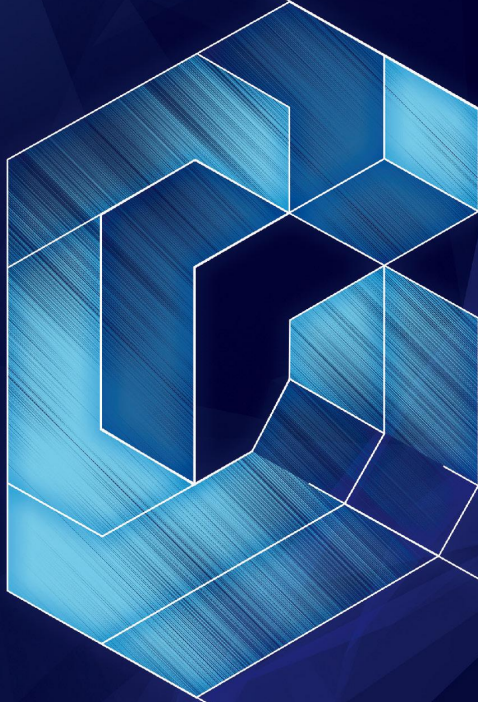


ASRock®



X299

CREATOR

User Manual

Version 1.0

Published October 2019

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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.

CALIFORNIA, USA ONLY

The Lithium battery adopted on this motherboard contains Perchlorate, a toxic substance controlled in Perchlorate Best Management Practices (BMP) regulations passed by the California Legislature. When you discard the Lithium battery in California, USA, please follow the related regulations in advance.

“Perchlorate Material-special handling may apply, see www.dtsc.ca.gov/hazardouswaste/perchlorate”

ASRock Website: <http://www.asrock.com>

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Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage caused by our goods. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure. If you require assistance please call ASRock Tel : +886-2-28965588 ext.123 (Standard International call charges apply)

CE Warning

This device complies with directive 2014/53/EU issued by the Commission of the European Community.

This equipment complies with EU radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Operations in the 5.15-5.35GHz band are restricted to indoor usage only.

	AT	BE	BG	CH	CY	CZ	DE
	DK	EE	EL	ES	FI	FR	HR
	HU	IE	IS	IT	LI	LT	LU
	LV	MT	NL	NO	PL	PT	RO
	SE	SI	SK	TR	UK		



Radio transmit power per transceiver type

Function	Frequency	Maximum Output Power (EIRP)
WiFi	2400-2483.5 MHz	18.5 + / -1.5 dbm
	5150-5250 MHz	21.5 + / -1.5 dbm
	5250-5350 MHz	18.5 + / -1.5 dbm (no TPC) 21.5 + / -1.5 dbm (TPC)
	5470-5725 MHz	25.5 + / -1.5 dbm (no TPC) 28.5 + / -1.5 dbm (TPC)
Bluetooth	2400-2483.5 MHz	8.5 + / -1.5 dbm

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Chapter 1 Introduction

Thank you for purchasing ASRock X299 Creator motherboard, a reliable motherboard produced under ASRock's consistently stringent quality control. It delivers excellent performance with robust design conforming to ASRock's commitment to quality and endurance.

In this documentation, Chapter 1 and 2 contains the introduction of the motherboard and step-by-step installation guides. Chapter 3 contains the operation guide of the software and utilities. Chapter 4 contains the configuration guide of the BIOS setup.



Because the motherboard specifications and the BIOS software might be updated, the content of this documentation will be subject to change without notice. In case any modifications of this documentation occur, the updated version will be available on ASRock's website without further notice. If you require technical support related to this motherboard, please visit our website for specific information about the model you are using. You may find the latest VGA cards and CPU support list on ASRock's website as well. ASRock website <http://www.asrock.com>.

1.1 Package Contents

- ASRock X299 Creator Motherboard (ATX Form Factor)
- ASRock X299 Creator Quick Installation Guide
- ASRock X299 Creator Support CD
- 1 x ASRock SLI_HB_Bridge_2S Card (Optional)
- 1 x ASRock WiFi 2.4/5 GHz Antenna (Optional)
- 4 x Serial ATA (SATA) Data Cables (Optional)
- 3 x Screws for M.2 Sockets (Optional)
- 3 x Standoffs for M.2 Sockets (Optional)
- 1 x I/O Panel Shield

1.2 Specifications

- Platform**
- ATX Form Factor
 - 8 Layer PCB
 - 2oz Copper PCB

- CPU**
- Supports Intel® Core™ X-Series Processor Family for the LGA 2066 Socket (Cascade Lake-X, Skylake X Refresh and Skylake X)
 - Digi Power design
 - 13 Power Phase design
 - Supports Intel® Turbo Boost Max Technology 3.0

- Chipset**
- Intel® X299

- Memory**
- Quad Channel DDR4 Memory Technology
 - 8 x DDR4 DIMM Slots
 - Supports DDR4 4200+(OC)*/4000(OC)/3800(OC)/3733(OC)/3600(OC)/3200(OC)/2933(OC)/2800(OC)/2666/2400/2133 non-ECC, un-buffered memory
 - * The maximum memory frequency supported may vary by processor type.
 - * Please refer to Memory Support List on ASRock's website for more information. (<http://www.asrock.com/>)
 - Max. capacity of system memory: 256GB
 - Supports Intel® Extreme Memory Profile (XMP) 2.0
 - 15µ Gold Contact in DIMM Slots

- Expansion Slot**
- 4 x PCI Express 3.0 x16 Slots*
- * If you install CPU with 48 lanes, PCIE1/PCIE2/PCIE3/PCIE5 will run at x16/x8/x16/x8.
If a M.2 PCI Express module is installed on M2_1 or M2_2, PCIE2 will downgrade to x4 mode.
If M.2 PCI Express modules are installed on M2_1 and M2_2, PCIE2 will be disabled.
- * If you install CPU with 44 lanes, PCIE1/PCIE2/PCIE3/PCIE5 will run at x16/x4/x16/x8.
If a M.2 PCI Express module is installed on M2_1, PCIE2 will be disabled.

* If you install CPU with 28 lanes, PCIE1/PCIE2/PCIE3/PCIE5 will run at x16/x4/x8/x0.

If a M.2 PCI Express module is installed on M2_1, PCIE2 will be disabled.

* Supports NVMe SSD as boot disks

- 1 x PCI Express 3.0 x1 Slot
- Supports AMD 3-Way CrossFireX™ and CrossFireX™ **
- Supports NVIDIA® 3-Way SLI™ and SLI™**
- Supports NVIDIA® NVLink™ with dual NVIDIA® GeForce® RTX series graphics cards***
- Support NVIDIA® SLI™ with NVIDIA® Quadro graphics cards

** 3-Way CrossFireX™ and 3-Way SLI™ are only supported with CPU with 48 lanes or 44 lanes.

*** NVIDIA NVLink Bridge does not come with the package. Please purchase it from NVIDIA® if necessary.

- 1 x Vertical M.2 Socket (Key E) with the bundled WiFi-802.11ax module (on the rear I/O)
- 15µ Gold Contact in VGA PCIe Slot (PCIE1 and PCIE3)

Thunderbolt™

- Intel® JHL7540 Thunderbolt™ 3 Controller (Titan Ridge)
- Supports Thunderbolt™ 3 interface with max. resolution of 5K (5120 x 2880) @ 60Hz for one display over a single cable connection
- Supports Thunderbolt™ 3 interface with max. resolution of 4K x 2K (4096x2160) @ 60Hz for dual displays over a single cable connection
- Supports up to two streams (eight lanes) of DisplayPort video bandwidth; supports daisy-chaining of multiple DisplayPort monitors

Audio

- 7.1 CH HD Audio with Content Protection (Realtek ALC1220 Audio Codec)
- Premium Blu-ray Audio support
- Supports Surge Protection (ASRock Full Spike Protection)
- Supports Purity Sound™ 4
 - Nichicon Fine Gold Series Audio Caps
 - 120dB SNR DAC with Differential Amplifier
 - NE5532 Premium Headset Amplifier for Front Panel Audio Connector (Supports up to 600 Ohm headsets)
 - Pure Power-In

- Direct Drive Technology
- PCB Isolate Shielding
- Impedance Sensing on Front Out port
- Individual PCB Layers for R/L Audio Channel
- Gold Audio Jacks
- 15µ Gold Audio Connector
- Supports DTS Connect

LAN

1 x 10 Gigabit LAN 100/1000/2500/5000/10000 Mb/s (AQUANTIA® AQC107):

- Supports Lightning/ESD Protection
- Supports PXE

1 x Intel Gigabit LAN 10/100/1000 Mb/s (Intel® I219V):

- Supports Wake-On-LAN
- Supports Lightning/ESD Protection
- Supports Energy Efficient Ethernet 802.3az
- Supports PXE

Wireless LAN

- Intel® 802.11ax WiFi Module
- Supports IEEE 802.11a/b/g/n/ax
- Supports Dual-Band (2.4/5 GHz)
- Supports high speed wireless connections up to 2.4Gbps
- 2 antennas to support 2 (Transmit) x 2 (Receive) diversity technology
- Supports Bluetooth 5.0 + High speed class II
- Supports MU-MIMO

Rear Panel I/O

- 2 x Antenna Ports
- 1 x Optical SPDIF Out Port
- 2 x USB 2.0 Ports (Supports ESD Protection)
- 2 x USB 3.2 Gen2 Thunderbolt™ 3 Type-C Ports (40Gb/s for Thunderbolt protocol; 10 Gb/s for USB3.2 protocol) (Supports ESD Protection)*

* Supports USB-PD 3.0 9V/3A(27W) and 5V/3A(15W)

- 2 x Mini DisplayPort Input Ports**

** Please choose regular mini DisplayPort to DisplayPort adapter cables instead of right angled ones if you use two mini DisplayPort input ports simultaneously.

- 4 x USB 3.2 Gen1 Ports (Supports ESD Protection)***

- *** Ultra USB Power is supported on USB3_34 ports.
- *** ACPI wake-up function is not supported on USB3_34 ports.
- 2 x RJ-45 LAN Ports with LED (ACT/LINK LED and SPEED LED)
- 1 x Clear CMOS Button
- HD Audio Jacks: Rear Speaker / Central / Bass / Line in / Front Speaker / Microphone (Gold Audio Jacks)

Storage

- 8 x SATA3 6.0 Gb/s Connectors, support RAID (RAID 0, RAID 1, RAID 5, RAID 10, Intel Rapid Storage Technology 17 and Intel Smart Response Technology), NCQ, AHCI and Hot Plug*
- * If M2_3 is occupied by a SATA-type M.2 device, SATA3_7 will be disabled.
- 2 x SATA3 6.0 Gb/s Connectors by ASMedia ASM1061, support NCQ, AHCI and Hot Plug
- 2 x Ultra M.2 Sockets (M2_1 and M2_2), support M Key type 2242/2260/2280 M.2 PCI Express module up to Gen3 x4 (32 Gb/s)**
- 1 x Ultra M.2 Socket (M2_3), supports M Key type 2242/2260/2280/22110 M.2 SATA3 6.0 Gb/s module and M.2 PCI Express module up to Gen3 x4 (32 Gb/s)**
- ** If you install CPU with 44 or 28 lanes, M2_2 will be disabled.
- ** Supports Intel® Optane™ Technology
- ** Supports PCIe RAID
- ** Supports NVMe SSD as boot disks

Connector

- 1 x Virtual RAID On CPU Header
- 1 x SPI TPM Header
- 1 x Power LED and Speaker Header
- 2 x RGB LED Headers
- * Supports in total up to 12V/3A, 36W LED Strip
- 2 x Addressable LED Headers
- * Support in total up to 5V/3A, 15W LED Strip
- 1 x CPU Fan Connector (4-pin)
- * The CPU Fan Connector supports the CPU fan of maximum 1A (12W) fan power.
- 1 x CPU/Water Pump Fan Connector (4-pin) (Smart Fan Speed Control)
- * The CPU/Water Pump Fan supports the water cooler fan of maximum 2A (24W) fan power.

- 5 x Chassis/Water Pump Fan Connectors (4-pin) (Smart Fan Speed Control)

* The Chassis/Water Pump Fan supports the water cooler fan of maximum 2A (24W) fan power.

* CPU_FAN2/WP, CHA_FAN1~5/WP can auto detect if 3-pin or 4-pin fan is in use.

- 1 x 24 pin ATX Power Connector (Hi-Density Power Connector)
- 2 x 8 pin 12V Power Connectors (Hi-Density Power Connector)
- 1 x Front Panel Audio Connector (15 μ Gold Audio Connector)
- 2 x USB 2.0 Headers (Support 4 USB 2.0 ports) (Supports ESD Protection)
- 1 x USB 3.2 Gen1 Header (Supports 2 USB 3.2 Gen1 ports) (Supports ESD Protection)
- 1 x Front Panel Type C USB 3.2 Gen2 Header (ASMedia ASM3142)
- 1 x Dr. Debug with LED
- 1 x Power Button with LED
- 1 x Reset Button

BIOS Feature

- 2 x AMI UEFI Legal BIOS with multilingual GUI support (1 x Main BIOS and 1 x Backup BIOS)
- Supports Secure Backup UEFI Technology
- ACPI 6.1 Compliant wake up events
- SMBIOS 3.0 Support
- CPU, DRAM, VPPM, VTTM, PCH 1.0V, VCCMPHY, VC-CIO, VCCSA, VCCPLL, CLK VDD Voltage Multi-adjustment

Hardware Monitor

- Temperature Sensing: CPU, CPU/Water Pump, Chassis/Water Pump Fans
- Fan Tachometer: CPU, CPU/Water Pump, Chassis/Water Pump Fans
- Quiet Fan (Auto adjust chassis fan speed by CPU temperature): CPU, CPU/Water Pump, Chassis/Water Pump Fans
- Fan Multi-Speed Control: CPU, CPU/Water Pump, Chassis/Water Pump Fans
- Voltage monitoring: +12V, +5V, +3.3V, CPU Vcore, DRAM, PCH 1.0V, VCCIO, VCCSA

OS • Microsoft® Windows® 10 64-bit

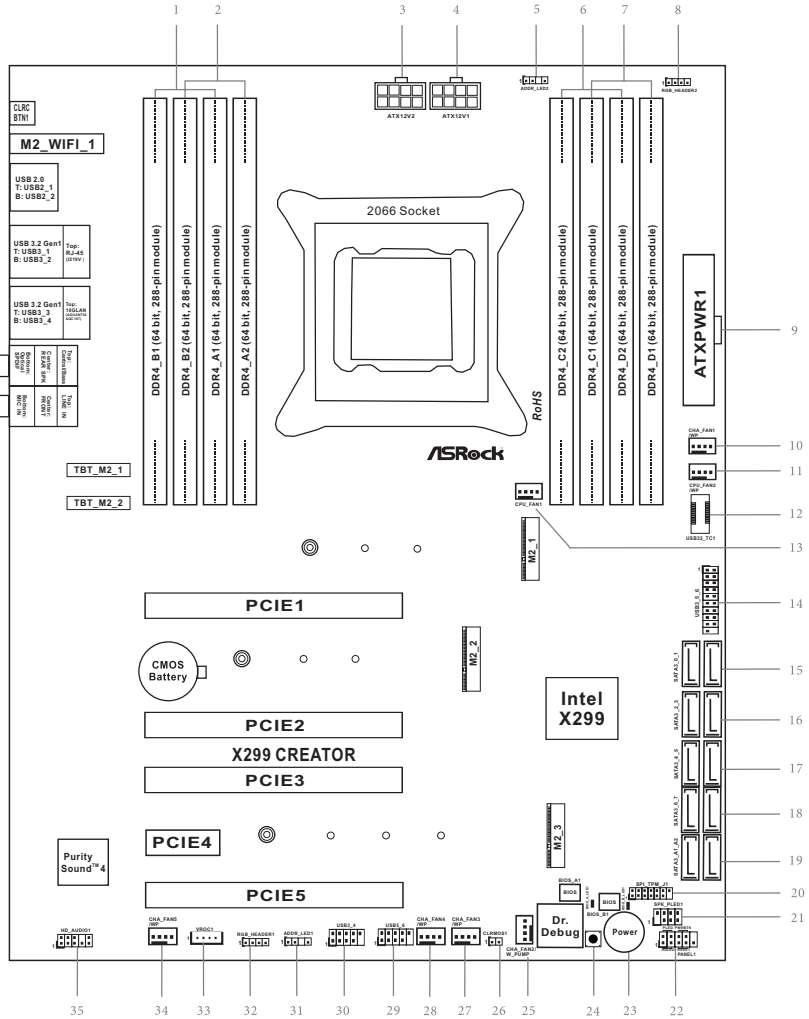
Certifications • FCC, CE
• ErP/EuP ready (ErP/EuP ready power supply is required)

* For detailed product information, please visit our website: <http://www.asrock.com>



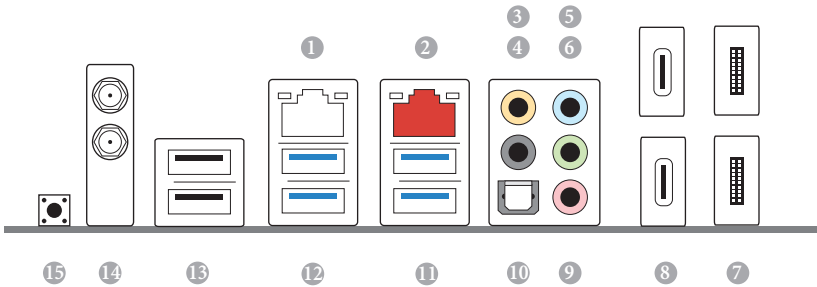
Please realize that there is a certain risk involved with overclocking, including adjusting the setting in the BIOS, applying Untied Overclocking Technology, or using third-party overclocking tools. Overclocking may affect your system's stability, or even cause damage to the components and devices of your system. It should be done at your own risk and expense. We are not responsible for possible damage caused by overclocking.

