum power of 350 W.
- We recommend that you use a PSU with a higher power output when configuring a system with more power-consuming devices. The system may become unstable or may not boot up if the power is inadequate.
- If you want to use two or more high-end PCI Express x16 cards, use a PSU with 1000W power or above to ensure the system stability.

## 6. M.2 slot

The M.2 slot allows you to install M.2 devices such as M.2 SSD modules.



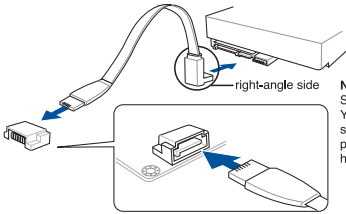
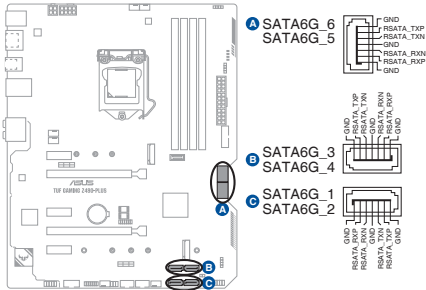
- M.2\_1 slot (Key M), type 2242/2260/2280/22110 (supports SATA & PCIe 3.0 x4 mode).
- M.2\_2 slot (Key M), type 2242/2260/2280 (supports SATA & PCIe 3.0 x4 mode).
- M.2\_1 shares bandwidth with SATA6G\_2. When M.2\_1 runs SATA mode, SATA6G\_2 will be disabled.
- M.2\_2 shares bandwidth with SATA6G\_56. When M.2\_2 is occupied, SATA6G\_56 will be disabled.
- M.2 slots support IRST (Intel® Rapid Storage Technology).



The M.2 SSD module is purchased separately.

## 7. SATA 6Gb/s ports

The SATA 6Gb/s ports allow you to connect SATA devices such as optical disc drives and hard disk drives via a SATA cable.



**NOTE:** Connect the right-angle side of SATA signal cable to SATA device. You may also connect the right-angle side of SATA cable to the onboard SATA port to avoid mechanical conflict with huge graphics cards.



If you installed SATA storage devices, you can create a RAID 0, 1, 5, and 10 configuration with the Intel® Rapid Storage Technology through the onboard Intel® Z490 chipset.

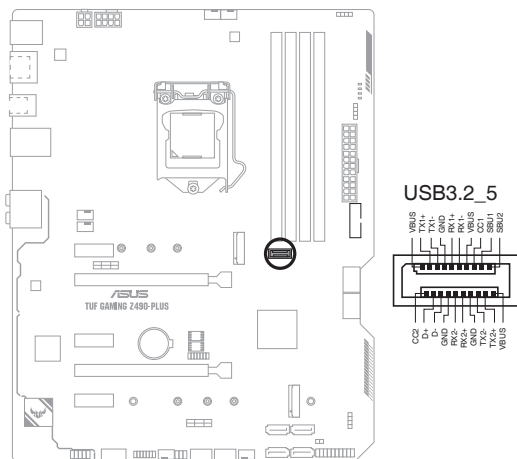


- The slots are set to **[AHCI Mode]** by default. If you intend to create a SATA RAID set using these connectors, set the SATA Mode item in the BIOS to **[Intel RST Premium With Intel Optane System Acceleration(RAID)]**.
- When a device in SATA mode is installed on the M.2\_1 socket, SATA6G\_2 port cannot be used.
- When a device is installed on the M.2\_2 socket, SATA6G\_56 ports cannot be used.
- Before creating a RAID set, refer to the **RAID Configuration Guide**. You can download the **RAID Configuration Guide** from the ASUS website.



## 8. USB 3.2 Gen 2 Front Panel connector

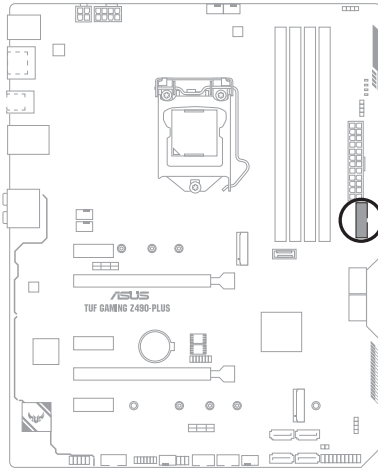
The USB 3.2 Gen 2 connector allows you to connect a USB 3.2 Gen 2 module for additional USB 3.2 Gen 2 ports. The USB 3.2 Gen 2 connector provides data transfer speeds of up to 10 Gb/s.



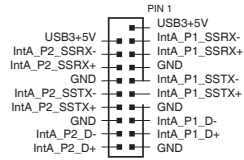
The USB 3.2 Gen 2 module is purchased separately.

## 9. USB 3.2 Gen 1 header

The USB 3.2 Gen 1 header allows you to connect a USB 3.2 Gen 1 module for additional USB 3.2 Gen 1 ports. The USB 3.2 Gen 1 header provides data transfer speeds of up to 5 Gb/s.



U32G1\_910



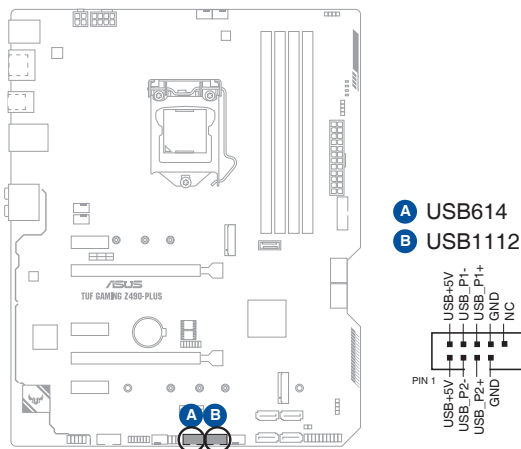
The USB 3.2 Gen 1 module is purchased separately.



The plugged USB 3.2 Gen 1 device may run on xHCI or EHCI mode depending on the operating system's setting.

## 10. USB 2.0 header

The USB 2.0 header allows you to connect a USB module for additional USB 2.0 ports. The USB 2.0 header provides data transfer speeds of up to 480 Mbps connection speed.



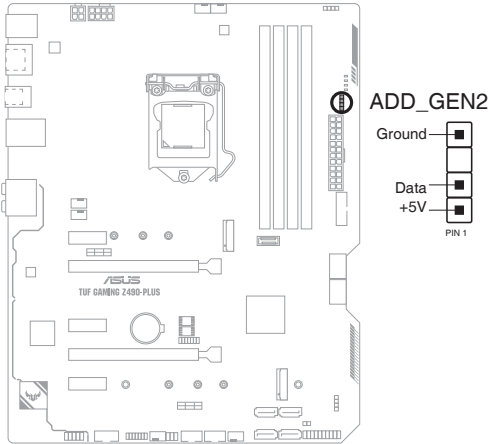
**DO NOT** connect a 1394 cable to the USB connectors. Doing so will damage the motherboard!



The USB 2.0 module is purchased separately.

## 11. Aura Addressable Gen2 header

The Addressable Gen2 header allows you to connect individually addressable RGB WS2812B LED strips or WS2812B based LED strips.



The Addressable Gen2 header supports WS2812B addressable RGB LED strips (5V/Data/Ground), with a maximum power rating of 3A (5V), and the addressable headers on this board can handle a combined maximum of 500 LEDs.



