

EMX-RLUC

13th Gen Intel® Core™ Soc BGA Processor, Thin Mini ITX
Motherboard.

User's Manual

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Document Amendment History

Revision	Date	By	Comment
1 st	April 2025	Avalue	Initial Release

Declaration of Conformity



This device complies with part 15 FCC rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference.

(2) This device must accept any interference received including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a class "a" digital device, pursuant to part 15 of the FCC rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CE statement

The product(s) described in this manual complies with all application European Union (CE) directives if it has a CE marking. For computer systems to remain CE compliant, only CE-compliant parts may be used. Maintaining CE compliance also requires proper cable and cabling techniques.

Notice

This guide is designed for experienced users to setup the system within the shortest time. For detailed information, please always refer to the electronic user's manual.

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Disclaimer

This manual is intended to be used as a practical and informative guide only and is subject

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to change without notice. It does not represent a commitment on the part of Avalue. This product might include unintentional technical or typographical errors. Changes are periodically made to the information herein to correct such errors, and these changes are incorporated into new editions of the publication.

A Message to the Customer

Avalue Customer Services

Each and every Avalue's product is built to the most exacting specifications to ensure reliable performance in the harsh and demanding conditions typical of industrial environments. Whether your new Avalue device is destined for the laboratory or the factory floor, you can be assured that your product will provide the reliability and ease of operation for which the name Avalue has come to be known.

Your satisfaction is our primary concern. Here is a guide to Avalue's customer services. To ensure you get the full benefit of our services, please follow the instructions below carefully.

Technical Support and Assistance

1. Visit the Avalue website at <https://www.avalue.com/> where you can find the latest information about the product.
2. Contact your distributor or our technical support team or sales representative for technical support if you need additional assistance. Please have following information ready before you call:
 - Product name and serial number
 - Description of your peripheral attachments
 - Description of your software (operating system, version, application software, etc.)
 - A complete description of the problem
 - The exact wording of any error messages

To receive the latest version of the user's manual; please visit our Web site at:

www.avalue.com

Product Warranty (Returns & Warranties policy)

1. Purpose

Avalue establishes the following maintenance specifications and operation procedures for providing the best quality of service and shortened repair time to our customers.

2. Warranty

2.1 Warranty Period

Avalue endeavors to offer customers the most comprehensive post-sales services and protection; besides offering a 2-year warranty for standard Avalue products, an extended warranty service can also be provided based on additional request from the customer. Within the warranty period, customers are entitled to receive comprehensive and prompt repair and warranty.

Standard products manufactured by Avalue are offered a 2-year warranty, from the date of delivery from Avalue. For ODM/OEM products manufactured by Avalue or PCBA with conformal coating, will follow up the define warranty of the agreement, otherwise will be offered 1-year warranty for ODM/OEM products but non-warranty for PCBA with conformal coating. For outsourcing parts kit by Avalue (ex: Motherboard, LCD touch panel, CPU, RAM, HDD) are offered a 6-month warranty, and Mobile/Tablet PC battery are offered a warranty of the half year, from the date of delivery by Avalue. Products before the mass production stage, i.e. engineering samples are not applied in this warranty or service policy. For extended warranty and cross-territory services, product defects resulting from design, production process or material are covered by the pre-set warranty period after the date of delivery from Avalue. For non-Avalue products, the product warranty and repair time shall be based on the service standards provided by the original manufacturer; in principle Avalue will provide these products a warranty service for no more than one year.

2.2 Maintenance services within the warranty period

In the case of Avalue product DOA (Defect-on-Arrival) when the customer finds any defect within 1 month after the delivery, Avalue will replace it with a new product in a soonest way. Except for custom products, once the customer is approved of a Cross-Shipment Agreement, which allows for delivery a new product to the customer before receiving the defective one, Avalue will immediately proceed with new product replacement for the said DOA case. On validation of the confirmed defect, Avalue is entitled to reserve the right whether to provide a new product for replacement. For the returned defective new product, it is necessary to verify that there shall be no bruise, alteration, scratch or marking to the appearance, and that none of the delivered accessories missing; otherwise, the customer will be requested to pay a processing fee. On the other hand, if the new product defect is resulting from incorrect configuration or erroneous use by the user instead of any problem of the hardware itself, the customer will also be requested to pay for relevant handling fees.

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As for other conditions, Avalue will handle defects by way of repair. The customer will be requested to send the defective product to an Avalue authorized service center, and Avalue will return the repaired product back to the customer as soon as possible.

2.3 Ruling of an out-of-warranty defect

The following situations are not included in the warranty:

- The warranty period has expired.
- Product has been altered or its label of the serial number has been torn off.
- Product functionality issues resulting from improper use by the user, unauthorized dismantle or alteration, unfit operation environment, improper maintenance, accident or other causes. Avalue reserves the right for the ruling of the aforementioned situations.
- Product damage resulting from lightning, flood, earthquake or other calamities.
- The warranty rules of non-Avalue products and accessories shall be in accordance with standards set up by the original manufacturer. These products and accessories include RAM, HDD, FDD, CD-ROM, CPU, FAN, etc.
- Product upgrade request or test request submitted by the customer after expiration of the warranty.
- PCBA with conformal coating.
- Avalue semi-product and outsourced products without Avalue serial number.
- Products before the mass production stage, i.e. engineering samples.

3. Procedure for sending for repair

3.1 Attain a RMA number

A customer's rejected product returned for repair shall have a RMA (Return Merchandise Authorization) number. Without a RMA number, Avalue will not provide any repair service for the rejected product, and the product will be returned to the customer at customer's cost. Avalue will not issue any notice for the return of the product.

Each returned product for repair shall have a RMA number, which is simply the authorization of the return for repair; it is not a guarantee that the returned goods can be repaired or replaced. For applying for a RMA number, the customer may enter the eRMA webpage of Avalue <https://www.avalue.com/en/member> and log-in with an account number and a password authorized by Avalue. The system will then automatically issue a RMA number.

When applying for the RMA number, it is essential to fill in basic information of the customer and the product, together with detailed description of the problem encountered. If possible, avoid using ambiguous words such as "does not work" or "problematic". Without a substantial description of the problem, it is hard to start the repair and will cause prolonged repair time. Lacking detailed statement of fault steps also makes the problem hard to be identified, sometimes resulting in second-time repairs.

In case the customer can't define the cause of problem, please contact Avalue application engineers. Sometimes when the problem can be resolved even before the customer sends back the product.

On the other hand, if the customer only returns the key parts to Avalue for repair, it is necessary that the serial number of the entire unit is given in the "Problem Description" field, so that warranty period can be ruled accordingly; or Avalue will handle the case as an Out-of-warranty case.

3.2 Return of faulty product for repair

It is recommended that the customer not to return the accessories (manual, connection cables, etc.) with the products for repair, devices such as CPU, DRAM, CF memory card, etc., shall also be removed from the faulty goods before return for repair. If these devices are relevant to described repair problems and necessary to be returned with the goods; please clearly indicate the items included in the eRMA application form. Avalue shall not be responsible for any item that is not itemized. Moreover, make sure the problem(s) are detailed in the "Problem Description" field.

In the list of delivery, the customer may fill-in a value which is lower than the actual value, to prevent customs levying a higher tax over the excessive value of the return goods. The customer shall be held responsible for extra fees caused by this. We strongly recommend that "Invoice for customs purpose only with no commercial value" be indicated on the delivery note. Also for the purpose of expedited handling, please printout the RMA number and put it in the carton, also indicate the number outside of the carton, with the recipient addressing to Avalue RMA Department.

When returning the defective product, please use an anti-static bag or ESD material to pack it properly. In case of improper packing resulting in damages in the transportation process, Avalue reserves the right to reject the un-repaired faulty good at the customer's costs. Furthermore, it is suggested that the faulty goods shall be sent via a door-to-door courier service. The customer shall be held responsible for any customs clearance fee or extra expenses if Air-Cargo is used for the delivery.

In case of a DOA situation of a new product, Avalue will be responsible for the product and the freight. If the faulty goods are within the warranty period, the sender will take responsibility for the freight. For an out-of-warranty case, the customer shall be responsible for the freight of both trips.

3.3 Maintenance Charge

Avalue will charge a moderate repair fee for the following conditions:

- The warranty period has expired.
- Product has been altered or its label of the serial number has been torn off.
- Product functionality issues resulting from improper use by the user, unauthorized dismantle or alteration, unfit operation environment, improper maintenance, accident

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or other causes. Avalue reserves the right for the ruling of the aforementioned situations.

- Product damage resulting from lightning, flood, earthquake or other calamities.
- The warranty rules for non-Avalue products and accessories shall be in accordance with standards set up by the original supplier. These products and accessories include RAM, HDD, FDD, CD-ROM, CPU, FAN, etc.
- Product upgrade request or test request submitted by the customer after expiry of the warranty.
- PCBA with conformal coating.
- Avalue semi-product and outsourced products without Avalue serial number
- Products before the mass production stage, i.e. engineering samples.
- In case the products received are examined as NPF (No Problem Found) within the warranty period, the customer shall be responsible for the freight of both trips.
- Please contact your local distributor to examine in advance to prevent unnecessary freight cost.

For system failure of out-of-warranty products, Avalue will provide a quotation prior to repair service. When the customer applies for the cost, please refer to the Quotation number. In case the customer does not return the DOA product that has already been replaced by a new one, or the customer does not sign back the quotation of the out-of-warranty maintenance, Avalue reserves the right of whether or not to provide the repair service. In case the customer does not reply in 3 months, Avalue shall directly scrap or return the product back to customer at customer's cost without further notice to the customer.

3.4 Maintenance service of phased-out products

For servicing phased-out products, Avalue provides an extended period, starting the date of phase-out, as a guaranteed maintenance period of such products, for continuance of the maintenance service to meet customer's requirements. In case of unexpected factors causing Avalue to be unable to repair/replace a warranted but phased-out product, Avalue will, depending on the availability, upgrade the product (free of charge with continued warranty period as of the original product), or, give partial refund (based on the length of the remaining warranty period) to solve this kind of problem.

3.5 Maintenance Report

On completion of repair of a defective product, a Maintenance Report indicating the maintenance result and part(s) replaced (if any) will be sent to the customer together with the product. If the customer demands an additional maintenance analysis report, a service fee of various level will be charged depending on the warranty status. In case the analysis result shows that the defect attributes to Avalue's faulty design or process, the analysis fee will be exempted.

4. Service Products

Avalue provides service products to manage with different customer needs. Should you have any need, please consult to Avalue Sales Department.

Defect Analysis Report (DAR)

Avalue provides DAR (Defect Analysis Report) services aiming to elevating customer satisfaction. A DAR includes defect cause identification/verification/suggestion and improvement precautions, with instructions on correct usage for the avoidance of any reoccurrence.

Upgrade Service

Avalue is capable to provide system upgrade service for customization requirements. This upgrade service is applicable for main parts, such as CPU, memory, HDD, SSD, storage devices; also replacements motherboards of systems. Please contact Avalue sales for details to evaluate the possibility of system upgrade service and obtain information of lead time and price.

Safety Instructions

Safety Precautions

Before installing and using this device, please note the following precautions.

1. Read these safety instructions carefully.
2. Keep this User's Manual for future reference.
3. Disconnected this equipment from any AC outlet before cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
8. Use a power cord that has been approved for using with the product and that it matches the voltage and current marked on the product's electrical range label. The voltage and current rating of the cord must be greater than the voltage and current rating marked on the product.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to

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avoid damage by transient overvoltage.

12. Never pour any liquid into an opening. This may cause fire or electrical shock.

13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel. If one of the following situations arises, get the equipment checked by service personnel:

- The power cord or plug is damaged.
- Liquid has penetrated into the equipment.
- The equipment has been exposed to moisture.
- The equipment does not work well, or you cannot get it work according to the user's manual.
- The equipment has been dropped and damaged.
- The equipment has obvious signs of breakage.

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

15. Equipment intended only for use in a **RESTRICTED ACCESS AREA**.

Explanation of Graphical Symbols

	Warning	A WARNING statement provides important information about a potentially hazardous situation which, if not avoided, could result in death or serious injury.
	Caution	A CAUTION statement provides important information about a potentially hazardous situation which, if not avoided, may result in minor or moderate injury to the user or patient or in damage to the equipment or other property.
	Note	A NOTE provides additional information intended to avoid inconveniences during operation.
		Direct current.
		Alternating current
		Stand-by, Power on
		FCC Certification
		CE Certification
		Follow the national requirements for disposal of equipment.
		Stacking layer limit
		This side up

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		Fragile Packaging
		Beware of water damage, moisture-proof
		Carton recyclable
		Handle with care
		Follow operating instructions of consult instructions for use.

Disposing of your old product

WARNING:

There is danger of explosion if the battery is mishandled or incorrectly replaced. Replace only with the same type of battery. Do not disassemble it or attempt to recharge it outside the system. Do not crush, puncture, dispose of in fire, short the external contacts, or expose to water or other liquids. Dispose of the battery in accordance with local regulations and instructions from your service provider.

CAUTION:

- Lithium Battery Caution: Danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type. Dispose batteries according to manufacturer's instructions.
- Disposal of a BATTERY into fire or a hot oven, or mechanically crushing or cutting of a BATTERY, that can result in an EXPLOSION
- Leaving a BATTERY in an extremely high temperature surrounding environment that can result in an EXPLOSION or the leakage of flammable liquid or gas.
- A BATTERY subjected to extremely low air pressure that may result in an EXPLOSION or the leakage of flammable liquid or gas.

Mise en garde!

AVERTISSEMENT : Il existe un risque d'explosion si la batterie est mal manipulée ou remplacée de manière incorrecte. Remplacez uniquement par le même type de batterie. Ne le démontez pas et ne tentez pas de le recharger en dehors du système. Ne pas écraser, percer, jeter au feu, court-circuiter les contacts externes ou exposer à l'eau ou à d'autres liquides. Jetez la batterie conformément aux réglementations locales et aux instructions de votre fournisseur de services.

MISE EN GARDE:

- Pile au lithium Attention : Danger d'explosion si la pile n'est pas remplacée correctement. Remplacer uniquement par un type identique ou équivalent. Jetez les piles conformément aux instructions du fabricant.
- L'élimination d'une BATTERIE dans le feu ou dans un four chaud, ou l'écrasement ou le découpage mécanique d'une BATTERIE, pouvant entraîner une EXPLOSION
- Laisser une BATTERIE dans un environnement à température extrêmement élevée pouvant entraîner une EXPLOSION ou une fuite de liquide ou de gaz inflammable.
- UNE BATTERIE soumise à une pression d'air extrêmement basse pouvant entraîner une EXPLOSION ou une fuite de liquide ou de gaz inflammable.

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1. Getting Started

1.1 Safety Precautions

Warning!



Always completely disconnect the power cord from your chassis whenever you work with the hardware. Do not make connections while the power is on. Sensitive electronic components can be damaged by sudden power surges. Only experienced electronics personnel should open the PC chassis.

Caution!



Always ground yourself to remove any static charge before touching the CPU card. Modern electronic devices are very sensitive to static electric charges. As a safety precaution, use a grounding wrist strap at all times. Place all electronic components in a static-dissipative surface or static-shielded bag when they are not in the chassis.

1.2 Packing List

Before installation, please ensure all the items listed in the following table are included in the package.

Item	Description	Q'ty
1	EMX-RLUC Motherboard	1
2	DB9M COM Cable	4

Note:

Before using the motherboard power, ensure the power pinout, cables, and voltage match to avoid equipment damage.



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

1.3 Manual Objectives

This manual describes in details Avalue Technology EMX-RLUC Single Board.

We have tried to include as much information as possible, but we have not duplicated information that is provided in the standard IBM Technical References, unless it proved to be necessary to aid in the understanding of this board.

We strongly recommend that you study this manual carefully before attempting to set up EMX-RLUC or change the standard configurations. Whilst all the necessary information is available in this manual, we would recommend that unless you are confident, you contact your supplier for guidance.

Please be aware that it is possible to create configurations within the CMOS RAM that make booting impossible. If this should happen, clear the CMOS settings, (see the description of the Jumper Settings for details).

If you have any suggestions or find any errors regarding this manual and want to inform us of these, please contact our Customer Service department with the relevant details.

1.4 System Specifications

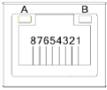
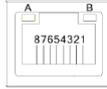
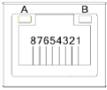
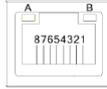
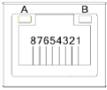
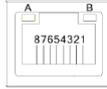
System	
CPU	Onboard Raptor Lake U series Intel® BGA Processor (TDP: 15W)
BIOS	AMI uEFI BIOS, 256Mbit SPI Flash ROM for i5 CPU AMI uEFI BIOS, 128Mbit SPI Flash ROM for i3 CPU
I/O Chip	Super I/O, ITE IT8786E-I
System Memory	2 x 260-Pin DDR4 3200MHz non-ECC SO-DIMM Socket Supports Up to 2 x 32GB
Watchdog Timer	H/W Reset, 1sec. – 65535sec./min.1sec. or 1min. step
H/W Status Monitor	CPU temperature monitoring Voltage monitoring CPU fan speed control
TPM	Onboard Infineon SLB 9670VQ2.0 support SPI TPM 2.0 By BOM optional
Expansion Slot	
M.2	<p>1 x M.2 Key-B 2242/3052 with USB3.2 Gen1x1 or PCIe x1 Signal, SIM card wafer for LTE/IO Cards support WWAN+GNSS or PCIe x1 SSD, and USB2.0. Default PCI-e x1 with USB2.0 only, USB 3.2 Gen1x1 by BOM optional</p> <p>*USB3.0 signal of M.2_Key-B_SSD/WWAN1 colay with R_USB2_UP. (BOM selectable) They could not be used at the same time, Default M.2 Key B USB 3.2 Gen1 disable.</p> <p>*USB2.0 signal of M.2_Key-B_SSD/WWAN1 colay with one of USB2.0 signal for F_USB2. They could not be used at the same time.</p> <p>Default M.2 Key B USB 2.0 enable.</p> <p>1 x 6 pin, pitch 1.25mm wafer connector for SIM Card (J_SIM1)</p> <p>1 x M.2 Key-E 2230 support Wi-Fi+BT module (1 x PCIe x1 & USB 2.0 Signal)</p> <p>*USB2.0 signal of M.2_Key-E_WLAN1 colay with one of USB2.0 signal for Internal F_USB2. They could not be used at the same time.</p> <p>Default M.2 Key E USB 2.0 enable.</p> <p>1 x M.2 Key-M 2242/2280 (PCIe x4/SATA) slot for storage NVMe/SATA SSD (Auto Detect)</p>
PCIe	1 x PCIe x4 Gen4 with PClex8 slot
Storage	

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M.2	1 x M.2 Key-M 2242/2280 (PCIe x4/SATA) slot for storage NVMe/SATA SSD (Auto Detect)
SATA	1 x SATA III (blue color connector)
Edge I/O	
LAN	1 x Intel® I210AT Gigabit Ethernet Controller 1 x Intel® I219-LM for core i5 CPU or 1 x Intel® I219V for i3 CPU Gigabit Ethernet Controller
USB	6 x USB3.2 Gen1x1 Type A, (each port) +5VSB/0.9A
DP	1 x DP++
HDMI	1 x HDMI2.0
Audio	Line-out + Mic-in 2in1 3.5mm Jack on rear I/O (Default CTIA, OMTP standard selectable by resistor.)
DC Input	DC in +12V Screw type DC in connector (co-lay Power Input 4Pin Wafer)
Onboard I/O	
COM	COM 1 to 4: 4 x 1 x 9 pin, pitch 1.25mm wafer for COM1~4: support RS-232 connector (J_COM1_4) [1]: PIN1 of COM1~4 can be DCD# (default) /5V, selectable by resistor. [2]: Board header PIN 8 to Cable side Pin 9 of COM1~4can be RI# (default)/ 12V by BOM optional production. COM 5~6 support RS-232/485 (TX/RX only) 2 x 1 x 3 pin, pitch 2.00mm wafer for COM5: support RS-232/485 connector (J_COM5 & J_COM6) 2 x 2 x 3 pin, pitch 2.54mm for COM 5: support RS232/485 selector by Jumper setting. (JP1_2) 2 x 2 x 3 pin, pitch 2.54mm for COM 6: support RS232/485 selector by Jumper setting. (JP3_4)
USB	1 x 2 x 5 pin, pitch 2.00mm wafer for 2 USB 2.0, +5V/0.5A (each port) (white color wafer)
GPIO	2 x 5 pin, pitch 2.00mm pin header for 8-bit GPIO, +3.3V level (J_GPIO1) (Max. 20mA output) *Pin10 is 5V by default, 3.3V is available if specified. (resistor selectable)
SATA Power	1 x 4 pin, pitch 2.00mm Wafer for 5/12V Power SATA Power,1A
CPU/System FAN	1 x 4 pin, pitch 2.54mm Wafer for CPU fan connector with smart fan function supported.(CPU_FAN1) 12V/1A. 1 x 4 pin, pitch 2.54mm Wafer for System fan connector with smart fan function supported.(SYS_FAN1) 12V/1A.
Buzzer	Onboard BUZZER 5V 88dB SMD
Front Panel	2 x 4 pin, pitch 2.00mm Wafer for Front panel (F_PANEL1, white color connector)

RTC Battery	1 x 2 pin, pitch 1.25mm Wafer horizontal type connector for CR2032(J_BAT1) (-20~60C Battery) Battery 3V/220mAh 35mm CR2032 Lithium Coin Cell.
AT/ATX Selector	1 x 3 pin, pitch 2.54mm pin header for AT/ATX jumper (J_AT/ATX1) Default ATX mode
Clear CMOS	1 x 3 pin, pitch 2.54mm pin header for CMOS clear (CLR_CMOS1)
LVDS	2 x 15 pin, pitch 2.00mm pin header connector for eDP or LVDS (JLVDS1/EDP1) default LVDS 2 x 3 pin, pitch 2.54mm pin header connector for LVDS VDD Select (JC_LVDS1) default 3.3V *Panel Power VDD is 3.3V by default, 5V/12V is selectable by LVDS VDD Select Jumper" (JC_LVDS1) *Default LVDS *eDP by BOM Optional production
LCD Backlight Brightness & LCD Inverter	1 x 6 pin, pitch 2.00mm Wafer connector LCD backlight brightness adjustment (PWM/DC) (Jumper default: 1-2 for PWM) (LVDS_P1) *LVDS_BKLT_CTL can be controlled by PWM(Default) /CCFL, selectable by Jumper" (JC_LVDS2) 1 x 3 pin, pitch 2.54mm pin header for LVDS Backlight PWM/CCFL select Jumper (JC_LVDS2)
eSPI	2 x 6 pin, pitch 2.00mm connector for eSPI debug (J_ESPI1) * Support BUF_PLT_RST_N by default, ESPI_RST0_N optional.
Amp Connector	1 x 4 pin, pitch wafer 2.00mm connector for 3W 8Ω x 2 Speaker (J_SPK1)
DC-Input	DC in +12V (Screw type, co-lay Power Input 4Pin Wafer) 1 x 4 pin, pitch wafer 3.96mm connector for DC 12V Power Input (J_DCIN3)
Power Output	1 x 4 pin, pitch wafer 2.5mm connector for DC +12V 2A /+5V 2A Power output (DC_OUT1)
Other	1 x 6 pin, pitch 1.25mm wafer connector for SIM Card (J_SIM1) (SIM card slot and cable sold separately) 1 x 6 pin, pitch 1.25mm wafer connector for I2C Touch screen(J_TCH1) By BOM optional production. 1 x 3 pin, pitch 2.54mm pin header for ME flash (J_ME1) for RD debug only, board without this pin header. 1 x 4 pin, pitch wafer 1.25mm wafer connector for Power Debug port (J_PRM1) Onboard Infineon SLB 9670VQ2.0 support SPI TPM 2.0) BOM optional
Display	