1.3 Motherboard Layout



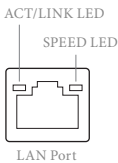
No.	Description
1	2 x 288-pin DDR4 DIMM Slots (DDR4_A1, DDR4_B1)
2	2 x 288-pin DDR4 DIMM Slots (DDR4_A2, DDR4_B2)
3	ATX 12V Power Connector (ATX12V2)
4	ATX 12V Power Connector (ATX12V1)
5	Addressable LED Header (ADDR_LED2)
6	2 x 288-pin DDR4 DIMM Slots (DDR4_C2, DDR4_D2)
7	2 x 288-pin DDR4 DIMM Slots (DDR4_C1, DDR4_D1)
8	RGB LED Header (RGB_HEADER2)
9	ATX Power Connector (ATXPWR1)
10	Chassis / Waterpump Fan Connector (CHA_FAN1/WP)
11	CPU / Waterpump Fan Connector (CPU_FAN2/WP)
12	Front Panel Type C USB 3.2 Gen2 Header (USB32_TC1)
13	CPU Fan Connector (CPU_FAN1)
14	USB 3.2 Gen1 Header (USB3_5_6)
15	SATA3 Connectors (SATA3_0_1)
16	SATA3 Connectors (SATA3_2_3)
17	SATA3 Connectors (SATA3_4_5)
18	SATA3 Connectors (SATA3_6_7)
19	SATA3 Connectors (SATA3_A1_A2)
20	SPI TPM Header (SPI_TPM_J1)
21	Power LED and Speaker Header (SPK_PLED1)
22	System Panel Header (PANEL1)
23	Power Button (PWRBTN1)
24	Reset Button (RSTBTN1)
25	Chassis / Waterpump Fan Connector (CHA_FAN2/WP)
26	Clear CMOS Jumper (CLRMOS1)
27	Chassis / Waterpump Fan Connector (CHA_FAN3/WP)
28	Chassis / Waterpump Fan Connector (CHA_FAN4/WP)
29	USB 2.0 Header (USB5_6)
30	USB 2.0 Header (USB3_4)
31	Addressable LED Header (ADDR_LED1)
32	RGB LED Header (RGB_HEADER1)
33	Virtual RAID On CPU Header (VROC1)
34	Chassis / Waterpump Fan Connector (CHA_FAN5/WP)
35	Front Panel Audio Header (HD_AUDIO1)

1.4 I/O Panel



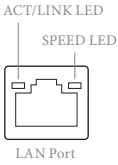
No.	Description	No.	Description
1	LAN RJ-45 Port (Intel® I219V)*	8	USB 3.2 Gen2 Thunderbolt™ 3 Type-C Ports
2	10G LAN RJ-45 Port (AQUANTIA® AQC107)**	9	Microphone (Pink)
3	Central / Bass (Orange)	10	Optical SPDIF Out Port
4	Rear Speaker (Black)	11	USB 3.2 Gen1 Ports (USB3_34)****
5	Line In (Light Blue)	12	USB 3.2 Gen1 Ports (USB3_1_2)
6	Front Speaker (Lime)***	13	USB 2.0 Ports (USB2_1_2)
7	Mini DisplayPort Input Ports****	14	Antenna Ports
		15	Clear CMOS Button

* There are two LEDs on each LAN port. Please refer to the table below for the LAN port LED indications.



Activity / Link LED		Speed LED	
Status	Description	Status	Description
Off	No Link	Off	10Mbps connection
Blinking	Data Activity	Orange	100Mbps connection
On	Link	Green	1Gbps connection

** There are two LEDs on each LAN port. Please refer to the table below for the LAN port LED indications.



Activity / Link LED		Speed LED	
Status	Description	Status	Description
Off	No Link	Orange	10Mbps/100Mbps/1Gbps/2.5Gbps /5Gbps connection
Blinking	Data Activity		
On	Link	Green	10Gbps connection

*** If you use a 2-channel speaker, please connect the speaker's plug into "Front Speaker Jack". See the table below for connection details in accordance with the type of speaker you use.

Audio Output Channels	Front Speaker (No. 6)	Rear Speaker (No. 4)	Central / Bass (No. 3)	Line In (No. 5)
2	V	--	--	--
4	V	V	--	--
6	V	V	V	--
8	V	V	V	V

**** Please choose regular mini DisplayPort to DisplayPort adapter cables instead of right angled ones if you use two mini DisplayPort input ports simultaneously.

***** ACPI wake-up function is not supported on USB3_34 ports.

1.5 WiFi-802.11ax Module and ASRock WiFi 2.4/5 GHz Antenna

WiFi-802.11ax + BT Module

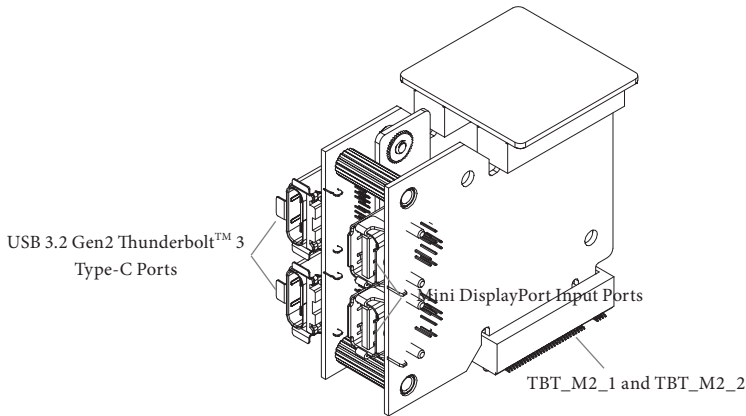
This motherboard comes with an exclusive WiFi 802.11 a/b/g/n/ax + BT v5.0 module (pre-installed on the rear I/O panel) that offers support for WiFi 802.11 a/b/g/n/ax connectivity standards and Bluetooth v5.0. WiFi + BT module is an easy-to-use wireless local area network (WLAN) adapter to support WiFi + BT. Bluetooth v5.0 standard features Smart Ready technology that adds a whole new class of functionality into the mobile devices. BT 5.0 also includes Low Energy Technology and ensures extraordinary low power consumption for PCs. The 2T2R WiFi solution sets a WiFi high speed standard and offers max link rate up to 2.4Gbps.

* The transmission speed may vary according to the environment.



ASRock WiFi 2.4/5 GHz Antenna

1.6 ASRock Thunderbolt™ 3 Module



Specifications

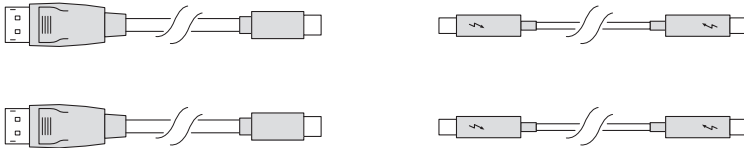
Platform	<ul style="list-style-type: none"> Size: 1.45-in x 1.65-in x 0.91-in, 3.7 cm x 4.2 cm x 2.3 cm
Controller	<ul style="list-style-type: none"> Intel® JHL7540 Thunderbolt™ 3 Controller (Titan Ridge)
M.2	<ul style="list-style-type: none"> Proprietary design for ASRock specific motherboard <p>* Please note that plugging into other M.2 connector may damage the motherboard and this module</p>
Connector	<ul style="list-style-type: none"> 2 x NGFF M Key Type M.2 Connectors 2 x Mini DisplayPort 1.4 Input Ports 2 x USB 3.2 Gen2 Thunderbolt™ 3 Type-C Ports (40Gb/s for Thunderbolt protocol; 10 Gb/s for USB3.2 protocol) (Support ESD Protection)* <p>*Supports daisy-chaining of up to six Thunderbolt™ devices. *This port supports USB-PD 3.0 power outputs 9V/3A 27W and 5V/3A 15W. For charging Type-C USB devices, the device should support Type-C standards to adjust the current because it will be different in Power On state (3 Amp). *Some Type-C USB devices may only be charged by its own adapter.</p>
Interface	<ul style="list-style-type: none"> PCI Express 3.0 x4 interface

Graphics	<ul style="list-style-type: none">• Supports Thunderbolt™ 3 interface with max. resolution of 5K (5120 x 2880) @ 60Hz for one display over a single cable connection• Supports Thunderbolt™ 3 interface with max. resolution of 4K x 2K (4096x2160) @ 60Hz for dual displays over a single cable connection• Supports up to two streams (eight lanes) of DisplayPort video bandwidth; supports daisy-chaining of multiple DisplayPort monitors
Data Rate	<ul style="list-style-type: none">• Supports 40Gbps bi-directional bandwidth per channel with Thunderbolt™ 3 port
OS	<ul style="list-style-type: none">• Microsoft® Windows® 10 64-bit

Installation

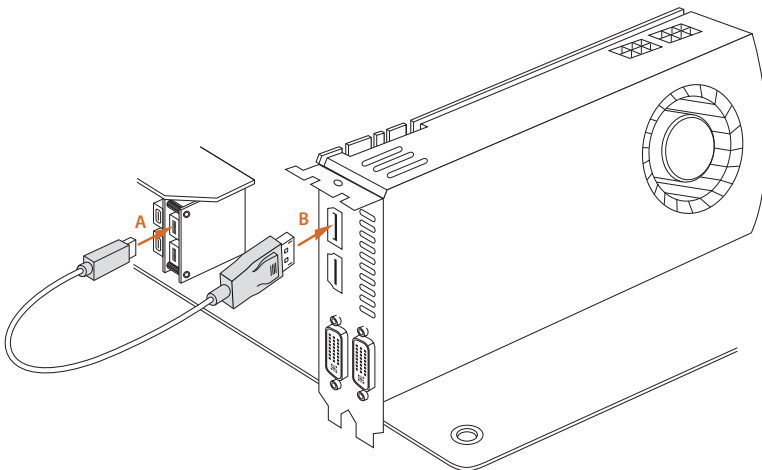
Step 1

Prepare two Mini DisplayPort to DisplayPort Adapter Cables and one/two Thunderbolt™ cables. All these cables are not included in the package.



Step 2

Connect one end of the Mini DisplayPort to DisplayPort Adapter Cable to the **Mini DisplayPort Input Port (A)** on ASRock Thunderbolt™ 3 Module on I/O panel. Then connect the other end of the cable to the **DisplayPort Output Port (B)** on the graphics card.

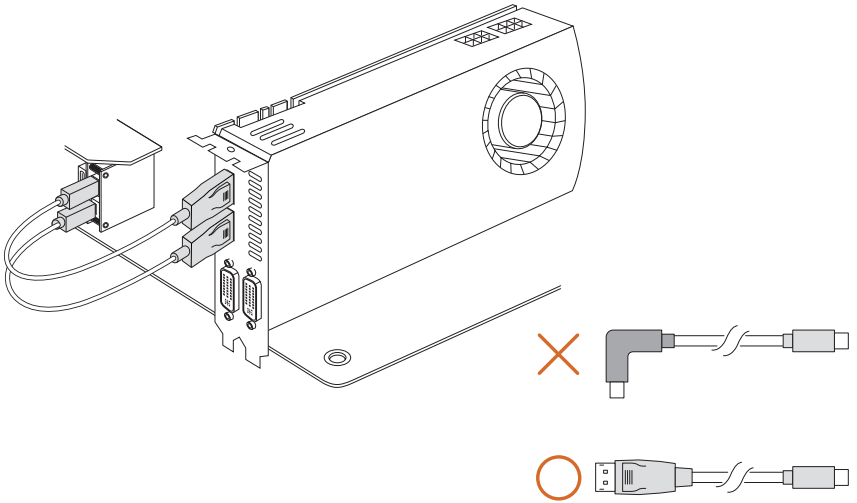


Step 3

Follow step 2 to connect the other Mini DisplayPort Input Port to the graphics card.

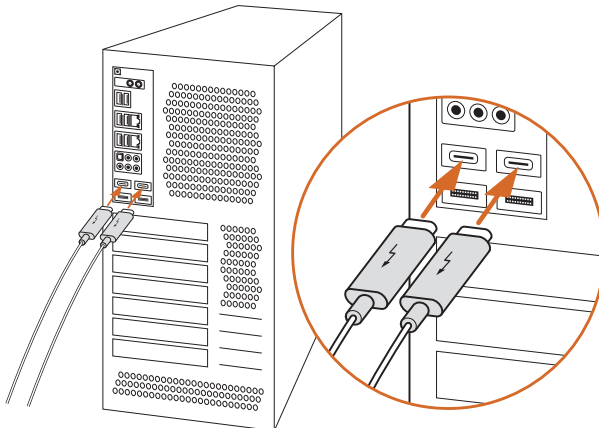


1. Make sure to connect both Mini DisplayPort Input Ports if you install the Thunderbolt™ output display device.
2. Please choose regular Mini DisplayPort to DisplayPort Adapter Cables instead of right angled ones if you use two Mini DisplayPort Input Ports simultaneously.



Step 4

Connect the Thunderbolt™ cable(s) from your Thunderbolt-enabled device(s) to the USB 3.2 Gen2 Thunderbolt™ 3 Type-C Port(s) on ASRock Thunderbolt™ 3 Module on I/O panel.



Chapter 2 Installation

This is an ATX form factor motherboard. Before you install the motherboard, study the configuration of your chassis to ensure that the motherboard fits into it.

Pre-installation Precautions

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

- Make sure to unplug the power cord before installing or removing the motherboard components. Failure to do so may cause physical injuries and damages to motherboard components.
- In order to avoid damage from static electricity to the motherboard's components, NEVER place your motherboard directly on a carpet. Also remember to use a grounded wrist strap or touch a safety grounded object before you handle the components.
- Hold components by the edges and do not touch the ICs.
- Whenever you uninstall any components, place them on a grounded anti-static pad or in the bag that comes with the components.
- When placing screws to secure the motherboard to the chassis, please do not over-tighten the screws! Doing so may damage the motherboard.

2.1 Installing the CPU

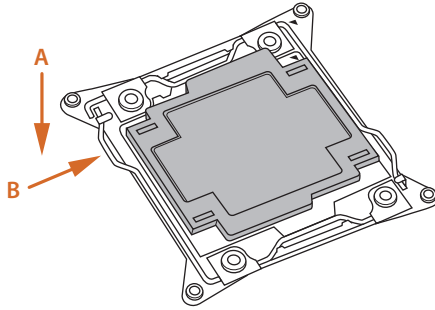


1. Before you insert the 2066-Pin CPU into the socket, please check if the **PnP cap** is on the socket, if the CPU surface is unclean, or if there are any **bent pins** in the socket. Do not force to insert the CPU into the socket if above situation is found. Otherwise, the CPU will be seriously damaged.
2. Unplug all power cables before installing the CPU.

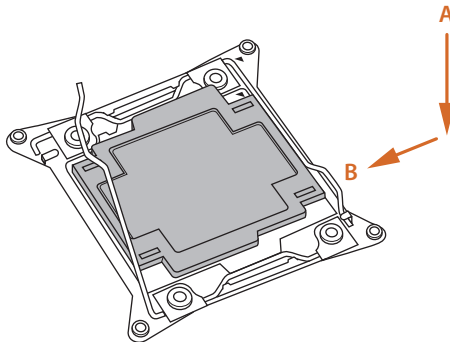
CAUTION:

Please note that X299 platform is only compatible with the **LGA 2066 socket**, which is incompatible with the LGA 2011-3 socket (for X99 platform).

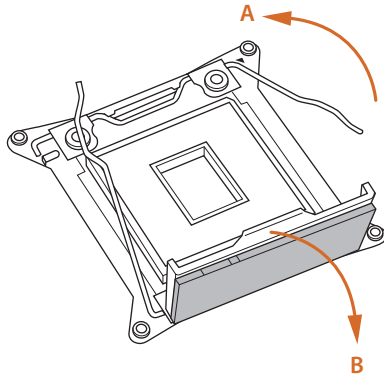
1



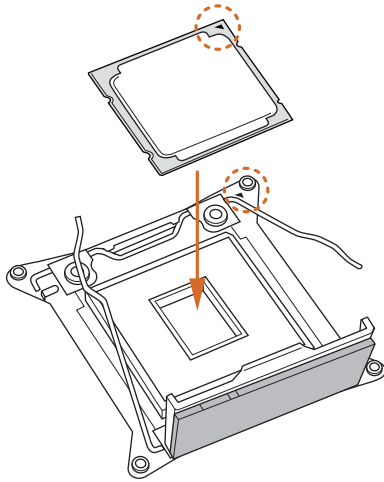
2



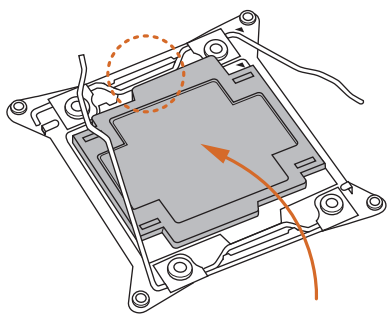
3



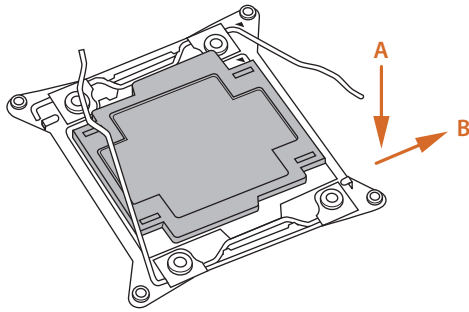
4



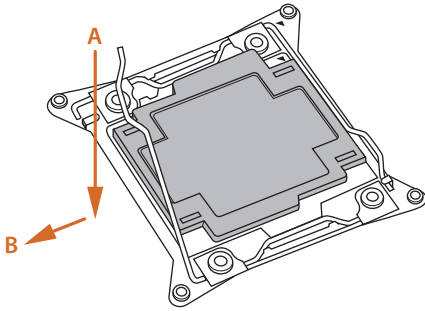
5



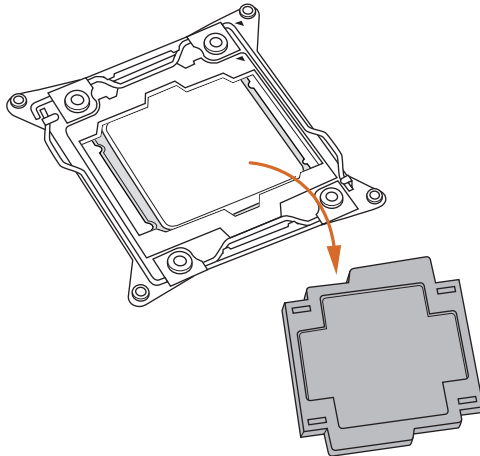
6



7

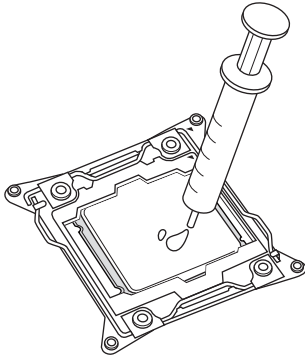
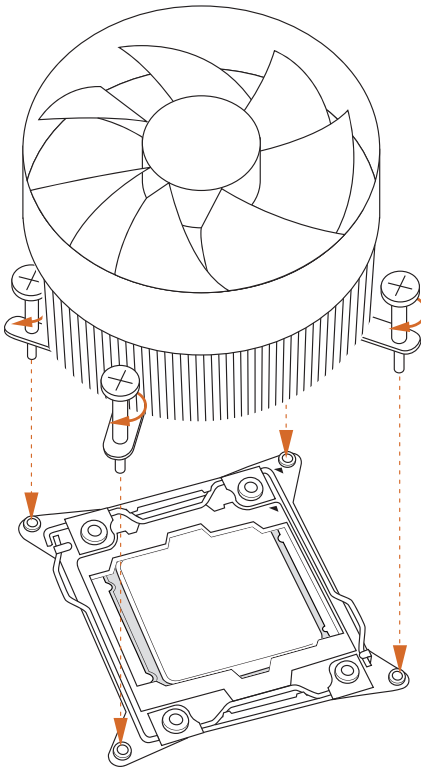
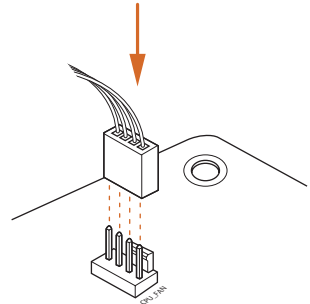


8



Please save and replace the cover if the processor is removed. The cover must be placed if you wish to return the motherboard for after service.