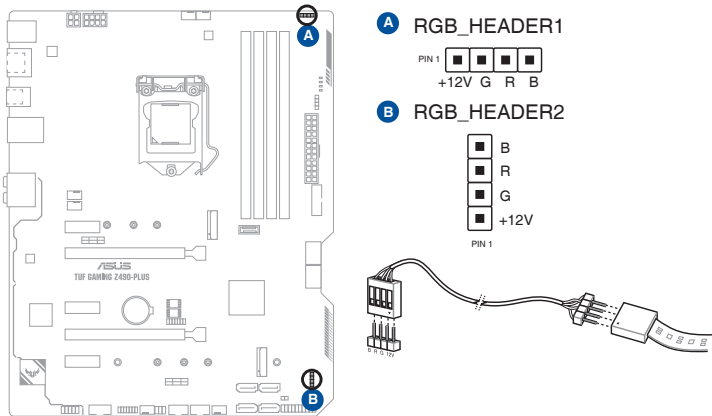
Before you install or remove any component, ensure that the power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, or components.



- Actual lighting and color will vary with LED strip.
- If your LED strip does not light up, check if the addressable RGB LED strip is connected in the correct orientation, and the 5V connector is aligned with the 5V header on the motherboard.
- The addressable RGB LED strip will only light up when the system is powered on.
- The addressable RGB LED strip is purchased separately.

## 12. AURA RGB LED header

The AURA RGB LED header allows you to connect RGB LED strips.



The AURA RGB LED header supports 5050 RGB multi-color LED strips (12V/G/R/B), with a maximum power rating of 3A (12V).



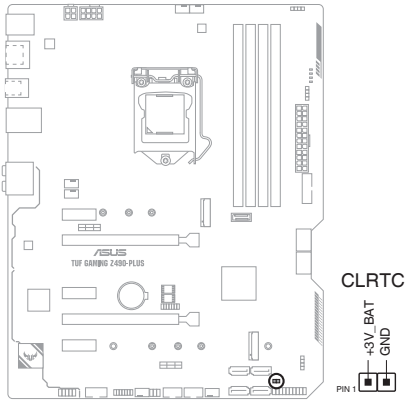
Before you install or remove any component, ensure that the power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, or components.



- Actual lighting and color will vary with LED strip.
- If your LED strip does not light up, check if the RGB LED extension cable and the RGB LED strip is connected in the correct orientation, and the 12V connector is aligned with the 12V header on the motherboard.
- The LED strip will only light up when the system is powered on.
- The LED strip is purchased separately.

### 13. Clear CMOS header

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



#### To erase the RTC RAM:

1. Turn OFF the computer and unplug the power cord.
2. Use a metal object such as a screwdriver to short the two pins.
3. Plug the power cord and turn on the computer.
4. Hold down the <Del> key during the boot process and enter BIOS setup to re-enter data.



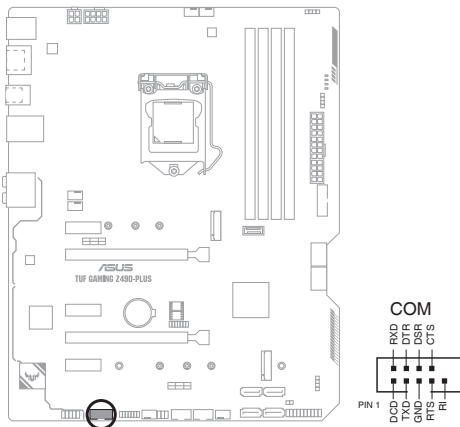
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If the steps above do not help, remove the onboard battery and short the two pins again to clear the CMOS RTC RAM data. After clearing the CMOS, reinstall the battery.

---

#### 14. COM Port header

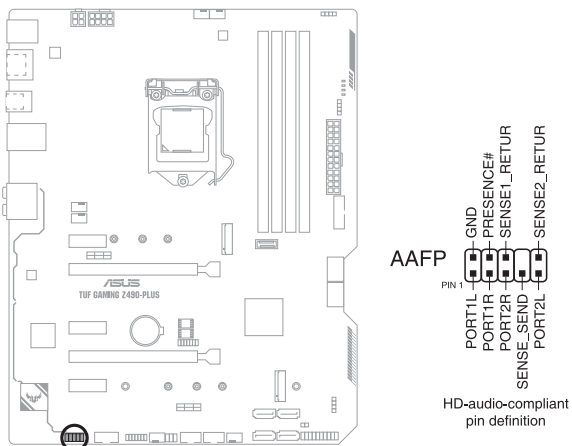
This connector is for a serial (COM) port. Connect the serial port module cable to this connector, then install the module to a slot opening at the back of the system chassis.



The COM module is purchased separately.

#### 15. Front Panel Audio header

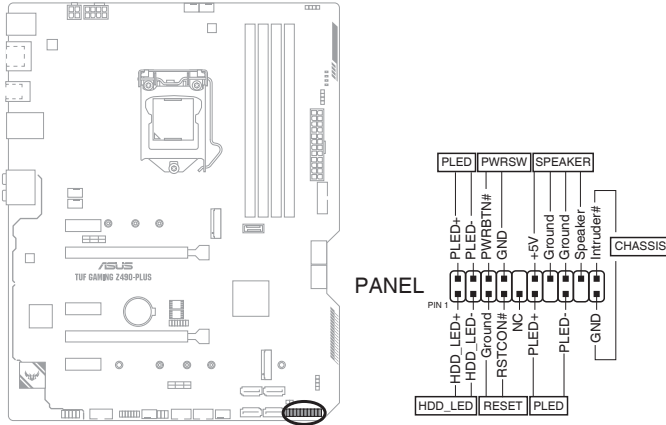
The front panel audio header is for a chassis-mounted front panel audio I/O module that supports HD Audio. Connect one end of the front panel audio I/O module cable to this header.



We recommend that you connect a high-definition front panel audio module to this connector to avail of the motherboard's high-definition audio capability.

## 16. System Panel header

The System Panel header supports several chassis-mounted functions.



- **System Power LED header (PLED)**

The 2-pin header allows you to connect the System Power LED. The System Power LED lights up when the system is connected to a power source, or when you turn on the system power, and blinks when the system is in sleep mode.

- **Storage Device Activity LED header (HDD\_LED)**

The 2-pin header allows you to connect the Storage Device Activity LED. The Storage Device Activity LED lights up or blinks when data is read from or written to the storage device or storage device add-on card.

- **System Warning Speaker header (SPEAKER)**

The 4-pin header allows you to connect the chassis-mounted system warning speaker. The speaker allows you to hear system beeps and warnings.

- **Power Button/Soft-off Button header (PWRSW)**

The 3-1 pin header allows you to connect the system power button. Press the power button to power up the system, or put the system into sleep or soft-off mode (depending on the operating system settings).

- **Reset button header (RESET)**

The 2-pin header allows you to connect the chassis-mounted reset button. Press the reset button to reboot the system.