EMX-RLUC User's Manual

Graphic Chipset	Intel® UHD Graphics for 13th Gen Intel® Processors or Intel® Iris® Xe Graphics eligible for 12th Gen Intel® Processors																																																																																		
Spec. & Resolution	1 x HDMI 2.0: 4096 x 2340@60 Hz 1 x DP(DP1.4a): Max: 4096 x 2340@60 Hz LVDS: 1920 x 1200 Dual channel 18/24-bits LVDS (CapStone CS5211 eDP to LVDS) (Default LVDS) eDP1.2: Max 3840 x 2160@60 Hz (by BOM optional production)																																																																																		
Multiple Display	Triple Independent Display: 1 x HDMI, 1 x DP, 1 x LVDS or eDP (Default LVDS)																																																																																		
Audio																																																																																			
Audio Codec	Realtek ALC888S audio codec																																																																																		
Amplifier	TI TPA3113D2PWP Stereo Class-D 3W 8Ω x 2 Audio Amplifier																																																																																		
Ethernet																																																																																			
LAN Chipset	1 x Intel® I210AT Gigabit Ethernet Controller 1 x Intel® I219-LM Gigabit Ethernet Controller																																																																																		
LAN Spec.	LAN1: Intel® I210AT 10/100/1000 Base-Tx GbE compatible LAN2: Intel® I219-LM 10/100/1000 Base-Tx GbE compatible																																																																																		
LED Indicator	<table border="1"> <tr> <td rowspan="5">  </td> <th>Graphic</th> <th>Pin</th> <th>Definition</th> <th>Pin</th> <th>Definition</th> </tr> <tr> <td></td> <td>1</td> <td>XMDI_0+</td> <td>5</td> <td>XMDI_2+</td> </tr> <tr> <td></td> <td>2</td> <td>XMDI_0-</td> <td>6</td> <td>XMDI_2-</td> </tr> <tr> <td></td> <td>3</td> <td>XMDI_1+</td> <td>7</td> <td>XMDI_3+</td> </tr> <tr> <td></td> <td>4</td> <td>XMDI_1-</td> <td>8</td> <td>XMDI_3-</td> </tr> <tr> <td>A</td> <td rowspan="3">Active LED</td> <td colspan="2">ACT: Twinkling Yellow</td> <td rowspan="3">B</td> <td rowspan="3">Speed LED</td> <td>1000M: Turn Orange</td> </tr> <tr> <td></td> <td colspan="2">Only LINK: Lights Off</td> <td>100M: Turn Green</td> </tr> <tr> <td></td> <td colspan="2">Stop: Lights Off</td> <td>10M: Lights Off</td> </tr> </table> <table border="1"> <tr> <td rowspan="5">  </td> <th>Graphic</th> <th>Pin</th> <th>Definition</th> <th>Pin</th> <th>Definition</th> </tr> <tr> <td></td> <td>1</td> <td>XMDI_0+</td> <td>5</td> <td>XMDI_2+</td> </tr> <tr> <td></td> <td>2</td> <td>XMDI_0-</td> <td>6</td> <td>XMDI_2-</td> </tr> <tr> <td></td> <td>3</td> <td>XMDI_1+</td> <td>7</td> <td>XMDI_3+</td> </tr> <tr> <td></td> <td>4</td> <td>XMDI_1-</td> <td>8</td> <td>XMDI_3-</td> </tr> <tr> <td>A</td> <td rowspan="3">Active LED</td> <td colspan="2">ACT: Twinkling Yellow</td> <td rowspan="3">B</td> <td rowspan="3">Speed LED</td> <td>1000M: Turn Orange</td> </tr> <tr> <td></td> <td colspan="2">Only LINK: Lights Off</td> <td>100M: Turn Green</td> </tr> <tr> <td></td> <td colspan="2">Stop: Lights Off</td> <td>10M: Lights Off</td> </tr> </table>		Graphic	Pin	Definition	Pin	Definition		1	XMDI_0+	5	XMDI_2+		2	XMDI_0-	6	XMDI_2-		3	XMDI_1+	7	XMDI_3+		4	XMDI_1-	8	XMDI_3-	A	Active LED	ACT: Twinkling Yellow		B	Speed LED	1000M: Turn Orange		Only LINK: Lights Off		100M: Turn Green		Stop: Lights Off		10M: Lights Off		Graphic	Pin	Definition	Pin	Definition		1	XMDI_0+	5	XMDI_2+		2	XMDI_0-	6	XMDI_2-		3	XMDI_1+	7	XMDI_3+		4	XMDI_1-	8	XMDI_3-	A	Active LED	ACT: Twinkling Yellow		B	Speed LED	1000M: Turn Orange		Only LINK: Lights Off		100M: Turn Green		Stop: Lights Off		10M: Lights Off
	Graphic		Pin	Definition	Pin	Definition																																																																													
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			3	XMDI_1+	7	XMDI_3+																																																																													
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Mechanical & Environmental Specification																																																																																			
Power Requirement	DC in +12V																																																																																		
ACPI	Single power ATX Support S0, S3, S4, S5 ACPI 5.0 Compliant																																																																																		

Power Mode	AT / ATX mode Switchable Through Jumper
Operating Temp.	Intel@ standard CPU SKU support: 0~60°C w/HDD/SSD, ambient with 0.5 m/s Air flow
Storage Temp.	-20~ +75°C
Operating Humidity	40°C @ 95% Relative Humidity, Non-condensing
Size (L x W)	6.7" x 6.7" (170mm x 170mm)
Weight	0.88lbs (0.4Kgs)
Vibration Test	<p><u>Package Vibration Test</u> Reference IEC60068-2-64 Testing procedures Test Fh: Vibration broadband random Test</p> <ol style="list-style-type: none"> 1. PSD: 0.026G²/Hz, 2.16 Grms 2. Non-operation mode 3. Test Frequency: 5-500Hz 4. Test Axis: X,Y and Z axis 5. 30 min. per each axis 6. IEC 60068-2-64 Test:Fh <p><u>Random Vibration Operation</u> Reference IEC60068-2-64 Testing procedures Test Fh : Vibration broadband random Test</p> <ol style="list-style-type: none"> 1. PSD: 0.00454G²/Hz, 1.5 Grms 2. Operation mode 3. Test Frequency : 5-500Hz 4. Test Axis : X,Y and Z axis 5. 30 minutes per each axis 6. IEC 60068-2-64 Test:Fh <p><u>Random Vibration Non Operation</u> Reference IEC60068-2-64 Testing procedures Test Fh : Vibration broadband random Test</p> <ol style="list-style-type: none"> 1. PSD: 0.01818G²/Hz, 3.0 Grms 2. Non Operation mode 3. Test Frequency : 5-500Hz 4. Test Axis : X,Y and Z axis 5. 30 minutes per each axis 6. IEC 60068-2-64 Test:Fh
Drop Test	<p><u>Packing Drop</u> Reference ISTA 2A, Method : IEC-60068-2-32 Test: Ed Drop Test</p>

EMX-RLUC User's Manual

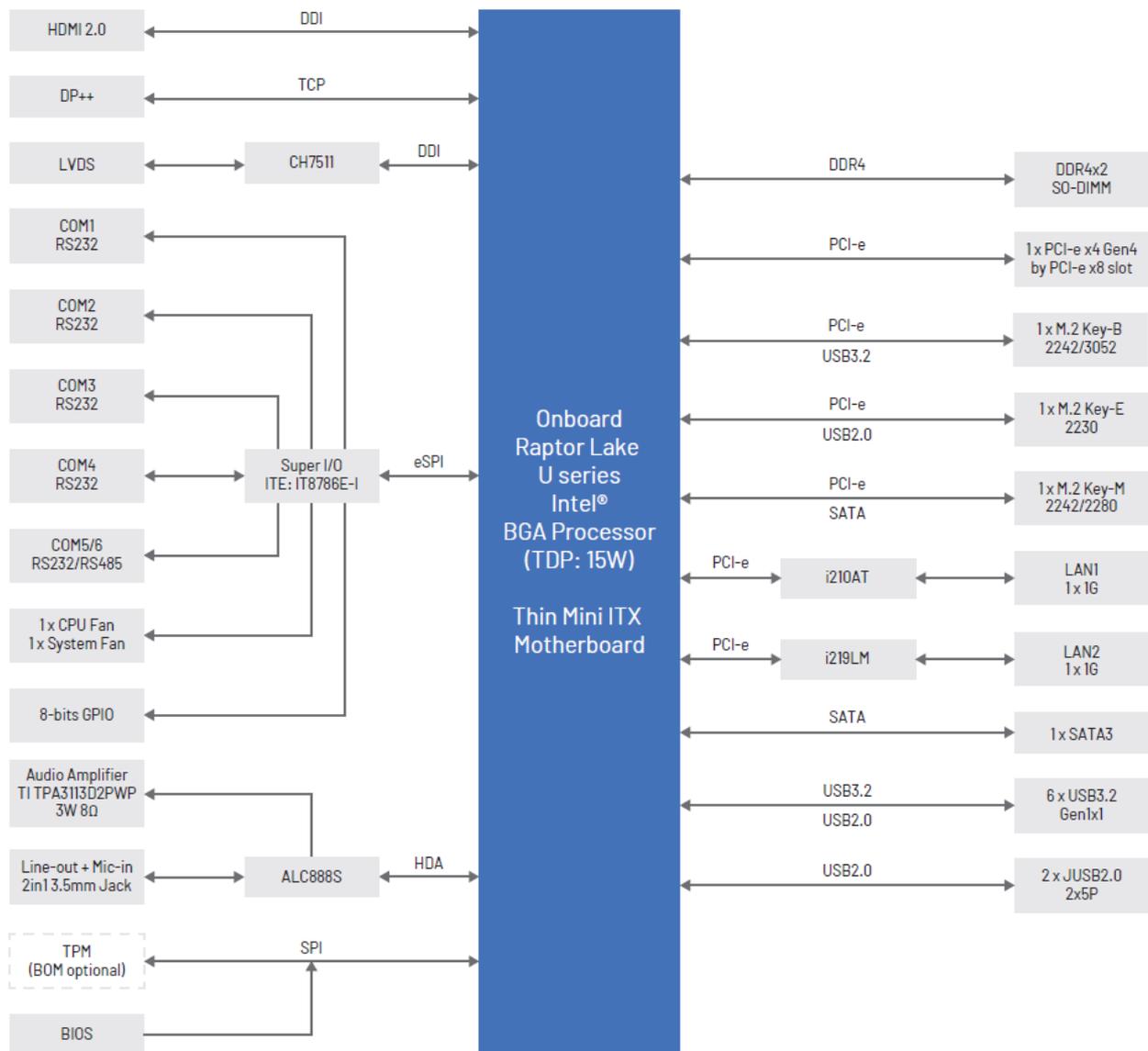
	1 One corner , three edges, six faces 2 ISTA 2A, IEC-60068-2-32 Test:Ed
OS Information	Windows 10 IoT Enterprise 2021 LTSC, Windows 10 (21H2), Windows 11 (21H2) or later, Linux Kernel 5.17 or later



Note: Specifications are subject to change without notice.

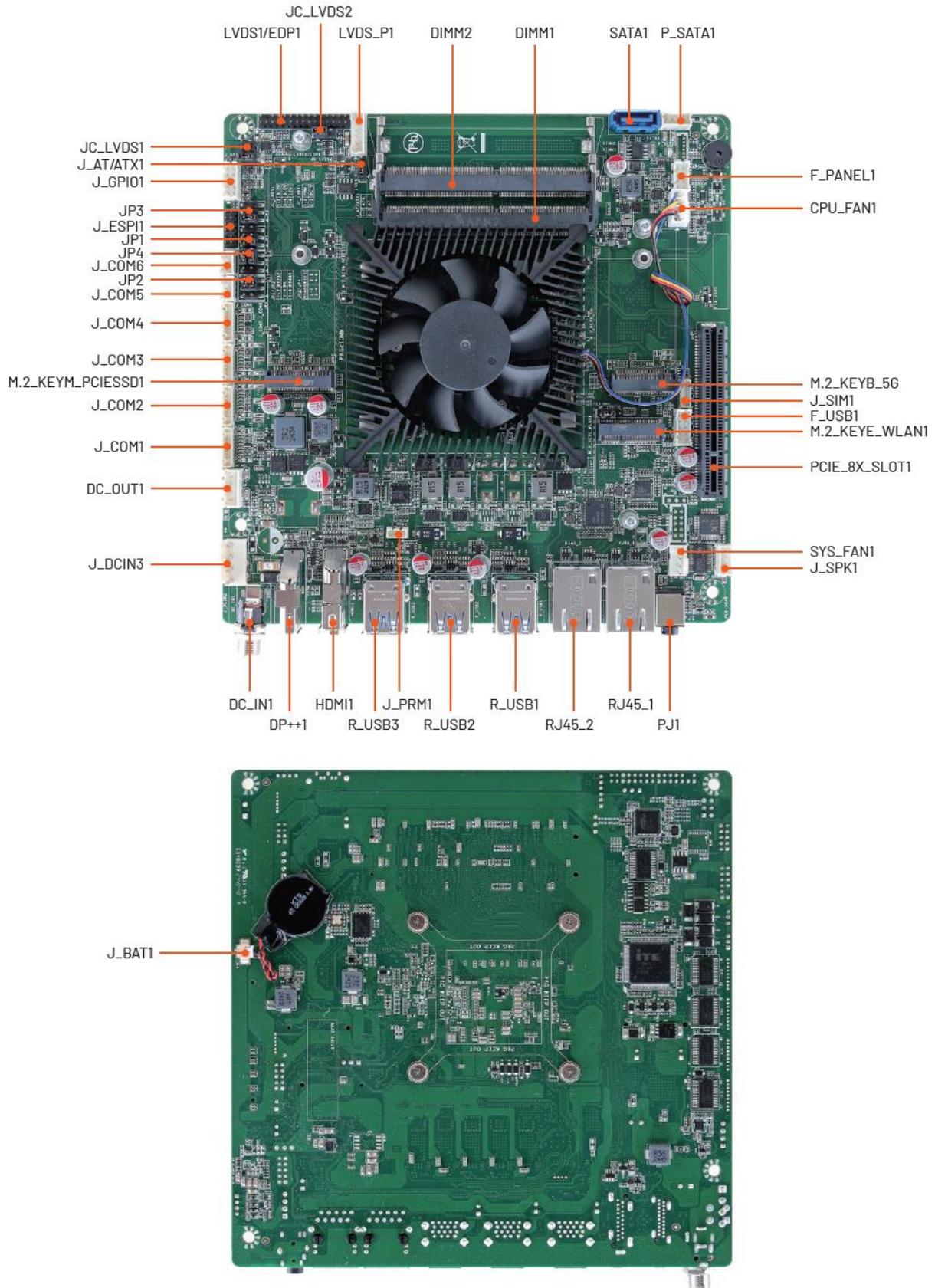
1.5 Architecture Overview—Block Diagram

The following block diagram shows the architecture and main components of EMX-RLUC.



2. Hardware Configuration

2.1 Product Overview



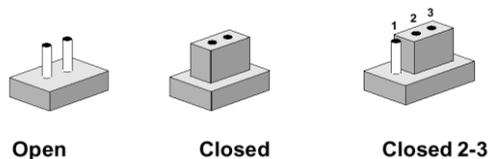
Note:

Before using the motherboard power, ensure the power pinout, cables, and voltage match to avoid equipment damage.

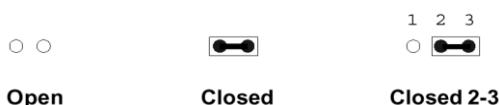
2.2 Jumper and Connector List

You can configure your board to match the needs of your application by setting jumpers. A jumper is the simplest kind of electric switch.

It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To “close” a jumper you connect the pins with the clip. To “open” a jumper you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2, and 3. In this case, you would connect either two pins.



The jumper settings are schematically depicted in this manual as follows:



A pair of needle-nose pliers may be helpful when working with jumpers.

Connectors on the board are linked to external devices such as hard disk drives, a keyboard, or floppy drives. In addition, the board has a number of jumpers that allow you to configure your system to suit your application.

If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any changes.

The following tables list the function of each of the board's jumpers and connectors.

Jumpers

Label	Function	Note
CLR_CMOS1	Clear CMOS	3 x 1 header, pitch 2.54mm
JC_LVDS1	LVDS VDD Select Jumper	3 x 2 header, pitch 2.54mm
JC_LVDS2	LVDS Backlight PWM/CCFL Select Jumper	3 x 1 header, pitch 2.54mm
J_AT/ATX1	AT/ATX Power Mode Select	3 x 1 header, pitch 2.54mm
JP1/2	COM5 RS232/RS485 Select Jumper 1/2	3 x 2 header, pitch 2.54mm
JP3/4	COM6 RS232/RS485 Select Jumper 3/4	3 x 2 header, pitch 2.54mm

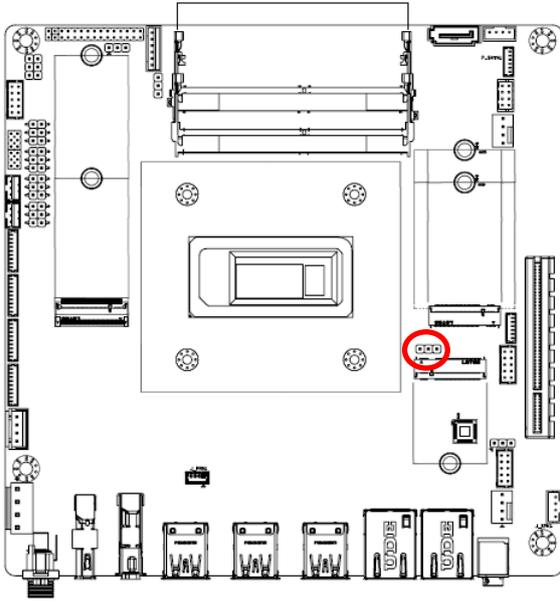
Connectors

Label	Function	Note
PJ1	Line-out & Mic-in audio jack	

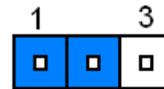
R_USB1/2/3	6 x USB3.2 Gen1 connector	
DP++1	DP connector	
M.2_KEYB_5G	M.2 KEY-B 5G connector	
M.2_KEYM_PCIESSD1	M.2 KEY-M 2242/2280 connector	
M.2_KEYE_WLAN1	M.2 KEY-E 2230 connector	
HDMI1	HDMI connector	
J_PRM1	Power Debug Wafer	4 x 1 wafer, pitch 1.25mm
LAN1/2	2 x RJ-45 Ethernet	
DC_IN1	12V Power connector	
DC_OUT1	DC 12V+5V Power Output Wafer	4 x 1 wafer, pitch 2.50mm
J_DCIN3	DC 12V Power Input Wafer	4 x 1 wafer, pitch 3.96mm
SYS_FAN1	SYS fan connector	4 x 1 wafer, pitch 2.54mm
CPU_FAN1	CPU fan connector	4 x 1 wafer, pitch 2.54mm
J_COM1/2/3/4	Serial port 1/2/3/4 connector	9 x 1 wafer, pitch 1.25mm
J_COM5/6	Serial port 5/6 connector	3 x 1 wafer, pitch 2.00mm
J_SPK1	Amplifier Wafer	4 x 1 wafer, pitch 2.00mm
F_USB1	USB2.0 connector	5 x 2 wafer, pitch 2.00mm
SATA1	Serial ATA connector	
P_SATA1	SATA power connector	4 x 1 wafer, pitch 2.00mm
DIMM1/2	DDR4 SODIMM socket	
LVDS1/EDP1	LVDS/eDP Signal Header	15 x 2 header, pitch 2.00mm
LVDS_P1	LVDS Backlight Control Wafer	6 x 1 wafer, pitch 2.00mm
J_ESPI1	ESPI Debug Header	6 x 2 header, pitch 2.00mm
J_SIM1	SIM card slot	6 x 1 wafer, pitch 1.25mm
J_GPIO1	GPIO Wafer	5 x 2 wafer, pitch 2.00mm
F_PANEL1	Front Panel Wafer	4 x 2 wafer, pitch 2.00mm
J_BAT1	Battery connector	2 x 1 wafer, pitch 1.25mm
PCIE_8X_SLOT1	PCI-E 8x Slot (PCI-E x4 Signal)	

2.3 Setting Jumpers & Connectors

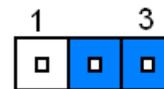
2.3.1 Clear CMOS (CLR_CMOS1)



Normal*

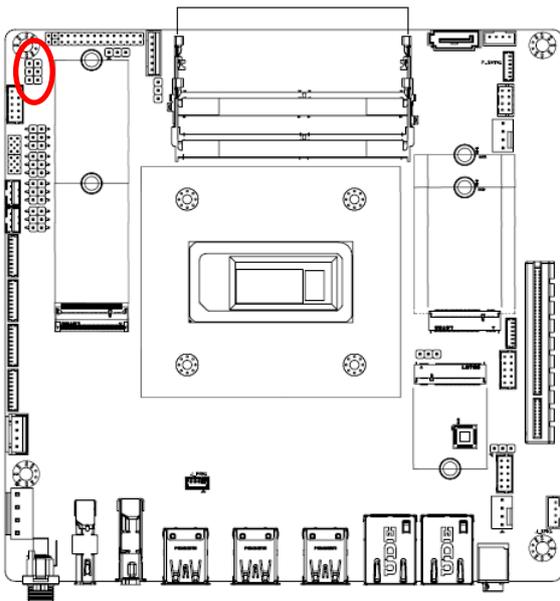


Clear CMOS

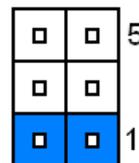


* Default

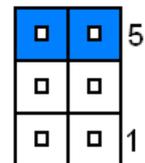
2.3.2 LVDS VDD Select Jumper (JC_LVDS1)