2.2 Installing the CPU Fan and Heatsink

**1****2**

2.3 Installation of Memory Modules (DIMM)

This motherboard provides eight 288-pin DDR4 (Double Data Rate 4) DIMM slots, and supports Quad Channel Memory Technology.



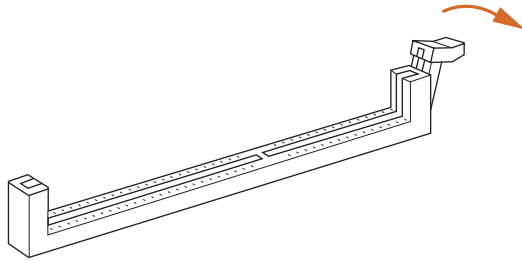
1. For quad channel configuration, you always need to install identical (the same brand, speed, size and chip-type) DDR4 DIMM pairs.
2. It is not allowed to install a DDR, DDR2 or DDR3 memory module into a DDR4 slot; otherwise, this motherboard and DIMM may be damaged.
3. The DIMM only fits in one correct orientation. It will cause permanent damage to the motherboard and the DIMM if you force the DIMM into the slot at incorrect orientation.

Quad Channel Memory Configuration (For CPU with 48, 44 or 28 PCIe lanes)

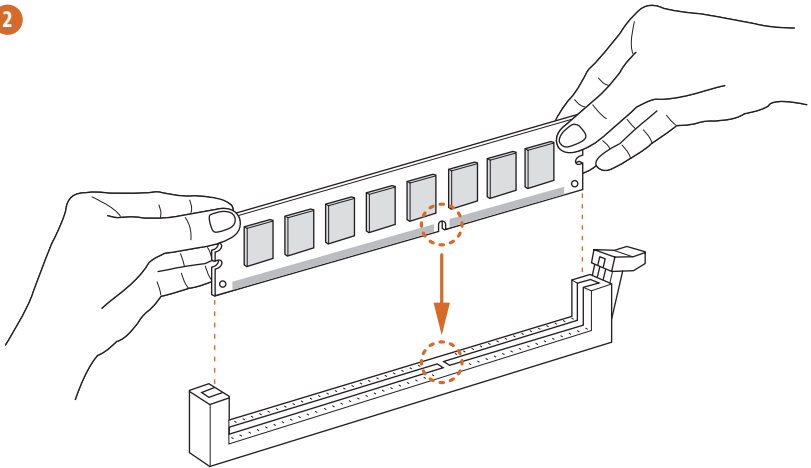
Priority	1	2
DDR4_B1	Populated	Populated
DDR4_B2		Populated
DDR4_A1	Populated	Populated
DDR4_A2		Populated
DDR4_D1	Populated	Populated
DDR4_D2		Populated
DDR4_C1	Populated	Populated
DDR4_C2		Populated

- Due to Intel® CPU spec definition, please install the memory modules on DDR4_A1, DDR4_B1, DDR4_C1 and DDR4_D1 for first priority. If the four DDR4 DIMM slots above are fully installed, and you want to use more than four memory modules, please install the other memory modules from left to right (from DDR4_A2, DDR4_B2, DDR4_D2 to DDR4_C2.)
- If only two memory modules are installed in the DDR4 DIMM slots, then Dual Channel Memory Technology is activated. If three memory modules are installed, then Triple Channel Memory Technology is activated. If more than four memory modules are installed in the DDR4 DIMM slots, then Quad Channel Memory Technology is activated.

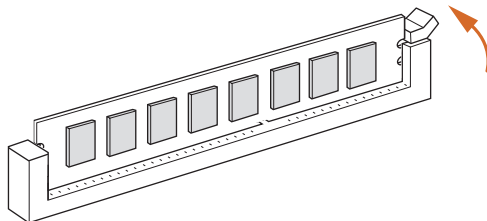
1



2



3



2.4 Expansion Slots (PCI Express Slots)

There are 5 PCI Express slots on the motherboard.



Before installing an expansion card, please make sure that the power supply is switched off or the power cord is unplugged. Please read the documentation of the expansion card and make necessary hardware settings for the card before you start the installation.

PCIe slots:

PCIe1 (PCIe 3.0 x16 slot) is used for PCI Express x16 lane width graphics cards.

PCIe2 (PCIe 3.0 x16 slot) is used for PCI Express x8 lane width graphics cards.

PCIe3 (PCIe 3.0 x16 slot) is used for PCI Express x16 lane width graphics cards.

PCIe4 (PCIe 3.0 x1 slot) is used for PCI Express x1 lane width cards.

PCIe5 (PCIe 3.0 x16 slot) is used for PCI Express x8 lane width graphics cards.

*If you install CPU with 48 lanes, PCIe1/PCIe2/PCIe3/PCIe5 will run at x16/x8/x16/x8.

* If you install CPU with 44 lanes, PCIe1/PCIe2/PCIe3/PCIe5 will run at x16/x4/x16/x8.

* If you install CPU with 28 lanes, PCIe1/PCIe2/PCIe3/PCIe5 will run at x16/x4/x8/x0.

PCIe Slot Configurations (For CPU with 48 PCIe lanes)

	PCIe1	PCIe2	PCIe3	PCIe4	PCIe5
Single Graphics Card	x16	N/A	N/A	N/A	N/A
Two Graphics Cards in CrossFireX™ or SLI™ Mode	x16	N/A	x16	N/A	N/A
Three Graphics Cards in 3-Way CrossFireX™ Mode or 3-Way SLI™ Mode	x16	N/A	x16	N/A	x8

If a M.2 PCI Express module is installed on M2_1 or M2_2, PCIe2 will downgrade to x4 mode.

If M.2 PCI Express modules are installed on M2_1 and M2_2, PCIe2 will be disabled.

PCIe Slot Configurations (For CPU with 44 PCIe lanes)

	PCI E1	PCI E2	PCI E3	PCI E4	PCI E5
Single Graphics Card	x16	N/A	N/A	N/A	N/A
Two Graphics Cards in CrossFireX™ or SLI™ Mode	x16	N/A	x16	N/A	N/A
Three Graphics Cards in 3-Way CrossFireX™ Mode or 3-Way SLI™ Mode	x16	N/A	x16	N/A	x8

If a M.2 PCI Express module is installed on M2_1, PCIe2 will be disabled.

PCIe Slot Configurations (For CPU with 28 PCIe lanes)

	PCI E1	PCI E2	PCI E3	PCI E4	PCI E5
Single Graphics Card	x16	N/A	N/A	N/A	N/A
Two Graphics Cards in CrossFireX™ or SLI™ Mode	x16	N/A	x8	N/A	N/A

If a M.2 PCI Express module is installed on M2_1, PCIe2 will be disabled.



For a better thermal environment, please connect a chassis fan to the motherboard's chassis fan connector (CHA_FAN1/WP, CHA_FAN2/WP, CHA_FAN3/WP, CHA_FAN4/WP or CHA_FAN5/WP) when using multiple graphics cards.

* If you install CPU with 44 or 28 lanes and encounter CrossFire issues, please do the followings.

1. Enter UEFI by pressing <F2> or during system startup.
2. Select "Boot > CSM" from the menu.
3. Set "Launch Storage OpROM policy" to "UEFI only".
4. Press F10 to Save and Exit.

PCIE Slot Speed (For CPU with 48 PCIe lanes)

PCIE1	x16
PCIE2	x8
PCIE3	x16
PCIE4	x1 (PCH)
PCIE5	x8

*If M.2 PCI Express modules are installed on M2_1 and M2_2, PCIE2 will be disabled.

PCIE Slot Speed (For CPU with 44 PCIe lanes)

PCIE1	x16
PCIE2	x4
PCIE3	x16
PCIE4	x1 (PCH)
PCIE5	x8

*If a M.2 PCI Express module is installed on M2_1, PCIE2 will be disabled.

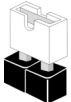
PCIE Slot Speed (For CPU with 28 PCIe lanes)

PCIE1	x16
PCIE2	x4
PCIE3	x8
PCIE4	x1 (PCH)
PCIE5	N/A

*If a M.2 PCI Express module is installed on M2_1, PCIE2 will be disabled.

2.5 Jumpers Setup

The illustration shows how jumpers are setup. When the jumper cap is placed on the pins, the jumper is “Short”. If no jumper cap is placed on the pins, the jumper is “Open”.



Short



Open

Clear CMOS Jumper
(CLRCMOS1)
(see p.8, No. 26)



2-pin Jumper

Short: Clear CMOS
Open: Default

CLRCMOS1 allows you to clear the data in CMOS. The data in CMOS includes system setup information such as system password, date, time, and system setup parameters. To clear and reset the system parameters to default setup, please turn off the computer and unplug the power cord, then use a jumper cap to short the pins on CLRCMOS1 for 3 seconds. Please remember to remove the jumper cap after clearing the CMOS. If you need to clear the CMOS when you just finish updating the BIOS, you must boot up the system first, and then shut it down before you do the clear-CMOS action.



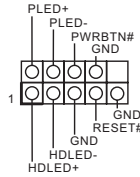
The Clear CMOS Button has the same function as the Clear CMOS jumper.

2.6 Onboard Headers and Connectors



Onboard headers and connectors are NOT jumpers. Do NOT place jumper caps over these headers and connectors. Placing jumper caps over the headers and connectors will cause permanent damage to the motherboard.

System Panel Header
(9-pin PANEL1)
(see p.8, No. 22)



Connect the power button, reset button and system status indicator on the chassis to this header according to the pin assignments below. Note the positive and negative pins before connecting the cables.



PWRBTN (Power Button):

Connect to the power button on the chassis front panel. You may configure the way to turn off your system using the power button.

RESET (Reset Button):

Connect to the reset button on the chassis front panel. Press the reset button to restart the computer if the computer freezes and fails to perform a normal restart.

PLED (System Power LED):

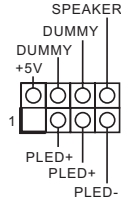
Connect to the power status indicator on the chassis front panel. The LED is on when the system is operating. The LED keeps blinking when the system is in S1/S3 sleep state. The LED is off when the system is in S4 sleep state or powered off (S5).

HDLED (Hard Drive Activity LED):

Connect to the hard drive activity LED on the chassis front panel. The LED is on when the hard drive is reading or writing data.

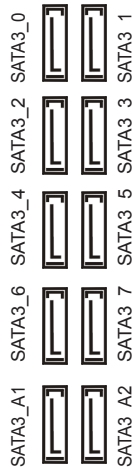
The front panel design may differ by chassis. A front panel module mainly consists of power button, reset button, power LED, hard drive activity LED, speaker and etc. When connecting your chassis front panel module to this header, make sure the wire assignments and the pin assignments are matched correctly.

Power LED and Speaker Header
(7-pin SPK_PLED1)
(see p.8, No. 21)



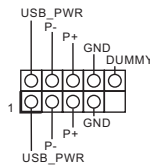
Please connect the chassis power LED and the chassis speaker to this header.

Serial ATA3 Connectors
(SATA3_0_1:
see p.8, No. 15)
(SATA3_2_3:
see p.8, No. 16)
(SATA3_4_5:
see p.8, No. 17)
(SATA3_6_7:
see p.8, No. 18)
(SATA3_A1_A2:
see p.8, No. 19)



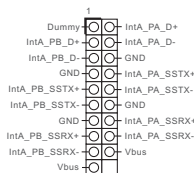
These ten SATA3 connectors support SATA data cables for internal storage devices with up to 6.0 Gb/s data transfer rate.
* To minimize the boot time, use Intel® X299 SATA ports (SATA3_0~7) for your bootable devices.
* If M2_3 is occupied by a SATA-type M.2 device, SATA3_7 will be disabled.

USB 2.0 Headers
(9-pin USB3_4)
(see p.8, No. 30)
(9-pin USB5_6)
(see p.8, No. 29)



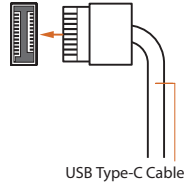
There are two headers on this motherboard. Each USB 2.0 header can support two ports.

USB 3.2 Gen1 Header
(19-pin USB3_5_6)
(see p.8, No. 14)



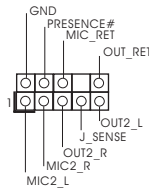
There is one header on this motherboard. This USB 3.2 Gen1 header can support two ports.

Front Panel Type C USB
3.2 Gen2 Header
(26-pin USB32_TC1)
(see p.8, No. 12)



There is one Front Panel Type C USB 3.2 Gen2 Header on this motherboard. This header is used for connecting a USB 3.2 Gen2 module for additional USB 3.2 Gen2 ports.

Front Panel Audio Header
(9-pin HD_AUDIO1)
(see p.8, No. 35)



This header is for connecting audio devices to the front audio panel.



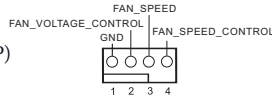
1. High Definition Audio supports Jack Sensing, but the panel wire on the chassis must support HDA to function correctly. Please follow the instructions in our manual and chassis manual to install your system.
2. If you use an AC'97 audio panel, please install it to the front panel audio header by the steps below:
 - A. Connect Mic_IN (MIC) to MIC2_L.
 - B. Connect Audio_R (RIN) to OUT2_R and Audio_L (LIN) to OUT2_L.
 - C. Connect Ground (GND) to Ground (GND).
 - D. MIC_RET and OUT_RET are for the HD audio panel only. You don't need to connect them for the AC'97 audio panel.
 - E. To activate the front mic, go to the "FrontMic" Tab in the Realtek Control panel and adjust "Recording Volume".

Chassis Water Pump Fan

Connectors

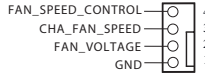
(4-pin CHA_FAN1/WP)

(see p.8, No. 10)



(4-pin CHA_FAN2/WP)

(see p.8, No. 25)



(4-pin CHA_FAN3/WP)

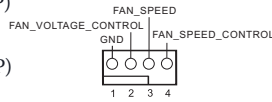
(see p.8, No. 27)

(4-pin CHA_FAN4/WP)

(see p.8, No. 28)

(4-pin CHA_FAN5/WP)

(see p.8, No. 34)

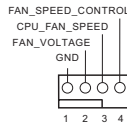


This motherboard provides five 4-Pin water cooling chassis fan connectors. If you plan to connect a 3-Pin chassis water cooler fan, please connect it to Pin 1-3.

CPU Fan Connector

(4-pin CPU_FAN1)

(see p.8, No. 13)

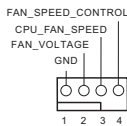


This motherboard provides a 4-Pin CPU fan (Quiet Fan) connector. If you plan to connect a 3-Pin CPU fan, please connect it to Pin 1-3.

CPU Water Pump Fan Connector

(4-pin CPU_FAN2/WP)

(see p.8, No. 11)

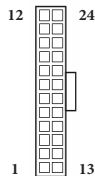


This motherboard provides a 4-Pin water cooling CPU fan connector. If you plan to connect a 3-Pin CPU water cooler fan, please connect it to Pin 1-3.

ATX Power Connector

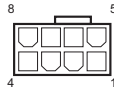
(24-pin ATXPWR1)

(see p.8, No. 9)



This motherboard provides a 24-pin ATX power connector. To use a 20-pin ATX power supply, please plug it along Pin 1 and Pin 13.

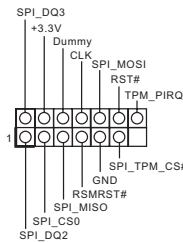
ATX 12V Power
Connectors
(8-pin ATX12V1)
(see p.8, No. 4)
(8-pin ATX12V2)
(see p.8, No. 3)



This motherboard provides two 8-pin ATX 12V power connectors. To use a 4-pin ATX power supply, please plug it along Pin 1 and Pin 5.

***Warning: Please make sure that the power cable connected is for the CPU and not the graphics PCIe power cable to this connector.**

SPI TPM Header
(13-pin SPI_TPM_J1)
(see p.8, No. 20)



This connector supports SPI Trusted Platform Module (TPM) system, which can securely store keys, digital certificates, passwords, and data. A TPM system also helps enhance network security, protects digital identities, and ensures platform integrity.