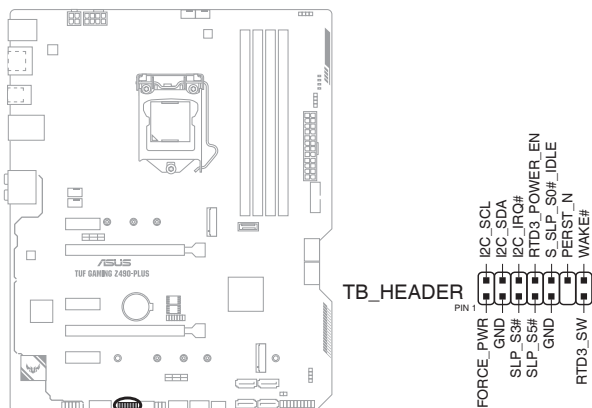
- **Chassis intrusion header (2-pin CHASSIS)**

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



## 17. Thunderbolt header

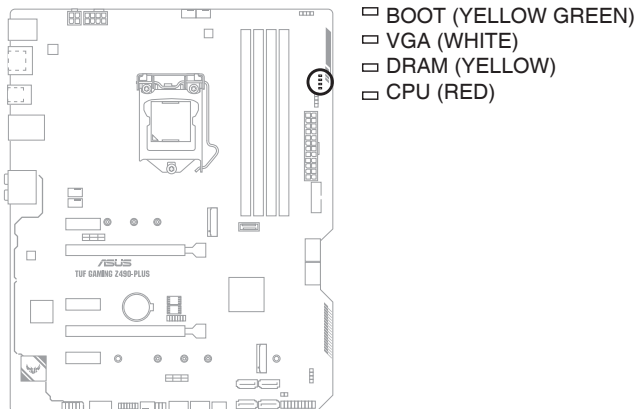
The Thunderbolt header allows you to connect an add-on Thunderbolt I/O card that supports Intel's Thunderbolt Technology, allowing you to connect up to six Thunderbolt-enabled devices and a DisplayPort-enabled display in a daisy-chain configuration.



The add-on Thunderbolt I/O card and Thunderbolt cables are purchased separately.

## 18. Q-LEDs

The Q-LEDs check key components (CPU, DRAM, VGA, and booting devices) during the motherboard booting process. If an error is found, the critical component's LED stays lit up until the problem is solved.



The Q-LEDs provide the most probable cause of an error code as a starting point for troubleshooting. The actual cause may vary from case to case.



# Basic Installation

# 2

## 2.1 Building your PC system

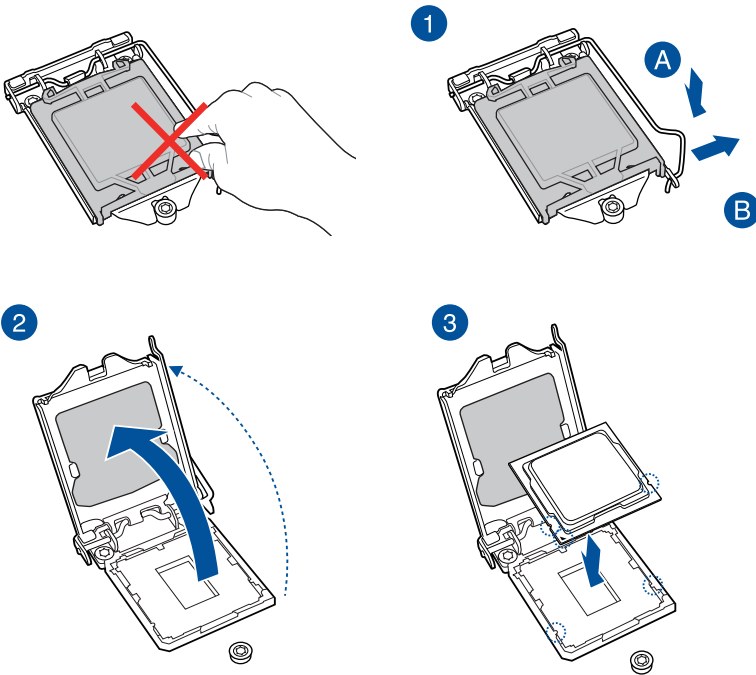


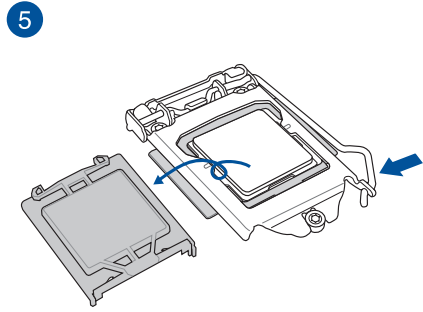
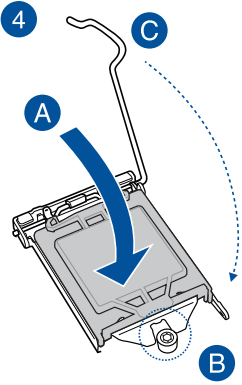
The diagrams in this section are for reference only. The motherboard layout may vary with models, but the installation steps are the same for all models.

### 2.1.1 CPU installation

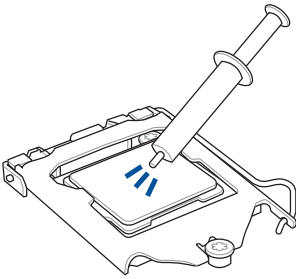


- Ensure that you install the correct CPU designed for LGA1200 socket only. DO NOT install a CPU designed for LGA1155, LGA1156, and LGA1151 sockets on the LGA1200 socket.
- ASUS will not cover damages resulting from incorrect CPU installation/removal, incorrect CPU orientation/placement, or other damages resulting from negligence by the user.



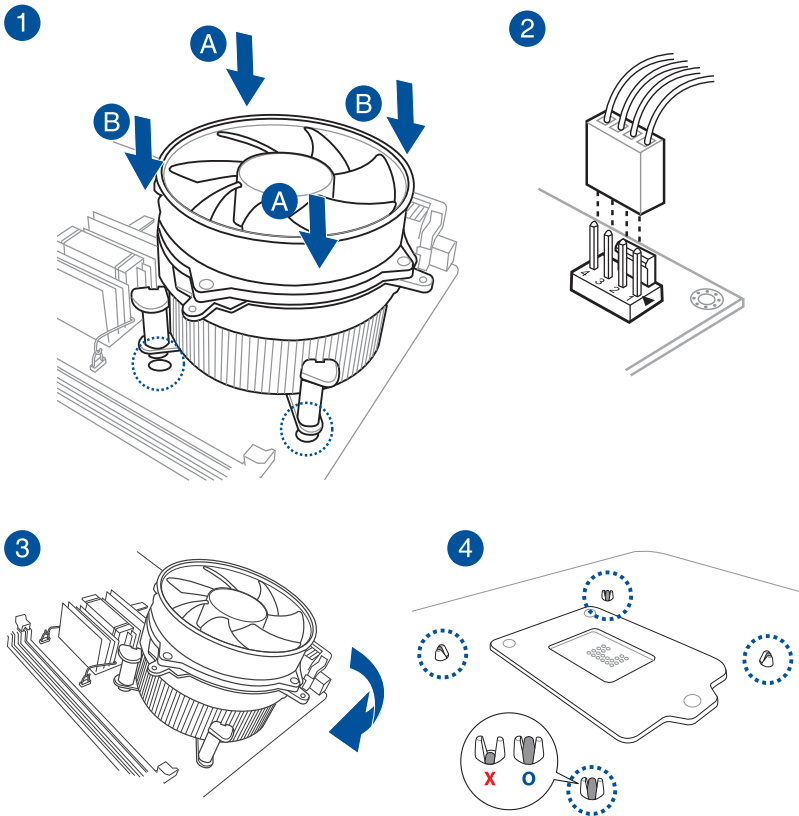


## 2.1.2 Cooling system installation



Apply Thermal Interface Material to the CPU cooling system and CPU before you install the cooling system, if necessary.