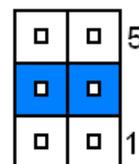
+3.3V*



+12V

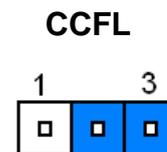
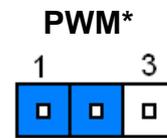
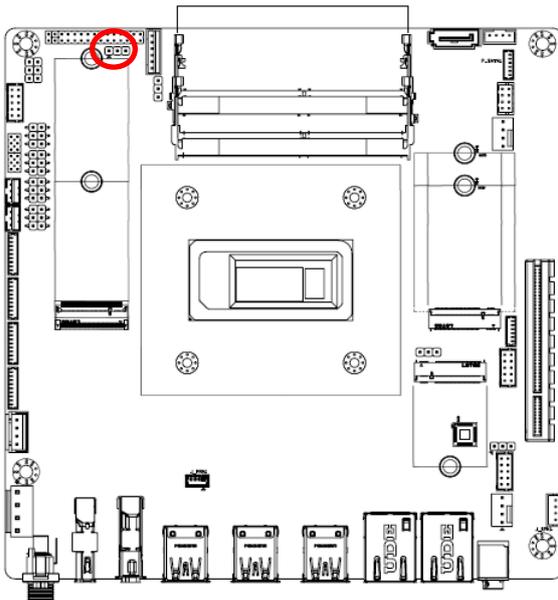


+5V



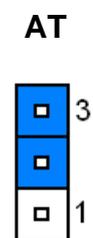
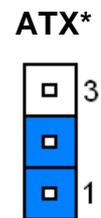
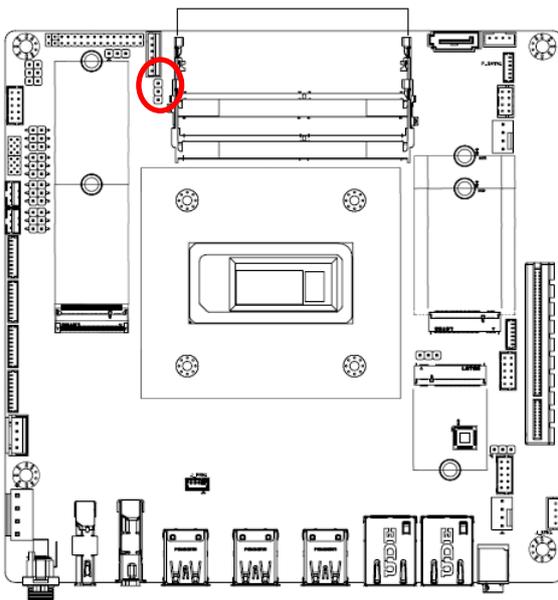
* Default

2.3.3 LVDS Backlight PWM/CCFL Select Jumper (JC_LVDS2)



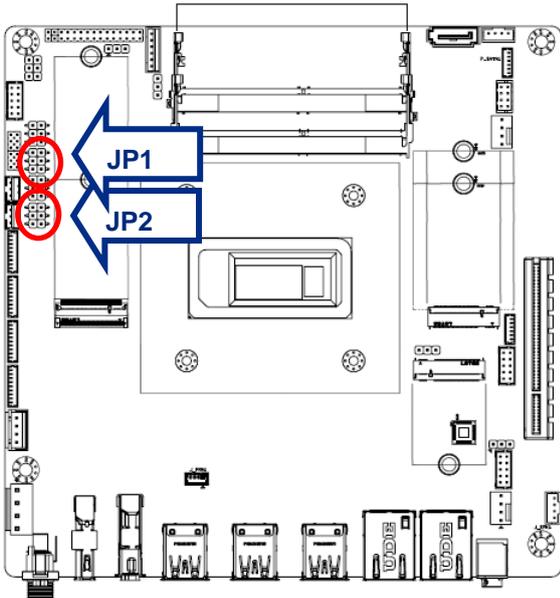
* Default

2.3.4 AT/ATX Power Mode Select (J_AT/ATX1)

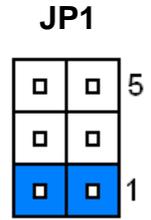
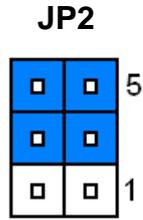


* Default

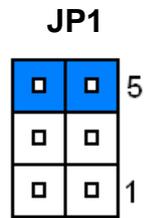
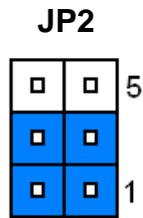
2.3.5 COM5 RS232/RS485 Select Jumper 1/2 (JP1/JP2)



RS232*

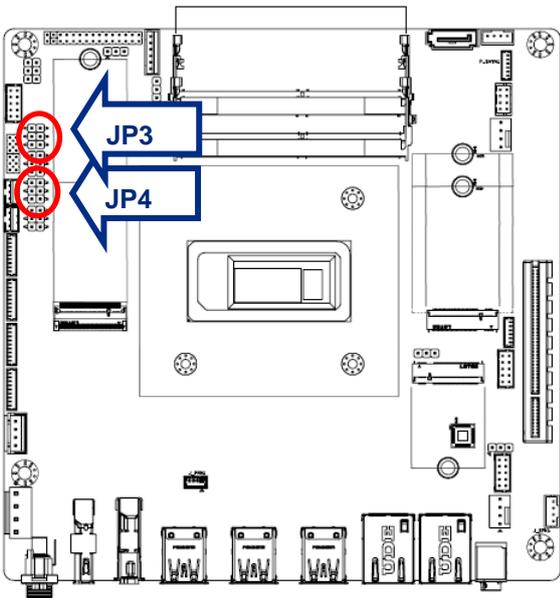


RS485

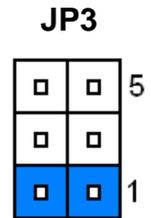
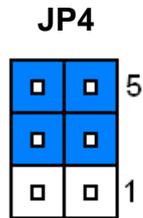


* Default

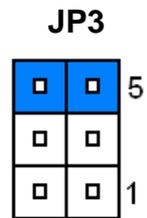
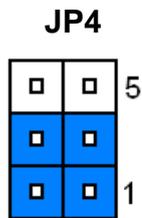
2.3.6 COM6 RS232/RS485 Select Jumper 3/4 (JP3/JP4)



RS232*

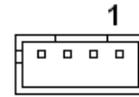
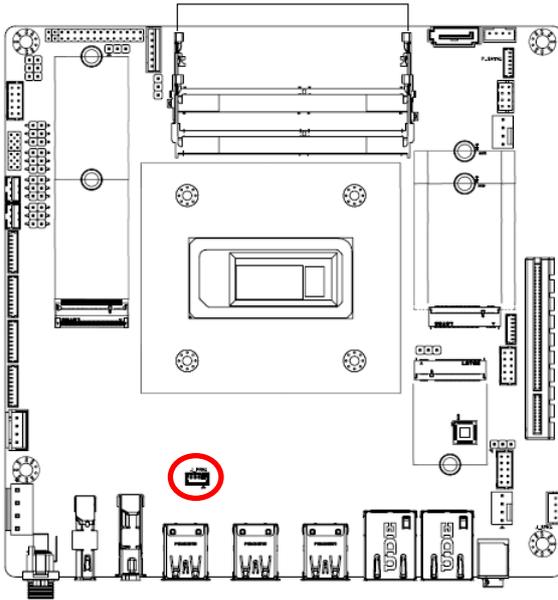


RS485



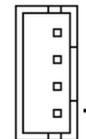
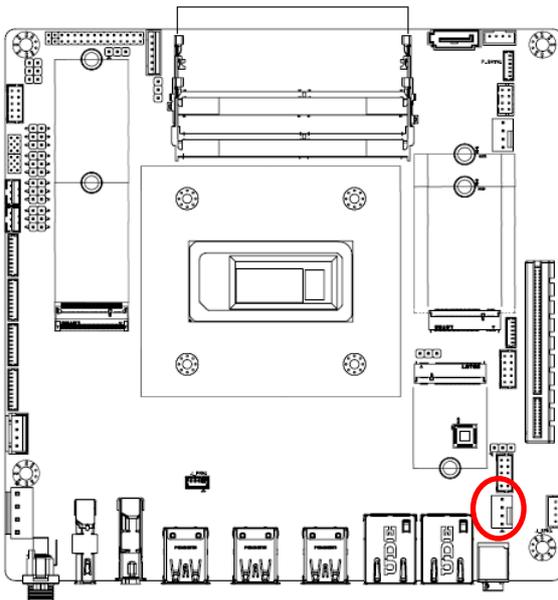
* Default

2.3.7 Power Debug Wafer (J_PRM1)



Signal	PIN
GND	1
IMVP_PE	2
VCCIN_SCL	3
VCCIN_SDA	4

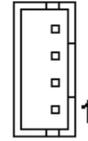
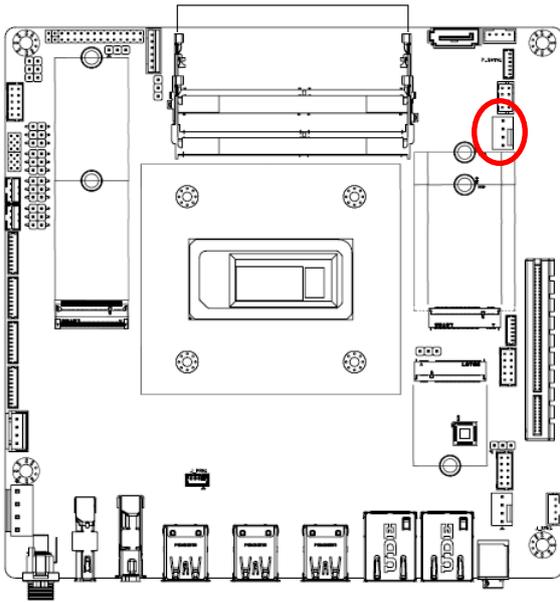
2.3.8 SYS fan connector (SYS_FAN1)



Signal	PIN
GND	1
+12V	2
FANTAC2	3
FANCTL2	4

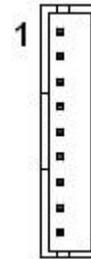
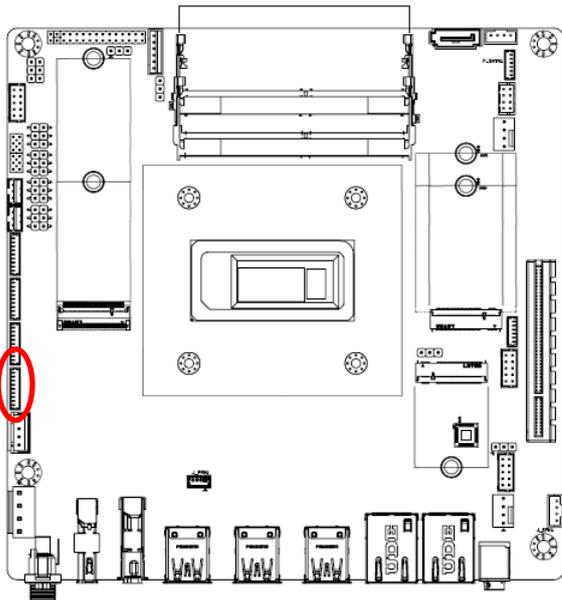
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2.3.9 CPU fan connector (CPU_FAN1)



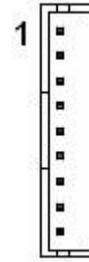
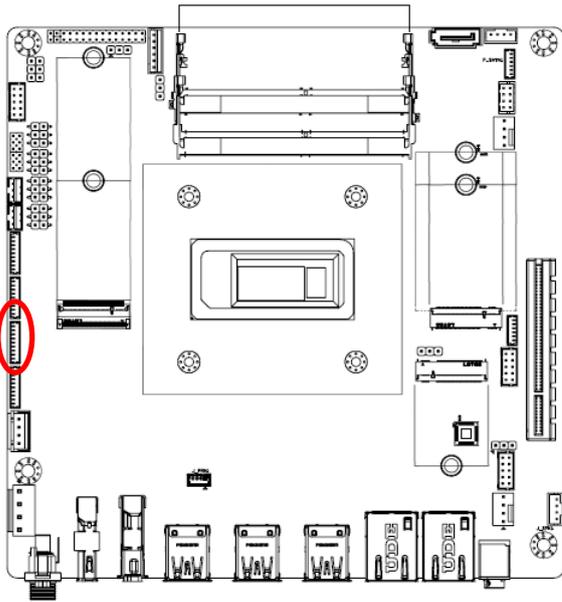
Signal	PIN
GND	1
+12V	2
FANTAC1	3
FANCTL1	4

2.3.10 Serial port 1 connector (J_COM1)



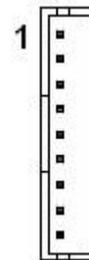
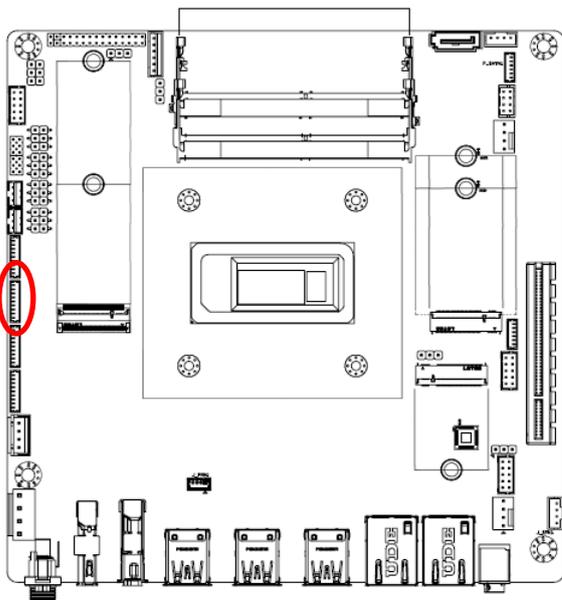
Signal	PIN	RS232_PIN	RS232 Signal
DCD#	1	1	DCD#
DSR#	2	6	DSR#
RXD	3	2	RXD
RTS#	4	7	RTS#
TXD	5	3	TXD
CTS#	6	8	CTS#
DTR#	7	4	DTR#
RI#	8	9	RI#
GND	9	5	GND

2.3.11 Serial port 2 connector (J_COM2)



Signal	PIN	RS232_PIN	RS232 Signal
DCD#	1	1	DCD#
DSR#	2	6	DSR#
RXD	3	2	RXD
RTS#	4	7	RTS#
TXD	5	3	TXD
CTS#	6	8	CTS#
DTR#	7	4	DTR#
RI#	8	9	RI#
GND	9	5	GND

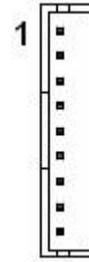
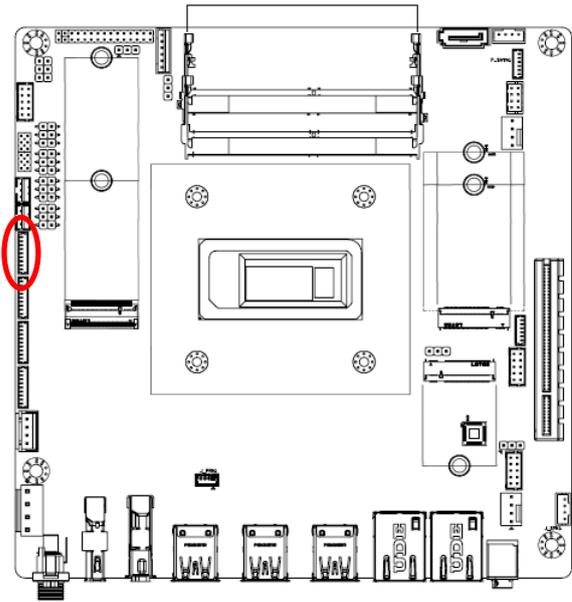
2.3.12 Serial port 3 connector (J_COM3)



Signal	PIN	RS232_PIN	RS232 Signal
DCD#	1	1	DCD#
DSR#	2	6	DSR#
RXD	3	2	RXD
RTS#	4	7	RTS#
TXD	5	3	TXD
CTS#	6	8	CTS#
DTR#	7	4	DTR#
RI#	8	9	RI#
GND	9	5	GND

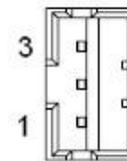
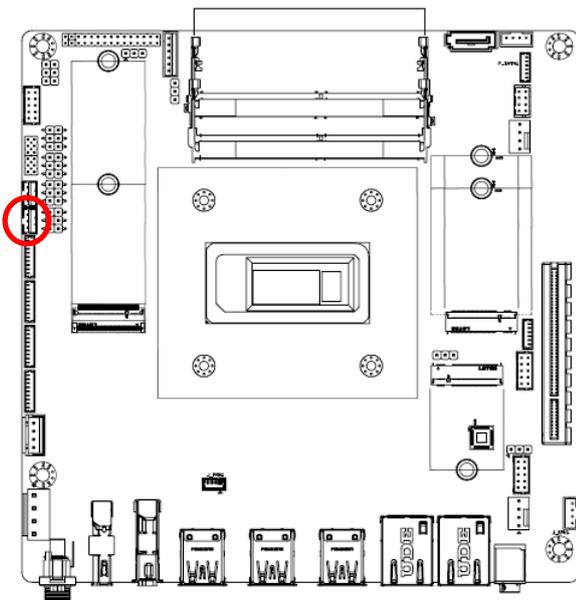
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2.3.13 Serial port 4 connector (J_COM4)



Signal	PIN	RS232_PIN	RS232 Signal
DCD#	1	1	DCD#
DSR#	2	6	DSR#
RXD	3	2	RXD
RTS#	4	7	RTS#
TXD	5	3	TXD
CTS#	6	8	CTS#
DTR#	7	4	DTR#
RI#	8	9	RI#
GND	9	5	GND

2.3.14 Serial port 5 connector (J_COM5)



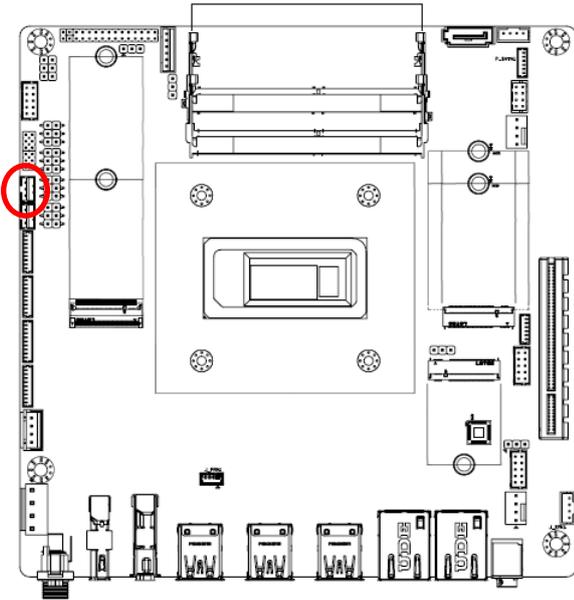
RS232

Signal	PIN
GND	3
TXD	2
RXD	1

RS485

Signal	PIN
GND	3
RS485-	2
RS485+	1

2.3.15 Serial port 6 connector (J_COM6)



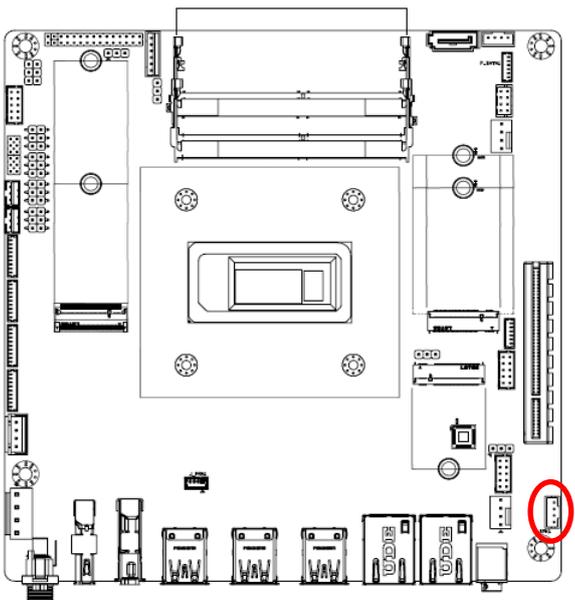
RS232

Signal	PIN
GND	3
TXD	2
RXD	1

RS485

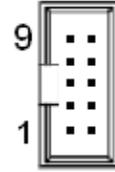
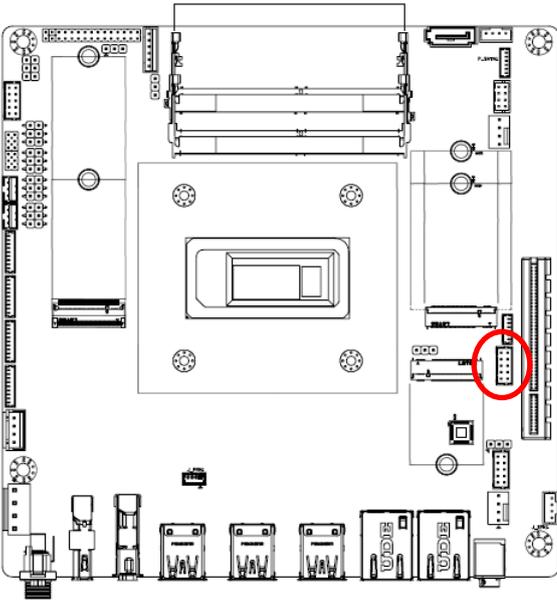
Signal	PIN
GND	3
RS485-	2
RS485+	1

2.3.16 Amplifier Wafer (J_SPK1)



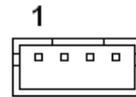
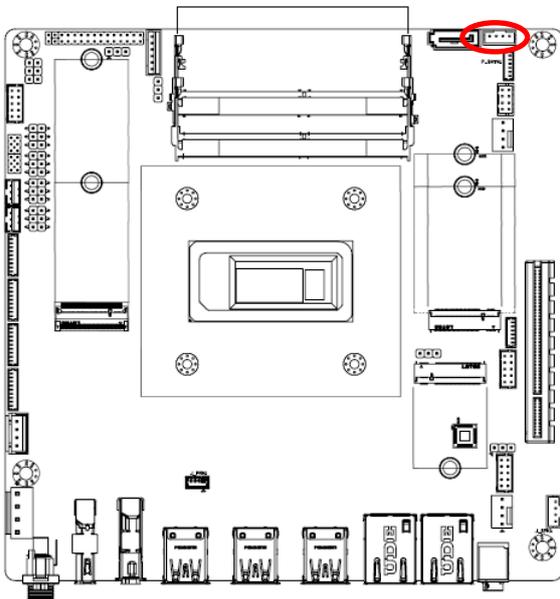
Signal	PIN
SPK_OUT_R+	4
SPK_OUT_R-	3
SPK_OUT_L+	2
SPK_OUT_L-	1

2.3.17 USB2.0 connector (F_USB1)



Signal	PIN	PIN	Signal
GND	9	10	GND
GND	7	8	GND
DATA+	5	6	DATA+
DATA-	3	4	DATA-
+5V	1	2	+5V

2.3.18 SATA Power connector (P_SATA1)

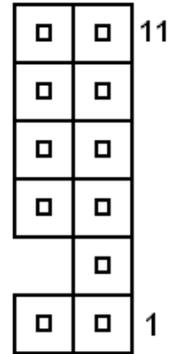
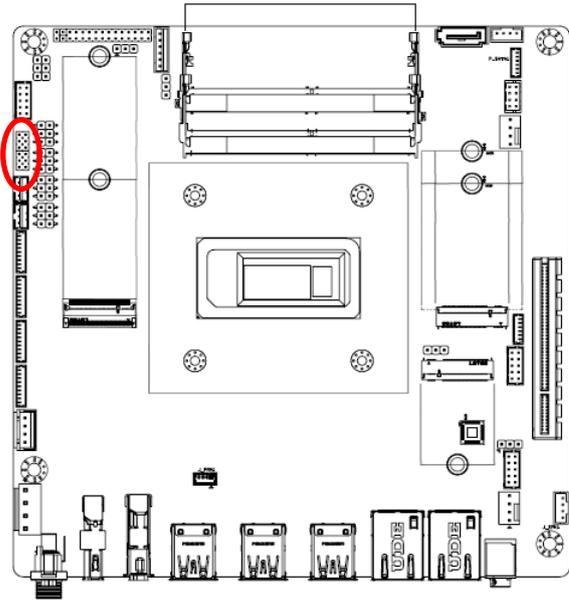


Signal	PIN
+12V	1
GND	2
GND	3
+5V	4

Note:

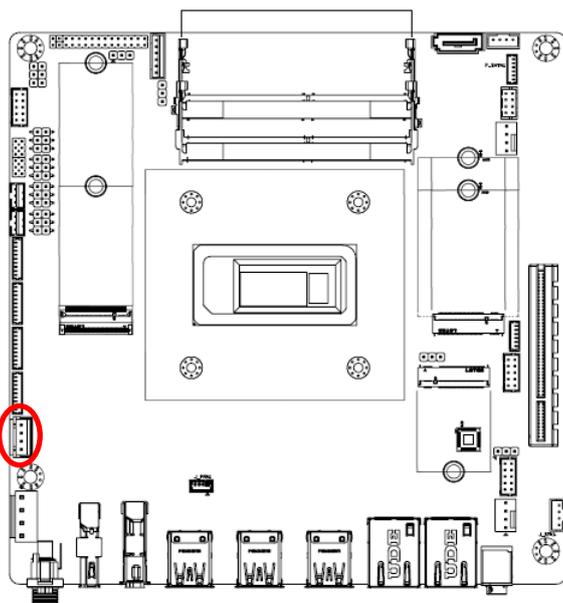
Before using the motherboard power, ensure the power pinout, cables, and voltage match to avoid equipment damage.