RGB LED Headers
(4-pin RGB_HEADER1)
(see p.8, No. 32)
(4-pin RGB_HEADER2)
(see p.8, No. 8)



These two RGB headers are used to connect RGB LED extension cable which allows users to choose from various LED lighting effects.

Caution: Never install the RGB LED cable in the wrong orientation; otherwise, the cable may be damaged.

*Please refer to page 67 for further instructions on this header.

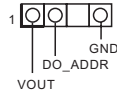
Addressable LED Headers

(3-pin ADDR_LED1)

(see p.8, No. 31)

(3-pin ADDR_LED2)

(see p.8, No. 5)

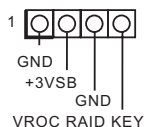


These two Addressable LED headers are used to connect Addressable LED extension cable which allows users to choose from various LED lighting effects.

Caution: Never install the Addressable LED cable in the wrong orientation; otherwise, the cable may be damaged.

*Please refer to page 68 for further instructions on this header.

Virtual RAID On CPU
Header
(4-pin VROC1)
(see p.8, No. 33)



This connector supports Intel® Virtual RAID on CPU and NVME/AHCI RAID on CPU PCIE.

With the introduction of the Intel VROC product, there are three modes of operation:

SKU	HW key required	Key features
Pass-thru	Not needed	<ul style="list-style-type: none"> • Pass-thru only (no RAID) • LED Management • Hot Plug Support • RAID 0 support for Intel Fultondale NVMe SSDs
Standard	VROCSTANMOD	<ul style="list-style-type: none"> • Pass-thru SKU features • RAID 0, 1, 10
Premium	VROCPREMMOD	<ul style="list-style-type: none"> • Standard SKU features • RAID 5
ISS	VROCISSDMOD	<ul style="list-style-type: none"> • RAID 5 Write Hole Closure

*Only Intel SSDs are supported.

*For further details on VROC, please refer to the official information released by Intel.

2.7 Smart Switches

The motherboard has three smart switches: Power Button, Reset Button and Clear CMOS Button, allowing users to quickly turn on/off the system, reset the system or clear the CMOS values.

Power Button
(PWRBTN)
(see p.8, No. 23)



Power Button allows users to quickly turn on/off the system.

Reset Button
(RSTBTN)
(see p.8, No. 24)



Reset Button allows users to quickly reset the system.

Clear CMOS Button
(CLRBTN1)
(see p.10, No. 15)



Clear CMOS Button allows users to quickly clear the CMOS values.



This function is workable only when you power off your computer and unplug the power supply.

2.8 Dr. Debug

Dr. Debug is used to provide code information, which makes troubleshooting even easier. Please see the diagrams below for reading the Dr. Debug codes.

Code	Description
0x10	PEI_CORE_STARTED
0x11	PEI_CAR_CPU_INIT
0x15	PEI_CAR_NB_INIT
0x19	PEI_CAR_SB_INIT
0x31	PEI_MEMORY_INSTALLED
0x32	PEI_CPU_INIT
0x33	PEI_CPU_CACHE_INIT
0x34	PEI_CPU_AP_INIT
0x35	PEI_CPU_BSP_SELECT
0x36	PEI_CPU_SMM_INIT
0x37	PEI_MEM_NB_INIT
0x3B	PEI_MEM_SB_INIT
0x4F	PEI_DXE_IPL_STARTED
0x60	DXE_CORE_STARTED
0x61	DXE_NVRAM_INIT
0x62	DXE_SBRUN_INIT

0x63	DXE_CPU_INIT
0x68	DXE_NB_HB_INIT
0x69	DXE_NB_INIT
0x6A	DXE_NB_SMM_INIT
0x70	DXE_SB_INIT
0x71	DXE_SB_SMM_INIT
0x72	DXE_SB_DEVICES_INIT
0x78	DXE_ACPI_INIT
0x79	DXE_CSM_INIT
0x90	DXE_BDS_STARTED
0x91	DXE_BDS_CONNECT_DRIVERS
0x92	DXE_PCI_BUS_BEGIN
0x93	DXE_PCI_BUS_HPC_INIT
0x94	DXE_PCI_BUS_ENUM
0x95	DXE_PCI_BUS_REQUEST_RESOURCES
0x96	DXE_PCI_BUS_ASSIGN_RESOURCES
0x97	DXE_CON_OUT_CONNECT
0x98	DXE_CON_IN_CONNECT

0x99	DXE_SIO_INIT
0x9A	DXE_USB_BEGIN
0x9B	DXE_USB_RESET
0x9C	DXE_USB_DETECT
0x9D	DXE_USB_ENABLE
0xA0	DXE_IDE_BEGIN
0xA1	DXE_IDE_RESET
0xA2	DXE_IDE_DETECT
0xA3	DXE_IDE_ENABLE
0xA4	DXE_SCSI_BEGIN
0xA5	DXE_SCSI_RESET
0xA6	DXE_SCSI_DETECT
0xA7	DXE_SCSI_ENABLE
0xA8	DXE_SETUP_VERIFYING_PASSWORD
0xA9	DXE_SETUP_START
0xAB	DXE_SETUP_INPUT_WAIT
0xAD	DXE_READY_TO_BOOT
0xAE	DXE_LEGACY_BOOT

0xAF	DXE_EXIT_BOOT_SERVICES
0xB0	RT_SET_VIRTUAL_ADDRESS_MAP_BEGIN
0xB1	RT_SET_VIRTUAL_ADDRESS_MAP_END
0xB2	DXE_LEGACY_OPROM_INIT
0xB3	DXE_RESET_SYSTEM
0xB4	DXE_USB_HOTPLUG
0xB5	DXE_PCI_BUS_HOTPLUG
0xB6	DXE_NVRAM_CLEANUP
0xB7	DXE_CONFIGURATION_RESET
0xF0	PEI_RECOVERY_AUTO
0xF1	PEI_RECOVERY_USER
0xF2	PEI_RECOVERY_STARTED
0xF3	PEI_RECOVERY_CAPSULE_FOUND
0xF4	PEI_RECOVERY_CAPSULE_LOADED
0xE0	PEI_S3_STARTED
0xE1	PEI_S3_BOOT_SCRIPT
0xE2	PEI_S3_VIDEO_REPOST

0xE3	PEI_S3_OS_WAKE
0x50	PEI_MEMORY_INVALID_TYPE
0x53	PEI_MEMORY_NOT_DETECTED
0x55	PEI_MEMORY_NOT_INSTALLED
0x57	PEI_CPU_MISMATCH
0x58	PEI_CPU_SELF_TEST_FAILED
0x59	PEI_CPU_NO_MICROCODE
0x5A	PEI_CPU_ERROR
0x5B	PEI_RESET_NOT_AVAILABLE
0xD0	DXE_CPU_ERROR
0xD1	DXE_NB_ERROR
0xD2	DXE_SB_ERROR
0xD3	DXE_ARCH_PROTOCOL_NOT_AVAILABLE
0xD4	DXE_PCI_BUS_OUT_OF_RESOURCES
0xD5	DXE_LEGACY_OPROM_NO_SPACE
0xD6	DXE_NO_CON_OUT
0xD7	DXE_NO_CON_IN

0xD8	DXE_INVALID_PASSWORD
0xD9	DXE_BOOT_OPTION_LOAD_ERROR
0xDA	DXE_BOOT_OPTION_FAILED
0xDB	DXE_FLASH_UPDATE_FAILED
0xDC	DXE_RESET_NOT_AVAILABLE
0xE8	PEI_MEMORY_S3_RESUME_FAILED
0xE9	PEI_S3_RESUME_PPI_NOT_FOUND
0xEA	PEI_S3_BOOT_SCRIPT_ERROR
0xEB	PEI_S3_OS_WAKE_ERROR

2.9 SLI™ and 3-Way SLI™ and Operation Guide

This motherboard supports NVIDIA® SLI™ and 3-Way SLI™ (Scalable Link Interface) technology that allows you to install up to three identical PCI Express x16 graphics cards. Currently, NVIDIA® SLI™ technology supports Windows® 10 64-bit

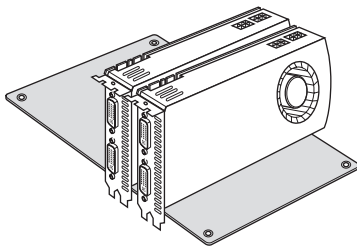
* 3-Way CrossFireX™ is only supported with CPU with 48 lanes or 44 lanes.



Requirements

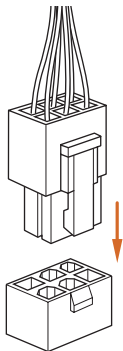
1. You should only use identical SLI™-ready graphics cards that are NVIDIA® certified.
2. Make sure that your graphics card driver supports NVIDIA® SLI™ technology. Download the drivers from the NVIDIA® website: www.nvidia.com
3. Make sure that your power supply unit (PSU) can provide at least the minimum power your system requires. It is recommended to use a NVIDIA® certified PSU. Please refer to the NVIDIA® website for details.

2.9.1 Installing Two SLI™-Ready Graphics Cards



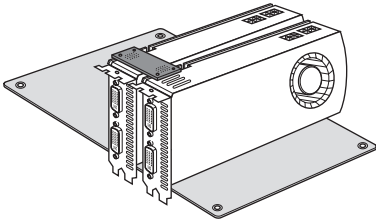
Step 1

Insert one graphics card into PCIe1 slot and the other graphics card to PCIe3 slot. Make sure that the cards are properly seated on the slots.



Step 2

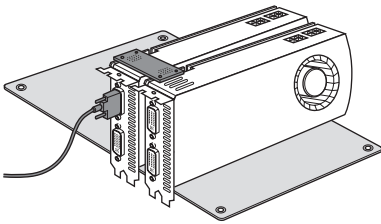
If required, connect the auxiliary power source to the PCI Express graphics cards.

**Step 3**

Align and insert the ASRock SLI_HB_Bridge_2S Card to the goldfingers on each graphics card. Make sure the ASRock SLI_HB_Bridge_2S Card is firmly in place.

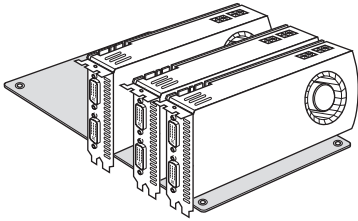


ASRock SLI_HB_Bridge_2S Card

**Step 4**

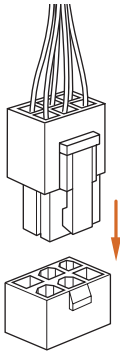
Connect a VGA cable or a DVI cable to the monitor connector or the DVI connector of the graphics card that is inserted to PCIE1 slot.

2.9.2 Installing Three SLI™-Ready Graphics Cards



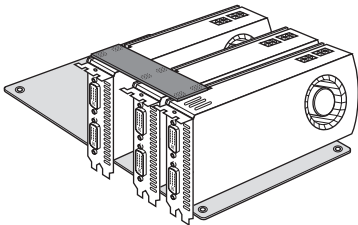
Step 1

Insert one graphics card into PCI E1 slot, another graphics card to PCI E3 slot, and the other graphics card to PCI E5 slot. Make sure that the cards are properly seated on the slots.



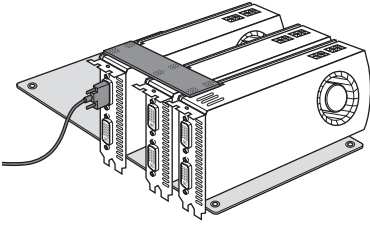
Step 2

Connect the auxiliary power source to the PCI Express graphics card. Please make sure that both power connectors on the PCI Express graphics card are connected. Repeat this step on the three graphics cards.



Step 3

Align and insert the bridge card to the goldfingers on each graphics card. Make sure the bridge card is firmly in place.

**Step 4**

Connect a VGA cable or a DVI cable to the monitor connector or the DVI connector of the graphics card that is inserted to PCIe1 slot.

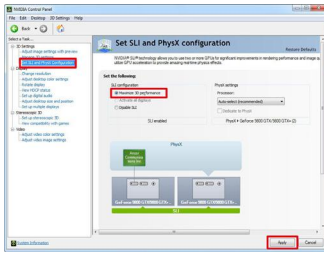
2.9.3 Driver Installation and Setup

Install the graphics card drivers to your system. After that, you can enable the Multi-Graphics Processing Unit (GPU) in the NVIDIA® nView system tray utility. Please follow the below procedures to enable the multi-GPU.



Step 1

Double-click the **NVIDIA Control Panel** icon in the Windows® system tray.



Step 2

In the left pane, click **Set SLI and PhysX configuration**. Then select **Maximize 3D performance** and click **Apply**.

Step 3

Reboot your system.

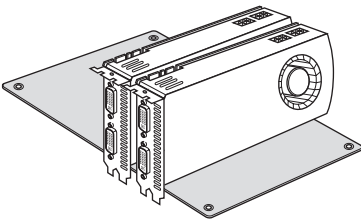
2.10 CrossFireX™ and 3-Way CrossFireX™ Operation Guide

This motherboard supports CrossFireX™ and 3-way CrossFireX™ that allows you to install up to three identical PCI Express x16 graphics cards. Currently CrossFireX™ and 3-way CrossFireX™ are supported with Windows® 10 64-bit OS. *3-Way SLI™ is only supported with CPU with 48 lanes or 44 lanes.



1. You should only use identical CrossFireX™-ready graphics cards that are AMD certified.
2. Make sure that your graphics card driver supports AMD CrossFireX™ technology. Download the drivers from the AMD's website: www.amd.com
3. Make sure that your power supply unit (PSU) can provide at least the minimum power your system requires. It is recommended to use a AMD certified PSU. Please refer to the AMD's website for details.
4. If you pair a 12-pipe CrossFireX™ Edition card with a 16-pipe card, both cards will operate as 12-pipe cards while in CrossFireX™ mode.
5. Different CrossFireX™ cards may require different methods to enable CrossFireX™. Please refer to AMD graphics card manuals for detailed installation guide.

2.10.1 Installing Two CrossFireX™-Ready Graphics Cards



Step 1

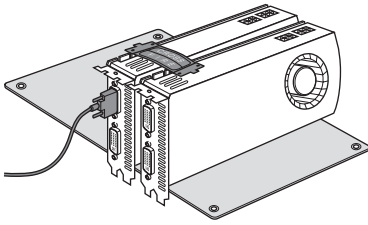
Insert one graphics card into PCI E1 slot and the other graphics card to PCI E3 slot. Make sure that the cards are properly seated on the slots.



CrossFire Bridge

Step 2

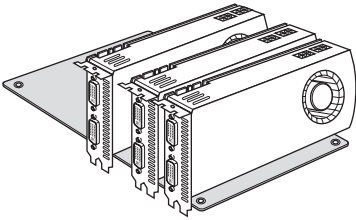
Connect two graphics cards by installing a CrossFire Bridge on the CrossFire Bridge Interconnects on the top of the graphics cards. (The CrossFire Bridge is provided with the graphics card you purchase, not bundled with this motherboard. Please refer to your graphics card vendor for details.)



Step 3

Connect a VGA cable or a DVI cable to the monitor connector or the DVI connector of the graphics card that is inserted to PCIE1 slot.

2.10.2 Installing Three CrossFireX™-Ready Graphics Cards



Step 1

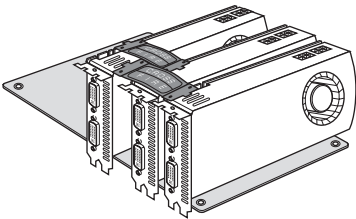
Insert one graphics card into PCI E1 slot, another graphics card to PCI E3 slot, and the other graphics card to PCI E5 slot. Make sure that the cards are properly seated on the slots.



CrossFire Bridge

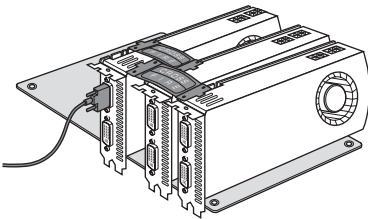
Step 2

Use one CrossFire Bridge to connect the graphics cards on PCI E1 and PCI E3 slots, and use the other CrossFire Bridge to connect the graphics cards on PCI E3 and PCI E5 slots. (The CrossFire Bridge is provided with the graphics card you purchase, not bundled with this motherboard. Please refer to your graphics card vendor for details.)



Step 3

Connect a VGA cable or a DVI cable to the monitor connector or the DVI connector of the graphics card that is inserted to PCI E1 slot.



2.10.3 Driver Installation and Setup

Step 1

Power on your computer and boot into OS.

Step 2

Remove the AMD drivers if you have any VGA drivers installed in your system.



The Catalyst Uninstaller is an optional download. We recommend using this utility to uninstall any previously installed Catalyst drivers prior to installation. Please check AMD's website for AMD driver updates.

Step 3

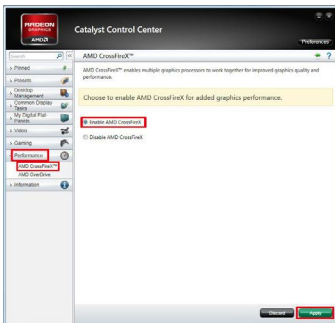
Install the required drivers and CATALYST Control Center then restart your computer. Please check AMD's website for details.



AMD Catalyst Control Center

Step 4

Double-click the **AMD Catalyst Control Center** icon in the Windows' system tray.



Step 5

In the left pane, click **Performance** and then **AMD CrossFireX™**. Then select **Enable AMD CrossFireX** and click **Apply**. Select the GPU number according to your graphics card and click **Apply**.

2.11 M.2_SSD (NGFF) Module Installation Guide (M2_1 and M2_2)

The M.2, also known as the Next Generation Form Factor (NGFF), is a small size and versatile card edge connector that aims to replace mPCIe and mSATA. The Ultra M.2 Sockets (M2_1 and M2_2) support M Key type 2242/2260/2280 M.2 PCI Express module up to Gen3 x4 (32 Gb/s).

For CPU with 48 PCIe lanes:

If a M.2 PCI Express module is installed on M2_1 or M2_2, PCIe2 will downgrade to x4 mode.

If M.2 PCI Express modules are installed on M2_1 and M2_2, PCIe2 will be disabled.