To install a CPU heatsink and fan assembly

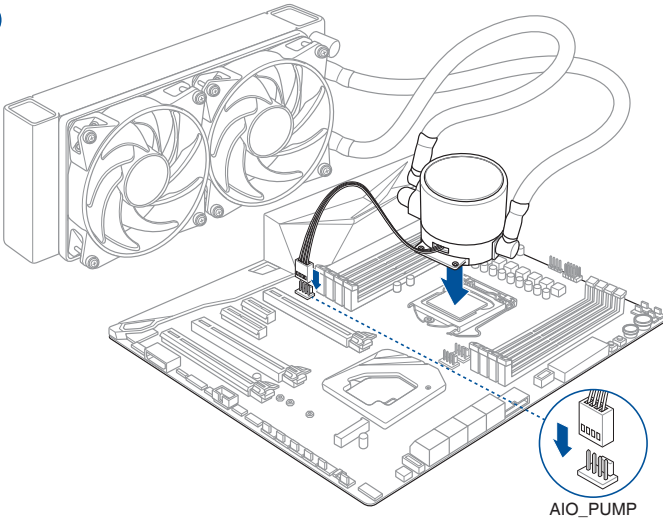


## To install an AIO cooler

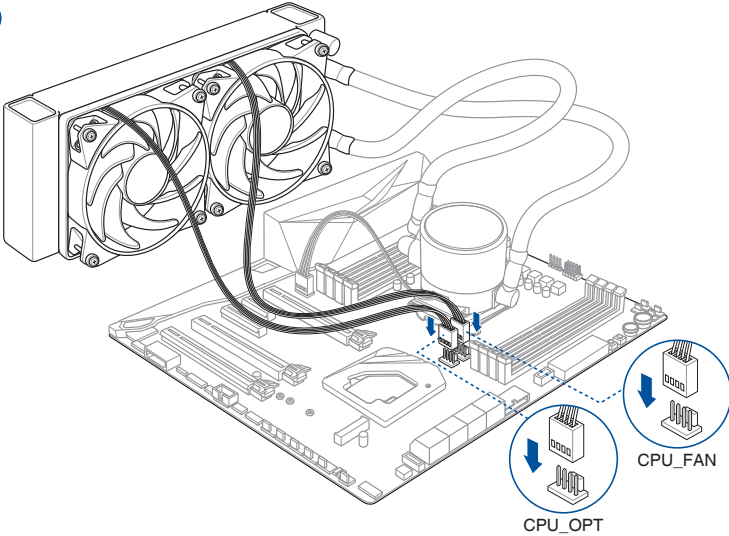


If you wish to install an AIO cooler, we recommend installing the AIO cooler after installing the motherboard into the chassis.

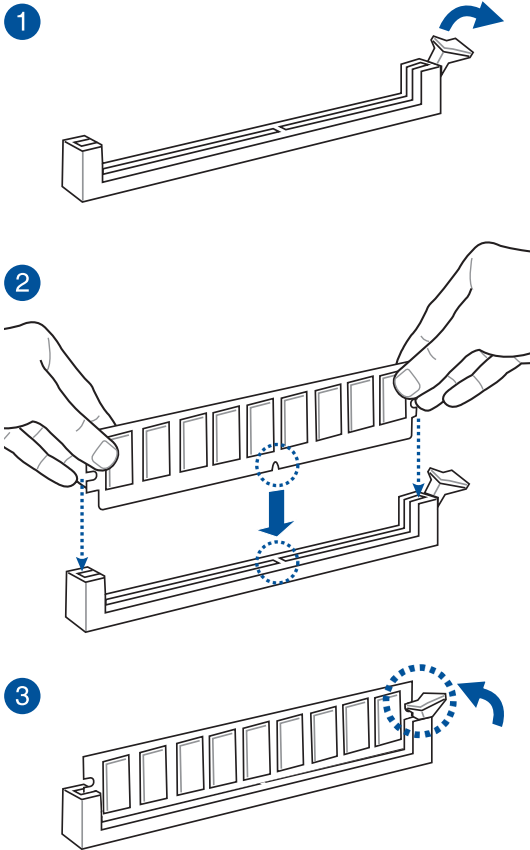
1



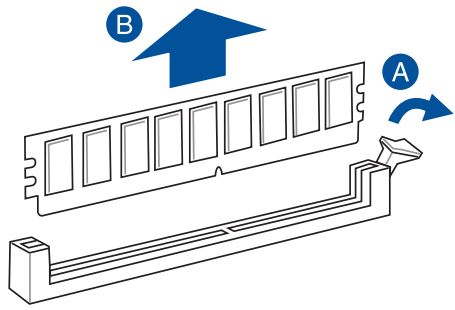
2



### 2.1.3 DIMM installation

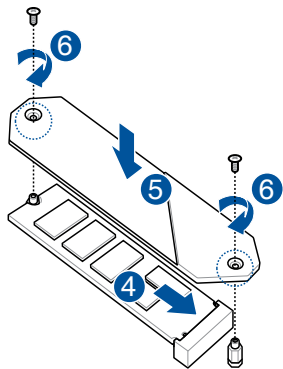
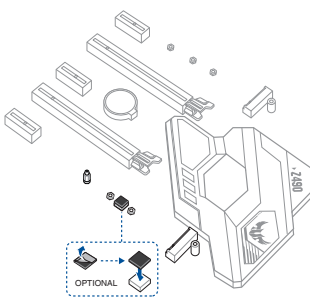
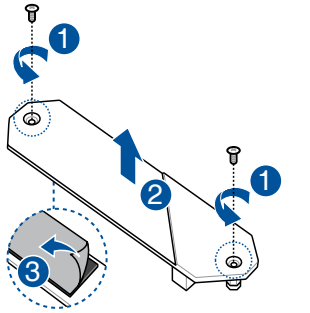


#### To remove a DIMM

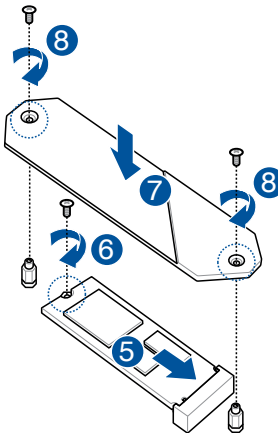
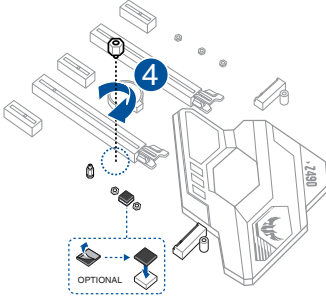
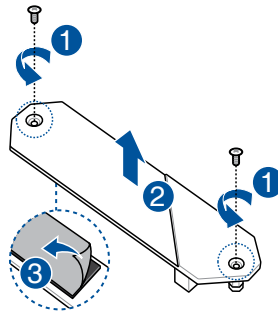


## 2.1.4 M.2 installation

For type 22110 M.2 on M.2\_1 slot



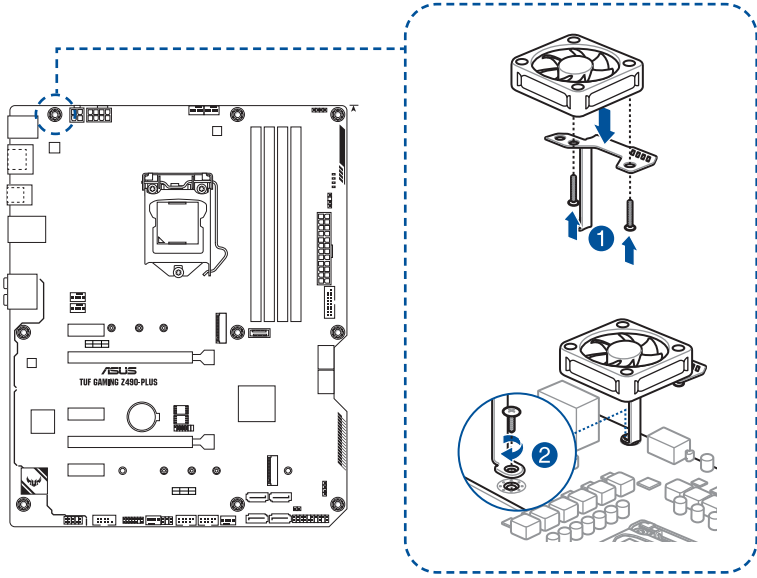
For type 2242 / 2260 / 2280 M.2 on M.2\_1 slot



- This M.2 rubber pad is optional for when installing a single sided M.2 storage device. Ensure to install the bundled M.2 rubber pad before installing your single sided M.2 storage device.
- DO NOT install the bundled M.2 rubber pads when installing a double-sided M.2 storage device. The rubber pad installed by default is compatible with double sided M.2 storage devices.
- The M.2 is purchased separately.