2.3.19 ESPI Debug Header (J_ESPI1)



Signal	PIN	PIN	Signal
ESPI_RST0_N	12	11	ESPI_ALERT0_N
+3.3V	10	9	ESPI_CS0_N
GND	8	7	ESPI_IO3_SIO
ESPI_CLK_SIO	6	5	ESPI_IO2_SIO
		3	ESPI_IO1_SIO
+3.3V	2	1	ESPI_IO0_SIO

2.3.20 DC Power Output Wafer (DC_OUT1)



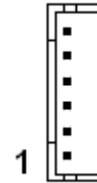
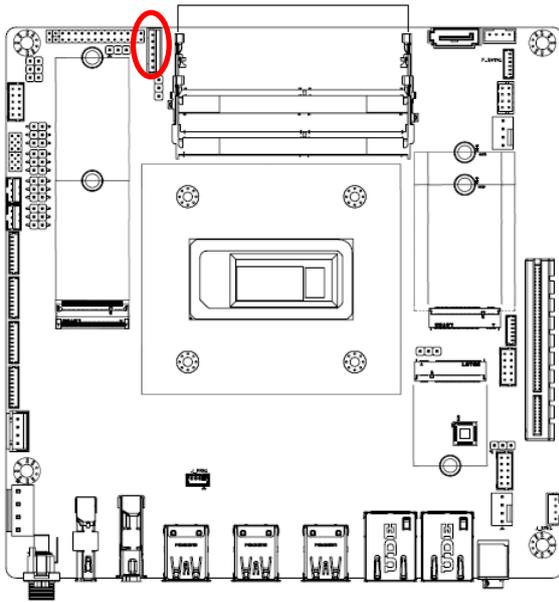
Signal	PIN
+5V	4
GND	3
GND	2
+12V	1

Note:

The maximum supply current for DC_OUT1 pin 1 and pin 4 is 5A per pin.

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2.3.21 LVDS Backlight Control Wafer (LVDS_P1)

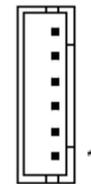
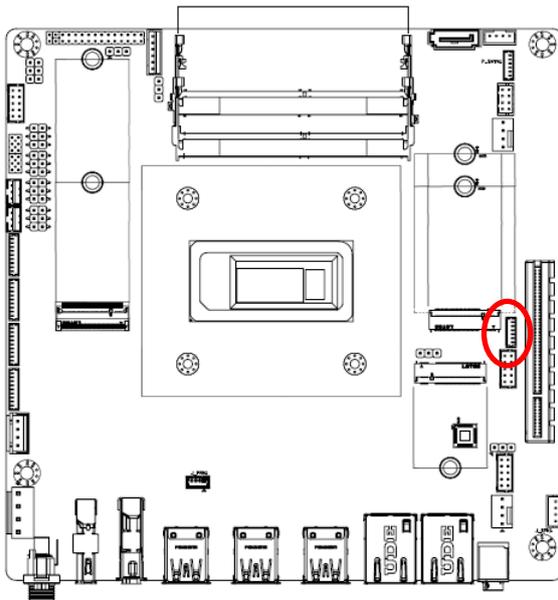


Signal	PIN
+12V	6
+12V	5
LVDS_BKLT_EN	4
LVDS_BKLTCTL	3
GND	2
GND	1

Note:

The maximum supply current for LVDS_P1 pin 5 and pin 6 is 2A per pin.

2.3.22 SIM card slot (J_SIM1)

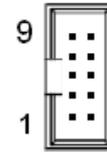
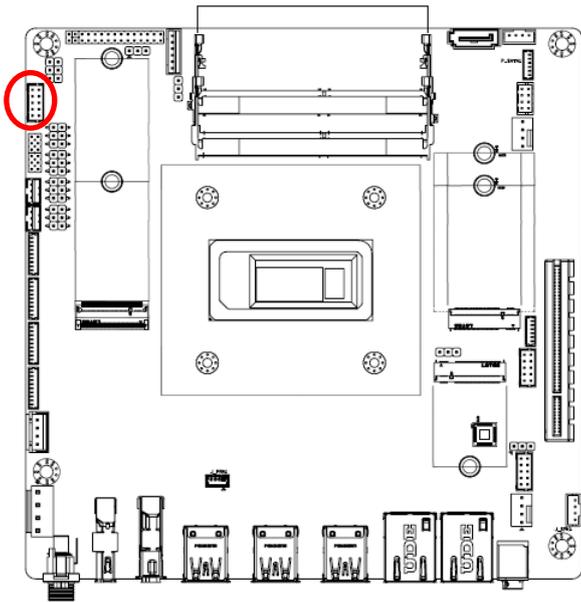


Signal	PIN
UIM1_VPP	6
UIM1_RST	5
UIM1_CLK	4
GND	3
UIM1_DAT	2
UIM1_PWR	1

Note:

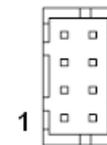
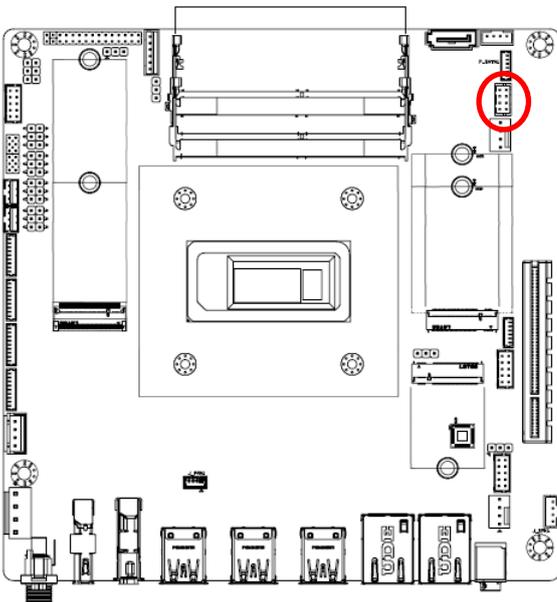
1. UIM1_PWR: Module power supply, dependent on the specific 4G module
2. UIM1_VPP: Module power supply, dependent on the specific 4G module..

2.3.23 GPIO Wafer (J_GPIO1)



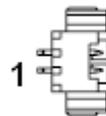
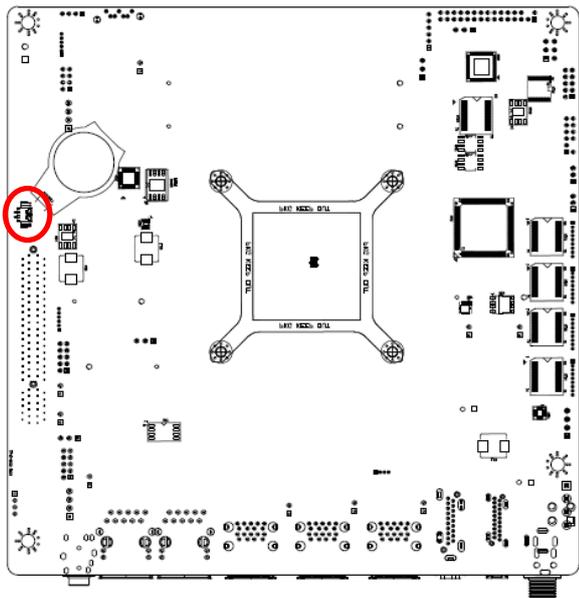
Signal	PIN	PIN	Signal
GND	9	10	+5V
SIO_GPO76	7	8	SIO_GPI77
SIO_GPO74	5	6	SIO_GPI75
SIO_GPO73	3	4	SIO_GPI72
SIO_GPO71	1	2	SIO_GPI70

2.3.24 Front Panel Wafer (F_PANEL1)



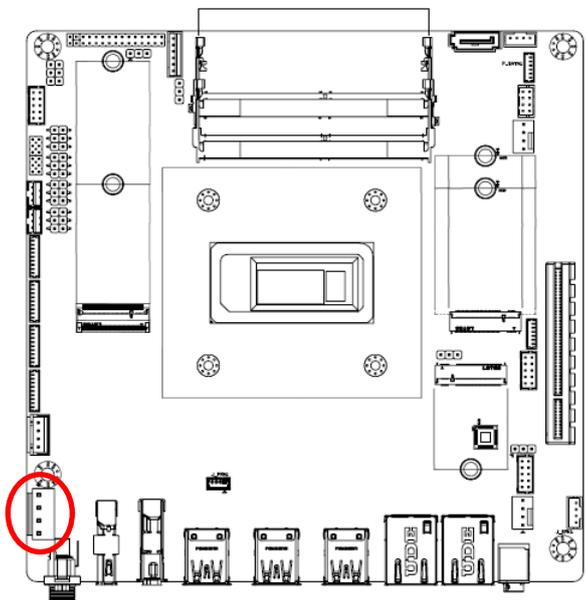
Description	Signal	PIN	PIN	Signal	Description
Power button	PWR-	7	8	RESET+	Reset
	PWR+	5	6	RESET-	button
PWR LED	PWR LED-	3	4	HDD_LED-	HDD LED
	PWR LED+	1	2	HDD_LED+	

2.3.25 Battery connector (J_BAT1)



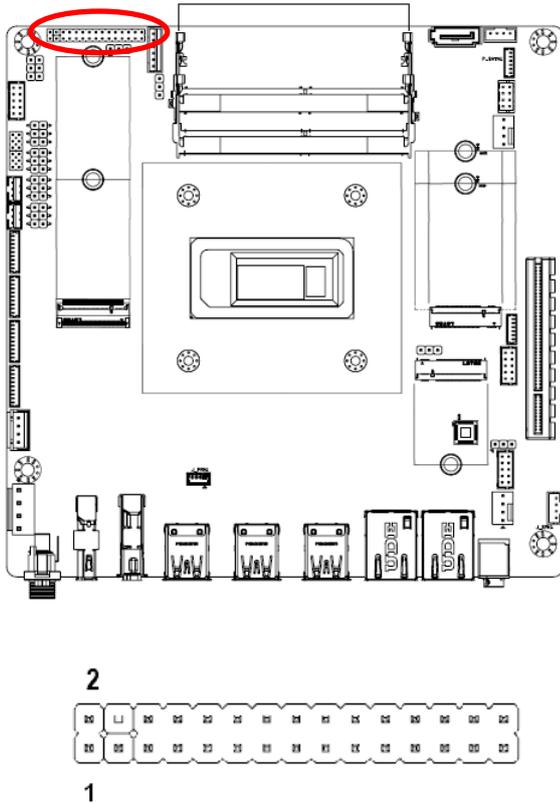
Signal	PIN
VCC_BAT	1
GND	2

2.3.26 DC 12V Power Input Wafer (J_DCIN3)



Signal	PIN
VCC_IN	1
VCC_IN	2
GND	3
GND	4

2.3.27 LVDS Signal Header (LVDS1)



Signal	PIN	PIN	Signal
VDD_PANEL	1	2	VDD_PANEL
VDD_PANEL	3	4	N/A
LVDS_PRSENT#	5	6	LVDS_PRSENT#
LVDS_DA_N0	7	8	LVDS_DA_P0
LVDS_DA_N1	9	10	LVDS_DA_P1
LVDS_DA_N2	11	12	LVDS_DA_P2
GND	13	14	GND
LVDS_CLKA_N	15	16	LVDS_CLKA_P
LVDS_DA_N3	17	18	LVDS_DA_P3
LVDS_DB_N0	19	20	LVDS_DB_P0
LVDS_DB_N1	21	22	LVDS_DB_P1
LVDS_DB_N2	23	24	LVDS_DB_P2
GND	25	26	GND
LVDS_CLKB_N	27	28	LVDS_CLKB_P
LVDS_DB_N3	29	30	LVDS_DB_P3

Note:

VDD_PANEL is +3.3V by default, +5V/+12V is selectable by Jumper(JC_LVDS1)

3. Drivers Installation

All the drivers are available on Avalue Downloads Area (<https://www.avalue.com/en/support/download>). Type the model name and press Enter to find all the relevant software, utilities, and documentation.

Chipset 1 Audio 1 Graphics 1 LAN 1 Other 1

Chipset Total 1 Files

No.	Release Date	Title	Description	Download
01	2023-09-20	Intel Chipset Driver for Win10 x64	Windows 10 64bit	

Audio Total 1 Files

No.	Release Date	Title	Description	Download
01	2023-09-20	Realtek Audio Driver for Win10 x64	Windows 10 64bit	

(For reference only)



Note: Installation procedures and screen shots in this section are for your reference and may not be exactly the same as shown on your screen.

3.1 Install Chipset Driver

All drivers can be found on the Avalue Official Website:
www.avalue.com.



Note: The installation procedures and screen shots in this section are based on Windows 11 operation system.



Step 3. Click Install.



Step1. Click Next.



Step 4. Click Finish to complete setup.



Step 2. Click Accept.

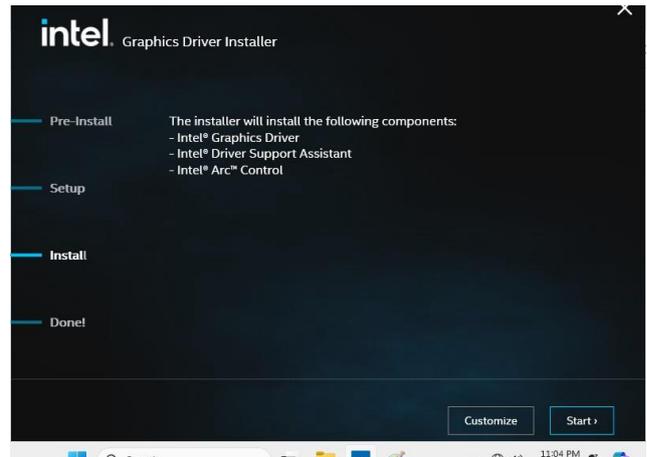
3.2 Install VGA Driver

All drivers can be found on the Avalue Official Website:

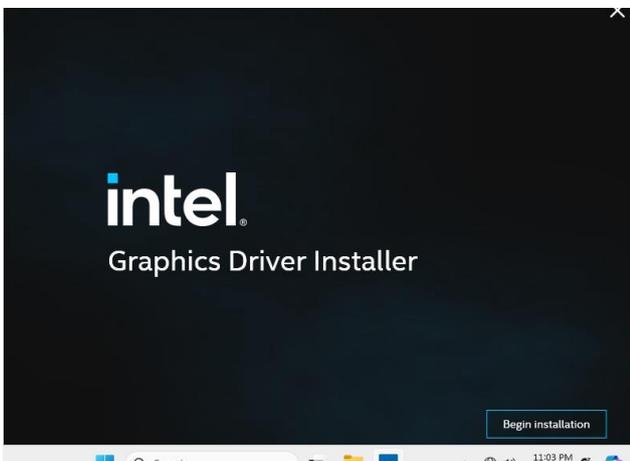
www.avalue.com.



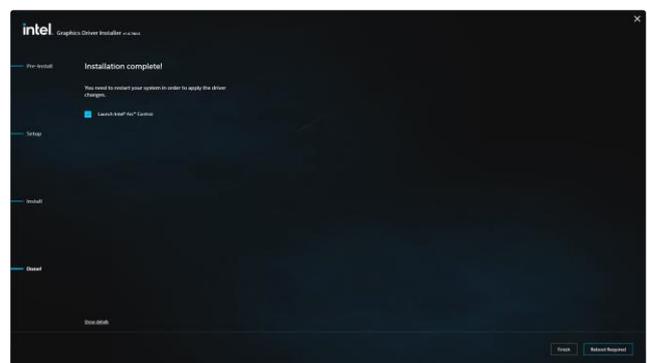
Note: The installation procedures and screen shots in this section are based on Windows 11 operation system.



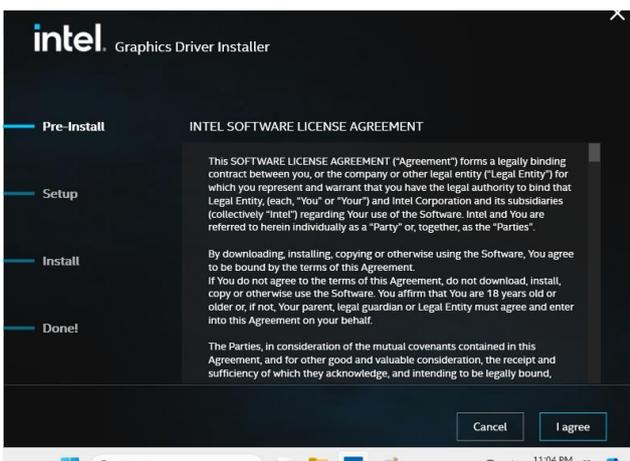
Step 3. Click Accept.



Step 1. Click Begin installation.



Step 4. Click Finish to complete setup.



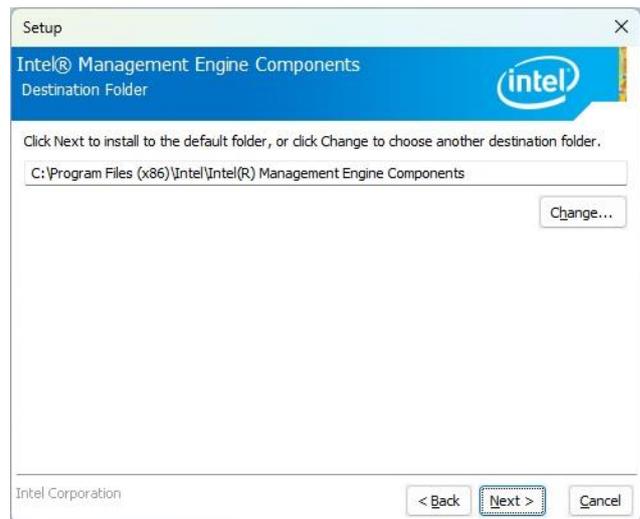
Step 2. Click I agree.

3.3 Install ME Driver

All drivers can be found on the Avalue Official Website:
www.avalue.com.



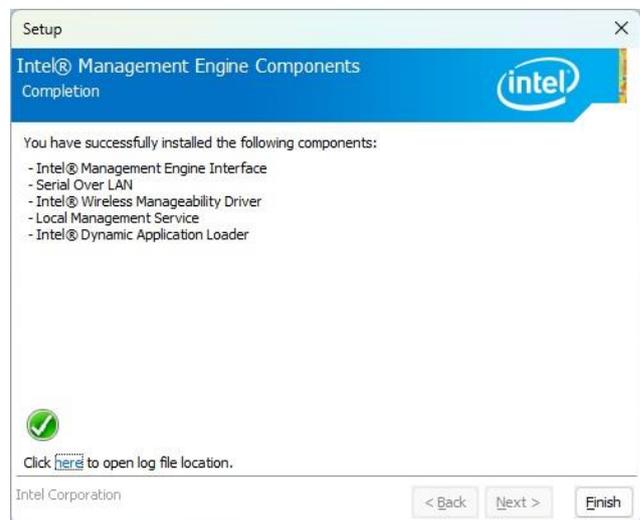
Note: The installation procedures and screen shots in this section are based on Windows 11 operation system.



Step 3. Click Next.



Step 1. Click Next to continue installation.



Step 4. Click Finish to complete setup.



Step 2. Click Next.