For CPU with 44 PCIe lanes:

If a M.2 PCI Express module is installed on M2_1, PCIe2 will be disabled.

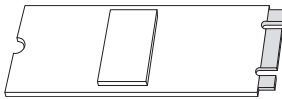
If you install CPU with 44 lanes, M2_2 will be disabled.

For CPU with 28 PCIe lanes:

If a M.2 PCI Express module is installed on M2_1, PCIe2 will be disabled.

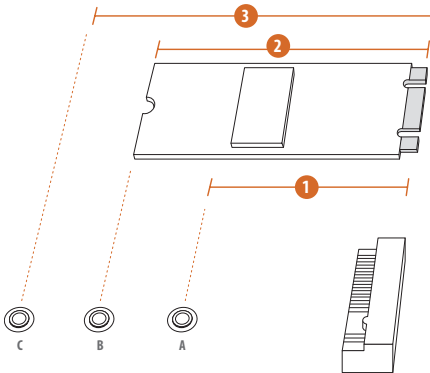
If you install CPU with 28 lanes, M2_2 will be disabled.

Installing the M.2_SSD (NGFF) Module



Step 1

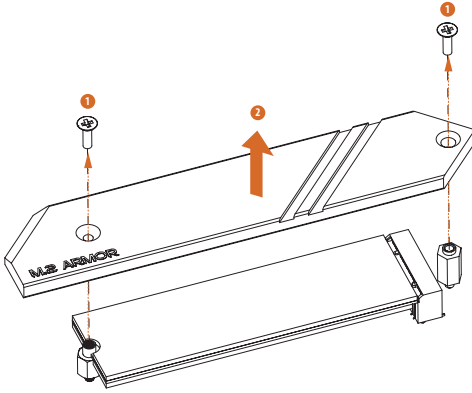
Prepare a M.2_SSD (NGFF) module and the screw.



Step 2

Depending on the PCB type and length of your M.2_SSD (NGFF) module, find the corresponding nut location to be used.

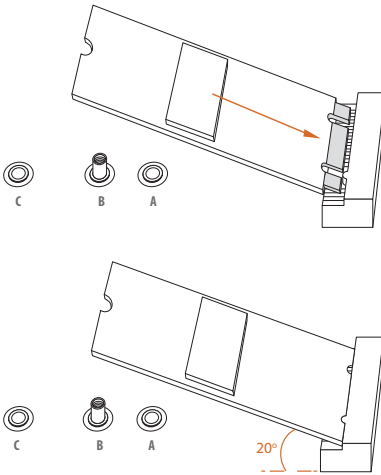
No.	1	2	3
Nut Location	A	B	C
PCB Length	4.2cm	6cm	8cm
Module Type	Type 2242	Type2260	Type 2280



Step 3

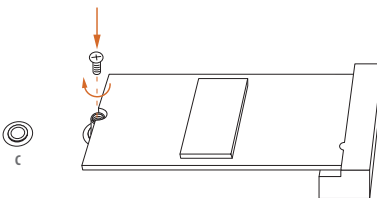
Before installing a M.2 (NGFF) SSD module, please loosen the screws to remove the M.2 heatsink.

*Please remove the protective films on the bottom side of the M.2 heatsink before you install a M.2 SSD module.



Step 4

Prepare the M.2 standoff that comes with the package. Then hand tighten the standoff into the desired nut location on the motherboard. Align and gently insert the M.2 (NGFF) SSD module into the M.2 slot. Please be aware that the M.2 (NGFF) SSD module only fits in one orientation.



Step 5

Tighten the screw with a screwdriver to secure the module into place. Please do not overtighten the screw as this might damage the module.

M.2_SSD (NGFF) Module Support List

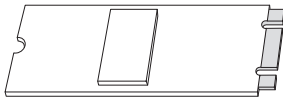
Vendor	Interface	P/N
SanDisk	PCIe	SanDisk-SD6PP4M-128G(Gen2 x2)
Intel	PCIe	INTEL 6000P-SSDPEKKF256G7 (nvme)
Intel	PCIe	INTEL 6000P-SSDPEKKF512G7 (nvme)
Intel	PCIe	SSDPEKKF512G7 NVME / 512GB
Kingston	PCIe	Kingston SHPM2280P2 / 240G (Gen2 x4)
Samsung	PCIe	Samsung XP941-MZHPU512HCGL(Gen2x4)
Samsung	PCIe	SM951 (NVME) / 512GB
Samsung	PCIe	SM951 (MZHPV512HDGL) / 512GB
ADATA	PCIe	ASX8000NP-512GM-C / 512GB
ADATA	PCIe	ASX7000NP-512GT-C / 512GB
Kingston	PCIe	SKC1000/480G
Kingston	PCIe	SKC1000/960GB NVME
PLEXTOR	PCIe	PX-512M8PeG/ 512GB
WD	PCIe	WDS512G1X0C-00ENX0 (NVME) / 512GB

For the latest updates of M.2_SSD (NFGG) module support list, please visit our website for details: <http://www.asrock.com>

2.12 M.2_SSD (NGFF) Module Installation Guide (M2_3)

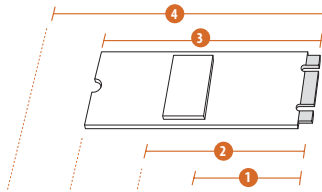
The M.2, also known as the Next Generation Form Factor (NGFF), is a small size and versatile card edge connector that aims to replace mPCIe and mSATA. The Ultra M.2 Socket (M2_3) supports M Key type 2242/2260/2280/22110 M.2 SATA3 6.0 Gb/s module and M.2 PCI Express module up to Gen3 x4 (32 Gb/s).

Installing the M.2_SSD (NGFF) Module



Step 1

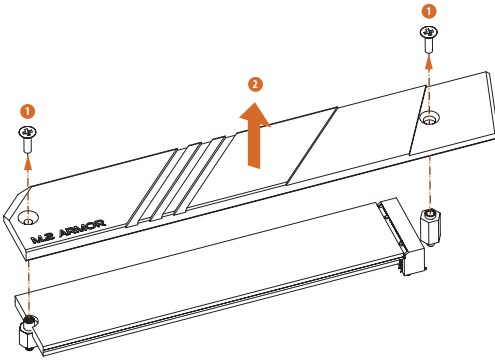
Prepare a M.2_SSD (NGFF) module and the screw.



Step 2

Depending on the PCB type and length of your M.2_SSD (NGFF) module, find the corresponding nut location to be used.

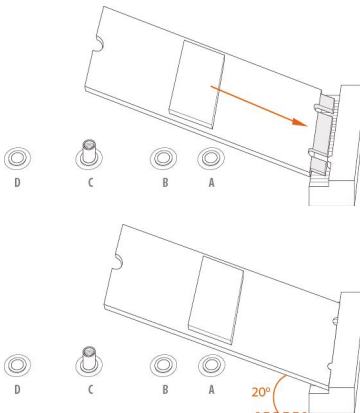
No.	1	2	3	4
Nut Location	A	B	C	D
PCB Length	4.2cm	6cm	8cm	11cm
Module Type	Type 2242	Type2260	Type 2280	Type 22110



Step 3

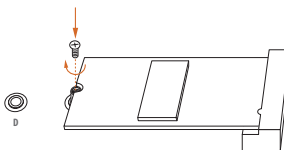
Before installing a M.2 (NGFF) SSD module, please loosen the screws to remove the M.2 heatsink.

*Please remove the protective films on the bottom side of the M.2 heatsink before you install a M.2 SSD module.



Step 4

Prepare the M.2 standoff that comes with the package. Then hand tighten the standoff into the desired nut location on the motherboard. Align and gently insert the M.2 (NGFF) SSD module into the M.2 slot. Please be aware that the M.2 (NGFF) SSD module only fits in one orientation.



Step 5

Tighten the screw with a screwdriver to secure the module into place. Please do not overtighten the screw as this might damage the module.

Vendor	Interface	P/N
SanDisk	PCIe	SanDisk-SD6PP4M-128G(Gen2 x2)
Intel	PCIe	INTEL 6000P-SSDPEKKF256G7 (nvme)
Intel	PCIe	INTEL 6000P-SSDPEKKF512G7 (nvme)
Intel	PCIe	SSDPEKKF512G7 NVME / 512GB
Intel	SATA	540S-SSDSCKKW240H6 / 240GB
Kingston	PCIe	Kingston SHPM2280P2 / 240G (Gen2 x4)
Samsung	PCIe	Samsung XP941-MZHPU512HCGL(Gen2x4)
Samsung	PCIe	SM951 (NVME) / 512GB
Samsung	PCIe	SM951 (MZHPV512HDGL) / 512GB
ADATA	SATA	ADATA - AXNS381E-128GM-B
ADATA	PCIe	ASX8000NP-512GM-C / 512GB
ADATA	PCIe	ASX7000NP-512GT-C / 512GB
ADATA	SATA	ASU800NS38-512GT-C / 512GB
Crucial	SATA	Crucial-CT240M500SSD4-240GB
ezlink	SATA	ezlink P51B-80-120GB
Intel	SATA	INTEL 540S-SSDSCKKW240H6-240GB
Kingston	SATA	Kingston SM2280S3G2/120G - Win8.1
Kingston	SATA	Kingston-RBU-SNS8400S3 / 180GD
Kingston	PCIe	SKC1000/480G
Kingston	PCIe	SKC1000/960GB NVME
LITEON	SATA	LITEON LJH-256V2G-256GB (2260)
PLEXTOR	SATA	PLEXTOR PX-128M6G-2260-128GB
PLEXTOR	SATA	PLEXTOR PX-128M7VG-128GB
PLEXTOR	PCIe	PX-512M8PeG/ 512GB
SanDisk	SATA	SanDisk X400-SD8SN8U-128G
SanDisk	SATA	Sandisk Z400s-SD8SNAT-128G-1122
SanDisk	SATA	SanDisk-SD6SN1M-128G
Transcend	SATA	Transcend TS256GMTS800-256GB
Transcend	SATA	TS512GMTS800 / 512GB
V-Color	SATA	V-Color 120G
V-Color	SATA	V-Color 240G
WD	SATA	WD GREEN WDS240G1G0B-00RC30
WD	PCIe	WDS512G1X0C-00ENX0 (NVME) / 512GB

For the latest updates of M.2_SSD (NFGG) module support list, please visit our website for details: <http://www.asrock.com>

Chapter 3 Software and Utilities Operation

3.1 Installing Drivers

The Support CD that comes with the motherboard contains necessary drivers and useful utilities that enhance the motherboard's features.

Running The Support CD

To begin using the support CD, insert the CD into your CD-ROM drive. The CD automatically displays the Main Menu if "AUTORUN" is enabled in your computer. If the Main Menu does not appear automatically, locate and double click on the file "ASRSETUP.EXE" in the Support CD to display the menu.

Drivers Menu

The drivers compatible to your system will be auto-detected and listed on the support CD driver page. Please click **Install All** or follow the order from top to bottom to install those required drivers. Therefore, the drivers you install can work properly.


Utilities Menu

The Utilities Menu shows the application software that the motherboard supports. Click on a specific item then follow the installation wizard to install it.

3.2 ASRock Motherboard Utility (A-Tuning)

ASRock Motherboard Utility (A-Tuning) is ASRock's multi purpose software suite with a new interface, more new features and improved utilities.

3.2.1 Installing ASRock Motherboard Utility (A-Tuning)

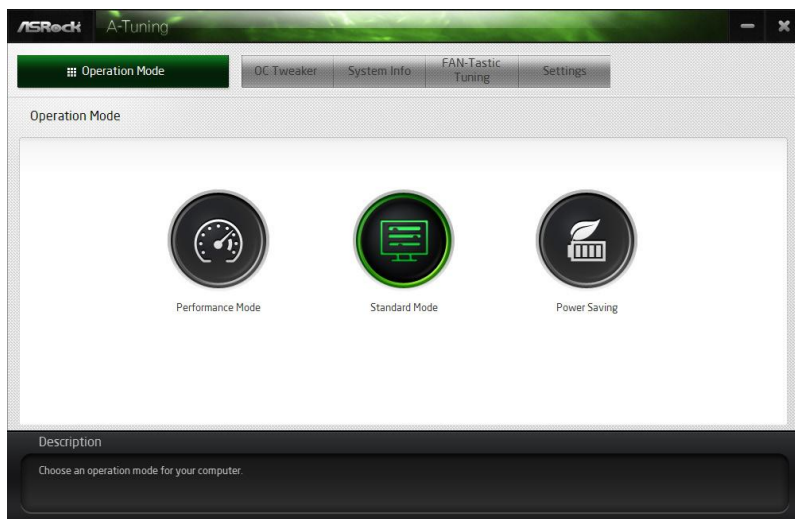
ASRock Motherboard Utility (A-Tuning) can be downloaded from ASRock Live Update & APP Shop. After the installation, you will find the icon "ASRock Motherboard Utility (A-Tuning)" on your desktop. Double-click the "ASRock Motherboard Utility (A-Tuning)"  icon, ASRock Motherboard Utility (A-Tuning) main menu will pop up.

3.2.2 Using ASRock Motherboard Utility (A-Tuning)

There are five sections in ASRock Motherboard Utility (A-Tuning) main menu: Operation Mode, OC Tweaker, System Info, FAN-Tastic Tuning and Settings.

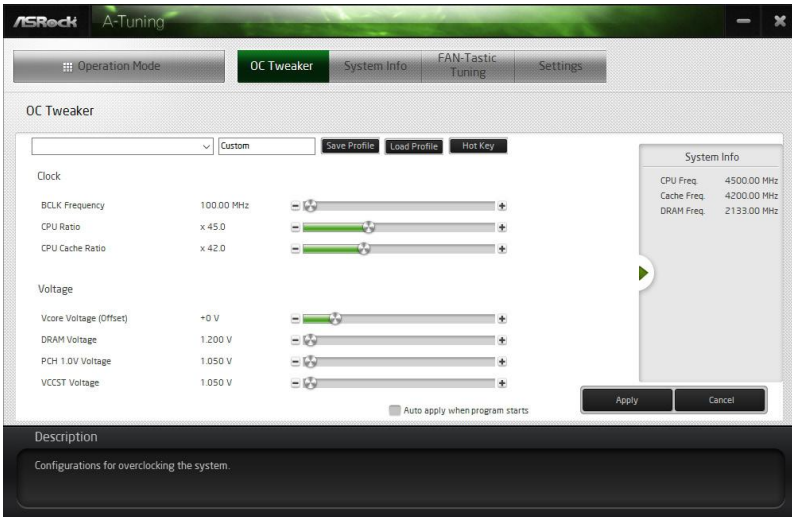
Operation Mode

Choose an operation mode for your computer.



OC Tweaker

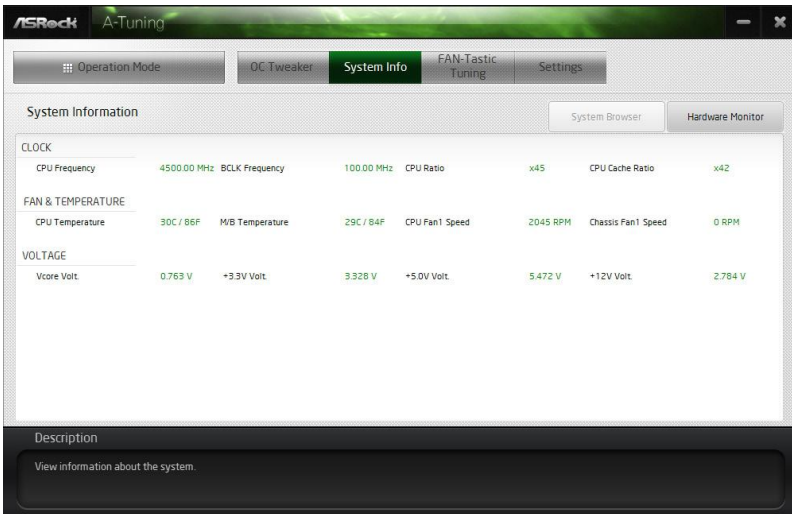
Configurations for overclocking the system.



System Info

View information about the system.

*The System Browser tab may not appear for certain models.



FAN-Tastic Tuning

Configure up to five different fan speeds using the graph. The fans will automatically shift to the next speed level when the assigned temperature is met.

FAN-Tastic Tuning

CPU FAN1

Start FAN Test

Fan Power	Fan Speed
100%	N/A RPM
90%	N/A RPM
80%	N/A RPM
70%	N/A RPM
60%	N/A RPM
50%	N/A RPM
40%	N/A RPM
30%	N/A RPM
20%	N/A RPM
10%	N/A RPM

Auto apply when program starts

Apply Cancel

Description

Configure different fan speeds for respective temperatures using the graph. The fans will automatically shift to the next speed level when the assigned temperature is met.

Settings

Configure ASRock ASRock Motherboard Utility (A-Tuning). Click to select "Auto run at Windows Startup" if you want ASRock Motherboard Utility (A-Tuning) to be launched when you start up the Windows operating system.

Settings

Auto run at Windows Startup


Description

Configure ASRock A-Tuning.

Version: 3.0.93

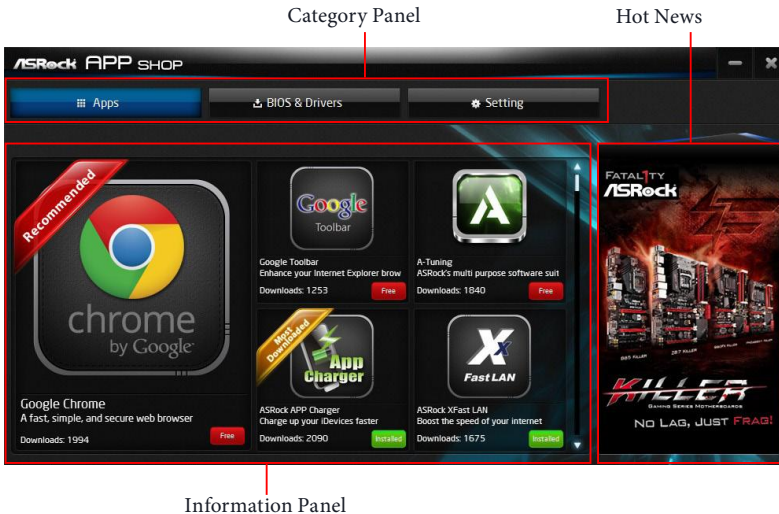
3.3 ASRock Live Update & APP Shop

The ASRock Live Update & APP Shop is an online store for purchasing and downloading software applications for your ASRock computer. You can quickly and easily install various apps and support utilities. With ASRock APP Shop, you can optimize your system and keep your motherboard up to date simply with a few clicks.