## 2.1.5 Fan bracket installation



When using high performance settings whilst overclocking, ensure to install the fan holder for additional fan(s).



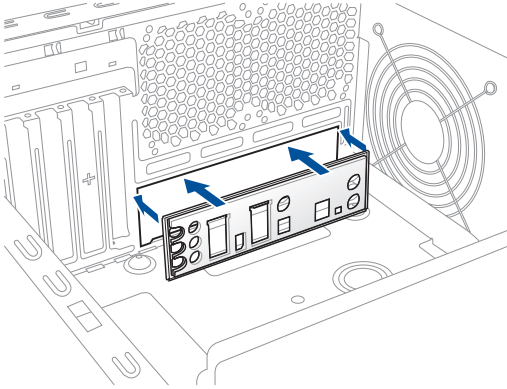
- You may install 12V (1A, 12W), 40mm x 40mm fans or 50mm x 50mm fans.
- Ensure to use the bundled screws that came with your fans.
- Fans are purchased separately.

## 2.1.6 Motherboard installation

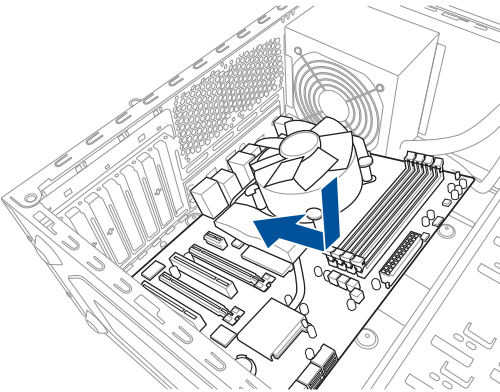
1. Install the ASUS I/O Shield to the chassis rear I/O panel.



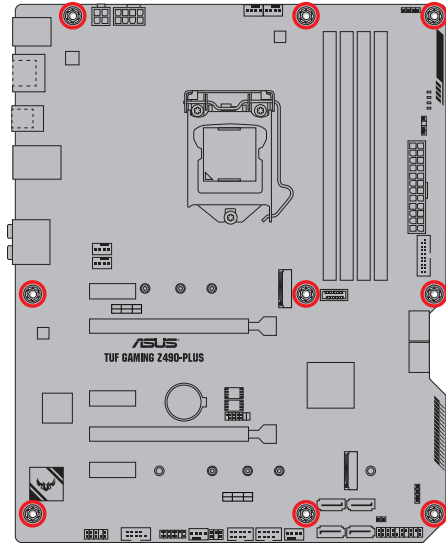
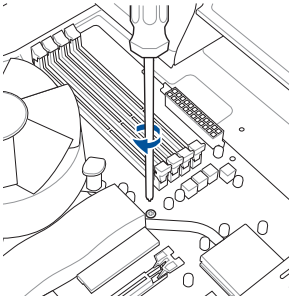
Some sharp edges and points might cause physical injury. We recommend you put on cut or puncture resistant gloves before motherboard and I/O shield installation.



2. Place the motherboard into the chassis, ensuring that its rear I/O ports are aligned to the chassis' rear I/O panel.



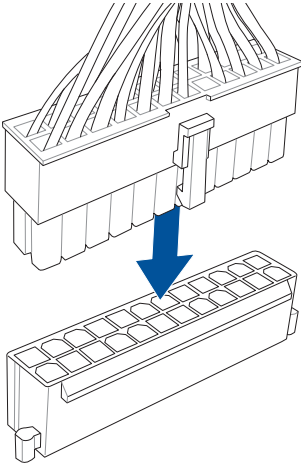
3. Place nine (9) screws into the holes indicated by circles to secure the motherboard to the chassis.



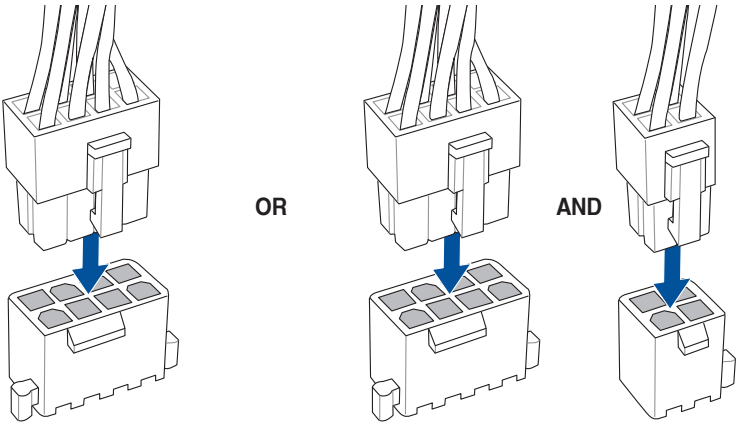
DO NOT over tighten the screws! Doing so can damage the motherboard.

## 2.1.7 ATX power connection

1

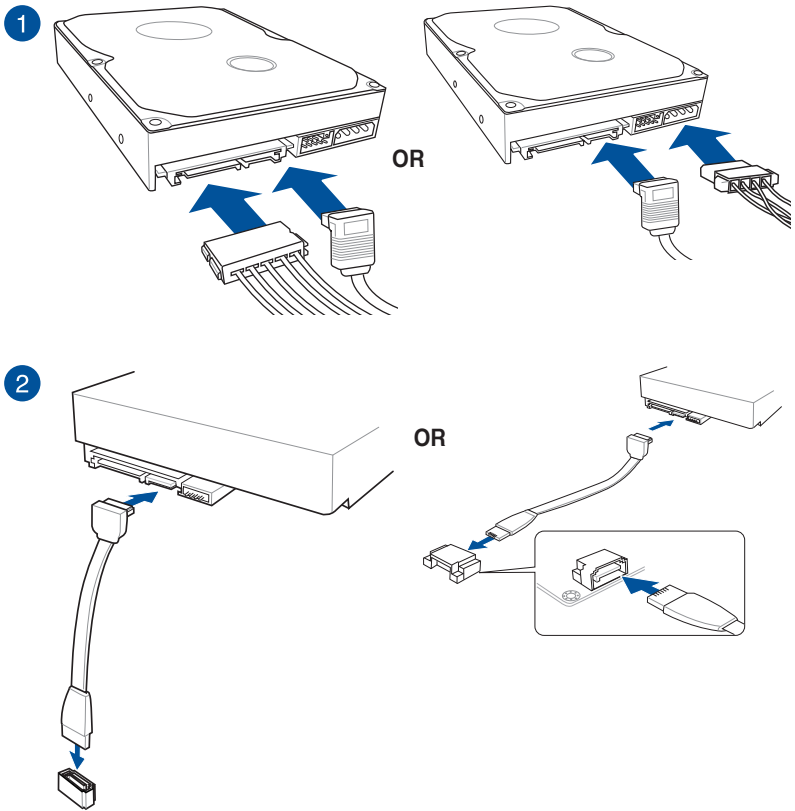


2



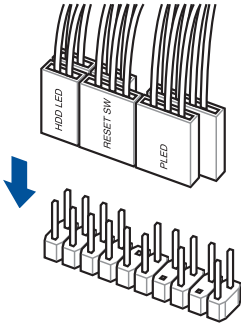
- DO NOT connect the 4-pin power plug only, the motherboard may overheat under heavy usage.
- Ensure to connect the 8-pin power plug, or connect both the 8-pin and 4-pin power plugs.