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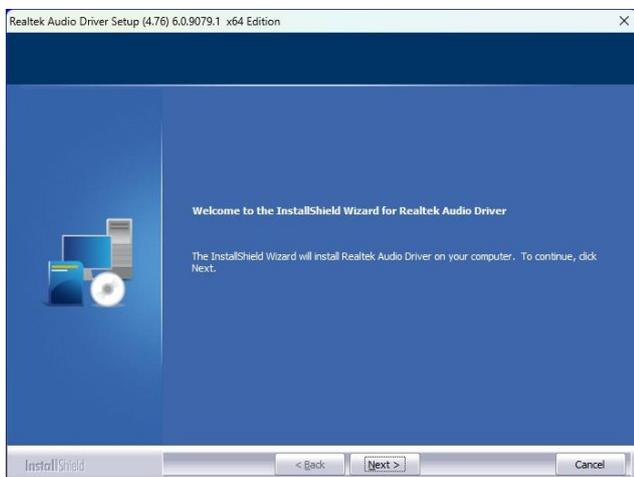
3.4 Install Audio Driver

All drivers can be found on the Avalue Official Website:

www.avalue.com.



Note: The installation procedures and screen shots in this section are based on Windows 11 operation system.



Step 1. Click Next.



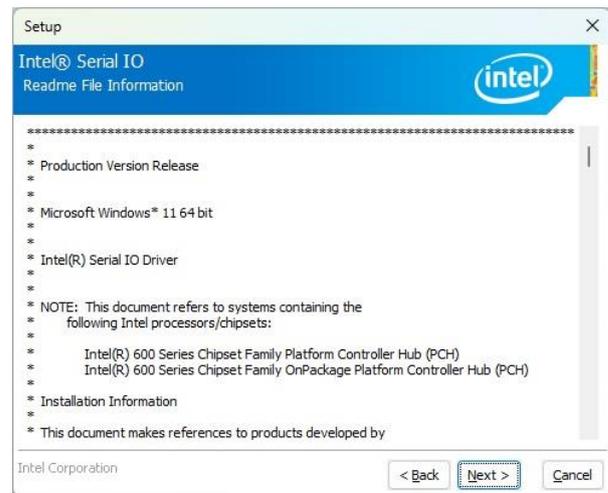
Step 2. Click Finish to complete setup.

3.5 Install Serial IO Driver

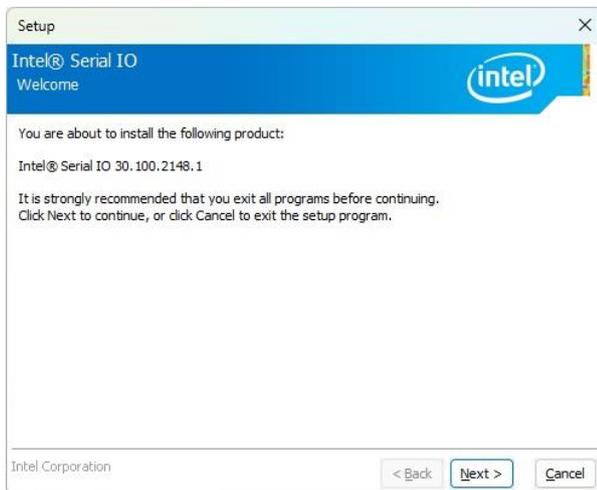
All drivers can be found on the Avalue Official Website:
www.avalue.com.



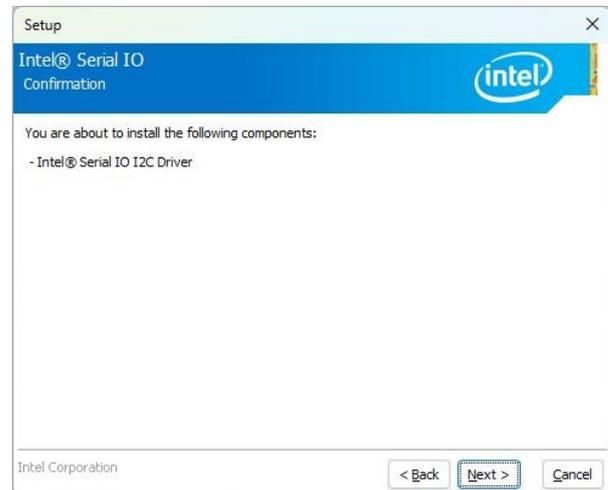
Note: The installation procedures and screen shots in this section are based on Windows 11 operation system.



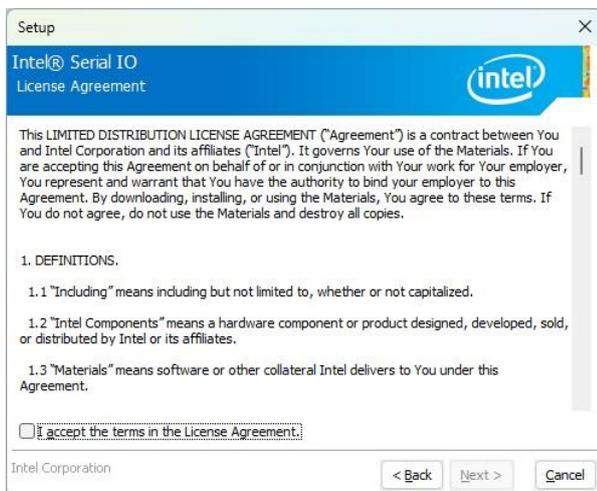
Step 3. Click Next.



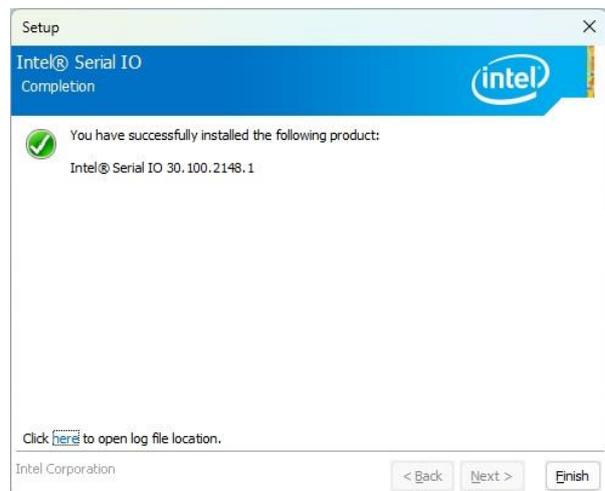
Step 1. Click Next to continue installation.



Step 4. Click Next.



Step 2. Click Next.



Step 5. Click Finish to complete setup.

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3.6 Install Ethernet Driver

All drivers can be found on the Avalue Official Website:

www.avalue.com.



Note: The installation procedures and screen shots in this section are based on Windows 11 operation system.



Step 1. Click **OK**.



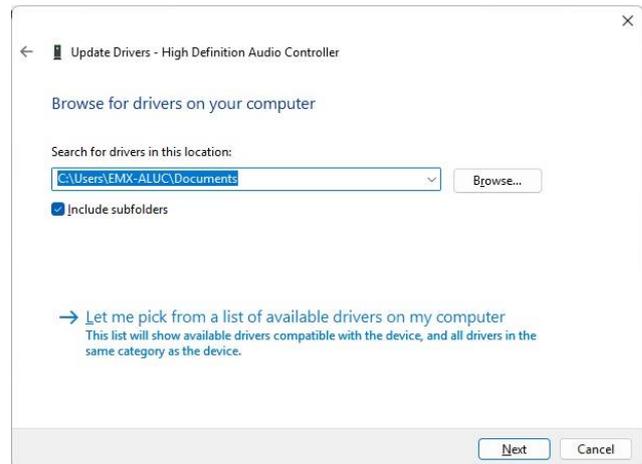
Step 2. Setup completed.

3.7 Install Intel_iSST Driver

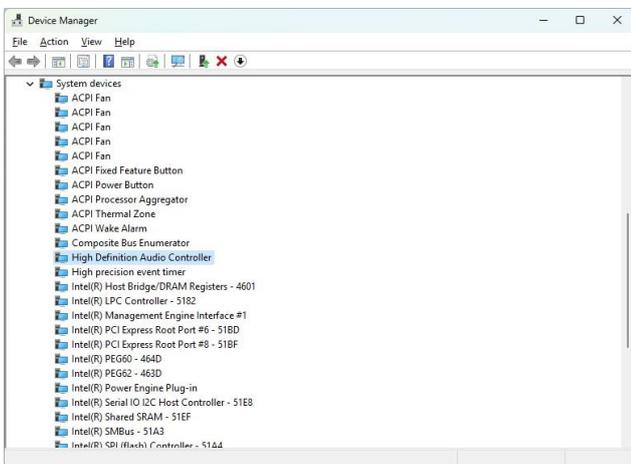
All drivers can be found on the Avalue Official Website:
www.avalue.com.



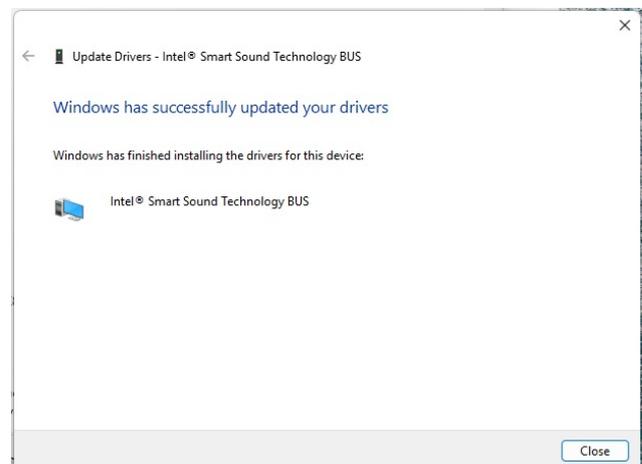
Note: The installation procedures and screen shots in this section are based on Windows 11 operation system.



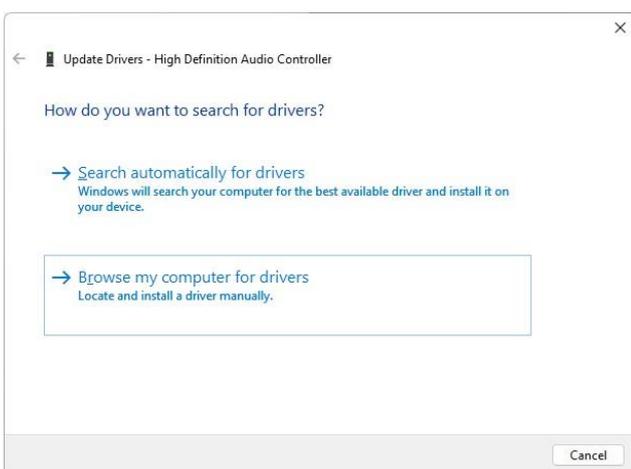
Step 3. Click Next.



Step 1. Click High Definition Audio Controller.



Step 4. Setup completed.



Step 2. Click Browse my computer for drivers.

4. BIOS Setup

4.1 Introduction

The BIOS setup program allows users to modify the basic system configuration. In this following chapter will describe how to access the BIOS setup program and the configuration options that may be changed.

4.2 Starting Setup

AMI BIOS™ is immediately activated when you first power on the computer. The BIOS reads the system information contained in the NVRAM and begins the process of checking out the system and configuring it. When it finishes, the BIOS will seek an operating system on one of the disks and then launch and turn control over to the operating system.

While the BIOS is in control, the Setup program can be activated in one of two ways:

By pressing <ESC> or immediately after switching the system on, or

By pressing the <ESC> or key when the following message appears briefly at the left-top of the screen during the POST (Power On Self Test).

Press <ESC> or to enter SETUP

If the message disappears before you respond and you still wish to enter Setup, restart the system to try again by turning it OFF then ON or pressing the "RESET" button on the system case. You may also restart by simultaneously pressing <Ctrl>, <Alt>, and <Delete> keys.

4.3 Using Setup

In general, you use the arrow keys to highlight items, press <Enter> to select, use the PageUp and PageDown keys to change entries, press <F1> for help and press <Esc> to quit. The following table provides more detail about how to navigate in the Setup program using the keyboard.

Button	Description
↑	Move to previous item
↓	Move to next item
←	Move to the item in the left hand
→	Move to the item in the right hand
Esc key	Main Menu -- Quit and not save changes into NVRAM Status Page Setup Menu and Option Page Setup Menu -- Exit current page and return to Main Menu
+ key	Increase the numeric value or make changes
- key	Decrease the numeric value or make changes
F1 key	General help, only for Status Page Setup Menu and Option Page Setup Menu
F2 key	Previous Values
F3 key	Optimized defaults
F4 key	Save & Exit Setup

- **Navigating Through The Menu Bar**

Use the left and right arrow keys to choose the menu you want to be in.



Note: Some of the navigation keys differ from one screen to another.

- **To Display a Sub Menu**

Use the arrow keys to move the cursor to the sub menu you want. Then press <Enter>. A “➤” pointer marks all sub menus.

4.4 Getting Help

Press F1 to pop up a small help window that describes the appropriate keys to use and the possible selections for the highlighted item. To exit the Help Window press <Esc> or the <Enter> key again.

4.5 In Case of Problems

If, after making and saving system changes with Setup, you discover that your computer no longer is able to boot, the AMI BIOS supports an override to the NVRAM settings which resets your system to its defaults.

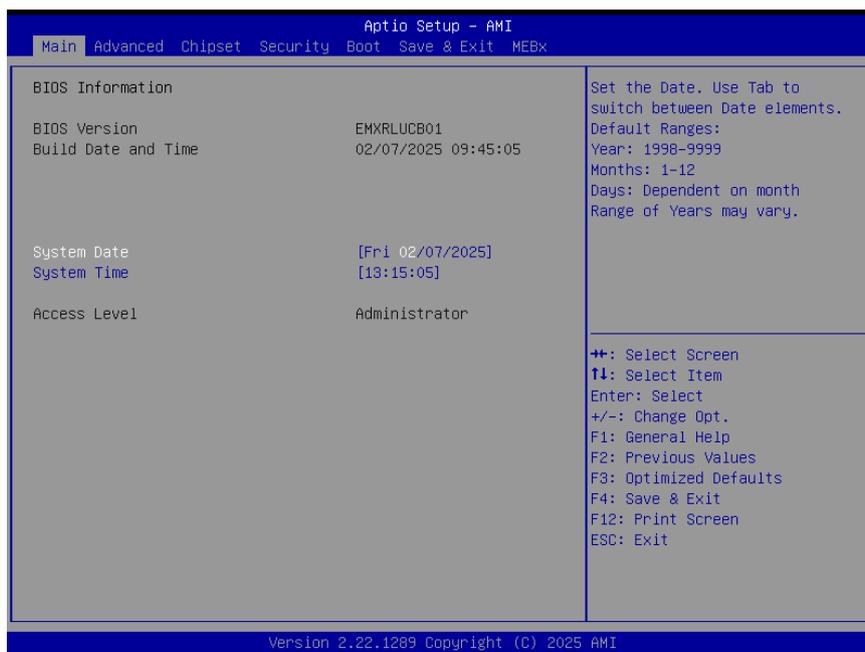
The best advice is to only alter settings which you thoroughly understand. To this end, we strongly recommend that you avoid making any changes to the chipset defaults. These defaults have been carefully chosen by both BIOS Vendor and your systems manufacturer to provide the absolute maximum performance and reliability. Even a seemingly small change to the chipset setup has the potential for causing you to use the override.

4.6 BIOS setup

Once you enter the Aptio Setup Utility, the Main Menu will appear on the screen. The Main Menu allows you to select from several setup functions and exit choices. Use the arrow keys to select among the items and press <Enter> to accept and enter the sub-menu.

4.6.1 Main Menu

This section allows you to record some basic hardware configurations in your computer and set the system clock.



4.6.1.1 System Date

Use the system date option to set the system date. Manually enter the Month, day and year.

4.6.1.2 System Time

Use the system time option to set the system time. Manually enter the hours, minutes and seconds.

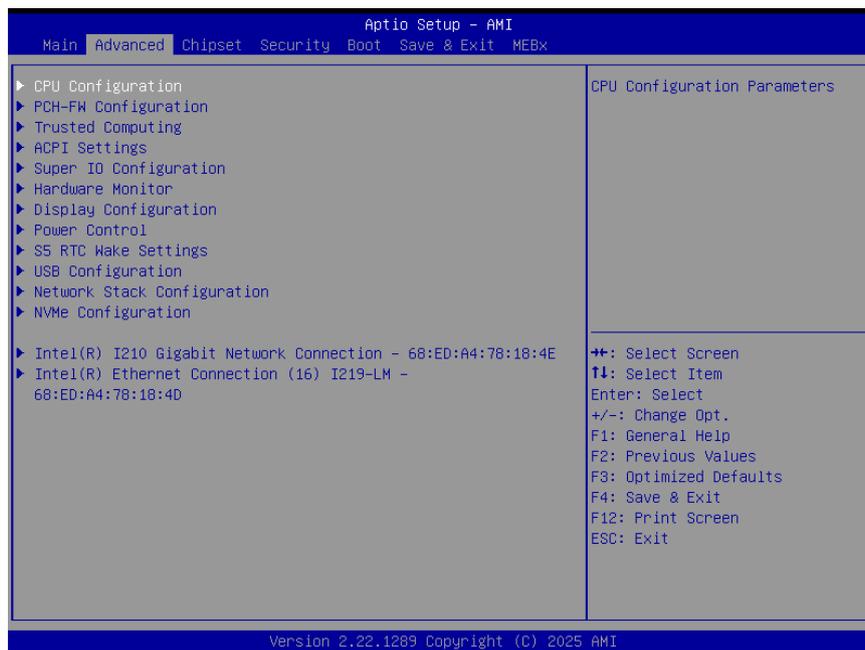


Note: The BIOS setup screens shown in this chapter are for reference purposes only, and may not exactly match what you see on your screen.

Visit the Avalue website (www.avalu.com) to download the latest product and BIOS information.

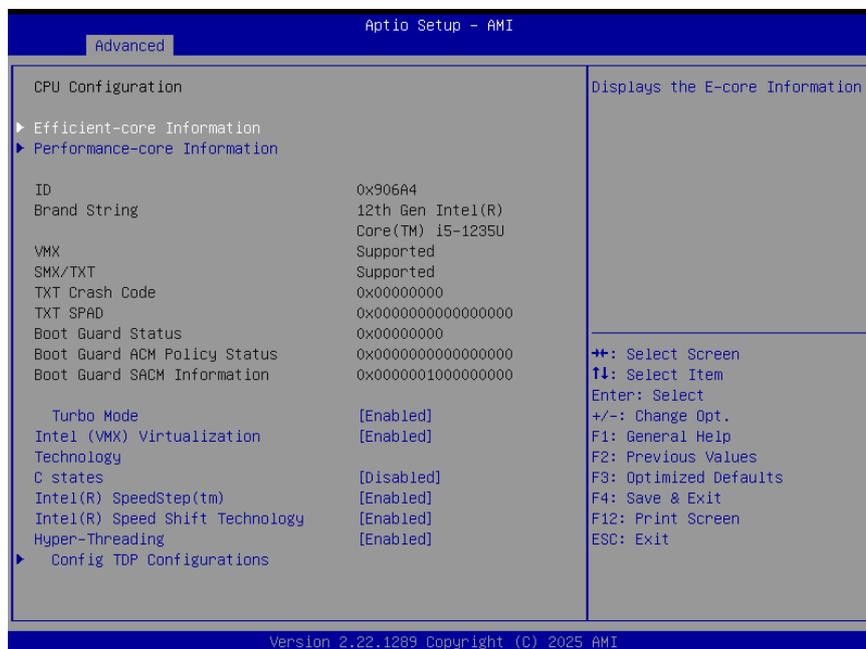
4.6.2 Advanced Menu

This section allows you to configure your CPU and other system devices for basic operation through the following sub-menus.



4.6.2.1 CPU Configuration

Use the CPU configuration menu to view detailed CPU specification and configure the CPU.

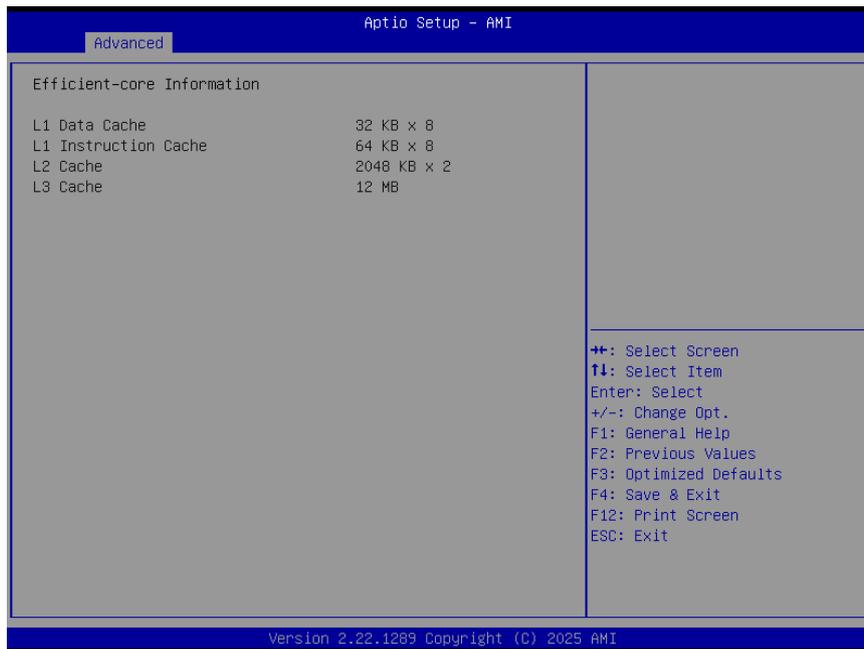


Item	Options	Description
Turbo Mode	Enabled[Default], Disabled	Enable/Disable processor Turbo Mode (requires EMTTM enabled too). AUTO means enabled.
Intel (VMX) Virtualization Technology	Disabled Enabled[Default]	When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool

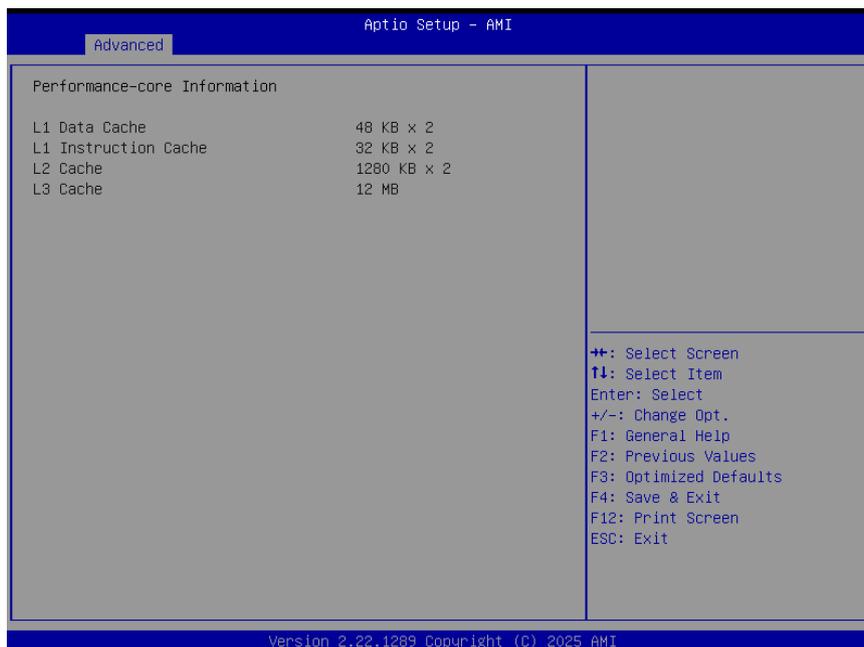
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		Technology.
C States	Enabled Disabled[Default],	Enable/Disable CPU Power Management. Allows CPU to go to C states when it's not 100% utilized.
Intel® SpeedStep™	Enabled[Default], Disabled	Allows more than two frequency ranges to be supported.
Intel® Speed Shift Technology	Enabled[Default], Disabled	Enable/Disable Intel® Speed Shift Technology support. Enabling will expose the CPPC v2 interface to allow for hardware controlled P-states.
Hyper-Threading	Disabled, Enabled[Default]	Enable or Disable Hyper-Threading Technology.