Double-click  on your desktop to access ASRock Live Update & APP Shop utility.

**You need to be connected to the Internet to download apps from the ASRock Live Update & APP Shop.*

3.3.1 UI Overview



Category Panel: The category panel contains several category tabs or buttons that when selected the information panel below displays the relative information.

Information Panel: The information panel in the center displays data about the currently selected category and allows users to perform job-related tasks.

Hot News: The hot news section displays the various latest news. Click on the image to visit the website of the selected news and know more.

3.3.2 Apps

When the "Apps" tab is selected, you will see all the available apps on screen for you to download.

Installing an App

Step 1

Find the app you want to install.



The most recommended app appears on the left side of the screen. The other various apps are shown on the right. Please scroll up and down to see more apps listed.

You can check the price of the app and whether you have already installed it or not.


Free - The red icon displays the price or "Free" if the app is free of charge.

Installed - The green "Installed" icon means the app is installed on your computer.

Step 2

Click on the app icon to see more details about the selected app.

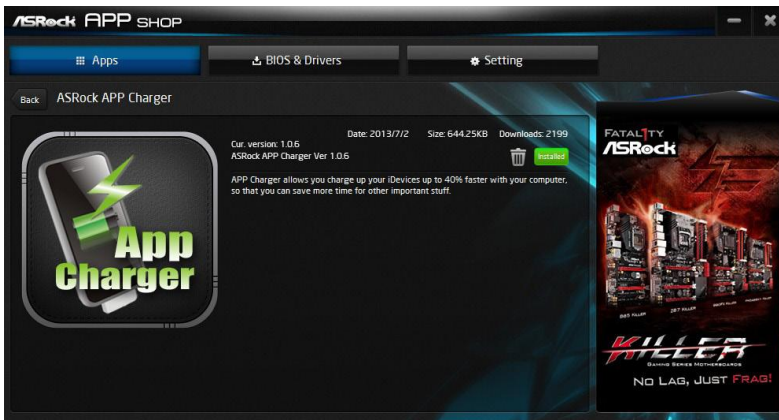
Step 3

If you want to install the app, click on the red icon  to start downloading.




Step 4

When installation completes, you can find the green "Installed" icon appears on the upper right corner.



To uninstall it, simply click on the trash can icon .
*The trash icon may not appear for certain apps.

Upgrading an App

You can only upgrade the apps you have already installed. When there is an available new version for your app, you will find the mark of "New Version"  appears below the installed app icon.



Step 1

Click on the app icon to see more details.

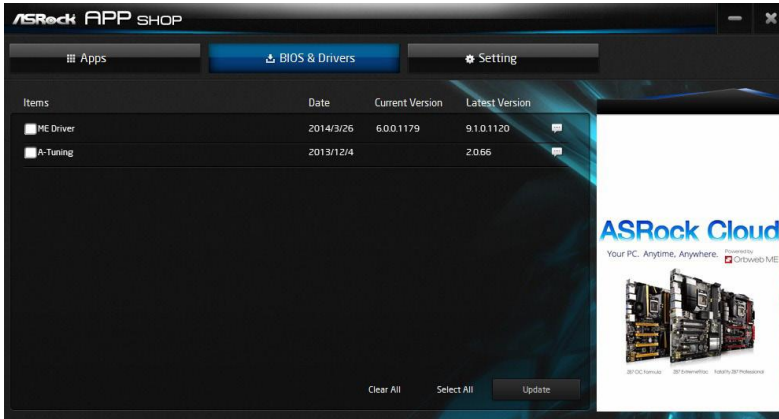
Step 2

Click on the yellow icon  to start upgrading.


3.3.3 BIOS & Drivers

Installing BIOS or Drivers

When the "BIOS & Drivers" tab is selected, you will see a list of recommended or critical updates for the BIOS or drivers. Please update them all soon.



Step 1

Please check the item information before update. Click on  to see more details.

Step 2

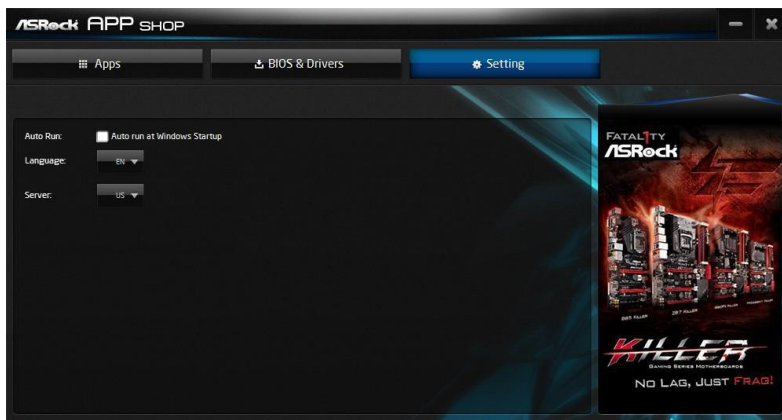
Click to select one or more items you want to update.

Step 3

Click Update to start the update process.

3.3.4 Setting

In the "Setting" page, you can change the language, select the server location, and determine if you want to automatically run the ASRock Live Update & APP Shop on Windows startup.

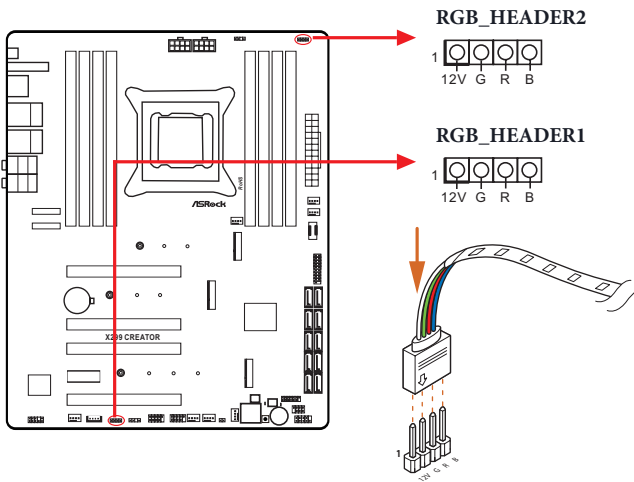


3.4 ASRock Polychrome SYNC

ASRock Polychrome SYNC is a lighting control utility specifically designed for unique individuals with sophisticated tastes to build their own stylish colorful lighting system. Simply by connecting the LED strip, you can customize various lighting schemes and patterns, including Static, Breathing, Strobe, Cycling, Music, Wave and more.

Connecting the LED Strip

Connect your RGB LED strips to the **RGB LED Headers (RGB_HEADER1, RGB_HEADER2)** on the motherboard.



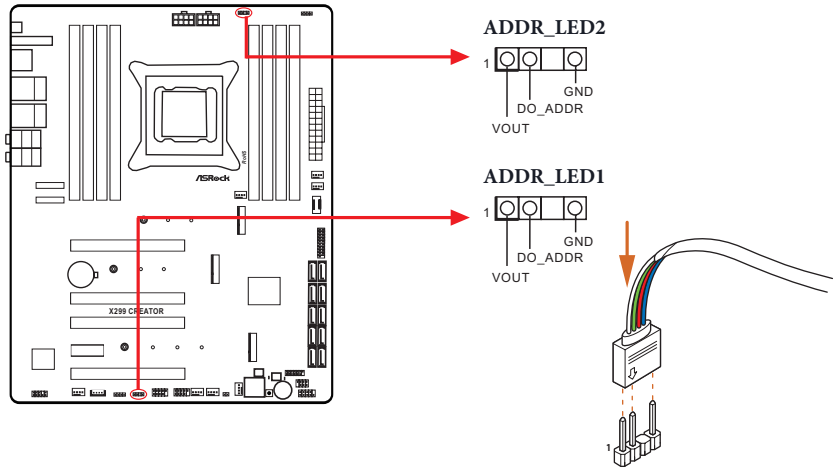
1. Never install the RGB LED cable in the wrong orientation; otherwise, the cable may be damaged.
2. Before installing or removing your RGB LED cable, please power off your system and unplug the power cord from the power supply. Failure to do so may cause damages to motherboard components.



1. Please note that the RGB LED strips do not come with the package.
2. The RGB LED header supports standard 5050 RGB LED strip (12V/G/R/B), with a maximum power rating of 3A (12V) and length within 2 meters.

Connecting the Addressable RGB LED Strip

Connect your Addressable RGB LED strip to the **Addressable LED Headers (ADDR_LED1, ADDR_LED2)** on the motherboard.



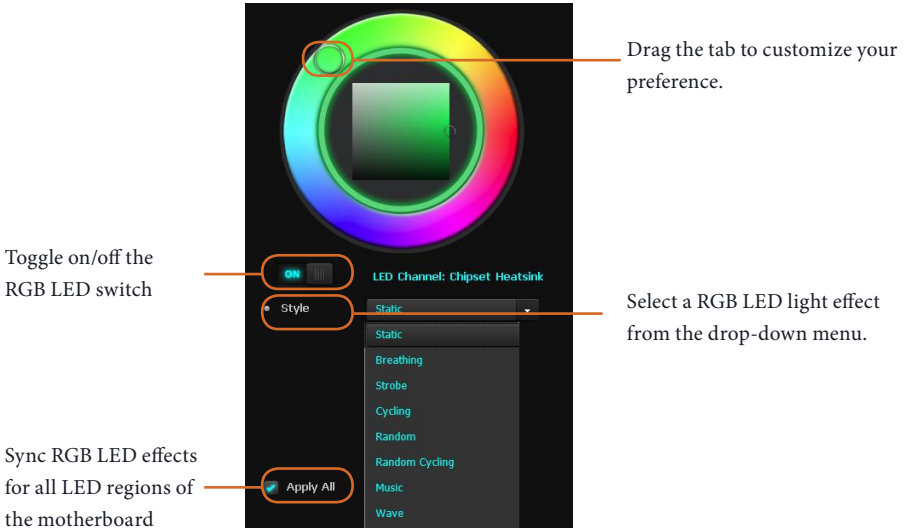
1. Never install the RGB LED cable in the wrong orientation; otherwise, the cable may be damaged.
2. Before installing or removing your RGB LED cable, please power off your system and unplug the power cord from the power supply. Failure to do so may cause damages to motherboard components.



1. Please note that the RGB LED strips do not come with the package.
2. The RGB LED header supports WS2812B addressable RGB LED strip (5V/Data/GND), with a maximum power rating of 3A (5V) and length within 2 meters.

ASRock Polychrome SYNC Utility

Now you can adjust the RGB LED color through the ASRock Polychrome SYNC utility. Download this utility from the ASRock Live Update & APP Shop and start coloring your PC style your way!



Chapter 4 UEFI SETUP UTILITY

4.1 Introduction

This section explains how to use the UEFI SETUP UTILITY to configure your system. You may run the UEFI SETUP UTILITY by pressing <F2> or right after you power on the computer, otherwise, the Power-On-Self-Test (POST) will continue with its test routines. If you wish to enter the UEFI SETUP UTILITY after POST, restart the system by pressing <Ctl> + <Alt> + <Delete>, or by pressing the reset button on the system chassis. You may also restart by turning the system off and then back on.

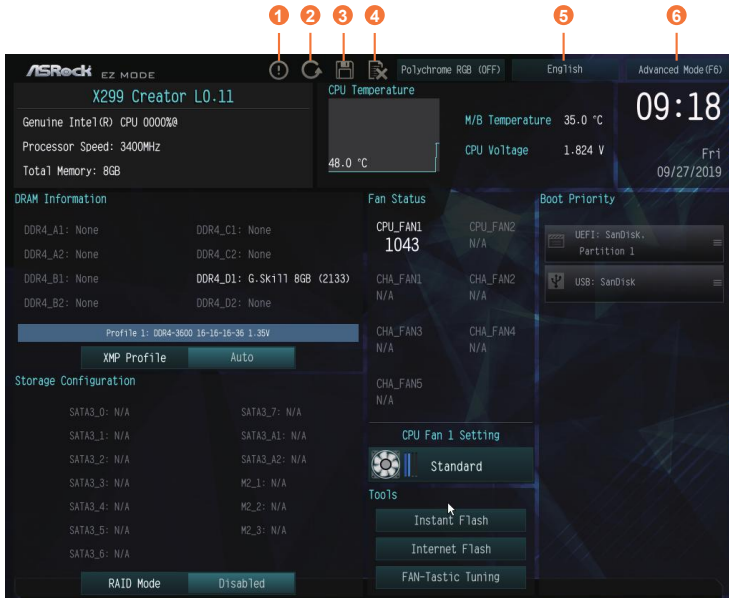


Because the UEFI software is constantly being updated, the following UEFI setup screens and descriptions are for reference purpose only, and they may not exactly match what you see on your screen.

4.2 EZ Mode

The EZ Mode screen appears when you enter the BIOS setup program by default. EZ mode is a dashboard which contains multiple readings of the system's current status. You can check the most crucial information of your system, such as CPU speed, DRAM frequency, SATA information, fan speed, etc.

Press <F6> or click the "Advanced Mode" button at the upper right corner of the screen to switch to "Advanced Mode" for more options.



No.	Function
1	Help
2	Load UEFI Defaults
3	Save Changes and Exit
4	Discard Changes
5	Change Language
6	Switch to Advanced Mode

4.3 Advanced Mode

The Advanced Mode provides more options to configure the BIOS settings. Refer to the following sections for the detailed configurations.

To access the EZ Mode, press <F6> or click the "EZ Mode" button at the upper right corner of the screen.

4.3.1 UEFI Menu Bar

The top of the screen has a menu bar with the following selections:

Main	For setting system time/date information
OC Tweaker	For overclocking configurations
Advanced	For advanced system configurations
Tool	Useful tools
H/W Monitor	Displays current hardware status
Boot	For configuring boot settings and boot priority
Security	For security settings
Exit	Exit the current screen or the UEFI Setup Utility

4.3.2 Navigation Keys

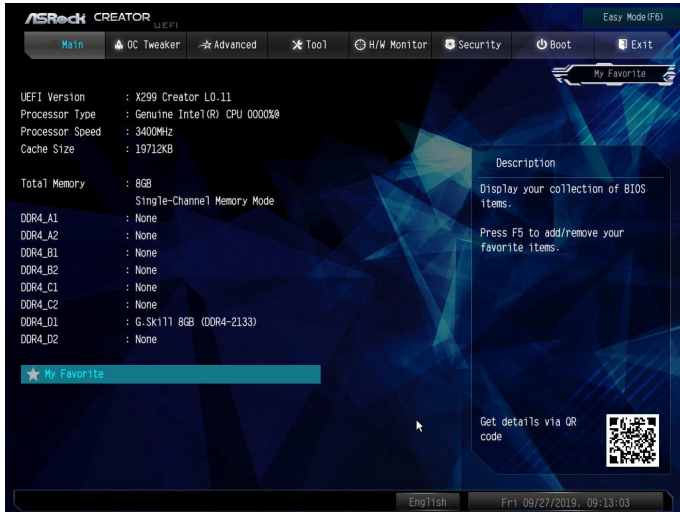
Use <←> key or <→> key to choose among the selections on the menu bar, and use <↑> key or <↓> key to move the cursor up or down to select items, then press <Enter> to get into the sub screen. You can also use the mouse to click your required item.

Please check the following table for the descriptions of each navigation key.

Navigation Key(s)	Description
+ / -	To change option for the selected items
<Tab>	Switch to next function
<PGUP>	Go to the previous page
<PGDN>	Go to the next page
<HOME>	Go to the top of the screen
<END>	Go to the bottom of the screen
<F1>	To display the General Help Screen
<F5>	Add / Remove Favorite
<F6>	Enter / Exit EZ Mode
<F7>	Discard changes and exit the SETUP UTILITY
<F9>	Load optimal default values for all the settings
<F10>	Save changes and exit the SETUP UTILITY
<F12>	Print screen
<ESC>	Jump to the Exit Screen or exit the current screen

4.4 Main Screen

When you enter the UEFI SETUP UTILITY, the Main screen will appear and display the system overview.



Favorite

Display your collection of BIOS items. Press F5 to add/remove your favorite items.

4.5 OC Tweaker Screen

In the OC Tweaker screen, you can set up overclocking features.



Because the UEFI software is constantly being updated, the following UEFI setup screens and descriptions are for reference purpose only, and they may not exactly match what you see on your screen.

CPU Configuration

Multi Core Enhancement

Improve the system's performance by forcing the CPU to perform the highest frequency on all CPU cores simultaneously. Disable to reduce power consumption .

CPU Ratio

The CPU speed is determined by the CPU Ratio multiplied with the BCLK. Increasing the BCLK will increase the internal CPU clock speed but also affect the clock speed of other components.

AVX2 Negative Offset

AVX2 Negative Offset reduces core frequency. The AVX2 Negative Offset specifies a negative offset from the Turbo Ratio Limit for AVX2 workloads.

AVX3 Negative Offset

AVX3 Negative Offset reduces core frequency. The AVX3 Negative Offset specifies a negative offset from the Turbo Ratio Limit for AVX3 workloads.

CPU Mesh Max OC Ratio

Use this item to set the maximum OC Ratio for the CPU Mesh.

CPU Mesh Min Ratio

Use this item to set the minimum OC Ratio for the CPU Mesh.

BCLK Frequency

Configure the BCLK Frequency.

Intel Turbo Boost Technology

Intel Turbo Boost Technology enables the processor to run above its base operating frequency when the operating system requests the highest performance state.

Intel SpeedStep Technology

Intel SpeedStep technology allows processors to switch between multiple frequencies and voltage points for better power saving and heat dissipation.

Intel Speed Shift Technology

Enable/Disable Intel Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states.