## 2.1.8 SATA device connection

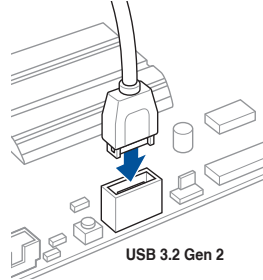


## 2.1.9 Front I/O connector

To install the front panel header

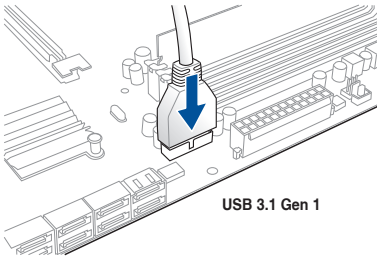


To install USB 3.2 Gen 2 connector

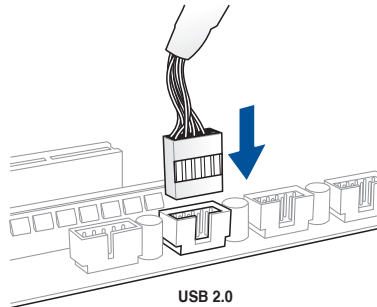


This connector will only fit in one orientation. Push the connector until it clicks into place.

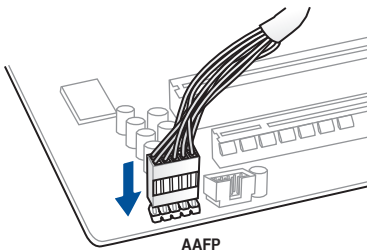
To install USB 3.2 Gen 1 connector



To install USB 2.0 connector

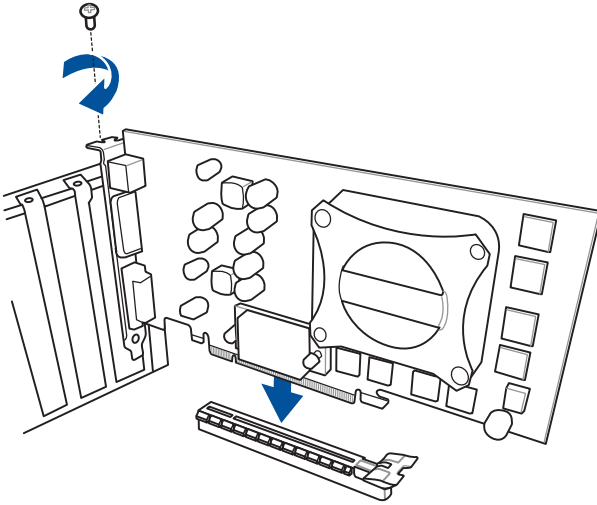


To install front panel audio connector

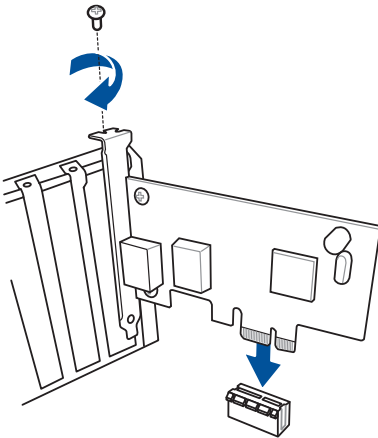


## 2.1.10 Expansion card installation

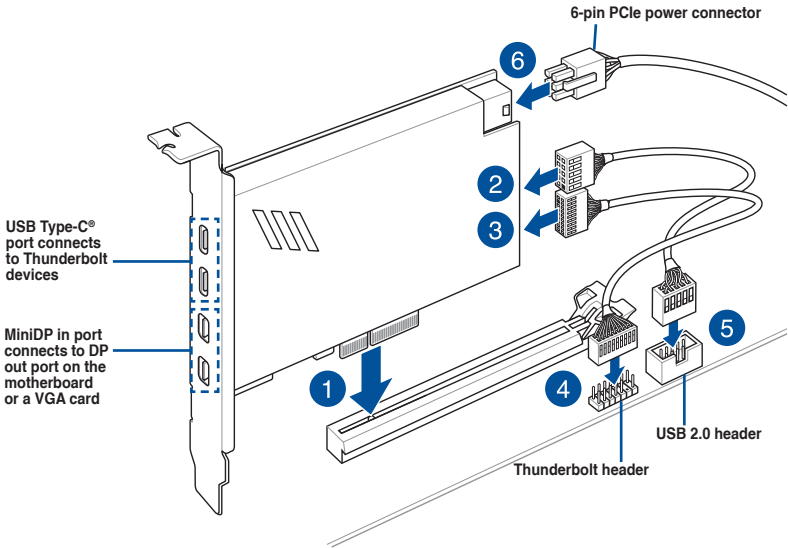
To install PCIe x16 cards



To install PCIe x1 cards



## To install ThunderboltEX 3-TR card



Ensure to install the ThunderboltEX 3-TR card to a PCIe slot from PCH.

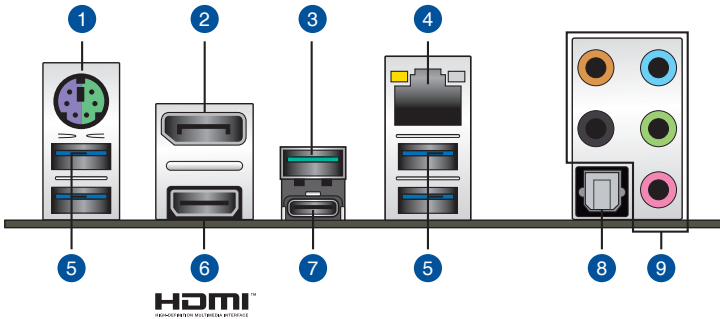


- Step 6 is optional, please connect a 6-pin PCIe power connector when you wish to use the USB Type-C® port Thunderbolt quick charge feature to charge a 5V or more device. The ThunderboltEX 3-TR card can support quick charging up to 100W.
- The TypeC\_1 port can support up to 20V devices, and the TypeC\_2 port can support up to 9V devices when the 6-pin PCIe power connector is connected.
- The Thunderbolt card is sold separately.



## 2.2 Motherboard rear and audio connections

### 2.2.1 Rear I/O connection



#### Rear panel connectors

- |    |                                      |
|----|--------------------------------------|
| 1. | PS/2 mouse/keyboard combo port       |
| 2. | DisplayPort                          |
| 3. | USB 3.2 Gen 2 Type-A port            |
| 4. | Ethernet (RJ-45) port*               |
| 5. | USB 3.2 Gen 1 Type-A ports 34 and 78 |
| 6. | HDMI™ port                           |
| 7. | USB Type-C®                          |
| 8. | Optical S/PDIF OUT port              |
| 9. | audio jacks**                        |

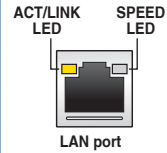
\* and \*\*: Refer to the tables on the next page for LAN port LEDs, and audio port definitions.