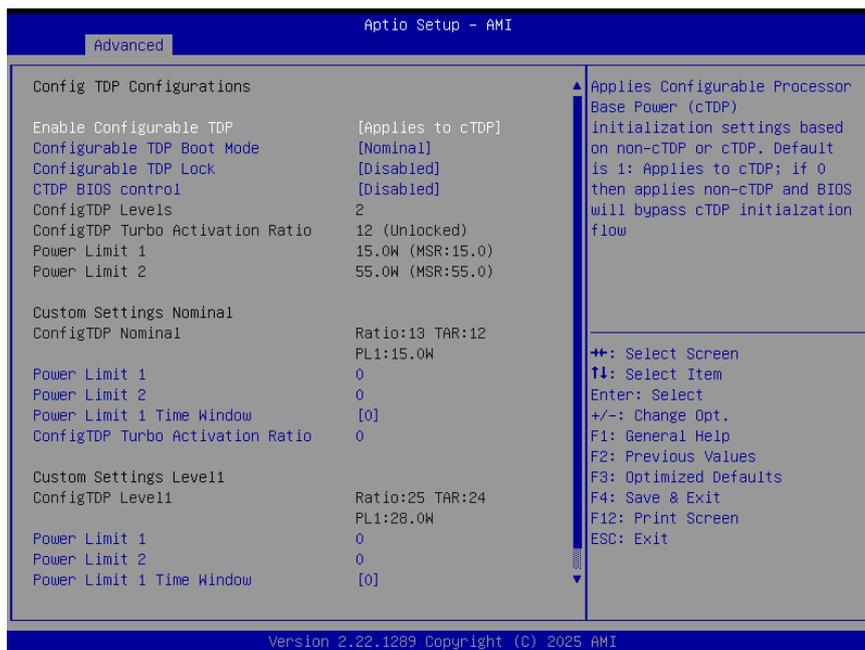
4.6.2.1.1 Efficient-core Information



4.6.2.1.2 Performance-core Information



4.6.2.1.3 Config TDP Configurations

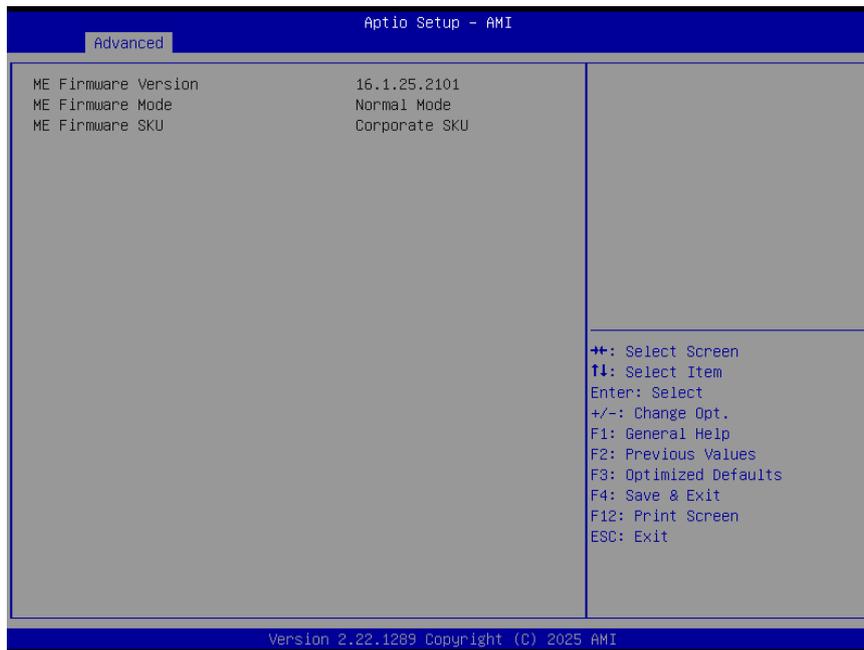


Item	Options	Description
Enable Configurable TDP	Applies to non-cTDP Applies to cTDP[Default],	Applies Configurable Processor Base Power (cTDP) initialization settings based on non-cTDP or cTDP. Default is 1: Applies to cTDP; if 0 then applies non-cTDP and BIOS will bypass cTDP initialization flow.
Configurable TDP Boot Mode	Nominal[Default] Level1 Deactivate	Configurable Processor Base Power (cTDP) Mode as Nominal/Level1/Level2/Deactivate TDP selection. Deactivate option will set MSR to Nominal and MMIO to Zero.
Configurable TDP Lock	Enabled Disabled[Default],	Configurable Processor Base Power (cTDP) Mode Lock bits on TURBO_ACTIVATION_RATIO and CONFIG_TDP_CONTROL. Note: When CTDP Lock is enabled Custom ConfigTDP Count will be forced to 1 and Custom ConfigTDP Boot Index will be forced to 0.
CTDP BIOS control	Enabled Disabled[Default],	Enables Configurable Processor Base Power (cTDP) control via runtime ACPI BIOS methods. This "BIOS only" feature does not require EC or driver support.
Power Limit 1/2	0	Power Limit 1/2 in Milli Watts. BIOS will round to the nearest 1/8W when programming. 0= no custom override. For 12.50w, enter 12500. Overclocking SKU: Value must be between Max and Min Power Limits (specified by PACKAGE_POWER_SKU_MSR). Other SKUs: This value must be between Min Power Limit and Processor Base Power

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		(TDP) Limit.
Power Limit 1 Time Window	0	Power Limit 1 Time Window value in seconds. The value may vary from 0 to 128.0= default value (28sec for Mobile and 8 sec for Desktop). Defines time window which Processor Base Power (TDP) value should be maintained.
ConfigTDP Turbo Activation Ratio	0	Custom value for Turbo Activation Ration. Needs to be configured with valid values from LFM to Max Turbo. 0 means don't use custom value.

4.6.2.2 PCH-FW Configuration



4.6.2.3 Trusted Computing



Item	Options	Description
Security Device Support	Disable, Enable[Default]	Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.

4.6.2.4 ACPI Settings

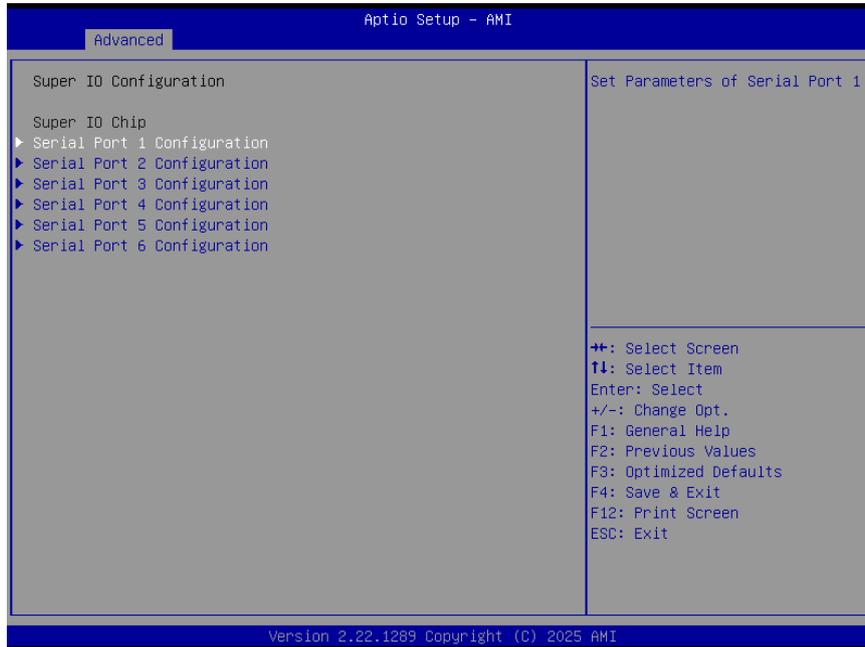


Item	Options	Description
Enable Hibernation	Disabled Enabled[Default],	Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may not be effective with some OS.
ACPI Sleep State	Suspend Disabled, S3 (Suspend to RAM)[Default]	Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.

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4.6.2.5 Super IO Configuration

You can use this item to set up or change the Super IO configuration for serial ports. Please refer to 4.6.2.5.1 ~ 4.6.2.5.6 for more information.



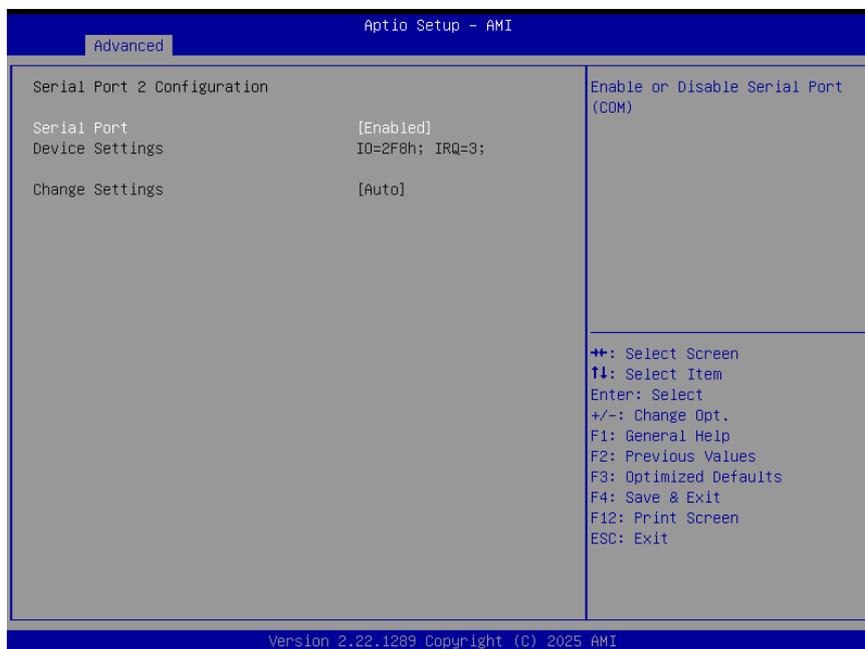
Item	Description
Serial Port 1 Configuration	Set Parameters of Serial Port 1 (COM1).
Serial Port 2 Configuration	Set Parameters of Serial Port 2 (COM2).
Serial Port 3 Configuration	Set Parameters of Serial Port 3 (COM3).
Serial Port 4 Configuration	Set Parameters of Serial Port 4 (COM4).
Serial Port 5 Configuration	Set Parameters of Serial Port 5 (COM5).
Serial Port 6 Configuration	Set Parameters of Serial Port 6 (COM6).

4.6.2.5.1 Serial Port 1 Configuration



Item	Option	Description
Serial Port	Enabled[Default], Disabled	Enable or Disable Serial Port (COM).

4.6.2.5.2 Serial Port 2 Configuration



Item	Option	Description
Serial Port	Enabled[Default], Disabled	Enable or Disable Serial Port (COM).

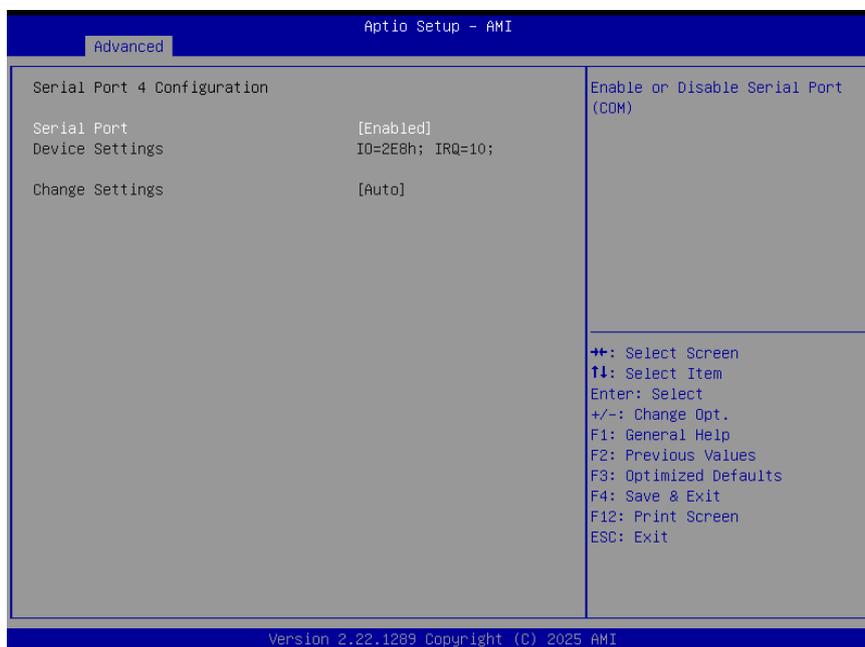
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4.6.2.5.3 Serial Port 3 Configuration



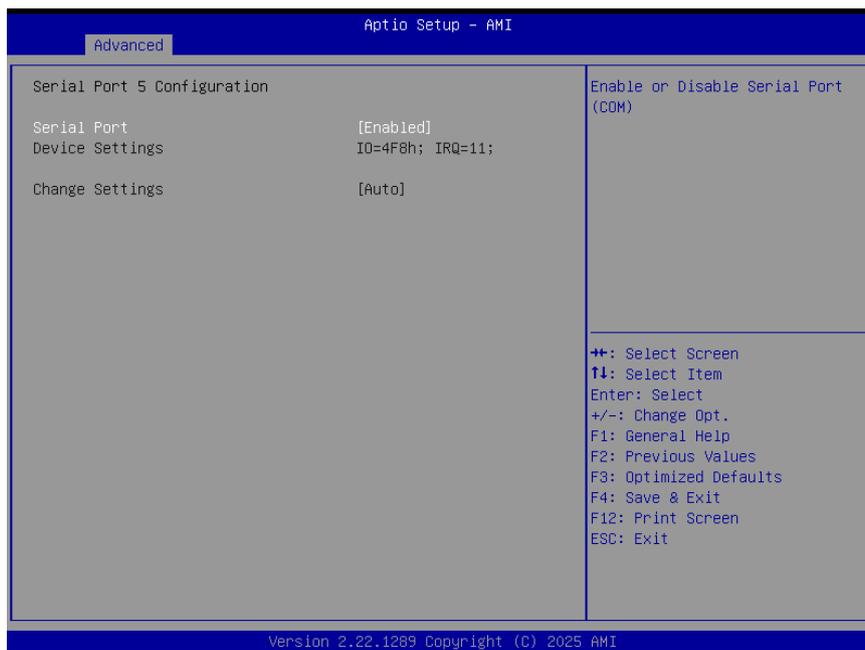
Item	Option	Description
Serial Port	Enabled[Default], Disabled	Enable or Disable Serial Port (COM).

4.6.2.5.4 Serial Port 4 Configuration



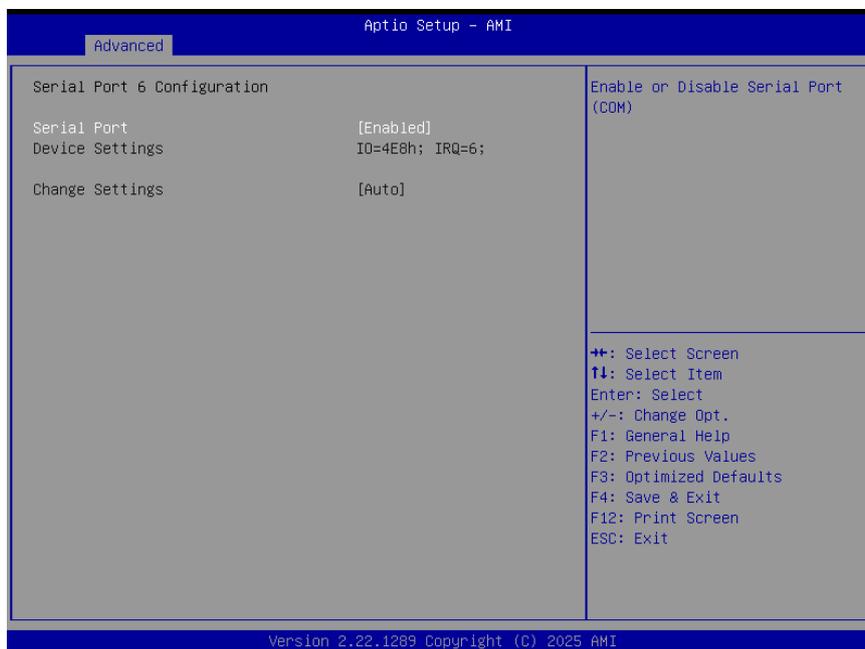
Item	Option	Description
Serial Port	Enabled[Default], Disabled	Enable or Disable Serial Port (COM).

4.6.2.5.5 Serial Port 5 Configuration



Item	Option	Description
Serial Port	Enabled[Default], Disabled	Enable or Disable Serial Port (COM).

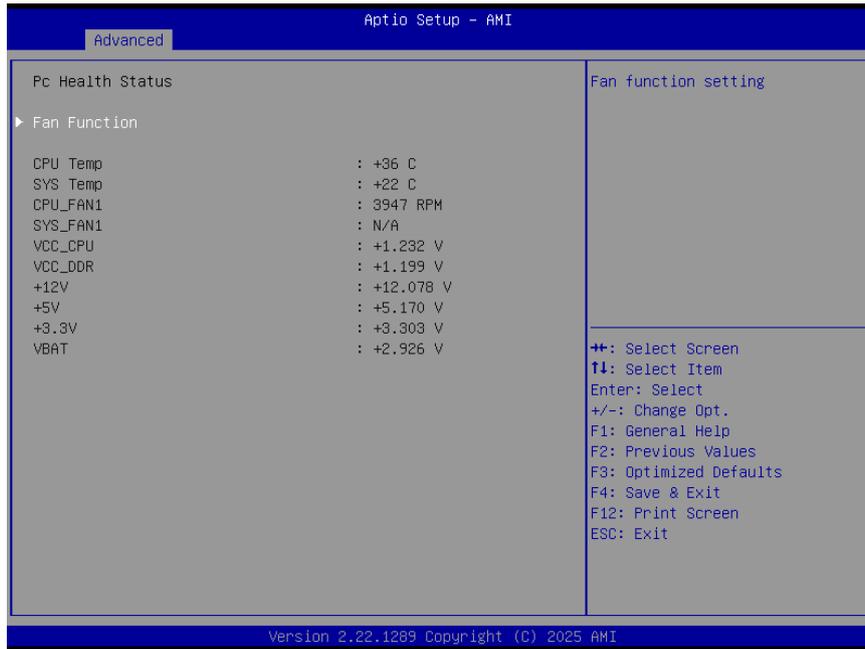
4.6.2.5.6 Serial Port 6 Configuration



Item	Option	Description
Serial Port	Enabled[Default], Disabled	Enable or Disable Serial Port (COM).

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4.6.2.6 Hardware Monitor



4.6.2.6.1 Fan Function



Item	Option	Description
CPU_FAN1 Mode	Full on Mode[Default], Automatic Mode Manual Mode	CPU_FAN1 Mode Select.
SYS_FAN1 Mode	Full on Mode[Default], Automatic Mode Manual Mode	SYS_FAN1 Mode Select.

4.6.2.7 Display Configuration



Item	Options	Description
LVDS Control	Disabled, Enabled [Default]	LVDS Control
LCD Panel Type	1024x768 18 Single 1680x1050 24 Dual 1600x1200 24 Dual 1600x900 24 Dual 1440x900 24 Dual 1366x768 24 Single 1366x768 18 Single 1280x1024 24 Dual 1280x1024 18 Dual 1024x768 24 Single [Default] 1920x1080 24 Dual 1024x600 24 Single 1024x600 18 Single 800x600 24 Single 800x600 18 Single 800x480 18 Single	Select LCD Panel Type.

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4.6.2.8 Power Control



Item	Options	Description
PowerOn after PowerFail	Power On Power Off[Default] Last State	Specify what state to got to when power is re-applied after a power failure (G3 state).
Soft-Off by PWR-BTTN	Instant-Off[Default] Delay 4 Sec.	Soft-Off by PWR-BTTN.

4.6.2.9 S5 RTC Wake Settings

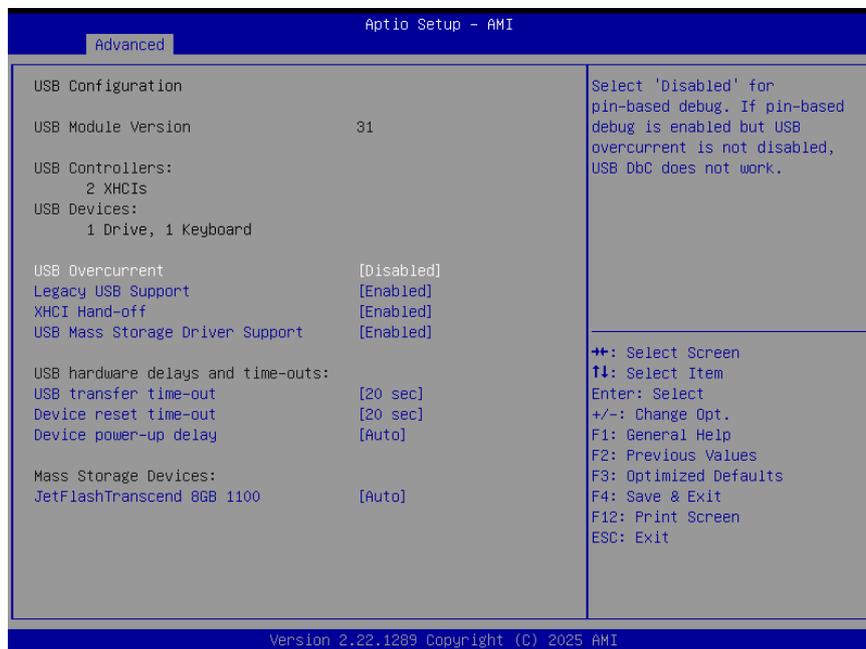


Item	Options	Description
Wake system from S5	Disabled[Default], Fixed Time	Enable or disable System wake on alarm event. Select Fixed Time, system will wake on the hr::min::sec specified.