Intel Turbo Boost Max Technology 3.0

Intel Turbo Boost Technology 3.0 enables the processor to run above its base operating frequency when the operating system requests the highest performance state.

Adjust Pll

Adjust the Pll for higher -BCLK ration combination.

Pll Trim

Adjust the Pll value between +63 ro -63.

Pll Trim Prefix

Adjust the Pll Trim Prefix.

Change MC-Pll Trim Value

Adjust the MC-Pll value between +63 ro -63.

Change MC-Pll Trim Prefix

Adjust the MC-Pll Trim Prefix.

Pll Trim for Memory Controller

Adjust the MC-Pll value between +63 ro -63.

Pll Trim for Prefix Memory Controller

Adjust the MC-Pll Trim Prefix.

Boot Performance Mode

Select the performance state that the BIOS will set before OS handoff.

DCST LUT0

Configure the DCST LUT0.

DCST LUT1

Configure the DCST LUT1.

DCST LUT2

Configure the DCST LUT2.

DCST LUT3

Configure the DCST LUT3.

TJ-Max

Adjust the TJ-Max.

Primary Plane Current Limit

Configure the current limit of the CPU under Turbo Mode in ampere. A lower limit can protect the CPU and save power, while a higher limit may improve performance.

Long Duration Power Limit

Configure Package Power Limit 1 in watts. When the limit is exceeded, the CPU ratio will be lowered after a period of time. A lower limit can protect the CPU and save power, while a higher limit may improve performance.

Long Duration Maintained

Configure the period of time until the CPU ratio is lowered when the Long Duration Power Limit is exceeded.

Short Duration Power Limit

Configure Package Power Limit 2 in watts. When the limit is exceeded, the CPU ratio will be lowered immediately. A lower limit can protect the CPU and save power, while a higher limit may improve performance.

DRAM Configuration

DRAM Tweaker

Fine tune the DRAM settings by leaving marks in checkboxes. Click OK to confirm and apply your new settings.

Memory Information

This option allows users to browse the serial presence detect (SPD) and Intel extreme memory profile (XMP) for DDR4 modules.

Load XMP Setting

Load XMP settings to overclock the DDR memory and perform beyond standard specifications.

BCLK Frequency

The CPU speed is determined by the CPU Ratio multiplied with the BCLK. Increasing the BCLK will increase the internal CPU clock speed but also affect the clock speed of other components.

DRAM Reference Clock

Select Auto for optimized settings.

DRAM Frequency

If [Auto] is selected, the motherboard will detect the memory module(s) inserted and assign the appropriate frequency automatically.

Primary Timing

CAS# Latency (tCL)

The time between sending a column address to the memory and the beginning of the data in response.

RAS# to CAS# Delay (tRCD)

RAS# to CAS# Delay : The number of clock cycles required between the opening of a row of memory and accessing columns within it.

Row Precharge (tRP)

Row Precharge: The number of clock cycles required between the issuing of the precharge command and opening the next row.

RAS# Active Time (tRAS)

The number of clock cycles required between a bank active command and issuing the precharge command.

Command Rate (CR)

The delay between when a memory chip is selected and when the first active command can be issued.

Secondary Timing

Write Recovery Time (tWR)

The amount of delay that must elapse after the completion of a valid write operation, before an active bank can be precharged.

Refresh Cycle Time (tRFC)

The number of clocks from a Refresh command until the first Activate command to the same rank.

RAS to RAS Delay (tRRD)

The number of clocks between two rows activated in different banks of the same rank.

RAS to RAS Delay (tRRD_L)

The number of clocks between two rows activated in different banks of the same rank.

Write to Read Delay (tWTR)

The number of clocks between the last valid write operation and the next read command to the same internal bank.

Write to Read Delay (tWTR_L)

The number of clocks between the last valid write operation and the next read command to the same internal bank.

Read to Precharge (tRTP)

The number of clocks that are inserted between a read command to a row pre-charge command to the same rank.

Four Activate Window (tFAW)

The time window in which four activates are allowed the same rank.

CAS Write Latency (tCWL)

Configure CAS Write Latency.

Third Timing

tREFI

Configure refresh cycles at an average periodic interval.

tCKE

Configure the period of time the DDR4 initiates a minimum of one refresh command internally once it enters Self-Refresh mode.

tCCD

Configure back to back CAS to CAS (i.e. READ to RAED or WRITE to WRITE) from same rank separation parameter.

tCCD_L

Configure back to back CAS to CAS (i.e. READ to RAED or WRITE to WRITE) from same rank separation parameter.

tCCD_WR_L

Configure back to back CAS to CAS (i.e. READ to RAED or WRITE to WRITE) from same rank separation parameter.

Turn Around Timing**tRRDS**

The number of clocks between two rows activated in different banks of the same rank.

tRRDS_L

The number of clocks between two rows activated in different banks of the same rank.

tRRDR

Configure Read to Read different rank dead cycle Back to back READ to WRITE from different DIMM separation parameter.

tRRDD

Use this item to change tRRDD setting. The default is [Auto].

tRWSR

Use this item to change tRWSR setting. The default is [Auto].

tRWDS

Use this item to change tRWDS setting. The default is [Auto].

tRWDR

Use this item to change tRWDR setting. The default is [Auto].

tRWDD

Use this item to change tRWDD setting. The default is [Auto].

tWRDS

Use this item to change tWRDS setting. The default is [Auto].

tWRDR

Use this item to change tWRDR setting. The default is [Auto].

tWRDD

Use this item to change tWRDD setting. The default is [Auto].

tWWDS

Use this item to change tWWDS setting. The default is [Auto].

tWWDR

Use this item to change tWWDR setting. The default is [Auto].

tWWDD

Use this item to change tWWDD setting. The default is [Auto].

Round Trip Timing

RTL (A1)

Configure round trip latency for channel A1.

RTL (A2)

Configure round trip latency for channel A2.

IO-L (B1)

Configure IO latency for channel B1.

IO-L (B2)

Configure IO latency for channel B2.

IO-L (C1)

Configure IO latency for channel C1.

IO-L (C2)

Configure IO latency for channel C2.

IO-L (D1)

Configure IO latency for channel D1.

IO-L (D2)

Configure IO latency for channel D2.

ODT Setting

ODT WR (A1)

Configure the memory on die termination resistors' WR for channel A1.

ODT WR (A2)

Configure the memory on die termination resistors' WR for channel A2.

ODT WR (B1)

Configure the memory on die termination resistors' WR for channel B1.

ODT WR (B2)

Configure the memory on die termination resistors' WR for channel B2.

ODT WR (C1)

Configure the memory on die termination resistors' WR for channel C1.

ODT WR (C2)

Configure the memory on die termination resistors' WR for channel C2.

ODT WR (D1)

Configure the memory on die termination resistors' WR for channel D1.

ODT WR (D2)

Configure the memory on die termination resistors' WR for channel D2.

ODT PARK (A1)

Configure the memory on die termination resistors' PARK for channel A1.

ODT PARK (A2)

Configure the memory on die termination resistors' PARK for channel A2.

ODT PARK (B1)

Configure the memory on die termination resistors' PARK for channel B1.

ODT PARK (B2)

Configure the memory on die termination resistors' PARK for channel B2.

ODT PARK (C1)

Configure the memory on die termination resistors' PARK for channel C1.

ODT PARK (C2)

Configure the memory on die termination resistors' PARK for channel C2.

ODT PARK (D1)

Configure the memory on die termination resistors' PARK for channel D1.

ODT PARK (D2)

Configure the memory on die termination resistors' PARK for channel D2.

Advanced Setting

C/A Parity

This item allows you to enable or disable the DDR4's command address parity.

MRC Promote Warnings

Determines if MRC warnings are promoted to system level.

Promote Warnings

Determines if warnings are promoted to system level.

Halt on mem Training Error

Use this item to enable or disable Halt on memory Training Error.

Memory Test

Use this item to enable or disable memory test during normal boot.

MemTestLoops

Set the number of memory test loops during normal boot.

Memory Test On Fast Boot

Use this item to enable or disable memory test during fast boot.

Attempt Fast Boot

Use this item to enable or disable memory test during fast boot.

Attempt Fast Cold Boot

When enabled, portions of memory reference code will be skipped when it is possible to increase boot speed.

Voltage Configuration

CPU Input Voltage

Configure the voltage for the CPU Vcore.

CPU Load-Line Calibration

CPU Load-Line Calibration helps prevent CPU voltage droop when the system is under heavy loading.

VPPM AB Voltage

Configure the voltage for the VPPM AB.

DRAM AB Voltage

Configure the voltage for the DRAM AB.

VTTM AB Voltage

Configure the voltage for the VTTM AB.

VPPM CD Voltage

Configure the voltage for the VPPM CD.

DRAM CD Voltage

Configure the voltage for the DRAM CD.

VTTM CD Voltage

Configure the voltage for the VTTM CD.

1.0V PCH Voltage

Configure the chipset voltage (1.0V).

VCCIO Voltage

Configure the voltage for the VCCIO.

CPU PLL Standby Voltage

Configure the voltage for the CPU PLL Standby .

PCH PLL Voltage

Configure the voltage for the PCH PLL V.

CLK VDD Voltage

Configure the voltage for the CLK VDD.

+3V_ANA

Configure the voltage for +3V_ANA.

VCCSA Voltage

Configure the voltage for the VCCSA.

FIVR Configuration

CPU Vcore Voltage Mode

Selects between Adaptive and Override Voltage modes. In Override Mode, the voltage selected will be applied over all operating frequencies. In Adaptive mode, the voltage is interpolated only in turbo mode.

Vcore Voltage Offset

Configure the dynamic Vcore voltage added to the Vcore.

Offset Prefix

Sets the offset value as positive or negative.

CPU Mesh Voltage Offset

Configure the amount of voltage fed to the UNCores of the processor, including its cache. Increase the voltage when increasing CPU Mesh Frequency.

[Auto] For optimized settings.

[Adaptive] Add voltage to the CPU Mesh when the system is under heavy loading.

[Override] The voltage is fixed.

Offset Prefix

Sets the offset value as positive or negative.

System Agent Voltage Offset

Specifies the Offset Voltage applied to the System Agent. This voltage is specified in millivolts.

Offset Prefix

Sets the offset value as positive or negative.

VCCU Voltage Offset

Specifies the Offset Voltage applied to the VCCU domain. This voltage is specified in millivolts.

Offset Prefix

Sets the offset value as positive or negative.

CPU Integrated VR Faults

Enable/Disable FIVR Faults. When FIVR faults are disabled, OVP and OCP protection mechanism will be masked. This is a dangerous configuration and the risk of using it is assumed by the user.

CPU Integrated VR Efficiency Mode

FIVR efficiency management is good for power delivery efficiency, but it may be an impediment to proper power delivery control under overclocking, particularly BCLK overclocking.

Dynamic SVID Support

Enable/Disable SVID. Disabling SVID disables input voltage overrides.

Save User Default

Type a profile name and press enter to save your settings as user default.

Load User Default

Load previously saved user defaults.

Save User UEFI Setup Profile to Disk

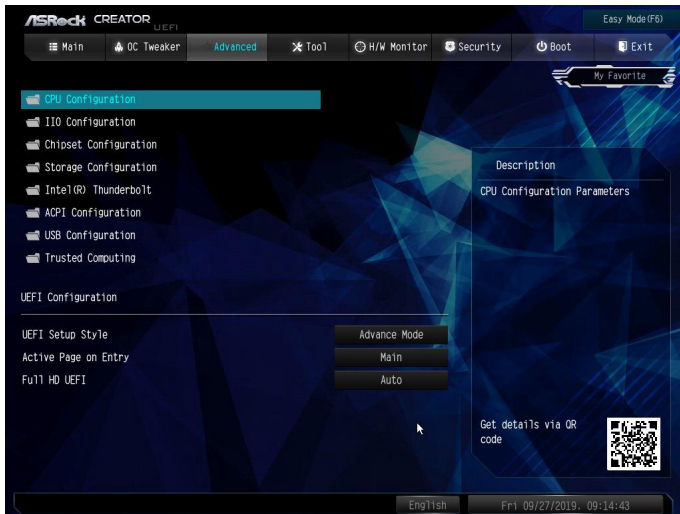
It helps you to save current UEFI settings as an user profile to disk.

Load User UEFI Setup Profile from Disk

You can load previous saved profile from the disk.

4.6 Advanced Screen

In this section, you may set the configurations for the following items: CPU Configuration, IIO Configuration, Chipset Configuration, Storage Configuration, Intel® Thunderbolt, ACPI Configuration, USB Configuration and Trusted Computing.



Setting wrong values in this section may cause the system to malfunction.

UEFI Configuration

UEFI Setup Style

Select the default mode when entering the UEFI setup utility.

Active Page on Entry

Select the default page when entering the UEFI setup utility.

Full HD UEFI

When [Auto] is selected, the resolution will be set to 1920 x 1080 if the monitor supports Full HD resolution. If the monitor does not support Full HD resolution, then the resolution will be set to 1024 x 768. When [Disable] is selected, the resolution will be set to 1024 x 768 directly.

4.6.1 CPU Configuration



Intel Hyper Threading Technology

Intel Hyper Threading Technology allows multiple threads to run on each core, so that the overall performance on threaded software is improved.

CPU C States Support

Enable CPU C States Support for power saving. It is recommended to keep C3, C6 and C7 all enabled for better power saving.

Processor Hot Modes

Use this item to configure the processor Hot Modes for CPU throttling. When a processor thermal sensor trips (either core), the PROCHOT# will be driven. If bi-directional is enabled, external agents can drive PROCHOT# to throttle the processor.

CPU Thermal Throttling

Enable CPU internal thermal control mechanisms to keep the CPU from overheating.

Intel Virtualization Technology

Intel Virtualization Technology allows a platform to run multiple operating systems and applications in independent partitions, so that one computer system can function as multiple virtual systems.

Intel Safer Mode Extensions (SMX)

Enable/disable the Intel SMX (Safer Mode Extensions).

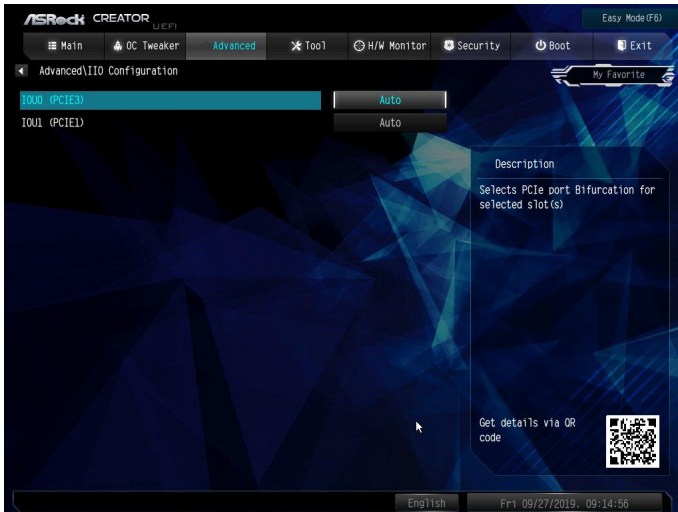
Hardware Prefetcher

Automatically prefetch data and code for the processor. Enable for better performance.

Adjacent Cache Line Prefetch

Automatically prefetch the subsequent cache line while retrieving the currently requested cache line. Enable for better performance.

4.6.2 IIO Configuration



IOU0 (PCIE3)

Select PCIe port Bifurcation for selected slot(s).

IOU1 (PCIE1)

Select PCIe port Bifurcation for selected slot(s).

4.6.3 Chipset Configuration



VT-d

Intel® Virtualization Technology for Directed I/O helps your virtual machine monitor better utilize hardware by improving application compatibility and reliability, and providing additional levels of manageability, security, isolation, and I/O performance.

Primary Graphics Adapter Select

Select the primary Graphics adapter.

PCIE1 Link Speed

Select the link speed for PCIE1.

PCIE2 Link Speed

Select the link speed for PCIE2.

PCIE3 Link Speed

Select the link speed for PCIE3.

PCIE4 Link Speed

Select the link speed for PCIE4.

PCIE5 Link Speed

Select the link speed for PCIe5.

PCIe ASPM Support

This option enables/disables the ASPM support for all CPU downstream devices.

PCH PCIe ASPM Support

This option enables/disables the ASPM support for all PCH PCIe devices.

PCH DMI ASPM Support

This option enables/disables the ASPM support for all PCH DMI devices.

Onboard LAN

Enable or disable the onboard network interface controller.

aQuantia 10G LAN

Enable or disable the onboard network interface controller (aQuantia® AQC107).

Onboard HD Audio

Enable/disable onboard HD audio. Set to Auto to enable onboard HD audio and automatically disable it when a sound card is installed.

Front Panel

Enable/disable front panel HD audio.

Onboard WAN Device

Enable/disable the Onboard WAN device.

WAN Radio

Enable/disable the WiFi module's connectivity.

Bluetooth

Enable/disable the Bluetooth's connectivity.

Deep Sleep

Configure deep sleep mode for power saving when the computer is shut down.

Restore on AC/Power Loss

Select the power state after a power failure. If [Power Off] is selected, the power will remain off when the power recovers. If [Power On] is selected, the system will start to boot up when the power recovers.

Turn On Onboard LED in S5

Turn on/off the LED in the ACPI S5 state.

Restore Onboard LED Default

Restore the onboard LED default value.

RGB LED

RGB LED and header allows users to connect LED strip and create their unique PC style easily.

Onboard Debug Port LED

Enable/disable the onboard Dr. Debug LED.

4.6.4 Storage Configuration



SATA Controller(s)

Enable/disable the SATA controllers.

SATA Controller Speed

Indicates the maximum speed the SATA controller can support.

SATA Mode Selection

[AHCI]: Supports new features that improve performance.

[RAID]: Combine multiple disk drives into a logical unit.

SATA Aggressive Link Power Management

SATA Aggressive Link Power Management allows SATA devices to enter a low power state during periods of inactivity to save power. It is only supported by AHCI mode.

Hard Disk S.M.A.R.T.

S.M.A.R.T stands for Self-Monitoring, Analysis, and Reporting Technology. It is a monitoring system for computer hard disk drives to detect and report on various indicators of reliability.