- We strongly recommend that you connect your devices to ports with matching data transfer rate. Please connect your USB 3.2 Gen 1 devices to USB 3.2 Gen 1 ports and your USB 3.2 Gen 2 devices to USB 3.2 Gen 2 ports for faster and better performance for your devices.
- Due to the design of the Intel chipset, all USB devices connected to the USB 3.2 Gen 1 ports are controlled by the xHCI controller. Some legacy USB devices must update their firmware for better compatibility.

**\* Ethernet port LED indications**

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

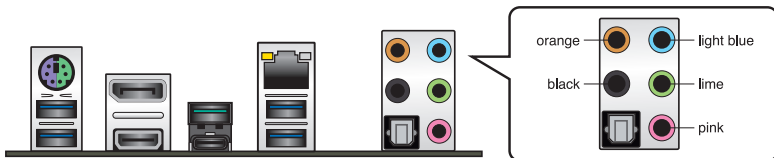


**\*\* Audio 2, 4, 5.1 or 7.1-channel configuration**

Port	Headset 2-channel	4-channel	5.1-channel	7.1-channel
Light Blue	Line In	Line In	Line In	Side Speaker Out
Lime	Line Out	Front Speaker Out	Front Speaker Out	Front Speaker Out
Pink	Mic In	Mic In	Mic In	Mic In
Orange	–	–	Center/Sub woofer	Center/Sub woofer
Black	–	Rear Speaker Out	Rear Speaker Out	Rear Speaker Out

**2.2.2 Audio I/O connections**

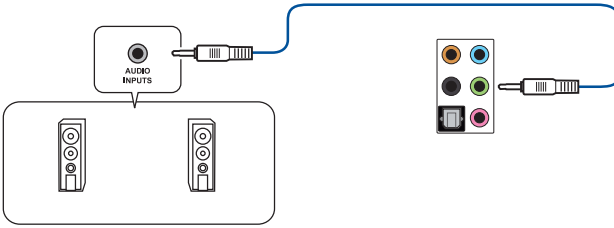
**Audio I/O ports**



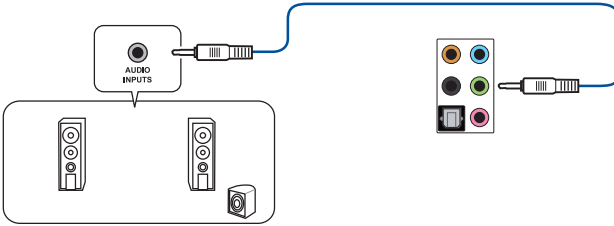
**Connect to Headphone and Mic**



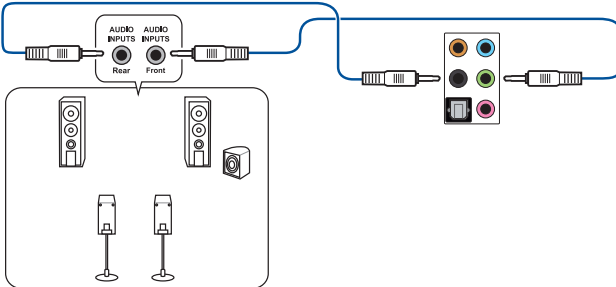
## Connect to Stereo Speakers



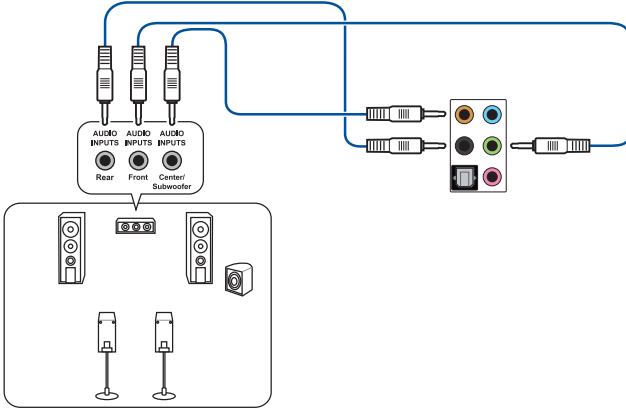
## Connect to 2-channel Speakers



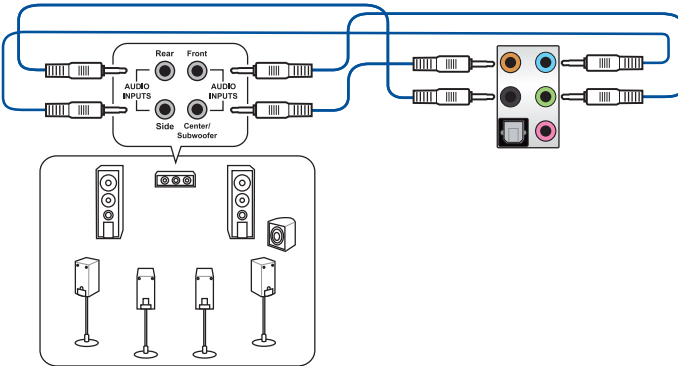
## Connect to 4-channel Speakers



### Connect to 5.1-channel Speakers



### Connect to 7.1-channel Speakers



## 2.3 Starting up for the first time

1. After making all the connections, replace the system case cover.
2. Ensure that all switches are off.
3. Connect the power cord to the power connector at the back of the system chassis.
4. Connect the power cord to a power outlet that is equipped with a surge protector.
5. Turn on the devices in the following order:
  - a. Monitor
  - b. External SCSI devices (starting with the last device on the chain)
  - c. System power
6. After applying power, the system power LED on the system front panel case lights up. For systems with ATX power supplies, the system LED lights up when you press the ATX power button. If your monitor complies with the “green” standards or if it has a “power standby” feature, the monitor LED may light up or change from orange to green after the system LED turns on.

The system then runs the power-on self tests (POST). While the tests are running, the BIOS beeps (refer to the BIOS beep codes table) or additional messages appear on the screen. If you do not see anything within 30 seconds from the time you turned on the power, the system may have failed a power-on test. Check the jumper settings and connections or call your retailer for assistance.

BIOS Beep	Description
One short beep	VGA detected Quick boot set to disabled No keyboard detected
One continuous beep followed by two short beeps then a pause (repeated)	No memory detected
One continuous beep followed by three short beeps	No VGA detected
One continuous beep followed by four short beeps	Hardware component failure

7. At power on, hold down the <Delete> key to enter the BIOS Setup. Follow the instructions in Chapter 3.

## 2.4 Turning off the computer

While the system is ON, press the power button for less than four seconds to put the system on sleep mode or soft-off mode, depending on the BIOS setting. Press the power button for more than four seconds to let the system enter the soft-off mode regardless of the BIOS setting.



# BIOS and RAID Support

# 3



For more details on BIOS and RAID configurations, please refer to [www.asus.com/support](http://www.asus.com/support).

## 3.1 Knowing BIOS



The new ASUS UEFI BIOS is a Unified Extensible Interface that complies with UEFI architecture, offering a user-friendly interface that goes beyond the traditional keyboard-only BIOS controls to enable a more flexible and convenient mouse input. You can easily navigate the new UEFI BIOS with the same smoothness as your operating system. The term "BIOS" in this user manual refers to "UEFI BIOS" unless otherwise specified.

BIOS (Basic Input and Output System) stores system hardware settings such as storage device configuration, overclocking settings, advanced power management, and boot device configuration that are needed for system startup in the motherboard CMOS. In normal circumstances, the default BIOS settings apply to most conditions to ensure optimal performance. **DO NOT change the default BIOS settings** except in the following circumstances:

- An error message appears on the screen during the system bootup and requests you to run the BIOS Setup.
- You have installed a new system component that requires further BIOS settings or update.