	Dynamic Time	Select Dynamic Time, System will wake on the current time + Increase minute(s).
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4.6.2.10 USB Configuration

The USB Configuration menu helps read USB information and configures USB settings.



Item	Options	Description
USB Overcurrent	Disabled[Default] Enabled	Select 'Disabled' for pin-based debug. if in-based debug is enabled but USB overcurrent is not disabled, USB DbC does not work.
Legacy USB Support	Enabled[Default] Disabled Auto	Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications.
XHCI Hand-off	Enabled[Default] Disabled	This is a workaround for Oses without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
USB Mass Storage Driver Support	Disabled Enabled[Default]	Enable/Disable USB Mass Storage Driver Support.
USB transfer time-out	1 sec 5 sec 10 sec 20 sec[Default]	The time-out value for Control, Bulk, and Interrupt transfers.
Device reset time-out	10 sec 20 sec[Default] 30 sec 40 sec	USB mass storage device Start Unit command time-out.
Device power-up delay	Auto[Default] Manual	Maximum time the device will take before it properly reports itself to the Host Controller. 'Auto' uses default value: for a Root port it is 100ms, for a Hub port the delay is taken form

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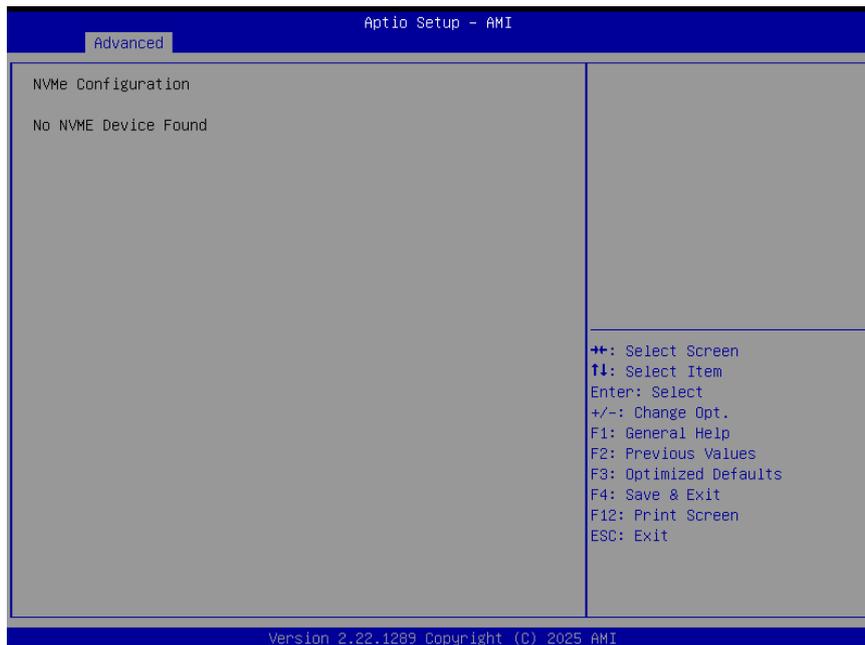
		Hub descriptor.
Mass Storage Devices	Auto[Default] Floppy Forced FDD Hard Disk CD-ROM	Mass storage device emulation type. 'AUTO' enumerates devices according to their media format. Optical drives are emulated as 'CDROM', drives with no media will be emulated according to a drive type.

4.6.2.11 Network Stack Configuration

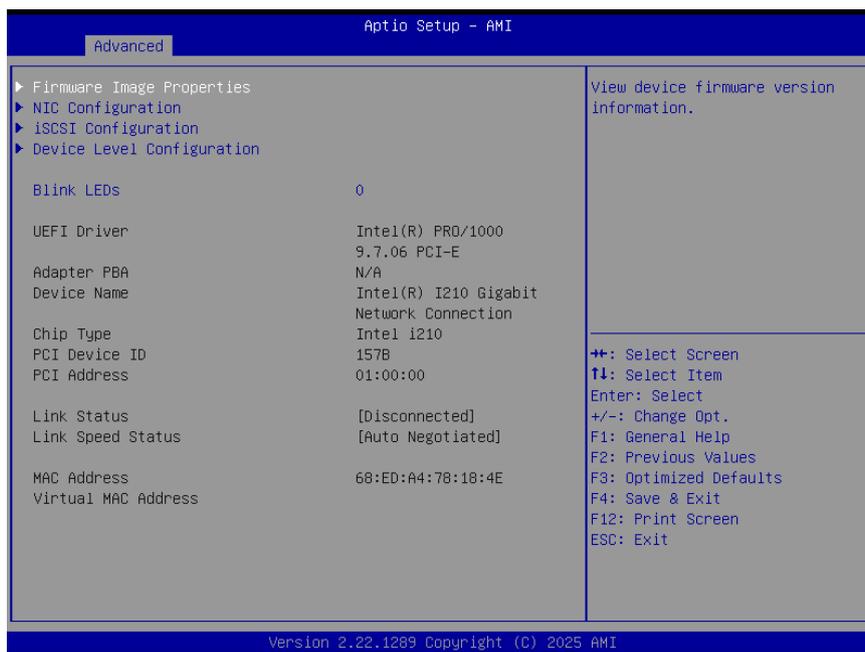


Item	Options	Description
Network Stack	Enabled Disabled [Default]	Enable/Disable UEFI Network Stack.

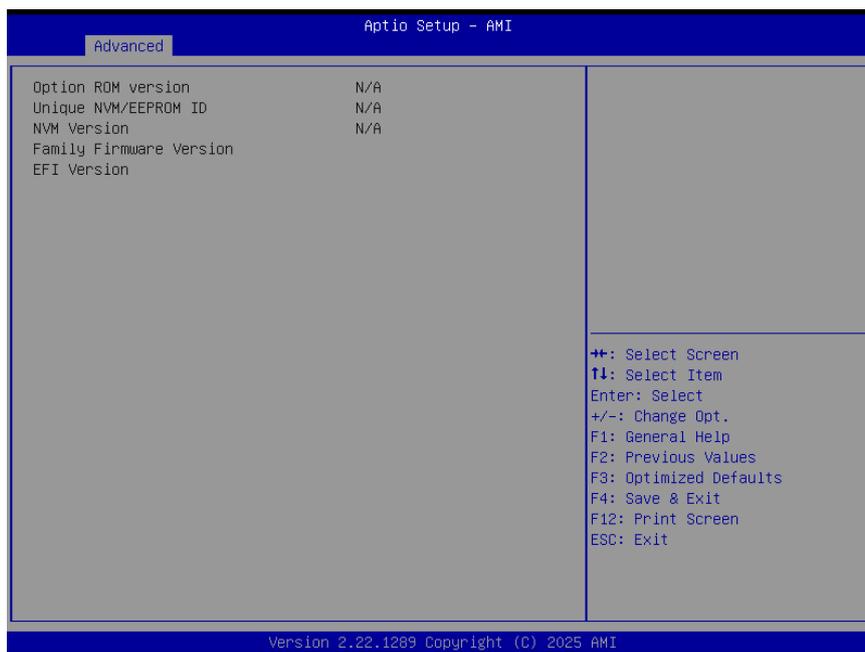
4.6.2.12 NVMe Configuration



4.6.2.13 Intel® I210 Gigabit Network Connection

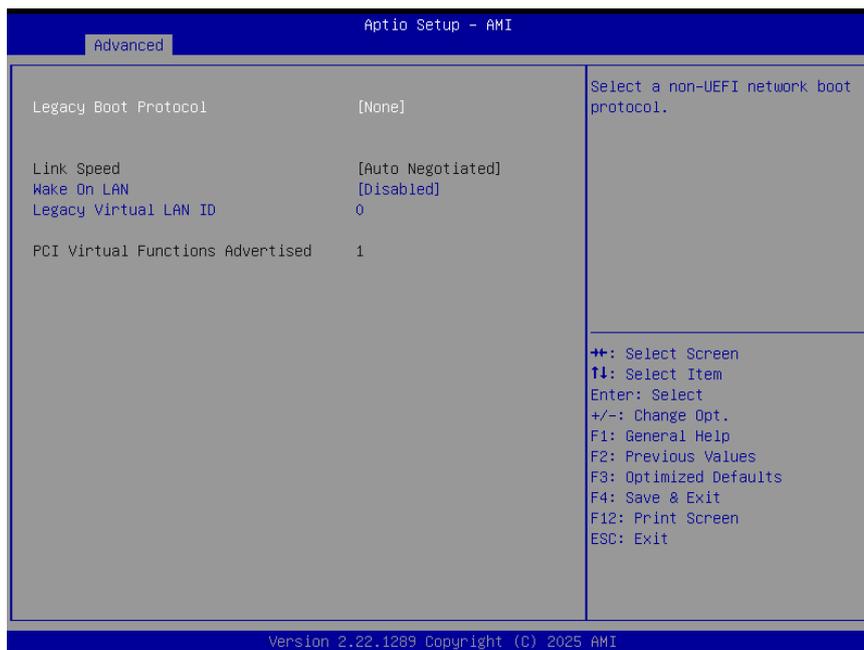


4.6.2.13.1 Firmware Image Properties



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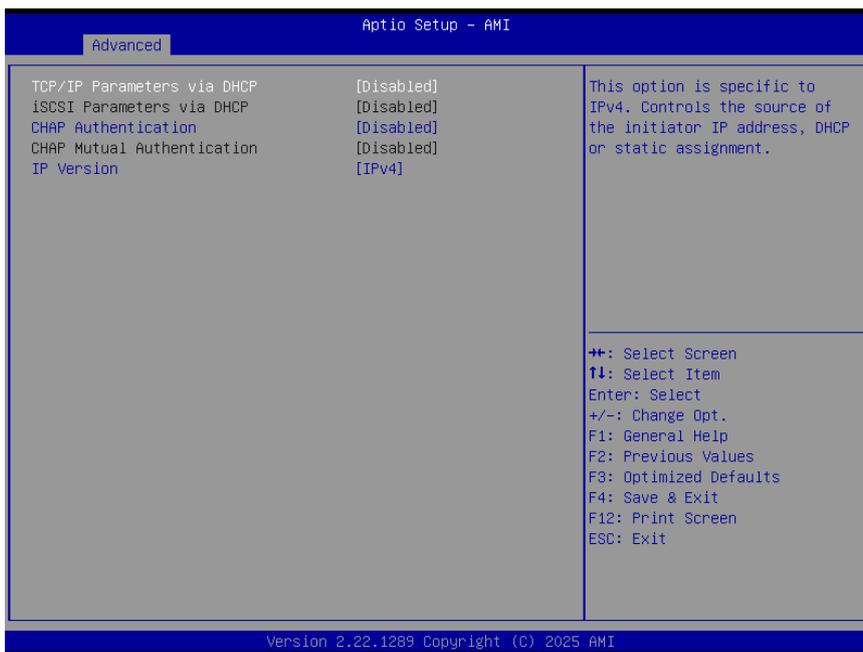
4.6.2.13.2 NIC Configuration



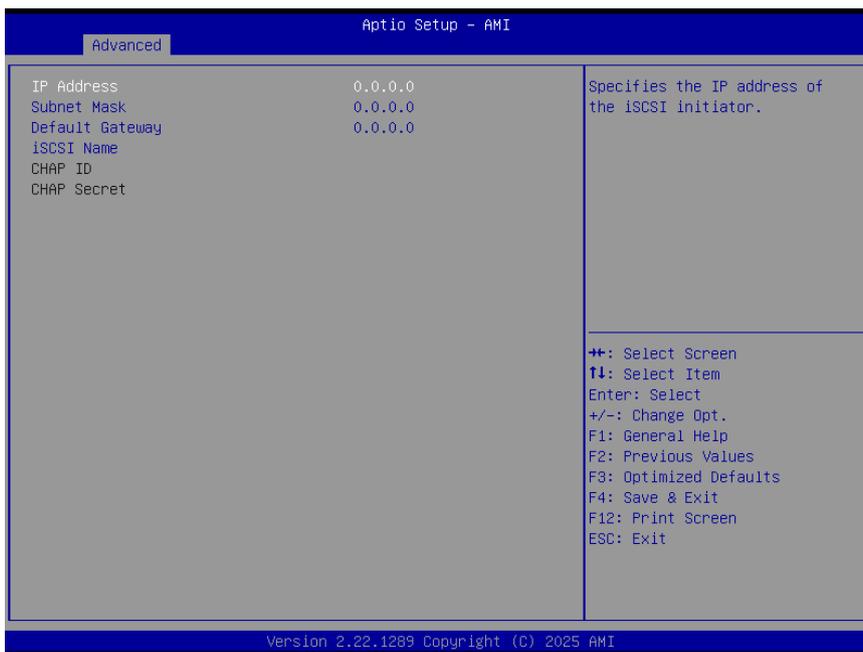
4.6.2.13.3 iSCSI Configuration



4.6.2.13.3.1 iSCSI General Parameters

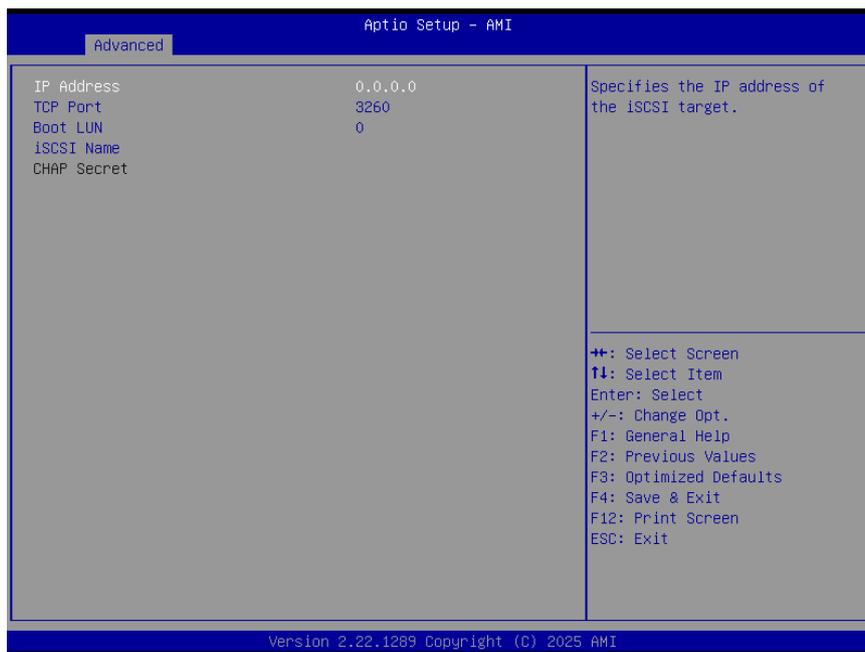


4.6.2.13.3.2 iSCSI Initiator Parameters

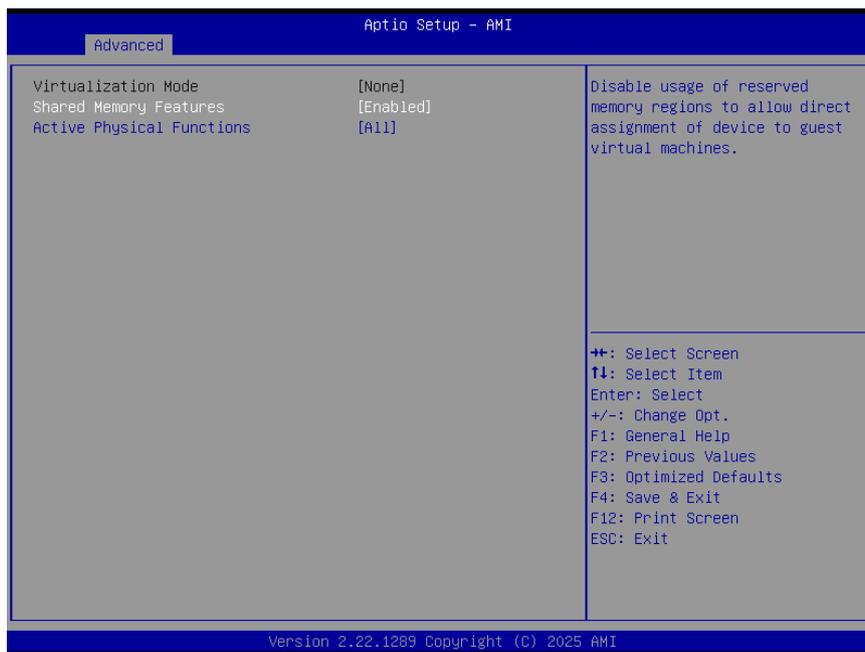


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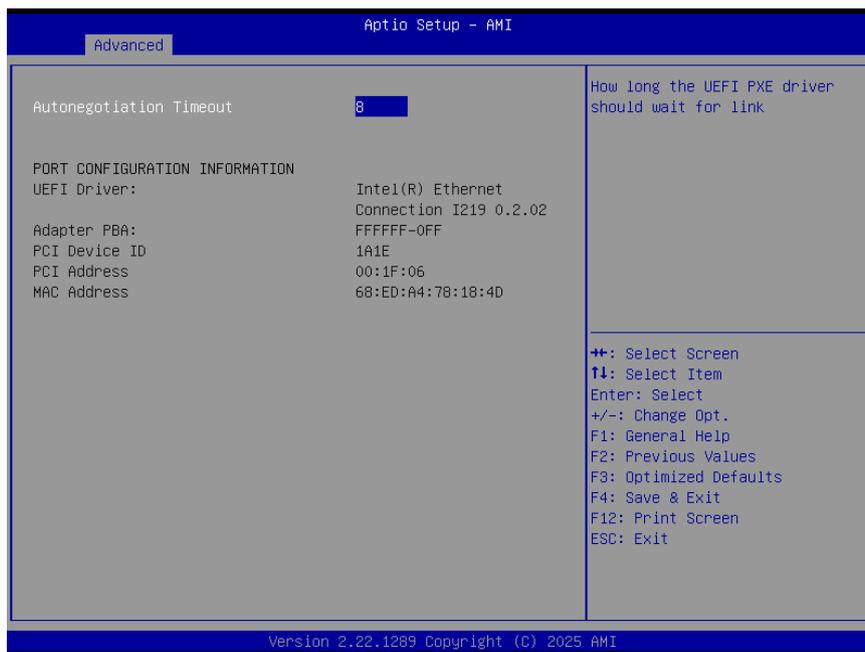
4.6.2.13.3 iSCSI First Target Parameters



4.6.2.13.4 Device Level Configuration



4.6.2.14 Intel® Ethernet Connection (16) I219-LM



4.6.3 Chipset



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4.6.3.1 System Agent (SA) Configuration



4.6.3.1.1 Memory Configuration



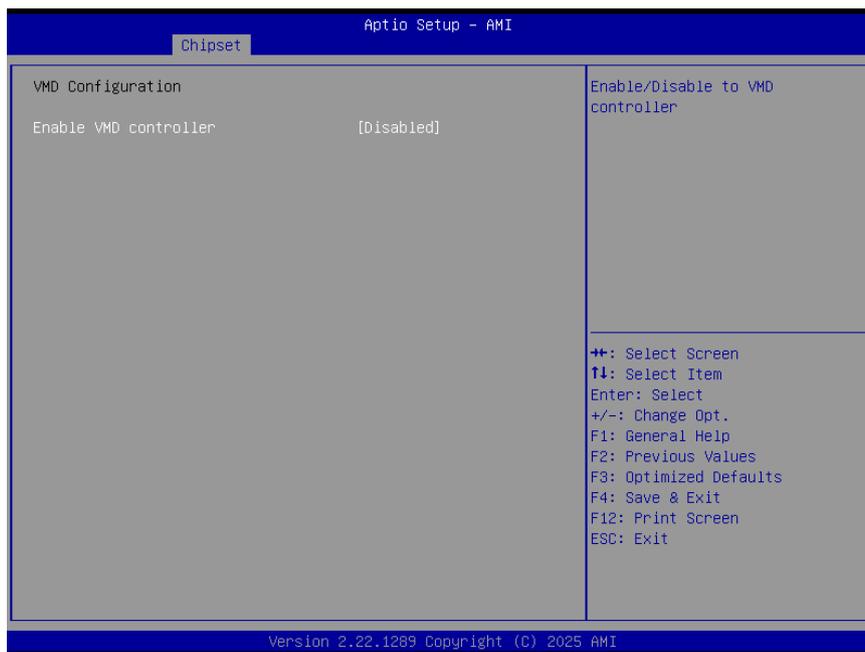
4.6.3.1.2 Graphics Configuration



Item	Option	Description
Primary Display	Auto[Default] IGFX PEG Slot PCH PCI HG	Select which of IGFX/PEG/PCI Graphics device should be Primary Display Or select HG for Hybrid Gfx.
Internal Graphics	Auto[Default] Disabled Enabled	Keep IGFX enabled based on the setup options.
Above 4GB MMIO BIOS assignment	Enabled[Default] Disabled	Enable/Disable above 4GB MemoryMappedIO BIOS assignment. This is enabled automatically when Aperture Size is set to 2048MB.

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4.6.3.1.3 VMD setup menu



Item	Option	Description
Enable VMD controller	Disabled[Default] Enabled	Enable/Disable to VMD controller.

4.6.3.1.4 PCI Express Configuration



4.6.3.1.4.1 PCI Express Root Port 1



Item	Option	Description
PCIEX8_SLOT1	Disabled Enabled [Default] ,	Control the PCI Express Root Port.
PCIe Speed	Auto [Default] Gen1 Gen2 Gen3 Gen4 Gen5	Configure PCIe Speed.