Third Party SATA3 Controller

Enable or disable the third party SATA3 controller.

Third Party SATA3 Hot Plug

Enable or disable Hot Plug for Third Party SATA3 port.

4.6.5 Intel® Thunderbolt™



Intel(R) Thunderbolt Technonogy

Enable/Disable the Intel(R) Thunderbolt function.

Security Level

Allows you to choose a security level for the Thunderbolt ports.

4.6.6 ACPI Configuration



Suspend to RAM

Select disable for ACPI suspend type S1. It is recommended to select auto for ACPI S3 power saving.

PCIE Devices Power On

Allow the system to be waked up by a PCIE device and enable wake on LAN.

RTC Alarm Power On

Allow the system to be waked up by the real time clock alarm. Set it to By OS to let it be handled by your operating system.

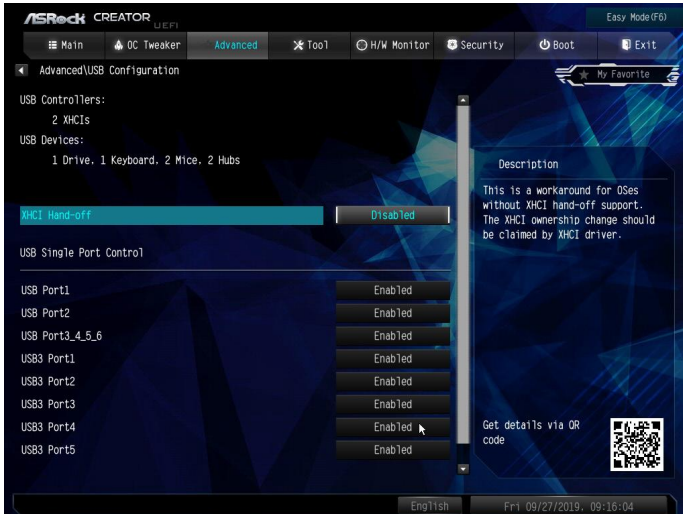
USB Keyboard/Remote Power On

Allow the system to be waked up by an USB keyboard or remote controller.

USB Mouse Power On

Allow the system to be waked up by an USB mouse.

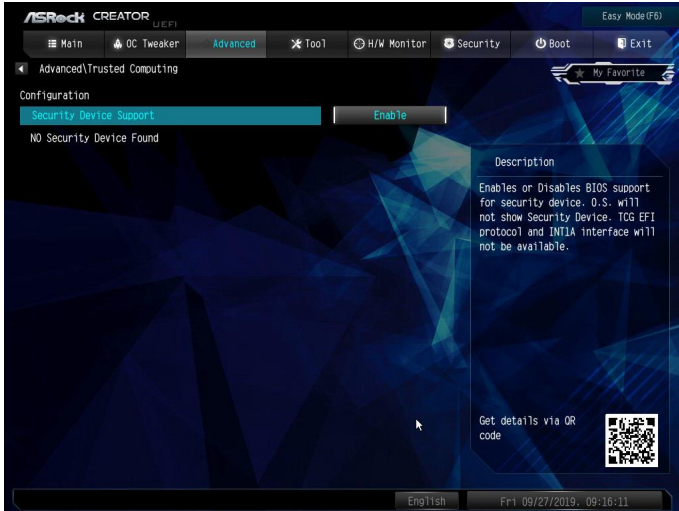
4.6.7 USB Configuration



XHCI Hand-off

This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.

4.6.8 Trusted Computing



Security Device Support

Enable or disable BIOS support for security device.

4.7 Tools



UEFI Tech Service

Contact ASRock Tech Service if you are having trouble with your PC. Please setup network configuration before using UEFI Tech Service.

Easy RAID Installer

Easy RAID Installer helps you to copy the RAID driver from the support CD to your USB storage device. After copying the drivers please change the SATA mode to RAID, then you can start installing the operating system in RAID mode.

SSD Secure Erase Tool

Use this tool to securely erase SSD.

NVME Sanitization Tool

After you sanitize SSD, all user data will be permanently destroyed on the SSD and cannot be recovered.

Instant Flash

Save UEFI files in your USB storage device and run Instant Flash to update your UEFI.

Internet Flash - DHCP (Auto IP), Auto

ASRock Internet Flash downloads and updates the latest UEFI firmware version from our servers for you. Please setup network configuration before using Internet Flash.

*For BIOS backup and recovery purpose, it is recommended to plug in your USB pen drive before using this function.

Secure Backup UEFI

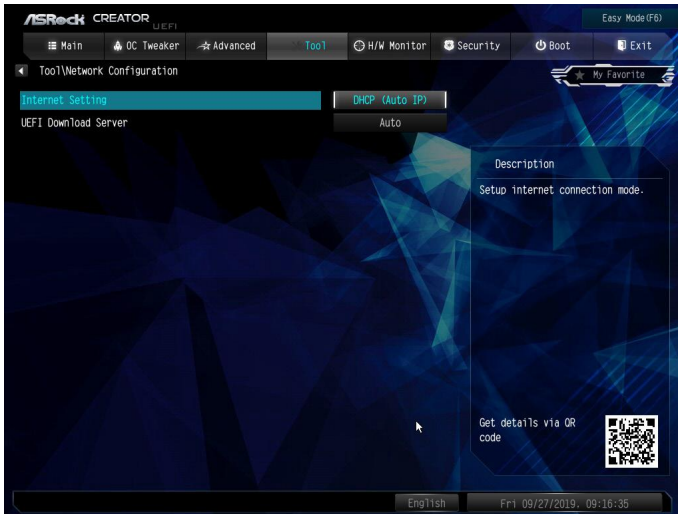
Whenever one of the ROM images are outdated or corrupted, switch to the other flash ROM and execute Secure Backup UEFI to duplicate the current working ROM image to the secondary flash ROM.



This motherboard has two BIOS chips, an active BIOS (BIOS_A) and a backup BIOS (BIOS_B), which enhances the safety and stability of your system. Use "Secure Backup UEFI" to duplicate a working copy of the BIOS files to the active BIOS to ensure normal system operation. Normally, the system will work on the active BIOS. However if the active BIOS is corrupted or damaged, after several failed boot attempts, the backup BIOS will take over. For safety issues, users are not able to update the backup BIOS manually. Users may refer to the BIOS LEDs (BIOS_A_LED or BIOS_B_LED) to identify which BIOS is currently activated.

Network Configuration

Use this to configure internet connection settings for Internet Flash.



Internet Setting

Enable or disable sound effects in the setup utility.

UEFI Download Server

Select a server to download the UEFI firmware.

4.8 Hardware Health Event Monitoring Screen

This section allows you to monitor the status of the hardware on your system, including the parameters of the CPU temperature, motherboard temperature, fan speed and voltage.



Fan Tuning

Measure Fan Min Duty Cycle.

Fan-Tastic Tuning

Select a fan mode for CPU Fan 1, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

CPU Fan 1 Setting

Select a fan mode for CPU Fan 1, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

CPU Fan 1 Step Up

Set the value of CPU Fan 1 Step Up.

CPU Fan 1 Step Down

Set the value of CPU Fan 1 Step Down.

CPU_FAN2 / W_Pump Switch

Select CPU Water Pump mode.

CPU Fan 2 Control Mode

Select PWM mode or DC mode for CPU Fan 2.

CPU Fan 2 Setting

Select a fan mode for CPU Fan 2, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

CPU Fan 2 Temp Source

Select a fan temperature source for CPU Fan 2.

CPU Fan 2 Step Up

Set the value of CPU Fan 2 Step Up.

CPU Fan 2 Step Down

Set the value of CPU Fan 2 Step Down.

CHA_FAN1 / W_Pump Switch

Select Chassis Fan 1 or Water Pump mode.

Chassis Fan 1 Control Mode

Select PWM mode or DC mode for Chassis Fan 1.

Chassis Fan 1 Setting

Select a fan mode for Chassis Fan 1, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

Chassis Fan 1 Temp Source

Select a fan temperature source for Chassis Fan 1.

Chassis Fan 1 Step Up

Set the value of Chassis Fan 1 Step Up.

Chassis Fan 1 Step Down

Set the value of Chassis Fan 1 Step Down.

CHA_FAN2 / W_Pump Switch

Select Chassis Fan 2 or Water Pump mode.

Chassis Fan 2 Control Mode

Select PWM mode or DC mode for Chassis Fan 2.

Chassis Fan 2 Setting

Select a fan mode for Chassis Fan 2, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

Chassis Fan 2 Temp Source

Select a fan temperature source for Chassis Fan 2.

Chassis Fan 2 Step Up

Set the value of Chassis Fan 2 Step Up.

Chassis Fan 2 Step Down

Set the value of Chassis Fan 2 Step Down.

CHA_FAN3 / W_Pump Switch

Select Chassis Fan 3 or Water Pump mode.

Chassis Fan 3 Control Mode

Select PWM mode or DC mode for Chassis Fan 3.

Chassis Fan 3 Setting

Select a fan mode for Chassis Fan 3, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

Chassis Fan 3 Temp Source

Select a fan temperature source for Chassis Fan 3.

Chassis Fan 3 Step Up

Set the value of Chassis Fan 3 Step Up.

Chassis Fan 3 Step Down

Set the value of Chassis Fan 3 Step Down.

CHA_FAN4 / W_Pump Switch

Select Chassis Fan 4 or Water Pump mode.

Chassis Fan 4 Control Mode

Select PWM mode or DC mode for Chassis Fan 4.

Chassis Fan 4 Setting

Select a fan mode for Chassis Fan 4, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

Chassis Fan 4 Temp Source

Select a fan temperature source for Chassis Fan 4.

Chassis Fan 4 Step Up

Set the value of Chassis Fan 4 Step Up.

Chassis Fan 4 Step Down

Set the value of Chassis Fan 4 Step Down.

CHA_FAN5 / W_Pump Switch

Select Chassis Fan 5 or Water Pump mode.

Chassis Fan 5 Control Mode

Select PWM mode or DC mode for Chassis Fan 5.

Chassis Fan 5 Setting

Select a fan mode for Chassis Fan 5, or choose Customize to set 5 CPU temperatures and assign a respective fan speed for each temperature.

Chassis Fan 5 Temp Source

Select a fan temperature source for Chassis Fan 5.

Chassis Fan 5 Step Up

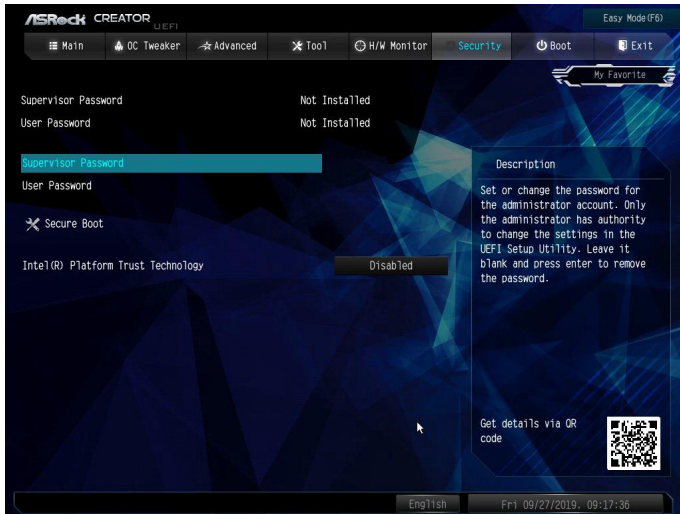
Set the value of Chassis Fan 5 Step Up.

Chassis Fan 5 Step Down

Set the value of Chassis Fan 5 Step Down.

4.9 Security Screen

In this section you may set or change the supervisor/user password for the system. You may also clear the user password.



Supervisor Password

Set or change the password for the administrator account. Only the administrator has authority to change the settings in the UEFI Setup Utility. Leave it blank and press enter to remove the password.

User Password

Set or change the password for the user account. Users are unable to change the settings in the UEFI Setup Utility. Leave it blank and press enter to remove the password.

Secure Boot

Use this item to enable or disable support for Windows 8.1 Secure Boot.

Intel(R) Platform Trust Technology

Enable/disable Intel PTT in ME. Disable this option to use discrete TPM Module.

4.10 Boot Screen

This section displays the available devices on your system for you to configure the boot settings and the boot priority.



Fast Boot

Fast Boot minimizes your computer's boot time. In fast mode you may not boot from an USB storage device. The VBIOS must support UEFI GOP if you are using an external graphics card. Please notice that Ultra Fast mode will boot so fast that the only way to enter this UEFI Setup Utility is to Clear CMOS or run the Restart to UEFI utility in Windows.

Boot From Onboard LAN

Allow the system to be waked up by the onboard LAN.

Setup Prompt Timeout

Configure the number of seconds to wait for the setup hot key.

Bootup Num-Lock

Select whether Num Lock should be turned on or off when the system boots up.

Boot Beep

Select whether the Boot Beep should be turned on or off when the system boots up. Please note that a buzzer is needed.

Full Screen Logo

Enable to display the boot logo or disable to show normal POST messages.

AddOn ROM Display

Enable AddOn ROM Display to see the AddOn ROM messages or configure the AddOn ROM if you've enabled Full Screen Logo. Disable for faster boot speed.

Boot Failure Guard Message

If the computer fails to boot for a number of times the system automatically restores the default settings.

CSM (Compatibility Support Module)



CSM

Enable to launch the Compatibility Support Module. Please do not disable unless you're running a WHCK test. If you are using Windows 8.1 64-bit and all of your devices support UEFI, you may also disable CSM for faster boot speed.

Launch PXE OpROM Policy

Select UEFI only to run those that support UEFI option ROM only. Select Legacy only to run those that support legacy option ROM only. Select Do not launch to not execute both legacy and UEFI option ROM.

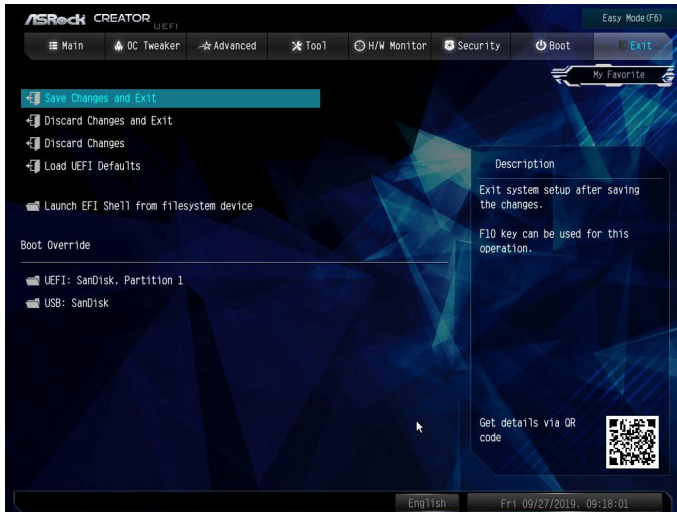
Launch Storage OpROM Policy

Select UEFI only to run those that support UEFI option ROM only. Select Legacy only to run those that support legacy option ROM only. Select Do not launch to not execute both legacy and UEFI option ROM.

Launch Video OpROM Policy

Select UEFI only to run those that support UEFI option ROM only. Select Legacy only to run those that support legacy option ROM only. Select Do not launch to not execute both legacy and UEFI option ROM.

4.11 Exit Screen



Save Changes and Exit

When you select this option the following message, “Save configuration changes and exit setup?” will pop out. Select [OK] to save changes and exit the UEFI SETUP UTILITY.

Discard Changes and Exit

When you select this option the following message, “Discard changes and exit setup?” will pop out. Select [OK] to exit the UEFI SETUP UTILITY without saving any changes.

Discard Changes

When you select this option the following message, “Discard changes?” will pop out. Select [OK] to discard all changes.

Load UEFI Defaults

Load UEFI default values for all options. The F9 key can be used for this operation.

Launch EFI Shell from filesystem device

Copy shellx64.efi to the root directory to launch EFI Shell.

Contact Information

If you need to contact ASRock or want to know more about ASRock, you're welcome to visit ASRock's website at <http://www.asrock.com>; or you may contact your dealer for further information. For technical questions, please submit a support request form at <https://event.asrock.com/tsd.asp>

ASRock Incorporation

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DECLARATION OF CONFORMITY

Per FCC Part 2 Section 2.1077(a)



Responsible Party Name: ASRock Incorporation

Address: 13848 Magnolia Ave, Chino, CA91710

Phone/Fax No: +1-909-590-8308/+1-909-590-1026

hereby declares that the product

Product Name : Motherboard

Model Number : X299 Creator

Conforms to the following specifications:

FCC Part 15, Subpart B, Unintentional Radiators

Supplementary Information:

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.

Representative Person's Name: James

Signature:

A handwritten signature in black ink, appearing to read 'James', written over a horizontal line.

Date : May 12, 2017

EU Declaration of Conformity

ASRock®

For the following equipment:

Motherboard

(Product Name)

X299 Creator / ASRock

(Model Designation / Trade Name)

ASRock Incorporation

(Manufacturer Name)

2F, No.37, Sec. 2, Jhongyang S. Rd., Beitou District, Taipei City 112, Taiwan (R.O.C.)

(Manufacturer Address)

EMC —Directive 2014/30/EU (from April 20th, 2016)

EN 55022:2010/AC:2011 Class B

EN 55024:2010/A1:2015

EN 55032:2012+AC:2013 Class B

EN 61000-3-3:2013

EN 61000-3-2:2014

RED—Directive 2014/53/EU

EN 300 328 V2.1.1

EN 301 489-17 V3.1.1

EN 301 893 V2.1.1

EN 301 489-3 V2.1.1

EN 300 220 V3.1.1

LVD —Directive 2014/35/EU (from April 20th, 2016)

EN 60950-1 : 2011+ A2: 2013

EN 60950-1 : 2006/A12: 2011

RoHS — Directive 2011/65/EU

CE marking



(EU conformity marking)

ASRock EUROPE B.V.

(Company Name)

Bijsterhuizen 1111 6546 AR Nijmegen The Netherlands

(Company Address)

Person responsible for making this declaration:

(Name, Surname)

A.V.P

(Position / Title)

November 22, 2019

(Date)

P/N: 15G062185000AK V1.0