Inappropriate BIOS settings may result in instability or boot failure. **We strongly recommend that you change the BIOS settings only with the help of a trained service personnel.**



- When downloading or updating the BIOS file, rename it as **TGZ490P.CAP** for this motherboard.
- BIOS settings and options may vary due to different BIOS release versions. Please refer to the latest BIOS version for settings and options.



For more information on BIOS configurations, please refer to <https://www.asus.com/support>, or download the BIOS manual by scanning the QR code.



## 3.2 BIOS setup program

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

### Entering BIOS at startup

To enter BIOS Setup at startup, press <Delete> or <F2> during the Power-On Self Test (POST). If you do not press <Delete> or <F2>, POST continues with its routines.

### Entering BIOS Setup after POST

To enter BIOS Setup after POST:

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

After doing either of the three options, press <Delete> key to enter BIOS.



- 
- Ensure that a USB mouse is connected to your motherboard if you want to use the mouse to control the BIOS setup program.
  - If the system becomes unstable after changing any BIOS setting, load the default settings to ensure system compatibility and stability. Select the **Load Optimized Defaults** item under the **Exit** menu or press hotkey <F5>.
  - If the system fails to boot after changing any BIOS setting, try to clear the CMOS and reset the motherboard to the default value.
  - The BIOS setup program does not support Bluetooth devices.
- 

### BIOS menu screen

The BIOS Setup program can be used under two modes: **EZ Mode** and **Advanced Mode**. You can change modes from **Setup Mode** in **Boot menu** or by pressing the <F7> hotkey.



### 3.3 ASUS EZ Flash 3

The ASUS EZ Flash 3 feature allows you to update the BIOS without using an OS-based utility.



---

Ensure to load the BIOS default settings to ensure system compatibility and stability. Select the **Load Optimized Defaults** item under the **Exit** menu or press hotkey <F5>.

---

#### To update the BIOS by USB:



- This function can support devices such as a USB flash disk with FAT 32/16 format and single partition only.
  - DO NOT shut down or reset the system while updating the BIOS to prevent system boot failure!
- 

1. Insert the USB flash disk that contains the latest BIOS file to the USB port.
2. Enter the Advanced Mode of the BIOS setup program. Go to the **Tool** menu to select **ASUS EZ Flash 3 Utility** and press <Enter>.
3. Select **via Storage Device(s)**.
4. Press <Tab> to switch to the **Drive** field.
5. Press the Up/Down arrow keys to find the USB flash disk that contains the latest BIOS, and then press <Enter>.
6. Press <Tab> to switch to the **Folder** field.
7. Press the Up/Down arrow keys to find the BIOS file, and then press <Enter> to perform the BIOS update process. Reboot the system when the update process is done.

## 3.4 ASUS CrashFree BIOS 3

The ASUS CrashFree BIOS 3 utility is an auto recovery tool that allows you to restore the BIOS file when it fails or gets corrupted during the updating process. You can restore a corrupted BIOS file using the motherboard support DVD or a USB flash drive that contains the BIOS file.



---

The BIOS file in the motherboard support DVD may be older than the BIOS file published on the ASUS official website. If you want to use the newer BIOS file, download the file at <https://www.asus.com/support/> and save it to a USB flash drive.

---

### Recovering the BIOS

#### To recover the BIOS:

1. Turn on the system.
2. Insert the motherboard support DVD to the optical drive, or the USB flash drive containing the BIOS file to the USB port.
3. The utility automatically checks the devices for the BIOS file. When found, the utility reads the BIOS file and enters ASUS EZ Flash 3 automatically.
4. The system requires you to enter BIOS Setup to recover the BIOS setting. To ensure system compatibility and stability, we recommend that you press <F5> to load default BIOS values.



---

**DO NOT** shut down or reset the system while updating the BIOS! Doing so can cause system boot failure!

---

## 3.5 RAID configurations

The motherboard comes with the Intel® Rapid Storage Technology that supports RAID 0, RAID 1, RAID 5 and RAID 10 configuration.



For more information on configuring your RAID sets, please refer to the **RAID Configuration Guide** which you can find at <https://www.asus.com/support>, or by scanning the QR code.



### RAID definitions

**RAID 0 (Data striping)** optimizes two identical hard disk drives to read and write data in parallel, interleaved stacks. Two hard disks perform the same work as a single drive but at a sustained data transfer rate, double that of a single disk alone, thus improving data access and storage. Use of two new identical hard disk drives is required for this setup.

**RAID 1 (Data mirroring)** copies and maintains an identical image of data from one drive to a second drive. If one drive fails, the disk array management software directs all applications to the surviving drive as it contains a complete copy of the data in the other drive. This RAID configuration provides data protection and increases fault tolerance to the entire system. Use two new drives or use an existing drive and a new drive for this setup. The new drive must be of the same size or larger than the existing drive.

**RAID 5** stripes both data and parity information across three or more hard disk drives. Among the advantages of RAID 5 configuration include better HDD performance, fault tolerance, and higher storage capacity. The RAID 5 configuration is best suited for transaction processing, relational database applications, enterprise resource planning, and other business systems. Use a minimum of three identical hard disk drives for this setup.

**RAID 10** is data striping and data mirroring combined without parity (redundancy data) having to be calculated and written. With the RAID 10 configuration you get all the benefits of both RAID 0 and RAID 1 configurations. Use four new hard disk drives or use an existing drive and three new drives for this setup.



# Appendix

## Notices

### FCC Compliance Information

Responsible Party: Asus Computer International

Address: 48720 Kato Rd., Fremont, CA 94538, USA

Phone / Fax No: (510)739-3777 / (510)608-4555

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.

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 instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment 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.

## Compliance Statement of Innovation, Science and Economic Development Canada (ISED)

This device complies with Innovation, Science and Economic Development Canada licence exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

CAN ICES-3(B)/NMB-3(B)

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CAN ICES-3(B)/NMB-3(B)

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取扱説明書に従って正しい取り扱いをして下さい。

VCCI-B

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Please refer to <http://csr.asus.com/Compliance.htm> for information disclosure based on regulation requirements ASUS is complied with:

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Complying with the REACH (Registration, Evaluation, Authorisation, and Restriction of Chemicals) regulatory framework, we published the chemical substances in our products at ASUS REACH website at <http://csr.asus.com/english/REACH.htm>.

### EU RoHS

This product complies with the EU RoHS Directive. For more details, see <http://csr.asus.com/english/article.aspx?id=35>

### India RoHS

This product complies with the “India E-Waste (Management) Rules, 2016” and prohibits use of lead, mercury, hexavalent chromium, polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs) in concentrations exceeding 0.1% by weight in homogenous materials and 0.01% by weight in homogenous materials for cadmium, except for the exemptions listed in Schedule II of the Rule.

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ASUS products sold in Vietnam, on or after September 23, 2011, meet the requirements of the Vietnam Circular 30/2011/TT-BCT.

Các sản phẩm ASUS bán tại Việt Nam, vào ngày 23 tháng 9 năm 2011 trở về sau, đều phải đáp ứng các yêu cầu của Thông tư 30/2011/TT-BCT của Việt Nam.

### Turkey RoHS

AEEE Yönetmeliğine Uygundur

## ASUS Recycling/Takeback Services

ASUS recycling and takeback programs come from our commitment to the highest standards for protecting our environment. We believe in providing solutions for you to be able to responsibly recycle our products, batteries, other components as well as the packaging materials. Please go to <http://csr.asus.com/english/Takeback.htm> for detailed recycling information in different regions.



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



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

## Regional notice for California



### WARNING

Cancer and Reproductive Harm -  
[www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



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## ASUS contact information

### ASUSTeK COMPUTER INC.

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