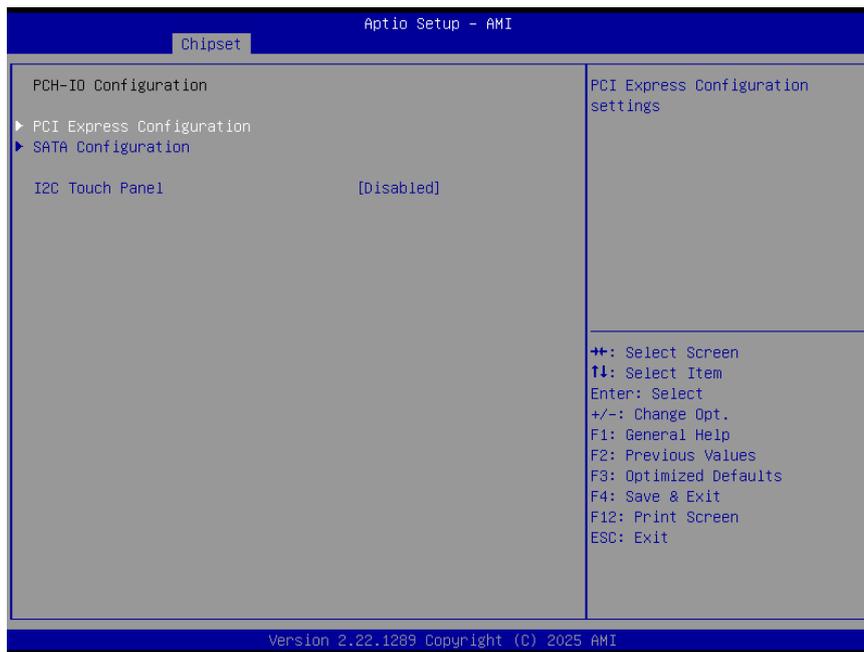
4.6.3.1.4.2 PCI Express Root Port 3



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Item	Option	Description
M.2_KEYM_PCIESSD1	Enabled[Default], Disabled	Control the PCI Express Root Port.
PCIe Speed	Auto[Default] Gen1 Gen2 Gen3 Gen4 Gen5	Configure PCIe Speed.

4.6.3.2 PCH-IO Configuration



Item	Option	Description
I2C Touch Panel	Enabled Disabled[Default],	Indicates what type of I2C Touch Panel is connected to this SerialIO controller.

4.6.3.2.1 PCI Express Configuration



4.6.3.2.1.1 M.2_KEYE_WLAN1



Item	Option	Description
M.2_KEYE_WLAN1	Enabled[Default], Disabled	Control the PCI Express Root Port.
PCIe Speed	Auto[Default] Gen1 Gen2 Gen3	Configure PCIe Speed.

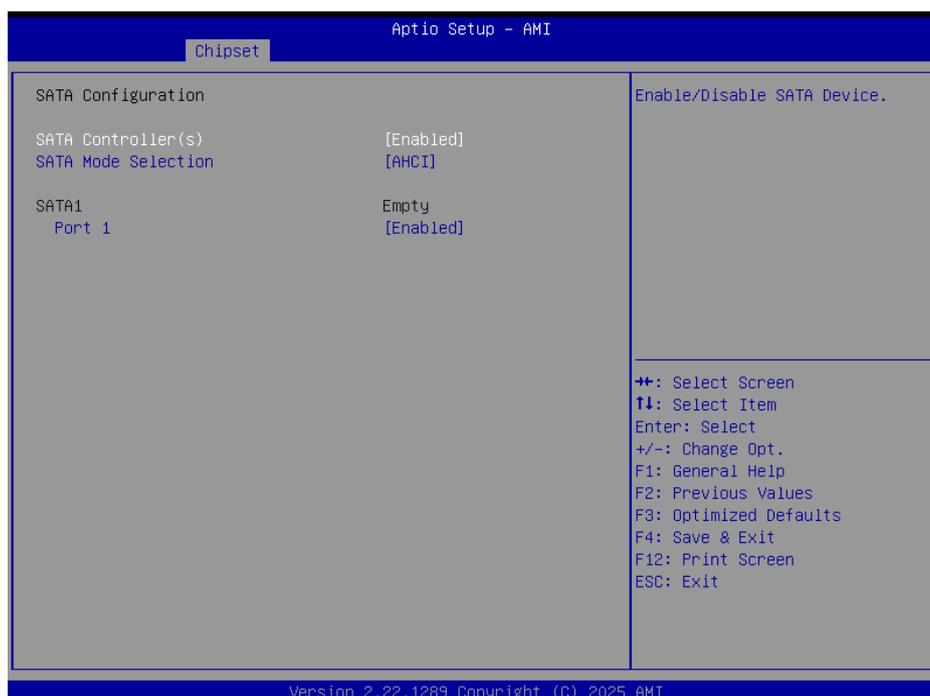
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4.6.3.2.1.2 LAN2



Item	Option	Description
LAN2	Enabled[Default], Disabled	Control the PCI Express Root Port.
PCIe Speed	Auto[Default] Gen1 Gen2 Gen3	Configure PCIe Speed.

4.6.3.2.2 SATA Configuration



Item	Options	Description
SATA Controller(s)	Enabled[Default] Disabled,	Enable/Disable SATA Device.
SATA Mode Selection	AHCI[Default]	Determines how SATA controller(s) operate.
Port 1	Enabled[Default] Disabled	Enable or Disable SATA Port.

4.6.4 Security



- **Administrator Password**

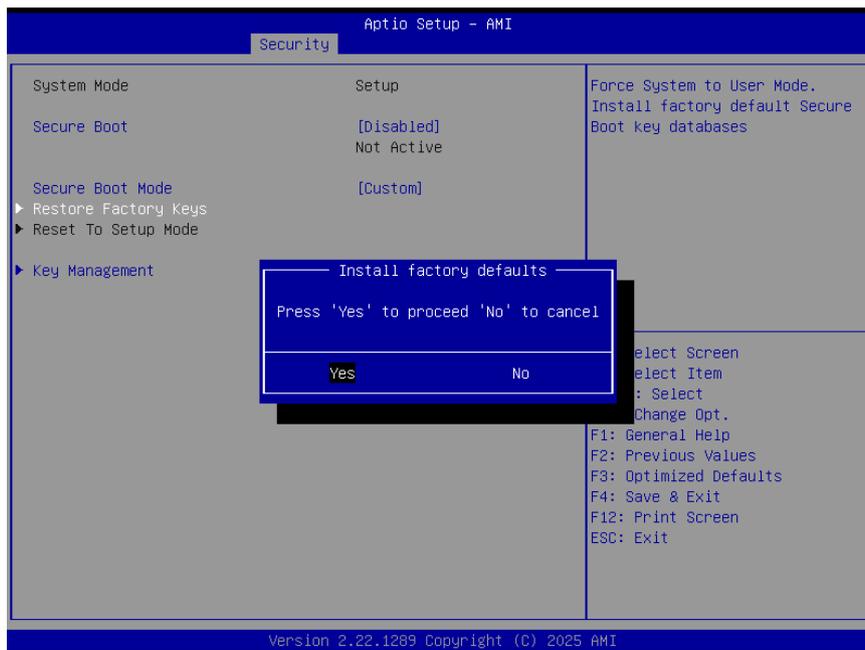
Set setup Administrator Password

- **User Password**

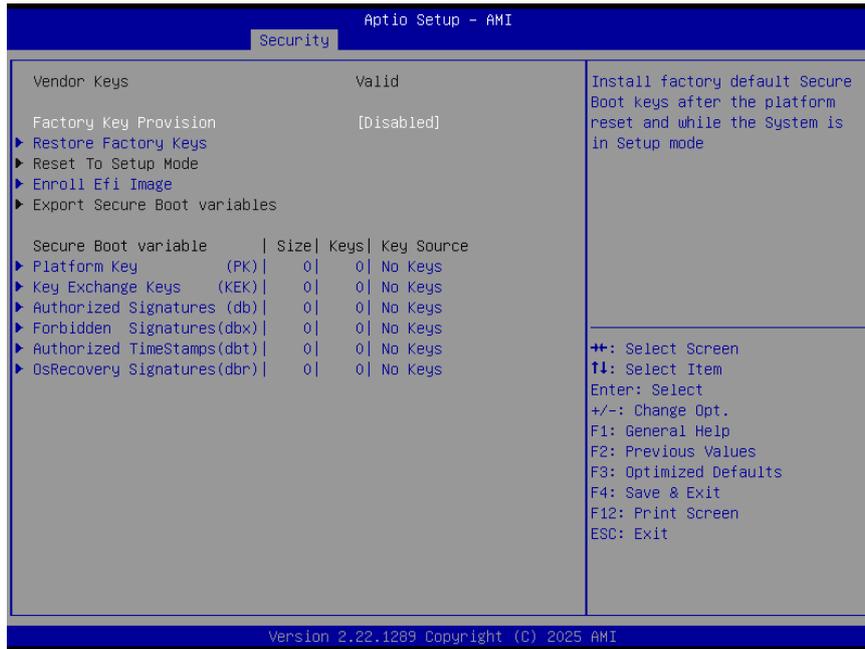
Set User Password

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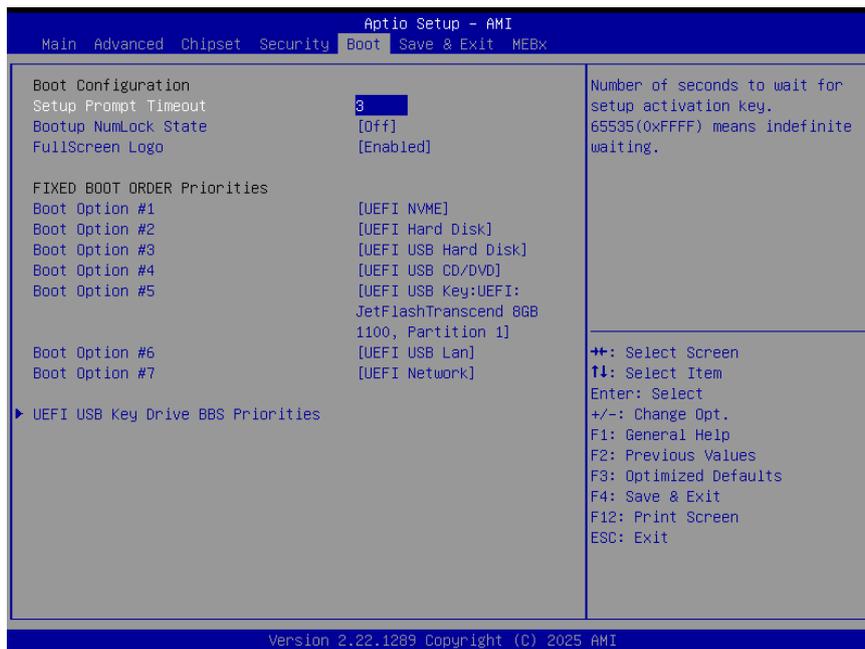
4.6.4.1 Security Boot



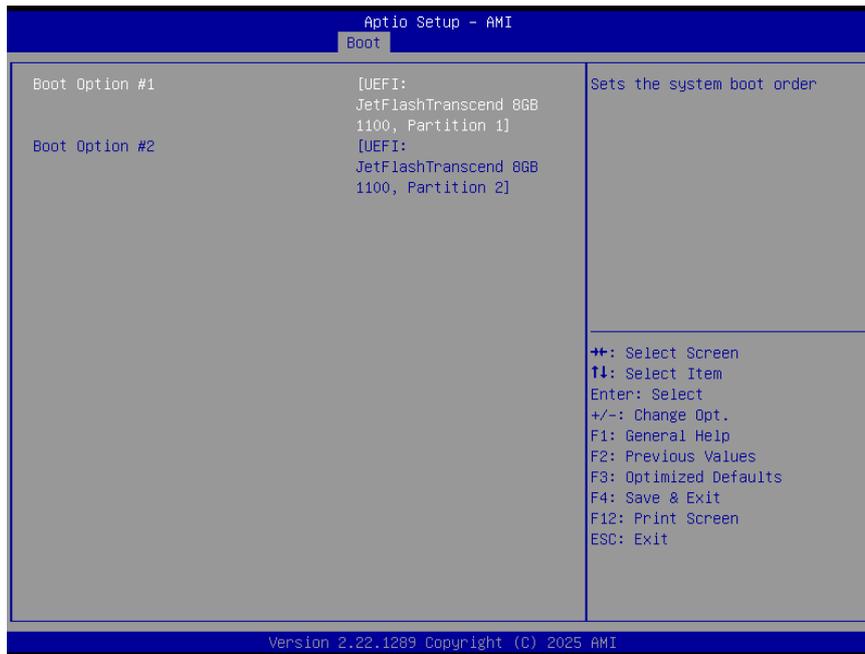
4.6.4.1.1 Key Management



4.6.5 Boot

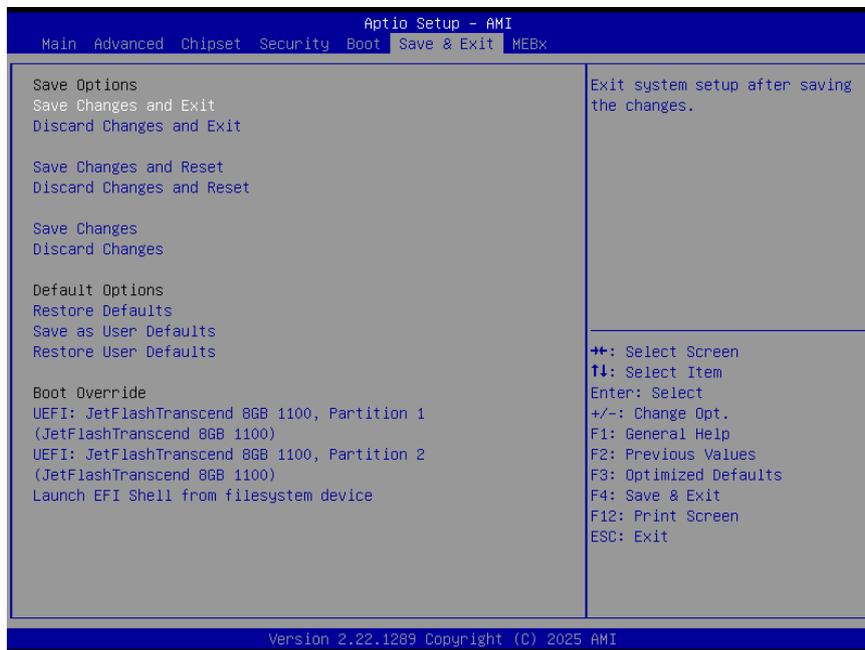


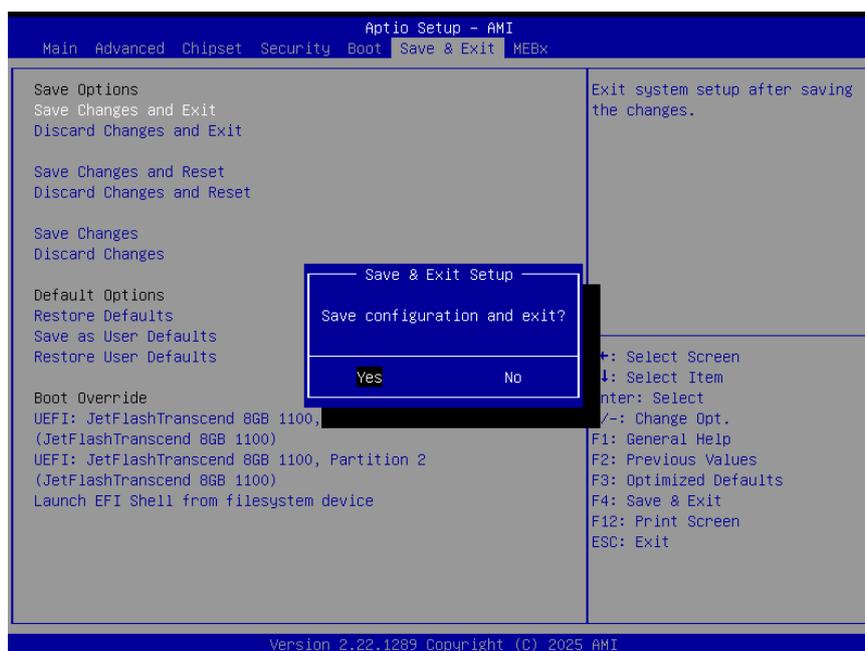
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Item	Option	Description
Boot Option #1/2/3/4/5/6/7		Set the system boot order.

4.6.6 Save and Exit





4.6.6.1 **Save Changes and Exit**

Use the save changes and reset option to save the changes made to the BIOS options and to exit the BIOS configuration setup program.

4.6.6.2 **Discard Changes and Exit**

Use the Discard changes and Exit option to exit the system without saving the changes made to the BIOS configuration setup program.

4.6.6.3 **Save Changes and Reset**

Reset the system after saving the changes.

4.6.6.4 **Discard Changes and Reset**

Any changes made to BIOS settings during this session of the BIOS setup program are discarded. The setup program then exits and reboots the controller.

4.6.6.5 **Save Changes**

Changes made to BIOS settings during this session are committed to NVRAM. The setup program remains active, allowing further changes.

4.6.6.6 **Discard Changes**

Any changes made to BIOS settings during this session of the BIOS setup program are

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discarded. The BIOS setup continues to be active.

4.6.6.7 Restore Defaults

This option restores all BIOS settings to the factory default. This option is useful if the controller exhibits unpredictable behavior due to an incorrect or inappropriate BIOS setting.

4.6.6.8 Save as User Defaults

This option saves a copy of the current BIOS settings as the User Defaults. This option is useful for preserving custom BIOS setup configurations.

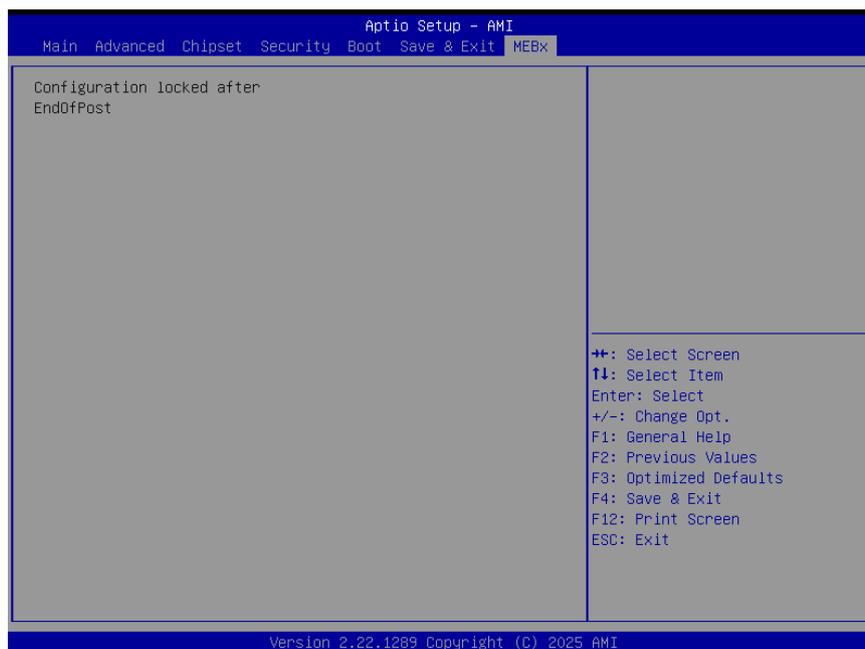
4.6.6.9 Restore User Defaults

This option restores all BIOS settings to the user defaults. This option is useful for restoring previously preserved custom BIOS setup configurations.

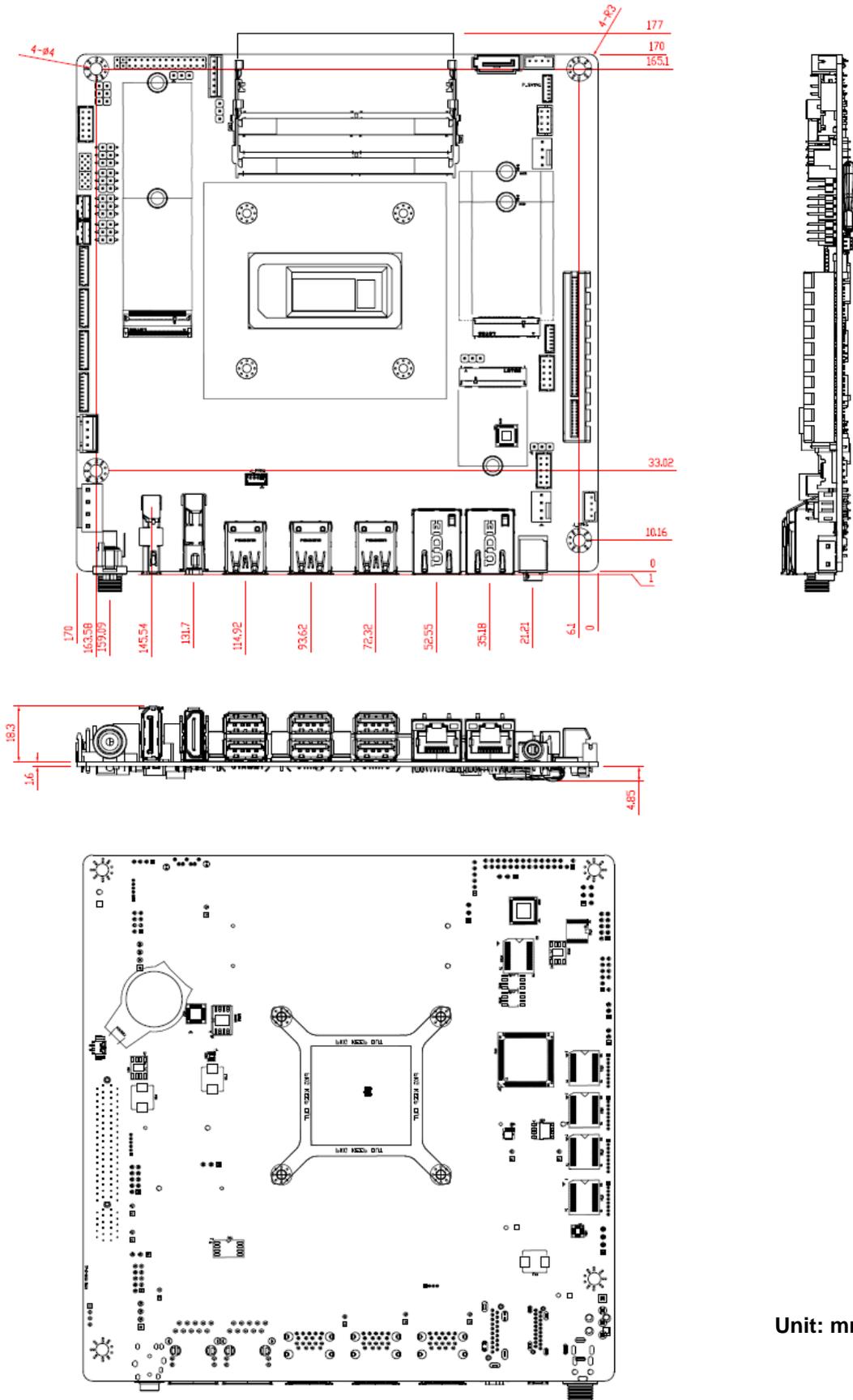
4.6.6.10 Boot override

This option lists all possible bootable devices and allows the user to override the **Boot Option Priorities** list for the current boot. If no changes have been made to the BIOS setup options, the system will continue booting to the selected device without first rebooting. If BIOS setup options have been changed and saved, a reboot will be required and the boot override selection will not be valid.

4.6.7 MEBx



5. Mechanical Drawing



Unit: mm

